Central Virginia PARTNERSHIP for ECONOMIC DEVELOPMENT

Central Virginia's Innovation Corridor:

A Strategy for Accelerating Biosciences and National Security Cluster Growth in GO Virginia Region 9

Performed For: Central Virginia Partnership for Economic Development
Performed By: TEConomy Partners, LLC
Funded By: GO Virginia

JUNE 2026

TECONOMY PARTNERS LLC

This project was funded in part by GO Virginia, a state-funded initiative administered by the Virginia Department of Housing and Community Development (DHCD) that strengthens and diversifies Virginia's economy and fosters the creation of higher wage jobs in strategic industries.

For more information on this report please contact its authors with TEConomy Partners, LLC:
info@teconomypartners.com | www.teconomypartners.com

Contents

Project Advisory Group

The Central Virginia Partnership for Economic Development would like to thank the project Advisory Group for their extremely valuable contributions throughout this effort—from attending several in-person meetings and participating in interviews to sharing critical insights and helping to shape the Strategic Roadmap. The Group members include:

Name	Organization
Todd Bagwell	Hourigan
Chris Bartley	BCubed Engineering
Sunnie Capelle	C-Star Solutions
Helen Cauthen	Central Virginia Partnership for Economic Development (CVPED)
Chris Engel	City of Charlottesville, VA
Fred Epstein	University of Virginia
George Foresman	University of Virginia
Tracey Gardner	Madison County
James Garrett	Luna Labs
Alex Gates	University of Virginia
Ia Gomez	Laurel Ridge Community College
Nikki Hastings	CvilleBioHub
Rebecca Haydock	Venture Central
Sylke Heil	Breakthrough to Solutions
Kari Henry	The MITRE Corporation
Shannon Holland	GO Virginia Region 9; CVPED
Rebecca Ivins	University of Virginia Foundation
Christine Jacobs	Thomas Jefferson Planning District Commission
Rob Jones	University of Virginia
Maureen Kelley	Nelson County, VA
Emily Kilroy	Albemarle County, VA
Mike Lansdown	Defense Intelligence Agency
Pace Lochte	University of Virginia
Patrick Mauney	Rappahannock-Rapidan Regional Commission
Lori McMahon	University of Virginia
Eizabeth Mitchell	National Geospatial-Intelligence Agency
Jim Nardone	Defense Intelligence Agency
Kelli Palmer	IDEA Minds Consulting
Doug Parsons	Fauquier County, VA
Paul Perrone	Perrone Robotics, Inc.
Julie Perry	Orange County, VA
PJ Rooney	National Ground Intelligence Center
Bryan Rothamel	Culpeper County, VA
Jean Runyon	Piedmont Virginia Community College
Jennifer Schmack	Fluvanna County, VA
Michael Scott	National Ground Intelligence Center
Thomas Thorpe	Afton Scientific
Deborah van Eersel	University of Virginia Foundation
Andy Wade	Louisa County, VA
Alan Yost	Green County, VA

Executive Summary

Central Virginia is entering a defining period in its economic development trajectory. Across biosciences, national security, and digital technologies, the region is experiencing a wave of investment and growth that is larger than any single project or company expansion. Major commitments by the University of Virginia (UVA), AstraZeneca, Afton Scientific, L3Harris, and many others—combined with the expanding mission presence around Rivanna Station and continued growth among software, cyber, data-driven, and engineering-intensive firms—are creating an important window of opportunity to shape a more coherent, innovation-led regional economy.

What distinguishes this moment is not just the pace of activity, but the way the region's assets increasingly intersect. UVA's research enterprise, health system, and translational capabilities; the region's growing biosciences base; and Central Virginia's national security and data-centric strengths are no longer operating as separate silos. Together, they form the basis for a more integrated *Innovation Corridor* in which research, industry, and mission-driven applications can reinforce one another and generate broader economic impact for the region.

This Strategic Roadmap was commissioned to help regional leaders answer a forward-looking question: where is Central Virginia (GO Virginia Region 9) best positioned to compete and differentiate itself in biosciences/life sciences, IT and digital, and national security domains in the next five to ten years? Rather than relying only on backward-looking cluster metrics, this study applies a "line-of-sight" framework that links the region's core research and technology competencies ("technology push") with the needs, momentum, and market opportunities generated by existing and emerging industry clusters ("market pull").

This Strategic Roadmap was commissioned to help regional leaders answer a forward-looking question: where is Central Virginia (GO Virginia Region 9) best positioned to compete and differentiate itself in biosciences/life sciences, IT and digital, and national security domains in the next five to ten years?

The strategy advanced in this report is based on a clear proposition—Central Virginia should not attempt to compete as a broad "generalist" innovation region. Its opportunity lies in concentrating on the domains where it already possesses distinctive scientific, technical, industrial, and institutional strengths—and where those strengths align with visible market demand and long-term growth potential.

The result is an identified focused portfolio of forward-looking growth opportunities in the biosciences and national security, along with a set of cross-cutting strategic actions intended to strengthen the regional ecosystem needed to realize them.

Figure ES-1.

REGIONAL DEFINITION OF GO VIRGINIA REGION 9—CITY OF CHARLOTTESVILLE AND TEN CENTRAL VIRGINIA COUNTIES

Source: GO Virginia.

A Region at an Inflection Point

Central Virginia has reached a point where several major investments and institutional developments are creating visible economic and innovation opportunities and opening a time-sensitive window for coordinated action.

Just some of the key recent regional developments include:

- Major new UVA investments in translational bioscience, biotechnology, data science, and national security-relevant research capabilities.
- AstraZeneca's large-scale manufacturing commitment in Albemarle County, adding a globally recognized anchor to the region's emerging therapeutics and biologics ecosystem.
- Continued expansion of defense and intelligence-related activity around Rivanna Station and among regional contractors, manufacturers, and technology firms. This includes a recent announcement by L3Harris regarding a $1 billion expansion of its manufacturing operations in Orange County and the creation of the Virginia Advanced Propulsion Facilities.
- Growth in digital infrastructure and data-intensive activity that supports both bioscience and national security applications.

Combined, these developments create exciting momentum for a region of Central Virginia's size. But that momentum alone is not enough; to convert it into lasting growth and reach its economic potential, the region will need stronger coordination across research, commercialization, talent, infrastructure, branding, and cluster development functions.

The message is straightforward—Central Virginia has enough differentiated assets to build nationally relevant positions in selected bioscience and national security domains, but only if the region becomes more intentional about connecting its institutional strengths, cluster development efforts, sites and infrastructure, workforce systems, and commercialization support functions.

Where Central Virginia Can Win: Identifying Forward-Looking Growth Opportunities

The growth framework applied in this strategy is designed to look beyond historic performance alone. Rather than asking only where Central Virginia has activity today, it asks where the region has the depth of capability to build defensible, forward-looking advantage.

The assessment utilized in this study brings together two forces:

- On one side is the region's "*technology push*" out of its research assets, primarily UVA. The technology push assessment considers and identifies areas of R&D excellence and critical mass (i.e., core competencies) across research publications, grants, R&D expenditures, research centers and institutes, intellectual property, and specialized scientific and engineering assets.

- On the other side is the region's "*market pull*" for innovation and talent needs and considers industry cluster growth, firm activity, venture and innovation signals, talent deployment, strategic investments, and demand emerging from both commercial markets and national security missions.

Importantly, the data analyses were complemented by extensive qualitative input and guidance. It is critical to go beyond quantitative analyses, to understand underlying dynamics and ground truths for the region, as well as to better understand forward-looking investments, strategic priorities, and additional activities that may help define potential growth opportunity areas. This information requires guidance from regional industry and academic, research, economic development, and other innovation ecosystem leadership. This input was gathered via two key qualitative approaches:

- **Guidance from a 40-member Advisory Group**, with members strategically selected to reflect leading industry clusters, UVA, federal agencies, and economic development leadership. In-person committee meetings and one-on-one interview discussions were held to ensure appropriate feedback and guidance.

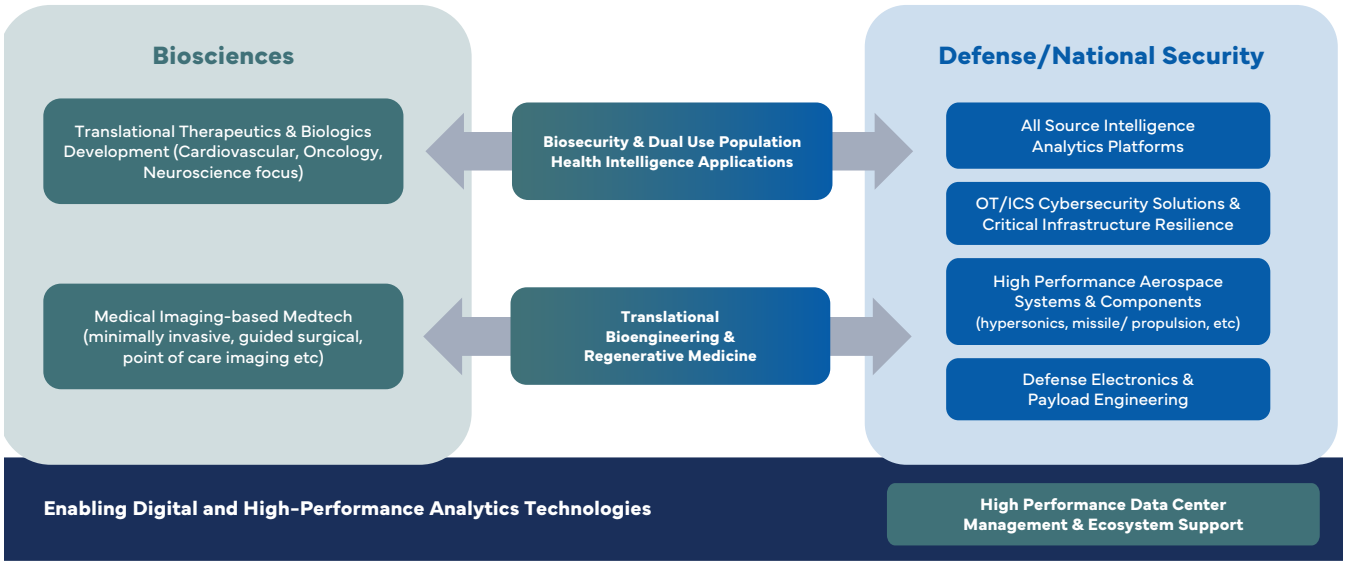
- **One-on-one or small group interviews** with 56 regional industry, university, and economic development stakeholders.

In some cases, the qualitative input and feedback confirmed initial recommended growth opportunity areas, and in others it helped to refine or alter the thrust of an area to better reflect present realities and planned future investments.

The synthesis of Central Virginia's technology push and market pull analyses points to a set of eight concrete, regionally grounded growth opportunities in biosciences and national security domains, with digital capabilities serving as connective tissue across many of them (Figure ES-2).

Figure ES-2.

CENTRAL VIRGINIA GROWTH OPPORTUNITIES IDENTIFIED IN TARGET BIOSCIENCES AND NATIONAL SECURITY DOMAINS



Source: TEConomy analyses.

The growth opportunity portfolio that emerges is grounded in assets Region 9 already possesses, but oriented towards markets where those assets can be translated into stronger specialization over time. In biosciences, Central Virginia is particularly well positioned around translational therapeutics and biologics, imaging-based and minimally invasive medtech, and selected bioscience-adjacent areas where data, population health, and dual-use applications intersect.

These opportunities are reinforced by a combination of institutional strengths and visible market activity. UVA's translational and clinical research depth, the soon to be launched Manning Institute of Biotechnology, existing and expanding companies in therapeutics, medtech, and industrial biosciences, and new manufacturing anchors such as AstraZeneca together give the region a stronger platform than it had even a few years ago.

On the national security side, the region's position is shaped by the proximity and mission relevance of Rivanna Station, the presence of defense contractors and specialized engineering firms, and UVA capabilities in data analytics, sensing, modeling, cybersecurity, aerospace, and systems engineering. The opportunity is therefore not limited to traditional defense contracting, it increasingly lies in the convergence of analytics, autonomy, cyber-physical systems, secure digital infrastructure, and dual-use technologies.

Across both domains, the underlying theme is the same—Central Virginia has the basis for specialization where research excellence, industry momentum, and mission-driven demand overlap. That is where regional strategy should concentrate its attention.

Situational Assessment and Strategic Implications: Regional Stakeholder Input

Stakeholder interviews and discussions inform the strategy in critical ways. The interviews describe a region that has moved from "potential to proof points," but they also reveal structural gaps that could limit the ability to convert current momentum into sustained cluster growth.

Overarching regional themes from stakeholder interviews include:

Across stakeholder input on the overall regional economy, several strengths stand out (Figure ES-3):

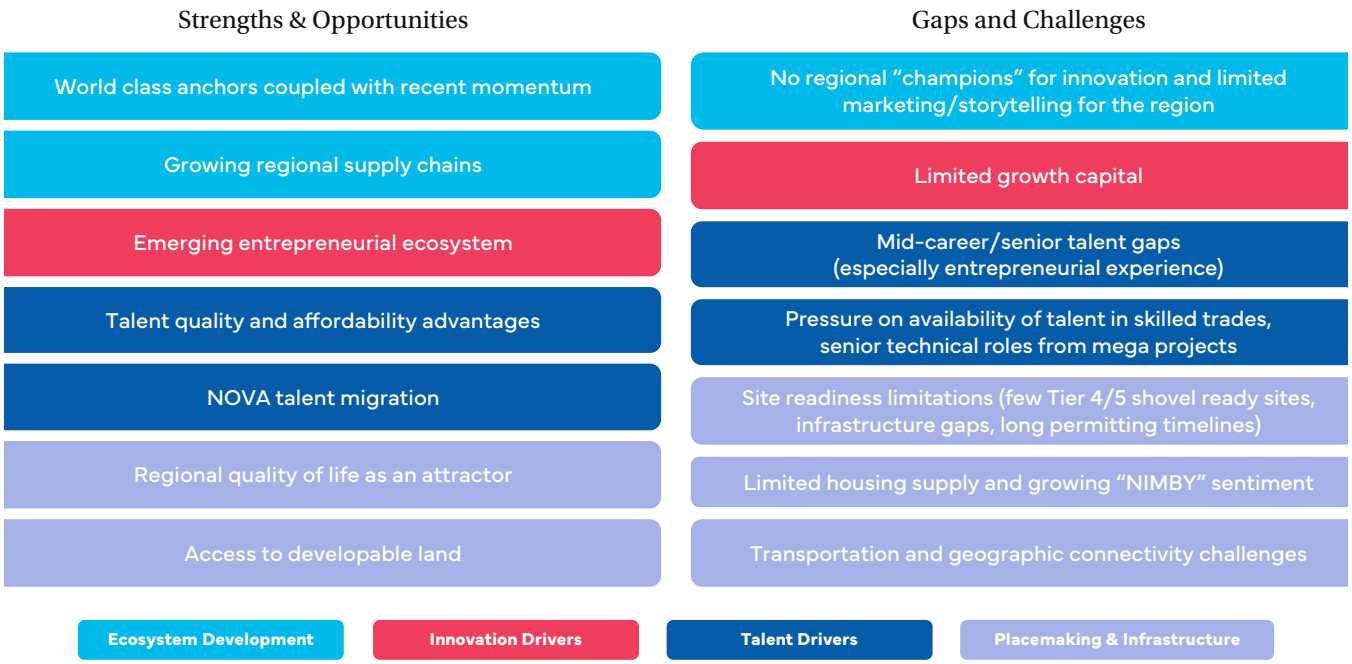
- A growing set of visible anchor investments and institutional commitments.
- A strong quality of life and talent proposition relative to larger coastal markets.
- Opportunity for cross-county supply chain and entrepreneurial linkages across the region.
- A research-intensive university and a federal mission presence that give the region unusual assets for its size.

At the same time, stakeholders identify cross-cutting gaps that affect both biosciences and national security development:

- The absence of a single, clear organizational home or champion for the broader Innovation Corridor concept.
- Fragmented marketing and storytelling about the region's differentiators.
- Gaps in commercialization support and growth capital, especially for capital-intensive ventures.
- Infrastructure and placemaking challenges, including sites, permitting, housing, connectivity, and specialized facilities.

Figure ES-3.

THEMES FROM REGION 9 ECONOMIC DEVELOPMENT STAKEHOLDER ENGAGEMENT INFORMING STRATEGIC PRIORITIES FOR CENTRAL VIRGINIA



Source: TEConomy regional stakeholder interview synthesis.

The report distills these into three broad strategic implications for the Innovation Corridor overall, with a need to address these in strategic interventions:

1. Seize the current window of opportunity created by anchor investments and visible momentum.
2. Organize the ecosystem more intentionally for success, including clarifying roles and coordination mechanisms.
3. Ensure that all counties in the region can benefit from and contribute to corridor growth.

Situational Assessment: Biosciences Themes

From regional biosciences stakeholder discussions, workforce and talent emerge as the most immediate and foundational issue for biosciences growth in Central Virginia. The region's recently published biosciences workforce strategy found a sizable and growing industry base with rising demand for talent, strong wages, and a robust but still fragmented set of education and training assets spanning K-12, community colleges, UVA, internships, bridge programs, apprenticeships, and incumbent-worker programs.

This strategy explicitly incorporates key findings from the recently completed *Talent Pathways* strategy, rather than duplicating that document in full.[1] Key takeaways from the Talent Pathways strategic plan include:

- Central Virginia's bioscience industry is already sizable and growing, but employers report persistent challenges in talent sourcing, retention, skills mismatches, and the scale of local entry-level pipelines.
- The region has a robust foundation of educational and training assets spanning K-12, community colleges, UVA, internships, bridge programs, and workforce initiatives, but these operate more as disconnected nodes than as an integrated talent system.
- Demand is expected to intensify significantly as investments such as the Manning Institute, AstraZeneca, and related initiatives come online.
- Retention is a major issue: many life sciences graduates leave the region over time even though employers report strong retention among those who do enter local firms.

Viewed as a critical challenge and limiting factor for enabling continued growth, CvilleBioHub and its regional partners initiated a strategic planning effort in 2025, in partnership with TEConomy, for a comprehensive plan to address the region's gaps and challenges around workforce and talent. The insights and key findings gleaned from this work are provided herein as talent remains the cluster's leading strategic priority.

The Talent Pathways work frames three mutually reinforcing priorities that this roadmap adopts as the biosciences workforce agenda:

- Strengthen regional pipelines for both technician/lab support roles and specialized science and engineering roles.
- Better connect the workforce ecosystem through more formal coordination and stronger career awareness.
- Better tell the region's bioscience story for recruitment and retention.

These priorities remain highly relevant not only for biosciences workforce development in its own right, but because they underpin the broader cluster growth agenda advanced here.

Beyond workforce, the biosciences situational assessment also surfaces another major issue—gaps in the commercialization continuum,

1 TEConomy Partners, LLC, "Talent Pathways: A Biosciences Workforce and Talent Strategy for GO Virginia Region 9 to Support Rapid Growth and Momentum of a Vibrant Industry," February 2026.

especially access to sophisticated early-stage and growth capital for regional bioscience firms.

Region 9 has important assets, including UVA commercialization functions, angel activity, and the Commonwealth BioAccelerator, but these do not yet fully meet the capital intensity and scale needs of emerging bioscience firms. The risk, if this gap persists, is that promising companies will remain undercapitalized or relocate to better-funded ecosystems.

Central Virginia's biosciences cluster is maturing and gaining momentum, but that success will depend upon building a stronger and more coordinated talent ecosystem, improving the commercialization continuum, and intentionally organizing programming around the highest-potential opportunity areas identified in this study.

Situational Assessment: National Security Themes

Central Virginia's national security cluster is shaped by a rare combination of federal mission presence, university research capacity, and an emerging base of private sector firms working across defense, intelligence, cyber, analytics, aerospace, and related dual-use technologies. At the center of this position is Rivanna Station, which hosts the National Ground Intelligence Center (NGIC), a Charlottesville element of the National Geospatial-Intelligence Agency (NGA), and a significant Defense Intelligence Agency (DIA) presence, giving the region one of the more distinctive intelligence community concentrations outside Northern Virginia.

That federal anchor gives Central Virginia unusual strategic assets. Stakeholders consistently pointed to the value of having all-source intelligence, geospatial analysis, signals-related capabilities, and biological threat assessment functions concentrated in one regional node, alongside close proximity to the broader Northern Virginia defense and intelligence ecosystem.

The region also benefits from a growing set of related university assets, including UVA's National Security Data and Policy Institute, the Biocomplexity Institute, the School of Data Science, the Link Lab, and aerospace and engineering research capabilities aligned with mission needs in analytics, modeling, sensing, cyber-physical systems, and advanced engineering.

The cluster, however, is no longer defined only by federal presence.

- Interviews suggest that awareness of the region's national security profile is rising among local firms, economic development organizations, and university actors, while recent growth in defense-related companies and adjacent innovation assets is beginning to create a broader cluster identity. Stakeholders also emphasized the region's quality of life and relative affordability compared with Northern Virginia as meaningful advantages for attracting and retaining mission-experienced talent, especially mid-career professionals seeking an alternative to the larger Washington-area market.

At the same time, it is clear that Central Virginia's national security assets do not yet operate as a fully integrated innovation ecosystem.

- The most consistent theme across stakeholder interviews is fragmentation—federal agencies, university units, prime contractors, specialized SMEs, economic development groups, and entrepreneurial support organizations remain only loosely connected, often engaging one another through individual relationships rather than through structured, durable mechanisms. The result is a cluster with significant raw material for growth, but one that still functions more as a set of parallel activities than as a coordinated regional system.

- This fragmentation has several practical consequences. There is no single, visible organizational home for the national security and defense cluster, no clearly designated regional champion, and no widely shared external narrative that communicates Central Virginia's strengths to prospective firms, federal partners, primes, or investors.

- Connections to other important Virginia defense assets and installations, including Dahlgren and Patuxent River, also appear underdeveloped, limiting the region's ability to position itself as part of a broader Mid-Atlantic defense innovation network.

The most consistent theme across stakeholder interviews is fragmentation—federal agencies, university units, prime contractors, specialized SMEs, economic development groups, and entrepreneurial support organizations remain only loosely connected, often engaging one another through individual relationships rather than through structured, durable mechanisms. *The result is a cluster with significant raw material for growth, but one that still functions more as a set of parallel activities than as a coordinated regional system.*

Stakeholders also highlighted the unusually high barriers to entry that shape national security innovation markets.

- For firms and university-originating technologies alike, the path from promising capability to sustainable contract revenue is long, complex, and risky, requiring navigation of federal acquisition regulations, multi-year budgeting cycles, classified or controlled work environments, and early-stage on-ramps such as SBIR/STTR programs or pilot contracts. In this context, many respondents described a persistent "valley of death" between early prototype development and program adoption, especially for hardware-intensive and dual-use technologies.

- Several enabling gaps compound that challenge. Regional firms face a relatively thin pool of growth-oriented capital aligned with defense and dual-use technologies, particularly for companies requiring longer development timelines and more patient financing. The assessment also points to limited use of SBIR and related commercialization vehicles by some regional firms, along with friction around university licensing, access to secure facilities, and the difficulty of aligning academic research processes with operational mission timelines at agencies such as DIA, NGIC, and NGA.

Infrastructure and placemaking issues further affect the cluster's ability to scale.

- Stakeholders repeatedly emphasized the shortage of Sensitive Compartmented Information Facility (SCIF) space and other secure, shared-use environments that would allow university researchers, startups, and SMEs to engage more effectively in classified or controlled national security work. More broadly, the region still lacks a sufficiently visible place-based development strategy for national security growth at

North Fork and Rivanna Futures, even though these sites represent some of the most promising physical platforms for co-location, acceleration, demonstration, and future cluster identity.

Talent is another central issue.

- Central Virginia has meaningful advantages, including UVA's programs in cyber defense, data science, aerospace engineering, and electrical and computer engineering, as well as a potential pool of mission-experienced talent drawn from the broader Washington region. Even so, stakeholders pointed to limited pools of cleared workers, difficulty attracting mid-career technical talent at scale, relatively low awareness among students and early-career professionals of national security career pathways, and growing competition for talent from other regional growth sectors.

Taken together, the situational assessment points to a clear strategic conclusion: no single technology area, firm, or institution can drive the next phase of national security cluster development on its own. The region's opportunity spans all-source intelligence analytics, aerospace and propulsion, defense electronics and payload engineering, cybersecurity, and emerging biosecurity and dual-use applications, but these strengths must be connected more intentionally if they are to produce a recognizable and competitive cluster.

The strategic priorities that emerge therefore operate at two levels:

1. Strengthen the connective tissue of the overall cluster by establishing a visible regional champion and coordination mechanism; building recurring convening, networking, and business-development programming; expanding talent pathways and career awareness; creating a stronger external brand and business attraction effort; and committing to a place-based development vision for North Fork and Rivanna Futures explicitly aligned with national security cluster growth.

2. Advance more targeted supports tied to the region's major opportunity areas, including shared-use secure and fabrication infrastructure for startups and SMEs; translational funding and commercialization support for university-originating and dual-use technologies; stronger pathways into SBIR/STTR and other early-stage defense contracting mechanisms; and domain-specific initiatives in areas such as all-source analytics, defense AI and machine learning, aerospace and hypersonics, defense electronics, sensing, and related secure digital systems.

Central Virginia already has the core ingredients of a significant national security innovation cluster: a major federal anchor, relevant research depth, a growing firm base, and a geography that can support both quality of life and specialized cluster development. The next phase depends less on proving that those assets exist and more on organizing them—physically, institutionally, and strategically—into a more coherent environment for defense innovation, collaboration, and growth.

Regional Vision for a Thriving Central Virginia National Security and Defense Cluster

The long-term vision for this ecosystem to fulfill its potential as a thriving national security and defense hub revolves around establishing a coordinated national security corridor built around a network of place-based assets and anchored by two key nodes—a research and intelligence node at the Southern end of the region (Charlottesville and Counties of Albemarle, Fluvanna, Greene, Louisa, and Nelson) and a testing/proving ground and manufacturing node towards the Northern parts of the region (Counties of Culpeper, Fauquier, Madison, and Orange):

- At the southern end, an intelligence technologies ecosystem anchored by Rivanna Station, North Fork Research Park, and the planned Rivanna Futures development, would be a key growth driver in which cleared talent, shared-use infrastructure, translational research pathways, and mission-aligned entrepreneurship reinforce each other in a self-sustaining growth cycle.

- Meanwhile, at its northern end, this corridor can be anchored by a set of integrated testing and demonstration sites for propulsion systems, such as L3Harris in Orange County, electronic warfare and spectrum dominance, unmanned systems, and other emerging technology platforms that are intentionally co-located with precision manufacturers and defense suppliers in the region's northern counties. These northern test and demonstration complexes would leverage the available land, favorable siting conditions, and receptive economic development partners already identified in those counties, while simultaneously capitalizing on the corridor's proximity to northern Virginia's dense defense and intelligence complex and the broader national capital region.

In combination, the southern intelligence node and northern test and manufacturing node can serve as the structure for an aspirational defense technologies corridor for the region, in which Charlottesville and Albemarle County can function as the early stage technologies engine of the ecosystem and the northern counties serve as a proving ground and production base that together can support a variety of next generation national security missions.

Central Virginia's Strategic Roadmap for Cluster & Ecosystem Development

Based on the situational assessments and identified strategic priorities of the overall ecosystem, the biosciences, and national security, a set of distinct strategies are elevated in the report and designed to address each. Strategic recommendations are presented in summary here, with details provided in the full report, and are designed to help address the identified gaps and challenges to realize the region's economic and growth potential going forward.

In addition, the identified growth opportunities further inform recommendations around cluster collaboration as well as ways in which to intentionally program and organize around these targeted opportunity areas.

Strategic Recommendations: Biosciences

1. **Advance the bioscience cluster's workforce and talent agenda** and implement the strategic recommendations set out in the recently published Talent Pathways plan developed with CvilleBioHub as the regional bioscience industry cluster's leading priority.

2. **Address identified gaps in Central Virginia's biosciences commercialization continuum,** including supporting access to growth capital as a leading priority, to ensure a thriving innovation ecosystem for continued regional cluster development.

3. **Organize regional bioscience cluster-related programming and focused activities around the differentiated priority growth opportunities identified in this strategy;** intentionally target and embed these opportunities in existing and new programming and collaborative cluster activities.

STRATEGY 1: ADVANCE THE WORKFORCE AND TALENT AGENDA AND STRATEGIC RECOMMENDATIONS SET OUT IN CVILLEBIOHUB'S *TALENT PATHWAYS* PLAN

Strategy #1: **Grow the Pipeline for the Regional Biosciences Technician and Laboratory Support Workforce**	*Action 1.1: Scale and Support Targeted Technical Training Programs in Partnership with Community Colleges and Regional Workforce Boards*
	Action 1.2: Expand Collaboration and Coordination with UVA Workforce and Training Programs to Complement Regional Training
	Action 1.3: Expand Experiential Learning and Lab Exposure Programs for Bachelor's Level Students to Better Position Entry-Level Graduates for Industry and Research Settings
	Action 1.4: Anchor Talent in the Region by Providing Ongoing Professional Development for Entry-Level and Early-Career Workers
Strategy #2: **Address Specialized Talent and Skills Demand in High-Skilled Roles**	*Action 2.1: Strengthen Structured Talent Pipelines by Expanding Experiential Learning and Skills-Based Development Programs for Science and Engineering Students*
	Action 2.2: Fully Reinstate and Fund the CvilleBioHub Internship Program (CHIP) at More Significant Scale and Connect to Other Regional Intern Programs
	Action 2.3: Leverage Proximity to UVA Health and Clinical Research Infrastructure to Create Translational Research Fellowships and Joint Industry-Clinician Training Programs
	Action 2.4: Build Programs for Interdisciplinary Skill Development that Bridge Research and Commercialization
	Action 2.5: Encourage Return Migration of Talent by Targeting Former UVA and Other Regional Graduates Now Working in Larger Biotech Hubs
Strategy #3: **Better and More Seamlessly Connect the Workforce and Talent Ecosystem and Resources by Formalizing a Regional Framework for Coordinating Biosciences Workforce Development Pathways and Enhancing Career and Company Awareness**	*Action 3.1: Establish and Fund a "Regional Biosciences Career Navigator" Function at CvilleBioHub*
	Action 3.2: Increase Cross-Company Awareness and Collaboration Through Signature Events and Industry-Wide Networking
	Action 3.3: Expand Networking Opportunities Like Those Offered by CvilleBioHub's CEO Roundtables to Enable Broader Participation and Access
	Action 3.4: Establish a Curated Venue for Emerging Leader Development and Advising to Seed Next Generation of Life Sciences Talent
	Action 3.5: Develop a Coordination Framework and Working Group Among Regional Workforce Development Stakeholders Which Can Seek to Better Integrate Programming, Avoid Duplicative Functions, and Improve Responsiveness
Strategy #4: **Develop, Tell, and Promote Central Virginia's Bioscience Industry "Story" and Associated Brand Identity for Specialized Talent Recruitment**	*Action 4.1: Leverage Ongoing Identification of Regional Strengths and Growth Opportunities in the Bioscience Industry and Innovation Thrusts Identified in Concurrent Work with CVPED and UVA for the "Innovation Corridor" Effort*
	Action 4.2: Coordinate with CvilleBioHub, CVPED, and UVA's New Manning Institute to Amplify the Regional Research Brand Around Focus on Early-Stage Biologics Development

Source: TEConomy Partners, LLC, "Talent Pathways: A Biosciences Workforce and Talent Strategy for GO Virginia Region 9 to Support Rapid Growth and Momentum of a Vibrant Industry," February 2026.

Strategy 2: Address Identified Gaps in Central Virginia's Biosciences Commercialization Continuum	Strategy 3: Organize Cluster Programming Around Priority Growth Opportunities
Action: Support efforts to establish a Seed Fund for Central Virginia biosciences investments	**Action:** Utilize growth opportunity areas as organizing frameworks for cluster programming
Action: Support pre-accelerator programming for the earliest stage biosciences startups	**Action:** Align CVPED's recruitment and retention agenda with the identified growth opportunity areas
Action: Seize on regional bioscience company excitement and interest in pursuing national security and defense-related markets and dual-use applications as a growth opportunity	**Action:** Embed opportunity themes into university–industry collaboration platforms
Action: Consider enhancing regional contract manufacturing capabilities and infrastructure.	**Action**: Use the growth opportunity framework to guide future cluster investments and advocacy

Strategic Recommendations: National Security

1. **Programming Support** for Building the National Security and Defense Cluster
2. **Establish a Regional Defense Technology Accelerator** with Shared Use SCIF and Fabrication Infrastructure
3. **Translational Funds and Support Mechanisms** for National Security/Defense Startups and SMEs
4. **Enhance a Robust Talent Pipeline** for the National Security Cluster
5. **Further Placemaking for the National Security/Defense Cluster** — Co-Location, Defense Facilities Gap Fund, and Innovation District Development
6. **Branding, Outreach, and Business Attraction** for the National Security Cluster

Strategy 1: Programming Support for Building the National Security and Defense Cluster
Action: Designate and resource a regional defense sector champion organization
Action: Identify common needs through dialogue with companies
Action: Serve as the region's lead organization for branding and marketing activities to grow the defense cluster (see Strategy 6 for more details).
Action: Establish a regional Defense Technology Forum series
Action: Develop a dedicated "Doing Business with Rivanna Station" onboarding resource for SMEs and university researchers
Action: Explore opportunities to partner with various military small business offices

Strategy 2: Establish a Regional Defense Technology Accelerator with Shared Use SCIF and Fabrication Infrastructure
Action: Establish a signature defense tech accelerator
Action: Develop shared SCIF space and access tiers
Action: Integrate light industrial and fabrication bays for hardware-intensive defense work
Action: Pursue DIU/NSIN OnRamp Hub designation for the accelerator

Strategy 3: Translational Funds and Support Mechanisms for National Security/ Defense Startups and SMEs
Action: Create a Regional Defense SBIR Navigation and Acceleration Program
Action: Establish a National Security Technologies Translational Fund
Action: Organize and promote a Defense Startup Capital Roundtable

Strategy 4: Enhance a Robust Talent Pipeline for the National Security Cluster
Action: Launch a Region 9 national security career awareness campaign
Action: Develop a Defense SME Internship Program
Action: Create a regional security clearance pipeline coordination program
Action: Partner with Virginia's Commonwealth Cyber Initiative (CCI) to expand activities
Action: Develop a mid-career defense talent attraction program targeting experienced talent

Strategy 5: Further Placemaking for the National Security/Defense Cluster — Co-Location, Defense Facilities Gap Fund, and Innovation District Development	Strategy 6: Branding, Outreach, and Business Attraction for the National Security Cluster
Action: Advocate for and support the adoption of a formal national security and defense cluster development plan for North Fork and Rivanna Futures and other sites in the region that designates land use zones and ensures real estate design align with cluster development priorities	**Action:** In conjunction with Strategy 1, develop and launch a regional National Security Innovation Corridor brand with a distinct identity, narrative, and marketing platform
Action: Establish a Defense Facilities Gap Fund	**Action:** Execute a targeted business attraction campaign that aligns with the primary growth opportunity areas
Action: Commission a coordinated development study for North Fork and Rivanna Futures with specific attention to most cited infrastructure or capabilities gaps	**Action:** Build and formalize institutional relationships with Naval Surface Warfare Center Dahlgren and NAS Patuxent River (Pax River)
Action: Conduct a siting and feasibility study for regional test ranges	**Action:** Engage proactively with Virginia-level statewide defense initiatives
Action: Develop a coordinated regional incentive package for defense testing users	**Action:** Build a regional defense storytelling effort

Implementation Considerations: Coordinating Organizational Functions

Central Virginia's next phase of growth depends not only on selecting promising sectors, but also on organizing the ecosystem more effectively around them. Stakeholder input points to the need for two complementary organizational functions—a cross-cutting innovation platform that can advance biosciences, digital technologies, and national security opportunities, and a stronger regional economic development function that can coordinate business attraction, branding, county alignment, and place-based development across jurisdictions.

Two organizational models have been posed for consideration by regional leaders and are detailed in the report:

- One option is a loose federation of existing organizations driving organic regional development. Under this approach, Central Virginia would continue to operate through a distributed network of partnering organizations that each lead within their existing missions, with stronger alignment around the shared strategic roadmap.

- A second option would move beyond a loosely coordinated network and establish the Innovation Corridor as a clearer organizing construct for the region's innovation-led development agenda. In this model, the Corridor would serve not only as a unified brand and messaging platform, but also as a central mechanism for coordination across cluster development, regional storytelling, partnership-building, and selected implementation functions. As discussions have evolved, this option may be strongest if the Innovation Corridor is ultimately stood up as its own organization. One path would be to establish an independent Innovation Corridor organization with its own executive director, board, and governance structure, while affiliated with CVPED, which could serve as the host or sponsoring organization during formation and early-stage operations. This option more directly responds to stakeholder feedback that the region lacks a visible organizational home for the Innovation Corridor and a consistent mechanism to coordinate activity across jurisdictions and sectors.

Conclusion

Central Virginia now has the assets, momentum, and institutional depth to compete for nationally relevant growth in biosciences and national security but converting that potential into sustained economic gains will require more intentional coordination, clearer organizational ownership, and continued investment in the ecosystem functions that make innovation scalable. Region 9 should not try to be general in its cluster development approach; instead, it should concentrate on the specific market and technology domains identified in this report where research excellence, industry momentum, and mission-driven demand intersect, while strengthening workforce pathways, commercialization support, infrastructure, branding, and cross-jurisdictional alignment so that promising firms, talent, and investments can stay, grow, and compound in Central Virginia.

I. Introduction

Central Virginia's economy is at an exciting inflection point. Across biosciences, information technology, and national security, the region is seeing a wave of investment and growth that is bigger than any single project—major new investments by the University of Virginia (UVA), anchor commitments from companies like AstraZeneca, L3Harris, and Afton Scientific, growth at Rivanna Station and related defense contractors, and steady expansion in software, cyber, and data driven firms. When combined, these shifts give GO Virginia Region 9 a chance to grow from a collection of promising assets into a more coherent "Innovation Corridor" where research, industry, and federal missions reinforce one another instead of operating in parallel.[2]

Recognizing the existing assets, significant investments, and forward-looking growth underway in Central Virginia, regional economic development leadership has a need to understand and organize around the specific areas in which Central Virginia is best positioned for strategic growth. The Central Virginia Partnership for Economic Development (CVPED), in collaboration with UVA economic development leadership and other regional partners, commissioned a strategic planning process to identify growth opportunities in biosciences/life sciences, IT and digital, and national security domains with commercial and national security applications for strategic development in GO Virginia Region 9. This Strategic Roadmap is aimed at assisting the region in shaping its focus and meeting the moment to realize its economic potential in these industry cluster and technology domains.

Central to the region's innovation capabilities is UVA as a top-tier research university and academic medical center at the heart of a relatively modest-sized region. UVA's investments in the Manning Institute of Biotechnology, its clinical trials and data infrastructure, and its engineering and computer and data sciences capabilities are reshaping the local innovation landscape, creating new translational and

The Central Virginia Partnership for Economic Development (CVPED), in collaboration with UVA's Office of Economic Development and other regional partners, commissioned a strategic planning process to identify growth opportunities in biosciences/life sciences, IT and digital, and national security domains with commercial and national security applications for strategic development in GO Virginia Region 9.

This Strategic Roadmap is aimed at assisting the region in shaping its focus and meeting the moment to realize its economic potential in these industry cluster and technology domains.

2 Throughout this report, the region of focus will be referred to as both Central Virginia and Region 9, aligned with the geographic definition of GO Virginia Region 9 which includes the following city and counties: City of Charlottesville and the Counties of Albemarle, Culpeper, Fauquier, Fluvanna, Greene, Louisa, Madison, Nelson, Orange, and Rappahannock.

commercialization pathways that did not exist a decade ago. At the same time, federal assets at and around Rivanna Station are expanding their missions in intelligence, data fusion, and national security, while the region's private sector base is diversifying and expanding into advanced manufacturing, biopharmaceuticals, medtech, defense technologies, and digital services. This mix of a top tier research anchor, growing federal presence, and an entrepreneurial company base is unusual for a region of Central Virginia's size—and it creates both opportunity and urgency.

The three targeted clusters in this strategy—biosciences, information technology, and national security—already represent more than 11,000 jobs and more than 1,100 business establishments in Region 9, and they have grown faster than comparable clusters statewide and nationally in recent years. The biosciences cluster is emerging, aided by UVA's research strengths and a growing base of companies in therapeutics, medtech, industrial biosciences and other segments. The national security and defense cluster, underpinned by missions at Rivanna Station and a mix of primes and specialized contractors, has also expanded employment at a pace well above national averages. IT and digital technologies cut across both, providing the software, analytics, and secure infrastructure that underpin modern bioscience and defense applications.

Yet this momentum by itself is not a strategy. Traditional cluster analysis can show where Central Virginia has been strong, but it is less helpful in answering where the region can be most competitive over the next decade. To move beyond backward looking metrics, this effort uses a "line of sight" approach that starts from identifying regional core competencies—the research driven, industry facing capabilities in areas like advanced therapeutics and biologics, imaging and minimally invasive medtech, all source intelligence analytics, cyber and secure infrastructure, and translational bioengineering and regenerative medicine—and then aligns them with region's "market pull" from the clusters to identify Central Virginia's most promising growth opportunities.

The result of this work is a focused portfolio of growth opportunities in biosciences and national security that are rooted in existing assets but oriented toward future opportunities and markets. In conducting the work, the regional IT/tech cluster and domain activity was found to be primarily geared toward and embedded within national security related applications and markets and is therefore integrated into this, and to some extent, the biosciences growth opportunities.

Realizing these opportunities will require more than isolated projects. It will require aligning the roles of key actors—the Central Virginia Partnership for Economic Development (CVPED) as the lead on business attraction, expansion, and place based development; UVA and its affiliated health and engineering enterprises as the primary source of research, talent, and translational capacity; CvilleBioHub as the primary cluster convener and company support platform for biosciences; and federal, national, and private sector security partners, including Central Virginia National Security Alliance (CVNSA), as mission drivers, sophisticated customers, and R&D collaborators. It will also depend on coordinated efforts to shore up cross cutting enablers such as specialized workforce pipelines, early stage capital, commercialization support, and shared infrastructure at sites like North Fork, Rivanna Futures, and others.

The aim with this strategic planning effort is straightforward—to help Central Virginia turn its current momentum into a durable, innovation driven economy by focusing on the places where its research strengths, industry clusters, and federal missions clearly overlap and align—and by giving regional leaders a shared playbook for acting on those opportunities.

This report has been developed to give Central Virginia a focused Strategic Roadmap for that agenda. The report is organized around the following elements:

- **Identifying and profiling innovation-led regional growth opportunities.** Detailed profiles of the most promising growth opportunities in biosciences and national security, based on in-depth quantitative analyses, the alignment of Central Virginia's technology push and market pull, and informed and vetted with stakeholder input.
- **Developing a situational assessment of the clusters and the supporting innovation ecosystem,** including performance, specialization, and key gaps in areas such as workforce, capital access, commercialization, and infrastructure, based on regional leader and stakeholder input.
- **Setting out a strategic framework.** Cross cutting strategies and actions to strengthen workforce and talent, close gaps in the commercialization continuum and growth capital pipeline, and organize cluster programming and business development around the identified opportunity areas.
- **Outlining implementation and governance.** Considerations for how regional partners—public, private, academic, and federal—can coordinate to move from analysis to action, sequence investments, and adjust as the Innovation Corridor evolves.

The aim with this strategic planning effort is straightforward—to help Central Virginia turn its current momentum into a durable, innovation driven economy by focusing on the places where its research strengths, industry clusters, and federal missions clearly overlap and align—and by giving regional leaders a shared playbook for acting on those opportunities.

Figure 1.

REGIONAL DEFINITION OF GO VIRGINIA REGION 9—CITY OF CHARLOTTESVILLE AND TEN CENTRAL VIRGINIA COUNTIES

Source: GO Virginia.

II. Identifying a Line of Sight to Growth Opportunities for Region 9

Modern economic development is based on the premise that each region has its own specific industry drivers and growth opportunities through which it is best positioned to differentiate itself and build world-class, specialized areas of expertise. At the same time, each university has its own set of core competencies based on those focus areas where there is demonstrated excellence and a critical mass of activity in research, talent generation, and unique facilities. To maximize the potential for economic development impact, it is critical to identify strategic areas that align a region's research assets and competencies with the needs and opportunities of its industry innovation drivers.

Why "Core Competencies" Matter in Central Virginia

In a dynamic technology and security environment, Central Virginia cannot rely only on retrospective cluster analysis that tells the story of historic employment and output patterns. Those indicators are useful, but they understate where the region has the capacity to grow, differentiate, and compete in the next decade. Instead, any strategy must be foundationally based on core industry facing technology competencies that cut across firms, UVA, and federal assets.

Economic development frameworks have long postulated that organizations should be viewed as portfolios of core competencies rather than portfolios of business or research units, a concept that translates directly to a regional context: Central Virginia's competitive position will hinge on a set of deep, transferable capabilities in areas such as biosciences, defense, data science and AI, and others which serve as gateways to future opportunities because they can be recombined and applied across many products and markets and they are difficult for others to imitate. These core competencies represent the critical mass of know how, specialized facilities, and talent spanning industry and UVA that enable innovation, technology commercialization, and dual use applications. They are what differentiate Central Virginia from other regions and allow its existing and emerging industry clusters to sustain competitiveness and grow into new markets.

Beyond guiding near term priorities, a focus on core competencies also provides Central Virginia with a disciplined framework for sequencing investments and managing risk over time. By clarifying which underlying capabilities truly differentiate the region and open doors into multiple markets, regional leaders

can align infrastructure, workforce, and partnership efforts around those platforms rather than spreading resources thinly across disconnected initiatives. This coherence helps ensure that new programs, sites, accelerators, and public–private collaborations all reinforce the same capability system, compounding learning and spillovers across existing and emerging technology domains in ways that are difficult for competing regions to replicate.

Industry Clusters and "Industry-Facing" Research

At the same time, growth opportunities must be anchored in the region's existing and emerging industry clusters and in the excellence already present across UVA, Rivanna Station, and the place-based investments and growth occurring across the region. Central Virginia's industry clusters in areas such as biosciences, manufacturing, and national defense are not abstract definitions, but rather are grounded in active companies, federal missions, and UVA labs that are driving contracting, hiring, and investment today.

Industry clusters are critical to regions like Central Virigina because they create economies of agglomeration that raise productivity and competitiveness for firms that choose to locate and grow within them. When related firms, suppliers, service providers, and institutions concentrate in a place, they benefit from shared specialized inputs and infrastructure, deeper and more specialized labor pools, and denser flows of knowledge and ideas that are difficult to replicate elsewhere. This concentration reduces transaction and search costs, improves matching between employers and workers, and allows companies to respond more quickly to market and technology shifts, which in turn can support higher wages, stronger innovation performance, and greater resilience over the business cycle.

Strong clusters also play a central role in business attraction and expansion decisions. Firms evaluating locations look for places where they can access customers, suppliers, and talent in close proximity, and where there is a critical mass of complementary activity that signals a supportive environment for their growth. Regions with well-developed clusters are better positioned to win new investment, because they offer not just individual sites or incentives, but an ecosystem of partners, specialized service providers, training institutions, and public or federal entities that collectively lower risk and speed time-to-market for new operations. In a context like Central Virginia, the presence of connected activity in areas such as life sciences, advanced manufacturing, and defense-related technologies helps reinforce perceptions of the region as a credible, scalable platform for additional private and public investment, even when those clusters are still in a formative stage.

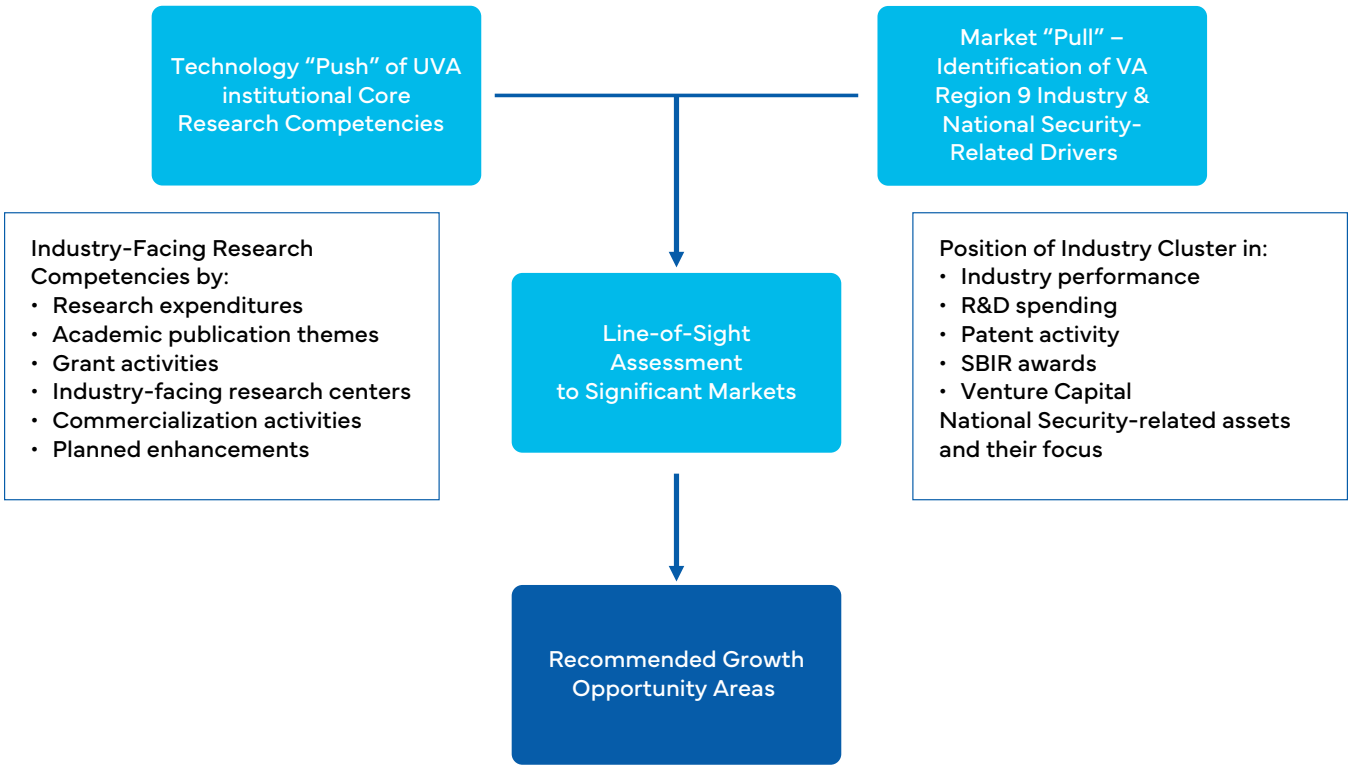
These same dynamics mean that industry-facing research and innovation assets are most valuable when they are tightly linked to regional clusters. Universities, labs, and shared testbeds embedded in cluster environments benefit from regular engagement with firms and mission agencies, which sharpens their understanding of practical problems and accelerates the translation of ideas into usable solutions. Firms, in turn, gain access to cutting-edge science, specialized facilities, and talent pipelines that they could not easily recreate on their own, whether through joint R&D projects, sponsored research, collaborative consortia, or shared use of infrastructure such as wet labs, wind tunnels, data facilities, or secure testing environments. In regions that combine a major research university, an emerging innovation corridor, and mission-driven federal assets, intentionally weaving these connections between clusters and "industry-facing" research is a primary mechanism for turning core competencies into sustained innovation-led growth.

The Line of Sight Methodology: Linking "Market Pull" and "Technology Push"

Innovation led opportunities in Central Virginia emerge where two forces intersect across the elements described above: the "market pull" from existing and emerging clusters and the "technology push" from the region's core research competencies. TEConomy terms this alignment of market pull and technology push as a "line-of-sight" to growth opportunities. Linking innovation-led industry drivers and university core competencies requires an understanding of both spaces to identify innovation platforms that can advance regional economic development. The results of applying this framework to Central Virginia's current research and industry landscape to identify the economic development opportunities of tomorrow are reported herein and outlined in Figure 2 below.

Figure 2.

APPROACH TO LINE OF SIGHT TO REGIONAL GROWTH OPPORTUNITIES USED IN ASSESSING CENTRAL VIRGINIA'S ECOSYSTEM



Source: TEConomy Partners, LLC.

When these two forces are deliberately connected, competitive clusters can flourish and self reinforce, creating a virtuous cycle in which research is translated into deployable solutions, new firms and products are created, and the resulting wealth and federal and private investment are reinvested into the research and innovation system. Identifying the specific domains where Central Virginia's industry drivers and its core technology competencies overlap provides the region with a clear line of sight into future innovation led markets that can sustain its existing clusters and position it to capitalize on next generation opportunities.

As noted in the Figure above, this approach leverages a portfolio of indicators and key metrics that highlight activity in the region and point to combinations of critical mass, specialization, or unique assets which affirm research capabilities and industry drivers that support growth opportunities.

Highlights of the Tech Push Analysis

To understand the region's core competencies, TEConomy conducted a set of quantitative "technology push" analyses that systematically characterize Central Virginia's research strengths in order to identify core competencies and then link them to potential growth opportunities via alignment to key markets. This set of analyses is intended to move beyond data points about excellence at individual labs or centers and instead build an evidence-based perspective that can pinpoint where the region has true critical mass, distinctive specialization, and clear line of sight to industry and mission applications.

To do so, the assessment draws on multiple complementary data sources and methods that, taken together, reveal where Central Virginia's research enterprise is already generating innovation-relevant capabilities and where further investment could have the greatest leverage. Key signals of research innovation and excellence examined to assess the region's tech push include:

- The **landscape of research publications activity**, used to identify areas of critical mass, specialization, and detailed potential application areas for translational research.
- The **current, active grants activity** which identifies research projects with potential alignment with industry.
- **R&D spending trends** that can identify investment areas supporting research applications.
- Profiles of **key industry-facing research centers and institutes** to assess R&D and innovation capacity and potential nodes for commercialization activity.
- A broad **asset inventory of resources & capabilities** that enable work in biosciences, national security and intelligence, digital technologies, and other related science and technology opportunity areas.

Ultimately, these analyses identify a set of core competencies being advanced in the region, summarized at the end of this section and categorized by their presence across key innovation and research activity metrics.

Thematic Areas of Research Activity Across Publications and Grant Awards

Central Virginia's technology push is anchored in a research base that is unusually concentrated for a region of its size, led by the University of Virginia and reinforced by a growing set of innovation-supporting assets. The region's research excellence is increasingly tied to translational opportunities in biosciences, digital technologies, and national security applications, with important connective tissue emerging among university labs, health and engineering programs, mission agencies at Rivanna Station, and new place-based development efforts and sites in the region.

One of the clearest areas where this concentration is evident is the volume and composition of peer-reviewed research publications, which provide evidence of where the region is sustaining deep scientific and technical activity that may support industry-facing applications over time. Across 2019 to the present, more than 22,000 peer-reviewed publications were identified with Central Virginia authors, including more than 20,000 involving UVA authors, pointing to a research enterprise with both scale and breadth across a wide set of domains.

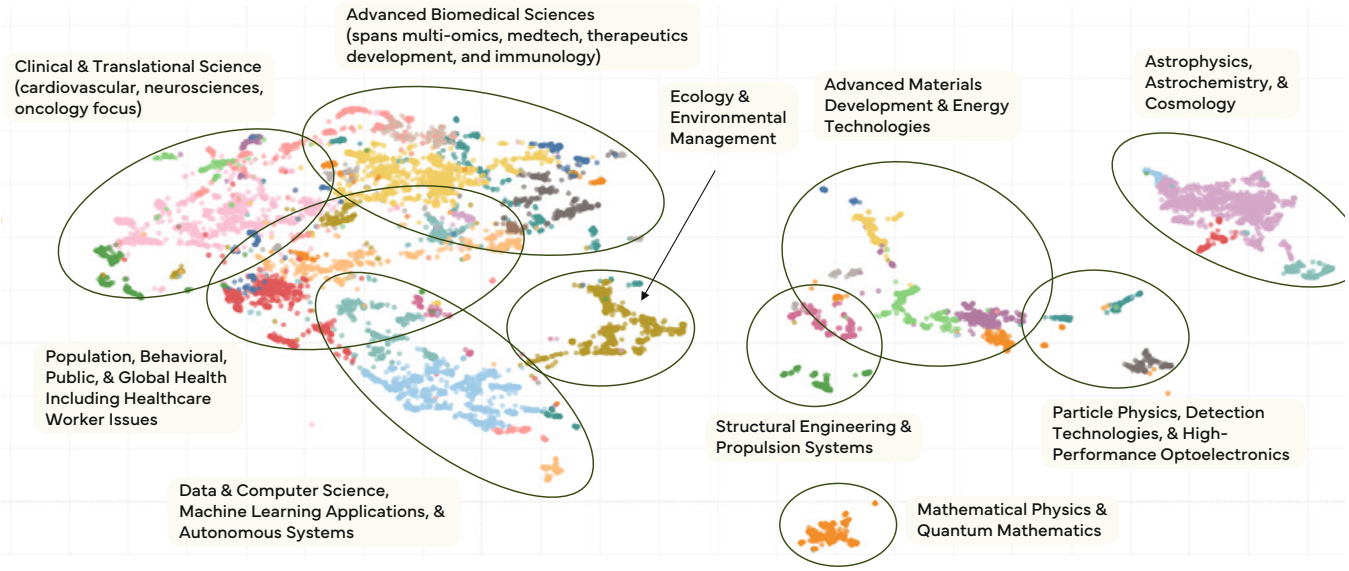
Recent publications activity reflects a research profile that is at the same time broad and also highly differentiated in a number of specific advanced fields. The largest bodies of publications activity include astronomy and astrophysics, surgery, electrical and electronic engineering, clinical neurology, materials science, and computer science, while the region also demonstrates particularly high specialization in areas such as metallurgy and metallurgical engineering, particle physics, mathematics, and biochemical research methods.

While research disciplines can be illustrative of the region's critical mass in broad areas of science, today's institutional research models emphasize multidisciplinary research that often combines the expertise of multiple faculty across multiple research areas to advance translational work, a perspective not easily captured using publication counts alone. To examine the context of research publications activity through the lens of its specific applied areas of impact and identify cross-cutting thematic areas of focus within publications, TEConomy analyzed the unstructured text content present in publications records using natural language processing methodologies and machine learning-based topic identification models to identify detailed topic themes within the body of research activity. Figure 3 below shows the key themes identified within the topology of thematic areas of activity across research publications records with Central Virginia authors, with topic areas of critical mass appearing as more tightly grouped clusters of topics.

A clustering and community detection algorithm then used the structure of text similarity to identify highly interrelated sets of topics that comprise broad thematic communities, identifying eight broad thematic groupings that highlight distinct areas of focus across the collective body of research publications activity. This landscape suggests a research base that spans fundamental discovery science, translational biomedical research, and digitally enabled engineering applications, producing a distinctive mix of strengths that are especially relevant to the region's emerging Innovation Corridor narrative.

Figure 3.

LANDSCAPE PERSPECTIVE OF BROAD THEMATIC AREAS ACROSS CENTRAL VIRGINIA RESEARCH PUBLICATIONS, 2019-2025



Source: TEConomy's analysis of Clarivate Web of Science Publications.
Note: Analysis of 22k+ publications with Region 9 authors, including 20k+ with UVA authors.

Within these eight broad thematic areas, there are a number of distinct specializations (further level of detail within identified topics available via graphics included in the appendix). Several key narratives about the region's research core competencies that emerge from the holistic picture of publications activity are:

- The presence of a large body of research focused on **clinical and translational science** with respect to biomedical application areas, with distinct concentrations in cardiovascular disease management and surgery, oncology (immunotherapy, hormone-based interventions, targeted therapeutics), and clinical neurosciences, is indicative of a well-developed clinical and translational research focus with strong connections to UVA Health and the basis for the forthcoming Manning Institute of Biotechnology.
- A highly active cluster of enabling **advanced biomedical sciences** research spanning multi-omics,[3] medtech instrumentation, therapeutics development, immunology, and regenerative medicine that reflects a maturing pipeline of both basic and applied discovery science with growing industry translation potential.
- The presence of a distinct and robust cluster in **data and computer science, machine learning applications, and autonomous systems** reflects the evolution of the region's research base in response to emerging analytics technologies and the computing-intensive demands of both commercial and national security applications, with applied themes in cyber-physical systems, robotics, smart manufacturing, IoT, and cybersecurity.

3 Multi-omics refers to the integrated analysis of multiple molecular data layers (for example, genomics, transcriptomics, proteomics, epigenomics, and metabolomics) using advanced computational and bioinformatics tools to generate more complete insight into health and disease.

- A strong cluster of activity in **advanced materials development and energy technologies** demonstrates the presence of key nodes in structural and functional materials science, including additive manufacturing, corrosion-resistant coatings, nanotech, and thermo-electronic devices, with some emerging cross-links to aerospace and defense applications.

- Unique and high-specialization clusters in **particle physics, advanced mathematics, and high-performance optoelectronics** reflect the presence of nationally recognized research programs with direct relevance to emerging applications in sensing, advanced photonics, and next-generation computing.

Critically, many of these thematic areas overlap, highlighting the cross functional nature of emerging technologies such as machine learning and AI for use in population health and epidemiological modeling or the use of advanced multi-omics approaches to advance clinical applications. Examples of further detailed themes present within and across the broad clusters identified are highlighted in Table 1 below.

Table 1.

DETAILED THEMATIC RESEARCH COMPETENCIES FROM TOPIC MODELING OF CENTRAL VIRGINIA RESEARCH PUBLICATIONS

Broad Thematic Community	Examples of Detailed Topic Themes Present Within Publications Activity
Clinical & Translational Science (Cardiovascular, Neuroscience, Oncology focus)	Clinical cardiology and cardiovascular imaging, neurosurgery and neuro-oncology, cancer screening and imaging, and injury prevention and rehabilitation.
Advanced Biomedical Sciences (Multi-omics, MedTech, Therapeutics, Immunology)	Population genomics and molecular mechanisms of disease, biomolecular characterization and imaging technologies, infectious disease biology, and regenerative medicine and tissue engineering.
Population, Behavioral, Public & Global Health	Global and infectious disease epidemiology, microbiome and antimicrobial resistance, public and behavioral health, and healthcare delivery and workforce dynamics.
Data & Computer Science, Machine Learning, & Autonomous Systems	Autonomous systems and robotics, IoT and advanced sensing and communications, specialized computing and control architectures, and data science and AI for health and complex systems.
Ecology & Environmental Management	Fundamental ecology and earth systems, and environmental management focused on water, carbon and nutrient cycles, land use, and climate and hazard monitoring.
Structural Engineering & Propulsion Systems	Structural materials and mechanics, and advanced fluid dynamics and propulsion for aerospace, marine, and energy systems.
Advanced Materials Development & Energy Technologies	Structural and functional materials, nanomaterials and coatings, and materials and devices for energy storage, conversion, and environmental applications.
Particle Physics, Detection Technologies, & High-Performance Optoelectronics / Quantum Technologies	Particle and high energy physics, detection and sensor technologies, high performance optoelectronics, and quantum science for computing, sensing, and materials.
Astrophysics, Astrochemistry, & Cosmology	Astrophysics, astrochemistry, and cosmology, including star and galaxy evolution, compact objects, and observational and instrumentation advances.

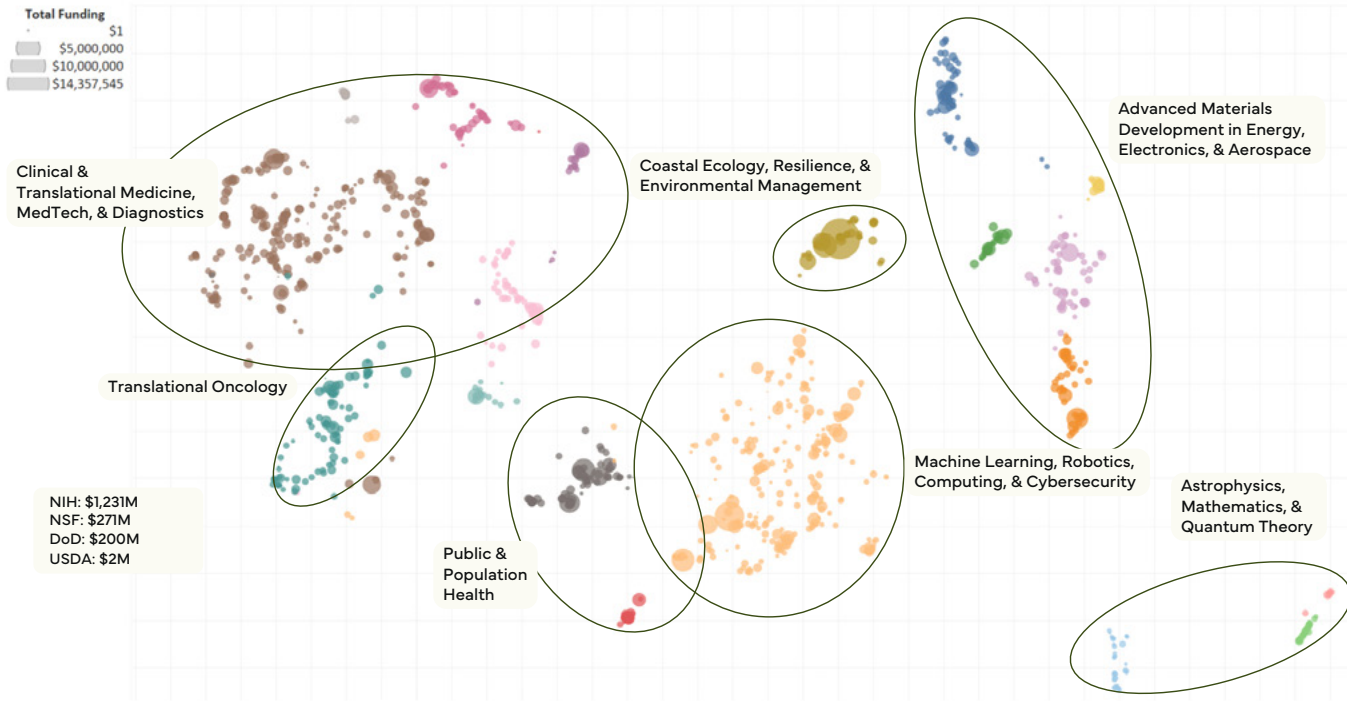
Source: TEConomy analysis of Clarivate Web of Science publications data.

In addition to publications activity, researcher-led project awards provide another important indicator of where Central Virginia-based investigators are actively building and extending core competencies. TEConomy examined researcher-initiated research project grants active from 2019 to present, a concept aligned closely with the "R01-equivalent" grants from NIH representing those most indicative of where researchers develop and invest in core competencies at an institution due to them being both researcher-initiated and often competitively funded.

TEConomy's review of active project awards drawn from NIH RePORTER, NSF, USDA CRIS, and DoD DTIC awarded grants identified a research funding base that is substantial in scale and strongly aligned with the region's translational and use-inspired profile, including approximately $1.2 billion from NIH, $271 million from NSF, $200 million from DoD, and $2 million from USDA across the active grants landscape examined. Figure 4 shows this set of research grant awards clustered by the similarity of text content describing the research project activity of the grants, providing a thematic landscape of where researcher-led investment is concentrated.

Figure 4.

LANDSCAPE OF BROAD THEMES WITHIN RESEARCHER-LED PROJECT GRANTS IN CENTRAL VIRGINIA ACTIVE FROM 2019-2025



Source: TEConomy's analysis of NIH RePorter, NSF, USDA CRIS, and DoD DTIC awarded grants data.
Note: Researcher-initiated research project grants are aligned closely with the concept of "R01-equivalent" grants from NIH. These types of project grants are often most indicative of where researchers develop and invest in core competencies at an institution. As per NIH's definition of the R01 series grant purpose, they are designed "To support a discrete, specified, circumscribed project…in an area representing the investigator's specific interest and competencies."

This current grant portfolio reinforces several narratives about the region's research strengths. First, the scale of NIH activity underscores the depth of Region 9's clinical and translational health enterprise, particularly in oncology, cardiovascular disease, neuroscience, diagnostics, and broader public and population health. Second, the presence of machine learning, robotics, computing, cybersecurity, and advanced materials themes points to a research ecosystem in which digital and engineering capabilities are being advanced not as isolated specialties, but as enabling technologies for both commercial and public mission use cases. Third, the continued presence of DoD-related activity, coupled with the region's proximity to NGIC, DIA, and NGA mission needs, suggests an important bridge between university-driven research and national security problem sets, particularly where data integration, modeling, sensing, imaging, and secure analytic systems are concerned.

As with publications activity, this picture of the region's researcher-led activity reveals several key narratives about Central Virginia's core competencies:

- A dominant cluster of activity focused around **clinical and translational medicine, medtech, and diagnostics** further evidences the depth of capabilities and institutional infrastructure for biomedical discovery at UVA Health, encompassing precision medicine, biomarker analysis, advanced imaging technologies, drug delivery systems, nanotherapeutics, and multi-omics platforms for disease identification and diagnosis.

- A leading cluster centered on **translational oncology** addresses novel cancer therapeutics and precision medicine including immunotherapy, targeted therapies, focused ultrasound and nanotech-based therapies, and tumor micro-environment dynamics, reflecting UVA's nationally recognized cancer research programs.

- A significant cluster of activity **in machine learning, robotics, computing, and cybersecurity** as well as **cyber-physical systems and intelligent decision-making** demonstrates applied computing research with direct linkages to both commercial technology markets and national security and defense missions.

- A major cluster around **aerospace and defense technologies** covering turbulent combustion and aircraft propulsion in extreme conditions, hypersonic vehicle design and aerodynamics, noise reduction, and thermal management reflects the region's unique research position, while a parallel cluster in **advanced materials** covers high-temperature coatings, phase transitions, nanoscale thermal transfer, and quantum, optical, and photonic materials and devices.

- A cluster focused on **regenerative medicine and tissue engineering for traumatic injury,** including military personnel, bridges UVA's translational biomedical capabilities with direct national security health applications.

There are several additional clusters of activity focused on metabolic dysfunction and neurological disease research, public health interventions connected to defense populations, and environmental resilience science, collectively showing a broad and multi-dimensional researcher population with strong cross-domain linkages (for further detailed landscape analyses of researcher-initiated grants, see additional figures in appendix).

Context of Industry-Facing Research Centers: UVA's $714M R&D Complex Includes Numerous Use-Inspired Centers and Institutes Aligned With Regional Industry and Defense Base

Among the innovation assets that shape a region's technology push, industry-facing research centers and institutes play a particularly important role because they concentrate expertise, connect faculty and students to external partners, and provide institutional platforms for translation, commercialization, and workforce development. In Region 9, this role is especially important because much of the region's opportunity rests not just on the presence of strong academic departments, but on the ability to organize interdisciplinary strengths into outward-facing capabilities that industry, government, and mission agencies can access.

The figure below identifies key industry-facing university research centers across UVA's enterprise that TEConomy identified as playing an especially important role in supporting the region's core competencies within the biosciences, digital and engineering, and national security and defense domains. These centers are some of the key enablers of linkages to industry applications that help to form the basis for the line of sight to growth opportunities, and their connections are discussed in further detail within the profiles of each growth opportunity area.

- **Biosciences and Biomedical Centers as Anchors for Translational Health and MedTech Opportunities.** The depth of UVA's biosciences center infrastructure is a distinguishing feature of Region 9's technology push, particularly in areas with direct commercial relevance. Institutes such as the BRAIN Institute, the newly-formed Manning Institute of Biotechnology, and the Wallace H. Coulter Center for Translational Research explicitly span the boundary between fundamental research and translatable applications in therapeutics, devices, and clinical platforms. Centers including the UVA Comprehensive Cancer Center, the Center for Diabetes Technology, the Robert M. Berne Cardiovascular Research Center, and the Center for Advanced Biomanufacturing further concentrate activity in disease-area research with strong alignment to the region's growing cluster of early-stage biopharmaceutical and medtech companies. Taken together, these assets form a tissue of capability that can support the full arc from molecular discovery through translational development, and they represent an important institutional bridge to commercial partners and clinical research networks both within and outside the region.

- **Digital and Engineering Centers Enabling a Cross-Cutting Computational and Cyber-Physical Systems Competency.** UVA's digital and engineering-focused centers collectively support competencies in intelligent systems, data analytics, and cyber-physical integration that crosses multiple industry end markets. The Link Lab, one of UVA's most visible interdisciplinary research platforms, focuses on connected autonomous and cyber-physical systems with applications spanning autonomous vehicles, infrastructure, and smart manufacturing. ASSIST, an NSF Engineering Research Center, pursues self-powered sensing and IoT systems with applications in health monitoring, environmental sensing, and defense-relevant platforms. CRISP advances memory and storage architectures, while the MIST Center develops multi-functional integrated system technologies under NSF IUCRC sponsorship, drawing in a consortium of industry partners. The Collaboratory for Applied Data Science and the Center for Business Analytics extend these computing capabilities into applied analytics contexts,

connecting faculty research to industry-facing problems in supply chain, finance, and operations. This portfolio of centers gives Region 9 the building blocks of a credible applied computing and intelligent systems ecosystem that industry partners from defense primes to commercial software firms can engage with directly.

- **National Security and Defense-Aligned Assets Creating a Dual-Use Research Interface.** A third dimension of UVA's center infrastructure is the set of assets specifically oriented toward national security, defense, and large-scale complex systems, which together give the region a rare institutional interface with a mission agency installation at Rivanna Station. The National Security Data and Policy Institute (NSDPI) is the most visible of these, serving as a hub for research and policy engagement at the intersection of data, technology, and national security and providing a forum through which UVA faculty can engage cleared partners, government stakeholders, and defense-oriented industry. The Biocomplexity Institute (BI) advances large-scale computational modeling of complex systems, with applications in biosurveillance, epidemiology, and social systems analysis that have direct relevance to intelligence and defense missions. The Aerospace Research Laboratory and the Rolls-Royce University Technology Center anchor capabilities in propulsion, fluid dynamics, and aerospace systems engineering, providing continuity between UVA research and the aerospace and defense manufacturing firms present across the broader region. Collectively, these assets position the region to engage the national security and defense opportunity in a substantive way as opposed to on a project by project basis.

Figure 5.

INDUSTRY-FACING RESEARCH CENTERS & INSTITUTES IDENTIFIED AT UVA IN TARGETED DOMAIN AREAS

Biosciences/ Biomedical

- **BRAIN Institute (BRAIN)**
- **Manning Institute of Biotechnology**
- Center for Advanced Biomanufacturing (Schools of Medicine, Engineering)
- Center for Applied Biomechanics (School of Engineering)
- UVA's Wallace H. Coulter Center for Translational Research (Schools of Medicine, Engineering)
- UVA Comprehensive Cancer Center (UVACCC, School of Medicine)
- Center for Diabetes Technology (CDT, School of Medicine)
- Robert M. Berne Cardiovascular Research Center (CVRC, School of Medicine)
- Center for Behavioral Health and Technology (School of Medicine)
- Christ Lab, Highley Lab (multidisciplinary labs)

Digital/ Tech-Focused

- Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST) (School of Engineering, NSF-ERC)
- Center for Business Analytics (CBA) (McIntire School)
- Center for Research in Intelligent Storage and Processing in Memory (CRISP) (School of Engineering; 10 Universities)
- Center for Risk Management of Engineering Systems (School of Engineering)
- Collaboratory for Applied Data Science in Business (SDS and Darden School)
- Multi-functional Integrated System technology (MIST) Center – NSF, IUCRC (School of Engineering)
- Link Lab (multidisciplinary research center, School of Engineering)

National Security/ Defense Related

- **National Security Data and Policy Institute (NSDPI)**
- **Biocomplexity Institute Initiative (BII)**
- Aerospace Research Laboratory (School of Engineering)
- Rolls-Royce University Technology Center (School of Engineering)

Others with Potential Relevance:

Commonwealth Center for Advanced Logistics Systems (CCALS, School of Engineering)
Commonwealth Center for Advanced Manufacturing (CCAM, School of Engineering)

Note: Centers and Institutes in bold font represent pan-university initiatives.
Source: TEConomy's scan of UVA Research Center and Institute websites and university research leadership interviews.

Additional Role of Rivanna Station in Driving Technology Push from National Security Investment Priority and Mission Needs

A distinctive feature of Region 9 relative to many peer innovation geographies is the added role of the defense community at key installations and their adjacent ecosystem in shaping technology demand and applied innovation pathways. Rivanna Station serves as a critical driver of this dynamic within the region, functioning as a sub-installation of Fort Belvoir in Albemarle County that employs roughly 2,000 to 2,500 total personnel. Rivanna Station hosts the U.S. Army's National Ground Intelligence Center (NGIC) and tenant elements from the Defense Intelligence Agency (DIA) and National Geospatial-Intelligence Agency (NGA), among other intelligence organizations, in an inter-agency analysis and support facility that supports real-time intelligence acquisition, assimilation, and analysis. The innovation and mission-critical technology drivers of these agencies define a meaningful parallel "technology push" from the demand side of national security research needs, as summarized below:

- **NGIC** is oriented around foreign ground forces analysis, foreign materiel exploitation, and battlefield forensics, generating innovation demand in modeling and simulation tools for event reconstruction and forensics, threat assessment technologies, and database management for combat incidents.

- **DIA** focuses on integration of HUMINT, SIGINT, GEOINT, and MASINT for comprehensive threat assessment, generating demand for all-source and multi-domain intelligence data fusion, high-performance computing (HPC) platforms for large-scale processing, and AI integration.

- **NGA** is focused on advanced satellite imagery analysis, mapping, and spatial-temporal analytics, generating demand for automated image analysis and classification, real-time processing of computer vision applications, continuous monitoring and detection systems, and AI integration.

Looking ahead, the Rivanna Futures initiative adds a complementary focus to activities already occurring at North Fork; in addition to serving as the site for recent pharmaceutical manufacturing expansion activity, the 462-acre site is intended to house a new Intelligence and National Security Innovation Acceleration Campus, bringing together public, private, and academic collaborators, representing a significant near-term amplifier of the region's technology push.

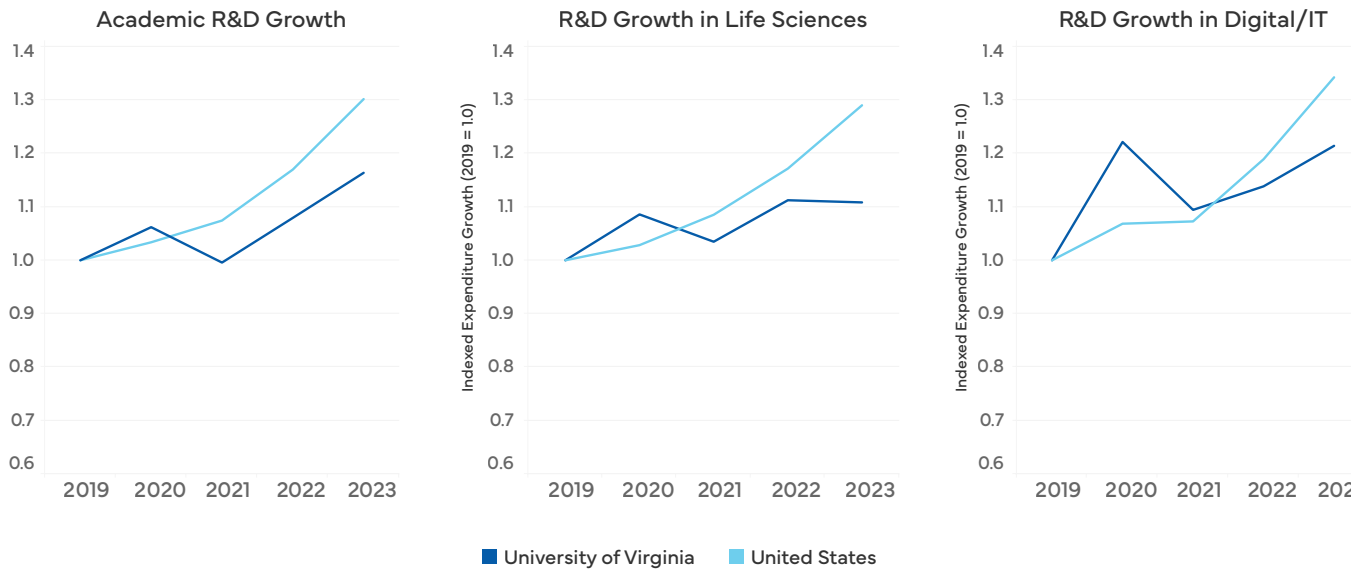
Trends in Regional Academic R&D Expenditures Highlight Overall Investment Priorities

UVA is the dominant reporting institution in academic R&D expenditure surveys for Region 9, and its $714 million in total R&D expenditures in 2023 establishes Central Virginia as a research region of meaningful scale. To understand what this investment base signals for broader economic development strategy, it is useful to examine not only the total level of activity but the rate of growth relative to national benchmarks across the three domain areas most relevant to the region's growth opportunity framework: overall academic R&D, life sciences, and digital and information technology.

Across all three domains from 2019 to 2023, UVA's R&D expenditures have experienced positive growth, but have also consistently tracked just below the national pace of growth. In overall academic R&D, national expenditures reached approximately 1.32 times the 2019 baseline by 2023, while UVA reached approximately 1.24 times; in life sciences, a similar gap is visible, with national growth driven by the surge in federal investment tied to pandemic response, biomedical innovation, and biosecurity. In digital and information technology, UVA has come closest to parity with national growth, reflecting accelerating investment in computing, autonomous systems, and sensing capabilities. Taken together, these trends confirm that Region 9's research base is expanding and strategically focused, while also identifying a clear and actionable investment gap relative to national R&D growth rates.

Figure 6.

TRENDS IN REGIONAL ACADEMIC R&D EXPENDITURES, 2019-23



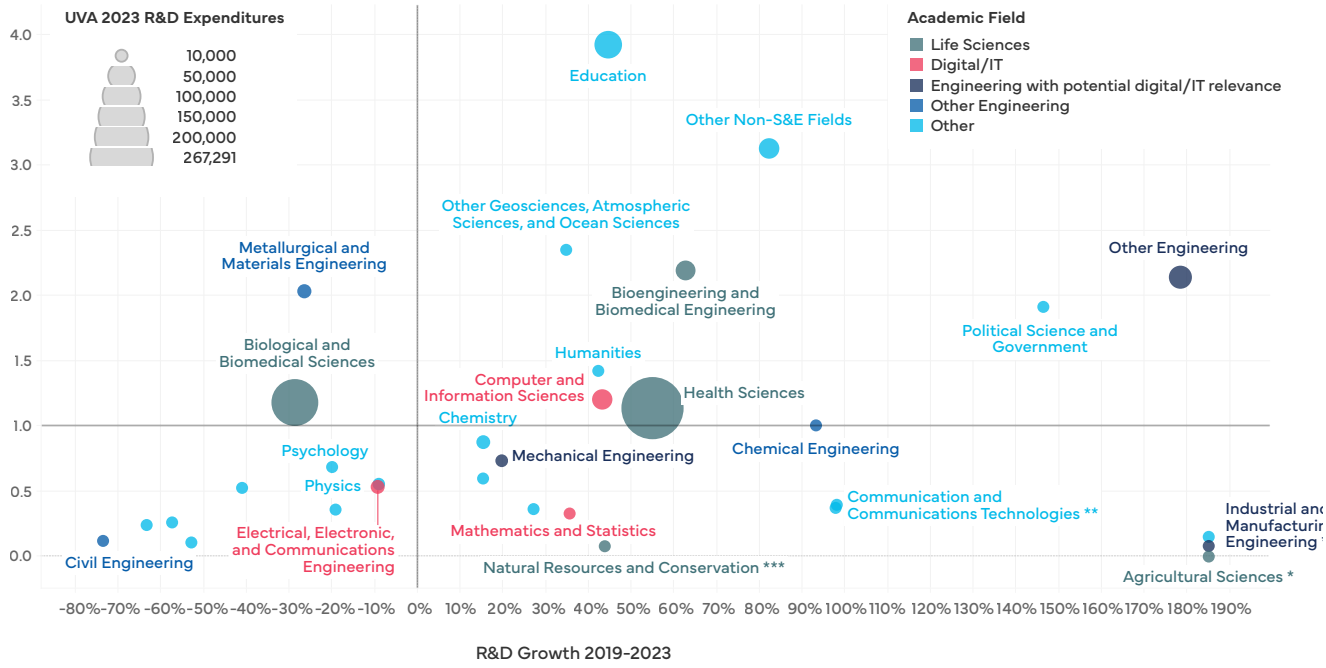
Source: TEConomy's analysis of Higher Education R&D Survey (HERD) data, National Center for Science and Engineering Statistics.

Among detailed academic disciplines, Health Sciences and Biological and Biomedical Sciences are both somewhat specialized in relative concentration and lead UVA's life sciences-related R&D in terms of overall spending volumes (Figure 7).[4] Fields with significant spending levels, growth, and high specialization include Bioengineering and Biomedical Engineering in life sciences, Computer and Information Sciences in digital/IT, and Other Engineering. Electrical, Electronic, and Communications Engineering has significant R&D levels, but spending has declined slightly in recent years, a trend worth monitoring given its relevance to defense electronics applications.

4 Per NSF's Higher Education Research and Development (HERD) survey taxonomy, Biological and Biomedical Sciences includes basic and preclinical life science fields such as biochemistry, molecular biology, genetics, microbiology, neuroscience, pharmacology, physiology, biotechnology, and related disciplines, while Health Sciences includes clinically focused and health professions–oriented fields such as clinical medicine research, advanced dentistry, allied health, medical assisting, public health, bioethics, and related health services research.

Figure 7.

CENTRAL VIRGINIA REGIONAL ACADEMIC R&D EXPENDITURES—SPENDING TOTAL (SIZE OF BUBBLE), RECENT TRENDS, AND CONCENTRATION RELATIVE TO NATIONAL AVERAGES, BY DETAILED ACADEMIC DISCIPLINE



Note: *Percent change from 0. **Percent change 2022-2023. ***Latest UVA expenditure from 2022.
Source: TEConomy's analysis of Higher Education R&D Survey (HERD) data, National Center for Science and Engineering Statistics.

While defense-related R&D expenditures are more difficult to track directly, DoD-funded R&D at UVA has remained at steady levels over the past three years at close to $35M annually and is primarily concentrated in Computer and Information Sciences, Biological and Biomedical Sciences, Electrical and Electronic Engineering, and Materials Engineering, a portfolio that aligns closely with the mission technology drivers identified at Rivanna Station and the growth opportunity areas identified through this analysis.

Presence of Core Competency Areas Across Indicators of Research and Innovation Activity

Figure 8, drawn from TEConomy's synthesis of quantitative analyses across publications, researcher-led grants, R&D expenditures, industry-facing research centers, and commercialization activity, provides an integrated scorecard of where Central Virginia demonstrates leading, strong, or emerging presence across use-inspired thematic research competencies relevant to the three focal domains of this study.

Figure 8.

SUMMARY OF CENTRAL VIRGINIA CORE COMPETENCY THEMES IDENTIFIED ACROSS INDICATORS OF RESEARCH AND INNOVATION ACTIVITY

●● = Leading, differentiated presence of core competency; ● = Strong presence of core competency; ○ = Some presence of core competency

Use-Inspired Thematic Research Competencies Emerging from Quantitative Analyses	Presence of Use-Inspired Themes in Research Publications Records	Presence of Researcher-led Project Awards Supporting Competency	Significant R&D Spending & Specialization	Presence of Industry-Facing Academic Research Centers or Assets - Placeholder	Evidence of University-Affiliated Startup & Commercialization Activity
Clinical & Translational Science (Cardiovascular, Oncology focus)	●●	●●	●●	●●	●●
Integrated Multi–omics for Population & Public Health	●●	●●	●●	●●	●
Medical Imaging Technologies	●	●	●●	●	●
Bioengineering, Regenerative Medicine, & Surgical MedTech	●●	●	●●	●●	●●
Neurobiology & Clinical Neurosciences	●	●	●●	●●	○
Cyber-Physical, Autonomous, & Control Systems	●●	●●	○	●	
Cybersecurity & Secure Communications/ Networking Systems	●	●●	●	●	○
Biocomplexity/Network Science & "Digital Twin" Simulation Modeling	●●	●●	●●	●●	
Data Science & Machine Learning Applications (Defense, Social Systems, Policy focus)	●●	●	●	●●	
Advanced Electronics, Energy Storage, & Sustainability Technologies	●●	●	○	●	○
High Performance Materials Engineering	●●	●●	●	●	
Aerospace & Defense Systems Engineering	●●	●●	●	●	
Environmental Monitoring & Dynamics	●●	●●	●	●●	

Source: TEConomy analyses.

This integrated scorecard underscores that Central Virginia's research base is not only broad, but exhibits multiple, clearly differentiated use inspired competencies that cut across biosciences, digital systems, and aerospace and defense engineering.

The strongest patterns of activity emerge where high volume and specialized publication clusters coincide with substantial researcher led grant portfolios, significant and growing R&D expenditures, and dense networks of industry facing centers, **particularly in clinical and translational science, multi omics and population health, medical imaging, bioengineering and surgical medtech, data science and machine learning, cyber physical and autonomous systems, and advanced electronics, energy, and propulsion.** At the same time, competencies such as high performance materials engineering, aerospace and defense systems, and environmental monitoring and dynamics appear as credible but research-driven platforms, with evidence of academic depth and center infrastructure but more limited commercialization activity to date. Taken together, the pattern confirms that the region already possesses the scientific, engineering, and translational "raw materials" needed to fuel potential growth opportunity areas given market facing activation of the capabilities that are already present in the university and federal agency ecosystem.

Taken together, the pattern confirms that the region already possesses the scientific, engineering, and translational "raw materials" needed to fuel potential growth opportunity areas given market facing activation of the capabilities that are already present in the university and federal agency ecosystem.

Highlights of the Market Pull Analysis

Conducted concurrently with the assessment of university research core competencies is a second major assessment focused on Central Virginia's industry clusters and the market pull they generate in the region and beyond for innovation and science- and technology-driven solutions, as well as skilled workforce and talent. The regional market pull assessment considers the following:

- The position and recent performance of the region's industry clusters, in this case limited to the prescribed areas of focus spanning biosciences, IT, and national security and defense.
- The identification and inclusion of the regional clusters as state/regional economic development targets and areas of focus.
- Identification of significant existing and planned or emerging regional industry assets and initiatives.
- The presence of emerging, high-growth potential companies receiving investments in the form of Angel, venture capital, and/or federal SBIR/STTR awards.
- Industry-led innovation, as informed by significant intellectual property activities in the form of patent applications and awards.
- Evidence of the deployment of skilled and STEM-related workforce and talent.

At the end of this discussion, the three targeted clusters for this study will be summarized and scored across each of these elements, which will then be used in the alignment with, and line-of-sight to, regional growth opportunities.

Industry Cluster Analysis

Detailed definitions of each of the three industry clusters were developed in close consultation with the project Steering Committee and presented to the Advisory Group. Each cluster is comprised of numerous individual detailed industries and organized across several major component subsectors.[5]

Today, the three advanced, traded sector[6] industry clusters targeted in this study represent sizable and rapidly growing employment and establishment foundations across Region 9. They combine to employ more than 11,000 Central Virginians across a base of 1,148 individual business establishments (Table 2). From 2019 through 2024, regional employment in the combined cluster set grew by nearly 14%, generating an impressive level of new jobs throughout the region and outpacing growth in the same cluster set for both the Commonwealth overall, and the nation. In fact, each of the three clusters grew by double-digit rates during this 5-year period.

The industry economic analysis makes use of regional location quotients or "LQs" to gauge the cluster's employment concentration in Region 9 relative to the national average. A LQ measures the private sector share of employment in the regional cluster relative to that same share nationally. A LQ greater than 1.0 indicates an above-average employment concentration in the region relative to national averages. A LQ at or above 1.2 indicates a significantly greater level of industry concentration that can be considered a "*specialized*" industry for Central Virginia.

Highlights from the analyses of each cluster include:

- National security and defense represents the largest of the three clusters in terms of employment at 6,000 jobs, and it has established an above-average concentration relative to national averages—its regional LQ is 1.06. The cluster's 13% overall regional growth since 2019 has been 1.5 times faster than that for the nation overall (5.2%).

- Information technology employs nearly 4,400 in Central Virginia, following net employment growth of nearly 11% since 2019. The cluster is relatively under-concentrated in the region relative to national averages, with a LQ of 0.87.

- The region's biosciences cluster has been rapidly emerging, with job growth of 23% since 2019 leading to an employment base of nearly 2,300 in 2024. The recent pace of regional job growth has doubled that for the fast-growing national cluster during this period. While not considered "specialized" in its concentration relative to national averages, the regional cluster stands out for its strong concentration relative to the rest of the Commonwealth—its Virginia LQ is 1.37, or 37% more concentrated relative to statewide averages.

5 For detailed definitions of each regional industry cluster, see the Appendix to this report.
6 Traded sector industry clusters represent those industries that drive new wealth creation by exporting goods and services to those beyond regional borders and therefore form the foundation for Central Virginia's valued-added economic growth.

Table 2.

GO VIRGINIA REGION 9 SUMMARY INDUSTRY EMPLOYMENT, ESTABLISHMENT, AND GROWTH METRICS FOR THE THREE TARGETED CLUSTERS, 2024

Industry Cluster	Establishments, 2024	Employment, 2024	VA LQ, 2024	U.S. LQ, 2024	Empl. Change, 2019-2024	VA Empl. Change, 2019-2024	U.S. Empl. Change, 2019-2024
National Security and Defense	217	6,006	0.5	1.06	13.2%	4.1%	5.2%
Information Technology	653	4,380	0.48	0.87	10.7%	7.1%	29.2%
Biosciences	278	2,268	1.37	0.81	23.2%	17.1%	12.2%
Total, All Industry Clusters	1,148	11,136	0.52	0.84	13.8%	6.2%	9.1%
Total Private Sector Employment	15,122	129,806	-	-	2.4%	4.4%	4.8%

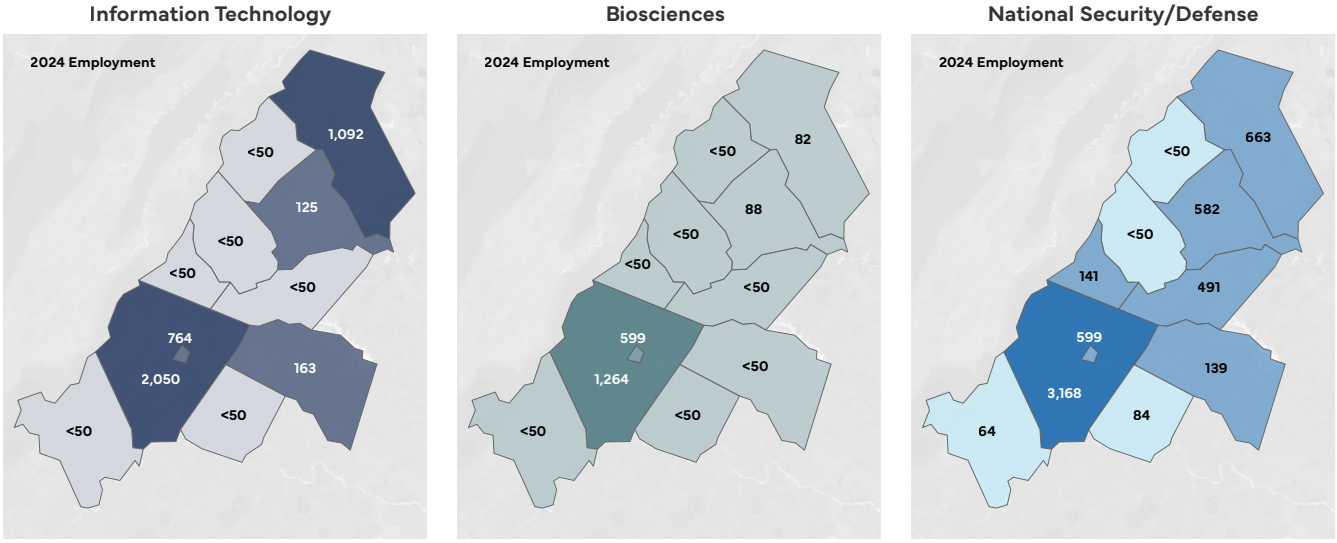
Note: Shading indicates outsized employment of the region's private sector industry mix, industry clusters that outperform VA or U.S. growth trends or represent highly specialized industry clusters (LQ >= 1.2).
Source: TEConomy analysis of Lightcast (2025.3) QCEW data.

Employment in the three clusters is spread across all counties in Region 9, though at differing levels of distribution and county-level concentration (Figure 9).

- The bioscience industry is most centrally and tightly concentrated in the region, with the majority of jobs and firms located in Albemarle County and the City of Charlottesville.
- National security and defense employers are more evenly spread throughout Region 9, with strong concentrations of operations and employment spanning multiple counties including Albemarle, Fauquier, Culpeper, Orange, Greene, Louisa Counties, as well as the City of Charlottesville.
- Information technology employment lies somewhat in between, with several counties home to tech operations and employment, including Fauquier, Albemarle, Louisa, and Culpeper, and the City of Charlottesville.

Figure 9.

EMPLOYMENT IN NATIONAL SECURITY AND DEFENSE, IT, AND BIOSCIENCES IN GO VIRGINIA REGION 9 BY COUNTY, 2024



Source: TEConomy analysis of Lightcast (2025.3) QCEW data.

The major component subsectors of each of the three targeted regional clusters were assessed around three key employment-related variables to understand their performance and relative competitive position. These are plotted in the "bubble" chart in Figure 10 and include the relative employment size of the industry in Central Virginia (represented by the size of the bubbles), the recent net growth rate for employment in each sector (plotted along the horizontal axis), and the industry's employment concentration (LQ) and plotted along the vertical axis. What stands out for each cluster includes:

- **National security and defense's recent growth has been driven by net job gains in three of its four component subsectors (blue bubbles)**—each positioned to the right of the vertical axis in Figure 10. R&D and engineering services, the largest of the cluster's four subsectors at more than 2,100 jobs, has seen the fastest growth (28%); following by aerospace manufacturing, the cluster's most highly concentrated and specialized subsector (LQ is 1.39; job growth is 19%); and civilian national security, which is also specialized in its regional concentration and has increased employment by 7.7% since 2019. Each of these three subsectors has outpaced the nation in their 5-year job growth rates.

  Unlike the other regional subsectors, military employment, with 1,824 jobs in 2024, has been relatively flat overall since 2019, with a minor net decline in regional employment of 0.9%. This modest loss of regional military employment coincides with a larger net decline in national military totals of 2.8% since 2019.

- **The bioscience industry's emergence in Central Virginia is reflected by strong job growth rates in several of its major subsectors** (green bubbles), many of which are modest in size but gaining momentum. These emerging, though not yet specialized sectors include pharmaceutical manufacturing, which has doubled its regional jobs base since 2019; medical devices and equipment, up 27% over the

5-year period; research, testing, and medical labs, up nearly 15%; and bioscience-related distribution, up 33% since 2019.

The region has highly specialized concentrations in the research and labs components of its higher education and hospitals subsectors, where the analysis has isolated these pieces of those much larger overall industries to reflect the core bioscience-related occupations and activities most aligned with the bioscience industry, and excluding the core education and clinical workforces that dominate these sectors.[7] Not surprisingly, these leading regional subsectors develop, test and trial, and deploy a wide range of biosciences and biomedical innovations, and their research-related workforces are reflective of that activity.

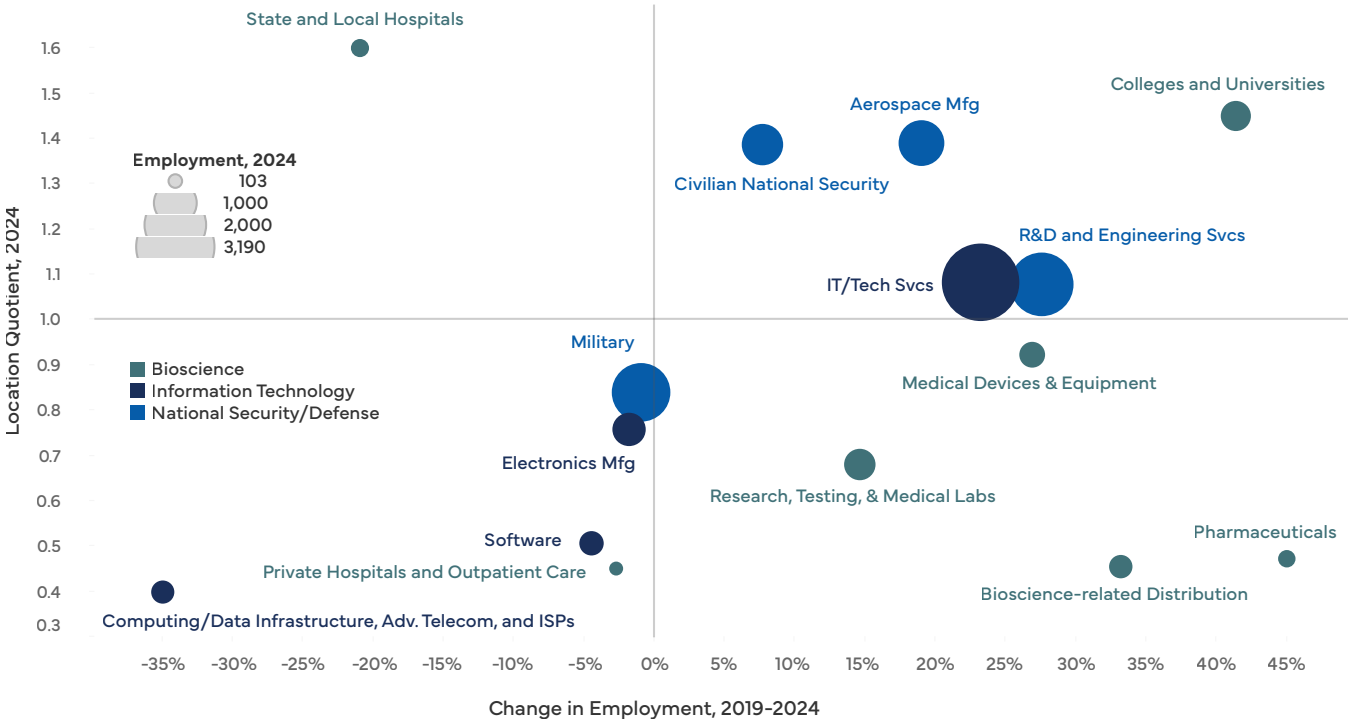
  - Jobs in the region's bio-related colleges and universities subsector, inclusive of UVA life sciences and biomedical-related research activities, is nearly five times more concentrated in Central Virginia than the nation overall, and has grown at a rapid 41% rate since 2019. Meanwhile, the bio-related state and local hospitals subsector also maintains a very high LQ, 5.43 in 2024, but has seen net job declines since 2019.

- **In information technology, Central Virginia's sizable and growing employment base (dark blue bubbles) is reflected by a large and highly concentrated, though not yet specialized, base of IT/technology services industries** (employment is nearly 3,200; LQ is 1.08) that has grown by 23% since 2019 and offset net job declines in the region's smaller IT subsectors such as software and electronics manufacturing. The region's IT/tech services subsector includes custom software and systems design and has outpaced the national job growth rate since 2019 by nearly 3 times—23% versus 8%, respectively.

7 For more information on the approach used to isolate these higher education and healthcare subsectors, see the Appendix to this report.

Figure 10.

CENTRAL VIRGINIA TARGETED INDUSTRY CLUSTERS—EMPLOYMENT SIZE, RELATIVE CONCENTRATION (LOCATION QUOTIENT), AND EMPLOYMENT CHANGE, 2019-24



Source: TEConomy analysis of Lightcast (2025.3) QCEW data.

Target Industries Identified by Central Virginia Partnership for Economic Development (CVPED)

Recognizing the regional importance of the traded sector industries of focus for this study, CVPED includes each of the three in its ongoing efforts to promote and strategically target regional cluster development. Its current set of targeted industries include the following, along with examples of existing companies operating in the region.

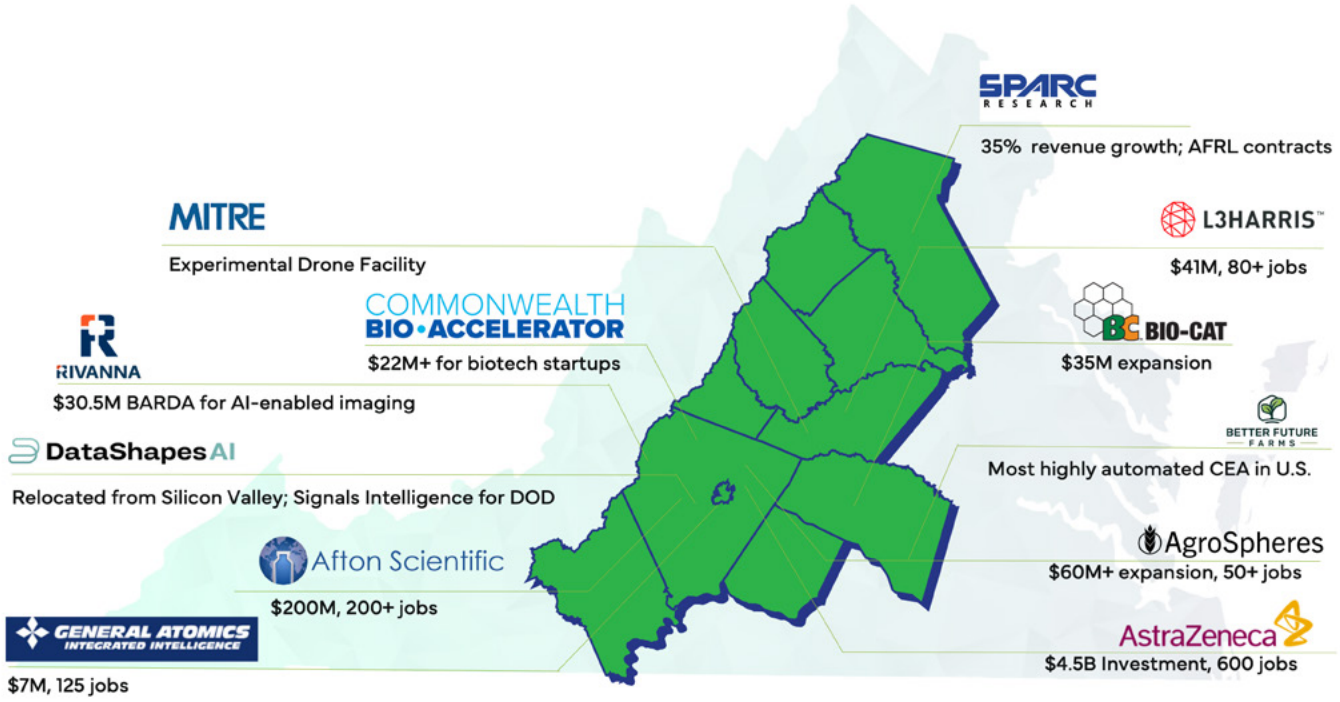
- **Biosciences and Medical Devices:** organizations include CvilleBioHub, Bonumose, Focused Ultrasound Foundation, BIO-CAT, MicroAire, InBio, AgroSpheres, Afton Scientific, and Contraline.
- **Agribusiness, Food Processing & Technology:** companies include Bell Nursery, Bright Farms, Equinox Growers, Merchant's Grocery Company, Devils Backbone Brewing Company, Grelen Nursery, Willow Run Greenhouse, and Virginia Distillery Company.
- **Information Technology:** organizations include the Equinix Culpeper Data Center, Insurance Institute for Highway Safety, TELUS Digital (fka WillowTree), SHINE Systems, Eiden Systems, Apex Clean Energy, Perrone Robotics, and SolarWinds.
- **Business and Financial Services:** organizations include the Equinix Culpeper Data Center, Amazon Web Services Data Centers, S&P Global Market Intelligence, National Audio-Visual Conservation Center, SWIFT, and CFA Institute.
- **Defense and National Security:** organizations include the National Ground Intelligence Center, Defense Intelligence Agency, National Geospatial-Intelligence Agency, EURO-COMPOSITES, Northrop Grumman, L3Harris (fka Aerojet Rocketdyne), Eiden Systems, CACI Enterprise Solutions, and MRI Global.
- **Advanced Manufacturing:** companies include EURO-COMPOSITES, Northrop Grumman, Virginia Diodes, Klöckner Pentaplast, L3Harris (fka Aerojet Rocketdyne), Mann+Hummel (Tri-Dim Filter Corporation), Lohmann Corporation, and Patriot Industries.

Source: Central Virginia Partnership for Economic Development, see: https://www.centralvirginia.org/site-selection-assistance/target-industries/.

Complementing the recent growth in the targeted regional clusters, what is especially exciting for Region 9 is the strong, forward-looking momentum the region has generated across all three clusters. Central Virginia is seeing region-wide major corporate expansions, new investments, and announced plans taking shape. Figure 11 highlights just some of these examples, an image that demonstrates much of the impetus for organizing around an Innovation Corridor opportunity in these dynamic advanced industry spaces.

Figure 11.

REGION 9 INVESTMENT ANNOUNCEMENTS AND MILESTONES SINCE 2023 IN BIOSCIENCES, IT/TECH, AND NATIONAL SECURITY-RELATED CLUSTERS



Source: CVPED and TEConomy.

A high-level listing of these and other transformative investments are included here.

UVA is continuing to make an exciting array of investments in its R&D and translational research capabilities in the biosciences as well as in digital/IT areas closely aligned with and relevant to national security and intelligence. These investments include but are not limited to:

- The establishment of the new Paul & Diane Manning Institute for Biotechnology, an investment of $350 million, designed to bring together researchers and scientific leaders from across the University spanning biomedical, engineering, and chemical sciences with the aim of advancing "collaborative science and establishing a state-of-the-art campus centered on the research, development, commercialization, manufacturing, and patient care of new, innovative cellular, gene, and immuno-therapies."

- The creation of UVA's National Security Data and Policy Institute, funded by the Office of the Director of National Intelligence (ODNI), which applies relevant academic and research knowledge emerging out of the School of Data Science, the Batten School of Public Policy, and the Biocomplexity Institute.

- Investments at the University's North Fork Research/Discovery Park where a significant share of tenant companies and organizations are DoD and/or intelligence contractors.

- The partnership with industry-led CvilleBioHub's Commonwealth BioAccelerator to launch an $8 million initiative to support life science startups that includes wet lab space, access to capital, and entrepreneurship support.

Other recent announcements, developments, and assets span infrastructure, talent, and entrepreneurship, and include:

- Piedmont Virginia Community College opened the Bolick Center to train students for careers in advanced manufacturing, robotics, cybersecurity, and forensics.

- Germanna Community College has received funding to provide fiber optic training and other skills necessary for AWS-related jobs.

- DataShapes AI recently relocated from Silicon Valley to North Fork.

- UVA's School of Data Science—the first of its kind in the nation—is expanding to accommodate additional students, researchers, and industry partners.

Similarly, recent corporate investments in Region 9 include:

- L3Harris Aerojet Rocketdyne's $1.27 billion expansion of its solid rocket motor production, adding 350 new jobs (Orange County).

- BIO-CAT's $35M expansion to increase fermentation capabilities for line of enzymes, microbials, and probiotics (Louisa County).

- Afton Scientific's $200M investment will expand clean-fill facility, adding 200+ jobs (Albemarle County).

- MITRE opened a new experimental drone facility to evaluate technological advances for commercial robotics, autonomous systems, and drones (Orange County).

- AWS and DataBank established $20B data campuses (Culpeper and Louisa Counties). EdgeCore Digital Infrastructure has announced a $17.2 billion data campus.

- AgroSpheres' $25M investment to develop sustainable crop protection, adding 50 new jobs. Recently announced $37M Series B funding and partnership with BASF (Albemarle County).

- SPARC Research expanded its program and engineering services in advanced missile and rocket propulsion (Fauquier County).

- GA-CCRi $7M investment will expand its services, adding 125+ jobs while serving the technology and intelligence sectors (City of Charlottesville).

Venture Capital Investments

Access to growth capital and non-dilutive federal funding is critical for advancing innovation-led industries and their technology and product development, including for those that make up the focus of this strategy. At a high level, companies in Region 9 were part of a cumulative 336 total VC and Angel deals totaling $1.27 billion in funding from 2019 through 2025 (YTD, through August, see Figure 12). Overall deal flow has been relatively flat over the full period, though 2023 saw a significant spike in deals. In terms of funding levels, total VC funding steadily increased from 2019 through 2022, then fell off significantly, in line with national trends in funding. Since 2023, investment levels have averaged $124 million, though 2025 levels, which represent activity through August, are on pace to surpass 2024, at least as a modest year over year increase. The overall regional trend generally mimics national post-pandemic investing which saw a national peak in 2021 followed by a sharp decline.

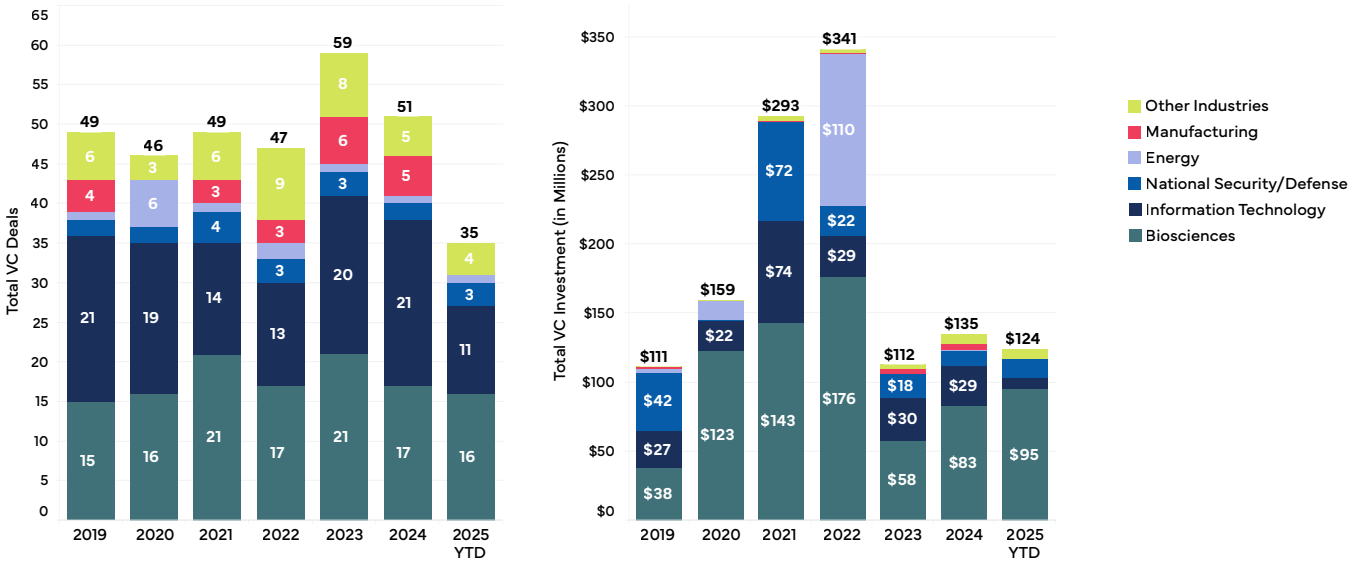
At the sector or cluster level, the analysis finds:

- Bioscience companies constitute 37% of total regional deals and 56% of total investment from 2019 to present.
- IT/Tech firms comprise 35% of deals and 17% of regional investment.
- National Security/Defense firms constitute 6% of deals and 14% of regional investment.

It is important to note that most of the companies identified as defense-related are also within the IT sector, though care has been taken to not double-count in the shares reported above. In terms of company stage at investment, later-stage deals have dominated the investment totals since 2023, with 80% of investment from 2023 through 2025 in later-stage companies, compared to a 59% share during the 2019 through 2022 period.

Figure 12.

REGION 9 VENTURE CAPITAL DEALS AND INVESTMENT TOTALS BY INDUSTRY, 2019-2025 (YEAR TO-DATE)*



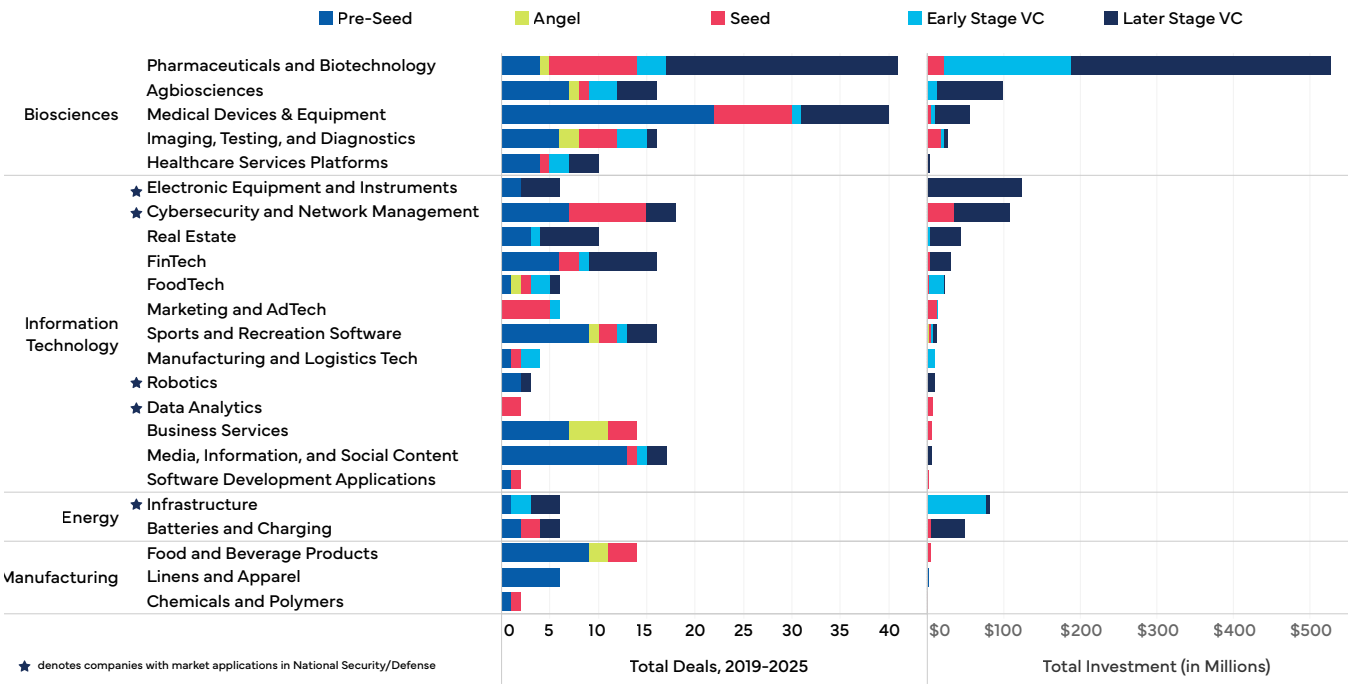
Source: TEConomy analysis of PitchBook data.
*Note: data for 2025 are not complete and represent activity only through August.

Specific areas of industry and market vertical related investments are highlighted in Figure 13. Areas that stand out for Central Virginia during this 7-year period include:

- In the biosciences, pharmaceuticals and biotechnology represent the leading area in terms of both deals and funding levels and driven by eight companies with $10 million or more invested, largely clinical stage biotechs working on drug discovery related to chronic and metabolic conditions, including:
    - Rivus Pharmaceuticals - $224M
    - Acumen Pharmaceuticals - $75M
    - HemoShear Therapeutics (no longer in business) - $45M
    - ZielBio (no longer in business) - $40M
    - Contraline - $39M
    - AMPEL BioSolutions - $38M
    - TearSolutions - $24M
    - LumaCyte - $17M
- Also in the biosciences cluster, medical devices and equipment stands out, with strong deal activity in particular, though lower levels of funding compared with the pharmaceutical and biotech activity. Activity has been driven by four companies with $5 million or more invested, including:
    - In lab instruments – BrightSpec Labs at $25M; and Cerillo at $5M.
    - In patient monitoring and personalized medicine domains – Luminoah at $12M; and Caretaker Medical at $11M.
- In the information technology sector, with many of the leading VC-backed companies operating in national security and defense related technology and market domains, the following areas stand out with relevance to this effort:
    - Electronic equipment and instruments, driven by one leading company—Everactive, with five deals totaling $123M.
    - Cybersecurity and network management, driven by five companies with at least $5 million invested, including:
        - SafeGuard Cyber - $68M
        - ValiCyber - $15M
        - DataShapes AI - $12M
        - RIIG - HOOTL - $7M
        - Mission Secure - $6M

Figure 13.

EMERGING MARKET FOCUS AREAS FROM RECENT VC INVESTMENT ACTIVITY IN REGION 9 COMPANIES, 2019-2025 (YTD)



Source: TEConomy analysis of PitchBook data.

*Note: data for 2025 are not complete and represent activity only through August.

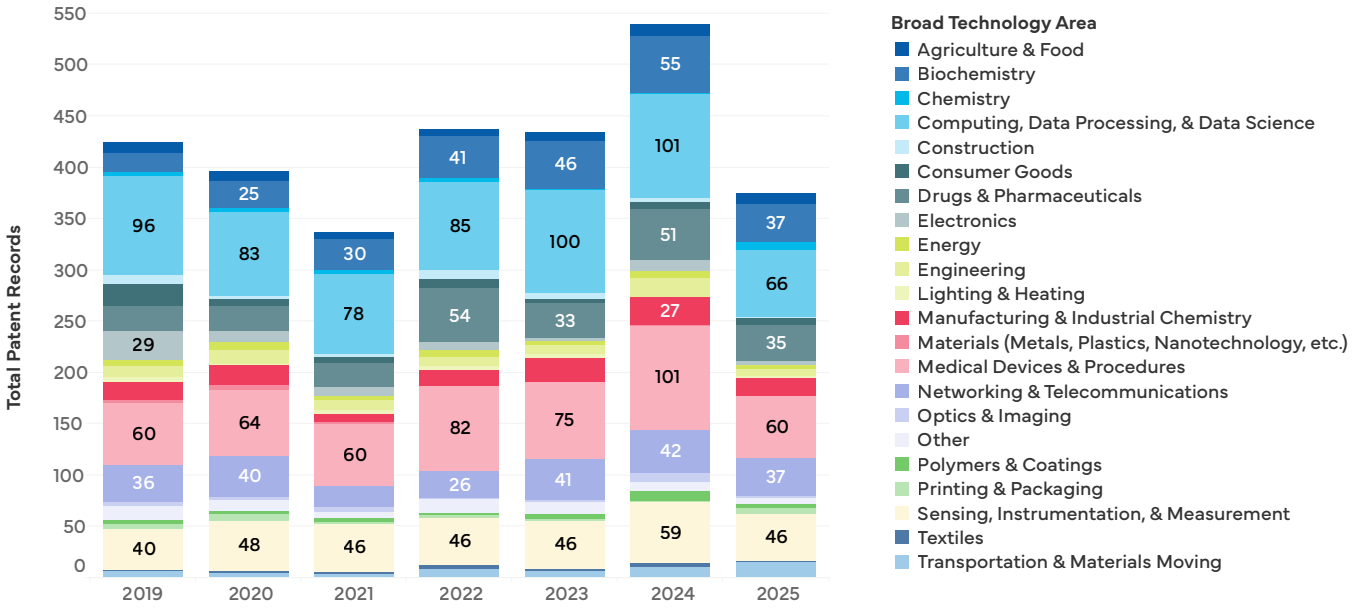
Patent Applications and Awards

Patenting represents another key gauge of industry innovation activities and the associated technology and innovation themes arising out of that activity in Central Virginia. The analysis of patent applications and awards examined the corporate and university assignees and patent classes in which they are protecting their intellectual property. The assessment included nearly 3,000 patent applications and awards combined over the period from 2019 through 2025 associated with at least one Region 9 inventor.

In terms of broad-based technology areas (Figure 14), the leaders include classification areas with strong relevance for the clusters and technology domains of interest in this strategic planning effort (with cumulative counts spanning all years) include Computing, Data Processing, & Data Science (609 records); Medical Devices & Procedures (502 records); Sensing, Instrumentation, & Measurement (331 records); Biochemistry (252 records); Drugs & Pharmaceuticals (242 records); and Networking & Telecommunications (242 records).

Figure 14.

PATENT AWARD AND APPLICATION TOTALS AND TRENDS, BY BROAD TECHNOLOGY AREA, 2019–2025



Source: TEConomy's analysis of USPTO data via Derwent Innovation.

Similar to publications and grants, it is possible to conduct a patent innovation landscape analysis that provides more detailed and refined insights into thematic areas of regional strength by combining related patent classifications and technology areas into clusters of concentrated themes. These are presented in Figure 15 and include relevant innovation themes spanning each of the three cluster domain areas at some level.

Across this IP landscape, several cross cutting themes emerge that reinforce the region's position at the intersection of life sciences, digital technologies, and national security–relevant innovation:

- First, there is a strong convergence of advanced sensing, imaging, and AI or data science capabilities applied to both healthcare and defense applications, ranging from ophthalmic and neurological imaging, wearable and implantable monitoring devices, and machine learning–enabled diagnostics, to cyber physical systems, anomaly detection, and secure network analytics that underpin mission critical decision support.

- Second, the landscape highlights a distinctive specialization in engineered hardware and materials platforms that bridge sectors, including biocompatible and bioengineered materials, implantable and orthopedic devices, advanced semiconductors and power systems, additive manufacturing, and novel polymers and coatings, which together enable new generations of medical technologies, protective equipment, and resilient infrastructure systems.

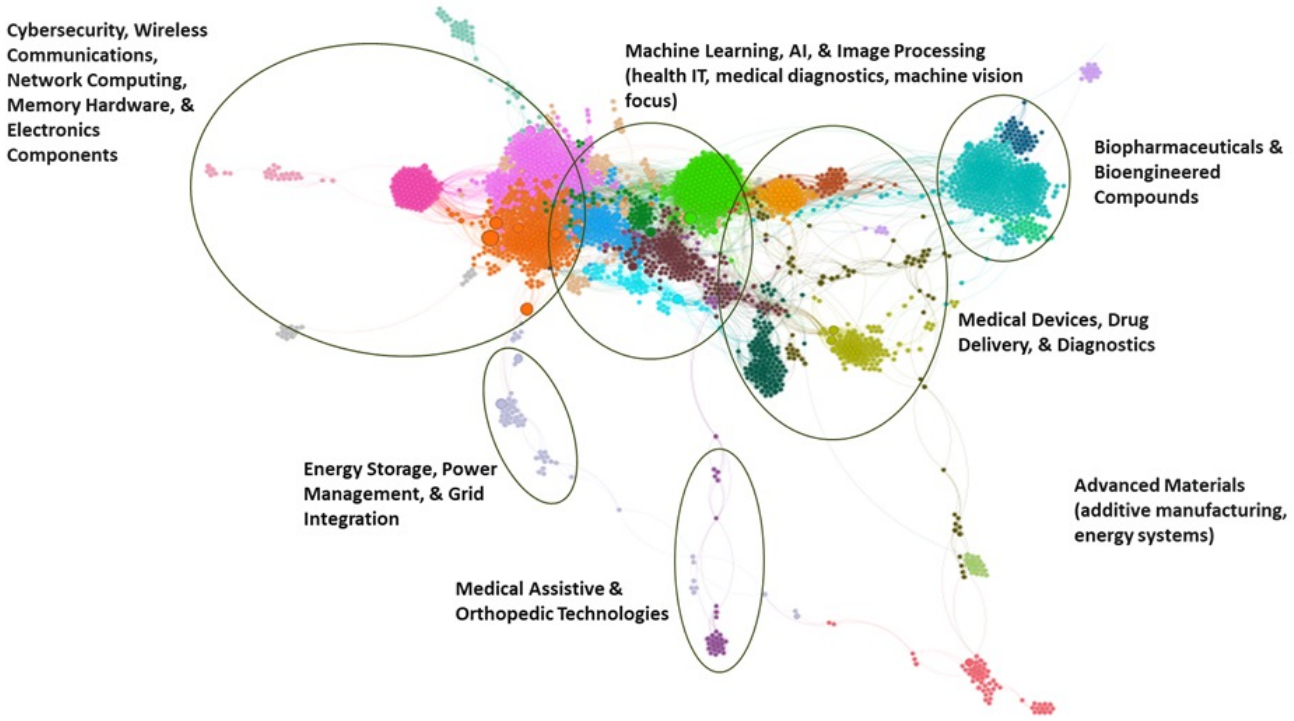
- Third, the patent clusters underscore innovation activity related to secure, data rich systems for managing complex environments, with significant IP around healthcare management platforms, secure authentication and network security

architectures, electronic payments and commerce, and industrial automation or control systems, collectively pointing to regional strengths in building trustworthy, software intensive systems.

- Finally, there is a specialized cluster of activity in biopharmaceuticals and bioengineered compounds, spanning small molecule drugs, biotherapeutics, vaccines, and engineered microbes, cells, peptides, and enzymes that target cancer, autoimmune, infectious, and neurological conditions as well as antimicrobial, antiviral, immune modulating, and agricultural applications, reflecting regional expertise in translational therapeutics and precision biologics at UVA and several key biotech companies.

Figure 15.

TECHNOLOGY AND INNOVATION THEMES IN LANDSCAPE ANALYSIS OF CENTRAL VIRGINIA PATENT AWARDS AND APPLICATIONS, 2019-2025



Source: TEConomy's analysis of USPTO data via Derwent Innovation.

Summary of Regional Industry Performance and Innovation Dynamics

Central Virginia's clusters of focus were analyzed across each of the market pull related indicators that examined their employment-driven industry position, their regional targeting status, consideration of existing industry-related assets and initiatives, and innovation stance as indicated by their respective presence of emerging VC-backed companies and patenting activity, as well as their relative deployment of a skilled workforce base (Table 3).

While the cluster profiles and levels of activity and performance vary, each of the three regional clusters is meeting some level of activity or positioning that spans the "some/emerging" through "leading, innovation-driven" scorecard in Table 3. Each is demonstrating strong growth in employment and regional footprint, each is a focus of the region's targeted cluster development efforts, and each is represented in regional assets and initiatives, though in the biosciences these are noted as especially forward-looking based on major new investments underway. The biosciences stand out in their presence of emerging companies, recognizing the cluster's leadership in VC investment activity and SBIR awards, though national security and IT both have a strong, though largely overlapping presence in indicators of emerging innovative companies. Region 9's IP activity in IT innovations stands out as a leading area, followed by bioscience-specific IP clusters. Each is deploying a high-skilled, STEM-intensive workforce and the biosciences combine that with a skilled technician and production workforce that is reflective of the cluster's advanced manufacturing focus.

Table 3.

SUMMARY OF ACTIVITY ACROSS INDICATORS OF "MARKET PULL" FOR REGION 9 INDUSTRY CLUSTERS OF FOCUS

●● = Leading, innovation-driven traded sector cluster; ● = Strong presence of traded sector cluster
○ = Some/emerging presence of traded sector cluster

Industry Clusters	Leading Industry Position*	State Economic Development Focus Areas	Existing Industry Assets & Initiatives	Presence of Emerging Companies Generating Investment	Evidence of Significant IP Generation Activity	Evidence of Skilled Workforce Base Aligned With Industry
National Security and Defense	●	●●	●●	●	○	●
Information Technology	●	●●	●	●	●●	●
Biosciences	●	●●	**	●●	●	●●

*Considers measures of employment size, recent growth in Region 9 and relative to U.S., and concentration/ specialization relative to national averages (LQs).
**New investments by AstraZeneca and UVA Manning Institute expected to significantly expand industry footprint.
Source: TEConomy analyses.

Each cluster has a clear innovation orientation and set of needs and drivers, and while they vary by degrees, the market pull analysis finds a regional ecosystem primed for significant forward-looking growth opportunities when aligned with the technology push coming out of UVA.

Central Virginia's Growth Opportunities that Emerge from Line of Sight Analysis

The detailed quantitative assessments of the technology push of core research competencies and the market pull of industry cluster performance and innovation activities result in a number of distinct, though preliminary, areas of alignment to growth opportunities. It is critical to go beyond quantitative analyses, however, to understand underlying dynamics and ground truths for the region, as well as to better understand forward-looking investments, strategic priorities, and additional activities that may help define potential growth opportunity areas. This information requires guidance from regional industry and academic, research, economic development, and other innovation ecosystem leadership. This input was gathered via two key qualitative approaches:

- **Guidance from a 40-member Advisory Group**, with members strategically selected to reflect leading industry clusters, UVA, federal agencies, and economic development leadership. In-person committee meetings and one-on-one interview discussions were held to ensure appropriate feedback and guidance.
- **One-on-one or small group interviews with 56 regional industry, university, and economic development stakeholders.**

In some cases, the qualitative input and feedback confirmed initial recommended growth opportunity areas, and in others it helped to refine or alter the thrust of an area to better reflect present realities and planned future investments.

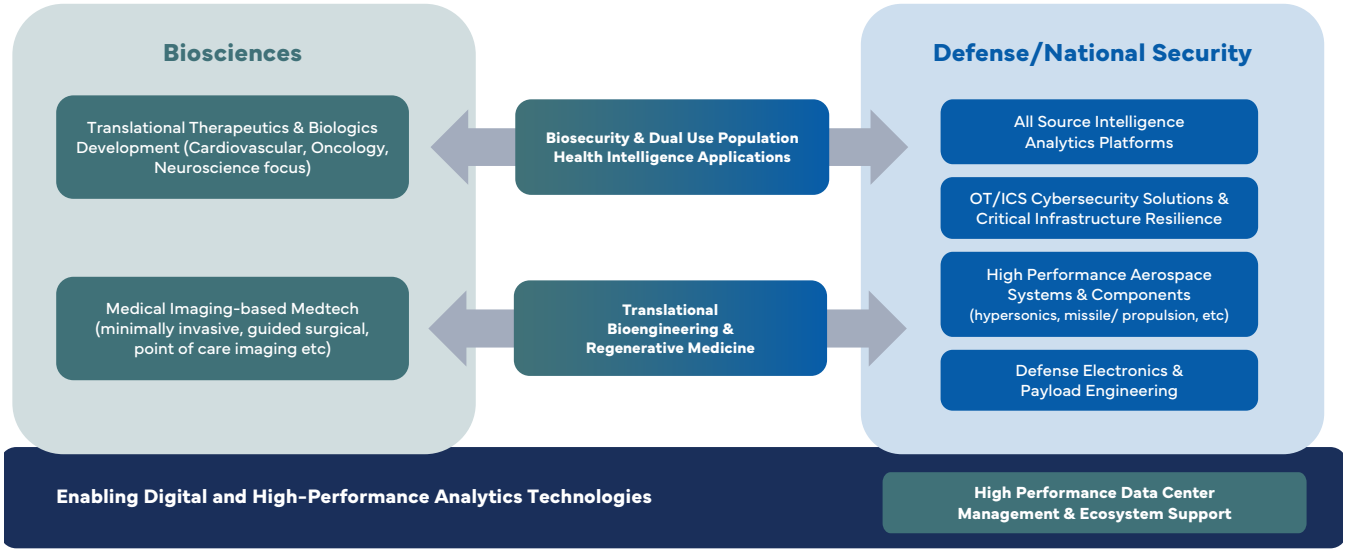
The synthesis of Central Virginia's technology push and market pull analyses points to **a set of eight concrete, regionally grounded growth opportunities in biosciences and national security domains** shown below in Figure 16. The region's core research competencies demonstrate that there is meaningful critical mass in multiple use-inspired domains, while parallel analysis of industry structure, performance, and innovation indicators reveals a number of private-sector demand and mission needs that are most strongly aligned and most likely to grow. Taken together, these perspectives yield a focused portfolio of growth opportunities for Central Virginia that connect research platforms to regional clusters in biopharmaceuticals and medtech, health data and analytics, advanced materials and engineered systems, secure digital infrastructure, and defense and intelligence solutions tied to Rivanna Station and the broader federal ecosystem.

Importantly, several of these growth opportunity areas are inherently cross-functional between biosciences and defense rather than siloed. Biosecurity and dual-use population health intelligence, for example, depend on the same integrated multi-omics, clinical and translational science, and advanced analytics capabilities that underpin precision health, while also drawing on defense-oriented strengths in threat detection, surveillance, and epidemiological modeling. Similarly, translational bioengineering and regenerative medicine intersect with defense and aerospace-related materials sciences where advanced biomaterials, tissue repair, and human performance enhancement meet extreme-environment engineering and mission resilience needs. **The resulting portfolio of growth opportunities described in the following section therefore reflects not only where Central Virginia has excellence in individual fields, but where those capabilities intersect in ways that can sustain existing clusters, open new market niches, and create durable**

innovation platforms that are resilient to shifts in any single sector or funding source.

Figure 16.

CENTRAL VIRGINIA GROWTH OPPORTUNITIES IDENTIFIED IN TARGET BIOSCIENCES AND NATIONAL SECURITY DOMAINS



Source: TEConomy analyses.

Notably, enabling digital and high-performance analytics technologies function as the connective tissue across nearly all of the identified growth opportunities, providing the data management, modeling, AI, and secure computational capabilities that make biosciences and defense technology applications commercially and operationally viable. These capabilities are increasingly intertwined with the region's expanding high-performance data center footprint and related infrastructure development, which together provide the scalable compute, storage, and connectivity needed to support advanced analytics for both commercial and mission users. At the same time, this enabling layer is best understood as a foundational platform rather than a standalone growth opportunity, since its value is realized through the way it amplifies and accelerates innovation in the domain-specific opportunity areas rather than through a distinct, separable market of its own.

III. Central Virginia's Growth Opportunities in Biosciences and National Security

Biosciences: Translational Therapeutics and Biologics Development

What is the opportunity?

Central Virginia sits at the threshold of an emerging, forward-looking growth opportunity in the development and manufacturing of therapeutics and biologics—one that could position the region as a significant innovation hub at the intersection of academic research, clinical translation, and advanced biomanufacturing. Fueled by major new investments from UVA's Paul and Diane Manning Institute of Biotechnology and AstraZeneca's planned regional manufacturing expansion, the region is establishing the ingredients to support a dynamic ecosystem for developing, testing, and producing next-generation medicines.

Therapeutics and biologics development encompasses the discovery, design, and production of advanced therapies—ranging from monoclonal antibodies and gene therapies to cell-based and RNA-based treatments. These technologies represent the forefront of modern biomedical innovation, addressing diseases through highly targeted mechanisms that require sophisticated capabilities in molecular biology, translational research, and precision manufacturing. As the global biopharmaceutical industry continues its shift toward personalized and biologic-based treatments, regions that can integrate and uniquely combine research excellence, clinical capacity, and specialized manufacturing infrastructure will capture growing investment and job creation potential.

Building such an ecosystem depends on leveraging and combining several regional capabilities:

- World-class research and translational science to drive discovery and early-stage clinical validation.
- Specialized biomanufacturing capacity with expertise in biologics process development, quality systems, and scale-up.

- Collaborative anchor institutions and players—academic, hospital, and industry partners—capable of advancing innovations from the lab bench to clinical trials to patient care.

- Workforce and talent pipelines that combine varied expertise and skill sets spanning life sciences researchers, bioprocess engineers, and regulatory experts.

- Supportive innovation infrastructure, including startup accelerators, shared lab space, and capital access vehicles.

Key Market Forces Driving Growth

The market opportunities in therapeutics and biologics development are vast, spanning a wide range of disease areas and conditions. At the same time, with a forward-looking opportunity that will evolve as major regional investments play out and are stood up and implemented, it is challenging to say with any certainty the specific disease areas and therapeutic targets that will be the ultimate primary areas of innovation and discovery focus in the next 3 to 5 years.

Recognizing all of this, the growth opportunity described herein focuses on existing areas of strength for the region, primarily in the form of established research strengths and core competencies at UVA today. From the assessment, these broad areas include:

- Cardiovascular
- Oncology
- Neuroscience

Beginning with the broadest context (non-disease specific), the following market forces represent at least some of the major drivers of what are robust and established high-growth therapeutics and biologics markets nationally and globally:

- **The rising burden of chronic disease.** The increasing global prevalence of cancer, diabetes, cardiovascular and autoimmune diseases is driving sustained demand for advanced therapies that can manage or modify complex conditions over the long term. As these diseases account for a growing share of morbidity and health spending worldwide, payers and health systems are prioritizing effective biologic and advanced therapeutics that improve outcomes and reduce downstream costs.

- **Aging populations and longevity.** Global aging is expanding the patient population for conditions such as arthritis, neurodegenerative diseases, and metabolic disorders, all of which are major targets for biologic interventions. Older and aging populations are expanding the patient population for conditions such as arthritis, neurodegenerative diseases, and metabolic disorders, all of which are major targets for biologic interventions.

- **A continued shift toward targeted and personalized medicine.** Personalized and precision approaches increase the value of platforms such as monoclonal antibodies, cell and gene therapies, and RNA-based products that can be engineered to highly specific targets. These approaches increase the market value of platforms such as monoclonal antibodies, cell and gene therapies, and RNA-based products that can be engineered to highly specific targets.

- **Adoption of biosimilars and access-focused policies.** The growing acceptance and use of biosimilars[8] is expanding access to biologic therapies in both mature and emerging markets, broadening the overall patient base. Regulatory and policy support for biosimilars and value-based care models is reinforcing the demand for biologics by making them more affordable, while still encouraging innovation at the high end of the market.

- Other market drivers include:
  - **Rapid innovation and R&D investments.** Biopharmaceutical companies, governments, and investors are steadily increasing R&D spending on biologics and advanced therapies, recognizing their superior growth and differentiation potential relative to traditional small molecules.

  - **Expanding biomanufacturing capacity and capabilities.** To meet rising demand, firms are investing heavily in new and upgraded cGMP biomanufacturing facilities, advanced process technologies, and intensified production platforms worldwide.

Why Central Virginia?

Central Virginia is establishing an impressive alignment of the key elements and factors necessary to realize this opportunity. The Manning Institute will enhance translational and manufacturing capabilities that bridge discovery and production, while AstraZeneca's activities signal industrial maturity and downstream manufacturing advanced enough to support large-scale therapeutic output. Together, along with existing expertise and company activities, they create a foundation for a vertically integrated biomedical Innovation Corridor serving multiple disease areas.

More specifically, this emerging growth opportunity can leverage UVA's leadership in cardiovascular medicine, oncology, and neuroscience, where the university's research strengths and assets align with high-growth therapeutic domains in the biopharmaceutical pipeline. These specialties offer not only scientific depth but also clear clinical pathways and market opportunities, from cell and gene therapy for brain and heart conditions to biologic-based immunotherapies for cancer.

Highlights of Technology Push

- **UVA has existing research competencies to leverage for translational therapeutics development pathways.** The analysis of research publications finds significant critical mass around several enabling thematic areas of expertise relevant to this opportunity set, including targeted therapeutics and delivery mechanisms in a broader context and focus in oncology with respect to immunotherapies, as well as neuro-oncology therapies in the context of radiotheranostics. The analysis of research grants reinforces these areas of excellence with distinct thematic areas of focus centered on novel cancer therapeutics and precision medicine including immunotherapy, targeted therapies, and focused ultrasound and nanotech-based therapies. Further, numerous grant awards are thematically concentrated in precision medicine aligned with medtech applications and strengths combining diagnostics and diagnostic imaging with drug delivery systems and nanotherapeutics and multi-omics platforms for disease identification and diagnosis—combined strengths aligned

8 Biosimilars are biological medicines that are highly similar to an already approved reference biologic and have no clinically meaningful differences from it in terms of safety, purity, or effectiveness.

with a regional innovation opportunity in theranostics and radiotheranostics.

- UVA has a relevant network of existing core research facilities and institutes that provide the scientific, translational, and manufacturing backbone for a regional therapeutics and biologics growth strategy.[9] The UVA Center for Human Therapeutics (cGMP Facility) offers FDA-compliant cleanroom manufacturing, quality control, and regulatory support for first-in-human, pilot, and Phase I trials in cellular and biologic therapies, directly enabling bench-to-bedside translation. These platforms are complemented by a robust set of shared cores (biomolecular analysis, biorepository and tissue research, imaging, radiochemistry, and others), the UVA Comprehensive Cancer Center and its Translational Research Teams, and the Wallace H. Coulter Center for Translational Research, which together support discovery, preclinical validation, and commercialization of new therapeutic technologies.

- The UVA Comprehensive Cancer Center's clinical trials capabilities are built to support a full spectrum of oncology research, from early-phase, first-in-human studies to large, multi-center trials, underpinned by its status as an NCI-designated Comprehensive Cancer Center and recognition as a top oncology program nationally. The Center supports more than 100 active cancer clinical trials, backed by centralized infrastructure that includes the School of Medicine's Clinical Trials Unit and Clinical Research Unit, which provide trained research nurses, coordinators, and regulatory, budgeting, and data management services so investigators can efficiently design, launch, and manage complex studies.

- **The University of Virginia's investment in the Paul and Diane Manning Institute of Biotechnology is designed to give the region a full translational pathway from discovery science to patients,** rather than just adding more lab space. It brings together advanced research, small-scale biomanufacturing, and industry-facing commercialization support under one umbrella, positioning UVA as both a science hub and a production partner for next-generation therapies.

  On the commercialization side, the Manning Institute is structured to help move promising discoveries out of traditional academic silos and into the market. It provides shared core facilities, regulatory and clinical trial expertise, and industry collaboration space to support spinouts, joint development with established biopharma, and licensing of UVA technologies. The goal is to shorten the distance between early-stage therapeutic concepts and first-in-human or early clinical studies, making Central Virginia an attractive place for companies looking for a translational partner.

  For production, the Institute incorporates GMP-capable biomanufacturing suites and process development capabilities that can support preclinical and early clinical production runs for biologics and advanced therapies. That means UVA investigators and industry partners can design, optimize, and produce clinical-grade material for Phase I/II trials locally, rather than outsourcing to distant contract manufacturers. As these capabilities mature, they create a

9 Radiotheranostics refers to targeted radiopharmaceutical approaches that combine diagnostic imaging and radionuclide therapy using the same or paired radiolabeled molecules, enabling "see what you treat and treat what you see" precision treatment, particularly in oncology.

natural bridge to larger-scale commercial manufacturing in the region, including AstraZeneca's facilities and other potential industrial partners.

Workforce and talent development are built into the model. The Manning Institute is intended to train the next generation of translational scientists, bioprocess engineers, and regulatory and quality specialists who are essential to a competitive therapeutics and biologics ecosystem. This includes new graduate and professional programs, hands-on training in GMP environments, and structured pathways for students, postdocs, and clinicians to gain industry-relevant skills. Over time, that talent pipeline becomes a regional asset, supplying skilled workers to startups, established manufacturers, and health systems across Central Virginia and reinforcing the case for further private investment.

- **The Manning Institute has signed a Master Research Collaboration Agreement with AstraZeneca that creates a streamlined framework for long-term R&D partnership across multiple therapeutic areas.** The agreement standardizes terms and operational pathways for preclinical projects, reducing administrative hurdles and shortening time-to-launch for collaboratively designed studies. It allows AstraZeneca's R&D teams to work more efficiently across UVA's scientific strengths and core facilities, including high-throughput screening, advanced imaging, computational modeling, and biomarker development. Initial work will focus on a C. difficile program, with the framework explicitly designed to expand into oncology, immunology, cardiovascular and metabolic disease, and infectious diseases as the portfolio grows. By tying the company's global drug discovery and biologics platforms to the Manning Institute's translational and engineering capabilities, the agreement is intended to accelerate the path from academic discovery to industry-grade candidates while also deepening training and engagement opportunities for UVA students, postdocs, and research staff.

Investing in the Biosciences Workforce Pipeline: The Virginia Center for Advanced Pharmaceutical Manufacturing (VCAPM)

A transformative regional announcement has accelerated institutional coordination around workforce development and skills training. In October 2025, pharmaceutical companies AstraZeneca, Eli Lilly and Co., and Merck committed $120 million in private industry investment, in coordination with state government and Virginia's higher education institutions, to establish the Virginia Center for Advanced Pharmaceutical Manufacturing (VCAPM). This landmark public-private partnership, anchored in the Richmond-Petersburg-Charlottesville corridor—a designated U.S. Economic Development Administration Tech Hub for Advanced Pharmaceutical Manufacturing—will operate on a hub-and-spoke model, with approximately 90,000 square feet of core simulated training space spanning the region and connections to the community college system. The VCAPM will train 2,000 to 2,500 graduates annually through stackable credentials and degree pathways ranging from technician-level certifications to advanced graduate programs, each aligned with real GMP (Good Manufacturing Practice) manufacturing principles. The center's operations will be led by the Virginia Innovation Partnership Corporation (VIPC) and Virginia Economic Development Partnership (VEDP) and will include pilot-scale manufacturing suites, analytical labs, classrooms,

and flexible training spaces. The VCAPM's educational partnerships encompass the full regional ecosystem of higher education institutions—including the University of Virginia, Virginia Commonwealth University, Virginia Tech, Old Dominion University, James Madison University, and Hampton University—working collaboratively with community colleges including Brightpoint Community College, Reynolds Community College, Piedmont Virginia Community College, and Blue Ridge Community College. This coordination mechanism establishes integrated pathways from secondary and adult learner entry points through to advanced degree programs.

Highlights of Market Pull

- **AstraZeneca's planned investment in Central Virginia represents a large-scale, long-term regional commitment that effectively anchors Region 9's emerging therapeutics and biologics cluster.** The company recently announced it is investing $4.5 billion to build two new manufacturing facilities at the Rivanna Futures Site in Albemarle County, Virginia, marking the company's largest single-site investment globally.

  The plants will produce a mix of drug substances—including small molecules, peptides and oligonucleotides for metabolic/weight-management treatments and antibody-drug conjugates for oncology—underscoring a broad scope of future output. The project is expected to generate about 600 highly skilled direct jobs (engineers, scientists, process facilitators, etc.), with roughly 3,000 additional construction and indirect jobs during build-out. By bringing new sophisticated manufacturing capacity to Central Virginia—supported by state and local incentives and workforce-training programs—AstraZeneca's entry further cements the region's emergence as a national-scale biosciences hub. This type of facility brings significant capital investment, high-wage technical and professional jobs, and an operating footprint that ties AstraZeneca's global pipeline directly to Central Virginia.

  From a regional cluster and therapeutics development perspective, AstraZeneca functions as both a demand driver and a signal. Its presence validates Central Virginia as a viable location for sophisticated biomanufacturing, which in turn encourages upstream and downstream activity—contract development and manufacturing partners, suppliers, packaging and logistics firms, specialized service providers, and a broader network of startups and scale-ups that want to be physically close to a major anchor. It also creates direct opportunities for translational collaboration with UVA and the Manning Institute, including tech transfer, process innovation, and small-batch clinical production that can graduate into full-scale manufacturing on AstraZeneca's site. **Coupled with workforce initiatives like the Virginia Center for Advanced Pharmaceutical Manufacturing (VCAPM, see callout), the investment helps position the region as a connected continuum, spanning discovery and early development at UVA, scale-up and commercialization through industry partnerships, and large-volume production via AstraZeneca's capabilities.**

- **The regional opportunity in therapeutics is not wholly new as Region 9 already hosts a growing base of companies** that demonstrate Central Virginia's capacity to support contract development and manufacturing, therapeutics R&D, and

precision medicine—providing a practical foundation for the region's forward-looking growth in biologics and advanced therapeutics. Afton Scientific operates as a specialized CDMO for sterile injectables and aseptic filling, and is now breaking ground on a 285,000-square-foot biopharmaceutical facility in Albemarle County that will significantly expand its commercial-scale capacity and add more than 200 new jobs, directly reinforcing the region's manufacturing depth.

On the therapeutics and precision medicine front, companies like AMPEL BioSolutions and Rivus Pharmaceuticals are translating cutting-edge science into commercial pipelines that align closely with the region's strengths. AMPEL is building RNA analytics and AI-driven precision medicine tools for autoimmune and inflammatory diseases. Rivus Pharmaceuticals, together with other early-stage biotech firms, illustrates a diversified base of existing clinical-stage and platform companies.

Biosciences: Medical Imaging-Based MedTech

What is the opportunity?

Central Virginia has established research and industry strengths in its biosciences cluster in medtech and medical devices, broadly speaking. UVA has long been a leading institution in bioengineering and Region 9 is home to a number of established and emerging companies operating in device and related equipment production. Recognizing these strengths, this study of forward-looking growth opportunities aims to narrow the lens and illuminate growth opportunities more specifically for medical-imaging based medtech based on the balance and synergies observed between forward-looking regional research competencies and technology commercialization, and leading regional medtech companies.

The opportunity is ripe to continue to reinforce and continue to grow a distinctive medtech cluster around medical imaging, image-guided intervention, and related minimally invasive care. The opportunity combines UVA's strengths in bioengineering, advanced imaging, and translational medicine with regional corporate and nonprofit assets to create a platform for developing, testing, and commercializing new technologies that help clinicians see better, intervene more precisely, and reduce the invasiveness of treatment. This includes technologies spanning MRI-guided procedures, ultrasound and focused ultrasound platforms, point-of-care imaging, radiotheranostics, and software-enabled tools that improve navigation and treatment targeting.

More broadly, this is a growth opportunity at the convergence of imaging, devices, and precision medicine. Across healthcare, demand is rising for tools that move care away from open procedures and toward minimally invasive, image-guided, and increasingly outpatient interventions, while also improving speed and precision at the point of care. **Regions that can link engineering talent, clinical validation, translational research, and commercialization support are especially well positioned because MedTech innovation depends on iterative testing between inventors, physicians, and early industry partners.**

Key Market Forces Driving Growth

Several national and global forces are driving demand and growth of market opportunities in this space:

- **Growing preference for minimally invasive and image-guided procedures that reduce complications, hospital days, and total cost of care.** These approaches allow clinicians to treat complex conditions through smaller incisions or percutaneous access, which typically leads to fewer adverse events, faster recovery, and lower spending for payers and health systems.

- **Rising prevalence of chronic and complex diseases that require repeated imaging for diagnosis, treatment planning, and longitudinal monitoring.** Patients with cancer, cardiovascular disease, and neurologic disorders increasingly depend on imaging not just at diagnosis, but throughout the full care pathway to track response, adjust therapy, and detect recurrence.

- **Rapid advances in imaging hardware (e.g., high-resolution MRI and ultrasound, portable and point-of-care devices) that expand where and how imaging can be delivered.** New platforms are smaller, more precise, and often less expensive, enabling high-quality imaging in community hospitals, ambulatory centers, and even primary care or home settings.

- **Integration of AI and advanced software to automate image interpretation, guide procedures, and personalize decisions, increasing the value of imaging data.** Machine learning algorithms can highlight subtle findings, quantify disease burden, and provide real-time guidance or decision support, which improves consistency of care and helps address radiologist and specialist shortages.

- **Shift of care to outpatient, ambulatory, and home-based settings, driving demand for compact, mobile, and user-friendly imaging systems. As procedures migrate out of the inpat**ient environment, providers need devices that fit into smaller spaces, are easier to operate, and can plug into existing IT and workflow systems without major infrastructure investments.

- **Pressure on health systems and payers to improve productivity and standardize quality, favoring interoperable, workflow-integrated imaging platforms.** Vendors that can offer systems tightly linked with electronic health records, scheduling, reporting, and analytics give providers a way to squeeze more value out of each scan or procedure while reducing variation in how care is delivered.

- **Significant public and private investment in image-guided therapies, focused ultrasound, and theranostics, including dual-use applications in defense, trauma, and emergency preparedness.** Funding from governments, strategic investors, and large medtech firms is accelerating translation of these technologies from research into clinical products, particularly where they can address both civilian health needs and national security or disaster-response priorities.

Several specific market lanes stand out within this broader opportunity. Focused ultrasound is a particularly compelling domain because it spans noninvasive neurosurgical applications, blood-brain barrier opening for targeted drug delivery, and emerging cancer immunotherapy uses, all areas where UVA has active clinical and research leadership. Radiotheranostics and precision medicine also represent an attractive path, as they depend on the tight integration of imaging, targeting, and therapeutic decision-making, aligning well with UVA's imaging infrastructure and translational orientation.

Why Central Virginia?

This opportunity area combines well-established, world-class UVA research strengths in bioengineering and in imaging technologies spanning MRI, ultrasound, focused ultrasound, and regional corporate and foundation strengths.

Highlights of Technology Push

- **UVA has deep, internationally recognized research strengths in medical imaging spanning multiple modalities with clear pathways to commercial translation and clinical impact.** This came through across the core competency analyses in all facets and was reinforced by university research and departmental leadership in interview discussions. At a high level, UVA researchers spent $27 million in R&D activities in the bioengineering and biomedical engineering field in 2023—a highly concentrated and specialized level of activity with more than two times the share in this field relative to national averages. Research expenditures in this field have increased by more than 60% since 2019.[10]

  In the publications analysis, several distinctive clusters emerge showing sizable research activity in this opportunity area focused in the following application areas:

  - Targeted, minimally-invasive neurosurgery and neuro-oncology therapies, including stereotactic radiosurgery,[11] nanoparticles, and ultrasound-based strategies.
  - Oncology with a focus on screening and imaging as well as numerous therapeutic technologies.
  - Cardiac surgery outcomes and complications, cardiovascular imaging and disease management, and cardiac arrest and other emergency medicine.

  Grant awards highlight the advancing nature in pairing imaging technologies with machine learning and AI applications with a distinctive cluster of awards focused in "Deep learning and object, event, and activity detection, with applications in medical imaging and prediction." In another of the grant award clusters, imaging is one of the areas leveraged in personalized and precision medicine combined with diagnostics and therapeutic applications.

  In the patent networks developed in this study, further application areas emerged where UVA stands out, alongside regional companies, related to ophthalmic imaging; deep learning and AI applied to medical imaging; advanced MRI techniques, ultrasonic imaging, and therapeutic ultrasound interventions; and advanced medical imaging techniques combined with immunotherapy and cancer treatment.

  Interviews with UVA leadership emphasized UVA's contributions to transformative MRI technologies into clinical practice, including a brain imaging sequence invented by clinical radiology faculty giving high-resolution, three-dimensional detail into the structure of the brain that is now found on scanners worldwide. Likewise, cardiovascular MRI research has led to "groundbreaking" advancements and applications in cardiovascular health assessment. UVA has had a long-standing partnership with

10 Based on TEConomy analysis of National Science Foundation, Higher Education Research and Development (HERD) Survey.

11 Stereotactic radiosurgery is a noninvasive form of radiation therapy that uses three-dimensional imaging to deliver a single or limited number of highly focused, high-dose radiation treatments to precisely targeted tumors or other abnormalities, typically in the brain and spine, while minimizing exposure to surrounding healthy tissue.

Siemens for commercializing medical imaging innovations.

The university's deep capabilities and historic strengths in ultrasound and focused ultrasound represent unique regional and in fact, national, assets from an innovation perspective. Focused ultrasound is utilized as a therapeutic technology to precisely target tissue deep in the body without incisions or radiation. At the focal point, ultrasound beams can heat, disrupt, or otherwise affect tissue to treat conditions such as tumors, movement disorders, or to open the blood–brain barrier for targeted drug delivery, while leaving surrounding tissue largely unharmed. One leading researcher points to the unique constellation of research and technology strengths at UVA for an opportunity to combine low-intensity focused ultrasound's ability to open the blood-brain barrier with unique imaging assets, and drug development capabilities enhanced by the Manning Institute investment for enhanced commercial plays in theranostics, including radiotheranostics.

- **UVA's long-running Wallace H. Coulter Translational Research Partnership is one of the region's most important commercialization engines for imaging-based medtech because it is explicitly designed to turn clinician–engineer collaborations into funded, de-risked products and companies.** In practice, the Coulter program at UVA runs like an internal, industry grade accelerator for clinician–engineer teams, rather than a traditional research grant program. Each year it competitively awards roughly $1 million to projects led jointly by biomedical engineering faculty and clinical collaborators, with selection based not just on scientific merit but also on market need, IP position, regulatory and reimbursement pathways, and a realistic product development plan. Once selected, projects receive staged, milestone based funding plus hands on support from a dedicated Coulter director and an oversight committee that includes technology transfer, business, regulatory, and venture experts.

  Over nearly two decades, the program has built repeatable processes, internal expertise, and a track record of licensing deals and startups in devices, diagnostics, and image-guided tools that demonstrate UVA can reliably move ideas from lab to market. UVA has established a Coulter Center

endowment to support the annual funding, which has grown to $34 million.[12]

For the medical-imaging growth opportunity, this matters in two ways. First, the Coulter model directly aligns with the kinds of innovations that define the space—minimally-invasive tools, image-guided systems, software and AI layers on top of imaging, and new sensor platforms—because its selection criteria emphasize strong clinical pull, clear regulatory and reimbursement pathways, and industry relevance. Historically, several Coulter-backed projects have involved imaging, navigation, and interventional technologies, providing concrete examples of how UVA clinicians and engineers have already co-developed IP, prototypes, and early-stage ventures in this domain. Second, the program has built foundational commercialization infrastructure—proof-of-concept funding, market diligence support, regulatory and IP guidance, and connections to industry partners and investors—that can now be pointed more intentionally toward imaging-based opportunities emerging from radiology, neurosurgery, cardiology, and biomedical engineering. The Coulter program gives Central Virginia a mature, proven pipeline for generating the next wave of imaging-enabled medtech companies and licensing opportunities that can feed the broader regional cluster.

Highlights of Market Pull

Region 9 also benefits from important industry and ecosystem assets in medical imaging-based medtech that make this more than just an academic strength. There exists today a sizable cluster of innovative startups, small- and mid-sized regional companies and even one foundation operating in this space, including:

- Caretaker Medical, a regional company whose VitalStream and Caretaker platforms use noninvasive waveform sensing and advanced signal analysis to provide continuous, wireless hemodynamic monitoring. The company is advancing monitoring and visualization technology that supports minimally invasive, image-rich care.

- HeartMotion, focused on cardiac imaging and functional analysis (e.g., using MRI/echo or CT-derived data to quantify heart motion and performance).

- IDPET, with expertise in molecular and PET imaging, providing tools and reagents that support advanced PET imaging workflows; this aligns with radiotheranostics and precision imaging, especially where PET is used to guide targeted therapies.

- LumaCyte, a developer of laser-based, image-driven cytometry ("Laser Force Cytology") that uses optical imaging and microfluidics for label-free single-cell analysis, sitting at the intersection of imaging, diagnostics, and analytics.

- MicroAire Surgical Instruments, while primarily a surgical instruments company, it develops powered and endoscopic tools that are frequently used in image-guided and minimally invasive procedures, contributing to the broader interventional medtech base.

- RetiVue, a company producing retinal imaging devices designed to improve access to high-quality retinal exams, especially in primary care and community settings, aligning with point-of-care imaging and tele-ophthalmology.

- RIVANNA Medical, a commercial developer and manufacturer of imaging-based devices such as the Accuro platform, which uses

12 See: https://engineering.virginia.edu/centers-institutes/coulter-center-translational-research.

AI-enabled ultrasound guidance for spinal needle interventions and musculoskeletal imaging, backed by BARDA and DoD-related funding. RIVANNA has received numerous federal SBIR awards and is among the region's leading biosciences companies in patent awards in recent years, highlighting its innovative profile.

- Scanoptix, a startup focused on automating ophthalmic diagnostic imaging workflows, creating wireless, real-time imaging and data management solutions for optometry and ophthalmology practices, including tele-ophthalmology capabilities. Scanoptix is among the leading regional patent assignees with IP in ophthalmic imaging technology classes.

- Springbok Analytics, a regional company using AI to convert standard MRI scans into detailed 3D muscle maps and quantitative analytics, enabling precision assessment of muscle health for medicine, sports, and military performance; it is fundamentally an imaging-analytics platform built directly on MRI data.

- Complementing the private sector cluster, the Focused Ultrasound Foundation is a Charlottesville-based nonprofit dedicated to accelerating the development and adoption of image-guided focused ultrasound as a noninvasive therapeutic technology. Primarily funded through philanthropy, it acts as the world's largest non-governmental funder of focused ultrasound research, coordinating and supporting clinical studies, technology development, and global collaborations to move the field from lab to widespread patient care more quickly.

- UVA's long-standing partnership with Siemens and PETNET has supported advanced molecular imaging capacity, including cyclotron-enabled access to imaging biomarkers. These kinds of partnerships matter because they create the connective tissue between discovery, clinical deployment, and market adoption, which is essential for an imaging-based medtech cluster to scale.

Considered all together, these firms and the Foundation extend the regional portfolio from imaging hardware and analytics (MRI, PET, cardiac, ultrasound) into continuous physiologic monitoring, creating a diversified but coherent set of companies that can both pull UVA innovations into the market and collaborate on clinical validation and product development.

Central Virginia also has reasons to view this as a dual-use opportunity with both healthcare and national security relevance. RIVANNA Medical is advancing imaging-based platforms with support tied to BARDA and military-focused funding pathways, while UVA researchers are pursuing novel ultrasound approaches with implications for traumatic brain injury and other defense-related needs. That combination of civilian clinical demand and federal mission-driven applications broadens the region's addressable market and strengthens the case for sustained innovation, testing, and company growth in imaging-based medtech.

Biosciences: Translational Bioengineering and Regenerative Medicine

What is the opportunity?

Translational bioengineering and regenerative medicine represents an emerging, longer horizon growth opportunity for Central Virginia that is anchored far more in UVA's research strengths and federal partnerships, including with DoD, than in an existing industry base today. It encompasses technologies and platforms that repair, reconstruct, or regenerate damaged tissues and organs—ranging from engineered muscle, nerve, and musculoskeletal tissue to advanced biomaterials, biofabrication, and 3D printed constructs—often aimed at restoring function after traumatic injury, including for wounded warriors, or degenerative disease.

This opportunity is elevated as one with emerging potential for regional development and so is forward-looking in its scope and it should complement more near-term and balanced opportunities identified in therapeutics/ biologics and imaging based medtech. Also, the opportunity is memorialized in this strategy given the importance of existing, impactful regional bioscience-related intersections with national security as a major area of emphasis for exploring regional growth opportunities. It leverages UVA's distinctive research assets, interdisciplinary collaborations, and federal relationships to position Central Virginia at the front edge of a field that may take longer to mature commercially, but which aligns tightly with national security priorities and high impact clinical needs.

For this type of emerging opportunity, the goal should be to solidify and grow the underlying research and translational platform, cultivate early connections with industry and defense partners, and ensure that as regenerative medicine technologies move closer to market, Central Virginia is prepared—with the right infrastructure, talent, and ecosystem—to capture a meaningful share of the resulting activity.

Key Market Forces Driving Growth

Several market forces are driving growth and the demand for innovative solutions in translational bioengineering and regenerative medicine, including:

- **Rising burden of trauma, musculoskeletal injury, and degenerative disease.** Aging populations, sports injuries, and a steady incidence of severe trauma and volumetric muscle loss are increasing demand for therapies that restore function rather than just manage symptoms.

- **Defense and national security demand for improved warfighter recovery.** DoD and related agencies are investing heavily in regenerative solutions for battlefield injuries, limb salvage, and rapid functional recovery, creating a sustained demand for muscle, nerve, and musculoskeletal regeneration technologies. This strong demand from the defense community has been reinforced consistently through project interviews.

- **Advances in stem cell science, gene editing, and tissue engineering.** Breakthroughs in stem cell platforms, CRISPR-based gene editing, and biomaterial-enabled tissue engineering are expanding what is technically feasible, moving regenerative approaches from bench concepts into clinical pipelines.

- **Emergence of 3D bioprinting and advanced biomanufacturing.** New biofabrication methods including 3D printing of tissues and organ-like constructs and automated tissue manufacturing devices are making it possible to scale production of complex regenerative products.

- **Growing investment and a strong global product pipeline.** The regenerative medicine market is projected to grow at double-digit annual rates, supported by a large pipeline of cell, gene, and tissue engineered therapies and by increasing venture, corporate, and public R&D investment.

- **Integration of AI, modeling, and advanced imaging into design and testing.** AI-driven modeling, high-resolution imaging, and in silico design are improving how regenerative products are designed, tested, and monitored, shortening development cycles and enabling more complex constructs and treatment strategies.

Why Central Virginia?

Highlights of Technology Push

At UVA, this opportunity area is found at the intersection of biomedical engineering, orthopedics, materials science, and data science, and is organized through efforts such as the Center for Advanced Biomanufacturing and labs focused on musculoskeletal tissue engineering, volumetric muscle loss, and tissue biofabrication, many of which have been supported by the Department of Defense, NSF, and national manufacturing consortia. University researchers are using leading-edge approaches in computational modeling, imaging, and systems biology to advance these research areas.

In the technology push analyses, elements of bioengineering and regenerative medicine are found across several of the quantitative and other research analyses:

- At a high level and as was noted in the medtech opportunity area, **bioengineering stands out as a distinctive strength of UVA** where R&D spending has been rapidly growing and has a highly specialized concentration relative to the overall R&D complex.

- **The University's Center for Advanced Biomanufacturing** aims to position UVA as a "world leader in in translational research for tissue engineering and regenerative medicine technologies and to build and support a community made up of members from academia, industry, government, and the nonprofit sectors."[13] The Center is developing new and more effective regenerative biomaterials and maintaining its state of the art facility.

- Also highly relevant in this space is **UVA's long-standing Center for Applied Biomechanics (CAB)**, billed as the largest university-based injury biomechanics lab in the world specializing in impact biomechanics for injury prevention. The CAB is working directly with several branches of the armed forces on injury mitigation efforts, monitoring human response in blast situations, traumatic brain injuries, and more.

- In researcher-led project grants, a tightly concentrated stand-alone cluster was surfaced in "regenerative medicine and tissue engineering for muscle repair, with focus on traumatic injuries in military personnel." This is reflective of the work conducted in the Laboratory of Regenerative Therapeutics at UVA, led by Dr. George Christ, as well as the focus of the Center for Advanced

13 See: https://advancedbiomanufacturing.virginia.edu/.

Biomanufacturing. This area has direct, existing connections with DoD in funded R&D with a strong commercialization orientation.

UVA PI's are developing devices, biomaterials, and manufacturing methods to automate tissue production, bioprint muscle and other tissues, and create battlefield deployable technologies (e.g., injectable scaffolds, regenerative "sponges," and muscle repair constructs) for wounded service members.

- In the landscape of regional research publications, regenerative medicine is captured and embedded in a broader cluster context spanning:
    - Population genomics and genetic, molecular, and cellular disease mechanisms supporting precision medicine and targeted therapies, with focus in metabolic, neurological, cardiovascular, renal, and ophthalmological disorders and regenerative medicine.

Highlights of Market Pull

As acknowledged above, the region's current base of companies operating in bioengineering and regenerative medicine spaces is limited.

- **Luna Labs is advancing work in regenerative medicine application spaces,** though it is not necessarily the primary focus of this innovative regional company working in numerous technology and market areas. Luna Labs' Aerovail, often described as a sprayable hydrogel adhesion barrier, is designed to form a thin, conformal barrier over tissues at risk for post surgical adhesions, using biocompatible, degradable polymers that match irregular anatomical surfaces and then reabsorb over time. That kind of bioengineered barrier product—aimed at improving tissue healing and reducing scar related complications—sits in the broader regenerative medicine space, but is different from many of the innovation areas identified at UVA.

  Luna is also working on a set of related technologies that are relevant to this opportunity space, including advanced hydrogel dressings for battlefield eye injuries and trauma stabilization and a "skin surrogate" platform used to test penetration risk. Those products draw on similar biomaterials and tissue interaction expertise and are targeted at both patient and warfighter applications, reinforcing the dual use character of the regional opportunity in translational bioengineering and regenerative medicine.

From a regional development standpoint, this opportunity is best understood as a "technology push" into future commercial markets and national security applications, rather than a near term cluster built around existing companies.

The primary near term market pull comes from national security and defense health needs, particularly the treatment of traumatic battlefield injuries. DoD and affiliated agencies are actively funding translational programs and consortia to develop regenerative therapies that can be deployed both in theater and in advanced rehabilitation settings, and UVA's existing portfolio of DoD backed projects positions Central Virginia as a credible partner.

Over time, many of the same technologies—engineered tissues, biofabricated grafts, advanced scaffolds, and regenerative biomaterials—also have clear civilian applications in orthopedics, sports medicine, reconstructive surgery, and chronic disease, creating a pathway from military medicine to broader health system markets.

National Security: All Source Intelligence Analytics

What Is the Opportunity?

All-source intelligence analytics platforms represent one of the most strategically significant growth areas at the intersection of national security, advanced computing, and artificial intelligence. In the defense and intelligence community, "all-source" refers to the integration and simultaneous exploitation of every available intelligence discipline, encompassing HUMINT (human intelligence), SIGINT (signals intelligence), GEOINT (geospatial intelligence), MASINT (measurement and signature intelligence), and OSINT (open-source intelligence), into a coherent, fused analytical picture to support decision-making at every level of national security, from tactical warfighter operations to strategic policy.

The fundamental technology challenge driving this opportunity is the staggering acceleration of data volume and complexity facing modern intelligence organizations. At the same time, the quality and abundance of open-source data now increasingly rivals traditional classified national intelligence sources. Intelligence analysts, once limited by scarcity of information, now face the inverse problem: data streams from satellite imagery, signals intercepts, social media, biometric repositories, commercial sensors, and drone-based surveillance feeds are all arriving simultaneously and in real time. The core analytical task is now the “fusion” of this information, the ability to correlate, contextualize, and derive actionable intelligence from disparate multi-domain data streams at machine speed.

The technology stack enabling this opportunity spans several interrelated domains. At its foundation are data fusion and integration platforms composed of software architectures capable of ingesting structured and unstructured data from heterogeneous classified and unclassified sources, resolving entity relationships across data types, and presenting unified operational pictures. Layered atop this are AI/ML-powered analytical engines that perform pattern recognition, anomaly detection, predictive threat assessment, and natural language processing on vast datasets, dramatically reducing the time burden on human analysts and enabling automated screening of low-value information. High performance computing (HPC) infrastructure provides the processing backbone for large-scale fusion tasks, while geospatial-temporal analytics provide critical situational awareness. Finally, command, control, and dissemination layers complete the "sense-make-act" cycle, pushing machine-synthesized intelligence recommendations to decision makers and autonomous platforms in operating environments.

Dual use commercial applications of this area now extend well beyond the defense and intelligence community. Platforms developed for data fusion have analogs in law enforcement, critical infrastructure protection, financial risk monitoring, and global supply chain risk analytics. This wide applicability to public and private markets means that core technology investments, software tools, and talent developed for national security applications carry significant commercial spillover potential.

Key Market Forces Driving Growth

Several broader market forces are driving the rapid expansion of market opportunities for solutions in this space:

- **Escalating global security complexity and defense modernization mandates** mean that defense establishments worldwide are fundamentally restructuring intelligence operations in response to emerging conflicts and the proliferation of sophisticated state-sponsored and non-state adversarial capabilities. Armed forces are rapidly integrating AI and advanced analytics into command, control, intelligence, surveillance, and reconnaissance (C4ISR) systems to process massive volumes of structured and unstructured data. Rising geopolitical tensions, including the ongoing conflict in Ukraine, Middle East instability, and China's military modernization, are accelerating investment timelines and procurement urgency across allied defense establishments.

- **Multi-INT fusion markets are entering a phase of transformative expansion** driven by the move from reactive to predictive intelligence postures and enabled by AI-driven platforms capable of ingesting and correlating data streams in real time. Concurrently, the signals intelligence market alone is projected to grow significantly, with AI-powered signal analysis, automated intelligence processing, and multi-domain signal integration all driving demand from public sector customers.

- **Open-source intelligence is emerging as a structural disruptor** amidst proliferation of digital data from commercial satellite constellations, social media, IoT devices, and commercially available geospatial imagery that is collapsing the historical advantage that classified collection systems once held. This shift places enormous demand on platforms capable of fusing open-source data with classified streams, a cross-domain integration challenge that requires novel software architectures, AI-powered triage systems, and rigorous data governance frameworks.

- **The "sense-make-act" paradigm is restructuring defense acquisition priorities** based around the Department of Defense's Joint All-Domain Command and Control (JADC2) concept which envisions all sensors across all domains (land, air, sea, space, cyber) feeding into a unified analytic cloud that pushes recommendations to the tactical edge in near-real-time. This in turn creates massive demand for software-defined intelligence platforms that can operate across classification levels, domains, and service-branch architectures. Companies that can deliver the "make sense" and "act" layers of this cycle are positioned at the center of defense technology investment.

- **AI integration is transforming the analyst workforce model** by addressing a persistent challenge across the intelligence community of the scarcity of qualified all-source analysts, compounded by data volumes that exceed human processing capacity. The response is a shift toward human-machine teaming architectures in which AI and machine learning tools handle the lower-level processing, screening, and initial pattern recognition tasks, freeing trained analysts to focus on higher-order synthesis, contextual judgment, and strategic assessment. The analyst workforce increasingly requires competency in AI tools, data analytics platforms, and automated workflows, creating sustained demand for technology providers who can develop, integrate, and maintain these AI-augmented analytics environments.

Why Central Virginia?

The Central Virginia region, anchored by the University of Virginia, the national security intelligence campus at Rivanna Station, and a rapidly growing regional defense contractor ecosystem, has an advantageous position in the all-source intelligence analytics landscape. **The region sits at the convergence of three essential value chain elements: world-class university research in data sciences, AI/ML, and computational modeling, the operational mission demands of major intelligence communities, and an established and growing ecosystem of defense software and analytics firms as well as manufacturers.** This combination creates an organic line-of-sight from research capability to mission need to commercialization that is rare among mid-sized innovation ecosystems and positions Central Virginia as a natural locus for all-source intelligence analytics cluster development.

Highlights of Technology Push

- **UVA Research Has Significant Assets Aligned with Enabling All-Source Analytics Technologies:** UVA provides a research base that includes multiple research centers and institutes directly relevant to all-source intelligence analytics. The National Security Data and Policy Institute (NSDPI) brings together UVA capabilities in modeling/simulation, AI/ML, and data-to-decisions specifically oriented toward national security community needs, with a focus on primarily unclassified research on emerging threats and policy translation. The Biocomplexity Institute (BI) has conducted national security engagements with DTRA, DARPA, and the U.S. Army Research Institute, with analytical skills directly transferable to multi-domain threat modeling, social network analysis, and adversary behavior modeling. The Link Lab and the School of Data Science further generate foundational research and applied methods in data fusion architectures, machine learning pipelines, and complex systems modeling, all core enabling technologies for next-generation all-source analytics platforms. UVA's quantitative research profile shows leading or differentiated competency in data science and machine learning applications, cyber-physical and autonomous systems, biocomplexity and network science, digital twin and simulation modeling, and cybersecurity each of which maps directly onto functional requirements of the intelligence analytics technology stack.

- **Demonstrated Potential for Tech Translation Aligned with Intelligence Solutions:** The region has begun developing an emerging capacity to translate foundational research excellence into applied technology platforms, talent pipelines, and commercialization opportunities. UVA's Computer Science, Data Science, and Engineering programs provide a continuous pipeline of technically skilled graduates directly relevant to the software and analytics development workforce needs of intelligence analytics firms, which NGIC and other Rivanna Station stakeholders are leveraging via workforce development and sponsored research engagement. Similarly, the university research base has demonstrated the ability to translate IP and expertise aligned with defense market needs. A compelling case for the region's commercialization potential in this space is GA-Intelligence (formerly Commonwealth Computer Research, Inc.), which traces its origins to UVA faculty and students and grew organically from a small research-phase company solving difficult problems for the intelligence community into a several hundred person operational analytics firm acquired by General Atomics in 2021. GA-Intelligence's core mission, providing global situational awareness via large-scale, low-latency data fusion offers a model for future spinouts and company attraction in this space.

- **Rivanna Station as a Source of Innovation Demand Signals:** Rivanna Station's three anchor agencies — NGIC, DIA, and NGA — serve as a powerful, persistent source of applied research problem sets and mission-aligned partnership opportunities that are difficult to replicate outside of major armed forces bases and installations. NGIC's innovation priorities, including modeling and simulation tools for battlefield forensics, threat assessment analytics, and database systems for combat incident analysis, and DIA's focus on all-source data fusion, HPC platforms, and AI integration help to define applied technology development use cases for regional firms and university researchers. Even where formal classified research contracts may be constrained, the proximity of these agencies creates informal but high-value channels: a skilled analyst workforce base, collaboration through NSDPI's research on emerging threats, and co-development opportunities on tools with local companies. These applied research linkages serve as a practical alternative to large-scale DoD funding contracts, providing industry-relevant problem framing and mission validation that commercial and entrepreneurial ventures can leverage to shape technically differentiated, market-ready analytics products.

Highlights of Market Pull

- **Rivanna Station and Regional Intelligence Analytics Firms as Underleveraged Economic Development Drivers:** Beyond the major primes with established Charlottesville footprints, the region has seeded a cohort of smaller, specialized intelligence analytics firms whose growth trajectories point to the potential of a focused economic development target. Examples such as DataShapes AI, Elder Research, Raven Technologies and Shine Systems provide value-added data analytics and intelligence-adjacent software services to national security customers, with regional companies also attracting significant venture capital and federal small business award investment. Collectively, such regional firms represent early-stage seeds of a dense intelligence software cluster, companies that, with targeted support, could follow the GA-Intelligence growth trajectory and anchor a robust next generation of regionally headquartered intelligence analytics firms. Similarly, Rivanna Station continues to anchor talent with longstanding expertise in mission use cases and operations within secure environments both within federal agencies as well as at regional primes with service contracts based out of the installation, providing the opportunity to leverage experienced talent in supporting new university spinouts and scaling companies that can be recruited to the region via intentional attraction strategies.

- **Intelligence Software and Analytics Tool Development as a Rapid Growth Market:** The intelligence analytics software segment occupies a distinctly favorable position for the region within the broader defense technology landscape since it combines the demand durability and mission criticality of national security markets with a fundamentally software-defined, people-intensive business model that scales rapidly without the capital-intensive infrastructure, specialized manufacturing facilities, or long hardware qualification timelines that characterize defense primes and aerospace/electronics manufacturers. Companies in this space grow primarily by adding software engineers, data scientists, and cleared technical analysts, talent pools directly available through UVA and through workforce transitions from the agencies themselves. In part, the regional national security and defense cluster has already leveraged this growth dynamic in its recent performance: cluster employment grew 13.2% from 2019–2024, more than 2.5

times the national sectoral growth rate of 5.2%, and the R&D and engineering services subsector most closely aligned with analytics platform development grew nearly 30% over the same period, outpacing both state and national benchmarks. This combination of rapidly expanding global demand, favorable business model economics, and demonstrated regional employment growth creates a compelling investment case for doubling down on intelligence analytics software as a targeted cluster development priority, particularly given that the upfront infrastructure cost to catalyze growth (shared SCIF space, workforce pipelines, SBIR support) is relatively modest.

- **Ability to Leverage Proximity to National Intelligence Hubs in Northern Virginia:** One of Central Virginia's most structurally underappreciated competitive advantages is its geographic and functional relationship with the national intelligence and defense technology hub anchored in Northern Virginia and the dense contractor corridor running from Reston through Tysons Corner and McLean. Northern Virginia's dominance in the national security technology market comes with well-known structural costs: commercial real estate in Reston and Tysons routinely commands significant premiums over comparable Charlottesville space, and the regional cost of living differential is substantial, a persistent factor that makes talent attraction and retention increasingly difficult for intelligence community employers in the DC metro. Charlottesville presents a compelling value proposition as a lower-cost, high-talent operational alternative that retains proximity to the Northern Virginia IC complex while offering significantly lower overhead for software-intensive firms as well as proximity to both UVA talent pipelines and Rivanna Station agency personnel. The flow of federal workforce reductions and remote/hybrid work adoption in the post-pandemic IC environment has further opened a channel of experienced, often already-cleared talent migrating away from Northern Virginia's cost pressures toward high-quality-of-life alternatives — a trend that regional economic developers can actively leverage to rapidly attract talent for scaling intelligence analytics firms.

National Security: High Performance Aerospace Systems & Components

What Is the Opportunity?

High performance aerospace systems and components represent one of the most technically demanding and strategically significant growth areas at the intersection of national defense, advanced materials science, and propulsion engineering. **The opportunity centers on the design, fabrication, testing, and system integration of the sophisticated structural and functional components that go into aerospace and missile systems, solid rocket motor (SRM) assemblies, propulsion units, and related defense platforms, ultimately serving defense applications driven by the combination of urgent near-term demand for replenished munitions stockpiles and longer-term structural expansion of the defense production base.** Unlike software-centric defense technology domains, this opportunity is rooted in physical manufacturing capability, specialized facilities, and deep engineering domain expertise.

The technology platform spans a spectrum of closely related manufacturing domains, all of which have the ability to serve opportunities across the aerospace and defense value chain. These include:

- Precision structural components for airframes, missiles, interceptors, and related platforms, spanning the nozzles, casings, guidance frames, inert hardware, actuators, and aerodynamic control surfaces that translate propulsion energy into controlled flight.

- Solid propellant development and SRM component production, encompassing propellant chemistry and mixing, precision casting of motor bodies, grain geometry design, ignition system manufacture, and the rigorous quality-control protocols required when handling energetics.

- Advanced materials manufacturing for extreme-environment applications, including high-temperature coatings for combustor and turbine surfaces, alloy components for leading-edge thermal protection, and aerospace composite structures that balance strength, weight, and thermal performance.

- Digital manufacturing infrastructure that supports high value component fabrication such as CNC machining, programmable logic controller (PLC)-based process controls, sensor-integrated quality assurance, and manufacturing data analytics that are replacing the legacy manual labor model in high-value aerospace and missile component production.

- Hypersonic systems and related advanced propulsion research are a relevant and complementary strand within this opportunity, with particular importance for the materials science and propulsion diagnostics dimensions of the platform. The development of air-breathing propulsion for hypersonic missiles requires many of the same high-temperature materials expertise, propulsion test infrastructure, and advanced manufacturing techniques such as conventional SRM and other aerospace systems production

The enabling materials science and engineering knowledge base is itself a core part of the opportunity, and the dual-use and cross-sector spillover potential of this opportunity area is significant. The same coating chemistry that protects the interior of a solid rocket motor combustion chamber is directly related to the corrosion-resistant coatings used in

commercial jet turbine blades, while advanced composites and multi-material architectures used in missile structural components share production methods with aerospace composite manufacturing for commercial aircraft frames. The propellant-testing and mixing equipment manufactured by companies in this space has direct analogs in the pharmaceutical manufacturing world, where the same equipment is used for regulated drug formulation. These cross-sector connections create dual-use commercial spillovers that deepen the economic development case for this opportunity beyond the defense procurement cycle.

Key Market Forces Driving Growth

Several broader market forces are driving the rapid expansion of market opportunities for solutions in this space:

- **Expansion and new entry in the propulsion and missile supply chain is multiplying demand** for precision manufacturing support services and specialized test equipment. Over the past decade, the SRM and air-breathing propulsion supply chain has expanded from a highly consolidated market to an ecosystem of additional suppliers including "neo-primes" and various defense startup entrants. Each of these new entrants requires propellant development and testing equipment as well as conceptual design support, trajectory analysis tools, and propulsion system development services that specialized engineering firms are positioned to provide. This fragmentation of the supply base creates a much larger and more distributed market for precision manufacturing support than in previous decades.

- **Accelerated munitions depletion from active conflicts has created a renewed emphasis on the domestic industrial base** that is restructuring U.S. defense production priorities. Ongoing global conflicts have consumed missile and rocket stocks at rates that far exceeded the peacetime production baseline, exposing a potential capacity gap in the ability of U.S. defense manufacturers to replenish tactical stockpiles. This creates an immediate, high-credibility demand signal for companies that already have production infrastructure in place and can ramp manufacturing rates.

- **Emerging defense technology programs such as hypersonics are creating a new tier of high-value component manufacturing demand** that the existing U.S. defense industrial base is broadly underprepared to serve. Hypersonic supply chain assessments note that current U.S. manufacturing capability is only adequate for small-number prototype production, a gap the DoD is actively working to close through targeted industrial base expansion contracts. As hypersonic weapons and next generation missile interceptor programs move from prototype to production, they are generating demand for specialized advanced materials, ultra-high-temperature coatings, precision structural components, and propulsion test infrastructure that few existing defense manufacturers produce at scale, in turn creating a generational opening for suppliers with relevant materials science and precision manufacturing.

- **Defense manufacturing is undergoing a transformation driven by automation, digital controls, and advanced machining** that creates new skill and service requirements. The shift from manual to CNC-based machining, from manual process monitoring to PLC-based controls, and from siloed quality data to integrated manufacturing analytics is restructuring the workforce and service requirements at production facilities. This transformation creates demand for controls engineering talent, digital manufacturing process services, data integration, and advanced

machining capabilities that connect naturally to regional university engineering programs. The same modernization dynamic also opens pathways for university-industry collaborations on manufacturing automation that are less constrained by the classified nature of defense research.

- **Defense supplier compliance mandates are raising the threshold for market participation across the aerospace precision manufacturing supply chain.** The Department of Defense's Cybersecurity Maturity Model Certification (CMMC) framework mandates third-party verified cybersecurity certification for all contractors handling Controlled Unclassified Information, making compliance a condition of contract eligibility rather than a competitive differentiator. Prime contractors are beginning auditing of their entire vendor base, meaning that regional small and medium-sized enterprises (SMEs) that invest in CMMC readiness and the associated manufacturing digitization infrastructure will be structurally advantaged to capture supply chain roles as production ramp-up accelerates, while non-compliant suppliers face exclusion regardless of technical capability.

Why Central Virginia?

Central Virginia's position in precision manufacturing for high performance aerospace components is grounded in a combination of assets: established solid rocket motor production and test facilities, a growing ecosystem of engineering services firms and specialized components manufacturers, a university research base with directly relevant materials science, propulsion, and advanced manufacturing competencies, and a geography that provides the land area, siting tolerance for energetics handling, and workforce access that production-scale aerospace manufacturing requires. The line-of-sight from university research to production operations to federal mission demand exists, but remains underdeveloped as a cohesive cluster, meaning the primary opportunity is to better coordinate and scale industry around existing assets while also better connecting the region to broader defense installations and initiatives.

Highlights of Technology Push

- **UVA's engineering, materials science and advanced manufacturing research create critical enabling technologies with direct precision aerospace and dual-use applications.** UVA's School of Engineering & Applied Science's strengths in combustion science, high-temperature materials, and advanced manufacturing are key disciplines that underpin SRM propellant development, combustion performance, and the design of thermally stressed components that define the technical challenges of the industry. As one example, UVA's sustained research partnership with Rolls-Royce on corrosion-resistant coatings for jet turbine blades has produced commercially deployed solutions whose underlying physics applies directly to combustion environments and thermal protection in defense applications, a dual use theme that spans commercial aviation and defense propulsion. UVA Engineering continues to maintain nationally competitive research expertise encompassing propulsion science, high-temperature materials and coatings, structural and functional materials in extreme environments, and advanced manufacturing methods which can serve as multiple entry points for translating research capabilities that underpin the design and fabrication of high-performance aerospace components.

- **UVA's Aerospace Research Laboratory and Hypersonics Research Complex represent a nationally differentiated physical research infrastructure that is difficult to replicate.** The aerospace research group operates a suite of experimental test facilities, including the Supersonic Combustion Facility, the ASOS shock tube, and the PISTL expansion tunnel currently being recommissioned from NASA Langley, which enable propulsion design validation and materials performance characterization at conditions relevant to both missile systems and advanced air-breathing propulsion. This infrastructure supports a recognized national position in hypersonics and extreme performance materials research and a pipeline of graduate-level engineers who are actively recruited by regional defense manufacturers and can be more actively leveraged towards early stage partnerships with emerging defense suppliers.

- **Some regionally embedded applied R&D capabilities exist in advanced materials and coatings directly relevant to precision aerospace manufacturing.** Several examples point to an emerging industry R&D ecosystem that can form the basis for a growing precision materials ecosystem that functions as a technology supply chain for regional aerospace component manufacturers. For example, Luna Labs, a significant SBIR/STTR awardee from DoD, DARPA, DTRA, MDA, Navy, and Air Force, operates as a rapid-response applied R&D resource in polymers, coatings, composites, and sealants that serves defense prime contractors needing fast-cycle materials solutions without committing to full development programs. Directed Vapor Technologies specializes in directed vapor deposition of high-performance thermal barrier and protective coatings on complex geometries with active Army, Navy, and DOE awards, while Laser Thermal develops fiber-optic thermoreflectance tools for thermal characterization in aerospace, ceramics, and power electronics. These companies have internal capabilities that can be leveraged towards a broader aerospace R&D strategy in conjunction with UVA's strengths.

Highlights of Market Pull

- **Central Virginia's aerospace manufacturing cluster is growing at a rate far outpacing state and national averages, signaling organic momentum even though its full potential as a coordinated industrial cluster has not yet been actualized.** Guided Missile and Space Vehicle Propulsion as well as Aeronautical Systems and Instrumentation Manufacturing industries in the region have high national and in-state specializations and have grown faster than national benchmarks, while broader aerospace manufacturing employment shows strong double-digit growth and clear specialization relative to the overall economy. At the same time, stakeholder input highlights limited coordination across firms, gaps in shared-use facilities, and weaker cluster branding, indicating that the region is still operating as a set of high-performing individual firms and assets rather than an integrated aerospace manufacturing ecosystem.

- **Local companies exemplify the kind of specialized aerospace engineering SME ecosystem that can be scaled around the region's value proposition.** Firms such as L3Harris-Aerojet Rocketdyne, SPARC Research, EURO-COMPOSITES, Virginia Diodes, Luna Labs, Directed Vapor Technologies, and Laser Thermal collectively cover propulsion, advanced materials, precision components, and applied R&D, and several have grown rapidly through defense contracts, SBIR/STTR awards, and supplier relationships with major primes. Their profiles demonstrate that Central Virginia can both anchor large-scale production and support smaller, highly specialized engineering and manufacturing firms that serve national security markets, suggesting a replicable model for further SME attraction and scaling. Situational assessment of the region also highlights that northern counties (Counties of Culpeper, Fauquier, Madison, and Orange) offer available land and receptive economic development offices for testing and demonstration sites, creating a logical geography for siting additional aerospace and defense test infrastructure that can serve these firms as they grow and locate in proximity to existing anchor companies.

- **Opportunities to link Central Virginia with broader state defense assets and emerging national defense initiatives (e.g. missile interceptor, hypersonics initiatives) remain underdeveloped but are strategically important.** The broader Virginia defense installation community including Rivanna Station, Dahlgren, and the Navy's Strategic Systems Programs provides a persistent federal demand signal for missile components, precision aerospace hardware, and propulsion engineering analysis that the regional cluster is positioned to serve, but not yet systematically connected to. Both quantitative analyses and stakeholder interviews point to limited systematic engagement with these installations today relative to peer defense communities, underscoring the need for more intentional connections to statewide testing assets and federal initiatives in areas such as interceptor systems and hypersonics so that Central Virginia firms can participate more fully in evolving defense supply chains.

National Security: Defense Electronics & Payload Engineering

What Is the Opportunity?

Defense electronics and payload engineering describes the design, fabrication, integration, and testing of the electronic systems, sensor suites, and functional payload modules that give modern military platforms their operational capabilities. Where aerospace and propulsion engineering addresses how a vehicle or munition moves, defense electronics and payload engineering addresses what that platform can sense, communicate, process, and act upon. The opportunity spans a wide technology spectrum, from electronic warfare (EW) systems that detect, jam, deceive, and exploit adversary radio frequency emissions, to signals intelligence (SIGINT) collection hardware and signal processing electronics, to the embedded sensor arrays, communication modules, navigation units, and processing boards that define what a drone, satellite, autonomous ground vehicle, or missile interceptor can actually do in the field.

The fundamental technical challenge driving this opportunity is the relentless compression of performance requirements against shrinking size, weight, power, and cost constraints. Modern unmanned platforms demand electronics subsystems that simultaneously collect sensor data, perform onboard processing, manage communications across contested spectrum, apply electronic countermeasures, and maintain navigational autonomy within tight mass and power budgets. The transition from analog to software-defined radio architectures and from fixed-function hardware to field-programmable and reconfigurable electronics means that competitive advantage in this space increasingly resides at the intersection of advanced materials, precision fabrication, and embedded software, a combination that creates strong demand for a dense, specialized supplier ecosystem.

The technology stack supporting this area also spans multiple interrelated layers. At the physical component level, it includes precision RF and millimeter-wave components operating from microwave through sub-terahertz bands, optoelectronic and photonic devices for optical communications and LIDAR-based sensing, and advanced energy storage electronics for operation in remote or contested environments. Above the component layer sit signal processing subsystems performing real-time waveform generation, signal exploitation, and adaptive jamming; embedded computing modules hosting AI-driven inference and sensor fusion at the tactical edge; and integrated payload management frameworks that allow multiple sensor and effector payloads to share platform resources. Testing and qualification infrastructure, including RF anechoic chambers, electromagnetic compatibility (EMC) test ranges, and hardware-in-the-loop simulation environments, completes the stack by providing the certification pathway from laboratory prototype to program-of-record hardware.

Near-term applications demand is anchored in three converging operational needs: the primacy of electromagnetic spectrum contestation in modern conflict, which has made EW a first-order priority across all branches; the explosive proliferation of unmanned aerial systems (UAS) at every scale, which is driving demand for low-cost, producible payload electronics across Group 1 micro-drones through autonomous swarming munitions; and next-generation missile and interceptor programs that require specialized RF seekers, high-speed signal processors, and radiation-hardened electronics capable of surviving extreme thermal and mechanical environments. Across all three, DoD's adoption of modular open-systems architecture (MOSA) standards means that electronics suppliers who build to interoperable payload specifications can

access a substantially broader base of platform customers than was previously possible.

The dual-use and cross-sector spillover potential of this opportunity is substantial. Millimeter-wave and terahertz component technologies developed for EW and radar have direct commercial analogs in 5G and beyond-5G communications infrastructure, automotive radar, and high-resolution medical imaging. Ultra-low-power chip design techniques essential for tactical battery-constrained payloads are directly applicable to industrial and environmental IoT sensing, remote infrastructure monitoring, and consumer wearables. Photonic and optoelectronic technologies built for military optical communications and LIDAR find parallel applications in fiber-optic data center interconnects and precision manufacturing metrology. These overlaps mean that investment in regional defense electronics capabilities compounds across commercial markets, giving the technology platforms developed here a broad, durable relevance that extends well beyond the defense procurement cycle.

Key Market Forces Driving Growth

Several broader market forces are driving the rapid expansion of market opportunities for solutions in this space:

- **Escalating electromagnetic spectrum competition and electronic warfare modernization are generating urgent, structurally elevated demand for advanced EW components and signal processing systems.** Observations from large-scale conflicts have revealed that electromagnetic spectrum dominance is now as operationally critical as kinetic firepower, with adversaries deploying sophisticated jamming, spoofing, and signals interception capabilities at unprecedented scale. The U.S. and allied defense establishments have responded with accelerated investment in electronic attack, electronic protection, and electronic support systems that require high-frequency, high-dynamic-range electronics components operating across increasingly wide spectral bands. This creates sustained demand for the millimeter-wave components, wideband amplifier chains, and software-defined radio signal processors at the heart of the opportunity.

- **The proliferation and weaponization of unmanned systems at all scales is restructuring the defense electronics supply chain around payload miniaturization and mass producibility.** UAS platforms now span the full operational spectrum from sub-kilogram intelligence-gathering micro-drones to autonomous swarming munitions to long-endurance persistent surveillance aircraft, and each tier requires electronics payloads engineered for the specific constraints of that platform class. The rapid fielding of low-cost UAS in recent conflicts, and the corresponding scramble to develop counter-UAS (C-UAS) capabilities that can detect, track, classify, and defeat large volumes of aerial threats, have simultaneously expanded both the UAS electronics market and the counter-UAS detection and EW market.

- **Defense modernization programs, including hypersonics and next-generation interceptor platforms, are opening new tiers of high-performance electronics demand that the existing U.S. supplier base is broadly underprepared to serve.** Hypersonic and near-hypersonic weapon systems require RF seekers, signal processors, and electronic navigation components that can function reliably at extreme velocities, altitudes, and thermal gradients, specifications that push the boundaries of current commercial electronics manufacturing. The DoD's accelerated pursuit of interceptor systems

including programs aligned with missile defense modernization initiatives has further amplified demand for the radiation-hardened, high-reliability electronics subsystems at the foundation of strategic defense. These programs create a generational market opening for electronics suppliers with the materials science, fabrication precision, and test infrastructure to meet their demanding specifications.

- **The commercial telecommunications and sensing markets are dramatically expanding the global demand base for the same millimeter-wave, photonic, and RF component technologies that underpin defense electronics.** The global rollout of 5G communications infrastructure and the early buildout of next-generation 6G research programs require components at frequencies where defense and commercial technology roadmaps are nearly identical. Similarly, commercial LIDAR for autonomous vehicle navigation and industrial robotics, and optical interconnects for hyperscale data centers, rely on the same photonics and optoelectronics fabrication ecosystem as military optical communications and sensing. This commercial demand parallelism provides electronics component suppliers with a dual revenue base that can sustain investment through defense procurement cycle fluctuations, making the business economics of this space significantly more resilient than traditional defense-only hardware markets.

- **Defense supply chain compliance requirements and the drive toward open-systems architectures are reshaping market access in ways that favor specialized regional suppliers.** As noted in the profile for high performance aerospace components, DoD's Cybersecurity Maturity Model Certification (CMMC) framework is tightening the compliance bar for all suppliers handling Controlled Unclassified Information, and the accelerating adoption of Modular Open Systems Approach (MOSA) standards is requiring that electronics payload suppliers certify compatibility with defined interface standards across multiple platform families. Suppliers who invest in CMMC readiness, secure software development practices, and MOSA-compliant payload architectures will have structural advantages in program competitions, while non-compliant or non-interoperable suppliers face progressive exclusion regardless of technical capability. This creates an opening for regionally anchored, compliance-ready suppliers to capture program roles that previously went by default to nationally distributed prime contractor networks.

Why Central Virginia?

Central Virginia's position as a growth location for defense electronics and payload engineering rests on a distinctive combination of assets: a research university with documented strengths in the physical science and engineering foundations of this technology space, a persistent federal intelligence and defense mission presence that shapes applied technology requirements, and a nascent but growing base of specialized electronics manufacturers and systems integrators already operating in the region. The line-of-sight logic for this growth opportunity runs from technology push rooted in UVA's Electrical and Computer Engineering and Physics research groups through specific, identified market pull from electronic warfare, signals processing, navigation, and payload integration demand concentrated at Rivanna Station and its contractor ecosystem, to place-based development potential centered on the North Fork Research Park, Rivanna Futures, and the testing infrastructure assets emerging in the region's northern counties (Counties of Culpeper, Fauquier, Madison, and Orange). The opportunity today is real but, similarly to

aerospace opportunities, not yet fully organized as a coherent cluster and realizing its potential will require deliberate coordination of research, industry, and infrastructure assets that currently operate in relative isolation.

Highlights of Technology Push

- **University capabilities in electronics, device engineering, optoelectronics, and chip design provide the foundational technology platform for this opportunity.** UVA's Department of Electrical and Computer Engineering (ECE) and its affiliated Physics faculty have documented research competencies in high-performance optoelectronics, including fabrication and characterization of laser devices, photodetectors, and photonic integrated circuits for high-bandwidth communications and sensing applications. Research groups within ECE have active programs in advanced radio-frequency, optical wireless, and integrated circuit technologies focused on efficient, low-power, and high-performance data transmission and positioning, capabilities that map directly onto the communications and navigation electronics requirements of modern defense payloads. DoD-funded R&D at UVA has been consistently concentrated in Electrical and Electronic Engineering alongside Computer Sciences and Materials Engineering, reflecting a deliberate investment alignment with national defense electronics technology priorities.

- **The Link Lab and related multidisciplinary research centers provide an applied research home for the cyber-physical and autonomous systems dimensions of payload engineering.** The Link Lab at UVA's School of Engineering is a multidisciplinary research center focused on cyber-physical systems, with research strengths in autonomous systems science, embedded sensing and control, IoT architectures, and wireless communication systems. These capabilities are directly relevant to the payload engineering opportunity: the integration challenge of combining multiple sensor modalities, processing boards, communication links, and actuator interfaces into a coherent, autonomous payload system is precisely the systems engineering and embedded control problem that the Link Lab is organized to address. UVA's multi-functional integrated system technology (MIST) center, organized as an NSF-sponsored Industry-University Cooperative Research Center (IUCRC), further provides a structured industry-engagement mechanism in integrated electronic systems design that can facilitate direct collaboration between UVA researchers and regional defense electronics companies. Alongside these centers, the Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST), a joint NSF Engineering Research Center, concentrates on ultra-low-power wireless sensing and energy harvesting architectures, capabilities with direct dual-use relevance in military edge computing and commercial IoT applications.

- **Applied research needs from NGIC and other defense stakeholders at Rivanna Station generate specific, actionable technology demand signals that can anchor research collaboration and product development in the region.** NGIC's core technical missions, including foreign materiel exploitation and the analysis of radar waveforms, signal signatures, and electronics-intensive foreign military systems, require persistent access to physicists, electrical engineers, and signal analysis specialists who can assess adversary hardware at the component and systems level. Stakeholder input notes that the center actively taps university capabilities through an experts program that engages faculty holding security clearances on short-term technical assignments, and that UVA's

expertise in electronic components is a recognized value.

- The Warrenton Training Center in Fauquier County, which includes electronics testing and communications lab facilities used by intelligence community agencies, further signals that the region has existing federal signal processing and electronics infrastructure with which regional industry and research capabilities could be more systematically linked.

Highlights of Market Pull

- **A base of SME defense electronics companies focused on signals processing, electronic warfare, and navigation systems is already operating in the region, creating the nucleus of a specialized electronics manufacturing cluster.** The regional defense contracting ecosystem includes a notable cohort of electronics-focused companies whose product portfolios map directly onto the payload engineering opportunity. Virginia Diodes designs and manufactures millimeter-wave and terahertz-frequency test and measurement components with SBIR awards from DARPA, NASA, and NIH, representing a regionally based manufacturer at the physical frequency frontier of next-generation EW and communications systems. Northrop Grumman's Charlottesville operation, which has been in the region since the 1950s, manufactures inertial navigation systems for U.S. Navy ships and operates an in-house anechoic chamber and RF test range, serving as an established anchor of precision electronics engineering and manufacturing capability. Other regional SMEs identified include Durandal, BCubed, Shine Systems, and Raven Technologies, companies focused on electronic warfare, signals processing, and cybersecurity applications that operate in the technical domains underpinning the payload electronics opportunity, as well as Dominion Microprobes and Laser Thermal, which manufacture precision components and measurement tools for electronics and semiconductor applications. DataShapes AI, a dual-use AI platform company focused on RF spectrum intelligence, further illustrates the region's emerging capacity in AI-enhanced signals processing, an increasingly critical layer of the defense electronics stack.

- **Opportunities exist to connect and coordinate the region's existing specialized components and materials manufacturers into a more coherent, multi-tier defense electronics and components manufacturing cluster.** The regional landscape includes not only the electronics SMEs described above but also a broader base of advanced materials and components manufacturers with partial alignment to the defense electronics supply chain. These include EURO-COMPOSITES and Austal Corporation which contribute structural and materials fabrication capabilities; Laser Plasma Technologies and Directed Vapor Technologies provide advanced optical sensor and coating technologies with Air Force and Navy SBIR awards; and Everactive, a regionally headquartered company with over $123 million in venture funding, has built a proprietary ultra-low-power, battery-less wireless sensor platform. **Individually, these companies serve different segments of the defense and dual-use market; collectively, they represent the raw material for a more integrated electronics components and manufacturing cluster that could begin to compete for multi-subsystem payload integration roles if organized around shared supply chain relationships, common compliance infrastructure, and coordinated workforce development.**

- **The combination of electronic warfare and signals testing infrastructure in the region's northern counties (Counties of Culpeper, Fauquier, Madison, and Orange)**

and near-term economic development investments at Rivanna Futures and North Fork create a compelling platform for anchoring major drone or autonomous systems manufacturers requiring modular payload engineering. Fauquier County's Warrenton Training Center hosts communications and electronics testing facilities used by intelligence community agencies, and the broader northern county geography, provides physical space for the electromagnetic test ranges, drone flight corridors, and hardware demonstration facilities that payload integration companies require before they can scale. Rivanna Futures and North Fork are explicitly designed to bring public, private, and academic collaborators into physical proximity with the intelligence community mission base. The Rivanna Futures development, once fully realized, could serve as a potential anchor for hardware-intensive defense electronics firms that need secure, mission-adjacent space for technology integration, prototype demonstration, and early product qualification, precisely the facilities that the SME stakeholders identified as most needed to support growth in this space. Attracting a sizable drone or autonomous platform manufacturer that requires a continuous supply of modular payload electronics would provide the demand anchor needed to catalyze further supplier investment and cluster cohesion, following the pattern of other successful defense electronics clusters nationally.

National Security: Cybersecurity Solutions & Critical Infrastructure Resilience

What Is the Opportunity?

Cybersecurity solutions and critical infrastructure resilience encompass hardware, software, and systems-engineering capabilities designed to protect digital networks, industrial control systems, data infrastructure, and cyber-physical environments from adversarial exploitation and disruption. The domain spans two interrelated application planes: information technology (IT) security, which addresses the confidentiality, integrity, and availability of data and software systems, and operational technology (OT) and industrial control systems (ICS) security, which protects the physical hardware and embedded computing systems governing energy grids, water systems, manufacturing operations, transportation networks, and military platforms. The convergence of these historically separate environments is the defining technical challenge and market opportunity across many current market applications spaces.

The fundamental problem driving demand is the rapid expansion of the "attack surface" created by digitization and the integration of IT systems into environments not originally designed with cybersecurity in mind. A Supervisory Control and Data Acquisition (SCADA) network is an industrial control system architecture that uses computers, networked data communications, and graphical user interfaces for high-level monitoring and control of industrial processes. SCADA networks and military cyber-physical platforms increasingly share infrastructure with enterprise IT systems, creating pathways through which adversaries can pivot from a compromised office environment to controls governing physical infrastructure. Unlike traditional data breaches, successful incursions into these environments threaten operational continuity, physical safety, and in national security contexts, mission success, demanding capabilities spanning vulnerability assessment, continuous monitoring and anomaly detection, incident response, secure firmware development, and IT-OT network segmentation.

The technology portfolio enabling this opportunity is multi-layered and constantly evolving. At the network level it includes SIEM platforms, next-generation firewalls, intrusion detection systems, and zero-trust architecture frameworks. For OT and ICS environments specifically, it adds protocol-aware threat detection capable of parsing industrial communication standards, asset discovery tools for poorly inventoried industrial device landscapes, and hardware-rooted security mechanisms enforcing authentication at the firmware and embedded processor level. AI/ML engines increasingly sit atop these layers, enabling behavioral analytics that detect anomalous device behavior and accelerate incident triage at machine speed. For defense systems specifically, cybersecurity extends to hardware-level protection against supply chain compromise and attacks across drone platforms, autonomous systems, and military IoT devices, making it a foundational enabler for virtually every other defense technology domain rather than a standalone sector.

Technologies developed for securing defense networks and military Incident Command System (ICS) environments share directly transferable architectures with those protecting commercial power utilities, financial networks, hospital infrastructure, and hyperscale data centers. As with several other growth opportunities relevant to defense, this bidirectional nature allows companies to pursue both government and commercial revenue streams, moderating dependence on defense procurement cycles and creating compounding market access.

Key Market Forces Driving Growth

Several broader market forces are driving the rapid expansion of market opportunities for solutions in this space:

- **Escalating nation-state and non-state cyber threats against critical infrastructure are driving unprecedented government investment in defensive capabilities.** High-profile cyber incidents in recent years targeting power grids, water treatment facilities, pipeline operations, and defense contractor networks have elevated critical infrastructure protection to the top tier of national security priorities globally. Governments across allied nations as well as commercial infrastructure operators have dramatically increased investment in monitoring, detection, and hardening technologies, creating structurally elevated and relatively procurement-cycle-resilient demand for cybersecurity solutions across both public and private sectors.

- **The convergence of IT and OT environments is creating a structurally new and underserved market for specialized operational technology security.** Industrial control systems and SCADA networks were historically air-gapped from enterprise IT environments, but the broad adoption of Industry 4.0 and smart manufacturing technologies has connected these environments to global networks, dramatically expanding the potential for attacks. The U.S. operational technology security market alone is projected to grow significantly, driven by the need for asset visibility, anomaly detection, and network segmentation in energy, manufacturing, and defense industrial base environments. This IT-OT convergence challenge creates strong demand for solutions that understand both the enterprise networking world and the specialized protocols and real-time requirements of industrial control systems.

- **Defense supply chain compliance mandates are transforming cybersecurity from a competitive differentiator into a condition of market entry for all defense contractors and their vendor ecosystems.** As noted in previous opportunity profiles, CMMC and related DoD regulatory dynamics create immediate, non-discretionary demand for cybersecurity assessment, implementation, and managed compliance services, and structurally favors companies and service providers who can guide regional defense firms through CMMC certification pathways. For a region with a large and growing base of defense SMEs, this compliance wave represents both a near-term professional services market and a longer-term product and platform development opportunity.

- **The explosion of connected defense platforms and cyber-physical weapons systems is creating a new frontier of hardware-level and embedded systems security demand.** Autonomous vehicles, drone swarms, networked munitions, electronic warfare systems, and AI-augmented surveillance platforms all embed significant software and firmware components that must be secured against adversarial compromise, particularly as adversaries have demonstrated the ability to intercept and manipulate control links for unmanned systems and exploit vulnerabilities in embedded processors to cause physical system failure. This creates growing demand for capabilities in secure firmware development, hardware security modules, supply chain integrity verification, and AI-driven anomaly detection in embedded systems.

- **National security policy is increasingly treating cybersecurity as a prerequisite for all forms of AI and data-intensive defense technology deployment, creating cross-domain demand.** The intelligence community's accelerating adoption of AI tools for threat analysis, the reliance of autonomous platforms on machine learning inference, and the sensitivity of data processed by all-source analytics platforms each create cybersecurity requirements that must be addressed before those systems can be operated at scale. As a result, cybersecurity is not a standalone growth area but a foundational enabler that cuts across the region's broader defense and national security cluster supporting applications areas that range from securing the data pipelines that feed intelligence fusion platforms to protecting the embedded computing systems within aerospace and defense electronics payloads.

Why Central Virginia?

Central Virginia's position in the cybersecurity solutions and critical infrastructure resilience space draws on a combination of underlying capabilities that, while not yet fully developed into a technology and IT services cluster, still provide foundational research strengths and leverage defense customer bases. The region benefits from a research university with nationally recognized, NSA/DHS-designated cybersecurity programs, a growing ecosystem of companies providing cyber solutions to government and defense customers, and the persistent demand signal generated by Rivanna Station's intelligence and defense agencies which continuously drive requirements for network security, data protection, and cyber-physical system integrity through their engagements with industry.

Highlights of Technology Push

- **UVA's Cyber Defense Program and National Security Data and Policy Institute (NSDPI) anchor a nationally recognized and institutionally embedded cybersecurity research and education capability.** UVA's Department of Computer Science operates one of a limited number of academic programs designated by both the NSA and DHS as a Center of Academic Excellence (CAE), holding both the CAE-R designation, which supports PhD-level research in cybersecurity, and the CAE-CD (Cyber Defense) designation at the undergraduate level. The program produces significant cybersecurity-credentialed graduates per year, drawing from curriculum grounded in computer systems, formal methods, software analysis, and applied cryptographic theory. Faculty have active DARPA-funded research in AI-driven autonomous agents for network defense and are engaged with the DoD Test Resource Measurement Center (TRMC), representing the kind of applied, use-inspired research at the boundary of cybersecurity and AI that maps directly onto operational national security needs. The NSDPI further integrates cybersecurity and data security dimensions into its national security research agenda, with active work on financial intelligence network security, LLM-based analytical tools for intelligence missions, and technology policy analysis that spans cyber policy domains. The NSPC and NSDPI together create an institutional capacity to combine the technical research dimensions of cybersecurity with the policy and governance frameworks needed to translate solutions into operational national security contexts.

- **Cybersecurity represents an underlying and cross-disciplinary innovation requirement for virtually every other area of regional applied research and defense technology activity, amplifying its strategic importance as a research competency.** UVA's Link Lab, electrical and computer engineering (ECE), mechanical and aerospace engineering, and systems engineering, addresses the embedded security and control architectures that define the security posture of autonomous platforms, drone swarms, and networked defense systems, aligned with the hardware-in-the-loop security challenges that DoD's accelerating adoption of unmanned and autonomous systems has made urgent. Research in ECE and CS encompassing formal verification, compiler-based security, software-defined radio architectures, and advanced network design provides foundational technical capabilities needed to address both the software and hardware dimensions of cybersecurity in defense electronics and embedded systems. The School of Data Science's active work with defense partners on AI-enabled analytical tools, and its broader research strengths in machine learning, anomaly detection, and network science, further extend UVA's cybersecurity-adjacent technical toolkit. The Commonwealth Cyber Initiative (CCI), a statewide network that supports regional cybersecurity research nodes at Virginia universities, represents a further coordination mechanism through which UVA and regional partners can connect with emerging commercialization pathways.

Highlights of Market Pull

- **A base of defense contractors and cyber-focused companies serving Rivanna Station provides a nascent cyber industry cluster nucleus.** The regional defense contracting ecosystem includes a meaningful cohort of firms with explicit cybersecurity and OT/ICS security portfolios serving Rivanna Station and broader national security customers. Companies such as Mission Secure, ValiCyber, SafeGuard Cyber, and RIIG/HOOTL are regionally headquartered or VC-backed firms active in the cybersecurity and OT protection space. The broader regional defense contracting ecosystem, including major primes such as Northrop Grumman, Booz Allen Hamilton, CACI International, Leidos, and General Dynamics Information Technology operating at or in support of Rivanna Station as well as specialized firms such as Raven Technologies, Shine Systems, and DataShapes AI operating in electronic warfare and signals security domains all generate persistent demand for cybersecurity capabilities and secure IT services that protect data-intensive defense operations, classified networks, and the software-embedded systems that underpin intelligence analysis and defense electronics platforms. These organizations collectively anchor a contractor cybersecurity workforce in the region and create sustained demand for both managed services and product-based cyber solutions.

- **Ongoing demand for CMMC compliance services, data center security, and cyber-physical protection from defense operations and regional infrastructure investments creates a growing near-term market across public and commercial sectors.** Beyond the defense contractor base, the region hosts a rapidly expanding data center sector, anchored by hyperscale investments from AWS and EdgeCore, that generates significant and growing commercial demand for network security, data sovereignty, and infrastructure hardening capabilities. The convergence of large-scale data center infrastructure with proximity to defense and intelligence operations creates a geography where cybersecurity solutions providers can serve both commercial and national security customers from the same regional base, a dual-market model well-suited to the kind of software-intensive, low overhead companies that thrive in a university talent market. Rivanna Station's three anchor agencies continuously drive technology requirements in areas including network defense, secure data fusion, and protection of sensitive intelligence databases. The planned Rivanna Futures development, a 462-acre Intelligence National Security Innovation Acceleration Campus adjacent to Rivanna Station, as well as UVA's North Fork discovery park represent major near-term infrastructure investment efforts designed to bring commercial, research, and national security actors into physical proximity, creating a potential landing space for cybersecurity firms that require SCIF-adjacent space, secure facilities, and direct mission customer access. Although the IT industry base remains relatively modest in scale today compared to other regions in the state, input across the region consistently identifies the need for a shared SCIF capability for researchers and company staff, fiber internet and dedicated HPC capacity, and expanded secure lab and testing infrastructure as potential investments which could help further scale the potential of this sector.

National Security: Biosecurity & Dual Use Population Health Intelligence Applications

What Is the Opportunity?

Biosecurity and dual-use population health intelligence sits at the intersection of data science, biomedicine, and national security. It arises from the convergence of two domains. The first is population-scale public health intelligence, focused on continual collection, integration, and analysis of biological and epidemiological data to understand disease dynamics at the population level. The second is biosecurity intelligence, concerned with detecting, characterizing, and forecasting biological threats, whether natural, accidental, or deliberate, across civilian and defense contexts. The core insight is that the same computational platforms, data architectures, and analytical methods that address complex civilian population health problems also underpin advanced national security biosurveillance. This creates a broad potential market for solutions spanning public health agencies, health systems, and defense and intelligence organizations.

Technical challenges in this area are defined by simultaneously handling high data volume, wide variation in information across populations, and the need for real-time information and analytics. Modern population health and biosurveillance systems must ingest and interpret data from diverse sources that include clinical records, genomic and multi-omic assays, syndromic surveillance feeds, wastewater monitoring, environmental sensor networks, pathogen sequencing outputs, open-source and commercial streams, and, for national security missions, classified biological intelligence and recovered materials. The difficulty lies less in sheer volume than in the fact that these data originate in different systems, arrive at different times, and vary in reliability and coverage. Delivering accurate and timely situational awareness across this fragmented landscape requires advanced data fusion architectures, machine learning pipelines that tolerate noisy and incomplete inputs, and high-performance computing that can execute simulations faster than real-world events unfold.

Foundational technologies rely on population-scale data integration platforms that can pull structured clinical and laboratory data, semi-structured multi-omic outputs, and unstructured surveillance narratives into unified analytical representations for modeling. On top of this layer sit simulation and forecasting engines, particularly agent-based or other "digital twin" models and ensemble probabilistic forecasters that capture behavioral, social, and biological transmission dynamics in synthetic populations at regional, national, or even global scales. These engines depend on operational high-performance computing configured for real-time, time-sensitive analytics rather than only batch research workloads. Biosecurity-specific needs add requirements in genomic and metagenomic analysis, such as interpretation of pathogen sequencing data, computational detection of novel or engineered organisms, and integration of sequence-level intelligence into broader threat assessment. Visualization and user-interface tools are used in the final steps of analysis to turn model outputs into decision support products that public health officials, emergency managers, and national security analysts can act upon.

The dual-use nature of this platform is a structural advantage. A single computational epidemiology system can support a state health department as it models the spread of a seasonal influenza variant and also supports a DoD biosurveillance mission assessing risks to deployed forces or evaluating the potential impact of a biological attack, provided that data access and security

are managed appropriately. Similarly, pathogen genomic surveillance capacity that guides clinical and public health decision-making can also inform intelligence assessments of novel or engineered biothreat agents. Because the technical requirements align so closely across civilian and defense users, firms and research groups can extend a common platform from one set of customers to another with relatively modest incremental investment. This creates business model flexibility, diversified revenue from both civilian and national security markets, and a strong fit for regions that have deep university talent pipelines and a growing base of data science and AI-focused talent pipelines oriented towards life sciences applications.

Key Market Forces Driving Growth

Several broader market forces are driving the rapid expansion of market opportunities for solutions in this space:

- **Escalating biological threat complexity is creating urgent demand for advanced population health platforms at unprecedented scale.** The 2025 Defense Intelligence Agency Worldwide Threat Assessment explicitly identifies global health and biodefense as one of a set of advanced technology domains, alongside AI and quantum sciences, reshaping the global threat landscape, noting that adversary advances in these fields augment military and technological capabilities in ways that increasingly challenge traditional detection and response postures. The convergence of synthetic biology advances, the proliferation of dual-use life science knowledge, and the potential application of AI-enabled biological design tools to pathogen enhancement has elevated biological threats on national security priority lists. This environment is generating new DoD and intelligence community investment in biosurveillance tools, emerging biothreat characterization platforms, and population health modeling capabilities that bridge the gap between open-source epidemiological intelligence and classified threat assessments.

- **Accelerated modernization of public health and digital health data systems is expanding demand for population scale analytics platforms.** In the wake of COVID 19, governments and health systems are investing heavily in real time surveillance, interoperable data infrastructure, and cloud based repositories to replace fragmented legacy systems. These efforts are creating a structural shift from retrospective reporting toward predictive and operational analytics in areas such as outbreak detection, chronic disease management, and health equity monitoring, which raises the value of vendors that can deliver scalable data fusion, machine learning, and decision-support capabilities across diverse public health and healthcare datasets. As digital health tools proliferate in clinical and community settings, the volume and variety of usable population health data are increasing, and this further reinforces a preference for flexible software platforms rather than bespoke point solutions.

- **The AI-enabled transition in pathogen genomics and multi-omics is fundamentally restructuring how population health data can be translated into biosurveillance intelligence.** The rapid deployment of next-generation sequencing and multi-omic profiling at population scale has created a qualitatively new category of biological data, one that contains rich information about pathogen genomics, host immune response dynamics, microbiome composition, and genetic risk factors simultaneously, but that requires sophisticated computational interpretation to translate into clinical or security-relevant insights. Machine learning platforms capable of integrating genomic,

proteomic, and transcriptomic data streams, correlating them with clinical and epidemiological outcomes, and identifying anomalous biological signals consistent with novel pathogens or engineered threats represent the high-value frontier of this field, and a frontier where commercial biosurveillance solution providers, academic medical centers, and national security agencies are all actively investing.

- **Supply chain vulnerability in biopharmaceutical manufacturing has elevated biosecurity as a national economic and defense priority, creating cross-sector demand for population health intelligence platforms that can assess biological risk across industrial and military contexts.** The recognized fragility of domestic pharmaceutical and biological manufacturing supply chains highlighted through both the COVID-19 pandemic has driven new federal and commercial interest in platforms that combine population health modeling, manufacturing network vulnerability analysis, and biological threat characterization into integrated risk intelligence tools. Federal agencies' active interest in biosurveillance of emerging biothreat agents, including potential WMD applications, overlaps directly with this broader concern about biological risks to military and civilian supply chains, creating a multi-directional demand signal for platforms that can serve both public health preparedness and national security biosurveillance missions from a common technical base.

Why Central Virginia?

Central Virginia occupies an unusually strong position for the development of a biosecurity and dual-use population health intelligence cluster because it hosts a convergence of world-class computational epidemiology and biocomplexity research, a substantial population and public health research base within UVA's academic medical center, and the active mission demand of national security organizations at Rivanna Station with explicit interest in emerging biothreat intelligence applications. UVA and its key research centers provide significant core competencies through internationally recognized computational modeling, network science, and multi-omics research while regional defense agencies and contractors provide a channel to mission-aligned opportunities via articulated biosurveillance and biothreat characterization needs. The regional biosciences cluster, anchored by new pharmaceutical manufacturing investments and an emerging early stage biotech ecosystem, is building the capacity for the early-stage commercial and translational ecosystem needed to seed new companies advancing innovation in this space. However, it is important to acknowledge that this is an area of emerging potential driven by the core competencies of the university and alignment to areas of interest of federal agencies rather than an established regional industry strength today, meaning ongoing ecosystem development will be necessary to realize its full economic development potential.

Highlights of Technology Push

- **Population-scale multi-omics and public health research at UVA create a translational research platform with direct dual-use applications in biosurveillance.** UVA's research base has a capacity in integrated multi-omics for population and public health that represents a leading, differentiated core competency, with evidence of strong presence in both peer-reviewed publications and researcher-led grant awards. This research theme encompasses population genomics and genetic disease mechanisms supporting precision medicine, multi-omics platforms for disease identification and diagnosis, global health and epidemiology research including child diarrheal and infectious disease management, COVID-19 clinical research and pathogenesis, microbiome dynamics and antimicrobial resistance, and tuberculosis. It further encompasses infectious disease pathogenesis research with a focus on viral and bacterial mechanisms, host-pathogen interaction dynamics, metabolic modeling, and gene regulation. From a biosurveillance standpoint, this cluster of competencies directly supports the ability to detect and characterize novel pathogens, assess biological threats at the population level, and develop the computational tools needed to translate genomic surveillance data into actionable health intelligence. UVA's Department of Public Health Sciences and associated infectious disease research groups within the School of Medicine also contribute epidemiological modeling, population health intervention research, and clinical infectious disease expertise that anchor the civilian public health dimension of this opportunity. The School of Medicine's ongoing investments in clinical data infrastructure further strengthens UVA's ability to serve as a platform for population-scale health intelligence research and application development.

- **The UVA Biocomplexity Institute serves as a center of excellence in computational epidemiology, network science, and biosecurity modeling that provides an analytical engine for applications in this opportunity area.** The Biocomplexity Institute has spent more than two decades developing and deploying sophisticated computational tools at the leading edge of public health modeling and national security biosurveillance, and its sponsor base reflects both dimensions of the dual-use opportunity. On the public health side, it has worked with the Centers for Disease Control and Prevention, the National Institute of Allergy and Infectious Diseases, NIH broadly, the Virginia Department of Health, and USAID while on the national security side, DTRA is a major ongoing sponsor with an active IDIQ contract, DARPA, the U.S. Army Research Institute, and IARPA. The Institute also manages the Virginia Pathogen Genomics Center of Excellence (VA PGCoE), a program explicitly designed to establish sustainable public health infrastructure that translates genomic data into actionable insights for disease prevention and control, and operates the Bacterial and Viral Bioinformatics Resource Center (BV-BRC), a federal resource for infectious disease informatics. Most recently, the Institute has worked closely with the National Security Data and Policy Institute (NSDPI) as a key collaborator, contributing advanced analytics and AI-driven methodologies to national security data applications, further reinforcing its position as a natural bridge between civilian biosurveillance and national security intelligence applications.

- **Other key research and academic programs, including UVA's School of Data Science and a growing set of health-focused data and AI initiatives, provide critical enabling infrastructure for population health intelligence and biosecurity applications.** These programs advance core methods in health informatics, bioinformatics, network and graph analytics, and machine learning for large-scale clinical and public health datasets, often in collaboration with UVA Health and public sector partners. They also educate cross-trained talent who are comfortable working at the interface of data science, epidemiology, and policy, building a workforce that can design, implement, and operationalize next-generation population health intelligence platforms in both civilian and national security settings.

Highlights of Market Pull

- **Rivanna Station organizations such as DIA and NGIC represent a direct and near-term national security demand signal for biosecurity and dual-use population health intelligence applications in the region.** There is strong interest in emerging biothreat agent characterization and WMD-related applications from Rivanna Station stakeholder communities, interest that overlaps with broader armed forces mission activities and creates a combined intelligence community demand signal from a single location. Intelligence community missions to integrate HUMINT, SIGINT, GEOINT, and MASINT into comprehensive threat assessments, combined with its focus on HPC platforms and AI integration, positions the region's biosurveillance and emerging biothreat activities as natural outlets for the kinds of computational platforms UVA researchers are developing even where formal classified research contracts remain limited by classification barriers. The Rivanna Futures development also represents a major infrastructure investment that could eventually provide co-location opportunities for biosecurity-oriented research and commercial organizations seeking proximity to intelligence community demand.

- **An emerging regional biosciences industry base in infectious disease and rapid diagnostics, combined with new pharmaceutical manufacturing investments, provides an early commercial foundation and dual-use supply chain opportunity.** The region's biosciences cluster has grown at nearly twice the national rate from 2019 to 2024, driven by gains across multiple subsectors, and is anchored by significant new investment from AstraZeneca's manufacturing facility in northern Albemarle County, the planned UVA Manning Institute of Biotechnology, and a $120 million state-backed high-tech biomanufacturing training initiative co-anchored by AstraZeneca, Merck, and Eli Lilly with UVA and VCU as institutional anchors. UVA tech transfer trends show immunology, infectious diseases, and biologics among UVA's strongest IP generation areas, while there are several regional examples of emerging biotech and contract research companies whose technology platforms have applicability or direct adjacency to the biosurveillance and population health intelligence space. These companies, while not themselves biosurveillance platform developers, demonstrate that the region's biosciences base has the potential to support dual-use biological research and that can increasingly be connected to biosecurity intelligence applications.

IV. Situational Assessment and Strategic Implications, Priorities Based on Stakeholder Input

Situational Assessment of Overall Regional Economic Development Dynamics

Central Virginia is experiencing an economic development boom, with billions of dollars invested or committed in recent years across emerging and established companies in the biosciences and national security industries. **Throughout Central Virginia, and Charlottesville in particular, stakeholders consistently described a region that has moved from "potential to proof points."** A critical mass of world-class anchors is now in place: the University of Virginia and the Manning Institute, a growing base of life science firms anchored by AstraZeneca's major investment, and significant new commitments in digital infrastructure from hyperscale data center operators. In parallel, a strong federal and defense/intelligence presence at Rivanna Station and among prime contractors has positioned the region as a strategic location for national security missions. Together, these developments are beginning to put Central Virginia on the map in ways that were not true even a few years ago—**and there is a desire for even greater momentum.**

Underlying the economic activity in Central Virginia is a talent and quality-of-life value proposition that compares favorably to coastal tech markets. The Charlottesville MSA has the country's third-highest share (56%) of adults with a bachelor's degree, and the highest average incomes among metro areas with fewer than 2.5 million residents.[14] The region offers high-quality talent at significantly lower cost than markets such as Silicon Valley or Boston, coupled with a high quality of life that attracts individuals unwilling to remain in those markets long term. Stakeholders also highlight the emerging opportunity to attract mid-career professionals from Northern Virginia, as remote work patterns, lifestyle choices, and potential federal restructuring generate new waves of talent willing to relocate. After decades of limited greenfield development, more localities are also open to growth, with developable land available in strategic locations to support both industrial and mixed-use projects. The new data center developments in places like Louisa County and Culpeper County are prime examples of this effect.

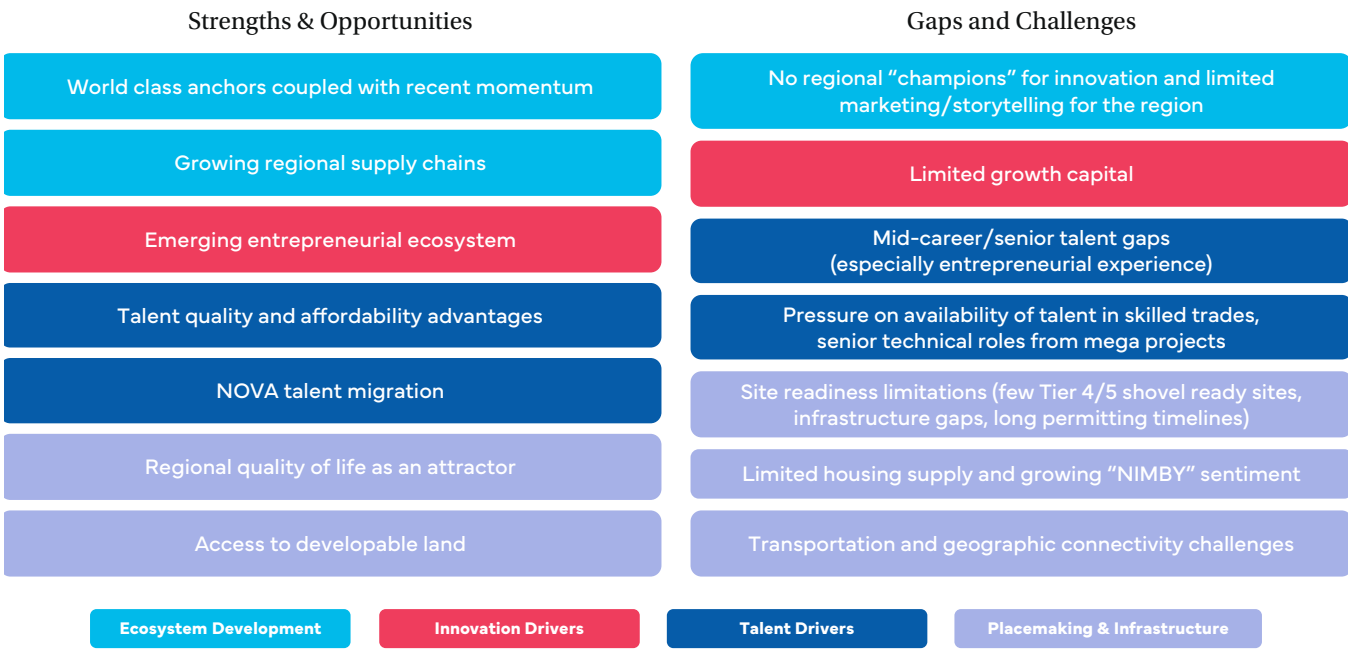
14 https://www.cvillechamber.com/2025/03/06/state-of-the-community-2025/

Looking ahead, stakeholders identified a strong opportunity for Central Virginia's counties to reinforce one another through developing supply chains and entrepreneurial activity. They highlighted expanding networks of suppliers, vendors, contract research organizations, and specialized service providers in sectors such as biosciences and defense/intelligence. MITRE's regional presence—with a drone testing range in Orange County and an office in Albemarle County—illustrates the kind of cross-county connections that strengthen the regional economy. Similar opportunities to foster collaboration and attract investment are also evident within the biosciences supply chain, particularly following AstraZeneca's recent investment.

Entrepreneurial organizations such as CvilleBioHub are increasingly recognized as a key strength for the region, and an example of what can be achieved with focused investment. The initiative is viewed by many as a potential model for other technology-based economic development efforts across the region. Ultimately, continued engagement from the University of Virginia will be essential to the long-term success of these initiatives in Central Virginia. CvilleBioHub's ability to collaborate effectively with the university, as well as with county and regional economic development partners, offers a promising framework that could be adapted for other growth sectors, such as defense (e.g., supporting biomedical needs of the warfighter). Others, such as Venture Central, the Central Virginia Small Business Development Center (CVSBDC), the Charlottesville Business Innovation Council (CBIC), and local angel groups, can help provide a base of programs and networks that provide other infrastructure for venture formation, peer learning, and sector-specific support.

Figure 17.

THEMES FROM REGION 9 ECONOMIC DEVELOPMENT STAKEHOLDER ENGAGEMENT INFORMING STRATEGIC PRIORITIES FOR CENTRAL VIRGINIA



Source: TEConomy regional stakeholder interview synthesis.

At the same time, stakeholder interviews surfaced a set of ecosystem gaps and constraints that, if left unaddressed, could blunt potential momentum. One common barrier identified was the absence of clear regional "champions" and a coherent organizational home for the Innovation Corridor concept. Stakeholders perceive that no single organization currently owns the story, the strategy, or the day-to-day orchestration required to knit together life sciences, digital, and defense/intelligence opportunities across jurisdictions. Marketing and storytelling are seen as fragmented and reactive, with the region's differentiating narrative not consistently conveyed to prospects, investors, or talent.

A second structural opportunity involves more fully leveraging the University of Virginia as a catalyst for regional economic growth—particularly in commercialization, industry collaboration, and engagement with counties across Central Virginia beyond Charlottesville and Albemarle. Stakeholders noted that there are opportunities to strengthen translational research, commercialization pathways, and support for faculty and students pursuing entrepreneurial ventures alongside academic careers. Expanding these efforts would help translate UVA's research excellence into a stronger pipeline of investable companies and collaborative projects, especially in complex, regulated sectors such as biosciences and national security technologies.

Access to growth capital remains a major constraint for emerging entrepreneurs in the region. Outside of Florida, the Charlottesville MSA ranks as the nation's highest for residents reporting investments as an income source (31 %).[15] However, stakeholders describe the local capital ecosystem for entrepreneurs as relatively thin and underdeveloped, particularly for capital intensive or long horizon ventures in fields such as biosciences or defense technologies.

The limited focus of experienced angel investors, long exit cycles for these investors post-pandemic, and the loss of the Virginia Angel Investor Tax Credit, in combination with the lack of locally based, Virginia focused venture funds can create barriers for companies seeking to scale. These capital gaps are compounded by a shortage of seasoned entrepreneurial and executive talent needed to lead firms through growth. As a result, founders often face unfavorable deal terms, dependence on out of region investors, or stalled progress at critical growth stages.

On the infrastructure side, stakeholder interviews highlight limitations in skilled trade talent, a lack of shovel-ready sites, gaps in enabling infrastructure (water, sewer, power, and broadband in specific locations), disconnects across municipalities, and long permitting timelines that can delay or deter investment. Housing supply constraints, emerging NIMBY sentiment, and limited regional transportation connectivity (such as the lack of critical nonstop air service to innovation hubs) can further stress the system as population and project pipelines grow.

Taken together, these strengths and gaps yield three strategic implications for the Innovation Corridor:

1. **Seizing the Opportunity:** First, the region must treat its current wave of anchor investments as a time-bounded window to lock in long-term competitive advantage. That requires moving from opportunistic, project-by-project responses to a proactive, coordinated strategy that deliberately leverages the biosciences, digital infrastructure, and defense/intelligence as mutually reinforcing growth platforms.

2. **Organizing for Success:** Second, the ecosystem needs organizational arrangements that separate but tightly connect the work of building

15 https://www.cvillechamber.com/2025/03/06/state-of-the-community-2025/

sector-specific innovation capacity from the work of coordinating regional economic development, business attraction, and placemaking.

3. **Connecting all Counties:** Third, there is a need to ensure that all counties in Central Virginia can take advantage of the opportunities created by economic growth in the biosciences and defense technologies. There is also a recognition that talent, housing, and infrastructure to regional economic development growth can no longer be treated as a background condition—they must become explicit priorities of Central Virginia's innovation-based economic strategy, similar to business recruitment or entrepreneurship support.

To build on this momentum, Central Virginia should capitalize on the two domains where it already possesses differentiated, nationally relevant strengths: national security and defense, and the biosciences. These areas reflect the organic trajectory of the region's economic and research base, the presence of major federal and industry anchors that have already established meaningful critical mass, and a set of UVA research capabilities that are genuinely world-class in areas directly relevant to both sectors. Whereas the general regional ecosystem assessment identifies a broad set of cross-cutting assets and challenges, it is in these two domains that the region has the deepest existing foundations from which a focused, sustained growth strategy can compound.

The two domains share several important characteristics that make them well suited to a coordinated regional strategy. Both are research-intensive industries that depend on continuous flows of innovation from leading academic institutions into applied, commercially or operationally viable products and services. Both involve complex, multi-stakeholder development ecosystems in which universities, industry, government, and specialized intermediary organizations must work in close and trusted coordination. And both are industries where the gap between knowledge creation and market or mission deployment, the well-documented "valley of death," poses a structural challenge that requires deliberate institutional design and sustained investment to bridge. At the same time, the two sectors have meaningfully different development requirements, procurement dynamics, regulatory environments, and talent profiles, and the strategy for each must be calibrated accordingly.

The sections that follow examine each domain in turn. Drawing on a structured stakeholder interview process that engaged over fifty five regional industry, university, federal agency, and economic development leaders, each section identifies strengths and opportunities alongside gaps and challenges across the dimensions of workforce and talent, ecosystem development, innovation drivers, and placemaking and infrastructure, and concludes with the strategic implications most relevant to cluster development priorities.

Situational Assessment: Biosciences Stakeholder Input

The growth opportunities provide a set of exciting, forward-looking technology and commercialization opportunities for the region to seize, but to realize these prospects in the biosciences requires a high-functioning regional innovation and development ecosystem.

The bioscience industry has unique development requirements that differ from other advanced industries and require an especially robust and supportive ecosystem. Cluster development calls for particularly close ties between industry, clinical care, and academic research and development, with at least one study showing, for example, that a majority of the most transformative drugs in recent decades resulted from collaborations between industry and academia.[16] Industry innovations are driven by complex science and rigorous regulatory oversight, involving clinical testing and post-approval monitoring. Due in part to these long time horizons, the industry often faces a significant "valley of death" between discovery and clinical testing that requires funding to see it through and survive as a firm. And highly specialized skills and lab requirements can pose hurdles and challenges, requiring a varied mix of qualified workforce and talent operating under complex regulatory oversight.

Interviews with Region 9 industry and ecosystem leaders and stakeholders—spanning industry executives, university research leaders and key faculty, economic development and cluster leadership—are critical to informing strategic needs and priorities for regional cluster development. A series of one-on-one interviews were conducted and the major themes from these conversations elevated to both inform, refine, and solidify the identified preliminary growth opportunities, as well as a situational assessment for Central Virginia's biosciences development. Areas of strength and opportunities raised, as well as important gaps and challenges identified by stakeholders are framed in this section across several key facets of the innovation ecosystem, including:

- Workforce and talent dynamics and drivers
- Ecosystem development
- Innovation drivers

From this assessment of thematic areas and needs emerge then a set of strategic implications and priorities for which the strategic recommendations will be organized and framed.

Workforce and Talent Dynamics and Drivers

As Region 9's biosciences cluster has grown rapidly and continued to emerge in Central Virginia, addressing the situation for biosciences workforce and talent has been a primary focal point and priority for regional cluster leadership and stakeholders. Viewed as a critical challenge and limiting factor for enabling continued growth, CvilleBioHub and its regional partners initiated a strategic planning effort in 2025, in partnership with TEConomy, for a comprehensive plan to address the region's gaps and challenges around workforce and talent. The complementary strategy, just released in early 2026, is designed to address in-depth the situation for and strategic recommendations to address the region's talent challenge.[17]

16 Tufts Center for the Study of Drug Development, Public and Private Contributions to the R&D of the Most Transformational Drugs of the Last 25 Years, January 2015.

17 TEConomy Partners, LLC, "Talent Pathways: A Biosciences Workforce and Talent Strategy for GO Virginia Region 9 to Support Rapid Growth and Momentum of a Vibrant Industry," February 2026.

Viewed as a critical challenge and limiting factor for enabling continued growth, CvilleBioHub and its regional partners initiated a strategic planning effort in 2025, in partnership with TEConomy, for a comprehensive plan to address the region's gaps and challenges around workforce and talent. The insights and key findings gleaned from this work are provided herein as talent remains the cluster's leading strategic priority.

This study will not duplicate, fully unpack, nor delve into every detail of the findings of the workforce and talent strategy. Instead, it will frame selected key findings and the situation for talent that drove the recommended strategies and actions, and it will reinforce those strategic priorities and recommendations by including them in the final section of this report.

Key findings and the situation for talent development from the year-long strategic planning effort[18] include:

- Workforce and talent emerged as both a defining strength and a potential growth constraint for Central Virginia's biosciences cluster, prompting CvilleBioHub and regional partners to commission a dedicated *Talent Pathways* strategy in 2025–26 that this report now builds upon.

- The talent report confirms that Region 9's bioscience industry is already sizable and specialized; but also that employers consistently struggle with talent sourcing and retention, skills mismatches, limited local entry-level pipelines, and a lack of cohesive, region wide workforce coordination.

- On the demand side, the assessment identifies a clear set of high-demand, high-priority roles that cut across pharmaceutical manufacturing, medtech and devices, health IT, and UVA's research and clinical enterprises. These include:

    - Higher-volume needs for medical scientists, biological and clinical lab technicians, other laboratory scientists (chemists, microbiologists, materials scientists), and skilled production workers.

    - More specialized but critical demand for biomedical engineers, software developers, QA/QC professionals, and data science/bioinformatics talent.

- Demand is poised to intensify as the Manning Institute, AstraZeneca, and other announced expansions come online, amplifying competition for both advanced degrees and technician-level talent across industry, UVA, and the health system.

- On the supply side, the *Talent Pathways* work finds that Central Virginia maintains a strong foundation of educational and training assets spanning K–12, community colleges, and UVA, but that these assets operate largely as disconnected "nodes" rather than an integrated biosciences talent system.

    - UVA serves as the anchor for baccalaureate and graduate life science/bioscience education, while PVCC, Germanna, and other community colleges provide biotechnology and lab science programs, stackable credentials, and short-term training—complemented by a dense array of Career and Technical Education (CTE), apprenticeship, bridge, internship, and micro-credential initiatives supported by institutional

18 Ibid.

champions and intermediaries like CvilleBioHub.

  - The core challenge is that these programs are not yet systematically coordinated or branded as a unified regional pathway for bioscience careers; awareness among students and job seekers is uneven, and employers report limited use of state and regional workforce programs despite their relevance.

- One of the most critical issues identified is talent retention—longitudinal data show that a large share of bachelor's-level life-science graduates leave the region over time, even as employers report very high tenure and loyalty among those who do stay, reflecting strong quality-of-life and mission-driven appeal once people land in local roles. This "leaky pipeline" dynamic underscores that Central Virginia's challenge is less about initial degree production and more about connecting students earlier to local opportunities, improving visibility of career pathways, and scaling on-ramps into lab, production, and clinical roles across the cluster.

- With major new biomanufacturing and translational investments arriving, the region is at an inflection point—without stronger coordination and a more intentional value proposition for talent, current gaps in entry-level pipelines and middle-skill technical roles could become a binding constraint on cluster growth.

Figure 18.

THEMES FROM REGION 9 BIOSCIENCES STAKEHOLDER ENGAGEMENT INFORMING STRATEGIC PRIORITIES FOR CENTRAL VIRGINIA—WORKFORCE AND TALENT DYNAMICS AND DRIVERS

Source: TEConomy regional stakeholder interview synthesis; as published in TEConomy Partners, LLC, "Talent Pathways: A Biosciences Workforce and Talent Strategy for GO Virginia Region 9 to Support Rapid Growth and Momentum of a Vibrant Industry," February 2026.

The *Talent Pathways* strategy therefore frames three mutually reinforcing priorities that this broader cluster plan adopts as its workforce agenda:

- First, develop and strengthen regional talent pipelines for both high-volume technician, lab support, and skilled production roles as well as specialized, high-skilled science and engineering occupations that underpin bioscience competitiveness.

- Second, address the disconnected nature of the current ecosystem by formalizing a regional framework for coordinating life-sciences workforce development, employer engagement, and career awareness efforts across K–12, community colleges, UVA, and industry.

- Third, more effectively "tell the story" of Central Virginia's bioscience strengths and career opportunities to improve recruitment and retention, leveraging the cluster's quality of life, mission-driven work, and emerging flagship investments as key differentiators in a national talent market.

These priorities align with specific recommended strategies and detailed actions, which are included in both the published *Talent Pathways* report and reinforced at a high level in the final section of this report.

Ecosystem Development: Access to Growth Capital

Regional biosciences leaders and stakeholders have consistently raised concerns about the ability of emerging, high-growth potential companies to access and raise sufficient growth capital (Figure 19).

Access to "sophisticated" growth capital is a structural necessity in the biosciences because companies are capital-intensive, slow to revenue, and high-risk; in smaller, more rural regions like Central Virginia, those needs run up against more modest local investor networks, less VC presence, and fewer "scaled" success stories, making it harder for emerging firms to get in front of the right investors and raise appropriately sized rounds. These reflect challenges raised by cluster leaders and stakeholders.

Access to growth capital matters in the biosciences for several reasons:

- Bioscience industry startups often require large, staged equity infusions (seed to Series B+) to fund long R&D cycles, regulatory milestones, clinical trials, and specialized infrastructure, well beyond the reach of "friends and family" or bank debt.

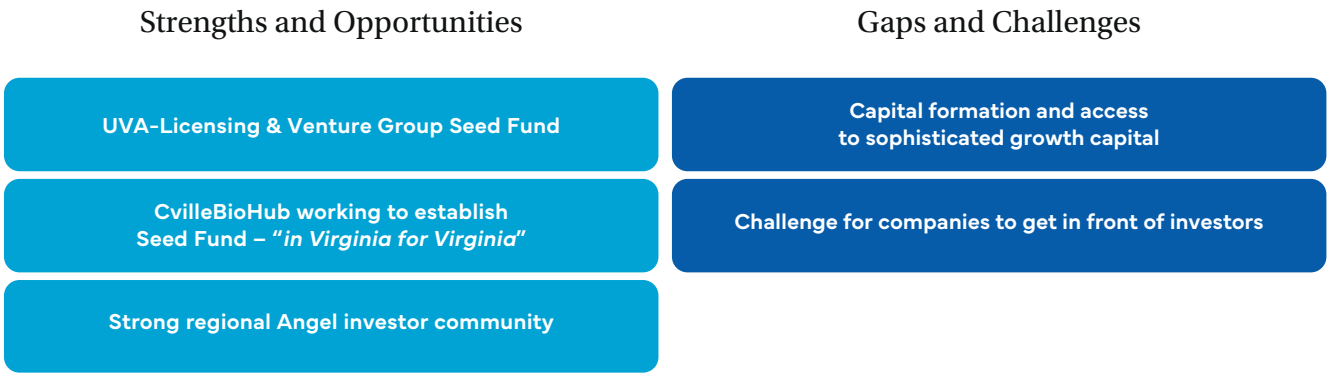
- Angels and VCs bring not just funding but sector expertise, governance, syndicate access, and investor connections that de-risk later, larger raises and help companies navigate regulatory, IP, and commercialization hurdles.

- In regions building biosciences clusters, targeted capital programs (co-investment funds, state-backed accelerators, specialized angel groups) have proven central to getting more early-stage life science companies investor ready and visible at the national level.

Stakeholders point to some existing, lower levels of investments in student entrepreneurship efforts at UVA, and for some emerging startups but at small dollar levels that one leader described as "not really impactful", in contrast to leading life sciences ecosystems nationally. Even with regional access to Greater Washington, DC, there are limited opportunities there as it is not a major investing market for biosciences and getting in front of investors is challenging and time-consuming. In general, stakeholders cite few venture capital firms investing consistently in Virginia.

Figure 19.

THEMES FROM REGION 9 BIOSCIENCES STAKEHOLDER ENGAGEMENT—ECOSYSTEM DEVELOPMENT



Source: TEConomy regional stakeholder interview synthesis.

The analysis of Angel and VC funding in regional biosciences companies point to a shift in funding to later-stage firms since 2023. In the years prior, investment shares going to seed through early-stage biosciences companies in Central Virginia represented about 40% of funding, that has shifted in 2023-25 to 20%, on average.[19]

The region risks a "leaky" ecosystem—when growth capital is unavailable locally, promising innovative firms are more likely to relocate to investor hubs, taking future jobs and their potential to anchor the regional ecosystem with them. With limited access to early-stage capital, some emerging biosciences companies have indeed exited the region to be closer to capital hubs such as Boston.

The region does have established funding assets at UVA, through its Licensing and Venture Group (LVG) and what is viewed as a relatively strong Angel investor community and network (e.g., Cav Angels, Charlottesville Angel Network); however, these are seen as limited with respect to the levels of funding typically needed in life sciences and not necessarily solely or primarily focused intentionally on the biosciences industry.

The UVA LVG Seed Fund is a $10 million, UVA-managed seed-stage investment fund that backs new ventures emerging from the university's research portfolio, with a focus on companies formed to commercialize UVA intellectual property or founded by UVA faculty, staff, students, and select alumni. Managed by the LVG, the fund's investment team works closely with UVA licensing professionals and is overseen by an independent committee of early-stage investors and startup leaders who are all UVA alumni, and its investments are typically made alongside other industry co-investors.[20]

CvilleBioHub has indicated its interest and early efforts to establish a Virginia- and Central Virginia-focused seed fund to address funding challenges and to close this gap in the regional biosciences ecosystem—an important opportunity for the region to not only realize potential ROI on innovative new companies, but also as a retention strategy to keep promising startups in Region 9. The strategy section of this report will offer recommendations on how to assist CvilleBioHub in this effort.

19 TEConomy analysis of PitchBook database.
20 For more information, see: https://lvg.virginia.edu/funding/uva-lvg-seed-fund.

Innovation Drivers

Region 9 bioscience industry leaders and stakeholders recognize several important assets, programs, investments, and opportunities as strengths of the regional innovation ecosystem that can and should be leveraged for continued cluster growth and expansion. These are highlighted in Figure 20 and include:

- UVA's bioengineering R&D enterprise has built a meaningful commercialization track record, particularly through the Coulter Program, which are explicitly designed to bridge academic research and market applications. These programs pair investigators with commercialization expertise, milestone-driven funding, and industry mentorship, helping de-risk technologies, shape them around clinical needs, and position them for follow-on seed and venture investment.

- Recent investments by UVA Health and the School of Medicine in a dedicated Clinical Trials Unit and a robust Clinical Data Warehouse create a powerful platform for clinical translation. Companies and faculty innovators can access streamlined trial infrastructure, experienced research staff, and rich, curated clinical data, allowing them to design smarter studies, validate technologies in real-world settings, and respond more quickly to partner and regulatory requirements.

- Anchor commitments and major investments from AstraZeneca and the UVA Manning Institute send a strong market signal that Central Virginia is a long-term hub for innovative advanced biomanufacturing. Their presence will catalyze local supply chain development, create opportunities for internships and talent upskilling, and give emerging companies potential partners, customers, and demonstration sites in the region. The partnership agreement between AstraZenca and the Manning Institute will solidify a focus on regional innovation going forward.

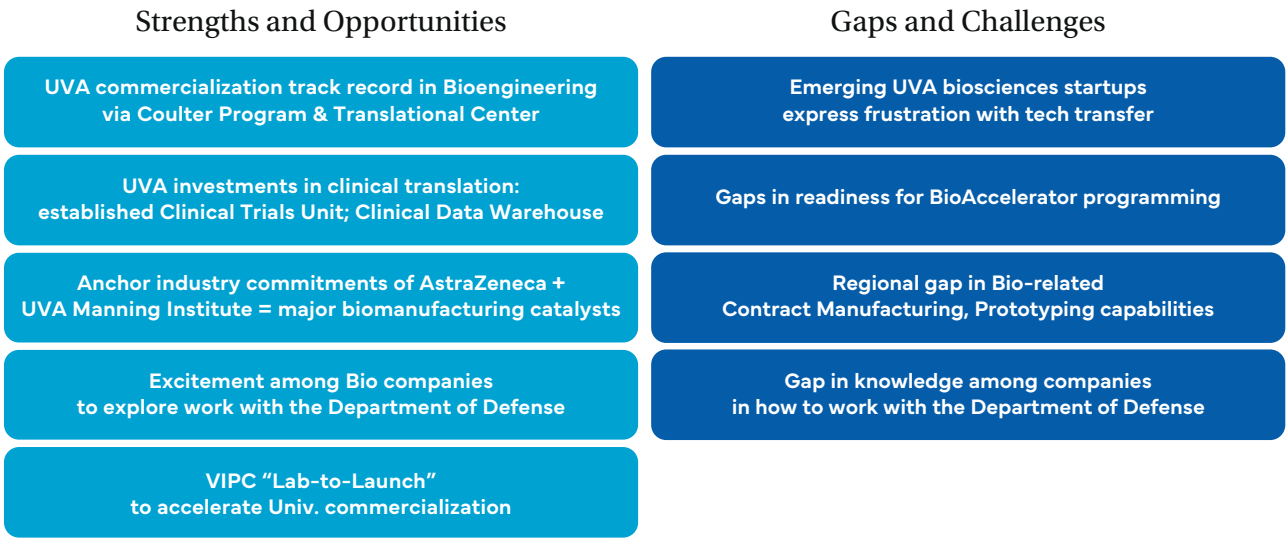
- Interviews surfaced notable enthusiasm among local bioscience companies to pursue opportunities with the Department of Defense, reflecting strong alignment between regional capabilities and national security, preparedness, and battlefield medicine needs. This interest suggests untapped growth potential that could bring in long-term contracting relationships and higher visibility for the cluster in federal innovation and procurement, and complement the Innovation Corridor efforts in national security.

- The Virginia Innovation Partnership Corporation's (VIPC) "Lab-to-Launch" initiative adds a key layer of support on top of UVA's internal programs by offering state-backed resources to help university discoveries take important steps into investable startups. By providing early capital, structured commercialization coaching, and connections to external partners and investors, Lab-to-Launch helps expand and accelerate the pipeline of UVA (and other Virginia R1 institutions') spinout companies, ensuring that more high-potential technologies actually reach the market.[21] This represents a key statewide initiative and resource; however, stakeholder feedback on the program points to limited progress in addressing university commercialization dynamics.

21 For more information, see: https://vipc.org/funding/lab-to-launch/.

Figure 20.

THEMES FROM REGION 9 BIOSCIENCES STAKEHOLDER ENGAGEMENT—INNOVATION DRIVERS



Source: TEConomy regional stakeholder interview synthesis.

Running counter to the identified regional strengths are several areas raised by bioscience industry and ecosystem stakeholders that represent gaps or challenges in the Region 9 ecosystem with respect to advancing and commercializing regional innovation.

While the Commonwealth BioAccelerator is in its very early days and stages, regional leaders offered some important initial insights that could enable it to operate at a higher foundational level going forward. Among the initial cohorts of companies entering the BioAccelerator are those at their earliest stages, where experimentation and early ideation is ongoing, their ability to consistently meet financial and rent payment obligations is unsure, renewed federal SBIR funding, which often provides early funding at these stages, has been on shaky ground, and the gap between startups ready to take advantage of the acceleration activities and meet their obligations has been widening. Going forward, it is important for the success of the BioAccelerator to establish a balance between supporting early ideation and startup activity, and those startups that are indeed ready for the programming and to hold up their end of the financial and other commitments of participation. Recommendations about supporting pre-accelerator programming to address these foundational challenges are included in the strategy section.

Early-stage bioscience companies leveraging technologies developed at UVA, like those taking residence at the BioAccelerator and others, are expressing frustration in working with the terms and approaches of university technology transfer. The challenges are framed around the inability to quickly secure a licensing agreement for university IP, which some say can take up to 6 months, the university taking a significant royalty and/or equity stake in the company and at the same time, charging the company for significant patenting fees. All of this requires time and can add up to significant costs, with time and money being limiting resources for startups at their earliest stages or inception. These challenges and approaches are not unique to UVA or Central Virginia, but reflect realistic

cost and procedural barriers to university startup activity and technology commercialization that can and should benefit the region. The VIPC Lab-to-Launch program is designed and intended to help support and ease these processes and address these barriers.

At least a few stakeholders raised as a regional gap in the biosciences-related innovation ecosystem or commercialization continuum the lack of regional contract manufacturing capabilities or facilities in the context of early innovation in medical device, medtech, biomaterials, and related technology or product development. Innovative regional companies often have manufacturing needs beyond an initial prototype for a significant first production run and corporate leaders cite companies extending out of region and out of state to access these contract manufacturing (CMO) services and expertise in places like Florida, Texas, or California. A recommendation to explore this gap and regional need is included in the strategy section.

With the context of this regional strategic planning effort focused not only in biosciences domains but also tech and national security, interview discussions probed on any ongoing activities with the Department of Defense, or interest in extending into national security markets for bio-related innovations or dual-use products. Companies expressed some legitimate interest in exploring these avenues for additional market access or applications or growth opportunities. Discussions with CvilleBioHub have reinforced this interest, finding that regional biosciences companies attending recent panel discussions regarding government contracting and defense-related work were especially excited about the possibilities. A gap remains, however, in how to work with DoD and leverage that opportunity space. A recommendation on how to intentionally engage companies is included in the strategy section.

The situation for Region 9's biosciences innovation ecosystem is robust and improving with recent investments but does reveal elements of a strategic agenda to filling these recognized gaps and enhancing the ability to translate regional innovation into commercial and even increasingly government or military markets.

Strategic Implications for Region 9's Biosciences Cluster

The interview discussions with regional biosciences executives, researchers, university leadership, and other stakeholders and the resulting situational assessment results in several key findings and frame a strategic agenda for enhanced cluster development in Central Virginia.

- The region's biosciences cluster and R&D base are maturing, growing, and seizing momentum.

- A robust, well-organized ecosystem has developed with a highly regarded regional cluster organization leading numerous efforts to enhance and connect the cluster in CvilleBioHub.

- Both supportive and transformative investments are underway in Region 9's biosciences cluster, including investments in talent development and connections with the VCAPM initiative; in the entrepreneurial and innovation ecosystem (Commonwealth BioAccelerator); in corporate operational expansions; and with major planned commercialization (UVA Manning Institute) and new anchor biomanufacturing operations (AstraZeneca) underway.

Implications and strategic priorities for the regional cluster. Based on the situational assessment, Region 9 should focus on the following as strategic priorities:

1. Advance the bioscience cluster's workforce and talent agenda and implement the strategic recommendations set out in the recently published *Talent Pathways* plan developed with CvilleBioHub as the regional bioscience industry cluster's leading priority.

2. Address identified gaps in Central Virginia's biosciences commercialization continuum, including supporting access to growth capital as a leading priority, to ensure a thriving innovation ecosystem for continued regional cluster development.

3. Organize regional bioscience cluster-related programming and focused activities around the differentiated priority growth opportunities identified in this strategy; intentionally target and embed these opportunities in existing and new programming and collaborative cluster activities.

Situational Assessment: National Security Stakeholder Input

The national security and defense growth opportunities identified in this study represent a portfolio of technologically sophisticated, mission-critical markets in which Central Virginia is already an active participant and where it can play a substantially larger role over the coming decade. Rivanna Station's concentration of all-source intelligence, geospatial analysis, signals intelligence, and biological threat assessment functions, together with a growing cadre of regional defense contractors and dual-use technology companies, gives the region an unusually diverse national security footprint for a market of its size. Yet, as with the biosciences, realizing the full economic and innovation potential of these opportunities depends on the presence of a high-functioning regional ecosystem that can support applied research, rapid technology transition, secure operations, and workforce development at scale. The defense and intelligence sectors have distinctive requirements that differ from most commercial advanced industries, including classified facilities and systems, complex and often opaque procurement processes, stringent compliance regimes, and a reliance on cleared, mission-experienced talent.

At the core of the regional opportunity is the way that national security innovation is increasingly driven by the convergence of several technology domains in which UVA and regional firms possess real strength: data science and AI/ML, cyber-physical systems, aerospace and hypersonics, advanced electronics, and biothreat modeling. Modern all-source intelligence and defense missions depend on the ability to fuse vast quantities of multimodal data, deploy advanced analytics in both unclassified and classified environments, and field hardware and software systems that can survive in contested operational theaters. These missions require not only leading-edge research but also robust mechanisms to move technologies from lower technology readiness levels into applied, testable, and fielded capabilities that meet DoD and intelligence community standards. Regional national security stakeholders emphasized that missions are charged with delivering capabilities at TRL 6–7 and often rely on structured applied research intermediaries such as UARCs, FFRDCs, and specialized contractors to translate academic insight into usable tools that can be integrated into classified workflows. Absent these translational structures, regional strengths in data science, biosecurity modeling, and aerospace research risk remaining underutilized in the very markets that most value them.

The national security domain is also characterized by especially high barriers to entry for firms and institutions seeking to engage as partners. Companies must navigate federal acquisition regulations, multi-year budgeting cycles, and a procurement environment in which early-stage pilots, SBIR/STTR awards, and other "on-ramps" into programs of record play an outsized role in determining long-run success. Conversations with regional defense and dual-use firms underscored that, despite substantial federal interest in their technologies, the path from initial concept to sustainable contract revenue is long, capital intensive, and subject to significant "valley of death" risk between early prototyping and program adoption. This risk is compounded by the relative scarcity of growth-oriented venture capital and patient private capital in Central Virginia for hardware-intensive, dual-use companies, and by the limited number of regional firms systematically pursuing SBIR and other early-stage defense commercialization mechanisms. For university-originating technologies, the challenge is further amplified by complex licensing negotiations, the need for secure infrastructure, and the difficulty of aligning academic research timelines with mission-driven program needs at agencies such as DIA, NGIC, and NGA.

In this environment, ecosystem design matters as much as innovation excellence. Stakeholders repeatedly emphasized that successful national security clusters elsewhere have relied on dense, trusted networks among federal agencies, primes and mid-tier contractors, specialized SMEs, and research institutions, often organized around shared secure spaces and intermediating organizations that manage collaboration, compliance, and business development. Central Virginia currently exhibits many of the raw ingredients of such a cluster - a strong federal anchor at Rivanna Station, world-class research strengths at UVA in national security–relevant domains, emerging dual-use firms with demonstrated success accessing BARDA, DoD, and other federal funding, and a growing set of entrepreneurial and economic development organizations. However, these assets are not yet knit together into an integrated, easily navigable ecosystem for defense innovation.

To better understand how to close this gap, this study undertook a series of interviews with national security and defense stakeholders across the region, including senior leaders from NGIC, NGA, and DIA, executives from defense and dual-use companies, UVA research and economic development leadership, and key regional economic development and ecosystem intermediaries. These conversations were critical both to refining and validating the preliminary national security growth opportunities and to developing a grounded situational assessment of Central Virginia's defense innovation position. The major themes that emerged - encompassing areas of strength and opportunity, as well as gaps and challenges - are synthesized by key themes below.

Ecosystem Development

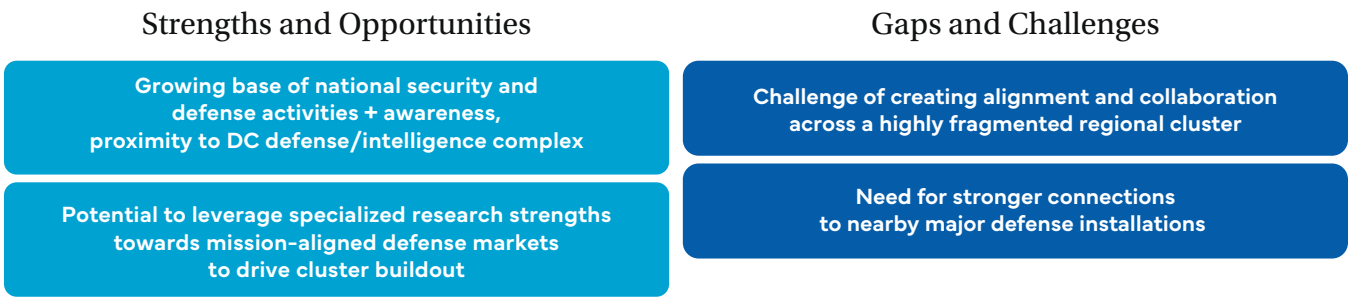
The foundation of the regional national security cluster rests on Rivanna Station, which hosts the National Ground Intelligence Center (NGIC), the National Geospatial Intelligence Agency's Charlottesville element, and a significant component of the Defense Intelligence Agency's Science and Technology and analytical workforce. This concentration of all-source intelligence, geospatial, signals analysis, and biological threat assessment capabilities has created one of the more distinctive and mission-diverse intelligence community presences outside the Northern Virginia corridor, and the cluster has grown substantially since the 2005 BRAC process redirected resources to the region. Stakeholders across sectors consistently referenced both the strategic value of this federal anchor and the rising awareness of its presence among regional companies, universities, and economic development partners as important positive momentum indicators.

The region also benefits from geographic proximity to the dense Northern Virginia defense and intelligence complex, which creates access to networks, contracting vehicles, and federal procurement relationships that would otherwise require years to develop from a standing start. This proximity also generates a meaningful pipeline of mid-career personnel with intelligence community experience who, in some cases, choose to relocate to the Charlottesville area for quality-of-life reasons, creating a latent pool of cleared and mission-experienced talent that the regional cluster can draw upon if the right retention mechanisms are in place.

Despite these assets, the most consistent theme across nearly all stakeholder interviews was the highly fragmented nature of the cluster. Stakeholders noted that there is no obvious regional champion for national security and defense innovation, no single organizational home that convenes federal agencies, industry, and university research actors around a shared development agenda, and no regionwide, coordinated market positioning effort that communicates the cluster's collective strengths to defense primes, program offices, and investors located outside the region. The agencies at Rivanna Station engage university and industry partners largely on an ad hoc basis, driven by individual relationships and specific problem needs rather than by structured and scalable collaboration mechanisms. Connections to nearby major defense installations, including Dahlgren Naval Surface Warfare Center and Patuxent River Naval Air Station, remain underdeveloped, representing a missed opportunity to embed the regional cluster within broader Virginia defense community initiatives such as hypersonics and emerging missile defense programs. Strengthening these statewide linkages was cited by multiple stakeholders as a prerequisite for the cluster to graduate from a locally interesting but regionally isolated presence into a recognized node in the broader Mid-Atlantic defense innovation ecosystem.

Figure 21.

THEMES FROM REGION 9 DEFENSE AND NATIONAL SECURITY STAKEHOLDER ENGAGEMENT – ECOSYSTEM DEVELOPMENT



Source: TEConomy regional stakeholder interview synthesis.

Innovation Drivers

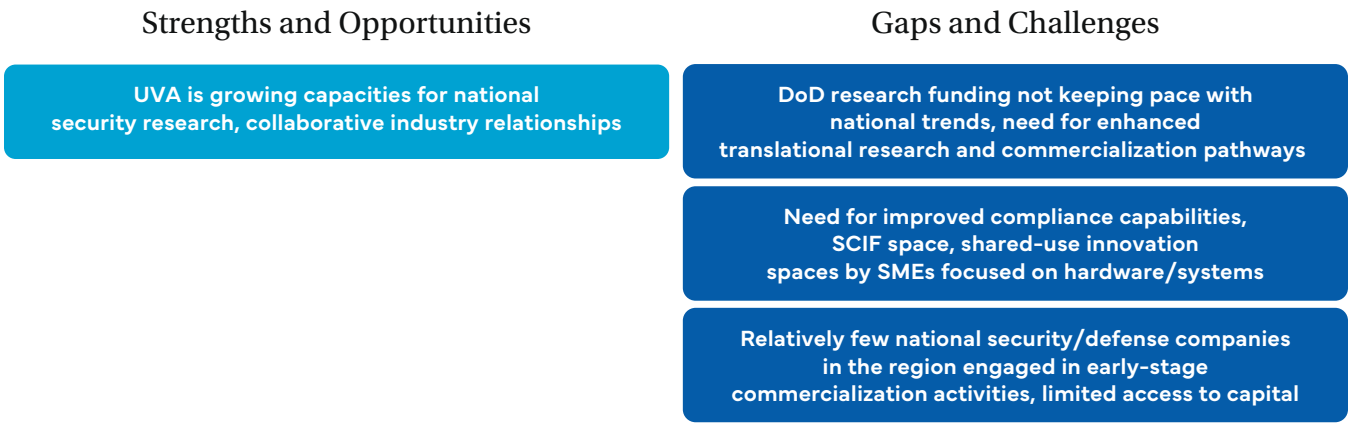
UVA's research portfolio represents the most differentiated and strategically significant innovation asset in the regional cluster, and it is increasingly being oriented toward national security applications. The National Security Data and Policy Institute (NSDPI), the School of Data Sciences, the Biocomplexity Institute, the Aerospace Research Laboratory, and the Link Lab collectively constitute a portfolio of research capabilities that align with several of the highest-priority growth opportunities identified in this study, including all-source intelligence analytics, high performance aerospace platforms, defense electronics and payload engineering, and biosecurity. The NSDPI has established contract vehicles with DIA that enable collaborative research projects, and multiple agency stakeholders noted the value of UVA's ability to engage on unclassified research questions that produce insights transferable to classified analytical contexts. The Biocomplexity Institute is similarly a world-recognized leader in public health modeling with longstanding engagement with DTRA, DARPA, and the U.S. Army Research Institute, giving it a credible foundation from which to pursue expanded national security research contracts, particularly in biosecurity and biological threat characterization.

Several important gaps constrain the ability to convert this research excellence into sustained economic activity for the cluster. Since 2019, UVA's DoD research funding has declined by approximately 5%, compared to 53% national growth in DoD funding to universities, meaning the university lost relative competitive ground in capturing defense research dollars even as its research capacity expanded. Agency stakeholders explained part of this gap structurally: DIA's Science and Technology Directorate, for example, primarily requires technologies at TRL 6–7, while university research naturally concentrates at earlier technology readiness levels. The absence of a classified applied research organization at UVA, analogous to the University-Affiliated Research Center (UARC) model employed at other major universities, was identified by agency interviewees as the most significant structural barrier to deeper and more sustained collaboration. Short of a broader infrastructure such as a UARC or formal applied research center, both of which can be highly resource and time-intensive investments for universities still scaling their defense engagement capabilities, there is a recognized need for expanded "middle men" functions, including applied research intermediaries, FFRDC-adjacent capabilities, and other mechanisms that can bridge academic research outputs to agency procurement needs.

The commercialization pipeline for national security technologies in the region is notably thin. Few regional defense and national security companies engage systematically in SBIR and STTR programs, which represent the primary federal mechanism for supporting early-stage dual-use technology commercialization. The regional venture capital environment was described by multiple industry stakeholders as a "venture capital desert" for hardware-intensive, dual-use technology companies, with even the nearest major market, the Washington DC metro area, not perceived as ranking among the top national markets for relevant technology investment. Companies working at the intersection of defense and commercial markets, such as Rivanna Medical, are exceptions rather than the norm in the region and their experience underscores both the potential and the difficulty of building a defense-facing commercialization culture in Central Virginia. Additionally, UVA's technology licensing function was cited across multiple interviews as a persistent barrier to early-stage commercialization, with terms and timelines that disadvantage early-stage spinouts relative to comparable programs at peer research universities.

Figure 22.

THEMES FROM REGION 9 DEFENSE AND NATIONAL SECURITY STAKEHOLDER ENGAGEMENT – INNOVATION DRIVERS



Source: TEConomy regional stakeholder interview synthesis.

Talent Drivers

The regional talent picture for the national security and defense cluster was noted as one of genuine near-term strength coupled with several emerging structural vulnerabilities. UVA produces a meaningful pipeline of PhD and graduate-level talent through its Cyber Defense Program as well as through its data sciences, aerospace engineering, electrical and computer engineering, and systems engineering programs. Agency stakeholders noted that UVA graduates generally possess not only the technical skills relevant to intelligence work but also the softer competencies around teamwork, analytical brevity, and cross-disciplinary communication that defense mission environments require. Early-stage internship pipelines are active and deepening, with security clearance processes for prospective interns, partnerships with university initiatives, and beginning engagement at the high school level through programs focused on key intelligence analytics skills.

However, company and agency stakeholders raised several significant talent concerns that, if unaddressed, will constrain the cluster's ability to grow and retain the workforce it needs. First, the regional talent pool, while high-quality at the PhD and entry level, is widely perceived as small in absolute terms particularly in software engineering and applied data science which are the disciplines most in demand across the full range of growth opportunity areas. Second, mid-career talent attraction is a persistent challenge: Northern Virginia offers substantially higher salary levels for cleared technical professionals, and the federal government's pay scales for civilian military personnel at Rivanna Station trail their DC metro equivalents, creating ongoing attrition pressure. Third, the anticipated expansion of AstraZeneca and other pharmaceutical employers in the region introduces direct competition for many of the same pools of data scientists, computational biologists, and precision engineers that defense organizations and national security contractors depend on.

There is also a recognized deficit in career awareness among early-stage candidates for defense pathways, particularly among cross-disciplinary students who might not self-select into national security careers but whose policy, data science, and engineering skill combinations are highly attractive to the intelligence community. Stakeholders noted a perception that UVA's current participation in DoD student clearance programs lags behind peer institutions such as James Madison University and Virginia Tech, which operate structured intelligence analysis pipelines and high school outreach programs that build awareness and clearance eligibility earlier in student careers. Expanding UVA's participation in these programs, increasing the volume of cleared internship opportunities available to regional students, and building more visible career pathways for cross-disciplinary defense careers were all cited as actionable near-term opportunities.

Figure 23.

THEMES FROM REGION 9 DEFENSE AND NATIONAL SECURITY STAKEHOLDER ENGAGEMENT – TALENT DRIVERS

Strengths and Opportunities	Gaps and Challenges
Access to relevant PhD and entry level workforce pipelines, successful Cyber Defense programs and other aligned accreditations	Company concerns that region retains a small technical talent pool despite UVA programs, perception of lower regional awareness of defense career opportunities
Opportunities to develop more robust credentialing, pipelines of cleared talent for national security/military industry	Mid-career talent hard to attract and regional pharma expansion expected to pose challenges to defense organizations retaining skilled workforce

Source: TEConomy regional stakeholder interview synthesis.

Placemaking and Infrastructure

The physical infrastructure dimension of the national security cluster reflects both genuine forward momentum and a set of unresolved commitments that are critical to the cluster's next growth phase. Many stakeholders affirmed that the most important development in progress is the emergence of North Fork Research Park as a complementary zone adjacent to the gated Rivanna Station campus. North Fork has the potential to serve as the "unclassified interface" for the cluster, providing the physical spaces where federal agency personnel, defense contractors, university researchers, and SMEs can interact, collaborate, and co-locate without the access restrictions of the installation itself. Agency leadership confirmed that because Rivanna Station is a gated facility, the availability of SCIF-equipped conference and collaboration spaces at North Fork is essential to enabling the kinds of sustained university-contractor-agency interactions that drive innovation in mature defense clusters. In addition, North Fork has recently rezoned for residential development and will continue in its evolution toward a multi-faceted and dynamic live-work-play district.

The planned Rivanna Futures development adjacent to the Station was also welcomed by regional stakeholders as an opportunity to create a higher-quality live-work-play environment that would improve the attractiveness of Rivanna Station as a duty assignment and help address the long-standing quality-of-life differential that contributes to talent competition with the DC metro area.

Several critical infrastructure gaps stand in the way of realizing this vision. The most immediate is the shortage of SCIF-equipped space for university researchers and SMEs, which limits the ability of both UVA faculty and regional companies to pursue classified or sensitive research engagements that require physical security compliance. Beyond SCIFs, there is a broader need for light industrial fabrication, hardware testing, and electromagnetic and RF testing facilities, which are prerequisites for many of the applications areas within the defense electronics, aerospace, and autonomous systems-related growth opportunity areas identified in this study. The absence of a dedicated national security data center with appropriate fiber connectivity and high-performance computing capacity also constrains the ability of regional companies and research institutions to support the data-intensive workloads associated with all-source intelligence analytics, signals processing, and biosecurity modeling.

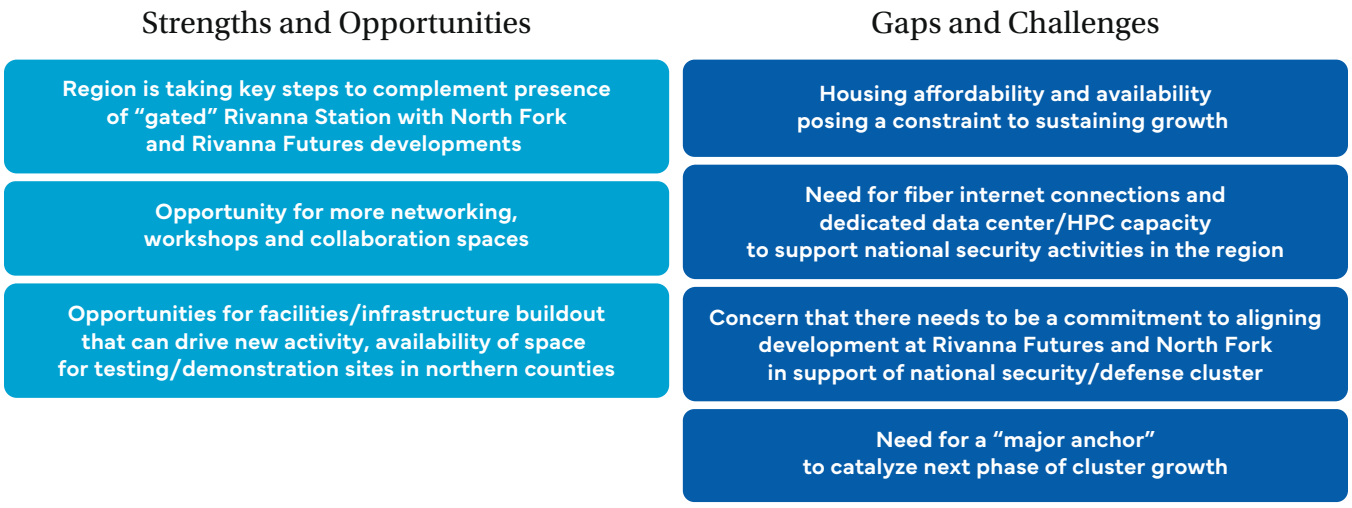
Housing affordability and availability represent a compounding constraint. Multiple economic development and industry stakeholders raised the concern that the region's tightening housing market limits the ability to relocate and retain the mid-career and senior technical talent that cluster growth requires, particularly as housing cost pressures are expected to intensify with the arrival of major employers in the pharmaceutical sector. However, more affordable housing options are available in Nelson, Fluvanna, and Madison Counties. The region's northern counties have available land for testing and demonstration sites and have expressed receptivity to supporting defense-related development, creating an opportunity to distribute some elements of the cluster's physical footprint across the corridor in ways that relieve pressure on the Charlottesville-Albemarle area.

The most structurally significant placemaking gap, however, is the perception of a gap in an explicit, committed development vision for Rivanna Futures and North Fork that positions these investments directly in service of the national security cluster's growth. Multiple stakeholders expressed concern that without a clear and publicly articulated alignment between these place-based development investments and the cluster's strategic needs, the momentum generated by potential defense investments could dissipate before it is converted into programmed, funded action. The parallel

success of pharmaceutical sector attraction, where anchor corporate commitments by AstraZeneca have catalyzed supply chain investment, talent development activity, and complementary facility development, illustrates both the transformative potential of a major anchor commitment for the national security cluster and the current absence of an equivalent catalyst on the defense side.

Figure 24.

THEMES FROM REGION 9 DEFENSE AND NATIONAL SECURITY STAKEHOLDER ENGAGEMENT – PLACEMAKING AND INFRASTRUCTURE



Source: TEConomy regional stakeholder interview synthesis.

Strategic Implications from the National Security Situational Assessment

The breadth and heterogeneity of the current regional defense cluster lead to a clear overarching strategic conclusion: no single growth opportunity, technology domain, or institutional actor can independently drive the cluster's next phase of development. The cluster today spans all-source intelligence analytics, high performance aerospace applications, defense electronics and payload engineering, cybersecurity, and emerging biosecurity capabilities, and these domains are served by a fragmented and loosely connected set of federal agencies, major primes, regional SMEs, university research centers, and economic development organizations that currently operate in largely parallel rather than coordinated modes.

This reality points to the need for a two-tier strategic framework:

- **First, a set of cross-cutting investments that strengthen the connective tissue of the entire cluster regardless of specific technology domain.** These include establishing a regional defense technology accelerator with shared-use SCIF and fabrication infrastructure; building out a structured networking, workshop, and convening function for the defense cluster; developing a robust and visible talent pipeline that increases cleared workforce availability, career awareness, and cross-disciplinary pathway options; launching a coordinated branding and business attraction campaign; and committing to an explicit development vision for Rivanna Futures and North Fork that is anchored in the cluster's strategic priorities.

- **Second, a set of targeted initiatives customized to the specific needs of each primary growth opportunity area that draw on the broader cross-cutting investments.** For example, within all-source intelligence analytics this could take the form of dedicated support for defense AI/ML entrepreneurs and startups and targeted attraction of AI and software companies with national security market orientations. For aerospace and hypersonics, it points to efforts to develop test range and demonstration capabilities, potentially in collaboration with broader Virginia testing assets and the statewide initiatives. For defense electronics, it highlights the need for shared-use facilities for hardware testing, technology integration, and demonstration. And across all domains, initiatives must focus on expanding the availability of translational funding mechanisms and early-stage commercialization support for SMEs and university spinouts.

The defining requirement running through all of these imperatives is placemaking at scale, coordinated across the region and focused on the creation of a physical, institutional, and programmatic environment that is visibly and credibly aligned with national security and defense cluster development. **The ability to attract and retain the anchor tenants, cleared workforce, and innovation-stage companies that will determine whether Central Virginia remains a distributed regional cluster or becomes a recognized and competitive node in the national defense innovation landscape.** The specific strategies and actions outlined in subsequent sections seek to address these strategic implications and situational themes.

V. Central Virginia's Strategic Roadmap for Cluster & Ecosystem Development

The preceding summaries of the situational assessment for biosciences, national security, and overall regional economic development inform and provide the foundation for the Strategic Roadmap. Strategic recommendations are presented in this section of the report and are designed to help address the identified gaps and challenges to realize the region's economic and growth potential going forward. In addition, the identified growth opportunities further inform recommendations around cluster collaboration as well as ways in which to intentionally program and organize around these targeted opportunity areas. This section walks through, in turn, the following pillars for the strategy:

- Biosciences strategy
- National security strategy
- Implementation and governance considerations

A Vision for Central Virginia's Biosciences Cluster

Central Virginia can position itself as a nationally recognized mid-sized biosciences hub where next-generation therapies, medtech, and advanced manufacturing are discovered, developed, and produced in a tightly connected regional ecosystem. The vision is not to try to replicate Boston or Research Triangle, but to build a distinctive "Innovation Corridor" that combines UVA's research and clinical strengths, a growing base of industrial anchors, and the quality of life and scale that make long-term talent retention and company building feasible. In this model, CvilleBioHub continues to serve as the organizing backbone for cluster development and company support, UVA and the Manning Institute drive research, translational science, and clinical validation, and partners such as CVPED, VCAPM, and industry leaders work in concert to deepen manufacturing capacity and supply chain presence.

Looking forward, the region's biosciences strategy is about turning a set of clear growth opportunities—advanced therapeutics and biologics, imaging-based medtech and minimally invasive care, and related national security and preparedness applications—into visible, investable regional specializations that attract companies, capital, and talent. Success means that students and researchers can see a full pathway from lab to local startup to scaled manufacturing; that emerging and established firms find the workforce, facilities, capital, and partners they need to stay and grow in Region 9; and that Central Virginia is recognized as a place where public, private, and economic development leaders and stakeholders are aligned around building an integrated, innovation-driven biosciences economy.

Strategic Recommendations: Biosciences

The situational assessment and resulting strategic priorities for Region 9's biosciences cluster development lead to a set of recommended strategies and actions to advance cluster growth across Central Virginia.

1. Advance the bioscience cluster's workforce and talent agenda and implement the strategic recommendations set out in the recently published *Talent Pathways* plan developed with CvilleBioHub as the regional bioscience industry cluster's leading priority.

2. Address identified gaps in Central Virginia's biosciences commercialization continuum, including supporting access to growth capital as a leading priority, to ensure a thriving innovation ecosystem for continued regional cluster development.

3. Organize regional bioscience cluster-related programming and focused activities around the differentiated priority growth opportunities identified in this strategy; intentionally target and embed these opportunities in existing and new programming and collaborative cluster activities.

The specific strategies and associated recommended actions are detailed in the following pages.

Strategy 1: Advance the Workforce and Talent Agenda and Strategic Recommendations Set Out in CvilleBioHub's Talent Pathway's Plan

Central Virginia's *Talent Pathways* strategy is designed to convert the region's strong but fragmented education and training assets into a coordinated engine that can supply the high-demand occupations identified in the combined quantitative and situational assessment—ranging from lab technicians and skilled production workers to medical scientists, engineers, and data scientist professionals. The recommendations recognize that major investments by UVA, AstraZeneca, and other employers will significantly increase demand at multiple skill levels, and that without deliberate action the region's existing challenges around entry-level pipelines, ecosystem coordination, and graduate retention will remain significant constraints on Region 9's bioscience cluster growth.[22]

Building from three overarching strategic priorities—growing technician and high-skill talent pipelines, better connecting the workforce ecosystem, and elevating the region's talent brand—the *Talent Pathways* effort elevates four mutually reinforcing strategies with associated actions. Together, these aim to scale targeted technical and scientific training, deepen experiential learning and industry engagement, create a more navigable and connected regional talent system, and more effectively tell Central Virginia's bioscience "story" to both homegrown and external recruits.

The following strategies and actions from the Talent Pathways report are abbreviated here, but it is vital to include these as the leading priority of the regional biosciences cluster strategy, which has been reinforced throughout this Innovation Corridor planning effort.[23] It is recommended that regional workforce and talent stakeholders read and understand the full context of the published report and detailed action recommendations as implementation of the strategy proceeds forward.

Strategy A: Grow the Pipeline for the Biosciences Technician and Lab Support Workforce

This strategy focuses on expanding and aligning technician level, lab support, and skilled production pathways—especially through community colleges, certificate, and other focused programs—to meet rising demand from biomanufacturing, medtech, and research operations.

- **Action A.1** – Scale targeted technical training with community colleges and workforce boards. Expand and adapt biotech, lab science, and manufacturing technician programs at PVCC, Germanna, and partner institutions (including stackable credentials and bootcamps) in close consultation with employers and regional workforce boards so curricula track validated high-demand roles.

- **Action A.2** – Expand collaboration with UVA workforce and training programs. More intentionally connect community college and Virginia Career Works programs with UVA's "Earn While You Learn," clinical research training, and other workforce initiatives to create clear on-ramps into UVA Health and research labs as well as industry roles.

22 TEConomy Partners, LLC, "Talent Pathways: A Biosciences Workforce and Talent Strategy for GO Virginia Region 9 to Support Rapid Growth and Momentum of a Vibrant Industry," February 2026.

23 Ibid. Note that strategies and actions presented here are assigned a letter, in the original report these were framed as Strategies 1 through 4.

- **Action A.3** – Increase experiential learning and lab exposure for bachelor's students. Grow internships, co-ops, and lab immersion experiences that give life science undergraduates practical skills in GLP/GMP environments, preparing them for entry-level roles in industry and clinical research, not just graduate school.

- **Action A.4 –** Anchor early-career talent through professional development. Offer structured upskilling, certifications, and advancement pathways for entry-level technicians and lab staff so they see long-term careers and stay in the region.

Best Practices Examples

NCBioImpact / BioNetwork (North Carolina): Operating since 2002 with sustained legislative funding, NCBioImpact connects industry, universities, and community colleges through standardized, industry-specified training. The BioNetwork delivers the BioWork certificate (136-hour process technician program) across 10+ community colleges, having trained thousands of workers over two decades. North Carolina's position as a global biopharmaceutical manufacturing leader directly reflects this sustained workforce investment.

- *Implications for Central Virginia:* Explore legislative commitment for sustained, strategic public investment; formalize public-private governance; build statewide standardization and scale.

BioHub Maryland Training and Education Center (Maryland): Opened October 2024, this 8,200-square-foot facility simulates real-world GMP manufacturing with mock clean rooms, gowning areas, and industry-standard equipment. Offers National Institute for Bioprocessing Research and Training (NIBRT) curriculum targeting veterans, people without four-year degrees, and incumbent workers.

- *Implications for Central Virginia:* Develop facility-based training in GMP simulation leveraging PVCC and UVA facilities and potential new developments at North Fork; explore VCAPM hub-and-spoke partnerships for specialized facilities.

Strategy B: Address Specialized Talent and Skills Demand in High-Skilled Roles

This strategy targets master's and PhD level scientists, engineers, and data/IT professionals whose specialized skills are critical to R&D, product development, and advanced manufacturing, but whose supply and retention are more constrained.

- **Action B.1 –** Strengthen structured pipelines via experiential and skills-based programs. Expand project based courses, research practicums, and industry-linked capstones for science and engineering students that build commercialization relevant skills and connect them directly with regional employers.

- **Action B.2 –** Reinstate and scale the CvilleBioHub Internship Program (CHIP). Restore CHIP at higher scale and link it with UVA and Virginia Talent and Opportunity Partnership (V-TOP) internship infrastructure to provide coordinated placements across companies, especially for graduate and advanced undergraduate students.

- **Action B.3 –** Create translational fellowships and joint industry–clinician training. Leverage UVA Health and clinical research assets to pilot fellowships where trainees split time between labs/clinics and industry projects, accelerating translational experience and seeding long-term cross-sector relationships.

- **Action B.4 –** Build interdisciplinary skills that bridge research and commercialization. Develop targeted programming (short courses, certificates, or fellows seminars) on regulatory science, IP, data science, and product development for scientists and engineers, equipping them to operate effectively in startup and industry settings.

- **Action B.5 –** Encourage return migration of alumni in major biosciences hubs. Systematically identify former UVA and regional graduates working in leading bioscience markets and market Central Virginia opportunities to them through targeted campaigns, alumni events, and curated "boomerang" recruitment efforts.

Best Practices Example

Stanford BioDesign Program: This fellowship program explicitly teaches biomedical professionals to identify clinical needs, develop solutions, and translate to market. Combines technical training with business, regulatory, and entrepreneurship education. Fellows graduate with both technical competency and commercialization capabilities.

- *Implications for Central Virginia:* Create structured programs bridging technical expertise with business acumen; emphasize awareness of translational pathways from idea to market.

Strategy C: Connect the Talent Ecosystem via a Regional Coordination Framework

This strategy aims to turn a collection of strong but siloed programs into a connected workforce system that is easier for students, job-seekers, and employers to navigate (Figure 25).

- **Action C.1 –** Create a "Regional Biosciences Career Navigator" at CvilleBioHub. Establish a dedicated function to serve as a front door for students and job-seekers, curate information on programs and openings, and broker connections between employers and education/training partners.

- **Action C.2 –** Increase cross company awareness and collaboration through signature events. Use recurring cluster wide career fairs, industry days, and open lab events to expose students and faculty to the breadth of regional employers and strengthen cross firm networks.

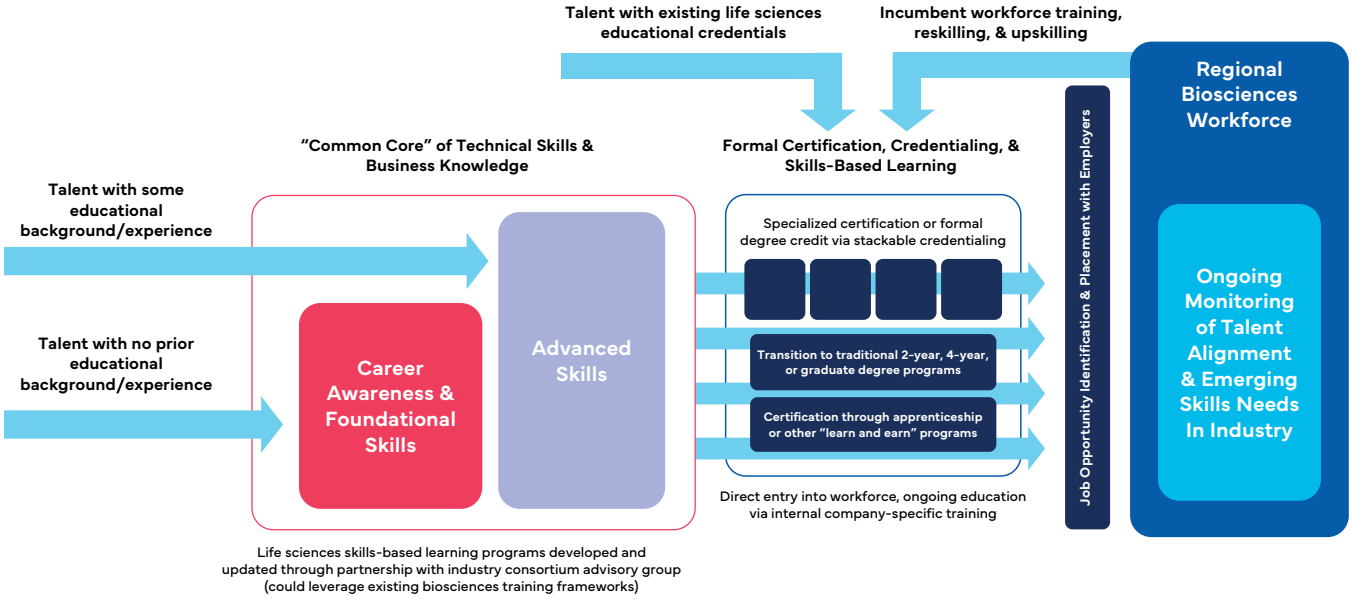
- **Action C.3 –** Expand networking platforms beyond CEO-level forums. Build on CvilleBioHub's CEO roundtables by creating additional peer groups and mixers for HR leaders, early-career professionals, and functional communities (e.g., QA, data science) to deepen ecosystem ties.

- **Action C.4 –** Establish an emerging leaders venue and advisory forum. Launch a curated program for rising scientists, engineers, and managers that combines leadership development with opportunities to advise on regional talent initiatives, cultivating the next generation of cluster champions.

- **Action C.5 –** Form a workforce coordination working group. Convene UVA, community colleges, K–12, workforce boards, and industry in a standing working group charged with aligning programs, reducing duplication, and jointly responding to emerging talent needs from major investments.

Figure 25.

EXAMPLE OF POTENTIAL REGIONAL COORDINATED FRAMEWORK FOR BIOSCIENCES SKILLS AND CREDENTIALING LEVERAGING MULTIPLE "ON" AND "OFF" RAMPS FOR TALENT



Source: TEConomy Partners, LLC, as published in TEConomy Partners, LLC, "Talent Pathways: A Biosciences Workforce and Talent Strategy for GO Virginia Region 9 to Support Rapid Growth and Momentum of a Vibrant Industry," February 2026.

Best Practices Examples

Life Science Washington Operating as state trade association and regional strategy "quarterback," Life Science Washington manages Career Connect Washington initiative convening industry, educators, and workforce partners. Produces strategies and reporting providing data-driven assessment guiding investment priorities.

- *Implications for Central Virginia:* CvilleBioHub or another dedicated regional authority can serve as a centralizing convener and steward of regional strategy, producing regular workforce assessments and leading partner engagement.

BioCrossroads / Indiana Career Apprenticeship Pathway: Industry association serving as workforce development authority, convening employer steering committees defining competencies and needs, working with Ivy Tech on aligned training, producing workforce reports, maintaining job board. Emphasizes "common language" for skills facilitating credential recognition and talent mobility and has formatted a new professional education and training pathway that combines classroom education with on-the-job training to prepare high school students and adults for careers in life sciences.

- *Implications for Central Virginia:* Industry association structure has potential to reach across institutions to take on sophisticated workforce coordination and training governance.

Strategy D: Develop and Promote Central Virginia's Bioscience Talent Brand

The final strategy focuses on telling a clearer, more compelling story about the region's bioscience strengths and career opportunities to improve both recruitment and retention.

- **Action D.1 –** Align branding with identified regional strengths and growth opportunities. Integrate the Talent Pathways findings with concurrent Innovation Corridor work to articulate clear thematic niches (e.g., advanced therapeutics, imaging-based medtech, advanced pharmaceutical manufacturing) that can anchor talent marketing.

- **Action D.2 –** Coordinate regional brand amplification with CvilleBioHub, CVPED, and the Manning Institute. Use shared messaging, digital campaigns, and joint outreach—including highlighting flagship investments and success stories—to position Central Virginia as a distinctive, mission-driven place to build a bioscience career.

Best Practices Example

North Carolina BioImpact and Accelerate NC Outreach and Marketing Programs: Positions North Carolina as global biopharmaceutical manufacturing leader. Campaign includes digital content, events, media relations, and direct recruitment outreach via ambassador programs. Emphasizes unique strengths in manufacturing, workforce development, and innovation ecosystem.

- *Implications for Central Virginia:* Emphasize distinctive innovation strengths and emerging momentum in pharmaceutical investments; develop compelling, consistent messaging using multi-channel approach.

Strategy 2: Address Identified Gaps in Central Virginia's Biosciences Commercialization Continuum

Region 9 is making important investments in its innovation ecosystem and the ability to translate scientific discovery in the biosciences/life sciences into commercial products and companies. The situational assessment, however, identified several areas of consistent gaps in the commercialization continuum for regional cluster development to address as strategic priorities.

These gaps and challenges span bolstering access to growth capital—the most consistently raised challenge; supporting pre-accelerator programming for early-stage biosciences startups; considering enhancing regional contract manufacturing capabilities and infrastructure; and seizing opportunities to diversify into national security markets.

The following actions are designed to address the identified challenges and to take advantage of emerging opportunities.

Action: Support efforts to establish a Seed Fund for Central Virginia biosciences investments; consider matching-fund approaches to retain emerging innovative companies in the region.

- Central Virginia should back the formation of a dedicated biosciences-focused seed fund (or sidecar vehicle) that can co-invest alongside UVA LVG, regional angels, outside angels, or formal VC funds to close the earliest equity gap for high-growth potential ventures.

- Specifically, it is recommended to support CvilleBioHub's emerging effort to raise and operate a dedicated biosciences seed fund, and to position this fund as a core piece of the region's cluster infrastructure. Regional partners should encourage CvilleBioHub to lead the fund design, while collectively pursuing GO Virginia support to underwrite one time setup expenses and a portion of ongoing administrative costs, including the potential hiring of a professional fund manager. This would allow the fund to be structured and governed to market standards from day one, signal seriousness to external co investors, and ensure that portfolio development, due diligence, and founder support are managed by experienced investment talent anchored in Central Virginia.

- The fund should consider a matching mechanism—tied to local job creation or commitments to maintain operations in the region—which can help keep emerging firms rooted in Central Virginia when they first attract coastal or other outside strategic capital.

Action: Support pre-accelerator programming for the earliest stage biosciences startups emerging from UVA or elsewhere.

The situational assessment finds that some startups entering the Commonwealth BioAccelerator are not yet "accelerator ready". This is not unique to Central Virginia, startups are often too early for accelerators but too advanced for simply ideation support. Many startups fail before ever reaching an accelerator because they have not conducted basic validation steps.

Pre-accelerator models are explicitly designed to meet companies in that middle ground. Best practice pre-accelerator service models have distinct goals of moving startups from idea to a validated concept to an early minimum viable product or "MVP" and a foundational business case and refined business model and therefore positioned as accelerator ready. In the biosciences, this often means working through plans for a defined regulatory pathway.

Several design features of relevant programs include the following:

- Short (typically between 6 to 10 weeks), well-structured and low-cost or free engagement for startups.

- A curriculum focused on fundamentals, e.g., customer discovery and problem validation, market sizing, regulatory pathway (including orientation introducing FDA and reimbursement considerations), basic IP strategies, and the overall value proposition of translating science into a commercial product.

- Utilize mentorships and domain experts matched to specific companies, these can be experienced founders, translational researchers, or others with domain expertise such as regulatory experience.

- Structure the programming as a direct feeder to the regional accelerator (in this case the Commonwealth BioAccelerator).

- Framing pathways for SBIR/STTR awards or other grant programs, emphasizing non-dilutive funding as a first step in fundraising particularly for biosciences where development timelines are lengthy.

- Emphasize tangible outcomes from programming such as a MVP concept or prototyping plan; a regulatory roadmap, an early pitch deck, etc.

To ensure that the Commonwealth BioAccelerator and similar programs are working with "accelerator-ready" ventures, partners should develop a pre-accelerator track focused on translational readiness, IP and licensing navigation, regulatory basics, and investor storytelling. Short, cohort-based offerings (e.g., 6–10 weeks) run in partnership with UVA, CvilleBioHub, and VIPC can help ideation-stage teams test commercial fit, reach clear milestones, and meet the financial and program expectations of later accelerator participation.

By implementing a thoughtfully designed pre-accelerator program, the region can address this gap directly, enabling more startups to progress from concept to commercialization and maximizing the return on existing investments in the BioAccelerator and downstream infrastructure. In doing so, the pre-accelerator becomes not simply an additional program, but a foundational component of a high-functioning, end-to-end bioscience innovation pipeline.

Best Practices Example: Indiana University IU LAB

Indiana University IU LAB (Launch Accelerator for Biosciences) is a university-anchored bioscience incubator and commercialization hub based in Indianapolis. It is designed to translate Indiana University's life science research into startup companies, products, and workforce talent, positioning Indiana as a global leader in human health and biosciences. IU LAB hosts a suite of programs aimed at different startup stages including IU Health Incubator at IU LAB; Pre-Accelerator (gBETA); and LifeTech Accelerator.

The Pre-Accelerator program is a free seven week program in partnership with gener8tor's gBETA program and offers coaching and mentorship, business-model refinement, customer discovery, and investor readiness and accelerator pitches for very early-stage bioscience and health startups. The program partners with vendors such as IBM Cloud, Amazon, Paypal and others for valuable "perks". It offers post-program support as well.

Action: Consider enhancing regional contract manufacturing capabilities and infrastructure.

In biosciences/life sciences innovation—especially medical devices, diagnostics, and biomaterials—the transition from prototype to early production is one of the most challenging and "fragile" points in the commercialization continuum. Companies may leave a region if they can build a prototype locally but not manufacture at small scale. At the same time, CMOs typically prefer larger firms who de-risk partnerships rather than early-stage companies.

- Recognizing the current leakage of contract manufacturing work to other states, Region 9 should evaluate the demand for and feasibility of a shared or networked contract manufacturing/prototyping resource for medical devices, MedTech, biomaterials, and related products.

- Options could range from:

    - Expanding existing machine shop and maker-space capacity with regulated-product capabilities, creating a curated network with specialty manufacturers. Developing wrap-around services such as regulatory guidance, small batch coordination, and/or vendor matchmaking and integrating with the existing commercialization pipeline in the region.

    - Creating a small-batch pilot manufacturing facility that local firms can book for design-for-manufacture, verification builds, and early production runs. Necessary capabilities would include CNC machining, assembly space, and a quality system in place, as well as ensuring flexible access for companies.

- Attracting a specialized MedTech-focused CMO partner, though this is much more challenging and requires proving demand and the strong pipeline of companies, as well as offering potential incentives.

- As a first step, it is vital that CvilleBioHub and CVPED first take the pulse on the regional demand and viability of this type of undertaking. It was raised in interview discussions but would require further vetting to prove the demand for these services and physical infrastructure. This could be undertaken via targeted outreach to a strong sample of regional medical device and medtech manufacturers as well as those innovating in novel biomaterials or with other "hardware" centric product development focus.

Action: Seize on regional bioscience company excitement and interest in pursuing national security and defense-related markets and dual-use applications as a growth opportunity—dedicate resources, support workshops and forums, and further educate companies on how to engage.

The convergence of biosciences and biotechnology and national security priorities presents a significant and typically under-leveraged opportunity for regional bioscience ecosystems. Federal agencies, particularly DoD, are increasingly investing in biosciences innovation to address mission-critical needs spanning medical countermeasures, industrial biomanufacturing, human performance, and supply chain resilience.

At the same time, many bioscience innovations inherently possess dual-use potential, with applications across both commercial healthcare markets and defense or national security use cases. Despite this alignment, most early-stage companies lack awareness of, or access to, defense-related funding, procurement pathways, and customer networks.

To address these gaps, Central Virginia should coordinate efforts to expose, educate, and connect bioscience companies to DoD and national security innovation pathways and needs. Instead of a single program, effective approaches often combine a range of relatively low-cost, high-leverage strategies including:

- Implementing a Defense Market "101" workshop series for demystifying DoD as a customer and funding source. Focus on how DoD procures, identifying key agencies within DoD, explaining differences compared with commercial markets, and highlighting case studies of dual-use bioscience products and companies.

- Mapping out dual-use opportunities in biosciences domains, which could include areas such as therapeutics applications for battlefield trauma or infectious diseases; digital health applications for warfighter performance; or diagnostics that can perform in rugged, harsh environments.

- Leverage DoD mentors, such as former program managers, SBIR reviewers, prime contractors, etc. for defense-specific expertise and guidance.

- Consider dual-use pitch events where startups pitch to DoD stakeholders or primes or even venture capital firms. Build in feedback and matchmaking opportunities.

- Target support for SBIR/STTR grant application readiness in identifying relevant solicitations, developing proposals, and positioning for awards.

- As the ecosystem matures, consider regional collaboration or pilot programs pairing startups with Rivanna Station or other regional defense installations for early validation steps.

There is immediate opportunity to convert expressed interest in Department of Defense and national security markets into a legitimate pipeline by standing up a focused defense markets support effort.

Priority actions could include any of the items proposed above as relatively low-cost ways in which to engage regional biosciences firms and entrepreneurs. The region could consider hiring advisory support, such as a part-time "Defense Markets Navigator" to work directly with companies if these early workshops and programming gain traction.

Best Practices Example: National Security Innovation Network

The National Security Innovation Network (NSIN)—a program within the U.S. DoD focused on enhancing collaboration between the military, private sector, and academia— provides a leading model for how regions can effectively connect early-stage, dual-use companies to DoD opportunities.

NSIN operates a suite of programs designed to bridge the gap between commercial innovation ecosystems and national security stakeholders, with a particular emphasis on making DoD engagement more accessible to non-traditional participants, including startups and university spinouts.

A core element of NSIN's approach is its Emerge and accelerator-style programming, which prepares dual-use startups to:

- Translate commercial technologies into defense-relevant applications.
- Understand and navigate DoD funding and procurement pathways (e.g., SBIR/STTR, Other Transaction Authorities).
- Engage directly with defense stakeholders through pitch showcases and curated matchmaking.

Notably, NSIN programs culminate in demo-day style events, where companies present to a blended audience of:

- DoD program managers and end users
- Prime contractors
- Dual-use investors

This model reinforces the dual-use value proposition, enabling companies to pursue both commercial and defense markets in parallel while building early relationships with potential government customers.

Strategy 3: Organize Cluster Programming Around Priority Growth Opportunities

Central Virginia should aim to intentionally organize its bioscience cluster programming, partnerships, and business development efforts around the specific growth opportunities identified in this strategy—anchored, at least initially, in advanced therapeutics/biologics and medical-imaging-based medtech—rather than treating "biosciences" as a broad, undifferentiated cluster. By intentionally embedding these opportunity areas into CvilleBioHub's ongoing work, CVPED's recruitment and expansion efforts, and UVA-led translational initiatives, the region can concentrate limited resources where it has clear scientific and translational research strengths, emerging industry anchors, and strong regional market pull. This opportunity-driven focus should also extend to targeted supply chain recruitment and retention, ensuring that contract manufacturers, specialized service providers, and enabling technology firms that support these niches are actively cultivated as part of the cluster.

Action: Utilize growth opportunity areas as organizing frameworks for cluster programming.

- Use the therapeutics/biologics and imaging-based medtech opportunity platforms as recurring themes across CvilleBioHub events, roundtables, peer groups, and company spotlights, so that local firms and entrepreneurs see themselves as part of coherent market subclusters rather than isolated businesses. This is not to suggest that other key segments of the industry should be ignored, but rather that intentional thematic focus should be considered, where appropriate.

- Encourage UVA researchers, startups, and established firms working in these domains to coalesce around focused working groups or initiative tracks within CvilleBioHub, creating natural venues for collaboration, problem-solving, and joint grant or partnership development.

Action: Align CVPED's recruitment and retention agenda with the identified growth opportunity areas.

- CVPED should utilize and develop targeted company and supply chain prospect lists honed on the identified opportunities—for example, biologics CDMOs, fill-finish providers, packaging firms, and cold chain logistics for therapeutics; or imaging hardware, software, and sensor companies for medtech—and integrate these into ongoing business attraction campaigns.

    - In the context of the therapeutics opportunity, the Partnership should aim to work with AstraZeneca as well as in a broader regional context with Merck and Eli Lilly and Company (with their recently announced expansion and market entry plans) to recruit and attract the biopharmaceutical supply chain to the region with location opportunities across Region 9.

- Use the presence of AstraZeneca, Afton Scientific, RIVANNA Medical, the Focused Ultrasound Foundation, and other firms as proof points in marketing to prospective companies, while also building structured retention touchpoints with existing firms to understand and address their ecosystem needs.

Action: Embed opportunity themes into university–industry collaboration platforms.

- Work with UVA Economic Development, the Manning Institute, and relevant schools to ensure that industry forums, innovation challenges, and translational programs explicitly highlight these opportunity areas and invite participation from regional companies and investors aligned with them.

- Encourage CvilleBioHub and UVA jointly to curate "innovation pipelines" in each focus area (e.g., a portfolio list of relevant labs, startups, and clinical assets) that can be used in conversations with prospective corporate partners, federal agencies, and philanthropic funders.

Action: Use the growth opportunity framework to guide future cluster investments and advocacy.

- When the region pursues new state, federal, or philanthropic funding (e.g., for facilities, shared equipment, or programs), prioritize proposals that clearly deepen capabilities in the chosen opportunity areas or fill enabling gaps such as early-stage device manufacturing, GMP simulation, or imaging-data infrastructure.

- Similarly, use the same opportunity language in branding and storytelling—across CvilleBioHub, CVPED, and partner communications—so external audiences consistently encounter Central Virginia as a place known for specific, high-value niches rather than a generalized "biosciences" region.

Example: Los Angeles County Life Sciences Strategy

Los Angeles County's 2025–2030 Life Sciences Industry Cluster Strategy explicitly organizes regional actions around a small set of priority niches—biopharmaceutical R&D, medical devices, and biomanufacturing—and then aligns business recruitment, zoning, infrastructure, and workforce programs to those focus areas.

The plan directs the economic development office to target incentives, marketing, and supply chain attraction (e.g., contract manufacturers, specialized labs) to these niches, creating a coherent narrative and coordinated project pipeline rather than a diffuse "life sciences" agenda.

Strategic Recommendations: National Security

Central Virginia is currently an emerging, but fragmented hub for defense technology innovation, anchoring an ecosystem that integrates world-class university research, an embedded intelligence community presence, and a growing ecosystem of defense contractors and SME manufacturers, including companies such as L3Harris, EURO-COMPOSITES, Northrop Grumman, and SPARC. The region's unique concentration of Rivanna Station organizations combined with the University of Virginia's differentiated research strengths and proximity to Northern Virginia's dense intelligence and defense complex offers the building-blocks for a thriving national security and defense cluster.

Vision for a Thriving Central Virginia National Security and Defense Cluster

The long-term vision for this ecosystem to fulfill its potential as a thriving national security and defense hub revolves around establishing a coordinated national security corridor built around a network of place-based assets and anchored by two key nodes—a research and intelligence node at the Southern end of the region (Charlottesville and Counties of Albemarle, Fluvanna, Greene, Louisa, and Nelson) and a testing/proving ground and manufacturing node towards the Northern parts of the region (Counties of Culpeper, Fauquier, Madison, and Orange):

- At the southern end, an intelligence technologies ecosystem anchored by Rivanna Station, North Fork Research Park, and the planned Rivanna Futures development, would be a key growth driver in which cleared talent, shared-use infrastructure, translational research pathways, and mission-aligned entrepreneurship reinforce each other in a self-sustaining growth cycle.

- Meanwhile, at its northern end, this corridor can be anchored by a set of integrated testing and demonstration sites for propulsion systems, such as L3Harris in Orange County, electronic warfare and spectrum dominance, unmanned systems, and other emerging technology platforms that are intentionally co-located with precision manufacturers and defense suppliers in the region's northern counties. These northern test and demonstration complexes would leverage the available land, favorable siting conditions, and receptive economic development partners already identified in those counties, while simultaneously capitalizing on the corridor's proximity to northern Virginia's dense defense and intelligence complex and the broader national capital region.

In combination, the southern intelligence node and northern test and manufacturing node can serve as the structure for an aspirational defense technologies corridor for the region, in which Charlottesville and Albemarle County can function as the early stage technologies engine of the ecosystem and the northern counties serve as a proving ground and production base that together can support a variety of next generation national security missions.

Achieving this vision requires a dual strategic approach: pursuing cross-cutting investments that improve the health of the entire defense cluster regardless of technology domain, while also deploying targeted initiatives tailored to the distinct needs of each of the region's technology-specific growth opportunities.

Situational Assessment

The situational assessment conducted through quantitative analysis and stakeholder interviews has surfaced a clear picture of a cluster that has significant organic momentum and genuine competitive assets, but that faces a defined set of structural barriers to transitioning into its next phase of growth.

The strengths and opportunities the strategy must build on include:

- A growing and increasingly prominent base of national security and defense activities anchored by Rivanna Station.
- UVA's growing capacity for national security research, exemplified by the National Security Data and Policy Institute (NSDPI), the School of Data Sciences, the Biocomplexity Institute, the Aerospace Research Laboratory, and the Link Lab.
- A demonstrated talent pipeline through UVA's Cyber Defense programs, graduate programs in data sciences, aerospace engineering, and electrical and computer engineering.
- Regional geography and quality of life that create a compelling value proposition relative to northern Virginia including lower real estate costs, a high-quality-of-life environment, and growing proximity-driven access to northern Virginia's dense defense contractor corridor.
- Active development at North Fork Research Park and the planned Rivanna Futures investments which can advance place-based development around emerging opportunities.

Meanwhile, gaps and challenges the strategy must systematically address include:

- A highly fragmented cluster in which collaboration, mutual awareness, and coordinated market positioning across the many relevant actors remain underdeveloped.
- Underleveraged translational research and commercialization pipelines and more limited engagement with the emerging commercialization pathways that successful university-defense clusters rely on to convert research excellence into industry activity.
- A shortage of Sensitive Compartmented Information Facility (SCIF) space for university researchers and SMEs, combined with institutional and industry readiness gaps at for Cybersecurity Maturity Model Certification (CMMC) compliance.
- Relatively few national security and defense companies in the region engaging in SBIR and other early-stage commercialization programs, combined with a regional venture capital environment that is not aligned with hardware-intensive, dual-use technology companies that anchor defense innovation clusters.

- More limited pools of cleared workforce, challenges attracting mid-career technical talent, low career awareness among early-stage candidates for defense pathways, and anticipated increased competition for talent from regional pharmaceutical expansion.

- The absence of a committed, coordinated development vision for Rivanna Futures, North Fork, and other sites in the region that explicitly positions these assets in support of the national security cluster, and no, or at least limited, major anchor tenants or federal catalyst that can drive momentum in the same way recent pharmaceutical announcements have for life sciences industries.

Given the breadth and diversity of the regional defense cluster, no single growth opportunity will define success. The cluster today encompasses a variety of innovation drivers including all-source intelligence analytics, aerospace and propulsion, defense electronics and payload engineering, cybersecurity, and emerging biosecurity capabilities, all of which operate in largely parallel environments and leverage more fragmented coordination, strategy, and investment mechanisms. The strategy for growth must therefore combine a set of cross-cutting investments that strengthen the connective tissue of the entire cluster with more targeted, growth-opportunity-specific initiatives that accelerate development in each domain.

Initiatives for Advancing the Regional National Security Cluster

As noted above and in recent economic impact studies, Central Virginia's national security and defense activities are already substantial but remain distributed across agencies, companies, and institutions that rarely see themselves as part of a single, coherent ecosystem. Stakeholders consistently emphasized that without intentional, cross-cutting initiatives to connect these actors, the region will underperform relative to its assets, leaving value on the table in the form of missed partnerships, underutilized facilities, and fragmented responses to emerging defense opportunities.

There are six cross-cutting initiatives set out below that are designed to address the structural challenges holding back Central Virginia's national security and defense cluster by building the shared infrastructure, programming, and institutional capacity that every segment of the corridor can leverage, regardless of specific technology domain or mission focus, allowing the region to then focus on the identified growth opportunities as a targeted means of advancing its position. These initiatives focus on establishing visible coordination and championing functions, shared support and testing facilities, translational funding mechanisms, robust talent pipelines, and a unified branding and outreach platform so that the corridor can begin to operate as an integrated offering for defense stakeholders and industry. These six cross-cutting initiatives detailed below include:

- Strategy 1: Programming Support for Building the National Security and Defense Cluster
- Strategy 2: Establish a Regional Defense Technology Accelerator with Shared Use SCIF and Fabrication Infrastructure
- Strategy 3: Translational Funds and Support Mechanisms for National Security/Defense Startups and SMEs
- Strategy 4: Enhance a Robust Talent Pipeline for the National Security Cluster
- Strategy 5: Further Placemaking for the National Security/Defense Cluster — Co-Location, Defense Facilities Gap Fund, and Innovation District Development
- Strategy 6: Branding, Outreach, and Business Attraction for the National Security Cluster

Strategy 1: Programming Support for Building the National Security and Defense Cluster

A key gap cited by regional stakeholders was the need for a coordination mechanism that can provide structured, sustained programming infrastructure to build awareness, trust, and collaboration across the regional defense cluster's otherwise fragmented actors, which include defense agencies, prime contractors, SMEs, UVA researchers, economic development organizations, and capital providers. In the absence of a visible, neutral forum and recurring opportunities to convene, information remains siloed, firms and researchers lack clear line-of-sight into each other's capabilities, and the region forfeits the network effects that successful defense hubs like Huntsville and St. Louis have achieved through deliberate, backbone-style coordination bodies and roadmaps.

Specific Actions:

- Designate and resource a regional defense sector champion organization, building on the stakeholder group represented by the existing Defense Affairs Committee/Central Virginia National Security Alliance to serve as the formal backbone entity for the corridor, with a mandate to convene stakeholders, speak with one voice to DoD and state partners, own the national security corridor brand, and coordinate implementation of this strategy across all eleven GO Virginia Region 9 localities.

- Identify common needs through dialogue with companies, and then focus on shaping common services, including those targeted to specific technology domain areas. These common services can include addressing technical assistance for modernization, access to markets, identifying DoD contracting opportunities, etc.

- Solidify a lead organization for branding and marketing activities to grow the defense cluster (see Strategy 6 for more details).

- Establish a regional Defense Technology Forum series, anchored by a lead organizing body (university research center, major prime, etc.), hosting at minimum two substantive cluster convenings per year: one focused on technology themes aligned with Rivanna Station demand signals (e.g. an all-source analytics conference), and one focused on business development and commercialization pathways (e.g., an SBIR matchmaking event with NGIC, DIA, and NGA program officers).

- Develop a dedicated "Doing Business with Rivanna Station" onboarding resource for SMEs and university researchers covering contracting vehicles (SBIR, OTAs, CRADAs, FAR-based contracts), CMMC compliance requirements and resources, security clearance processes for startup teams, and points of contact at NGIC, DIA, and NGA for technology partnership inquiries.

- Explore opportunities to partner with various military small business offices (e.g. INSCOM's Small Business Office (Army Contracting Command-Detroit Arsenal, which manages INSCOM contracting including NGIC at Charlottesville) to host regular industry engagement days at which regional SMEs can present technology capabilities to program offices.

Best Practice Reference: National Center for Simulation in Central Florida

Across the nation, many regional defense clusters have formed non-profit industry-led organizations to help build collaborations across government, industry, academia and broader community stakeholders and support a vibrant defense-focused ecosystem, often with a key technology focus that has dual-use opportunities.

One long-standing example is the National Center for Simulation (NCS), a nonprofit trade association based around the defense simulation complex found in Orlando, Fl, which includes the Army, Navy, Air Force, Marine Corps and Department of Homeland Security (DHS). It was established back in 1993 to support Central Florida's emerging modeling, simulation, and training (MS&T) community and serve as the link among the defense industry, government agencies, and academia on behalf of the entire MS&T community. It began as an initiative of the Technology Reinvestment Project (TRP) in the 1990's to assist communities facing cuts in defense spending with the end of the Cold War.

Today, NCS brings together more than 290 members from across industry, government, and academia members to help grow the sector, support workforce development, promote policy, and advance simulation innovation. That makes it part industry association, part convener, and part advocacy organization for the simulation ecosystem in Central Florida.

Among its main activities include hosting networking and business-development events, including an active calendar of industry activities to help connect members across the MS&T community. Among the industry activities are:

- **Lunch & Learns.** Conduct a Lunch & Learn for our NCS members. Periodically NCS in collaboration with membership companies, will host Lunch and Learn events to showcase your business capability and share knowledge of a subject of interest to our members. This is a free event with lunch being provided.
- **Procurement Administrative Lead Time (PALT)** sessions (coordinated with Lunch and Learn events), that were initiated in response to industry's requests to improve communication between military acquisition commands, and industry stakeholders. The Army/Marine Corp PALTs are in the morning and the Navy in the afternoon.
- **Team Orlando Industry Days.** Team Orlando Industry Capability Days (ICDs) presented by NCS take place 3-4 times per year. ICDs are a come-and-go style event featuring up to 14 business/organizations who are looking for the opportunity to share their newest or most innovative ideas with Team Orlando. Around 200+ Government researchers, contracting officers, and acquisition buyers from the Army, Navy, Marine Corp, Air Force, and DHS arrive to discuss and view company capabilities. If you are interested in showcasing your capability, ICDs provides a free venue to reach Team Orlando.
- **Training & Simulation Industry Symposium (TSIS)** is an in-person symposium, held annually, and an excellent opportunity to hear from procurement officials for Training and Simulation products and services from the Army, Air Force, Navy, Marine Corps, and Joint Program Office Medical Simulation. As always, the focus will be on providing insight into acquisition and procurement opportunities forthcoming in the near to mid-future.

NCS also provides more hands-on business development and growth services to its members, including:

- **Consultation Strategy Sessions** to promote and grow an industry member's business, including helping industry members navigate their next steps in new situations like expanding into a new line of business; working with government for the first time; involving themselves in community action; or searching out new partners for innovative ideas.
- **Technology Demonstrations & Referrals.** Support for visits and tours of member organizations by National and International visitors. Opportunities to showcase your products and services to a wide range of customers.
- **Member Representation.** Promotion of our members, their products, and services at trade shows & conferences.
- **Introductions.** NCS will assist our members in growing their companies by making introductions to our key partners who are the companies and individuals that are established and currently working in MS&T. This includes government, academia, and industry MS&T players. Our NCS Board of Directors who are key industry partners are vital to our organization and will help mentor you and your business.
- **Business Referrals.** Recommendations in response to inquiries from Government and Industry.

NCS is actively involved in STEM programs including offering an industry- accredited certification in Modeling and Simulation (M&S) curriculum available to high schools, internships for certified students and scholarships for post-secondary M&S students. NCS also brings together the STEM community twice a year to plan, coordinate and share M&S STEM activities happening around Central Florida.

NCS is governed by a 23-member Board of Directors, with 16 members from industry, 2 members from universities in Orlando, 3 members from local government and 2 members from economic development organizations. It also has an Advisory Board, primarily comprised of key DoD organizations based in Orlando, Fl. In 2024, NCS had 6 staff and a budget of $1.450 million to support its activities.

Strategy 2: Establish a Regional Defense Technology Accelerator with Shared Use SCIF and Fabrication Infrastructure

Many researcher and industry stakeholders highlighted the need to create a regionally anchored defense technology accelerator that provides SMEs, defense startups, and university researchers with shared-use access to a classified space, light industrial fabrication space, and electromagnetic/RF (EMRF) testing infrastructure that can anchor and support emerging companies across several key intelligence and defense electronics innovation areas. This accelerator would serve as a critical infrastructure investment the cluster can make to remove the barriers that currently prevent early stage companies and researchers from pursuing classified and controlled-unclassified defense work.

Specific Actions:

- Establish a defense tech accelerator at or immediately adjacent to North Fork Research Park or Rivanna Futures or other site in the region, designed from the outset with multi-tenant SME access in mind and intended to serve as a hub for early phase defense tech commercialization activity.

- Develop shared SCIF space and access tiers that can accommodate a variety of stakeholder groups: a faculty/graduate research track allowing cleared researchers to access classified collaboration space on a reserved basis, and a commercial SME track providing vetted defense companies access to secure project rooms, classified network infrastructure, and cleared workspace on a fee-for-service model.

- Integrate light industrial and fabrication bays for hardware-intensive defense work, including CNC machining and composites prototyping, alongside EMC/RF shielded test cells usable for electronic warfare component testing, signal processing validation, and payload integration work to address infrastructure needs that regional defense electronics SMEs consistently cited as missing from the region.

- Pursue DIU/NSIN OnRamp Hub designation for the accelerator, which would provide a DoD demand signal, connection to the broader national defense innovation network, and access to commercial solutions openings and Other Transaction Authority (OTA) contracting vehicles. The Defense Innovation Unit's criteria for hub designation explicitly includes the robustness of the defense innovation ecosystem and expressed demand from the innovation community.

Best Practice Reference:

HUSTLE Defense Accelerator Program at Griffiss Institute

There are a growing number of dedicated defense focused accelerator programs being established across defense communities in the U.S. One excellent example is in Rome, NY at the Griffiss Institute, located at the former Griffiss Air Force Base, which is a Partnership Intermediary Organization involved in technology transfer, commercialization and education for the Air Force Research Lab, whose Information Directorate continues to operate at the former Griffiss AFB.

The HUSTLE (Helping Upstate Science and Technology Leaders and Entrepreneurs) Defense Accelerator Program is designed to empower tech startups pioneering advancements in dual use technology. Led by a team of seasoned professionals, the program offers tailored education and mentorship, providing insights into navigating government contracts, establishing strategic partnerships, and securing funding to fuel growth. This program is sponsored by the Air Force Research Laboratory, New York State Empire State Development (ESD), and National Grid.

The HUSTLE Defense Accelerator is open to all pre-seed and seed-stage startups focused on dual use solutions with the potential to elevate the United States' national security and economic competitiveness. Key areas of technology focus include: AI/ML, cyber, quantum and Uncrewed Autonomous Systems (UAS) solutions. There is a strong preference for startup companies that have at least two (2) teammates: one (1) with a technical background, and one (1) with a business background.

Participants compete for up to $550,000 in follow-on funding, made possible through sponsorship from New York State Empire State Development (ESD), and support from National Grid and AFRL. Companies awarded funding are required to demonstrate at least one year of corporate residency in New York State, reinforcing GI's mission to bolster economic growth in the state and the Mohawk Valley region.

Startups participating in the HUSTLE Defense Accelerator grant Griffiss Institute a Simple Agreement for Future Equity (the "SAFE"), under which $24,500 in-kind programming, plus $7,500 per founder (maximum $15,000) (the agreed-upon value of the services provided to you by GI under this agreement), and total prize money (if won), will be convertible into equity of the company once it is formed.

Since its inception in 2022, HUSTLE has supported 37 startups. with three relocating directly to the Innovare Advancement Center in Rome, NY. Alumni companies have also gained recent global recognition, with two selected to participate in this year's NATO DIANA Programme: Drone City and NanTenna. These achievements highlight the program's ability to support companies that create meaningful impact locally, nationally, and internationally.

Strategy 3: Translational Funds and Support Mechanisms for National Security/Defense Startups and SMEs

Based on stakeholder discussions, it is critical to establish dedicated financial support mechanisms that fill the "valley of death" between basic research and defense contract revenue for the SMEs and startups driving innovation in the regional national security cluster, with a specific focus on SBIR navigation, OTA access, and early-stage risk capital for hardware-intensive ventures. This gap is particularly acute in defense and aerospace, where product development cycles are long, qualification and testing costs are high, and traditional venture investors often hesitate to commit capital until there is clear line-of-sight to substantial production contracts, which themselves can take years to materialize. Without targeted funds and structured support into follow-on contracting pathways, promising technologies emerging from UVA labs and regional SMEs risk stalling at the prototype stage or leaving the region to scale elsewhere.

Specific Actions:

- Create a Regional Defense SBIR Navigation and Acceleration Program, partnering with relevant service branch SBIR offices to provide active SBIR proposal development support, Phase I to Phase II transition coaching, and Phase III commercialization bridge assistance to regional defense SMEs. The program should track and measure SBIR award activity as a primary performance indicator, targeting a measurable increase in DoD SBIR awards to Region 9 companies within five years.

- Establish a National Security Technologies Translational Fund, a regionally capitalized co-investment vehicle that provides proof-of-concept and pre-SBIR funding to university spinouts and early-stage defense ventures at the technology readiness levels (TRL 2–5) where most defense startups are still too early for SBIR Phase I but have exceeded what academic grants can support. This fund would build on the model of UVA's existing seed fund infrastructure but with an explicit defense and dual-use mandate and capitalization above current university seed funds, which stakeholders described as a gap relative to peer institutions.

- Organize and promote a Defense Startup Capital Roundtable, bringing together regional angel networks, Virginia-based or nearby Atlantic region VC funds with defense mandates, and federal capital programs, to increase the region's visibility as a defense investment destination and help promising companies navigate the gap between federal non-dilutive capital and private institutional capital.

Best Practice Reference: CenterState CEO (NY) Grants for Growth

CenterState CEO's Grants for Growth program is a Syracuse-based, university-industry seed-funding initiative that supports applied research projects to help emerging companies in Central New York move technology from the lab to market. It is not a defense-specific fund, but several recipients operate in sectors closely tied to defense and national-security-adjacent industries (e.g., advanced manufacturing, semiconductors, sensors, and systems integration).

Grants for Growth is run by CenterState CEO, a business-leadership and economic-development organization serving a 12-county area in Central New York. It is supported through funding from New York State.

The program funds applied research collaborations between companies and academia, typically led by small and mid-sized firms working with faculty and labs at regional universities (Syracuse University, SUNY colleges, Cornell, etc.). It is structured as a competitive grant program offering grants at different funding levels for companies based on their growth stage, including:

- Ignition grants for early-stage companies (up to $10,000)
- Proof of Concept grants (up to $25,000)
- Commercialization investments for later-stage companies (up to $100,000)

Grants for Growth has generated strong successes over its first decade of operations:

- Awarded 54 grants/investments totaling nearly $3.8 million
- Established connections for growing regional companies to 135 professors across seven colleges and universities, underscoring the university-industry collaboration model.
- Leveraged $44.8 million in additional investments
- Created 68 patents in line with its focus on applied research
- Created the potential for 873 new jobs

Strategy 4: Enhance a Robust Talent Pipeline for the National Security Cluster

There is a need for a comprehensive, multi-stage talent pipeline that addresses the cluster's workforce gaps across several dimensions: career awareness among early-stage candidates, clearance pipeline acceleration for university graduates, internship and placement support for SMEs, and mid-career attraction and retention. Stakeholder input underscored that the region is not constrained by a lack of training capacity at UVA and other institutions, but rather by weaker connections between that capacity and defense career pathways, persistent challenges getting graduates cleared and placed into regional firms, and difficulty attracting and retaining mid-career technical talent in competition with Northern Virginia and other national security hubs.

At the same time, NGIC and other Rivanna Station organizations continue to recruit for a wide range of cleared civilian and contractor roles, offering structured internship programs and participating in national pipeline programs, which demonstrates a sustained and diverse demand signal for intelligence, engineering, cyber, and analytic talent in the region. As the cluster continues to grow, it is critical to close the gap between that demand and the region's supply of prepared, interested, and appropriately cleared workers by aligning education and training programs, creating dedicated clearance and placement pathways into both government and industry roles, and positioning the corridor as a compelling long-term career destination for both emerging and experienced national security professionals.

Specific Actions:

- Launch a Region 9 national security career awareness campaign targeting undergraduate students at UVA across multiple disciplines including data science, computer science, aerospace engineering, electrical and computer engineering, physics, and policy/public affairs to increase awareness of defense career pathways, correct misperceptions about the nature and breadth of defense work, and position Charlottesville as a compelling career destination relative to Northern Virginia.

- Develop a Defense SME Internship Program, providing matching grant support to small and mid-size defense companies in the region to create structured, paid internship opportunities that give students exposure to defense industry work while simultaneously addressing the workforce access challenges that SMEs cannot resolve through full-time recruiting. Successful models at peer institutions, including University of Missouri's embedded student program at NGA, demonstrate the value of placing university talent in mission-adjacent environments as a gateway to full-time cleared employment.

- Create a regional security clearance pipeline coordination program, working with Rivanna Station organizations, UVA's security administration, and regional contractors to systematize the process by which graduating students with prior suitability reviews can be sponsored for entry-level clearances by hiring defense companies, dramatically compressing the time-to-cleared-workforce that currently limits regional SME and emerging company staffing.

- Partner with Virginia's Commonwealth Cyber Initiative (CCI) to expand the CCI's Central Virginia Node's activities to include defense workforce development programming, cleared talent certification tracks, and direct engagement with Rivanna Station agencies beyond UVA's current relationship.

- Develop a mid-career defense talent attraction program specifically targeting experienced, cleared intelligence community and defense contractors in the Northern Virginia market who are receptive to Charlottesville's quality-of-life advantages. This program should include relocation support resources, a cost-of-living communication strategy, and housing awareness tools that address one of the cluster's primary perceived competitive disadvantages relative to Northern Virginia.

Best Practice Reference: The Patuxent Partnership

A typical approach found across the nation is having a dedicated non-profit focused on the needs of a regional defense ecosystem collaborate with major defense organizations in its region to support post-secondary and K-12 STEM education and workforce activities.

A nearby example is **The Patuxent Partnership (TPP)**, a non-profit industry-led organization based around Naval Air Station (NAS) Patuxent River, that connects government, industry, and academia to support defense-related talent and workforce development priorities and serve as a bridge to the broader Southern Maryland defense ecosystem. NAS Pax River is the headquarters for the Naval Air Systems Command (NAVAIR), which oversees naval aviation acquisition and life-cycle support, and the Naval Air Warfare Center Aircraft Division (NAWCAD), responsible for aircraft development, testing, and evaluation. TPP also supports a broader range of support activities for building collaborations, including speaker programs, forums, networking, and science and technology transfer efforts.

TPP's STEM-based education and workforce efforts focus on building the regional talent pipeline through internships, apprenticeships, grants, and academic partnerships. A long-standing effort by TPP is its Educational Partnership Agreement (EPA) with NAWCAD and St. Mary's College of Maryland (SMCM) that has supported a wide range of ongoing STEM education and workforce development activities, including:

- **Joint research projects:** SMCM faculty and students conduct applied research aligned with NAWCAD's technical needs (e.g., physics, engineering, data science), often using NAWCAD facilities and mentorship.
- **Student research and internships at NAWCAD:** SMCM students participate in research based internships at Patuxent River Naval Air Station, gaining hands on experience in naval aviation, autonomy, and related STEM fields.
- **Physics and STEM scholarships at SMCM:** TPP funds targeted scholarships (for example, multiple annual physics scholarships) to attract and retain STEM major students whose work can feed into NAWCAD/NAVAIR relevant disciplines.
- **STEM focused K 12 outreach events:** SMCM, TPP, and NAWCAD co host regional STEM events such as "STEM ING" (Science, Technology, Engineering & Math – Inspiring the Next Generation), which connects middle school girls and other students across Southern Maryland with laboratory experiences and career pathways tied to NAWCAD missions.

- **Curriculum and pedagogy alignment:** Faculty and NAWCAD scientists collaborate to align classroom content and teaching methods with real world naval aviation problems, including through workshops and professional development activities for SMCM and regional STEM educators.

- **Pathway building from SMCM to NAWCAD/NAVAIR:** The EPA supports structured pathways (coursework, research, internships, and mentoring) that prepare SMCM graduates to transition into NAWCAD, NAVAIR, or TPP member companies in STEM and technical roles.

These EPA driven activities are designed so that SMCM serves as a direct feeder institution for STEM skilled talent into the NAWCAD and NAVAIR ecosystem.

Additionally, TPP is involved in broader K-12 STEM education and workforce development activities in support of NAWCAD and NAVAIR, including:

- **Next Generation NAWCAD Workforce (N2W) Internship Program:** Unpaid, project based internships at Patuxent River Naval Air Station for rising high school seniors, working on unmanned air vehicle and related platforms under Navy/contractor mentorship.

- **TechJobsRule (TJR) high school apprentice program:** Connects students at the Dr. James A. Forrest Career and Technology Center to paid apprenticeships and internships with NAWCAD, TPP member companies, and Apprenticeship Maryland Program (AMP) approved employers.

- **SoMD 2030 Workforce Development:** Regional initiative funded by NAWCAD through TPP that links students across Southern Maryland (St. Mary's, Charles, and Calvert counties and local colleges) to paid internships, apprenticeships, and early career STEM opportunities with NAWCAD/NAVAIR aligned employers.

TPP also acts as the non-profit intermediary under a Partnership Intermediary Agreement (PIA) with NAWCAD to shape regional workforce development strategy. This includes facilitating collaboration between NAWCAD, industry, academia and the broader community to align K 12 and higher ed programs with naval aviation, unmanned systems, modeling & simulation, and test & evaluation needs. It offers TPP resources to fund programs such as engineering scholarships at the College of Southern Maryland, quadcopter training via ONR grants and events like NAWCAD Industry Days.

Best Practice Reference:
SCALE Microelectronics Defense Workforce Development Program

Increasingly, more technology-specific talent and workforce development initiatives are being developed between universities and specific DoD technology areas. **One excellent example is SCALE (Scalable Asymmetric Lifecycle Engagement), the U.S. Department of Defense's flagship microelectronics workforce development program**, focused on rebuilding a domestic pipeline of semiconductor and microelectronics-ready engineers and technicians for the defense-industrial base (DIB). It is funded under DoD's Trusted and Assured Microelectronics (T&AM) portfolio and is led by Purdue University with management by the Naval Surface Warfare Center, Crane Division (NSWC-Crane). SCALE leverages a relatively new and flexible contracting vehicle, known as Other Transaction Authority (OTA) under DoD's Trusted and Assured Microelectronics program, that has provided more than $100 million cumulative funding over the years.

Key activities of SCALE, include:

- **Curriculum and course development:** SCALE-affiliated universities develop specialized microelectronics courses in areas such as advanced packaging, analog/RF, security-aware design, embedded systems, and supply-chain-aware design practices.
- **Student pathway programming:** Undergraduate and graduate students receive scholarships, structured mentoring, internships, and research projects with DoD and defense-industrial partners, often leading directly to full-time employment.
- **K-12 and community-college outreach:** SCALE supports K-12 pipeline activities (e.g., classroom engagements) and aims to standardize and enrich microelectronics curriculum at community colleges and technical-education programs.
- **Center for Secure Microelectronics Ecosystem (CSME):** This industry-supported center helps students and faculty transition research into mission-relevant applications and connects them to defense-sector problems.

Purdue University serves as the central academic lead and "hub" of the SCALE microelectronics workforce program, hosting much of its core design, coordination, and hands-on student engagement. Purdue's roles span leadership, curriculum innovation, immersive student pathways, and organizing national-scale events and workshops.

To date, SCALE has a strong record of engagement and success, including:

- Over 1600 students served with 35 universities and over 110 faculty and staff now participating
- 1071 SCALE students currently enrolled at SCALE universities
- 528 students graduated to date
- 186 new full time job placements recorded
- 9 of the 10 of the most common employers for both post-graduate and internship roles are in the defense sector
- Demonstrated 80% SCALE acceptance rate in First-time Researcher feeder program 113 public, private, and academic partners

Strategy 5: Further Placemaking for the National Security/ Defense Cluster — Co-Location, Defense Facilities Gap Fund, and Innovation District Development

Alongside talent and investment support, it is similarly critical to accelerate and align physical development at Rivanna Futures, North Fork Research Park, and other place-based development activity in explicit support of the national security cluster, establishing both a committed development vision and a defense facilities gap fund to incentivize multi-tenant space investment in the types of facilities that the market will not provide on its own. Albemarle County has already positioned Rivanna Futures as an Intelligence and National Security Innovation Acceleration Campus adjacent to Rivanna Station, with more than $11 million in state site-readiness funding, while North Fork Discovery Park hosts secure UVA National Security Programs space and a growing mix of contractors, researchers, and technology firms. However, without intentional land use planning, shared infrastructure investments, and targeted tools to close the financing gap for specialized defense facilities these assets risk evolving as conventional business parks rather than connected, next-generation defense innovation assets.

In parallel, there is a complementary placemaking opportunity in the region's northern counties (Counties of Culpeper, Fauquier, Madison, and Orange), where available land, lower development pressures, and receptive economic development authorities create ideal conditions for siting testing and demonstration infrastructure that cannot be accommodated near Rivanna Station. Counties such as Culpeper and Fauquier already market large, infrastructure-served tracts such as the Culpeper Tech Zone and industrial sites with access to fiber, power, and transportation, and Fauquier and Greene have established Defense Production Zones that can offer targeted incentives to defense-related businesses. Intentional placemaking around these northern assets could include dedicated missile and propulsion test ranges, RF and electromagnetic warfare proving grounds, and signals intelligence and spectrum experimentation corridors, designed and permitted in ways that align with federal safety and environmental requirements while leveraging open land and clean spectrum conditions that are increasingly scarce in more urbanized markets.

Specific Actions:

- Advocate for and support the adoption of a formal national security and defense cluster development plan for North Fork and Rivanna Futures and other sites in the region that explicitly designates land use zones for classified lab space, hardware testing and demonstration facilities, light industrial defense manufacturing, and a multi-tenant secure innovation hub, ensuring that real estate decisions align with cluster development priorities.

- Establish a Defense Facilities Gap Fund leveraging a regional economic development matching fund modeled on industrial development bonds and innovation infrastructure grants to subsidize the capital cost differential between standard commercial construction and the specialized build-out costs of SCIF-compliant spaces and other defense-grade infrastructure that private developers may be less likely to fund without incentive.

- Commission a coordinated development study for North Fork, Rivanna Futures, and other sites in Region 9 with specific attention to the infrastructure or capabilities gaps most cited by defense and intelligence software SMEs: fiber connectivity to support classified network operations, dedicated HPC/data center capacity co-located adjacent to or within the Rivanna campus, and housing and live-work amenity development that makes the innovation district competitive for talent retention.

- Conduct a siting and feasibility study for regional test ranges that identifies specific parcels suitable for propulsion test stands, RF/EM anechoic and open-air ranges, UAS flight corridors, and secure signals-intel experimentation sites, including environmental and community impact considerations and compatibility with nearby military installations such as Dahlgren. Based on this study, designate at least one shovel-ready testing and demonstration "mega site" in the region's northern counties (Culpeper, Fauquier, Orange, or Madison), capitalizing on available land, lower density, and receptive economic development offices that were identified in stakeholder interviews as assets for aerospace component testing, propulsion test infrastructure, and drone flight corridors.

- Develop a coordinated regional incentive package for defense testing users that layers local tools (tax abatements, expedited permitting, infrastructure cost-sharing) with state Defense Production Zone benefits and GO Virginia funding to support the specialized infrastructure and permitting required for these sites.

Best Practice Reference: Port San Antonio and Cummings Research Park Collaborations with Regional Universities on Innovation Placemaking

A critical means for supporting a regional defense cluster is through the advancement of place-based developments. One critical means for advancing these developments is through co-locating innovation-based activities of regional universities to support defense-related developments.

Port San Antonio (Port SA)/University of Texas San Antonio (UTSA) Collaboration
Port San Antonio (Port SA) represents a two-decade strategic effort to establish a technology and innovation campus Southwest of San Antonio's downtown at the former Kelly Air Force Base. The Port sits on nearly 2,000 acres with facilities leveraging almost $1 billion in capital improvements including significant upgrades to military facilities, new construction, and major infrastructure upgrades—for example, campus-wide cyber upgrades to establish specialized, secure spaces for operations. Port SA is home to private and public sector industry concentrations in aerospace and defense, logistics, manufacturing, cybersecurity (including the Air Force 16th Cyber Command), and education.

The University of Texas San Antonio (UTSA) has been advancing a collaborative relationship with Port SA to increase opportunities for both R&D and workforce training and education in synergistic fields and industry applications including cybersecurity and cybersecure manufacturing, data analytics, critical infrastructure, automation and robotics, space sciences and hypersonics, and AI.

A key driver of this collaboration of Port SA and UTSA is through UTSA's Cybersecurity Manufacturing Innovation Institute (CyManII), a national research institute funded by the Department of Energy (DOE) and led by UTSA in partnership with numerous major leading research universities and national DOE labs. CyManII's efforts are focused on advancing the ongoing digital transformation of manufacturing and specifically the infrastructure and platform required to secure this increasingly "smart" cyber-physical production environment while ensuring energy efficiency. CyManII's research and applications are focused in cybersecurity, smart and energy efficient manufacturing, as well as supply chains, factory automation, and workforce development.

CyManII has located in the heart of Port SA a 17,000-square-foot training and technology demonstration facility that supports manufacturers by providing access to applied research, engineering support, and hands-on workforce training in secure smart manufacturing.

The Port San Antonio site also has the potential to create artistic and creative spaces at its newly approved 130,000 SF Innovation Center that will house the San Antonio Museum of Science and Technology and offer broader community gathering and meeting spaces.

Additionally, Port SA is in close proximity to UTSA's new Downtown Campus that houses its new School of Data Sciences.

University of Alabama at Huntsville Invention to Innovation Center at Cummings Research Park

The University of Alabama at Huntsville (UAH) Invention to Innovation Center (I²C) serves as a key technology incubator and accelerator within Cummings Research Park's ecosystem, fostering tech-based entrepreneurship and commercialization for startups and emerging companies. Located on UAH's campus within Cummings Research Park, the 45,000 sq. ft. facility supports regional innovation through incubation, co-working spaces, mentorship, funding access, and strategic partnerships.

As part of UAH's research and economic development arm, I²C channels UAH's technology transfer from over 80 industry research agreements and is committed to supporting new venture activity and entrepreneurship involving UAH technologies. This includes supporting UAH faculty and students in entrepreneurial journeys, ideation, and ventures through mentorship and programming. I²C plays an active role in UAH's I-Corp Program centered on customer discovery, mentorship, and funding support for new ventures based on UAH technologies.

I²C also hosts broader venture development efforts taking place within Huntsville. This includes the CRP DefenseTech Accelerator, a 12-week program for early-stage tech companies to pair them with defense tech advisors to assess federal market fit, coaches to shape go-to-market strategies, experts to support business development and proposals, and access to a broad network of users, customers, and investors. Additionally, the SPARK Huntsville showcase is held at I²C and features presentations from founders that completed that seven-week venture-creation program.

I²C has an active Corporate Innovation Hub offering startup tenants dedicated office space, shared conference rooms, event spaces, and strategic commercialization support, including product pipeline development and mentor/advisory board access. It currently supports 17 startup companies in its incubator space. The center emphasizes collaborative co-creation in flexible co-working areas (15,000 sq. ft.), classrooms, and community events. It also assists in assisting startups with access to UAH students for internships, employment, and hackathons; faculty expertise and labs for research projects; and events linking startups with scholars and researchers.

Strategy 6: Branding, Outreach, and Business Attraction for the National Security Cluster

It is important to proactively position the region's national security and defense cluster as a recognized, coherent, and distinctive innovation destination through active branding, targeted business attraction, and strategic relationship-building with regional defense installations and state-level defense initiatives. Today, the region's assets are largely underrepresented at the national scale, with Rivanna Station, UVA's national security research strengths, and a growing base of primes and SMEs not yet packaged into a clear "Defense and Intelligence Corridor" identity that resonates with federal sponsors, prime contractors, investors, or talent in the way that "Team Redstone" does for Huntsville or "GeoFutures" now does for St. Louis' geospatial ecosystem.

Changing this dynamic requires intentional market positioning by developing a unified corridor brand, promoting compelling, evidence-based stories about the region's defense successes, and executing proactive outreach to installations such as NGIC, Dahlgren, and Pax River as well as to statewide defense initiatives and site-readiness efforts under GO Virginia. Business and federal investment attraction requires both branding and ongoing outreach to position the region as a competitive choice to pilot new missions, locate satellite operations, and co-invest in place-based development.

Specific Actions:

- In conjunction with Strategy 1, develop and launch a regional National Security Innovation Corridor brand (and in parallel with the Biosciences) with a distinct identity, narrative, and marketing platform that communicates the cluster's unique value proposition to target audiences including defense prime contractors evaluating satellite office expansion, intelligence analytics software firms, defense electronics manufacturers, and the private capital community.

- Execute a targeted business attraction campaign that aligns with the primary growth opportunity areas, particularly focused on all-source intelligence software firms in the Northern Virginia and Boston defense tech markets, defense electronics and payload engineering companies exploring production facility expansion, and aerospace and propulsion systems manufacturers who could benefit from proximity to UVA's Aerospace Research Laboratory and testing infrastructure.

- Build and formalize institutional relationships with Naval Surface Warfare Center Dahlgren and NAS Patuxent River (Pax River), the two major regional defense installations with which the Charlottesville cluster is most under-connected despite significant potential for research and supply chain partnerships. Virginia Tech's relatively stronger relationship with Dahlgren was cited in stakeholder interviews as a model for UVA and the regional cluster to emulate and surpass. In addition, engage proactively with NASA Wallops Flight Facility and the Mid-Atlantic Regional Spaceport to explore joint use of launch, range, and coastal test infrastructure for integrated platform testing (e.g., hypersonic-relevant flight profiles, missile interceptor components, UAS and payload demonstrations), positioning Region 9 aerospace and defense electronics firms as upstream development and manufacturing partners that can feed test campaigns conducted at Wallops.

- Engage proactively with Virginia-level statewide defense initiatives, including hypersonics programs leveraging the state's testing assets, the emerging interceptor missile defense initiative, and potential Space Force activities building on Virginia's defense infrastructure, ensuring that Region 9's companies and research capabilities are consistently recognized as resources for these programs.

- Build a regional defense storytelling effort including success story documentation, cluster metrics dashboards, and case studies of anchor company growth trajectories such as GA-Intelligence's development from a UVA-rooted startup to a several-hundred-person General Atomics-acquired analytics firm that give the cluster's narrative a concrete, compelling, and verifiable foundation.

Best Practice Reference: STL GeoFutures Branding and Marketing

"*The Future of Geospatial is STLMade … start up, stand out, stay*" was the branding of an active marketing campaign by a coalition of St. Louis economic development organizations to position the region for geospatial intelligence development, spurred by the decision of the National Geospatial-Intelligence Agency (NGA) to locate its $1.75 billion investment in the Next NGA West (N2W) campus in North St. Louis City, a depressed area of the City adjacent to downtown St. Louis, and consolidate more than 3,000 employees of NGA focused on providing GEOINT serve as a hub for both classified and unclassified geospatial work.

Defense-related geospatial intelligence has had a long history in the St. Louis region, starting as a center for mapping and planning during WWII. Over the years, St. Louis remained strategically important due for our nation's geospatial intelligence due to its central location, robust infrastructure, and skilled workforce . In 1972, the St. Louis facility transitioned to the Defense Mapping Agency in 1972 and later became part of the National Imagery and Mapping Agency (NIMA) in 1996. In 2003, NIMA was renamed to NGA, reflecting its expanded mission in geospatial intelligence (GEOINT).

But until the 2016 selection by NGA of North St. Louis City as the site for its Next NGA West (N2W), it was largely an overlooked driver for economic development. The N2W campus secured NGA's long-term presence in St. Louis and raised the profile of St. Louis as a key actor in geospatial intelligence for national security, defense, disaster response, safety of navigation, and the creation and dissemination of foundational geospatial data.

Branding efforts have positioned St. Louis as a recognized hub for geospatial activities, gaining national and international attention. Greater St. Louis, Inc. (GSL) led a coalition of economic development organizations in leveraging the STLMade brand at national and international convenings of the geospatial industry to promote the region as a hub for the industry. The main venue was the annual GEOINT Symposium, the largest gathering of geospatial intelligence professionals, which was hosted in St. Louis in 2021, 2023, and 2025. Additionally, Greater St. Louis, Inc. and its partners organized a strong St. Louis presence at Esri User Conferences, Geospatial World Forums, and GeoGov Summits.

At the same time, there was an ongoing focus to raise the profile of geospatial development in the St. Louis region. Starting in 2019, NGA and St. Louis University started to co-host an annual Geo-Resolution conference. This has become an important venue for promoting collaboration among geospatial experts and students in government, academia, and industry. Over the 2019-2020 period, there was also an active strategic planning process that brought together dozens of organizations as part of its Advisory Committee, and engaged a wide range of stakeholders, to develop a comprehensive regional development strategic for geospatial development in the region, known as GeoFutures. Plus, T-Rex, a downtown St. Louis innovation center, established an ongoing capacity to support geospatial events, programs, and networking through its Geospatial Innovation Center and GEOINT Hub. The GEOINT Hub hosts small business collider series, hackathons, intelligence community summits, and academic/workforce development initiatives in geosciences under a Partnership Intermediary Agreement with the NGA.

This led to considerable success in raising the national and international awareness of St. Louis for geospatial intelligence activities, especially among defense-supporting contractors involved in the federal GEOINT sector. It supported the attraction and expansion of eight geospatial firms in St. Louis in response to the N2W development, adding over 600 geospatial jobs to the regional ecosystem.

A 2026 strategic re-assessment of the GeoFutures initiative endorsed continuing to champion St. Louis to build, brand and showcase the region as a global geospatial leader. It recognized that over the 2020-2025 period there was an overemphasis on branding versus ecosystem building and limited recognition that St. Louis was still early in its development as a global hub compared to other leading regions.

Still, going forward St. Louis is emphasizing the continued importance of branding and marketing, and set out the following efforts over the 2025-2028 period:

- Focus marketing on new prioritized goals and St. Louis as an important node in a larger national and global network.
- Enhance storytelling to raise the region's profile nationally and internationally.
- Develop a comprehensive, real-time catalog and showcase of ecosystem assets and initiatives for clear and efficient wayfinding purposes.
- Proactively address concerns about safety and regional reputation through success stories and real-world examples.
- Enhance community building, collaboration, and a culture of trust across the ecosystem.
- Consider a role for government affairs and policy engagement for GeoFutures.

Potential Targeted Initiatives for Growth Opportunity Areas

The cross-cutting initiatives above build the cluster's common infrastructure, talent, and market positioning, creating the enabling environment that a broad spectrum of national security or defense enterprises in Central Virginia will rely on. Under this broader structure, potential targeted initiatives provide the lens through which those horizontal investments can be focused against specific markets, anchor companies, and federal program opportunities in each of the region's primary national security growth domains, ensuring that shared assets like SCIF space, testing facilities, translational capital, and talent pipelines are aligned with clearly defined demand signals rather than deployed in a generic way.

Concretely, these growth opportunity areas map onto identifiable DoD and IC priorities such as C4ISR modernization, hypersonics and missile defense programs, electronic warfare and spectrum dominance, and emerging biodefense missions. By organizing targeted initiatives around these domains, the region can more effectively engage Rivanna Station tenants, defense primes, and relevant federal sponsors, and can systematically translate corridor-wide investments into concrete projects, contracts, and firm-level growth. Potential targeted initiatives for further exploration based around key stakeholder comments and input and grounded in the line of sight for the region are outlined below, and can serve as tactical examples of areas for the region to engage in more focused development activity leveraging the cross-cutting organizational capacity described above.

Potential Targeted Initiatives for All-Source Intelligence Analytics Platforms

- **Support for Defense AI/ML Entrepreneurs and Startups:** A potential targeted initiative can focus on building an integrated regional engine for translating UVA and Rivanna Station–aligned AI, data science, and analytics research into scalable companies that choose to anchor in the corridor and could include actions such as:

    - Establishing a dedicated AI/ML venture studio modeled on national defense startup studios, where mission-relevant research teams enter structured cohorts that provide entrepreneurial coaching, product-market fit support, and direct guidance from Rivanna Station mission owners on real problem sets and operational constraints.

    - Creating bespoke federal customer access programs that curate and de-risk introductions between early-stage intelligence analytics ventures and NGIC, DIA, NGA, and other IC program offices, closing the "valley of access" that typically prevents new entrants from breaking into classified or sensitive mission environments.

    - Creating a sponsored, recurring AI for National Security grand challenge or other defense-focused "hackathons" and competitions, which can surface high-potential teams from UVA, regional firms, and external startups, with winners receiving prioritized SBIR support, accelerator slots, and workspace offers at North Fork or Rivanna Futures.

- Over time, this combination of venture studio capacity, curated access to federal customers, and challenge-driven deal flow could be coupled with an intentional business attraction and retention strategy that offers emerging AI/ML intelligence companies clear reasons to locate engineering teams and headquarters in places like North Fork Discovery Park, explicitly seeking to replicate the path of regional firms such as of GA Intelligence which scaled from UVA-rooted startup to acquisition as a key subsidiary for a nationally significant defense contractor while remaining anchored in the region.

- **Talent Retention for Intelligence Analytics Workforce:** A potential targeted initiative can focus on systematically retaining more of UVA's data science, computer science, and related graduates, as well as existing cleared analysts, within the Defense and Intelligence Corridor and could include actions such as:

  - Building a formal Intelligence Analytics Career Pathway program that clearly lays out local career options across Rivanna Station, major primes, and regional SMEs, including typical progression, compensation benchmarks, and opportunities for research–industry hybrid roles.

  - Creating a coordinated clearance acceleration pipeline in partnership with NGIC, DIA, NGA, and regional contractors so that selected students and early-career hires can move rapidly from provisional status to fully cleared roles without losing them to Northern Virginia or other markets during long wait times.

  - Offering regionally branded retention incentives such as matching funds for student loan repayment, housing support, and early equity or profit-sharing mechanisms at high-growth firms, making local offers more competitive with Northern Virginia packages for in-demand AI, cyber, and analytics talent.

  - Developing a "stay here, work globally" narrative and set of alumni engagement strategies that position Charlottesville and the broader corridor as a place where analysts and engineers can work on national missions at military and IC customers while enjoying lower costs, stronger community ties, and a higher quality of life than in major metro defense hubs.

Potential Targeted Initiatives for High Performance Aerospace Systems and Components

- **Test Range Capabilities and Initiatives for Group 1 Drones/UAS Swarms:** A potential targeted initiative can focus on creating dedicated regional test and experimentation environments for unmanned systems, counter-UAS capabilities, and related payload and secure communications technologies to access new markets aligned with the emerging defense tech base in the region and could include actions such as:

    - Identifying and pursuing medium-sized, growing Group 1 drone platform manufacturers for significant manufacturing plant operations sited in the region via business attraction campaigns, purposefully aligning targeting to emphasize complementary platforms for existing regional companies in RF/EM applications, payload engineering, and data fusion.

    - Identifying and designating suitable parcels in northern counties (Counties of Culpeper, Fauquier, Madison, and Orange) as UAS and counter-UAS test zones, with airspace, safety, and spectrum conditions that support Group 1 and small Group 2 flight testing, swarm experimentation, and RF/electronic warfare exercises. This could include investing in modular, scalable ground infrastructure such as launch/recovery pads, instrumentation and tracking systems, and portable RF/EM assets that can support both unclassified and controlled testing campaigns for regional companies and external users.

    - Developing shared-range governance and scheduling mechanisms that allow multiple firms and researchers to use facilities while meeting DoD safety, environmental, and export control requirements, and aligning range capabilities with DIU, AFWERX, and service lab priorities in counter-UAS and autonomous systems.

    - Marketing the test complex as the "proving ground" end of the corridor for UAS, counter-UAS, and related payloads, explicitly linking it to analytic and software capabilities at Rivanna Station and UVA so that platform testing and algorithm development can occur within a single integrated regional ecosystem.

- **Classified Propulsion and Missile Laboratory and Supply Chain Development:** A potential targeted initiative can focus on turning UVA's aerospace and propulsion research strengths and the region's emerging missile/aerospace manufacturers into a coherent propulsions and advanced missile supply chain and could include actions such as:

    - Creating structured collaboration programs between UVA researchers and regional firms in propulsion, materials, and precision components so that early-stage research can transition more quickly into manufacturable concepts aligned with missile, interceptor, and hypersonic system needs.

- Coordinating with relevant service labs, DARPA, and prime contractors to align the lab's research agenda and test capabilities with documented gaps in the national advanced missile industrial base, positioning Region 9 firms as go-to suppliers in selected niches.

- Integrating existing UVA assets and regional missile component firms into the corridor's broader branding and business attraction strategy so that emerging missile and aerospace firms see Central Virginia as a viable alternative or complement to legacy missile centers, with room to grow in both classified research and production.

- **Collaboration with Broader Virginia Testing Assets and Defense Programs:** A potential targeted initiative can focus on linking Central Virginia's aerospace and defense companies to state and federal test ranges and programs that sit outside the corridor but are critical to its long-term growth and could include actions such as:

  - Establishing a structured liaison function that helps corridor firms access and navigate test and evaluation resources at facilities such as Dahlgren, Wallops, and other Virginia installations, reducing transaction costs and helping align local capabilities with statewide programs in hypersonics, missile defense, and space.

  - Creating joint demonstration projects in which components designed and manufactured in Region 9 are integrated and tested on platforms or systems at those installations, making the corridor visible as a reliable contributor to high-priority programs.

  - Advocating for Region 9 representation in statewide defense and aerospace planning bodies, ensuring that corridor infrastructure and company capabilities are considered as Virginia pursues new federal missions or large-scale defense investments.

Potential Targeted Initiatives for Defense Electronics and Payload Engineering

- **Shared-Use Facilities for Defense Electronics Hardware Testing and Integration:** A potential targeted initiative can focus on building shared infrastructure that lowers barriers for defense electronics and payload engineering firms to prototype, test, and qualify new systems and could include actions such as:

  - Developing a multi-tenant defense electronics test and integration center as a key element of the proposed Defense Tech Accelerator that includes RF anechoic space, EMC test capability, hardware-in-the-loop simulation environments, and environmental test assets tailored to the needs of radar, EW, SIGINT, and payload subsystems.

  - Structuring facility governance and security to accommodate both unclassified and CUI work, allowing SMEs that cannot independently invest in full CMMC-compliant labs to undertake defense-relevant projects in a trusted shared environment.

  - Embedding graduate research and capstone design projects from UVA's ECE, physics, and systems engineering programs into shared use facility operations, so that students gain

hands-on experience with defense electronics hardware and local firms benefit from a steady pipeline of technically prepared talent.

  - Positioning the ecosystem as a natural "landing spot" for small and mid-sized defense electronics suppliers, including those currently clustered in Northern Virginia or other metros, by combining access to test infrastructure with proximity to Rivanna Station and lower operating costs.

- **Applied Research Capacity for Platform Technologies:** A potential targeted initiative can focus on expanding the region's applied research and prototyping capacity in cyber-physical and autonomous systems that sit at the intersection of software, electronics, and platforms and could include actions such as:

  - Standing up a dedicated applied research group co-located with North Fork or Rivanna Futures, staffed by full-time research engineers and scientists who bridge UVA's cyber-physical, robotics, and control systems faculty strengths with the rapid response timelines and integration needs of defense customers.

  - Pursuing a portfolio of multiyear applied research programs with DoD sponsors in areas such as swarm autonomy, resilient communications, and cyber-resilient platforms, explicitly designed to produce transition-ready technologies for regional firms.

  - Creating joint test and demonstration campaigns that use the northern test ranges, shared electronics facilities, and Rivanna Station partnerships to evaluate new concepts in realistic operational environments.

Potential Targeted Initiatives for Cybersecurity Solutions and Critical Infrastructure Resilience

- **Regional CMMC Compliance and OT/ICS Cybersecurity Support:** A potential targeted initiative can focus on turning a current gap in CMMC readiness and demand for OT/ICS security capabilities into a regional advantage and could include actions such as:

  - Building a centralized CMMC and cyber compliance support center at UVA or within the corridor that provides advisory services, templates, and shared technical capabilities to help SMEs and research groups achieve and maintain required certification levels.

  - Expanding UVA's cyber research and education programs to include dedicated OT/ICS and critical infrastructure security tracks aligned with the needs of defense manufacturers, utilities, and other infrastructure operators in and beyond Region 9.

  - Creating demonstration environments that mirror real industrial control systems and defense-relevant OT networks, where students, researchers, and companies can develop and test defensive technologies.

- Marketing the corridor as a place where defense suppliers can find both talent and shared services to meet rising security and compliance requirements, reducing frictions that elsewhere limit smaller firms' ability to participate in defense supply chains.

Potential Targeted Initiatives for Biosecurity and Dual-Use Population Health Intelligence

- **Collaborative Biosecurity and Population Health Intelligence Platforms:** A potential targeted initiative can focus on leveraging UVA's Biocomplexity Institute and related biosciences assets to build a dual-use biosecurity and health intelligence niche within the corridor and could include actions such as:

  - Formalizing joint research programs between the Biocomplexity Institute, NSDPI, regional health systems, and Rivanna Station agencies focused on computational biosurveillance, pathogen evolution modeling, and health-related early warning systems.

  - Creating shared, secure data environments and analytic platforms that allow cross-sector use of de-identified health and environmental data to support biosecurity and resilience applications, while respecting privacy and regulatory requirements.

  - Launching partnership programs and pilot projects that apply these tools to real-world problems such as pandemic preparedness, biodefense, and supply chain resilience in pharmaceuticals and critical medical products. In particular, the formalized joint research programs should seek to partner with Astrazeneca's new site location and UVA's Manning Institute to identify industry use cases related to pharmaceutical manufacturing supply chains that might provide further industry crossover applications.

Implementation Recommendations: Coordinating Organizational Functions

Across engagement with regional stakeholders, feedback and input coalesces around the need for two complementary, coordinated organizational functions. Today, no single existing entity is positioned to both drive sector-specific innovation in biosciences and defense/intelligence and simultaneously manage regional business attraction, county alignment, and infrastructure. The recommended model therefore establishes a dual structure: a cross-cutting innovation function focused on strategic clusters, and an expanded regional economic development function focused on ecosystem coordination and place (Figure 26).

Figure 26.

STAKEHOLDER FEEDBACK INDICATES NEED FOR COMPLEMENTARY ORGANIZATIONAL FUNCTIONS

A Cross-Cutting Focus on Innovation, Life Sciences, Digital and National Security

- Sector-Specific Innovation Support
- Accelerators
- Venture Development (Fund)
- Affinity Groups
- High-Level Strategy
- Talent Attraction and Placement
- Networking

A Focus on Regional Economic Development and Coordination

- Marketing/Storytelling
- Business Attraction and Site Development
- Coordination/Consistency Across Counties and Policy Alignment
- Mega-Project Coordination
- Workforce Pipeline Development
- Regional Infrastructure Advocacy (Housing, Infrastructure, Transportation)

Dual structure addresses both regional competitiveness AND sector-specific innovation gaps.

Source: TEConomy Partners, LLC.

The first function is a cross-cutting platform for innovation in biosciences, digital technologies, and national security. Its core purpose is to turn the region's research, federal, and corporate anchors into a sustained engine of venture creation, growth, and specialized talent development and attraction. To do this, the innovation function would provide sector-specific innovation support, including targeted accelerators tailored to defense/intel technologies and related digital and data infrastructure. It would steward a venture development platform (potentially including a dedicated fund or aligned capital vehicles) to address current gaps in early- and growth-stage financing for relevant companies.

Beyond capital, this entity would convene and cultivate affinity groups and cluster councils that connect firms, researchers, investors, and support organizations around shared challenges and opportunities. It would be responsible for high-level innovation strategy, such as tracking pipeline opportunities, identifying cross-sector synergies, and brokering partnerships with UVA, federal agencies, and corporate anchors. A further role would be focused talent attraction and placement for startups and scale-ups, especially around entrepreneurial leadership, technical executives, and specialized scientific or security-cleared roles. Conceptually, stakeholders saw this function as a natural evolution and expansion of the existing model of CvilleBioHub, with the creation of a broader corridor-wide mandate to cover additional sectors and potentially spin up biosciences and national defense-related subsidiary organizations.

Another approach could be to strengthen the Central Virginia National Security Alliance (formerly the Defense Affairs Committee) within CVPED. While this organization has been in existence since 2009, it has gone through several organizational shifts and has only recently begun to focus on regional economic growth in the defense and national security sectors.

The second function centers on regional economic development and coordination, anchored in an expanded role for the Central Virginia Partnership for Economic Development (CVPED). Its primary mandate is to ensure that the Innovation Corridor competes effectively for investment and that growth occurs in a coherent, region-serving way across local jurisdictions. This function would lead marketing and storytelling for the region, managing a unified brand and narrative that highlights anchor assets, sector strengths, and quality-of-life advantages. It would also own proactive business attraction and site development (e.g., packaging regional sites, aligning incentive tools, and serving as the front door for major prospects) in partnership with localities and the state.

Equally important, the expanded function would coordinate policy and practice across counties and cities. This includes working toward common standards and expectations on zoning, permitting, data center and industrial policies, and other regulatory issues that currently vary and can create uncertainty for investors. It would convene and facilitate mega-project coordination, bringing together large industrial, biosciences, data center, and federal investments to address shared needs around construction labor, infrastructure capacity, and phasing. In the talent arena, the regional function would work with educational institutions and employers to align workforce pipelines, especially in skilled trades, technical operations, and mid-skill roles critical to both data centers and advanced manufacturing.

Implementing the Central Virginia Innovation Corridor Strategy

Organizational Model Options for Consideration

Regional leadership should consider organizational paths for advancing the Central Virginia Innovation Corridor, initial discussions have centered around two options for the near-term. The first largely reflects the current ecosystem and would emphasize strengthening and better resourcing existing organizations, while the second would establish the Innovation Corridor itself as a more explicit organizing platform for regional coordination and strategy execution.

Option 1: Loose Federation of Existing Organizations Driving Organic Regional Development

Under this approach, Central Virginia would continue to operate through a distributed network of partnering organizations that each lead within their existing missions, with stronger alignment around the shared strategic roadmap. CVPED would continue to serve as the principal regional economic development platform focused on business attraction, regional coordination, county alignment, and broader ecosystem development, while CvilleBioHub would continue leading biosciences-related strategy and cluster-building activities.

A central implication of this option is that the national security and defense function could not remain in its current form if the region expects to execute the report's recommendations at meaningful scale. Instead, the CVNSA, would need to be reimagined as a significantly more capable and better-resourced defense ecosystem organization with an expanded regional mandate, stronger staffing and programming capacity, and independent governance, while still remaining affiliated with CVPED as a host or sponsoring partner.

This model has the advantage of requiring less structural change and may be the most practical near-term path if regional leaders prefer to build from organizations that already have credibility, relationships, and operating history. At the same time, it would only partially address stakeholder interest in a stronger central coordinating mechanism for the full Innovation Corridor, and it may continue to rely on informal alignment across organizations unless roles, interfaces, and shared accountability are made more explicit.

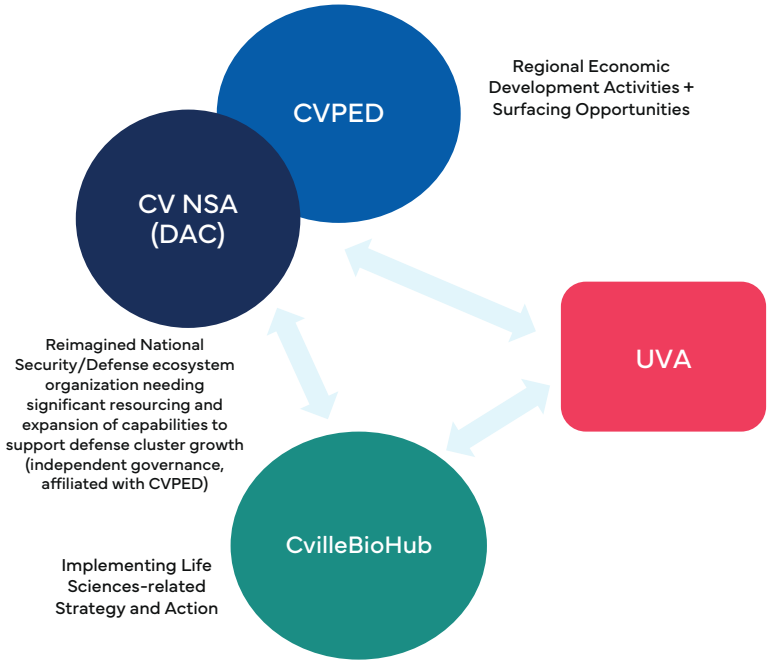
In practice, this option would work best if leadership formalizes a light but durable coordination framework across the participating entities. That could include shared strategic priorities, frequent executive coordination, clear division of labor on branding and implementation, and agreed mechanisms for joint planning around cross-cutting issues such as talent, placemaking, major project coordination, and university engagement.

Figure 27.

POTENTIAL ORGANIZATIONAL STRUCTURE 1: LOOSE FEDERATION OF EXISTING ORGANIZATIONS DRIVING ORGANIC REGIONAL DEVELOPMENT (CURRENT ECOSYSTEM)

Potential Advantages
Requires lower levels of organizational change from current dynamics
Helps create and resource needed defense-related industry group to drive momentum

Potential Disadvantages
Only partially addresses stakeholder desire for central coordinating mechanisms
Uncertain ability to drive long-term growth at scale or present unified regional value proposition
Potential fragmentation/duplication of functions and resourcing



Source: TEConomy Partners, LLC.

Option 2: Innovation Corridor as an Organizing Construct

The second option would move beyond a loosely coordinated network and establish the Innovation Corridor as a clearer organizing construct for the region's innovation-led development agenda. In this model, the Corridor would serve not only as a unified brand and messaging platform, but also as a central mechanism for coordination across cluster development, regional storytelling, partnership-building, and selected implementation functions.

As discussions have evolved, this option may be strongest if the Innovation Corridor is ultimately stood up as its own organization. One path would be to establish an independent Innovation Corridor organization with its own executive director, board, and governance structure, while affiliated with CVPED, which could serve as the host or sponsoring organization during formation and early-stage operations.

Within this structure, CVPED would continue to play a critical regional economic development role, particularly around business attraction, local government coordination, and broader regional competitiveness. The Innovation Corridor organization, however, would provide the focal point for shared regional branding, strategic coordination, and alignment across the region's priority clusters, while working closely with partner entities such as CvilleBioHub and CVNSA, each of which would continue to lead sector-specific strategies and actions, as well as importantly, with UVA as the region's anchor innovation driving institution.

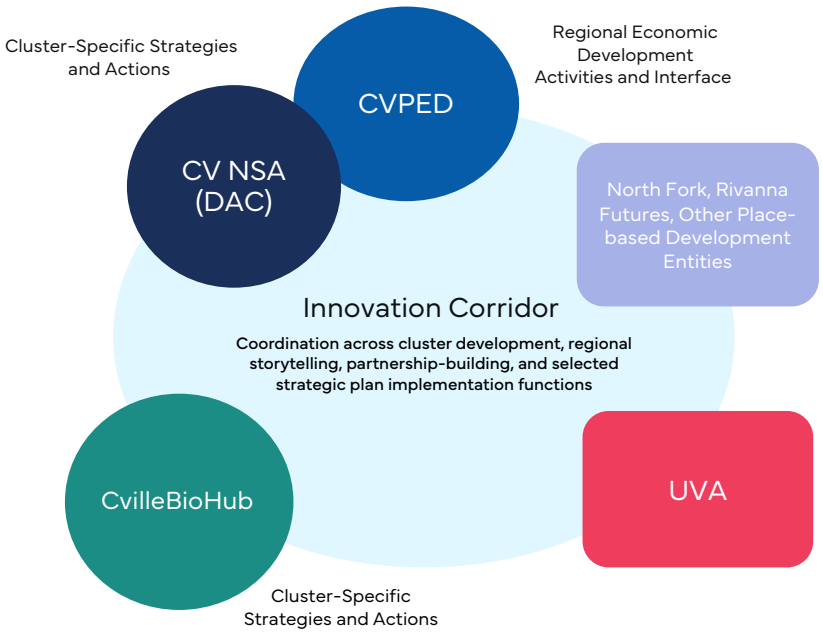
This option more directly responds to stakeholder feedback that the region lacks a visible organizational home for the Innovation Corridor and a consistent mechanism to coordinate activity across jurisdictions and sectors. It also offers a stronger platform for presenting a unified regional value proposition to investors, companies, talent, and external partners, although it would require greater buy-in, clearer governance, and more intentional agreement on roles, responsibilities, and resourcing among participating organizations.

Figure 28.

POTENTIAL ORGANIZATIONAL STRUCTURE 2: INNOVATION CORRIDOR AS AN ORGANIZING CONSTRUCT

Potential Advantages
Coordinated regional brand/messaging
Addresses stakeholder desire for central coordinating mechanism
Allows for sector-specific strategies/ actions leveraging broader regional capabilities and know-how • CvilleBioHub • CV National Security Alliance (affiliated partner of CVPED with independent governance)

Potential Disadvantages
Requires buy-in to shared coordination/ vision from regional stakeholders
Requires explicit coordination of roles/ responsibilities across partners



Source: TEConomy Partners, LLC.

These two options offer the region viable near-term paths, not necessarily fixed blueprints. The first offers a lower-change model that builds from the current ecosystem but depends on significantly strengthening the defense-focused organizational capacity through a reimagined CVNSA; the second offers a more intentional regional structure centered on the Innovation Corridor itself, potentially through a new affiliated organization with independent governance and a dedicated coordinating mandate. In either case, the key implementation consideration is less whether functions are entirely centralized and more whether the region clearly assigns ownership for cluster development, regional coordination, branding, and cross-jurisdictional execution.

Conclusion

Central Virginia now has the assets, momentum, and institutional depth to compete for nationally relevant growth in biosciences and national security, but converting that potential into sustained economic gains will require more intentional coordination, clearer organizational ownership, and continued investment in the ecosystem functions that make innovation scalable. Region 9 should not try to be general in its cluster development approach; instead, it should concentrate on the specific market and technology domains identified in this report where research excellence, industry momentum, and mission-driven demand intersect, while strengthening workforce pathways, commercialization support, infrastructure, branding, and cross-jurisdictional alignment so that promising firms, talent, and investments can stay, grow, and compound in Central Virginia.

Appendix

Industry Cluster Definitions

The following figures provide the detailed NAICS-based industry definitions and major subsectors utilized in this report for GO Virginia Region 9.

Figure A-1.

DEFINITION OF GO VA REGION 9'S NATIONAL SECURITY AND DEFENSE INDUSTRY

Federal Government

Military

- Includes active duty, reservists, and National Guard (non-QCEW)

Civilian National Security

- 928110 National Security

Private Sector

R&D and Engineering Services

- 541330 Engineering Services
- 541690 Other Scientific and Technical Consulting Services
- 54171 R&D in the Physical Sciences (excluding Life Sciences)

Aerospace Manufacturing

- 334511 Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
- 336415 Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing
- 336413 Other Aircraft Parts and Auxiliary Equipment Manufacturing
- 336414 Guided Missile and Space Vehicle Manufacturing
- 336411 Aircraft Manufacturing
- 336412 Aircraft Engine and Engine Parts Manufacturing
- 336419 Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing

Munitions Manufacturing

- 332994 Small Arms, Ordnance, and Ordnance Accessories Manufacturing
- 332992 Small Arms Ammunition Manufacturing
- 332993 Ammunition (except Small Arms) Manufacturing

Figure A-2.

DEFINITION OF GO VA REGION 9'S INFORMATION TECHNOLOGY INDUSTRY

IT/Tech Services

- 541511 Custom Computer Programming Services
- 541512 Computer Systems Design Services
- 541519 Other Computer Related Services
- 516210 Media Streaming Distribution Services, Social Networks, and Other Media Networks and Content Providers
- 811210 Electronic and Precision Equipment Repair
- 423430 Computer and Computer Peripheral Equipment and Software Merchant Wholesalers
- 611420 Computer Training and Maintenance
- 541513 Computer Facilities Management Services

Electronics Manufacturing

- 3344 Semiconductor and Other Elec. Component Mfg
- 334515 Instrument Mfg for Meas. and Testing Electricity and Electrical Signals
- 334310 Audio and Video Equipment Mfg
- 3342 Communications Equipment Mfg
- 334514 Totalizing Fluid Meter and Counting Device Mfg (47)
- 334513 Instruments and Rel. Products Mfg for Measuring, Displaying, and Controlling Industrial Process Variables
- 3341 Computer and Peripheral Mfg
- 334512 Auto Environmental Control Mfg for Residential, Commercial, and Appliance Use
- 334519 Other Measuring and Controlling Device Mfg
- 334610 Mfg and Reproducing Magnetic and Optical Media
- 333242 Semiconductor Machinery Mfg

Software

- 513210 Software Publishers

Computing/Data Infrastructure, Advanced Telecommunications, and Internet Services Providers

- 518210 Computing Infrastructure Providers, Data Processing, Web Hosting, and Related Services
- 519290 Web Search Portals and All Other Information Services
- 517810 All Other Telecommunications
- 517121 Telecom Resellers
- 517410 Satellite Telecommunications

Figure A-3.

DEFINITION OF GO VIRGINIA REGION 9'S BIOSCIENCES INDUSTRY

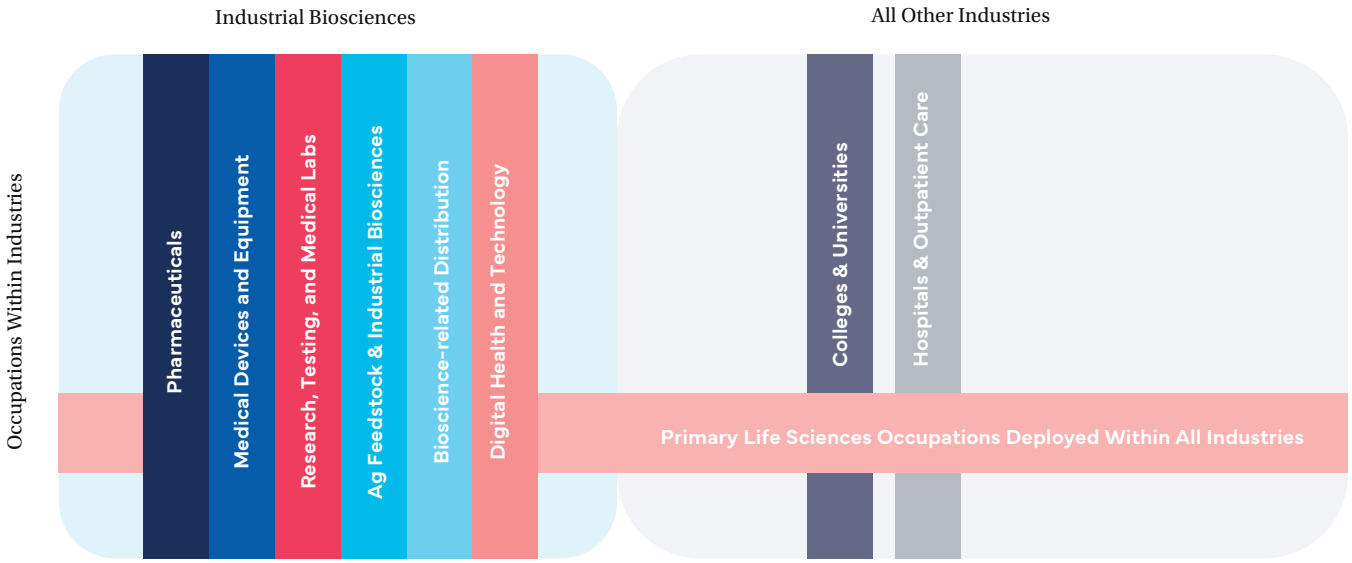


Table A-1.

DEFINING THE BIOSCIENCES INDUSTRY—NAICS-BASED INDUSTRY DEFINITION

Biosciences Industry Subsector	NAICS Code	NAICS Description
Agricultural Feedstock & Industrial Biosciences	311221	Wet Corn Milling
	311224	Soybean and Other Oilseed Processing
	325193	Ethyl Alcohol Manufacturing
	325311	Nitrogenous Fertilizer Manufacturing
	325312	Phosphatic Fertilizer Manufacturing
	325314	Fertilizer (Mixing Only) Manufacturing
	325315	Compost Manufacturing
	325320	Pesticide and Other Agricultural Chemical Manufacturing
Bioscience-related Distribution	423450*	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers
	424210*	Drugs and Druggists' Sundries Merchant Wholesalers
	424910*	Farm Supplies Merchant Wholesalers
Medical Devices & Equipment	334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
	334516	Analytical Laboratory Instrument Manufacturing
	334517	Irradiation Apparatus Manufacturing
	339112	Surgical and Medical Instrument Manufacturing
	339113	Surgical Appliance and Supplies Manufacturing
	339114	Dental Equipment and Supplies Manufacturing
Pharmaceuticals	325411	Medicinal and Botanical Manufacturing
	325412	Pharmaceutical Preparation Manufacturing
	325413	In-Vitro Diagnostic Substance Manufacturing
	325414	Biological Product (except Diagnostic) Manufacturing
Research, Testing, & Medical Laboratories	541380*	Testing Laboratories
	541713*	Research and Development in Nanotechnology
	541714	Research and Development in Biotechnology (except Nanobiotechnology)
	541715*	Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology)
	621511	Medical Laboratories
Colleges & Universities	611310**	Colleges, Universities, and Professional Schools
Hospitals & Healthcare	621410**	Family Planning Centers
	621420**	Outpatient Mental Health and Substance Abuse Centers
	621491**	HMO Medical Centers
	621492**	Kidney Dialysis Centers
	621493**	Freestanding Ambulatory Surgical and Emergency Centers
	621498**	All Other Outpatient Care Centers
	621512**	Diagnostic Imaging Centers
	621991**	Blood and Organ Banks
	621999**	All Other Miscellaneous Ambulatory Health Care Services
	622110**	General Medical and Surgical Hospitals
	622210**	Psychiatric and Substance Abuse Hospitals
	622310**	Specialty (except Psychiatric and Substance Abuse) Hospitals
Digital Health	N/A***	N/A

*Note: Includes only the portion of these industries engaged in relevant life sciences activities
**Note: Includes only the portion of these sectors engaged in relevant life sciences activities, focused on clinical and life sciences scientific R&D-related personnel (i.e., non-clinical and excluding core teaching faculty).
***Note: Digital Health companies identified and employment data estimated through additional sources, including PitchBook, SBIR/STTR databases, Hoovers D&B, CvilleBioHub.

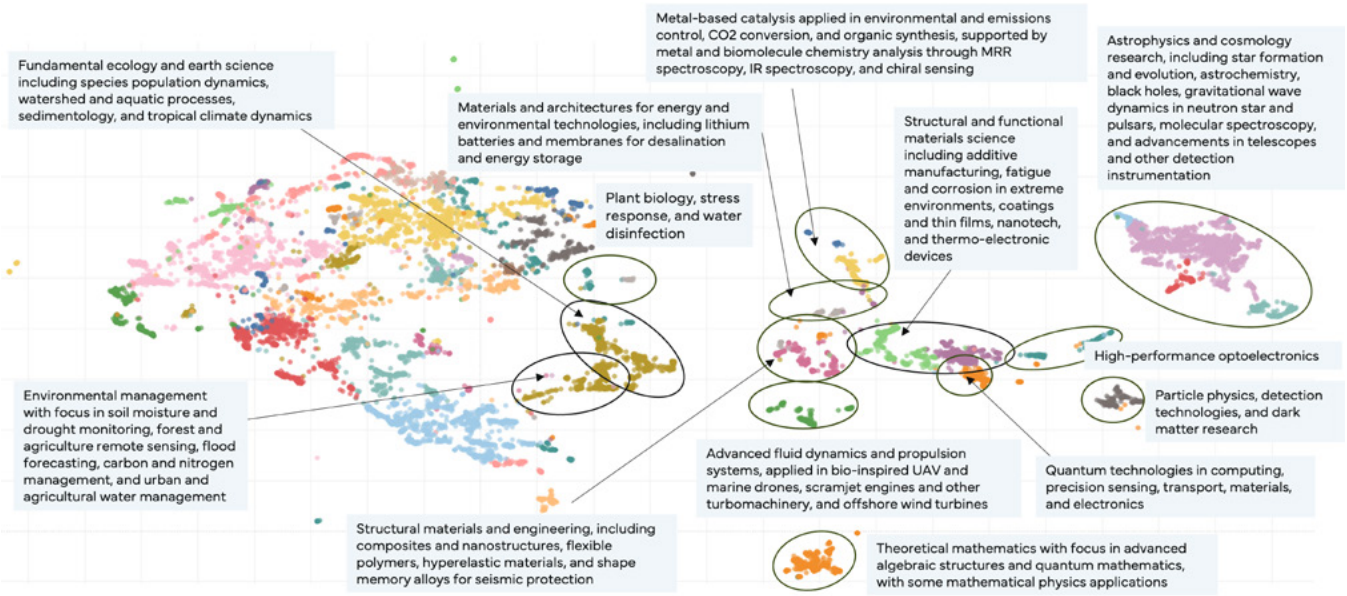
Detailed "Landscape" Graphics

The following provide further selected details in support of the identification of university research competencies and the region's technology "push".

Figure A-4.

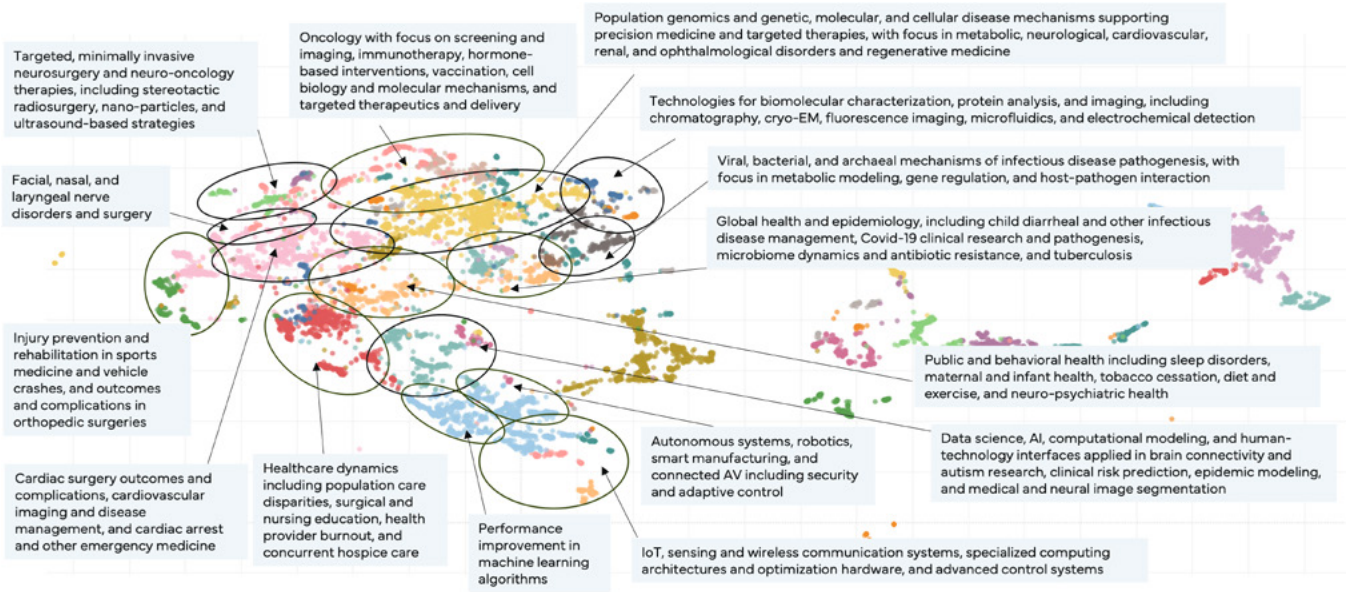
LANDSCAPE PERSPECTIVE OF BROAD THEMATIC AREAS ACROSS CENTRAL VIRGINIA RESEARCH PUBLICATIONS, 2019-2025 (ENHANCED DETAILED VERSION)

[Detailed Themes, 1 of 2]



Source: TEConomy's analysis of Clarivate Web of Science Publications.

[Detailed Themes, 2 of 2]

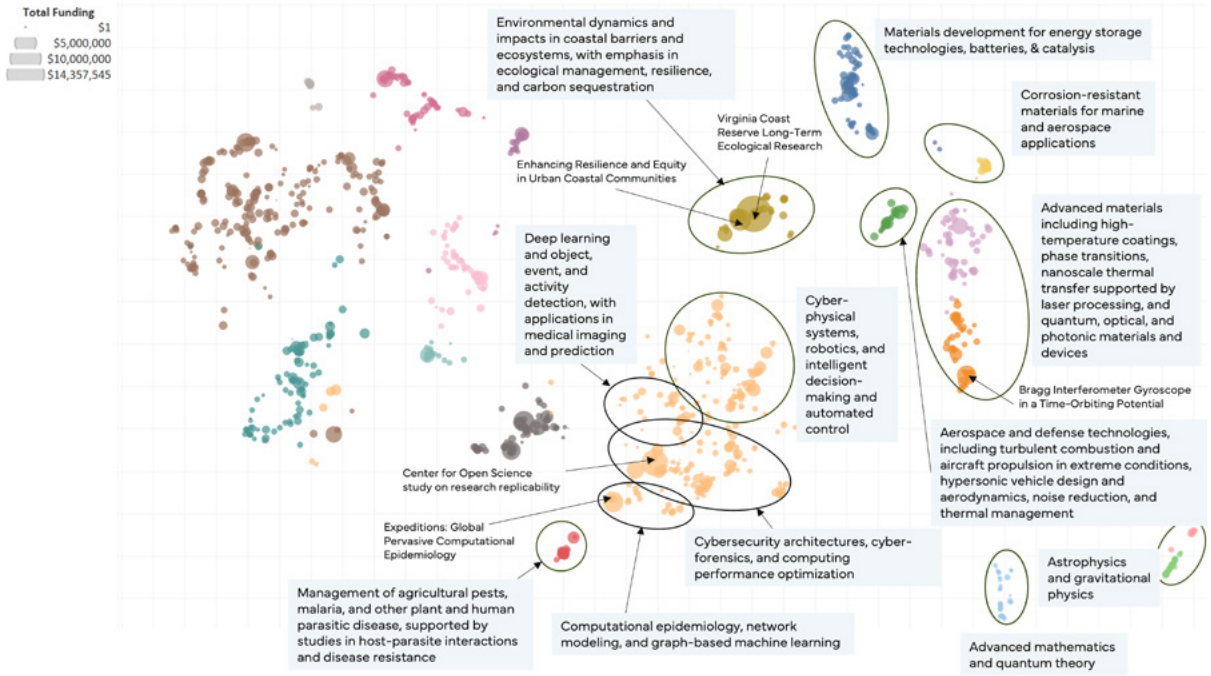


Source: TEConomy's analysis of Clarivate Web of Science Publications.

Figure A-5.

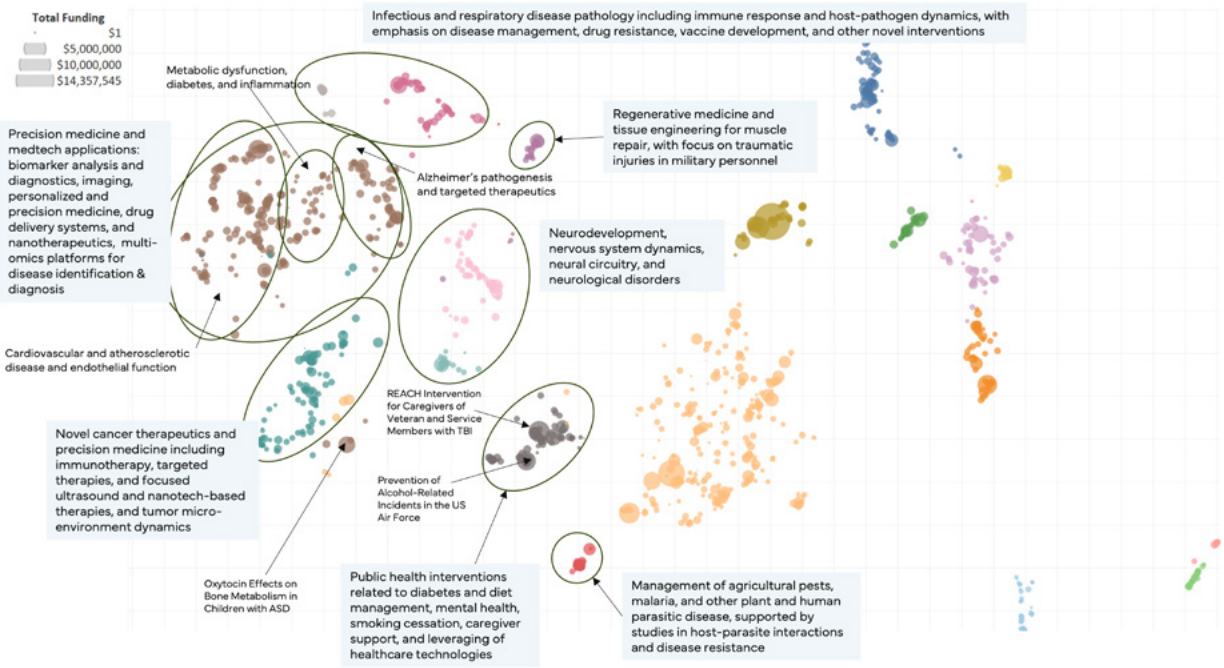
LANDSCAPE OF BROAD THEMES WITHIN RESEARCHER-LED PROJECT GRANTS IN CENTRAL VIRGINIA ACTIVE FROM 2019-2025 (ENHANCED DETAILED VERSION)

[Detailed Themes, 1 of 2]



Source: TEConomy's analysis of NIH RePorter, NSF, USDA CRIS, and DoD DTIC awarded grants data.

[Detailed Themes, 2 of 2]



Source: TEConomy's analysis of NIH RePorter, NSF, USDA CRIS, and DoD DTIC awarded grants data.


TECONOMY
PARTNERS LLC