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Department of Education

# Cybersecurity Careers for Everyone

Webinar for School  
Counselors



UNIVERSITY OF MARYLAND  
GLOBAL CAMPUS



NATIONAL CRYPTOLOGIC MUSEUM FOUNDATION  
CYBER CENTER FOR EDUCATION & INNOVATION

★ HOME OF THE NATIONAL CRYPTOLOGIC MUSEUM ★



Welcome!

Mark Loepker  
Education Program Manager  
Cyber Center for Education & Innovation –  
Home of the National Cryptologic Museum  
Foundation



MARYLAND STATE  
**Department of Education**



“Thank You” to  
our Sponsor!

# Webinar Guests

Dr. Loyce Pailen, Senior Director,  
Center for Cybersecurity Studies,  
UMGC

Dr. Greg von Lehmen, Special  
Assistant to the President,  
Cybersecurity UMGCC

Jeffrey Smith, Targeted  
Populations Grant Program  
Manager, Maryland Department  
of Labor



# Key Questions

What is cybersecurity?

What are cybersecurity work roles?

Where can I get detailed information about employment opportunities in cybersecurity?

What are some pathways to cybersecurity jobs?

Concluding take-aways



# During the Presentations



Please submit your questions through the chat



We look forward to addressing them in the Q/A!



# The NICE Cybersecurity Workforce Framework

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Dr. Loyce Pailen

A network diagram background consisting of numerous blue circular nodes connected by thin, light blue lines, forming a complex web-like structure. The nodes are distributed across the right side of the slide, with some appearing more prominent than others.

# The World We Live In

“Former National Cybersecurity Center director Rob Beckstrom summarized it this way: (i) anything connected to the internet can be hacked, (ii) everything is being connected to the internet, (ii) as a result, everything is becoming vulnerable.”

From Bruce Schneier, *Click Here to Kill Everybody*. New York: Norton & Company (2018), p. 19

**COVID-19 Complication: Ransomware Keeps Hitting Healthcare**  
 Cybercrime Continues Despite Pandemic Intensifying

Mathew J. Schwartz | [Security](#) | March 16, 2020

Twitter Facebook LinkedIn Credit Engine Get Permission

FA30D-Readme - Notepad  
 File Edit Format View Help  
 M!!  
 Your files are encrypted.  
 All encrypted files for this computer has extension: .fa30d  
 ---  
 If for some reason you read this text before the encryption ended,  
 this can be understood by the fact that the computer slows down,  
 and your heart rate has increased due to the ability to turn it off,  
 then we recommend that you move away from the computer and accept that you have been compro  
 rebooting/shutdown will cause you to lose files without the possibility of recovery and eve  
 it could be files on the network belonging to other users, sure you want to take that respo  
 ---  
 Our encryption algorithms are very strong and your files are very well protected, you can't

**Vox** RECODE EXPLAINERS THE HIGHLIGHT FUTURE PERFECT THE GOODS POLITICS & POLICY MORE

**Russia hacked voting systems in 39 states before the 2016 presidential election**

This goes way deeper than we first thought.

By Alex Ward | [@AlexWardVox](#) | [alex.ward@vox.com](#) | Jun 13, 2017, 2:00pm EDT

MIT Technology Review Topics Magazine Newsletters

**Zoom is facing questions about how private or secure it really is**

Zoom has rapidly become the video-conferencing platform of choice as people stay home during the coronavirus pandemic. Now it's under pressure.



MIT Technology Review

Computing Feb 10

**The US says the Chinese military hacked Equifax. Here's how.**



# Cybersecurity?

# Cybersecurity?

Generally speaking, cybersecurity is concerned with an organization's ability to protect its data and networks, to rebound quickly if networks are compromised, and to operate networks in a manner that respects legal rights and ethical considerations.

The cybersecurity workforce includes both technical and non-technical professionals who contribute to cybersecurity-related aspects of organizations.<sup>1</sup>

**1. Foundational Resource:** National Initiative for Cybersecurity Education Cybersecurity Workforce Framework (SP NIST 800-181)

<https://www.nist.gov/itl/applied-cybersecurity/nice/resources/nice-cybersecurity-workforce-framework>



# NICE Framework Categories

<https://niccs.us-cert.gov/workforce-development/cyber-security-workforce-framework>



## Analyze

Performs highly-specialized review and evaluation of incoming cybersecurity information to determine its usefulness for intelligence.



## Collect and Operate

Provides specialized denial and deception operations and collection of cybersecurity information that may be used to develop intelligence.



## Investigate

Investigates cybersecurity events or crimes related to information technology (IT) systems, networks, and digital evidence.



## Operate and Maintain

Provides the support, administration, and maintenance necessary to ensure effective and efficient information technology (IT) system performance and security.



## Oversee and Govern

Provides leadership, management, direction, or development and advocacy so the organization may effectively conduct cybersecurity work.



## Protect and Defend

Identifies, analyzes, and mitigates threats to internal information technology (IT) systems and/or networks.



## Securely Provision

Conceptualizes, designs, procures, and/or builds secure information technology (IT) systems, with responsibility for aspects of system and/or network development.



# Categories to Specialty Areas

	<b>Analyze</b> Performs highly-specialized review and evaluation of incoming cybersecurity information to determine its usefulness for intelligence.	Specialty Areas ▾
	<b>Collect and Operate</b> Provides specialized denial and deception operations and collection of cybersecurity information that may be used to develop intelligence.	Specialty Areas ▾
	<b>Investigate</b> Investigates cybersecurity events or crimes related to information technology (IT) systems, networks, and digital evidence.	Specialty Areas ▲
	<b>→ Cyber Investigation</b> Applies tactics, techniques, and procedures for a full range of investigative tools and processes to include, but not limited to, interview and interrogation techniques, surveillance, counter surveillance, and surveillance detection, and appropriately balances the benefits of prosecution versus intelligence gathering.	
	<b>→ Digital Forensics</b> Collects, processes, preserves, analyzes, and presents computer-related evidence in support of network vulnerability mitigation and/or criminal, fraud, counterintelligence, or law enforcement investigations.	

<https://niccs.us-cert.gov/workforce-development/cyber-security-workforce-framework>

# Specialty Area to Work Roles & KSAs

Example: Cyber Crime Investigator

	ENTRY	INTERMEDIATE	ADVANCED
CONTINUOUS LEARNING	<p><b>Recommended:</b> N/A</p> <p><b>Examples:</b> N/A</p>	<p><b>Recommended:</b> Not essential but may be beneficial</p> <p><b>Examples:</b> 40 hours annually (may include mentoring, shadowing, conferences, webinars, or rotations)</p>	<p><b>Recommended:</b> Not essential but may be beneficial</p> <p><b>Examples:</b> 40 hours annually (may include mentoring, shadowing, conferences, webinars, or rotations)</p>
EDUCATION	<p><b>Recommended:</b> No (not an Entry-level Work Role)</p> <p><b>Example Types:</b> N/A</p> <p><b>Example Topics:</b> N/A</p>	<p><b>Recommended:</b> Not essential but may be beneficial</p> <p><b>Example Types:</b> Bachelor's</p> <p><b>Example Topics:</b> Computer science, cybersecurity, information technology, software engineering, information systems, computer engineering</p>	<p><b>Recommended:</b> Not essential but may be beneficial</p> <p><b>Example Types:</b> Bachelor's</p> <p><b>Example Topics:</b> Computer science, cybersecurity, information technology, software engineering, information systems, computer engineering</p>

Abilities
Knowledge
Skills
Tasks
Capability Indicators

# Non-technical Cybersecurity Work Role Examples

## Cyber Legal Advisor (OV-LGA-001)

Provides legal advice and recommendations on relevant topics related to cyber law.

### Abilities

- **A0046:** Ability to monitor and assess the potential impact of emerging technologies on laws, regulations, and/or policies.

### Knowledge

### Skills

### Tasks

## Cyber Workforce Developer and Manager (OV-SPP-001)

Develops cyberspace workforce plans, strategies, and guidance to support cyberspace workforce manpower, personnel, training and education requirements and to address changes to cyberspace policy, doctrine, materiel, force structure, and education and training requirements.

## Multi-Disciplined Language Analyst (AN-LNG-001)

Applies language and culture expertise with target/threat and technical knowledge to process, analyze, and/or disseminate intelligence information derived from language, voice and/or graphic material. Creates and maintains language-specific databases and working aids to support cyber action execution and ensure critical knowledge sharing. Provides subject matter expertise in foreign language-intensive or interdisciplinary projects.

# Who should reference the NICE Framework?



Educators and school counselors



Employers



Job seekers



Students



Mid-Career changers



Policy makers



Technology Developers



Training and Certification Providers





# Cyberseek

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Dr. Greg von Lehmen

A network diagram background consisting of numerous small blue circular nodes connected by thin, light blue lines, forming a complex web-like structure. The nodes are distributed across the right side of the image, with some appearing more prominent than others.

# Market Demand & Career Paths

<https://www.cyberseek.org/>

Hack the Gap: Close the cybersecurity talent gap with interactive tools and data

[Go to tools](#)

## About this tool

Cybersecurity workers protect our most important and private information, from bank accounts to sensitive military communications. However, there is a dangerous shortage of cybersecurity workers in the United States that puts our digital privacy and infrastructure at risk.

From April 2017 through March 2018, there were 122,000 openings for Information Security Analysts, but only 105,000 workers currently employed in those positions - an annual talent shortfall of 17,000 workers for cybersecurity's largest job.

There are nearly 200,000 additional openings requesting cybersecurity-related skills, and employers are struggling to find workers who possess them. Jobs requesting public cloud security skills, for example, remain open 79 days on average - longer than almost any other IT skill.

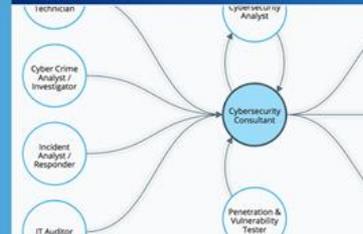
**To help close the cybersecurity skills gap, CyberSeek provides detailed, actionable data about supply and demand in the cybersecurity job market.**

### Interactive Map



A heat map of cybersecurity supply and demand

### Career Pathway



An interactive career pathway showing common roles within cybersecurity and transition opportunities between them



# What Cyberseek Provides

- **The number of cybersecurity Job openings in the US** over a given time period
- Common **job titles** for cybersecurity-related work
  - mapped to the NICE Framework Categories
- Information about **job requirements**; e.g. industry certifications
- Salaries
- **Career pathways**: how one job can lead to more advanced positions in the market



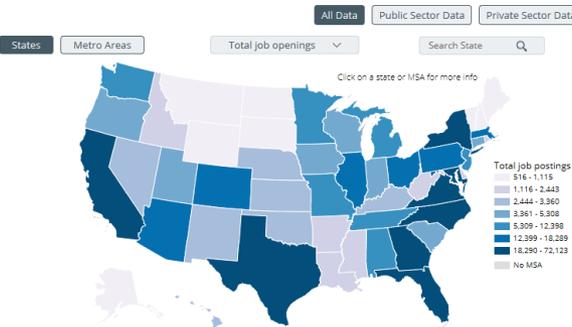
# Using the Heatmap: National Market Demand

<https://www.cyberseek.org/heatmap.html>

## Cybersecurity Supply/Demand Heat Map

Cybersecurity talent gaps exist across the country. Closing these gaps requires detailed knowledge of the cybersecurity workforce in your region. This interactive heat map provides a granular snapshot of demand and supply data for cybersecurity jobs at the state and metro area levels, and can be used to grasp the challenges and opportunities facing your local cybersecurity workforce.

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## National level

### TOTAL CYBERSECURITY JOB OPENINGS

504,316

### TOTAL EMPLOYED CYBERSECURITY WORKFORCE

997,058

### SUPPLY OF CYBERSECURITY WORKERS

Very Low  
CYBERSECURITY WORKFORCE  
SUPPLY/DEMAND RATIO



### GEOGRAPHIC CONCENTRATION

Average  
LOCATION QUOTIENT



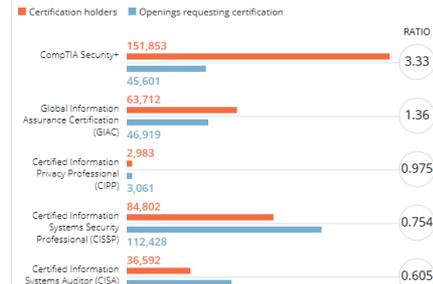
### TOP CYBERSECURITY JOB TITLES

- Cyber Security Engineer
- Cyber Security Analyst
- Network Engineer / Architect
- Cyber Security Consultant
- Cyber Security Manager / Administrator
- Systems Engineer
- Vulnerability Analyst / Penetration Tester
- Software Developer / Engineer
- Cyber Security Specialist / Technician

### JOB OPENINGS BY NICE CYBERSECURITY WORKFORCE FRAMEWORK CATEGORY



### CERTIFICATION HOLDERS / OPENINGS REQUESTING CERTIFICATION

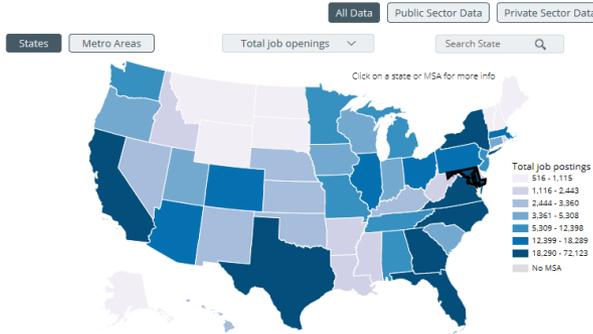


# Demand in Maryland

## Cybersecurity Supply/Demand Heat Map

Cybersecurity talent gaps exist across the country. Closing these gaps requires detailed knowledge of the cybersecurity workforce in your region. This interactive heat map provides a granular snapshot of demand and supply data for cybersecurity jobs at the state and metro area levels, and can be used to grasp the challenges and opportunities facing your local cybersecurity workforce.

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## Maryland

### TOTAL CYBERSECURITY JOB OPENINGS

20,516

### TOTAL EMPLOYED CYBERSECURITY WORKFORCE

45,412

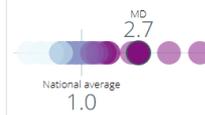
### SUPPLY OF CYBERSECURITY WORKERS

Very Low  
CYBERSECURITY WORKFORCE  
SUPPLY/DEMAND RATIO



### GEOGRAPHIC CONCENTRATION

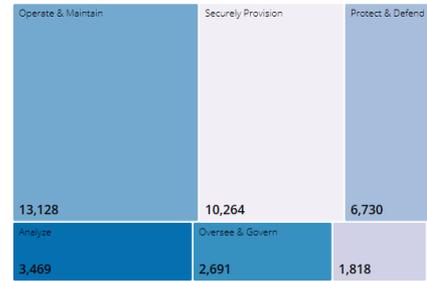
Very High  
LOCATION QUOTIENT



### TOP CYBERSECURITY JOB TITLES

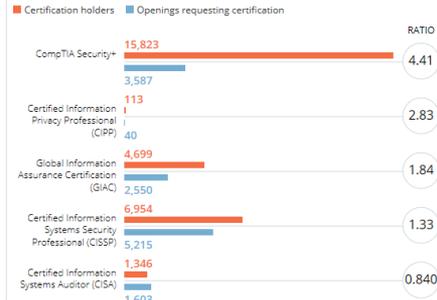
- Cyber Security Engineer
- Cyber Security Analyst
- Systems Engineer
- Cyber Security Manager / Administrator
- Network Engineer / Architect
- Software Developer / Engineer
- Cyber Security Consultant
- Cyber Security Specialist / Technician
- Systems Administrator

### JOB OPENINGS BY NICE CYBERSECURITY WORKFORCE FRAMEWORK CATEGORY



Note: The Investigate category usually has fewer openings than other categories and may not be visible

### CERTIFICATION HOLDERS / OPENINGS REQUESTING CERTIFICATION

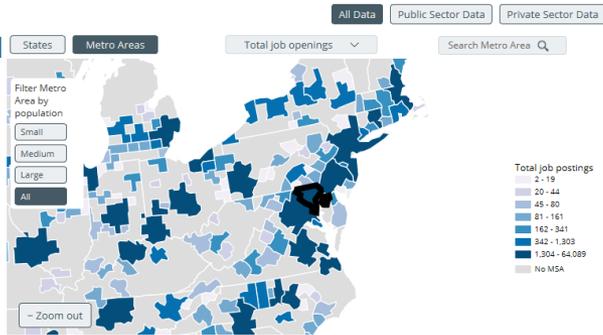


# Baltimore - Towson

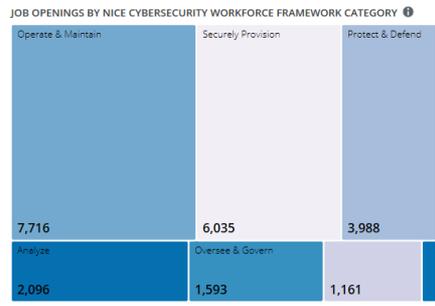
## Cybersecurity Supply/Demand Heat Map

Cybersecurity talent gaps exist across the country. Closing these gaps requires detailed knowledge of the cybersecurity workforce in your region. This interactive heat map provides a granular snapshot of demand and supply data for cybersecurity jobs at the state and metro area levels, and can be used to grasp the challenges and opportunities facing your local cybersecurity workforce.

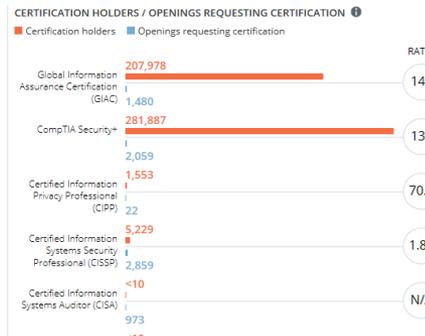
[Share](#)
[Embed](#)



## Baltimore-Columbia-Towson, MD



Note: The Investigate category usually has fewer openings than other categories and may not be visible in the chart. To view data for the Investigate category, please hover over the thin line in the bottom right.



# Cyber Career Pathways

[About](#) [Interactive map](#) [Career pathway](#) [Who this tool is for](#)

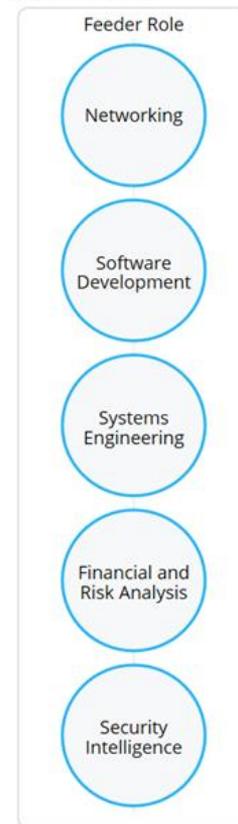
## Cybersecurity Career Pathway

There are many opportunities for workers to start and advance their careers within cybersecurity. This interactive career pathway shows key jobs within cybersecurity, common transition opportunities between them, and detailed information about the salaries, credentials, and skillsets associated with each role.

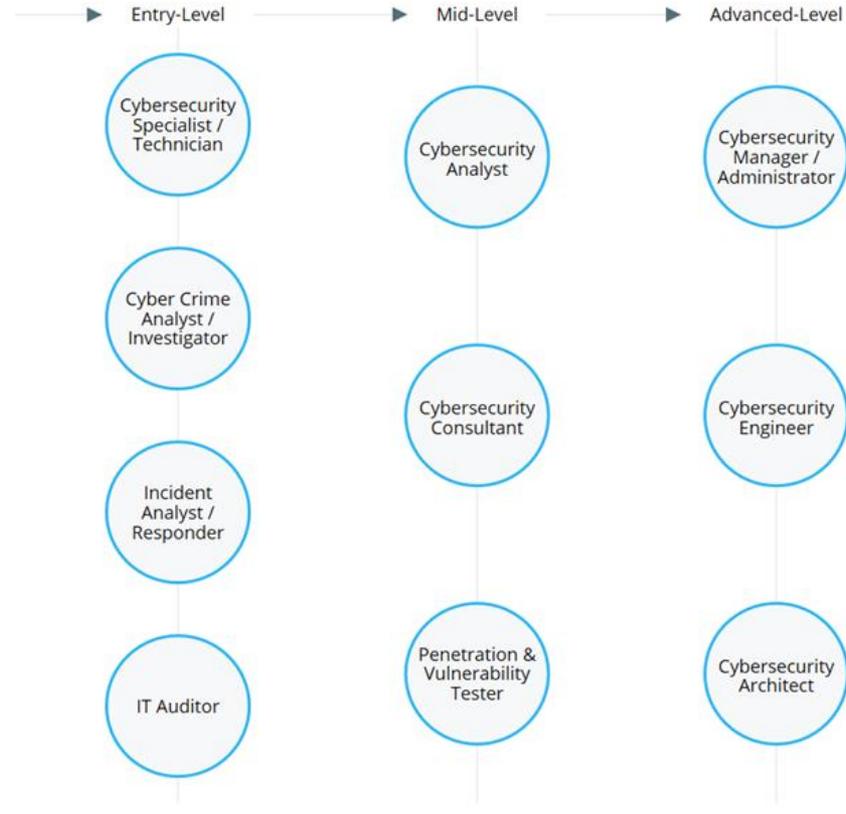
[Share](#)

[Embed](#)

### Common Cybersecurity Feeder Roles ⓘ



### Core Cybersecurity Roles ⓘ

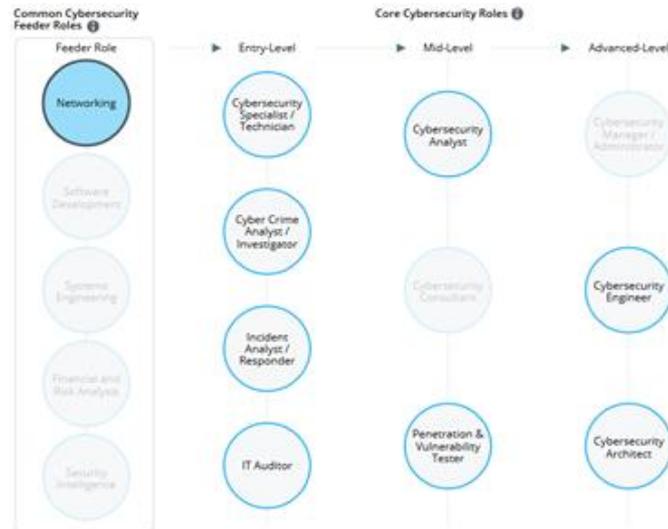


# Networking Work Role – Where From There?

## Cybersecurity Career Pathway

There are many opportunities for workers to start and advance their careers within cybersecurity. This interactive career pathway shows key jobs within cybersecurity, common transition opportunities between them, and detailed information about the salaries, credentials, and skillsets associated with each role.

Share Embed



## Networking

### TOTAL JOB OPENINGS

245,049



### COMMON JOB TITLES

- Systems Administrator
- Network Engineer
- Senior Network Engineer
- Solutions Architect
- Network Administrator

### TOP SKILLS REQUESTED

- 1 System Administration
- 2 Cisco
- 3 Network Engineering
- 4 LINUX
- 5 VMware
- 6 Technical Support
- 7 Switches
- 8 Routing

### TOP CYBERSECURITY SKILLS TO ADD

- 1 Information Security
- 2 Information Systems
- 3 Cryptography
- 4 Information Assurance
- 5 Security Operations
- 6 Risk Assessment
- 7 Python
- 8 Risk Management

### REQUESTED EDUCATION (%)

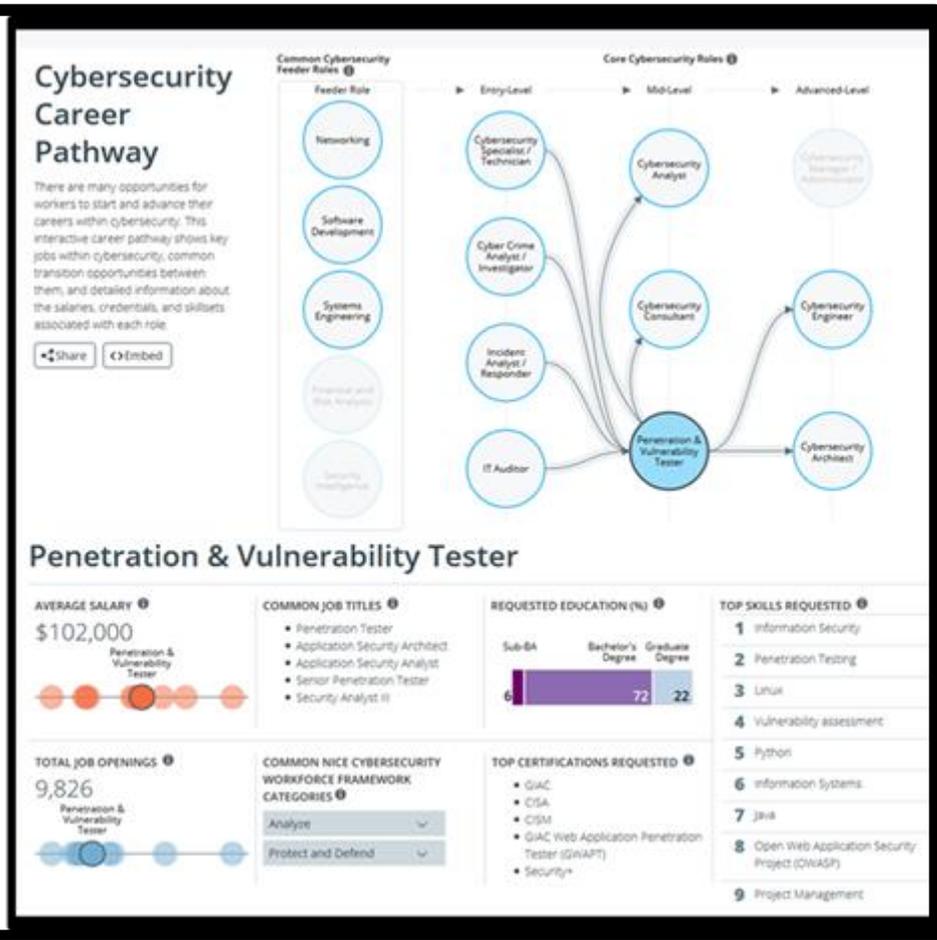
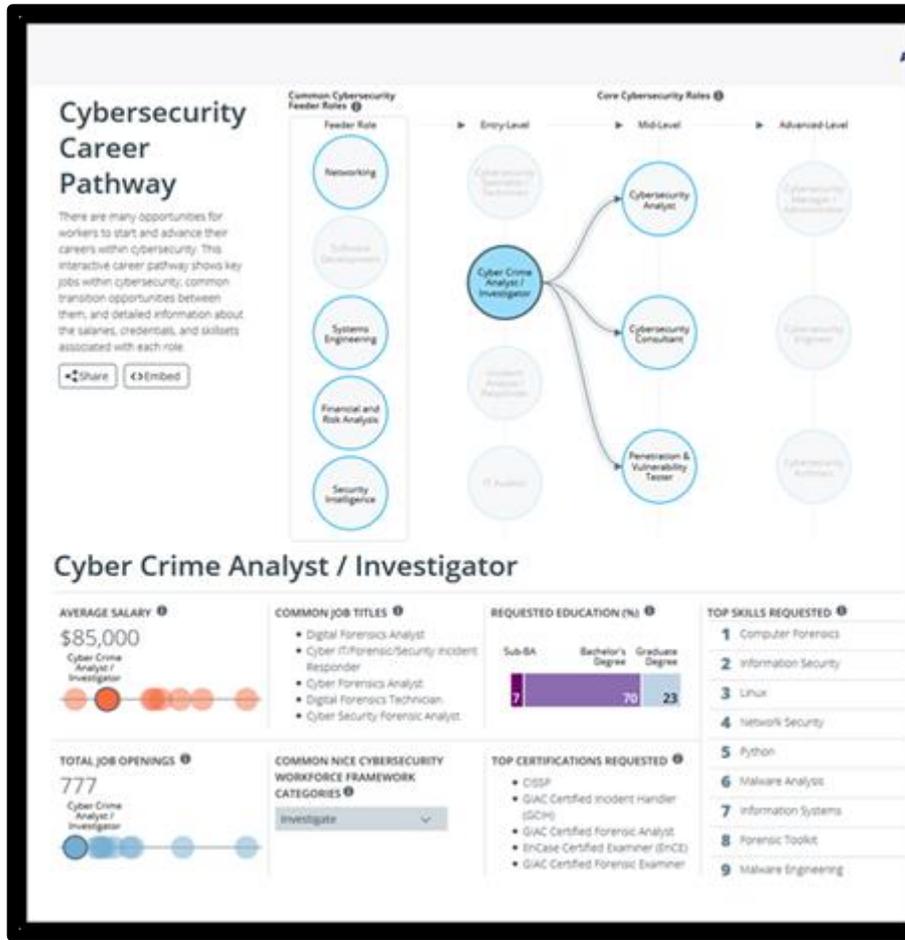


### TOP CERTIFICATIONS REQUESTED

- Network+
- Cisco Certified Network Associate (CCNA)
- Cisco Certified Network Professional (CCNP)
- Security+



# Career Progression - Example

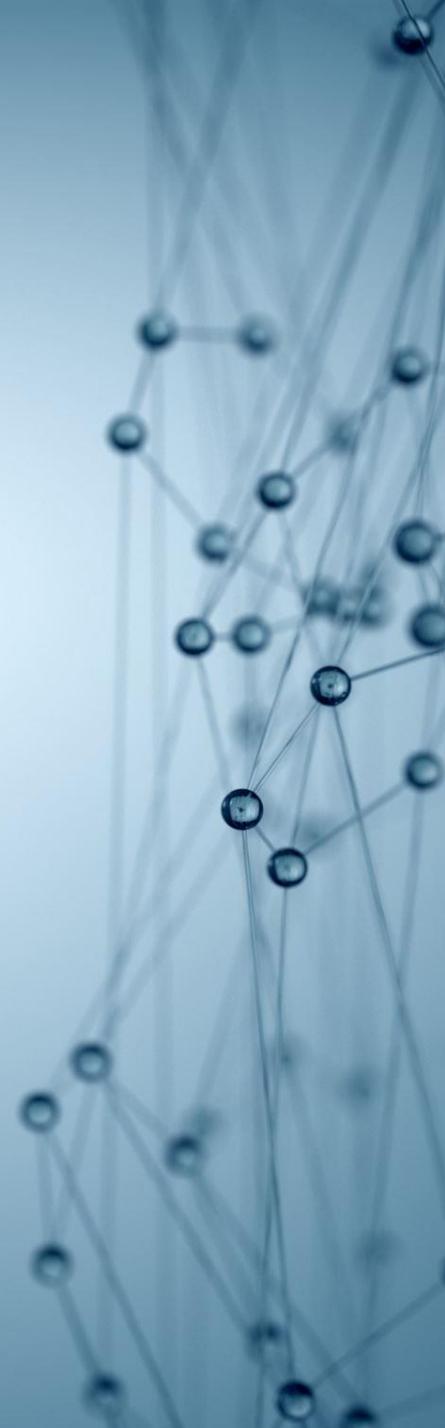




# Training & Education Pathways

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Jeffrey Smith



Educational  
Pathways to  
Cyber Work Roles

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Traditional degree  
pathways (AS, BS, MS)

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Nontraditional Pathway:  
Apprenticeships

---

Nontraditional Pathway:  
Industry Certifications

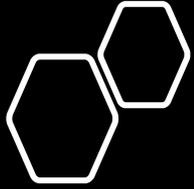
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# Traditional Pathways – Degree Programs

<https://www.caecommunity.org/#>



The screenshot shows the homepage of the CAE in Cybersecurity Community. At the top left is the CAE logo, which consists of a circular emblem with a shield and a key, followed by the text "CAE IN CYBERSECURITY COMMUNITY". To the right of the logo is a navigation menu with the following items: "HOME", "ABOUT US", "NEWS", "CALENDAR", and "RESOURCES". The main content area features a large, dark background with a blurred image of a hand pointing at a screen displaying the word "Security". Overlaid on this background is the text "Welcome to the CAE in Cybersecurity Community" in a large, white, sans-serif font.

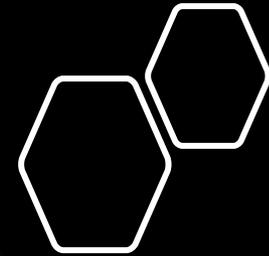


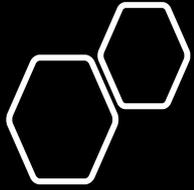
## Nontraditional Pathway

Apprenticeship: A Proven  
Pathway in Maryland to  
Cyber-related Careers

- Apprenticeship is an **industry-driven, high-quality** career **pathway** where employers can **develop** and prepare their **future workforce**, and individuals can obtain **paid work** experience, **classroom instruction**, and a portable, **nationally-recognized credential**.

## Youth Apprenticeship - Maryland Apprenticeship and Training Program (MATP)





# Nontraditional Pathway

# Industry Certifications

- Software/Hardware-specific. Examples:
  - Microsoft certifications
  - CISCO certifications
- Non-vendor based. Examples:
  - CompTia
  - ISACA
  - (ISC)<sup>2</sup>

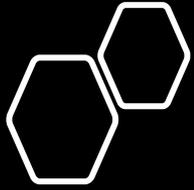


# Conclusion

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Mark Loepker

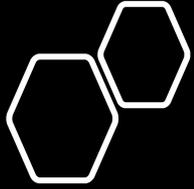




# Takeaways!

- Cybersecurity is fundamental to the interconnected work that we live in.
- The demand for cybersecurity professionals is off the charts and will continue to grow.
- Cybersecurity as a field offers a wide range of employment opportunities, including both technical and non-technical jobs.
- There are varied pathways to a cyber job, depending on what someone wants to do and what level they want to work. A college degree is only one of several educational pathways.

Questions?



# More Information

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