NICE Webinar Series

NATIONAL INITIATIVE FOR CYBERSECURITY EDUCATION

The Information Technology Workforce and Skills for the Future

September 15, 2021

NICE Framework Category: Operate and Maintain

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

NICE Strategic Plan

Objective 4.1 Align the NICE Framework to the NIST Cybersecurity Framework, NIST Privacy Framework, and other cybersecurity, privacy, and risk management publications

Employer-Led National IT Skill Standards

Ann Beheler, Project Lead/PI

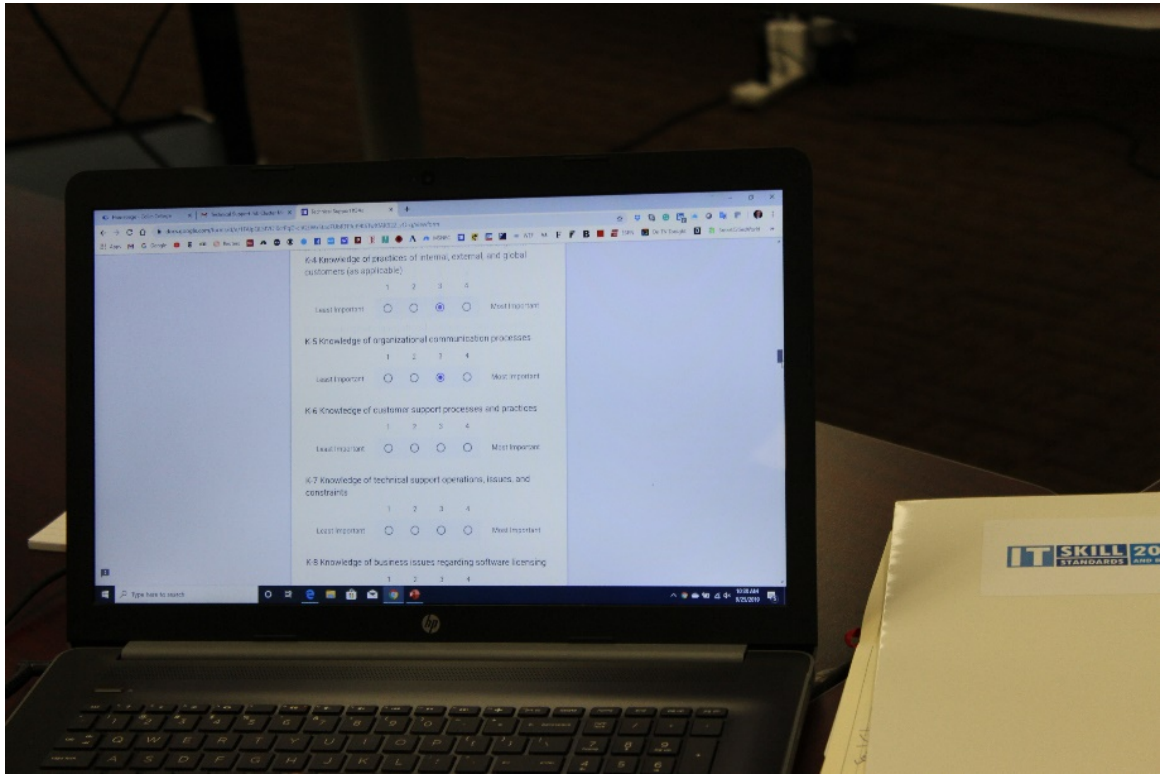
NICE Webinar

September 15, 2021

ITSS 2020 and Beyond Project's Purpose

- **WIDEN** the pipeline of qualified candidates for the many open IT/Cyber positions nationally
- **CREATE** a contemporary and future-facing set of comprehensive IT Skill Standards.
- **ASSIST** both employers and educators to more easily apply the standards.

ITSS Engages Employers BILT



- **Business & Industry Leadership Team** process is the basis for work with employers to identify what they want graduates to know 12-36 month into the future
- **Employers co-lead** the work, not just advise

BILT Model Created by the National Convergence Technology Center www.connectedtech.org

ITSS Thought Leaders Identified Critical Job Clusters

Approximately 100 Thought Leaders were recruited and vetted to identify the first set of project Job Clusters

- Thought Leaders are typically CTO's, CIO's, CISO's or other individuals responsible for "seeing the future" to keep their companies in business.
- Goal was to identify 8-10 of the most critical and difficult to fill job clusters for the future through four facilitated meetings
- Project team synthesized results
- Employer consensus was obtained for 7 job clusters initially
- A second set of Thought Leader meetings were held to identify remaining 2 to 3 clusters; several skill sets under consideration instead

Job Cluster Definitions

- **The thought leaders defined what each job cluster included**
  - **Example:** "Technical Project Management comprises the planning and management of a technical initiative from concept through to a concrete deliverable. This includes overall responsibility for outcomes and requires specific knowledge of technologies, applied methodologies and development models to ensure success in planning, managing budget, estimation and execution of the project. Additionally, this area is responsible for change management. The Technical Project Management serves as the liaison between the business and technical experts. This definition was adapted from Iasa Global with input from national IT Thought Leaders."

First 7 Job Clusters Identified

Skill standards completed

- Infrastructure Connectivity Administration and Engineering
- Technical Support
- Technical Project Management
- Software Development and Engineering (recently completed)
- Data Management and Engineering (the IT side of Data)
- Data Analytics and Predictive Modeling

Skill standards in process

- Cybersecurity (more details to follow)

Employers SMEs Drove Job Cluster Meetings

- **The Project Team compiled pro forma KSAs and Tasks** for employer evaluation using a variety of existing skill standards (e.g. NICE and NIST, ACM, various state standards) – no reinvention of the wheel

- **Employer SMEs voted** on the pro forma KSAs and Tasks they want workforce ready grads to do/have in the future using the structured, repeatable process from the BILT, followed by discussion

- **Employer SMEs could add, change, and delete** items during the 2-3 meetings per job cluster that were held

- **Employers identified the appropriate level of Employability Skills** needed per job cluster

Task, Knowledge, Skill and Ability

This is a snippet of a KSA and Task list the entire list contain a minimum of 100 items across all sections.

Technical Support Tasks and KSAs		
		Avg
Tasks SPECIFIC THINGS an entry level person would BE EXPECTED TO PERFORM on the job WITH LITTLE SUPERVISION.		
Install, Configure, Update, Maintain		
T-1	Install and maintain network infrastructure device operating system software (e.g., IOS, firmware).	3.0
T-2	Install and configure hardware, software, and peripheral equipment for system users in accordance with organizational standards.	3.7
T-3	Manage changes/updates for both internal and external customers when policies and procedures cha	3.4
T-4	Maintain computer hardware.	3.6
T-5	Provide technical support for software maintenance or use.	3.7
Knowledge Knowledge focuses on the understanding of concepts. It is theoretical. An individual may have an understanding of a topic or tool or some textbook knowledge of it but have no experience applying it. For example, someone might have read hundreds of articles on health and nutrition, many of them in scientific journals, but that doesn't make that person qualified to dispense advice on nutrition.		
K-1	Knowledge of the basic operation of computers.	3.9
K-2	Knowledge of computer networking concepts and protocols, and network security methodologies.	3.5
K-3	Knowledge of operating environments, organizational software and applications.	3.6
K-4	Knowledge of practices of internal, external, and global customers (as applicable).	3.2
K-5	Knowledge of internal organizational communication processes.	3.3
Skills The capabilities or proficiencies developed through training or hands-on experience. Skills are the practical application of theoretical knowledge. Someone can take a course to gain knowledge of concepts without developing the skills to apply those concepts. Development of skills requires hands-on application of the concepts.		
S-1	Skill in identifying possible causes of degradation of system performance or availability as well as skill in initiating actions needed to mitigate this degradation.	3.3
S-2	Skill in using the appropriate tools for repairing software, hardware, and peripheral equipment of a s	3.4
S-3	Skill in conducting research for troubleshooting novel client-level problems.	3.1
S-4	Skill in configuring and validating network workstations and peripherals in accordance with approved standards and/or specifications.	3.4

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Employability Skills – 3 Possible levels

Technical Support Employability Skills

Workplace Professionalism & Work Ethics	Level 1 - Employee learns expectations of workplace environment (professional behavior and ethics) and adheres to practices with some guidance. Level 2 - Employee exhibits sound professionalism, judgment, and integrity and accepts responsibility for own behavior. Employee exhibits these qualities without guidance but occasionally refers to policies as needed.
Written Communication	Level 1 - Employee understands written instructions and executes tasks with guidance and feedback from supervisor. Employee clearly communicates concepts in writing. Level 2 - Employee comprehends and executes written instructions with minimal guidance. Employee composes well-organized written documents.
Oral Communication	Level 1 - Employee understands oral instructions and executes tasks with guidance and feedback from supervisor. Employee communicates concepts orally while clarifying for meaning. Employee develops listening skills. Level 2 - Employee comprehends and executes oral instructions with minimal guidance and exhibits good listening skills. Employee clarifies for meaning without needing prompting from supervisor.
Teamwork	Level 1 - With guidance and feedback from supervisor, employee obeys team rules and understands team member roles. Employee actively participates in team activities, volunteers for special tasks, and establishes rapport with co-workers. Level 2 - Employee demonstrates commitment, enthusiasm and supports team members. Employee follows up on assigned tasks and leads by example.

Focuses on these 12 areas

- Workplace Professionalism & Work Ethics
- Written Communication
- Oral Communication
- Teamwork
- Problem Solving & Critical Thinking
- Organization & Planning
- Adaptability & Flexibility
- Initiative
- Accuracy
- Cultural Competence
- Self Development & Career Development

After The Initial Job Cluster Meetings

- **Project team** synthesized data across meetings (votes + discussion)
- **Follow-up meeting** addressed
  - **Employer SMEs verifying the synthesis** done by the team and changing anything they did not approve
  - **Employer SMEs voting on Key Performance Indicators (KPIs)** for Tasks
- **Educator SMEs** also developed **Student Learning Outcomes** after the second employer SME meetings
- **ITSS worked with ~200 different business SMEs over first 6 job clusters**
- **Skill Standards Approved by Texas Skill Standards System for distribution throughout the state**

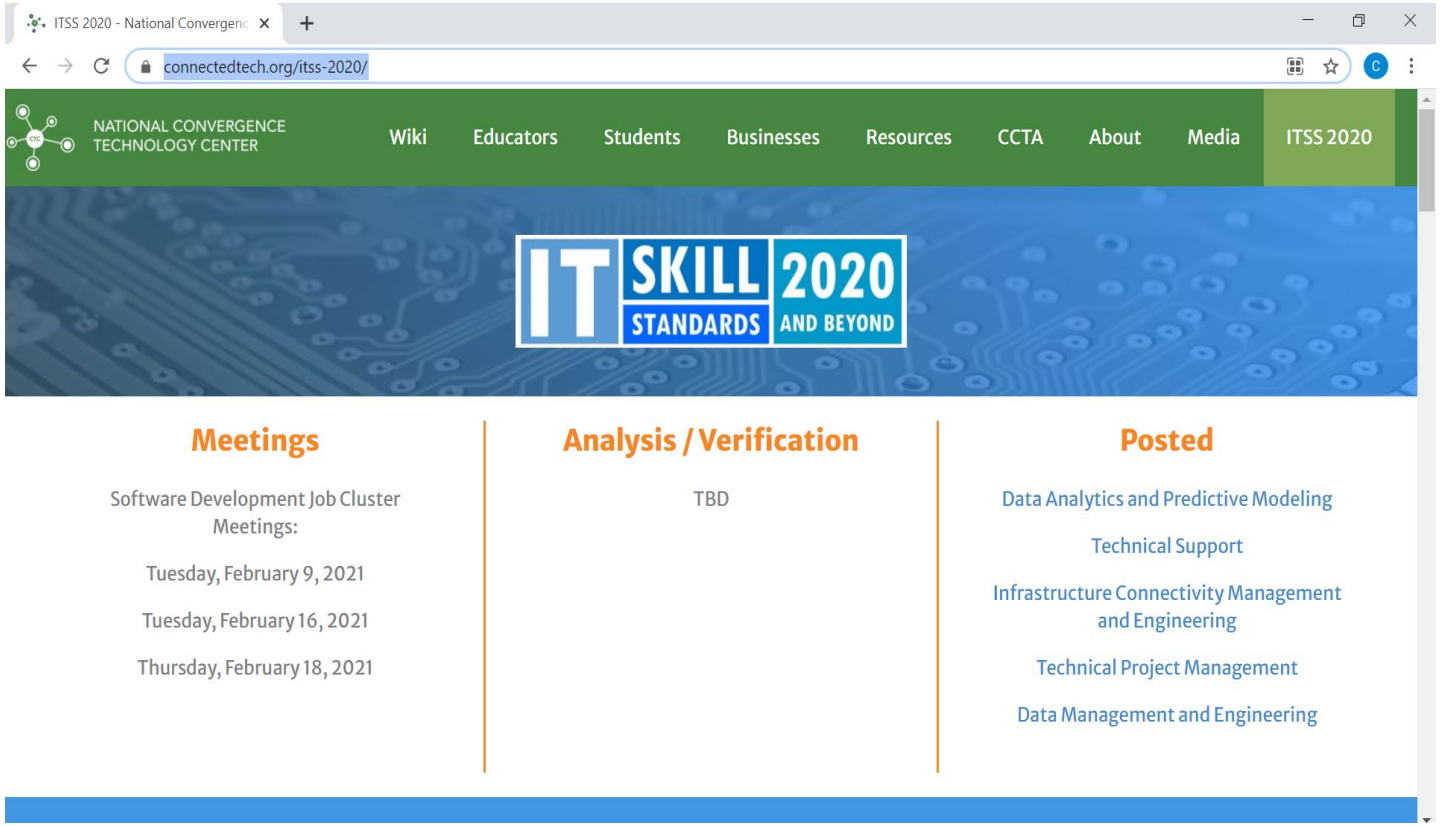
Components Of Each Job Cluster's Skill Standards

- **Created by employers using the BILT processes**
  - **Tasks + KSAs** with numerical average of votes across SME meetings
    - PDF and Excel formats
  - **Key Performance Indicators (KPIs)** for Tasks
  - Levels of Key **Employability Skills**

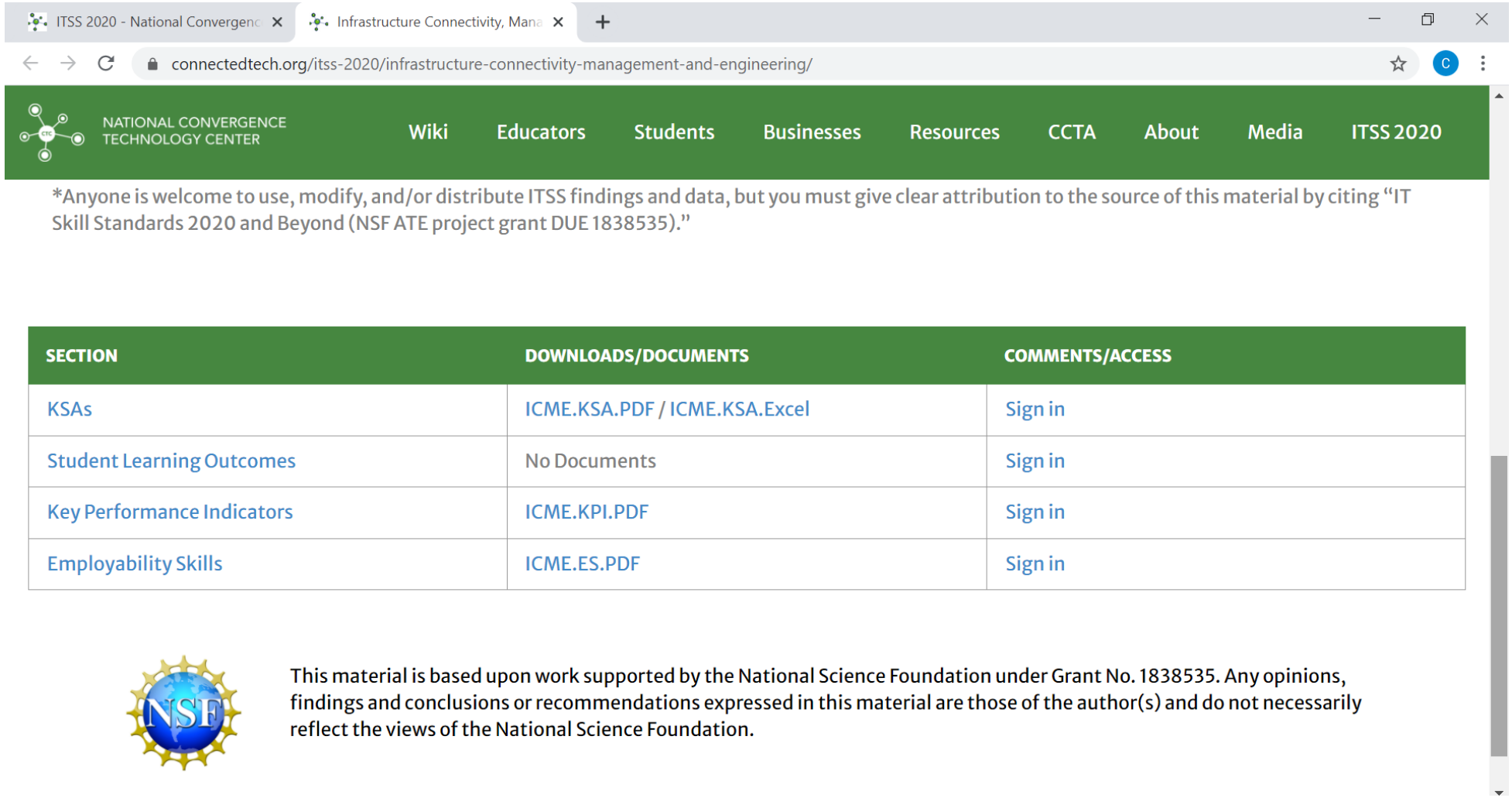
- **Created by educators** from the employer-determined KSAs
  - **Student Learning Outcomes** to use in creating and updating curriculum

How to Access The Skill Standards – No Login Needed

All job cluster results are posted on the ITSS 2020 website https://itskillstandards.org.



Components Available Per Job Cluster



Thought Leaders Reconvened to Determine Remaining 2-3 Job Clusters for Remaining Work

- Rather than focus on job clusters, Thought Leaders requested the team to switch focus to creating **3-5 skill sets** to be layered onto previous clusters and possibly other disciplines. Areas under consideration are:
    - AI,
    - ML,
    - Blockchain,
    - 5G (likely integrated into infrastructure),
    - IoT,
    - IT Automation,
    - AR/VR
- After working with **NICE**, **Cybersecurity job cluster work is being converted to a skill set** instead of duplicating work

Cybersecurity Skill Set

- Focuses on more than awareness and less than enough knowledge and skills to obtain a job in cybersecurity

- Upcoming Employer SME meetings
  - September 29, 2021 from 2-5 ET
  - October 5, 2021 from 11-2 ET
  - Contact Christina Titus to register ctitus@collin.edu

Sustainability

Ongoing process

- **Piloting a crowd-sourcing** approach to keep the job skills updated (Currently testing thru the ITSS 2020 website)
- **Seeking industry financial support** and leadership for continuing support

Upcoming Professional Development

Using Skill Standards to Advance Your College IT Curriculum

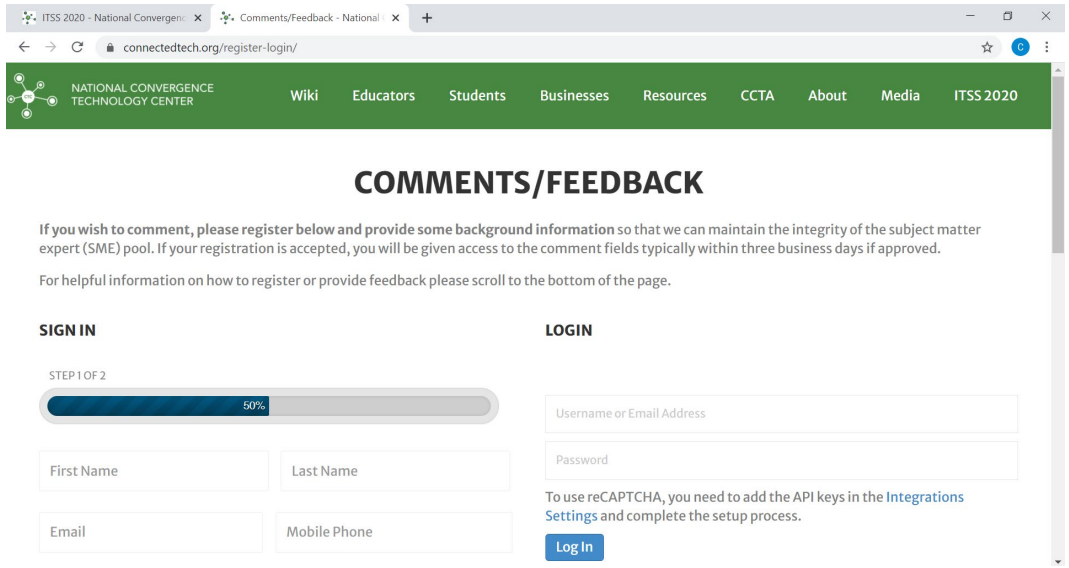
- September 17, 2021
- 2 pm – 3 pm ET
- https://bit.ly/ITSSTraining

Other Opportunities For Engagement

- **Provide feedback** on the Skill Standards already posted on ITSS website (http://www.itskillstandards.org)
- **Apply to be an educator SME** for upcoming skill sets that are within your expertise
- **Apply to be an employer SME** for upcoming skill sets that are within your expertise
- **Learn more about how to use the Skill Standards** to update curriculum

How to Register to Provide Feedback – Requires Login

- Registration Page: https://connectedtech.org/register-login/
- Helpful videos
  - Signing In and Commenting: https://youtu.be/lBFgl3nvdV8
  - Comment and Registration: https://youtu.be/3CzrvUs4Ys4



CONTACT US!

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Q & A

NICE
NATIONAL INITIATIVE FOR CYBERSECURITY EDUCATION

O*NET Overview

Occupational Information Network

Pam Frugoli
Senior Workforce Analyst
USDOL Employment and Training Administration

September 2021

Employment and Training Administration

- **Mission**
  - **Contribute to the more efficient functioning of the U.S. labor market** by providing high-quality job training, employment, labor market information, and income maintenance services primarily through state and local workforce development systems.

- 8 Guiding Principles—one of which is:

  We will strive to turn individuals into career entrepreneurs by:

  - **equipping them with the information they need**
  - **to develop the knowledge, skills and abilities sought after in the new economy.**

Workforce and Labor Market Information (WLMI)

- **Bureau of Labor Statistics** (BLS)
  - **Occupational Employment and Wage Statistics** (OEWS)
    - Also has distribution of occupational employment by industry
  - **Occupational Employment Projections**
  - **Occupational Outlook Handbook**

- **Employment and Training Administration** (ETA)
  - **Occupational Information Network (O*NET)** – career exploration and research
    - Specifically including Knowledge, Skills, and Abilities
  - **CareerOneStop** – information and services
  - **WorkforceGPS** – technical assistance website for states and grantees
- Both BLS and ETA support development and dissemination of extensive **state and local** WLMI

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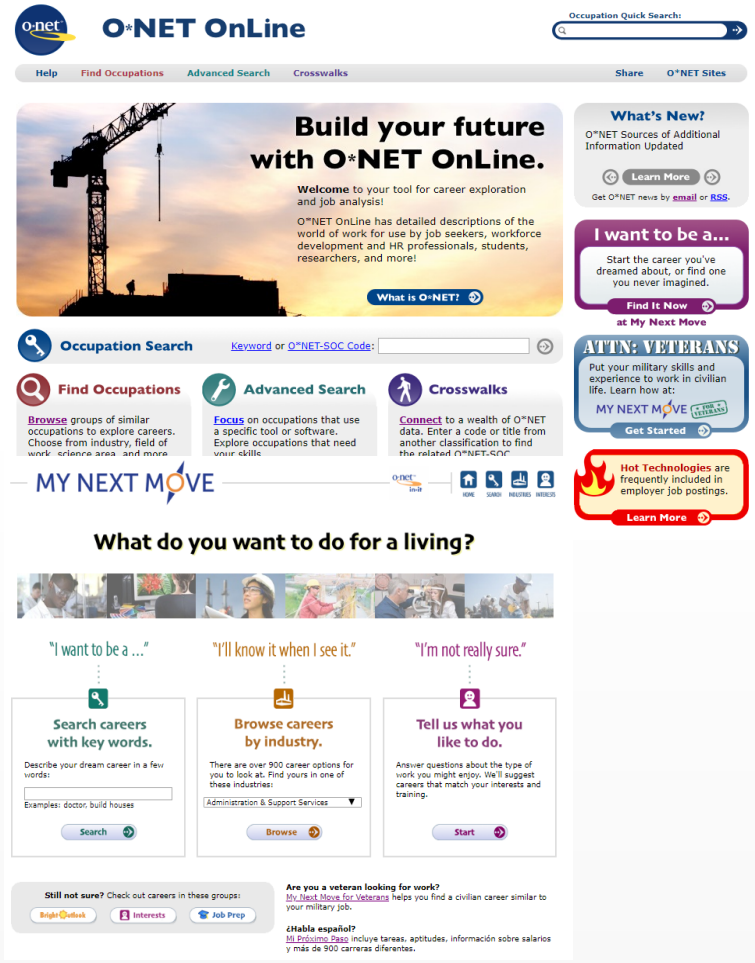
O*NET has multiple public-facing websites

- O*NET OnLine
- My Next Move
- My Next Move for Veterans
- Mi Proximo Paso
- O*NET Resource Center
  - Downloadable data files
  - Web services and APIs
  - Open linked data



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O*NET SITE TRAFFIC

Standard annual O*NET combined website traffic:

Combined Annual Visits > 60,000,000

Annual Web Service Calls > 800,000,000

Concepts relating to the organization of work

- **Occupation**
  - Is a category that groups together multiple jobs based on "work performed and, in some cases, on the skills, education and/or training needed to perform the work"
  - SOC Classification Principles and Coding Guidelines
- **Job**
  - Multiple jobs in any occupation category
  - The same job title may mean *different* things when used by different employers
  - Different job titles may mean the *same* thing when used by different employers
- **Work Role**
  - A job or position may involve multiple *work roles*
- **Functional work area**
- **Competency**
  - **Tasks**
  - **Knowledge**
  - **Skills**

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Occupational Information Network (O*NET) system

- Primary source for ***descriptive*** information on **occupational** characteristics and requirements

- Covers the work conducted in the U.S. economy
  - 923 occupations
  - Based on 2018 Standard Occupational Classification taxonomy to align with other occupational data sources from BLS and states on wages, employment, outlook

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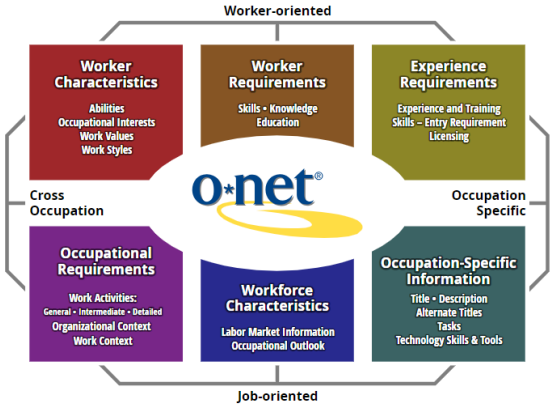
What's in O*NET?

Knowledge
Skills
Abilities
Tasks
Work Activities
Work Context

Interests
Work Styles
Work Values
Tools & Technologies
Related Occupations



Supplemented with:

- Education, Training and Experience Required
- Wages
- Employment Trends/Outlook
- Links to resources on job openings, credentials, education/training

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Both Stable and Dynamic Descriptors of Occupations

STABLE descriptors

- **33** *Knowledge* categories (broad)
- **35** *Skill* categories (broad)
- **53** *Abilities* categories
- **57** *Work Context* descriptors
- **20** *Work Values*
- **15** *Work Styles*
- **6** *Career Interests (R-I-A-S-E-C)*

DYNAMIC descriptors

- **31,079** *Technology Skills*
- **52,823** *Alternate Titles*
- **19,232** *Tasks*

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Comparison of O*NET and NICE content

O*NET	NICE Cybersecurity Framework
923 Occupations	**52** Work Roles
19,566 Tasks	**928** Tasks
33 Knowledge categories	**614** Knowledge statements
35 Skill categories	may be equivalent to Competency?
	359 Skill statements
8,800+ Technology Skills	

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O*NET Work Activities Hierarchy

- **40** Generalized Work Activities
- **332** Intermediate Work Activities
- **2,069** Detailed Work Activities
- **19,450** **Tasks** (specific to a single occupation)

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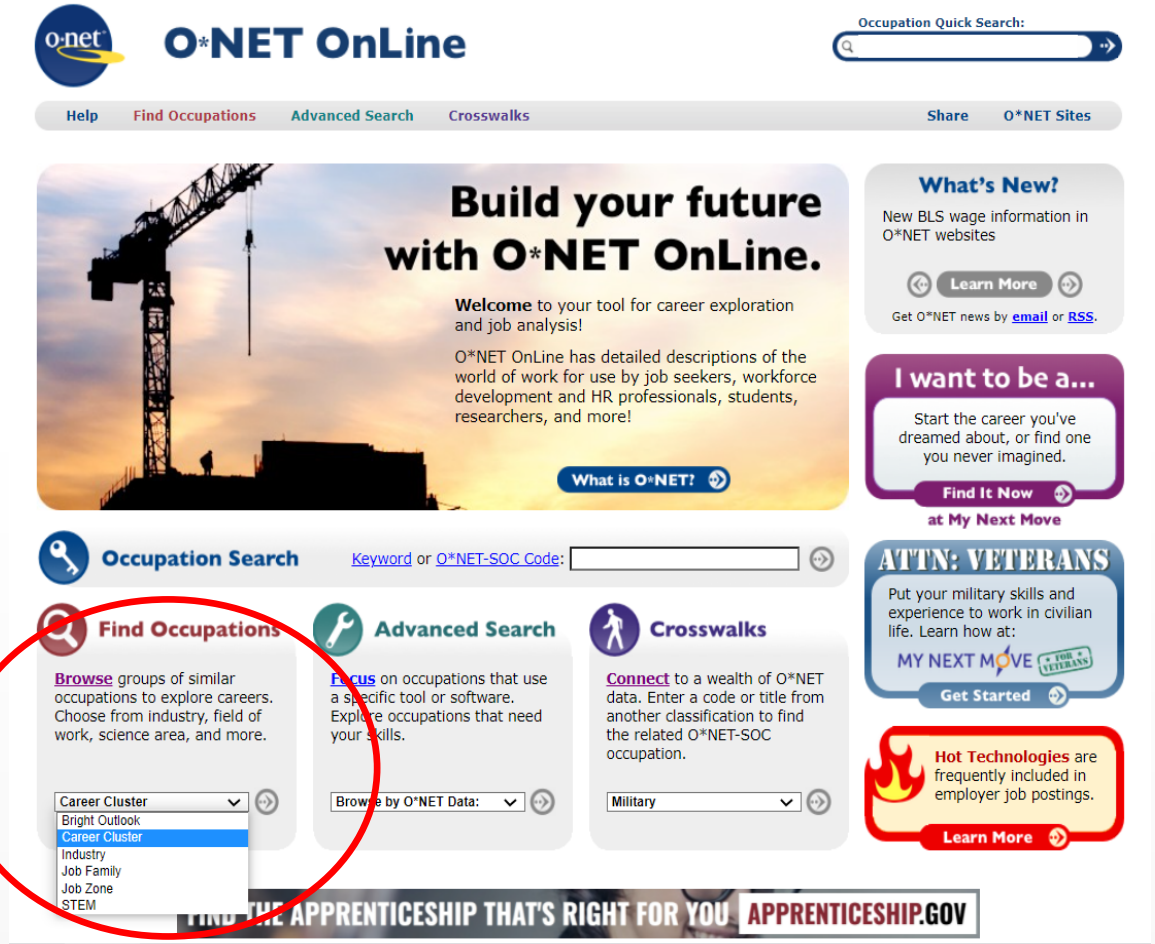
Search O*NET occupations by Career Cluster



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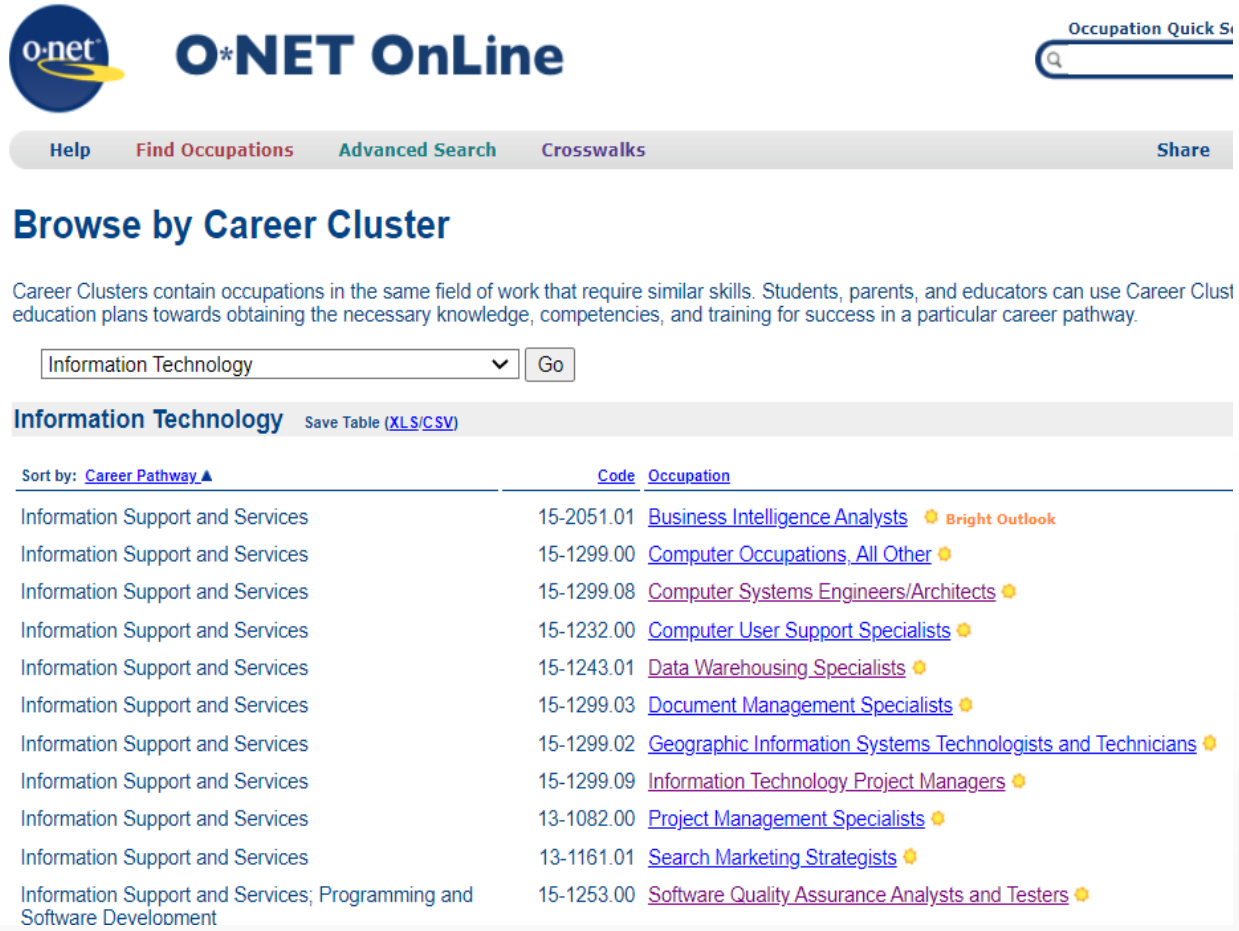
Partial results for Information Technology cluster



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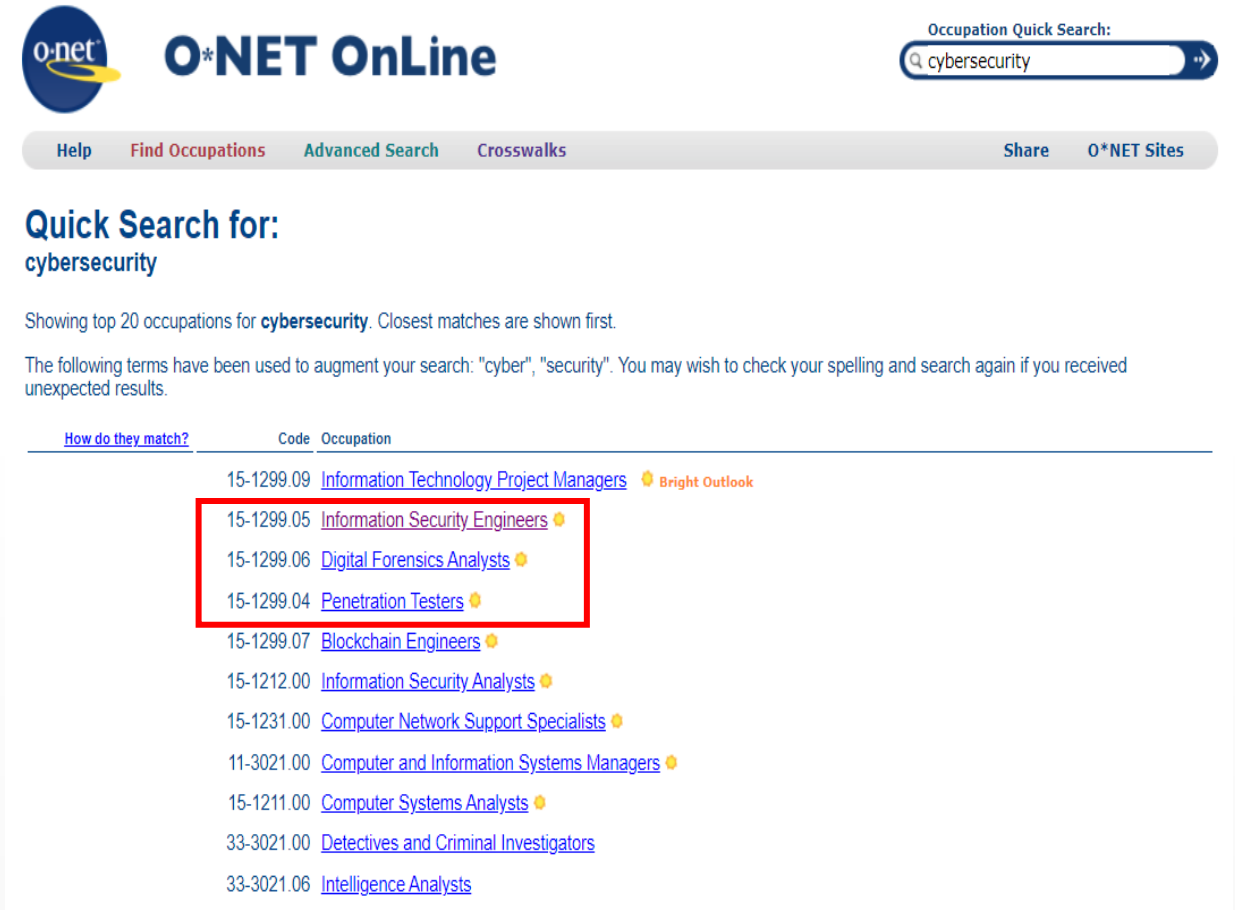
Partial results for keyword search for “cybersecurity”



O*NET OnLine

Occupation Quick Search: cybersecurity

Help | Find Occupations | Advanced Search | Crosswalks | Share | O*NET Sites

Quick Search for:
cybersecurity

Showing top 20 occupations for **cybersecurity**. Closest matches are shown first.

The following terms have been used to augment your search: "cyber", "security". You may wish to check your spelling and search again if you received unexpected results.

How do they match?	Code	Occupation
	15-1299.09	Information Technology Project Managers — Bright Outlook
	15-1299.05	Information Security Engineers
	15-1299.06	Digital Forensics Analysts
	15-1299.04	Penetration Testers
	15-1299.07	Blockchain Engineers
	15-1212.00	Information Security Analysts
	15-1231.00	Computer Network Support Specialists
	11-3021.00	Computer and Information Systems Managers
	15-1211.00	Computer Systems Analysts
	33-3021.00	Detectives and Criminal Investigators
	33-3021.06	Intelligence Analysts

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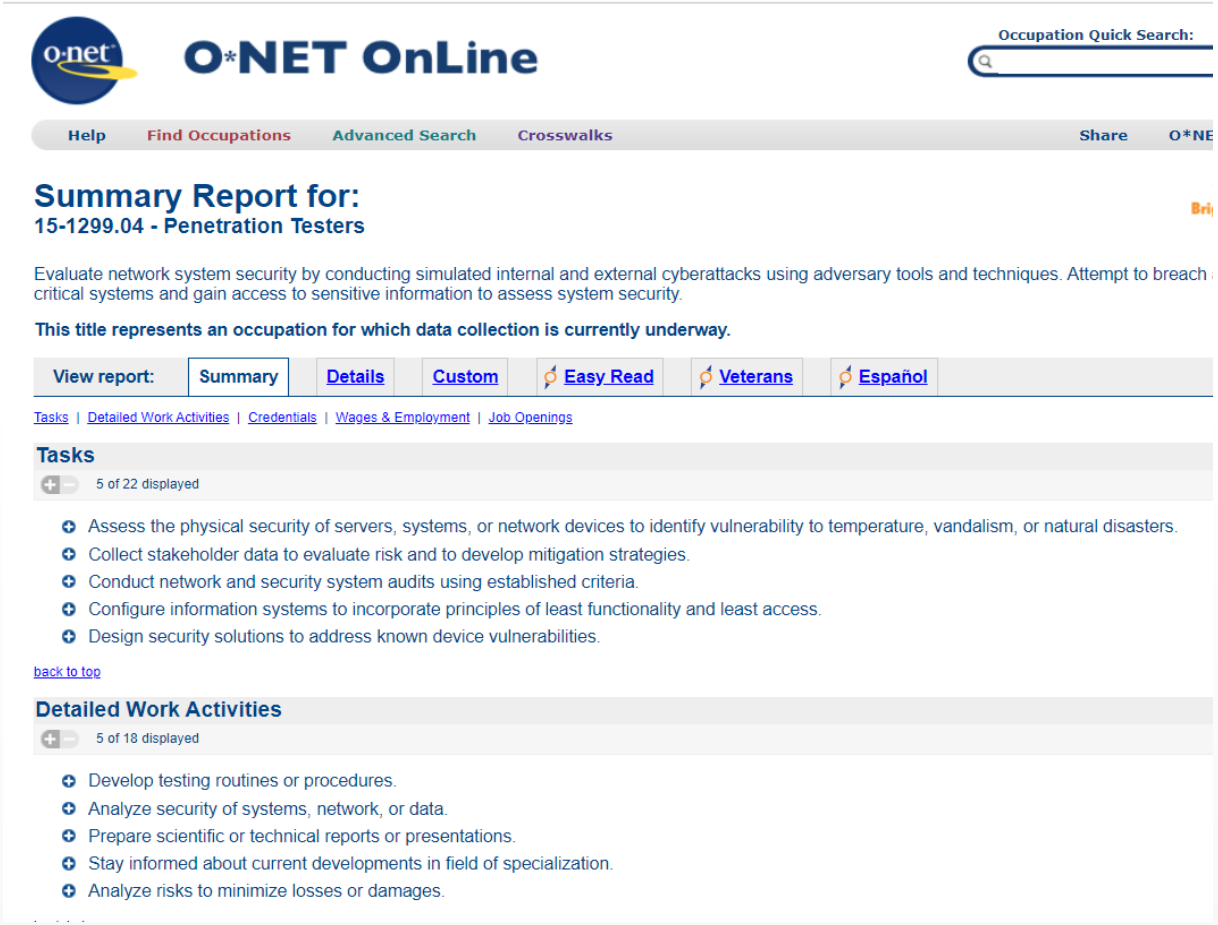

O*NET OnLine

Occupation Quick Search:

Help | Find Occupations | Advanced Search | Crosswalks | Share | O*NE

Summary Report for:
15-1299.04 - Penetration Testers

Evaluate network system security by conducting simulated internal and external cyberattacks using adversary tools and techniques. Attempt to breach critical systems and gain access to sensitive information to assess system security.

This title represents an occupation for which data collection is currently underway.

View report: Summary | Details | Custom | Easy Read | Veterans | Español

Tasks | Detailed Work Activities | Credentials | Wages & Employment | Job Openings

Tasks

5 of 22 displayed

- Assess the physical security of servers, systems, or network devices to identify vulnerability to temperature, vandalism, or natural disasters.
- Collect stakeholder data to evaluate risk and to develop mitigation strategies.
- Conduct network and security system audits using established criteria.
- Configure information systems to incorporate principles of least functionality and least access.
- Design security solutions to address known device vulnerabilities.

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Detailed Work Activities

5 of 18 displayed

- Develop testing routines or procedures.
- Analyze security of systems, network, or data.
- Prepare scientific or technical reports or presentations.
- Stay informed about current developments in field of specialization.
- Analyze risks to minimize losses or damages.

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Technology Skills (updated quarterly)

Summary Report for:

15-1299.08 - Computer Systems Engineers/Architects

Updated 2021

Bright Outlook

Design and develop solutions to complex applications problems, system administration issues, or network concerns. Perform systems management and integration functions.

Sample of reported job titles: Electronic Data Interchange System Developer (EDI System Developer), Information Technology Architect (IT Architect), Network and Infrastructure Engineer, Network Engineer, Solutions Architect, Systems Architect, Systems Consultant, Systems Engineer

View report: Summary | Details | Custom | Easy Read | Veterans | Español

Tasks | Technology Skills | Tools Used | Knowledge | Skills | Abilities | Work Activities | Detailed Work Activities | Work Context | Job Zone | Education | Credentials | Interests | Work Styles | Work Values | Related Occupations | Wages & Employment | Job Openings | Additional Information

Tasks

Technology Skills

5 of 64 displayed Show 14 tools used

- **Development environment software** — Apache Ant; Apache Kafka; Common business oriented language COBOL; Go
- **Object or component oriented development software** — Advanced business application programming ABAP; jQuery; Objective C; Scala
- **Operating system software** — Microsoft Windows Server; Oracle Solaris; Red Hat Enterprise Linux; UNIX Shell
- **Project management software** — Confluence; Microsoft Teams; Oracle Primavera Enterprise Project Portfolio Management; Slack
- **Web platform development software** — Backbone.js; Microsoft ASP.NET Core MVC; React; Spring Framework

O*NET Data Collection
How current is it?

Multi-Method Data Collection

- **Job Incumbents**—primary source
- **Occupational Experts**
  - Both of above complete O*NET survey questionnaires
- **Occupational Analysts**
  - I/O Psychologists using survey responses and following standardized procedures
- **Additional reference resources**
  - Employer job postings, internet research, professional association/customer input—

(This latter input is independently validated/verified since it is not obtained through a statistically representative sample)

How Current is the Data?

- Ongoing data collection program
- 100+ occupations updated **annually**
- Updated occupations prioritized on multiple factors:
  - Size, growth rate, changes in technology or body of knowledge
- Quarterly database updates (Technology Skills and alternate titles)

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Data Collection Information for:

15-1212.00 - Information Security Analysts Bright Outlook

The data in O*NET OnLine is regularly updated as part of an ongoing data collection program. For more information, visit the O*NET Resource Center. The table below lists the date and source for data provided for this occupation.

Technology Skills & Tools	Employer Job Postings (2021)
Alternate Titles	Multiple sources (2020)
Education	Incumbent Questionnaire Responses (2018)
Knowledge	Incumbent Questionnaire Responses (2018)
Tasks	Incumbent Questionnaire Responses (2018)
Work Activities	Incumbent Questionnaire Responses (2018)
Work Context	Incumbent Questionnaire Responses (2018)
Work Styles	Incumbent Questionnaire Responses (2018)
Sample of Reported Titles	Analyst (2020)
Abilities	Analyst (2018)
Job Zone	Analyst (2018)
Skills	Analyst (2018)
Detailed Work Activities	Analyst (2014)
Interests	Analyst (2008)
Work Values	Analyst (2008)

Competency Model Clearinghouse within CareerOneStop

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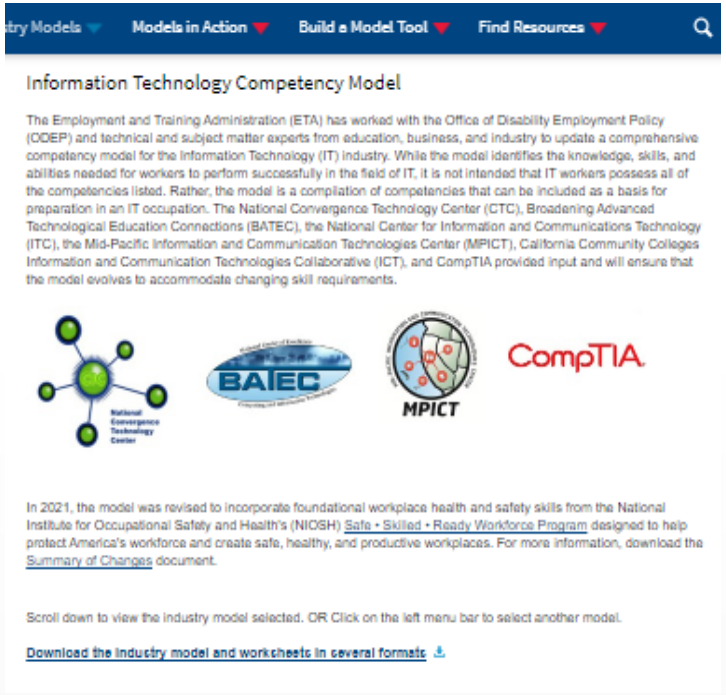
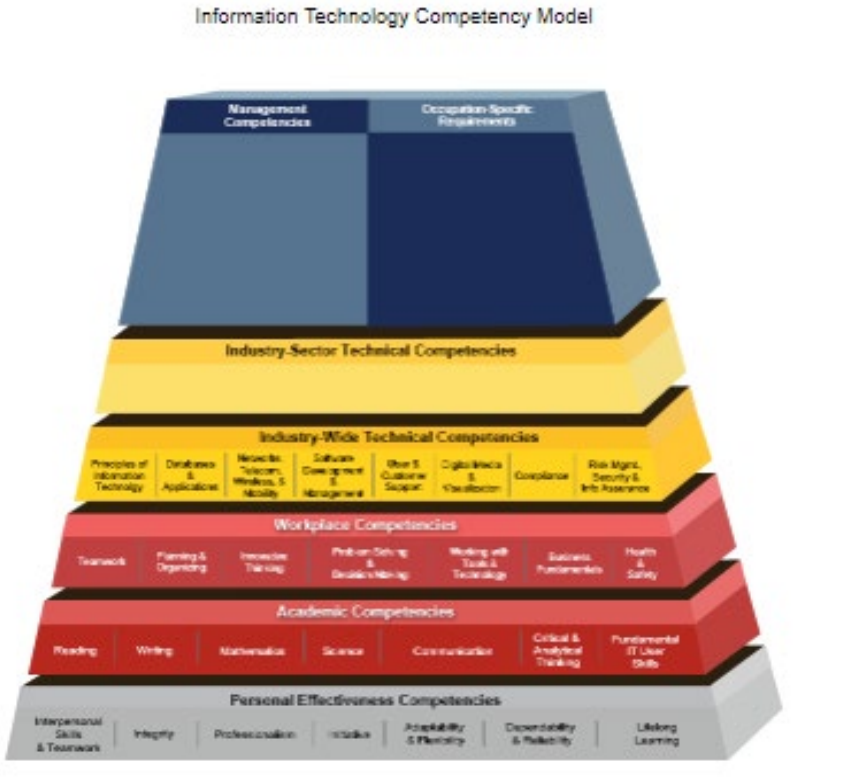
Information Technology and Cybersecurity Competency Models





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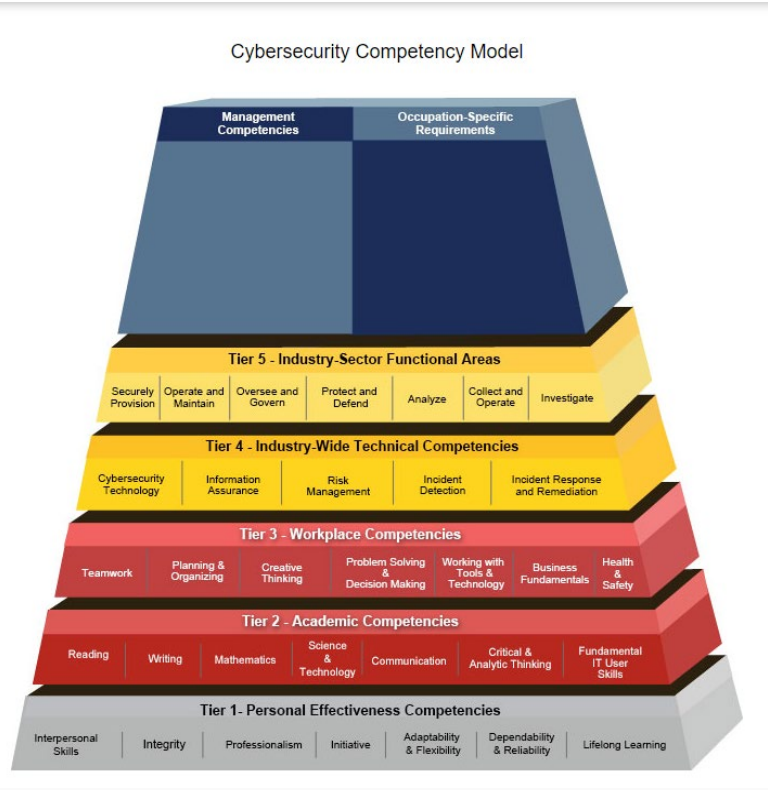
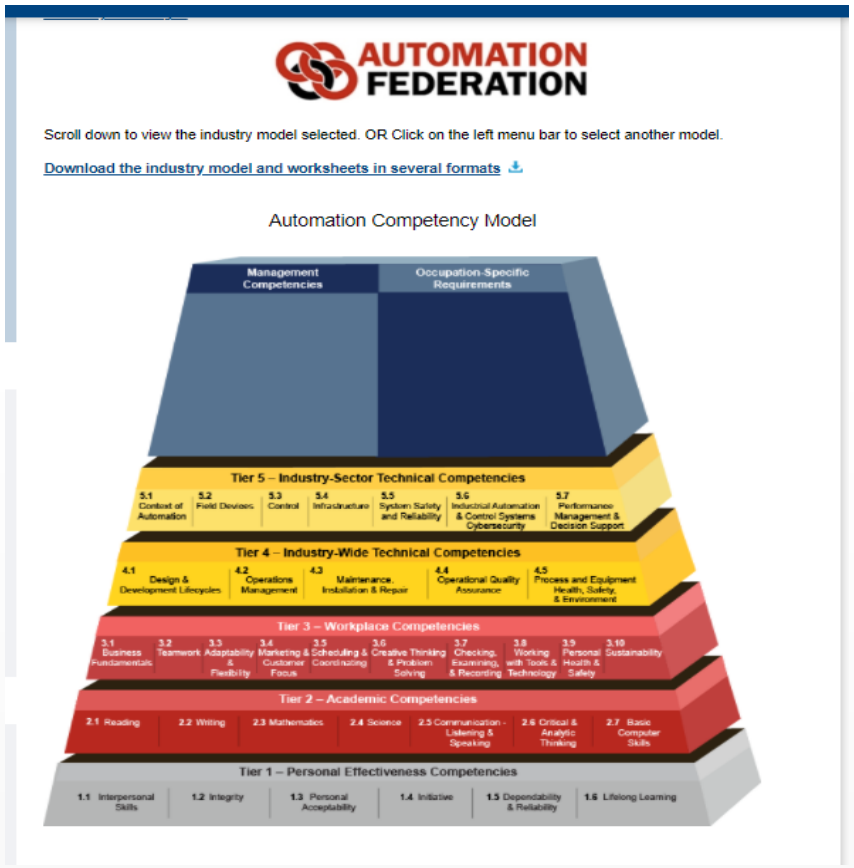
Cybersecurity, Automation, and Mechatronics models





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Q & A

Thank You for Joining Us!

Upcoming Webinar: "Digital Citizenship- Safety and Security for an Online World"

When: Wednesday, October 20, 2021 at 2-3PM ET

Register: https://go.usa.gov/xMDwT

nist.gov/nice/webinars