

IT Career Pathways & Skill Standards (Credentials) Descriptive Model

*Prepared by the Center for Individual & Organizational Effectiveness (C4IOE.com)
for the Tri-County Workforce Investment Board – Butler, Pennsylvania
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This Descriptive Model accompanies an Information Technology Report and a Graphic Model of Information Technology Career Pathways & Skill Standards, which are all available on the Tri-County Workforce Investment Board website. This model is not intended to identify ALL information technology occupations (and their related credentialing requirements), but does identify representative occupations within each of the occupational clusters.



CAREER PATH: General Information Technology & Support / Services: General IT

JOB ROLE	POTENTIAL WORK SETTINGS	EDUCATION & TRAINING REQUIREMENTS	CERTIFICATION / LICENSE REQUIREMENTS
Computer User Support Specialist	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Agriculture Technologies	<p>Computer user support specialist jobs require some computer knowledge, but not necessarily a postsecondary degree. Applicants who have taken some computer-related classes are often qualified. For computer network support specialists, many employers accept applicants with an associate's degree, although some prefer applicants to have a bachelor's degree.</p> <p>Large software companies that provide support to business users who buy their products or services often require a bachelor's degree.</p>	<p>Suggested:</p> <ul style="list-style-type: none"> CompTIA IT Fundamentals CompTIA A+ Cisco Certified Entry Networking Technician Linux Essentials CompTIA Network+ CompTIA Cloud+ Cisco Certified Network Associate Data Center Certified Novell Administrator Microsoft Certified Solutions Associate
Computer Programmers	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Agriculture Technologies	<p>BA; however, some employers hire workers who have an associate's degree. Most programmers get a degree in computer science or a related subject. Programmers who work in specific fields, such as healthcare or accounting, may take classes in that field to supplement their degree in computer programming. In addition, employers value experience, which many students gain through internships.</p>	<p>Suggested:</p> <ul style="list-style-type: none"> CompTIA A+ CompTIA IT Fundamentals Microsoft Technology Associate: IT Infrastructure Track CompTIA Network + HDI Desktop Support Manager Salesforce.com Certified Administrator Microsoft Certified HPE Accredited Technical Professional Solutions Expert: Enterprise Device Apps

<p>Network & Computer Systems Administrator</p>	<p>Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Agriculture Technologies</p>	<p>BA in a field related to computer or information science. Some employers may require only a postsecondary certificate.</p>	<p>Suggested:</p> <p>CompTIA A+ Certification. CompTIA Network+ Certification. CompTIA Security+ Certification. Cisco CCNA Certification. Cisco CCNP Certification. Microsoft MCSE Certification. Microsoft Certified Solutions Associate (MCSA)</p>
<p>Database Administrators</p>	<p>Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Agriculture Technologies</p>	<p>BA in an information- or computer-related subject such as computer science.</p>	<p>Suggested:</p> <p>Certification is generally offered directly from software vendors or from vendor-neutral certification providers. Certification validates the knowledge and best practices required from DBAs. Companies may require their database administrators to be certified in the products they use</p> <p>Microsoft Technology Associate: Security Fundamentals CompTIA A+ CompTIA IT Fundamentals CompTIA Security+ CompTIA Network+ OCP: Oracle Certified Professional SAP HANA: SAP Certified Technology Associate - SAP HANA (Edition 2016) Microsoft SQL Server Database Certifications IBM Certified Database Administrator for DB2</p>

<p>Information Security Analyst</p>	<p>Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies</p>	<p>BA in computer science, programming, or a related field. As information security continues to develop as a career field, many schools are responding with information security programs for prospective job seekers. These programs may become a common path for entry into the occupation. Currently, a well-rounded computer education is preferred.</p>	<p>Suggested:</p> <p>Multiple certifications available; many employers prefer job candidates to have one.</p> <p>Microsoft Technology Associate: Security Fundamentals CompTIA A+ CompTIA IT Fundamentals CompTIA Security+ CompTIA Network+ SANS CASP Cisco Certified Network Associate Security EC-Council Certified Network Defender Certified Ethical Hacker Computer Forensic Investigator Cisco Certified Design Professional</p>
<p>Computer Systems Analyst</p>	<p>Information Technologies Business + Finance Technologies</p>	<p>BA; Some employers prefer applicants who have a master's degree in business administration (MBA) with a concentration in information systems. For more technically complex jobs, a master's degree in computer science may be more appropriate. Although many computer systems analysts have technical degrees, such a degree is not always a requirement. Many analysts have liberal arts degrees and have gained programming or technical expertise elsewhere.</p>	<p>Suggested</p> <p>PMI Certified Associate in Project Management PMI Project Management Professional Office of Government Commerce (OGC) Prince2 Foundation Office of Government Commerce (OGC) Prince2 Practitioner Certification Certified ScrumMaster® (CSM) Microsoft Certified Solutions Developer: Application Lifecycle Management</p>

IT Manager	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies	BA in a computer- or information science–related field; includes courses in computer programming, software development, and mathematics. Management information systems (MIS) programs usually include business classes as well as computer-related ones.	Suggested: CompTIA IT Fundamentals CompTIA A+ Project Management Professional (PMP) Certified Information Systems Security Professionals (CISSP) Red Hat Certified Engineer (RHCE) VMware Certified Professional (VCP) Oracle DBA
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CAREER PATH: Interactive Media & Web: Interactive Media / 3-D

JOB ROLE	POTENTIAL WORK SETTINGS	EDUCATION & TRAINING REQUIREMENTS	CERTIFICATION / LICENSE REQUIREMENTS
Interactive Media / 3-D Designer: Junior/Entry	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies	BA, BFA, MFA	<p>Must be somewhat familiar with:</p> <ul style="list-style-type: none"> Adobe Creative Suite Vector illustration 3D modeling JavaScript SQL Flash ACE: Adobe Certified Expert MTA & MCSD: Microsoft Developer Certifications <p>Video experience (Premier Pro, After Effects, Final Cut Pro)</p> <p>Must have on-line portfolio of work</p>
Interactive Media / 3-D Designer: Intermediate	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Healthcare Technologies	<p>BA, BFA, MFA</p> <p>1-2 years' industry/agency experience</p> <p>4 year degree (Computer Science, Software Engineering, Game Art, Game Design, Game Programming or similar area) with no experience or 3 years of experience in a Game Designer Field in lieu of degree</p>	<p>Must have strong knowledge of:</p> <ul style="list-style-type: none"> Adobe Creative Suite Vector illustration 3D modeling JavaScript SQL Flash ACE: Adobe Certified Expert MTA & MCSD: Microsoft Developer Certifications Video experience (Premier Pro, After Effects, Final Cut Pro)

			Must have on-line portfolio of work
Interactive Media / 3-D Designer: Senior	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies	BA, BFA, MFA 5+ years' industry/agency experience 4 year degree (Computer Science, Software Engineering, Game Art, Game Design, Game Programming or similar area) with no experience or 3 years of experience in a Game Designer Field in lieu of degree	Must have superior knowledge of: C++ Adobe Creative Suite Vector illustration 3D modeling JavaScript SQL Flash ACE: Adobe Certified Expert MTA & MCSD: Microsoft Developer Certifications Video experience (Premier Pro, After Effects, Final Cut Pro) Must have on-line portfolio of work

CAREER PATH: Interactive Media & Web: Web Designer

JOB ROLE	POTENTIAL WORK SETTINGS	EDUCATION & TRAINING REQUIREMENTS	CERTIFICATION / LICENSE REQUIREMENTS
Web Designer	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Agriculture Technologies	BA in Graphic Design, Design, Media or related creative field 0-3 years relevant experience	Basic knowledge of HTML/CSS or a strong desire to learn it quickly Experience with Javascript and other "lite" web development is a plus
Web Developer	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Agriculture Technologies	AA, BA For more technical developer positions, such as back-end web developers, some employers prefer workers who have at least a bachelor's degree in computer science, programming, or a related field.	Suggested: Web developers need to have a thorough understanding of HTML programming. Microsoft Technology Associate (MTA) JavaScript SQL Flash ACE: Adobe Certified Expert MTA & MCSD: Microsoft Developer Certifications Zend Certified PHP Engineer Certified Web Development Professional Google Analytics Individual Qualification (IQ)

Senior front-end web developer	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Agriculture Technologies	BA in Graphic Design or related field 5+ years of experience in web design Integrated marketing experience preferred.	Expert knowledge of HTML5, JavaScript and jQuery Expert knowledge of CSS2 and CSS3 Knowledge of AngularJS or similar JavaScript MVC framework Knowledge of SASS and similar SCSS preprocessors Working knowledge of RESTful web services Comfort developing for all modern web browsers and devices
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CAREER PATH: Network Systems: Computer Network Support Specialist

JOB ROLE	POTENTIAL WORK SETTINGS	EDUCATION & TRAINING REQUIREMENTS	CERTIFICATION / LICENSE REQUIREMENTS
Computer Network Support Specialist: Entry	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies	AA, BA in related Computer Information Technology, Computer Technology Integration; Networking Technology 3 years prior related work experience in technology field Knowledge of networks, hardware/software systems, and peripherals Experience troubleshooting LAN/WAN problems Knowledge of maintaining mobile devices and wireless networks	Suggested: CompTIA A+ Technician CompTIA Network+ Cisco Certified Network Associate (CCNA) VMWare Certified Associate
Technology Support Specialist: Intermediate	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies	BA in Computer Science, Computer Engineering, Math or Engineering 3-5 years prior related work experience in technology field	Cisco Certified Network Associate (CCNA) Data Center Cisco Certified Network Professional (CCNP) Data Center VMware Certified Professional 6 - Data Center Virtualization (VCP6-DCV) Juniper Networks Certified Professional Data Center (JNCIP-DC)

<p>IT Support Specialist / Administrator / Supervisor: Senior</p>	<p>Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies</p>	<p>BA, MA in Computer Science, Business, Information Technology or related field.</p> <p>A minimum of 5 years prior related work experience in technology field</p> <p>Some security clearances may be required.</p>	<p>Highly specialized:</p> <p>UNIX or Windows System Administration</p> <p>CompTIA Security+CE</p> <p>Microsoft Certified Systems Administrator (MSCA) or Redhat Certified Technician (RHCT) certification is highly desirable for some positions.</p>
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CAREER PATH: Network Systems: Computer Network Architect

JOB ROLE	POTENTIAL WORK SETTINGS	EDUCATION & TRAINING REQUIREMENTS	CERTIFICATION / LICENSE REQUIREMENTS
Network Administration/Variou Entry / Intermediate Level Positions	Information Technologies Manufacturing + Materials Technologies Energy Technologies Business + Finance Technologies Engineering Technologies	BA computer science, network administration, systems engineering, or a related field of study. 2+ years prior related work experience in technology field Systems administration training, LAN & WAN installation & configuration, routing & switching, and network security training	CompTIA's Network+ Cisco's CCNA Microsoft's MCTS: Server 2008 Network Infrastructure Configuration
Computer Network Architect	Information Technologies Manufacturing + Materials Technologies Energy Technologies Business + Finance Technologies Engineering Technologies	BA in computer science, information systems, engineering, or a related field. Degree programs in a computer-related field give network architects hands-on laboratory work in classes such as network security or database design. Employers of network architects sometimes prefer applicants to have a Master's of Business Administration (MBA) in information systems. MBA programs generally require 2 years of study beyond the undergraduate level and include both business and computer-related courses.	Suggested: Certification programs are generally offered by product vendors or software firms. Vendor-specific certification verifies a set of skills to ensure network architects are able to work in specific networking environments. Companies may require their network architects to be certified in the products they use. VMWare Advanced Certificates Red Hat Advanced Certificates Cisco Certified Network Professional CompTIA Security+

CAREER PATH: Network Systems: Computer Network Specialist

<p>Support Specialist: Entry</p>	<p>Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Agriculture Technologies</p>	<p>Computer user support specialist jobs require some computer knowledge, but not necessarily a postsecondary degree. Applicants who have taken some computer-related classes are often qualified. For computer network support specialists, many employers accept applicants with an associate's degree, although some prefer applicants to have a bachelor's degree.</p> <p>Large software companies that provide support to business users who buy their products or services often require a bachelor's degree.</p> <p>1-2 years of experience</p>	<p>Suggested:</p> <p>CompTIA IT Fundamentals CompTIA A+ Cisco Certified Entry Networking Technician Linux Essentials CompTIA Network+ CompTIA Cloud+</p>
<p>Support Specialist: Intermediate</p>	<p>Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Agriculture Technologies</p>	<p>BS in Computer Science, MIS or related degree or minimum 3-4 years' equivalent work experience</p>	<p>Suggested certifications:</p> <p>Windows VMWare Certified Professional UNIX SQL Cisco Certified Network Associate Data Center, Associate & Professional Certified Novell Administrator Microsoft Certified Solutions Associate/Expert Red Hat Certifications</p>

<p>Support Specialist: Senior</p>	<p>Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Agriculture Technologies</p>	<p>BS in Computer Science, MIS or related degree or minimum 3-4 years' equivalent work experience</p> <p>5+ years of experience</p>	<p>Suggested certifications:</p> <p>Data and IP Services (MPLS, VoIP, VPN, IP PBX) Managed Network Services (LAN, WAN, CDN, Managed IP PBX) Managed Security Cloud Services and Data Center Outsourcing (application hosting, managed storage) Unified Communications Technologies Cisco Career Certifications – CCIE, CCDA, CCNA, CCNP, CCDP, CCVP Microsoft, Polycom, Oracle CISSP, TOGAF, ITIL</p>
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CAREER PATH: Network Systems: Operational Research Analysts

<p>Operations Research Analysts</p>	<p>Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Agriculture Technologies</p>	<p>Although employers prefer to hire applicants with a master’s degree or Ph.D., entry-level positions are available for those with a bachelor’s degree. Analysts typically have a degree in operations research, management science, analytics, math, engineering, computer science, or another technical or quantitative field.</p> <p>Individuals need extensive coursework in mathematics. Courses include statistics, calculus, and linear algebra.</p> <p>Coursework in computer science is important because analysts rely on advanced statistical and database software to analyze and model data.</p> <p>Courses in other areas, such as engineering, economics, and political science, are useful because operations research is a multidisciplinary field with a wide variety of applications.</p>	<p>Suggested:</p> <p>CompTIA A+ OCP: Oracle Certified Professional SAP HANA: SAP Certified Technology Associate - SAP HANA (Edition 2016) Microsoft SQL Server Database Certifications IBM Certified Database Administrator for DB2 Oracle Certified Professional, MySQL 5.6 Database Administrator</p>
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CAREER PATH: Programming & Software: Software Developer/Engineer

JOB ROLE	POTENTIAL WORK SETTINGS	EDUCATION & TRAINING REQUIREMENTS	CERTIFICATION / LICENSE REQUIREMENTS
Entry level / Junior Developer	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies	BA, typically in computer science (CS), software engineering, or a related field; a degree in mathematics is also acceptable. 1-2 years' experience	Suggested: CompTIA IT Fundamentals CompTIA CSA+ CompTIA Project+
Senior Developer	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies	BA, typically in computer science (CS), software engineering, or a related field; a degree in mathematics is also acceptable. 5+ years' experience	CompTIA Linux+ CompTIA Network+ CompTIA Security+ CompTIA CASP Java C, C++ PHP Objective-C Perl Python
Lead Developer or Architect	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies	7-10+ Years of Experience Same base skills as a Senior Developer	CompTIA Linux+ CompTIA Network+ CompTIA Security+ CompTIA CASP Java C, C++ PHP Objective-C Perl Python
Developer Manager	Information Technologies Life Sciences Technologies Manufacturing + Materials	BA computer science (CS), software engineering, or a related field; MBA	Most Development Managers will have a full spectrum of the above suggested certifications.

	Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies		
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CAREER PATH: Information Security & Business Continuity: Information Security Analyst

JOB ROLE	POTENTIAL WORK SETTINGS	EDUCATION & TRAINING REQUIREMENTS	CERTIFICATION / LICENSE REQUIREMENTS
Information Security Analyst: Entry Also called Network Security Engineer, Systems Security Analyst, Security Administrator	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies	BA, typically in computer science (CS), software engineering, or a related field; a degree in mathematics is also acceptable. 1-3 years' experience	CompTIA Security+ & Network+ EC-Council Certified Ethical Hacker (CEH) ISC2 Certified Information Systems Security Professional (CISSP) GIAC Certified Incident Handler (GCIH) EnCase Certified Examiner (EnCE)
Information Security Analyst: Intermediate Also called Security Consultant, Security Manager IT Director Manager	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies	BA, typically in computer science (CS), software engineering, or a related field; a degree in mathematics is also acceptable. 3-5+ years' experience	CompTIA Security+ & Network+ EC-Council Certified Ethical Hacker (CEH) ISC2 Certified Information Systems Security Professional (CISSP) GIAC Certified Incident Handler (GCIH) EnCase Certified Examiner (EnCE)
Information Security Analyst: Senior Also called Chief Information Security Officer	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies	BA, typically in computer science (CS), software engineering, or a related field; a degree in mathematics is also acceptable. 10+ years' experience	CompTIA Advanced Security Practitioner (CASP) CompTIA Security+ & Network+ EC-Council Certified Ethical Hacker (CEH) ISC2 Certified Information Systems Security Professional (CISSP) GIAC Certified Incident Handler (GCIH) EnCase Certified Examiner (EnCE)

CAREER PATH: Information Security & Business Continuity: Certified Information Security Professional

JOB ROLE	POTENTIAL WORK SETTINGS	EDUCATION & TRAINING REQUIREMENTS	CERTIFICATION / LICENSE REQUIREMENTS
Certified Information Systems Security Professional	Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies	AA, BA, typically in computer science (CS), software engineering, or a related field	Certified Information Systems Security Professional (CISSP) is an independent information security certification granted by the International Information System Security Certification Consortium, also known as (ISC) ² .

CAREER PATH: Information Security & Business Continuity: Computer Forensics Analyst

JOB ROLE	POTENTIAL WORK SETTINGS	EDUCATION & TRAINING REQUIREMENTS	CERTIFICATION / LICENSE REQUIREMENTS
<p>Computer Forensics Analyst: Entry Also known as Information Security Officer, Security Analyst, Informatics Associate.</p>	<p>Police departments and offices Crime laboratories Morgues Medical examiner/coroner offices Local, State, Federal Government Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies</p>	<p>AA, BA, typically in computer science (CS), IT</p> <p>Possible to enter through law enforcement related career such as police or security guard, although not typical</p>	<p>GIAC Certified Forensic Analyst (GCFA) CCE: Certified Computer Examiner EnCe: EnCase Certified Examiner CFCE: Certified Forensic Computer Examiner CSFA: CyberSecurity Forensic Analyst</p> <p>Possession of Security + certification, and completion of appropriate USG-sponsored (DOD, DNI, etc.) ISSO/ISSM training courses preferred for many positions.</p>
<p>Computer Forensics Analyst: Intermediate to Senior Also known as Senior Network Security, Forensic Examiner, Information Security Engineer</p>	<p>Police departments and offices Crime laboratories Morgues Medical examiner/coroner offices Local, State, Federal Government Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies</p>	<p>BA, MA typically in computer science (CS), IT, Information Security, Information Assurance</p> <p>Advanced degree preferred (MBA / MS) 5+ years of experience in a sr management role</p>	<p>GIAC Certified Forensic Analyst (GCFA) CCE: Certified Computer Examiner EnCe: EnCase Certified Examiner CFCE: Certified Forensic Computer Examiner CSFA: CyberSecurity Forensic Analyst Most positions beyond entry level may</p>

	<p>Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies</p>	<p>Experience in the telecommunications, defense contractor or government industries desired.</p>	<p>require some level of security clearances.</p> <p>Possession of Security + certification, and completion of appropriate USG-sponsored (DOD, DNI, etc.) ISSO/ISSM training courses preferred</p> <p>Advanced certification may include: EnCase, Forensic Toolkit, iLook, Red Team / Blue Team exercises, Cyber Kill Chain, Detective Technologies (IPS, IDS, End Point Security, etc.)</p>
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CAREER PATH: Information Security & Business Continuity: Systems / Business Continuity Manager

JOB ROLE	POTENTIAL WORK SETTINGS	EDUCATION & TRAINING REQUIREMENTS	CERTIFICATION / LICENSE REQUIREMENTS
<p>Systems / Business Continuity Manager: Entry</p> <p>Also knows as Continues Improvement Engineer, Continuous Delivery Architect, Manager Continuous Improvement</p>	<p>Information Technologies</p> <p>Life Sciences Technologies</p> <p>Manufacturing + Materials Technologies</p> <p>Environmental Technologies</p> <p>Energy Technologies</p> <p>Business + Finance Technologies</p> <p>Engineering Technologies</p> <p>Healthcare Technologies</p>	<p>BA or experience in the field; 1-3 years' experience</p>	<p>CompTIA Security+</p> <p>CEH: Certified Ethical Hacker</p> <p>GSEC: SANS GIAC Security Essentials</p> <p>CISSP: Certified Information Systems Security Professional</p> <p>CISM: Certified Information Security Manage</p> <p>Linux/Unix systems</p>
<p>Systems / Business Continuity Manager: Intermediate to Senior</p> <p>Also knows as Continues Improvement Engineer, Continuous Delivery Architect, Manager Continuous Improvement</p>	<p>Information Technologies</p> <p>Life Sciences Technologies</p> <p>Manufacturing + Materials Technologies</p> <p>Environmental Technologies</p> <p>Energy Technologies</p> <p>Business + Finance Technologies</p> <p>Engineering Technologies</p> <p>Healthcare Technologies</p>	<p>BA, MA, MBA</p> <p>5+ years' experience</p> <p>Will have background knowledge/experience as a system administrator or storage architect, or have knowledge of enterprise backup solutions</p>	<p>CompTIA Security+</p> <p>CEH: Certified Ethical Hacker</p> <p>GSEC: SANS GIAC Security Essentials</p> <p>CISSP: Certified Information Systems Security Professional</p> <p>CISM: Certified Information Security Manage</p> <p>Linux/Unix systems</p>

CAREER PATH: General IT User Support – Community & Call Center: Computer Repair Technician

JOB ROLE	POTENTIAL WORK SETTINGS	EDUCATION & TRAINING REQUIREMENTS	CERTIFICATION / LICENSE REQUIREMENTS
<p>Computer Repair Technician: Call Center Support Representative, Content Manager <i>Customer</i>: Liaison, Service Representative, Service Professional <i>Help Desk</i>: Specialist, Technician Maintenance Technician, PC Support</p>	<p>Information Technologies Life Sciences Technologies Manufacturing + Materials Technologies Environmental Technologies Energy Technologies Business + Finance Technologies Engineering Technologies Healthcare Technologies Agriculture Technologies</p>	<p>Employees in these occupations usually need one or two years of training involving both on-the-job experience and informal training with experienced workers</p> <p>General IT user support specialist jobs require some computer knowledge, but not necessarily a postsecondary degree. AS, BA; however, some employers hire workers who have an associate's degree.</p>	<p>Suggested:</p> <p>CompTIA A+ Technician CompTIA Network+ Cisco Certified Network Associate (CCNA) VMWare Certified Associate</p>

CLUSTER	JOB ROLE	JOB DESCRIPTIONS
General Information Technology	Computer User Support Specialist	Computer support specialists provide help and advice to people and organizations using computer software or equipment. Some, called computer network support specialists, support information technology (IT) employees within their organization. Others, called computer user support specialists, assist non-IT users who are having computer problems.
	Computer Programmer	Computer programmers write and test code that allows computer applications and software programs to function properly. They turn the program designs created by software developers and engineers into instructions that a computer can follow.
	Network & Computer Systems Administrators	Network administrators install, support and manage the networks and computer systems that keep information flowing. They implement and maintain network hardware and software, troubleshoot network problems, and ensure network security, availability & performance standards. Determine an organization's network and computer system needs. Install all network hardware and software and make needed upgrades and repairs. Maintain network and computer system security and ensure that all systems are operating correctly. Collect data, evaluate and optimize network or system performance. Add users to a network and assign and update security permissions on the network. Train individuals to use systems.
	Database Administrator	Database Administrators make sure that data is available to users and are secure from unauthorized access. Database administrators (DBAs) use specialized software to store and organize data, such as financial information and customer shipping records.
	Computer Security Specialist	IT security specialists install, configure and upgrade security software to prevent cyber-attacks, educate [technical and non-technical] employees on computer security, monitor networks for security breaches, and inevitably respond to successful attacks with the appropriate countermeasures. Some IT security professionals specialize in computer crime investigation; these highly trained security pros use cutting-edge forensics hardware and software to gather evidence for use in prosecuting cyber crimes.
	Computer Systems Analyst	Computer systems analysts study an organization's current computer systems and procedures and design information systems solutions to help the organization operate more efficiently and effectively. They bring business and information technology (IT) together by understanding the needs and limitations of both.
	IT Manager	Computer and information systems managers, often called information technology (IT) managers or IT project managers, plan, coordinate, and direct computer-related activities in an organization.

CLUSTER	JOB ROLE	JOB DESCRIPTIONS
Interactive Media & Web	Interactive Media / 3-D Designer	Interactive media designers create the overall look and feel of a wide range of interactive communication products and often use text, data, graphics, sound and animation and other digital and visual effects.
	Web Developer	Web Developers are responsible for the look of the site. They are also responsible for the site's technical aspects, such as its performance and capacity, which are measures of a website's speed and how much traffic the site can handle. In addition, web developers may create content for the site
Network Systems	Computer Network Support Specialists	<p>Computer support specialists provide help and advice to people and organizations using computer software or equipment. Some, called computer network support specialists, support information technology (IT) employees within their organization. Others, called computer user support specialists, assist non-IT users who are having computer problems.</p> <p>The job duties of these professionals may vary significantly, but they generally need broad and extensive knowledge of networking, computer systems, and periphery systems.</p> <p>Intermediate and Senior Specialists need a strong experience in Networking technologies that can lead the technical strategy development, planning, architecture, design, program management, project implementation and operational procedures for the network tower. They must have responsibility for LAN, WAN, Wireless LAN, Network Security and wiring technologies. Additional oversight of network technology vendors and the associated implementation suppliers, collaborate with mobility, unified communications, cloud architects project managers and other IT personnel to develop and implement solution designs.</p>
	Computer Network Architect	<p>Create plans and layouts for data communication networks.</p> <p>Consider information security when designing networks.</p> <p>Upgrade hardware, such as routers or adaptors, and software, such as network drivers, as needed to support computer networks. Research new networking technologies to determine what would best support their organization in the future.</p>
	Operations Research Analysts	Operations research analysts use advanced mathematical and analytical methods to help organizations investigate complex issues, identify and solve problems, and make better decisions.

CLUSTER	JOB ROLE	JOB DESCRIPTIONS
Programming & Software	Software Developer / Engineer	<p>Software developers are the creative minds behind computer programs. Some develop the applications that allow people to do specific tasks on a computer or another device. Others develop the underlying systems that run the devices or that control networks. Analyze users' needs; design, test, and develop software to meet those needs.</p> <p>Recommend software upgrades, programs and systems.</p> <p>Design each piece of an application or a system and plan how the pieces will work together.</p> <p>Create models and diagrams that instruct programmers how to write software code.</p> <p>Ensure that a program continues to function normally through software maintenance and testing.</p> <p>Junior:</p> <ul style="list-style-type: none"> • 0-3 Years of Experience (usually right out of college) • Can write simple scripts • Preliminary understanding of an entire application lifecycle • Preliminary understand of databases and application services (queues, caching, etc.) <p>Senior:</p> <ul style="list-style-type: none"> • 4-10+ Years of Experience • Can write complex applications • Deep understanding of an entire application lifecycle • Deep understanding of databases and application services (queues, caching, etc.) • Comfortable working on any area of an app building whole applications at scale <p>Lead/Architects:</p> <p>Architects sometimes write code, but more often they design complex systems that will be implemented by teams of senior and junior developers. An architect's job is to use his technical wisdom earned after years of experience (leaning programming patterns and anti-patterns) to create the structure for a successful software project.</p> <p>Developer Manager:</p> <p>Manages projects through completion; analyzes, designs and develops software enhancements and new modules; manages development project from initial design through testing while providing strategic management direction. However the most common manager that a programmer turns into is a developer manager. The typical role of the developer manager is to mediate the needs of the product manager and project manager with the personalities of the development team. This role requires strong people skills, talent at mediating conflicts, and frequently acting like the group shrink. The developer manager's job is not just to hire, but also to fire the developers when needed.</p>

CLUSTER	JOB ROLE	JOB DESCRIPTIONS
Information Security & Business Continuity	Information Security Analyst	Information security analysts plan and carry out security measures to protect an organization's computer networks and systems. IT security specialists install, configure and upgrade security software to prevent cyber-attacks, educate [technical and non-technical] employees on computer security, monitor networks for security breaches, and inevitably respond to successful attacks with the appropriate countermeasures.
	Certified Information Security Professional	Certified Information Systems Security Professional (CISSP) is an independent information security certification granted by the International Information System Security Certification Consortium, also known as (ISC) ² .
	Computer Forensics Analyst	Computer forensics analysts collect information from digital devices as part of legal investigations. Some forensic science technicians, called <i>forensic computer examiners</i> or <i>digital forensics analysts</i> , specialize in computer-based crimes. They collect and analyze data to uncover and prosecute electronic fraud, scams, and identity theft. The abundance of digital data helps them solve crimes in the physical world as well. Computer forensics technicians must adhere to the same strict standards of evidence gathering found in general forensic science because legal cases depend on the integrity of evidence.
	Systems / Business Continuity Manager	<p>Business continuity management (BCM) is a framework for identifying an organization's risk of exposure to internal and external threats.</p> <p>The goal of BCM is to provide the organization with the ability to effectively respond to threats such as natural disasters or data breaches and protect the business interests of the organization. BCM includes disaster recovery, business recovery, crisis management, incident management, emergency management and contingency planning.</p> <p>A business continuity manager is the person who is responsible for the development and management of a business process before, during, and after a disaster. This is a position which will generally work in an office, though some travel can often be required. While this position will typically keep traditional office hours, extended work hours may be required depending on the organization and the position. This person will work with a team of employees, and the position is supervisory in nature. A business continuity manager should minimally attain a bachelor's degree in a field relating to business, and many organizations require several years of experience within disaster recovery.</p> <ul style="list-style-type: none"> • Develop, implement, and test disaster recovery policies and plans. • Review and analyze business impacts for each financial group, tracking status, and risks. • Test and evaluate software and vendors for security and redundancy of services and data. • Respond to emergencies and data losses, mitigate incidents, and plan to avoid them in the future.

CLUSTER	JOB ROLE	JOB DESCRIPTIONS
General IT User Support – Community & Call Center	Computer Repair Technician	Repair and maintain computer systems for individuals or businesses. May also include assisting: <ul style="list-style-type: none"> • Helpdesk • Computer • Support • Advanced Helpdesk • Helpdesk • Managers

List of Resources for this Model

(NOTE: There are other resources that were used for the entire project, including the report, listed in the accompanying report).

Burning Glass Technologies: Supply, Demand, and the Future of Work in the Pittsburgh Region

<http://www.alleghenyconference.org/wp-content/uploads/2016/08/InflectionPoint.pdf>

Comp TIA

<https://www.comptia.org>

Indeed

www.indeed.com

Indiana County Technology Center

<http://www.ictc.edu/high-school-programs/information-technologies/computer-systems/>

IT Career Finder

<http://www.itcareerfinder.com/it-careers.html>

Lenape Technical High School

<http://www.lenape.k12.pa.us/4/Content/cit>

Pennsylvania State Civil Service Commission

http://www.scsc.pa.gov/Job-Seekers/career-paths/Documents/IT_Careers_1_12_10.pdf

Technology Schools.Org

<http://technologyschools.org>

U.S. Bureau of Labor Statistics

www.bls.gov