

Eastern Center for Arts and Technology

Program Review

Networking and Cybersecurity

2019

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Eastern Center for Arts and Technology

Networking and Cybersecurity

Occupational Outlook

Locally, the opportunities look very good for the three job categories that EASTERN's Networking and Cybersecurity (NCS) program graduates are most likely to enter. Data from the state's Pennsylvania Workforce Development reports indicate promising job growth in Montgomery and surrounding counties for *Computer Support Specialists, Network and Computer Systems Administrators, and Information Security Analysts*. Below are the total open job postings as of Nov. 25th, 2019 for those three position categories.

Computer Support Specialist		Network and Computer Systems Administrator		Information Security Analyst	
Montgomery	694	Montgomery	608	Montgomery	365
Bucks		Bucks		Bucks	
Philadelphia		Philadelphia		Philadelphia	

If we include projections for the other nearby counties, Berks, Lehigh, Chester, and Delaware, we get an additional 633 total open job openings. This gives a total of 2300 open job opportunities for students based on current openings. Of course, not all of these jobs are for entry level candidates, but with so much demand employers are forced to consider well-prepared entry level candidates.

Opportunities at the national level are also promising with 5% average growth expected in the next 9 years for Network and Computer Systems Administrators. Information Security Analysts outlook looks ever better, with a growth above average at 32% over the next 9 years. See Appendix A for related information from Bureau of Labor statistics 2018 - 2028 national job outlook report.

The EASTERN NCS students continue to perform very well on the annual National Occupational Competency Testing Institute (NOCTI) tests. During the 2018-2019 timeframe, 100% of the students scored Competent and Advanced.

Enrollment over the past year has increased since the course adjustment to add cybersecurity. We have had 3 students move into the program since the start of the year. The cohort entering in 2019 has 18 students. Of the 18 students, 15 are juniors, 2 are first year seniors, and 1 is a second-year senior. When most students are asked why they are attending the program, dual enrollment is always in the top two reasons. EASTERN NCS students are able to graduate with 12 graded, transferable credits from Montgomery County Community College. It is not unusual for students in the program to take additional credits at Montgomery County Community College while still in high school. Parents and students are realizing the financial benefits of dual enrollment.

Most of the EASTERN NCS students are continuing on to college for at least an Associate's degree. The number of students pursuing a Bachelor's degree initially is increasing. In addition, a number of students are pursuing work in program related fields throughout high school and in college. Most employers are looking for at least an Associate's degree, but some small companies will hire people without a degree if they have professional certifications and hands-on experience for entry-level positions.

A concern today with any technology career is the threat of offshoring - the practice of sending technology jobs to lower cost countries such as India or Russia. With the advent of cloud computing and increased bandwidth this practice has become prevalent in most technology fields. Are these a threat to U.S. jobs? It's possible that some support jobs could move off-shore, however most organizations are understaffed for hardware support positions. Companies also need local staff to support high availability and 24x7 work environments. Cybersecurity has also had a positive impact on keeping jobs in the U.S. With companies concerned about state sponsored hacks, the need for local security professionals is growing. State sponsored attacks have also moved into the hardware realm. There has been huge concern over state sponsored hardware attacks with foreign suppliers.

Growing businesses need additional technical resources, often this is staff, physical server infrastructure, and expanding infrastructure. Networking and Cybersecurity can be complex and requires personal interaction with the business stakeholders to properly support the company. The growing concern with information security is

prevalent in the approximately 30% projected growth in Information Security Analysts.

Outsourcing, where support staff is employed by a third party or managed service provider, may or may not include off-shore resources. Many local companies find outsourcing to be a viable solution and hire local outsourcing companies. These companies are potential employers of our students.

Program Viability

Based on recent studies at both the national and regional level that show a very positive outlook for job opportunity for our students, the OAC supports continuing the NCS program. It is clear that this educational program continues to be attractive for the segment of the sending school's population. The feedback from the graduates show that our students are getting good jobs in the computer field with impressive advancements and salaries. There is no reason to expect this to diminish. The continuing market demand for networking and cybersecurity skills is the single strongest factor in this recommendation. This demand is supported by the following sources:

- Statistics show in the PA Workforce and the US Department of Labor reports, strong growth potential in job areas for which our students will be qualified. This is especially prevalent in Information Security Analysis
- Input from committee members
- Program performance shows that the students are entering college immediately after completing the NCS program
- Local job listings showing frequent new job postings

Area colleges also support the continuation of the NCS program through our dual enrollment program with Montgomery County Community College and an articulation agreement with Penn State - Abington.

- The MCCC dual enrollment program offers students 12 graded, transferable college credits through the NCS curriculum. Students can take additional courses for credit through MCCC

- PSU-Abington offers successful NCS students guaranteed entry in their highly coveted Information Systems and Technology (IS&T) program, provided they meet PSU's other entry requirements
- Students may also qualify for advanced placement credit at Penn College of Technology, part of the Penn State University system

Although it may be possible for students to obtain employment with the skills taught in the NCS program, students are always encouraged to go on to post-secondary education to obtain at least a two-year Associate degree or, preferably, a four-year Bachelor degree. As a result, most of our graduates go on to some post-secondary education. Students graduating from our NCS program have attended the following institutions:

- Drexel University
- Indiana University of Pennsylvania
- Kutztown University
- Montgomery County Community College
- New York Institute of Technology (NYC)
- Pace University (NYC)
- Penn College of Technology
- Penn State University - Abington
- Rensselaer Polytechnic Institute (NY State)
- Temple University
- West Chester University

Summary of Industry Trends

- Technology - What's trending in the industry?
 - The major server operating system used today is Microsoft Windows Server.
 - Cisco continues to be a major vendor in network infrastructure.
 - Virtualization of formally single tier servers is being used at all levels of computer networks. VMware is the dominant vendor in this technology area.
 - Cloud computing is an emerging platform for systems and software as a service business models.
 - Mobile devices continue to play a major role in the day to day operations of many organizations.

- Employers continue to seek employees with skills beyond technical, such as:
 - Logical thinking
 - Problem solving
 - Working independently
 - Being resourceful
 - Being able to see a task or problem through to the end
 - Being customer focused
 - Continuing education and professional certification
 - Good communications, both oral and written
 - Good team work
 - Positive attitude
 - Dependability
 - Good work ethics

- What did we learn?
 - Dual enrollment program through Montgomery County Community College continues to be viable. It began with the 2008-2009 school year.
 - Professional certification continues to be important in the industry and therefore for our students.
 - Eastern's NCS program must continue to keep up with current trends, teaching the latest operating systems and exposing the students to current technology and practices.

- The industry changes on a continuous basis and therefore the OAC will continue to monitor the trends and adjust the curriculum accordingly.

Program Recommendations

- Curriculum Adjustments
 - The OAC recommends that the curriculum be adjusted to better represent industry trends. The recommended changes are removing Linux Server curriculum and adding Cybersecurity curriculum.
- Student certifications
 - Since certifications are an important part of the student's portfolio, the OAC will continue to require the TestOut Microsoft Server Pro 2016 certification.
- Instructor Professional Development
 - The OAC recommends that the instructor receives training and certification in Microsoft Server 2016 and Cybersecurity.
- Equipment and materials needed
 - The OAC recommends that the classroom equipment be refreshed as required by new course curriculum or technologies. With the addition of Cybersecurity and CCNA v7.0, Cisco Network gear will need to be refreshed. (See Appendix B for Cisco Lab Requirements)
- Facilities and materials needed
 - The OAC will continue to monitor any facilities needs that arise:
 - Any classroom chairs or desks that are unsafe or falling apart should be replaced.
 - The raised classroom floor will be maintained.
- Frequency of Program Review
 - The OAC recommends the NCS OAC maintain the frequency of program reviews as every 5 years. Due to the nature of the industry, the NCS OAC is constantly watching industry trends and adjusting the curriculum as needed.
- Dual enrollment
 - The OAC recommends further development of Dual Enrollment programs with post-secondary institutions towards achieving an Associate or Bachelor Degree

- Honors Status
 - The OAC recommends that EASTERN continue to pursue honors status for the NCS courses in all of the participating high schools.

Implementation

	Cost Estimate
● School Year 2020-2021	
○ Instructor training	\$5000
○ Additional Cisco router/layer 3 switches	\$10,000
○ Software/License Fees	\$4000
○ Server Racks	\$2000
○ Lab Tables – Workbenches - Shelving	\$2000
○ Replacement Tools and Equipment	\$6000
Total:	\$29,000
● School Year 2021-2022	
○ Instructor training	\$5000
○ Cisco Routers/Layer 3 Switches	\$10,000
○ Replacement Tools and Equipment	\$3000
○ Software/License Fees	\$4000
Total:	\$22,000
● School Year 2022-2023	
○ Instructor training	\$5000
○ New Tools and Equipment	\$5000
○ Replacement Tools and Equipment	\$6000
○ Software/License Fees	\$4000
Total:	\$20,000
Grand Total:	\$71,000

Appendix A

Network and Computer Systems Administrators

Summary



Administrators maintain network LANs, WANs, and intranets.

Quick Facts: Network and Computer Systems Administrators

2018 Median Pay	\$82,050 per year \$39.45 per hour
Typical Entry-Level Education	Bachelor's degree
Work Experience in a Related Occupation	None
On-the-job Training	None
Number of Jobs, 2018	383,900
Job Outlook, 2018-28	5% (As fast as average)
Employment Change, 2018-28	18,200

[What Network and Computer Systems Administrators Do](#)

Network and computer systems administrators are responsible for the day-to-day operation of computer networks.

[Work Environment](#)

Network and computer systems administrators work with the physical computer networks of a variety of organizations and therefore are employed in many industries.

[How to Become a Network and Computer Systems Administrator](#)

Most employers require network and computer systems administrators to have a bachelor's degree in a field related to computer or information science. Others may require only a postsecondary certificate or an associate's degree.

[Pay](#)

The median annual wage for network and computer systems administrators was \$82,050 in May 2018.

[Job Outlook](#)

Employment of network and computer systems administrators is projected to grow 5 percent from 2018 to 2028, about as fast as the average for all occupations. Demand for information technology (IT) workers is high and should continue to grow as firms invest in newer, faster technology and mobile networks.

[State & Area Data](#)

Explore resources for employment and wages by state and area for network and computer systems administrators.

[Similar Occupations](#)

Compare the job duties, education, job growth, and pay of network and computer systems administrators with similar occupations.

[More Information, Including Links to O*NET](#)

Learn more about network and computer systems administrators by visiting additional resources, including O*NET, a source on key characteristics of workers and occupations.

What Network and Computer Systems Administrators Do?



Administrators fix computer server problems.

Computer networks are critical parts of almost every organization. Network and computer systems administrators are responsible for the day-to-day operation of these networks. They organize, install, and support an organization's computer systems, including local area networks (LANs), wide area networks (WANs), network segments, intranets, and other data communication systems.

Duties

Network and computer systems administrators typically do the following:

- Determine an organization's system needs and install network hardware and software
- Make needed upgrades and repairs to networks and ensure that systems are operating correctly
- Maintain network and computer system security
- Evaluate and optimize network or system performance

- Add users to a network, and assign and update security permissions on the network
- Train users in the proper use of hardware and software
- Interpret and solve problems when a user or an automated monitoring system alerts them that a problem exists

Administrators manage an organization’s servers and desktop and mobile equipment. They ensure that email and data storage networks work properly. They also make sure that employees’ workstations are working efficiently and stay connected to the central computer network. Some administrators manage telecommunication networks.

Administrators may help network architects design and analyze network models. They also participate in decisions about buying future hardware or software to upgrade their organization’s network. Some administrators provide technical support to computer users, and they also may supervise [computer support specialists](#) who help solve users’ problems.

Work Environment



Network and computer systems administrators work with both IT and non-IT staff.

Network and computer systems administrators held about 383,900 jobs in 2018. The largest employers of network and computer systems administrators were as follows:

Computer systems design and related services	18%
Educational services; state, local, and private	10
Information	10
Finance and insurance	10
Management of companies and enterprises	7

Although many network and computer systems administrators are employed by firms in the computer systems design and related services industry, they work in a variety of settings. Some might administer systems and networks for financial firms, and others work in hospitals or local government offices.

Network and computer systems administrators work with many types of workers, including other IT workers, such as [computer support specialists](#), [database administrators](#), [computer network architects](#), and [computer and information systems managers](#).

Work Schedules

Most network and computer systems administrators work full time. Organizations depend on their computer networks, so administrators may need to work overtime to ensure that the networks are operating properly around the clock.

How to Become a Network and Computer Systems Administrator



Administrators evaluate network and system performance and determine how changes in the environment will affect them.

Most employers require network and computer systems administrators to have a bachelor's degree in a field related to computer or information science. Others may require only a postsecondary certificate or an associate's degree.

Education

Although some employers require only a postsecondary certificate or an associate's degree, most require a bachelor's degree in a field related to computer or information science. There are degree programs that focus on computer network and system administration. However, because administrators work with computer hardware and equipment, a degree in computer engineering or electrical engineering usually is acceptable as well. Programs in these fields frequently include classes in computer programming, networking, or systems design.

Because network technology is constantly changing, administrators need to keep up with the latest developments. Many continue to take courses throughout their careers and attend information technology (IT) conferences to keep up with the latest technology. Some businesses require that administrators have a master's degree.

Licenses, Certifications, and Registrations

Companies generally require their network and computer systems administrators to be certified in the products they use. Certification programs usually are offered directly from vendors or from vendor-neutral certification providers. Certification validates the knowledge and the use of best practices that are required of network and computer systems administrators. Microsoft and Cisco offer some of the most common certifications.

Advancement

Network administrators can advance to become [computer network architects](#). They can also advance to managerial jobs in information technology (IT) departments, such as [computer and information systems managers](#).

Important Qualities

Analytical skills. Administrators need to evaluate networks and systems to make sure that they perform reliably and to anticipate new requirements as customers' needs change.

Communication skills. Administrators must describe problems and their solutions to non-IT workers.

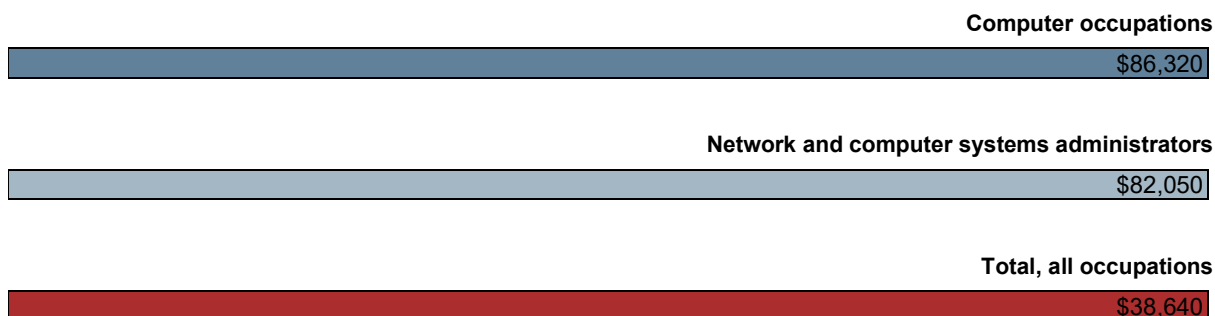
Multitasking skills. Administrators may have to work on many problems and tasks at the same time.

Problem-solving skills. Administrators must quickly resolve problems that arise with computer networks.

Pay

Network and Computer Systems Administrators

Median annual wages, May 2018



Note: All Occupations includes all occupations in the U.S. Economy.

Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics

The median annual wage for network and computer systems administrators was \$82,050 in May 2018. The median wage is the wage at which half the workers in an occupation earned more than that amount and half earned less. The lowest 10 percent earned less than \$50,990, and the highest 10 percent earned more than \$130,720.

In May 2018, the median annual wages for network and computer systems administrators in the top industries in which they worked were as follows:

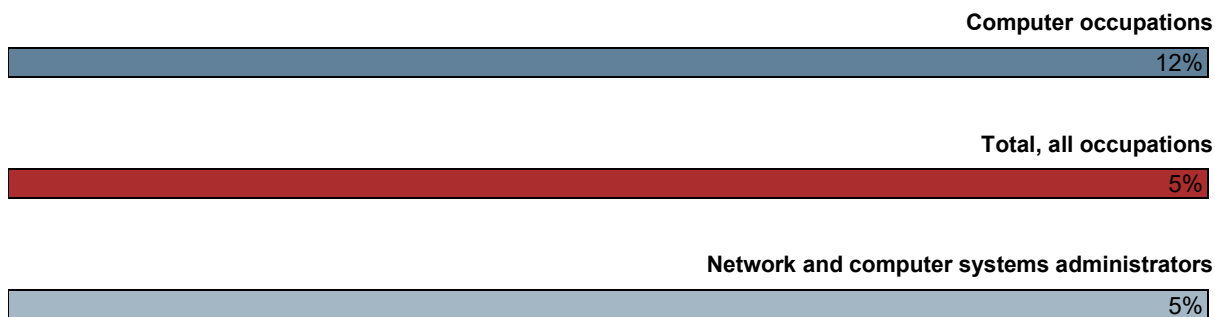
Information	\$88,440
Finance and insurance	87,950
Management of companies and enterprises	86,230
Computer systems design and related services	85,880
Educational services; state, local, and private	71,990

Most network and computer systems administrators work full time. Organizations depend on their computer networks, so administrators may need to work overtime to ensure that the networks are operating properly around the clock.

Job Outlook

Network and Computer Systems Administrators

Percent change in employment, projected 2018-28



Note: All Occupations includes all occupations in the U.S. Economy.

Source: U.S. Bureau of Labor Statistics, Employment Projections program

Employment of network and computer systems administrators is projected to grow 5 percent from 2018 to 2028, about as fast as the average for all occupations. Demand for information technology (IT) workers is high and should continue to grow as firms invest in newer, faster technology and mobile networks. Growth also is expected as the use of IT in healthcare increases. However, an increase in cloud computing could raise the productivity of network administrators, slowing their growth across many industries.

Employment of network administrators in the computer systems design and related services industry is projected to grow 24 percent from 2018 to 2028. The increasing adoption of cloud services by small and medium-sized businesses that do not have their own dedicated IT departments could increase the demand for network and computer systems administrators within this industry.

Job Prospects

Job opportunities should be favorable. Prospects should be best for applicants who have a bachelor’s degree in computer network and systems administration or computer science and who are up to date on the latest technology, especially cloud computing.

Employment projections data for network and computer systems administrators, 2018-28

Occupational Title	SOC Code	Employment, 2018	Projected Employment, 2028	Change, 2018-28		Employment by Industry
				Percent	Numeric	
SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program						
Network and computer systems administrators	15-1142	383,900	402,100	5	18,200	Get data

State & Area Data

Occupational Employment Statistics (OES)

The [Occupational Employment Statistics](#) (OES) program produces employment and wage estimates annually for over 800 occupations. These estimates are available for the nation as a whole, for individual states, and for metropolitan and nonmetropolitan areas. The link(s) below go to OES data maps for employment and wages by state and area.

- [Network and computer systems administrators](#)

Projections Central

Occupational employment projections are developed for all states by Labor Market Information (LMI) or individual state Employment Projections offices. All state projections data are available at www.projectionscentral.com.







Information on this site allows projected employment growth for an occupation to be compared among states or to be compared within one state. In addition, states may produce projections for areas; there are links to each state's websites where these data may be retrieved.






CareerOneStop

CareerOneStop includes hundreds of [occupational profiles](#) with data available by state and metro area. There are links in the left-hand side menu to compare occupational employment by state and occupational wages by local area or metro area. There is also a [salary info tool](#) to search for wages by zip code.

Similar Occupations

This table shows a list of occupations with job duties that are similar to those of network and computer systems administrators.

	OCCUPATION	JOB DUTIES	ENTRY-LEVEL EDUCATION	2018 MEDIAN PAY
	Computer and Information Systems Managers	Computer and information systems managers plan, coordinate, and direct computer-related activities in an organization.	Bachelor's degree	\$142,530
	Computer Hardware Engineers	Computer hardware engineers research, design, develop, and test computer systems and components.	Bachelor's degree	\$114,600
	Computer Network Architects	Computer network architects design and build data communication networks, including local area networks (LANs), wide area networks (WANs), and Intranets.	Bachelor's degree	\$109,020
	Computer Programmers	Computer programmers write and test code that allows computer applications and software programs to function properly.	Bachelor's degree	\$84,280
	Computer Support Specialists	Computer support specialists provide help and advice to computer users and organizations.	See How to Become One	\$53,470
	Computer Systems Analysts	Computer systems analysts study an organization's current computer systems and find a solution that is more efficient and effective.	Bachelor's degree	\$88,740

	OCCUPATION	JOB DUTIES	ENTRY-LEVEL EDUCATION	2018 MEDIAN PAY
	<u>Database Administrators</u>	Database administrators (DBAs) use specialized software to store and organize data.	Bachelor's degree	\$90,070
	<u>Information Security Analysts</u>	Information security analysts plan and carry out security measures to protect an organization's computer networks and systems.	Bachelor's degree	\$98,350
	<u>Electrical and Electronics Engineers</u>	Electrical engineers design, develop, test, and supervise the manufacture of electrical equipment.	Bachelor's degree	\$99,070
	<u>Software Developers</u>	Software developers create the applications or systems that run on a computer or another device.	Bachelor's degree	\$105,590
	<u>Web Developers</u>	Web developers design and create websites.	Associate's degree	\$69,430

Information Security Analysts

Summary



Information security analysts work to protect a company's computer systems.

Quick Facts: Information Security Analysts	
2018 Median Pay	\$98,350 per year \$47.28 per hour
Typical Entry-Level Education	Bachelor's degree
Work Experience in a Related Occupation	Less than 5 years
On-the-job Training	None
Number of Jobs, 2018	112,300
Job Outlook, 2018-28	32% (Much faster than average)
Employment Change, 2018-28	35,500

[What Information Security Analysts Do](#)

Information security analysts plan and carry out security measures to protect an organization's computer networks and systems.

[Work Environment](#)

Most information security analysts work for computer companies, consulting firms, or business and financial companies.

[How to Become an Information Security Analyst](#)

Most information security analyst positions require a bachelor's degree in a computer-related field. Employers usually prefer to hire analysts with experience in a related occupation.

[Pay](#)

The median annual wage for information security analysts was \$98,350 in May 2018.

[Job Outlook](#)

Employment of information security analysts is projected to grow 32 percent from 2018 to 2028, much faster than the average for all occupations. Demand for information security analysts is expected to be very high, as these analysts will be needed to create innovative solutions to prevent hackers from stealing critical information or causing problems for computer networks.

[State & Area Data](#)

Explore resources for employment and wages by state and area for information security analysts.

[Similar Occupations](#)

Compare the job duties, education, job growth, and pay of information security analysts with similar occupations.

[More Information, Including Links to O*NET](#)

Learn more about information security analysts by visiting additional resources, including O*NET, a source on key characteristics of workers and occupations.

What Information Security Analysts Do



Information security analysts install software, such as firewalls, to protect computer networks.

Information security analysts plan and carry out security measures to protect an organization's computer networks and systems. Their responsibilities are continually expanding as the number of cyberattacks increases.

Duties

Information security analysts typically do the following:

- Monitor their organization's networks for security breaches and investigate a violation when one occurs
- Install and use software, such as firewalls and data encryption programs, to protect sensitive information
- Prepare reports that document security breaches and the extent of the damage caused by the breaches
- Conduct penetration testing, which is when analysts simulate attacks to look for vulnerabilities in their systems before they can be exploited
- Research the latest information technology (IT) security trends
- Develop security standards and best practices for their organization
- Recommend security enhancements to management or senior IT staff
- Help computer users when they need to install or learn about new security products and procedures

IT security analysts are heavily involved with creating their organization's disaster recovery plan, a procedure that IT employees follow in case of emergency. These plans allow for the continued operation of an organization's IT department. The recovery plan includes preventive measures such as regularly copying and transferring data to an offsite location. It also involves plans to restore proper IT functioning after a disaster. Analysts continually test the steps in their recovery plans.

Information security analysts must stay up to date on IT security and on the latest methods attackers are using to infiltrate computer systems. Analysts need to research new security technology to decide what will most effectively protect their organization.

Work Environment



Many analysts work in IT departments and manage the security of their company's computer networks.

Information security analysts held about 112,300 jobs in 2018. The largest employers of information security analysts were as follows:

Computer systems design and related services	26%
Finance and insurance	18
Management of companies and enterprises	10
Information	8
Administrative and support services	6

Many information security analysts work with other members of an information technology department, such as [network administrators](#) or [computer systems analysts](#).

Work Schedules

Most information security analysts work full time. Information security analysts sometimes have to be on call outside of normal business hours in case of an emergency. Some work more than 40 hours per week.

How to Become an Information Security Analyst



There are a number of information security certifications available, and many employers prefer candidates to have certification.

Most information security analyst positions require a bachelor's degree in a computer-related field. Employers usually prefer analysts to have experience in a related occupation.

Education

Information security analysts usually need at least a bachelor's degree in computer science, information assurance, programming, or a related field.

Some employers prefer applicants who have a Master of Business Administration (MBA) in information systems. Programs offering the MBA in information systems generally require 2 years of study beyond the undergraduate level and include both business and computer-related courses.

Work Experience in a Related Occupation

Information security analysts generally need to have previous experience in a related occupation. Many analysts have experience in an information technology department, often as a [network or computer systems administrator](#). Some employers look for people who have already worked in fields related to the one in which they are hiring. For example, if the job opening is in database security, they may look for a database administrator. If they are hiring in systems security, a computer systems analyst may be an ideal candidate.

Licenses, Certifications, and Registrations

There are a number of information security certifications available, and many employers prefer candidates to have certification, which validates the knowledge and best practices required from information security analysts. Some are general information security certificates, such as the [Certified Information Systems Security Professional](#) (CISSP), while others have a more narrow focus, such as penetration testing or systems auditing.

Advancement

Information security analysts can advance to become chief security officers or another type of [computer and information systems manager](#).

Important Qualities

Analytical skills. Information security analysts must carefully study computer systems and networks and assess risks to determine how security policies and protocols can be improved.

Detail oriented. Because cyberattacks can be difficult to detect, information security analysts must pay careful attention to computer systems and watch for minor changes in performance.

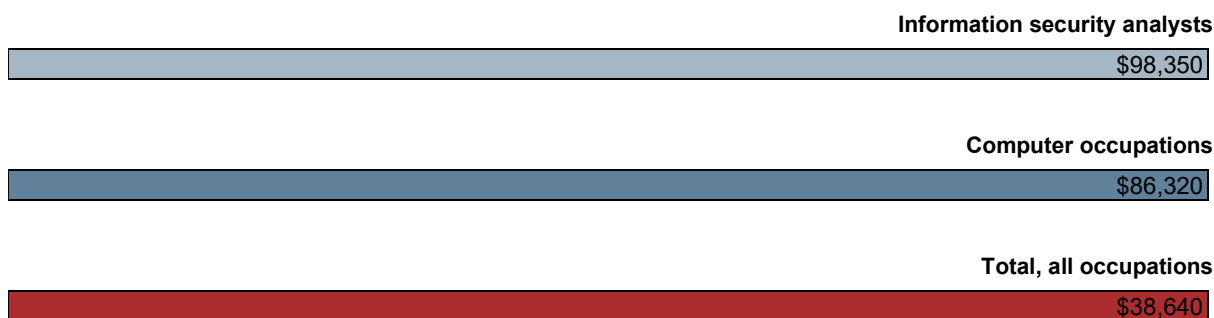
Ingenuity. Information security analysts must anticipate information security risks and implement new ways to protect their organizations' computer systems and networks.

Problem-solving skills. Information security analysts must respond to security alerts and uncover and fix flaws in computer systems and networks.

Pay

Information Security Analysts

Median annual wages, May 2018



Note: All Occupations includes all occupations in the U.S. Economy.

Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics

The median annual wage for information security analysts was \$98,350 in May 2018. The median wage is the wage at which half the workers in an occupation earned more than that amount and half earned less. The lowest 10 percent earned less than \$56,750, and the highest 10 percent earned more than \$156,580.

In May 2018, the median annual wages for information security analysts in the top industries in which they worked were as follows:

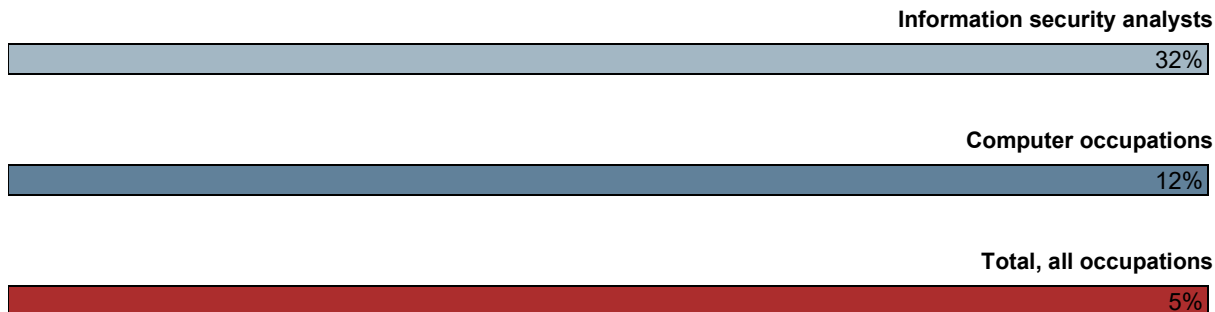
Computer systems design and related services	\$102,620
Finance and insurance	101,130
Information	96,580
Management of companies and enterprises	94,180
Administrative and support services	94,120

Most information security analysts work full time. Information security analysts sometimes have to be on call outside of normal business hours in case of an emergency. Some work more than 40 hours per week.

Job Outlook

Information Security Analysts

Percent change in employment, projected 2018-28



Note: All Occupations includes all occupations in the U.S. Economy.

Source: U.S. Bureau of Labor Statistics, Employment Projections program

Employment of information security analysts is projected to grow 32 percent from 2018 to 2028, much faster than the average for all occupations.

Demand for information security analysts is expected to be very high. Cyberattacks have grown in frequency, and analysts will be needed to come up with innovative solutions to prevent hackers from stealing critical information or creating problems for computer networks.

Banks and financial institutions, as well as other types of corporations, will need to increase their information security capabilities in the face of growing cybersecurity threats. In addition, as the healthcare industry expands its use of electronic medical records, ensuring patients' privacy and protecting personal data are becoming more important. More information security analysts are likely to be needed to create the safeguards that will satisfy patients' concerns.

Employment of information security analysts is projected to grow 55 percent in computer systems design and related services from 2018 to 2028. The increasing adoption of cloud services by small and medium-sized businesses and a rise in cybersecurity threats will create demand for managed security services providers in this industry.

Job Prospects

Job prospects for information security analysts should be good. Information security analysts with related work experience will have the best prospects. For example, an applicant with experience as a database administrator would have better prospects in database security than someone without that experience.

Employment projections data for information security analysts, 2018-28

Occupational Title	SOC Code	Employment, 2018	Projected Employment, 2028	Change, 2018-28		Employment by Industry
				Percent	Numeric	
SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program						
Information security analysts	15-1122	112,300	147,700	32	35,500	Get data

State & Area Data

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- [Information security analysts](#)

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CareerOneStop includes hundreds of [occupational profiles](#) with data available by state and metro area. There are links in the left-hand side menu to compare occupational employment by state and occupational wages by local area or metro area. There is also a [salary info tool](#) to search for wages by zip code.

Similar Occupations

This table shows a list of occupations with job duties that are similar to those of information security analysts.

	OCCUPATION	JOB DUTIES	ENTRY-LEVEL EDUCATION	2018 MEDIAN PAY
	Computer and Information Research Scientists	Computer and information research scientists invent and design new approaches to computing technology and find innovative uses for existing technology.	Master's degree	\$118,370
	Computer and Information Systems Managers	Computer and information systems managers plan, coordinate, and direct computer-related activities in an organization.	Bachelor's degree	\$142,530
	Computer Network Architects	Computer network architects design and build data communication networks, including local	Bachelor's degree	\$109,020

	OCCUPATION	JOB DUTIES	ENTRY-LEVEL EDUCATION	2018 MEDIAN PAY
	<u>Computer Programmers</u>	<p>area networks (LANs), wide area networks (WANs), and Intranets.</p> <p>Computer programmers write and test code that allows computer applications and software programs to function properly.</p>	Bachelor's degree	\$84,280
	<u>Computer Support Specialists</u>	Computer support specialists provide help and advice to computer users and organizations.	<u>See How to Become One</u>	\$53,470
	<u>Computer Systems Analysts</u>	Computer systems analysts study an organization's current computer systems and find a solution that is more efficient and effective.	Bachelor's degree	\$88,740
	<u>Database Administrators</u>	Database administrators (DBAs) use specialized software to store and organize data.	Bachelor's degree	\$90,070
	<u>Network and Computer Systems Administrators</u>	Network and computer systems administrators are responsible for the day-to-day operation of computer networks.	Bachelor's degree	\$82,050
	<u>Software Developers</u>	Software developers create the applications or systems that run on a computer or another device.	Bachelor's degree	\$105,590
	<u>Web Developers</u>	Web developers design and create websites.	Associate's degree	\$69,430

Appendix B

Lab Equipment Requirements in this Spreadsheet

1. **Equipment Lists: Option 1, Option 2, Option 3** (Note: Select option from below that would best fit your specific curriculum delivery audience and budget. Option 1 requires the least investment and provides all needed equipment for CCNA labs. Options 2 & 3 can support labs with advanced service modules, Unified Communications features, or to support more complex topologies.)
2. **Optional Products**
3. **Additional Lab Hardware and Software Required**

Equipment List (Option 1)

The Cisco 4221 router shown in Option 1 should be ordered with IOS-XE Image with Payload Encryption: e.g. SISR4200UK9-xxx (select a current version for xxx), Cisco ISR 4200 Series IOS XE Universal

Qty	Product Number	Description	Notes
2	ISR4221/K9	Cisco ISR 4221 (2GE, 2NIM, 8G FLASH, 4G DRAM, IPB) See note above regarding IOS-XE image.	1,2
2	WS-C2960+24TC-L (IN BRAZIL: SUBSTITUTE WS-C2960+24TC-BR= IN RUSSIA: SUBSTITUTE WS-C2960R+24TC-L)	Catalyst 2960 Plus 24 10/100 + 2T/SFP LAN Base Image	1, 2
1	Wireless Router	Wireless router (generic brand) with WPA2 support. Note: Wireless router is required for course #2 - Switching, Routing, and Wireless Essentials (SRWE)	

Equipment List (Option 2)

The Cisco 4321 router shown in Option 2 should be ordered with IOS-XE Image with Payload Encryption: e.g. SISR4300UK9-xxx (select a current version for xxx), Cisco ISR 4300 Series IOS XE Universal

Qty	Product Number	Description	Notes
2	ISR4321/K9	Cisco ISR 4321 (2GE,2NIM,4G FLASH,4G DRAM, IPB). See note above regarding IOS-XE image.	1,2
2	WS-C2960+24TC-L (IN BRAZIL: SUBSTITUTE WS-C2960+24TC-BR= IN RUSSIA: SUBSTITUTE WS-C2960R+24TC-L)	Catalyst 2960 Plus 24 10/100 + 2T/SFP LAN Base Image	1, 2
1	Wireless Router	Wireless router (generic brand) with WPA2 support. Note: Wireless router is required for course #2 - Switching, Routing, and Wireless Essentials (SRWE)	

Equipment List (Option 3)

The Cisco 4331 router shown in Option 3 should be ordered with IOS-XE Image with Payload Encryption: e.g. SISR4300UK9-xxx (select a current version for xxx), Cisco ISR 4300 Series IOS XE Universal

Qty	Product Number	Description	Notes
2	ISR4331/K9	Cisco ISR 4331 (3GE,2NIM,1SM,4G FLASH,4G DRAM, IPB). See note above regarding IOS-XE image.	

2	WS-C2960+24TC-L (IN BRAZIL: SUBSTITUTE WS-C2960+24TC-BR= IN RUSSIA: SUBSTITUTE WS-C2960R+24TC-L)	Catalyst 2960 Plus 24 10/100 + 2T/SFP LAN Base Image	1, 2
1	Wireless Router	Wireless router (generic brand) with WPA2 support. Note: Wireless router is required for course #2 - Switching, Routing, and Wireless Essentials (SRWE)	

Optional Products

	ACS-4220-RM-19=	19-inch rack mount kit for Cisco ISR 4220 (Note: this kit is compatible with ISR4221)	
	NIM-2T=	2-Port Serial WAN Interface card	5
	CAB-SS-V35MT=	V.35 Cable, DTE Male to Smart Serial, 10 Feet	
	CAB-SS-V35FC=	V.35 Cable, DCE Female to Smart Serial, 10 Feet	
Console Cables			
Qty	Product Number	Description	Notes
	CAB-CONSOLE-USB=	Console Cable 6ft with USB Type A and mini-USB Type B	2
	CAB-CONSOLE-RJ45=	Console Cable 6ft with RJ45 and DB9F	2
Service Products			
	Product Number	Description	
	CON-SNT-WSC296TC	SNTC-8X5XNBD Catalyst 2960 24 10/100 + 2 1000BT LAN	
	CON-SNT-ISR4221K	SNTC-8X5XNBD Cisco ISR 4221 (2GE,2NIM,8G FLASH,4G DRAM, IPB)	
	CON-SNT-ISR4321K	SNTC-8X5XNBD Cisco ISR 4321 (2GE,2NIM,4G FLASH,4G DRAM, IPB)	
	CON-SNT-ISR4331K (IN BRAZIL: SUBSTITUTE CON-SNT-ISR43BK9)	SNTC-8X5XNBD Cisco ISR 4331 (2GE,2NIM,4G FLASH,4G DRAM, IPB)	
Optional Equipment for NETLAB+			
	HWIC-16A=	16-Port Async HWIC	6
	NIM-16A=	16-Port Async Serial NIM	5,7
	CAB-HD8-ASYNC=	High Density 8-port EIA-232 Async Cable	
	CAB-ASYNC-8=	Async cable Octopus Cable for Async NIM	5,7
	WS-C2960+48TC-L	Catalyst 2960 Plus 48 10/100 + 2 T/SFP LAN Base	4
	CON-SNT-WSC2968C	SNTC-8X5XNBD Catalyst 2960 Plus 48 10/100 + 2 T/SFP L	

Additional Lab Hardware and Software Required

Hardware			
Qty	Description		Notes
1	(optional) PC acting as an application server (MS Windows Server or Windows 7 or later)		
3	Desktop PCs acting as clients (MS Windows 7 or later)		
2	Wireless LAN Adapters for the client PCs		
--	Ethernet cables and Serial Cables as required		
Software			
Qty	Description		Notes
--	Packet Tracer v7.3		

--	Tera Term source SSH client software for lab PCs.	
--	Oracle VirtualBox, most recent version.	
--	Wireshark version 2.5 or higher.	
--	Open-source server software: For various services and protocols, such as Telnet, SSH, HTTP, DHCP, FTP, TFTP, etc.	

NOTE 1: The Networking Academy - Image & Hardware Support Document lists the tested and supported IOS images for each hardware platform that provide expected and consistent results for the lab exercises. Routers and switches always ship with the latest IOS version and it may be necessary to move them to the tested and supported IOS image. The NetAcad Maintenance program allows instructors to download the recommended IOS image at no cost. The Image & Hardware Support Document and information on signing up for NetAcad Maintenance can be found in the Equipment Information section of netacad.com

NOTE 2: Console cables are not included with the purchase of new network devices and they have been added in the optional equipment section. Our recommendation is to purchase one console cable with each router or switch. CAB-CONSOLE-RJ45= cable is supported on all devices (Routers, Switches and ASAs). CAB-CONSOLE-USB= cable is supported on the 4321 and 4331 routers.

NOTE 3: The 4221 router does not support the Unified Communications Technology Package. Voice labs are supported on the 4321/4331 routers. There are no voice labs in the CCNA curricula; however, this could be an issue for academies that wish to use the devices to also teach a voice course as well as CCNA.

NOTE 4: Recommended for institutions using NETLAB+ as a control switch			
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NOTE 5: Not supported by 1921, 1941, 2901, 2911 router

NOTE 6: Not supported by ISR 4321 router

NOTE 7: NIM-16A= requires IOS-XE 16.3.1 or later