Lesson 3: Unified Network Careers

At a Glance

The people involved in the unification of networks are working at the heart of the Internet Revolution. They are working to deliver vastly more reliable, secure, integrated networks that bring together data, voice and services, WAN and LAN, fiber optics and wireless, for customers ranging from global carriers to home businesses.

This lesson describes some of the career opportunities for individuals interested in redefining how the world shares ideas, giving special attention to network designers/architects.

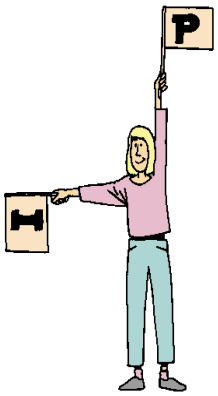
What You Will Learn

After completing this lesson, you will be able to do the following:

- Describe how the job of network design has changed over time
- Identify qualifications of a network designer/architect
- Identify key personnel a network architect works with and the duties of each
- Describe the benefits of certification

Student Notes:

Tech Talk



- **Certification**—An industry training credential, typically achieved by passing a proctored electronic exam covering specific technical topics.
- **IP Telephony**—The transmission of voice signals over IP networks.
- **Newbie**—Refers to a person who is new to a subject or activity, such as computers, the Internet, and networking.
- **Overengineered Network**—A network that is designed in such a way that no lines or links are used to their fullest capacity. This is made possible by adding more routers, switches, or bridges to segment the network and by increasing the number of transmission line within a network.
- **Telecommunications**—The transmission of digital information over wires, fibers, or through the air.

What is in a name?

Job titles in the computer industry are a lot like the common names of insects; consistency is definitely a problem. The common names of insects change from person to person and geographic region to geographic region. For example, some individuals refer to the insect family Reduviidae as "Assassin Bugs" and others might refer to it as "Stink Bugs." A very common misnomer involves the "Pill Bug," also known as the "RollyPolly" or the "Sow Bug." Not only does the Pill Bug have multiple names, it is not even an insect; it is a crustacean. In the case of the computer industry, the job title also changes depending on the geographic region or the company offering employment. One company may advertise for a Network Engineer and another company is looking for a Network Analyst. In fact, they are often looking for the same individual, with the same qualifications.

As a "newbie" to the computer industry, it can be very confusing. How does one determine which job title describes his or her qualifications? It is important to focus on the qualifications within the advertisement, rather than the job title.

Job Title Confusion

Below is a sample list of job titles one might encounter when looking for a job in networking, specifically jobs that are involved with the development of unified networks. Many of these titles have alternative titles and often they are changed to represent specialty areas. Those titles that are offset are examples of alternative job titles with or without specialties attached.

- Network Architect
  - Network Designer
  - VoIP Network Architect
- Manager of Information Services (MIS)
  - Operations Manager
- Director of Information Services (DIS)
  - Director of Information Technology
- Chief Information Officer (CIO)
- Network Engineer
  - Network Analyst
  - Voice Engineer
  - Wireless Networking Engineer
- Telecommunications Technician
  - Video Technician
  - Satellite Technician
  - Voice Technician
- Telecommunications Engineer
  - Telecommunications Analyst
- Internet Service Engineer
  - Online Service Engineer
  - Internet Network Administrator
- Internet Consultant
- Solutions Engineering Consultant
  - Carrier IP Consultant

Check Your Understanding

- The list of job titles is very incomplete. Many new job titles are popping up in an attempt to succinctly describe jobs that are specific to the convergence of networking. Create four job titles that indicate the job requires specific skills for the unification of networks. (For example, VoIP Network Architect.) Use the knowledge you have gained from completing this course to guide you in your choices.

- Without seeing an actual job description, speculate what might be the qualifications for an IP Telephony Specialist.

- Speculate why job titles are so varied from company to company.

The Future of Network Designers

During this course, the job of designing networks has been a constant underlying theme. The task of network design has always been very complex, but in the beginning, networks were much simpler than they are today. Networks of the past often consisted of small LANs. Then as the demands for greater connectivity increased, these small networks grew into many interconnected LANs, MANs, and WANs.

As networks grew, implementation issues and problems arose. Often the problems grew so quickly that there was not enough time to think through solutions. Most solutions were generally on the level of a patch, done to solve only the immediate problem. This patchwork approach has resulted, over time, in large, often overengineered networks that are costly and hard to manage.

Data and voice networks developed independently of each other. Organizations even today maintain separate infrastructures for their data and voice communications. They maintain separate management personnel and support staff for each infrastructure. With the advent of the Internet and the development of numerous emerging technologies, the future of networking is going to change. The separate world of data and voice will converge into one infrastructure.

With that change will come even greater challenges to design networks that can mesh voice, data, wireless, video, and the power of the Internet into one unified network.

The approach to network design can no longer be patchwork. In order to provide quality of service, unified networks must be implemented with extreme care and planning. The network architects or designers of the future must have very special qualifications to meet the challenges of building unified networks.

Qualifications

So just what is a network architect or designer? The definition may be different for different people, but overall a network architect is:

- A planner who is capable of looking at the big picture, not just the day-to-day problems.
- A visionary; someone capable of forecasting the future growth potential of the network and taking advantage of emerging technologies in a logical, yet cost conservative, manner.
- A person who has achieved the highest level of technical training. A network architect must understand every aspect of a network. Many people in networking are experts in one aspect or another, such as routing or cabling, but a network architect must be highly trained in all networking concepts, such as:
  - Networking standards, including the OSI model
  - Network protocols, particularly TCP/IP
  - Routing protocols (e.g., RIP, OSPF, and BGP)
  - Network components (e.g., bridges, switches, routers)
  - LAN technologies (e.g., Ethernet and Token Ring)
  - Frame and cell switching
  - ATM and Frame Relay implementation
  - WAN devices, interfaces, and speeds
  - IP addressing
  - VPN and voice solutions
  - Wireless technologies
- A person skilled in research and business strategies
- A person with highly developed listening and communication skills
- A writer capable of creating clearly defined goals, explanations, and recommendations
- An organized person who not only is organized within his or her environment, but also capable of creating order out of chaos
- An innovator, a thinker, a manager, a team player, and a perpetual learner

The Network Design Team

Implementing unified networks requires coordination and teamwork between the network architect and many other networking professionals. Each professional has specific knowledge that the architect may tap into for information and direction while developing a complete network design proposal. This section of the lesson covers only a few of the networking professionals an architect may collaborate with while preparing a network design.

Chief Information Officer (CIO)

The CIO is often the highest information services executive within a large organization. This is a person with not only a high level of understanding of technology, but also strong business sense. The CIO frequently makes decisions about the implementation of technologies that will improve the organization's position in the business world; give the organization a competitive edge. This is a highly paid position that typically requires graduate degrees in information technology, industry certifications, and often a Masters degree in Business Administration (MBA). The CIO frequently makes the first contact with a network architect to investigate how the organization's network operations can be improved. The architect works closely with the CIO to gather information on the goals and future plans of the organization.

Director of Information Systems (DIS)

In medium size organizations, there may not be a CIO. A CIO commands a very high salary (up to $200,000 in some major companies) and smaller organizations simply cannot afford a CIO. In such cases, an organization may have a Director of Information Systems (DIS) or perhaps a Manager of Information Systems (MIS). The DIS typically is in charge of managing the Information Services (IS) department of a small to medium size organization. The IS department consists of technicians that perform the day-to-day maintenance operations required to keep the network operational. Like the CIO, the DIS is concerned with the big picture and the future of the organization's network. Although a DIS salary level is lower than a CIO, this is still a well-paid job typically requiring a graduate degree in information systems and industry certifications. The network architect works with the DIS in the same manner he or she would work with a CIO.

Manager of Information Systems (MIS)

Typically, small organizations leave the management of the network to a Manager of Information Systems (MIS). A MIS is a lower paid position than either the CIO or the DIS. The responsibilities may involve managing a small IS department, but often the duties are more encompassing. The MIS may have hands-on duties, such as configuring the network, and assigning and maintaining databases of network users. A MIS usually holds an undergraduate degree or equivalent experience in computer science or information systems. Some companies require the MIS to hold industry certifications. If a network architect is called in to recommend design changes, the MIS may provide similar information as a CIO and DIS would, and even provide statistical data about the current network.

Network Engineer or Analyst

The job title of network engineer or network analyst is a good example of how different organizations have different names for the same job. Frequently, network engineers or analysts are network designers for small companies. The network engineer may be responsible for predicting future network expansion and creating a network design to accommodate those needs. However, network engineers typically work on a smaller scale than the network architect. The engineer is often responsible for the installation and configuring of network hardware and software, analyzing the network performance, and implementing changes that improve the quality of service. An undergraduate degree or equivalent experience and industry certifications are expected of network engineers. The statistical data required by the architect to analyze the state of the current network is often gathered and maintained by the network engineer.

Telecommunications Engineers and Technicians

Telecommunication positions require individuals with a strong background in internetworking data networks with the telephone system and the Internet. Engineers and technicians interface with Internet Service Providers, install and configure modems, support video conferencing and even some voice communications. They must have knowledge of networking components, WAN interfaces, wireless systems, and communication line speeds. An undergraduate degree and experience in the telecommunications field is expected of engineers, while technicians may often have a community college degree or work experience. Telecommunications engineers may work directly with the network architect in designing the infrastructure required for the integration of the voice, video, and data networks. They can provide valuable information on the existing network and expectations for the future.

IP Telephony Specialists

This is a relatively new employment category. It encompasses specialized engineers, architects, and technicians that are trained in data and voice transmission (including switching, signaling, and routing systems). Successful individuals have experience in the emerging technologies behind both voice and data communications, including TCP/IP, Frame Relay, ATM, T1, ISDN, SONET, ATM, PSTN technologies and PBX systems. Experience, training and education, and industry certifications define the type of position. The duties of IP telephony specialist range from analyzing current network conditions and creating network designs for the convergence of data and voice networks to the installation of telephony and computer network equipment. Network architects may collaborate with IP telephony engineers when designing a unified network. IP telephony technicians often provide valuable information on the state of current voice and data networks, and past successful and/or failed implementations of IP telephony within the organization.

Internet Service Provider and Internet Telephony Service Provider

Internet Service Providers (ISP) are businesses that provide network connections to the Internet for a fee. They maintain a high level network backbone of gateways, high-speed transmission lines, and web servers. An ISP may or may not provide VPN services. Where VPN services are offered, the ISP may provide the equipment and management for the VPN. Internet Telephony Service Providers extend the services of an ISP to include VoIP gateways for customers to place calls between the PSTN and VoIP terminals (e.g., PCs or IP Telephones). An ISP or ITSP employs a variety of support personnel and IP engineers. As the network architect develops a network design, he/she may collaborate with the owner of the ISP/ITSP, the support personnel, and the IP engineers for service contracts, quality of service agreements, and pricing.

Check Your Understanding

- What are the differences between a CIO, a DIS, and a MIS?
- Speculate why experience may be just as important as classroom education or training.
- Who would a network architect contact to gain insight into an organization's business requirement and goals for future growth?
- Who would the architect contact for statistical information on the current network?

Industry Certification

Certification is an industry training credential, typically achieved by passing a proctored electronic exam covering specific technical topics. Not every networking job requires certification. Many networking companies are hiring individuals whose only qualifications include a strong interest and willingness to learn about the industry and high communication and people skills.

Where certification is required or recommended for employment, every networking company and every organization may require different certifications. There is a certification for nearly any skill in computing and networking; some are very specific and others are more general.

Universities, colleges, community colleges, and private industry are all creating certification programs to train anyone interested in joining the networking workforce, or upgrading their current networking skills. Frequently, the entry-level training and certification programs do not require more than a high school diploma. For those individuals interested in bypassing higher education, a training facility may have the program that will accommodate that goal.

So if certification is not always required, why go through the process at all? The computer and networking world is a highly competitive place. It may be possible to acquire an entry level position and even progress up the career ladder without pursuing certification, but ultimately, certification improves a person's marketability and speeds up the promotion process. Additionally, the computer industry is changing so rapidly, that it is very difficult to keep up with all the new technologies under development. Certification demonstrates to potential employers that a person is interested in remaining current in the field.

One of the major problems associated with certification centers on the proprietary nature of certification. Many certifications are vendor specific, focusing on their equipment and their proprietary software. For example, it is conceivable that a person could take two or more routing certifications from different vendors, so he/she can accurately market his/her credentials to companies with a mixture of networking equipment. Additionally, to complete one certification, one might have to complete a prerequisite certification.

Planning and research is an important component for preparing for any career. Researching and planning what certifications are required for a specific career is an important step in realizing that goal.

Network +

Network + is a vendor-neutral certification exam on the fundamentals of networking. This new nationally recognized exam was created by the Computing Technology Industry Association (CompTIA) to certify networking technicians with 18-24 months of experience in the Information Technology industry. Possessing the Network + certification indicates to an employer that the individual possesses the knowledge needed to configure and install the TCP/IP client within a network.

Nortel Networks Certification Framework

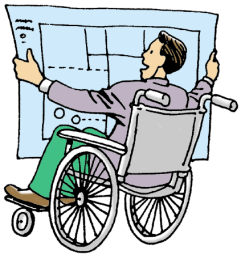
As previously stated, many companies offer certification covering a myriad of subjects. Many of these certifications are progressive. Below is an outline of the certification framework for the Nortel Networks certification program.

- **Certified Account Specialist**—Completion indicates a fundamental level of Nortel Networks products, industry and technology expertise.
- **Certified Design Specialist**—Completion indicates a fundamental level of design expertise. Individuals participate in planning activities for networks that utilize Nortel Networks solutions.
- **Certified Design Expert**—Completion indicates an advanced knowledge of Nortel Networks products and solutions. Individuals can develop optimal network solutions and detailed network designs based on customer requirements.
- **Certified Support Specialist**—Completion indicates a fundamental level of technical expertise that enable a candidate to deploy, operate, and troubleshoot Nortel Networks solutions. Specialists provide the day-to-day operational support for sophisticated networks.
- **Certified Support Expert**—Completion indicates the ability to effectively implement, configure, support, troubleshoot, and optimize Nortel Networks solutions. Successful candidates provide advanced operational network support.
- **Certified Network Architect**—Completion indicates an advanced level of consulting, technical, and design expertise. To achieve this credential, candidates must pass a rigorous portfolio assessment.

Try It Out: Listening Skills

Materials Needed:

- Windows 95 PC
- Any Word Processor (e.g., MS Word)
- Pen/Pencil and Paper



Listening and communication skills are very important qualifications for anyone aspiring to work in the field of networking. This is particularly true for those aspiring to become network architects some day. Architects need to determine from conversations with their various contacts, what the business requirements and performance expectations exist. The designer must translate this information into network design requirements that will accomplish the business requirements and still provide performance. If the architect has poor listening skills, the network design may fall short of the expectations of the customer.

In this activity, you will rate your listening skills. This will give you a guide as to what improvements you may need to make to your ability to listen to your client (or anyone).

1. Work in pairs.

2. Before beginning this listening exercise, write a one-page paper about any subject that you are knowledgeable about. Your partner must do the same. Do not share your papers. The written portion of the exercise is just for your record and will be used later if there is a disagreement about what each of you said during the activity.

3. Write a ten-question quiz covering the information in your paper. Make sure your quiz is not too easy. You will use the quiz to test your partner's listening skills.

4. You and your partner must participate in the activity as a listener and as a speaker.

5. Spend 15 minutes talking about the subject that you wrote about in step 2. As you are talking, your partner must listen without interrupting or taking notes.

6. After you have finished talking, your partner must spend 15 minutes taking about the subject that he or she wrote about in step 2. You must listen to your partner without interrupting or taking notes.

7. After you and your partner are finished talking, separate for 15 minutes. During this period, take the quiz your partner prepared. Your partner must take the quiz you prepared.

8. After you and your partner have finished the quizzes, exchange the quizzes and grade them.

9. What was your score? Rate yourself according the scale below.

Score	Type of Listener
90-100 %	Excellent Listener
80-90%	Good Listener
70-80%	Fair Listener
Below 70%	Poor Listener

10. If your rating was fair or lower, why did you have problems?

11. What steps could you take to improve your listening skills?

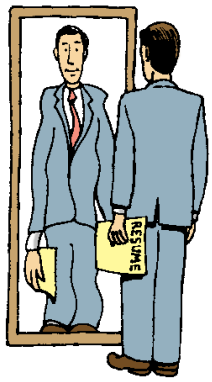
Rubric: Suggested evaluation criteria and weightings:

Criteria	%	Your Score
Completion of one page paper and quiz	25	
Quit and attentive listening without interrupting or taking notes	25	
Thoughtful analysis of listening skills	25	
Good or Excellent Listener rating	25	
TOTAL	**100**	

Stretch Yourself: 2005 Network Job Search

Materials Needed:

- Windows 95 PC
- Internet Connection
- Any Word Processor (e.g., MS Word)
- Calculator (optional)
- Pen/Pencil and Paper



1. Explore the Internet to find job openings for networking and communications professionals. Use these sites as starting points:

- http://www.snellingsearch.com/jobis.html
- http://www.bell-atl.com/jobpost/avail.htm
- http://www.looksmart.com/eus1/eus65300/eus71314/eus76271/eus216934/r?isp=zl&comefrom=izl-catmatch

2. Make notes on jobs that interest you. Look at the qualifications for those jobs to determine the education and experience required.

3. Using a word processor, and your knowledge of Unified Networks, write a job advertisement for a Unified Network career position that might appear on the Internet in year 2005.

4. Design a method to calculate the appropriate salary range. Share your logic with your teacher for evaluation and comment.

5. Include the salary range in the advertisement.

6. Print the job position and post it on a career bulletin board in your classroom.

7. Select one of the job advertisements, written by another student, that interests you.

8. Research the knowledge, skills, education, experience, and abilities required for the position. If you were to apply for that position in 2005, what choices would you be making in the next 5 years to get there?

9. Develop a career development plan that would give you the skills and experience to apply for the job.

10. Assuming that you followed the career development plan you just developed, write a resume and application for the job you have selected.

11. Give it to the student who wrote the advertisement. Then make sure it gets to your teacher so you can place it in your portfolio.

Rubric: Suggested evaluation criteria and weightings:

Criteria	%	Your Score
Thorough research	25	
Complete advertisement reflecting knowledge of Unified Networks	25	
Logical method for determining salary range	25	
Resume reflecting career development plan	25	
TOTAL	**100**	

Network Wizards: Unified Networks Technology Career Symposium

Materials Needed:

- Windows 95 PC
- Any Word Processor (e.g., MS Word)
- Pen/Pencil and Paper
- Reserved Conference Space within school (e.g., cafeteria or auditorium)
- School's Videoconferencing equipment (optional)

This activity requires that you work closely with all the NetKnowledge students within your school and your instructors to organize a technology career symposium. A technology symposium gives students an opportunity to explore the vast opportunities in technology. Students can learn about local technology companies in the area and potentially meet future employers. Those students planning to attend college may discover academic programs in technology offered by the local and state universities and colleges.

The tasks that are required for organizing such an event must be divided amongst all the students. No one person can do all the tasks. Perhaps a specific task can be assigned to each class or students can sign-up for a task that interests them. Research job fairs and determine the key characteristics of a job fair. These characteristics may help you in determining all the tasks necessary for conducting a good symposium.

Below are some suggestions to get started.

- Invite local industry representatives and colleges to participate.
- Include in the symposium, an exhibitor's room.
- Arrange for industry panel discussions on various subjects, such as the future of technology and how to land a job in the industry.
- Offer a resume writing workshop.
- Make sure food and beverages are available.
- Consider a student panel discussion.
- Consider if some of the participants will need overnight accommodations. If so, organize accommodations in student homes (if possible) and negotiate reduced hotel rates for participants.

If your school has video conferencing equipment, add another dimension to your symposium by video conferencing some of the panel presentations throughout the school's classrooms, so that other students may take advantage of the discussions.

Negotiate with your teacher the grading criteria to which you will be held accountable. Depending on your task, the criteria will be different. Overall, all students will be required to show enthusiastic participation, organization, professionalism, and cooperative teamwork.

Rubric: Suggested evaluation criteria and weightings:

Criteria	**%**	**Your Score**
Enthusiastic participation	25	
Organized and professional contributions	25	
Cooperative teamwork	50	
TOTAL	**100**	

Part Two: Network Design Portfolio Case Study

You have reached the end of the Unified Networks Emerging Technology course and you should have your network design proposal prepared for presentation to your teacher, classmates, and your client.

There are several points to remember when doing a presentation:

- **Be prepared**—Make sure you have all your materials organized and prepared in a professional manner. Do not attempt to read your presentation, practice enough that you can use your notes only sparingly.
- **Make eye contact**—Try to look at your audience as much as possible. Avoid looking down at the floor. Such actions suggest a lack of confidence. The last thing you want is for your client to think you are not confident about the information you are presenting. If you are not confident, your audience will not be confident.
- **Speak clearly**—Avoid those nasty "UMs". Practice taking a breath when you feel an "UM" coming on. Typically, "UMs" are our unconscious way of filling dead air space while we think about what to say next.
- **Be rested and dress professionally**—You want to give a good impression. Avoid yawning. Be sure to wear clean and neat clothing.
- **Allow discussion**—Offer a question and answer session. Do not worry if you can not answer all the questions. Do not try to fake it. Indicate that you will research the question and get the answer.
- **Be gracious**—Remember to thank your audience for coming.

Summary

Unified Network Careers

In this lesson, you learned the following:

- How the job of network design has changed over time
- The qualifications of a network designer/architect
- Key personnel a network architect works with and the duties of each
- The benefits of certification

Review Questions

Unified Network Careers

Part A:

1. Describe why the job of a network designer has changed over time.

Part B:

Identify each statement about the qualification of a network designer/architect as either True or False.

1. _____ Network designers are technicians that only perform the day-to-day operations to keep a network performing.
2. _____ Network designers are not interested in the budgetary constraints of the client.
3. _____ Network designers are visionaries, capable of forecasting the future growth potential of a network.
4. _____ Network designers must achieve the highest level of technical training in all aspects of networking.
5. _____ Network designers are not skilled in business strategies.
6. _____ Listening and communication skills are a must for network designers.
7. _____ Network designers must write clearly defined goals and recommendations.
8. _____ Network designers work alone. Teamwork is not important.
9. _____ Network designers are not managers.
10. _____ Network designers are perpetual learners.

Part C:

1. The highest information services executive within a large organization is

   a. The Manager of Information Systems.

   b. The Chief Information Officer.

   c. The Director of Information Systems.

   d. The Network Architect.

   e. None of the above.

2. The duties of a Network Engineer include

   a. Network design to accommodate future needs of the organization.

   b. Installation and configuring of network hardware.

   c. Analyzing the network performance.

   d. A, B, and C

   e. B and C only

3. Who would a network designer contact to get statistical information on the current network?

   a. The network engineer and the CIO

   b. The network engineer, the telecommunications technician, and the IP telephony technician.

   c. The Internet Service Provider

   d. All of the above.

   e. None of the above.

4. An undergraduate degree is required to work in any position within the networking field.

   a. True

   b. False

5. Who would the network designer contact to gather information about a company's business requirements?

   a. The CIO

   b. The DIS

   c. The network engineer

   d. The MIS

   e. A, B, and D

Part D:

1. In many circumstances, certification is not required. Given that fact, what are the benefits of certification?

2. Briefly describe the Network + certification.

Scoring

Criteria	%	Your Score
Part A: Describe how the job of network design has changed over time.	20	
Part B: Identify qualifications of a network designer/architect.	30	
Part C: Identify key personnel a network architect works with and the duties of each.	30	
Part D: Describe the benefits of certification.	20	
TOTAL	**100**	
Try It Out:	**100**	
Stretch Yourself:	**100**	
Network Wizards:	**100**	
FINAL TOTAL	**400**	

Resources:

Christianson, J.S.& Fajen, A..(1998). Computer and Network Professional's Certification Guide. San Francisco: Network Press.

Henderson, H. (1999). Career Opportunities in Computers and Cyberspace. New York: Checkmark Books.

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Ruhl, J. (1996). The Computer Consultant's Workbook. Leverett, Massachusetts: Technion Books.