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Closing The IT Network Skills Gap

How managers can understand and prepare for new networking skill requirements

A commissioned study conducted by Forrester Consulting on behalf of Cisco



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Executive Summary

Managing talent in the network environment is becoming increasingly challenging for CIOs, IT managers, and HR decision-makers. Traditionally, the network has been viewed as the “dial tone” of IT — providing “always on and always available” connectivity. But the network’s sophistication is evolving rapidly as it transitions from a basic transport system to a business-critical application and services delivery platform. To keep pace with the new business requirements, companies are investing heavily in new tools and infrastructure.

As the sophistication of the network increases, however, the skills requirements for network professionals will also increase. Traditional positions within the network - such as network architects, engineers, and administrators - require employees with more specialized skills and greater levels of experience. At the same time, new job skills related to security, voice, wireless, and remote office work are becoming critical to the functionality of the network. What should IT managers do? They need to hire, train, and ramp dedicated professionals. In this rapidly changing network environment, network education, skills assessment tools, and training and certification programs are required.

We recommend that hiring managers take a three-phase approach:

1. **Focus on roles, not titles.** IT organizations can prepare for these changes by focusing on the evolution of network roles. Unlike job titles, which may vary significantly between organizations, roles are universal and do not vary significantly - regardless of a company’s geography, industry, or size.
2. **Assess your skills gaps.** By examining the skills requirements of various network-related roles and understanding how these roles are changing, IT organizations can make more targeted, effective investments and close skills gaps as networking roles evolve.
3. **Provide training and certification to ensure relevant skills.** The final step is to optimize staffing by training and certifying network professionals. This will ensure that they can execute on the hard skills (implementation, maintenance, and monitoring) as well as the soft skills (architectural planning, project management, and business case justification) necessary to keep pace with the evolution of the network.

Study Methodology

To understand how network roles are evolving, Cisco commissioned Forrester Consulting to conduct a 1,500-response survey of individuals responsible for managing, evaluating, or hiring network professionals. The survey was conducted in 10 countries, each with 150 survey responses, and focused on three market-type categories:

- “Emerging” market countries: Brazil, China, South Korea, and India.
- “Early Transforming” market countries: Mexico and Russia.
- “Mature” market countries: United States/Canada, Germany, United Kingdom, and Japan.

The goal of the survey was to gather data about the various job roles within the network and understand how skills requirements would change over a five-year time horizon. In addition, we

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asked respondents how they hire and train network professionals, the extent to which they rely on professional certifications, and how they had progressed through their own network careers.

The Evolution Of The IT Network

Network managers are under pressure to ensure the network is fail-safe. They're tasked with providing secure access to an expanding portfolio of applications to an increasingly distributed workforce. Ensuring adequate levels of service is becoming more difficult, with a host of new business-critical technologies now interacting with the network. As with many technology domains, the innovation in networking tools is outpacing the skills required to implement and manage them. The macro-level issues affecting the network can be reduced to three familiar areas: people, process, and technology.

- **People.** The network is becoming a more critical asset for the business, but networking professionals are still primarily viewed as just “firefighters” within most IT organizations. As network technology evolves and the network becomes a more mission-critical component of business processes, expect the profile of the typical network professional to change dramatically. Networking staff will also need to be increasingly collaborative, working with server, storage, security, and desktop colleagues to operate the network as an end-to-end service delivery platform.
- **Process.** As IT matures into a process-driven organization — influenced by frameworks like ITIL — and the network becomes more closely tied to the business, the managers of the network are being held more accountable.¹ As a result, managers are now responsible for measuring success on a whole new set of metrics such as service levels, process refinements, and other service delivery and support requirements. In particular, network professionals will have to streamline implementation processes as well as align ongoing operations with the business. This means service level agreements (SLAs) must reflect revenue growth, profitability, productivity, and process optimization as opposed to the traditional availability, packet loss, jitter, and throughput.
- **Technology.** Traditional network technologies are commoditizing, and advanced technologies are becoming the mainstay for day-to-day network operations. SOA, virtualized IT, and ubiquitous mobility are bringing the network “front and center” to the business. If applied correctly, these new technologies allow companies to create the more relevant SLAs as well as reduce costs, leverage existing infrastructure, increase security, and increase productivity. However, if organizations expect to maximize the value from their new technologies, they'll need network professionals who are trained on the technologies and have the skills necessary to manage them.

A Role-Focused View Of The Network

To prepare for the changes in the network, network hiring managers need to first understand the evolution of network roles. In this paper, we distinguish a “role” from a “title” or a “position” in order to focus on the underlying skills required to support a typical network. For example, the network architect “role” has traditionally had responsibility for design and strategy. Though the title for the network architect role could vary across companies of different geographies, industries, or company sizes, the responsibilities of this role are likely to be consistent.

As part of an initial analysis, Forrester categorized the network roles into two broad categories: IT infrastructure (and operations) and IT architecture. Forrester identified 11 roles that require network expertise (see Figure 1). However, we also determined that three of these roles — enterprise

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architect, security architect, and infrastructure generalist — required fewer networking-specific skills and overlapped significantly with the remaining eight roles.² We then explicitly tested these eight roles by surveying the 1,500 IT managers worldwide.

To further explore these roles and determine which have critical mass, we asked organizations whether there was a person with dedicated responsibility or shared responsibilities for these network-related functions (i.e., as opposed to outsourced to a third party or not managed at all). See Appendix A for the distribution of respondents by company size.

Figure 1: The Majority Of Companies Dedicate Resources For Eight Network Roles*

		Percent indicating dedicated role	Percent indicating shared role	Percent indicating no role	
IT Architecture	Network Architect (e.g., design)	55%	35%	11%	
	Security Architect†	NT	NT	NT	
	IT Architect†	NT	NT	NT	
IT Infrastructure	Infrastructure Generalist† (IT support)	NT	NT	NT	
	Networking	Network Generalist	55%	33%	12%
		Network Engineer (Implementation and maintenance)	50%	38%	12%
		Security Expert	46%	48%	6%
		Voice Expert	40%	47%	13%
		Network Operations Center Manager	39%	52%	9%
		Wireless Expert	36%	53%	11%
		Remote Office Expert	36%	49%	15%

*Totals may exceed 100%, due to rounding.

†Role not tested: See endnote for explanation

Base: 1500 managers in charge of network hiring and training

The majority of respondents said that these roles exist within their network operations and architecture staff. Between 36% and 55% of respondents stated that they have a position within their organization that is fully dedicated to carrying out responsibilities related to that role. The second column shows the percent of organizations that have “shared” roles, meaning the role exists but is covered by an individual with multiple responsibilities. For example, a network engineer may double as the resident voice and security specialist.

While Forrester does not expect the 11 job roles outlined in Figure 1 to change significantly over a five-year time horizon, we do expect to see the development of at least two new roles. In particular, we expect the importance of mobility specialists and unified communications specialists to grow as IT organizations adapt to the new network functionalities that are becoming more embedded in networks. We anticipate that these emerging roles will encompass more than just networking; they’ll

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be a critical liaison between network-specific expertise, end user devices, and collaboration applications.

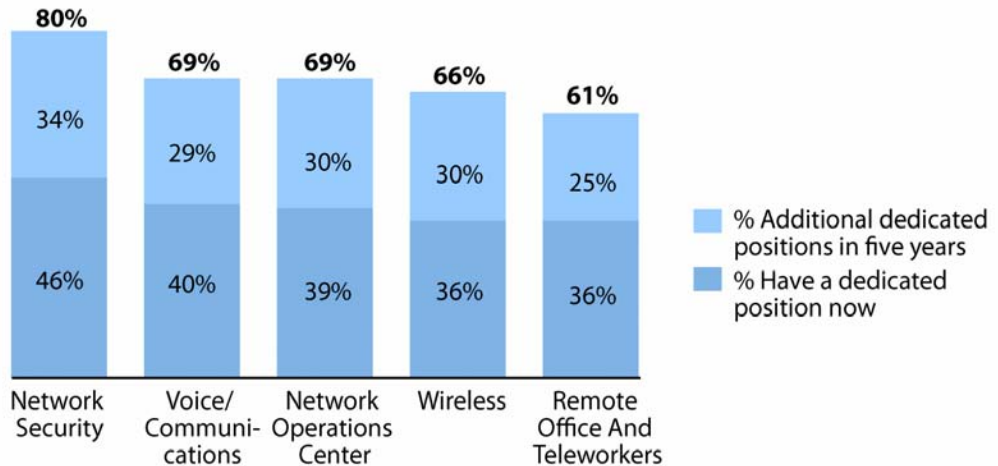
Role Dedication Is Increasing

In today's network environment, the more established roles (architect, engineer, generalist), have the highest tendency towards role dedication, with over 50% of respondents saying they had at least one dedicated individual for that role. Respondents indicated that the emerging network roles (including security, voice, wireless, network operations center, and remote office) were more likely to share their responsibilities with the administrator and engineer roles.

However, this will change over time. When Forrester asked survey respondents how roles would evolve over the next five years, we found that role specialization and dedication will clearly increase. In particular:

- Between one-fourth and one-third of respondents who operate with shared roles anticipate that these roles will become dedicated positions in the next five years.
- All of the "newer" roles (security, voice, wireless, network operations center, remote office) are expected to see a significant rise in role-dedication, such that the majority of these roles will have dedicated employees within the next five years (see Figure 2).

Figure 2: Organizations Will Dramatically Increase Dedicated Networking Roles



Base: 1500 managers in charge of network hiring and training

* Totals may exceed 100%, due to rounding.

Source: A commissioned study by Forrester Consulting on behalf of Cisco

Organizations are driven to dedicate these roles because:

- **Security is becoming a nearly ubiquitous concern.** Worldwide regulatory compliance requires that organizations better protect sensitive data and mitigate emerging threats. As a

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result, more organizations are recognizing the need for dedicated network professionals who can protect data in transit.

- **Management practices are maturing.** Most organizations are currently tweaking organizational structures to better handle outsourcing relationships and facilitate more process-centric departments. Part of this includes creating “centers of excellence” with dedicated network operations center professionals who can guarantee business operations remain running 24x7 across the globe.
- **The network must connect an increasingly distributed workforce.** Nearly three-quarters of today’s workers reside outside of a headquarters location.³ As a result, organizations must ratchet up network services, connectivity, and security for this distributed workforce with dedicated wireless and branch office/teleworker professionals.
- **Voice is a critical foundation for collaboration.** In a workplace environment that is increasingly characterized by globalization, collaboration, and mobility, companies need to guarantee that users have constant communications. In particular, voice over IP has become the de facto method for connecting organizations and requires a shift away from traditional telecom experts to dedicated networking voice professionals with data backgrounds.

Skills Like Security, Risk, And Performance Management Are Emerging As Important, Regardless Of Role

In addition to testing the presence of roles, Forrester also tested various skills requirements associated with these roles. We created a list of 22 standard skills and tested their relevance by asking respondents to rank their level of importance. A list of the skills tested across all roles is presented in Appendix B.

The results highlighted the fact that some cross-role skills are becoming increasingly important to managing the network:

- **Security, risk, and performance are today’s sought-after skills.** . . . Companies are currently placing a premium on skills such as “establishing network security requirements,” “risk management,” and “identifying and mitigating performance problems.” Out of the 22 skills tested, these skills ranked near the top for almost all of the roles in Figure 1.
- **. . . And will remain the top skills in five years.** When we asked respondents which skills would increase in relevance over the next five years, these skills were again ranked near the top.

At the same time, other skills require specific domain expertise and don’t apply across all roles. Architecturally-oriented skills (such as development of technology roadmaps, network design, and project management) and procurement skills (such as managing vendor relationships, tracking costs, and procuring products and services) did not rank as highly in terms of importance across all roles. For example, network architects will retain these specialized skills and hone them as they progress to more senior levels or into a broader enterprise architecture role.

Skill Requirements Are Consistent Across Geographies

While Forrester anticipated significant variation by geography, we were surprised to find that the role-related skills requirements were consistent. We saw only minor variations between the regions

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we had categorized as “emerging”, “transforming” and “mature”.⁴ Examples of the differences included:

- **Mature markets are placing greater importance on the newer roles...** The one exception to the geographic consistency is that the skills related to “newer” roles – such as network operations center and wireless roles – are considered more important in “mature” nations than in the emerging countries. We believe this is because the mature markets have more legacy infrastructure, and are just starting to ramp up their talent for these roles.
- **... While emerging markets have already dedicated these newer roles.** At the same time, the emerging market group was more likely to have individuals dedicated to the “newer” roles. We believe this is because emerging nations have less legacy infrastructure and have thus established newer network architectures including more pervasive mobile and wireless connectivity. Organizations in these countries have responded by adding dedicated roles.

Despite these minor differences, the relative consistency in skills requirements across geographies highlights an important factor for hiring managers to consider: similar trends exist in network roles regardless of geography, indicating that there is a broad, global talent pool facing common networking challenges. The skills training requirements facing regional companies will be similar to those faced by global companies and role specialization is a global trend.

Organizations Seek More Network Certifications

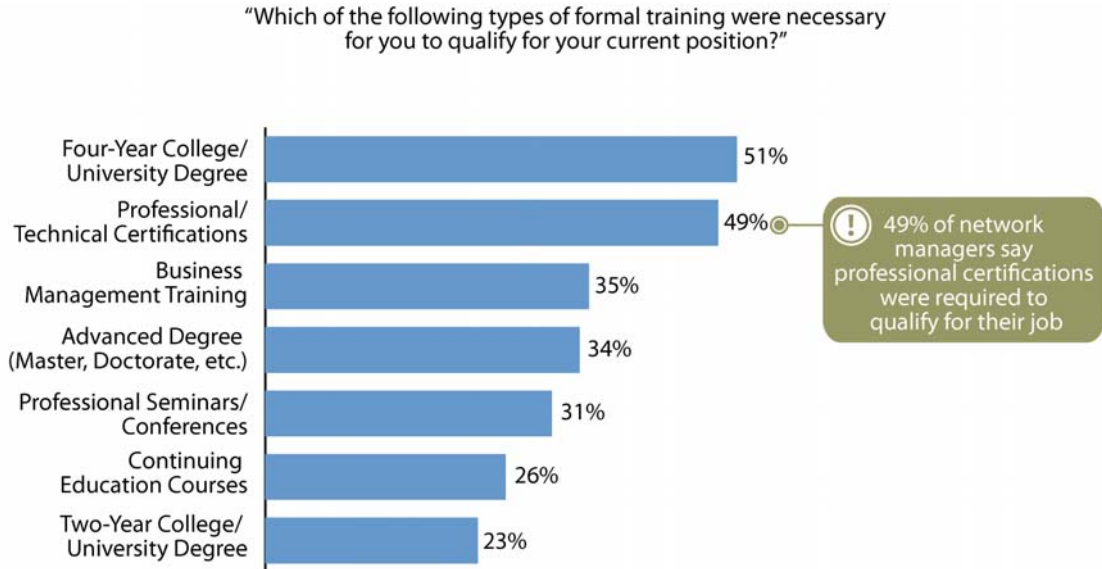
In addition to testing roles and skills, we sought to understand the level of importance placed on training programs and how they affect the career development of network professionals. The survey results highlighted the importance of certification programs to IT managers:

- **IT managers cited certifications as important to qualifying new candidates.** Technical certifications were cited as critical for individuals seeking an advanced IT skills position, just after previous work experience and on-the-job training.
- **They also cited the importance of certifications in their own professional development.** In their own career history, the IT decision-makers surveyed indicated that professional and technical certifications were second only to a four-year college degree to qualify for their position (see Figure 3).
- **Half to three-quarters of IT decision-makers expect that the importance of certifications to increase.** For all roles, respondents also noted that within five years certifications will become “somewhat” to “absolutely” critical for the advanced skills roles (see Figure 4.)

As noted, the changing requirements of the network will require hiring managers to change the way they recruit, train, and manage network professionals. As the network evolves, hiring managers will likely have to invest more resources in skills development programs — whether it is dedicating more time to the recruiting process, money for training, or more time for employees to keep pace with technology changes. Training and certification programs are, and will continue to be, a critical part of this process.

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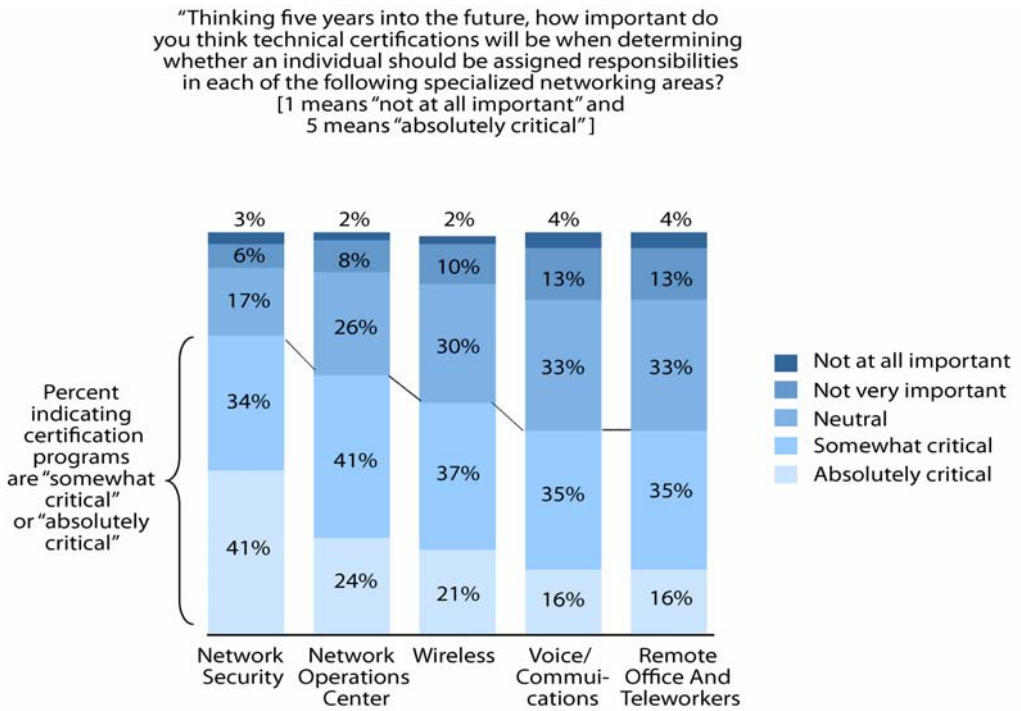
Figure 3: IT Managers Cite Professional Certifications As Critical To Their Job Qualification



Base: 1500 managers in charge of network hiring and training

Source: A commissioned study by Forrester Consulting on behalf of Cisco

Figure 4: IT Managers Claim Certifications Are Increasing In Criticality For All Roles



Base: 1500 managers in charge of network hiring and training

* Totals may exceed 100%, due to rounding.

Source: A commissioned study by Forrester Consulting on behalf of Cisco

Recommendations

Assess Your Roles And Invest In Training And Certifications To Close Skills Gaps

For network managers and hiring professionals considering how roles and skills requirements will affect them now and in the future, Forrester recommends three primary steps:

1. **Map the roles to professionals within your network.** Evaluate how the professionals within your network cover each of the 11 roles outlined in Figure 1. While you probably won't have dedicated professionals for each role, it will be increasingly important for IT managers to address issues in each of these core network areas. For example, a company that is placing a higher level of importance on network security, but has no dedicated network security professional, needs to consider investing in training and certification programs — or even hiring a dedicated security professional. These training and hiring requirements will be particularly relevant for the “newer” roles that will increase in importance in coming years.
2. **Assess the skills requirements of your network professionals to identify gaps.** In the rapidly changing network environment, it will be critical for network managers to continuously test and assess the skills of their network professionals. Hiring managers will want to know with certainty how their network professionals are developing skills to keep pace with hot network areas like security and risk management. We recommend IT managers use a twofold approach: 1) assess skills externally by seeking certification programs that offer online self-assessment tools for annual or semi-annual assessments; and 2) assess skills internally by pursuing more systematic assessments from process frameworks like ITIL for continuous improvement.
3. **Invest in network hiring, recruiting, and training efforts to fill gaps.** Companies can't keep up with changing network requirements with a “business-as-usual” mentality. While the approach to training network professionals will vary, companies will have to spend more time recruiting, hiring, and training. Training and certification programs are already ranked highly by IT managers for their ability to prepare individuals for advanced networking positions — and these programs will only increase in importance over the next five years. Investing in these programs will help many organizations — especially those with mandatory employee training quotas — to maximize the most value for their dollar in developing network talent.

As noted, by assessing the emerging skills requirements of your company's network professionals, understanding where gaps exist, and proactively working to fill those gaps, managers will be in a stronger position to support their company's network-related business initiatives. Following the role-based framework outlined in this paper should help organizations map their capabilities to the increasingly specialized requirements of the future.

Appendix A: Survey Methodology

The survey for this research was created by Forrester Consulting in partnership with Momentum Market Intelligence. Cisco contributed to the survey focus and scope.

Within each country where the survey was fielded, quotas were set to ensure equal representation from different sized companies, defined by the number of employees worldwide:

- Small and medium businesses (5-249 employees): 55% of survey respondents
- Mid-market (250-999 employees): 27% of survey respondents
- Enterprise (1,000 or more employees): 18% of survey respondents

All survey respondents were required to meet the following qualifications:

- Manager-level and above decision-making authorities within their company's IT organization
- Familiar with or responsible for managing, hiring, or evaluating skills requirements for at least one of the 11 identified roles

Appendix B: Skills Tested

We tested this standard set of skills across all roles. The list is a slightly modified version of the Fault, Configuration, Accounting, Performance, and Security (or "FCAPS") framework. We asked our survey respondents to rate the importance of these skills for each role that they felt qualified to comment on:

- Define network services and associated service levels.
- Develop high-level architectural and detailed design.
- Develop technology roadmap for network devices.
- Provide project management for network aspects of projects.
- Troubleshoot, log, and resolve tier 1 and 2 network and service issues for applications and end users.
- Develop basic understanding of broader systems management tools for fault resolution.
- Install and configure traditional network devices (e.g., routers, switches, etc.).
- Install and configure advanced network devices (e.g., load balancers, wireless infrastructure, etc.).
- Install and configure voice and telephony devices (VoIP phones, PBXs, etc.).
- Maintain inventory of network components (circuits, switches, routers, premises wiring, etc.).
- Implement moves, adds, and changes.
- Perform planned and unplanned network upgrades.
- Monitor and report on performance of components and overall network.
- Identify future performance problems and mitigate.
- Establish network security requirements.
- Track and report security threats, including viruses, worms, and DoS attacks.
- Establish firewall support, performance monitoring, intrusion detection, and risk management.
- Set quality of service (QoS) policies and mechanisms.
- Procure network products and services.
- Manage vendor relationships and adherence to service levels.
- Track and report on network-related costs.
- Develop business cases for network elements.

Endnotes

¹ ITIL stands for the Information Technology Infrastructure Library. It includes a set of concepts and techniques for managing information technology infrastructure, development, and operations.

² While we believe that all 11 roles are indeed relevant to the network, Forrester analysts believe that three of these roles track closely to other roles, and as a result, only eight roles were tested (this also allowed Forrester to simplify the survey for respondents). The security expert tracked closely to the security architect, the enterprise architect tracked closely to the network architect, and the infrastructure generalist tracked closely to the network engineer.

³ In a recent survey, we found that 81% of organizations responded that they have branch offices, with more than 30% of companies indicating that they support more than 100 branch offices. Moreover, these same organizations reported that more than 70% of employees are now working outside of headquarter locations. See the April 23, 2008 report "Today's WANs Don't Keep Pace With Applications."