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REPORT

The Network Architect: A Skilled Technologist with Many Stakeholders

Understanding the Cybersecurity Skills Shortage

An Analysis of Employer and Jobseeker Skills and Occupational Demographics

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Executive Summary

This report is a part of a series that appraises various network and cybersecurity occupations using natural language processing (NLP).[1] This particular study examines the role of network architect from the vantage point of both employers and jobseekers. Findings show that employers seek skilled technologists with a broad mix of skills, and jobseekers tend to present themselves as more tactical than strategic.

Core takeaways from the analysis include:

Employers

- Employers **emphasize soft skills somewhat less than hard skills** in job ads for network architects, with 7 of the 20 most-cited skills identified as soft skills. The soft skill of **communications** is the most-cited skill, found in 98% of employer postings.

- Hard skills referenced in job ads **tend to be tactical rather than strategic in nature**, such as routing, switching, and documentation. But there are enough exceptions to indicate that employers are looking for candidates equally comfortable with the strategic and the tactical.

- Although the network architect is not a cybersecurity role, **security architecture is referenced on 68% of job ads**, reflecting the increasing importance of security in network design.

- Soft skills cited by employers are **relatively balanced across the four quadrants**, with somewhat fewer skills in the Personal Characteristics Quadrant.

- A significant subset of job listings **cite many more soft skills** than the median, perhaps reflecting a corporate culture or HR processes more geared toward these more subjective skills.

Jobseekers

- Resumes for candidates seeking network architect roles **include many more hard skills than employers**. While **design** is the most commonly cited skill by jobseekers and can be interpreted as a strategic skill, virtually all the other commonly referenced hard skills are tactical in nature.

- Applicants **cite nearly as many soft skills as employers**, and skills on resumes are spread similarly across the quadrants compared with job ads.

- Despite the reasonable number of soft skills found on resumes, the huge number of tactical hard skills cited may result in an **overall self-presentation that is overly tactical** for an advanced individual contributor role.

Comparison of Employers vs. Jobseekers

- The large number of hard skills cited on resumes means that **the biggest disparities** between resumes and job ads are **tactical hard skills overemphasized by jobseekers**. The largest disparity is with **installation**.

- A few hard skills were underemphasized by candidates, most notably **best practices** and **working knowledge**.

- While **communications** is the most-cited soft skill for both employers and jobseekers, its lower prevalence on resumes makes it the biggest deviation among soft skills. Other soft skills underemphasized by applicants include **mentoring** and **teamwork** in the Leadership Quadrant.

- Candidates overemphasize soft skills in several quadrants, including **scheduling, troubleshooting, planning, consultation,** and **evaluation**.

About This Series

This report series is based on an analysis of thousands of job ads and resumes using natural language processing (NLP) to highlight skill-set gaps (including hard and soft skills), educational attainment and certifications, average career tenure, and gender breakdown. The goal is to provide actionable insights for hiring managers and executives to help them optimize their recruiting and build the best networking and cybersecurity teams possible.

Network architect roles are increasingly important in many organizations in an era of rapid change. For more than a decade, infrastructure, applications, and data have steadily moved into the cloud and enterprise networking has become increasingly reliant on the public internet. That trend may now be reversing itself, with cyber-physical systems and the vast amounts of data they generate necessitating more processing at the edge of the network.[2] These changes often must be made quickly,[3] and the network architect is intimately involved in their design.

Demographics

- A **bachelor's degree is the consensus educational level** for employers and jobseekers, with both averaging approximately one degree. Jobseekers list more certifications than employers, likely in hopes of citing the specific certification requested on a job ad.

- Jobseekers typically had **two jobs in the past five years**, and some have remained in the same job for many years. Overall, the rate of job-hopping for network architects is slightly lower than average among the occupations we surveyed.

- Just **4% of the resumes we studied belong to women**, the third-lowest percentage among occupations we surveyed. Fortunately, network architect job ads were more gender balanced in terms of terminology used than with any other occupation we surveyed.

This report covers the professional who designs new and updated data networks for an organization. The positions we surveyed all included "network" and "architect" in the job title—sometimes in combination with a function like "security" or a portion of the network like "cloud." All in all, network architects are in high demand as networks become more complex and the amount of data that moves through them increases exponentially. In fact, network architects are among the highest-paid IT staffers outside of management and comparable with security architects.[5]

> "The main trend here is blurring of the lines between the various traditional enterprise network fiefdoms. Increasingly, an on-premises data-center network has to extend to a public cloud, a branch, or a corporate campus."[4]

We identified hundreds of distinct skills in the network architect resumes and job listings we analyzed. The median job listing included 43 unique skills, while the median resume referenced 82 unique skills. Interestingly, resumes show a larger disparity in the number of skills mentioned than job listings—ranging from fewer than 10 skills to more than 180. The middle 50% of resumes ranged from 50 to 105 skills. All of these numbers are higher than any of the other occupations we surveyed.

What Skills Matter to Employers: Analysis of Network Architect Job Listings

By far the most-cited skill on network architect job listings is the soft skill of communications (Figure 1), found on 98% of job ads we analyzed. At first glance, this could seem counterintuitive for such a technical role. However, IT networks have many stakeholders and network changes can be disruptive to business, making clear and concise communication paramount to the role. Less surprising is the clear second on the list: **design** (88%). Overall, 7 of the 20 most-cited skills are soft skills, which is near the median in the occupations we surveyed. Interestingly, only two of these soft skills appear in the top 10.

Top Skills—Hard, Soft, and in Aggregate

A few of the most commonly cited hard skills are more strategic in nature: **design, security architecture, best practices**. However, many of them are more tactical and technical, such as **routing, switching, implementation,** and **firewall**. This may suggest that employers are looking for candidates who are equally comfortable in the strategic and tactical roles. Network architects must exist "in the weeds" while designing the details of an IT network. At the same time, they must engage with executives and other leaders at their level.

It is interesting that **security architecture** is cited on more than two-thirds (68%) of job listings, given that the network architect is not technically a cybersecurity position. The need to make security a part of the underlying design of a network, rather than an add-on, is increasingly recognized.

Rank	Top Hard and Soft Skills Combined	Top Hard Skills	Top Soft Skills
1	Communications (98%)	Design (88%)	Communications (98%)
2	Design (88%)	Routing (78%)	Analytics (70%)
3	Routing (78%)	Security Architecture (68%)	Making Recommendations (50%)
4	Analytics (70%)	Implementation (58%)	Troubleshooting (48%)
5	Security Architecture (68%)	Standards (58%)	Planning (43%)
6	Implementation (58%)	Switching (58%)	Complexity (38%)
7	Standards (58%)	Documentation (53%)	Management (38%)
8	Switching (58%)	Firewall (53%)	Leadership (33%)
9	Documentation (53%)	Configuration (40%)	Mentoring (30%)
10	Firewall (53%)	Best Practices (38%)	Participation (30%)
11	Making Recommendations (50%)	Cloud (35%)	Problem Solving (30%)
12	Troubleshooting (48%)	Hardware (35%)	Partnership (30%)
13	Planning (43%)	Network Operations Center (35%)	Collaboration (28%)
14	Configuration (40%)	Organization (35%)	Writing (25%)
15	Best Practices (38%)	Wireless (35%)	Research (20%)
16	Complexity (38%)	Cisco (33%)	Vision (20%)
17	Management (38%)	Networks (33%)	Drive (18%)
18	Cloud (35%)	TCP (30%)	Evaluation (18%)
19	Hardware (35%)	Data Center (30%)	Acting as a Liaison (18%)
20	Network Operations Center (35%)	Software (30%)	Prioritization (18%)

Figure 1: Top 20 hard and soft skills for employers.

Soft Skills Quadrants

Soft skills can be better understood when they are divided into four quadrants (see Figure 2). Besides **communications** (in the Communications/Interpersonal Quadrant), soft skills among the top 20 overall skills are commensurate with a senior technical position: **analytics, making recommendations, troubleshooting,** and **planning**. It is interesting that three of these four are in the Analytical Quadrant. **Planning**, cited on 43% of job listings, is the most-cited skill in the Leadership Quadrant.

Despite the prominence of the Analytical Quadrant among the most-cited soft skills, job ads are fairly balanced in the mix of soft skills they refer to, indicating employers look at a wide range of soft skills—perhaps customized to the position and corporate culture. The median job listing had three skills each in the Leadership, Analytical, and Communications/Interpersonal Quadrants—and two skills in the Personal Characteristics Quadrant. This suggests that employers seek a qualified technologist who is well-rounded as an individual.

It should be noted that some job listings emphasize soft skills more than others, and a significant subset cite significantly more than the median number of soft skills in each quadrant. For example, one-quarter of resumes cited between 5 and 8 Analytical Quadrant skills while one outlier mentioned 10. The result is that the average number of skills cited for each quadrant is higher than the median. Recruiting practices often align with other aspects of corporate culture, and it seems that a nontrivial number of them emphasize more soft skills as a part of HR department practices or other aspects of organizational identity.
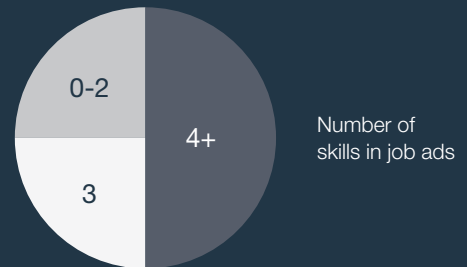
Analytical

3.6 **Average Skills** Per Job Ad

93% **Occurrence** in Job Ads

Number of skills in job ads
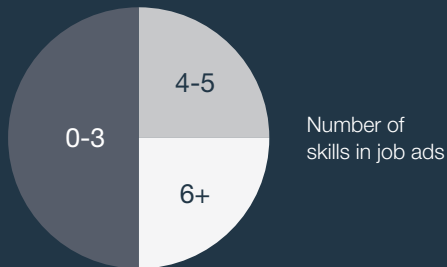
Leadership

3.2 **Average Skills** Per Job Ad

88% **Occurrence** in Job Ads

Number of skills in job ads

Personal Characteristics

2.5 **Average Skills** Per Job Ad

85% **Occurrence** in Job Ads

Number of skills in job ads
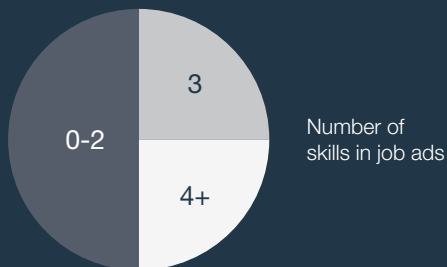
Communications/Interpersonal

3.4 **Average Skills** Per Job Ad

98% **Occurrence** in Job Ads

Number of skills in job ads
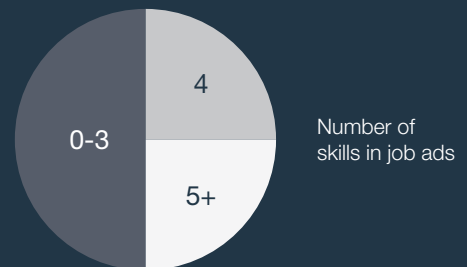
Figure 2: Job ad soft skills quadrant matrix: network architect.

The two most-cited Personal Characteristics Quadrant skills are mentioned on only 18% of job ads—**drive** and **prioritization**—tied for 17th among the most-cited soft skills. The top 20 skills on that list include:

- 7 in Analytical (analytics, making recommendations, troubleshooting, complexity, problem solving, research, evaluation)
- 6 in Leadership (planning, management, leadership, mentoring, partnership, vision)
- 5 in Communications/Interpersonal (communications, participation, collaboration, writing, acting as a liaison)
- 2 in Personal Characteristics (drive, prioritization)

The distribution of hard and soft skills on job ads is commensurate with a senior technical position that is critical for the success of the business. The primacy of communication—followed up with a balanced set of hard, soft, strategic, and tactical skills—paints a picture of someone who thinks on his or her feet and yet adheres rigorously to best practices to ensure the best result.

Examining the Candidate: Network Architect Resumes

While employers list a balance of hard and soft skills in their job listings for network architect roles, jobseekers place heavy weight on hard skills. However, the sheer number of soft skills on resumes is almost as high as with job ads: 11 compared with 13 (Figure 5). The big difference is the much higher number of hard skills on the average resume: 56 as compared with 31 hard skills on the average employer posting.

The result of this disparity in hard skills is that only four soft skills rank among the top 20 skills cited on resumes (Figure 3)—**communications** (69%), **troubleshooting** (68%), **analytics** (61%), and **planning** (60%).

Top Skills—Hard, Soft, and in Aggregate

The most common skill on network architect resumes is design, cited on 95% of resumes, which can be interpreted as a strategic skill. However, most of the remaining hard skills in the top 20 are more tactical in nature:

- Tasks such as **implementation, configuration, switching,** and **routing**
- Network elements such as **firewall, servers, software, hardware,** and **wireless**
- Technical specifications such as **Cisco**

Rank	Top Hard and Soft Skills Combined	Top Hard Skills	Top Soft Skills
1	Design (95%)	Design (95%)	Communications (69%)
2	Cisco (83%)	Cisco (83%)	Troubleshooting (68%)
3	Implementation (79%)	Implementation (79%)	Analytics (61%)
4	Routing (79%)	Routing (79%)	Planning (60%)
5	Configuration (75%)	Configuration (75%)	Making Recommendations (49%)
6	Servers (73%)	Servers (73%)	Complexity (44%)
7	Switching (72%)	Switching (72%)	Evaluation (35%)
8	Installation (71%)	Installation (71%)	Management (35%)
9	Communications (69%)	Networks (68%)	Vision (33%)
10	Networks (68%)	Software (67%)	Consultation (29%)
11	Troubleshooting (68%)	Firewall (64%)	Partnership (29%)
12	Software (67%)	Security Architecture (63%)	Research (29%)
13	Firewall (64%)	Hardware (61%)	Scheduling (29%)
14	Security Architecture (63%)	Wireless (61%)	Leadership (27%)
15	Analytics (61%)	Network Operations Center (60%)	Collaboration (25%)
16	Hardware (61%)	Data Center (57%)	Strategy (23%)
17	Wireless (61%)	Deployment (56%)	Assessment (21%)
18	Network Operations Center (60%)	MPLS (55%)	Drive (21%)
19	Planning (60%)	VPN (53%)	Participation (21%)
20	Data Center (57%)	Network Infrastructure (53%)	Problem Solving (21%)

Figure 3: Top hard and soft skills for network architect jobseekers.

Soft Skills Quadrants

Just as the number of soft skills cited on resumes versus job ads is not very different, their distribution across the quadrants is not dissimilar (Figure 4). The median resume contained 4 Analytical, 3 Leadership, 2 Communications/Interpersonal, and 1 Personal Characteristics soft skills.

The list of the most commonly cited soft skills on resumes contains many of the same skills as those most often mentioned by employers, although the percentages differ somewhat. Unfortunately, the huge number of hard skills cited by applicants may result in an overall self-presentation as a very tactical technologist.
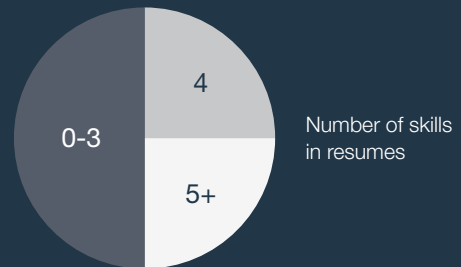
Analytical

3.7 Average Skills Per Resume

92% Occurrence in Resumes

2-3

0-1

4+

Number of skills
in resumes
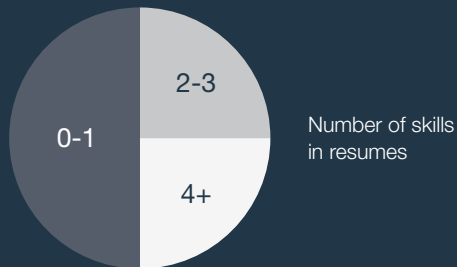
Leadership

3.1 Average Skills Per Resume

88% Occurrence in Resumes

4

0-3

5+

Number of skills
in resumes

Personal Characteristics

1.9 Average Skills Per Resume

76% Occurrence in Resumes

2-3

0-1

4+

Number of skills
in resumes
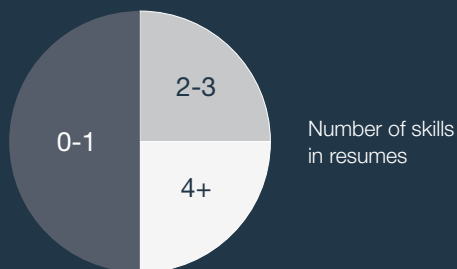
Communications/Interpersonal

2.2 Average Skills Per Resume

89% Occurrence in Resumes

3

0-2

4+

Number of skills
in resumes
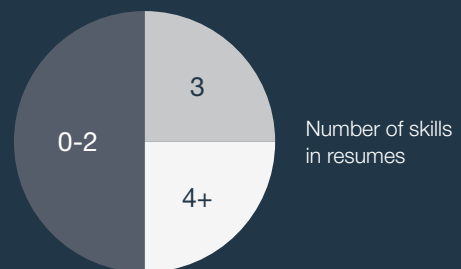
Figure 4: Resume soft skills quadrant matrix: network architect.

Analyzing the Gaps Between Employers and Network Architect Jobseekers

The large difference in the number of hard skills between resumes and job ads means that the biggest gaps in our analysis, by far, are hard skills that are overemphasized by jobseekers. In contrast, most of the skills underemphasized by applicants are soft skills, and the deviations are much smaller. A number of soft skills are also overemphasized on resumes compared with job listings.

Hard Skills Deviations

Installation appears on 66% more resumes than job ads, by far the biggest gap in either direction. The remainder of the top 20 are almost exclusively very tactical skills that might seem out of place for an advanced technical position. Jobseekers at this level would do well to "thin out" the tactical hard skills on their resumes in favor of higher-level summaries of these skills.

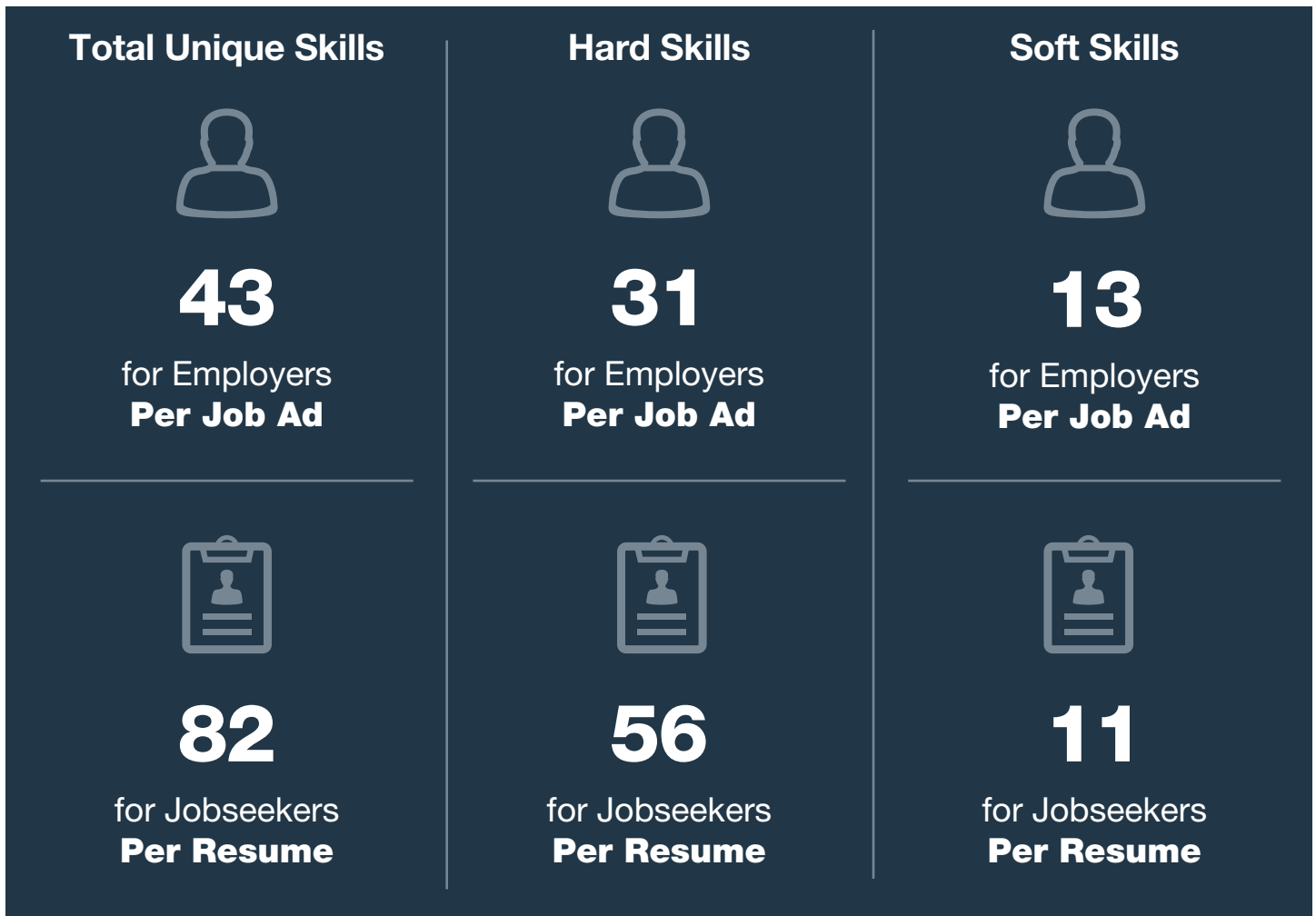| Total Unique Skills	Hard Skills	Soft Skills
43 for Employers **Per Job Ad**	**31** for Employers **Per Job Ad**	**13** for Employers **Per Job Ad**
82 for Jobseekers **Per Resume**	**56** for Jobseekers **Per Resume**	**11** for Jobseekers **Per Resume**

Figure 5: Average number of skills per job ad and resume.

Some hard skills were also underemphasized by applicants. **Best practices** and **working knowledge** top this list with differentials of 20 and 15 percentage points, respectively. The omission of these skills is probably more a difference in style and phraseology than in substance, but jobseekers should be cognizant of this distinction.

Also included in the top 20 are **governance** (10%) and **TCP** (9%). Given the difficulties enterprises are having in complying with new data privacy regulations such as the EU's General Data Protection Regulation (GDPR),[6] IT governance is an increasingly important aspect of network design. As a result, jobseekers would do well to emphasize any experience in that area.

Soft Skills Deviations

While **communications** (Communications/Interpersonal Quadrant) was the most-cited soft skill for both employers and jobseekers, it appears on a smaller percentage of resumes than job ads. As a result, it easily tops the list of skills underemphasized by applicants, with a 28-point disparity. Interestingly, in that same quadrant, **consultation** was *overemphasized* by jobseekers by 17%.

The second-largest disparity among soft skills, at 24%, was an overemphasis by jobseekers on **scheduling** (Personal Characteristics Quadrant). Jobseekers also significantly overemphasize **troubleshooting** (21%) and **evaluation** (17%) in the Analytical Quadrant. In the Leadership Quadrant, jobseekers overemphasize **planning** (18%) and underemphasize **mentoring** and **teamwork** (both by 14%).

While these details are interesting, it should be emphasized that the differentials in soft skills are relatively small, and jobseekers are fairly well-aligned with employers regarding soft skills. The big disparity is with the large number of tactical hard skills found on resumes.

Skills Cited by Employers More Often	Skills Cited by Jobseekers More Often
Communications (28%)	Installation (66%)
Best Practices (20%)	Servers (51%)
Working Knowledge (15%)	Cisco (50%)
Mentoring (14%)	LAN (49%)
Team Oriented (14%)	Windows (46%)
Interpersonal (13%)	MPLS (42%)
Self Starter (13%)	Deployment (39%)
Verbal Communications (13%)	Configuration (37%)
Prioritization (12%)	Software (37%)
Time Management (11%)	Networks (36%)
Governance (10%)	Linux (35%)
Industry Standards (10%)	VPN (31%)
Root Cause Analysis (10%)	Network Infrastructure (31%)
Acting as a Liaison (10%)	Databases (30%)
Analytics (9%)	Setup (30%)
Audiences (9%)	WAN (29%)
Business Goals (9%)	VoIP (29%)
Being Motivated (9%)	VMware (29%)
Presentation Skills (9%)	Testing (28%)
TCP (9%)	Maintenance (28%)

Figure 6: Percent difference in top 20 skills listed by employers and network architect jobseekers.

Education and Certification

Based on our analysis of job ads, the consensus of employers is that candidates should have a bachelor's degree, and most applicants have one. The average job listing requests 1.2 degrees and the average applicant has 0.9. Of course, education level is one of many considerations in any hiring process, and candidates should also emphasize what they have done to keep their skills current in a quickly evolving technology landscape.

Degrees
- Job ads: **1.19**
- Resumes: **0.93**

Certifications
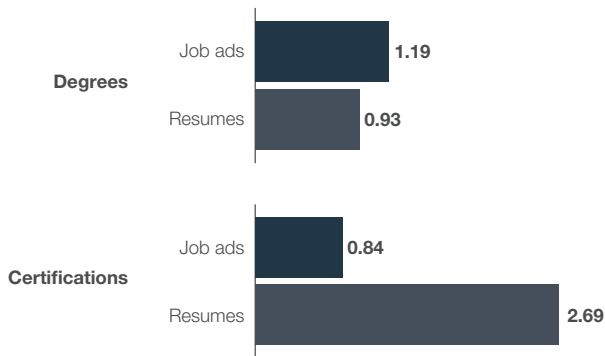- Job ads: **0.84**
- Resumes: **2.69**

Figure 7: Degrees and certifications cited on network architect resumes and job ads.

As with most of the other occupations we surveyed, jobseekers listed more certifications that employers requested—2.69 on average compared with 0.84 on job listings. This is in line with other technical roles we surveyed, and technical workers tend to value certifications in their self-presentation. Of course, having a specific certification is typically more important than the number, and jobseekers would do well to list all the certifications they have earned.

Career Tenure and Job-Hopping

Applicants for network architect roles started their careers an average of 23 years ago, when first-generation corporate IT networks were being built out. They are now at midcareer, presumably having progressed along a technical career track rather than a managerial one.

- Average years since first job: **22.5**
- Number of jobs in past 2 years: **1.4**
- Number of jobs in past 5 years: **2.0**
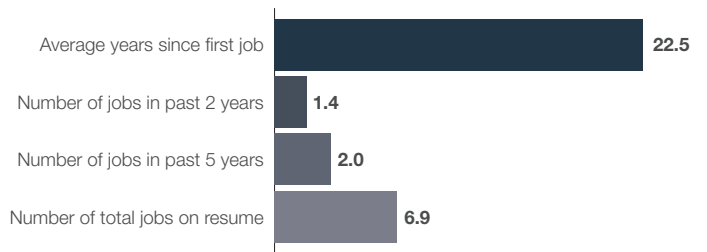- Number of total jobs on resume: **6.9**

Figure 8: Job tenure in network architect resumes.

Jobseekers we analyzed have had an average of 1.4 jobs in the past two years and 2 jobs in the past five years. These numbers reflect a lower than average rate of job-hopping among the occupations we surveyed. Interestingly, a subset of network architects we surveyed have held the same job for a very long time, bringing the average tenure for the current or most recent job to 7.5 years.

The data is mixed as to whether job-hopping is getting worse in the overall economy,[7] and there is some evidence that the problem decreases with age and tenure.[8] The current market for IT talent can incentivize good employees to seek higher pay or other benefits at new companies, and employers would do well to have a well-crafted retention effort in place.

Gender Gap

The gender gap in technology is widely noted with concern,[9] and the research is clear that diverse teams drive better outcomes.[10] Unfortunately, of the resumes we randomly selected and analyzed for network architect positions, only 4% belonged to women. This is the third-lowest percentage of female resumes among the occupations we surveyed, with fewer women represented in the most technical roles.

4.9
Male-Gendered Terms
Per Job Ad
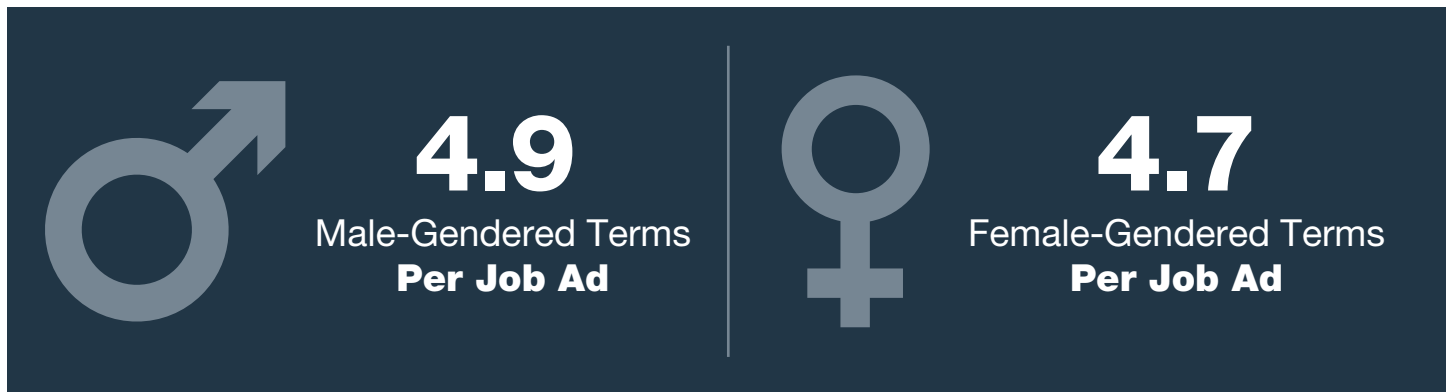
4.7
Female-Gendered Terms
Per Job Ad

Figure 9: Gender-oriented language in job ads.

Fortunately, the employer postings we surveyed show promising progress toward gender neutrality in the terminology used. The average job ad contained 4.9 male-oriented terms (such as "strong" and "leader") and 4.7 female-oriented terms (such as "collaborate" and "mentor"). This makes network architect job listings the most balanced among the occupations we surveyed. One would hope that such balance will help employers to find a more balanced pool of candidates.

Concluding Thoughts

As the threat landscape gets more complex, it becomes more important for security to be built into the underlying architecture of enterprise IT networks. As a result, the once-isolated functions of networking and security are starting to converge,[11] and network architects need a well-rounded skill set that includes knowledge of cybersecurity. The rapid pace of network evolution also requires candidates with a strategic orientation, but who are also familiar with the nuts and bolts of network design. Jobseekers would do well to balance their resumes to better reflect strategic and soft skills alongside their tactical skills.

In today's enterprise, the network architect will not be successful without a broad, integrated, and automated security infrastructure. The Fortinet Security Fabric enables security teams to focus on proactive threat prevention rather than reactive remediation. For more information on the Fortinet Security Fabric, check out the eBook, "Fortinet Security Fabric Powers Digital Transformation."[12]

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