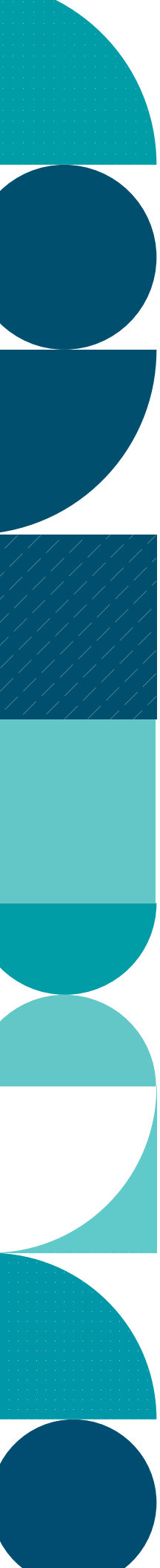**CompTIA**

Advancing Tech Talent and Diversity Community

The HR Manager's Guide to Hiring IT Pros

How to find candidates with the emerging skills needed for today's IT jobs

It's Time to Rethink How to Hire IT Pros

Over the past decade, there have been dramatic changes in the use of technology within businesses. For many years, technology was primarily a tactical endeavor, with IT infrastructure and applications supporting the main activities of the organization. Now, technology has strategic importance, with companies being more proactive in leveraging technology to meet business objectives. This has a significant impact in the way that companies view technology investments and hiring.

At the same time, technology has become more ubiquitous and more complex. As the cost of technology development has dropped and consumer technology has introduced new behaviors, companies can more easily procure basic components and combine them into a novel solution. This creates more demand for specialized skills, which are often in short supply.

All these changes create new challenges for HR professionals. Technical managers hiring for open positions may start with very specific requirements in an attempt to find the ideal candidate, but screening based on those requirements may produce a very limited pool. In a highly dynamic environment, HR professionals need a tool for understanding which candidates and which skills are close matches for filling these roles.

This guide provides that translation. By condensing the universe of technology job titles into 13 standard roles and describing both traditional and emerging skills in those roles, HR professionals can use this guide to sort through the jargon of the IT industry and find the best candidates to move forward. Especially in a time when in-demand skills are scarce because the technologies are so recent, understanding the way skills are evolving can lead to discovering candidates that are only one or two steps away from checking all the boxes.

Based on research from CompTIA and discussions with subject matter experts recruited by CompTIA's Advancing Tech Talent and Diversity Community, the 13 roles in this guide are broken down into six groups based on common IT operations:

✓ **IT Support**: The most common foundation for IT jobs, requiring basic knowledge of the other groups and providing a potential starting point for careers in those fields.

✓ **Infrastructure**: The backbone of IT operations, focusing primarily on the hardware that underpins IT systems.

✓ **Software development**: A discipline that has spread from a concentration in large enterprises to a much broader swath of businesses as customization and automation grow in importance.

✓ **Cybersecurity**: Once viewed as part of the infrastructure group, this newly dedicated practice uses technology, process and education to protect critical corporate assets.

✓ **Data**: Another practice becoming a dedicated function in most companies as they focus more on deep analysis of their comprehensive collection of data.

✓ **Project management**: A role that is not focused directly on technology but still requires solid technical knowledge in order to ensure that IT projects stay on track as they grow in volume and complexity.

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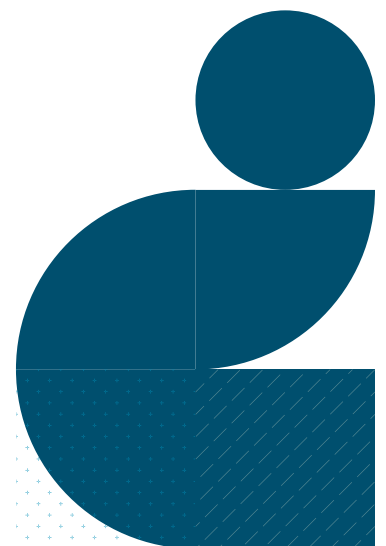
How to Use This Guide

Each of the 13 roles in this guide is presented in the following format. HR professionals can leverage the information to understand the key criteria to look for on candidates' resumes. Discussions with the hiring manager can help refine the required skills, but it is important to remember that highly specific skills might be more easily obtained by training a highly qualified candidate rather than finding the perfect match.

\<Job Role> - the overarching job role that covers a variety of job titles

Sample job titles – examples of common job titles that may be included in a job posting or on a resume.

Core Skills	Emerging Skills	Certifications
The foundational technical skills critical to success in the job role. In most cases, these skills are well established, with training pathways that have been in place for many years.	Cutting-edge skills that are becoming more important in the job role. Depending on the specific need of the hiring manager, there may be more or less of these skills that are desirable. Since they are more recent, many of these skills may be less common on resumes.	A list of IT certifications that validate skill competency. Certifications will generally cover core skills as emerging skills build towards critical mass.

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IT Support

Sample job titles – Help Desk Technician, Computer Support Specialist, Computer Repair Technicianposting or on a resume.

Core Skills	Emerging Skills	Certifications
Since this role is the first line of defense for employees when technology has problems, it requires operational knowledge of end user hardware, including **laptops/PCs, smartphones, tablets and printers.** After the hardware, the next place problems might occur is the operating system, so candidates should have knowledge of **Windows, MacOS, iOS** and **Android.** While every company has many different software applications, the most common by far are email and productivity suites, such as **Microsoft Outlook** and **Microsoft Office.** Beyond end user applications, IT support candidates should have a working knowledge of IT security and networking protocols such as **DHCP** and **DNS.** While **customer service** is not a technical skill, it is very important for this role in order to manage the wide variety of requests.	One of the largest changes affecting the IT support role is cloud computing. This could include a need to support new interfaces for end users such as **virtual desktops,** or it could include support for cloud-based productivity suites such as **Microsoft Office 365** or **Google Suite.** As security becomes more critical, additional security measures may be required for the workforce. One of the most common new techniques is **multifactor authentication.**	CompTIA A+

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Network Engineer

Sample job titles – Network Administrator, Infrastructure Engineer, Cloud Engineer

Core Skills	Emerging Skills	Certifications
This role must be familiar with common network hardware, such as **routers, firewalls** and **gateways**. Candidates should also be familiar with network topology, commonly described by the OSI model. From an operational standpoint, candidates should be familiar with practices such as **subnetting, virtual networks/VLANs** and **quality of service (QoS)**. Common network protocols that are used on the job include **DNS, SSL, DHCP** and **TCP/IP**. Finally, candidates should be well versed in **network security.** This may include practices such as **access control** and **network segmentation**.	**Software defined networking (SDN or SD-WAN)** is becoming more important as networks must be more tightly controlled to handle the volume and variety of traffic. As companies shift infrastructure to the cloud, candidates should be familiar with **Amazon Web Services (AWS), Azure** or **Google Cloud Platform (GCP)**. From a security perspective, candidates may be building expertise in cloud-based firewalls.	CompTIA Network+ Cisco CCNA Cisco CCENT Microsoft MTA

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Systems Engineer

Sample job titles – Systems Administrator, Systems Analyst, Systems Integration Specialist

Core Skills	Emerging Skills	Certifications
As most companies are still operating some amount of physical data centers, candidates should be familiar with hardware such as **servers** and **storage**. They should also be familiar with **electrical/HVAC systems** used in data centers or server rooms. Even in physical environments, candidates will need to utilize **virtualization** using tools such as **VMWare** and **Microsoft Hypervisor**. Some of the common software tools used to manage systems are **Microsoft Windows Server, Microsoft Active Directory** and **SQL**. Systems engineers typically perform **scripting** using **Linux, Java** or **Python**.	As companies shift infrastructure to the cloud, candidates should be familiar with **Amazon Web Services (AWS)**, **Azure** or **Google Cloud Platform (GCP)**. Typical cloud-based tasks include l**oad balancing** and **cloud orchestration.** New system management tools in cloud environments include **Azure Active Directory, OKTA, CloudStack** and **OpenStack**. The next level of virtualization includes the use of **containers**, leveraging tools such as **Docker** and **Kubernetes**. As IT complexity grows, companies are seeking more automation through infrastructure as code (IaC), using tools such as **Ansible, Microsoft Powershell, Chef** and **Puppet**. A greater emphasis on software development is driving demand for **DevOps**, which is the overlap of infrastructure and software.	CompTIA Server+ CompTIA Linux+ Microsoft Certified Solutions Expert (MCSE) Cisco CCNA Data Center

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Software Developer

Sample job titles – Application Developer, Computer Programmer, Web Developer

Core Skills	Emerging Skills	Certifications
The primary skill needed in any software development role is a thorough knowledge of the **programming language** being used. This will differ from company to company. Common examples include Java, C#, C++, Swift, and React. In addition to the main programming language used for applications, **scripting** knowledge is also a must. Common examples include Python and PHP. In order to maintain consistency when working with a team of programmers, candidates should have expertise in **version control,** using tools such as GitHub. Especially as development takes place across both cloud and on-prem systems, a solid understanding of the **software development** lifecycle is crucial. This includes experience with the **continuous integration/ continuous deployment (CI/CD) pipeline** and a background in **agile development techniques** such as **scrum**.	A recent shift in the approach to software development is to break an application into many small, interconnected pieces. This is known as **microservice architecture**. Building on the concept of microservices, many software teams now practice a form of virtualization called **containers**, where individual parts of an application run in their own virtual environment. The broad use of containers within a cloud environment has led to the rise of **serverless computing,** where development teams run their code in containers and rely on the cloud provider to handle the infrastructure layer. Finally, **artificial intelligence** and **machine learning** are becoming important in the software field. Companies may be seeking candidates who will directly build these new algorithms, or they may be seeking more traditional programmers who simply need to know the basics of these areas in order to properly interact with third-party code.	Microsoft Technology Associate (MTA): Software Development Fundamentals Amazon Web Services Certified Developer C++ Certified Professional Programmer

Quality Assurance (QA) Engineer

Sample job titles – Application Developer, Computer Programmer, Web Developer

Core Skills	Emerging Skills	Certifications
While these workers do not directly write the applications, they still need to have a working knowledge of the **programming language** being used by the development team. **Automation** is an emerging skill for some roles, but it has been in place for QA engineers for some time. **Scripting** with a language like Python is one way of performing automation, and experience with tools such as Selenium or Postman is a plus. As they are an integral part of the process, candidates for this role should have the same understanding of the **CI/CD pipeline** and **agile development techniques** as software developers. With automation enabling rapid testing of many software components, troubleshooting now includes **data analysis,** often using SQL to manage large sets of data.	**Artificial intelligence** and **machine learning** play a dual role for QA engineers. To start, these candidates must have knowledge of how AI algorithms function in order to properly test the software. Secondly, QA engineers may directly use AI algorithms in order to build more robust **test automation**. This could happen either by directly building tools that use AI/ML or by working with a third party that has the technology built into their toolset.	International Software Testing Qualifications Board Foundation Level Quality Assurance Institute Certified Test Engineer

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DevOps Engineer
Sample job titles – DevOps Developer, Build Engineer

Core Skills	Emerging Skills	Certifications
Although this job role is commonly considered a software role, it also has strong ties to infrastructure. As a result, candidates need a strong understanding of foundational skills in both areas. On the infrastructure side, this includes familiarity with **servers, storage, virtualization,** and **network configuration**. On the software side, this includes the **CI/CD pipeline, agile development techniques,** languages used for both **coding** and **scripting,** and **version control**. As an emerging role dealing with the complex overlap of infrastructure and software development, candidates should have some experience with **automating both IT configurations** and **software deployment**. Common tools include Puppet, Chef, Ansible, and Drone.	As with other software roles, **artificial intelligence** and **machine learning** are changing the workflow for DevOps engineers. Building new algorithms or using new tools with embedded AI leads to greater automation and efficiency when configuring infrastructure and deploying applications. On the infrastructure side, knowledge of **cloud architecture** is critical. Since cloud systems have risen to prominence at the same time as DevOps, most candidates will be familiar with providers such as **AWS, Azure,** and **GCP**. To fully leverage cloud systems, many DevOps engineers are turning to Infrastructure as Code (IaC). Using this technique, they can use configuration files to quickly set up infrastructure in a repeatable way, rather than rely on manual configuration.	Amazon Web Services Certified DevOps Engineer Microsoft Azure DevOps Engineer Expert Google Cloud Platform Professional Cloud DevOps Engineer

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Cybersecurity Engineer
Sample job titles – Information Security Analyst, Cybersecurity Specialist

Core Skills	Emerging Skills	Certifications
The traditional responsibility for this role has been **network security,** including backend functions like firewall configuration and frontend functions like endpoint antivirus. When implementing a security strategy, cybersecurity engineers typically rely on an understanding of various **security frameworks,** such as NIST or COBIT. To determine which investments to make in cybersecurity, candidates should be well versed in **vulnerability assessment,** which analyzes the risk of various cyber threats to the organization. Finally, cybersecurity engineers should have at least a basic understanding of **regulatory issues** that might affect a company. These could be very specific to an industry, such as PCI-DSS or HIPAA, but increasingly there are broad mandates such as GDPR that virtually all companies must abide by.	As infrastructure becomes more cloud-based, top candidates have an understanding of **cloud security,** including evaluation of cloud providers and knowledge of how to close any security gaps when migrating systems. One of the most dominant emerging threats is social engineering, and the best way to combat this threat is through **workforce education**, which ensures that all employees understand best practices for using technology. For companies allowing employees to bring their own device to work, candidates should understand the techniques for **securing a BYOD environment**. As a company expands their technology footprint with internet of things, **IoT security** is becoming an important skill since these devices have different characteristics from traditional IT equipment.	CompTIA Security+ (ISC)2 SSCP GIAC GSEC

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Cybersecurity Analyst
Sample job titles – Threat Intelligence Analyst

Core Skills	Emerging Skills	Certifications
This role is part of an expanded security team, focusing specifically on maintaining defenses (also known as blue team). As such, their knowledge extends beyond vulnerability assessment into **vulnerability management**, which actively addresses issues once they are found. Finding cybersecurity issues within a network relies on the use of **intrusion detection systems (IDS),** and preventing further incidents is handled through **intrusion prevention systems (IPS)**. Aside from detecting specific security breaches, cybersecurity analysts examine the general behavior of the network for anomalies. This consists of through **testing, monitoring,** and **data analytics**. Basic data analysis is performed with **relational databases** and **SQL** queries.	The availability of **big data** tools for analyzing different types of data gives cybersecurity engineers an opportunity to include more information in their analysis. Given the growing complexity of both IT infrastructure and the cybersecurity threat landscape, many cybersecurity analysts are turning to **artificial intelligence** and **machine learning** as methods for automating the analysis and discovering new insights.	CompTIA CySA+ EC-Council ECSA GIAC GMON CISA

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Penetration Tester
Sample job titles – Vulnerability Tester

Core Skills	Emerging Skills	Certifications
This role is part of an expanded security team, focusing specifically on proactively testing corporate systems (also known as red team). Rather than being an extension of the traditional defensive cybersecurity role, this is a new role focused on probing systems for vulnerabilities. Foundational system administration knowledge is needed, such as **network protocols** and **Linux**. Many attacks are built by using scripting languages such as Python, and higher-level **programming languages** can also be used to search for weaknesses. With companies conducting significant business activities over the internet, candidates should have deep knowledge of **internet protocols** and **technologies**. This includes HTML, HTTP, CSS, and PHP.	In addition to building technical exploits, penetration testers should understand how to employ **social engineering** to extract information from employees that can then be used for further attacks. Knowledge of common **IoT vulnerabilities** can give penetration testers another avenue to access a company's network.	CompTIA PenTest+ EC-Council CEH GIAC GPEN OSCP

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Database Administrator
Sample job titles – Database Developer, Database Systems Coordinator

Core Skills	Emerging Skills	Certifications
Database administrators are responsible for creation and maintenance of databases that hold a company's information. Traditionally, these databases have been **relational databases** provided by vendors such as Oracle, Microsoft and IBM. A key part of maintaining databases includes a focus on **high availability,** using techniques such as clustering and tools such as Microsoft Always On and Oracle RAC. Candidates should have strong skills in **SQL,** which is used for manipulating data in databases. Knowledge of other **scripting languages** is also useful. While database administrators may not have deep analysis skills, they are typically required to perform **data reporting,** using tools such as Microsoft SQL Server Reporting Services (SSRS). In addition to infrastructure security, candidates should be well versed in database security, including data encryption and access control.	As companies move to cloud infrastructure, there is also an opportunity to explore new **cloud databases,** also known as database as a service (DBaaS). Relational database offerings are available from the traditional vendors, and there are also new offerings such as MYSQL, Amazon Relational Database Service and Google Cloud SQL. Using cloud systems also allows more companies to explore big data. This starts with **non-relational databases** (also known as **NoSQL databases),** which come in many varieties depending on the type of data they store. Common examples are MongoDB, Cassandra, and Amazon DynamoDB. **Apache Hadoop** is not strictly considered a database since it is a broader framework for storing and managing data, but it is also a common tool used for big data operations.	Oracle Database Administrator Certified Professional Microsoft Technology Associate (MTA): Database Fundamentals

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Data Analyst
Sample job titles – Business Analyst, Business Intelligence Engineer

Core Skills	Emerging Skills	Certifications
Data analysts concentrate on mining existing data to find patterns and insights. While they are not quite as responsible for database maintenance, they should still be familiar with **relational databases**. To prepare data for analysis, candidates should be familiar with the **Extract/Transform/Load (ETL)** methodology. Although **Microsoft Excel** is a fairly basic tool for data analysis, it is widely used. More robust tools include Tableau, SAS, and Power BI. Scripting and programming are also key techniques used for data analysis. The **R language** is one of the most popular choices for high-level programming, while **Python** is a popular choice for scripting. After discovering insights from the data, candidates will need to employ **data visualization** techniques in order to present the findings in actionable ways to decision makers.	As with database administrators, data analysts are expanding their knowledge of databases to include relational and non-relational **cloud database** offerings. Many of these new offerings come with their own analytics capabilities. **Artificial intelligence** and **machine learning** are also impacting the role of a data analyst, as these techniques can be used to automate analysis and discover new insights.	Certified Analytics Professional (CAP) Cloudera Certified Associate Data Analyst

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Data Scientist
Sample job titles – Statistician, Machine Learning Scientist

Core Skills	Emerging Skills	Certifications
Rather than simply mining existing data to discover current insights, data scientists are responsible for **statistical modeling** in order to predict future trends. This relies on a deep understanding of probability, statistics, and multivariate calculus. Knowledge of **relational databases** is a foundational requirement for these roles. To prepare data for analysis, candidates should be familiar with the **Extract/Transform/Load (ETL)** methodology. Scripting and programming are also key techniques used for data science. The **R language** is one of the most popular choices for high-level programming, while **Python** is a popular choice for scripting. After discovering insights from the data, candidates will need to employ **data visualization** techniques in order to present the findings in actionable ways to decision makers.	As one of the most recent IT roles to be established, most data science candidates will be familiar with **cloud databases** (both relational and non-relational). **Artificial Intelligence** and **machine learning** are also common skills for data scientists, especially in the practice of **model deployment**. This connects a theoretical machine learning model to existing production data.	IBM Data Science Professional Certificate SAS Certified Data Scientist Data Science Council of America Principal Data Scientist

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Project Manager
Sample job titles – Project Coordinator

Core Skills	Emerging Skills	Certifications
The project manager role in IT does not deal directly with systems and applications, but it still requires a strong technical understanding of **IT architecture operations**. From a project management perspective, the core skills include **scheduling, budgeting, risk management,** and **dependency tracking**. Different methodologies are used for project management depending on the organization or type of project. Common examples are **waterfall** and **agile**. To manage the complexity and scope of IT projects, candidates should be familiar with **project management software** such as Asana or Smartsheet.	Project managers will not directly use emerging technologies in their job role, but they should still have a working knowledge of new trends such as **IoT, AI,** and **big data**.	CompTIA Project+ PMI CAPM PMI PMP

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Related Resources

Technology Workforce
CompTIA Tech Town Index
Diversity and Inclusion (D&I) Plan for Tech SMBs
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Individual Development Plan Template for IT Professionals
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Workforce and Learning Trends 2020

Technology Careers
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Technology Trends
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