

Certification Guide

Systems Administration



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How to Succeed as a Sysadmin

System administrators, or sysadmins, are the IT pros that install, maintain, and fix the technology that helps modern businesses run. From troubleshooting printers to managing cloud infrastructure, sysadmins do it all. If you pursue a career in system administration, you can expect plenty of challenges, exposure to a variety of technologies, and plenty of middle of the night emergency phone calls.

Here, we'll look at the skills you need to succeed as a sysadmin and walk through what you can expect when it comes to career progression.

Skills Needed for a Sysadmin Career

The great thing about a career as a sysadmin is there are a variety of paths you can take depending on what technology interests you the most. As you advance, the specific hard skills a sysadmin specializing in Linux needs will be different than those a Windows expert requires. However, there are a few foundational skills that generally apply across the board. These include:

Computer hardware. Even if you go the cloud computing route, a solid understanding of RAM, CPU, I/O, and storage will serve you well. Knowing the ins-and-outs of how compute and storage devices work will help with everything from troubleshooting to system design.

Networking. You'll certainly need to dabble in networking. Depending on the size of your IT department, you may do much more of this than you'd imagine. A good sysadmin will need to understand how networks function, and what to do when something can't connect.

IT security. A good sysadmin needs a fundamental understanding of security. As the primary managers of tech in businesses, sysadmins play a big role in implementing security policies.

Scripting. Automation and DevOps are becoming a bigger part of what sysadmins do. Knowledge of a scripting language or two, can help future-proof your skills and make you a better sysadmin.

Critical thinking. Being a sysadmin isn't just about understanding tech in a vacuum. To troubleshoot problems and design solutions, you'll need to think critically about how systems (and people) work.

Interpersonal skills. Sysadmins have to help users resolve problems with tech and explain complex issues to non-technical managers and staff. Patience and effective communication skills will be an important part of completing these tasks effectively.

Patience. Midnight phone calls, frustrated users, and updates that take forever are all part of life as a sysadmin. As a result, the idea that “patience is a virtue” applies to a career as a sysadmin.

A Look at Sysadmin Career Progression

IT careers don’t follow a single, well-defined path. Your career progression will be determined by a combination of opportunity and your preferences, skills, certifications, experience, and education.

With that being said, let’s take a look at what a general sysadmin career path might look like. At a high-level, sysadmins can choose between Windows, Linux, and cloud infrastructure. In general, you can expect career progression to map roughly to the common IT certification path of:

entry-level → experience → associate → experience → professional → experience → expert

The “experience” between each milestone is important. Employers look for both credentials (IT certifications and education history) that validate skills and hands-on experience using those skills. It’s important to strike the right balance.

Entry-level: The First Year

Your first job on the path to becoming a full-fledged sysadmin will likely start in a helpdesk, support, or other junior-level role. In these roles, you'll gain exposure to the frontline of life in IT. Password resets, installing equipment in server racks, running cable, and troubleshooting everything from printers to cellphones can be expected.

The experience you gain in a support role will be valuable for three reasons:

- **Reason 1:** Hands-on experience is a must for career advancement.
- **Reason 2:** Working directly with users and other IT pros will help you develop your interpersonal skills.
- **Reason 3:** You'll learn where you want to specialize going forward.

If you don't have any IT certifications or education when you start this role, an entry-level certification can go a long way. Don't worry too much about specialization yet though. Focus on the fundamentals for now, they'll serve you well as you progress.

Relevant certifications: CompTIA A+, CompTIA Network+, LPI Linux Essentials, Microsoft Technology Associate certifications

Common job titles: IT Helpdesk Representative, Junior sysadmin, Junior server administrator, IT support specialist

Associate: 3 to 5 Years

At this stage in your career, you should have a firm grasp of fundamental hard skills as well as experience applying them. You'll also have the required work experience for many "systems administrator" job postings.

You'll likely be involved in troubleshooting complex issues and work on projects related to systems design and implementation. Patching systems, provisioning new technology, and day-to-day maintenance should all be in your wheelhouse as well. You may also become the go-to person for those middle of the night emergencies.

Additionally, specialization starts to make sense at this point. For example, a CCNA can help you build a network-centric career going forward. Similarly, the AWS SysOps Administrator cert makes sense for cloud. If you're focusing your career on virtualization, then a VCA would make the most sense for you.

Relevant certifications: CCNA, AWS Certified SysOps Administrator - Associate, VMware VCA, LPIC-1 and LPIC-2, MCSA

Common job titles: Systems administrator, server administrator, data center administrator

Professional: 5 to 7 Years

After five to seven years working in the field, you should be at the professional level. You should have a firm grasp on your area of specialization and be a viable candidate for senior positions. In these roles, you can expect to be the technical lead on a variety of projects. You can also expect more autonomy than you've had previously.

Relevant certifications: CCNP (Data Center), AWS Certified DevOps Engineer – Professional, VMware VCP, LPIC-3, MCSE

Common job titles: Senior Systems Administrator, Systems Engineer, Senior Data Center Administrator

Expert: 7 to 10 Years

By this stage in your career, you should have expert-level soft skills and hard skills in your area of specialization. In addition to being able to lead complex design projects, you should be one of the highest points of escalation for troubleshooting.

At the expert-level, you'll often be expected to have solid project management skills as well. This is because the projects you'll be involved in, such as data center build-outs or network refreshes, will not only require technical skills but also need to be on time and within budget. IT pros that can compliment their tech skills with a bit of business acumen can excel at this point.

Relevant certifications: CCIE Data Center) AWS Certified Advanced Networking - Specialty, VMware VCDX

Common job titles: Network Manager, Senior Systems Engineer, Systems Architect

What's Next?

Once you've spent a few years at the expert-level, there are a few paths you can take. For starters, staying in Systems Engineer or Architect roles for the remainder of your career is certainly viable. The rapid pace of change in technology alone can help keep you engaged and challenged as you go.

Alternatively, moving up the management ladder is a common path. If you enjoy leading a team or have a knack for the business side of things, moving into a management position is a logical transition. From there, climbing the corporate ladder from manager to director to CTO or CIO. If you have an entrepreneurial streak, going into business for yourself as an IT consultant is another viable path.

However, much of what you do 10 years into your journey will depend on decisions you've made beforehand. That means it's important to get started and find a path you're passionate about today. Of course, there's no one-size-fits-all answer.

To help make the right decision for yourself, consider these questions:

What experience do you have? If you're overqualified for entry-level positions, you may be able to transition straight into more senior roles.

What technology do you want to work with? This will matter a lot when it comes time to specialize. If you have a passion for Linux systems, select a job and certification track that focuses on them. Conversely, if you love working in data centers, consider going down the path of CCIE Datacenter

Do you prefer leading a team or hands-on work? As you advance in your career, this question can help guide your choice to move to systems architect roles or management.

Using This Certification Guide

In this certification guide, we've listed every certification for the top vendors you'll likely encounter as a systems administrator — Microsoft, VMware, Citrix, AWS, Google, and Linux. You'll find relevant CompTIA certifications as well. Each chapter is ordered from foundational to expert. Choose your path based on your career goals, experience level, and stated prerequisites.



CBTnu**o**ets

Microsoft Certifications

Microsoft remains a preferred vendor at the enterprise level despite increased competition in recent years. Windows and Windows Servers are used by many organizations across different industries. Meanwhile, Azure and Office 365 have seen a recent surge in popularity among the enterprise. As such, the demand is high for professionals who can help organizations leverage Microsoft products and services.

Microsoft certifications validate the knowledge and skills that IT professionals need to be successful managing and maintaining Microsoft technologies. Microsoft offers six levels of certification for IT professionals covered in this guide:

- **Role-Based Microsoft Certifications**
- **Microsoft Technology Associate (MTA)**
- **Microsoft Certified Solutions Associate (MCSA)**
- **Microsoft Certified Solutions Expert (MCSE)**
- **Microsoft Solutions Developer (MCSD)**
- **Microsoft Office Specialist (MOS)**

Where to Start with Microsoft Certifications

The Microsoft certification program is migrating toward role-based credentials for Azure and Microsoft 365 developers, administrators, solutions architects, and functional consultants. However, its certification offering still includes a number of product-oriented credentials.

As Microsoft transitions to role-based certifications, it still maintains traditional technology-based Microsoft certification paths: Microsoft Technology Associate (MTA), Microsoft Certified Solutions Associate (MCSA), Microsoft Certified Solutions Expert (MCSE), Microsoft Certified Solutions Developer (MCSA), and Microsoft Office Specialist (MOS).

The Microsoft Technology Associate (MTA) is a foundational certification that prepares new IT and business professionals with the skills they need to progress early in their career. The MTA certifications are also useful to prepare for the higher level MCSA certifications.

The Microsoft Certified Solutions Associate (MCSA) is an entry-level Microsoft certification that validates the knowledge and skills an entry-level IT professional will learn in their first years working with a Microsoft product. That's why Microsoft recommends that test-takers have at least one year of experience working in a Microsoft environment.

To earn the MCSA, IT professionals typically must pass three exams. Certification at the associate level prepares IT professionals for job roles including system or network administrator, desktop support specialist, or other support roles. MCSA certification is also a prerequisite for MCSE certification.

MCSE (Microsoft Certified Solution Expert) is an expert-level Microsoft certification. While the MCSA is a two- or three-exam series, earning MCSE requires passing only one exam. The MCSE validates a higher level of expertise than MCSA. It may only require an additional exam to earn the MCSE, but the subject matter is more difficult and technically deeper than MCSA exams. The MCSE typically qualifies candidates for IT management roles.

While Microsoft MTA and some MCSA certifications have no prerequisites, all MCSE certifications have prerequisites. Candidates must earn a prerequisite MCSA certification before they sit for an MCSE exam.

For example, an IT professional may start with MTA or MOS certification(s) before stepping up to the MCSA certification level. Once a candidate has acquired MCSA certification, the next logical step is to earn MCSE certification, Microsoft's expert-level certification. Microsoft's role-based certifications have similar layers, which reflect increasing levels of knowledge and experience.

Role-Based Microsoft Certifications

Role-based certifications, the newest addition to the Microsoft certification program, are designed to address the disconnect that exists between the knowledge needed to pass certification exams and the knowledge needed to successfully perform job roles. Role-based Microsoft certification paths are organized in three levels of increasing experience:

- **FUNDAMENTAL**
- **ASSOCIATE**
- **EXPERT**
- **SPECIALTY**

Fundamental-Level Role-Based Microsoft Certifications

Most IT professionals acknowledge a gap exists between what certifications test and real-world situations. At the fundamental level, the width of that gap is great because these certifications are designed for brand new IT professionals. Microsoft offers four fundamental-level certifications:

- **Microsoft 365 Certified Fundamentals**
- **Azure Fundamentals**
- **Dynamics 365 Fundamentals**
- **Power Platform Fundamentals**

FUNDAMENTAL ROLE-BASED

Microsoft 365 Certified Fundamentals

The Microsoft 365 Certified Fundamentals certification is designed for IT professionals who communicate options available in Microsoft 365 and the benefits of adopting cloud services, the Software as a Service (SaaS) cloud model, and implement Microsoft 365 cloud services. This certification validates a candidate's ability to:

- **Understand cloud concepts**
- **Understand core Microsoft 365 services and concepts**
- **Understand security, compliance, privacy, and trust in Microsoft 365**
- **Understand Microsoft 365 pricing and support**

Required exams: Earning the Microsoft 365 Certified Fundamentals certification requires passing one exam — Microsoft 365 Fundamentals (MS-900).

Prerequisites: None.

Recommended experience: Microsoft designed this certification for IT professionals and business professionals with some hands-on experience with Microsoft 365.

FUNDAMENTAL ROLE-BASED

Microsoft Certified Azure Fundamentals

The Microsoft Certified Azure Fundamentals certification is designed for IT professionals who work with core Azure Services, Azure pricing and support, and the fundamentals of cloud security, privacy, compliance, and trust. This certification validates a candidate's ability to:

- **Understand cloud concepts**
- **Understand core Azure services**
- **Understand security, privacy, compliance, and trust**
- **Understand Azure pricing and support**

Required exams: Earning the Microsoft Certified Azure Fundamentals certification requires passing one exam — Microsoft Azure Fundamentals (AZ-900).

Prerequisites: None.

Recommended experience: Microsoft designed this certification for IT professionals with hands-on experience with fundamental Azure functions and pricing structures.

FUNDAMENTAL ROLE-BASED

Microsoft Certified Dynamics 365 Fundamentals

The Microsoft Certified Dynamics 365 Fundamentals certification is designed for IT professionals who use Microsoft Dynamics 365 and Power Platform, including understanding Dynamic 365 licensing, onboarding, and support, and deployment and release options. This certification validates a candidate's ability to:

- **Understand Dynamics 365**
- **Understand cloud concepts**
- **Understand deployments and releases**

Required exams: Earning the Dynamics 365 Fundamentals certification requires passing one exam — Microsoft Dynamics 365 Fundamentals (MB-901).

Prerequisites: None.

Recommended experience: Microsoft designed this certification for IT professionals and business professionals with some hands-on experience with Dynamics 365.

FUNDAMENTAL ROLE-BASED

Microsoft Certified Dynamics 365 Fundamentals

The Microsoft Certified: Power Platform Fundamentals certification is designed for IT professionals who regularly work with Power Bi, Power Apps, and Power Automate. This certification validates a candidate's ability to:

- **Identify the components of Power Bi, Power Apps, and Power Automate**
- **Identify business cases for each tool with Power Platform**

Required exams: Earning the Power Platform certification requires passing one exam — Power Platform Fundamentals (PL-900).

Prerequisites: None.

Recommended experience: Microsoft designed this certification for IT professionals with hands-on experience with fundamental knowledge of Power Platform tools.

Associate-Level Role-Based Microsoft Certifications

Microsoft offers 23 associate-level certifications:

- **Modern Desktop Administrator Associate**
- **Messaging Administrator Associate**
- **Teamwork Administrator Associate**
- **Security Administrator Associate**
- **Developer Associate**
- **Teams Administrator Associate**
- **Azure AI Engineer Associate**
- **Azure Administrator Associate**
- **Azure Developer Associate**
- **Azure Security Engineer Associate**
- **Data Analyst Associate**
- **Azure Data Scientist Associate**
- **Azure Data Engineer Associate**
- **Sales Functional Consultant Associate**
- **Marketing Functional Consultant Associate**
- **Customer Service Functional Consultant Associate**
- **Field Service Functional Consultant Associate**
- **Finance Functional Consultant Associate**
- **Supply Chain Management, Manufacturing Functional Consultant Associate**
- **Supply Chain Management Functional Consultant Associate**
- **Power Apps + Dynamics 365 Developer Associate**
- **Finance and Operations Apps Developer Associate**
- **Azure Database Administrator Associate**

ASSOCIATE ROLE-BASED**Microsoft 365 Certified: Modern Desktop Administrator Associate**

The Modern Desktop Administrator Associate certification is designed for IT professionals who deploy, configure, secure, manage, and monitor devices and client applications in an enterprise environment. This certification validates a candidate's ability to:

- Deploy Windows
- Manage devices and data
- Configure connectivity
- Maintain Windows
- Deploy and update operating systems

Required exams: Earning the Microsoft 365 Certified: Modern Desktop Administrator Associate certification requires passing two exams:

- Windows 10 (MD-100)
- Managing Modern Desktops (MD-101)

Prerequisites: The Microsoft 365 Certified Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft recommends hands-on experience managing and maintaining the Windows 10 operating system and devices prior to attempting this certification exam.

ASSOCIATE ROLE-BASED**Microsoft 365 Certified: Messaging Administrator Associate**

The Messaging Administrator Associate certification is designed for IT professionals who deploy, configure, manage, and monitor messaging infrastructure, permissions, client access, and mail protection on-premises, hybrid, and cloud enterprise environments. This certification validates a candidate's ability to:

- Manage modern messaging infrastructure
- Manage mail flow topology
- Manage recipients and devices
- Plan and implement a hybrid configuration and migration
- Secure the messaging environment

Required exams: Earning the Dynamics 365 for Customer Service Functional Consultant Associate certification requires passing two exams:

- Planning and Configuring a Messaging Platform (MS-200)
- Implementing a Hybrid and Secure Messaging Platform (MS-201)

Prerequisites: The Microsoft 365 Certified Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft designed this certification for entry-level IT professionals experienced with Microsoft collaboration services.

ASSOCIATE ROLE-BASED**Microsoft 365 Certified: Teamwork Administrator Associate**

The Microsoft 365 Certified: Teamwork Administrator Associate certification is designed for IT professionals who configure, deploy, and manage Office 365 workloads that focus on efficient and effective collaboration such as SharePoint (online, on-premises, and hybrid), OneDrive, and Teams. This certification validates a candidate's ability to:

- Configure and manage SharePoint Online
- Configure and manage OneDrive for Business
- Configure and manage Teams
- Configure and manage SharePoint On-Premises
- Migrate to SharePoint Online

Required exams: Earning the Microsoft 365 Certified: Teamwork Administrator Associate certification requires passing two exams:

- Deploying Microsoft 365 Teamwork (MS-300)
- Deploying SharePoint Server Hybrid (MS-301)

Prerequisites: The Microsoft 365 Certified Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft designed this certification for entry-level IT professionals experienced with Microsoft collaboration services.

ASSOCIATE ROLE-BASED**Microsoft 365 Certified: Security Administrator Associate**

The Microsoft 365 Certified: Security Administrator Associate certification is designed for IT professionals who deploy Microsoft 365 enterprise and hybrid environments, implement and manage security and compliance solutions, respond to threats, and enforce data governance. This certification validates a candidate's ability to:

- Implement and manage identity and access
- Implement and manage threat protection
- Implement and manage information protection
- Manage governance and compliance features in Microsoft 365

Required exam: Earning the Microsoft 365 Certified: Security Administrator Associate certification requires passing one exam — Microsoft 365 Security Administration (MS-500).

Prerequisites: The Microsoft 365 Certified Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft recommends hands-on experience implementing security features on Microsoft 365 prior to attempting this certification exam.

ASSOCIATE ROLE-BASED**Microsoft Certified: Developer Associate**

The Microsoft 365 Certified: Developer Associate certification is designed for IT professionals who design, build, test, and maintain applications and solutions that are optimized for the productivity and collaboration needs of organizations using the Microsoft 365 platform. This certification validates a candidate's ability to:

- Build apps with Microsoft Graph
- Extend and customize SharePoint
- Extend and customize Teams
- Implement Microsoft Identity

Required exams: Earning the Developer Associate certification requires passing one exam — Building Applications and Solutions with Microsoft 365 Core Services (MS-600).

Prerequisites: The Microsoft 365 Certified Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft designed this certification for entry-level IT professionals experienced with Microsoft collaboration services.

ASSOCIATE ROLE-BASED**Microsoft Certified: Teams Administrator Associate**

The Microsoft 365 Certified: Teams Administrator Associate certification is designed for IT professionals who configure, deploy, and manage Office 365 workloads for Microsoft Teams that focus on efficient and effective collaboration and communication in an enterprise environment. This certification validates a candidate's ability to:

- Plan and configure Microsoft Teams
- Manage Chat, Calling, and Meetings
- Manage Teams and App Policies

Required exams: Earning the Teams Administrator Associate certification requires passing one exam — Managing Microsoft Teams (MS-700).

Prerequisites: The Microsoft 365 Certified Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft designed this certification for entry-level IT professionals experienced with Microsoft collaboration services.

ASSOCIATE ROLE-BASED**Microsoft Certified: Azure AI Engineer Associate**

The Microsoft Certified: Azure AI Engineer Associate certification is designed for IT professionals who deploy cognitive services, machine learning, and knowledge mining to architect and implement Microsoft AI solutions involving natural language processing, speech, computer vision, bots, and agents. This certification validates a candidate's ability to:

- Analyze solution requirements
- Design AI solutions
- Implement and monitor AI solutions

Required exams: Earning the Microsoft Certified: Azure AI Engineer Associate certification requires passing one exam — Designing and Implementing an Azure AI Solution (AI-100).

Prerequisites: The Microsoft Certified: Azure Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft recommends hands-on experience building, managing, and maintaining Azure AI services prior to attempting this certification exam.

ASSOCIATE ROLE-BASED**Microsoft Certified: Azure Administrator Associate**

The Microsoft Certified: Azure Administrator Associate certification is designed for IT professionals who implement, monitor, and maintain Microsoft Azure solutions, including major services related to compute, storage, network, and security. This certification validates a candidate's ability to:

- Manage Azure subscriptions and resources
- Implement and manage storage
- Deploy and manage virtual machines
- Configure and manage virtual networks
- Manage identities

This certification is a prerequisite for the Microsoft Certified: Azure DevOps Engineer Expert certification.

Required exams: Earning the Microsoft Certified: Azure Administrator Associate certification requires passing one exam — Microsoft Azure Administrator (AZ-103).

Prerequisites: The Microsoft Certified: Azure Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft recommends hands-on experience building, managing, and maintaining Azure cloud services prior to attempting this certification exam.

ASSOCIATE ROLE-BASED**Microsoft Certified: Azure Developer Associate**

The Microsoft Certified: Azure Developer Associate certification validates that the candidate possesses the knowledge and skills to design, develop, test, and maintain cloud solutions, such as applications and services. This certification validates a candidate's ability to:

- **Develop Azure IaaS compute solutions**
- **Develop Azure PaaS compute solutions**
- **Develop for Azure storage**
- **Implement Azure security**
- **Connect to Azure and third-party services**

This certification is a prerequisite for the Microsoft Certified: Azure DevOps Engineer Expert.

Required exam: Earning the Microsoft Certified: Azure Developer Associate certification requires passing one exam — Developing Solutions for Microsoft Azure (AZ-203).

Prerequisites: The Microsoft Certified: Azure Fundamentals certification is suggested, but not required.

Recommended experience: Microsoft recommends hands-on experience building, managing, and maintaining Azure computing services prior to attempting this certification exam.

ASSOCIATE ROLE-BASED**Microsoft Certified: Azure Security Engineer Associate**

The Microsoft Certified: Azure Security Engineer Associate certification is designed for IT professionals who implement security controls and threat protection, manage identity and access, and protect data, applications, and networks in cloud and hybrid environments as part of end-to-end infrastructure. This certification validates a candidate's ability to:

- **Manage identity and access**
- **Implement platform protection**
- **Manage security operations**
- **Secure data and applications**

Required exam: Earning the Microsoft Certified: Azure Security Engineer Associate certification requires passing one exam — Microsoft Azure Security Technologies (AZ-500).

Prerequisites: The Microsoft Certified: Azure Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft recommends hands-on experience implementing Azure security services prior to attempting this certification exam.

ASSOCIATE ROLE-BASED**Microsoft Certified: Data Analyst Associate**

The Microsoft Certified: Data Analyst Associate certification is designed for IT professionals who regularly use Power BI to prepare, model, and visualize data for business intelligence. This certification validates a candidate's ability to:

- Prepare data for Power BI ingestion
- Model data with Power BI
- Visualize and analyze data
- Deploy and maintain user deliverables

Required exams: Earning the Data Analyst Associate certification requires passing one exam — Analyzing Data with Microsoft Power BI (DA-100).

Prerequisites: The Microsoft Certified: Azure Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft recommends hands-on experience with the Power BI platform as well as a good understanding of how to work with common data types, databases, and data processing techniques.

ASSOCIATE ROLE-BASED**Microsoft Certified: Azure Data Scientist Associate**

The Microsoft Certified: Azure Data Scientist Associate certification is designed for IT professionals who apply Azure's machine learning techniques to train, evaluate, and deploy models that solve business problems. This certification validates a candidate's ability to:

- Define and prepare development environment
- Prepare data for modeling
- Perform feature engineering
- Develop models

Required exams: Earning the Microsoft Certified: Azure Data Scientist Associate certification requires passing one exam — Designing and Implementing a Data Science Solution on Azure (DP-100).

Prerequisites: The Microsoft Certified: Azure Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft recommends hands-on experience building, managing, and maintaining Azure data services prior to attempting this certification exam.

ASSOCIATE ROLE-BASED**Microsoft Certified: Azure Data Engineer Associate**

The Microsoft Certified: Azure Data Engineer Associate certification is designed for IT professionals who design and implement the management, monitoring, security, and privacy of data using the full stack of Azure data services to satisfy business needs. This certification validates a candidate's ability to:

- Implement data storage solutions
- Manage and develop data processing
- Monitor and optimize data solutions
- Design Azure data storage solutions
- Design for data security and compliance

Required exams: Earning the Microsoft Certified: Azure Data Engineer Associate certification requires passing two exams:

- Implementing an Azure Data Solution (DP-200)
- Designing an Azure Data Solution (DP-201)

Prerequisites: The Microsoft Certified: Azure Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft recommends hands-on experience building, managing, and maintaining Azure data services prior to attempting this certification exam.

ASSOCIATE ROLE-BASED**Microsoft Certified: Dynamics 365 for Sales Functional Consultant Associate**

The Microsoft Certified: Dynamics 365 for Sales Functional Consultant Associate certification is designed for IT professionals who implement solutions that anticipate and plan customer connections, manage deals through processing and closing, and accelerate sales team performance using data analytics. This certification validates a candidate's ability to:

- Perform solutions deployment and testing
- Perform configuration
- Manage core sales entities
- Manage sales entities

Required exams: Earning the Microsoft Certified: Dynamics 365 for Customer Service Functional Consultant Associate certification requires passing two exams:

- Dynamics 365 Customer Engagement (MB-200)
- Dynamics 365 for Sales (MB-210)

Prerequisites: The Microsoft Certified Dynamics 365 Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft designed this certification for entry-level IT professionals and business professionals experienced with Dynamics 365.

ASSOCIATE ROLE-BASED**Microsoft Certified: Dynamics 365 for Marketing Functional Consultant Associate**

Microsoft Certified: Dynamics 365 for Marketing Functional Consultant Associate certification is designed for IT professionals who implement solutions that attract and convert leads, build brand awareness, standardize omni-channel messaging, and deliver marketing insights. This certification validates a candidate's ability to:

- Perform discovery, planning, and analysis
- Manage user experience design
- Manage entities and data
- Implement security
- Implement integration

Required exams: Earning the Dynamics 365 for Marketing Functional Consultant Associate certification requires passing two exams:

- Microsoft Dynamics 365 Customer Engagement Core (MB-200)
- Microsoft Dynamics 365 for Marketing (MB-220)

Prerequisites: The Microsoft Certified Dynamics 365 Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft designed this certification for entry-level IT professionals and business professionals experienced with Dynamics 365.

ASSOCIATE ROLE-BASED**Microsoft Certified: Dynamics 365 for Customer Service Functional Consultant Associate**

The Microsoft Certified: Dynamics 365 for Customer Service Functional Consultant Associate certification is designed for IT professionals who build customer experience (CX) solutions that are fast, agile, and leverage artificial intelligence (AI) to drive actionable insights that anticipate customer needs. This certification validates a candidate's ability to:

- Perform solutions deployment and testing
- Perform configuration
- Manage cases and the knowledge base
- Manage queues, entitlements, and SLAs
- Configure voice of the customer

Required exams: Earning the Dynamics 365 for Customer Service Functional Consultant Associate certification requires passing two exams:

- Dynamics 365 Customer Engagement (MB-200)
- Dynamics 365 for Customer Service (MB-230)

Prerequisites: The Microsoft Certified Dynamics 365 Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft designed this certification for entry-level IT professionals and business professionals experienced with Dynamics 365.

ASSOCIATE ROLE-BASED**Microsoft Certified: Dynamics 365 for Field Service Functional Consultant Associate**

The Microsoft Certified: Dynamics 365 for Field Service Functional Consultant Associate certification is designed for IT professionals who implement solutions that manage the field service lifecycle, and deploying the Connected Field Service (IoT) solution. This certification validates a candidate's ability to:

- Perform discovery, planning, and analysis
- Manage user experience design
- Manage entities and data
- Implement security
- Implement integration

Required exams: Earning the Microsoft Certified: Dynamics 365 for Field Service Functional Consultant Associate certification requires passing two exams:

- Microsoft Dynamics 365 Customer Engagement Core (MB-200)
- Microsoft Dynamics 365 for Field Service (MB-240)

Prerequisites: The Microsoft Certified Dynamics 365 Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft designed this certification for entry-level IT professionals and business professionals experienced with Dynamics 365.

ASSOCIATE ROLE-BASED**Microsoft Certified: Dynamics 365 for Field Service Functional Consultant Associate**

The Microsoft Certified: Dynamics 365 for Marketing Functional Consultant Associate certification is designed for IT professionals who implement solutions that attract and convert leads, build brand awareness, standardize omni-channel messaging, and deliver marketing insights. This certification validates a candidate's ability to:

- Perform discovery, planning, and analysis
- Manage user experience design
- Manage entities and data
- Implement security
- Implement integration

Required exams: Earning the Microsoft Certified: Dynamics 365 for Marketing Functional Consultant Associate certification requires passing two exams:

- Microsoft Dynamics 365 Customer Engagement Core (MB-200)
- Microsoft Dynamics 365 for Marketing (MB-220)

Prerequisites: The Microsoft Certified Dynamics 365 Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft designed this certification for entry-level IT professionals and business professionals experienced with Dynamics 365.

ASSOCIATE ROLE-BASED**Microsoft Certified: Dynamics 365 for Finance Functional Consultant Associate**

The Microsoft Certified: Dynamics 365 for Finance and Operations, Financials Functional Consultant Associate certification is designed for IT professionals who unify global financials and operations, automate tasks and workflows, and streamline customer actions. This certification validates a candidate's ability to:

- Set up and configure financial management
- Manage and apply common processes
- Implement and manage accounts payable and receivable
- Manage budgeting and fixed assets

Required exams: Earning the Dynamics 365 for Finance and Operations, Financials Functional Consultant Associate certification requires passing two exams:

- Dynamics 365 Unified Operations Core (MB-300)
- Dynamics 365 for Finance and Operations, Financials (MB-310)

Prerequisites: The Microsoft Certified Dynamics 365 Fundamentals certification is suggested, but not required.

Recommended experience: Microsoft designed this certification for entry-level IT professionals and business professionals experienced with Dynamics 365.

ASSOCIATE ROLE-BASED**Microsoft Certified: Dynamics 365 for Supply Chain Management, Manufacturing Functional Consultant Associate**

The Dynamics 365 for Finance and Operations, Manufacturing Functional Consultant Associate certification is designed for professionals who integrate digital and physical systems, manufacturing efficiency and flexibility, and lower costs for their clients. This certification validates a candidate's ability to:

- Perform data migration
- Validate and support the solution
- Set up and configure manufacturing
- Create and manage production and lean orders
- Create and manage production batch orders

Required exams: Earning the Microsoft Certified: Dynamics 365 for Finance and Operations, Manufacturing Functional Consultant Associate certification requires passing two exams:

- Dynamics 365 Unified Operations Core (MB-300)
- Microsoft Dynamics 365 for Finance and Operations, Manufacturing (MB-320)

Prerequisites: The Dynamics 365 Fundamentals certification is recommended, but not required.

Recommended experience: Microsoft designed this certification for professionals experienced with Dynamics 365.

ASSOCIATE ROLE-BASED

Microsoft Certified: Dynamics 365 for Supply Chain Management Functional Consultant Associate

The Microsoft Certified: Dynamics 365 for Finance and Operations, Supply Chain Management Functional Consultant Associate certification is designed for IT professionals who streamline essential business functions. This certification validates a candidate's ability to:

- Perform data migration
- Validate and support the solution
- Implement product information management
- Implement inventory management
- Implement and manage supply chain processes

Required exams: Earning the Microsoft Certified: Dynamics 365 for Finance and Operations, Supply Chain Management Functional Consultant Associate certification requires passing two exams:

- Dynamics 365 Unified Operations Core (MB-300)
- Microsoft Dynamics 365 for Finance and Operations, Supply Chain Management (MB-330)

Prerequisites: The Dynamics 365 Fundamentals certification is suggested, but not required.

Recommended experience: Microsoft designed this certification for professionals experienced with Dynamics 365.

ASSOCIATE ROLE-BASED

Microsoft Certified: Power Apps + Dynamics 365 Developer Associate

Microsoft Certified: Power Apps + Dynamics 365 Developer Associate certification is designed for IT professionals who work with Microsoft Power Apps and Dynamics 365, and design, develop, secure, and extend a Dynamics 365 implementation. This certification validates a candidate's ability to:

- Extend the Power Apps platform
- Manage user experience design
- Configure business process automation
- Develop integrations between Dynamics 365 and Power Apps

Required exams: Earning the Power Apps + Dynamics 365 Developer Associate certification requires passing two exams:

- Microsoft Dynamics 365 Customer Engagement Core (MB-200)
- Microsoft Power Apps + Dynamics 365 Developer (MB-400)

Prerequisites: The Microsoft Certified Dynamics 365 Fundamentals is recommended, but not required.

Recommended experience: Microsoft designed this certification for entry-level developers with experience in JavaScript, TypeScript, C#, HTML, .NET, Microsoft Azure, Office 365, RESTful Web Services, ASP.NET, and Power BI.

ASSOCIATE ROLE-BASED**Microsoft Certified: Dynamics 365: Finance and Operations Apps Developer Associate**

Microsoft Certified: Dynamics 365: Finance and Operations Apps Developer Associate certification is designed for IT professionals who work with Finance and Operations apps in Microsoft Dynamics 365 implement and extend applications to meet the requirements of the business. This certification validates a candidate's ability to:

- Develop and test code
- Implement reporting
- Integrate and manage data solutions
- Plan architecture and solution design

Required exams: Earning the Dynamics 365: Finance and Operations Apps Developer Associate certification requires passing two exams:

- Unified Operations Core (MB-300)
- Finance and Operations Apps Developer (MB-500)

Prerequisites: The Microsoft Certified Dynamics 365 Fundamentals is recommended, but not required.

Recommended experience: Microsoft designed this certification for developers familiar with at least one object-oriented programming language, T-SQL, PowerShell, Visual Studio, Azure DevOps, and SSMS.

ASSOCIATE ROLE-BASED**Microsoft Certified: Azure Database Administrator Associate**

Microsoft Certified: Azure Database Administrator Associate certification is designed for IT professionals who implement and manage the operational aspects of cloud-native and hybrid data platform solutions built on Azure Data Services and SQL Server. This certification validates a candidate's ability to:

- Plan and implement data platform resources
- Implement a secure environment
- Monitor and optimize operational resources
- Perform administration by using T-SQL

Required exams: Earning the Azure Database Administrator Associate certification requires passing one exam — Administering Relational Databases on Microsoft Azure (DP-900).

Prerequisites: The Microsoft Certified: Azure Fundamentals is recommended, but not required.

Recommended experience: Microsoft recommends hands-on experience with Azure Data Services and SQL Server, and a good handle on T-SQL.

Expert-Level Role-Based Microsoft Certifications

In an effort to bridge the gap between product and job, Microsoft created role-based certs to better prepare IT professionals for success on the job. Microsoft offers five expert-level certifications:

- Enterprise Administrator Expert
- Azure Solutions Architect Expert
- Azure DevOps Engineer Expert
- Dynamics 365 + Power Platform Solution Architect Expert
- Dynamics 365: Finance and Operations Apps Solution Architect Expert

EXPERT ROLE-BASED

Microsoft 365 Certified: Enterprise Administrator Expert

The Microsoft 365 Certified: Enterprise Administrator Expert certification is designed for IT professionals who migrate, deploy, and manage Microsoft 365 services. This certification validates a candidate's ability to:

- Design and implement Microsoft 365 services
- Plan Office 365 workloads and applications
- Implement modern device services
- Implement Microsoft 365 security and threat management
- Manage Microsoft 365 governance and compliance

Required exams: Earning the Enterprise Administrator Expert certification requires passing two exams:

- Microsoft 365 Identity and Services (MS-100)
- Microsoft 365 Mobility and Security (MS-101)

Prerequisites: Prior to attempting this certification, candidates must earn one of five certifications:

- Modern Desktop Administrator Associate
- Teamwork Administrator
- Security Administrator Associate
- Messaging Administrator Associate
- Teams Administrator

Recommended experience: Microsoft recommends considerable hands-on experience managing, migrating, and deploying Microsoft 365 services prior to attempting this certification exam.

EXPERT ROLE-BASED

Microsoft Certified: Azure Solutions Architect Expert

The Microsoft Certified: Azure Solutions Architect Expert certification is designed for IT professionals who design solutions that run on Azure, including expertise in compute, network, storage, and security. This certification validates a candidate's ability to:

- Deploy and configure infrastructure
- Create and deploy apps
- Implement authentication and secure data
- Develop for the cloud and for Azure storage
- Determine workload requirements

Required exams: Earning the Microsoft Certified: Azure Solutions Architect Expert certification requires passing two exams:

- Microsoft Azure Architect Technologies (AZ-300)
- Microsoft Azure Architect Design (AZ-301)

Prerequisites: None.

Recommended experience: Microsoft recommends considerable hands-on experience managing, migrating, and deploying Azure services prior to attempting this certification exam.

EXPERT ROLE-BASED

Microsoft Certified: Azure DevOps Engineer Expert

The Microsoft Certified: Azure DevOps Engineer Expert certification is designed for IT professionals who combine people, processes, and technologies to continuously deliver valuable products and services that meet business objectives and the needs of users. This certification validates a candidate's ability to:

- Implement continuous integration
- Implement continuous delivery
- Implement dependency management
- Implement application infrastructure
- Implement continuous feedback

Required exam: Earning the Azure DevOps Engineer Expert certification requires passing one exam — Microsoft Azure DevOps Solutions (AZ-400).

Prerequisites: Prior to attempting this Expert-level role-based certification, candidates must earn either Azure Administrator Associate or Azure Developer Associate.

Recommended experience: Microsoft recommends considerable hands-on experience managing, migrating, and deploying Azure services prior to attempting this certification exam.

EXPERT ROLE-BASED**Microsoft Certified: Dynamics 365 + Power Platform Solution Architect Expert**

The Microsoft Certified: Dynamics 365 + Power Platform Solution Architect Expert certification is designed for IT professionals who lead successful implementations of the two platforms and focus on how solutions address the broader business and technical needs of organizations. This certification validates a candidate's ability to:

- Perform solution envisioning and requirement analysis
- Architect a solution
- Implement the solution

Required exam: Earning the Dynamics 365 + Power Platform Solution Architect Expert certification requires passing one exam — Microsoft Dynamics 365 + Power Platform Solution Architect (MB-600).

Prerequisites: Prior to attempting this Expert-level role-based certification, candidates must one of Associate-level role-based Dynamics 365 certifications:

- Power Apps + Dynamics 365 Developer Associate
- Sales Functional Consultant Associate
- Marketing Functional Consultant Associate
- Customer Service Functional Consultant Associate
- Field Service Functional Consultant Associate

EXPERT ROLE-BASED**Microsoft Certified: Dynamics 365: Finance and Operations Apps Solution Architect Expert**

The Microsoft Certified: Dynamics 365: Finance and Operations Apps Solution Architect Expert certification is designed for IT professionals who consult with organizations and implementation team members to refine business needs into a well-defined and cost-effective solution. This certification validates a candidate's ability to:

- Identify solution requirements
- Design solution components
- Define solution testing and management strategies

Required exam: Earning the Finance and Operations Apps Solution Architect Expert certification requires passing one exam — Microsoft Dynamics 365: Finance and Operations Apps Solution Architect (MB-700).

Prerequisites: Prior to attempting this Expert-level role-based certification, candidates must one of Associate-level role-based certifications:

- Finance Functional Consultant Associate
- Supply Chain Management, Manufacturing Functional Consultant Associate
- Supply Chain Management Functional Consultant Associate
- Finance and Operations Apps Developer Associate

Specialty Role-Based Microsoft Certifications

Microsoft specialty role-based certifications validate that a candidate can fully implement specialized applications of Azure services.

Microsoft offers two specialty certifications:

- Azure for SAP Workloads Specialty
- Azure IoT Developer Specialty

SPECIALTY ROLE-BASED

Microsoft Certified: Azure for SAP Workloads Specialty

The Microsoft Certified: Azure for SAP Workloads Specialty certification is designed for architects with extensive experience with SAP solutions. This certification validates a candidate's ability to:

- Migrate SAP Workloads to Azure
- Design an Azure solution to support SAP workloads
- Build and deploy Azure for SAP workloads
- Validate Azure infrastructure for SAP workloads
- Operationalize Azure SAP architecture

Required exam: Earning the Azure for SAP Workloads Specialty certification requires passing one exam — Planning and Administering Microsoft Azure for SAP Workloads (AZ-120).

Prerequisites: Prior to attempting this Specialty-level role-based certification, Microsoft strongly recommends architects have the Azure Administrator or Azure Architect certification, and SAP HANA and Linux certifications.

SPECIALTY ROLE-BASED

Microsoft Certified: Azure IoT Developer Specialty

The Microsoft Certified: Azure IoT Developer Specialty certification is designed for IT professionals who implement Azure IoT tools and services required to create and maintain the cloud and edge portion of an IoT solution. This certification validates a candidate's ability to:

- **Implement the IoT solution infrastructure**
- **Provision and manage devices**
- **Implement Edge**
- **Process and manage data**
- **Monitor, troubleshoot, and optimize IoT solutions**

Required exam: Earning the Azure IoT Developer Specialty certification requires passing one exam — Microsoft Azure IoT Developer (AZ-220).

Prerequisites: Prior to attempting this Specialty-level role-based certification, Microsoft recommends hands-on experience with IoT coding tasks in at least one Azure-supported language, including C#, Node, C, or Python.

Microsoft Technology Associate (MTA) Certification

Microsoft MTA certifications are entry level and designed to provide foundational knowledge in areas including Windows, networking, security, the cloud, and programming. It's an ideal starting point for those who are new to IT, or Microsoft certification, and prepares learners to earn MCSA certification or role-based certifications.

Microsoft offers 12 MTA certifications:

- Database Fundamentals
- HTML5 Application Development Fundamentals
- Introduction to Programming Using HTML and CSS
- Introduction to Programming Using Java
- Introduction to Programming Using JavaScript
- Introduction to Programming Using Python
- Mobility and Device Fundamentals
- Networking Fundamentals
- Security Fundamentals
- Software Development Fundamentals
- Windows Operating System Fundamentals
- Windows Server Administration Fundamentals

MICROSOFT TECHNOLOGY ASSOCIATE

MTA: Database Fundamentals

The MTA: Database Fundamentals certification is designed for IT professionals who store data in relational databases, manipulate data, and secure and backup databases. This certification validates a candidate's ability to:

- Understand core database concepts
- Use the Data Manipulation Language
- Manipulate data
- Understand data storage
- Administer a database

Required exam: Earning the MTA: Database

Fundamentals certification requires passing one exam — Database Fundamentals (98-364).

Prerequisites: None.

Recommended experience: Microsoft recommends hands-on experience with Microsoft SQL Server and SQL prior to attempting this exam.

MICROSOFT TECHNOLOGY ASSOCIATE**MTA: HTML5 Application Development Fundamentals**

The MTA: HTML5 Application Development Fundamentals certification is designed for IT professionals who configure HTML5 tags to display text, graphics, and media, and manage and maintain JavaScript. This certification validates a candidate's ability to:

- Manage the application life cycle
- Build the user interface
- Format the user interface by using Cascading Style Sheets
- Code by using JavaScript
- Application Cache API

Required exam: Earning the MTA: HTML5 Application Development Fundamentals certification requires passing one exam — HTML5 Application Development Fundamentals (98-375).

Prerequisites: None.

Recommended experience: Microsoft recommends experience with programming languages HTML5, CSS3, and JavaScript prior to attempting this exam.

MICROSOFT TECHNOLOGY ASSOCIATE**MTA: Introduction to Programming Using HTML and CSS**

The MTA: Introduction to Programming Using HTML and CSS certification is designed for IT professionals who use front-end programming languages HTML and CSS, structure HTML markup, and style pages with CSS. This certification validates a candidate's ability to:

- Understand HTML fundamentals
- Understand CSS fundamentals
- Structure documents using HTML
- Present multimedia using HTML
- Style web pages using CSS

Required exam: Earning the MTA: Introduction to Programming Using HTML and CSS certification requires passing one exam — Introduction to Programming Using HTML and CSS (98-383).

Prerequisites: None.

Recommended experience: Microsoft recommends at least 100 hours of instruction or hands-on experience with programming languages HTML and CSS prior to attempting this exam.

MICROSOFT TECHNOLOGY ASSOCIATE

MTA: Introduction to Programming Using Java

The MTA: Introduction to Programming Using Java certification is designed for IT professionals who construct and evaluate code, implement flow controls, and troubleshoot code. This certification validates a candidate's ability to:

- Understand Java fundamentals
- Work with data types, variables, and expressions
- Implement flow control
- Perform object-oriented programming
- Compile and debug code

Required exam: Earning the MTA: Introduction to Programming Using Java certification requires passing one exam — Introduction to Programming Using Java (98-388).

Prerequisites: None.

Recommended experience: Microsoft recommends 150 hours of instruction or hands-on experience with Java prior to attempting this exam.

MICROSOFT TECHNOLOGY ASSOCIATE

MTA: Introduction to Programming Using JavaScript

The MTA: Introduction to Programming Using JavaScript certification is designed for IT professionals who write code in JavaScript, interact with the Document Object Model, and interact with HTML forms. This certification validates a candidate's ability to:

- Program with JavaScript operators, methods, and keywords
- Program with variables, data types, and functions
- Implement and analyze decisions and loops
- Interact with the document object model
- Interact with HTML forms

Required exam: Earning the MTA: Introduction to Programming Using JavaScript certification requires passing one exam — Introduction to Programming Using JavaScript (98-382).

Prerequisites: None.

Recommended experience: Microsoft recommends 100 hours of instruction or hands-on experience with JavaScript prior to attempting this exam.

MICROSOFT TECHNOLOGY ASSOCIATE

MTA: Introduction to Programming Using Python

The MTA: Introduction to Programming Using Python certification is designed for IT professionals who write in Python, troubleshoot syntax and logic errors, handle errors, and use built-in Python modules. This certification validates a candidate's ability to:

- Perform operations using data types and operators
- Control flow with decisions and loops
- Perform input and output operations
- Document and structure code
- Perform troubleshooting and error handling
- Perform operations using modules and tools

Required exam: Earning the MTA: Introduction to Programming Using Python certification requires passing one exam — Introduction to Programming Using Python (98-381).

Prerequisites: None.

Recommended experience: Microsoft recommends 100 hours of instruction or hands-on experience with Python prior to attempting this exam.

MICROSOFT TECHNOLOGY ASSOCIATE

MTA: Mobility and Device Fundamentals

The MTA: Mobility and Device Fundamentals certification is designed for IT professionals who configure devices, manage data access, cloud services, device security, and enterprise mobility. This certification validates a candidate's ability to:

- Understand device configurations
- Understand data access and management
- Understand device security
- Understand cloud services
- Understand enterprise mobility

Required exam: Earning the MTA: Mobility and Device Fundamentals certification requires passing one exam — Mobility and Devices Fundamentals (98-368).

Prerequisites: None.

Recommended experience: Microsoft recommends hands-on experience with Windows devices prior to attempting this exam.

MICROSOFT TECHNOLOGY ASSOCIATE**MTA: Networking Fundamentals**

The MTA: Networking Fundamentals certification is designed for IT professionals who work with network infrastructure, hardware, and protocols on wired and wireless networks. This certification validates a candidate's ability to:

- Understand network infrastructures
- Understand network hardware
- Understand protocols and services

Required exam: Earning the MTA: Networking Fundamentals certification requires passing one exam — Networking Fundamentals (98-366).

Prerequisites: None.

Recommended experience: Microsoft recommends some hands-on experience with the Windows Server, Windows-based networking, network management tools, DNS, TCP/IP, and network protocols and topologies prior to attempting this exam.

MICROSOFT TECHNOLOGY ASSOCIATE**MTA: Security Fundamentals**

The MTA: Security Fundamentals certification is designed for IT professionals who work with security layers, operating system security, network security, and security software. This certification validates a candidate's ability to:

- Understand security layers
- Understand operating system security
- Understand network security
- Understand security software

Required exam: Earning the MTA: Security Fundamentals certification requires passing one exam — Security Fundamentals (98-367).

Prerequisites: None.

Recommended experience: Microsoft recommends some hands-on experience with the Windows Server, Windows-based networking, Active Directory, anti-malware products, firewalls, network topologies and devices, and network ports prior to attempting this exam.

MICROSOFT TECHNOLOGY ASSOCIATE

MTA: Software Development Fundamentals

The MTA: Software Development Fundamentals certification is designed for IT professionals who work with programming web applications and desktop applications with C# or .NET. This certification validates a candidate's ability to:

- Understand object-oriented programming
- Understand general software development
- Understand web applications
- Understand desktop applications
- Windows forms application basics

Required exam: Earning the MTA: Software Development Fundamentals certification requires passing one exam — Software Development Fundamentals (98-361).

Prerequisites: None.

Recommended experience: Microsoft recommends some hands-on experience with C# or Microsoft Visual Basic .NET prior to attempting this exam.

MICROSOFT TECHNOLOGY ASSOCIATE

MTA: Windows Operating System Fundamentals

The MTA: Windows Operating System Fundamentals certification is designed for IT professionals who manage and maintain applications, files, folders, devices, and operating system configurations on Microsoft Windows. This certification validates a candidate's ability to:

- Understand operating system configurations
- Install and upgrade client systems
- Manage applications and devices
- Manage files and folders
- Understand operating system maintenance

Required exam: Earning the MTA: Windows Operating System Fundamentals certification requires passing one exam — Windows Operating System Fundamentals (98-349).

Prerequisites: None.

Recommended experience: Microsoft recommends some hands-on experience with Windows prior to attempting this exam.

MICROSOFT TECHNOLOGY ASSOCIATE**MTA: Windows Server Administration Fundamentals**

The MTA: Windows Server Administration

Fundamentals certification is designed for IT professionals who install and maintain servers, Active Directory, storage, server performance, and server maintenance. This certification validates a candidate's ability to:

- Understand server installation
- Understand Active Directory
- Understand storage
- Understand server performance management
- Understand server maintenance

Required exam: Earning the MTA: Windows Server Administration Fundamentals certification requires passing one exam — Windows Server Administration Fundamentals (98-365).

Prerequisites: None.

Recommended experience: Microsoft recommends some hands-on experience with Windows Server, Windows-based networking, Active Directory, account management, and system recovery tools prior to attempting this exam.

Microsoft Certified Solutions Associate (MCSA) Certification

NOTE: Microsoft will be retiring all MCSA certifications and exams on January 31, 2021.

Microsoft MCSA certifications validate that candidates possess the technical knowledge needed for entry-level IT jobs.

Microsoft offers 10 Associate-level certifications:

- MCSA: BI Reporting
- MCSA: Microsoft Dynamics 365 for Operations
- MCSA: SQL 2016 BI Development
- MCSA: SQL 2016 Database Administration
- MCSA: SQL 2016 Database Development
- MCSA: SQL Server 2012/2014
- MCSA: Universal Windows Platform
- MCSA: Web Applications
- MCSA: Windows Server 2012
- MCSA: Windows Server 2016

MICROSOFT CERTIFIED SOLUTIONS ASSOCIATE

MCSA: BI Reporting

The MCSA: BI Reporting certification is designed for IT professionals who analyze data with both Power BI and Excel. Candidates should have experience using and transforming data, modeling and visualizing data, and configuring dashboards using those tools. This certification validates a candidate's ability to:

- **Consume and transform data by using Power BI Desktop**
- **Model and visualize data**
- **Configure dashboards, reports and apps in the Power BI Service**
- **Consume and transform data with Excel**

Required exams: Earning the MCSA: BI Reporting certification requires passing two exams:

- Analyzing and Visualizing Data with Power BI (70-778)
- Analyzing and Visualizing Data with Microsoft Excel (70-779)

Prerequisites: None. Candidates should have experience using Power BI and Excel.

Recommended experience: Microsoft designed this certification for entry-level BI professionals and data analysts experienced with PowerBI and Excel.

MICROSOFT CERTIFIED SOLUTIONS ASSOCIATE**MCSA: SQL 2016 BI Development**

The MCSA: SQL 2016 BI Development certification is designed for IT professionals who create business intelligence (BI) solutions with multidimensional data models, OLAP cubes, and tabular data models using both on-premises and cloud-based databases. This certification validates a candidate's ability to:

- Design, implement, and maintain a data warehouse
- Extract, transform, and load data
- Build data quality solutions
- Design a multidimensional business intelligence
- Design a tabular BI semantic model

Required exams: Earning the MCSA: SQL 2016 BI Development certification requires passing two exams:

- Implementing a SQL Data Warehouse (70-767)
- Developing SQL Data Models (70-768)

Prerequisites: None.

Recommended experience: Microsoft designed this certification for entry-level BI professionals and developers experienced with SQL and database infrastructure.

MICROSOFT CERTIFIED SOLUTIONS ASSOCIATE**MCSA: SQL 2016 Database Administration**

The MCSA: SQL 2016 Database Administration certification is designed for IT professionals who install, maintain, and provision both on-premises and cloud-based databases. This certification validates a candidate's ability to:

- Configure data access and auditing
- Manage backup and restore of databases
- Manage and monitor SQL Server instances
- Manage high availability and disaster recovery

Required exams: Earning the MCSA: SQL 2016 Database Administration certification requires passing two exams:

- Administering SQL Database Infrastructure (70-764)
- Provisioning SQL Databases (70-765)

Prerequisites: None.

Recommended experience: Microsoft designed this certification for entry-level data professionals experienced with SQL and database infrastructure.

MICROSOFT CERTIFIED SOLUTIONS ASSOCIATE**MCSA: SQL 2016 Database Development**

The MCSA: SQL 2016 Database Development certification is designed for IT professionals who build and administer high-availability databases for both on-premises and cloud-based environments. This certification validates a candidate's ability to:

- Design and implement database objects
- Implement programmability objects
- Manage database concurrency
- Manage data with Transact-SQL
- Query data with advanced Transact-SQL components

Required exams: Earning the MCSA: SQL 2016 Database Development certification requires passing two exams:

- Querying Data with Transact-SQL (70-761)
- Developing SQL Databases (70-762)

Prerequisites: None.

Recommended experience: Microsoft designed this certification for entry-level data professionals and developers experienced with T-SQL and database infrastructure.

MICROSOFT CERTIFIED SOLUTIONS ASSOCIATE**MCSA: SQL Server 2012/2014**

The MCSA: SQL Server 2012/2014 certification is designed for IT professionals who develop, implement and maintain mission-critical database, data warehouse, and business intelligence solutions. This certification validates a candidate's ability to:

- Install and configure SQL Server 2012
- Understand surface area configuration
- Hardware and software requirements for installing SQL Server 2012
- Create database objects

Required exams: Earning the MCSA: SQL Server 2012/2014 certification requires passing three exams:

- Querying Microsoft SQL Server 2012/2014 (70-461)
- Administering Microsoft SQL Server 2012/2014 Databases (70-462)
- Implementing a Data Warehouse with Microsoft SQL Server 2012/2014 (70-463)

Prerequisites: None.

Recommended experience: Microsoft designed this certification for entry-level data professionals, system engineers, and developers experienced with SQL Server 2012/2014.

MICROSOFT CERTIFIED SOLUTIONS ASSOCIATE**MCSA: Universal Windows Platform**

The MCSA: Universal Windows Platform certification is designed for IT professionals who develop Universal Windows Platform apps that offer a compelling user experience across a wide range of Windows devices. This certification validates a candidate's ability to:

- Develop a XAML page layout for an adaptive UI
- Implement page navigation and lifecycle events
- Implement feature detection for adaptive coding
- Manage user input and custom user interactions
- Manage authentication and identity management

Required exams: Earning the MCSA: Universal Windows Platform certification requires passing two exams:

- Programming in C# (70-483)
- Developing Mobile Apps (70-357)

Prerequisites: None.

Recommended experience: Microsoft recommends at least two years of experience with C++, XAML and Visual Studio 2015 prior to attempting this certification exam.

MICROSOFT CERTIFIED SOLUTIONS ASSOCIATE**MCSA: Web Applications**

The MCSA: Web Applications certification is designed for IT professionals who implement modern Microsoft ASP.NET web apps using JavaScript/CSS3 or C#. This certification validates a candidate's ability to:

- Design the application architecture
- Understand entity framework development workflows
- Understand data adapters and data readers
- Understand ASP.NET state management
- Design the build and deployment architecture

Required exams: Earning the MCSA: Web Applications certification requires passing three exams:

- Programming in HTML5 with JavaScript and CSS3 (70-480)
- Programming in C# (70-483)
- Developing ASP.NET MVC Web Applications Exam (70-486)

Prerequisites: None.

Recommended experience: Microsoft recommends a candidate have at least three years of experience using JavaScript/CSS3 or C# to develop web applications prior to attempting this certification exam.

MICROSOFT CERTIFIED SOLUTIONS ASSOCIATE**MCSA: Windows Server 2012**

The MCSA: Windows Server 2012 certification is designed for IT professionals who implement, manage, maintain, and provision services and infrastructure in a Windows Server 2012 environment. This certification validates a candidate's ability to:

- Install and configure servers
- Deploy, manage, and maintain servers
- Understand Windows Server update services
- Configure and manage high availability
- Manage network load balancing clusters

Required exams: Earning the MCSA: Windows Server 2012 certification requires passing three exams:

- Installing and Configuring Windows Server 2012 (70-410)
- Administering Windows Server 2012 (70-411)
- Configuring Advanced Windows Server 2012 (70-412)

Prerequisites: None.

Recommended experience: Microsoft designed this certification for entry-level systems or network administration professionals experienced with Windows Server 2012.

MICROSOFT CERTIFIED SOLUTIONS ASSOCIATE**MCSA: Windows Server 2016**

The MCSA: Windows Server 2016 certification is designed for IT professionals who implement and manage the installation, storage, compute, and networking features, and Active Directory identity functionality available in Windows Server 2016. This certification validates a candidate's ability to:

- Install Windows Servers in Host and Compute Environments
- Implement Storage Solutions
- Implement Hyper-V
- Implement Windows Containers
- Implement High Availability

Required exams: Earning the MCSA: Windows Server 2016 certification requires passing three exams:

- Installation, Storage, and Compute with Windows Server 2016 (70-740)
- Networking with Windows Server 2016 (70-741)
- Identity with Windows Server 2016 (70-742)

Prerequisites: None.

Recommended experience: Microsoft designed this certification for entry-level systems or network administration professionals experienced with Windows Server 2016.

MICROSOFT CERTIFIED SOLUTIONS ASSOCIATE**MCSA: Microsoft Dynamics 365 for Operations**

The MCSA: Microsoft Dynamics 365 for Operations certification is designed for IT professionals who implement the basic technical and development tasks required to customize Microsoft Dynamics 365 for Operations. This certification validates a candidate's ability to:

- **Understand the architecture and development environment**
- **Develop new elements with Explorer**
- **Read and write Basic X++**
- **Manage the User Interface for Developers**
- **Develop and extend retail components**

Required exams: Earning the MCSA: Microsoft Dynamics 365 for Operations certification requires passing three exams:

- Administering a Microsoft SQL Database Infrastructure (70-764)
- Provisioning SQL Databases (70-765)
- Development, Extensions, and Deployment for Microsoft Dynamics 365 for Finance and Operations (MB6-894)

Prerequisites: None.

Recommended experience: Microsoft designed this certification for entry-level technical consultants, programmers, and IT professionals experienced with SQL and database infrastructure.

Microsoft Certified Solutions Expert (MCSE) Certification

NOTE: Microsoft will be retiring all MCSE certifications and exams on January 31, 2021.

Microsoft MCSE certifications are expert-level certifications aimed at IT professionals who need to keep developing their skill sets and stay up to date on the latest technologies and best practices.

Microsoft offers four MCSE certifications:

- MCSE: Business Applications
- MCSE: Core Infrastructure
- MCSE: Data Management and Analytics
- MCSE: Productivity Solutions Expert

MICROSOFT CERTIFIED SOLUTIONS EXPERT

MCSE: Business Applications

The MCSE: Business Applications certification is designed for IT professionals who implement, configure, and troubleshoot Microsoft Dynamics 365 technologies. This certification validates a candidate's ability to:

- **Configure Microsoft Dynamics 365**
- **Implement Microsoft Dynamics 365 entities, entity relationships, and fields**
- **Create and manage Microsoft Dynamics 365 solutions, forms, views, and visualizations**
- **Implement business rules, workflows, and business process flows**

Required exams: Earning the MCSE: Business Applications certification requires passing one of three exams:

- Microsoft Dynamics 365 Customization and Configuration (MB2-716)
- Microsoft Dynamics 365 for Retail (MB6-897)
- Microsoft Dynamics 365 for Talent (MB6-898)

Prerequisites: Prior to attempting this MCSE, candidates must earn either MCSA: Microsoft Dynamics 365 or MCSA: Microsoft Dynamics 365 for Operations.

Recommended experience: Microsoft recommends at least three years of experience with Dynamics 365 prior to attempting this certification exam.

MICROSOFT CERTIFIED SOLUTIONS EXPERT**MCSE: Core Infrastructure**

The MCSE: Core Infrastructure certification is designed for IT professionals who run a modern data center, and identity management, systems management, virtualization, storage, and networking. This certification validates a candidate's ability to:

- **Plan and deploy a server infrastructure**
- **Deploy Windows with the ADK**
- **Understand Windows deployment services**
- **Install, use, and remove windows server migration tools**
- **Design and implement network infrastructure**

Required exams: Earning the MCSE: Core Infrastructure certification requires passing one of five exams:

- Securing Windows Server 2016 (70-744)
- Implementing an SD Datacenter (70-745)
- Designing and Implementing a Server Infrastructure (70-413)
- Implementing an Advanced Server (70-414)
- Configuring and Operating a Hybrid Cloud with Microsoft Azure Stack (70-537)

Prerequisites: Prior to attempting this MCSE, candidates must earn either MCSA: Windows Server 2016 or MCSA: Windows Server 2012.

Recommended experience: Microsoft recommends at least three years of experience with Windows Server 2012 or Windows Server 2016 prior to attempting this certification exam.

MICROSOFT CERTIFIED SOLUTIONS EXPERT**MCSE: Data Management and Analytics**

The MCSE: Data Management and Analytics certification is designed for IT professionals who use the SQL programming language, build enterprise-scale data solutions, and leverage business intelligence data — in both on-premise and cloud environments. This certification validates a candidate's ability to:

- **Design and implement database objects**
- **Implement programmability objects**
- **Manage database concurrency**
- **Optimize database objects and SQL infrastructure**

Required exams: Earning the MCSE: Data Management and Analytics certification requires passing one of eight exams:

- Developing Microsoft SQL Server DBs (70-464)
- Designing Database Solutions for Microsoft SQL Server (70-465)
- Implementing Data Models and Reports with Microsoft SQL Server (70-466)
- Designing Business Intelligence Solutions with Microsoft SQL Server (70-467)
- Developing SQL Databases (70-762)
- Implementing a Data Warehouse (70-767)
- Developing SQL Data Models (70-768)
- Implementing Microsoft Azure Cosmos DB (70-777)

Prerequisites: Prior to attempting this MCSE, candidates must earn one of five MCSA certifications:

- MCSA: SQL Server 2012/2014
- MCSA: SQL 2016 Database Administration
- MCSA: SQL 2016 Database Development
- MCSA: SQL 2016 BI Development
- MCSA: BI Reporting

Recommended experience: Microsoft recommends at least three years of experience with SQL Server 2012/2014, SQL, data modelling, or Azure databases prior to attempting this certification exam.

MICROSOFT CERTIFIED SOLUTIONS EXPERT

MCSE: Productivity Solutions Expert

The MCSE Productivity Solutions Expert certification is designed for IT professionals who move their organization to the cloud and increase user productivity and flexibility. This certification validates a candidate's ability to:

- Plan, deploy, manage, and troubleshoot mailbox databases
- Plan, deploy, manage and troubleshoot client access services
- Plan and design Skype for business with enterprise voice
- Deploy and configure enterprise voice
- Design SharePoint infrastructure

Required exams: Earning the MCSE: Productivity Solutions Expert certification requires passing one of four exams:

- Designing and Deploying Microsoft Exchange Server 2016 (70-345)
- Managing SharePoint Server 2016 (70-339)
- Deploying Enterprise Voice with Skype for Business 2015 (70-333)
- Core Solutions of Skype for Business 2015 (70-334)

Prerequisites: Prior to attempting this MCSE, candidates must earn either MCSA: Windows Server 2016 or MCSA: Windows Server 2012.

Recommended experience: Microsoft recommends at least three years of experience with Microsoft collaboration products.

Microsoft Certified Solutions Developer (MCSD) Certification

The Microsoft Certified Solutions Developer (MCSD) is an expert-level certification aimed specifically at developers.

Microsoft offers one MCSD certification:

- **MCSD App Builder**

MICROSOFT CERTIFIED SOLUTIONS DEVELOPER

MCSD: App Builder

The MCSD: App Builder certification is designed for IT professionals who build modern web and mobile applications and services. This certification validates a candidate's ability to:

- **Develop a XAML page layout for an adaptive UI**
- **Implement page navigation and lifecycle events**
- **Implement data access and data binding**
- **Implement feature detection for adaptive coding**
- **Manage user input and custom user interactions**

Required exams: Earning the MCSD: App Builder certification requires passing one of three exams:

- Developing Mobile Apps (70-357)
- Developing ASP.NET MVC Web Apps (70-486)
- Developing Azure and Web Services (70-487)

Prerequisites: Prior to attempting this MCSD, candidates must earn either MCSA: Web Applications or MCSA: Universal Windows Platform.

Recommended experience: Microsoft recommends at one to five years of experience developing Microsoft web applications prior to attempting this certification exam.

Microsoft Office Specialist (MOS) Certification

Microsoft offers a range of Microsoft Office certifications for its suite of productivity apps — Word, Excel, PowerPoint, and Outlook.

There are four tiers of MOS certification, with increasing levels of difficulty:

- **SPECIALIST**
- **ASSOCIATE**
- **EXPERT**
- **MASTER**

Microsoft Office Specialist (MOS)

Specialist-level Microsoft Office Specialist certifications demonstrate a fundamental knowledge of Microsoft Office programs. At this level, candidates specialize in Word, Excel, PowerPoint, Access, or Outlook. Each certification requires passing just one exam.

Microsoft offers eight MOS certifications:

- Microsoft Word 2016
- Microsoft Excel 2016
- Microsoft PowerPoint 2016
- Microsoft Access 2016
- Microsoft Outlook 2016
- Word Associate (Word and Word 2019)
- Excel Associate (Excel and Excel 2019)
- PowerPoint Associate (PowerPoint and PowerPoint 2019)

MICROSOFT OFFICE SPECIALIST**Microsoft Office Specialist: Microsoft Word 2016**

The MOS: Microsoft Word 2016 certification is designed for business professionals who use the Word environment and use basic word processing features such as formatting text, creating tables, and inserting and manipulating images. This certification validates a candidate's ability to:

- Create and manage documents
- Format text, paragraphs, and sections
- Create tables and lists
- Create and manage references
- Insert and format graphic elements

Required exam: Earning the MOS: Microsoft Word 2016 certification requires passing one exam — Word 2016: Core Document Creation, Collaboration, and Communication (77-725).

Prerequisites: None.

Recommended experience: Microsoft recommends at least 150 hours of instruction and hands-on experience with Microsoft Word 2016 prior to attempting the exam.

MICROSOFT OFFICE SPECIALIST**Microsoft Office Specialist: Microsoft Excel 2016**

The MOS: Microsoft Excel 2016 certification is designed for business professionals who use the Excel environment and use basic data processing features such as merging data, summarizing data with functions, and creating charts. This certification validates a candidate's ability to:

- Create and manage worksheets and workbooks
- Manage data cells and ranges
- Create tables
- Perform operations with formulas and functions
- Create charts and objects

Required exam: Earning the MOS: Microsoft Excel 2016 certification requires passing one exam — Excel 2016: Core Data Analysis, Manipulation, and Presentation (77-727).

Prerequisites: None.

Recommended experience: Microsoft recommends at least 150 hours of instruction and hands-on experience with Microsoft Excel 2016 prior to attempting the exam.

MICROSOFT OFFICE SPECIALIST**Microsoft Office Specialist: Microsoft PowerPoint 2016**

The MOS: Microsoft PowerPoint 2016 certification is designed for business professionals who use the PowerPoint environment and use basic presentation features such as adding images, charts, and tables, applying transitions, and managing multiple presentations. This certification validates a candidate's ability to:

- Create and manage presentations
- Insert and format text, shapes, and images
- Insert tables, charts, smartart, and media
- Apply transitions and animations
- Manage multiple presentations

Required exam: Earning the MOS: Microsoft PowerPoint 2016 certification requires passing one exam — Microsoft Office PowerPoint 2016 (77-729).

Prerequisites: None.

Recommended experience: Microsoft recommends at least 150 hours of instruction and hands-on experience with Microsoft PowerPoint 2016 prior to attempting the exam.

MICROSOFT OFFICE SPECIALIST**Microsoft Office Specialist: Microsoft Access 2016**

The MOS: Microsoft Access 2016 certification is designed for business professionals who use the Access environment and use basic data processing features such as importing data, building and creating tables, queries, and reports. This certification validates a candidate's ability to:

- Create and manage a database
- Build tables
- Create queries
- Create forms
- Create reports

Required exam: Earning the MOS: Microsoft Access 2016 certification requires passing one exam — Microsoft Office Access 2016 (77-730).

Prerequisites: None.

Recommended experience: Microsoft recommends at least 150 hours of instruction and hands-on experience with Microsoft Access 2016 prior to attempting the exam.

MICROSOFT OFFICE SPECIALIST**Microsoft Office Specialist: Microsoft Outlook 2016**

The MOS: Microsoft Outlook 2016 certification is designed for business professionals who use the Outlook environment and use basic email client features such as formatting emails, managing contacts, and creating appointments, meetings, and events. This certification validates a candidate's ability to:

- **Manage the Outlook environment for productivity**
- **Manage messages**
- **Manage schedules**
- **Manage contacts and groups**

Required exam: Earning the MOS: Microsoft Outlook 2016 certification requires passing one exam — Microsoft Outlook 2016 (77-731).

Prerequisites: None.

Recommended experience: Microsoft recommends at least 150 hours of instruction and hands-on experience with Microsoft Outlook 2016 prior to attempting the exam.

Microsoft Office Specialist: Associate Certification

The MOS: Microsoft Office Specialist: Associate (Office 365 and Office 2019) certification is designed for business professionals who use the Microsoft Office 365 or Office 2019 productivity tool suites.

Microsoft offers three certifications for Office 2019 that are prerequisites for the new Microsoft Office Specialist: Associate certification:

- Microsoft Office Specialist: Word Associate (Office 365 and Office 2019)
- Microsoft Office Specialist: Excel Associate (Excel 365 and Excel 2019)
- Microsoft Office Specialist: PowerPoint Associate (PowerPoint 365 and PowerPoint 2019)
- Coming Soon - Microsoft Outlook (Outlook and Outlook 2019) (MO-400)

MICROSOFT OFFICE SPECIALIST: ASSOCIATE

Microsoft Office Specialist: Word Associate (Word and Word 2019)

The MOS: Word Associate (Word and Word 2019) certification is designed for business professionals who use the Word environment and use basic word processing features such as formatting text, creating tables, and inserting and manipulating images. This certification validates a candidate's ability to:

- Format text, paragraphs, and sections
- Manage tables and lists
- Create and manage references
- Insert and format graphic elements
- Manage document collaboration

Required exam: Earning the MOS: Word Associate (Word and Word 2019) certification requires passing one exam — Microsoft Word (Word and Word 2019) (MO-100).

Prerequisites: None.

Recommended experience: Microsoft recommends at least 150 hours of instruction and hands-on experience with Microsoft Word or Word 2019 prior to attempting the exam.

MICROSOFT OFFICE SPECIALIST: ASSOCIATE**Microsoft Office Specialist: Excel Associate (Excel 365 and Excel 2019)**

The MOS: Excel Associate (Excel and Excel 2019) certification is designed for business professionals who use the Excel environment and use basic data processing features such as merging data, summarizing data with functions, and creating charts. This certification validates a candidate's ability to:

- **Manage worksheets and workbooks**
- **Manage data cells and ranges**
- **Manage tables and table data**
- **Perform operations by using formulas and functions**
- **Manage charts**

Required exam: Earning the MOS: Excel Associate (Excel and Excel 2019) certification requires passing one exam — Microsoft Excel (Excel and Excel 2019) (MO-200).

Prerequisites: None.

Recommended experience: Microsoft recommends at least 150 hours of instruction and hands-on experience with Microsoft Excel or Excel 2019 prior to attempting the exam.

MICROSOFT OFFICE SPECIALIST: ASSOCIATE**Microsoft Office Specialist: PowerPoint Associate (PowerPoint 365 and PowerPoint 2019)**

The MOS: PowerPoint Associate (PowerPoint and PowerPoint 2019) certification is designed for business professionals who use the PowerPoint environment and use basic presentation features such as adding images, charts, and tables, applying transitions, and managing multiple presentations. This certification validates a candidate's ability to:

- **Manage presentations**
- **Manage slides**
- **Insert and format text, shapes, and images**
- **Insert tables, charts, smartArt, 3D models, and media**
- **Apply transitions and animations**

Required exam: Earning the MOS: PowerPoint Associate certification requires passing one exam — Microsoft PowerPoint (PowerPoint and PowerPoint 2019) (MO-300).

Prerequisites: None.

Recommended experience: Microsoft recommends at least 150 hours of instruction and hands-on experience with Microsoft PowerPoint or PowerPoint 2019 prior to attempting the exam.

Microsoft Office Specialist: Expert (MOS Expert)

Expert-level Microsoft Office Specialist certifications demonstrate a deep knowledge of Microsoft Office programs. At this level, candidates specialize in either Word or Excel.

Microsoft offers two expert-level MOS certifications:

- **Microsoft Office Specialist: Expert on Microsoft Office 2016**
- **Microsoft Office Specialist: Expert on Microsoft Office 2019**

MICROSOFT OFFICE SPECIALIST: EXPERT

Microsoft Office Specialist: Expert on Microsoft Office 2016

The MOS: Expert on Microsoft Office 2016 certification is designed for business professionals who use the Microsoft Office 2016 suite of tools.

Required exams: Earning the Microsoft Office Specialist: Expert on Microsoft Office 2016 certification requires passing one exam in either Word or Excel, respectively:

- Microsoft Word 2016 Expert: Creating Documents for Effective Communication (77-726)
- Microsoft Excel 2016 Expert: Interpreting Data for Insights (77-728)

Prerequisites: Prior to attempting this Expert-level Office certification, candidates must first earn the Microsoft Office Specialist: Associate certification.

Recommended experience: Microsoft recommends that candidates be expert-level users of Word 2016 and/or Excel 2016 and proficient in the use of advanced features of the relevant program(s).

COMING SOON

Microsoft Office Specialist: Expert on Microsoft Office 2019

The MOS: Expert on Microsoft Office 2019 certification is designed for business professionals who use the Microsoft Office 2019 suite of tools.

Required exams: Earning the Microsoft Office Specialist: Expert on Microsoft Office 2019 certification requires passing one of two additional yet-to-be-released Expert-level exams.

Prerequisites: Prior to attempting this Expert-level Office certification, candidates must first earn the Microsoft Office Specialist: Associate certification.

Recommended experience: Microsoft recommends that candidates be expert-level users of Word 2019, Excel 2019, and PowerPoint 2019 and be proficient in using the advanced features of these programs.

Microsoft Office Specialist Master (MOS Master)

The Microsoft Office Specialist: Master (MOS Master) is the broadest credential in the MOS certification set. It validates that the candidate has a comprehensive set of skills and knowledge spanning the Microsoft Office suite.

Required exams: Earning the Microsoft Office Specialist: Master on Microsoft Office 2016 certification requires passing two exams — one of three Expert-level exams:

- Microsoft Word 2016 Expert: Creating Documents for Effective Communication (77-726)
- Microsoft Excel 2016 Expert: Interpreting Data for Insights (77-728)
- PowerPoint 2016 (77-729)

Additionally, candidates must pass one of the following two exams:

- Access 2016: Core Database Management, Manipulation, and Query Skills (77-730)
- Outlook 2016: Core Communication, Collaboration and Email Skills (77-731)

Prerequisites: None.

Recommended experience: Microsoft recommends that candidates be expert users of a full set of Office 2016 products, including Word, Excel, and PowerPoint, as well as Outlook or Access.

Microsoft Certification Cost

Most Microsoft exams cost \$165 for test takers in the United States and Canada. Exams for the fundamentals-level, role-based Microsoft certifications cost \$99, while MTA exams cost \$127 and MOS exams cost \$100. These prices do not include any taxes, vouchers, promotions, or discounts you may have. Microsoft certification exam costs for international test takers range from \$55 to \$165 per exam in their local currency.

Because MCSA and MCSE certifications require either two or three exams, the total cost to earn MCSA and MCSE certifications ranges from \$330 to \$495 in the United States.

Microsoft Recertification and Renewal

Microsoft certifications do not expire or require recertification/renewal. Microsoft certification holders can find all their certifications listed on their official Microsoft Certified Professional Transcript. Certifications are classified as “Active” or “Legacy.” Certifications will remain in “Active” status until Microsoft retires their associated exams. Microsoft typically retires exams when products or services associated with exams reach the end of life. When that happens, certifications will be listed as “Legacy,” but they aren’t expired.

While not required, recertification exams are currently available for all MCSE and MCSA specialties. Recertification exams cover material from the exams taken to originally earn the credential, with particular emphasis on the most recent technology and process changes. As new technologies and products are released, learners are strongly advised to consider earning associated certifications to keep their knowledge and skill sets up to date.

With the new elective exam structure for continuing education, learners have the option to take an elective exam of their choosing each year, in order to “re-earn” an annual badge on their certification. This verifies that they are keeping their skills current with changing technologies.

Microsoft Certification Salary and Career Information

Payscale.com provides helpful salary information that can help learners determine appropriate pay scales for job opportunities associated with Microsoft certifications. Payscale.com reports a range of salaries in the United States between \$50,000 and \$145,000 for IT pros holding Microsoft certification.

Common roles for those who hold MTA, MCSA, and MCSE certification include IT manager, IT director, systems administrator, and senior systems engineer.

According to Payscale the average U.S. salary for MTA-certified professionals is \$66,000, MCSA-certified professionals is \$73,000 and MCSE-certified professionals is \$92,000. Of course these are averages, so salaries in particular regions, for specific industries, and for different specializations may be significantly higher. Experience level can also play a factor in salary ranges.

Common roles for those who hold MOS certification include executive assistant, office manager, and receptionist. According to Payscale.com, the average salary for MOS-certified professionals is \$50,000. Microsoft's new role-based certifications are designed to prepare learners for on-the-job success from the start. They represent Microsoft's attempt to address a common concern among IT professionals. The knowledge required to pass certification exams doesn't always apply to real-world situations. For those who are new to IT and Microsoft certifications, these role-based certifications represent an excellent opportunity to build a strong career foundation.

Microsoft Certification Training

CBT Nuggets offers a wide variety of Microsoft certification training. Our Microsoft training is broken down into areas of expertise, which include Azure, networking, systems administration, server administration, and Office.

CBT Nuggets also has certification playlists for in-demand Microsoft certifications — meaning all the training learners need to earn those certifications can be accessed in one place. Microsoft certification playlists include Office 365 and Server 2016. A CBT Nuggets subscription includes access to Virtual Labs that cover Microsoft technologies. Virtual Labs enable learners to get hands-on experience with products in a sandbox environment.

A CBT Nuggets subscription also includes access to practice exams, which include practice tests for a variety of Microsoft certifications.

Good luck to you as you start on your Microsoft certification path! Our training offerings change from time to time as we support the Microsoft certification roadmap. Be sure to check CBT Nuggets for new and updated on-line courses that are relevant to your personal Microsoft career path.



CBTnuggets

VMware Certifications

When it comes to virtualization technologies, VMware is the undisputed industry leader. As a result, there's a strong demand for IT professionals who can help organizations leverage VMware products and services. VMware's certification program is designed to build and validate the knowledge and skills needed to use their technologies.

VMware certification prepares IT professionals to work with VMware products in a variety of environments. VMware offers different levels of certifications to help IT pros continue to develop and hone their virtualization skills.

VMware offers four levels of certification for virtualization professionals:

- **VMware Certified Associate (VCA)**
- **VMware Certified Professional (VCP)**
- **VMware Certified Advanced Professional (VCAP)**
- **VMware Certified Design Expert (VCDX)**

Each level includes specific certifications dedicated to areas of technology: networking, hyper-convergence, virtual desktop infrastructure, automation, and cloud computing.

VMware VCA Certification

VMware's entry-level certification is VMware Certified Associate (VCA). This certification is aimed at learners who are new to virtualization. However, it can also be beneficial for company executives who are tasked with making decisions regarding VMware solutions and technologies. This certification level is mainly geared toward systems administrator, architect, and executive roles. There is currently one VCA certification that can be earned:

- **VMware Certified Associate - Digital Business Transformation 2020 (VCA-DBT 2020)**

VMWARE CERTIFIED ASSOCIATE

VMware Certified Associate - Digital Business Transformation 2020 (VCA-DBT 2020)

The VCA - Digital Business Transformation 2020 certification is designed for IT professionals who use VMware products and technologies that support VMware Cloud Foundation and Cross-Cloud Architecture solutions including vSphere, vSAN, NSX, and the vRealize Suite.

The VCA-DBT 2020 certification validates a candidate's understanding of these topics and skills:

- **Define and describe the VMware Cross-Cloud Architecture**
- **Define and describe vSphere solutions**
- **Define and describe vSAN solutions**
- **Define and describe the NSX solution**
- **Define and describe vRealize Suite solutions**
- **Define and describe Horizon Suite solutions**
- **Recommend the right products for a solution that meets customer requirements**

Required exam: Earning the VCA-DBT 2020 certification requires passing one exam — VCP - Data Center Virtualization (1V0-701).

Prerequisites: None.

Recommended experience: VMware recommends that candidates understand virtualization concepts before attempting the VCA-DBT 2020 certification.

VMware VCP Certification

The VMware Certified Professional (VCP) level of certification is designed for IT professionals who install, configure, manage, and optimize VMware solutions.

This certification level is mainly geared toward systems administrator and engineer roles.

VMware offers six VCP certifications:

- **VCP - Network Virtualization 2020 (VCP-NV 2020)**
- **VCP - Network Virtualization 2020: NSX-V Track**
- **VCP - Network Virtualization 2020: NSX-T Track**
- **VCP - Cloud Management and Automation 2020 (VCP-CMA 2020)**
- **VCP - Desktop and Mobility 2020 (VCP-DTM 2020)**
- **VCP - Digital Workspace 2020 (VCP-DW 2020)**

VMWARE CERTIFIED PROFESSIONAL

VMware Certified Professional 2020 – Data Center Virtualization (VCP-DCV 2020)

The VCP - Data Center Virtualization 2020 certification is designed for IT professionals who administer and troubleshoot vSphere V6 infrastructures, leveraging best practices to provide a scalable and reliable virtualization platform for organizations. VCP6-DCV is VMware's most popular certification with more than 100,000 professionals certified.

The VCP6-DCV certification validates a candidate's understanding of these topics and skills:

- **VMware vSphere architectures and technologies**
- **VMware products and solutions**
- **Install, configure, and set up a VMware vSphere solution**
- **Tune and optimize a VMware vSphere solution**
- **Administrative and operational tasks in a VMware vSphere solution**

Required exams: Earning the VCP - Data Center Virtualization 2020 certification requires passing one of two exams — VCP6.5 - Data Center Virtualization (2V0-622) or Professional vSphere 6.7 (2V0-21.19).

Prerequisites: VMware has a series of specific prerequisites based on current certification status to earn the VCP - Data Center Virtualization 2020.

You don't have a VCP cert. VMware requires candidates who hold no other VCP certification to attend one of nine VMware vSphere training courses.

You hold a VCP6.5-DCV. VMware provides two options for VCP6.5-DCV certification holders — attend one of nine VMware vSphere training courses or pass one of two exams:

- Professional vSphere 6.7
- Professional vSphere 6.7 Delta

You hold a VCP3 or VCP4-DCV. VMware requires professionals with these earlier certifications to:

- Attend one of nine VMware vSphere training courses
- Pass one Foundation exam:
 - vSphere 6.7 Foundations
- Pass one of two Professional Data Center Virtualization exams:
 - VCP6.5 - DCV
 - Professional vSphere 6.7

You hold a VCP5 or VCP6-DCV. VMware requires professionals with these earlier certifications to pass one of four Professional Data Center Virtualization exams:

- Professional vSphere 6.7
- Professional vSphere 6.7 Delta
- VCP6.5 - DCV
- VCP6.5 - DCV Delta

You hold a VCP-DW 2018. VMware requires professionals with this certification to:

- Pass vSphere 6.7 Foundations
- Pass one Professional Data Center Virtualization exam:
 - VCP6.5 - DCV
 - Professional vSphere 6.7

You hold a VCP6 (CMA or NV), VCP7 (CMA or DTM), or VCP-DTM 2018. VMware requires professionals with these certifications to pass one Professional Data Center Virtualization exam:

- VCP6.5 - DCV
- Professional vSphere 6.7

Recommended experience: VMware recommends that candidates gain experience with vSphere 6.7 before attempting the VCP-DCV 2020 certification.

VMWARE CERTIFIED PROFESSIONAL**VMware Certified Professional -
Network Virtualization 2020
(VCP-NV 2020)**

The VCP-Network Virtualization 2020 certification is designed for IT professionals who install, configure, and administer VMware NSX virtual networking implementations. There are two tracks with the VCP-NV 2020 certification — [NSX-T](#) and [NSX-V](#).

VMware recommends that certification candidates select the path and exams relevant to their virtual environment.

VMWARE CERTIFIED PROFESSIONAL**VCP-NV 2020: NSX-V Track**

The VCP - Network Virtualization 2020 (NSX-V) certification is designed for IT professionals who install, configure, and administer VMware NSX-V. The VCP-NV 2020: NSX-V certification validates a candidate's understanding of these topics and skills:

- Understand VMware NSX technology and architecture
- Understand VMware NSX physical infrastructure requirements
- Configure and manage vSphere networking
- Install and upgrade VMware NSX
- Configure VMware NSX virtual networks

Required exam: Earning the VCP-Network

Virtualization 2020 (NSX-V) certification requires passing one exam — VMware Professional NSX-T Data Center 2.4 (2V0-41.19), which is the same exam as the NSX-T track. VCP-CMA 2020

Prerequisites: VMware has a series of specific prerequisites based on current certification status to earn the VCP - Network Virtualization 2020 (NSX-V).

You don't have a VCP cert. VMware requires candidates who hold no other VCP certification to:

- Attend one of nine VMware NSX-V training courses
- Pass one Foundation exam:
 - vSphere 6.7 Foundations
- Pass the VMware Professional 6 - Network Virtualization 6.2 exam

You hold a VCP6-NV. VMware provides two options for VCP6.5-DCV certification holders — attend one of nine VMware NSX-V training courses or pass the VMware Professional 6 - Network Virtualization 6.2 exam.

You hold a VCP-DW 2018 or a Cisco certification. It's possible to forgo the required training courses if you have the VCP-DW 2020 or any CCNA, CCNP, or CCIE. However, you'll still need to:

- Pass vSphere 6.7 Foundations
- Pass the VMware Professional 6 - Network Virtualization 6.2 exam

You hold one of these VCP certs. VMware recommends one of nine training courses, but it's not mandatory. If you have one of these certifications, you only need to pass the VMware Professional 6 - Network Virtualization 6.2 exam to earn the VCP-NV 2020 in the NSX-V track:

- VCP6.x (DCV or CMA)
- VCP7 (CMA or DTM)
- VCP-DW

Recommended experience: VMware recommends that candidates gain experience with NSX Data Center solution (NSX-V) before attempting the VCP-NV 2020 certification.

VMWARE CERTIFIED PROFESSIONAL

VCP-NV 2020 - NSX-T Track

The VCP - Network Virtualization 2020 (NSX-T) certification is designed for IT professionals who install, configure, and administer VMware NSX-T virtual networking implementations. The VCP-NV 2020: NSX-T certification validates a candidate's understanding of these topics and skills:

- Understand NSX technology and architecture
- Understand NSX infrastructure requirements
- Configure and manage vSphere networking
- Install and upgrade VMware NSX
- Configure VMware NSX virtual networks

Required exam: Earning the VCP-Network Virtualization 2020 (NSX-T) certification requires passing one exam — VMware Professional NSX-T Data Center 2.4 (2V0-41.19).

Prerequisites: VMware has a series of specific prerequisites based on current certification status to earn the VCP-Network Virtualization 2020 (NSX-T).

You don't have a VCP cert. VMware requires candidates who hold no other VCP certification to attend one of four VMware NSX-T training courses, and pass the VMware Professional NSX-T Data Center 2.4 exam.

You hold one of these certs. VMware recommends one of four training courses, but it's not mandatory. If you have one of these certifications, you only need to pass the VMware Professional NSX-T Data Center 2.4 exam to earn the VCP-NV 2020:

- VCP6.x (DCV or CMA)
- VCP7 (CMA or DTM)
- VCP DTM 2018
- VCP-DW
- Cisco CCNA, CCNP, or CCIE

Recommended experience: VMware recommends that candidates gain experience with NSX Data Center solution (NSX-T) before attempting the VCP-NV 2020 certification.

VMWARE CERTIFIED PROFESSIONAL**VMware Certified Professional - Cloud Management and Automation 2020 (VCP-CMA 2020)**

The VCP - Cloud Management and Automation 2020 certification is designed for IT professionals who install, configure and administer a VMware vRealize environment. The VCP-CMA 2020 certification validates a candidate's understanding of these topics and skills:

- **Performance-tune, optimize, and upgrade VMware environments**
- **Troubleshoot and repair vRealize**
- **Conduct administrative and operational VMware cloud tasks**

Required exam: Earning the VCP-Cloud Management and Automation 2020 certification requires passing Professional VMware vRealize Automation 7.6 (2V0-31.19).

Prerequisites: VMware has a series of specific prerequisites based on current certification status to earn the VCP-Cloud Management and Automation 2020.

You don't have a VCP cert or the VCP-CMA. VMware requires candidates who hold no other VCP certification or the VCP-CMA to:

- Attend one of eight VMware vRealize training courses
- Pass vSphere 6.7 Foundations
- Pass Professional VMware vRealize Automation 7.6

You hold a VCP7-CMA or VCP6-CMA. VMware provides two options for VCP7-CMA and VCP6-CMA certification holders — attend a recommended training course or pass the Professional VMware vRealize Automation 7.6 exam. These are the same requirements for anyone with a VCP-NV, VCP7-DTM, or VCP6-DCV or newer certification.

You hold a VCP-DW 2018 or newer. For test takers who hold the VCP-DW 2018 or a later exam, VMware recommends one of eight training courses, but it's not mandatory. However, they must pass two exams:

- Pass vSphere 6.7 Foundations
- Pass Professional VMware vRealize Automation 7.6

Recommended experience: VMware recommends that candidates gain experience installing, configuring, testing, managing, and troubleshooting vRealize Automation 7.6 solution running on vSphere 6.x. before attempting the VCP-CMA 2020 certification.

VMWARE CERTIFIED PROFESSIONAL**VMware Certified Professional -
Desktop and Mobility 2020
(VCP-DTM 2020)**

The VCP - Desktop and Mobility 2020 certification is designed for IT professionals who design, install, and manage a VMware Horizon with View environment deployed on a VMware vSphere implementation. The VCP-DTM 2020 certification validates a candidate's understanding of these topics and skills:

- **Install and configure
Horizon Server components**
- **Create and configure pools**
- **Configure and manage Identity Manager**
- **Configure and manage
User Environment Manager**
- **Configure and manage App Volumes**
- **Configure vRealize Operations for Horizon**

Required exam: Earning the VCP - Desktop and Mobility 2020 certification requires passing VMware Professional Horizon 7.7.

Prerequisites: VMware has a series of specific prerequisites based on current certification status to earn the VCP - Desktop and Mobility 2020.

You don't have a VCP cert or VCP-DTM, or VCP6-DTM or older. VMware requires candidates who hold no other VCP certification or the VCP-CMA to:

- Attend one of six VMware Horizon 7 training courses
- Pass vSphere 6.7 Foundations
- Pass VMware Professional Horizon 7.7

You hold one of these certs. VMware recommends one of six training courses, but it's not mandatory. If you have one of these certifications, you either need to pass VMware Professional Horizon 7.7 to earn the VCP-DTM 2020:

- VCP-NV
- VCP6-CMA or newer
- VCP6-DCV or newer
- VCP-DTM 2018 or newer
- VCP7-DTM

Recommended experience: VMware recommends that candidates gain experience with Horizon 7.7 before attempting the VCP-DTM 2020 certification.

VMWARE CERTIFIED PROFESSIONAL**VMware Certified Professional - Digital Workspace 2020 (VCP-DW 2020)**

The VCP - Digital Workspace 2020 certification is designed for IT professionals who configure, deploy, manage, maintain, optimize, and perform basic troubleshooting of VMware Workspace ONE and related solutions. The VCP-DW 2020 certification validates a candidate's understanding of these topics and skills:

- Understand architecture and technologies
- Understand VMware products and solutions
- Plan and design VMware solutions
- Install, configure, and setup VMware solutions
- Performance-tune, optimize, and deploy Workspace ONE
- Troubleshoot and repairing Workspace ONE

Required exams: Earning the VCP - Digital Workspace 2020 certification requires passing one of two exams — VCP - Digital Workspace 2018 (2V0-761) or VMware Professional Workspace ONE (2V0-61.19).

Note: The 2V0-61.19 exam will retire on September 30, 2020, and be replaced by 2V0-61.20.

Prerequisites: VMware requires candidates who hold no other VCP certification to attend one of seven VMware Workspace ONE training courses. While it's recommended that candidates with an active VCP-DW 2018, VCP6.x (DCV or CMA or NV), VCP7 (CMA or DTM), or VCP-DTM 2018 certification take the training course, it's not mandatory.

Recommended experience: VMware recommends that candidates gain experience with Workspace ONE and Digital Workspace solutions before attempting this exam.

VMware VCAP Certification

VMware Certified Advanced Professional (VCAP) is VMWare's advanced-level certification path. VCAP certification is aimed at professionals who design and build VMware Solutions (VCAP Design) and manage and optimize VMware solutions (VCAP Deployment). VMware offers seven VCAP certifications:

- **VCAP - Data Center Virtualization Design 2020 (VCAP-DCV Design 2020)**
- **VCAP - Data Center Virtualization Deploy 2020 (VCAP-DCV Deploy 2020)**
- **VCAP - Network Virtualization Deployment 2020 (VCAP-NV Deploy 2020)**
- **VCAP - Cloud Management and Automation Design 2020 (VCAP-CMA Design 2020)**
- **VCAP - Cloud Management and Automation Deploy 2020 (VCAP-CMA Deploy 2020)**
- **VCAP - Desktop and Mobility Deployment 2020 (VCAP-DTM Deploy 2020)**
- **VCAP - Desktop and Mobility Design (VCAP-DTM Design 2020)**

VCAP certifications are geared toward professionals in administrator, architect, and engineer roles.

VMWARE CERTIFIED ADVANCED PROFESSIONAL

VMware Certified Advanced Professional – Data Center Virtualization Design 2020 (VCAP-DCV Design 2020)

The VCAP - Data Center Virtualization Design 2020 certification is designed for IT professionals who recommend and design VMware solutions to meet business goals and processes. The VCAP-DCV Design 2020 certification validates a candidate's understanding of these topics and skills:

- **Create a vSphere 6.5 conceptual design**
- **Create a vSphere 6.x logical design from an existing conceptual design**
- **Create a vSphere 6.x physical design from an existing logical design**

Required exam: Earning the VCAP - Data Center Virtualization Design 2020 certification requires passing one exam — VCAP6.5-DCV Design Exam (3V0-624).

Prerequisites: Prior to attempting this VCAP certification, VMware requires earning the VCAP-DCV 2019 or VCAP-DCV 2020 certifications. This applies to candidates with VCAP6-DCV or a VCAP or VCAP in a different track.

Recommended experience: VMware recommends that candidates have advanced knowledge of end-user computing environments and components and vSphere 6.5 before attempting the exam.

VMWARE CERTIFIED ADVANCED PROFESSIONAL**VMware Certified Advanced Professional – Data Center Virtualization Deploy 2020 (VCAP-DCV Deploy 2020)**

The VCAP - Data Center Virtualization Deploy 2020 certification is designed for IT professionals who deploy and optimize VMware vSphere 6.x infrastructures. The VCAP-DCV Deploy 2020 certification validates a candidate's understanding of these topics and skills:

- Create and deploy vSphere 6.x infrastructure components
- Deploy and manage a vSphere 6.x storage Infrastructure
- Deploy and manage a vSphere 6.x network infrastructure
- Configure a vSphere 6.x Deployment for availability and scalability
- Configure a vSphere 6.x deployment for manageability
- Configure a vSphere 6.x deployment for performance
- Configure a vSphere 6.x deployment for recoverability
- Configure a vSphere 6.x environment for security

Required exam: Earning the VCAP - Data Center Virtualization Deploy certification requires passing one of two exams:

- Advanced Deploy vSphere 6.5 (3V0-21.18)
- Advanced Deploy vSphere 6.5 (3V0-21.19)

Prerequisites: Prior to attempting this VCAP certification, VMware requires earning the VCP-DCV 2019 or VCP-DCV 2020 certifications. This applies to candidates with VCP6-DCV or a VCP or VCAP in a different track.

Recommended experience: VMware recommends that candidates gain experience deploying, optimizing, and troubleshooting a VMware NSX 6.x solution running on vSphere 6.x architecture before attempting the VCAP - Data Center Virtualization Deploy 2020 certification.

VMWARE CERTIFIED ADVANCED PROFESSIONAL**VMware Certified Advanced Professional – Network Virtualization Deployment 2020 (VCAP-NV Deploy 2020)**

The VCAP - Network Virtualization Deploy 2020 certification is designed for IT professionals who deploy and optimize VMware NSX environments. The VCAP-NV Deploy 2020 certification validates a candidate's understanding of these topics and skills:

- Prepare VMware NSX infrastructure
- Create and manage VMware NSX virtual networks

- Deploy and manage VMware NSX network services
- Secure a vSphere Data Center with VMware NSX
- Perform operational management of a VMware NSX implementation
- Configure cross vCenter Networking and security
- Perform advanced NSX troubleshooting
- Utilize API Commands to manage a VMware NSX deployment

Required exam: Earning the VCAP - Network Virtualization Deploy 2020 certification requires passing one exam — VCAP6-NV Deploy Exam (3V0-643).

Prerequisites: VMware requires candidates start with the VCP in the Network Virtualization track — VCP-NV 2019 or VCP-NV 2020. There's one exception: If you have an active CCIE, you can forgo the VCP-NV 2020 and attempt the VCAP6-NV Deploy Exam.

Recommended experience: VMware recommends that candidates gain experience deploying, optimizing and troubleshooting a VMware NSX 6.x solution running on vSphere 6.x architecture before attempting the VCAP - Network Virtualization Deploy 2020 certification.

VMWARE CERTIFIED ADVANCED PROFESSIONAL

VMware Certified Advanced Professional – Cloud Management and Automation Design 2020 (VCAP-CMA Design 2020)

The VCAP - Cloud Management and Automation Design 2020 certification is designed for IT professionals who design and integrate vRealize Automation 7.2 solutions within large enterprise environments. This industry-recognized certification increases credibility and proves a deep understanding of cloud management design principles and methodologies. The VCAP-CMA Design 2020 certification validates a candidate's understanding of these topics and skills:

- Create a vRealize Automation conceptual design
- Create a vRealize Automation logical design
- Design a vRealize Automation management infrastructure
- Design vRealize Automation tenants
- Create a vRealize Automation resource design
- Create a vRealize Automation blueprint design
- Complete an extensibility design
- Complete a catalog design

Required exam: Earning the VCAP - Cloud Management and Automation Design 2020 certification requires passing one exam — VCAP-CMA Design Exam (3V0-732).

Prerequisites: Prior to attempting this VCAP certification, VMware requires earning the VCP-CMA

2019 or VCP-CMA 2020 certifications. This applies to candidates with another VCAP-CMA version, or a VCP or VCAP in a different track as well.

Recommended experience: VMware recommends that candidates gain experience translating business requirements into a vRealize Automation 7.x design before attempting the VCAP - Cloud Management and Automation Design 2020 certification.

VMWARE CERTIFIED ADVANCED PROFESSIONAL

VMware Certified Advanced Professional – Cloud Management and Automation Deploy 2020 (VCAP-CMA Deploy 2020)

The VCAP - Cloud Management and Automation Deploy 2020 certification is designed for IT professionals who deploy and optimize data center environments using the tools provided by vRealize Automation. The VCAP-CMA Deploy 2020 certification validates a candidate's understanding of these vRealize Automation topics:

- Blueprints
- Resource Management
- Approval and Governance
- Troubleshooting
- Tenant Administration
- Deployment Architecture
- Extensibility
- Security

Required exam: Earning the VCAP - Cloud Management and Automation Deploy 2020 certification requires passing one exam — Advanced Deploy vRealize Automation 7.3 (3V0-31.19).

Prerequisites: Prior to attempting this VCAP certification, VMware requires earning the VCP-CMA 2019 or VCP-CMA 2020 certifications. This applies to candidates with another VCAP-CMA version, or a VCP or VCAP in a different track as well.

Recommended experience: VMware recommends that candidates have professional-level knowledge of VMware vSphere and VMware NSX for vSphere and advanced knowledge of vRealize Suite before attempting the VCAP - Cloud Management and Automation Deploy 2020 certification.

VMWARE CERTIFIED ADVANCED PROFESSIONAL**VMware Certified Advanced Professional – Desktop and Mobility Deployment 2020 (VCAP-DTM Deploy 2020)**

The VCAP - Desktop and Mobility Deployment 2020 certification is designed for IT professionals who deploy and optimize VMware Horizon 6 (with View) environments. The VCAP-DTM Deploy 2020 certification validates a candidate's understanding of these topics and skills:

- **Configure Horizon components**
- **Configure and optimize Horizon Desktop images**
- **Create and manage Horizon desktop pools**
- **Configure and manage Horizon endpoints**
- **Configure and administer VMware Mirage**
- **Configure and administer VMware Identity Manager**
- **Configure and manage storage for a Horizon deployment**

Required exam: Earning the VCAP - Desktop and Mobility Deployment 2020 certification requires passing one exam — VMware Certified Advanced Professional 6 – Desktop and Mobility Deployment Exam (3V0-653).

Prerequisites: Prior to attempting this VCAP certification, VMware requires passing the VCP-DTM 2019 or VCP-DTM 2020 exams and earning the VCP -

Desktop and Mobility 2020 certification. This applies to candidates with another VCAP-DTM version, or a VCP or VCAP in a different track as well.

Recommended experience: VMware recommends that candidates have at least two years experience deploying, managing, and troubleshooting a VMware Horizon 6.x solution running on vSphere 6.x architecture before attempting the VCAP - Desktop and Mobility Deployment 2020 certification.

VMWARE CERTIFIED ADVANCED PROFESSIONAL**VMware Certified Advanced Professional – Desktop and Mobility Design (VCAP-DTM Design 2020)**

The VCAP - Desktop and Mobility Design 2020 certification is designed for IT professionals who design and integrate large scale VMware Horizon 7.2 environments.

The VCAP-DTM Design 2020 certification validates a candidate's understanding of these topics and skills:

- Create a Horizon conceptual design
- Create a Horizon logical design
- Create a physical design for vSphere and Horizon components
- Create a physical design for Horizon storage
- Create a physical design for Horizon Networking
- Create a physical design for Horizon desktops and pools
- Incorporate application services into a Horizon physical design
- Incorporate endpoints into a Horizon Design

Required exam: Earning the VCAP - Desktop and Mobility Design 2020 certification requires passing one exam — VMware Certified Advanced Professional 7 – Desktop and Mobility Design Exam (3V0-752).

Prerequisites: Prior to attempting this VCAP certification, VMware requires passing the VCP-DTM 2020 exam and earning the VCP - Desktop and Mobility 2020 certification. This applies to candidates with another VCAP-DTM version, or a VCP or VCAP in a different track.

Recommended experience: VMware recommends that candidates have at least five years of general IT experience and at least one year experience designing end-user computing solutions before attempting the VCAP - Desktop and Mobility Design 2020 certification.

VMware VCDX Certification

VMware's expert-level certification is the VMware Certified Design Expert (VCDX). VCDX recognizes IT professionals who design, build, and manage VMware solutions and systems. This certification level is mainly geared toward those in architect-level roles.

VMware offers four VCDX certifications:

- **VCDX - Data Center Virtualization 2020**
- **VCDX - Cloud Management and Automation 2020**
- **VCDX - Desktop And Mobility 2020**
- **VCDX - Network Virtualization 2020**

Unlike the other levels of certification, learners can only earn their VCDX through submitting and successfully defending a production-ready VMware Solution before a panel of veteran VCDX holders.

VMWARE CERTIFIED DESIGN EXPERT

VMware Certified Design Expert – Data Center Virtualization 2020 (VCDX-DCV 2020)

The VCDX - Data Center Virtualization 2020 certification is designed for IT professionals who deliver true business value by validating their expertise in vSphere6.x and enabling the best performance, availability, and efficiency from infrastructure and applications.

Certification requirements: There is no formal exam for this certification. Earning the VCDX - Data Center Virtualization 2020 certification requires building a design, submitting an application and design review, and defending the design against three panelists.

Prerequisites: Prior to attempting this VCDX certification, VMware requires passing the VCP6-DCV or VCP6.5-DCV certification, and either the VCIX6-DCV or VCIX6.5-DCV badge.

VMWARE CERTIFIED DESIGN EXPERT

VMware Certified Design Expert – Network Virtualization 2020 (VCDX-NV 2020)

The VCDX - Network Virtualization 2020 certification validates a candidate's expert-level vSphere and NSX 6.x skills. It also proves they can deliver strong business value by designing a VMware NSX®-platform-based data center that meets customer objectives and constraints.

Certification requirements: There is no formal exam for this certification. Earning the VCDX - Network Virtualization 2020 certification requires building a design, submitting an application and design review, and defending the design against three panelists.

Prerequisites: Prior to attempting this VCDX certification, VMware requires earning the VCP-NV 2020 and the VCIX-NV 2020 badge.

VMWARE CERTIFIED DESIGN EXPERT

VMware Certified Design Expert 7 – Cloud Management and Automation 2020 (VCDX-CMA 2020)

The VCDX - Cloud Management and Automation 2020 certification is designed for IT professionals who design, plan, and integrate VMware vSphere and vCloud Management and Automation solutions.

Certification requirements: There is no formal exam for this certification. Earning the VCDX - Cloud Management and Automation 2020 certification requires building a design, submitting an application and design review, and defending the design to three panelists.

Prerequisites: Prior to attempting this VCDX certification, VMware requires passing the VCP-CMA 2020 certification and the VCIX-CMA 2020 badge.

VMWARE CERTIFIED DESIGN EXPERT

VMware Certified Design Expert - Desktop And Mobility 2020 (VCDX-DTM 2020)

The VCDX - Desktop And Mobility 2020 certification is designed for IT professionals who design and implement enterprise-class VMware Horizon 7® and VMware Workspace solutions. This is in addition to having strong vSphere and data center virtualization skills.

Certification requirements: There is no formal exam for this certification. Earning the VCDX - Desktop And Mobility 2020 certification requires building a design, submitting an application and design review, and defending the design against three panelists.

Prerequisites: Prior to attempting this VCDX certification, VMware requires passing the VCP-DTM 2020 certification, and the VCIX-DTM 2020 badge.

VMware Digital Badges

When a candidate earns a VMware certification, completes an IT Academy challenge, or contributes to the certification program, they can easily and quickly share VMware badges. These digital badges reward contribution and communicate that holders have validated VMware knowledge and skills.

VMware badges are represented by a digital image that, once clicked on by a colleague or employer, will display verified information including:

- Issue Date
- What it took to earn the badge
- The steps undertaken to earn the skills

Once a VMware badge is earned, holders will receive an email notification alerting them to claim their badge. Once they accept the badge, they are immediately integrated into a sharing workflow that allows them to share that badge to Facebook, Twitter, LinkedIn, embed in a personal website, or share via email.

While digital badges are not equivalent to certifications, they do offer learners a unique opportunity to demonstrate specific skill proficiencies. VMware digital badges are a single source that combines verified credentials with a complete overview of skills. They also provide employers with an easy way to validate a candidate's VMware credentials.

How Much Does It Cost to Get VMware Certified?

The cost for VMware certification is dependent on the level of certification. The cost to sit for VMware VCA, VCP, and VCAP certifications are \$125, \$250, and \$450, respectively. VCDX certification cost is dependent on the track — and they cost \$3,995. Pricing for all exams also varies based on location and currency.

Keep in mind that exam costs typically aren't the only expense associated with getting certified. Between training materials, lab equipment, and travel and lodging (for VCDX), earning VMware certification can be quite an investment.

VMware Recertification and Renewal

Recertification is widely recognized in the IT industry as important to professional growth. If your skills are not current, your certification loses value. Staying current with your certifications enhances your credibility and demonstrates a commitment to learning, your career, and your organization.

VMware VCP certifications expire two years from the date they were earned. VMware's recertification policy provides three ways to recertify:

- Advance to the next level by earning a new VMware Certified Advanced Professional (VCAP) certification on the same track as your VCP.
- Earn the next version of VCP in the same track (if available).
- Earn a new VCP certification on a different track. (You may not take the same VCP exam used for earning your previous certification.)

Regardless of the option you choose, recertifying keeps your VMware knowledge up to date.

VMware Certification Salary and Career Information

Demand for IT professionals with virtualization skills is constantly rising and continues to grow as increasing numbers of organizations take advantage of the increased efficiency, availability, and cost savings afforded by virtualizing IT resources. VMware is one of the leading providers of virtualization products and solutions. Getting certified in VMware technologies can boost value in almost any IT career.

IT professionals who holds a VCP certification can earn anywhere from \$67,359 to \$102,709 annually. Roles for VCPs include systems administrator, IT manager, and systems engineer.

Employees with VCAP certification can earn between \$84,998 and \$152,308 annually. VCAP holders are typically seen in roles such as IT architect, IT director, and senior technical consultant.

VCDX holders, on the other hand, can earn up to \$170,000 per year. They are typically seen in chief architect, virtualization architect, and solutions architect roles.

VMware Certification Training

CBT Nuggets offers a variety of training resources for learners who are interested in pursuing VMware certification.

The CBT Nuggets Learning Experience helps you learn more efficiently, retain information longer, and gain practical, hands-on experience. In addition to watching our videos, you can reinforce core IT practices and concepts with built-in quiz questions, simulated practice exams, and customized VMware virtual labs.



CBTnuggets

Citrix Certifications

Citrix Systems is known for its Xen desktop, server, and application virtualization products. The suite is an established alternative to VMware, Microsoft Hyper-V, and other enterprise virtualization and cloud offerings.

Like most enterprise software companies, Citrix recognized the value of certification to both its customers and IT professionals. The company supports a comprehensive Citrix certification program with defined three Citrix certification paths.

- Citrix Digital Workplace
- Citrix Networking
- Citrix Partner Services

Citrix vs. VMware

While VMware is undoubtedly the 800-pound gorilla in the field of virtualization, Citrix does have a loyal enterprise following. The company claims that 99% of the Fortune 500 companies and 100 million users over 400,000 organizations use Citrix products.

The Citrix product suite is not as broad as VMware's and is focused on specific niche areas that leverage Citrix strengths in connectivity. For example, Citrix has a longstanding relationship with Microsoft, and as such its virtual app and desktop products work seamlessly within Microsoft's Azure cloud and Office 365 environments.

That said, the question of whether to follow a Citrix certification path — or say the VMware one — depends on your individual circumstances.

If you work — or would like to work — for an organization that is heavily invested in VMware, then Citrix certification is probably not for you. However, if your organization uses, or is considering using, Citrix — especially in conjunction with Azure and Office 365 — then Citrix certification is going to be a good option. In that case, as well, you might be wise to consider a joint Microsoft/Citrix certification approach.

What is Citrix Certification?

Citrix certifications validate that an IT professional has the proficiency to install, configure, and manage relevant Citrix Digital Workplace or Networking products in complex enterprise cloud and networking environments.

The basic Citrix certification path features three levels of experience:

- **Citrix Certified Associate**
- **Citrix Certified Professional**
- **Citrix Certified Expert**

The Citrix certification path features credentials for Citrix Virtual Apps and Desktops on Citrix Cloud or Microsoft's Azure cloud platform, as well as for Citrix ShareFile, Citrix Endpoint Management, Citrix XenServer, and Citrix SD-WAN. Citrix certifications also include the Citrix Certified Services Delivery Professional certification for those IT professionals who work for Citrix solution providers.

In addition to credentials which require candidates to pass certification exams, the Citrix certification program offers Proficiency and Skill digital badges, which IT professionals can display on their resumes to demonstrate their familiarity and skill with various Citrix products and solutions. These badges only require completion of relevant Citrix eLearning courses and assessments.

Citrix Digital Workplace Certifications

The credentials covered by Citrix Digital Workplace Certification include those for Citrix Virtualization, Citrix Virtual Apps and Desktops on Cloud — Citrix Cloud, as well as Microsoft Azure, ShareFile, Endpoint Management, and XenServer.

Citrix offers eight Digital Workplace certifications:

- Citrix Certified Associate - Virtualization (CCA-V)
- Citrix Certified Professional - Virtualization (CCP-V)
- Citrix Certified Expert - Virtualization (CCE-V)
- Citrix Virtual Apps and Desktops Service on Citrix Cloud Certified (CC-VAD-CC)
- Citrix Virtual Apps and Desktops Service Integration with Microsoft Azure (CC-VAD-MA)
- Citrix ShareFile Certified (CC-SHAREFILE)
- Citrix Endpoint Management Certified (CC-CEM)
- Citrix XenServer Certified (CC-XENSERVER)

The Citrix Virtualization certifications are tiered — Associate, Professional, and Expert — with each lower tier being a prerequisite to the higher one.

DIGITAL WORKPLACE

Citrix Certified Associate - Virtualization (CCA-V)

The Citrix Certified Associate - Virtualization is designed for early-career IT professionals who install, configure and manage Citrix Virtual Apps and Desktops 7, either on-premises or in the Citrix Cloud. The CCA-Virtualization certification validates a candidate's understanding of these topics:

- Architecture overview
- Deploying the site
- Apps and desktops images
- Provisioning and delivering app and desktop resources
- Providing access to app and desktop resources
- Managing the user experience
- Published app and desktop presentation and management
- Managing printing for user sessions
- Citrix profile management
- Managing and monitoring sites
- Citrix Virtual Apps and Desktops security
- Monitoring sites
- Supporting and troubleshooting Citrix Virtual apps and desktops
- Migrating to Citrix Cloud

Required exam: Earning the CCA-Virtualization certification requires passing one exam — Citrix Virtual Apps and Desktops 7 Administration (1Y0-204).

Prerequisites: None.

Recommended experience: Citrix recommends hands-on experience installing, configuring and managing a high availability configuration of Citrix Virtual Apps and Desktops, and other Citrix virtualization and cloud technologies prior to attempting the CCA-V exam.

DIGITAL WORKPLACE

Citrix Certified Professional - Virtualization (CCP-V)

The Citrix Certified Associate - Virtualization is designed for mid-career IT professionals — desktop virtualization engineers and system administrators — who work in a Citrix virtual app and desktop environment.

The CCP-Virtualization certification validates a candidate's understanding of these topics and skills:

- **Workspace Environment Management (WEM)**
- **FlexCast Management Architecture (FMA)**
- **The Virtual Delivery Agent (VDA)**
- **App layering**
- **User environment**
- **StoreFront**

- **HDX**
- **Provisioning services infrastructure**
- **Streaming the vDisk**
- **Target devices**
- **Integrating provisioning services with XenApp and XenDesktop**
- **Advanced provisioning services architecture**

Required exam: Earning the CCP-V certification requires passing one exam — Citrix XenApp and XenDesktop 7 Advanced Administration (1Y0-312).

Prerequisites: Prior to attempting this certification, candidates must earn the Citrix Certified Associate - Virtualization certification.

Recommended experience: This Citrix certification is for IT professionals with six or more months of hands-on experience with a XenDesktop 7 solution prior to attempting the CCP-V exam.

DIGITAL WORKPLACE**Citrix Certified Expert - Virtualization (CCE-V)**

The Citrix Certified Associate - Virtualization is designed for senior IT professionals — architects, engineers, and consultants. The CCE-Virtualization certification validates a candidate's understanding of these topics and skills:

- Design methodology and readiness assessment
- User layer and connectivity
- Accessing architecture and store design
- Accessing layer scalability, security, and redundancy
- Image management strategy and design
- Application delivery
- Personalization design
- XenApp and XenDesktop site and administrative design
- Physical resource design
- High-Availability and Multi-Location solutions
- Disaster recovery planning and design

Required exam: Earning the CCE-Virtualization certification requires passing one exam — Citrix XenApp and XenDesktop 7 Assessment, Design and Advanced Configurations (1Y0-403).

Prerequisites: Prior to attempting this certification, candidates must earn the CCP - Virtualization certification.

Recommended experience: This Citrix certification is for IT professionals with hands-on experience assessing and designing Citrix Virtual Apps and Desktops solutions based on Citrix XenApp and XenDesktop 7.

DIGITAL WORKPLACE

Citrix Virtual Apps and Desktops Service on Citrix Cloud Certified (CC-VAD-CC)

The Citrix Virtual Apps and Desktops Service on Citrix Cloud Certified certification is designed for IT professionals who regularly use Citrix Cloud platform, or plan to move to Citrix Cloud platform.

The CC-VAD-CC certification validates a candidate's understanding of these topics and skills:

- **Architecture overview**
- **Deploying the site**
- **Apps and desktops images**
- **Provisioning and delivering app and desktop resources**
- **Providing access to app and desktop resources**
- **Managing the user experience**
- **Published app and desktop presentation and management**
- **Managing printing for user sessions**
- **Citrix profile management**
- **Managing and monitoring sites**

Required exam: Earning the CC-VAD-CC certification requires passing one exam — the Citrix Virtual Apps and Desktops Service on Citrix Cloud (Certification Assessment 1Y0-130).

Prerequisites: Prior to attempting this certification, candidates must complete one of four mandatory training courses:

- CXD-250 Moving to the Citrix Virtual Apps and Desktops Service on Citrix Cloud
- CXD-252 Moving to the Citrix Virtual Apps and Desktops Service on Citrix Cloud with Microsoft Azure
- CWS-215: Citrix Virtual Apps and Desktops 7 Administration On-Premises and in Citrix Cloud
- CMB-318: Citrix Virtual Apps and Desktops 7, App Layering, and WEM Administration (Fast-Track)

Recommended experience: Citrix recommends hands-on experience with Citrix Virtual Apps and Desktops technology prior to attempting this certification exam.

DIGITAL WORKPLACE

Citrix Virtual Apps and Desktops Service Integration with Microsoft Azure (CC-VAD-MA)

The Citrix Virtual Apps and Desktops Service Integration with Microsoft Azure Certified certification is designed for IT professionals who regularly use Virtual Apps and Desktops Service, or plan to move to Virtual Apps and Desktops Service.

The CC-VAD-MA certification validates a candidate's understanding of these topics and skills:

- Citrix Virtual Apps and Desktops on Azure
- Citrix Virtual Apps and Desktops integration with Azure Active
- Connecting to Microsoft Azure
- Deploying Virtual Apps and Desktops
- Providing access to end users
- Maintaining infrastructure
- Planning for a successful POC

Required exam: Earning the CC-VAD-MA certification requires passing one exam — Citrix Virtual Apps and Desktops Service Integration with Microsoft Azure (1Y0-150).

Prerequisites: Prior to attempting this certification, candidates must complete one of two mandatory training courses:

- CXD-251 Citrix Virtual Apps and Desktops Service on Microsoft Azure
- CXD-252 Moving to the Citrix Virtual Apps and Desktops Service on Citrix Cloud with Microsoft Azure

Recommended experience: Citrix recommends hands-on experience with Citrix Virtual Apps and Desktops technology and Microsoft Azure prior to attempting this certification exam.

DIGITAL WORKPLACE

Citrix ShareFile Certified (CC-SHAREFILE)

The Citrix ShareFile Certified certification is designed for IT professionals who regularly use Citrix ShareFile to provide end users with secure file sync and sharing. The CC-SHAREFILE certification validates a candidate's understanding of these topics:

- Enterprise file synchronization
- Architecture
- Administration
- StorageZones
- User management
- Endpoint clients
- User experience
- Troubleshooting and management

Required exam: Earning the CC-SHAREFILE certification requires passing one exam — Understanding Citrix ShareFile (1Y0-100).

Prerequisites: While not required, Citrix recommends that candidates complete one training course in preparation for this exam — CSF-201 Citrix Content Collaboration Essentials.

Recommended experience: Citrix recommends hands-on experience with Citrix ShareFile prior to attempting this certification exam.

DIGITAL WORKPLACE

Citrix Endpoint Management Certified (CC-CEM)

The Citrix Endpoint Management Certified (CC-CEM) certification is designed for IT professionals who regularly use Citrix Endpoint Management (formerly XenMobile) to provide end users with secure file sync and sharing to facilitate mobile device management, mobile application management and secure productivity. The CC-CEM certification validates a candidate's understanding of these topics and skills:

- Introduction to Citrix Endpoint Management
- Citrix Endpoint management architecture
- Cloud components
- Common device management tasks
- Device enrollment
- Managing device security
- Working with apps
- Integrating Citrix Content
- Maintaining and troubleshooting
- Monitoring and reporting

Required exam: Earning the CC-CEM certification requires passing one exam — Managing Citrix Endpoint Management (1Y0-170).

Prerequisites: While not required, Citrix recommends that candidates complete one training course in preparation for this exam — CEM-205 Manage Citrix Endpoint Management.

Recommended experience: Citrix recommends hands-on experience administering a Citrix Endpoint Management environment prior to attempting this certification exam.

DIGITAL WORKPLACE

Citrix XenServer Certified (CC-XENSERVER)

The Citrix XenServer Certified (CC-XENSERVER) certification is designed for IT professionals who install, manage, secure, size, and troubleshoot an enterprise XenServer implementation. XenServer is now known as the Citrix Hypervisor. Citrix XenServer Certified certification validates a candidate's understanding of these topics:

- XenServer Architecture
- Managing Virtual Machines
- Installing XenServer
- Resource pools
- Networking
- Storage
- High Availability
- Security
- Sizing and optimizations

Required exam: Earning the CC-XENSERVER certification requires passing one exam — Administering Citrix XenServer (1Y0-120).

Prerequisites: While not required, Citrix recommends that candidates complete the CXS-301 Citrix XenServer 7.1 LTSR Administration training course.

Recommended experience: Citrix recommends hands-on experience configuring, implementing, and managing an organization's virtual server environment prior to attempting this certification exam.

Citrix Networking Certifications

Citrix networking certifications are designed to validate a candidate's proficiency in using Citrix ADC capabilities — including implementation for app and desktop delivery, networking performance and optimization, network security, and automation and orchestration.

Citrix offers four networking certifications:

- Citrix Certified Associate - Networking (CCA-N)
- Citrix Certified Professional - Networking (CCP-N)
- Citrix Certified Expert - Networking (CCE-N)
- Citrix SD-WAN Certified (CC-SDWAN)

NETWORKING

Citrix Certified Associate - Networking (CCA-N)

The Citrix Certified Associate - Networking certification is designed for early-career networking professionals such as network administrators and engineers, systems engineers, sysadmins, and cloud administrators. This certification has two tracks that focus on two Citrix products:

- Citrix ADC 12
- Citrix NetScaler 12

NETWORKING

Citrix Certified Associate - Networking (CCA-N): ADC 12

The Citrix Certified Associate - Networking certification is designed for IT professionals who implement and manage Citrix ADC for traffic management, load balancing, content switching, and SSL offloading. The CCA-Networking certification validates a candidate's understanding of these topics and skills:

- Basic networking
- Citrix ADC platforms
- High Availability
- Load balancing
- SSL offload

- Securing the Citrix ADC
- Troubleshooting
- Classic and default policies
- Rewrite, responder and URL transform
- Content switching
- Optimization
- Global server load balancing

Required exam: Earning the CCA-Networking certification requires passing one exam — Citrix ADC 12 Essentials and Traffic Management (1Y0-240).

Prerequisites: While not required, Citrix recommends that candidates complete one training course in preparation for this exam — CNS-220 Citrix ADC 12.x Essentials and Traffic Management.

Recommended experience: Citrix recommends at least six months of hands-on experience with basic networking and security, Windows and Linux server administration, and Citrix ADC 12.

NETWORKING

Citrix Certified Associate - Networking (CCA-N): Citrix NetScaler 12

The Citrix Certified Associate - Networking certification is designed for IT professionals who install, manage and support Citrix ADC and Citrix Gateway 12 environments.

The CCA-Networking certification validates a candidate's understanding of these topics and skills:

- Basic networking
- Citrix ADC platforms
- High Availability
- Load balancing
- SSL offload
- Securing the Citrix ADC
- Troubleshooting
- Citrix Gateway
- AppExpert expressions and policies
- Authentication, authorization, and policies
- Managing client connection
- Integration for Citrix Virtual Apps and Desktops
- Configuring Citrix Gateway

Required exam: Earning the CCA-Networking certification requires passing one exam — Citrix NetScaler 12 Essentials and Unified Gateway (1Y0-230).

Prerequisites: While not required, Citrix recommends that candidates complete one training course in preparation for this exam — CNS-222 Citrix ADC 12.x Essentials and Citrix Gateway.

Recommended experience: Citrix recommends at least six months experience with Citrix technologies including Citrix ADC, Citrix Gateway, and Citrix Virtual Apps and Desktops.

NETWORKING

Citrix Certified Professional - Networking (CCP-N)

The Citrix Certified Professional - Networking certification is designed for IT professionals who deploy and manage Citrix Web App Firewall to secure application access in a Citrix ADC 12.x environment, administer a Citrix ADC environment with Citrix Application Delivery Management, and optimize ADC-managed application delivery traffic.

The CCP-Networking certification validates a candidate's understanding of these topics and skills:

- Citrix Web App firewall
- Citrix Web App firewall profiles and policies
- Regular expression
- Attacks and protections
- Monitoring and troubleshooting
- Security and filtering
- Application delivery management
- Managing and monitoring Citrix ADC instances
- Managing Citrix ADC configurations
- Citrix ADC web logging
- Integrated caching
- Front-end optimization
- Tuning and optimizations

Required exam: Earning the CCP-Networking certification requires passing one exam — Citrix ADC Advanced Topics - Security, Management, and Optimization (1Y0-341).

Prerequisites: Prior to attempting this certification, candidates must earn the CCA - Networking certification. Additionally, while not required, Citrix recommends that candidates complete one training course in preparation for this exam — CNS-320 Citrix ADC 12.x Advanced Concepts - Security, Management and Optimization.

Recommended experience: Citrix recommends at least six months experience with Citrix ADC 12 operations including Citrix Web App Firewall profiles and policies, attacks and protections, and configuring, managing and monitoring Citrix ADC instances.

NETWORKING**Citrix Certified Expert - Networking (CCE-N)**

The Citrix Certified Expert - Networking certification is designed for senior IT professionals who assess and design comprehensive architectures for a Citrix networking environment and configure complex networking configurations.

The CCE-Networking certification validates a candidate's understanding of these topics and skills:

- **Networking methodology and assessment**
- **Citrix ADC deployment architecture and topology**
- **Advanced authentication and authorization**
- **Citrix ADC security**
- **VPN configuration**
- **Advanced traffic management**
- **Citrix application delivery management automation and orchestration**

Required exam: Earning the CCE-Networking certification requires passing one exam — Architecting a Citrix Networking Solution (1Y0-440).

Prerequisites: Prior to attempting this certification, candidates must earn the CCP - Networking certification. Additionally, Citrix recommends that candidates complete one training course in preparation for this exam — CNS-420 Citrix Networking Assessment, Design, and Advanced Configuration.

Recommended experience: Citrix recommends extensive networking and Citrix ADC experience prior to attempting this exam.

NETWORKING**Citrix SD-WAN Certified (CC-SDWAN)**

The Citrix SD-WAN Certified certification is designed for senior IT professionals who configure Citrix SD-WAN (formerly NetScaler SD-WAN) in order to increase wide-area network throughput, reliability and performance, while improving the application experience. The CC-SDWAN certification validates a candidate's understanding of these topics and skills:

- Citrix SD-WAN introduction
- Citrix SD-WAN deployment
- Citrix SD-WAN provisioning
- Citrix SD-WAN security
- Citrix SD-WAN Quality of Service
- Citrix SD-WAN optimizations

Required exam: Earning the CC-SDWAN certification requires passing one exam — Understanding Citrix SD-WAN (1Y0-140).

Prerequisites: While not required, Citrix recommends that candidates complete one training course in preparation for this exam — CNS-230 Deploy & Manage Citrix SD-WAN - Essentials.

Recommended experience: Citrix recommends hands-on experience deploying or managing Citrix SD-WAN wide area networks.

Citrix Partner Services Certifications

The Citrix Partner Services certification path focuses on skills that are most important to channel partner personnel who manage and execute consulting projects pertaining to Citrix products. Citrix offers one Partner Services certification — Citrix Certified Services Delivery Professional.

PARTNER SERVICES

Citrix Certified Services Delivery Professional

The Citrix Certified Services Delivery Professional certification is designed for engineers and consultants who work for Citrix solution provider and consulting companies. The Citrix Certified Services Delivery Professional certification validates a candidate's understanding of these topics:

- **Communication**
- **Presentation**
- **Methodology**
- **Project Execution**

Required exam: Earning the Citrix Certified Services Delivery Professional certification requires passing one exam — Service Delivery Professional (1Y0-500).

Prerequisites: Prior to attempting this certification, candidates must earn either the Citrix Certified Professional - Virtualization or Citrix Certified Professional - Networking certifications. Additionally, Citrix requires that candidates complete the Professional Services eLearning modules in preparation for this exam.

Recommended experience: Citrix recommends hands-on experience managing and executing consulting projects pertaining to Citrix products.

How Much Does It Cost to Get Citrix Certified?

Citrix certification exams cost \$300 for Citrix Certified Professional and Citrix Certified Expert level credentials, and \$200 for other Citrix certifications including Citrix Certified Associate. Your total Citrix certification cost also includes any fees you pay for related training, self-study, and practice. Note that Citrix certification exams are included in VA Education Benefits, so U.S. military veterans are eligible to be reimbursed for some or all of the exam costs associated with Citrix certifications.

Citrix Recertification and Renewal

Citrix certifications are valid for three years after passing the relevant Citrix certification exam. The Citrix Recertification Program allows holders to recertify in either of two ways. As long as their Citrix certification has not yet expired, Citrix certified professionals can renew their Citrix certification(s) by either:

- Completing a designated instructor-led training course(s) relevant to their particular Citrix certification(s).
- Taking and passing the most recent version of the Citrix certification exam associated with each of their current Citrix certifications.

Individuals whose Citrix certification has expired must re-earn all lower-level certifications and pass the associated exam to regain certification. For example, a person whose Citrix Certified Expert - Virtualization (CCE - V) certification has expired would be required to pass three levels of Citrix certification exams — CCA - V, CCP - V, and CCE - V — in order to recertify.

Citrix Certification Salary and Career Information

A search for job openings for certified IT professionals on the Indeed.com job site reflects the relative market position of Citrix to VMware and Microsoft. Job opportunities for individuals holding their certification badges far outstrip those with Citrix certifications.

However, this also indicates the possibility of a relative shortage of Citrix certified professionals — hence a scarcity which drives up employers' willingness to pay. For example, let's compare the CCA - V certification with VMware's VCA starter cert. There are 10 times as many job openings requiring the VCA than those requiring the CCA - V, but the CCA - V's average Citrix certification salary (\$81,600) is 50% higher than the VCA's \$52,800.

At the Professional level, VMware's VCP showed 20 times the number of job openings, but average salaries were nearly 10% lower than the Citrix certification salary enjoyed by CCP - V openings (\$82,500 vs. \$88,400).

USD). On the networking side, job openings for the Citrix Certified Professional – Networking offered an average of \$97,300.

The outlook is even better on the Citrix Certified Expert front, where the analysis indicated an average Citrix certification salary of \$89,300 for CCE-V and \$100,500 for jobs requiring a Citrix Certified Expert - Networking.

Citrix Certification Training

CBT Nuggets offers a number of Citrix certification training courses. CBT Nuggets also has certification playlists for in-demand certifications — meaning that all the training you need to earn those certifications can be accessed in one place.

A CBT Nuggets subscription includes access to Virtual Labs that cover Citrix technologies. Virtual Labs enable learners to get hands-on experience with products in a sandbox environment.

Good luck to you as you start on your Citrix certification path. Our training offerings change from time to time as we support the Citrix certification roadmap. So, be sure to check CBT Nuggets for new and updated training that is relevant to your personal Citrix career journey.



AWS Certifications

Amazon Web Services, commonly known as AWS, provides on-demand cloud services to individuals and organizations on a subscription basis. AWS dominates the growing cloud marketplace. At the end of Q4 2018, AWS owned more of the \$70 billion dollar market than its next four rivals — combined.

Due to the popularity of AWS, the demand for IT professionals who can leverage the AWS platform continues to increase. Getting AWS-certified is the best way for IT pros to gain and develop the knowledge and skills they need to successfully use AWS and its services.

AWS offers a robust certification program that consists of four levels:

- Foundational
- Associate
- Professional
- Specialty

This CBT Nuggets AWS certification guide covers the certification program, the recommended training, and the career opportunities associated with AWS.

What is AWS Certification?

AWS certification validates the knowledge and skills needed to work with AWS and its services. The AWS certification path comprises four levels: Foundational, Associate, Professional, and Specialty — the first three levels of which build upon each other. AWS Specialty certs are standalone, but are more narrow and focused in scope. As such, professionals who attempt to earn a Specialty certification will likely have earned other AWS certifications.

Please note AWS recently did away with prerequisites for its certification exams due to the amount of crossover between path levels. For example, AWS Certified Solutions Architect exists as both an Associate and Professional certification. AWS received feedback from exam takers about the frustration of having to earn the Associate before the Professional.

AWS now provides recommended knowledge for its certifications. While it's relative to your AWS experience, we at CBT Nuggets suggest you view this as required knowledge.

FOUNDATIONAL CERTIFICATION

AWS Certified Cloud Practitioner (CCP)

The Certified Cloud Practitioner certification is designed for entry-level IT professionals and business professionals with a basic knowledge of the AWS platform. The AWS CCP certification validates a candidate's understanding of these topics and skills:

- **Basic architectural principles**
- **Key services and their usage cases**
- **Security and compliance for AWS model**
- **Billing and pricing models**

The Certified Cloud Practitioner is the ideal starting point toward earning AWS Associate certification and an excellent resource for non-technical project stakeholders.

Required exam: Earning the Certified Cloud

Practitioner certification requires passing one exam — the AWS Certified Cloud Practitioner (CLF-C01).

Prerequisites: None.

Recommended qualifications: AWS recommends that candidates have at least six months experience using AWS in any capacity, whether it be IT, non-technical, or executive-level. AWS also recommends that candidates have a basic understanding of IT.

AWS Associate Certifications

Next on the Amazon AWS certification path is Associate certification. This level includes three certifications:

- **AWS Certified Solutions Architect – Associate**
- **AWS Certified Developer – Associate**
- **AWS Certified SysOps Administrator – Associate**

AWS Associate certifications are not required to earn AWS Professional certifications, but the knowledge and skills earned by an Associate certification can increase your odds of attaining Professional certification.

For Associate certifications, AWS recommends one year experience solving problems and implementing solutions using the AWS Cloud.

ASSOCIATE CERTIFICATION

AWS Certified Solutions Architect

The AWS Certified Solutions Architect - Associate certification is designed for IT professionals who are in solutions architect roles. The exam, successfully passed, proves the ability to architect and deploy applications on AWS technologies. The AWS Solutions Architect - Associate certification validates a candidate's understanding of these topics and skills:

- **Define solutions using architectural design principles based on customer requirements**
- **Provide implementation guidance based on AWS best practices during project life cycles**

Required exam: Earning the AWS Certified Solutions Architect - Associate certification requires passing one exam — the AWS Solutions Architect - Associate exam.

Prerequisites: None.

Recommended qualifications: AWS recommends at least one year experience designing cost-efficient, fault-tolerant, and scalable distributed systems on AWS.

ASSOCIATE CERTIFICATION**AWS Certified Developer**

The AWS Certified Developer - Associate certification is designed for IT professionals who are in development roles — and have one or more years of hands-on experience developing and maintaining AWS-based applications. The AWS Developer - Associate certification validates a candidate's understanding of these topics and skills:

- Understanding of core AWS services, uses, and basic architecture best practices
- Proficiency in developing, deploying, and debugging cloud-based applications using AWS

Required exam: Earning the AWS Certified Developer - Associate certification requires passing one exam — the AWS Developer - Associate exam.

Prerequisites: None.

Recommended qualifications: AWS recommends at least one year of in-depth experience in developing and maintaining AWS applications.

ASSOCIATE CERTIFICATION**AWS Certified SysOps Administrator**

The AWS Certified SysOps Administrator - Associate certification is designed for IT professionals with one to two years of experience as an administrator in a systems operations role. The AWS SysOps Administrator - Associate certification validates a candidate's understanding of these topics and skills:

- Deploy, manage, and operate scalable, highly available, and fault-tolerant systems on AWS
- Implement and control the flow of data to and from AWS
- Determine appropriate AWS services based on compute, data, or security requirements
- Use AWS operational best practices
- Estimate AWS usage costs and identify operational cost control mechanisms
- Migrate on-premises workloads to AWS

Required exam: Earning the AWS Certified SysOps Administrator - Associate certification requires passing one exam — the AWS SysOps Administrator - Associate exam.

Prerequisites: None.

Recommended qualifications: AWS recommends at least one year of hands-on experience using AWS, especially in managing and operating systems on AWS.

AWS Professional Certifications

Professional is the highest level of AWS certification and it includes two certifications: AWS Certified Solutions Architect – Professional and AWS Certified DevOps Engineer – Professional.

As previously mentioned, AWS no longer has exam prerequisites. It's not required to have AWS Associate certification to earn an AWS Professional certification. However, AWS recommends at least two years of in-depth experience designing, operating, and troubleshooting solutions using AWS cloud.

PROFESSIONAL CERTIFICATION

AWS Certified Solutions Architect

The AWS Certified Solutions Architect - Professional certification is designed for IT professionals who work in solution architect roles. To pass this exam, advanced technical skills and experience designing distributed applications and systems in AWS are required. The AWS Solutions Architect - Professional certification validates a candidate's understanding of these topics and skills:

- **Design and deploy dynamically scalable, highly available, and fault-tolerant applications on AWS**
- **Determine appropriate AWS services to design and deploy applications**
- **Migrate complex multi-tier applications on AWS**
- **Design and deploy enterprise-wide scalable operations on AWS**
- **Implement cost-control strategies**

Required exam: Earning the AWS Certified Solutions Architect - Professional certification requires passing one exam — the AWS Solutions Architect - Professional exam.

Prerequisites: None.

Recommended qualifications: AWS recommends two or more years hands-on experience designing and deploying cloud architecture(s) on AWS.

PROFESSIONAL CERTIFICATION**AWS Certified DevOps Engineer**

The AWS Certified DevOps Engineer – Professional certification is designed for IT professionals who work in DevOps engineer roles. Candidates need to possess technical expertise in provisioning, operating, and managing distributed application systems using AWS. The AWS DevOps Engineer – Professional certification validates a candidate’s understanding of these topics and skills:

- **Implement and manage continuous delivery systems on AWS**
- **Implement and automate security controls, governance processes, and compliance validation**
- **Define and deploy monitoring, metrics, and logging systems on AWS**
- **Implement highly available, scalable, and self-healing systems on AWS**
- **Design, manage, and maintain tools to automate operational processes**

Required exam: Earning the AWS Certified DevOps Engineer – Professional certification requires passing one exam — the AWS DevOps Engineer – Professional exam.

Prerequisites: None.

Recommended qualifications: AWS recommends two or more years experience provisioning, operating, and managing AWS environments.

AWS Specialty Certifications

AWS Specialty certifications enable cloud professionals to validate their skills in specific technical areas. AWS offers six Specialty certifications:

- **AWS Certified Advanced Networking**
- **AWS Certified Security**
- **AWS Certified Data Analytics**
- **AWS Certified Machine Learning**
- **AWS Certified Alexa Skill Builder**
- **AWS Certified Database**

AWS recommends two to five years of deep technological experience in the specialty areas as they relate to the AWS cloud and its services.

SPECIALTY CERTIFICATION

AWS Certified Advanced Networking

The AWS Certified Advanced Networking – Specialty certification is designed for IT professionals who perform complex networking tasks. The AWS Advanced Networking – Specialty certification validates a candidate's understanding of these topics and skills:

- **Designing, developing, and deploying cloud-based solutions using AWS.**
- **Implementing core AWS services.**
- **Designing and maintaining network architecture for AWS services.**
- **Leveraging tools to automate AWS networking tasks.**

Required exam: Earning the AWS Certified Advanced Networking - Specialty certification requires passing one exam — the AWS Advanced Networking - Specialty exam.

Prerequisites: None. However, AWS recommends candidates for AWS Certified Big Data - Specialty certification have either AWS Certified Cloud Practitioner or any current Associate-level certification.

Recommended qualifications: AWS recommends a minimum of five years IT security experience designing and implementing security solutions, at least two years hands-on experience securing AWS workloads. AWS also recommends that candidates have a deep understanding of security controls for AWS workloads.

SPECIALTY CERTIFICATION**AWS Certified Security**

The AWS Certified Security – Specialty certification is designed to enable experienced cloud security professionals to demonstrate their knowledge and skills in securing the AWS platform. The Security – Specialty certification validates a candidate’s understanding of these topics and skills:

- **Specialized data classifications and AWS data protection mechanisms**
- **Data encryption methods and AWS mechanisms**
- **Secure internet protocols and AWS mechanisms to implement them**
- **Using AWS security services and features of services to provide a secure production environment**
- **Deployment experience using AWS security services and features**
- **An understanding of security operations and risk**

Required exam: Earning the AWS Certified Security – Specialty certification requires passing one exam — the AWS Security – Specialty exam.

Prerequisites: None.

Recommended qualifications: AWS recommends a minimum of five years IT security experience designing and implementing security solutions, and at least two years hands-on experience securing AWS workloads. They also recommend you have a deep understanding of security controls for AWS workloads.

SPECIALTY CERTIFICATION**AWS Certified Data Analytics**

The AWS Certified Data Analytics - Specialty certification is designed for professionals who perform in-depth unstructured data analysis. The AWS Data Analytics - Specialty certification validates a candidate’s understanding of these topics and skills:

- **Implement core AWS big data services according to basic architecture best practices**
- **Design and maintain big data**
- **Leverage tools to automate data analysis**

Required exam: Earning the AWS Certified Big Data - Specialty certification requires passing one exam — the AWS Big Data - Specialty exam.

Prerequisites: None.

Recommended qualifications: AWS recommends candidates for AWS Certified Data Analytics - Specialty certification have either AWS Certified Cloud Practitioner or any current Associate-level certification. Candidates should also possess the following:

- **At least five years hands-on experience in a data analytics field.**
- **Background in defining and architecting AWS data analytics services.**
- **Experience in designing scalable and cost-effective architectures to process data.**

SPECIALTY CERTIFICATION**AWS Certified Machine Learning**

The AWS Certified Machine Learning – Specialty certification is designed for data scientists who design, deploy, and maintain machine learning solutions. The Machine Learning – Specialty certification validates a candidate’s understanding of these topics and skills:

- **Select and justify the appropriate ML approach for a given business problem**
- **Identify appropriate AWS services to implement ML solutions**
- **Design and implement scalable, cost-optimized, reliable, and secure ML solutions**

Required exam: Earning the AWS Certified Machine Learning – Specialty certification requires passing one exam — the AWS Machine Learning – Specialty exam.

Prerequisites: None.

Recommended qualifications: AWS recommends at least two (2) years hands-on experience developing machine learning workloads with best practices.

SPECIALTY CERTIFICATION**AWS Certified Alexa Skill Builder**

The AWS Certified Alexa Skill Builder – Specialty certification is designed for developers who build, test, and publish Alexa Skills. The Alexa Skill Builder – Specialty certification validates a candidate’s understanding of these topics and skills:

- **Explain the value of voice**
- **Design the user experience**
- **Design the architecture to build the skill**
- **Follow AWS and Alexa security best practices for the skill**
- **Develop, test, validate, and troubleshoot the skill**
- **Manage the skill-publishing process and work with the Alexa Developer Console**
- **Manage skill operations and life cycles**

Required exam: Earning the AWS Certified Alexa Skill Builder – Specialty certification requires passing one exam — the AWS Alexa Skill Builder – Specialty exam.

Prerequisites: None.

Recommended qualifications: AWS recommends at least six months hands-on experience developing skills with the Alexa Skills kit, and that a candidate has published an Alexa skill.

SPECIALTY CERTIFICATION**AWS Certified Database**

The AWS Certified Database – Specialty certification is designed for cloud professionals who design, recommend, and maintain AWS database services.

The Database – Specialty certification validates a candidate's understanding of these topics and skills:

- **Understand and differentiate the key features of AWS database services**
- **Analyze needs and requirements to recommend and design appropriate database solutions using AWS services**

Required exam: Earning the AWS Certified Database – Specialty certification requires passing one exam — the AWS Database – Specialty exam.

Prerequisites: None.

Recommended qualifications: AWS recommends at least two (2) years with general AWS experience and at least five (5) years of experience with database technologies.

How Much Does It Cost to Get AWS Certified?

AWS certification costs vary by level. The AWS Foundational Certification - Certified Cloud Practitioner costs \$100. AWS Associate certifications cost \$150. Meanwhile, AWS Professional and Specialty certifications cost \$300.

While AWS provides a lot of free exam preparation material, especially for its Associate certifications, you'll likely want to use other supplemental study resources. Video training, like CBT Nuggets, or study guides will add to your AWS certification journey costs. So, budget accordingly.

AWS Recertification and Renewal

Technology is always changing. That's why it's crucial for IT professionals to keep their knowledge and skills up to date. If you can't leverage the latest in-demand technologies, products, or services for organizations, you might find yourself left behind.

Recertification is an excellent way to ensure your skill set is current — and AWS offers several ways to recertify. Here's how you can recertify for each AWS certification level.

Foundational-Level

Retake the current AWS Certified Cloud Practitioner exam or earn any AWS Associate or Professional certification.

Associate-Level

Take the Associate-level exam for the certification you already have or pass either the AWS Certified Solutions Architect - Professional exam for the Architect path or AWS Certified DevOps Engineer - Professional exam for the Developer or Operations path.

Professional-Level

Take the current Professional-level exam for the certification you already have.

Specialty-Level

Take the current Specialty exam for the certification you already have. AWS recertification is a simple and straightforward process. An added bonus is that AWS typically offers 50% discount vouchers that apply toward recertification exams. Check the Benefits section of your AWS Certification account for vouchers. AWS makes it easy to recertify, so cert-holders should take advantage — and keep their skills current.

AWS Certification Salary and Career Information

Professionals with AWS certification are typically among the highest paid in the IT industry according to Payscale.com. It reports a salary range between \$97,588 and \$114,345 for AWS certification holders. Not surprisingly, salaries increase by certification level, meaning that AWS Professional certification holders command higher salaries than AWS Associate certification holders.

Keep in mind there are a number of factors that determine salaries: Professional experience, geography and company size. It's also important to consider the cost of living in regard to national salary averages and range. Lastly, larger organizations typically pay more, but the tradeoff is that their hiring processes are usually more complicated and take longer.

Roles associated with AWS certification holders include cloud architect, SysOps administrator, cloud developer, cloud sales & purchase manager, cloud DevOps engineer, cloud key account manager, cloud software engineer, AWS networking specialist, AWS systems integrator, and AWS Big Data specialist.

AWS Certification Training

CBT Nuggets offers a variety of AWS training that map to specific AWS certification exams and skills that learners need to know to leverage the AWS cloud platform.

Our team of industry-expert trainers constantly creates new training, so our AWS library is constantly growing and being updated. All of our AWS training contains built-in quizzes to help reinforce what you're learning as you go.

A CBT Nuggets subscription includes access to Virtual Labs, designed by our industry-expert trainers, to help learners gain hands-on experience in sandbox environments.

Our subscriptions also provide access to practice exams, which provide a baseline for learners to test their knowledge. These practice exams help learners evaluate their strengths and weaknesses, so they can pinpoint areas to focus on when studying.



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Google Certifications

While Google's cloud offerings — Google Cloud Platform (GCP) and the G Suite set of office productivity apps — trail their AWS and Azure competitors, Google's CEO has claimed that it is the fastest growing major public cloud provider in the world. With this background, it's no surprise that Google has been busy promoting its Google Cloud Certification and Google Developer Certification programs as a way to promote user adoption of the Google Cloud Platform and — separately — growth of Android-based mobile phone and tablet apps.

Google offers eight certifications:

- Google Associate Cloud Engineer
- Google Professional Cloud Architect
- Google Professional Data Engineer
- Google Professional Cloud Security Engineer
- Google Professional Cloud Network Engineer
- Google Professional Cloud Developer
- Google Professional Collaboration Engineer
- Google G Suite

Where to Start with Google Certifications

Google Cloud Platform represents a small part of Google's overall product and services offerings, trailing its search and advertising offerings. There are numerous Google certifications for search, web advertising, and education. For example, Google Certified Level 1 certification validates a teacher's proficiency in using Google tools in their classroom. This guide does not concern itself with search or advertising, but is focused instead on Google certification programs related to Google cloud technology (including G Suite) and development certifications.

Google Cloud certifications begin with an Associate-level certification, for those new to IT or to the Google Cloud Platform. Beyond that, we go to Professional-level Google tech certification accreditations, for more experienced IT professionals — in roles such as data engineers, cloud architects, and collaboration engineers.

The Google Cloud certification in G Suite is separate from the associate- and professional-level Google certifications list. With G Suite certification, the target is office productivity specialists — typically help desk people — rather than hard-core IT folks.

Finally, the Google Developer certifications — Google Associate Android Developer and Google Mobile Web Specialist — focus on validating the proficiency and skill of mobile app developers.

In addition to the Google Cloud Platform, Google's Android system is an “800 pound gorilla” in mobile operating systems and a favorite for mobile app development. The story with G Suite is not as positive, as Google competes against Microsoft's Office and Office365 franchise — but even there Google is making inroads.

Google Cloud Associate-Level Certifications

Google Cloud certifications begin with an Associate-level certification, for those new to IT or to the Google Cloud Platform.

Google offers one Associate-level certification:

- **Google Associate Cloud Engineer (ACE)**

GOOGLE CLOUD ASSOCIATE

Google Associate Cloud Engineer (ACE)

The Google Associate Cloud Engineer certification is designed for new IT professionals or junior-level engineers new to cloud computing and the Google Cloud Platform. The ACE exam validates a candidate's understanding of both general and GCP-specific cloud topics including:

- **Set up a cloud solution environment**
- **Plan and configure a cloud solution**
- **Deploy and implement a cloud solution**
- **Ensure successful operation of a cloud solution**
- **Configure access and security**

Required exam: Earning the Google ACE certification requires passing one exam — the Associate Cloud Engineer (ACE) exam.

Prerequisites: None.

Recommended experience: Google recommends that candidates have six or more months of hands-on experience with the Google Cloud Platform.

Google Cloud Professional-Level Certifications

Google Cloud Professional-level Google certification are designed for experienced IT professionals — in roles such as data engineers, cloud architects, and collaboration engineers.

Google offers six Professional-level certification:

- Google Professional Cloud Architect
- Google Professional Data Engineer
- Google Professional Cloud Security Engineer
- Google Professional Cloud Network Engineer
- Google Professional Cloud Developer
- Google Professional Collaboration Engineer

GOOGLE CLOUD PROFESSIONAL

Google Professional Cloud Architect (PCA)

The Google Professional Cloud Architect certification is designed for IT professionals who design, develop, and manage secure, scalable, high-availability cloud solutions based on the GCP. The Google PCA exam validates a candidate's understanding of both general and GCP-specific cloud topics including:

- **Design and plan a cloud solution architecture**
- **Manage and provision the cloud solution infrastructure**
- **Design for security and compliance**
- **Analyze and optimize technical and business processes**
- **Manage implementations of cloud architecture**
- **Ensure solution and operations reliability**

Required exam: Earning the Google PCA certification requires passing one exam — the Professional Cloud Architect (PCA) exam.

Prerequisites: None.

Recommended experience: Google recommends that candidates have more than three years of industry experience, including at least one year designing and managing GCP-based solutions.

GOOGLE CLOUD PROFESSIONAL

Google Professional Data Engineer (PDE)

The Google Professional Data Engineer certification is designed for IT professionals who design and implement data processing systems, as well as deploy operational machine learning models on the Google Cloud Platform. The Google PDE exam validates a candidate's understanding of both general and GCP-specific data processing and analysis topics including:

- **Design data processing systems**
- **Build and operationalize data processing systems**
- **Operationalize machine learning models**
- **Ensure solution quality**

Required exam: Earning the Google PDE certification requires passing one exam — the Professional Data Engineer (PDE) exam.

Prerequisites: None.

Recommended experience: Google recommends that candidates have more than three years of industry experience, including more than one year designing and managing GCP-based solutions.

GOOGLE CLOUD PROFESSIONAL

Google Professional Cloud Security Engineer (PCSE)

The Google Professional Cloud Security Engineer Certification is designed for security analysts, engineers, and architects who design and implement secure infrastructures on the Google Cloud Platform. The Google PCSE exam validates a candidate's understanding of both general and GCP-specific security topics including:

- **Configure access within a cloud solution environment**
- **Configure network security**
- **Ensure data protection**
- **Manage operations within a cloud solution environment**
- **Ensure compliance**

Required exam: Earning the Google PCSE certification requires passing one exam — the Professional Cloud Security Engineer (PCSE) exam.

Prerequisites: None.

Recommended experience: Google recommends that candidates have more than three years of industry experience, including more than one year designing, managing, and securing GCP-based solutions.

GOOGLE CLOUD PROFESSIONAL**Google Professional Cloud Network Engineer (PCNE)**

The Google Professional Cloud Network Engineer certification is designed for network engineers and architects who implement, manage, and optimize network architectures on the Google Cloud Platform. Candidates should have experience implementing VPCs, hybrid connectivity, network services, and security for established network architectures. The Google PCNE exam validates a candidate's understanding of both general and GCP-specific networking topics including:

- **Design, plan, and prototype a GCP network**
- **Implement a GCP virtual private cloud (VPC)**
- **Configure network services**
- **Implement hybrid interconnectivity**
- **Implement network security**

Required exam: Earning the Google PCNE certification requires passing one exam — the Professional Cloud Network Engineer (PCNE) exam.

Prerequisites: None.

Recommended experience: Google recommends that candidates have more than three years of industry experience, including one or more years of hands-on experience designing, deploying, and managing GCP-based networked solutions.

GOOGLE CLOUD PROFESSIONAL**Google Professional Cloud Developer (PCD)**

The Google Professional Cloud Developer certification is designed for app developers who design and build applications to run on the GCP. Candidates should have experience with GCP products such as Compute Engine, Cloud Storage, Security key enforcement, and BigQuery. The Google PCD exam validates a candidate's understanding of both general and GCP-specific development topics including:

- **Design highly scalable, available, and reliable cloud-native applications**
- **Build and test applications**
- **Deploy applications**
- **Integrate Google Cloud Platform services**
- **Manage application performance monitoring**

Required exam: Earning the Google PCD certification requires passing one exam — the Professional Cloud Developer (PCD) exam.

Prerequisites: None.

Recommended experience: Google recommends that candidates have more than three years of industry experience, including more than one year designing and managing GCP-based solutions.

GOOGLE CLOUD PROFESSIONAL**Google Professional Collaboration Engineer (PCE)**

The Google Professional Collaboration Engineer certification is designed for IT professionals and collaboration engineers who help improve business efficiencies and office productivity by leveraging G Suite and the Google Cloud toolset. Candidates should also know GCP tools, programming languages, and APIs to automate workflows to increase operational efficiency. The exam for the Google Professional Collaboration Engineer (PCE) validates the candidate's ability to:

- **Implement G Suite authorization and access**
- **Manage user, resource, and Team Drive lifecycles**
- **Manage electronic mail**
- **Control and configure G Suite services**
- **Configure and manage endpoint access**
- **Monitor organizational operations**
- **Advance G Suite adoption and collaboration**

Required exam: Earning the Google PCE certification requires passing one exam — the Professional Collaboration Engineer (PCE) exam.

Prerequisites: None.

Recommended experience: Google recommends that candidates have more than three years of experience, including one or more years working with G Suite and designing and managing GCP-based solutions.

GOOGLE CLOUD PROFESSIONAL**Google G Suite Certification**

The Google G Suite certification is designed for IT and business professionals who use the core tools and services in the Google G Suite application portfolio. This Google certification denotes that the candidate has the proven ability to complete common workplace activities using cloud-based tools to create and share documents, spreadsheets, presentations, and files.

The Google G Suite exam validates the candidate's proficiency in key features of the G Suite platform:

- **Drive**
- **Gmail**
- **Hangouts Meet**
- **Docs**
- **Sheets**
- **Forms**
- **Slides**

Required exam: Earning the Google G Suite certification requires passing one exam — the Google G Suite Certification exam.

Prerequisites: None.

Recommended experience: Google recommends that candidates have more than three years of industry experience, including one or more years working with G Suite solutions.

Google Developers Certifications

As with other tech vendors, Google sees tremendous value in having a vibrant network of developers who are certified to build apps using Google Android and web technologies.

For employers, the Google Developers Certifications validate the proficiency and skills of prospective employees. Likewise, the Google Developer certification program allows certified programmers to promote themselves to employers, projects, and communities.

Google offers two developer certifications:

- Google Associate Android Developer Certification
- Google Mobile Web Specialist Certification

GOOGLE DEVELOPER

Google Associate Android Developer (AAD)

The Google Associate Android Developer certification is designed for entry-level Android developers. The certification exam is performance-based, which means candidates will have to demonstrate proficiency through a number of coding challenges. The Google Associate Android Developer exam validates a candidate's understanding of these topics:

- **Use Android's messaging, multitasking, connectivity and media services to design full-featured apps primarily for mobile devices**
- **Quickly create apps with user interfaces that take advantage of Android's rich UI frameworks**
- **Leverage Android's frameworks and techniques to perform or schedule data retrieval/storage efficiently in a mobile environment**
- **Use Android Studio debugging tools**
- **Test the execution of a program and find errors and abnormal or unexpected behavior**

Required exam: Earning the Google Associate Android Developer certification requires passing one exam — the Google Associate Android Developer exam. The Google Associate Android Developer Certification exam consists of a coding project and an exit interview (in English). Candidates have up to eight hours to

complete and upload the coding project and then they must record and upload a 10 to 15 minute video “exit interview”.

Prerequisites: There are no prerequisites for this Google developer certification, but candidates are required to be more than 13 years old and reside in a non-embargoed country.

Recommended experience: Google recommends that candidates have the coding proficiency of an entry-level Android developer.

GOOGLE DEVELOPER

Google Mobile Web Specialist Certification

The Google Mobile Web Specialist certification is designed for developers who create responsive and flexible web apps regardless of the platform. The certification exam is performance-based, which means candidates will have to demonstrate proficiency through a number of coding challenges. The certification exam tests the candidate’s ability to solve the following types of coding challenges:

- **Build a web app’s responsive layout and style appropriate to the user’s device using only HTML, CSS, and JavaScript**
- **Use JavaScript to set up reliable front-end networking protocols with appropriate error handling**

- **Use accessibility best practices to make web apps accessible to all users, including those with impairments**
- **Create web apps that are available offline and provide a consistent, native-app-like experience**
- **Audit an app’s performance to reduce page load times and maintain responsive user experiences**
- **Write unit tests that verify expected behaviors and diagnose common web-app problems**
- **Implement ES2015 syntax to perform common JavaScript tasks**
- **Design efficient and secure web forms with basic HTML**

Required exam: Earning the Google Mobile Web Specialist certification requires passing one exam — the Mobile Web Specialist exam. The Google Mobile Web Specialist Certification exam consists of a coding project and an exit interview (in English). Candidates have up to four hours to complete and upload the coding project and then they must record and upload a 10-minute video “exit interview”.

Prerequisites: There are no prerequisites for this Google developer certification, but candidates are required to be more than 13 years old and reside in a non-embargoed country.

Recommended experience: Google recommends that candidates be mobile web developers with at least three years of front-end web development experience, including Progressive Web Apps.

How Much Does It Cost to Get Google Certified?

The Google certification exam cost varies by level. The Google Cloud Certified Associate Cloud Engineer certification costs \$125. Each Google Cloud Certified Professional certification costs \$200. The G Suite Certification exam costs \$75 and the Google developer certification exams for Associate Android Developer and Mobile Web Specialist Certification each cost \$149.

Your total Google certification program cost will include costs for study materials and Google certification training courses that you take in preparation for taking the exam. Google provides many free exam preparation resources such as study guides, videos, and labs. However, you may incur costs for other study resources, so budget accordingly.

Google Recertification and Renewal

Because of the rate of technology change, Google certification programs — like most others nowadays — have expiration dates. While it may seem like a pain to have to recertify and renew your Google cloud certification or your Google developer certification, it does make sure that your credentials are current and valuable.

Google Cloud certifications are valid for two years from the date certified. All candidates must recertify in order to maintain their certification status. The Associate Android Developer and Mobile Web Specialist certifications expire 36 months from the date when candidates receive their digital badge. At or before expiration, candidates must complete the registration and certification process again in order to renew their certification.

Google Certification Salary and Career Information

Your Google Cloud experience and certification will be just one indicator of the value that you bring to the table. Other factors such as regional cost-of-living, industry, and company size will play a big part in how much a job will pay. A July 2019 search of the Indeed.com job search site for full-time jobs requiring Google Cloud showed more than 10,000 opportunities with annual salaries of \$75,000 and more than 8,000 with salaries over \$100,000.

Compensation data provider PayScale tracked salaries for employees with Google Cloud Platform expertise in the AppEngine and BigQuery products. These products are most closely related to the Google Professional Cloud Developer and Google Professional Data Engineer certifications. DevOps Engineers with Google AppEngine skills commanded average salaries

of \$75,000, while software engineers were averaging \$95,000 to \$105,000 depending on seniority. The average salary for professionals with Google BigQuery skills was \$108,000 — Data Engineers averaged \$95,000 and Architects \$99,000. With the current interest in data analytics and big data, the Google Professional Data Engineer certification looks like a good bet financially.

Google Certification Training

Good luck to you as you start on your Google certification path. Our course offerings do change from time-to-time as we support the Google certification

roadmap, so be sure to check CBT Nuggets for new and updated Google certification video training courses. All of our Google Cloud training contains built-in quizzes to help reinforce what you're learning, as you learn. A CBT Nuggets subscription also includes access to Virtual Labs, which are designed by our industry-expert trainers to help learners gain hands-on experience in sandbox environments.

Our subscriptions also provide access to practice exams, which provide a baseline for learners to test their knowledge. These practice exams help learners evaluate their strengths and weaknesses, so they can pinpoint areas to focus on when studying.



CBTnuggets

Open Source & Linux Certifications

You just name an enterprise systems area and there's probably a viable open source option available. With this rush to open source, it's no wonder that enterprises are looking to hire IT professionals with open source expertise. The Linux Foundation's 2018 Open Source Jobs Report noted that 87 percent of hiring managers reported having problems recruiting open source talent and that Linux was the highest demand open source skill. Such is the scarcity of qualified recruits, that companies are opting to retrain their own IT employees and pay for them to get certified.

With that in mind, CBT Nuggets has prepared this guide to the Linux open source software certification options available to IT professionals. This Linux Certification guide will focus on the major Linux certification paths.

- **LPI certifications**
- **Red Hat certifications**
- **The Linux Foundation certifications**
- **SUSE Linux certifications**
- **Oracle Linux certifications**

What is LPI Certification?

The Linux Professional Institute (LPI) is a non-profit organization that provides certification and career support for Linux open source professionals. LPI claims to be the largest provider of vendor-neutral Linux certification.

The LPI Linux certification path begins with their LPI Linux Essentials cert. Although it is not a prerequisite for any of the subsequent certifications, LPI Linux Essentials is suggested as the ideal entry-point to the Linux administration certification for sysadmins (LPIC-1: Linux Administrator) and engineers (LPIC-2: Linux Engineer).

For more experienced Linux Enterprise Professionals, LPI has three specialist certs:

- **LPIC-3 300: Linux Enterprise Professional - Mixed Environment**
- **LPIC-3 303: Linux Enterprise Professional - Security**
- **LPIC-3 304: Linux Enterprise Professional - Virtualization & High Availability**

LPI CERTIFICATION

Linux Essentials

LPI Linux Essentials is the LPI's foundational Linux certification designed for new IT professionals, or experienced professionals — developers, administrators, engineers — who want to establish foundational Linux skills.

The LPI Linux Essentials certification validates a candidate's understanding of these topics:

- **The most popular open source applications**
- **The major components of the Linux operating system**
- **Working on the Linux command line**
- **Linux security and administration**

Required exam: Earning the LPI Linux Essentials certification requires passing one exam — LPI Linux Essentials (LPI 010).

Prerequisites: None.

Required experience: LPIC recommends a basic understanding of the Linux operating system and comfort on the Linux command line.

LPI CERTIFICATION**LPIC-1 Certified Linux Administrator**

The LPIC-1 Certified Linux Administrator certification is designed for professionals such as sysadmins and network administrators who will be installing and configuring computers running Linux, setting up basic networking, and performing Linux maintenance tasks. The LPIC-1 certification validates a candidate's understanding of these topics and skills:

- The architecture of a Linux system
- Installing and maintaining a Linux workstation, including X11 and setting it up as a network client
- Working at the Linux command line, including common GNU and Unix commands
- Handling files and access permissions as well as system security
- Common maintenance tasks: helping users, adding users to a larger system, backup and restore, shutdown and reboot

Required exam: Earning the LPIC-1 Certified Linux Administrator certification requires passing two exams — LPIC-1 Exam 101 and LPIC-1 Exam 102.

Prerequisites: None.

Required experience: LPIC recommends hands-on experience installing and configuring computers running Linux.

LPI CERTIFICATION**LPIC-2 Certified Linux Engineer**

The LPIC-2 Certified Linux Engineer certification is designed for professionals such as sysadmins and network administrators who will be administering small-to-medium sized networks of systems running Linux and other operating systems. The LPIC-2 certification validates a candidate's ability to:

- Perform advanced system administration, including common tasks regarding the Linux kernel, system startup and maintenance
- Perform advanced management of block storage and file systems, as well as advanced networking and authentication and system security, including firewall and VPN
- Install and configure fundamental network services
- Supervise assistants and advise management on automation and purchases

Required exam: Earning the LPIC-2 Certified Linux Administrator certification requires passing two exams — LPIC-2 Exam 201 and LPIC-2 Exam 202.

Prerequisites: Candidates may take the exams in any order. However, LPIC requires that candidates have an active LPIC-1 certification before being LPIC-2 certified.

Required experience: LPIC recommends hands-on experience administering Linux and other operating systems.

LPIC-3 Certifications

LPIC 300-series certifications are a specialty tier meant for enterprise-level Linux professionals and LPI claims that it is the highest level of professional, distribution-independent Linux certification within the industry. There are three separate LPIC-3 specialty certifications available in this Linux certification tier:

- **LPIC-3 300: Linux Enterprise Professional Mixed Environment**
- **LPIC-3 303: Linux Enterprise Professional Security**
- **LPIC-3 304: Linux Enterprise Professional Virtualization and High Availability**

LPI CERTIFICATION

LPIC-3 300: Linux Enterprise Professional Mixed Environment

The LPIC-3: Linux Enterprise Professional Mixed Environment certification is the third-tier of LPI's multi-level Linux professional certification program. The LPIC-3 Exam 300 certification validates a candidate's understanding of these topics:

- **OpenLDAP configuration**
- **OpenLDAP as an authentication backend**
- **Samba basics**
- **Samba Share configuration**
- **Samba user and group management**
- **Samba domain integration**
- **Samba Name Services**
- **Working with Linux and Windows clients**

Required exam: Earning the LPIC-3: Linux Enterprise Professional Mixed Environment certification requires passing one exam — LPIC-3 Exam 300: Mixed Environment.

Prerequisites: Candidates may take the exams in any order. However, LPIC requires candidates to have an active LPIC-2 certification before they can become LPIC-3 certified in any of the three specialties.

Required experience: LPIC recommends hands-on experience administering enterprise-wide networks of systems running Linux and other operating systems.

LPI CERTIFICATION

LPIC-3 303: Linux Enterprise Professional Security

The LPIC-3 303: Linux Enterprise Professional Security is designed for enterprise-level Linux professionals who will be administering and securing enterprise-wide networks of systems running Linux and other operating systems. The LPIC-3 Exam 303 certification validates a candidate's understanding of these topics:

- **Cryptography**
- **Access control**
- **Application security**
- **Operations security**
- **Network security**

Required exam: Earning the LPIC-3: Linux Enterprise Professional Security certification requires passing one exam — LPIC-3 Exam 303: Security.

Prerequisites: Candidates may take the exams in any order. However, LPIC requires candidates to have an active LPIC-2 certification before they can become LPIC-3 certified in any of the three specialties.

Required experience: LPIC recommends hands-on experience securing and hardening enterprise-wide systems of Linux-based servers and services and networks.

LPI CERTIFICATION

LPIC-3 304: Linux Enterprise Professional Virtualization and High Availability

The LPIC-3 304: Linux Enterprise Professional Virtualization and High Availability cert is designed for enterprise-level Linux professionals who will be administering enterprise-wide high-availability networks of virtualized systems running Linux and other operating systems. The LPIC-3 Exam 304 certification validates a candidate's understanding of these topics:

- **Virtualization**
- **High-Availability Cluster management**
- **High-Availability Cluster storage**

Required exam: Earning the LPIC-3: Linux Enterprise Professional Virtualization and High Availability certification requires passing one exam — LPIC-3 Exam 304: Virtualization.

Prerequisites: Candidates may take the exams in any order. However, LPIC requires candidates to have an active LPIC-2 certification before they can become LPIC-3 certified in any of the three specialties.

Required experience: LPIC recommends hands-on experience planning and implementing enterprise-wide virtualization and high-availability setups using Linux-based technologies.

LPI CERTIFICATION**LPI DevOps Tools Engineer**

The LPI DevOps Tools Engineer certification is designed for IT professionals who are involved in applying DevOps practices to reduce delivery time and improve quality in the development of new software. The certification focuses on the practical skills required to work in a DevOps environment and use leading DevOps tools. This is arguably more an open source software certification rather than a Linux certification.

The LPI DevOps Tools Engineer certification validates a candidate's understanding of these topics and technologies:

- **Software engineering and architecture**
- **Container and machine deployment**
- **Configuration management and monitoring**
- **Utilities such as Docker, Vagrant, Ansible, Puppet, Git, and Jenkins**

Required exam: Earning the LPI DevOps Tools Engineer certification requires passing one exam — LPI Exam 701: DevOps Tools Engineer.

Prerequisites: None.

Required experience: LPIC recommends hands-on experience with a variety of open source tools and technologies widely used in DevOps, such as OpenStack, containers, and Kubernetes.

Red Hat Certification

Red Hat Enterprise Linux competes with Microsoft's Windows as the server operating system of choice. According to a recent IDC report, Red Hat Enterprise Linux had over 30 percent of the worldwide market share for server operating systems — trailing only Windows which had about 50 percent. IDC reported that Red Hat's share was growing at nearly 20 percent annually, while Microsoft's share was falling by 3 percent year-over-year. This means that enterprises are really interested in IT professionals with specific Red Hat Linux certification. Red Hat's recent acquisition by IBM is probably going to add to this interest.

Red Hat certification for Linux is a multi-level program with certs for sysadmins, engineers, and architects.

Red Hat offers three certifications:

- **Red Hat Certified System Administrator (RHCSA)**
- **Red Hat Certified Engineer (RHCE)**
- **Red Hat Certified Architect (RHCA)**

RED HAT CERTIFICATION

Red Hat Certified System Administrator (RHCSA)

The Red Hat Certified System Administrator (RHCSA) certification is designed for sysadmins who are new to Linux, as well as experienced Linux administrators or senior UNIX admins. This certification validates a candidate's ability to:

- **Use essential tools for handling files, directories, and command-line environments**
- **Operate running systems**
- **Configure local storage using partitions and logical volumes**
- **Create and configure file systems and file system attributes**
- **Deploy, configure, and maintain systems**
- **Manage users and groups**
- **Manage security, including basic firewall and SELinux configuration**

Required exam: Earning the RHCSA certification requires passing one exam — Red Hat Certified System Administrator (EX200).

Prerequisites: None.

Required experience: Red Hat recommends that candidates should have work experience as a system administrator on Red Hat Enterprise Linux, or have taken two related courses — Red Hat System Administration I (RH124) and Red Hat System Administration II (RH134).

RED HAT CERTIFICATION**Red Hat Certified Engineer (RHCE)**

The Red Hat Certified Engineer (RHCE) is designed for certified RHCSAs who will be involved in automating Red Hat Enterprise Linux tasks, integrating Red Hat emerging technologies, and applying automation for efficiency and innovation.

In 2019, Red Hat announced a new Red Hat certification path that places increased emphasis on automation skills associated with the recently announced Red Hat Enterprise Linux 8. Candidates for the Red Hat Certified Engineer (RHCE) can choose from one of two paths:

- **Legacy Red Hat Enterprise Linux 7**
- **New Red Hat Enterprise Linux 8**

RED HAT CERTIFICATION**Enterprise Linux 7 Track**

The RHCE: Legacy Red Hat Enterprise Linux 7 certification places more emphasis on network services skills than the new Linux 8 track. The RHCE certification validates a candidate's ability to:

- **Handle all responsibilities expected of a Red Hat Certified System Administrator**
- **Accomplish without assistance a range of tasks related to configuration and management of System, network, and database services on Red Hat Enterprise Linux 7**

Required exam: Earning the RHCE: Legacy Red Hat Enterprise Linux 7 certification requires passing one exam — Red Hat Certified Engineer (EX300).

Prerequisites: Prior to attempting this certification, candidates must earn the RHCSA.

Required experience: Red Hat recommends that candidates should have work experience as a system administrator on Red Hat Enterprise Linux.

RED HAT CERTIFICATION**Enterprise Linux 8 Track**

This RHCE: Red Hat Enterprise Linux 8 certification is focused on the automation of Linux system administration tasks using Ansible and shell scripting. The RHCE certification validates a candidate's ability to:

- **Handle all responsibilities expected of a Red Hat Certified System Administrator**
- Understand core components of Ansible
- Install and configure an Ansible control node
- Configure Ansible managed nodes
- Script administration tasks
- Create and use static inventories to define groups of hosts
- Use Ansible modules for system administration tasks

Required exam: Earning the RHCE: Red Hat Enterprise Linux 8 certification requires passing one exam — Red Hat Certified Engineer (EX294).

Prerequisites: Prior to attempting this certification, candidates must earn the RHCSA.

Required experience: Red Hat recommends that candidates should have work experience as a Red Hat Enterprise Linux system administrator or DevOps professional.

RED HAT CERTIFICATION**Certified Enterprise Microservices Developer (RHCEMD)**

The Red Hat Certified Enterprise Microservices Developer (RHCEMD) certification is designed for Java developers who want to further their ability to develop applications in a microservice-style environment. The RHCEMD certification validates a candidate's ability to:

- **Separate execution logic from business logic using Microprofile Fault Tolerance**
- **Probe the state of a computing node from another machine using MicroProfile Health Check**
- **Export monitoring data to management agents using Microprofile Metrics**
- **Understand and apply MicroProfile Interoperable JWT RBAC: OpenID Connect (OIDC)-based JSON Web Tokens (JWTs) for role-based access control (RBAC) of microservice endpoints**

Required exam: Earning the RHCEMD certification requires passing two exams — Red Hat Certified Enterprise Application Developer exam (EX183) and Red Hat Certified Enterprise Microservices Developer exam (EX283).

Prerequisites: None.

Required experience: Red Hat recommends that candidates should have considerable experience developing enterprise Java applications in a microservice environment.

RED HAT CERTIFICATION

Certified Architect in Infrastructure (RHCA)

The Red Hat Certified Architect in Infrastructure (RHCA) certification is designed for Red Hat Certified Engineers (RHCEs) who want to demonstrate greater depth and breadth of knowledge and skills in Red Hat Enterprise Linux and other Red Hat products.

Required exams: Earning the RHCA in Infrastructure certification requires passing five exams from the RHCA in Infrastructure list. Each of these exams also earns the candidate a certification.

While candidates are free to choose any five exams from the list, Red Hat has also organized these exams into four role-related programs:

OPEN HYBRID CLOUD PROGRAM

- Red Hat Certified Specialist in Hybrid Cloud Management (EX220)
- Red Hat Certified Specialist in Gluster Storage Administration (EX236)
- Red Hat Certified Specialist in Virtualization (EX318)
- Red Hat Certified Specialist in OpenShift Administration (EX280)
- Red Hat Certified Engineer in Red Hat OpenStack (EX310)
- Red Hat Certified Specialist in Deployment and Systems Management (EX403)

DEVOPS, CONTAINERS AND OPENSIFT PROGRAM

- Red Hat Certified Specialist in OpenShift Administration (EX280)
- Red Hat Certified Specialist in Ansible Automation (EX407)
- Red Hat Certified Specialist in Configuration Management (EX405)
- Red Hat Certified Specialist in Advanced Automation: Ansible Best Practices (EX447)
- Red Hat Certified Specialist in API Management (EX240)

TELCO CLOUD PROGRAM

- Red Hat Certified System Administrator in Red Hat OpenStack (EX210)
- Red Hat Certified Engineer in Red Hat OpenStack (EX310)
- Red Hat Certified Specialist in Ceph Storage Administration (EX125)
- Red Hat Certified Specialist in Ansible Automation (EX407)
- Red Hat Certified Specialist in Configuration Management (EX405)
- Red Hat Certified Specialist in Advanced Automation: Ansible Best Practices (EX447)

LINUX MASTERY PROGRAM

- Red Hat Certified Specialist in Linux Diagnostics and Troubleshooting (EX342)
- Red Hat Certified Specialist in Linux Performance Tuning (EX442)
-

- **Red Hat Certified Specialist in Server Security and Hardening (EX413)**
- **Red Hat Certified Specialist in Identity Management exam (EX362)**
- **Red Hat Certified Specialist in High Availability Clustering (EX436)**
- **Red Hat Certified Specialist in Deployment and Systems Management (EX403)**
- **Red Hat Certified Specialist in Advanced Automation: Ansible Best Practices (EX447)**

Prerequisites: Prior to attempting this certification, candidates must earn the Red Hat Certified Engineer (RHCE) certification.

Required experience: Red Hat recommends that candidates should have considerable experience with the networking, development, and the Red Hat products listed in the individual exam objectives.

RED HAT CERTIFICATION

Certified Architect in Enterprise Applications (RHCA)

The Red Hat Certified Architect in Enterprise Applications (RHCA) certification is designed for Red Hat Certified Engineers (RHCEMDs) and RHCJDs (now a retired certification) who want to demonstrate greater depth and breadth of knowledge in Red Hat middleware and applications.

Required exams: Earning the RHCA in Enterprise Applications certification requires passing five exams from the RHCA in Enterprise Applications list. Each of these exams also earn the candidate a certification.

While candidates are free to choose any five exams from the list, Red Hat has also organized these exams into one set of recommended exams and three role-related programs:

RECOMMENDED EXAMS

- **Red Hat Certified Specialist in OpenShift Application Development exam (EX288)**
- **Red Hat Certified JBoss Administrator (EX248)**

APPLICATION ACCELERATION AND INTEGRATION

- **Red Hat Certified Specialist in Fast-Cache Application Development (EX453)**
- **Red Hat Certified Specialist in Camel Development (EX421)**
- **Red Hat Certified Specialist in Messaging Administration (EX440)**

APPLICATION AUTOMATION

- **Red Hat Certified Specialist in Business Process Design (EX427)**
- **Red Hat Certified Specialist in Business Rules (EX465)**

DEVOPS, CONTAINERS, AND OPENSIFT

- Red Hat Certified Specialist in Ansible Automation (EX407)
- Red Hat Certified Specialist in Configuration Management (EX405)
- Red Hat Certified Specialist in API Management (EX240)

Prerequisites: Prior to attempting this certification, candidates must earn the Red Hat Certified Engineer (RHCE) certification.

Required experience: Red Hat recommends that candidates should have considerable experience with the networking, development, and Red Hat products supported by the exam.

RED HAT CERTIFICATION

RHCA Level II Designation

Acquiring five credentials from the list of RCHA exams allow candidates with a current RHCE to become a Red Hat Certified Architect – Level I. Earning six or more credentials earns the candidate the RHCA – Level II designation. The appropriate number of certifications must remain current in order to maintain the relevant RHCA status level.

The Linux Foundation

The Linux Foundation is the organization that hosts the core Linux kernel development project with Linux creator Linus Torvalds. As part of their mission to promote open source, they have created a number of Linux certification and open source certification credentials. The Linux Foundation offers seven certifications:

- **Linux Foundation Certified System Administrator (LFCS)**
- **Linux Foundation Certified Engineer (LFCE)**
- **Cloud Foundry Certified Developer (CFCD)**
- **Certified Kubernetes Administrator (CKA)**
- **Certified Kubernetes Application Developer (CKAD)**
- **Certified Hyperledger Sawtooth Administrator (CHSA)**
- **Certified Hyperledger Fabric Administrator (CHFA)**

LINUX CERTIFICATION

Foundation Certified System Administrator (LFCS)

The Linux Foundation Certified System Administrator (LFCS) is designed for aspiring or entry-level IT professionals. The LFCS certification validates a candidate's understanding of these topics and skills:

- **Essential commands**
- **Operation of running systems**
- **User and group management**
- **Networking**
- **Service configuration**
- **Storage management**

Required exams: Earning the Linux Foundation Certified System Administrator (LFCS) certification requires passing one exam — the LFCS exam.

Prerequisites: None.

Required experience: While the Linux Foundation does not specify qualifications for this certification, the LFCS is a performance-based exam, which means candidates will need to solve problems on the command line.

LINUX CERTIFICATION**Foundation Certified Engineer (LFCE)**

The Linux Foundation Certified Engineer (LFCE) is designed for Linux engineers looking to demonstrate a higher level of skill. The LFCE certification validates a candidate's understanding of these topics and skills:

- Essential commands
- Operation of running systems
- User and group management
- Networking
- Service configuration
- Storage management
- System design and deployment

Required exams: Earning the Linux Foundation Certified Engineer (LFCE) certification requires passing one exam — the LFCE exam.

Prerequisites: None.

Required experience: The Linux Foundation recommends three to five years of hands-on experience with Linux prior to attempting this certification.

LINUX CERTIFICATION**Cloud Foundry Certified Developer (CFCD)**

The Cloud Foundry Certified Developer (CFCD) is designed for IT professionals developing applications on the Cloud Foundry platform. The CFCD certification validates a candidate's understanding of these topics and skills:

- Cloud Foundry basics
- Cloud-native architectural principles
- Troubleshooting applications on Cloud Foundry
- Cloud-native application security
- Working with services in Cloud Foundry
- Application management on Cloud Foundry
- Container management within Cloud Foundry

Required exams: Earning the Cloud Foundry Certified Developer (CFCD) certification requires passing one exam — the CFCD exam.

Prerequisites: None.

Required experience: The Linux Foundation recommends hands-on experience with a programming language such as Python, Node.js, or Ruby.

LINUX CERTIFICATION

Certified Kubernetes Administrator (CKA)

The Certified Kubernetes Administrator (CKA) is designed for IT professionals administering Kubernetes. The CKA certification validates a candidate's understanding of these topics and skills:

- Application lifecycle management
- Installation, configuration, and validation
- Core Kubernetes concepts
- Networking
- Scheduling
- Security
- Cluster maintenance
- Logging and monitoring
- Storage
- Troubleshooting

Required exams: Earning the Certified Kubernetes Administrator (CKA) certification requires passing one exam — the CKA exam.

Prerequisites: None.

Required experience: While the Linux Foundation does not specify qualifications for this certification, the CKA is a performance-based exam, which means candidates will need to solve problems on the command line.

LINUX CERTIFICATION

Certified Kubernetes Application Developer (CKAD)

The Certified Kubernetes Application Developer (CKAD) is designed for IT professionals building, configuring, and exposing cloud native applications for Kubernetes. The CKAD certification validates a candidate's understanding of these topics and skills:

- Core concepts
- Configuration
- Multi-container pods
- Observability
- Pod design
- Services and networking
- State persistence

Required exams: Earning the Certified Kubernetes Application Developer (CKAD) certification requires passing one exam — the CKAD exam.

Prerequisites: None.

Required experience: The Linux Foundation recommends hands-on experience with Docker or rkt, and a programming language such as Python, Node.js, Go, or Java. Additionally, CKAD candidates should be comfortable with cloud concepts and architectures.

LINUX CERTIFICATION

Certified Hyperledger Sawtooth Administrator (CHSA)

The Certified Hyperledger Sawtooth Administrator (CHSA) is designed for IT professionals building Hyperledger Sawtooth networks for commercial deployment. The CHFA certification validates a candidate's understanding of these topics and skills:

- Installing Sawtooth
- Configuring Sawtooth
- Permissioning, identity management, and security
- Sawtooth Lifecycle
- Troubleshooting the Hyperledge environment

Required exams: Earning the Certified Hyperledger Sawtooth Administrator (CHSA) certification requires passing one exam — the CHSA exam.

Prerequisites: None.

Required experience: While the Linux Foundation does not specify qualifications for this certification, the CHSA is a performance-based exam, which means candidates will need to solve problems on the command line.

LINUX CERTIFICATION

Certified Hyperledger Fabric Administrator (CHFA)

The Certified Hyperledger Fabric Administrator (CHFA) is designed for IT professionals deploying and operating a Hyperledger Fabric network through the command line. The CHFA certification validates a candidate's understanding of these topics and skills:

- Application lifecycle management
- Install and configure network
- Diagnostics and troubleshooting
- Membership service provider
- Network maintenance and operations

Required exams: Earning the Certified Hyperledger Fabric Administrator (CHFA) certification requires passing one exam — the CHFA exam.

Prerequisites: None.

Required experience: While the Linux Foundation does not specify qualifications for this certification, the CHFA is a performance-based exam, which means candidates will need to solve problems on the command line.

SUSE Linux Certifications

Though not a market leader, the SUSE Linux Enterprise Server (SLES) is nevertheless a popular Linux distribution. The SUSE has a multi-level Linux certification program, which covers their base Enterprise Linux, OpenStack Cloud, Enterprise Storage, and Systems Management product sets.

SUSE offers three levels of certification:

- **SUSE Administrator (Level 1)**
- **SUSE Engineer (Level 2)**
- **SUSE Architect (Level 3)**

SUSE Administrator (Level 1) Certifications

The SUSE Level 1 certifications have two divergent paths: Enterprise Linux 15 and Enterprise Linux 12. With the release of the SCA in Enterprise Linux 15 certification, SUSE now has parallel tracks for the Linux 12 and Linux 15 certifications. Linux 12 remains a prerequisite for some SCA+ and SCE certifications. However, SCA in Enterprise Linux 15 is a prerequisite for Linux 15 SCA+ and SCE certifications. In 2018, SUSE released an upgrade certification to bridge the gap between the two tracks.

SUSE offers six Administrator certifications:

- **SUSE Certified Administrator (SCA)**
in Enterprise Linux
- **SCA+ in SUSE Linux Enterprise High Availability**
- **SCA+ in SUSE Linux Enterprise Server 12**
for SAP Applications
- **SUSE Certified Administrator (SCA)**
in OpenStack Cloud
- **SUSE Certified Administrator (SCA)**
in Enterprise Storage
- **SUSE Certified Administrator (SCA)**
in Systems Management

SUSE ADMINISTRATOR CERTIFICATION**SUSE Certified Administrator (SCA)
in Enterprise Linux 12**

The SUSE Certified Administrator (SCA) in Enterprise Linux 12 is designed for IT professionals who have experience with SUSE Linux products. The SCA in Enterprise Linux certification validates a candidate's understanding of these topics and skills:

- SUSE Linux Enterprise
- Linux filesystem
- Work with the command line
- Vim Editor basics
- Remote administration
- System initialization
- Process management
- Identity and security
- Software management
- Network management
- Storage management
- Administration and monitoring
- Installing SUSE Linux Enterprise

Required exams: Earning the SUSE Certified Administrator (SCA) in Enterprise Linux 12 certification requires passing one exam — SCA Exam 050-747.

Prerequisites: None.

Required experience: While SUSE does not specify qualifications for this certification, SCA was designed for professionals with hands-on experience with SUSE Linux Enterprise.

SUSE ADMINISTRATOR CERTIFICATION**SUSE Certified Administrator (SCA)
in Enterprise Linux 15**

The SUSE Certified Administrator (SCA) in Enterprise Linux 15 is designed for IT professionals who have experience with SUSE Linux products. The SCA in Enterprise Linux certification validates a candidate's understanding of these topics and skills:

- SUSE Linux Enterprise
- Linux filesystem
- Work with the command line
- Vim Editor basics
- Remote administration
- System initialization
- Process management
- Identity and security
- Software management
- Network management
- Storage management
- Administration and monitoring
- Installing SUSE Linux Enterprise

Required exams: Earning the SUSE Certified Administrator (SCA) in Enterprise Linux 15 certification requires passing one exam — SCA Exam 050-754.

Prerequisites: None.

Required experience: While SUSE does not specify qualifications for this certification, SCA was designed for professionals with hands-on experience with SUSE Linux Enterprise.

SUSE ADMINISTRATOR CERTIFICATION**SUSE Certified Administrator (SCA+) in High Availability**

The SUSE Certified Administrator (SCA+) in High Availability is designed for IT professionals who have experience with SUSE Linux products. The SCA in Enterprise Linux certification validates a candidate's understanding of these topics and skills:

- HA architecture
- HA in the public cloud
- Cluster implementation requirements
- Cluster node preparation
- Deploy a cluster
- Administer the HA cluster
- Split brain avoidance
- Cluster resources
- Controlling cluster behavior using constraints
- Cluster managed storage
- Access control lists

Required exams: Earning the SUSE Certified Administrator (SCA+) in High Availability certification requires passing one exam — SCA+ Exam 050-757.

Prerequisites: While candidates may take the exam, candidates must earn one of two certifications — SCA or SCE in Enterprise Linux 12 or 15.

Required experience: While SUSE does not specify qualifications for this certification, SCA was designed for professionals with hands-on experience with SUSE Linux Enterprise.

SUSE ADMINISTRATOR CERTIFICATION**SUSE Certified Administrator (SCA+) in Server 12 for SAP Applications**

The SUSE Certified Administrator (SCA+) in Server 12 for SAP Applications is designed for IT professionals who have experience with SUSE Linux products. The SCA in Enterprise Linux certification validates a candidate's understanding of these topics and skills:

- SLES for SAP applications life cycle
- SLES priority support for SAP applications
- SUSE Connect program
- Installation media and software channels
- SAP certified hardware
- SLES for SAP installation workflow
- Required installation parameters
- Software patterns
- Networking
- Kernel settings and tuning
- YaST SAP installation wizard

Required exams: Earning this certification requires passing one exam — SCA Exam 050-748.

Prerequisites: Candidates must earn the SCA in Enterprise Linux 12 before earning this certification. This certification is only available on the Server 12 track.

Required experience: While SUSE does not specify qualifications for this certification, SCA was designed for professionals with hands-on experience with SUSE Linux Enterprise.

SUSE ADMINISTRATOR CERTIFICATION**SUSE Certified Administrator (SCA)
in Enterprise Storage**

The SUSE Certified Administrator (SCA) in Enterprise Storage is designed for IT professionals who have experience with SUSE Linux products. The SCA in Enterprise Linux certification validates a candidate's understanding of these topics and skills:

- SUSE Enterprise Storage 5
- OpenATTIC management console
- Block storage in SES 5 with rbd
- Object Storage Gateway (RADOS-GW)
- Ceph Object Gateway
- Installation of the Object Storage Gateway
- CephFS
- iSCSI with lrbid
- NFS-Ganesha
- Configuring openATTIC
- Using openATTIC to monitor SES

Required exams: Earning the SUSE Certified Administrator (SCA) in Enterprise Storage certification requires passing one exam — SCA Exam 050-751.

Prerequisites: None.

Required experience: While SUSE does not specify qualifications for this certification, SCA was designed for professionals with hands-on experience with SUSE Linux Enterprise storage solutions.

SUSE ADMINISTRATOR CERTIFICATION**SUSE Certified Administrator (SCA)
in Systems Management**

The SUSE Certified Administrator (SCA) in Systems Management is designed for IT professionals who have experience with SUSE Linux system management products. This certification validates a candidate's understanding of these topics and skills:

- SUSE Manager and Spacewalk
- SUSE Manager and Salt
- SUSE Manager Architecture and Components
- Installation process
- Initial configuration
- Organization and SUSE Manager configuration
- SUSE channel configuration
- SUSE Manager web UI features
- The first administrative user
- Delegation of administration
- PAM authentication

Required exams: Earning the SUSE Certified Administrator (SCA) in Systems Management certification requires passing one exam — SCA Exam 050-742.

Prerequisites: None.

Required experience: While SUSE does not specify qualifications for this certification, SCA was designed for professionals with hands-on experience with SUSE Linux Enterprise systems management.

SUSE Engineer (Level 2) Certifications

The second level of SUSE Linux certification is the SUSE Certified Engineer (SCE). Again, there are variants for the SUSE product sets. The SUSE Linux certification path requires that an SCE also hold a valid SCA for the product track. So, for example, a candidate for SCE in Enterprise Linux must possess a valid SCA in Enterprise Linux in order to receive the SCE cert.

SUSE offers four Engineer certifications:

- **SUSE Certified Engineer (SCE) in Enterprise Linux**
- **SUSE Certified Engineer (SCE) in OpenStack Cloud**
- **SUSE Certified Engineer (SCE) in Enterprise Storage**
- **SUSE Certified Engineer (SCE) in Systems Management**

SUSE ENGINEER CERTIFICATION

SUSE Certified Engineer (SCE) in Enterprise Linux

The SUSE Certified Engineer (SCE) in Enterprise Linux is designed for IT professionals who have experience with SUSE Linux system management products.

The Systems Management certification validates a candidate's understanding of these topics and skills:

- **Advanced system administration**
- **Encryption**
- **Shell scripting**
- **Hardware**
- **Advanced networking**
- **Storage administration**
- **Centralized authentication**
- **Advanced deployment**
- **Configuration management**
- **Packaging and updates**

Required exams: Earning the SUSE Certified Engineer (SCE) in Enterprise Linux certification requires passing one exam — the Enterprise Linux 12 practicum.

Prerequisites: While candidates may take the exam at any time, candidates must pass the SCA in Enterprise Linux 15 exam before earning this certification.

Required experience: While SUSE does not specify qualifications for this certification, SCA was designed for professionals with hands-on experience with SUSE Linux Enterprise systems.

SUSE ENGINEER CERTIFICATION**SUSE Certified Engineer (SCE)
in OpenStack Cloud**

The SUSE Certified Engineer (SCE) in OpenStack Cloud is designed for IT professionals who have experience with SUSE Linux OpenStack products. The OpenStack certification validates a candidate's understanding of these topics and skills:

- Plan for an OpenStack cloud deployment
- Fundamentals of networking in the modern datacenter
- Overview of the OSI Model
- Introduction to Crowbar
- Install and configure the Admin Node
- Deploy a Highly Available SUSE OpenStack Cloud
- Understand Admin node backups

Required exams: Earning the SUSE Certified Engineer (SCE) in OpenStack Cloud certification requires passing one exam — SCE Exam 050-746.

Prerequisites: While candidates may take the exam at any time, candidates must pass the SCA in OpenStack Cloud exam before earning this certification.

Required experience: While SUSE does not specify qualifications for this certification, SCA was designed for professionals with hands-on experience with SUSE products, and advanced networking topics.

SUSE ENGINEER CERTIFICATION**SUSE Certified Engineer (SCA)
in Enterprise Storage**

The SUSE Certified Engineer (SCA) in Enterprise Storage is designed for IT professionals who have experience with SUSE storage products. The storage certification validates a candidate's understanding of these topics and skills:

- Understand how to shutdown a cluster
- Use Deepsea to deploy BlueStore in single and multiple device configurations
- Plan, define, and implement CRUSH Maps and CRUSH Map Rules
- Add Storage capacity using Deepsea to add additional nodes and OSDs
- Configure authentication using cephx and manage user capabilities
- Plan High Availability for SES components
- Manage the Admin node

Required exams: Earning the SUSE Certified Engineer (SCA) in Enterprise Storage certification requires passing one exam — SCE Exam 050-752.

Prerequisites: While candidates may take the exam at any time, candidates must pass the SCA in Enterprise Storage exam before earning this certification.

Required experience: While SUSE does not specify qualifications for this certification, SCA was designed for professionals with hands-on experience with SUSE enterprise storage solutions.

SUSE ARCHITECT CERTIFICATION

SUSE Architect (Level 3) Certification

The SUSE Certified Engineer (SEA) in Enterprise Storage is designed for IT professionals who have experience broad experience all SUSE products.

Required exams: Earning the SUSE Certified Engineer (SEA) in Enterprise Storage certification requires passing at least six exams:

- **Three Administrator certifications**
- **Two Engineer certifications, which require Administrator certifications in the same track**
- **One elective certification from any track**

Prerequisites: Candidates attempting the SEA certification should refer to the individual Administrative and Engineer level certifications to determine prerequisites.

Required experience: While SUSE does not specify qualifications for this certification, SCA was designed for professionals with extensive hands-on experience with SUSE products.

Oracle Linux Certification

Oracle has a two-level Linux certification path for systems administrators, as well as a stand-alone Oracle Linux certification for implementation specialists who work for Oracle Linux solution providers. Oracle offers three Linux certifications:

- Oracle Certified Associate, Linux 5 and 6
- Oracle Certified Professional, Oracle Linux 6
- Oracle Linux 6 Certified Implementation Specialist

ORACLE LINUX CERTIFICATION

Oracle Certified Associate, Linux 5 and 6

The Oracle Certified Associate, Oracle Linux 5 and 6 System Administrator certification is designed for IT professionals who administer the Oracle Linux operating system. The OCA: Linux 5 and 6 certification validates a candidate knows how to:

- Install Oracle Linux
- Understand system configuration options
- Manage Ksplice
- Manage system logging
- Manage users and groups
- Manage storage devices
- Manage file sharing
- Manage Linux security
- Use OpenSSH
- Manage network configuration

Required exams: Earning this Oracle Certified Associate certification requires passing one exam — Oracle Linux 5 and 6 System Administrator (1Z0-100).

Prerequisites: None.

Required experience: While Oracle does not specify qualifications for this certification, the OCA: Linux 5 and 6 was designed for professionals with hands-on experience with both Linux and Oracle systems, specifically the Oracle Linux operating system.

ORACLE LINUX CERTIFICATION**Oracle Certified Professional,
Oracle Linux 6**

The Oracle Certified Professional, Oracle Linux 6 System Administrator certification is designed for IT professionals who administer the Oracle Linux operating system. The OCP: Linux 6 certification validates a wide range of Linux and Oracle topics and skills, including:

- Btrfs file system
- Linux Containers (LXC)
- Oracle Cluster File System 2
- Core dump analysis
- Configuring and maintaining BIND
- Virtualization with Linux
- XFS for Oracle File System
- Managing SELinux
- Dynamic Tracing with Dtrace
- Control groups (cgroups)
- Managing web and email services

Required exams: Earning this Oracle Certified Professional certification requires passing one exam — Oracle Linux 6 Advanced System Administration (1Z0-105).

Prerequisites: None.

Required experience: While Oracle does not specify qualifications for this certification, the OCP: Linux 6 was designed for professionals with hands-on experience with the Oracle Linux operating system.

ORACLE LINUX CERTIFICATION**Oracle Linux 6 Certified
Implementation Specialist**

The Oracle Linux 6 Certified Implementation Specialist certification is designed for IT and business professionals who sell and implement the Oracle Linux operating system. The Linux 6 Certified Specialist certification validates a wide range of Linux and Oracle topics and skills, including:

- Linux boot process
- Oracle Linux package management
- Automate tasks and system logging
- Oracle Linux file systems and storage administration
- Basic security administration
- Installing Oracle Linux 6
- Oracle Linux system configuration and process management
- Ksplice Zero downtime updates
- Oracle Linux System monitoring and troubleshooting

Required exams: Earning this Oracle Certified Professional certification requires passing one exam — Oracle Linux 6 Implementation Essentials (1Z0-460).

Prerequisites: None.

Required experience: Oracle recommends hands-on experience in the field installing and configuring Oracle Linux-based systems prior to taking this certification exam.

Open Source Recertification and Renewal

The Linux certifications we have discussed have a variety of “sell-by-dates.” Let’s take a look at some of the “rules-of-the-road” for recertification and renewal.

Linux Professional Institute (LPI) Recertification and Renewal

Linux Professional Institute (LPI) certs are each valid for five years from passing the exams for the highest level certification held. In order to retain an ACTIVE LPI certification status, a cert holder is required to recertify within five years of the certification designation.

For example, LPIC-2 holders need only pass (within five years) the relevant current LPIC-2 exams to keep both their LPIC-1 and LPIC-2 credentials valid. If a holder does not renew their credentials with the five-year window, then their certifications will become INACTIVE. At that point, they will need to retake and pass the LPIC exams for ALL of their certs.

LPIC certifications can be verified on-line at the LPI Certification Verification page, using the holder’s LPI ID and their certification’s verification code. The holder can retrieve the verification code by logging on to their LPI Profile page.

Red Hat Certification

A Red Hat certification does not expire, but it can become “non-current.” This is because as the technology changes, the content of the original certification does too, therefore the cert itself can become outdated.

All Red Hat certifications are current for three years, by which time you can renew them by gaining a higher level certification, or by simply passing the current version of the original Red Hat certification exam. For the Red Hat Certified Architect (RHCA) certification, holders must keep their Red Hat Certified Engineer (RHCE) current, as well as maintain current certs in five or more of the eligible certifications from the Red Hat system administrator list.

CompTIA Linux+ Certification

The CompTIA Linux+ certification expires three years from the date of original certification and must be renewed before its expiration date. CompTIA recertification and renewal comes under the auspices of the CompTIA Continuing Education (CE) program and holders must be enrolled in that program to renew their CompTIA Linux+ certification.

Open Source Certification Salary and Career Information

There is a strong demand for IT professionals with Linux and other open source skills. A 2018 open source job report said that 87 percent of hiring managers were having trouble finding open source talent and that 80 percent of hiring managers were looking for professionals with Linux skills.

Let's consider what a salary an IT professional could command with an equivalent Microsoft certification. We looked at data collected by the compensation data provider PayScale for the Microsoft Certified Systems Administrator (MCSA), which is roughly equivalent to early-career Linux admin certifications. The average salary for IT professionals holding an MCSA was \$73,000, with systems admins averaging \$65,000 and senior sysadmins earning \$83,000.

Compare this to salaries for Linux Systems Administrators holding the CompTIA Linux+ cert. The average salary for all jobs was \$70,000, but dedicated Linux admin salaries were averaging up to \$74,000. Salaries for holders of the LPI Linux Certification - Level 1 were similar, with an average of \$73,000 for all jobs and senior systems admins averaging \$86,000.

The entry -level Red Hat Linux certification are an entirely different story. Employers pay an average of \$84,000 to people who are certified as a Red Hat Certified System Administrator (RHCSA). Linux sysadmins averaged nearly \$74,000 and senior systems admins averaged a shade under \$100,000. Clearly, there's a high "willingness to pay" for people who hold a Red Hat admin cert.

Stepping up a level, the average salary for the Linux Professional Institute Certification 2 (LPIC-2) was \$76,000, with Linux System Administrators averaging \$85,000. At the second tier of the Red Hat Linux certification path, the average salary for Red Hat Certified Engineers (RHCE) was \$98,000, with salaries for Linux system administrators reported as high as \$112,000 and as high as \$121,000 for senior systems admins.

There appears to be a higher willingness to pay for people with the vendor-specific Red Hat certs, compared with the vendor-neutral CompTIA and LPI Linux certifications. Clearly, there must be some element of supply and demand that drives up Red Hat certification salaries, but a look at PayScale's list of most common employers for people holding the certs, may give us an additional clue. The top employers for RHCEs were all leading high tech vendors — Rackspace, Cisco, Dell, Apple, Google, Intel, and Red Hat themselves. By contrast, the top employers for CompTIA Linux+ certified people are systems integrators and defense contractors like General

Dynamics, Leidos, and Raytheon, whose expenditures are constrained by the terms of the government contracts that they are servicing.

Clearly, a Linux certification will be just one component in the determination of the salary that an IT pro can command. Other factors will play a big part in how much a job will pay. So, for example, although the average salary for CompTIA Linux+ is \$70,000, PayScale reports salaries up to \$107,000 for Linux+ people in Seattle and up to \$132,000 in Washington DC.

Open Source & Linux Certification Training

As we mentioned earlier, there is a strong demand for IT professionals with Linux skills. Such is the demand that 55 percent of employers surveyed are offering to pay for employee certifications. With that in mind, be sure to check in with CBT Nuggets for relevant video training courses to help you prepare for your chosen Linux certification path.

CBT Nuggets has training that supports the Linux certification programs from CompTIA, The Linux Foundation, and the Linux Professional Institute (LPI).

In addition, we have training on other Linux distributions such as CentOS and Ubuntu, as well as popular open source technologies like the Ansible open-source software provisioning tool and the Apache Hadoop big data platform.

Finally, of course, the Kali Linux distribution is an important tool used by cybersecurity specialists for penetration testing. Penetration Testing with Linux Tools is helpful preparation for certification as a Kali Linux Certified Professional or as an Offensive Security Certified Professional (OSCP).

Good luck to you as you start on your Linux certification path. Our course offerings do change from time-to-time, so be sure to check CBT Nuggets for new and updated on-line courses that are relevant to your personal Linux certification program.



CBTnu**o**ets

CompTIA Certifications

CompTIA — formally called the Computing Technology Industry Association — is a non-profit organization with membership comprising more than 200 leading IT companies and 2,000 member companies.

As an IT industry trade organization, a CompTIA goal is to help ensure that there is a strong pool of IT professionals with the skills required to drive the adoption and use of information technologies in enterprises worldwide. CompTIA is the leading provider of vendor-neutral training and certification programs for those IT professionals, having issued more than two million certificates to date.

CompTIA certificate programs have been established for IT support, networking, security, open-source (Linux) development, and cloud. In addition to technical certifications, additional professional CompTIA certificate programs are available for business professionals, non-IT staff, and technical trainers.

What is CompTIA Certification?

CompTIA provides vendor-neutral certifications that validate candidates have achieved a specific level of expertise that can be applied universally, regardless of vendor. The CompTIA certification program has three categories relating to networking:

- **CORE**
- **INFRASTRUCTURE**
- **STACKABLE INFRASTRUCTURE**

CompTIA Core Certifications

CompTIA Core Certifications are for beginners and entry-level IT professionals. There are four CompTIA Core Certifications:

- **CompTIA IT Fundamentals+**
- **CompTIA A+**
- **CompTIA Network+**
- **CompTIA Security+**

CompTIA A+, CompTIA Network+, and CompTIA Security+ are all DoD 8570.01-M-approved certifications.

COMPTIA CORE

CompTIA IT Fundamentals+

CompTIA IT Fundamentals+ is designed for individuals who want to begin exploring a career in IT. It's also a good option for business, sales, and marketing professionals who work closely with systems and information technology.

The IT Fundamentals+ certification validates a candidate's understanding of these topics:

- **Computing**
- **IT infrastructure**
- **Software development**
- **Database use**

Required exam: Earning the CompTIA IT Fundamentals+ Certification requires passing one exam — CompTIA IT Fundamentals+ (FC0-U61).

Prerequisites: None.

Recommended experience: CompTIA recommends this exam for advanced end users or individuals thinking about entering the IT field. That means you should feel comfortable using computer systems and networks.

COMPTIA CORE**CompTIA A+**

The CompTIA A+ certification is designed for people who want to build a career in IT technical support and operations. The CompTIA A+ certification validates a candidate's ability to:

- **Identify, use, and connect hardware components**
- **Install and support Windows OS**
- **Troubleshoot PC and mobile device issues**
- **Explain types of networks and connections**
- **Troubleshoot device and network issues**
- **Identify and protect against security vulnerabilities**
- **Install & configure laptops and other mobile devices**
- **Understand Mac OS, Linux and mobile OS**

Required exams: Earning the CompTIA A+ certification requires passing two exams — CompTIA A+ 220-1001 and CompTIA A+ 220-1002.

Prerequisites: None.

Recommended experience: While there are no specific prerequisites for the exams, CompTIA recommends that candidates have 9 to 12 months hands-on experience with various mobile, desktop, and networking tasks.

COMPTIA CORE**CompTIA Network+**

The CompTIA Network+ certification is designed for IT professionals with entry-level experience. Network+ is a common stepping stone common to move into network administration. Given that almost everything is networked, networking experience is a valuable asset for any IT professional. The CompTIA Network+ certification validates the candidate's ability to:

- **Implement networking concepts**
- **Determine the appropriate cabling, device and storage technologies**
- **Use best practices to manage a network**
- **Summarize physical security, and common wired and wireless attacks**
- **Explain the network troubleshooting methodology**

Required exam: Earning the CompTIA Network+ certification requires passing one exam — CompTIA Network+ (N10-007).

Prerequisites: None.

Recommended experience: While there are no specific prerequisites for the exam, CompTIA recommends that candidates have obtained CompTIA A+ certification and at least 9 to 12 months of networking experience.

COMPTIA CORE**CompTIA Security+**

The CompTIA Security+ certification validates the baseline cybersecurity skills required of IT administrators and security professionals. The CompTIA Security+ certification validates the candidate's ability to:

- **Detect various types of threats, attacks and vulnerability**
- **Install, configure, and deploy network security components**
- **Implement a secure network architecture**
- **Install, configure and manage identity and access services**
- **Implement risk management procedures to mitigate business impact**
- **Install and configure wireless security settings and implement public key infrastructure**

Required exam: Earning the CompTIA Security+ certification requires passing one exam — CompTIA Security+ (SY0-501).

Prerequisites: None.

Recommended experience: There are no specific prerequisites for the exam, although CompTIA recommends that candidates have obtained CompTIA Network+ certification and two years of experience in IT administration with a security focus.

CompTIA Infrastructure Certifications

The next level of the CompTIA certification program consists of the CompTIA Infrastructure Certifications. As the name suggests, these certs are related to key infrastructure technologies such as cloud computing, open source operating systems, and servers. There are three certs at this level:

- **CompTIA Cloud+**
- **CompTIA Linux+**
- **CompTIA Server+**

COMPTIA INFRASTRUCTURE

CompTIA Cloud+

The CompTIA Cloud+ certification validates that a certified professional has the expertise needed for a cloud data center job. Typical job titles that may require CompTIA Cloud+ certification include systems administrator, network administrator, cloud engineer, systems or network engineer, and data center manager. The CompTIA Cloud+ certification validates the candidate's ability to:

- **Analyze system requirements to successfully execute workload migrations to the cloud**
- **Determine proper allocation of cloud resources**
- **Apply appropriate technologies and processes**
- **Implement appropriate security controls given requirements**
- **Troubleshoot capacity, automation, connectivity and security issues related to cloud implementations**

Required exam: Earning the CompTIA Cloud+ certification requires passing one exam — CompTIA Cloud+ (CV0-002).

Prerequisites: None.

Recommended experience: While there are no specific prerequisites for the exam, CompTIA recommends that candidates have at least two years of experience in system administration.

COMPTIA INFRASTRUCTURE**CompTIA Linux+**

The CompTIA Linux+ certification is designed for IT professionals with hands-on experience configuring, monitoring, and supporting servers running major Linux distributions. The CompTIA Linux+ certification validates the candidate's ability to:

- **Configure Linux kernel modules, network parameters, storage, cloud and virtualization technologies**
- **Manage software and services**
- **Manage permissions and authentication, firewalls, and file management**
- **Troubleshoot user, app, and hardware issues**
- **Use Linux automation & scripting**

Required exams: Earning the CompTIA Linux+ certification requires passing one exam — CompTIA Linux+ (XK0-004).

Prerequisites: None.

Recommended experience: While there are no specific prerequisites for the exam, CompTIA recommends that candidates have CompTIA A+ and CompTIA Network+ certifications, as well as 12 months of experience in Linux administration.

COMPTIA INFRASTRUCTURE**CompTIA Server+**

The CompTIA Server+ certification is designed for IT professionals with hands-on experience administering, troubleshooting, and securing those servers regardless of type or location. CompTIA Server+ is the only vendor-neutral certification covering the major server platforms. The CompTIA Server+ certification validates the candidate's ability to:

- **Configure and support server components**
- **Manage and maintain servers**
- **Support storage devices technologies, including capacity and growth planning**
- **Apply physical and network data security techniques**
- **Configure systems for network connectivity**
- **Understand disaster recovery and implement backup techniques**
- **Diagnose and resolve system hardware, software, connectivity, storage, and security issues**

Required exam: Earning the CompTIA Server+ certification requires passing one exam — CompTIA Server+ (SK0-004).

Prerequisites: None.

Recommended experience: While there are no specific prerequisites for the exam, CompTIA recommends that candidates have obtained CompTIA A+ certification and have 18 to 24 months of IT experience.

CompTIA Stackable Certifications

CompTIA recognizes that IT pros build their technical proficiencies incrementally, gaining experience as they become established IT professionals.

As they progress in their careers, IT professionals can acquire multiple CompTIA certifications that combine to represent expertise in specific functional areas. CompTIA has formalized this bundling of certs as CompTIA Stackable Certifications. They have taken specific job functions and identified the stacks of certifications that are most relevant to each job.

The job functions for the CompTIA Stackable Certifications are further categorized by the expected experience level of the job — specialist, professional, or expert:

- **Specialist:** Early-career IT professionals with 0–2 years of experience
- **Professional:** Mid-level IT professionals with 2–5 years of experience
- **Expert:** Established IT professionals with 5+ years of experience

Getting Your CompTIA Stackable Certifications

When you complete the set of CompTIA certifications that represent a particular CompTIA Stackable Certification, you will be automatically granted the relevant stackable certification(s). These will be found in the Stackable Certifications tab on your CompTIA certification account. You'll be able to download the stackable certification logo for your personal professional use.

Stackable certifications require active continuing education (CE) certifications. Good-for-life certification holders may earn these stackable certifications by re-certifying and validating that their skills are up to date.

Stackable Infrastructure Certifications

The CompTIA Infrastructure Career Pathway is for IT professionals who want to work with organizations' system and network infrastructures — servers, networks, data centers, and cloud services. There are five job functions that are represented by sets of CompTIA stackable certifications.

- **CompTIA IT Operations Specialist (CIOS)**
- **CompTIA Systems Support Specialist (CSSS)**
- **CompTIA Cloud Admin Professional (CCAP)**
- **CompTIA Network Infrastructure Professional (CNIP)**
- **CompTIA Linux Network Professional (CLNP)**

COMPTIA STACKABLE SPECIALIST

CompTIA IT Operations Specialist (CIOS)

The CompTIA IT Operations Specialist stackable certification is designed for IT operations specialists who regularly create and respond to tickets, maintain systems, and resolve customer issues.

Required exams: To earn the CIOS stackable certification, you must earn both CompTIA A+ and Network+ certifications.

COMPTIA STACKABLE SPECIALIST

CompTIA Systems Support Specialist (CSSS)

The CompTIA Systems Support Specialist stackable certification is designed for support specialists who support help desk operations and assist customers with issues related to hardware, software, and networks.

Required exams: To earn the CSSS stackable certification, you must earn both CompTIA A+ and Linux+ certifications.

COMPTIA STACKABLE PROFESSIONAL**CompTIA Cloud Admin Professional (CCAP)**

The CompTIA Cloud Admin Professional stackable certification is designed for IT professionals who regularly work with cloud service implementation and maintenance.

Required exams: To earn the CCAP stackable certification, you must earn both CompTIA Network+ and Cloud+ certifications.

COMPTIA STACKABLE PROFESSIONAL**CompTIA Linux Network Professional (CLNP)**

The CompTIA Linux Network Professional stackable certification is designed for IT professionals that regularly support and monitor systems that operate on Linux.

Required exams: To earn the CLNP stackable certification, you must earn both CompTIA Network+ and Linux+ certifications.

COMPTIA STACKABLE PROFESSIONAL**CompTIA Network Infrastructure Professional (CNIP)**

The CompTIA Network Infrastructure Professional stackable certification is designed for networking professionals who design and implement infrastructure projects.

Required exams: To earn the CNIP stackable certification, you must earn both CompTIA Network+ and Server+.

How Much Does CompTIA Certification Cost?

CompTIA certification exams range in cost between \$219 and \$349, depending on the exam. For CompTIA A+, you must pass two exams for a total cost of \$438. For CompTIA Security+, the single CompTIA certification exam costs \$339. The cost for the CompTIA Network+ exam is \$319.

How Do I Get a Copy of My CompTIA Certification?

What happens if you need verification of your CompTIA certification(s) for a job application, for your resume, or to submit to a potential client? Through your CompTIA certification account CompTIA provides two ways to provide proof of your certs:

- **Download a PDF Certificate:** You can download a PDF certificate that contains a URL and verification code that can be used to authenticate your certification.
- **Create a Transcript:** You can create a customized certification transcript which will be sent by email to a designated recipient.

CompTIA Recertification and Renewal

CompTIA certifications earned since 2011 are valid for three years from the date of original certification. They must be renewed before their expiration date. CompTIA recertification and renewal comes under the auspices of the CompTIA Continuing Education (CE) program. You must be enrolled in that program to renew a certification.

There are a number of ways to renew a certification. You can simply recertify by paying for, and taking, the most recent version of the relevant CompTIA certification exam(s). Here are some of the other ways to renew a CompTIA certification:

- **Complete a CompTIA CertMaster CE course.** CertMaster CE e-learning courses are available for A+, Network+, and Security+. When you complete the course, you'll automatically earn Continuing Education Units (CEU) for the exam in your CompTIA certification account. CertMaster CE e-learning courses cost between \$129 and \$199.
- **Earn a higher-level CompTIA certification.** If you earn or renew a qualifying higher-level CompTIA certification, your existing CompTIA certifications are renewed.

- **Earn a non-CompTIA IT industry certification.**

If you earn or renew a qualifying non-CompTIA IT industry certification, you'll earn Continuing Education Units (CEU) that can apply toward the renewal requirements for your existing CompTIA certification. For example, earning a Cisco CCNA Security cert gives you the 50 CEUs you need for CompTIA Security+ certification renewal.

- **Earn other CEUs.** You can earn CEUs to apply to recertification through a number of different avenues. These include taking training and higher education, participating in IT Industry activities, publishing articles or white papers, or even submitting relevant work experience.

CBT Nuggets CompTIA Certification Training

CBT Nuggets offers a variety of training that maps to CompTIA certification exams, ranging from A+ to Cloud+.

Our training changes from time-to-time as we support the CompTIA certification roadmap. So be sure to check CBT Nuggets for new and updated training relevant to your personal CompTIA certification goals.