

Pro Exchange 2019 and 2016 Administration

For Exchange On-Premises and Office 365

—
Second Edition

—
Michel de Rooij
Jaap Wesselius

Apress®

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About the Authors



Michel de Rooij is a consultant and Microsoft MVP since 2013. He lives in the Netherlands and has been working in the IT industry for over 20 years. Michel helps customers with their journeys related to Microsoft 365, with a focus on Exchange and Identity, but also related technologies such as Microsoft Teams or email in general. Michel has a developer background, but after some long-term dedicated Exchange-related work for a large multinational, he switched to Exchange and never looked back. He is also a big fan of automating processes and procedures related to infrastructure, being either supporting projects or automating administrator tasks. Michel is also active in online communities, such as the Microsoft Tech Community, and on social media such as Twitter (@mderooij). He runs an Exchange-related blog at eightwone.com, guest authors for several other sites, and speaks at international events.



Jaap Wesselius is an independent consultant based in the Netherlands. As a consultant, Jaap has been working with Exchange server since Exchange 5.0 in 1997. After working for Microsoft, he became an independent consultant in 2006. For his work in the (Exchange) community, Jaap has received a Microsoft MVP award in 2007, an award he still holds in 2021. The first MVP category was Exchange server, but over the years that has changed to Office Apps and Services. Besides working with Exchange, Jaap also works with Office 365, identity management, privacy, and security. He is 54 years old, married, has three (almost) grown-up sons, and likes to ride his motorcycle, when possible.

About the Technical Reviewers



Kay Sellenrode works as a freelance consultant/architect, focusing on unified messaging solution, that is, Exchange server and Exchange Online/Office 365. He has been actively working with Exchange since 5.5 and is a Microsoft Certified Master (MCM) and Architect (MCA) on Exchange Server.

In all those years, he has seen environments from small businesses to large and from simple setups to complex multiforest mergers or splits of Exchange.

As a speaker, he has spoken at several events like TechEd US and local events in the Netherlands and is always willing to share his knowledge.



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Acknowledgments

Another book! When Jaap asked me if I wanted to join him in writing the successor to our previous book that we both co-authored in 2014, I immediately got enthusiastic again. And now, after a few months, the fruit of our labor has once more seen the light. It always is an interesting and rewarding experience. The amount of depth and widening is intense, especially in the cloud era where the rate of change is insane. Then, when you finish writing, you feel you achieved something. Something useful for people that are on their own learning path, be it Exchange or Microsoft 365, something to help them understand and grow.

Again, a word of thanks to Jaap Wesselius for getting me on board this project. Finally, I am grateful to my wife Juliana, two kids, and family who had to share me in the evenings with this project as well. This, while already working from home during the pandemic. Also to the community, and especially the MVPs, intelligent people that are never hesitant to help out or exchange ideas. To you and everybody else I forgot, I say thank you.

—Michel

Introduction

I have been working with Exchange since 1997 when Microsoft introduced Exchange server 5.0. Over the years, a lot has changed in Exchange, or as they say in marketing terms, “it has been built from the ground up,” and with the move writing Exchange in managed code (i.e., .NET), that’s completely true.

But there’s this other beast called Exchange Online, part of Office 365. It is not a big secret that Microsoft wants everybody to move to Office 365, and for a lot of customers, that is the best solution. All Microsoft developments and new features are in the cloud, and Exchange server on-premises is in a status quo. There are not a lot of new developments, and all updates are about stability and security.

But why a book about Exchange server? There still is a demand for Exchange server on-premises. Sometimes, organizations are running Exchange server for the wrong reason (“the cloud is too expensive,” for example), but there are organizations that do not want to be the first, or they cannot move to the cloud for legal reasons. Do not forget there are still millions of mailboxes on-premises, and this book is targeted for administrators that are completely moving to the cloud anytime soon and still have Exchange servers on-premises. This can be a full on-premises environment and I still have these types of customers, but also in a hybrid environment where Exchange server on-premises is configured with Exchange Online.

This book is divided into four parts:

1. **Exchange Infrastructure**—In this part, we cover an introduction and how to install and configure Exchange server. We will also cover the Client Access and the mailbox services, which were dedicated server roles in previous Exchange versions. Managing Mailboxes and mail transport are also included in this part.
2. **Upgrading Exchange Server**—In this part, we discuss the upgrade path from Exchange 2010 to Exchange 2016 and from Exchange 2013 to Exchange 2019. Why an Exchange 2010 upgrade path? In our experience, a lot of customers are still running

Exchange 2010, and they must move to Exchange 2016 anytime soon since Exchange 2010 is not supported at all anymore. From a security perspective, this is an unacceptable situation.

3. **Integration with Office 365**—Although this is a book about Exchange server on-premises, customers are running an Exchange hybrid environment, and we should not close our eyes to this. And running Exchange hybrid can be the best of both worlds. This part covers identities, directory synchronization, Exchange federations, Autodiscover in a hybrid environment, and Exchange Online Protection.
4. **Security and Compliance**—This is perhaps one of the most important aspects of running any environment. In this part, we cover authentication methods, including Hybrid Modern Authentication, Multi-Factor Authentication, and Role-Based Access Control (RBAC). Chapter 11 focuses more on safeguarding the information with features like journaling, in-place hold and eDiscovery, messaging records management, data loss prevention, and auditing.

There still is demand for Exchange server on-premises, and there still is demand for an up-to-date book about Exchange server on-premises. This book is about Exchange 2019 and also covers Exchange 2016 and Exchange 2013 where appropriate. Exchange server is not dead, since Microsoft already announced a new version of Exchange on-premises, at the time of writing, referred to as “Exchange vNext.” From the information publicly available, I do not expect too much changes in Exchange vNext.

But until then, enjoy Exchange 2019 and never stop learning.

PART 1

Exchange Infrastructure

CHAPTER 1

Introduction to Exchange 2019

In April 1996, Microsoft released the first version of Exchange server which was Exchange server 4.0. At the time of writing, we are 25 years later, and Exchange is still around. The current version is Exchange server 2019, released by the end of 2018, but a new version has already been announced by Microsoft with the codename Exchange vNext. Although the Microsoft cloud shows a tremendous growth month over month, there is still a demand for an on-premises version of Exchange server.

Looking back over the years, three real major changes can be identified in Exchange server:

- **Use of Active Directory**—The first versions of Exchange server had their own X.500 directory which was used in combination with the NT4 directory. User accounts were created in the NT4 domain, and mailboxes were created in the Exchange directory. Exchange 2000 was the first version of Exchange that was using Active Directory, and it still is until today.
- **64-bit architecture**—Exchange server 2007 was the first version that was built on the X64 platform, although a 32-bit version for testing purposes was still available. Exchange server was growing tremendously, and it hit the boundaries of the 32-bit architecture of Exchange server 2003 which resulted in major performance issues. By moving to a 64-bit architecture, Microsoft was able to work on the performance issues, and performance has been improved with each new version.

- **Managed code**—Exchange server 2013 was the first version that was 100% built on top of the .NET Framework, and as such it was really built from the ground up. I do not want to sound like a marketing guy, but this really was a big change. Another big change with the introduction of Exchange server 2013 was that Exchange server 2013 and Exchange Online shared the same codebase which means that all releases and Cumulative Updates (CUs) of Exchange server 2013 are a spin-off of Exchange Online. This was continued with Exchange server 2016 but stopped with Exchange 2019 which now is a separate product compared to Exchange Online. From Exchange 2019 on, it is a separate product compared to Exchange Online. This was clearly visible when the HAFNIUM vulnerability hit—Exchange servers on-premises were vulnerable, but Exchange Online was not.

Starting with Exchange server 2013, Microsoft introduced a new servicing model based on Cumulative Updates or CUs. Microsoft is releasing a CU on a quarterly basis which contains fixes and new features when available. Microsoft stepped away from the concept of service packs; all features are now included in CUs. Because of the cumulative nature of the CUs, a CU contains all features and fixes of earlier CUs. Therefore, you can “jump” over several CUs, for example, from Exchange server 2019 CU7 to Exchange server 2019 CU10. There is no need to install CUs that are between those versions.

CUs are only released when the product is in mainstream support. When critical security issues are found and a product is in extended support, a Security Update (SU) is released. This happened in March 2021, when Microsoft released Security Updates for all Exchange servers in mainstream and in extended support for the HAFNIUM vulnerability. SUs are also cumulative, so the March 2021 security updates contain all security updates included in previous SUs for the same CU. SUs are also CU specific, so a SU for Exchange Server 2019 CU9 is different from a SU for Exchange Server 2019 CU8. Microsoft typically releases SUs only for the current CU and the previous CU. For the HAFNIUM vulnerability, an exception was made. Because of the critical and dangerous nature of the HAFNIUM vulnerability, SUs were released for older CUs and even out-of-support Exchange builds as well, but this should really be considered an exception.

Exchange Servers 2013, 2016, and 2019 are very similar and to some extent compatible. Over the years, there have not been major changes to the product, but lots of improvements.

The first area of improvement is security with support for Windows Server Core, TLS 1.2, and blockage of the Exchange Control Panel and Exchange Management Shell externally.

Another area of improvement is performance and reliability. Performance improvement in Exchange server 2019 is achieved by modern hardware support (Exchange server 2019 now supports up to 256 GB memory!), a new search engine (which also improves failover times), and the MetaCache database, a combination of large JBOD disks and SSDs.

There are also several client improvements, such as the “do not forward” option in meeting invites, improved out-of-office support, and the option to remove calendar events (using PowerShell), possibly the most requested feature.

Of course, there are differences between Exchange servers 2013, 2016, and 2019, especially when it comes to features. But these versions also work together quite well. For example, it is possible to create a load-balanced array for Exchange servers with all three versions in this array. It does not matter on which Exchange server a client connection is terminated; the request is automatically proxied to the correct mailbox server. This is extremely useful when upgrading your Exchange environment to Exchange server 2019.

There is one major difference between Exchange server 2013 and Exchange servers 2016 and 2019. Exchange server 2013 does have two server roles, the Client Access server role and the Mailbox server role. In Exchange server 2016 and up, these two roles are combined, and only the Mailbox server role is available. The different components are still there, but only available in one server role. The Edge Transport server role is still available in Exchange servers 2016 and 2019.

Exchange server 2019 is targeted toward large enterprise customers; as such Exchange server 2019 is only available via the volume license center (VLC). Smaller customers can still use Exchange server 2016 or move to Exchange Online, not surprisingly the Microsoft recommended approach. Exchange Online contains the latest and greatest features; Exchange server 2019 is the rock-solid solution for enterprise customers that need a solid mail environment.

This book is about Exchange server 2019, but where needed a sidestep to Exchange server 2016 is made. The reason to add Exchange server 2016 is because of the upgrade path from Exchange server 2010, a version still in use by a lot of customers.

Exchange 2016 or Exchange 2019?

In the beginning of 2021, two versions of Exchange server were available:

- **Exchange Server 2016**—Mainstream support for Exchange server 2016 ended in October 2020, but Exchange Server 2016 is in extended support until October 2025.
- **Exchange Server 2019**—Mainstream support for Exchange server 2019 will end in January 2024, but Exchange Server 2019 is in extended support only until October 2025.

This is shown in Figure 1-1.

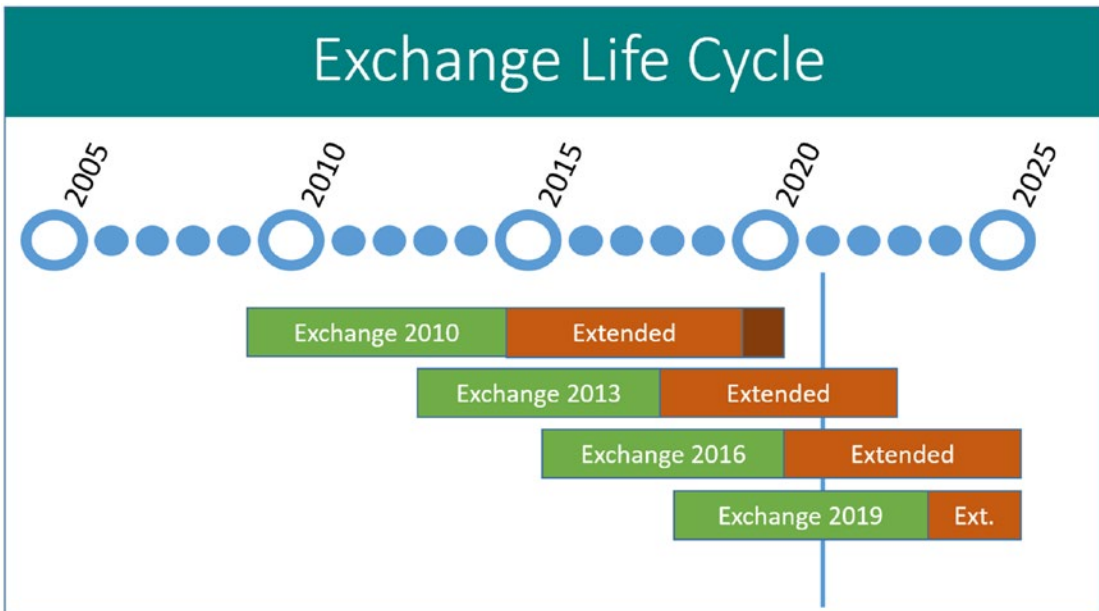


Figure 1-1. Support life cycle of various Exchange server versions

It is expected that Microsoft will release a new version of Exchange server by the end of 2021, at the time of writing, with the codename “Exchange vNext.”

This raises the question which version one must use. There are several answers to this question, and “it depends”:

- If you do not have a volume license agreement with Microsoft, you do not have access to Exchange server 2019, so Exchange server 2016 is your only option for an on-premises deployment.
- When building a brand-new Exchange environment, a so-called greenfield deployment, Exchange server 2019 is the way to go.
- If you are currently running Exchange server 2010 and are going to upgrade, then move to Exchange server 2016. You can then decide to move to Exchange server 2019.
- If you are in Exchange server 2010, 2013, or 2016 hybrid and have moved all mailboxes to Exchange Online, keep one Exchange server 2016 server for management purposes. You can use a free “hybrid license” for this. A free hybrid license is not available for Exchange server 2019.
- If you are on Exchange server 2013 or 2016, you can move to Exchange server 2019.

When possible, move to Exchange server 2019 because of Exchange vNext. Although nothing has been released yet, Microsoft announced that the integration of Exchange vNext into an Exchange server 2019 environment will be very easy. It is compatible on the protocol level, so you can add an Exchange vNext server into a load-balanced array of previous Exchange servers. But what is more interesting, the Mailbox databases are also compatible, so you can add Exchange vNext Mailbox servers into an Exchange server 2019 Database Availability Group. This will make upgrading from Exchange server 2019 to Exchange vNext “a piece of cake.”

Getting Started

To begin, let’s take a general look at Exchange 2019. First, we will consider the two Exchange 2019 editions and review their features. Then, we will look at their features compared to previous versions of Exchange.

Exchange Server 2019 Editions

Exchange 2019 is available in two editions:

- **Exchange 2019, Standard Edition**—This is a “normal” Exchange 2019 but limited to five mailbox databases per Mailbox server.
- **Exchange 2019, Enterprise Edition**—This version can host up to 100 mailbox databases per Mailbox server.

Except for the number of mailbox databases per Exchange server, there are no differences between the two versions; the binaries are the same.

Entering the Exchange 2019 license key changes the limit of maximum mailbox databases for that server. Besides the Exchange 2019 server license, there is also a Client Access License (CAL), which is required for each user or device accessing the server software.

There are two types of CALs available:

- **Standard CAL**—This CAL offers standard email functionality from any platform. The license is for typical Exchange and Outlook usage.
- **Enterprise CAL**—This more advanced CAL offers functionality such as integrated archiving, compliance features, and information protection capabilities. The CAL is an add-on to the Standard CAL, so both licenses need to be purchased!

This is not a complete list of all available features for the different CALs. For a complete overview, visit the Microsoft licensing page at <http://bit.ly/X2019Licensing>.

Note An Exchange server 2019 server license is always needed. But an Exchange Online P1 or P2 or Office 365 E1 or E3 license can also be used for a CAL. When an Exchange server 2016 server is used in a hybrid environment, and all mailboxes are in Exchange Online, customers might be eligible for a free “hybrid server license” from Microsoft.

What’s New in Exchange Server 2019?

So, what are the new features and improvements in Exchange server 2019? There are a lot of new features, valuable both from an administrator’s point of view and from that of an end user. Let us discuss the most important changes here, compared to previous versions of Exchange server 2019:

- **Support for Windows Server 2019 server core**—Exchange server 2019 is supported on Windows server 2019, both the Desktop Experience and Server Core. Windows server 2019 server core is the recommended operating system for Exchange server 2019 because of the lower footprint and improved security. Windows Server 2019 is also the only supported operating system for Exchange server 2019. Please note that Exchange server 2016 is only supported on Windows server 2016 (Desktop Experience only, no server core support) and Windows Server 2012 R2.
- **TLS 1.2**—To improve the client to server connections, the default protocol for encrypting traffic between clients and the Exchange server 2019 server. Older versions are still available but are disabled by default. Please note that a client in this respect can also be another (Exchange) server that is communicating with the Exchange server 2019 server.
- **Block external access of ECP and EMS**—In Exchange server 2019, it is possible to block external access to the Exchange Control Panel (ECP) and Exchange Management Shell (EMS) using Client Access Rules. Based on conditions, exceptions, and actions, Client Access Rules help you to control access to ECP and EMS in a very granular manner.
- **Improved search infrastructure**—The search infrastructure in Exchange server 2019 is improved and is now based on the Bing search technology. Its codename is “Big Funnel,” something you can still see in Exchange server 2019 under the hood. Search indexes are no longer stored in a separate directory on the disk containing the Mailbox database, but they are stored in the user’s mailbox. Because of this, search data replication is always up to date, and Mailbox database failovers are much faster, therefore improving performance of the Exchange server 2019 server.
- **Modern hardware support**—Exchange server 2019 supports more modern hardware, up to 256 GB memory and up to 48 CPU cores. The minimum recommended amount of memory for Exchange server 2019 is also 128 GB (it can run with less memory though), and

performance greatly benefits from this large amount of memory. Large memory and multiple processor cores also enable switching from Workstation Garbage Collection (GC) to Server GC. This setting in .NET Framework can handle more requests per second, thus improving performance.

- **MetaCache database**—Exchange server 2019 has a new feature called metacache database (MCDB). This feature uses SSD disks to store frequently accessed data from Mailbox databases. Mailbox databases are still stored on slow JBOD disks, but frequently accessed data can now be cached on SSD disks. For every four (slow) JBOD disks, one SSD disk is used to cache information. This greatly improves performance and latencies, which is very beneficial for Remote Desktop or Citrix environments where Outlook clients are running in online mode.
- **Dynamic database cache**—Mailbox database information is kept in memory. While this is useful for active Mailbox databases, it does not make much sense for passive Mailbox databases in a Database Availability Group. Previous versions of Exchange did not differentiate between these two, therefore “wasting” valuable memory on passive Mailbox databases. Exchange server 2019 has a dynamic database cache, which means that passive Mailbox databases use less memory than active Mailbox databases. In other words, active Mailbox databases in Exchange server 2019 can use memory than they could in Exchange server 2016. This also improves overall Exchange server 2019 performance.
- **A different look and feel for client interfaces**—The Outlook Web App (OWA) or Outlook on the Web as it is called these days did not change much since Exchange server 2013. The overall themes have changed a bit or the location of buttons, but that is basically it. But when moving from Exchange server 2010 to Exchange server 2016, users will see a completely new user interface with a different look and feel. It also comes with several new features in OWA, like Bing Maps integration as shown in Figure 1-2, support for server-side