# Microsoft Exchange Server 2013 PowerShell Cookbook Second Edition

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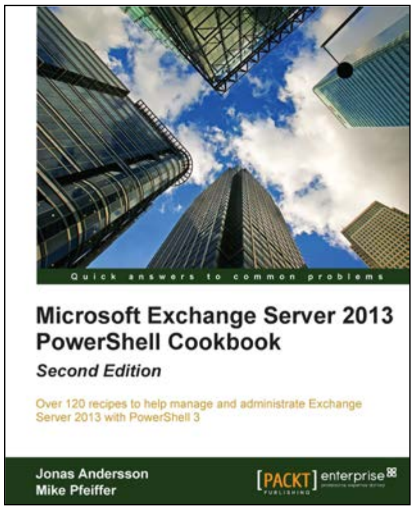
Quick answers to common problems
Microsoft Exchange Server 2013 PowerShell Cookbook
Second Edition
Over 120 recipes to help manage and administrate Exchange Server 2013 with PowerShell 3
Jonas Andersson
Mike Pfeiffer
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PUBLISHING

Chapter No. 10

"Exchange Security"

## In this package, you will find:

A Biography of the authors of the book

A preview chapter from the book, Chapter NO.10 "Exchange Security"

A synopsis of the book’s content

Information on where to buy this book

## About the Authors

**Jonas Andersson** is a devoted person who is constantly developing himself and his skills. He started in the IT business in 2004 and worked at first in a support center where he got his basic knowledge. In 2007 he started his career as a Microsoft infrastructure consultant and from 2008 onwards his focus has been on Microsoft Exchange.

Even though his focus is on Microsoft Exchange, his interests include migrations, backup, storage, and archiving. At the start of 2010, he was employed at a large outsourcing company a messaging specialist, specializing in Microsoft Exchange. His work includes designing, implementing, and developing messaging solutions for enterprise customers.

His unique knowledge makes him a key figure in large and complex migration projects where he works with design and implementation. Examples of these projects include migrations from the IBM Domino mail platform to Microsoft Exchange 2007/2010 and Office 365, using Quest Software with full coexistence between the systems for mail flow, directory synchronization, and free busy lookups.

Apart from his daily job, he was active on TechNet forums, he also writes articles at his blog (`http://www.testlabs.se/blog`), and Twitter and other social media.

As a reward for the work in the community he was been awarded the Microsoft Community Contributor Award both 2011 and 2012.

**Mike Pfeiffer** has been in the IT field for 15 years, and has been working on Exchange for the majority of that time. He is a Microsoft Certified Master and a former Microsoft Exchange MVP. These days he works at Microsoft as a Premier Field Engineer where he helps customers deploy and maintain Microsoft Exchange and Lync Server solutions. You can find his writings online at `mikepfeiffer.net`, where he occasionally blogs about Exchange, Lync, and PowerShell-related topics.

# Microsoft Exchange Server 2013 PowerShell Cookbook Second Edition

This book is full of immediately usable task-based recipes for managing and maintaining your Microsoft Exchange 2013 environment with Windows PowerShell 3.0 and the Exchange Management Shell. The focus of this book is to show you how to automate routine tasks and solve common problems. While the Exchange Management Shell literally provides hundreds of cmdlets, we will not cover every single one of them individually. Instead, we'll focus on the common, real world scenarios. You'll be able to leverage these recipes right away, allowing you to get the job done quickly, and the techniques that you'll learn will allow you to write your own amazing one-liners and scripts with ease.

## What This Book Covers

*Chapter 1, PowerShell Key Concepts*, introduces several PowerShell core concepts such as command syntax and parameters, working with the pipeline, and flow control with loops and conditional logic. The topics covered in this chapter lay the foundation for the remaining code samples in each chapter.

*Chapter 2, Exchange Management Shell Command Tasks*, covers day-to-day tasks and general techniques for managing Exchange from the command line. The topics include configuring manual remote shell connections, exporting reports to external files, sending e-mail messages from scripts, and scheduling scripts to run with the Task Scheduler.

*Chapter 3, Managing Recipients*, demonstrates some of the most common recipient-related management tasks, such as creating mailboxes, distribution groups, and contacts. You'll also learn how to manage server-side inbox rules, out of office settings, and import user photos into the Active Directory.

*Chapter 4, Managing Mailboxes*, shows you how to perform various mailbox management tasks that include moving mailboxes, importing and exporting mailbox data, and the detection and repair of corrupt mailboxes. In addition, you'll learn how to delete and restore items from a mailbox, manage the new public folders, and generate some basic reports.

*Chapter 5, Distribution Groups and Address Lists*, takes you deeper into distribution group management. The topics include distribution group reporting, distribution group naming policies, and allowing end users to manage distribution group membership. You'll also learn how to create address lists and hierarchal address books.

*Chapter 6, Mailbox Database Management,* shows how to set database settings and limits. Report generation for mailbox database size, average mailbox size per database, and backup status is also covered in this chapter.

*Chapter 7, Managing Client Access,* covers the managing of ActiveSync, OWA, POP, and IMAP. It also covers the configuration of these components in Exchange 2013. We'll also take a look at controlling connections from various clients, including ActiveSync devices.

*Chapter 8, Managing Transport Service,* explains the various methods used to control mail flow within your Exchange organization. You'll learn how to create, send, and receive connectors, allow application servers to relay mail, and manage transport queues.

*Chapter 9, High Availability,* covers the implementation and management tasks related to Database Availability Groups (DAGs). Topics include creating DAGs, adding mailbox database copies, and performing maintenance on DAG members. It also covers the new feature called automatic reseed.

*Chapter 10, Exchange Security,* introduces the new Role Based Access Control (RBAC) permissions model. You'll learn how to create custom RBAC roles for administrators and end users, and also how to manage mailbox permissions and implement SSL certificates.

*Chapter 11, Compliance and Audit Logging,* covers the new compliance and auditing features included in Exchange 2013. Topics such as archiving mailboxes and discovery search are covered here, as well as administrator and mailbox audit logging.

*Chapter 12, Server Monitoring and Troubleshooting,* shows you how to monitor and report on service availability and resource utilization using PowerShell core cmdlets and WMI. Event log monitoring and Exchange server role troubleshooting tactics are also covered.

*Chapter 13, Scripting with the Exchange Web Services Managed API,* introduces advanced scripting topics that leverage Exchange Web Services. In this chapter, you'll learn how to write scripts and functions that go beyond the capabilities of the Exchange Management Shell cmdlets.

*Appendix A, Common Shell Information,* is a reference for the variables, scripts, and the filtering functions. These references will help you when writing scripts or running interactive.

*Appendix B, Query Syntaxes,* is a reference for the Advanced Query Syntax (AQS). Here are lots of different examples that can be used in the real world.

# 10
# Exchange Security

In this chapter, we will cover the following:

- Granting users full access permissions to mailboxes
- Finding users with full access to mailboxes
- Sending e-mail messages as another user or group
- Working with Role Based Access Control (RBAC)
- Creating a custom RBAC role for administrators
- Creating a custom RBAC role for end users
- Troubleshooting Role Based Access Control
- Generating a certificate request
- Installing certificates and enabling services
- Importing certificates on multiple exchange servers

## Introduction

When it comes to managing security in Exchange 2013, you have several options, depending on the resources that you're dealing with. For example, you can allow multiple users to open a mailbox by assigning them full access permissions on a mailbox object, but granting administrators the ability to create recipient objects needs to be done through Role Based Access Control (RBAC). Obviously, since the security for both of these components is handled differently, we have unrelated sets of cmdlets that need to be used to get the job done, and managing each of them through the shell will require a unique approach.

In this chapter, we'll take a look at several solutions implemented through the Exchange Management Shell that address each of the components described previously, as well as some additional techniques that can be used to improve your efficiency when dealing with Exchange security.

## Performing some basic steps

To work with the code samples in this chapter, follow these steps to launch the Exchange Management Shell:

1. Log onto a workstation or server with Exchange Management Tools installed.
2. You can connect using a remote PowerShell if you, for some reason, don't have Exchange Management Tools installed. Use the following command to do this:

   ```
   $Session = New-PSSession -ConfigurationName Microsoft.Exchange `
   -ConnectionUri http://tlex01/PowerShell/ `
   -Authentication Kerberos
   Import-PSSession $Session
   ```

3. Open the Exchange Management Shell by navigating to **Start** | **All Programs** | **Exchange Server 2013**.
4. Click on the **Exchange Management Shell** shortcut.

To launch a standard PowerShell console, navigate to **Start** | **All Programs** | **Accessories**, and then click on the **Windows PowerShell** folder and then on the **Windows PowerShell** shortcut.

Unless otherwise specified in the *Getting ready* section, all of the recipes in this chapter will require the use of the Exchange Management Shell.

Remember to start the Exchange Management Shell using **Run As Admin** to avoid permission problems.

In this chapter, notice that in the examples of cmdlets, I have used the back tick (`) character for breaking up long commands into multiple lines. The purpose of this is to make it easier to read. The back ticks are not required and should only be used if needed.

# Granting users full access permissions to mailboxes

One of the most common administrative tasks that Exchange administrators need to perform is managing the access rights to one or more mailboxes. For example, you may have several users that share access to an individual mailbox, or you may have administrators and help desk staff that need to be able to open end users and mailboxes when troubleshooting a problem or providing technical support. In this recipe, you'll learn how to assign the permissions required to perform these tasks through the Exchange Management Shell.

## How to do it...

To assign full access rights for an individual user to a specific mailbox, use the `Add-MailboxPermission` cmdlet:

```
Add-MailboxPermission -Identity dsmith `
-User hlawson `
-AccessRights FullAccess
```

After running this command, the user `hlawson` will be able to open the mailbox belonging to `dsmith` and read or modify the data within the mailbox.

## How it works...

When you assign full access rights to a mailbox, you may notice that the change does not take effect immediately, and the user that has been granted permissions to a mailbox still cannot access that resource. This is because the Information Store service uses a cached mailbox configuration that, by default, is only refreshed every two hours. You can force the cache to refresh by restarting the Information Store service on the mailbox server that is hosting the active database where the mailbox resides. Obviously, this is not something that should be done during business hours on production servers, as it will disrupt mailbox access for end users.

Since we can grant permissions to a mailbox using the `Add-MailboxPermission` cmdlet, you would be correct when assuming that this change can also be reversed if needed. To remove the permissions assigned in the previous example, use the `Remove-MailboxPermission` cmdlet:

```
Remove-MailboxPermission -Identity dsmith `
-User hlawson `
-AccessRights FullAccess `
-Confirm:$false
```

In addition to assigning full access permissions to individual users, you can also assign this right to a group:

```
Add-MailboxPermission -Identity dsmith `
-User "IT Help Desk" `
-AccessRights FullAccess
```

In this example, the `IT Help Desk` is a mail-enabled universal security group, and it has been granted full access to the `dsmith` mailbox. All users who are members of this group will be able to open the mailbox and access its contents through Outlook or OWA.

Of course, you may need to do this for multiple users, and doing so one mailbox at a time is not very efficient. To make this a little easier, we can make use of a simple pipeline command. For example, let's say that you want to grant full access rights to all mailboxes in the organization:

```
Get-MailboxDatabase |
  Add-ADPermission -User support `
  -AccessRights GenericAll
```

The given command retrieves all user mailboxes in the organization, and sends them down the pipeline to the `Add-MailboxPermission` cmdlet, where full access rights are assigned to the `IT Help Desk` group.

## There's more...

If you need to assign access permissions to all the mailboxes in your organization, you probably should consider doing this at the database level rather than on an individual mailbox basis. In the previous example, we used a pipeline operation to apply the permissions to all mailboxes with a one-liner. The limitation with this is that the command only sets the permissions on the existing mailboxes; any new mailbox created afterwards will not inherit these permissions. You can solve this problem by assigning the `GenericAll` extended right to a user or group on a particular database.

For example, if all of our mailboxes are located in the `DB01` database, we can allow user access to every mailbox in the database using the following command:

```
Add-ADPermission -Identity DB01 `
-User support `
-AccessRights GenericAll
```

After running this command, the support account will be able to log on to every mailbox in the `DB01` database as well as any mailboxes created in that database in the future.

Of course, you'll likely have more than one database in your organization. If you want to apply this setting to every mailbox database in the organization, pipe the output from the `Get-MailboxDatabase` cmdlet to the `Add-ADPermission` cmdlet using the appropriate parameters:

```
Get-MailboxDatabase |
  Add-ADPermission -User support `
  -AccessRights GenericAll
```

Once this command has been run, the user account `support` will be able to connect to any mailbox in the Exchange organization.

## See also

- The *Sending e-mail messages as another user or group* recipe

## Finding users with full access to mailboxes

One of the issues with assigning full mailbox access to users and support personnel is that things change over time. People change roles, move to other departments, or even leave the organization. Keeping track of all of this and removing full access permissions when required can be challenging in a fast-paced environment. This recipe will allow you to solve that issue using the Exchange Management Shell to find out exactly who has full access permissions for the mailboxes in your environment.

### How to do it...

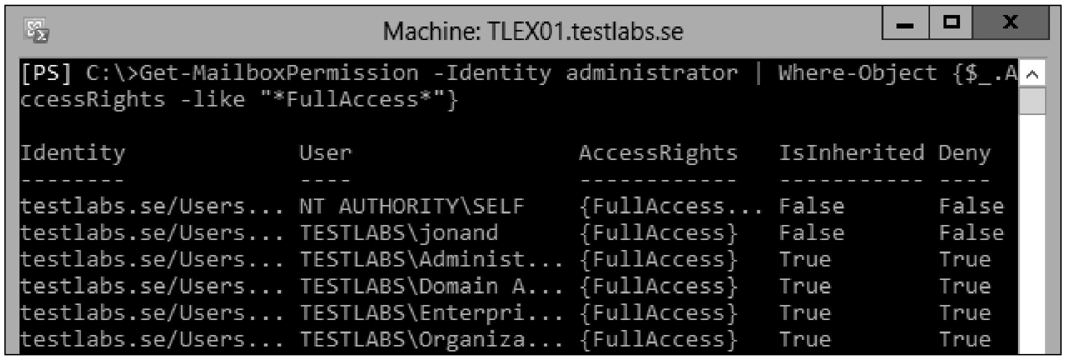
To find all of the users or groups who have been assigned full access rights to a mailbox, use the `Get-MailboxPermission` cmdlet:

```
Get-MailboxPermission -Identity administrator |
  Where-Object {$_.AccessRights -like "*FullAccess*"}
```

You can see here that we are limiting the results using a filter by piping the output to the `Where-Object` cmdlet. Only the users with the `FullAccess` access rights will be returned.

### How it works...

The previous command is useful for quickly viewing the permissions for a single mailbox while working interactively in the shell. The first problem with this approach is that it also returns a lot of information that we're probably not interested in. Consider the following truncated output from our previous command:



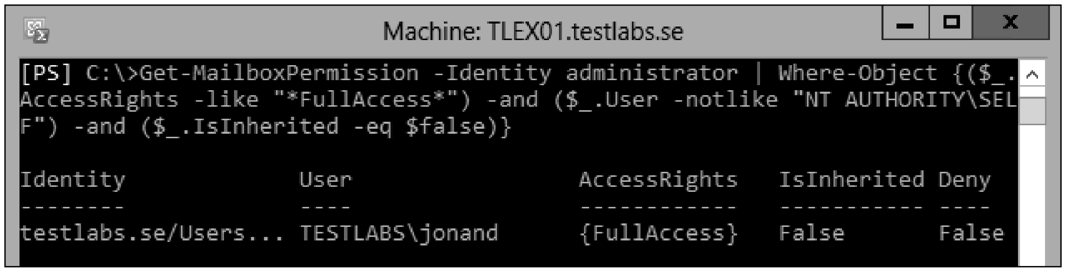
```
[PS] C:\>Get-MailboxPermission -Identity administrator | Where-Object {$_.A
ccessRights -like "*FullAccess*"}

Identity             User                 AccessRights   IsInherited Deny
--------             ----                 ------------   ----------- ----
testlabs.se/Users... NT AUTHORITY\SELF    {FullAccess... False       False
testlabs.se/Users... TESTLABS\jonand      {FullAccess}   False       False
testlabs.se/Users... TESTLABS\Administ... {FullAccess}   True        True
testlabs.se/Users... TESTLABS\Domain A... {FullAccess}   True        True
testlabs.se/Users... TESTLABS\Enterpri... {FullAccess}   True        True
testlabs.se/Users... TESTLABS\Organiza... {FullAccess}   True        True
```

Notice that both the `IT Help Desk` and `sysadmin` have full access permissions to the `administrator` mailbox. This is useful because we know that someone assigned these permissions to the mailbox, as this is not something Exchange is going to do on its own. What is not so useful is that we also see all of the built-in full access permissions that apply to every mailbox, such as the `NT AUTHORITY\SELF` and other default permissions. To filter out this information, we can use a more complex filter:

```
Get-MailboxPermission administrator |
  Where-Object {
    ($_.AccessRights -like "*FullAccess*") `
    -and ($_.User -notlike "NT AUTHORITY\SELF") `
    -and ($_.IsInherited -eq $false)
  }
```

You can see that we're still filtering based on the `AccessRights` property, but now we're excluding the `SELF` account and any other accounts that receive their permissions through inheritance. The output now gives us something that's a little easier to work with when reviewing a report:



```
[PS] C:\>Get-MailboxPermission -Identity administrator | Where-Object {($_.
AccessRights -like "*FullAccess*") -and ($_.User -notlike "NT AUTHORITY\SEL
F") -and ($_.IsInherited -eq $false)}

Identity             User                 AccessRights   IsInherited Deny
--------             ----                 ------------   ----------- ----
testlabs.se/Users... TESTLABS\jonand      {FullAccess}   False       False
```

This is an easy way to figure out which accounts have been assigned full access to a mailbox via the `Add-MailboxPermission` cmdlet. Keep in mind that users who have been assigned these permissions at the database level receive their permissions through inheritance, so you may need to adjust the filter to meet your specific needs.

## There's more...

Finding out which users have full access rights to an individual mailbox can be useful for quick troubleshooting, but chances are you're going to need to figure this out for all the mailboxes in your organization. The following code will generate the output that provides this information:

```
foreach($mailbox in Get-Mailbox -ResultSize Unlimited) {
  Get-MailboxPermission $mailbox |
    Where-Object {
    ($_.AccessRights -like "*FullAccess*") `
    -and ($_.User -notlike "NT AUTHORITY\SELF") `
    -and ($_.IsInherited -eq $false)
  }
}
```

As you can see here, we use a `foreach` loop to process all of the mailboxes in the organization. Inside the loop, we're using the same filter from the previous example to determine which users have full access rights to each mailbox.

## Sending e-mail messages as another user or group

In some environments, it may be required to allow users to send e-mail messages from a mailbox as if the owner of that mailbox had actually sent this message. This can be accomplished by granting `Send-As` permissions to a user on a particular mailbox. In addition, you can also allow a user to send e-mail messages that are sent using the identity of a distribution group. This recipe explains how you can manage these permissions from the Exchange Management Shell.

### How to do it...

To assign `Send-As` permissions to a mailbox, we use the `Add-ADPermission` cmdlet:

```
Add-ADPermission -Identity "Frank Howe" `
-User "Eric Cook" `
-ExtendedRights Send-As
```

After running the previous command, Eric Cook can send messages from Frank Howe's mailbox.

### How it works...

The `Add-ADPermission` cmdlet uses the `-Identity` parameter to classify the object to which you will assign the permissions. Unlike many of the Exchange cmdlets, you cannot use the alias of the mailbox when assigning a value to the `-Identity` parameter. You can use the user's display name, as shown previously, as long as it is unique, or you can use the distinguished name of the object. If you do not know a user's full name, you can use the `Get-Mailbox` cmdlet and pipe the object to the `Add-ADPermission` cmdlet:

```
Get-Mailbox fhowe |
  Add-ADPermission -User ecook -ExtendedRights Send-As
```

You might find this syntax useful when assigning the `Send-As` right in bulk. For example, to grant a user `Send-As` permission for all users in a particular OU, use the following syntax:

```
Get-Mailbox -OrganizationalUnit contoso.com/Sales |
  Add-ADPermission -User ecook -ExtendedRights Send-As
```

If you ever need to remove these settings, simply use the `Remove-ADPermission` cmdlet. This command will remove the permissions assigned in the first example:

```
Remove-ADPermission -Identity "Frank Howe" `
-User ecook `
-ExtendedRights Send-As `
-Confirm:$false
```

## There's more...

To assign `Send-As` permissions to a distribution group, the process is exactly the same as for a mailbox. Use the `Add-ADPermission` cmdlet:

```
Add-ADPermission -Identity Marketing `
-User ecook `
-ExtendedRights Send-As
```

You can also provide the identity of the group to the `Add-ADPermission` cmdlet via a pipeline command, just as we saw earlier with the `Get-Mailbox` cmdlet. To do this with a distribution group, use the `Get-DistributionGroup` cmdlet:

```
Get-DistributionGroup -ResultSize Unlimited |
  Add-ADPermission -User ecook -ExtendedRights Send-As
```

In the given example, the user `ecook` is given the `Send-As` right for all the distribution groups in the organization.

# Working with Role Based Access Control (RBAC)

The security model that was introduced in Exchange 2010 is still present in Exchange 2013. With the introduction of the Role Based Access Control (RBAC) permissions model, you can essentially determine which cmdlets administrators and end users are allowed to use in order to change settings within the system. This recipe will show you how to work with the predefined RBAC permissions in Exchange 2013.

## How to do it...

Let's say that you need to allow a member of your staff to manage the settings of the Exchange servers in your organization. This administrator only needs to manage server settings, and should not be allowed to perform any other tasks, such as recipient management.

Exchange 2013 provides a large set of predefined permissions that can be used to address common tasks like this. In this case, we can use the `Server Management` role group that allows administrators to manage the servers in the organization.

All we need to do to assign the permission is to add the required user account to this role group:

```
Add-RoleGroupMember -Identity "Server Management" -Member bwelch
```

At this point, the user can use the Exchange Management Console or the Exchange Management Shell to perform server-related management tasks.

## How it works...

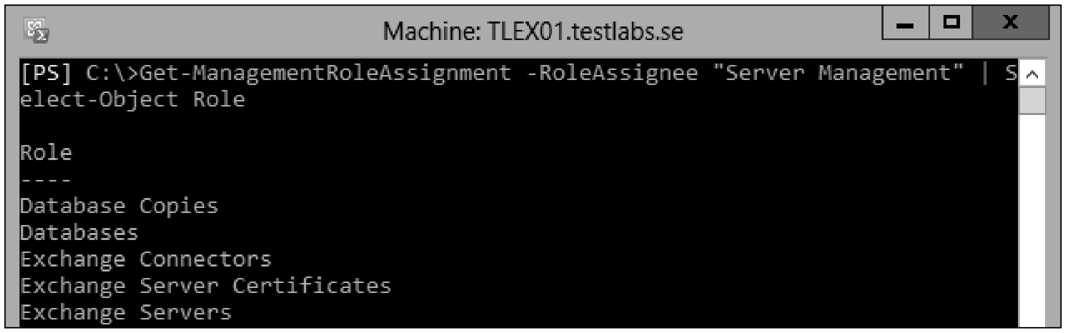
Exchange 2013 implements RBAC by grouping sets of cmdlets used to perform specific tasks into management roles. Think of a management role simply as a list of cmdlets. For example, one of the roles assigned via the `Server Management` role group is called `Exchange Servers`. This role allows an assigned user the ability to use over 30 separate cmdlets that are specifically related to managing servers, such as `Get-ExchangeServer`, `Set-ExchangeServer`, and more.

There are a number of built-in role groups that you can use to delegate typical management tasks to the administrators in your environment. You can view all of the built-in role groups using the `Get-RoleGroup` cmdlet.

Role groups can assign many different management roles to a user. In the previous example, we were working with the `Server Management` role group, which assigns a number of different management roles to any user that is added to this group. To view a list of these roles, we can use the `Get-ManagementRoleAssignment` cmdlet:

```
Get-ManagementRoleAssignment -RoleAssignee 'Server Management' |
  Select-Object Role
```

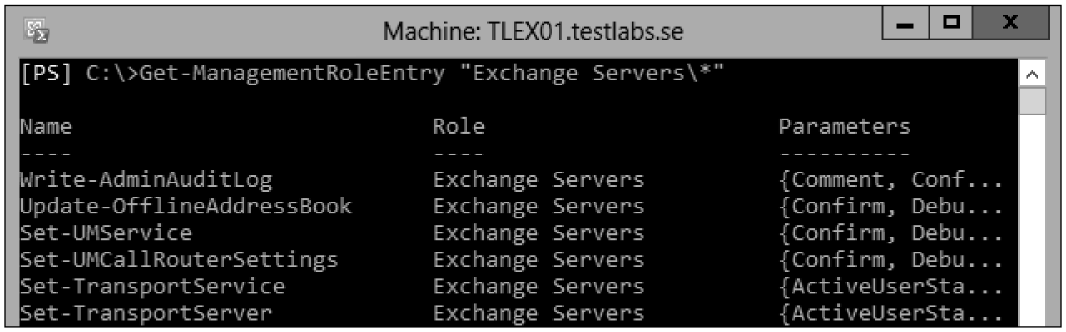
The output from this command is shown in the following screenshot:



```
[PS] C:\>Get-ManagementRoleAssignment -RoleAssignee "Server Management" | S
elect-Object Role

Role
----
Database Copies
Databases
Exchange Connectors
Exchange Server Certificates
Exchange Servers
```

As you can see, each management role assigned through this role group is returned. To determine which cmdlets are made available by each of these roles, we can run the `Get-ManagementRoleEntry` cmdlet against each of them individually. An example of this can be seen in the following screenshot:



```
[PS] C:\>Get-ManagementRoleEntry "Exchange Servers\*"

Name                           Role                      Parameters
----                           ----                      ----------
Write-AdminAuditLog            Exchange Servers          {Comment, Conf...
Update-OfflineAddressBook      Exchange Servers          {Confirm, Debu...
Set-UMService                  Exchange Servers          {Confirm, Debu...
Set-UMCallRouterSettings       Exchange Servers          {Confirm, Debu...
Set-TransportService           Exchange Servers          {ActiveUserSta...
Set-TransportServer            Exchange Servers          {ActiveUserSta...
```

Management role entries are listed in the format of `<Role Name>\<Cmdlet Name>`. The `Get-ManagementRoleEntry` cmdlet can be used with wildcards, as shown with the previous command. The output from the `Get-ManagementRoleEntry` command in the previous example is truncated for readability, but as you can see, there are several cmdlets that are part of the `Exchange Servers` management role, which can be assigned via the `Server Management` role group. If only this role is assigned to a user, they are given access to these specific cmdlets and will not see other cmdlets, such as `New-Mailbox`, as that is part of another management role.

To view all of the management roles that exist in the organization, use the `Get-ManagementRole` cmdlet. You can then use the `Get-ManagementRoleEntry` cmdlet to determine which cmdlets belong to that role.

## There's more...

Many of the management roles installed with Exchange 2013 can be assigned to users by adding them to a role group. **Role groups** are associated with management roles through something called **role assignments**. Although the recommended method of assigning permissions is through the use of role groups, you can still directly assign a management role to a user with the `New-ManagementRoleAssignment` cmdlet:

```
New-ManagementRoleAssignment -Role 'Mailbox Import Export' `
-User administrator
```

In this example, the administrator is assigned the `Mailbox Import Export` role, which is not associated with any of the built-in role groups. In this case, we can create a direct assignment as shown previously, or use the `–SecurityGroup` parameter to assign this role to an existing role group or a custom role group created with the `New-RoleGroup` cmdlet.

### RBAC is for end users too

Everything we've discussed so far is related to RBAC for administrators, but end users need to be able to run cmdlets too. Now, this doesn't mean that they need to fire up EMS and start executing commands, but other things that they change will require the use of PowerShell cmdlets behind the scenes.

A good example of this is the **Exchange Control Panel** (**ECP**). When a user logs into ECP, the very first thing they see is the **Account Information** screen that allows them to change various settings that apply to their user account, such as their address, city, state, zip code, and phone numbers. When users change this information in ECP, those changes are carried out in the background with Exchange Management Shell cmdlets.

Here's the confusing part. End users are also assigned permissions from management roles, but not through role groups or role assignments, as they are applied to administrators. Instead, end users are assigned their management roles through something called a **role assignment policy**.

When you install Exchange, a single role assignment policy is created. Mailboxes that are created or moved over to Exchange 2013 will use the `Default Role Assignment Policy` role group, which gives users some basic rights, such as modifying their contact information, creating inbox rules through ECP, and more.

To determine which management roles are applied to the default role assignment policy, use the following command:

```
Get-RoleAssignmentPolicy "Default Role Assignment Policy" |
  Format-List AssignedRoles
```

## See also

- The *Creating a custom RBAC role for administrators* recipe
- The *Creating a custom RBAC role for end users* recipe
- *Troubleshooting Role Based Access Control* recipe

## Creating a custom RBAC role for administrators

Sometimes, the management roles that are installed by Exchange are not specific enough to meet your needs. When you are faced with this issue, the solution is to create a custom RBAC role. The process can be a little tricky, but the level of granular control that you can achieve is quite astounding. This recipe will show you how to create a custom RBAC role that can be assigned to administrators based on a very specific set of requirements.

### How to do it...

Let's say that your company has decided that a group of support personnel should be responsible for the creation of all new Exchange recipients. You want to be very specific about what type of access this group will be granted, and you plan on implementing a custom management role based on the following requirements:

- Support personnel should be able to create Exchange recipients in the Employees OU in the Active Directory
- Support personnel should not be able to create Exchange recipients in any other OU in the Active Directory
- Support personnel should not be able to remove recipients in the Employees OU, or any other OU in the Active Directory

Use the following steps to implement a custom RBAC role for the support group based on the previous requirements:

1. First, we need to create a new custom management role:

```
New-ManagementRole -Name "Employee Recipient Creation" `
-Parent "Mail Recipient Creation"
```

2. Next, we need to modify the role so that the support staff cannot remove recipients from the organization:

   ```
   Get-ManagementRoleEntry "Employee Recipient Creation\*" |
     Where-Object {$_.name -like "remove-*"} |
       Remove-ManagementRoleEntry -Confirm:$false
   ```

3. Now we need to scope this role to a specific location in Active Directory:

   ```
   New-ManagementScope -Name Employees `
   -RecipientRoot contoso.com/Employees `
   -RecipientRestrictionFilter {
     (RecipientType -eq "UserMailbox") -or
     (RecipientType -eq "MailUser") -or
     (RecipientType -eq "MailContact")
   }
   ```

4. Finally, we can create a custom role group and add the support staff as members:

   ```
   New-RoleGroup -Name Support `
   -Roles "Employee Recipient Creation" `
   -CustomRecipientWriteScope Employees `
   -Members bjacobs,dgreen,jgordon
   ```

## How it works...

The built-in management roles cannot be modified, so, when we want to customize an existing role to meet our needs, we need to create a new custom role based on an existing parent role. Since we know that the built-in `Mail Recipient Creation` role provides the cmdlets that our support group will need, the first thing we must do is create a new role as a child of the `Mail Recipient Creation` role, called `Employee Recipient Creation`.

One of the requirements in our scenario was that support personnel should not be able to remove recipients from the organization, so we edited our custom role to get rid of any cmdlets that could be used to remove recipients from the `Employees` OU, or from any other location in the Active Directory. We used the `Remove-ManagementRoleEntry` cmdlet to delete all of the `Remove-*` cmdlets from our custom role, and therefore, this will prevent users assigned to the custom role from removing recipient objects.

Next, we created a management scope that defines what the support group can access. We used the `New-ManagementScope` cmdlet to create the `Employee` management scope. As you can see from the command, we specified the recipient root as the `Employees` OU, as per the requirements in our scenario. When specifying a `RecipientRoot`, we are also required to specify a `RecipientRestrictionFilter`, which will be limited to the `UserMailbox`, `MailUser`, and `MailContact` recipient types.

Finally, we created our management role group using the `New-RoleGroup` cmdlet. The command used created a role group named `Support`, which created a universal security group in the Microsoft Exchange Security Groups OU in Active Directory. The role group was created using the `Employees` management scope, limiting access to the `Employees` OU. Also, notice that we added three users to the group using the `-Members` parameter. Doing it this way automatically creates the management role assignment for us. You can view management role assignments using the `Get-ManagementRoleAssignment` cmdlet.

## There's more...

One of the things making custom RBAC role assignments so powerful is the use of the management scope. When we created the `Employees` management scope, we used the `-RecipientRestrictionFilter` parameter to limit the types of recipients that would apply to that scope. When creating the role group, we specified this scope using the `-CustomRecipientWriteScope` parameter. This locks the administrator down to only writing to recipient objects that match the scope's filter and recipient root.

Keep in mind that scopes can be created with a `ServerRestrictionFilter`, and role groups and role assignments can be configured to use these scopes by assigning them to the `CustomConfigWriteScope` parameter. This can be useful when assigning custom RBAC roles for administrators who will be working on servers, as opposed to recipients. For example, instead of limiting your staff to working with recipient objects in a specific OU, you could create a custom role that only applies to specific servers in your organization, such as ones that are located in another city or another Active Directory site.

## See also

- The *Working with Role Based Access Control (RBAC)* recipe
- The *Creating a custom RBAC role for end users* recipe
- The *Troubleshooting Role Based Access Control* recipe

## Creating a custom RBAC role for end users

Like custom RBAC roles for administrators, you can also create custom roles that apply to your end users. This may be useful when you need to allow them to modify additional configuration settings that apply to their own accounts through the Exchange Control Panel (ECP). This recipe will provide a real-world example of how you might implement a custom RBAC role for end users in your Exchange organization.

## How to do it...

When users log on to ECP, they have the ability to modify their work phone number, their fax number, their home phone number, and their mobile phone number, among other things. Let's say that we need to limit this so that they can only update their home phone number, as their work, fax, and mobile numbers will be managed by the administrators in your organization.

Since built-in roles cannot be modified, we need to create a custom role based on one of the existing built-in roles. Use the following steps to implement a custom RBAC role for end users based on the previous requirements:

1. The `MyContactInformation` role allows end users to modify their contact information, so we'll create a new custom role based on this parent role:

   ```
   New-ManagementRole -Name MyContactInfo `
   -Parent MyContactInformation
   ```

2. The `Set-User` cmdlet is what executes in the background when users modify their contact information. This is done using several parameters made available through this cmdlet. We'll create an array that contains all of these parameters so we can modify them later:

   ```
   $parameters = Get-ManagementRoleEntry "MyContactInfo\Set-User" |
     Select-Object -ExpandProperty parameters
   ```

3. Next, we'll create a new array that excludes the parameters that allow the end users to change their business related phone numbers:

   ```
   $parameters = $parameters |
     Where-Object{
       ($_ -ne "Phone") -and `
       ($_ -ne "MobilePhone") -and `
       ($_ -ne "Fax")
     }
   ```

4. Now we'll modify the `Set-User` cmdlet so that it only provides our custom list of parameters:

   ```
   Set-ManagementRoleEntry -Identity "MyContactInfo\Set-User" `
   -Parameters $parameters
   ```

5. The `MyContactInformation` role is assigned to end users through the default role assignment policy, so we need to remove that assignment from the policy:

   ```
   Remove-ManagementRoleAssignment -Identity `
   "MyContactInformation-Default Role Assignment Policy" `
   -Confirm:$false
   ```

6. Finally, we can add our custom RBAC role to the default role assignment policy:

```
New-ManagementRoleAssignment -Role MyContactInfo `
-Policy "Default Role Assignment Policy"
```

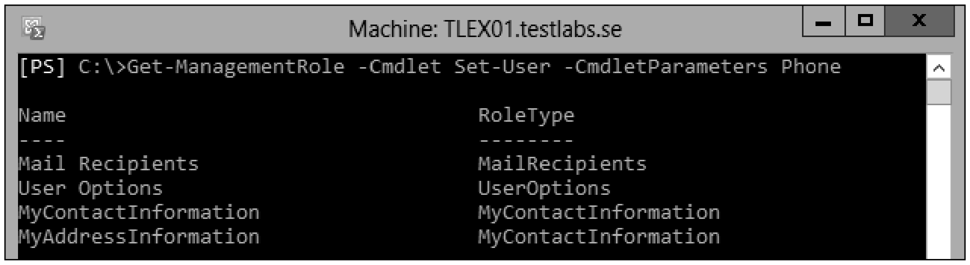
When users log in to ECP, they'll only be able to modify their home phone numbers.

## How it works...

As you can see from these steps, not only do management roles provide users with access to cmdlets, but also to specific parameters available on those cmdlets. We're able to limit the use of the `Set-User` cmdlet by removing access to the parameters that allow users to modify properties of their account that we do not want them to change.

End user management roles are assigned through a role assignment policy. By default, only one role assignment policy is created when you deploy Exchange 2013, called the `Default Role Assignment Policy`. In the first example, we created a custom role based on the existing `MyContactInformation` role that allows end users to update their personal contact details.

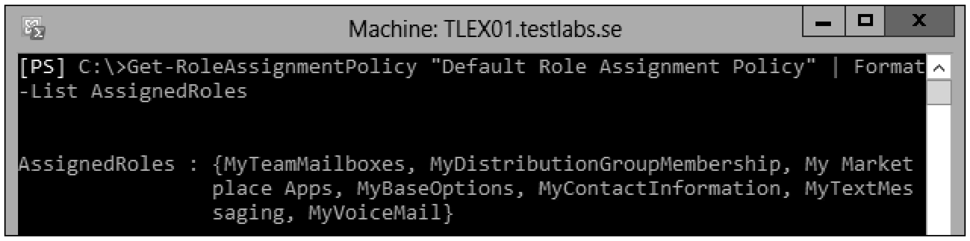
One of the questions you may be asking at this point is how did we determine that the `MyContactInformation` role was the one that needed to be modified? Well, we can come to this conclusion by first checking which roles assign the `Set-User` cmdlet with the `-Phone` parameter:



```
[PS] C:\>Get-ManagementRole -Cmdlet Set-User -CmdletParameters Phone

Name                                  RoleType
----                                  --------
Mail Recipients                       MailRecipients
User Options                          UserOptions
MyContactInformation                  MyContactInformation
MyAddressInformation                  MyContactInformation
```

All of the built-in end user management roles are prefixed with `My`, and as you can see from the previous output, the only two roles that apply here are listed at the bottom. Now we need to check the default role assignment policy:



```
[PS] C:\>Get-RoleAssignmentPolicy "Default Role Assignment Policy" | Format
-List AssignedRoles


AssignedRoles : {MyTeamMailboxes, MyDistributionGroupMembership, My Market
                place Apps, MyBaseOptions, MyContactInformation, MyTextMes
                saging, MyVoiceMail}
```

As you can clearly see from the output, the only roles assigned to the end users that contain the `Set-User` cmdlet are assigned by the `MyContactInformation` role, and we know that this is the role that needs to be replaced with a custom role.

## There's more...

If you don't want to modify the existing role assignment policy, you can create a new role assignment policy that can be applied to individual users. This may be useful if you need to test things without affecting other users. To do this, use the `New-RoleAssignmentPolicy` cmdlet and specify a name for the policy and all the roles that should be applied via this role assignment policy:

```
New-RoleAssignmentPolicy -Name MyCustomPolicy `
-Roles MyDistributionGroupMembership,
MyBaseOptions,
MyTeamMailboxes,
MyTextMessaging,
MyVoiceMail,
MyContactInfo
```

Once this is complete, you can assign the role assignment policy to an individual user with the `Set-Mailbox` cmdlet:

```
Set-Mailbox -Identity "Ramon Shaffer" `
-RoleAssignmentPolicy MyCustomPolicy
```

If you later decide that this new policy should be used for all of your end users, you'll need to do two things. First, you'll need to set this role assignment policy as the default policy for new mailboxes:

```
Set-RoleAssignmentPolicy MyCustomPolicy -IsDefault
```

Then you'll need to modify the existing users so that they'll be assigned the new role assignment policy:

```
Get-Mailbox -ResultSize Unlimited |
  Set-Mailbox -RoleAssignmentPolicy MyCustomPolicy
```

## See also

- The *Working with Role Based Access Control (RBAC)* recipe
- The *Creating a custom RBAC role for administrators* recipe
- The *Troubleshooting Role Based Access Control* recipe

## Troubleshooting Role Based Access Control

Troubleshooting permission issues can be challenging, especially if you've implemented custom RBAC roles. In this recipe, we'll take a look at some useful troubleshooting techniques that can be used to troubleshoot issues related to RBAC.

### How to do it...

There are several scenarios in which you can use the Exchange Management Shell cmdlets to solve problems with RBAC, and there are a couple of cmdlets that you'll need to use to do this. The following steps outline the solutions for some common troubleshooting situations:

1. To determine which management roles have been assigned to a user, use the following command syntax:

   ```
   Get-ManagementRoleAssignment -GetEffectiveUsers |
     Where-Object {$_.EffectiveUserName -eq 'sysadmin'}
   ```

2. To retrieve a list of users that have been assigned a specific management role, run the following command and specify a role name, such as the `Legal Hold` role, as shown next:

   ```
   Get-ManagementRoleAssignment -Role 'Legal Hold' -GetEffectiveUsers
   ```

3. You can determine if a user has write access to a recipient, server, or database. For example, use the following syntax to determine if the `sysadmin` account has the ability to modify the Dave Jones mailbox:

   ```
   Get-ManagementRoleAssignment -WritableRecipient djones `
   -GetEffectiveUsers |
     Where-Object{$_.EffectiveUserName -eq 'sysadmin'}
   ```

After running the previous command, any roles that give the `sysadmin` write access to the specified recipient will be returned.

## How it works...

The `Get-ManagementRoleAssignment` cmdlet is a useful tool when it comes to troubleshooting RBAC issues. If an administrator is unable to modify a recipient or make a change against a server, it is very possible that the role assignment is either incorrect or it might not exist at all. In each step shown previously, we used the `-GetEffectiveUsers` parameter with this cmdlet, which provides a quick way to find out if certain roles have been assigned to a specific user.

In addition to the `-WritableRecipient` parameter, you have the option of using either the `-WritableServer` or `-WritableDatabase` parameters. These can be used to determine if an administrator has write access to a server or database object. This can be useful in determining if a role assignment has not been made for an administrator that should be able to modify one of these objects. You can also use this as a method of determining if some administrators have been granted too much control in your environment.

## There's more...

If someone is not receiving the permissions you think they should, they may not be a member of the required role group. The steps outlined previously should help you make this determination, but it may be as simple as making sure the administrator has been added to the right role group that will assign the appropriate roles. You can retrieve the members of a role group in the shell using the `Get-RoleGroupMember` cmdlet. This command will return all the members of the `Organization Management` role group:

```
Get-RoleGroup 'Organization Management' | Get-RoleGroupMember
```

You can also use these cmdlets to generate a report of all the members of each role group. For example, this will display the member of each role group in the shell:

```
foreach($rg in Get-RoleGroup) {
  Get-RoleGroupMember $rg |
    Select-Object Name,@{n="RoleGroup";e={$rg.Name}}
}
```

## See also

- The *Working with Role Based Access Control (RBAC)* recipe
- The *Creating a custom RBAC role for administrators* recipe
- The *Creating a custom RBAC role for end users* recipe

## Generating a certificate request

In order to create a new certificate, you need to generate a certificate request using either the Exchange Admin Center, or through the shell using the `New-ExchangeCertificate` cmdlet. Once you have a certificate request generated, you can obtain a certificate from an internal Certificate Authority or a third-party external Certificate Authority. In this recipe, we'll take a look at the process of generating a certificate request from the Exchange Management Shell.

### How to do it...

1. In this example, we'll generate a request using two Subject Alternative Names (SANs). This will allow us to support multiple URLs with one certificate:

```
$cert = New-ExchangeCertificate -GenerateRequest `
-SubjectName "c=US, o=Contoso, cn=mail.contoso.com" `
-DomainName autodiscover.contoso.com,mail.contoso.com `
-PrivateKeyExportable $true
```

2. After the request has been generated, we can export it to a file that can be used to submit a request to a certificate authority:

```
$cert | Out-File c:\cert_request.txt
```

### How it works...

When you install Exchange 2013, self-signed certificates are automatically generated and installed to encrypt data passed between servers. Since these self-signed certificates will not be trusted by your client machines when accessing the CAS role, it is recommended that you replace these certificates with new certificates issued from a trusted certificate authority. If you do not replace these certificates, clients such as Outlook 2013 and Outlook Web App users will receive certificate warnings informing them that the certificates are not issued from a trusted source. This can create some confusion for end users and could generate calls to your help desk.

You can get around these certificate warnings by installing the server's self-signed certificates in the Trusted Root Certificate Authority store on the client machines, but even in a small environment, this can become an administrative headache. That's why it is recommended to replace the self-signed certificates before placing your Exchange 2013 servers into production.

When using the `New-ExchangeCertificate` cmdlet to generate a certificate request, you can use the `-SubjectName` parameter to specify the common name of the certificate. This value is set using an X.500 distinguished name, and as you saw in step 2, the common name for the certificate was set to `mail.contoso.com`. If you do not provide a value for the `-SubjectName` parameter, the hostname of the server where the cmdlet is run to generate the request will be used.

The `-DomainName` parameter is used to define one or more FQDNs that will be listed in the Subject Alternative Names field of the certificate. This allows you to generate certificates that support multiple FQDNs that can be installed on multiple Exchange servers. For example, you may have several CAS servers in your environment and instead of generating multiple certificates for each one, you can simply add Subject Alternative Names to cover all of the possible FQDNs that users will need to access, and then install a single certificate on multiple CAS servers.

The `New-ExchangeCertificate` cmdlet outputs a certificate request in `Base64` format. In the previous example, we saved the output of the command in a variable so we could simply output the data to a text file. Once the request is generated, you'll need to supply the data from this request to the issuing **Certificate Authority** (**CA**). This is usually done through a web form hosted by the CA where you submit the certificate request. You can simply open the request file in Notepad, copy the data, and paste it into the submission form on the CA website. Once the information is submitted, the CA will generate a certificate that can be downloaded and installed on your servers. See the next recipe in this chapter titled *Installing certificates and enabling services* for steps on how to complete this process.

## There's more...

It's recommended as a best practice that you limit the number of Subject Alternative Names on your certificates, so your name space design should be completely defined before creating your certificates. For example, let's say that you've got four CAS servers in a CAS array and all of your servers are located in a single Active Directory site. Even though you have multiple servers, you only need to include the FQDNs that your end users will use to access these servers. If you configure your CAS URLs appropriately, there's no requirement to include the server's FQDN or hostname as a Subject Alternative Name in this scenario.

If you plan on installing a certificate on multiple servers, make sure that you mark the certificate as exportable by setting the `-PrivateKeyExportable` parameter to `$true`. This will allow you to export the certificate and install it on the remaining servers in your environment.

## See also

- The *Installing certificates and enabled services* recipe
- The *Importing certificates on multiple exchange servers* recipe

## Installing certificates and enabling services

After you've generated a certificate request and have obtained a certificate from a certificate authority, you will need to install the certificate on your server using the `Import-ExchangeCertificate` cmdlet. This recipe will show you how to install certificates issued from a certificate authority and how to assign services to the certificate using the Exchange Management Shell.

### How to do it...

1. Let's say that you have requested and downloaded a certificate from an Active Directory Enterprise CA and downloaded the file to the root of `C:\`. First, read the certificate data into a variable in the shell:

   ```
   $certificate = Get-Content -Path c:\certnew.cer `
   -Encoding Byte `
   -ReadCount 0
   ```

2. Next, we can import the certificate and complete the pending request:

   ```
   Import-ExchangeCertificate -FileData $certificate
   ```

3. Now that the certificate is installed, we can enable it for specific services:

   ```
   Get-ExchangeCertificate -DomainName mail.contoso.com |
     Enable-ExchangeCertificate -Services IIS,SMTP
   ```

At this point, the certificate has been installed and will now be used for Client Access services, such as Outlook Web App and the Exchange Control Panel, and also for securing SMTP.

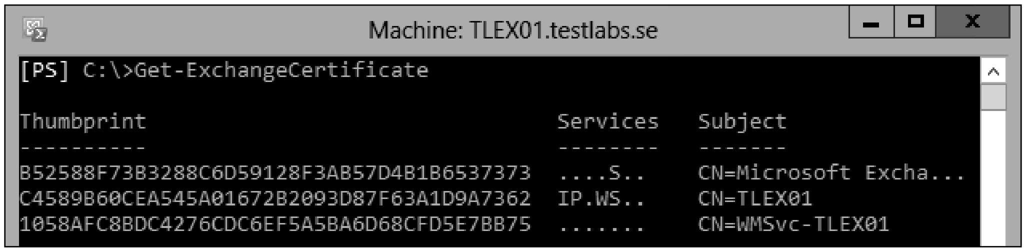
### How it works...

Since the Exchange Management Shell uses remote PowerShell sessions, the `Import-ExchangeCertificate` cmdlet cannot use a local file path to import a certificate file. This is because the cmdlet could be running on any server within your organization and a local file path may not exist. This is why we need to use the `-FileData` parameter to provide the actual data of the certificate. In step 1, we read the certificate data into a byte array using the `Get-Content` cmdlet, which is a PowerShell core cmdlet, and is not run through the remote shell on the Exchange server. The content of the certificate is stored as a byte array in the `$certificate` variable, and we can assign this data to the `-FileData` parameter of the `Import-ExchangeCertificate` cmdlet that allows us to import the certificate to any Exchange server through the remote shell.

Use the `-Server` parameter with the `Get-ExchangeCertificate` cmdlet to target a specific server. Otherwise, the cmdlet will run against the server you are currently connected to.

## There's more...

As shown previously, once the certificate has been imported, it needs to have one or more services assigned before it can be used by an Exchange server. After importing a certificate, you can use the `Get-ExchangeCertificate` cmdlet to view it:



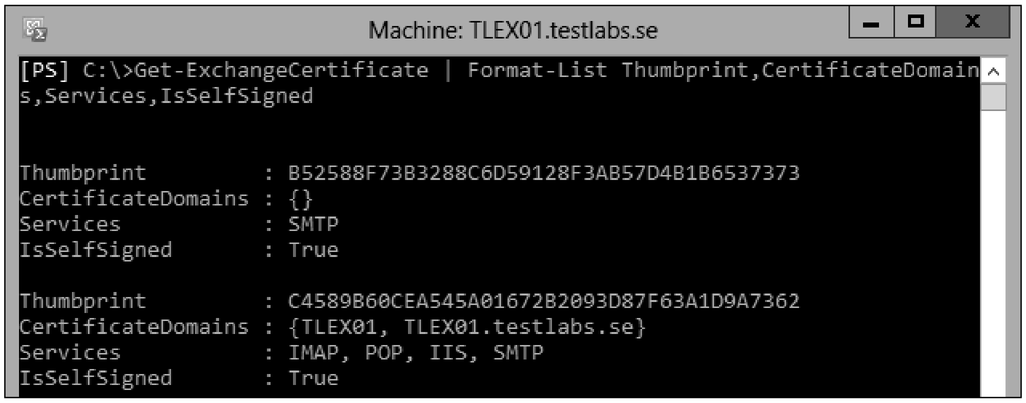
Machine: TLEX01.testlabs.se

```
[PS] C:\>Get-ExchangeCertificate

Thumbprint                                Services   Subject
----------                                --------   -------
B52588F73B3288C6D59128F3AB57D4B1B6537373  ....S..    CN=Microsoft Excha...
C4589B60CEA545A01672B2093D87F63A1D9A7362  IP.WS..    CN=TLEX01
1058AFC8BDC4276CDC6EF5A5BA6D68CFD5E7BB75  .......    CN=WMSvc-TLEX01
```

You can see that we have two certificates installed. When assigning services to a certificate, we need to be specific about which one needs to be modified. We can do this either by specifying the thumbprint of the certificate when running the `Enable-ExchangeCertificate` cmdlet, or by using the method shown previously, where we used the `Get-ExchangeCertificate` cmdlet with the `-DomainName` parameter to retrieve a particular certificate, and send it down the pipeline to the `Enable-ExchangeCertificate` cmdlet.

Let's say that we're connected to a server named `EXCH01`. We've imported a certificate, and now we need to view all of the installed certificates so we can figure out which one needs to be enabled and assigned the appropriate services. We can do this by viewing a few key properties of each certificate using the `Get-ExchangeCertificate` cmdlet:



Machine: TLEX01.testlabs.se

```
[PS] C:\>Get-ExchangeCertificate | Format-List Thumbprint,CertificateDomain
s,Services,IsSelfSigned


Thumbprint         : B52588F73B3288C6D59128F3AB57D4B1B6537373
CertificateDomains : {}
Services           : SMTP
IsSelfSigned       : True

Thumbprint         : C4589B60CEA545A01672B2093D87F63A1D9A7362
CertificateDomains : {TLEX01, TLEX01.testlabs.se}
Services           : IMAP, POP, IIS, SMTP
IsSelfSigned       : True
```

Here you can see that we've retrieved the `Thumbprint`, `CertificateDomains`, and assigned `Services` for each installed Exchange certificate in list format. We've also selected the `IsSelfSigned` property that will tell us whether or not the certificate was issued from a certificate authority or installed by Exchange as a self-signed certificate. It's pretty clear from the output that the second certificate in the list is the one that was issued from a certificate authority, since the `IsSelfSigned` property is set to `$false`. At this point, we can use the certificate thumbprint to assign services to this certificate:

```
Enable-ExchangeCertificate `
-Thumbprint CF61E66A6BE1A286471B30DFCEA1126F6BC7DCBB `
-Services IIS,SMTP
```

If you have multiple certificates installed, especially with duplicate domain names, use the method shown here to assign services based on the certificate thumbprint. Otherwise, you may find it easier to enable certificates based on the domain name, as shown in the first example.

## See also

- The *Importing certificates on multiple exchange servers* recipe
- The *Generating a certificate request* recipe

## Importing certificates on multiple exchange servers

If your environment contains multiple Exchange servers, you'll likely want to use the same certificate on multiple servers. If you have a large amount of servers, importing certificates one at a time, even with the Exchange Management Shell, could end up being quite time-consuming. This recipe will provide a method for automating this process using the Exchange Management Shell.

## How to do it...

Once you've gone through the process of generating a certificate request, installing a certificate, and assigning the services on one server, you can export that certificate and deploy it to your remaining servers. The following steps outline the process of exporting an installed certificate on a server named `CAS1` and importing that certificate on a server named `CAS2`:

1. In order to export a certificate, we'll first need to assign a password to secure the private key that will be exported with the certificate:

   ```
   $password = ConvertTo-SecureString -String P@ssword `
   -AsPlainText `
   -Force
   ```

2. Now we can export the certificate data with the `Export-ExchangeCertificate` cmdlet. We'll retrieve the certificate from the `CAS1` server and export the data to a binary-encoded value stored in a variable:

   ```
   $cert = Get-ExchangeCertificate `
   -DomainName mail.contoso.com -Server cas1 |
     Export-ExchangeCertificate -BinaryEncoded:$true `
     -Password $password
   ```

3. Next, we can import the certificate file data into the `CAS2` server as a certificate:

   ```
   Import-ExchangeCertificate -FileData $cert.FileData `
   -Password $password `
   -Server cas2
   ```

4. Finally, we can assign the services to the certificate that was recently imported on the `CAS2` server:

   ```
   Get-ExchangeCertificate `
   -DomainName mail.contoso.com -Server cas2 |
     Enable-ExchangeCertificate -Services IIS,SMTP
   ```

## How it works...

As you can see from these steps, exporting a certificate from one server and importing it on an additional server is rather complex, and would be even more so if you want to do this on 5 to 10 servers. If this is a common task that needs to be done frequently, then it makes sense to automate it even further. The following PowerShell function will automate the process of exporting a certificate from a source server and will import the certificate on one or more target servers:

```
function Deploy-ExchangeCertificate {
  param(
    $SourceServer,
    $Thumbprint,
    $TargetServer,
    $Password,
    $Services
  )

  $password = ConvertTo-SecureString -String $Password `
  -AsPlainText `
  -Force

  $cert = Get-ExchangeCertificate -Thumbprint $Thumbprint `
  -Server $SourceServer |
    Export-ExchangeCertificate –BinaryEncoded:$true `
    -Password $Password

  foreach($Server in $TargetServer) {
    Import-ExchangeCertificate -FileData $cert.FileData `
    -Password $Password `
    -Server $Server

    Enable-ExchangeCertificate -Thumbprint $Thumbprint `
    -Server $Server `
    -Services $Services `
    -Confirm:$false `
    -Force
  }
```

This function allows you to specify a certificate that has been properly set up and installed on a source server, and then deploy that certificate and enable a specified list of services on one or more servers. The function accepts a number of parameters and requires that you specify the thumbprint of the certificate that you want to deploy.

Let's say that you've got a Client Access server array that contains six CAS servers. You've gone through the certificate generation process, obtained the certificate from a trusted certificate authority, and installed the certificate on the first CAS server. Now you can add the `Deploy-ExchangeCertificate` function to your PowerShell session and deploy the certificate to the remaining servers in the array.

First, you need to determine the thumbprint on the source server you want to deploy, and you can do this using the `Get-ExchangeCertificate` cmdlet. The next step is to run the function with the following syntax:

```
Deploy-ExchangeCertificate -SourceServer cas1 `
-TargetServer cas2,cas3,cas4,cas5,cas6 `
-Thumbprint DE4382508E325D27D2D48033509EE5F9C621A07B `
-Services IIS,SMTP `
-Password P@ssw0rd
```

The function will export the certificate on the `CAS1` server with the thumbprint value assigned to the `-Thumbprint` parameter. The value assigned to the `-Password` parameter will be used to secure the private key when the certificate data is exported. The certificate will then be installed on the five remaining CAS servers in the array, and will have the IIS and SMTP services assigned.

## There's more...

You may want to export your certificates to an external file that can be used to import the certificate on another server at a later time. For example:

```
$password = ConvertTo-SecureString `
-String P@ssword `
-AsPlainText `
-Force

$file = Get-ExchangeCertificate `
-Thumbprint DE4382508E325D27D2D48033509EE5F9C621A07B `
-Server cas1 |
  Export-ExchangeCertificate -BinaryEncoded:$true `
  -Password $password

Set-Content -Path c:\cert.pfx -Value $file.FileData -Encoding Byte
```

This is similar to the previous examples, except this time we're exporting the certificate data to an external `.pfx` file.

You can use the following commands to import this certificate at a later time on another server in your environment:

```
$password = ConvertTo-SecureString `
-String P@ssword `
-AsPlainText `
-Force

$filedata = Get-Content -Path c:\cert.pfx -Encoding Byte -ReadCount 0

Import-ExchangeCertificate -FileData ([Byte[]]$filedata) `
-Password $password `
-Server cas2
```

This will import the certificate from the external `.pfx` file to the `CAS2` server. Once this is complete, you can use the `Enable-ExchangeCertificate` cmdlet to assign the required services to the certificate.

## See also

- The *Generating a certificate request* recipe
- The *Installing certificates and enabling services* recipe