



Written By

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## A Bit about the Author

Prior to joining the United States Air Force after high school (and a first year of college in Hawaii that had more to do with surfing than studying), Josh's only computer experience was literally limited to Solitaire, ICQ, Yahoo! Mail, and Microsoft Bob. The military soon proved to be an excellent place to kick off a career in IT, however, as his first active duty job after only three months of Tech Training was as an Exchange Administrator on Kadena Air Base, Okinawa, Japan. While this position working with Exchange 5.5 had more to do with managing Active Directory user accounts and troubleshooting end user mailbox issues than it had to do with the engineering of Exchange, it was a solid beginning to a long IT career based in various Microsoft technologies.



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Over the next decade, Josh's experience branched out amongst various Microsoft product suites. He also used this time to achieve a Bachelor's of Science in Computer Science, an MBA in Information Management, and various Microsoft certifications. Most recently, Josh earned his MCSE: Communication and MCSA: Office 365 in early 2015.

Exchange Server continued to be a core part of Josh's roles at various companies, but he also became deeply involved with Active Directory, DFS-R, ISA Server 2006, SharePoint Server, IIS, SQL Server, Hyper-V, various backup technologies, and Windows operating systems from Windows Server NT to Windows Server 2012 R2. He didn't find his real passion within the Microsoft realm, however, until he began working with Office Communications Server 2007 R2. Josh found his "groove" in the Microsoft UC space.

Rackspace is where Josh's experience and involvement in the Microsoft UC practice area really took root. As a Lync Engineer with Rackspace, he designed, deployed, and managed both multi-tenant (Lync Server 2013 Hosting Pack) and dedicated Lync Server 2013 and Skype for Business Server 2015 customer environments, from simple Standard Edition deployments, to full blown enterprise environments with Enterprise Voice. In January of 2016, Josh started the next leg of his career as a UC Architect with Deloitte.

Josh has also become an enthusiast and explorer of all-things-Office 365, and accordingly, he has passionately embraced the rising wave of Hybrid. He firmly believes in the value and agility that Hybrid can bring to organizations. And therein lies the basis for this book!

*Skype for Business Server 2015: Hybrid Handbook*

Visit <http://www.get-csjosh.com> for more Microsoft UC Awesomeness.

## Author's Opening Notes

Thank you for choosing this book to assist you with your Skype for Business Hybrid deployment! While I am thrilled that you have turned to this book for guidance in implementing (or troubleshooting) a Hybrid solution, I feel that I should start out with a few short comments to properly set the tone of the book. The first thing to note is that this is my first book. **Ever**. Let me clarify: this is the first book that I have ever written, not read. Yes, that seems like a funny thing to clarify, but there's always that one kid in the classroom that has to ask the clever questions!

I have done my fair share of blogging and authoring of various one-off posts on social media outlets like LinkedIn, but have never embarked upon the task of actually penning [read, "Typing"] out a book, technical or otherwise. That being said, my style is probably not what you would classify as...shall we say, conventional. I will try to be as clear and to-the-point as possible throughout the book, so that you can dig right into the meat of what you are looking for, but I may not be able to help throwing in a bit of my own thoughts here and there, with an occasional dash of sarcasm! Honestly, though, when you are reading something as "thrilling" as a technical document/book anyway, isn't a brush of humor or sarcasm a welcome thing?

Next, this practice area (Microsoft UC) seems that it is changing in some new way almost every week. As such, this book will be a work in progress, either via minor updates or major revisions. Especially with certain features still being in Preview, there is the potential for much of what is in this book to change over time. Along these lines, I am also a HUGE proponent of feedback. No, it doesn't have to be constructive, but it sure might make me feel better if it was! If you feel that there are things I have left out, or sections that should be added, please reach out to me via any of the below methods and share your thoughts:

Email: [josh@get-csjosh.com](mailto:josh@get-csjosh.com)

Website & Blog: <http://www.get-csjosh.com>

Twitter: @GetCsJosh

Thank you immensely for reading, and I hope you find this book insightful and valuable. If you do, feel free to share it with a fellow UC buddy!

Regards,

*Josh Blalock*

## Terminology Review

Before we start talking about environments, prerequisites, requirements, and all that jazz, it might be a good idea to make sure we are all on the same page with the terminology that will be used throughout this book. While my intended audience will likely have a solid enough grasping of most of the common terms, some points of reference and review won't hurt anybody, now will it?

**Directory Synchronization** – “Directory Synchronization” refers to the synchronization of data (users, passwords, metadata) from the on-premises Active Directory to the Azure AD instance that runs behind the Skype for Business Online Tenant, and vice versa.

**Hybrid** – this term has become almost as over-used as the term “cloud” within IT, but for the purposes of this book, “Hybrid” refers to a Skype for Business Server 2015 On-Prem deployment that is synchronized and paired with a Skype for Business Online Tenant; users for the SIP domain can exist either on-premises or Online (in Office 365).

**On-Prem** – “On-Prem” is an abbreviated form for “on-premises”, and simply refers to a deployment or resources that exist within an organization’s own infrastructure, or within their hosting company’s infrastructure.

**SIP** – SIP stands for “Session Initiation Protocol”, and it is a request-response protocol that can establish and manage multimedia sessions, on a very high level.

**SIP Domain** – A SIP Domain simply refers to the domain name that Skype for Business uses to authenticate users on. For example, if your SIP Domain was contoso.com, then Johnny’s SIP address would look something like: [sip:johnny@contoso.com](mailto:sip:johnny@contoso.com). When Johnny logs in to his Skype for Business client, though, he would simply use: [johnny@contoso.com](mailto:johnny@contoso.com). In general, it is best to have your SIP Domain match the SMTP domain that is used in your Exchange environment.

**Tenant** – When “Tenant” is referred to in this book, it is referencing users and mailboxes within a specific domain that has been set up for Skype for Business Online in Office 365.



## Chapter 1: Introduction to Skype for Business Environments

Laying a solid foundation is always a good idea for most topics, especially in technology. After all, how can one be expected to learn to drive a car if they are not even familiar with how a car works? Ok, that may not be the best analogy, as I don't really plan on going into much detail at all about *what* Skype for Business is, how to configure it, or what any of the more "foundational" topics are. Instead, the assumption here is that you are already pretty well-versed in Skype for Business (or Lync Server), and that you are looking for guidance, or a go-to resource, for the various topics related to a Hybrid Skype for Business environment.

So, since we will not be digging into "the basics" of Skype for Business, the foundation I am looking to lay down is simply a solid understanding of what the environments look like that we will be working with to create a hybrid environment. Let's start with a brief overview of what an *on-prem* environment is, and follow that up with the *online* environment.

### Skype for Business Server 2015 (On-Premises)

On-Premises, or as we shall refer to it from here on out in this document, "on-prem", refers to a Skype for Business deployment that exists in your own infrastructure, as opposed to one that exists in a shared, or multi-tenant, environment. On-prem can also refer to a deployment that exists in a hosting provider's facilities or data centers, but that lives on equipment that is dedicated to your organization, as opposed to equipment that is shared amongst multiple organizations. The "Server" version of Skype for Business is installed on-prem, *Skype for Business Server 2015*.

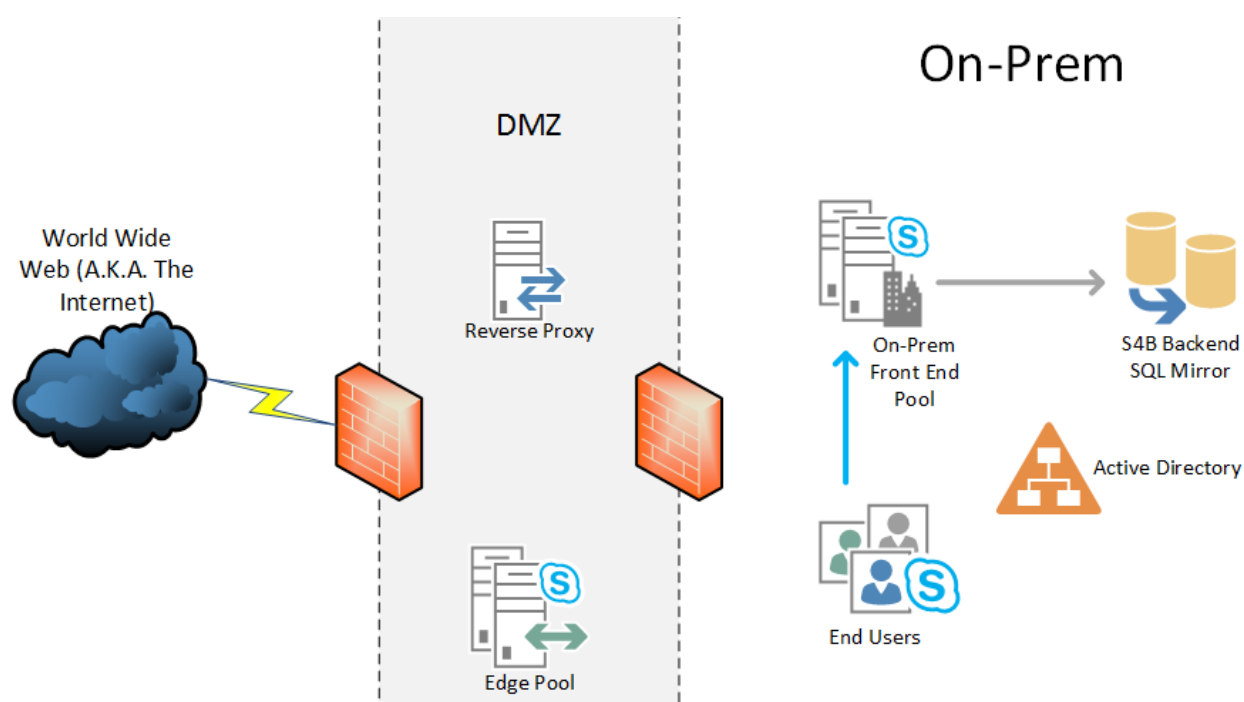
Environments that are on-prem have their own dedicated servers, either physical or virtual, and are typically utilized for a couple different reasons:

- First, your company is super security conscious, and is still not certain that having your Instant Messaging (IM) or Audio/Video (A/V) conversations homed in the "Cloud" would satisfy all compliance and regulatory requirements.
- You have very complex and/or advanced functionality needs, like specific Enterprise Voice features or Persistent Chat, and therefore cannot utilize a multi-tenant environment like Office 365.
- Your hefty performance needs are better suited for dedicated equipment than shared resources.

Of course, there very well could be other reasons that you would choose on-prem over Skype for Business Online, but the examples above are probably the most typical, in no certain order.

A last note about on-prem environments is that due to their nature of being built on dedicated hardware, they are normally the more costly of the two environments. The cost is based on licensing rather than on a utility-billing setup. **Figure 1.1** gives a simple representation of a typical on-prem environment, with your Reverse Proxy and Edge Pool in the DMZ, and your Front End pool, backend SQL mirror, users, and Active Directory environment on your internal network beyond the DMZ. Of course, this figure represents the most basic of deployments, with no Office Web App farm, Exchange servers, Persistent Chat, Mediation Servers, gateways, SBAs, SBCs, PBXs, etc.

**Figure 1.1**



So, nothing monumental about what we have demonstrated here. The simple take away of this section is that “on-prem” refers to an environment with dedicated server resources, whether they be virtual or physical resources, in contrast to a multi-tenant environment like **Skype for Business Online**.



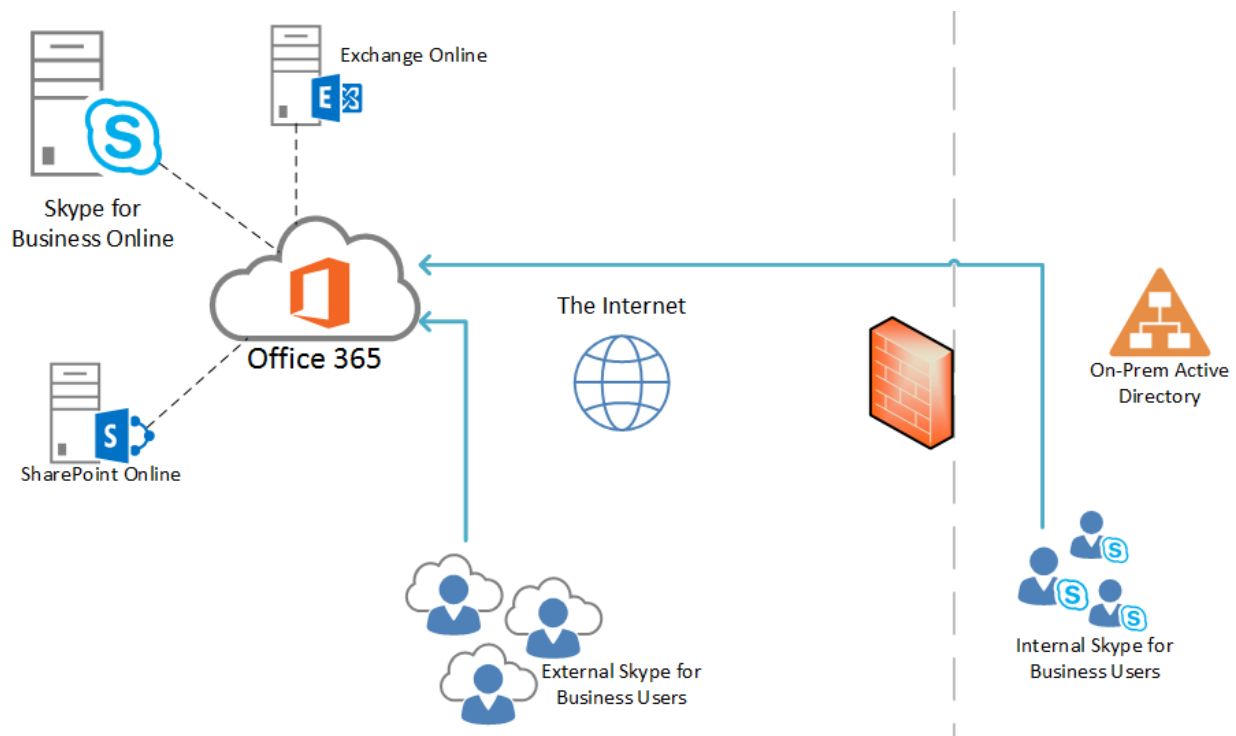
## Skype for Business Online

Now that we have gone over a brief review of what the more traditional half of a Skype for Business Hybrid configuration consists of (on-prem), let's talk about the more fluid cloud-based half: **Skype for Business Online**.

Essentially, Skype for Business Online provides you with most of the available Skype for Business features via a subscription within the greater Office 365 suite. Rather than having your own Skype for Business servers to manage and maintain, all the servers exist with Microsoft's own datacenters. Microsoft then offers Skype for Business services by placing multiple customers, or **tenant** organizations, within the same Skype for Business deployment. This type of deployment is what we refer to as "multi-tenant", since there are several different companies using the same deployment while being logically separated from other "tenants".

So, if you don't have access to the actual Skype for Business servers, how do you manage users? Microsoft has provided a general Office 365 Admin Center for managing much of your overall Office 365 tenant, but it has also provided individual Admin Center portals for managing the individual server products. This means that there is a portal called the Skype for Business Admin Center. You can manage your users' licenses in the Office 365 Admin Center, and then once they have been assigned a license that grants them access to Skype for Business Online functionality, you can manage their individual Skype for Business settings in the Skype for Business Admin Center. Man, do you think I fit the words "Skype for Business" into that last sentence enough times, or what?!

Figure 1.2



Now, obviously there is extra configuration needed within your organization if you are going to synchronize your on-prem users with your users in Skype for Business Online, but we'll get into that a bit later. For now, we are just establishing a scenario in which your users can log into a Skype for Business (or Lync, if you are behind the times!) client while the actual services are homed in Microsoft's cloud. So, outside of setting up the service and managing your users in Office 365, you also need to make sure your public DNS zone has the proper Skype for Business records, and that they point to Microsoft's provided servers (this DNS setup can be automatically done via a wizard in Office 365 when setting up your domain, depending on who your DNS provider is). **Figure 1.2** above gives a bird's eye view of what things look like when your users connect to Skype for Business Online.

## Chapter 2: On-Premises vs. Online: Feature Comparison

The previous section highlighted a few key areas that might cause an organization to opt for an on-prem deployment instead of a Skype for Business Online tenant, but what if those reasons were not as relevant for an organization? What if the organization did not have crazy resource requirements, and it was not concerned about security and compliance beyond what was already offered in Office 365? After all, with Skype for Business Online being the more economical choice of the two, why wouldn't all of those organizations simply choose Skype for Business Online? Well, I suppose if it just boiled down to the cost, then yes, Skype for Business Online is the likely winner.

There are more factors to consider, though, like the available feature set. That's right! You cannot take advantage of all the same features in Skype for Business Online that you get from an on-prem deployment. With a varying feature-set, it is therefore necessary to highlight the difference in features between environments so that you can determine which environment is appropriate.

Technet provides a few different in-depth feature comparison tables to break-down which features are available in Skype for Business Online versus Skype for Business Server 2015, but they are rather lengthy, and for the most part, reflect that most features are available across the board. Rather than display what is the same between environments, I have instead created the below table, **Table 2.1**, to call out specific features that exist for one platform, but not the other. Again, the scope of this book is not to educate you what the below components are; there is an assumption that you are already familiar with these features. Instead, this table serves to help establish what the differences are between environments, and why you might place an end user in one over the other.

Properly understanding the limitations to each environment is key to successfully planning out your organization's UC strategy. As a matter of fact, possessing this knowledge may even lead to the conclusion by many companies that they do indeed need a Hybrid strategy. For example, a company that has 50,000 end users spread across the globe, with only 2,000 end users in Chicago that require Response Groups, will most certainly want to take advantage of the cost benefits that are associated with placing the other 48,000 end users in Skype for Business Online.

**Table 2.1**

Feature	Skype for Business Server 2015 (ON-PREM)	Skype for Business Online (All Plans)
Persistent Chat	X	
Skype Meeting Broadcast		X
Response Groups	X	
Media Bypass	X	
Call Park	X	
Voice Resiliency	X	
Analog & Common Area Phones	X	
Private Line	X	
On-Prem Call Center Integration	X	
Call Via Work	X	
Basic 9-1-1 <sup>1</sup>	X	X
E9-1-1 <sup>2</sup>	X	
XMPP Federation	X	
IM & File Filtering	X	
Archiving of Application & Desktop Sharing	X	
Archiving Interop w/ Exchange Server	X	

<sup>1</sup>Basic 9-1-1 provides a public safety answering point (PSAP) with location information that is assigned to your trunk or PBX.

<sup>2</sup>E9-1-1, which is only available to on-prem users, provides more granular information about the caller, which allows for a specific location as opposed to the granular location information that is assigned at the trunk or PBX level. If caller is calling from somewhere in Texas, but their PBX has location information for Maryland, then it is obvious to see why Basic 9-1-1 would not be helpful to a dispatcher.

## Chapter 3: Supported Hybrid Configurations and Available Features

Great, you have established that you need to approach your Skype for Business planning from a Hybrid point of view. So now what? What will this environment look like?

One of the amazing components of the Skype for Business product, and historically Lync Server and Office Communications Server, is its integration capabilities with Exchange Server and SharePoint Server. With that in mind, how will those Server components come into play with a hybrid Skype for Business deployment? Will our Skype for Business Online users get the same Exchange Server integration as the on-prem users? Those are all great questions, so let's dig in to them!

### Exchange Server On-Premises Integration

When you create your tenant in Office 365, you have the ability to license your users at a packaged level, which means that each user will have a certain level of licensing for Skype for Business Online, Exchange Online, and SharePoint Online. Alternatively, you can also purchase "Standalone" licensing, which licenses a particular user, or group of users, for a single product, such as Skype for Business Online.

In either case, if you choose to keep your Exchange Server deployment on-prem rather than using Exchange Online, and you plan on taking advantage of the benefits of integrating your hybrid Skype for Business deployment with your on-prem Exchange deployment, you need to be aware of what levels of integration your users will experience. **Table 3.1** lists the various features that are available when integrating your Skype for Business deployment with Exchange Server, and then highlights which features are available in both halves of your hybrid Skype for Business deployment.

**Table 3.1 Hybrid Skype for Business with Exchange Server 2013**

Features	Skype for Business Server 2015 Users	Skype for Business Online Users
IM & Presence in Outlook	X	X
Meeting Schedule/Join via Outlook	X	X
IM & Presence in Outlook Web App (OWA)	X	
Meeting Schedule/Join via OWA	X	
IM & Presence in Mobile Clients	X	X
Online Meeting Join via Mobile Clients	X	X
Publish Status via Outlook Calendar Free/Busy Information	X	X
Contact List (Unified Contact Store) <sup>1</sup>	X	
High-Res Contact Photo in Lync 2013 and Lync Web App <sup>2</sup>	X	X <sup>4</sup>
Meeting Delegation <sup>3</sup>	X	X
Missed Conversation History/Call Logs Written To User's Exchange Mailbox	X	X
Archive Content to Exchange <sup>2</sup>	X	
Search Archived Content <sup>2</sup>	X	
Voicemail	X	

<sup>1</sup> This requires Exchange Server 2013, and the client must be either Lync Server 2013 or Skype for Business Desktop client.

<sup>2</sup> This requires Exchange Server 2013.

<sup>3</sup> This is only supported when both the users are homed on the same platform. Both must either be on-prem, or on Skype for Business Online.

<sup>4</sup> In addition to requiring Exchange Server 2013, this is not supported for Skype for Business Online users in Lync Web App.

A quick note on the Voicemail integration: as we will see in the next section, Voicemail is available for Skype for Business Online users when they use Exchange Online. Therefore, in your hybrid Skype for Business environment, you may also end up wanting to deploy hybrid Exchange, so that your Skype for Business Online users will have access to Voicemail as well.

## Exchange Online Integration

Perhaps you are looking to keep your IT infrastructure as lean as possible. While you may have technical requirements that force you to keep a hybrid Skype for Business environment, you may not have requirements that dictate a need to keep your Exchange on-prem. Thus, you decide your entire Exchange deployment will exist within Exchange Online!

**Table 3.2** helps highlight what features you can expect to be available to your hybrid Skype for Business users when your Exchange environment is entirely in Exchange Online.

**Table 3.2 Hybrid Skype for Business with Exchange Online**

Features	Skype for Business Server 2015 Users	Skype for Business Online Users
IM & Presence in Outlook	X	X
Meeting Schedule/Join via Outlook	X	X
IM & Presence in Outlook Web App (OWA)	X	X
Meeting Schedule/Join via OWA	X	X
IM & Presence in Mobile Clients	X	X
Online Meeting Join via Mobile Clients	X	X
Publish Status via Outlook Calendar Free/Busy Information	X	X
Contact List (Unified Contact Store) <sup>1</sup>	X	X
High-Res Contact Photo in Lync 2013, Skype for Business client, and Lync Web App Meeting Delegation <sup>2</sup>	X	X
Missed Conversation History/Call Logs Written To User's Exchange Mailbox	X	X
Archive Content to Exchange	X	X
Search Archived Content	X	X
Voicemail	X	X

<sup>1</sup> This pertains to Lync Server 2013 on-prem only. A Lync 2013 or Skype for Business client is required.



<sup>2</sup>This is only supported when both the users are homed on the same platform. Both must either be on-prem, or on Skype for Business Online.

Clearly, integration is still very strong and tells a compelling story in all possible scenarios. The only real time where integration functionality drops off a bit is when we have Skype for Business Online users using Exchange Server 2013. However, if we simply deploy Exchange in a hybrid manner as well, then we can cover all features for all users.

### SharePoint Server On-Premises Integration

Alright, to be perfectly frank, I think that the only reason SharePoint is even mentioned when it comes to integration is because it sounds more impressive to have three enterprise server applications integrate tightly than just two. Let's cut to the chase, though: the integration in SharePoint is present, but not anything too mind-blowing. We are talking Presence information and Skill Search. That's it!

For the sake of being thorough, though, **Table 3.3** lists out the integration options present for both Skype for Business Online and on-prem users when you have an on-prem SharePoint Server 2013 deployment.

**Table 3.3 Hybrid Skype for Business with SharePoint Server 2013**

Features	Skype for Business Server 2015 Users	Skype for Business Online Users
Skills Search	X	
Presence	X	X

### SharePoint Online Integration

Again, there really is not anything too revealing to share in this section, but I want to be as complete as possible. So, if your organization plans on utilizing SharePoint Online alongside your hybrid Skype for Business deployment, the features in **Table 3.4** will be available to your users.

**Table 3.4 Hybrid Skype for Business with *SharePoint Online***

Features	Skype for Business Server 2015 Users	Skype for Business Online Users
Skills Search		
Presence	X	X

There you have it. If you want Skill Search available for your Skype for Business users, you will need SharePoint Server with Skype for Business Server 2015. If Skill Search is not a defining requirement for your Skype for Business users, and I can't imagine that it would be, then you should get Presence in all other possible integration scenarios.

## Chapter 4: Hybrid Prerequisites and Requirements

Once you have planned out the hybrid Skype for Business environment that will satisfy the requirements of the various stakeholders within your organization, and you are confident that all the reasonable needs of your end users will be met, it is time to get the project rolling. Again, deployment of Skype for Business Server 2015 is not within the scope of this book. For that matter, neither is the deployment of a brand new Office 365 tenant with Skype for Business Online licensing.

Instead, the assumption is that you already have these individual environments in place and functioning independently of each other. The level of functionality may vary, just as the actual presence of any users in a particular environment may vary. At the very least, most of the content in this book is based around the assumption that you have a functional public-facing Skype for Business Server 2015 environment, and an Office 365 tenant in which you could easily deploy new users and add Skype for Business Online licensing.

With that base in mind, what are the requirements and pre-requisites that need to be met in order to achieve a functioning hybrid Skype for Business environment? The following sections dive into these various pre-requisites and requirements.

### Skype for Business Online Management with PowerShell

If you have been living under a rock in the Microsoft world for the past several years, then you may not yet realize how much of a role that PowerShell plays in the management of various Windows-based environments. Skype for Business Server 2015, AND Skype for Business Online, are no exception to that rule.

The Skype for Business Control Panel does an excellent job at allowing you to manage most aspects of your on-prem Skype for Business environment. As good as the Control Panel is, however, the Skype for Business Management Shell (PowerShell pre-loaded with Skype for Business cmdlets) is the most comprehensive and versatile option for gaining control of 100% of the available settings and features that come with Skype for Business Server 2015.

When it comes to the Skype for Business Admin Center, the GUI portal that allows you to control your Skype for Business Online environment, you have even less control over the environment. This is partly due to the fact that Skype for Business Online is a multi-tenant environment, and therefore you will never be given the keys to other tenants' kingdoms. However, if you ignore that last fact, there is still a little more control available to you if you use the on-prem Skype for Business Management Shell and import the SkypeOnlineConnector module.

The module should already be present on your Skype for Business Front End servers, as it should have been installed during the deployment of the Skype for Business Server 2015 software. If you choose to manage your Skype for Business Online tenant from a separate management server, though, you will need to download this module, and import it into your PowerShell window. This module is used during the steps that are taken to actually configure Hybrid in your deployment, if you choose to use the Management Shell instead of the Skype for Business Control Panel.

## On-Prem Infrastructure Requirements

In terms of requirements within your on-prem infrastructure, not a whole lot of additional hardware is required. However, a key piece of implementing hybrid is having your on-prem users synchronized to your Office 365 tenant. This process is referred to as Directory Synchronization, and you should typically have a separate server setup to deploy the Azure AD Connect tool, at least per the recommendations by Microsoft.

A significant amount of disk space should not be required for this additional server, and there are no extensive memory or CPU requirements. The machine does need to be joined to your internal AD domain, however.

Optionally, if you choose to implement Single-Sign-On (SSO) in your environment so that your Skype for Business Online users are not having to re-enter their usernames and passwords to sign into their Skype for Business client, you will need to have Active Directory Federation Services (AD FS) deployed, along with an AD FS Web Proxy server. If you do not currently have these additional servers deployed in your environment, then those are two additional servers that you will have to plan for.

## Supported (Required) Topologies

In order to successfully deploy hybrid in your Skype for Business deployment, there is an important requirement regarding the type of Topology that is deployed in your on-prem environment. The on-prem environment must have Skype for Business Server 2015, Lync Server 2013, or Lync Server 2010 installed in a single, **supported** deployment. In a previous version of this book I had stated that you could not mix-and-match server types, but it turns out that this was an incorrect interpretation on my part of the Technet documentation (Yep, I got “schooled”). As long as the Topology is supported, you can have more than one type of Server version deployed (for example, you could have Lync Server 2013 pools, **AND** Skype for Business Server 2015 pools, in the same deployment). However, if one of those versions is Lync Server

2010, you will need to have at least Lync Server 2013 Admin Tools for moving users into Skype for Business Online once your Hybrid environment is configured.

## Federation in a Hybrid Environment

The key to Federation within a Hybrid environment is that the Federation settings in your on-Prem deployment must match the Federation settings in your Skype for Business Online tenant exactly. For example, if you have Open Federation configured in your Online tenant, you must have Partner Discovery enabled in your on-prem deployment. Likewise, if you have allowed federation with specific domains in your on-prem environment (no Partner Discovery enabled), then you need to have Closed Federation setup in your Online tenant.

These Federation requirements get even more stringent, however. If you have 3 specific partner domains setup in your Allowed List in your on-prem deployment, you need to have the exact same set of partner domains present in your Online tenant's Allowed List, and vice versa. The same concept applies to the Block List in both environments.

Lastly, it almost goes without saying at this point, you will need to have Federation enabled for your Online tenant in order to allow for external communication.

## DNS and Port Requirements

When it comes to DNS, usually the first question that comes to mind in a hybrid deployment is "Well, which environment should I point my SRV records too?" Given the somewhat cumbersome DNS requirements that can accompany a Skype for Business deployment, this is a perfectly natural question, especially as it seems we are adding a layer of complexity by expanding our Skype for Business Server 2015 environment into the cloud. Fortunately, the DNS aspect is kept fairly straightforward, as we will leave the following SRV DNS records pointing at the on-prem Access Edge public IP address:

\_sip.\_tls.<domain>

\_sipfederationtls.\_tcp.<domain>

On the firewall level, connections from wildcard domain names need to be accepted. If this cannot be achieved, then you will have to determine the specific IP ranges that will be required to connect to your Online tenant. As for port/protocol requirements, there are no additional requirements beyond those that already exist for allowing Federation in your on-prem deployment.

## Chapter 5: User Data, Features, and Policy Limitations

Before you begin the actual implementation and start making changes to your infrastructure, there are a few more considerations that you should keep in mind. The first of these considerations is regarding the sourcing of your users.

### Notes About User Data

In order for your Active Directory to be aware of the existence of a user in your hybrid Skype for Business deployment, that user needs to have been created in your on-prem Active Directory. By doing this, the user will be synchronized to your Office 365 tenant via Directory Synchronization. Creating the user in Office 365 first means that they will not be present in Active Directory. This could cause problems, such as missing users in the Address Book.

To build on this thought, when setting up your Directory Synchronization with the Azure AD Connect tool, you have the option of only syncing specific users, or groups of users, instead of all users. While this is handy for pilots and testing, it can negatively impact the communications between on-prem Skype for Business users, and Skype for Business Online users. Therefore, you should make sure that you sync all of your Skype for Business users to Office 365, even if you don't plan on assigning licenses to all of them, and even if you plan to leave some of them enabled for Skype for Business in your on-prem deployment.

There are a couple more notes on moving users to Skype for Business Online. First, there is a limit of 250 contacts in your contact lists in Skype for Business Online. This means that if you move a user with more than 250 contacts in their list to Skype for Business Online, only the first 250 contacts will be migrated with them. Second, a user's scheduled meetings, meeting content, and conferencing data **DOES NOT** get migrated with them. That's right, those users will have to reschedule their meetings after they are migrated. This can be a bit of a...bummer...for some users, so make sure proper communication and education is relayed around this point.

### Notes About Policies

There are also a couple notes that should be made regarding Policies and Conferencing. The first one is quite simple, and seems very common sense, but we will just call it out anyway. In a hybrid Skype for Business deployment, you can enable a user for IM and Conferencing in on-prem or Online, but not in both places at the same time. I don't know why you would want to

enable a user in both places anyway, as it would mean licensing costs in two environments instead of one, but just in case you got the idea to do this, you cannot.

The second thing involves the creation of and management of policies. Specifically, they must be created in each environment; you cannot create a “Global” policy to apply to all users throughout your Hybrid deployment. You must create policies for your on-prem users via your Skype for Business Control Panel or Management Shell, and then you need to create separate policies for your Online users. Perhaps one day the product will evolve to the stage that we can set policies at a truly global level over an entire hybrid deployment in one place, but until that day, you must remember to manage both environments separately as far as policies go.



## Chapter 6: Configure Directory Synchronization with Azure AD Connect

While the focus of this book is not Directory Synchronization itself, Directory Synchronization between your on-prem Active Directory domain and your Office 365 tenant lies at the heart of a hybrid Skype for Business deployment. Ok, I suppose that the “heart” would actually be the unified communications capabilities that Skype for Business brings to the table, but at the very least, Directory Synchronization would be the glue. For this reason, it is important to spend a little time going over this critical piece of preparation to your overall environment.

Now, when directory synchronization is set up with Microsoft’s Azure Active Directory Connect (AADC) tool, which is the latest iteration of the tool (like Skype for Business Server, this tool has undergone multiple name changes over the last few years), there are a few options that we can choose from. The options range from an “Express” configuration in which you can synchronize user accounts and passwords for “same sign-on”, to an advanced configuration in which Active Directory Federation Services (AD FS) is utilized to achieve Single Sign-On (SSO). While SSO is really cool and a nice feature to have, it does require additional server configuration, and advanced options within the AADC tool itself. As this is not really necessary to establish directory synchronization for our hybrid Skype for Business environment, we will focus on setting up AADC with Express settings. The difference between “same sign-on” and “single sign-on” is important to note, however: “single sign-on” allows you to access your cloud-based app (Skype for Business Online) without the need to enter your credentials separately, while “same sign-on” means that you will still get prompted to sign in, but with your same on-prem credentials.

For those of you that have followed my blog, [blog.Get-CsJosh.com](http://blog.Get-CsJosh.com), you may know that I actually authored a blog series on configuring the various available options for directory synchronization with AADC. You can reference those posts for the instructions on more advanced configurations (such as SSO), but for this portion of the book, I will be using some of the images, instructions, and notes from my post titled *“Exploring Azure AD Connect - Establishing Synchronization with Express Configuration”*. Let’s dig in:

For the instructions in this chapter, we have our Online tenant and our on-prem Active Directory infrastructure set up without any Skype for Business servers present. The two environments are set up as follows:

### **Office 365 Environment**

For starters, I have a single admin user: `admin@skype4businesslab.onmicrosoft.com`. I have added a test domain to my Office 365 tenant called “**s4blab.org**”, and setup all necessary DNS records through the Domain Add wizard within the Office 365 portal. Awesome! This domain

should match the Active Directory domain that we will be synchronizing from.

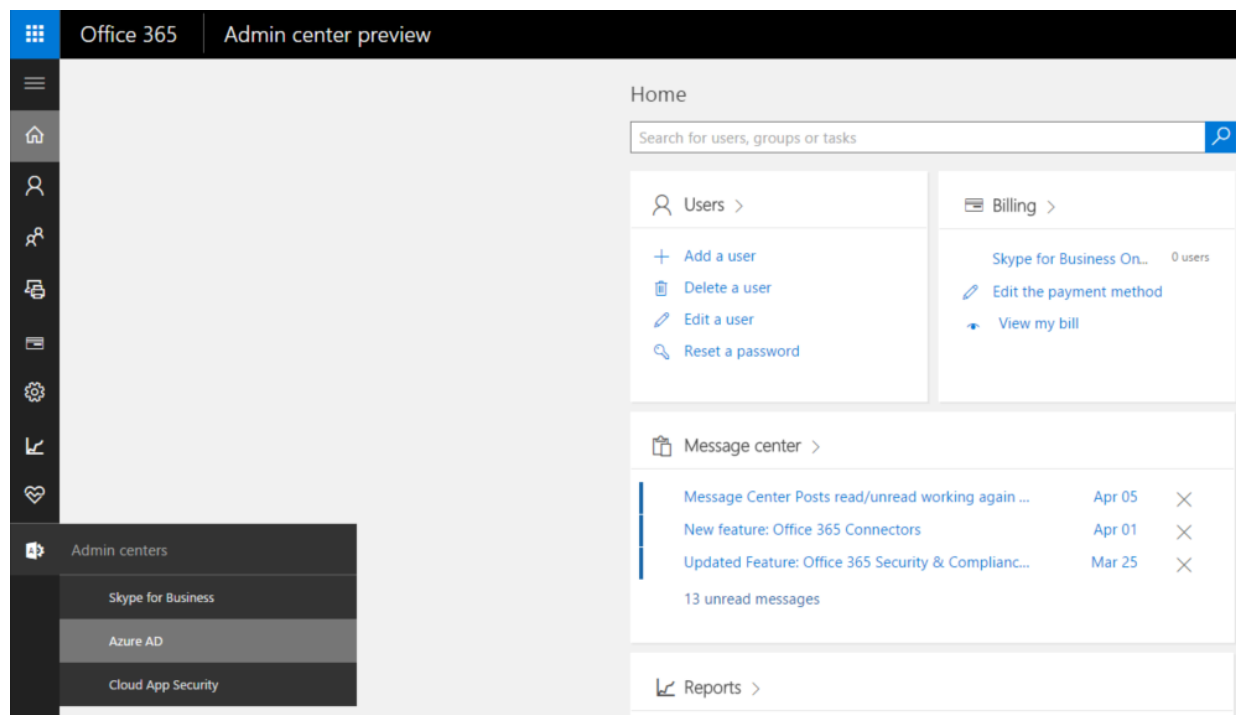
### **On-Prem Lab Environment**

My "On-Prem" environment is actually a virtual environment in a Hyper-V instance on my laptop. So far, the environment consists of:

- 1 Active Directory Domain Controller
- 1 small server for installing Azure Active Directory Connect

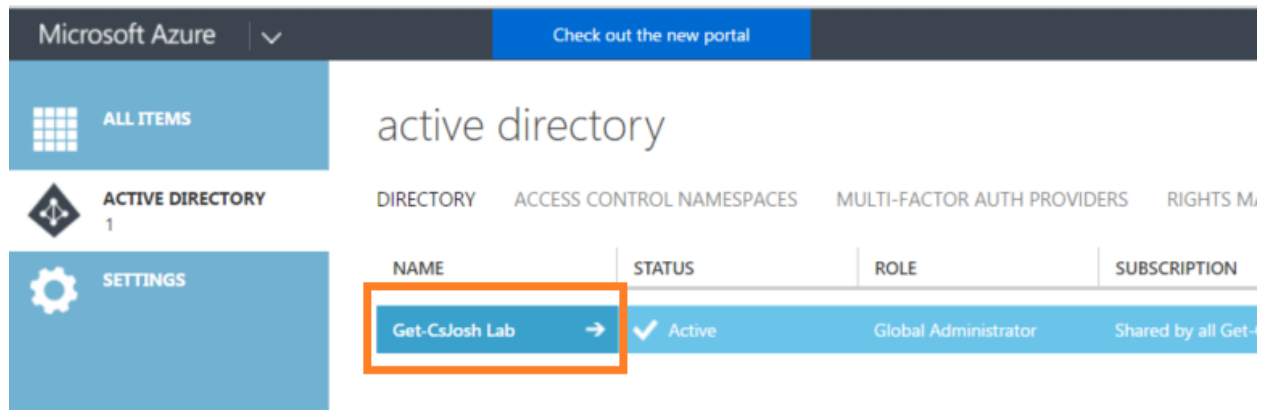
### **Configuring Azure AD Connect: Express Installation**

First, you should get familiar with accessing your Azure AD instance from within the portal. From within the Office 365 portal, on the left-side menu, navigate to: **Admin centers -> Azure AD**. (Notice, I am using the newer version of the Office 365 Admin Center, which is currently in Preview mode.)



*Note: This chapter utilizes the Preview of the newer Office 365 Admin Center GUI, as well as a separate environment with different users than are used in subsequent chapters. This is done to demonstrate upcoming changes in Office 365, but as it is not GA, I didn't want to change the remaining examples in later chapters to a look-and-feel that is still in Preview.*

Once you have set up your profile for accessing Azure AD, you will see the below screen. As you can see, with **Active Directory** highlighted on the left, we can see that we have one directory currently setup, named "Get-CsJosh Lab".



Click on the name of your existing Azure Active Directory instance. Once you do this, you will see where you can manage your Users, Groups, Applications, Domains, Licenses, Reports, and **Directory Integration**! Click on **Directory Integration**, and you will see that *Directory Sync* is currently *Deactivated*, but that there are a series of steps to complete. First, since the "s4blab.org" domain has already been added, toggle the **Directory Sync** status to **Activated**, agreeing with the confirmation prompts.

Once this is complete, go to Step 2, where you are instructed to download the sync tool. You will use this link to download the Azure Active Directory Sync tool to the AADC server.

Microsoft Azure | Check out the new portal | admin@skype4

## get-csjosh lab

USERS GROUPS APPLICATIONS DOMAINS DIRECTORY INTEGRATION CONFIGURE REPORTS LICENSES

### integration with local active directory

DOMAINS VERIFIED FOR DIRECTORY SYNC	1
DOMAINS PLANNED FOR SINGLE SIGN-ON	0

DIRECTORY SYNC ACTIVATED DEACTIVATED

### deploy and manage

- #### Add domains

ADD DOMAINS Go to the domains page to add at least one custom domain. If you have users in a domain that will not use single sign-on, you need to verify that your organization owns these domains.
- #### Install and run Azure AD Connect

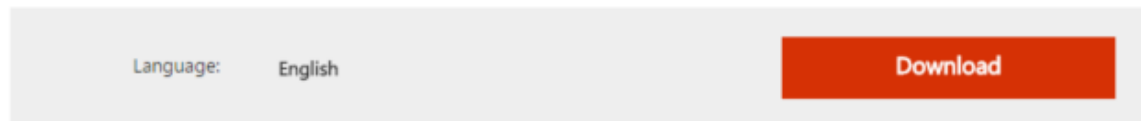
DOWNLOAD [Download Azure AD Connect here](#)

INSTALL AND RUN Install and run Azure AD Connect on a server that is joined to your local Active Directory domain.
- #### Verify and manage directory sync

VERIFY INITIAL SYNC After the initial sync is complete, go to the users page to verify that your local directory data was successfully synchronized to Microsoft Azure AD.

Clicking on the download link in Step 2 brings you to the Download page below for Azure AD Connect. Please note, the new version for this tool is 1.1.119.0, and using Version 1.1 is important.

## Microsoft Azure Active Directory Connect



Azure AD Connect allows you to quickly onboard to Azure AD and Office 365

### Details

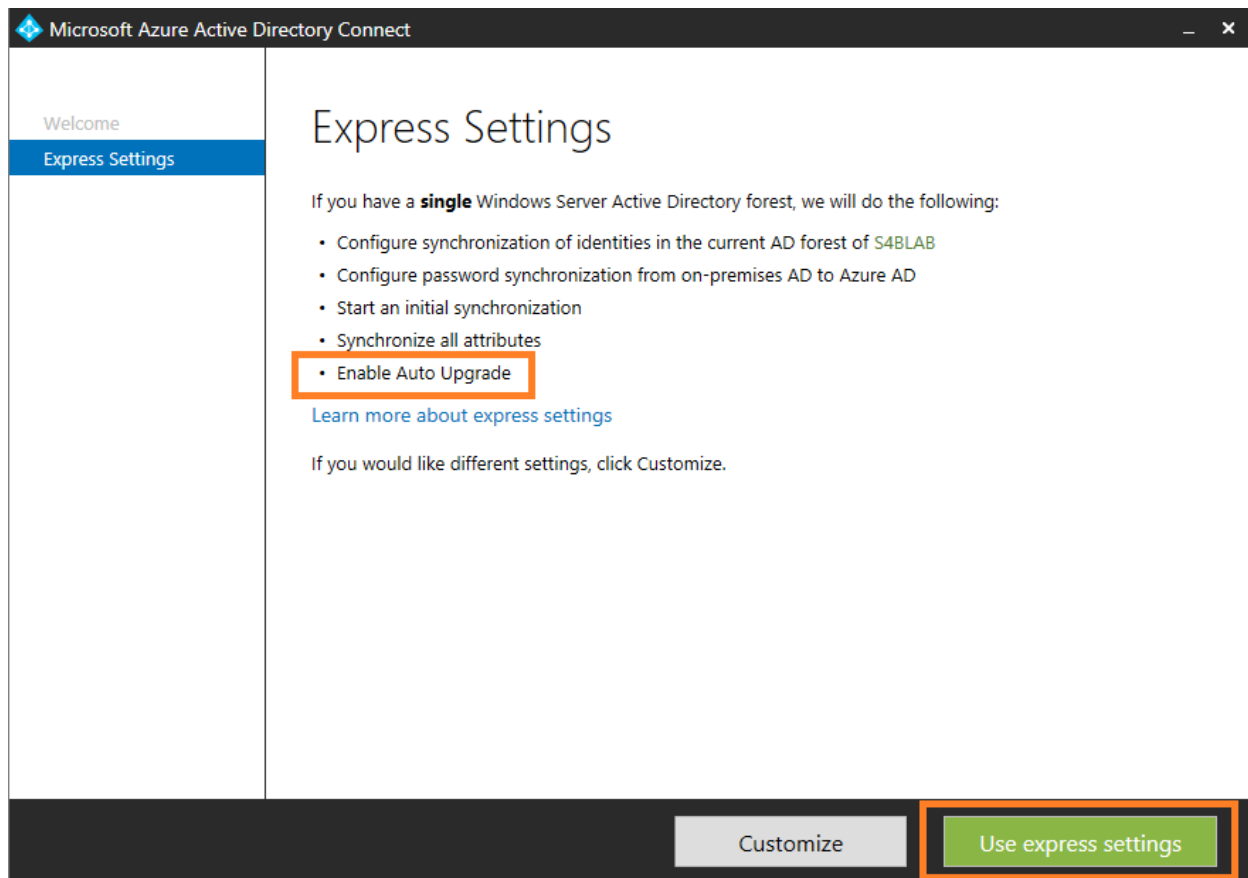
Version:	Date Published:
1.1.119.0	3/14/2016
File Name:	File Size:
AzureADConnect.msi	73.6 MB

This version of the AADC tool was released into General Availability (GA) in February of 2016 and includes several key improvements over the older tool that improve operations and simplify administration, such as:

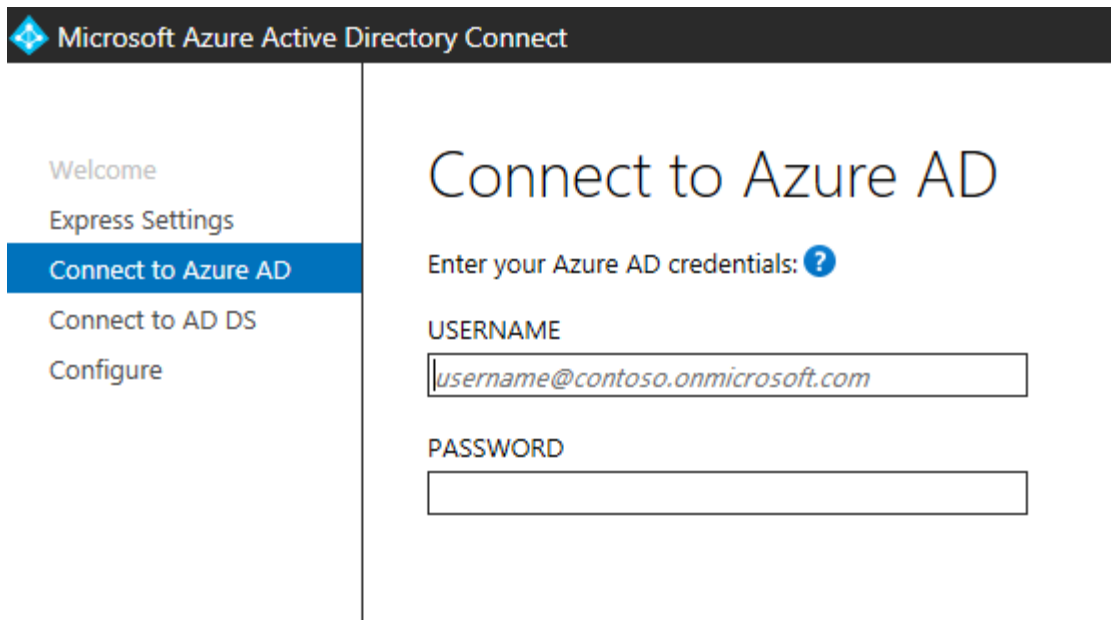
- This new version of AADC provides a mechanism for automatically updating the tool, as long as the tool has been configured with “Express Settings”. This was previously a manual process, creating extra operational overhead.
- A long-time complaint of the previous versions of the tool was the 3-hour synchronization interval. This was simply too long to wait for some organizations that needed much faster sync times to Azure AD. This limit has been cut down to 30 minutes, a very welcome improvement.
- Support for Modern Authentication is now provided.
- The filtering by domain and OU capabilities are now greatly improved and provide much more granular control over synchronization settings.
- My personal favorite on the improvement list is the ability to change sign-in methods without having to completely uninstall and reinstall the AADC tool. Previously, if you wanted to change from “password sync” to AD FS, you needed to uninstall AADC completely, and then re-install it, specifying all your new settings. Very annoying. Thankfully, you can now simply launch the wizard and change the sign-in method!

Once you have downloaded Azure AD Connect onto the virtual machine in your on-prem lab, double-click it to get started. You will have to agree to the license terms, etc, on the first

screen, and then you will see the below screen after clicking **Continue**. Notice, this newer version of the tool shows us that **Auto Upgrade** will be enabled:

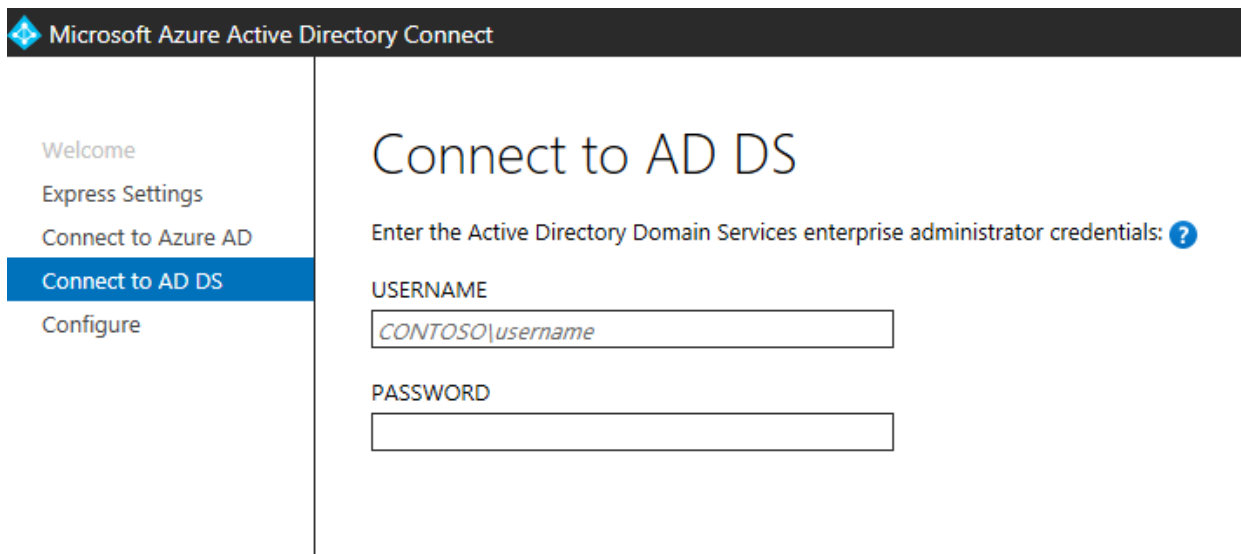


After clicking on "**Use express settings**", you will briefly see the wizard install other required components before bringing you to the **Connect to Azure AD screen**. At this screen, you need to input credentials with Global Admin access to your Office 365 subscription. You should use credentials that are setup as such: *admin@yourdomain.onmicrosoft.com*. Using credentials from the domain that you are about to sync (@yourdomain.com), you will receive an error about the account being in the same forest.



The screenshot shows the 'Connect to Azure AD' screen of the Microsoft Azure Active Directory Connect tool. The left sidebar contains a navigation menu with the following items: 'Welcome', 'Express Settings', 'Connect to Azure AD' (highlighted in blue), 'Connect to AD DS', and 'Configure'. The main content area has the title 'Connect to Azure AD' and the instruction 'Enter your Azure AD credentials: ?'. Below this, there are two input fields: 'USERNAME' with the placeholder text 'username@contoso.onmicrosoft.com' and 'PASSWORD' with an empty field.

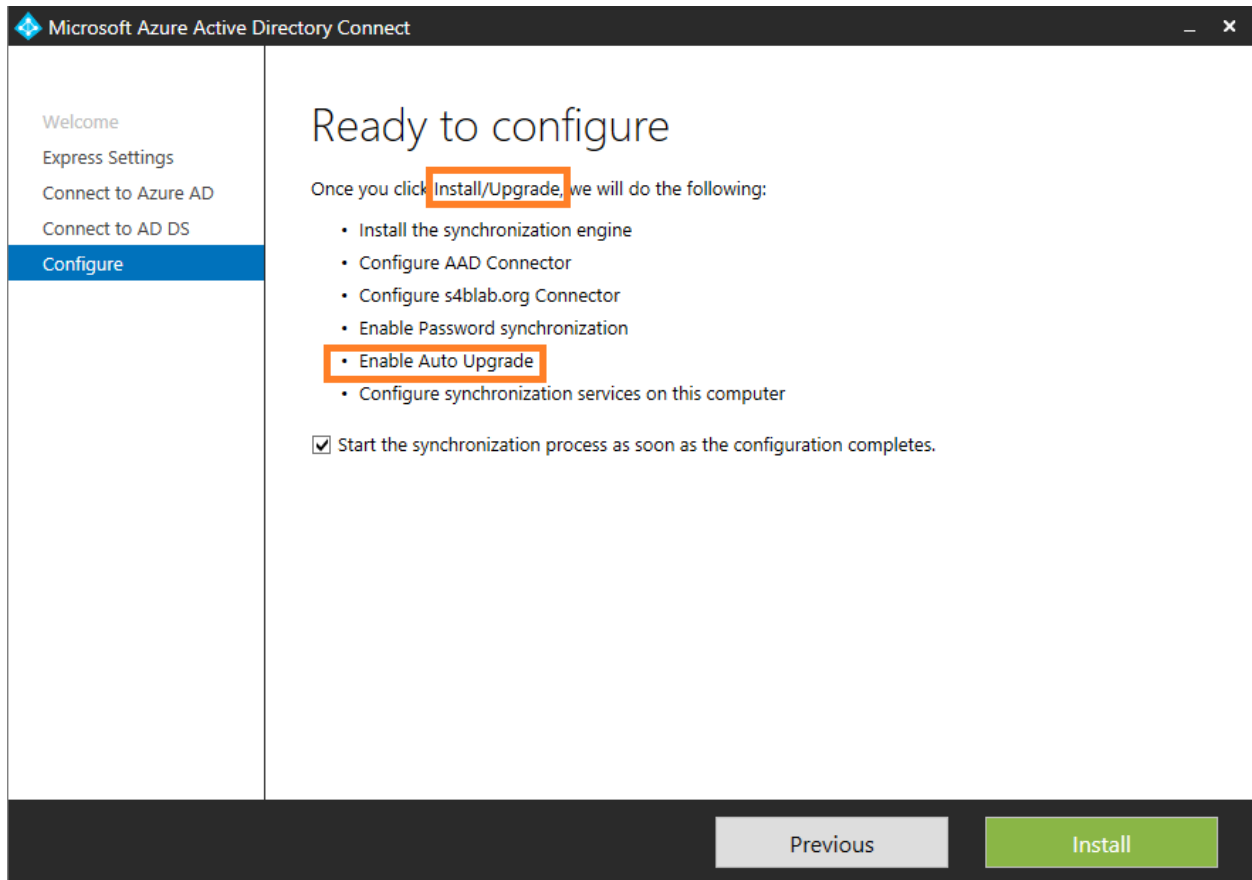
The next screen is where you input your Domain Admin credentials for your on-prem Active Directory environment. These creds will obviously be from the domain that you are attempting to sync to Office 365.



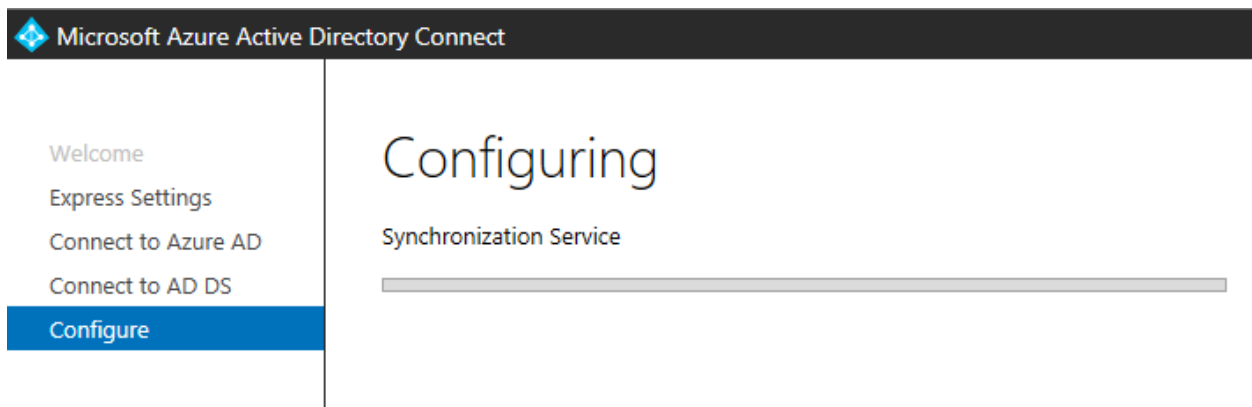
The screenshot shows the 'Connect to AD DS' screen of the Microsoft Azure Active Directory Connect tool. The left sidebar contains a navigation menu with the following items: 'Welcome', 'Express Settings', 'Connect to Azure AD', 'Connect to AD DS' (highlighted in blue), and 'Configure'. The main content area has the title 'Connect to AD DS' and the instruction 'Enter the Active Directory Domain Services enterprise administrator credentials: ?'. Below this, there are two input fields: 'USERNAME' with the placeholder text 'CONTOSO\username' and 'PASSWORD' with an empty field.

Finally, you are presented with the **Ready to configure** screen. This screen reviews the actions that are about to be taken, and then allows you to run the sync after installation is complete via a checkbox. Notice that the tool now shows “Install/Upgrade” on this screen, as we are now able to go back into the tool after initial configuration to change sign-in options. Click **Install**.

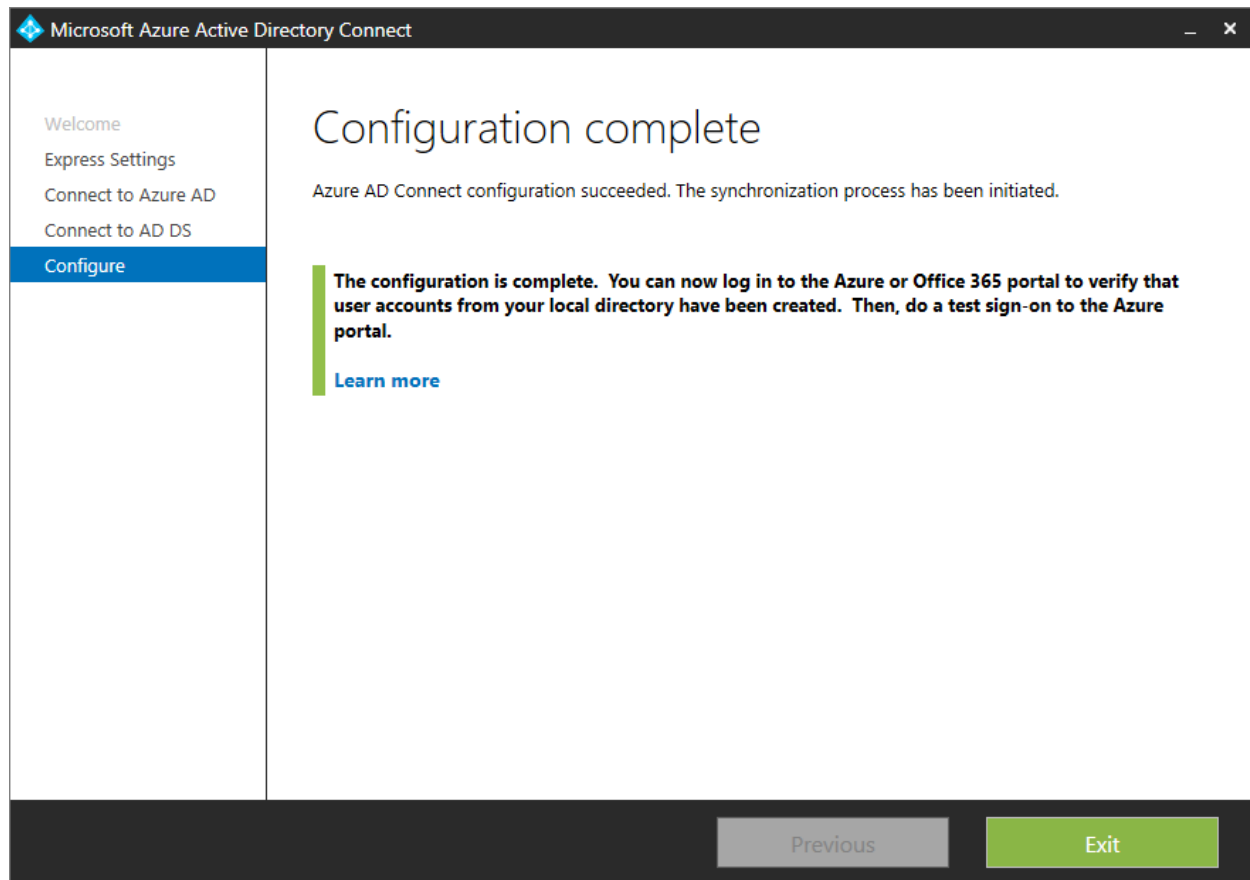




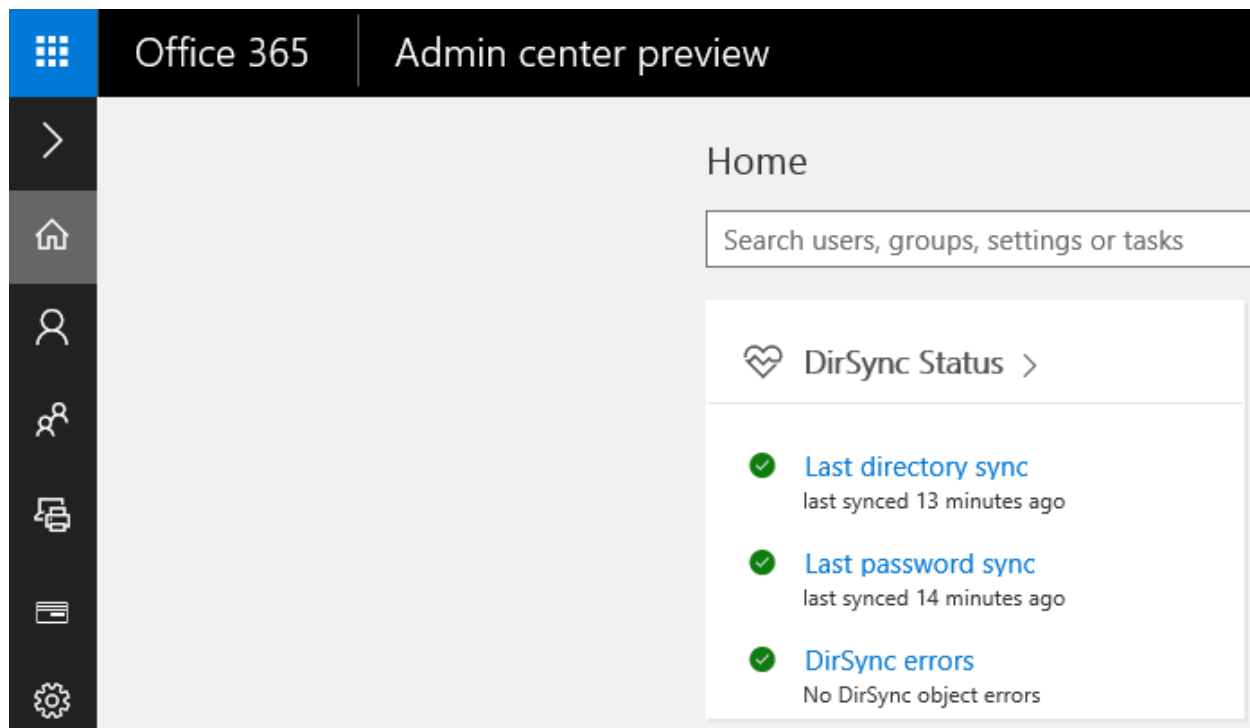
At this stage, several components get configured, and the screen updates you as it installs and configures each component:



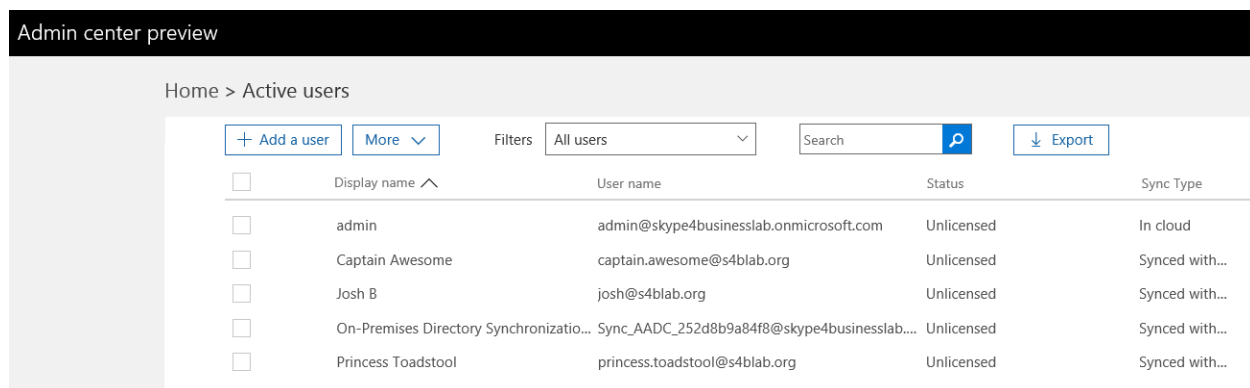
Lastly, the wizard reports that configuration is complete, and it instructs you to log into Azure AD to check on the status of the synchronized accounts. You can now click **Exit**.



At this stage, the Azure AD Connect wizard is complete, all required components have been installed on-prem, and I should now be able to go into Office 365 to check on the status of my Synced accounts. Immediately, as soon as I get logged in and am looking at the dashboard, I see that Directory Synchronization was successful and looks healthy:



Below, while in **USERS -> Active Users** within the Office 365 portal, you can see a few users that I created in my On-Prem environment. These users also have a **Status** of *Synced with Active Directory*. Respectively, we have Captain Awesome (captain.awesome@s4blab.org), Josh B (josh@s4blab.org), and Princess Toadstool (princess.toadstool@s4blab.org). You will also notice the "On-Premises Directory Synchronization Service Account" that was created by this process.



Also, if we go to our Azure AD portal, we can now see that our last sync was less than an hour ago, that Synchronization is **Activated**, and that we are good to go.

Microsoft Azure |

Check out the new portal

## get-csjosh lab

USERS GROUPS APPLICATIONS DOMAINS DIRECTORY INTEGRATION C

### integration with local active directory

DOMAINS VERIFIED FOR DIRECTORY SYNC	1
DOMAINS PLANNED FOR SINGLE SIGN-ON	0
DIRECTORY SYNC	<input checked="" type="checkbox"/> ACTIVATED <input type="checkbox"/> DEACTIVATED
LAST SYNC	Less than one hour ago

This has established the minimum directory synchronization that is necessary to facilitate your hybrid Skype for Business deployment. Now that users are being synchronized from your on-prem Active Directory, Skype for Business users in both environments will be aware of each other, and you will be able to migrate users between both Skype for Business environments in your hybrid deployment.

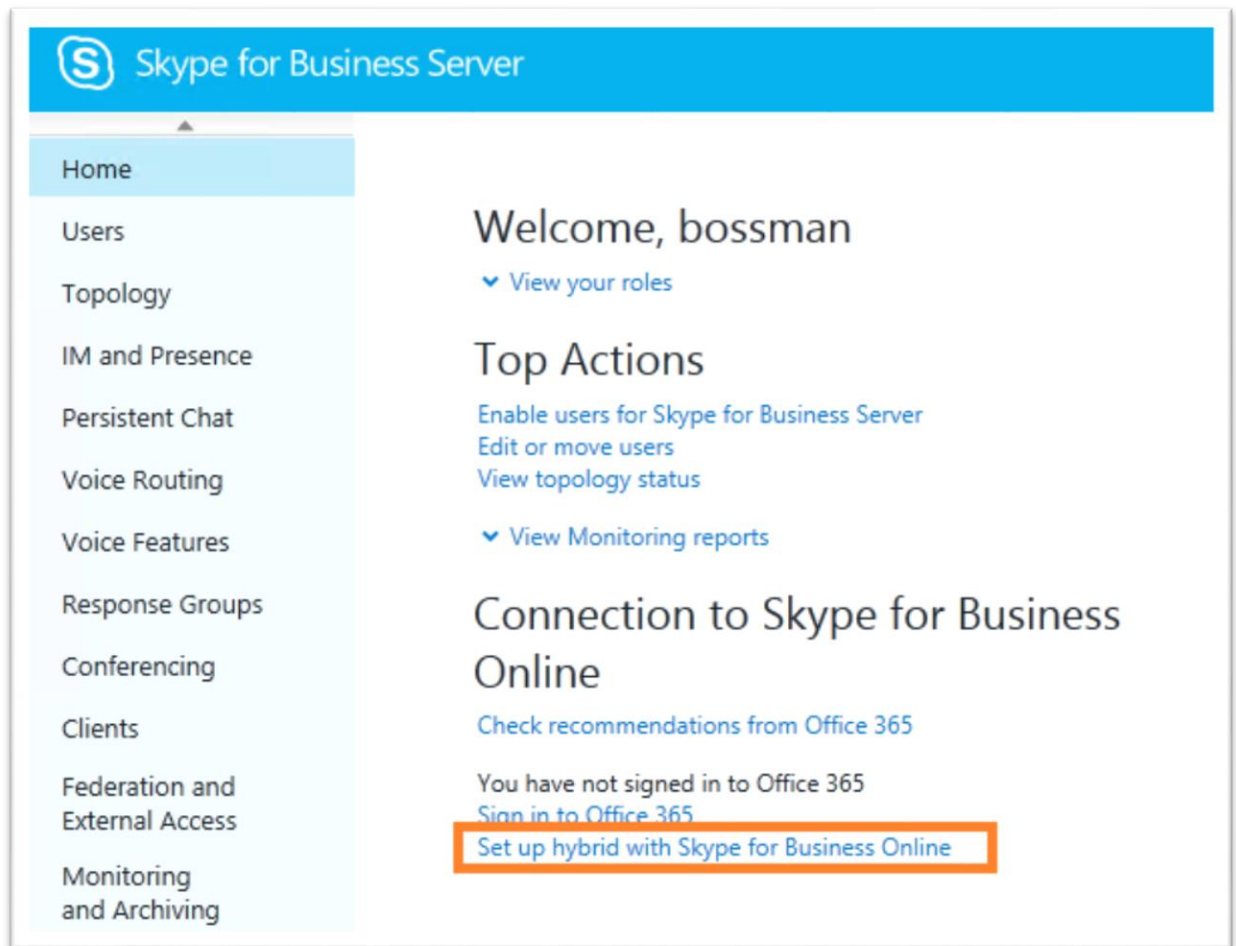
## Chapter 7: Set Up Federation with Skype for Business Online Tenant

Before you can actually move any (or all) of your on-prem Skype for Business users to Skype for Business Online you will need to configure Federation between your Online tenant and your Skype for Business Server 2015 deployment. There are two methods for achieving this. The first is GUI-based via your Skype for Business Control Panel (on-prem), and it comes in the form of a *“Set up Hybrid with Skype for Business Online”* wizard. The second option is to run all the necessary cmdlets in the Skype for Business Management Shell.

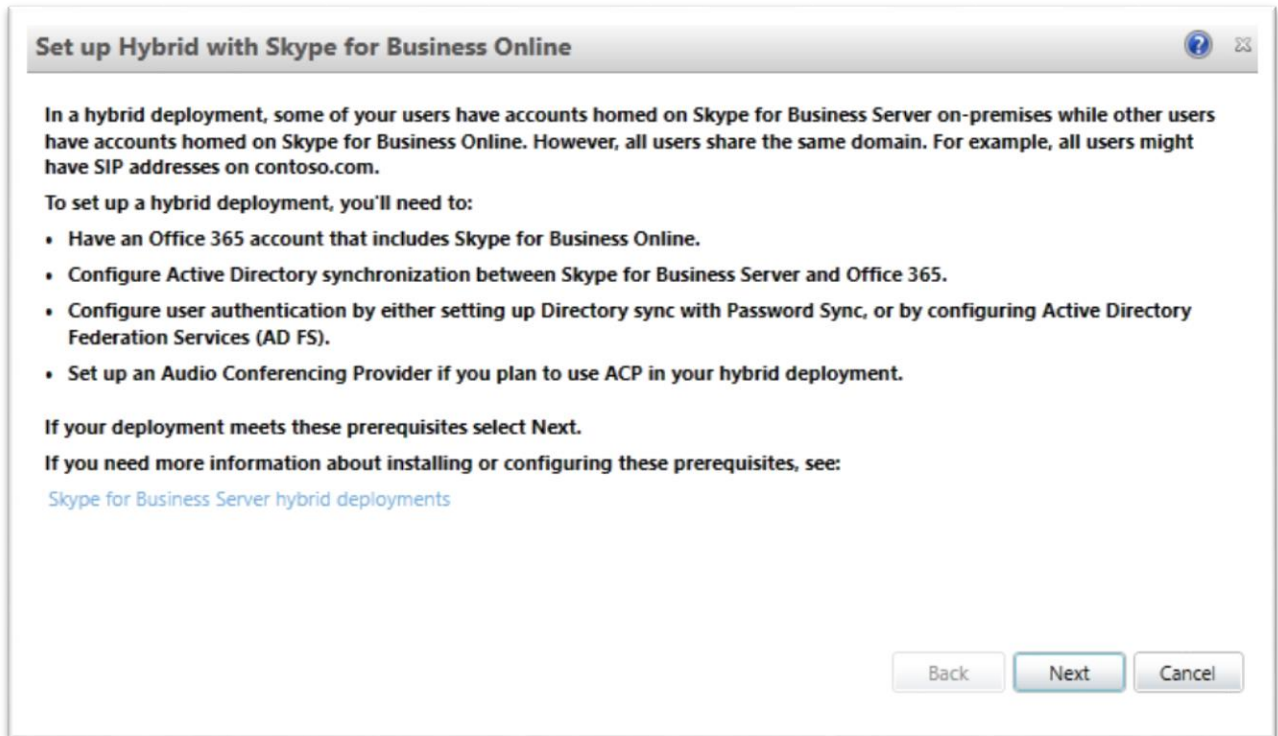
### GUI-Based: Set up Hybrid with Skype for Business Online Wizard

This option is the most straightforward and automated way to accomplish the needed Federation configuration. In fact, it is so simple and straightforward that I don't want to dwell on it too long, because there simply is not much you need to do. The below steps will walk you through setting up the needed Federation with this wizard.

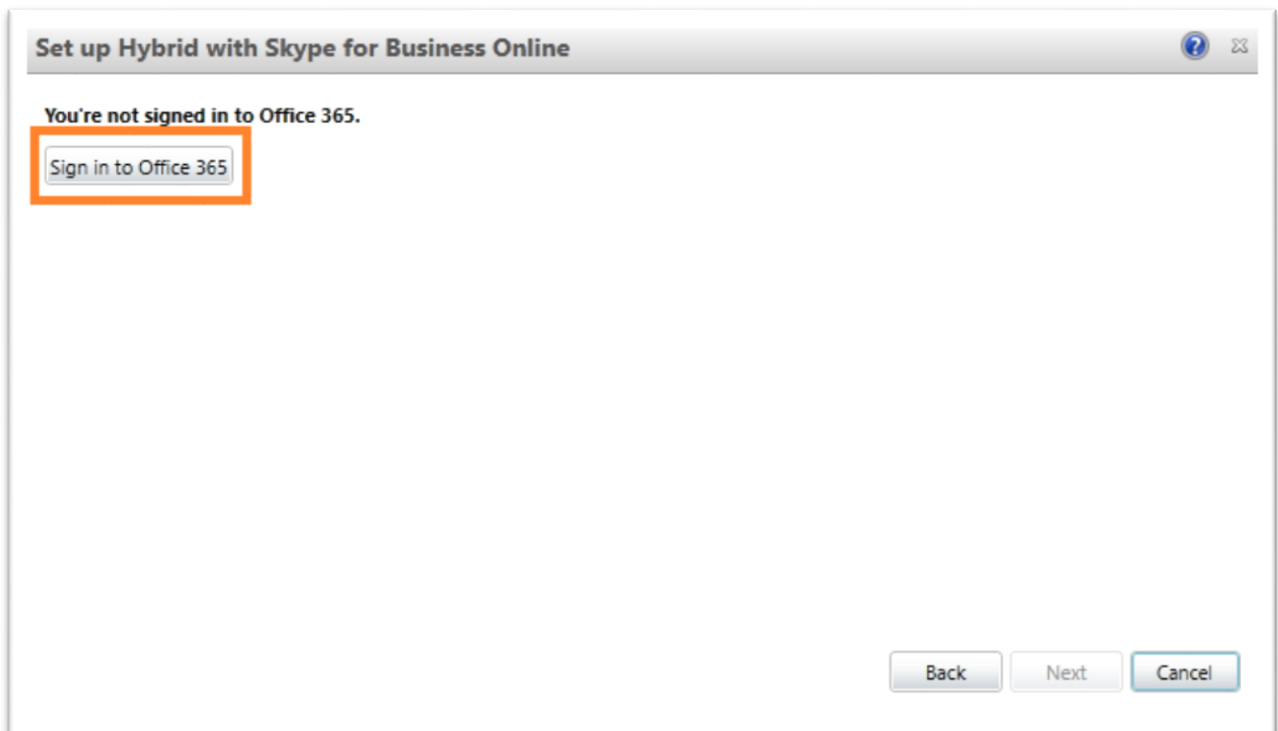
1. From one of your on-prem servers, open the **Skype for Business Control Panel**.
2. While on the **Home** tab of the Control Panel you will see a link titled “**Set Up Hybrid with Skype for Business Online**”. Click this link.



3. The next thing you will see is a list of pre-requisites. You will notice that all of these have already been accomplished by you, or are not relevant to your particular deployment (for instance, setting up an Audio Conferencing Provider). Click **Next**.

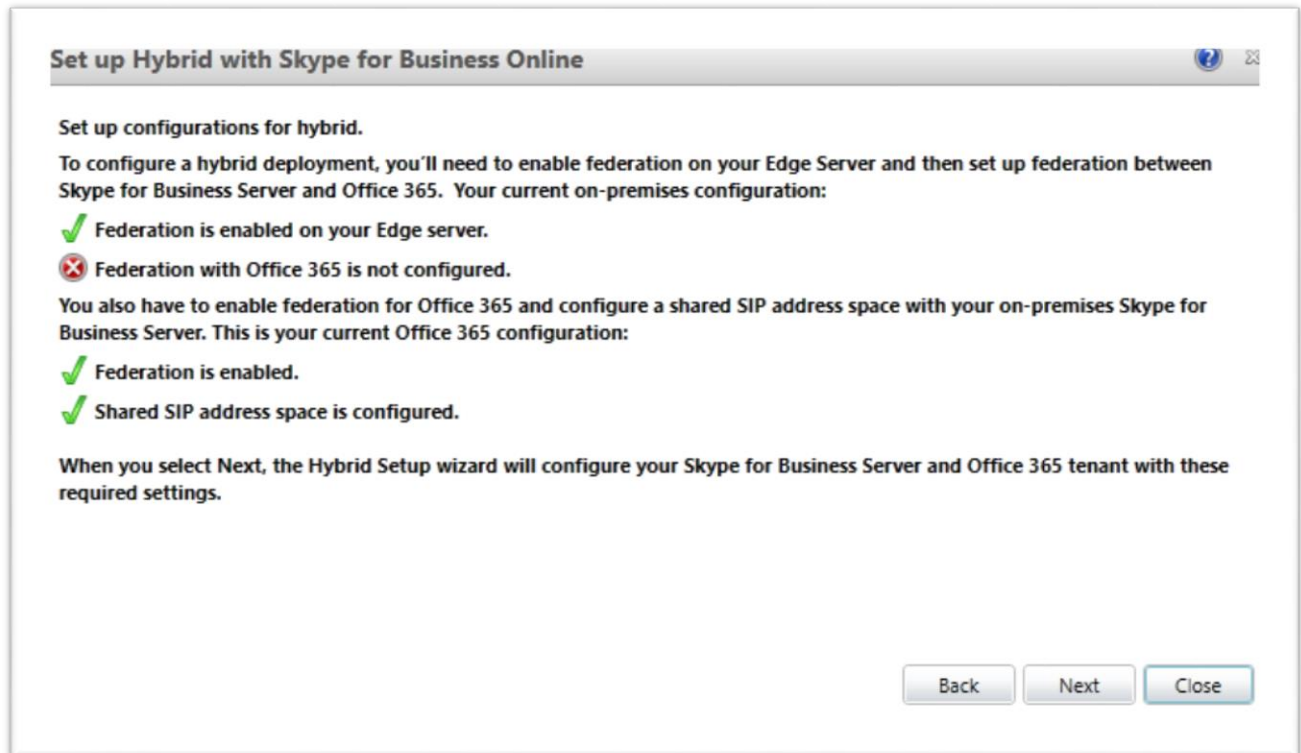


4. When it is available, use the sign-in button to authenticate to your Office 365 tenant with credentials of a user that has been assigned the Global Admin role.

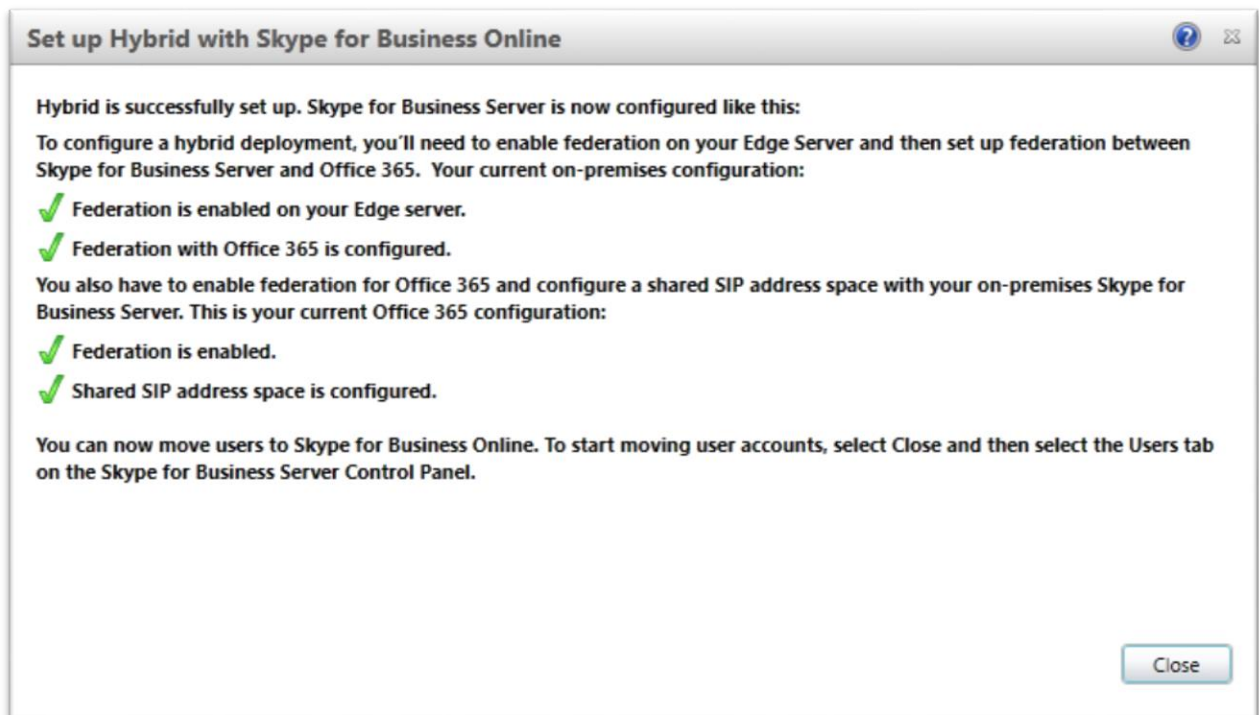




5. At this stage, the wizard will check both the state of your Skype for Business Online tenant, and the state of your on-prem Skype for Business Server 2015 deployment. When you are presented with the results, you will see a list of checks that are either failed or successful. You may have some successful results if you already have Federation enabled in either environment, but you will likely have failed results for the items that include configured a Shared SIP Address Space. Not to worry, that is the beauty of the wizard. You simply need to click **Next**, and the wizard will finish configuring the required items automatically. That is pretty freakin' cool!



6. The last screen you will see in the wizard should present you with a new list of all successful items (if all pre-requisites are in place per earlier chapters in this book). You can now click **Close**.



As you can see the Control Panel wizard makes this leg of the hybrid configuration almost *too* simple. You are now ready to start moving users!

### PowerShell-Based: Configure Federation with the Management Shell

If you are a more adventurous spirit, or simply just like PowerShell and enjoy seeing more of the system at work, then you might choose to configure Federation between your on-prem deployment and your Skype for Business Online tenant using the **Skype for Business Management** Shell and the *SkypeOnlineConnector* module. In this section, you will walk through the steps required to do this.

Before we jump straight into the steps that accomplish the same configuration changes that were implemented in the previous section, let's establish that this is a new environment, as we are demonstrating the same thing as the previous section, but with a different methodology. In this on-prem deployment, you can see that we have Scooby Doo and the gang (or part of the gang) enabled for Skype for Business in the on-prem Control Panel:

Skype for Business Server

Home  
Users  
Topology  
IM and Presence  
Persistent Chat  
Voice Routing  
Voice Features  
Response Groups  
Conferencing  
Clients

USER SEARCH

☒ Search ☐ LDAP search

Search for users by typing a user's name or clicking Add filter

Find + Add filter

Search results: 3

Enable users Edit Action

Display name	Enabled	SIP address	Registrar pool
Scooby Doo	✓	sip:Scooby@s4blab.org	S4B-FE.s4blab.org
Shaggy	✓	sip:shaggy@s4blab.org	S4B-FE.s4blab.org
Thelma	✓	sip:thelma@s4blab.org	S4B-FE.s4blab.org

With directory synchronization also in place, these same users have already been synchronized from the on-prem Active Directory to the Office 365 tenant.

Office 365 admin center <<

Search users, admin tasks and...

Active Users  
Deleted Users  
Partner Relationships  
COMPANY PROFILE  
GROUPS  
DOMAINS  
PUBLIC WEBSITE  
BILLING  
EXTERNAL SHARING  
SERVICE SETTINGS  
SERVICE HEALTH  
SUPPORT  
PURCHASE SERVICES

DASHBOARD | ACTIVE USERS

Single sign-on: [Set up](#) | [Learn more](#)  
Active Directory synchronization: [Deactivate](#) | [Manage](#) | Last synced 2 hours ago | [Learn more](#)  
Change the password expiration policy for your users: [Change now](#)  
Set Multi-factor authentication requirements: [Set up](#) | [Learn more](#)

Select a view: All users

Display name	User name	Status
admin	admin@skype4businesslab.onmicrosoft.c...	In cloud
fs_service	fs_service@s4blab.org	Synced with Active Directory
Scooby Doo	Scooby@s4blab.org	Synced with Active Directory
Shaggy	shaggy@s4blab.org	Synced with Active Directory
On-Premises Directory Synchronization S...	Sync_AADC_2f14da652005@skype4busi...	Synced with Active Directory
Thelma	thelma@s4blab.org	Synced with Active Directory

Now that this clean new “Scooby Doo” themed environment has been established, it is time to configure Federation between both environments. Start by opening the Skype for Business

Management Shell, and running: ***Set-CSAccessEdgeConfiguration -AllowOutsideUsers 1 -AllowFederatedUsers 1 -UseDnsSrvRouting -EnablePartnerDiscovery \$true.***

```

Administrator: Skype for Business Server Management Shell
Loading Modules for Skype for Business Server 2015...
PS C:\Users\administrator.S4BLAB> Set-CSAccessEdgeConfiguration -AllowOutsideUsers 1 -AllowFederatedUsers 1 -UseDnsSrvRouting
Set-CSAccessEdgeConfiguration : You must specify a value for
EnablePartnerDiscovery when switching to DNS SRV Routing mode.
At line:1 char:1
+ Set-CSAccessEdgeConfiguration -AllowOutsideUsers 1 -AllowFederatedUsers 1
-UseDnsSrvRouting ~~~~~
+ ~~~~~
+ CategoryInfo          : InvalidArgument: (Global:String) [Set-CsAccessEdgeConfiguration], ArgumentException
+ FullyQualifiedErrorId : InvalidUpdate,Microsoft.Rtc.Management.Internal.SetAccessEdgeSettingsCmdlet

PS C:\Users\administrator.S4BLAB> Set-CSAccessEdgeConfiguration -AllowOutsideUsers 1 -AllowFederatedUsers 1 -UseDnsSrvRouting -EnablePartnerDiscovery $true
PS C:\Users\administrator.S4BLAB> _
  
```

The thing to note about the image above is that when the cmdlet was run the first time without the ***-EnablePartnerDiscovery*** parameter, it failed.

While this next step may not actually be necessary, I prefer to do it to keep things clean in the environment, and to start with scratch for the cmdlets that I will run. In the Skype for Business Control Panel, navigate to the **Federation and External Access** tab, and open the section titled **SIP FEDERATED PROVIDERS**. Once on this page, delete the default entry for *Skype for Business Online*, leaving only the entry for *Skype*.

Skype for Business Server

EXTERNAL ACCESS POLICY   ACCESS EDGE CONFIGURATION   SIP FEDERATED DOMAINS   SIP FEDERATED PROVIDERS   XMPP FEDERATED PARTNERS

Home  
Users  
Topology  
IM and Presence  
Persistent Chat  
Voice Routing  
Voice Features  
Response Groups  
Conferencing  
Clients  
Federation and External Access

Search

+ New   Edit   Refresh

Provider type	Provider	Edge Server	Enabled
Public provider	Skype	federation.messenger.msn.com	Enabled

Now, back in the Skype for Business Management Shell, run the following cmdlet: ***New-CsHostingProvider -Identity SkypeforBusinessOnline -ProxyFqdn -"sipfed.online.lync.com" -Enabled \$true -EnabledSharedAddressSpace \$true -HostsOCSUsers \$true -VerificationLevel UseSourceVerification -IsLocal \$false -AutodiscoverUrl <https://webdir.online.lync.com/AutodiscoverService.svc/root>***. The ***-EnabledSharedAddressSpace*** is important because this tells the on-prem deployment that we will be sharing the SIP domain that is in use with an Online tenant.

```

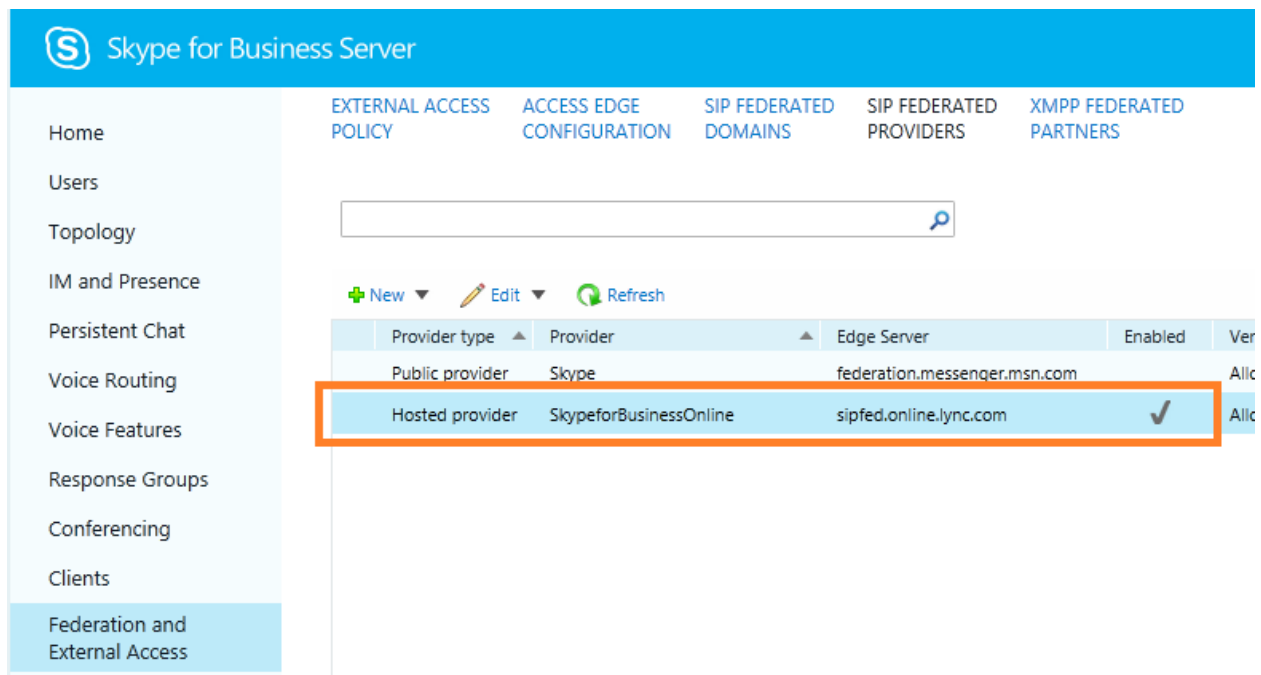
Administrator: Skype for Business Server Management Shell
Loading Modules for Skype for Business Server 2015...
PS C:\Users\administrator.$4BLAB> New-CSHostingProvider -Identity SkypeforBusine
ssOnline -ProxyFqdn "sipfed.online.lync.com" -Enabled $true -EnabledSharedAddres
sSpace $true -HostsOCSUsers $true -VerificationLevel UseSourceVerification -IsLo
cal $false -AutodiscoverUrl https://webdir.online.lync.com/Autodiscover/Autodisc
overService.svc/root

Identity           : SkypeforBusinessOnline
Name               : SkypeforBusinessOnline
ProxyFqdn          : sipfed.online.lync.com
VerificationLevel  : UseSourceVerification
Enabled            : True
EnabledSharedAddressSpace : True
HostsOCSUsers      : True
IsLocal            : False
AutodiscoverUrl    : https://webdir.online.lync.com/Autodiscover/Autodisc
coverService.svc/root

PS C:\Users\administrator.$4BLAB> _

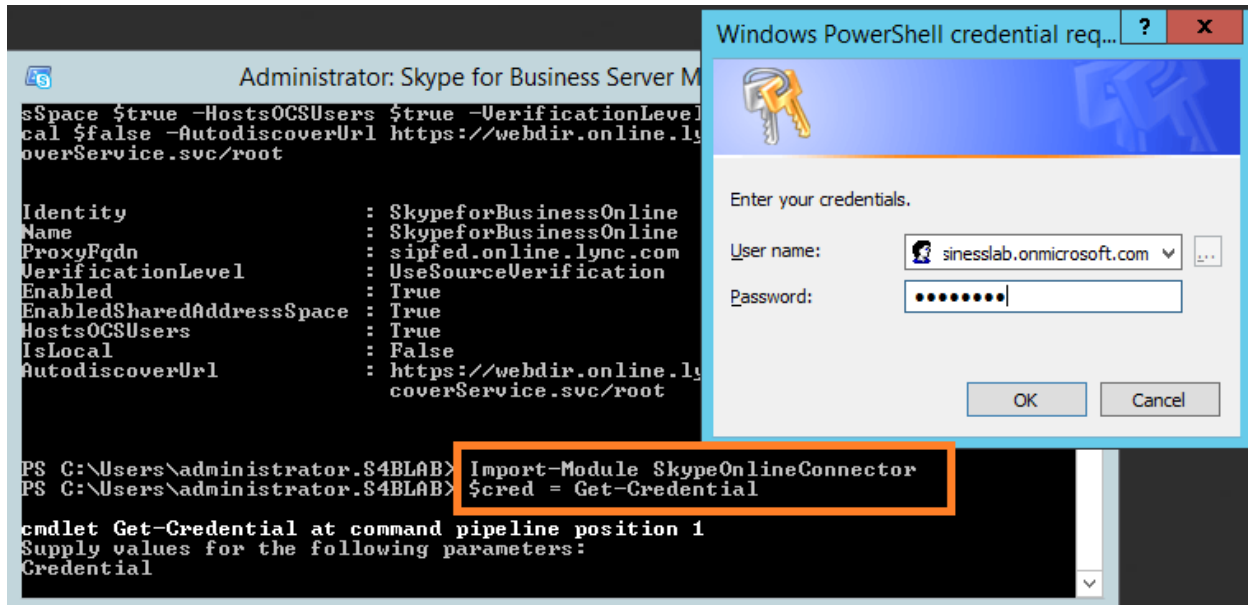
```

If you take a brief look back at the Control Panel, you can now see that the new Hosting Provider is in place, after a screen refresh, of course:

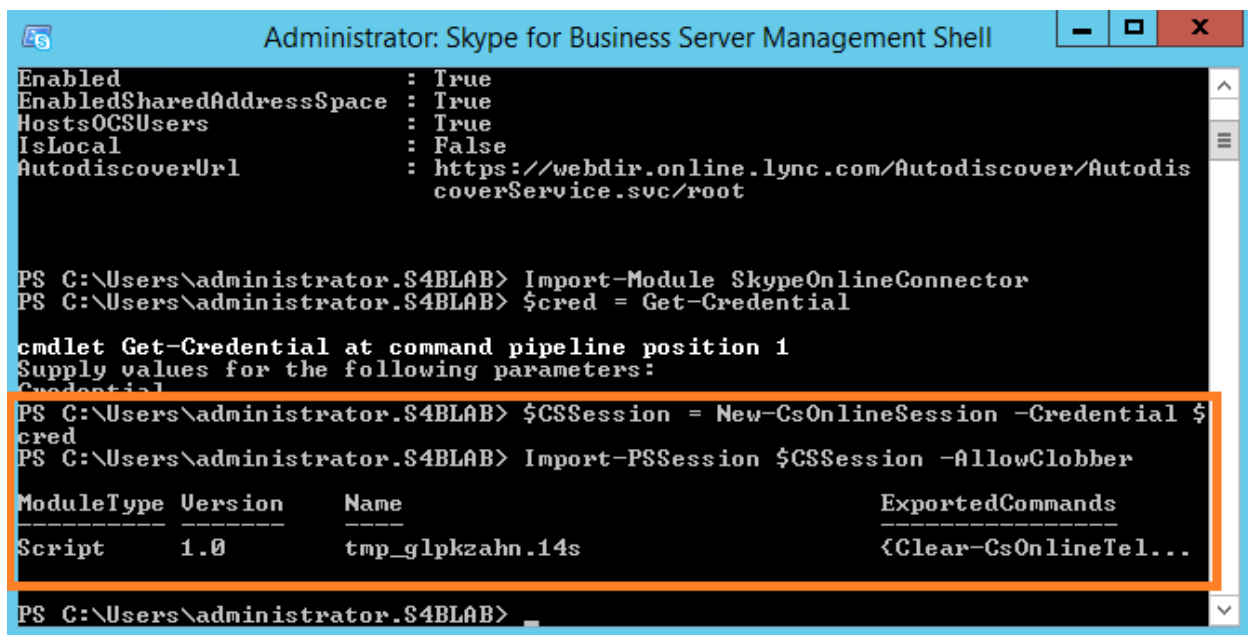


At this point, you will import the **SkypeOnlineConnector** PowerShell module within the Management Shell. This should already be present on the server if you are using a server that

has Skype for Business Server 2015 installed. Otherwise, you will need to download this module from Microsoft first. Run **Import-Module SkypeOnlineConnector**, and then store your Skype for Business Online Global Admin credentials in a new variable with this cmdlet: **\$cred = Get-Credential**.



You will now create another variable to store a new online session with your recently stored `$cred` variable: **\$CSSession = New-CsOnlineSession -Credential \$cred**. Import that new session: **Import-PSSession \$CSSession -AllowClobber**.



Just as you configured the Hosting Provider entry in the on-prem deployment for Shared SIP address space, you also need to configure the Online tenant for Shared SIP address space: ***Set-CsTenantFederationConfiguration -SharedSipAddressSpace \$true***.

```

Administrator: Skype for Business Server Management Shell
HostsOCSUsers           : True
IsLocal                  : False
AutodiscoverUrl          : https://webdir.online.lync.com/Autodiscover/AutodiscoverService.svc/root

PS C:\Users\administrator.S4BLAB> Import-Module SkypeOnlineConnector
PS C:\Users\administrator.S4BLAB> $cred = Get-Credential

cmdlet Get-Credential at command pipeline position 1
Supply values for the following parameters:
Credential
PS C:\Users\administrator.S4BLAB> $CSSession = New-CsOnlineSession -Credential $cred
PS C:\Users\administrator.S4BLAB> Import-PSSession $CSSession -AllowClobber

ModuleType Version      Name                               ExportedCommands
-----
Script      1.0             tmp_glpkzahn.14s                  {Clear-CsOnlineTel...

PS C:\Users\administrator.S4BLAB> Set-CsTenantFederationConfiguration -SharedSipAddressSpace $true
PS C:\Users\administrator.S4BLAB>

```

And that does it! You have now configured Federation between your Skype for Business Server 2015 on-prem deployment and your Skype for Business Online tenant. This completes the necessary steps for being able to move users between the two environments. Aside from the actual act of assigning Skype for Business Online licenses and moving users, you have effectively created a hybrid Skype for Business environment.

### Federating with an Audio Conferencing Provider

If you plan to use an Audio Conferencing Provider (ACP) in your hybrid Skype for Business deployment, and you do not have **Enable Partner Discovery** enabled, then you must configure federation with the ACP in your on-prem deployment. There really is not anything at all to this process beyond the typical steps that are required to establish federation with any other external domain. You simply need to have the SIP domain of the ACP, and the corresponding Edge Server FQDN (unless of course you have open federation enabled), and then you can add this domain in as an external partner with whom federation is allowed. As the granular steps to perform this action are outside the scope of this book, I will defer to Microsoft's documentation for establishing this federation if it is required.



## Chapter 8: Move Users from On-Prem to Skype for Business Online

Before we dig into this chapter, let me clarify that the examples utilize our “Scooby-Doo”-themed environment. Also, the screenshots of the Office 365 Admin Center demonstrate use of the “Classic” GUI, rather than the newer, sleeker, Preview environment.

When your environment has been fully prepared, with all pre-requisites in place, and all needed configurations having been configured, it is finally time to start moving users to Skype for Business Online. However, before you pull the trigger on trying to move users and run into an error, there is one last thing that you need to have in place before a user can be moved to Skype for Business Online.

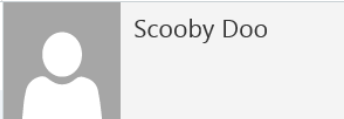
**A valid license MUST be assigned to the user in Office 365 before the existing on-prem Skype for Business user can be moved to Skype for Business Online.** Whether it be a standalone Skype for Business Online license or an Enterprise bundled license, a license that grants Skype for Business Online capabilities must be assigned to the user within Office 365. If this is not done, errors will occur during the attempted move of the user from on-prem to Online. Once you have assigned the license, you will still want to wait for about 15 minutes or so for the “Provisioning” process, as this change may not be recognizable from your on-prem deployment immediately.

To license the user before moving them from on-prem to Office 365, go to the user in Office 365 Admin Center, under the **Active Users** section, and when you select Scooby (you will notice it was Scooby in the above screenshot) you will see that he has no license assigned:

Select a view: All users

+ + + +

<input type="checkbox"/>	Display name	User name	Status
<input type="checkbox"/>	admin	admin@skype4businesslab.onmicrosoft.c...	In cloud
<input type="checkbox"/>	fs service	fs_service@s4blab.org	Synced with Active Directory
<input checked="" type="checkbox"/>	Scooby Doo	Scooby@s4blab.org	Synced with Active Directory
<input type="checkbox"/>	Shaggy	shaggy@s4blab.org	Synced with Active Directory
<input type="checkbox"/>	On-Premises Directory Synchronization S...	Sync_AADC_2f14da652005@skype4busi...	Synced with Active Directory
<input type="checkbox"/>	Thelma	thelma@s4blab.org	Synced with Active Directory



**Scooby Doo**

RESET PASSWORD EDIT USER ROLES

DELETE EDIT

ADD TO GROUP



Assigned license

No license [Edit](#)

Click on the **Edit** link next to the text “**No license**” under **Assigned License**, and in the **Assign License** box, select “**United States**” in the **Set user location** dropdown box, and then check the

box for **Skype for Business Online (Plan 2)**, or whatever particular license you are using. Click **Save**.


Learn more.' The 'Set user location' dropdown is set to 'United States'. A license is selected: 'Skype for Business Online (Plan 2)' with a checkbox, showing '1 of 1 licenses available' and a 'Buy more' link." data-bbox="292 161 748 461"/>

 **SAVE**  **CANCEL**

## Assign License

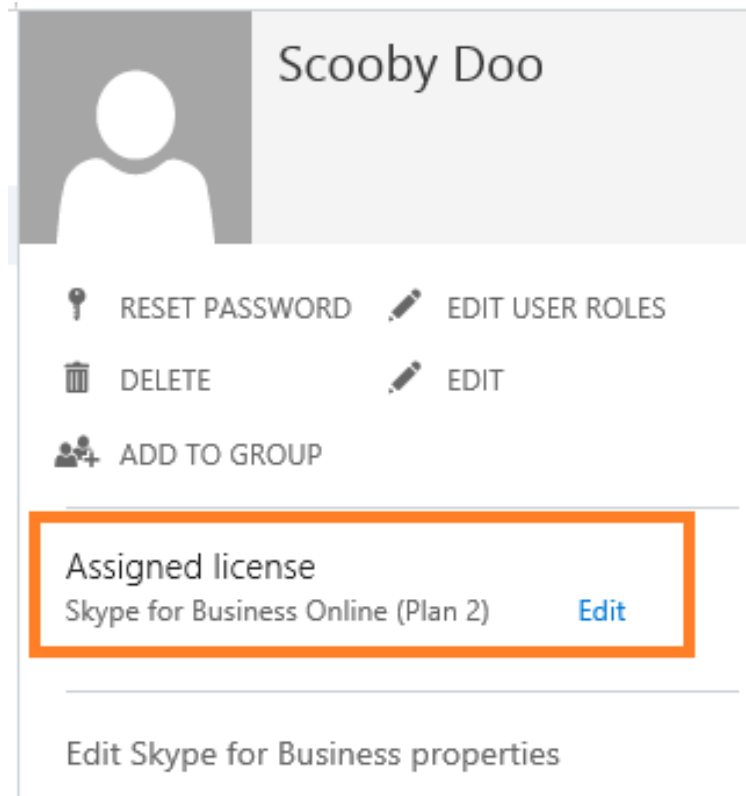
Different services are available in different locations. [Learn more](#)

**Set user location**

United States 

☒ **Skype for Business Online (Plan 2)**  
1 of 1 licenses available [Buy more](#)

You can now see that the user *Scooby* has a **Skype for Business Online (Plan 2)** license assigned.



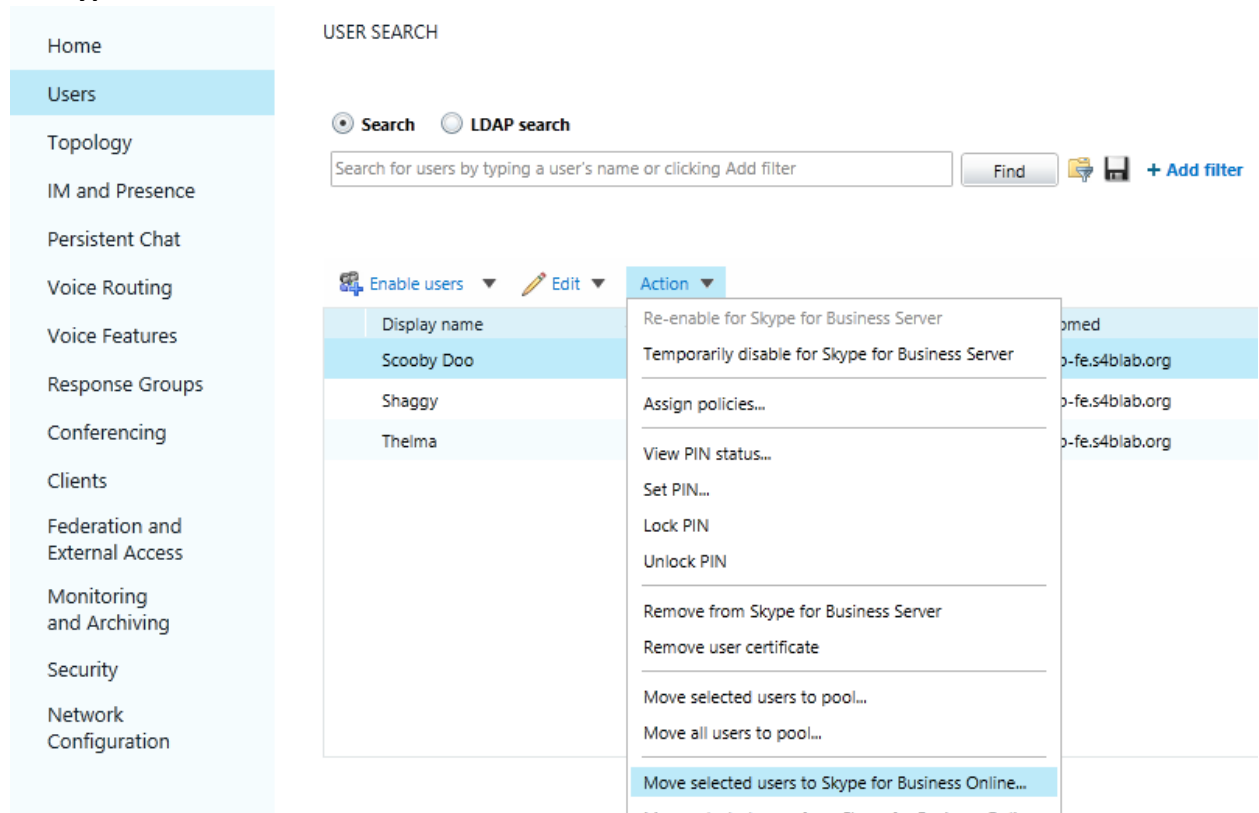
### Pilot Users First

If this entire environment is a “green field” deployment, meaning you are setting it up from scratch and end users will not yet be impacted by any changes made in the environment, then you can move users pretty freely. However, in most cases, sometimes even in “green field” deployments, it is still a good idea to exercise caution. Before immediately executing a bold move like migrating ALL your users to Skype for Business Online, it would be advisable to create a small group of pilot users to migrate first. This will allow you to get comfortable with the migration process, and will ensure that everything goes as expected for the end users. Essentially, you have a chance to work out the kinks, or to prepare to give your end users a proper head’s up before they are migrated.

### Move Users in the Control Panel

Moving a user, or users, within the Control Panel is a very simple and straightforward process. The few steps that are required for this are detailed below:

1. Open the Skype for Business Control Panel, and navigate to the **Users** tab.
2. Search for a user in the search box, and click **Find**.
3. When you see the user that you want to move to Skype for Business Online, highlight their entry in the search results list, and click on the **Actions** drop-down.
4. From the Actions drop-down menu, choose the option that says “**Move selected users to Skype for Business Online...**”.



5. You should get a reminder that the user needs to be licensed for Skype for Business Online, which of course is the case.

### Move users to Skype for Business Online



Before you move the selected users to Skype for Business Online, you should make sure that:

- Each user is assigned a license for Office 365. A license is required to sign in to Office 365 and use services such as Skype for Business Online.
- You are familiar with the differences between the features supported in Skype for Business Server and Skype for Business Online. The user experience may be different for some users depending on how they use Skype for Business. For more information, see

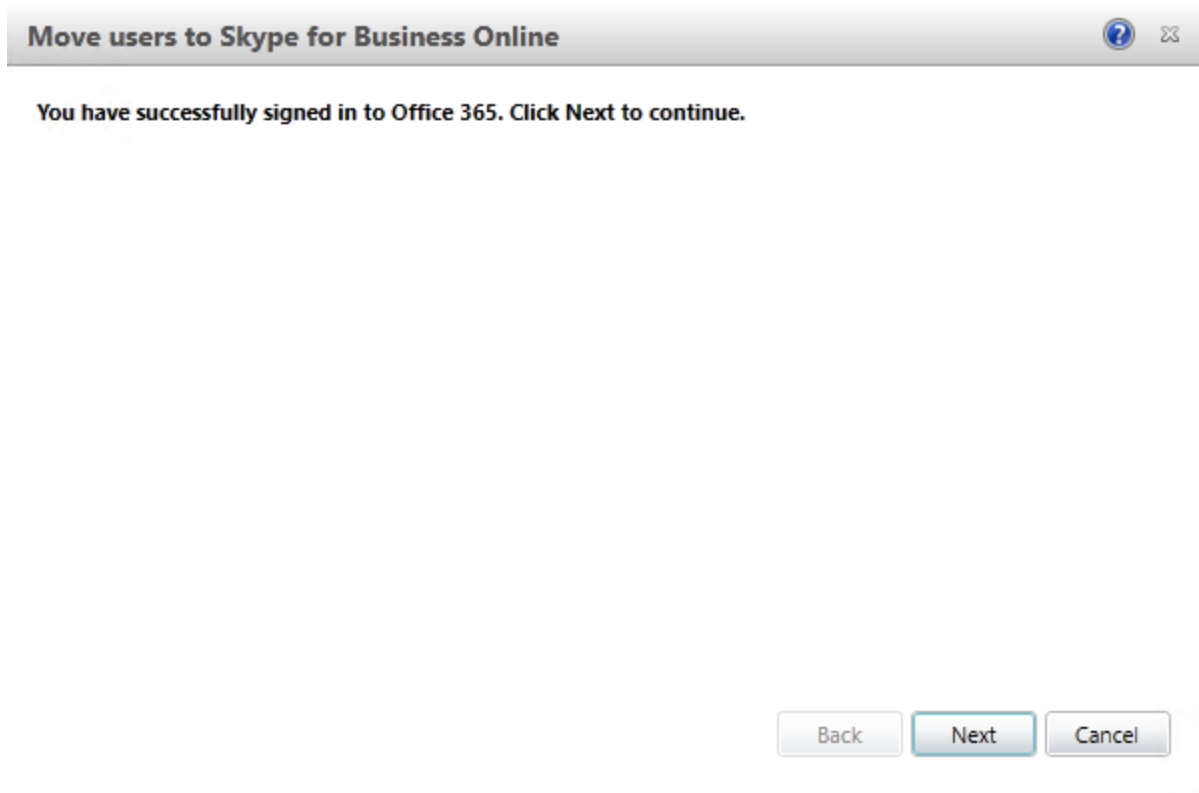
[Compare Skype for Business Options](#)

Back

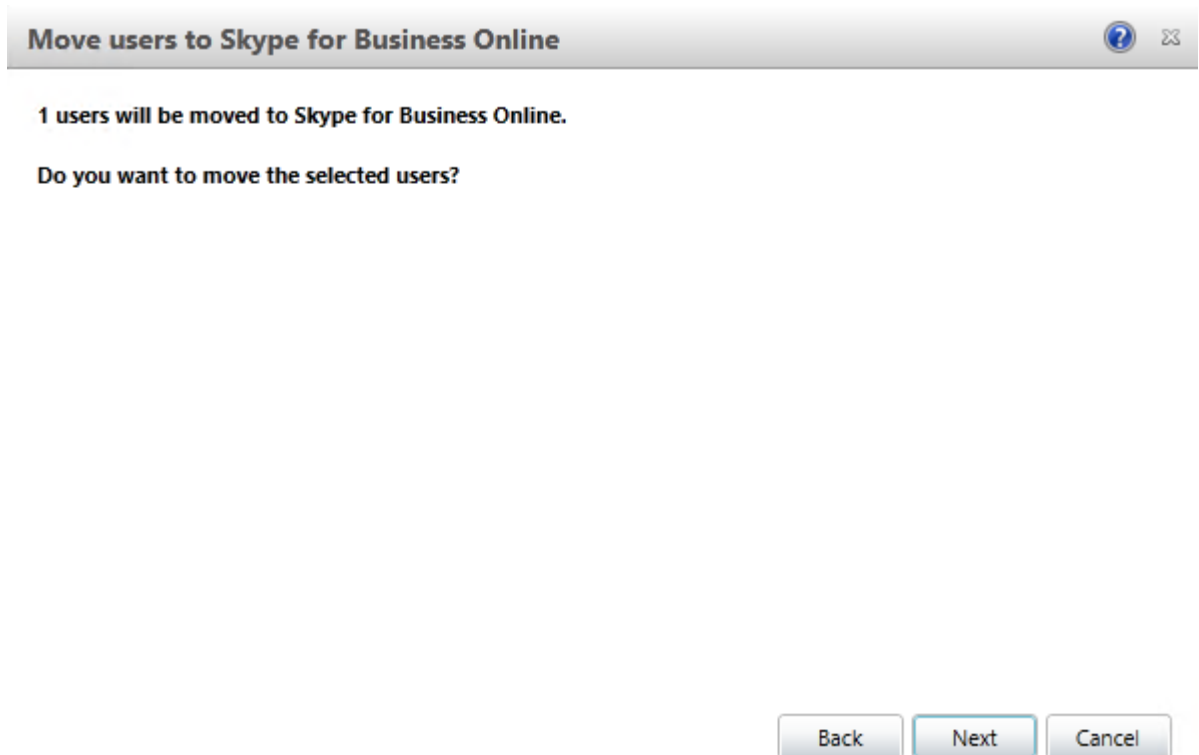
Next

Cancel

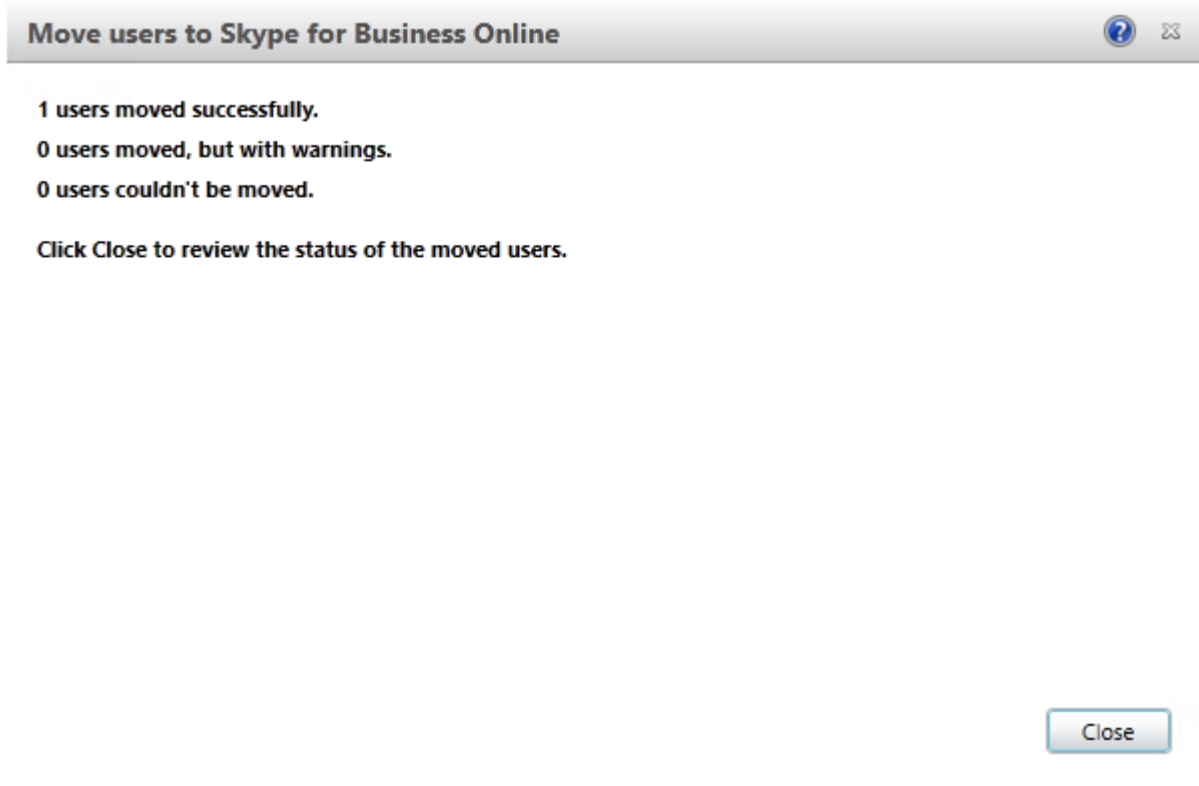
6. You may now be prompted to sign into Office 365 again with your Global Admin credentials. Click **Next** after entering your credentials and successfully authentication to Office 365.



7. Once you have signed in, you can click on **Next** to initiate the move.



8. Finally you will see a summary of the migration. This summary will tell you how many users moved successfully, how many moved with warnings, and how many failed to move. This summary will obviously be more helpful in instances where you are moving larger groups of users to Skype for Business Online. Click **Close**.



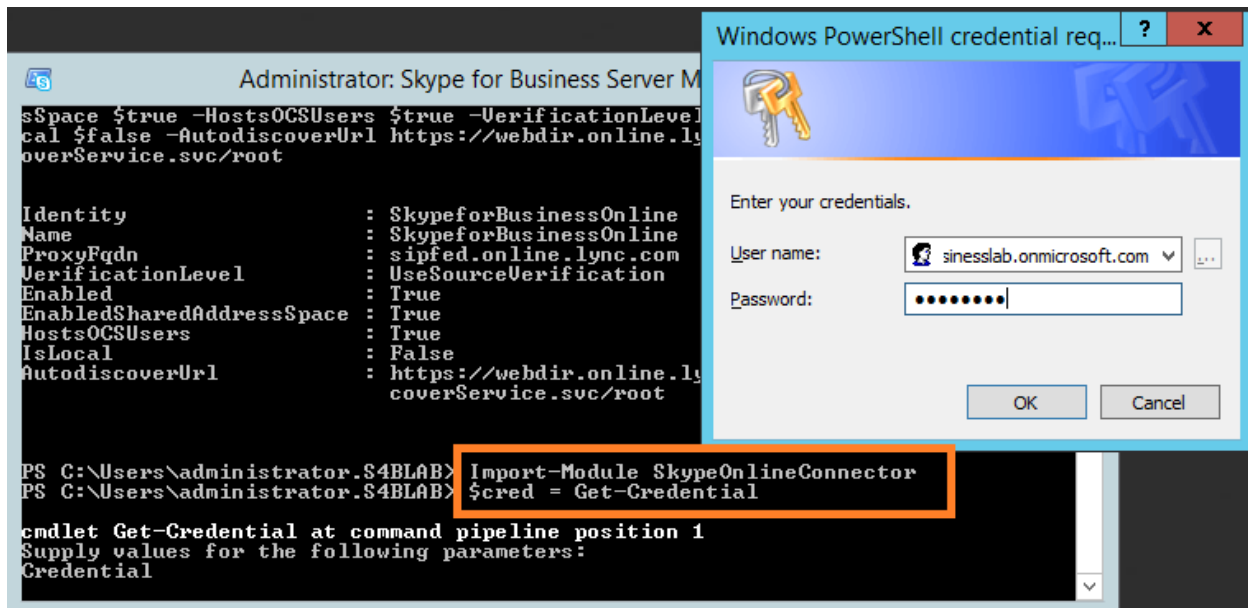
And there you have it, folks. Moving users from your on-prem deployment into the cloud is so simple, a cavema...wait, that may be some sort of copyright infringement. You get the picture, though. You do have to cross your "t"s and dot your "i"s, but if you do, management of users within the environment is amazingly simple.

### Move Users in the Management Shell (PowerShell)

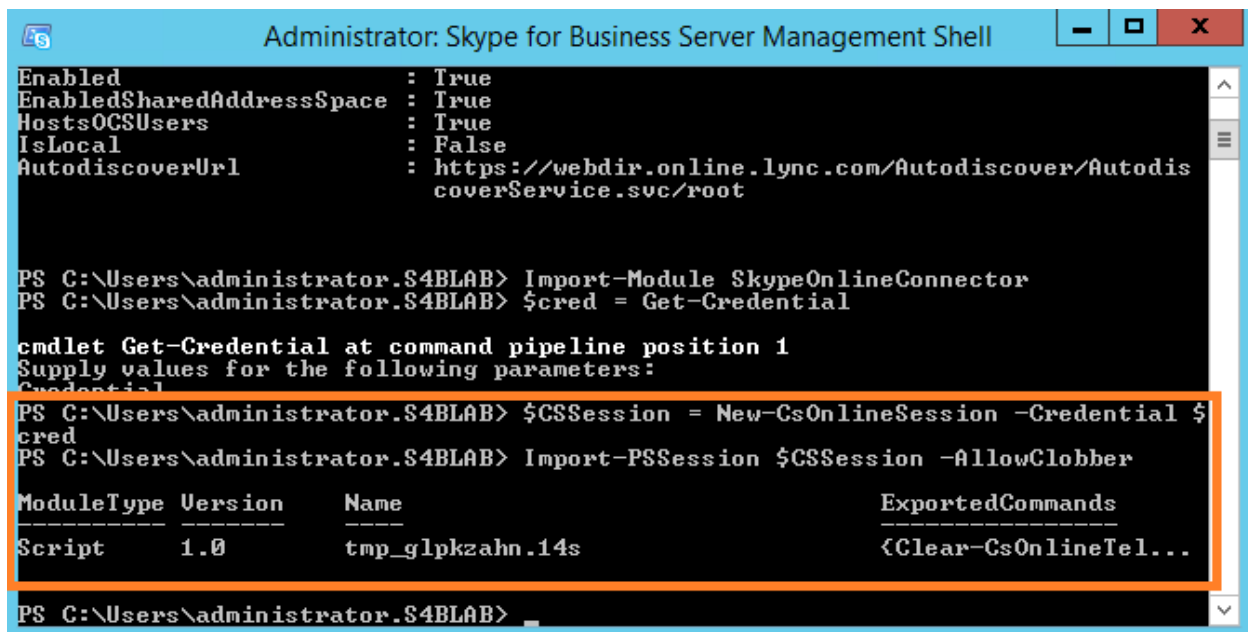
Again, I know there are some in the audience that prepare to throw users between environments with the power of PowerShell cmdlets. For those that are more at home running commands or scripting out these actions for the sake of automation, this section goes over how to move your users in the Skype for Business Management Shell.

If you are opening a new Skype for Business Management Shell, you will need to connect to your Skype for Business Online tenant again with the **SkypeOnlineConnector** module.

Run **Import-Module SkypeOnlineConnector**, and then store your Skype for Business Online Global Admin credentials in a new variable with this cmdlet: **\$cred = Get-Credential**.



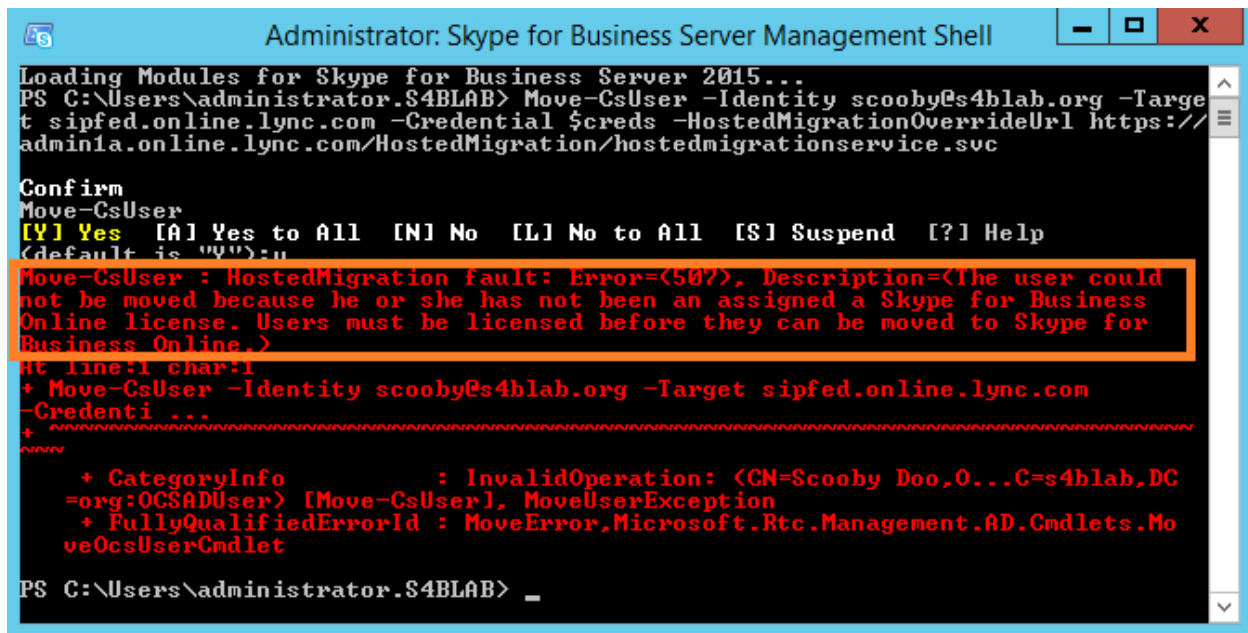
Create a new session: **\$CSSession = New-CsOnlineSession -Credential \$cred**. Import that new session: **Import-PSSession \$CSSession -AllowClobber**.



As in the previous section, you must make sure that you have already properly licensed your user in Office 365 for Skype for Business Online before running the cmdlet to move them, or you will get an



error. Luckily, if you make this mistake, the error is very descriptive, so there is no guesswork in trying to figure out what went wrong:



```

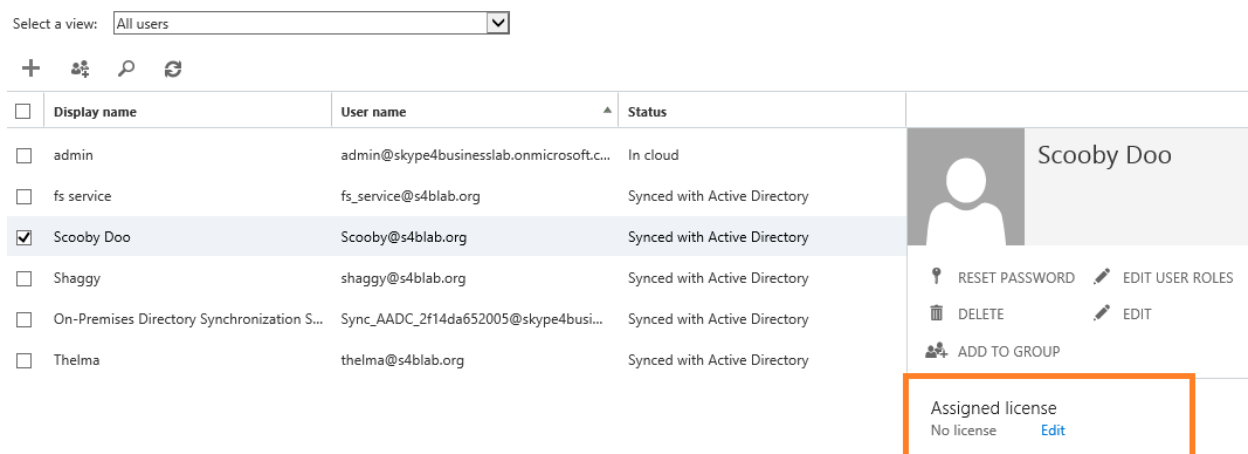
Administrator: Skype for Business Server Management Shell
Loading Modules for Skype for Business Server 2015...
PS C:\Users\administrator.S4BLAB> Move-CsUser -Identity scooby@s4blab.org -Target sipfed.online.lync.com -Credential $creds -HostedMigrationOverrideUrl https://admin1a.online.lync.com/HostedMigration/hostedmigrationservice.svc

Confirm
Move-CsUser
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help
(default is "Y")
Move-CsUser : HostedMigration fault: Error=(507), Description=(The user could not be moved because he or she has not been assigned a Skype for Business Online license. Users must be licensed before they can be moved to Skype for Business Online.)
At line:1 char:1
+ Move-CsUser -Identity scooby@s4blab.org -Target sipfed.online.lync.com
+ ~~~~~
+ CategoryInfo          : InvalidOperation: (CN=Scooby Doo,0...C=s4blab,DC=org:OCSADUser) [Move-CsUser], MoveUserException
+ FullyQualifiedErrorId : MoveError,Microsoft.Rtc.Management.AD.Cmdlets.MoveOcsUserCmdlet

PS C:\Users\administrator.S4BLAB>

```

To license the user before moving them from on-prem to Office 365, go to the user in Office 365 Admin Center, under the **Active Users** section, and when you select Scooby (you will notice it was Scooby in the above screenshot) you will see that he has no license assigned:



Select a view: All users

Display name	User name	Status
<input type="checkbox"/> admin	admin@skype4businesslab.onmicrosoft.c...	In cloud
<input type="checkbox"/> fs service	fs_service@s4blab.org	Synced with Active Directory
<input checked="" type="checkbox"/> Scooby Doo	Scooby@s4blab.org	Synced with Active Directory
<input type="checkbox"/> Shaggy	shaggy@s4blab.org	Synced with Active Directory
<input type="checkbox"/> On-Premises Directory Synchronization S...	Sync_AADC_2f14da652005@skype4busi...	Synced with Active Directory
<input type="checkbox"/> Thelma	thelma@s4blab.org	Synced with Active Directory

**Scooby Doo**

RESET PASSWORD EDIT USER ROLES

DELETE EDIT



ADD TO GROUP

Assigned license  
No license [Edit](#)

Click on the **Edit** link next to the text "**No license**" under **Assigned License**, and in the **Assign License** box, select "**United States**" in the **Set user location** dropdown box, and then check the

box for **Skype for Business Online (Plan 2)**, or whatever particular license you are using. Click **Save**.


Learn more.' The 'Set user location' dropdown is set to 'United States'. A license is selected: 'Skype for Business Online (Plan 2)' with a checkbox, showing '1 of 1 licenses available' and a 'Buy more' link." data-bbox="292 161 748 461"/>

 **SAVE**  **CANCEL**

## Assign License

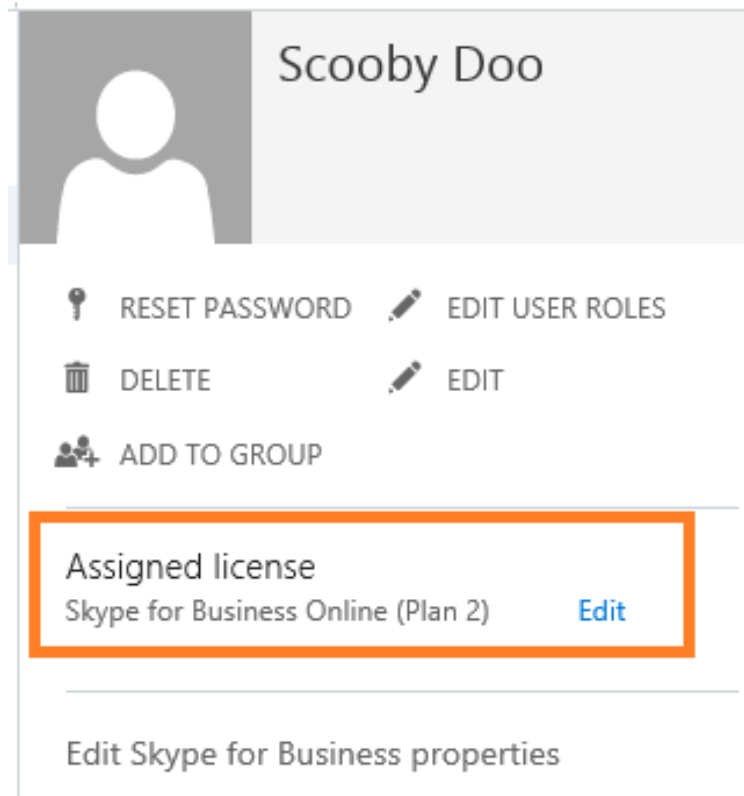
Different services are available in different locations. [Learn more](#)

**Set user location**

United States 

☒ **Skype for Business Online (Plan 2)**  
1 of 1 licenses available [Buy more](#)

You can now see that the user *Scooby* has a **Skype for Business Online (Plan 2)** license assigned.



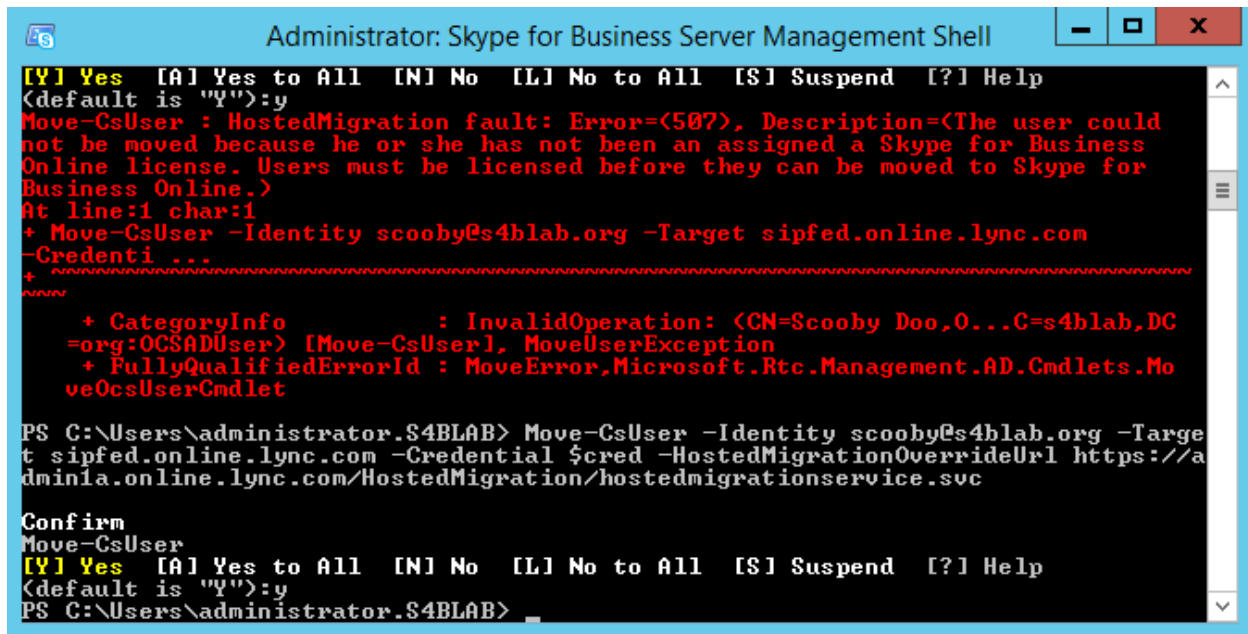
However, if you attempt to run the **Move-CsUser** command again immediately, you may still see the same error, which doesn't make sense, right? Well, you may need to wait 15 - 30 minutes after assigning this license, as the provisioning process is not exactly what you might call...quick.

After provisioning has finished, you can now run the cmdlet successfully:

```
Move-CsUser -Identity <user@domain.com> -Target sipfed.online.lync.com -Credential $cred -HostedMigrationOverrideUrl https://admin1a.online.lync.com/HostedMigration/hostedmigrationservice.svc.
```

**\*\*IMPORTANT\*\*** In the above command, you first need to make sure you change **-Identity** to the user that you are attempting to move. Second, in order to get the proper **HostedMigrationOverrideUrl**, log into your Skype for Business Admin Center, and copy the URL up through ".lync.com", and then append **"/HostedMigration/hostedmigrationservice.svc"** to the end of that URL. This may be different for different tenants.

You will then be prompted to **Confirm**. Type **"y"** and hit **Enter**. You should then see the below if it was successful:



```

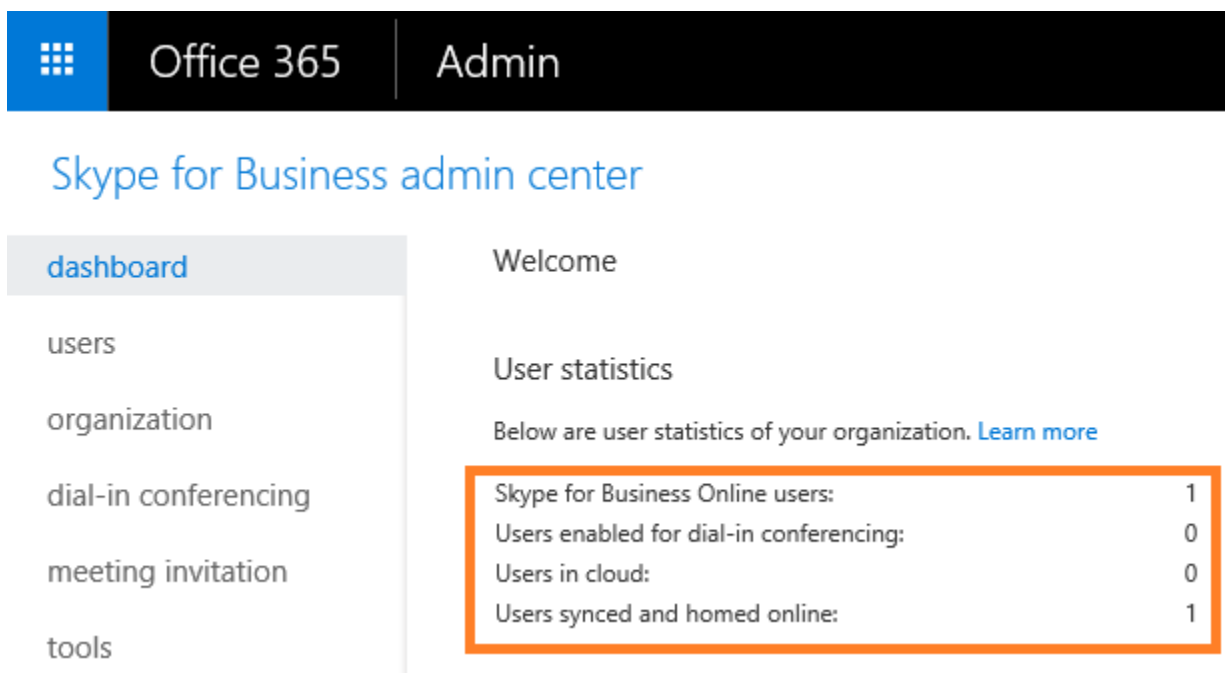
Administrator: Skype for Business Server Management Shell
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help
(default is "Y"):y
Move-CsUser : HostedMigration fault: Error=(507), Description=(The user could
not be moved because he or she has not been assigned a Skype for Business
Online license. Users must be licensed before they can be moved to Skype for
Business Online.)
At line:1 char:1
+ Move-CsUser -Identity scooby@s4blab.org -Target sipfed.online.lync.com
-Credenti ...
+ ~~~~~
+ CategoryInfo          : InvalidOperation: (CN=Scooby Doo,0...C=s4blab,DC
=org:OCSADUser) [Move-CsUser], MoveUserException
+ FullyQualifiedErrorId : MoveError,Microsoft.Rtc.Management.AD.Cmdlets.Mo
veOcsUserCmdlet

PS C:\Users\administrator.$4BLAB> Move-CsUser -Identity scooby@s4blab.org -Targe
t sipfed.online.lync.com -Credential $cred -HostedMigrationOverrideUrl https://a
dmin1a.online.lync.com/HostedMigration/hostedmigrationservice.svc

Confirm
Move-CsUser
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help
(default is "Y"):y
PS C:\Users\administrator.$4BLAB>

```


Again, provisioning is involved at this point, so after you run **Move-CsUser**, you may need to wait a while before you see the stats get updated in your Skype for Business Admin Center:



The screenshot shows the 'Office 365 Admin' interface. The left sidebar contains a navigation menu with 'dashboard' selected. The main content area displays 'Welcome' and 'User statistics'. Below this, a table shows user statistics for the organization, with the table content highlighted by an orange border.

Skype for Business Online users:	1
Users enabled for dial-in conferencing:	0
Users in cloud:	0
Users synced and homed online:	1

Next, click on the **Users** tab in the Skype for Business Admin Center, and you should now see good ol' Scooby in there!



 Office 365 | Admin

## Skype for Business admin center

dashboard

users

organization

<input type="checkbox"/>	DISPLAY NAME ▲	USER NAME
<input type="checkbox"/>	Scooby Doo	Scooby@s4blab.org

With a user migrated to Skype for Business Online, you can now start testing logins, communication with on-prem users, and all other features. Test things such as Exchange integration, and all other expected behavior for the Online users before you start migrating the rest of your users to Skype for Business Online.

## Chapter 9: User Management in a Hybrid Environment

As was discussed in an earlier chapter, managing users in a hybrid deployment requires policies to be in place in both environments; you cannot create a “global” policy in either environment that will apply to users in both environments. Creating and assigning policies in on-prem environment and configuring conferencing and user settings in Skype for Business Online are both topics that are outside the scope of this book. Since they are managed separately, there is not really any change in how to manage users in a hybrid deployment from how you would manage users in separate environments.

That being said, it is time to consider what needs to be done when moving users back from Online to on-prem. The process for doing this is actually almost exactly the same as it is for moving users Online from on-prem. Shuffling through the available settings and configurations in the Office 365 Skype for Business Admin Center is not the answer here, though, as there is no GUI-based mechanism for moving those users back within that portal. So, how do you move users back?

### Move Users to On-Prem in the Control Panel

Moving a user, or users, within the on-prem Control Panel is a very simple and straightforward process. The few steps that are required for this are detailed below:

1. Open the Skype for Business Control Panel in your on-prem environment, and navigate to the **Users** tab.
2. Search for a user in the search box, and click **Find**.
3. When you see the user that you want to move to Skype for Business Server 2015 from Online, highlight their entry in the search results list, and click on the **Actions** drop-down. Below we see that Scooby Doo is homed in Skype for Business Online:

Skype for Business Server

Home  
Users  
Topology  
IM and Presence  
Persistent Chat  
Voice Routing  
Voice Features  
Response Groups  
Conferencing  
Clients

USER SEARCH

☒ Search ☐ LDAP search

Search for users by typing a user's name or clicking Add filter Find + Add filter

Search result

Enable users Edit Action

Display name	Enabled	SIP address	Homed	Telephony
Scooby Doo	✓	sip:scooby@s4blab.org	Skype For Business Online	
Shaggy	✓	sip:shaggy@s4blab.org	sfb-fe.s4blab.org	PC-to-PC only
Thelma	✓	sip:thelma@s4blab.org	sfb-fe.s4blab.org	PC-to-PC only

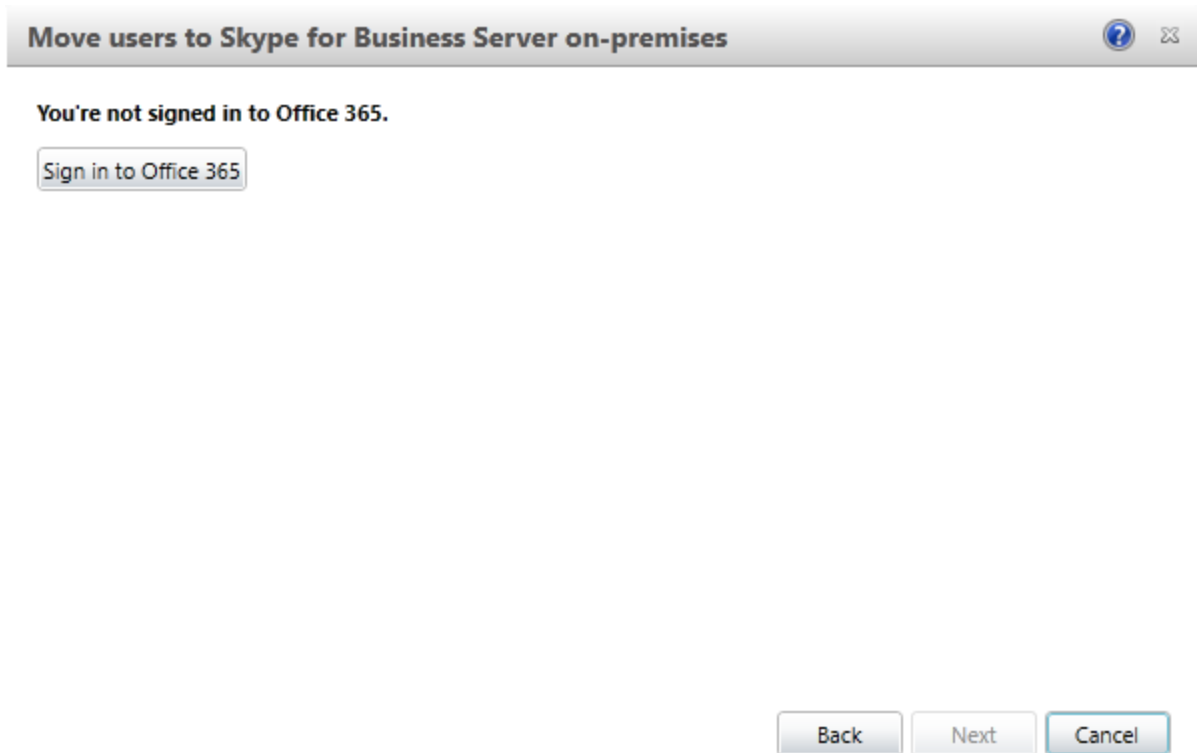
4. From the Actions drop-down menu, choose the option that says **“Move selected users from Skype for Business Online...”**.

Enable users Edit Action

Display name	Enabled	SIP address	Homed	Telephony
Scooby Doo	✓	sip:scooby@s4blab.org	Skype For Business Online	
Shaggy	✓	sip:shaggy@s4blab.org	sfb-fe.s4blab.org	PC-to-PC only
Thelma	✓	sip:thelma@s4blab.org	sfb-fe.s4blab.org	PC-to-PC only

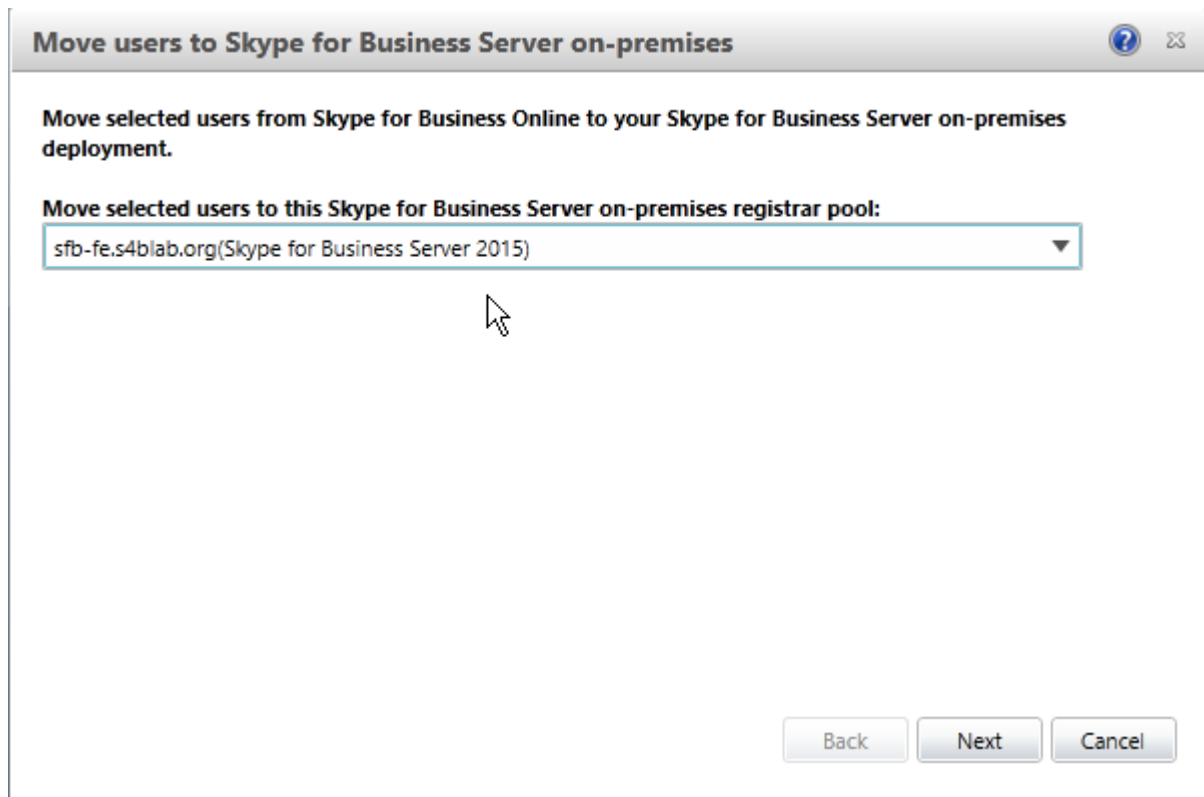
Re-enable for Skype for Business Server  
Temporarily disable for Skype for Business Server  
Assign policies...  
View PIN status...  
Set PIN...  
Lock PIN  
Unlock PIN  
Remove from Skype for Business Server  
Remove user certificate  
Move selected users to pool...  
Move all users to pool...  
Move selected users to Skype for Business Online...  
Move selected users from Skype for Business Online...

5. Of course, once again, you will need to authenticate to Office 365 with an account that has been assigned the Global Admin role.



6. Once you have successfully authenticated, click **Next**. On the next screen you are presented with a drop-down box in the ***Move selected users to this Skype for Business Server on-premises registrar pool***, select your on-prem pool and then click **Next**.





The screenshot shows a Windows-style window titled "Move users to Skype for Business Server on-premises". The window has a header bar with a question mark icon and a close button. The main content area contains the following text:

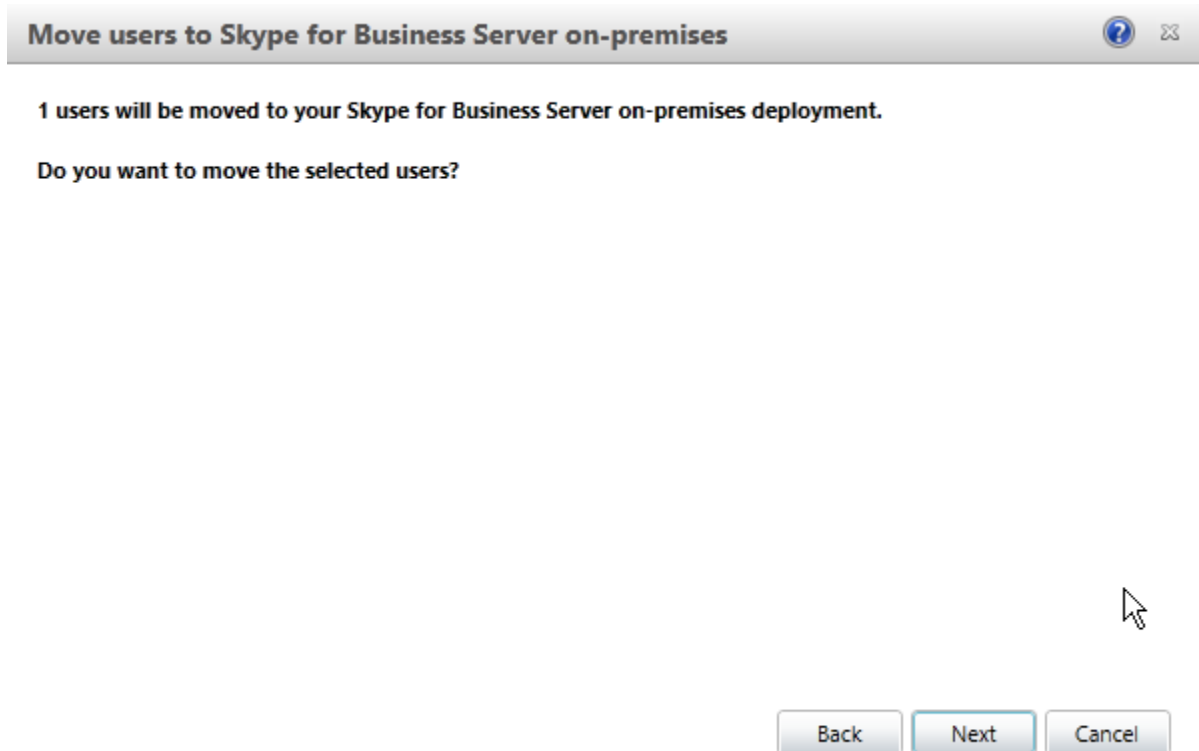
**Move selected users from Skype for Business Online to your Skype for Business Server on-premises deployment.**

**Move selected users to this Skype for Business Server on-premises registrar pool:**

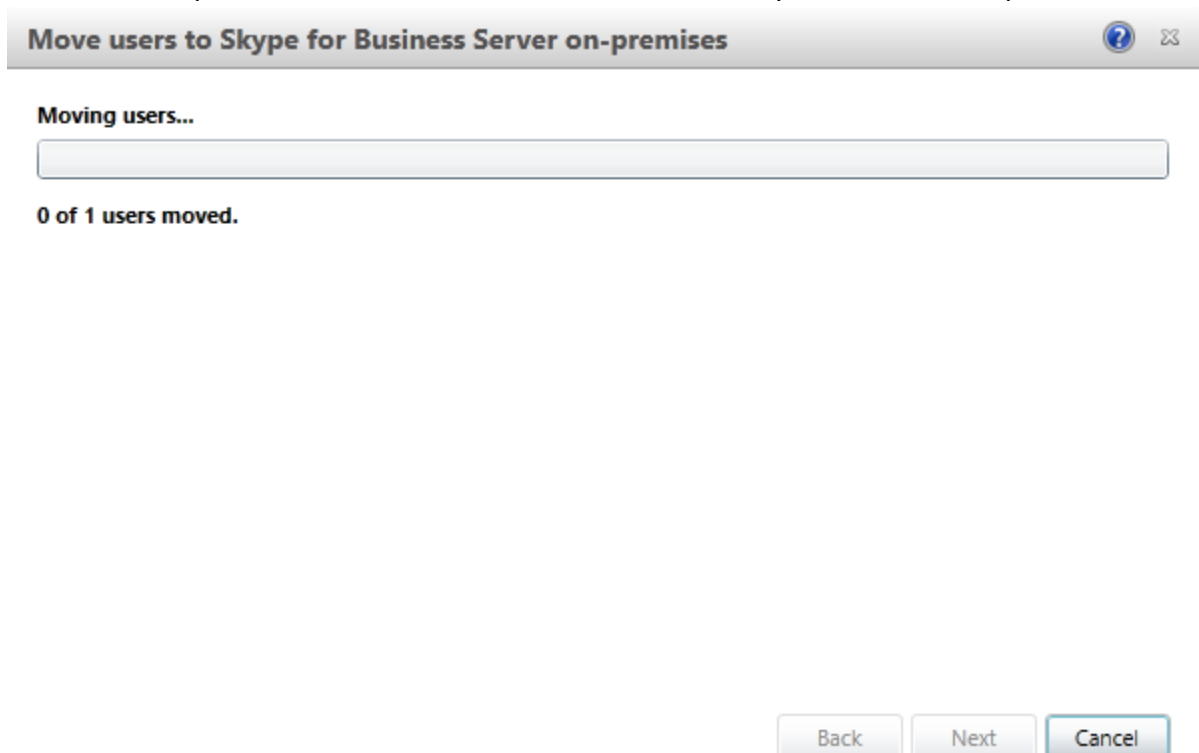
A dropdown menu is displayed with the text "sfb-fe.s4blab.org(Skype for Business Server 2015)". A mouse cursor is pointing at the dropdown arrow.

At the bottom right of the window, there are three buttons: "Back", "Next", and "Cancel".

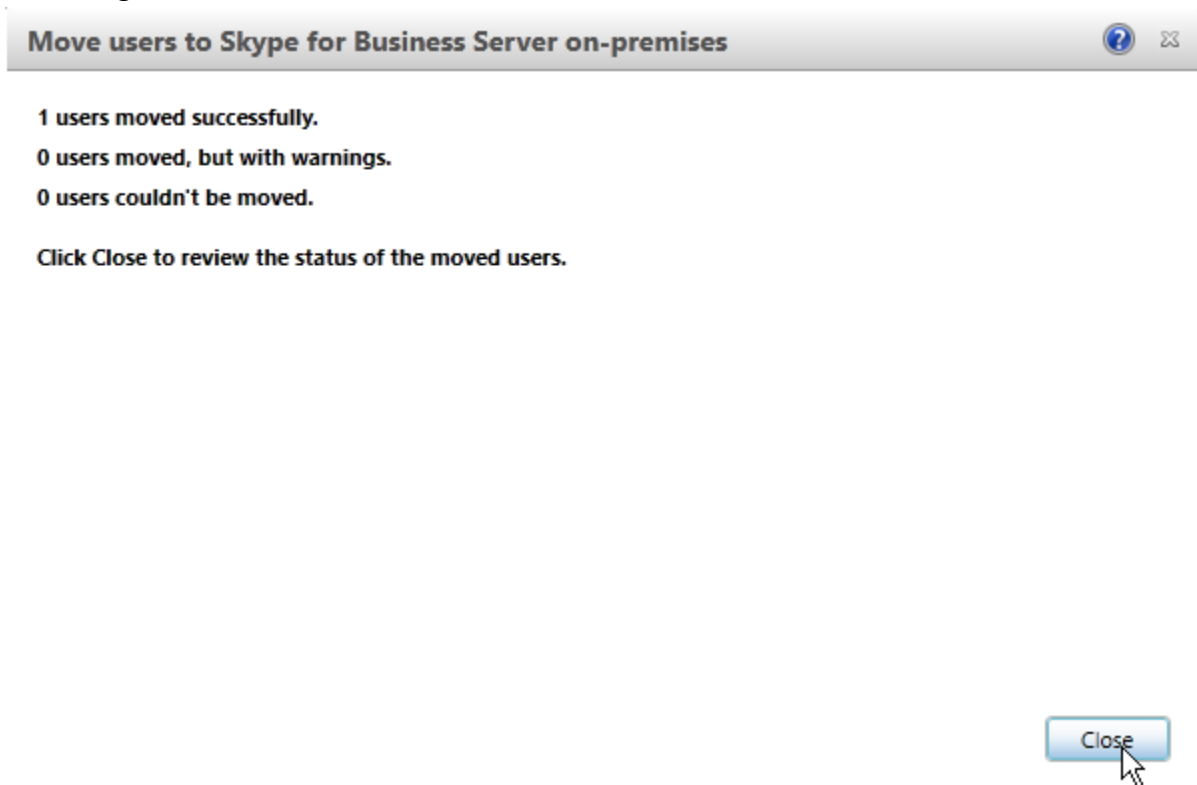
7. On the next screen you will be presented with the number of users that you are attempting to move to your on-prem deployment, and asked to confirm. Confirm by clicking **Next**.



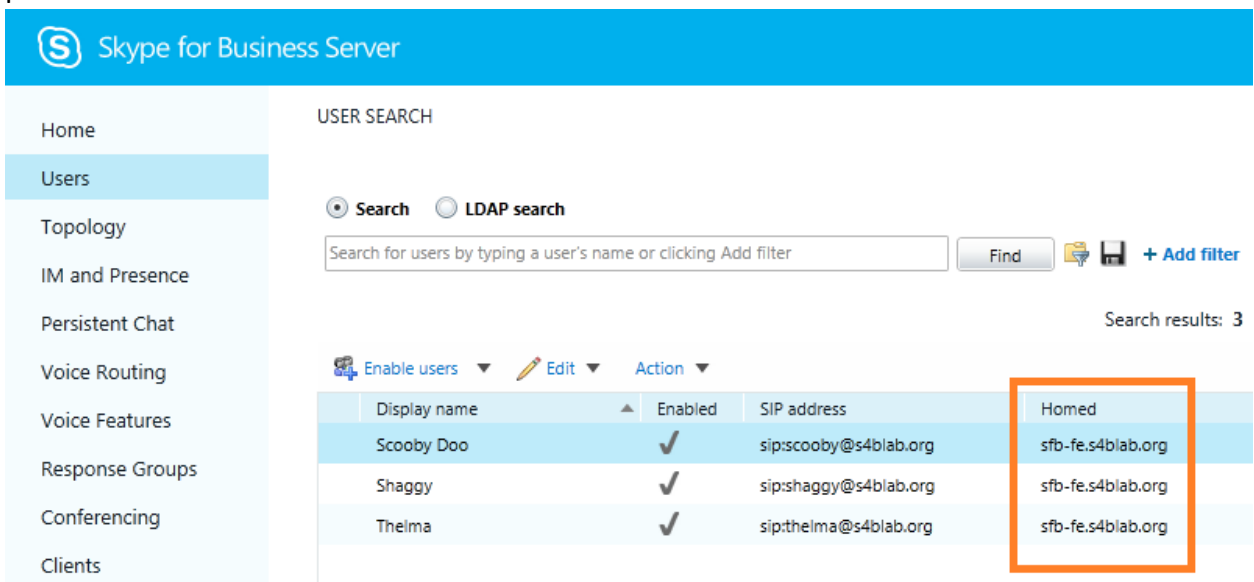
8. You will now be presented with a progress bar as the move is being performed. Once the move completes, the **Next** button will be enabled, and you can click it to proceed.



9. Finally, you will be presented with the summary screen, letting you know how many users were moved successfully, and how many were not. Click **Close** once you are done reviewing this screen.



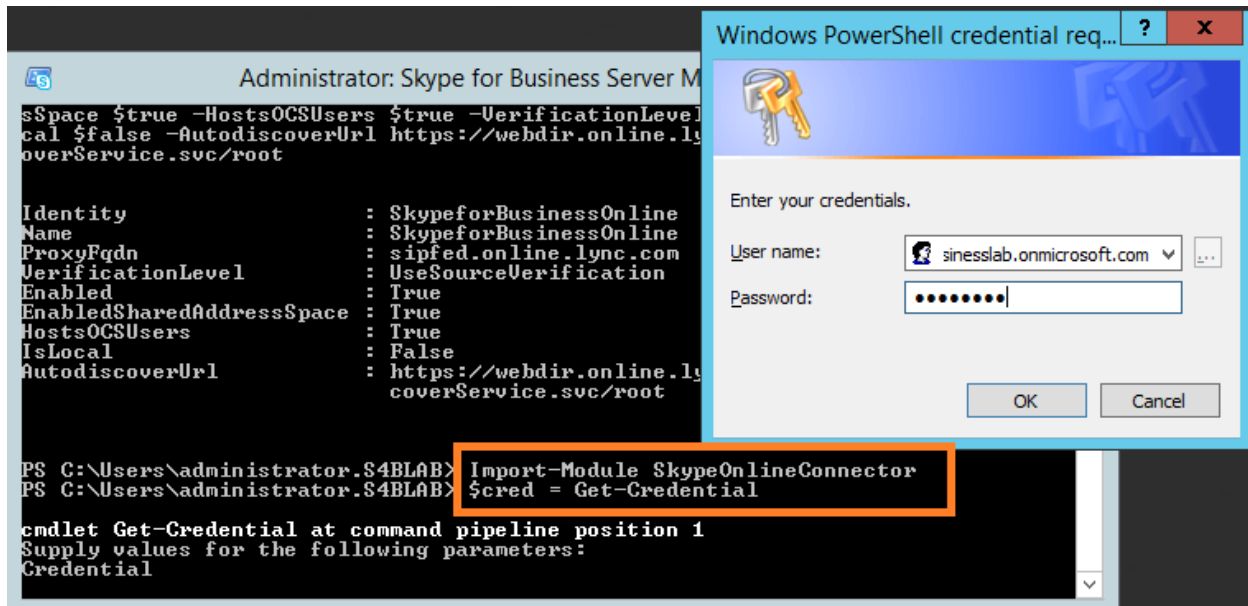
10. Now, looking back at your users in the **Users** section of your **Skype for Business Control Panel** (on-prem), you can see that Scooby Doo is once again homed in your on-prem pool:



## Move Users On-Prem in the Management Shell (PowerShell)

Open a new Skype for Business Management Shell. You will need to connect to your Skype for Business Online tenant again with the **SkypeOnlineConnector** module.

Run **Import-Module SkypeOnlineConnector**, and then store your Skype for Business Online Global Admin credentials in a new variable with this cmdlet: **\$cred = Get-Credential**.



Create a new session: **\$CSSession = New-CsOnlineSession -Credential \$cred**. Import that new session: **Import-PSSession \$CSSession -AllowClobber**.

```

Administrator: Skype for Business Server Management Shell
Enabled : True
EnabledSharedAddressSpace : True
HostsOCSUsers : True
IsLocal : False
AutodiscoverUrl : https://webdir.online.lync.com/Autodiscover/AutodiscoverService.svc/root

PS C:\Users\administrator.S4BLAB> Import-Module SkypeOnlineConnector
PS C:\Users\administrator.S4BLAB> $cred = Get-Credential

cmdlet Get-Credential at command pipeline position 1
Supply values for the following parameters:
Credential
PS C:\Users\administrator.S4BLAB> $CSSession = New-CsOnlineSession -Credential $cred
PS C:\Users\administrator.S4BLAB> Import-PSSession $CSSession -AllowClobber

ModuleType Version Name ExportedCommands
-----
Script 1.0 tmp_glpkzahn.14s {Clear-CsOnlineTel...

PS C:\Users\administrator.S4BLAB>

```

Run the **Move-CsUser** cmdlet, but with the **-Target** set to your on-prem Skype for Business Server 2015 pool FQDN. In the below example, the [scooby@s4blab.org](mailto:scooby@s4blab.org) user is being moved back to a Standard Edition pool called "skypeFE.s4blab.org":

**Move-CsUser -Identity scooby@s4blab.org -Target skypeFE.s4blab.org -Credential \$cred -HostedMigrationOverrideUrl <URL>**

**\*\*IMPORTANT\*\*** In the above command, you first need to make sure you change **-Identity** to the user that you are attempting to move. Second, in order to get the proper **HostedMigrationOverrideUrl**, log into your Skype for Business Admin Center, and copy the URL up through ".lync.com", and then append **"/HostedMigration/hostedmigrationservice.svc"** to the end of that URL. This may be different for different tenants.

The steps in this chapter equip you with the tools that you need to effectively move Skype for Business users back to your on-prem environment from Skype for Business Online, should you have a need to do so. All other aspects of user management remain the same as they would be in completely separate environments.

## Chapter 10: Deploy Hybrid in a Multi-Forest Environment

There's nothing quite like taking a complex hybrid Skype for Business deployment, and throwing *multi-forest* considerations into the mix, now is there? Honestly, it really is not too bad; some people just tend to become intimidated by the term *multi-forest*. Like anything else, if the planning and implementation is simply approached with a one-step-at-a-time mentality, then the environment does not become too overwhelming.

No matter how logically you approach it, though, planning out a hybrid Skype for Business deployment in a multi-forest environment does take some extra planning, and does involve some extra considerations. Let's tackle each of these areas of consideration one at a time.

### Forest Topology

Supported forest topologies involve User/Resource Forest configurations. A model like this involves a forest in which Active Directory users are created and enabled, which is what we call the user forest, and another forest called a resource forest, where you install various server application resources, like Skype for Business, Exchange, and SharePoint. Both single user forest and multiple user forest topologies are supported, but in each case, they will both tie back to your single resource forest.

In your resource forest, copies of users that exist in the user forest are created, disabled, and tied back to the originating users via a source attribute. In order to manage these disabled duplicate users, and to keep their attributes properly synced, an identity management solution should be implemented, like Forefront Identity Management. When this identity management solution is in place, the attributes in Table 10.1 should be synced for proper synchronization.

**Table 10.1 Attributes That Need to be Synced Between User and Resource Forests**

User Forest	Resource Forest
chosen account link attribute	chosen account link attribute
mail	mail
ProxyAddresses	ProxyAddresses
ObjectSID	msRTCSIP-OriginatorSID

There are a couple of important notes about syncing these user accounts. First, for the “chosen account link attribute”, this should be an immutable (i.e., not changeable) attribute that is used to identify a user in one environment (User Forest) and a user in another environment (Resource Forest) as being the same user. It is a completely unique identifier. If an attribute other than the default is selected for this, though, you will need to keep this in mind when setting up Azure AD Connect. You will also need to modify your AD FS Claims Rule.

Second, do not synchronize the UPN from the User Forest to the Resource Forest. Doing so will break AD FS authentication.

Suppose that you have a user forest of **user.awesome.com**, and a resource forest of **resource.awesome.com**. The SIP domain has been configured as *awesome.com* within Skype for Business Server 2015, so the SIP address for sign-on would look something like [scooby@awesome.com](mailto:scooby@awesome.com). Scooby’s enabled Active Directory account is in the *user.awesome.com* forest, and his UPN is [scooby@user.awesome.com](mailto:scooby@user.awesome.com). The client sign in process would look like the below:

1. The Skype for Business client is going to make the assumption that the SIP address and the UPN are one and the same, and will then try to authenticate via the UPN.
2. When the client tries to sign in using a UPN of [scooby@awesome.com](mailto:scooby@awesome.com) (because this is the SIP address that was used in the client), it will try this UPN against the disabled contact that is found for Scooby in the *resource.awesome.com* forest, but it will fail because this UPN will not be found to be associated with the disabled account.
3. The client will then prompt Scooby to enter his credentials. While his SIP address will still be [scooby@awesome.com](mailto:scooby@awesome.com), he will have to enter a UPN of [scooby@user.awesome.com](mailto:scooby@user.awesome.com) and his password.
4. The above credentials will be tried against the domain controllers in the *user.awesome.com* forest, and they will pass as the user object will be an active user.
5. Once that leg of the authentication process passes successfully, then the log-in against the associated disabled contact in the resource forest works, and the Skype for Business client is allowed to sign in.

By contrast, if the UPN gets synchronized to the disabled user object in *resource.awesome.com*, the client log in process changes in this way:

1. The Skype for Business client is going to make the assumption that the SIP address and the UPN are one and the same, and will then try to authenticate via the UPN.
2. When the client tries to sign in using a UPN of [scooby@awesome.com](mailto:scooby@awesome.com) (because this is the SIP address that was used in the client), it will try this UPN against the disabled contact that is found for Scooby in the *resource.awesome.com* forest, and it will then fail because this UPN will not be found to be associated with the disabled account.

3. The Skype for Business Server 2015 will determine that the user that is enabled for Skype for Business is not enabled for logons (because it determined that the user is the disabled contact in the resource forest).

Given the above two scenarios, the importance of not synchronizing the UPN from the User Forest to the Resource Forest is evident.

## Forest Trusts

While some of the Microsoft documentation that you may come across on Technet will suggest that a Two-way Transitive trust is required between the user and resource forests, only the resource forest should need to trust the user forest for the authentication and synchronization process. This means you should be able to get away with a one-way trust. To ensure a broader spectrum of functionality, however, it may be necessary to have a two-way trust, depending on your AD FS deployment (if applicable) and the uniqueness of SIP, SMTP and UPN domains between forests.

## Hybrid User Placement Considerations

In this User/Resource Forest model, there are a couple of additional considerations to make in terms of where you should place your users in regards to Exchange requirements. For instance, if your Skype for Business users are placed on-prem in this model, then they can take advantage of either Exchange on-prem or Exchange Online. Conversely, users that are homed in Skype for Business Online will only be able to take advantage of Exchange Online.

## Notes on AD FS Configuration

While having AD FS deployed in your hybrid User/Resource Forest environment is not mandatory, it is required if single sign-on (SSO) is required. Otherwise, DirSync with Password Synchronization will at least provide “same sign-on” functionality.

The optimal AD FS configuration involves having an AD FS farm deployed in each user forest, and having matching SIP, SMTP, and UPN domains within each user forest, as is seen in **Figure 10.1**. For example, User1 from **domainA.awesome.com** would have the following domains in their addresses:

- SIP Address: @domainA.awesome.com

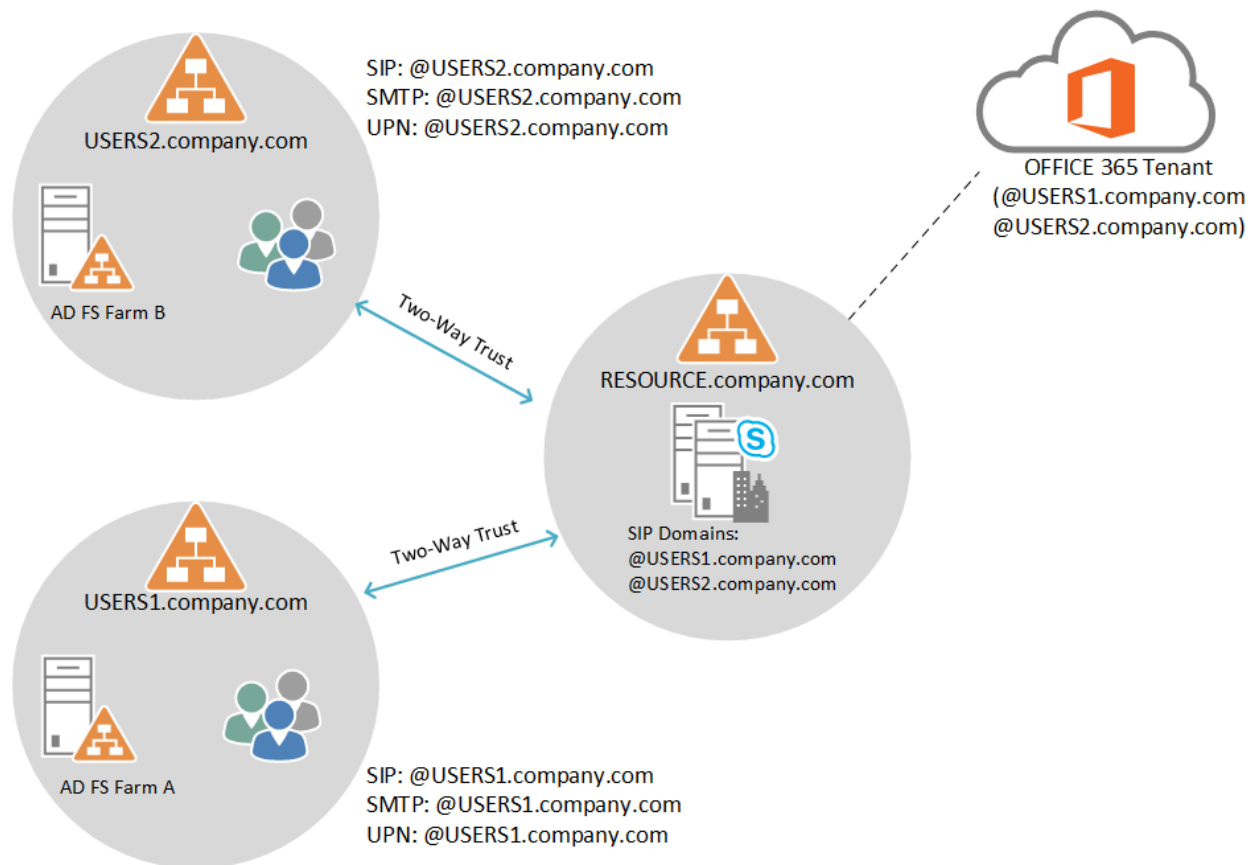


- SMTP Address: @domainA.awesome.com
- UPN: @domainA.awesome.com

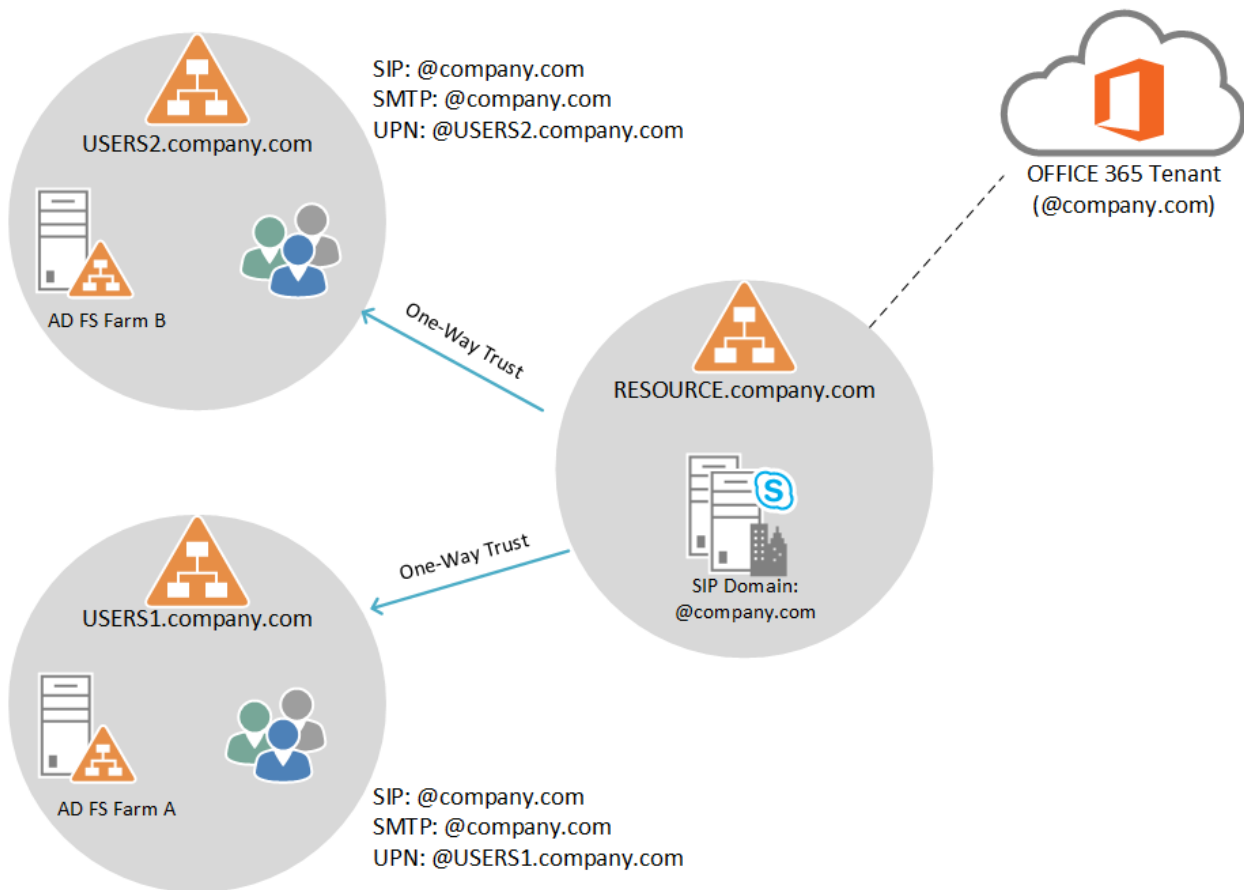
User2 from **domainB.awesome.com** would have the following domains in their addresses:

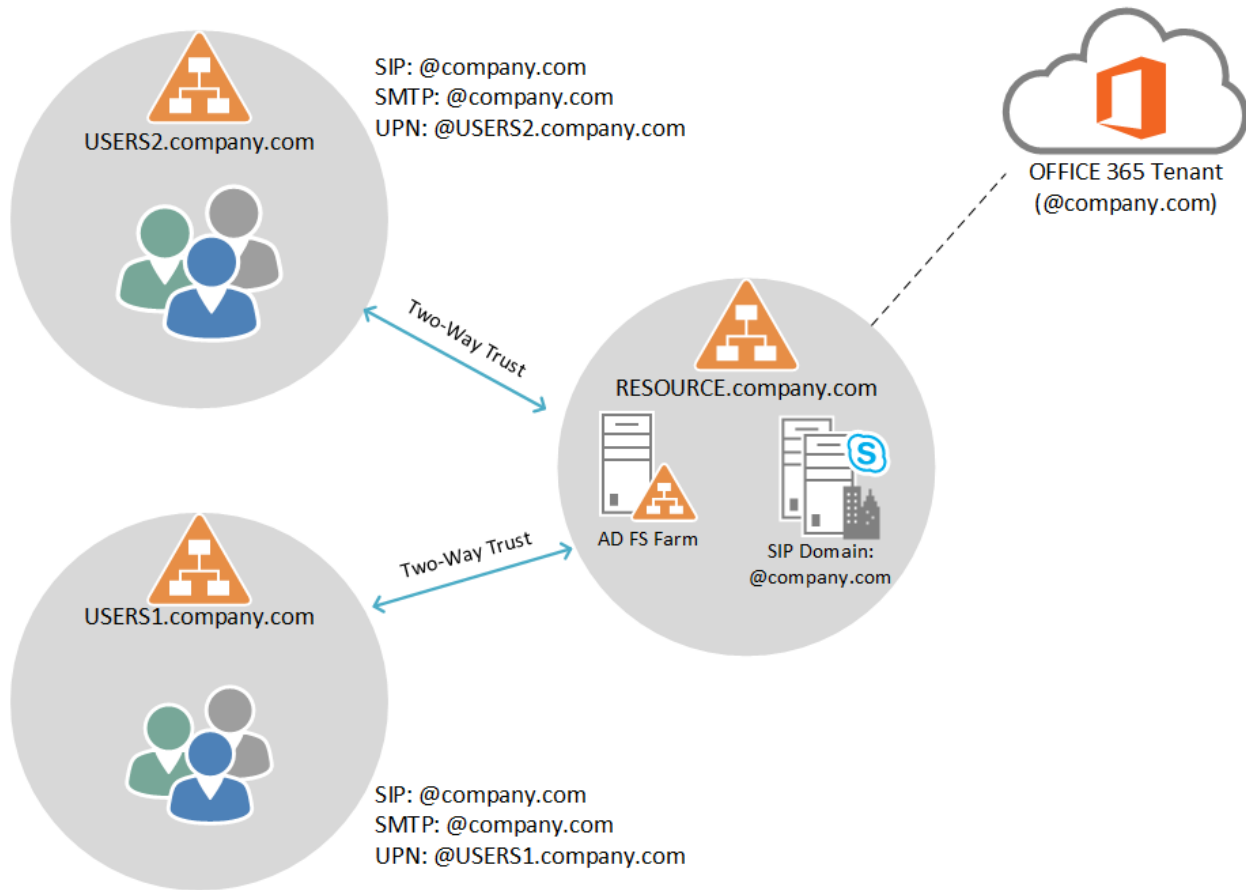
- SIP Address: @domainB.awesome.com
- SMTP Address: @domainB.awesome.com
- UPN: @domainB.awesome.com

**Figure 10.1**



So what happens if you don't go with the optimal deployment? Let's say your UPN domain isn't as "friendly" as you want your SIP and SMTP domains to be. Well you can still deploy AD FS in such a configuration, but you risk problems with SSO and Exchange integration. For example, you can deploy the AD FS as in **Figure 10.2** and **Figure 10.3**, but with these expected SSO and Exchange integration problems:

**Figure 10.2 One-Way/Two-Way Trust with AD FS in User Forests**

**Figure 10.3 Two-Way Trust with AD FS in Resource Forest**

Ensure that your AD FS deployment is configured and working before moving on with setting up Azure Active Directory Connect (AADC) or enabling hybrid in your environment. Don't forget, the AD FS Claims Rule will need to be modified if the Source Anchor attribute was changed from the default attribute.

### Notes on Azure Active Directory Connect

When deploying Azure Active Directory Connect (AADC) in a User/Resource Forest model environment, the defaults can be left in place for the most part. There are, however, a few key points to keep in mind during configuration of AADC.

First, since AD FS should already be deployed and working before moving on to configuring AADC (if applicable), "Do Not Configure" should be selected on the Single Sign-on portion of the wizard. In a normal single-forest on-prem Skype for Business Server 2015 deployment, one of

the benefits of the AADC wizard is that it can deploy and configure AD FS for you. In this special environment, though, that is something you need to take care of ahead of time.

The next thing to keep in mind is that when adding in the on-prem AD directories that you will be syncing with Office 365, you need to add in more than just the first one. Clearly, you need to account for all domains that your user forests cover.

On the screen where you need to identify the users in the on-prem directories that you want to synchronize, don't just glaze over the settings. Make sure to select **User identities exist across multiple directories**, and below that, ensure that you select **ObjectSID and MsExchangeMasterAccountSID attributes**. **Figure 10.4** shows the default settings that most deployments will choose, but required selections for the User/Resource Forest model are highlighted in the orange boxes.

**Figure 10.4**

**Microsoft Azure Active Directory Connect**

Welcome  
Express Settings  
User Sign-In  
Connect to Azure AD  
Sync  
Connect Directories  
**Identifying users**  
Filtering  
Optional Features  
AD FS Farm  
Azure AD Domain  
Configure  
Verify

## Uniquely identifying your users

Select how users should be identified in your on-premises directories. ?

- ☒ Users are represented only once across all directories.
- ☐ User identities exist across multiple directories. Match using:
  - ☒ Mail attribute
  - ☐ ObjectSID and msExchangeMasterAccountSID attributes
  - ☐ SAMAccountName and MailNickName attributes
  - ☐ A specific attribute
  - CUSTOM ATTRIBUTE

Select how users should be identified with Azure AD.

SOURCE ANCHOR ?

USER PRINCIPAL NAME ?

Also, in the *SOURCE ANCHOR* drop-down box that is displayed in **Figure 10.4** above, make sure to set this to the attribute that you chose previously for uniquely identifying your users, and leave *USER PRINICIPAL NAME* set to ***userPrincipalName***.

Finally, on the *AD FS Farm* screen, you will select the option to **Use an existing Windows Server 2012 R2 AD FS farm**, and then type in the name of the existing AD FS server. If everything else has been set up correctly, you should be set to proceed with configuring your hybrid Skype for Business settings.

## Chapter 11: Configure Hybrid in Reverse: Online-to-On-Prem

In some cases, organizations may find themselves in a position of needing to migrate users to a new on-prem Skype for Business Server 2015 deployment after having first established these users in a Skype for Business Online tenant. The procedures that are required to migrate users in this direction are very similar to those for migrating users in the opposite direction. In both cases, the “hybrid” configuration must have been complete and in-place.

Directory Synchronization was covered in Chapter 6. The actual process of configuring “hybrid” was covered in Chapter 7, with examples of accomplishing this with a GUI-based approach and a PowerShell-based approach. Therefore, it is not necessary to cover those details again here. It is simply important to know that you must have directory synchronization in place, with synchronization having already taken place, and hybrid must already be configured between Skype for Business Server 2015 and Skype for Business Online.

Another thing to note is that since the users are currently using Skype for Business Online, the public DNS records (and private DNS records, if split-brain DNS is being used) should *NOT* be changed to point to the on-prem environment until *AFTER* hybrid Skype for Business has been established and verified. If the records are changed before the hybrid configuration is fully in place, then subsequent user login attempts will not be able to find the Office 365 tenant.

Assuming that directory synchronization and the hybrid configuration is in place and functioning, the steps for migrating users from Skype for Business Online to on-prem are fairly simple. First, you will want to enable the on-prem user for Skype for Business Server 2015 by running the following cmdlet from the Skype for Business Management Shell:

```
Enable-CsUser -Identity "<username>" -SipAddress sip:<username>@<domain> -  
HostingProviderProxyFqdn "sipfed.online.lync.com"
```

When running the above cmdlet, make sure that you don't forget the – **HostingProviderProxyFqdn "sipfed.online.lync.com"** portion; this is necessary with the user still being homed in Skype for Business Online.

The above example is great for testing out a single user, but in the real world, it is likely that many users will need to be migrated rather than just a single user. In that case, you could create a file with all the usernames of the users that you intend to migrate. A script could then be put together to read those usernames from the file, and feed them to the **Enable-CsUser** cmdlet like so:

***Enable-CsUser -Identity \$Identity -SipAddress \$SipAddress -HostingProviderProxyFqdn "sipfed.online.lync.com"***

The above cmdlet would obviously assume that your script was feeding the username to the ***\$Identity*** and ***\$SipAddress*** variables.

Once the user, or users, have been enabled for on-prem Skype for Business, re-run the synchronization from AADC to make sure the latest changes and attributes for these users have been synchronized to Skype for Business Online. At this point, the users are now ready to be moved to Skype for Business Server 2015 on-prem. Before pulling the trigger on that, however, the DNS records now need to be changed. **Table 11.1** lists the public DNS records that need to be pointed to your on-prem environment.

**Table 11.1**

DNS Record	Type of DNS Record	Port	Change to Point To
<b><i>lyncdiscover.&lt;domain&gt;</i></b>	A	N/A	Public IP of On-Prem Reverse Proxy
<b><i>_sip._tls.&lt;domain&gt;</i></b>	SRV	443	FQDN of On-Prem Access Edge
<b><i>_sipfederationtls._tcp.&lt;domain&gt;</i></b>	SRV	5061	FQDN of On-Prem Access Edge

If the internal DNS zone is the same domain as the public-facing zone for your SIP domain (split-brain DNS), you will need to change the records in **Table 11.1** to point to your Skype for Business Front End server or Front End pool.

With the DNS records changed, it is now time to move the users from Skype for Business Online to Skype for Business Server 2015 (on-prem). Before running the cmdlet to move the user, take a look at the user's properties with this cmdlet:

**Get-CsUser -Identity <username>@<domain>**

The above cmdlet should reflect a value of ***"sipfed.online.lync.com"*** for the ***HostingProviderProxyFQDN*** field. This means that the user is currently homed in Skype for Business Online. Once the user gets moved to on-prem, that field will have a value of ***"SRV:"***.

Now, to move the user, first capture the Office 365 Global Admin credentials in the \$cred variable:

***\$cred = Get-Credential***

Once the Global Admin credentials have been captured, the following cmdlet must be run to actually move the user:

***Move-CsUser -Identity <username>@<domain> -Target "<fe-pool>.<domain>" -Credential \$cred -HostedMigrationOverrideURL <URL>***

**\*\*IMPORTANT\*\*** In the above command, you first need to make sure you change *-Identity* to the user that you are attempting to move. Second, in order to get the proper **HostedMigrationOverrideUrl**, log into your Skype for Business Admin Center, and copy the URL up through ".lync.com", and then append ***"/HostedMigration/hostedmigrationservice.svc"*** to the end of that URL. This may be different for different tenants.

Again, the above cmdlet is fine for migrating a single user, which is ideal for testing or one-off migrations. However, migrations typically involve moving large numbers of users at once. To accomplish a larger migration with the above ***Move-CsUser*** cmdlet, you could use the ***Get-CsUser*** cmdlet with an appropriate filter applied, and pipe the results to the ***Move-CsUser*** cmdlet above.

For example, if the goal was to move all users that were currently homed in Skype for Business Online to Skype for Business Server 2015 on-prem, the *HostingProviderProxyFQDN* attribute could be used. As previously stated, when this attribute has a value of "sipfed.online.lync.com", it means that the user is homed in Skype for Business Online. Thus, running the following cmdlet will find all users that are homed in Skype for Business Online, and move them to the on-prem deployment:

***Get-CsUser -Filter {Hosting Provider -eq "sipfed.online.lync.com"} | Move-CsUser -Target "<fe-pool>.<domain>" -Credential \$creds -HostedMigrationOverrideURL <URL>***

Again, if you run the ***Get-CsUser*** cmdlet with a user Identity specified, you can verify that the user was moved by the value of the *HostingProviderProxyFQDN* attribute. All that remains is for



all affected users to log off of their Skype for Business client, and then to log back in, and they should be set!

## Chapter 12: Cloud PBX with PSTN Connectivity via On-Premises Environment

Cloud PBX is now in General Availability as of December 1<sup>st</sup>, 2015, and was made GA with Microsoft's launch of the Office 365 E5 license. If you are reading this, then the assumption is that you are already aware of how awesome and versatile the options are becoming with Skype for Business Online, especially in the area of Hybrid. The ability to have Skype for Business Online users use on-prem PSTN connectivity for Enterprise Voice, however, is a truly radical development in the evolution of the Skype for Business product as a whole.

Before digging into how to accomplish such a configuration, though, it is important to understand the differences in features that are available to a Cloud PBX Enterprise Voice user, as compared to an on-prem Enterprise Voice user.

### Feature Comparison

While it is flat out amazing that an Online user can be enabled for Enterprise Voice, and can actually make PSTN phone calls via on-Prem PSTN Connectivity or Cloud Voice, this capability should not be likened to the full feature set that a user has access to when they are enabled for Enterprise Voice on-prem. **Table 12.1** lists out the Enterprise Voice features that are available to users in both environments. While the list is not exhaustive, it contains the most commonly needed features, and can serve as a good baseline for determining whether or not a particular user's Enterprise Voice needs can be met with Cloud PBX.

**Table 12.1 Enterprise Voice Feature Comparison**

Voice Feature	On-Prem	Cloud PBX
PSTN Calling	X	X
Call Hold/Retrieve	X	X
Call Transfer	X	X
Call Forwarding	X	X
Simultaneous Ring	X	X
Voicemail	X	X
USB Peripherals	X	X
Mobile Devices	X	X
Delegation (Boss/Admin Scenario)	X	X
Team Call	X	X
Response Groups	X	
Call Park	X	
Media Bypass	X	
Enhanced 9-1-1	X	

### Enabling a User for Cloud PBX with PSTN Connectivity

Before a user can actually be enabled to use Cloud PBX through your on-prem PSTN connectivity, the user must be currently homed on-prem. This does not mean that they need to have been on-prem at one point; they must be on-prem to begin the following actions. If the user is currently in Skype for Business Online, then yes, you must actually move them to Skype for Business Server 2015 on-prem before you can proceed.

If the user that you want to enable for Cloud PBX with PSTN Connectivity is already homed on-prem, then open up the Skype for Business Control Panel, and find the user on the **Users** tab. Once you access the properties of this Skype for Business user, you need to enable them for **Enterprise Voice** under the *Telephony* category, and assign them a **Line URI** (for example, <tel:+15555550100>). Once these changes have been made to the user, click **Commit** to save them.

### Configure & Assign Voice Routing Policy

With the user enabled for Enterprise Voice, they now need a Voice Routing Policy assigned to them, which in turn must have PSTN Usages assigned to it. Please note, this policy only defines the routing information for this user's voice traffic; it does NOT define the calling features that

are assigned to this user. The calling features are defined in a voice policy that is pre-defined by Microsoft and applied to all Cloud PBX users; it cannot be changed.

Assuming that the PSTN Usages have already been deployed, the choices are to either use the Global voice routing policy, or to create a new user-specific voice routing policy with these PSTN Usages assigned. Assume that there are two PSTN Usages: "Local" and "Long Distance" (these are pretty much the two PSTN Usages used in all teaching examples, and in production quite often). To configure the Global voice routing policy, open the Skype for Business Management Shell and execute the following cmdlet:

***Set-CsVoiceRoutingPolicy -Identity Global -PSTNUsages "Local", "Long Distance"***

Clearly, this is a pretty straightforward cmdlet. The cmdlet for creating a new user-specific voice routing policy is almost as simple:

***New-CsVoiceRoutingPolicy -Identity CloudPBXPolicy -Name CloudPBX -PSTNUsages "Local", "Long Distance"***

Both ***-Identity*** and ***-Name*** in the above cmdlet are simply strings that you create and provide. Once you have either modified the Global policy, or created a new one, you must assign it to the user:

***Grant-CsVoiceRoutingPolicy -Identity "Scooby Doo" -PolicyName CloudPBXPolicy***

Yep, back to the Scooby Doo thing. At any rate, the above steps are incredibly simple, and now this user is almost ready to be moved back into the cloud.

## Assign Licensing in Office 365

The assumption for this sub-section is that the administrator performing these actions has already purchased the proper license subscription within Office 365. The other assumption is that directory synchronization has already been set up, and the on-prem users have already been synced to Office 365.

Before the user can be enabled for Cloud PBX with PSTN Calling, they must have the proper licensing assigned that will grant them this capability. They will either need an E5 license applied, which grants Cloud PBX functionality, or will need a lesser subscription with a standalone Cloud PBX license. To assign either of those licensing options, perform the following:

1. Navigate to the Office 365 Admin Center in a browser.

- From the tree menu on the left side of the portal, expand **Users**, and then select **Active Users**.
- Check the box to the left of the user's name
- From the menu of options within the user property box on the right, click on the **Edit** link beside **"Assigned License"**

Select a view: All users

+ + + +

<input type="checkbox"/>	Display name	User name	Status
<input type="checkbox"/>	admin	admin@skype4businesslab.onmicrosoft.c...	In cloud
<input type="checkbox"/>	fs service	fs_service@s4blab.org	Synced with Active Directory
<input checked="" type="checkbox"/>	Scooby Doo	Scooby@s4blab.org	Synced with Active Directory
<input type="checkbox"/>	Shaggy	shaggy@s4blab.org	Synced with Active Directory
<input type="checkbox"/>	On-Premises Directory Synchronization S...	Sync_AADC_2f14da652005@skype4busi...	Synced with Active Directory
<input type="checkbox"/>	Thelma	thelma@s4blab.org	Synced with Active Directory

**Scooby Doo**

RESET PASSWORD
 EDIT USER ROLES  
 DELETE
 EDIT  
 ADD TO GROUP

**Assigned license**  
 No license [Edit](#)

- Assign the appropriate licenses that will grant Cloud PBX functionality

**SAVE** **CANCEL**

## Assign License

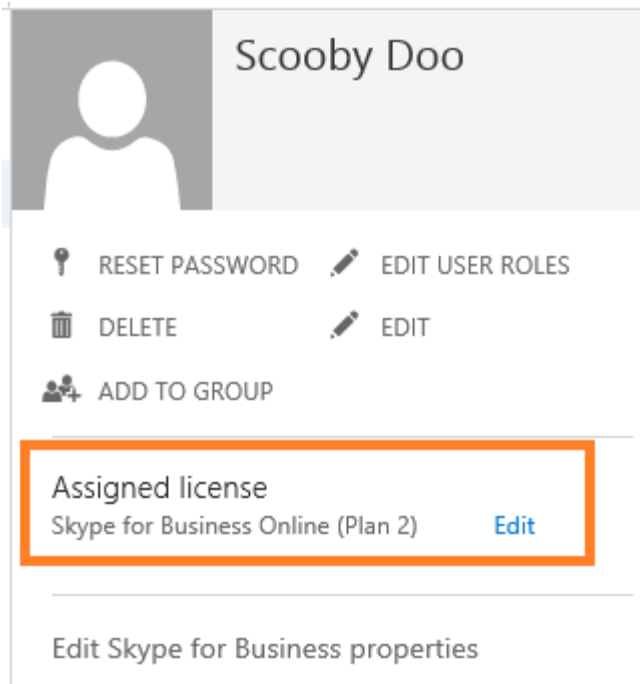
Different services are available in different locations. [See restrictions](#)

**Set user location**

United States

☒ **Skype for Business Online (Plan 2)**  
1 of 1 licenses available [Buy more](#)

- Once you click **SAVE**, after checking the box beside the appropriate license, you will now see that the license is properly applied to the user in the portal:



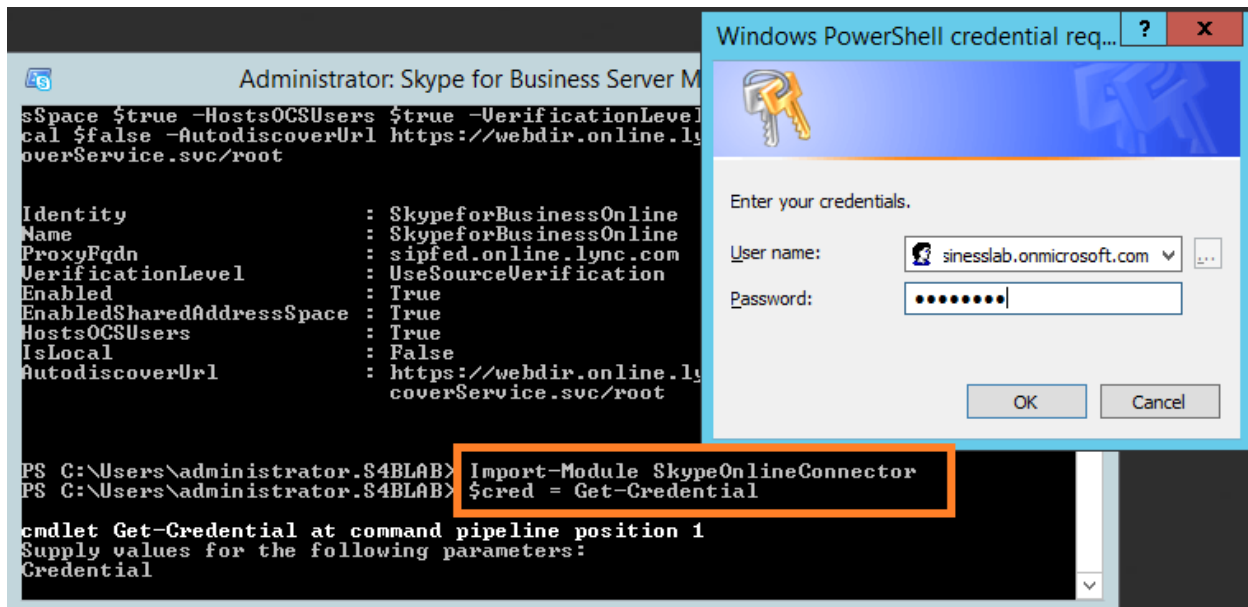
### Move the User to Skype for Business Online

The user can now be moved from on-prem to Skype for Business Online, as they have been enabled for Enterprise Voice, had a Line URI assigned, had a voice routing policy with PSTN Usages assigned, and have valid subscription licensing assigned in Office 365. Please reference Chapter 8 for the exact steps required to move the user to Skype for Business Online.

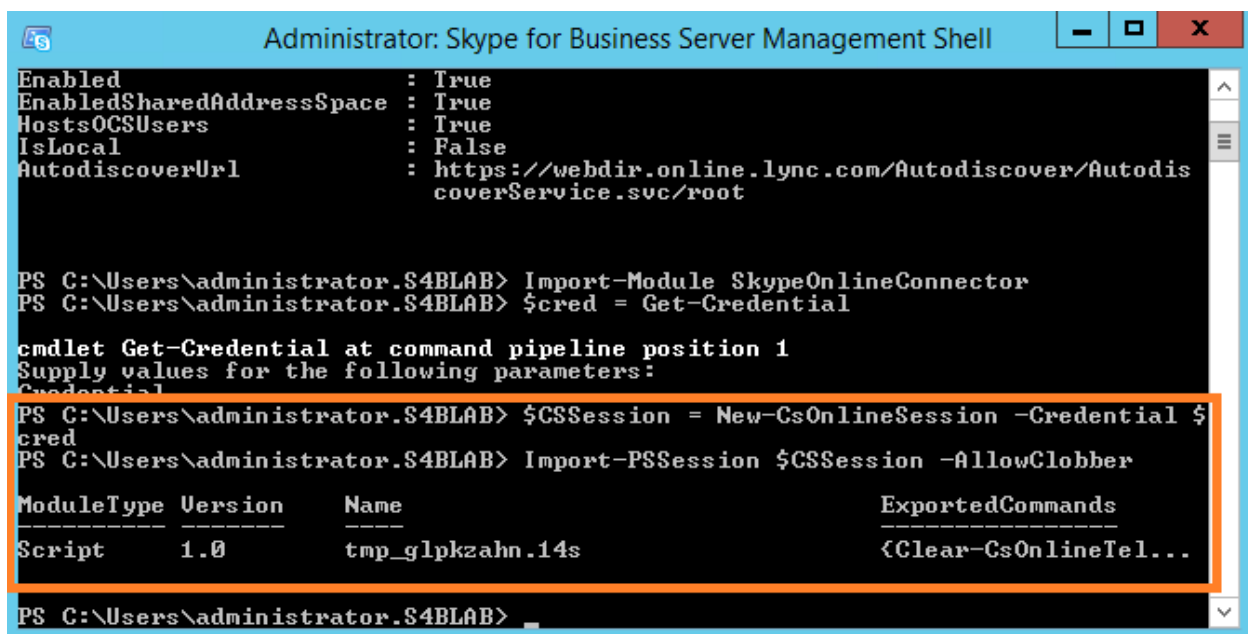
### Enable for Enterprise Voice and Cloud PBX Voicemail

Lastly, you will need to connect to Skype for Business Online via the Skype for Business Management Shell on your on-prem servers, and then enable the user for Enterprise Voice and Cloud PBX Voicemail. First, connect to your Skype for Business Online tenant with the **SkypeOnlineConnector** Module:

Run **Import-Module SkypeOnlineConnector**, and then store your Skype for Business Online Global Admin credentials in a new variable with this cmdlet: **\$cred = Get-Credential**.



You will now create another variable to store a new online session with your recently stored \$cred variable: **\$CSSession = New-CsOnlineSession -Credential \$cred**. Import that new session: **Import-PSSession \$CSSession -AllowClobber**.



Finally, run the following cmdlet, in all its glory:

***Set-CsUser -Identity "Scooby Doo" -EnterpriseVoiceEnabled \$true -HostedVoiceMail \$true***

I know, it should go without saying, but please replace "Scooby Doo" in the above cmdlet with your own user identity. And that's it! That is all that is required to configure Cloud PBX with PSTN Connectivity for your Skype for Business Online users.



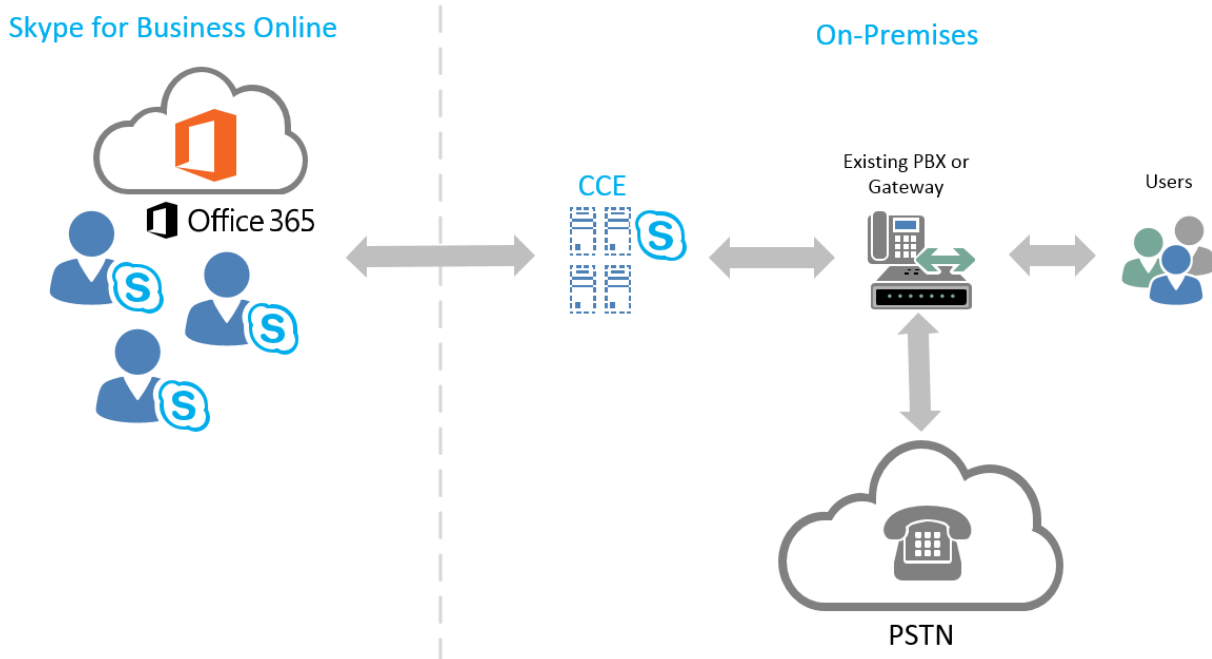
## Chapter 13: Cloud Connector Edition

In the last half of 2015, the buzzword “MinTopology” began circulating in the social circles of Lync and Skype for Business techs. A new Skype for Business hybrid deployment option began to see the light of day, in Preview form. This particular deployment option was very different than the existing options for a Lync or Skype for Business hybrid deployment, as the whole idea was to bring hybrid to an organization that only had Skype for Business Online, and absolutely no on-prem deployment in existence.

Does this sound a little backward to you? Why on earth would a company that chose to go with a completely Office 365 approach in the first place want to create a hybrid environment? The simple answer: ***an existing on-prem voice infrastructure***! You see, the last quarter of 2015 was also when the much anticipated Cloud PBX licensing reached General Availability (December 1<sup>st</sup>, to be exact). With the arrival of Cloud PBX licensing came the possibility of On-Prem PSTN Connectivity for hybrid environments, allowing organizations to leverage an existing on-prem voice infrastructure for their Skype for Business Online users. This was a powerful concept. It provided a path for a more tiered migration approach, and gave companies the freedom to choose their voice provider. Again, though, hybrid was a requirement for this mystical wizardry.

The good folks at Microsoft went a step further, however. They realized that companies that chose to home their Skype for Business users solely in Office 365 should also be able to provide PSTN voice services to their Cloud PBX users via their existing on-prem voice infrastructure, without having to deploy a fully licensed on-prem Skype for Business Server 2015 environment. How did they provide this path? They created a pre-packaged, downloadable set of virtual machines that could be deployed on a single Hyper-V host server in an organization’s on-prem DMZ network, and eventually named it ***Skype for Business Cloud Connector Edition (CCE)***. CCE became generally available in April of 2016.

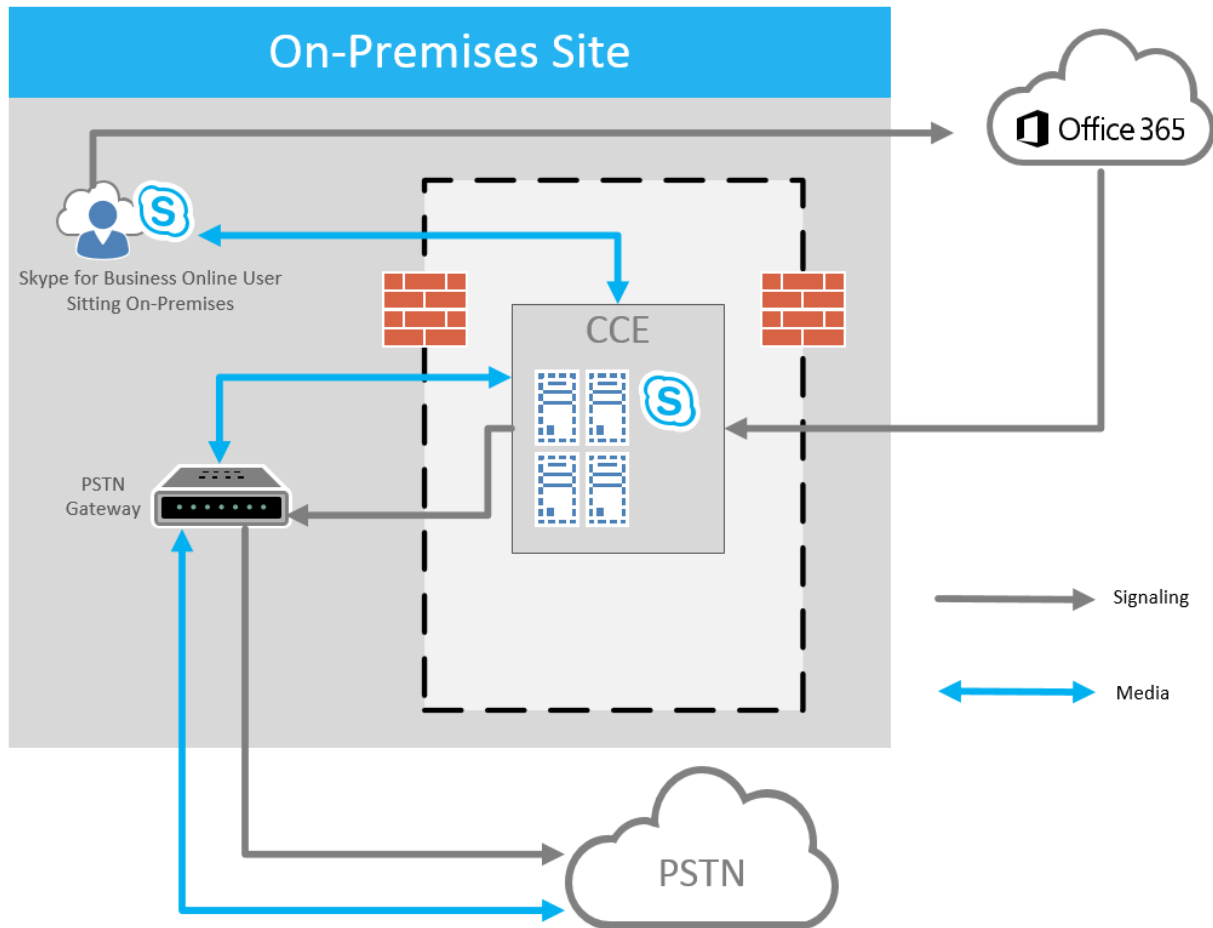
This download consists of four virtual machines, representing the “minimum topology” that is required to provide a functioning Skype for Business deployment on-prem. Keep in mind that when I say “functioning Skype for Business deployment,” I only mean in terms of its ability to serve as the on-prem portion of a hybrid environment; no actual Skype for Business users can be homed in this deployment. Essentially, Cloud Connector Edition serves as a “bridge” between the Skype for Business Online users in Office 365, and an organization’s on-prem voice infrastructure. At a very high level, the below diagram demonstrates the point at which CCE becomes involved in the flow of media when it is deployed:



Looking at the above diagram might raise a good question or two, though. For example, if a user that is enabled for Enterprise Voice through a CCE deployment is sitting in the company office, and signs into Skype for Business with their Skype for Business Online account, then the path for a call from the user doesn't seem like it would be very optimal. At first glance, this path might seem to be:

***User Endpoint (on-prem) -> Call goes to Skype for Business Online (cloud) -> Call is sent back to CCE (on-prem) -> Call is then relayed to PSTN Gateway (on-prem) -> Call is sent to PSTN.***

The above path does not seem optimal for media, as looping out to Office 365 and back down to CCE on-prem might introduce quality issues for your calls. Luckily, this is not what happens. Instead, the SIP signaling traffic follows the above pattern, but then the audio is allowed to bypass Skype for Business Online, instead going directly to CCE from the user's Skype for Business endpoint. The below diagram highlights this traffic flow:



Now that the concept of CCE has been established, it is time to dive into what CCE actually consists of.

### A Minimum Topology

As was already mentioned, CCE is available in the form of a download from Microsoft (<https://www.microsoft.com/en-us/download/details.aspx?id=51693>). What Skype for Business Server roles constitute a “minimum topology”, you ask? Great question! Once CCE has been fully setup on the Hyper-V host that it needs to be installed on (yes, these VMs must be installed on a Hyper-V host, and a beefy one at that), the following four roles are present, each on their own virtual machine:

- Domain Controller.** An Active Directory Domain Controller (DC) is needed, as all Skype for Business deployments rely on an existing Active Directory (AD). In this case, the AD Forest that gets setup is a standalone forest, and not at all connected or related to your existing on-prem AD Forest. This standalone DC and AD Forest exists solely to support the remaining roles, and to provide DNS services.

- **Central Management Server (CMS).** While a full-blown Lync Front End/Registrar role is not exactly deployed, the oh-so-important CMS role still gets deployed to store topology and configuration data.
- **Mediation Server.** Remember, the whole point of having a CCE deployed is to provide access to the on-prem voice infrastructure for your Skype for Business Online users. Therefore, with CCE acting as a “bridge”, it is actually bridging media (audio), and of course SIP signaling data as well. If media traversal is the name of the game here, then it is necessary to have a Mediation role present for porting the media to the on-prem PSTN gateway
- **Edge Server.** Connecting a CCE deployment to your Office 365 tenant is obviously a form of hybrid deployment. As with all other hybrid deployments, an Edge server is a critical link in the chain of communication between an Office 365 tenant and an organization’s on-prem Skype for Business servers. There is no getting around an Edge Server role in CCE!

That’s all there is to it! As you can see, compared to most other Skype for Business Server 2015 deployments, this is indeed a minimum topology. There are no Reverse Proxy, Director, Monitoring, Archiving, Persistent Chat, or OWAS roles needed. Don’t be fooled by the seeming simplicity of the “minimum topology”, though; planning and deployment is not quite as simple as “Click, click, Finish.”

## Topology Considerations & Options

While the concept of CCE may seem simple enough, there is actually quite a bit more to know before you just go adding “Deploy CCE” to your list of “Things to Do” for the afternoon. Like most other software deployment projects, proper planning will ensure that a smoother implementation with less troubleshooting and less “bumps in the road.”

At the center of supported CCE topologies is the key concept of **PSTN Sites**. A PSTN site refers to a CCE instance, or multiple instances that are deployed at the same physical location.

### PSTN Site Characteristics

- A common PSTN Gateway is shared between all CCE instances within a PSTN Site.
- They allow for users to be connected to PSTN gateways that are physically closest to them.
- A single PSTN Site can have between 1 and 4 CCE instances deployed. Having more than one CCE instance deployed per PSTN Site provides HA.
- Multiple PSTN Sites (up to 200 total) can exist for a single Skype for Business Online tenant, providing Scalability.

While a single PSTN Site can have up to 4 CCE instance deployed, they would be deployed in a 3+1 format. This means that the first 3 instance would be serving up connections, while the 4<sup>th</sup> instance would be for maintaining HA should one of the first 3 need to be taken offline. As for having multiple PSTN Sites, the benefit is fairly obvious: users in different physical sites can use the CCE instance that provides the closest PSTN gateway connection to their physical location. What if you have more than

200 sites, you ask? It seems that the solution would be to assign users in sites without a CCE instance to the nearest PSTN Site available.

**Workloads.** Before I crunch the workload numbers, it is important to identify that there are two hardware-based flavors that CCE can be deployed in: a *larger version*, and a *smaller version*. I know, they are named so descriptively, aren't they?! The larger version will provide the infrastructure necessary for handling 500 calls simultaneously. By contrast, the smaller version only allows for 50 simultaneous calls. Honestly, once you see the hardware requirements, I think you will agree that you might as well spring for the larger CCE instance, and think optimistically about all the growth that is in your company's future.

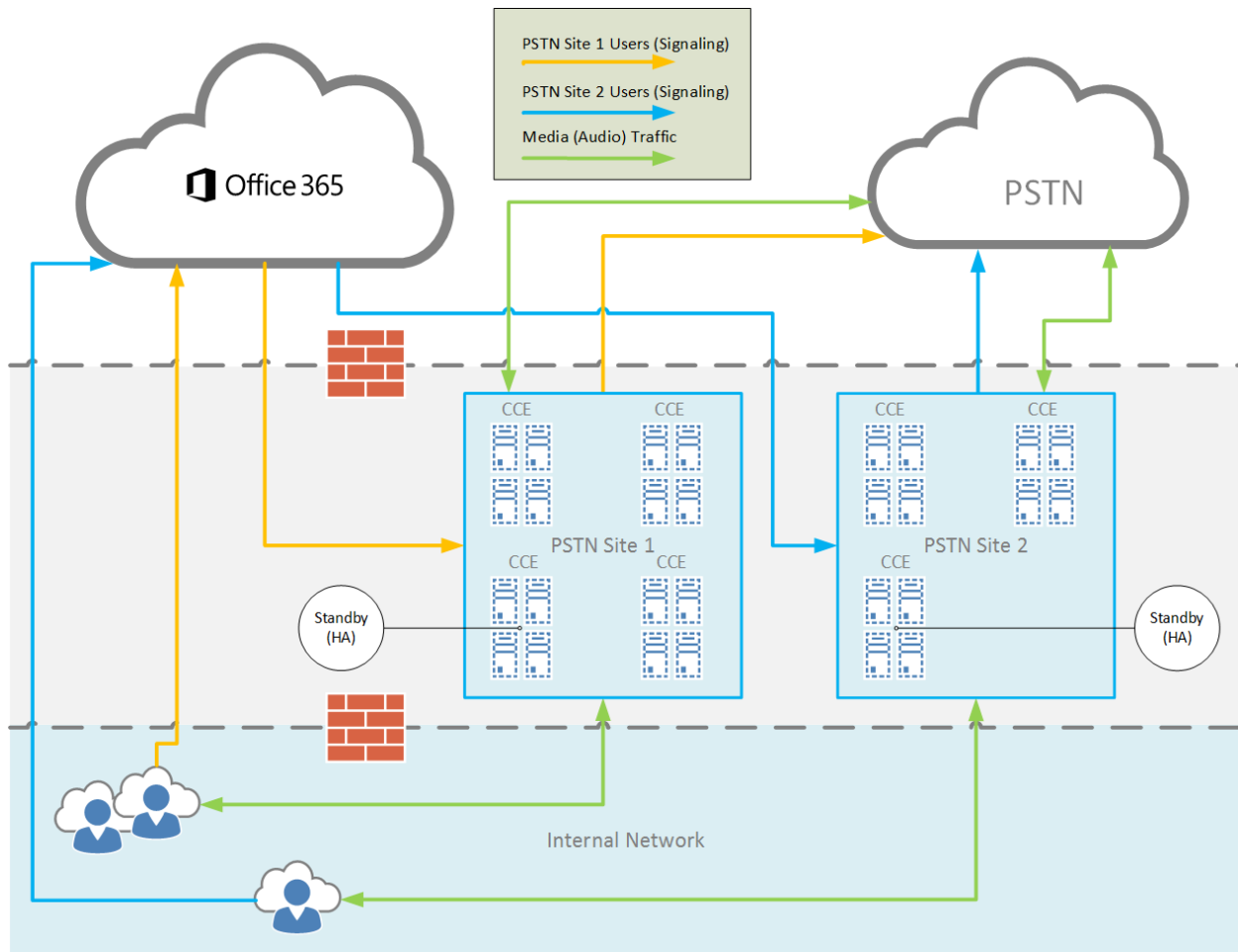
I am going to focus on the larger (and more realistic, in my opinion) version, and will leave the smaller version number crunching to you. Assuming an office location that peaks at about 1,300 concurrent calls during the busiest time of the work day, I can immediately see that a single CCE instance will not suffice. With a single CCE instance allowing for 500 concurrent calls, this site will clearly need at least 3 instances of CCE, allowing for up to 1,500 concurrent calls.

Great, so I know that I need 3 instances of CCE to handle the peak 1,300 calls on any given day for this PSTN Site. Wait! Somebody tripped on a wire in the neat-and-tidy data center, causing their Venti Iced Coffee with skim milk and 3 ½ pumps of Classic to go flying through the air, spilling all over one of the CCE instances. Now I am down to 2 CCE instances, and only a couple hours before the peak time of day. I can be expecting more than 1,000 concurrent calls very soon, but with only 2 instances of CCE, the PSTN Site is only going to be able to process 1,000. Ruh-Roh!

The above coffee disaster (or any other conceivable disaster) is exactly why you will want to plan on that extra stand-by CCE instance. Looking back at this example of 1,300 concurrent calls, a PSTN Site with 3 CCE instances will cover the traffic (3 X 500), but a PSTN Site with 4 CCE instances (3+1) will ensure we have HA in the event of an instance being taken out of commission.

Expanding on the above scenario, let's assume that the office location has just absorbed another nearby office, and I am now projecting 2,200 concurrent calls during the peak of the day. With a single PSTN Site being capable of 4 CCE instances, one of them in standby, it is obvious that a single PSTN Site maxes out at 1,500 concurrent calls, 700 short of the expected volume. Does this mean that I simply cannot achieve greater than 1,500 concurrent calls at any given office using a Cloud Connector Edition hybrid solution? Of course not! This simply means that I will now have to launch **multiple PSTN Sites at the same physical office location**.

What does this look like? Well, the first PSTN Site, **PSTN Site 1**, will have 4 (3+1) CCE instances, taking care of 1,500 concurrent calls. The second, **PSTN Site 2**, will have 3 (2+1) CCE instances, taking care of an additional 1,000 concurrent calls, and ensuring HA across the entire solution. This physical location would now have capacity for up to 2,500 concurrent calls. Should this location ever grow past the peak of 2,200 concurrent calls to over 2,500, they could simply add another CCE instance to **PSTN Site 2**, increasing capacity to 3,000 concurrent potential calls. Awesome. The below graphic shows us the high-level flow of traffic in an environment like this, with the caveat that the PSTN gateway has been left out of the picture:



## Host Server Requirements

As has already been referenced in an earlier section, a Hyper-V host server with substantial physical resources is required for deploying CCE, and this server will need to be physically located in the infrastructure's DMZ network. I also referenced the fact that there are two "flavors" of CCE: a larger version, and a smaller version. Let's first take a look at the larger version requirements for the Hyper-V Host:

### Hyper-V Host (Larger Version)

- *RAM:* 64GB ECC
- *Disks:* At least four 600 GB disks (10K RPM 128M Cache SAS 6Gbps) in RAID 5
- *Processors:* 64-bit Dual Processor (6 cores, 12 total), with 2.50GHz or better
- *Network Adapters:* Three high throughput 1Gbps NICs (RJ45)

As I said, substantial. Now for the smaller host version:

### Hyper-V Host (Smaller Version)

- *RAM*: 32GB DDR3-1600 (non-ECC)
- *Disks*: Two 1TB disks (7200 RPM SATA III 6Gbps) in RAID 0
- *Processors*: i7 Quad Core (4790 with Intel 4600 Graphics)
- *Network Adapters*: Two 1Gbps NICs (RJ45)

Again, the smaller version is still a hefty host, and is about half the server, though it provides far less capacity.

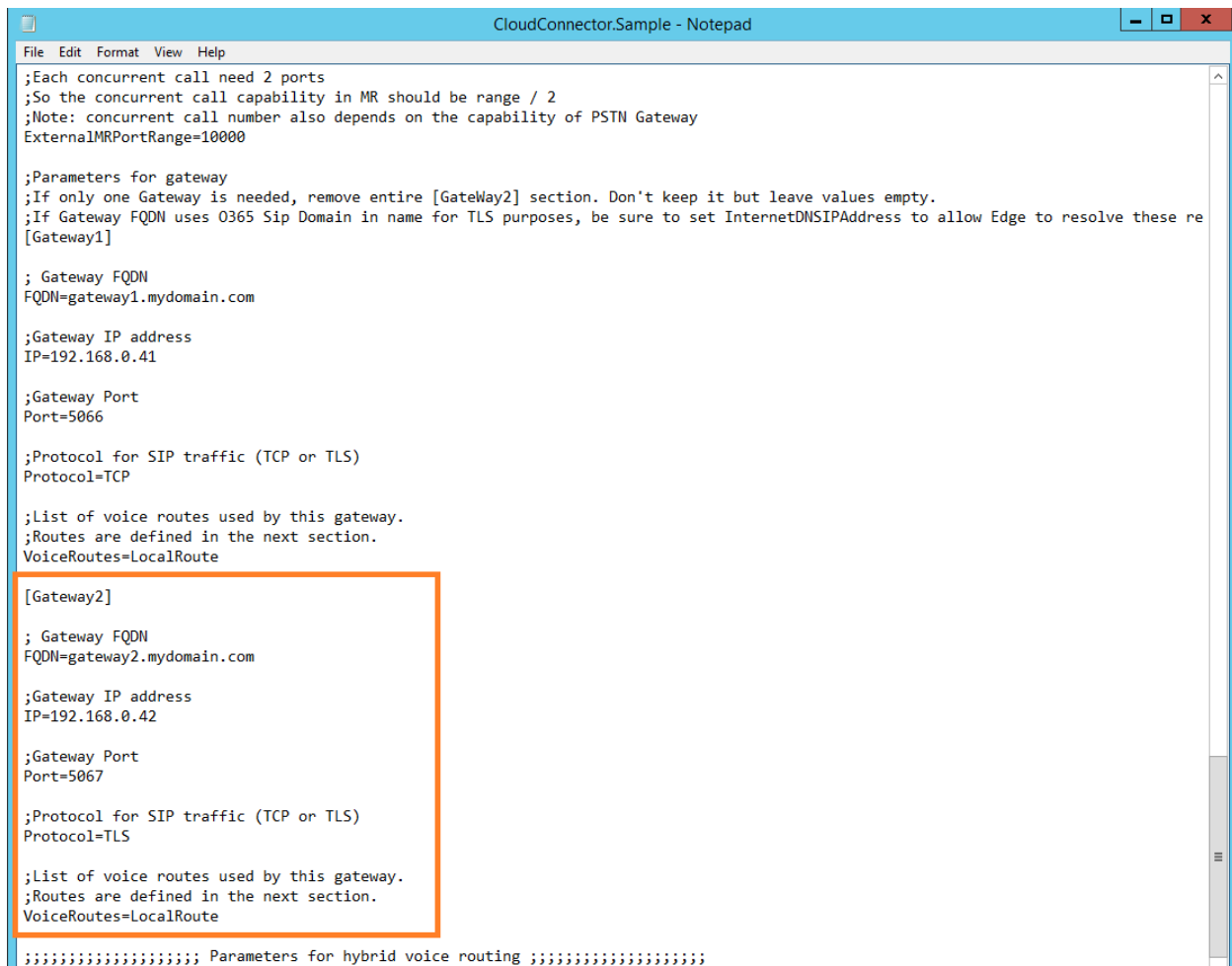
### Other Requirements & Considerations

Making sure that your host is built appropriately is obviously going to be key to installing the CCE package, however, there are clearly many other variables and requirements to account for. I am going to go through and address most of these requirements in a brief summary of each, but there are some requirements that I am not going to be covering in depth. For example, all the various port and firewall requirements are critical, but rather than just putting the same well-drawn-up table in this book that already exists in Technet, I am going to provide the link to the “Planning...” article that has these granular requirements listed out: <https://technet.microsoft.com/en-us/library/mt605227.aspx>.

The above link also provides a great breakdown of every section within the **CloudConnector.ini** file. The *CloudConnector.ini* file is the configuration file that is used during installation of CCE. After this file has had all the needed values supplied and/or modified by the installing admin, it is used by the installation process for properly configuring the various components of the minimum Skype for Business topology that is being deployed (SIP domains, number of PSTN Sites, etc). On to the other considerations and requirements!

**PSTN Gateways.** While it may seem obvious if you are deploying CCE, I am just going to establish that a qualified Trunk, Gateway, SBC or PBX should already be deployed in your on-prem infrastructure. You will need to provide the IP address and port of your gateway in the CloudConnector.ini file for installation. It is recommended that you have at least two (2) gateways for HA purposes, but that is not a requirement, of course.

Along these lines, if you only plan on using a single gateway, you will need to ensure that you remove the section for a second gateway from the CloudConnector.ini file:



```

CloudConnector.Sample - Notepad
File Edit Format View Help
;Each concurrent call need 2 ports
;So the concurrent call capability in MR should be range / 2
;Note: concurrent call number also depends on the capability of PSTN Gateway
ExternalMRPortRange=10000

;Parameters for gateway
;If only one Gateway is needed, remove entire [GateWay2] section. Don't keep it but leave values empty.
;If Gateway FQDN uses 0365 Sip Domain in name for TLS purposes, be sure to set InternetDNSIPAddress to allow Edge to resolve these re
[Gateway1]

; Gateway FQDN
FQDN=gateway1.mydomain.com

;Gateway IP address
IP=192.168.0.41

;Gateway Port
Port=5066

;Protocol for SIP traffic (TCP or TLS)
Protocol=TCP

;List of voice routes used by this gateway.
;Routes are defined in the next section.
VoiceRoutes=LocalRoute

[Gateway2]

; Gateway FQDN
FQDN=gateway2.mydomain.com

;Gateway IP address
IP=192.168.0.42

;Gateway Port
Port=5067

;Protocol for SIP traffic (TCP or TLS)
Protocol=TLS

;List of voice routes used by this gateway.
;Routes are defined in the next section.
VoiceRoutes=LocalRoute

;;;;;;;;;;;;; Parameters for hybrid voice routing ;;;;;;;;;;;;;;

```

**Permissions.** As with deploying any software, the appropriate permissions need to be in place for the admin, or installation is going nowhere fast. To install and configure Hyper-V during the deployment, local Administrator group membership is required on the host server that Hyper-V is to be installed on. Since this environment will not integrate or connect with your on-prem Active Directory, permissions beyond the local host server are not necessary.

**External DNS Records.** Public DNS records will need to be created for the Access Edge component of each PSTN Site. If more than one CCE instance is deployed in a PSTN Site, then one IP will need to be added to that public DNS A record for each Edge component within that PSTN Site. For example, if you have a DNS record created for your PSTN Site called '*accessSite1.<domain>.com*', and if you have 3 CCE instances created (and therefore 3 Edge VMs), then you will have 3 separate IP addresses pointing to that same FQDN.

**\*\*IMPORTANT\*\*** A couple quick NO-NOs: 1) Do not setup your CCE instance using the '*onmicrosoft.com*' domain, and 2) Do not use '*sip.<domain>.com*' to point to any of your Access Edge servers – this record must continue to point to Office 365.



**Internal DNS Resolution.** The Active Directory Domain Controller (DC) that gets deployed in CCE is also deployed with the DNS Server role. The Edge server can use the DNS server for lookups, but there are caveats. For instance, a DNS Zone will need to be setup on the DC with a record or two, and it must be configured for forwarding queries to other public DNS servers. This is necessary so that the Edge server can resolve the DNS names of Office 365 components.

However, if the media gateway is configured using the same domain name as the SIP domain (remember, this will be configured in the CloudConnector.ini file), then the installation process will setup the authoritative DNS zone for this domain on the internal DC. This means that the Edge server will be unable to resolve the necessary public DNS SRV records that point to Office 365. In this case, it is important to setup a public DNS server in the NIC properties of your Edge server's external interface. In addition, set up the HOSTS file on the Edge servers with records that resolve to the other CCE components (i.e., DC, Mediation server, and CMS).

**SSL Certificates.** There are a few considerations when it comes to the creation of the needed SSL certificates for the Edge role in the CCE instances. First, is your company open to using Wildcard certificates? Second, do you need to plan for a single SIP domain, or will this CCE instance support multiple SIP domains?

Let's first assume that the organization is open to wildcard certificates. In the below tables 'accessedgesite1.<domain.com>' and 'accessedgesite1.<domain1.com>' represents the names of the Edge pools that were assigned in the CloudConnector.ini file:

#### *Single Domain with Wildcard SSL Certificate*

Subject Name	Subject Alternative Names (SANs)
accessedgesite1.<domain.com> or sip.<domain.com>	sip.<domain.com> *.<domain.com>

### Multiple Domains with Wildcard SSL Certificate

Subject Name	Subject Alternative Names (SANs)
<code>accessedgesite1.&lt;domain1.com&gt;</code> or <code>sip.&lt;domain1.com&gt;</code>	<code>sip.&lt;domain1.com&gt;</code> <code>*.&lt;domain1.com&gt;</code> <code>sip.&lt;domain2.com&gt;</code> <code>*.&lt;domain2.com&gt;</code> <code>sip.&lt;domain3.com&gt;</code> <code>*.&lt;domain3.com&gt;</code>

Many organizations, however, are not down with wildcard certs for one reason or another. In that case, the UCC SAN certificate that will be needed will be in one of the following formats. Notice that unlike the wildcard options, there is no option for using the 'sip.' address in the Subject Name. It is, however, needed as a SAN entry. The entry in the Subject Name field is, again, the Edge pool name that was assigned to the first PSTN Site:

### Single Domain with non-Wildcard SSL Certificate

Subject Name	Subject Alternative Names (SANs)
<code>accessedgesite1.&lt;domain.com&gt;</code>	<code>sip.&lt;domain.com&gt;</code> <code>accessedgesite1.&lt;domain.com&gt;</code> <code>accessedgesite2.&lt;domain.com&gt;</code>  <i>(Note: The Edge Pool FQDN is needed for each PSTN Site that this SSL will serve)</i>

### Multiple Domains with non-Wildcard SSL Certificate

Subject Name	Subject Alternative Names (SANs)
<code>accessedgesite1.&lt;domain1.com&gt;</code>	<code>sip.&lt;domain1.com&gt;</code> <code>sip.&lt;domain2.com&gt;</code> <code>accessedgesite1.&lt;domain1.com&gt;</code> <code>accessedgesite2.&lt;domain1.com&gt;</code> <code>accessedgesite1.&lt;domain2.com&gt;</code> <code>accessedgesite2.&lt;domain2.com&gt;</code>  <i>(Note: The Edge Pool FQDN is needed for each PSTN Site that this SSL will serve, as well as for each SIP domain.)</i>

Does that make tons and tons of sense? I hope so. If you have worked with Skype for Business deployments at all in the past, then you should already be familiar with SSL situations that are not the most straightforward to work through. This is just par for the course!

One last note on SSL requirements as they relate to DNS: despite having the *sip.<domain.com>* entry in your SAN or SN field on the SSL certificate, do **NOT** change your public *sip.<domain.com>* record to point to any of your CCE Edge IPs. It is important that this public DNS record continues to point to your Office 365 environment.

**Office 365 Tenant.** This may be one of the most obvious requirements, but before you go configuring your CCE instance(s), you must already have an Office 365 tenant setup, with a verified domain or domains, and all the appropriate public DNS records already published. Accomplishing this is not really in the scope of this Chapter, or even this book, really, but just be sure that your Office 365 tenant is fully setup and functional before you go down the CCE road.

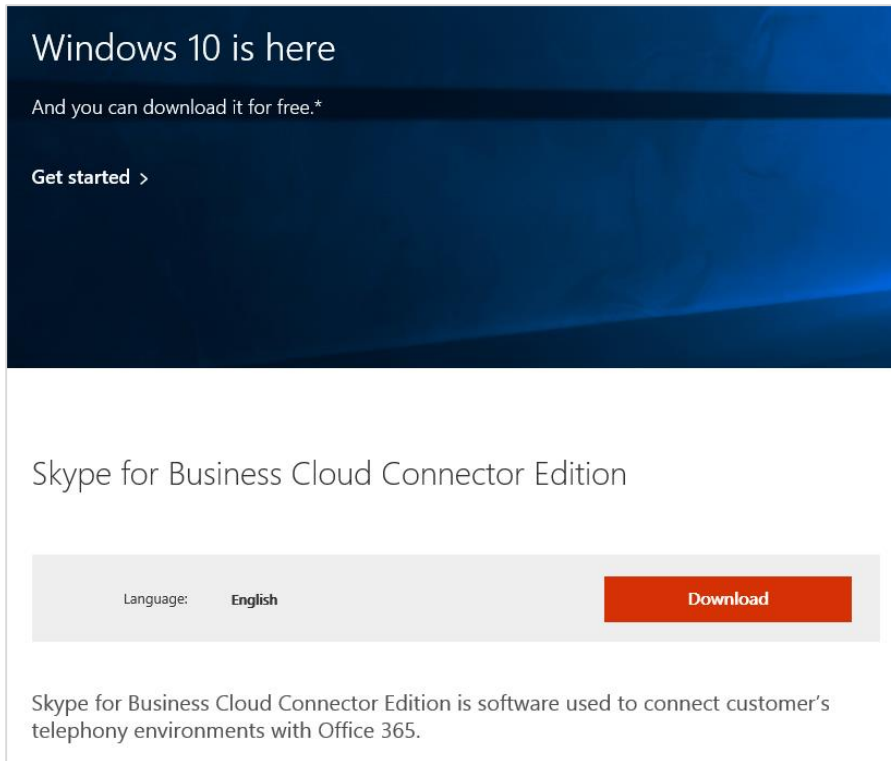
Again, I have gone through all the prerequisites and requirements for CCE in this chapter, specifically having left out firewall/port requirements. Those are very meticulously documented on Technet, and I would recommend supplementing this chapter with a look at those firewall/port requirement tables. Time to move on to some configuration!

## Environment Preparation and Configuration

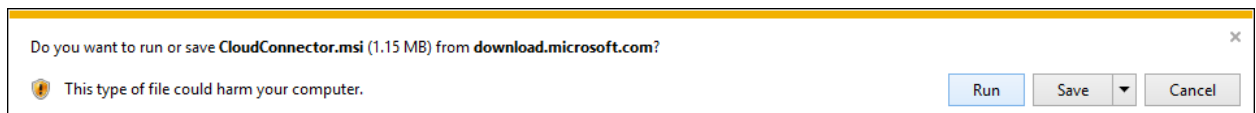
While it is almost embarrassing to say this, I did not have a proper lab environment for CCE at my disposal. In my defense, the recommended hardware for setting up CCE is pretty hefty, and needs to be physical. I was able to do some testing up to a certain point on a VM in my local Hyper-V environment, meaning that I can provide some screenshots to that point, but I will wrap up the configuration portion with the officially documented steps. Now that I have given my disclaimer on configuration, it's time to move on to the actual steps!

### Install Cloud Connector Edition

1. From the Hyper-V host that you will be installing CCE on, open a browser and navigate to <http://aka.ms/cloudconnectorinstaller> (that is the address at the time of writing, anyway).
2. Download Skype for Business Cloud Connector Edition. Also, Windows 10 is here, in case you were not aware...



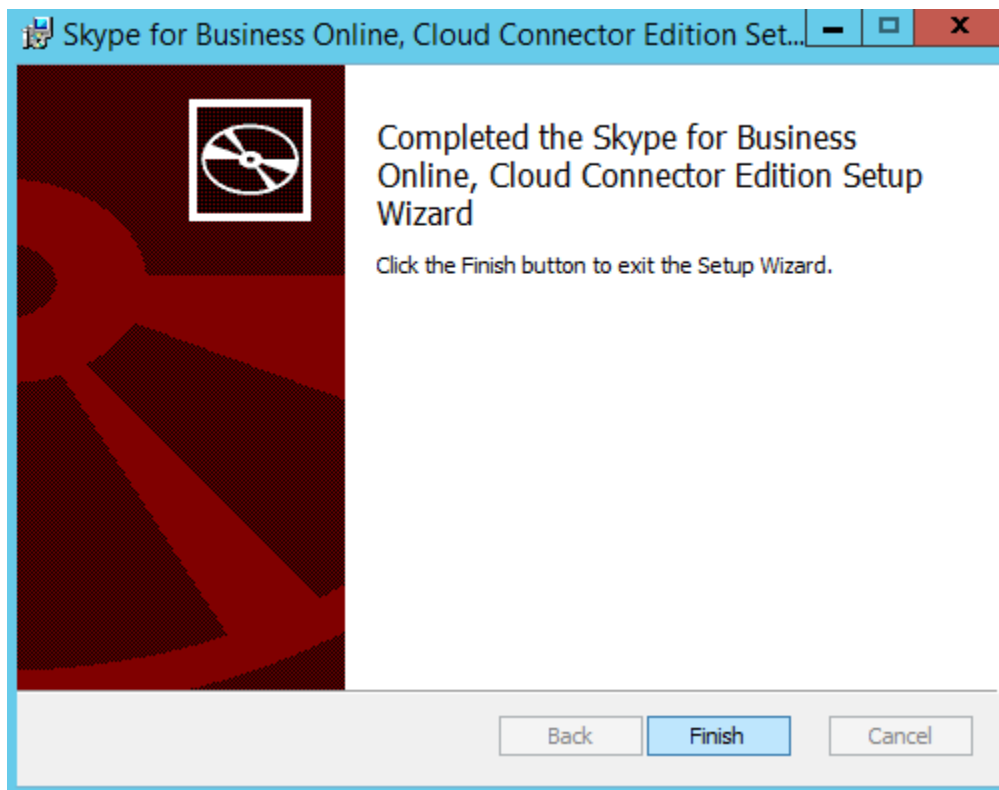
3. When prompted, you can either **Run** the installer, or if you are downloading on another machine prior to copying the installer to the Hyper-V host, you can **Save** the file. In these instructions, I have clicked on **Run**.



4. When the installation wizard opens up and you see the license screen, check the box next to “*I accept the terms in the License Agreement*” box, and click **Install**.

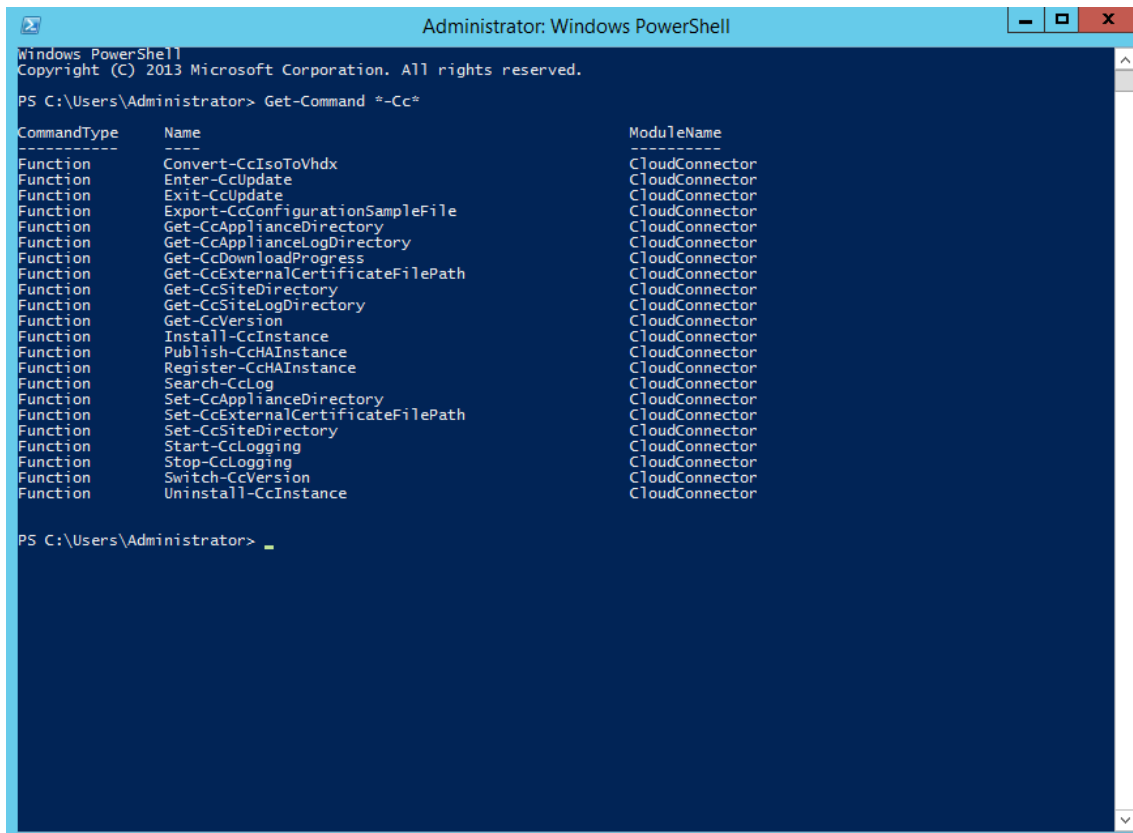


5. At the Completed screen, click **Finish**.
- i



## Verify and Configure the CCE Installation

Now that installation has finished via the previous wizard, I will verify that the PowerShell cmdlets for CCE are present on the server. Open a PowerShell window, type in ***Get-Command \*-Cc\****, and hit **Enter**. This will display all of the CCE-specific cmdlets that were installed by the wizard:



```

Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) 2013 Microsoft Corporation. All rights reserved.

PS C:\Users\Administrator> Get-Command *-Cc*

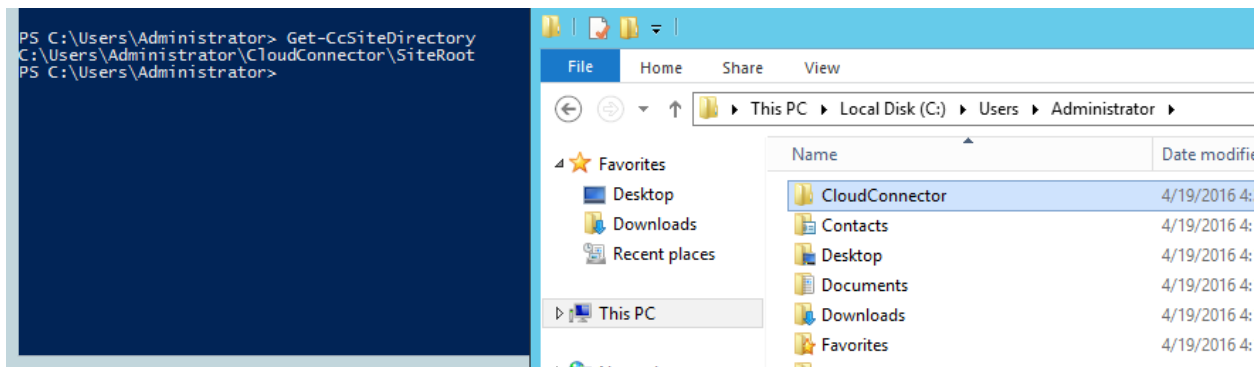
CommandType      Name                                           ModuleName
-----
Function          Convert-CcIsoToVhdx                          CloudConnector
Function          Enter-CcUpdate                              CloudConnector
Function          Exit-CcUpdate                              CloudConnector
Function          Export-CcConfigurationSampleFile             CloudConnector
Function          Get-CcApplianceDirectory                   CloudConnector
Function          Get-CcApplianceLogDirectory                 CloudConnector
Function          Get-CcDownloadProgress                     CloudConnector
Function          Get-CcExternalCertificateFilePath           CloudConnector
Function          Get-CcSiteDirectory                        CloudConnector
Function          Get-CcSiteLogDirectory                     CloudConnector
Function          Get-CcVersion                             CloudConnector
Function          Install-CcInstance                         CloudConnector
Function          Publish-CcHAInstance                       CloudConnector
Function          Register-CcHAInstance                      CloudConnector
Function          Search-CcLog                              CloudConnector
Function          Set-CcApplianceDirectory                   CloudConnector
Function          Set-CcExternalCertificateFilePath           CloudConnector
Function          Set-CcSiteDirectory                        CloudConnector
Function          Start-CcLogging                           CloudConnector
Function          Stop-CcLogging                            CloudConnector
Function          Switch-CcVersion                           CloudConnector
Function          Uninstall-CcInstance                       CloudConnector

PS C:\Users\Administrator>

```

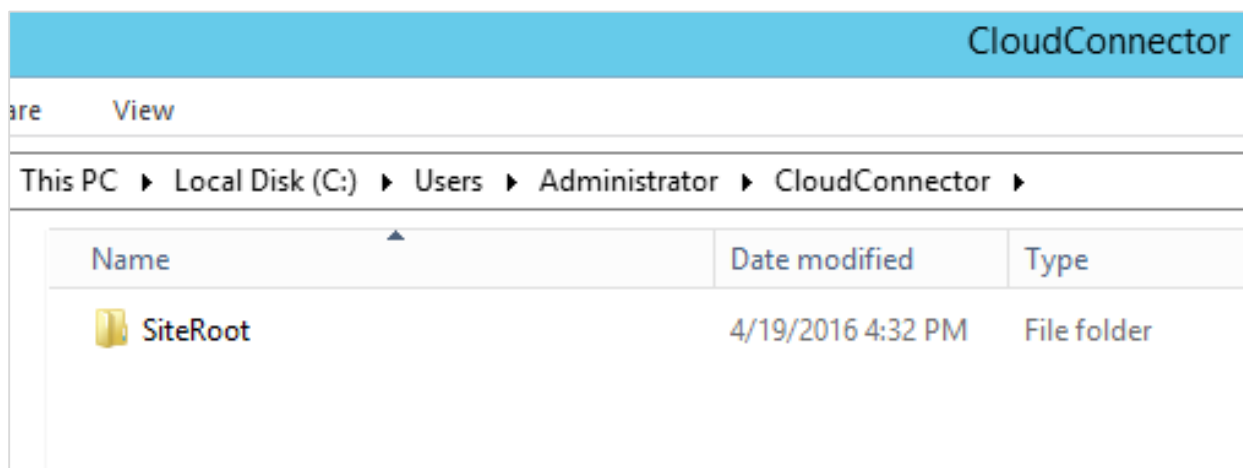
Perfect. Now that the installation has been verified, it is time to start doing some configuration of the environment. Before any more commands are run, it is important to understand what the **Site Directory** and the **Appliance Directory** are, and what they should contain.

**Site Directory.** CCE will store various things within the Site Directory, namely the Virtual Hard Disks (VHDs) for the Virtual Machines that will be deployed, the Skype for Business Server bits, and VersionInfo files. By default, the Site Directory is placed here: `%USERPROFILE%\CloudConnector\SiteRoot`. Running ***Get-CcSiteDirectory*** will show you the location. Also, if you were to browse that location before ever running this cmdlet, you will notice that the folder is not present; running this for the first time actually creates the folder, so be sure to run it at least once:

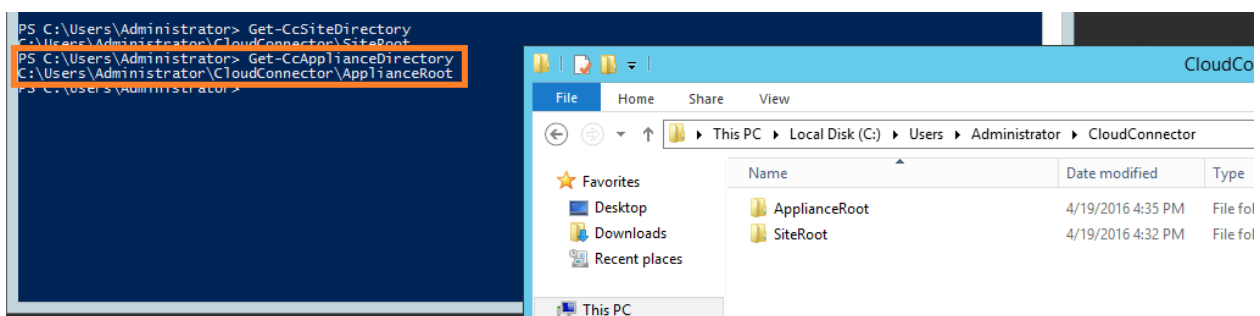


In the above image we see this command run for the first time, and we also see the default location of the CloudConnector folder. If you are setting up HA, however, or even a multi-site environment, this location will need to be changed to a file share that is accessible by the other CCE instances. To change the Site Directory for these purposes, run the following cmdlet: ***Set-CcSiteDirectory <FilePath>***.

**Appliance Directory.** The other directory that needs to be prepped, Appliance Directory, is used to store information such as the needed SSL certificates, instances, and log files. Like the Site Directory, you can retrieve the Appliance Directory by running ***Get-CcApplianceDirectory***, and by default this directory gets created here: `%USERPROFILE%\CloudConnector\ApplianceRoot`. Again, this folder is not present in the CloudConnector folder at first:



Therefore, it is necessary to run ***Get-CcApplianceDirectory*** at least that first time. Once it has been run, both folders will be present:

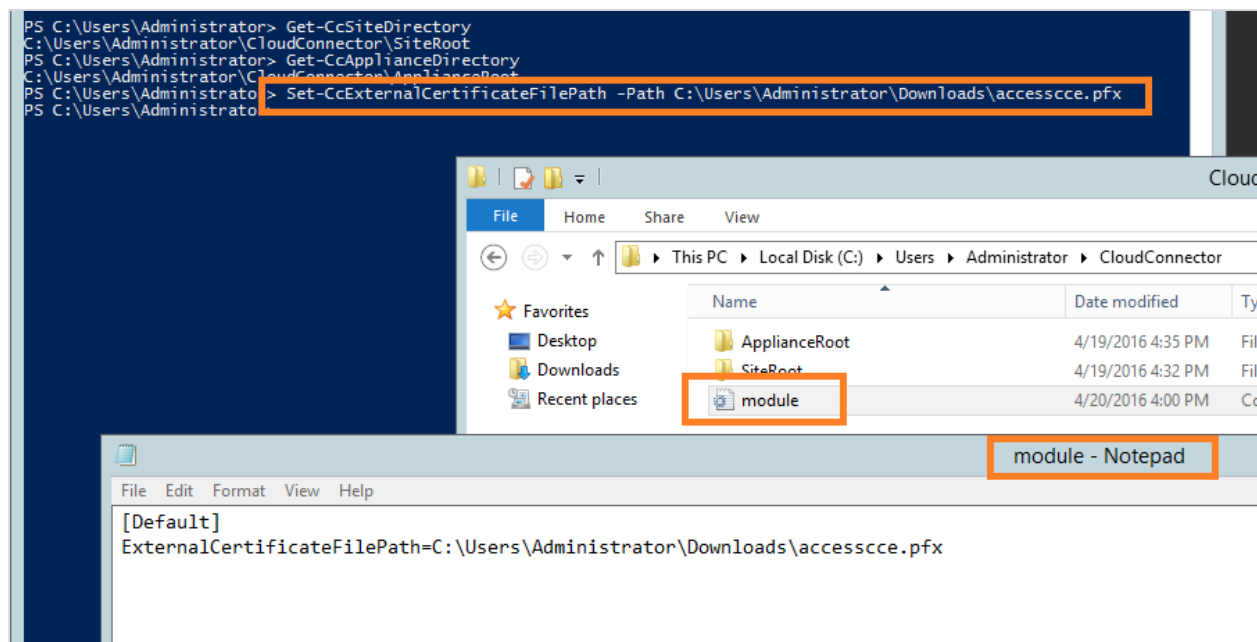


Also like the Site Directory, you can change the location of the Appliance Directory, if so desired, by running ***Set-CcApplianceDirectory <FilePath>***.

There are a couple important notes to make about the Appliance Directory. First, the folder location CANNOT contain any spaces. Second, the location can only be set during this initial setup. If you decide you want to change the location later on, you will actually have to redeploy the host server. Not fun...

**SSL Certificate.** With both of these directories created, it is now time to tell CCE where that much needed SSL certificate is located. Notice that I did not walk through the actual creation of the SSL certificate; that is out of scope. I assume that if you are installing CCE, you know how to generate an SSL certificate request with SAN entries per the guidelines earlier in this chapter.

There is a cmdlet that needs to be run, ***Set-CcExternalCertificateFilePath***, and this cmdlet is supposed to copy the SSL certificate to the Appliance Directory that we set up in the previous step, at least per Technet documentation. However, in my experience, the SSL certificate did not get copied to the ApplianceRoot folder. I did run ***Get-CcExternalCertificateFilePath***, though, and it did return the correct path to the certificate. Make sure that the certificate contains the private key, or problems shall ensue. Your certificate can be located in either a local folder, or on a file share. The cmdlet is ***Set-CcExternalCertificateFilePath -Path <File Path, including file name>***. After running the cmdlet, verify that it was successful by opening up the ***module*** file in the *CloudConnector* directory and ensuring that the path is correct, as is seen below:



**Download the Bits.** The next step is to initiate the download of the actual Skype for Business bits and version information files. This again is triggered by a new cmdlet, ***Start-CcDownload***.

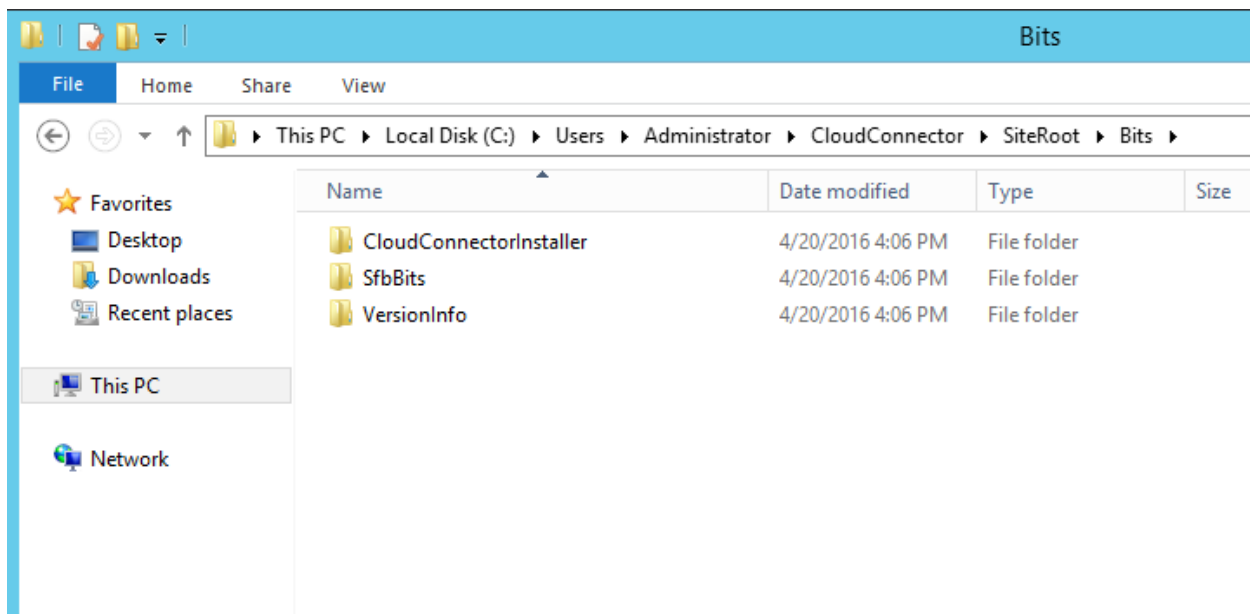


```

PS C:\Users\Administrator> Get-CcSiteDirectory
C:\Users\Administrator\CloudConnector\SiteRoot
PS C:\Users\Administrator> Get-CcApplianceDirectory
C:\Users\Administrator\CloudConnector\ApplianceRoot
PS C:\Users\Administrator> Set-CcExternalCertificateFilePath -Path C:\Users\Administrator\Downloads\accesssce.pfx
PS C:\Users\Administrator> Start-CcDownload
The StartDownload log is in C:\Users\Administrator\CloudConnector\SiteRoot\Log\WIN_UTAAQ3TJPFJ_StartDownload_04_00_2016_04_20_16_06_28.log.
The current scripts version is 6.0.9319.255.
There are no instances currently running.
DownloadUrlRoot:
Downloading latest version file.
Start downloading version file. From: http://go.microsoft.com/fwlink/?LinkId=746642, To: C:\Users\Administrator\CloudConnector\SiteRoot\Bits\VersionInfo\WIN-UTAAQ3TJPFJ-latest-temp.txt
Download of file succeeded. From: http://go.microsoft.com/fwlink/?LinkId=746642, To: C:\Users\Administrator\CloudConnector\SiteRoot\Bits\VersionInfo\WIN-UTAAQ3TJPFJ-latest-temp.txt, JobName: SfbCcDownloadJob-VersionFile-20160420160628.
Version file download success? : True.
Latest version file downloaded.
Local version: 1.3.4, latestServerVersion: 1.3.4
Installed version is the same as latest version. Starting download of Skype for Business Cloud Connector Edition files.
Current version: 1.3.4.
Downloading version file to C:\Users\Administrator\CloudConnector\SiteRoot\Bits\VersionInfo\temp-1.3.4.txt.
Start downloading version file. From: http://go.microsoft.com/fwlink/?LinkId=746642, To: C:\Users\Administrator\CloudConnector\SiteRoot\Bits\VersionInfo\temp-1.3.4.txt
Download of file succeeded. From: http://go.microsoft.com/fwlink/?LinkId=746642, To: C:\Users\Administrator\CloudConnector\SiteRoot\Bits\VersionInfo\temp-1.3.4.txt, JobName: SfbCcDownloadJob-VersionFile-20160420160635.
Version file download success? : True.
Version file was downloaded.
Cleaning up existing download state
The download state for the current version was not found.
Start downloading Skype for Business Cloud Connector Edition files
File SfbBits-6.0.9319.145 downloaded in C:\Users\Administrator\CloudConnector\SiteRoot\Bits\SfbBits: False
File SfbBits-6.0.9319.145 downloading: False
SfbBits-6.0.9319.145 download started, jobName: SfbCcDownloadJob-SfbBits-6.0.9319.145.
Download in process for Skype for Business Cloud Connector Edition files.
PS C:\Users\Administrator>

```

Clearly, there is quite a bit that gets kicked off with the above command. After kicking off the download, looking in the *SiteRoot\Bits\* folder shows us that new folders are present, and the bits are on their way:



This download may take several minutes, and if you have the same minute amount of patience that I do, you may want to run **Get-CcDownloadProgress** to see how far along the download is:

```

download in process for SfbCcDownloadProgress
PS C:\Users\Administrator> Get-CcDownloadProgress
The GetDownloadProgress log is in C:\Users\Administrator\CloudConnector\SiteRoot\Log\WIN_UTAAQ3TJPFJ_GetDownloadProgress
_04_00_2016_04_20_16_08_52.log.
The current scripts version is 6.0.9319.255.
There are no instances currently running.
Current Version: 1.3.4
Checking existing job.

Name                           Value
----                           -
DownloadedPercentage           11%
Status                         Downloading
Description                     Downloading Skype for Business Cloud Connector Edition files, please wait until it is...

PS C:\Users\Administrator>

```

Finally, it finishes:

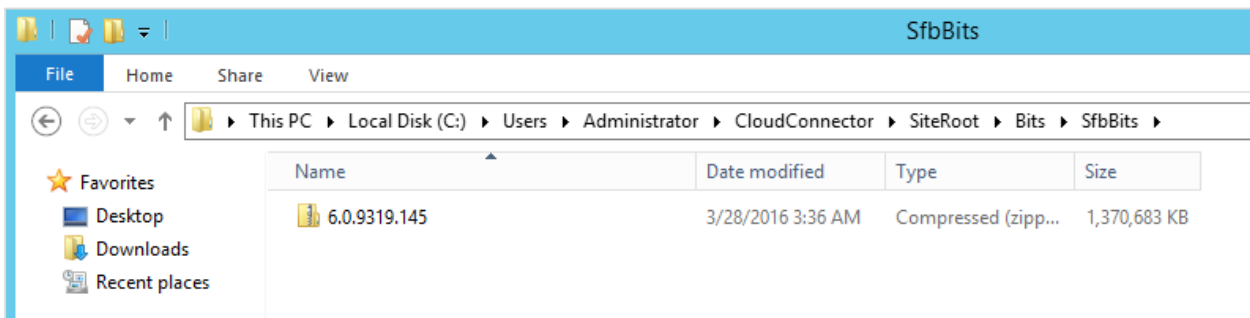
```

PS C:\Users\Administrator> Get-CcDownloadProgress
The GetDownloadProgress log is in C:\Users\Administrator\CloudConnector\SiteRoot\Log\WIN_UTAAQ3TJPFJ_GetDownloadProgress
_04_00_2016_04_20_16_37_41.log.
The current scripts version is 6.0.9319.255.
There are no instances currently running.
Current Version: 1.3.4
Checking existing job.
Download file finished, job Name: SfbCcDownloadJob-SfbBits-6.0.9319.145
All files have downloaded. Move the download status to 'Downloaded'.
Skype for Business Cloud Connector Edition Version: 1.3.4. The download completed.

Name                           Value
----                           -
DownloadedPercentage           100%
Status                         Downloaded
Description                     Downloading Skype for Business Cloud Connector Edition succeeded

```

Going back to the *SiteRoot\Bits* folder, opening the *SfbBits* folder shows us that the bits are indeed present. Cool beans.



**Virtual Switches.** While I don't have screenshots of this section, I would still like to go over these brief, but important, steps.

1. Within the **Hyper-V Manager** navigate to **Virtual Switch Manager**, and select **New Virtual Switch Manager**.
2. Create a new External virtual switch named "**SfB CCE Corpnet Switch**", and bind it to the physical NIC for your internal network.
3. Create a new External virtual switch named "**SfB CCE Internet Switch**", and bind it to the physical NIC that is connected to the internet. This NIC should be the one that corresponds to a publicly-routable IP address.

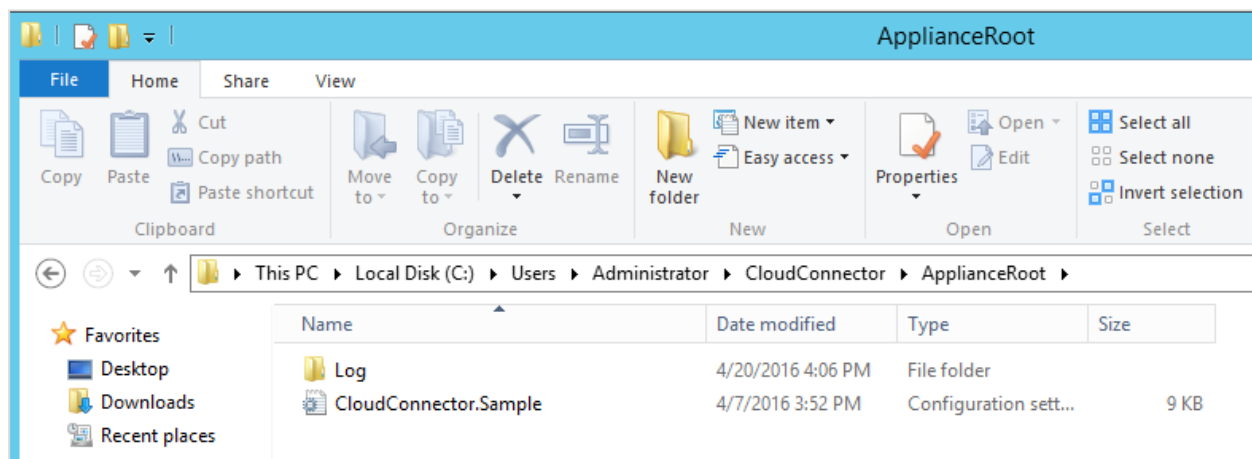
Good job. Give yourself a pat on the back.

**Prepare the CloudConnector.ini.** I have referenced the CloudConnector.ini file several times in the previous sections of this chapter, and that is because it is a very integral part of the deployment process. This file is pretty much the manifest that lays out all the important directions and parameters for how the installation should configure the deployment. If you configure even a single character wrong in this file, your entire Office 365 tenant will be permanently deleted! Ok, that last sentence is completely false, but I just wanted to make sure you were still awake and not reading this in your sleep. Now that I have clarified that this file will not lead your Office 365 tenant to oblivion, let's retrieve the file.

How is the file retrieved? You guessed it: another PowerShell cmdlet! Run **Export-CcConfigurationSampleFile** to retrieve a sample template that you can edit:

```
PS C:\Users\Administrator> Export-CcConfigurationSampleFile
Export the configuration sample file to C:\Users\Administrator\CloudConnector\ApplianceRoot\CloudConnector.Sample.ini.
PS C:\Users\Administrator>
```

The above output shows that the sample template, **CloudConnector.Sample.ini**, has been created in the ApplianceRoot folder. Going to this folder reveals that this is indeed true:

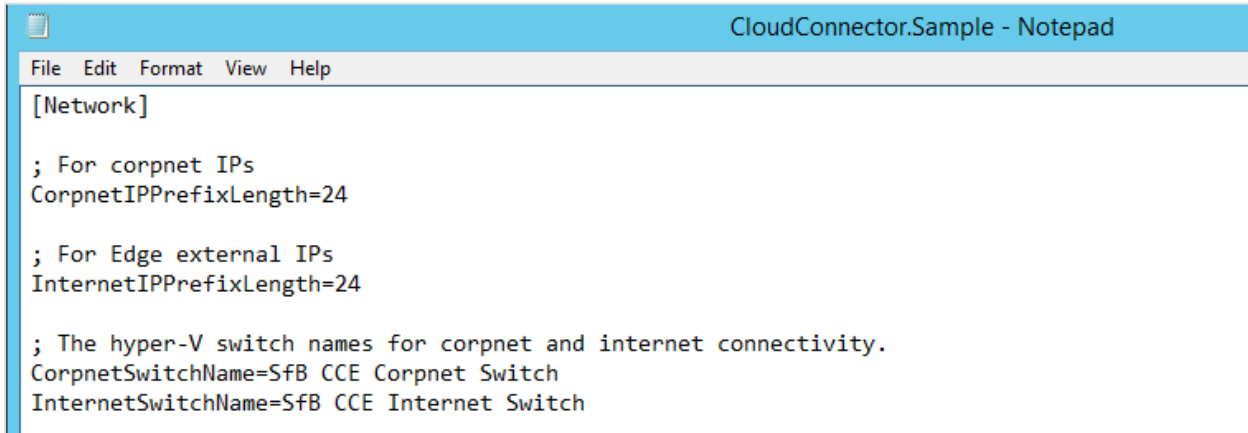


Now, there are a good number of parameters and fields to fill out in this file, and most of the parameters will be very specific to your environment (IP addresses, naming convention preferences, etc.). For this reason, like the firewall/ports/protocols requirements, I will not be covering all the parameters of the CloudConnector.ini file; I will instead defer to the detailed breakdown given on the Technet article provided in the previous section titled “Other Requirements & Considerations”.

There are a few key areas in the CloudConnector.ini file that should be touched on before moving on to the next steps.

First, navigate to the section “; **The hyper-V switch names for corpnet and internet connectivity.**” You will notice that the names, as seen in the image below, correspond to the virtual switches that were

created earlier. If you created these switches with different names in the Hyper-V Manager, be sure to update the names of the switches in this section.



```

[Network]

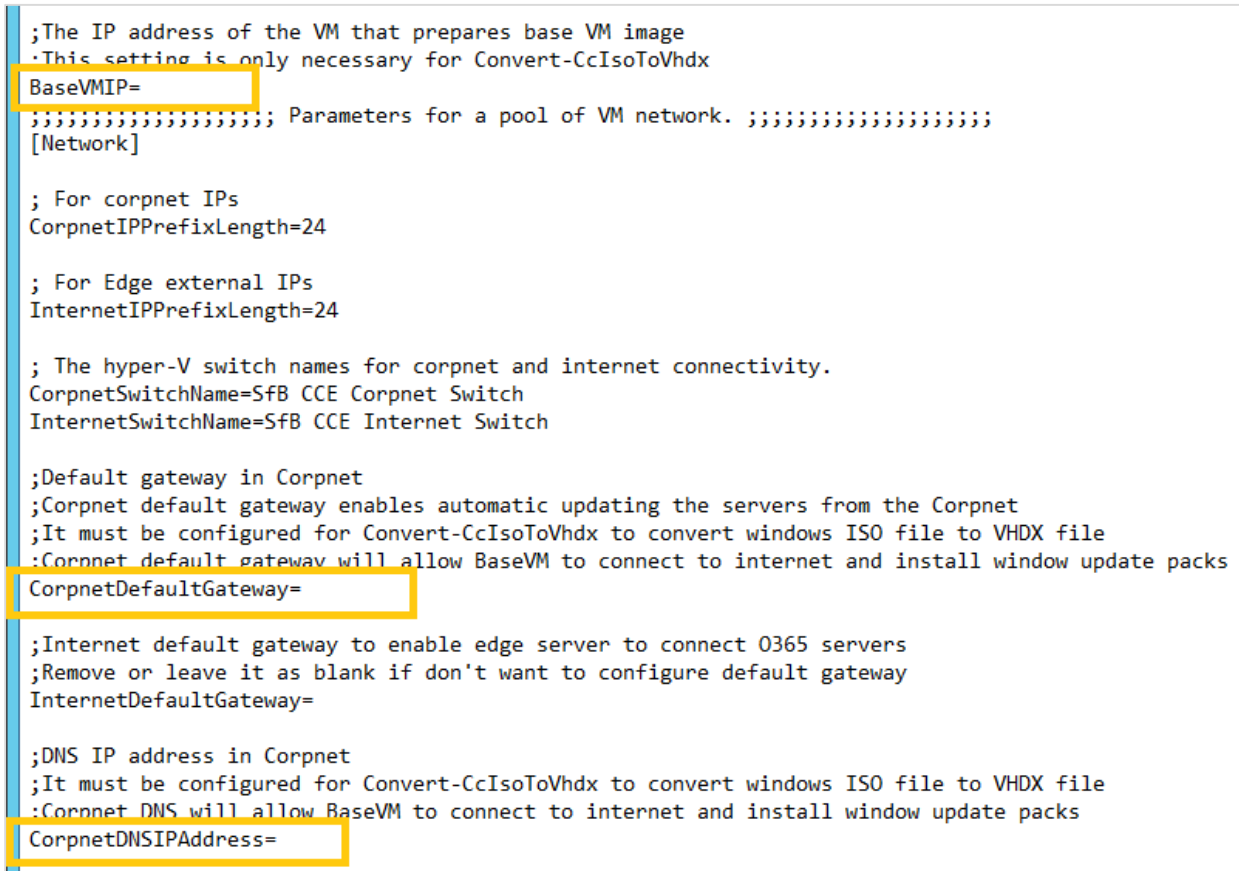
; For corpnet IPs
CorpnetIPPrefixLength=24

; For Edge external IPs
InternetIPPrefixLength=24

; The hyper-V switch names for corpnet and internet connectivity.
CorpnetSwitchName=SfB CCE Corpnet Switch
InternetSwitchName=SfB CCE Internet Switch

```

Second, the Base VM is essentially a VM template that gets created by converting a Windows OS ISO to a VHDX file. From the Base VM, the 4 VMs that make up a CCE instance get created. For the original conversion of the ISO to a VHDX, information is pulled from the CloudConnector.ini to construct the vNICs on the Base VM so that it can reach the internet for automatic Windows updates. The three pieces of information that need to be properly configured are the **BaseVMIP**, the **CorpnetDefaultGateway**, and the **CorpnetDNSIPAddress**. See below:



```

;The IP address of the VM that prepares base VM image
;This setting is only necessary for Convert-CcIsoToVhdx
BaseVMIP=
;Parameters for a pool of VM network.
[Network]

; For corpnet IPs
CorpnetIPPrefixLength=24

; For Edge external IPs
InternetIPPrefixLength=24

; The hyper-V switch names for corpnet and internet connectivity.
CorpnetSwitchName=SfB CCE Corpnet Switch
InternetSwitchName=SfB CCE Internet Switch

;Default gateway in Corpnet
;Corpnet default gateway enables automatic updating the servers from the Corpnet
;It must be configured for Convert-CcIsoToVhdx to convert windows ISO file to VHDX file
;Corpnet default gateway will allow BaseVM to connect to internet and install window update packs
CorpnetDefaultGateway=

;Internet default gateway to enable edge server to connect O365 servers
;Remove or leave it as blank if don't want to configure default gateway
InternetDefaultGateway=

;DNS IP address in Corpnet
;It must be configured for Convert-CcIsoToVhdx to convert windows ISO file to VHDX file
;Corpnet DNS will allow BaseVM to connect to internet and install window update packs
CorpnetDNSIPAddress=

```

For the **BaseVMIP**, this can be any unused IP address from the network that the “internal” NIC of the Hyper-V host is connected to; the IP will only be used temporarily in the making of the Base VM. The **CorpnetDefaultGateway** is obviously going to be the Default Gateway for the network of the IP that you assigned to the **BaseVMIP**. If you are following this thought process so far, then you now know that the **CorpnetDNSIPAddress** is the IP address of the DNS server for the same network. When their powers combine, your Base VM can reach the internet during its conversion process.

Next, for both **CorpnetIPPrefixLength** and **InternetIPPrefixLength**, make sure that you change the value if the default value of “24” is not the correct subnet mask for either of those networks. If the default value is correct, though, then leave it alone! Also, when configuring the specific IP addresses for the different components, especially if you find yourself needing/wanting to change the defaults where they exist, double and triple check to make sure you have no IP conflicts. That would not work out too well if you did...

Like I said, I have only touched on a few key parameters from the CloudConnector.ini file. When going through this file, even if it seems a bit...boring, read through each section carefully, and make sure that you fill in all sections appropriately (or that the defaults will work just fine in your environment). For the most part, the descriptions that precede each parameter are quite thorough.

Once you have finished editing the **CloudConnector.Sample.ini**, save it as **CloudConnector.ini** in the *ApplianceRoot* folder. It is time to convert that ISO!

**Convert the OS ISO to a VHDX.** As you are now well aware, CCE consists of 4 virtual machines on a Hyper-V host. Each of these machines gets created using a preconfigured virtual disk file. By preconfigured, I mean that the VHDX file has the Windows Server 2012 Datacenter Edition OS installed, along with other necessary components and the latest Windows updates. How nice of Microsoft to provide this virtual disk for us, right?! Yeah, that is not quite the case. What Microsoft has provided is a handy little PowerShell cmdlet to convert an already-licensed copy (provided by you) of Windows Server 2012 Data Center Edition into that templated virtual disk file.

To create the virtual disk file, a temporary VM is created (the Base VM I have been talking about) using the networking parameters from the CloudConnector.ini file as discussed above. The OS gets installed, other components get installed, updates get installed, and then the VM is generalized and cleaned up, leaving us with a shiny new VHDX.

Now that the process of what goes on in the background has been laid out, I will point out the obvious: the actual ISO file needs to be copied to an accessible location to run the cmdlet. Once the ISO is in place, the following syntax will kick this process off:

***Convert-CclsoToVhdx -IsoFilePath <File Path, including the actual ISO file name>***

Once the conversion is complete, a new “VHD” folder will be created:  
`\CloudConnector\SiteRoot\Bits\VHD`. This new folder is where that new VHDX file will land.

We’re really getting somewhere now, aren’t we?! Before going much further, though, the remaining PowerShell scripts require that execution policy be set to RemoteSigned. If you are not in PowerShell as

an Administrator already, open a new PowerShell window “As Administrator” and run: **Set-ExecutionPolicy -RemoteSigned**.

## Installation of CCE Instance

For version 2.0 of this book, I am only going to be going over the steps needed to install a single instance of CCE in a single PSTN Site. There are additional steps and considerations if you are planning to deploy multiple instances of CCE within a single site for HA, or if you plan to deploy multiple sites, and for now I will defer once again to the appropriate Technet documentation. I may include these additional scenarios in a later version of this book, but no promises!

With all the folders setup appropriately, PowerShell execution policy set, and the CloudConnector.ini file edited and in place it is time to push the big red button for installation. Ok, there is no big red button, and the next cmdlet is a bit anti-climactic, but to start the instance installation run this cmdlet from the PowerShell window:

### **Install-CclInstance**

Yep. Like I said, anti-climactic. This cmdlet kicks off the installation, but your job is not done yet! There will be prompts to provide the password for the SSL certificate, a Safe Mode admin password, another password for the Domain Admin of the new AD forest that is being created, and admin password for the VM.

Before moving on from the instance installation, let’s go over a few brief steps to change the configuration of this instance, should the need arise:

1. Run the **Uninstall-CclInstance** cmdlet.
2. Modify the *CloudConnector.ini* file with the desired configuration changes.
3. Run the **Install-CclInstance** cmdlet to re-install the CCE instance with the new settings, providing the passwords where requested.
4. Once finished, crack open a beer and enjoy (probably not at the office, though).

## DNS Changes

Luckily, there is not a crazy amount of DNS changes to make. As a matter of fact, for a single instance of CCE, and a single site, there is really only one public A record that needs to be created: the A record for the Access Edge. By default, the CloudConnector.ini file names the Access Edge name as ‘ap’. Therefore, if this name was not changed prior to the install of the CCE instance, then the A record will be as follows:

Record Type	Hostname	IP Address	TTL
A	ap	<Public IP Address specified in the Cloud Connector.ini file>	1 Hour

Clearly, if the **ExternalSIPPoolName** parameter was changed from 'ap' in the CloudConnector.ini file, the above required A record would contain the changed name. Once that DNS record has been created in the public DNS zone for your SIP domain, the new record creation is completed.

While there are not more records to create, it is still important to verify that the Edge server VM within the CCE instance can resolve the below DNS SRV records.

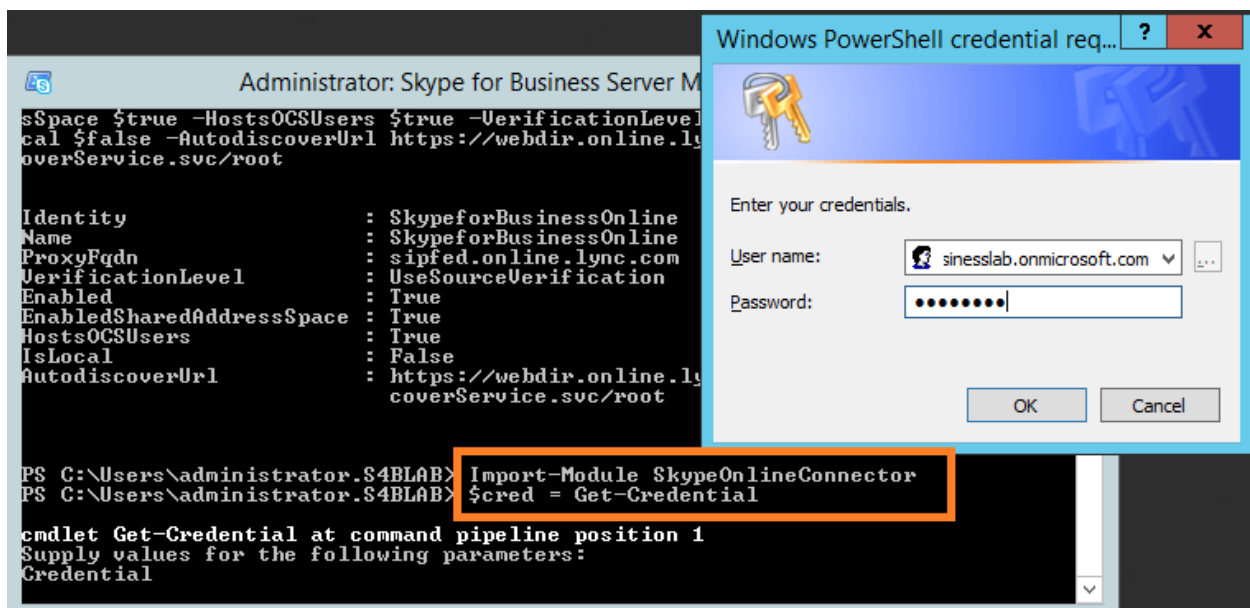
Record Type	Service	Protocol	Port	Target FQDN	TTL
SRV	_sip	_tls	443	sipfed.online.lync.com	1 Hour
SRV	_sipfederationtls	_tcp	5061	sipfed.online.lync.com	1 Hour

Again, the above records do not have to be created as part of this process, as they should have been created via the DNS wizards when the SIP domain was being configured in the Office 365 tenant. They do have to be resolvable by the CCE Edge role, however.

## Configure Hybrid

With the Office 365 tenant up and fully operational, and Cloud Connector Edition installed successfully, it is time to connect the two environments. Bring on the **Hybrid**! First, from a server that has the **SkypeOnlineConnector** PowerShell module installed, open a new PowerShell console. You will need to connect to your Skype for Business Online tenant with the **SkypeOnlineConnector** module.

Run **Import-Module SkypeOnlineConnector**, and then store your Skype for Business Online Global Admin credentials in a new variable with this cmdlet: **\$cred = Get-Credential**.





Create a new session: **\$CSSession = New-CsOnlineSession -Credential \$cred**. Import that new session: **Import-PSSession \$CSSession -AllowClobber**.

```

Administrator: Skype for Business Server Management Shell
Enabled : True
EnabledSharedAddressSpace : True
HostsOCSSUsers : True
IsLocal : False
AutodiscoverUrl : https://webdir.online.lync.com/Autodiscover/AutodiscoverService.svc/root

PS C:\Users\administrator.S4BLAB> Import-Module SkypeOnlineConnector
PS C:\Users\administrator.S4BLAB> $cred = Get-Credential

cmdlet Get-Credential at command pipeline position 1
Supply values for the following parameters:
Credential

PS C:\Users\administrator.S4BLAB> $CSSession = New-CsOnlineSession -Credential $cred
PS C:\Users\administrator.S4BLAB> Import-PSSession $CSSession -AllowClobber

ModuleType Version      Name                               ExportedCommands
-----
Script      1.0             tmp_glpkzahn.14s                 {Clear-CsOnlineTel...

PS C:\Users\administrator.S4BLAB>

```

Now, to setup Skype for Business Online for Hybrid, the following cmdlet specifies the FQDN of the Peer Access Edge server, and it also specifies that the on-prem dial plan is not going to be used:

**Set-CsTenantHybridConfiguration -PeerDestination <External Access Edge FQDN> -UseOnPremDialPlan \$false**

For **<External Access Edge FQDN>**, the default per the CloudConnector.ini file will be 'ap.<domain.com>'. Again, though, if this value was changed during the editing of the file, be sure to put the proper FQDN of the CCE Access Edge in.

The next cmdlet lets Office 365 know that a shared SIP address space is going to be in use, meaning that the same SIP domain that is in use in your Office 365 tenant is also in use in your CCE instance:

**Set-CsTenantFederationConfiguration -SharedSipAddressSpace \$True**

Oh Happy Day, the Office 365 tenant is now configured for Hybrid with your installed Cloud Connector Edition instance!

## PSTN Gateways & Trunks

The last step before setting up the users in Office 365 is to make sure that trunks are created from the PSTN Gateways to the Mediation servers. One trunk should be created per Mediation server. On one end the trunk should connect to the Mediation server FQDN or IP address, and on the other end it will



obviously connect to the PSTN Gateway. In an environment with only a single CCE instance deployed, such as the one that is being discussed in this chapter, this means there will only need to be a single trunk connecting the Mediation server to the PSTN Gateway.

## Configure Office 365 Users for Voice

At this stage, assuming that the firewalls in your on-prem environment have already been configured to allow the necessary ports and protocols through for the appropriate CCE-related IP addresses, and assuming that the rest of the environment has been configured per the previous sections, it is time to configure the users in Office 365 for voice. Before doing this, it is imperative that the users are properly licensed. Each user that will be enabled for voice must have either an E5 license applied, or a Cloud PBX license on top of an E3 license (E5 licenses include Cloud PBX). After the users have been properly licensed, it is time to dig back into some PowerShell awesomeness.

First, connect to Skype for Business Online with a new PowerShell session using the steps that were used in the **Configure Hybrid** section (two sections back). After successfully completing the `Import-PSSession $session`, run the following cmdlet to enable a user for Enterprise Voice, Hosted Voicemail, and to assign their `OnPremLineUri`:

***Set-CsUser -Identity "<User name>" -EnterpriseVoiceEnabled \$true -HostedVoiceMail \$true -OnPremLineUri tel:+phonenumber***

Looking over the above cmdlet, it is pretty much self-explanatory. This cmdlet enables a specified Skype for Business Online user for Enterprise Voice and Hosted Voicemail, and then assigns the phone number that this user already uses within your on-prem voice infrastructure. For the ***-Identity*** parameter, this can be a SIP address, User Principal Name (UPN), Active Directory display name, or the `domain\username` combination.

After running the above cmdlet for a user, or maybe even just to check on a user's status later on, there is a brief check that can be done in PowerShell via a script provided by Microsoft:

```
# Input the user name you want to verify
$user = Get-CsOnlineUser <User name>

# For a hybrid user, the value of $user.EnterpriseVoiceEnabled should be True
$user.EnterpriseVoiceEnabled

# For a hybrid user, the value of $user.HostedVoiceMail should be True
$user.HostedVoiceMail

# For a hybrid user, the value of $user.VoicePolicy should be "HybridVoice"
$user.VoicePolicy
```

Simple enough, right? A decision also has to be made about whether or not the voice-enabled user should be able to place international calls. After all, this decision could have real cost implications. The default setting is for users to have international dialing enabled. Therefore, if the desire is to disallow international dialing, a particular Voice Routing Policy has to be applied with this cmdlet:

***Grant-CsVoiceRoutingPolicy -PolicyName InternationalCallDisallowed -Identity \$user***

Notice that the above cmdlet assumes that \$user is still set from the Microsoft-provided script above. If it is not, and you have just opened up a new PowerShell window (and remote session) to disable international calling, you will first need to set \$user with ***\$user = Get-CsOnlineUser <User name>***.

If the user has already had international dialing disabled, and the goal is to now enable international dialing for them, then the cmdlet looks like this:

***Grant-CsVoiceRoutingPolicy -PolicyName InternationalCallAllowed -Identity \$user***

Finally, you need to check to make sure voice mail has been finalized for all users. A UM Dial Plan named “*BusinessVoice\_8D\_DialPlan*” must exist for voice mail, and to check for this UM Dial Plan’s existence, run:

***Get-CsOnlineUMDialplan | Select Identity***

If the *BusinessVoice\_8D\_DialPlan* does not exist, then you will need to run the following cmdlet to create it:

***New-CsOnlineUMDialplan -Identity BusinessVoice\_8D\_DialPlan -CountryOrRegionCode 1 -NumberOfDigitsInExtension 8***

## Validate It All

Wow, I can’t believe we are finally ready to test this thing, can you? Well believe it, cause this chapter is a long one, and it is definitely time to wrap it up! So, how do you validate that it all works. Very, VERY simple:

1. Have an enabled Office 365 user log into their Skype for Business client and place a call to a PSTN line, ensuring that the voice all works as expected.
2. Place a call to this same user’s assigned PSTN number, and ensure that their client rings, that they can answer the call, and that you can both engage in a stimulating conversation about anything but the sad state of affairs of the U.S. Presidential race.

And that is a wrap! That is what is required to set up Cloud Connector Edition. Again, I did not go over the requirements and steps for configuring an HA CCE deployment, or a multi-site deployment. This should be enough to get you going, though, and the Technet documentation alluded to earlier will provide the extra steps needed to deploy HA. Good luck!

## Stay Tuned...

This book has covered many topics that are continually subject to change and improvements, as well as some features that are still in Preview (or freshly out of Preview). Given that last statement, I foresee other future editions to this publication. There may also be sections that are added onto, expanded, or possibly even completely new sections that get added.

With that in mind, I want to make sure that this resource is the best resource that it can be for those that use it as a reference in their Hybrid adventures. If you have been patient enough to read through the book, or even through certain chapters, and you have feedback for me, do not hesitate for a second to fire that feedback at me via my provided email address or blog! I gladly welcome any feedback and/or suggestions, whether it be constructive criticism or outright sarcasm.

Thanks again for taking the time to download a copy of the book, and please feel free to point others in the direction of the download link if you found it useful! Stay tuned for future updates or major revisions!