Assignment Report, Research, Plan and Deploy (Again)

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Contents

1 Preamble

The current planned topology/implementation of Skype for Business(SfB) application is a single non-clustered Skype Server with ancillary services such as SQL and filestore services. What is tested is text communications amongst users within the domain. Voice should work between users with the domain but this has yet to be tested due to the lack of microphones and additional configuration required for mobility clients.

The deployment and testing has been troublesome. The following are some common issues that occurred during testing and initial deployment. Details of issues and troubleshooting methods employed will be detailed in related sections.

Unlike Exchange, it is a multi-step process and it is not clearly outlined in Microsoft documentation; Exchange beyond the running the domain and forest preperation is a single button install for a basic install. Much of the instructions imply that certain aspects of the your domain have already been configured and/or otherwise not clearly defined. A prime example would be SQL Permission Errors mentioned in the permissions. While, Microsoft informs the user in the guide, it does so at the very end of the page describing the publishing of the topology. At no point does it provide any real solution to the error and resolving it requires previous knowledge or experience with SQL Server. Another example would be that the documentation assumes that you already have a certificate authority installed or preconfigured certificates from a third party. It is not mentioned in the prerequisites despite being a major part of the installation as seen in section 5.2.4.

Troubleshooting was equally difficult. The Microsoft's note of errors requiring SQL permissions is a exception rather than the norm. While some logs are available in plain text documents, others are found in Event Viewer. As such there is so centralized location for such logs and there are times where the application will not inform the user where said log is without additional research and support. Occasionally, log information was not helpful nor was it consistent in its location. The installers may direct the administrators to a folder that error log only to find that there is no way of opening the file. In other cases, there are so many non-descriptive log files, it was difficult find the appropriate one. Furthermore, there are unexplained errors such as that of the powershell script mentioned in Skype Server prerequisites section. Most of the time, the only solution was to reinstall or reconfigure that aspect of the install.

The worst offender was the actual installation of the Skype Server. Occasionally, the installation may run quickly. At other times parts of the installation will stall and the system will show 0% CPU process for an hours before finally providing an error. Many of these errors were not resolvable without republishing the topology as previously mentioned. Furthermore, the SfB Enterprise installation will install SQL Server express on its local store which may increase install time.

For more detailed timeline, instructions, topology, and troubleshooting see sections below.

2 Timeline

There are some mistakes in the configuration that required correcting. Of note, `sip.gabrielk.local` for the sip domain rather than `gabrielk.local`. This requires will require republishing. Another mistake inconsistent naming of the filestore share. Although we could simply repbulish the topology, based on anecdotal experience of peers we might have to reconfigure the SfB server.

Nonetheless, given the general steps and concepts better understood the previously mistakes can be resolved and reconfigured within 2 work days. The correct topology has already recreated and can be quickly imported and republished. Furthermore, most of the VMS we can keep. The domain controller already has its schema preped and the only VM that needs to be reconfigured from scratch may be the SfB Server. This should be quick as well given that we have snapshots of the SfB Server prior to the installation. The SQL Server database can be cleared with the following powershell command:

```
uninstall-csdatabase -sqlserverfqdn sqlsever.gabrielk.local ^
 -centralmanagementdatabase
```

Additional Features may require more time and coordination with the administrators in charge of exchange.

3 Topology

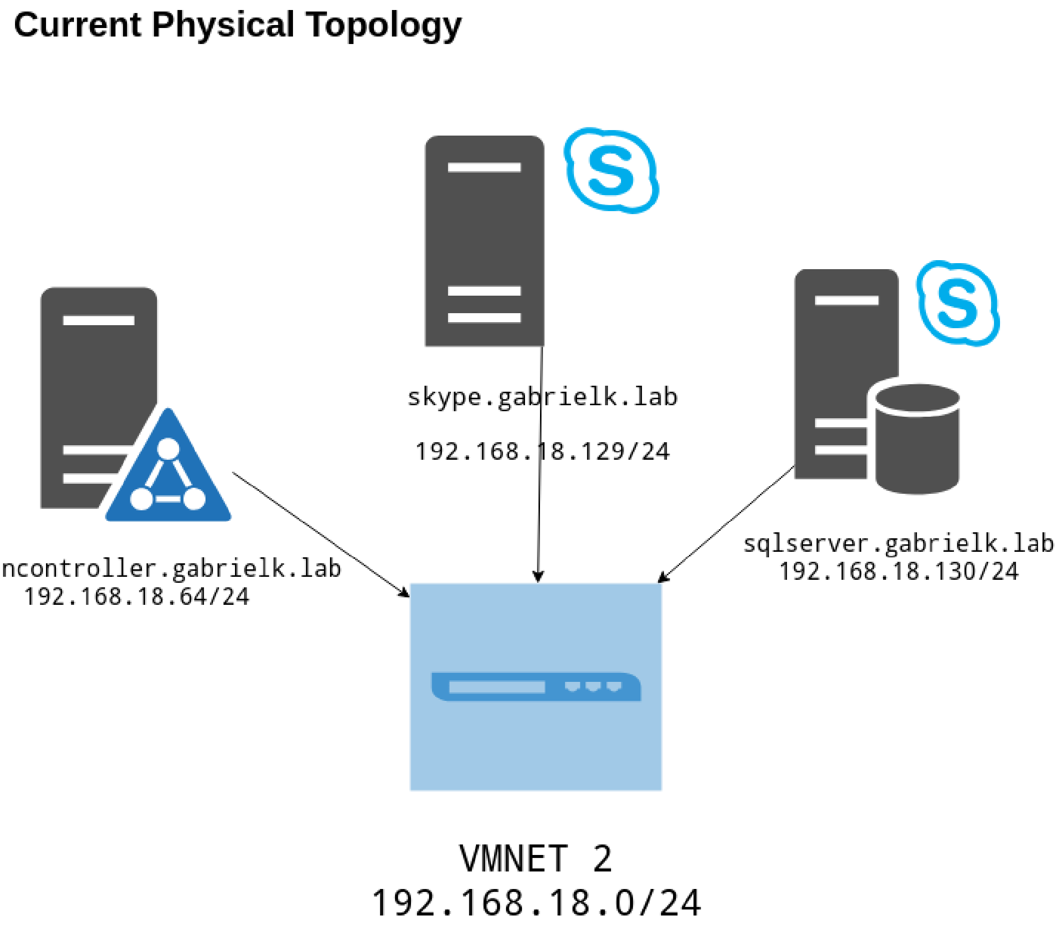
Microsoft is not clear on how many services are required at a minimum to have basic functionality. After some research we need a minimum of the following:

1. Skype For Business
2. Microsoft SQL database
3. DNS
4. Active Directory
5. Certificate Authority with Web Enrollment
6. File Share

However, many of these roles can can be condensed into 3 machines as follows:

1. Skype For Business Server
2. SQL Server + FileStore
3. Active Directory Domain Controller, DNS, and CA server

The attempted deployment and testing was done on Windows Server 2016 DataCenter. The Microsoft SQL Version used was 2017. SfB version was 2015.



All machines are virtual and are currently running in VMWare workstation. They will be moved to an EXSI once ready for production.

The subnet used 192.168.18.0/24. Each machine is connected to a host only switch called VMNET2 for purposes of testing. In full deployment, virtual machines will be attached to a external network for client access. All Servers are part of the Active Directory.

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4 Prerequisites

There are several requirements for installing Skype for Business. The following diagram outlines the general steps:

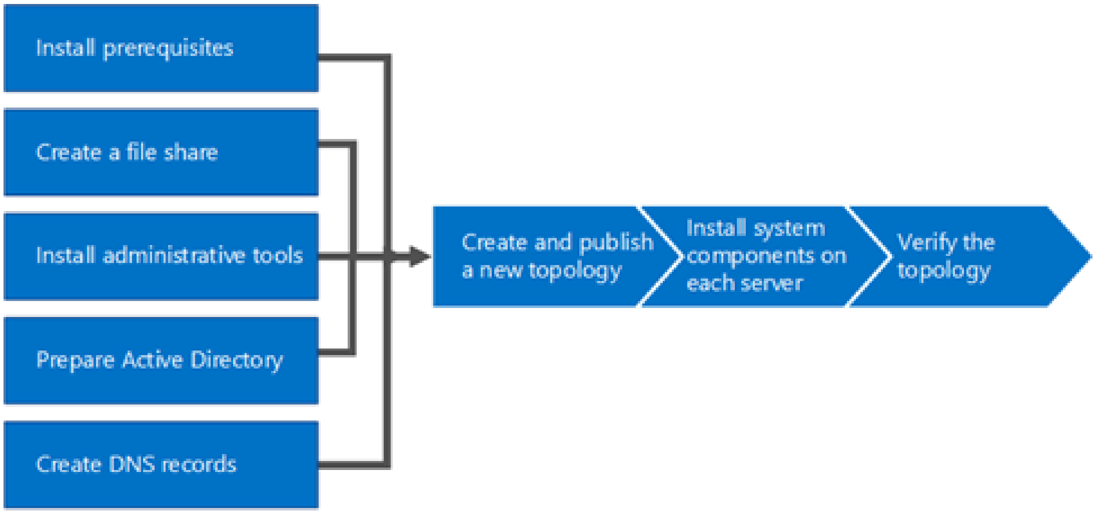

Install prerequisites
Create a file share
Install administrative tools
Prepare Active Directory
Create DNS records
Create and publish a new topology
Install system components on each server
Verify the topology

Figure 1: Courtesy of Microsoft, a diagram demonstrating install procedure of SfB

Note that any of the steps on the left side of the graph can be completed in any order. The steps that must be done in sequence follow that, starting with *Create and publish a new topology*

All servers are running Server 2016.

4.1 Skype Server

There are two things that must be installed on the Skype for Business server based on Microsoft documentation. Those are:

1. The required windows Libraries, and Windows Features
2. Administrative tools

4.1.1 Required Libraries and Windows Features

The server that will be hosting in question requires various additional features and libraries. Here are the requirements per Microsoft Documentation found here.

- Common HTTP Features
  - Default Document
  - HTTP Errors
  - Static Content
- Health and Diagnostics
  - HTTP Logging
  - Logging Tools
  - Tracing
- Performance

  - Static Content Compression
- Security
  - Request Filtering
  - Client Certificate Mapping Authentication
  - Windows Authentication
- Application Development
  - .NET Extensibility 3.5
  - .NET Extensibility 4.5
  - ASP.NET 3.5
  - ASP.NET 4.5
  - ISAPI Extension
  - ISAPI Filters

These features can be installed using the following powershell script provided by the aforementioned Microsoft Documentation:

```
Add-WindowsFeature NET-Framework-Core, RSAT-ADDS, Windows-Identity-Foundation,^
 Web-Server, Web-Static-Content, Web-Default-Doc, Web-Http-Errors, Web-Dir-Browsing,^
 Web-Asp-Net, Web-Net-Ext, Web-ISAPI-Ext, Web-ISAPI-Filter, Web-Http-Logging,^
 Web-Log-Libraries, Web-Request-Monitor, Web-Http-Tracing, Web-Basic-Auth,^
 Web-Windows-Auth, Web-Client-Auth, Web-Filtering, Web-Stat-Compression,^
 Web-Dyn-Compression, NET-WCF-HTTP-Activation45, Web-Asp-Net45, Web-Mgmt-Tools,^
 Web-Scripting-Tools, Web-Mgmt-Compat, Server-Media-Foundation, BITS
```

Note that this script must be run with administrative rights in **powershell**. Not to be confused with Command Prompt.

While this script *should* run smoothly and complete within 10-20 minutes, it may require manual execution of said features that fail to install using the provided powershell script. This was the case durring testing and initial deployment. This can be resolved by running the command with the failed features and libraries in question as follows:

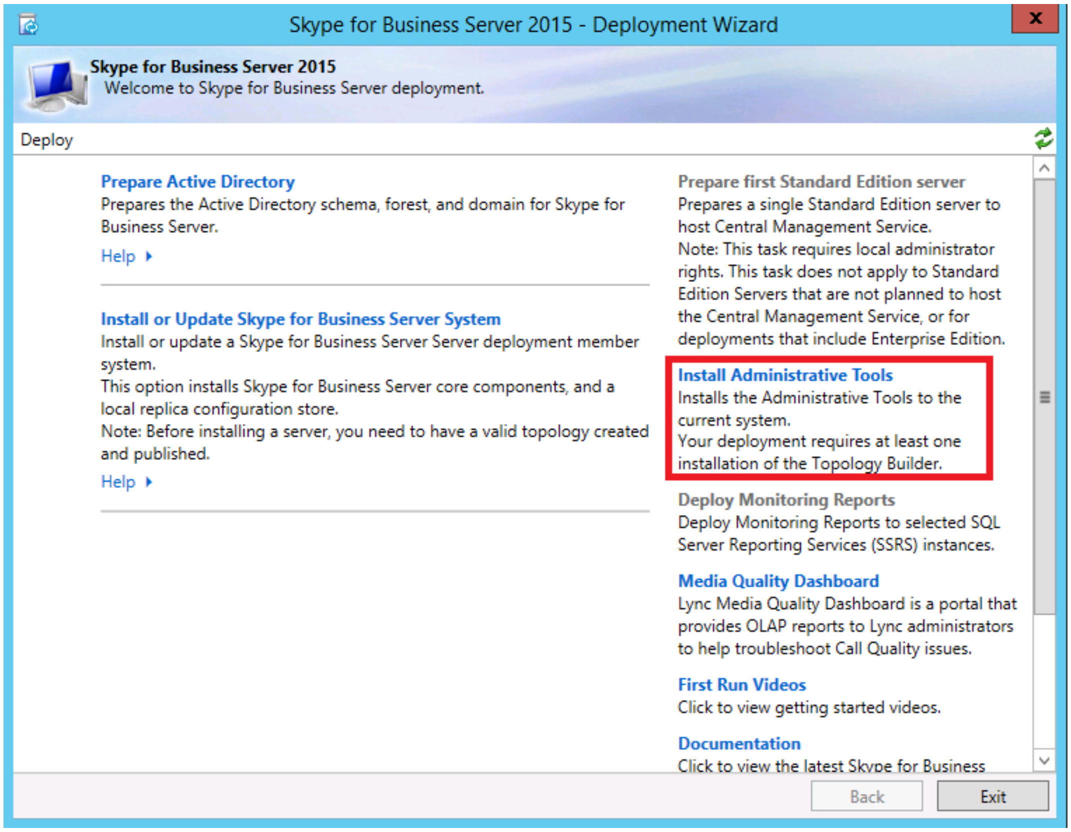
```
Add-WindowsFeature <feature-name 1>[, <feature-name 2>][, <feature-name3>]
```

4.1.2 Administrative Tools Installation

The administrative tools need to install, publish and manage various aspects of the SfB deployment. A prerequisties to installing the administrative tools is Microsoft Visual C++. If this is not installed prior to the installation of the tool, the administrator will be prompted to install durring the setup. SfB Administrative tools can be installed in the following steps:

1. Mount the SfB media onto the Skype server
2. The media will request administrator to install the Microsoft Visual C++ to be installed if it has not already
3. Do not accept updates, go to the next page
4. Review the License Agreement and accept the conditions
5. Once that is installed, exit installer

6. Skype for Business Server Deployment Wizard is now installed
7. Once the Wizard is open, select the "Install Administrative Tools". See below:



Skype for Business Server 2015 - Deployment Wizard
Skype for Business Server 2015
Welcome to Skype for Business Server deployment.
Deploy

Prepare Active Directory
Prepares the Active Directory schema, forest, and domain for Skype for Business Server.
Help

Install or Update Skype for Business Server System
Install or update a Skype for Business Server Server deployment member system.
This option installs Skype for Business Server core components, and a local replica configuration store.
Note: Before installing a server, you need to have a valid topology created and published.
Help

Prepare first Standard Edition server
Prepares a single Standard Edition server to host Central Management Service.
Note: This task requires local administrator rights. This task does not apply to Standard Edition Servers that are not planned to host the Central Management Service, or for deployments that include Enterprise Edition.

Install Administrative Tools
Installs the Administrative Tools to the current system.
Your deployment requires at least one installation of the Topology Builder.

Deploy Monitoring Reports
Deploy Monitoring Reports to selected SQL Server Reporting Services (SSRS) instances.

Media Quality Dashboard
Lync Media Quality Dashboard is a portal that provides OLAP reports to Lync administrators to help troubleshoot Call Quality issues.

First Run Videos
Click to view getting started videos.

Documentation
Click to view the latest Skype for Business

8. SfB Server Topology Builder and Server Control Panel will be installed

4.2 CA Server

In order for clients to authenticate, the servers must have the appropriate certificates. As such a Certificate Authority Server must be enabled to accept web enrollment. There were two major hiccups with our CA deployment. First, a CA server is not explicitly mentioned in the requirements and is only implied as part of installation of Skype for business step that follows the topology. It is however necessary for clients to connect to the SIP domain. This is unlike other Microsoft solutions such as Exchange which allow the clients to accept the certificates regardless of the potentially dubious orgins of the certificate. Secondly, our CA was initially installed on our Active Directory Server. However, this resulted in various trust issues with regards to the certificates issued. To avoid this, the CA was moved to the SfB Server.

NOTE: that any changes to the topology later or additional servers that require DNS records will require reissue of to ensure that the server is trusted. Additional Servers added to topology at a later date must be added to the Subject Alternative Name. More on that later.

4.2.1 Installing Certificate Authority

The following steps were used to install the Certificate Authority:

1. Open Server Manager on the server in question
2. Click tools > add roles and features
3. Click next until Server roles

4. Select Active Directory Certificate Services in the roles and click next
5. In the active Directory Services page, click next
6. In the Role services, add the Certficiate Authority Web Enrollment, click next
7. Select Install

4.2.2 Configuring Certificate Authority for Web Enrollment

1. Open Server Manager
2. Select the Post-deployment configuration for Certificate Servcies
3. In the AD CS window, enter the domain admin credentials
4. In the Role Services page, select the Certificate Authority and Certification Authority Web Enrollment, click next
5. On the CA type page, Select Enterprise CA, click next
6. On the Specify the type of CA page, select the Root CA, click
7. In the Specify the type of private key page, select Create a new private key, click next
8. On the Cryptography for CA page, RSA#Microsoft Software Key Storage Provider, keylength 2048 and SHA256, click next
9. In the Common name for this CA: use <domainname>-SKYPESERVER-<ROOT-DOMAIN>, in the Distinguish name suffix: use DC=<domain-name>, DC=<root-domain-name>
10. In the nextpage, specify the validity period of 1 year
11. In the Certificate database page, leave the defaults
12. In the final page, select configure after reviewing the settings.

4.3 Domain Controller and other Domain Settings

SfB requires an Active Directory Domain Controller available with a functional level of at least the following:

- Windows Server 2019
- Windows Server 2016
- Windows Server 2012 R2
- Windows Server 2012

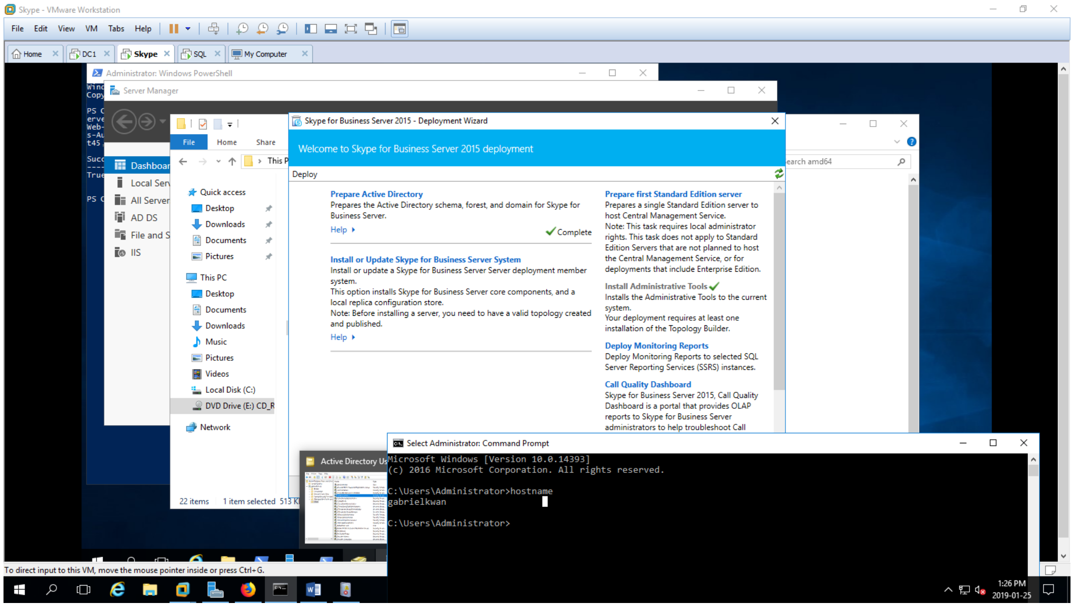
In our case, we have a have a Windows 2016 Domain controller with a functional level of Windows Server 2016. Server 2016 was chosen because it is modern yet stable product. While Server 2019 is available, it is a newer product and is prone to feature updates that may break functionality.

Beyond having an Active Directory available, its schema needs to be modified as well. **Be sure to create snapshots prior to executing this step.** Schema prep can only be done once. Upon completion, the installer should show a check mark as seen below:

Schema Prep can be done in the following steps:

4.3.1 Steps to Prepare AD Schema

1. Mount the SfB ISO or Disk
2. Login into a user with permissions to modified Schema
3. Open the Skype for Business Deployment Wizard



Skype - VMware Workstation
File Edit View VM Tabs Help
Home DC1 Skype SQL My Computer
Administrator: Windows PowerShell
Server Manager
Dashboard
Local Server
All Servers
AD DS
File and S
IIS
File Home Share
Quick access
Desktop
Downloads
Documents
Pictures
This PC
Music
Videos
Local Disk (C:)
DVD Drive (E:) CD_R
Network
22 items 1 item selected 513 K
Active Directory Us
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
1:26 PM
2019-01-25

Skype for Business Server 2015 - Deployment Wizard

Welcome to Skype for Business Server 2015 deployment

Deploy

Prepare Active Directory
Prepares the Active Directory schema, forest, and domain for Skype for Business Server.
Help ▸ ✓ Complete

Install or Update Skype for Business Server System
Install or update a Skype for Business Server Server deployment member system.
This option installs Skype for Business Server core components, and a local replica configuration store.
Note: Before installing a server, you need to have a valid topology created and published.
Help ▸

Prepare first Standard Edition server
Prepares a single Standard Edition server to host Central Management Service.
Note: This task requires local administrator rights. This task does not apply to Standard Edition Servers that are not planned to host the Central Management Service, or for deployments that include Enterprise Edition.

Install Administrative Tools ✓
Installs the Administrative Tools to the current system.
Your deployment requires at least one installation of the Topology Builder.

Deploy Monitoring Reports
Deploy Monitoring Reports to selected SQL Server Reporting Services (SSRS) instances.

Call Quality Dashboard
Skype for Business Server 2015, Call Quality Dashboard is a portal that provides OLAP reports to Skype for Business Server administrators to help troubleshoot Call

Select Administrator: Command Prompt

```
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

C:\Users\Administrator>hostname
gabrielkwan

C:\Users\Administrator>
```

Figure 2: Checkmark after completing Active Directory Prep

4. Select the Prepare Active Directory Link
5. Review Preprequisites; then click run next to Step One to continue
6. Once the schema has been prepared, you can View Log or select finish to complete
   (a) Verify by opening ADSI edit found in Server Manager > Tools
   (b) Once the console opens, go to Action menu > Connect to
   (c) In the dialgo box under *Select a well known Naming context*, select *schema* and click ok
   (d) In the Schema container, search using the the term `CN=ms-RTC-SIP-SchemaVersion`
   (e) Object must exist
   (f) `rangeUpper` must be equal to 1150
   (g) `rangeLower` must be 3
   (h) if the aforementioned critera are not met, schema has not been applied
7. Next run Step 3 to prepare forset
   (a) Specify the domain where the universal groups will be created, in this case it is Gabrielk.lab

4.3.2 Post Schema Configuration

Upon the completion of Schema preparation, several security groups will be created for the purposes of implementing Role Based Access Control. You will need to add users that need to add any administrators of the SfB to the csadmin group and add users to the csuser groups.

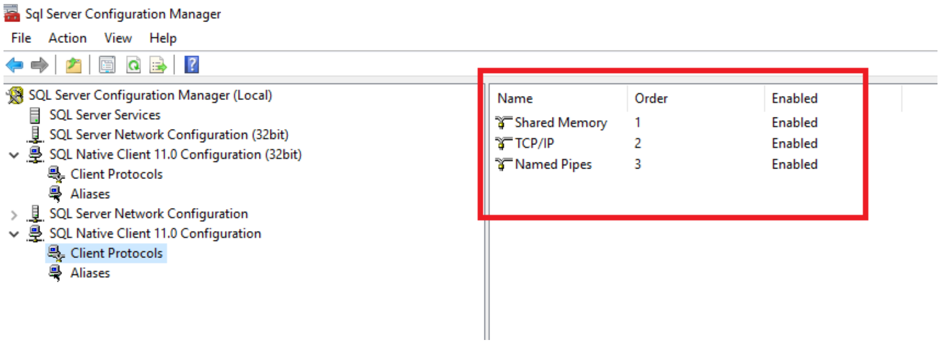
4.4 SQL Server

The SQL Server running Server 2016 with Microsoft SQL Server 2017 will host the primary database known as Central Management Store. This serves to store management, topology, and configuration data for the SfB service. Although Microsoft recommends SQL 2016 Enterprise 64 bit, SQL 2017 enterprise is supported as well. Because of the limited resources, no SQL clustering for fail-over was configured. These installers were sourced from directly from Microsoft's website and were completed using defaults.

Additional post-install configuration is required. They are as follows:

1. TCP/IP functionality must be enabled
2. Firewall ports on the SQL Server must be opened
3. Enable proper SQL server access

4.4.1 TCP/IP functionality


Sql Server Configuration Manager
File
Action
View
Help
SQL Server Configuration Manager (Local)
SQL Server Services
SQL Server Network Configuration (32bit)
SQL Native Client 11.0 Configuration (32bit)
Client Protocols
Aliases
SQL Server Network Configuration
SQL Native Client 11.0 Configuration
Client Protocols
Aliases

Name	Order	Enabled
Shared Memory	1	Enabled
TCP/IP	2	Enabled
Named Pipes	3	Enabled

Figure 3: TCP settings to enable SQL Server access over TCP/IP

By default, TCP/IP functionality is disabled for SQL Server and must be enabled manually by the administrator. Failure to do so will result in the topology builder being unable to access the database. The steps to do so are as follows:

1. With an Administrative account, open start menu and type "sql Server Configuration Manager", the application should show up in search.
2. Start the SQL Server Configuration Manager
3. Select SQL Native Client 11.0 Configuration as seen in the following image
4. Ensure that TCP/IP is enabled
5. If TCP/IP is not enabled, right click and select enable
6. Restart the SQL Service by selecting the SQL Server Network Services in the side bar, and then right clicking SQL Server (MSSQLSERVER) and selecting restart

4.4.2 Steps to opening Firewall ports on the SQL server

In this particular deployment, only a single default database instance is available for use. This requires opening port TCP 1433. If named instances have been created, an additional UDP 1434 must be opened for SQL Server Browser Service to provide clients with the corresponding TCP ports. Failure open the appropriate ports in the firewall will result in the servers in the topology being unable to connect to the SQL Server when required. This was the case on the initial installation. To avoid this, use the following steps:

1. With an account with administrative access, open start menu and search for "Windows Firewall with Advanced Security"
2. On the right side pane, select inbound rules
3. Then, in the Actions pane on the left hand side select new rule
4. In the Inbound Wizard Rule Wizard, select port and click next
5. Leave TCP selected and specify 1433 in the text box labelled "Specific Local Ports", click next
6. Ensure that "Allow the connection" radial dial is selecting, select next.
7. Select all options, those being Domain, Private, Public. Click Next.
8. Provide a name and description. In our case, we should give the name SQL Server Default.
9. Select Finish to complete
10. Close the "Windows Firewall with Advanced Security

4.4.3 Add Domain Admin access to Sysadmin Role

This is required for Domain Admin access and control of the SQL server database. The steps to do so are as follows:

1. Open Microsoft SQL Server Management Studio 17
2. login using administrator account
3. In the Object Explorer on the left hand side, navigate to Security > Server Roles > right click login and select new
4. Specify the Domain Admin group (should be BUILTIN)
5. enter credentials
6. Ensure that default database is selected
7. In the Server Roles Page, ensure sysadmin is selected.

4.5 DNS Server

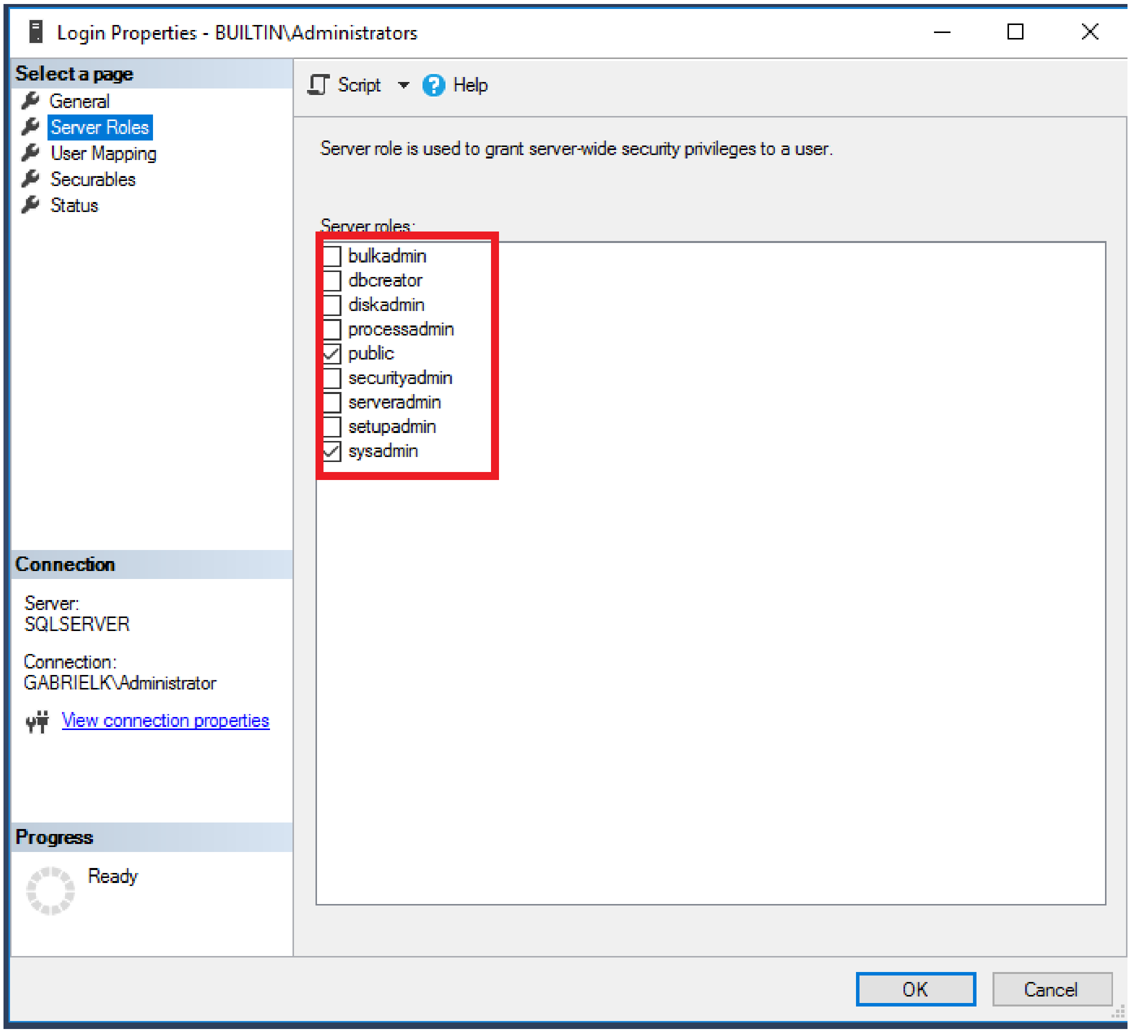
In our topology, the DNS services is installed on our Active Directory Server. There are host records (A) that need to be created. Those are as follows:

NOTE: In the current deployment, not all of theses records represent real functionality or usable services. They are merely place holders used for creating creating and publishing the topology.

NOTE: Also that in our testing, the sip domain was `sip.gabrielk.local` resulting in various issues. All instructions should reflect the actual sip domain which is just `gabrielk.local`

4.6 File Share

The file share `firestore.gabrielk.local` is used to store and exchange files between computers within the SfB topology. **Microsoft recommends the following with regards in the file share:**



Server role is used to grant server-wide security privileges to a user.

Server roles:

- □ bulkadmin
- □ dbcreator
- □ diskadmin
- □ processadmin
- ☑ public
- □ securityadmin
- □ serveradmin
- □ setupadmin
- ☑ sysadmin

Server:
SQLSERVER

Connection:
GABRIELK\Administrator

Figure 4: BUILTINare have the sysadmin role in SQL Server

Table 1: DNS Records

FQDN	IP Address
domaincontroller.gabrielk.local	192.168.18.64
sqlserver.gabrielk.lab	192.168.18.130
skypeserver.gabrielk.local	192.168.18.129
filestore.gabrielk.local	192.168.18.130
pool.gabrielk.local	192.168.18.129
wac.gabrielk.local	192.168.18.129
apps.gabrielk.local	192.168.18.129
dialin.gabrielk.local	192.168.18.129
meet.gabrielk.local	192.168.18.129
sip.gabrielk.local	192.168.18.129
sipexternal.gabrielk.local	192.168.18.129
sipinternal.gabrielk.local	192.168.18.129

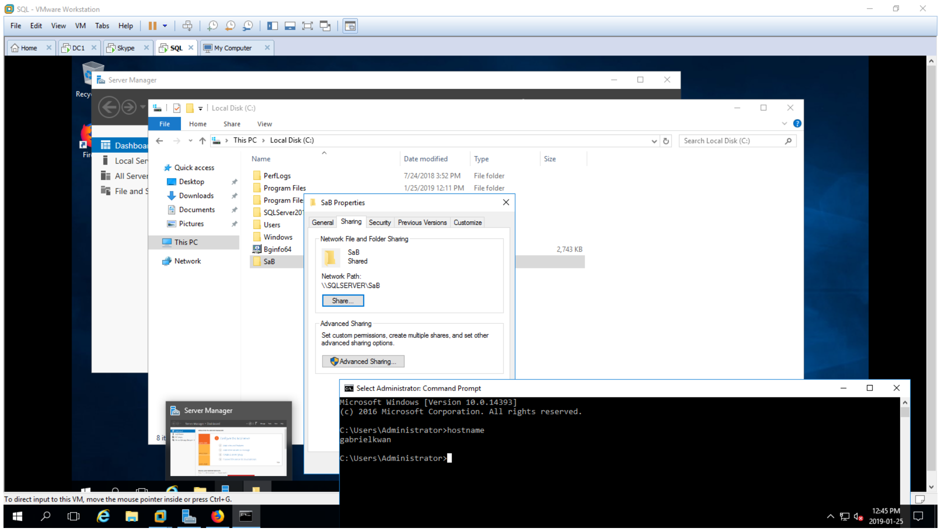
1. Share needs to be either direct attached storage (DAS) or on a storage area network (SAN)
   - this also includes DFS and RAID
2. Use a shared cluster for the file on either Server 2012 or Server 2012 R2 minimum

In our case, the File Store Server is also our SQL server. While it would be nice to have a clustered file share for SfB, it is extremely expensive to set up and adds additional administrative overhead.

Other requirements on the files share are that it must be be world read-write/everybody.

4.6.1 Configuring the filestore:

1. In File explorer, create a folder called C:
2. Right click the new folder and select properties
3. then select sharing tab
4. Then click advanced
5. then select share this folder
6. click permissions
7. Give everyone read-write access.
8. Press OK



Network File and Folder Sharing

SaB
Shared

Network Path:
\\SQLSERVER\SaB

Advanced Sharing

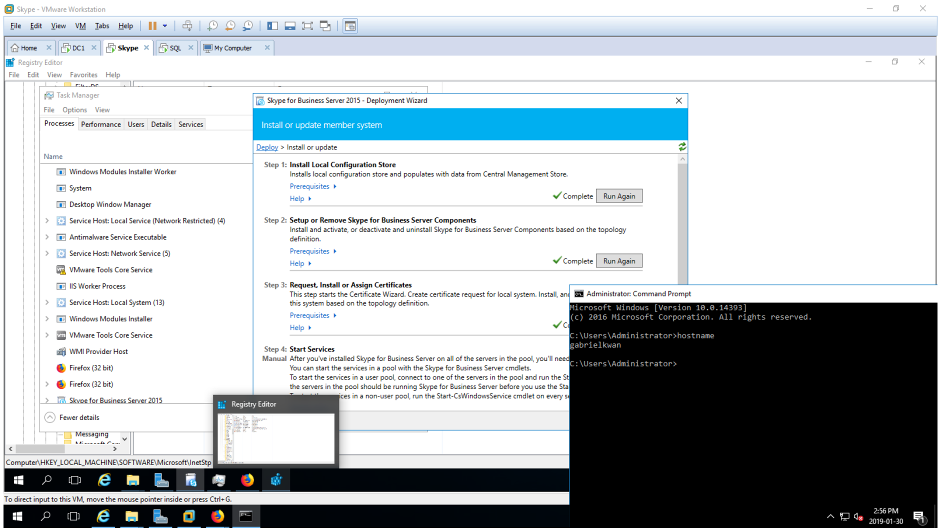
Set custom permissions, create multiple shares, and set other advanced sharing options.

```
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

C:\Users\Administrator>hostname
gabrielkwan

C:\Users\Administrator>
```

Figure 5: Filestore properties. There is a typo here. SaB should be SfB on final install. As long as the correct share is specified when publishing the topology, it will work.

5 Installation

The following Sections need to be completed in order. The rest of the installation will not work as intended otherwise. By the end of the installation, you should have several check marks on the installer. See the figure below.


Skype - VMware Workstation
File Edit View VM Tabs Help
Home DC1 Skype SQL My Computer
Registry Editor
File Edit View Favorites Help
Task Manager
File Options View
Processes Performance Users Details Services
Name
Windows Modules Installer Worker
System
Desktop Window Manager
Service Host: Local Service (Network Restricted) (4)
Antimalware Service Executable
Service Host: Network Service (5)
VMware Tools Core Service
IIS Worker Process
Service Host: Local System (13)
Windows Modules Installer
VMware Tools Core Service
WMI Provider Host
Firefox (32 bit)
Firefox (32 bit)
Skype for Business Server 2015
Fewer details
Messaging
Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\InetStp
Registry Editor
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
2:56 PM
2019-01-30

Skype for Business Server 2015 - Deployment Wizard

Install or update member system

Deploy > Install or update

Step 1: **Install Local Configuration Store**
Installs local configuration store and populates with data from Central Management Store.
Prerequisites ▸
Help ▸
✓ Complete Run Again

Step 2: **Setup or Remove Skype for Business Server Components**
Install and activate, or deactivate and uninstall Skype for Business Server Components based on the topology definition.
Prerequisites ▸
Help ▸
✓ Complete Run Again

Step 3: **Request, Install or Assign Certificates**
This step starts the Certificate Wizard. Create certificate request for local system. Install, an
this system based on the topology definition.
Prerequisites ▸
Help ▸
✓ C

Step 4: **Start Services**
Manual After you've installed Skype for Business Server on all of the servers in the pool, you'll need
You can start the services in a pool with the Skype for Business Server cmdlets.
To start the services in a user pool, connect to one of the servers in the pool and run the St
the servers in the pool should be running Skype for Business Server before you use the Sta
ices in a non-user pool, run the Start-CsWindowsService cmdlet on every s

Administrator: Command Prompt

```
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

C:\Users\Administrator>hostname
gabrielkwan

C:\Users\Administrator>
```

Figure 6: Major Steps of installation complete:

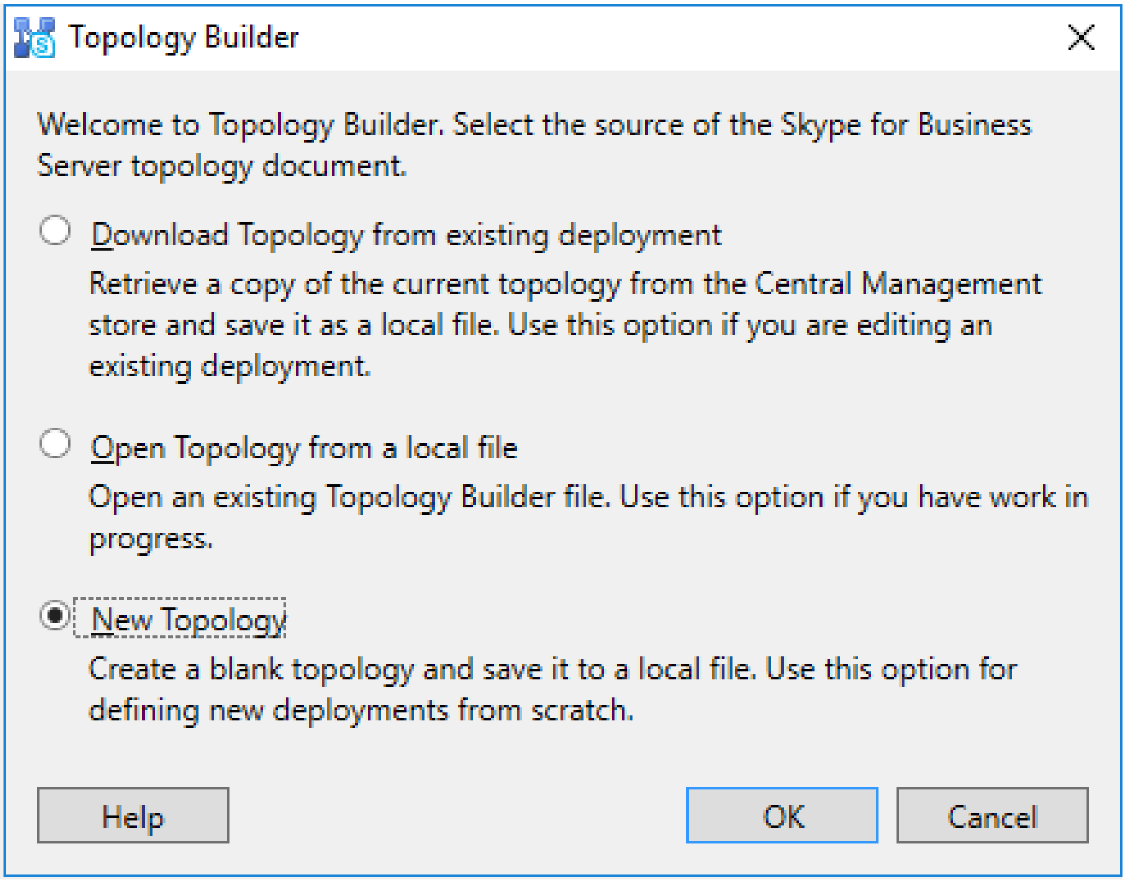
5.1 Creating and publishing new Topology

Once the Servers and the DNS records were in place, a topology must be created using Skype Topology Builder. The topology creator should have been installed when installing the administrative tools. If this is not foundon the SfB server, please refer to section 4.1.2 regarding installation of Administrative tools on the Skype Server.

One issue in the initial deployment and testing was that we used the `sip.gabrielk.local` in the 4th step of Create a new topology. While this technically work, it will require additional DNS records of such as internalsip.sip.gabrielk.local and users will login using username.sip.gabrielk.local. This is not ideal.

The following steps are sourced from Microsoft's Create and Publish new topology for SfB with some minor changes. These changes are mostly related to settings specific to our deployment.

5.1.1 Create a new topology



Topology Builder

Welcome to Topology Builder. Select the source of the Skype for Business Server topology document.

○ Download Topology from existing deployment

Retrieve a copy of the current topology from the Central Management store and save it as a local file. Use this option if you are editing an existing deployment.

○ Open Topology from a local file

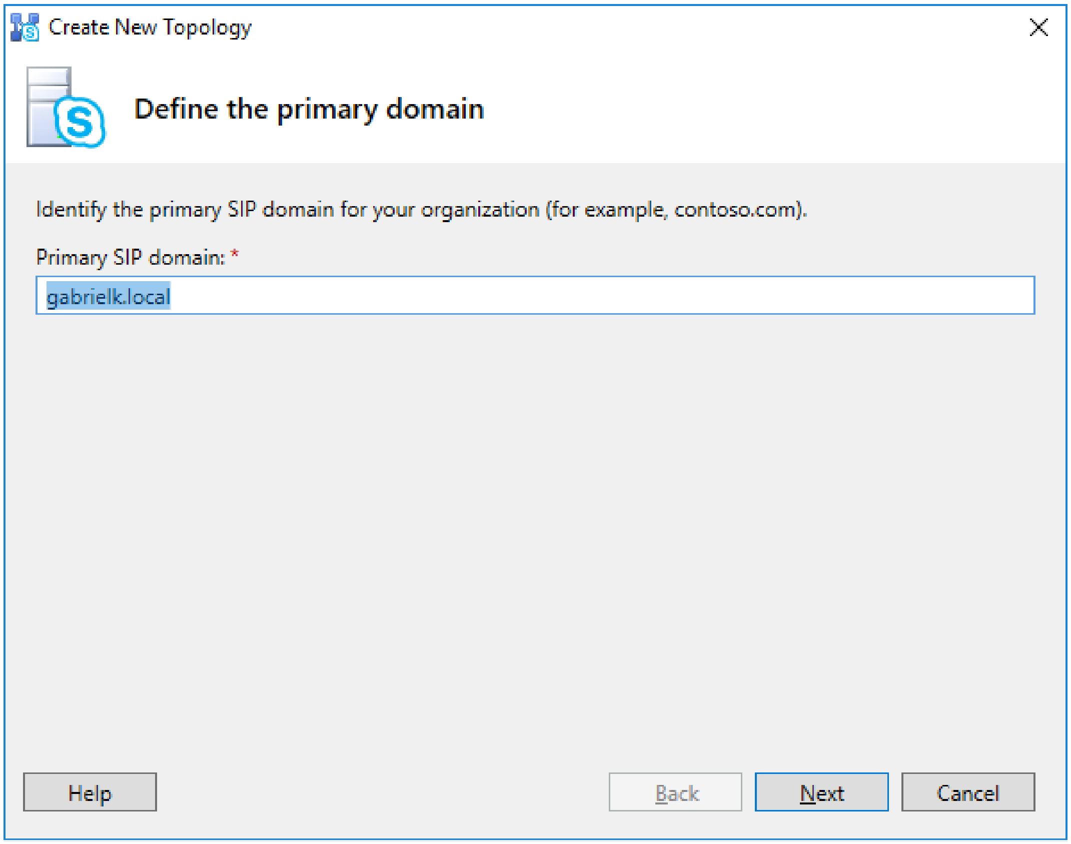
Open an existing Topology Builder file. Use this option if you have work in progress.

● New Topology

Create a blank topology and save it to a local file. Use this option for defining new deployments from scratch.

Figure 7: Creating a new topology

1. Login to the skype server with an account in the csadmin group
2. launch Skype for Business Topology and select new Topology in the popup window
3. Specify the name and location of the topology configuration file. Save to somewhere that it can be accessed easily in case of troubleshooting
4. In the textbox for primary SIP, use the domain name. That being gabrielk.local, not sip.gabrielk.local, click next.



Define the primary domain

Identify the primary SIP domain for your organization (for example, contoso.com).

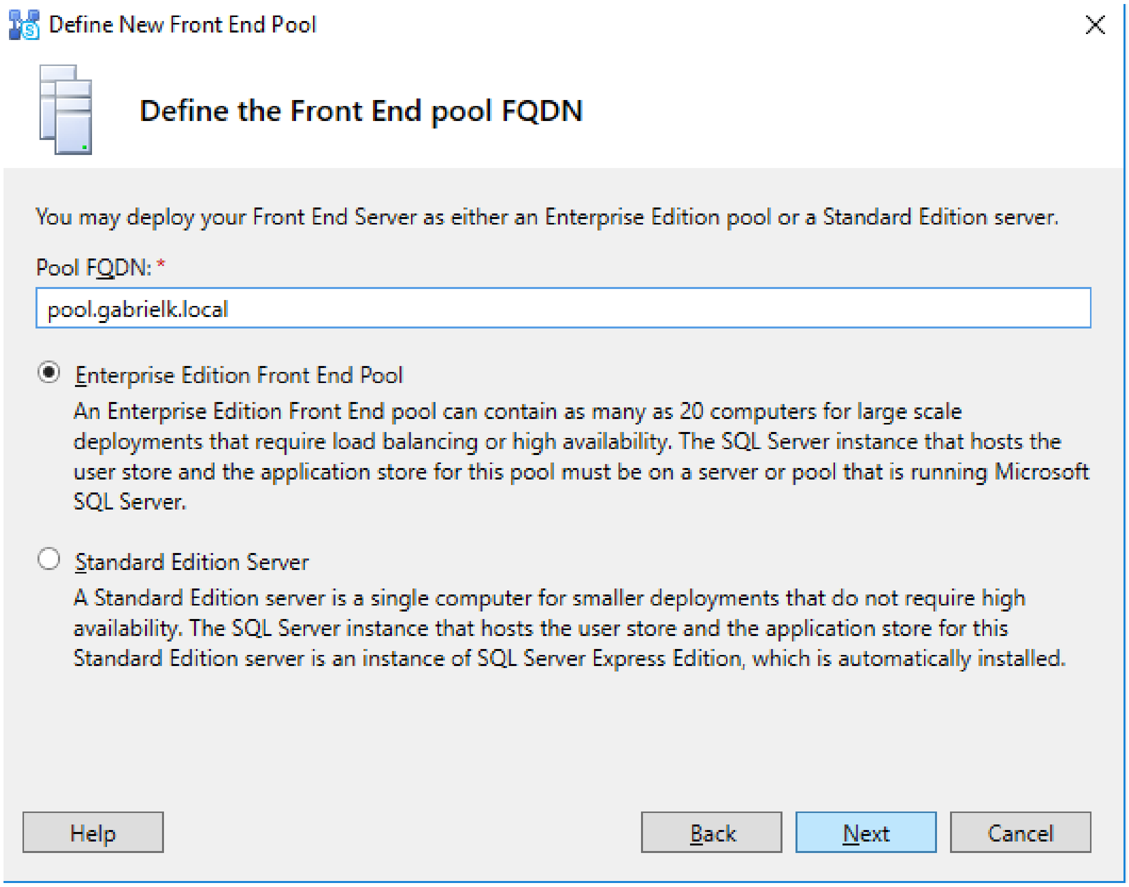
Primary SIP domain: *

gabrielk.local

5. Click next on the following page for additional SIP domains. At this time we do not have any additional SIP domains.
6. On the "Define the first Site" page, enter the name of the site and description.
7. On the Next page, add input the city, state/provinces, and country region code for the site, and click next.
8. Click Finish to complete the process of defining a new topology.

NOTE: The front end wizard will launch automatically, you will need to go through this wizard.

5.1.2 Defining a Front End



Define New Front End Pool

Define the Front End pool FQDN

You may deploy your Front End Server as either an Enterprise Edition pool or a Standard Edition server.

Pool FQDN: *

pool.gabrielk.local

● Enterprise Edition Front End Pool

An Enterprise Edition Front End pool can contain as many as 20 computers for large scale deployments that require load balancing or high availability. The SQL Server instance that hosts the user store and the application store for this pool must be on a server or pool that is running Microsoft SQL Server.

○ Standard Edition Server

A Standard Edition server is a single computer for smaller deployments that do not require high availability. The SQL Server instance that hosts the user store and the application store for this Standard Edition server is an instance of SQL Server Express Edition, which is automatically installed.

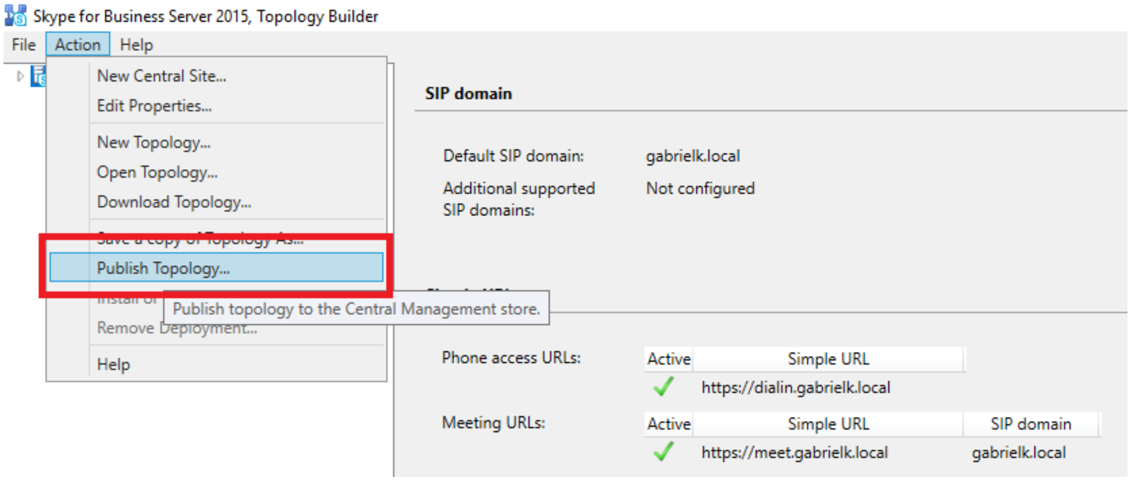
Figure 8: Defining the Enterprise Frontend pool FQDN

1. Enter the FQDN of the pool server, that being `pool.gabrielk.local`
2. Ensure that that Enterprise Edition Front End Pool and then click next.
3. In the "Define the computers in this pool page", add the `skype.gabrielk.local` server, click next
   - NOTE: If you have multiple SfB servers avaliable, be sure to add those as well. In our case we only have one.
4. In the "Select Features Page", select all the features on the page.
5. On the "Select collocated server role", choose to deploy it as a standalone server. Then proceed to the next page.
6. Next, define the SQL store by click new and inputing the SQL Server FQDN in the as specified. Based on our topology that is `sqlserver.gabrielk.local`
7. When prompted for the instance, use the default instance. Proceed to the next section.
8. Then, define the file store. Enter the FQDN of our filestore server and the file share. In our case, it is `filestore.gabrielk.local`. The share was SfB. See this section for more details or if the filestore has not been created.
9. Leave the "Specify the Web Services URL" alone. Move to the next section
10. On the "Define New Office Web Apps Server Dialoge box, use the FQDN `apps.gabrielk.local`

- NOTE: This is not a real app server. Attempts to use this will not succeeed. This is only to fulfil the requirements of the topology server.

11. At this point, you can publish the topology. Do so.

5.1.3 Publishing the topology and Verifying the Topology



SIP domain

Default SIP domain: gabrielk.local

Additional supported SIP domains: Not configured

Phone access URLs:

Active	Simple URL
✓	https://dialin.gabrielk.local

Meeting URLs:

Active	Simple URL	SIP domain
✓	https://meet.gabrielk.local	gabrielk.local

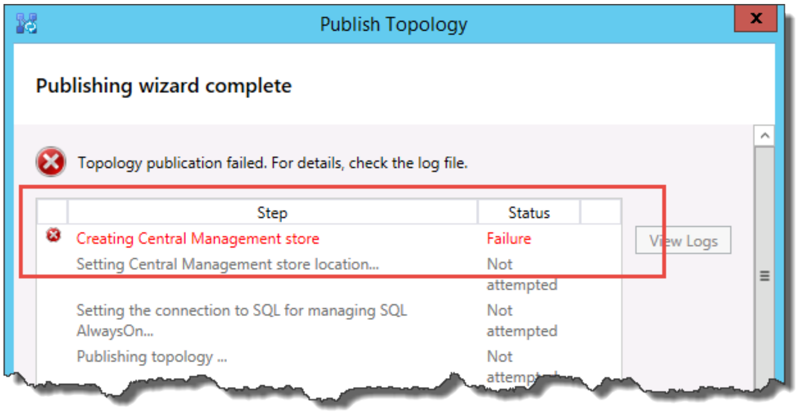
Figure 9: Publishing the Topology

1. Confrim all the URLs are correct and confirm that connectivity between Skype Server ,the SQL server, and the file store are sound. See the SQL Server and the File Share section for more details.
2. Confirm that other required prerequsites are completed.
3. Verify that the servers in question are listed in active directory. This can be done in either Active Directory Users and Computers or
4. Right click on the Server Node and click publish, click next until the "Select Central Management Server"
5. Ensure that pool.contoso.local and the site name that was previously created in section Create a new topology.
6. Select the appropriate page in the "Select database" page. Should be only one.
7. Click next to complete the publishing process.

5.1.4 Issues with publishing The Topology

When publishing the topology in the Publishing Wizard, we stumbled onto an error that states that Creating the Central Managment Store has failed as seen in the following figure. To avoid this issue, ensure that the administrator has administrative access and rights to the SQL server. See this section here to resolve this.

There is a strong chance that the publishing may complete with warnings. You can check these logs or save the logs to be viewed later.



Publishing wizard complete

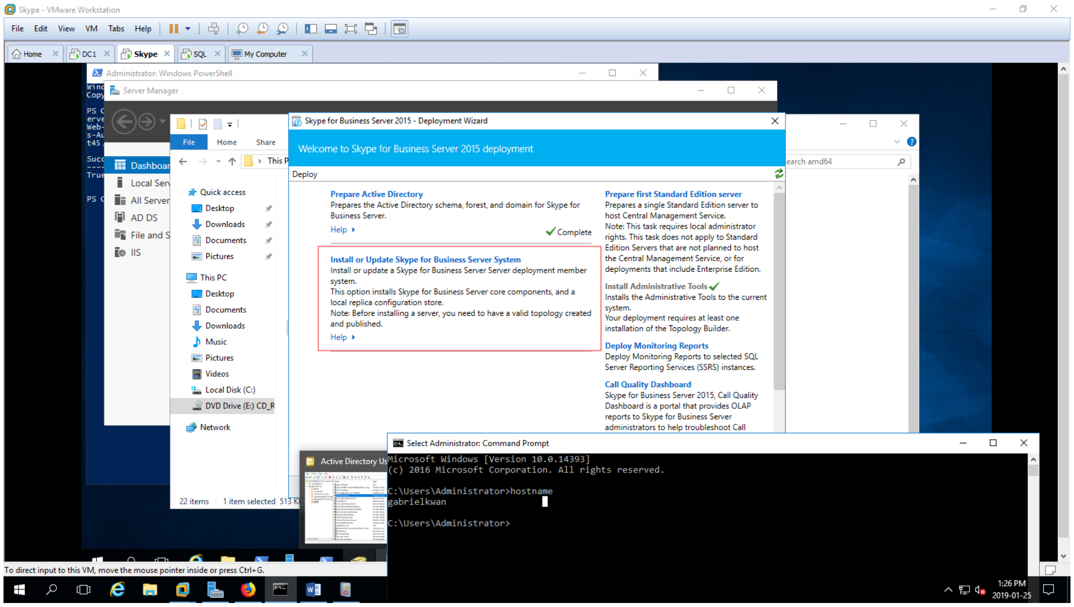
Topology publication failed. For details, check the log file.

Step	Status
Creating Central Management store	Failure
Setting Central Management store location...	Not attempted
Setting the connection to SQL for managing SQL AlwaysOn...	Not attempted
Publishing topology ...	Not attempt

Figure 10: Error Stating that Creating the Central Management Store has failed. Courtesy of Microsoft.

5.2 Installing the Skype for Business Server system

The following steps and information were sourced from Install Skype for Business Server on servers in the topology documentation unless otherwise specified.


Skype - VMware Workstation
File Edit View VM Tabs Help
Home DC1 Skype SQL My Computer
Administrator: Windows PowerShell
Server Manager
Dashboard
Local Serv
All Server
AD DS
File and S
IIS
File Home Share
Quick access
Desktop
Downloads
Documents
Pictures
This PC
Music
Videos
Local Disk (C:)
DVD Drive (E:) CD_R
Network
22 items 1 item selected 513 K
Active Directory Us
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
1:26 PM
2019-01-25

Skype for Business Server 2015 - Deployment Wizard

Welcome to Skype for Business Server 2015 deployment

Deploy

Prepare Active Directory
Prepares the Active Directory schema, forest, and domain for Skype for Business Server.
Help ▸ ✓ Complete

Install or Update Skype for Business Server System
Install or update a Skype for Business Server Server deployment member system.
This option installs Skype for Business Server core components, and a local replica configuration store.
Note: Before installing a server, you need to have a valid topology created and published.
Help ▸

Prepare first Standard Edition server
Prepares a single Standard Edition server to host Central Management Service.
Note: This task requires local administrator rights. This task does not apply to Standard Edition Servers that are not planned to host the Central Management Service, or for deployments that include Enterprise Edition.

Install Administrative Tools ✓
Installs the Administrative Tools to the current system.
Your deployment requires at least one installation of the Topology Builder.

Deploy Monitoring Reports
Deploy Monitoring Reports to selected SQL Server Reporting Services (SSRS) instances.

Call Quality Dashboard
Skype for Business Server 2015, Call Quality Dashboard is a portal that provides OLAP reports to Skype for Business Server administrators to help troubleshoot Call

Select Administrator: Command Prompt

```
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

C:\Users\Administrator>hostname
gabrielkwan

C:\Users\Administrator>
```

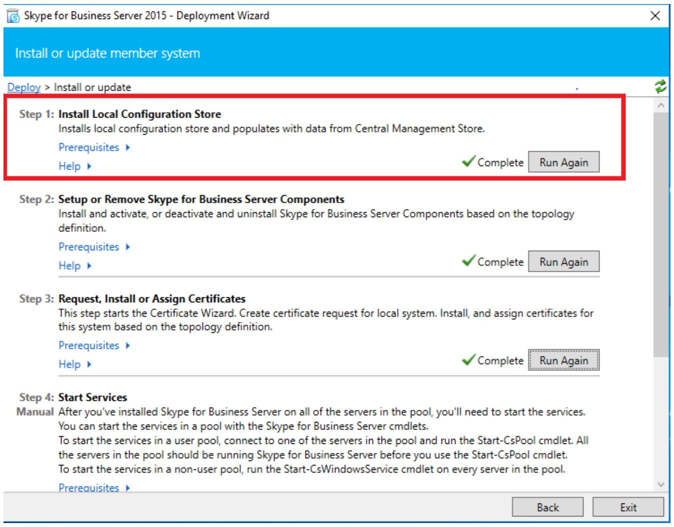
Figure 11: Select the red outlined step to begin install SfB Server System

The Installation of the Skype for Buisness services is a multistep process that consists of the following:

1. Install Local Configuration Store
2. Setup or Remove Skype for Business Server Componenets
3. Request, Install or Assign Certificates
4. Start Services

NOTE: that you must be an both a local administrator and an RTCUniversalServerAdmins group member for install to work

5.2.1 Installing the local Configuration Store


Skype for Business Server 2015 - Deployment Wizard
Install or update member system
Deploy > Install or update
Prerequisites
Help
Complete
Run Again
Back
Exit

Step 1: **Install Local Configuration Store**
Installs local configuration store and populates with data from Central Management Store.

Step 2: **Setup or Remove Skype for Business Server Components**
Install and activate, or deactivate and uninstall Skype for Business Server Components based on the topology definition.

Step 3: **Request, Install or Assign Certificates**
This step starts the Certificate Wizard. Create certificate request for local system. Install, and assign certificates for this system based on the topology definition.

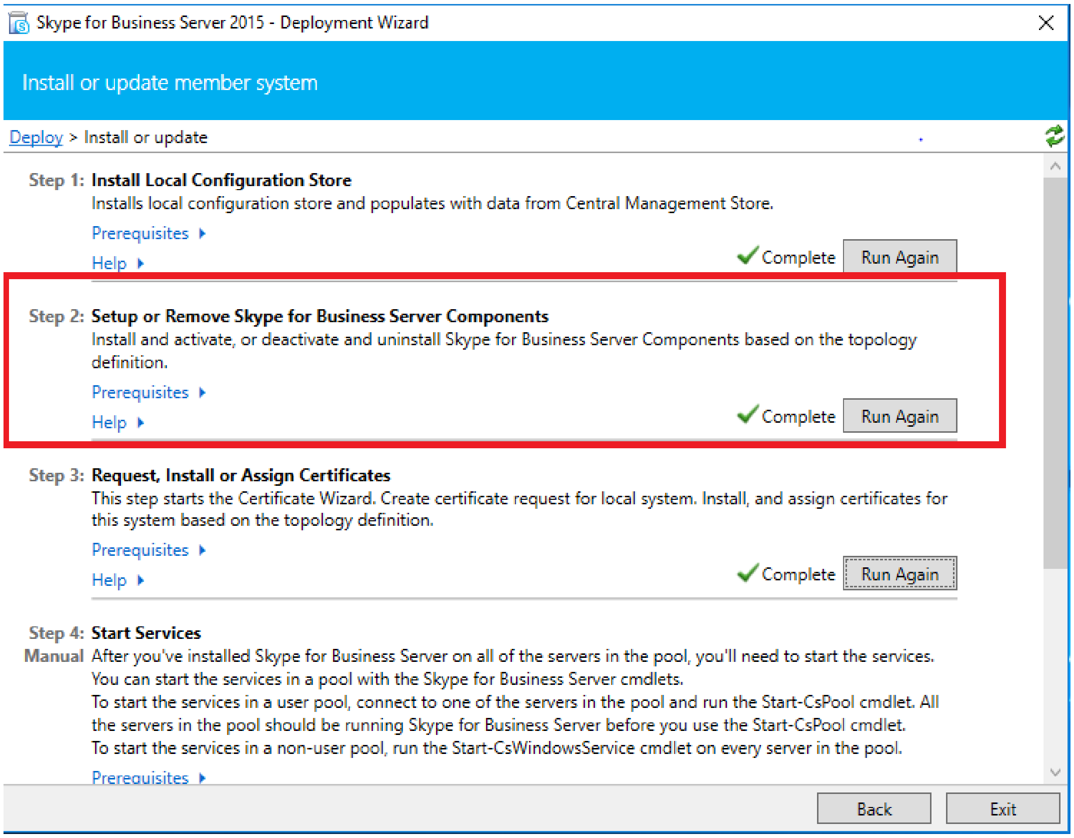
Step 4: Manual **Start Services**
After you've installed Skype for Business Server on all of the servers in the pool, you'll need to start the services.
You can start the services in a pool with the Skype for Business Server cmdlets.
To start the services in a user pool, connect to one of the servers in the pool and run the Start-CsPool cmdlet. All the servers in the pool should be running Skype for Business Server before you use the Start-CsPool cmdlet.
To start the services in a non-user pool, run the Start-CsWindowsService cmdlet on every server in the pool.

Figure 12: Where to begin installing local configuration store

This step initiates the creation of a read-only copy of the Central Mangament Store found on the `filestore.gabrielk.local` on the Skype Server.

1. Mount the SfB iso image and run the setup executable
2. Select the Install or Update Skype for Business Server System
3. Then select the "Install the local configuration store"
4. Ensure that the option "Retrieve directly from the Central Management Store" option is selected on the "Install Local Configuration Store Page.

5.2.2 Setup or remove Skype for Business Server Components


Skype for Business Server 2015 - Deployment Wizard
Install or update member system
Deploy > Install or update
Prerequisites
Help
✓ Complete
Run Again
Back
Exit

Step 1: Install Local Configuration Store
Installs local configuration store and populates with data from Central Management Store.

Step 2: Setup or Remove Skype for Business Server Components
Install and activate, or deactivate and uninstall Skype for Business Server Components based on the topology definition.

Step 3: Request, Install or Assign Certificates
This step starts the Certificate Wizard. Create certificate request for local system. Install, and assign certificates for this system based on the topology definition.

Step 4: Start Services
Manual After you've installed Skype for Business Server on all of the servers in the pool, you'll need to start the services.
You can start the services in a pool with the Skype for Business Server cmdlets.
To start the services in a user pool, connect to one of the servers in the pool and run the Start-CsPool cmdlet. All the servers in the pool should be running Skype for Business Server before you use the Start-CsPool cmdlet.
To start the services in a non-user pool, run the Start-CsWindowsService cmdlet on every server in the pool.

Figure 13: Where to Install Server Components

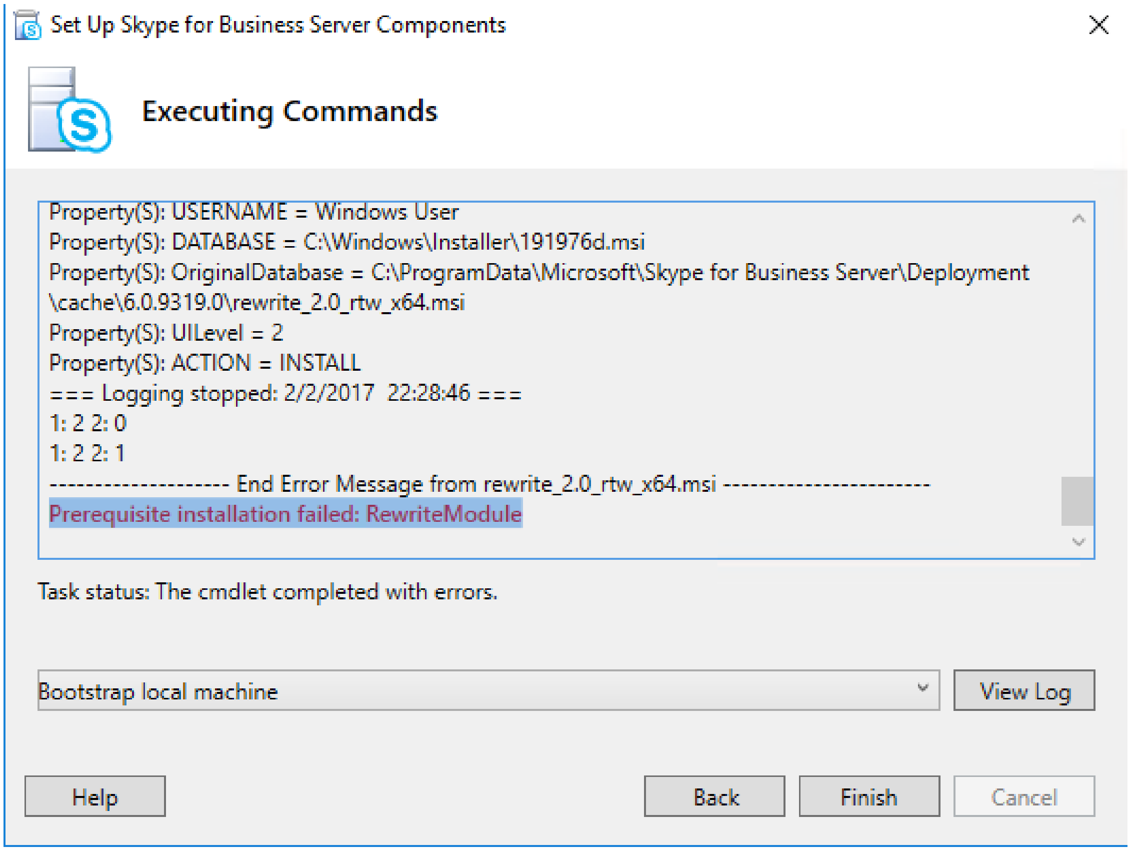
NOTE: This part of the setup takes the longest. Our initial install took several hours as it installs SQL Server 2016 Express on top of other components. Furthermore it is prone to break without warning. See Issues with Setup for SfB server Components for troubleshooting information. The basic steps to install are as follows:

1. Assuming you have mounted to the setup executable, and still have the installation wizard up, run step two.
2. On the Set up Skype for Business Server Componenets page, click next to start installing componenets
3. In the Executing Commands page, there will be a summary of commands and other installation information.

5.2.3 Issues with Setup for SfB server componenets

As previously mentioned, there were many issues that we ran into. Most of which were only resolved by republishing the topology. Others we were able to troubleshoot. Most notable of the issues that we could troubleshoot was the installer stating that a prerequisite installation has failed with regards to RewriteModule for IIS. After some research, we found several others who have run into this issue.

As Eli Shlomo suggest on his blogpost Prerequisite Installation Failed: Rewrite Module with Skype for Business on Windows Server 2016, this issue is caused by the version of RewriteModule that comes with SfB not not validating IIS10 found on Server 2016. More specifically, an arbitrary check for IIS version higher than 7 is conducted by the installer. However, we have version 10, which is much newer than 7. To resolve this issue, modifications to the registry value stating the version of IIS were made in the registery so that it



```
Property(S): USERNAME = Windows User
Property(S): DATABASE = C:\Windows\Installer\191976d.msi
Property(S): OriginalDatabase = C:\ProgramData\Microsoft\Skype for Business Server\Deployment
\cache\6.0.9319.0\rewrite_2.0_rtw_x64.msi
Property(S): UILevel = 2
Property(S): ACTION = INSTALL
=== Logging stopped: 2/2/2017  22:28:46 ===
1: 2 2: 0
1: 2 2: 1
-------------------- End Error Message from rewrite_2.0_rtw_x64.msi ----------------------
Prerequisite installation failed: RewriteModule
```

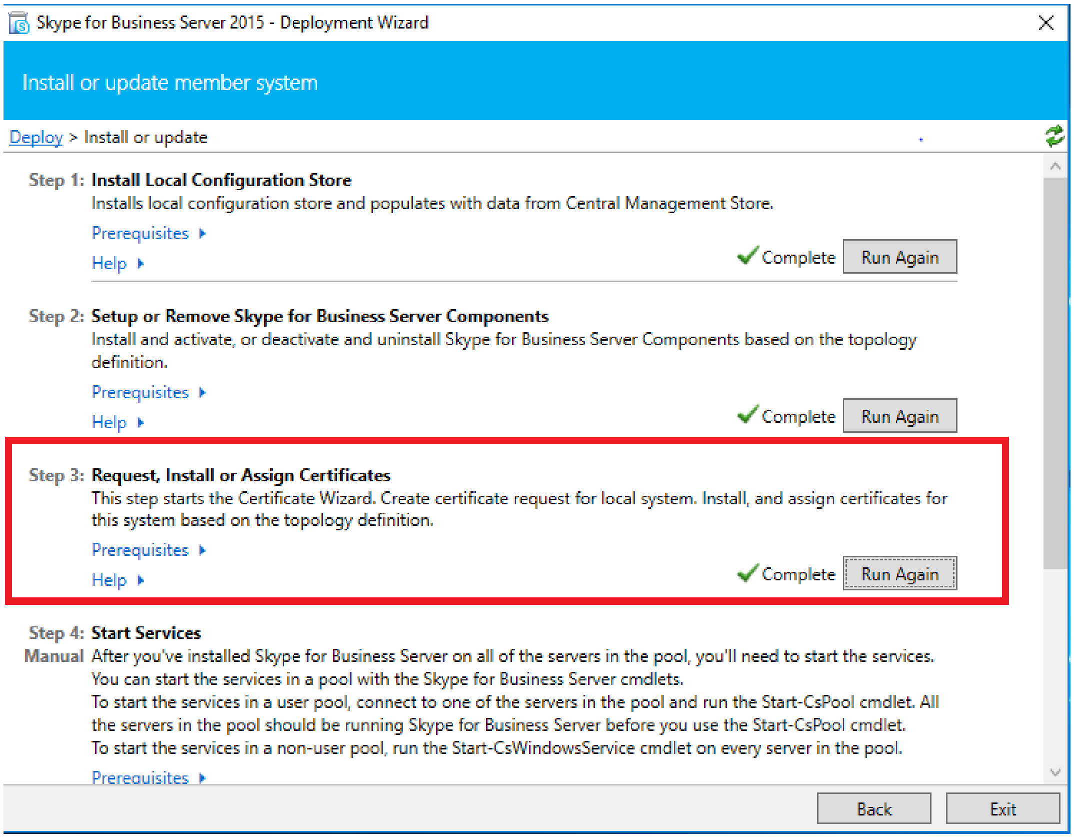
Task status: The cmdlet completed with errors.

Figure 14: Rewrite Module Error, sourced from Aerrow

matches the requirement of the installer. In doing so, the installer's check is circumvented. The steps to do so are as follows:

1. Start regedit.exe
2. Then navigate to `HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\inetStp`
3. Edit the MajorVersion so that its value is 7
4. Run install again, should succeed this time
5. Change MajorVersion back to 10.

5.2.4 Request, Install or assign certificates



Skype for Business Server 2015 - Deployment Wizard

Install or update member system

Deploy > Install or update

Step 1: **Install Local Configuration Store**
Installs local configuration store and populates with data from Central Management Store.

Step 2: **Setup or Remove Skype for Business Server Components**
Install and activate, or deactivate and uninstall Skype for Business Server Components based on the topology definition.

Step 3: **Request, Install or Assign Certificates**
This step starts the Certificate Wizard. Create certificate request for local system. Install, and assign certificates for this system based on the topology definition.

Step 4: **Start Services**
Manual
After you've installed Skype for Business Server on all of the servers in the pool, you'll need to start the services.
You can start the services in a pool with the Skype for Business Server cmdlets.
To start the services in a user pool, connect to one of the servers in the pool and run the Start-CsPool cmdlet. All the servers in the pool should be running Skype for Business Server before you use the Start-CsPool cmdlet.
To start the services in a non-user pool, run the Start-CsWindowsService cmdlet on every server in the pool.

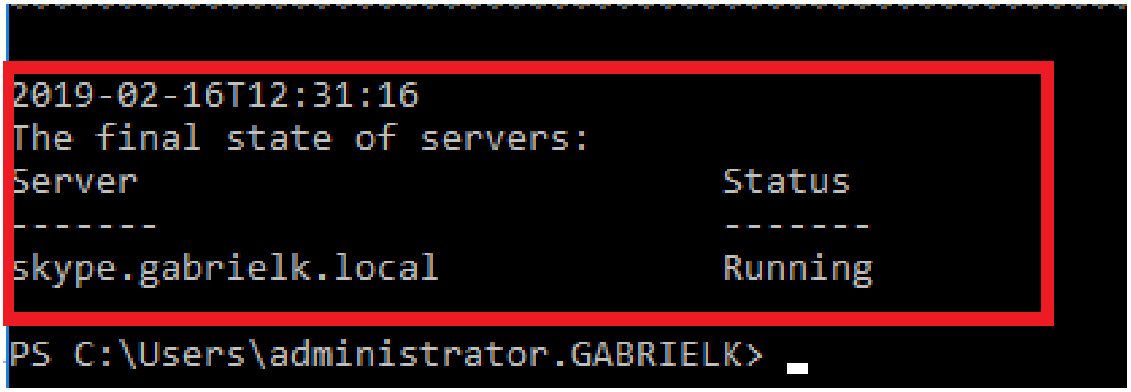
Figure 15: Where to Request a Certificate

1. In the certificate Wizard page, click request
2. In the certificate Request page, fill in the appropriate information and click next
3. click next on the following pages until executing command page.
4. Click next again to see summary.
5. Once thats complete, the Certificate assignment Page will show show up, click next
6. In the Summary Page, verify information is correct.
7. On the Executing Commands page verify that the tasks have been completed.

5.2.5 Start Services

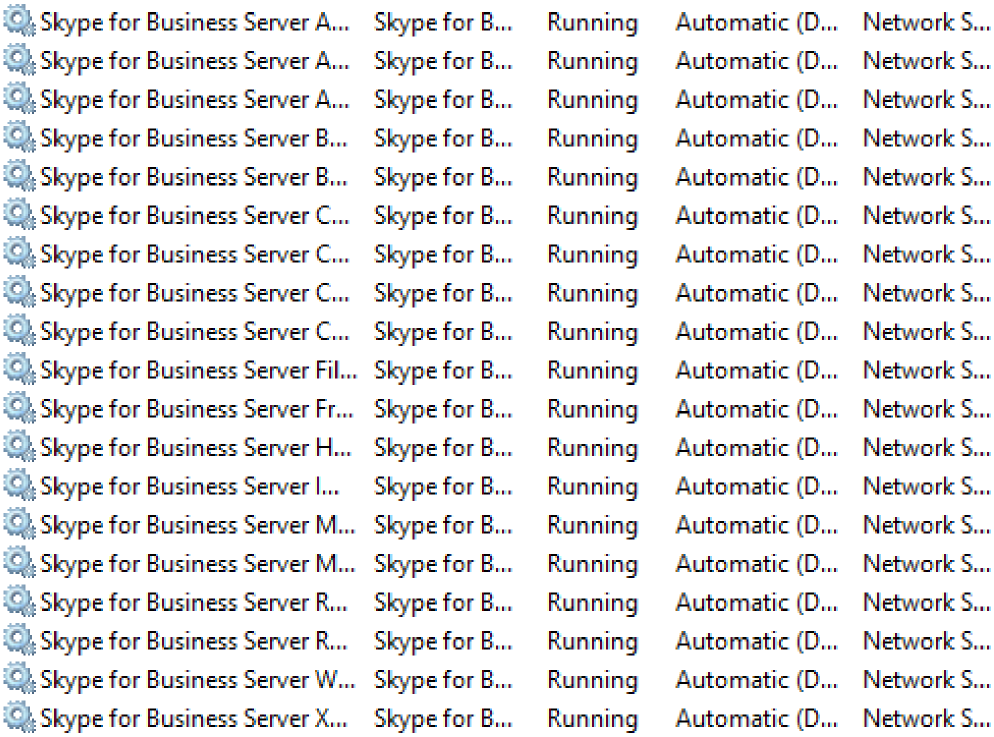
1. Open the Skype for Business Server Management Shell
2. enter Start-CsPool cmdlet and run.
3. When prompted, enter the pool fqdn, `pool.gabrielk.local`
4. The process may take a couple minutes,

Once its done it should show the something similar to the following:



```
2019-02-16T12:31:16
The final state of servers:
Server                         Status
--------                       --------
skype.gabrielk.local           Running

PS C:\Users\administrator.GABRIELK> _
```

Figure 16: Starting Services success



Skype for Business Server A...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server A...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server A...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server B...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server B...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server C...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server C...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server C...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server C...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server Fil...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server Fr...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server H...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server I...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server M...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server M...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server R...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server R...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server W...	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server X...	Skype for B...	Running	Automatic (D...	Network S...

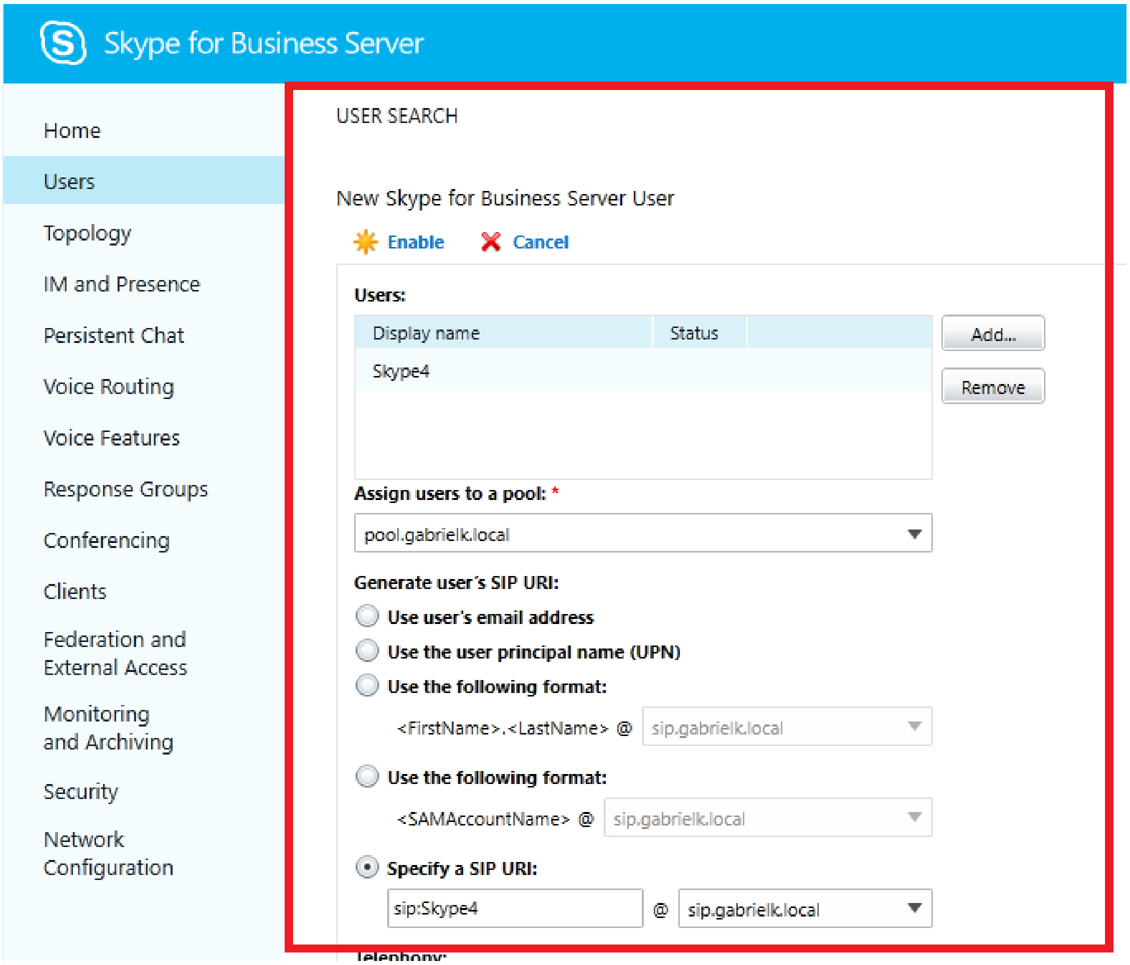
Figure 17: All Skype for business services should be running in services.msc

6 Testing Install

There were couple steps that needed to be taken in order to test.

1. Enable users
2. Install the clients
3. Login to Machine and Skype for Business

6.1 Enabling Users



New Skype for Business Server User

Users:

Display name	Status
Skype4	

Assign users to a pool: *

pool.gabrielk.local

Generate user's SIP URI:

○ Use user's email address

○ Use the user principal name (UPN)

○ Use the following format:

<FirstName>.<LastName> @ sip.gabrielk.local

○ Use the following format:

<SAMAccountName> @ sip.gabrielk.local

● Specify a SIP URI:

sip:Skype4 @ sip.gabrielk.local

Figure 18: Example configuration

1. Open the Skype for Business Control Pannel
   - you may need to install silverlight for this to work
2. When prompted enter csadmin credentials
3. Select Users on the right menu pane
4. Select Enable users action
5. Select Add
6. Search for users

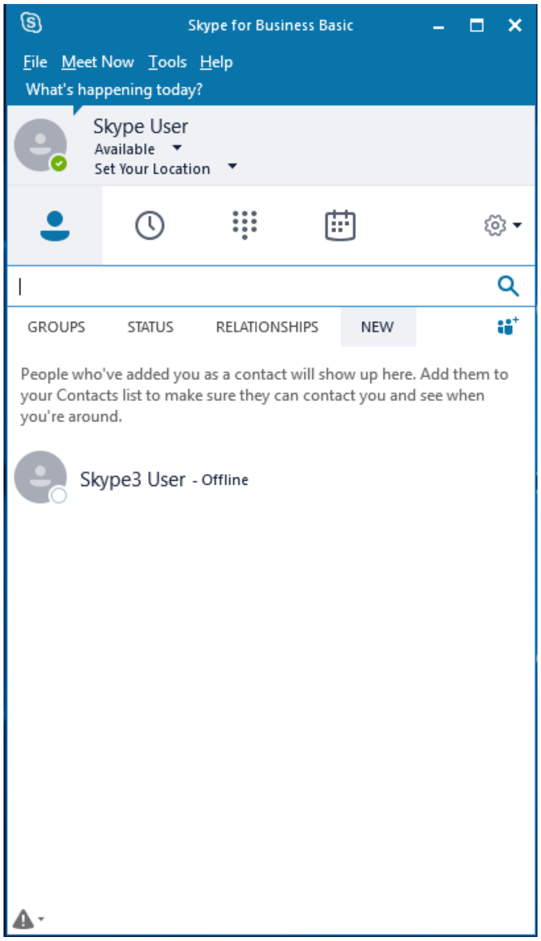
7. Click add once user has been found
8. add additional users if necessary
9. In the Assign users to pool textbox, select `pool.gabrielk.local`
10. Then select Specify SIP URI and enter as follows `<sip:username>@gabrielk.local`

6.2 Installing Clients

Clients software were sourced from here. Do not change any of the default settings when installing the clients.

6.3 Login to Clients

The final step to testing SfB is to login.

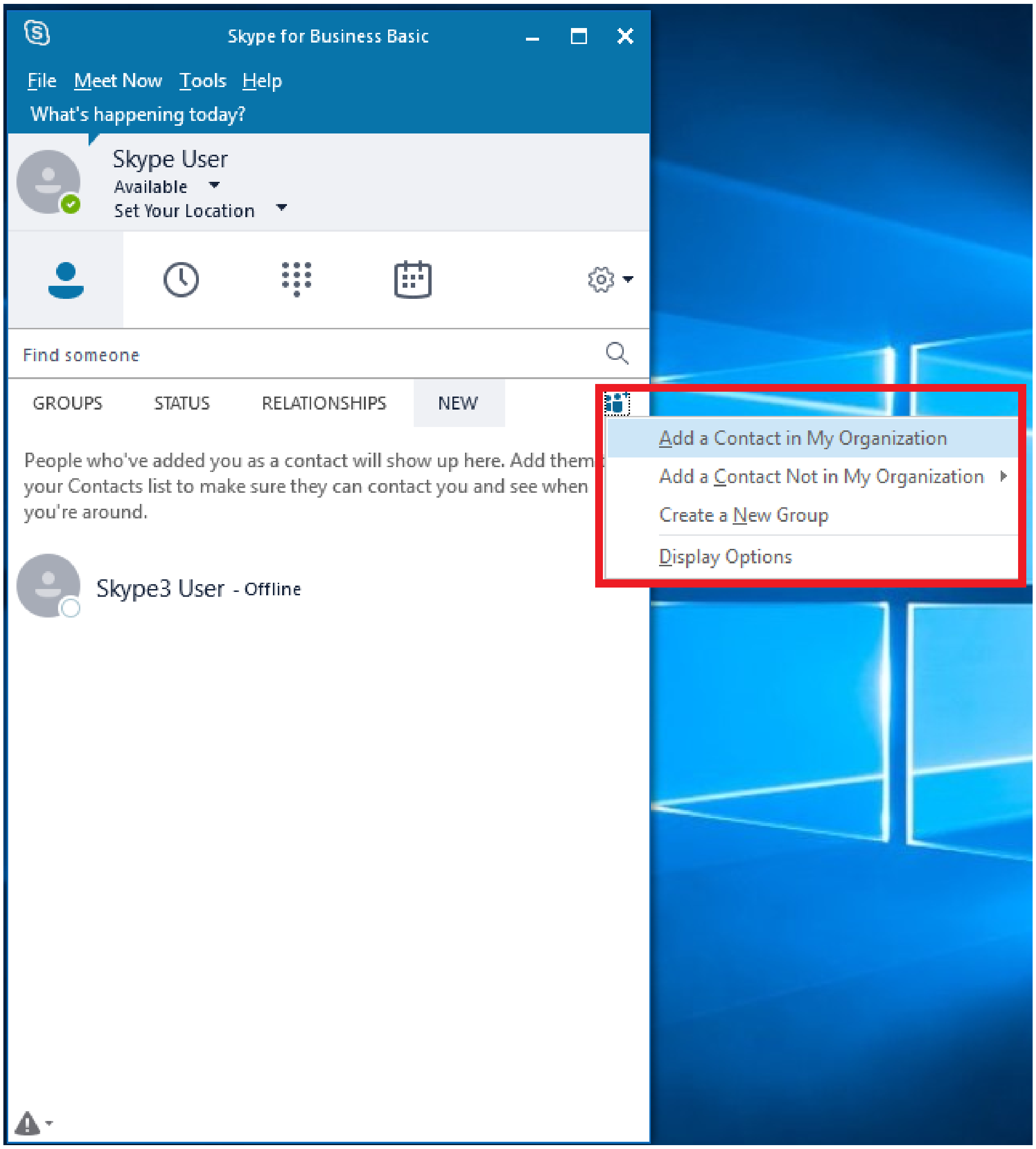


People who've added you as a contact will show up here. Add them to your Contacts list to make sure they can contact you and see when you're around.

Skype3 User - Offline

Figure 19: Example of client when logged in.

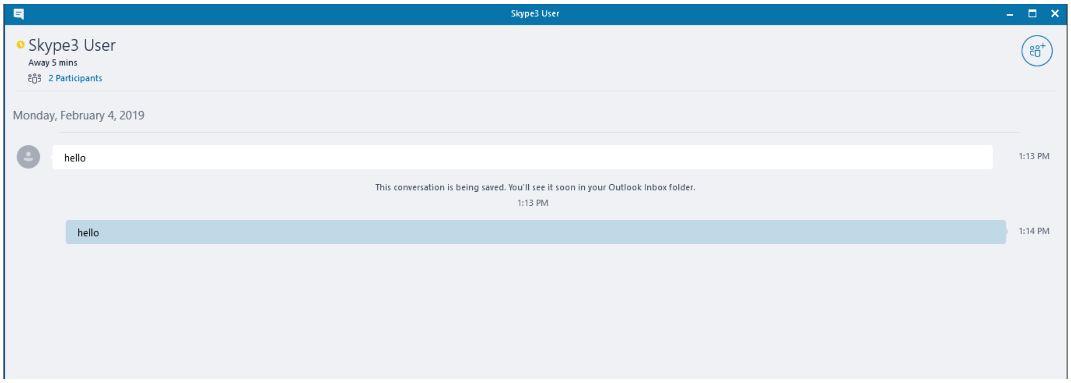
1. Login to desktop with enabled user
2. Open Skype for Business and specify the SIP URI and enter password to login
3. To add users click on the icon as seen here:



People who've added you as a contact will show up here. Add them your Contacts list to make sure they can contact you and see when you're around.

Skype3 User - Offline

4. repeat the previous steps on another machine with SfB
5. Search for the contact > right click on contact > Add to contact list
6. In the main screen, you can then test chats to users by double clicking them as seen here:



Monday, February 4, 2019

hello 1:13 PM

This conversation is being saved. You'll see it soon in your Outlook Inbox folder.
1:13 PM

hello 1:14 PM

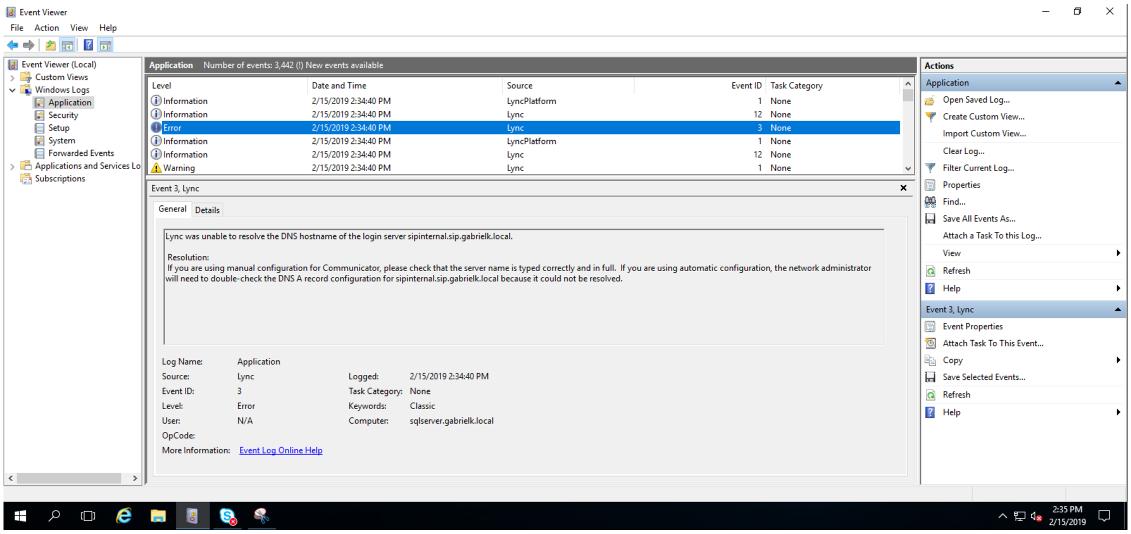
7. Check if other user can recieve messages

6.4 Issues with logging in

When clients were trying to login, there were some errors that came up despite having connectivity with the skype server. In order to troubleshoot we needed to enable logging for the clients. This can be done as follows:

1. In the Skype for business Client, select the gear icon on the right side
2. In the "General Section page", under the "Help your support team help you" pane, set the logging in Skype for Business to full.
3. To view the logs, open Event Viwer, and under Windows Logs select Application to view logs related to SfB Client

The biggest issue that we ran into was that SfB requires additional DNS records. In our case, it was not being able to resolve `sipinternal.sip.gabrielk.local` and `sipexternal.sip.gabrielk.local`. In order to resolve this, the DNS records for both these were created to point to the our skype server. In the case of final deployment, additional records of `sipinternal.gabrielk.local` and `sipexternal.gabrielk.local` will be created instead in light of using `gabrielk.local` as the sip domain rathern than `sip.gabrielk.local`.



Application   Number of events: 3,442 (!) New events available

```
Level          Date and Time          Source          Event ID  Task Category
Information    2/15/2019 2:34:40 PM   LyncPlatform           1  None
Information    2/15/2019 2:34:40 PM   Lync                  12  None
Error          2/15/2019 2:34:40 PM   Lync                   3  None
Information    2/15/2019 2:34:40 PM   LyncPlatform           1  None
Information    2/15/2019 2:34:40 PM   Lync                  12  None
Warning        2/15/2019 2:34:40 PM   Lync                   1  None
```

Event 3, Lync

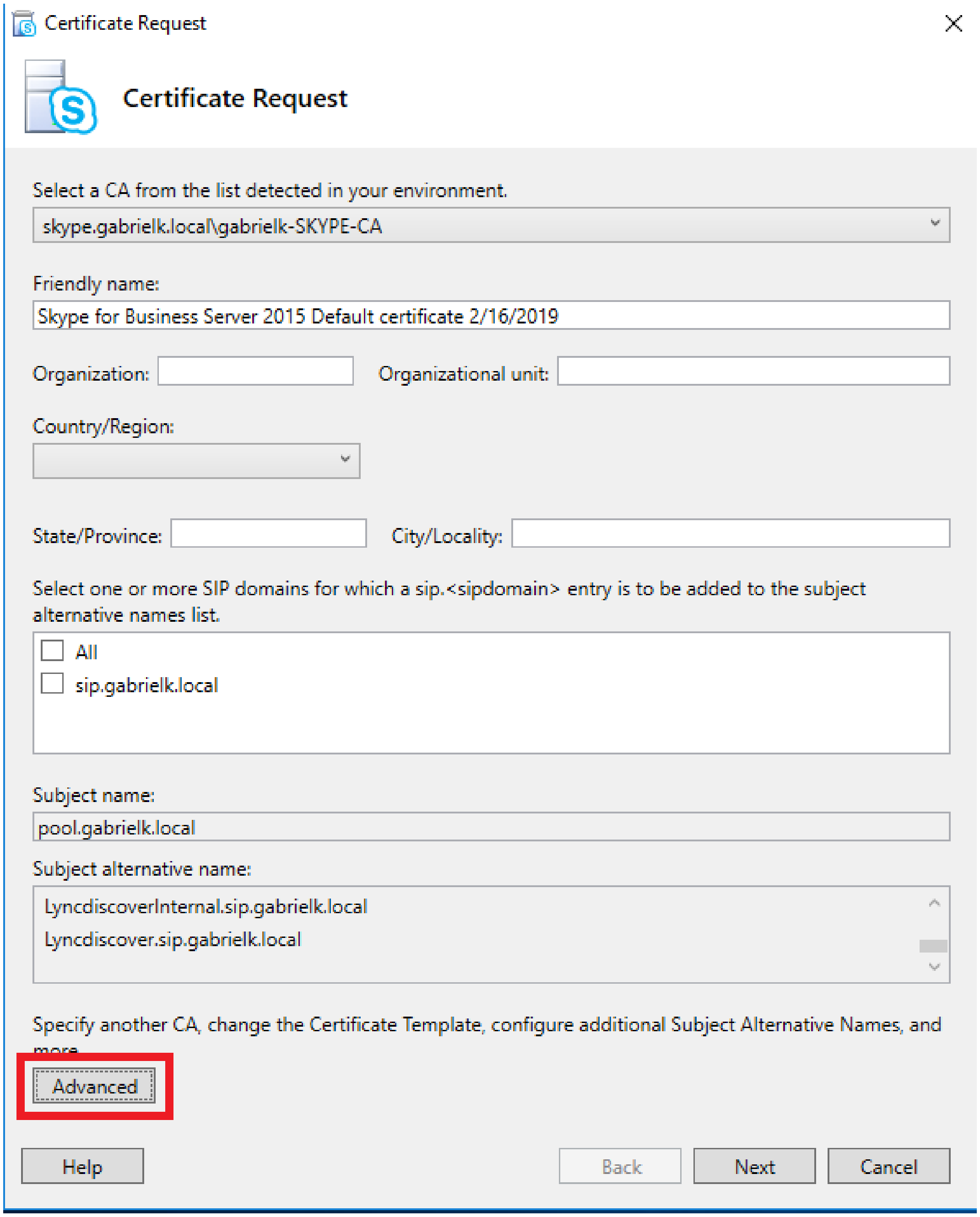
```
Lync was unable to resolve the DNS hostname of the login server sipinternal.sip.gabrielk.local.

Resolution:
If you are using manual configuration for Communicator, please check that the server name is typed correctly and in full.  If you are using automatic configuration, the network administrator
will need to double-check the DNS A record configuration for sipinternal.sip.gabrielk.local because it could not be resolved.
```

Log Name: Application
Source: Lync
Logged: 2/15/2019 2:34:40 PM
Event ID: 3
Task Category: None
Level: Error
Keywords: Classic
User: N/A
Computer: sqlserver.gabrielk.local
OpCode:
More Information: Event Log Online Help

Figure 20: Example of Lync server requesting sipinternal.sip.gabrielk.local

Because of the additional DNS records, these FQDNs needed to be added to the SaN of the Certificates as well. This can be done in the advanced settings when requesting a Certificate. This can be done by doing the following:

1. Open the Deployment Wizard on the Skype Server
2. Navigate to Install or Update Skype for Business Server System > Request, Install or Assign Certificates > Run Again
3. Click Request on the Certificate wizard
4. Click advanced as seen below:



Certificate Request

Select a CA from the list detected in your environment.

skype.gabrielk.local\gabrielk-SKYPE-CA

Friendly name:

Skype for Business Server 2015 Default certificate 2/16/2019

Organization:

Organizational unit:

Country/Region:

State/Province:

City/Locality:

Select one or more SIP domains for which a sip.<sipdomain> entry is to be added to the subject alternative names list.

□ All

□ sip.gabrielk.local

Subject name:

pool.gabrielk.local

Subject alternative name:

LyncdiscoverInternal.sip.gabrielk.local

Lyncdiscover.sip.gabrielk.local

Specify another CA, change the Certificate Template, configure additional Subject Alternative Names, and more.

5. Leave defaults until "Name and Security Settings" specify an appropriate name
6. In the "Configure Additional Subject Alternative Names", specify the additional DNS records that were created.
   - such as `sipexternal.gabrielk.local`
7. After you finish, Specify other information such as sip domain, orgnization, OU, country, etc and continue on with the regular process as specified in section Request, Install or assign certificates

7 Future Deployment

There are three major feature additions that the organization should consider to integrate Skype for Business into existing workflows. Those are as follows:

1. Remote User Connections
2. Exchange Integration
3. Client Side Devices
4. Federation with other SIP domains

7.1 Remote User Connection

While the current topology would certainly work for local machines connected to the network, Network Address translation may pose a problem for users to connect remotely. Some solutions would be to use VPNs, port forwarding, Remote Desktop, or placing the an proxy edge sever in a DMZ with public address.

VPNs have some notable benefits. First, we can encrypt all traffic destined for our network from remote employees using client-to-site VPNs such as Microsoft's Remote Access solutions or Cisco Anyconnect, or site-to-site VPNs using GRE over IPsec tunnels to remote sites. Secondly, a site-to-site VPN using ISRs require no additional public IP addressing beyond what is already being used to access the internet. Third, VPNs will allow maintaining existing ip addressing scheme across connected sites. This could potentially simplify the network at all layers of the campus network.

However, there are some drawbacks to VPNs. Depending on the amount of traffic, our ISRs could be overloaded by traffic from Skype for Business or other traffic. If voice communications is priority, QoS will further increase the compute necessary on our ISRs and may decrease overall effective WAN throughput. Furthermore, if security is of primary concern, Skype for Business Server already has encryption built in. Per Microsoft's Documentation Encryption for Skype for Business Server, Skype for business "use[s] TLS and MTLS to encrypt instant messages". As seen in our own deployment, the `skype.gabrielk.local` server required a certificate with the proper SaN and information for clients to be verify and connect to the server. Although increased security is not necessary a detraction, we must take into consideration the opportunity costs and additional administrative overhead of maintaining a CA as well as the VPNs.

Implementing a Edge Server server would also enable external connectivity without direct exposure of domain enabled servers and enables Skype for Business Mobility Client, and enables Federation. A reverse proxy is also required to enable various features such as downloading meeting content, mobility, autodiscovery and push notifications. Additionally Microsoft recomends using split brain DNS to allow external clients to access the server external NAT address while internal clients can connect a private address in "Advanced Edge Server DNS planning for Skype for Business". This has the additional benifit of saving WAN bandwidth.

There are several drawbacks however. Most notably would be the expense of implementation and complexity. Additional hardware or software licensing that may be required. Buying dedicated hardware such as Cisco ASAs would decrease latency and jitter of real time applications such as streaming, voice and conferencing; however, adding licensing for existing routers to have ASA features on existing routers would affect also compromise performance. Basic NAT configurability of currently employed ISRs are possible, however not scalable as complexity increases.

At this time, if it is a priority to enable remote user access as soon as possible, VPNs are the best solution. There are no additional configuration on the Skype Servers other than mentioned previously. Furthermore, all additional hardware/software requirements can be met with existing hardware. Additional VMs for client-to-site VPN Microsoft Remote Access Server should be quick, and GRE/IPSec tunnels could be set up after business hours quickly and brought down for troubleshooting quickly as well. However, for a more scalable and feature rich implementation, an Edge Server could be implemented. This document will outline some steps to install the edge server and reverse proxy. Note that configuration of the firewall is beyond the scope of this document and will be discussed at a later time.

The following section will contain 5 steps to implement remote user access. According to Microsoft's "Create your Edge topology for Skype for Business Server", there are 3 major steps to implementing an Edge Server. There are two additional steps that are required. All the steps are as follows:

1. Defining your Edge Server Topology
2. Publish your Edge Server Topology
3. Export your your Edge Server Topology
4. Deploy Edge Server
5. Reverse Proxy

The following section contains a summary of the above steps required to enable a single Edge server in the current topology. NOTE: These steps have not been tested and are based entirely on the previously mentioned article.

7.1.1 Defining your edge Server Topology

1. On your SfB Frontend pool server, open the SfB Server Topology Builder
2. Download the existing topology when prompted
3. Once the existing topology has been loaded, in the console tree, expand the site and right click Edge Pools and click new Edge Pool
4. On the "Define New Edge Pool" page, select next.
5. On the "Define the Edge pool FQDN screen specify the FQDN of the edge server ensure that option "Single Computer pool" is selected
6. In the features screen select the relevant features and proceed to the next page of the wizard
7. In the IP Options screen, ensure that atleast the ipv4 options are selected. At this time we do no have IPv6 implemented. In the case we do have IPv6 enabled for our networks by the time we implement this, ensure that the IPv6 is also selected.
    - Select "External IP address of this Edge pool is translated by NAT"
8. In step 7, enter the external FQDN in the SIP address box and provide a port number for each service and feature enabled
    - Microsoft recomends 444(Web Conferencing), 5061 (SIP), 443 (for A/V).
9. In the "Define the Internal IP Address" screen, type the IP address of the of the Edge Server
10. On the "Define the External IP Address" screen use the external IP address that will be used.
11. Enter the Public Ip address that will be used by external users. Contact the Firewall Administrator for this ip address when prompted.
12. In the "Define the next hop" screen, select the name of the internal pool. That should be `pool.gabrielk.local`.
13. Proceed to the following screen and click next.

7.1.2 Publishing the Edge Server Topology

Republish the topology as seen in 5.1.3

7.1.3 Exporting the Edge Server Topology

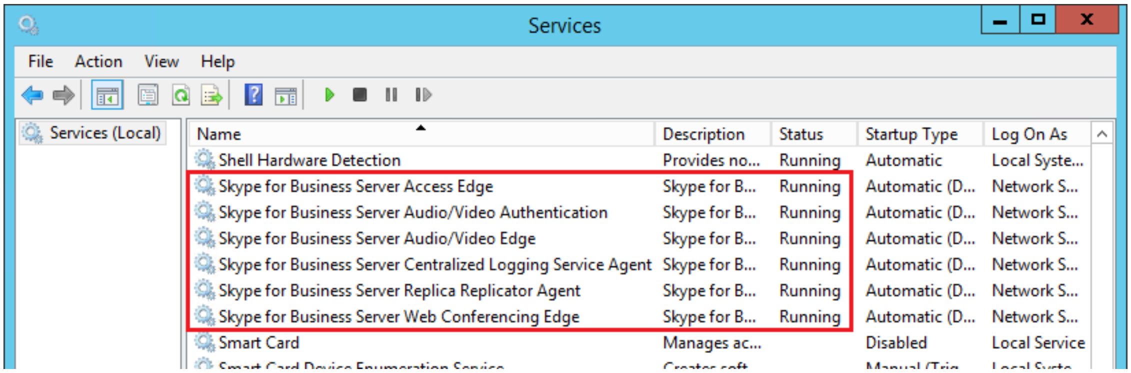
SfB deployment Wizard needs to access the central store for successful deployment. The following Steps will implement this:

1. Start the Managment Shell on the SfB frontend
2. run the following: `Export-CsConfiguration -FileName <ConfigurationFilePath.zip>`
3. Place the exported file in a file share that is reachable from the Edge Server

7.1.4 Deploying Edge Server

Microsoft does not have any documentation installing the edge server. As such, external resources are required. Based on Bob Schertz's "Skype for Business 2016 Edge Server Deployment" blog post, simply use the installer as you did with the backend servers but when prompted for the Data Import, import the arcive created in 7.1.3. An External certificate will be required. This is must be created by the CA.

Once its installed and certificates registered, start the services using services.msc as seen below:



Name	Description	Status	Startup Type	Log On As
Shell Hardware Detection	Provides no...	Running	Automatic	Local Syste...
Skype for Business Server Access Edge	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server Audio/Video Authentication	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server Audio/Video Edge	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server Centralized Logging Service Agent	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server Replica Replicator Agent	Skype for B...	Running	Automatic (D...	Network S...
Skype for Business Server Web Conferencing Edge	Skype for B...	Running	Automatic (D...	Network S...
Smart Card	Manages ac...		Disabled	Local Service
Smart Card Device Enumeration Service	Creates soft...		Manual (Trig...	Local Syste...

Figure 21: Sourced from Jeff Schertz blog post.

7.1.5 Deploying Reverse Proxy

The reverse proxy will require an additional server in the DMZ with IIS and Application Request routing. This server is not formally part of the topology or domain. Additional DMZ port forwarding rules may be required for it to work properly.

1. Install URL Rewrite for IIS on a fresh Server 2016 install. URL Rewrite can be acquired from IIS.net.
2. Once installed, go to the IIS control pannel of the IIS server, under the Default Website find URL rewrite module
3. Then choose add rules > Reverse Proxy
4. Then in the Inbound Rules input the FQDNs for `meet.gabrielk.local`, `dialin.gabrielk.local` and `schedule.gabrielk.local`
   (a) these DNS should be created and should point to the SfB server
   (b) two entries for each, of the FQDNs each with port 8080 or 4443

7.2 Exchange Integration

Per Microsoft Documentation "Configure Partner applications in Skype for Business Server and Exchange Server", integrating these other solutions are quite simple and allow for features such as Exchange Archiving, Exchange Unified Messaging for voice mail, and unified contact store amongst others. These integration's enable for more efficient workflow and increased productivity for both end users and administrators. Exchange Archiving enables administrators to maintain transcripts of user IMs and Web Conferencing on mailboxes rather than on the sql server associated with SfB. This enables the use of Exchange's robust mailbox search, providing a single interface for archiving/eDiscovery of all electronics communications for legal or policy reasons. Exchange Unified Messaging for voice mail enables voice mail storage on the Exchange Server. As suggested in "Exchange Server Unified Messaging for Skype for Business Server voice mail", users can have their voice mail messages saved on Exchange 2016/2013 as email messages in user inboxes. Integration of contacts is also important feature allowing the user to use a single set of contacts for both email, and unified communications.

While it appears to be straight forward, there are some requirements. Beyond requiring at least exchange server 2013 and Sharepoint 2013, third party security tokens must be configured for communications between outside of our forest. To enable communications between servers within the domain there are several scripts that must be run. These are already built into the installers/active applications. See the aforementioned documentation for "Configuring Partner Applications in Skype for Business Server and Exchange Server" for more details.

The commands to configure interoperability between Exchange and SfB are sourced from Microsoft documentation with minor changes to match our topology. Said commands to configure base integration between Exchange and SfB are as follows:

7.2.1 CMDs to integrate Exchange and SfB

The following Commands are used for integrating SfB with Exchange. Some of the commands will require support from the Exchange Admin Team.

```
"C:\Program Files\Microsoft\Exchange Server\V15\Scripts\Configure-EnterprisePartnerApplication.ps1 ^
-AuthMetaDataUrl 'pool.gabrielk.local/metadata/json/1' -ApplicationType Lync"
```

Figure 22: Command to be run in Exchange Management Shell, the `AuthMetaDataURL` argument should be the FQDN of the Skype for Business server pool with the additiona `/metadata/json/1` path.

```
iisreset <exchange server>
```

Figure 23: Command to be run in Echange Management Shell to restart IIS Services. This is required after the `Configure-EnterprisePartnerApplication.ps1` PS script is run

```
New-CsPartnerApplication -Identity Exchange -ApplicationTrustLevel Full -MetadataUrl ^
"https://autodiscover.gabrielk.local/autodiscover/metadata/json/1"
```

Figure 24: Command to be run in the SfB Management console. The MetadataURL argument should be the autodiscover FQDN with the additional `/autodiscover/metadata/json/1`

```
Test-CsExStorageConnectivity -SipUri "sip:skypeuser@gabrielk.local"
```

Figure 25: Command to test integration on SfB Console. THe command will fail if interoperability is not functional.

Additional features like Exchange Archiving, Exchange Unified Messaging for voice mail, and unified contact store require additional steps and commands. Those steps will be discussed in the following sections.

7.2.2 Enabling Exchange Archiving

```
Set-CsArchivingConfiguration -Identity "global" -EnableArchiving ImOnly -EnableExchangeArchiving $True
```

Figure 26: Command to be run in Exchange Management Shell to enable Exchange Archiving

7.2.3 Enabling Unified Contact Store

```
Set-CsUserServicesPolicy -Identity global -UcsAllowed $True
```

Figure 27: Command to enable unified contact store for all users

If you wish to enable for a single user, use `$False` for UcsAllowed argument and manually enable user by using the following:

```
Grant-CsUserServicesPolicy -Identity "Skype User" -PolicyName "AllowUnifiedContactStore"
```

Figure 28: Command to create a new SfB service policy named `AllowUnifiedContactStore`.

```
Grant-CsUserServicesPolicy -Identity "Skype User" -PolicyName "AllowUnifiedContactStore"
```

Figure 29: Command to enable Unified Contact Store for a single user by applying the previously created policy. Use `-Identity <Firstname> <lastname>` to specify the user.

```
Test-CsUnifiedContactStore -UserSipAddress "sip:skypeuser@gabrielk.local" -TargetFqdn ^
"pool.gabrielk.local"
```

Figure 30: Testing the Unified Contact Store. If command succeeds, integration is complete

7.2.4 Configure Exchange Server Unified Messaging for Skype for Business Server Voice Mail

The following section contains an high level overview of enabling SfB voice mail on Exchange. The details of enabling this feature is quite extensive and deserves its own independent documentation. See page for more details.

1. Create a new unified messaging dial plan on Exchange Server
2. Ensure that Unified messaging Server is set to Dual mode
3. Configure UM Call Router
4. Create a UM mailbox Policy
5. Apply policy to users

7.3 Client Side Devices

Beyond the Windows client tested, there are several other methods of accessing the SfB Server. Mot notably, are Mobile devices. Android and iOS clients are available on their respective app stores. To ensure connectivity for mobility devices, Edge Server an the appropriate DNS records must be implemented. Further testing on the actual implementation is required before deployment. Said testing will be conducted the main deployment is complete. Other devices include ip phones. Per Microsoft documentation, SfB provides reliable, scalable PSTN connectivity using SIP trunks to Service Providers, Direct SIP connection to a PSTN gateway, and direct SIP connection to a PBX.

7.4 Federation

Federation would allow our organization to communicate with partner who also have SfB as their messaging platform. For this configuration to work, follow the steps in 7.1.1 but also select Enable Federation for Edge Pool (Port 5061) in step 6. A DNS SRV record in your external DNS Server must also be created. This would be `_sipfederationtls._tcp.gabrielk.local`. Additional ports 5061 must be opened on the firewall and forwarded to the Edge Server's A record. This will allow partner Federations to discover the edge server.

8 Conclusion

Overall, setting up SfB has been a frustrating experience. There were issues at every nearly every major step. Anticipate even more issues and delays as integration with existing systems like Exchange increase. Although Microsoft cites easy integration with single powershell scripts, those claims are dubious given our experience so far. Unless on-premise text chat is required, there are plenty of alternatives including own Microsoft Teams, and Slack amongst others.

More importantly, it appears that SfB on-premise is ending its life cycle as a premier Microsoft product. Despite the latest release of SfB 2019 on October 2018, Microsoft states in its FAQ that while they "recognize that customers are using Skype for Business Server and many need to continue to use Skype for Buiness on-premise for some users or geographies due to their requirements," they also "encourage organizations to adopt Teams in conjunction with Skype for Business." This statement suggests that SfB, at least in its on-premise form, is near its end of developement. It would be prudent to move towards products likely to see continued developement and support.