Citrix SD-WAN Center 10.1
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</table>
System requirements and installation

January 9, 2019

Before you install Citrix SD-WAN Center on a VM, make sure that you must understand the hardware and software requirements and have met the prerequisites.

Note
The system requirements are common for both single-region network and multi-region network.

Hardware requirements

Citrix SD-WAN Center has the following hardware requirements.

Processor

- 4 Core, 3 GHz (or equivalent) processor or better for a server managing up to 64 sites.
- 8 Core, 3 GHz (or equivalent) processor or better for a server managing up to 128 sites.
- 16 Core, 3 GHz (or equivalent) processor or better for a server managing up to 256 sites.
- 32 core, 3 GHz (or equivalent) processor or better for a server managing up to 550 sites.

Memory

- A minimum of 8GB of RAM is strongly recommended for a VM managing up to 64 sites.
- A minimum of 16GB of RAM is strongly recommended for a VM managing up to 128 sites.
- A minimum of 32GB of RAM is strongly recommended for a VM managing up to 256 sites.
- A minimum of 32GB of RAM is strongly recommended for a VM managing up to 550 sites.

Disk space requirements

The following table provides some guidelines for determining the disk space requirements for Citrix SD-WAN Center data storage. Use direct access storage.

Estimated disk space requirement
### Network Bandwidth

The following table provides some guidelines for determining network bandwidth requirements for the Citrix SD-WAN Center VM.

<table>
<thead>
<tr>
<th># Client Sites</th>
<th>Average # WAN Links per Site</th>
<th>Average # Intranet/Internet Services per Site</th>
<th>Average # Virtual Paths per Site</th>
<th>Database Size (TB) for 1 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1.2T</td>
</tr>
<tr>
<td>32</td>
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<td>32</td>
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<td>8</td>
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<td>2</td>
<td>1.8T</td>
</tr>
<tr>
<td>96</td>
<td>4</td>
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<td>3.3T</td>
</tr>
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<td>96</td>
<td>8</td>
<td>8</td>
<td>8</td>
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<td>128</td>
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<td>8</td>
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<td>2</td>
<td>2.6T</td>
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<td>5.6T</td>
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</table>

**Network Bandwidth**

The following table provides some guidelines for determining network bandwidth requirements for the Citrix SD-WAN Center VM.

Estimated network bandwidth requirements
### Citrix SD-WAN Center 10.1

<table>
<thead>
<tr>
<th># Client Sites</th>
<th>Average # WAN Links</th>
<th>Average # Virtual Paths per Site</th>
<th>Total VWAN Data per 5-min Poll (MB)</th>
<th>Bandwidth Rate to Configure per 5-min Poll (Kbps)</th>
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<tr>
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<td>Default 1000</td>
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<td>4</td>
<td>89.3</td>
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<tr>
<td>550</td>
<td>8</td>
<td>8</td>
<td>415.7</td>
<td>24000</td>
</tr>
</tbody>
</table>

**Software**

Citrix SD-WAN Center VPX can be configured on the following platforms:

- Hypervisor
Citrix SD-WAN Center 10.1

- VMware ESXi server, version 5.5.0 or higher.
- Citrix XenServer 6.5 or higher.
- Microsoft Hyper-V 2012 R2 or higher.

Cloud Platform

- Microsoft Azure

Browsers must have cookies enabled, and JavaScript installed and enabled.

The Citrix SD-WAN Center Web Interface is supported on the following browsers:

- Google Chrome 40.0+
- Microsoft Internet Explorer 11+
- Mozilla Firefox 41.0+

Prerequisites

Following are the prerequisites for installing and deploying Citrix SD-WAN Center:

- The SD-WAN Master Control Node (MCN) and existing client nodes must be upgraded to the latest Citrix SD-WAN software version.
- It is recommended to have a DHCP server available and configured in the SD-WAN network.
- You must have the Citrix SD-WAN Center installation files.

Note

You cannot customize or install any third party software on Citrix SD-WAN Center. However, you can modify the vCPU, memory and storage settings.

Download Citrix SD-WAN Center software

Download the Citrix SD-WAN Center Management Console software installation files, for the required release and platform, from the Downloads page.

The Citrix SD-WAN Center installation files use the following naming convention:

ctx-sdwc-version_number-platform.extension

- *version_number* is the Citrix SD-WAN Center release version number.
- *platform* is the platform type, hypervisor, or cloud platform name.
- *extension* is the installation file extension.

<table>
<thead>
<tr>
<th>Platform</th>
<th>File extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citrix XenServer</td>
<td>.xva</td>
</tr>
</tbody>
</table>
Gather the Citrix SD-WAN Center installation and configuration information

This section provides a checklist of the information you will need to complete your Citrix SD-WAN Center installation and deployment.

Gather or determine the following information:

- The IP address of the ESXi server, XenServer, Hyper-V server, or Azure that hosts the Citrix SD-WAN Center Virtual Machine (VM).
- A unique name to assign to the Citrix SD-WAN Center VM.
- The amount of memory to allocate for the Citrix SD-WAN Center VM.
- The amount of disk capacity to allocate for the virtual disk for the VM.
- The Gateway IP Address the Citrix SD-WAN Center will use to communicate with external networks.
- The subnet mask for the network in which the Citrix SD-WAN Center VM will be installed.

Install and configure Citrix SD-WAN Center on ESXi Server

October 15, 2018

Install the VMware vSphere client

Following are basic instructions for downloading and installing the VMware vSphere client that you will use to create and deploy the Citrix SD-WAN Center Virtual Machine. For more information, see VMware vSphere Client documentation.

To download and install the VMware vSphere Client, do the following:

1. Open a browser and navigate to the ESXi server that will host your vSphere Client and Citrix SD-WAN Center Virtual Machine (VM) instance.
   The VMware ESXi Welcome page appears.
2. Click the **Download vSphere Client** link to download the vSphere Client installation file.

3. Install the vSphere Client.
   
   Run the vSphere Client installer file that you just downloaded, and accept each of the default options when prompted.

4. After the installation completes, start the vSphere Client program.
   
   The VMware vSphere Client login page appears, prompting you for the ESXi server login credentials.
5. Enter the ESXi server login credentials:
   - **IP address / Name**: Enter the IP Address or Fully Qualified Domain Name (FQDN) for the ESXi server that will host your Citrix SD-WAN Center VM instance.
   - **User name**: Enter the server administrator account name. The default is root.
   - **Password**: Enter the password associated with this administrator account.

6. Click **Login**.

   The vSphere Client main page appears.
Creating the Citrix SD-WAN Center VM using OVF template

After installing the VMware vSphere client, create the Citrix SD-WAN Center virtual machine.

1. If you have not already done so, download the Citrix SD-WAN Center OVF template file (.ova file) to the local PC.
   For more information, see System requirements and installation.

2. In the vSphere Client, click File, and then select Deploy OVF Template from the drop-down menu.
   The Deploy OVF Template wizard appears.
3. Click **Browse** and select the Citrix SD-WAN Center OVF template (.ova file) that you want to install.

4. Click **Next**.
   
   The ova file is imported and the OVF Template Details page appears.

5. Click **Next**.

6. On the End User License Agreement page, click **Accept**, and then click **Next**.

7. On the Name and Location page, enter a unique name for the new VM (or accept the default value).
   
   The name must be unique within the current **Inventory** folder, and can be up to 80 characters in length.

8. Click **Next**.

   The Storage page appears.
9. For now, accept the default storage resource by clicking **Next**. You can also configure the datastore. For more information see **Add and configure the Datastore on ESXi server**.
10. On the Disk Format page, accept the default settings, and click **Next**.

11. On the Network Mapping page, accept the default (VM Network) and click **Next**.

12. On the Ready to Complete page, click **Finish** to create the VM.

   **Note:**
   
   Decompressing the disk image onto the server could take several minutes.

13. Click **Close**.

**View and record the management IP address on ESXi server**

The management IP address is the IP address of the SD-WAN Center VM, use this IP address to log into the Citrix SD-WAN Center Web UI.

   **Note**

   The DHCP server must be present and available in the SD-WAN network.

To display the management IP address, do the following:

1. On the vSphere client Inventory page, select the new Citrix SD-WAN Center VM in the **Inventory** tree (left pane).
2. On the Citrix SD-WAN Center page, under Basic Tasks, click **Power on the Virtual Machine**.

3. Select the **Console** tab, and then click anywhere inside the console area to enter console mode. This turns control of your mouse cursor over to the VM console.

   **Note**

   To release console control of your cursor, press the <Ctrl> and <Alt> keys simultaneously.

4. Press **Enter** to display the console login prompt.

5. Log into the VM console.

   The default login credentials for the new Citrix SD-WAN Center VM are as follows:
   - Login: admin
   - Password: password
6. Record the Citrix SD-WAN Center VM’s management IP address, which is shown as the Host IP address in a welcome message that appears when you log on.

**Note**

The DHCP server must be present and available in the SD-WAN network, or this step cannot be completed.

If the DHCP server is not configured in the SD-WAN network, you have to manually enter a static IP
address.

To configure a static IP address as the management IP address:

1. When the VM is started, click the Console tab.
2. Log into the VM. The default login credentials for the new Citrix SD-WAN Center VM are as follows:
   - Login: admin
   - Password: password
3. In the console enter the CLI command `management_ip`.
4. Enter the command `set interface <ipaddress> <subnetmask> <gateway>`, to configure management IP.

**Add and Configure the Datastore on an ESXi server**

You can add and configure datastore to store statistics from Citrix SD-WAN Center.

To add and configure the datastore:

1. In the vSphere client, click the Inventory icon to open the Inventory page.
2. Expand the Inventory tree branch for the Citrix SD-WAN Center VM host server.
3. In the left pane, click + next to the IP Address for the server hosting the Citrix SD-WAN Center VM you just created.
4. Open the new Citrix SD-WAN Center VM for editing.
5. In the Inventory tree, right-click on the name of the Citrix SD-WAN Center VM you just created and select Edit Setting from the drop-down menu.
6. In the Memory Size field, enter the amount of memory to allocate for this VM. For more information, see Memory Requirements.

7. Click Add.

8. On the Device Type page of the Add Hardware wizard, select Hard Disk and then click Next.
9. On the Select a Disk page, select **Create a new virtual disk** and click **Next**.

10. On the Create a Disk page, in the **Capacity** section, select the disk capacity for the new virtual...
disk.

11. In the Disk Provisioning section, select **Thick Provision Lazy Zeroed** (the default).

12. In the Location section, select **Specify a datastore or datastore cluster**.

13. Click **Browse**.

14. Select a datastore with sufficient available space, and click **OK**.

15. Click **Next**.

16. On the Advanced Options page, accept the **Advanced Options** default settings and click **Next**.
17. Click **Finish**.

This adds the new virtual disk, dismisses the Add Hardware wizard, and returns you to the Virtual Machine Properties page.

18. Click **OK**.
Install and configure Citrix SD-WAN Center on XenServer

October 25, 2018

Before installing the Citrix SD-WAN Center virtual machine on a XenServer server, gather the necessary information as described in Gathering the Citrix SD-WAN Center Installation and Configuration Information.
**Install the XenServer server**

To install the Citrix XenServer server on which you will deploy the Citrix SD-WAN Center virtual machine, you must have XenCenter installed on your computer. If you have not already done so, download and install XenCenter.

To install a XenServer server:

1. Open the XenCenter application on your computer.

2. In the left tree pane, right-click on `XenCenter` and select *Add*.

3. In the **Add New Server** window, enter the required information in the following fields:
   - **Server**: Enter the IP Address or Fully Qualified Domain Name (FQDN) of the XenServer server that will host your Citrix SD-WAN Center VM instance.
   - **Username**: Enter the server administrator account name. The default is root.
   - **Password**: Enter the password associated with this administrator account.

4. Click *Add*.

The new server’s IP address appears in the left pane.
Create the Citrix SD-WAN Center VM using the XVA file

The Citrix SD-WAN Center virtual machine software is distributed as an XVA file. If you have not already done so, download the .xva file. For more information, see System requirements and installation.

To create the Citrix SD-WAN Center VM:

1. In XenCenter, right-click XenServer and click Import.

2. Browse to the downloaded .xva file, select it, and click Next.
3. Select a previously created XenServer server as the location to which to import the VM, and click Next.

4. Select a storage repository where the virtual disk for the new VM will be stored, and click Import.

For now, you can accept the default storage resource. Or you can configure the datastore. For
The imported Citrix SD-WAN Center VM appears in the left pane.

5. Select a network to which to connect the VM, and click **Next**.
6. Click **Finish**.

**View and record the management IP address on XenServer**

The management IP address is the IP address of the Citrix SD-WAN Center VM, use this IP address to log into the Citrix SD-WAN Center Web UI.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>The DHCP server must be present and available in the SD-WAN network.</td>
</tr>
</tbody>
</table>

To display the management IP Address:

1. In the XenCenter interface, in the left pane, right-click the new Citrix SD-WAN Center VM and select **Start**.

2. When the VM is started, click the **Console** tab.
3. Make a note of the management IP address.

   **Note**
   The DHCP server must be present and available in the SD-WAN network, or this step cannot be completed.

4. Log into the VM. The default login credentials for the new Citrix SD-WAN Center VM are as follows:

   **Login**: admin  
   **Password**: password

   If the DHCP server is not configured in the Citrix SD-WAN network, you have to manually enter a static IP address.

To configure a static IP address as the management IP address:

1. When the VM is started, click the **Console** tab.

2. Log into the VM. The default login credentials for the new Citrix SD-WAN Center VM are as follows:

   **Login**: admin  
   **Password**: password

3. In the console enter the CLI command **management_ip**.

4. Enter the command `set interface <ipaddress> <subnetmask> <gateway>`, to configure management IP.

**Add and configuring data storage for a XenServer server**

You can add and configure data storage to store statistics from Citrix SD-WAN center.

To add and configure the data storage:

1. In XenCenter, shut down the Citrix SD-WAN Center VM.

2. On the **Storage** tab, click **Add**.
3. In the **Name** field, enter a name for the virtual disk.

4. In the **Description** field enter a description of the virtual disk.

5. In the **Size** field select the size required.

6. In the **Location** field select the local storage.

7. Click **Add**.

---

**Install and configure Citrix SD-WAN Center on Microsoft Hyper-V**

August 9, 2018

Before installing the Citrix SD-WAN Center virtual machine (VM) on the Microsoft Hyper-V server, gather the necessary information as described in **System requirements and installation**.

Download the SD-WAN Center software for Hyper-V, as described in Downloading the Citrix SD-WAN Center Software section of **System requirements and installation**.

Ensure that the Hyper-V feature and management tool are enabled on your Windows server.

To create the SD-WAN Center VM on Hyper-V server:
1. On the Hyper-V Manager, right-click the Hyper-V server and select **New > Virtual Machine**.

   ![Hyper-V Manager](image1.png)

   The **New Virtual Machine Wizard** appears. Click **Next**.

2. Specify a name for your SD-WAN center VM and change the VM storage location, if necessary. Click **Next**.

   ![New Virtual Machine Wizard](image2.png)
3. Choose the required VM generation. Click Next.

4. Assign a memory of 8 GB for the VM. Click Next.

Note
The Citrix SD-WAN Center VM requires a minimum of 8 GB memory to manage up to 64 sites. For more information on memory to the number of sites mapping, see System requirements and installation.

5. Choose the Virtual switch to be used by the VM’s network adapter, Click Next.

6. Select Use an existing virtual hard disk, browse, and select the SD-WAN Center VHD file that you downloaded. Click Next.
7. Review the VM summary and change the settings if necessary, else click **Finish**. The SD-WAN Center VM is created and is listed in the **Virtual Machines** section.

8. Right-click the SD-WAN Center VM and select **Settings**. Set the number of virtual processors to four and click **Apply**.
9. Right-click the SD-WAN Center VM and click **Connect**.

10. Click the **Start** button.
Note

The initial installation may take up to 50 min, depending on the number of CPUs and RAM that you have configured.

11. Once the VM is started, selected Citrix SD-WAN Center and hit enter.
12. Log into the VM. The default login credentials for the new SD-WAN Center VM are as follows:

   **Login**: admin

   **Password**: password
The management IP address is displayed in the console use this IP to access the SD-WAN Center web interface.

Note
If DHCP is not configured in the SD-WAN network, you have to enter a static IP address manually.

To configure a static IP address as the management IP address:

1. Log into the VM. The default login credentials for the new SD-WAN Center VM are as follows:
   
   **Login**: admin
   
   **Password**: password

2. In the console, enter the CLI command **management_ip**.

3. Enter the command **set interface <ipaddress> <subnetmask> <gateway>**, to configure the management IP.

Use the management IP to access the Citrix SD-WAN Center web interface.
Install and configure Citrix SD-WAN Center on Microsoft Azure

August 9, 2018

Before installing the Citrix SD-WAN Center virtual machine (VM) on the Microsoft Azure, gather the necessary information as described in System requirements and installation.

Ensure that you have access to Microsoft Azure.

To deploy Citrix SD-WAN Center VM on Microsoft Azure:

1. In Microsoft Azure, navigate to Storage accounts and click +Add.

2. Enter a name for the storage account, select a resource group, and click Create.

   Note

   A resource group is a container that holds related resources for an Azure solution. The resource group can include all the resources for the solution, or only those resources that you want to manage as a group. You can decide how you want to allocate resources to resource groups based on your deployment.

3. Once the storage account is created, within the storage account click Blobs service.
4. In the **Blob service** page, click + **Container**. Enter a name for the new container and click **OK**.

5. Open the container and click **Upload**. Browse and select the SD-WAN Center VHD file for Azure that you downloaded and click **Upload**.
6. Navigate to Network Interfaces and click +Add. Create a network interface with a dynamic private IP address and the same resource group as the storage account.

7. Navigate to the newly created Network interface, click IP Config, and click Public IP Address.
8. Enable Public IP Address and create a new static public IP Address and save it. Use this public IP address to access Citrix SD-WAN Center from anywhere on the internet.

9. From the PowerShell console, log in to your Azure account using the following command.

   ```powershell
   $AzureAccount = Login-AzureRMAccount
   ```

10. Execute the following commands in PowerShell. Enter the values for the parameters as per your configuration.

    ```powershell
    $virtualNetworkName = “resource1-vnet”
    $locationName = “Location Name”
    $virtualNetwork = Get-AzureRmVirtualNetwork -ResourceGroupName $resourceGroupName -Name $virtualNetworkName
    $NIC1 = Get-AzureRmNetworkInterface -Name “Network Interface Name” -ResourceGroupName “Resource Group Name”
    ```
$VMName="SD-WAN Center VM Name"

$vmConfig = New-AzureRmVMConfig -VMName $VMName -VMSize “Standard_D3_v2”

$DiskName='OSDisk-4+$VMName

$destinationVhd =’Link to destination VHD ‘

$vmConfig = Set-AzureRmVMOSDisk -VM $vmConfig -Name $DiskName -VhdUri

$destinationVhd -CreateOption Attach –Linux

$vmConfig = Add-AzureRmVMNetworkInterface -VM $vmConfig -Id $NIC1.Id -Primary

Note
To view the destination VHD link, navigate to Storage account > Blobs > Container > SD-WAN VHD > Overview > URL.

11. Enter the following command to create and boot the SD-WAN Device using the above VM Configuration.
$vm = New-AzureRmVM -VM $vmConfig -Location $locationName -ResourceGroupName $resourceGroupName

12. In Azure, navigate to Virtual machines > SD-WAN Center VM > Overview and copy the Public IP address.

Use this public IP address to access the SD-WAN Center web interface.

Two factor authentication

September 28, 2018

Two-factor authentication (TFA) presents two authentication factors to gain access to Citrix SD-WAN Center for both local and remote user accounts. It introduces an extra layer of security in the Citrix SD-WAN Center login sequence.

The first level of authentication for a local user account is achieved by using the password configured on Citrix SD-WAN Center. For more information, see User accounts.
The first level of authentication for a remote user account is achieved by using the primary RADIUS or TACACS+ authentication server. For more information, see Primary authentication.

An extra secondary RADIUS or TACACS+ authentication server can be configured for both local and remote user accounts to enable two-factor authentication. For more information, see Secondary authentication.

Citrix SD-WAN Center login credentials:

- **Username**: The username configured on SD-WAN Center or the primary authentication server.
- **Password**: The password configured on SD-WAN Center or the primary authentication server.
- **Secondary Password**: The password configured on the secondary authentication server.

**Note**

The **Secondary Password** option appears only when the secondary authentication server is configured.

**Primary authentication**

March 7, 2019

You can configure authentication servers such as RADIUS or TACACS+ to authenticate remote users logging on to Citrix SD-WAN Center. Primary authentication is the first authenticating factor for remote users when two-factor authentication is enabled. For more information, see Two-factor authentication.
Note
Ensure that user accounts are created on the required authentication servers.

**RADIUS authentication server**

To use RADIUS authentication, you must specify and configure at least one RADIUS server. Optionally, you configure redundant backup servers, up to a maximum of three RADIUS servers. The servers are checked sequentially, starting with the server listed first in the Servers section. Ensure that the required user accounts are created on the RADIUS authentication server.

To enable and configure RADIUS authentication:

1. In the Citrix SD-WAN Center web interface, navigate to **Administration > User/Authentication Settings**.
2. In the **Primary Authentication > RADIUS Authentication** section, select the **Enable RADIUS Authentication** check box.
   
   **Note**
   If TACACS+ authentication is already enabled, it gets disabled.

3. In the **Timeout** field, enter the time interval (in seconds) to wait for an authentication response from the RADIUS server.
   
   The timeout value should be less than or equal to 10 seconds.

4. In the **Server Key** field, enter a secret key to use when connecting to the RADIUS servers.
5. In the **Confirm Server Key** fields, reenter the secret key.
   
   **Note**
   The **Timeout** and **Server Key** settings are applied to all configured servers.

6. Select **Enable Two-factor**, to enable two-factor authentication.
   
   **Note**
   The **Enable Two-factor** option appears only when the secondary authentication server is configured.
   
   Configure a secondary authentication server, either RADIUS, or TACAS+. For more information, see **Secondary authentication**.

7. Click the plus icon (+) next to **Servers** to add a RADIUS server.

8. In the **IP Address** field, enter the host IP address for the RADIUS server.
9. In the Port field, enter the port number for RADIUS server. The default port number is 1812.

![RADIUS Authentication settings]

10. Click Apply.

11. Click Verify to verify the connection to the RADIUS server. The Verify RADIUS Server Settings dialog box appears.

![Verify RADIUS Server Settings]

12. Enter a valid username and password for the authentication servers, and click Verify.

To configure more servers, repeat the steps 7 through 12.

**TACACS+ authentication server**

To use TACACS+, you must specify and configure at least one TACACS+ server. Optionally, you configure redundant backup servers, up to a maximum of three TACACS+ servers. The servers are checked sequentially, starting with the server listed first in the Servers section. Ensure that the required user accounts are created on the TACACS+ authentication server.
To enable and configure TACACS+ authentication:

1. In the Citrix SD-WAN Center web interface, navigate to Administration > User/Authentication Settings.

2. In the Primary Authentication > TACACS+ Authentication section, select the Enable TACACS+ Authentication check box.

   Note
   If RADIUS authentication is already enabled, it gets disabled.

3. In the Timeout field, enter the time interval (in seconds) to wait for an authentication response from the TACACS+ server.
   
   The timeout value should be less than or equal to 10 seconds.

4. In the Authentication Type field, select the encryption method to use to send the username and password to the TACACS+ server.

5. In the Server Key field, enter a secret key to use when connecting to the TACACS+ servers.

6. In the Confirm Server Key fields, reenter the secret key.

   Note
   The Timeout, Authentication Type, and Server Key settings are applied to all the configured servers.

7. Select Enable Two-factor, to enable two-factor authentication.

   Note
   The Enable Two-factor option appears only when the secondary authentication server is configured.

   Configure a secondary authentication server, either RADIUS, or TACAS+. For more information, see Secondary authentication.

8. Click the plus icon (+) next to Servers to add a TACACS+ server.

9. In the IP Address field, enter the host IP address for the TACACS+ server.

10. In the Port field, enter the port number for TACACS+ server. The default port number is 49.
11. Click **Apply**.

12. Click **Verify** to verify the connection to the RADIUS server. The **Verify TACACS+ Server Settings** dialog box appears.

13. Enter a valid username and password for the authentication servers, and click **Verify**.

To configure more servers, repeat the steps 8 through 13.

**Secondary authentication**

March 7, 2019

Secondary authentication is configured to enable Two-factor authentication for local and remote user accounts. You can configure either the RADIUS or TACACS+ authentication server as the secondary authenticating serve. For more information, see [Two-factor authentication](#).
Secondary RADIUS authentication server

To use RADIUS authentication, you must specify and configure at least one RADIUS server. Optionally, you configure redundant backup servers, up to a maximum of three RADIUS servers. The servers are checked sequentially, starting with the server listed first in the Servers section. Ensure that the required user accounts are created on the RADIUS authentication server.

To enable and configure RADIUS authentication:

1. In the Citrix SD-WAN Center web interface, navigate to Administration > User/Authentication Settings.

2. In the Secondary Authentication > RADIUS Authentication section, select the Enable Secondary RADIUS Authentication checkbox.

   Note
   If TACACS+ authentication is already enabled, it gets disabled.

3. In the Timeout field, enter the time interval (in seconds) to wait for an authentication response from the RADIUS server.

   The timeout value should be less than or equal to 10 seconds.

4. In the Server Key field, enter a secret key to use when connecting to the RADIUS servers.

5. In the Confirm Server Key fields, reenter the secret key.

   Note
   The Timeout and Server Key settings are applied to all configured servers.

6. Click the plus icon (+) next to Servers to add a RADIUS server.

7. In the IP Address field, enter the host IP address for the RADIUS server.

8. In the Port field, enter the port number for RADIUS server. The default port number is 1812.
9. Click **Apply**.

10. Click **Verify** to verify the connection to the RADIUS server. The **Verify Secondary RADIUS Server Settings** dialog box appears.

11. Enter a valid username and password for the authentication servers, and click **Verify**.

To configure more servers, repeat the steps 6 through 11.

**Secondary TACACS+ authentication server**

To use TACACS+, you must specify and configure at least one TACACS+ server. Optionally, you configure redundant backup servers, up to a maximum of three TACACS+ servers. The servers are checked sequentially, starting with the server listed first in the **Servers** section. Ensure that the required user accounts are created on the TACACS+ authentication server.

To enable and configure TACACS+ authentication:

1. In the SD-WAN Center web interface, navigate to **Administration > User/Authentication Settings**.
2. In the **Secondary Authentication > TACACS+ Authentication** section, select the **Enable Secondary TACACS+ Authentication** checkbox.

   **Note**
   
   If RADIUS authentication is already enabled, it gets disabled.

3. In the **Timeout** field, enter the time interval (in seconds) to wait for an authentication response from the TACACS+ server.

   The timeout value should be less than or equal to 10 seconds.

4. In the **Authentication Type** field, select the encryption method to use to send the username and password to the TACACS+ server.

5. In the **Server Key** field, enter a secret key to use when connecting to the TACACS+ servers.

6. In the **Confirm Server Key** fields, reenter the secret key.

   **Note**
   
   The **Timeout**, **Authentication Type**, and **Server Key** settings are applied to all the configured servers.

7. Click the plus icon (+) next to **Servers** to add a TACACS+ server.

8. In the **IP Address** field, enter the host IP address for the TACACS+ server.

9. In the **Port** field, enter the port number for TACACS+ server. The default port number is 49

10. Click **Apply**.

11. Click **Verify** to verify the connection to the RADIUS server. The **Verify TACACS+ Server Settings** dialog box appears.
12. Enter a valid username and password for the authentication servers, and click **Verify**.

To configure more servers, repeat the steps 7 through 12.

**Single-region network deployment**

February 20, 2019

If your organization has a small network spanning a single administrative (or geographical) boundary, you can use Citrix SD-WAN Center in the default mode (with single “default region”). A region can support a maximum of up to 550 sites.

A single region network has a Master Control Node (MCN) for centralized control, and Citrix SD-WAN Center for centralized management. The region associated with and controlled by the MCN is referred to as the default region. The Citrix SD-WAN Center polls the MCN and all the branch appliances in the default region.
To deploy Citrix SD-WAN Center for single-region:

1. Download the Citrix SD-WAN Center Software. For more information, see System requirements and installation.

2. Install the Citrix SD-WAN Center on ESXi Server, XenServer, Hyper-V or Azure.

3. Configuring the management interface settings. For more information, see Configure the management interface settings.

4. Install the Citrix SD-WAN Center Certificate on the MCN. For more information, see Install the Citrix SD-WAN Center certificate.

5. In the Citrix SD-WAN Center GUI navigate to Configuration > Network Discovery > Discover Settings.

6. In the Master Controller Node MGT IP Address field, enter the MCN IP address and click Test. This establishes a connection between the MCN and Citrix SD-WAN Center.
7. Click **Discover**. If you have already discovered an MCN, this option changes to **Rediscover**.

8. After the discovery operation completes, click the **Inventory and Status** tab.

   The **Inventory and Status** table displays the status information for all the discovered Citrix SD-WAN Appliances.

9. Select the **Poll** checkbox in the top left corner of the table heading.

   This selects the **Poll** checkbox for each appliance listed in the table. To exclude an appliance from the polling list, clear its check box.

10. Click **Apply**.
Tip
You can increase the storage size of the Citrix SD-WAN Center by creating a data store on your virtual machine and switching the data store. For more information see, **Switch the active storage to new data storage.**

Multi-region network deployment

February 20, 2019

If your organization has a large network spanning multiple administrative (or geographical) boundaries, you can use Citrix SD-WAN Center in multi-region mode, with each region supporting a maximum of up to 550 sites.

The multi-region network supports a hierarchical architecture with a Master Control Node (MCN) controlling multiple Regional Control Nodes (RCNs). Each RCN, in turn, controls multiple client sites. The MCN can also be optionally used to control some client sites directly as part of the “default region”. This hierarchical and distributed architecture enables higher scale, and effective delegation of regional administration.

The Citrix SD-WAN Center polls the MCN, RCNs and all the associated branch appliances.

The multi-region Citrix SD-WAN Center architecture requires addition of a collector per region, to collect and store region level data and statistics. This distributed architecture enables higher scale across multiple regions, while preserving the “single pane of glass” view for managing the entire network.
Note

For a multi-region deployment, the default region statistics include statistics of all the sites managed by the MCN. Additionally, it may also include RCN statistics since the RCNs have virtual paths to the MCN.

To deploy Citrix SD-WAN Center for Multi-region:

1. Download the Citrix SD-WAN Center Software. For more information, see System requirements and installation.
2. Install the Citrix SD-WAN Center on ESXi Server, XenServer, Hyper-V or Azure.
3. Configuring the management interface settings. For more information, see Configure the management interface settings.
4. Log-into the Citrix SD-WAN Center interface.
5. Download the SSL Certificate from the Citrix SD-WAN Center VM and install it on the MCN appliance. For more information, see Install the Citrix SD-WAN Center certificate.
6. In the Citrix SD-WAN Center GUI navigate to Configuration > Network Discovery > Discover Settings.
7. In the Master Controller Node MGT IP Address field, enter the MCN IP address and click Test. This establishes a connection between the MCN and Citrix SD-WAN Center.
8. Click Discover. A list of all the RCNs connected to the MCN appears in the Collector Configuration section.
Note
The Citrix SD-WAN Center acts as a collector for the default region.

9. Click the edit icon and in the Collector IP field, enter the IP address of the Citrix SD-WAN Center that you want to configure as a collector for a region.

Note
To set up a collector, install a Citrix SD-WAN Center VM and configure the management IP address. The management IP address of that Citrix SD-WAN Center is the collector IP address.

10. Click the Save icon to save the collector IP address and push the Certificate-Key pair to the RCN.

11. Enter the credentials for the RCN and click Push Certificate.
12. Similarly, configure collector IP address for all the RCNs.

**Note**

The appliances are discovered automatically every 30 minutes. If new RCNs are added to the network and a change management is done, you could select the appliance and click **Discover Appliance** to discover the appliance immediately.

After the **Discovery Status** changes to **Done**, you can view the discovered sites in the **Inventory and Status** Page.
You can filter the sites based on the region name. In the **Select Region** field, select the region.

13. In the **Inventory and Status** Page, select the sites that you want to start polling and click **Apply**.

You can increase the storage size of the collector by creating a data store on your virtual machine. For more information see, **Switching the active storage to new data storage**.

You can select specific regions to view event and statistic reports.

The events and statistic reports data is fetched from the respective region's collector.
Configuration

August 13, 2018

The initial few steps to configure Citrix SD-WAN Center is common for both single-region network and multi-region network. The following is a list of the common configuration procedures:

- Configure the management interface settings
- Install the Citrix SD-WAN Center certificates.
- Switch the active storage to new data storage.

Configure the management interface settings

August 9, 2018

You can use the Citrix SD-WAN Center web interface to configure the management interface settings.

The management Interface settings include the following:

- Citrix SD-WAN Center Management IP Address
- Gateway IP Address
- Subnet Mask
- Primary DNS
- Secondary DNS

To configure the management interface settings:
1. In the Citrix SD-WAN Center web interface, select the **Administration** tab. By default, the **User/Authentication Settings** page appears.

2. In the navigation tree, select **Global Settings**.

3. Configure the Management and DNS settings.

   In the **Management and DNS** section, add the required information to the following fields:
   - **IP Address**: Enter the IP Address for the Citrix SD-WAN Center.
   - **Gateway IP Address**: Enter the Gateway IP Address the Citrix SD-WAN Center VM will use to communicate with external networks.
   - **Subnet Mask**: Enter the subnet mask to define the network in which the Citrix SD-WAN Center VM resides.

4. Click **Apply**.

   **Note**
   
   Connectivity to the Citrix SD-WAN Center will be terminated when your changes are applied.

### Install the Citrix SD-WAN Center certificate

**August 9, 2018**

To establish a connection between Citrix SD-WAN Center and Citrix SD-WAN Master Control Node (MCN), download the SSL certificate from the SD-WAN Center and installing it on the MCN.

To download and install the Citrix SD-WAN certificate:

1. In the Citrix SD-WAN Center web interface, on the **Configuration** tab, select **Network Discovery**.

2. On the SSL Certificate page, click **Download Certificate**.

   This opens a file browser on your computer for selecting the download location. Navigate to the desired location and save the certificate.
3. Log into the Citrix SD-WAN Master Control Node web interface.

4. Click the **Configuration** tab.

5. In the navigation tree (left pane), click the + icon next to the **Virtual WAN** branch.

6. Select **SD-WAN Center Certificates**.

7. On the SD-WAN Center Certificates page, next to the **Install Certificate** field, click **Browse**.
   
   This opens a file browser on the local PC for selecting the file you want to upload. Select the certificate file you just downloaded, and click **Open**.

8. Click **Upload and Install**.
   
   This uploads the certificate file to the master control node (MCN) and displays a success message when installation is complete.

9. Click **Continue**.
   
   This displays the MCN Management Web Interface Dashboard page. At this point, you can log out of the MCN (optional).

### Switch the active storage to new data storage

**August 13, 2018**

In Citrix SD-WAN Center, you can switch the active storage to the data store you created on your virtual server. This allows you to store more statistics data obtained by polling all the Citrix SD-WAN appliances in the WAN. For information on creating a datastore on ESXi server, see [Adding and Configuring the Datastore on ESXi Server](#). For information on creating a datastore on XenServer, see [Adding and Configuring the Data Storage on XenServer](#)

To specify the active storage for the Citrix SD-WAN Center VM:

1. Log into Citrix SD-WAN Center VM.
   
   The default login credentials for Citrix SD-WAN Center are as follows:
Login: admin  
Password: password

2. Click the Administration tab and then click Storage Maintenance.

3. In the Active column of the Storage Systems table, select the storage you created.

4. Select Migrate Data and click Apply.

5. The Delete All Existing Files message appears, click Switch.

This places Citrix SD-WAN Center into Maintenance Mode and displays a progress bar in the main page area.

6. When the activation completes, click Continue.

This dismisses the progress bar and returns to the main Storage Maintenance page.

Deploy Citrix SD-WAN appliance

August 9, 2018
You can use Citrix SD-WAN Center to create the appliance configuration or appliance settings file and use the change management wizard to push the configuration to the appliances on the network. For more information, see Configure Citrix SD-WAN appliances.

You can configure Citrix SD-WAN Center to act as the central licensing server and provides licensing services to all the nodes in the network. This eliminates the need to install licenses on individual nodes locally. For more information, see Citrix SD-WAN Center as a license server.

You can use Citrix SD-WAN Center to streamline the process of deploying the SD-WAN appliances at branch offices using the Zero Touch Deployment feature. For more information, see Zero Touch Deployment.

**Configure Citrix SD-WAN appliances**

August 9, 2018

Use the Configuration Editor to edit the configuration settings and to export the configuration package to the MCN. For more information see, Configuration Editor.

You can use the change management wizard of the MCN appliance through Citrix SD-WAN Center. For more information see, Change Management Wizard.

You can configure appliance setting on Citrix SD-WAN Center and export it to a set of managed Citrix SD-WAN appliances in your SD-WAN network. For more information see, Appliance settings.

**Configuration Editor**

August 9, 2018

The Configuration Editor is available as a component of the Citrix SD-WAN Center Web Interface, and in the Citrix SD-WAN Management Web Interface running on the Master Control Node (MCN) of the SD-WAN network.

**Note**

- You cannot push configurations to the discovered appliances directly from Citrix SD-WAN Center.
- You can use the Configuration Editor to edit the configuration settings and to create a configuration package. When the configuration package has been created, you can export it to the MCN and install it. The changes are then reflected in the MCN.
- You have to log on with administrative rights to the Citrix SD-WAN Center appliance and the MCN.
to edit the configurations on Citrix SD-WAN center and to export and install the configurations on the MCN.

For detailed instructions on using the Configuration Editor to configure your Citrix SD-WAN, see Citrix SD-WAN 10.1 documentation.

The Configuration Editor enables you to do the following:

- Add and configure Citrix SD-WAN Appliance sites and connections.
- Provision the Citrix SD-WAN appliance.
- Create and define Citrix SD-WAN Configuration.
- Define and view Network Maps of your SD-WAN system.

To open the Configuration Editor:

1. In the Citrix SD-WAN Center web interface, click the Configuration tab.
2. Click Network Configuration.

The below figure outlines the basic navigation and page elements of the Configuration Editor, and the terminology used in this guide to identify them.

The primary screen of the Configuration Editor has the following navigation elements:

- Configuration Editor Menu Bar: Contains the primary activity buttons for Configuration Editor operations. In addition, at the far right edge of the menu bar is the View Tutorial link button for initiating the Configuration Editor tutorial. The tutorial walks you through a series of bubble descriptions for each element of the Configuration Editor display.
- Configuration Editor Sections: Each tab represents a top-level section. There are six sections: Basic, Global, Sites, Connections, Optimization and Provisioning. Click a section tab to reveal the configuration tree for that section.
• **View Region**: For multi-region deployment, it lists all the regions configured. For single-region deployment, the default-region is displayed by default. To view the sites in a region, select a region from the drop-down list.

• **View Sites**: Lists the site nodes that have been added to the configuration and are currently opened in the Configuration Editor. To view the site configuration, select a site from the drop-down list.

• **Network Map**: Provides a schematic view of the SD-WAN network. Hover the mouse cursor over the sites or the path to view more details. Click the sites to view report options.

• **Audit Status Bar**: The dark grey bar at the bottom of the Configuration Editor page, and spanning the entire width of the Configuration Editor page. The **Audits** status bar is available only when the **Configuration Editor** is open. An Audit Alert icon (red dot or goldenrod delta) at the far left of the status bar indicates one or more errors present in the currently opened configuration. Click the status bar to display a complete list of all unresolved audit alerts for that configuration.

## Change Management Wizard

August 9, 2018

The Change Management wizard guides you through the process of uploading, downloading, staging, and activating the Citrix SD-WAN software and configuration on the Master Control Node (MCN) appliance and client appliances.

The Change Management wizard is a component of the Citrix SD-WAN Management Web Interface running on the MCN, and is not part of the Citrix SD-WAN Center. However, you can use the Citrix SD-WAN Center to connect to the specified MCN, and access the Change Management wizard.

To open the Change Management Wizard:

1. In the Citrix SD-WAN Center web interface, click the **Configuration** tab.

2. Click **Change Management**.
3. At the **Click here to Open Master Control Node’s Change Management** prompt, click the **here** link.

You will be automatically logged in into the MCN GUI.

**Note**

You do not have to login into the MCN GUI using the MCN credentials, the auto-login feature enables single sign on.

4. In the MCN management web interface, click the **Configuration** tab.

5. In the navigation tree (left pane), click + next to the **Virtual WAN** branch to expand that branch.

6. Click **Change Management**.

This displays the first page of the **Change Management** wizard, the **Change Process Overview** page, as shown in the figure below.

7. To start the wizard, click **Begin**.
Note
For complete instructions on using the wizard to upload, stage, and activate the SD-WAN software and configuration on the appliances, please see the SD-WAN 9.1.0 User Guide.

The Change Management wizard has the following navigation elements:

- **Page area**: Displays the forms, tables, and activity buttons for each page of the Change Management wizard.

- **Change Management wizard page tabs**: On the left side of the page area, on each page of the wizard, tabs are listed in the order in which the corresponding steps occur in the wizard process. When a tab is active, you can click it to return to a previous page in the wizard. An active tab displays its name displays in a blue font. A gray font indicates an inactive tab. Tabs are inactive until all dependencies (previous steps) have been fulfilled without error.

- **Appliance-Site table**: At the bottom of the wizard page area, this table contains information about each configured appliance site, and links for downloading the active or staged appliance packages for that appliance model and site. A package in this context is a zip-file bundle containing the appropriate SD-WAN software package for that appliance model, and the specified configuration package. The Configuration Filenames section above the table shows the package name for the current active and staged packages on the local appliance.

- **Active/Staged download links**: In the Download Package field (far right column) of each entry in the Appliance-Site table, you can click a link in an entry to download the active or staged package for that appliance’s site.

- **Begin button**: Click Begin to initiate the Change Management wizard process and proceed to the Change Preparation tab page.

- **Activate Staged button**: If this is not an initial deployment, and you want to activate the currently staged configuration, you have the option of proceeding directly to the Activation step. Click Activate Staged to proceed directly to the Activation page and initiate activation of the currently staged configuration.

Appliance settings

August 9, 2018

You can configure appliance setting on Citrix SD-WAN Center and export it to a set of managed Citrix SD-WAN appliances in your SD-WAN network. The Appliance Settings page allows you to perform the following actions:

- Create a new appliance settings file.
- Open and edit an existing appliance settings file.
• Import an appliance settings file from your local computer.
• Download an appliance settings file to your local computer.
• Export an appliance settings file to the managed appliances.

To create an appliance settings file and export it to managed appliances:

1. In the Citrix SD-WAN Center web interface, click the Configuration tab.
2. Click Appliance Settings and then click New.

3. Select Include in file for the required settings and specify the parameter values for the settings. For more information, see appliance settings table.
4. Click Export. In the Save as dialog box, enter a name for the appliance settings file and click Save. The Export Appliance Settings dialog box appears.
5. In the Destination field select Managed Appliances and select the appliances for which you want to export the appliance settings to.
To download the appliance settings to your local computer, in the Destination field select File Download.

6. Click Export.

Citrix SD-WAN Center as a license server

December 18, 2018

You can acquire the licenses for the appliances in your network, upload and install it in SD-WAN Center. To use SD-WAN Center as the remote license server, configure the IP address of SD-WAN Center as the remote server for centralized license management. For more information see, Centralized License Management.

After you push the network configuration to the sites through the change management process, and once the configuration is activated, the branch appliances automatically obtain the licenses from the SD-WAN Center.
For these licenses to be used one must assign the licenses to the host of the SD-WAN Center itself.

To view the license details of all the appliances discovered by SD-WAN Center navigate to Configuration > Licensing > Network Summary.

The following parameters are displayed:

- **Site Name**: The name of the Site.
- **License Server**: The IP Address and port number of the license server. If the license was installed locally on the appliance, it is displayed as “Locally Licensed”.
- **State**: The current license state of the appliance, Licensed or Unlicensed.
- **Model**: The appliance model that the license supports.
- **MAXBW**: The maximum bandwidth permitted by the license.
- **Feature**: The Citrix SD-WAN edition that the license supports.
- **Maintenance Expiry**: The expiry date of Citrix Subscription Advantage.

**Note**

During Software upgrade, if the software build date is higher than the Maintenance Expiry date then the software upgrade is not allowed.

- **License Expiry**: The expiry date of the license.
- **License Type**: The type of license.

To upload and install license files in SD-WAN Center:

1. Obtain the license for the Citrix SD-WAN appliances and save it on your local computer.

**Note**

For instructions on obtaining a Citrix SD-WAN software license, contact Citrix SD-WAN Customer Support.
2. In the SD-WAN Center GUI, navigate to **Licensing > File Management**.

3. In the **Upload File** section, click **Browse**. Select the license file from your local computer and click **Upload and Install**.

   The installed license files are listed in the **Files** drop-down menu, you can choose to view or delete the license files.

   ![License Management](image)

   **Note**

   The Host ID is the SD-WAN Center host ID, used to generate the license files. The license files generated using a different host ID cannot be uploaded and installed on Citrix SD-WAN Center.

   You can view the details of all the license files uploaded and installed on Citrix SD-WAN Center, at a glance, by navigating to **Configuration > Licensing > License Details**.

   ![License Details](image)

   The following parameters are displayed:

   - **Model**: The appliance model that the license supports.
   - **Used Count**: The number of appliances on which this license is installed.
   - **Total Count**: The total number of appliances on which this license can be installed.
   - **Maintenance Expiry**: The expiry date of Citrix Subscription Advantage.
   - **License Expiry**: The expiry date of the license.
• **License Type**: The type of license.

**Zero Touch Deployment**

March 25, 2019

The Zero Touch Deployment service is supported only on select Citrix SD-WAN appliances:

- SD-WAN 210 Standard Edition
- SD-WAN 410 Standard Edition
- SD-WAN 2100 Standard Edition
- SD-WAN 4100 Standard Edition
- SD-WAN 5100 Standard Edition
- SD-WAN 5100 Premium Edition (reimage required)
- SD-WAN 1000 Standard Edition
- SD-WAN 1000 Premium Edition (reimage required)
- SD-WAN 1100 Standard Edition
- SD-WAN 1100 Premium Edition (reimage required)
- SD-WAN 2000 Standard Edition
- SD-WAN 2000 Premium Edition (reimage required)
- SD-WAN AWS VPX instance

Zero Touch Deployment (ZTD) Service is a Citrix operated and managed cloud service which allows discovery of new appliances in the Citrix SD-WAN network, and automates the deployment process for branch offices. The ZTD Cloud Service is accessible from any node in the network via Internet, and over Secure Socket Layer (SSL) Protocol.

The ZTD Cloud Service securely communicates with backend Citrix Network services storing identification of customers who have purchased Zero Touch capable devices (e.g. SD-WAN 410-SE, 2100-SE). The backend services are in place to authenticate any Zero Touch Deployment request, properly validating association between the Customer Account and the Serial Numbers of Citrix SD-WAN appliances.

**ZTD High-Level Architecture and Workflow**

**Data Center Site**

**Citrix SD-WAN Administrator** – A user with Administration rights of the SD-WAN environment with the following primary responsibilities:
• Configuration creation using Citrix SD-WAN Center Network Configuration tool, or import of configuration from the Master Control Node (MCN) SD-WAN appliance
• Citrix Cloud Login to initiate the Zero Touch Deployment Service for new site node deployment.

**Note**

If your SD-WAN Center is connected to the internet through a proxy server, you have to configure the proxy server settings on the SD-WAN Center. For more information, see Proxy Server Settings for Zero Touch Deployment.

**Network Administrator** – A user responsible for Enterprise network management (DHCP, DNS, internet, firewall, etc.)

- If necessary, configure firewalls for outbound communication to FQDN `sdwanzt.citrixnetworkapi.net` from SD-WAN Center.

**Remote Site**

**Onsite Installer** – A local contact or hired installer for on-site activity with the following primary responsibilities:

- Physically unpack the Citrix SD-WAN appliance.
- Reimage non-ZTD ready appliances.
  - Required for: SD-WAN 1000-SE, 2000-SE, 1000-EE, 2000-EE
  - Not required for: SD-WAN 410-SE, 2100-SE
- Power cable the appliance.
- Cable the appliance for internet connectivity on the Management interface (e.g. MGMT, or 0/1).
- Cable the appliance for WAN link connectivity on the Data interfaces (e.g. apA.WAN, apB.WAN, apC.WAN, 0/2, 0/3, 0/5, etc).

**Note**

The interface layout is different each model, so please reference the documentation for identification of data and management ports.
The following prerequisites are required before starting any Zero Touch Deployment service:

- Actively running SD-WAN promoted to Master Control Node (MCN).
- Actively running SD-WAN Center with connectivity to the MCN through Virtual Path.
- Citrix Cloud Login credentials created on https://onboarding.cloud.com (reference the instruction below on account creation).
- Management network connectivity (SD-WAN Center and SD-WAN Appliance) to the Internet on port 443, either directly or through a proxy server.
- Internet connectivity on port 443 to access the SD-WAN Center web portal for the ZTD initial setup.
- (optional) At least one actively running SD-WAN appliance operating at a branch office in Client Mode with valid Virtual Path connectivity to MCN to help validate successful path establishment across the existing underlay network.

The last prerequisite is not a requirement, but allows the SD-WAN Administrator to validate that the underlay network allows Virtual Paths to be established when the Zero Touch Deployment is complete with any newly added site. Primarily, this validates that the appropriate Firewall and Route policies are in place to either NAT traffic accordingly or confirm ability for UDP port 4980 can successfully penetrate the network to reach the MCN.
Zero Touch Deployment Service Overview

The Zero Touch Deployment Service works in tandem with the SD-WAN Center to provide an easier deployment of branch office SD-WAN appliances. SD-WAN Center is configured and used as the central management tool for the SD-WAN Standard and Enterprise (Premium) Edition appliances. To utilize the Zero Touch Deployment Service (or ZTD Cloud Service), an Administrator must begin by deploying the first SD-WAN device in the environment, then configure and deploy the SD-WAN Center as the central point of management. When the SD-WAN Center, release 9.1 or later, is installed with connectivity to the public internet on port 443, SD-WAN Center automatically initiates the Cloud Service and install necessary components to unlock the Zero Touch Deployment features and to make the Zero Touch Deployment option available in the GUI of SD-WAN Center. Zero Touch Deployment is not available by default in the SD-WAN Center software. This is purposely designed to make sure the proper preliminary components on the underlay network are present before allowing an Administrator to initiate any on-site activity involving Zero Touch Deployment.

After a working SD-WAN environment is up and running registration into the Zero Touch Deployment Service is accomplished through creating a Citrix Cloud account login. With SD-WAN Center able to communicate with the ZTD service, the GUI exposes the Zero Touch Deployment options under the Configuration tab. Logging into the Zero Touch Service authenticates the Customer ID associated with the particular SD-WAN environment and registers the SD-WAN Center, in addition to unlocking the account for further authentication of ZTD appliance deployments.

Using the Network Configuration tool in SD-WAN Center, the SD-WAN Administrator will then need to utilize the templates or clone site capability to build out the SD-WAN Configuration to add new sites. The new configuration is used by the SD-WAN Center to initiate the deployment of ZTD for the newly added sites. When the SD-WAN Administrator initiates a site for deployment using the ZTD pro-
cess, he or she has the option to pre-authenticate the appliance to be used for ZTD by pre-populating the serial number, and initiating email communication to on-site installer to begin on-site activity.

The Onsite Installer receives email communication that the site is ready for Zero Touch Deployment and can begin the installation procedure of powering on and cabling the appliance for DHCP IP address assignment and internet access on the MGMT port. Also, cabling in any LAN and WAN ports. Everything else is initiated by the ZTD Service and progress is monitored by the utilizing the activation URL. In the event the remote node to be installed is a cloud instance, opening up the activation URL begins the workflow to automatically install the instance in the designated cloud environment, no action is needed by a local installer.

The Zero Touch Deployment Cloud Service automates the following actions:

**Download and Update the ZTD Agent if new features are available on the branch appliance.**

- Authenticate the branch appliance by validating the serial number.
- Authenticate that the SD-WAN Administrator accepted the site for ZTD using the SD-WAN Center.
- Pull the configuration file specific for the targeted appliance from the SD-WAN Center.
- Push the configuration file specific for the targeted appliance to the branch appliance.
- Install the configuration file on the branch appliance.
- Push any missing SD-WAN software components or required updates to the branch appliance.
- Push a temporary 10 Mbps license file for confirmation of Virtual Path establishment to the branch appliance.
- Enable the SD-WAN Service on the branch appliance.

More steps are required of the SD-WAN Administrator to install a permanent license file on the appliance.

**Zero Touch Deployment Service Procedure**

The following procedure detail the steps required to deploy a new site using the Zero Touch Deployment Service. Have a running MCN and one client node already working with proper communication to SD-WAN Center, as well as established Virtual Paths confirming connectivity across the underlay network. The following steps are required of the SD-WAN Administrator to initiate the deployment of zero touch:
How to Configure Zero Touch Deployment Service

The SD-WAN Center has the functionality to accept requests from newly connected appliances to join the SD-WAN Enterprise network. The request is forwarded to the web interface through the zero touch deployment service. Once the appliance connects to the service, configuration and software upgrade packages are downloaded.

Configuration workflow:

- Access SD-WAN Center > Create New site configuration or Import existing configuration and save it.
- Log in to Citrix Workspace Cloud to enable ZTD service. The Zero Touch Deployment menu option is now displayed in the SD-WAN center web management interface.
- In SD-WAN Center, navigate to Configuration > Zero Touch Deployment > Deploy New Site.
- Select an appliance, click Enable, and click Deploy.
- Installer receives activation email > Enter the serial number > Activate > Appliance is deployed successfully.

To configure Zero Touch Deployment service:

1. Install SD-WAN Center with enabled Zero Touch Deployment capabilities.
   a) Install SD-WAN Center with DHCP assigned IP address.
   b) Verify that SD-WAN Center is assignment a proper management IP address and network DNS address with connectivity to the public internet across the management network.
   c) Upgrade the SD-WAN Center to the latest SD-WAN software release version.
   d) With proper internet connectivity, the SD-WAN Center initiates the Zero Touch Deployment (ZTD) Cloud Service and automatically download and install any firmware updates specific
to ZTD, if this call home procedure fails the following Zero Touch Deployment option will not be available in the GUI.

e) Read the Terms and Conditions, and then select “I acknowledge that I have read and agree to the above Terms and Conditions.”

f) Click the “Login to Citrix Workspace Cloud” button if a Citrix Cloud account has already been created.

g) Login into the Citrix Cloud account, and upon receiving the following message of successful login, **PLEASE DO NOT CLOSE THIS WINDOW UP, THE PROCESS REQUIRES ANOTHER ~20 SECONDS FOR THE SD-WAN CENTER GUI TO BE REFRESHED.** The window should close on its own when it is complete.

h) To create a Cloud Login account follow the below procedure:
   • Open a web browser to https://onboarding.cloud.com
   • Click on the link for “Wait, I have a Citrix.com account.”
i) Sign-in with an existing Citrix account.

j) Once logged into SD-WAN Center Zero Touch Deployment page, you might notice that no sites are available for ZTD deployment because of the following reasons:

- The active configuration has not been selected from the Configuration drop-down menu
- All the sites for the current active configuration have already been deployed
- The configuration was not built using the SD-WAN Center, but rather the Configuration Editor available on the MCN
• Sites were not built in the configuration referencing zero touch capable appliances (e.g. 410-SE, 2100-SE, Cloud VPX)

2. Update the configuration to add a **new remote** site with a **ZTD capable SD-WAN appliance** using SD-WAN Center Network Configuration.

If the SD-WAN configuration was not built using the SD-WAN Center Network Configuration, import the active configuration from the MCN and begin modifying the configuration using SD-WAN Center. For Zero Touch Deployment capability, the SD-WAN Administrator must build the configuration using SD-WAN Center. The following procedure should be used to add a new site targeted for zero touch deployment.

Design the new site for SD-WAN appliance deployment by first outlining the details of the new site (that is, Appliance Model, Interface Groups usage, Virtual IP Addresses, WAN Links with bandwidth and their respective Gateways).

**Important**

You might notice any site node that has VPX selected as the model is also listed, but currently ZTD support is only available for the AWS VPX instance.

**Note**

- Make sure that you are using a support web browser for Citrix SD-WAN Center
- Make sure the web browser is not blocking any pop-up windows during the Citrix Workspace Login

![Branch Office Topology](image)

This is an example deployment of a branch office site, the SD-WAN appliance is deployed physically in path of the existing MPLS WAN link across a 172.16.30.0/24 network, and using an existing backup link by enabling it into an active state and terminating that second WAN link directly into the SD-WAN appliance on a different subnet 172.16.31.0/24.

**Note**

The SD-WAN appliances automatably assign a default IP address of 192.168.100.1/16. With
DHCP enabled by default, the DHCP Server in the network might provide the appliance a second IP address in a subnet that overlaps the default. This can possibly result in a routing issue on the appliance where the appliance might fail to connect to the ZTD Cloud Service. Configure the DHCP server to assign IP addresses outside of the range of 192.168.0.0/16.

There are various different deployment modes available for SD-WAN product placement in a network. In the above example, SD-WAN is being deployed as an overlay on top of existing networking infrastructure. For new sites, SD-WAN Administrators might choose to deploy the SD-WAN in Edge or Gateway Mode deployment, eliminating the need for a WAN edge router and firewall, and consolidating the network needs of edge routing and firewall onto the SD-WAN solution.

a) Open the SD-WAN Center web management interface and navigate to the **Configuration > Network Configuration** page.

- a) Make sure a working configuration is already in place, or import the configuration from the MCN.
- b) Navigate to the Advanced tab to create a site.
- c) Open the Sites tile to display the currently configured sites.
- d) Quickly build the configuration for the new site by utilizing the clone feature of any existing site.

- e) Populate all the required fields from the topology designed for this new branch site.
f) After cloning a new site, navigate to the site's **Basic Settings**, and verify that the Model of SD-WAN is correctly selected which would support the zero touch service.
g) The SD-WAN model for the site can be updated, but do be aware that the Interface Groups might have to be redefined since the updated appliance might have a new interface layout then what was used to clone.

h) Save the new configuration on SD-WAN Center, and use the export to the “Change Management inbox” option to push the configuration using Change Management.

i) Follow the Change Management procedure to properly stage the new configuration, which makes the existing SD-WAN devices aware of the new site to be deployed via zero touch, you need to utilize the “Ignore Incomplete” option to skip attempting to push the configuration to the new site that still needs to go through the ZTD workflow.

3. Navigate back to the SD-WAN Center Zero Touch Deployment page, and with the new active configuration running, the new site is available for deployment.

   a) In the Zero Touch Deployment page, under the Deploy New Site tab, select the running network configuration file

   b) After the running configuration file is selected, the list of all the branch sites with undeployed SD-WAN devices that are supported for zero touch will be displayed

   c) Select the branch sites you want to configure for Zero Touch service, click Enable, and then Deploy.
A Deploy New Site pop-up window appears, where the Admin can provide the Serial Number, branch site Street Address, Installer Email address, and more Notes, if necessary.

**Note**

The Serial Number entry field is optional and depending if it is populated or not, will result in a change in on-site activity the Installer is responsible for.

- If Serial Number field is populated – The installer is not required to enter serial number into the activation URL generated with the deploy site command
- If Serial Number field is left blank – The installer is responsible for entering the correct serial number of the appliance into the activation URL generated with the deploy site command

a) After clicking the **Deploy** button, a message will appear indicating that “The Site configuration has been deployed.”

b) This action triggers the SD-WAN Center, which was previously registered with the ZTD Cloud Service, to share the configuration of this particular site to be temporarily stored in the ZTD Cloud Service.

c) Navigate to the Pending Activation tab to confirm that the branch site information populated successfully and was put into a pending installer activity status.
Note

A zero touch deployment in the Pending Activation state can optionally be chosen to Delete or Modify, if information is incorrect. If a Site is deleted from the pending activation page, it becomes available to be deployed in the Deploy New Site tab page. Once you choose to delete the branch site from Pending activation, the activation link send to the installer becomes invalid.

If the Serial Number field was not populated by the SD-WAN Administrator, the Status Field indicates “Waiting for Installer” instead of “Connecting.”

4. The next series of activities is performed by the On-site Installer.

a) The Installer verifies the mailbox for the email address that the SD-WAN Administrator used when deploying the site.

b) Open the zero touch deployment Activation URL in an internet browser window.

c) If the SD-WAN Administrator did not pre-populate the serial number in the deploy site step, then the Installer would be responsible for locating the serial number on the physical appliance and entering the serial number manually into the activation URL, then click the
d) If the Admin pre-populating the Serial Number information, the Activation URL will have already progressed to the next step.

![Zero Touch Deployment Service]

The installer must physically be on-site to perform the following actions:

- Cable all WAN and LAN interfaces to match the topology and configuration built in earlier steps.
- Cable the management interface (MGMT, 0/1) in the segment of the network that provides DHCP IP address and connectivity to the Internet with DNS and FQDN to IP address resolution.
- Power cable the SD-WAN appliance.
- Turn on the power switch of the appliance.

**Note**

Most appliances automatically power on when the power cable is attached. Some appliance might have to be powered on using the power switch on the front of the appliance, others might have the power switch on the rear of the appliance. Some power switches require holding the power button until the unit powers up.

The next series of steps are automated with the help of the Zero Touch Deployment service, but requires that the following pre-requisites are available.

- The branch appliance should be powered up
- DHCP must be available in the existing network to assign management and DNS IP address
- Any DHCP assigned IP address requires connectivity to the internet with ability to resolve FQDNs
- IP assignment can be configured manually, as long as the other pre-requisites are meet
1. The appliance obtains an IP address from the networks DHCP Server, in this example topology this is achieved through the bypassed data interfaces of a factory default state appliance.

   **Power on NetScaler SD-WAN**

   ![](image)

2. As the appliance obtains the web management and DNS IP addresses from the underlay network DHCP Server, the appliance initiates the Zero Touch Deployment Service and download any ZTD related software updates.

3. With successful connectivity to the ZTD Cloud Service, the deployment process automatically perform the following:
   - Download the Configuration File that is stored earlier by the SD-WAN Center
   - Applying the Configuration to the local appliance
   - Download and Install a temporary 10 MB license file
   - Download and Install any software updates if needed
   - Activate the SD-WAN Service

4. Further confirmation can be done in the SD-WAN Center web management interface, the Zero Touch Deployment menu displays successfully activated appliances in the **Activation History** tab.
5. The Virtual Paths might not immediately show in a connected state because the MCN might not trust the configuration handed down from the ZTD Cloud Service, and reports “Configuration version mismatch” in the MCN Dashboard.

6. The configuration is redelivered to the newly installed branch office appliance and the status is monitored on the MCN > Configuration > Virtual WAN > Change Management page (this process can take several minutes to complete).
7. The SD-WAN Administrator can monitor the head-end MCN web management page for the established Virtual Paths of the remote site.

8. SD-WAN Center can also be utilized to identify the DHCP assigned IP address of the on-site appliance from the Configuration > Network Discovery > Inventory and Status page.
9. At this point the SD-WAN Network Administrator can gain web management access to on-site appliance utilizing the SD-WAN overlay network.

Remote GUI access through Virtual Path

10. Web management access to the remote site appliance indicates that the appliance has been installed with a temporary Grace License at 10 Mbps, which enables the ability for the Virtual Path Service Status to report as active.
11. The appliance configuration can be validated using the **Configuration > Virtual WAN > View Configuration** page.
12. The appliance license file can be updated to a permanent license using the **Configuration > Appliance Settings > Licensing** page.

13. After uploading and installing the permanent license file, the Grace License warning ban-
ner disappears and during the license install process no loss in connectivity to the remote site will occur (zero pings are dropped).

October 15, 2018

On-prem zero touch

For instructions about how to deploy an SD-WAN appliance with Zero Touch Service, see the topic; How to Configure Zero Touch Deployment Service.

AWS

August 13, 2018

Deploying in AWS

With SD-WAN release 9.3, zero touch deployment capabilities have extended to Cloud instances. The procedure to deploy zero touch deployment process four cloud instances is slightly different from appliance deployment for zero touch service.

1. Update the configuration to add a new remote site with a ZTD capable SD-WAN cloud device using SD-WAN Center Network Configuration.

    If the SD-WAN configuration was not built using the SD-WAN Center Network Configuration, import the active configuration from the MCN and begin modifying the configuration using SD-WAN Center. For Zero Touch Deployment capability, the SD-WAN Administrator must build the configuration using SD-WAN Center. The following procedure should be used to add a new cloud node targeted for zero touch deployment.
a) Design the new site for SD-WAN cloud deployment by first outlining the details of the new site (i.e. VPX size, Interface Groups usage, Virtual IP Addresses, WAN Link(s) with bandwidth and their respective Gateways).

**Note**

- Cloud deployed SD-WAN instances must be deployed in Edge/Gateway mode.
- The template for the cloud instance is limited to three interfaces; Management, LAN, and WAN (in that order).
- The available cloud templates for SD-WAN VPX are currently hard-set to obtain the #.#.#.11 IP address of the available subnets in the VPC.

**Cloud Topology with NetScaler SD-WAN**

This is an example deployment of a SD-WAN cloud deployed site, the Citrix SD-WAN device is deployed as the edge device servicing a single Internet WAN link in this cloud network. Remote sites will be able to leverage multiple distinct Internet WAN links connecting into this same Internet Gateway for the cloud, providing resiliency and aggregated bandwidth connectivity from any SD-WAN deploy site to the cloud infrastructure. This provides cost effective and highly reliable connectivity to the cloud.

b) Open the SD-WAN Center web management interface and navigate to the **Configuration > Network Configuration** page.
c) Make sure a working configuration is already in place, or import the configuration from the MCN.

d) Navigate to the Basic tab to create a new site.

e) Open the Sites tile to display the currently configured sites.

f) Quickly built the configuration for the new cloud site by utilizing the clone feature of any existing site, or manually build a new site.
g) Populate all the required fields from the topology designed earlier for this new cloud site. Keep in mind that the template available for cloud ZTD deployments are hard-set to utilize the #.#.#.11 IP address for the Mgmt, LAN, and WAN subnets. If the configuration is not set to match the expected .11 IP host address for each interface, then the device will not be able to properly establish ARP to the cloud environment gateways and IP connectivity to the Virtual Path of the MCN.
h) After cloning a new site, navigate to the site’s **Basic Settings**, and verify that the Model of SD-WAN is correctly selected which would support the zero touch service.

i) Save the new configuration on SD-WAN Center, and use the export to the “**Change Management inbox**” option to push the configuration using Change Management.

j) Follow the Change Management procedure to properly stage the new configuration, which
makes the existing SD-WAN devices aware of the new site to be deployed via zero touch, you will need to utilize the “Ignore Incomplete” option to skip attempting to push the configuration to the new site that still needs to go through the ZTD workflow.

2. Navigate back to the SD-WAN Center Zero Touch Deployment page, and with the new active configuration running, the new site will be available for deployment.
   a) In the Zero Touch Deployment page, under the **Deploy New Site** tab, select the running network configuration file.
   b) After the running configuration file is selected, the list of all the branch sites with undeployed Citrix SD-WAN devices that are supported for zero touch will be displayed.
   c) Select the target cloud site you want to deploy using the Zero Touch service, click **Enable**, and then **Provision and Deploy**.
d) A pop-up window will appear, where the Citrix SD-WAN Admin can initiate the deployment for Zero Touch.

Populate an email address where the activation URL can be delivered, and select the **Provision Type** for the desired Cloud.

![Provision and Deploy](image)

**Note**

Make use of the help links for guidance on how to setup the SSH Key and Role ARN on the Cloud account. Also make sure the select region matches what is available on the account and that the selected Instance Size matches VPX or VPXL as the selected model in the SD-WAN configuration.

f) Click **Deploy**, triggering the SD-WAN Center, which was previously registered with the ZTD Cloud Service, to share the configuration of this site to be temporarily stored in the ZTD Cloud Service.

g) Navigate to the **Pending Activation** tab to confirm that the site information populated successfully and was put into a provisioning status.
3. Initiate the Zero Touch Deployment process as the Cloud Admin.

   a) The Installer will need to check the mailbox of the email address the SD-WAN Administrator used when deploying the site.

   b) Open the activation URL found in the email in an internet browser window.

   c) If the SSH Key and Role ARN are properly inputted, the Zero Touch Deployment Service will immediately start provisioning the SD-WAN instance, otherwise connections errors will immediately be displayed.
d) For additional troubleshooting on the AWS console, the Cloud Formation service can be utilized to catch any events that occur during the provisioning process.

e) Allow the provisioning process ~8-10 minutes and activation another ~3-5 minutes to fully
f) With successful connectivity of the SD-WAN cloud instance to the ZTD Cloud Service, the service will automatically perform the following:

- Download the site-specific Configuration File that was stored earlier by the SD-WAN Center
- Applying the Configuration to the local instance
- Download and Install a temporary 10 MB license file
- Download and Install any software updates if needed
- Activate the SD-WAN Service

![Citrix SD-WAN Center 10.1](image)

g) Further confirmation can be done in the SD-WAN Center web management interface; the Zero Touch Deployment menu will display successfully activated appliances in the **Activation History** tab.
h) The Virtual Paths may not immediately show in a connected state, this is because the MCN may not trust the configuration handed down from the ZTD Cloud Service, and will report “Configuration version mismatch” in the MCN Dashboard.

i) The configuration will automatically be redelivered to the newly installed branch office appliance, the status of this can be monitoring on the **MCN > Configuration > Virtual WAN> Change Management** page (depending on the connectivity, this process can take several minutes to complete).
j) The SD-WAN Administrator can monitor the head-end MCN web management page for the established Virtual Paths of the newly added cloud site.

k) If troubleshooting is required, open the SD-WAN instances user interface using the public IP assigned by the cloud environment during provisioning, and utilize the ARP table in the Monitoring > Statistics page to identify any issues connecting to the expected gateways, or utilize the trace route and packet capture options in diagnostics.
With SD-WAN release 9.3, zero touch deployment capabilities have extended to Cloud instances. The procedure to deploy zero touch deployment process for cloud instances is slightly different from appliance deployment for zero touch service.

Updating the configuration to add a new remote site with a ZTD capable SD-WAN cloud device using SD-WAN Center Network Configuration

If the SD-WAN configuration was not built using the SD-WAN Center Network Configuration, import the active configuration from the MCN and begin modifying the configuration using SD-WAN Center. For Zero Touch Deployment capability, the SD-WAN Administrator must build the configuration using SD-WAN Center. The following procedure should be used to add a new cloud node targeted for zero touch deployment.

1. Design the new site for SD-WAN cloud deployment by first outlining the details of the new site (i.e. VPX size, Interface Groups usage, Virtual IP Addresses, WAN Link(s) with bandwidth and their respective Gateways).

Note

- Cloud deployed SD-WAN instances must be deployed in Edge/Gateway mode.
- The template for the cloud instance is limited to three interfaces; Management, LAN,
and WAN (in that order).

- The available Azure cloud templates for SD-WAN VPX are currently hard-set to obtain the 10.9.4.106 IP for the WAN, 10.9.3.106 IP for the LAN, and 10.9.0.16 IP for the Management address. The SD-WAN configuration for the Azure node targeted for Zero Touch must match this layout.

- The Azure site name in the configuration must be all lowercase with no special characters (e.g. ztdazure).

This is an example deployment of a SD-WAN cloud deployed site, the Citrix SD-WAN device is deployed as the edge device servicing a single Internet WAN link in this cloud network. Remote sites will be able to leverage multiple distinct Internet WAN links connecting into this same Internet Gateway for the cloud, providing resiliency and aggregated bandwidth connectivity from any SD-WAN deploy site to the cloud infrastructure. This provides cost effective and highly reliable connectivity to the cloud.

2. Open the SD-WAN Center web management interface and navigate to the Configuration > Network Configuration page.
3. Make sure a working configuration is already in place, or import the configuration from the MCN.

4. Navigate to the Basic tab to create a new site.

5. Open the Sites tile to display the currently configured sites.

6. Quickly built the configuration for the new cloud site by utilizing the clone feature of any existing site, or manually build a new site.

7. Populate all the required fields from the topology designed earlier for this new cloud site.

Keep in mind that the template available for Azure cloud ZTD deployments is currently hard-set to obtain the 10.9.4.106 IP for the WAN, 10.9.3.106 IP for the LAN, and 10.9.0.16 IP for the Management address. If the configuration is not set to match the expected VIP address for each interface, then the device will not be able to properly establish ARP to the cloud environment gateways and IP connectivity to the Virtual Path of the MCN.
It is important that the site name be compliant with what Azure expects. The site name must be in all lower case, at least 6 characters, with no special characters, it must confirm to the following regular expression `^[a-z][a-z0-9-]{1,61}[a-z0-9]$.

8. After cloning a new site, navigate to the site's Basic Settings, and verify that the Model of SD-WAN is correctly selected which would support the zero touch service.
9. Save the new configuration on SD-WAN Center, and use the export to the “Change Management inbox” option to push the configuration using Change Management.

10. Follow the Change Management procedure to properly stage the new configuration, which makes the existing SD-WAN devices aware of the new site to be deployed via zero touch, you will need to utilize the “Ignore Incomplete” option to skip attempting to push the configuration to the new site that still needs to go through the ZTD workflow.
Navigate to the SD-WAN Center’s Zero Touch Deployment page, and with the new active configuration running, the new site will be available for SD-WAN Center Provision and Deploy Azure (Step 1 of 2)

1. In the Zero Touch Deployment page, login with your Citrix account credentials. Under the Deploy New Site tab, select the running network configuration file.

2. After the running configuration file is selected, the list of all the branch sites with ZTD capable Citrix SD-WAN devices will be displayed.

3. Select the target cloud site you want to deploy using the Zero Touch service, click Enable, and then Provision and Deploy.

4. A pop-up window will appear, where the Citrix SD-WAN Admin can initiate the deployment for Zero Touch. Validate that the site name complies with the requirements on Azure (lowercase with no special characters). Populate an email address where the activation URL can be delivered, and select Azure as the Provision Type for the desired Cloud, before clicking Next.
5. After clicking **Next**, the Provision and Deploy Azure (step 1 of 2) window will require input of obtained from the Azure account.

Copy and paste each required field after obtaining the information from your Azure account. The steps below outline how to obtain the required Subscription ID, Application ID, Secret Key, and Tenant ID from your Azure account, then proceed by clicking **Next**.

a) On the Azure account, we can identify the required **Subscription ID** by navigating to “More Services” and select **Subscriptions**.
b) To identify the required **Application ID**, navigate to Azure Active Directory, Application registrations, and click **New application registration**.
c) In the app registration create menu, enter a Name and a Sign-on URL (this can be any URL, the only requirement is that it must be valid), then click Create.

d) Search for and open the newly created Registered App, and note the Application ID.
e) Again open the newly created Registration App, and to identify the required Security Key, under API Access, select **Required permissions**, to allow a third party to provision and instance. Then select **Add**.

![Screenshot of SD-WAN Center 10.1](image)

f) When adding the Required permissions, **Select an API**, then highlight **Windows Azure Service Management API**.
g) Enable **Delegate Permissions** to provision instances, then click **Select** and **Done**.

h) For this Registered App, under API Access, select **Keys**, and create a secret **key description** and **the desired duration** for the key to be valid. Then click **Save which** will produce a **secret key** (the key is only required for the provisioning process, it can be deleted after the instance is made available).
i) Copy and save the secret key (note you will not be able to retrieve this later).

j) To identify the required Tenant ID, navigate back to the App registration pane, and select Endpoints.

k) Copy the Federation Metadata Document, to identify your Tenant ID (note the Tenant
ID is 36-character string located between the “online.com/” and the “/federation” in the URL).

i) The last item required is the **SSH Public Key**. This can be created using Putty Key Generator or ssh-keygen and will be utilized for authentication, eliminating the need for passwords to log in. The SSH public key can be copied (including the heading ssh-rsa and trailing rsa-key strings). This public key will be shared through SD-WAN Center input to the Citrix Zero Touch Deployment Service.

m) Additional steps are required to assign the application a role. Navigate back to More Services, then Subscriptions.
n) Select the active subscription, then Access control (AIM), next click Add.

o) In the add permissions pane, select “Owner” role, assign access to “Azure AD user, group, or application” and search for the registered app in the **Select field** to allow the Zero Touch Deployment Cloud Service to create and configure the instance on the Azure subscription. Once the app is identified, select it and make sure it populates as a Selected member before clicking Save.
After collecting the required inputs and entering them into SD-WAN Center, click Next. If the inputs are not correct, you will encounter an authentication failure.

SD-WAN Center Provision and Deploy Azure (Step 2 of 2)

1. Once the Azure authentication is successful, populate the appropriate fields to select the desired Azure Region, and the appropriate Instance Size, then click Deploy.
2. Navigating to the **Pending Activation** tab in SD-WAN Center, will help track the current status of the deployment.

3. An email with an activation code will be delivered to the email address inputted in step 1, obtain the email and open the **activation URL** to trigger the process and check the activation status.
4. An email with an activation URL will be delivered to the email address inputted in step 1. Obtain the email and open the activation URL to trigger the process and check the activation status.

5. It will take a few minutes for the instance to be provisioned by the SD-WAN Cloud Service. You can monitor the activity on the Azure portal, under Activity log for the Resource Group which is automatically created. Any issues or errors with the provisioning will be populated here, as well as replicated to SD-WAN Center in the Activation Status.
6. In the Azure portal, the successfully launched instance will be available under **Virtual Machines**. To obtain the assigned public IP, navigate to the Overview for the instance.

7. After the VM is in a running state, give it a minute before the service will reach out and start the process of downloading the configuration, software and license.
8. After each of the SD-WAN Cloud service steps are automatically complicated, log in to the SD-WAN instances web interface using the public IP obtained from the Azure portal.
9. The Citrix SD-WAN Monitoring Statistics page will identify successful connectivity from the MCN to the SD-WAN instance in Azure.

10. Furthermore, the successful (or unsuccessful) provisioning attempt will be logged in the SD-WAN Center’s Activation History page.
Proxy Server Settings for zero touch deployment

August 13, 2018

As a prerequisite for Zero Touch Deployment, the Citrix SD-WAN Center should be connected to the internet. If your Citrix SD-WAN Center is connected to the internet through a proxy server, you have to configure the proxy server settings on the Citrix SD-WAN Center.

**Note**

This proxy server setting is used for Zero Touch Deployment only.

To configure zero touch proxy server settings:

1. In the SD-WAN Center web interface, navigate to **Administration > Global Settings > Management Interface**.

2. In the **Zero Touch Proxy Server Setting** section, enter values for the following fields:
   - **IP Address**: The IP address of the proxy server.
   - **Port**: The network port number on which the proxy server accepts connections.
   - **UserName**: The proxy server user name
   - **Password**: The password for the proxy server.

**Note**

You can leave the **UserName** and **Password** field blank if there is no authentication configured on the proxy server.
3. Click **Apply**, a confirmation dialog box appears.

![Confirmation dialog box](image)

4. Click **Apply**.

**Note**
You can remove the proxy server settings altogether, if the Citrix SD-WAN Center is connected to the internet directly. You can also remove the proxy server settings and configure another proxy server, if required.

**To remove proxy server settings:**

1. In the Citrix SD-WAN Center web interface, navigate to Administration > Global Settings > Management Interface.

2. In the **Zero Touch Proxy Server Setting** section, click **Remove**.

![Proxy server settings](image)

3. Click **Remove**, a confirmation dialog box appears.
4. Click **Remove**.

**Azure Virtual WAN**

October 16, 2018

Microsoft Azure Virtual WAN and Citrix SD-WAN provide simplified network connectivity and centralized management across hybrid cloud workloads. You can automate configuration of branch appliances to connect to the Azure WAN and configure branch traffic management policies according to your business requirements. The built-in dashboard interface provides instant troubleshooting insights that can save time and provides visibility for large-scale site-to-site connectivity.

Microsoft Azure Virtual WAN allows you to enable simplified connectivity to Azure Cloud workloads and to route traffic across the Azure backbone network and beyond. Azure provides 54+ regions and multiple points of presence across the globe Azure regions serve as hubs that you can choose to connect to the branches. After the branches are connected, use the Azure cloud service through hub-to-hub connectivity. You can simplify connectivity by applying multiple Azure services including hub peering with Azure VNETs. Hubs serve as traffic gateways for the branches.

Microsoft Azure Virtual WAN offers the following advantages:

- Integrated connectivity solutions in hub and spoke - Automate site-to-site connectivity and configuration between on premises and the Azure hub from various sources including connected partner solutions.

- Automated setup and configuration – Connect your virtual networks to the Azure hub seamlessly.

- Intuitive troubleshooting – You can see the end-to-end flow within Azure and use this information to take required actions.
Using Citrix SD-WAN to connect to Microsoft Azure Virtual WAN

November 28, 2018

For on-premises devices to connect into Azure a controller is required. A controller ingests Azure APIs to establish site-to-site connectivity with the Azure WAN and a Hub.

Microsoft Azure Virtual WAN includes the following components and resources:

- **WAN**: Represents entire network in Microsoft Azure. It contains links to all Hubs that you would like to have within this WAN. WANs are isolated from each other and cannot contain a common hub, or connections between two hubs in different WANs.

- **Site**: Represents your on-premises VPN device and its settings. A Site can connect to multiple hubs. By using Citrix SD-WAN, you can have a built-in solution to automatically export this information to Azure.

- **Hub**: Represents the core of your network in a specific region. The Hub contains various service endpoints to enable connectivity and other solutions to your on-premises network. Site-to-site connections are established between the Sites to a Hubs VPN endpoint.

- **Hub virtual network connection**: Hub network connects the Azure Virtual WAN Hub seamlessly to your virtual network. Currently, connectivity to virtual networks that are within the same Virtual Hub Region is available.

- **Branch**: The branches are the on-premises Citrix SD-WAN appliances, which exist in customer office locations. An SD-WAN controller manages the branches centrally. The connection originates from behind these branches and terminates into Azure. The SD-WAN controller is responsible for applying the required configuration to these branches and to Azure Hubs.

The following illustration describes the Virtual WAN components:
How does Microsoft Azure Virtual WAN work

1. The SD-WAN Center is authenticated by using service principal, principal, or role-based access functionality, which is enabled in the Azure GUI.

2. The SD-WAN Center obtains Azure connectivity configuration and updates the local device. This automates the configuration download, editing, and updating of the on-premise device.

3. After the device has the correct Azure configuration, a site-to-site connection (two active IPSec tunnels) is established to the Azure WAN. Azure requires the branch device connector to support IKEv2 settings. The BGP configuration is optional.

   Note: IPSec parameters for establishing IPSec tunnels are standardized.

<table>
<thead>
<tr>
<th>IPSec Property</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ike Encryption Algorithm</td>
<td>AES 256</td>
</tr>
<tr>
<td>Ike Integrity Algorithm</td>
<td>SHA 256</td>
</tr>
<tr>
<td>Dh Group</td>
<td>DH2</td>
</tr>
<tr>
<td>IPsec Property</td>
<td>Parameter</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>IPsec Encryption Algorithm</td>
<td>GCM AES 256</td>
</tr>
<tr>
<td>IPsec Integrity Algorithm</td>
<td>GCM AES 256</td>
</tr>
<tr>
<td>PFS Group</td>
<td>None</td>
</tr>
</tbody>
</table>

Azure Virtual WAN automates connectivity between the workload virtual network and the hub. When you create a Hub Virtual Network Connection, it sets the appropriate configuration between the provisioned hub and the workloads virtual network (VNET).

**Prerequisites and requirements**

Read the following requirements before proceeding with configuring Azure and SD-WAN to manage branch sites connecting to Azure hubs.

1. Have whitelisted Azure subscription for Virtual WAN.
2. Have an on premise appliance such as, an SD-WAN appliance to establish IPsec into Azure resources.
3. Have Internet links with public IP addresses. Though a single Internet link is sufficient to establish connectivity into Azure, you need two IPsec tunnels to use the same WAN link.
4. SD-WAN controller – a controller is the interface responsible for configuring SD-WAN appliances for connecting into Azure.
5. A VNET in Azure that has at least one workload. For instance, a VM, which is hosting a service. Consider the following points:
   a) The virtual network should not have an Azure VPN or Express Route gateway, or a network virtual appliance.
   b) The virtual network should not have a user-defined route, which routes traffic to a non-Virtual WAN virtual network for the workload accessed from on premise branch.
   c) Appropriate permissions to access the workload must be configured. For example, port 22 SSH access for a ubuntu VM.

The following diagram illustrates a network with two sites and two virtual networks in Microsoft Azure.
Set up Microsoft Azure Virtual WAN

For on premise SD-WAN branches to connect into Azure and access the resources over IPsec tunnels, the following steps should be completed.

1. Configuring WAN resources.
2. Enabling SD-WAN branches to connect into Azure using IPsec tunnels.

Configure Azure network before configuring SD-WAN network, since the Azure resources required to connect to SD-WAN appliances must be available beforehand. However, you can configure SD-WAN configuration before configuring Azure resources, if you prefer. This topic discusses setting up the Azure Virtual WAN network first before configuring SD-WAN appliances. [https://microsoft.com azure virtual-wan](https://microsoft.com/azure-virtual-wan).

Create a WAN resource

To use Virtual WAN features and connect the on premises branch appliance into Azure:
1. Go to Azure Virtual WAN. Sign into Microsoft Azure, and select Create WAN.

2. Enter a name for the WAN and select the subscription you wish to use for WAN.
3. Select an existing resource group or create a fresh resource group. Resource groups are logical constructs and data exchange across resource groups is always possible.

4. Select the location where you want your resource group to reside. WAN is a global resource that does not have a location. However, you need to enter a location for the resource group that will contain metadata for WAN resource.

5. Click **Create**. This starts the process to validate and deploy your settings.

**Create site**

You can create a site by using a preferred vendor. The preferred vendor sends the information about your device and site to Azure or you can decide to manage the device yourself. If you want to manage the device, you need to create the site in Azure Portal.
**SD-WAN network and Microsoft Azure Virtual WAN workflow**

Configure SD-WAN appliance:

1. Provision a Citrix SD-WAN appliance
   - Connect SD-WAN branch appliance to the MCN appliance.
2. Configure SD-WAN appliance
   - Configure Intranet Services for Active-Active connection.

Configure SD-WAN Center:

- Configure SD-WAN Center to connect to Microsoft Azure.

Configure Azure settings:

- Provide Tenant ID, Client ID, Secure Key, Subscriber ID, and Resource Group.

Configure branch site to WAN association:

1. Associate one WAN resource to a branch. Same site cannot be connected to multiple WANs.
2. Click **New** to configure Site-WAN association.
3. Select **Azure Wan-resources**.
4. Select **Services** (Intranet) for the site. Select two services for Active-Standby support.
5. Select **Site Names** to be associated with the Wan-resources.
6. Click **Deploy** to confirm the association.
7. Wait for the status to change to **Tunnels Deployed** to view the **IPsec tunnel** settings.
8. Use the SD-WAN Center Reporting view to check status of the respective IPsec tunnels.

**Configure Citrix SD-WAN network**

**MCN:**

The MCN serves as the distribution point for the initial system configuration and subsequent configuration changes. There can be only one active MCN in a Virtual WAN.

By default, appliances have the pre-assigned role of client. To establish an appliance as the MCN, you must first add and configure the site as an MCN. The network configuration GUI becomes available after a site is configured as an MCN. Upgrades and configuration changes must be performed from the MCN or SD-WAN center only.

**Role of MCN:**

The MCN is the central node that acts as the controller of an SD-WAN network and the central administration point for the client nodes. All configuration activities, as well as preparation of firmware packages and their distribution to the clients, are configured on the MCN. In addition, monitoring information is available only on the MCN. The MCN can monitor the entire SD-WAN network, whereas client nodes can monitor only the local Intranets and some information for those clients, which they
are connected. The primary purpose of the MCN is to establish overlay connections (virtual paths) with one or more client nodes located across the SD-WAN network for Enterprise Site-to-Site communication. An MCN can administer and have Virtual Paths to multiple client nodes. There can be more than one MCN, but only one can be active at any given time. The below figure illustrates the basic diagram of the MCN and client (branch node) appliances for a small two site network.

Configure SD-WAN appliance as MCN

To add and configure the MCN, you must first log into the Management Web Interface on the appliance you are designating as the MCN, and switch the Management Web Interface to MCN Console mode. MCN Console mode enables access to the Configuration Editor in the Management Web Interface to which you are currently connected. You can then use the Configuration Editor to add and configure the MCN site.

To switch the Management Web Interface to MCN Console mode, do the following:

1. Log into the SD-WAN management web interface on the appliance you want to configure as the MCN.
2. Click Configuration in the main menu bar of the Management Web Interface main screen (blue bar at the top of the page).
3. In the navigation tree (left pane), open the Appliance Settings branch and click Administrator Interface.
4. Select the Miscellaneous tab. The miscellaneous administrative settings page opens.
At the bottom of the **Miscellaneous** tab page is the **Switch to [Client, MCN] Console** section. This section contains the **Switch Console** button for toggling between appliance console modes.

The section heading indicates the current console mode, as follows:

- When in Client Console mode (default), the section heading is Switch to MCN Console.
- When in MCN Console mode, the section heading is Switch to Client Console.

By default, a new appliance is in the Client Console mode. MCN Console mode enables the Configuration Editor view in the navigation tree. The Configuration Editor is available on the MCN appliance, only.

**Configure MCN**

To add and begin configuring the MCN appliance site, do the following:

1. In the SD-WAN appliance GUI, navigate to **Virtual WAN > Configuration Editor**.
2. Click **Sites** in the Sites bar to begin adding and configuring the MCN site. The **Add Site** dialog box is displayed.

3. Enter a site name that lets you determine the geographic location and role of the appliance (DC/secondary DC). Select the correct appliance model. Selecting the correct appliance is crucial since the hardware platforms differ from each other in terms of processing power and licensing. Since we are configuring this appliance as the primary head end appliance, choose the mode as primary MCN and click **Add**.

4. This adds the new site to the sites tree and the default view shows the basic settings configuration page as shown below:
5. Enter the basic settings such as location, site name.

6. Configure the appliance so that it can accept traffic from Internet/MPLS/Broadband. Define the interfaces where the links are terminated. This depends on whether the appliance is either in overlay or underlay mode.

7. Click on **Interface groups** to start defining the interfaces.

8. Click + to add virtual interface groups. This adds a new virtual interface group, the number of virtual interfaces depends on the links that you want the appliance to handle. The number of links that an appliance can handle varies from appliance model to model and the maximum number of links can be up to eight.
9. Click + to the right of virtual interfaces to view the screen as shown below.

10. Select the **Ethernet interfaces**, which form the part of this virtual interface. Depending on the platform model, appliances have a pre-configured pair of fail-to-wire interfaces. If you want to enable fail-to-wire on appliances, then ensure that you are choosing the correct pair of interfaces and ensure that you choose fail-to-wire under the **Bypass Mode** column.

11. Select the security level from the drop-down list. Trusted mode is chosen, if the interface is serving MPLS links and Untrusted is chosen when Internet links are used on the respective interfaces.

12. Click + to the right of the label named virtual interfaces. This shows the Name, firewall zone and VLAN IDs. Enter the **Name and VLAN ID** for this virtual interface group. VLAN ID is used to identifying and marking traffic to and from the virtual interface, use 0 (zero) for native/untagged traffic.
13. To configure the interfaces in fail to wire, click on Bridge pairs. This adds a new bridge pair and allows for editing. Click **Apply** to confirm these settings.

14. To add more virtual interface groups click + to the right of the interface groups branch and proceed as above.

15. After the interfaces are chosen, the next step is to configure IP addresses on these interfaces. In Citrix SD-WAN terminology this is known as a VIP (Virtual IP).

16. Continue in the sites view and click on the Virtual IP address to view the interfaces for configuring VIP.

17. Enter the IP Address / Prefix information, and select the **Virtual Interface** with which the ad
address is associated. The Virtual IP Address must include the full host address and netmask. Select the desired settings for the Virtual IP address, such as the Firewall Zone, Identity, Private, and Security. Click **Apply**. This adds the address information to the site and includes it in the site Virtual IP Addresses table. To add more Virtual IP Addresses, click + to the right of the Virtual IP Addresses, and proceed as above.

18. Continue in the sites section to configure WAN Links for the site.

19. Click **Add link**, at the top of the panel on the right hand side. This opens a dialog box, which allows you to choose the type of link to be configured.

20. Public Internet is for Internet/broadband/DSL/ADSL links, whereas private MPLS is for MPLS links. Private Intranet is also for MPLS links. The difference between private MPLS and private Intranet links is that private MPLS allows for preserving the QoS policies of MPLS links.

21. If you are choosing public Internet and the IPs are assigned through DHCP, choose the auto detect IP option.

22. Select **Access Interfaces** in the WAN link configuration page. This opens the Access Interfaces
view for the site. Add and configure the VIP and gateway IP for each of the links as shown below.

23. Click + to add an interface. This adds a blank entry to the table and opens it for editing.

24. Enter the name you want to assign to this Interface. You may choose to name it based on the link type and location. Keep the routing domain as default if you do not want to segregate networks and assign an IP to the Interface.

25. Ensure that you provide a publically reachable gateway IP address if the link is an internet link or a private IP if the link is an MPLS link. Keep the virtual path mode as primary since you need this link to form virtual path.

   Note: Enable proxy ARP as the appliance replies to ARP requests for the gateway IP address when the gateway is unreachable.

26. Click Apply to finish configuring WAN link. If you want to configure more WAN links, then repeat the steps for another link.

27. Configure routes for the site. Click on Connections view and select routes.

28. Click + to add routes, this opens a dialog box as shown below.
29. Enter the following information is available for the new route:

- Network IP Address
- Cost – Cost determines which route takes precedence over the other. Paths with lower costs take precedence over higher cost routes. The default value is five.
- Service type – Select the service, a service can be any of the following:
  - Virtual Path
  - Intranet
  - Internet
  - Passthrough
  - Local
  - GRE Tunnel
  - LAN IPsec tunnel

30. Click **Apply**.

To add more routes for the site click + to the right of the routes branch and proceed as above. For more information, refer to **Configure MCN**.

**Configure virtual path between MCN and branch sites**

Establish connectivity between the MCN and branch node. You can do this by configuring a virtual path between these two sites. Navigate to the **Connections** tab in the configuration tree of the configuration editor.

1. Click the **Connections** tab in the configuration section. This displays the connections section of configuration tree.

2. Select the **MCN** from view site drop-down menu in the **connections** section page.
3. Select virtual path from under the connections tab to create virtual path between the MCN and branch sites.

4. Click **Add Virtual Path** next to the name of the static virtual path in the virtual paths section. This opens up a dialog box as shown below. Choose the branch for which you want the Virtual path to be configured. You need to configure this under the label named remote site. Select the branch node from this drop-down list, and click on the check box **Reverse Also**.
Traffic classification and steering are mirrored on both sites of the virtual path. After this is complete, select paths from the drop-down menu under the label named section as shown below.

5. Click + Add above the paths table, which displays the add path dialog box. Specify the endpoints within which the virtual path needs to be configured. Now, click Add to create the path and click the Reverse Also checkbox.

**Note:** Citrix SD-WAN measures link quality in both directions. This means point A to point B is one path and point B to point A is another path. With the help of unidirectional measurement of link conditions, the SD-WAN is able to choose the best route to send traffic over. This is different from measures such as RTT, which is a bi-directional metric to measure latency. For example, one connection between point A and point B is displayed as two paths and for each of them the link performance metrics are calculated independently.

This setting is enough to bring the virtual paths up between the MCN and the branch, other configuration options are also available. For more information, refer to Configure virtual path service between MCN and Client sites.

**Deploy MCN configuration**

The next step is to deploy the configuration. This involves the following two steps:
1. Export the SD-WAN configuration package to Change Management.
   - Before you can generate the Appliance Packages, you must first export the completed configuration package from the Configuration Editor to the global Change Management staging inbox on the MCN. Refer to the steps provided in the section, Perform change management.

2. Generate and stage the appliance packages.
   - After you have added the new configuration package to the Change Management inbox, you can generate and stage the Appliance Packages on the branch sites. To do this, you use the Change Management wizard in the management web interface on the MCN. Refer to the steps provided in the section, Stage Appliance Packages.

**Configure intranet services to connect with Azure WAN resources**

1. In the SD-WAN appliance GUI, go to the Configuration Editor, navigate to the Connections tile. Click + Add Service to add an Intranet Service for that site.

2. In the Basic Settings for the Intranet Service, there are several options on how you want the Intranet Service to behave during unavailability of WAN links.
   - **Enable primary reclaim** – check this box if you want the chosen primary link to take over when it comes up after failing over. If you however, choose not to check this option then the secondary link would continue to send traffic over.
   - **Ignore WAN Link status** – If this option is enabled, then packets destined for this intranet service would continue to use this service even if the constituent WAN links are unavailable.
3. After configuring the basic settings, the next step is to choose the constituent WAN Links for this service. At the maximum of two links are chosen for one Intranet service. To choose the WAN links please select the WAN links option from the dropdown labeled Section. The WAN links function in primary and secondary mode and only one link are chosen as a primary WAN link.

**Note:** When a second intranet service is created, it must have the primary and secondary wan-link mapping.

4. Branch site specific Rules are available, enabling the capability of customization of each branch site uniquely overriding any general settings configured in the global default set. Modes include desired delivery over a specific WAN link, or as an Override Service allowing for pass through or discard of the filtered traffic. For instance, if there is some traffic, which you do not want to be going over the intranet service, you can write a rule to discard that traffic or send it over a different service (internet or pass through).
5. With Intranet Service enabled for a site, the **Provisioning** tile is made available to allow for the bidirectional (LAN to WAN / WAN to LAN) distribution of bandwidth for a WAN link among the various services utilizing the WAN link. The **Services** section allows you to further fine-tune bandwidth allocation. In addition, fair share can be enabled, allowing services to receive their minimum reserved bandwidth before fair distribution is enacted.

Configure SD-WAN Center

The following diagram describes the high-level workflow of SD-WAN Center and Azure Virtual WAN connection.
Configure Azure settings:

- Provide Tenant ID, Client ID, Secure Key, Subscriber ID, and Resource Group.

Configure branch site to WAN association:

- Associate one WAN resource to a branch site. Same site cannot be connected to multiple WANs.
- Click New to configure Site-WAN association.
- Select Azure Wan-resources.
- Select Services (Intranet) for the site. Two services should be selected for Active-Standby support.
- Select Site Names to be associated with the Wan-resources.
- Click Deploy to confirm the association.
- Wait for the status to change to ‘Downloaded’ to view the IPsec tunnel settings.
- Use the SD-WAN Center Reporting view to check status of the respective IPsec tunnels. The IPsec
tunnel status should be GREEN for the data traffic to flow.

**Provision SD-WAN Center:**

SD-WAN center is the management and reporting tool for Citrix SD-WAN. The required configuration for Virtual WAN is performed in SD-WAN Center. SD-WAN center is available only as a virtual form factor (VPX) and needs to be installed on a VMWare ESXi or a XenServer hypervisor. The minimum resources needed to configure an SD-WAN center appliance are 8 GB RAM and 4 CPU cores. Here are the steps to Install and configure an SD-WAN center VM.

**Configure SD-WAN Center for Azure connectivity**

Ensure that intranet services for the required sites are configured and the service policy information of the Azure portal is configured in the SDWAN center. See instructions provided in the section above. Before using SD-WAN center to connect with Azure WAN resources, you need to create a service principal used to authenticate a third party application (SD-WAN center in this case) with Azure. Read create a service principal for more information.

To successfully authenticate SD-WAN center with Azure, the following parameters should be available:

- Tenant ID
- Client ID
- Secure Key
- Subscriber ID

Ensure that intranet services for the required sites are configured and the service policy information of the Azure portal is configured in the SDWAN center. See instructions provided in the section above.

**Authenticate SD-WAN Center:**

In the SD-WAN Center UI, navigate to **Configuration > Cloud Connectivity**. Configure Azure connection settings. Refer to the following link for more information about configuring Azure VPN connection, [Azure Resource Manager](#).
Enter the **Tenant ID**, Secure Key, Subscriber ID, and Application ID. This step is required to authenticate SD-WAN center with Azure. If the credentials entered above are not correct, then the authentication fails and further action is not allowed. Click **Apply**.

The **Storage account** field refers to the storage account that you have created in Azure. If you did not create a storage account then a new storage account is automatically created in your subscription when you click **Apply**.

**Obtain Azure Virtual WAN resources:**

After authentication is successful, Citrix SD-WAN polls Azure for obtaining a list of Azure virtual WAN resources, which you created in the first step after logging into Azure portal. The WAN resources are the endpoints or hubs for terminating the IPsec tunnels initiated from the branch sites. This resource represents your entire network in Azure. It contains links to all Hubs that you would like to have within this WAN. WANs are isolated from each other and cannot contain a common hub or connections between two different hubs in different WAN resources.
To associate branch sites and Azure WAN resources:

A branch site needs to be associated with Azure WAN resources to establish IPsec tunnels. One branch can be connected to multiple such Azure virtual WAN resources and one Azure virtual WAN resource can be connected with multiple on premise branch sites.

To add multiple sites:

You can choose to add multiple sites at once and associate them to an Azure WAN resource.

1. Click **Add Multiple** to add all the sites with same set of services and associate them with the chosen WAN resources.

2. The Azure WAN resources dropdown list (shown below) is pre-populated with the resources belonging to your Azure account. If no WAN resources have been created then this list is empty, and you need to navigate to the Azure portal to create the resources. If the list is populated with WAN resources, choose the **Azure WAN resource** to which you need the branch sites to be connected to.
3. Select the Intranet service created, you can select two Intranet services in this field. Services correspond to the Intranet services you created using SD-WAN configuration.

4. Choose one or all of the branch sites to initiate the process of IPsec tunnel establishment. Based on the Intranet services selected, the available branch information is populated. All branches with required services are displayed.
To add single site:

You can also choose to add sites one-by-one (single) and as your network grows, or if you are performing a site-by-site deployment, you can choose to add multiple sites as described above.

1. Click **Add New Entry** to select one Site Name for the Site-Wan association. Add sites in the **Configure Sites to Azure Network** dialog box.
2. The Intranet services you created using the SD-WAN configuration are populated based for the selected site under Intranet Services (Tunnel1 and Tunnel2). Choose one or two Intranet services.

3. Select the wan-resource to which the site needs to be associated to from the Azure Virtual WANs drop-down menu.

4. Click **Deploy** to confirm the association. The status (“Not pushed,” “Pushed” & “Downloaded”) is updated to notify you about the process.

The deploy process includes the following status:

- Push Site Information
- Waiting for VPN configuration
- Tunnels Deployed
- Connection Active (IPsec Tunnel is up) or Connection Down (IPsec Tunnel is down)

Wait for the Status to change to Connection Active to view the **IPsec tunnel** settings. View IPsec settings associated with the selected services.
SD-WAN Azure settings:

By default, the Change Management process is automated. This means that anytime a new configuration is available at Azure Virtual WAN infrastructure, SD-WAN Center obtains it and starts applying it to branches automatically. However, this behavior is controlled, if you want to control when a configuration needs to be applied to branches. One benefit of disabling automatic change management is that the configuration for this feature and other SD-WAN features is managed independently.

Polling interval option controls the interval of looking for configuration updates in Azure Virtual WAN infrastructure, the recommended time for polling interval is 2 minutes.

- **Disable Branch-to-Branch Connection** – Disables branch-to-branch communication over Azure Virtual WAN infrastructure. By default, this option is disabled. Once you enable this, it means on-prem branches are able to communicate with each other and the resources behind the branches over IPsec through Azure’s Virtual WAN Infra. This does not have any effect on branch-to-branch communication over SD-WAN virtual path, branches are able to communicate with each other and their respective resources/end points over virtual path even if this option is disabled.

- **Debug Level** – Enables capturing logs to debug if there is any connectivity issues.
Refresh WAN resources:

Click the **Refresh** icon to retrieve latest set of WAN Resources that you updated on the Azure Portal. A message stating, “successfully refreshed WAN resources” is displayed after the refresh process is complete.

Remove site-wan resource association

Select one or multiple mappings to perform deletion. Internally, the SD-WAN appliance Change Management process is triggered and until it is successful, the Delete option is disabled to prevent from
performing further deletions. Deleting mapping requires you to disassociate or delete the corresponding sites in the Azure portal.
Monitor IPsec Tunnels

Navigate to the SD-WAN Center Reporting view to check status of the respective IPsec tunnels. The tunnel status should be GREEN for the data traffic to flow.

Monitoring

August 9, 2018

The Citrix SD-WAN Center Dashboard allows you to view the SD-WAN network statistics and graphs on a single pane. For more information, see Dashboard.

You can also view the SD-WAN network Events and Reports in Citrix SD-WAN Center.

Monitoring related articles:

- Diagnostic Packages
- Event Notifications
- Log Files
- Memory Dumps
- Polling Interval
- Statistics
- System Information
Dashboard

October 25, 2018

The Citrix SD-WAN Center Dashboard displays a subset of the common statistics at a glance. For a single-region deployment, the statistics are obtained from the MCN that is discovered in Citrix SD-WAN Center. For a multi-region deployment, the statistics are obtained from all the regional Citrix SD-WAN Center collectors for the selected time interval. You can view the following statistics:

- Network Summary
- Network QoE
- Top Sites
- Inventory
- Events and Alarms
- Top Apps
- HDX QoE
- Management Infra

For a single-region deployment, the default region statistics are displayed on the dashboard. For a multi-region deployment, you can choose to view the multi-region dashboard or the regional dashboard. To view the multi-region dashboard, in the **Region** menu select **All**.

You can view the MCN Connection status on each region tile. The MCN Connection status is the health status of the virtual path between a RCN and the MCN.

**Note**

For a multi-region deployment, the default region statistics include statistics of all the sites managed by the MCN. It may also include RCN statistics since the RCNs have virtual paths to the MCN.

The **Region** drop-down menu is not available in Citrix SD-WAN Center Collectors.
The Citrix SD-WAN Center Dashboard is refreshed based on the configured polling interval. The default polling interval is five minutes. For more information, see Polling Interval.

**Network Summary**

For a multi-region deployment, the Network Summary widget provides an overview of the network health at all the various regions. A region card for every region in the network is displayed with the following information:

- The total number of sites in the region.
- The number of sites in the Poor state. A site is in the Poor state when at least one virtual path is DOWN.
- The number of sites in the Fair state. A site is in the Fair state when all the virtual paths in the site are UP, but at least one path has congestion issue or a member path is DOWN.
- The number of sites in the Good state. A site is in the Good state when all the virtual paths and the associated member paths are UP.
- The number of sites in the Unknown state. A site is in the Unknown state when polling is in progress.

To view multi-region network summary, navigate to Dashboard > Default Dashboard > Network > Network Summary and in the Region drop-down menu, select All.
By default the screen appears in **Network view**. You can see the current network health of the multi-region network summary by clicking the **Region wise view**. You can also see the MCN Connection status on each region tile.

Click a region card to drill down into the regional dashboard.

For an individual region, the **Network Summary** widget provides an overview of the network health of the selected region.

To view regional network summary, navigate to **Dashboard > Default Dashboard > Network > Network Summary** and in the **Region** drop-down menu, select a region.

You can view the regional network summary in either the tile view or the schematic view.

You can use the timeline control to view the network status summary for a selected period. You can also play or pause the network status over a time range.

Mode helps to see the time as a relative or an absolute concept.

For more information on Timeline and mode see **Timeline controls**.

**Tile View**

The tile view provides the following information:
- The total number of sites in the region.
- The number of sites in the Poor state. A site is in the Poor state when at least one virtual path is DOWN.
- The number of sites in the Fair state. A site is in the Fair state when all the virtual paths in the site are UP, but at least one path has congestion issue or a member path is DOWN.
- The number of sites in the Good state. A site is in the Good state when all the virtual paths and the associated member paths are UP.
- The number of sites in the Unknown state. A site is in the Unknown state when polling is in progress.

To view a graphical representation of a path between two sites, select the path and click **Visualize**.
Schematic View

The schematic view provides a graphical view of the SD-WAN network. The information displayed in this section is updated depending on the selected configuration and routing domain. To view a network map here, you must import the network configuration and Network maps from the Master Controller Node (MCN). For more information, see Import MCN configuration.

Hover the mouse cursor over the sites or the path to view more details. Click the sites to view report options.
Network QoE

The Network QoE widget provides a graphical representation of the availability, loss, and utilization parameters of a virtual path. It provides the statistics for both overlay virtual path and the underlay member paths.

For a multi-region deployment, you can view a list of the top 10 virtual paths across all the regions, which have the highest loss %. The virtual path data is collected from all the regional collectors for the selected time interval. You can view the bandwidth, jitter, loss, and congestion details of the virtual paths that need your attention the most.

To view multi-region virtual path health, navigate to Dashboard > Default Dashboard > Network > Network QoE and in the Region drop-down menu select All.
For an individual region, you can view a list of the top 10 virtual paths in the region, which have the highest loss %. The statistics are collected for the selected time interval. You can view the bandwidth, jitter, loss, and congestion details of the virtual paths that need your attention the most.

To view regional virtual path health statistics, navigate to Dashboard > Default Dashboard > Network > Network QoE and in the Region drop-down menu select a region.
For a multi-region deployment, the **Top Sites** widget lists the top 10 sites across all the regions, which have the highest bandwidth usage, in the selected time interval.

To view the top sites across all regions, navigate to **Dashboard > Default Dashboard > Network > Top Sites** and in the Region drop-down menu select **All**.
Click a site or metric to view detailed reports and statistics.

For an individual region, the Top Sites widget displays the bandwidth usage statistics for all the sites in the region. The statistics are collected for the selected time interval. You can filter the sites based on the routing domain.

**Inventory**

Every 30 minutes, the Inventory manager gathers the hardware information from all the Citrix SD-WAN appliances that are discovered on Citrix SD-WAN Center.

To view the multi-region inventory statistics, navigate to Dashboard > Default Dashboard > Network > Inventory and in the Region drop-down menu select.

To view inventory statistics of a specific region, in the Region drop-down menu select the region.

You can view the following inventory statistics:

- **Site:** Name of the site found in the configuration running in the MCN. If the appliance is a secondary MCN, “(secondary)” appears next to the name. You can click the name to access the appliance web console.
- **Connection Status:** Connectivity state to the appliance. A red icon appears when the connection is not reachable or not authenticated.
- **Management IP:** Management IP address of the appliance. You can click the IP address to access the appliance web console.
- **BIOS Version:** BIOS version of the appliance.
- **Model:** Hardware model of the appliance.
- **Serial Number:** Serial Number of the appliance.
• **Software**: SD-WAN software version number.

• **Days Since Memory Dump**: Time since last system-error memory dump. If the appliance dumped its memory in the past four days, an error icon appears next to the time. If the memory dump occurred between 5 and 10 days ago, a warning icon appears. N/A appears if no dump is available. Clicking the time opens the log page of the SD-WAN.

• **Active OS**: The OS currently running on the appliance.

• **RAM Size (GB)**: Amount of RAM currently installed on the appliance in GB.

• **Drive Type**: Type of data-storage drive installed on the appliance. The value can be SSD (Solid State Drive) or HDD (Hard Disk Drive).

• **Drive Size (GB)**: Size of the data-storage drive currently installed on the appliance in GB.

---

**Note**

You can arrange the columns for the inventory statistics table by using the *Show/Hide Columns* option.
Events and alarms

For a multi-region deployment, you can view the events and alarms of all the regions in the network. This information is collected for the selected time interval. To view multi-region events and statistics, navigate to Dashboard > Default Dashboard > Network > Events & Alarms and in the Region drop-down menu select All.

You can also view all the events and alarms of an individual region. This information is collected for the selected time interval. To view events and alarm statistics, navigate to Dashboard > Default Dashboard > Network > Events & Alarms and in the Region drop-down menu select a region.

The Event Summary section gives a graphical overview of the event type and quantity of events. You can click the graph to view the events on the Fault page. The display also outlines how many events are in each category. Alarm triggers can be configured on the individual SD-WAN Appliances. For more information see, Event notifications.

The High Severity Events section displays a list of the severe events. You can filter the events based on the routing domain. The information displayed in this section is gathered from the Fault tab. For more information, see Events.

Top Apps

Deep packet inspection (DPI) allows the SD-WAN appliance to parse the traffic passing through it and identify the application and application family types. For a multi-region deployment, you can view the top applications and top application families across all the regions in the network. This information is collected for the selected time interval.
To view top application statistics across all the regions in the network, navigate to **Dashboard > Default Dashboard > Apps > Top Apps**, and in the **Region** drop-down menu select **All**.

You can view the searchable dropdown for site selection for both **Top Application** and **Top Application Families**.

You can also view the top applications and top application families of a particular region.

To view the application statistics of a region, navigate to **Dashboard > Default Dashboard > Apps > Top Apps** and in the **Region** drop-down menu select a region.

You can select the site and time interval as last 24 hours, last 1 hour, or current.
Quality of Experience (QoE) is a calculated index that helps you understand your ICA quality of experience. This index is calculated for all ICA application traffic traversed from WAN to the site. Statistics of packet drop, jitter, and latency are used in the QoE calculation. The QoE is an integer between [0, 100], the higher the number, the better the user experience. The jitter, latency, and packet drop statistics are tracked on data paths during packet processing.

Sites in the entire network are categorized as good, fair, poor, or no HDX traffic based on the QoE of HDX traffic. For more information, see Application QoE.

To view HDX QoE of sites, across all the regions in the network, navigate to Dashboard > Default Dashboard > Apps > HDX QoE, and in the Region drop-down menu select All.

You can view the following HDX QoE metrics for the individual regions.

- Network HDX: Quality Summary
- Network HDX: Users and Sessions
- Network HDX: Bottom five Sites (Quality)
- Site HDX: Users
- Site HDX: Sessions
- Site HDX: Quality of Experience

To view HDX QoE statistics, navigate to Dashboard > Default Dashboard > Apps > HDX QoE and in the Region drop-down menu select a region.
Note

Sometimes, the HDX dashboard data and HDX reports from different sites may not seem to be in-sync because each site statistic is polled independently.

On HDX dashboard widgets, you may see a site with no HDX traffic, but there may be a non-zero number of HDX sessions and users. It happens when the HDX sessions remain idle for that polling period and still stay in open state.

Network HDX: Quality summary

The HDX traffic is classified into the following quality categories:

<table>
<thead>
<tr>
<th>Quality</th>
<th>QoE Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>80–100</td>
</tr>
<tr>
<td>Fair</td>
<td>50–80</td>
</tr>
<tr>
<td>Poor</td>
<td>0–50</td>
</tr>
<tr>
<td>No HDX Traffic</td>
<td>N/A</td>
</tr>
</tbody>
</table>
You can click the chart to view HDX reports per site. For more information, see How to View HDX Reports.

**Network HDX: Users and Sessions**

This widget provides information on the number of active HDX users and sessions. The number of sessions is the total number of active Single Session ICA (SSI) and Multi-Session ICA (MSI) sessions.

**Note**

In the current release, the number of users is not based on distinct user names. That is, two sessions started by a single user on two different machines is counted as two users.
Network HDX: Bottom 5 Sites (Quality)

This widget provides a list of the bottom 5 sites that have the least QoE score. It helps drive better end-user experience initiatives.

Site HDX: Users

This widget provides a graphical representation of the number of users that were active at a particular site for the selected time interval. You can select the site and the time interval as last 24 hours, last 1 hour, or last 5 minutes.
**Site HDX: Sessions**

This widget provides a graphical representation of the number of MSI and SSI sessions that are active at a particular site for the selected time interval. You can select the site and the time interval as last 24 hours, last 1 hour, or last 5 minutes.

**Site HDX: Quality of experience**

This widget provides a graphical representation of the overall QoE at a particular site for the selected time interval. You can select the site and the time interval as last 24 hours, last 1 hour, or last 5 minutes.
Management infra

The Management Infra page allows you to view the Citrix SD-WAN Center database usage and storage statistics.

For a multi-region deployment, you can view the database usage of all the collectors in the network. To view multi-region database statistics, navigate to Dashboard > Default Dashboard > Management Infra and in the Region drop-down menu select All.

To view Citrix SD-WAN Center database statistics for a particular region, navigate to Dashboard > Default Dashboard > Management Infra, and in the Region drop-down menu select a region.

The Database Usage section displays a graphical overview of the database resource usage and the thresholds for sending notifications, or halting the collection of data. You can click the graph to view the details on the Database Maintenance page.

- **Usage**: Database capacity currently being used, in GB.
- **Notification**: Threshold for generating a database usage notification. The threshold is a percentage of the maximum size of the database. If an email alert is configured, an email notification is sent when the size of the database exceeds this threshold. For more information, see Event notifications.
- **Stop Polling**: Threshold for halting statistics polling. The threshold is a percentage of the maximum size of the database. Polling stops when the size of the database exceeds this threshold. For more information, Manage database.
Custom dashboard

You can customize the Citrix SD-WAN Center dashboard and choose the statistics that you want to view on the dashboard based on your analytical needs. Create a custom dashboard of regional details or a global summary. You can also customize an existing report.

Note

You can now pin a report as widget to your custom dashboard, by using the Add to Dashboard option on the Reports page.
Enter the report name and select the custom dashboard.

For Regional Details custom dashboard, you can choose from the following region level widgets:

- Site Summary
- Virtual Path
- Region Events
- Region Alarm Summary
- Inventory Manager (Per Region)
- Top Sites Per Region
Citrix SD-WAN Center 10.1

- Paths
- MPLS Queues
- Ethernet
- LAN GRE Tunnels
- IPsec Tunnels
- Service Summary
- Classes
- Site Events
- Top Applications Per Region
- Top Application Family Per Region
- Site HDX: Users
- Site HDX: Sessions
- Site HDX: QoE
- MOS Applications
- Database Usage

For a Global Summary custom dashboard, you can choose from the following network level widgets:

- Multi-region Summary
- Virtual Path Health in Network
- Events
- Alarm Summary
- Inventory Manager
- Top Sites in Network
- Network HDX
- Database Usage in Collectors
- Top Applications
- Top Application Families

To create a custom dashboard:

1. Navigate to **Dashboard > Custom Dashboard** and click **Create Dashboard**.

   ![Dashboard Custom Dashboard](dashboard_custom_dashboard.png)

   **Note**
   You can also import an existing dashboard in JSON format by clicking **Import Dashboard**.

2. In the **Name** field, enter a name for the custom dashboard.
3. Select the widget type. Select **Global Summary** to view network level widgets, select **Regional Details** to view regional level widgets.
Create a Custom Dashboard

Name*
Regional DB1

Widget Type
- Regional Details
- Global Summary

Region Level Widgets

Users to Share

Create  Close
4. Click **Add** and select the required widgets.

The widgets are categorized into three levels: Network, Apps, and Management Infrastructure.

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**Create a Custom Dashboard**

- **Name**: RegionalDB1
- **Widget Type**: Regional Details

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**Region Level Widgets**

- **Available [3]**
  - Network
  - Apps
  - Management Infrastructure

---

**Note**

In single-region deployment, only the **Region Level Widgets** are available.
You can also share the custom dashboard with multiple users. For more information on users, see User accounts.

5. Click Create. The newly created custom dashboard is listed under Custom Dashboard.

Tip
You can edit or delete the custom dashboard.
Diagnostic packages

August 9, 2018

A diagnostic package consists of all of the system log files, system information, and other necessary details that will assist the Citrix SD-WAN Support team in diagnosing and resolving issues with your system.

After creating the package you can download it to your computer and then mail the diagnostic package to Citrix Customer Support or you can directly upload it to the Citrix Customer Support server (or another server).

**Note**

Citrix SD-WAN Center can store a maximum of five diagnostic packages at a time.

To create a diagnostic package:

1. In the Citrix SD-WAN Center web interface, click the **Monitoring** tab and then click **Diagnostics**.

2. In the **Diagnostics Packages** section, under **Create Package**, from the **Include Workspaces For** drop-down list select a user whose workspaces will be copied into the diagnostics.

   **Note**

   The diagnostics package will include the five configurations most recently modified by the selected user.

3. In the **Package Name** field, enter a name for the diagnostic package.

4. Click **Create**. This runs a system diagnostics and generates a diagnostic package.

To download a diagnostic package:

1. In the **Diagnostics Packages** section, under **Manage Package**, from the **Diagnostic Packages** drop-down list select the package that you want to download.
2. Click **Download**. The diagnostic package is downloaded to your local computer.

To upload a diagnostic package to an FTP server:

1. In the **Diagnostics Packages** section, under **Manage Package**, from the **Diagnostic Packages** drop-down list select a package that you want to upload.

2. Click **Upload to FTP**. This opens the **Upload to FTP Server** dialog box for specifying your FTP authentication information and uploading the package to the Citrix Customer Support FTP server, or to another FTP host.

3. In the **Customer Name** field, enter a name to assist Citrix SD-WAN Support in identifying the diagnostic packages. A directory with this name will be created on the Citrix FTP server, and your files will be uploaded to that location.

4. In the **FTP Host** field, enter the IP address or host name (if DNS is configured) of the FTP server.

5. In the **Username** field, enter a user name to be used to log onto the FTP server.

6. In the **Password** field, enter the password associated with the user name.
7. Click **Upload**.

**Note**

It is recommended to periodically delete old diagnostic packages, to prevent exceeding the limit for the maximum allowable packages. To delete an existing diagnostic package, select a diagnostic package from the **Diagnostic Package** drop-down list, and then click **Delete**.

**Events**

September 28, 2018

Citrix SD-WAN Center collects event information from all the discovered appliances in the network. This event information can be filtered and viewed in the **Event Viewer** page.

The event details include the following information.

- **Time**: The time the event was generated.
- **Site**: The name of the site on which the event originated.
- **Appliance ID**: Shows whether the appliance from which the event originated is a primary (0) or secondary (1) appliance.

**Note**

The Appliance ID column is hidden by default. To display the column, click **Show/Hide** (gear icon) and select the **Appliance ID** checkbox from the drop-down menu.

- **Object Name**: The name of the object generating the event.
- **Object Type**: The type of object generating the event.
- **Severity**: The severity level of the event.
- **Previous State**: The state of the object before the event. The state will be listed as **unknown** if not applicable.
- **Current State**: The state of the object at the time of the event.
- **Description**: A text description of the event.

**Viewing events**

You can view the events, filter it and also download it from the Event Viewer page.

**To access the event viewer page.**
In the Citrix SD-WAN Center web interface click the **Fault** tab.

The Event Viewer page appears by default.

You can select and view reports of a particular time frame by using the timeline controls. For more information, see, [Timeline controls](#).

You can also create, save and open report views. For more information, see, [Manage views](#).

**Using Filters**

You can create custom filters for narrowing the Events table results.

To create and apply a filter:

1. Click + icon to the right of the **Filters** section label.
2. Select a category form the drop-down menu.

   The options available are:
   - Size
   - Object Name
   - Object Type
   - Severity
   - Previous State
   - Current State
3. Select an operator from the middle drop-down menu.

   The options are as follows:
• is
• is not
• is one of
• contains
• does not contain
• less than
• less than or equal to
• greater than
• greater than or equal to

4. Enter the string or value by which to delimit the filter.

Note
This field is case sensitive.

Note
You can create and apply multiple filters.
For Multi-region network, you can select specific regions to view event.

The events data is fetched from the respective region’s collector.
Note
In single-region network deployment, the Region drop-down list is not available.

To download the events table as a CSV file:
Click the Download icon at the upper right corner of the events table.

For more information on event statistics, see Event report.

You can configure Citrix SD-WAN Center to send external event notifications for different event types as email, SNMP traps or syslog messages. For more information, see Event notifications.

Event notifications

August 9, 2018

You can configure Citrix SD-WAN Center to send event notifications for different event types as email, SNMP traps or syslog messages. Once you have configured the email, SNMP and syslog notification settings you can select the severity for different event types and select the mode (email, SNMP, syslog) to send event notifications. Notifications are generated for events equal to or above the specified severity level for the event type.

The available severity levels are as follows, in descending order of severity:

- EMERGENCY
- ALERT
- CRITICAL
- ERROR
- WARNING
- NOTICE
- INFORMATIONAL
- DEBUG

Tip
You can configure notification settings to receive event alerts by email, SNMP traps or Syslog messages on both Citrix SD-WAN Center and the individual Citrix SD-WAN appliances in your network.

However, enabling notifications on Citrix SD-WAN Center allows you to receive event notifications for the entire Citrix SD-WAN network (i.e., MCN and all the sites). While, enabling notifications on the Citrix SD-WAN appliances allows you to receive notifications from the individual appliances only.
It is advised to enable notifications on the Citrix SD-WAN Center only, to avoid redundant notifications from the other Citrix SD-WAN appliances in your network.

**Configuring email notification settings**

To configure email notification settings:

1. In the Citrix SD-WAN Center web management interface, navigate to **Fault > Notification Settings > Email Alerts**.

2. Select **Enable Event Emails**.

3. In the **Destination Email Address(es)** field, enter the email address to which alert notifications are to be sent.

   **Note**
   
   You can enter multiple email addresses separated by semicolons.

4. In the **Host** field, enter the IP Address or hostname of an external SMTP server to relay email messages to the internet.

5. In the **Port** field, enter the port number to be used for the SMTP connection. The default port is 25.

6. In the **Source Email Address** field, enter the email address from which email alerts are sent.

7. Select **Enable SMTP Authentication**.

8. In the **User Name** field, enter a user name for the SMTP server used for authentication.

9. In the **Password** field, enter the password associated with the user name for the SMTP server used for authentication.
10. Click **Apply**.

**Configuring SNMP trap notification settings**

To configure SNMP trap notification settings:

1. In the Citrix SD-WAN Center web management interface, navigate to **Fault > Notification Settings > SNMP Traps**.
2. Select **Enable Event SNMP Traps**.
3. In the **Host(s)** field, enter the IP address or the host name of an external SNMP system. This host will receive the events as SNMP traps.

   - **Note**: You can enter multiple IP addresses or hostnames separated by semicolons.
4. In the **UDP Port** field, enter the UDP port to be used to send the SNMP traps. By default, the UDP port is set to 162.
5. Click **Apply** to apply the SNMP traps notification settings.

   - **Note**: Alternately, click **Send Test Trap** to verify whether the system is able to send an SNMP trap to the configured destination.

**Configuring syslog notification settings**

To configure syslog notification settings:
1. In the Citrix SD-WAN Center web management interface, navigate to **Fault > Notification Settings > Syslog**.

2. Select **Enable Event Syslog Messages**.

3. In the **Host** field, enter the IP address or the host name of an external syslog server, which will be used to receive events as syslog messages.

4. Click **Apply** to apply the syslog notification settings.

   **Note**
   
   Alternately, click **Send Test Message** to verify whether the system can send a syslog message to the configured host.

### Configuring event notifications

**To configure event notifications:**

1. In the Citrix SD-WAN Center web management interface, navigate to **Fault > Severity Settings**.

2. In the **Alert if Sate Persists** field, select the time duration after which if the event still persists a notification will be sent.
3. For each event type select the notification option and select the severity.

   Note
   The Email, Syslog and SNMP notification options will be enabled only after configuring the respective notification settings.

4. Click Apply.

Configuring alarms

You can also configure alarms in Citrix SD-WAN Center and push it to individual appliances.

To configure alarm in Citrix SD-WAN Center, navigate to Configuration > Appliance Settings > Notification Settings > Alarm Configuration and Click +.

Select or enter values for the following fields:

- **Event Type**: The Citrix SD-WAN appliance can trigger alarms for particular subsystems or objects in the network, these are called event types. The available event types are SERVICE, VIRTUAL_PATH, WANLINK, PATH, DYNAMIC_VIRTUAL_PATH, WAN_LINK_CONGESTION, USAGE_CONGESTION, FAN, POWER_SUPPLY, PROXY_ARP, ETHERNET, DISCOVERED_MTU, GRE_TUNNEL, and IPSEC_TUNNEL.
• **Trigger State**: The event state that triggers an alarm for an Event Type. The available Trigger State options depend on the chosen event type.

• **Trigger Duration**: The duration in seconds, this determines how quickly the appliance triggers an alarm. Enter ‘0’ to receive immediate alerts or enter a value between 15-7200 seconds. Alarms are not triggered, if additional events occur on the same object within the Trigger Duration period. Additional alarms are triggered only if an event persists longer than the Trigger Duration period.

• **Clear State**: The event state that clears an alarm for an Event Type after the alarm is triggered. The available Clear State options depend on the chosen Trigger State.

• **Clear Duration**: The duration in seconds, this determines how long to wait before clearing an alarm. Enter ‘0’ to immediately clear the alarm or enter a value between 15-7200 seconds. The alarm is not cleared, if another clear state event occurs on the same object within the specified time.

• **Severity**: A user-defined field that determines how urgent an alarm is. The severity is displayed in the alerts sent when the alarm is triggered or cleared and in the triggered alarm summary.

• **Email**: Alarm trigger and clear alerts for the Event Type is sent via email.

• **Syslog**: Alarm trigger and clear alerts for the Event Type is sent via Syslog.

• **SNMP**: Alarm trigger and clear alerts for the Event Type is sent via SNMP trap.

### Memory dumps

August 9, 2018

A memory dump is generated when a process crashes. All memory dumps currently on the system can be downloaded in one combined package, and uploaded to an FTP server for examination by the Citrix support team. However, you can delete individual memory dumps.

To download memory dumps:

1. In the Citrix SD-WAN Center web interface, click the **Monitoring** tab and then click **Diagnostics**.

2. In the **Memory Dumps** section, from the **Memory Dump Package** drop-down list select a memory dump package.

3. Click **Download All**. Save the memory dump package on your local computer.
To upload a memory dump package to an FTP server:

1. In the Memory Dumps section, from the Memory Dump Package drop-down list select a memory dump package.

2. Click Upload to FTP Server. This opens the Upload All to FTP dialog box for specifying your FTP authentication information and uploading the package to the Citrix Customer Support FTP server, or to another FTP host.

3. In the Customer Name field, enter a name to assist Citrix SD-WAN Support in identifying the diagnostic packages.

   A directory with this name will be created on the Citrix FTP server, and your files will be uploaded to that location.

4. In the FTP Host field, enter the IP address or host name (if DNS is configured) of the FTP server.

5. In the Username field, enter a user name to be used to log onto the FTP server.

6. In the Password field, enter the password associated with the user name.

7. Click Upload.

Log files

August 9, 2018

The Log files collect information related to the web console, user interface exceptions, internal crashes and so on. These logs can be used to troubleshoot issues in the Citrix SD-WAN Center.
To view log files:

1. In the Citrix SD-WAN Center web interface, click the **Monitoring** tab.

2. Click **Diagnostics**.

3. From the **Log File** drop-down list, select the log file you want to view.

4. Click **View**. The log file content is displayed.

5. If you want to download the log files to your computer, click **Download**.

**Polling interval**

August 13, 2018

Polling refers to the process of collecting statistics from the discovered appliance. You can configure the interval and bandwidth limit for polling operations after discovering the appliances. For information on discovering the appliance, see Single-region network deployment or Multi-region network deployment.

To perform polling configuration:
1. In the Citrix SD-WAN Center web interface, navigate to Configuration > Network Discovery > Discovery Settings.

2. In the Polling Interval field, enter the polling frequency in minutes. The range is 2–60 minutes. The default value is 5 minutes.

3. In the Bandwidth Limit field, enter the polling bandwidth limit in kbps. The MCN will limit bandwidth to the specified value when transferring polling statistics from the appliance to the Citrix SD-WAN Center. The range is 100 Kbps – 1 Gbps. The default value is 1 Mbps.

4. Click Apply.

Statistics

September 28, 2018

You can view the statistics collected by Citrix SD-WAN Center as graphs. These graphs are plotted as timeline versus usage, allowing you to understand the usage trends of various network object properties. You can view graphs for network-wide application statistics. For every site in the SD-WAN network, you can view graphs for the following network parameters:

- Bandwidth
- QoS
- Virtual Path
- Internet Services
- Intranet Services
- Pass-through Services
- WAN Links
- Ethernet Interfaces
- GRE Tunnels
- IPsec Tunnels
- Applications
- Application Families

Tip
You can create views as per your requirement, save it and open existing views.

To view statistical graphs:

1. In Citrix SD-WAN Center web UI, navigate to Monitoring > Statistics.
2. Select a region and a routing domain.
3. From the Objects and Properties hierarchical tree, find and select the properties of interest.

Tip
You can also use the Filter drop-down menu and Presets Menu to simplify the process of finding and selecting properties.

4. Click Update to display graphs for the selected properties.

Tip
Deselect a property and click Update to remove the graph for that property from the Graphs Display area.

5. Select a period for the current view. For more information, see Timeline Controls

The graphs are displayed based on the selected properties.
Tip
If you select more than one property, the graphs display in **Trend View** mode to save vertical space. Click on a graph heading to show and hide the fully expanded graph. You can also show and hide the trend view and legends on the graphs.

Tip
To zoom a graph, click and drag the graph plot area. Zooming on one graph zooms all graphs, to the selected time, to maintain a consistent view. Click the reset icon (₿) to reset the zoom.
Tip

You can show and hide the trend line by clicking the (/) icon.
Note

You could print the graphs, or download the graph set as a CSV file.

System information

August 9, 2018

The following information is displayed on the system information page:

- **Citrix SD-WAN Center Software Version**: The Citrix SD-WAN Center software version currently installed and running on this virtual machine.
- **Configuration Plugin Version**: The version of the Configuration Editor Plugin currently installed and running in this Citrix SD-WAN Center virtual machine.
- **Hard Disk Usage**: The amount of hard disk space used by the operating system and data partitions.
- **Logged-in Users**: The user name, IP Address, and logon type for each user currently logged into this Citrix SD-WAN Center virtual machine.

To display the system information:
In the Citrix SD-WAN Center web interface, click the **Monitoring** tab and then click **System Information**.

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## Reporting

**October 15, 2018**

Citrix SD-WAN Center provides the following reports:

- **Applications**: Displays details about incoming traffic, outgoing traffic and total traffic of the top applications, sites, and application families.

- **HDX**: Displays detailed HDX data for every site.

- **Sites**: Displays site level statistics for every site in the Virtual WAN. Sites rows expand to show the **Services** table filtered for the Site.

- **Service**: Displays summary statistics by service type (Virtual Path, Internet, Intranet and Pass-through) for every site in the Virtual WAN. Services rows expand to show the individual Services for the Service type.

- **Virtual Paths**: Displays Virtual Path level statistics for every Virtual Path in the SD-WAN. Virtual Paths rows expand to show the Paths contained within the Virtual Path.

---

**Note**

Virtual Path data is recorded from the perspective of both endpoints, as such, each Virtual Path may have two rows identified by the Site that recorded the statistics.

- **Paths**: Displays Path level statistics for every Path in the Virtual WAN.

- **WAN Links**: Displays WAN Link level statistics for every WAN Link at each Site in the Virtual WAN. WAN Links rows expand to show a Usage Summary for each Service type for that WAN Link. Each Service type row will then expand to show usages for each Service of that type. If the WAN Link is a Private MPLS link, a second table will be shown showing the MPLS Queues for the WAN Link.
• **MPLS Queues**: The MPLS Queues rows expand to show a usage summary for each Service type for that Queue. Each Service type row will then expand to show usages for each Service of that type.

• **Classes**: Displays Class level statistics for every Class for each Virtual Path in the Virtual WAN.

• **MOS Score**: The mean opinion score (MOS) provides a numerical measure of the quality of the experience that an application delivers to end users.

• **Ethernet Interfaces**: Displays Ethernet Interface level statistics for every Interface at each Site in the Virtual WAN.

• **GRE Tunnels**: Displays statistics of every LAN GRE tunnel at each site in the WAN.

• **IPsec Tunnels**: Displays statistics of every IP security tunnel at each site in the WAN.

• **Events**: Displays summary counts of events occurring at each Site in the Virtual WAN. **Events** rows expand to show summary counts by Object Type for that Site. Each Object Type will then expand to show summary counts for each Object of that type.

On the **Reporting** tab of the Citrix SD-WAN Center web interface, you can view all reports or selected reports. You can also download reports.

You can select and view reports of a particular time frame by using the timeline controls. For more information, see, **Timeline controls**.

You can also create, save and open report views. For more information, see, **Manage views**.

For Multi-region network, you can select specific regions to view statistic reports.

The reports data is fetched from the respective region’s collector.
Note

In single-region network deployment, the Region drop-down list is not available.

For more details on viewing different reports, see the following topics:

Application report
Bandwidth report
Class report
Ethernet interface report
Event report
GRE tunnel report
HDX report
IPsec tunnel report
Link performance report
MOS for applications
MPLS queues report

Application report

October 15, 2018

Deep packet inspection (DPI) enables the SD-WAN appliance to parse the traffic passing through it and identify the application and application family types. Citrix SD-WAN appliance records the number of
bytes and bandwidth of incoming and outgoing traffic of every application. SD-WAN Center polls the SD-WAN appliance at the defined polling interval, obtains this data, and displays it on the dashboard and as reports.

You can view top applications, top sites, and top application family reports. These reports provide details about the total, incoming, and outgoing data and bandwidth.

**To view application reports in Citrix SD-WAN Center:**

1. In Citrix SD-WAN Center web UI, navigate to **Reporting > Applications**.
2. In the time-line control, select the time interval. For more information, see **Timeline controls**.
3. Select the unit to display the data. You can choose to view report data in units of Kbps, Mbps, or Gbps.
4. From the **Report Type** drop-down list, select one of the following report types:
   - **Top Applications**: The top applications used in the network for the selected time interval. You can filter top application by site name. By default, the top applications for all the sites are displayed.
   - **Top Application Families**: Top application families used in the network. You can filter top application families by site name. By default, the top application families for all the sites is displayed.
   - **Top Sites**: Traffic at the top sites for the selected time interval. You can filter top sites by application or application family name.

For each report type, you can view the following data:

- **Aggregated Incoming Data**: Application data coming into the site from the WAN.
• **Aggregated Outgoing Data**: Application data sent from the site to the WAN.
• **Aggregated Data**: Sum of incoming and outgoing traffic.
• **Average Incoming Bandwidth**: Bandwidth of incoming application traffic.
• **Average Outgoing Bandwidth**: Bandwidth of outgoing application traffic.
• **Average Bandwidth**: Total bandwidth consumed by incoming and outgoing application traffic.

**Tip**
For every value, you can hover the mouse cursor over the graph icon to view a mini-graph, or click to open graph view in another window. For more information, see Statistics.

**Bandwidth report**

October 15, 2018

Citrix SD-WAN Center provides a central view of bandwidth statistics data polled from different sites in your SD-WAN network.

In the Citrix SD-WAN configuration, traffic flowing through the virtual paths is classified as belonging to realtime, interactive, or bulk class types. The classes are predefined, but you can customize these classes and apply rules to them. For more information, see Customizing Classes and Rules by IP Address and Port Number.

Using Citrix SD-WAN Center, you can view, along with the basic bandwidth statistics, the bandwidth consumed by applications belonging to these class types at each site, path or WAN link level.

**To view bandwidth statistics:**

In Citrix SD-WAN Center, navigate to Reporting > Sites, and in the timeline control select a time period.

You can select and view reports of a particular time frame by using the timeline controls. For more information, see, Timeline controls.

You can also create, save and open report views. For more information, see, Manage views.
You can view the following metrics:

- **Bandwidth**: Total bandwidth consumed by all packet types. Bandwidth = Control Bandwidth + Realtime Bandwidth + Interactive Bandwidth + Bulk Bandwidth. For example, in the above screenshot, at SITE2, Bandwidth = 1120.99 + 166.61 + 117.21 + 810.78 + 26.40

- **Available Bandwidth**: Total bandwidth allocated to all the WAN links of a site.

- **Control Bandwidth**: Bandwidth used to transfer control packets that contain routing, scheduling, and link statistics information.

- **Permitted Bandwidth**: Bandwidth available for transmitting information.

- **Realtime Bandwidth**: Bandwidth consumed by applications that belong to the realtime class type in the Citrix SD-WAN configuration. The performance of such applications depends to a great extent upon network latency. A delayed packet is worse than a lost packet (for example, VoIP, Skype for Business).

- **Interactive Bandwidth**: Bandwidth consumed by applications that belong to the interactive class type in the Citrix SD-WAN configuration. The performance of such applications depends to a great extent upon network latency, and packet loss (for example, XenDesktop, XenApp).

- **Bulk Bandwidth**: Bandwidth consumed by applications that belong to the bulk class type in the Citrix SD-WAN configuration. These applications involve very little human intervention and are mostly handled by the systems themselves (for example, FTP, backup operations).
Class report

October 15, 2018

The virtual services can be assigned to particular QoS classes, and different bandwidth restraints can be applied to different classes. A class can be one of three basic types:

- **Realtime classes**: Serve traffic flows that demand prompt service up to a certain bandwidth limit. Low latency is preferred over aggregate throughput.
- **Interactive classes**: Serve traffic flows that are sensitive to loss and latency. Interactive classes have lower priority than realtime but have absolute priority over bulk traffic.
- **Bulk classes**: Serve traffic flows that require high bandwidth and are sensitive to loss. Bulk classes have the lowest priority.

Specifying different bandwidth requirements for different classes enables the virtual path scheduler to arbitrate competing bandwidth requests from multiple classes of the same type. The scheduler uses the Hierarchical Fair Service Curve (HFSC) algorithm to achieve fairness among the classes.

For more information about customizing classes, see Customizing Classes.

**To view class statistics:**

In Citrix SD-WAN Center, navigate to Reports > Classes, and in the timeline control select a time period.

You can select and view reports of a particular time frame by using the timeline controls. For more information, see, Timeline controls.

You can also create, save and open report views. For more information, see, Manage views.
You can view the following metrics:

- **Name**: Class name
- **Type**: Class Type. Releatime, interactive, or bulk.
- **Wait Time**: The time interval between transmitting packets in milliseconds.
- **Sent Bandwidth**: Transmitted bandwidth
- **Data Sent**: Data sent, in Kbps.
- **Packets Sent**: Number of packets sent.
- **Data Pending**: Data to be sent, in Kbps.
- **Packets Pending**: Number of packets to be sent.
- **Drop**: Percentage of data dropped.
- **Data Dropped**: Data dropped, in Kbps.
- **Packets Dropped**: Number of packets dropped, because of network congestion.
- **Data Coverage**: Percentage of the selected time period for which data is available.

**Note**

Click the settings icon to select the metrics that you want to view.
**Ethernet interface report**

October 25, 2018

Citrix SD-WAN Center provides a central view of all the Ethernet interfaces on the different Citrix SD-WAN appliances on your SD-WAN network. This helps you during troubleshooting to quickly see whether any of the ports are down. You can also view the transmitted and received bandwidth, or packet details at each port. You can also view the number of errors that occurred on these interfaces during a certain time period.

The Ethernet interfaces are configured on each Citrix SD-WAN appliance during setting up the SD-WAN network.

For information about configuring interface groups for MCN sites, see [Configure MCN](#).

For information about configuring interface groups for branch sites, see [Configure Branch Node](#).

**To view Ethernet interface statistics:**

In Citrix SD-WAN Center, navigate to Reports > Ethernet, and in the timeline control select a time period.

You can select and view reports of a particular time frame by using the timeline controls. For more information, see, [Timeline controls](#).

You can also create, save and open report views. For more information, see, [Manage views](#).
You can view the following metrics:

- **Name**: Name of the Ethernet interface.
- **Worst State**: Worst state observed during the selected time period.
- **TX Bandwidth**: Bandwidth transmitted.
- **RX Bandwidth**: Bandwidth received.
- **TX Packets**: Number of packets transmitted.
- **RX Packets**: Number of packets received.
- **Errors**: Number of errors observed during the selected time period.
- **Data Coverage**: Percentage of the selected time period for which data is available.

**Note**

Click the settings icon to select the metrics that you want to view.

**Event report**

October 15, 2018

You can view counts of different events occurring at each site in the SD-WAN network.

For more information about events, see *Events*.

**To view event statistics:**

In Citrix SD-WAN Center, navigate to *Reports > Events*, and in the timeline control select a time period.

You can select and view reports of a particular time frame by using the timeline controls. For more information, see, *Timeline controls*.

You can also create, save and open report views. For more information, see, *Manage views*. 
You can view the following metrics:

- **Info Events**: Number of information events that occurred during the selected time period. These are low-level events.
- **Notice Events**: Number of notice events that occurred during the selected time period. These are events that the administrator should know about.
- **Warning Events**: Number of warning events that occurred during the selected time period. These are events that require action in the near future.
- **Error Events**: Number of error events that occurred during the selected time period. These are events that indicate some type of error.
- **Alert Events**: Number of alert events that occurred during the selected time period. These are events that might require action.
- **Critical Events**: Number of critical events that occurred during the selected time period. These are events that indicate an imminent crisis.
- **Emergency Events**: Number of emergency events that occurred during the selected time period. These are events that indicate an immediate crisis (for example, power supply failure, fan failure, hard disk threshold exceeded, service disabled).
- **Debug Events**: Number of debugging events that occurred during the selected time period. Debug events are generated when Test Email or Test Syslog options are used on the Citrix SD-WAN appliances.

**Note**

Click the settings icon to select the metrics that you want to view.
The following table lists a few examples of the state changes of objects for which events are reported.

<table>
<thead>
<tr>
<th>Event</th>
<th>Object Type</th>
<th>Previous State</th>
<th>Current State</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTICE</td>
<td>LAN to WAN path</td>
<td>BAD</td>
<td>GOOD</td>
</tr>
<tr>
<td></td>
<td>GOOD</td>
<td>BAD</td>
<td>GOOD</td>
</tr>
<tr>
<td></td>
<td>WAN to LAN path</td>
<td>BAD</td>
<td>GOOD</td>
</tr>
<tr>
<td></td>
<td>GOOD</td>
<td>BAD</td>
<td>GOOD</td>
</tr>
<tr>
<td></td>
<td>Dynamic virtual path</td>
<td>BAD</td>
<td>GOOD</td>
</tr>
<tr>
<td></td>
<td>GOOD</td>
<td>BAD</td>
<td>GOOD</td>
</tr>
<tr>
<td>WARNING</td>
<td>Virtual path</td>
<td>GOOD</td>
<td>BAD</td>
</tr>
<tr>
<td></td>
<td>WAN link congestion</td>
<td>UNCONGESTED</td>
<td>CONGESTED</td>
</tr>
<tr>
<td></td>
<td>CONGESTED</td>
<td>UNCONGESTED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Usage congestion</td>
<td>UNCONGESTED</td>
<td>CONGESTED</td>
</tr>
<tr>
<td></td>
<td>CONGESTED</td>
<td>UNCONGESTED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LAN to WAN path</td>
<td>GOOD</td>
<td>DEAD</td>
</tr>
<tr>
<td></td>
<td>BAD</td>
<td>DEAD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WAN to LAN path</td>
<td>GOOD</td>
<td>DEAD</td>
</tr>
<tr>
<td></td>
<td>BAD</td>
<td>DEAD</td>
<td></td>
</tr>
<tr>
<td>ALERT</td>
<td>Virtual path</td>
<td>BAD</td>
<td>DEAD</td>
</tr>
<tr>
<td></td>
<td>DEAD</td>
<td>BAD</td>
<td></td>
</tr>
<tr>
<td>ERROR</td>
<td>WAN-link</td>
<td>GOOD</td>
<td>DEAD</td>
</tr>
<tr>
<td></td>
<td>Ethernet</td>
<td>GOOD</td>
<td>UNDEFINED</td>
</tr>
<tr>
<td></td>
<td>UNDEFINED</td>
<td>DEAD</td>
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<tr>
<td>INFO</td>
<td>Proxy-arp</td>
<td>UNDEFINED</td>
<td>ACTIVE</td>
</tr>
<tr>
<td></td>
<td>UNDEFINED</td>
<td>STANDBY</td>
<td></td>
</tr>
</tbody>
</table>

You can configure Citrix SD-WAN Center to send external event notifications for different event types as email, SNMP traps or syslog messages. For more information, see Event notifications.

**GRE tunnel report**

October 15, 2018

You can use a tunneling mechanism to transport packets of one protocol within another protocol. The protocol that carries the other protocol is called the transport protocol, and the carried protocol is called the passenger protocol. Generic Routing Encapsulation (GRE) is a tunneling mechanism that uses IP as the transport protocol and can carry many different passenger protocols.
The tunnel source address and destination address are used to identify the two endpoints of the virtual point-to-point links in the tunnel.

For more information about configuring GRE tunnels on Citrix SD-WAN appliances, see GRE Tunnel. Citrix SD-WAN Center can show you the state of all the GRE tunnels configured in your Citrix SD-WAN network.

To view GRE tunnel statistics:
In Citrix SD-WAN Center, navigating to Reporting > GRE, and in the timeline control select a time period.

You can select and view reports of a particular time frame by using the timeline controls. For more information, see, Timeline controls.

You can also create, save and open report views. For more information, see, Manage views.

You can view the following metrics:

- **Worst State**: Worst state observed during the selected time period.
- **MTU**: Maximum transmission unit — the size of the largest IP datagram that can be transferred through a specific link.
- **TX Bandwidth**: Bandwidth transmitted.
- **RX Bandwidth**: Bandwidth received.
- **TX Packets**: Number of packets transmitted.
- **RX Packets**: Number of packets received.
- **Packets Dropped**: Number of packets dropped, because of network congestion.
- **Packets Fragmented**: Number of packets fragmented. Packets are fragmented to create smaller packets that can pass through a link with an MTU that is smaller than the original datagram. The fragments are reassembled by the receiving host.
- **Data Coverage**: Percentage of the selected time period for which data is available.

  **Note**
  Click the settings icon to select the metrics that you want to view.

**HDX report**

October 15, 2018

HDX report provides detailed HDX data per site. The data for each site is shown in two views.

**Summary view**

This view shows the following data for a site:

- **QoE Index** - The QoE is a numeric value between 0 – 100, the higher the value the better the user experience.
- **Users** – The number of active users on the site.
- **TCP Flows** - The number of active HDX sessions on the site that use TCP protocol.
- **UDP Flows** – The number of active HDX sessions on the site that use UDP protocols.
- **Sessions** – The total number of active HDX sessions on the site, this includes both SSI and MSI sessions.

**Detail View**

You can click on individual site to view details about all the variables affecting QoE. Each pair of row shows the QoE factors for data calculated at local and remote sides for a given virtual path.

Latency, jitter and packet drop variables affecting QoE are effective numbers that Citrix SD-WAN appliance is measuring. For example, there could be larger percent of packet drop in the network, since Citrix SD-WAN corrects the packet drops through its own protocol, the effective packet loss seen by the application would be much lesser, hence improves the QoE for HDX applications. Similarly, latency improvement through packet duplication also improves the QoE for HDX applications. In other words, Citrix SD-WAN improves the QoE for HDX traffic by improving the factors those affect the QoE.

For more information see, [Application QoE](#).

**To view HDX Reports:**

In Citrix SD-WAN Center, navigate to **Reporting > HDX**, and in the timeline control select a period.
You can select and view reports of a particular time frame by using the timeline controls. For more information, see, Timeline controls.

You can also create, save and open report views. For more information, see, Manage views.

IPsec tunnel report

October 25, 2018

IP Security (IPsec) protocols provide security services such as encrypting sensitive data, authentication, protection against replay, and data confidentiality for IP packets. Encapsulating Security Payload (ESP), and Authentication Header (AH) are the two IPsec security protocols used to provide these security services.

In IPsec tunnel mode, the entire original IP packet is protected by IPsec. The original IP packet is wrapped and encrypted, and a new IP header is added before transmitting the packet through the VPN tunnel.

For more information about configuring IPsec tunnels on Citrix SD-WAN appliances, see IPsec Tunnel Termination.

Citrix SD-WAN Center can show you the state of all the IPsec tunnels configured in your Citrix SD-WAN network.

To view IPsec tunnel statistics:

In Citrix SD-WAN Center, navigate to Reporting > IPsec Tunnels, and in the timeline control select a time period.
You can select and view reports of a particular time frame by using the timeline controls. For more information, see, **Timeline controls**.

You can also create, save, and open report views. For more information, see, **Manage views**.

You can view the following metrics:

- **Name**: Application name.
- **Site**: Name of the site.
- **Service Type**: Type of the service.
- **Intranet Service Type**: Type of intranet service associated with the IPsec tunnel. The following are the type of intranet services:
  - Default
  - Microsoft Azure Virtual WAN
  - Zscaler
  - Citrix SaaS Gateway
- **IPsec Worst State**: Worst state observed during the selected time period.
- **MTU**: Maximum transmission unit—size of the largest IP datagram that can be transferred through a specific link.
- **TX Bandwidth**: Bandwidth transmitted.
- **RX Bandwidth**: Bandwidth received.
- **TX Packets**: Number of packets transmitted.
- **RX Packets**: Number of packets received.
- **Data Dropped**: Data dropped, in Kbps.
- **Packets Dropped**: Number of packets dropped.
Note
Click the settings icon to select the metrics that you want to view.

Link performance report

January 17, 2019

Citrix SD-WAN Center can show performance statistics at the site, service, virtual path, or WAN-link level.

Consider a network in which organization ABC has four branch offices. Brownouts have been reported at SITE3. That is, the employees are sometimes unable to view the intranet pages. You suspect that it's because of the performance of the underlying links.

You can get a high-level view of the link statistics by hovering your mouse cursor over the path between a site and the data center on the Network Map on the Dashboard.

The above screenshot shows that there are two WAN links (WL-1 and WL-2) between SITE 3 and the Master Controller Node (MCN), and displays statistics for the most recent 10 minutes.
The virtual paths Master-WL2->SITE3-WL2 and SITE3-WL2 ->Master-WL2 are not functioning, and alternative paths Master-WL1->SITE3-WL1 and SITE3-WL1 ->Master-WL1 are in poor condition, losing a significant percentage of the transmitted data. That is the probable cause of the brown-out issue at SITE3.

Alternatively, you can view the link statistics by navigating to Reporting > Paths.

In the timeline control select a time period.

You can select and view reports of a particular time frame by using the timeline controls. For more information, see, Timeline controls.

You can also create, save, and open report views. For more information, see, Manage views.
You can view the following metrics:

- **Name**: The path name.
- **From (Site and WAN Link)**: The source site and WAN link.
- **To (Site and WAN Link)**: The destination site and WAN link.
- **LAN to WAN**
  - **Work State**:
    - **Bandwidth**: Total bandwidth consumed by all packet types. \( \text{Bandwidth} = \text{Control Bandwidth} + \text{Real-time Bandwidth} + \text{Interactive Bandwidth} + \text{Bulk Bandwidth} \).  
    - **Control Bandwidth**: Bandwidth used to transfer control packets that contain routing, scheduling, and link statistics information.  
    - **Real-time Bandwidth**: Bandwidth consumed by applications that belong to the real-time class type in the SD-WAN configuration. The performance of such applications depends on a great extent upon network latency. A delayed packet is worse than a lost packet (for example, VoIP, Skype for Business).  
    - **Interactive Bandwidth**: Bandwidth consumed by applications that belong to the interactive class type in the SD-WAN configuration. The performance of such applications depends on a great extent upon network latency, and packet loss (for example, XenDesktop, XenApp).  
    - **Bulk Bandwidth**: Bandwidth consumed by applications that belong to the bulk class type in the SD-WAN configuration. These applications involve very little human intervention and are mostly handled by the systems themselves (for example, FTP, backup operations).  
    - **Congestion**: Congestion due to increased traffic or unexpected delay in packet flow in the WAN.
- **WAN to LAN**:
  - **Worst State**: The worst WAN to LAN state observed during the time period.  
  - **Bandwidth**:
    - **BOWT Latency (ms)**: Best one-way time (BOWT) taken for a packet to move from one point to another, in milliseconds.  
    - **Jitter (ms)**: Variation in the delay of received packets, in milliseconds.  
    - **Loss (%)**: Percentage of packets lost.  
    - **OOO (%)**: Percentage of packets that are not in the right order or out of order (OOO).  
    - **Congestion**: Congestion due to increased traffic or unexpected delay in packet flow in the WAN.

Click on **Settings** icon and select the parameters that you want to view on reports.
MOS for applications

October 15, 2018

The mean opinion score (MOS) provides a numerical measure of the quality of the experience that an application delivers to end users. It is primarily used for VoIP applications. In Citrix SD-WAN, MOS is also used to assess the quality of non-VoIP applications by judging the traffic as if it were a VoIP call.

Citrix SD-WAN Center calculates and displays MOS for the traffic that passes through the virtual path. Enable the Estimate MOS option for each application on every Citrix SD-WAN appliance to display the MOS scores of these applications in Citrix SD-WAN Center.

For more information about enabling MOS for applications in Citrix SD-WAN, see Add Rule Groups and Enable MOS.

Note

Enable the Track Performance option, under Rules to estimate MOS for applications and display it in Citrix SD-WAN Center. For more information on rules, see Rules by IP address and port number.

To view MOS for applications:

In Citrix SD-WAN Center, navigating to Reporting > Applications, and in the timeline control select a time period.

You can select and view reports of a particular time frame by using the timeline controls. For more information, see, Timeline controls.

You can also create, save and open report views. For more information, see, Manage views.

You can view the following metrics:
• **Name**: Name of the application.
• **Average Virtual WAN MOS**: Average quality score calculated over the selected time period.
• **Lowest Virtual WAN MOS**: Lowest quality score calculated within the selected time period.

The scores are graded as follows:

• 5 – Users are very satisfied.
• 4 – Users are satisfied.
• 3 – Users are dissatisfied.
• 2 – Users are very dissatisfied.
• 1 – Not recommended.

### MPLS queues report

October 15, 2018

MPLS Queues provide service queues controlled by standard Differentiated Services Code Point (DSCP) tags. The tags control the quality of service between two sites on the Virtual WAN.

MPLS Queues allow MPLS providers to identify traffic on the basis of DSCP markings, so that class of service can be applied by the provider.

For more information about configuring private MPLS WAN links on Citrix SD-WAN appliances, see [MPLS Queues](#).

To view MPLS queue statistics:

In Citrix SD-WAN Center, navigate to **Reports > MPLS Queues**, and in the timeline control select a time period.

You can select and view reports of a particular time frame by using the timeline controls. For more information, see, [Timeline controls](#).

You can also create, save and open report views. For more information, see, [Manage views](#).
You can view the following metrics:

- **MPLS WAN Link**: Name of the MPLS WAN link that the MPLS queue is a member of.
- **Name**: The DSCP tag name.
- **Bandwidth**: Total bandwidth consumed by all packet types. \( \text{Bandwidth} = \text{Control Bandwidth} + \text{Realtime Bandwidth} + \text{Interactive Bandwidth} + \text{Bulk Bandwidth} \).
- **Control Bandwidth**: Bandwidth used to transfer control packets that contain routing, scheduling, and link statistics information.
- **Realtime Bandwidth**: Bandwidth consumed by applications that belong to the realtime class type in the Citrix SD-WAN configuration. The performance of such applications depends to a great extent upon network latency. A delayed packet is worse than a lost packet (for example, VoIP, Skype for Business).
- **Interactive Bandwidth**: Bandwidth consumed by applications that belong to the interactive class type in the Citrix SD-WAN configuration. The performance of such applications depends to a great extent upon network latency, and packet loss (for example, XenDesktop, XenApp).
- **Bulk Bandwidth**: Bandwidth consumed by applications that belong to the bulk class type in the Citrix SD-WAN configuration. These applications involve very little human intervention and are mostly handled by the systems themselves (for example, FTP, backup operations).
- **Mismatched Bandwidth**: Frames that do not match the defined DSCP tags are mapped to a default queue designated for mismatched bandwidth.
- **Available Bandwidth**: The sum of bandwidth allocated to all the WAN links of a site.
- **Permitted Bandwidth**: Bandwidth available for transmitting information.
- **BOWT Latency**: Best one-way time taken for a packet to move from one point to another, in milliseconds.
- **Jitter**: Variation in the delay of received packets, in milliseconds.
- **Packets Lost**: Number of packets lost.
• **Loss**: Percentage of packets lost.
• **OOO**: Percentage of packets that are not in the right order.
• **Congestion**: Congestion due to increased traffic or unexpected delay in packet flow in the WAN.

**Note**
Click the settings icon to select the metrics that you want to view.

**Administration**

September 28, 2018
You can manage and maintain your Citrix SD-WAN Center VPX using the following administrative options.

Configure date and time
HTTPS certificates
Import MCN configuration
Manage database
Manage views
Software upgrade
Timeline controls
User accounts

**Configure date and time**

September 28, 2018
You can change the date and time of the Citrix SD-WAN Center management system either manually or by using an NTP server. If you select the **Use NTP server** option, then you cannot manually enter a current date and time.

To manually set the date and time:

1. In the Citrix SD-WAN Center web interface, click the **Administration** tab.
2. Click **Global Settings**, and then click **Timezone**.
3. In the **Time Zone** field, select a *city* in your current time zone. Alternatively, enter the current date and time for your time zone.

4. Click **Apply**.

You can synchronize the Citrix SD-WAN Center clock with an external NTP server.

To set the date and time by using an NTP Server:

1. In the Citrix SD-WAN Center web interface, click the **Administration** tab.
2. Click **Global Settings** and then click **TimeZone**.
3. Select **Use NTP Server**.

   This disables the Date and Time fields, and displays the NTP Servers table.

4. To add a new NTP server, click the + icon next to NTP Server.

5. In the **Address** field, enter the **IP Address** for the NTP Server.

   You can specify up to three NTP servers, but you must specify at least one. These act as backup NTP servers, if one server is down the Citrix SD-WAN Center automatically synchronizes with the other NTP server.
If you specify a domain name for an NTP server, you must also configure a DNS server unless you have already done so. To remove a server entry from the table, click the Delete icon in the Delete column of the entry.

6. Click Verify to verify that the server is reachable, before applying your settings.

7. Click Apply.

**HTTPS certificates**

September 28, 2018

HTTPS certificate is required for establishing secured management HTTPS connection to Citrix SD-WAN Center.

**View installed HTTPS certificate details**

Citrix To evaluate the current certificate, you can display the certificate details.

To display the details of HTTPS certificate already installed on Citrix SD-WAN Center:

1. In the Citrix SD-WAN Center web interface, click the Administration tab.

2. Click Global Settings and then click HTTPS Certificate.

The HTTPS certificate details appear in the Installed HTTPS Certificate section.
Upload and install an HTTPS certificate

Installing an HTTPS Certificate puts Citrix SD-WAN Center into Maintenance Mode until the operation is complete. When the operation is complete, the web server is restarted, invalidating all connected sessions. If the connection to the server is lost when the web server is restarted, the maintenance mode screen automatically reloads the previous page and displays a security notice from the browser. If the screen does not reload, click Continue to reload the previous page.

To upload and install the HTTPS certificate:

1. In the Citrix SD-WAN Center web interface, click the Administration tab.
2. Click Global Settings and then click HTTPS Certificates.
3. In the HTTPS Certificate upload and Install section, in the HTTPS certificate file field, click Browse and select a HTTPS certificate.
4. For the field HTTPS private key file, click Browse and select an HTTPS private key file.
5. Click Upload and Install.

Regenerate the HTTPS certificate

You can regenerate a self-signed certificate that secures the Management HTTPS connection to Citrix SD-WAN Center. Regenerating the HTTPS Certificate puts Citrix SD-WAN Center into Maintenance Mode until the operation is complete. When the operation is complete, the web server is restarted, invalidating all connected sessions.

If the connection to the server is lost when the web server is restarted, the maintenance mode screen automatically reloads the previous page and displays a security notice from the browser. If the screen does not appear, click Continue to reload the previous page.

To regenerate the HTTPS certificate:

1. In the Citrix SD-WAN Center web interface, click the Administration tab.
2. Click **Global Settings** and then click **HTTPS Certificates**.

3. In the **Regenerate HTTPS Certificate** section, click **Regenerate HTTPS Certificate**.

The Regenerate HTTPS Certificate message appears. Click **Regenerate**.

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**Import MCN configuration**

September 28, 2018

When Citrix SD-WAN Center is set up and a connection is established between the master control node (MCN) and Citrix SD-WAN Center, you can import the MCN configuration to Citrix SD-WAN Center and view the network maps.

The Import function imports a configuration into an open or new Citrix SD-WAN master configuration. If an Citrix SD-WAN master configuration is open when you use the import function, it and its maps are overwritten by the new Citrix SD-WAN master configuration. If no Citrix SD-WAN master configuration is open, an untitled package is created.

To import the MCN configuration to Citrix SD-WAN Center:

1. In the Citrix SD-WAN Center web interface click the **Configuration** tab.
2. Click **Network Configuration** and then click **Import**.
3. In the **From Network** field select one of the following options:

   - **Active MCN**: Connect to the active MCN and download the current Configuration.
   - **Other**: Connect to an IP address of a different MCN and download the current Configuration. You may have to install the security Certificate from this Citrix SD-WAN Center in the MCN before you can import the Configuration.

   For more information, see, [Install the Citrix SD-WAN Center Certificate](#).

4. Alternatively, in the **From File** section, click **Browse** and select a Configuration to be uploaded from your computer.

5. In the **Import to** field select **Current Package** to import the contents of the selected file into the current open package.

6. In the **Use Network Maps from**, field select one of the following options.

   - **Current Package**: Retain the currently saved set of network maps after the import.
   - **New Package**: Use the network maps from the imported package and discard the current set of maps.
   - **Both Packages**: Use the imported maps in addition to the currently saved maps.

7. Click **Import**. The configuration is imported.
8. In the **Network Map** section. Click the settings icon and select **Auto populate** to automatically add and arrange each site in the configuration to the map.
Manage database

September 28, 2018

You can monitor and manage the database to ensure that there is enough available disk space to store the polling data from all the discovered appliances on the network.

Viewing database statistics

The **Statistics** table displays the available database statistics, and includes input fields for specifying the database disk usage thresholds for notifications and polling.

To view database statistics:

1. In the Citrix SD-WAN Center Web UI click the **Administration** tab.
2. Click **Database Maintenance**. Under **Statistics** section the following information is displayed.
   - **Record Time**: Displays the date and timestamp for the oldest and most recent records in the database. This column contains the following information:
     - **Start**: Displays the date and timestamp of the oldest record in the database.
     - **End**: Displays the date and timestamp of the most recent record in the database.
   - **Active Storage Size (MB)**: Displays the current active storage’s disk space.
   - **Database Size (MB)**: Displays the current database size and use information. This column contains the following information:
     - **Total (MB)**: Displays the total size in MB of the database.
     - **Usage (%)**: Displays the percentage of database disk usage in current active storage’s disk space.

To set the notification and polling threshold:

1. In the **Notification** field, enter the percentage of the database size or active storage size to use as a threshold for generating a database usage notification. An email notification will be sent when database use exceeds this threshold.
2. In the **Stop Polling** field, enter the database disk usage threshold (percentage) at which to stop statistics polling. Select a value from **10%** to **50%** from the drop-down menu. The default is **50%**.

3. Click **Apply**.

**Configuring auto cleanup**

To keep database disk usage under control, you can specify thresholds that, when exceeded, trigger the removal of older records from the database.

**To enable database cleanup and configure the thresholds:**

1. In the Citrix SD-WAN Center Web UI click the **Administration** tab.

2. Click **Database Maintenance**.

3. Under **Auto Cleanup** section, select the **Remove oldest records by day when**... checkbox to enable database cleanup.

When enabled, the database is automatically checked at 2:00 AM every day. The check initiates a database cleanup if the specified thresholds are met or exceeded. By default, this is not enabled.

4. Select **...database usage exceeds (%) of active storage size** and then select a percentage from the drop-down menu to specify the threshold for a database cleanup. The options are from **10%** to **50%** in increments of **5%**.

5. Select **AND** or **OR**, an operator from the drop-down menu between the “...database usage exceeds...” and “...database has more than...” thresholds to specify an operator how to apply for this rule these thresholds. The default is **AND**.

6. Select **...database has more than [# months] months of data** and then select the number of months from the drop-down menu to specify the time span threshold for a database cleanup for which to keep data in the database. The options are from **3 months** to **12 months** in increments of one month.
7. Click **Apply**.

**Configuring manual cleanup**

You can manually remove statistics and events records from the database, based on specified criteria.

**To perform a manual database cleanup:**

1. In the Citrix SD-WAN Center web interface click the **Administration** tab.

2. Click **Database Maintenance**.

3. Under **Manual Cleanup section** select a filter from the **Remove Records** drop-down menu. The filter options are:
   - **older than**: Remove records collected before a specified date. When you select this filter, a date field and calendar selection button appear. Click the calendar button to select a date. All records older than the specified date will be removed.
   - **for Site**: Remove records collected before a specified date. When you select this filter, a date field and calendar selection button appear. Click the calendar button to select a date. All records older than the specified date will be removed.

4. Click **Remove**.

**Manage views**

September 28, 2018

The Fault, Reporting, Network Map and Statistics page allows you to create, display, modify and delete the respective views.
Note
The screenshots used in the procedure may vary from the actual user interface depending on the type of the view.

To create a new view:

1. Click New View, this creates a new, unnamed view and resets the time specification to the current time.
2. Create and apply filters or make the necessary changes.
3. Click Save As.
4. In the Save View dialog box enter a name for your view.
5. Click Save.

To open and modify an existing view:

1. Click Open.
2. In the Open View dialog box, select a report view from the drop-down list.
3. Click Open. The event view opens.
4. Make the necessary modification as required.
5. Click Save.

To delete a view, open the view and click the delete icon.

Software upgrade

September 28, 2018
You can use the Software Upgrade option to upgrade your Citrix SD-WAN Center software to the latest version. The software upgrade process places Citrix SD-WAN Center into maintenance mode. If a database migration is required, this process can take several hours. During this time, no statistics data will be collected from the Virtual WAN, and all Citrix SD-WAN Center functionality will be unavailable.

**Important**

Running the upgrade during maintenance hours is recommended.

**Note**

Download the appropriate Citrix SD-WAN Center software package to your local computer. You can download this package from [Downloads page](#).

To upload and install a new version of the Citrix SD-WAN Center software

1. In the Citrix SD-WAN Center web interface, click the **Administration** tab.
2. Click **Global Settings** and then click **Software Upgrade**.
3. Click **Browse** to open a file browser, and select the software package you want to upload.
4. Click **Upload** to upload the selected software package to the current Citrix SD-WAN Center virtual machine.
5. After the upload completes, click **Install**.
6. When prompted to confirm, click **Install**.
7. In the dialog box that appears, select the **I accept the End User License Agreement** checkbox, and then click **Install**.

**Timeline controls**

September 28, 2018
The Timeline at the top of the Fault, Reporting, Network Map and Statistics page provides controls for restricting the time frame of the current View. You can view a time frame of up to 30 days of data from the current database.

**Note**

Based on selected time period, you can view the historic data irrespective of the current Citrix SD-WAN network configuration.

**Time**

You can use the following elements for specifying a time frame for the current View:

- **Time** - Enter a date and time in the Time field to narrow the graph results to a specific date and time. The format can be any of the following:
  - *Month Day, Year Hour:Minutes [am / pm]* For example: September 7, 2015 2:00pm.
  - *MM/DD/YYYY HH:MM [am / pm]* For example: 09/07/2015 8:36am.
  - *M/D/YY HH:MM [am / pm]* For example: 9/7/15 10:14pm

- **Calendar** - (Calendar icon) Click the calendar icon to the right of the Time field and select a date to restrict the view results to that date.

- **Timeline** - Click and drag to another point on a timeline to select a time frame of at least 30 minutes.

- **Last: Hour / Day / Week / Month** - Click an option (Hour, Day, Week, or Month) to restrict the view results to that time frame.

**Mode**

The Timeline mode determines how the timeline interprets time frame selections, and how automatic updates are reflected in the current view and on the Dashboard. There are two mode options, **Relative (selected time frame)** and **Absolute (selected time frame)**, where selected time frame is the time frame specified in the Time field.

To change the Timeline mode, select either **Relative** or **Absolute** from the Mode drop-down menu at the top far right corner of the Timeline.
Relative Mode

If you select **Relative** mode, the Timeline treats the time frame specified for **Time** as a time relative to now. If you save the view and open it later, the information represented in the view will be relative to the time that the view was opened. If you have enabled automatic updates and a statistics update is detected, the view is updated relative to the latest time recorded in the database.

The currently specified time frame is shown in parenthesis as part of the **Relative** menu option. For example, if you selected **Last: Day** as the time frame, the **Relative** option displays as Relative (1 day ago - 1 minute from now).

Absolute Mode

If you select **Absolute** mode, the Timeline treats the time frame specified for **Time**: as absolute (static) points in time. The view will always represent the selected time, even if you save the view and open it at a later time, or if you enable automatic updates. The currently specified time frame is shown in parenthesis as part of the **Absolute** menu option, using the following format:

**Absolute** \( (start\_date\_start\_time - end\_date\_end\_time) \)

For example, if you selected **Last: Day** as the time frame, and the current date and time are 9/7 4:43 PM, the **Absolute** option displays as **Absolute** \( (9/6 4:43 PM - 9/7 4:43 PM) \).

User accounts

March 7, 2019

You can view a list of all local and remote user accounts that have logged into Citrix SD-WAN Center virtual machine at least once. Remote user accounts are authenticated through RADIUS or TACACS+ authentication servers. You can also add a new local user account to Citrix SD-WAN Center.

**Note**

If a user-account is available on a remote authentication server but is never used to log on to Citrix SD-WAN Center, it is not displayed in the **Users** list.

To view user accounts

In the SD-WAN Center web interface, navigate to **Administration > User/Authentication Settings**.

A list of user accounts appears in the **Users** section.
The following information is displayed:

- **Name**: The user account name.
- **Type**: The type of user account, it can be one of the following:
  - **Local**: User accounts created and managed locally using the SD-WAN Center interface.
  - **RADIUS**: Remote user accounts authenticated by the RADIUS server.
  - **TACACS+**: Remote user accounts authenticated by the TACACS+ server.
- **Level**: The account privilege. Admin account has administrative privileges, while a guest account is a read-only account.
- **Created**: For local user accounts, the date the user account was created. For a remote user account, the date of the first login session.
- **Modified**: For local user accounts, the date the password was last changed. For remote users, the date of the first login session.
- **Last Login**: The date the user last successfully logged in. A tooltip displays the IP Address of the device used to log in.
- **Last Active**: The date the last request was made to the server. A tooltip displays the IP Address of the device used to log in.
- **Manage**: Click the gear icon to view a menu containing the following options:
  - **Set Password**: Change Password for the local user account. The current root password is required to change the root password. You cannot change passwords of remote user accounts.
  - **Reset**: Remove the workspaces and preferences for this user account.
  - **Delete**: Delete the local user account, workspaces, and preferences from SD-WAN Center. You cannot delete remote and admin accounts.
  - **Enable Two-factor**: Enable two-factor authentication for the local and remote user account. For more information, see Two-factor Authentication.

To add a new local user account to the Citrix SD-WAN Center:

**Note**

The user accounts created locally on Citrix SD-WAN Center do not have the privilege to edit and
export the network configuration package to the MCN.

1. Click the add icon + next to **Users**. The **Add Local User** dialog box appears.

![Add Local User dialog box]

2. Enter values for the following parameters:
   - **User Name**: The username for the local user account.
   - **Level**: The account privilege. A guest user account is a read-only account limited to viewing dashboard, reports, and statistics. The guest user account does not have the privilege to edit and export the network configuration package to the MCN.
   - **Password**: The password for the user account.
   - **Confirm Password**: Reenter the password for confirmation.

3. Select **Enable Two-factor** to enable two-factor authentication for the local user account.

   **Note**
   The **Enable Two-factor** option appears only when the secondary authentication server is configured.

   Configure a secondary authentication server, either RADIUS, or TACAS+ authentication. Ensure that the user account is configured on the secondary authentication server. For more information, see **Secondary authentication**.

4. Click **Add**. The new user account is created and the account information is added to the **Users** table.
Note

Citrix SD-WAN Center can have up to 600 local users.