BACnet/SC Virtual Hub v1.12

Installation and Start-up Guide

BACnet Secure Connect

⚠ Verify that you have the most current version of this document from **www.hvacpartners.com**, the **Carrier Partner Community** website, or your local Carrier office.

Important changes are listed in **Document revision history** at the end of this document.

Contents

Installing and starting up the BACnet/SC Virtual Hub

The BACnet/SC Virtual Hub is a software application that acts as the central director of traffic between all node devices on a BACnet/SC network. It provides a web-based interface that allows you to configure the hub, including installation of the certificates the hub will use to authenticate connected devices.

After installation and start-up, see the *BACnet/SC Setup Guide* for instructions on configuring and maintaining the hub.

Server requirements

The BACnet/SC Virtual Hub web server requires a 64-bit Windows® or Linux® operating system with a minimum of 4 GB RAM.

The server memory requirements vary based on the:

- number of connected devices
- volume of traffic between devices

NOTES

- On a Linux system, the BACnet/SC Virtual Hub should run as a Linux Daemon. See *To set up the BACnet/SC Virtual Hub Server to run as a Linux SystemD Daemon/Service* (page 12).

- If your hub is communicating over Wi-Fi on a Windows system, disable the Random Hardware Addresses feature in your server's Wi-Fi settings.

Security

- The BACnet/SC Virtual Hub is a web server intended for use on intranet sites, not on the public Internet.

- The BACnet/SC Virtual Hub server should run as a non-administrator or non-root user with minimum privileges. This limits potential information loss or damage if the server is compromised. The BACnet/SC Virtual Hub server maintains this security by storing most information in a Data Location which must be accessible to the user that the BACnet/SC Virtual Hub server is run with. This Data Location can be edited in the Admin Tool.

- The BACnet/SC Virtual Hub software should be installed to a protected folder (such as C:\Program Files) because it contains executable code and sensitive configuration information. The Admin Tool modifies this sensitive configuration and therefore must run with elevated or root privileges.

Licensing

Purchase the BACnet/SC Virtual Hub license that coincides with the number of Gen5 routers that you plan to connect to your BACnet/SC network. The license allows for 3 additional connections for:

- the BACnet/SC Hub

- your i-Vu® Pro system

- a failover hub, if you have one

Upgrades

When upgrading from a previous version of the BACnet/SC Virtual Hub, the installation steps are the same as an initial install. The installation wizard automatically uninstalls your previous version. Your configuration data, including your license and certificates, are retained.

Installing the BACnet/SC Virtual Hub on a Windows computer

To install and start-up the BACnet/SC Virtual Hub on a Windows® computer:

1   *Install the product* (page 3).

2   *Set up and start the BACnet/SC Virtual Hub server in the Admin Tool* (page 3).

3   *Launch the configuration Interface in a web browser* (page 5).

If needed, you can:
Stop or start the BACnet/SC Virtual Hub server after the initial setup (page 7).

To install the BACnet/SC Virtual Hub product

1   Go to the Carrier® Partner Community website.

2   Select **Orders** > **Software Licenses**.

3   Select **BACnet/SC Virtual Hub**.

4   Download and run the file **BACnet_SC_Hub_windows-x64_< version >.exe**.

5   Follow the installer prompts.

6   When installation is complete, you will be prompted to accept the End User License Agreement (EULA). Accept the EULA, and then click **OK**.

7   The Admin Tool will be displayed. See next section.

To set up and start the BACnet/SC Virtual Hub server in the Admin Tool

You may need to edit your initial settings in the BACnet/SC Hub Admin Tool.

NOTE To access the BACnet/SC Hub Admin Tool, you must have either local or remote access credentials to the server on which the hub has been installed. This requires the site administrator to provision user access to the server on which the hub is installed.

1   If the BACnet/SC Virtual Hub is already running

   a)   In the Windows system tray, double-click the [icon] icon.

   NOTE See *To stop or start the BACnet/SC Virtual Hub server* (page 7) for more information.

   b)   Click **Stop Hub**.

2   Edit the settings as needed. See table below.

3   Click **Save & Start Hub** to start the BACnet/SC Virtual Hub server.

Field	Notes
Server Settings	

Admin Password	This password will be used to create the single user administrator account used to log in to the BACnet/SC Virtual Hub's configuration interface from a web browser. The password is stored on the hub server using a SHA1 hashing algorithm.
	
	NOTE This password should not be shared. If multiple people will be configuring the hub, the hub account should be entered as a service account in the customer's Identity and Access Management tool.
	
	The password must:
	
	• Meet the "strong password" strength threshold
	
	• Be at least 8 characters long
	
	• Include at least one:
	   ○ upper case letter
	   ○ lower case letter
	   ○ number
	   ○ special character
	
	• Contain no spaces

Data Location	The location where you want the BACnet/SC Virtual Hub to store the configuration, system run-time data, and backup files.
BACnet Settings	
Network Interface	This is the network interface that will be used for BACnet communications. **NOTES** • If you want to use one computer for both the i-Vu Pro Server application and the BACnet/SC Virtual Hub, see To run i-Vu Pro Server and the BACnet/SC Virtual Hub on the same computer. • Do not change the Network Interface when your hub license is active. See *To change the BACnet/SC network interface* (page 22).
BACnet/SC Port	This is the port that will be used for BACnet/SC communications. 443 is the default BACnet/SC port, but you can change it if needed.
URIs	Comma-separated list of one or more web addresses to display as the Secure Connect endpoints of the BACnet/SC Virtual Hub. This list will be displayed in the BACnet/SC Hub configuration interface for information only. The listed URIs are intended to be used when configuring devices to connect to this hub.
Web Server Settings	
Network Interface	<table><tr><td>**Select...**</td><td>**To have the web server respond to requests...**</td></tr><tr><td>**All**</td><td>On all of the computer's network interfaces.</td></tr><tr><td>**Local only**</td><td>Originating on this computer.</td></tr><tr><td>**A specific interface**</td><td>On an individual interface. **NOTE** If you want to use one computer for both the i-Vu Pro Server application and the BACnet/SC Virtual Hub, select the same IP address in this field that you selected in the **BACnet Settings** > **Network Interface** field described above.</td></tr></table>

Field	Notes
HTTPS (always enabled)	This is the web server port for HTTPS (TLS) requests.
	443 is the standard HTTPS port, but since this is the default for BACnet/SC, the default for HTTPS is 8443. See NOTE below this table.
Enable HTTP redirect to HTTPS	BACnet/SC Virtual Hub responds only to HTTPS requests. Uncheck this option if you do not want to allow HTTP requests to be redirected to HTTPS.
	80 is the standard HTTP port.
HTTP Port	On the computer running the Admin Tool, this is the web server port for HTTP requests. Set this port to 8080. If **Enable HTTP redirect to HTTPS** is checked, the requests will be redirected to the HTTPS port. See NOTE below this table.
DNS Names	Enter all possible domain names for accessing this computer over HTTPS. These names will be included in the automatically-generated self-signed certificate as Subject Alternative Names (SAN). This self-signed certificate is generated when you click **Save & Start Hub**. Check with your Network Administrator for assistance.

NOTES

- You may need to adjust your firewall settings to allow access to the BACnet/SC Virtual Hub. Set the **Local Port** field of your firewall rule to the specific ports you are using for the hub. Set the **Remote Port** field of your firewall rule to the default value "All Ports".

- If you change the HTTPS or HTTP port, you will need to do one of the following to access the new port:

  ○ Add a colon and the new port number to the BACnet/SC Virtual Hub's URL when opening it in a web browser.

  ○ Use a port-forwarding firewall to redirect the server's standard http/https traffic to the new port.

To launch the BACnet/SC Hub configuration interface in a web browser

1 Open a web browser.

2 Type the BACnet/SC Virtual Hub's address in the web browser's address field.

NOTES

- You can type `https://localhost` if the BACnet/SC Virtual Hub and the web browser are running on the same computer.
- If the **HTTPS Port** in the Admin Tool is anything other than 443, you will need to add a colon and the port number to the URL. For example, `https://localhost:8443`.
- Depending on the web browser, you may get prompted that the server being accessed is not trusted. The browser should give advanced options to allow you to view and import the server's certificate as a trusted server. Follow the browser's prompts to import the certificate.
- Enter the password, and then click **Log in**.

To run i-Vu Pro Server and the BACnet/SC Virtual Hub on the same computer

If you want to run both applications on the same computer, set the BACnet/SC Virtual Hub's port numbers such that they do not conflict with the i-Vu® Pro application's port number(s). You assign the port numbers in the BACnet/SC Virtual Hub Admin Tool. See *To set up and start the BACnet/SC Virtual Hub in the Admin tool* (page 3).

However, if you would like to use the same port number(s) for both products, you will need two IP addresses for the computer's network interface, one for each product, to avoid conflicts.

- Use one IP address for the i-Vu Pro Server. You assign the IP address in SiteBuilder and on the i-Vu® Pro **Connections** page. See "To assign the i-Vu Pro Server's IP address" below.

- Use the other IP address for the BACnet/SC Virtual Hub. You assign the IP address in the BACnet/SC Virtual Hub Admin Tool. See *To set up and start the BACnet/SC Virtual Hub in the Admin tool* (page 3).

To create a second IP address for the BACnet/SC Virtual Hub

NOTE The following instructions are for a Windows® 10 operating system. See *Windows Help* if you are running a different version.

1   Click **Start**, type `settings`, and then select **Settings**.

2   Click **Network and Internet** > **Ethernet** > **Change adapter options**.

3   Right-click the network connection that you want to use for the BACnet/SC Virtual Hub and then click **Properties**.

4   Select **Internet Protocol Version 4 (TCP/IPv4)** or select **Internet Protocol Version 6 (TCP/IPv6)**, and then click **Properties**.

5   Select **Use the following IP address**, enter the **IP address**, **Subnet mask** and **Default gateway**, and then click **Advanced**.

6   Under **IP addresses**, click **Add**.

7   Enter the **IP address** and **Subnet mask** that you want to use for the BACnet/SC Virtual Hub, click **Add**, and then click **OK**.

8   Restart the Admin Tool to see the new IP address in the **BACnet Settings Network Interface** and **Web Server Network Interface** fields.

To assign the i-Vu Pro Server's IP address

1   In SiteBuilder, go to **Configure** > **Preferences** > **Web Server**.

2   In the **Restrict to IP Address** field, select the IP address that you are going to use for the i-Vu Pro Server.

3   Click **OK**.

4   Close SiteBuilder.

5   If the i-Vu® Pro application is using a BACnet/IP connection:

   a)   In the i-Vu® Pro interface, go to the   > **System Options** tree > **Connections** page.

   b)   On the **Configure** tab, select **BACnet/IP Connection** in the table.

   c)   In the **Server IP Address** field, enter the same IP address that you selected in step **2**.

To stop or start the BACnet/SC Virtual Hub server

The BACnet/SC Virtual Hub installs an icon in the system tray on your computer's taskbar so that you have quick access to the Admin Tool.

To stop or start the BACnet/SC Virtual Hub server:

1   Double-click on the appropriate icon below to open the Admin Tool.

This icon...	Indicates....
	BACnet/SC Virtual Hub server is running.
	BACnet/SC Virtual Hub server is stopped.

2   Click one of the following:

- ○   **Stop Hub** to stop the server.

- ○   **Save and Start Hub** to start the server.

NOTE If the icon is removed from the system tray, you can reopen it if needed. In the Windows Start menu under **BACnet SC Hub**, select **Tray Icon**.

To uninstall the BACnet/SC Virtual Hub product

NOTE The uninstall process does not delete the BACnet/SC Virtual Hub application data. If you re-install, that data will be available for the new installation.

1   Open the Windows Run Dialog by simultaneously pressing the Windows Icon + R keys.

2   Type appwiz.cpl in the dialog box and press **Enter**.

3   Select BACnet SC Hub in the list and click **Uninstall/Change**.

4   Follow uninstaller prompts.

Installing BACnet/SC Virtual Hub on a computer running Linux Ubuntu 20.04 (or later) with a graphical user interface

To install and start-up BACnet/SC Virtual Hub on a computer running Linux® Ubuntu 20.04 or later with a graphical user interface:

1 *Install the product* (page 9).

2 Set up the BACnet/SC Virtual Hub server in the Admin Tool.

3 *Start the BACnet/SC Virtual Hub server* (page 11).

4 *Launch the BACnet/SC Virtual Hub application in a web browser* (page 12).

If needed, you can:

- Set up the i-Vu Pro Server and the BACnet/SC Virtual Hub to run on the same computer.

- *Set up the BACnet/SC Virtual Hub server to run as a Linux SystemD Daemon/Service* (page 12).

- *Stop, start, or get the status of the BACnet/SC Virtual Hub server* (page 13).

NOTES

- The Linux instructions in this document assume that you installed the BACnet/SC Virtual Hub to the default directory **/usr/local/bacnet_sc_hub**. If you installed it to a different directory, you will need to insert your install directory where appropriate when following the instructions.

- On a Linux system, changes in the Admin Tool require a restart of the service. Launching the Admin Tool preemptively stops the service when it is launched.

To install the BACnet/SC Virtual Hub product

1 Go to the Carrier® Partner Community website.

2 Select **Orders** > **Software Licenses**.

3 Select **BACnet/SC Virtual Hub**.

4 Download the file **BACnet_SC_Hub_unix_< version >.sh** to your User's home directory.

5 Open a Terminal.

6 Type: `cd ~`

7 Press **Enter**.

8 Type: `chmod +x BACnet_SC_Hub_unix_< version >.sh`

9 Press **Enter**.

10 Type: `sudo ./BACnet_SC_Hub_unix_< version >.sh`

11 Press **Enter**.

12 Follow the installer prompts.

13 When installation is complete, you will be prompted to accept the End User License Agreement (EULA). Accept the EULA, and then click **OK**.

14 The Admin Tool will be displayed. See next section.

NOTE Other variations of Linux may fail to launch the installer due to a missing module, the **canberra-gtk-module**. Install it using the Linux Package Manager.

To set up BACnet/SC Virtual Hub in the Admin Tool

You may need to edit your initial settings in the Admin Tool.

NOTES

- To access the BACnet/SC Hub Admin Tool, you must have either local or remote access credentials to the server on which the hub has been installed. This requires the site administrator to provision user access to the server on which the hub is installed.

- On a Linux system, changes in the Admin Tool require a restart of the service. Launching the Admin Tool preemptively stops the service when it is launched.

1 If the BACnet/SC Virtual Hub is already installed

   a) Open a Terminal.

   b) Type: `sudo /usr/local/bacnet_sc_hub/admin_tool`

2 Enter the information required to run the BACnet/SC Virtual Hub. See table below.

3 Click **Save**.

4 Start the service. See *To stop, start, and get the status of the BACnet/SC Virtual Hub server* (page 13).

Field	Notes
Server Settings	
Admin Password	This password will be used to create the single user administrator account used to log in to the BACnet/SC Virtual Hub's configuration interface from a web browser. The password is stored on the hub server using a SHA1 hashing algorithm.
	NOTE This password should not be shared. If multiple people will be configuring the hub, the hub account should be entered as a service account in the customer's Identity and Access Management tool.
	The password must:
	• Meet the "strong password" strength threshold
	• Be at least 8 characters long
	• Include at least one:
	○ upper case letter
	○ lower case letter
	○ number
	○ special character
	• Contain no spaces
Data Location	The location where you want the BACnet/SC Virtual Hub to store the configuration, system run-time data, and backup files.
BACnet Settings	
Network Interface	This is the network interface that will be used for BACnet communications.
	NOTE Do not change the Network Interface when your hub license is active. See *To change the BACnet/SC network interface* (page 22).
BACnet/SC Port	This is the port that will be used for BACnet/SC communications. 443 is the default BACnet/SC port, but you can change it if needed.
URIs	Comma-separated list of one or more web addresses to display as the Secure Connect endpoints of the BACnet/SC Virtual Hub. This list will be displayed in the BACnet/SC Hub configuration interface for information only. The listed URIs are intended to be used when configuring devices to connect to this hub.
Web Server Settings	
Network Interface	**Select...** **To have the web server respond to requests...**
	All On all of the computer's network interfaces.
	Local only Originating on this computer.
	A specific interface On an individual interface.
HTTPS (always enabled)	This is the web server port for HTTPS (TLS) requests.
	443 is the standard HTTPS port, but since this is the default for BACnet/SC, the default for HTTPS is 8443. See NOTE below this table.

Field	Notes
Enable HTTP redirect to HTTPS	BACnet/SC Virtual Hub responds only to HTTPS requests. Uncheck this option if you do not want to allow HTTP requests to be redirected to HTTPS.
	80 is the standard HTTP port.
DNS Names	Enter all possible domain names for accessing this computer over HTTPS. These names will be included in the automatically-generated self-signed certificate as Subject Alternative Names (SAN). This self-signed certificate is generated when you click **Save.** Check with your Network Administrator for assistance.

NOTES

- You may need to adjust your firewall settings to allow access to the BACnet/SC Virtual Hub. Set the **Local Port** field of your firewall rule to the specific ports you are using for the hub. Set the **Remote Port** field of your firewall rule to the default value "All Ports".

- When you change the HTTPS or HTTP port, you will need to do one of the following to access the new port:

  - Add a colon and the new port number to the BACnet/SC Virtual Hub's URL when opening it in a web browser.

  - Use iptables to redirect the server's standard http/https traffic to the new port. See *To redirect privileged ports to non-standard port numbers on a Linux Ubuntu 20.04 or later system* (page 21).

To start the BACnet/SC Virtual Hub server

1 Open a Terminal.

2 If you created symlinks (the default installer options when installing the BACnet/SC Virtual Hub)

   a) Type: `bacnet_sc_hub_service start`

3 If you did not create symlinks

   a) Type: `cd /usr/local/bacnet_sc_hub/bin`

      NOTE The installation directory may be different for other variations of Linux.

   b) Press **Enter.**

   c) Type: `./bacnet_sc_hub_service`

4 Press **Enter.**

💡**TIP** We recommend that you run BACnet/SC Virtual Hub as a service. This ensures that in the event of an unexpected reboot, such as a power failure, BACnet/SC Virtual Hub will automatically restart and restore configurations.

To launch the BACnet/SC Virtual Hub application in a web browser

1   Open a web browser.

2   Type the BACnet/SC Virtual Hub's address in the web browser's address field.

    NOTES

- You can type `https://localhost` if the Admin Tool and the web browser are running on the same computer.
- If the **HTTPS Port** in the Admin Tool is anything other than 443, you will need to add a colon and the port number to the URL. For example, `https://localhost:8443`.

3   Depending on the web browser, you may get prompted that the server being accessed is not trusted. The browser should give advanced options to allow you to view and import the server's certificate as a trusted server. Follow the browser's prompts to import the certificate.

4   Enter the password, then click **Log in.**

To set up the BACnet/SC Virtual Hub server to run as a Linux SystemD Daemon/Service

1   Open a Terminal.

2   Type: `sudo gedit /usr/local/bacnet_sc_hub/bin/bacnet_sc_hub.service`

3   Press **Enter**.

4   Under the `[Service]` section, add: `User=< non-privileged user name >`

    ⚠️ **IMPORTANT** For the security of your system, this step changes BACnet/SC Virtual Hub to run as a non-privileged user. After doing this, you will have to run the web server on ports higher than 1024. See:
To set up BACnet/SC Virtual Hub in the Admin Tool
To redirect privileged ports to non-standard port numbers on a Linux Ubuntu 20.04 or later system (page 21)

5   If you installed to a directory other than **/usr/local/bacnet_sc_hub** (the default directory), replace any occurrence of **/usr/local/bacnet_sc_hub** in this file with the appropriate path.

6   Save the **bacnet_sc_hub.service** file, and then close gedit.

7   Type: `sudo cp /usr/local/bacnet_sc_hub/bin/bacnet_sc_hub.service /etc/systemd/system`
    NOTE There is a space between "bacnet_sc_hub.service" and "/etc/" in the line above.

8   Press **Enter**.

9   Reinitialize Linux to recognize the BACnet/SC Virtual Hub server's service file copied in step **2**.
    Type: `sudo systemctl daemon-reload`

10   10. Register the BACnet/SC Virtual Hub server to launch at startup.
    Type: `sudo systemctl enable bacnet_sc_hub.service`

NOTES

- To manually start the BACnet/SC Virtual Hub server's service, type:
  `sudo systemctl start bacnet_sc_hub.service`

- To manually shutdown the BACnet/SC Virtual Hub server's service, type:
  `sudo systemctl stop bacnet_sc_hub.service`

- To check the status of the BACnet/SC Virtual Hub server's service, type:
  `sudo systemctl status bacnet_sc_hub.service`

To stop, start, and get the status of the BACnet/SC Virtual Hub server

1 Open a Terminal.

2 If you did not create symlinks when installing the BACnet/SC Virtual Hub

    a) Type: `cd /usr/local/bacnet_sc_hub/bin`

    b) Press **Enter**.

3 Type one of the following:

> **NOTE** If you did not create symlinks when installing the BACnet/SC Virtual Hub, use
> "`./bacnet_sc_hub_service`" in place of "`bacnet_sc_hub_service`" in the instructions below.

To...	Type...
Stop the BACnet/SC Virtual Hub	`bacnet_sc_hub_service stop`
Start the BACnet/SC Virtual Hub	`bacnet_sc_hub_service start`
Get the status of the BACnet/SC Virtual Hub	`bacnet_sc_hub_service status`

4 Press **Enter**.

To uninstall the BACnet/SC Virtual Hub product

1 Open a Terminal

2 Type: `sudo /usr/local/bacnet_sc_hub/uninstall`

3 Press **Enter**

Installing BACnet/SC Virtual Hub on a computer running Linux Ubuntu 20.04 (or later) with no graphical user interface

To install and start-up the BACnet/SC Virtual Hub on a computer running Linux® without a graphical user interface:

1   *Install the product* (page 14).

2   Set up the BACnet/SC Virtual Hub server in the Admin Tool.

3   *Start the BACnet/SC Virtual Hub server* (page 18).

4   *Launch the BACnet/SC Virtual Hub configuration interface in a web browser* (page 19).

If needed, you can:

- *Set up the BACnet/SC Virtual Hub server to run as a Linux SystemD Daemon/Service* (page 12).

- *Stop, start, or get the status of the BACnet/SC Virtual Hub server* (page 20).

NOTES

- The Linux instructions in this document assume that you installed the BACnet/SC Virtual Hub to the default directory **/usr/local/bacnet_sc_hub**. If you installed it to a different directory, you will need to insert your install directory where appropriate when following the instructions.

- On a Linux system, changes in the Admin Tool require a restart of the service. Launching the Admin Tool preemptively stops the service when it is launched.

To install the BACnet/SC Virtual Hub product

1   Go to the Carrier® Partner Community website.

2   Select **Orders** > **Software Licenses**.

3   Select **BACnet/SC Virtual Hub**.

4   Download the file **BACnet_SC_Hub_unix_< version >.sh** to your User's home directory.

5   Open a Terminal.

6   Type: `cd ~`

7   Press **Enter**.

8   Type: `sudo chmod +x BACnet_SC_Hub_unix_< version >.sh`

9   Press **Enter**.

10 Type: `sudo ./BACnet_SC_Hub_unix_< version >.sh`

11 Press **Enter**.

12 Press **Enter** or "**o**" to install when prompted.

13 Press **Enter** to install in standard location or type in custom location when prompted.

14 Press Enter or "**y**" to create symlinks or "**n**" to skip.

> **NOTE** Creating symlinks for the admin_tool and the bacnet_sc_hub_service will allow you to run these programs by typing the name from any directory. If symlinks are not created, you must navigate to the installed location to run the admin_tool or bacnet_sc_hub_service.

NOTE Other variations of Linux may fail to launch the installer due to a missing module, the **canberra-gtk-module**. Install it using the Linux Package Manager.

To set up BACnet/SC Virtual Hub in the Admin Tool

You may need to edit your initial settings in the Admin Tool.

NOTES

- To access the BACnet/SC Hub Admin Tool, you must have either local or remote access credentials to the server on which the hub has been installed. This requires the site administrator to provision user access to the server on which the hub is installed.

- On a Linux system, changes in the Admin Tool require a restart of the service. Launching the Admin Tool preemptively stops the service when it is launched.

1 Open a Terminal.

2 If you created symlinks when installing the BACnet/SC Virtual Hub:

a) Type: `sudo admin_tool –p`

3 If you did not create symlinks:

a) Type: `cd /usr/local/bacnet_sc_hub/`

b) Press **Enter**.

4 Type: `sudo ./admin_tool –p`

5 The first time you run the admin tool, you will be prompted to accept the End User License Agreement (EULA). To accept the EULA, type "**a**".

6 Press **Enter** to display the current settings in the Admin Tool.

For each setting that you want to change, type the appropriate information from the table below. Press **Enter** after each line.

NOTE If you did not create symlinks when installing the BACnet/SC Virtual Hub, use "./admin_tool" in place of "admin_tool" in the instructions below.

To set the...	Type...	Where...

To set the...	Type...	Where...
Server Settings		
Admin password	`sudo admin_tool -sp <password>`	`<password>` is the password used to create the single user administrator account used to log in to the BACnet/SC Virtual Hub's configuration interface from a web browser. The password is stored on the hub server using a SHA1 hashing algorithm. **NOTE** This password should not be shared. If multiple people will be configuring the hub, the hub account should be entered as a service account in the customer's Identity and Access Management tool. The password must: • Meet the "strong password" strength threshold • Be at least 8 characters long • Include at least one: 　○ upper case letter 　○ lower case letter 　○ number 　○ special character • Contain no spaces
Data Location	`sudo admin_tool -sd <path>`	`<path>` is the location where you want the BACnet/SC Virtual Hub to store the configuration, system run-time data, and backup files. **NOTE** The path you set must be writable by the BACnet/SC Virtual Hub's user.
BACnet Settings		
Network Interface	`sudo admin_tool -sbi <ip address>`	`<ip address>` identifies the network interface(s) that will be used for BACnet/SC communications.
BACnet/SC Port	`sudo admin_tool -sbp <port number>`	`<port number>` is the port that will be used for BACnet/SC communications. 443 is the default BACnet/SC port, but you can change it if needed.
URIs	`sudo admin_tool -swsu <uri list>`	`<uri list>` is a comma-separated list of one or more URIs used to connect to the BACnet/SC Virtual Hub.

To set the...	Type...	Where...
Web Server Settings		
Network Interface	`sudo admin_tool -swi <ip address>`	`<ip address>` identifies the network interface(s) on which the BACnet/SC Virtual Hub will respond to web browser requests. To have the web server respond to requests: • Originating on this computer only type `127.0.0.1` • On all of the computer's network interfaces, type `all` • On a specific interface, type the IP address. **NOTE** Do not change the Network Interface when your hub license is active. See *To change the BACnet/SC network interface* (page 22).
HTTPS Port	`sudo admin_tool -swtp 4443`	`8443` is the default web server port for HTTPS (TLS) requests. See NOTES below this table.
Enable HTTP redirect to HTTPS	`sudo admin_tool -swhe <true/false>`	BACnet/SC Virtual Hub responds only to HTTPS requests. Type `false` if you do not want HTTP requests to be redirected to HTTPS. Otherwise type `true`.
HTTP Port	`sudo admin_tool -swhp 8080`	`80` is the default web server port for HTTP requests. This port will be used if **Enable HTTP redirect to HTTPS** is true. See NOTES below this table.
DNS Names	`sudo admin_tool -swd <dns names>`	`<dns names>` is a comma separated list of all possible domain names for accessing this computer over HTTPS. These names will be included in the automatically-generated self-signed certificate as Subject Alternative Names (SAN). This self-signed certificate is generated when you click **Save & Start Hub**. Check with your Network Administrator for assistance.

After each command, the Terminal will display the current Admin Tool settings.
Example of the output text:

```
Changes saved.  Settings after changes:
---- Server Settings ----
Admin Password: **********
Data Location: /home/user/gateway

---- BACnet Settings ----
Network Interface: 192.168.1.2 (Subnet: 255.255.255.0)
BACnet Port: 47808
URIs: wss://192.168.1.2

---- WebServer Settings ----
Network Interface: 192.168.1.2
HTTPS (always enabled)                Port: 8443
HTTP redirect to HTTPS: enabled       Port: 80
DNS Names: localhost,ubuntu-vm,localhost
```

NOTES

- You may need to adjust your firewall settings to allow access to the BACnet/SC Virtual Hub. Set the **Local Port** field of your firewall rule to the specific ports you are using for the hub. Set the **Remote Port** field of your firewall rule to the default value "All Ports".

- If you change the HTTPS or HTTP port, you will need to do one of the following to access the new port.

  - **Preferred method**: Use iptables to redirect the server's standard http/https traffic to the new port. See *To redirect privileged ports to non-standard port numbers on a Linux Ubuntu 20.04 or later system* (page 21).

  - Add a colon and the new port number to the BACnet/SC Virtual Hub's URL when opening it in a web browser.

- To list all the supported options the Admin Tool supports from the command line, execute the Admin Tool with the -h option.

To start the BACnet/SC Virtual Hub server

1   Open a Terminal.

2   If you created symlinks when installing the BACnet/SC Virtual Hub

  a) Type: `bacnet_sc_hub_service start`

3   If you did not create symlinks

  a) Type: `cd /usr/local/bacnet_sc_hub/bin`

    NOTE The installation directory may be different for other variations of Linux.

  b) Press **Enter**.

  c) Type: `./bacnet_sc_hub.service start`

4   Press **Enter**.

TIP We recommend that you run BACnet/SC Virtual Hub as a service. This ensures that in the event of an unexpected reboot, such as a power failure, BACnet/SC Virtual Hub will automatically restart and restore configurations.

To launch the BACnet/SC Hub configuration interface in a web browser

1 Open a web browser.

2 Type the BACnet/SC Virtual Hub's address in the web browser's address field.

NOTES
- You can type `https://localhost` if the Admin Tool and the web browser are running on the same computer.
- If you changed the **HTTPS Port** in the Admin Tool from 443, you will need to add a colon and the port number to the URL. For example, `https://localhost:8443`.

3 Depending on the web browser, you may get prompted that the server being accessed is not trusted. The browser should give advanced options to allow you to view and import the server's certificate as a trusted server. Follow the browser's prompts to import the certificate.

4 Enter the password, and then click **Log in.**

To set up the BACnet/SC Virtual Hub server to run as a Linux SystemD Daemon/Service

1 Open a Terminal.

2 Type: `sudo nano /usr/local/bacnet_sc_hub/bin/bacnet_sc_hub.service`

3 Press **Enter**.

4 Under the `[Service]` section, add: `User=< non-privileged user name >`

⚠️ **IMPORTANT** For the security of your system, this step changes BACnet/SC Virtual Hub to run as a non-privileged user. After doing this, you will have to run the web server on ports higher than 1024. See:
To set up BACnet/SC Virtual Hub in the Admin Tool.
To redirect privileged ports to non-standard port numbers on a Linux Ubuntu 20.04 or later system (page 21).

5 If you installed to a directory other than **/usr/local/bacnet_sc_hub** (the default directory), replace any occurrence of **/usr/local/bacnet_sc_hub** in this file with the appropriate path.

6 Save the **bacnet_sc_hub.service** file, and then close nano.

7 Type: `sudo cp /usr/local/bacnet_sc_hub/bin/bacnet_sc_hub.service /etc/systemd/system`

8 Press **Enter**.

9 Reinitialize Linux to recognize the BACnet/SC Virtual Hub server's service file copied in step **2**.
Type: `sudo systemctl daemon-reload`

10 Register the BACnet/SC Virtual Hub server to launch at startup.
Type: `sudo systemctl enable bacnet_sc_hub.service`

NOTES

- To manually start the BACnet/SC Virtual Hub server's service, type:
  `sudo systemctl start bacnet_sc_hub.service`

- To manually shutdown the BACnet/SC Virtual Hub server's service, type:
  `sudo systemctl stop bacnet_sc_hub.service`

- To check the status of the BACnet/SC Virtual Hub server's service, type:
  `sudo systemctl status bacnet_sc_hub.service`

To stop, start, and get the status of the BACnet/SC Virtual Hub server

1 Open a Terminal.

2 If you did not create symlinks when installing the BACnet/SC Virtual Hub

    a) Type: `cd /usr/local/bacnet_sc_hub /bin`

    b) Press **Enter**.

3 Type one of the following:

> **NOTE** If you did not create symlinks when installing the BACnet/SC Virtual Hub, use
> "`./bacnet_sc_hub_service`" in place of "`bacnet_sc_hub_service`" in the instructions below.

To...	Type...
Stop the BACnet/SC Virtual Hub	`bacnet_sc_hub_service stop`
Start the BACnet/SC Virtual Hub	`bacnet_sc_hub_service start`
Get the status of the BACnet/SC Virtual Hub	`bacnet_sc_hub_service status`

4 Press **Enter**.

To uninstall the BACnet/SC Virtual Hub product

1 Open a Terminal.

2 Type: `sudo /usr/local/bacnet_sc_hub/uninstall`

3 Press **Enter.**

To redirect privileged ports to non-standard port numbers on a Linux Ubuntu 20.04 (or later) system

The default HTTP port is 80 and the default BACnet/SC port is 443. These are privileged ports in a Linux system. If the BACnet/SC Virtual Hub is not running as root, you must assign unprivileged ports (higher than 1024) and redirect traffic to the desired privileged ports. We recommend assigning ports 8080 and 4443 respectively to the BACnet/SC Virtual Hub for this purpose. Then follow the instructions below to use iptables to redirect the traffic from ports 80 and 443 to the alternate ports.

1 Open a Terminal.

2 Type: `sudo iptables -A PREROUTING -t nat -p tcp --dport 80 -j REDIRECT --to-ports 8080`

3 Press **Enter**.

4 Type: `sudo iptables -A PREROUTING -t nat -p tcp --dport 443 -j REDIRECT --to-ports 4443`

5 Press **Enter**.

6 Type: `sudo iptables -t nat -A OUTPUT -o lo -p tcp --dport 80 -j REDIRECT --to-port 8080`

7 Press **Enter**.

8 Type: `sudo iptables -t nat -A OUTPUT -o lo -p tcp --dport 443 -j REDIRECT --to-port 4443`

9 Press **Enter**.

10 Type: `sudo iptables-save > /etc/iptables/rules.v4`

11 Press **Enter**.

12 This step requires an Internet connection. Type: `sudo apt-get install  iptables-persistent`

13 Press **Enter**.

NOTES

- The above commands may differ if your Linux system is RHEL/CentOS/Fedora.

- On a Linux system, changes in the Admin Tool require a restart of the service. Launching the Admin Tool preemptively stops the service when it is launched.

To change the BACnet/SC network interface

The Host ID associated with the hub's license, found on the **Connections** > **License Admin** tab, is tied to the BACnet Network Interface card chosen in the **Admin Tool**. If you change the network card while the license is active, Flexera will invalidate your license the next time it checks it because the Host IDs do not match. In this case, contact Carrier Control Systems Support for a new license.

The proper procedure for changing the BACnet Network Interface card is to:

1   Deactivate your BACnet/SC Virtual Hub license. See "License Admin tab" in the *BACnet/SC Setup Guide*.

2   Change the network card using the BACnet/SC Virtual Hub Admin Tool.

3   Reactivate your BACnet/SC Virtual Hub license. See "License Admin tab" in the *BACnet/SC Setup Guide*.

Managing TLS certificates

To replace the self-signed certificate with a user-supplied certificate on a Windows® computer

1 Stop the BACnet/SC Hub and close the BACnet/SC Hub window.

2 Open the Windows Command Prompt.

3 Type: `cd "C:\Program Files\BACnet SC Hub"` (or navigate to the installation folder if different than the default location)

4 Press Enter.

5 Type: `"BACnet SC Hub Admin Tool.exe" -console -cc`

6 Press Enter. If the changes are successful, the command prompt displays **Certificate changes saved**.

7 Press Enter again to return to the command prompt.

8 Type: `"BACnet SC Hub Admin Tool.exe" -console -ic "<path to certificate>" -icp "<certificate file's password>"`
NOTE The -ic and -icp options must be used together.

9 Press Enter. If the changes are successful, the command prompt displays **Import successful. Certificate changes saved.**

10 Press Enter again to return to the command prompt.

NOTES

- To clear out all previously imported user-supplied certificates, type:
  `admin_tool -console -cc`

- To list all currently registered certificates, type:
  `admin_tool -console -pc`

To replace the self-signed certificate with a user-supplied certificate on a Linux® computer

1 Open the Linux Terminal.

2 Stop the BACnet/SC Hub.

3 If you created symlinks when installing the BACnet/SC Virtual Hub

a) Type: `sudo admin_tool -cc`

b) Press Enter.

c) Type: `sudo admin_tool -ic "<path to certificate>" -icp "<certificate file's password>"`

   NOTE The -ic and -icp options must be used together.

4 If you did not create symlinks

    a) Type: `cd /usr/local/bacnet_sc_hub` (or navigate to the installation folder if different than the default location)

    b) Press Enter.

    c) Type: `sudo ./admin_tool -cc`

    d) Press Enter.

    e) Type: `sudo ./admin_tool -ic "<path to certificate>" -icp "<certificate file's password>"`
    NOTE The -ic and -icp options must be used together.

5 Press Enter. If the changes are successful, the terminal displays **Import successful. Certificate changes saved.**

NOTES

- When specifying the path and password in the above commands, escape special characters with the backslash character '\' as needed.

- If you created symlinks when installing the BACnet/SC Virtual Hub

    ○ To clear out all previously imported user-supplied certificates, type:
    `sudo admin_tool -cc`

    Press Enter.

    ○ To list all currently registered certificates, type:
    `sudo admin_tool -pc`

    Press Enter.

- If you did not create symlinks

    ○ Type: `cd /usr/local/bacnet_sc_hub` (or navigate to the installation folder if different than the default location)

    Press Enter.

    ○ To clear out all previously imported user-supplied certificates, type:
    `sudo ./admin_tool -cc`

    Press Enter.

    ○ To list all currently registered certificates, type:
    `sudo ./admin_tool -pc`

    Press Enter.

Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

Date	Topic	Change description	Code*
7/18/22	Upgrades	New section	X-PM-LO-R
5/17/22	To set up BACnet/SC Virtual Hub in the Admin Tool (Linux w/o GUI)	Expanded note on firewall settings	X-PM-LO-E-LO
	To set up BACnet/SC Virtual Hub in the Admin Tool (Linux)		
	To set up BACnet/SC Virtual Hub in the Admin Tool (Windows)		
	Server requirements	Added note regarding communicating over Wi-Fi	

* For internal use only