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Brocade SDN Controller

Software Installation Guide

Supporting Brocade SDN Controller version 2.0.1

BROCADE

Contents

Preface

Document conventions

The document conventions describe text formatting conventions, command syntax conventions, and important notice formats used in Brocade technical documentation.

Text formatting conventions

Text formatting conventions such as boldface, italic, or Courier font may be used in the flow of the text to highlight specific words or phrases.

Format	Description
bold text	Identifies command names
	Identifies keywords and operands
	Identifies the names of user-manipulated GUI elements
	Identifies text to enter at the GUI
italic text	Identifies emphasis
	Identifies variables
	Identifies document titles
`Courier font`	Identifies CLI output
	Identifies command syntax examples

Command syntax conventions

Bold and italic text identify command syntax components. Delimiters and operators define groupings of parameters and their logical relationships.

Convention	Description
bold text	Identifies command names, keywords, and command options.
italic text	Identifies a variable.
value	In Fibre Channel products, a fixed value provided as input to a command option is printed in plain text, for example, **--show** WWN.

Convention	Description
[ ]	Syntax components displayed within square brackets are optional. Default responses to system prompts are enclosed in square brackets.
{ **x** | **y** | **z** }	A choice of required parameters is enclosed in curly brackets separated by vertical bars. You must select one of the options. In Fibre Channel products, square brackets may be used instead for this purpose.
x | **y**	A vertical bar separates mutually exclusive elements.
< >	Nonprinting characters, for example, passwords, are enclosed in angle brackets.
...	Repeat the previous element, for example, *member*[*member*...].
\	Indicates a “soft” line break in command examples. If a backslash separates two lines of a command input, enter the entire command at the prompt without the backslash.

Notes, cautions, and warnings

Notes, cautions, and warning statements may be used in this document. They are listed in the order of increasing severity of potential hazards.

NOTE
A Note provides a tip, guidance, or advice, emphasizes important information, or provides a reference to related information.

ATTENTION
An Attention statement indicates a stronger note, for example, to alert you when traffic might be interrupted or the device might reboot.

CAUTION
A Caution statement alerts you to situations that can be potentially hazardous to you or cause damage to hardware, firmware, software, or data.

DANGER
A Danger statement indicates conditions or situations that can be potentially lethal or extremely hazardous to you. Safety labels are also attached directly to products to warn of these conditions or situations.

Brocade resources

Visit the Brocade website to locate related documentation for your product and additional Brocade resources.

You can download additional publications supporting your product at www.brocade.com. Select the Brocade Products tab to locate your product, then click the Brocade product name or image to open the individual product page. The user manuals are available in the resources module at the bottom of the page under the Documentation category.

To get up-to-the-minute information on Brocade products and resources, go to MyBrocade. You can register at no cost to obtain a user ID and password.

Release notes are available on MyBrocade under Product Downloads.

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Online	Telephone	E-mail
Preferred method of contact for non-urgent issues: • My Cases through MyBrocade • Software downloads and licensing tools • Knowledge Base	Required for Sev 1-Critical and Sev 2-High issues: • Continental US: 1-800-752-8061 • Europe, Middle East, Africa, and Asia Pacific: +800-AT FIBREE (+800 28 34 27 33) • For areas unable to access toll free number: +1-408-333-6061 • Toll-free numbers are available in many countries.	support@brocade.com Please include: • Problem summary • Serial number • Installation details • Environment description

Brocade OEM customers

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- OEM/Solution Providers are trained and certified by Brocade to support Brocade® products.
- Brocade provides backline support for issues that cannot be resolved by the OEM/Solution Provider.

- Brocade Supplemental Support augments your existing OEM support contract, providing direct access to Brocade expertise. For more information, contact Brocade or your OEM.
- For questions regarding service levels and response times, contact your OEM/Solution Provider.

Document feedback

To send feedback and report errors in the documentation you can use the feedback form posted with the document or you can e-mail the documentation team.

Quality is our first concern at Brocade and we have made every effort to ensure the accuracy and completeness of this document. However, if you find an error or an omission, or you think that a topic needs further development, we want to hear from you. You can provide feedback in two ways:

- Through the online feedback form in the HTML documents posted on www.brocade.com.
- By sending your feedback to documentation@brocade.com.

Provide the publication title, part number, and as much detail as possible, including the topic heading and page number if applicable, as well as your suggestions for improvement.

Brocade SDN Controller Overview

About this guide

This guide assists you in installing Brocade SDN Controller and the user interface. It also discusses the initial configuration of the controller.

This guide is intended for experienced network engineers who have a good understanding of Linux operating systems. For more operational information regarding the controller, refer to *Brocade SDN Controller User Guide*.

About the controller

Brocade SDN Controller is a software-defined networking (SDN) controller that is based on the OpenDaylight project.

The controller consists of packages that form a platform on which you can install or build apps. Packages that provide a common functionality and are essential for running the controller are part of the base controller. Packages that are optional are extensions that can be installed to enable additional functionality. The controller is built on a modular design that allows apps and extensions to be updated while maintaining a stable platform, which helps to improve the delivery time of apps and extensions and reduce risk to users.

Unless mentioned otherwise in this guide, the controller refers to Brocade SDN Controller.

About the base controller

The base controller is a platform on which various apps and extensions can be installed or built to provide additional functionality. Apps and extensions sometimes depend on a specific version of the controller.

The following list presents the current components of the base controller:

- bvc-*version*.zip—Contains the base controller packages
- bvc-dependencies-*version*.zip—Contains the dependencies packages for the base controller
- bvc-core-ux-*version*.zip—Contains the user interface packages for the base controller

About the extensions

The Brocade SDN extensions add functionality to the controller and change the way you can configure the controller or other extensions. The extensions are optional but may be required for other extensions or apps to work as expected.

The following list presents the currently available extensions:

- bvc-ext-openflow-packaging-*version*.zip—Contains the OpenFlow packages
- bvc-ext-bgp-pcep-packaging-*version*.zip—Contains the Border Gateway Protocol (BGP) and Path Computation Element Protocol (PCEP) packages
- bvc-ext-hosttracker-noflood-packaging-*version*.zip—Contains the Host Tracker No Flood Mode packages.
- bvc-ext-ovsdb-packaging-*version*.zip—Contains the Open vSwitch Database Management protocol (OVSDB) packages
- bvc-ext-l2switch-packaging-*version*.zip—Contains the Layer 2 (L2) switch packages
- bvc-ext-utilities-packaging-*version*.zip—Contains the controller utilities packages

When you run the controller `./installbsc` installation script command with the `-y` argument, all the extensions are installed by default. If you do not use the `-y` argument, you are prompted to install each extension.

About the apps

The controller provides additional apps as add-on packages. You can access the apps by using the controller user interface.

Brocade Topology Manager is installed by default when you install the controller user interface. Most apps are not installed as part of the controller installation script. Some apps may require additional licensing rights. The following list provides some of the available apps:

- Brocade Topology Manager
- Brocade Flow Manager

For more information about the apps, refer to the specific app User Guide.

Prerequisites for installing the controller

Brocade SDN Controller requires that specific hardware and software be configured before you can install the controller. You can install the controller on either the Ubuntu operating system version, 14.04, or the Red Hat Enterprise Linux operating system, version 7.1.

The controller installation script checks the hardware requirements of the system and prompts you if the minimum criteria are not met. The following table lists the hardware prerequisites for installing the controller.

TABLE 1 Hardware Prerequisites

Hardware Component	Minimum	Recommended
RAM	6 GB	16 GB
Network	1 GE	10 GE
CPU	4 Cores	8 Cores

TABLE 1 Hardware Prerequisites (Continued)

Hardware Component	Minimum	Recommended
Storage	32 GB	64 GB

The following list presents the software prerequisites for installing the controller, the latest stable version for the operating system is recommend:

- OpenJDK
- Zip
- Unzip
- cURL
- OpenSSH
- Node.js
- Psycopg
- Google Chrome or Mozilla Firefox
- PSmisc (for Red Hat Enterprise Linux only)

Best practices for installing the controller

Follow the best practices that are outlined in this section for installing the controller. The following list provides key recommendations from Brocade.

- Ensure that you meet all the prerequisites and system requirements that are outlined in the preceding sections.

  Install OpenJDK, OpenSSH, Pyscopg, and PSmisc (for Red Hat Enterprise Linux only) before you install the controller. If you do not install these before you run the installation script, the script prompts you to install the missing prerequisite and then rerun the installation script. The controller installation script installs Zip, Unzip, and Node.js as part of the installation procedure. You do not have to install these prerequisites separately before you run the installation script.
- Install the latest patch or minor version of OpenJDK Java, version 67 or later.

  NOTE
  OpenJDK Java 7 is not supported.
- The controller user interface is tested with Node.js version 0.10.29. Only Node.js 0.10 version 29 or later is supported.

  If you have a version earlier than 29 (for example 0.10.11), upgrade to the latest Node.js version that is supported.
- You must have an Internet connection available to run the installation procedure.
- You must have desktop access to the system on which you are going to install the controller.

Before Installing the Controller

Downloading the installation files for the controller and apps

You can download the installation files for the controller and the apps from the **My Brocade** website.

To download the files, perform the following steps:

1. Go to the **MyBrocade** web site at https://my.brocade.com and log in with your username and password.
2. If you are visiting **MyBrocade** for the first time, click **Register Now** instead and follow the prompts to register yourself.
3. On the top navigation bar, click **downloads**.
4. Under **Product Downloads**, select **Downloaded by SDN Controller and Apps**.
   A list of Brocade SDN Controller files is displayed under **Product Name**.
5. Select the latest Brocade SDN Controller files for download.
6. Accept the terms of the Export Compliance statement and the End User Terms and Conditions statement to initiate the download.

   If you have any concerns about the Export Compliance statement or the End User Terms and Conditions statement, consult Brocade Technical Support.
7. Save the tar.gz file to a local directory on your system.
8. Click **back to downloads** if you want to download additional files.

Installing the OpenJDK Java environment

The Brocade SDN Controller installation script requires OpenJDK Java to provide prompts to the user to install a prerequisite or an extension as part of the controller installation procedure.

The installation script automatically attempts to locate an installed version of OpenJDK Java. If it is unable to locate a compatible version, you are prompted for the location of an existing OpenJDK Java installation. Brocade recommends that you install the OpenJDK Java environment before running the controller installation script.

For Red Hat Enterprise Linux

To install the OpenJDK Java environment for Red Hat Enterprise Linux by using the **yum install** command, perform the following steps:

1. Enter this command to install OpenJDK Java: `sudo yum install java-1.7.0-openjdk-devel`

   The installer automatically detects the Java installation during the initial installation of the controller.
2. To check whether the installation was successful, enter this command: `java -version`
   The following is a sample output displaying the version of OpenJDK Java that was installed:
   ```
   java version "1.7.0_75"
   OpenJDK Runtime Environment (rhel-2.5.4.7.el7_1-x86_64 u75-b13)
   OpenJDK 64-Bit Server VM (build 24.75-b04, mixed mode)
   ```

For Ubuntu

To install the OpenJDK Java environment for Ubuntu by using the **apt-get install** command, perform the following steps:

1. Enter this command to download the package lists from the repositories and update them: `sudo apt-get update`
2. Enter this command to install OpenJDK Java: `sudo apt-get install openjdk-7-jdk`

   The installer automatically detects the OpenJDK Java installation during the initial installation of the controller.
3. To check whether the installation was successful, enter this command: `java -version`
   The following is a sample output displaying the version of OpenJDK Java that was installed:
   ```
   java version "1.7.0_80"
   Java(TM) SE Runtime Environment (build 1.7.0_80-b15)
   Java HotSpot(TM) 64-Bit Server VM (build 24.80-b11, mixed mode)
   ```

Installing OpenSSH

OpenSSH is a free version of the SSH connectivity tools. To prevent attacks, OpenSSH encrypts all traffic.

Brocade recommends that you install OpenSSH before running the controller installation script.

For Red Hat Enterprise Linux

To install OpenSSH by using the **yum install** command, perform the following steps:

1. Enter this command to install the OpenSSH server: `sudo yum install openssh-server`
2. To check the version of OpenSSH that is running, enter this command: `SSH -v`
   If OpenSSH is running correctly, a message similar to the following is displayed:
   ```
   OpenSSH_6.6.1p1, OpenSSL 1.0.1e-fips 11 Feb 2013
   ```

For Ubuntu

To install OpenSSH by using the **apt-get install** command, perform the following steps:

1. Enter this command to download the package lists from the repositories, and update them: `sudo apt-get update`
2. Enter this command to install the OpenSSH server: `sudo apt-get install openssh-server`
3. To check the version of OpenSSH that is running, enter this command: `ssh -V`
   A message similar to the following is displayed: `OpenSSH_6.6.1p1, OpenSSL 1.0.1e-fips 11 Feb 2013`

Installing Psycopg

Psycopg is a PostgreSQL adapter for the Python programming language. It is a wrapper for libpq, the PostgreSQL client library. You require the Python driver to run the controller change_password utility.

The Psycopg2 package is the current mature implementation of the adapter. Brocade recommends that you install Psycopg2 before running the controller installation script.

For Red Hat Enterprise Linux

To install Psycopg2 by using the **yum install** command, perform the following steps:

1. Enter this command to install Psycopg2: `sudo yum install python-psycopg2`
2. To check the version of Psycopg2 that is running, enter this command: `yum list installed python-psycopg2`
   If Psycopg2 is running correctly, a message similar to the following is displayed:

```
Loaded plugins: langpacks, refresh-packagekit
google-chrome/primary      | 1.9 kB  00:00
google-chrome        3/3
Installed Packages
python-psycopg2.x86_64     2.5.4-1.fc20@updates
```

For Ubuntu

To install Psycopg2 by using the **apt-get install** command, perform the following steps:

1. Enter this command to download the package lists from the repositories, and update them: `sudo apt-get update`
2. Enter this command to install Psycopg2: `sudo apt-get install python-psycopg2`
3. To check the version of Psycopg2 that is running, enter this command: `sudo dpkg -l | grep psycopg2`
   If Psycopg2 is running correctly, a message similar to the following is displayed:

```
psycopg2
ii  python-psycopg2 2.4.5-1build5 amd64  Python module for PostgreSQL
```

Installing PSmisc for Red Hat Enterprise Linux only

The PSmisc package is a set of small and useful utilities that use the proc file system. Fuser is a part of the PSmisc package and required during the installation of the controller.

Brocade recommends that you install PSmisc before running the controller installation script.

1. Enter this command to download the PSmisc package and update them: `sudo yum install psmisc`
2. Enter this command to verify that fuser is installed and access is allowed: `fuser --version`
   If access is verified, a message similar to the following example is displayed::

```
fuser (PSmisc) 22.20
Copyright (C) 1993-2010 Werner Almesberger and Craig Small
PSmisc comes with ABSOLUTELY NO WARRANTY.
This is free software, and you are welcome to redistribute it under
the terms of the GNU General Public License.
For more information about these matters, see the files named COPYING.
```

If a message similar to the preceding section is not displayed, but the installation is successful, include `/sbin` in the PATH variable.

Installing Zip and Unzip

Zip file utilities compress one or more files into one smaller file. Unzip file utilities expand a compressed file into the original set of files.

The Zip file utilities are installed as part of running the controller installation script when connected to the Internet. Brocade recommends that you install the Zip file utilities before running the controller installation script only for an offline installation.

For Red Hat Enterprise Linux

To install Zip and Unzip by using the **yum install** command, perform the following steps:

1. Enter this command to install Zip: `sudo yum install zip`
2. Enter this command to install Unzip: `sudo yum install unzip`
3. To verify wether Zip and Unzip are installed correctly, run the following commands:

   - `zip -v`

     A result similar to the following is displayed:

```
Copyright (c) 1990-2008 Info-ZIP - Type 'zip "-L"' for software license.
This is Zip 3.0 (July 5th 2008), by Info-ZIP.
Currently maintained by E. Gordon.  Please send bug reports to
the authors using the web page at www.info-zip.org; see README for details.

Latest sources and executables are at ftp://ftp.info-zip.org/pub/infozip,
as of above date; see http://www.info-zip.org/ for other sites.

Compiled with gcc 4.8.2 for Unix (Linux ELF) on Oct 21 2013 [continued]
```

   - `unzip -v`

     A message similar to the following is displayed:

```
UnZip 6.00 of 20 April 2009, by Debian. Original by Info-ZIP.

Latest sources and executables are at ftp://ftp.info-zip.org/pub/infozip/ ;
see ftp://ftp.info-zip.org/pub/infozip/UnZip.html for other sites.
```

```
Compiled with gcc 4.8.2 for Unix (Linux ELF) on Jan  7 2015. [continued]
```

For Ubuntu

To install Zip and Unzip by using the **apt-get install** command, perform the following steps:

1. Enter the following command to download the package lists from the repositories and update them:
   `sudo apt-get update`
2. Enter this command to install Zip: `sudo apt-get install zip`
3. Enter this command to install Unzip: `sudo apt-get install unzip`
4. To verify wether Zip and Unzip are installed correctly, run the following commands:
   - `zip -v`

     A message similar to the following is displayed:
     ```
     Copyright (c) 1990-2008 Info-ZIP - Type 'zip "-L"' for software license.
     This is Zip 3.0 (July 5th 2008), by Info-ZIP.
     Currently maintained by E. Gordon.  Please send bug reports to
     the authors using the web page at www.info-zip.org; see README for details.

     Latest sources and executables are at ftp://ftp.info-zip.org/pub/infozip,
     as of above date; see http://www.info-zip.org/ for other sites.

     Compiled with gcc 4.8.2 for Unix (Linux ELF) on Oct 21 2013 [continued]
     ```
   - `unzip -v`

     A message similar to the following is displayed:
     ```
     UnZip 6.00 of 20 April 2009, by Debian. Original by Info-ZIP.

     Latest sources and executables are at ftp://ftp.info-zip.org/pub/infozip/ ;
     see ftp://ftp.info-zip.org/pub/infozip/UnZip.html for other sites.

     Compiled with gcc 4.8.2 for Unix (Linux ELF) on Jan  7 2015. [continued]
     ```

Installing Node.js

Node.js is a platform that is used to build network applications. The graphical user interface of the controller requires Node.js.

Node.js is installed as part of running the controller installation script when connected to the Internet. Brocade recommends that you install Node.js before running the controller installation script only for an offline installation.

For Red Hat Enterprise Linux

To install Node.js by using the **yum install** command, perform the following steps:

1. Enter the following command to download the scripts that are required to set up Node.js:
   `curl -sL https://rpm.nodesource.com/setup | sudo bash -`
2. Enter this command to install Node.js: `sudo yum install nodejs`

NOTE
Ensure that the version of Node.js is a version later than v0.10.29. If the version displayed is earlier than the required version, rerun the commands in Steps 1 and 2.

3. Enter this command to check the version of the Node.js that is installed: `node --version`
   A sample output for the version of Node.js follows: `v0.10.38`

For Ubuntu

To install Node.js by using the **apt-get install** command, perform the following steps:

1. Enter this command to fetch the scripts that are required to set up Node.js: `curl -sL https://deb.nodesource.com/setup | sudo bash -`
2. Enter this command to install Node.js:`sudo apt-get install nodejs`

NOTE
Ensure that the version of Node.js is a version later than v0.10.29. If the version displayed is lower than the required version, re-run the commands in steps 1 and 2.

3. Enter this command to check the version of the Node.js that is installed: `node --version`
   A sample output for the version of Node.js follows: `v0.10.33.`

Installation Tasks

About the installation script

The controller installation script is a tar.gz file that you download from the My Brocade website.

Two types of installation for the controller are supported:

- *Online installation*—When you install the controller on a system that is connected to the Internet, it is an online installation. For this type of installation, the controller installation script installs Zip, Unzip, and Node.js software as part of the installation procedure. You do not have to install these prerequisites separately before you run the installation script. Brocade recommends that you install OpenJDK, OpenSSH, Psycopg, and PSmisc (for Red Hat Enterprise Linux only) software before you install the controller. If you do not install these before you run the installation script, the script prompts you to install the missing prerequisite and then rerun the installation script.
- *Offline installation*—When you install the controller on a system that is not connected to the Internet, it is an offline installation. For this type of installation, you must first install all the prerequisites such as Zip, Unzip, Node.js, OpenJDK, OpenSSH, Psycopg, and PSmisc (for Red Hat Enterprise Linux only) software before running the installation script.

In both types of installation, you must first unzip the files to run the installation script. If you run the installation script command `./installbsc` without any arguments, the script prompts you before installing each extension. If you run the `./installbsc` installation script command with the `-y` argument, the extensions are installed without any prompts. The installation script installs the following components:

- Core controller
- Controller user interface
- Controller extensions
- Controller dependencies
- Brocade Topology Manager

The apps, other than Brocade Topology Manager are not installed as part of the installation script.

If you did not install an extension as part of the installation procedure and want to install it later, you must rerun the controller installation script.

Installing the controller and user interface

Before installing the controller and the user interface, you must first download the installation files, create a directory, and then run the installation command.

If you have other controllers installed on the system, ensure that you stop all running instances of them to avoid port-conflict issues. If you have a previous version of the controller installed, the installation process stops the controller as part of the process. You must run the installation script as `sudo`. The script fails if you run it as `root`.

The controller installation command is `./installbsc` and uses the following arguments:

- `-c`: Performs the prerequisite checks and exits. The controller installation is not initiated.
- `-y`: Installs the extensions without any prompts.
- `-h`: Displays help for the installation command.

To install the controller and user interface, perform the following steps:

1. Go to the folder to which you downloaded the installation files and enter this command to unzip the tar.gz file:`tar -zxvf SDN-Controller-`*`version`*`-Software.tar.gz`
   The installation file is unzipped to display the names of the following files:
   - bvc-ext-openflow-packaging-*version*.zip
   - bvc-ext-ovsdb-packaging-*version*.zip
   - bvc-ext-l2switch-packaging-*version*.zip
   - bvc-*version*.zip
   - bvc-app-topologymanager-packaging-*version*.zip
   - bvc-ext-hosttracker-noflood-packaging-*version*.zip
   - bvc-ext-bgp-pcep-packaging-*version*.zip
   - bvc-core-ux-packaging.*version*.zip
   - bvc-ext-utilities-packaging-*version*.zip
   - bvc-dependencies-*version*.zip
   - bvc-distribution-packaging-*version*/installbsc
2. List the current contents of the folder by using the `ls` command to check that the SDN-Controller-*version*-Software folder is created.
3. Navigate to the SDN-Controller-*version*-Software folder by entering this command: `cd SDN-Controller-`*`version`*`-Software`
4. Enter this command to run the installation script: `./installbsc`

   The installation script checks for prerequisites.

   - If you have not installed a prerequisite, a message similar to the following is displayed:
     ```
     Checking for prerequisite packages ...
     "nodejs" is required, would you like to run command "sudo apt-get -y install
     nodejs"? y/n
     ```
     Press `y` and then press Enter to install the missing prerequisites.

     NOTE
     For some missing prerequisites, you must rerun the installation script.
   - If all the prerequisites are installed, the following message is displayed:
     ```
     Checking for prerequisite packages ...
     All prerequisite packages are installed!
     creating /opt/bvc installation directory
     ....
     ```

   If you already have the /opt/bvc directory, you see a message similar to following:
   ```
   /opt/bvc already exists. Do you wish to reinstall or add new options? y/n
   ```

Press `y` and then press Enter to continue.

5. At the prompt `Would you like to install optional feature bvc-ext-ovsdb? y/n`, press `y` and then Enter to continue. Follow the prompts to install the other extensions. After all the extensions are installed, a message similar to the following is displayed:

```
Brocade SDN Controller Installation

Starting @ : 2015-08-04 04:35:40.460742

Performing prerequisite check ...
JDK Check ............................... [ OK ]
CPU Count Check: ........................ [ OK ]
Memory Size Check: ...................... [ OK ]
Controller stopped already .............

Running pre-install scripts ...
 ...
 ...
 ...

Install completed @ :  2015-08-04 04:37:31.316032
```

The installation script displays the URL that starts the controller user interface. For example: `http://`*`controller_ip`*`:9001`

The variable *controller_ip* is the IP address of the host on which you install the controller.

After the installation is completed, you can verify the installation.

Verifying the installation of the controller

This section provides two methods for verifying whether the controller was correctly installed. One method is connecting to RESTCONF and the other is accessing the API Doc Explorer application.

Connecting to RESTCONF

You can verify the installation of the controller by connecting to RESTCONF.

To connect to RESTCONF, perform the following steps:

1. After you install the controller, open a browser, and go to the following web location: http://*controller-ip*:8181/restconf/modules

   The *controller-ip* variable is the IP address of the host on which you install the controller.
2. Log in with these default credentials: `admin`/`admin`.
   The target web page displays a list of the YANG modules that are defined in the controller.

Accessing the API Doc Explorer

You can verify th installation of the controller by accessing the API Doc Explorer application.

To access the API Doc Explorer, perform the following steps:

After you install the controller, open a browser and go to the following web location: http://*controller-ip*:8181/apidoc/explorer/index.html

The *controller-ip* variable is the IP address of the host on which you install the controller.

The OpenDaylight RESTCONF API documentation page displays the following information:

- List of APIs supported by the controller
- Mount points for any API that you select

Verifying the installation of the user interface

You can verify installation of the user interface by using the default credentials to log in.

To verify installation of the user interface, perform the following steps:

1. Go to the following web location: http://*controller-ip*:9001
   The variable *controller-ip* is the IP address of the host on which you install the controller.
2. Log in with these default credentials: `admin`/`admin`.
   The user interface of the controller with the Topology Manager app is displayed.

Installing controller apps

Except for Topology Manager, which is installed by default when you run the controller installation script, all other controller apps must be installed separately.

For a list of currently supported apps, refer to *Brocade SDN Controller Compatibility Matrix with Apps and Extensions*. To install an app, perform the following steps:

1. Download the app that you want to install for the controller from the My Brocade website.
   For more information, refer to Downloading the installation files for the controller and apps on page 13.
2. Enter a command to unzip the app into the /opt directory.
   For example, to unzip Brocade Flow Manager, enter this command: `unzip Flow-Manager-`*`version`*`-Software.zip -d /opt`
3. Go to the installation directory by entering this command: `cd /opt/bvc`
4. Run the installation script by entering this command: `./install`
   - If the controller is not running, it is started.
   - The .jar files are copied, and the features are installed.
   - If the app is already installed, the server is stopped, the Karaf files are modified, and the controller is restarted.

Installing a controller extension after installing the controller

Controller extensions are installed when running the controller installation script. To install an extension after the controller installation has completed, you must rerun the controller installation script.

Starting and shutting down the controller and user interface

The controller is automatically started after it is installed. The instructions to start and shut down the controller are useful for troubleshooting.

1. Enter this command to start the controller and user interface: `/opt/bvc/bin/start`
2. Enter this command to stop the controller and user interface: `/opt/bvc/bin/stop`

Configuring the Controller

Enabling HTTPS on the controller

HTTPS provides authentication of the website and the associated web server and also provides a bidirectional encryption of communication between the client and the server. The authentication and encryption provide a reasonable guarantee that the contents of the communication between you, the controller, and the controller GUI cannot be read or forged by any third party.

You have already installed the controller and user interface and verified that both are running successfully.

To enable HTTPS and disable HTTP communication on the controller and user interface, perform the following steps:

1. Stop the controller by entering this command:`/opt/bvc/bin/stop`
2. Run the setup_https script to enable HTTPS by entering this command: `/opt/bvc/bin/setup_https on`
3. Start the controller by entering this command: `/opt/bvc/bin/start`
4. Go to https://host:8443/restconf/modules and https://host:9443 and for both the web sites, configure the browser to allow self-signed certificates.

   For more information about adding self-signed certificates to the exception list of your browser, refer to Chrome or Firefox documentation.

- The controller responds to HTTPS on port 8443 instead of port 8181.
- The controller GUI responds to HTTPS on port 9443 instead of port 9001.

NOTE
When you run the setup_https script, the script generates a self-signed certificate and installs the certificate on the website and in the controller processes.

Changing the controller memory limits

This section describes how to change the controller memory limits, such as JAVA_MAX_MEM and JAVA_MAX_PERM_MEM.

The Java Virtual Machine (JVM) heap size determines how often and how long the VM collects garbage. Garbage comprises objects that cannot be reached from any pointer in a running program. A large heap size results in slower but infrequent garbage collection. A heap size in accordance with memory requirements ensures full garbage collection, which is not only faster but also more frequent.

By default, environment variables are automatically detected and persist during the installation of the controller. These variables do not have to be changed to run the controller. Only experienced users must perform the the following steps.

1. Open the /opt/bvc/controller/bin/setenv file with a text editor.

   The /opt/bvc/controller/bin/setenv file stores environment variables for the controller. The controller loads the file on startup.

2. Locate the lines in the file that are similar to the lines that follow, and make required changes.

   Append the changes to the end of the file, outside of any if conditions. Do not change the existing file contents. This process enables you to roll back to the original configuration if errors occur.

   The following commands are provided as examples. The values set for the files must reflect your requirements.

   a) **export JAVA_MAX_MEM=8128m**

      JAVA_MAX_MEM must have the trailing `m`, which denotes MB, or the trailing `G`, which denotes GB.

      Ensure that the JAVA_MAX_MEM setting does not exceed available memory and leaves at least 15 percent of memory for other processes. By default, the installation sets this percentage to 85 percent of available memory, up to a maximum of 12 GB. This amount of memory is the current limit for a Java process that is based on the pause times for garbage collection.

   b) **export JAVA_MAX_PERM_MEM=512m**

3. Save the file, and exit the editor.
4. Enter the following command to stop the Karaf process: `/opt/bvc/bin/stop`
5. Restart the Karaf process by entering the following command for the new environment variables to take effect: `/opt/bvc/bin/start`

Upgrading and Uninstalling the Controller, Apps, and Extensions

Uninstalling the controller and user interface

You must stop the controller and user interface before uninstalling them.

1. Enter this command to stop the controller and user interface: `/opt/bvc/bin/stop`
2. Enter this command to remove the /opt/bvc directory: `sudo rm -rf /opt/bvc/`

Upgrading the controller and extensions

Brocade SDN Controller and extensions are upgraded together when you run the installation script. You cannot upgrade the controller and extensions from 1.*x.x* to 2.*x.x*.

NOTE
For more information about compatibility of the controller with various apps and extensions, refer to *Brocade SDN Controller Compatibility Matrix with Apps and Extensions*.

The following upgrade scenario uses 2.0.1 as the previous version and 2.0.2 as the new version. The following list presents important information about upgrading the controller and the extensions:

- When the controller and the extensions are upgraded, the installation script checks for system conformance.
- To upgrade the apps, see Upgrading the apps on page 28.
- The upgrade of clusters will be supported in a future release.

To upgrade the controller and extensions, perform the following steps:

1. Download the controller installation files from the My Brocade website.

   For more information, refer to Downloading the installation files for the controller and apps on page 13.
2. Enter this command to stop the controller: `/opt/bvc/bin/stop`
3. Enter this command to back up the /opt/bvc directory: `zip -r bvc-`*`date`*`/opt/bvc`

   In the command,*date* is the current date.
4. Go to the folder to which you downloaded the installation files and enter this command to unzip the tar.gz file:`tar -zxvf SDN-Controller-2.0.2-Software.tar.gz`
5. List the current contents of the folder by using the `ls` command to check that the SDN-Controller-2.0.2-Software folder is created.

6. Navigate to the SDN-Controller-2.0.2-Software folder by entering this command: `cd SDN-Controller-2.0.2-Software`
7. Enter this command to run the installation script: `./installbsc`

   The installation script checks for prerequisites. As you already have the /opt/bvc directory, you see a message similar to following:
   `/opt/bvc already exists. Do you wish to reinstall or add new options? y/n`

   Press `y` and then press Enter to continue.
8. At the prompt `Would you like to install optional feature bvc-ext-ovsdb? y/n`, press `y` and then Enter to continue. Follow the prompts to install other extensions. After all the extensions are installed, a message similar to the following is displayed:

```
Brocade SDN Controller Installation

Starting @ : 2015-08-04 04:35:40.460742

Performing prerequisite check ...
JDK Check ................................ [ OK ]
CPU Count Check: ......................... [ OK ]
Memory Size Check: ....................... [ OK ]
Controller stopped already .............

Running pre-install scripts ...
 ...
 ...
 ...

Install completed @ :  2015-08-04 04:37:31.316032
```

The installation script displays the URL that starts the controller user interface. For example: Server @http://*controller_ip*:9001

The *controller_ip* variable is the IP address of the host on which you install the controller.

Upgrading the apps

The controller apps must be upgraded separately; they are not upgraded as part of the controller and extensions upgrade.

To upgrade an app, perform the following steps:

1. Download the app that you want to upgrade from the My Brocade website.

   For more information, refer to Downloading the installation files for the controller and apps on page 13.
2. Enter this command to stop the controller: `/opt/bvc/bin/stop`
3. Enter this command to back up the /opt/bvc directory: `zip -r bvc-date/opt/bvc`

   In the command, *date* is the current date.
4. Enter the command to unzip the app into the /opt directory.
   For example, to unzip Flow Manager, enter this command: `unzip Flow-Manager-version.Software.zip -d /opt`
5. Go to the installation directory by entering this command: `cd /opt/bvc`
6. Run the installation script by entering this command: `./install`