Linux KVM Installation Guide, 17.2.0

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Supporting AT&T Vyatta Network Operating System

Contents

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About This Guide

This guide describes how to install and upgrade the AT&T Vyatta vRouter (referred to as a virtual router, vRouter, or router in the guide) running on Linux KVM environment.

Installing the System

Overview of installing on Linux KVM

The AT&T Vyatta vRouter supports the Kernel-Based Virtual Machine (KVM) hypervisor on Linux operating systems. Like other virtualization platforms, the Linux KVM provides the ability to run multiple virtual systems on a single hardware platform. AT&T provides a prebuilt Linux KVM image that runs on the KVM. This image has a number of Linux KVM-specific modifications and optimizations.

> **Note:** KVM uses Linux bridging functionality that includes IGMP/MLD snooping. The IGMP/MLD snooping support in Linux works correctly on a Linux KVM host, but does not work correctly when there is more than one router connected to a single network. Therefore, we recommend that you disable the IGMP/MLD snooping on the Linux host when KVM is used.

Preparing for installation

The VM install image is the simplest way to get an AT&T Vyatta vRouter up and running quickly. If the parameters of the VM install image do not meet your requirements or additional settings are required, then the vRouter can be installed from the ISO

Before installing, prepare for the installation.

- Download the AT&T Vyatta vRouter KVM files. Refer to Downloading the Vyatta file for Linux KVM *(page 6)* for instructions on how to download the available files.
- Install the Linux operating system on the system where you are going to install the AT&T Vyatta vRouter software. Refer to the Linux documentation for the procedure.
- Download and install virt-manager, including the desktop application as you are going to use virt-manager to create virtual machines. For more information, refer to http://virt-manager.org.
- The virtual machine host must support Supplemental Streaming SIMD Extensions 3 (SSSE3). Refer to the processor specifications for more information. Alternatively, run the command `grep ssse3 /proc/cpuinfo` on the host machine to check for support for the feature.
- Ensure that you have a minimum of 2 GB of free space on the system for a root partition. A minimum of 4 GB of free space is recommended for a production installation.
- Ensure that you have a minimum of 2 GB of RAM on the system. A minimum of 4 GB is recommended.
- The data plane supports from 1 to 128 CPUs. At least 4 CPUs are recommended for optimum performance.

Downloading the AT&T Vyatta vRouter file for Linux KVM

AT&T Vyatta vRouter is available for a variety of virtual environments. To download the KVM disk image, follow the procedure in this section.

The KVM disk image file is labeled with the prefix of `vyatta-kvm_` and has a file extension of `.img`. This file is compressed by using GNU zip that produces a file extension of `.gz`, for example, `vyatta-kvm_VSEyyyy.img.gz`.

To download the AT&T Vyatta vRouter Linux KVM image:

1. Go to the Business Center website at https://www.att.com/ebiz/registration/home.jsp#/login and sign in.
2. Select **Support**.
3. From the Support page, select **Product Help**.
4. Select **Vyatta**, **5600**, and **ISOs**.
5. From the list of downloadable files, locate the KVM file.
6. Click on the file to proceed with the download. After you click on the file to be downloaded, the Export Compliance screen with an Export Compliance statement is displayed followed by an End User License Agreement (EULA).
7. You must agree to accept both the statement and EULA to download the file.

8. Save the downloaded file to a desired location on your local system.
9. Use the `gunzip` command to uncompress the image, as in the following example: `gunzip vyatta-kvm_xxxx_yyyy.img.gz`

   Info:

   The `.gz` extension is removed from the file. For example, the resulting file is `vyatta-kvm_xxxx_yyyy.img`.

Installing the AT&T Vyatta vRouter Linux KVM image

After downloading the AT&T Vyatta vRouter Linux KVM disk image file, install it on the Linux operating system. The following example shows an installation on Red Hat Enterprise Linux, but installing it on other versions would be similar.

> **Note:** In the AT&T Vyatta vRouter, a data plane interface is an abstraction that represents the underlying physical or virtual Ethernet interface of the system. The terms Ethernet interface and data plane interface are synonymous in this guide.

> **Note:** If you install or upgrade the image without setting the CPU flags, the system boots and displays the following error: Starting vPlane services: huge igb_uio data plane ERROR: This system does not support "SSSE3". Please check that RTE_MACHINE is set correctly.

1. Log in to the Linux operating system and check that you have the necessary rights to perform installations for the AT&T Vyatta vRouter.
2. Start the Virtual Machine Manager by selecting **Applications # System Tools # Virtual Machine Manager**. Alternatively, enter the `virt-manager` command from the Linux command line. The **Virtual Machine Manager** screen is displayed.
   a. In the top left corner, click **Create a new virtual machine**.

      Result: The **Create a new virtual machine** wizard is displayed at Step 1 of 5.

   b. In the **Name:** field, enter a name for the new virtual machine and select **Import existing disk image**.
   c. Click **Forward**.

      Result: The **Create a new virtual machine** wizard is displayed at Step 2 of 5.

   d. Click **Browse...**. The **Locate or create storage volume** dialog window is displayed.
   e. Click **Browse Local**. The **Locate existing storage** dialog window is displayed.
   f. Navigate to the uncompressed image that you downloaded.
3. Click **Open**. The **Create a new virtual machine** wizard is displayed at Step 2 of 5, showing the specified image.
   a. From the **OS type:** drop#down list, select **Linux**.
   b. From the **Version:** drop#down list, select **Debian Wheezy**.
4. Click **Forward**.

   Info: The **Create a new virtual machine** wizard is displayed at Step 3 of 5.

   a. In the **Memory (RAM):** field, specify the amount of memory to allocate for the virtual machine.
   b. In the **CPUs:** field, specify the number of CPUs to allocate for the virtual machine.

      Info: The minimum required is 2 vCPUs.

   c. Click **Forward**.

      Result: The **Create a new virtual machine wizard** is displayed at Step 5 of 5. (Note that Step 4 of 5 does not appear.)

5. Check the **Customize configuration before install** checkbox.
6. Under **Advanced options**, select the virtual network type that best meets your needs.
7. Select **Set a fixed MAC address** so that the system generates a unique MAC address for the main Ethernet interface.

8. Leave **Virt Type:** as **kvm** and set the **Architecture:** field to **i686**.
9. Click **Finish**.

   Result: The **configuration customization** screen is displayed.

Customizing the configuration

To customize your configuration, follow the steps in this procedure for the **configuration customization** screen.

1. In the left menu bar, select **Processor**.
2. Click the **Configuration** option on the right pane, then click **Copy host CPU configuration**.
3. Click **Apply**.
4. In the left menu bar, select **NIC :e9:8e:24**. The **Virtual Network Interface** configuration screen is displayed.
5. From the **Device model:** drop#down list, select **virtio** to enable the enhanced virtual network interface driver. Click **Apply**.

   Info:

   > **Note:** Currently virtio is the only NIC driver supported in KVM for AT&T Vyatta vRouter.

6. Select **Disk 1** in the left menu. The **Virtual Disk** screen is displayed.
7. From the **Disk Bus:** drop#down list, select **Virtio** to enable the enhanced virtual disk driver. Leave other fields at their default values. Click **Apply**.
8. Remove any devices that are not required (such as the **Sound** device) by selecting the device and clicking **Remove**.
9. At the top left of the screen, click **Begin Installation**.

   Info:

   The new virtual machine is created and begins to run in a separate window. When the AT&T Vyatta vRouter finishes loading, the Vyatta login prompt appears in the virtual machine console.

At this point, test your installation.

Testing your installation

After the system has successfully booted, you see the `vyatta login:` prompt. This prompt indicates that the system is operational.

Perform the following procedures:

- Verify the Release and System Type
- Verify Connectivity

Verifying the release and system type

The next step is to confirm that the correct release is running and it is running on the device that you expect.

To verify the release and system type:

1. Log in as the **vyatta** user. Use the default password of **vyatta** unless you have changed it.
2. Enter the `show version` command.

   Info:

   - The `Version:` line shows the version number of the system that is running. Make sure the **Version:** line shows the version you expect.
   - The `System type:` line shows the type of hardware on which the system is running and whether it is in a virtual environment. Make sure the **System type:** line shows the information you expect.
   - The `Boot via:` line shows the type of system that is running. Make sure the **Boot via:** line shows one of the following image systems:
   - `livecd`—The system is running from LiveCD.

`image`—The system is running as an image-based system.

`disk`—The system is running as a disk-based system.

Verifying connectivity

After you confirm that the correct version is running, you must confirm that the system can be accessed on the local network. Configure an Ethernet interface on the system and ping the interface from another host on the network.

> **Note:** In the system, a data plane interface is an abstraction that represents the underlying physical or virtual Ethernet interface of the system. The terms Ethernet interface and data plane interface are synonymous in this guide.

To test the system connectivity, perform the following steps:

1. At the command prompt, enter the commands that are shown in the example, substituting an IP address from your existing subnet. The example uses the following network and IP address.

   Info:

   - The network is 192.168.1.0/24.
   - The IP address of the interface is 192.168.1.81.

   Make the appropriate substitutions for your network, as shown in the following example.

   Example:

   ```
   vyatta@vyatta:~$ configure
   vyatta@vyatta# set interfaces dataplane dp0sN address 192.168.1.81/24
   vyatta@vyatta# commit
   vyatta@vyatta# save
   vyatta@vyatta# exit
   vyatta@vyatta:~$
   ```

2. From another host on the same subnet, ping the interface to ensure that it is up. From a Linux or Windows command prompt, enter the following command, substituting the IP address you assigned to the interface.

   Info:

   ```
   ping 192.168.1.81
   ```

   If the system can be reached, you see replies from it in response to the pings. If so, your system is installed and can be accessed on your network.

Upgrading the Linux KVM System

Release-specific upgrade information

Your system may have special upgrade considerations, depending on the release.

For release-specific upgrade information, and to ensure that configuration information is correctly preserved across upgrades, consult the release notes for your release.

Before upgrading

Before upgrading your system, perform the following tasks.

- Save your existing configuration file for reference. Your configuration file is named `config.boot` and is located in the directory `/config`.
- Make sure you have enough space on your root partition to load the image. You can determine the amount of space available by using the `show system storage` command.
- If you install or upgrade the AT&T Vyatta vRouter image without setting the CPU flags, the system boots and displays the following error: `Starting vPlane services: huge igb_uio dataplane ERROR: This system does not support “SSSE3”. Please check that RTE_MACHINE is set correctly`. Refer to the procedure Installing the Vyatta Linux KVM image *(page 7)* to resolve the issue.

Upgrading the system by using the add system image command

The `add system image` command uses an AT&T Vyatta vRouter ISO file as the image source. It installs the new image and sets the new image as the default boot image. The new image is run the next time the system is rebooted.

To prepare for the upgrade, download the new image, determine the location of the AT&T Vyatta vRouter ISO file, and record the name of the file.

To upgrade the ISO, perform the following steps:

1. Enter the `add system image` command.

   Use the location and name of the AT&T Vyatta vRouter SO file as arguments in the command, as shown in the following example.
2. Before you reboot, confirm that the new image is loaded and ready to run the next time the system is rebooted. Enter the `show system image` command.

   See the example for the command in the next sections.
3. Reboot the system by entering the `reboot` command. The system restarts with the new system image.

Sample session: “add system image”

The following example shows a session in which the `add system image` command is used to upgrade to the *xxx*`.iso` system image, where *xxx* is the file name of the ISO image you have downloaded.

The following example uses the 3.2R1 image:

```
vyatta@vyatta:~$ add system image /home/vyatta/xxx.iso
Checking MD5 checksums of files on the ISO image...OK.
Done!
What would you like to name this image? [3.2R1]:
OK.  This image will be named: 3.2R1
```

```
Installing "3.2R1" image.
Copying new release files...
Would you like to save the current configuration
directory and config file? (Yes/No) [Yes]:
Copying current configuration...
Would you like to save the SSH host keys from your
current configuration? (Yes/No) [Yes]:
Copying SSH keys...
Setting up grub configuration...
Done.
vyatta@vyatta:~$
```

The following example shows how to display installed images:

```
vyatta@vyatta:~$ show system image
The system currently has the following image(s) installed:
   1: xxx (default boot)
   2: yyy (running version)
```

Installation and Upgrade Commands

add system image

Adds a binary system image to the currently running system.

Syntax:
`add system image` { *iso-filename* | *iso-URL* [**`username`** *username* **`password`** *password*] }

iso-filename
Name of the image file to be added.

iso-URL
URL location of the image file to be added.

`username` ***username***
Specifies the username that is required to log in to the remote system at the indicated URL location.

`password` ***password***
Specifies the password that is required to log in to the remote system at the indicated URL location. If the username is specified, then a password must also be specified.

Operational mode

Use this command to add a binary image to the currently running system. A system image can be added to a system that was installed by using a disk-based installation or an image-based installation. After an image is added, it is set as the new default boot image and is run the next time the system is booted.

The command validates the MD5 checksums of the files that are contained in the ISO image to ensure that the image has not been corrupted. In addition, the command does not allow more than one copy of an image to exist on the same system.

The *iso-filename* and *iso-URL* arguments provide the source for the ISO image file.

The following table shows how to specify the file syntax for different file locations.

Location	Specification
An absolute path	For *iso-filename*, use standard UNIX file specification.
A relative path	For *iso-filename*, you can also specify the path name relative to the current directory.
FTP server	Use the following syntax for the *iso-URL* argument: `ftp://user:passwd@host/image-file` where *user* is the username on the host, *passwd* is the password that is associated with the username, *host* is the host name or IP address of the FTP server, and *image-file* is the ISO image file, including the path. Alternatively, the username and password can be specified as **`username`** and **`password`** arguments of the `add system image` command. If you do not specify *user* and *passwd*, you are prompted for them.

Location	Specification
SCP server	Use the following syntax for the *iso-URL* argument: `scp://user:passwd@host/image-file` where *user* is the username on the host, *passwd* is the password that is associated with the username, *host* is the host name or IP address of the SCP server, and *image-file* is the ISO image file, including the path. Alternatively, the username and password can be specified as **`username`** and **`password`** arguments to the `add system image` command. If you do not specify *user* and *passwd*, you are prompted for them.
HTTP server	Use the following syntax for the *iso-URL* argument: `http://host/image-file` where *host* is the host name or IP address of the HTTP server and *image-file* is the ISO image file, including the path relative to the HTTP root directory.
TFTP server	Use the following syntax for the *iso-URL* argument: `tftp://host/image-file` where *host* is the host name or IP address of the TFTP server, and *image-file* is the ISO image file, including the path relative to the TFTP root directory.

clone system image

Creates a copy of a system image that is installed on the local system or a remote system.

Syntax:
`clone system image` [*user@host:*] *source-image-name new-image-name* [**`clean`**]

user
Username on a remote host. A username is required for remote host access through SCP and is not required for cloning a local system image.

host
Host name or IP address of a remote host. The host name or IP address is required for remote access through SCP and is not required for cloning a local system image.

source-image-name
Name of a system image to be copied. The source image can exist on the local system or a remote system.

new-image-name
Name of the new (copied) system image. An image with this name must not exist on the system.

`clean`
Creates an empty read/write directory tree for the new image, which is a new image that is functionally equivalent to the source image as it existed when it was originally installed.

Operational mode

Use this command to create a copy of a system image that is installed on the local system or a remote system.

If *user@host* is specified, the image is fetched from the named host by using the Secure Copy Protocol (SCP). If *user@host* is omitted, *source-image-name* is the name of an image that exists on the system, and *new-image-*

name is the image name that the system uses for the clone. No image that is named *source-image-name* can exist on the system.

Command completion is performed for local image names if *user@host* is not specified. No command completion is performed on remote image names if *user@host* is specified.

If the **`clean`** argument is omitted, the command copies the `squashfs` file that is being used by the image named *source-image-name* and the read/write directory tree of *source-image-name*. If the **`clean`** argument is given, the read/write directory tree of *source-image-name* is not copied. Instead, an empty read/write directory tree is created for the new image, which creates a new image that is functionally equivalent to the source image as it existed when it was initially installed.

Images created by this command behave the same as images that are installed by install image *(page 14)* or add system image *(page 12)*.

Both the HTTPS and SSH services must be enabled on the remote system for clone system image *(page 13)* to work properly. The HTTPS service is enabled by using the `set service https` command in configuration mode. The SSH service is enabled by using the `set service ssh` command in configuration mode.

delete system image

Deletes an image from the local disk drive.

Syntax:
`delete system image` [*image-name*]

When the command is entered without an image name, the system prompts for the image to delete.

image-name
Name of an image to be deleted.

Operational mode

Use this command to delete an image from the local disk drive.

The image and all its local files, including its configuration file, are destroyed. Because this command is destructive, the system prompts for confirmation.

Command completion displays all valid completions for the *image-name* argument. If the *image-name* argument is omitted, the system displays a list of available images and prompts you to select one.

If the system was originally installed in disk-based mode, an **`image-name`** option is available that you can use to direct that the disk-based installation must be deleted.

The system does not allow you to delete the currently running system image. However, the system does allow you to delete the image currently selected to be run at the next reboot. If you delete that image, the system uses the currently running image when the system is next rebooted.

install image

Installs a binary image of the system.

Syntax:
`install image`

Operational mode

Use this command to install a binary image of the system.

After the installation is completed, you can add multiple image versions to the same partition by using the `add system image` command, and you can then choose which version to boot by using the `set system image default-boot` command. This functionality allows you to move easily between different versions of the system.

If you have a new system and want to install from scratch, you can boot LiveCD or LiveUSB and run the `install image` command to install the image on LiveCD or LiveUSB to the disk. The `install image` command operates similarly to the `install system` command—it creates and formats a new disk partition and then installs the image to the partition while preserving the system configuration.

rename system image

Renames an image.

Syntax:
`rename system image` *old-image-name new-image-name*

old-image-name
Name of an existing image to be renamed.

new-image-name
New name for the image.

Operational mode.

Use this command to rename an image.

The old name must match the name of an image on the system. The system does not allow you to rename the currently running system image. The new system image name cannot be in use by another image.

set system image default-boot

Selects an image to be run when the system is next rebooted.

Syntax:
`set system image default-boot [` *image-name* `]`

If the command is used without specifying an image name, the system displays a list of available images and prompts you to select one.

image-name
Name of an image to be run when the system is rebooted.

Operational mode

Use this command to select an image to run when the system is next rebooted.

When multiple system images have been installed by using the `add system image` command, you can use this command to direct the system to boot from a specific system image the next time the system is restarted.

Command completion displays all valid completions for the *image-name* argument. If the *image-name* argument is omitted, the system displays a list that shows all images that are installed on the system and prompts you to select one. If the system was originally installed in disk-based mode, a special **`image-name`** option is available so that you can select the disk-based system as the default system from which to boot.

show system image

Displays a list of all images that are installed on the system.

Syntax:
`show system image [` **`storage`** `|` **`version`** `]`

`storage`
Displays the amount of disk space that is used by each image.

`version`
Includes the image version number in the display of system images.

Operational mode

Use this command to display a list of all images that are installed on the system.

The command output identifies the image that is currently running and the image that has been selected to run when the system is next rebooted. If the system was originally installed in disk-based mode, one of the image names identifies that installation.

spawn

Allows you to run any native Linux command through the operational mode infrastructure.

Syntax:

`spawn` *command-name* [*text*]

command-name

Command to run

text

An argument to a command

Operational mode

Use this command to run any native Linux command through the operational mode infrastructure.

Commands that are spawned are run by the local shell, and with the current user's permissions. The spawned command provides a documented and supported way of running any Linux command.

The spawned command prevents any changes to the set of modeled commands from effecting the user's ability to run native commands consistently, if they are using this supported method.

List of Acronyms

Acronym	Description
ACL	access control list
ADSL	Asymmetric Digital Subscriber Line
AH	Authentication Header
AMI	Amazon Machine Image
API	Application Programming Interface
AS	autonomous system
ARP	Address Resolution Protocol
AWS	Amazon Web Services
BGP	Border Gateway Protocol
BIOS	Basic Input Output System
BPDU	Bridge Protocol Data Unit
CA	certificate authority
CCMP	AES in counter mode with CBC-MAC
CHAP	Challenge Handshake Authentication Protocol
CLI	command-line interface
DDNS	dynamic DNS
DHCP	Dynamic Host Configuration Protocol
DHCPv6	Dynamic Host Configuration Protocol version 6
DLCI	data-link connection identifier
DMI	desktop management interface
DMVPN	dynamic multipoint VPN
DMZ	demilitarized zone
DN	distinguished name
DNS	Domain Name System

Acronym	Description
DSCP	Differentiated Services Code Point
DSL	Digital Subscriber Line
eBGP	external BGP
EBS	Amazon Elastic Block Storage
EC2	Amazon Elastic Compute Cloud
EGP	Exterior Gateway Protocol
ECMP	equal-cost multipath
ESP	Encapsulating Security Payload
FIB	Forwarding Information Base
FTP	File Transfer Protocol
GRE	Generic Routing Encapsulation
HDLC	High-Level Data Link Control
I/O	Input/Output
ICMP	Internet Control Message Protocol
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronics Engineers
IGMP	Internet Group Management Protocol
IGP	Interior Gateway Protocol
IPS	Intrusion Protection System
IKE	Internet Key Exchange
IP	Internet Protocol
IPOA	IP over ATM
IPsec	IP Security
IPv4	IP Version 4
IPv6	IP Version 6
ISAKMP	Internet Security Association and Key Management Protocol
ISM	Internet Standard Multicast

Acronym	Description
ISP	Internet Service Provider
KVM	Kernel-Based Virtual Machine
L2TP	Layer 2 Tunneling Protocol
LACP	Link Aggregation Control Protocol
LAN	local area network
LDAP	Lightweight Directory Access Protocol
LLDP	Link Layer Discovery Protocol
MAC	medium access control
mGRE	multipoint GRE
MIB	Management Information Base
MLD	Multicast Listener Discovery
MLPPP	multilink PPP
MRRU	maximum received reconstructed unit
MTU	maximum transmission unit
NAT	Network Address Translation
NBMA	Non-Broadcast Multi-Access
ND	Neighbor Discovery
NHRP	Next Hop Resolution Protocol
NIC	network interface card
NTP	Network Time Protocol
OSPF	Open Shortest Path First
OSPFv2	OSPF Version 2
OSPFv3	OSPF Version 3
PAM	Pluggable Authentication Module
PAP	Password Authentication Protocol
PAT	Port Address Translation
PCI	peripheral component interconnect

Acronym	Description
PIM	Protocol Independent Multicast
PIM-DM	PIM Dense Mode
PIM-SM	PIM Sparse Mode
PKI	Public Key Infrastructure
PPP	Point-to-Point Protocol
PPPoA	PPP over ATM
PPPoE	PPP over Ethernet
PPTP	Point-to-Point Tunneling Protocol
PTMU	Path Maximum Transfer Unit
PVC	permanent virtual circuit
QoS	quality of service
RADIUS	Remote Authentication Dial-In User Service
RHEL	Red Hat Enterprise Linux
RIB	Routing Information Base
RIP	Routing Information Protocol
RIPng	RIP next generation
RP	Rendezvous Point
RPF	Reverse Path Forwarding
RSA	Rivest, Shamir, and Adleman
Rx	receive
S3	Amazon Simple Storage Service
SLAAC	Stateless Address Auto-Configuration
SNMP	Simple Network Management Protocol
SMTP	Simple Mail Transfer Protocol
SONET	Synchronous Optical Network
SPT	Shortest Path Tree
SSH	Secure Shell

Acronym	Description
SSID	Service Set Identifier
SSM	Source-Specific Multicast
STP	Spanning Tree Protocol
TACACS+	Terminal Access Controller Access Control System Plus
TBF	Token Bucket Filter
TCP	Transmission Control Protocol
TKIP	Temporal Key Integrity Protocol
ToS	Type of Service
TSS	TCP Maximum Segment Size
Tx	transmit
UDP	User Datagram Protocol
VHD	virtual hard disk
vif	virtual interface
VLAN	virtual LAN
VPC	Amazon virtual private cloud
VPN	virtual private network
VRRP	Virtual Router Redundancy Protocol
WAN	wide area network
WAP	wireless access point
WPA	Wired Protected Access