



# **Turbonomic 6.4.29 Installation Guide**

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## Introduction

Thank you for choosing Turbonomic, the Intelligent Workload Automation Management solution for Cloud and Virtualized Environments. This guide gives you information you need to install Turbonomic in your virtual environment, install your license, and get started managing your resources.

If you have any questions, please contact Turbonomic support. Visit our support site at <https://support.turbonomic.com>.

Sincerely:

The Turbonomic Team



## Task Overview

This *Turbonomic Installation Guide* provides instructions to accomplish the following tasks:

If you need to:	Perform or go to:
Deploy a new Turbonomic installation.	<ul style="list-style-type: none"><li>• Review the <i>Turbonomic Release Notes</i>.</li><li>• Ensure you satisfy the minimum requirements. See <a href="#">Minimum Requirements (on page 7)</a>.</li><li>• Perform the installation procedure in <a href="#">Installing Turbonomic (on page 9)</a>.</li><li>• Configure any settings if necessary. See <a href="#">General Configuration Tasks (on page 24)</a>.</li><li>• Log in for the first time. See <a href="#">License Installation and First-time Login (on page 35)</a>.</li><li>• Install your license. See <a href="#">License Installation and First-time Login (on page 35)</a>.</li><li>• Configure SSO if necessary. See <a href="#">Single Sign-On Authentication (on page 37)</a>.</li><li>• Continue to use your Turbonomic instance. See the <i>Turbonomic User Guide</i> and the <i>Turbonomic Target Configuration Guide</i>.</li></ul>
Deploy a new Turbonomic installation on RHEL.	<ul style="list-style-type: none"><li>• Review the <i>Turbonomic Release Notes</i>.</li><li>• Ensure you satisfy the minimum requirements. See <a href="#">Requirements for RHEL and Setup (on page 49)</a>.</li><li>• Perform the installation procedure in <a href="#">Installing and Updating on a RHEL Platform (on page 49)</a>.</li></ul>

If you need to:	Perform or go to:
Upgrade a license.	Follow the instructions in <a href="#">Upgrading Your Turbonomic License (on page 36)</a> .
Update your existing Turbonomic installation.	<ul style="list-style-type: none"> <li>• Review the <i>Turbonomic Release Notes</i>.</li> <li>• Ensure you satisfy the minimum requirements for updating Turbonomic on supported hypervisors or the RHEL platform: <ul style="list-style-type: none"> <li>◦ <a href="#">Minimum Requirements (on page 7)</a>.</li> <li>◦ <a href="#">Requirements for RHEL and Setup (on page 49)</a></li> </ul> </li> <li>• Perform one of the following update procedures: <ul style="list-style-type: none"> <li>◦ <a href="#">Updating Turbonomic to a New Version (on page 43)</a></li> <li>◦ <a href="#">Updating the RHEL Deployment (on page 54)</a></li> </ul> </li> <li>• Upgrade your license, if necessary. See <a href="#">Upgrading Your Turbonomic License (on page 36)</a>.</li> <li>• Log in.</li> <li>• Continue to use your Turbonomic instance. See the <i>Turbonomic User Guide</i> and the <i>Turbonomic Target Configuration Guide</i>.</li> </ul>
Migrate your Turbonomic instance to a newer version.	<ul style="list-style-type: none"> <li>• Review the <i>Turbonomic Release Notes</i>.</li> <li>• Review the migration decision table. See <a href="#">Do I Need to Migrate? (on page 45)</a></li> <li>• Ensure you satisfy the minimum requirements. See <a href="#">Minimum Requirements (on page 7)</a>.</li> <li>• Perform the migration instructions in <a href="#">Migrating to a New Turbonomic Distribution (on page 45)</a>.</li> </ul>



## Minimum Requirements

The following are minimum requirements to run Turbonomic:

Supported Technology		Storage Requirements	Memory	CPUs
VMware	vCenter versions 5.5, 6.0, 6.5, 6.7, and 7.0	500 GB or greater  <b>NOTE:</b> Can be thin provisioned depending on the storage requirements.	32 GB	4 vCPUs
Citrix	XenServer versions 5.6.x and 6.x			
Microsoft	Hyper-V as bundled with Windows 2016, 2008 R2, Hyper-V Server 2012, or Hyper-V Server 2012 R2			
Red Hat Enterprise Virtualization	RHEV versions 4.x and 3.x			
OpenStack	Icehouse or greater			
Nutanix AHV	All Acropolis versions			
Amazon Web Services (AWS)				
Microsoft Azure				

**NOTE:**

Minimum requirements depend on the size of your environment's inventory. The more datastores, hosts, VMs, and applications you have, the more resources you need to run the installation effectively. Also note that other management software might recommend that you run the Turbonomic VM with lower resources. Please be sure to give Turbonomic enough resources, using the guidelines above.

If you intend to use price adjustments or Azure rate cards, Turbonomic recommends that you increase the memory allocated to the VM that hosts your Turbonomic instance as follows:

- For price adjustments assigned to one or more billing groups:
  - For the first price adjustment, increase by 4 GB.
  - For each subsequent price adjustment, increase by an additional 1 GB.
- For Azure rate cards assigned to one or more subscriptions:
  - For the first rate card, increase by 4 GB.
  - For each subsequent rate card, increase by an additional 4 GB.

See "Billing and Costs" in the *Turbonomic User Guide* for information about price adjustments and Azure rate cards.

Turbonomic supports DHCP or static IP addressing. For information about using static IP addresses, see [\(Optional\) Specifying a Static IP Address \(on page 24\)](#).

## Browser Requirements

Turbonomic operates with most commonly-used Web browsers (for example, Internet Explorer, Mozilla Firefox, Google Chrome, and Apple Safari).

The Web browsers must have JavaScript enabled.

In addition, the browser that you use for the Turbonomic user interface must be synchronized with the Turbonomic instance to within one minute. Without this synchronization, Turbonomic can show incorrect metric values.

Also, if you use Google Chrome for the Turbonomic user interface, you must turn off the Chrome Preview mode before you download reports in order to view those reports.





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# Installing Turbonomic

As you get started with Turbonomic, be aware that there are different downloads available for the supported hypervisors. These downloads all deliver the same version of Turbonomic with the same capabilities, but they are packaged to install and run on different hypervisor platforms.

You can also install the Turbonomic software on a VM running Red Hat (see [Installing and Updating on a RHEL Platform \(on page 49\)](#)).

## NOTE:

Turbonomic OVAs are released on CentOS. To check if your operating system is running CentOS, perform the instructions in [How to Determine the Linux Kernel Version Running on Your Turbonomic Instance \(on page 56\)](#). If your operating system is not CentOS, contact Turbonomic Technical Support for assistance.

Each installation manages virtual environments in exactly the same way. The installation you choose depends on the policies and standards for your enterprise. This document describes installation procedures for each of the Turbonomic downloads. *The installation you choose has no effect on the technologies you can manage with Turbonomic. No matter which type of machine hosts Turbonomic, you can manage all workloads running on the supported hypervisors, as well as those managed via cloud platforms and load balancer targets.*

This section describes how to install a new Turbonomic instance. If you are updating a current installation to new version, you should not perform a full install — Instead you should update your current installation. See [Updating Turbonomic to a New Version \(on page 43\)](#).

Before you perform an update, you should make sure you do not need to perform a migration, which includes migration of your historical and configuration data. *Check the Turbonomic Release Notes for migration requirements and refer to [Do I Need to Migrate? \(on page 45\)](#) in this document.*

This section includes installation instructions for the following supported virtual platforms:

- [Installing on VMware Systems \(on page 10\)](#)
- [Installing on Citrix XenServer \(on page 10\)](#)
- [Installing on Microsoft Hyper-V \(on page 11\)](#)
- [Installing on RHEV Systems \(on page 12\)](#)
- [Installing on Nutanix AHV Systems \(on page 13\)](#)
- [Installing on OpenStack Systems \(on page 13\)](#)
- [Installing on AWS from the AWS Marketplace \(on page 13\)](#)

- [Installing on AWS \(on page 15\)](#)
- [Installing on Azure \(on page 21\)](#)

When you deploy Turbonomic, you should install it on a VM that does not include underscore characters in its name. If you cannot change the host name, you can use a workaround described in [How Can I Work Around the Restriction for Host Names \(on page 59\)](#).

**NOTE:**

If you want to use IAM Roles to discover AWS targets, then Turbonomic has to be deployed on AWS and you have to assign the Turbonomic instance to the IAM Role. For instructions, see the Green Circle article: <https://greencircle.vmturbo.com/docs/DOC-5593>. If you need assistance, contact Technical Support.

## Installing on VMware Systems

This download of the Turbonomic instance is in the .OVA 1.0 format.

To install Turbonomic:

1. Download the Turbonomic installation package.  
Refer to the email you received from Turbonomic for links to the Turbonomic download pages.
2. Import the OVA file into your VMware infrastructure using VCenter.
3. Start the Turbonomic appliance and record its IP address.  
Users navigate to the appliance IP address to start up the Web User Interface in a browser.
4. If necessary, specify a static IP address for the appliance.  
If your environment does not have DHCP, or if you want to give the Turbonomic instance a static IP address, see [\(Optional\) Specifying a Static IP Address \(on page 24\)](#).
5. Perform the required configuration steps for the Turbonomic instance.  
See [General Configuration Tasks \(on page 24\)](#).

## Installing on Citrix XenServer

To install Turbonomic:

1. Download the Turbonomic installation package.  
Refer to the email you received from Turbonomic for links to the Turbonomic download pages.
2. Unpack the .gzip file to a machine that can be accessed by the XenCenter import operation.
3. In the XenCenter application, choose **File > Import** to open the Import Wizard.
4. Follow the steps in the Wizard and provide this information:
  - The location of the Turbonomic instance you want to import
  - The home server in which you will import Turbonomic
  - The storage repository that provides disks for the Turbonomic instance
  - Virtual network interfaces for the Turbonomic instance

5. Click **Finish** to import the Turbonomic instance.
6. Start the Turbonomic appliance and record its IP address.  
Users navigate to the appliance IP address to start up the Web User Interface in a browser.
7. If necessary, specify a static IP address for the appliance.  
If your environment does not have DHCP, or if you want to give the Turbonomic instance a static IP address, see [\(Optional\) Specifying a Static IP Address \(on page 24\)](#).
8. Perform the required configuration steps for the Turbonomic instance.  
See [General Configuration Tasks \(on page 24\)](#).

## Installing on Microsoft Hyper-V

To install Turbonomic:

1. Download the Turbonomic installation package.  
Refer to the email you received from Turbonomic for links to the Turbonomic download pages.
2. Expand the .zip file and copy the contents, which includes the Virtual Machine image, to your Hyper-V server (either to your cluster shared volume or to a local hard drive).
3. Use the Import Virtual Machine Wizard in the Hyper-V Manager to import the Virtual Machine into your environment.
4. Make sure your virtual network adapter is connected to the correct virtual network.
5. Ensure the Turbonomic instance will have sufficient memory.  
Turbonomic recommends that you use static memory for your Turbonomic instance. However, you can specify static or dynamic memory for the instance.  
In **Properties** for the instance, navigate to **Hardware Configuration**:
  - For Static Memory, set **Virtual machine memory** to at least 32 GB.
  - For Dynamic Memory, then set **Startup memory** and **Minimum memory** to 32 GB.
6. Start the Turbonomic appliance and record its IP address.  
Users navigate to the appliance IP address to start up the Web User Interface in a browser.
7. If necessary, specify a static IP address for the appliance.  
If your environment does not have DHCP, or if you want to give the Turbonomic instance a static IP address, see [\(Optional\) Specifying a Static IP Address \(on page 24\)](#).
8. Perform the required configuration steps for the Turbonomic instance.  
See [General Configuration Tasks \(on page 24\)](#).

### NOTE:

The Turbonomic instance configuration includes a NIC that is not connected to any network. After installing the instance, you should use the Hyper-V Manager to configure the network and VLAN settings to suit the requirements of your cluster's network.

# Installing on RHEV Systems

Turbonomic distributes the Turbonomic instance as TGZ archives. RHEV provides a utility named `rhev-image-uploader` that you must use to upload and import the Turbonomic instance to a system in the RHEV environment. This utility must be installed before you can use it. For more information, refer to the RHEV portal article, *RHEV: How do I use an appliance downloaded from the Market Place?* You can find this article at:

<https://access.redhat.com/knowledge/articles/67891>.

The following steps assume you have:

- The `rhev-image-uploader` installed and configured.
- Identified the export domain where you will upload the Turbonomic instance.

To install Turbonomic:

1. Download the Turbonomic installation package.

Refer to the email you received from Turbonomic for links to the Turbonomic download pages.

2. Upload the .TGZ file to the identified export domain.

Use the `rhev-image-uploader` utility to upload the .TGZ file. Execute the following command:

```
# rhev-image-uploader -e <export_domain> --name <name> upload <filename.tgz>
```

where `<export_domain>` is the name of the export domain, and `<name>` is the name of the VM you want to create for the Turbonomic instance. You must execute this command on a system that can mount the NFS export domain.

3. Import a VM from the package into the export domain.
  - a. Open the RHEV admin interface and display the **Storage** tab.
  - b. Locate and select the identified export domain, and click **Import**.
  - c. In the confirmation dialog that appears, click **OK**.

The import operation may take some time — import runs in the background. When the import process is done, an event "Vm `<name>` was successfully imported" appears under the **Events** tab.

4. Attach the Turbonomic VM to the "rhev" network.

The `rhev-image-uploader` tool does not create any network interfaces. You must manually create a network interface and attach the VM to the `rhev` network.

- a. In the RHEV admin interface, display the **Virtual Machines** tab.
- b. Locate and select the Turbonomic virtual machine you just created.
- c. Click **Network Interfaces** and then **New**.
- d. Use the provided default values and click **OK**.

5. Start the Turbonomic appliance and record its IP address.

Users navigate to the appliance IP address to start up the Web User Interface in a browser.

6. If necessary, specify a static IP address for the appliance.

If your environment does not have DHCP, or if you want to give the Turbonomic instance a static IP address, see [\(Optional\) Specifying a Static IP Address \(on page 24\)](#).

7. Perform the required configuration steps for the Turbonomic instance.

See [General Configuration Tasks \(on page 24\)](#).

# Installing on Nutanix AHV Systems

This download of the Turbonomic instance is in the QCOW2 format.

To install Turbonomic:

1. Download the Turbonomic installation package.  
Refer to the email you received from Turbonomic for links to the Turbonomic download pages.
2. Extract the image from the archive.
3. Upload the image in Nutanix using the Image Configuration wizard.  
During the wizard process, ensure the image meets the Turbonomic minimum requirements.
4. Verify that the image was configured successfully.
5. Launch an instance that meets the minimum requirements, using the previously created image.

# Installing on OpenStack Systems

This download of the Turbonomic instance is in the QCOW2 format.

To install Turbonomic:

1. Download the Turbonomic installation package.  
Refer to the email you received from Turbonomic for links to the Turbonomic download pages.
2. Upload the image in OpenStack using the Create Image wizard.

**NOTE:**

You may need to extract the image from the archive.

3. Create a flavor that meets the minimum requirements in the Create Flavor wizard.
4. Launch an instance using the previously created flavor and image.

# Installing on AWS from the AWS Marketplace

This installation of Turbonomic is presented as an Amazon Machine Image (AMI).

Turbonomic supports two methods for installing the Turbonomic instance on AWS:

- Use the 1-Click Launch method from the AWS Marketplace which is described in this section.
- Use the CloudFormation template offered by Turbonomic which is described in [Installing on AWS \(on page 15\)](#).

For both methods, you need to ensure that your deployment follows Turbonomic and Amazon best practices, including:

- Automatic scheduling and executing of EBS data volume snapshots  
AWS will perform these snapshots daily and store them in a user-created S3 bucket on a rolling 14-day period.
- EBS volume encryption  
Turbonomic recommends using a Security Group to only allow access to the Turbonomic instance through HTTPS.
- Setup and use of Identity and Access Management (IAM) Instance Profiles (Instance Roles) for authentication

Turbonomic recommends Instance Roles over Access Keys. Instance Roles are much easier to manage for compliance purposes, and are natively supported by the AWS SDK.

Further, Turbonomic recommends enabling cross-account access for your Instance roles by following the steps found here: <https://aws.amazon.com/blogs/security/how-to-enable-cross-account-access-to-the-aws-management-console/>.

- Utilize auto-scaling for HA/recovery purposes

Through AWS's auto-scaling, Turbonomic ensures that there is an instance running at all times.

The CloudFormation template ensures that these best practices are followed. If you deploy from the AWS Marketplace, you are responsible for ensuring that these best practices are followed.

## (Optional) 1-Click Launch Method: Creating a Security Group

When you install Turbonomic using the 1-Click Launch on the AWS Marketplace, you can choose a security group that you created or use the Turbonomic default security group.

If you create your own security group, the minimum Turbonomic requirements are:

- The security group restricts access to HTTPS only for the Turbonomic instance.
- For the Outbound rule (outgoing browser connection from Turbonomic), it can be any TCP to anywhere.
- For the Inbound rule (incoming browser connection to Turbonomic), it needs to allow SSH according to your company's SSH policies from anywhere and uses ports 443 or 80. If you configure the Turbonomic User Interface to only accept incoming connections from port 443, then the security group also needs to use port 443.

As an alternative, you can also modify the Turbonomic default security group afterwards in AWS EC2 by editing the security group after the VM is deployed.

Read the Amazon documentation for more information on security groups. See [http://docs.aws.amazon.com/AmazonVPC/latest/UserGuide/VPC\\_SecurityGroups.html](http://docs.aws.amazon.com/AmazonVPC/latest/UserGuide/VPC_SecurityGroups.html).

## Using 1-Click Launch on the AWS Marketplace

This section describes how to install the Turbonomic instance on AWS from the AWS Marketplace.

You can install the Turbonomic instance from the AWS Marketplace as described in the Green Circle article: <https://greencircle.vmturbo.com/docs/DOC-5413>.

Before you begin, make sure that you have:

- AWS Account Access
- (Optional) A security group that you created instead of the Turbonomic default security group.
- Reviewed the templates that are available for the EC2 Instance Type. For example, you can use `m5.xlarge` (recommended), `m5.large`, `m5.2xlarge`, `m4.xlarge`, `m4.large`, `m4.2xlarge`, `r4.xlarge`, `r4.2xlarge`, `r5.xlarge`, `r5.2xlarge`, `i2.xlarge`, `i3.xlarge`, `c4.2xlarge`, or `c5.2xlarge`. For a complete list of templates, see the URL: <https://aws.amazon.com/marketplace/pp/B073FDDGRP>.

To install Turbonomic from the AWS Marketplace:

1. Navigate your Web browser to the AWS Marketplace: Hybrid Cloud Management Platform.  
Use the URL: <https://aws.amazon.com/marketplace/pp/B073FDDGRP>.
2. Click **Continue to Subscribe**.

3. Log in to your AWS account.
4. Choose values for the following items:
  - Region
  - EC2 Instance Type
  - Security group. Choose an existing security group or accept the default one provided by Turbonomic.
  - Key Pair
5. Click **Launch with 1-click**.
6. Verify in the EC2 console that your AMI EC2 instance is running and passed the status check.

**IMPORTANT:**

Make a record of the instance ID displayed in this screen. It is the default password for the Turbonomic administrator user.

7. Log in to your Turbonomic instance.

Launch your Turbonomic instance in a Web browser.

- Use the default credential for **Username**: administrator.
- Type the <instance ID> for **Password**.

Make sure to use the `https://` protocol.

You can change the administrator password after your initial login.

## Installing on AWS

This installation of Turbonomic is presented as an Amazon Machine Image (AMI).

Turbonomic supports two methods for installing the Turbonomic instance on AWS:

- Use the 1-Click Launch method from the AWS Marketplace. See [Installing on AWS from the AWS Marketplace \(on page 13\)](#).
- Use the CloudFormation template offered by Turbonomic which is described in this section.

For both methods, you need to ensure that your deployment follows Turbonomic and Amazon best practices, including:

- Automatic scheduling and executing of EBS data volume snapshots

AWS will perform these snapshots daily and store them in a user-created S3 bucket on a rolling 14-day period.

- EBS volume encryption

Turbonomic recommends using a Security Group to only allow access to the Turbonomic instance through HTTPS.

- Setup and use of Identity and Access Management (IAM) Instance Profiles (Instance Roles) for authentication

Turbonomic recommends Instance Roles over Access Keys. Instance Roles are much easier to manage for compliance purposes, and are natively supported by the AWS SDK.

Further, Turbonomic recommends enabling cross-account access for your Instance roles by following the steps found here: <https://aws.amazon.com/blogs/security/how-to-enable-cross-account-access-to-the-aws-management-console/>.

- Utilize auto-scaling for HA/recovery purposes

Through AWS's auto-scaling, Turbonomic ensures that there is an instance running at all times.

The CloudFormation template ensures that these best practices are followed. If you deploy from the AWS Marketplace, you are responsible for ensuring that these best practices are followed.

## Installing using the CloudFormation Template

This template directs you through launching a VM that runs CentOS and that hosts a Turbonomic instance. This template ensures that your deployment will follow both Turbonomic and Amazon best practices.

To install Turbonomic using the CloudFormation template:

1. Download the Turbonomic CloudFormation template.

The template is provided from the Green Circle article:

<https://greencircle.vmturbo.com/docs/DOC-5274>

2. Modify the template to set parameters depending on your AWS environment.

For information, review the [CloudFormation Template Summary \(on page 17\)](#).

3. Log in to your AWS console and choose the CloudFormation service.

4. Create a new Stack.

When you are prompted for your template:

- a. Click **Upload a template to Amazon S3**.
  - b. Choose the template you downloaded and modified.
  - c. Click **Next**.
5. On the Specify Details page, enter your stack information.

Enter a stack name and choose the image size. Click **Next**.

### NOTE:

Turbonomic recommends the `m5.xlarge` instance type, but you can also use `m5.large`, `m5.2xlarge`, `m4.xlarge`, `m4.large`, `m4.2xlarge`, `r4.xlarge`, `r4.2xlarge`, `r5.xlarge`, `r5.2xlarge`, `i2.xlarge`, `i3.xlarge`, `c4.2xlarge`, or `c5.2xlarge`.

6. On the Options page, enter any tags you need.

For example, change the default values for the Key-Value pair to set periodic backups of your data.

After you add any tags, click **Next**.

Tags are a convenient way to group instances based on security needs, business requirements, and more. See <https://aws.amazon.com/answers/account-management/aws-tagging-strategies/> for more information.

7. On the Review page, ensure that your selections are correct.

Once you have reviewed your selections and are satisfied, click **Create**.

## (Optional) Creating a Security Group

### NOTE:

When you install Turbonomic via the CloudFormation template, that installation automatically performs this step.



If you install Turbonomic without using the CloudFormation template, Turbonomic recommends that you create a security group to restrict access to HTTPS only for the Turbonomic instance and attach this group to the Turbonomic instance.

Read the Amazon documentation for more information on security groups. See [http://docs.aws.amazon.com/AmazonVPC/latest/UserGuide/VPC\\_SecurityGroups.html](http://docs.aws.amazon.com/AmazonVPC/latest/UserGuide/VPC_SecurityGroups.html)

## CloudFormation Template Summary

This section provides additional explanations about portions of the CloudFormation template which may be useful when you are preparing your template.

This snippet creates the structure of the CloudFormation template, used by the rest of the template.

Metadata:

Instances:

Description: Your Turbonomic instance is created with an encrypted EBS Volume. If you create an encrypted volume and don't specify this property, AWS CloudFormation uses the default master key.

'AWS::CloudFormation::Designer':

5979b605-17c1-4e1a-9158-ae132fb86736:

size:

width: 60

height: 60

position:

x: 30

'y': -20

z: 1

embeds: []

ef20cdef-19a0-4d61-9f16-0108bb0330e1:

size:

width: 60

height: 60

position:

x: 150

'y': 10

z: 1

embeds: []

dependson:

- ea836120-be24-44ab-bd80-e2c9749fad84

- b4bc499e-9882-4ab9-9c37-e165e51fe589

ea836120-be24-44ab-bd80-e2c9749fad84:

size:

width: 60

height: 60

position:

x: -60

'y': 210

z: 1

embeds: []

b4bc499e-9882-4ab9-9c37-e165e51fe589:

size:

width: 60

```

    height: 60
  position:
    x: 180
    'y': 210
    z: 1
    embeds: []
    dependson:
      - ea836120-be24-44ab-bd80-e2c9749fad84
    isrelatedto:
      - ea836120-be24-44ab-bd80-e2c9749fad84
6e649c64-891f-4e11-a83a-2df5cf26d0b5:
  source:
    id: ef20cdef-19a0-4d61-9f16-0108bb0330e1
  target:
    id: ea836120-be24-44ab-bd80-e2c9749fad84
  z: 2
7c216255-250c-4574-9bcf-fb02673b306e:
  source:
    id: ef20cdef-19a0-4d61-9f16-0108bb0330e1
  target:
    id: b4bc499e-9882-4ab9-9c37-e165e51fe589
  z: 2
84fca9b5-0bb0-4a88-b0e3-c74af6b00b80:
  source:
    id: b4bc499e-9882-4ab9-9c37-e165e51fe589
  target:
    id: ea836120-be24-44ab-bd80-e2c9749fad84
  z: 2

```

The following snippet sets the allowable deployment templates, and defines your VPC ID to use later in the template.

Parameters:

InstanceTypeParameter:

Type: String

Default: m4.xlarge

AllowedValues:

- m4.large
- m4.xlarge
- m4.2xlarge

Description: 'Enter m4.large, m4.xlarge, or m4.2xlarge. Default is m4.xlarge.'

VpcIdParameter:

Type: 'List<AWS::EC2::VPC::Id>'

Description: VpcId of your existing Virtual Private Cloud (VPC)

ConstraintDescription: must be the VPC Id of an existing Virtual Private Cloud.

The following snippet maps the various AWS regions to ensure that your Turbonomic instance is deployed in your default region.

#### NOTE:

The list of available AMIs by region changes periodically. To obtain the latest list of AMIs for Turbonomic, go to the AWS Marketplace and log in with your AWS credentials. Click the Manual Launch tab. Then, choose the latest version of Turbonomic to display the regions and AMI IDs. Make a record of the regions and AMI IDs for use in your template.

Mappings:

```

RegionMaptoAMI:
us-east-2:
AMI:
- "ami-366f4e53"
us-east-1:
AMI:
- "ami-7ae9c16c"
us-west-1:
AMI:
- "ami-898fa2e9"
us-west-2:
AMI:
- "ami-f656428f"
ap-south-1:
AMI:
- "ami-f23f419d"
ap-northeast-2:
AMI:
- "ami-76f02f18"
ap-southeast-1:
AMI:
- "ami-756fe316"
ap-southeast-2:
AMI:
- "ami-f32d3d90"
ap-northeast-1:
AMI:
- "ami-e834208f"
ca-central-1:
AMI:
- "ami-28cd724c"
eu-central-1:
AMI:
- "ami-72eb4d1d"
eu-west-1:
AMI:
- "ami-1d7b607b"
eu-west-2:
AMI:
- "ami-eb61778f"
sa-east-1:
AMI:
- "ami-cce289a0"

```

The following snippet creates the Turbonomic security group, which limits access to the Turbonomic instance to HTTPS only:

```

Resources:
  TurbonomicSecurityGroup:
    Type: AWS::EC2::SecurityGroup
    Properties:
      GroupName: TurbonomicSecurityGroup
      GroupDescription: Creates and limits access to Turbonomic instance through port 443 only
      VpcId:

```

```

Ref: VpcIdParameter
SecurityGroupIngress:
- IpProtocol: tcp
FromPort: '443'
ToPort: '443'
CidrIp: 0.0.0.0/0
Metadata:
  'AWS::CloudFormation::Designer':
    id: ef20cdef-19a0-4d61-9f16-0108bb0330e1
DependsOn:
- Turbonomic

```

The following snippet sets the following items for the Turbonomic instance:

- Instance size
- Instance region
- Block storage properties, including access, backup, and encryption
- Security Group

**NOTE:**

DeleteOnTermination is set to `false` by default. This ensures that even if the EC2 instance is terminated at a later time, the data will persist.

```

Turbonomic:
  Type: 'AWS::EC2::Instance'
  Properties:
    InstanceType:
      Ref: InstanceTypeParameter
    ImageId:
      'Fn::FindInMap':
        - RegionMaptoAMI
        - Ref: 'AWS::Region'
        - AMI
    BlockDeviceMappings:
      - DeviceName: /dev/sdi
        Ebs:
          VolumeType: gp2
          DeleteOnTermination: false
          VolumeSize: 150
          Encrypted: true
    EbsOptimized: true
    InstanceInitiatedShutdownBehavior: stop
  Metadata:
    'AWS::CloudFormation::Designer':
      id: ea836120-be24-44ab-bd80-e2c9749fad84

```

The following snippet creates an auto scaling group of 1, which ensures that a Turbonomic EC2 instance is always running:

```

TurbonomicAutoScalingGroup:
  Type: 'AWS::AutoScaling::AutoScalingGroup'
  Properties:
    AvailabilityZones:

```

```
- !GetAtt Turbonomic.AvailabilityZone
InstanceId:
  Ref: Turbonomic
Cooldown: '1800'
MinSize: '1'
MaxSize: '1'
DesiredCapacity: '1'
HealthCheckType: EC2
HealthCheckGracePeriod: 900
Metadata:
  'AWS::CloudFormation::Designer':
    id: b4bc499e-9882-4ab9-9c37-e165e51fe589
DependsOn:
  - Turbonomic
```

The following snippet creates the S3 bucket required for the daily backups:

```
TurbonomicS3BackupBucket:
  Type: 'AWS::S3::Bucket'
  Properties:
    AccessControl: AuthenticatedRead
    BucketName: turbonomic-s3-volume-backup-bucket
  Metadata:
    'AWS::CloudFormation::Designer':
      id: 5979b605-17c1-4e1a-9158-ae132fb86736
```

## Installing on Azure

Turbonomic provides the Azure Marketplace Template that you can use to deploy a Turbonomic instance on an Azure cloud account. This template simplifies setup, and ensures compliance with Turbonomic minimum requirements.

### Prerequisites

Before you begin, make sure you have the following:

- Access to the Azure portal.
- An active Azure subscription with permissions to deploy VMs.
- A valid Turbonomic license.

## Installing Turbonomic on Azure

To install Turbonomic on Azure:

1. Log in to your Azure portal.

Use the URL: <https://portal.azure.com> and log in with your Azure credentials.

2. Open the Turbonomic template.

Navigate to

```
https://azuremarketplace.microsoft.com/en-us/marketplace/apps/vmturbo.turbonomic?tab=Overview
```

Then, click **Get It Now**. This displays the **Create a virtual machine** page in your Azure portal, open to the **Basics** tab.

3. Provide authentication and other basic details for the VM.

The settings that are specific to deploying a Turbonomic instance include:

- **Subscription:**  
Choose the Azure subscription for the deployment.
- **Resource Group:**  
Choose an existing or create a new Resource Group in which you will deploy the Turbonomic VM.
- **Virtual Machine Name:**  
The name of the Turbonomic Server
- **Region:**  
The region best suited for your deployment.
- **Image:**  
The Turbonomic image. *Do not change the image. This deployment workflow chooses the correct image for you.*
- **Size:**  
The instance size for the virtual machine. This deployment workflow chooses the most appropriate size for a Turbonomic deployment.
- **Username:**  
`azureuser`  
**NOTE:**  
You must enter `azureuser` in this Username field. It is a required value.
- **Password:**  
Give the password for this user to access the virtual machine.
- **Inbound Port Rules**  
Turn on **Allow selected ports** and enable the following:
  - HTTP (80)
  - HTTPS (443)
  - SSH (22)

For the other settings in the **Basics** tab, leave them at their default values.

4. Ensure Accelerated Networking is turned on.

Navigate to the **Networking** tab and view the option for Accelerated Networking. Make sure that the option is turned on.

5. Verify your settings and purchase the template.

Navigate to the **Review + create** tab to look over your settings. Before you purchase the template, be sure the settings are correct. When you are satisfied, click **Purchase**.

6. Finalize the VM setup.

Once Azure has deployed the Turbonomic template, navigate a browser to the Azure-assigned IP. Make sure to use the `https://` protocol.

Follow the on-screen prompts to set up and begin using your Turbonomic instance.

**NOTE:**

You may see an HTTPS certificate error when navigating to the instance. Ignore this warning.



---

## General Configuration Tasks

After you install the Turbonomic instance, perform the following configuration tasks:

- (Optional) Specify a static IP address.
- (Best practice) Synchronize the system clock and configure your time servers.
- (Optional) Configure remote MariaDB connections.
- (Required) Ensure the ports that Turbonomic needs for network communication are open.
- (Optional) Open a non-default port on the Turbonomic VM to allow communication from a target.
- (Required) Configure a listener for a custom port for reporting.
- (Optional) Enforce secure access by installing a trusted certificate.
- (Optional) Configure email notifications for database disk usage.

### (Optional) Specifying a Static IP Address

Many installations use DHCP for dynamic IP address allocation. You can also specify a static address via the virtual machine's IP configuration.

*Only* if you need to specify a static IP address, choose one of the following methods:

- Use the `ipsetup` script from Turbonomic.
- Configure the static IP address manually as described in this topic.

### The `ipsetup` Script

Turbonomic provides the `ipsetup` script to assist you with this task.

1. Open an SSH terminal session to your Turbonomic instance.

Use the following default credentials:

- Username: `root`



- Password: vmturbo
2. Once the session is open, execute the script with the `ipsetup` command.

## Manually Configuring a Static IP Address

**NOTE:**

If you are configuring a static IP for an installation running on a XenServer VM, use the instructions in the following support article:

<https://support.turbonomic.com/hc/en-us/articles/200681546>

To specify a static IP address, perform these steps:

1. Open an SSH terminal session to your Turbonomic instance.

Use the following default credentials:

- Username: `root`
- Password: `vmturbo`

2. Open the connection editor.

- a. Execute the `nmtui` command.

This opens the user interface for the NetworkManager.

- b. Click **Edit a connection** to open the editor.

3. Add a new connection.

Click **Add** on the screen to open the New Connection dialog box.

4. Add an Ethernet connection.

- a. Choose **Ethernet** from the list of options and complete the following information (values given are examples only):

- Profile Name: `eth0`
- Device: `eth0`
- IPv4 Configuration: `Manual`
- Click **Show** and complete the Configuration sub-settings based on your environment.

- b. Click **OK** to return to the configuration list.

5. Verify that the connection you created is present.

6. Click **Quit** to return to the command line.

7. Restart the network services.

```
service network restart
```

The network service restarts successfully.

8. Verify that your machine is accessible and the static IP address is correct.

```
ifconfig eth0
```

This procedure applies the IP address to the Turbonomic instance. You can now access the Web user interface using this IP address.

## (Best practice) Synchronizing Time

It is important that you synchronize the clock on the Turbonomic instance with the devices on the same network. For performance reasons, Turbonomic recommends that you set your Turbonomic system clock to your time zone, because Turbonomic runs regular data maintenance processes at night. Use the Network Time Protocol daemon (`ntpd`) to set your Turbonomic system clock.

**NOTE:**

*Do not use the `yast` option to set up an NTP service.* To set up NTP, use the instructions below. The `yast` `timezone` utility provides an option to set up NTP, but you must not use this `yast` option.

To configure the NTP server:

1. Open an SSH terminal session to your Turbonomic instance.
2. Open the `ntp` configuration file.

For example, execute the command: `vi /etc/ntp.conf`

3. Find the lines that specify the time servers.
4. Replace these time server lines with the fully-qualified domain names of your time servers.

The safest approach is usually to provide the IP address of the your time server. If you only have one time server, you can delete the second time server entry.

5. Save the file.
6. Make sure the NTP daemon is enabled.

The NTP daemon should be enabled by default. To enable the daemon, execute the `systemctl enable ntpd` command.

7. Verify the NTP daemon is running.

Execute: `systemctl status ntpd`

8. Verify that your time is correct.

Execute the `date` command. You should see results similar to:

```
Thu Oct 18 14:25:45 CST 2018
```

## (Optional) Enabling Remote Connections to the Turbonomic Database

By default, you cannot access the Turbonomic database from a remote connection, unless you connect through a SSH tunnel. If you enable remote connections, you can then access the database through your own code base or using an application.

To enable remote client connections to the MariaDB database in the Turbonomic instance, you will:

- Update the database configuration to allow the connection
- Create the user account that you will make the connection with
- Make the connection

## Updating the Database Configuration

To enable remote client connections to the MariaDB database:

1. Open an SSH terminal session to your Turbonomic instance.

Use the following default credentials:

- Username: root
- Password: vmturbo

2. Open the `bind-addr` configuration file.

For example, use the `vi /etc/my.cnf.d/bind-addr.cnf` command.

3. Set the `bind_address` parameter.

You must set the bind address to `0.0.0.0`. This enables connections from any location.

For example, set the following: `bind_address=0.0.0.0`

4. Save the file.

5. Restart the MariaDB service.

Execute the `systemctl restart mariadb` command.

## Creating a User Account on the Database

To create the user that you connections will use:

1. Access the database as root.

While still in your SSH session to Turbonomic, execute the command (where `<rootDbPwd>` is the root user password):

```
mysql -uroot -p<rootDbPwd> mysql
```

2. Create the user account.

Execute the following command, where `<NewUser>` is the username, and `<NewPwd>` is the users password:

```
CREATE USER '<NewUser>'@'%' IDENTIFIED BY '<NewPwd>';
```

3. Grant the user privileges.

Execute the commands:

```
GRANT SELECT on vmtdb.* to <NewUser>@'%' IDENTIFIED BY '<NewPwd>';  
GRANT EXECUTE on vmtdb.* to <NewUser>@'%' IDENTIFIED BY '<NewPwd>';  
GRANT SHOW VIEW on vmtdb.* to <NewUser>@'%' IDENTIFIED BY '<NewPwd>';
```

4. Reload the privileges in the database.

Execute the command:

```
FLUSH PRIVILEGES;
```

## Connecting to the Database

To connect to the database, use the following address, where `<PlatformIP>` is the IP address of your Turbonomic installation:

`<PlatformIP>:3306`

## (Required) Configuring Ports

Ensure the ports for network communication are open.

Turbonomic uses the following ports:

Port:	To support:
80	Incoming browser connections over HTTP
443	<ul style="list-style-type: none"> <li>Incoming browser connections over HTTPS</li> <li>Proactive Support (automatically generate support tickets for Turbonomic issues)</li> </ul>

For browser connections with the Turbonomic instance, you should use either port 80 or 443.

### NOTE:

Various targets that you use with Turbonomic may require you to open ports on those targets to allow communications with Turbonomic. For more information and a list of default ports, see "Port Configuration" in the *Turbonomic Target Configuration Guide*.

## (Optional) Opening a Non-Default Port

If your target is using a non-default, non-standard port, you can open the port on the Turbonomic VM to allow communication from the target. To open a port, use the SELinux `audit2allow` diagnostic tool. The `audit2allow` tool parses the Access Vector Cache (AVC) messages from the audit log and creates the module (`semodule`) to allow access to a port.

To open a non-default, non-standard port, perform these steps:

1. Open an SSH terminal session to your Turbonomic instance.
2. Change to a temporary directory from which you can run SELinux commands (for example, `/tmp/selinux`).
3. Create the module, `myapp`.

Use the `audit2allow` command with the `-M` option:

```
audit2allow -M myapp < /var/log/audit/audit.log
```

4. Load the module into the kernel.

```
semodule -i myapp.pp
```

5. Retest access to the port.

# (Required) Configuring a Listener for a Custom Port for Reporting

If you are using a custom port number as required by your company policy and your reports fail with the exception `Error Generating Report`, you need to configure a listener for the local host interface address (127.0.0.1) on port 443.

To configure the listener, perform these steps:

1. Open an SSH terminal session to your Turbonomic instance.

Use the following default credentials:

- Username: `root`
- Password: `vmturbo`

2. Open the Apache `ssl.conf` file.

For example, use the `vi /etc/httpd/conf.d/ssl.conf` command.

3. In the configuration file, search for the listener section.

Look for the following code:

```
# When we also provide SSL we have to listen to the
# the HTTPS port in addition.
#
```

4. Add the listener for the local host interface address (127.0.0.1) on port 443.

In this example, assume that the custom port 1443 already exists. Note that the listener has been added for port 443.

```
# When we also provide SSL we have to listen to the
# the HTTPS port in addition.
#
Listen 1443 https
Listen 127.0.0.1:443 https
```

5. Check the `VirtualHost` section in the `ssl.conf` file.

- If the original `VirtualHost` section for port 443 still exists, ensure that it matches the following `VirtualHost` section.
- If the original `VirtualHost` section was modified for the custom port, add the following `VirtualHost` section for the listener at the very top of the `ssl.conf` file.

#### IMPORTANT:

The same key pair used for the custom port must be used for the listener.

```
<VirtualHost 127.0.0.1:443>
ErrorLog logs/ssl_error_log
```

```

TransferLog logs/ssl_access_log
LogLevel warn
SSLEngine on
SSLCertificateFile /etc/pki/tls/certs/localhost.crt
SSLCertificateKeyFile /etc/pki/tls/private/localhost.key
<Files ~ "\.(cgi|shtml|phtml|php3?)$" >
    SSLOptions +StdEnvVars
</Files>
<Directory "/var/www/cgi-bin">
    SSLOptions +StdEnvVars
</Directory>
SSLHonorCipherOrder On
SSLCipherSuite HIGH:!NULL:!MD5:!DSS:!3DES
SSLProtocol -all +TLSv1.2
SSLCipherSuite ALL:+HIGH:!ADH:!EXP:!SSLv2:!SSLv3:!DSS:!3DES:!MEDIUM:!LOW:!NULL:!a
NULL
CustomLog logs/ssl_request_log \
    "%t %h %{SSL_PROTOCOL}x %{SSL_CIPHER}x \"%r\" %b"
</VirtualHost>

```

6. Write and quit the `ssl.conf` file.

Press **esc**, type `:wq!`, and press **Enter**.

7. Restart the http service.

```
service http restart
```

## (Optional) Enforcing Secure Access

If your company policy requires a trusted certificate, Turbonomic enables you to install a trusted certificate from a known certificate authority.

For more information, see:

<https://greencircle.vmturbo.com/docs/DOC-4630>

1. Request a certificate.
  - a. Open an SSH terminal session to your Turbonomic instance.  
The default credentials are:
    - Username: `root`
    - Password: `vmturbo`
  - b. Change to the `/private` directory where you will store the private key.  
`cd /etc/pki/tls/private`
  - c. Execute the command to create the private key file.  
`openssl genrsa -out turbonomic.key 2048`
  - d. Create a file containing the information used to generate the CSR.  
`vi certsingreq.cfg`

- e. In the file, insert the following code and specify the fields:

```
[req]
ts = 2048
prompt = no
default_md = sha256
req_extensions = req_ext
distinguished_name = dn

[dn]
C=<country, 2 letter code>
L=<city>
O=<company>
OU=<organizational unit name>
CN=<FQDN>
emailAddress=<email address>

[req_ext]
subjectAltName = @alt_names

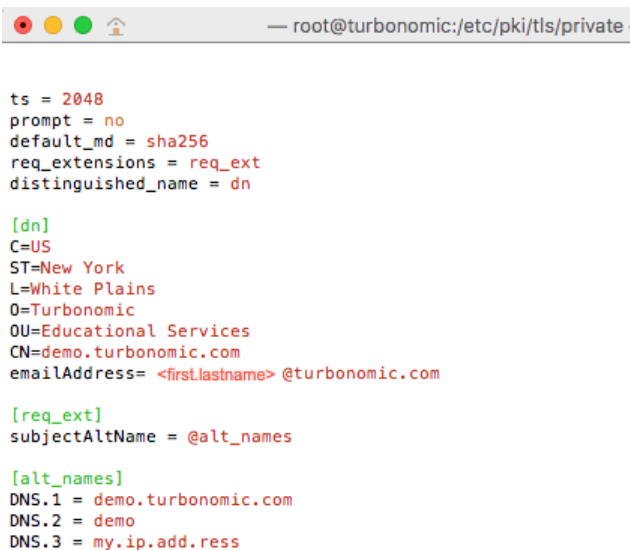
[alt_names]
DNS.1 = <FQDN>
DNS.2 = <server's short name>
DNS.3 = <server's IP address>
```

**NOTE:**

For the CN field, specify the fully-qualified domain name of the Turbonomic instance.

Alternate names are other ways to access the Turbonomic instance. In the alternate names ([alt\_names]) section, the value for the DNS.1 field is required. For the DNS.1 field, specify the fully-qualified domain name of the Turbonomic instance. Values for the DNS.2 and DNS.3 fields are optional. You can add more DNS.<n> fields if needed.

For example:



```
root@turbonomic:/etc/pki/tls/private

ts = 2048
prompt = no
default_md = sha256
req_extensions = req_ext
distinguished_name = dn

[dn]
C=US
ST=New York
L=White Plains
O=Turbonomic
OU=Educational Services
CN=demo.turbonomic.com
emailAddress= <first.lastname> @turbonomic.com

[req_ext]
subjectAltName = @alt_names

[alt_names]
DNS.1 = demo.turbonomic.com
DNS.2 = demo
DNS.3 = my.ip.add.ress
```

- f. Write and quit the file.

Press **esc**, type `:wq!`, and press **Enter**.

- g. Create the certificate request file.

Execute the command:

```
openssl req -new -sha256 -nodes -out turbonomic.csr -key turbonomic.key -config
certsignreq.cfg
```

- h. Transfer the certificate request file to your local machine.

The path to the certificate request file (`turbonomic.csr`) on your remote machine is `/etc/pki/tls/private`.

- i. Send this file to your certificate authority.

Your certificate authority will use this file to create the certificate for you.

If your certificate authority gives you an encoding choice between DER and Base 64, choose **Base 64**.

2. Rename the certificate file.

When you receive the certificate file from your certificate authority (CA), check the name of the certificate file.

Rename it to `turbonomic.crt`.

For an Intermediate Certificate Bundle, certificate authorities (for example, GoDaddy or Symantec) may use intermediate certificates as a proxy to their root certificate for security purposes – if so, you will also receive a certificate chain bundle. If this is the case, also name the certificate chain with the `.crt` extension (for example: `<intermediate>.crt`).

3. Upload the certificate.

Transfer the above certificate file(s) to the `/etc/pki/tls/certs` directory of the Turbonomic instance.

4. Apply the certificate.

- a. Open an SSH terminal session to your Turbonomic instance.

The default credentials are:

- Username: `root`
- Password: `vmturbo`

- b. Make a backup file of the `ssl.conf` file.

```
cp /etc/httpd/conf.d/ssl.conf /etc/httpd/conf.d/ssl.conf-LOCALHOST
```

- c. Open the `ssl.conf` file.

```
vi /etc/httpd/conf.d/ssl.conf
```

- d. Edit the `ssl.conf` file to specify the file paths for the new key and crt files.

- Replace the `localhost.crt` with the name of the new certificate (`turbonomic.crt`).

```
# Server Certificate
```

```
SSLCertificateFile /etc/pki/tls/certs/localhost.crt
```

- Also, replace the `localhost.key` with the name of the new key file (`turbonomic.key`).

```
# Server Private Key
```

```
SSLCertificateKeyFile /etc/pki/tls/private/localhost.key
```

- If you received an intermediate certificate bundle, replace the `server-chain.crt` with the name of the new intermediate file (`<intermediate>.crt`).

```
# Server Certificate Chain
```



```
SSLCertificateChainFile /etc/pki/tls/certs/server-chain.crt
```

- e. Write and quit the `ssl.conf` file.

Press **esc**, type `:wq!`, and press **Enter**.

- f. Restart the `httpd` service.

```
service httpd restart
```

## 5. (Optional) Set up secure LDAP.

- a. Save the SSL Certificate information from your LDAPS Server to a `.CER` file.

For example, view the certificate properties and click **Save As** or **Export** to create a `.CER` file.

- b. Transfer this `.CER` file from your system to the Turbonomic appliance.

For example, use the SCP (secure copy) command with the default credentials (`root/vmturbo`) to copy the `.CER` file to the `/tmp` directory of the Turbonomic instance.

- c. In the Turbonomic instance, copy the `.CER` file to the `/anchors` directory.

For example, copy the `rootca.cer` file to the `/usr/share/pki/ca-trust-source/anchors/` directory.

- d. Run the `update-ca-trust` command as `root`.

This automatically updates the built-in `cacerts.jks` and puts the certificates in the proper location to be used by `curl` without additional options.

- e. Restart the `Tomcat` service.

```
service tomcat restart
```

# (Optional) Configure Email Notifications for Database Disk Usage

You can configure Turbonomic to notify you by email whenever the database is down or storage exceeds 80% utilization. To configure this notification, you will first execute a script that initializes the configuration. Then to set up a regular check of disk consumption, you will set up a cron job to execute the scripts Turbonomic provides on its server.

To perform the one-time configuration for this notification:

1. Execute one of the notification scripts.

To initialize the configuration, you can execute either of the provided scripts. To do so, execute one of the following commands:

- `/srv/tomcat/script/appliance/turbo_check_db.sh`
- `/srv/tomcat/script/appliance/turbo_check_disk.sh`

2. Provide the information as the script prompts you for it.

The script displays the following prompts:

```
[root@turbonomic appliance] ./turbo_check_db.sh
Configuration file does not exist.
Creating default configuration file.
```

```
Database name (Default: vmtdb):  
Database user (Default: root):  
Database password:  
Database port (Default: 3306):  
Email address to send notifications to:
```

Be sure to give the email address where you want to receive the notifications.

Running the script creates a configuration file that saves the settings you provide.

To set up regular checks that run every 30 minutes, append the following lines to your crontab file:

```
*/30 * * * * /srv/tomcat/script/appliance/turbo_check_db.sh >/dev/null 2>&1  
*/30 * * * * /srv/tomcat/script/appliance/turbo_check_disk.sh >/dev/null 2>&1
```

After you set up the cron job, if the database goes down, or if disk usage exceeds 80%, the scripts send an email alert to the recipient that you specified in the initial configuration. In addition, the scripts write alerts to the log file: `/var/log/tomcat/monitor.log`.



---

## License Installation and First-time Login

Before you begin, make sure you have your full or trial license key file that was sent to you in a separate email. Save the license file on your local machine so you can upload it to your Turbonomic installation.

To use Turbonomic for the first time, perform the following steps:

1. Type the IP address of your installed Turbonomic instance in a Web browser to connect to it.
2. Log in to Turbonomic.
  - Use the default credential for **USERNAME**: `administrator`.
  - Type a password for **PASSWORD**.
  - Type the password again to verify it for **REPEAT PASSWORD**.
  - Click **CONFIGURE**.
3. Decide whether to enable Usage Data and Analytics.

Click **AGREE** or **No**.

You can always change this setting later. For information, see "Administrative Tasks" in the *Turbonomic User Guide*.

4. Continue setting up your Turbonomic installation.

Click **LET'S GO**.

5. Open the **Enter License** fly-out.

Click **IMPORT LICENSE**.

6. Upload your license key file.

- a. In the Enter License fly-out, you can upload the license in one of the following ways:

- Drag the license key file into the Enter License fly-out.
- Browse to the license key file.

Be sure to upload only `.xml` or `.lic` files.

- b. Click **SAVE**.

Depending on which license you have installed, the license enables either a trial or a full unlimited license for Turbonomic.

# Upgrading Your Turbonomic License

If you purchased a license to upgrade from a trial version to a full version, or if you purchased a license to add more workload capacity to your installation, you will receive a new license in an email message. Save the license file on your local machine so you can upload it to your Turbonomic installation.

To install this new license, perform the following steps:

1. Navigate to the License Configuration page.  
Choose **Settings > License**.
2. Open the **Enter License** fly-out.  
Click **IMPORT LICENSE**.
3. Upload your license key file.
  - a. In the Enter License fly-out, you can upload the license in one of the following ways:
    - Drag the license key file into the Enter License fly-out.
    - Browse to the license key file.Be sure to upload only .xml or .lic files.
  - b. Click **SAVE**.

Once you install the new license, the additional workload capacity automatically becomes available to you.

For an upgrade from a trial license to a full or different license, the features become available as well as any data collected in a database during a trial evaluation.



---

## Single Sign-On Authentication

If your company policy supports Single Sign-On (SSO) authentication, Turbonomic enables SSO authentication by using Security Assertion Markup Language (SAML) 2.0.

At a high-level, the process involves:

- Creating external groups or at least one external user for SSO. See "Managing User Accounts" in the *Turbonomic User Guide*.
- Configuring Turbonomic to connect to the SAML Identity Provider (IdP). See [Configuring Single Sign-On \(on page 38\)](#).

When SSO is enabled, use your SSO credentials to log in to your Turbonomic instance. Do not use your local or Active Directory (AD) credentials for the login. The Identity Provider (IdP) will perform the authentication.

### NOTE:

When you enable SSO, Turbonomic only accepts authentication from the IdP you configure. Remote requests via the Turbonomic REST API do not use SSO.

If you wish to use the Turbonomic REST API and SSO for end-user authentication simultaneously, you can do so by setting the SAML\_ENABLE policy when you configure SSO (see [Configuring Single Sign-On \(on page 38\)](#)). If you set the SAML\_ENABLE policy, end-user authentication to the application is delegated to your IdP, and an audited class of locally defined users is made available for use for the REST API integration.

Another choice is the SAML\_ONLY security policy. If you set the SAM\_ONLY policy, all authentication is delegated to your IdP. For security reasons, REST API requests will not execute when the SAML\_ONLY policy is configured.

## Prerequisites

Before you begin, make sure the IdP is set up for SSO. You can use a proprietary or public IdP. For examples of settings for a public Okta IdP, see [What Are the Typical Settings for an IdP? \(on page 60\)](#).

# Configuring Single Sign-On

To configure Single Sign-On, perform these steps:

1. (Required) Create external groups or at least one external user for SSO.

**IMPORTANT:**

When SSO is enabled, Turbonomic only permits logins via the SSO IdP. Whenever you navigate to your Turbonomic installation, it redirects you to the SSO Identity Provider (IdP) for authentication before displaying the Turbonomic user interface.

Before you enable SSO for your Turbonomic installation, *you must configure at least one SSO user with Turbonomic administrator privileges*. If you do not, then once you enable SSO you will not be able to configure any SSO users in Turbonomic. To authorize an SSO user as an administrator, use **EXTERNAL AUTHENTICATION** to do one of the following:

- Configure a single SSO user with administrator authorization.  
Add an external user. The username must match an account that is managed by the IdP.
- Configure an SSO user group with administrator authorization.  
Add an external group. The group name must match a user group on the IdP, and that group must have at least one member.

For information about creating external groups or external users for SSO, see "Managing User Accounts" in the *Turbonomic User Guide*.

2. (Required) Ensure that the NTP server is configured and the system time on your Turbonomic instance is correct.

For instructions, see [\(Best practice\) Synchronizing Time \(on page 26\)](#).

3. Open an SSH terminal session to your Turbonomic instance.
4. Download the metadata from your IdP.
5. Examine your metadata.

Compare your metadata to the sample provided in [Example of IdP Metadata \(on page 40\)](#).

If your metadata includes optional attribute tags that are not listed in the example, you must remove those optional attribute tags since they are not supported.

6. Import the IdP metadata into the saml.xml file.

- a. Create the `saml.xml` file.

```
vi /srv/tomcat/data/config/saml.xml
```

- b. Copy the IdP metadata into the `/srv/tomcat/data/config/saml.xml` file.
- c. Save the file.

7. Modify the Tomcat configuration file.

- a. Open the Tomcat configuration file.

```
vi /etc/tomcat/tomcat.conf
```

- b. Set the CATALINA\_OPTS variable.

Choose one of the following:

- SAML\_ONLY: Allows SAML authentication only. Turbonomic REST API integration is not supported.
- SAML\_ENABLE: Allows SAML authentication and supports Turbonomic REST API integration (local and LDAP authentications).

For example: CATALINA\_OPTS="-Dadmin.policy.localusers=SAML\_ONLY"

- c. Save the file.

8. Copy the properties file.

```
cp /srv/tomcat/data/config/saml.template.properties /srv/tomcat/data/config/saml.properties
```

9. Modify the properties file.

- a. Open the saml.properties file.

```
vi /srv/tomcat/data/config/saml.properties
```

- b. Set the IDP.entityId property to the same value as the IdP's Audience Restriction property.

For example: IDP.entityId=urn:test:turbo:markharm

- c. Set the Turbonomic public IP address.

For example: Turbonomic.Location=10.10.10.123

- d. Save the file.

10. Generate the SAML configuration file.

Run the `config_saml.sh` script to parse the values in the properties file and transfer them to the SAML configuration file, `saml-security.xml`.

- a. Change to the directory for the SAML configuration script.

```
cd /srv/tomcat/script/appliance/
```

- b. Execute the SAML configuration script.

```
./config_saml.sh
```

11. Add a trusted custom IdP certificate.

The public domain default key store only trusts two public IdPs, Okta and SSO Circle. If you are using a proprietary IdP or other public IdPs, contact your security administrator to add the IdP certificates to the default key store.

Default key store location: `/srv/tomcat/webapps/vmturbo/WEB-INF/security/samlKeystore.jks`

Key store password: `nalle123`

12. Restart the Tomcat service.

```
service tomcat restart
```

13. Verify that the configuration is successful.

- a. Navigate to the Turbonomic User Interface.

You will be automatically redirected to your IdP for authentication.

- b. Log in with the username that is a member of the external group or external user previously configured.

- c. Verify that the system time on your Turbonomic instance is correct.

If the time is not synchronized, this might cause an `HTTP Status 401 -authentication failed` exception in the browser.

- d. If the configuration is not successful, look for an HTTP Status 500 exception in the `/var/log/tomcat/catalina.out` log file. If this exception exists, review your metadata for invalid optional attribute tags.

## Example of IdP Metadata

This section provides an example of IdP metadata which may be useful when you are examining the optional attributes in your metadata.

If your metadata includes optional attribute tags that are not listed in the example, you must remove those optional attribute tags since they are not supported.

```
<?xml version="1.0" encoding="UTF-8"?>
<md:EntityDescriptor xmlns:md="urn:oasis:names:tc:SAML:2.0:metadata"
entityID="http://www.okta.com/exkexl6xc9MhzqiC30h7">
<md:IDPSSODescriptor WantAuthnRequestsSigned="false"
protocolSupportEnumeration="urn:oasis:names:tc:SAML:2.0:protocol">
<md:KeyDescriptor use="signing">
<ds:KeyInfo xmlns:ds="http://www.w3.org/2000/09/xmldsig#">
<ds:X509Data>
<ds:X509Certificate>
MIIDpDCCAoygAwIBAgIGAWMnhv7cMA0GCSqGSIb3DQEBCwUAMIGSMQswCQYDVQQGEwJVUzETMBE
GA1UECAwKQ2FsaWZvcmlkZm1kZlZlZzARBGNVBAWMMCMRldi03NzEyMDIxHDAaBgkqhkiG9w0BCQEW
DWluZm9Ab2t0YS5jb20wHhcNMjgwNTAzMTk0MTI4WWhcNMjgwNTAzMTk0MjI4WjCBkzEjMAkGA1UE
BhMCVGVzZzARBGNVBAWMMCMRldi03NzEyMDIxHDAaBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEA
ugxQGqHAXp jVQZws09n8l8bFCoEevH3AZbz7568XuQm6MK6h7/09wB4C5oUYddemt5t2Kc8GRhf3
BDXX5MVZ8G9AUpG1MSqe1CLV2J96rMnwMIJsKeRXr01LYxv/J4k jnktpOC389wmcy2fE4RbPoJne
P4u2b32c2/V7xsJ7UEjPPSD4i8l2QG6qsUkkx3Ayns jo89PekMfm+Iu/dFKXkd jwXZXPxaL0HrNW
PTpzek8NS5M5rvf8yaD+eElzS0I/HicHbPOVvLa10JZyN/f4bp0XJkxZJz6 jF5DvBkwIs8/Lz5GK
nn4XW9Cqjk3equSCJPo5o1Ms j8v1LrJYVarqhwIDAQABMA0GCSqGSIb3DQEBCwUAA4IBAQC26kYe
LgqjIkF5rvxB2QzTgcd0LVzXOuiVVTzr8Sh5714 jJqbDoIgvAQrRrRSQzD/X+hcmhuwdp9s8zPHS
JagtUJXiypwNtrzb6fM71trWB9sdNrqc99dlgOVRr0Kt5pLtaLe5kkq7dRaQoOIVIjH9wgynaAK
HF/SL3mHUyt jXggs88AAQa8JH9hEpwG2srN8EsizX6xwQ/p92hm2oLvK5CSMwTx4VBuGod70EOWp
6TaluRLQh6 jCCOCWRuzbbz2T3/sOX+sibC4rLiLwfyTkUopF/bTSdWwknORskK4dBekFcvN9N+C
p/qaHYcQd6i2vyor888DLHDPXhSKWhpG
</ds:X509Certificate>
</ds:X509Data>
</ds:KeyInfo>
</md:KeyDescriptor>
<md:NameIDFormat>urn:oasis:names:tc:SAML:1.1:nameid-format:unspecified
</md:NameIDFormat>
<md:NameIDFormat>urn:oasis:names:tc:SAML:1.1:nameid-format:emailAddress
</md:NameIDFormat>
<md:SingleSignOnService Binding="urn:oasis:names:tc:SAML:2.0:bindings:HTTP-POST"
Location="https://dev-771202.oktapreview.com/app/ibmdev771202_turbo2_1/exkexl6xc9M
hzqiC30h7/sso/saml"/>
<md:SingleSignOnService Binding="urn:oasis:names:tc:SAML:2.0:bindings:HTTP-Redirec
t" Location="https://dev-771202.oktapreview.com/
app/ibmdev771202_turbo2_1/exkexl6xc9MhzqiC30h7/sso/saml"/>
```



```
</md:IDPSSODescriptor>  
</md:EntityDescriptor>
```

## Disabling Single Sign-On

If for some reason you no longer want to use SSO, you can disable it for your Turbonomic installation. To disable Single Sign-On, perform these steps:

1. Open an SSH terminal session to your Turbonomic instance.
2. Modify the Tomcat configuration file to disable the CATALINA\_OPTS variable.
  - a. Open the Tomcat configuration file.

```
vi /etc/tomcat/tomcat.conf
```
  - b. Insert a comment character or delete the line for the CATALINA\_OPTS variable.  
For example: `# CATALINA_OPTS="-Dadmin.policy.localusers=SAML_ONLY"`
  - c. Save the file.
3. Navigate to the Tomcat configuration directory on your local machine.  
The directory is: `/srv/tomcat/data/config`
4. Remove files from the Tomcat configuration directory.  
Delete:
  - The metadata file: `/srv/tomcat/data/config/saml.xml`
  - The SAML configuration file: `/srv/tomcat/data/config/saml-security.xml`
  - The SAML properties file: `/srv/tomcat/data/config/saml.properties`
5. Restart the Tomcat service.

```
service tomcat restart
```
6. Verify that the configuration is successful.
  - a. Navigate to the Turbonomic User Interface.  
You will no longer be redirected to your IdP for authentication. You will be redirected to the default Turbonomic login screen.
  - b. Log in with a local account or an Active Directory (AD) account.

## Support for Single Logout

If you are using the SSO feature, Turbonomic supports the Single Logout feature provided by Security Assertion Markup Language (SAML) 2.0. When you click **Logout** in the Turbonomic session that has SSO enabled, the SAML 2.0 Single Logout feature terminates the Turbonomic session, the browser session, the Identity Provider (IdP) session, and sessions at other Service Providers (SP) connected to the same IdP session.

If you want to use this feature, contact your security administrator to configure it.

The following are requirements:

- The `Single Logout` setting must be enabled on the IdP.
- The IdP needs to trust the Turbonomic SAML key store certificate.

If the IdP does not enable or support Single Logout, you need to manually log out from the IdP to fully log out from Turbonomic.

If you close the browser without clicking **Logout** or if your browser session times out, you can log in again provided the Turbonomic or the IDP session is valid.



---

# Updating Turbonomic to a New Version

## IMPORTANT:

ONLY PERFORM THESE UPDATE STEPS IF YOU ARE SURE YOU DO NOT NEED TO MIGRATE TO A NEW DISTRIBUTION. *It is important to verify that you do not need to migrate to a newer Turbonomic VM distribution.* For more information, see [Migrating to a New Turbonomic Distribution \(on page 45\)](#).

Turbonomic continually and rapidly innovates and improves all aspects of this product. This means that Turbonomic periodically releases newer versions of this product. You should check regularly to see if a new version is available.

When a new version is available, it is important to properly update your existing installed instance, rather than just install a new one. When you first installed Turbonomic, you put into place sophisticated data collection and analysis processes. Internal to the installation is an integrated database that retains performance data from across your virtual environment. Turbonomic uses this historical data for right-sizing, projecting trends, and other analysis. This means that the database is important to Turbonomic *and becomes more so over time*. Properly updating your installation of Turbonomic preserves the database for continued use.

For free evaluation versions of Turbonomic, these installations also use the database, even though the more advanced functionality based on this data might not be available. If you later install a different license, the newly added features can use the stored data.

To perform an online update of your Turbonomic installation:

1. Ensure your server has external Internet access.

External access is necessary to perform an online update. If your installation does not have external Internet access, navigate to the following location to get started with an offline update:

`https://greencircle.turbonomic.com/docs/DOC-1292`

2. Save a snapshot of your current Turbonomic VM.

Before updating, you should properly shut down (not power off) the Turbonomic VM and perform a snapshot (or clone the VM). This provides a reliable restore point you can turn to in the event that trouble occurs during the update. After you have the snapshot, bring the VM back online.

3. Check the version of your current installation and check to see whether a new version is available.
  - a. To see the version of your current installation, navigate to **Settings > Updates** and click **About**.
  - b. To check for a newer version, navigate to **Settings > Updates**. Then, click **Check** to compare your current version with the latest available version.

The listing shows numbers for the available versions of the packages that make up Turbonomic. If the listing shows a higher version number for the available version, you can update your installation.

4. Update your current product to the newer version.

To update your current installation, click **Update** and then click **YES** to proceed.

Turbonomic updates automatically, and the update completes in a few minutes.

5. Clear your browser data and refresh your browser.

If you use the Classic UI, you also need to clear the Flash cache. Refer to [When do I need to clear my local Adobe Flash cache? \(on page 57\)](#) for more information.

After clearing the browser data and refreshing your browser, you have full access to Turbonomic features.

However, features that rely on current analysis data will not be available until after a full market cycle — usually 10 minutes. For example, the Lists of Pending Actions will not show any actions until after a full market cycle.

6. Verify the new version.

Navigate to **Settings > Updates** and click **About**.

7. (Optional) Allow remote client connections.

For instructions, see [\(Optional\) Configuring remote MariaDB connections for the Turbonomic instance \(on page 26\)](#).

8. Notify other users to clear their browser data and refresh their Turbonomic browser sessions.

If the other users use the Classic UI, they also need to clear the Flash cache. Refer to [When do I need to clear my local Adobe Flash cache? \(on page 57\)](#) for more information.



---

# Migrating to a New Turbonomic Distribution

## IMPORTANT:

PERFORM THESE MIGRATION STEPS ONLY IF YOU INTEND TO MIGRATE TO A NEWER VERSION OF THE VM OS AND PLATFORM. Occasionally, a new version of Turbonomic includes improvements that require a full installation of a new VM. This new VM will replace your current installation of Turbonomic. *Simply updating your current installation will not properly migrate your data to the newer version of Turbonomic.*

There are occasions when the new version of Turbonomic includes changes to the platform. These changes can include an upgraded version of the CentOS, a newer version of the JVM, newer versions of the application containers that serve up Turbonomic, or changes to the Turbonomic database. The standard Turbonomic Update functions do not replace the platform — to take advantages of these changes you must install a new instance of the Turbonomic VM, and migrate your existing configuration and database to that new instance.

At a high-level, the migration process involves:

- Saving a snapshot of your current installation.
- Updating your current installation to the desired version.
- Backing up the updated installation.
- Installing a new Turbonomic installation.
- Restoring the data from the current installation into the new instance.

During the migration process, the current installation and the new instance must be the same Turbonomic version.

## Do I Need to Migrate?

Migrating to a new distribution of Turbonomic is not difficult, but it requires preparation and it will disrupt your Turbonomic services for a short time. You should not perform a migration unless the latest distribution includes changes to the underlying platform that are not in your current installation.

First, determine which version of Turbonomic you have installed. To do so, choose **Settings > Updates** and click **About** to view your current version.

Then, locate your version and the appropriate action in the following table:

If you have Turbonomic version:	To migrate to Turbonomic 6.4, do the following:
5.7 through 5.9	<p>Check if your operating system is running CentOS in <a href="#">How to Determine the Linux Kernel Version Running on Your Turbonomic Instance (on page 56)</a>.</p> <ul style="list-style-type: none"> <li>• If your operating system is running OpenSUSE, contact Turbonomic Technical Support first to discuss the migration process for your installation. Technical Support can assist you with the migration or you can perform the procedure in <a href="#">Migrating to a New Installation (on page 46)</a>.</li> <li>• If your operating system is running CentOS, perform the update procedure in <a href="#">Updating Turbonomic to a New Version (on page 43)</a>.</li> </ul>
6.0 through 6.3.x	Perform the update procedure in <a href="#">Updating Turbonomic to a New Version (on page 43)</a> .

Starting with the release of Turbonomic 5.9, the OVA is only available on CentOS.

# Migrating to a New Installation

If you have looked up your Turbonomic version in the table in [Do I Need to Migrate? \(on page 45\)](#), and you need to perform a migration, follow these steps:

1. Ensure your VM has external Internet access.
 

External access is necessary to perform an online update.

If your installation does not have external Internet access, navigate to the following location to access the files for an offline update:

`https://greencircle.turbonomic.com/docs/DOC-1292`
2. Save a snapshot of your current Turbonomic VM.
 

Before migrating to a later version, you should properly shut down (not power off) the Turbonomic VM and perform a snapshot (or clone the VM). This provides a reliable restore point you can turn to in the event that trouble occurs during the migration. After you have the snapshot, bring the VM back online.
3. Check the version of your current installation and check to see whether a new version is available.
  - a. To see the version of your current installation, navigate to **Settings > Updates** and click **About**.
  - b. To check for a newer version, navigate to **Settings > Updates**. Then, click **Check** to compare your current version with the latest available version.
 

The listing shows numbers for the available versions of the packages that make up Turbonomic. If the listing shows a higher version number for the available version, you can update your installation.
4. Update your current installation to the latest version.
 

Before migrating your data, you must update the current installation to the latest version. The migration involves backing up your current installation, and restoring the data to an installation of a new distribution. The backup and restore must be performed on installations of the same version.

For update instructions, see [Updating Turbonomic to a New Version \(on page 43\)](#).
5. Back up the updated version of your current installation.

**NOTE:**

You must back up your current installation *after you have updated it to the new version*.

To perform a backup:

- a. Establish a console or Putty SSH session to the Turbonomic instance.

Log in as `root`. The default password is `vmturbo`.

- b. Execute the backup.

Run the following command to create the backup file:

```
vmturbo:~ # /srv/tomcat6/script/appliance/vmtbackup.sh -o full
```

The command executes a full backup which includes the historical database, retained reports, and the configuration files.

This command saves the backup file to `/tmp/vmtbackup.zip`.

Also, make a record of any SMTP, HTTP Proxy, or HTTPS protocol settings. At the end of this procedure, you might need to manually configure the settings.

6. Download and install a new Turbonomic.

You will migrate your saved backup data to this new installation of Turbonomic.

See [Installing Turbonomic \(on page 9\)](#).

7. Copy your saved backup file to the new Turbonomic installation.

To restore a backup to a Turbonomic installation, you first need to copy the backup file from the original Turbonomic instance over to the new Turbonomic instance. To do this:

- a. Establish a console or Putty SSH session to the original Turbonomic instance.

Log in as `root`. The default password is `vmturbo`.

- b. Copy the backup file to your new Turbonomic instance.

Run the following command:

```
vmturbo:~ # scp /tmp/vmtbackup.zip <IP_addr>:/tmp
```

For example, assuming the IP address is `10.25.100.115`, the command is:

```
vmturbo:~ # scp /tmp/vmtbackup.zip 10.25.100.115:/tmp
```

- c. When prompted, provide your root password for the new instance.

The command copies your backup file to the new instance of Turbonomic, to the following location:

```
/tmp/vmtbackup.zip
```

8. Restore your saved backup file to the new Turbonomic installation.

**WARNING:** Before restoring your backup to the new installation, you must shut down the older installation of Turbonomic. This ensures there is only one Turbonomic installation operating in your environment with the same configuration.

To restore a backup to the new Turbonomic installation:

- a. Establish a console or Putty SSH session to the new Turbonomic instance.

Log in as `root`. The default password is `vmturbo`.

- b. Make sure the shell is at the path `root`.

Execute the command:

```
vmturbo:~ # cd /
```

- c. Perform the backup restore.

Execute the command:

```
vmturbo:~ # /srv/tomcat/script/appliance/vmtrestore.sh -o full
```

This performs a full restore from the backup file. It assumes the backup file is in the following location:

```
/tmp/vmtbackup.zip.
```

9. Verify that the migration was successful.

Log in to the new Turbonomic user interface and confirm that the migration is complete and successful. Check at least the following items:

- Settings — Check the configuration data such as license, user accounts, and target configurations, and check operational data such as custom groups and policies.
  - Landing Page — Check the widgets and move the time slider to verify import of historical data.
10. Manually configure your protocol settings, because the migration process does not update them.

Refer to your notes that you made earlier while performing the step to create a backup.

Configure:

- SMTP configuration.
- HTTP Proxy configuration.
- If you had configured your original Turbonomic instance to use HTTPS protocol only, you will need to configure this setting for the new instance of Turbonomic.





---

# Installing and Updating on a RHEL Platform

Turbonomic delivers a server that runs on the Red Hat Linux (RHEL) 7.x platform installed on a VM with x86 architecture. This is to support environments for which administrative policies require RHEL.

**NOTE:**

The most common delivery of Turbonomic is on a VM with x86 architecture, that runs CentOS as an OS. The CentOS deliveries include all the necessary components — If an upgrade to the CentOS platform becomes necessary, Turbonomic releases a new delivery that includes the platform update. This section describes the less common deployment on a VM running RHEL. For RHEL platforms, you are responsible for keeping the platform up-to-date.

## Requirements for RHEL and Setup

Whether you are performing a new installation, or updating an existing Turbonomic installation, you should ensure that your platform is up-to-date.

In addition, you must run an openJDK version that corresponds with the Turbonomic version you want to run. Current Turbonomic versions require openJDK 1.8.

Turbonomic makes the following setup recommendations for your RHEL VM:

- The VM should have 4 vCPUs and 32 GB of RAM.
- You should create a boot partition for the OS kernel, giving it 500 MB.
- The VM storage requirement is 500 GB or greater. It can be thin provisioned depending on the storage requirements.
- You should create LVM volumes for the following purposes:
  - A swap partition following Red Hat recommendation for partition schemes.
  - The swap partition size should match the allocated RAM size (for example, 32 GB RAM and 32 GB swap partition)
  - 30 GB for system logs to be stored on `/var/log/`
  - 20 GB for system temp storage on `/tmp/`
  - 50 GB for the product installation on the root partition (`/`)

- Use the remaining space, approximately 380 GB, for the database on `/var/lib/mysql`

In addition, the VM must meet the following prerequisites:

- The OS platform is RHEL 7.x.
- The firewall is configured to allow connections on ports 80 and 443.
- The `unzip` utility must be installed.
- The VM does not include underscore characters in its name. If you cannot change the host name, you can use a workaround described in [How Can I Work Around the Restriction for Host Names \(on page 59\)](#).
- The following DejaVu fonts are installed:
  - `dejavu-fonts-common`
  - `dejavu-sans-fonts`
  - `dejavu-sans-mono-fonts`
  - `dejavu-serif-fonts`

To check for the fonts, use the command:

```
rpm -qa | grep dejavu
```

If the DejaVu fonts are not installed, perform the instructions in [How Do I Add Fonts to Enable Reporting for the RHEL Platform? \(on page 58\)](#).

(Optional) If your RHEL platform uses SELinux, ensure that the following are set up:

- Configure SELinux to allow communication between Apache and Tomcat:
  1. Edit the `/etc/selinux/config` file. In the file, search for `SELINUX=permissive` and set it to `SELINUX=enforcing`.
  2. Restart your RHEL operating system.

```
systemctl reboot
```

3. Enable communication between Apache and Tomcat.

Execute the following command:

```
setsebool -P httpd_can_network_connect=1
```

- Install the `policycoreutils-python-2.2.5-11.el7_0.1.x86_64` package.

Execute the following commands:

```
yum provides /usr/sbin/semanage
```

```
yum install policycoreutils-python
```

## Browser Requirements

Turbonomic operates with most commonly-used Web browsers (for example, Internet Explorer, Mozilla Firefox, Google Chrome, and Apple Safari).

The Web browsers must have JavaScript enabled.

In addition, the browser that you use for the Turbonomic user interface must be synchronized with the Turbonomic instance to within one minute. Without this synchronization, Turbonomic can show incorrect metric values.

Also, if you use Google Chrome for the Turbonomic user interface, you must turn off the Chrome Preview mode before you download reports in order to view those reports.

## Installing on a RHEL VM

To create a RHEL deployment of Turbonomic, you will create a VM running RHEL 7.x, download a Turbonomic update, and install the necessary components. In addition, you will have to modify the directory structure on your VM, make changes to the database config file, and start up the required services.

1. Create a VM running the RHEL 7.x operating system.
2. Install the Turbonomic product on your RHEL VM.

You can configure an offline update or an online update to install the initial version of Turbonomic:

- **Offline Update:**

You can find links to offline updates on the following Green Circle document:

```
https://greencircle.turbonomic.com/docs/DOC-1292
```

When you have identified the offline update version that you want, open a shell with root permissions and perform the following commands. Note that `<update64_redhat-XXXXX-X.X.X.zip>` is the name of the offline update.

```
cd /root
```

```
curl -O http://download.vmturbo.com/appliance/download/updates/<update64_redhat-XXXXX-X.X.X.zip>
```

```
cd /tmp
```

```
unzip /root/<update64_redhat-XXXXX-X.X.X.zip>
```

```
cp /tmp/vmturbo_temp.repo /etc/yum.repos.d/
```

- **Online Update:**

Create a YUM Repository configuration file named `vmturbo.repo` in the following location:

```
/etc/yum.repos.d/vmturbo.repo
```

Give the file the following content:

```
[vmturbo]
```

```
name=vmturbo
```

```
baseurl=http://download.vmturbo.com/appliance/download/vmturbo-redhat
```

```
type=rpm-md
```

```
enabled=1
```

```
autorefresh=1
```

```
gpgcheck=0
```

3. Install the other required components.

To install the components, execute the following commands, in this order:

- a. `apache/mod_ssl`

```
yum install mod_ssl
```

b. The Java Runtime Environment

Note that you must install the JRE version that matches the version of Turbonomic that you are installing. This example shows installation for JRE 1.8:

```
yum install java-1.8.0-openjdk
update-alternatives --config java
```

At command, choose the version of Java that corresponds to the version just installed (see [Requirements for RHEL and Setup \(on page 49\)](#)).

c. The Turbonomic bundle

```
yum install vmt-bundle --nogpgcheck
```

4. Set up the correct file structure.

Execute the following commands to set up the required directory structure:

```
ln -s /srv/www/htdocs /srv/www/html
rmdir /var/www/cgi-bin
rmdir /var/www/html
ln -s /srv/www/cgi-bin /var/www/cgi-bin
ln -s /srv/www/htdocs /var/www/html
rm -rf /var/lib/tomcat6/ /var/lib/tomcat/
ln -s /srv/tomcat6/ /var/lib/
ln -s /srv/tomcat/ /var/lib/
mkdir -p /var/lib/mysql/tmp
chown mysql:mysql /var/lib/mysql/tmp
mkdir /var/lib/wwrun
chown -R apache.apache /var/lib/wwrun
```

5. Initialize the database that was installed in the Turbonomic bundle.

Execute the following commands:

```
cd /srv/rails/webapps/persistence/db/
./initialize_all.sh
```

6. Start the associated services.

You can restart the VM or you can execute the following commands to start the services:

```
service tomcat start
service httpd start
```

7. Ensure that time is synchronized between the VM and the physical machine that hosts the VM.

Confirm that the NTP service is running.

For a host that is managed by VMware vSphere, disable the **Synchronize Guest Time With Host** option for the VM. You can find that setting in **Options > VMware Tools > Advanced**.

8. Change the context of the /cgi-bin directory to enable the execution of cgi scripts.

Execute the following commands:

```
semanage fcontext -a -t httpd_sys_script_exec_t "/srv/www/cgi-bin(/.*)?"
restorecon -Rv /srv/www/cgi-bin/
```

9. Enable http(s) communication by adding http and https to firewall.

Execute the following commands:

- a. Edit the `/etc/firewalld/zones/public.xml` file.

Modify the settings in the public zone section. For example:

```
<zone>
<short>Public </short>
<description>For use in public areas. You do not trust the other
    computers on networks to not harm your computer. Only selected
    incoming connections are accepted. </description>
<service name="dhcpv6-client"/>
<service name="ssh"/>
<service name="http"/>
<service name="https"/>
</zone>
```

- b. Reload the firewall.

```
firewall-cmd --complete-reload
```

- c. Restart the firewalld service.

```
systemctl restart firewalld
```

10. (Optional) Allow remote MariaDB client connections.

- a. Open the `bind-addr` configuration file.

For example, use the `vi /etc/my.cnf.d/bind-addr.cnf` command.

- b. Set the `bind_address` parameter to the IP address of your Turbonomic instance.

For example: `bind_address=10.10.10.123`

- c. Save the file.

- d. Restart the MariaDB service.

Execute the `systemctl restart mariadb` command.

**NOTE:**

If you allow remote MariaDB client connections, be sure to add the line `<service name="mysql"/>` in the `/etc/firewalld/zones/public.xml` file.

11. (Optional) Set up SSO authentication. For instructions, see [Single Sign-On Authentication \(on page 37\)](#).

# Updating the RHEL Deployment

After you have deployed Turbonomic on a RHEL platform, you can update that installation with new versions of Turbonomic as they become available. Choose one of the following methods to update Turbonomic:

- Offline Update
- Online Update

**NOTE:**

You should be sure that the DejaVu fonts are installed and the JDK version is compatible with the new Turbonomic version. For information, see [Requirements for RHEL and Setup \(on page 49\)](#).

## Offline Update

Perform these steps:

1. Download a new offline deliverable and unzip it to the /tmp directory. Note that <update64\_redhat-XXXXX-X.X.X.zip> is the name of the offline update.

```
rm -rf /tmp/vmturbo
```

```
cd /tmp
```

```
unzip <update64_redhat-XXXXX-X.X.X.zip>
```

2. Execute these commands to update the installed components.

```
yum clean all
```

```
cd /tmp/vmturbo
```

```
yum -y localupdate x86_64/* i586/* | tee /var/lib/wwrun/manual_vmturbo_update.txt
```

3. Clear your browser data and refresh your browser.

If you use the Classic UI, you also need to clear the Flash cache. Refer to [When do I need to clear my local Adobe Flash cache? \(on page 57\)](#) for more information.

After clearing the browser data and refreshing your browser, you have full access to Turbonomic features. However, features that rely on current analysis data will not be available until after a full market cycle — usually 10 minutes. For example, the Lists of Pending Actions will not show any actions until after a full market cycle.

4. Verify the new version.

Navigate to **Settings > Updates** and click **About**.

5. (Optional) Allow remote MariaDB client connections.

- a. Open the `bind-addr` configuration file.

For example, use the `vi /etc/my.cnf.d/bind-addr.cnf` command.

- b. Set the `bind_address` parameter to the IP address of your Turbonomic instance.

For example: `bind_address=10.10.10.123`

- c. Save the file.

- d. Restart the MariaDB service.

Execute the `systemctl restart mariadb` command.

6. Notify other users to clear their browser data and refresh their Turbonomic browser sessions.

If the other users use the Classic UI, they also need to clear the Flash cache. Refer to [When do I need to clear my local Adobe Flash cache? \(on page 57\)](#) for more information.

## Online Update

Perform these steps:

1. Execute YUM commands to update the installed components.

```
yum clean all
```

```
yum update vmt-bundle vmt-config vmt-persistence vmt-platform vmt-presentation vmt-reports vmt-ui birt-runtime
```

2. Clear your browser data and refresh your browser.

If you use the Classic UI, you also need to clear the Flash cache. Refer to [When do I need to clear my local Adobe Flash cache? \(on page 57\)](#) for more information.

After clearing the browser data and refreshing your browser, you have full access to Turbonomic features. However, features that rely on current analysis data will not be available until after a full market cycle — usually 10 minutes. For example, the Lists of Pending Actions will not show any actions until after a full market cycle.

3. Verify the new version.

Navigate to **Settings > Updates** and click **About**.

4. (Optional) Allow remote MariaDB client connections.

- a. Open the `bind-addr` configuration file.

For example, use the `vi /etc/my.cnf.d/bind-addr.cnf` command.

- b. Set the `bind_address` parameter to the IP address of your Turbonomic instance.

For example: `bind_address=10.10.10.123`

- c. Save the file.

- d. Restart the MariaDB service.

Execute the `systemctl restart mariadb` command.

5. Notify other users to clear their browser data and refresh their Turbonomic browser sessions.

If the other users use the Classic UI, they also need to clear the Flash cache. Refer to [When do I need to clear my local Adobe Flash cache? \(on page 57\)](#) for more information.



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## FAQs

To ensure that you have the most rewarding experience with Turbonomic, we have collected the top installation issues that people experience. If you have any further questions, contact Turbonomic Technical Support.

### Do I need special software to run the Turbonomic client?

If you use the Classic UI, make sure that you have installed an up-to-date Flash plug-in to your browser. If your URL takes you to a blank page, it is possible that the Flash plug-in is not installed.

### How to Determine the Linux Kernel Version Running on Your Turbonomic Instance

If you need to verify which version of CentOS you are running, perform these steps:

1. Open a secure shell to your Turbonomic machine using the default credentials: `root/vmturbo`.
2. Display the `os-release` file.

In the shell, enter `cat /etc/os-release`.

The result includes your OS version. For example:



```
[root@turbonomic ~] cat /etc/os-release
NAME="CentOS Linux"
VERSION="7 (Core)"
ID="centos"
ID_LIKE="rhel fedora"
VERSION_ID="7"
PRETTY_NAME="CentOS Linux 7 (Core)"
ANSI_COLOR="0;31"
CPE_NAME="cpe:/o:centos:centos:7"
HOME_URL="https://www.centos.org/"
BUG_REPORT_URL="https://bugs.centos.org/"

CENTOS_MANTISBT_PROJECT="CentOS-7"
CENTOS_MANTISBT_PROJECT_VERSION="7"
REDHAT_SUPPORT_PRODUCT="centos"
REDHAT_SUPPORT_PRODUCT_VERSION="7"
```

3. Enter **Control-c** to close the file.
4. Log out of the secure shell session.

## When do I need to clear my local Adobe Flash cache?

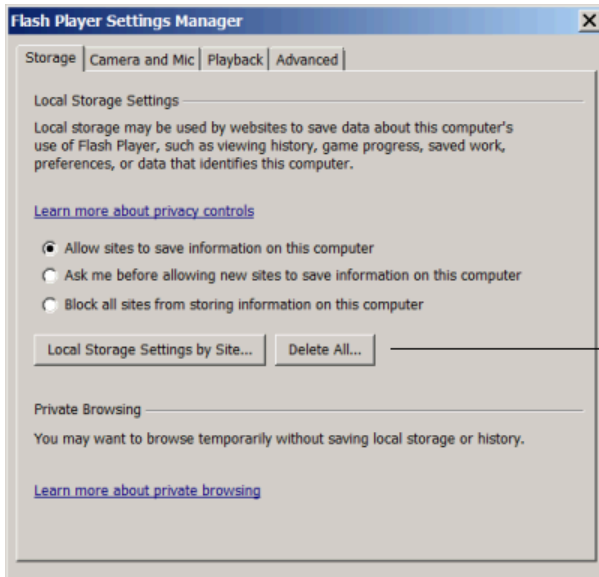
If you use the Classic UI, after you update the Turbonomic instance, you must then clear the Flash cache. Clearing the Flash cache ensures that the Turbonomic user interface will be fully refreshed in the browser.

To clear the cache, you can open the Flash Settings Manager locally on your system, or can access the Settings Manager through the following Adobe site:

[http://www.macromedia.com/support/documentation/en/flashplayer/help/settings\\_manager07.html](http://www.macromedia.com/support/documentation/en/flashplayer/help/settings_manager07.html)

To open the Settings Manager locally on the system, click:

- Windows: **Start > Settings > Control Panel > Flash Player**
- Macintosh: **System Preferences (under Other) > Flash Player**
- Linux Gnome: **System > Preferences > Adobe Flash Player**
- Linux KDE: **System Settings > Adobe Flash Player**



Click **Local Storage Settings by Site** to clear just the Operations Manager appliance, or click **Delete All** clear the cache for all sites that have run on your computer.

## Why can I not execute some of the recommendations made by Turbonomic?

To automate the Turbonomic recommendations, review the *Turbonomic User Guide* for complete information about setting policies. Policies are located in **Settings > Policies**.

Turbonomic supports the following action modes:

- Disabled — Do not recommend or perform the action.
- Recommended — Recommend the action so a user can perform it using the given hypervisor or by other means.
- Manual — Recommend the action, and provide the option to perform that action through the user interface.
- Automated — Turbonomic performs the action automatically.

Some actions are set to Recommend or Disabled by default. To enable execution of these actions, you must change them to Manual or Automated.

Other actions cannot be executed by Turbonomic. These actions will only have Disabled or Recommended as an option.

## How Do I Add Fonts to Enable Reporting for the RHEL Platform?

To check if the DejaVu fonts are installed, use the command:

```
rpm -qa | grep dejavu
```

If the DejaVu fonts are not installed, perform these steps:

1. Open a shell with root permissions and execute this YUM command to install the DejaVu fonts.

```
yum install -y dejavu-fonts-common dejavu-sans-fonts dejavu-sans-mono-fonts dejavu-serif-fonts
```

2. Create the new configuration file.

```
vi /etc/fonts/local.conf
```

3. Copy this code into the `/etc/fonts/local.conf` file.

```
<?xml version='1.0'?>
<!DOCTYPE fontconfig SYSTEM 'fonts.dtd'>
<fontconfig>
<alias>
  <family>serif</family>
  <prefer><family>Utopia</family></prefer>
</alias>
<alias>
  <family>sans-serif</family>
  <prefer><family>Utopia</family></prefer>
</alias>
<alias>
  <family>monospace</family>
  <prefer><family>Utopia</family></prefer>
</alias>
<alias>
  <family>dialog</family>
  <prefer><family>Utopia</family></prefer>
</alias>
<alias>
  <family>dialoginput</family>
  <prefer><family>Utopia</family></prefer>
</alias>
</fontconfig>
```

4. Save the file.

## How Can I Work Around the Restriction for Host Names Containing Underscore Characters?

By default, Apache no longer supports host names with underscore characters in the name. When you deploy Turbonomic, you should install it on a VM that does not include those characters in its name. If the host name includes an underscore character, Apache responds with a 400 error when you try to open the user interface.

If you cannot change the host name, you can modify the Apache configuration file to enable legacy behavior as a workaround. To do so, perform these steps:

1. Open a secure shell to your Turbonomic machine using the default credentials: `root/vmturbo`.

2. Open the Apache configuration file.  

```
vi /etc/httpd/conf/httpd.conf
```
3. Enable the `HttpProtocolOptions unsafe` setting.
  - a. Remove the comment character to enable the `HttpProtocolOptions unsafe` setting.
  - b. Insert the comment character to disable the `HttpProtocolOptions strict` setting.

For example:

```
HttpProtocolOptions unsafe
# HttpProtocolOptions strict
```

4. Save the file.
5. Restart the `httpd` service.

```
service httpd restart
```

## What Are the Typical Settings for an IdP?

Before you begin configuring Single Sign-On (SSO), you need to make sure the IdP is set up for SSO.

Here are typical settings for a public Okta IdP which may be useful when you set up your IdP.

SAML Settings: GENERAL	
Setting	Example
Single Sign On URL	<code>https://10.10.10.123/vmturbo/saml/SSO</code>
Recipient URL	<code>https://10.10.10.123/vmturbo/saml/SSO</code>
Destination URL	<code>https://10.10.10.123/vmturbo/saml/SSO</code>
Audience Restriction	<code>urn:test:turbo:markharm</code>
Default Relay State	
Name ID Format	Unspecified
Application username	The username for the account that is managed by Okta
Response	Signed
Assertion Signature	Signed
Signature Algorithm	RSA_SHA256
Digital Algorithm	SHA256
Assertion Encryption	Unencrypted
SAML Single Logout	Enabled
Single Logout URL	<code>https://10.10.10.123/vmturbo/rest/logout</code>

**SAML Settings: GENERAL**

Setting	Example
SP Issuer	turbo
Signature Certificate	Example.cer (CN=apollo)
authnContextClassRef	PasswordProtectedTransport
Honor Force Authentication	Yes
SAML Issuer ID	http://www.okta.com/\$(org.externalKey)

**SAML Settings: GROUP ATTRIBUTE STATEMENTS**

Name	Name Format	Filter
group	Unspecified	Matches regex:.*admin.*.