# Installation Guide

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OpenNMS 17.0.1-SNAPSHOT

Last updated 2016-03-10 07:55:17 -05:00

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# Chapter 1. Basic Installation of OpenNMS

The *OpenNMS* platform can be installed in several ways. This guide describes the installation of the platform on *RHEL-*, *Debian-* and *Microsoft Windows* based operation systems. Installable pre-compiled software packages are provided through *RPM* and *Debian* repository servers. Running *OpenNMS* requires the following components:

- Internet access to download and verify installation packages from public repository server
- Installed Oracle Java 8 environment
- PostgreSQL 9.1+ data base
- Set link to section which describes to install with RRDTool. Optional RRDtool to persist long term performance data

**NOTE** *OpenJDK 8* can be used, but for production and critical environments *Oracle Java 8* is recommended.

**NOTE** `${OPENNMS_HOME}` is referred to the path *OpenNMS* is installed to. On *RHEL-based* systems it is `/opt/opennms` on *Debian-based* systems it is `/usr/share/opennms`. The environment in *Microsoft Windows* can refer to `C:\Program Files\opennms`

With the *opennms* meta package all dependencies needed for the components mentioned above are maintained. The following sections describe how to install *OpenNMS* on a single system. Dependencies for *Java* and the *PostgreSQL* data base are maintained with the *opennms* meta installation package.

## 1.1. Repositories for Releases

Installation packages are available for different releases of *OpenNMS*. The configuration of the repository decides which *OpenNMS* release will be installed.

The following releases are available for installation:

*Table 1. OpenNMS release name convention*

| Release | Description |
|---|---|
| `stable` | Latest stable release |
| `testing` | Release candidate for next stable |
| `snapshot` | Latest successful develop build |
| `branches/${BRANCH-NAME}` | Install from a specific branch name, e.g. `branches/features-newts` installs the repository for the *Newts* development branch.<br>Branches can be found in<br>http://yum.opennms.org/branches/ or<br>http://debian.opennms.org/dists/branches/ |
| `branches/${RELEASE}` | Install a specific release, e.g. `branches/release-14.0.3`.<br>This release branches are also found in<br>http://yum.opennms.org/branches/ or<br>http://debian.opennms.org/dists/branches/ |

To install a different release the repository files have to be installed and manually modified.

### 1.1.1. Specific Release on RHEL-based system

*Installation of release specific repositories*

```
rpm -Uvh http://yum.opennms.org/repofiles/opennms-repo-${RELEASE}-rhel7.noarch.rpm<1>
rpm --import http://yum.opennms.org/OPENNMS-GPG-KEY
```

① Replace `${RELEASE}` with a release name like `testing` or `snapshot`.

Install *OpenNMS* with *YUM* following the normal installation procedure.

*Installation of the full OpenNMS application with all dependencies*

```
yum install opennms
```

**TIP** Verify the release of *OpenNMS* packages with `yum info opennms`.

### 1.1.2. Specific Release on Debian-based system

Create a new apt source file (eg: `/etc/apt/sources.list.d/opennms.list`), and add the following 2 lines:

*Package repository configuration for Debian-based systems*

```
deb http://debian.opennms.org ${RELEASE} main <1>
deb-src http://debian.opennms.org ${RELEASE} main <1>
```

① Replace `${RELEASE}` with a release name like `testing` or `snapshot`.

Import the packages' authentication key with the following command:

*GPG key import for Debian-based systems*

```
wget -O - http://debian.opennms.org/OPENNMS-GPG-KEY | apt-key add -
```

Run `apt-get update` and install *OpenNMS* with *apt* following the normal installation procedure.

**TIP** Verify the release of *OpenNMS* packages with `apt-cache show opennms`.

## 1.2. Installing on RHEL-based system

This section describes how to install the *OpenNMS* platform on *CentOS 7.1*. The setup process is described in the following steps:

1. Install *OpenNMS YUM* repository server with GPG key to verify packages
2. Installation of the *opennms* meta package which handles all dependencies
3. Initialize *PostgreSQL* database and configure access
4. Initialize *OpenNMS* and first start of the application

### 1.2.1. Setup OpenNMS YUM repository

*Installation of stable repository and GPG key*

```
rpm -Uvh http://yum.opennms.org/repofiles/opennms-repo-stable-rhel7.noarch.rpm
rpm --import http://yum.opennms.org/OPENNMS-GPG-KEY
```

### 1.2.2. Install OpenNMS package

*Installation of the full application with all dependencies like PostgreSQL and Java*

```
yum -y install opennms
```

The following packages will be automatically installed:

- *opennms*: The platform meta package which handles all dependencies from *OpenNMS* repository.
- *jicmp6* and *jicmp*: *Java* bridge to allow sending *ICMP messages* from *OpenNMS* repository.
- *opennms-core*: *OpenNMS* core services, e.g. *Provisiond*, *Pollerd* and *Collectd* from *OpenNMS* repository.
- *opennms-webapp-jetty*: *OpenNMS* web application from *OpenNMS* repository
- *jdk1.8*: *Oracle Java 8* environment from *OpenNMS* respository
- *postgresql*: *PostgreSQL* database server from distribution repository
- *postgresql-libs*: *PostgreSQL* database from distribution repository

With the successful installed packages the *OpenNMS* platform is installed in the following directory structure:

```
[root@localhost /opt/opennms]# tree -L 2
.
└─── opennms
    ├─── bin
    ├─── contrib
    ├─── data
    ├─── deploy
    ├─── etc
    ├─── jetty-webapps
    ├─── lib
    ├─── logs -> /var/log/opennms
    ├─── share -> /var/opennms
    └─── system
```

### 1.2.3. Prepare PostgreSQL

The *CentOS* package installs but doesn't initialize the *PostgreSQL* database directory. Additionally *OpenNMS* requires authentication to access the database and are described in this section. Initialize the database directory with

*Initialization of the PostgreSQL database*

```
postgresql-setup initdb
```

*System startup configuration for PostgreSQL*

```
systemctl enable postgresql
```

*Startup PostgreSQL database*

```
systemctl start postgresql
```

The next step is setting the *postgres* super user password and creating an *opennms* database user with password. Additionally it is required to configure the authentication method to allow authentication from the local network.

*Accounting and database management for OpenNMS*

```
su - postgres
createuser -P opennms
createdb -O opennms opennms
exit
```

*Set password for Postgres super user*

```
su - postgres
psql -c "ALTER USER postgres WITH PASSWORD 'YOUR-POSTGRES-PASSWORD';"
exit
```

**NOTE** The super user is required to be able to initialize and change the database schema for installation and updates.

To allow *OpenNMS* access to the database over the local network *PostgreSQL* has to be configured.

```
vi /var/lib/pgsql/data/pg_hba.conf
```

*Configuration of network access for PostgreSQL*

```
host    all             all             127.0.0.1/32            md5<1>
host    all             all             ::1/128                 md5<1>
```

① Change method from `ident` to `md5` for *IPv4* and *IPv6* on localhost.

*Apply configuration changes for PostgreSQL*

```
systemctl reload postgresql
```

In the next step configure the *OpenNMS* database configuration.

```
vi ${OPENNMS_HOME}/etc/opennms-datasources.xml
```

*Configuration for database authentication in OpenNMS*

```
<jdbc-data-source name="opennms"
                  database-name="opennms"
                  class-name="org.postgresql.Driver"
                  url="jdbc:postgresql://localhost:5432/opennms"
                  user-name="** YOUR-OPENNMS-USERNAME **"<1>
                  password="** YOUR-OPENNMS-PASSWORD **" /><2>

<jdbc-data-source name="opennms-admin"
                  database-name="template1"
                  class-name="org.postgresql.Driver"
                  url="jdbc:postgresql://localhost:5432/template1"
                  user-name="postgres"<3>
                  password="** YOUR-POSTGRES-PASSWORD **" /><4>
```

① Set the user name to access the *OpenNMS* database table

② Set the password to access the *OpenNMS* database table

③ Set the *postgres* user for administrative access to PostgreSQL

④ Set the password for administrative access to PostgreSQL

### 1.2.4. Initialize OpenNMS

*OpenNMS* is now configured to access the database. It is required to set the *Java* environment running *OpenNMS* and initialize the database schema.

*Configuration of Java environment for OpenNMS*

```
${OPENNMS_HOME}/bin/runjava -s
```

*Initialization of database and system libraries*

```
${OPENNMS_HOME}/bin/install -dis
```

*System startup configuration for OpenNMS*

```
systemctl enable opennms
```

*Startup OpenNMS*

```
systemctl start opennms
```

After starting *OpenNMS* the web application can be accessed on http://<ip-or-fqdn-of-your-server>:8980/opennms. The default login user is *admin* and the password is initialized to *admin*.

**IMPORTANT** Change the default admin password to a secure password immediately.

## 1.3. Install on Debian-based systems

This section describes how to install the *OpenNMS* platform on *Ubuntu 14.04 LTS*. The setup process is described in the following steps:

1. Install *OpenNMS* apt repository server with GPG key to verify packages
2. Installation of the *opennms* meta package which handles all dependencies
3. Initialize *PostgreSQL* database and configure access
4. Initialize *OpenNMS* and first start of the application

### 1.3.1. Setup OpenNMS Debian repository

*OpenNMS* can be installed with Installation of stable repository and GPG key

*Installation of OpenNMS Debian repository*

```
deb http://debian.opennms.org stable main
deb-src http://debian.opennms.org stable main
```

*Installation of repository GPG key*

```
wget -O - http://debian.opennms.org/OPENNMS-GPG-KEY | apt-key add -
```

*Update apt repository cache*

```
apt-get update
```

### 1.3.2. Install OpenNMS package

*Installation of the full application with all dependencies like PostgreSQL and Java*

```
apt-get install -y opennms
```

The following packages will be automatically installed:

- *opennms*: The platform meta package which handles all dependencies from *OpenNMS* repository.
- *jicmp6* and *jicmp*: *Java* bridge to allow sending *ICMP messages* from *OpenNMS* repository.
- *opennms-core*: *OpenNMS* core services, e.g. *Provisiond*, *Pollerd* and *Collectd* from *OpenNMS* repository.
- *opennms-webapp-jetty*: *OpenNMS* web application from *OpenNMS* repository
- *jdk1.8*: *Oracle Java 8* environment from *OpenNMS* respository
- *postgresql*: *PostgreSQL* database server from distribution repository
- *postgresql-libs*: *PostgreSQL* database from distribution repository

With the successful installed packages the *OpenNMS* platform is installed in the following directory structure:

```
[root@localhost /usr/share/opennms]# tree -L 2
.
└── opennms
    ├── bin
    ├── data
    ├── deploy
    ├── etc -> /etc/opennms
    ├── instances
    ├── jetty-webapps
    ├── lib -> ../java/opennms
    ├── logs -> /var/log/opennms
    ├── share -> /var/lib/opennms
    └── system
```

### 1.3.3. Prepare PostgreSQL

The *Debian* package installs also *PostgreSQL* database and is already initialized and added in the runlevel configuration. It is only necessary to start the *PostgreSQL* database without a restart.

*Startup PostgreSQL database*

```
service postgresql start
```

The next step is creating an *opennms* database user with password and configure the authentication method.

*Accounting and database management for OpenNMS*

```
su - postgres
createuser -P opennms
createdb -O opennms opennms
exit
```

**NOTE** It is not necessary to change the authentication method in `pg_hba.conf`, it is by default set to `md5` for localhost connections.

*Set password for Postgres super user*

```
su - postgres
psql -c "ALTER USER postgres WITH PASSWORD 'YOUR-POSTGRES-PASSWORD';"
exit
```

**NOTE** The super user is required to be able to initialize and change the database schema for installation and updates.

```
vi ${OPENNMS_HOME}/etc/opennms-datasources.xml
```

*Configuration for database authentication in OpenNMS*

```
<jdbc-data-source name="opennms"
                  database-name="opennms"
                  class-name="org.postgresql.Driver"
                  url="jdbc:postgresql://localhost:5432/opennms"
                  user-name="** YOUR-OPENNMS-USERNAME **"<1>
                  password="** YOUR-OPENNMS-PASSWORD **" /><2>

<jdbc-data-source name="opennms-admin"
                  database-name="template1"
                  class-name="org.postgresql.Driver"
                  url="jdbc:postgresql://localhost:5432/template1"
                  user-name="postgres"<3>
                  password="** YOUR-POSTGRES-PASSWORD **" /><4>
```

① Set the user name to access the *OpenNMS* database table

② Set the password to access the *OpenNMS* database table

③ Set the *postgres* user for administrative access to PostgreSQL

④ Set the password for administrative access to PostgreSQL

### 1.3.4. Initialize OpenNMS

*OpenNMS* is now configured to access the database. It is required to set the *Java* environment running *OpenNMS* and initialize the database schema.

*Configuration of Java environment for OpenNMS*

```
${OPENNMS_HOME}/bin/runjava -s
```

*Initialization of database and system libraries*

```
${OPENNMS_HOME}/bin/install -dis
```

**NOTE** It is not necessary to add *OpenNMS* to the run level manually, it is automatically added after setup.

*Startup OpenNMS*

```
service opennms start
```

After starting OpenNMS, the web application can be accessed on http://<ip-or-fqdn-of-your-server>:8980/opennms. The default login user is *admin* and the password is initialized to *admin*.

**IMPORTANT** Change the default admin password to a secure password immediately.

## 1.4. Install on Microsoft Windows Systems

*OpenNMS* is mostly developed on Unix/Linux based systems, nevertheless it is possible to install the platform on *Microsoft Windows* operating systems. To install the application a graphical installer is provided and can be used to install *OpenNMS* on *Microsoft Windows*. This section describes how to install the *OpenNMS* platform on *Microsoft Windows 2012 Server*.

**NOTE** The standalone installer for *Microsoft Windows* is only available for the most recent stable version of *OpenNMS*.

**IMPORTANT** It is required to have Oracle JDK 8 installed. The *JRE* is **NOT** sufficient.

**TIP** To edit *OpenNMS* configuration files on *Microsoft Windows* the tool Notepad++ can deal with the formatting of *.property* and *.xml* files.

The setup process is described in the following steps:

1. Installation of *PostgreSQL* database service
2. Download and install the graphical *OpenNMS* installer
3. First start of the *OpenNMS* application

### 1.4.1. Installation PostgreSQL

*PostgreSQL* is available for *Microsoft Windows* and latest version can be downloaded from Download PostgreSQL page. Follow the on-screen instructions of the graphical installer.

**NOTE** The placeholder `{PG-VERSION}` represents the *PostgreSQL* version number. A version of *9.1+* is required for *OpenNMS*.

The following information has to be provided:

- Installation directory for *PostgreSQL*, e.g. `C:\Program Files\PostgreSQL{PG-VERSION}`
- Password for the database superuser (*postgres*), this password will be used during the *OpenNMS* setup.
- Port to listen for *PostgreSQL* connections, default is `5432` and can normally be used.
- Locale for the database, keep `[Default locale]`, if you change the locale, *OpenNMS* may not be able to initialize the database.

**TIP** It is not required to install anything additional from the *PostgreSQL Stack Builder*.

**NOTE** The database data directory is automatically initialized during the setup and the *postgresql-x64-{PG-VERSION}* is already added as service and automatically started at system boot.

**NOTE** It is not necessary to change the authentication method in `pg_hba.conf`, it is by default set to `md5` for localhost connections.

### 1.4.2. Install OpenNMS with GUI installer

For *Microsoft Windows* environments download the *standalone-opennms-installer-{ONMS-VERSION}.zip* file from the OpenNMS SourceForge repository. Extract the downloaded *ZIP* file.

**NOTE** The `{ONMS-VERSION}` has to be replaced with the latest stable version.

Start the graphical installer and follow the on screen instructions. The following information has to be provided:

- Path to *Oracle JDK*, e.g. `C:\Program Files\Java\jdk1.8.0_51`

- Installation path for *OpenNMS*, e.g. `C:\Program Files\OpenNMS`
- Select packages which has to be installed, the minimum default selection is *Core* and *Docs*
- PostgreSQL Database connection
  - Host: Server with *PostgreSQL* running, e.g. `localhost`
  - Name: Database name for *OpenNMS*, e.g. `opennms`
  - Port: *TCP* port connecting to *PostgreSQL* server, e.g. `5432`
  - Username (administrative superuser): *PostgreSQL* superuser, e.g. `postgres`
  - Password (administrative superuser): Password given during *PostgreSQL* setup for the superuser
  - Username (runtime user for opennms): Username to connect to the *OpenNMS* database, e.g. `opennms`
  - Password (runtime user for opennms): Password to connect to the *OpenNMS* database, e.g. `opennms`
- Configure a discovery range for an initial node discovery. If you don't want any discovery set begin and end to the same unreachable address.

| | |
|---|---|
| **IMPORTANT** | Choose secure passwords for all database users and don't use the example passwords above in production. |
| **WARNING** | There is currently an open issue in the installer NMS-7831. Username and password are not written to the `opennms-datasources.xml` file and has to be changed manually. The initialize of the database will fail with an authentication error. |

*Configuration for database authentication in OpenNMS*

```
<jdbc-data-source name="opennms"
                  database-name="opennms"
                  class-name="org.postgresql.Driver"
                  url="jdbc:postgresql://localhost:5432/opennms"
                  user-name="** YOUR-OPENNMS-USERNAME **"<1>
                  password="** YOUR-OPENNMS-PASSWORD **" /><2>

<jdbc-data-source name="opennms-admin"
                  database-name="template1"
                  class-name="org.postgresql.Driver"
                  url="jdbc:postgresql://localhost:5432/template1"
                  user-name="postgres"<3>
                  password="** YOUR-POSTGRES-PASSWORD **" /><4>
```

① Set the user name to access the *OpenNMS* database table

② Set the password to access the *OpenNMS* database table

③ Set the *postgres* user for administrative access to PostgreSQL

④ Set the password for administrative changes of the *OpenNMS* database table

After setting the username and passwords in `opennms-datasources.xml` re-run the graphical installer and also initialize the database. *OpenNMS* can be started and stopped with the `start.bat` and `stop.bat` script located in `%OPENNMS_HOME%\bin` directory.

After starting *OpenNMS* with the `start.bat` file the web application can be accessed on http://<ip-or-fqdn-of-your-server>:8980/opennms. The default login user is *admin* and the password is initialized to *admin*.

**IMPORTANT** Change the default admin password to a secure password immediately.

**TIP** The Wiki article Configuring OpenNMS as Windows Service describes how to create a *Windows Service* from the `start.bat` files. There is also a Java Wrapper which allows to install *Java* applications as *Windows Service*.

# Chapter 2. Installing Oracle Java Environment

Installing *Oracle Java 8* requires external installation packages. These packages are provided from *Oracle* or 3rd party maintainer for the *Debian* and *Ubuntu-based Linux Distributions*. The following tools should be installed to follow this installation manual:

- download files and tools with `wget` and `curl`
- extract archives with `tar`
- text manipulation with `sed`
- Editor, e.g. `vi`, `nano` or `joe`
- internet access

**WARNING** By downloading the *Oracle Java 8 RPM* installer you'll accept the license agreement from *Oracle* which can be found on the Java distribution web site.

## 2.1. Setup on RHEL-based systems

This section describes how to install *Oracle Java 8* on a *RPM-based* system like *Red Hat Enterprise Linux 7* or *CentOS 7.1*.

*Download Oracle JDK RPM*

```
wget --no-cookies \
     --no-check-certificate \
     --header \
              "Cookie: oraclelicense=accept-securebackup-cookie" \
              "http://download.oracle.com/otn-pub/java/jdk/8u45-b14/jdk-8u45-linux-x64.rpm" \
     -O /tmp/jdk-8-linux-x64.rpm
```

*Install Oracle JDK RPM file*

```
yum install /tmp/jdk-8-linux-x64.rpm
```

## 2.2. Setup on *Debian-based* systems

This section describes how to install *Oracle Java 8* on a *Debian-based* system like *Debian 8* or *Ubuntu 14.04 LTS*.

*Add Java repository from webupd8 maintainer*

```
su -
echo "deb http://ppa.launchpad.net/webupd8team/java/ubuntu trusty main" | tee
/etc/apt/sources.list.d/webupd8team-java.list
echo "deb-src http://ppa.launchpad.net/webupd8team/java/ubuntu trusty main" | tee -a
/etc/apt/sources.list.d/webupd8team-java.list
```

*Add repository key server and update repository*

```
apt-key adv --keyserver hkp://keyserver.ubuntu.com:80 --recv-keys EEA14886
apt-get update
```

*Install Oracle Java 8 installer*

```
apt-get install -y oracle-java8-installer
```

## 2.3. Setup on Windows Server

This section describes how to install *Oracle Java 8* on a system running the *Microsoft Windows Server 2012* operating system.

*Download the Microsoft Windows Java 8 installer with PowerShell or a browser*

```
cd C:\Users\Administrator\Downloads
Invoke-WebRequest http://javadl.sun.com/webapps/download/AutoDL?BundleId=107944 -Outfile java8-
installer.exe
```

Start the `java8-installer.exe` from the command line or with *Windows Explorer* from the Administrator's *Download* folder.

**NOTE** The setup requires administrative privileges.

## 2.4. Java Environment

To provide *Java*, applications use the `$JAVA_HOME` environment variable. The environment can be set for a specific user or globally for the whole system on boot time.

- RHEL: `/usr/java/jdk1.8.0_51`
- Debian: `/usr/lib/jvm/java-8-oracle`
- Windows Server 2012: `C:\Program Files\Java\jre1.8.0_51`

### 2.4.1. Set Java home in Linux

*Option 1: Set the Java environment for the current user*

```
vi ~/.bash_profile
export JAVA_HOME=/path/to/java
```

*Option 2: Set the Java environment for all users on boot time*

```
vi /etc/profile
export JAVA_HOME=/path/to/java
```

### 2.4.2. Set Java home in Windows Server 2012

*Option 1: Set JAVA_HOME as user specific system variable*

```
setx "JAVA_HOME" "path\to\java"
```

*Option 2: Set JAVA_HOME as a System variable*

```
setx /M "JAVA_HOME" "path\to\java"
```

# Chapter 3. RRDtool as Time Series Database

In most *Open Source* application RRDtool is often used and is the de-facto open standard for *Time Series Data*. The basic installation of *OpenNMS* comes with *JRobin* enabled and it is possible to persist *Time Series Data* in *RRDtool*. This section describes how to install *RRDtool*, the *jrrd2 OpenNMS Java Interface* and how to configure *OpenNMS* to use it.

## 3.1. RRDtool Installation

*RRDtool* can be installed from the official package repositories provided by *RHEL* and *Debian* based *Linux* distributions.

*Installation on RHEL/CentOS*

```
yum install rrdtool
```

*Installation of RRDtool on Debian/Ubuntu*

```
apt-get install rrdtool
```

**NOTE** If you want to install the latest *RRDtool* from source, make sure the `rrdtool` binary is in search path. To make the setup easier, you can link the binary to `/usr/bin/rrdtool` which is the location *OpenNMS* will expect the executable binary.

## 3.2. Install jrrd2 Interface

To get access from the *OpenNMS Java Virtual Machine* you have to install *jrrd2* as an interface. You can install it from the *OpenNMS* package repository with:

*Installation of jrrd2 on RHEL/CentOS*

```
yum install jrrd2
```

*Installation of jrrd2 on Debian/Ubuntu*

```
apt-get install jrrd2
```

**NOTE** With OpenNMS 17.0.0 it is preferred to use *jrrd2* instead of *jrrd*. The *jrrd2* module is improved for performance by adding multithreading capabilities.

## 3.3. Configuration of OpenNMS

To configure *OpenNMS* to use *RRDtool* instead of *JRobin* configure the following properties in `rrd-configuration.properties`.

*Configuration of RRDtool in OpenNMS on RHEL/CentOS*

```
org.opennms.rrd.strategyClass=org.opennms.netmgt.rrd.rrdtool.MultithreadedJniRrdStrategy
org.opennms.rrd.interfaceJar=/usr/share/java/jrrd2.jar
opennms.library.jrrd2=/usr/lib64/libjrrd2.so
```

*Configuration of RRDtool in OpenNMS on Debian/Ubuntu*

```
org.opennms.rrd.strategyClass=org.opennms.netmgt.rrd.rrdtool.MultithreadedJniRrdStrategy
org.opennms.rrd.interfaceJar=/usr/share/java/jrrd2.jar
opennms.library.jrrd2=/usr/lib/jni/libjrrd2.so
```

**TIP** *OpenNMS* expects the *RRDtool* binary in `/usr/bin/rrdtool`.

*Table 2. References to the RRDtool binary*

| Configuration file | Property |
|---|---|
| `opennms.properties` | `rrd.binary=/usr/bin/rrdtool` |
| `response-adhoc-graph.properties` | `command.prefix=/usr/bin/rrdtool` |
| `response-graph.properties` | `command.prefix=/usr/bin/rrdtool`<br><br>`info.command=/usr/bin/rrdtool` |
| `snmp-adhoc-graph.properties` | `command.prefix=/usr/bin/rrdtool` |
| `snmp-graph.properties` | `command.prefix=/usr/bin/rrdtool`<br><br>`command=/usr/bin/rrdtool info` |

# Chapter 4. Installing Time Series database Newts

Newts is a time-series data store based on Apache Cassandra. *Newts* is a persistence strategy, that can be used as an alternative to JRobin or RRDtool.

| | |
|---|---|
| **IMPORTANT** | It is currently not supported to initialize the *Newts* keyspace from *Microsoft Windows Server* operating system. *Microsoft Windows* based *Cassandra* server can be part of the cluster, but keyspace initialization is only possible using a _Linux-_based system. |

## 4.1. Setting up Cassandra

It is recommended to install *Cassandra* on a dedicated server, but is also possible to run a node on the *OpenNMS* server itself. This installation guide describes how to set up a single *Cassandra* instance for evaluating and testing *Newts*. These steps are not suitable for a high performance production *Cassandra Cluster*. For further information see Cassandra Getting Started Guide. If you already have a running cluster you can skip this section.

### 4.1.1. Installing on RHEL-based systems

This section describes how to install the latest *Cassandra 2.1.x* release on a *RHEL* based systems for *Newts*. The first step is to add the *DataStax* community repository and install the required *GPG Key* to verify the integrity of the *RPM packages*. After that install the package with *yum* and the *Cassandra* service is managed by *Systemd*.

| | |
|---|---|
| **NOTE** | This description was built on *RHEL 7* and *CentOS 7.1*. |

*Add the DataStax repository*

```
vi /etc/yum.repos.d/datastax.repo
```

*Content of the datastax.repo file*

```
[datastax]
name = "DataStax Repo for Apache Cassandra"
baseurl = http://rpm.datastax.com/community
enabled = 1
gpgcheck = 1
```

*Install GPG key to verify RPM packages*

```
rpm --import http://rpm.datastax.com/rpm/repo_key
```

*Install latest Cassandra 2.1.x package*

```
yum install dsc21
```

*Enable Cassandra to start on system boot*

```
chkconfig cassandra on
```

*Start cassandra service*

```
service cassandra start
```

**TIP** Verify whether the *Cassandra* service is automatically started after rebooting the server.

### 4.1.2. Installing on Debian-based systems

This section describes how to install the latest *Cassandra 2.1.x* release on a *Debian*-based system for *Newts*. The first step is to add the *DataStax* community repository and install the required *GPG Key* to verify the integrity of the *DEB packages*. After that install the packages with *apt* and the *Cassandra* service is added to the runlevel configuration.

**NOTE** This description was built on *Debian 8* and *Ubuntu 14.04 LTS*.

*Add the DataStax repository*

```
vi /etc/apt/sources.list.d/cassandra.sources.list
```

*Content of the cassandra.sources.list file*

```
deb http://debian.datastax.com/community stable main
```

*Install GPG key to verify DEB packages*

```
wget -O - http://debian.datastax.com/debian/repo_key | apt-key add -
```

*Install latest Cassandra 2.1.x package*

```
apt-get update
apt-get install dsc21=2.1.10-1 cassandra=2.1.10
```

The *Cassandra* service is added to the runlevel configuration and is automatically started after installing the package.

**TIP** Verify whether the *Cassandra* service is automatically started after rebooting the server.

### 4.1.3. Installing on Windows Server systems

This section describes how to install the latest *Cassandra 2.1.x* release on a *Microsoft Windows Server* based systems for *Newts*. The first step is to download the graphical installer and register *Cassandra* as a *Windows Service* so it can be manged through the *Service Manager*.

**NOTE** This description was built on *Windows Server 2012*.

*Download the DataStax graphical installer for Cassandra from PowerShell or a Browser*

```
cd C:\Users\Administrator\Downloads
Invoke-WebRequest http://downloads.datastax.com/community/datastax-community-64bit_2.1.10.msi -Outfile
datastax-community-64bit_2.1.10.msi
```

Run the Windows Installer file from *PowerShell* or through *Windows Explorer* and follow the setup wizard to install. During the installation, accept the options to automatically start the services. By default the *DataStax Server*, *OpsCenter Server* and the *OpsCenter Agent* will be automatically installed and started.

**NOTE** The *DataStax OpsCenter Server* is only required to be installed once per *Cassandra Cluster*.

**IMPORTANT** If you install the *DataStax OpsCenter* make sure you have *Chrome* or *Firefox* installed.

## 4.2. Configure OpenNMS

Once *Cassandra* is installed, *OpenNMS* can be configured to use *Newts*. To enable and configure *Newts*, set the following properties in `${OPENNMS_HOME}/etc/opennms.properties`:

*Configuration for OpenNMS*

```
# Configure storage strategy
org.opennms.rrd.storeByForeignSource=true
org.opennms.timeseries.strategy=newts

# Configure Newts time series storage connection
org.opennms.newts.config.hostname=$ipaddress$
org.opennms.newts.config.keyspace=newts
org.opennms.newts.config.port=9042
```

**NOTE** The `org.opennms.newts.config.hostname` property also accepts a comma separated list of hostnames and or IP addresses.

Once *Newts* has been enabled, you can initialize the *Newts* schema in *Cassandra* with the following:

*Initialize Newts keyspace in Cassandra*

```
${OPENNMS_HOME}/bin/newts init
```

Optionally, you can now connect to your *Cassandra* cluster and verify that the keyspace has been properly initialized:

*Verify if the keyspace is initialized with cqlsh*

```
cqlsh
use newts;
describe table terms;
describe table samples;
```

Restart *OpenNMS* to apply the changes.

# Chapter 5. Installing R

R is a free software environment for statistical computing and graphics. *OpenNMS* can leverage the power of *R* for forecasting and advanced numerical computations of time series data.

*OpenNMS* interfaces with *R* via *stdin* and *stdout*, and for this reason, *R* must be installed on the same host. Note that installing *R* is optional, and not required by any of the core components.

**IMPORTANT** The *R* integration is not currently supported on *Microsoft Windows* systems.

## 5.1. Installing on RHEL-based systems

This section describes how to install *R* on a *RHEL* based system.

**NOTE** This description was built on *RHEL 7* and *CentOS 7.1*.

*Install the EPEL repositories*

```
yum install epel-release
```

*Install R*

```
yum install R
```

## 5.2. Installing on Debian-based systems

This section describes how to install *R* on a *Debian*-based system.

**NOTE** This description was built on *Debian 8* and *Ubuntu 14.04 LTS*.

*Install R*

```
sudo apt-get install r-recommended
```