**Install and Configure MySQL NDB Cluster on Linux**

**Type of Installation of NDB Cluster are:-**

1. Installing an NDB Cluster Binary Release.
2. Installing an NDB Cluster from RPM
3. Installing an NDB Cluster Using .deb file
4. Building an NDB Cluster from Source on Linux

Each NDB Cluster host computer must have the correct executable programs installed. A host running an SQL node must have installed on it a MySQL Server binary ([**mysqld**](https://dev.mysql.com/doc/refman/5.7/en/mysqld.html)). Management nodes require the management server daemon ([**ndb\_mgmd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndb-mgmd.html)); data nodes require the data node daemon ([**ndbd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndbd.html) or [**ndbmtd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndbmtd.html)). It is not necessary to install the MySQL Server binary on management node hosts and data node hosts. It is recommended that you also install the management client ([**ndb\_mgm**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndb-mgm.html)) on the management server host.

**Installing an NDB Cluster Binary Release on Linux: *-***  To install the correct executables for each type of Cluster node from precompiled binaries supplied by Oracle.

For setting up a cluster using precompiled binaries, the first step in the installation process for each cluster host is to download the binary archive from the [NDB Cluster downloads page](https://dev.mysql.com/downloads/cluster/). (For the most recent 64-bit NDB 7.6 release, this is mysql-cluster-gpl-7.6.24-linux-glibc2.12-x86\_64.tar.gz.) We assume that you have placed this file in each machine's /var/tmp directory.

**SQL nodes.** On each of the machines designated to host SQL nodes, perform the following steps as the system root user:

1. Check your /etc/passwd and /etc/group files (or use whatever tools are provided by your operating system for managing users and groups) to see whether there is already a mysql group and mysql user on the system. Some OS distributions create these as part of the operating system installation process. If they are not already present, create a new mysql user group, and then add a mysql user to this group:

$> groupadd mysql

$> useradd -g mysql -s /bin/false mysql

The syntax for **useradd** and **groupadd** may differ slightly on different versions of UNIX, or they may have different names such as **adduser** and **addgroup**.

1. Change location to the directory containing the downloaded file, unpack the archive, and create a symbolic link named mysql to the mysql directory.

$> cd /var/tmp

$> tar -C /usr/local -xzvf mysql-cluster-gpl-7.6.24-linux-glibc2.12-x86\_64.tar.gz

#### $> ln -s /usr/local/mysql-cluster-gpl-7.6.24-linux-glibc2.12-x86\_64 /usr/local/mysql

1. Change location to the mysql directory and set up the system databases using [**mysqld**](https://dev.mysql.com/doc/refman/5.7/en/mysqld.html) [--initialize](https://dev.mysql.com/doc/refman/5.7/en/server-options.html#option_mysqld_initialize) as shown here:

$> cd mysql

$> mysqld --initialize

This generates a random password for the MySQL root account. If you do *not* want the random password to be generated, you can substitute the [--initialize-insecure](https://dev.mysql.com/doc/refman/5.7/en/server-options.html#option_mysqld_initialize-insecure) option for --initialize. In either case, you should review [Section 2.10.1, “Initializing the Data Directory”](https://dev.mysql.com/doc/refman/5.7/en/data-directory-initialization.html), for additional information before performing this step. See also [Section 4.4.4, “mysql\_secure\_installation — Improve MySQL Installation Security”](https://dev.mysql.com/doc/refman/5.7/en/mysql-secure-installation.html).

1. Set the necessary permissions for the MySQL server and data directories:

$> chown -R root .

$> chown -R mysql data

$> chgrp -R mysql .

1. Copy the MySQL startup script to the appropriate directory, make it executable, and set it to start when the operating system is booted up:

$> cp support-files/mysql.server /etc/rc.d/init.d/

$> chmod +x /etc/rc.d/init.d/mysql.server

$> chkconfig --add mysql.server

(The startup scripts directory may vary depending on your operating system and version—for example, in some Linux distributions, it is /etc/init.d.)

Here we use Red Hat's **chkconfig** for creating links to the startup scripts; use whatever means is appropriate for this purpose on your platform, such as **update-rc.d** on Debian.

Remember that the preceding steps must be repeated on each machine where an SQL node is to reside.

**Data nodes.** Installation of the data nodes does not require the [**mysqld**](https://dev.mysql.com/doc/refman/5.7/en/mysqld.html) binary. Only the NDB Cluster data node executable [**ndbd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndbd.html) (single-threaded) or [**ndbmtd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndbmtd.html) (multithreaded) is required. These binaries can also be found in the .tar.gz archive. Again, we assume that you have placed this archive in /var/tmp.

As system root (that is, after using **sudo**, **su root**, or your system's equivalent for temporarily assuming the system administrator account's privileges), perform the following steps to install the data node binaries on the data node hosts: -

1. Change location to the /var/tmp directory, and extract the [**ndbd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndbd.html) and [**ndbmtd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndbmtd.html) binaries from the archive into a suitable directory such as /usr/local/bin:

$> cd /var/tmp

$> tar -zxvf mysql-cluster-gpl-7.6.24-linux-glibc2.12-x86\_64.tar.gz

$> cd mysql-cluster-gpl-7.6.24-linux-glibc2.12-x86\_64

$> cp bin/ndbd /usr/local/bin/ndbd

$> cp bin/ndbmtd /usr/local/bin/ndbmtd

(You can safely delete the directory created by unpacking the downloaded archive, and the files it contains, from /var/tmp once [**ndb\_mgm**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndb-mgm.html) and [**ndb\_mgmd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndb-mgmd.html) have been copied to the executables directory.)

1. Change location to the directory into which you copied the files, and then make both of them executable:

$> cd /usr/local/bin

$> chmod +x ndb\*

The preceding steps should be repeated on each data node host.

Although only one of the data node executables is required to run an NDB Cluster data node, we have shown you how to install both [**ndbd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndbd.html) and [**ndbmtd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndbmtd.html) in the preceding instructions. We recommend that you do this when installing or upgrading NDB Cluster, even if you plan to use only one of them, since this should save time and trouble in the event that you later decide to change from one to the other.

**Note: -** The data directory on each machine hosting a data node is /usr/local/mysql/data. This piece of information is essential when configuring the management node.

**Management nodes.** Installation of the management node does not require the [**mysqld**](https://dev.mysql.com/doc/refman/5.7/en/mysqld.html) binary. Only the NDB Cluster management server ([**ndb\_mgmd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndb-mgmd.html)) is required; you most likely want to install the management client ([**ndb\_mgm**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndb-mgm.html)) as well. Both of these binaries also be found in the .tar.gz archive. Again, we assume that you have placed this archive in /var/tmp.

As system root, perform the following steps to install [**ndb\_mgmd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndb-mgmd.html) and [**ndb\_mgm**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndb-mgm.html) on the management node host:

1. Change location to the /var/tmp directory, and extract the [**ndb\_mgm**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndb-mgm.html) and [**ndb\_mgmd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndb-mgmd.html) from the archive into a suitable directory such as /usr/local/bin:

$> cd /var/tmp

$> tar -zxvf mysql-cluster-gpl-7.6.24-linux-glibc2.12-x86\_64.tar.gz

$> cd mysql-cluster-gpl-7.6.24-linux-glibc2.12-x86\_64

$> cp bin/ndb\_mgm\* /usr/local/bin

(You can safely delete the directory created by unpacking the downloaded archive, and the files it contains, from /var/tmp once [**ndb\_mgm**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndb-mgm.html) and [**ndb\_mgmd**](https://dev.mysql.com/doc/refman/5.7/en/mysql-cluster-programs-ndb-mgmd.html) have been copied to the executables directory.)

1. Change location to the directory into which you copied the files, and then make both of them executable:

$> cd /usr/local/bin

$> chmod +x ndb\_mgm\*

The preceding steps should be repeated on each data node host.

#### **Installing NDB Cluster from RPM: -**

To install the correct executables for each type of NDB Cluster 8.0 node using RPM packages supplied by Oracle.

As an alternative to the method described in this section, Oracle provides MySQL Repositories for NDB Cluster that are compatible with many common Linux distributions. Two repositories, listed here, are available for RPM-based distributions:

* For distributions using **yum** or **dnf**, you can use the MySQL Yum Repository for NDB Cluster. See [*Installing MySQL NDB Cluster Using the Yum Repository*](https://dev.mysql.com/doc/mysql-yum-repo-quick-guide/en/#repo-qg-yum-fresh-cluster-install), for instructions and additional information.
* For SLES, you can use the MySQL SLES Repository for NDB Cluster. See [*Installing MySQL NDB Cluster Using the SLES Repository*](https://dev.mysql.com/doc/mysql-sles-repo-quick-guide/en/#repo-qg-sles-fresh-cluster-install), for instructions and additional information.

RPMs are available for both 32-bit and 64-bit Linux platforms. The filenames for these RPMs use the following pattern:

mysql-cluster-community-data-node-8.0.31-1.el7.x86\_64.rpm

mysql-cluster-*license*-*component*-*ver*-*rev*.*distro*.*arch*.rpm

*license*:= {commercial | community}

*component*: {management-server | data-node | server | client | *other—see text*}

*ver*: *major*.*minor*.*release*

*rev*: *major*[.*minor*]

*distro*: {el6 | el7 | sles12}

*arch*: {i686 | x86\_64}

***License*** indicates whether the RPM is part of a Commercial or Community release of NDB Cluster. In the remainder of this section, we assume for the examples that you are installing a Community release.

A single bundle (.tar file) of all NDB Cluster RPMs for a given platform and architecture is also available. The name of this file follows the pattern shown here:

mysql-cluster-*license*-*ver*-*rev*.*distro*.*arch*.rpm-bundle.tar

You can extract the individual RPM files from this file using **tar** or your preferred tool for extracting archives.

The components required to install the three major types of NDB Cluster nodes are given in the following list:

* *Management node*: management-server
* *Data node*: data-node
* *SQL node*: server and common

In addition, the client RPM should be installed to provide the [**ndb\_mgm**](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster-programs-ndb-mgm.html) management client on at least one management node. You may also wish to install it on SQL nodes, to have [**mysql**](https://dev.mysql.com/doc/refman/8.0/en/mysql.html) and other MySQL client programs available on these. We discuss installation of nodes by type later in this section.

***ver*** represents the three-part NDB storage engine version number in 8.0.***x*** format, shown as 8.0.31 in the examples. rev provides the RPM revision number in ***major***.***minor*** format. In the examples shown in this section, we use 1.1 for this value.

The ***distro*** (Linux distribution) is one of rhel5 (Oracle Linux 5, Red Hat Enterprise Linux 4 and 5), el6 (Oracle Linux 6, Red Hat Enterprise Linux 6), el7 (Oracle Linux 7, Red Hat Enterprise Linux 7), or sles12 (SUSE Enterprise Linux 12). For the examples in this section, we assume that the host runs Oracle Linux 7, Red Hat Enterprise Linux 7, or the equivalent (el7).

***arch*** is i686 for 32-bit RPMs and x86\_64 for 64-bit versions. In the examples shown here, we assume a 64-bit platform.

The NDB Cluster version number in the RPM file names (shown here as 8.0.31) can vary according to the version which you are actually using. *It is very important that all of the Cluster RPMs to be installed have the same version number*. The architecture should also be appropriate to the machine on which the RPM is to be installed; in particular, you should keep in mind that 64-bit RPMs (x86\_64) cannot be used with 32-bit operating systems (use i686 for the latter).

**Data nodes.** On a computer that is to host an NDB Cluster data node it is necessary to install only the data-node RPM. To do so, copy this RPM to the data node host, and run the following command as the system root user, replacing the name shown for the RPM as necessary to match that of the RPM downloaded from the MySQL website:

$> rpm -Uhv mysql-cluster-community-data-node-8.0.31-1.el7.x86\_64.rpm

This installs the [**ndbd**](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster-programs-ndbd.html) and [**ndbmtd**](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster-programs-ndbmtd.html) data node binaries in /usr/sbin. Either of these can be used to run a data node process on this host.

**SQL nodes.** Copy the server and common RPMs to each machine to be used for hosting an NDB Cluster SQL node (server requires common). Install the server RPM by executing the following command as the system root user, replacing the name shown for the RPM as necessary to match the name of the RPM downloaded from the MySQL website:

$> rpm -Uhv mysql-cluster-community-server-8.0.31-1.el7.x86\_64.rpm

This installs the MySQL server binary ([**mysqld**](https://dev.mysql.com/doc/refman/8.0/en/mysqld.html)), with NDB storage engine support, in the /usr/sbin directory. It also installs all needed MySQL Server support files and useful MySQL server programs, including the [**mysql.server**](https://dev.mysql.com/doc/refman/8.0/en/mysql-server.html) and [**mysqld\_safe**](https://dev.mysql.com/doc/refman/8.0/en/mysqld-safe.html) startup scripts (in /usr/share/mysql and /usr/bin, respectively). The RPM installer should take care of general configuration issues (such as creating the mysql user and group, if needed) automatically.

**Important**

You must use the versions of these RPMs released for NDB Cluster; those released for the standard MySQL server do not provide support for the NDB storage engine.

To administer the SQL node (MySQL server), you should also install the client RPM, as shown here:

$> rpm -Uhv mysql-cluster-community-client-8.0.31-1.el7.x86\_64.rpm

This installs the [**mysql**](https://dev.mysql.com/doc/refman/8.0/en/mysql.html) client and other MySQL client programs, such as [**mysqladmin**](https://dev.mysql.com/doc/refman/8.0/en/mysqladmin.html) and [**mysqldump**](https://dev.mysql.com/doc/refman/8.0/en/mysqldump.html), to /usr/bin.

**Management nodes.** To install the NDB Cluster management server, it is necessary only to use the management-server RPM. Copy this RPM to the computer intended to host the management node, and then install it by running the following command as the system root user (replace the name shown for the RPM as necessary to match that of the management-server RPM downloaded from the MySQL website):

$> rpm -Uhv mysql-cluster-community-management-server-8.0.31-1.el7.x86\_64.rpm

This RPM installs the management server binary [**ndb\_mgmd**](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster-programs-ndb-mgmd.html) in the /usr/sbin directory. While this is the only program actually required for running a management node, it is also a good idea to have the [**ndb\_mgm**](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster-programs-ndb-mgm.html) NDB Cluster management client available as well. You can obtain this program, as well as other NDB client programs such as [**ndb\_desc**](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster-programs-ndb-desc.html) and [**ndb\_config**](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster-programs-ndb-config.html), by installing the client RPM as described previously.

After installing from RPM, you still need to configure the cluster; see [Section 23.3.3, “Initial Configuration of NDB Cluster”](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster-install-configuration.html), for the relevant information.

*It is very important that all of the Cluster RPMs to be installed have the same version number*. The ***architecture*** designation should also be appropriate to the machine on which the RPM is to be installed; in particular, you should keep in mind that 64-bit RPMs cannot be used with 32-bit operating systems.

**Data nodes.** On a computer that is to host a cluster data node it is necessary to install only the server RPM. To do so, copy this RPM to the data node host, and run the following command as the system root user, replacing the name shown for the RPM as necessary to match that of the RPM downloaded from the MySQL website:

$> rpm -Uhv MySQL-Cluster-server-gpl-8.0.31-1.sles11.i386.rpm

Although this installs all NDB Cluster binaries, only the program [**ndbd**](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster-programs-ndbd.html) or [**ndbmtd**](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster-programs-ndbmtd.html) (both in /usr/sbin) is actually needed to run an NDB Cluster data node.

**SQL nodes.** On each machine to be used for hosting a cluster SQL node, install the server RPM by executing the following command as the system root user, replacing the name shown for the RPM as necessary to match the name of the RPM downloaded from the MySQL website:

$> rpm -Uhv MySQL-Cluster-server-gpl-8.0.31-1.sles11.i386.rpm

This installs the MySQL server binary ([**mysqld**](https://dev.mysql.com/doc/refman/8.0/en/mysqld.html)) with [NDB](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster.html) storage engine support in the /usr/sbin directory, as well as all needed MySQL Server support files. It also installs the [**mysql.server**](https://dev.mysql.com/doc/refman/8.0/en/mysql-server.html) and [**mysqld\_safe**](https://dev.mysql.com/doc/refman/8.0/en/mysqld-safe.html) startup scripts (in /usr/share/mysql and /usr/bin, respectively). The RPM installer should take care of general configuration issues (such as creating the mysql user and group, if needed) automatically.

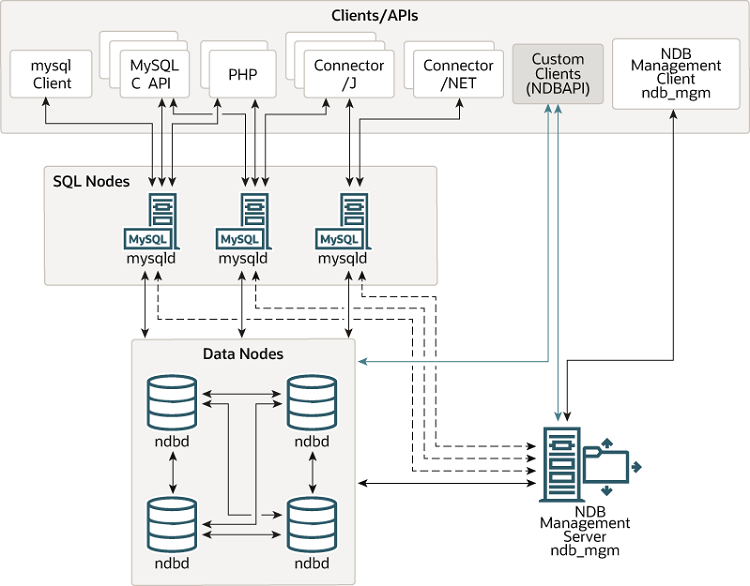
To administer the SQL node (MySQL server), you should also install the client RPM, as shown here:

$> rpm -Uhv MySQL-Cluster-client-gpl-8.0.31-1.sles11.i386.rpm

This installs the [**mysql**](https://dev.mysql.com/doc/refman/8.0/en/mysql.html) client program.

**Management nodes.** To install the NDB Cluster management server, it is necessary only to use the server RPM. Copy this RPM to the computer intended to host the management node, and then install it by running the following command as the system root user (replace the name shown for the RPM as necessary to match that of the server RPM downloaded from the MySQL website):

$> rpm -Uhv MySQL-Cluster-server-gpl-8.0.31-1.sles11.i386.rpm



NDB Cluster is designed not to have any single point of failure. In a shared-nothing system, each component is expected to have its own memory and disk, and the use of shared storage mechanisms such as network shares, network file systems, and SANs is not recommended or supported.

NDB Cluster integrates the standard MySQL server with an in-memory clustered storage engine called [NDB](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster.html) (which stands for “Network Database”). In our documentation, the term [NDB](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster.html) refers to the part of the setup that is specific to the storage engine, whereas “MySQL NDB Cluster” refers to the combination of one or more MySQL servers with the [NDB](https://dev.mysql.com/doc/refman/8.0/en/mysql-cluster.html) storage engine.

An NDB Cluster consists of a set of computers, known as hosts, each running one or more processes. These processes, known as nodes, may include MySQL servers (for access to NDB data), data nodes (for storage of the data), one or more management servers, and possibly other specialized data access programs.