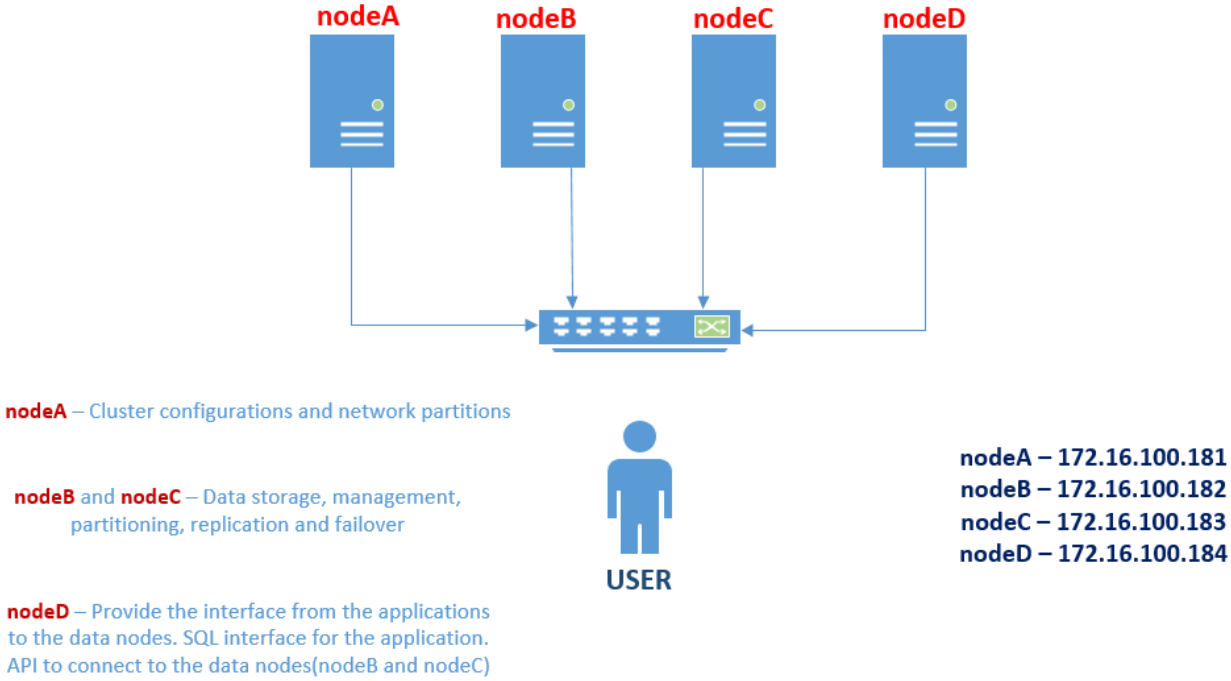
MySQL Cluster 7.4.12

Our purpose is install and configure MySQL cluster. For that we need four machines. I will describe the as following:

1 - Management server.
2 - Data server.
1 - SQL server.

The network topology will be as following:

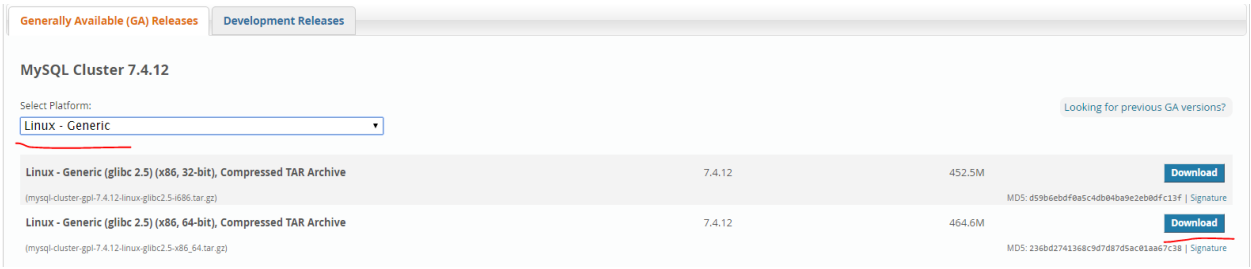


As virtual environment I have used VMWare workstation 10.1.
As server environment I have used Ubuntu 14.04 x64 server. Already installed, configured and updated to all virtual machines.

The IP addresses of the servers will be as following:
172.16.100.181(Hostname: **nodeA**) - Management server.
172.16.100.182(Hostname: **nodeB**) - Data node1
172.16.100.183(Hostname: **nodeC**) - Data node2
172.16.100.184(Hostname: **nodeD**) - SQL node.

First of all we must be registered in the http://dev.mysql.com/downloads/cluster/ site and download MySQL-Cluster package.

Select **"Linux - Generic"** and click to **download** button.



When download is finished, copy **mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64.tar.gz** file from Windows desktop to the **nodeA** via WinSCP. And after that copy this file via **scp** from **nodeA** to all other(**nodeB, nodeC, nodeD**) nodes.

Install **libaio1** package to the all nodes:
root@nodeA:~# **apt-get -y install libaio1**
root@nodeB:~# **apt-get -y install libaio1**
root@nodeC:~# **apt-get -y install libaio1**
root@nodeD:~# **apt-get -y install libaio1**

Install and configure Management node

We will install **ndb_mgmd** and **ndb_mgm** to the management node **nodeA**.

root@**nodeA**:~# **tar zxvf mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64.tar.gz**
root@**nodeA**:~# **cd mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64/**
root@nodeA:~/mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64# **cp bin/ndb_mgm* /usr/local/bin**

Make this files executable:
root@**nodeA**:~/mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64# **cd /usr/local/bin/**
root@**nodeA**:/usr/local/bin# **chmod +x ndb_mgm***

Create configuration directory and configuration file:
root@**nodeA**:/usr/local/bin# **mkdir /var/lib/mysql-cluster; cd /var/lib/mysql-cluster**
config.ini file will be as following:
aroot@nodeA:/var/lib/mysql-cluster# cat config.ini

```
[ndbd default]
NoOfReplicas=2    # Replication count number
DataMemory=80M    # Memory allocation size for data storage
IndexMemory=18M   # Memory allocation for index storage

[tcp default]
portnumber=2202   # Default port number which needed for communicate between nodes.

[ndb_mgmd]
hostname=172.16.100.181          # Hostname or IP address of MGM node
datadir=/var/lib/mysql-cluster   # Directory for MGM node log files
```

```
[ndbd]
hostname=172.16.100.182          # Hostname or IP address of data node
datadir=/usr/local/mysql/data    # Directory for this data node's data files

[ndbd]
hostname=172.16.100.183          # Hostname or IP address of data node
datadir=/usr/local/mysql/data    # Directory for this data node's data files

[mysqld]
hostname=172.16.100.184          # Hostname or IP address of SQL node
```

Add service to the startup. For that we will use **/etc/rc.local** file.

```
root@nodeA:~# cat /etc/rc.local | grep -v "^#" | grep -v '^$'
/usr/local/bin/ndb_mgmd -f /var/lib/mysql-cluster/config.ini --
configdir=/var/lib/mysql-cluster
exit 0
```

Installation and configuration data node

The following steps we will do for **nodeB** and **nodeC**(Just look at the hostnames):

```
root@nodeB:~# tar zxvf mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64.tar.gz
root@nodeC:~# tar zxvf mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64.tar.gz

root@nodeB:~# cd mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64/
root@nodeC:~# cd mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64/

root@nodeB:~/mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64# cp bin/ndbd /usr/local/bin
root@nodeC:~/mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64# cp bin/ndbd /usr/local/bin
```

Make **ndbd** and **ndbmtd** files, executable:

```
root@nodeB:~/mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64# cd /usr/local/bin
root@nodeB:/usr/local/bin# chmod +x ndb*

root@nodeC:~/mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64# cd /usr/local/bin
root@nodeC:/usr/local/bin# chmod +x ndb*
```

Create data folder for each data nodes:

```
root@nodeB:/usr/local/bin# mkdir -p /usr/local/mysql/data
root@nodeC:/usr/local/bin# mkdir -p /usr/local/mysql/data
```

/etc/my.cnf file for **nodeB** and **nodeC** will be as following:

```
# cat /etc/my.cnf
[mysqld]
ndbcluster                          # run NDB storage engine

[mysql_cluster]
ndb-connectstring=172.16.100.181  # IP address or hostname of management server
```

Add data **nodeB** and **nodeC** to the startUP. For that we will use the **/etc/rc.local** file.

```
root@nodeB:~# cat /etc/rc.local | grep -v '^#' | grep -v '^$'
/usr/local/bin/ndbd
exit 0

root@nodeC:~# cat /etc/rc.local | egrep -v '^$|^#'
/usr/local/bin/ndbd
exit 0
```

Installation and configuration SQL node

We need install MySQL server and for that we will use **mysql** user and group.

The following commands we will use in the **nodeD** server.

```
root@nodeD:~# groupadd mysql
root@nodeD:~# useradd -r -g mysql -s /bin/false mysql
```

Extract downloaded file and create symlink to the mysql:

```
root@nodeD:~# tar zxvf mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64.tar.gz
root@nodeD:~# mv mysql-cluster-gpl-7.4.12-linux-glibc2.5-x86_64 /usr/local/
root@nodeD:~# ln -s /usr/local/mysql-cluster-gpl-7.4.12-linux-glibc2.5-
x86_64/ /usr/local/mysql
```

Go to the MySQL folder and install database with mysql user:

```
root@nodeD:~# cd /usr/local/mysql
root@nodeD:/usr/local/mysql# scripts/mysql_install_db --user=mysql
```

Set needed permissions to the server and data directories:

```
root@nodeD:/usr/local/mysql# chown -R root .
root@nodeD:/usr/local/mysql# chown -R mysql data
root@nodeD:/usr/local/mysql# chgrp -R mysql .
```

Copy mysql startup script to the startUp folder and add service to the startup:

```
root@nodeD:/usr/local/mysql# cp support-files/mysql.server /etc/init.d
root@nodeD:/usr/local/mysql# chmod +x /etc/init.d/mysql.server
root@nodeD:/usr/local/mysql# update-rc.d mysql.server defaults
 Adding system startup for /etc/init.d/mysql.server ...
```

```
   /etc/rc0.d/K20mysql.server -> ../init.d/mysql.server
   /etc/rc1.d/K20mysql.server -> ../init.d/mysql.server
   /etc/rc6.d/K20mysql.server -> ../init.d/mysql.server
   /etc/rc2.d/S20mysql.server -> ../init.d/mysql.server
   /etc/rc3.d/S20mysql.server -> ../init.d/mysql.server
   /etc/rc4.d/S20mysql.server -> ../init.d/mysql.server
   /etc/rc5.d/S20mysql.server -> ../init.d/mysql.server
```

The content of the **/etc/my.cnf** file will be as following:

```
[mysqld]
ndbcluster                      # run NDB storage engine

[mysql_cluster]
ndb-connectstring=172.16.100.181  # IP address or hostname of management server
```

Add symlink to the binary files:

```
root@nodeD:~# ln -s /usr/local/mysql/bin/* /usr/sbin/
```

Note: You can set MySQL root password only after start MySQL service. And for that use the **"mysql_secure_installation"** command after **"Start MySQL cluster"** section.

Set MySQL root password:

```
root@nodeD:~# mysql_secure_installation
Set root password? [Y/n] Y
New password: newpass
Re-enter new password: newpass
Password updated successfully!
Reloading privilege tables..
 ... Success!

Remove anonymous users? [Y/n] Y
 ... Success!

Disallow root login remotely? [Y/n] Y
 ... Success!

Remove test database and access to it? [Y/n] Y
 - Dropping test database...
 ... Success!
 - Removing privileges on test database...
 ... Success!

Reload privilege tables now? [Y/n] Y
 ... Success!
```

Start MySQL cluster

First of all we should start management **nodeA**. And after that we should start **nodeB** and **nodeC** data nodes. At the end we should start **nodeD** SQL node.

Start management **nodeA**:
root@**nodeA**:~# **/usr/local/bin/ndb_mgmd -f /var/lib/mysql-cluster/config.ini --configdir=/var/lib/mysql-cluster**

Start data nodes **nodeB** and **nodeC**:
root@**nodeB**:~# **/usr/local/bin/ndbd**
root@**nodeC**:~# **/usr/local/bin/ndbd**

At the end start **nodeC** SQL node:
root@**nodeD**:~# **/etc/init.d/mysql.server start**

It is the end to our cluster configuration. To check cluster configuration go to the Management (**nodeA**) server and use the following command to see cluster configuartion:

```
root@nodeA:~# ndb_mgm
-- NDB Cluster -- Management Client --
ndb_mgm> show
Connected to Management Server at: localhost:1186
Cluster Configuration
---------------------
[ndbd(NDB)]     2 node(s)
id=2    @172.16.100.182  (mysql-5.6.31 ndb-7.4.12, Nodegroup: 0, *)
id=3    @172.16.100.183  (mysql-5.6.31 ndb-7.4.12, Nodegroup: 0)

[ndb_mgmd(MGM)] 1 node(s)
id=1    @172.16.100.181  (mysql-5.6.31 ndb-7.4.12)

[mysqld(API)]   1 node(s)
id=4    @172.16.100.184  (mysql-5.6.31 ndb-7.4.12)
```

Look at the status of all nodes:

```
ndb_mgm> 1 STATUS
Node 1: connected (Version 7.4.12)

ndb_mgm> 2 STATUS
Node 2: started (mysql-5.6.31 ndb-7.4.12)

ndb_mgm> 3 STATUS
Node 3: started (mysql-5.6.31 ndb-7.4.12)

ndb_mgm> 4 STATUS
Node 4: connected (Version 7.4.12)
```

Go to the SQL node and check Cluster status from the SQL:

```
root@nodeD:~# mysql -uroot -p'password'
mysql> SHOW ENGINE NDB STATUS \G
*************************** 1. row ***************************
  Type: ndbcluster
  Name: connection
Status: cluster_node_id=4, connected_host=172.16.100.181,
connected_port=1186, number_of_data_nodes=2, number_of_ready_data_nodes=2,
connect_count=0
```

Create new database with NDB engine and test this database:

```
mysql> CREATE DATABASE cluster;

mysql> USE cluster;

mysql> CREATE TABLE cluster_test (name VARCHAR(20), value VARCHAR(20))
ENGINE=ndbcluster;

mysql> INSERT INTO cluster_test (name,value)
VALUES('some_name','some_value');

mysql> SELECT * FROM cluster_test;
```

Go back to the Management node and look at the reports:

```
root@nodeA:~# ndb_mgm
-- NDB Cluster -- Management Client --
ndb_mgm> all report memory;
Connected to Management Server at: localhost:1186
Node 2: Data usage is 1%(27 32K pages of total 2560)
Node 2: Index usage is 1%(24 8K pages of total 2336)
Node 3: Data usage is 1%(27 32K pages of total 2560)
Node 3: Index usage is 1%(24 8K pages of total 2336)
```