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?? MySQL Cluster ??? RAM ???(???)????? data-node ?????????????? RAM?????????????????

?? Cluster ?????? redundancy???????? data node ?? load balance?

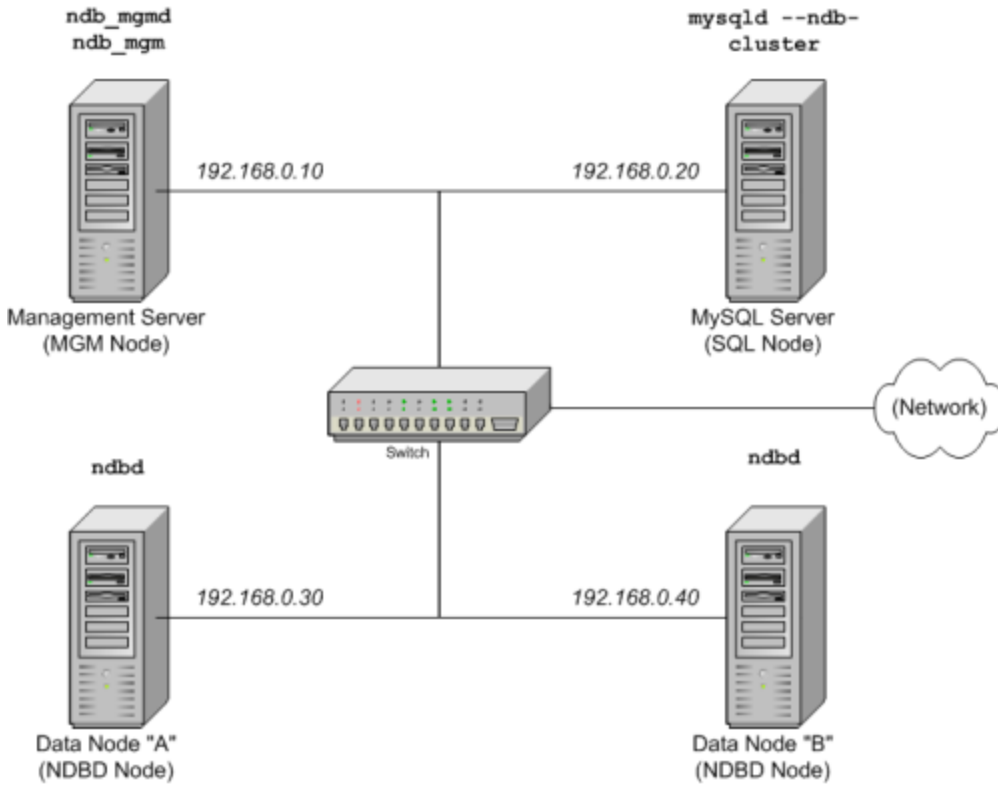
Update by 2012-02-21??? MySQL Cluster 7.2.4

- ?????<http://dev.mysql.com/doc/index-cluster.html>
- ?????<http://www.mysql.com/downloads/cluster/#downloads>

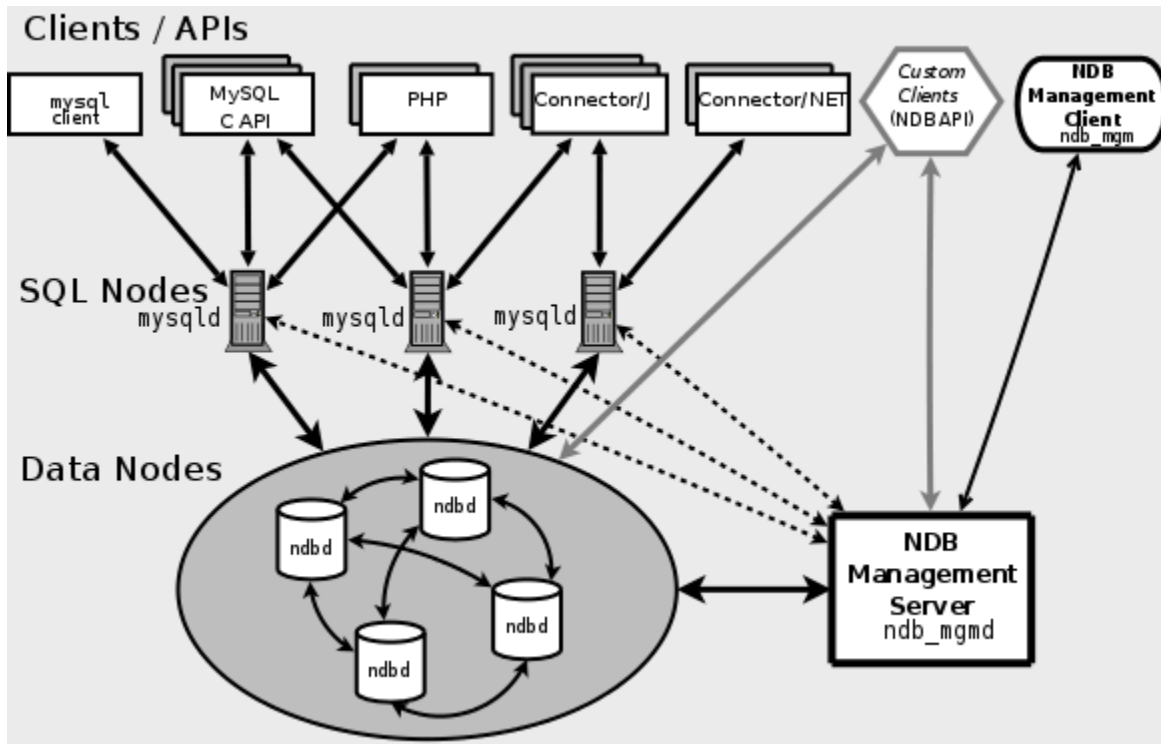
??????

node	ip address	package	process
Management & SQL node	10.10.10.131	MySQL-server-community-5.0.67-0.rhel5 MySQL-client-community-5.0.67-0.rhel5 MySQL-clustertools-community-5.0.67-0.rhel5 MySQL-clustermanagement-community-5.0.67-0.rhel5	ndb_mgmd & ndb_mgm(for Mgm node) mysqld(for SQL node)
data node #1	10.10.10.132	MySQL-clusterstorage-community-5.0.67-0.rhel5	ndbd
data node #2	10.10.10.133	MySQL-clusterstorage-community-5.0.67-0.rhel5	ndbd

???????????????????????????? IP ????????????????????? Management node ? SQL node ??????????????????



????????????????????



1. **mgm node** - ???/? Cluster???????????? DB ?????????
2. **SQL node** - ??? Web AP ? DB ????????????? AP ??????DB???????????? node ?????????????????
3. **data-node** - ???

???? Management & SQL node

????????????????????????????

[MySQL-5.0.67](#) [MySQL-6.3.20](#)

```
rpm -ivh MySQL-client-community-5.0.67-0.rhel5.i386.rpm
rpm -ivh MySQL-shared-compat-5.0.67-0.rhel5.i386.rpm
rpm -ivh MySQL-devel-community-5.0.67-0.rhel5.i386.rpm
rpm -ivh MySQL-server-community-5.0.67-0.rhel5.i386.rpm
```

????? SQL node ????

```
rpm -ivh perl-HTML-Template-2.9-1.el5.rf.noarch.rpm
rpm -ivh MySQL-clustermanagement-community-5.0.67-0.rhel5.i386.rpm
rpm -ivh MySQL-clustertools-community-5.0.67-0.rhel5.i386.rpm
```

????? Management node ?????? perl-HTML-Template ?????????????????? Google ???

??????

/etc/my.cnf (SQL node ???)

Options for mysqld process:

```
[MYSQLD]
ndbcluster          # run NDB engine
ndb-connectstring=10.10.10.131 # location of MGM node
```

Options for ndbd process:

```
[MYSQL_CLUSTER]
ndb-connectstring=10.10.10.131 # location of MGM node
```

/var/lib/mysql-cluster/config.ini (Management node ???)

Options affecting ndbd processes on all data nodes:

```
[NDBD DEFAULT]
NoOfReplicas=2 # Number of replicas
DataMemory=256M # How much memory to allocate for data storage
IndexMemory=18M # How much memory to allocate for index storage
# For DataMemory and IndexMemory, we have used the
# default values. Since the "world" database takes up
# only about 500KB, this should be more than enough for
# this example Cluster setup.
```

TCP/IP options:

```
[TCP DEFAULT]
```

```
portnumber=2202 # This the default; however, you can use any
                # port that is free for all the hosts in cluster
                # Note: It is recommended beginning with MySQL 5.0 that
                # you do not specify the portnumber at all and simply allow
                # the default value to be used instead
```

```
# Management process options:
```

```
[NDB_MGMD]
```

```
hostname=10.10.10.131 # Hostname or IP address of MGM node
```

```
datadir=/var/lib/mysql-cluster # Directory for MGM node logfiles
```

```
# Options for data node "A":
```

```
[NDBD]
```

```
# (one [NDBD] section per data node)
```

```
hostname=10.10.10.132 # Hostname or IP address
```

```
datadir=/mysql-data # Directory for this data node's datafiles
```

```
# Options for data node "B":
```

```
[NDBD]
```

```
hostname=10.10.10.133 # Hostname or IP address
```

```
datadir=/mysql-data # Directory for this data node's datafiles
```

```
# SQL node options:
```

```
[MYSQLD]
```

```
hostname=10.10.10.131 # Hostname or IP address
```

```
    # (additional mysqld connections can be
```

```
    # specified for this node for various
```

```
    # purposes such as running ndb_restore)
```

```
???? Data node
```

```
????????????????????????????
```

```
MySQL-5.0.67 MySQL-6.3.20
```

```
rpm -ivh MySQL-clusterstorage-community-5.0.67-0.rhel5.i386.rpm
```

```
?????
```

```
/etc/my.cnf
```

```
# Options for mysqld process:
```

```
[MYSQLD]
```

```
ndbcluster # run NDB engine
```

```
ndb-connectstring=10.10.10.131 # location of MGM node
```

```
# Options for ndbd process:
```

```
[MYSQL_CLUSTER]
```

ndb-connectstring=10.10.10.131 # location of MGM node

?????????

??? Managemnet console??? Management & SQL node???

ndb_mgmd -f /var/lib/mysql-cluster/config.ini

? data node #1 ? #2?????

ndbd --initial

????????????????? --initial???

? Management & SQL node ?? MySQL

service mysql stop

service mysql start

? Management node ???? Cluster ?????

ndb_mgm

>show

Connected to Management Server at: 10.10.10.131:1186

Cluster Configuration

[ndbd(NDB)] 2 node(s)

id=2 @10.10.10.132 (Version: 5.0.67, Nodegroup: 0)

id=3 @10.10.10.133 (Version: 5.0.67, Nodegroup: 0, Master)

[ndb_mgmd(MGM)] 1 node(s)

id=1 @10.10.10.131 (Version: 5.0.67)

[mysqld(API)] 1 node(s)

id=4 @10.10.10.131 (Version: 5.0.67)

>all status

Node 2: started (Version 5.0.67)

Node 3: started (Version 5.0.67)

My Tips:

- data-node ????? started ???????? starting?????????????
- ?? config.ini ?? NoOfReplicas=2????????? data-node ???????? started?
- ? mysqld(API) ?????????? SQL node ? MySQL ??????

???? Cluster

?????mgm node -> data-node -> SQL node

?????

- mgm node - ndb_mgmd -f /var/lib/mysql-cluster/config.ini
- data node - ndbd
- SQL node - service mysql start

????????(Rolling Restart) *DBA??*

?????<http://dev.mysql.com/doc/refman/5.0/...g-restart.html>

?????

- ?? Cluster ????
- Cluster ????
- Node ??????????
- Cluster ????????? Cluster ??
- ????????? Cluster ?????

? node ?????????

- mgm node
1. ???? mgm node(ndb_mgmd ??)
 2. ?????
 3. ????? mgm node
- data node
????????????????????????????????
 - SQL node
????????????????????????????????

Cluster ??

????? Cluster????? Management node???

ndb_mgm -e shutdown

??? data node(ndbd) ?????????? Cluster ?????????

My Tips:

- ???? SQL node ?????? ndb_mgmd ?????????? data node(????????? downtime)?

??? Cluster ??

????? <http://dev.mysql.com/doc/refman/5.0/...a-queries.html>

?????? Cluster ??????????

- Table ? storage engine ??? NDBCLUSTER?
- Table ????? primary key???????????????????? primary key?
- ????????? Cluster ??? SQL node ??????????????
- ?? SQL node ????? node ?????????????????????

? SQL node ?????????? mydb?

```
CREATE SCHEMA mydb;
```

```
???? city ? table ???? city_table.sql
```

```
DROP TABLE IF EXISTS `City`;
CREATE TABLE `City` (
  `ID` int(11) NOT NULL auto_increment,
  `Name` char(35) NOT NULL default "",
  `CountryCode` char(3) NOT NULL default "",
  `District` char(20) NOT NULL default "",
  `Population` int(11) NOT NULL default '0',
  PRIMARY KEY (`ID`)
) ENGINE=NDBCLUSTER DEFAULT CHARSET=latin1;
```

```
INSERT INTO `City` VALUES (1,'Kabul','AFG','Kabol',1780000);
INSERT INTO `City` VALUES (2,'Qandahar','AFG','Qandahar',237500);
INSERT INTO `City` VALUES (3,'Herat','AFG','Herat',186800);
```

```
????????? mydb
```

```
mysql -u root -p mydb < city_table.sql
```

????

```
Cluster ???ndb_mgm -> show
```

```
[root@mgm_sql-node ~]# ndb_mgm
-- NDB Cluster -- Management Client --
ndb_mgm> show
Connected to Management Server at: 10.10.10.131:1186
Cluster Configuration
-----
[ndbd(NDB)] 2 node(s)
id=2 @10.10.10.132 (Version: 5.0.67, Nodegroup: 0, Master)
id=3 @10.10.10.133 (Version: 5.0.67, Nodegroup: 0)
```

[ndb_mgmd(MGM)] 1 node(s)
 id=1 @10.10.10.131 (Version: 5.0.67)

[mysqld(API)] 2 node(s)
 id=4 @10.10.10.131 (Version: 5.0.67)
 id=5 @10.10.10.135 (Version: 5.0.67)

?????

date node#1 - down

data node#2 - up

mgm node - up

SQL node#1 - ????

SQL node#2 - ????

date node#1 - down

data node#2 - up

mgm node - down

SQL node#1 - ????

SQL node#2 - ????

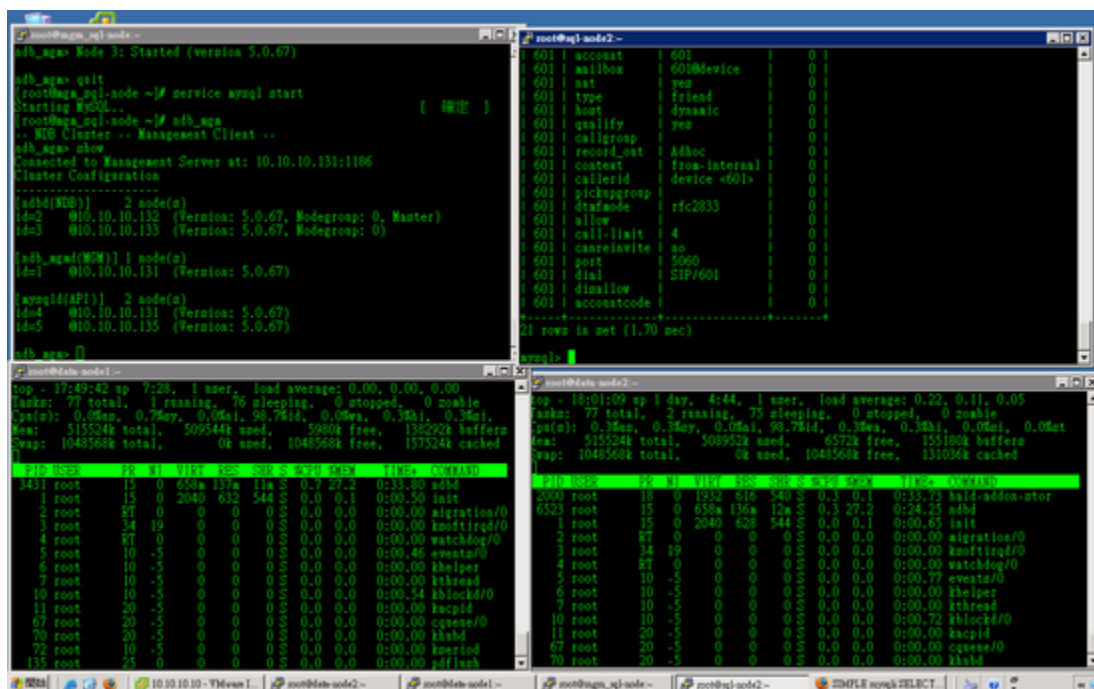
date node#1 - down

data node#2 - up

mgm node - down

SQL node#1 - down

SQL node#2 - ????



????

- [nginx Load Balancer????for MySQL or MariaDB Galera Cluster](#)