

Hitachi Content Platform Gateway Database Replication Setup for Linux

Release Version 4.1.4

Linux

The objective of this document is to provide details on the configuration and use of the Hitachi Content Platform Gateway with the Hitachi Content Platform (HCP) storage system.

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Chapter 1 Introduction

This document will cover the many replication configurations of the Hitachi Content Platform Gateway. It is not the intent of this document to provide complete step-by-step instructions but rather high-level guidance to configuring the various replication scenarios. In the *HCP Gateway Administration Guide* the topic of Replication Database Configuration is covered in detail. It is recommended that you read that chapter prior to reading this document.

All examples in this document will use the following IP addresses:

```
hcpg1 10.1.1.11
hcpg2 10.1.1.12
hcpg3 10.1.1.13
hcpg4 10.1.1.14
```

In addition, the internal database replication commands will use a generic fixed name called '**nodeX**', where the 'X' is 1-4. These names directly correspond to the database server.id. Therefore, node1 is the database for hcpg1 and so forth.

There are two 'server.id' properties, they are independent of each other, although in most cases they use the same number. First is the HCP Gateway (hcpg) sam.properties server.id that identifies the HCP Gateway from other HCP Gateway's. Second there is a database server.id that distinguishes the database instances.

The HCP Gateway runs on both Windows Server and Debian Linux and this document will cover the following database replication configurations for Linux:

- **Two Node:** Master node to Replica node replication for Read-only copy on second site
- **Two Node:** Master node to Master node replication for Manual DR Failover
- **Three Node:** Master to Master replication for HA Cluster and optional Replica for Read-only copy on second site
- **Four Node:** Master to Master replication for HA Cluster and Master to Master HA Cluster nodes on the DR failover site

Please note that the following configuration is not supported at this time:

Three Nodes: Master to Master Replication for HA Cluster on Site A with DR Failover to Single Gateway on Site B (Master-Master-Master replication).

	Cluster Nodes in Production site	DR Failover to Site B	Read-only Copy on Site B
Two Node: Master to Replica DB copy (Read-only access on Site B)			✓
Two Node: Master to Master DB copy (DR Hot Standby on Site B)		✓ (single node)	✓
Two or Three Node: Master to Master HA Cluster on Site A with <u>optional</u> Replica DB copy on Site B (Read-only access on Site B)	✓	✓ (Manual process)	✓ (optional)
Four Node: Master to Master HA Cluster on Site A and Master to Master HA Cluster on Site B (DR Hot standby on Site B)	✓	✓ (cluster nodes)	✓

Regardless of the configuration type used the replication process is basically the same. When a file is written to the primary node the metadata is immediately replicated to the other node(s). In the cases where there is no shared cache between the node(s) the data will not be accessible on the other node(s) until the original file data is copied to the storage. This is usually a short delay*.

*Be aware that HCP Gateway user Policies can be configured that could cause long delays before the data can be accessible on the alternate node(s).

Refer to the HCP Gateway Shares Chapter Section 10.2 for more details about setting the Replicated parameter in a Replication configuration.

In all configurations, if you are **not** using a cluster or a shared cache, then these common database tables are not replicated and need to be added to, or uncommented out of, the /etc/mysql/mariadb.cnf file. Your /etc/mysql/mariadb.cnf file should look like the following:

```
# ignore tables when replicate SAM database (cluster mode)
replicate-wild-ignore-table = SAM.%event
replicate-wild-ignore-table = SAM.license
```

```
replicate-wild-ignore-table = sam.%event
replicate-wild-ignore-table = sam.license
```

```
# ignore more tables when replicate SAM database to DR HCP Gateway server (replication mode
without sharing cache)
replicate-wild-ignore-table = SAM.%backfill
replicate-wild-ignore-table = SAM.%restoration
```

```
replicate-wild-ignore-table = SAM.%migration
```

```
replicate-wild-ignore-table = sam.%backfill  
replicate-wild-ignore-table = sam.%restoration  
replicate-wild-ignore-table = sam.%migration
```

In all configurations, if you are using a cluster or a shared cache, then these common database tables are not replicated and need to be added to the `/etc/mysql/mariadb.cnf` file. Your `/etc/mysql/mariadb.cnf` file should look like the following:

```
# ignore tables when replicate SAM database (cluster mode)  
replicate-wild-ignore-table = SAM.%event  
replicate-wild-ignore-table = SAM.license
```

```
replicate-wild-ignore-table = sam.%event  
replicate-wild-ignore-table = sam.license
```

```
# ignore more tables when replicate SAM database to DR HCP Gateway server (replication mode  
without sharing cache)  
#replicate-wild-ignore-table = SAM.%backfill  
#replicate-wild-ignore-table = SAM.%restoration  
#replicate-wild-ignore-table = SAM.%migration
```

```
#replicate-wild-ignore-table = sam.%backfill  
#replicate-wild-ignore-table = sam.%restoration  
#replicate-wild-ignore-table = sam.%migration
```

WARNING: No matter the number of HGP Gateways only one may be active for user access at a time.

WARNING: If the Active node fails and the Passive nodes takes over as the new Active node, if a Legal Hold was being applied to file(s) on the original Active node and the Passive node is not able to connect to the HCP storage, the Legal Hold may not be applied until the original Active node comes back online and sets the Legal Hold on the file(s).

Important Notes:

- 1) Only 1 Gateway device can be active at a time.
- 2) The files have to be written to the HCP and if there is a second HCP, replicated to the second HCP, before the content will be available on the non-active node(s) that have a separate

cache. For example, if using a Copy or Tiering policy that waits 5 days before writing files to HCP storage, then you have to wait 5 days before you see the file content on the non-active node(s) that are not sharing the cache.

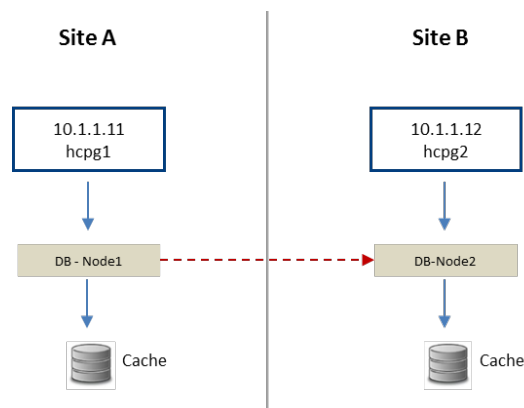
- 3) For the "Two Node: Master to Replica" and "Three Node: Master to Master HA Cluster with Replica for Read-only copy", if any data changes or writes are made to the Gateway on Site B , manual intervention is required to replicate the metadata back to Site A.
- 4) These instructions can be used to setup the initial replication and can also be used to reset replication if one or more of the nodes encounters a replication error.

Chapter 2 Two Node: Master node to Replica node (Read only copy)

In this configuration, the database on hcp1 is copied to hcp2. The two gateways have an independent local cache, data written to hcp1 is available to hcp2 after a slight delay (one-way replication). The intent with this configuration is that Site B (hcp2) is a **read-only copy** of Site A, and also can be used to access data if Site A is offline.

Note: It is the Administrators responsibility to ensure the Site B shares are configured as read-only.

Two Nodes: Master-Replica (Read-only Copy)



The gateway (hcp1) on Site A is the active system and is accessible to users. Upon ingest the file name, path and metadata is captured in the Node1 database and made available to the Virtual File System. The file content is written to local cache, prior to being written to HCP. The caches on the 2 HCP Gateway devices are independent. After a slight delay for database Node1 to replicate to Node2, the file metadata written to hcp1 should become available on hcp2. The actual data needs to be replicated separately using HCP replication.

This configuration requires the *server.ignore* and *cluster* flags in the *sam.properties* file to be disabled. The latter is accomplished by setting the flags equal to zero (0). This change must be made on both hcp gateway systems.

WARNING:

1. You must stop all of the shares in the HCP Gateway UI and the saml service by issuing the command ***sudo systemctl stop saml*** before making any changes to the *sam.properties* file. Then restart the saml service by issuing the command ***sudo systemctl start saml*** after saving the file.

2. You must stop the mysql service by issuing the command ***sudo systemctl stop mariadb*** if any changes are made to the mariadb.cnf file. Then restart the mysql service by issuing the command ***sudo systemctl start mariadb*** after saving the file.

Step 1 – Update the HCP Gateway properties file for each node.

Locate the file at: /etc/sam/sam.properties

Make the following edits:

On HCPG 1

```
server.id=1
server.ignore=0
cluster=0
binlog.name=hcpg-1-bin
```

On HCPG2

```
server.id=2
server.ignore=0
cluster=0
binlog.name=hcpg-2-bin
```

Step 2 – Edit the mariadb.cnf file on both HCPGs.

The database configuration must be setup to allow seamless interleaving of database records. This has an added benefit of preventing name collisions should the 'read-only' site have data written to it. This change must be made on both hcpg systems, and, with the exact settings as shown for each hcpg system. Note the entire mariadb.cnf file is not displayed in the instructions just the relevant part in the '[mariadb]' section of the respective mariadb.cnf file.

Edit File /etc/mysql/mariadb.cnf

Note: The following is added or changed in the '[mariadb]' section of the respective mariadb.cnf file.

Ensure the migration table is excluded from being replicated in addition to the common list of excluded tables.

HCPG1 [mariadb] . . .

```
# Global Transaction ID
gtid-domain-id=1
gtid-ignore-duplicates=ON

## Unique Server ID
server-id = 1

## Replication Configuration
auto-increment-offset = 1
auto-increment-increment = 2
```

```
# ignore tables when replicate SAM database
```

[See chapter 1 for appropriate tables to ignore](#)

Binary Logging

```
log_bin = /var/log/mysql/binlog/hcpg-1-bin
```

Relay Logging

```
relay-log = /var/log/mysql/relaylog/hcpg-1-relay
```

HCPG2 [mariadb] . . .

```
# Global Transaction ID
gtid-domain-id=2
gtid-ignore-duplicates=ON

## Unique Server ID
server-id = 2
```

```

## Replication Configuration
auto-increment-offset = 2
auto-increment-increment = 2

# ignore tables when replicate SAM database
See chapter 1 for appropriate tables to ignore

## Binary Logging
log_bin          = /var/log/mysql/binlog/hcpg-2-bin

# Relay Logging
relay-log        = /var/log/mysql/relaylog/hcpg-2-relay

```

Step 3 – Common Replication Setup Steps

It is required to perform the replication setup before any data is written to any of the nodes in the HCP Gateway. These steps need to be run on HCPG1 and HCPG2 with HCPG1 as the active node. If another node is the active node, then adjust the instructions for the active node.

In this configuration step a replication user account will be created on all nodes;
 Note: the password is the string immediately following 'IDENTIFIED BY'

This step requires the use of the MariaDB Command Prompt, which is available by issuing the mysql command as the root user. When issuing the command, if prompted with "[sudo] password for vault: ", enter the password for the user vault. When prompted with " Enter password:", enter the MariaDB root password.

MariaDB Command Prompt (MariaDB [(none)]>) run on HCPG1 and HCPG2

```
sudo mysql -u root -p <press enter>
```

Execute this command on each node to check if replication was previously configured and if so that there are no errors listed in the output. Resolve any errors before continuing to setup the replication.

```
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

In the MariaDB Command Prompt (MariaDB [(none)]>) run on HCPG1 and HCPG2

```
MariaDB [(none)]> stop all slaves;
```

```
MariaDB [(none)]> reset slave all;
```

Execute these commands on HCPG1 and HCPG2, you only need to execute these commands the first time replication is setup. If replication is being reconfigured and the replication_user already exists, skip these 7 commands.

```
MariaDB [(none)]> delete from mysql.user where user='replication_user';
```

```
MariaDB [(none)]> FLUSH PRIVILEGES;
```

```
MariaDB [(none)]> FLUSH TABLES;
```

```
MariaDB [(none)]> CREATE USER 'replication_user'@'%' IDENTIFIED BY 'Organ1cReplication';
```

```
MariaDB [(none)]> GRANT REPLICATION SLAVE ON *.* TO 'replication_user'@'%';
```

```
MariaDB [(none)]> FLUSH PRIVILEGES;
```

```
MariaDB [(none)]> FLUSH TABLES;
```

Stop all of the shares in the HCP Gateway UI and then stop the saml, wildfly and mysql services by issuing the command **sudo systemctl stop <service-name>** on HCPG1 and HCPG2.

```
vault@hcpg-linux-1:~$ sudo systemctl stop saml
```

```
vault@hcpg-linux-1:~$ sudo systemctl stop wildfly
```

```
vault@hcpg-linux-1:~$ sudo systemctl stop mariadb
```

Delete all the .info files in the /var/lib/mysql/ folder on HCPG1 and HCPG2.

```
vault@hcpg-linux-1:~$ cd /var/lib/mysql
```

```
vault@hcpg-linux-1:/var/lib/mysql$ ls -l *.info
```

```
-rw-rw---- 1 mysql mysql 177 Feb 16 15:36 master-node2.info
```

```
-rw-rw---- 1 mysql mysql  6 Feb 16 15:21 multi-master.info
```

```
-rw-rw---- 1 mysql mysql 84 Feb 16 15:36 relay-log-node2.info
```

```
vault@hcpg-linux-1:/var/lib/mysql$ sudo rm *.info
```

```
vault@hcpg-linux-1:/var/lib/mysql$ ls -l *.info
```

```
ls: cannot access '*.info': No such file or directory
```

```
vault@hcpg-linux-1:/var/lib/mysql$
```

Delete or rename the /var/log/mysql/*.err file on HCPG1 and HCPG2.

```
vault@hcpg-linux-1:/var/lib/mysql$ cd /var/log/mysql
```

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l *.err
```

```
-rw-rw---- 1 mysql adm 15045 Feb 16 14:22 mariadb.err
```

```
vault@hcpg-linux-1:/var/log/mysql$ sudo mv mariadb.err old.mariadb.err
```

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l *.err
```

```
-rw-rw---- 1 mysql adm 15045 Feb 16 14:22 old.mariadb.err
```

```
vault@hcpg-linux-1:/var/log/mysql$
```

Delete the `/var/log/mysql/binlog/hcp**` files that **begin with hcp* on HCPG1 and HCPG2**. The filenames on HCPG1 will be `hcpg-1- *` and `hcpg-2- *` on HCPG2.

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l binlog
```

```
total 20
```

```
-rw-rw---- 1 mysql adm 2101 Feb 16 11:30 hcpg-1-bin.000001
```

```
-rw-rw---- 1 mysql adm 2115 Feb 16 13:44 hcpg-1-bin.000002
```

```
-rw-rw---- 1 mysql adm 2724 Feb 16 14:22 hcpg-1-bin.000003
```

```
-rw-rw---- 1 mysql adm 120 Feb 16 14:12 hcpg-1-bin.index
```

```
-rw-rw---- 1 mysql adm 7 Feb 16 14:22 hcpg-1-bin.state
```

```
vault@hcpg-linux-1:/var/log/mysql$ sudo rm binlog/hcp**
```

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l binlog
```

```
total 0
```

```
vault@hcpg-linux-1:/var/log/mysql$
```

Delete all the files in the `/var/log/mysql/relaylog` folder **that begin with hcp* on HCPG1 and HCPG2**.

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l relaylog
```

```
total 0
```

```
-rw-r--r-- 1 root adm 0 Feb 16 15:02 hcpg-1-relay-node2.00002
```

```
-rw-r--r-- 1 root adm 0 Feb 16 15:02 hcpg-1-relay-node2.index
```

```
vault@hcpg-linux-1:/var/log/mysql$ sudo rm relaylog/hcp**
```

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l relaylog
```

```
total 0
```

```
vault@hcpg-linux-1:/var/log/mysql$
```

Start the mysql service by issuing the command **`sudo systemctl start mariadb`** on HCPG1 and HCPG2.

```
vault@hcpg-linux-1:~$ sudo systemctl start mariadb
```

Check the `/var/log/mysql/*.err` file for any errors on HCPG1 and HCPG2. The expected output is shown below.

```
vault@hcp-linux-1:/var/log/mysql$ cat mariadb.err
2021-02-16 15:07:50 0 [Note] InnoDB: Using Linux native AIO
2021-02-16 15:07:50 0 [Note] InnoDB: Mutexes and rw_locks use GCC atomic builtins
2021-02-16 15:07:50 0 [Note] InnoDB: Uses event mutexes
2021-02-16 15:07:50 0 [Note] InnoDB: Compressed tables use zlib 1.2.11
2021-02-16 15:07:50 0 [Note] InnoDB: Number of pools: 1
2021-02-16 15:07:50 0 [Note] InnoDB: Using SSE2 crc32 instructions
2021-02-16 15:07:50 0 [Note] mysqld: O_TMPFILE is not supported on /tmp (disabling future attempts)
2021-02-16 15:07:50 0 [Note] InnoDB: Initializing buffer pool, total size = 256M, instances = 1, chunk size = 128M
2021-02-16 15:07:50 0 [Note] InnoDB: Completed initialization of buffer pool
2021-02-16 15:07:50 0 [Note] InnoDB: If the mysqld execution user is authorized, page cleaner thread priority can be changed. See the man page of setpriority().
2021-02-16 15:07:50 0 [Note] InnoDB: 128 out of 128 rollback segments are active.
2021-02-16 15:07:50 0 [Note] InnoDB: Creating shared tablespace for temporary tables
2021-02-16 15:07:50 0 [Note] InnoDB: Setting file './ibtmp1' size to 12 MB. Physically writing the file full; Please wait ...
2021-02-16 15:07:50 0 [Note] InnoDB: File './ibtmp1' size is now 12 MB.
2021-02-16 15:07:50 0 [Note] InnoDB: 10.4.17 started; log sequence number 61417; transaction id 20
2021-02-16 15:07:50 0 [Note] InnoDB: Loading buffer pool(s) from /var/lib/mysql/ib_buffer_pool
2021-02-16 15:07:50 0 [Note] Plugin 'FEEDBACK' is disabled.
2021-02-16 15:07:50 0 [Note] InnoDB: Buffer pool(s) load completed at 210216 15:07:50
2021-02-16 15:07:50 0 [Note] Server socket created on IP: '0.0.0.0'.
2021-02-16 15:07:50 0 [Note] Reading of all Master_info entries succeeded
2021-02-16 15:07:50 0 [Note] Added new Master_info '' to hash table
2021-02-16 15:07:50 0 [Note] /usr/sbin/mysqld: ready for connections.
```

Version: '10.4.17-MariaDB-1:10.4.17+maria~buster-log' socket: '/var/run/mysqld/mysqld.sock'
port: 3306 mariadb.org binary distribution

```
vault@hcpg-linux-1:/var/log/mysql$
```

Step 4 – Collect the replication positions

HCPG1 (the active node)

In the MariaDB Command Prompt, execute the following command:

```
MariaDB [(none)]> RESET MASTER;
```

Change directory to /home/vault. Dump the SAM database to a .sql file that will be copied to the other replication node using the script from the Database Backup Script chapter.

```
vault@hcpg-linux-1:/var/log/mysql$ cd /home/vault
```

```
vault@hcpg-linux-1:~$ ./mysqldump.replication.hcp1.sh
```

```
Enter MariaDB root username then space then the MariaDB root password: root  
<MariaDB-root-password>
```

```
vault@hcpg-linux-1:~$
```

Back in the MariaDB Command Prompt, execute the following commands:

```
MariaDB [(none)]> SHOW MASTER STATUS;
```

```
+-----+-----+-----+-----+  
| File           | Position | Binlog_Do_DB | Binlog_Ignore_DB |  
+-----+-----+-----+-----+  
| hcp1-1-bin.000001 |      329 |             | mysql              |  
+-----+-----+-----+-----+
```

Note: The output or result from this command will be used in 'hcp2'

```
MariaDB [(none)]> SELECT BINLOG_GTID_POS('hcp1-1-bin.000001', 329);
```

```
+-----+  
| BINLOG_GTID_POS('hcp1-1-bin.000001', 329) |  
+-----+  
| NULL |  
+-----+
```

HCPG2

Change directory to /home/vault. Copy the mysqldump.replication.hcp1.sql file from HCPG1 to the /home/vault folder on HCPG2. Import the SAM database .sql file to copy the database from HCPG1 to HCPG2.

```
vault@hcpg-linux-2:/var/log/mysql$ cd /home/vault
vault@hcpg-linux-2:~$ scp
vault@10.1.1.11:/home/vault/mysqldump.replication.hcp1.sql .
The authenticity of host '10.1.1.11 (10.1.1.11)' can't be established.
ECDSA key fingerprint is
SHA256:DJ/EfAf4hOaeooyrSUUgxoX80x6AdHwUtOzWU2Lu3x4.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.1.1.11' (ECDSA) to the list of known hosts.
vault@10.1.1.11's password:
mysqldump.replication.hcp1.sql          100% 23KB 25.6MB/s
00:00
```

WARNING: This command will replace the database on HCPG2 with the data imported from the database on HCPG1. If there is production data on HCPG2 that was not replicated to HCPG1, then the production data on HCPG2 will be lost.

```
vault@hcpg-linux-2:~$ mysql -uroot -p < mysqldump.replication.hcp1.sql
Enter password:
vault@hcpg-linux-2:~$
```

Step 5 – Enable Replication

HCPG2

In the MariaDB Command Prompt, execute the following commands:

Note: The position information is from 'hcp1' BINLOG_GTID_POS output

If the result is empty or NULL, enter an empty string " (2 single quotes)

If the result is a string of numbers separated by dashes '-',
example: '1-1-3'
use the entire string enclosed by single quotes '1-1-3'

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = ""; ← This is for a NULL value (2 single quotes).
```

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = '1-1-3'; ← This is value of 1-1-3.
```

Note: The IP address below is for hcpG1

```
MariaDB [(none)]> CHANGE MASTER 'node1' TO master_host="10.1.1.11",  
master_port=3306,  
master_user="replication_user", master_password='Organ1cReplication',  
master_use_gtid=slave_pos, master_ssl=1;
```

Step 6 – Start replication on node HCPG2

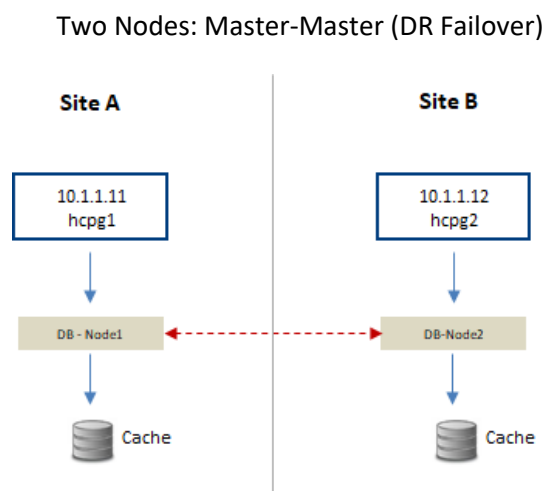
```
MariaDB [(none)]> START ALL SLAVES;  
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

Step 7 – Start the wildfly and saml services by issuing the command ***sudo systemctl start <service-name>*** on all nodes and then start the shares in the HCP Gateway UI on HCPG1.

```
vault@hcpg-linux-1:~$ sudo systemctl start saml  
vault@hcpg-linux-1:~$ sudo systemctl start wildfly
```

Chapter 3 Two Node: Master node to Master node Replication (Manual DR Failover)

The intent of this configuration is that Site B (hcpg2) is a hot-standby copy of Site A and can be used to read/write data if Site A is offline. The two HCP Gateway devices do not have a shared cache. In addition, the expectation is the inactive site will have the data automatically updated from the active site without any intervention. This configuration does not support both sites being active at the same time, it requires manual intervention to switch to the DR site, and to fail back from Site B to Site A.



The configuration requires the `server.ignore` and `cluster` flags in the `sam.properties` file to be disabled. The latter is accomplished by setting the flags equal to zero (0). This change must be made on both hcpg systems.

WARNING:

1. You must stop all of the shares in the HCP Gateway UI and the saml service by issuing the command **`sudo systemctl stop saml`** before making any changes to the `sam.properties` file. Then restart the saml service by issuing the command **`sudo systemctl start saml`** after saving the file.
2. You must stop the mysql service by issuing the command **`sudo systemctl stop mariadb`** if any changes are made to the `mariadb.cnf` file. Then restart the mysql service by issuing the command **`sudo systemctl start mariadb`** after saving the file.

Step 1 – Update HCPG Gateway properties file

Locate the properties file at: /etc/sam/sam.properties

Make the following edits:

HCPG1

```
server.id=1
server.ignore=0
cluster=0
binlog.name=hcpg-1-bin
```

HCPG2

```
server.id=2
server.ignore=0
cluster=0
binlog.name=hcpg-2-bin
```

Step 2 – Edit the mariadb.cnf files on both HCPGs.

The database configuration must be setup to allow seamless interleaving of database records. This has an added benefit of preventing name collisions should the 'hot-standby' site have data written to it. This change must be made on both hcpg systems, and, with the exact settings as shown for each hcpg system.

Edit File /etc/mysql/mariadb.cnf

Note: The following is added or changed in the '[mariadb]' section of the respective mariadb.cnf file.

Ensure the migration table is excluded from being replicated in addition to the common list of excluded tables.

You must stop and restart the mysql service if any changes are made.

HCPG1 [mariadb] . . .

```
# Global Transaction ID
gtid-domain-id=1
gtid-ignore-duplicates=ON
```

```
## Unique Server ID
server-id = 1
```

```
## Replication Configuration
auto-increment-offset = 1
auto-increment-increment = 2

# ignore tables when replicate SAM database
See chapter 1 for appropriate tables to ignore

## Binary Logging
log_bin          = /var/log/mysql/binlog/hcpg-1-bin

# Relay Logging
relay-log        = /var/log/mysql/relaylog/hcpg-1-relay
```

HCPG2 [mariadb] . . .

```
# Global Transaction ID
gtid-domain-id=2
gtid-ignore-duplicates=ON

## Unique Server ID
server-id = 2

## Replication Configuration
auto-increment-offset = 2
auto-increment-increment = 2

# ignore tables when replicate SAM database
See chapter 1 for appropriate tables to ignore

## Binary Logging
log_bin          = /var/log/mysql/binlog/hcpg-2-bin

# Relay Logging
relay-log        = /var/log/mysql/relaylog/hcpg-2-relay
```

Step 3 – Common Replication Setup Steps

It is required to perform the replication setup before any data is written to any of the nodes in the HCP Gateway. These steps need to be run on HCPG1 and HCPG2 with HCPG1 as the active node. If another node is the active node, then adjust the instructions for the active node.

In this configuration step a replication user account will be created on all nodes;

Note: the password is the string immediately following 'IDENTIFIED BY'

This step requires the use of the MariaDB Command Prompt, which is available by issuing the mysql command as the root user. When issuing the command, if prompted with "[sudo] password for vault: ", enter the password for the user vault. When prompted with " Enter password:", enter the MariaDB root password.

MariaDB Command Prompt (MariaDB [(none)]>) run on HCPG1 and HCPG2

```
sudo mysql -u root -p <press enter>
```

Execute this command on each node to check if replication was previously configured and if so that there are no errors listed in the output. Resolve any errors before continuing to setup the replication.

```
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

In the MariaDB Command Prompt (MariaDB [(none)]>) run on HCPG1 and HCPG2

```
MariaDB [(none)]> stop all slaves;
```

```
MariaDB [(none)]> reset slave all;
```

Execute these commands on HCPG1 and HCPG2, you only need to execute these commands the first time replication is setup. If replication is being reconfigured and the replication_user already exists, skip these 7 commands.

```
MariaDB [(none)]> delete from mysql.user where user='replication_user';
```

```
MariaDB [(none)]> FLUSH PRIVILEGES;
```

```
MariaDB [(none)]> FLUSH TABLES;
```

```
MariaDB [(none)]> CREATE USER 'replication_user'@'%' IDENTIFIED BY 'Organ1cReplication';
```

```
MariaDB [(none)]> GRANT REPLICATION SLAVE ON *.* TO 'replication_user'@'%';
```

```
MariaDB [(none)]> FLUSH PRIVILEGES;
```

```
MariaDB [(none)]> FLUSH TABLES;
```

Stop all of the shares in the HCP Gateway UI and then stop the saml, wildfly and mysql services by issuing the command **sudo systemctl stop <service-name>** on HCPG1 and HCPG2.

```
vault@hcpg-linux-1:~$ sudo systemctl stop saml
vault@hcpg-linux-1:~$ sudo systemctl stop wildfly
vault@hcpg-linux-1:~$ sudo systemctl stop mariadb
```

Delete all the .info files in the /var/lib/mysql/ folder on HCPG1 and HCPG2.

```
vault@hcpg-linux-1:~$ cd /var/lib/mysql
vault@hcpg-linux-1:/var/lib/mysql$ ls -l *.info
-rw-rw---- 1 mysql mysql 177 Feb 16 15:36 master-node2.info
-rw-rw---- 1 mysql mysql  6 Feb 16 15:21 multi-master.info
-rw-rw---- 1 mysql mysql 84 Feb 16 15:36 relay-log-node2.info
vault@hcpg-linux-1:/var/lib/mysql$ sudo rm *.info
vault@hcpg-linux-1:/var/lib/mysql$ ls -l *.info
ls: cannot access '*.info': No such file or directory
vault@hcpg-linux-1:/var/lib/mysql$
```

Delete or rename the /var/log/mysql/*.err file on HCPG1 and HCPG2.

```
vault@hcpg-linux-1:/var/lib/mysql$ cd /var/log/mysql
vault@hcpg-linux-1:/var/log/mysql$ ls -l *.err
-rw-rw---- 1 mysql adm 15045 Feb 16 14:22 mariadb.err
vault@hcpg-linux-1:/var/log/mysql$ sudo mv mariadb.err old.mariadb.err
vault@hcpg-linux-1:/var/log/mysql$ ls -l *.err
-rw-rw---- 1 mysql adm 15045 Feb 16 14:22 old.mariadb.err
vault@hcpg-linux-1:/var/log/mysql$
```

Delete the /var/log/mysql/binlog/hcp* files **that begin with hcp*** on HCPG1 and HCPG2. The filenames on HCPG1 will be hcp-1-* and hcp-* on HCPG2.

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l binlog
total 20
-rw-rw---- 1 mysql adm 2101 Feb 16 11:30 hcp-1-bin.000001
-rw-rw---- 1 mysql adm 2115 Feb 16 13:44 hcp-1-bin.000002
```

```

-rw-rw---- 1 mysql adm 2724 Feb 16 14:22 hcpg-1-bin.000003
-rw-rw---- 1 mysql adm 120 Feb 16 14:12 hcpg-1-bin.index
-rw-rw---- 1 mysql adm 7 Feb 16 14:22 hcpg-1-bin.state
vault@hcpg-linux-1:/var/log/mysql$ sudo rm binlog/hcpg*
vault@hcpg-linux-1:/var/log/mysql$ ls -l binlog
total 0
vault@hcpg-linux-1:/var/log/mysql$

```

Delete all the files in the `/var/log/mysql/relaylog` folder **that begin with `hcpg*`** on HCPG1 and HCPG2.

```

vault@hcpg-linux-1:/var/log/mysql$ ls -l relaylog
total 0
-rw-r--r-- 1 root adm 0 Feb 16 15:02 hcpg-1-relay-node2.00002
-rw-r--r-- 1 root adm 0 Feb 16 15:02 hcpg-1-relay-node2.index
vault@hcpg-linux-1:/var/log/mysql$ sudo rm relaylog/hcpg*
vault@hcpg-linux-1:/var/log/mysql$ ls -l relaylog
total 0
vault@hcpg-linux-1:/var/log/mysql$

```

Start the mysql service by issuing the command **`sudo systemctl start mariadb`** on HCPG1 and HCPG2.

```

vault@hcpg-linux-1:~$ sudo systemctl start mariadb

```

Check the `/var/log/mysql/*.err` file for any errors on HCPG1 and HCPG2. The expected output is shown below.

```

vault@hcpg-linux-1:/var/log/mysql$ cat mariadb.err
2021-02-16 15:07:50 0 [Note] InnoDB: Using Linux native AIO
2021-02-16 15:07:50 0 [Note] InnoDB: Mutexes and rw_locks use GCC atomic builtins
2021-02-16 15:07:50 0 [Note] InnoDB: Uses event mutexes
2021-02-16 15:07:50 0 [Note] InnoDB: Compressed tables use zlib 1.2.11
2021-02-16 15:07:50 0 [Note] InnoDB: Number of pools: 1
2021-02-16 15:07:50 0 [Note] InnoDB: Using SSE2 crc32 instructions
2021-02-16 15:07:50 0 [Note] mysqld: O_TMPFILE is not supported on /tmp (disabling future attempts)

```

```
2021-02-16 15:07:50 0 [Note] InnoDB: Initializing buffer pool, total size = 256M, instances = 1,
chunk size = 128M
2021-02-16 15:07:50 0 [Note] InnoDB: Completed initialization of buffer pool
2021-02-16 15:07:50 0 [Note] InnoDB: If the mysqld execution user is authorized, page cleaner
thread priority can be changed. See the man page of setpriority().
2021-02-16 15:07:50 0 [Note] InnoDB: 128 out of 128 rollback segments are active.
2021-02-16 15:07:50 0 [Note] InnoDB: Creating shared tablespace for temporary tables
2021-02-16 15:07:50 0 [Note] InnoDB: Setting file './ibtmp1' size to 12 MB. Physically writing the
file full; Please wait ...
2021-02-16 15:07:50 0 [Note] InnoDB: File './ibtmp1' size is now 12 MB.
2021-02-16 15:07:50 0 [Note] InnoDB: 10.4.17 started; log sequence number 61417; transaction
id 20
2021-02-16 15:07:50 0 [Note] InnoDB: Loading buffer pool(s) from
/var/lib/mysql/ib_buffer_pool
2021-02-16 15:07:50 0 [Note] Plugin 'FEEDBACK' is disabled.
2021-02-16 15:07:50 0 [Note] InnoDB: Buffer pool(s) load completed at 210216 15:07:50
2021-02-16 15:07:50 0 [Note] Server socket created on IP: '0.0.0.0'.
2021-02-16 15:07:50 0 [Note] Reading of all Master_info entries succeeded
2021-02-16 15:07:50 0 [Note] Added new Master_info '' to hash table
2021-02-16 15:07:50 0 [Note] /usr/sbin/mysqld: ready for connections.

Version: '10.4.17-MariaDB-1:10.4.17+maria~buster-log' socket: '/var/run/mysqld/mysqld.sock'
port: 3306 mariadb.org binary distribution

vault@hcp-gateway-1:/var/log/mysql$
```

Step 4 – Collect the replication positions

HCPG1 (the active node)

In the MariaDB Command Prompt, execute the following command:

```
MariaDB [(none)]> RESET MASTER;
```

Change directory to /home/vault. Dump the SAM database to a .sql file that will be copied to the other replication node using the script from the Database Backup Script chapter.


```
vault@hcp1-linux-1:/var/log/mysql$ cd /home/vault
```

```
vault@hcp1-linux-1:~$ ./mysqldump.replication.hcp1.sh
```

Enter MariaDB root username then space then the MariaDB root password: root
<MariaDB-root-password>

```
vault@hcp1-linux-1:~$
```

Back in the MariaDB Command Prompt, execute the following commands:

```
MariaDB [(none)]> SHOW MASTER STATUS;
```

```
+-----+-----+-----+-----+
| File           | Position | Binlog_Do_DB | Binlog_Ignore_DB |
+-----+-----+-----+-----+
| hcp1-1-bin.000001 |      329 |              | mysql              |
+-----+-----+-----+-----+
```

Note: The output or result from this command will be used in 'hcp2'

```
MariaDB [(none)]> SELECT BINLOG_GTID_POS('hcp1-1-bin.000001', 329);
```

```
+-----+
| BINLOG_GTID_POS('hcp1-1-bin.000001', 329) |
+-----+
| NULL                                     |
+-----+
```

HCPG2

Copy the mysqldump.replication.hcp1.sql file from HCPG1 to the /home/vault folder on HCPG2. Change directory to /home/vault. Import the SAM database .sql file to copy the database from HCPG1 to HCPG2.

```
vault@hcp2-linux-2:/var/log/mysql$ cd /home/vault
```

```
vault@hcp2-linux-2:~$ scp
```

```
vault@10.1.1.11:/home/vault/mysqldump.replication.hcp1.sql .
```

The authenticity of host '10.1.1.11 (10.1.1.11)' can't be established.

ECDSA key fingerprint is

SHA256:DJ/EfAf4hOaeooyrSUUgxoX80x6AdHwUtOzWU2Lu3x4.

Are you sure you want to continue connecting (yes/no/[fingerprint])? yes

Warning: Permanently added '10.1.1.11' (ECDSA) to the list of known hosts.

```
vault@10.1.1.11's password:
```

```
mysqldump.replication.hcpg1.sql
00:00
```

```
100% 23KB 25.6MB/s
```

WARNING: This command will replace the database on HCPG2 with the data imported from the database on HCPG1. If there is production data on HCPG2 that was not replicated to HCPG1, then the production data on HCPG2 will be lost.

```
vault@hcpg-linux-2:~$ mysql -uroot -p < mysqldump.replication.hcpg1.sql
Enter password:
vault@hcpg-linux-2:~$
```

In the MariaDB Command Prompt, execute the following commands:

```
MariaDB [(none)]> RESET MASTER;
MariaDB [(none)]> SHOW MASTER STATUS;
```

```
+-----+-----+-----+-----+
| File           | Position | Binlog_Do_DB | Binlog_Ignore_DB |
+-----+-----+-----+-----+
| hcpg-2-bin.000001 |      329 |              | mysql              |
+-----+-----+-----+-----+
```

Note: The output or result from this command will be used in 'hcpg1'

```
MariaDB [(none)]> SELECT BINLOG_GTID_POS('hcpg-2-bin.000001', 329);
+-----+
| BINLOG_GTID_POS('hcpg-2-bin.000001', 329) |
+-----+
| 2-1-3 |
+-----+
```

Step 5 – Enable Replication

HCPG1

Note: The position information is from 'hcpg2' BINLOG_GTID_POS output

If the result is empty or NULL, enter an empty string '' (2 single quotes)

If the result is a string of numbers separated by dashes '-',

example: '2-1-3'

use the entire string enclosed by single quotes '2-1-3'

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = ""; ← This is for a NULL value (2 single quotes).
```

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = '2-1-3'; ← This is value for 2-1-3.
```

Note: The IP address below is for hcp2

```
MariaDB [(none)]> CHANGE MASTER 'node2' TO master_host="10.1.1.12",
master_port=3306,
master_user="replication_user", master_password='Organ1cReplication',
master_use_gtid=slave_pos, master_ssl=1;
```

HCPG2

Note: The position information is from 'hcp1' BINLOG_GTID_POS output

If the result is empty or NULL, enter an empty string "" (2 single quotes)

If the result is a string of numbers separated by dashes '-',

example: '1-1-3'

use the entire string enclosed by single quotes '1-1-3'

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = ""; ← This is for a NULL value (2 single quotes).
```

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = '1-1-3'; ← This is value of 1-1-3.
```

Note: The IP address below is for hcp1

```
MariaDB [(none)]> CHANGE MASTER 'node1' TO master_host="10.1.1.11",
master_port=3306,
master_user="replication_user", master_password='Organ1cReplication',
master_use_gtid=slave_pos, master_ssl=1;
```

Step 6 – Start replication on both nodes HCPG1 and HCPG2.

```
MariaDB [(none)]> START ALL SLAVES;  
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

Step 7 – Start the wildfly and saml services by issuing the command ***sudo systemctl start <service-name>*** on all nodes and then start the shares in the HCP Gateway UI on **HCPG1**.

```
vault@hcpg-linux-1:~$ sudo systemctl start saml  
vault@hcpg-linux-1:~$ sudo systemctl start wildfly
```

Chapter 4 Three Node: Master to Master Replication for HA Cluster with optional Read-only Copy

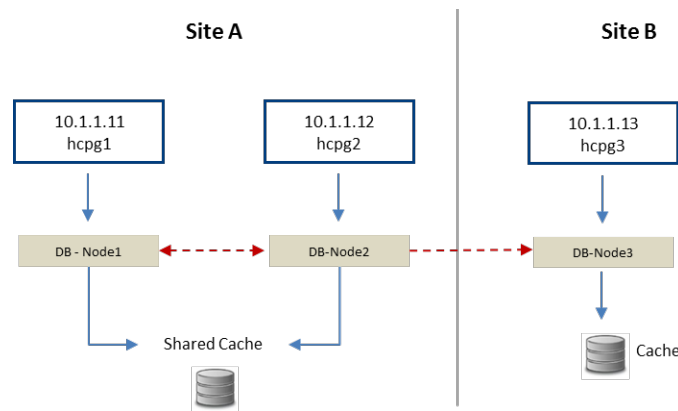
The two gateways on Site A are in a cluster and have a shared cache, only one gateway is active. The gateway on Site B has an independent cache. Metadata written to Site A database, will be available on Site B after a short delay. In this configuration,

- Database on hcp1 is replicated to hcp2 and hcp3 nodes
- Database on hcp2 is replicated to hcp1 and hcp3 nodes

The intent for this configuration is that Site B (hcp3) is a *read-only* copy of Site A, and also could be used to read/write data if Site A is offline. This configuration does not support both sites being active at the same time.

Note: In the event that Site A is down, if data is written or modified on Site B, manual intervention will be required to sync that data back to Site A when it is brought back online.

Three Nodes: Master-Master HA Cluster and optional Read-only copy



WARNING:

1. You must stop all of the shares in the HCP Gateway UI and the saml service by issuing the command **`sudo systemctl stop saml`** before making any changes to the `saml.properties` file. Then restart the saml service by issuing the command **`sudo systemctl start saml`** after saving the file.
2. You must stop the mysql service by issuing the command **`sudo systemctl stop mariadb`** if any changes are made to the `mariadb.cnf` file. Then restart the mysql service by issuing the command **`sudo systemctl start mariadb`** after saving the file.

Step 1 – Update HCPG Gateway properties file

The configuration requires the `server.ignore` and `cluster` flags in the `sam.properties` file to be enabled for `hcpg1`, `hcpg2` and to be disabled for `hcpg3`. This change must be made on all respective `hcpg` systems.

Edit the properties file at: `/etc/sam/sam.properties`

Make the following edits:

HCPG1

```
server.id=1
server.ignore=1
cluster=1
binlog.name=hcpg-1-bin
```

HCPG2

```
server.id=2
server.ignore=1
cluster=1
binlog.name=hcpg-2-bin
```

HCPG3

```
server.id=3
server.ignore=0
cluster=0
binlog.name=hcpg-3-bin
```

Step 2 – Edit the `mariadb.cnf` files on the three HCP Gateways

The database configuration must be setup to allow seamless interleaving of database records. This has an added benefit of prevent name collisions should the 'hot-standby' site have data written to it. This change must be made on all 3 `hcpg` systems, and, with the exact settings as shown for each `hcpg` system.

Edit File `/etc/mysql/mariadb.cnf`

Note: The following is added or changed in the '[mariadb]' section of the respective `mariadb.cnf` file.

Ensure the migration table is excluded from being replicated in addition to the common list of excluded tables.

HCPG1 [mariadb]

```
# Global Transaction ID
gtid-domain-id=1
gtid-ignore-duplicates=ON
```

```
## Unique Server ID
server-id = 1
```

```
## Replication Configuration
auto-increment-offset = 1
auto-increment-increment = 3
```

```
# ignore tables when replicate SAM database
```

[See chapter 1 for appropriate tables to ignore](#)

```
## Binary Logging
log_bin = /var/log/mysql/binlog/hcp-1-bin
```

```
# Relay Logging
relay-log = /var/log/mysql/relaylog/hcp-1-relay
```

HCPG2 [mariadb]

```
# Global Transaction ID
gtid-domain-id=2
gtid-ignore-duplicates=ON
```

```
## Unique Server ID
server-id = 2
```

```
## Replication Configuration
auto-increment-offset = 2
auto-increment-increment = 3

# ignore tables when replicate SAM database
See chapter 1 for appropriate tables to ignore

## Binary Logging
log_bin = /var/log/mysql/binlog/hcpg-2-bin

# Relay Logging
relay-log = /var/log/mysql/relaylog/hcpg-2-relay
```

HCPG3 [mariadb]

```
# Global Transaction ID
gtid-domain-id=3
gtid-ignore-duplicates=ON

## Unique Server ID
server-id = 3

## Replication Configuration
auto-increment-offset = 3
auto-increment-increment = 3

# ignore tables when replicate SAM database
See chapter 1 for appropriate tables to ignore
```



```
## Binary Logging
log_bin      = /var/log/mysql/binlog/hcpg-3-bin

# Relay Logging
relay-log    = /var/log/mysql/relaylog/hcpg-3-relay
```

Step 3 – Common Replication Setup Steps

It is required to perform the replication setup before any data is written to any of the nodes in the HCP Gateway. These steps need to be run on HCPG1, HCPG2 and HCPG3 with HCPG1 as the active node. If another node is the active node, then adjust the instructions for the active node.

In this configuration step a replication user account will be created on all nodes;
Note: the password is the string immediately following 'IDENTIFIED BY'

This step requires the use of the MariaDB Command Prompt, which is available by issuing the mysql command as the root user. When issuing the command, if prompted with "[sudo] password for vault: ", enter the password for the user vault. When prompted with " Enter password:", enter the MariaDB root password.

MariaDB Command Prompt (MariaDB [(none)]>) run on HCPG1, HCPG2 and HCPG3

```
sudo mysql -u root -p <press enter>
```

Execute this command on each node to check if replication was previously configured and if so that there are no errors listed in the output. Resolve any errors before continuing to setup the replication.

```
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

In the MariaDB Command Prompt (MariaDB [(none)]>) run on HCPG1, HCPG2 and HCPG3

```
MariaDB [(none)]> stop all slaves;
```

```
MariaDB [(none)]> reset slave all;
```

Execute these commands on HCPG1, HCPG2 and HCPG3, you only need to execute these commands the first time replication is setup. If replication is being reconfigured and the replication_user already exists, skip these 7 commands.

```
MariaDB [(none)]> delete from mysql.user where user='replication_user';
```

```
MariaDB [(none)]> FLUSH PRIVILEGES;
```

```

MariaDB [(none)]> FLUSH TABLES;
MariaDB [(none)]> CREATE USER 'replication_user'@'%' IDENTIFIED BY 'Organ1cReplication';
MariaDB [(none)]> GRANT REPLICATION SLAVE ON *.* TO 'replication_user'@'%';
MariaDB [(none)]> FLUSH PRIVILEGES;
MariaDB [(none)]> FLUSH TABLES;

```

Stop all of the shares in the HCP Gateway UI and then stop the saml, wildfly and mysql services by issuing the command **sudo systemctl stop <service-name>** on **HCPG1, HCPG2 and HCPG3**.

```

vault@hcpg-linux-1:~$ sudo systemctl stop saml
vault@hcpg-linux-1:~$ sudo systemctl stop wildfly
vault@hcpg-linux-1:~$ sudo systemctl stop mariadb

```

Delete all the .info files in the /var/lib/mysql/ folder on **HCPG1, HCPG2 and HCPG3**.

```

vault@hcpg-linux-1:~$ cd /var/lib/mysql
vault@hcpg-linux-1:/var/lib/mysql$ ls -l *.info
-rw-rw---- 1 mysql mysql 177 Feb 16 15:36 master-node2.info
-rw-rw---- 1 mysql mysql  6 Feb 16 15:21 multi-master.info
-rw-rw---- 1 mysql mysql 84 Feb 16 15:36 relay-log-node2.info
vault@hcpg-linux-1:/var/lib/mysql$ sudo rm *.info
vault@hcpg-linux-1:/var/lib/mysql$ ls -l *.info
ls: cannot access '*.info': No such file or directory
vault@hcpg-linux-1:/var/lib/mysql$

```

Delete or rename the /var/log/mysql/*.err file on **HCPG1, HCPG2 and HCPG3**.

```

vault@hcpg-linux-1:/var/lib/mysql$ cd /var/log/mysql
vault@hcpg-linux-1:/var/log/mysql$ ls -l *.err
-rw-rw---- 1 mysql adm 15045 Feb 16 14:22 mariadb.err
vault@hcpg-linux-1:/var/log/mysql$ sudo mv mariadb.err old.mariadb.err
vault@hcpg-linux-1:/var/log/mysql$ ls -l *.err
-rw-rw---- 1 mysql adm 15045 Feb 16 14:22 old.mariadb.err
vault@hcpg-linux-1:/var/log/mysql$

```

Delete the `/var/log/mysql/binlog/hcpg-#*` files **that begin with hcpg*** on **HCPG1, HCPG2 and HCPG3**. The filenames on HCPG1 will be `hcpg-1-*`, `hcpg-2-*` on HCPG2 and `hcpg-3-*` on HCPG3.

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l binlog
total 20
-rw-rw---- 1 mysql adm 2101 Feb 16 11:30 hcpg-1-bin.000001
-rw-rw---- 1 mysql adm 2115 Feb 16 13:44 hcpg-1-bin.000002
-rw-rw---- 1 mysql adm 2724 Feb 16 14:22 hcpg-1-bin.000003
-rw-rw---- 1 mysql adm 120 Feb 16 14:12 hcpg-1-bin.index
-rw-rw---- 1 mysql adm 7 Feb 16 14:22 hcpg-1-bin.state
vault@hcpg-linux-1:/var/log/mysql$ sudo rm binlog/hcpg*
vault@hcpg-linux-1:/var/log/mysql$ ls -l binlog
total 0
vault@hcpg-linux-1:/var/log/mysql$
```

Delete all the files in the `/var/log/mysql/relaylog` folder **that begin with hcpg*** on **HCPG1, HCPG2 and HCPG3**.

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l relaylog
total 0
-rw-r--r-- 1 root adm 0 Feb 16 15:02 hcpg-1-relay-node2.00002
-rw-r--r-- 1 root adm 0 Feb 16 15:02 hcpg-1-relay-node2.index
vault@hcpg-linux-1:/var/log/mysql$ sudo rm relaylog/hcpg*
vault@hcpg-linux-1:/var/log/mysql$ ls -l relaylog
total 0
vault@hcpg-linux-1:/var/log/mysql$
```

Start the mysql service by issuing the command **`sudo systemctl start mariadb`** on **HCPG1, HCPG2 and HCPG3**.

```
vault@hcpg-linux-1:~$ sudo systemctl start mariadb
```

Check the `/var/log/mysql/*.err` file for any errors on **HCPG1**, **HCPG2** and **HCPG3**. The expected output is shown below.

```
vault@hcpg-linux-1:/var/log/mysql$ cat mariadb.err
2021-02-16 15:07:50 0 [Note] InnoDB: Using Linux native AIO
2021-02-16 15:07:50 0 [Note] InnoDB: Mutexes and rw_locks use GCC atomic builtins
2021-02-16 15:07:50 0 [Note] InnoDB: Uses event mutexes
2021-02-16 15:07:50 0 [Note] InnoDB: Compressed tables use zlib 1.2.11
2021-02-16 15:07:50 0 [Note] InnoDB: Number of pools: 1
2021-02-16 15:07:50 0 [Note] InnoDB: Using SSE2 crc32 instructions
2021-02-16 15:07:50 0 [Note] mysqld: O_TMPFILE is not supported on /tmp (disabling future attempts)
2021-02-16 15:07:50 0 [Note] InnoDB: Initializing buffer pool, total size = 256M, instances = 1, chunk size = 128M
2021-02-16 15:07:50 0 [Note] InnoDB: Completed initialization of buffer pool
2021-02-16 15:07:50 0 [Note] InnoDB: If the mysqld execution user is authorized, page cleaner thread priority can be changed. See the man page of setpriority().
2021-02-16 15:07:50 0 [Note] InnoDB: 128 out of 128 rollback segments are active.
2021-02-16 15:07:50 0 [Note] InnoDB: Creating shared tablespace for temporary tables
2021-02-16 15:07:50 0 [Note] InnoDB: Setting file './ibtmp1' size to 12 MB. Physically writing the file full; Please wait ...
2021-02-16 15:07:50 0 [Note] InnoDB: File './ibtmp1' size is now 12 MB.
2021-02-16 15:07:50 0 [Note] InnoDB: 10.4.17 started; log sequence number 61417; transaction id 20
2021-02-16 15:07:50 0 [Note] InnoDB: Loading buffer pool(s) from /var/lib/mysql/ib_buffer_pool
2021-02-16 15:07:50 0 [Note] Plugin 'FEEDBACK' is disabled.
2021-02-16 15:07:50 0 [Note] InnoDB: Buffer pool(s) load completed at 210216 15:07:50
2021-02-16 15:07:50 0 [Note] Server socket created on IP: '0.0.0.0'.
2021-02-16 15:07:50 0 [Note] Reading of all Master_info entries succeeded
2021-02-16 15:07:50 0 [Note] Added new Master_info '' to hash table
2021-02-16 15:07:50 0 [Note] /usr/sbin/mysqld: ready for connections.
```

Version: '10.4.17-MariaDB-1:10.4.17+maria~buster-log' socket: '/var/run/mysqld/mysqld.sock'
port: 3306 mariadb.org binary distribution

```
vault@hcpg-linux-1:/var/log/mysql$
```

Step 4 – Collect the replication positions

HCPG1 (the active node)

In the MariaDB Command Prompt, execute the following command:

```
MariaDB [(none)]> RESET MASTER;
```

Change directory to /home/vault. Dump the SAM database to a .sql file that will be copied to the other replication node using the script from the Database Backup Script chapter.

```
vault@hcpg-linux-1:/var/log/mysql$ cd /home/vault
```

```
vault@hcpg-linux-1:~$ ./mysqldump.replication.hcp1.sh
```

```
Enter MariaDB root username then space then the MariaDB root password: root
```

```
<MariaDB-root-password>
```

```
vault@hcpg-linux-1:~$
```

Back in the MariaDB Command Prompt, execute the following commands:

```
MariaDB [(none)]> SHOW MASTER STATUS;
```

```
+-----+-----+-----+-----+
| File           | Position | Binlog_Do_DB | Binlog_Ignore_DB |
+-----+-----+-----+-----+
| hcp1-1-bin.000001 |      329 |              | mysql              |
+-----+-----+-----+-----+
```

Note: The output or result from the show master status command will be used in command below ('hcp1-1-bin.000001', 329).

```
MariaDB [(none)]> SELECT BINLOG_GTID_POS('hcp1-1-bin.000001', 329);
```

```
+-----+
| BINLOG_GTID_POS('hcp1-1-bin.000001', 329) |
+-----+
| NULL                                         |
+-----+
```

Note: The output or result from this command will be used in 'hcp2'

HCPG2

Copy the mysqldump.replication.hcpg1.sql file from HCPG1 to the /home/vault folder on HCPG2. Change directory to /home/vault. Import the SAM database .sql file to copy the database from HCPG1 to HCPG2.

```
vault@hcpg-linux-2:/var/log/mysql$ cd /home/vault
vault@hcpg-linux-2:~$ scp
vault@10.1.1.11:/home/vault/mysqldump.replication.hcpg1.sql .
The authenticity of host '10.1.1.11 (10.1.1.11)' can't be established.
ECDSA key fingerprint is
SHA256:DJ/EfAf4hOaeooyrSUUgxoX80x6AdHwUtOzWU2Lu3x4.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.1.1.11' (ECDSA) to the list of known hosts.
vault@10.1.1.11's password:
mysqldump.replication.hcpg1.sql                               100% 23KB 25.6MB/s
00:00
```

WARNING: This command will replace the database on HCPG2 with the data imported from the database on HCPG1. If there is production data on HCPG2 that was not replicated to HCPG1, then the production data on HCPG2 will be lost.

```
vault@hcpg-linux-2:~$ mysql -uroot -p < mysqldump.replication.hcpg1.sql
Enter password:
vault@hcpg-linux-2:~$
```

In the MariaDB Command Prompt, execute the following commands:

```
MariaDB [(none)]> RESET MASTER;
MariaDB [(none)]> SHOW MASTER STATUS;
```

```
+-----+-----+-----+-----+
| File           | Position | Binlog_Do_DB | Binlog_Ignore_DB |
+-----+-----+-----+-----+
| hcpg-2-bin.000001 |      329 |              | mysql              |
+-----+-----+-----+-----+
```

Note: The output or result from the show master status command will be used in command below ('hcpG-2-bin.000001', 329).

```
MariaDB [(none)]> SELECT BINLOG_GTID_POS('hcpG-2-bin.000001', 329);
```

```
+-----+
| BINLOG_GTID_POS('hcpG-2-bin.000001', 329) |
+-----+
| NULL |
+-----+
```

HCPG3

Copy the mysqldump.replication.hcpG1.sql file from HCPG1 to the /home/vault folder on HCPG3. Change directory to /home/vault. Import the SAM database .sql file to copy the database from HCPG1 to HCPG3.

```
vault@hcpG-linux-3:/var/log/mysql$ cd /home/vault
```

```
vault@hcpG-linux-3:~$ scp
```

```
vault@10.1.1.11:/home/vault/mysqldump.replication.hcpG1.sql .
```

```
The authenticity of host '10.1.1.11 (10.1.1.11)' can't be established.
```

```
ECDSA key fingerprint is
```

```
SHA256:DJ/EfAf4hOaeooyrSUUgxoX80x6AdHwUtOzWU2Lu3x4.
```

```
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
```

```
Warning: Permanently added '10.1.1.11' (ECDSA) to the list of known hosts.
```

```
vault@10.1.1.11's password:
```

```
mysqldump.replication.hcpG1.sql          100% 23KB 25.6MB/s
00:00
```

WARNING: This command will replace the database on HCPG3 with the data imported from the database on HCPG1. If there is production data on HCPG3 that was not replicated to HCPG1, then the production data on HCPG3 will be lost.

```
vault@hcpG-linux-3:~$ mysql -uroot -p < mysqldump.replication.hcpG1.sql
```

```
Enter password:
```

```
vault@hcpG-linux-3:~$
```

Step 5 – Enable replication

HCPG1

Note: The position information is from the 'hcpg2' SELECT BINLOG_GTID_POS output

If the result is empty or NULL, enter an empty string '' (2 single quotes)

If the result is a string of numbers separated by dashes '-',

example: '2-1-3'

use the entire string enclosed by single quotes '2-1-3'

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = ""; ← This is for a NULL value (2 single quotes).
```

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = '2-1-3'; ← This is value of 2-1-3.
```

Note: The IP address below is for hcpg2

```
MariaDB [(none)]> CHANGE MASTER 'node2' TO master_host="10.1.1.12",  
master_port=3306,  
master_user="replication_user", master_password='0rgan1cReplication',  
master_use_gtid=slave_pos, master_ssl=1;
```

HCPG2

Note: The position information is from the 'hcpg1' SELECT BINLOG_GTID_POS output

If the result is empty or NULL, enter an empty string '' (2 single quotes)

If the result is a string of numbers separated by dashes '-',

example: '1-1-3'

use the entire string enclosed by single quotes '1-1-3'

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = ""; ← This is for a NULL value (2 single quotes).
```



```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = '1-1-3'; ← This is value of 2-1-3.
```

Note: The IP address below is for hcp1

```
MariaDB [(none)]> CHANGE MASTER 'node1' TO master_host="10.1.1.11",  
master_port=3306,  
master_user="replication_user", master_password='Organ1cReplication',  
master_use_gtid=slave_pos, master_ssl=1;
```

HCPG3

Note: The position information is from the 'hcp1' and 'hcp2' SELECT BINLOG_GTID_POS output

If the result is empty or NULL, enter an empty string " (2 single quotes)

If the result is a string of numbers separated by dashes '-',

example: '1-1-3' from hcp1 and '2-1-3' from hcp2

use the entire string from both hcp1 and hcp2 enclosed by single quotes '1-1-3,2-1-3'

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = ""; ← This is for a NULL value (2 single quotes).
```

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = '1-1-3,2-1-3'; ← This is value of 1-1-3 and 2-1-3.
```

enter an empty string " (2 single quotes)

Note: The IP address below is for hcp1

```
MariaDB [(none)]> CHANGE MASTER 'node1' TO master_host="10.1.1.11",  
master_port=3306,  
master_user="replication_user", master_password='Organ1cReplication',  
master_use_gtid=slave_pos, master_ssl=1;
```

Note: The IP address below is for hcpG2

```
MariaDB [(none)]> CHANGE MASTER 'node2' TO master_host="10.1.1.12",
master_port=3306,
    master_user="replication_user", master_password='Organ1cReplication',
    master_use_gtid=slave_pos, master_ssl=1;
```

Step 6 – Start replication

HCPG1

```
MariaDB [(none)]> START ALL SLAVES;
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

HCPG2

```
MariaDB [(none)]> START ALL SLAVES;
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

HCPG3

```
MariaDB [(none)]> START ALL SLAVES;
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

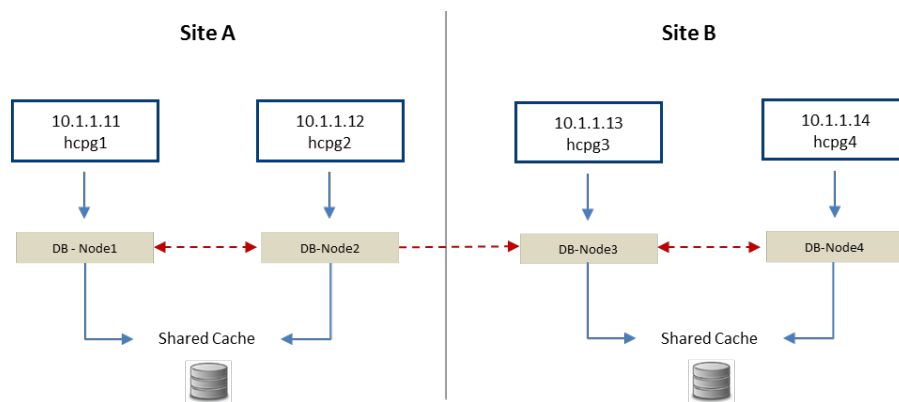
Step 7 – Start the wildfly and saml services by issuing the command ***sudo systemctl start <service-name>*** on all nodes and then start the shares in the HCP Gateway UI on **HCPG1**.

```
vault@hcpG-linux-1:~$ sudo systemctl start saml
vault@hcpG-linux-1:~$ sudo systemctl start wildfly
```

Chapter 5 Four Nodes: Master-Master Replication for HA Cluster with DR Failover to HA Cluster

The intent for this configuration is that Site B is a hot-standby copy of Site A, and also can be used to read/write data if Site A is offline. This configuration does not support both sites being active at the same time. Manual intervention is required to fail back from Site B to Site A. In this configuration, the databases on all gateways are replicated to each other. The two gateways on Site A are in a cluster and have a shared cache, only one gateway is active. The two gateways on Site B are in a cluster and have a shared cache, only one gateway is active. Data written to Site A, will be available on Site B after a short delay.

Four Nodes: Master-Master HA Cluster on both sites



WARNING:

1. You must stop all of the shares in the HCP Gateway UI and the saml service by issuing the command ***sudo systemctl stop saml*** before making any changes to the `saml.properties` file. Then restart the saml service by issuing the command ***sudo systemctl start saml*** after saving the file.
2. You must stop the mysql service by issuing the command ***sudo systemctl stop mariadb*** if any changes are made to the `mariadb.cnf` file. Then restart the mysql service by issuing the command ***sudo systemctl start mariadb*** after saving the file.

Step 1 - Update HCPG Gateway properties file

The configuration requires the `server.ignore` and `cluster` flags in the `sam.properties` file to be enabled for `hcpg1`, `hcpg2`, `hcpg3`, and `hcpg4`. This change must be made on all respective `hcpg` systems.

Note: You must stop and restart the SAM VFS service if any changes are made.

Edit properties file at: `/etc/sam/sam.properties`

Make the following edits:

HCPG1

```
server.id=1
server.ignore=1
cluster=1
binlog.name=hcpg-1-bin
```

HCPG2

```
server.id=2
server.ignore=1
cluster=1
binlog.name=hcpg-2-bin
```

HCPG3

```
server.id=3
server.ignore=1
cluster=1
binlog.name=hcpg-3-bin
```

HCPG4

```
server.id=4
server.ignore=1
cluster=1
binlog.name=hcpg-4-bin
```

Step 2 - Edit the `mariadb.cnf` files on the four HCP Gateways

The database configuration must be setup to allow seamless interleaving of database records. This change must be made on all four `hcpg` systems, and, with the exact settings as shown for each `hcpg` system.

Note: The following is added or changed in the `'[mariadb]'` section of the respective `mariadb.cnf`

file.

Ensure the migration table is excluded from being replicated in addition to the common list of excluded tables.

You must stop and restart the mysql service if any changes are made.

Edit File `/etc/mysql/mariadb.cnf`

HCPG1 [mariadb]

Global Transaction ID

gtid-domain-id=1

gtid-ignore-duplicates=ON

Unique Server ID

server-id = 1

Replication Configuration

auto-increment-offset = 1

auto-increment-increment = 4

ignore tables when replicate SAM database

See chapter 1 for appropriate tables to ignore, in addition these following entries must be added.

node3.replicate_wild_ignore_table = SAM.%migration

node4.replicate_wild_ignore_table = SAM.%migration

node3.replicate_wild_ignore_table = sam.%migration

node4.replicate_wild_ignore_table = sam.%migration

Binary Logging

log_bin = /var/log/mysql/binlog/hcpg-1-bin

```
# Relay Logging
relay-log      = /var/log/mysql/relaylog/hcpg-1-relay
```

HCPG2 [mariadb]

```
# Global Transaction ID
gtid-domain-id=2
gtid-ignore-duplicates=ON

## Unique Server ID
server-id = 2

## Replication Configuration
auto-increment-offset = 2
auto-increment-increment = 4
```

```
# ignore tables when replicate SAM database
```

See chapter 1 for appropriate tables to ignore, in addition these following entries must be added.

```
node3.replicate_wild_ignore_table = SAM.%migration
```

```
node4.replicate_wild_ignore_table = SAM.%migration
```

```
node3.replicate_wild_ignore_table = sam.%migration
```

```
node4.replicate_wild_ignore_table = sam.%migration
```

```
## Binary Logging
```

```
log_bin      = /var/log/mysql/binlog/hcpg-2-bin
relay-log    = /var/log/mysql/relaylog/hcpg-2-relay
```

HCPG3 [mariadb]

```
# Global Transaction ID
gtid-domain-id=3
gtid-ignore-duplicates=ON
```

```
## Unique Server ID
```

```
server-id = 3
```

```
## Replication Configuration
```

```
auto-increment-offset = 3
```

```
auto-increment-increment = 4
```

```
# ignore tables when replicate SAM database
```

See chapter 1 for appropriate tables to ignore, in addition these following entries must be added.

```
node1.replicate_wild_ignore_table = SAM.%migration
```

```
node2.replicate_wild_ignore_table = SAM.%migration
```

```
node1.replicate_wild_ignore_table = sam.%migration
```

```
node2.replicate_wild_ignore_table = sam.%migration
```

```
## Binary Logging
```

```
log_bin = /var/log/mysql/binlog/hcpg-3-bin
```

```
# Relay Logging
```

```
relay-log = /var/log/mysql/relaylog/hcpg-3-relay
```

HCPG4 [mariadb]

```
# Global Transaction ID
```

```
gtid-domain-id=4
```

```
gtid-ignore-duplicates=ON
```

```
## Unique Server ID
```

```
server-id = 4
```

```
## Replication Configuration
```

```

auto-increment-offset = 4
auto-increment-increment = 4

# ignore tables when replicate SAM database
See chapter 1 for appropriate tables to ignore, in addition these following entries must be
added.

node1.replicate_wild_ignore_table = SAM.%migration

node2.replicate_wild_ignore_table = SAM.%migration

node1.replicate_wild_ignore_table = sam.%migration

node2.replicate_wild_ignore_table = sam.%migration

## Binary Logging
log_bin          = /var/log/mysql/binlog/hcpg-4-bin

# Relay Logging
relay-log        = /var/log/mysql/relaylog/hcpg-4-relay

```

Step 3 – Common Replication Setup Steps

It is required to perform the replication setup before any data is written to any of the nodes in the HCP Gateway. These steps need to be run on **HCPG1, HCPG2, HCPG3 and HCPG4** with HCPG1 as the active node. If another node is the active node, then adjust the instructions for the active node.

In this configuration step a replication user account will be created on all nodes;

Note: the password is the string immediately following 'IDENTIFIED BY'

This step requires the use of the MariaDB Command Prompt, which is available by issuing the mysql command as the root user. When issuing the command, if prompted with "[sudo] password for vault: ", enter the password for the user vault. When prompted with " Enter password:", enter the MariaDB root password.

MariaDB Command Prompt (**MariaDB [(none)]>**) run on **HCPG1, HCPG2, HCPG3 and HCPG4**

```
sudo mysql -u root -p <press enter>
```


Execute this command on each node to check if replication was previously configured and if so that there are no errors listed in the output. Resolve any errors before continuing to setup the replication.

```
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

In the MariaDB Command Prompt (MariaDB [(none)]>) run on HCPG1, HCPG2, HCPG3 and HCPG4

```
MariaDB [(none)]> stop all slaves;
```

```
MariaDB [(none)]> reset slave all;
```

Execute these commands on HCPG1, HCPG2, HCPG3 and HCPG4, you only need to execute these commands the first time replication is setup. If replication is being reconfigured and the replication_user already exists, skip these 7 commands.

```
MariaDB [(none)]> delete from mysql.user where user ='replication_user';
```

```
MariaDB [(none)]> FLUSH PRIVILEGES;
```

```
MariaDB [(none)]> FLUSH TABLES;
```

```
MariaDB [(none)]> CREATE USER 'replication_user'@'%' IDENTIFIED BY 'Organ1cReplication';
```

```
MariaDB [(none)]> GRANT REPLICATION SLAVE ON *.* TO 'replication_user'@'%';
```

```
MariaDB [(none)]> FLUSH PRIVILEGES;
```

```
MariaDB [(none)]> FLUSH TABLES;
```

Stop all of the shares in the HCP Gateway UI and then stop the saml, wildfly and mysql services by issuing the command **sudo systemctl stop <service-name>** on HCPG1, HCPG2, HCPG3 and HCPG4.

```
vault@hcp-g-linux-1:~$ sudo systemctl stop saml
```

```
vault@hcp-g-linux-1:~$ sudo systemctl stop wildfly
```

```
vault@hcp-g-linux-1:~$ sudo systemctl stop mariadb
```

Delete all the .info files in the /var/lib/mysql/ folder on HCPG1, HCPG2, HCPG3 and HCPG4.

```
vault@hcp-g-linux-1:~$ cd /var/lib/mysql
```

```
vault@hcp-g-linux-1:/var/lib/mysql$ ls -l *.info
```

```
-rw-rw---- 1 mysql mysql 177 Feb 16 15:36 master-node2.info
```

```
-rw-rw---- 1 mysql mysql  6 Feb 16 15:21 multi-master.info
```

```
-rw-rw---- 1 mysql mysql 84 Feb 16 15:36 relay-log-node2.info
```

```
vault@hcp-g-linux-1:/var/lib/mysql$ sudo rm *.info
```

```
vault@hcp-g-linux-1:/var/lib/mysql$ ls -l *.info
```

```
ls: cannot access '*.info': No such file or directory
```

```
vault@hcpg-linux-1:/var/lib/mysql$
```

Delete or rename the `/var/log/mysql/*.err` file on **HCPG1, HCPG2, HCPG3 and HCPG4**.

```
vault@hcpg-linux-1:/var/lib/mysql$ cd /var/log/mysql
```

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l *.err
```

```
-rw-rw---- 1 mysql adm 15045 Feb 16 14:22 mariadb.err
```

```
vault@hcpg-linux-1:/var/log/mysql$ sudo mv mariadb.err old.mariadb.err
```

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l *.err
```

```
-rw-rw---- 1 mysql adm 15045 Feb 16 14:22 old.mariadb.err
```

```
vault@hcpg-linux-1:/var/log/mysql$
```

Delete all the files in the `/var/log/mysql/binlog` that begin with **hcpg*** on **HCPG1, HCPG2, HCPG3 and HCPG4**. The filenames on HCPG1 will be `hcpg-1-*`, `hcpg-2-*` on HCPG2, `hcpg-3-*` on HCPG3 and `hcpg-4-*` on HCPG4.

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l binlog
```

```
total 20
```

```
-rw-rw---- 1 mysql adm 2101 Feb 16 11:30 hcpg-1-bin.000001
```

```
-rw-rw---- 1 mysql adm 2115 Feb 16 13:44 hcpg-1-bin.000002
```

```
-rw-rw---- 1 mysql adm 2724 Feb 16 14:22 hcpg-1-bin.000003
```

```
-rw-rw---- 1 mysql adm 120 Feb 16 14:12 hcpg-1-bin.index
```

```
-rw-rw---- 1 mysql adm 7 Feb 16 14:22 hcpg-1-bin.state
```

```
vault@hcpg-linux-1:/var/log/mysql$ sudo rm binlog/hcpg*
```

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l binlog
```

```
total 0
```

```
vault@hcpg-linux-1:/var/log/mysql$
```

Delete all the files in the `/var/log/mysql/relaylog` folder that begin with **hcpg*** on **HCPG1, HCPG2, HCPG3 and HCPG4**.

```
vault@hcpg-linux-1:/var/log/mysql$ ls -l relaylog
```

```
total 0
-rw-r--r-- 1 root adm 0 Feb 16 15:02 hcp-1-relay-node2.00002
-rw-r--r-- 1 root adm 0 Feb 16 15:02 hcp-1-relay-node2.index
vault@hcp-1-linux-1:/var/log/mysql$ sudo rm relaylog/hcp*
vault@hcp-1-linux-1:/var/log/mysql$ ls -l relaylog
total 0
vault@hcp-1-linux-1:/var/log/mysql$
```

Start the mysql service by issuing the command ***sudo systemctl start mariadb*** on **HCPG1, HCPG2, HCPG3 and HCPG4**.

```
vault@hcp-1-linux-1:~$ sudo systemctl start mariadb
```

Check the `/var/log/mysql/*.err` file for any errors on **HCPG1, HCPG2, HCPG3 and HCPG4**. The expected output is shown below.

```
vault@hcp-1-linux-1:/var/log/mysql$ cat mariadb.err
2021-02-16 15:07:50 0 [Note] InnoDB: Using Linux native AIO
2021-02-16 15:07:50 0 [Note] InnoDB: Mutexes and rw_locks use GCC atomic builtins
2021-02-16 15:07:50 0 [Note] InnoDB: Uses event mutexes
2021-02-16 15:07:50 0 [Note] InnoDB: Compressed tables use zlib 1.2.11
2021-02-16 15:07:50 0 [Note] InnoDB: Number of pools: 1
2021-02-16 15:07:50 0 [Note] InnoDB: Using SSE2 crc32 instructions
2021-02-16 15:07:50 0 [Note] mysqld: O_TMPFILE is not supported on /tmp (disabling future attempts)
2021-02-16 15:07:50 0 [Note] InnoDB: Initializing buffer pool, total size = 256M, instances = 1, chunk size = 128M
2021-02-16 15:07:50 0 [Note] InnoDB: Completed initialization of buffer pool
2021-02-16 15:07:50 0 [Note] InnoDB: If the mysqld execution user is authorized, page cleaner thread priority can be changed. See the man page of setpriority().
2021-02-16 15:07:50 0 [Note] InnoDB: 128 out of 128 rollback segments are active.
2021-02-16 15:07:50 0 [Note] InnoDB: Creating shared tablespace for temporary tables
2021-02-16 15:07:50 0 [Note] InnoDB: Setting file './ibtmp1' size to 12 MB. Physically writing the file full; Please wait ...
```

```
2021-02-16 15:07:50 0 [Note] InnoDB: File './ibtmp1' size is now 12 MB.
2021-02-16 15:07:50 0 [Note] InnoDB: 10.4.17 started; log sequence number 61417; transaction
id 20
2021-02-16 15:07:50 0 [Note] InnoDB: Loading buffer pool(s) from
/var/lib/mysql/ib_buffer_pool
2021-02-16 15:07:50 0 [Note] Plugin 'FEEDBACK' is disabled.
2021-02-16 15:07:50 0 [Note] InnoDB: Buffer pool(s) load completed at 210216 15:07:50
2021-02-16 15:07:50 0 [Note] Server socket created on IP: '0.0.0.0'.
2021-02-16 15:07:50 0 [Note] Reading of all Master_info entries succeeded
2021-02-16 15:07:50 0 [Note] Added new Master_info '' to hash table
2021-02-16 15:07:50 0 [Note] /usr/sbin/mysqld: ready for connections.
Version: '10.4.17-MariaDB-1:10.4.17+maria~buster-log' socket: '/var/run/mysqld/mysqld.sock'
port: 3306 mariadb.org binary distribution
vault@hcp-g-linux-1:/var/log/mysql$
```

Step 4 – Collect the replication positions

Note: The output or result from this command will be used in the other 3 hcpgs. For example the output from 'hcpg1' will be used in 'hcpg2', 'hcpg3', 'hcpg4'

HCPG1 (the active node)

In the MariaDB Command Prompt, execute the following command:

```
MariaDB [(none)]> RESET MASTER;
```

Change directory to /home/vault. Dump the SAM database to a .sql file that will be copied to the other replication node using the script from the Database Backup Script chapter.

```
vault@hcp-g-linux-1:/var/log/mysql$ cd /home/vault
```

```
vault@hcp-g-linux-1:~$ ./mysqldump.replication.hcp1.sh
```

```
Enter MariaDB root username then space then the MariaDB root password: root
```

```
<MariaDB-root-password>
```

```
vault@hcp-g-linux-1:~$
```

Back in the MariaDB Command Prompt, execute the following commands:

```
MariaDB [(none)]> SHOW MASTER STATUS;
```

```
+-----+-----+-----+-----+
| File           | Position | Binlog_Do_DB | Binlog_Ignore_DB |
+-----+-----+-----+-----+
| hcpg-1-bin.000001 |      329 |               | mysql              |
+-----+-----+-----+-----+
```

Note: The output or result from the show master status command will be used in command below ('hcpg-1-bin.000001', 329).

```
MariaDB [(none)]> SELECT BINLOG_GTID_POS('hcpg-1-bin.000001', 329);
```

```
+-----+-----+
| BINLOG_GTID_POS('hcpg-1-bin.000001', 329) |
+-----+-----+
| 1-1-14                                     |
+-----+-----+
```

HCPG2

Copy the mysqldump.replication.hcp1.sql file from HCPG1 to the /home/vault folder on HCPG2. Change directory to /home/vault. Import the SAM database .sql file to copy the database from HCPG1 to HCPG2.

```
vault@hcpg-linux-2:/var/log/mysql$ cd /home/vault
```

```
vault@hcpg-linux-2:~$ scp
```

```
vault@10.1.1.11:/home/vault/mysqldump.replication.hcp1.sql .
```

The authenticity of host '10.1.1.11 (10.1.1.11)' can't be established.

ECDSA key fingerprint is

SHA256:DJ/EfAf4hOaeooyrSUUgxoX80x6AdHwUtOzWU2Lu3x4.

Are you sure you want to continue connecting (yes/no/[fingerprint])? yes

Warning: Permanently added '10.1.1.11' (ECDSA) to the list of known hosts.

```
vault@10.1.1.11's password:
```

```
mysqldump.replication.hcp1.sql
```

```
100% 23KB 25.6MB/s
```

```
00:00
```

WARNING: This command will replace the database on HCPG2 with the data imported from the database on HCPG1. If there is production data on HCPG2 that was not replicated to HCPG1, then the production data on HCPG2 will be lost.

```
vault@hcpg-linux-2:~$ mysql -uroot -p < mysqldump.replication.hcp1.sql
```

Enter password:

```
vault@hcpg-linux-2:~$
```

In the MariaDB Command Prompt, execute the following commands:

```
MariaDB [(none)]> RESET MASTER;
```

```
MariaDB [(none)]> SHOW MASTER STATUS;
```

```
+-----+-----+-----+-----+
| File           | Position | Binlog_Do_DB | Binlog_Ignore_DB |
+-----+-----+-----+-----+
| hcp1-2-bin.000001 | 329 | | mysql |
+-----+-----+-----+-----+
```

Note: The output or result from the show master status command will be used in command below ('hcp1-2-bin.000001', 329).

```
MariaDB [(none)]> SELECT BINLOG_GTID_POS('hcp1-2-bin.000001', 329);
```

```
+-----+
| BINLOG_GTID_POS('hcp1-2-bin.000001', 329) |
+-----+
| NULL |
+-----+
```

HCPG3

Copy the mysqldump.replication.hcp1.sql file from HCPG1 to the /home/vault folder on HCPG3. Change directory to /home/vault. Import the SAM database .sql file to copy the database from HCPG1 to HCPG3.

```
vault@hcpg-linux-3:/var/log/mysql$ cd /home/vault
```

```
vault@hcpg-linux-3:~$ scp
```

```
vault@10.1.1.11:/home/vault/mysqldump.replication.hcp1.sql .
```

The authenticity of host '10.1.1.11 (10.1.1.11)' can't be established.

ECDSA key fingerprint is

SHA256:DJ/EfAf4hOaeooyrSUUgxoX80x6AdHwUtOzWU2Lu3x4.

Are you sure you want to continue connecting (yes/no/[fingerprint])? yes

Warning: Permanently added '10.1.1.11' (ECDSA) to the list of known hosts.

vault@10.1.1.11's password:

mysqldump.replication.hcp1.sql
00:00

100% 23KB 25.6MB/s

WARNING: This command will replace the database on HCPG3 with the data imported from the database on HCPG1. If there is production data on HCPG3 that was not replicated to HCPG1, then the production data on HCPG3 will be lost.

```
vault@hcpg-linux-3:~$ mysql -uroot -p < mysqldump.replication.hcp1.sql
```

Enter password:

```
vault@hcpg-linux-3:~$
```

In the MariaDB Command Prompt, execute the following commands:

```
MariaDB [(none)]> RESET MASTER;
```

```
MariaDB [(none)]> SHOW MASTER STATUS;
```

```
+-----+-----+-----+-----+
| File           | Position | Binlog_Do_DB | Binlog_Ignore_DB |
+-----+-----+-----+-----+
| hcp1-3-bin.000001 |      329 |              | mysql              |
+-----+-----+-----+-----+
```

Note: The output or result from the show master status command will be used in command below ('hcp1-3-bin.000001', 329).

```
MariaDB [(none)]> SELECT BINLOG_GTID_POS('hcp1-3-bin.000001', 329);
```

```
+-----+
| BINLOG_GTID_POS('hcp1-3-bin.000001', 329) |
+-----+
| 3-1-14                                     |
+-----+
```

HCPG4

Copy the mysqldump.replication.hcp1.sql file from HCPG1 to the /home/vault folder on HCPG4. Change directory to /home/vault. Import the SAM database .sql file to copy the database from HCPG1 to HCPG4.

```
vault@hcpg-linux-4:/var/log/mysql$ cd /home/vault
```

```
vault@hcpg-linux-4:~$ scp
```

```
vault@10.1.1.11:/home/vault/mysqldump.replication.hcp1.sql .
```

The authenticity of host '10.1.1.11 (10.1.1.11)' can't be established.

ECDSA key fingerprint is

SHA256:DJ/EfAf4hOaeooyrSUUgxoX80x6AdHwUtOzWU2Lu3x4.

Are you sure you want to continue connecting (yes/no/[fingerprint])? yes

Warning: Permanently added '10.1.1.11' (ECDSA) to the list of known hosts.

vault@10.1.1.11's password:

mysqldump.replication.hcpg1.sql
00:00

100% 23KB 25.6MB/s

WARNING: This command will replace the database on HCPG4 with the data imported from the database on HCPG1. If there is production data on HCPG4 that was not replicated to HCPG1, then the production data on HCPG4 will be lost.

```
vault@hcpg-linux-4:~$ mysql -uroot -p < mysqldump.replication.hcpg1.sql
```

Enter password:

```
vault@hcpg-linux-4:~$
```

In the MariaDB Command Prompt, execute the following commands:

```
MariaDB [(none)]> RESET MASTER;
```

```
MariaDB [(none)]> SHOW MASTER STATUS;
```

```
+-----+-----+-----+-----+
| File           | Position | Binlog_Do_DB | Binlog_Ignore_DB |
+-----+-----+-----+-----+
| hcpg-4-bin.000001 |      329 |              | mysql              |
+-----+-----+-----+-----+
```

Note: The output or result from the show master status command will be used in command below ('hcpg-4-bin.000001', 329).

```
MariaDB [(none)]> SELECT BINLOG_GTID_POS('hcpg-4-bin.000001', 329);
```

```
+-----+
| BINLOG_GTID_POS('hcpg-2-bin.000001', 329) |
+-----+
| NULL                                         |
+-----+
```


Step 5 - Enable replication

HCPG1

Note: The position information is from the 'hcp2', 'hcg3' and 'hcg4' SELECT BINLOG_GTID_POS output

If the result is empty or NULL, enter an empty string '' (2 single quotes)

If the result is a string of numbers separated by dashes '-',

example: '2-1-14' from hcp2 and '3-1-14' from hcg3, the hcg4 result was empty or NULL.

use the entire string from both hcp2 and hcg3 enclosed by single quotes '2-1-14,3-1-14', do not enter a value from hcg4 since the result was empty or NULL.

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = ''; ← This is for a NULL value (2 single quotes).
```

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = '2-1-14,3-1-14'; ← This is value of 1-1-14 and 3-1-14.
```

Note: The IP address below is for hcp2

```
MariaDB [(none)]> CHANGE MASTER 'node2' TO master_host="10.1.1.12",  
master_port=3306,  
master_user="replication_user", master_password='Organ1cReplication',  
master_use_gtid=slave_pos, master_ssl=1;
```

Note: The IP address below is for hcp3

```
MariaDB [(none)]> CHANGE MASTER 'node3' TO master_host="10.1.1.13",  
master_port=3306,  
master_user="replication_user", master_password='Organ1cReplication',  
master_use_gtid=slave_pos, master_ssl=1;
```

Note: The IP address below is for hcp4

```
MariaDB [(none)]> CHANGE MASTER 'node4' TO master_host="10.1.1.14",
master_port=3306,
    master_user="replication_user", master_password='Organ1cReplication',
    master_use_gtid=slave_pos, master_ssl=1;
```

HCPG2

Note: The position information is from the 'hcp1', 'hcg3' and 'hcg4' SELECT BINLOG_GTID_POS output

If the result is empty or NULL, enter an empty string " (2 single quotes)

If the result is a string of numbers separated by dashes '-',

example: '1-1-14' from hcp1 and '3-1-14' from hcg3, the hcg4 result was empty or NULL.

use the entire string from both hcp1 and hcg3 enclosed by single quotes '1-1-14,3-1-14', do not enter a value from hcg4 since the result was empty or NULL.

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = ""; ← This is for a NULL value (2 single quotes).
```

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = '1-1-14,3-1-14'; ← This is value of 1-1-14 and 3-1-14.
```

Note: The IP address below is for hcp1

```
MariaDB [(none)]> CHANGE MASTER 'node1' TO master_host="10.1.1.11",
master_port=3306,
    master_user="replication_user", master_password='Organ1cReplication',
    master_use_gtid=slave_pos, master_ssl=1;
```

Note: The IP address below is for hcp3

```
MariaDB [(none)]> CHANGE MASTER 'node3' TO master_host="10.1.1.13",
master_port=3306,
    master_user="replication_user", master_password='Organ1cReplication',
    master_use_gtid=slave_pos, master_ssl=1;
```

Note: The IP address below is for hcp4

```
MariaDB [(none)]> CHANGE MASTER 'node4' TO master_host="10.1.1.14",
master_port=3306,
    master_user="replication_user", master_password='Organ1cReplication',
    master_use_gtid=slave_pos, master_ssl=1;
```

HCPG3

Note: The position information is from the 'hcpg1', 'hcpg2' and 'hcpg4' SELECT BINLOG_GTID_POS output

If the result is empty or NULL, enter an empty string " (2 single quotes)

If the result is a string of numbers separated by dashes '-',

example: '1-1-14' from hcp1 and '2-1-14' from hcp2, the hcp4 result was empty or NULL.

use the entire string from both hcp1 and hcp2 enclosed by single quotes '1-1-14,2-1-14', do not enter a value from hcp4 since their result was empty or NULL.

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = ""; ← This is for a NULL value (2 single quotes).
```

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = '1-1-14,2-1-14'; ← This is value of 1-1-14 and 2-1-14.
```

Note: The IP address below is for hcp1

```
MariaDB [(none)]> CHANGE MASTER 'node1' TO master_host="10.1.1.11",
master_port=3306,
    master_user="replication_user", master_password='Organ1cReplication',
    master_use_gtid=slave_pos, master_ssl=1;
```

Note: The IP address below is for hcp2

```
MariaDB [(none)]> CHANGE MASTER 'node2' TO master_host="10.1.1.12",
master_port=3306,
    master_user="replication_user", master_password='Organ1cReplication',
    master_use_gtid=slave_pos, master_ssl=1;
```

Note: The IP address below is for hcp4

```
MariaDB [(none)]> CHANGE MASTER 'node4' TO master_host="10.1.1.14",
master_port=3306,
    master_user="replication_user", master_password='Organ1cReplication',
    master_use_gtid=slave_pos, master_ssl=1;
```

HCPG4

Note: The position information is from the 'hcpg1', 'hcpg2' and 'hcpg3' SELECT BINLOG_GTID_POS output

If the result is empty or NULL, enter an empty string " (2 single quotes)

If the result is a string of numbers separated by dashes '-',

example: '1-1-14' from hcp1 and '3-1-14' from hcp3, the hcp2 result was empty or NULL.

use the entire string from both hcp1 and hcp3 enclosed by single quotes '1-1-14,3-1-14', do not enter a value from hcp2 since the result was empty or NULL.

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = ""; ← This is for a NULL value (2 single quotes).
```

```
MariaDB [(none)]> SET GLOBAL gtid_slave_pos = '1-1-14,3-1-14'; ← This is value of 1-1-14 and 3-1-14.
```

Note: The IP address below is for hcp1

```
MariaDB [(none)]> CHANGE MASTER 'node1' TO master_host="10.1.1.11",  
master_port=3306,  
master_user="replication_user", master_password='Organ1cReplication',  
master_use_gtid=slave_pos, master_ssl=1;
```

Note: The IP address below is for hcp2

```
MariaDB [(none)]> CHANGE MASTER 'node2' TO master_host="10.1.1.12",  
master_port=3306,  
master_user="replication_user", master_password='Organ1cReplication',  
master_use_gtid=slave_pos, master_ssl=1;
```

Note: The IP address below is for hcp3

```
MariaDB [(none)]> CHANGE MASTER 'node3' TO master_host="10.1.1.13",  
master_port=3306,  
master_user="replication_user", master_password='Organ1cReplication',  
master_use_gtid=slave_pos, master_ssl=1;
```

Step 6 – Start replication

HCPG1

```
MariaDB [(none)]> START ALL SLAVES;
```

```
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

HCPG2

```
MariaDB [(none)]> START ALL SLAVES;
```

```
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

HCPG3

```
MariaDB [(none)]> START ALL SLAVES;
```

```
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

HCPG4

```
MariaDB [(none)]> START ALL SLAVES;
```

```
MariaDB [(none)]> SHOW ALL SLAVES STATUS\G
```

Step 7 – Start the wildfly and saml services by issuing the command ***sudo systemctl start <service-name>*** on all nodes and then start the shares in the HCP Gateway UI on **HCPG1**.

```
vault@hcpg-linux-1:~$ sudo systemctl start saml
```

```
vault@hcpg-linux-1:~$ sudo systemctl start wildfly
```

Chapter 6 Database Backup Script

This script is run on the active node HCPG1, replace HCPG1 with the name of the active node in your environment.

Copy the text below to a Windows Notepad first to remove any formatting by Microsoft Word, then copy the text into a script named **mysqldump.replication.hcpg1.sh** in the **/home/vault** folder on **HCPG1**.

As an alternative once the file is copied to the Gateway, a tool called **dos2unix** can be used convert the format.

Example:

```
dos2unix mysqldump.replication.hcpg1.sh
```

Configure the script to be executable with the command **chmod +x mysqldump.replication.hcpg1.sh**. If the database is large on HCPG1, then you may need to adjust the script to write the **mysqldump.replication.hcpg1.sql** file to the **/var/lib/mysql** folder on **HCPG1**.

The database backup will be saved to a file named **/home/vault/mysqldump.replication.hcpg1.sql**.

Note: If there is not enough space in /home/vault for the dump file, then change the location of the dump file from /home/vault to /storage/Backup in the script below, and use /storage/Backup as the location of the dump file when copying and importing the dump.

```
#!/bin/bash

# Enter the database root username followed by a space and then the database root password
read -p "Enter MariaDB root username then space then the MariaDB root password: " user pass

#specify your database, e.g. "mydb"

DB="SAM"

DBS=""

j=0
```

```
for i in `grep 'replicate-wild-ignore-table' /etc/mysql/mariadb.cnf | grep -v '#' | grep SAM | awk
-F"." '{print $NF}' | sort -u`
```

```
do
```

```
SQL_STRING="select group_concat(concat('--ignore-table=', TABLE_SCHEMA, '.', table_name)
SEPARATOR ' ') from information_schema.tables where TABLE_SCHEMA = '$DB' and
TABLE_NAME like '$i'";
```

```
if [[ $j -eq 0 ]]
```

```
then
```

```
DBS=$(echo $SQL_STRING | mysql -u $user -p$pass -Bs --database=$DB )
```

```
else
```

```
DBS="$DBS"" "$(echo $SQL_STRING | mysql -u $user -p$pass -Bs --database=$DB )
```

```
fi
```

```
j=$((j + 1))
```

```
done
```

```
#Now you have a string in $DBS like this: "--ignore_table=someprefix1 --
ignore_table=someprefix2 ..."
```

```
DBS=$(echo $DBS | sed 's/NULL//g')
```

```
mysqldump --routines --hex-blob=1 -u$user -p$pass --databases $DB $DBS >
/home/vault/mysqldump.replication.hcpg1.sql
```


Chapter 7 HCP Gateway Failover to Standby

1. On the standby HCP Gateway node or cluster pair of nodes, if the HCP system associated with it is no longer accessible, change the HCP system setting in the HCP Gateway management console.
2. On the standby HCP Gateway node or cluster pair of nodes, if the SMB shares have Read-only permissions, change the permissions to Read-Write.
3. Configure DNS or Load Balancer to point to the standby HCP Gateway.

To failback to primary Gateway, please contact Hitachi Vantara Support.

Hitachi Vantara



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