Maximize Your Oracle Experience

שבוע אורקל 2015

MySQL Administration

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Maintenance Operations

Table Maintenance Operations

- There are multiple SQL statements for performing table maintenance:
  - **ANALYZE TABLE**: Updates index statistics
  - **CHECK TABLE**: Checks the integrity of the table
  - **CHECKSUM TABLE**: Reports a checksum for the table
  - **REPAIR TABLE**: Repairs the table only applies to MyISAM, ARCHIVE, and CSV tables.
  - **OPTIMIZE TABLE**: Optimizes the table
- Each statement takes one or more table names and optional keywords.
- Example of a maintenance statement and output:

```
mysql> CHECK TABLE world_innodb.City;
+--------------------+-------+----------+----------+
| Table              | Op    | Msg_type | Msg_text |
+--------------------+-------+----------+----------+
| world_innodb.City  | check | status   | OK       |
+--------------------+-------+----------+----------+
```

mysqlcheck Client Program

- Is a command-line client that checks, repairs, analyzes, and optimizes tables
- Can be more convenient than issuing SQL statements
- Works with InnoDB, MyISAM, and ARCHIVE tables
- Three levels of checking:
  - Table-specific
  - Database-specific
  - All databases
- Some **`mysqlcheck`** maintenance options:
  - **`--analyze`**: Perform an **`ANALYZE TABLE`**.
  - **`--check`**: Perform a **`CHECK TABLE`** (default).
  - **`--optimize`**: Perform an **`OPTIMIZE TABLE`**.
  - **`--repair`**: Perform a **`REPAIR TABLE`**.

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Backup **Because bad things do happen**

Schrodinger's Backup

"The condition of any backup is unknown until a restore is attempted."

@nixcraft

Backups with MySQL

- Logical (textual representation: SQL statements)
- Physical (binary copy of data files)
- Snapshot-based
- Replication-based
- Incremental (binary log flushed)

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Comparing Backup Methods

Method	Hot/Warm/ Cold	Storage Engines	Logical/ Physical	Consistent	Availability
MySQL Enterprise Backup	Hot (InnoDB)/ warm (other)	All	Physical	Yes	Commercially available
`mysqlhotcopy`	Warm	MyISAM	Physical	Yes	Freely available
`mysqldump`	Hot (InnoDB)/ warm (other)	All	Logical	Yes	Freely available
Snapshots	Hot	All	Physical	Yes	Need snapshot volume or file system
Replication	Hot	All	Logical or physical	Yes	Freely available
SQL Statements	Warm	All	Logical	No	Freely available
OS Copy Commands	Cold or warm	All	Physical	Yes	Freely available

Logical Backups

- Logical backups:
  - Convert databases and tables to SQL statements
  - Require that the MySQL server be running during the backup
  - Can back up both local and remote MySQL servers
  - Are generally slower than raw (binary) backups
  - Very slow recover time
- The size of a logical backup file may exceed the size of the database being backed up.

```
mysqldump --sock=mysql.sock  -u root -p --no-data  --
database test  > test_ddl.sql
```

Snapshot-Based Backups

- Snapshot-based backups:
  - Create a point-in-time “copy” of the data
  - Provide a logically frozen version of the file system from which you can take MySQL backups
  - Greatly reduce the time during which the database and applications are unavailable
- A raw backup is typically performed against the snapshot copy.
- can perform a hot backup of InnoDB tables; for other engines, perform a warm backup.

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Replication-Based Backups

- MySQL replication can be used for backups:
  - The master is used for the production applications.
  - A slave is used for cold backup .
- This eliminates the impact on production applications.
- Higher cost: There must be another server and storage to store replica of the database.

MySQL Enterprise Backup

- Hot backup
  - InnoDB storage engine
- Warm backup
  - Non-InnoDB storage engines
- Incremental backups:
  - Back up data that changed since the previous backup
  - Are primarily intended for InnoDB tables, or non-InnoDB tables that are read-only or rarely updated
- Single-file backups:
  - Provide the ability to create a backup in a single-file format
  - Can be streamed or piped to another process

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MySQL Enterprise Backup

Hot Backup

Hot backups are performed while the database is running. This type of backup does not block normal database operations, and it captures even changes that occur while the backup is happening.

For InnoDB tables

Warm Backup

For non-InnoDB storage engines, MySQL Enterprise Backup performs a warm backup in which the database tables can be read, but the database cannot be modified while the non-InnoDB backup runs.

Single-File Backup

Because the single-file backup can be streamed or piped to another process, such as a tape backup or a command such as `scp`, you can use this technique to put the backup on another storage device or server without significant storage overhead on the original database server.

MySQL Enterprise Backup
mysqlbackup

- **mysqlbackup** is an easy-to-use tool for all backup and restore operations.
- Basic usage:

```
mysqlbackup -u<user> -p<password>
  --backup_dir=<backup-dir>
  backup-and-apply-log
```

- **backup**: Performs the initial phase of a backup
- **backup-and-apply-log**: Includes the initial phase of the backup and the second phase, which brings the InnoDB tables in the backup up to date, including any changes made to the data while the backup was running

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MySQL Enterprise Backup
mysqlbackup

- Creating a Cloud Backup on Amazon S3

```
mysqlbackup\
--cloud-service=s3 --cloud-aws-region=<aws region> \
--cloud-access-key-id=<aws access key id> --cloud-secret-access-key=< aws secret access key> \
--cloud-bucket=<s3 bucket name> --cloud-object-key=<aws object key> \
--backup-dir=/home/user/dba/s3backuptmpdir \
--backup-image=- \
backup-to-image
```

Restoring a Backup with `mysqlbackup`

Basic usage:

```
mysqlbackup --backup-dir=<backup-dir>
    copy-back
```

- ***<backup-dir>***: Specifies where the backed up files are stored
- **`copy-back`**: Tells **`mysqlbackup`** to perform a restore operation

Percona Xtrabackup

One of the strongest and widely used solutions for consistently backing up MySQL files focused on Xtradb/Innodb but also support for non-transactional tables too. Xtrabackup makes use of the XtraDB/ InnoDB crash recovery cycle to apply the redo logs to the data when preparing for a restore. This prepare phase can happen at the end of the backup or as part of the recovery phase.

Full Backup

```
innobackupex –socket=mysql.sock
--port=3306 --databases=world --user=root --password=oracle /u01/backup/
innobackupex --socket=/u01/data/mysql01/mysql.sock --user=root --
password=oracle --apply-log /backup/
```

FLUSH TABLES WITH READ LOCK

- Many backup tools including Percona Xtrabackup, MyLVMBackup,MEB and others use

FLUSH TABLES WITH READ LOCK

to temporary make MySQL read only.

- The impact of **FLUSH TABLES WITH READ LOCK** can be quite large because of the time it may take to complete this statement

- **FLUSH TABLES WITH READ LOCK will wait to other READ LOCK like long** " full join"

FLUSH TABLES WITH READ LOCK

- consider using –no-lock option with Percona Xtrabackup
- --safe-slave-backup in Percona Xtrabackup on the slave
- Stop slave and Look for Slave_open_temp_tables in SHOW STATUS is zero
- Cold Bakup the slave database

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Thank You!

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