Advanced Database

Database Backup and Recovery
MySQL

Plan

- Type of back up and recovery
- Back up and recovery strategy
- Backup using mysqldump
- Incremental recovery with binary log

Type of Backup and Recovery

- Physical: consist of raw copies of the directories and files that store DB contents.
  - Fast for both backup and recovery
  - Small in size
  - Level: entire data directory or individual file, log and configuration file.
  - Tool: mysqlbackup, MySQL Enterprise Backup and file system command.
  - Portable only for machine with similar hardware characteristics
  - Can perform when server is running, but need to exclusively lock all tables during backup.

Type of Backup and Recovery

- Logical: contains logical DB structure (CREATE) and content (INSERT)
  - Slower than the former
  - Bigger output file
  - Level: databases, tables
  - No log or configuration file included
  - Tool: mysqldump and SELECT … INTO OUTFILE, LOAD DATA INFILE, mysqlimport, source...
  - Portable
  - Can perform when server is running.

Type of Backup and Recovery

- Online (hot): take place when server is running
  - Backup: clients still can read data
  - Recovery: client cannot read data
- Offline (cold): take place when server is stopped
  - Client can’t access database in both backup and recovery.

Type of Backup

- Local : the backup is initiate on the same host as server
  - Physical backup is local and can be done offline or online.
- Remote: the backup is initiate from a remote client
- Full backup: consists of all data managed by MySQL server at a given point of time
- Incremental backup: consists of the changes made to data during a given time span
  - Use binary log.

Type of Recovery

- Full recovery:
  - Recover from a full backup: restore server to the state when it was backup.
  - Can be used with incremental backup to bring server to a more up-to-date state.
- Incremental recovery:
  - Recover using binary log (incremental backup)

Back up and recovery strategy

- Type of crash
  - Disk data may still available after restart
    - Operating system crash
    - Power failure
  - Disk data may be damaged or partially damaged
    - File system crash
    - Hardware problem (hard drive, motherboard, and so forth)

Back up and recovery strategy

- Disk data may still available after restart
  - Binary log is needed for data consistency.
- Disk data may be damaged or partially damaged
  - Full backup (and incremental backup) is needed for restoring data to an operational state.

Back up and recovery strategy

- Full backup at a given point of time regularly plus incremental backup regularly (daily)
  - Full backup once a week
  - Incremental daily
  - Store backup file in separate storage device from data
- Always run server with binary log option (--log-bin)
  - Store binary log in separate storage device from data

Backup using mysqldump

- Full logical backup

  ```
  shell> mysqldump --all-databases > file_name.sql
  ```

  ```
  shell> mysqldump --all-databases > full_2017_06_21.sql
  ```

- With authentication

  ```
  shell> mysqldump --user=admin -p --all-databases > full_2017_06_21.sql
  ```

- Backup some databases

  ```
  shell> mysqldump --databases db1 db2 > file_name.sql
  ```

  ```
  shell> mysqldump --databases employees sailor > employees_sailor_2017_06_21.sql
  ```

Backup using mysqldump

- Backup some tables

  ```
  shell> mysqldump db_name table1 table2 > file_name.sql
  ```

  ```
  shell> mysqldump employees department employees > department_employees.sql
  ```

- No CREATE DATABASE and USE statement included in departments_employees.sql

Backup using mysqldump

- Dumping data in delimited-text format

```
shell>mysqldump --user=admin -p –tab=/tmp  sailors
```

- Output:
  - table_name.sql : for table structure
  - Table_name.txt : for data; one line per table row
- Use --help for detail

```
shell>mysqldump --help
```

Incremental recovery

- Need to enable binarylog
- Show all binary log files

```
SHOW BINARY LOGS;
```

- Show current binary log

```
SHOW MASTER STATUS;
```

- Use mysql client to process out put of binary log

```
shell> mysqlbinlog binlog_files | mysql -u root -p
```

- Save output to a file

```
shell> mysqlbinlog binlog_files > tmpfile
```

Incremental recovery

- Execute more than one binary log

```
shell>mysqlbinlog binlog.000001 binlog.000002 | mysql -u root -p
```

- Save to out put file

```
shell> mysqlbinlog binlog.000001 > /tmp/statements.sql
shell> mysqlbinlog binlog.000002 >> /tmp/statements.sql
```

- Execute output file with mysql client

```
shell> mysql -u root -p -e "source /tmp/statements.sql"
```