XtraBackup: Hot Backups and More

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MySQL CE
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Introduction

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## Comparing Backup Options

<table>
<thead>
<tr>
<th>Engine</th>
<th>Warmth</th>
<th>Flex Backup</th>
<th>Flex Restore</th>
<th>Backup time</th>
<th>Restore time</th>
<th>Binlog coord</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>mysqldump</td>
<td>InnoDB/XtraDB</td>
<td>HOT</td>
<td>ROW</td>
<td>MOST</td>
<td>MED</td>
<td>WORST</td>
<td>YES</td>
</tr>
<tr>
<td>mysqldump</td>
<td>ALL</td>
<td>WARM</td>
<td>ROW</td>
<td>MOST</td>
<td>MED</td>
<td>WORST</td>
<td>YES</td>
</tr>
<tr>
<td>Snapshot</td>
<td>ALL</td>
<td>MOSTLY HOT</td>
<td>SYSTEM</td>
<td>SYSTEM</td>
<td>SLOW-MED</td>
<td>BEST</td>
<td>YES</td>
</tr>
<tr>
<td>XtraBackup</td>
<td>InnoDB/XtraDB</td>
<td>HOT</td>
<td>TABLE</td>
<td>TABLE</td>
<td>FAST</td>
<td>BEST</td>
<td>YES</td>
</tr>
<tr>
<td>InnoDB Hot Backup</td>
<td>InnoDB</td>
<td>HOT</td>
<td>TABLE</td>
<td>TABLE</td>
<td>FAST</td>
<td>BEST</td>
<td>YES</td>
</tr>
<tr>
<td>XtraBackup / InnoDB Hot Backup</td>
<td>ALL</td>
<td>WARM</td>
<td>TABLE</td>
<td>TABLE</td>
<td>FAST</td>
<td>BEST</td>
<td>YES</td>
</tr>
<tr>
<td>MySQLHotCopy</td>
<td>MyISAM</td>
<td>WARM</td>
<td>TABLE</td>
<td>TABLE</td>
<td>FAST</td>
<td>BEST</td>
<td>YES</td>
</tr>
<tr>
<td>Cold Backup</td>
<td>ALL</td>
<td>COLD</td>
<td>SYSTEM</td>
<td>SYSTEM</td>
<td>BEST</td>
<td>BEST</td>
<td>YES</td>
</tr>
</tbody>
</table>

*Note: Engines refer to MySQL variants such as InnoDB and XtraDB.*
What is talk about

- XtraBackup
- Internals
- Basic and advance usage
Idea

- Copy XtraDB / InnoDB tables without stopping server (and locking tables)
- Challenge: Tables are being changed in background
- Alternative solutions
  - ZFS snapshot (Solaris / FreeBSD)
  - LVM, good if performance is not concern
    - 160 ios -> 25 ios
    - ~20% space reservation
  - InnoDB Hot Backup / Oracle Online Backup
    - Commercial, per-server, last release 2006?
    - Can be expensive for X,000 servers
Solution

• Copy tables and log changes
  – InnoDB transactional redo logs are doing the same
  – XtraBackup is mini instance of XtraDB / InnoDB
  – Idea taken from InnoDB Hot Backup
Basic design

- Copy tables, log changes into xtrabackup_logfile
- Prepare – apply log to copied tables
XtraBackup

- Non-blocking online backup of XtraDB / InnoDB / InnoDB–plugin tables
- Blocking for MyISAM
Tools

- **Binaries**
  - xtrabackup
    - Copy .ibd & xtrabackup_logfile
  - tar4ibd

- **Script**
  - innobackupex-1.5.1
    - Taken from InnoDB Hot Backup (GPL), heavily modified
    - Copy .frm, myisam, locking etc
Basic usage

- `innobackupex-1.5.1 /destination/dir`

- `innobackupex-1.5.1 --apply-log /backup/dir`
  - `--use-memory` (1GB defaults)

- `innobackupex-1.5.1 --throttle=IOS /destination/dir`
Stream

- `innobackupex-1.5.1 --stream=tar ./ > backup.tar`
- Tar compatible stream (`-i` required to extract)
  - Tar was replaced by libtar and tar4ibd
- Compress
  - `innobackupex-1.5.1 --stream=tar ./ | gzip - > backup.tar.gz`
- Copy to remote host
  - `innobackupex-1.5.1 --stream=tar ./ | ssh vadim@desthost "cat - > /data/vol1/mysqluc/backup.tar"`
- The same but with throttling
  - `innobackupex --stream=tar | pv -q -L10m | ssh vadim@desthost "tar xfi -"`
Slave

• To setup slave from master
  – No specific actions needed
    • File xtrabackup_binlog_info
      mysql-bin.000020        70206554

• To backup from slave
  – innobackupex-1.5.1 --slave-info /destination/dir

• LOCK caveats
  – FLUSH TABLES WITH READ LOCK to get master/slave info and to copy MYISAM tables
  – 100GB of MyISAM tables will cause a problem
We are able to copy only changes from last backup

- `xtrabackup --backup --target-dir=/data/backups/incremental --incremental-basedir=/data/backups/2010-04-11_17-55-54`

From output:
- ... `xtrabackup: The latest check point (for incremental): '2438774348'` ...

```
xtrabackup --prepare --target-dir=/data/vadim/mysqluc/2010-04-11_20-45-42 --incremental-dir=/data/vadim/mysqluc/incremental
```
Export/import

- Export only table to another server
  - xtrabackup --table=tpcc.order_line --backup --target-dir=/data/vadim/mysqluc/order_line/

- Prepare
  - xtrabackup --prepare --export --target-dir=/data/vadim/mysqluc/order_line/

- Copy to remote host (it has to be XtraDB)
  - alter table order_line discard tablespace;
  - set global innodb_expand_import=1;
  - alter table order_line import tablespace;
Statistics

• Show details on tables / indexes

table: tpcc/order_line, index: PRIMARY, space id: 25, root page: 3, zip size: 0

estimated statistics in dictionary:
  key vals: 32471816, leaf pages: 264267, size pages: 302592
real statistics:
  level 2 pages: pages=1, data=8406 bytes, data/pages=51%
  level 1 pages: pages=467, data=4756806 bytes, data/pages=62%
  leaf pages: recs=35116662, pages=264267, data=2410713870 bytes, data/pages=55%
Thank you!

- Questions?
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