mysql备份恢复技术

一、mysql备份类型 ：

热备 ： 读，写不受影响

温备 ：仅可执行读操作

冷备 ：离线备份，读写均中止

物理备份 ： 复制数据文件

逻辑备份 ： 将数据导出值文本文件中

完全备份 ： 备份全部数据

增量备份 ： 仅备份上次完全备份或增量备份以后变化的数据

差异备份 ： 仅备份上次完全备份依赖变化的数据

1. mysqldump 逻辑备份工具

MyISAM是温备，InnoDB是热备。mysqldump的工作原理很简单，它先查出表的结构，在dump文件中生成一个CREATE语句，然后将表中所有记录转换成一条INSERT语句。通过这些语句，就能创建并插入数据。对于中等级别业务量的系统来说，备份策略可以这么定：第一次完全备份，每天一次增量备份，每周再做一次完全备份，如此一直重复。而对于重要的且繁忙的系统来说，则可能需要每天一次全量备份，每小时一次增量备份，甚至更频繁。为了不影响线上业务，实现在线备份，并且能增量备份，最好的办法就是采用主从复制机制(replication)，在 slave 机器上做备份。

基本语法 ：

(1) 备份同一个数据库的多个表 ：

```
mysqldump -u username -p dbname table1, table2 ... > backupname.sql
```

(2)备份多个数据库 ：

```
mysqldump -u username -p --databases dbname1 dbname2 > backupname.sql
```

(3)备份所有数据库 ：

```
mysqldump -u username -p --al-databases > backupname.sql
```

(4)mysqldump的详细help信息 ：

```
[root@vm-finance-mysql-db1 ~]# mysqldump --help
mysqldump  Ver 10.13 Distrib 5.6.22, for Linux (x86_64)
Copyright (c) 2000, 2014, Oracle and/or its affiliates. All rights reserved.
Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.
Dumping structure and contents of MySQL databases and tables.
Usage: mysqldump [OPTIONS] database [tables]
OR     mysqldump [OPTIONS] --databases [OPTIONS] DB1 [DB2 DB3...]
OR     mysqldump [OPTIONS] --all-databases [OPTIONS]
Default options are read from the following files in the given order:
/etc/my.cnf /etc/mysql/my.cnf /usr/etc/my.cnf ~/.my.cnf
The following groups are read: mysqldump client
The following options may be given as the first argument:
--print-defaults        Print the program argument list and exit.
--no-defaults           Don't read default options from any option file,
                        except for login file.
--defaults-file=#       Only read default options from the given file #.
--defaults-extra-file=# Read this file after the global files are read.
--defaults-group-suffix=#
                        Also read groups with concat(group, suffix)
--login-path=#          Read this path from the login file.
  -A, --all-databases Dump all the databases. This will be same as --databases
                      with all databases selected.
  -Y, --all-tablespaces
                      Dump all the tablespaces.
  -y, --no-tablespaces
                      Do not dump any tablespace information.
  --add-drop-database Add a DROP DATABASE before each create.
  --add-drop-table    Add a DROP TABLE before each create.
                      (Defaults to on; use --skip-add-drop-table to disable.)
  --add-drop-trigger  Add a DROP TRIGGER before each create.
```

```
--add-locks         Add locks around INSERT statements.
                    (Defaults to on; use --skip-add-locks to disable.)
--allow-keywords    Allow creation of column names that are keywords.
--apply-slave-statements
                    Adds 'STOP SLAVE' prior to 'CHANGE MASTER' and 'START
                    SLAVE' to bottom of dump.
--bind-address=name IP address to bind to.
--character-sets-dir=name
                    Directory for character set files.
-i, --comments      Write additional information.
                    (Defaults to on; use --skip-comments to disable.)
--compatible=name   Change the dump to be compatible with a given mode. By
                    default tables are dumped in a format optimized for
                    MySQL. Legal modes are: ansi, mysql323, mysql40,
                    postgresql, oracle, mssql, db2, maxdb, no_key_options,
                    no_table_options, no_field_options. One can use several
                    modes separated by commas. Note: Requires MySQL server
                    version 4.1.0 or higher. This option is ignored with
                    earlier server versions.
--compact           Give less verbose output (useful for debugging). Disables
                    structure comments and header/footer constructs.  Enables
                    options --skip-add-drop-table --skip-add-locks
                    --skip-comments --skip-disable-keys --skip-set-charset.
-c, --complete-insert
                    Use complete insert statements.
-C, --compress      Use compression in server/client protocol.
-a, --create-options
                    Include all MySQL specific create options.
                    (Defaults to on; use --skip-create-options to disable.)
-B, --databases     Dump several databases. Note the difference in usage; in
                    this case no tables are given. All name arguments are
                    regarded as database names. 'USE db_name;' will be
                    included in the output.
-#, --debug[=#]     This is a non-debug version. Catch this and exit.
--debug-check       Check memory and open file usage at exit.
--debug-info        Print some debug info at exit.
--default-character-set=name
                    Set the default character set.
--delayed-insert    Insert rows with INSERT DELAYED.
--delete-master-logs
                    Delete logs on master after backup. This automatically
                    enables --master-data.
-K, --disable-keys  '/*!40000 ALTER TABLE tb_name DISABLE KEYS */; and
                    '/*!40000 ALTER TABLE tb_name ENABLE KEYS */; will be put
                    in the output.
                    (Defaults to on; use --skip-disable-keys to disable.)
--dump-slave[=#]    This causes the binary log position and filename of the
                    master to be appended to the dumped data output. Setting
                    the value to 1, will printit as a CHANGE MASTER command
                    in the dumped data output; if equal to 2, that command
                    will be prefixed with a comment symbol. This option will
                    turn --lock-all-tables on, unless --single-transaction is
                    specified too (in which case a global read lock is only
                    taken a short time at the beginning of the dump - don't
                    forget to read about --single-transaction below). In all
                    cases any action on logs will happen at the exact moment
                    of the dump.Option automatically turns --lock-tables off.
-E, --events        Dump events.
```

```
-e, --extended-insert
                    Use multiple-row INSERT syntax that include several
                    VALUES lists.
                    (Defaults to on; use --skip-extended-insert to disable.)
--fields-terminated-by=name
                    Fields in the output file are terminated by the given
                    string.
--fields-enclosed-by=name
                    Fields in the output file are enclosed by the given
                    character.
--fields-optionally-enclosed-by=name
                    Fields in the output file are optionally enclosed by the
                    given character.
--fields-escaped-by=name
                    Fields in the output file are escaped by the given
                    character.
-F, --flush-logs    Flush logs file in server before starting dump. Note that
                    if you dump many databases at once (using the option
                    --databases= or --all-databases), the logs will be
                    flushed for each database dumped. The exception is when
                    using --lock-all-tables or --master-data: in this case
                    the logs will be flushed only once, corresponding to the
                    moment all tables are locked. So if you want your dump
                    and the log flush to happen at the same exact moment you
                    should use --lock-all-tables or --master-data with
                    --flush-logs.
--flush-privileges  Emit a FLUSH PRIVILEGES statement after dumping the mysql
                    database.  This option should be used any time the dump
                    contains the mysql database and any other database that
                    depends on the data in the mysql database for proper
                    restore.
-f, --force         Continue even if we get an SQL error.
-?, --help          Display this help message and exit.
--hex-blob          Dump binary strings (BINARY, VARBINARY, BLOB) in
                    hexadecimal format.
-h, --host=name     Connect to host.
--ignore-table=name Do not dump the specified table. To specify more than one
                    table to ignore, use the directive multiple times, once
                    for each table.  Each table must be specified with both
                    database and table names, e.g.,
                    --ignore-table=database.table.
--include-master-host-port
                    Adds 'MASTER_HOST=<host>, MASTER_PORT=<port>' to 'CHANGE
                    MASTER TO..' in dump produced with --dump-slave.
--insert-ignore     Insert rows with INSERT IGNORE.
--lines-terminated-by=name
                    Lines in the output file are terminated by the given
                    string.
-x, --lock-all-tables
                    Locks all tables across all databases. This is achieved
                    by taking a global read lock for the duration of the
                    whole dump. Automatically turns --single-transaction and
                    --lock-tables off.
-l, --lock-tables   Lock all tables for read.
                    (Defaults to on; use --skip-lock-tables to disable.)
--log-error=name    Append warnings and errors to given file.
--master-data[=#]   This causes the binary log position and filename to be
                    appended to the output. If equal to 1, will print it as a
```

```
                      CHANGE MASTER command; if equal to 2, that command will
                      be prefixed with a comment symbol. This option will turn
                      --lock-all-tables on, unless --single-transaction is
                      specified too (in which case a global read lock is only
                      taken a short time at the beginning of the dump; don't
                      forget to read about --single-transaction below). In all
                      cases, any action on logs will happen at the exact moment
                      of the dump. Option automatically turns --lock-tables
                      off.
--max-allowed-packet=#
                      The maximum packet length to send to or receive from
                      server.
--net-buffer-length=#
                      The buffer size for TCP/IP and socket communication.
--no-autocommit       Wrap tables with autocommit/commit statements.
-n, --no-create-db    Suppress the CREATE DATABASE ... IF EXISTS statement that
                      normally is output for each dumped database if
                      --all-databases or --databases is given.
-t, --no-create-info
                      Don't write table creation info.
-d, --no-data         No row information.
-N, --no-set-names    Same as --skip-set-charset.
--opt                 Same as --add-drop-table, --add-locks, --create-options,
                      --quick, --extended-insert, --lock-tables, --set-charset,
                      and --disable-keys. Enabled by default, disable with
                      --skip-opt.
--order-by-primary    Sorts each table's rows by primary key, or first unique
                      key, if such a key exists.  Useful when dumping a MyISAM
                      table to be loaded into an InnoDB table, but will make
                      the dump itself take considerably longer.
-p, --password[=name]
                      Password to use when connecting to server. If password is
                      not given it's solicited on the tty.
-P, --port=#          Port number to use for connection.
--protocol=name       The protocol to use for connection (tcp, socket, pipe,
                      memory).
-q, --quick           Don't buffer query, dump directly to stdout.
                      (Defaults to on; use --skip-quick to disable.)
-Q, --quote-names     Quote table and column names with backticks (`).
                      (Defaults to on; use --skip-quote-names to disable.)
--replace             Use REPLACE INTO instead of INSERT INTO.
-r, --result-file=name
                      Direct output to a given file. This option should be used
                      in systems (e.g., DOS, Windows) that use carriage-return
                      linefeed pairs (\r\n) to separate text lines. This option
                      ensures that only a single newline is used.
-R, --routines        Dump stored routines (functions and procedures).
--set-charset         Add 'SET NAMES default_character_set' to the output.
                      (Defaults to on; use --skip-set-charset to disable.)
--set-gtid-purged[=name]
                      Add 'SET @@GLOBAL.GTID_PURGED' to the output. Possible
                      values for this option are ON, OFF and AUTO. If ON is
                      used and GTIDs are not enabled on the server, an error is
                      generated. If OFF is used, this option does nothing. If
                      AUTO is used and GTIDs are enabled on the server, 'SET
                      @@GLOBAL.GTID_PURGED' is added to the output. If GTIDs
                      are disabled, AUTO does nothing. If no value is supplied
                      then the default (AUTO) value will be considered.
```

```
  --single-transaction
                      Creates a consistent snapshot by dumping all tables in a
                      single transaction. Works ONLY for tables stored in
                      storage engines which support multiversioning (currently
                      only InnoDB does); the dump is NOT guaranteed to be
                      consistent for other storage engines. While a
                      --single-transaction dump is in process, to ensure a
                      valid dump file (correct table contents and binary log
                      position), no other connection should use the following
                      statements: ALTER TABLE, DROP TABLE, RENAME TABLE,
                      TRUNCATE TABLE, as consistent snapshot is not isolated
                      from them. Option automatically turns off --lock-tables.
  --dump-date         Put a dump date to the end of the output.
                      (Defaults to on; use --skip-dump-date to disable.)
  --skip-opt          Disable --opt. Disables --add-drop-table, --add-locks,
                      --create-options, --quick, --extended-insert,
                      --lock-tables, --set-charset, and --disable-keys.
  -S, --socket=name   The socket file to use for connection.
  --secure-auth       Refuse client connecting to server if it uses old
                      (pre-4.1.1) protocol.
                      (Defaults to on; use --skip-secure-auth to disable.)
  --ssl               Enable SSL for connection (automatically enabled with
                      other flags).
  --ssl-ca=name       CA file in PEM format (check OpenSSL docs, implies
                      --ssl).
  --ssl-capath=name   CA directory (check OpenSSL docs, implies --ssl).
  --ssl-cert=name     X509 cert in PEM format (implies --ssl).
  --ssl-cipher=name   SSL cipher to use (implies --ssl).
  --ssl-key=name      X509 key in PEM format (implies --ssl).
  --ssl-crl=name      Certificate revocation list (implies --ssl).
  --ssl-crlpath=name  Certificate revocation list path (implies --ssl).
  --ssl-verify-server-cert
                      Verify server's "Common Name" in its cert against
                      hostname used when connecting. This option is disabled by
                      default.
  -T, --tab=name      Create tab-separated textfile for each table to given
                      path. (Create .sql and .txt files.) NOTE: This only works
                      if mysqldump is run on the same machine as the mysqld
                      server.
  --tables            Overrides option --databases (-B).
  --triggers          Dump triggers for each dumped table.
                      (Defaults to on; use --skip-triggers to disable.)
  --tz-utc            SET TIME_ZONE='+00:00' at top of dump to allow dumping of
                      TIMESTAMP data when a server has data in different time
                      zones or data is being moved between servers with
                      different time zones.
                      (Defaults to on; use --skip-tz-utc to disable.)
  -u, --user=name     User for login if not current user.
  -v, --verbose       Print info about the various stages.
  -V, --version       Output version information and exit.
  -w, --where=name    Dump only selected records. Quotes are mandatory.
  -X, --xml           Dump a database as well formed XML.
  --plugin-dir=name   Directory for client-side plugins.
  --default-auth=name Default authentication client-side plugin to use.
Variables (--variable-name=value)
and boolean options {FALSE|TRUE}  Value (after reading options)
--------------------------------- ----------------------------------------
all-databases                     FALSE
```

all-tablespaces	FALSE
no-tablespaces	FALSE
add-drop-database	FALSE
add-drop-table	TRUE
add-drop-trigger	FALSE
add-locks	TRUE
allow-keywords	FALSE
apply-slave-statements	FALSE
bind-address	(No default value)
character-sets-dir	(No default value)
comments	TRUE
compatible	(No default value)
compact	FALSE
complete-insert	FALSE
compress	FALSE
create-options	TRUE
databases	FALSE
debug-check	FALSE
debug-info	FALSE
default-character-set	utf8
delayed-insert	FALSE
delete-master-logs	FALSE
disable-keys	TRUE
dump-slave	0
events	FALSE
extended-insert	TRUE
fields-terminated-by	(No default value)
fields-enclosed-by	(No default value)
fields-optionally-enclosed-by	(No default value)
fields-escaped-by	(No default value)
flush-logs	FALSE
flush-privileges	FALSE
force	FALSE
hex-blob	FALSE
host	(No default value)
include-master-host-port	FALSE
insert-ignore	FALSE
lines-terminated-by	(No default value)
lock-all-tables	FALSE
lock-tables	TRUE
log-error	(No default value)
master-data	0
max-allowed-packet	25165824
net-buffer-length	1046528
no-autocommit	FALSE
no-create-db	FALSE
no-create-info	FALSE
no-data	FALSE
order-by-primary	FALSE
port	0
quick	TRUE
quote-names	TRUE
replace	FALSE
routines	FALSE
set-charset	TRUE
single-transaction	FALSE
dump-date	TRUE
socket	/mysqldata/mysql.sock

```
secure-auth                     TRUE
ssl                             FALSE
ssl-ca                          (No default value)
ssl-capath                      (No default value)
ssl-cert                        (No default value)
ssl-cipher                      (No default value)
ssl-key                         (No default value)
ssl-crl                         (No default value)
ssl-crlpath                     (No default value)
ssl-verify-server-cert          FALSE
tab                             (No default value)
triggers                        TRUE
tz-utc                          TRUE
user                            (No default value)
verbose                         FALSE
where                           (No default value)
plugin-dir                      (No default value)
default-auth                    (No default value)
[root@vm-finance-mysql-db1 ~]#
```

2. mysqlhotcopy 物理备份工具 （只支持MyISAM引擎）

mysqlhotcopy支持不停止MySQL服务器备份，而且比mysqldump快。mysqlhotcopy是一个Per l脚本，主要在Linux系统下使用。通过LOCK TABLES, FLUSH TABLES 和cp 来进行快速备份。mysqlhotcopy并非mysql自带，需要安装Perl的数据库接口包，目前，该工具也仅仅能备份MyISAM类型的表。

基本语法 ：

```
mysqlhotcopy [option] dbname1 dbname2 backupDir/
```

eg ：

```
mysqlhotcopy -u username -p dbname /databackup/
```

mysqlhotcopy help的详细信息 ：

```
[root@vm-finance-mysql-db1 ~]# mysqlhotcopy --help
Warning: /usr/bin/mysqlhotcopy is deprecated and will be removed in a future version.
/usr/bin/mysqlhotcopy Ver 1.23
Usage: /usr/bin/mysqlhotcopy db_name[./table_regex/] [new_db_name | directory]
  -?, --help            display this help-screen and exit
  -u, --user=#          user for database login if not current user
  -p, --password=#      password to use when connecting to server (if not set
                        in my.cnf, which is recommended)
  -h, --host=#          hostname for local server when connecting over TCP/IP
  -P, --port=#          port to use when connecting to local server with TCP/IP
  -S, --socket=#        socket to use when connecting to local server
      --old_server      connect to old MySQL-server (before v5.5) which
                        doesn't have FLUSH TABLES WITH READ LOCK fully implemented.
  --allowold            don't abort if target dir already exists (rename it _old)
  --addtodest           don't rename target dir if it exists, just add files to it
  --keepold             don't delete previous (now renamed) target when done
  --noindices           don't include full index files in copy
  --method=#            method for copy (only "cp" currently supported)
  -q, --quiet           be silent except for errors
  --debug               enable debug
  -n, --dryrun          report actions without doing them
  --regexp=#            copy all databases with names matching regexp
  --suffix=#            suffix for names of copied databases
  --checkpoint=#        insert checkpoint entry into specified db.table
  --flushlog            flush logs once all tables are locked
  --resetmaster         reset the binlog once all tables are locked
  --resetslave          reset the master.info once all tables are locked
  --tmpdir=#            temporary directory (instead of /tmp)
  --record_log_pos=#    record slave and master status in specified db.table
  --chroot=#            base directory of chroot jail in which mysqld operates
```

```
  Try 'perldoc /usr/bin/mysqlhotcopy' for more complete documentation
[root@vm-finance-mysql-db1 ~]#
```

3. xtrabackup 开源工具，ibbackup的替代品

MyISAM是温备，InnoDB是热备Xtrabackup有两个主要的工具：xtrabackup、innobackupex

xtrabackup 只能备份InnoDB和XtraDB两种数据表，而不能备份MyISAM数据表。innobackupex 是参考了InnoDB Hotbackup的innoback脚本修改而来的.innobackupex是一个perl脚本封装，封装了xtrabackup。主要是为了方便的同时备份InnoDB和MyISAM引擎的表，但在处理myisam时需要加一个读锁。并且加入了一些使用的选项。如slave-info可以记录备份恢复后作为slave需要的一些信息，根据这些信息，可以很方便的利用备份来重做slave。

xtrabackup的详细help信息 ：

```
[root@vm-finance-mysql-db1 ~]# xtrabackup --help
xtrabackup version 2.3.2 based on MySQL server 5.6.24 Linux (x86_64) (revision id: 306a2e0)
Open source backup tool for InnoDB and XtraDB
Copyright (C) 2009-2015 Percona LLC and/or its affiliates.
Portions Copyright (C) 2000, 2011, MySQL AB & Innobase Oy. All Rights Reserved.
This program is free software; you can redistribute it and/or
modify it under the terms of the GNU General Public License
as published by the Free Software Foundation version 2
of the License.
This program is distributed in the hope that it will be useful,
but WITHOUT ANY WARRANTY; without even the implied warranty of
MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
GNU General Public License for more details.
You can download full text of the license on http://www.gnu.org/licenses/gpl-2.0.txt
Usage: [xtrabackup [--defaults-file=#] --backup | xtrabackup [--defaults-file=#] --prepare] [OPTIONS]
Default options are read from the following files in the given order:
/etc/my.cnf /etc/mysql/my.cnf /usr/etc/my.cnf ~/.my.cnf
The following groups are read: mysqld xtrabackup client
The following options may be given as the first argument:
--print-defaults        Print the program argument list and exit.
--no-defaults           Don't read default options from any option file,
                        except for login file.
--defaults-file=#       Only read default options from the given file #.
--defaults-extra-file=# Read this file after the global files are read.
--defaults-group-suffix=#
                        Also read groups with concat(group, suffix)
--login-path=#          Read this path from the login file.
  -v, --version       print xtrabackup version information
  --target-dir=name   destination directory
  --backup            take backup to target-dir
  --stats             calc statistic of datadir (offline mysqld is recommended)
  --prepare           prepare a backup for starting mysql server on the backup.
  --export            create files to import to another database when prepare.
  --apply-log-only    stop recovery process not to progress LSN after applying
                      log when prepare.
  --print-param       print parameter of mysqld needed for copyback.
  --use-memory=#      The value is used instead of buffer_pool_size
  --throttle=#        limit count of IO operations (pairs of read&write) per
                      second to IOS values (for '--backup')
  --log-copy-interval=#
                      time interval between checks done by log copying thread
                      in milliseconds (default is 1 second).
  --extra-lsndir=name (for --backup): save an extra copy of the
                      xtrabackup_checkpoints file in this directory.
  --incremental-lsn=name
                      (for --backup): copy only .ibd pages newer than specified
                      LSN 'high:low'. ##ATTENTION##: If a wrong LSN value is
                      specified, it is impossible to diagnose this, causing the
```

```
                    backup to be unusable. Be careful!
--incremental-basedir=name
                    (for --backup): copy only .ibd pages newer than backup at
                    specified directory.
--incremental-dir=name
                    (for --prepare): apply .delta files and logfile in the
                    specified directory.
--to-archived-lsn=# Don't apply archived logs with bigger log sequence
                    number.
--tables=name       filtering by regexp for table names.
--tables-file=name  filtering by list of the exact database.table name in the
                    file.
--databases=name    filtering by list of databases.
--databases-file=name
                    filtering by list of databases in the file.
--create-ib-logfile ** not work for now** creates ib_logfile* also after
                    '--prepare'. ### If you want create ib_logfile*, only
                    re-execute this command in same options. ###
-h, --datadir=name  Path to the database root.
-t, --tmpdir=name   Path for temporary files. Several paths may be specified,
                    separated by a colon (:), in this case they are used in a
                    round-robin fashion.
--parallel=#        Number of threads to use for parallel datafiles transfer.
                    Does not have any effect in the stream mode. The default
                    value is 1.
--stream=name       Stream all backup files to the standard output in the
                    specified format. Currently the only supported format is
                    'tar'.
--compress[=name]   Compress individual backup files using the specified
                    compression algorithm. Currently the only supported
                    algorithm is 'quicklz'. It is also the default algorithm,
                    i.e. the one used when --compress is used without an
                    argument.
--compress-threads=#
                    Number of threads for parallel data compression. The
                    default value is 1.
--compress-chunk-size=#
                    Size of working buffer(s) for compression threads in
                    bytes. The default value is 64K.
--encrypt=name      Encrypt individual backup files using the specified
                    encryption algorithm.
--encrypt-key=name  Encryption key to use.
--encrypt-key-file=name
                    File which contains encryption key to use.
--encrypt-threads=# Number of threads for parallel data encryption. The
                    default value is 1.
--encrypt-chunk-size=#
                    Size of working buffer(S) for encryption threads in
                    bytes. The default value is 64K.
--log[=name]        Ignored option for MySQL option compatibility
--innodb[=name]     Ignored option for MySQL option compatibility
--innodb-adaptive-hash-index
                    Enable InnoDB adaptive hash index (enabled by default).
                    Disable with --skip-innodb-adaptive-hash-index.
                    (Defaults to on; use --skip-innodb-adaptive-hash-index to disable.)
--innodb-additional-mem-pool-size=#
                    Size of a memory pool InnoDB uses to store data
                    dictionary information and other internal data
```

structures.
--innodb-autoextend-increment=#
Data file autoextend increment in megabytes
--innodb-buffer-pool-size=#
The size of the memory buffer InnoDB uses to cache data
and indexes of its tables.
--innodb-checksums Enable InnoDB checksums validation (enabled by default).
Disable with --skip-innodb-checksums.
(Defaults to on; use --skip-innodb-checksums to disable.)
--innodb-data-file-path=name
Path to individual files and their sizes.
--innodb-data-home-dir=name
The common part for InnoDB table spaces.
--innodb-doublewrite
Enable InnoDB doublewrite buffer (enabled by default).
Disable with --skip-innodb-doublewrite.
(Defaults to on; use --skip-innodb-doublewrite to disable.)
--innodb-io-capacity[=#]
Number of IOPs the server can do. Tunes the background IO
rate
--innodb-file-io-threads=#
Number of file I/O threads in InnoDB.
--innodb-read-io-threads=#
Number of background read I/O threads in InnoDB.
--innodb-write-io-threads=#
Number of background write I/O threads in InnoDB.
--innodb-file-per-table
Stores each InnoDB table to an .ibd file in the database
dir.
--innodb-flush-log-at-trx-commit[=#]
Set to 0 (write and flush once per second), 1 (write and
flush at each commit) or 2 (write at commit, flush once
per second).
--innodb-flush-method=name
With which method to flush data.
--innodb-force-recovery=#
Helps to save your data in case the disk image of the
database becomes corrupt.
--innodb-log-arch-dir=name
Where full logs should be archived.
--innodb-log-buffer-size=#
The size of the buffer which InnoDB uses to write log to
the log files on disk.
--innodb-log-file-size=#
Size of each log file in a log group.
--innodb-log-files-in-group=#
Number of log files in the log group. InnoDB writes to
the files in a circular fashion. Value 3 is recommended
here.
--innodb-log-group-home-dir=name
Path to InnoDB log files.
--innodb-max-dirty-pages-pct=#
Percentage of dirty pages allowed in bufferpool.
--innodb-open-files=#
How many files at the maximum InnoDB keeps open at the
same time.
--innodb-use-native-aio
Use native AIO if supported on this platform.

```
--innodb-page-size=#
                    The universal page size of the database.
--innodb-log-block-size=#
                    The log block size of the transaction log file. Changing
                    for created log file is not supported. Use on your own
                    risk!
--innodb-fast-checksum
                    Change the algorithm of checksum for the whole of
                    datapage to 4-bytes word based.
--innodb-doublewrite-file=name
                    Path to special datafile for doublewrite buffer. (default
                    is : not used)
--innodb-buffer-pool-filename=name
                    Filename to/from which to dump/load the InnoDB buffer
                    pool
--debug-sync=name   Debug sync point. This is only used by the xtrabackup
                    test suite
--compact           Create a compact backup by skipping secondary index
                    pages.
--rebuild-indexes   Rebuild secondary indexes in InnoDB tables after applying
                    the log. Only has effect with --prepare.
--rebuild-threads=# Use this number of threads to rebuild indexes in a
                    compact backup. Only has effect with --prepare and
                    --rebuild-indexes.
--innodb-checksum-algorithm=name
                    The algorithm InnoDB uses for page checksumming. [CRC32,
                    STRICT_CRC32, INNODB, STRICT_INNODB, NONE, STRICT_NONE]
--innodb-log-checksum-algorithm=name
                    The algorithm InnoDB uses for log checksumming. [CRC32,
                    STRICT_CRC32, INNODB, STRICT_INNODB, NONE, STRICT_NONE]
--innodb-undo-directory=name
                    Directory where undo tablespace files live, this path can
                    be absolute.
--innodb-undo-tablespaces=#
                    Number of undo tablespaces to use.
--incremental-force-scan
                    Perform a full-scan incremental backup even in the
                    presence of changed page bitmap data
--defaults-group=name
                    defaults group in config file (default "mysqld").
--open-files-limit=#
                    the maximum number of file descriptors to reserve with
                    setrlimit().
--close-files       do not keep files opened. Use at your own risk.
--core-file         Write core on fatal signals
--copy-back         Copy all the files in a previously made backup from the
                    backup directory to their original locations.
--move-back         Move all the files in a previously made backup from the
                    backup directory to the actual datadir location. Use with
                    caution, as it removes backup files.
--galera-info       This options creates the xtrabackup_galera_info file
                    which contains the local node state at the time of the
                    backup. Option should be used when performing the backup
                    of Percona-XtraDB-Cluster. Has no effect when backup
                    locks are used to create the backup.
--slave-info        This option is useful when backing up a replication slave
                    server. It prints the binary log position and name of the
                    master server. It also writes this information to the
```

"xtrabackup_slave_info" file as a "CHANGE MASTER" command. A new slave for this master can be set up by starting a slave server on this backup and issuing a "CHANGE MASTER" command with the binary log position saved in the "xtrabackup_slave_info" file.

--no-lock Use this option to disable table lock with "FLUSH TABLES WITH READ LOCK". Use it only if ALL your tables are InnoDB and you DO NOT CARE about the binary log position of the backup. This option shouldn't be used if there are any DDL statements being executed or if any updates are happening on non-InnoDB tables (this includes the system MyISAM tables in the mysql database), otherwise it could lead to an inconsistent backup. If you are considering to use --no-lock because your backups are failing to acquire the lock, this could be because of incoming replication events preventing the lock from succeeding. Please try using --safe-slave-backup to momentarily stop the replication slave thread, this may help the backup to succeed and you then don't need to resort to using this option.

--safe-slave-backup Stop slave SQL thread and wait to start backup until Slave_open_temp_tables in "SHOW STATUS" is zero. If there are no open temporary tables, the backup will take place, otherwise the SQL thread will be started and stopped until there are no open temporary tables. The backup will fail if Slave_open_temp_tables does not become zero after --safe-slave-backup-timeout seconds. The slave SQL thread will be restarted when the backup finishes.

--rsync Uses the rsync utility to optimize local file transfers. When this option is specified, innobackupex uses rsync to copy all non-InnoDB files instead of spawning a separate cp for each file, which can be much faster for servers with a large number of databases or tables. This option cannot be used together with --stream.

--force-non-empty-directories

This option, when specified, makes --copy-back or --move-back transfer files to non-empty directories. Note that no existing files will be overwritten. If --copy-back or --nove-back has to copy a file from the backup directory which already exists in the destination directory, it will still fail with an error.

--no-version-check This option disables the version check which is enabled by the --version-check option.

--no-backup-locks This option controls if backup locks should be used instead of FLUSH TABLES WITH READ LOCK on the backup stage. The option has no effect when backup locks are not supported by the server. This option is enabled by default, disable with --no-backup-locks.

--decompress Decompresses all files with the .qp extension in a backup previously made with the --compress option.

--user=name This option specifies the MySQL username used when connecting to the server, if that's not the current user. The option accepts a string argument. See mysql --help for details.

--host=name This option specifies the host to use when connecting to the database server with TCP/IP. The option accepts a string argument. See mysql --help for details.

--port=# This option specifies the port to use when connecting to

the database server with TCP/IP. The option accepts a string argument. See mysql --help for details.

--password=name This option specifies the password to use when connecting to the database. It accepts a string argument. See mysql --help for details.

--socket=name This option specifies the socket to use when connecting to the local database server with a UNIX domain socket. The option accepts a string argument. See mysql --help for details.

--incremental-history-name=name
This option specifies the name of the backup series stored in the PERCONA_SCHEMA.xtrabackup_history history record to base an incremental backup on. Xtrabackup will search the history table looking for the most recent (highest innodb_to_lsn), successful backup in the series and take the to_lsn value to use as the starting lsn for the incremental backup. This will be mutually exclusive with --incremental-history-uuid, --incremental-basedir and --incremental-lsn. If no valid lsn can be found (no series by that name, no successful backups by that name) xtrabackup will return with an error. It is used with the --incremental option.

--incremental-history-uuid=name
This option specifies the UUID of the specific history record stored in the PERCONA_SCHEMA.xtrabackup_history to base an incremental backup on.
--incremental-history-name, --incremental-basedir and --incremental-lsn. If no valid lsn can be found (no success record with that uuid) xtrabackup will return with an error. It is used with the --incremental option.

--decrypt=name Decrypts all files with the .xbcrypt extension in a backup previously made with --encrypt option.

--ftwrl-wait-query-type=name
This option specifies which types of queries are allowed to complete before innobackupex will issue the global lock. Default is all.

--kill-long-query-type=name
This option specifies which types of queries should be killed to unblock the global lock. Default is "all".

--history[=name] This option enables the tracking of backup history in the PERCONA_SCHEMA.xtrabackup_history table. An optional history series name may be specified that will be placed with the history record for the current backup being taken.

--kill-long-queries-timeout=#
This option specifies the number of seconds innobackupex waits between starting FLUSH TABLES WITH READ LOCK and killing those queries that block it. Default is 0 seconds, which means innobackupex will not attempt to kill any queries.

--ftwrl-wait-timeout=#
This option specifies time in seconds that innobackupex should wait for queries that would block FTWRL before running it. If there are still such queries when the timeout expires, innobackupex terminates with an error. Default is 0, in which case innobackupex does not wait for queries to complete and starts FTWRL immediately.

--ftwrl-wait-threshold=#

```
                      This option specifies the query run time threshold which
                      is used by innobackupex to detect long-running queries
                      with a non-zero value of --ftwrl-wait-timeout. FTWRL is
                      not started until such long-running queries exist. This
                      option has no effect if --ftwrl-wait-timeout is 0.
                      Default value is 60 seconds.
  --debug-sleep-before-unlock=#
                      This is a debug-only option used by the XtraBackup test
                      suite.
  --safe-slave-backup-timeout=#
                      How many seconds --safe-slave-backup should wait for
                      Slave_open_temp_tables to become zero. (default 300)
  --binlog-info[=name]
                      This option controls how XtraBackup should retrieve
                      server's binary log coordinates corresponding to the
                      backup. Possible values are OFF, ON, LOCKLESS and AUTO.
                      See the XtraBackup manual for more information
Variables (--variable-name=value)
and boolean options {FALSE|TRUE}  Value (after reading options)
--------------------------------- ----------------------------------------
version                           FALSE
target-dir                        /root/xtrabackup_backupfiles/
backup                            FALSE
stats                             FALSE
prepare                           FALSE
export                            FALSE
apply-log-only                    FALSE
print-param                       FALSE
use-memory                        104857600
throttle                          0
log-copy-interval                 1000
extra-lsndir                      (No default value)
incremental-lsn                   (No default value)
incremental-basedir               (No default value)
incremental-dir                   (No default value)
to-archived-lsn                   0
tables                            (No default value)
tables-file                       (No default value)
databases                         (No default value)
databases-file                    (No default value)
create-ib-logfile                 FALSE
datadir                           /mysqldata
tmpdir                            (No default value)
parallel                          1
stream                            (No default value)
compress                          (No default value)
compress-threads                  1
compress-chunk-size               65536
encrypt                           NONE
encrypt-key                       (No default value)
encrypt-key-file                  (No default value)
encrypt-threads                   1
encrypt-chunk-size                65536
log                               (No default value)
innodb                            (No default value)
innodb-adaptive-hash-index        TRUE
innodb-additional-mem-pool-size   1048576
innodb-autoextend-increment       8
```

innodb-buffer-pool-size	8589934592
innodb-checksums	TRUE
innodb-data-file-path	(No default value)
innodb-data-home-dir	/mysqldata
innodb-doublewrite	TRUE
innodb-io-capacity	1000
innodb-file-io-threads	4
innodb-read-io-threads	4
innodb-write-io-threads	4
innodb-file-per-table	TRUE
innodb-flush-log-at-trx-commit	1
innodb-flush-method	O_DIRECT
innodb-force-recovery	0
innodb-log-arch-dir	(No default value)
innodb-log-buffer-size	1048576
innodb-log-file-size	50331648
innodb-log-files-in-group	2
innodb-log-group-home-dir	(No default value)
innodb-max-dirty-pages-pct	90
innodb-open-files	300
innodb-use-native-aio	FALSE
innodb-page-size	16384
innodb-log-block-size	512
innodb-fast-checksum	FALSE
innodb-doublewrite-file	(No default value)
innodb-buffer-pool-filename	(No default value)
debug-sync	(No default value)
compact	FALSE
rebuild-indexes	FALSE
rebuild-threads	1
innodb-checksum-algorithm	innodb
innodb-log-checksum-algorithm	innodb
innodb-undo-directory	(No default value)
innodb-undo-tablespaces	0
incremental-force-scan	FALSE
defaults-group	mysqld
open-files-limit	0
close-files	FALSE
copy-back	FALSE
move-back	FALSE
galera-info	FALSE
slave-info	FALSE
no-lock	FALSE
safe-slave-backup	FALSE
rsync	FALSE
force-non-empty-directories	FALSE
no-version-check	FALSE
no-backup-locks	FALSE
decompress	FALSE
user	(No default value)
host	(No default value)
port	3306
password	(No default value)
socket	/mysqldata/mysql.sock
incremental-history-name	(No default value)
incremental-history-uuid	(No default value)
decrypt	NONE
ftwrl-wait-query-type	UPDATE

```
kill-long-query-type            SELECT
kill-long-queries-timeout       0
ftwrl-wait-timeout              0
ftwrl-wait-threshold            60
debug-sleep-before-unlock       0
safe-slave-backup-timeout       300
binlog-info                     auto
[root@vm-finance-mysql-db1 ~]#
```

4. cp 文件系统冷备工具

直接复制整个数据库目录，最简单，最快速。但要停服务器，才能保证在复制期间数据不会发生变化。当你使用直接备份方法时，必须保证表不在被使用。如果服务器在你正在拷贝一个表时改变它，拷贝就失去意义。保证你的拷贝完整性的最好方法是关闭服务器，拷贝文件，然后重启服务器。如果你不想关闭服务器，要在执行表检查的同时锁定服务器。如果服务器在运行，相同的制约也适用于拷贝文件，而且你应该使用相同的锁定协议让服务器“安静下来”。当你完成了备份时，需要重启服务器(如果关闭了它)或释放加在表上的锁定(如果你让服务器运行)。要用直接拷贝文件把一个数据库从一台机器拷贝到另一台机器上，只是将文件拷贝到另一台服务器主机的适当数据目录下即可。

注 ： 这种方法不适用于InnoDB存储引擎的表，使用于MyISAM存储引擎的表。

5. lvm 文件系统热备工具

几乎是热备，支持所有引擎，基于快照的物理备份，只影响数据几秒钟。LVM的限制：不能对多个逻辑卷同一时间进行备份，所以数据文件和事务日志等各种文件必须放在同一个LVM上。而ZFS则非常好的可以在多逻辑卷之间备份。

6. ibbackup 商业工具

MyISAM是温备，InnoDB是热备，备份还原速度都很快，但要收费。

8. 数据还原

（1）使用mysqldump

```
mysql -u root -p [dbname] < backup.sql
```

（2）直接复制目录的备份

这种方式的还原，必须保证两个MySQL数据库的版本号相同，对MyISAM类型的表有效，对InnoDB类型的表不可用，InnoDB表的表空间不能直接复制。