zmanda
A BETSOL® COMPANY

ZMANDA RECOVERY MANAGER

QUICK START GUIDE

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1. INTRODUCTION

Zmanda Recovery Manager for MySQL Features

MySQL is one of the most common and versatile database engines. ZRM Enterprise provides global backup and recovery management for MySQL servers.

In addition to its command line and configuration file interface, ZRM for MySQL also includes the Zmanda Management Console for MySQL (ZMC). The ZMC is a web-based management console that delivers all the automation, management, monitoring, and recovery capabilities of ZRM for MySQL in an intuitive graphical user interface.

The following diagram shows the local server running ZMC backing up two more MySQL servers with multiple MySQL databases. These are backed up by configuring at least two backup sets, i.e., at least one backup set per MySQL server.

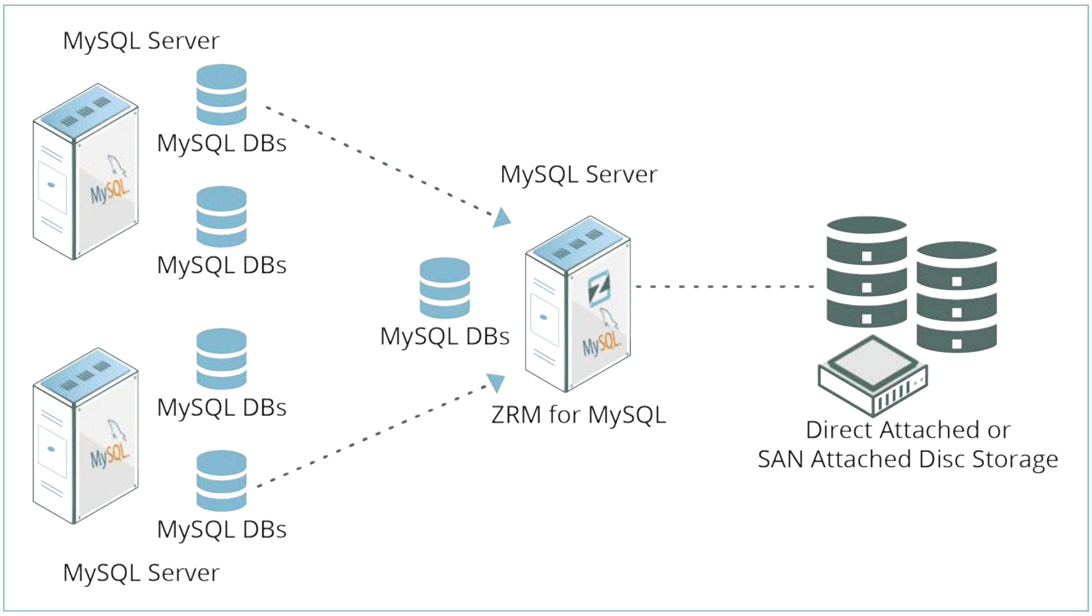


Figure 1. ZRM for MySQL Server

Backup Sets

Most ZMC operations work on backup sets. A backup set defines of the ***"what"***, ***"where"***, ***"when"*** , and ***"how"*** of data that is to be backed up. ZMC users can have two roles: Administrator or Operator. All backups and reports previously created using community versions of ***"ZRM"*** can be managed using ZMC.

ZMC Components

ZMC consists of the following components:

- Apache web server.
- Internal MySQL database server.
- PHP, Perl, and PHP/Perl modules.

All ZMC components are installed in a separate directory (under /*opt/zmanda/zrm* and /*opt/zmanda/common*), and therefore do not impact existing installations of AMP stack on the backup server.

ZMC runs on the ZRM server and can be accessed from any web browser. ZMC is supported on IE 9 or later on Windows, Firefox and Chrome on Windows and Linux.

ZMC and the Zmanda Network

The ZMC is closely integrated with the Zmanda Network, which provides documentation as well as context-sensitive help on messages and error resolution. The Zmanda Network is continuously updated with the latest ZRM information. This allows the ZMC to provide up-to-date suggestions and resolutions for specific issues faced by a backup administrator.

Features

ZRM for MySQL optimizes backup and restore operations on MySQL Databases. It provides full flexibility to individually leverage native MySQL/OS backup tools, levels, scheduling, etc. It generates logs that assist in optimizing these capabilities. It also provides filters to easily locate anomalous database events.

BACKUP FEATURES:

- Backs up multiple MySQL databases managed by one or more MySQL servers.
- Backs up tables in a single database.
- Supports hot backup of databases.
- Supports multiple backup methods, depending on the storage engine used by MySQL tables.
- Support for Xtrabackup and MySQL Enterprise backup tools.

- Full, differential, and incremental database backups.
- Supports use of mysqldump, mysqlhotcopy, Xtrabackup, MySQL Enterprise Backup, storage, and file system snapshots and MySQL replication to execute backups.
- Backups are integrated with Netapp Snapshots and Snapvault features.
- Creates consistent backups of the database regardless of the storage engine used by database tables.
- Supports SSL authentication between the local ZRM for MySQL and remote MySQL server to allow secure backups over the Internet and across firewalls.
- Verifies backed up data images.
- Backup images can be compressed as well as encrypted using standard tools such as gzip, GPG, etc.
- Backup runs can be canceled by users with Administrative privileges.

RECOVERY FEATURES:

- Optionally maintain a backup index that stores information about each backup run.
- Includes a reporting feature that can be used to browse indexes.
- Supports recovery of full and incremental database backups.
- Perform selective, incremental restores based on binary log position, or by a given point in time, thus protecting the database from operator errors.
- Binary log filtering helps you decide what to restore and what to discard.
- Depending on the type of backups selected, data can be recovered to the same machine or a different machine.

REPORTING AND SCHEDULING CAPABILITIES:

- ZRM for MySQL can schedule backup runs immediately or in daily/weekly/monthly intervals (even every 15 minutes).
- It automatically generates backup reports.
- It includes standard backup reports as well as custom (i.e. user-defined) backup reports.
- It can report any backup statistic or combination thereof.
- It can format reports as HTML or Text.
- It sends an email notification about the backup run status.
- It can provide backup reports as RSS feed.

PLUGINS:

ZRM for MySQL allows plugin operations to extend ZRM for MySQL capabilities. Plugins allow you to optimize the backup process for your environment. The following plugin operations are supported (see the Backup How page for detailed configuration information):

- Pre-scheduling
- Pre-backup
- Post-backup
- Copy plugins for Linux/Unix and Windows
- Binary log parser plugin
- Snapshot plugin (feature license required)
- InnoDB Hot Backup plugin (feature license required)

Window Server Differences

When running Windows-based ZRM servers (XP, 2003 Server, Vista), the following limitations apply

- ZRM Windows Server 3.1 works well with ZRM Windows Client 3.5.
- Backup methods that are supported are logical and snapshot backup using VSS. A raw backup method is not supported by MySQL on Windows.
- No support for backup of Linux/Solaris MySQL servers; use ZRM on Linux or Solaris to back up MySQL servers running on multiple platforms to a single ZRM server.
- Support for native Windows compression & encryption. No support for encryption on Vista Home basic and Vista Home Premium.
- Backup of replication slaves running on Windows.
- No Quick Snapshots. The number of snapshots that can be maintained on XP is limited to 1.
- No backup data verification.
- No support for MySQL clusters.
- No email/RSS notifications. Information will be logged in Windows event logs.

2. INSTALLATION

a) Supported Platforms

Please see the latest platform support information on the Zmanda Network.

b) System Requirements

This page provides the list of requirements for ZRM Backup Server, ZRM client (MySQL server), MySQL server configuration and requirements for various backup methods. Users must read this section before starting to install ZRM for MySQL components as described in Downloading and Installing instructions section.

Throughout this document, The ***MySQL*** Server refers to the database server being backed up by the ***ZRM*** for ***MySQL Server***, which is also called the ***ZRM Server***.

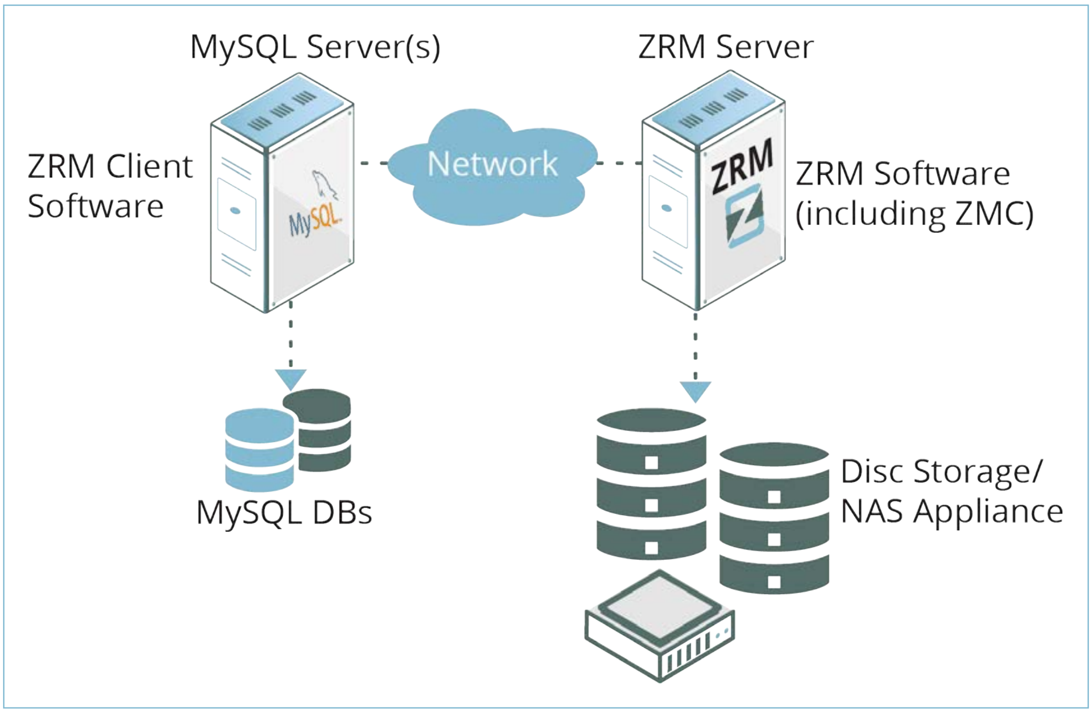


Figure 2. Database Servers(s)

ZRM Backup Server Requirements

The backup server performs various CPU, Memory, Network, and Disk intensive operations. While hardware requirements will vary based on your backup environment, we recommend a server with at least 4GB of memory and a modern quad-core server-class CPU. The bandwidth of the network link between the backup server and your network switch is also very critical. If network bonding is supported by your switch, we recommend providing a bonded connection to the backup server.

- You should have at least 2GB of disk space on the disk where ZRM Enterprise software is being installed.

- Zmanda UI installation directory (***/opt/zmanda/zrm***) must not be a NFS mounted directory.

- Ensure that there is at least 10% free disk space in the Zmanda installation (***/opt/zmanda/zrm***) and temporary directories (***/tmp***).

Linux/Solaris

- Verify that the ZRM server has operating system accounts for a *MySQL* user belonging to the *MySQL* group. The account should have a login shell, and be able to execute commands on the ZRM server. If implementing a copy plugin to back up clients, matching accounts must be set up on the MySQL servers. The *uid* and *gid* of the *MySQL* user must match on the ZRM server and the MySQL server (backup client).

- The *MySQL* user must be added to *cron.allow* file. This file is usually in /*etc* or /*etc*/*cron.d* directory. The crontab file must also be editable by *MySQL* user.

- On ubuntu platform, the *crontab* for *MySQL* must set the *MAILTO* parameter to a valid email address (or an empty string). The following example shows the entry for setting the parameter to an empty string:

```
MAILTO=””
```

- The ZRM server must have the locale set to *en_US.UTF-8* (U.S English, UTF-8 Character set).

Windows

- ZRM server must be installed and run from the Administrator account.
- Windows server must be running . English edition.

ZRM Server Package Dependencies

The following packages are required on the ZRM Server (32-bit versions of packages required):

Linux:

- ZRM for MySQL requires the MySQL client commands listed below to be installed on the ZRM server. ZRM uses the following MySQL commands on the ZRM server:
  - mysqladmin
  - mysqlhotcopy
  - mysqldump
  - mysqlbinlog
  - mysql
- The MySQL client commands installed on the ZRM server must be compatible with the version of MySQL servers being backed up. Zmanda recommends installing the same version of MySQL software on the ZRM server and MySQL server. The ZRM server uses mysqlbinlog command to parse binary logs created by the MySQL servers. So, the version of mysqlbinlog command must be compatible with binary logs generated by different MySQL servers that are being backed up.
- MySQL Enterprise Backup and Xtrabackup binaries must be installed on the ZRM server in the same location as MySQL server under the following use cases: streaming backup mode (default configuration) and when apply logs are performed during restores (apply-log parameter should be set to 0 in the backup set's *mysql-zrm.conf*).
- The ZRM server assumes that the MySQL commands are installed in */usr/bin/*. You can change this default either globally or by backup set. If necessary, you can change the client command location and binary log location in Set Site Defaults page. See the MySQL subsection of the Backup Tab for details.

- On some distributions (such as debian), the default MySQL binary log location /var/log/mysql is owned by *MySQL* user and *adm* group. ZRM expects the binary logs to be owned by *MySQL* user and *MySQL* group. Please change the group ownership of the directory.

- *mailx:* The *mailx* package can be found as part of the Linux distribution. The *mailx* package must be configured to send mail from the ZRM machine to the MySQL database backup administrator.

- On 64-bit ubuntu/debian platforms, ZRM installer needs ia32-libs package. On 64bit RHEL/Oracle Enterprise Linux/Fedora/CentOS platforms, glibc.i686, libgcc.i686, libstdc++.i686 and ncurses-libs.i686 packages are required.

- ZRM server also installs ZRM client. So, all ZRM client dependencies are also required.

The dependency packages are installed by default on most Linux distributions. If you need to add them, you can use *yum* or *apt-get*, either from the distribution media, or from a distribution repository (run either as root):

```
#yum install package_name
```

or

```
#apt-get install package_name
```

Solaris:

- ZRM for MySQL requires the MySQL client commands listed below to be installed on the ZRM server. ZRM uses the following MySQL commands on the ZRM server:

  - mysqladmin
  - mysqlhotcopy
  - mysqldump
  - mysqlbinlog
  - mysql

- The MySQL client commands installed on the ZRM server must be compatible with the version of MySQL servers being backed up. Zmanda recommends installing the same version of MySQL software on the ZRM server and MySQL server.

- The ZRM server assumes that the MySQL backup client's MySQL commands are installed in */usr/bin/*. You can change this default either globally or by backup set. If necessary, you can change the client command location and binary log location in Set Site Defaults page. See the MySQL subsection of the Backup Tab for details.

- *mailx:* The *mailx* package can be found as part SUNWcsu package. ZRM uses *mailx* program to send email notification.

- GNU utilities (such as GNU tar, GNU find) are also required on the server.

The Zmanda Network downloads collect all these packages in a downloadable tar archive (which is made available after you select a platform to download). If necessary, download the tar archive to the local system, extract it, and run *pkgadd* as the superuser to install any necessary packages:

```
# pkgadd -d package_name
```

Windows:

- ZRM server can only run on 32bit Windows platform.

  ActivePerl version 5.8.8 is required. Please contact Zmanda if you do not have access to ActivePerl version 5.8.8. After downloading the file, run the *Setup* program. After you confirm the license agreement, the *Setup* program asks you what programs to install and prompts you for some installation details. Install all of the products in their default locations, and make sure that the *Add Perl to the PATH environment variable* and *create Perl file extension association* boxes are checked before clicking through the *Finish* dialog.

  Additional Perl modules are also required. These are installed as part of the ZRM installation. ZRM installer requires connection to the Internet during installation.

  ZRM for MySQL requires the MySQL client commands listed below to be installed on the ZRM server. ZRM uses the following MySQL commands on the ZRM server:

  - mysqladmin
  - mysqlhotcopy
  - mysqldump
  - mysqlbinlog
  - mysql

MySQL Server (Backup Client) Requirements

- Verify that the version(s) of MySQL server(s) that you deploy are supported by Zmanda Recovery Manager for MySQL. Check the supported platform compatibility matrix.
- You must set up an operating system account for the **MySQL** user. Our recommendation is the MySQL user should have UID and GID that match MySQL user on the ZRM server, especially for ssh copy plugin. This user must have read/write access to the MySQL data directory and binary logs.
- MyDumper (Logical parallel backup tool) or MySQL Enterprise Backup or Xtrabackup (1.6 or later) tools must be installed on the MySQL server if the tool is going to be used for full backups. If you are planning to use Xtrabackup compression option, the compression tool, qpress must be installed on the MySQL server.

MySQL Server (Backup Clients) Package Dependencies

Linux:

- *perl:* The *perl-DBI*, *perl-DBD-MySQL*, and *perl-XML-Parser* modules are also required.
- *perl* LWP-UserAgent module is required for Netapp snapshot backups.
- *xinetd*
- *sudo* (required only for snapshot backup configurations)
- Gnu *tar* version 1.15 or later

These programs are installed by default on most Linux distributions. If you need to add them, you can use *yum* or *apt-get* to install them, either from the distribution media or from a distribution repository (you run either as root):

```
#yum install package_name
```

or

```
#apt-get install package_name
```

Solaris:

- *perl:* The *Perl-DBI*, *Perl-DBD-MySQL*, and *perl-XML-Parser* modules are also required.
- *perl* LWP-UserAgent module is required for Netapp snapshot backups.
- *SUNWcsu*
- *SUNWsshcu*
- *SUNWgzip*
- *SMCtar* (version 1.15.1 or greater)
- *SMCgpgme*
- *SMCsudo* (required only for snapshot backup configurations)
- *SMCgrep*
- *SMCcoreu*

The Zmanda Network downloads page collects all these packages in a downloadable tar archive (which is made available after you select Solaris platform). If necessary, download the tar archive to the local system, extract it, and run pkgadd as the superuser to install any necessary packages:

```
# pkgadd -d package_name
```

If you are using ZRM dependency tarball for installation, you may need additional dependency common-1.4.5-SunOS5.8-sparc-CSW.pkg that is not part of the tarball.

Windows:

- Databases to be backed up must be stored on NTFS volumes with the Volume Shadow Copy Service (VSS) enabled.
- Windows clients must open inbound TCP ports 10080 and 10081, and outbound TCP ports 700:800.
- Windows clients must open inbound TCP ports 10080 and 10081, and outbound TCP ports 700:800.
- The Remote Registry Service must be enabled before installation.

MySQL Database User for ZRM

We recommend creating a MySQL database user for ZRM backup and recovery instead of using the MySQL root user. If the MySQL database backup user and restore user are different, set the privileges of the backup user in Backup Tab for the backup set.

Restore user privileges can be specified on the **mysql-zrm(1)** command line via the **--user** and **--password** options.

If you are using Xtrabackup or MySQL Enterprise Backup as the full backup method, the MySQL user should have privileges to access the database(s) from the localhost (MySQL server) as well as the ZRM server.

Although MySQL allows dollar signs (**$**) in passwords, the ZMC does not. If you must use passwords that include dollar signs at your site, consider using one of the alternative methods for storing MySQL user passwords described in the MySQL article “Keeping your Password Secure”.

Required Privileges for the MySQL Account

MySQL backup and restore users need, at minimum, the following MySQL privileges (MySQL 5.1.6 or later):

Backup User
LOCK TABLES, SELECT, FILE, RELOAD, SUPER, UPDATE, TRIGGER, SHOW VIEW, EXECUTE, EVENT

Restore User

CREATE, DROP, INDEX, SHUTDOWN, INSERT, ALTER, DELETE, UPDATE, TRIGGER, SUPER, REPLICATION CLIENT, CREATE VIEW EXECUTE, SHOW VIEW, and CREATE VIEW privileges are required for MySQL server version 5.0 or greater. Before MySQL 5.1.6, the SUPER privilege was required to create or drop triggers and so TRIGGER and EVENT privileges are not required.

MySQL backup user requires SUPER privileges even when MySQL replication is not being used. For incremental backups, ZRM for MySQL requires SUPER privileges to enable binary logging.

A MySQL replication slave backup user should have REPLICATION CLIENT privileges in addition to the above privileges.

Examples:

1. MySQL 5.5 or later version - Following MySQL client command grants user privileges for MySQL user **dbabackup** to perform backup and recovery of MySQL server running on ZRM server

```
GRANT LOCK TABLES, EXECUTE, SELECT, FILE, RELOAD, SUPER, CREATE,
DROP,EVENT,INDEX,  SHUTDOWN,  INSERT,  ALTER,  UPDATE,  SUPER,
REPLICATION CLIENT, TRIGGER,SHOW VIEW, CREATE VIEW on *.* to
'dbabackup'@'localhost' identified by 'PASSWORD';
```

2. MySQL 5.1 server - Following command that grants minimal user privileges for database user **dbabackup** to backup and restores database **expenses** remotely from machine **server.company.com** :

```
mysql> GRANT LOCK TABLES, EXECUTE, SELECT, FILE, RELOAD, DELETE,
SUPER,  CREATE,  DROP,  INDEX,  SHUTDOWN,  INSERT,  ALTER,  UPDATE,
SUPER,  REPLICATION CLIENT,  TRIGGER,  SHOW VIEW,  CREATE VIEW
     -> ON expenses.*
     -> TO 'dbabackup'@'server.company.com'
     -> IDENTIFIED BY 'obscure';
```

ZRM for MySQL should be running on *server.company.com.* If you are restoring from logical backups, additional privileges will be required for the restore user. For example, if there are stored procedures in the logical backup image being restored, the restore user must have *CREATE ROUTINE* and *ALTER ROUTINE* privileges. If you are not sure of the list of privileges that are required for restoration, temporarily grant the restore user all privileges for the databases and/or tables being restored.

Note:

1. If you are backing up remote MySQL server, backup user privileges should be granted for the backup user accessing from the MySQL server as well as the server running ZRM (ZRM server).

2. RELOAD privilege is granted at MySQL server level (not at database level) and so following grant command for RELOAD privilege at MySQL server level. Please see MySQL documentation for privileges.

```
grant RELOAD on *.* to 'user'@'host' identified by 'password
```

Enabling MySQL Server Binary Logs

MySQL backups (full and log incremental) require that binary logging on the MySQL server. To enable binary logging, start the MySQL server daemon (*mysqld*) with the *--log-bin* option:

```
mysqld --log-bin=BinLogFilename
```

Enabling binary logs on a MySQL server reduces performance by about 1%. Actual performance degradation depends on the type of database workload. It is the best practice to store binary logs in a different file system than the file system containing the database directories.

Consult MySQL reference manual for more information on MySQL binary logs.

log-slave-updates must be enabled on the replication slave mysqld options file (my.cnf) if you are performing backups of a MySQL replication slave. Please note when replication master is switched over to a slave, and there is chained replication (master -> slave -> slave), there might be duplicate events if *log-slave-updates* is enabled on the slave.

Requirements for Snapshot and Storage Checkpoint Backups

ZRM for MySQL can create temporary snapshots of the file systems or storage volumes and use these snapshot volumes to do backups. If the database resides on a Veritas File System (VxFS), storage checkpoints can be leveraged.

Various storage and filesystem snapshots are supported. Some snapshot mechanisms are licensed and will require licenses to be purchased. All MySQL database files (data, log, indexes) must be stored on snapshot-capable storage volumes.

The requirements for each file system and storage snapshot is different. They are discussed in the Snapshot Plugins chapter.

Requirements for InnoDB Hot Backup/ MySQL Enterprise Backup

The *ibbackup* command (which is installed as part of the MySQL Enterprise Backup or InnoDB Hot Backup product) must be installed on the MySQL Server. MySQL Enterprise Backup or InnoDB Hot Backup product must be purchased from Oracle or at www.innodb.com. ZRM provides integration with MySQL Enterprise Backup or InnoDB Hot Backup product. Make sure the *mysql* operating system user has permissions to execute the command.

If *ibbackup* command is installed in a place other than /*usr/bin*, you must specify the path when you choose *InnoDB Hot Backup* on the *Backup How* page.

SSL Between MySQL Servers and ZRM Server

SSL provides an additional layer of security while moving backups over a network. We recommended that you enable SSL on the MySQL server if the backups are performed on unsecured networks. Installing SSL between the local ZRM for MySQL server and remote MySQL server(s) is necessary only for logical backups of remote MySQL servers.

To verify the availability of SSL support in the MySQL server, you can either:

- Run the following command on the local server:

```
# mysqld --ssl --help
```

When the SSL support does not exist, the system responds with a message like this:

```
060828 15:25:08 [ERROR] mysqld: unknown option ‘--ssl’
```

- Examine the value of the have_openssl system variable:

```
mysql> SHOW VARIABLES LIKE ‘have_openssl’;
+---------------+-------+
| Variable_name | Value |
+---------------+-------+
| have_openssl  | YES   |
+---------------+-------+
```

Zmanda recommends using either of the two options given below to configure SSL when remote backups of MySQL servers done using unsecured networks.

- Set SSL parameters in the *my.cnf* file of MySQL on the ZRM server.

```
ssl-ca=mySQL_conf_dir/openssl/cacert.pem
ssl-cert=mySQL_conf_dir/openssl/client-cert.pem
ssl-key=mySQL_conf_dir/openssl/client-key.pem
```

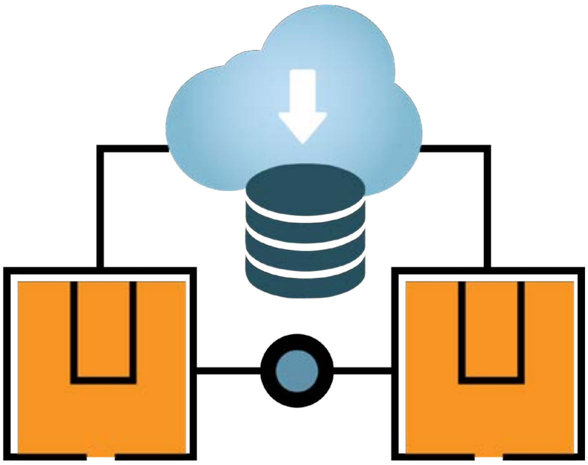
- Set SSL parameters for all backup set in mysql-zrm.conf file of ZRM for MySQL or you can specify it in the SSL options field in Backup What page of ZMC.

```
ssl-options=”--ssl --ssl-ca=mySQL_conf_dir/openssl/cacert.pem
            --ssl-cert=mySQL_conf_dir/openssl/client-cert.pem
            --ssl-key=mySQL_conf_dir/openssl/client-key.pem”
```

c) Downloading and Installing the Software

Download distribution files from the Zmanda Network Downloads page. Note that there are several different packages for various MySQL server and ZRM server architectures.

If you are installing ZRM for MySQL version 3.8 over a previous version, please see the "Compatibility with Previous Versions of the Zmanda Recovery Manager for MySQL" section of the ZRM for MySQL 3.8 Release Notes.



ZRM Server Components

The ZRM Server is the backup server. It can run either Linux, Solaris, or Windows.
The *installer.run* (or, for Windows, *installer-win.exe*) packages are binary executables for the ZMC Rapid Installer, which install the ZRM Server software, the Zmanda Management Console (ZMC) and all dependencies: this is the recommended method of installation. The *installer.run* packages include the ZRM command line interface and ZRM client software. The installation instructions are provided in the next section.

Linux:

ZRM-enterprise-3.8-installer.run
All supported linux distributions.

Solaris:

ZRM-enterprise-3.4-installer-sparc.run
Solaris on Sparc platform
ZRM-enterprise-3.8-installer-intel.run
Solaris on Intel/AMD platform

Windows:

ZRM-enterprise-3.1-installer-win.exe
Windows on x86 (32bit only)

MySQL Server (ZRM Client) Components

The *MySQL server* is the machine being backed up (i.e., the backup client). No ZRM client components are required if logical backup and recovery of MySQL server.

Linux:

MySQL-zrm-enterprise-client-3.8-1.noarch.rpm
RHEL, SLES and Fedora distribution. Install using the following command (run as root):

```
# rpm -i MySQL-zrm-enterprise-client-3.8-1.noarch.rpm
```

mysql-zrm-enterprise-client_3.8_all.
Ubuntu, Debian distribution. Install using the following command (run as root):

```
# dpkg -i mysql-zrm-enterprise-client_3.8_all.deb
```

Solaris:

MySQL-zrm-client-3.8-solaris.pkg
Open Solaris and Solaris 10 on Intel/AMD and Sparc platforms. After downloading the Solaris client package, install using the following command (run as superuser) in the directory where the package was downloaded:

```
# pkgadd -G -d .
```

The above command installs the package in all zones.

Windows:

ZRM-Windows-*.zip
Windows 32-bit and 64-bit platforms. Latest version of Windows client is 3.7. Install by extracting the archive and running the resulting *Setup.exe*. Administrator privileges are required for installation.

During installation, you have to specify the name of ZRM server or its IP address. If this information is not available at the time of ZRM client installation, you can use ZRM client configuration utility (*Start > Programs > ZRM Client For MySQL > ZRM Client Configuration Utility > Server*) to set the correct IP address of ZRM server and restart ZWC Service from the Services menu. ZRM client must be registered with ZRM server before backups are performed.

The ZMC Rapid Installer (Linux and Unix)

For installation using a method other than the Rapid Installer, please see the sections that follow.

1. Copy the Rapid Installer binary file to the host where the given component will be installed.
2. Log in to the host as the superuser.
3. Make sure that the Rapid Installer binary file is executable. For example:

```
# chmod +x ZRM-enterprise-3.8-installer.run
```

4. Run the installer by double-clicking on it, or enter the following command line:

```
#  ./ZRM-enterprise-3.8-installer.run
```

5. The Rapid Installer then starts. Follow the on-screen instructions.

Important Note: When prompted to choose the **Zmanda Web Server protocol**, we strongly recommend that you choose **https** for security reasons. Even if you choose http for browser/ZMC communication, the ZMC still requires https for internal communication purposes, and will, therefore, prompt you for an SSL port during installation in all cases.

Note: The installer performs several tasks after creating and populating the Zmanda directories. These are completed after the progress bar (which only tracks the archive extraction) shows 100 percent completion. These tasks take time. Please wait till they complete.

6. After the ZRM for MySQL binaries has been extracted and installed, the Zmanda Management Console is launched, and the **readme** file is displayed. The **readme** file includes the default ZRM for MySQL username and password. You can now login to the console using any supported browser and begin backing up MySQL databases.

7. After installing the ZRM server, please make sure license keys are installed on the ZRM server.

Rapid Installer Command Line Options

Run the installer with the **--help** option to see what command line parameters are available.

--help
    Display the list of valid options.

--version
    Display product version information.
--optionfile optionfile
    Use command line parameters specified in optionfile.
--mode mode
    Choose the installation mode, where mode is **gtk** (the default), **xwindow, text**, or **unattended.**
--apache_server_port apache_server_port
    The ZMC Web Server port (default is **80**).
--apache_server_ssl_port apache_server_sslport
    ZMC Web Server SSL port (default is **443**).
--mysql_port mysql_port
    Specify the ZMC MySQL Server port (default is **3036**).

Uninstalling ZRM for MySQL (Linux and UNIX)

Important Note to Customers of Amanda Enterprise Edition: Before running the uninstall script for ZRM for MySQL, you must first stop the Amanda Enterprise Edition services from running (enter /*etc/init.d/zmc stop* as root), then restart it manually after the uninstall script completes (*/etc/init.d/zmc start)*.

You can unistall ZRM for MySQL by clicking the uninstall script located in /*opt/zmanda/zrm/uninstall*. Using this script, you can remove the ZRM for MySQL binaries, with the option of leaving configuration files intact. Follow the on-screen instructions after running the script.

The ZMC Rapid Installer (Windows)

Installation must be run from the Administrator account. First, make sure that the system meets the requirements for ZRM servers on Windows. If the correct version of ActivePerl is not installed (5.8.8) before installing ZRM for MySQL server, the ZRM installation program will prompt you to install it before it allows you to continue. If you do not have access to this version of Perl, please contact Zmanda Support Team.

1. Obtain the Windows ZRM server installation program *ZRM-enterprise-3.1-installer-win.exe* from the Zmanda Network Downloads page. Go to the folder where you downloaded the file and double-click it to start the installation. Stay connected to the internet during the installation process. Installing some of the dependencies requires internet access.

2. Follow the on-screen instructions. Because the installation program installs the Zmanda Windows Client as well as the web server and ZRM server, it must extract a large number of files before the setup process can begin. Please be patient.

3. *Important Note:* When prompted to choose the *Zmanda Web Server protocol*, we strongly recommend that you choose *https* for security reasons. Even if you choose *http* for browser/ZMC communication, the ZMC still requires HTTPS for internal communication purposes, and will, therefore, prompt you for an SSL port during installation in all cases.

The installer performs several tasks after creating and populating the Zmanda directories. These are completed after the progress bar (which only tracks the archive extraction) shows 100 percent completion. These tasks take time. Please wait until they complete.

After the server and client software has been extracted and installed, the Zmanda Management Console is launched, and the *readme* file is displayed. The *readme* file includes the default ZRM for MySQL username and password. You can now login to the console using any supported browser and begin backing up MySQL databases.

The following services are installed as part of ZRM for MySQL server, and must be running for the ZRM server to function:

- ZMC Service
- ZRM EnterpriseApache
- ZRM EnterpriseMySQL
- ZWC Service

After installing the ZRM server, please make sure license file is installed on the ZRM server.

Uninstalling ZRM for MySQL Windows Server

You can use the *Uninstall ZRM* option added to the Windows *Start->All Programs* menu or the *Add/ Remove Programs* option from the Control Panel to remove ZRM for MySQL from the system. After you initiate the uninstall, you are prompted whether you would like to remove backup configuration data as well as the program itself. If you plan to upgrade, you should choose to keep the configuration data.

Note that removing the ZRM Windows Client requires that you use the *Add/ Remove Programs* option available on the Windows Control Panel.

Installing ZRM License

After you have purchased a base license and any feature licenses (such as a snapshot license), the Zmanda Network Downloads page will include an option to download a license file (*zmanda_license*). On Linux/Solaris ZRM servers, download the license file to the /*etc/zmanda* directory, then make sure that the file permissions are set to 644 and that the owner is root. On Windows ZRM servers, download the file to ZRM_installation_dir*etc\zmanda* as the Administrator.

Secure Socket Layer (SSL) Certificate for ZMC web server

Although ZRM for MySQL is shipped with pre-packaged Apache SSL certificate to get you started, Zmanda recommends you purchase (or create your own self-signed) SSL certificates and distribute them to all the browsers from which you wish to access the ZMC. The pre-packaged certificates are not secure (as all ZRM shares them for MySQL customers). These generic certificates will also generate security warnings on some browser versions.

Zmanda recommends that you either; 1) Create self-signed certificates and distribute them to all the client machines that require access to the ZMC, or 2) Distribute certificates from a recognized Certificate Authority. Option 1 (self-signed certificates) is free and is adequate for most organizations that deploy ZMC servers and the machines that access them ***behind the same firewall***.

If using a certificate from a recognized Certificate Authority, your browser will automatically create a secure connection with no errors or warnings.

If using a self-signed certificate, you must then deploy a mechanism to get the relevant browser(s) to accept this new root CA. One method is to generate the certificate using a special format that can be directly imported by common web browsers, and then providing a link on a secure intranet for ZMC users to download (web browsers automatically display the import dialog if the file is in the correct format and sent by the intranet web server using the correct mime type). PKCS12 (now part of OpenSSL, provides a mechanism to distribute self-signed private key certificates in a number of formats recognized by different browsers.

Another approach is to manually add the new self-signed root CA to the root CA list of the client system, which will automatically provide access to the new CA for all web browsers on the client system. This article covers the procedures for doing this in a Microsoft Windows server environment.

For more details on certificate validation issues, see this article from OpenSSL.

d) ZRM for MySQL Component File Locations

ZRM for MySQL files are installed in the following directories:

ZRM Server File(s)	**Location**
CLI Executables	**/usr/bin**
Man pages	**/usr/share/man**
GUI/Web Components	**/opt/zmanda/zrm**
License key file	**/etc/zmanda/zmanda_license**
Backup Set and other configuration files	**/etc/mysql-zrm, /etc/cron.d, /et logrotate.d**
Plugin templates	**/usr/share/mysql-zrm/plugins**
README files and other offline documentation	**/usr/share/doc/MySQL-zrm-enterprise-*** or **/usr/share/doc/mysql-zrm-enterprise**
Libraries	**/usr/lib/mysql-zrm**
Log files (including ssh-copy plugin output)	**/var/log/mysql-zrm/mysql-zrm.log**
Backup images and catalog (default)	**/var/lib/mysql-zrm**
Zmanda Management Console	**/opt/zmanda/zrm, /opt/zmanda/common**

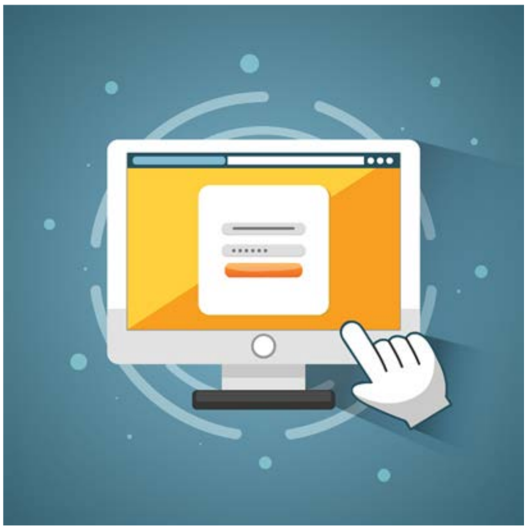
File Locations on MySQL Server

MySQL Server File(s)	**Location**
Binary executables and scripts (Windows)	**C:\Program Files\Zmanda\Zmanda Client for Windows\bin**
Log files	Socket copy plugin output is logged to **/var/log/mysql-zrm/socket-server.log** on the client. There are other log files depending on the type of backup.

Caution: Do not directly delete or change any of these files or directories unless directed to do so by the Zmanda Support Team. Changing any of these files directly can result in failed backups and other problems.

3. LOGIN PAGE

Logging in to the Zmanda Management Console



The ZMC is web-based and can be accessed from any machine on the network. Internet Explorer 9 or later or FireFox or Chrome is the recommended browser.

To access ZMC, open any web browser, and point it to the ZMC server. For example, if the backup server is *ZMCbackupserver.company.com,* and you have specified port *1234* for web services during the ZRM Enterprise installation process, use the following URL:

```
https://ZMCbackupserver.company.com:1234
```

By default, the ZMC web server uses port 443.

If you are running Amanda Enterprise and ZRM Enterprise products on the same server, you will have to use port number configured during Amanda Enterprise installation to access both Amanda Management console and ZRM Management console.

Initial User name and Password

After you have downloaded and installed the ZMC, log in with the default user name *"admin"* using a password of *"admin"*.

Important note: We strongly recommend that you change the password as soon as possible.

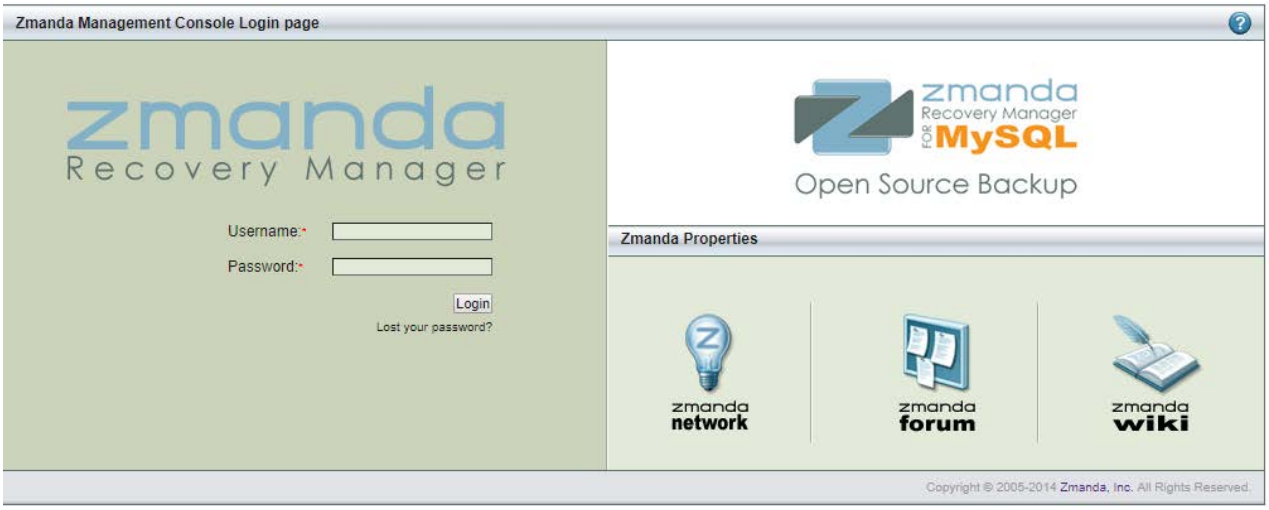


Figure 3. Initial User name and Password

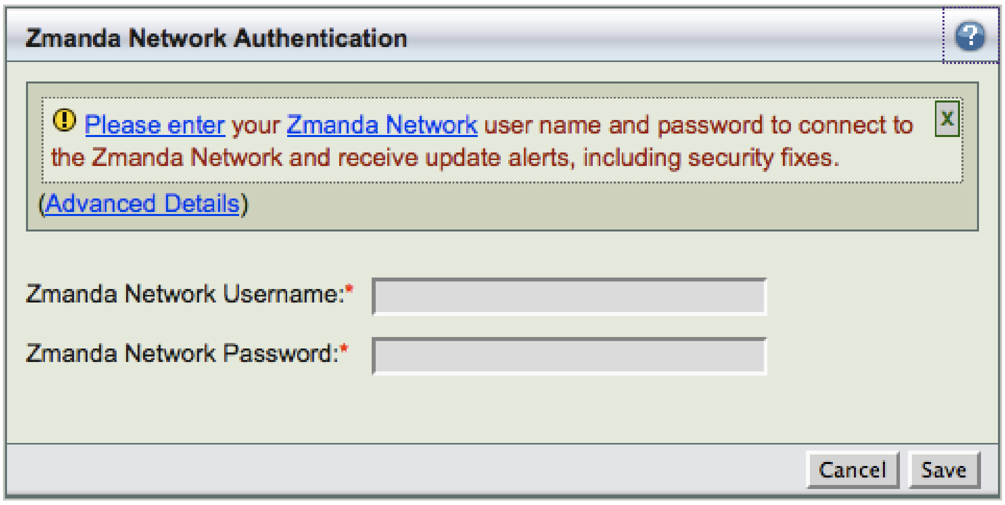
Lost Password

If you do not remember the password, please click *Lost your password?* link. Please enter the ZMC user name in the Lost *Password section*. Please note that password will be mailed to the mail address registered to the ZMC user account. Please note that email service should be configured on the ZRM backup server to receive the lost password email.

If you have difficulty resetting the password, please contact Zmanda Support.

Zmanda Network Authentication

ZMC will ask Zmanda Network User name and password if you log in as an admin user. This authentication allows ZMC to connect to Zmanda Network to authenticate the user as well as obtain alerts including security alerts.



Zmanda Network Authentication

Please enter your Zmanda Network user name and password to connect to the Zmanda Network and receive update alerts, including security fixes.

(Advanced Details)

Zmanda Network Username:*

Zmanda Network Password:*

Figure 4. Zmanda Network Authentication

Zmanda Network Authentication is not supported when the Web proxy server is in use. If there is a web proxy server or there is no internet connection on the Amanda server, please select *Cancel* button.

Zmanda Network Authentication is performed every time ZMC admin *user* logs in.

4. BACKUP SETS

About Backup Sets

The backup set is a grouping mechanism that simplifies and optimizes backing up MySQL databases, and tables that are accessible for a MySQL server or is a part of MySQL cluster. It allows an administrator to define a set of backup policies (what, how, where and when) to automatically schedule different backup runs.

All ZMC actions (backup, restore, reporting, and monitoring) are performed in the context of backup sets.

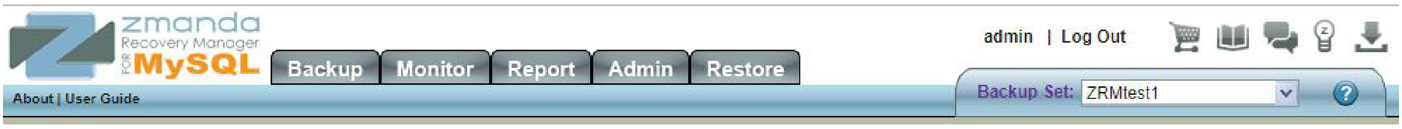
A backup set cannot include more than one MySQL server unless those servers form a cluster.

A backup set can include one or more databases. When selecting individual tables as backup sources, you must select a single database, then the tables it contains. A single backup set cannot contain tables from multiple databases.

Multiple backup sets are useful for protecting a large number of systems with different backup requirements, but many organizations with less complex backup requirements can define a single backup set to meet their needs. For example, on a network that includes several databases with high transaction rate along with other databases that change more slowly, you would probably want to create one backup set for the more active databases, and another backup set for the less active ones.

What a Backup Set Contains?

A backup set is defined by the following Figure 5:



Backup Set: ZRMtest1

Figure 5. Backup Set

Name

Besides being unique, the name must consist of alphanumeric characters. Dashes (-) and underline (_) characters are also allowed.

What

Type and Name of MySQL host: Identifies the MySQL server (identified by DNS name or IP) or cluster being backed up, and the database(s), or table(s) within in a database to back up.

Where

The destination directory where the backups will be stored until they are expired by the **retention date** specified by the retention policy.

When

Specifies the backup cycle policies used when automatically generating backup schedules.

How

Specifies the backup method to use and other parameters such as Backup Mode, Replication, Encryption, snapshots, etc.

Multiple Backup Set Configurations

ZRM for MySQL employs multiple levels of default inheritance to simplify the process of administering multiple backup sets:

01

FACTORY SETTINGS

These are the ***“built-in”*** assumptions that allow many administrators to use ZRM for MySQL right ***“out of the box”*** with few configuration changes.

02

SITE SETTINGS

These allow the administrator to set global defaults used when creating backup sets. For example, if you have a single MySQL server and are creating multiple backup sets for different the databases it contains, you can set up a site-wide default MySQL server (and related parameters).

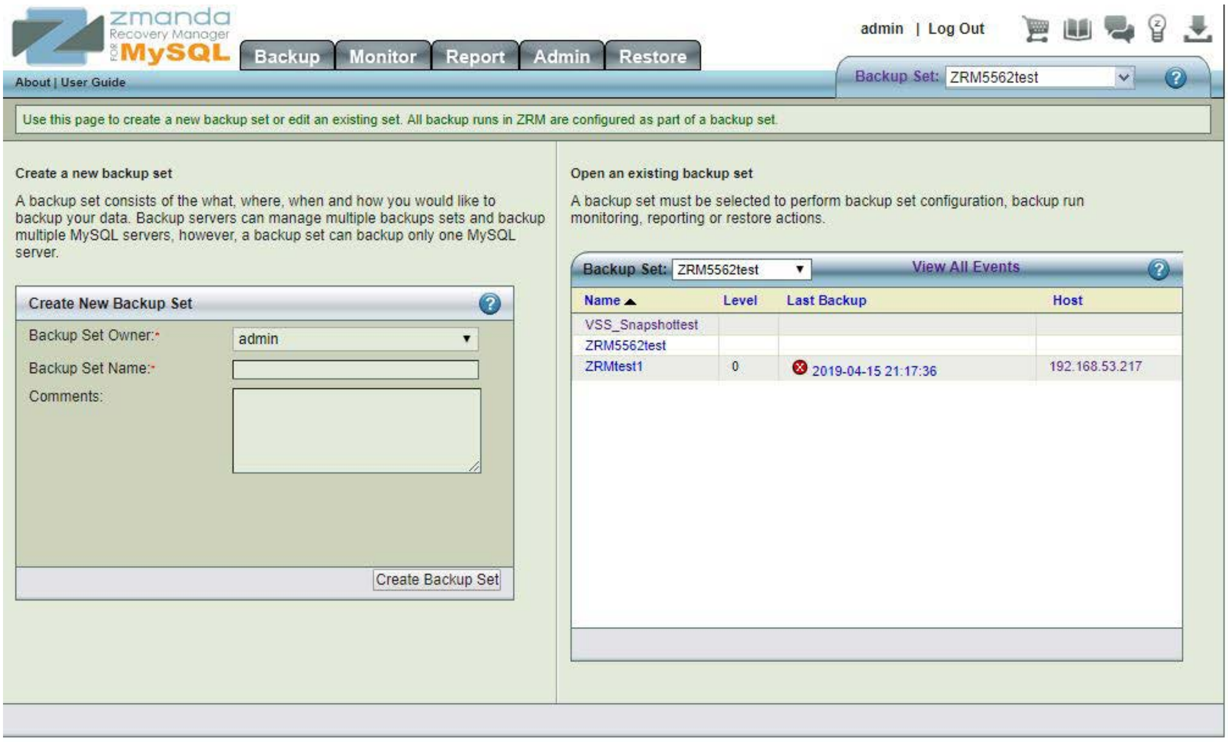
03

BACKUP SET

The backup set itself allows you to override either Factory or Site settings.

Backup Set Starter Page

This is the first page of Zmanda Management Console (see below figure 6). The left panel can be used to create a new backup set. The right panel is the backup set dashboard that shows the list of backup sets, the status of the backup set backups and which MySQL server is being backed up.



Use this page to create a new backup set or edit an existing set. All backup runs in ZRM are configured as part of a backup set.

Create a new backup set

A backup set consists of the what, where, when and how you would like to backup your data. Backup servers can manage multiple backups sets and backup multiple MySQL servers, however, a backup set can backup only one MySQL server.

Create New Backup Set

Backup Set Owner:* admin

Backup Set Name:*

Comments:

Create Backup Set

Open an existing backup set

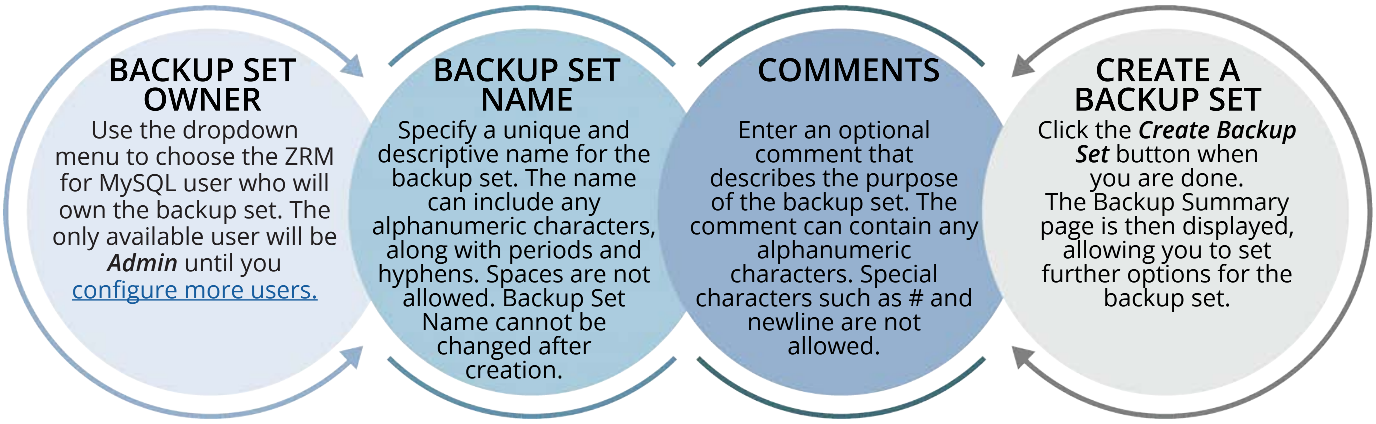
A backup set must be selected to perform backup set configuration, backup run monitoring, reporting or restore actions.

Backup Set: ZRM5562test   View All Events

Name ▲	Level	Last Backup	Host
VSS_Snapshottest			
ZRM5562test			
ZRMtest1	0	⊗ 2019-04-15 21:17:36	192.168.53.217

Figure 6. Backup Set Starter Page

Create New Backup Set



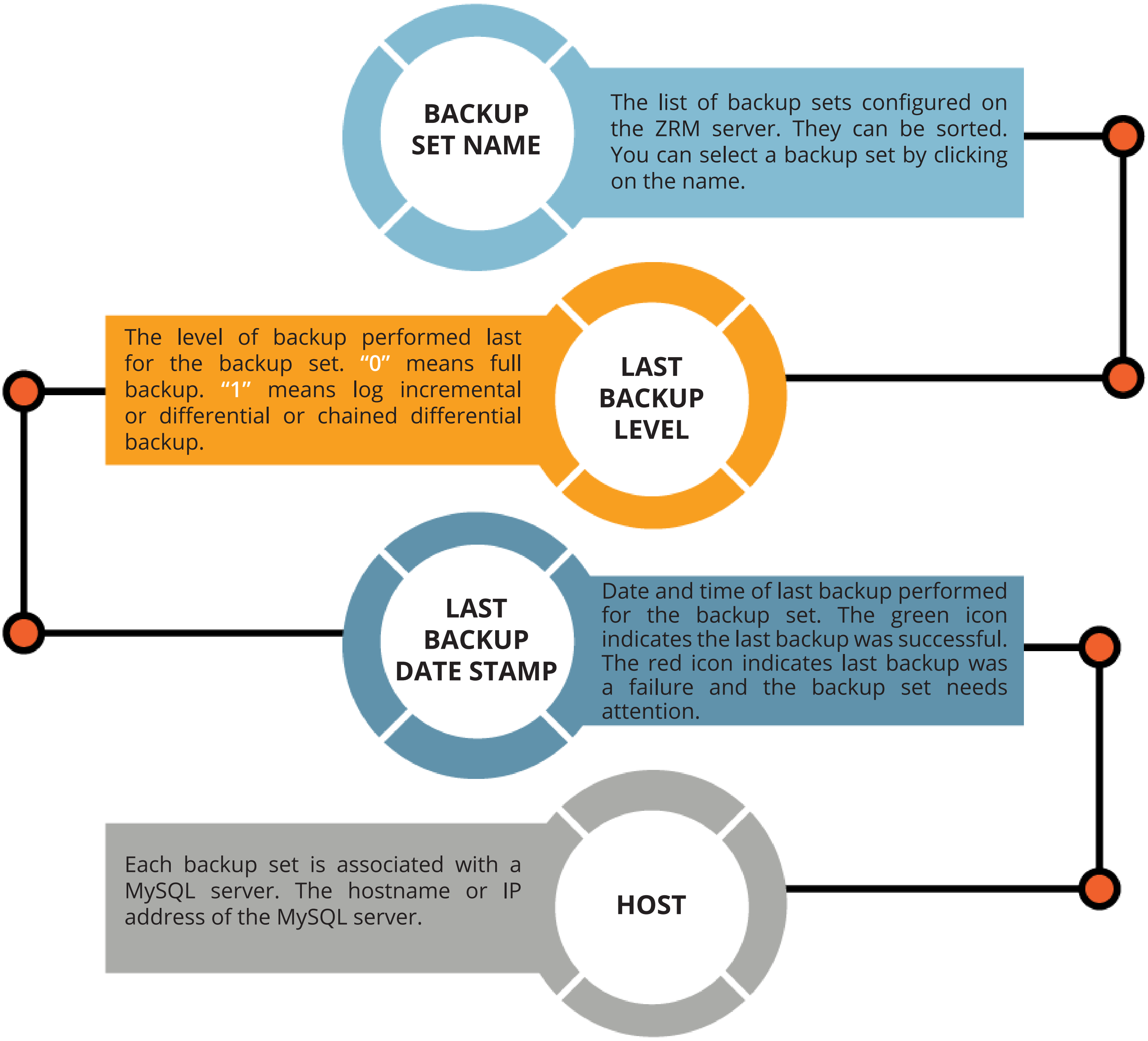
BACKUP SET OWNER
Use the dropdown menu to choose the ZRM for MySQL user who will own the backup set. The only available user will be ***Admin*** until you configure more users.

BACKUP SET NAME
Specify a unique and descriptive name for the backup set. The name can include any alphanumeric characters, along with periods and hyphens. Spaces are not allowed. Backup Set Name cannot be changed after creation.

COMMENTS
Enter an optional comment that describes the purpose of the backup set. The comment can contain any alphanumeric characters. Special characters such as # and newline are not allowed.

CREATE A BACKUP SET
Click the ***Create Backup Set*** button when you are done. The Backup Summary page is then displayed, allowing you to set further options for the backup set.

Backup Set Dashboard



BACKUP SET NAME

The list of backup sets configured on the ZRM server. They can be sorted. You can select a backup set by clicking on the name.

LAST BACKUP LEVEL

The level of backup performed last for the backup set. “0” means full backup. “1” means log incremental or differential or chained differential backup.

LAST BACKUP DATE STAMP

Date and time of last backup performed for the backup set. The green icon indicates the last backup was successful. The red icon indicates last backup was a failure and the backup set needs attention.

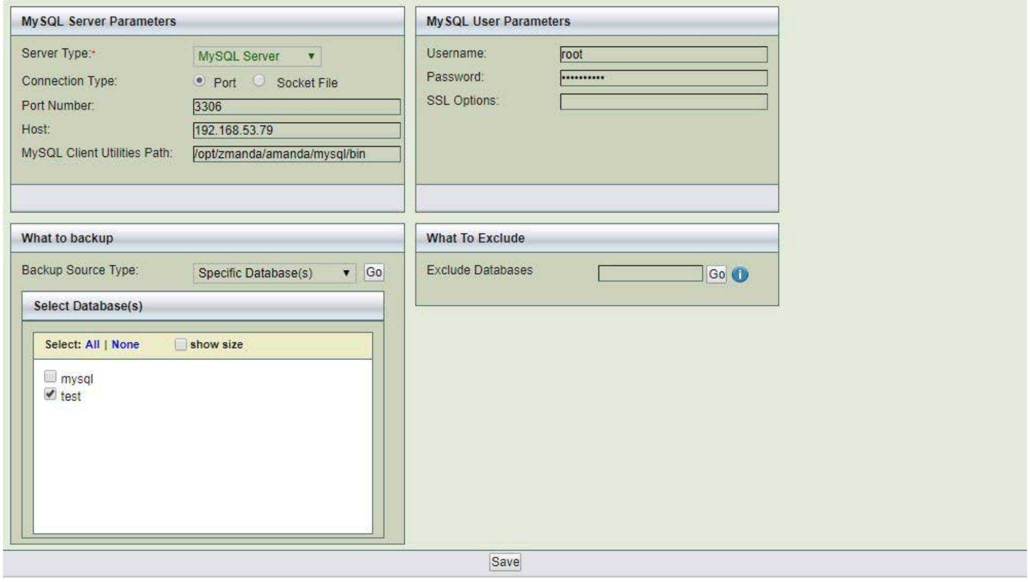
HOST

Each backup set is associated with a MySQL server. The hostname or IP address of the MySQL server.

5. BACKUP WHAT

Specifying What to Back Up

The Backup What page lets you define what databases and tables from a particular MySQL server to back up in the current backup set. To define multiple MySQL servers requires multiple backup sets.



MySQL Server Parameters

Server Type:* MySQL Server ▾

Connection Type: ● Port ○ Socket File

Port Number: 3306

Host: 192.168.53.79

MySQL Client Utilities Path: /opt/zmanda/amanda/mysql/bin

MySQL User Parameters

Username: root

Password: ••••••••••

SSL Options:

What to backup

Backup Source Type: Specific Database(s) ▾

Select Database(s)

Select: All | None □ show size

□ mysql

☑ test

What To Exclude

Exclude Databases

Figure 7. MySQL Server to Backup

As with many of the Zmanda Console Management forms, the fields change depending on the context; selecting different values can change the options that are displayed.

Note also that backup sets inherit default values from the Set Site Defaults page, which in turn will default to factory settings unless you change them. Text fields show inherited defaults on a gray background (see Host parameter localhost in the example screen shown above).

Server Parameters

The first group of options (Server Parameters) let you specify the connection details for the MySQL Server to back up. MySQL Server is selected as the Server Type by default, and that is what is documented here. If you choose MySQL cluster, Backup What displays different options, which are described on the Backing Up a MySQL Cluster page.

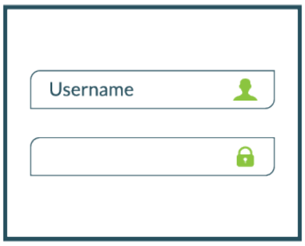
Server Parameters

Connection Type:
Choosing **Port** lets you enter a port number for communication with the MySQL server; choosing **Socket File** enables you to enter a path to the socket file.

Host:
Enter the hostname or IP address of the MySQL server being backed up, or **localhost** if the MySQL server and the ZRM server are on the same machine. Binary logs must be enabled for the MySQL server.

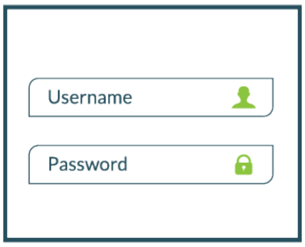
MySQL Client Utilities Path:
If you have installed the same versions of MySQL client commands on the ZRM server and the MySQL server (typically in **/usr/bin**), use the factory (Or Site Settings) defaults for all backup sets. If you have installed different versions of MySQL on the ZRM server and the MySQL server (i.e., the backup client), enter the full path to where MySQL binary commands are installed on the backup client. For example: **/opt/lampp/bin** or `C:\Program Files\MySQL\MySQL Server 5.0\bin\`

MySQL User Parameters



User Name:

Enter the username of the MySQL user on the MySQL server. If no user is specified here, ensure that you have the MySQL backup user (with appropriate privileges) specified explicitly as a Site Default, or that the MySQL user specified in the **my.cnf** or --options file has the necessary privileges described in System Requirements.



Password:

Enter the password for the MySQL user. If you wish to prevent the password from being sent in plaintext over the network, you may wish to configure the MySQL username and password using the MySQL **my.cnf** or --options file. The following characters are allowed in passwords: a-z A-Z 0-9 _ - / . = " ' + * and space. For the remaining criteria, please see this MySQL documentation.

SSL Options:

This field is valid only for logical full backups. If the connection from ZMC server to the remote server is via SSL, specify the MySQL **SSL** parameters here. If you are backing up databases on the **localhost**, leave this field empty. Please see configuring SSL connection between MySQL server and ZRM server.

What to Backup

Choose an option from the dropdown menu. Note that because the database(s) and table(s) shown on this page are updated dynamically based on information retrieved from the MySQL server, these may not match what has been set on the Site Settings page. The Go buttons allow you to refresh the connection to the MySQL server(s) to determine what databases and tables are currently available for backup. Available options are:

All Database(s)

Choosing this option includes all databases and all tables for backup.

Specific Database(s)

Choosing this option displays a list of databases available for backup on the MySQL server. Check all the databases that you want to add to this backup set. Size of the databases is also displayed if ***show size*** checkbox is selected.This will help determine the size needed for full uncompressed backup images. See ***Note*** below.

Specific Table(s)

Choosing this option displays a dropdown menu that lets you select a database from which to select tables to backup, followed by the list of tables in the selected database; check all the tables that you want to add to this backup set. Size of the tables is also displayed if the show size checkbox is selected. This will help determine the size needed for full uncompressed backup images. ***See Note*** below.

If you are planning to use the parallel logical backup as a full method and select specific tables for backup, stored procedures, views and triggers will not be backed up. Please use Specific Databases if you want to back up stored procedures, views and/ or triggers.

Parallel Logical backups are completed much faster if you select all tables in a database instead of selecting the database. Database names and table names cannot contain # character.

If you are planning to restore a table from logical backups (full backup method is logical), you must select the specific table(s) in the backup set.

You must have ***innodb_file_per_table*** parameter enabled in the MySQL server to restore the database(s) that use InnoDB storage engine.

Note: Database(s) or table(s) using InnoDB storage engine can be restored to another MySQL server containing other InnoDB tables only if the restore target MySQL server is running Percona MySQL server and backup is done using Xtrabackup method.

If you are planning to use snapshot backup like full backup method and are using InnoDB storage engine, you should select all databases in the MySQL server. You will be able to restore all databases to the original or alternate server. You will not be able to selectively restore the database.

What to Exclude

Exclusions can be used to backup all databases except few or all tables in a database except few that match the specified pattern. This is useful when a MySQL server has a mixture of production and test databases and test databases need not be backed up. It can also be used to split large environment (a lot of databases or lot of tables) into multiple backup sets.

The pattern applies to database names if specific databases are in the backup set. The pattern is matched with table names if a specific tables are in the backup set.

The exclude pattern does not work when all databases are selected. Users can be backup all databases and exclude databases from the restoration.

The wildcards that are supported are:

***** matches one or more character. For example; zmanda*db pattern will exclude zmanda_bugs_db,zmanda_wiki_db and will not match zmanda_network names.
? match only one character. For example; zmanda_db? will match zmanda_test1 and they will be excluded from the backup set.
[<char><char><char>...] match any character. For example; test[123] will match *test1, test2, and test3.*
| match one of the patterns. For example; cat*|dog* will match all names that begin with a *cat* or *dog*.

Backing up MySQL Application-Specific Files

MySQL applications such as Sugar and MediaWiki consist of MySQL databases and associated configuration files. Backing up the databases alone will not completely protect these application servers from mishaps. For this reason, Zmanda allows you to add configuration files to backup. However, the ZMC GUI does not yet support this. To add such application-specific files to the backup, edit the MySQL configuration file, mysql-zrm.conf for the given backup set, and use the --config-file-list option to mysql-zrm-backup(1) command to specify the files you wish to backup.

All application files that are backed up are compressed or encrypted depending on the backup set configuration. Backup of configuration files specified by config-file-list in the mysql-zrm.conf are backed up only during full backups. Incremental backup of these files are not performed. The backup is performed as mysql user. So, mysql user should have permissions to read these files.

This functionality is available only on Linux and Solaris platforms.

To use this functionality:

- Define *config-file-list* parameter in the *mysql-zrm.conf* for the backup set. Edit */etc/mysql-zrm/<backup set name>/mysql-zrm.conf.* for example:

```
config-file-list=”/etc/mysql-zrm/<backup set name>/application-
configuration-files”
```

The configuration file can be in any directory in the ZRM server.

- (Optional) It might be useful to generate the application configuration file dynamically before the backup run. This will allow all application files to be part of the backup set. The generation of the configuration file can be done using pre-backup-plugin. The pre-backup plugin can be configured in ZMC Backup|How page.

  The pre-backup plugin can be used to find command to generate a list of files in the application directory. You can specify a list of directories or files to exclude to find command. Following script can be used to backup ZMC dependency configuration files. This script can be used as a pre-backup plugin.

```
#!/bin/sh
#
# List of directories to backup
#
dirs=”/opt/zmanda/zrm /opt/zmanda/common”;
#
# List of sub-directories to be excluded from the backup
#
exclude_dirs=”/opt/zmanda/zrm/tmp
             /opt/zmanda/zrm/php/tmp
             /opt/zmanda/zrm/mysql/tmp”;
#
# List of files that should be excluded
#
exclude_filename_wildcards=”*.tmp *svn*”;
#
# configuration_file: List of files to be backed up. Do not change
this value without
# fixing mysql-zrm.conf
#
configuration_file=”/etc/mysql-zrm/zmc-backup/zmc-configuration-
files”;
```

```
for exclude in $exclude_filename_wildcards;
do
       excl_fname_pattern=”$excl_fname_pattern -o -name
‘$exclude’”;
done
# strip the first -o
excl_fname_pattern=`echo $excl_fname_pattern | sed -e ‘s/-o//1’`;
excl_dir_pattern=””;
for exclude in $exclude_dirs;
do
       excl_dir_pattern=”$excl_dir_pattern -o -type d -path
$exclude -prune”;
done
rm -f $configuration_file
for dir in $dirs;
do
       find $dir -type f -not ‘(‘ $excl_fname_pattern $excl_dir_
pattern ‘)’ -print >> $configuration_file;
done
exit 0;
```

MySQL Cluster (NDB Storage Engine) Backup/Recovery

- Please note that MySQL cluster is backed up using NDB management tools (ndb_mgm and ndb_restore). NDB management tools are required on the ZRM server.

- Full backup of each NDB data node is performed on each data node in the backup directory (configured in Backup|Where page). The backup directory must be present in each NDB data node and cannot be the same directory across nodes. The backup is then copied to ZRM server using copy plugin. The ssh or socket copy plugin must be configured in each NDB data node (See Backup|How page).

- Incremental backups of MySQL cluster cannot be performed on NDB data nodes. Since there can be multiple SQL nodes in a NDB cluster, the incremental backups cannot be performed correctly.

Backup What Page

By default, ZRM for MySQL shows the options for a MySQL server on the **Backup What** page. When you choose Cluster as the server type, options appropriate for MySQL **Cluster** are displayed.

NDB Connect String:

This identifies the cluster to connect with for making the backup. To back up multiple clusters, multiple backup sets are required, each set with the appropriate NDB connect string. The connect string is not validated when you save the settings, so be careful to enter a valid connect string if you want to avoid subsequent backup failures.

MySQL Client Utilities Path:

The location of MySQL binary commands used to manage the cluster server.

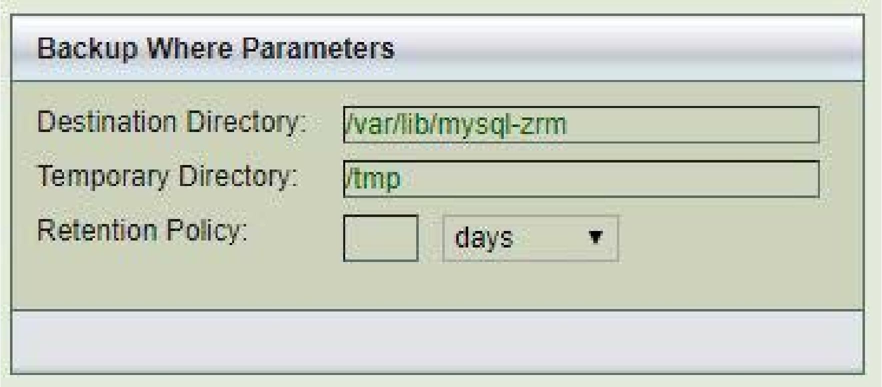
What to Backup:

When performing backups on clusters, all databases are backed up; the **what to backup** option is grayed out and disabled.

6. BACKUP WHERE

Backup Where

This page specifies where the backup images for the backup set will be stored, and how long to retain them.



Backup Where Parameters

Destination Directory: /var/lib/mysql-zrm

Temporary Directory: /tmp

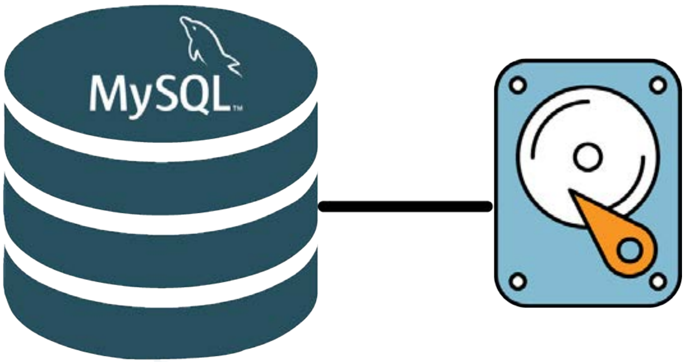
Retention Policy: days ▾

Figure 8. Backup where Parameters

Destination Directory

Regardless of where the remote MySQL server is hosted, backups are stored under the backup directory of the local machine where ZMC runs. The default /var/lib/mysql-zrm. If you specify another directory, you must create it yourself on both the ZRM server and the MySQL server, and ensure that its permission settings allow read/write access to the mysql backup user. The directory used on the MySQL server and ZRM server cannot be the same, i.e., cannot be the same CIFS or NFS share.

The recommended practice is to mount a filesystem at /var/lib/mysql-zrm. Use local, NFS, or CIFS mounted storage for storing MySQL backup data. The MySQL backup data can be migrated to other storage devices using Network-based backup and recovery utilities such as Amanda. If you are using NFS or CIFS storage as Destination directory, the root user and mysql user should have privileges to read and write to this directory.



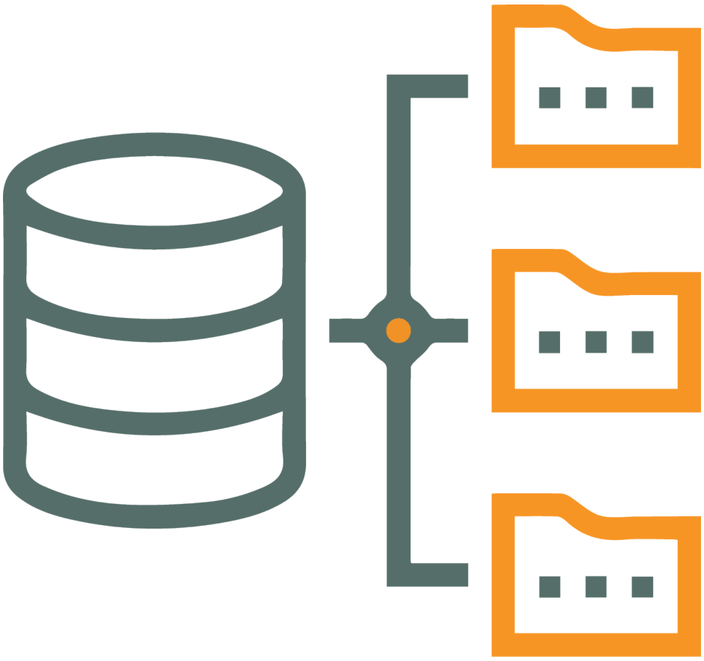
You must allocate sufficient disk space to store the MySQL databases. If sufficient disk space is not available, the backup run will fail. The destination directory should have at least 150 percent of uncompressed backup space available for a successful backup run. This additional space is required even when backups are configured for compression since the additional space is used for compression during the backup run. The additional space is freed after the backup run.

Example: Backup set “daily” requires 150GB of disk space for uncompressed backups and backup image upon compression are 100GB. The backup directory filesystem should have at least 225GB (1.5 * 150GB) for space.

After backup run is completed, only 100GB of disk space will be used.

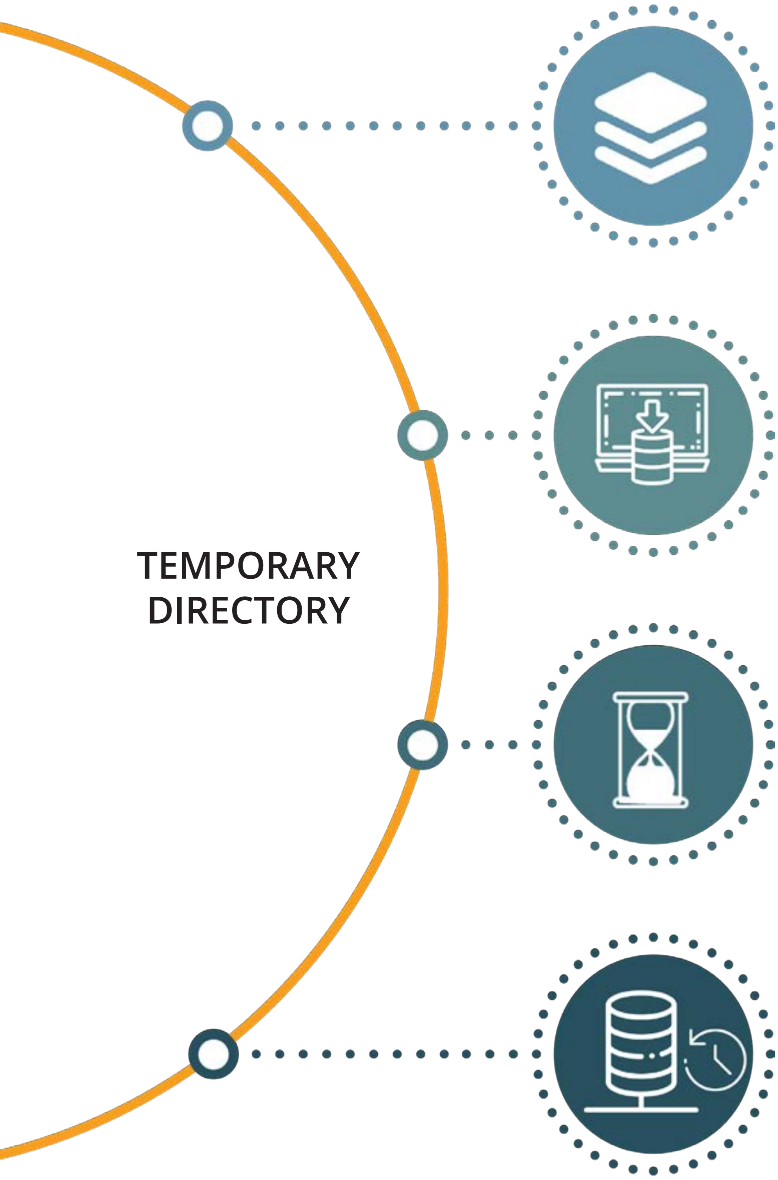
The destination directory must not be under autofs controlled mount point because snapshot based backups mount the file system or storage snapshot under the Destination directory.

Temporary Directory



The default is to use the OS-specified temporary directory ($TMPDIR on Linux). It is recommended that the default value is changed so that sufficient temporary space is available for backup and restoration. In any case, the directory must exist on both the client and server and have permissions set to allow read/ write access to the MySQL backup user. If $TMPDIR is defined differently on the ZRM server and the MySQL server, you must explicitly set the path here and make sure that directory exists on both machines. In case of Solaris /tmp is a memory based file system and filling it up will cause processes to run out of memory. So, the default value must be changed.

The disk space used in the temporary directory depends on the backup method.



Logical backup, MyDumper and Snapshot backup:
Few kilobytes are required during backup and size of full backup image is required during restoration. The space is required on the ZRM server.

Raw backup (using mysqlhotcopy):
Size of full backup image plus 10 percent is required during backup as well as restoration. The space is required on the MySQL server.

Xtrabackup tool:
During backup, disk space equal to full size of backup image is required on the MySQL server. During restoration of full backups, space equivalent to backup image size is required on the ZRM server. If restoration involves full backup, differential/chained differential backups, size of the temporary directory on the ZRM server must be the sum of all backup images. The streaming backup mode does not require disk space equal to full backup image size on the MySQL server.

MySQL Enterprise Backup:
Size of the full backup image plus 10 percent is required during backup on mysql server. During the restoration of full backups, space equivalent to backup image size is required on the ZRM server. If restoration involves full backup, differential/chained differential backups, size of the temporary directory on the ZRM server must be the sum of all backup images. Space is not required on the MySQL server. Streaming backup mode does not require disk space equal to full backup image size on the MySQL server.

Retention Policy

A retention policy sets the limit of the period for which the backup set will be retained. Images older than the retention policy specified are automatically purged. The retention policy for a backup image is stored in the backup index at the time of backup. So, changing the retention policy will not change the retention policy of backup runs that have been completed. If the retention policy is not specified, the backup images are retained forever.

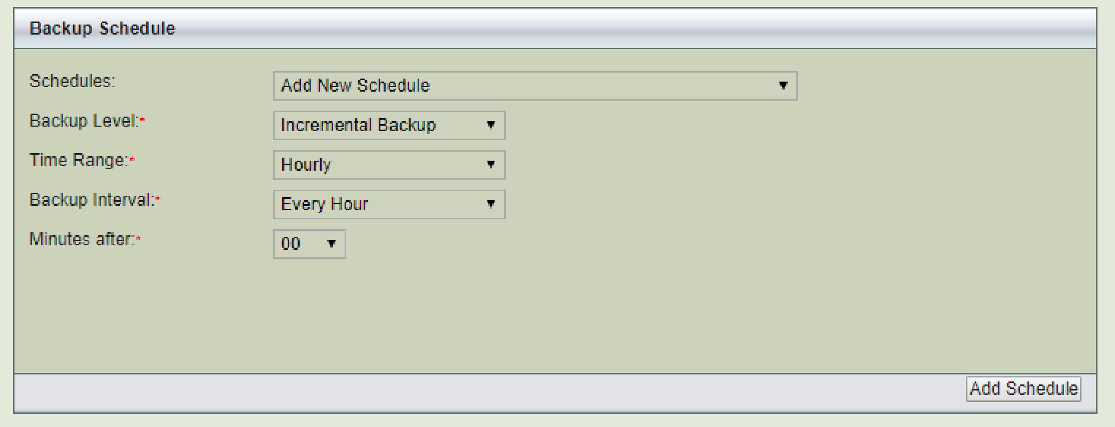
7. BACKUP WHEN

Backup When

This ZMC page allows users to schedule backup runs for the backup set. Users can add a schedule new backup run (Add Schedule), modify an existing scheduled run (Modify Schedule) and delete an existing scheduled run (Delete Schedule).

ZRM uses operating system crontab tool to implement this functionality.

The figure below shows a backup schedule that is being created. There is a weekly full backup scheduled at 2 am (local time on the ZRM server) on Sundays. A Log incremental backup is being added on other days at 2 am.



Backup Schedule

Schedules:	Add New Schedule
Backup Level:*	Incremental Backup
Time Range:*	Hourly
Backup Interval:*	Every Hour
Minutes after:*	00

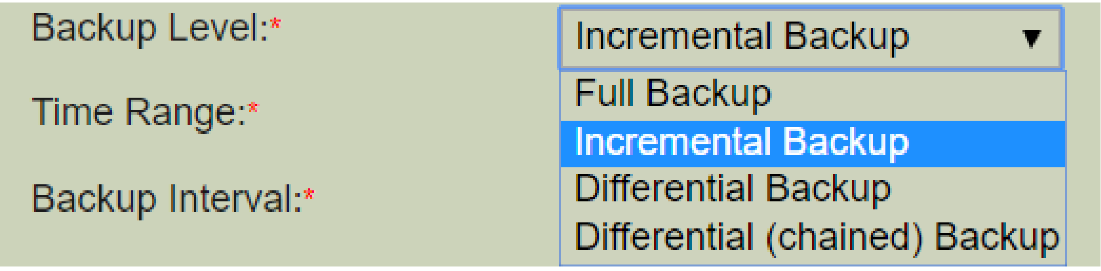
Figure 9. ZRM Backup Run

Schedules

List of schedules that have been configured for the backup set. If there are no scheduled backup runs, Add New Schedule is displayed. ZRM does not check to see if the scheduled backup runs overlap. Overlapping backup runs can be scheduled for certain backup methods.

Backup Level

There are various backup levels as shown below.



Backup Level:*
Time Range:*
Backup Interval:*

Incremental Backup ▼
- Full Backup
- Incremental Backup
- Differential Backup
- Differential (chained) Backup

Figure 10. Backup Levels

Full backup means all databases/ tables in the backup set (specified in **Backup What** page) are backed up. It also backs up all binary logs from the MySQL server. The method used for Full backup is determined by **Backup How** page parameters.

Log incremental Backup is available for all backup methods. The incremental backup will contain all binary logs since the last full backup or last incremental backup. This backup type requires Binary logs to be enabled on the MySQL server. The incremental backup in earlier ZRM versions is log incremental backup.

Differential Backup is available only for MySQL Enterprise Backup. This backup contains all block-level changes since the last full backup. Using this backup incremental type when compared to Chained Differential incremental type, makes the restoration easier but the backup size becomes larger for every successive Differential backup.

Chained Differential Backup is available only for MySQL Enterprise Backup. This backup contains all block-level changes since last differential backup or full backup.

Time Range

The values can be Hourly, Daily, Weekly, Monthly. Weekly backup allows you to select the list of specific days and Monthly backup allows you select the list of specific dates in a month. Hourly backups can be scheduled by selecting Daily backup and specifying various backup times. Hourly backups can be scheduled every hour or every 30 minutes between two specific hours of the day (for example; backups are done every hour between 7 am and 9 pm daily).

Backup Time

Specific time of the day (24-hour clock) when the backup run starts. The local time zone of the ZRM server is used. This field is displayed when the user selects Monthly/Weekly/Daily Time Range.

Minutes After

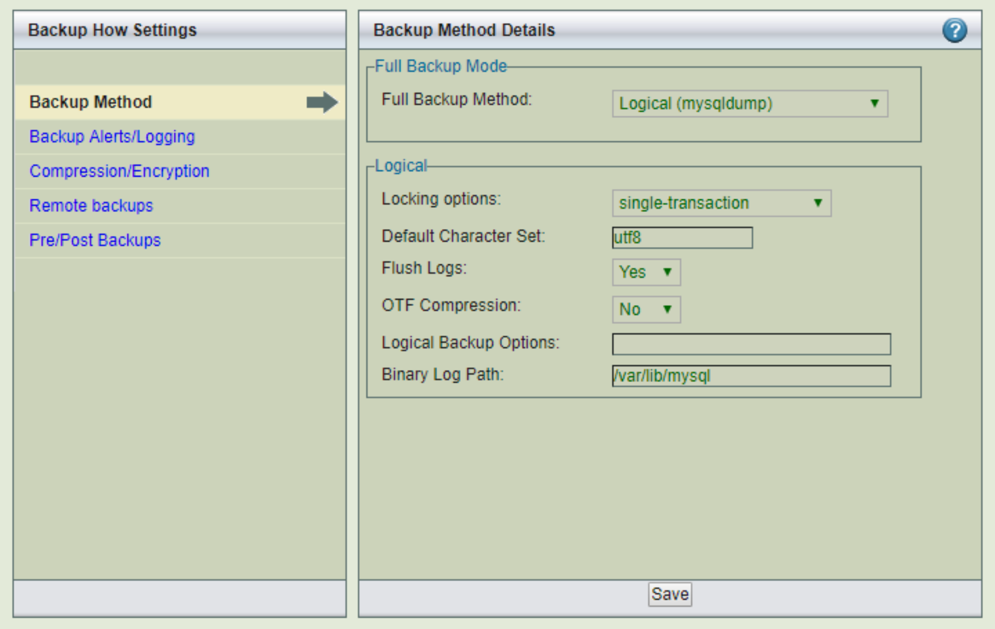
The user can specify minutes after the hour when the backup should start. This value can be specified when the Time Range is set to Hourly. For example: If the value is set to 18, the backups will start 18 minutes after every hour.

8. BACKUP HOW

Backup How

The Backup how page lets you specify the backup method along with other options that let you optimize the type of backup given the performance required at your site.

All configuration parameters can be configured by selecting the links from the left panel - Backup Method, Backup Alerts/ Logging, Compression/ Encryption, Remote Backups, and Pre/ Post Backups. The Backup How page below shows the Backup Method selected and configured for



Backup How Settings

- Backup Method
- Backup Alerts/Logging
- Compression/Encryption
- Remote backups
- Pre/Post Backups

Backup Method Details

Full Backup Mode

Full Backup Method: Logical (mysqldump)

Logical

Locking options: single-transaction

Default Character Set: utf8

Flush Logs: Yes

OTF Compression: No

Logical Backup Options:

Binary Log Path: /var/lib/mysql

Figure 11. Backup Method

Most of the settings have default values, inherited from the Site Settings page or from factory defaults. Default strings are shown in the text field with a grey background. Radio buttons options (Yes, No, Default) show the current default value in parentheses to the right of the Default radio button (Y or N).

Backup Method

The backup method defines which method to use for full backups. ZRM supports different methods to perform full backups. Each backup set can have a different full backup method. Each full backup method is described in a separate section. Snapshot backup methods are described in the next chapter.

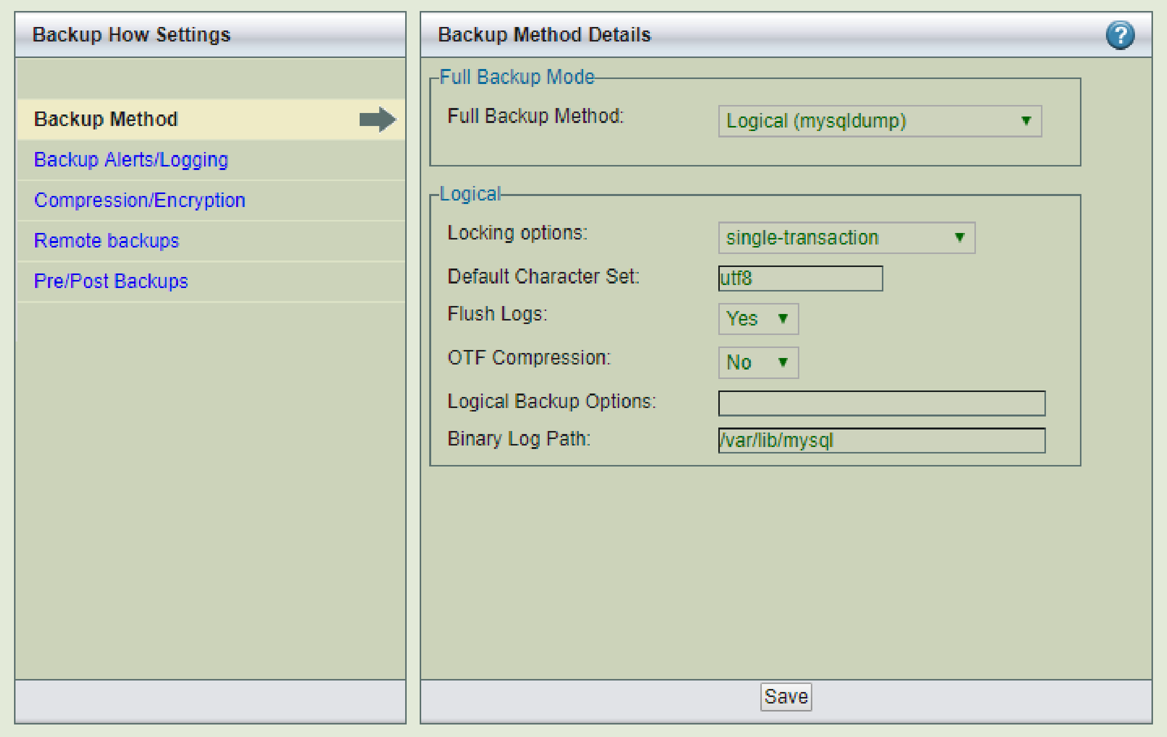
Logical Backup Using mysqldump

Following screenshot shows the logical full backup method. The databases/ tables in the backup set are locked for updates during the backup process. The backup image contains SQL statements that can be changed if needed.

Choosing Logical non-parallel option uses a mysqldump backup that copies MySQL binary logs regardless of the storage engine. MySQL binary logs track and save all database server transactions as a list of SQL statements. To implement a logical backup strategy, binary logging must be enabled on the MySQL server, and a path to the log files must be supplied (the default is /var/lib/mysql) in the Binary Log Path field.

Logical backup method works with all MySQL storage engines except the MySQL cluster NDB storage engine. Logical backups can also be restored to any platform architecture or database that supports SQL. For example, Backups of MySQL database running on Redhat Enterprise server PowerPC platform can be restored to Ubuntu server running on x86 platform.

Because logical backups require a read lock on the database(s) or tables being backed up (not in the case all tables are using InnoDB storage engine), they can have a greater impact on the applications using the MySQL database. Logical backups also result in increased restore times, as restoring the data is accomplished by re-playing the transactions against the target database instead of just copying files. In case of InnoDB tables, the backups are performed as a single transaction and will not obtain any locks.



Full Backup Mode

Full Backup Method: Logical (mysqldump)

Logical

Locking options: single-transaction

Default Character Set: utf8

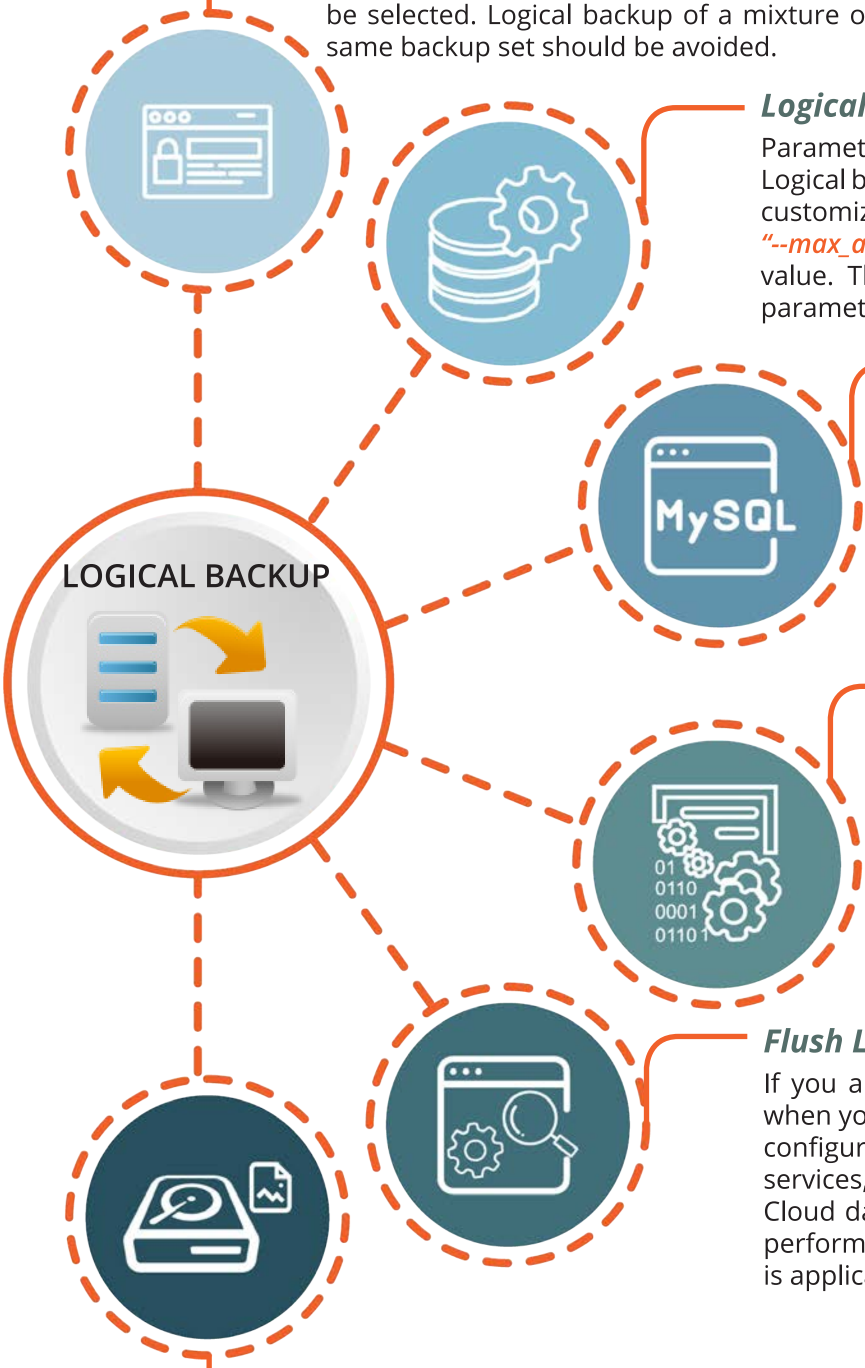
Flush Logs: Yes

OTF Compression: No

Logical Backup Options:

Binary Log Path: /var/lib/mysql

Figure 12. Logical Backup



Locking Options

When the backup set contains MyISAM tables, the lock-tables option should be selected. When the backup set contains only InnoDB tables, the single-transaction option should be selected. Logical backup of a mixture of InnoDB tables and MyISAM tables in the same backup set should be avoided.

Logical Backup Options

Parameters to the mysqldump MySQL command. Logical backup uses mysqldump command. You can customize the options using this field. For example: *"--max_allowed_packet=1G"* can be specified as value. These parameters are used in addition to parameters passed by ZRM.

Default Character Set

Specify the default character set that is used in the MySQL database. The default value is utf8; if the database uses a different character set, reset accordingly.

Binary Log Path

Enter the full path where the MySQL binary logs are stored once binary logging has been enabled. If nothing is entered here, the site default path is used. If the site defaults page does not have binary log location specified, binary logs are expected to be in MySQL server datadir location.

Flush Logs

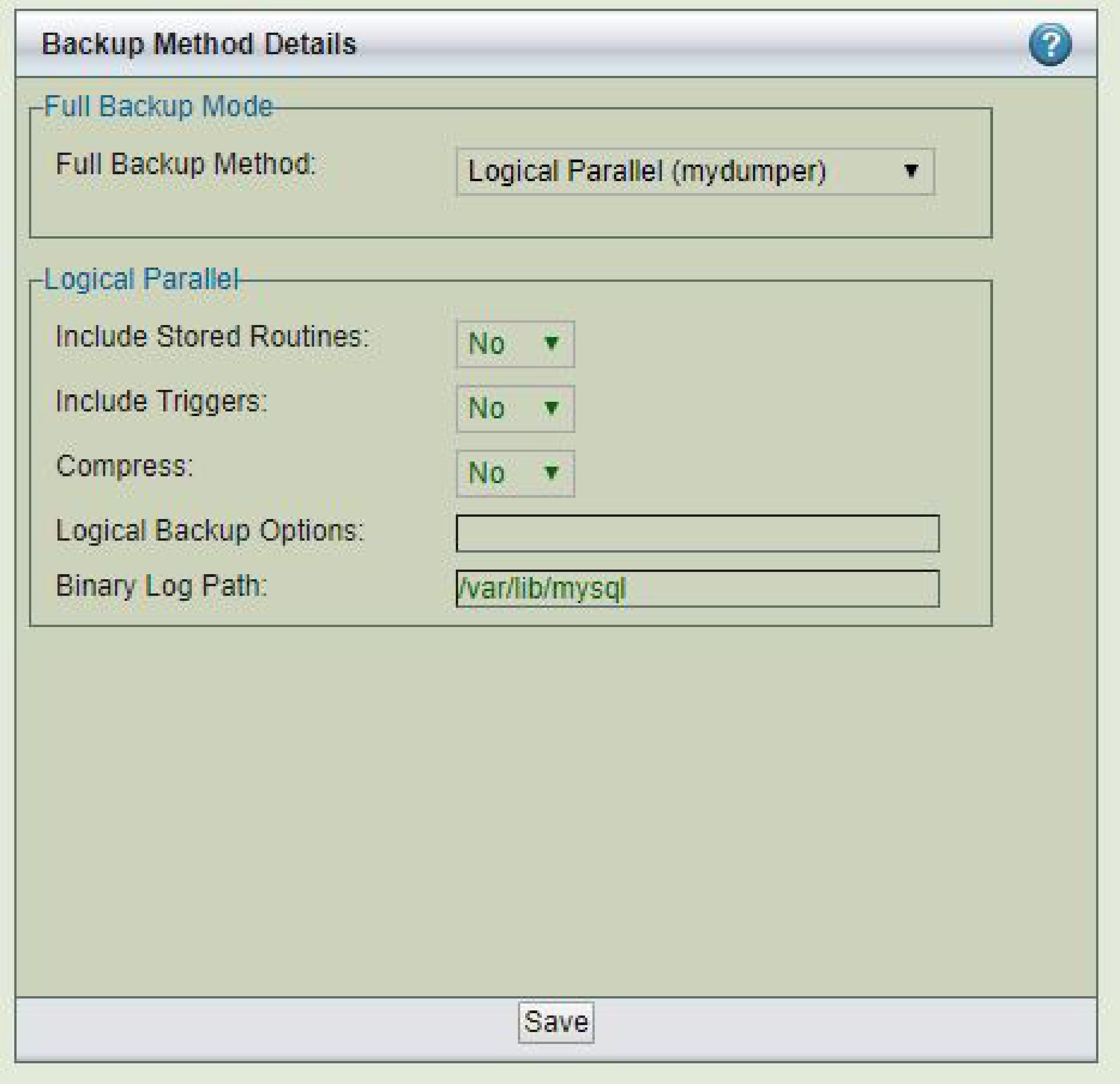
If you are backing up cloud database services (or when you do not have control over database server configuration) such as Amazon Relational Database services, you should set this parameter to No. Cloud database services do not allow end users to perform MySQL server operations. This parameter is applicable only for full backups.

On-The-Fly (OTF) Compression

Specify whether backup image files stored on disk should be compressed as the backup progresses. The default is to start compression only after all backup files have been saved to disk. Turning this option on can save disk space, but results in slower backups.

Parallel Logical Backup using MyDumper

Users can perform Logical full backups using MyDumper (Download it from https://launchpad.net/mydumper) command. You have to select Full Backup Method as Logical Parallel (mydumper) as shown below.



Backup Method Details

Full Backup Mode

Full Backup Method: Logical Parallel (mydumper)

Logical Parallel

Include Stored Routines: No

Include Triggers: No

Compress: No

Logical Backup Options:

Binary Log Path: /var/lib/mysql

Figure 13. Parallel Logical Backup (MyDumper)

Parallel Logical Backups can work with InnoDB and MyISAM storage engines. Read locks are obtained in case of MyISAM tables. If the backup set only has InnoDB tables, locks are not used during backup, and MySQL transactions are not impacted.

Parallel Logical Backup:

Logical Backup Options

All MyDumper options are set in this field. These parameters are passed to MyDumper command during full backups.

Include Triggers

This option specifies whether database triggers should be included during logical backups. The default value is No. If your version of MySQL supports this feature, it should probably be set to Yes. Setting the value to Default implies Site-specific value is used for this parameter. The triggers are backed up only if the backup set contains databases (not specific tables).

Include Stored Routines

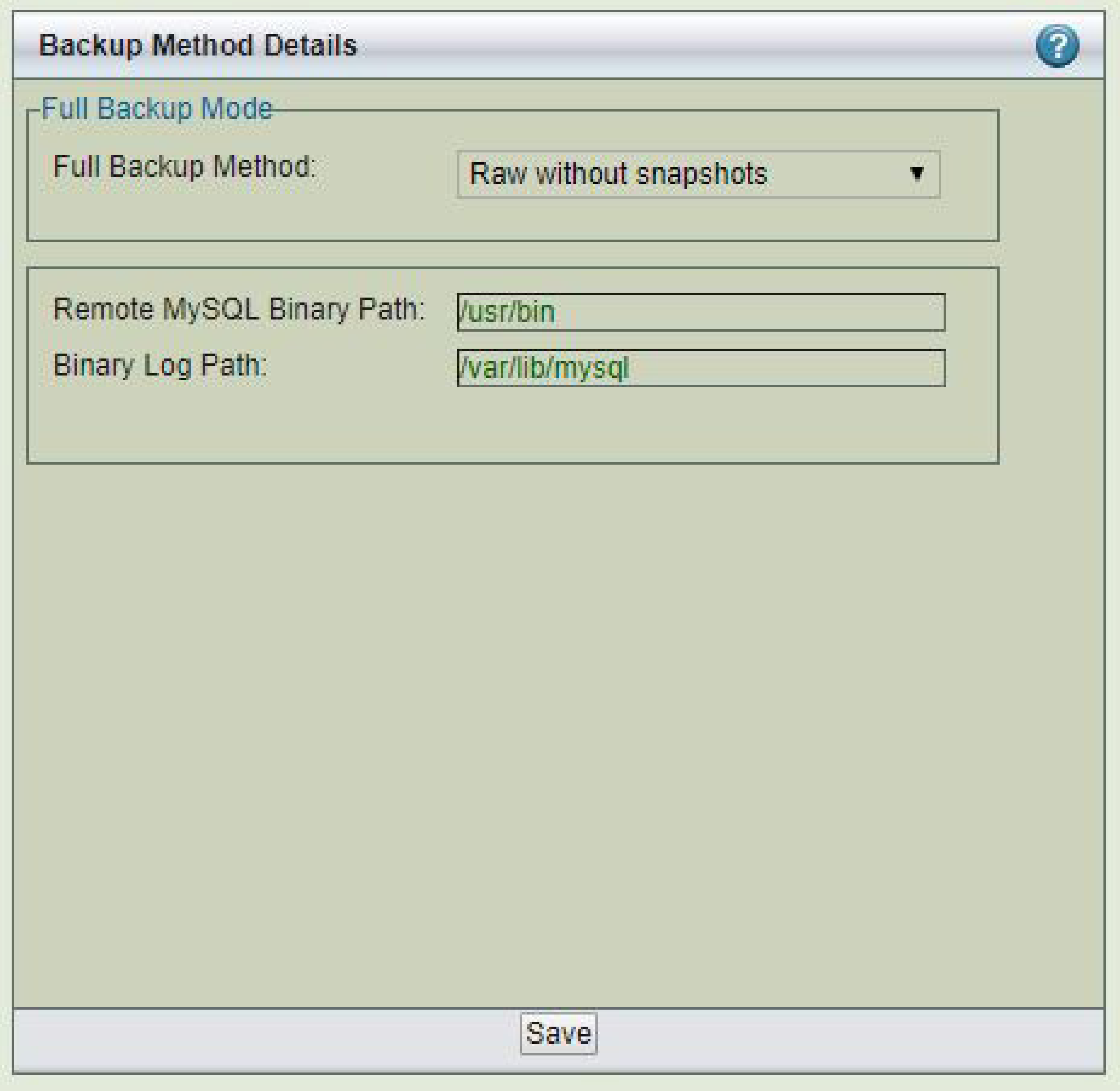
To improve the performance of database functions and procedures, MySQL versions 5.0 and higher allow users to compile and store them as reusable routines (Stored routines). This option specifies whether stored routines should be included during logical backups. Setting the value to Default implies Site-specific value is used for this parameter. The stored procedures are backed up only if the backup set contains databases (not specific tables).

Binary Log Path

Enter the full path where the MySQL binary logs are stored once binary logging has been enabled. If nothing is entered here, the site default path is used.

Raw Backup Method/ without Snapshots

A raw backup makes a copy of the binary disk image of databases stored on non-transactional storage engines by using mysqlhotcopy. Although raw backups can be restored more quickly than logical backups, they can only be restored to the same version of MySQL server on the same platform architecture. If any of the databases or tables are stored on a transactional storage engine (such as InnoDB), a logical mysqldump backup is taken instead unless snapshot backup method is configured.



Backup Method Details

Full Backup Mode

Full Backup Method: Raw without snapshots

Remote MySQL Binary Path: /usr/bin

Binary Log Path: /var/lib/mysql

Figure 14. Raw Backup Method

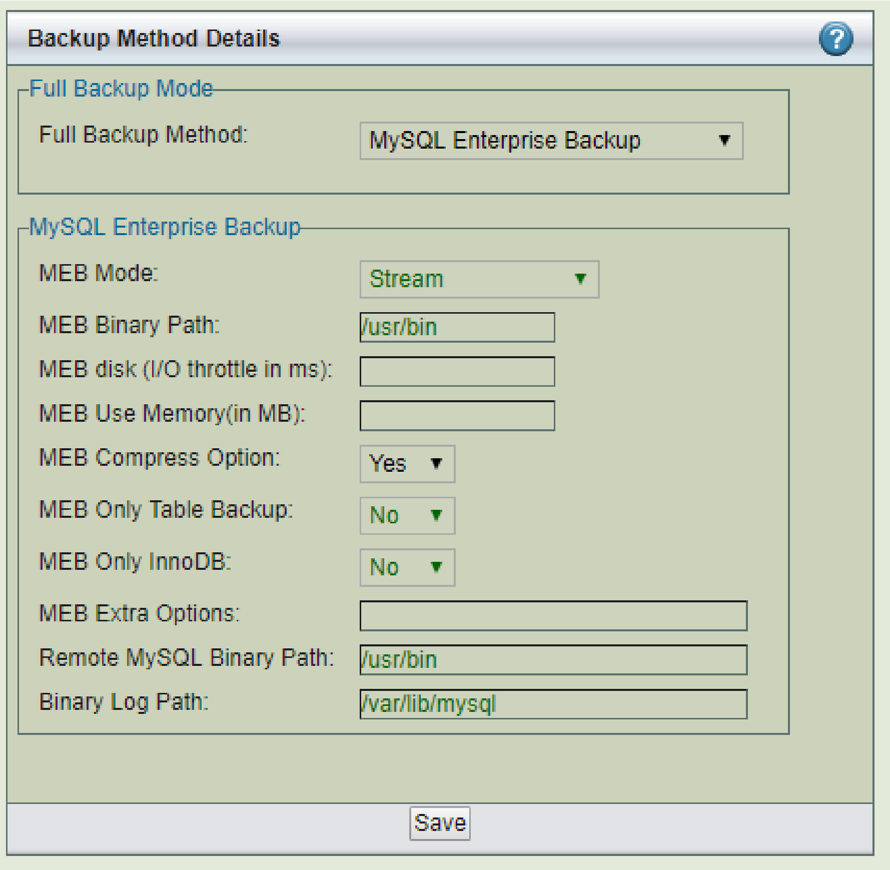
Remote MySQL Binary Path

Path to the MySQL commands on the MySQL server.

Binary Log Path

Enter the full path where the MySQL binary logs are stored once binary logging has been enabled. If nothing is entered here, the site default path is used.

MySQL Enterprise Backup



Backup Method Details

Full Backup Mode

Full Backup Method:	MySQL Enterprise Backup ▼

MySQL Enterprise Backup

MEB Mode:	Stream ▼
MEB Binary Path:	/usr/bin
MEB disk (I/O throttle in ms):	
MEB Use Memory(in MB):	
MEB Compress Option:	Yes ▼
MEB Only Table Backup:	No ▼
MEB Only InnoDB:	No ▼
MEB Extra Options:	
Remote MySQL Binary Path:	/usr/bin
Binary Log Path:	/var/lib/mysql

Figure 15. MySQL Backup

MySQL Enterprise Backup (MEB) tool available from Oracle (requires a license from Oracle) can be used as the backup method for the backup set. Full, Differential and Chained differential backups can be performed using this tool. The mysql-zrm.conf parameter apply-log parameter should be to zero to perform differential and chained differential backups.

Select **MySQL Enterprise Backup** as the full backup method to use MySQL Enterprise Backup to perform the backup. MySQL Enterprise Backup tool is bundled as part of MySQL Enterprise Server Standard edition or premium versions. This option provides integration between ZRM and the Oracle product.

Above image shows the full backup method configured as MySQL Enterprise Backup.

Backups done by particular version of MySQL Enterprise Backup can be restored only by the same version of MySQL Enterprise Backup.

MySQL Enterprise Backup binaries must be installed on the ZRM server in the same location as MySQL server under the following use cases: streaming backup mode (default configuration) and when apply logs are performed during restores (apply-log parameter should be set to 0 in the backup set's mysql-zrm.conf).

MySQL Backup:

MEB Mode

Regular or Streaming mode. Regular mode requires additional disk space on the MySQL server during backups. Streaming mode does not require disk space on the MySQL server during backups. Streaming mode requires the MySQL Enterprise Backup 3.6 or higher.

MEB Binary Path

Path to the InnoDB Hot Backup tools: the **ibbackup** binary and the **mysqlbackup** tool, which must be installed in the same path on the MySQL server being backed up and ZRM server. The default path is **/usr/bin.** The***mysql*** user should have permissions to execute the **mysqlbackup** tool.

MEB Disk (I/O throttle)

MEB disk throttle can be specified to throttle disk I/O during backup. It is specified in milliseconds; the backup sleeps for that time between disk I/O.

MEB Use Memory (in MB)

Amount of memory on the MySQL server that can be used MySQL Enterprise Backup. The default is to use as much as memory as available. If you reduce the memory available for MEB significantly, the backup performance will have a significant impact.

MEB Only InnoDB

MySQL Enterprise Backup tool is used for backups of tables with InnoDB storage engine only. The default is No.

Remote MySQL Binary Path

Path to the MySQL commands on the MySQL server.

MEB Only Table Backup

This option is applicable only MySQL 5.6 or later servers. If set to Yes, database tables can be selectively restored. Default is No. It should not set for backing up MySQL server running 5.5 or earlier.

Binary Log Path

Enter the full path where the MySQL binary logs are stored once binary logging has been enabled. If nothing is entered here, the site default path is used.

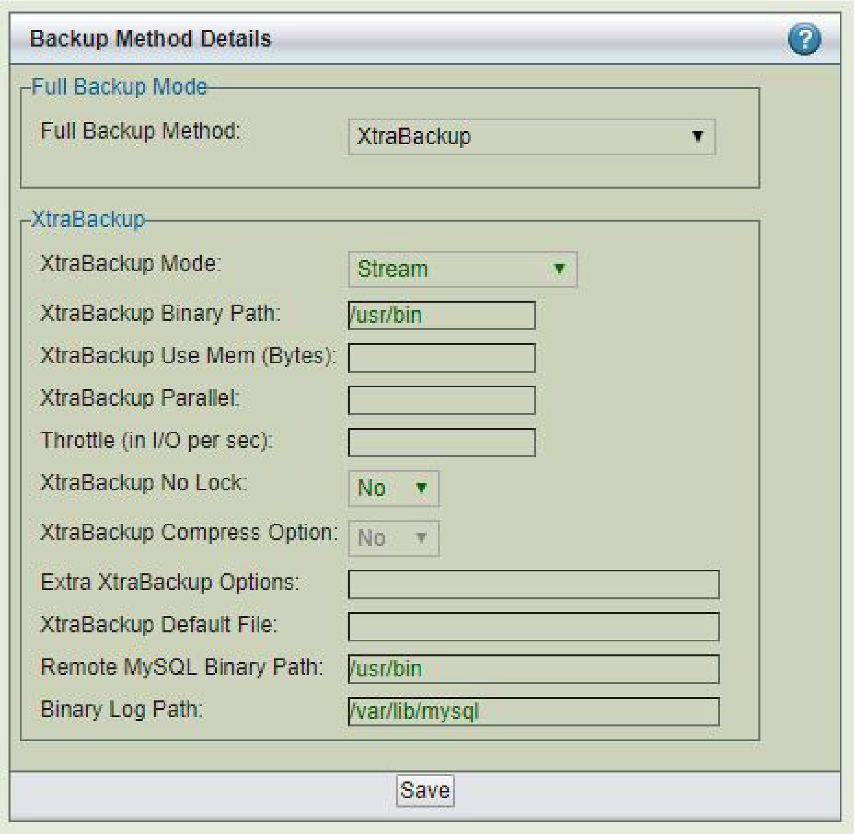
XtraBackup

Select XtraBackup as the backup method to Xtrabackup tool to perform the backup. Xtrabackup tool can be downloaded from Percona. It is open source and can be downloaded to MySQL server. This option provides integration between ZRM and Xtrabackup. This allows backup to proceed without setting any locks or impacting database operation.

Full, differential and chained differential backups are performed using this tool. The mysql-zrm.conf parameter apply-log parameter should be to zero to perform differential and chained differential backups. This tool also uses to restore a table from a database backup. Restores of table can be performed only to Percona MySQL servers.

Xtrabackup binaries must be installed on the ZRM server in the same location as MySQL server under the following use cases: streaming backup mode (default configuration) and when apply logs are performed during restores (apply-log parameter is set to 0 in the backup set's mysql-zrm.conf). Differential backups cannot be performed in Xtrabackup streaming backup mode. Use log incremental with Xtrabackup streaming full backup.

Backups done by a particular version of XtraBackup can be restored only by the same version of XtraBackup tool.



Backup Method Details

Full Backup Mode

Full Backup Method: XtraBackup

XtraBackup

XtraBackup Mode: Stream
XtraBackup Binary Path: /usr/bin
XtraBackup Use Mem (Bytes):
XtraBackup Parallel:
Throttle (in I/O per sec):
XtraBackup No Lock: No
XtraBackup Compress Option: No
Extra XtraBackup Options:
XtraBackup Default File:
Remote MySQL Binary Path: /usr/bin
Binary Log Path: /var/lib/mysql

Figure 16. Xtrabackup Tool

XtraBackup Mode

Regular or Streaming mode. Regular mode requires additional disk space on the MySQL server during backups. Streaming mode does not require disk space on the MySQL server during backups. Xtrabackup 1.6 or higher is required for streaming mode.

XtraBackup Binary Path

You must then supply the path to the Xtrabackup tools: the ***xtrabackup*** binary and the ***innobackupex*** tool, which must be installed in the same path on the MySQL server being backed up. The default path is ***/usr/bin.*** The mysql user should have permissions to execute the ***innobackupex*** tool.

XtraBackup Use Memory (in MB)

Amount of memory used by Xtrabackup tool. The default is 100MB.

XtraBackup Parallel

Specifies the number of threads created by xtrabackup to copy data files. This option is useful when multiple tablespaces option is enabled (innodb_file_per_table MySQL server option) or the shared tablespace must be stored in multipe ibdata files with the innodb_data_file_path MySQL server option. The default is 1.

Throttle (in I/O per second)

Xtrabackup backups can be throttled by specifying the number of disk I/Os performed by the backup tool in a second.

XtraBackup No Lock

Use -- the no-lock option of Xtrabackup. Use this only if you are not planning to do log incremental backups and all your tables in the database are InnoDB.

XtraBackup Default File

If you want to use different my.cnf when xtrabackup starts up the InnoDB during backup. This is required if you are allowing on secure access to the database server.

Remote MySQL Binary Path

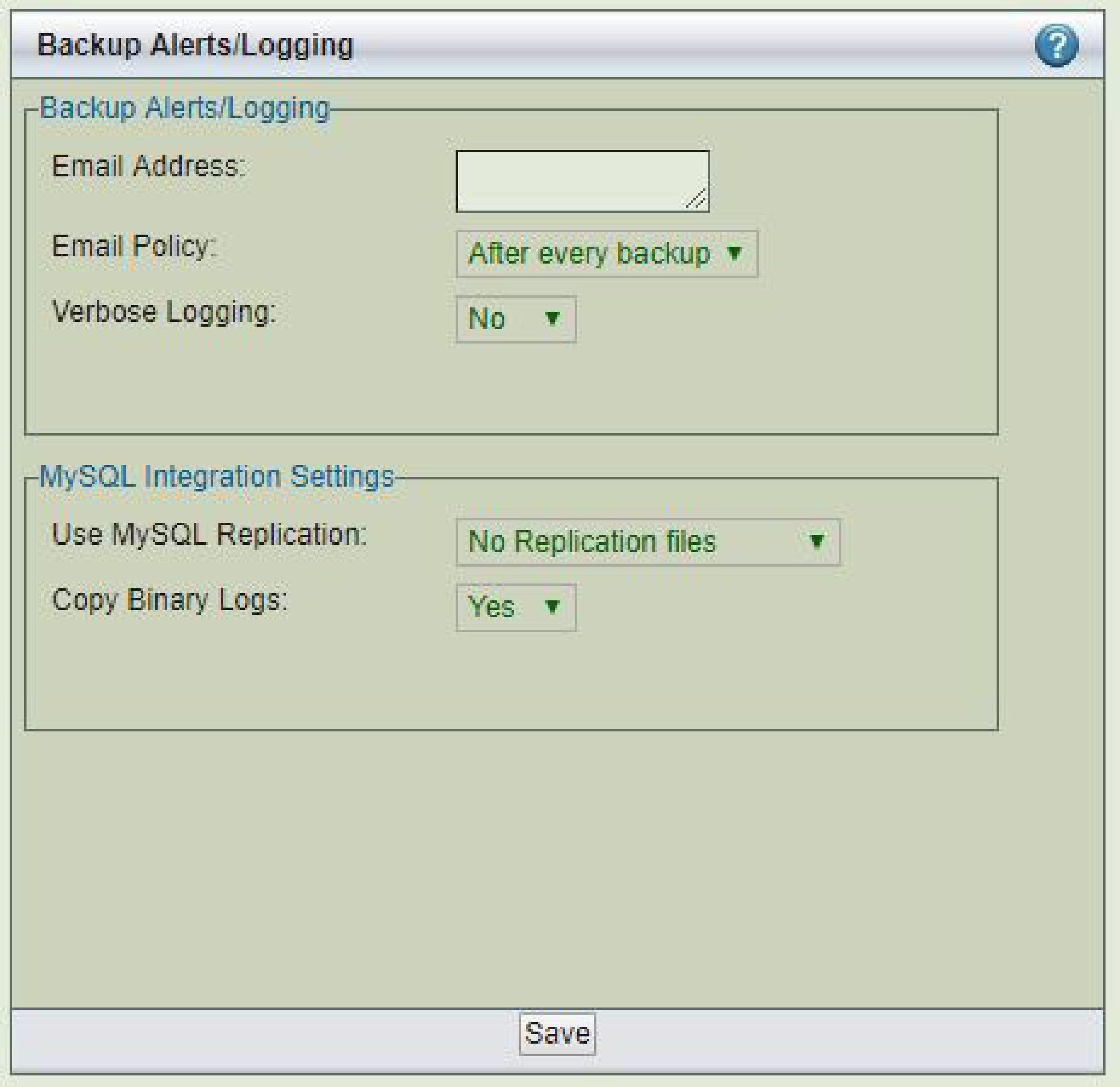
Path to the MySQL commands on the MySQL server.

Binary Log Path

Enter the full path where the MySQL binary logs are stored once binary logging has been enabled. If nothing is entered here, the site default path is used.

Backup Alerts/ Logging

Select Backup Alerts/ Logging to send email notifications and control log verbosity.



Backup Alerts/Logging

Backup Alerts/Logging

Email Address:

Email Policy: After every backup

Verbose Logging: No

MySQL Integration Settings

Use MySQL Replication: No Replication files

Copy Binary Logs: Yes

Figure 17. Xtrabackup Tool

Email Address or Update Windows Event Log on Windows servers

On Linux/ Solaris servers, enter the email address of the ZMC backup administrator. All backup run notifications and summary reports will be automatically sent to the email address based on the email policy. A Mail User Agent (MUA) such as Mailx must be manually configured on the MySQL server before any email can be sent.

To email reports and notifications to more than one user, set up a group email alias on your mail server and enter group email alias here. Alternatively, you can enter multiple email addresses separated by space.

For example:admin1@company.comadmin2@company.com

On Windows ZRM servers, select whether to use the Windows Event Log to save and display notifications and summary reports. Note that even when logging successful ZRM operations, the Windows Event Log might show error message that **"Event Description not found"**. The "Event description not found" messages can be safely ignored.

Email Policy

This policy determines when email should be sent to the configured ***Email Address.*** Policy can be ***After every backup*** (the default value), Never (no notification is performed) or ***Backup with error*** (when there are failures in the backup run).

Verbose Logging

Verbose logging should be turned ***on*** or ***off.*** Zmanda Support Team will ask you turn on verbose logging for backup sets to troubleshoot problems in a backup set.

MySQL Replication

Specifies whether ZRM for MySQL will use the MySQL Replication facility that has been enabled on the MySQL server that is to be backed up. Backing up a replication slave reduces the impact on the production database near zero while backups are in progress.

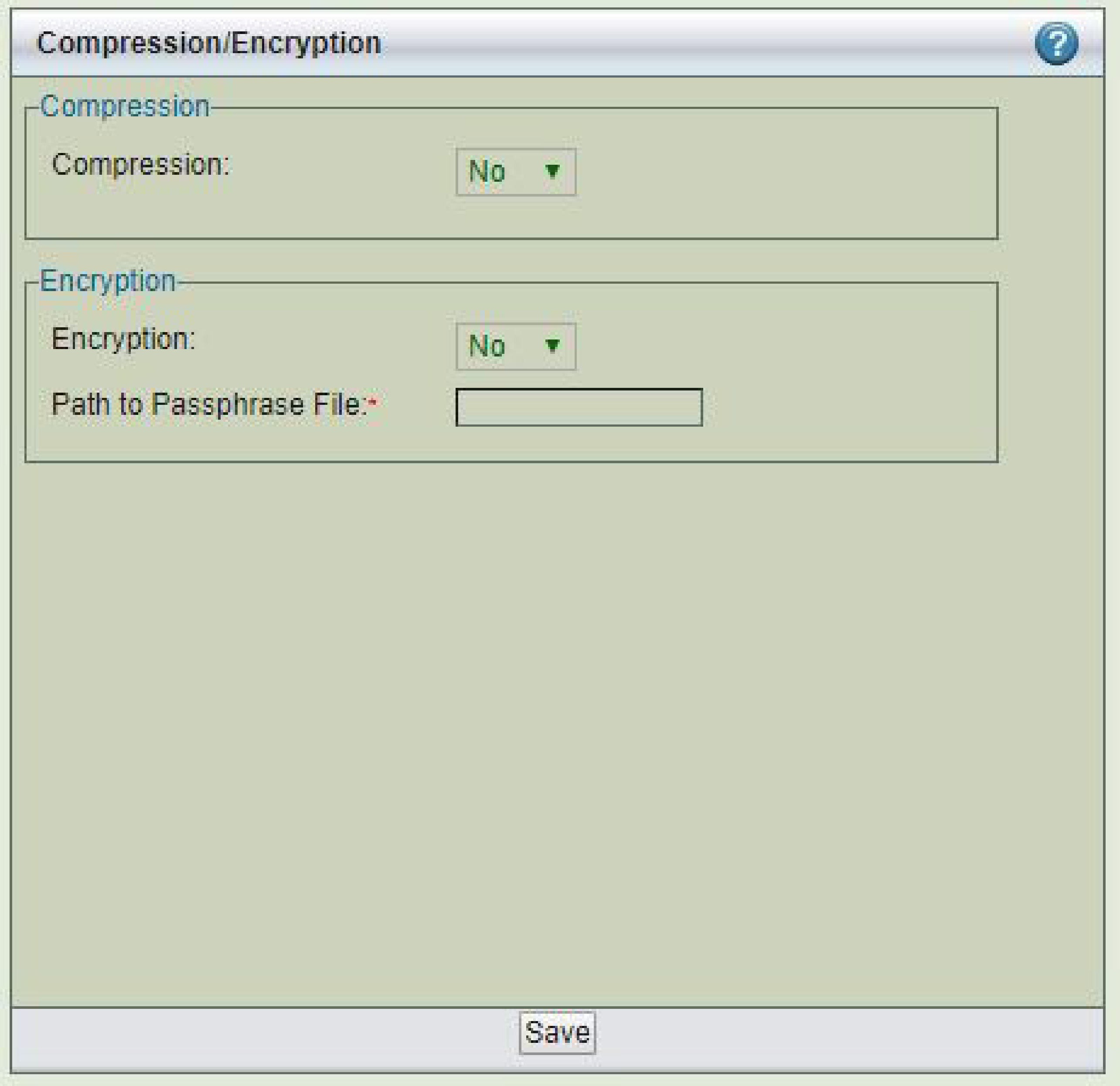
When this option is enabled, and the mMySQL server is a replication slave, ZRM for MySQL will back up the ***master.info, relay-log.info*** and any ***SQL_LOAD-**** files if they exist. The ***master.info*** and ***relay-log.info*** files are described here. Please note that the replication file names have to be***master.info*** and ***relay-log.info.*** Please make sure ***relay-log-info-file*** and ***the master-info-file*** parameter in the MySQL server configuration file my.***cnf*** is set to the default value. If you are backing up replication slave, you need to enable ***log-slave-updates*** in the replication slave in MySQL configuration file (***my.cnf***) for log incremental backups.

Copy Binary Logs

By default, ZRM copies binary logs during full backups (Default value is Yes). This allows ZRM to restore to any event between the last backup before full backup and the full backup. You can turn this behavior off by setting the value to No.

Compression/ Encryption

Backup can be compressed and encrypted. ZRM compression and encryption are performed on the ZRM server.



Compression/Encryption

Compression

Compression: No

Encryption

Encryption: No

Path to Passphrase File:*

Figure 18. ZRM Compression and Encryption

Compression

Backup compression is performed on the ZRM server. Allows you to compress the image using ***gzip*** on the ZRM server. If the storage engine already compresses data (such as ARCHIVE storage engine), there is no value in setting this to ***Yes.***

Encryption

Backup encryption is performed on the ZRM server. Default encryption is performed using GPG. ZRM server should have GPG (GNU Privacy Guard) packages installed. These packages are part of Linux and Solaris distribution. The default encryption algorithm used is AES 256. If different key length or cryptographic algorithm is required, please modify gpg parameters in the script */usr/share/mysql-zrm/plugins/encrypt-plugin.pl* on the ZRM server. Please contact Zmanda support team for help.

Path to Passphrase File

The full path to the encryption passphrase file. The encryption file is usually stored as /etc/mysql-zrm/<backup set name>/.passphrase on the ZRM server. The passphrase should be owned by ***mysql*** user and should have 400 permission. It is very important to protect the contents of the passphrase file. Passphrase file contains the sequence of words or a string that is used for encryption. It is important to choose a good passphrase.

The longer and more random the passphrase, the more difficult to crack the encryption. The passphrase file should contain the passphrase in the first line (other lines in the file are not read). A method to generate passphrase is to use the following command:

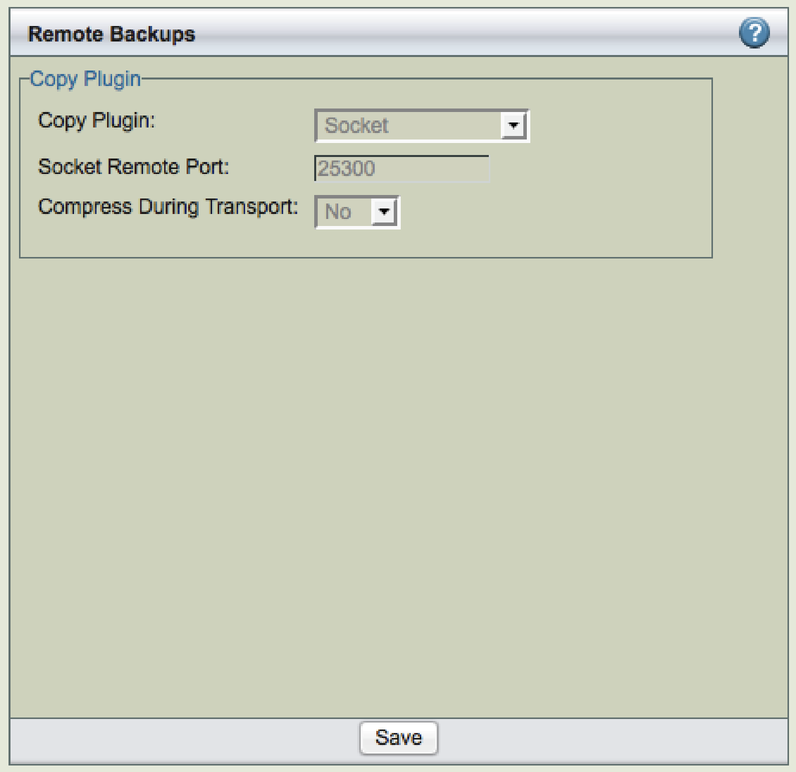
```
$ gpg --gen-random 1 16 | gpg --enarmor | sed -n 5p > /etc/mysql-
```

Backup Encryption Caution: It is very important to store the encrypt-plugin.pl and the passphrase file used for the backup set. These files are necessary for restoration. Without these files, it is impossible to restore the backup image and backup image is no longer useful.

Remote Backups

ZRM uses copy plugins to move data from the MySQL server to the ZRM server. All remote MySQL backups must use a copy plugin. Copy plugin is used in the following cases:

- Backing up any Windows-based MySQL server; use the Windows copy plugin.
- Remote incremental backup is required.
- Copying replication-related files from a remote machine.
- Executing mysqlhotcopy (MySQL command) to copy the data from the remote MySQL server.
- Executing mysqlhotcopy to restore the data to a remote MySQL server.
- Backing up remote machines via snapshot backups.



Remote Backups

Copy Plugin

Copy Plugin: Socket

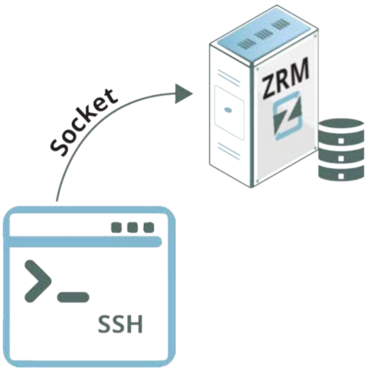
Socket Remote Port: 25300

Compress During Transport: No

Figure 19. Remote Backups

SSH

Secure Shell-based communication. Use when a higher level of security is required (such as when the client and server communicate across a firewall). This can be only used for non-Windows MySQL servers. You must then enter the SSH username on the remote MySQL server, and the path where MySQL commands are installed on the remote machine. For backup, it is necessary to set up password-less ssh configuration is required (i.e.,***mysql*** user on ZRM server should be able to ssh to MySQL server without being prompted for a password). During restore, users will be prompted for ssh password if needed. The user id and group id of ***mysql*** user must be same on the ZRM and MySQL server.



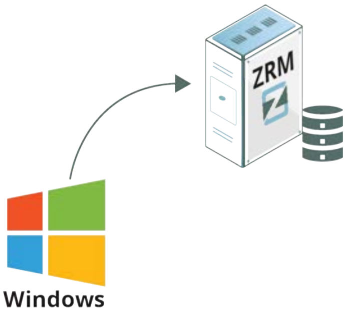
Socket

Socket-based communication. This is the default copy plugin. This plugin requires MySQL server running on a non-Windows platform. This requires that the ZRM client components are installed on the remote machine, as described in the Installation Instructions. You must then enter a port for the remote socket (the factory default is 25300. The path where MySQL commands are installed on the remote machine must be provided. The user id and group id of mysql user must be same on the ZRM and MySQL server.

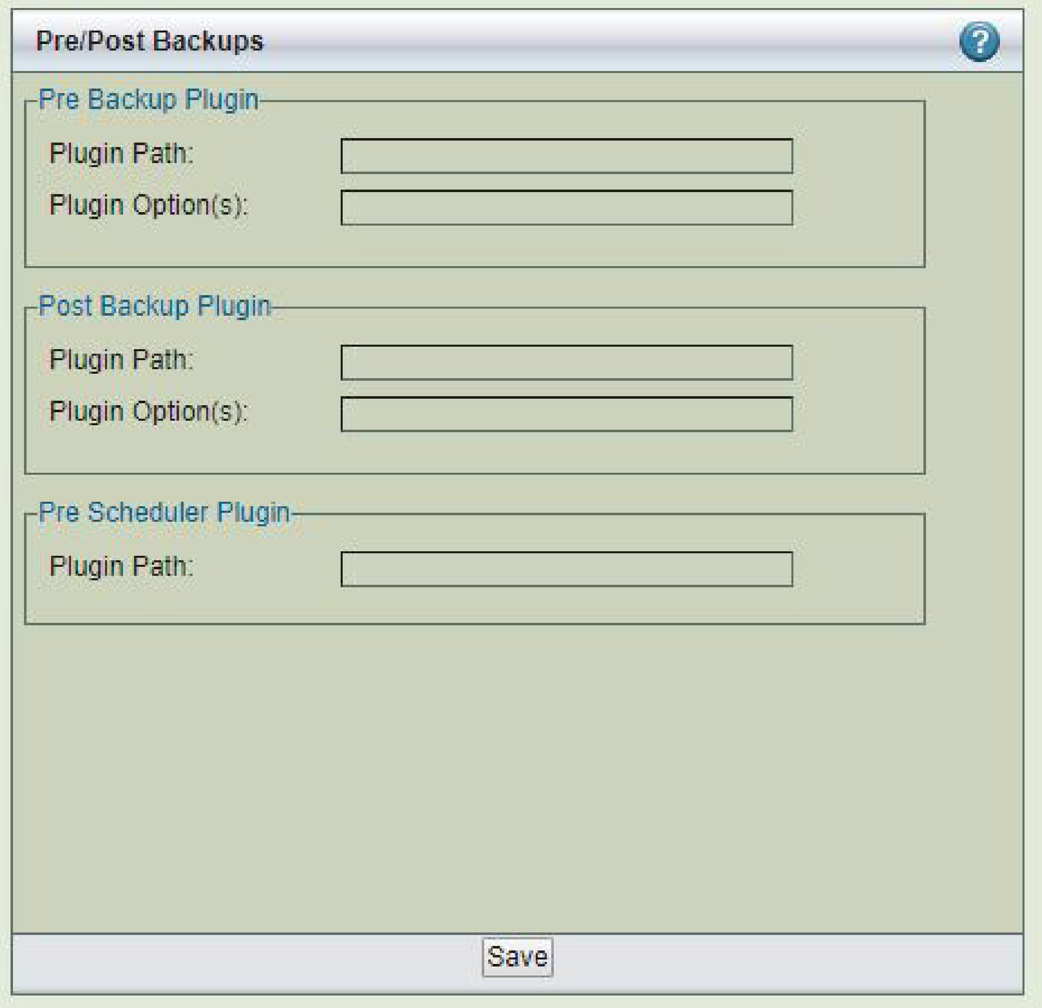
You can specify the port to be used for communication. This requires changes in the remote MySQL server installation (xinetd configuration files).

Windows

The Windows copy plugin is required for backing up any Windows-based MySQL server. It requires the ZRM for MySQL Windows client components described in [the Installation Instructions.](#) You must then enter the communications ports to use during backup (default is ***10080***) and restore (default is ***10081***) operations.



Pre-/ Post- Backup



Pre/Post Backups

Pre Backup Plugin

Plugin Path:

Plugin Option(s):

Post Backup Plugin

Plugin Path:

Plugin Option(s):

Pre Scheduler Plugin

Plugin Path:

Figure 20. Remote Backups

Specify the full path and any command-line options to the script or utility you want to be executed before the backup run starts (***pre-backup***) or after the backup run is completed (***post-backup***). This feature can be used to check and prepare the MySQL server environment for backup. For example, you could use it to notify all MySQL database users that a backup is about to begin.

ZRM for MySQL does not check if the path is a valid path, nor if the plugin is present at the given location. The recommended location for plugins is */usr/share/mysql-zrm/plugins* directory. A template file (***pre-backup.pl*** or ***post-backup.pl***) is installed in this location; use the template when writing your own pre-backup plugin. All pre-backup plugin scripts must accept the following command-line parameters (which are passed to the plugin using the ***Plugin Option(s)*** field:

--all-databases

Used when all databases in the MySQL server are being backed up.

--database database1, database2, ...

Used when specific databases are backed up.

--database database1 --tables table1, table2, ...

Used when specific tables in a database are being backed up.

The script should be written to return a non-zero value on the error; pre-backup plugin failures should cancel the backup and generate a failure message for reports and logs.

Post backup plugin is passed an additional parameter with information on the location of backup images (--*backup-directory path*).

The post-backup plugin is executed twice: before the checksum is performed, and after the checksum is complete. See the page for ***mysql-zrm-backup***(1) for more details on how the post-backup plugin operates and the flags it returns. Note that although failures of the post-backup plugin are logged, they are not included in backup reports if the backup itself succeeded.

Pre-Scheduler plugin can be used to delay the execution of the scheduled backup run. You can use this plugin to avoid backup during certain operational procedures such as MySQL upgrade or database upgrades. The value returned by the plugin determines how many hours the scheduled execution of backup run is delayed. It can be delayed for up to 11 hours.

You can optionally compress the data during transport. This might provide better performance.

8.1 Snapshots or Storage Checkpoints for Backup

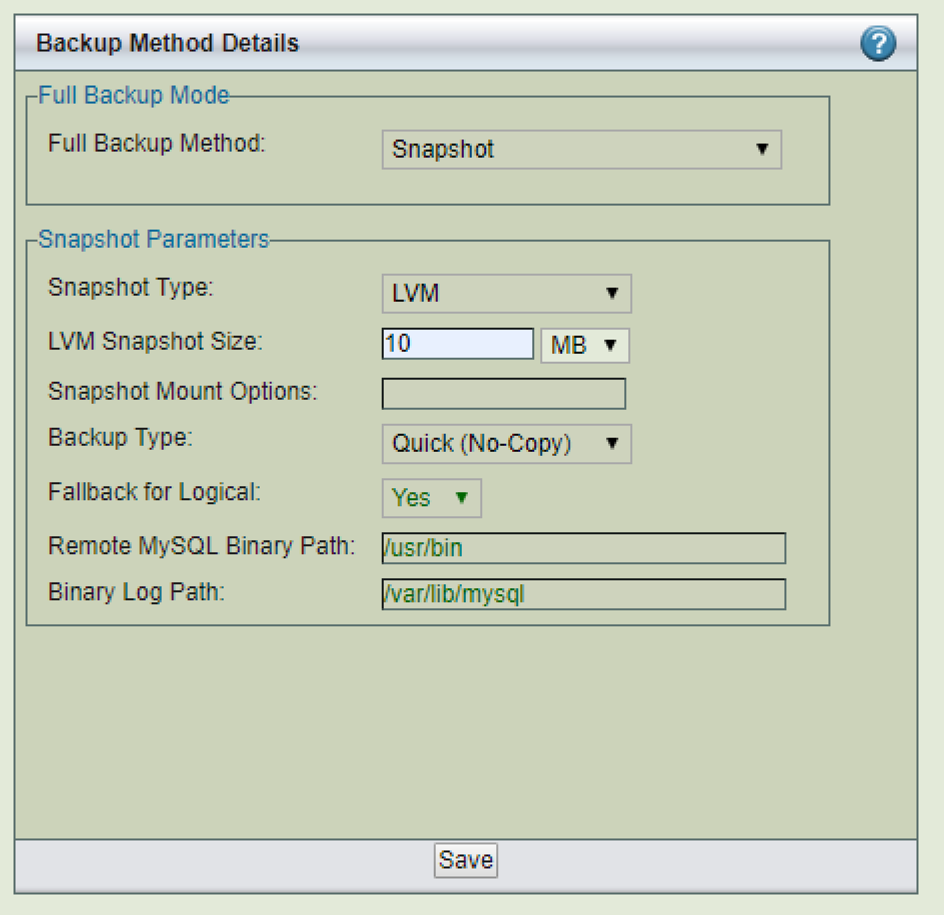
Snapshot Plugins

ZRM for MySQL can be licensed to use various third-party snapshot and storage checkpoint mechanisms to acquire a quiescent, consistent copy of the MySQL database while minimizing application downtime. Unlike other backup methods, snapshots and storage checkpoints scale well; they do not increase the backup window as databases grow.

Because snapshot and storage checkpoint mechanisms are faster than backups to other media, this reduces the time that database tables must be locked. These technologies create a consistent copy of the MySQL database with little impact on MySQL applications and thus scale well as databases grow. If the MySQL databases or tables use only transactional storage engines such as InnoDB, the time the application is locked is further reduced.

While taking snapshots of databases or tables that use non-transactional storage engines such as MyISAM, ZRM for MySQL flushes the database pages to the disk and obtains a read lock on the database(s) / table(s). The read lock is held only for a moment. File system I/O is stopped before taking a snapshot when the database resides on the file systems that support freeze/ thaw operations such as XFS, VxFS (Veritas file systems).

Snapshot Type as the full backup method are configured in the *Backup How* page. Only snapshots that are licensed appear in the drop-down box.



Backup Method Details

Full Backup Mode

Full Backup Method:	Snapshot ▼

Snapshot Parameters

Snapshot Type:	LVM ▼
LVM Snapshot Size:	10 MB ▼
Snapshot Mount Options:	
Backup Type:	Quick (No-Copy) ▼
Fallback for Logical:	Yes ▼
Remote MySQL Binary Path:	/usr/bin
Binary Log Path:	/var/lib/mysql

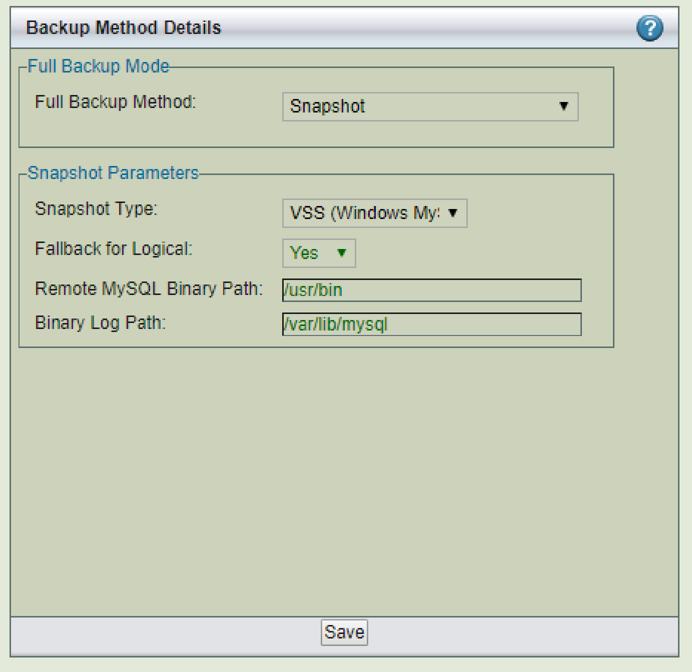
Figure 21. Using Snapshots or Storage Checkpoints for Backup

The snapshots are named “zrm<unique string_<yyyymmddhhmmss>”. This will allow users to identify when the snapshots were taken.

Supported Mechanisms

ZRM for MySQL supports several different snapshot mechanisms provided by OS, filesystem, and storage appliance vendors (follow the links for details on requirements and configuration):

- VxFS: The Symantec Veritas File System. ZRM for MySQL supports all versions of VxFS (including HP's JFS and OJFS). Depending on licenses purchased ZRM for MySQL can use either a filesystem snapshot or a storage checkpoint for backup.
- NetApp: If the database resides on a NetApp storage system (connected using NFS), ZRM for MySQL can use the NetApp snapshots to back up a snapshot of the MySQL database. ZRM for MySQL snapshots can be integrated with Netapp SnapVault. The Netapp snapshots can be used only for backups of MySQL server running on Linux.
- Logical Volume Manager: On Linux platforms, ZRM for MySQL can use Logical Volume Manager snapshots.
- ZFS: ZRM for MySQL can take advantage of ZFS snapshot capability when backing up a MySQL server installed on a Solaris ZFS file system.
- EMC Snapview: ZRM for MySQL can take advantage of EMC Snapview capability when backing up a MySQL server installed on an EMC CLARiiON networked storage system.
- Amazon EBS: Amazon Elastic Block Storage snapshots to backup MySQL databases running on Amazon EC2.
- Microsoft Volume Shadow Copy Service (VSS): On Windows platforms, ZRM for MySQL always uses the Microsoft Volume Shadow Copy Service to perform snapshot backups; no license is required. There are no special requirements beyond installing the Windows client, which is described in the Windows client section of the installation instructions. Please make sure Volume Shadow Services (VSS) services are running on the Windows MySQL server.



Backup Method Details

Full Backup Mode

Full Backup Method: Snapshot

Snapshot Parameters

Snapshot Type: VSS (Windows My:

Fallback for Logical: Yes

Remote MySQL Binary Path: /usr/bin

Binary Log Path: /var/lib/mysql

Figure 22. Backup Method Details

Quick (No-copy) Option

When the Quick (No-copy) snapshot ***Backup Type*** is enabled, ZRM for MySQL uses the snapshot itself as the backup rather than transferring the data into a standard backup archive on the ZRM server.

Quick snapshot backups are appropriate for large databases and for databases that have high transaction rates. In addition to eliminating data transfer bottlenecks during backup, quick snapshot backups also provide much faster database restoration than other backup methods.

Because quick snapshot backups do not copy the data off of the MySQL server, they do not protect data against server media failure. For this reason, quick snapshot backups can be converted at any time into standard backups stored on the ZRM server by using the ***Convert Backup*** option on the ***Reports*** menu tab, described in Converting Quick Snapshots to Standard Backups.

Setting Retention Policies for the Quick Snapshot Option

Because using the quick snapshot option for backups is so fast and convenient, administrators tend to schedule many of them. This is fine, so long as you set retention policies to prevent collecting too many snapshots on the MySQL server. Depending on the snapshot technology implemented, retaining an excessive number of snapshot backups can:

- Cause the MySQL server to perform more slowly.
- Cause the MySQL server to run into disk space limitations.
- Exceed the number of snapshots per server that are allowed by the given technology.

Refer to the documentation provided by the snapshot technology vendor when scheduling and setting retention policies for snapshot backups.

8.1.1 Linux Logical Volume Snapshots

Linux Logical Volume Manager Snapshots

Logical Volume Management (LVM) is a way of virtually partitioning a hard disk space such that it can be flexibly allocated to various applications. It is being utilized by an increasing number of MySQL installations.

ZRM for MySQL has an optional mechanism to help backup such installations using snapshots (a feature license is required). It can create temporary snapshots of the logical volumes and use the snapshot volume to do backups. The advantage of using snapshots is that you need to lock the database tables only for the time taken to create a snapshot. The snapshots are removed when the backups are completed. Snapshots help to create a consistent copy of the MySQL database as the consistency is ensured before the snapshot is taken.

On file systems such as XFS, VxFS (Veritas file systems) that support freeze/ thaw operations, file system activity is stopped before taking a snapshot.

MySQL Configuration

- Sudo privileges must be configured for mysql user on the MySQL server (see the next section).

- If you are backing up a remote MySQL server, the destination directory specified on the *Backup Where* page must exist on the MySQL server as well as the ZRM server. The MySQL backup user (OS-level) must have read/write permission to access this directory.

The mysql data must reside on logical volumes. The following are some of the possible configurations

- All MySQL data is on a single logical volume.

- Specific database directories are on different logical volumes.

- For databases containing InnoDB based tables, the lvm snapshot can only be used if the database directory, the InnoDB data files, and the InnoDB logs are on the same logical volume.

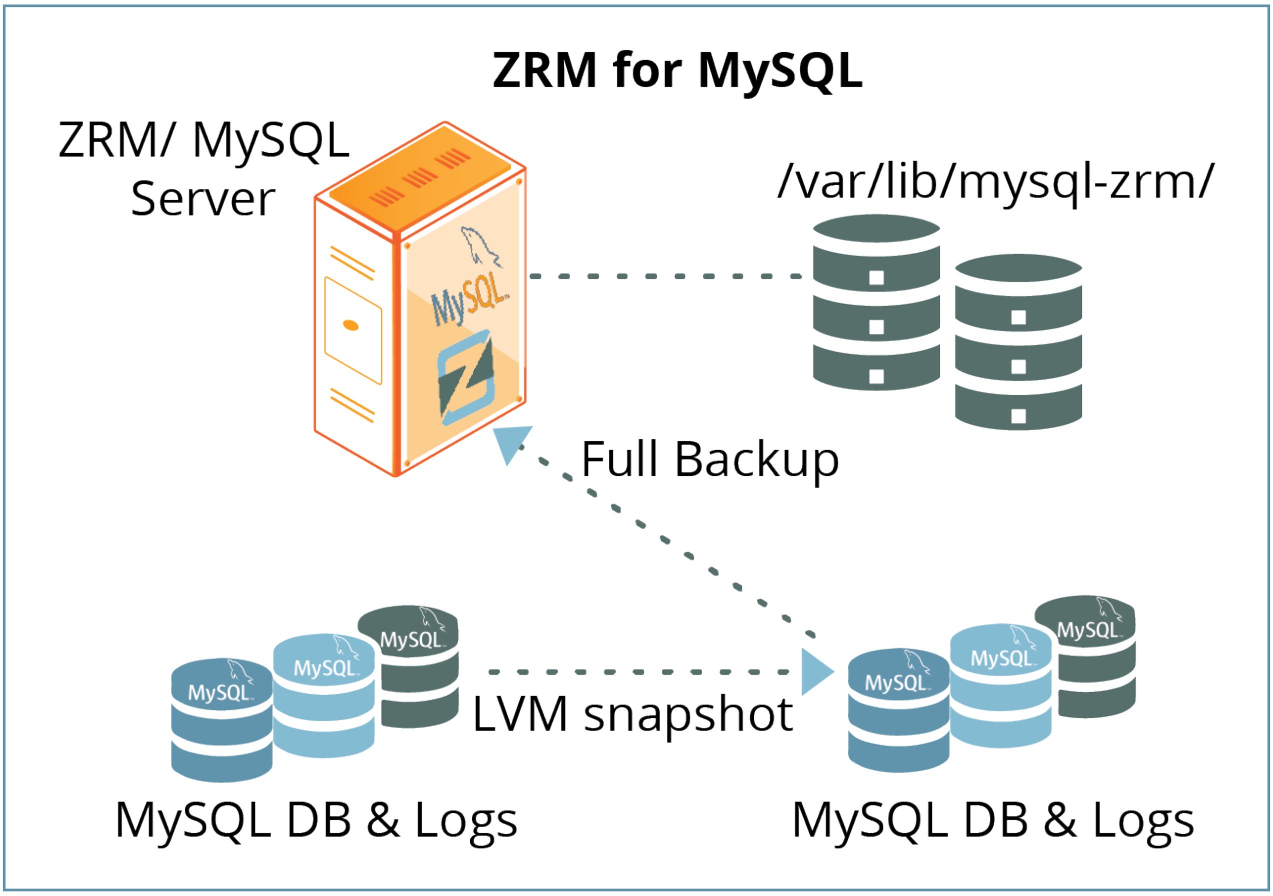


Figure 23. MySQL Configuration

Pre-conditions for Using LVM Snapshots

The MySQL backup user must be granted sudo privileges to execute lvm commands on the MySQL server. Add a line similar to the following example to /etc/sudoers on the MySQL server:

```
mysql  <FQDN  of  MySQL  Server>=NOPASSWD:/bin/mount,NOPASSWD:/bin/
umount,NOPASSWD:/bin/df,NOPASSWD:/usr/sbin/lvdisplay,NOPASSWD:/
usr/sbin/lvcreate,NOPASSWD:/usr/sbin/lvremove,NOPASSWD:/sbin/
fuser
```

Where *MySQLserver.mycompany.com* is the fully-qualified domain name for the MySQL server. Note that if lvm commands are installed in other locations, the above example would not work without editing it to reflect the different paths.

Additional free extents in the logical volume are needed for creating snapshots. You can check extents using the **vgdisplay** command.

The free extents required are specified in mysql-zrm.conf

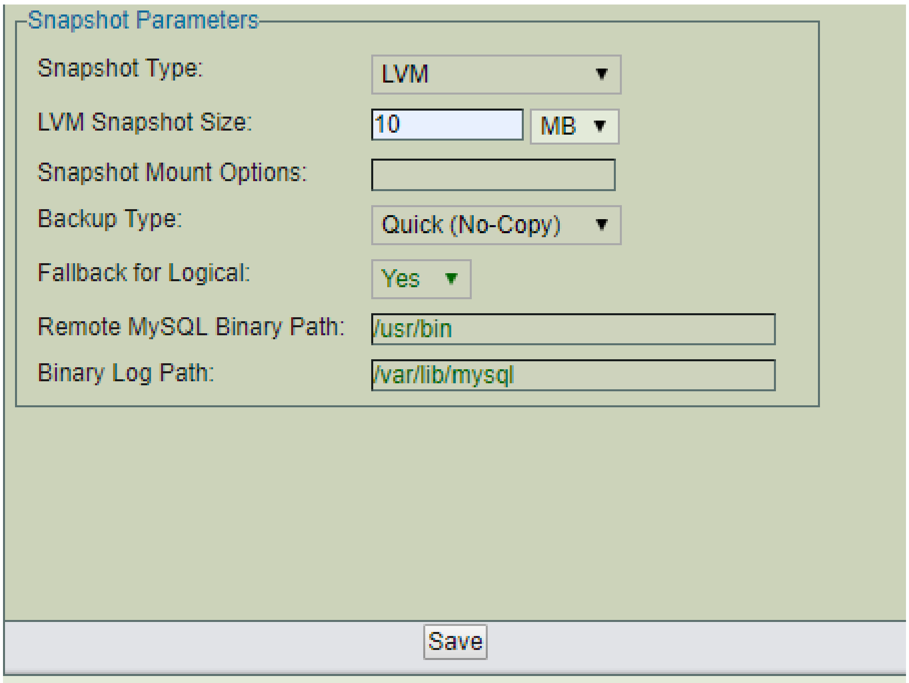
LVM stores the snapshot blocks corresponding to the blocks that are modified in the original logical volume in the snapshot volume. If the database is highly active during the backup, many blocks will be modified and the snapshot volume may run out of space.

Specifying a sufficient amount of space for creating the snapshot is critical; if the snapshot volume runs out of space, the backup will not be consistent.

All MySQL database files (data, log, indexes) must be stored in LVM logical volumes to ensure consistency. If any of the files are not on LVM, the snapshot is skipped, and either a raw backup via mysqlhotcopy or a logical backup using mysqldump will be taken based on the storage engines of the tables in each of the databases.

Configuration Parameters

The ***Backup How*** page allows you to select LVM snapshots as a backup mechanism.



Snapshot Parameters

Snapshot Type:	LVM
LVM Snapshot Size:	10 MB
Snapshot Mount Options:	
Backup Type:	Quick (No-Copy)
Fallback for Logical:	Yes
Remote MySQL Binary Path:	/usr/bin
Binary Log Path:	/var/lib/mysql

Figure 24. Configuration Parameters

Snapshot Size

Set the size of the LVM snapshot. For raw backups, each specified database is first checked to ensure that it is on an LVM volume, and then a snapshot of the specified size is created and used to backup the database (unless the quick (no-copy) option is selected; see below). If the specified database is not on a LVM volume, either *mysqlhotcopy* or *mysqldump* is used to create the backup.

Size of LVM snapshot depends on the amount of activity in the logical volume during the backup window. This is difficult to predict. If the value is too small, the backup will fail. Select a value conservatively for the first backup run. The ZRM logs on the server (/var/log/mysql-zrm/mysql-zrm.log) shows the amount of snapshot space that was used during the backup window when the backup completes successfully. This value can be used to tune the snapshot size configuration. Look for the value of *COW-table size* as shown below in the log message:

```
Tue May 04 12:59:28 2010: INFO: Output of the command sudo lvdisplay
/dev/nik_vg/zrm5pEeycW9LA 2>/tmp/ZRMKLOSo2o9 is    --- Logical volume
---
   LV Name                /dev/nik_vg/zrm5pEeycW9LA
   VG Name                nik_vg
   LV UUID                DronVf-GybO-rSQf-3Uqb-RG6I-krvP-aLTw8o
   LV Write Access        read/write
   LV snapshot status     active destination for /dev/nik_vg/lv_mysql
   LV Status              available
   # open                 0
   LV Size                30.00 GB
   Current LE             7680
   COW-table size         12.00 MB
   COW-table LE           3
   Allocated to snapshot  0.65%
   Snapshot chunk size    8.00 KB
   Segments               1
   Allocation             inherit
   Read ahead sectors     0
   Block device           253:4
```

Snapshot Mount Options

List of file system mount options used when the lvm snapshot(s) are mounted on the MySQL server during full backup process. This field is optional.

Backup Type

Choose the method of snapshot backup. The *Standard (Copy)* option specifies that the snapshot should be copied to a standard ZRM for MySQL backup archive. The *Quick (No Copy)* option specifies that the snapshot itself should be used as a near-line backup. Quick backups are convenient as they provide faster backups and restores, but because they remain on the MySQL server, they do not protect against media or server failure. Note that if the *quick* option is specified, the *compress* and *encrypt* options are ignored, and the backup size will always be zero. Also, no checksums are performed, which means that quick snapshot backups cannot be verified. Quick snapshot backups may be converted to standard backups stored on the ZRM server using the *Convert Backup* option available from the *Reports* menu tab.

Fallback for Logical

If this field is set to yes and snapshot backup fails, the logical backup is attempted. Set the value to No if you do not want to do logical backup if there is a snapshot backup failure.

Remote MySQL Binary Path

Path to the MySQL commands on the MySQL server.

Binary Log Path

Location of binary logs on the MySQL server that is used for log incremental backups.

Advantages of Using LVM Snapshots for Backup

- Hot backup for transaction-based storage engines (no impact on the application using the database) and Warm backups for other storage engines.
- Backup time is not dependent on the size of the database. As a result, this backup method is suitable for large databases.
- Almost instantaneous. The database gets locked only for the time taken to create the snapshot.

Disadvantages of Using LVM Snapshots for Backup

- Works well only for filesystems that support freeze operation such XFS, VxFS.
- Additional disk space for logical volume snapshots is required.
- LVM snapshots can be used only for local backups.

8.1.2 VxFS Snapshots and Storage Checkpoints

Symantec VxFS Snapshots

Symantec Veritas file systems (a.k.a VxFSs) allow two technologies to minimize application downtime during backup runs:

- Snapshot devices, which mirror the original storage and allow “freezing” for backup while the original data stays live.
- Storage checkpoints, which use the same filesystem volumes as to the original to only mirror changed data.

ZRM for MySQL includes an optional VxFS plugin that integrates with the Veritas File System to leverage native Storage Checkpoint capability.

This page describes the configuration of VxFS snapshot/storage checkpoint backups, including requirements for the MySQL database.

MySQL Configuration Requirements

- Both the ZRM server and MySQL server require the configuration of sudo privileges (see the next section) on Solaris platforms; this means the *SMCsudo* package must be installed.
- If you are backing up a remote MySQL server, the destination directory specified on the Backup Where page must exist on the MySQL server as well as the ZRM server. The MySQL backup user (OS-level) must have read/write permission to access this directory.

All MySQL data and logs must reside on VxFS volumes. The following are some of the possible configurations:

- All MySQL data is on a single VxFS Volume.
- Specific database directories are on different volumes.
- For databases containing InnoDB-based tables, the snapshot can only be used if the database directory, the InnoDB data files, and the InnoDB logs are all on VxFS volumes.
    - The InnoDB shared data files are on a separate VxFS volume.
    - The InnoDB logs are on a separate VxFS volume.

Refer to Veritas-supplied VxFS documentation for details on VxFS storage checkpoint configuration.

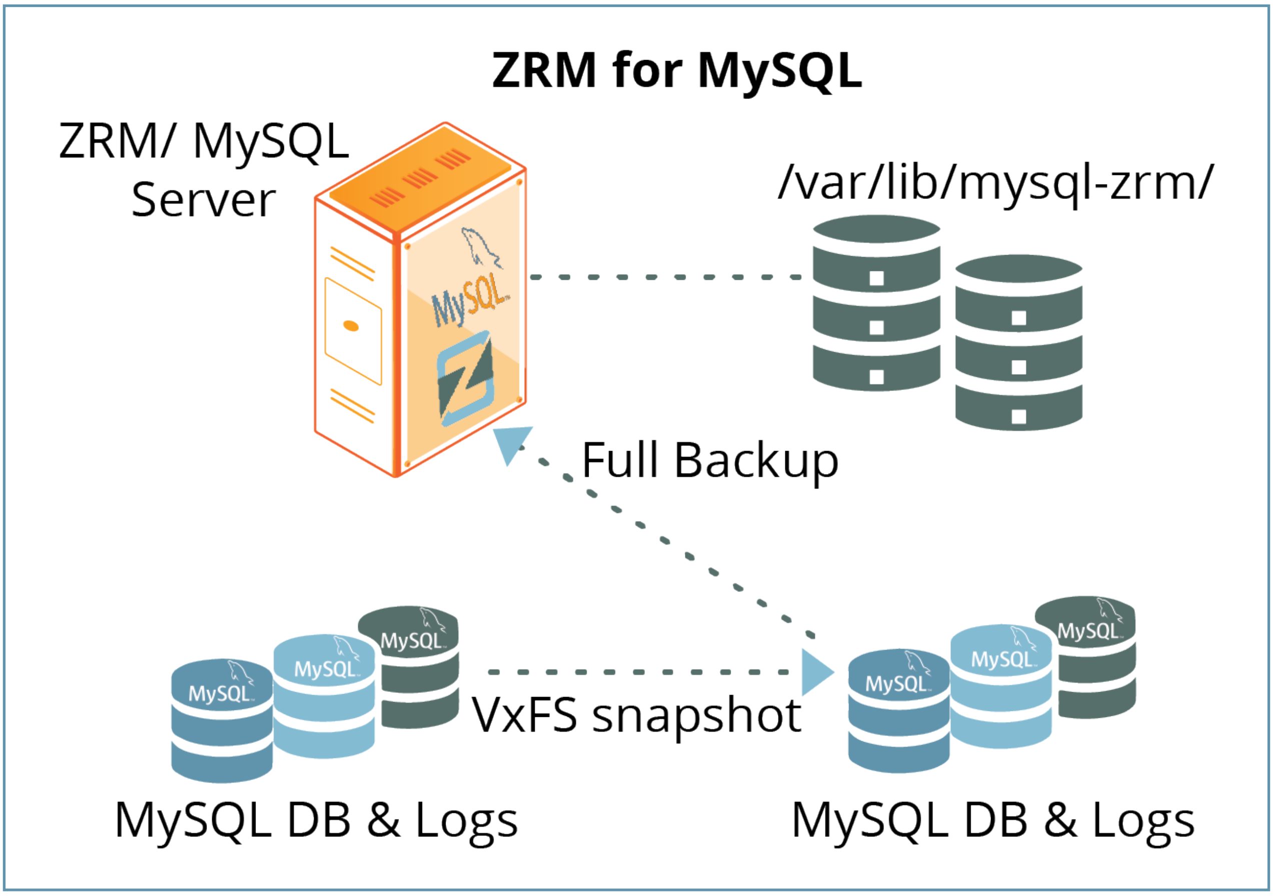


Figure 25. MySQL Configuration Requirements

The VxFS volumes are mounted on ZRM server. ZRM user "mysql" should have permissions to read and write to the volumes.

Pre-conditions for Using VxFS Snapshots

- The MySQL backup user must be granted sudo privileges to execute VxFS commands on the MySQL server. Add a line similar to the following example to /etc/sudoers on the MySQL server:

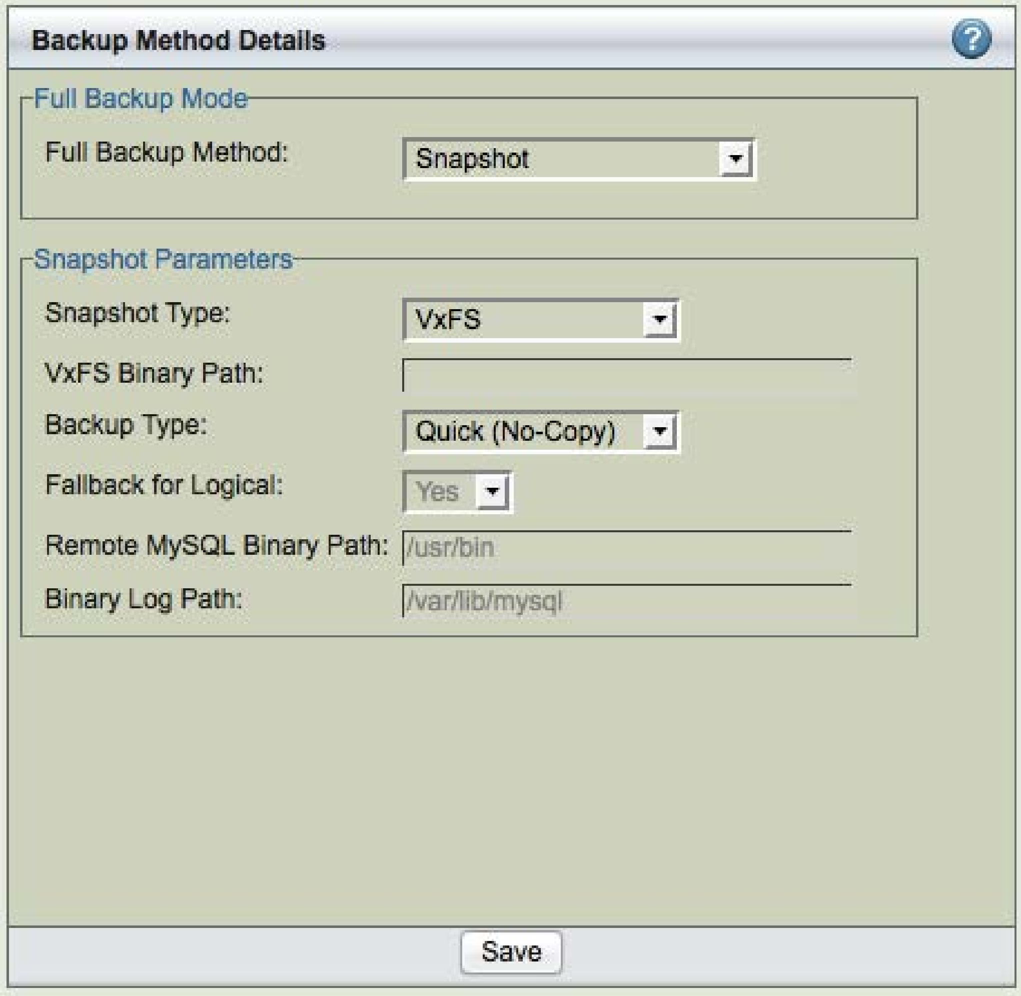
```
     mysql MySQLserver.mycompany.com
Server>=NOPASSWD:/bin/mount,NOPASSWD:/bin/umount,NOPASSWD:/bin/
df, \
      NOPASSWD:/sbin/fsckptadm, NOPASSWD:/sbin/fuser
```

Where MySQLserver.mycompany.com is the fully-qualified domain name for the MySQL server. Note that if VxFScommands are installed in non-standard locations, the above example will not work without editing it to reflect the different paths. Please see KB article for more information on sudo configuration.

- All MySQL database files (data, log, indexes) must be stored in VxFS volumes to ensure consistency. If any of the files are not on VxFS volumes, a raw backup using mysqlhotcopy, or a logical backup using mysqldump will be taken based on the storage engines of the tables in each of the databases.

Configuring ZRM for MySQL to Use VxFS Snapshots

To activate the use of VxFS storage checkpoints, you must select the VxFS Snapshot Type for Backup Method from the Backup How page:



Backup Method Details

Full Backup Mode

Full Backup Method: Snapshot

Snapshot Parameters

Snapshot Type: VxFS

VxFS Binary Path:

Backup Type: Quick (No-Copy)

Fallback for Logical: Yes

Remote MySQL Binary Path: /usr/bin

Binary Log Path: /var/lib/mysql

Figure 26. Configuring ZRM for MySQL to Use VxFS Snapshots

There are two options for VxFS snapshots:

VxFS Binary Path

Supply the path to VxFS *fsckptadm* command (the default is /*opt/VRTS/bin*).

Backup Type

Choose the method of snapshot backup. The *Standard (Copy)* option specifies that the snapshot should be copied to a standard ZRM for MySQL backup archive. The *Quick (No Copy)* option specifies that the snapshot itself should be used as a near-line backup. Quick backups are convenient as they provide faster backups and restores, but because they remain on the MySQL server, they do not protect against media or server failure. Note that if the *quick* option is specified, the *compress* and *encrypt* options are ignored. Also, no checksums are performed, which means that quick snapshot backups cannot be verified. Quick snapshot backups may be converted to standard backups stored on the ZRM server using the *Convert Backup* option available from the *Reports* menu tab.

Fallback for Logical

If this field is set to yes and snapshot backup fails, the logical backup is attempted. Set the value to No if you do not want to do logical backup if there is a snapshot backup failure.

Remote MySQL Binary Path

Path to the MySQL commands on the MySQL server.

Binary Log Path

Location of binary logs on the MySQL server that is used for log incremental backups.

8.1.3 Solaris ZFS Snapshots

ZFS Snapshots

Sun Microsystem's Solaris ZFS filesystem include snapshot capability, which facilitates near-instantaneous hot backups and rapid restores.

If you purchase the feature license from Zmanda (available at the Zmanda Network Downloads page), ZRM for MySQL includes an optional snapshot plugin that integrates with ZFS to create consistent MySQL full backups. It creates temporary snapshots of the ZFS volumes on which to perform a full backup. When snapshots are enabled, ZRM for MySQL can perform backups with minimal impact on MySQL applications. Database writes will be blocked only during snapshot creation, which typically takes less than a second regardless of database size.

This page describes the configuration of ZFS snapshot backups, including requirements for the MySQL database.

MySQL Configuration Requirements

- Sudo privileges must be configured for mysql user on the MySQL server (see the next section). On Solaris platforms, this means the ***SMCsudo*** package must be installed.
- If you are backing up a remote MySQL server, the destination directory specified on the Backup Where page must exist on the MySQL server as well as the ZRM server. The MySQL backup user (OS-level) must have read/write permission to access this directory.

To take advantage of ZFS snapshots, all MySQL database files (data, log, indexes) belonging to the backup set must be stored in ZFS volumes to ensure consistency.

If any of the files are not on ZFS volumes, a raw backup using mysqlhotcopy, or a logical backup using mysqldumpis performed depending on the storage engines of the tables in each of the databases.

Refer to the Solaris ZFS documentation for details on ZFS administration.

Here are some valid scenarios of database storage on ZFS:

- All MySQL data is stored on a single ZFS Volume.
- Specific database directories are stored on different volumes.
- For databases containing InnoDB-based tables, the snapshot can only be used if the database directory, the InnoDB data files and the InnoDB logs are all on ZFS volumes.
  - The InnoDB shared data files are on a separate ZFS volume
  - The InnoDB logs are on a separate ZFS volume

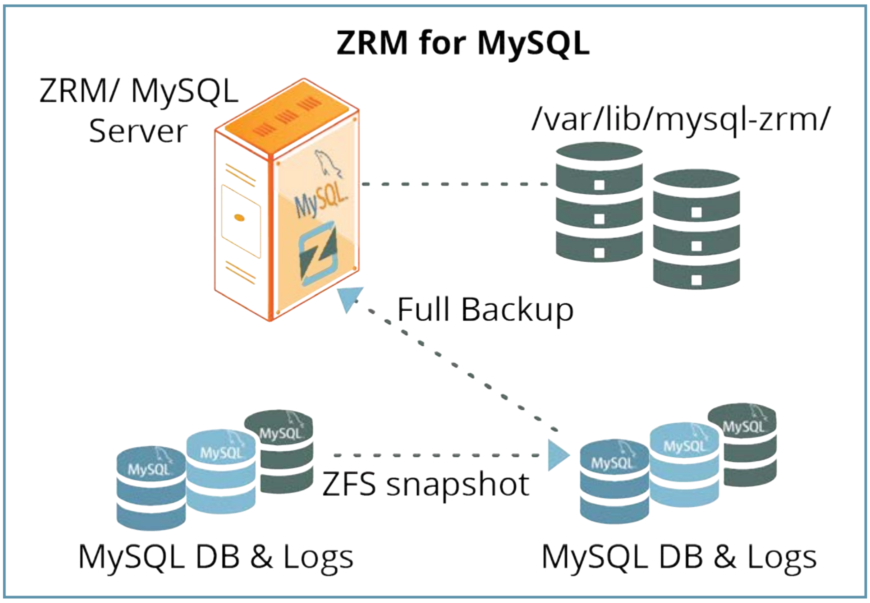


Figure 27. MySQL Configuration Requirements

MySQL Backup User sudo Privileges

The MySQL backup user (described in System Requirements) must be granted *sudo* privileges to execute *ZFS* commands on the MySQL server. Add a line similar to the following example to /*usr/local/etc/sudoers* on the MySQL server:

```
mysql
MySQLserver.mycompany.com=NOPASSWD:/usr/sbin/df,NOPASSWD:/usr/
sbin/zfs
```

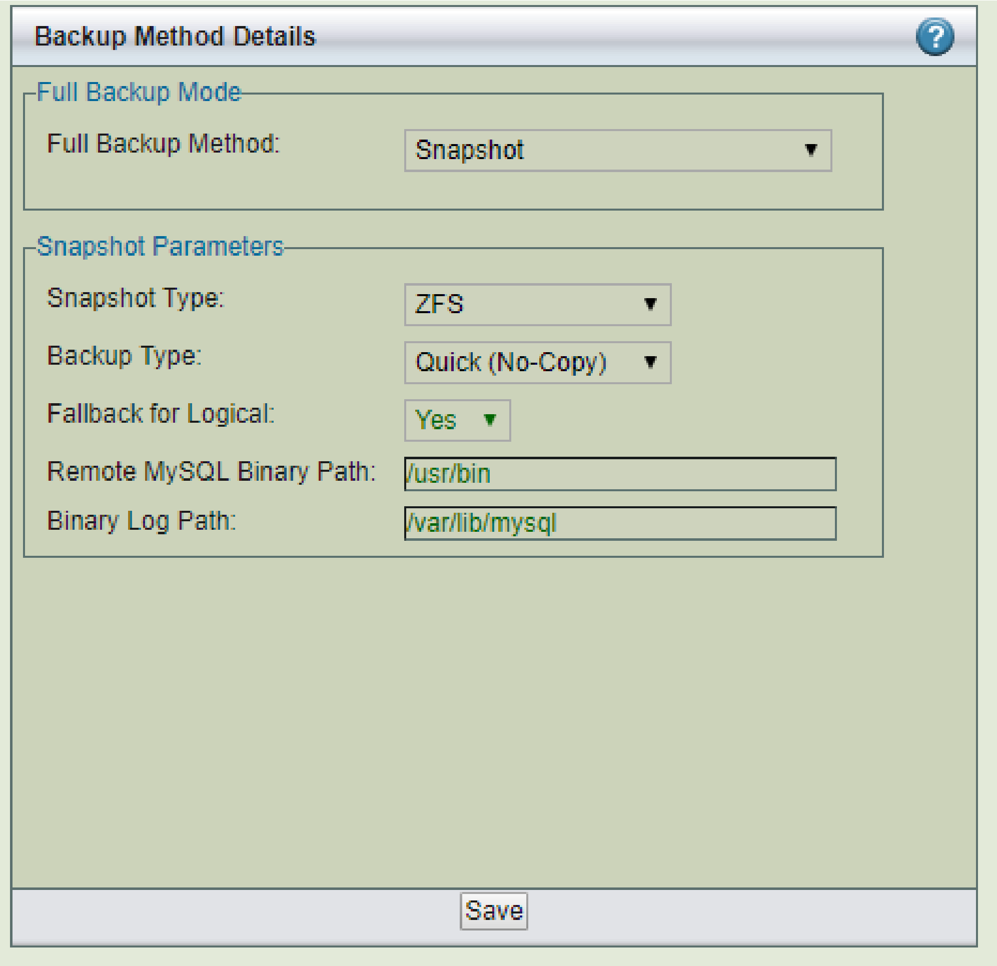
Where MySQLserver.mycompany.com is the fully-qualified domain name for the MySQL server. If the MySQL database resides on the ZRM server, the ZRM server name should be used. Note that if *ZFS* commands are installed in non-standard locations, the above example will not work without editing it to reflect the different paths.

To test the *sudo* configuration, run the command as the “mysql” user. The command should execute correctly without prompting for a password. For example:

```
# su - mysql
  $ /usr/local/bin/sudo /usr/sbin/df
```

Configuring ZRM for MySQL to use ZFS Snapshots

To activate the use of ZFS Snapshots for full backups, simply select the *ZFS* Snapshot Type for *Backup method* from the *Backup How* page:



Backup Method Details

Full Backup Mode

Full Backup Method: Snapshot

Snapshot Parameters

Snapshot Type: ZFS

Backup Type: Quick (No-Copy)

Fallback for Logical: Yes

Remote MySQL Binary Path: /usr/bin

Binary Log Path: /var/lib/mysql

Figure 28. Configuring ZRM for MySQL to use ZFS Snapshots

Backup Type

Choose the method of snapshot backup. The *Standard (Copy)* option specifies that the snapshot should be copied to a standard ZRM for MySQL backup archive. The *Quick (No Copy)* option specifies that the snapshot itself should be used as a near-line backup. Quick backups are convenient as they provide faster backups and restores, but because they remain on the MySQL server they do not protect against media or server failure. Note that if the *quick* option is specified, the *compress* and *encrypt* options are ignored. In addition, no checksums are performed, which means that quick snapshot backups cannot be verified. Quick snapshot backups may be converted to standard backups stored on the ZRM server using the *Convert Backup* option available from the *Reports* menu tab.

Fallback for Logical

If this field is set to yes and snapshot backup fails, the logical backup is attempted. Set the value to No if you do not want to do logical backup if there is a snapshot backup failure.

Remote MySQL Binary Path

Path to the MySQL commands on the MySQL server.

Binary Log Path

Location of binary logs on the MySQL server that are used for log incremental backups.

8.1.4 Amazon EBS Snapshots

Amazon EC2

ZRM for MySQL can backup MySQL servers running on Amazon EC2 instances in Amazon cloud. The backups are stored in Amazon S3 cloud storage. The backup images can be restored only to an Amazon EC2 instance. The backups are performed using Elastic Block Store (EBS) snapshots to S3.

If you purchase the feature license from Zmanda (available at the Zmanda Network Downloads page), ZRM for MySQL includes an optional snapshot plugin that integrates with Amazon EBS to create consistent MySQL full backups. It creates snapshots of the EBS volumes on which to perform a full backup.

When snapshots are enabled, ZRM for MySQL can perform backups with minimal impact on MySQL applications. Database writes will be blocked only during snapshot creation, which typically takes less than a second regardless of database size.

This page describes the configuration of Amazon EBS snapshot backups, including requirements for the MySQL databases in the cloud.

Requirements

- ZRM server and MySQL server must be running Linux EC2 instances. Solaris and Windows platforms are not supported.
- ZRM client software must be installed on the MySQL server EC2 instance.

- Perl module Net::Amazon::EC2 must be installed on the ZRM server under /opt/ zmanda/ zrm directory. This perl module is available only from CPAN. To install this module, run the following commands as superuser on the ZRM server:

```
# /opt/zmanda/zrm/perl/bin/cpan

At CPAN prompt, type “install Net::Amazon::EC2”
```

- The destination directory specified on the Backup Where page must exist on the MySQL server as well as the ZRM server. The MySQL backup user (OS-level) must have read/write permission to access this directory.

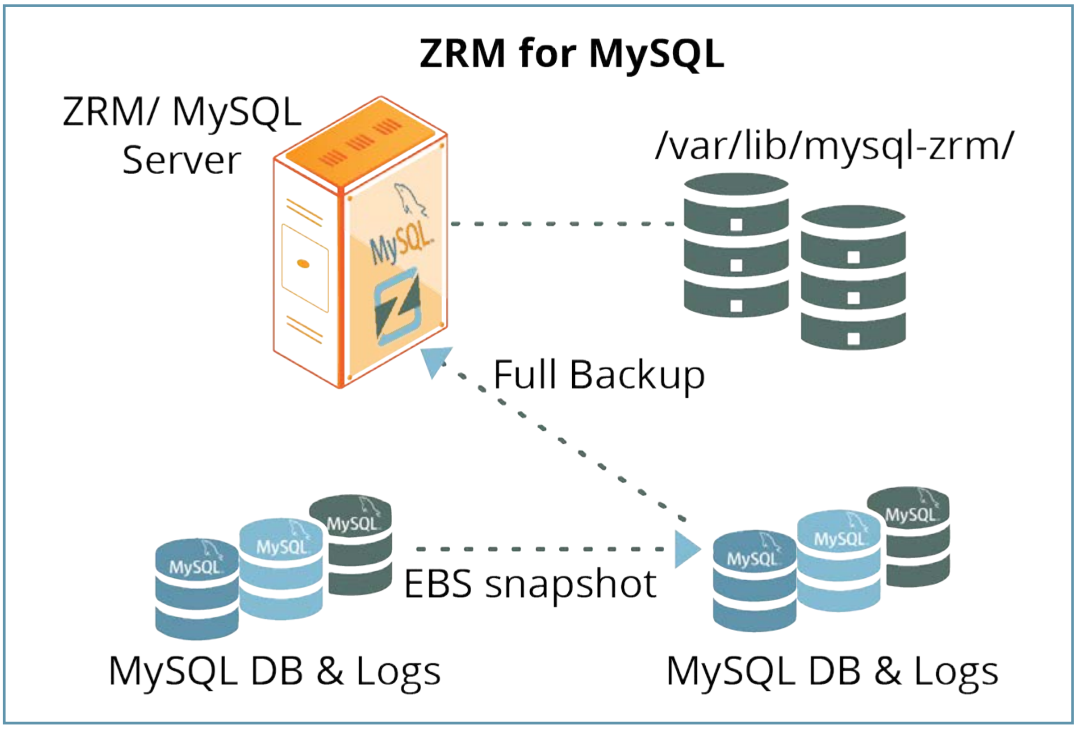


Figure 28. ZRM server and MySQL server Configuration Requirements

- All MySQL database files (data, log, indexes) must be stored in non-partitioned Amazon Elastic Block Store (EBS) volumes. ZRM user “mysql” should have permissions to read and write to the volumes. Please see Amazon documentation on how to use Elastic Block Storage in Amazon EC2.

- Only ***Quick*** backup method is supported. ***Regular*** backups cannot be performed.

- The number of EBS snapshots (full backups) that can be created depends on the Amazon account limit. The default limit is 500 EBS snapshots per amazon account. If full backups have to be retained for a long time, please contact Amazon to increase the EBS snapshot limit.

- Please make sure that the system date and time on the MySQL server and ZRM server, if they are running on Amazon EC2, is correct. Incorrect date and time will fail EBS snapshots and hence the backups.

- The MySQL backup user must be granted *sudo* privileges to execute system commands "df" and "xfs_freeze" (if XFS file system is in use) on the MySQL server. Add a line similar to the following example to */etc/sudoers* on the MySQL server:

```
mysql ec2-75-101-206-181.compute-
1.amazonaws.com=NOPASSWD:/bin/df,NOPASSWD:/usr/sbin/xfs_
freeze,NOPASSWD:/bin/mount,NOPASSW

D:/bin/umount,NOPASSWD:/sbin/fuser
```

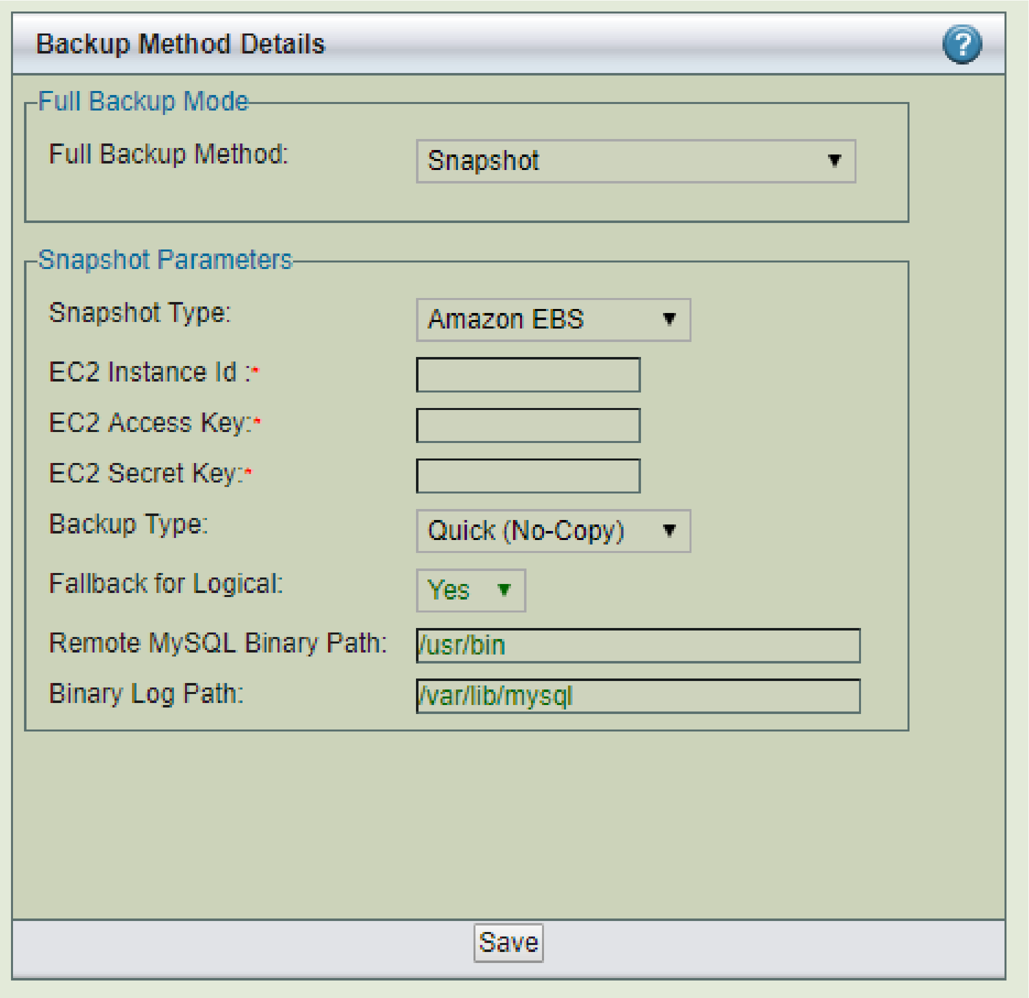
where *ec2-75-101-206-181.compute-1.amazonaws.com* is the IP address of ZRM server on Amazon EC2.

Configuring ZRM for MySQL to use Amazon EBS Snapshots

- Install the EBS snapshot license on the ZRM server. You will have to download the license file from Zmanda network and copy it to /etc/zmanda directory.

- Choose the Amazon EC2 instance's private DNS name as the host name for the MySQL server in the Backup|What page. For example: domU-12-31-39-06-70-22.compute-1.internal

- Select Snapshot Type as *Amazon EBS* in the Snapshot Type drop down box after selecting *Backup Method* in the *Backup How* page.



Backup Method Details

Full Backup Mode

Full Backup Method: Snapshot

Snapshot Parameters

Snapshot Type: Amazon EBS

EC2 Instance Id :*

EC2 Access Key:*

EC2 Secret Key:*

Backup Type: Quick (No-Copy)

Fallback for Logical: Yes

Remote MySQL Binary Path: /usr/bin

Binary Log Path: /var/lib/mysql

Figure 29. Configuring ZRM for MySQL to use Amazon EBS Snapshots

Amazon EC2 access key

Amazon account access key identifier. This information can be obtained from Amazon account page (Select Your Account -> Access Identifiers).

Amazon EC2 secret key

Amazon account secret key identifier. This information can be obtained from Amazon account page (Select Your Account -> Access Identifiers).

Amazon EC2 instance id

The Instance ID of the Amazon EC2 instance where MySQL server is running. This MySQL server should be configured in the Backup|What page in the backup set. Usually, the ID begins with the string “i-”. This information can be obtained from the AWS Management Console (Amazon account information is required).

Backup Type

Only *Quick* backup is supported. The *Quick (No Copy)* option specifies that the snapshot itself should be used as a near-line backup. Quick backups are convenient as they provide faster backups and restores. Backups are stored in highly reliable and scalable Amazon S3 that offers protection against media or server failure. Note that if the *quick* option is specified, the *compress* and *encrypt* options are ignored. In addition, no checksums are performed, which means that quick snapshot backups cannot be verified. Quick snapshot backups using EBS cannot be converted into *regular* backups.

Fallback for Logical

If this field is set to yes and snapshot backup fails, the logical backup is attempted. Set the value to No if you do not want to do logical backup if there is a snapshot backup failure.

Remote MySQL Binary Path

Path to the MySQL commands on the MySQL server.

Binary Log Path

Location of binary logs on the MySQL server that is used for log incremental backups.

Restoring EBS Snapshot Backup

Elastic Block store snapshot backups can be restored only to an Amazon EC2 instance. There are two ways to do the restoration of EBS snapshot backups.

- Restoration of EBS snapshots to an EC2 where MySQL server is already running. This method is the recommended method. It can be used to restore MySQL backups back to original EC2 instance. This method is supported by Zmanda Management Console. For more details on how to configure destination Amazon EC2 instance id and other EBS parameters in the restore process, please see Restore Where page.
- Restoration of EBS snapshots to an EC2 where MySQL server is not running. This method is useful for quick recovery of MySQL data. This restoration option is available in command line only.

```
mysql-zrm-manage-backup --mount-snapshots --source-directory <directory where backup images are stored> \
                --ec2-instance-id <instance id of amazon ec2 where the snapshots have to be mounted> \
                    --device-fs-map <name of the mapping file containing devices and mount points>
```

The EBS devices are mounted at the mount points specified in the device mapping file on the destination amazon ec2 instance. The user can start a MySQL server with the datadir and logdir pointing to the mounted EBS devices to start accessing restored data.

An example of device mapping file:

/dev/sdf=/db
/dev/sdk=/innodb_data
/dev/sdn=/innodb_logs

and MySQL server to use the above data will have to be configured as follows in the MySQL server options file (*my.cnf*)

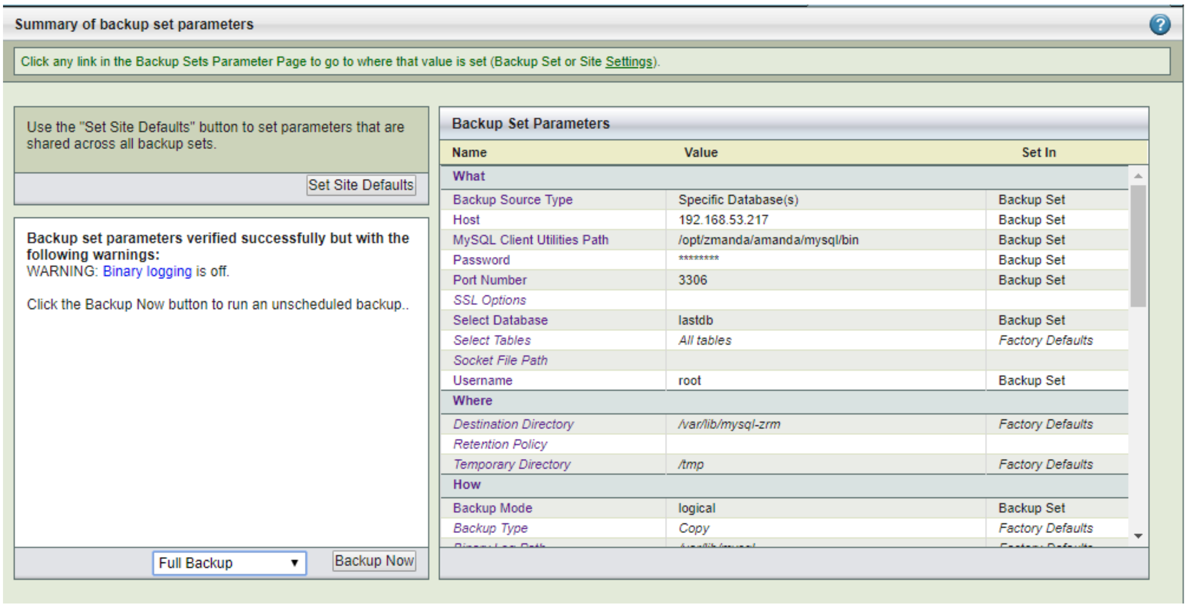
datadir=/db
innodb_data_home_dir=/innodb_data
innodb_log_group_home_dir=/innodb_logs

Use --dismount-existing option to *mysql-zrm-manage-backup* command if the EC2 where backups are being restored to already has EBS volumes mounted at the mount points.

9. BACKUP SUMMARY

The Backup Summary page conveniently lists all relevant settings for the backup set in one place, showing each option, and where the option was set (i.e., either factory, site, or in the backup set itself).

Backup Summary provides information about the configuration parameter values for the backup set and where it was set - ***Factory Settings*** (ZRM default value), ***Site Defaults*** (Set in Set ***Site Defaults page***) and Backup Set (Set in Backup What/ Where/ When/ How pages).



Summary of backup set parameters

Click any link in the Backup Sets Parameter Page to go to where that value is set (Backup Set or Site Settings).

Use the "Set Site Defaults" button to set parameters that are shared across all backup sets.

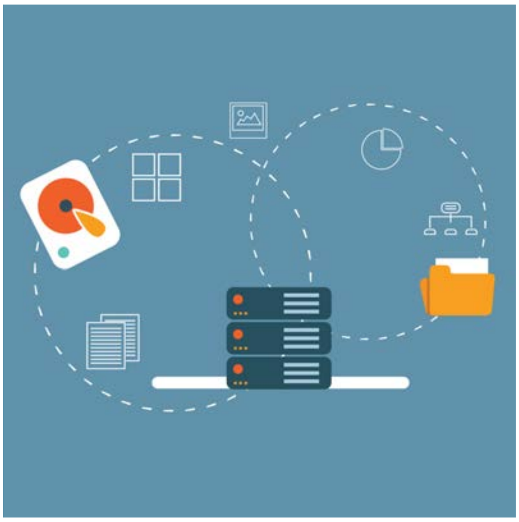
Backup set parameters verified successfully but with the following warnings:
WARNING: Binary logging is off.

Click the Backup Now button to run an unscheduled backup..

Backup Set Parameters

Name	Value	Set In
What		
Backup Source Type	Specific Database(s)	Backup Set
Host	192.168.53.217	Backup Set
MySQL Client Utilities Path	/opt/zmanda/amanda/mysql/bin	Backup Set
Password	********	Backup Set
Port Number	3306	Backup Set
SSL Options		
Select Database	lastdb	Backup Set
Select Tables	*All tables*	*Factory Defaults*
Socket File Path		
Username	root	Backup Set
Where		
Destination Directory	*/var/lib/mysql-zrm*	*Factory Defaults*
Retention Policy		
Temporary Directory	*/tmp*	*Factory Defaults*
How		
Backup Mode	logical	Backup Set
Backup Type	*Copy*	*Factory Defaults*

Figure 30. Backup Summary



The summary items are listed under headings that correspond to the Backup page where the option is set. Note that the **"Backup Type"** field in this context refers to whether a copy of the backup was transferred to the ZRM server. This field will display ***Copy*** for all backup operations except for Quick Snapshots, where it will display ***No-copy***.

You can click on the ***Set Site Defaults*** to see and modify the site configuration default values for the ZRM server.

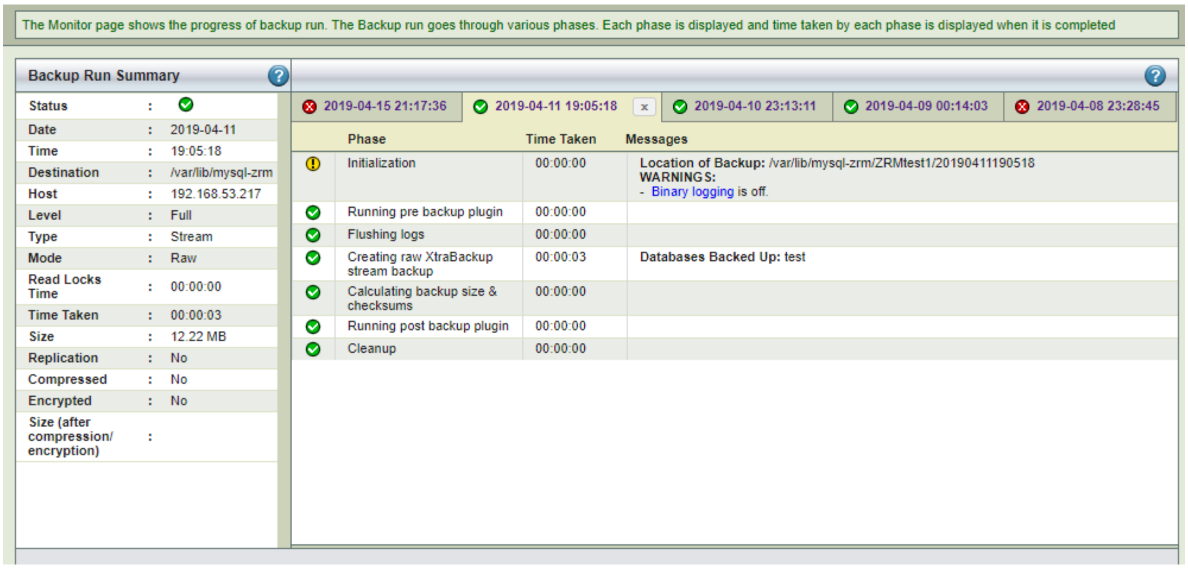
This page allows performs configuration check on ZRM server and the MySQL server for the backup set configuration. All errors/warnings are displayed in the left panel. If there are errors, backups will not be performed. Warnings about disk space availability on the backup destination location are also displayed. It is important to enable binary logs for the MySQL server for both full as well as log incremental backups.

You can also start Full, Log Incremental, Differential, Chained Differential backups using ***Backup Now*** button. Last two backup options are available only if MySQL Enterprise Backup is selected in ZMC ***Backup How*** page. This is a good way to test the backups before scheduled backups run.

10. MONITOR

a) Monitor Backups

The *Monitor* page shows the progress of the backup run. The Backup run goes through various phases. Each phase is displayed, and the time taken by each phase is displayed when it is completed. It is possible to abort a backup run when it is absolutely necessary. The backup will stop at the next appropriate time (most likely at the beginning of the next phase). The cancel button will appear during the backup run. The client process is not terminated and will have to be terminated manually.



The Monitor page shows the progress of backup run. The Backup run goes through various phases. Each phase is displayed and time taken by each phase is displayed when it is completed

Backup Run Summary

Status	:	✓
Date	:	2019-04-11
Time	:	19:05:18
Destination	:	/var/lib/mysql-zrm
Host	:	192.168.53.217
Level	:	Full
Type	:	Stream
Mode	:	Raw
Read Locks Time	:	00:00:00
Time Taken	:	00:00:03
Size	:	12.22 MB
Replication	:	No
Compressed	:	No
Encrypted	:	No
Size (after compression/ encryption)	:	

	Phase	Time Taken	Messages
!	Initialization	00:00:00	**Location of Backup:** /var/lib/mysql-zrm/ZRMtest1/20190411190518 **WARNINGS:** - Binary logging is off.
✓	Running pre backup plugin	00:00:00	
✓	Flushing logs	00:00:00	
✓	Creating raw XtraBackup stream backup	00:00:03	**Databases Backed Up:** test
✓	Calculating backup size & checksums	00:00:00	
✓	Running post backup plugin	00:00:00	
✓	Cleanup	00:00:00	

Figure 31. Monitoring Backups

The left panel shows a summary and configuration of the backup run. The Monitor shows information about the most recent backup run or the backup run in progress.

The backup processes divided into multiple phases. The right panel shows the progress of each phase. The name of the phase, time taken for each phase and any important messages regarding the phase are displayed.

Parallel Backups within a Backup Set

There can be multiple backup runs in progress for a backup set. All backup runs are displayed in a separate tab.

ZRM allows queueing one backup run waiting for the backup phase. Users will have to configure the time for which the backup run will wait in the queue in */etc/mysql-zrm/<backup set name>/mysql-zrm.conf* in the ZRM server.

Se the ***backup-wait-timeout*** parameter to the number of seconds a backup run can wait in the queue before it is timed out. This value should not be greater than the next backup run scheduled because there can be only one backup run in the queue. Following parameter sets the ***backup-wait-timeout*** to 300 seconds in mysql-zrm.conf.

```
backup-wait-timeout = 300
```

You can permanently close the backup tab by clicking the x icon in the tab.

Backup Status Icons

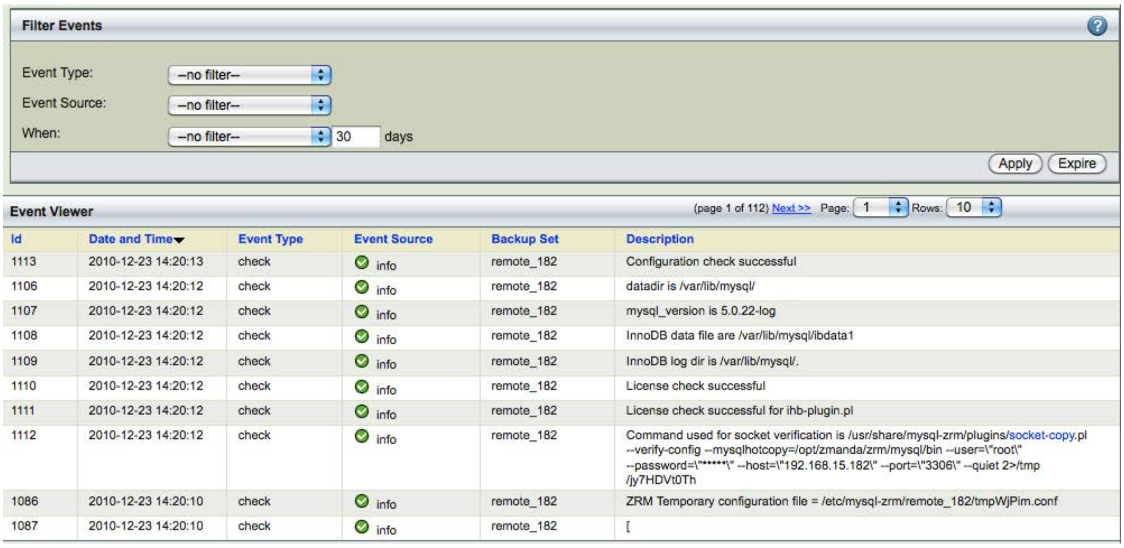
! The yellow exclamation point (!) indicates warnings. They may require attention to prevent future backup failures.

✓ The green checkmark symbol indicates a task that is executed successfully.

X The red octagon ("stop sign") symbol indicates backup has failed.

b) Events

ZMC provides all backup and configuration check events across backup sets in the *Event Viewer* as shown below.



Event Type: --no filter--

Event Source: --no filter--

When: --no filter-- 30 days

Event Viewer

(page 1 of 112) Next >> Page: 1 Rows: 10

Id	Date and Time	Event Type	Event Source	Backup Set	Description
1113	2010-12-23 14:20:13	check	✓ info	remote_182	Configuration check successful
1106	2010-12-23 14:20:12	check	✓ info	remote_182	datadir is /var/lib/mysql/
1107	2010-12-23 14:20:12	check	✓ info	remote_182	mysql_version is 5.0.22-log
1108	2010-12-23 14:20:12	check	✓ info	remote_182	InnoDB data file are /var/lib/mysql/ibdata1
1109	2010-12-23 14:20:12	check	✓ info	remote_182	InnoDB log dir is /var/lib/mysql/.
1110	2010-12-23 14:20:12	check	✓ info	remote_182	License check successful
1111	2010-12-23 14:20:12	check	✓ info	remote_182	License check successful for ihb-plugin.pl
1112	2010-12-23 14:20:12	check	✓ info	remote_182	Command used for socket verification is /usr/share/mysql-zrm/plugins/socket-copy.pl --verify-config --mysqlhotcopy=/opt/zmanda/zrm/mysql/bin --user=\"root\" --password=\"*****\" --host=\"192.168.15.182\" --port=\"3306\" --quiet 2>/tmp /jy7HDVt0Th
1086	2010-12-23 14:20:10	check	✓ info	remote_182	ZRM Temporary configuration file = /etc/mysql-zrm/remote_182/tmpWjPim.conf
1087	2010-12-23 14:20:10	check	✓ info	remote_182	[

Figure 32. Event Viewer

Event Viewer

The columns of the page are:

Id
Event identifier

Date and Time
Time stamp of the event, displayed in 24-hour format

Event Type
Configuration check and backup

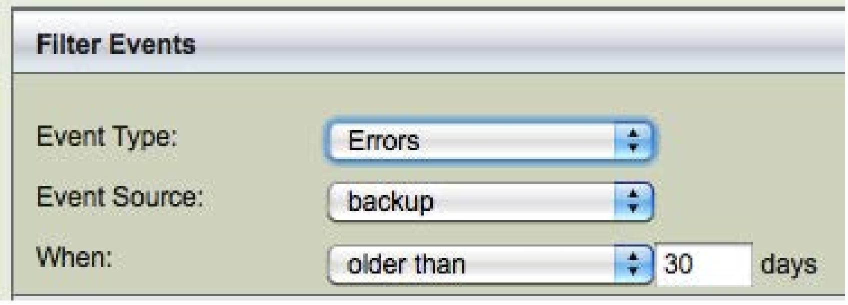
Event Source
The source of the event or log is either the local ZMC console or the Zmanda network. It also shows failure, warning, or info. All failure events need immediate attention.

Backup Set
Displays the backup set name if the event is not a Zmanda Network Alert.

Description
Event description. Some event descriptions have links. Clicking the links will provide information from knowledgebase in the Zmanda Network or the wiki about how to resolve the problem if it is an error.

Alerts can also come from Zmanda Network, providing security and product updates. The ZMC can generate many events during a backup process and configuration process. By clicking on the header of any column, the view of the page can be altered so that it is sorted as per that column.

Filter Events



Filter Events

Event Type: Errors

Event Source: backup

When: older than 30 days

Figure 33. Filter Events

You can select the events in the viewer using Event Type and Event Source. Event Type can be Errors or Warnings. Event Source can be backup or check. You can filter based on the time stamp.

You can purge events using the ***Expire*** button. Select the events to be removed using ***When*** field. Events take space in the internal database, and if there are disk space constraints, it is important to expire events regularly when they are no longer needed.

Log Rotate Utility

ZMC works with a log rotate utility that allows sysadmins to effectively prune active logs. Sysadmins should rotate the logs using ***crontab***.

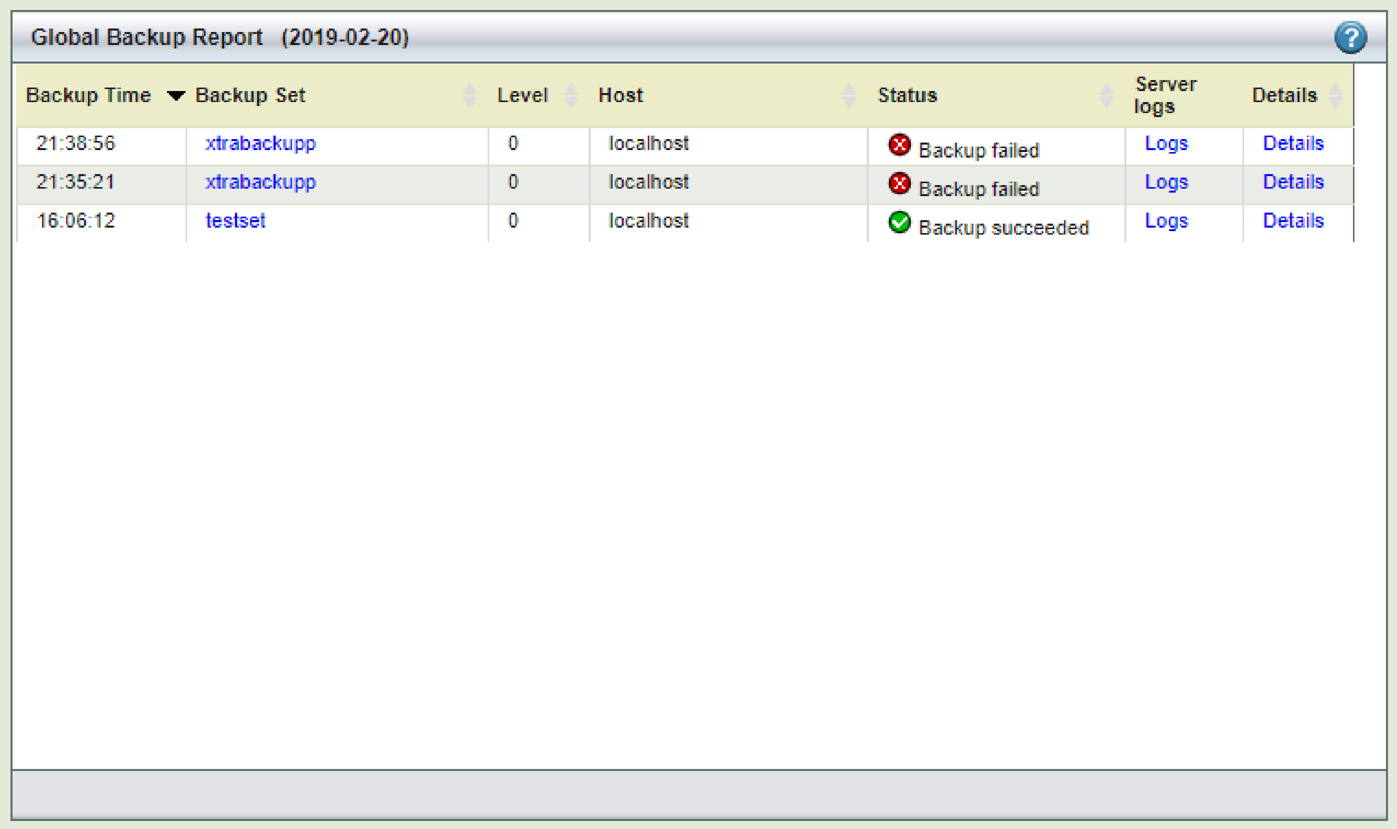
```
For example:
0 1 * * 1,5 logrotate /etc/logrotate.d/zmc_logrotate (For 1 AM on
Monday and Friday of each week)
```

The pruned logs are not saved by the utility; they are simply pruned by it. You must manually copy the logs before pruning if you wish to retain them.

11. REPORTS

a) Global Reports

Report Summary across all backup sets and all backups run is available in this page.

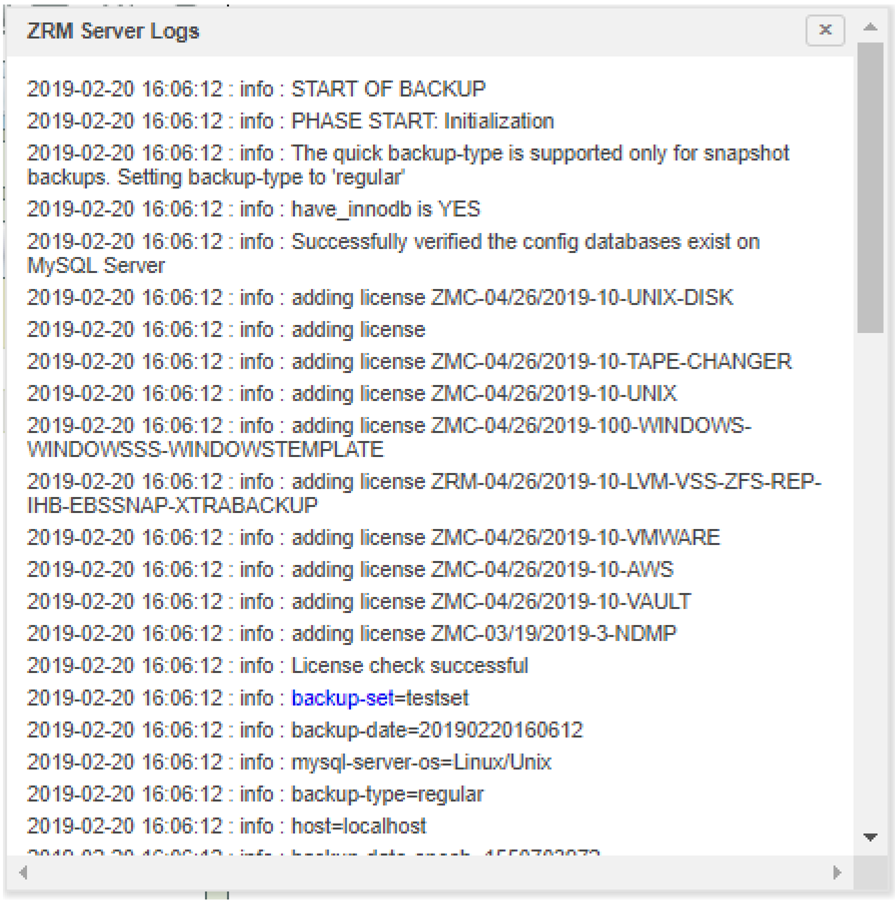


Global Backup Report (2019-02-20)

Backup Time	Backup Set	Level	Host	Status	Server logs	Details
21:38:56	xtrabackupp	0	localhost	✗ Backup failed	Logs	Details
21:35:21	xtrabackupp	0	localhost	✗ Backup failed	Logs	Details
16:06:12	testset	0	localhost	✓ Backup succeeded	Logs	Details

Figure 34. Global Backup Report

The backup date is selected from the calendar on the left-hand side. All the backup runs for all backup sets for that date are displayed. The time of backup (*Backup Time*), backup set name, backup level, MySQL server host name (*Host*), the status of backups is displayed. You can sort on any of the columns to look at the backup runs for a backup set or all failures. The default sort order is based on the backup time. The last column *ZRM Server logs* provides a link to the backup logs for that backup run. Clicking on the Logs link shows:



```
2019-02-20 16:06:12 : info : START OF BACKUP
2019-02-20 16:06:12 : info : PHASE START: Initialization
2019-02-20 16:06:12 : info : The quick backup-type is supported only for snapshot
backups. Setting backup-type to 'regular'
2019-02-20 16:06:12 : info : have_innodb is YES
2019-02-20 16:06:12 : info : Successfully verified the config databases exist on
MySQL Server
2019-02-20 16:06:12 : info : adding license ZMC-04/26/2019-10-UNIX-DISK
2019-02-20 16:06:12 : info : adding license
2019-02-20 16:06:12 : info : adding license ZMC-04/26/2019-10-TAPE-CHANGER
2019-02-20 16:06:12 : info : adding license ZMC-04/26/2019-10-UNIX
2019-02-20 16:06:12 : info : adding license ZMC-04/26/2019-100-WINDOWS-
WINDOWSSS-WINDOWSTEMPLATE
2019-02-20 16:06:12 : info : adding license ZRM-04/26/2019-10-LVM-VSS-ZFS-REP-
IHB-EBSSNAP-XTRABACKUP
2019-02-20 16:06:12 : info : adding license ZMC-04/26/2019-10-VMWARE
2019-02-20 16:06:12 : info : adding license ZMC-04/26/2019-10-AWS
2019-02-20 16:06:12 : info : adding license ZMC-04/26/2019-10-VAULT
2019-02-20 16:06:12 : info : adding license ZMC-03/19/2019-3-NDMP
2019-02-20 16:06:12 : info : License check successful
2019-02-20 16:06:12 : info : backup-set=testset
2019-02-20 16:06:12 : info : backup-date=20190220160612
2019-02-20 16:06:12 : info : mysql-server-os=Linux/Unix
2019-02-20 16:06:12 : info : backup-type=regular
2019-02-20 16:06:12 : info : host=localhost
2019-02-20 16:06:12 : info : backup-date-epoch=1550703972
```

Figure 35. ZRM Server Logs

The log viewer can be used to review the logs for a particular backup run. This information can be used to troubleshoot the problems in case the information available in the Report Summary is insufficient to fix the backup failure.

The ***Details*** column provides the information with a summary of backup details (what was backed up and backup parameters).

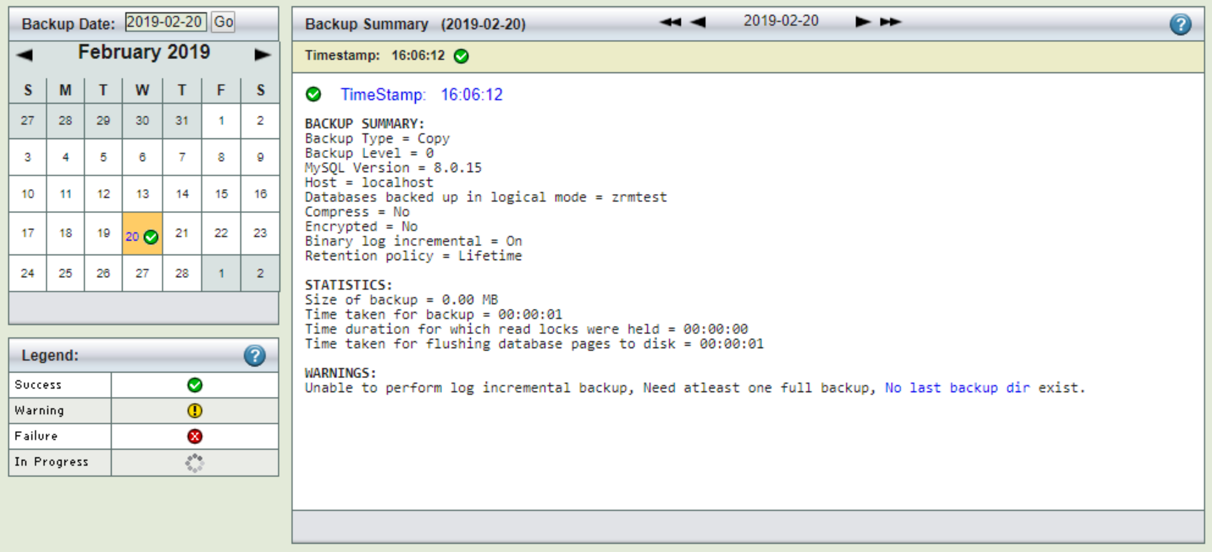
b) Summary Reports

Report Summary

ZRM for MySQL automatically generates backup reports after the backup run is completed (or if it fails for some reason). This backup summary report includes:

- Status of the current/ last backup run
- The backup type in other words, whether the backup was a quick (no-copy) snapshot backup
- Backup statistics
- Location of the backup image
- Backup level

If the machine where ZMC is running is configured to send mail, reports can be automatically e-mailed after every backup run.



Backup Date: 2019-02-20 Go

February 2019

S	M	T	W	T	F	S
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20 ✓	21	22	23
24	25	26	27	28	1	2

Legend:

Success	✓
Warning	!
Failure	✗
In Progress	○

Backup Summary (2019-02-20) 2019-02-20

Timestamp: 16:06:12 ✓

```
✓ TimeStamp: 16:06:12

BACKUP SUMMARY:
Backup Type = Copy
Backup Level = 0
MySQL Version = 8.0.15
Host = localhost
Databases backed up in logical mode = zrmtest
Compress = No
Encrypted = No
Binary log incremental = On
Retention policy = Lifetime

STATISTICS:
Size of backup = 0.00 MB
Time taken for backup = 00:00:01
Time duration for which read locks were held = 00:00:00
Time taken for flushing database pages to disk = 00:00:01

WARNINGS:
Unable to perform log incremental backup, Need atleast one full backup, No last backup dir exist.
```

Figure 36. Backup Summary Report

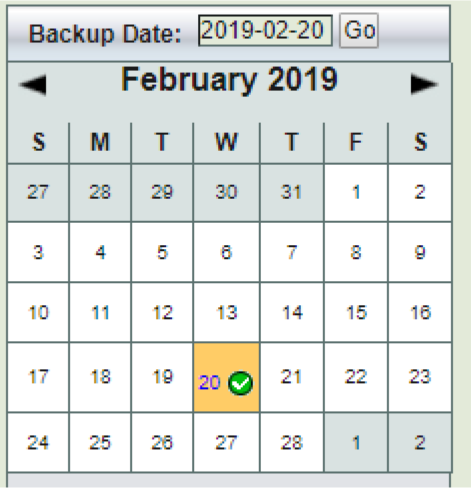
The Summary Report page is divided into two panels:

- The left panel shows a calendar control from which you can select report dates and a legend that explains the report icons.
- The right panel displays the report for the date selected on the calendar.

You can select reports using any of the following:

- Browse buttons at the top of the report itself.
- You can enter a date on the left panel and click the Go button.
- You can pick a date of the calendar.

Selecting a Backup Date



Backup Date: 2019-02-20 Go

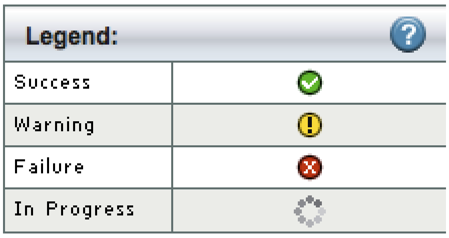
◄ February 2019 ►

S	M	T	W	T	F	S
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20 ✓	21	22	23
24	25	26	27	28	1	2

Figure 37. Summary Data Calendar

You can either enter the date (mm/dd/yy[yy]) and click *Go* or click on any icon in the calendar. When you click *Go* (or click on a different date), the report shows any summary data (if any is available) for that date.

Legend



Legend:	
Success	✓
Warning	!
Failure	✗
In Progress	○

Figure 38. Legend

The legend shows four possible status for a backup run:

Error
Requires immediate attention

Warning
A recoverable failure

Success
Successful backup run, the data backed up can be recovered from this image

Progress

Backup run is in progress. Please check Monitor page for more information about this backup run

Summary Panel

The date browses buttons allow to conveniently move back and forth one day (using < or >) or one week (using <<or>>) at a time.

Timestamp links below the browse buttons show the time at which the backup run was initiated. If there are multiple backups in a day, you will see multiple time stamps. Clicking on a Timestamp link go to the Restore What page with the date and time automatically filled in.

Backup Summary

The what, when, where, and how of the backup run. Note that **Backup Type** indicates whether the backup is a standard backup copied to the ZRM server (**Copy**), a quick snapshot backup (**No-copy**), or a quick snapshot that has been converted to a standard backup (**Copy (converted)**).

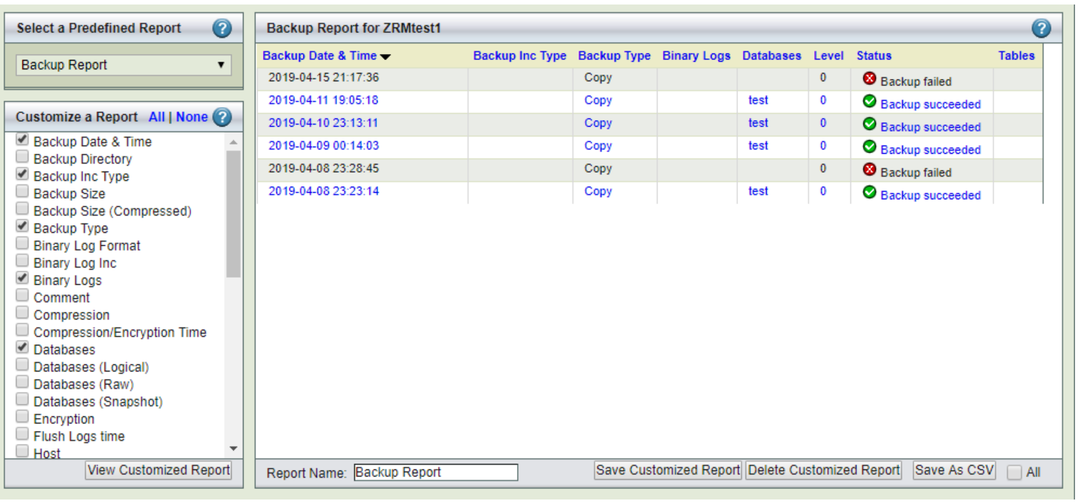
Statistics

How much data was backed up and how long it took. Note that quick snapshot (**No-copy**) backups always display a backup size of zero, because no data transfer occurs when this type of backup is run.

c) Custom Reports

Report Custom

ZRM for MySQL generates a number of Predefined backup reports you can easily customize. ZRM for MySQL automatically generates backup reports after each backup run is completed.



Select a Predefined Report

Backup Report

Customize a Report All | None

☑ Backup Date & Time
☐ Backup Directory
☑ Backup Inc Type
☐ Backup Size
☐ Backup Size (Compressed)
☑ Backup Type
☐ Binary Log Format
☐ Binary Log Inc
☑ Binary Logs
☐ Comment
☐ Compression
☐ Compression/Encryption Time
☑ Databases
☐ Databases (Logical)
☐ Databases (Raw)
☐ Databases (Snapshot)
☐ Encryption
☐ Flush Logs time
☐ Host

View Customized Report

Backup Report for ZRMtest1

Backup Date & Time	Backup Inc Type	Backup Type	Binary Logs	Databases	Level	Status	Tables
2019-04-15 21:17:36		Copy			0	✗ Backup failed	
2019-04-11 19:05:18		Copy		test	0	✓ Backup succeeded	
2019-04-10 23:13:11		Copy		test	0	✓ Backup succeeded	
2019-04-09 00:14:03		Copy		test	0	✓ Backup succeeded	
2019-04-08 23:28:45		Copy			0	✗ Backup failed	
2019-04-08 23:23:14		Copy		test	0	✓ Backup succeeded	

Report Name: Backup Report

Figure 39. Backup Reports ZRM for MySQL

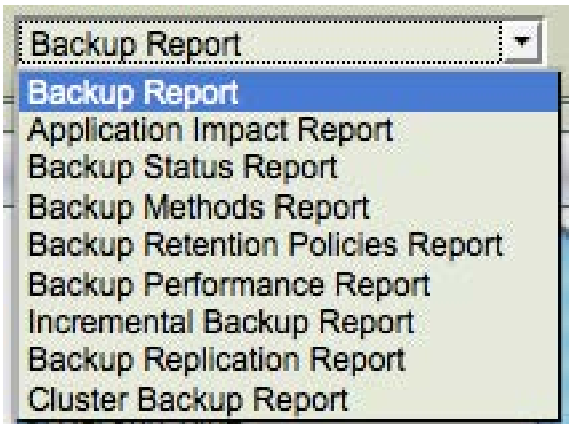
The Custom Reports displays a list of predefined reports, along with checkboxes that allow the user to customize reports.

- The left panel shows a list of predefined reports; beneath this list is a series of checkboxes that let you customize the display.
- The right panel displays the Report.

Predefined Reports

The list of Predefined Reports and User-defined reports that can be run for the selected backup set can be selected from the drop-down box on the left panel.

The predefined reports are shown and described below. The reports are shown displaying the default columns; you can customize each of the reports to display the desired column fields.



Backup Report
Backup Report
Application Impact Report
Backup Status Report
Backup Methods Report
Backup Retention Policies Report
Backup Performance Report
Incremental Backup Report
Backup Replication Report
Cluster Backup Report

Figure 40. Predefined Reports

The Backup Date and Time column is common to all the reports. It identifies and differentiates between different Backup Runs of the same backup set. A few key columns are discussed below.

When any link is clicked, ZRM for MySQL jumps to the ***Restore What*** page with the date and time filled in based on the backup you selected from the report

BACKUP REPORT

The ***Backup Report*** has columns that display ***Level, Database and Tables***, corresponding to the ***Backup What*** parameters. It also has a column that shows the ***status*** of the run.

APPLICATION IMPACT REPORT

The ***Application Impact Report*** displays the ***Read Lock Time*** and ***Total Time*** for each run. These allow you to determine how the backup run affected database application performance.

BACKUP STATUS REPORT

The ***Backup Status Report*** displays the ***Status*** and the ***Destination Directory*** where the data has been backed up. The Status of the run is also displayed.

BACKUP METHOD REPORT

The ***Backup Method Report*** displays the backup method (i.e., ***Databases Logical, Databases Raw and Snapshots***) used to create the backup. The data in these columns will not change across runs. By changing the backup set selection in the drop-down box at the top of the page, can quickly see which backup sets have what methods.

BACKUP RETENTION POLICY REPORT

The ***Backup Retention Report*** shows the retention policy for the backup set. A blank column indicates that no purge policy has been set for the backup set.

BACKUP PERFORMANCE REPORT

The ***Backup Performance Report*** displays compression and performance statistics for the backup set.

INCREMENTAL BACKUP REPORT

The ***Incremental Backup Report*** shows the kind of backup performed: Incremental Backup Sets will display a value, while full backups display a blank column.

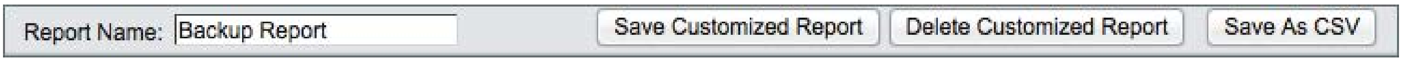
REPLICATION BACKUP REPORT

The ***Replication Backup Report*** has two columns. ‘***Replication Files***’ and ‘***Slave Load Files***’ show values when Replication has been set for the backup set.

CLUSTER BACKUP REPORT

The ***Cluster Backup Report*** has three columns. ‘***NDB Backup ID***’ , ‘***NDB Connect String*** ***and*** ‘***NDB Node List*** that will show the same values until changed by the User. The ***Status*** column allows users to judge the impact of changing these parameters.

Customized Report



Report Name: Backup Report

Figure 41. Customized Report

You can name the customized report so that it can be retrieved later. All ZMC users can retrieve the report. The report name appears as part of the list of Predefined reports.

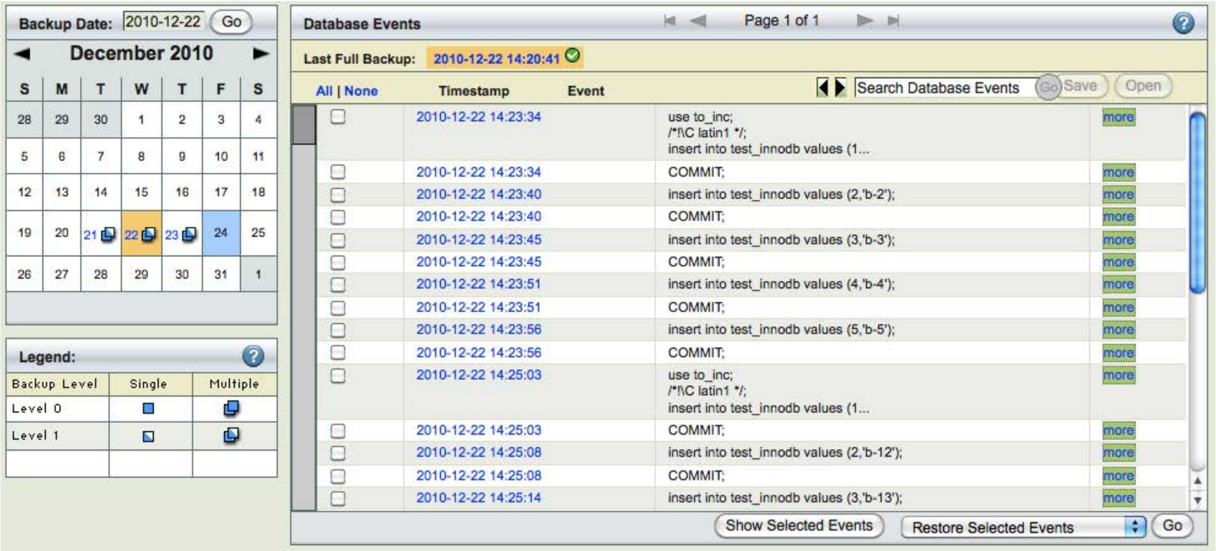
Save as CSV button allows users to save custom reports in CSV format. This format can be read by any spreadsheet or report analysis tool. Before saving a custom report as CSV, you must name the report using ***Save Customized Report***. The CSV output is saved in a file named zrm3_5-<custom report name>.csv

d) Database Events

Database Events Report

The *Database Events* page lets you find and view all the database events logged and copied during incremental backups. This is useful when you need to find a particular malicious or erroneous transaction so you can roll back the unintended change. Once you find the problem event, you can easily launch a restore operation that will roll back all changes to the moment before the damage occurred. To back up and restore at the transaction level requires that binary logging is enabled on the MySQL server.

It is possible to restore selected events or undo selective events from the database. You can also search for errors and save the search query for future searches. This will make identification of erroneous events easier.



S	M	T	W	T	F	S
28	29	30	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	1

Legend:

Backup Level	Single	Multiple
Level 0	■	⧉
Level 1	◪	⧉

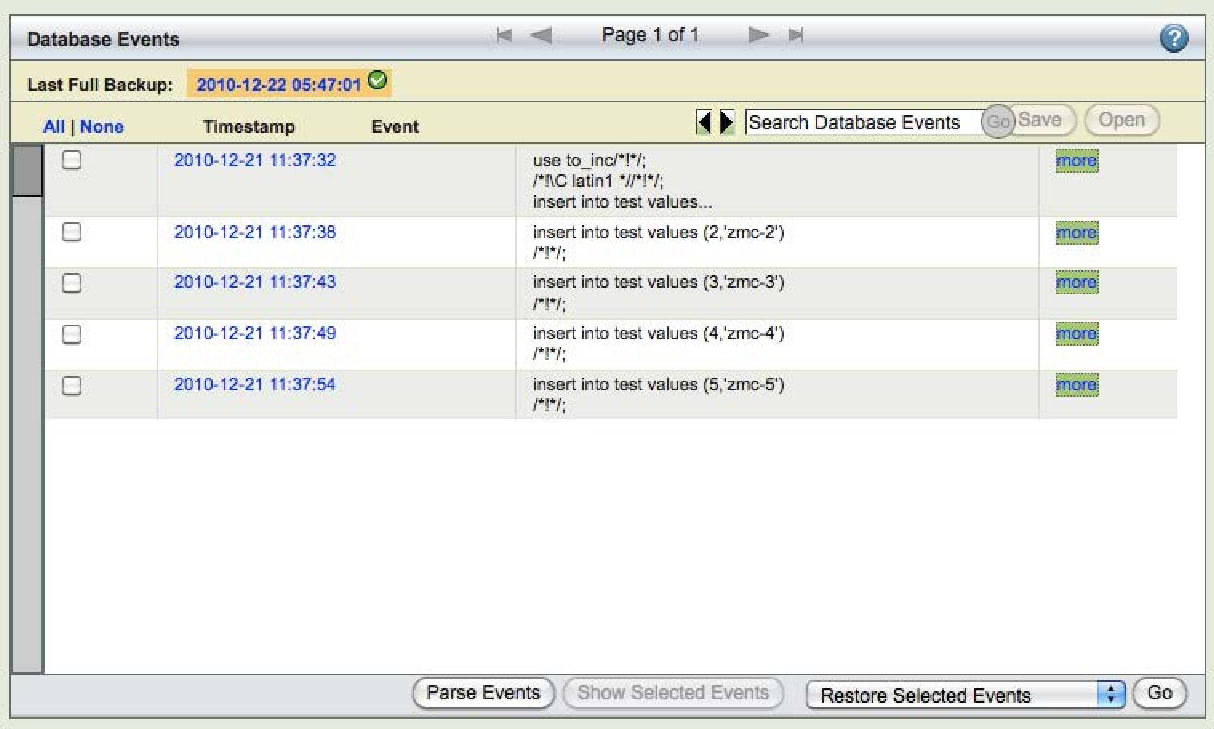
	Timestamp	Event	
□	2010-12-22 14:23:34	use to_inc; /*!\C latin1 */; insert into test_innodb values (1...	more
□	2010-12-22 14:23:34	COMMIT;	more
□	2010-12-22 14:23:40	insert into test_innodb values (2,'b-2');	more
□	2010-12-22 14:23:40	COMMIT;	more
□	2010-12-22 14:23:45	insert into test_innodb values (3,'b-3');	more
□	2010-12-22 14:23:45	COMMIT;	more
□	2010-12-22 14:23:51	insert into test_innodb values (4,'b-4');	more
□	2010-12-22 14:23:51	COMMIT;	more
□	2010-12-22 14:23:56	insert into test_innodb values (5,'b-5');	more
□	2010-12-22 14:23:56	COMMIT;	more
□	2010-12-22 14:25:03	use to_inc; /*!\C latin1 */; insert into test_innodb values (1...	more
□	2010-12-22 14:25:03	COMMIT;	more
□	2010-12-22 14:25:08	insert into test_innodb values (2,'b-12');	more
□	2010-12-22 14:25:08	COMMIT;	more
□	2010-12-22 14:25:14	insert into test_innodb values (3,'b-13');	more

Figure 42. Database Events

The left panel displays a calendar control that lets you select a backup icon from dates on which single or multiple backups where processed.

The right panel features controls that help you locate events within the selected backup. When you open the page, the right panel displays events from the selected backup date for the selected backup set. Binary log backups are stored as part of full and log incremental backups.

Parsing of binary logs from the backup images can take time (up toa few minutes). To refresh the report page using *Parse Events* button at the bottom of the page (as shown below). The backup images are parsed again, and report is re-populated.

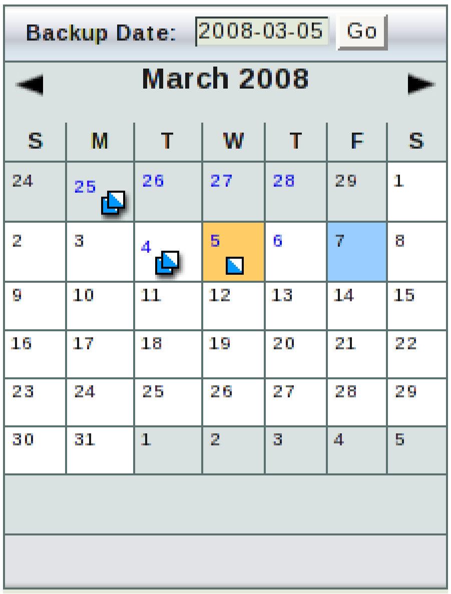


Last Full Backup: 2010-12-22 05:47:01 ✓

	Timestamp	Event	
□	2010-12-21 11:37:32	use to_inc/*!*/; /*!\C latin1 *//*!*/; insert into test values...	more
□	2010-12-21 11:37:38	insert into test values (2,'zmc-2') /*!*/;	more
□	2010-12-21 11:37:43	insert into test values (3,'zmc-3') /*!*/;	more
□	2010-12-21 11:37:49	insert into test values (4,'zmc-4') /*!*/;	more
□	2010-12-21 11:37:54	insert into test values (5,'zmc-5') /*!*/;	more

Figure 43. Database Events Report

Selecting Backup Date



Backup Date: 2008-03-05

March 2008

S	M	T	W	T	F	S
24	25	26	27	28	29	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

Figure 44. Backup Date

There are two methods for selecting a backup:

- You can click a backup icon on the calendar.
- You can enter the backup date (*mm/dd/yy[yy]*) at the top of the left panel and click ***Go*** to select a backup date.

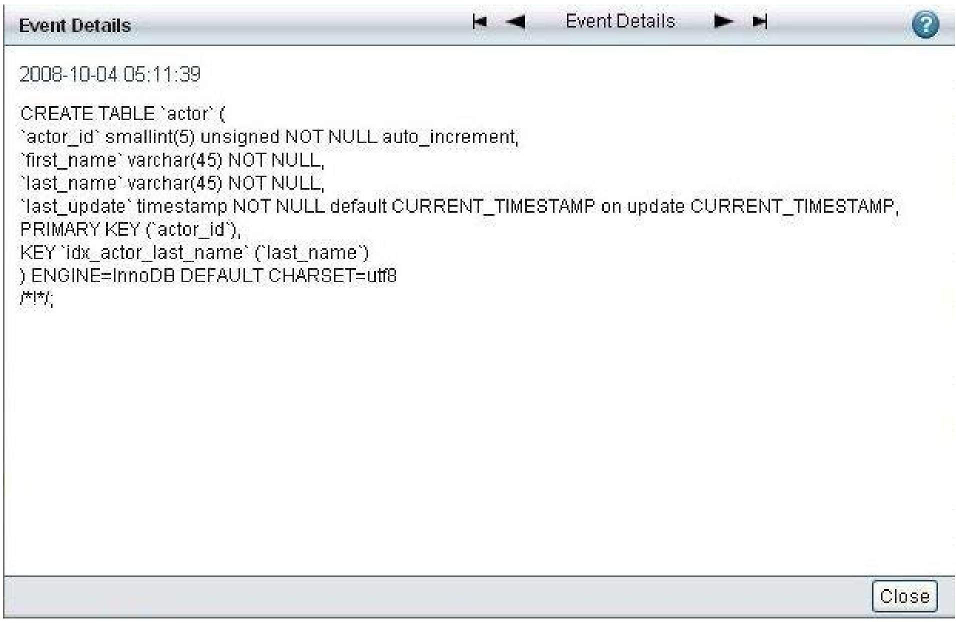
The calendar shows the dates on which full backup (level 0) and incremental backups (level 1) were performed. If the multiple backup runs happened on a calendar day, it is shown with a different icon. You can select any date that has full or incremental backups.

The binary logs in the backups are parsed and displayed in the database events window. When the user selects a backup date, the backups done on that date are parsed. You can use ***Parse Events*** button to parse the backup image again. Page refresh will not parse backups again.

Note: If no backup exists for the selected date, then no data is displayed. This does not necessarily mean that database event logs do not exist for that date; they may be available from a binary log that was backed up subsequently. In other words, the Database Events log includes all data from a given backup to the next backup that included logged events.

Database Event Viewer

After you have selected a backup that includes log data, the events viewer lists the events it contains in a summary list. You can click on the more link to get a complete description of the event as shown below.

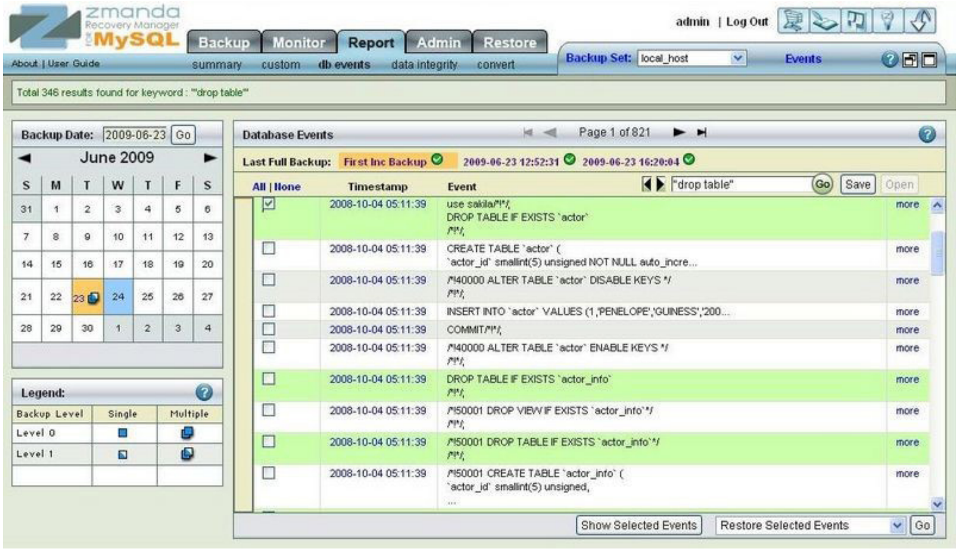


2008-10-04 05:11:39

```
CREATE TABLE `actor` (
`actor_id` smallint(5) unsigned NOT NULL auto_increment,
`first_name` varchar(45) NOT NULL,
`last_name` varchar(45) NOT NULL,
`last_update` timestamp NOT NULL default CURRENT_TIMESTAMP on update CURRENT_TIMESTAMP,
PRIMARY KEY (`actor_id`),
KEY `idx_actor_last_name` (`last_name`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8
/*!*/;
```

Figure 45. Event Details

Database Event Search



Backup Set: local_host

Total 346 results found for keyword : ""drop table""

Backup Date: 2009-06-23

June 2009

S	M	T	W	T	F	S
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	1	2	3	4

Legend:

Backup Level	Single	Multiple
Level 0		
Level 1		

Database Events — Page 1 of 821

Last Full Backup: First Inc Backup 2009-06-23 12:52:31 2009-06-23 16:20:04

Search: "drop table"

All | None	Timestamp	Event	
☑	2008-10-04 05:11:39	use sakila/*!*/; DROP TABLE IF EXISTS `actor` /*!*/;	more
□	2008-10-04 05:11:39	CREATE TABLE `actor` (`actor_id` smallint(5) unsigned NOT NULL auto_incre...	more
□	2008-10-04 05:11:39	/*!40000 ALTER TABLE `actor` DISABLE KEYS */ /*!*/;	more
□	2008-10-04 05:11:39	INSERT INTO `actor` VALUES (1,'PENELOPE','GUINESS','200...	more
□	2008-10-04 05:11:39	COMMIT/*!*/;	more
□	2008-10-04 05:11:39	/*!40000 ALTER TABLE `actor` ENABLE KEYS */ /*!*/;	more
□	2008-10-04 05:11:39	DROP TABLE IF EXISTS `actor_info` /*!*/;	more
□	2008-10-04 05:11:39	/*!50001 DROP VIEW IF EXISTS `actor_info`*/ /*!*/;	more
□	2008-10-04 05:11:39	/*!50001 DROP TABLE IF EXISTS `actor_info`*/ /*!*/;	more
□	2008-10-04 05:11:39	/*!50001 CREATE TABLE `actor_info` (`actor_id` smallint(5) unsigned, ...	more

Restore Selected Events

Figure 46. Database Event Search

You can enter a text string to search for specific database events. You can use MySQL fulltext search Boolean operators to further control the search. For example, you can quote entire phrases to find them, and use plus (+) operator to refine searches on individual words.

- + A leading plus sign indicates that this word must be present in each row that is returned.
- - A leading minus sign indicates that this word must not be present in any of the rows that are returned. You can use both + and - together
- * The asterisk serves as the truncation (or wildcard) operator. Unlike the other operators, it should be appended to the word to be affected. Words match if they begin with the word preceding the * operator.
- " A phrase that is enclosed within double quote ("''") characters matches only rows that contain the phrase literally, as it was typed. Search "open source backup" we will do the search for exactly that phrase only.

All the search results are selected. The search results are also highlighted. It is possible to use the left and right arrow buttons next to the search box to go from one search result to another. Search queries can be named and saved for future searches (Use the Save button next to the search box). Clicking the Open button next to the search box to use saved search queries. Saving search queries can help in performing the same queries on multiple backup sets or multiple backup dates.

Launching Restores from the Database Events Reports

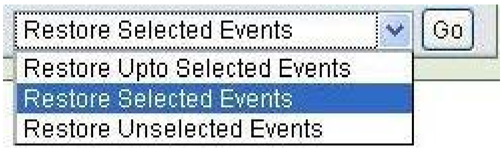
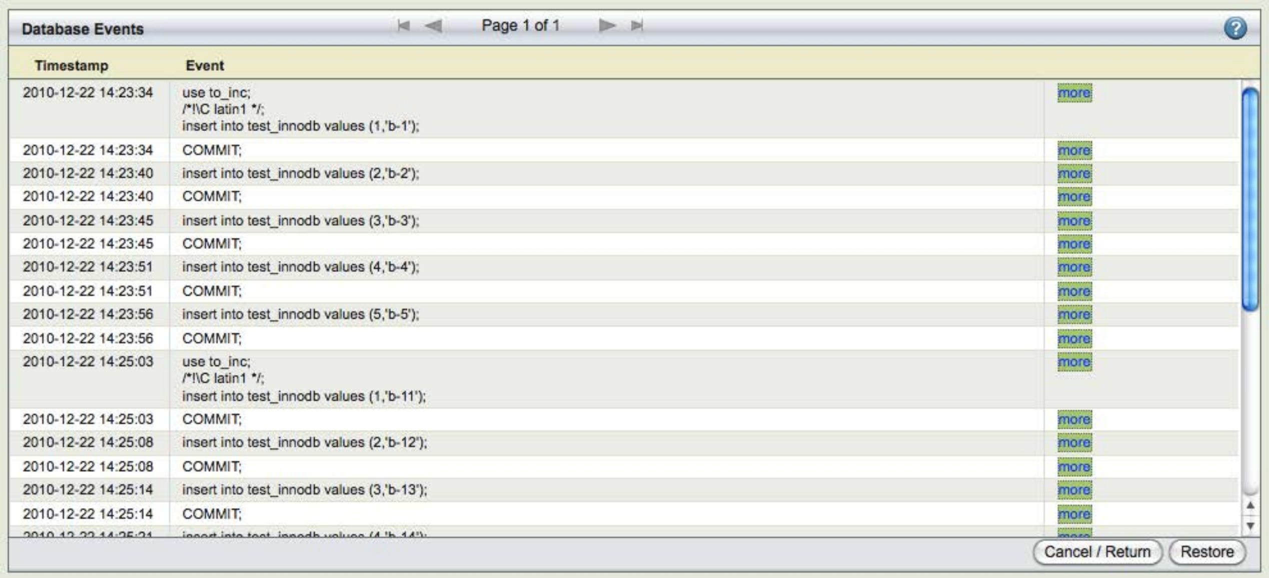


Figure 47. Database Events Reports

After selecting the event(s) using the checkbox next to each event, you can restore to a selected event (of course, only one event should be selected) or restore only the selected events or restore everything except the selected event (undo selected events). Multiple events can be selected for restoration or undo the effects of the selected events. Restoring to a selected event is equivalent of point-in-time recovery i.e., all database events starting from last full backup to the specified event are restored.



Timestamp	Event	

2010-12-22 14:23:34	use to_inc;
	/*!\C latin1 */;
	insert into test_innodb values (1,'b-1');
		more

2010-12-22 14:23:34	COMMIT;	more
2010-12-22 14:23:40	insert into test_innodb values (2,'b-2');	more
2010-12-22 14:23:40	COMMIT;	more
2010-12-22 14:23:45	insert into test_innodb values (3,'b-3');	more
2010-12-22 14:23:45	COMMIT;	more
2010-12-22 14:23:51	insert into test_innodb values (4,'b-4');	more
2010-12-22 14:23:51	COMMIT;	more
2010-12-22 14:23:56	insert into test_innodb values (5,'b-5');	more
2010-12-22 14:23:56	COMMIT;	more

2010-12-22 14:25:03	use to_inc;
	/*!\C latin1 */;
	insert into test_innodb values (1,'b-11');
		more

2010-12-22 14:25:03	COMMIT;	more
2010-12-22 14:25:08	insert into test_innodb values (2,'b-12');	more
2010-12-22 14:25:08	COMMIT;	more
2010-12-22 14:25:14	insert into test_innodb values (3,'b-13');	more
2010-12-22 14:25:14	COMMIT;	more
2010-12-22 14:25:21	insert into test_innodb values (4,'b-14');	more

Figure 48. Database Events

Show selected events button shows all the selected events on one page as shown above. This can be used to review selected events and confirm the restoration process. Clicking ***Go*** in the Database event report or ***Restore*** in the selected events page takes you to ***Restore What*** page to continue with the restoration process.

Selective restores should be performed carefully. Otherwise, there can be restoration failures or data loss. Few important points that the user must be aware of:

1. ZRM does not have the capability of verifying if the selected events for restoration or the undo operation makes sense from the database or the database application. It is up to the user confirm that the restoration of events will keep the database consistent from the application point of view and there will be loss of data.

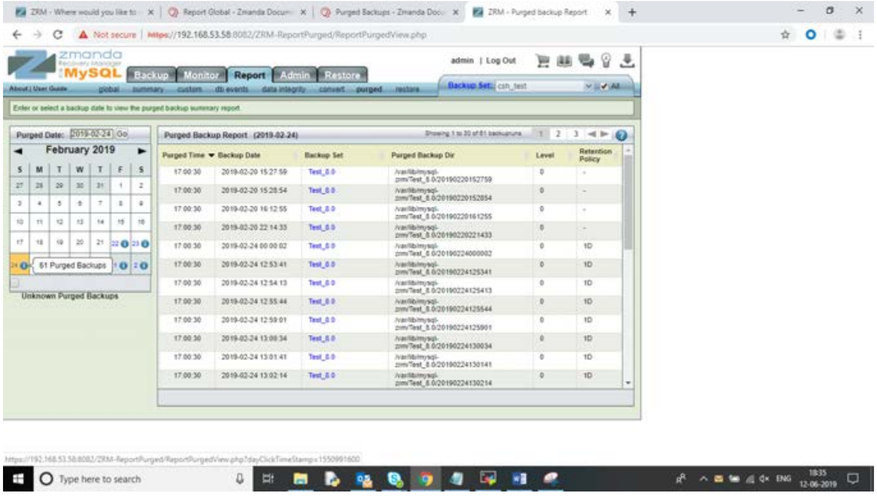
2. While performing a selective restore, database constraints should be met after selective restoration. Selective restore can fail due to database constraints.

3. The mysql user used for restoration (defined in ***Backup What*** page) should have privileges to perform the selected events being restored. The privileges should be granted to the user before attempting restoration.

4. Selective restoration depends on the time to be in sync between the ZRM server and MySQL server in case of remote MySQL servers. Otherwise, correct events may not be restored.

e) Purged Backups

This report page provides information about backup images who have been purged because they are no longer within the retention policy. This information can be used in case the ZRM is integrated with Netbackup or TSM or Network backup software. This will allow getting backup images that are stored in a different device (i.e., not under control of ZRM).



https://192.168.53.58:8082/ZRM-ReportPurged/ReportPurgedView.php

Backup Set: csh_test ✓ All

Enter or select a backup date to view the purged backup summary report.

Purged Date: 2019-02-24 Go

61 Purged Backups

Unknown Purged Backups

Purged Backup Report (2019-02-24) Showing 1 to 30 of 81 backupruns

Purged Time	Backup Date	Backup Set	Purged Backup Dir	Level	Retention Policy
17:00:30	2019-02-20 15:27:59	Test_8.0	/var/lib/mysql-zrm/Test_8.0/20190220152759	0	-
17:00:30	2019-02-20 15:28:54	Test_8.0	/var/lib/mysql-zrm/Test_8.0/20190220152854	0	-
17:00:30	2019-02-20 16:12:55	Test_8.0	/var/lib/mysql-zrm/Test_8.0/20190220161255	0	-
17:00:30	2019-02-20 22:14:33	Test_8.0	/var/lib/mysql-zrm/Test_8.0/20190220221433	0	-
17:00:30	2019-02-24 00:00:02	Test_8.0	/var/lib/mysql-zrm/Test_8.0/20190224000002	0	1D
17:00:30	2019-02-24 12:53:41	Test_8.0	/var/lib/mysql-zrm/Test_8.0/20190224125341	0	1D
17:00:30	2019-02-24 12:54:13	Test_8.0	/var/lib/mysql-zrm/Test_8.0/20190224125413	0	1D
17:00:30	2019-02-24 12:55:44	Test_8.0	/var/lib/mysql-zrm/Test_8.0/20190224125544	0	1D
17:00:30	2019-02-24 12:59:01	Test_8.0	/var/lib/mysql-zrm/Test_8.0/20190224125901	0	1D
17:00:30	2019-02-24 13:00:34	Test_8.0	/var/lib/mysql-zrm/Test_8.0/20190224130034	0	1D
17:00:30	2019-02-24 13:01:41	Test_8.0	/var/lib/mysql-zrm/Test_8.0/20190224130141	0	1D
17:00:30	2019-02-24 13:02:14	Test_8.0	/var/lib/mysql-zrm/Test_8.0/20190224130214	0	1D

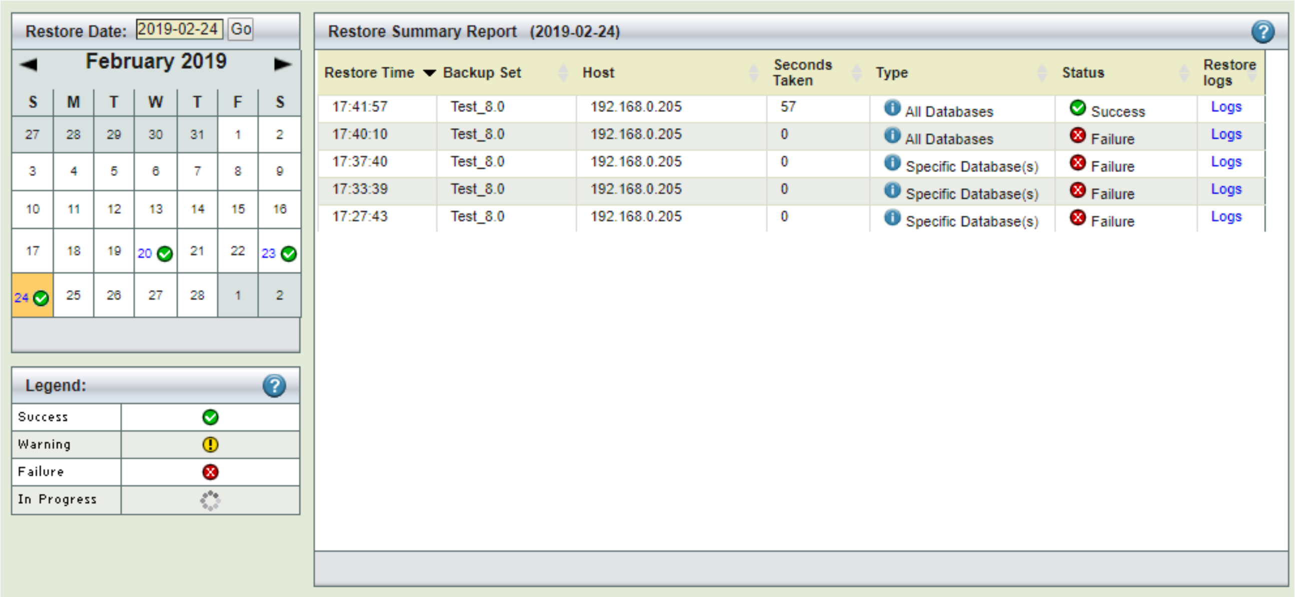
Figure 49. Purged Backup Reports

This report provides information about all backup sets (irrespective of which backup set is selected). It also provides information when the backup image was deleted on the selected date in the calendar. ***Backup Date*** is the backup image creation date i.e, time stamp of the backup run. The ***Purged Backup Dir*** is the location of the backup image from where it was removed. Retention Policy of the backup image and Backup level are also available.

f) Restores

Restore Summary Report

This report provides a summary of all restore operations performed across all backup sets (irrespective of which backup set has been selected).



Restore Date: 2019-02-24 Go

February 2019

S	M	T	W	T	F	S
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20 ✓	21	22	23 ✓
24 ✓	25	26	27	28	1	2

Legend:

Success	✓
Warning	!
Failure	✕
In Progress	◌

Restore Summary Report (2019-02-24)

Restore Time	Backup Set	Host	Seconds Taken	Type	Status	Restore logs
17:41:57	Test_8.0	192.168.0.205	57	All Databases	✓ Success	Logs
17:40:10	Test_8.0	192.168.0.205	0	All Databases	✕ Failure	Logs
17:37:40	Test_8.0	192.168.0.205	0	Specific Database(s)	✕ Failure	Logs
17:33:39	Test_8.0	192.168.0.205	0	Specific Database(s)	✕ Failure	Logs
17:27:43	Test_8.0	192.168.0.205	0	Specific Database(s)	✕ Failure	Logs

Figure 50. Restore Summary Report

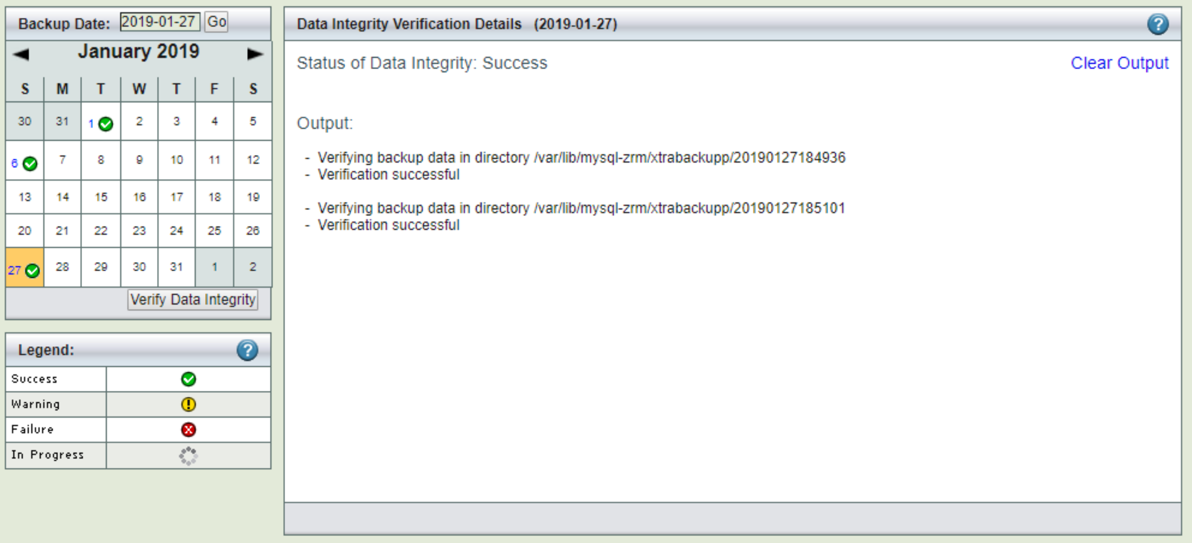
Select the date of restoration on the calendar. The *Restore Time* is the time when the restoration started. The *Host* is the MySQL server host to which databases/tables were restored to. *Seconds Taken* is the time taken in seconds to perform the restoration. The *Status* column shows the status of the restore operation. You can click on the *Logs* column to look at the restoration logs. You can find the details of restoration in the logs.

Only restores performed using the ZRM management interface are available on this page. Command line restores are not available in this report.

g) Data Integrity

Backup Image Integrity Report

The Data Integrity page provides a tool to query and confirm that the backed up data has not been altered since it was backed up. Verifying the integrity of data is important when you move a backup image from the hard disk to save space, and then move it back online in preparation for restoring it. In all circumstances, verifying the backup image is recommended before restoring databases from it.



Backup Date: 2019-01-27

Legend:	
Success	✓
Warning	!
Failure	✗
In Progress	○

Data Integrity Verification Details (2019-01-27)

Status of Data Integrity: Success

Output:

```
- Verifying backup data in directory /var/lib/mysql-zrm/xtrabackupp/20190127184936
- Verification successful

- Verifying backup data in directory /var/lib/mysql-zrm/xtrabackupp/20190127185101
- Verification successful
```

Figure 51. Report Data Integrity

- The left panel contains a Calendar Control that allows Users to navigate to the Backup Date when the backup took place.
- The right panel displays the status and results of the verification process.

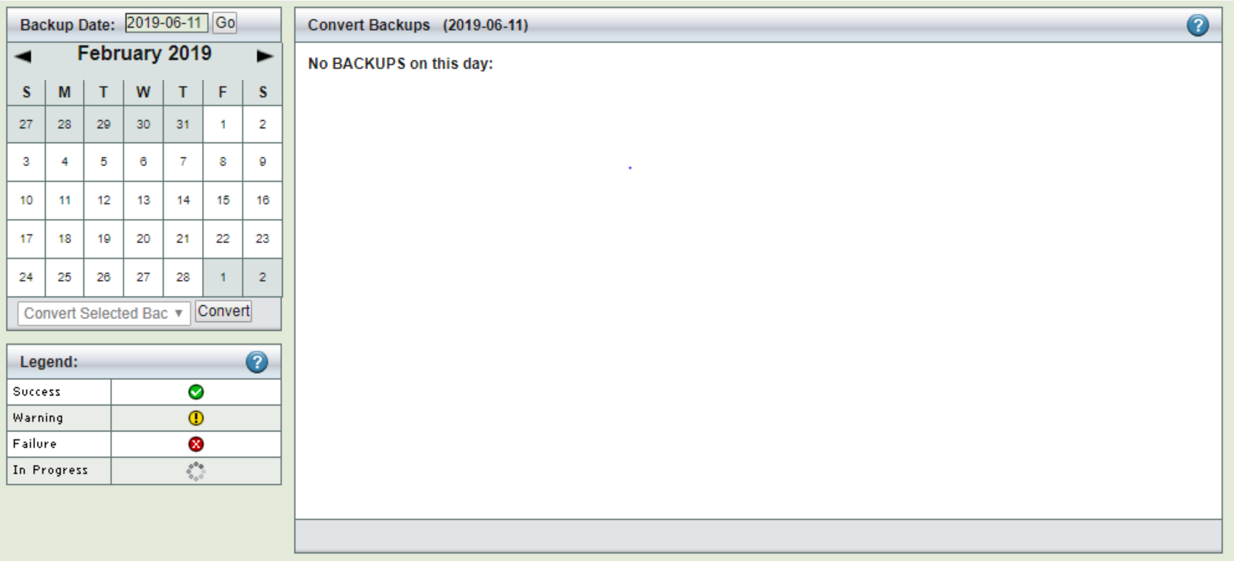
Clicking the ***Verify Data Integrity*** button starts the verification process. After you click the ***Verify Data Integrity*** button, the right panel shows the progress and result of the verification.

When you open the page, the Status panel displays a message 'No Task launched' until you click the ***Verify Data Integrity*** button. The message changes to ***Running*** after you click ***Verify Data Integrity***. The verification process assumes that the backed up data is present in the same directory where it was originally backed up. If the data is not present, the verification fails.

Note that Quick Snapshot backups involve no backup images (just snapshots), and therefore cannot be verified.

h) Converting quick backups to standard backups

This page displays any Quick (No-copy) backups that have been performed, allowing you to select and convert the quick snapshot to a standard ZRM backup stored on the ZRM server:



Backup Date: 2019-06-11 Go

◄ February 2019 ►

S	M	T	W	T	F	S
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	1	2

Convert Selected Bac ▾ Convert

Legend:

Success	✓
Warning	!
Failure	✗
In Progress	⟳

Convert Backups (2019-06-11)

No BACKUPS on this day:

Figure 52. Quick Backups

Quick snapshots and the reasons for converting them are described in Snapshots overview section. The *Convert* page is divided into two panels:

- The left panel contains a Calendar Control that let you select a backup by date and time to convert. Backups are displayed in the calendar as indicated by the legend. Quick full backups are only displayed.

- The right panel displays the results of the verification process.

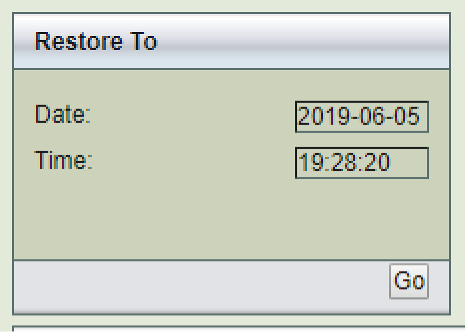
You can either enter the date (*mm/dd/yy[yy]*) and click *Convert*, or click on the backup icon in the calendar. When you click *Convert*, ZRM for MySQL begins converting the backup for that date.

Clicking the *Convert* button starts the conversion. Status is displayed as described below. Note that once a quick snapshot has been successfully converted, it is no longer available for selection in the calendar.

12. RESTORE

a) Restore What

This is the first step in the restoration process



Restore To

Date: 2019-06-05

Time: 19:28:20

Figure 53. Restoration Process

Restore To

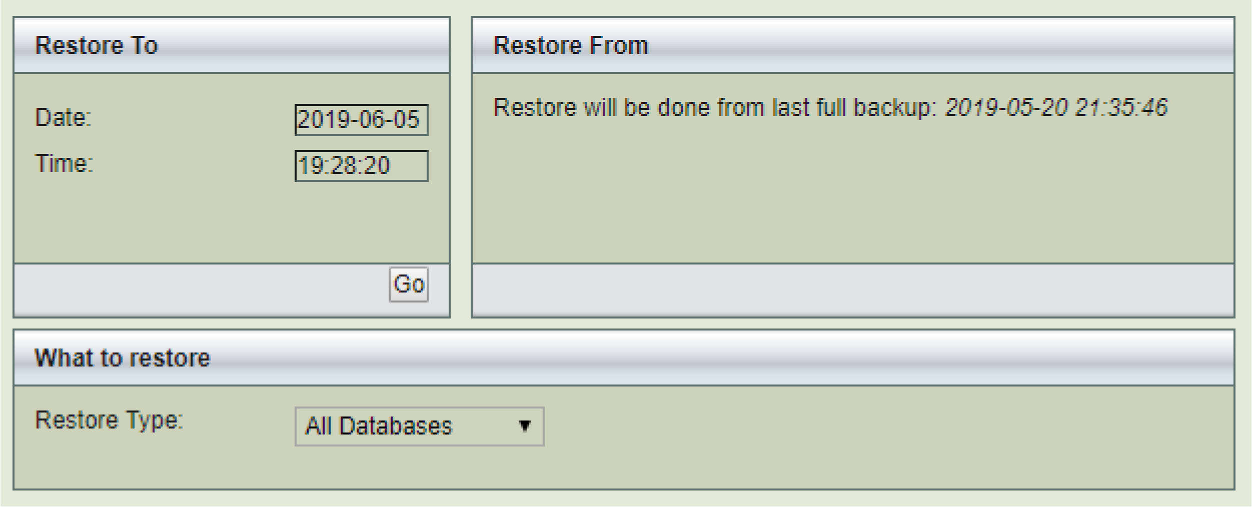
If you came to this page using one of the report links (which is recommended), the date and time would be filled in based on the link that you clicked to get to this page. Otherwise, enter a date and time to match the date and time you want the backup restored to.

Go

After you click Go, the ZMC validates your entry by looking for an existing backup and displays more options as appropriate. These options are described in the sections that follow.

Restore From

If users are restoring from *Full Backups* and no incremental backups exist, then the backup set just before the time entered will be used to restore the data.



Restore To

Date: 2019-06-05

Time: 19:28:20

Restore From

Restore will be done from last full backup: *2019-05-20 21:35:46*

What to restore

Restore Type: All Databases

Figure 54. Restoring from Full Backups

When ***incremental backups*** exist, ZMC for MySQL provides the ability to restore till the specified time. One of the more common reasons for a restore is to roll back the database to the point before a particular event (such as a mistake or malicious activity) damaged the database. In that case, you should use the Database Events viewer to launch the restore, and all of this information will be automatically prefilled on the ***Restore What*** page.

If the ***Restore from*** time is not specified, ZRM restores the most recent full backup and also looks at the subsequent incremental backup for transactions to restore to fulfill the user-specified ***Restore to*** time.

For example: A full backup was completed on Oct 8 at 16:17:29, and the next incremental backup occurred on Oct 8 at 18:00:00. If you specify a ***Restore to*** time of Oct 8, 16:17:29 and do not specify a "restore from" time, ZRM restores from the full backup dated Oct 8, 16:17:29 and all transactions that are present in the next incremental backup (Oct 8, 18:00:00) that occurred at Oct 8, 16:17:29.

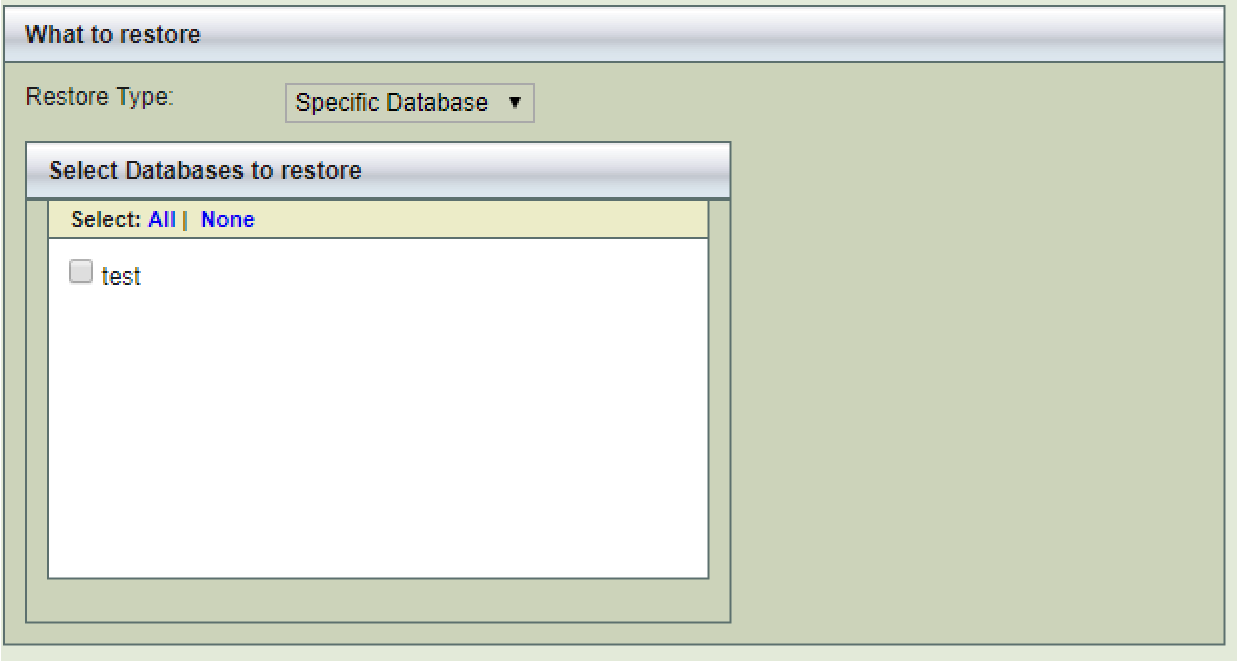
What to Restore

All Databases

When the default choice, ***All Databases*** is accepted, the GUI does not change any further. Note that in this context the term ***All Databases*** means all the databases that have been backed up as part of the current backup set; such a restore could be all databases, selected databases, or selected table(s).

Specific Database

Choose this option to display the list of databases backed up within the set.



What to restore

Restore Type: Specific Database

Select Databases to restore

□ test

Figure 55. Databases Backup

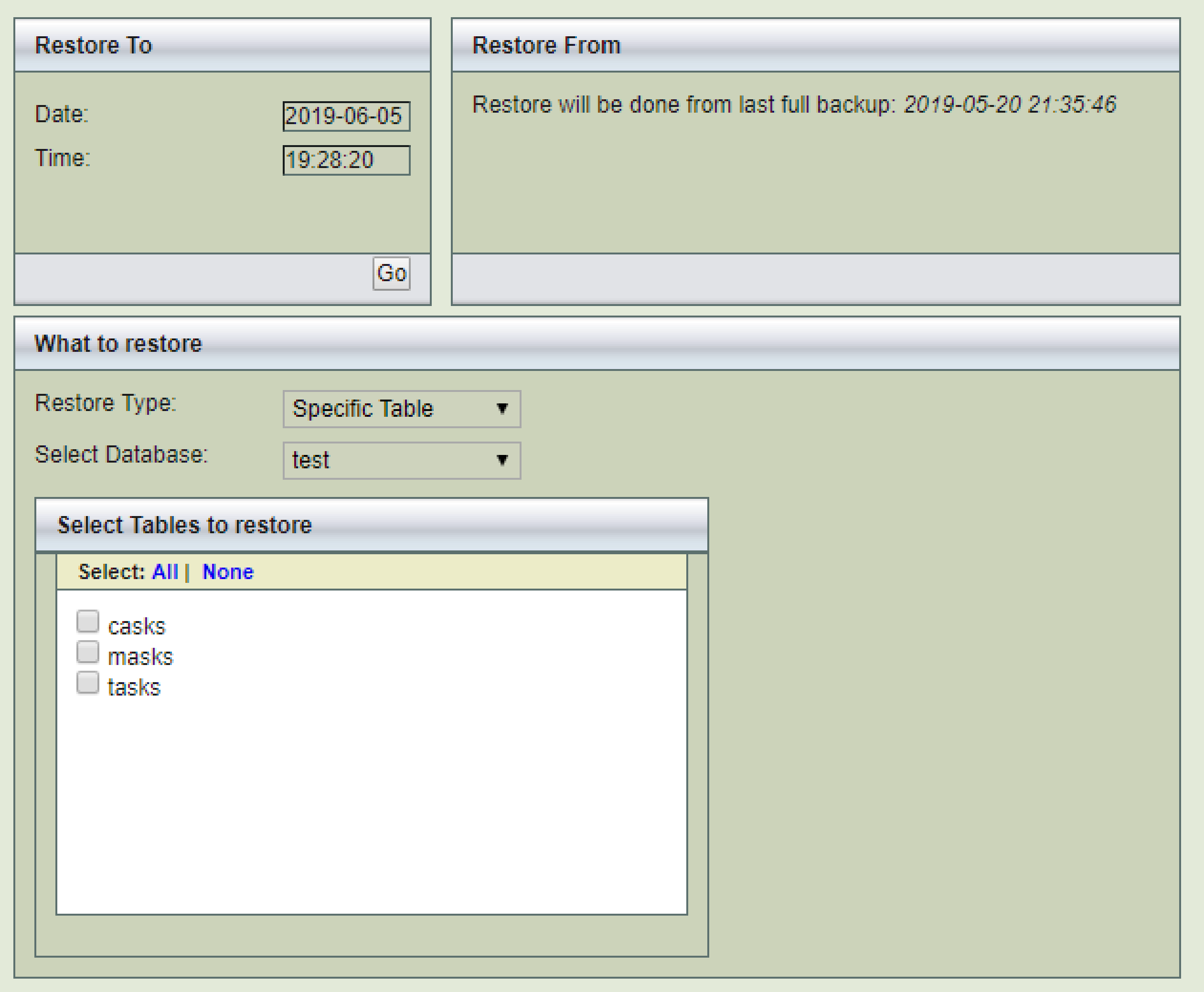
Specific Tables

This option of restoring specific tables from a database backup is available only for backups performed using logical or parallel logical or Xtrabackup tool.

If you have performed a logical or parallel logical backup, there are no restrictions.

If you have performed a backup using Xtrabackup tool, you can restore a table from a database backup to Percona MySQL server running XtraDB engine. For this functionality, InnoDB tables should be stored in separate data files i.e.,**innodb_file_per_table** must be specified in my.cnf MySQL configuration file during the backup and requires **innodb_expand_import** to be enabled on the destination Percona server running XtraDB engine. See Percona documentation for the requirements.

Restoration involves the importing the table to the Percona MySQL server and this step has to be performed manually. You can perform the import only to Percona MySQL server.



Restore To

Date: 2019-06-05

Time: 19:28:20

Restore From

Restore will be done from last full backup: *2019-05-20 21:35:46*

What to restore

Restore Type: Specific Table

Select Database: test

Select Tables to restore

Select: All | None

□ casks
□ masks
□ tasks

Figure 56. Specific Tables

The above figure shows ***customers*** table from the ***classic model's*** database has been selected for restoration. The Restore Type ***Specific Table*** will appear only for backups performed using Logical or Parallel logical or Xtrabackup tool.

You can select to restore a table from the backup images if you are backing certain backup methods. If you are using parallel logical backup using MyDumper command, you can restore a specific table. You can do specific table restoration from full backups done using Xtrabackup command. When you restore specific tables, stored procedures, views and triggers that are backed up will not be restored.

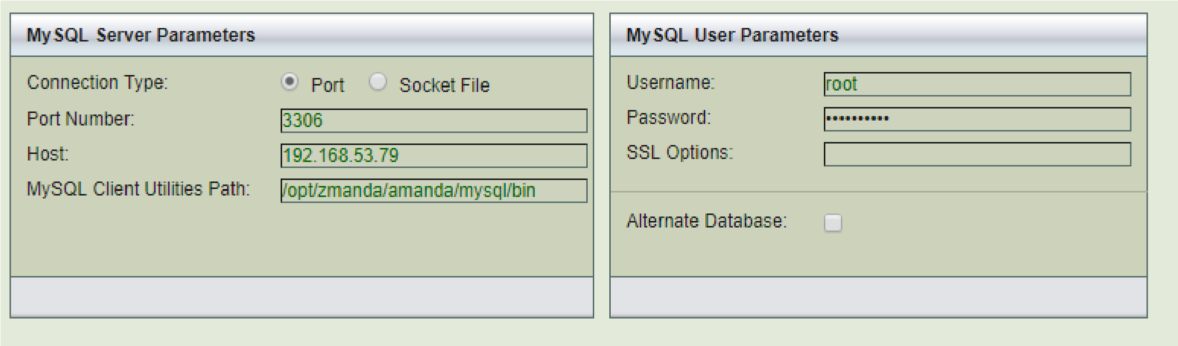
If you are performing table level restores of logical or parallel logical backups done using earlier releases of ZRM, you will have to run the following command as a mysql user on the ZRM server before restores can be performed.

```
$ /usr/bin/mysql-zrm-parse-sql --source-directory <backup image
directory> --update-table-list
```

Clicking *Next Step* button initiates an error checking routine, first checking that the *Go* button has been clicked first. If the *Go* button has not been clicked, you are prompted to do that. You must correct any errors displayed by clicking *Go* before you can proceed to the next step. If there are no problems, clicking *Next Step* takes you to the Restore Where page, with parameters in the Restore What page saved and transferred to Restore Restore page.

b) Restore Where

The *Restore Where* page lets you specify where the database is to be restored: either the original source or to some other machine (Database or Table name cannot be changed).



MySQL Server Parameters

Connection Type:	● Port ○ Socket File
Port Number:	3306
Host:	192.168.53.79
MySQL Client Utilities Path:	/opt/zmanda/amanda/mysql/bin

MySQL User Parameters

Username:	root
Password:	••••••••••
SSL Options:	
Alternate Database:	□

Figure 57. Restored Database

These are the same fields on the *Backup What* page MySQL Server Parameters panel describe here. As noted, you can fill them out to connect to the original database (in other words, with the same values used in the *Backup What* page), or fill them out to point to a different server. Click *Next Step* when you are done.

If you are restoring a database from logical or parallel logical backups, you can change the name of the database being restored. Please provide the name of the database in the *Alternate Database* field.

If you are restoring selected databases/ tables (especially with InnoDB storage engine) and have not used Xtrabackup as the backup method, do NOT restore to MySQL server that already has other InnoDB tables. MySQL server may not start after the restoration. You should restore to a temporary MySQL server or restore the complete backup set that was running on the original MySQL server. If you have used Xtrabackup as a backup method, you can restore InnoDB tables to a Percona MySQL server that already has other InnoDB tables.

If you are restoring backup images created using MySQL Enterprise Backup tool to a MySQL server, you must have the same data file configuration as the original MySQL server i.e, *innodb_data_file_path* and *innodb_data_home_dir* values must be identical to the original MySQL server.

EBS Snapshot Restore Parameters

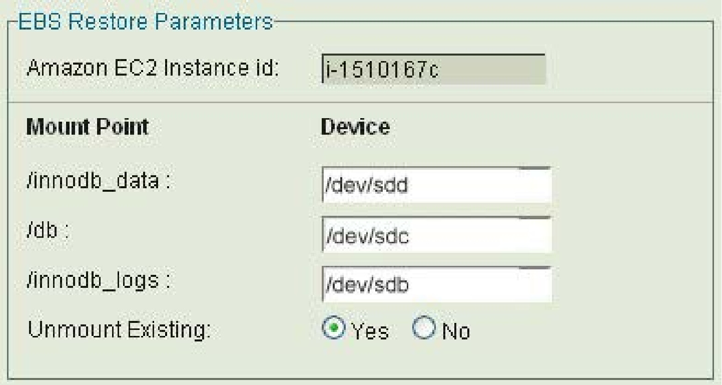
In addition to other restore parameters, restoration from Amazon Elastic Block Storage snapshot full backups requires the target Amazon EC2 instance id to where the snapshots are restored to. ZMC also provides an option to change device mapping from the original backup. *Device mapping* maps how the EBS volumes and mount points on the original Amazon EC2 instance which was backed up. For example: the mapping at the time of backup could be:

```
/innodb_data : /dev/sda
  /db : /dev/sdb
  /innodb_logs : /dev/sdd
```

It could be changed at the time of restoration on the restore target EC2 instance. ZRM remembers the original mapping as part of the backup image.

If you are changing the mount points at the time of restoration, you should provide next available device in lexicographic order. For example: If the system has **"/dev/sda,/dev/sdb,/dev/sdc"** devices, the customer must enter the next device name in lexicographic order - /dev/sdd. In newer kernels, the device names have **"xv"** prefix instead of **"s"** prefix. So, in newer kernels, if the system has devices attached as /dev/xvda, /dev/xvdb and /dev/xvdm, then you should enter **"/dev/xvdc"** since its available and is the next in lexicographic order.

The snapshots are restored and incremental backups are replayed on the target EC2 instance. If there are EBS volumes already mounted at the mount point, the restoration will fail. To prevent this, Check *Unmount Existing* to allow ZRM to unmount existing volumes before restoration of full backups.



EBS Restore Parameters

Amazon EC2 Instance id: i-1510167c

Mount Point	Device
/innodb_data :	/dev/sdd
/db :	/dev/sdc
/innodb_logs :	/dev/sdb

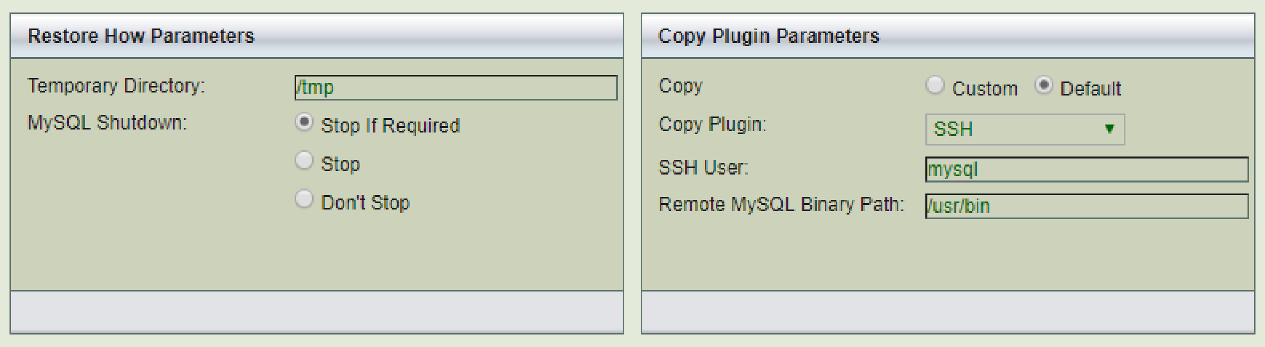
Unmount Existing: ● Yes ○ No

Figure 58. EBS Snapshot Restore Parameters

Above panel appears only when the backup being restored contains Amazon EBS snapshots.

c) Restore How

The *Restore How* lets you set some operational details for the restore. If you have set the global settings appropriately in the Site Settings page, you can just use the default values for the controls on this page.



Restore How Parameters

Temporary Directory: /tmp

MySQL Shutdown: ● Stop If Required ○ Stop ○ Don't Stop

Copy Plugin Parameters

Copy: ○ Custom ● Default

Copy Plugin: SSH

SSH User: mysql

Remote MySQL Binary Path: /usr/bin

Figure 59. Restore How Parameters

Temporary Directory

ZMC creates temporary files and directories during restore on the ZRM server or MySQL server depending on the backup method used. Disk space usage and default values of this parameter are discussed here.

MySQL Shutdown Options

The ‘MySQL Shutdown’ radio buttons let you specify whether the MySQL server should shut down during the restore process.

The options are:

- **Stop if Required** - MySQL server will be shut down only for Full raw backup restoration.
- **Stop** - MySQL server will be shut down before files are restored. MySQL server will not be shut down in case of full logical backup restoration and incremental log backup restoration.
- **Don't stop** - MySQL server will not be shut down. This option is not recommended for full raw backup restoration.

Restore Replication Files

Set this parameter if you are restoring a backup taken from one replication slave to another MySQL server to create a new slave. You can set the parameter to restore all files (master.info, relay-bin.log files, SQL_LOAD*) or restore only master.info file or none of the replication files.

The relay-bin.log are not restored when incremental backups are restored. When the replication is restarted, the slave will start replicating from the full backup timestamp from the master. You can replay the replication logs to the time of incremental backup by running the following commands from the master server:

```
mysqlbinlog <backup-directory>/slave-log | mysql -h <slave-machine>
```

Copy Plugin Parameters

If performing a restore to a remote MySQL server, specify the mechanism used to transfer files between the local ZMC server and the remote MySQL server. The recommended location for plugins is the /*usr/share/mysql-zrm/plugins* directory.

Copy Option

Lets you select whether to use a Copy Plugin during the restore process. Set the 'Copy' radio button to **Yes** to opt for the Copy plugin. If the 'No' option of Copy is selected, then the rest of the input boxes in the panel can be ignored.

SSH

This plugin uses the Secure Shell protocol to transfer files between the MySQL server and the ZRM server. Since SSH is being used, the data transfer is secure. Unless you have set up SSH keys for the MySQL restore user, you will be prompted for a password when restoring from the backup set.

SSH User

SSH user name

Remote MySQL Binary path

Specify the path on the remote MySQL server under either of the two options.

Socket

The socket based plugin is called **socket-copy.pl**. The socket copy plugin requires MySQL ZRM socket server package to be installed on all MySQL servers. The socket-server package installs **xinetd/inetd** socket server service and restarts **xinetd/inetd**.

The socket copy plugin uses the TCP protocol to transfer data between the MySQL server the ZRM server. It uses port 25300 by default on the MySQL server. You can change the port using the field displayed after you select the socket copy plugin.

Socket Remote Port

Enter the port you wish to use.
Remote MySQL Binary Path
Specify the path on the remote MySQL server where the MySQL binary commands are installed.

Windows

The Windows copy plugin is required for restoring any Windows-based MySQL server. It requires the ZRM for MySQL Windows client components described in [the Installation Instructions](). You must then enter the communications ports to use during restore (default is **10081**) operations, and the retry count.

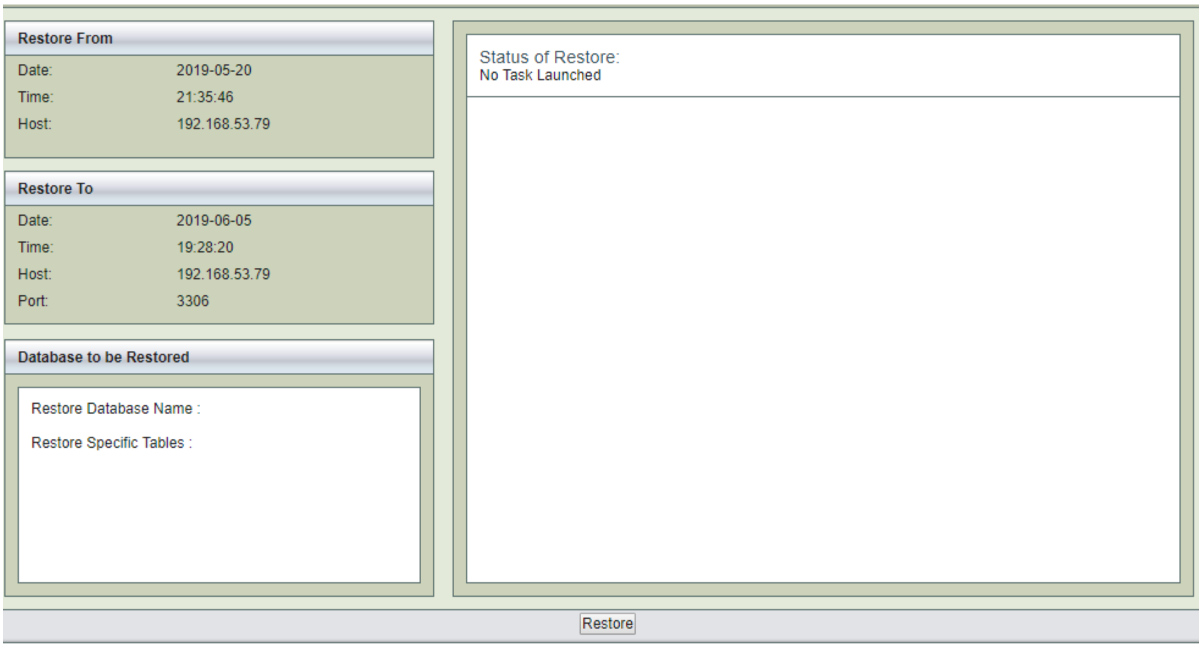
The retry count specifies the number of times ZRM will attempt to restore a raw backup in case shutting down the MySQL server takes more time than expected. Hence ZRM will only attempt to retry for the restore of the very first file that is attempted to be restored. The default value is 2.

Clicking the *Next Step* button at the bottom takes you to the *Run Restore* page.

d) Run Restore Process

Run Restore

The *Run Restore* ppage lets you launch and monitor the restore process that has been selected in the previous dialogs.



Restore From	
Date:	2019-05-20
Time:	21:35:46
Host:	192.168.53.79

Restore To	
Date:	2019-06-05
Time:	19:28:20
Host:	192.168.53.79
Port:	3306

Database to be Restored

Restore Database Name :

Restore Specific Tables :

Status of Restore:
No Task Launched

Figure 60. Run Restore Page

The three panels on the left side (*Restore From*, *Restore To*, and *Database to be Restored*) of the page contain the data previously gathered. Note the **Restore To** host is displayed only if it differs from the *Restore From* host.

The restore process uses disk space under the temporary directory configured in the Backup Where page. The amount of disk space required depends on the number of backup images required for restoration and the backup method used.

Restores can take a long time if the database is large. The status of the restore process is shown in the right-hand panel. The restore process can be canceled using the *Cancel* link that appears in the right-hand pane. ZRM will cancel the restore process only when it is safe to do so (i.e., will not cause data corruption or loss of data).

Restore task can be canceled:

1. Before the restore process starts
2. When waiting for user input
3. Between restoration of images i.e., between full backup restoration and incremental backup restoration and between incremental backup restorations.

Only the process running on the ZRM server are stopped during cancellation. All processes on the MySQL server may have to be stopped manually.

After restoration, it is important to check the database(s)/table(s) that were restored. SQL command CHECK TABLE can be used for consistency checking. Use of EXTENDED option is recommended. EXTENDED option does a full key lookup for all rows in the table and will take significant time for a large database.

```
mysql> CHECK TABLE <table1>, <table2> EXTENDED;
```

No other application can be using the database during table consistency check.

When you are restoring databases with InnoDB tables to a MySQL server that already has InnoDB tables, the common InnoDB files are overwritten (ib_data and ib_logfile*). ZRM displays a warning message :

```
Backup directory contains InnoDB data and InnodDB log files, During
the
restore process these files will be overwritten on target MySQL
server. You may
loose the existing data from the MySQL server. Are you sure you want
to continue the Restore?
```

It is important to make sure that there are no InnoDB tables in the MySQL server being restored to. Please see restoration of InnoDB tables section below for an alternative.

Restoring to a MySQL Replication Slave

This procedure can be used to instantiate a MySQL slave.

You need to follow the procedure from the MySQL manual on how to set up replication. Instead of steps 3 and 5, you can use ZRM backups of the master server to restore the data to the slave server in step 5.

After restoring data to the replication slave either from backup images of MySQL master or another MySQL replication slave, you need to set up configure master server information on the slave.

Perform MySQL CHANGE MASTER TO command on the replication slave as shown below

```
mysql> CHANGE MASTER TO
    ->     MASTER_HOST=’replication_master_host_name’,
    ->     MASTER_USER=’replication_user_name’,
    ->     MASTER_PASSWORD=’replication_password’,
    ->      MASTER_LOG_FILE=’value from next-binlog parameter from
ZRM reports’,
    ->     MASTER_LOG_POS=0;
```

MASTER_LOG_FILE

This value can be obtained from ZRM reports for the backup that was restored. Use ZRM Custom Reports page and look at Next BinLog parameter for the backup run.

MASTER_LOG_POS

The master-log-position will be zero because logs are rotated when backups are performed.

Restoring a Table from a Database Backup

If you have performed a backup using Xtrabackup, you can restore one or more InnoDB table(s) from a database backup. You should select the tables for restoration in the ***Restore Where*** page. ZRM restore process exports the InnoDB tables.

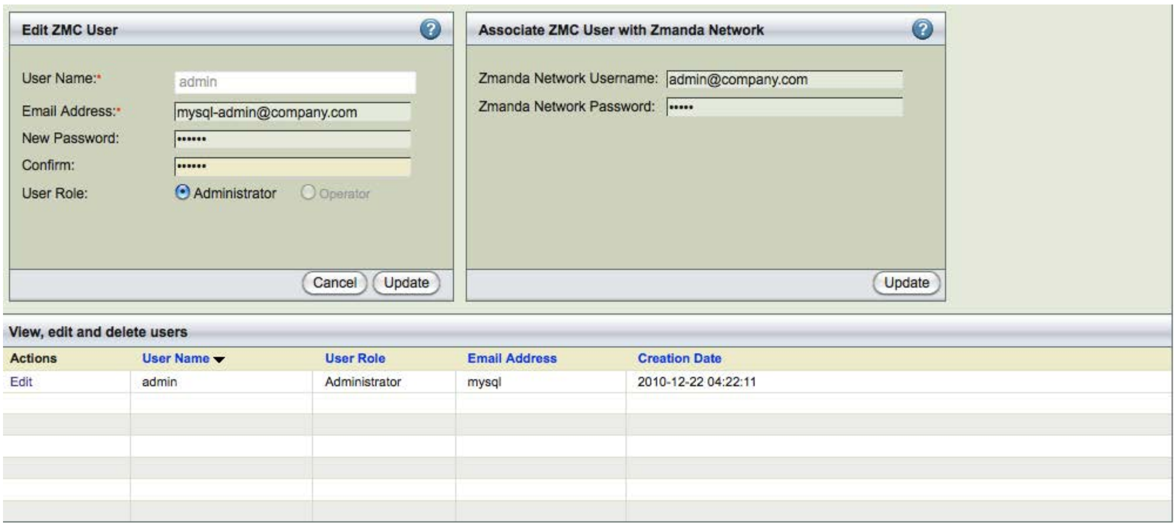
The exported InnoDB tables will have to be manually imported into Percona MySQL server. These steps will have to be performed manually and are documented in the Percona manual (version 5.5). A similar feature is available for MySQL 5.6.

13. ADMINISTRATION

a) User Management

ZMC User Administration

The *Admin Users* provides a convenient way to create, edit, view, and delete ZRM for MySQL users. It also lets you register ZMC users with the Zmanda Network. Please take the time to register users with the Zmanda Network; registration is required for accessing the Zmanda Network Knowledgebase from within the Zmanda Management Console.



Edit ZMC User

User Name:* admin
Email Address:* mysql-admin@company.com
New Password: ••••••
Confirm: ••••••
User Role: ● Administrator ○ Operator

Associate ZMC User with Zmanda Network

Zmanda Network Username: admin@company.com
Zmanda Network Password: •••••

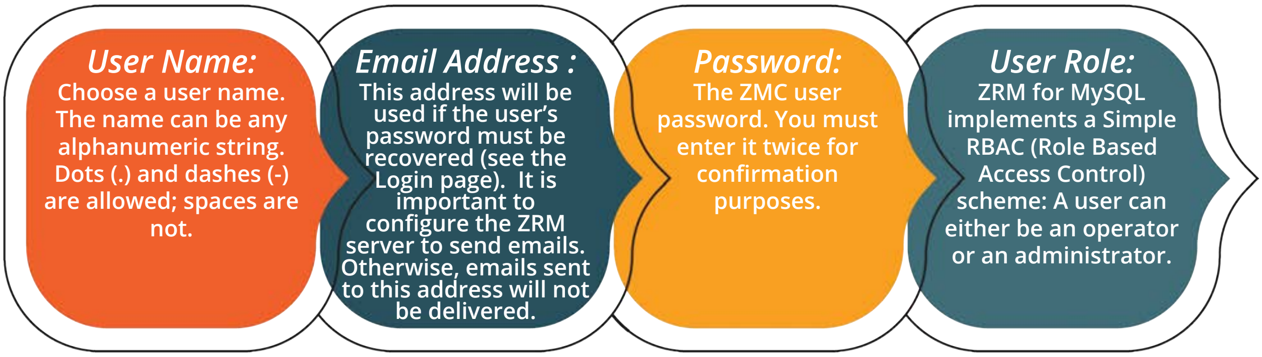
View, edit and delete users

Actions	User Name	User Role	Email Address	Creation Date
Edit	admin	Administrator	mysql	2010-12-22 04:22:11

Figure 61. ZMC User Administration

ZMC User

The default username is *Admin,* with a password of *admin*. You should change this upon the first login. ZMC users are not linked to LDAP or Active Directory services.



User Name:
Choose a user name. The name can be any alphanumeric string. Dots (.) and dashes (-) are allowed; spaces are not.

Email Address :
This address will be used if the user's password must be recovered (see the Login page). It is important to configure the ZRM server to send emails. Otherwise, emails sent to this address will not be delivered.

Password:
The ZMC user password. You must enter it twice for confirmation purposes.

User Role:
ZRM for MySQL implements a Simple RBAC (Role Based Access Control) scheme: A user can either be an operator or an administrator.

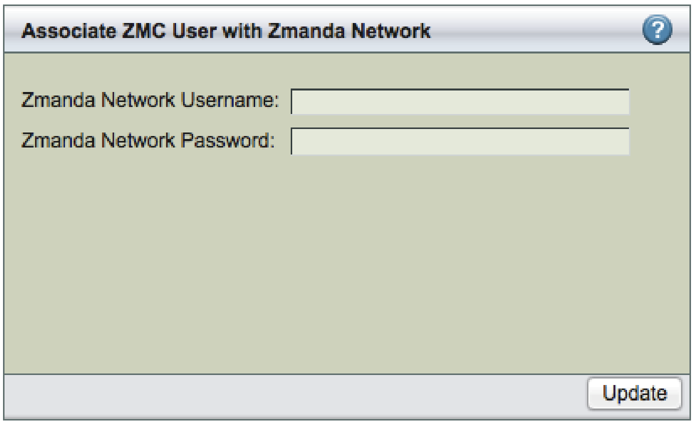
An administrator can:

- Create backup sets and assign their ownership to anyone in the system.
- Edit or delete backup sets owned by any other user in the system.
- See all events and all alerts.

An operator can:

- Create backup sets owned by that operator.
- Edit or delete backup sets owned by that operator.
- See all alerts, but only the events attached to the backup set owned by that operator.

Associating with Zmanda Network



Associate ZMC User with Zmanda Network

Zmanda Network Username:

Zmanda Network Password:

Figure 62. Associating with Zmanda Network

Zmanda Network Username and Password

These fields let you associate the ZMC user with an existing Zmanda Network login ID. Enter the username (i.e., the email address) and password that were provided during Zmanda network registration. Click the *Add* button to validate the Zmanda network log in details. If the login credentials are correct (i.e., they match those in the Zmanda Network), the change is updated on the ZMC user list.

Editing/Deleting ZMC User

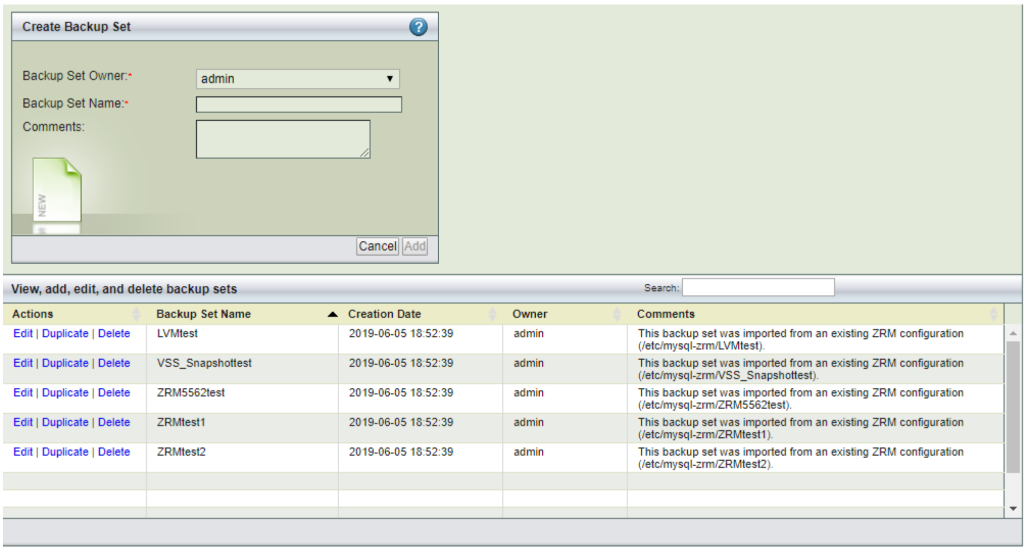
To edit or delete an existing user, click either the *Edit* or *Delete* link next to that user. When you click *Edit*, the contents of the row are displayed in the fields above for editing.

All Users can edit their own password and email address; only users with administrator privileges can edit or delete another user's account.

b) Backup Sets

Managing Backup Sets

The main functionality of the *Admin Backup Sets* page is to create, edit, delete backup sets. It also provides a way to duplicate backup set configurations.



Create Backup Set

Backup Set Owner:* admin

Backup Set Name:*

Comments:

Cancel | Add

View, add, edit, and delete backup sets

Search:

Actions	Backup Set Name	Creation Date	Owner	Comments
Edit | Duplicate | Delete	LVMtest	2019-06-05 18:52:39	admin	This backup set was imported from an existing ZRM configuration (/etc/mysql-zrm/LVMtest).
Edit | Duplicate | Delete	VSS_Snapshottest	2019-06-05 18:52:39	admin	This backup set was imported from an existing ZRM configuration (/etc/mysql-zrm/VSS_Snapshottest).
Edit | Duplicate | Delete	ZRM5562test	2019-06-05 18:52:39	admin	This backup set was imported from an existing ZRM configuration (/etc/mysql-zrm/ZRM5562test).
Edit | Duplicate | Delete	ZRMtest1	2019-06-05 18:52:39	admin	This backup set was imported from an existing ZRM configuration (/etc/mysql-zrm/ZRMtest1).
Edit | Duplicate | Delete	ZRMtest2	2019-06-05 18:52:39	admin	This backup set was imported from an existing ZRM configuration (/etc/mysql-zrm/ZRMtest2).

Figure 63. Admin Backup Sets

- The top panel, Create *Backup Set and Comments*, lets you create backup sets along with comments.
- The bottom panel, *View, Duplicate, Edit and Delete backup sets*, lets you manage backup sets.

Backup Set Creation

BACKUP SET OWNER

Specify which ZMC user owns the backup set. By default, the owner is the user who created the backup set. All users can transfer their ownership to another user by editing the backup set and clicking the *Update* button.

Specify a unique and descriptive name for the backup set. The name can include any alphanumeric characters, along with periods and dashes (as long as they are surrounded by alphanumerics; for example, *admin-backup* is allowed, whereas *admin--backup* is not). Spaces are not allowed.

BACKUP SET NAME

COMMENTS

Enter an optional comment that describes the purpose of the backup set.

Click *Save* to create the backup set. After it has been saved, it will be added to the list of backup sets. Other than name and comments, it will inherit all of its settings and options from the *Site Settings* page. Note that if the backup set list consists of multiple pages, you will have to page to the end of the list to see the new backup set.

Modifying Backup Sets

The Duplicate, Edit and Delete links let you manage the backup set list. Click on the appropriate link to the left of the backup set to perform the operation.

Duplicate a Backup Set:

Adds a duplicate copy of the given backup set to the bottom of the list. This allows you to create a backup set that inherits its properties from the source backup set rather than the **Set Site Defaults** page. Duplicate sets are named after the original, with the **_copy** suffix appended. Edit the backup set as necessary to meet your requirements.

Edit Backup Set:

Click to edit the given backup set.

Delete Backup Set:

Removes the given backup set (and all its settings) from the ZMC. The ZMC will prompt for confirmation; proceed with caution as there is no way to undo the deletion. If you attempt to delete a backup set that is active (i.e., selected from the **Backup Set** dropdown at the top right of the page), the ZMC will take you to the **Create a New Backup Set** page after confirmation, otherwise you will remain on the **Admin Backup Sets** page. Note that deleting a backup set does not effect backups already completed using that set or the backup images.

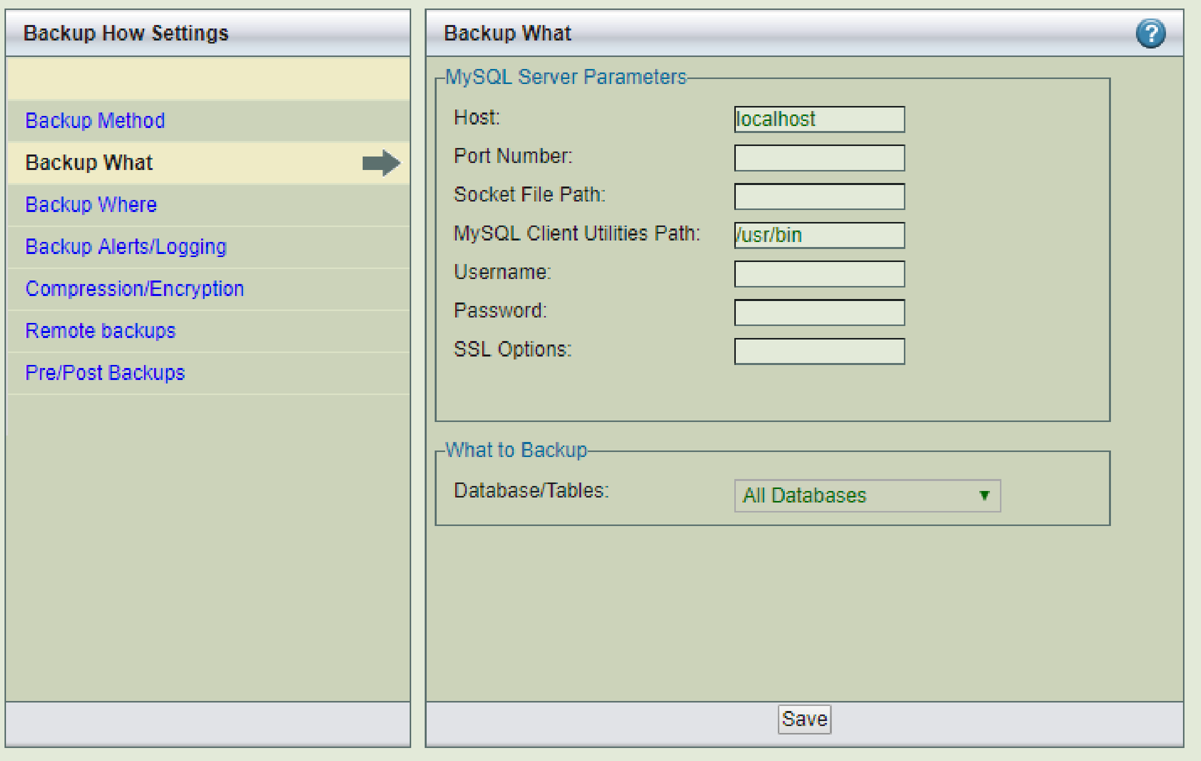
c) Set Site Defaults

The *Set Site Defaults* specifies the global default values for backup sets. Setting the appropriate defaults for your site will make backup set configuration much easier. Changes set here take effect when the next backup run is executed.

If you have multiple MySQL servers backed up by ZRM, you should store all parameters common to all MySQL servers as site defaults. These values are inherited by all backup sets. You can configure MySQL server specific information such as the IP address of MySQL server in the backup set configuration.

Backup Summary provides information about the configuration parameter value and where it was set - *Factory Settings* (ZRM default value), *Site Defaults* (Set in Set Site Defaults page) and Backup Set (Set in Backup What/Where/When/How pages).

The values can be modified by the *Administrator* user



MySQL Server Parameters

Host: localhost

Port Number:

Socket File Path:

MySQL Client Utilities Path: /usr/bin

Username:

Password:

SSL Options:

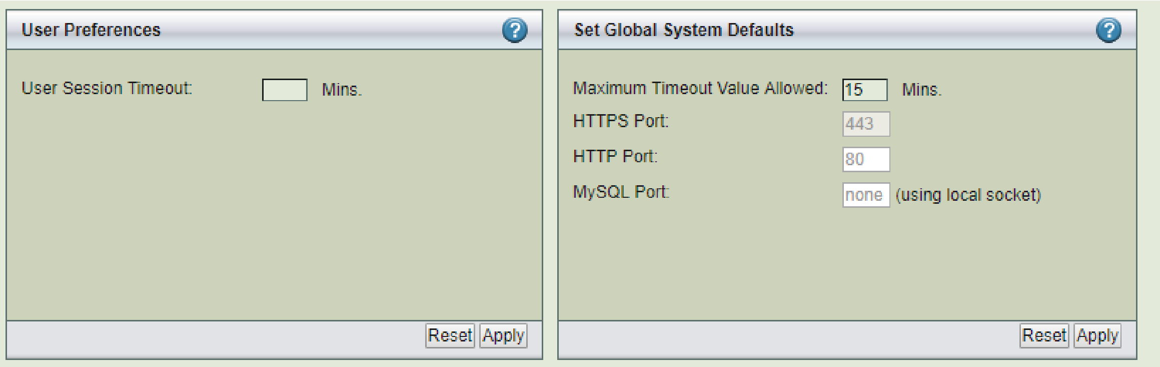
What to Backup

Database/Tables: All Databases ▾

Figure 64. Set Site Defaults

d) Preferences

Admin Preferences



User Preferences

User Session Timeout: Mins.

Set Global System Defaults

Maximum Timeout Value Allowed: 15 Mins.

HTTPS Port: 443

HTTP Port: 80

MySQL Port: none (using local socket)

Figure 65. Admin Preferences

The *Admin Preferences* page lets you set the user and session timeouts and look at the ports used by ZMC Apache processes and MySQL processes.

User Session Timeout

Set the number of minutes you (i.e., the user who is logged in to ZMC) is allowed to stay logged in with no activity. The default is **0**, which allows the user to stay logged in the maximum number of minutes allowed by the **Session Timeout** setting (described below). The user session timeout cannot exceed the session timeout.

Maximum Timeout Allowed

Set the number of minutes any user is allowed to stay logged into the ZMC. The default is 15 minutes, with a maximum of 300 minutes allowed. The setting takes effect upon the next login. A long session timeout value (for example, over an hour) can have security implications, so exercise caution in setting the value too high.

HTTP, HTTPS port

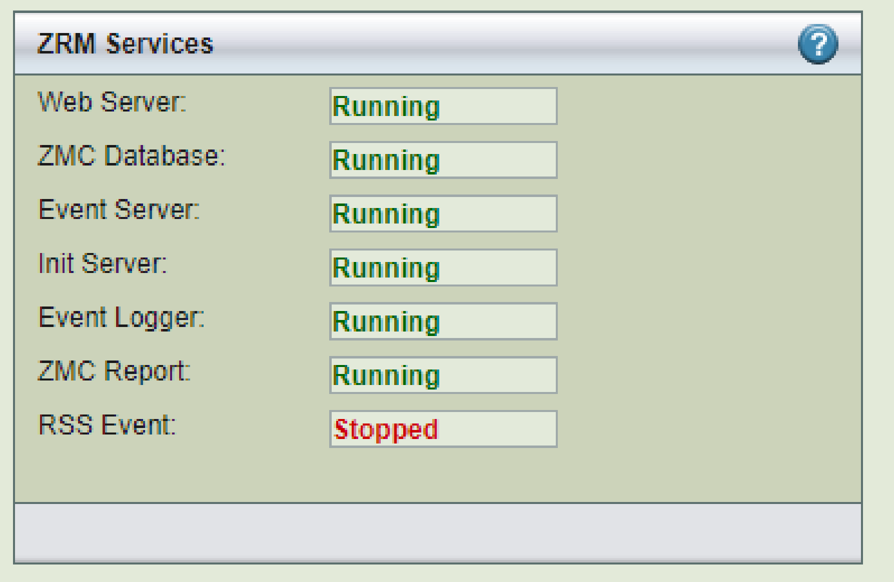
Ports used by Apache web server. This is a display field. To change the value, please see the Zmanda Network Knowledge Base how-to article.

MySQL Port

ZMC MySQL services do not accept requests from TCP/IP port. All communication is done using a local socket file.

e) Services

ZMC Services Status



ZRM Services

Web Server:	Running
ZMC Database:	Running
Event Server:	Running
Init Server:	Running
Event Logger:	Running
ZMC Report:	Running
RSS Event:	Stopped

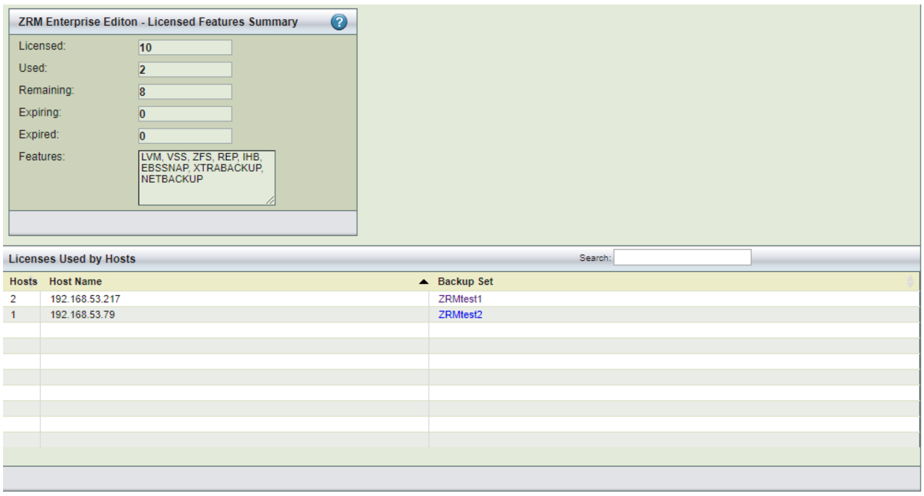
Figure 66. ZMC Services

The *Admin Services* page shows the status of all ZMC processes. There are multiple components of the Zmanda Management Console. All components have to be in *running* state for Zmanda Management Console to function correctly. The **"running"** state does not imply that they are consuming CPU/Memory resources. It implies they are waiting for requests.

f) Licenses

ZRM License Status

ZRM Enterprise product is a licensed product. The license file can be downloaded from Zmanda Network. The license file should be stored in the ZRM server. This page (shown below) shows the licensed quantities, subscription time, and how they are used.



ZRM Enterprise Editon - Licensed Features Summary

Licensed: 10

Used: 2

Remaining: 8

Expiring: 0

Expired: 0

Features: LVM, VSS, ZFS, REP, IHB, EBSSNAP, XTRABACKUP, NETBACKUP

Licenses Used by Hosts

Search:

Hosts	Host Name	Backup Set
2	192.168.53.217	ZRMtest1
1	192.168.53.79	ZRMtest2

Figure 67. ZRM License Status

The *Licensed Features Summary* panel shows the features that are licensed. All features and MySQL servers Hosts are licensed for the subscription period.

Licensed

The number of MySQL servers (IP addresses) that can be backed up by this ZRM server that have a valid subscription.

Used

The number of MySQL server licenses used by backup sets.

Remaining

The number of MySQL server licenses unused.

Expiring

The number of MySQL server licenses expiring in the next 30 days.

Remaining

The number of MySQL server licenses unused.

Expired

The number of MySQL server licenses that have expired.

Features

The list of licensed snapshot features.

Licenses Used by Hosts table shows the list of MySQL server Hosts, their IP addresses and the backup sets that configured for the MySQL server.

14. SUPPORT TOOLS

Using the Zmanda Troubleshooting Scripts

Licensed users can collect and send troubleshooting information directly to the Zmanda Support Team using convenient scripts located on ZRM servers and Windows clients.

Running the Support Script on the ZRM server

ZMC includes a support script that gathers various logs helpful for troubleshooting. It includes options for mailing the logs to the Zmanda Support Team (e-mail must be configured and running on the ZRM server).

To start the script, log in as root and run the following commands:

```
# cd /opt/zmanda/zrm/bin
# ./zm-support
```

This generates an archive of all the log files in the current directory. The automatically-generated file name will be displayed at the end of zm-support run:

```
...

/opt/zmc/logs/zmc_gui_debug.log
/opt/zmc/logs/zmc_gui_errors.log
/opt/zmc/logs/zmc_installer_16904.log
/opt/zmc/logs/zmc_server.log
/opt/zmc/mysql/data/mysqld.log
/opt/zmc/apache2/logs/access_log
/opt/zmc/apache2/logs/error_log
/opt/zmc/apache2/logs/httpd.pid
/opt/zmc/apache2/logs/NOTEMPTY

Please send this log file -> zm-logs-ZmandaNetworkAccountID-LogID.
tar.g
```

You can email the file using your regular e-mail mechanism.

Alternatively, use *zm-support --ship-to-zmanda* to send the logs, assuming e-mail is configured on the Amanda server.

zm-support Options

The --help option generates a usage message. Options are detailed below.

--config ConfigFile1 [, ConfigFile2...]

Specifies configuration files to include in the archive. By default, all configuration files are archived.

--skip-config ConfigFile1 [, ConfigFile2...]

Same as above, except this specifies configurations to exclude.

--no-zmc

Excludes ZMC and related information from the archive.

--no-amanda

Excludes Amanda and related information from the archive.

--no-mysql-dump

Excludes the ZMC *mysql* database from the archive.

--no-mysql-zrm

Excludes the ZMC *mysql-zrm* log files from the archive.

--no-var-log-messages

Excludes the /*var/log/messages* file from the archive.

-f or --ftp-to-zmanda

Automatically transfer the archive to Zmanda Support using *ftp*.

-ship

Automatically mails the archive to Zmanda Support.

--no-tar

Rather than creating an archive, create a system information file (*system-info-timestamp*) in the current directory, and list the configurations and logs that should be examined or sent to Zmanda Support.

-v

List the files as they are gathered. The default to operate silently.

--help

Display a usage message

Running the Windows Client Support Script

The *zwc-support* utility collects system log files, log files related to ZWC and system related information. The utility then archives these log files into a single compressed file. This compressed file can be then sent to the Zmanda Support team for analysis.

Files Gathered

The following types of log files are gathered by *zwc-support*:

Zmanda Client for Windows Installation Logs

- C:\amanda_install.log
- C:\amanda_uninstall.log
- C:\Program Files\Zmanda\Zmanda Client for Windows\Debug\LogFile.txt

Zmanda Client for Windows Debug Logs

- C:\Program Files\Zmanda\Zmanda Client for Windows\Debug\LogFile(n).txt
- Zmanda Client for Windows configuration info

System Logs

- System-info
- Application and System Logs

Additional information

- Files and Folders count on all the drives.
- Environment variables list.

Output File

After the utility is run, an output file with the name *zwc-logs*-datetimestamp*.cab* is created in the Zmanda installation directory.