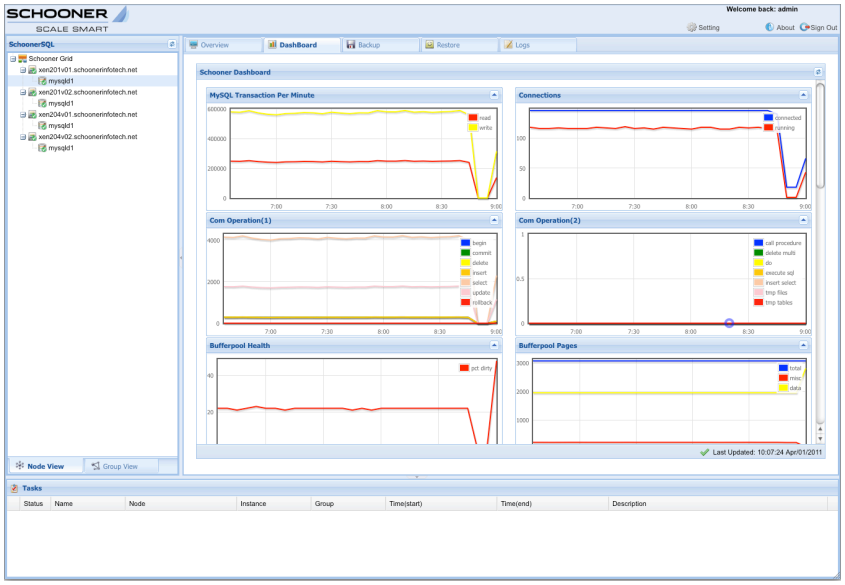
Installation & Setup Guide

SchoonerSQL™

A Full High-Availability High-Performance Build of MySQL and InnoDB

Version 5.1



SCHOONER
SCALE SMART

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SchoonerSQL™– Installation & Setup Guide

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Contents

Chapter 1: Introduction

This guide explains how to install and run SchoonerSQL™, a full high-availability, high-performance build of MySQL and InnoDB. For information about managing and monitoring SchoonerSQL™, see the *SchoonerSQL™ QuickStart Guide* and the *SchoonerSQL™ Administration Guide*.

Hardware Recommendations

SchoonerSQL™ will run on many hardware and software platforms, for the database on hard drives (HDDs), flash drives (SSDs), or a SAN. SchoonerSQL has extensive optimizations to fully exploit the power of modern SSDs, making flash an appealing upgrade path for extreme vertical scaling. We don't list required configurations but do list recommended configurations on which we have done extensive testing.

Here are the main items in your selection of hardware:

- x86_64 CPU
  - 2 sockets
  - 16 cores
  - hyper-threading enabled
- 64 GB DRAM
- Storage
  - You may use high-speed HDD or flash drives for database storage.
- Controllers
  - For SSD installations, separate controllers for HDD and SSD.
  - For PCIe flash card installations, a single HDD controller suffices.
- Log device
  - Controller cache with write-back enabled.
  - Drive cache disabled.
- BIOS
  - Power saving mode disabled.

SchoonerSQL™ will execute on any hardware platform that supports the required software versions. You may evaulate SchoonerSQL™ on virtual machines or hardware with moderate performance. The maximum performance of SchoonerSQL™ will of course be affected by the capabilities of the hardware platform.

Please see Chapter 3 for details on recommended hardware platforms.

Software Requirements

SchoonerSQL™ is supported on the following Linux releases:

- Centos 5.4/5.5
- RHEL 5.4/5.5

Schooner services make use of the following TCP/UDP ports:

- SchoonerSQL™ Administrator
  - 80
- SchoonerSQL™ Database
  - 3306 to 3338
- SchoonerSQL™ Management
  - 29600 to 29616
- SchoonerSQL™ Cluster Manager
  - 29500
  - 29501
  - 29503
  - 29505
  - 29512
- SchoonerSQL™ Failure Handlers
  - 23435
  - 23450
  - 29000
  - 29651 to 29666
  - 29676 to 29679
  - 35000

SchoonerSQL™ supports a performance charting package that requires PHP 5.1.6 or later. Centos/RHEL PHP 5.1.6 is recommended.

The SchoonerSQL™ charting package is compatible with Internet Explorer 7.0 (or later), or Firefox 3.0 (or later).

Adobe® Flash® Player is required to view SchoonerSQL™ charts.

Chapter 2: Installation and Licensing

Installation

SchoonerSQL™ Database Directories

SchoonerSQL™ comes with a default `my.cnf` configuration file that includes settings tuned for best performance. Additionally, it defines the database directory paths as follows:

- `basedir = /opt/schooner/ac_5.1/mysql`
- `datadir = /schooner/data/db1`
- `tmpdir = /schooner/data/tmp/db1`
- `innodb_data_home_dir = /schooner/txlog/db1`
- `innodb_log_group_home_dir = /schooner/txlog/db1`

The `basedir` configuration must be as shown but you may modify any of the other paths. Please be sure that all directory paths are properly mounted before installing Schooner MySQL Core. If you are using flash storage devices, please be sure that the `datadir` and `tmpdir` paths map onto these devices.

SchoonerSQL™ Installation Package

SchoonerSQL™ is distributed as a self-installing file. Note that the file name format is <product> <release id> <build id>. The "yum" utility is required to satisfy package dependencies. Please make sure that yum is operational before attempting to install SchoonerSQL™.

- The installer will create a default administrator account "`sacadmin`" with the password "`sacadmin`". The shell for this account is the Schooner CLI.
- Before installation, you should edit `/etc/sudoers` (preferably using the "`visudo`" command):
    - Disable "`Defaults requiretty`" if it exists.
    - Add the default SchoonerSQL™ user group:

      `%schooner  ALL=(ALL)  NOPASSWD: ALL`
- Execute the install script and read the EULA:

```
# sh schoonersql-5.1-1442.51.sh --install
* Checking system...
* Checking for running processes...
* Extracting all files into current script directory...
           EAD THIS AGREEMENT CAREFULLY.

IF YOU HAVE ENTERED INTO A SEPARATE WRITTEN LICENSE AGREEMENT WITH
SCHOONER FOR USE OF THE SOFTWARE, THE TERMS AND CONDITIONS OF SUCH
OTHER AGREEMENT SHALL PREVAIL OVER ANY CONFLICTING TERMS OR CONDITIONS
IN THIS AGREEMENT.

BY CLICKING ON THE "I AGREE" BUTTON OR INSTALLING OR USING ALL OR ANY
PORTION OF THE SOFTWARE, YOU ARE ACCEPTING ALL OF THE TERMS AND
```

```
CONDITIONS OF THIS AGREEMENT. YOU AGREE THAT THIS AGREEMENT IS
ENFORCEABLE LIKE ANY WRITTEN NEGOTIATED AGREEMENT.

        END-USER LICENSE FOR THE SCHOONERSQL(TM)
…

Do you accept the EULA for SchoonerSQL? Please type "Y" or "N" as your answer
y
Thank you for accepting the EULA for SchoonerSQL
* This script will install SchoonerSQL...
* Checking previous configured SchoonerSQL versions...
* Checking hardware configuration
* Creating uninstall script /opt/schooner/ac_5.1/bin/uninstall.sh...

* Congratulations! All operations completed successfully.
* Please do the following before start using SchoonerSQL:
* Use "su sacadmin" to login to CLI
* Use http://xen201v05.schoonerinfotech.net/admin/index.html to login to GUI
* * *
* Apache configuration for admin site was installed as /etc/httpd/conf.d/sch-
5.1.conf
* Please create symlink appropriately, if httpd third-party config directory
is not /etc/httpd/conf.d
* * *
```

- The installer will try to resolve any dependencies using yum.
- If the install fails due to software package dependencies, please resolve the issues and retry the installation.
- Installation of SchoonerSQL™ includes a set of services that are required for cluster maintenance and failover handling. These services are not started after installation, but are started when you initialize SchoonerSQL™ (see the next section).
- SchoonerSQL™ sevices are controlled using the standard commands. For example, if you need to start the Schooner service, execute the following:

```
# service schooner_ac-mysql-5.1 start
* Starting SchoonerSQL...
* Checking for running Apache
* Checking MySQL directories...
* Checking SELINUX...
* Checking /etc/sudoers file...
Starting Schooner Cluster Manager ...
Schooner Cluster Manager is started
Starting SchFHandler:                                      [  OK  ]
```

NOTE: The emt package is not compatible with the Oracle MySQL client. You must use the mysql client that ships with Centos or RHEL5.

Installing with a Configuration File

You may initialize SchoonerSQL™ during the installation step rather than executing the CLI to provide basic configuration settings. The installer will accept a configuration file with the following:

- A set of key/value pairs with no spaces.
- skip_hw_check=yes
    - Do not perform the hardware verification check.
- schooner_license_agreed=yes
    - Agree to the license restrictions (do not display license).

- ftw_admin_interface=eth0
  - SchoonerSQL™ administration interface.
- ftw_data_directory=/schooner/data
  - SchoonerSQL™ database directory.
- ftw_txlog_directory=/schooner/txlog
  - SchoonerSQL™ transaction log directory.
- ftw_recovery_storage_dir=/schooner/data
  - SchoonerSQL™ recovery directory.
- ftw_recovery_storage_size=50G
  - SchoonerSQL™ recovery storage size.
- ftw_innodb_buffer_pool_size=48G
  - SchoonerSQL™ InnoDB buffer pool size.

Use the following command to specify the configuration file during installation:

```
# sh schoonersql-5.1-1442.51.sh --install --config <path to file>
```

Initializing SchoonerSQL™

- After installing SchoonerSQL™, you must initialize it by accessing the CLI.
- Enter the network interface to be used for cluster administration.
- Enter the directory paths for MySQL data, TXLOG and temporary storage. You may simply hit “enter” to use the default value displayed. The temporary storage for recovery is used to store replicated transactions at slave during the recovery phase. The MySQL data directory is normally a directory mounted on flash drives with XFS file system. The TXLOG directory is a directory in Hard disk.

```
# su - sacadmin
Welcome to Schooner Appliance for MySQL Command Line Interface (CLI)!

Schooner First Time Wizard
==========================

Admin Interface Setup
-------------------------

Please specify the admin interface with a system interface which has valid ip.
Admin Interface        [eth0]:

MySQL Instance Setup
------------------------
Data directory for MySQL instances        [/schooner/data]:
Txlog directory for MySQL instances       [/schooner/txlog]:
Temporary storage for recovery            [/schooner/data]:
Temporary storage size for recovery       [50G]:5G
Innodb buffer pool size                   [48G]:1G

Data directory for MySQL instances        :/schooner/data
Txlog directory for MySQL instances       :/schooner/txlog
Temporary storage for recovery            :/schooner/data
Temporary storage size for recovery       :5G
Innodb buffer pool size                   :1G

Do you want to apply changes above?(y/n)[y]:y

Initializing MySQL. Please wait...
First Time Wizard has completed
Now entering Schooner CLI to administer the appliance
```

```
…
* You can use the UP and the DOWN arrow keys to browse for previously
  entered commands.

* You can return to this help page at any time by executing the 'help'
  command.

xen201v02.schoonerinfotech.net> enable
xen201v02.schoonerinfotech.net# configure terminal
xen201v02.schoonerinfotech.net(config)# mysql
xen201v02.schoonerinfotech.net(mysql)# instance mysqld1
xen201v02.schoonerinfotech.net(mysqld1)# show mysql_status

mysqld1: on [MYSQL_READY]

xen201v02.schoonerinfotech.net(mysqld1)#
```

During initialization, an instance of Schooner MySQL is created for you using the MySQL configuration found at:

`/opt/schooner/ac_5.1/support-files/my.cnf`

This file is automatically copied to `/etc/my.cnf` when you initialize SchoonerSQL™ using the CLI or whenever you create a new instance using the CLI or GUI. Modifications are made to a copy of this file at `/etc/my.cnf`.

These default values have been carefully selected to provide the optimum performance of SchoonerSQL™ when used with the recommended hardware configuration.

Platform Verification

The SchoonerSQL™ installer will check for required hardware resources:

- CPU cores and hyper-threading
- DRAM capacity

If any of the requirements are not met an error message will be displayed:

```
* Checking hardware configuration

| Required Hardware Configuration Not Met
| ------------------------------------------------------------------------------
  CPU core count 8 is less than the required 16
  Total DRAM size 32.00G is less than the required 64G
| ------------------------------------------------------------------------------
| End
* Do You want to proceed anyway? Please type "Y" or "N" as your answer
```

Please note that if the hardware resource check fails and you decide to proceed, your performance may not reach the levels qualified by Schooner Information Technology.

You should also check your controller configuration for the log device and make sure that the controller cache has write-back enabled and that the log disk drive caches are disabled.

Upgrade

To upgrade SchoonerSQL™:

- Stop the Schooner service (this will also stop all Schooner MySQL instances):

```
# service schooner_ac-mysql-3.1.5 stop
* Stopping Schooner Active Cluster...
* Stopping all MySQL instances...
Shutting down MySQL1
.......                                                    [  OK  ]
```

```
Stopping SchFHandler:                                      [  OK  ]
Stopping Schooner Cluster Manager ...
Schooner Cluster Manager is stopped
```

- Upgrade using the "--upgrade" option:

```
# sh schoonersql-5.1-1442.51.sh --upgrade
* Checking system...
* Checking for running processes...
* Extracting all files into current script directory...
…
* Congratulations! All operations completed successfully.
* Please do the following before start using schooner active cluster:
* Please use "/etc/init.d/schooner_ac-mysql-5.1 start" to start the Schooner
Active Cluster
* Use "su sacadmin" to login to CLI
* Use http://<server>/admin/index.html to login to GUI
```

To upgrade all nodes in the cluster without service interruption, the upgrade should be done one node at a time(User should wait for all instances in the upgraded node to come up before upgrading another node).

Uninstall

Uninstall of SchoonerSQL™ is performed as follows:

```
# cd /opt/schooner/ac_5.1/bin
# sh uninstall.sh
* Checking for running processes...
* Removing all installed Schooner RPMs and deps...
Loaded plugins: fastestmirror
Setting up Remove Process
Resolving Dependencies
--> Running transaction check
---> Package emt-mysql.noarch 0:0.2-16281 set to be erased
---> Package giflib.x86_64 0:4.1.3-7.1.el5_5.1 set to be erased
…

Removed:
  emt-mysql.noarch 0:0.2-16281             giflib.x86_64 0:4.1.3-7.1.el5_5.1
  java-1.6.0-openjdk.x86_64 1:1.6.b17.el5  jpackage-utils.noarch 0:1.7.3-1.2.el5
  lam-libs.x86_64 2:7.1.2-14.el5           libibcm.x86_64 0:1.0.5-1.el5
  libibverbs.x86_64 0:1.1.3-2.el5          librdmacm.x86_64 0:1.0.10-1.el5
  maatkit.noarch 0:4790-1                  mpi-selector.noarch 0:1.0.2-1.el5
  mysql.x86_64 0:5.0.77-4.el5_5.4          openib.noarch 0:1.4.1-5.el5
  openmpi-libs.x86_64 0:1.4-4.el5          perl-Compress-Raw-Bzip2.x86_640-el5.rf
  perl-Compress-Raw-Zlib.x86_64 0:2.el5.rf perl-DBD-MySQL.x86_64 0:3.0007-2.el5
  perl-DBI.x86_64 0:1.52-2.el5             perl-IO-Compress.noarch 0:2.el5.rfx
  perl-TermReadKey.x86_64 0:2.30-3.el5.rf  php.x86_64 0:5.1.6-27.el5_5.3
  php-cli.x86_64 0:5.1.6-27.el5_5.3        php-common.x86_64 0:5.1.6-27.el5_5.3
  php-mysql.x86_64 0:5.1.6-27.el5_5.3      php-pdo.x86_64 0:5.1.6-27.el5_5.3
  schooner_ac-helm.x86_64 0:5.1-177.26     schooner_ac-mysql.x86_64 0:5.1-140.269
  schooner_ac-mysql-devel.x86_64 0:5.1.269 schooner_ac-mysql-test.x86_64 0:3.269
  schooner_ac-scm.x86_64 0:5.1-151.6       schooner_ac-tools.x86_64 0:5.1-151.3
  schooner_utils.x86_64 0:5.1-16236.95     sharutils.x86_64 0:4.6.1-2
  sysstat.x86_64 0:7.0.2-3.el5_5.1         tzdata-java.x86_64 0:2010l-1.el5

Complete!
```

Licensing

SchoonerSQL™ comes with a 96-hour trial license. After the license expires SchoonerSQL™ will cease to function.

You may view the time to license expiration by examining the MySQL error log:

```
Schooner: License file is:/opt/schooner/ac_5.1/mysql/schooner_license
Schooner: License check failed: Failed to open license file
Schooner: You have 96 hour(s) to renew a license.
```

Please contact Schooner Sales to purchase a product license.

Once you have purchased a license, install it by copying the file to the license directory:

```
# cp schooner_license /opt/schooner/ac_5.1/mysql/
```

You do not have to restart SchoonerSQL™ after installing the license file.

This Schooner release uses a number of third-party software packages. The licenses for these packages are provided in a companion license file kept with the release tar file on the download site, and in a license directory at

```
/opt/schooner/license
```

Chapter 3: Recommened Hardware Platforms

SchoonerSQL™ will run on many hardware and software platforms, for the database on hard drives (HDDs), flash drives (SSDs), or a SAN. SchoonerSQL has extensive optimizations to fully exploit the power of modern SSDs, making flash an appealing upgrade path for extreme vertical scaling. We don't list required configurations but do list recommended configurations on which we have done extensive testing.

Here are the main items in your selection of hardware.

Base Server

You can use any HP, Dell, or IBM multi-core x86 server or blade (abbreviated simply as servers below), running Red Hat Linux 5.4/5.5 or CentOS 5.4/5.5.

We optimized our software for maximum concurrency to fully exploit multiple cores. Schooner-powered servers deliver great performance when they have at least two 4-, 6-, or 8-core processors, and performance scales linearly with number of cores. Our software runs on less powerful machines, but performance will suffer.

We recommend 64 GB of DRAM.

If you use flash drives and their controllers pay special attention to your server power supply. PCIe-based flash drives tend to consume much more power than SAS drives. You may have a server with say, a standard 460W power supply, but find that you use 465W or more when it's fully outfitted.

One "gotcha" in many servers (as of January 2011) is the default disk controller. SAS and SATA flash drives (see next section) can be seen as super-fast energy-efficient disk drives, and are inserted into HDD slots. But many servers ship with a default disk controller that is ineffective with SAS and SATA drives. We have found this to be quite common with HP and Dell, for example. Be careful about the controller if you use SAS or SATA drives; you can always upgrade to something better such as the LSI 9211, or use PCIe flash drives.

Many modern servers have a power-saving mode, settable in the BIOS. You should turn this off to get the maximum benefit from Schooner software.

Flash Memory

We support flash memory in the SATA, SAS, and PCIe form factors. This includes flash memory qualified and sold by HP, Dell, and IBM, and from Fusion-io, LSI, Unigen, Intel, OCZ, Smart Modular, and Pliant.

Recommended Configurations

These servers have been qualified by Schooner:

- DELL R710
- HP DL 380 G6/G7
- IBM 3650 M3

While the supported server platforms include widely deployed models using standard configurations, price and performance considerations may dictate an upgrade of installed servers or affect the bill of materials for new server orders.

In particular, Schooner has qualified two sets of platform and flash configurations, one that maximizes performance and another that maximizes price/performance.

Flash storage devices are extremely fast compared with hard disks. They are best used for database table storage while logging is more suited to hard disks. In order to support the highest level of transaction throughput, the I/O path to each type of drive must be configured for optimal performance.

The following sections describe in detail the hardware platform configurations and settings recommended by SchoonerSQL™.

DELL

Price/Performance Configuration 1

- Controller: 1 x PERC H700
- Storage: eMLC or MLC SSDs

Price/Performance Configuration 2

- Controller: 2 x PERC H700
  - 1 PERC H700 attached to HDD log devices.
  - 1 PERC H700 attached to SSD data devices.
- Storage: eMLC or MLC SSDs

Maximum Performance Configuration

- Controller: 1 x PERC H700 or PERC 6i
- Storage: PCIe flash

Additional Notes for DELL

- In Configuration 2, DELL does not support two internal H700 controllers in a single server. You may be asked to remove the second H700 controller before DELL support will support your environment.
- Schooner recommends 256MB or more of non-volatile (NV) cache for the H700 controllers.

HP

Price/Performance Configuration

- Controller: 2 x HP Smart Array P410i
  - 1 HP Smart Array P410i attached to HDD log devices.
  - 1 HP Smart Array P410i attached to SSD data devices.
- Storage: eMLC or MCL SSDs

Maximum Performance Configuration

- Controller: 1 x HP Smart Array P410i
- Storage: PCIe flash

Additional Notes for HP

- Schooner recommends 256MB or more of non-volatile (NV) cache for the P410i controllers.

IBM

Price/Performance Configuration

- Controllers:
  - 1 x IBM ServeRAID MR10i attached to HDD log devices.
  - 1 x LSI 9211-8i attached to SSD data devices.
- Storage: eMLC or MLC SSDs

Maximum Performance Configuration

- Controller: 1 x IBM ServeRAID MR10i
- Storage: PCIe flash

Additional Notes for IBM

- Schooner recommends 256MB or more of non-volatile (NV) cache for the two controllers.

System Tuning

While the supported server platforms include widely deployed models using standard configurations, price and performance considerations may dictate an upgrade of installed hardware and reconfiguration of controller and BIOS settings.

Log HDD IO Path

Logging is critical to the performance of SchoonerSQL™ because of the very high transaction rates that can be sustained relative to the performance of HDD-only platforms. If not configured properly, the logging file system can become a performance bottleneck.

- Controller cache
  - Minimum of 256MB.
  - Write-back enabled.
- Disk cache
  - Disabled for all log HDD.
- File system
  - EXT3

SSD Controller

For SSD installations, a dedicated controller will yield the best performance. Installations that connect both HDD and SSD on a single controller will be performance limited.

- Controller cache
    - Minimum of 256MB
- File system
    - XFS

BIOS

BIOS settings that control CPU clock rates may have an effect on performance of SchoonerSQL™. In particular, power saving modes can decrease the clock rate.

- Power saving mode off.
- Processor hyper-threading on.

Networking

SchoonerSQL™ replication traffic can greatly benefit from a high-speed network interface:

- 10GE interface
- Bonded, multiple 1GE interfaces

  The required capacity of the replication network interface depends on the workload. In general, the higher the write rate the faster the required replication interface.