

Administrator's Guide: perfSONAR MDM 3.0

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1 Introduction

The perfSONAR multi-domain monitoring (MDM) service allows you to access network performance metrics from your own domain or from any other European REN network. You can also perform network monitoring actions in the different network domains.

Using out-of-the-box or customised web-interfaces you can track and eliminate network problems and performance bottlenecks quickly, and identify and prevent potential performance issues before service disruption occurs.

The MDM service comprises the following perfSONAR web services:

Lookup Service (LS)

The LS keeps track of which perfSONAR web services are available. The web services can register with the LS in regular intervals to signal that they are running, so that other clients (usually visualisation tools) can then request this information from the LS to find out which services are available.

Authentication Service (AS)

The AS provides authentication to protect perfSONAR web services from unrestricted access. By specifying request types that require authentication before they are executed by the web service, access can be restricted to users who have an identity provider (e.g. GIdP) account, so that only they can send messages of the specified types.

RRD MA

The RRD MA retrieves IP interface information: link utilisation, link capacity, input errors and output drops.

SQL MA

The SQL MA retrieves circuit/lightpath status and IP interface information: link utilisation, link capacity, input errors and output drops.

PerfSONAR-BUOY MA

BWCTL measurement tools collect throughput metrics and store them in an SQL archive from where the perfSONAR-BUOY MA can retrieve them.

BWCTL MP

The BWCTL MP measures achievable throughput (TCP) and UDP throughput between two BWCTL clients.

SSH/Telnet MP

The SSH/Telnet MP executes requests for RTT, SHOW command and traceroute information.

Command Line MP

The Command Line MP is a perfSONAR web service for requesting on-demand or scheduled measurements using common command line network measurement tools such as ping, Traceroute, OWAMP and BWCTL.

perfSONAR-PS PingER MP and MA

The perfSONAR-PS PingER comprises an MP and an MA. The MP collects availability, latency and jitter measurements and stores them in a database from where the MA can retrieve them.

2 Getting Started

Important points before you start:

- It is recommended that you install the Lookup Service, so you are able to check which services you can access across the network.
- It is recommended that you install the Authentication Service, so you can enable authentication for your web services.
- If you require the Lookup Service and the Authentication Service, you should install the Lookup Service first and the Authentication Service second, before you install any of the other services.

2.1 Deciding Which Services to Install

The following table provides an overview of which functionality the different perfSONAR web services provide.

	LS	AS	RRD MA	SQL MA	BUOY MA	BWCTL MP	SSH/ Telnet MP	Command Line MP	PingER MP/MA
View E2E circuit monitoring information				✓					
Detect congestion			✓	✓	✓			✓	
Detect path changes			(✓)	(✓)	✓		✓	✓	
Detect abnormal link behaviour/performance degradation			✓	✓	✓	✓		✓	✓
Test/verify TCP transfer					✓	✓		✓	
Detect small packet loss					✓	✓		✓	
Assess impact of network configuration changes					✓	✓		✓	✓
Assess incident impact					✓	✓		✓	✓
Assess user experience					✓	✓		✓	✓
Access show commands (Looking glass)							✓		
Discover other network monitoring functionalities	✓								
Authenticate tool users		✓+	✓*	✓*		✓	✓*	✓	

(✓) indirect observation

* optional functionality

+ mandatory to access authenticated perfSONAR web services

2.2 Supported Platforms

The following platforms are supported:

- Red Hat Enterprise Linux 4.x or 5.x
- Fedora 8
- CentOS 5.1
- Debian 4.0

2.3 Supported browsers

The following browsers are supported:

- Mozilla Firefox

2.4 Installing Pre-requisite Software Using Packages

The perfSONAR MDM services require some software to be present on their host machine, before they can be installed:

	LS	AS	RRD MA	SQL MA	BUOY MA	BWCTL MP	SSH/ Telnet MP	Command Line MP	PingER MP / MA
Java JDK 6	✓	✓	✓	✓			✓	✓	
perfSONAR Tomcat 6.x	✓	✓	✓	✓			✓	✓	
perfSONAR eXist 1.1.x or 1.2.x	✓		✓	✓			✓		
RRDtool 1.2.x			✓						
BWCTL tool						✓		*	
MySQL 5.x				✓	✓				✓
Perl 5.8.x						✓			
lperf tool						✓		*	
NTP						✓			
OWAMP tool								*	
Apache http server					✓	✓			✓

* optional

2.4.1 Installing the Java JDK

For easy installation of all required packages, it is recommended that you install Sun-Java distributions on your server. However, if you install a different distribution of Java, you need to modify Tomcat startup scripts to point them to the correct JDK home (see *Installing Java* on page 9).

On Fedora, Red Hat Enterprise or CentOS:

1. Download the Java Development Kit (JDK) 6 Update 6 from the following location:
<http://java.sun.com/javase/downloads/index.jsp>
2. Select the Linux platform (or x64 if you are using a 64 bit distribution) and accept the license agreement.
3. Download the Linux RPM self-extracting file, and transfer it to the machine on which you want to install the MDM service.
4. Log on to this machine.
5. Check if any JRE or JDK package is already installed. If this is the case, you have to remove it as it conflicts with the Sun-Java package. To remove it run the following command as root:

```
yum remove jre  
yum remove jdk
```

Note: Please make sure that these package changes do not affect any other Java-based applications (non-perfSONAR) that are installed on the machine. In most cases, you only need to point the PATH variable to the new location.

6. As root, install the Sun RPM:

```
jdk-6u6-linux-x64-rpm.bin  
sh ./jdk-6u6-linux-x64-rpm.bin
```
7. Type **q** to accept the license, then **yes** and press Return.
8. Let the script run until the Sun JDK RPM is installed.
9. Update the alternatives system, so programs know where to find the java installation (this is not done by the Sun RPMs). Run the following command:

```
alternatives --install /usr/bin/java java /usr/java/latest/bin/java 20000 \  
--slave /usr/bin/keytool keytool /usr/java/latest/bin/keytool \  
--slave /usr/bin/orbd orbd /usr/java/latest/bin/orbd \  
--slave /usr/bin/pack200 pack200 /usr/java/latest/bin/pack200 \  
--slave /usr/bin/policytool policytool /usr/java/latest/bin/policytool \  
--slave /usr/bin/rmid rmid /usr/java/latest/bin/rmid \  
--slave /usr/bin/rmiregistry rmiregistry /usr/java/latest/bin/rmiregistry \  
--slave /usr/bin/servertool servertool /usr/java/latest/bin/servertool \  
--slave /usr/bin/tnameserv tnameserv /usr/java/latest/bin/tnameserv \  
--slave /usr/bin/unpack200 unpack200 /usr/java/latest/bin/unpack200 \  
--slave /usr/lib/jvm/jre jre /usr/java/latest  
alternatives --set java /usr/java/latest/bin/java
```

Java is installed in `/usr/java`. The symbolic link `/usr/java/latest` will point to the latest version of java installed in the `/usr/java` directory.

Note: If you want to install JRE, the `JAVA_HOME` variable needs to be set. If you are installing the repositories as described above, the perfSONAR software does not require the `JAVA_HOME` variable to be set. However, other Java-based, non-perfSONAR applications may require this setting as well as setting the `PATH` variable to java.

On Debian:

1. To enable the non-free Debian repository, edit the file `/etc/apt/sources.list`. Find the following line:

```
deb http://ftp.debian.org etch main contrib
```

Note: If you are using mirrors, the host name may be different. If the line is not present in the file, you need to add it.

2. Add **non-free** to the end, so the line looks as follows:

```
deb http://ftp.debian.org etch main contrib non-free
```

3. As root, run the following:

```
apt-get install sun-java5-jdk
```

Note: If you want to install JRE, the `JAVA_HOME` variable needs to be set. If you are installing the repositories as described above, the perfSONAR software does not require the `JAVA_HOME` variable to be set. However, other Java-based, non-perfSONAR applications may require this setting as well as setting the `PATH` variable to java.

2.4.2 Installing perfSONAR Tomcat

On Fedora, Red Hat Enterprise or CentOS:

For 32 bit distributions

As root run the following commands:

```
wget http://downloads.perfsonar.eu/dependencies/perfsonar-tomcat-6.0.16-7.i386.rpm (or the latest available file)
```

```
rpm -i perfsonar-tomcat-6.0.16-7.i386.rpm
```

For 64 bit distributions

As root run the following commands:

```
wget http://downloads.perfsonar.eu/dependencies/perfsonar-tomcat-6.0.16-7.x86\_64.rpm (or the latest available file)
```

```
rpm -i perfsonar-tomcat-6.0.16-7.x86_64.rpm
```

On Debian:

As root, run the following commands:

```
apt-get install jsvc  
wget http://downloads.perfsonar.eu/dependencies/debian/perfsonar-tomcat\_6.0.16-2\_all.deb (or the  
latest available file)  
dpkg -i perfsonar-tomcat_6.0.16-2_all.deb
```

2.4.3 Checking Your perfSONAR Tomcat Installation

To check if you have installed perfSONAR Tomcat successfully:

1. Start Tomcat using the command:

```
/etc/init.d/perfsonar-tomcat start
```

2. Open a Mozilla browser and enter the following URL:

```
http://<host>:<port>/
```

```
<host>
```

The IP address or name of the machine that hosts the web service.

```
<port>
```

The port on which the Tomcat listens for commands. By default this is 8080.

For example:

```
http://mdm-4.par.fr.geant2.net:8080/
```

If the **Tomcat Welcome** page is displayed, Tomcat is installed correctly.

2.4.4 Starting and Stopping Tomcat

You can start and stop any of the MDM web services by starting and stopping Tomcat. If you make configuration changes to an MDM service, you need to start/restart Tomcat to apply these changes.

To start Tomcat use the command: `/etc/init.d/perfsonar-tomcat start`

To stop Tomcat use the command: `/etc/init.d/perfsonar-tomcat stop`

To restart Tomcat use the command: `/etc/init.d/perfsonar-tomcat restart`

2.4.5 Installing perfSONAR eXist

On Fedora, Red Hat Enterprise or CentOS:

As root, run the following commands:

```
wget http://downloads.perfsonar.eu/dependencies/perfsonar-exist-1.1.1-3.noarch.rpm (or the latest available file)
rpm -i perfsonar-exist-1.1.1-3.noarch.rpm
```

On Debian:

As root, run the following commands:

```
wget http://downloads.perfsonar.eu/dependencies/debian/perfsonar-exist_1.1.1-3_all.deb (or the latest available file)
dpkg -i perfsonar-exist_1.1.1-3_all.deb
```

2.4.6 Checking Your perfSONAR eXist Installation

To check if you have installed perfSONAR eXist successfully:

Open a Mozilla browser and enter the following URL:

http://<host>:<port>/exist

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the Tomcat listens for commands. By default this is 8080.

For example:

<http://mdm-4.par.fr.geant2.net:8080/exist>

If the **eXist Welcome** page is displayed, eXist is installed correctly.

2.5 Installing Pre-requisite Software Using Tar Files

The perfSONAR MDM services require some software to be present on their host machine, before they can be installed:

	LS	AS	RRD MA	SQL MA	BUOY MA	BWCTL MP	Telnet/ SSH MP	Command Line MP	PingER MP / MA
JDK 1.5.x	✓	✓	✓	✓			✓	✓	
Tomcat 6.0.x	✓	✓	✓	✓			✓	✓	
eXist 1.1.x or 1.2	✓		✓	✓			✓		
RRDtool 1.2.x			✓						
BWCTL tool						✓		*	
MySQL 5.x				✓	✓				✓
Perl					✓	✓			✓
Iperf						✓		*	
NTP					✓	✓		*	
OWAMP tool								*	

* optional

2.5.1 Installing Java

To install Java as a tar file:

1. Download the JDK tar file from the Sun website and extract it to **/etc** or **/opt**. Use symlinks to enable easy JAVA upgrades.
2. After you have finished installing Java, set the **JAVA_HOME** variable to point to the root folder where Java is installed (otherwise Tomcat cannot start up). You must add this variable to the profile of all accounts or the account that will be used to start and stop tomcat (for example, perfsonar account). For example:

```
bash-2.05$ echo $JAVA_HOME
/net/dante-sw/opt/jdk1.5.0_01
```

2.5.2 Installing Tomcat

To install Tomcat using a tar file:

Download Tomcat version 6.0.x from the Apache Tomcat website and extract it to:

`/opt/perfSONAR`

For example:

1. Create the `/opt/perfsonar` directory.
2. Download `apache-tomcat-6.0.16.tar.gz`
3. Extract tomcat into the `/opt/perfsonar` directory. This creates `/opt/perfsonar/apache-tomcat-6.0.16`

Note: For security reasons, it is highly recommended to start tomcat as a user with low privileges (non-root).

2.5.3 Checking Your Tomcat Installation

To check if you have installed Tomcat successfully:

1. Start tomcat using the startup script. for example:

`/opt/perfsonar/$tomcat/bin/startup.sh`

2. Open a Mozilla browser and enter the following URL:

http://<host>:<port>/

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the Tomcat listens for commands. By default this is 8080.

For example:

`http://mdm-4.par.fr.geant2.net:8080/`

If the **Tomcat Welcome** page is displayed, Tomcat is installed correctly.

2.5.4 Configuring Tomcat to Upload MDM Services

Tomcat includes the **server.xml** configuration file for loading and unloading web applications. It is recommended that you use this file to configure the access path (i.e. the access point or URL) for perfSONAR-MDM web services, as this prevents URL and access point changes when web services are upgraded.

To load a web application in Tomcat:

1. Open the **server.xml** file in a text editor.
2. Before the closing Host tag **</Host>**, add an access path to the latest available exist WAR file. For example:

```
<Context path='/exist' docBase='/opt/perfsonar/exist-1.1.1.war'> </Context>
```

Note: tag names in the **server.xml** file are case-sensitive.

3. Restart Tomcat to apply your changes.

Example

The following example extract from the **server.xml** file shows the eXist xml database and two other web services loaded into tomcat.

```
<Context path='/exist' docBase='/opt/perfsonar/exist-1.1.1.war'> </Context>
<Context path='/geant2-java-sshtelnet-mp' docBase='/opt/perfsonar/exist-
1.1.1.war'> </Context>
<Context path='/geant2-java-as' docBase='/opt/perfsonar/geant2-java-as-1.0-
1.war '> </Context>
</Host>
</Engine>
</Service>
</Server>
```

2.5.5 Starting and Stopping Tomcat

You can start and stop any of the MDM web services by starting and stopping Tomcat. If you make configuration changes to an MDM service, you need to start/restart Tomcat to apply these changes.

To start Tomcat use the command: `/opt/perfsonar/$tomcat/bin/startup.sh`

To stop Tomcat use the command: `/opt/perfsonar/$tomcat/bin/shutdown.sh`

2.5.6 Installing eXist

You can install eXist as a web application (webapp or WAR file) inside Tomcat or as a standalone server. It is recommended that you choose the web application method as it is easy to install and configure to work with the perfSONAR MDM web services.

To install eXist Webapp (WAR file):

1. Download the war file version 1.1.1 or 1.2.x from the eXist webpage to:
`/opt/perfSONAR`
2. Open the Tomcat **server.xml** file in a text editor.
3. Before the closing Host tag **</Host>**, add an access path to the latest available exist WAR file. For example:
`<Context path='/exist' docBase='/opt/perfsonar/exist-1.1.1.war'> </Context>`
Note: tag names in the **server.xml** file are case-sensitive.
4. Restart Tomcat to apply your changes

2.5.7 Checking Your eXist Installation

To check if you have installed eXist successfully:

Open a Mozilla browser and enter the following URL:

http://<host>:<port>/exist

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the Tomcat listens for commands. By default this is 8080.

For example:

`http://mdm-4.par.fr.geant2.net:8080/exist`

If the **eXist Welcome** page is displayed, eXist is installed correctly. It is recommended that you now change the admin user's default login details as follows:

1. Display the **eXist Welcome** page.
2. In the navigation area's **Administration** section, click **Admin**. The **Login** page is displayed.
3. In the **Username** field, enter **admin**. Leave the **Password** field empty. (These are the default login details).
4. Click the **Submit Query** button. The **System Status** page is displayed.
5. In the navigation area, click **Manage Users**. The **User Management** page is displayed.
6. Select the admin user and click the **Edit** button. The admin user's editable details are displayed.

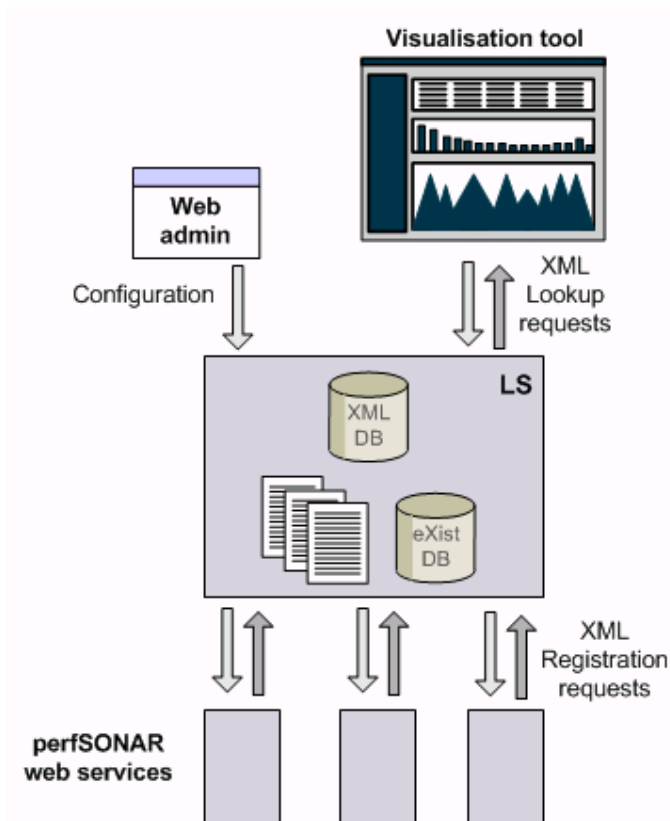
7. In the **Password** field, enter a password for the admin user. Re-enter the same password in the **Repeat field** to confirm it.
Note: it is recommended that you make a note of the password in a safe location, so that you can find it again in case you should forget it at any point. You need the admin login details to configure perfSONAR MDM services.
8. Click the **Change** button. The new password is set and you are returned to the **User Management** page.
9. In the navigation area's **Administration** section, click **Logout** to log out.

3 Lookup Service

The Lookup Service (LS) allows you to check which web services are available on the network.

Every time a service starts running, it can register with the LS to signal its availability and provide a description of its capabilities. Other clients (usually visualisation tools) can then request this information to find out which services are available. Keep Alives are used to keep the status of registered services up-to-date.

3.1 System Architecture



perfSONAR web services register with the Lookup Service by sending an XML request. The Lookup Service stores their status in its XML database and confirms that services have successfully registered by returning an XML response.

Clients (usually visualisation tools) send XML queries to the Lookup Service to find out which web services they can access. In response, the Lookup Service returns a list of the currently available services.

The LS is configured via a Web Admin interface which is included in the LS installation. The Web Admin interface stores the configuration settings in an eXist database (meta configuration information) and files (non-meta configuration information) from where they are applied to the LS.

3.2 Installing

You can install the LS on a Linux operating system (Red Hat Enterprise, Fedora, CentOS or Debian) or on other UNIX-based operating systems (see

Installing on any UNIX-based OS on page 18).

Note:

- It is recommended that you install the Lookup Service, so you are able to check which services you can access across the network.
- It is recommended that you install the Authentication Service, so you can enable authentication for your web services.
- If you require the Lookup Service and the Authentication Service, you should install the Lookup Service first and the Authentication Service second before you install any of the other services.

3.2.1 Installing on Linux

If you are running a Linux operating system, you can install the LS using RPM distributions or in a non-RPM distribution. If you are using Debian, you need to install the LS using Debian packages.

To install using RPM distributions:

1. Log on as root to the machine on which you want to host the LS.
2. Check that you have installed the dependency RPMs (see *Installing Pre-requisite Software Using Packages* on page 4).
3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/>
4. Download the latest rpm file available. For example:
geant2-java-xml-ls-1.2-1.noarch.rpm

5. Install the LS. For example:

```
rpm -i geant2-java-xml-ls-1.2-1.noarch.rpm
```
6. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).

Once you have finished installing, it is recommended that you test your installation.

To install the RPM files in a non-RPM Linux distribution:

1. Check that you have installed the dependency RPMs (see *Installing Pre-requisite Software Using Packages* on page 4).
2. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/>
3. Download the latest rpm file available. For example:

```
geant2-java-xml-ls-1.2-1.noarch.rpm
```
4. Install the LS. For example:

```
rpm -i --nodeps geant2-java-xml-ls-1.2-1.noarch.rpm
```
5. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).

Once you have finished installing, it is recommended that you test your installation.

To install using Debian packages:

1. Log on as root to the machine on which you want to host the LS.
2. Check that you have installed the dependency debian files (see *Installing Pre-requisite Software Using Packages* on page 4).
3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/debian>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/debian>
4. Download the latest deb file available. For example:

```
geant2-java-xml-ls-1.2-1.noarch.deb
```
5. Install the LS. For example:

```
dpkg -i geant2-java-xml-ls-1.2-1.noarch.deb
```
6. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).

Once you have finished installing, it is recommended that you test your installation.

3.2.2 Installing on any UNIX-based OS

If you don't have root access to the machine on which you want to host the LS, you can install the LS using a WAR file. This installation method is supported for any UNIX-based operating system.

1. Log on to the machine on which you want to host the LS. It is recommended that you don't use the root account.
2. Check that you have installed the dependency software (see *Installing Pre-requisite Software Using Tar Files* on page 9).
3. Go to one of the following locations:

<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/war>

<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/war>

4. Find the latest available version of the LS war file. For example:
geant2-java-xml-ls-1.2-1.war
5. Download the war file into the /opt/perfsonar/services directory. For example:
/opt/perfsonar/services/geant2-java-xml-ls-1.2-1.war
6. To Tomcat's **server.xml** file, add an access path to the LS to load it (see *Configuring Tomcat to Upload MDM Services* on page 11). For example:
<Context path='/xml-ls' docBase='/opt/perfsonar/services/geant2-java-xml-ls-1.2-1.war'> </Context>

Note: tag names in the **server.xml** file are case-sensitive.

7. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 11).

Once you have finished installing, it is recommended that you test your installation.

3.2.3 Testing the Installation

You can test if you have installed the LS correctly by checking if the Web Admin pages can be displayed. The Web Admin pages are a web interface that you need to configure the service, once you have successfully tested its installation.

To test the installation:

Open a Mozilla browser and enter the following URL:

http://<host>:<port>/xml-ls

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/xml-ls>

If you have installed the LS correctly, the Web Admin pages are displayed.

Note: if you have installed the LS using a WAR file and not chosen the service's recommended name (xml-ls), you have to modify the service's name accordingly in the URL.

Once you have successfully tested your installation, you need to configure the service (see *Configuring the LS* on page 19).

3.3 Configuring the LS

Before you can use the LS, you need to configure it. For this you can use the perfSONAR Web Administration pages, a web interface that provides a central point from which you can configure all the service's settings.

The Web Admin pages are split into basic and advanced configuration. Only the basic configuration is mandatory, the advanced configuration is optional and not normally needed.

Note: The purpose of the Web Admin pages is to aid you in the initial configuration that the service requires after its installation. It does not store the modifications you make to the service's configuration and displays the original default values if you open it again. That means that if you want to use the Web Admin pages to reconfigure the service at any point, you must again specify values for all settings, if you don't want to overwrite their configuration with the original default settings.

3.3.1 Mandatory Basic Configuration

To configure the settings that the LS requires:

1. Open a Mozilla browser and enter the following URL to display the Web Admin pages:

http://<host>:<port>/xml-ls

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/xml-ls>

Note: if you have installed the LS using a WAR file and not chosen the service's recommended name (xml-ls), you have to modify the service's name accordingly in the URL.

2. Under the **Basic Configuration** heading in the navigation panel, click **Service**.

A login prompt is displayed.

3. Enter your login details (the default login is perfsonaruser and perfsonarpass), and click **OK**.

The basic service configuration settings page is displayed. This page lists the settings that the LS requires to be configured to be able to run:

Would you like to use eXist DB XML

Select **on** to register the LS with the eXist database (this is required).

Enter the location of the eXist database

Enter the URL to the location where your eXist database is installed.

Specify the service username for the eXist user

Enter the service username for the LS user of the eXist database. It is recommended that you use the default value.

Specify the user password for eXist

Specify the password that LS users have to enter to log in to the eXist database.

Specify the administration password for eXist

Enter the password for the eXist administrator (if this field displays an asterisk, you must enter the correct password anyway because the value in this field always overwrites the current configuration).

Would you like to initialise the database structure?

Select yes to initialise the eXist database. Initialising the database adds the user access details you have configured to the database. If you already have a database containing data and don't want to remove it, you should not initialise your database structure, as this will remove all your LS data.

4. Click **apply**.
5. Use the start and stop commands to restart Tomcat and apply your configuration changes.

Once you have completed the basic configuration, you should test your deployment (see *Testing Your Deployment* on page 21).

3.3.2 Optional Advanced Configuration

The advanced configuration is optional and not normally needed.

To configure advanced settings:

1. Log on to the Web Admin pages.
2. Under the Advanced Configuration heading in the navigation panel, click **Service**.
The advanced service configuration settings page is displayed. This page lists the service settings that you can configure to customise the LS according to your requirements.
3. Drag your mouse cursor over each of the listed settings to display a brief description of them. Check if the default values suit your environment and modify them if you need to.
4. Click **apply** to apply your modifications.
5. Under the **Advanced Configuration** heading in the navigation panel, click **Logging**.
The advanced **service** configuration settings page is displayed. This page lists the logging settings that you can configure to customise the LS according to your requirements.
6. Drag your mouse cursor over each of the listed settings to display a brief description of them. Check if the default values suit your environment and modify them if you need to.
7. Click **apply** to apply your modifications.
8. Under the **Advanced Configuration** heading in the navigation panel, click **eXist Database**.
A login prompt is displayed.
9. Enter your login details (the default username is admin and an empty password field, unless you have set an administration password) and click **OK**.

The **eXist Database Administration** page is displayed. This page comprises the following tabs:

Manage Collections

This tab lists the eXist resources and their details (owners, groups, permissions and creation dates). You can select a resource and click **Edit Resource** to change its details or **Delete Resource** to delete it. You can also create a new resource by clicking **Create Resource**, specifying the required details and clicking **Create**.

Manage Users

This tab lists the eXist users and their details (groups and homes). You can select a user and click **Edit** to change their details or **Delete** to delete them. You can also create a new user by clicking **Create**, specifying the required details and clicking **Create**.

10. Restart Tomcat to apply your configuration changes.

If you have made any changes to advanced configuration, you should test your deployment (see *Testing Your Deployment* on page 21).

3.4 Testing Your Deployment

You can use the perfsonarUI client to check if you have deployed the LS correctly:

1. Start PerfsonarUI and display the **Playground** page.
2. In the **Service address** field, enter the URL to the LS:

http://<host>:<port>/xml-ls/services/LookupService

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/xml-ls/services/LookupService>

Note: if you have installed the LS using a WAR file and not chosen the service's recommended name (xml-ls), you have to modify the service's name accordingly in the URL.

3. In the **Execute query** section, click **Query** to send an EchoRequest to the LS. If you have installed the service correctly an EchoResponse is returned. For example:

```
<?xml version="1.0" encoding="UTF-8"?>
<nmwg:message id="message1208947296_resp"
  messageIdRef="message1208947296" type="EchoResponse"
  xmlns:nmwg="http://ggf.org/ns/nmwg/base/2.0/">
  <nmwg:metadata id="resultCodeMetadata">
    <nmwg:eventType>success.echo</nmwg:eventType>
  </nmwg:metadata>
  <nmwg:data id="resultDescriptionData_for_resultCodeMetadata"
    metadataIdRef="resultCodeMetadata">
```

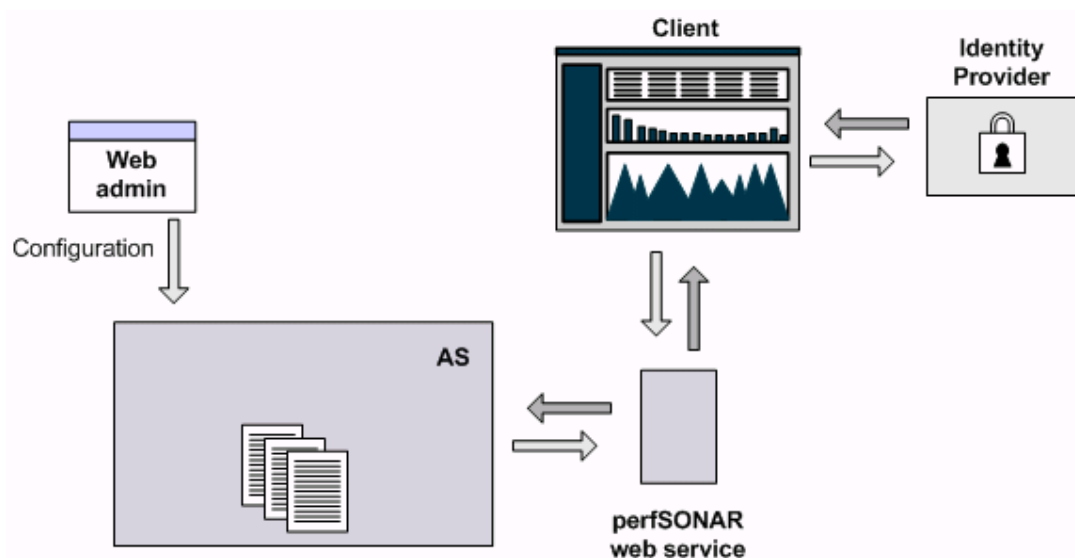
```
<nmwgr:datum xmlns:nmwgr="http://ggf.org/ns/nmwg/result/2.0/">This is the  
echo response from the service.</nmwgr:datum>  
</nmwg:data>  
</nmwg:message>
```

4 Authentication Service

The Authentication Service (AS) provides authentication to protect perfSONAR web services from unrestricted access. If you configure your web services to register with the AS, you can specify the request types that require authentication before they are executed. This means that only users who have an identity provider (e.g. GIdP) account can send messages of the specified types to your web services, while unauthorised users cannot access them.

The AS accepts all identities that are issued by any eduGAIN-connected identity provider without any further checks. Any user can install an identity provider (using the IdP software) and get valid identities which are accepted by all AS deployments.

4.1 System Architecture



If a perfSONAR web service is integrated with the AS, any request that a client sends to this web service includes authentication information which identifies the user of the client (if a web client is used) or the location of the client (if an automated client is used). This authentication information is provided by an identity provider (for example, GIdP).

The perfSONAR web service then sends an XML request to the Authentication Service to check if the received authentication information is valid. The Authentication Service checks the authentication information and returns an XML reply that indicates if the authentication was successful.

The AS is configured via a Web Admin interface which is included in the AS installation. The Web Admin interface stores the configuration settings in files (non-meta configuration information) from where they are applied to the AS.

4.2 Installing

You can install the AS on a Linux operating system (Red Hat Enterprise, Fedora, CentOS or Debian) or on other UNIX-based operating systems (see *Installing on any UNIX-based OS* on page 26).

Note:

- It is recommended that you install the Authentication Service, so you can enable authentication for your web services.
- It is recommended that you also install the Lookup Service, so you are able to check which services you can access across the network.
- If you require the Lookup Service and the Authentication Service, you should install the Lookup Service first and the Authentication Service second before you install any of the other services.
- Before you start installing the AS, it is recommended that you check the system time of your server as some authentication information requires to be checked against it. You can synchronise your server's system time using the Network Time Protocol (NTP).

4.2.1 Installing on Linux

If you are running a Linux operating system, you can install the AS using RPM distributions or in a non-RPM distribution. If you are using Debian, you need to install the AS using Debian packages.

To install using RPM distributions:

1. Log on as root to the machine on which you want to host the AS.
2. Check that you have installed the dependency RPMs (see *Installing Pre-requisite Software Using Packages* on page 4).

3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/>
 4. Download the latest rpm file available. For example:
geant2-java-as-1.0-1.noarch.rpm
 5. Install the AS. For example:
rpm -i geant2-java-as-1.0-1.noarch.rpm
 6. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).
- Once you have finished installing, it is recommended that you test your installation.

To install the RPM files in a non-RPM Linux distribution:

1. Check that you have installed the dependency RPMs (see *Installing Pre-requisite Software Using Packages* on page 4).
 2. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/>
 3. Download the latest rpm file available. For example:
geant2-java-as-1.0-1.noarch.rpm
 4. Install the AS. For example:
rpm -i --nodeps geant2-java-as-1.0-1.noarch.rpm
 5. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).
- Once you have finished installing, it is recommended that you test your installation.

To install using Debian packages:

1. Log on as root to the machine on which you want to host the AS.
 2. Check that you have installed the dependency debian files (see *Installing Pre-requisite Software Using Packages* on page 4).
 3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/debian>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/debian>
 4. Download the latest deb file available. For example:
geant2-java-as-1.0-1.noarch.deb
 5. Install the AS. For example:
dpkg -i geant2-java-as-1.0-1.noarch.deb
 6. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).
- Once you have finished installing, it is recommended that you test your installation.

4.2.2 Installing on any UNIX-based OS

If you don't have root access to the machine on which you want to host the AS, you can install the AS using a WAR file. This installation method is supported for any UNIX-based operating system.

1. Log on to the machine on which you want to host the AS. It is recommended that you don't use the root account.
2. Check that you have installed the dependency software (see *Installing Pre-requisite Software Using Tar Files* on page 9).
3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/war>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/war>
4. Find the latest available version of the AS war file. For example:
geant2-java-as-1.0-1.war
5. Download the war file into the **/opt/perfsonar/services** directory. For example:
/opt/perfsonar/services/geant2-java-as-1.0-1.war
6. To Tomcat's **server.xml** file, add an access path to the AS to load it see *Configuring Tomcat to Upload MDM Services* on page 11). For example:

```
<Context path='/geant2-java-as' docBase='/opt/perfsonar/services/geant2-java-as-1.0-1.war'>  
</Context>
```

Note: tag names in the **server.xml** file are case-sensitive.
7. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 11).

Once you have finished installing, it is recommended that you test your installation.

4.2.3 After the Installation

After installing the AS, you need to include some Java libraries which the AS uses as endorsed libraries in Tomcat's classpath:

1. Create an 'endorsed' directory inside your TOMCAT home directory:
/opt/perfsonar/tomcat/endorsed
2. Copy the following jar files from **/opt/perfsonar/tomcat/webapps/geant2-java-as/WEB-INF/lib/** into this directory:
xalan-2.7.0.jar
xalan-serializer-2.7.0.jar
xercesImpl-2.8.0.jar
xerces-xml-apis-2.8.0.jar
3. Start or restart Tomcat.

4.2.4 Testing the Installation

You can test if you have installed the AS correctly by checking if the Web Admin pages can be displayed. The Web Admin pages are a web interface that you need to configure the service, once you have successfully tested its installation.

To test the installation:

Open a Mozilla browser and enter the following URL:

http://<host>:<port>/geant2-java-as

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-as>

If you have installed the AS correctly, the Web Admin pages are displayed.

Note: if you have installed the AS using a WAR file and not chosen the service's recommended name (geant2-java-as), you have to modify the service's name accordingly in the URL.

Once you have successfully tested your installation, you need to configure the service (see *Configuring the AS* on page 27).

4.3 Configuring the AS

Before you can use the AS, you need to configure it. For this you can use the perfSONAR Web Administration pages, a web interface that provides a central point from which you can configure all the service's settings.

The Web Admin pages are split into basic and advanced configuration. Only the basic configuration is mandatory, the advanced configuration is optional and not normally needed.

Note: The purpose of the Web Admin pages is to aid you in the initial configuration that the service requires after its installation. It does not store the modifications you make to the service's configuration and displays the original default values if you open it again. That means that if you want to use the Web Admin pages to reconfigure the service at any point, you must again specify values for all settings, if you don't want to overwrite their configuration with the original default settings.

4.3.1 Mandatory Basic Configuration

To configure the settings that the AS requires:

1. Open a Mozilla browser and enter the following URL to display the Web Admin pages:

http://<host>:<port>/geant2-java-as

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-as>

Note: if you have installed the AS using a WAR file and not chosen the service's recommended name (geant2-java-as), you have to modify the service's name accordingly in the URL.

2. Under the **Basic Configuration** heading in the navigation panel, click **Service**.

A login prompt is displayed.

3. Enter your login details (the default login is perfsonaruser and perfsonarpass) and click **OK**.

The basic service configuration settings page is displayed. This page lists the settings that the AS requires to be configured in order to be able to run:

LS Configuration

This section allows you to register your AS with the Lookup Service.

Do you wish to register to a LS

Select **yes** to register the AS with the Lookup Service. This means that every time the AS starts running, it signals its availability to the LS. From there other clients (usually visualisation tools) can see that the AS is available and check its capabilities.

Enter the service name

Enter a name for the AS service. It is recommended that you include an identifier of the domain that the service belongs to in the service's name.

Enter a description for the service

Enter a description for the AS service. The LS displays this to clients as part of the AS' capability details.

Enter the service administrator's email address

Enter the email address of the AS administrator. The LS displays this to clients as part of the AS' capability details.

Enter the name of the organization running this service

Enter the email address of the organisation who is hosting the AS. The LS displays this to clients as part of the AS' capability details.

Enter the LS URL

Enter the URL of the LS that you want to register the AS with. For example, <http://localhost:8080/xml-Is/services/LookupService>

Set the registration interval (milliseconds)

Enter the amount of time (in milliseconds) to elapse between registration requests to the Lookup Service. By default this is 43200000 milliseconds (12 hours).

Enter the service access point

Enter the URL to the location where your AS is installed. For example, <http://myhost:8080/geant2-java-as/services/AuthService>

Administration Configuration

This section allows you to set the login details for the Web Admin pages.

Enter the username for logging in to the admin pages

Specify the username that users have to enter to log in to the Web Admin pages.

Enter the password for logging in to the admin pages

Specify the password that users have to enter to log in to the Web Admin pages (if this field displays an asterisk, you must enter the correct password anyway because the value in this field always overwrites the current configuration).

Authentication Configuration:

This section allows sets the details required to set up secure authentication.

Enter the full path to the TrustStore file containing the CA certs

This configuration entry has a default value that points to eduGAIN/perfSONAR trust store. It is recommended that you do not change the default as it disables the AS from accepting eduGAIN/perfSONAR certified user identities.

Enter the password for the TrustStore file

The password that protects the specified TrustStore file. You must not change this, unless the TrustStore or its password has been manually changed.

Enter the full path to a file containing valid Component IDs in eduGAIN

The full path to the file which contains a list of acceptable Identifiers. You must not change this as these identifiers specify eduGAIN identity providers that are supported by the AS. Currently, all identity providers including SASL CA are accepted.

Enter the maximum lifetime (milliseconds) token allowed in the service

Identity verification requests that are sent to the AS contain identities or tokens that include a timestamp which indicates their issue date and time. The age of the token is calculated and if it is less than the value specified in this field, the identity considered valid.

It is recommended that you do not change the default value.

4. Click **apply**.
5. Restart Tomcat to apply your configuration changes.

Once you have completed the basic configuration, you should test your deployment (see *Testing Your Deployment* on page 30).

4.3.2 Optional Advanced Configuration

The advanced configuration is optional and not normally needed.

To configure advanced settings:

1. Log on to the Web Admin pages.
2. Under the **Advanced Configuration** heading in the navigation panel, click **Service**.
The advanced service configuration settings page is displayed. This page lists the service settings that you can configure to customise the AS according to your requirements.
3. Drag your mouse cursor over each of the listed settings to display a brief description of them. Check if the default values suit your environment and modify them if you need to.
4. Click **apply** to apply your modifications.
5. Under the **Advanced Configuration** heading in the navigation panel, click **Logging**.
The advanced service configuration settings page is displayed. This page lists the logging settings that you can configure to customise the AS according to your requirements.
6. Drag your mouse cursor over each of the listed settings to display a brief description of them. Check if the default values suit your environment and modify them if you need to.
7. Click **apply**.
8. Restart Tomcat to apply your configuration changes.

If you have made any changes to advanced configuration, you should test your deployment (see *Testing Your Deployment* on page 30).

4.4 Testing Your Deployment

You can use the perfsonarUI client to check if you have deployed the AS correctly:

1. Start PerfsonarUI and display the **Playground** page.
2. In the **Service address** field, enter the URL to the AS:
http://<host>:<port>/geant2-java-as/services/AuthService
<host>
The IP address or name of the machine that hosts the web service.
<port>
The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-as/services/AuthService>

Note: if you have installed the AS using a WAR file and not chosen the service's recommended name (geant2-java-as), you have to modify the service's name accordingly in the URL.

3. In the **Execute query** section, click **Query** to send an EchoRequest to the AS. If you have installed the service correctly an EchoResponse is returned:

```
<?xml version="1.0" encoding="UTF-8"?>
<nmwg:message id="message1208947296_resp"
  messageIdRef="message1208947296" type="EchoResponse"
  xmlns:nmwg="http://ggf.org/ns/nmwg/base/2.0/">
  <nmwg:metadata id="resultCodeMetadata">
    <nmwg:eventType>success.echo</nmwg:eventType>
  </nmwg:metadata>
  <nmwg:data id="resultDescriptionData_for_resultCodeMetadata"
    metadataIdRef="resultCodeMetadata">
    <nmwgr:datum xmlns:nmwgr="http://ggf.org/ns/nmwg/result/2.0/">This is the
      echo response from the service.</nmwgr:datum>
  </nmwg:data>
</nmwg:message>
```

You can also send a LookupInfoRequest to test if you have deployed the AS correctly:

1. Start PerfsonarUI and display the **Playground** page.
2. In the **Service address** field, enter the URL to the AS:
http://<host>:<port>/<service>/services/AuthService

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-as/services/AuthService>

Note: if you have installed the AS using a WAR file and not chosen the service's recommended name (geant2-java-as), you have to modify the service's name accordingly in the URL.

3. In the **Query** field, enter the following LookupInfoRequest:

```
<?xml version="1.0" encoding="UTF-8"?>
<nmwg:message id="id1" type="LookupInfoRequest"
  xmlns:nmwg="http://ggf.org/ns/nmwg/base/2.0/">
  <nmwg:metadata id="meta">
    <nmwg:eventType>http://schemas.perfsonar.net/tools/admin/lookup
      info/2.0</nmwg:eventType>
  </nmwg:metadata>
  <nmwg:data id="data" metadataIdRef="meta"/>
</nmwg:message>
```

4. In the **Execute query** section, click **Query** to send the LookupInfoRequest to the AS. If you have installed the service correctly a LookupInfoResponse is returned. For example:

```
<?xml version="1.0" encoding="UTF-8"?>
<nmwg:message id="idl_resp" messageIdRef="idl" type="LookupInfoResponse"
xmlns:nmwg="http://ggf.org/ns/nmwg/base/2.0/">
  <nmwg:metadata id="localhost.localdomain.841f726:11957c178d1:-7f30"/>
  <nmwg:data id="localhost.localdomain.841f726:11957c178d1:-7f2f"
metadataIdRef="localhost.localdomain.841f726:11957c178d1:-7f30">
    <psservice:datum
xmlns:psservice="http://ggf.org/ns/nmwg/tools/org/perfsonar/service/1.0/">
      <psservice:service>
        <psservice:serviceName>perfSONAR AS</psservice:serviceName>
        <psservice:accessPoint>http://localhost:8080/perfSONAR-
AS/services/AuthService</psservice:accessPoint>
        <psservice:serviceType>as</psservice:serviceType>
        <psservice:serviceDescription>perfSONAR AS</psservice:serviceDescription>
        <psservice:serviceVersion>1.0</psservice:serviceVersion>
        <psservice:organization>my organisation</psservice:organization>
        <psservice:contactEmail>user@domain</psservice:contactEmail>
      </psservice:service>
    </psservice:datum>
  </nmwg:data>
</nmwg:message>
```

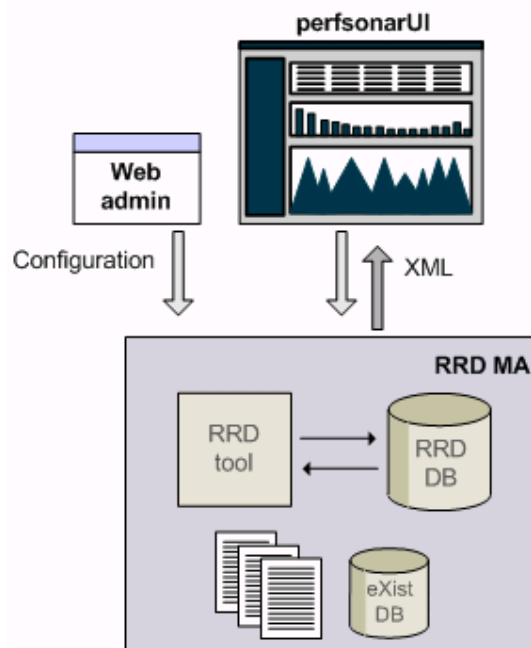
5 RRD MA

The Round Robin Database Measurement Archive (RRD MA) stores time-series data that is usually collected by SNMP-based measurement tools. It provides the following measurements:

- IP interface link utilisation
- IP interface link capacity
- IP interface input errors
- IP interface output drops

You can access the data using the perfsonarUI web client or the DFN CNM.

5.1 System Architecture



When users access archived data from the RRD MA from the perfsonarUI web client, perfsonarUI sends an XML request to the RRD MA. The RRD MA then retrieves the data from the RRD DB via the RRD tool and returns an XML reply to the client.

The RRD MA is configured via a Web Admin interface which is included in the RRD MA installation. The Web Admin interface stores the configuration settings in an eXist database (meta configuration information) and files (non-meta configuration information) from where they are applied to the RRD MA.

5.2 Installing

You can install the RRD MA on a Linux operating system (Red Hat Enterprise, Fedora, CentOS or Debian) or on other UNIX-based operating systems (see *Installing on any UNIX-based OS* on page 36).

Note:

- It is recommended that you also install the Lookup Service, so you are able to check which services you can access across the network.
- It is recommended that you install the Authentication Service, so you can enable authentication for your web services.
- If you are also installing the Lookup Service and the Authentication Service, you should install the Lookup Service first and the Authentication Service second before you install any of the other services.

5.2.1 Installing on Linux

If you are running a Linux operating system, you can install the RRD MA using RPM distributions or in a non-RPM distribution. If you are using Debian, you need to install the RRD MA using Debian packages.

To install using RPM distributions:

1. Log on as root to the machine on which you want to host the RRD MA.
2. Check that you have installed the dependency RPMs (see *Installing Pre-requisite Software Using Packages* on page 4).

Note: if you are running Red Hat Enterprise Linux 5, you need to install the rrdtool rpm installer as this is not included in Red Hat Enterprise Linux 5. You can download the installer by executing the following command:

```
wget
```

```
ftp://ftp.pbone.net/mirror/ftp.sourceforge.net/pub/sourceforge/o/op/opennms/rrdtool-1.2.23-0.rhel5.x86\_64.rpm
```

3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/>
4. Download the latest rpm file available. For example:
geant2-java-rrd-ma-3.0-1.i386.rpm (for 32 bit machines)
geant2-java-rrd-ma-3.0-1.x86_64.rpm (for 64 bit machines)
5. Install the RRD MA web service. For example:
rpm -i geant2-java-rrd-ma-3.0-1.i386.rpm
6. Set the **LD_LIBRARY_PATH** environment variable to the following value:
export LD_LIBRARY_PATH=:/usr/lib:/opt/perfsonar/services/geant2-java-rrd-ma/WEB-INF/contrib/rrdjtool/build
7. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).

Once you have finished installing, it is recommended that you test your installation.

To install the RPM files in a non-RPM Linux distribution:

1. Check that you have installed the dependency RPMs (see *Installing Pre-requisite Software Using Packages* on page 4).
2. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/>
3. Download the latest rpm file available. For example:
geant2-java-rrd-ma-3.0-1.i386.rpm (for 32 bit machines)
geant2-java-rrd-ma-3.0-1.x86_64.rpm (for 64 bit machines)
4. Install the RRD MA web service. For example:
rpm -i --nodeps geant2-java-rrd-ma-3.0-1.i386.rpm
5. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).

Once you have finished installing, it is recommended that you test your installation.

To install using Debian packages:

1. Log on as root to the machine on which you want to host the RRD MA.
2. Check that you have installed the dependency debian files (see *Installing Pre-requisite Software Using Packages* on page 4).
3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/debian>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/debian>

4. Download the latest deb file available. For example:
 geant2-java-rrd-ma-3.0-1.i386.deb (for 32 bit machines)
 geant2-java-rrd-ma-3.0-1.x86_64.deb (for 64 bit machines)
 5. Install the RRD MA web service. For example:
 dpkg -i geant2-java-rrd-ma-3.0-1.i386.deb
 6. Set the LD_LIBRARY_PATH environment variable to the following value:
 export LD_LIBRARY_PATH=./usr/lib:/opt/perfsonar/services/geant2-java-rrd-ma/WEB-INF/contrib/rrdtool/build
 7. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).
- Once you have finished installing, it is recommended that you test your installation.

5.2.2 Installing on any UNIX-based OS

If you don't have root access to the machine on which you want to host the RRD MA, you can install the RRD MA using a WAR file. This installation method is supported for any UNIX-based operating system.

1. Log on to the machine on which you want to host the RRD MA. It is recommended that you don't use the root account.
 2. Check that you have installed the dependency software (see *Installing Pre-requisite Software Using Tar Files* on page 9).
 3. Go to one of the following locations:
 <http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/war>
 <http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/war>
 4. Find the latest available version of the RRD MA war file. For example:
 geant2-java-rrd-ma-3.0-1.i386.war (for 32 bit machines)
 geant2-java-rrd-ma-3.0-1.x86_64.war (for 64 bit machines)
 geant2-java-rrd-ma-3.0-1.sparc.war (for sparc machines)
 5. Download the war file into the **/opt/perfsonar/services** directory. For example:
 /opt/perfsonar/services/geant2-java-rrd-ma-3.0-1.i386.war
 6. To Tomcat's **server.xml** file, add an access path to the RRD MA to load it (see *Configuring Tomcat to Upload MDM Services* on page 11). For example:
 <Context path='/geant2-java-rrd-ma' docBase='/opt/perfsonar/services/geant2-java-rrd-ma-3.0-1.i386.war'> </Context>
- Note:** tag names in the **server.xml** file are case-sensitive.
7. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 11).
- Once you have finished installing, it is recommended that you test your installation.

5.2.3 Testing the Installation

You can test if you have installed the RRD MA correctly by checking if the Web Admin pages can be displayed. The Web Admin pages are a web interface that you need to configure the service, once you have successfully tested its installation.

To test the installation:

Open a Mozilla browser and enter the following URL:

http://<host>:<port>/geant2-java-rrd-ma

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-rrd-ma>

If you have installed the RRD MA correctly, the Web Admin pages are displayed.

Note: if you have installed the RRD MA using a WAR file and not chosen the service's recommended name (geant2-java-rrd-ma), you have to modify the service's name accordingly in the URL.

Once you have successfully tested your installation, you need to configure the service (see *Configuring the RRD MA* on page 37).

5.3 Configuring the RRD MA

Before you can use the RRD MA, you need to configure it. For this you can use the perfSONAR Web Administration pages, a web interface that provides a central point from which you can configure all the service's settings.

The Web Admin pages are split into basic and advanced configuration. Only the basic configuration is mandatory, the advanced configuration is optional and not normally needed.

Note: The purpose of the Web Admin pages is to aid you in the initial configuration that the service requires after its installation. It does not store the modifications you make to the service's configuration and displays the original default values if you open it again. That means that if you want to use the Web Admin pages to reconfigure the service at any point, you must again specify values for all settings, if you don't want to overwrite their configuration with the original default settings.

5.3.1 Mandatory Basic Configuration

To configure the settings that the RRD MA requires:

1. Open a Mozilla browser and enter the following URL to display the Web Admin pages:

http://<host>:<port>/geant2-java-rrd-ma

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-rrd-ma>

Note: if you have installed the RRD MA MP using a WAR file and not chosen the service's recommended name (geant2-java-rrd-ma), you have to modify the service's name accordingly in the URL.

2. Under the **Basic Configuration** heading in the navigation panel, click **Service**.

A login prompt is displayed.

3. Enter your login details (the default login is perfsonaruser and perfsonarpass) and click **OK**.

The basic service configuration settings page is displayed. This page lists the settings that the RRD MA requires to be configured in order to be able to run:

LS Configuration

This section allows you to register your RRD MA with the Lookup Service.

Do you wish to register with an LS

Select **yes** to register the RRD MA with the Lookup Service. This means that every time the RRD MA starts running, it signals its availability to the LS. From there other clients (usually visualisation tools) can see that the RRD MA is available and check its capabilities.

Enter the service name

Enter a name for the RRD MA service. It is recommended that you include an identifier of the domain that the service belongs to in the service's name.

Enter a description for the service

Enter a description for the RRD MA service. The LS displays this to clients as part of the RRD MA's capability details.

Enter the service administrator's email address

Enter the email address of the RRD MA administrator. The LS displays this to clients as part of the RRD MA's capability details.

Enter the name of the organization running this service

Enter the email address of the organisation who is hosting the RRD MA. The LS displays this to clients as part of the RRD MA's capability details.

Enter the LS URL

Enter the URL of the LS that you want to register the RRD MA with. For example, <http://localhost:8080/xml-ls/services/LookupService>

Set the registration interval (milliseconds)

Enter the amount of time (in milliseconds) to elapse between registration requests to the Lookup Service. By default this is 43200000 milliseconds (12 hours).

Enter the service access point

Enter the URL to the location where your RRD MA is installed. For example, <http://myhost:8080/geant2-java-rrd-ma/services/MeasurementArchiveService>

eXist Configuration

This section allows you to set the login details for the Web Admin pages.

Enter the location of the eXist database

Enter the URL to the location where your eXist database is installed.

Enter the service username for the eXist user

Enter the service username for the RRD MA user of the eXist database. It is recommended that you use the default value.

Enter the password for the eXist user

Specify the password that RRD MA users have to enter to log in to the eXist database.

Enter the eXist administration password

Enter the password for the eXist administrator (if this field displays an asterisk, you must enter the correct password anyway because the value in this field always overwrites the current configuration).

Enter the old eXist administration password

If you install the RRD MA and already have an existing eXist installation, the Web Admin pages cannot access the admin password of the existing eXist database. Enter the existing eXist admin password in this field, so the RRD MA can access it. If you want to keep the existing password, you also need to enter it in the **Enter the eXist administration password** field. If you want to change it, enter the password that you want to replace it with in the **Enter the eXist administration password** field.

Enter the full path of the metadata configuration file

Enter the full path to the XML metadata configuration file required for stitching (see *RRD MA Stitching* on page 43). By default the path to an example metadata configuration file is specified, which comes with the service. This file contains some test data that you can use as a template for creating your own file.

While initialising RRD MA this XML file will be copied from this location to the eXist database, so that the RRD MA can start to use it.

Administration Configuration

This section allows you to set the login details for the Web Admin pages.

Enter the username for logging in to the admin pages

Specify the username that users have to enter to log in to the Web Admin pages.

Enter the password for logging in to the admin pages

Specify the password that users have to enter to log in to the Web Admin pages (if this field displays an asterisk, you must enter the correct password anyway because the value in this field always overwrites the current configuration).

Authentication Configuration

If you have installed an Authentication Service or are permitted to use a third party AS, this section allows you to enable authentication for your RRD MA by registering it with this AS. This means that you can restrict specific request types to only be executable by users with an identity provider (e.g. GIdP) account, while the requests of unauthorised users are ignored.

Do you wish to enable authentication

Select **yes** if you want to restrict access to the RRD MA. This means that only users who have an identity provider (e.g. GIdP) account can send messages of types specified in the **Enter the message types which should be authenticated** field to the RRD MA.

Enter the URL address of the Authentication Service

Enter the URL of the AS that you are using to authenticate users. This can be an AS you have installed yourself or a third party AS that you are permitted to use.

Enter the message types which should be authenticated

Enter a CSV of the types of message for which you require authentication. You can restrict the following message types:

- **MetadataKeyRequest**
Requests a list of all supported devices and the commands they support.
- **SetupDataRequest**
Executes commands on the devices the RRD MA is connected to.
- **MeasurementArchiveStoreRequest**
Stores measurement data in the RRD MA.

4. Click **apply** to apply your modifications.
5. Under the **Advanced Configuration** heading in the navigation panel, click **Service**.

The advanced service configuration settings page is displayed. This page lists the service settings that you can configure to customise the RRD MA according to your requirements.

6. Drag your mouse cursor over each of the listed settings to display a brief description of them. Check if the default values suit your environment and modify them if you need to.
7. Click **apply**.
8. Restart Tomcat to apply your configuration changes.

Once you have completed the basic configuration, you should test your deployment (see *Testing Your Deployment* on page 41).

5.3.2 Optional Advanced Configuration

The advanced configuration is optional and not normally needed.

To configure advanced settings:

1. Log on to the Web Admin pages.
2. Under the **Advanced Configuration** heading in the navigation panel, click **Logging**.

The advanced service configuration settings page is displayed. This page lists the logging settings that you can configure to customise the RRD MA according to your requirements.

3. Drag your mouse cursor over each of the listed settings to display a brief description of them. Check if the default values suit your environment and modify them if you need to.
4. Click **apply** to apply your modifications.
5. Under the **Advanced Configuration** heading in the navigation panel, click **eXist Database**.
A login prompt is displayed.
6. Enter your login details (the default username is admin and an empty password field, unless you have set an administration password) and click **OK**.

The **eXist Database Administration** page is displayed. This page comprises the following tabs:

Manage Collections

This tab lists the eXist resources and their details (owners, groups, permissions and creation dates). You can select a resource and click **Edit Resource** to change its details or **Delete Resource** to delete it. You can also create a new resource by clicking **Create Resource**, specifying the required details and clicking **Create**.

Manage Users

This tab lists the eXist users and their details (groups and homes). You can select a user and click **Edit** to change their details or **Delete** to delete them. You can also create a new user by clicking **Create**, specifying the required details and clicking **Create**.

7. Restart Tomcat to apply your configuration changes.

If you have made any changes to advanced configuration, you should test your deployment (see *Testing Your Deployment* on page 41).

5.4 Testing Your Deployment

You can test if you have deployed the RRD MA correctly by sending requests from PerfsonarUI.

To send an EchoRequest:

1. Start PerfsonarUI and display the **Playground** page.
2. In the **Service address** field, enter the URL to the RRD MA service:
http://<host>:<port>/geant2-java-rrd-ma/services/MeasurementArchiveService
<host>
The IP address or name of the machine that hosts the web service.
<port>
The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-rrd-ma/services/MeasurementArchiveService>

Note: if you have installed the RRD MA using a WAR file and not chosen the service's recommended name (geant2-java-rrd-ma), you have to modify the service's name accordingly in the URL.

3. In the **Execute query** section, click **Query** to send an EchoRequest to the RRD MA. If you have installed the service correctly an EchoResponse is returned:

```
<?xml version="1.0" encoding="UTF-8"?>
<nmwg:message id="message1208947296_resp"
  messageIdRef="message1208947296" type="EchoResponse"
  xmlns:nmwg="http://ggf.org/ns/nmwg/base/2.0/">
  <nmwg:metadata id="resultCodeMetadata">
    <nmwg:eventType>success.echo</nmwg:eventType>
  </nmwg:metadata>
  <nmwg:data id="resultDescriptionData_for_resultCodeMetadata"
    metadataIdRef="resultCodeMetadata">
    <nmwgr:datum xmlns:nmwgr="http://ggf.org/ns/nmwg/result/2.0/">This is the
      echo response from the service.</nmwgr:datum>
  </nmwg:data>
</nmwg:message>
```

To send a LookupInfoRequest:

1. Start PerfsonarUI and display the **Playground** page.
2. In the **Service address** field, enter the URL to the RRD MA service:
http://<host>:<port>/geant2-java-rrd-ma/services/MeasurementArchiveService
<host>
The IP address or name of the machine that hosts the web service.
<port>
The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-rrd-ma/services/MeasurementArchiveService>

Note: if you have installed the RRD MA MP using a WAR file and not chosen the service's recommended name (geant2-java-rrd-ma), you have to modify the service's name accordingly in the URL.

3. In the **Query** field, enter the following LookupInfoRequest:

```
<?xml version="1.0" encoding="UTF-8"?>
<nmwg:message id="id1" type="LookupInfoRequest"
  xmlns:nmwg="http://ggf.org/ns/nmwg/base/2.0/">
  <nmwg:metadata id="meta">
    <nmwg:eventType>http://schemas.perfsonar.net/tools/admin/lookup
      info/2.0</nmwg:eventType>
  </nmwg:metadata>
  <nmwg:data id="data" metadataIdRef="meta"/>
</nmwg:message>
```

4. In the **Execute query** section, click **Query** to send the LookupInfoRequest to the RRD MA. If you have installed the service correctly a LookupInfoResponse is returned. For example:

```
<?xml version="1.0" encoding="UTF-8"?>
<nmwg:message id="idl_resp" messageIdRef="idl" type="LookupInfoResponse"
xmlns:nmwg="http://ggf.org/ns/nmwg/base/2.0/">
  <nmwg:metadata id="localhost.-3056f7be:11977e9a1c8:-7a42"/>
  <nmwg:data id="localhost.-3056f7be:11977e9a1c8:-7a41"
metadataIdRef="localhost.-3056f7be:11977e9a1c8:-7a42">
    <psservice:datum
xmlns:psservice="http://ggf.org/ns/nmwg/tools/org/perfsonar/service/1.0/">
      <psservice:service>
        <psservice:serviceName>perfSONAR RRD MA</psservice:serviceName>
        <psservice:accessPoint>http:// localhost:8080/geant2-java-rrd-
ma/services/MeasurementArchiveService</psservice:accessPoint>
        <psservice:serviceType>ma</psservice:serviceType>
        <psservice:serviceDescription>perfSONAR RRD
MA</psservice:serviceDescription>
        <psservice:serviceVersion>3.0</psservice:serviceVersion>
        <psservice:organization>PSNC</psservice:organization>
        <psservice:contactEmail>user@my_domain</psservice:contactEmail>
      </psservice:service>
    </psservice:datum>
  </nmwg:data>
</nmwg:message>
```

Once you have successfully tested your deployment, you need to perform RRD MA stitching (see *RRD MA Stitching* on page 43).

5.5 RRD MA Stitching

To be able to understand the measurement data that the RRD MA provides access to, it needs meta information that puts the data into context. For example, metadata that defines:

- the IP interface address for which measurement data is collected
- the DNS name of the network element in which the IP interface is hosted
- the IP interface 's capacity

The meta information is stored in an XML metadata configuration file which you need to create for your network and then apply to your RRD MA. This process is referred to as "stitching".

5.5.1 Creating the Metadata Config File

The following documents provide a sample metadata configuration file and explain the required format:

http://anonsvn.internet2.edu/svn/perfsonar/tags/GEANT2-JAVA-RRD-MA-3.0/conf/rrd-database_TEST.xml

http://anonsvn.internet2.edu/svn/perfsonar/tags/GEANT2-JAVA-RRD-MA-3.0/doc/Metadata_Configuration_Specification.doc

Note: To save time (especially for large networks) and avoid errors, it is recommended that you use automated scripts and tools to generate your metadata configuration.

5.5.2 Applying your metadata configuration

Once you have created your metadata configuration file and checked that it has the required format, you need to configure your RRD MA to use your metadata configuration file instead of the default test/dummy file:

1. Log on to the Web Admin pages (see *Mandatory Basic Configuration* on page 38).
2. Under the **Advanced Configuration** heading in the navigation panel, click **eXist Database**.
A login prompt is displayed.
3. Log on using the service credentials you provided when you configured the service for the first time (by default the rrdmaservice username and a password chosen by you), and click **OK**.
The **eXist Database Administration** page is displayed.
Note: you must not log in as admin user to upload/change metadata config files.
4. Display the **Manage Collections** tab
5. Click the name of the previously created RRD MA collection (listed in the Resource column). By default this is **rrdmaconfig**.
6. A list of XML files or resources that are stored in this collection is displayed. This list is either empty or may contain the default RRD MA config file (**rrd-database_TEST.xml**).
7. Click the **Create Resource** button.
8. Browse to the metadata configuration file that you have created for your RRD MA, and click the **Create** button to upload it.
9. Click **Refresh** to update the file list.
10. Select the default/dummy metadata configuration file and click the **Delete Resource** button to delete it.
11. Click the **log out** button to log out.

You can now test your new configuration using perfsonar UI. You should be able to see all the interfaces that you have configured. If you have any problems check the format of the file, follow all the steps above and try again.

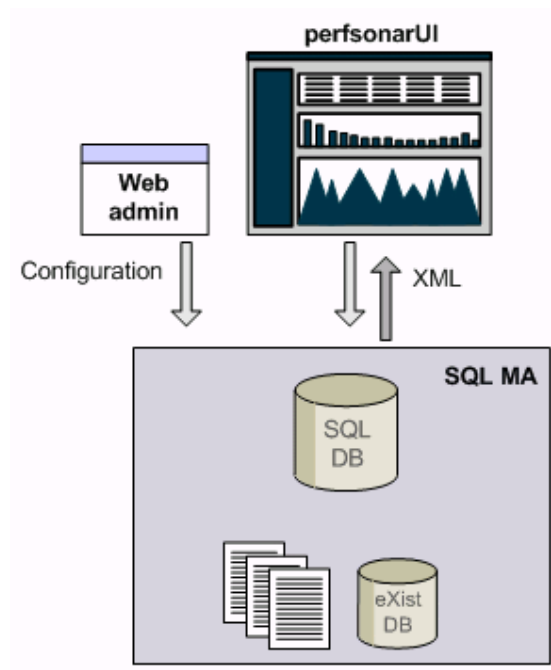
6 SQL MA

The SQL Measurement Archive (SQL MA) stores link data that is collected by measurement tools. It provides the following measurements:

- IP interface link utilisation
- IP interface link capacity
- IP interface input errors
- IP interface output drops
- Circuit / lightpath status

You can access the data using the perfsonarUI web client (for IP link utilisation) or E2EMon (for circuit / lightpath status).

6.1 System Architecture



When users access archived data from the SQL MA from the perfsonarUI web client, perfsonarUI sends an XML request to the SQL MA. The SQL MA then retrieves the data from the SQL DB and returns an XML reply to the client.

The SQL MA is configured via a Web Admin interface which is included in the SQL MA installation. The Web Admin interface stores the configuration settings in an eXist database (meta configuration information) and files (non-meta configuration information) from where they are applied to the SQL MA.

6.2 Installing

You can install the SQL MA on a Linux operating system (Red Hat Enterprise, Fedora, CentOS or Debian) or on other UNIX-based operating systems (see

Installing on any UNIX-based OS on page 49).

Note:

- It is recommended that you also install the Lookup Service, so you are able to check which services you can access across the network.
- It is recommended that you install the Authentication Service, so you can enable authentication for your web services.
- If you are also installing the Lookup Service and the Authentication Service, you should install the Lookup Service first and the Authentication Service second before you install any of the other services.

6.2.1 Installing on Linux

If you are running a Linux operating system, you can install the LS using SQL MA distributions or in a non-RPM distribution. If you are using Debian, you need to install the SQL MA using Debian packages.

To install using RPM distributions:

1. Log on as root to the machine on which you want to host the SQL MA.
2. Check that you have installed the dependency RPMs (see *Installing Pre-requisite Software Using Packages* on page 4).
3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/>
4. Download the latest rpm file available. For example:
geant2-java-sql-ma-2.0-1.noarch.rpm
5. Install the SQL MA web service. For example:
rpm -i geant2-java-sql-ma-2.0-1.noarch.rpm

6. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).

Once you have finished installing, it is recommended that you test your installation.

To install the RPM files in a non-RPM Linux distribution:

1. Check that you have installed the dependency RPMs (see *Installing Pre-requisite Software Using Packages* on page 4).
2. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/>
3. Download the latest rpm file available. For example:
geant2-java-sql-ma-2.0-1.noarch.rpm
4. Install the LS. For example:
rpm -i --nodeps geant2-java-sql-ma-2.0-1.noarch.rpm
5. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).

Once you have finished installing, it is recommended that you test your installation.

To install using Debian packages:

1. Log on as root to the machine on which you want to host the SQL MA.
2. Check that you have installed the dependency debian files (see *Installing Pre-requisite Software Using Packages* on page 4).
3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/debian>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/debian>
4. Download the latest deb file available. For example:
geant2-java-sql-ma-2.0-1.noarch.deb
5. Install the SQL MA web service. For example:
dpkg -i geant2-java-sql-ma-2.0-1.noarch.deb
6. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).

Once you have finished installing, it is recommended that you test your installation.

6.2.2 Installing on any UNIX-based OS

If you don't have root access to the machine on which you want to host the SQL MA, you can install the SQL MA using a WAR file. This installation method is supported for any UNIX-based operating system.

1. Log on to the machine on which you want to host the SQL MA. It is recommended that you don't use the root account.
2. Check that you have installed the dependency software (see *Installing Pre-requisite Software Using Tar Files* on page 9).
3. Go to one of the following locations:

<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/war>

<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/war>

4. Find the latest available version of the SQL MA war file. For example:

geant2-java-sql-ma-2.0-1.war

5. Download the war file into the **/opt/perfsonar/services** directory. For example:

/opt/perfsonar/services/geant2-java-sql-ma-2.0-1.war

6. To Tomcat's **server.xml** file, add an access path to the SQL MA to load it (see *Configuring Tomcat to Upload MDM Services* on page 11). For example:

```
<Context path='/geant2-java-sql-ma' docBase='/opt/perfsonar/services/geant2-java-sql-ma-2.0-1.war'>
</Context>
```

Note: tag names in the **server.xml** file are case-sensitive.

7. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 11).

Once you have finished installing, it is recommended that you test your installation.

6.2.3 Testing the Installation

You can test if you have installed the RRD MA correctly by checking if the Web Admin pages can be displayed. The Web Admin pages are a web interface that you need to configure the service, once you have successfully tested its installation.

To test the installation:

Open a Mozilla browser and enter the following URL:

http://<host>:<port>/geant2-java-sql-ma

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-sql-ma>

If you have installed the SQL MA correctly, the Web Admin pages are displayed.

Note: if you have installed the SQL MA using a WAR file and not chosen the service's recommended name (`geant2-java-sql-ma`), you have to modify the service's name accordingly in the URL.

Once you have successfully tested your installation, you need to configure the service (see *Configuring the SQL MA* on page 50).

6.3 Configuring the SQL MA

Before you can use the SQL MA, you need to configure it. For this you can use the perfSONAR Web Administration pages, a web interface that provides a central point from which you can configure all the service's settings.

The Web Admin pages are split into basic and advanced configuration. Only the basic configuration is mandatory, the advanced configuration is optional and not normally needed.

Note: The purpose of the Web Admin pages is to aid you in the initial configuration that the service requires after its installation. It does not store the modifications you make to the service's configuration and displays the original default values if you open it again. That means that if you want to use the Web Admin pages to reconfigure the service at any point, you must again specify values for all settings, if you don't want to overwrite their configuration with the original default settings.

6.3.1 Mandatory Basic Configuration

To configure the settings that the SQL MA requires:

1. Open a Mozilla browser and enter the following URL to display the Web Admin pages:

`http://<host>:<port>/geant2-java-sql-ma`

`<host>`

The IP address or name of the machine that hosts the web service.

`<port>`

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-sql-ma>

Note: if you have installed the SQL MA using a WAR file and not chosen the service's recommended name (`geant2-java-sql-ma`), you have to modify the service's name accordingly in the URL.

2. Under the **Basic Configuration** heading in the navigation panel, click **Service**.

A login prompt is displayed.

3. Enter your login details (the default login is perfsonaruser and perfsonarpass) and click **OK**.

The basic service configuration settings page is displayed. This page lists the settings that the SQL MA requires to be configured in order to be able to run:

LS Configuration

This section allows you to register your RRD MA with the Lookup Service.

Do you wish to register to a LS

Select **yes** to register the SQL MA with the Lookup Service. This means that every time the SQL MA starts running, it signals its availability to the LS. From there other clients (usually visualisation tools) can see that the SQL MA is available and check its capabilities.

Enter the service name

Enter a name for the SQL MA service. It is recommended that you include an identifier of the domain that the service belongs to in the service's name.

Enter a description for the service

Enter a description for the SQL MA service. The LS displays this to clients as part of the SQL MA's capability details.

Enter the service administrator's email address

Enter the email address of the SQL MA administrator. The LS displays this to clients as part of the SQL MA's capability details.

Enter the name of the organization running this service

Enter the email address of the organisation who is hosting the SQL MA. The LS displays this to clients as part of the SQL MA's capability details.

Enter the LS URL

Enter the URL of the LS that you want to register the SQL MA with. For example, <http://localhost:8080/xml-ls/services/LookupService>

Set the registration interval (milliseconds)

Enter the amount of time (in milliseconds) to elapse between registration requests to the Lookup Service. By default this is 43200000 milliseconds (12 hours).

Enter the service access point

Enter the URL to the location where your SQL MA is installed. For example, <http://myhost:8080/geant2-java-sql-ma/services/MeasurementArchiveService>

eXist Configuration

This section allows you to set the login details for the Web Admin pages.

Enter the location of the eXist database

Enter the URL to the location where your eXist database is installed.

Enter the service username for the eXist user

Enter the service username for the SQL MA user of the eXist database. It is recommended that you use the default value.

Enter the password for the eXist user

Specify the password that SQL MA users have to enter to log in to the eXist database.

Enter the eXist administration password

Enter the password for the eXist administrator (if this field displays an asterisk, you must enter the correct password anyway because the value in this field always overwrites the current configuration).

Enter the old eXist administration password

If you install the SQL MA and already have an existing eXist installation, the Web Admin pages cannot access the admin password of the existing eXist database. Enter the existing eXist admin password in this field, so the SQL MA can access it. If you want to keep the existing password, you also need to enter it in the **Enter the eXist administration password** field. If you want to change it, enter the password that you want to replace it with in the **Enter the eXist administration password** field.

Enter the full path of the metadata configuration file

Enter the full path to the XML metadata configuration file required for stitching (see *SQL MA Stitching* on page 56). By default the path to an example metadata configuration file is specified, which comes with the service. This file contains some test data that you can use as a template for creating your own file.

While initialising SQL MA this XML file will be copied from this location to the eXist database, so that the SQL MA can start to use it.

Administration Configuration

This section allows you to set the login details for the Web Admin pages.

Enter the username for logging in to the admin pages

Specify the username that users have to enter to log in to the Web Admin pages.

Enter the password for logging in to the admin pages

Specify the password that users have to enter to log in to the Web Admin pages (if this field displays an asterisk, you must enter the correct password anyway because the value in this field always overwrites the current configuration).

Authentication Configuration

If you have installed an Authentication Service or are permitted to use a third party AS, this section allows you to enable authentication for your SQL MA by registering it with this AS. This means that you can restrict specific request types to only be executable by users with an identity provider (e.g. GldP) account, while the requests of unauthorised users are ignored.

Do you wish to enable authentication

Select **yes** if you want to restrict access to the SQL MA. This means that only users who have an identity provider (e.g. GldP) account can send messages of types specified in the **Enter the message types which should be authenticated** field to the SQL MA.

Enter the URL address of the Authentication Service

Enter the URL of the AS that you are using to authenticate users. This can be an AS you have installed yourself or a third party AS that you are permitted to use.

Enter the message types which should be authenticated

Enter a CSV of the types of message for which you require authentication. You can restrict the following message types:

- MetadataKeyRequest
Requests a list of all supported devices and the commands they support.

- SetupDataRequest
Executes commands on the devices the RRD MA is connected to.
 - MeasurementArchiveStoreRequest
Stores measurement data in the RRD MA.
4. Click **apply**.
 5. Restart Tomcat to apply your configuration changes.

Once you have completed the basic configuration, you should test your deployment (see *Testing Your Deployment* on page 54).

6.3.2 Optional Advanced Configuration

The advanced configuration is optional and not normally needed.

To configure advanced settings:

1. Log on to the Web Admin pages.
2. Under the **Advanced Configuration** heading in the navigation panel, click **Service**.
The advanced service configuration settings page is displayed. This page lists the service settings that you can configure to customise the SQL MA according to your requirements.
3. Drag your mouse cursor over each of the listed settings to display a brief description of them. Check if the default values suit your environment and modify them if you need to.
4. Click **apply** to apply your modifications.
5. Under the **Advanced Configuration** heading in the navigation panel, click **Logging**.
The advanced service configuration settings page is displayed. This page lists the logging settings that you can configure to customise the SQL MA according to your requirements.
6. Drag your mouse cursor over each of the listed settings to display a brief description of them. Check if the default values suit your environment and modify them if you need to.
7. Click **apply** to apply your modifications.
8. Under the **Advanced Configuration** heading in the navigation panel, click **eXist Database**.
A login prompt is displayed.
9. Enter your login details (the default username is admin and an empty password field, unless you have set an administration password) and click **OK**.
10. The **eXist Database Administration** page is displayed. This page comprises the following tabs:
 - Manage Collections**
This tab lists the eXist resources and their details (owners, groups, permissions and creation dates). You can select a resource and click **Edit Resource** to change its details or **Delete Resource** to delete it. You can also create a new resource by clicking **Create Resource**, specifying the required details and clicking **Create**.
 - Manage Users**
This tab lists the eXist users and their details (groups and homes). You can select a user and click **Edit** to change their details or **Delete** to delete them. You can also create a new user by clicking **Create**, specifying the required details and clicking **Create**.
11. Under the **Advanced Configuration** heading in the navigation panel, click **SQL MA Admin**.

12. The SQL MA administration page is displayed. This page lists the iBATIS files used by the SQL MA and their details (metric type, database URL, database name, user name and table name). You can select an iBATIS file and click **Edit File** to change its details or **Delete File** to delete it. You can also create a new iBATIS file by clicking **Create File**, specifying the required details and clicking **Create**.
13. Restart Tomcat to apply your configuration changes.

If you have made any changes to advanced configuration, you should test your deployment (see *Testing Your Deployment* on page 54).

6.4 Testing Your Deployment

You can test if you have deployed the SQL MA correctly by sending requests from PerfsonarUI.

To send an EchoRequest:

1. Start PerfsonarUI and display the **Playground** page.
2. In the **Service address** field, enter the URL to the SQL MA service:
http://<host>:<port>/geant2-java-sql-ma/services/MeasurementArchiveService
<host>
The IP address or name of the machine that hosts the web service.
<port>
The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-sql-ma/services/MeasurementArchiveService>

Note: if you have installed the SQL MA using a WAR file and not chosen the service's recommended name (geant2-java-sql-ma), you have to modify the service's name accordingly in the URL.

3. In the **Execute query** section, click **Query** to send an EchoRequest to the SQL MA. If you have installed the service correctly an EchoResponse is returned:

```
<?xml version="1.0" encoding="UTF-8"?>
<nmwg:message id="message1208947296_resp"messageIdRef="message1208947296"
type="EchoResponse" xmlns:nmwg="http://ggf.org/ns/nmwg/base/2.0/">
  <nmwg:metadata id="resultCodeMetadata">
    <nmwg:eventType>success.echo</nmwg:eventType>
  </nmwg:metadata>
  <nmwg:data id="resultDescriptionData_for_resultCodeMetadata"
metadataIdRef="resultCodeMetadata">
    <nmwgr:datum xmlns:nmwgr="http://ggf.org/ns/nmwg/result/2.0/">This is the
echo response from the service.</nmwgr:datum>
  </nmwg:data>
</nmwg:message>
```

To send a LookupInfoRequest:

1. Start PerfsonarUI and display the **Playground** page.
2. In the **Service address** field, enter the URL to the SQL MA service:
http://<host>:<port>/geant2-java-sql-ma/services/MeasurementArchiveService
<host>
The IP address or name of the machine that hosts the web service.
<port>
The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-sql-ma/services/MeasurementArchiveService>

Note: if you have installed the SQL MA using a WAR file and not chosen the service's recommended name (geant2-java-sql-ma), you have to modify the service's name accordingly in the URL.

3. In the **Query** field, enter the following LookupInfoRequest:

```
<?xml version="1.0" encoding="UTF-8"?>
<nmwg:message id="id1" type="LookupInfoRequest"
xmlns:nmwg="http://ggf.org/ns/nmwg/base/2.0/">
  <nmwg:metadata id="meta">
    <nmwg:eventType>http://schemas.perfsonar.net/tools/admin/lookup
info/2.0</nmwg:eventType>
  </nmwg:metadata>
<nmwg:data id="data" metadataIdRef="meta"/>
</nmwg:message>
```

4. In the **Execute query** section, click **Query** to send the LookupInfoRequest to the SQL MA. If you have installed the service correctly a LookupInfoResponse is returned. For example:

```
<?xml version="1.0" encoding="UTF-8"?>
<nmwg:message id="id1_resp" messageIdRef="id1" type="LookupInfoResponse"
xmlns:nmwg="http://ggf.org/ns/nmwg/base/2.0/">
  <nmwg:metadata id="localhost.-3056f7be:11977e9a1c8:-7a3e"/>
  <nmwg:data id="localhost.-3056f7be:11977e9a1c8:-7a3d"
metadataIdRef="localhost.-3056f7be:11977e9a1c8:-7a3e">
    <psservice:datum
xmlns:psservice="http://ggf.org/ns/nmwg/tools/org/perfsonar/service/1.0/">
      <psservice:service>
        <psservice:serviceName>perfSONAR SQL MA</psservice:serviceName>
        <psservice:accessPoint>http://localhost:8080/geant2-java-sql-
ma/services/MeasurementArchiveService</psservice:accessPoint>
        <psservice:serviceType>ma</psservice:serviceType>
        <psservice:serviceDescription>perfSONAR SQL
MA</psservice:serviceDescription>
```

```
<psservice:serviceVersion>2.0</psservice:serviceVersion>
<psservice:organization>PSNC</psservice:organization>
<psservice:contactEmail>user@domain</psservice:contactEmail>
</psservice:service>
</psservice:datum>
</nmwg:data>
</nmwg:message>
```

Once you have successfully tested your deployment, you need to perform SQL MA stitching (see *SQL MA Stitching* on page 56).

6.5 SQL MA Stitching

To be able to understand the measurement data that the SQL MA provides access to, it needs meta information that puts the data into context. For example, metadata that defines:

- the IP interface address for which measurement data is collected
- the DNS name of the network element in which the IP interface is hosted
- the IP interface 's capacity

The meta information is stored in an XML metadata configuration file which you need to create for your network and then apply to your SQL MA. This process is referred to as "stitching". Before you can perform this you need to expose your MySQL or PostgreSQL database to the SQL MA.

6.5.1 Exposing Your MySQL or PostgreSQL Database to the SQL MA

Before you can carry out the stitching process, you need to be familiar with the structure of the SQL database/tables in which your measurements are stored. If you don't yet have a structure, it is recommended that you use the default structure described here:

<http://anonsvn.internet2.edu/svn/perfsonar/tags/GEANT2-JAVA-SQL-MA-2.0/conf/mysql-sqlma-dbsetup.sql>

(MySQL database default structure)

<http://anonsvn.internet2.edu/svn/perfsonar/tags/GEANT2-JAVA-SQL-MA-2.0/conf/psql-sqlma-dbsetup.sql>

(PostgreSQL database default structure)

If you are planning to use the recommended table structures, note down the names of the sql tables that you intend to use. The SQL MA uses ibatis configuration files to keep track of tables and table data access. Each SQL table is represented by at least one ibatis file. The information contained in each file is mostly about table name, database location, username, password, etc.

The following table lists the default database tables and the associated ibatis filenames. These ibatis files are created and made available by default. You only need to change their values.

Metric Family	Metric	SQL Table Name	ibatis file name	Database particulars (URL, username, password)
Packet	Utilisation	perfsonar-utilisation	ibatis-SqlMapConfig-utilization.xml	jdbc:mysql://127.0.0.1 , perfsonar_ma , perfsonar_ma
	Errors	perfsonar-utilisation	ibatis-SqlMapConfig-errors.xml	jdbc:mysql://127.0.0.1 , perfsonar_ma , perfsonar_ma
	Discards	perfsonar-discards	ibatis-SqlMapConfig-discards.xml	jdbc:mysql://127.0.0.1 , perfsonar_ma , perfsonar_ma
Circuit/ lightpath status	Domain link	domain_link	ibatis-SqlMapConfig-L2-status-domain.xml	jdbc:mysql://127.0.0.1 , perfsonar_ma , perfsonar_ma
	Interdomain link	interdomain_link	ibatis-SqlMapConfig-L2-status-interdomain.xml	jdbc:mysql://127.0.0.1 , perfsonar_ma , perfsonar_ma

Note: To help you compile the information, you may want to create a similar table to list your own database tables, the associated ibatis files and database access particulars.

To change ibatis file values on the system:

1. Check that you have created all necessary SQL tables, usernames and passwords in your SQL database.
2. Log on to the Web Admin pages (see *Mandatory Basic Configuration* on page 50).
3. Under the **Advanced Configuration** heading in the navigation panel, click **SQL MA Admin**.

The SQL MA administration page is displayed. This page lists the iBATIS files used by the SQL MA and their details (metric type, database URL, database name, user name and table name). You can select an iBATIS file and click **Edit File** to change its details or **Delete File** to delete it. You can also create a new iBATIS file by clicking **Create File**, specifying the required details and clicking **Create**.

6.5.2 Creating the Metadata Config File

The following documents provide sample metadata configuration files and explain the required format:

http://anonsvn.internet2.edu/svn/perfsonar/tags/GEANT2-JAVA-SQL-MA-2.0/conf/sql-database-L2status_TEST.xml (lightpath status)

http://anonsvn.internet2.edu/svn/perfsonar/tags/GEANT2-JAVA-SQL-MA-2.0/conf/sql-database_discards_TEST.xml (discards)

http://anonsvn.internet2.edu/svn/perfsonar/tags/GEANT2-JAVA-SQL-MA-2.0/conf/sql-database_errors_TEST.xml (errors)

http://anonsvn.internet2.edu/svn/perfsonar/tags/GEANT2-JAVA-SQL-MA-2.0/conf/sql-database_utilization_TEST.xml (utilisation)

Note: To save time (especially for large networks) and avoid errors, it is recommended that you use automated scripts and tools to generate your metadata configuration.

6.5.3 Applying your metadata configuration

Once you have created your metadata configuration file and checked that it has the required format, you need to configure your SQL MA to use your metadata configuration file instead of the default test/dummy file:

1. Log on to the Web Admin pages (see *Mandatory Basic Configuration* on page 50).
2. Under the **Advanced Configuration** heading in the navigation panel, click **eXist Database**.
A login prompt is displayed.
3. Log on using the service credentials you provided when you configured the service for the first time (by default the sqlmaservice username and a password chosen by you), and click **OK**.
4. The **eXist Database Administration** page is displayed.
Note: you must not log in as admin user to upload/change metadata config files.
5. Display the **Manage Collections** tab.
6. Click the name of the previously created SQL MA collection (listed in the Resource column). By default this is **sqlmaconfig**.
A list of XML files or resources that are stored in this collection is displayed. This list is either empty or may contain the default SQL MA config file (**sql-database_TEST.xml**).
7. Click the **Create Resource** button.
8. Browse to the metadata configuration file that you have created for your SQL MA, and click the **Create** button to upload it.
9. Click **Refresh** to update the file list.
10. Select the default/dummy metadata configuration file and click the **Delete Resource** button to delete it.
11. Click the **log out** button to log out.

You can now test your new configuration using perfsonar UI. You should be able to see all the interfaces that you have configured. If you have any problems check the format of the file, follow all the steps above and try again.

7 PerfSONAR-Buoy MA

BWCTL measurement tools collect throughput metrics and store them in an SQL archive from where the perfSONAR-BUOY MA can retrieve them.

See the following for detailed information about the perfSONAR-BUOY MA:

<http://anonsvn.internet2.edu/svn/perfSONAR-PS/trunk/doc/service/pSB/>

<https://wiki.internet2.edu/confluence/display/PSPS/Deploying+perfSONAR-PS+PingER>

Note: the perfSONAR-BUOY MA does not support authentication.

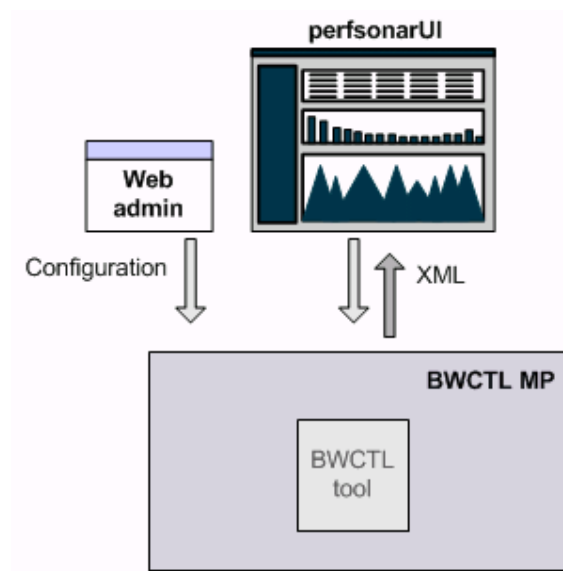
8 BWCTL MP

The Bandwidth Controller Measurement Point (BWCTL MP) executes on-demand bandwidth tests between two BWCTL tools (a BWCTL tool is a wrapper around the iperf bandwidth test tool). It provides the following measurements:

- Achievable throughput (TCP)
- UDP throughput

You can access the data using the personarUI web client or the command line client.

8.1 System Architecture



When users request throughput measurements between 2 BWCTL tool hosts from personarUI, the client sends an XML request to the BWCTL MP (this normally resides on one side of the tested path). The BWCTL MP then executes the measurement using the BWCTL tool (a wrapper around the Iperf bandwidth test tool) and returns the requested data to the client in an XML response.

The BWCTL MP is configured via a Web Admin interface which is included in the BWCTL MP installation. The Web Admin interface stores the configuration settings in an eXist database (meta configuration information) and files (non-meta configuration information) from where they are applied to the BWCTL MP.

8.2 Installing

Before you install the BWCTL MP, it is recommended that you manually test your BWCTL installation to ensure that BWCTL itself is running properly.

To test the BWCTL:

Start the BWCTL daemon and run a test from your box to another box that also has BWCTL installed and the daemon running. See <http://e2epi.internet2.edu/bwctl/> for more information on how to install and run BWCTL. If everything works fine, your perfSONAR daemon should have no problems executing tests.

Note:

- It is recommended that you also install the Lookup Service, so you are able to check which services you can access across the network.
- It is recommended that you install the Authentication Service, so you can enable authentication for your web services.
- If you are also installing the Lookup Service and the Authentication Service, you should install the Lookup Service first and the Authentication Service second before you install any of the other services.

8.2.1 On Linux

If you are running a Linux operating system, you can install the BWCTL using RPM distributions. If you are using Debian, you need to install the LS using Debian packages.

To install using RPM distributions:

1. Log on as root to the machine on which you want to host the BWCTL MP.
2. Check that you have installed the dependency RPMs (see *Installing Pre-requisite Software Using Packages* on page 4).

Note: These RPMs have dependencies for Perl modules which might not be part of your distribution. RPM informs you about missing dependencies, so you can complete your Perl environment properly.

3. Go to one of the following locations:

<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/>

<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/>

4. Download the latest rpm file available. For example:
Perl-perfSONAR-0.4.MDM_perfSONAR_3.fc7.noarch.rpm
Perl-perfSONAR-MP-BWCTL-0.4.MDM_perfSONAR_3.fc7.noarch.rpm
Perl-perfSONAR-WebAdmin-0.1.MDM_perfSONAR_3.fc7.noarch.rpm

5. Install the rpm files. For example:
rpm -i Perl-NMWG-0.01.MDM_perfSONAR_3.fc7.noarch.rpm
rpm -i Perl-perfSONAR-0.4.MDM_perfSONAR_3.fc7.noarch.rpm
rpm -i Perl-perfSONAR-MP-BWCTL-0.4.MDM_perfSONAR_3.fc7.noarch.rpm
rpm -i Perl-perfSONAR-WebAdmin-0.1.MDM_perfSONAR_3.fc7.noarch.rpm

Note: The BWCTL MP Web Admin interface uses a cgi-script which Apache must be able to execute, and your Apache user must have write-access to the **perfsonar.conf** file provided by the perfSONAR packages. To prevent unauthorised use of the Web Admin, it is recommended that you set up an authorisation mechanism with Apache.

6. Start or restart Apache to finish the installation.
7. Once you have finished installing, it is recommended that you test your installation.

To install using Debian packages:

1. Log on as root to the machine on which you want to host the BWCTL MP.
2. Check that you have installed the dependency debian files (see *Installing Pre-requisite Software Using Packages* on page 4).

Note: These debian packages have dependencies for Perl modules which might not be part of your distribution. Dpkg informs you about missing dependencies, so you can complete your Perl environment properly.

3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/debian>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/debian>

4. Download the latest available deb files. For example:
Perl-nmwg-0.01-1_all.deb
Perl-perfsonar-_0.4-1_all.deb
Perl-perfsonar-mp-bwctl_0.4-1_all.deb
Perl-perfsonar-webadmin_0.1-1_all.deb

5. Install the deb files. For example:
dpkg -i Perl-nmwg-0.01-1_all.deb
dpkg -i Perl-perfsonar-_0.4-1_all.deb
dpkg -i Perl-perfsonar-mp-bwctl_0.4-1_all.deb
dpkg -i Perl-perfsonar-webadmin_0.1-1_all.deb

Note: The BWCTL MP Web Admin interface uses a cgi-script which Apache must be able to execute, and your Apache user must have write-access to the **perfsonar.conf** file provided by the perfSONAR packages. To prevent unauthorised use of the Web Admin, it is recommended that you set up an authorisation mechanism with Apache.

6. Start or restart Apache to finish the installation.

Once you have finished installing, it is recommended that you test your installation.

8.2.2 Testing the Installation

You can test if you have installed the BWCTL MP correctly by checking if the Web Admin pages can be displayed. The Web Admin pages are a web interface that you need to configure the service, once you have successfully tested its installation.

To test the installation:

Open a Mozilla browser and enter the following URL:

`http://<host>:<port>/bwctl/WebAdmin/index.html`

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/bwctl/WebAdmin/index.html>

If you have installed the BWCTL MP correctly, the Web Admin pages are displayed.

Once you have successfully tested your installation, you need to configure the service (see *Configuring the BWCTL MP* on page 63).

8.3 Configuring the BWCTL MP

Before you can use the BWCTL MP, you need to configure it. For this you can use the perfSONAR Web Administration pages, a web interface that provides a central point from which you can configure all the service's settings.

The Web Admin pages are split into basic and advanced configuration. Only the basic configuration is mandatory, the advanced configuration is optional and not normally needed.

Note: The purpose of the Web Admin pages is to aid you in the initial configuration that the service requires after its installation. It does not store the modifications you make to the service's configuration and displays the original default values if you open it again. That means that if you want to use the Web Admin pages to reconfigure the service at any point, you must again specify values for all settings, if you don't want to overwrite their configuration with the original default settings.

8.3.1 Mandatory Basic Configuration

To configure the settings that the BWCTL MP requires:

1. Open a Mozilla browser and enter the following URL to display the Web Admin pages:

http://<host>:<port>/bwctl/WebAdmin/index.html

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/bwctl/WebAdmin/index.html>

A login prompt is displayed.

2. Enter your login details (the default login is perfsonaruser and perfsonarpass) and click **OK**.
3. Under the **Basic Configuration** heading in the navigation panel, click **Service**.

The basic service configuration settings page is displayed. This page lists the settings that the BWCTL MP requires to be configured in order to be able to run:

BWCTL Configuration

This section allows you to configure BWCTL-specific settings.

Enter the path to the BWCTL binary

Enter the path to the directory in which the BWCTL binary file is stored.

LS Configuration

This section allows you to register your BWCTL MP with the Lookup Service.

Do you wish to register with an LS

Select **yes** to register the BWCTL MP with the Lookup Service. This means that every time the BWCTL MP starts running, it signals its availability to the LS. From there other clients (usually visualisation tools) can see that the BWCTL MP is available and check its capabilities.

Enter the service name

Enter a name for the BWCTL MP service. It is recommended that you include an identifier of the domain that the service belongs to in the service's name.

Give a description of the service

Enter a description for the BWCTL MP service. The LS displays this to clients as part of the BWCTL MP's capability details.

Enter the contact email address

Enter the email address of the BWCTL MP administrator. The LS displays this to clients as part of the BWCTL MP's capability details.

Enter the name of the organization running this service

Enter the email address of the organisation who is hosting the BWCTL MP. The LS displays this to clients as part of the BWCTL MP's capability details.

Give the LS url

Enter the URL of the LS that you want to register the BWCTL MP with. For example, <http://localhost:8080/xml-ls/services/LookupService>

Give the registration interval in seconds

Enter the amount of time (in seconds) to elapse between registration requests to the Lookup Service. By default this is 3600 seconds (1 hour).

Give the service hostname

Enter the URL to the location where your BWCTL MP is installed. For example, <http://localhost:8080/services/MP/BWCTL>

Give the service port

Enter the port on which the BWCTL MP listens for requests. For example, 8080.

AS Configuration

If you have installed an Authentication Service or are permitted to use a third party AS, this section allows you to enable authentication for your BWCTL MP by registering it with this AS. This means that you can restrict requests to only be executable by users with an identity provider (e.g. GIdP) account, while the requests of unauthorised users are ignored.

Do you wish to enable authentication

Select **yes** if you want to restrict access to the BWCTL MP. This means that only users who have an identity provider (e.g. GIdP) account can send messages to the BWCTL MP.

Enter the URL address of the Authentication Service

Enter the URL of the AS that you are using to authenticate users. This can be an AS you have installed yourself or a third party AS that you are permitted to use.

4. Click **apply**.
5. Restart Tomcat to apply your configuration changes.

Once you have completed the basic configuration, you should test your deployment (see *Testing Your Deployment* on page 66).

8.3.2 Optional Advanced Configuration

The advanced configuration is optional and not normally needed.

To configure advanced settings:

1. Log on to the Web Admin pages.
2. Under the **Advanced Configuration** heading in the navigation panel, click **Service**.

The advanced service configuration settings page is displayed. This page lists the settings that you can configure to customise the BWCTL MP according to your requirements.

3. Drag your mouse cursor over each of the listed settings to display a brief description of them. Check if the default values suit your environment and modify them if you need to.
4. Click **apply**.
5. Restart Tomcat to apply your configuration changes.

If you have made any changes to advanced configuration, you should test your deployment (see *Testing Your Deployment* on page 66).

8.4 Testing Your Deployment

You can use the perfsonarUI client to check if you have deployed the BWCTL MP correctly:

1. Start the PerfSONAR daemon:

```
/opt/perfsonar/services/bin/perfsonar.pl --port=4040 --nologfile --nopidfile
```

2. Start PerfsonarUI and display the **Playground** page.
3. In the **Service address** field, enter the URL to the BWCTL MP service:

http://<host>:<port>/services/MP/BWCTL

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/services/MP/BWCTL>

4. In the **Execute query** section, click **Query** to send an EchoRequest to the BWCTL MP. If you have installed the service correctly an EchoResponse is returned:

```
<?xml version="1.0" encoding="UTF-8"?>
<nmwg:message id="message1208947296_resp"
  messageIdRef="message1208947296" type="EchoResponse"
  xmlns:nmwg="http://ggf.org/ns/nmwg/base/2.0/">
  <nmwg:metadata id="resultCodeMetadata">
    <nmwg:eventType>success.echo</nmwg:eventType>
  </nmwg:metadata>
  <nmwg:data id="resultDescriptionData_for_resultCodeMetadata"
    metadataIdRef="resultCodeMetadata">
    <nmwgr:datum xmlns:nmwgr="http://ggf.org/ns/nmwg/result/2.0/">This is the
      echo response from the service.</nmwgr:datum>
    </nmwg:data>
  </nmwg:message>
```

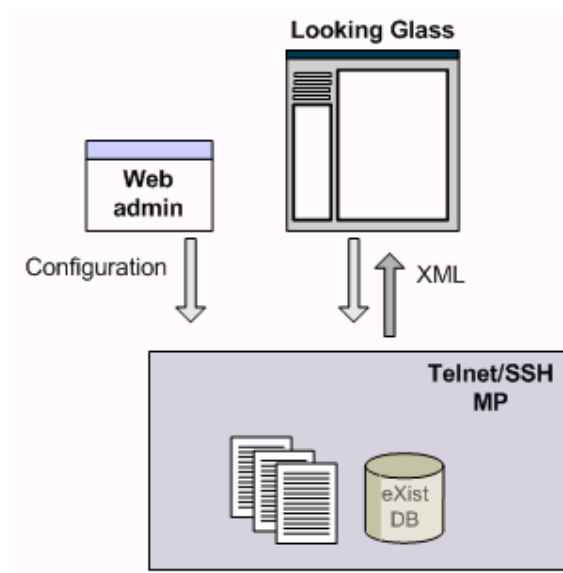
9 Telnet/SSH MP

The Telnet/SSH Measurement Point (MP) executes on-demand requests on routers. It provides the following measurements:

- RTT
- Show Command
- Traceroute

You can access the data using the Looking Glass web client.

9.1 System Architecture



When users request RTT, Show Command or Traceroute information from the Looking Glass, the client sends an XML request to the Telnet/SSH MP. The Telnet/SSH MP then retrieves the requested information from the routers it connects to and returns the requested data to the client in an XML response.

The Telnet/SSH MP is configured via a Web Admin interface which is included in the Telnet/SSH MP installation. The Web Admin interface stores the configuration settings in an eXist database (meta configuration information) and files (non-meta configuration information) from where they are applied to the Telnet/SSH MP.

9.2 Installing

You can install the Telnet/SSH MP on a Linux operating system (Red Hat Enterprise, Fedora, CentOS or Debian) or on other UNIX-based operating systems (see *Installing on any UNIX-based OS* on page 69).

Note:

- It is recommended that you also install the Lookup Service, so you are able to check which services you can access across the network.
- It is recommended that you install the Authentication Service, so you can enable authentication for your web services.
- If you are also installing the Lookup Service and the Authentication Service, you should install the Lookup Service first and the Authentication Service second before you install any of the other services.

9.2.1 Installing on Linux

If you are running a Linux operating system, you can install the Telnet/SSH MP using RPM distributions or in a non-RPM distribution. If you are using Debian, you need to install the Telnet/SSH MP using Debian packages.

To install using RPM distributions:

1. Log on as root to the machine on which you want to host the Telnet/SSH MP.
2. Check that you have installed the dependency RPMs (see *Installing Pre-requisite Software Using Packages* on page 4).
3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/>
4. Download the latest rpm file available. For example:
geant2-java-sshtelnet-mp-1.3-1.noarch.rpm
5. Install the Telnet/SSH MP. For example:
rpm -i geant2-java-sshtelnet-mp-1.3-1.noarch.rpm
6. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).

Once you have finished installing, it is recommended that you test your installation.

To install the RPM files in a non-RPM Linux distribution:

1. Check that you have installed the dependency RPMs (see *Installing Pre-requisite Software Using Packages* on page 4).
2. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/>
3. Download the latest rpm file available. For example:
geant2-java-sshtelnet-mp-1.3-1.noarch.rpm
4. Install the Telnet/SSH MP. For example:
rpm -i geant2-java-sshtelnet-mp-1.3-1.noarch.rpm
5. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).

Once you have finished installing, it is recommended that you test your installation.

To install using Debian packages:

1. Log on as root to the machine on which you want to host the Telnet/SSH MP.
2. Check that you have installed the dependency debian files (see *Installing Pre-requisite Software Using Packages* on page 4).
3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/debian>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/debian>
4. Download the latest deb file available. For example:
geant2-java-sshtelnet-mp-1.3-1.noarch.deb
5. Install the Telnet/SSH MP. For example:
dpkg -i geant2-java-sshtelnet-mp-1.3-1.noarch.deb
6. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 7).

Once you have finished installing, it is recommended that you test your installation.

9.2.2 Installing on any UNIX-based OS

If you don't have root access to the machine on which you want to host the Telnet/SSH MP, you can install the Telnet/SSH MP using a WAR file. This installation method is supported for any UNIX-based operating system.

1. Log on to the machine on which you want to host the Telnet/SSH MP. It is recommended that you don't use the root account.
2. Check that you have installed the dependency software (see *Installing Pre-requisite Software Using Tar Files* on page 9).

3. Go to one of the following locations:
<http://downloads.perfsonar.eu/bundles/perfsonar-mdm-bundle/3.0/war>
<http://www.perfsonar.net/download/bundles/perfsonar-mdm-bundle/3.0/war>
4. Find the latest available version of the Telnet/SSH MP war file. For example:
geant2-java-sshtelnet-mp-1.3-1.war
5. Download the war file into the /opt/perfsonar/services directory. For example:
/opt/perfsonar/services/geant2-java-sshtelnet-mp-1.3-1.war
6. To Tomcat's **server.xml** file, add an access path to the Telnet/SSH MP to load it (see *Configuring Tomcat to Upload MDM Services* on page 11). For example:

```
<Context path='/geant2-java-sshtelnet-mp' docBase='/opt/perfsonar/services/geant2-java-sshtelnet-mp-1.3-1.war'> </Context>
```

Note: tag names in the **server.xml** file are case-sensitive.
7. Start or restart Tomcat to finish the installation (see *Starting and Stopping Tomcat* on page 11).

Once you have finished installing, it is recommended that you test your installation.

9.2.3 Testing the Installation

You can test if you have installed the Telnet/SSH MP correctly by checking if the Web Admin pages can be displayed. The Web Admin pages are a web interface that you need to configure the service, once you have successfully tested its installation.

To test the installation:

Open a Mozilla browser and enter the following URL:

http://<host>:<port>/geant2-java-sshtelnet-mp

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-sshtelnet-mp>

If you have installed the Telnet/SSH MP correctly, the Web Admin pages are displayed.

Note: if you have installed the Telnet/SSH MP using a WAR file and not chosen the service's recommended name (geant2-java-sshtelnet-mp), you have to modify the service's name accordingly in the URL.

Once you have successfully tested your installation, you need to configure the service (see *Configuring the SSH/Telnet MP* on page 71).

9.3 Configuring the SSH/Telnet MP

Before you can use the Telnet/SSH MP, you need to configure it. For this you can use the perfSONAR Web Administration pages, a web interface that provides a central point from which you can configure all the service's settings.

The Web Admin pages are split into basic and advanced configuration. Only the basic configuration is mandatory, the advanced configuration is optional and not normally needed.

Note: The purpose of the Web Admin pages is to aid you in the initial configuration that the service requires after its installation. It does not store the modifications you make to the service's configuration and displays the original default values if you open it again. That means that if you want to use the Web Admin pages to reconfigure the service at any point, you must again specify values for all settings, if you don't want to overwrite their configuration with the original default settings.

9.3.1 Mandatory Basic Configuration

To configure the settings that the Telnet/SSH MP requires:

1. Open a Mozilla browser and enter the following URL to display the Web Admin pages:

http://<host>:<port>/geant2-java-sshtelnet-mp

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-sshtelnet-mp>

Note: if you have installed the Telnet/SSH MP using a WAR file and not chosen the service's recommended name (geant2-java-sshtelnet-mp), you have to modify the service's name accordingly in the URL.

2. Under the **Basic Configuration** heading in the navigation panel, click **Service**.

A login prompt is displayed.

3. Enter your login details (the default login is perfsonaruser and perfsonarpass) and click **OK**.

The basic service configuration settings page is displayed. This page lists the settings that the Telnet/SSH MP requires to be configured in order to be able to run:

LS Configuration

This section allows you to register your Telnet/SSH MP with the Lookup Service.

Do you wish to register to a LS

Select **yes** to register the Telnet/SSH MP with the Lookup Service. This means that every time the Telnet/SSH MP starts running, it signals its availability to the LS. From there other clients (usually visualisation tools) can see that the Telnet/SSH MP is available and check its capabilities.

Enter the version of the service

Enter the version number of the Telnet/SSH MP.

Give the LS url

Enter the URL of the LS that you want to register the Telnet/SSH MP with. For example, <http://localhost:8080/xml-ls/services/LookupService>

Give the path to the metadata configuration file which needs to be uploaded to the LS

Enter the full path to the XML metadata configuration file required for stitching (see *Telnet/SSH MP Stitching* on page 76). By default the path to an example metadata configuration file is specified, which comes with the service. This file contains some test data that you can use as a template for creating your own file.

While initializing Telnet/SSH MP this XML file will be copied from this location to the eXist database

eXist Configuration

This section allows you to set the login details for the Web Admin pages.

Give the name of the metadata configuration file

Enter the name of the XML metadata configuration file required for stitching (see *Telnet/SSH MP Stitching* on page 76). By default the name of an example metadata configuration file is specified, which comes with the service.

Give the path to the metadata configuration file (needed for uploading the file into eXist)

Enter the full path to the XML metadata configuration file required for stitching (see *Telnet/SSH MP Stitching* on page 76). By default the path to an example metadata configuration file is specified, which comes with the service. This file contains some test data that you can use as a template for creating your own file.

While initialising Telnet/SSH MP this XML file will be copied from this location to the eXist database, so that the Telnet/SSH MP can start to use it.

Give the URI for the eXist database

Enter the URI to the eXist database.

Give the username for the eXist database

Enter the service username for the Telnet/SSH MP user of the eXist database. It is recommended that you use the default value.

Give the non-admin password for the eXist database (for the user specified above)

Specify the password that Telnet/SSH MP users have to enter to log in to the eXist database.

Give the old admin password for the eXist database

If you install the Telnet/SSH MP and already have an existing eXist installation, the Web Admin pages cannot access the admin password of the existing eXist database. Enter the existing eXist admin password in this field, so the Telnet/SSH MP can access it. If you want to keep the existing password, you also need to enter it in the **Give the admin password for the eXist database** field. If you want to change it, enter the password that you want to replace it with in the **Give the admin password for the eXist database** field.

Give the admin password for the eXist database

Enter the password for the eXist administrator (if this field displays an asterisk, you must enter the correct password anyway because the value in this field always overwrites the current configuration).

Authentication Configuration

If you have installed an Authentication Service or are permitted to use a third party AS, this section allows you to enable authentication for your Telnet/SSH MP by registering it with this AS. This means that you can restrict specific request types to only be executable by users with an identity provider (e.g. GIdP) account, while the requests of unauthorised users are ignored.

Do you wish to enable authentication

Select **yes** if you want to restrict access to the Telnet/SSH MP. This means that only users who have an identity provider (e.g. GIdP) account can send restricted messages to the Telnet/SSH MP. You can restrict the following message types from the **Advanced Configuration Service** page, using the **service.as.authn_for_msg_types** setting (in the **Authentication** group):

- **MetadataKeyRequest**
Requests a list of all supported devices and the commands they support.
- **SetupDataRequest**
Executes commands on the devices the Telnet/SSH MP is connected to.

Enter the URL address of the Authentication Service

Enter the URL of the AS that you are using to authenticate users. This can be an AS you have installed yourself or a third party AS that you are permitted to use.

Administration Configuration

This section allows you to set the login details for the Web Admin pages.

Give the username to use for logging in to the admin pages

Specify the username that users have to enter to log in to the Web Admin pages.

Give the password to use for logging in to the admin pages

Specify the password that users have to enter to log in to the Web Admin pages (if this field displays an asterisk, you must enter the correct password anyway because the value in this field always overwrites the current configuration).

4. Click **apply**.
5. Restart Tomcat to apply your configuration changes.

Once you have completed the basic configuration, you should test your deployment (see *Testing Your Deployment* on page 74).

9.3.2 Optional Advanced Configuration

The advanced configuration is optional and not normally needed.

To configure advanced settings:

1. Log on to the Web Admin pages.
2. Under the **Advanced Configuration** heading in the navigation panel, click **Service**.

The advanced service configuration settings page is displayed. This page lists the service settings that you can configure to customise the Telnet/SSH MP according to your requirements.

3. Drag your mouse cursor over each of the listed settings to display a brief description of them. Check if the default values suit your environment and modify them if you need to.

4. Click **apply** to apply your modifications.
5. Under the **Advanced Configuration** heading in the navigation panel, click **Logging**.
The advanced service configuration settings page is displayed. This page lists the logging settings that you can configure to customise the Telnet/SSH MP according to your requirements.
6. Drag your mouse cursor over each of the listed settings to display a brief description of them. Check if the default values suit your environment and modify them if you need to.
7. Click **apply** to apply your modifications.
8. Under the **Advanced Configuration** heading in the navigation panel, click **eXist Database**.
A login prompt is displayed.
9. Enter your login details (the default username is admin and an empty password field, unless you have set an administration password) and click **OK**.
The **eXist Database Administration** page is displayed. This page comprises the following tabs:
 - Manage Collections**
This tab lists the eXist resources and their details (owners, groups, permissions and creation dates). You can select a resource and click **Edit Resource** to change its details or **Delete Resource** to delete it. You can also create a new resource by clicking **Create Resource**, specifying the required details and clicking **Create**.
 - Manage Users**
This tab lists the eXist users and their details (groups and homes). You can select a user and click **Edit** to change their details or **Delete** to delete them. You can also create a new user by clicking **Create**, specifying the required details and clicking **Create**.
10. Restart Tomcat to apply your configuration changes.

If you have made any changes to advanced configuration, you should test your deployment (see *Testing Your Deployment* on page 74).

9.4 Testing Your Deployment

You can use the perfsonarUI client to check if you have deployed the Telnet/SSH MP correctly:

1. Start PerfsonarUI and display the **Playground** page.
2. In the **Service address** field, enter the URL to the Telnet/SSH MP:

http://<host>:<port>/geant2-java-sshtelnet-mp/services/TelnetSSH

<host>

The IP address or name of the machine that hosts the web service.

<port>

The port on which the web service listens for commands. By default this is 8080.

For example:

<http://localhost:8080/geant2-java-sshtelnet-mp/services/TelnetSSH>

Note: if you have installed the Telnet/SSH MP using a WAR file and not chosen the service's recommended name (geant2-java-sshtelnet-mp), you have to modify the service's name accordingly in the URL.

3. In the **Execute query** section, click **Query** to send an EchoRequest to the Telnet/SSH MP. If you have installed the service correctly an EchoResponse is returned. For example:

```
<?xml version="1.0" encoding="UTF-8"?>
<nmwg:message id="message1208947296_resp"
  messageIdRef="message1208947296" type="EchoResponse"
  xmlns:nmwg="http://ggf.org/ns/nmwg/base/2.0/">
  <nmwg:metadata id="resultCodeMetadata">
    <nmwg:eventType>success.echo</nmwg:eventType>
  </nmwg:metadata>
  <nmwg:data id="resultDescriptionData_for_resultCodeMetadata"
    metadataIdRef="resultCodeMetadata">
    <nmwgr:datum xmlns:nmwgr="http://ggf.org/ns/nmwg/result/2.0/">This is the
      echo response from the service.</nmwgr:datum>
    </nmwg:data>
  </nmwg:message>
```

Once you have successfully tested your deployment, you need to perform Telnet/SSH MP stitching.

9.5 Telnet/SSH MP Stitching

To be able to execute SHOW commands on routers, the Telnet/SSH MP needs these commands to be defined for each router. This definition is made in an XML metadata configuration file which you need to create for your network and then apply to your Telnet/SSH MP. This process is referred to as “stitching”.

9.5.1 Creating the Metadata Config File

You need to configure a set of SHOW commands that the Telnet/SSH MP can execute and a list of routers that these commands can be executed on. You can find information about the available commands here:

http://anonsvn.internet2.edu/svn/perfsonar/trunk/geant2_java-sshtelnet-mp/conf/

- `commands-complete-list.xls`
A complete set of commands that the MP supports.
- `commands_minimum_set.xls`
Strongly recommended set of commands to be configured.

To create an XML metadata configuration file for your network, you can use the following scripts:

- **CSV Generator script**
Used to generate a CSV file of routers and commands that you may wish to enable. This is useful for large networks and if you want to configure a large number of routers.
- **Configuration Tool**
Used to generate the metadata configuration file. To generate this file, you need to provide a list of commands and routers. For this you can use one of the following:
 - The CSV file generated by the CSV Generator script.
 - A previously generated metadata configuration file which you edit using the tool.
 - The tool's command line feature to provide the list of routers and commands. This is suitable if you have a small number of routers (up to 5).

These scripts and a readme file that contains additional explanations are stored in the following location:

http://anonsvn.internet2.edu/svn/perfsonar/trunk/geant2_java-sshtelnet-mp/contrib/metadata%20configuration%20tools/

The following document provides a sample metadata configuration file and explains the required format. If you don't want to use the scripts provided to generate a metadata config file, it is recommended that you use the sample metadata config file in this document as a template.

http://anonsvn.internet2.edu/svn/perfsonar/tags/GEANT2_JAVA-SSHTELNET-MP-1.3/doc/Metadata%20Configuration%20file%20for%20SHTelnet%201.3.doc

Note: The sample file is Cisco-specific and needs to be adapted for alternative equipment. Passwords must be BASE64 encoded.

9.5.2 Applying your metadata configuration

Once you have created your metadata configuration file and checked that it has the required format, you need to configure your Telnet/SSH MP to use your metadata configuration file instead of the default test/dummy file:

Note: Make sure your new metadata configuration file is named as `sshtelnetmetadata.xml`. This will reduce a couple of configuration steps.

1. Log on to the Web Admin pages (see *Mandatory Basic Configuration* on page 71).
2. Under the **Advanced Configuration** heading in the navigation panel, click **eXist Database**.
A login prompt is displayed.
3. Log on using the service credentials you provided when you configured the service for the first time (by default the `sshtelnet` username and a password chosen by you), and click **OK**.
The **eXist Database Administration** page is displayed.
Note: you must not log in as admin user to upload/change metadata config files.
4. Display the **Manage Collections** tab. Here, you can find the dummy/test metadata configuration file called as **`sshtelnetmetadata.xml`**.
5. Select the default/dummy metadata configuration file and click the **Delete Resource** button to delete it.
6. Click the **Create Resource** button.
7. Browse to the metadata configuration file that you have created for your Telnet/SSH MP, and click the **Create** button to upload it.
8. Click **Refresh** to update the file list. Confirm that your new file is present on the system.
9. Click the log out button to log out.

You can now test your new configuration using the Looking Glass UI. You should be able to see all the commands that you have configured. If you have any problems check the format of the file, follow all the steps above and try again.

10 Command Line MP

The Command Line MP is a perfSONAR web service for requesting on-demand or scheduled measurements using common command line network measurement tools such as ping, Traceroute, OWAMP and BWCTL.

See the following document for detailed instructions regarding installation and configuration of Command Line MP:

http://anonsvn.internet2.edu/svn/perfsonar/trunk/rnp_java-cl-mp/doc/

Note: the Command Line MP does not support authentication.

11 perfSONAR-PS Pinger MP and MA

The perfSONAR-PS PingER comprises an MP and an MA. The MP collects availability, latency and jitter measurements and stores them in a database from where the MA can retrieve them.

See the following documents for detailed information about the perfSONAR-PS PingER:

<http://anonsvn.internet2.edu/svn/perfSONAR-PS/trunk/doc/service/pinger-interface-specification.doc>

<http://anonsvn.internet2.edu/svn/perfSONAR-PS/trunk/doc/service/pinger-ps-functional-specification.doc>

Note: the perfSONAR-PS PingER does not support authentication.

12 Acronyms

GIdP	GÉANT Identity Provider
IdP	Identity Provider
MA	Measurement Archive
MP	Measurement Point
MDM	Multi-Domain Monitoring
OS	Operating System