Platform RTM
Version 9.1

Installing

SC14-7576-00

Platform RTM
Version 9.1

Installing

SC14-7576-00

Note
Before using this information and the product it supports, read the information in "Notices" on page 27.

First edition

This edition applies to version 9, release 1 of Platform RTM (product number 5725-G82) and to all subsequent releases and modifications until otherwise indicated in new editions.

Contents

About this information

IBM® Platform RTM can be installed on a variety of operating systems. This documentation contains all the necessary information for any installation path. Note that you will not need to use all the information. Refer only to those topics that apply to your selected installation path.

In brief, installing Platform RTM entails the following steps:

1. Preparing to install Platform RTM
2. Installing Platform RTM
3. Activating Platform RTM

Chapter 1. Pre-installation checklist for Platform RTM

System sizing depends on a number of factors, the most significant include:

- The number of jobs per day across all clusters
- The number of hosts to be monitored
- The number of clusters to be monitored
- The polling frequencies for each cluster
- The number of concurrent logins to be supported
- The RRDfile data retention wanted
- The amount of historical job data to be retained
- Job graph for archiving

Keep in mind the following tips while you size up your Platform RTM file system:

Database

- Database sizing depends on number of jobs per day and job detail data retention.
- Assume 4 KB per job for this type of file system.
- Length of running jobs is a factor on job usage storage requirements.

Cacti RRDfiles

- Cacti RRDfiles size depends on the data retention.
- The default data retention results in smaller RRDfiles; assume 1-2MB per host, 30 MB + per cluster, depending on the number of users, projects, or queues.
- This file can be huge depending on customer data retention requirements.

Job Graphs

- Job Graphs, in general, are created on demand. So data storage requirements vary depending on the number of users that are viewing job graphs.
- Each set of job graphs results in 2 MB of file storage. However, if Job Graph archiving is enabled and you have high volume clusters, then it can result in TB of RRDfiles. For example, 10,000 jobs per day results in 20 GB of storage that is required per day for archiving.

Syslog Volume

The syslog database can become large depending on your per host logging level, the number of hosts, and your discard rules. Currently, there is no estimate that is established for the syslog database sizing.

System requirements

The following are the minimum requirements for Platform RTM installation:

- A system with a minimum of 2 GB RAM and 40 GB disk.
- A VMware or Xen virtual system can also be used. For Xen, full virtualization environment must be set.

  This minimum specification can support a cluster with:

  – Up to 500 hosts

  - Average daily 100,000 jobs
  - Up to 300 users and 300 user groups

  For larger clusters, refer to performance tuning in *IBMPlatform RTM Administration*.
- If the system is on DHCP, configuration is done automatically. If the system is not on DHCP, configuration can be made through the default Linux networking tools.
- An LSF® cluster must be accessible by Platform RTM.
- The Platform RTM host must be an LSF client of that LSF cluster.
- RTM requires access to the LIM (load information manager) port. If you do not specify LIM port, RTM will not be able to communicate with the LSF cluster. The default LIM port is 7869 for LSF 7 and up clusters.

Chapter 2. Installing Platform RTM

You can install Platform RTM with the following 64-bit operating systems:

- Red Hat Enterprise Linux (RHEL) version 5 (5.2 to 5.8) or RHEL 6 (6.2 to 6.3) for 64-bit
- CentOS version 5.2 to 5.8 or CentOS 6.3 for 64-bit
- SuSE Linux Enterprise Server (SLES) version 10 SP2 and 11 SP1 for 64-bit
- Scientific Linux version 5.6 or 6.1 for 64-bit

Installing Platform RTM on RHEL, CentOS, or Scientific Linux

This documentation refers to RHEL 5.2 as the operating system on which RTM is being installed; however, follow the same steps for CentOS and Scientific Linux.

Preparing to install Platform RTM on RHEL

Perform this task to prepare to install Platform RTM.

Before you begin

Important: If you want to enable the SNMP monitor feature in RTM, then you must install the PHP-SNMP package. For correct installation on RHEL 6.*x*, download the RHEL 6.2: `php-snmp-5.3.3-3.el6_1.3.x86_64.rpm` or RHEL 6.3: `php-snmp-5.3.3-3.el6_2.8.x86_64.rpm` package from the Red Hat official site by using your Red Hat Network (RHN) account. The `rhel-server-6.x-x86_64-dvd.iso` image does not contain the PHP-SNMP package.

Procedure

1. Run the RHEL 5.2 or above installation program.

   For more information, see your Red Hat Enterprise installation documentation.
2. Either disable the firewall or ensure that port 80 is open, and disable Security Enhanced Linux (SELinux).

   In the **Security level** field, if you select **Enable firewall**, you must also select the **Web Server (HTTP, HTTPS)** field.

   For the **Enable SELinux** field, select **Disable**.
3. Ensure that the following packages are selected by default:
   - **@ MySQL Database**
   - **@ Editors**
   - **@ System Tools**
   - **@ Text Internet**
   - **@ Web Server**
   - **@ Mail Server**
   - **@ unixODBC**
   - **@ mysql-connector-odbc**

   After you select the packages, the program proceeds with the installation.
4. If you did not disable SELinux or allowed port 80 during installation, run the following commands:

```
# system-config-securitylevel-tui
# reboot
```

5. Restart the Platform RTM host to complete the installation and log in to the host as root.

What to do next

Attention: Platform RTM works with only one version of unixODBC. Therefore, do the following before you install RTM:

1. Uninstall the unixODBC that you installed:
   ```
   rpm -e --allmatches --nodeps unixODBC mysql-connector-odbc
   ```
2. Install the correct version of unixODBC that is required for Platform RTM:
   ```
   yum install unixODBC.x86_64 mysql-connector-odbc
   ```

Obtaining the installation files (must have)

Download the necessary files to a location on the Platform RTM host.

Procedure

1. Log in to the Platform RTM host as root.
2. Create a directory to store the installation packages.

   For example:

   ```
   mkdir -p /mnt/rtm
   ```
3. Download the following Platform RTM packages:
   - `rtm-datapoller-9.1.0-rhel(5 or 6).tar.gz`
   - `rtm-server-9.1.0-rhel(5 or 6).tar.gz`
4. Download the following third-party files in any order and copy them into the installation directory, such as `/mnt/rtm`:

   Important: You can install Platform RTM only if you have the following packages downloaded.

   You can download the packages by copying the **wget** line into your command prompt.

   - Cacti v0.8.7g + PIA v2.9.tgz:

```
wget http://www.cacti.net/downloads/pia/cacti-plugin-0.8.7g-PA-v2.9.tar.gz
```

   - ADOdb v4.92a.tgz:

```
wget http://sourceforge.net/projects/adodb/files/adodb-php-4-and-5/adodb-492-for-php/adodb492.tgz
```

   - Boost-v4.3-1.tgz:

```
wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:boost-v4.3-1.tgz
```

   - Clog-v1.6-1.tgz:

```
wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:clog-v1.6-1.tgz
```

   - Nectar-v0.34-1:

```
wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:nectar-v0.34-1.tgz
```

   - Settings-v0.71-1.tgz:

```
wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:settings-v0.71-1.tgz
```

   - Superlinks-v1.4-2.tgz:

```
wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:superlinks-v1.4-2.tgz
```

- Syslog-v1.22-2.tgz:

```
wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:syslog-v1.22-2.tgz
```

Note: If you installed RHEL5, download and install the following rpm packages if it is not already installed on your workstation. If you have other versions of RHEL, you can omit these packages.

- php-json-1.2.1-5.fc6.x86_64.rpm:

```
wget http://dl.fedoraproject.org/pub/archive/fedora/linux/extras/6/x86_64/php-json-1.2.1-5.fc6.x86_64.rpm
```

- rrdtool-1.2.27-3.el5.x86_64.rpm:

```
wget http://kojipkgs.fedoraproject.org/packages/rrdtool/1.2.27/3.el5/x86_64/rrdtool-1.2.27-3.el5.x86_64.rpm
```

Installing the Platform RTM packages

Perform this task to install the Platform RTM packages on the host.

Procedure

1. Log in to the Platform RTM host as root.
2. Make sure that you download all the installation packages as described in "Obtaining the installation files (must have)" on page 4 before you run the installation script.
3. Erase existing databases from your host.

   This step is necessary because Platform RTM tunes the MySQL configuration to optimize the database performance that is based on the specifications of your host. This process requires the recreation of the InnoDB log and data files.

   Note: If you have any data that you need on the existing databases, back up the MySQL database (for example, by using **mysqldump**) before proceeding.

   Run the following commands to erase the MySQL databases from your host:

   ```
   service mysqld stop
   rm -f /var/lib/mysql/ibdata*
   rm -f /var/lib/mysql/ib_logfile*
   ```

4. Go to the RTM installation package directory:

   ```
   cd /mnt/rtm
   ```

5. Temporarily allow the Platform RTM host to install unsigned packages.

   You must allow unsigned packages because some of the installation packages are unsigned.

   a. Make a backup copy of the `/etc/yum.conf` file:

      ```
      cp /etc/yum.conf /etc/yum.conf.orig
      ```

   b. Edit the `/etc/yum.conf` file and specify `gpgcheck=0` in the file.

6. Uncompress the `rtm-datapoller-9.1.0-rhel.tar.gz` tar file in the `/mnt/rtm` directory.

   ```
   tar -zxvf rtm-datapoller-9.1.0-rhel.tar.gz
   ```

7. Run the `rtm_install.sh` script to install Platform RTM.

   For example:

   ```
   cd /mnt/rtm/NOOSS/x86_64
   sh rtm_install.sh
   ```

8. Change the method that your host uses to forward log messages in the network from **syslogd** to **rsyslog**.

   The Cacti syslog plug-in included with Platform RTM requires the use of **rsyslog** instead of **syslogd** to function correctly.

   Run the following commands to change from **syslogd** to **rsyslog**:

   ```
   service syslog stop
   chkconfig syslog off
   chkconfig rsyslog on
   service rsyslog start
   ```

9. Allow the Platform RTM host to accept **syslog** messages that are forwarded from other hosts:
   a. Run the **iptables** command to create an **iptables** rule for accepting **syslog** messages from other hosts:

      ```
      iptables -A INPUT -i eth0 -p udp -m state --state NEW --dport 514 -j ACCEPT
      ```

   b. Save the current **iptables** rules to the /etc/sysconfig/iptables file:

      ```
      service iptables save
      ```

      Important: By default, /etc/sysconfig/iptables file does not exist on a newly installed host. Run the **service iptables save** command to save the current firewall policy to the /etc/sysconfig/iptables file. The /etc/sysconfig/iptables file can be saved only when the iptables service is running.

Installing Platform RTM on SLES

This documentation refers to SLES 10 SP2 (64-bit) and SLES 11 SP1 (64-bit) as the operating system on which Platform RTM is being installed.

Preparing to Install Platform RTM on SLES

Procedure

1. Run the SLES installation program and follow the installation steps:

   ```
   # zypper install -t pattern lamp_server
   ```

   For more SLES information, see your SLES installation documentation.
2. Ensure that the following packages are selected by default:
   - **@ php5-curl**
   - **@ php5-ldap**
   - **@ php5-gd**
   - **@ php5-mysql**
   - **@ gd**
   - **@ python-openssl**
   - For SLES 10, select **@ python-devel** and **@ MyODBC-unixODBC**.
   - For SLES 11, select **@ rrdtool**, **@ perl-DBD-mysql**.

   Note: If you want to use SNMP monitor feature, then ensure that you select these **@ php5-snmp** and **@ net-snmp** packages.

   After you select the packages, the program proceeds with the installation.
3. For SLES 11, install **MyODBC-unixODBC** manually. It is available in SUSE Linux Enterprise Software Development Kit 11 SP1 ISO (SLE-11-SP1-SDK-DVD-x86_64-GM-DVD1.iso).
4. Remove postfix and install **sendmail**.

```
# zypper install sendmail
```

Select **delete postfix** when prompted.

5. Disable Novell AppArmor for Platform RTM to work properly:
   a. Run **yast**.
   b. Choose **Novell AppArmor** and select **AppArmor Control Panel**.
   c. Clear the **enable** option and choose **Done**.
6. Configure the firewall:
   a. In YaST, choose **Security** and **Users** > **Firewall**.
   b. Choose **Allowed Services** tab and select the **Advanced** option. Ensure that selected zone is External Zone.
   c. Enter following values for the following ports:
      - TCP Ports: 22 25 80 113 443 513:1023
      - UDP Ports: 514
   d. Proceed to see configuration summary. Review the settings for "Open Services, Ports, and Protocols" and accept the settings.
   e. Choose **Security** and **Users**>**Firewall**.
   f. Select **Start-Up** > **When Booting**. Under **Switch On and Off,** select **Start Firewall Now**.
   g. Review the settings and then accept it.
7. Configure Apache2 Web Server. Platform RTM uses a symbolic link to the `htdocs` folder. Make the following changes to allow the symbolic link:

   ```
   # cd /etc/apache2
   # vim default-server.conf
   ```

   Under the **Configure the DocumentRoot** section, change **Options None** to **Options FollowSymLinks**. Save and exit.
8. Ensure the **APACHE_MODULES** parameter has **php5** in the list. For example:

   ```
   APACHE_MODULES=actions alias auth_basic authn_file authz_host authz_groupfile
   authz_default authz_user authn_dbm autoindex cgi dir env expires include
   log_config mime negotiation setenvif ssl suexec userdir php5
   ```

9. Turn on Apache2 and MySQL server:

   ```
   # chkconfig mysql on
   # chkconfig apache2 on
   ```

10. Configure the timezone.

    Edit the `/etc/php5/apache2/php.ini` and `/etc/php5/cli/php.ini` file and add timezone information under the **[Date]** section. For example:

    ```
    [Date]
    date.timezone = Asia/Hong_Kong
    ```

Obtaining the installation files (must have)

Download the necessary files to a location on your Platform RTM host.

Procedure

1. Log in to the Platform RTM host as root.
2. Create a directory to store the installation packages. For example:

   ```
   mkdir -p /mnt/rtm
   ```

3. Download the following Platform RTM packages:
   - `rtm-datapoller-9.1.0-sles(10 or 11).tar.gz`
   - `rtm-server-9.1.0-sles(10 or 11).tar.gz`

4. Download the following third-party files in any order and copy them into the installation directory, such as `/mnt/rtm`.

   Important: You can install Platform RTM only if you have the following packages downloaded.

   You can download the package by copying the **wget** line into your command prompt.

   - Cacti v0.8.7g + PIA v2.9.tgz:

```
wget http://www.cacti.net/downloads/pia/cacti-plugin-0.8.7g-PA-v2.9.tar.gz
```

   - ADOdb v4.92a.tgz:

```
wget http://sourceforge.net/projects/adodb/files/adodb-php-4-and-5/adodb-492-for-php/adodb492.tgz
```

   - Boost-v4.3-1.tgz:

```
wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:boost-v4.3-1.tgz
```

   - Clog-v1.6-1.tgz:

```
wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:clog-v1.6-1.tgz
```

   - Nectar-v0.34-1:

```
wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:nectar-v0.34-1.tgz
```

   - Settings-v0.71-1.tgz:

```
wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:settings-v0.71-1.tgz
```

   - Superlinks-v1.4-2.tgz:

```
wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:superlinks-v1.4-2.tgz
```

   - Syslog-v1.22-2.tgz:

```
wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:syslog-v1.22-2.tgz
```

   Note: If you installed SLES 11 SP1, you also need the following packages. If you have other versions of SLES, you can omit these packages.

   - mysql-tools:

```
wget http://download.opensuse.org/update/11.1/rpm/x86_64/mysql-tools-5.0.67-12.18.1.x86_64.rpm
```

   - php5-sockets:

```
wget http://download.opensuse.org/update/11.1/rpm/x86_64/php5-sockets-5.2.6-49.14.3.x86_64.rpm
```

Installing Platform RTM

Perform this task to install Platform RTM on your host.

Procedure

1. Log in to the Platform RTM host as root.
2. Make sure to download all the installation packages, as described in"Obtaining the installation files (must have)" on page 7 before you run the installation script.
3. Erase existing databases from your host.

Erasing is necessary because Platform RTM tunes the MySQL configuration to optimize the database performance that is based on the specifications of your host. This process requires the recreation of the InnoDB log and data files.

Note: If you have any data that you need on the existing databases, back up the MySQL database (for example, by using **mysqldump**) before proceeding.

Run the following commands to erase the MySQL databases from your host:

```
service mysql stop
rm -f /var/lib/mysql/ibdata*
rm -f /var/lib/mysql/ib_logfile*
```

4. Go to the RTM installation package directory. For example:

   ```
   cd /mnt/rtm
   ```

5. Uncompress the rtm-datapoller-9.1.0-*sles*.tar.gz tar file:

   ```
   tar -zxvf rtm-datapoller-9.1.0-sles.tar.gz
   ```

6. Run the rtm_install.sh to install the Platform RTM. For example:

   ```
   cd /mnt/rtm/NOOSS/x86_64
   sh rtm_install.sh
   ```

7. Restart the syslog service to view the messages in the RTM GUI:

   ```
   # service syslog restart
   ```

8. Start the sendmail service:

   ```
   # service sendmail start
   ```

Chapter 3. Configuring Platform RTM

Perform this task to complete the initial post-installation configuration for Platform RTM to function properly.

Before you begin

Ensure that your local host (that is, the computer that you use to access the Platform RTM Console) is running a supported web browser.

Platform RTM supports Firefox 3.6, 11 and up, and Internet Explorer (IE) 8, 9, and 10.

Procedure

1. Log in to your local host.
   a. Use your web browser to start the Platform RTM Console.

      The URL for the Platform RTM Console is `http://rtm_host/cacti` where *rtm_host* is either the Platform RTM host name or IP address.

      For example, if your Platform RTM host name is `hostA.example.com` with IP address `192.168.1.5`, you can use either of the following URLs to start the Platform RTM Console:

      - `http://hostA.example.com/cacti`
      - `http://192.168.1.5/cacti`

   b. Specify the Platform RTM administrator name and password.

      The default administrator name is `admin`, and the default password for this account is `admin`.
2. Add LSF clusters for RTM to monitor.

   Follow the steps that are described in "Add or edit LSF clusters for Platform RTM to monitor" in *Platform RTM Administration* for every LSF cluster that you want RTM to monitor.
3. Add license servers for Platform RTM to monitor.

   Follow the steps described in Chapter 4, "Setting up remote license or LSF pollers," on page 13 for every license server that you want RTM to monitor.
4. (Optional) Set up the Platform RTM database on a remote host.

   By default, the Platform RTM host runs as the database host. You can choose to set up the database on another host to disperse Platform RTM activity to other workstations or to use a more optimal database host.

   Follow the steps in *Platform RTM Administration* to set up the RTM database on a remote host.

Setting the time zone

Go to the **Datetime Edit** page by clicking the **Admin** tab, then the **Date & Time** subtab. The page defines the time zone and the current date and time. You can also specify an NTP server.

After any of these settings are changed, RTM restarts the system services.

Note: If the server is not able to synchronize the date and time, you can manually set the date and time. NTP overrides any manual settings after the server is able to synchronize.

Chapter 4. Setting up remote license or LSF pollers

Platform RTM is pre-configured with local license or LSF pollers to collect information from license or LSF servers. Optionally, if you want to use remote license or LSF pollers, you must set up and configure the remote license pollers to work with Platform RTM.

Setting up remote license pollers

This document describes the requirements and steps for installing remote license poller for Platform RTM.

Before you begin

Supported OS for remote poller host:

- CentOS 5.2 or above (64-bit)
- RHEL 5.2 or above (64-bit)
- RHEL 6.2, 6.3 (64-bit)
- SLES 10.2 (64-bit)
- SLES 11.1 (64-bit)
- Scientific Linux 5.6, 6.1 (64-bit)

Make sure that the unixODBC is installed and configured.

Procedure

1. Install the remote poller OS, if applicable, make sure MySQL client is installed:

   ```
   # yum install mysql
   ```

2. Download the following RPMs from rtm-datapoller-9.1.0-< *OS_Type* >.tar.gz:

   ```
   - rtm-flexlm-<VERSION>.<ARCH>.rpm
   - rtm-lic-pollers-<VERSION>.<ARCH>.rpm
   ```

3. Copy the RPMs to the remote poller host then install:

   ```
   # rpm -Uvh rtm-*.rpm
   ```

4. Modify the `/opt/rtm/etc/lic.conf file`:
   a. Change `DB_Host` to point to the RTM database IP. If remote database is used, configure the IP to point to that host. For more information about configuring IP, see the *Administering IBM Platform RTM* guide.
   b. Modify `Poller_Loc` to set a label for the remote poller location. Use a single word with no spaces, such as "remoteLicPoller"
   c. Change `Log_File` directive to point to a path that exists in the remote poller host.
   d. Set `Daemon_User` to the user. The user must have read/write permissions for `/opt/flexlm/log` and `/opt/rtm/etc`, and its subdirectories The default user is **apache** on RedHat or **wwwrun** on SuSE. Give the user **apache** permissions:

      ```
      # setfacl -R -m u:apache:rwx /opt/rtm/lic /opt/flexlm/log
      ```

   e. (Optional) Set `Offline_Mode` to 1 to enable offline remote polling, when there is network failure between remote host and database server.
5. Add the `licpollerd` daemon as system services

```
# chkconfig licpollerd on
```

6. Grant the remote poller host access in the RTM database:

```
# mysql -u root mysql -e "GRANT ALL ON cacti.* TO cacti@ <ip of remote poller host>
IDENTIFIED BY 'admin';"
# mysql -u root mysql -e "GRANT SELECT ON mysql.time_zone_name TO cacti@
 <ip of remote poller host> IDENTIFIED BY 'admin';"
```

7. Modify the firewall of the RTM database and License server to allow connection from the remote poller host.
8. Start the poller daemon in the remote poller host:

```
# service licpollerd start
```

9. Go to the RTM Console > **License Management** > **License Pollers** > **Add**.
   a. Give a name for the remote poller and choose the license server type to poll.
   b. Enter the binary location for the license poller `For example, /opt/rtm/lic/bin`and set the remote license poller location.

      Note: The **Poller Location** field must be the value for " Poller_Loc" that was set earlier in the `lic.conf` file.
10. In the RTM console, add new license servers to poll and choose the remote poller that was created in the previous step. The remote poller host starts polling on the license servers created.

Setting up remote LSF pollers

This document describes the requirements and steps for installing remote LSF pollers for Platform RTM.

Before you begin

Supported OS for remote poller host:

- CentOS 5.2 or above (64-bit)
- RHEL 5.2 or above (64-bit)
- RHEL 6.2, 6.3 (64-bit)
- SLES 10.2 (64-bit)
- SLES 11.1 (64-bit)
- Scientific Linux 5.6, 6.1 (64-bit)

Make sure that the unixODBC is installed and configured

Procedure

1. Install the remote poller OS if applicable. Ensure that the MySQL client is installed.

```
# yum install mysql
```

2. Download the following RPMs from rtm-datapoller-9.1.0-< *OS_Type*>.tar.gz: For example,

```
- rtm-lsf<LSF_VERSION>-poller-<VERSION>.<ARCH>.rpm
- rtm-lsfpollerd-<VERSION>.<ARCH>.rpm
```

3. Copy the RPMs to the remote poller host and then install.

```
# rpm -Uvh rtm-*.rpm
```

4. Add the new Remote Pollers through the RTM console. Ensure that you are adding only the correct LSF versions for your needs. Note the Poller ID for the next step.

5. Modify the /opt/rtm/etc/lsfpollerd.conf and /opt/rtm/lsf<*version is in a 123 format*>/bin/grid.conf files on the remote poller.
   a. Change DB_Host to point to the RTM database IP.

      Note: If remote database is used, configure the IP to point to that host. For more information about configuring IP, see the "Administering IBM Platform RTM" guide.
   b. Remove the DB_Pollerid Entry.
   c. Add a New entry DB_Pollerids. It contains a comma-separated list of all remote poller ids (no spaces).
   d. Change theLog_File path to something locally accessible (such as /var/log/lsfpollerd).
   e. Set Daemon_User to the user. This user must have read/write permissions to the log directory. The default user is **apache** on RedHat or **wwwrun** on SuSE.
6. Add the lsfpollerd daemon as system services:

   ```
   # chkconfig lsfpollerd on
   ```
7. Grant the remote poller host access in the RTM database:

   ```
   # mysql -u root mysql -e "GRANT ALL ON cacti.* TO cacti@<ip of remote poller host>
   IDENTIFIED BY 'admin';"
   # mysql -u root mysql -e "GRANT SELECT ON mysql.time_zone_name TO cacti@
    <ip of remote poller host> IDENTIFIED BY 'admin';"
   ```
8. Modify the firewall of RTM database and LSF Server to allow connection from remote poller host.
9. Modify the /opt/rtm/etc/lsfpollerd.conf file on the main RTM server as explained.

   Note: Ensure that the DB_Pollerids is set to a comma-separated list of 'local' pollerid's to the RTM server.
10. Modify /opt/rtm/lsf<*version in a 123 format*>/bin/grid.conf and modify the poller ID to match the main RTM system.
11. Restart the lsfpollerd service on the RTM server:

    ```
    # service lsfpollerd restart
    ```
12. Copy the folder /opt/rtm/etc/*clusterID* from the RTM host onto /opt/rtm/etc/*clusterID* the remote lsf poller host.

    Note: If you are using advance LSF conf option, you do not have to do the preceding step but you must ensure that the path toLSF_ENVDIR is accessible by the remote LSF poller host.
13. Start the remote poller service:

    ```
    # service lsfpollerd start
    ```
14. From the RTM Console, change the poller ID for the clusters you want to poll remotely.

Install remote license poller or LSF poller on AIX

This document describes the requirements and steps for installing Remote License Poller and Remote LSF Poller on AIX® 6/7 for IBM Platform RTM

Before you begin

- Check the supported OS for remote poller host: AIX 6/7 ppc 64 bit
- Make sure that the environment variable for **LIBPATH** is set:

– For sh/bash:

```
#export LIBPATH=/usr/linux/lib64:/usr/linux/lib:$LIBPATH;
```

– For csh/tcsh:

```
#setenv LIBPATH /usr/linux/lib64:/usr/linux/lib:$LIBPATH;
```

Procedure

1. Download & install unixODBC relevant RPMs according to their installation instructions.
   - #rpm -ivh gettext-0.17-1.aix5.1.ppc.rpm

     ```
     wget http://www.oss4aix.org/download/RPMS/gettext/gettext-0.17-1.aix5.1.ppc.rpm
     ```

   - #rpm -ivh bash-4.1-7.aix5.1.ppc.rpm

     ```
     wget http://www.oss4aix.org/download/RPMS/bash/bash-4.1-7.aix5.1.ppc.rpm
     ```

   - #rpm -ivh info-4.13a-2.aix5.1.ppc.rpm

     ```
     wget http://www.oss4aix.org/download/RPMS/info/info-4.13a-2.aix5.1.ppc.rpm
     ```

   - #rpm -ivh readline-6.2-3.aix5.1.ppc.rpm

     ```
     wget http://www.oss4aix.org/download/RPMS/readline/readline-6.2-3.aix5.1.ppc.rpm
     ```

   - #rpm -ivh unixODBC-2.3.1-1.aix5.1.ppc.rpm

     ```
     wget http://www.oss4aix.org/download/RPMS/unixODBC/unixODBC-2.3.1-1.aix5.1.ppc.rpm
     ```

   - #rpm -ivh openssl-0.9.8o-1.aix5.1.ppc.rpm

     ```
     #wget http://www.oss4aix.org/download/RPMS/openssl/openssl-0.9.8o-1.aix5.1.ppc.rpm
     ```

2. Download MySQL unixODBC connector (32-bit and 64-bit)

```
wget http://downloads.mysql.com/archives/mysql-connector-odbc-3.51/mysql-connector-odbc-3.51.27-aix5.3-powerpc-64bit.tar.gz
wget http://downloads.mysql.com/archives/mysql-connector-odbc-3.51/mysql-connector-odbc-3.51.27-aix5.3-powerpc-32bit.tar.gz
```

   Extract these two packages and install `mysql-connector-odbc 3.51`. Make sure that you copy 32-bit and 64-bit libraries:

   ```
   #cd <untar_path>/mysql-connector-odbc-3.51.27-aix5.3-powerpc-32bit/lib
   #cp * /usr/lib
   #cd <untar_path>/mysql-connector-odbc-3.51.27-aix5.3-powerpc-64bit/lib
   #cp * /usr/lib64
   ```

3. Check the current path for configuring drivers and DNS:

   ```
   #odbcinst -j
   ```

   For example, the path is something similar to the following:

   ```
   unixODBC 2.3.1
    DRIVERS............: /opt/freeware/etc/odbcinst.ini
    SYSTEM DATA SOURCES: /opt/freeware/etc/odbc.ini
    FILE DATA SOURCES..: /opt/freeware/etc/ODBCDataSources
    USER DATA SOURCES..: //.odbc.ini
    SQLULEN Size.......: 4
    SQLLEN Size........: 4
    SQLSETPOSIROW Size.: 2
   ```

4. Configure ODBC driver:

   Edit `/opt/freeware/etc/odbcinst.ini`

   ```
   [MySQL ODBC 3.51 Driver]
   Driver=/usr/lib/libmyodbc3.so
   Driver64=/usr/lib64/libmyodbc3.so
   Setup=/usr/lib/libmyodbc3S.so
   Setup64=/usr/lib64/libmyodbc3S.so
   ```

   To make the driver ini file effective

   ```
   #odbcinst -i -d -f /opt/freeware/etc/odbcinst.ini
   ```

5. Configure DNS

   Edit `/opt/freeware/etc/odbc.ini`

```
[cacti]
Description=Mysql
Driver=MySQL ODBC 3.51 Driver
Server=localhost
Database=cacti
UID=cacti
PASSWORD=admin
Port=3306
Socket=
Option=4196352
Stmt=
```

To make DNS ini file effective:

```
#odbcinst -i -s -l -f /opt/freeware/etc/odbc.ini
```

6. Test if your driver/DNS is installed

```
#odbcinst -q -s   //for data source
#odbcinst -q -d   //for drivers
```

7. Set up remote MySQL control privilege

   Go to local RTM MySQL database server, login to MYSQL as root:

```
#mysql -u root
mysql>use mysql;
```

   a. Make sure that the table "USER" has a "localhost" under the **Host** column and "cacti" under the **User** column, and leave the rest to default.

```
mysql>select * from user where host='localhost' and user='cacti';
```

      Note: If you do not see those values in the **User** table, then RTM cannot connect to local MySQL server: FATAL: Cannot connect to MySQL server on 'localhost'. Make sure that you specified a valid MySQL database name in`'include/config.php'`. To avoid this error, add **`localhost-cacti`** record in the **User** table.

```
mysql>GRANT ALL ON cacti.* TO cacti@localhost IDENTIFIED BY 'admin';
```

   b. Add a record for remote MySQL unixODBC connection:

```
mysql>GRANT ALL ON cacti.* TO cacti@<ip of remote poller host> IDENTIFIED
BY 'admin';

mysql>GRANT SELECT ON mysql.time_zone_name TO cacti@<ip of remote poller host>
IDENTIFIED BY 'admin';
```

8. In the AIX server, check if you can connect ODBC to a remote database.

```
isql -v cacti   // test 32bit driver
isql_64 -v cacti  // test 64bit driver
```

Configure remote pollers on AIX

Procedure

1. Install the remote poller on the AIX host:

   Note: For installation, log on to the *AIX host*, go to the directory where RTM AIX remote poller RPMs are stored

```
#rpm -Uvh --nodeps *.rpm
```

2. Configure LSF poller and License poller

   Note: Make sure that DB_Host, DB_Pollerid and Log_File are replaced with the remote AIX settings.

```
update /opt/rtm/etc/lsfpollerd.conf
DB_Host         localhost  //replace it with the host name of your remote database
DB_Database     cacti
```

```
DB_User         cacti
DB_Pass         admin
DB_Port         3306
DB_Pollerid     10
Log_File        /var/log/lsfpollerd/cacti.log
Daemon_User     root
```

Repeat same steps to update the LSF `grid.conf` file in

```
/opt/rtm/lsfversion/bin/grid.conf
DB_Host         localhost    //replace it with the host name of your remote database
DB_Database     cacti
DB_User         cacti
DB_Pass         admin
DB_Port         3306
DB_Pollerid     10
Log_File       /var/log/lsfpollerd/cacti.log
Daemon_User     root
```

For License configuration, repeat the same configuration steps in the `/opt/rtm/etc/lic.conf` file.

3. Copy the folder `/opt/rtm/etc/clusterid` from the RTM host into `/opt/rtm/etc/clusterid` on the remote LSF poller host. If you are using advance LSF conf option, you are not required to do this step, but ensure that the path to`LSF_ENVDIR` is accessible by the remote LSF poller host.
4. Modify the firewall of RTM Database and LSF Server to allow connection from remote poller host.
5. Start **`lsfpollerd`** and **`licpollerd`**. **`lsfpollerd`** and **`licpollerd`** can be started only if the following requirements are met:
   - New poller ID is added through RTM Console (Console -> RTM Pollers).
   - AIX unixODBC is activated.
   - `lsfpollerd.conf` and `lic.conf` are configured properly.
   - LSF `grid.conf` in `/opt/rtm/lsfversion/bin/grid.conf` is configured properly
   - Make sure that the `/opt/rtm/etcclusterid/lsf.conf` file exists.

   ```
   #/opt/rtm/bin/lsfpollerd -c /opt/rtm/etc/lsfpollerd.conf
   #/opt/rtm/bin/licpollerd -c /opt/rtm/etc/lic.conf
   ```

Uninstall Remote Pollers

Procedure

To uninstall remote pollers complete the following step:

```
#rpm -qa |grep rtm- |xargs rpm -e
```

Chapter 5. Enabling remote hosts syslog transfer

Before you begin

To enable cluster hosts to display on the Platform RTM **Syslogs** page, make sure that the hosts run **syslogd** to forward log messages in the network.

About this task

Optionally, if you want any hosts in the LSF clusters that Platform RTM monitors to display on the Platform RTM **Syslogs** page, you must enable the hosts to forward logs to the Platform RTM host.

Important: The `syslog` must be installed on a host where you want system logs to be forwarded to RTM host. The `syslog.conf` file cannot exist if the application is not installed.

Perform the following steps on each host that you want displayed on the Platform RTM **Syslogs** page.

Procedure

1. Log in to a remote host.
2. Edit the `/etc/syslog.conf` file and add the following line to the end of the file:

   `*.* @`*`rtm_host_ip`*

   where *rtm_host_ip* is the IP address of your Platform RTM host.

   For example, if your IP address is 192.168.1.5, add the following to the end of the `syslog.conf` file:

   ```
   *.* @192.168.1.5
   ```
3. Restart the **syslog** service to apply your changes:

   ```
   service syslog restart
   ```

Chapter 6. Enabling grid control on an LSF cluster

Enable grid control on an LSF cluster to grant Platform RTM access to that cluster. You can then run LSF commands on that cluster.

Before you begin

Ensure that the LSF cluster and the RTM host meet the following requirements:

- The LSF master host is a Linux, AIX, HPUX, or Solaris host with **sh** or **bash** installed.
- The Platform RTM host is an LSF server or is added to the LSF cluster as an LSF client.
- The RTM host has **rsh** or **ssh** access to the LSF master host.
- The LSF master host uses at least one of the following methods of authentication and meets the corresponding requirements:
  - **ssh** password authentication: You are asked for the password of the LSF master host root user each time you start a cluster control action.
  - **ssh** private key authentication
    - You created an **ssh** public key pair by running `sshkeygen -t rsa` on the RTM host as root, then adding the public key to the `authorized_keys` file of the LSF master host root user.
    - The LSF master host has password-less authentication (**ssh** private key authorization or **rsh**) available with all other hosts in the LSF cluster.
  - **rsh** password-less authentication
    - The `.rhosts` file in the LSF master host specifies the root user of the RTM host.
    - The LSF master host and the RTM host both have the incoming TCP port 514 open.
    - The LSF master host has password-less authentication (**ssh** private key authorization or **rsh**) available with all other hosts in the LSF cluster.

About this task

Perform the following steps to enable grid control and you can control LSF clusters from the Platform RTM Console.

Procedure

1. Click the **Console** tab.
2. Enable grid control for each applicable user in the RTM host.
   a. Under the Utilities section of the Console menu bar, click **User Management**.
   b. Click the name of the user for which you want to enable grid control.
   c. In the **Realm Permissions** section, select the **Cluster Control Management** field, if it is cleared.
3. Under the Grid Management section of the Console menu bar, click **Clusters**.
4. Enable grid control on LSF clusters.

   Perform the following steps for each cluster that you want to control:

   a. Click the name of the cluster that you want to control.

The **Cluster Edit** page displays.

b. Click **Control** tab.

   The **User Authentication settings** section is displayed.

c. In the **User Authentication settings** section, specify the settings for the Primary LSF administrator account in the LSF master host.

   To ensure that RTM has access to the appropriate LSF commands, you must consider the following points:

   - The specified Primary LSF administrator user name is the name of the LSF administrator account in the LSF cluster for which you are enabling grid control. You must specify the user name of the Primary LSF Administrator for the LSF workstation. You must set the cluster user name before you run cluster by advocate, otherwise, invalid credentials/no user name specified error is displayed.

     This account is used by the Host-, Queue-, and Job-level controls through **eauth** in the LSF master host to start the control actions. After these settings are saved, this user name is created as a disabled Unix local account in the RTM host.

   - If you are connecting to the LSF master host through **ssh** private key authentication, you must provide the private key path that points to the private key file. As shown in the prerequisites, the public key of this file is added to the `authorized_keys` file of the LSF master host root user.

   - The LSF server top directory is the top-level LSF installation directory (`LSF_TOP`).

d. Click **Save** to apply your changes.

Chapter 7. Upgrading RTM to a newer version

The Platform RTM 9.1 packages upgrade your RTM system from previous version to version 9.1.

About this task

This documentation supports upgrading Platform RTM from version 2.1.2 or higher to version 9.1 on the following operating systems:

- Red Hat Enterprise Linux (RHEL):
  - RHEL 5.*x* (5.2 to 5.8), 64-bit
  - RHEL 6.*x* (6.0 to 6.3), 64-bit
- SUSE Linux Enterprise Server (SLES):
  - SLES 10.2, 64-bit
  - SLES 11.1, 64-bit

Procedure

1. Log in to the Platform RTM host as root.
2. Create a directory to store the installation packages. For example:
   ```
   mkdir -p /mnt/rtm
   ```
3. Download the following Platform RTM installation packages compatible with your operating system and store them in the directory you created:
   - `rtm-datapoller-9.1.0-(rhel5/rhel6/sles10/sles11).tar.gz`
   - `rtm-server-9.1.0-(rhel5/rhel6/sles10/sles11).tar.gz`
4. Download the following third-party files in any order and copy them to the same installation directory, such as `/mnt/rtm`.

   Important: You can upgrade Platform RTM only if you have all the following packages downloaded.

   You can download the packages by copying the **wget** line into your command prompt.

   - Cacti v0.8.7g + PIA v2.9:
     ```
     #wget http://www.cacti.net/downloads/pia/cacti-plugin-0.8.7g-PA-v2.9.tar.gz
     ```
   - ADOdb v4.92a:
     ```
     #wget http://sourceforge.net/projects/adodb/files/adodb-php-4-and-5/adodb-492-for-php/adodb492.tgz
     ```
   - Boost v4.3-1:
     ```
     #wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:boost-v4.3-1.tgz
     ```
   - Clog v1.6-1:
     ```
     #wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:clog-v1.6-1.tgz
     ```
   - Nectar v0.34-1:
     ```
     #wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:nectar-v0.34-1.tgz
     ```
   - Settings v0.71-1:
     ```
     #wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:settings-v0.71-1.tgz
     ```
   - Superlinks v1.4-2:
     ```
     #wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:superlinks-v1.4-2.tgz
     ```
   - Syslog v1.22-2:
     ```
     #wget --restrict-file-names=windows http://docs.cacti.net/_media/plugin:syslog-v1.22-2.tgz
     ```
5. Make sure that the **unixODBC** and **unixODBC** drivers for MySQL are installed.

- For RHEL:

  ```
  # yum install unixODBC mysql-connector-odbc
  ```

- For SUSE 10:

  ```
  # zypper install MyODBC-unixODBC
  ```

- For SUSE 11, install MyODBC-unixODBC manually. It is available in SUSE Linux Enterprise Software Development Kit 11 SP1 ISO (`SLE-11-SP1-SDK-DVD-x86_64-GM-DVD1.iso`).

6. Go to the directory with the upgrade installation packages and uncompress the `rtm-datapoller-9.1.0-(rhel5/rhel6/sles10/sles11).tar.gz` file. For example:

   ```
   #cd /mnt/rtm
   #tar -zxvf rtm-datapoller-9.1.0-(rhel5/rhel6/sles10/sles11).tar.gz
   ```

7. Before you back up the database, stop the RTM services:

   ```
   # service licpollerd stop
   # service lsfpollerd stop
   # service advocate stop
   # service crond stop
   ```

8. Back up the RTM basic database before proceeding.

   In the RTM GUI, go to **Console** > **Utilities** > **Grid Utilities** > **Force Cacti Backup**.

   The backup process can take a long time for large deployments.

   Note: If you are using a remote database or remote pollers, you must reconfigure the remote database/poller settings during or after the upgrade. Be sure to back up your remote database/poller settings before you configure them.

9. If RTM is using a remote database, edit the `/etc/rtm_install.conf` file to configure the remote database connection information:

   ```
   remote_db='Y'

   # Enter the username to be used to connect to database during installation
   # to perform database changes
   # This user needs to have sufficient privileges to create/delete/modify database/tables.
   db_username='root'

   # Enter the password to be used to connect to the database during installation
   # to perform database changes
   db_password=''

   # Specify the database hostname
   db_host=''

   # Specify the database port number
   db_port=''
   ```

10. Run the `rtm_upgrade.sh` script to upgrade Platform RTM to version 9.1.

    You can refer to`/var/log/rtm.upgrade.log` for details or errors that are encountered during the upgrade. For example:

    ```
    #cd /mnt/rtm/NOOSS/x86_64
    #sh rtm_upgrade.sh
    ```

    Notes:

    a. If you run the command and encounter one or more of the following messages:

       `Warning:<`*`config file path`*`> created as <`*`config file path`*`>.rpmnew`

means that the configuration file was modified since the last installation. Merge the modifications into the *<config file path>*.rpmnew file and replace all the files. For example:

```
# diff <config file path> <config file path>.rpmnew
# cp <config file path> <config file path>.bak
# vi <config file path>.rpmnew
# mv <config file path>.rpmnew <config file path>
```

b. The upgrade script creates a background process to upgrade the jobs table. This process will continue even after you complete the upgrade steps. During this period, the job search is limited.

c. If you are upgrading from RTM 2.1.2 to 9.1, the upgrade script does not silently upgrade existing data source templates. You must log in to the Cacti database in MySQL as root (that is, `mysql -u root cacti`) and do either of the following steps:

- Run the following SQL statement:

```
# UPDATE data_template_rrd SET rrd_maximum=0
WHERE data_source_type_id=1 AND rrd_maximum <> 0;
```

- Import the `cacti_data_template_`*`datasource-name`*`.xml` file from `/opt/cacti/templates/upgrade/`.

11. If RTM is using remote pollers, refer to the remote poller chapter to configure the remote pollers.
    - For remote license pollers, you can find the following RPMs in `/mnt/rtm`:
      – `rtm-flexlm-`*`VERSION`*`.`*`ARCH`*`.rpm`
      – `rtm-lic-pollers-`*`VERSION`*`.`*`ARCH`*`.rpm`

      Copy the RPMs to the remote poller host and install them on the remote host:

      ```
      # rpm -Uvh rtm-*.rpm
      ```

    - For remote LSF pollers, you can find the following RPMs in `/mnt/rtm`:
      – `rtm-lsf`*`LSF_VERSION`*`-poller-`*`VERSION`*`.`*`ARCH`*`.rpm`
      – `rtm-lsfpollerd-`*`VERSION`*`.`*`ARCH`*`.rpm`

      Copy the RPMs to the remote poller host and install them on the remote host:

      ```
      # rpm -Uvh rtm-*.rpm
      ```

    Run the RTM upgrade command to upgrade the pollers, database, and templates.
12. Restart the RTM services:

```
# service lsfpollerd restart
# service licpollerd restart
# service advocate restart
# service crond restart
```

13. If you no longer need them, you can remove the upgrade files. For example:

```
# rm -rf /mnt/rtm
```

Results

RTM is upgraded to Platform RTM Version 9.1. After you upgrade to a newer version, all the plug-ins except **Ptskin** are enabled. If you want to disable any plug-in or enable **Ptskin**, then go to **Console** >**Configuration** >**Plugin Management** and enable or disable.

Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

For license inquiries regarding double-byte character set (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

Intellectual Property Licensing
Legal and Intellectual Property Law
IBM Japan, Ltd.
19-21, Nihonbashi-Hakozakicho, Chuo-ku
Tokyo 103-8510, Japan

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law:

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web

sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

IBM Corporation
Intellectual Property Law
Mail Station P300
2455 South Road,
Poughkeepsie, NY 12601-5400
USA

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this document and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurement may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrates programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application

programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. The sample programs are provided "AS IS", without warranty of any kind. IBM shall not be liable for any damages arising out of your use of the sample programs.

Each copy or any portion of these sample programs or any derivative work, must include a copyright notice as follows:

© (your company name) (year). Portions of this code are derived from IBM Corp. Sample Programs. © Copyright IBM Corp. _enter the year or years_.

If you are viewing this information softcopy, the photographs and color illustrations may not appear.

Trademarks

IBM, the IBM logo, and ibm.com® are trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at http://www.ibm.com/legal/copytrade.shtml.

Intel, Intel logo, Intel Inside, Intel Inside logo, Intel Centrino, Intel Centrino logo, Celeron, Intel Xeon, Intel SpeedStep, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Java™ and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

LSF, Platform, and Platform Computing are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide.

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.

Printed in USA

SC14-7576-00