Rational. Directory Server

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Installation Guide

IBM Rational Directory Server

Installation Guide

Release 5.1

Before using this information, be sure to read the general information under Appendix, "Notices"on page 37.

This edition applies to **VERSION 5.1, IBM Rational Directory Server** and to all subsequent releases and modifications until otherwise indicated in new editions.

Table of contents

1 About this manual

This manual guides you through the IBM® Rational® Directory Server (RDS) installation and uninstallation. It contains the following sections:

- Introduction
- Types of RDS installations
- Modes of installations
- Preparing installation information
- Server Installation
- Server Removal
- Client Installation
- Troubleshooting RDS

RDS documentation

This section provides the information on the related documents available for RDS. The following RDS documents are available on the Product Support Web site, http://www.ibm.com/software/rational/support/

Document name	Description
IBM Rational Directory Server Installation Guide	Provides information about how installing RDS.
IBM Rational Directory Server Product Manual	Provides detailed information about RDS features supported in this release.
IBM Rational Directory Server Administration Guide	Provides information about RDS administration.

Contacting IBM Rational Software Support

If the self-help resources have not provided a resolution to your problem, you can contact IBM® Rational® Software Support for assistance in resolving product issues.

Note If you are a heritage Telelogic customer, a single reference site for all support resources is located at http://www.ibm.com/software/rational/support/telelogic/

Prerequisites

To submit your problem to IBM Rational Software Support, you must have an active Passport Advantage® software maintenance agreement. Passport Advantage is the IBM comprehensive software licensing and software maintenance (product upgrades and technical support) offering. You can enroll online in Passport Advantage from http://www.ibm.com/software/lotus/passportadvantage/howtoenroll.html

- To learn more about Passport Advantage, visit the Passport Advantage FAQs at http://www.ibm.com/software/lotus/passportadvantage/brochures_faqs_quickguides.html.
- For further assistance, contact your IBM representative.

To submit your problem online (from the IBM Web site) to IBM Rational Software Support, you must additionally:

- Be a registered user on the IBM Rational Software Support Web site. For details about registering, go to http://www.ibm.com/software/support/.
- Be listed as an authorized caller in the service request tool.

Submitting problems

To submit your problem to IBM Rational Software Support:

1. Determine the business impact of your problem. When you report a problem to IBM, you are asked to supply a severity level. Therefore, you need to understand and assess the business impact of the problem that you are reporting.

   Use the following table to determine the severity level.

Severity	Description
1	The problem has a *critical* business impact: You are unable to use the program, resulting in a critical impact on operations. This condition requires an immediate solution.
2	This problem has a *significant* business impact: The program is usable, but it is severely limited.

Severity	Description
3	The problem has *some* business impact: The program is usable, but less significant features (not critical to operations) are unavailable.
4	The problem has *minimal* business impact: The problem causes little impact on operations or a reasonable circumvention to the problem was implemented.

2. Describe your problem and gather background information, When describing a problem to IBM, be as specific as possible. Include all relevant background information so that IBM Rational Software Support specialists can help you solve the problem efficiently. To save time, know the answers to these questions:
   - What software versions were you running when the problem occurred?

     To determine the exact product name and version, use the option applicable to you:
     - Start the IBM Installation Manager and select **File** > **View Installed Packages**. Expand a package group and select a package to see the package name and version number.
     - Start your product, and click **Help** > **About** to see the offering name and version number.
   - What is your operating system and version number (including any service packs or patches)?
   - Do you have logs, traces, and messages that are related to the problem symptoms?
   - Can you recreate the problem? If so, what steps do you perform to recreate the problem?
   - Did you make any changes to the system? For example, did you make changes to the hardware, operating system, networking software, or other system components?
   - Are you currently using a workaround for the problem? If so, be prepared to describe the workaround when you report the problem.
3. Submit your problem to IBM Rational Software Support. You can submit your problem to IBM Rational Software Support in the following ways:
   - **Online**: Go to the IBM Rational Software Support Web site at https://www.ibm.com/software/rational/support/ and in the Rational support

task navigator, click **Open Service Request.** Select the electronic problem reporting tool, and open a Problem Management Record (PMR), describing the problem accurately in your own words.

For more information about opening a service request, go to http://www.ibm.com/software/support/help.html

You can also open an online service request using the IBM Support Assistant. For more information, go to http://www.ibm.com/software/support/isa/faq.html.

- **By phone**: For the phone number to call in your country or region, go to the IBM directory of worldwide contacts at http://www.ibm.com/planetwide/ and click the name of your country or geographic region.
- **Through your IBM Representative**: If you cannot access IBM Rational Software Support online or by phone, contact your IBM Representative. If necessary, your IBM Representative can open a service request for you. You can find complete contact information for each country at http://www.ibm.com/planetwide/.

Conventions used in this guide

Typeface	Description
Italic	Used for book titles and terminology.
Bold	Used for items that you can select and menu paths, also used for emphasis.
`Courier`	Used for commands, file names, and directory paths. Represents command syntax to be entered verbatim. Signifies computer output that displays on-screen.
`Courier Italic`	Represents values in a command string that you supply. For example, `(drive:\username\commands)`.

2 Introduction

The RDS is a single enterprise directory solution designed for user authentication and administration for IBM® Rational® Solutions for Enterprise Lifecycle Management tools. The RDS allows the users to log on using the same credentials across Enterprise Lifecycle Management tools for which they have authorized access.

The RDS 5.1 is designed to support a wide range of platforms. For more information on the platform support see Operating system requirements (page 15).

The RDS comes with the Graphical User Interface (GUI) based client application IBM® Rational® Directory Administration (RDA), that can be installed separately. For information on installation instruction and procedure, refer to Installing the RDA (page 27).

Obtaining the RDS software

You can download RDS from the support site at http://www.ibm.com/support/fixcentral/ or from the zip distribution.

Installation sequence

The RDS must be present in the system for other tools to connect. You can install the RDS prior to or post other product installation.

Types of RDS installations

There are two types of RDS installations:

Installation type	Description
Server Installation	Installs RDS on a local machine. The RDS provides user authentication and administration across Enterprise Lifecycle Management tools using the same credentials. The server installation also provides the option to install RDA client. However, you can choose to install that separately.
Client Installation	Installs the client (RDA) as part of the server installation. There is no separate client installation available on UNIX platforms.

Modes of installations

The RDS supports the following modes of installations:

Installation mode	Description
Stand-Alone	You can use RDS to administer and perform searches for the users and groups that exist locally.

Installation mode	Description
Corporate LDAP Backbone Support	You can configure RDS to integrate with the external corporate LDAP repositories. You can use this option to enable your corporate backbone to serve as the user/group read-only repository for Enterprise Lifecycle Management tools.
OS Authentication	You can configure RDS to grant login using OS logon name. RDS authenticate users against the OS hosting the RDS and enable access to the Enterprise Lifecycle Management tools after successful authentication. RDS uses Pluggable Authentication Modules (PAM) for authentication. Refer to *IBM Rational Directory Server Administration Guide* for PAM configuration.

Preparing installation information

Preparing installation information in advance can help you to complete the installation process quickly. Before starting the installation, consider creating a worksheet to record the basic installation information, as described for a typical installation in the following table..

Description	Example
Host name	ExampleServer
Directory server port number	Default LDAP port: `1389`. This can be changed to any available free port.
Secure port number	Default LDAP port: `1636`. This can be changed to any available free port.
Directory administrator password	Password must contain the following: • Password must be of minimum 8 characters in length

Description	Example
Directory administrator ID	tdsadmin (set by default)
Installation directory	• `/var/IBM/Rational/RDS_5.1` or any other specified path.

Frequently Asked Questions

1. *Which are the external LDAP servers supported by RDS?*

   Sun Java(tm) System Directory Server and Microsoft(r) Active Directory Server.

2. *What is the schema required by RDS in the external corporate server?*

   The user information are extracted from the corporate servers based on the `person/inetOrgPerson` schema class and the primary attributes `cn, sn, email, uid, givenname, telephoneNumber, mail, facsimileTelephoneNumber, description, postalAddress, and sAMAccountName.`

   The group information are extracted based on the `group/groupOfUniqueNames` schema class and the attributes `member/uniqueMember, description`.

3. *Do we need an Administrator privileges to create a partition?*

   You need a corporate LDAP server user with a *Read* access to the search bases specified in the partition.

4. *Is the Apache Server installed as a service?*

   No. This functionality will be added in a future release.

5. *I cannot use RDA on Solaris to create a partition with SSL enabled?*

   This is a known limitation. You need to install RDA on Windows as a workaround.

6. *Why DOORS do not show up a user after changing the name of the user from one ou to another in the corporate LDAP?*

   If the name of a user (firstname, lastname, cn etc.) is changed keeping the same UID, or if a user is moved from one OU to another in the corporate LDAP, DOORS may not show up the user. The reason is, the RDS has already created an extended user object with the `uid` as the user logon name

(based on the logon attribute selected in the corporate partition) and `tdsCorporateDn` as the corporate DN of the user. If the corporate DN of the user changes in the corporate LDAP server, RDS will try to recreate the extended user object with the same user logon name (which is not changed in corporate LDAP) and would fail, as the user object with the same logon name already exists in the corporate LDAP. Hence, the particular user would not be shown in DOORS.

To solve this issue, it is recommended to modify the required attributes of the extended user object in RDS. Deleting the extended user object also solves the issue but it may delete the DOORS specific values for that user object, which may lead to information loss.

7. *Is the Apache Server installed as a service?*

   No. This functionality will be added in a future release.

8. *I cannot use RDA on Solaris to create a partition with SSL enabled?*

   This is a known limitation. You need to install RDA on Windows as a workaround.

9. *Why DOORS do not show up a user after changing the name of the user from one ou to another in the corporate LDAP?*

   If the name of a user (firstname, lastname, cn etc.) is changed keeping the same UID, or if a user is moved from one OU to another in the corporate LDAP, DOORS may not show up the user. The reason is, the RDS has already created an extended user object with the `uid` as the user logon name (based on the logon attribute selected in the corporate partition) and `tdsCorporateDn` as the corporate DN of the user. If the corporate DN of the user changes in the corporate LDAP server, RDS will try to recreate the extended user object with the same user logon name (which is not changed in corporate LDAP) and would fail, as the user object with the same logon name already exists in the corporate LDAP. Hence, the particular user would not be shown in DOORS.

   To solve this issue, it is recommended to modify the required attributes of the extended user object in RDS. Deleting the extended user object also solves the issue but it may delete the DOORS specific values for that user object, which may lead to information loss.

10. *Will error opening *.cat files messages affect functionality of RDS 5.1 for Tivoli in anyway?*

    No. You can ignore such error messages, they keep coming because of a minor localization issue with Tivoli which will no way affect RDS and its functionalities.

11. *Is RDS supported on VMWare?*

    Currently, the RDS is not supported on a virtual environment.

12. *I installed RDS as user root, is there a way to start the Apache version of the Rational Directory Server as any other user then root?*

    This can be accomplished by changing the group and ownership to another user. Run the following command from within the `...IBM/Rational`

    chown ccm_root RDS_5.X -R

    chgrp ccm_root RDS_5.X -R

    chown ccm_root RDA_5.X -R

    `chgrp ccm_root RDA_5.X -R`

    After the permissions have been changed, start the RDS and RDA Web server as user `ccm_root`.

13. *How do you change the Webserver port from 8080 to any other values for IBM Rational Directory Administration (RDA)?*

To change the default port number:

a. Edit the following lines in the `Server.xml` file located under <RDS_HOME/RDA_HOME>\WebAccessServer\apache-tomcat-6.0.16 (-6.0.24 for 5.1.0.1 and 5.1.0.2)\conf folder:

```
Connector port="8090" protocol="HTTP/1.1"
connectionTimeout="20000"
redirectPort="8443" />
<!-- A "Connector" using the shared thread pool-->
```

b. Restart the RDA for the changes to take effect.

Note The new port number is changed to 8090 in the above example.

3 Server Installation

This chapter contains the installation instructions for installing RDS on Solaris, Linux, and IBM-AIX platforms.

This chapter contains the following sections:

System requirements

The following section describes the system requirements for the RDS.

Industry standards

The RDS is developed based on the following industry standards.

- LDAP v3 operations
- LDAP search filters
- LDAP v3 intelligent referral

Operating system requirements

RDS and RDA are supported on the following platforms:

- Sun Solaris 10 operating system 64 bit (/ SPARC Platform)
- Red Hat Enterprise Linux Server 5 operating system 32 and 64 bit
- IBM-AIX 6.1 operating system 64 bit

Disk space and memory requirements

Minimum system requirements for RDS

Ensure that sufficient disk space is available before installing the RDS. The following table shows the sample disk space requirement for RDS.

# of Entries	Minimum disk space required	Minimum memory required
10,000 - 250,000	2 GB	1-2 GB
250,000 - 1,000,000	3 GB	4 GB
Over 1,000,000	4 GB	4 GB

Requirement for RDA

Make sure that sufficient disk space is available before installing the RDA. The following table shows the minimum disk space and memory requirements for RDA.

Minimum disk space required	Minimum memory required
300 MB	512 MB

Before installing RDS

Before you install the RDS, ensure that the system is equipped with the set of configurations recommended in this manual to avoid any installation errors.

This section also describes the following settings that must be in place.

- Shell requirements
- What is not supported

Shell requirements

The following settings are recommended for Solaris and Linux installation.

- On Solaris 10 - Korn shell (KSH) must be installed on the OS.
- Red Hat 5 - Korn shell is not available by default. Install the `ksh` on the OS or create a soft link from the `zsh` to `ksh`.

What is not supported

This section describes the modes or systems that are not supported by RDS. You must not use the modes or systems referred in this section to avoid any installation errors.

More information on RDS installation

This section describes certain in built settings and behavior post RDS installations.

This section contains the following components:

- Installation path

Installation path

The database is created under the user specified or default installation path: `/var/IBM/Rational/RDS_5.1`

Installing the RDS

To Install RDS, do the following:

1. Unzip the RDS installer in a folder, using the gunzip utility.

   ```
   $ gunzip CZ9PTEN.tar.gz
   ```

2. Extract the `CZ9PTEN.tar` file.

   ```
   $ tar -xvf CZ9PTEN.tar
   ```

3. Path settings:

   - Ensure that the utilities: `gunzip, dos2unix` and are in the system path.

4. In the **install** directory, type `./rds_install.sh` and press **Enter**. The **License Agreement** information is displayed.

5. Review and type **1** and press **Enter** to accept the license agreement.

6. Press enter to choose the default installation location or type different location for installation. By default, the RDS is installed in the following location: `/var/IBM/Rational/RDS_5.1`
7. Type the password for the *tdsadmin* user and press **Enter**. The password should be of minimum 8 characters. The *tdsadmin* is the Directory Administrator user.
8. Re-enter the password and press **Enter**. Both passwords should match for the installation to continue.
9. By default, the installer uses the LDAP server port number `(1389)`. Press **Enter** to use the default value provided by the installer or type a valid port number for the server and press **Enter**.
10. By default, the installer uses the secure LDAP port number `(1636)` to enable the Secure Socket Layer (SSL). Press **Enter** to use the default value provided by the installer or type a valid secure port number and press **Enter**.
11. Type the mode of installation from the following, and press **Enter**.
    - 0. Stand-Alone
    - 1. Corporate LDAP Backbone Support
    - 2. OS Authentication

The install complete message is displayed if the installation is successful.

Post installation instructions

This section details the basic checks that you can perform to ensure that the installation has went through fine.

This section contains the following components:

- Server startup
- Review log files

Server startup

1. Ensure that the server is started after the installation. In case the **server is not started automatically**, start the server manually using the following commands:

   ```
   $> cd <RDS_Home>/RDSUtility
   $> ./rdsctl.sh start
   ```

2. You must start the RDA web server manually, by running the following command.

   ```
   <RDS_InstallHome>/WebAccessServer/Start_RDAWebServer.sh
   ```

   For example:

   ```
   $> /var/IBM/Rational/RDS_5.1/WebAccessServer/
   Start_RDAWebServer.sh
   ```

Review log files

1. If the installation is corrupted and the server is not started, review the following log files carefully for any errors.
   - `<RDS_InstallHome>/apacheds_1.5.4/var/log`
   - `/tmp/rdsinstall.log`
2. If there are any schema modification errors, review the following log files carefully for the errors.
   - `<RDS_InstallHome>/schema-error0.log`
   - `<RDS_InstallHome>/schema-error1.log`

Note The above listed log files must be sent along with the other relevant information to the support specialist while reporting the errors. For more information on reporting the errors, see Contacting IBM Rational Software Support (page 1).

Upgrading to a new release

To upgrade the IBM Rational Directory Server to a new release, download the latest RDS installer from http://www.ibm.com/support/fixcentral/, install the newer version of RDS on your computer. For more information on installing the RDS see, Installing the RDS (page 18).

After installing the RDS, perform an online data migration between the Apache instances using the RDA tool. For more information on migration see, *Rational Directory Server Product Manual* or the online help.

Note The previous RDS installation can co-exist on the same machine.

4 Server Removal

Removing the RDS

This chapter describes the steps to remove RDS on all platforms. Remove the server with the same user account that was used for installation.

To remove RDS, do the following:

1. Stop the Directory Server by executing the following command:

   ```
   $> cd <RDS_Home>/RDSUtility
   $> ./rdsctl.sh stop
   ```

2. Stop the WebAccessServer if it is running by executing the following command:

   ```
   $> cd <RDS_Home>/WebAccessServer/apache-tomcat-6.0.1/bin
   $> ./catalina.sh stop
   ```

3. Change directory to move one level above the install location, and execute the following command:

   ```
   $> rm -rf RDS_5.1
   ```

Note Follow the same procedure for uninstalling the RDS on Linux, and IBM-AIX platforms.

Settings for automatic restart on system reboot

The following section describes the scripts you can use to start and stop the directory server process on Solaris platform. Run the scripts to automate the system startup process.

The automatic system startup procedures vary for each platform and operating system (different UNIX flavors). If you want to run these scripts on other systems, you must change the scripts and the startup files from which they are called.

Note The examples shown here apply to the Sun SPARC platform running on Solaris 10.

To start the directory server automatically after a system reboot, create the following scripts in `/etc/init.d`

1. Script **startRDS**.

   ```
   cd "<RDS_InstallHome>/RDSUtility"
   ./rdsctl.sh start
   ```

   The above script starts the directory server.

2. Script **stopRDS**.

   ```
   cd "<RDS_InstallHome>/RDSUtility"
   ./rdsctl.sh stop
   ```

   The above script stop the directory server.

Start process automatically

The following example shows how to set up an `/etc/rc2.d` script.

Set up a symbolic link in `/etc/rc2.d`:

```
/etc/rc2.d/S##startRDS --> /etc/init.d/startRDS
```

The file names in `rc2.d` directories are of the form `[SK]nn<init.d filename>` where `S` means start this job. `rc2.d` represents the run level of the operation. Level 2 startup is the standard. The pound signs (##) reflect the order in which operations are performed. This value should be high so that everything else (e.g., NFS) is started before the server is started. `S##` does not have to be different from `K##`.

Stop process automatically

The following example shows how to set up an `/etc/rc0.d` script.

Set up a symbolic link in `/etc/rc0.d:`

```
/etc/rc0.d/K##stopRDS--> /etc/init.d/stopRDS
```

The value `K` means kill this job. `rc0.d` represents the run level of the operation. Level 0 shutdown is the standard. The pound signs (##) reflect the order in which operations are performed. This value should be low. `K##` does not have to be different from `S##`.

5 Client Installation

Rational® Directory® Administration (RDA) is a GUI based client application helps the user to perform day-to-day administration tasks such as creating users, groups, roles, performing searches, migrating data, etc.

Installing the RDA

RDA is installed as part of the RDS installation. There is no separate client installer available on UNIX platforms.

After RDS installation is complete, you must start the RDA web server manually.

- To start the RDA web server, run the following command:

  ```
  <RDS_InstallHome>/WebAccessServer/Start_RDAWebServer.sh
  ```

  For example:

  ```
  $> /var/IBM/Rational/RDS_5.1/WebAccessServer/
  Start_RDAWebServer.sh
  ```

- To stop the RDA web server, run the following command:

  ```
  <RDS_Install_Dir>/WebAccessServer/apache-tomcat-6.0.16/
  bin/catalina.sh stop
  ```

  For example:

  ```
  $> /var/IBM/Rational/RDS_5.1/WebAccessServer/apache-
  tomcat-6.0.16/bin/catalina.sh stop
  ```

Note If the tomcat process is not running, see the Troubleshooting RDS (page 31) section for details on starting the server.

6 Launching RDA

This chapter describes how to launch the RDA application.

You can launch RDA from any machine by providing the appropriate URL. RDA is supported on Mozilla browser.

Note The RDA web server starts automatically during installation.

To start the RDA, do the following:

1. If the RDA web server is not started, run the following command to **start** the web server.

   `<RDA_Home>/WebAccessServer/Start_RDAWebServer.sh`

   For example:

   ```
   $> /var/IBM/Rational/RDA_5.1/WebAccessServer/
   Start_RDAWebServer.sh
   ```

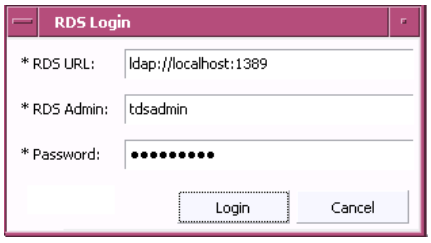
2. Open the browser and type the URL for the RDS: `http://<hostname>:8080/webrda/rda`.

   For example:

   `http://rdsserver:8080/webrda/rda`

Note The `<hostname>` refers to the name of the server where the RDS is installed.

3. The **RDS Login** dialog box is displayed.



4. On the **Login** dialog box, type the details as:

Field name	Description
RDS URL	The LDAP URL should include a valid server name and a port number that was given at the time of RDS installation. For example: ldap://dirserv:1636. To open the RDS in secure mode, you can include the letter "s" in the ldap URL (where the "s" refers to the secure port), followed by a valid server name and a port number.
RDS Admin	The admin user name for RDS. The admin user *tdsadmin* is set by the RDS installer.
Password	The admin password set at the time of RDS installation.

5. Click **Login**.

7 Troubleshooting RDS

This chapter describes the possible problems and solutions for RDS users.

Problem	Solution
Client cannot locate the server	Use the host name, such as *rdsserver*. Make sure the server is listed in the name service you are using, such as DNS, and try the fully qualified domain name (for example, rdsserver.example.com). Use the IP address for the host (for example, 192.168.2.60).
The port is in use	Examine which ports are in use with an appropriate utility, such as the **netstat with the -a** option, to determine which ports are available.
Server installation fails. Cannot find the error log.	The RDS log file can be found at the /tmp folder: `e.g. /tmp/rdsinstall.log` Refer to additional log file located at: • `<RDS_InstallHome>/apacheds_1.5.4/var/log` • `<RDS_InstallHome>/schema-error0.log` • `<RDS_InstallHome>/schema-error1.log`

Problem	Solution

A bind exception is thrown on the command prompt when starting the Web Access Server.	**1.** After installing the **RDS**, verify if the Web Access Server has started, using the following command:
	`ps -ef | grep tomcat`
	2. If there is no `tomcat` running, execute the following command to **start** the server.
	`<RDS_Home>/WebAccessServer/Start_RDAWebServer.sh`
	3. If you get a bind exception error when starting the web access server, do the following:
	4. Open the `Server.xml` file from the following location:
	`<RDS_Install_Dir>/WebAccessServer/apache-tomcat-6.0.16/conf`
	5. Search for the following line:
	`<Connector executor="tomcatThreadPool" port="8080" protocol="HTTP/1.1" connectionTimeout="20000" redirectPort="8443" />`
	6. Change the `port="8080"` attribute to a port that is free.
	7. Search for the following line:
	`<Server port="8005" shutdown="SHUTDOWN">`
	8. Change the `port="8005"` to a free port that is available.
	9. Save the `Server.xml` file.
	10. Run the following command to **start** the web server.
	`<RDS_Home>/WebAccessServer/Start_RDAWebServer.sh`

Problem	Solution

RDA login page does not launch.	Do the following:
	1. Shutdown the Tomcat server by running the following command:
	`<RDS_Install_Dir>\WebAccessServer\apache-tomcat-6.0.16\bin\shutdown.bat`
	2. Delete the work folder from the following path:
	`<RDS_Install_Dir>\WebAccessServer\apache-tomcat-6.0.16\work`
	3. Start the server again by running the following command:
	`<RDS_Install_Dir>\WebAccessServer\Start_RDAWebServer.sh`
	4. Launch RDA using the web browser.

The below errors are observed for example: [org.apache.directory.server.core.entry.DefaultServerAttribute] - The value 'inetOrgPerson' is incorrect, it hasn't been added [12:13:10] ERROR [org.apache.directory.server.core.entry.DefaultServerAttribute] - The value '1.3.6.1.4.1.1466.20037' is incorrect, it hasn't been added [12:13:10] ERROR [org.apache.directory.server.core.entry.DefaultServerAttribute] - The value '1.3.6.1.4.1.18060.0.1.3' is incorrect, it hasn't been added	Ignore these errors.

Terms and Concepts

Term	Definition
LDAP	Lightweight Directory Access Protocol. directory service protocol designed to run over TCP/IP and across multiple platforms.
OS authentication	Operating system authentication is the process of proving the identity of the client user to the directory server based on the operating system log on name.
PAM	A pluggable authentication modules (PAM) is set of libraries and services used for authentication.
SSL	A Secure Sockets Layer. (SSL) is a software library that establishes a secure connection between a client and server.
RDS Client	A RDS client is a interface that requests services or information from a server.

Appendix: Notices

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