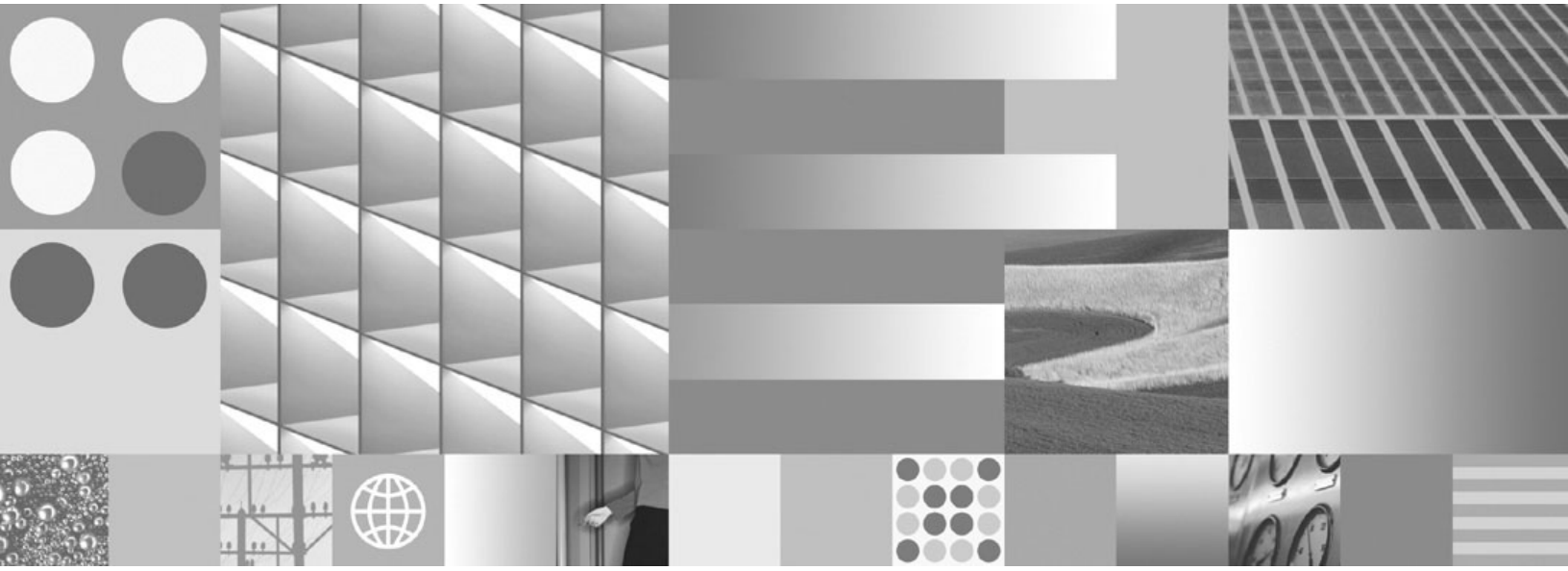
IBM FileNet Image Services

4.1.2

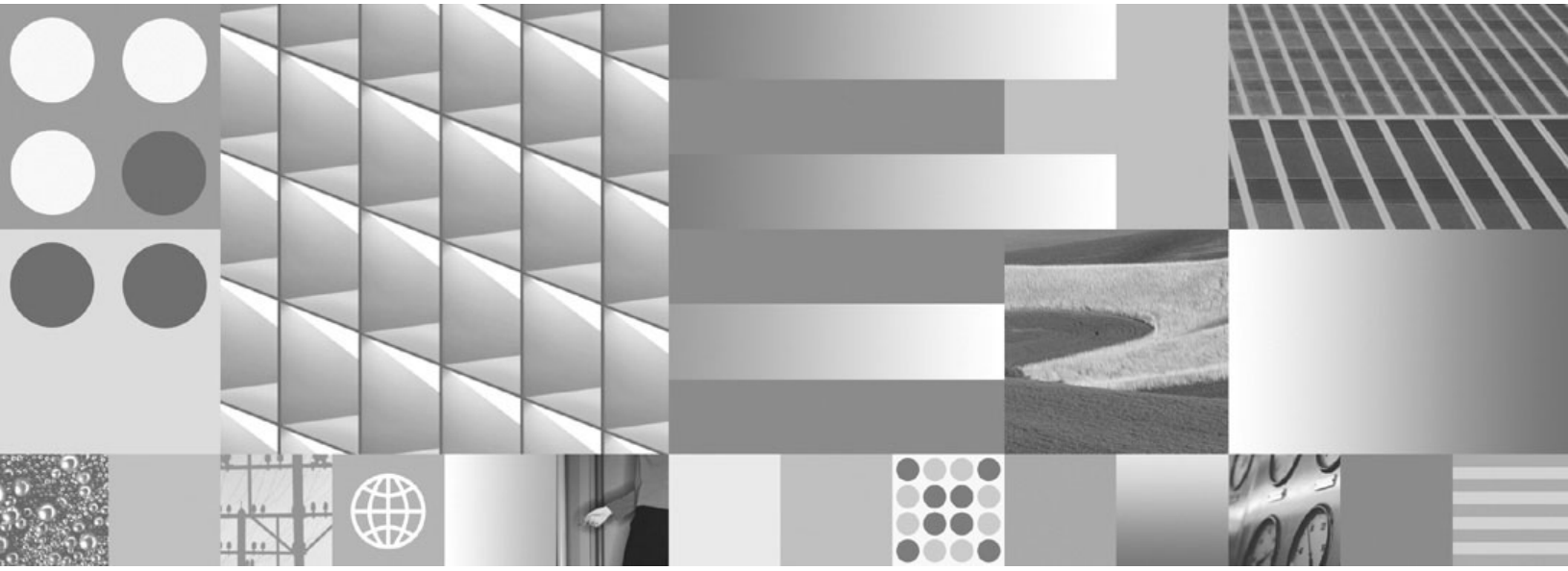


Guidelines for Installing and Configuring IBM DB2 Software

SC19-2671-01

IBM FileNet Image Services

4.1.2



Guidelines for Installing and Configuring IBM DB2 Software

SC19-2671-01

Note

Before using this information and the product it supports, read the information in "Notices" on page 31.

This edition applies to version 4.1.2 of IBM FileNet Image Services (product number 5724-R95) and to all subsequent releases and modifications until otherwise indicated in new editions.

Contents

1

Guidelines for Installing and Configuring IBM DB2 Software

This document provides guidelines for installing IBM® DB2® V8.2, V9.1, or V9.5 software on AIX®, HP-UX® (HP 9000 or HP Integrity,) Sun® Solaris, and Windows® Servers for use with IBM FileNet® Image Services.

Server Types

Perform the procedures in this document on these Image Services servers:

Root/Index - (Multi-server installation)

Root/Index/Storage Library - (Combined or Entry server install)

Application - (Running WorkFlo Queue Services, SQL Services or VW Services)

The **Database Administrator** is responsible for installing the DB2 software on both Server and Client computers, and for creating the DB2 database.

At this time, Image Services requires the DB2 database and server software to be located on a remote AIX 5L (v5.3 or v6.1) 64-bit server or on a remote Solaris 9 or Solaris 10 64-bit server.

The DB2 client software can be installed on any UNIX® or Windows Server system supported by Image Services: AIX, HP-UX (HP 9000 or HP Integrity), Solaris, or Windows Server.

Note Image Services and the DB2 database cannot be collocated on the same AIX or Solaris server at this time.

Document revision history

IS version	Date	Comment
4.1.2	Dec, 2008	Expanded the section, **“Create the DB2 Database” on page 19**.
4.1.2	Nov. 2008	Initial release.

Accessing IBM FileNet Documentation

To access documentation for IBM FileNet products:

1. Navigate to **Product Documentation for FileNet P8 Platform** at **http://www-1.ibm.com/support/docview.wss?rs=3278&uid=swg27010422**
2. Select the **FileNet Image Manager Active Edition** link.
3. Select the **FileNet Image Services** link.

IBM FileNet Education

IBM FileNet provides various forms of education. Please visit the Training and certification page on IBM’s Web site at (**www-306.ibm.com/software/sw-training/**).

Feedback

Documentation feedback

Send comments on this publication or other IBM FileNet Image Services documentation by e-mail to **comments@us.ibm.com**. Be sure to include the name of the product, the version number of the product, and the name and part number of the book (if applicable). If you are commenting on specific text, include the location of the text (for example, a help topic title, a chapter and section title, a table number, or a page number).

Product consumability feedback

Help us identify product enhancements by taking a **Consumability Survey**. The results of this comprehensive survey are used by product development teams when planning future releases. Although we are especially interested in survey responses regarding the most recent product releases, we welcome your feedback on any of our products.

The survey takes approximately 30 minutes to complete and must be completed in a single session; there is no option to save a partially completed response.

DB2 Software requirements

For current information on supported hardware platforms, operating system versions, and application software compatiblity, see the *IBM FileNet Image Services, Image Services Resource Adapter, and Print Hardware and Software Requirements*. To download this document from the IBM Web site, see **"Accessing IBM FileNet Documentation" on page 9**.

Important DB2 V9.5 client software is supported on AIX, HP Integrity, Solaris servers, and Windows servers; it is not supported on HP 9000 (PA-RISC) servers.

Operating system and disk space requirements

Check the IBM DB2 Web site at **http://www-01.ibm.com/software/data/db2/9/sysreqs.html** and select **DB2 V8, DB2 9, or DB2 9.5** from the drop-down list for the latest OS and disk space requirements.

Hardware and software requirements

For current information on supported hardware platforms, operating system versions, and application software compatiblity, see the *IBM FileNet Image Services, Image Services Resource Adapter, and Print Hardware and Software Requirements*. To download this document from the IBM Web site, see **"Accessing IBM FileNet Documentation" on page 9**.

Important DB2 V9.5 client software is supported on AIX, HP Integrity, Solaris servers and Windows servers; it is not supported on HP 9000 (PA-RISC) servers.

Installing DB2 ESE software on AIX and Solaris servers

To install and configure the DB2 software on the server that will host the DB2 database, see **Chapter 2, "Guidelines for Installing DB2 ESE Server Software," on page 12**.

Installing DB2 Client software

To install the DB2 client software on the server that will host Image Services and link to the DB2 database, see **Chapter 3, "Guidelines for Installing DB2 Client Software," on page 23**.

2

Guidelines for Installing DB2 ESE Server Software

This chapter describes how to configure a DB2 database on a dedicated, remote AIX or Solaris 64-bit server.

Before You Begin

Create DB2 Users and Groups

Three users and three groups are required to use DB2. You can specify your own user and group names as long as they adhere system naming rules and DB2 naming rules. (Check the IBM DB2 documentation to be sure.) If you choose to let DB2 create them for you during the installation process, they'll have the default names shown in the following table:

	Default User Name	Default Group Name
Instance Owner	db2inst1	db2iadm1
Fenced User	db2fenc1	db2fadm1
DB2 Administration Server User	db2as	db2asgrp

- The **instance owner** home directory is where the DB2 instance will be created.

- The **fenced user** runs user-defined functions (UDFs) and stored procedures outside the address space used by the DB2 database.
- The **DB2 Administration Server (DAS) user** runs the DB2 administration server on your system.

To prevent environmental conflicts between two or more instances, you should ensure that each instance has its own home file system. Errors will be returned when the home file system is shared.

Each instance owner must have a unique home directory. All of the files necessary to run the instance are created in the home directory of the instance owner's user ID/username.

The instance owner and the group that is the System Administration (SYSADM) group are associated with every instance. The instance owner and the SYSADM group are assigned during the process of creating the instance.

Note The **root** user cannot act as a DBA. You must logon as the instance owner to act as the DBA. For example:

```
su - <instance owner>
```

The primary group of the instance owner automatically becomes the system administration group for the instance and gains SYSADM authority over the instance. Other user IDs or user names that are members of the primary group of the instance owner also gain this level of authority.

Create Image Service Users for DB2 Server Authentication

DB2 provides a variety of authentication types to authenticate users to access databases. FileNet Image Services supports authentication types of SERVER, SERVER_ENCRYPT, and CLIENT.

- **SERVER** authentication specifies that authentication occurs on the server using local operation system security.
- **SERVER_ENCRYPT** authentication specifies that the server accepts encrypted SERVER authentication scheme.
- **CLIENT** authentication specifies that authentication occurs on the database partition where the application is invoked using operating system security.

Note We recommend that you use SERVER or SERVER-ENCRYPT authentication for Image Services.

SERVER or SERVER_ENCRYPT Authentication

When the database authentication type is set to SERVER or SERVER_ENCRYPT, the following users must be created on the DB2 server where the DB2 database resides.

FileNet Image Services requires four users that have SYSADM authority to access the DB2 database. The standard FileNet names for these users are:

- **f_sw:** The primary user of the Image Services relational databases and eProcess.
- **f_maint:** Mainly used by GDB_exim, a generic database export/import utility. It is also used by your service representative to gain

access to the system's relational database for troubleshooting and investigation.

- **f_sqi:** This user is used by the SQI subsystem of IS Toolkit. If you have IS Toolkit or IS Process Analyzer installed, the f_sqi user can be used to access some of the features of these products.
- **f_open:** The default database logon user used by the SQI subsystem of IS Toolkit. It is the database logon default user.

You can use these standard FileNet names, or you can choose other names. These users are regular OS level users, and unlike the instance owner users, they don't need to have a separate file system for their home directories. **The only requirement is that they belong to the primary group of the instance owner, so they will have SYSADM authority over that instance.**

AIX

An AIX Example

If the instance owner group is fn_grp1, enter the following commands as a user with **root** privileges. These sample commands use the standard FileNet names, but you can choose other names:

```
mkuser  pgrp=fn_grp1  f_sw
mkuser  pgrp=fn_grp1  f_sqi
mkuser  pgrp=fn_grp1  f_maint
mkuser  pgrp=fn_grp1  f_open
```

Set their passwords by entering:

```
passwd  f_sw
passwd  f_sqi
passwd  f_maint
passwd  f_open
```

Logoff as **root** user, and logon as each of the four new users, one at a time, to change the password to avoid connection problems the first time they're used.

SOL

A Solaris Example

If the instance owner group is fn_grp1, enter the following commands as a user with **root** privileges. These sample commands use the standard FileNet names, but you can choose other names:

```
useradd  -d  /export/home/f_sw
useradd  -d  /export/home/f_sqi
useradd  -d  /export/home/f_maint
useradd  -d  /export/home/f_open

useradd  -g  fn_grp1  -G  Staff

useradd  -s  /bin/ksh  -m  f_sw
useradd  -s  /bin/ksh  -m  f_sqi
useradd  -s  /bin/ksh  -m  f_maint
useradd  -s  /bin/ksh  -m  f_open
```

Logoff as **root** user, and logon as each of the four new users, one at a time, to change the password to avoid connection problems the first time they're used.

CLIENT Authentication

When the authentication type is CLIENT, these users must be created on the DB2 client computer (IS Root/Index server) with special requirements. See **Chapter 3, "Guidelines for Installing DB2 Client Software," on page 23** for details.

Install DB2 ESE

1. As a user with **root** privileges, create a temporary file system with 2.0 GB of free space to contain the tar.Z and the uncompressed installation file.
2. Mount the CD-ROM.
3. Copy the compressed image and uncompress it.
4. Launch the DB2 Installer and make the following selections:
   - Install Product
   - DB2 UDB Enterprise Edition
   - Typical Installation
   - Create a 64-bit instance
   - Single partition instance
5. When the installation is finished, view the status report or go to /tmp to view all DB2 install logs to ensure there are no errors.

   After a successful installation, DB2 the instance should be up and running. Continue with the next section.

Install 64-bit JDK or JRE

Because you have created a 64-bit instance of DB2 ESE, you need to install the Java Developer's Kit (JDK) or Java Runtime Environment (JRE) before you can use any DB2 functionality that depends on Java.

On an AIX Server

1. Unmount and remove the DB2 CD-ROM, and load the AIX 5L Bonus Pack CD-ROM.

2. Follow the instructions on the CD to install the Java 1.4.1.0 JDK or JRE.

3. Unmount and remove the AIX 5L Bonus Pack CD.

On a Solaris Server

Sun produces Java 6 SE (Java 6 Standard Edition), both JRE and JDK, that runs on Solaris 9 and Solaris 10 servers.

1. Download Java 6 SE from the Sun Developer Network (SDN) Web site:

   http://java.sun.com/javase/downloads/index.jsp

   - **Java SE Runtime Environment (JRE) 6 Update 10**
     The Java SE Runtime Environment (JRE) allows end-users to run Java applications.
   - **Java SE Development Kit (JDK) 6 Update 10**
     The Java SE Development Kit (JDK) includes the Java SE Runtime Environment (JRE) and command-line development tools that are useful for developing applets and applications.

2. Also read the Readme, Release Notes, and Sun License that are available on this site.

3. Follow the installation instructions to install the JRE or JDK on your server.

4. Unmount and remove the DB2 CD-ROM.

Create the DB2 Database

You need SYSADM authority to create the database. The database name must be unique and can be from 1 to 8 characters long. For example, **indexdb**.

Tip If possible, use the same name for both the database name and the database alias name. See the DB2 documentation for a complete information on creating a database.

When you create a database for your Image Services index, use the following options:

USING CODESET
Specifies the code set to be used for data entered into this database. You can select an ISO8859 character set or one of several multibyte character sets as described in the "Multicultural Support" appendix of the *IS System Administrator's Handbook*. After you create the database, you cannot change the code set.

Important The default code set for databases created on DB2 9.5 is Unicode. If you do not specify a code set when you create a database after installing DB2 9.5, you might see warning messages in the IS event log if multi-byte enhanced security has not been enabled.

If you decide to use the Unicode code page for your IS index database, you must ensure that the Image Services Multi-Byte Enhanced Security schema is enabled. See the *IS 4.1.2 Release Notes* for more information on this feature. To download this document from the IBM Web site, see **"Accessing IBM FileNet Documentation" on page 9**.

TERRITORY
Specifies the territory to be used for data entered into this data-

base. The territory is a two-letter code such as US for United States, FR for France, DE for Germany, and so on. See the DB2 documentation for valid territory codes. After you create the database, you cannot change the territory.

PAGESIZE
This option is required because the default page size for DB2 is 4 KB, which is not supported by Image Services. A page size of 32 KB is the most desirable.

For example, the following command creates a database named indexdb that uses the ISO8859-01 codeset, the territory of United States, the SYSTEM collation (the default), and the 32 KB page size:

CREATE DATABASE indexdb USING CODESET ISO8859-1 TERRITORY US PAGESIZE 32 k

Create the DB2 Tablespace

Recommended Tablespace Name	Tablespace Name Actually Assigned	Minimum Size (MB)	Tablespace Size Actually Created
userspace1		200	
indexspace1 (optional)		200	

To place all tables and indexes on one tablespace, only one tablespace is needed.

To place table raw data and index information in different tablespaces, create two tablespaces: one for the table raw data, and one for index information.

Report to Sys Admin and your service representative

Please return the following information to the System Administrator and your service representative or ValueNet Partner.

	Default User Name	User Name You Chose	Default Group Name	Group Name You Chose
Instance Owner	db2inst1		db2iadm1	
Fenced User	db2fenc1		db2fadm1	
DB2 Administration Server User	db2as		db2asgrp	

Recommended Tablespace	Tablespace Name Actually Assigned	Minimum Size (MB)	Tablespace Size Actually Created
userspace1		200	
indexspace1 (optional)		200	

FileNet User Name	User Name you chose (optional)	Password
f_sw		
f_sql		
f_maint		
f_open		

DB2 Database Alias Name: _____
(indexdb, for example)

User Tablespace Location: _____
(userspace1, for example)

Continue the DB2 Client Installation

After the DB2 server software has been successfully installed, you can continue with the next chapter, **Chapter 3, “Guidelines for Installing DB2 Client Software,” on page 23**.

3

Guidelines for Installing DB2 Client Software

This chapter describes how to configure a DB2 client software on the Image Services server and link it to the DB2 index database.

The Image Services server can be either a Root/Index server or an Application server.

Important Image Services supports DB2 V8.2 and V9.1 client software on AIX, HP 9000, HP Integrity, Solaris, and Windows servers.

DB2 V9.5 client software is supported on AIX, HP Integrity, Solaris servers and Windows servers; it is not supported on HP 9000 (PA-RISC) servers.

Before You Begin

If you are using SERVER or SERVER_ENCRYPT authentication, skip to **"Install DB2 Client" on page 26**.

Create Image Service Users for DB2 Client Authentication

For CLIENT authentication, FileNet Image Services requires four OS-level users that need to be created on the DB2 client computer (the IS Root/Index server). Their privileges need to be set up differently from SERVER or SERVER_ENCRYPT authentication type since SYSADM authority cannot be granted on the DB2 client system.

In this case, the **f_sw**, **f_sqi**, and **f_open** users need to have connect and createtab privileges, while the **f_maint** user needs to have dbadm privileges for the database. Use the same user names you created in the previous chapter.

1. After the database has been created, you can grant these privileges by entering the following SQL commands as the instance owner on the DB2 server. These sample commands use the standard FileNet names, but you should use the names you chose:

   Connect to <dbname> ;
   Grant createtab, connect on database to user f_sw;
   Grant createtab, connect on database to user f_sqi;
   Grant createtab, connect on database to user f_open;
   Grant dbadm on database to f_maint;l

2. Enable DB2_SNAPSHOT_NOAUTH at the instance level on the DB2 database server:

   db2set DB2_SNAPSHOT_NOAUTH=on

Note According to DB2, turning on the DB2_SNAPSHOT_NOAUTH registry variable to enable all users to access system monitor data introduces some security risks. Therefore, we recommend the SERVER and SERVER_ENCRYPT authentication types.

The following table summarizes the privilege for each authentication type for the four FileNet database users

OS and RDBMS User	Privilege for CLIENT Authentication Type
f_sw	Connect, createtab db2set DB2_SNAPSHOT_NOAUTH=on
f_maint	Dbadm db2set DB2_SNAPSHOT_NOAUTH=on
f_sqi	Connect, createtab db2set DB2_SNAPSHOT_NOAUTH=on
f_open	Connect, createtab db2set DB2_SNAPSHOT_NOAUTH=on

AIX

An AIX Example

If the instance owner group is fn_grp1, enter the following commands as a user with **root** privileges. These sample commands use the standard FileNet names, but you should use the names you chose:

```
mkuser  pgrp=fn_grp1  f_sw
mkuser  pgrp=fn_grp1  f_sqi
mkuser  pgrp=fn_grp1  f_maint
mkuser  pgrp=fn_grp1  f_open
```

Set their passwords by entering:

```
passwd  f_sw
passwd  f_sqi
```

```
passwd  f_maint
passwd  f_open
```

Logoff as **root** user, and logon as each of the new users, one at a time, to change the password to avoid connection problems the first time they are used.

SOL

A Solaris Example

If the instance owner group is fn_grp1, enter the following commands as a user with **root** privileges. These sample commands use the standard FileNet names, but you should use the names you chose:

```
useradd  -d  /export/home/f_sw
useradd  -d  /export/home/f_sqi
useradd  -d  /export/home/f_maint
useradd  -d  /export/home/f_open

useradd  -g  fn_grp1  -G  Staff

useradd  -s  /bin/ksh  -m  f_sw
useradd  -s  /bin/ksh  -m  f_sqi
useradd  -s  /bin/ksh  -m  f_maint
useradd  -s  /bin/ksh  -m  f_open
```

Logoff as **root** user, and logon as each of the four new users, one at a time, to change the password to avoid connection problems the first time they're used.

Install DB2 Client

To install DB2 Client, you must be logged on as a user with **root** privileges (UNIX servers) or with **Administrator** privileges (Windows servers).

1. Mount the CD-ROM.
2. As a user with **root** privileges on AIX and Solaris servers, create a temporary 2 GB file system. Then copy and uncompress the DB2 installation files in the file system.

Tip This temporary file system can be a mountable file system on another server.

3. Launch the DB2 Installer and make the following selections:
   - Install Products
   - DB2 Administration Client or DB2 Run-Time Client
   - Typical Installation
   - Create either a 32-bit or a 64-bit instance
   - Set existing user: fnsw (fnsw is the standard FileNet software user name; use the name that has been selected by the IS system administrator.)
   - Select installation directory/folder
   - UN-check “Configure NetBIOS... .” (This is not needed.)
   - Install
4. When the installation is finished, view the status report or go to /tmp (UNIX) or \My Documents\DB2log (Windows) to view all DB2 install logs to ensure there are no errors.

To Catalog the DB2 Server Node

Reboot the server and log onto the Image Services (DB2 Client) server as the instance owner, such as **fnsw**. You can catalog the DB2 server node by using the db2ca tool, if it is available, or by using the Command Line Processor as shown here:

```
db2 catalog tcpip node <server alias> remote <server name>
    server <Tcpip port number of DB2 server instance>
```

For example:

```
db2 catalog tcpip node hplido remote hpvenice server 60004
```

Note The db2ca tool is not available in DB2 V9 on UNIX servers.

To Catalog the Image Services Databases

You can catalog the remote DB2 database by using the db2ca tool, if it is available, or by using the Command Line Processor as shown in this example:

```
db2 catalog database indexdb at node hplido [as <alias name>]
```

In this case, hplido is the database alias used in the connect statement to verify the connection between the DB2 client and the remote DB2 server. If you specify the ‘as’ clause, <alias name> is the db alias name. Otherwise the database name (indexdb) is the db alias name. When connecting to the database, you should use the db alias name.

Link to the DB2 Database

Since the DB2 database is located on a remote AIX or Solaris server, make sure that TCP/IP communications have been configured successfully on both server and client computers.

1. Use the DB2 Configuration Assistant, if it is available, to connect the DB Client to the DB2 database on the remote server. Enter **db2ca** at a command prompt.

2. After successfully connecting to the remote DB2 database, you can check the connection using the Command Line Processor (CLP). Launch the Command Line Processor and enter:

   DB2> **connect to <db_alias_name> user f_sw using <f_sw password>**

Update IS Configuration Files (if necessary)

You can upgrade to DB2 9.1 or DB2 9.5 several weeks or months after upgrading to Image Services 4.1.2. If you are upgrading DB2 independently of an Image Services 4.1.2 installation or upgrade, run **fn_setup_rdb** to update the IS configuration files and RDBMS related files.

(This step is also included in the IS 4.1.2 Upgrade procedures, so you do not need to run this command now if you are also also upgrading to IS 4.1.2 at this time.)

Note Verify that the relational database is up before running the fn_setup_rdb command.

As an IS software user, such as **fnsw**, enter:

fn_setup_rdb -u

You will be prompted to enter the passwords for the four IS database users, **fn_sw**, **f_sqi**, **f_open**, and **f_maint**.

Continue the Image Services Installation

After the DB2 software has been successfully installed, your service representative or ValueNet Partner can continue with the Image Services installation in the section, “Installing the FileNet Image Services Software.” of the *Image Services Installation and Configuration Procedures*.

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 (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

IBM World Trade Asia Corporation
Licensing

2-31 Roppongi 3-chome, Minato-ku
Tokyo 106-0032, 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
J46A/G4
555 Bailey Avenue
San Jose, CA 95141-1003
U.S.A.

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 measurements 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 illustrate 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.

Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. If these and other IBM trademarked terms are marked on their first occurrence in this information with a trademark symbol (® or ™), these symbols indicate U.S. registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list

of IBM trademarks is available on the Web at “Copyright and trademark information” at **www.ibm.com/legal/copytrade.shtml**.

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

UNIX is a registered trademark of The Open Group in the United States and other countries.

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

U.S. Patents Disclosure

This product incorporates technology covered by one or more of the following patents: U.S. Patent Numbers: 6,094,505; 5,768,416; 5,625,465; 5,369,508; 5,258,855.

Program Number: 5724-R95

Printed in USA

SC19-2671-01