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Chapter 1. Overview of replication and event publishing for z/OS

On the z/OS® operating system you can replicate data and publish data to external applications by using WebSphere® Replication Server and WebSphere Data Event Publisher.

Replication and event publishing products

WebSphere Replication Server for z/OS and WebSphere Data Event Publisher for z/OS each include a common base function modification identifier (FMID) and at least one FMID that includes the load modules.

The base FMID includes the message catalogs, samples, utility programs, and a common dynamic link library (DLL) for all solutions. Install the base FMID only once, even if you purchase multiple replication and publishing products.

Figure 1 shows what each product includes.

Figure 1. Replication and event publishing products for z/OS. Both products share the same base code but include specific replication and event publishing programs.

As shown in the previous figure, the following products comprise replication and event publishing for z/OS:
WebSphere Replication Server for z/OS
This product provides a Q replication and SQL replication solution.
WebSphere Replication Server for z/OS is packaged such that you can purchase Q replication, SQL replication, or both.

WebSphere Data Event Publisher for z/OS
This product provides an event publishing solution.

Base code
The base code contains the DLL asnrbase, all of the packages, and all of the samples. You will use only the packages and samples needed for your products.

The product identifier (PID) for WebSphere Replication Server for z/OS is 5655-R55. All of the components of the product have the component identifier (COMPID) 5655L8800. Table 1 shows the FMIDs for the components of WebSphere Replication Server for z/OS.

Table 1. FMIDs for WebSphere Replication Server for z/OS

<table>
<thead>
<tr>
<th>Component</th>
<th>FMID</th>
</tr>
</thead>
<tbody>
<tr>
<td>WebSphere replication and event publishing product base code</td>
<td>HAAW910</td>
</tr>
<tr>
<td>Q Capture program</td>
<td>JAAW911</td>
</tr>
<tr>
<td>Q Apply program</td>
<td>JAAW912</td>
</tr>
<tr>
<td>SQL replication</td>
<td>JAAW913</td>
</tr>
</tbody>
</table>

The product identifier (PID) for WebSphere Data Event Publisher for z/OS is 5655-R56. All of the components of the product have the component identifier (COMPID) 5655L8800. Table 2 shows the FMIDs for the components of WebSphere Data Event Publisher for z/OS.

Table 2. FMIDs for WebSphere Data Event Publisher for z/OS

<table>
<thead>
<tr>
<th>Component</th>
<th>FMID</th>
</tr>
</thead>
<tbody>
<tr>
<td>WebSphere replication and event publishing product base code</td>
<td>HAAW910</td>
</tr>
<tr>
<td>Q Capture program</td>
<td>JAAW911</td>
</tr>
</tbody>
</table>

Replication and event publishing solutions

WebSphere Replication Server for z/OS and WebSphere Data Event Publisher for z/OS offer Q replication, SQL replication, and event publishing solutions.

The following list briefly describes these solutions. For more details, see Introduction to replication and publishing.

Q replication
Q replication provides a low-latency, high-throughput solution for replicating committed transactional data by using WebSphere MQ queues.

SQL replication
SQL replication allows you to replicate data from sources to targets by using staging tables.
Event publishing

Event publishing allows you to publish committed transactional or row-level data from DB2® tables as messages in Extensible Markup Language (XML) format.

Table 3 lists the replication and event publishing products with their corresponding solutions.

Table 3. Replication and event publishing solutions

<table>
<thead>
<tr>
<th>Product</th>
<th>Replication solutions included</th>
</tr>
</thead>
<tbody>
<tr>
<td>WebSphere Replication Server for z/OS</td>
<td>• Q replication</td>
</tr>
<tr>
<td></td>
<td>• SQL replication</td>
</tr>
<tr>
<td></td>
<td>• Event publishing</td>
</tr>
<tr>
<td>WebSphere Data Event Publisher for z/OS</td>
<td>Event publishing</td>
</tr>
</tbody>
</table>

Replication and event publishing programs

Four main programs comprise the replication and event publishing products. Each replication and event publishing program responds to certain command programs.

Programs that comprise the products

The following programs comprise WebSphere Replication Server for z/OS and WebSphere Data Event Publisher for z/OS:

Q Capture program

The Q Capture program reads the DB2 recovery log for changes to source tables, transforms the changes into messages, and puts the messages on a WebSphere MQ queue. The Q Apply program or a user application processes these messages. The Q Capture program supports Q replication and event publishing.

Q Apply program

The Q Apply program gets messages from WebSphere MQ queues, rebuilds the transactions that the messages contain, and applies the transactions to target tables or stored procedures. The Q Apply program supports Q replication.

Capture program

The Capture program reads the DB2 recovery log for changed source data and saves the committed changed data to staging tables. The Capture programs supports SQL replication.

Apply program

The Apply program retrieves captured data from staging tables and delivers the data to targets. The Apply program supports SQL replication.

The IBM WebSphere Information Integration Replication and Event Publishing Guide and Reference (SC19-1029-00) and the IBM WebSphere Information Integration SQL Replication Guide and Reference (SC19-1030-00) describe these programs and how to administer them.

Table 4 on page 4 describes the replication and event publishing programs and supporting command programs that comprise each product offering.
Table 4. Replication programs and supporting command programs

<table>
<thead>
<tr>
<th>Product</th>
<th>Replication programs included</th>
<th>Supporting command programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>WebSphere Replication Server for z/OS</td>
<td>• Q Capture (asnqcap)</td>
<td>• asnqccmd</td>
</tr>
<tr>
<td></td>
<td>• Q Apply (asnqapp)</td>
<td>• asnqacmd</td>
</tr>
<tr>
<td></td>
<td>• Capture (asncap)</td>
<td>• asncmd</td>
</tr>
<tr>
<td></td>
<td>• Apply (asnapply)</td>
<td>• asnacmd</td>
</tr>
<tr>
<td>WebSphere Data Event Publisher for z/OS</td>
<td>• Q Capture (asnqcap)</td>
<td>• asnqccmd</td>
</tr>
</tbody>
</table>

Programs that comprise the base code

The following programs comprise the replication and event publishing base code:

**Replication Alert Monitor**

The Replication Alert Monitor checks a replication or publishing environment and notifies you about certain conditions that occur. The Replication Alert Monitor supports Q replication, SQL replication, and event publishing. The monitor program is asnmon. The command program that supports the monitor is asnccmd.

**Table difference utility**

The asntdiff utility compares all of the columns in a source table to their corresponding columns in a target table and generates a list of differences between the two tables in the form of a DB2 table.

**Table repair utility**

The asntrep utility repairs differences between source and target tables on all DB2 servers by deleting unmatched rows from the target and then inserting rows that are missing from the target. This utility is not available in native z/OS. You must run asntrep from Linux, UNIX, or Windows to repair z/OS tables.

**Trace facility**

The trace facility (asntrc) logs program flow information from the Q Capture, Q Apply, Capture, Apply, and Replication Alert Monitor programs. You can provide this trace information to IBM® Software Support for troubleshooting assistance.

**Message format utilities**

The message format utilities (asnqfmt and asnqxfmt) format and display messages that are used in Q replication and event publishing.

**asnmig8**

The asnmig8 program creates Version 8 CD tables and control tables and drops the pre-version 8 tables. You also can use the migration program to migrate directly from Version 7 to Version 9. The Version 8 and Version 9 replication control tables are identical, except you need to create a few new control tables if you are running Capture in DB2 Version 9 in z/OS. All of these control tables are in sample job ASNCTLZD. The asnmig8 program sets the correct architecture level, without any user updates needed.

**asnplxfy**

The asnplxfy program migrates a non-data-sharing SQL replication environment to a data-sharing environment. Contact support to migrate a non-data-sharing Q replication environment to a data-sharing environment.
The following documents describe these programs and how to administer them:

- IBM WebSphere Information Integration: Replication and Event Publishing Guide (SC19-1029-00)
- IBM WebSphere Information Integration: SQL Replication Guide and Reference (SC19-1030-00)
- IBM WebSphere Information Integration: Migrating to SQL Replication Version 8 (SC19-1026-00)
- IBM WebSphere Information Integration: Migrating to Replication Version 9 (SC19-1027-00)
Chapter 2. Preparing an HFS data set

Before you install the base FMID, you must allocate and mount an HFS data set.

About this task

Your product's program directory lists the space requirements for the Hierarchical File System (HFS) data set and other distribution libraries. The HFS holds the message catalog and placeholder programs that enable the replication and event publishing programs to run on UNIX® System Services for z/OS (USS). If you did not prepare an HFS for the base code, you must allocate and mount an HFS data set.

Procedure

To prepare an HFS data set for the replication and event publishing base code:

1. Allocate and mount the HFS data set. The sample job below defines the DPROPR.OMVS.HFS data set in an MKFS DD statement and mounts it at the /dpropr directory for read-write. You can mount the HFS data set at the/usr/lpp/db2repl_09_01 mount point or a directory that you select, such as /dpropr.

   //OMVSXX JOB
   //DEFINE EXEC PGM=IEFBR14
   //MKFS DD DSNAME=DPROPR.OMVS.HFS,
   // SPACE=(TRK,(80,15,1)),DCB=(DSORG=PO),
   // DSNTYPE=HFS,
   // DISP=(NEW,CATLG,DELETE),
   // STORCLAS=STANDARD
   //MOUNT EXEC PGM=IKJEFT01,DYNAMNBR=20
   //SYSTSIN DD *

   PROFILE MSGID
   MOUNT FILESYSTEM('DPROPR.OMVS.HFS') -
   MOUNTPOINT('/dpropr') -
   TYPE(HFS) -
   MODE(RDWR)
   END
   //

2. Specify that the system mount the new HFS each time the system starts. The BPXPRMxx member of the SYS1.PARMLIB parameter library contains the parameters that control the z/OS UNIX System Services environment and the file systems. Include the FILESYSTYPE statement in BPXPRMxx member that will be used to load the initial program (IPL). Then, the system will automatically mount the new HFS every time it loads the IPL. Here is an example:

   FILESYSTYPE TYPE(AUTOMNT) ENTRYPNT (BPXTAMD)

The MVS™ Initialization and Tuning Reference describes the BPXPRMxx member and its parameters in detail.
Chapter 3. Configuring z/OS for replication and event publishing

After you install a product, you must configure z/OS to support the replication and event publishing programs.

Authorizing replication and event publishing programs to run as z/OS UNIX applications

You must authorize the replication and event publishing programs to run as z/OS UNIX applications by granting the programs security access and access to the message catalogs.

About this task

The following procedure describes how to authorize the replication and event publishing programs in the resource access control facility (RACF®). If you use another security program such as Top Secret or ACF2, grant similar authorizations for your security program.

If many users and groups need access, you can use default OMVS segments to authorize security access. See the z/OS Security Server RACF Security Administrator’s Guide for details.

Procedure

To authorize replication and event publishing programs to run as z/OS UNIX applications:

1. Authorize security access to UNIX System Services (USS).
   a. Define RACF groups by using the ADDGROUP command. Any user IDs that will run replication and event publishing programs that communicate with each other should belong to the same group. For example, the asncmd command and the Capture program communicate with each other, so any user IDs that will issue the asncmd command and any user IDs that will run the Capture program should belong to the same RACF group. See the z/OS Security Server RACF Security Administrator’s Guide for details.
   b. Optional: Specify group identifiers (GID) for those RACF groups. You can assign a GID by specifying a GID value in the OMVS segment of the RACF group profile or by using the AUTOGID keyword. When a GID is assigned to a group, all users who are connected to that group, who have a user identifier (UID) in their user profile, and whose default or current connect group has a GID in the group profile can use z/OS UNIX functions and can access z/OS UNIX files based on the GID and UID values that are assigned.
   c. Optional: Specify a unique user identifier (UID) for each user ID that will run replication and event publishing programs. The RACF user profile for each user ID contains an OMVS segment. To define a unique OMVS segment, specify an integer identifier (between 0 and 2147483647) in the USER.OMVS.UID field by using the ALTUSER command, which requires update authority to the OMVS segment. For example, the following ALTUSER command specifies a UID of 122649 for user ID USER1:

```plaintext
ALTUSER USER1 OMVS(UID(122649) HOME('/u/USER1') PROGRAM('/bin/sh'))
```
The users and groups that run replication and event publishing programs can use a default OMVS segment or have their own OMVS segment defined.

2. Grant any user ID that runs replication and event publishing programs read access to the HFS install directory -PathPrefix-/usr/lpp/db2repl_09_01 and its subdirectories so that the user ID can read the message catalogs. For example:
   `chmod -R a+r -PathPrefix-/usr/lpp/db2repl_09_01`

3. Grant any user ID that runs replication and event publishing programs write access to either the /tmp directory or the directory that the TMPDIR environment variable specifies. See “Specifying temporary directories” on page 13 for details. If a user ID that runs replication and event publishing programs does not have security access, you will see this error message:

   CEE5101C During initialization, the callable service BPXIMSS failed.
   The system reason code was OB0C00FB. The application will be terminated.

## Defining your environment

The /etc/profile file, /etc/environment file, and .profile file contain variables that specify the environment on your system.

### About this task

- Define environment variables in the /etc/profile to set defaults for all users on a system.
- Define environment variables in the /etc/environment to specify the basic environment for all processes.
- Define environment variables in the .profile file to customize the working environment for an individual user ID.

You need to set environment variables if you will run replication and event publishing programs from a USS command session, a BPXBATCH job, or from the Replication Center. See Chapter 12, “Example environment setup for replication and event publishing on z/OS,” on page 41 for a complete definition that you can use in your /etc/profile or .profile files.

## Specifying your time zone

You must identify a time zone for your replication and event publishing environment.

### About this task

The TZ environment variable maps your local time zone to the Greenwich mean time (GMT) or universal time coordinated (UTC). Set the TZ environment variable in the /etc/profile file.

The three primary fields specify the time zone:

- The local standard time, abbreviated (for example, CST or PDT).
- The time offset west from the universal reference time. You must specify the hours west from universal reference time, but you can also specify minutes and seconds. A minus sign (-) indicates an offset east of the universal reference time.
- The daylight savings time zone, abbreviated (for example, CDT). If the local standard time matches the daylight savings zone time, or if you do not specify the daylight savings time zone, the system will not convert to daylight savings time. You can also specify when daylight savings time starts and ends.
Procedure

To specify your time zone setting:

1. Identify your time zone setting. Chapter 13, “Time zone codes for the TZ environment variable,” on page 43 lists the time zone settings.

2. Set the TZ environment variable. For example, if you want to set your time zone to central standard time (CST), specify: TZ=CST6CDT. You must specify your time zone setting even for the GMT time zone.

Selecting the language for your messages

You must select in which language your error messages will display.

About this task

You can issue a MSGS DD statement or set the LANG and NLSPATH environment variables to select your language. The LANG environment variable contains a code that identifies your language, and the NLSPATH environment variable identifies the directory that contains the messages in your language. “Message catalog paths” on page 12 lists the message catalog path for each language.

Procedure

To select the language for your messages:

- If you will always use JCL or system-started tasks to run the replication and publishing programs, then use the MSGS DD statement. Include the path for the HFS where the product is installed followed by the message catalog path for your language. For example, if you want to display your messages in United States English, and you installed WebSphere Replication Server for z/OS in the /u/USER01 directory, specify:
  //MSGS DD PATH='/u/USER01/usr/lpp/db2repl_09_01/msg/En_US/db2asn.cat'

- If you will ever use UNIX System Services (USS) to run replication and publishing programs, set the LANG and NLSPATH environment variables in the /etc/profile file.

  1. Set the LANG environment variable. For example to set the LANG environment variable to Italian, specify: LANG=It_IT
  2. Set the NLSPATH environment variable to the directory where you installed the product followed by the message catalog path. For example, if you installed WebSphere Replication Server for z/OS into the /u/USER01 HFS directory, and you want to read your messages in German, specify:
     NLSPATH=${NLSPATH}:/u/USER01/usr/lpp/db2repl_09_01/msg/Da_DK/db2asn.cat
  3. If the .profile file (for the user ID that runs replication) does not export the NLSPATH environment variable and the /etc/profile file does not specify message path, create a symbolic link from the NLSPATH path to the message catalog files. Run the ASNISLKM sample job. The user ID that submits the ASNISLKM job must be able to use z/OS UNIX functions. The user ID must have permission to access the -NlsPath- directory so that it can create subdirectories. Superuser status is required to preserve access permission bits.

  4. Run the ASNISLKM sample job to create symbolic links from an NLSPATH to the message catalogs that you installed. You can create symbolic links from the NLSPATH path that the /etc/profile file specifies to the directory where you installed the message catalogs. The user ID that submits the ASNISLKM job must be a superuser or have sufficient authority to add links.
to the NLSPATH directory. For example, assume that the USERA user ID runs replication, the /etc/profile file specifies the IBM default NLSPATH directory (/usr/lib/nls/msg/%L/%N), and the USERA user ID does not define the NLSPATH environment variable in its .profile file. You can run the ASNSILKM job using the superuser USERB user ID to create symbolic links between the IBM default NLSPATH directory (/usr/lib/nls/msg/%L/%N) and the directory that contains the message catalogs.

**Message catalog paths**

WebSphere Replication Server offers messages in 18 national languages. The -PathPrefix-/usr/lpp/db2repl_09_01/msg directory contains the messages for all languages. A subdirectory for each language contains the message catalog, named db2asn.cat, for that language.

Table 5 lists the LANG environment variable values for each language and the path where messages for each language reside.

<table>
<thead>
<tr>
<th>Language</th>
<th>LANG value</th>
<th>Message catalog path</th>
</tr>
</thead>
<tbody>
<tr>
<td>German</td>
<td>Da_DK</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/Da_DK/IBM/db2asn.cat</td>
</tr>
<tr>
<td>Danish</td>
<td>De_DE</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/De_DE/IBM/db2asn.cat</td>
</tr>
<tr>
<td>English Upper</td>
<td>En_UP</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/En_UP/IBM/db2asn.cat</td>
</tr>
<tr>
<td>United States</td>
<td>En_US</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/En_US/IBM/db2asn.cat</td>
</tr>
<tr>
<td>Spanish</td>
<td>Es_ES</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/Es_ES/IBM/db2asn.cat</td>
</tr>
<tr>
<td>Italian</td>
<td>It_IT</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/It_IT/IBM/db2asn.cat</td>
</tr>
<tr>
<td>Finnish</td>
<td>Fi_FI</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/Fi_FI/IBM/db2asn.cat</td>
</tr>
<tr>
<td>French</td>
<td>Fr_FR</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/Fr_FR/IBM/db2asn.cat</td>
</tr>
<tr>
<td>Japanese</td>
<td>Ja_JP</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/Ja_JP/IBM/db2asn.cat</td>
</tr>
<tr>
<td>Korean</td>
<td>ko_KR</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/ko_KR/IBM/db2asn.cat</td>
</tr>
<tr>
<td>Norwegian</td>
<td>No_NO</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/No_NO/IBM/db2asn.cat</td>
</tr>
<tr>
<td>Polish</td>
<td>Pl_PL</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/Pl_PL/IBM/db2asn.cat</td>
</tr>
<tr>
<td>Brazilian</td>
<td>Pt_BR</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/Pt_BR/IBM/db2asn.cat</td>
</tr>
<tr>
<td>Swedish</td>
<td>Sv_SE</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/Sv_SE/IBM/db2asn.cat</td>
</tr>
<tr>
<td>Czech</td>
<td>Cs_CZ</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg(Cs_CZ/IBM/db2asn.cat</td>
</tr>
<tr>
<td>Simplified Chinese</td>
<td>Zh_CN</td>
<td>-PathPrefix-/usr/lpp/db2repl_09_01/msg/Zh_CN/IBM/db2asn.cat</td>
</tr>
</tbody>
</table>
## Specifying temporary directories

You must specify a temporary directory for the replication and publishing programs to use.

### About this task

The TMPDIR environment variable identifies the name of the directory where replication and publishing programs can create temporary files. The replication and event publishing commands must run with the same TMPDIR setting as the program that the command operates. The replication and event publishing programs will create their temporary files in the /tmp directory if you do not specify the TMPDIR environment variable. In this case, user IDs that run the replication and publishing programs must have write access to the /tmp directory.

For example, if the USER1 user ID issues the asnmcmd reinit command that reinitializes a Replication Alert Monitor program, but the USER2 user ID started that monitor, then the TMPDIR environment variable for USER1 must be set to the same value as the TMPDIR environment variable for USER2.

As another example, if the USER3 user ID issues the asntrc command to log program flow information from the Q Apply program, but the USER4 user ID started the Q Apply program. The TMPDIR environment variable for USER3 must be set to the same value as the TMPDIR environment variable for USER4, since the asntrc command can log program flow information or any replication or publishing program.

Table 6 matches the commands that store their files in temporary directories with the programs that require similar TMPDIR environment variable settings.

### Table 6. Replication and event publishing commands and the programs they operate

<table>
<thead>
<tr>
<th>The user ID that issues this command ...</th>
<th>must have the same TMPDIR value as the user ID that starts this program ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>asnmcmd</td>
<td>Apply</td>
</tr>
<tr>
<td>asnccmd</td>
<td>Capture</td>
</tr>
<tr>
<td>asnmcmd</td>
<td>Replication Alert Monitor</td>
</tr>
<tr>
<td>asnqacmd</td>
<td>Q Apply</td>
</tr>
<tr>
<td>asnqccmd</td>
<td>Q Capture</td>
</tr>
<tr>
<td>asntrc</td>
<td>Capture, Apply, Q Capture, Q Apply, Replication Alert Monitor</td>
</tr>
</tbody>
</table>

### Procedure

To specify temporary directories:
To define temporary directories, set the TMPDIR environment variable for all user IDs that run replication and event publishing programs.

**Enabling the replication and event publishing programs to be run from a USS shell**

Setting the PATH and STEPLIB environment variables enables the replication and event publishing programs to be run from a UNIX System Services (USS) shell.

**About this task**

The PATH environment variable points to a list of directories that the system searches to find executable programs. The STEPLIB environment variable contains the path of the data set that contains the executable load modules. The replication and publishing programs are installed into the `/db2repl_09_01/bin` directory as empty files with the sticky bit set. The sticky bit causes the system to search the data set that is specified by the STEPLIB environment variable, the link pack area, or the link list concatenation to find the load module to run in place of the HFS program.

**Procedure**

To enable the replication and event publishing programs:

1. Specify the directories to search for executable commands by setting the PATH environment variable to the product’s installation bin directory. For example, if you installed WebSphere Replication Server for z/OS or WebSphere Data Event Publisher for z/OS into the `/dpropr` HFS directory, you specify:
   ```
   PATH=/dpropr/usr/lpp/db2repl_09_01/bin:${PATH }
   ```
2. Specify the data set that contains the executable files for the replication programs by setting the STEPLIB environment variable. For example, if `DPROPR.V910` is the high-level qualifier for the product’s load library, and the `DSN7` is the high-level qualifier for the DB2 for z/OS load library, then you specify:
   ```
   STEPLIB=DPROPR.V910.SASNLOAD:DSN7.SDSNLOAD:{STEPLIB}
   ```
3. View the enabled replication programs. You can use the `ls -la` command to view the enabled programs.
   a. Change directories to the directory specified by the PATH environment variable.
   b. Issue the `ls -la` command. See Chapter 12, “Example environment setup for replication and event publishing on z/OS,” on page 41 for a sample and output.

**Directing spill files to storage**

If the Capture program or the Q Capture program exceeds its memory limit when it tries to write a row in memory, it creates a spill file to store the largest transaction.

**About this task**

Make sure that you allocate enough space to hold your largest transaction. You should direct the spill file to a CAPSPILL DD card. Specify the SYSDA unit if possible. Otherwise, the spill file will go to VIO by default.
**Procedure**

To direct spill files to storage:

1. If you will direct spill files to a CAPSPILL DD card and specify the SYSDA unit, use the following example:
   
   ```plaintext
   CAPSPILL DD DSN=&&CAPSPL,DISP=(NEW,DELETE,DELETE),
   UNIT=SYSDA,SPACE=(CYL,(50,10)),
   DCB=(RECFM=VB,BLKSIZE=6404)
   ```
   
   Ensure the SPACE parameter specifies enough storage space to contain your largest transaction.

2. If you will direct spill files to a CAPSPILL DD card and specify the VIO unit, use the following example:
   
   ```plaintext
   CAPSPILL DD DSN=&&CAPSPL,DISP=(NEW,DELETE,DELETE),
   UNIT=VIO,SPACE=(CYL,(50,10)),
   DCB=(RECFM=VB,BLKSIZE=6404)
   ```
   
   Ensure the SPACE parameter specifies enough storage space contain your largest transaction.

**APF authorizing load libraries**

The Q Capture and Capture programs must run from a load library that is authorized by the Authorized Program Facility (APF).

**About this task**

You can either run all the replication and event publishing programs from one APF-authorized load library, or you can create a separate load library for the Q Capture and Capture programs and copy the base code (asnrbase) to that load library.

**Procedure**

To APF authorize the appropriate load modules:

1. If you will run all replication and event publishing programs from the same load library, APF authorize that load library.
2. If you do not want to APF authorize the base code (asnrbase), then set up and APF authorize multiple load libraries.
   a. Create a separate load library for the Q Capture and Capture programs.
   b. Copy the base code (asnrbase) to the library that contains the Q Capture and Capture programs.
   c. APF authorize the load library that contains the Q Capture and Capture programs.
   d. For Q replication or event publishing, APF authorize the load library that contains SCSLOAD for WebSphere MQ.
Chapter 4. Configuring DB2 for z/OS for Q replication and event publishing

Q replication and event publishing for z/OS require you to set parameters, authorize user IDs to run statements in DB2 for z/OS, and bind packages into specific plans.

Procedure

To configure DB2 for z/OS for Q replication and event publishing:

1. Set the DSNZPARM parameters in the DSN6SYSP macro to the following recommended values:
   
   CONDBAT=600  
   CTHREAD=800  
   IDBACK=200  
   IDFORE=400  
   MAXDBAT=600

   Increasing the value IDFORE parameter value from 40, the default value, to 400 prevents you from exceeding the maximum number of thread connections. If you exceed the maximum number of connections, you will receive error message 00F30055:

   The maximum number of concurrent identify level agents has been exceeded.
   This abend code is issued by the following CSECT: DSN3ID30

2. Set WebSphere MQ parameters in the CSQ6SYSP macro. See Chapter 6, “Configuring WebSphere MQ for replication and event publishing,” on page 21 for details.

3. Authorize user IDs that operate the Q Capture, Q Apply, and Replication Alert Monitor programs to run all of the DB2 for z/OS statements that are listed in Chapter 14, “DB2 authorizations required by replication and event publishing on z/OS,” on page 45.

4. Bind any necessary packages. Chapter 15, “DB2 packages and plans for replication and event publishing on z/OS,” on page 49 describes which DB2 packages to bind into plans for replication and event publishing programs. Follow these steps:

   a. Edit the ASNQBNDL sample job that you will use to bind packages, and specify the ENABLE bind option.

   b. If Distributed Relational Database Architecture™ (DRDA®) is not the default protocol for your installation, edit any sample jobs that you will use to bind Apply and DSNUTIL packages, and specify the DBPROTOCOL(DRDA) bind option.

   c. Bind packages for local subsystems. Run the ASNQBNDL sample job to bind packages for the Q replication and event publishing programs (Q Capture, Q Apply, and Replication Alert Monitor).

   d. Bind packages for remote subsystems. If the Q Apply program or the Replication Alert Monitor needs to access a remote subsystem, a remote database, or a remote federated database, you must bind the packages that the program requires both on the remote DB2 for z/OS database and on the local DB2 for z/OS database. The plan must include the local and remote packages. Run the ASNQBNDR sample job to bind packages for the Q Apply program or the Replication Alert Monitor.
Chapter 5. Configuring DB2 for z/OS for SQL replication

SQL replication for z/OS requires you to set parameters, authorize user IDs to run statements in DB2 for z/OS, and bind packages into specific plans.

Procedure

To configure DB2 for z/OS for SQL replication:

1. Set the DSNZPARM parameters in the DSN6SYSP macro to the following recommended values:
   - CONDBAT=600
   - CTHREAD=800
   - IDBACK=200
   - IDFORE=400
   - MAXDBAT=600

   Increasing the value IDFORE parameter value from 40, the default value, to 400 prevents you from exceeding the maximum number of thread connections. If you exceed the maximum number of connections, you will receive error message 00F30055:
   The maximum number of concurrent identify level agents has been exceeded.
   This abend code is issued by the following CSECT: DSN3ID30
   If these values are too high for your system, adjust them accordingly.

2. Authorize user IDs that operate the Capture, Apply, and Replication Alert Monitor programs to run the DB2 for z/OS statements that are listed in Chapter 14, “DB2 authorizations required by replication and event publishing on z/OS,” on page 45.

3. Bind any necessary packages. Chapter 15, “DB2 packages and plans for replication and event publishing on z/OS,” on page 49 describes which DB2 packages to bind into plans for SQL replication programs. Follow these steps:
   a. Edit the ASNBNDSR sample job that you will use to bind packages, and specify the ENABLE bind option.
   b. If Distributed Relational Database Architecture (DRDA) is not the default protocol for your installation, edit any sample jobs that you will use to bind Apply and DSNUTIL packages, and specify the DBPROTOCOL(DRDA) bind option.
   c. Run the ASNBNDSR sample job to bind packages for the SQL replication programs (Capture, Apply, and Replication Alert Monitor) for local subsystems.
   d. If the Apply program or the Replication Alert Monitor needs to access a remote subsystem or database, you must bind the packages that the program requires both on the remote DB2 for z/OS database and on the local DB2 for z/OS database. The plan must include the local and remote packages.
      - Run the ASNBNDDDR sample job to bind packages for the Apply program.
      - Run the ASNQBNDR sample job to bind packages for the Replication Alert Monitor.

4. If the Apply program runs on a z/OS system but its source, target, or control server is located on different DB2 for z/OS subsystem, set the SYNLVL
parameter to SYNCPT in the VTAM® APPL definition statements for each DB2 subsystem. For example: SYNCLVL=SYNCPT.
Chapter 6. Configuring WebSphere MQ for replication and event publishing

The Q replication and event publishing programs use WebSphere MQ queues to transport data.

About this task

Follow these steps before you set up and run replication and event publishing. *IBM WebSphere Information Integration Replication and Event Publishing Guide and Reference* (SC19-1029-00) provides details about how the replication and event publishing programs use WebSphere MQ objects.

The ASNQDEFQ sample job defines queues for Q replication and event publishing. You should edit the ASNQDEFQ sample job now so that it will properly define queues later when you configure WebSphere MQ more thoroughly and run the sample job.

Procedure

To configure WebSphere MQ for Q replication and event publishing:

- Optional: Set the following parameters in the CSQ6SYSP macro to the recommended values below:
  
  CTHREAD=1300
  IDBACK=600
  IDFORE=600

- Edit the ASNQDEFQ sample job.
  
  1. Edit the queue names in the sample job. They should match the queue names that you specify in your control tables and queue maps. Queue names are case sensitive.
  
  2. Edit the local queue definitions statements in the sample job to specify the SHARE option and the REPLACE option when you define the local queues. The SHARE option allows multiple program threads to access the same queue.
  
  3. Edit the model queue definition statement in the ASNQDEFQ sample job. Here is an example:

```sql
DEFINE QMODEL('IBMREP.SPII.MQDEQ') DEFSOFT(SHARED)
MAXDEP(500000)+ MSGDEVSQ(FIFO) DEFTYPE(PERMDYN)
```

The default name for the model queue is IBMQREP.SPII.MODELQ. When you create or change a Q subscription, you can specify that you want to use a model queue with a different name, and you can specify a different model queue for each Q subscription.
Chapter 7. Optional: Enabling the ASNCLP program to run on USS

Some optional configuration steps are required if you want to enable the ASNCLP command-line program to run on UNIX System Services for z/OS.

Before you begin

This function requires the PTF for APAR PK85947 to be installed on the USS system.

About this task

Running the ASNCLP on USS enables you to generate SQL scripts for creating and changing replication objects for z/OS source and target servers without the need for a remote Linux®, UNIX, or Windows® system to connect to the servers.

A new library partition, AASNCLP, is created in the Replication Server Common FMID (HAAW910) to hold the new ASNCLP-related parts. AASNCLP requires 150 3390 tracks.

Procedure


2. Install the IBM DB2 JDBC Driver, Version 7, 8, or 9, on USS. The DB2 driver for JDBC and SQLJ is shipped as an optional FMID (JDB7712, JDB8812, or JDB9912 respectively for V7, 8, and 9). The default installation options create the following directories in USS:

   **Version 7**
   `/usr/lpp/db2/db2x10_jdbc`
   `/usr/lpp/db2/db2x10_jdbc/classes`
   `/usr/lpp/db2/db2x10_jdbc/lib`
   `/usr/lpp/db2/db2x10_jdbc/bin`
   `/usr/lpp/db2/db2x10_jdbc/samples`

   **Version 8 and 9**
   `/usr/lpp/db2x10_jdbc`
   `/usr/lpp/db2x10_jdbc/classes`
   `/usr/lpp/db2x10_jdbc/lib`
   `/usr/lpp/db2x10_jdbc/bin`
   `/usr/lpp/db2x10_jdbc/samples`

   **Note:** The IBM JDBC driver requires a z/OS license file to connect to z/OS subsystems. On the Version 9 driver the license file is named `db2jcc_license_cisuz.jar` and is located in the `/usr/lpp/db2x10_jdbc/classes` directory.

3. Bind the DB2 JDBC Driver packages and set environment variables. This step enables the JDBC driver to communicate with DB2 for z/OS. You can find detailed information in the README file in the `/usr/lpp/db2x10_jdbc` directory.
4. You must install ASNCLP into a hierarchical file system (HFS). You can create a new HFS or install the program into an existing HFS. If you plan to create a new HFS for ASNCLP, you can use the following sample job to allocate and mount the HFS data set.

The sample job defines the DPROPR.ASNZCL.P.HFS data set in an MKFS DD statement and mounts it at the /usr/lpp/db2repl_09_01/asnzclp directory for read-write:

```
//OMVSXX JOB
//DEFINE EXEC PGM=IEFBR14
//MKFS DD DSNAME=DPROPR.ASNZCLP.HFS,
// SPACE=(TRK,(300,15,1)),DCB=(DSORG=P0),
// DSNTYPE=HFS,
// DISP=(NEW,CATLG,DELETE),
// STORCLAS=STANDARD
//MOUNT EXEC PGM=IKJEFT01,DYNAMNBR=20
//SYSTSPRT DD SYSOUT=* 
//SYSPRINT DD SYSOUT=* 
//SYSUDUMP DD SYSOUT=* 
//SYSTSIN DD * PROFILE MSGID
MOUNT FILESYSTEM('DPROPR.ASNZCLP.HFS') - 
MOUNTPOINT('/usr/lpp/db2repl_09_01/asnzclp') - 
TYPE(HFS) - 
MODE(RDWR)
END 
//
```

5. Perform SMP/E RECEIVE for the PTF for APAR PK85947 to get sample jobs ASNMKCLP, ASNISCLP, and ASNDDCLP.

6. Edit and submit sample job ASNISCLP to create the HFS paths for ASNCLP. You can create the HFS paths in the same high-level directory name that you used for the messages. Consult the instructions in the sample job for more information.

7. Update and submit ASNDDCLP to create DDDEF entries for the SMP/E target and distribution libraries for ASNCLP-related parts.

8. Perform SMP/E APPLY for the PTF for APAR PK85947.

9. Verify that ASNCLP is successfully installed by making sure that the following files exist on USS:

```
/usr/lpp/db2repl_09_01/asnzclp/classes/db2qreplapis.jar
/usr/lpp/db2repl_09_01/asnzclp/classes/db2replapis.jar
/usr/lpp/db2repl_09_01/asnzclp/classes/db2replmsgs.jar
/usr/lpp/db2repl_09_01/asnzclp/classes/cacdb21.jar
/usr/lpp/db2repl_09_01/asnzclp/classes/common.jar
/usr/lpp/db2repl_09_01/asnzclp/classes/commontrace.jar
/usr/lpp/db2repl_09_01/asnzclp/bin/asnclp
/usr/lpp/db2repl_09_01/asnzclp/README
```

10. Update the CLASSPATH environment variable for the ASNCLP, depending on the version of the JDBC driver: (The following examples use line breaks for readability; the export statements do not allow line breaks or blank spaces.)

```
Version 7
export CLASSPATH=$CLASSPATH:
/usr/lpp/db2repl_09_01/asnzclp/classes/db2qreplapis.jar:
/usr/lpp/db2repl_09_01/asnzclp/classes/db2replapis.jar:
/usr/lpp/db2repl_09_01/asnzclp/classes/db2replmsgs.jar:
/usr/lpp/db2repl_09_01/asnzclp/classes/cacdb21.jar:
/usr/lpp/db2repl_09_01/asnzclp/classes/common.jar:
/usr/lpp/db2repl_09_01/asnzclp/classes/commontrace.jar:
```
Version 8 and 9

export CLASSPATH=$CLASSPATH:
/usr/lpp/db2repl_09_01/asnzclp/classes/db2qreplapis.jar:
/usr/lpp/db2repl_09_01/asnzclp/classes/db2replapis.jar:
/usr/lpp/db2repl_09_01/asnzclp/classes/db2replmsgs.jar:
/usr/lpp/db2repl_09_01/asnzclp/ classes/cacjdbc21.jar:
/usr/lpp/db2repl_09_01/asnzclp/classes/common.jar:
/usr/lpp/db2repl_09_01/asnzclp/classes/commontrace.jar:
/usr/lpp/db2repl_09_01/asnzclp/bin/asnclp:
/usr/lpp/db2/db2x10jdbc/classes/db2jcc.jar:
/usr/lpp/db2/db2x10jdbc/classes/db2jcc_license_cisuz.jar:

11. Create the configuration file that the ASNCLP program uses to connect to the source and target servers.

12. Optional: Use the ASNCLP SET LOG command to specify the location in the USS hierarchical file system (HFS) where the program writes log files during script generation and other tasks.
Chapter 8. Optional: Enabling the replication administration tools to work with WebSphere MQ

You can enable the Replication Center and ASNCLP command-line program to list, select, and validate WebSphere MQ queues that are needed for Q replication and event publishing. To do so, you run an optional sample job that creates a stored procedure on the subsystems where the replication programs run.

About this task

When you create control tables and queue maps for Q replication or event publishing, you specify WebSphere MQ queues. To avoid having to manually enter the names of the queues in the Replication Center, you can create a stored procedure that enables the Replication Center to connect to the queue manager and retrieve a list of queues for selection. The ASN.ADMINIF stored procedure also enables the Replication Center to validate whether the queues have the correct properties for Q replication and event publishing, and to send a test message between the queues that are specified in a replication queue map.

If you are using the ASNCLP program, the stored procedure only enables you to validate queues and send test messages.

Important: When performing WebSphere MQ operations, the stored procedure inherits the security environment from the user ID that is associated with the Workload Manager (WLM) application environment under which it runs. Ensure that this user ID has update authority on the system model queue (SYSTEM.DEFAULT.MODEL.QUEUE). The stored procedure needs this authority to create a dynamic temporary queue that serves as a reply-to queue to receive the output of a DISPLAY QUEUE command. The Replication Center then uses this output to build a list of queues from which you can select.

Procedure

To enable the replication administration tools to work with WebSphere MQ:

1. Run the following PERMIT commands to grant update privileges on the dynamic queue that the stored procedure creates (CSQ4SAMP.*) and on the SYSTEM.DEFAULT.MODEL.QUEUE.

   PERMIT CSQ4SAMP.* CL(MQUEUE) ID(WLM-AE-UID) ACCESS(UPDATE)

   PERMIT SYSTEM.DEFAULT.MODEL.QUEUE CL(MQUEUE) ID(WLM-AE-UID) ACCESS(UPDATE)

2. Run the ASNADMS sample job in the SASNSAMP data set.
Chapter 9. Optional: Adding replication and publishing documentation to a locally installed information center

You can order an installable version of the Information Management Software for z/OS Solutions Information Center that includes documentation for replication and event publishing.

The installable information center runs on Microsoft® Windows XP systems. It can run on a local system or on an intranet server. The installable information center includes the same content as the online information center, including product documentation for DB2 for z/OS Version 8 and Version 9, IMS™ Version 9 and Version 10, DB2 and IMS Tools, DB2 QMF™ Version 8 and Version 9, the current versions of InfoSphere™ Replication Server and InfoSphere Event Publisher, and more.

The installable information center also features an update mechanism to help ensure that you always have the most current product documentation.

The Information Management for z/OS Solutions Information Center DVD (SK5T-7377) can be ordered from the IBM Publication Center for a low cost.

- [Order the Information Center DVD](#)

Chapter 10. Considerations for changing source tables in reordered row format

Replication source tables that are in the reordered row format (RRF) in DB2 for z/OS Version 9.1 might need their table spaces reorganized in some situations where the table structure was changed.

Tables in table spaces that were created before DB2 for z/OS Version 9 new-function mode (NFM) are in basic row format (BRF) until you use the REORG utility on the table space or load the table by using the LOAD utility with the REPLACE option in Version 9 NFM. The REORG utility in V9 NFM can convert any table space to reordered row format. The Q Capture or Capture program must maintain schema history information for tables in RRF to properly decode log records. Log records for tables that are in basic row format look the same as they do in DB2 for z/OS Version 8.

Note: You need Q Capture or Capture Version 9.1 and must apply the PTF for replication APAR PK85673 if you are running with DB2 for z/OS Version 9.

Starting a Q subscription or registration for a table in RRF requires you to use the REORG utility on the table space if any columns were altered on this table and if the Q Capture or Capture program does not have schema history for this table. The Q Capture or Capture programs use two control tables, IBMQREP_TABVERSION and IBMQREP_COLVERSION, to maintain this history when they detect that a replicated table is in reordered row format from the DB2 system catalogs (FORMAT='R' in SYSIBM.SYSTABLEPART) or DB2 log.

Q Capture or Capture only reads the version tables for source tables that are in RRF. You must have these version tables created before you start the Q Capture or Capture programs in DB2 V9 NFM. The DDL for creating these tables can be found in the ASNQMZV9 sample job in the SASNSAMP partitioned data set. Ensure that these tables have the CODEPAGE and SCALE columns. If not, you can use the following statements to add these columns:

```
ALTER TABLE capschema.IBMQREP_COLVERSION
ADD CODEPAGE INTEGER;

ALTER TABLE capschema.IBMQREP_COLVERSION
ADD SCALE INTEGER;
```

If you added or changed one or more columns in an RRF table that was not being actively replicated, you need to use the REORG utility on the table space that contains the table before you activate the Q subscription or registration for the table.

Table 7 summarizes when a REORG operation is needed after you make changes to your replication environment.

<table>
<thead>
<tr>
<th>Situation</th>
<th>REORG needed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column was altered when the table was not being replicated</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 7. Situations where REORG operation is needed (continued)

<table>
<thead>
<tr>
<th>Situation</th>
<th>REORG needed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column was altered when the table was being replicated (Q Capture or Capture maintains schema history information in the version tables)</td>
<td>No</td>
</tr>
<tr>
<td>Q subscription or registration was stopped and started without any ALTER ADD COLUMN to the table while stopped (Q Capture or Capture has current schema history information in the version tables)</td>
<td>No</td>
</tr>
</tbody>
</table>

You can run one of the following queries to find out which table spaces that contain replication source tables need a REORG operation in V9 NFM before you start capturing changes for the tables. Replace `schema` with the schema of the Q Capture or Capture control tables.

**Q replication**

```sql
SELECT DISTINCT SUBSTR(TAB.CREATOR,1,10) AS CREATOR,
       SUBSTR(TAB.NAME,1,35) AS NAME,
       SUBSTR(TAB.DBNAME,1,7) AS DBNAME,
       SUBSTR(TAB.TSNAME,1,8) AS TSNAME,
       TS.REORG_LR_TS
FROM SYSIBM.SYSTABLES TAB,
     SYSIBM.SYSCOLUMNS COL,
     SYSIBM.SYSTABLEPART TS,
     schema.IBMQREP_SUBS SUBS
WHERE (TAB.CREATOR = SUBS.SOURCE_OWNER) AND
  (TAB.NAME = SUBS.SOURCE_NAME) AND
  (TAB.DBNAME = TS.DBNAME) AND
  (TAB.TSNAME = TS.TSNAME) AND
  (TAB.CREATOR = COL.TBCREATOR) AND
  (TAB.NAME = COL.TBNAME) AND
  (TS.FORMAT = 'R') AND
  (((TS.REORG_LR_TS < '0001-01-01-00.00.00.000000') AND
    (COL.CREATEDTS > TS.REORG_LR_TS)) OR
  ((TS.REORG_LR_TS = '0001-01-01-00.00.00.000000') AND
    (COL.CREATEDTS > TAB.CREATEDTS)));```

**SQL replication**

```sql
SELECT DISTINCT SUBSTR(TAB.CREATOR,1,10) AS CREATOR,
       SUBSTR(TAB.NAME,1,35) AS NAME,
       SUBSTR(TAB.DBNAME,1,7) AS DBNAME,
       SUBSTR(TAB.TSNAME,1,8) AS TSNAME,
       TS.REORG_LR_TS
FROM SYSIBM.SYSTABLES TAB,
     SYSIBM.SYSCOLUMNS COL,
     SYSIBM.SYSTABLEPART TS,
     schema.IBMMSNAP_REGISTER REG
WHERE (TAB.CREATOR = REG.SOURCE_OWNER) AND
  (TAB.NAME = REG.SOURCE_NAME) AND
  (TAB.DBNAME = TS.DBNAME) AND
  (TAB.TSNAME = TS.TSNAME) AND
  (TAB.CREATOR = COL.TBCREATOR) AND
  (TAB.NAME = COL.TBNAME) AND
  (TS.FORMAT = 'R') AND
  (((TS.REORG_LR_TS < '0001-01-01-00.00.00.000000') AND
    (COL.CREATEDTS > TS.REORG_LR_TS)) OR
  ((TS.REORG_LR_TS = '0001-01-01-00.00.00.000000') AND
    (COL.CREATEDTS > TAB.CREATEDTS)));```
If a table space contains a table with an edit routine (EDITPROC) or validation routine (VALIDPROC), the table space is not converted to reordered row format by the REORG or LOAD REPLACE commands. A table space can be created as RRF in V9 NFM and have an EDITPROC or VALIDPROC. The PTF for DB2 for z/OS APAR PK78959 changes this behavior and allows conversion to reordered row format when a table has an EDITPROC. Also, a VALIDPROC can be altered to null and then the table space can be converted to reordered row format. The PTF for DB2 for z/OS APAR PK78958 disables RRF conversion for compressed page sets.

After adding one or more columns, you must use the ADDCOL signal if you want the new column or columns to be replicated.

**Dropping tables**

Regardless of the row format of a replicated table, if you want to drop a table and re-create it, you must stop the Q subscription or registration, drop and re-create the table, and then start the Q subscription or registration. If the table is in reordered row format, you do not need to use the REORG utility on the table space because the table is new.

**Attention:** Do not attempt to drop and re-create a replicated table with an active Q subscription or registration while the Q Capture or Capture programs are running. Loss of data could occur. Always stop the Q subscription or registration before you drop the table.

**Using RUNSTATS on system catalog tables in DB2 for z/OS Version 9**

If you are seeing slow initialization by the Q Capture or Capture programs on DB2 for z/OS Version 9, use the RUNSTATS utility for system catalog tables. Specifically, run the utility on the DSNDB06.SYSDATABASE table space. Use the following command:

```
RUNSTATS TABLESPACE DSNDB06.SYSDATABASE
   TABLE (ALL)
   INDEX (ALL)
   SHRLEVEL CHANGE
   REPORT NO UPDATE ALL
```
Chapter 11. Data sets created for replication and event publishing products

The replication and event publishing products create data sets on the z/OS systems where they are installed.

Replication and event publishing data sets

The replication and event publishing data sets contain the DBRMs, executable members, sample programs, and the HFS file system.

Table 8 describes the contents of the data sets that the replication and event publishing products install on z/OS. TARGPRE is the target prefix that is added before the data sets are installed.

Table 8. Replication and publishing data sets

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>TARGPRE.SASNDBRM</td>
<td>Database request modules (DBRM) for the replication programs</td>
</tr>
<tr>
<td>TARGPRE.HFS</td>
<td>HFS file system that is mounted onto the HFS installation directory</td>
</tr>
<tr>
<td>TARGPRE.SASNLOAD</td>
<td>Executable members for the load modules</td>
</tr>
<tr>
<td>TARGPRE.SASNSAMP</td>
<td>Sample programs</td>
</tr>
</tbody>
</table>

Replication and event publishing load modules

The replication and event publishing programs and utilities exist as load modules on z/OS.

Table 9 correlates the load modules with the replication and event publishing applications. The SASNLOAD data set contains the executable members for each of those load modules.

Table 9. Executable members in the SASNLOAD data set

<table>
<thead>
<tr>
<th>Application</th>
<th>Load module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply command</td>
<td>asncmd</td>
</tr>
<tr>
<td>Module for stored procedure</td>
<td>asnadmsp</td>
</tr>
<tr>
<td>ASN.ADMINIF to query the MQ queues</td>
<td></td>
</tr>
<tr>
<td>Apply program</td>
<td>asncap</td>
</tr>
<tr>
<td>Capture command</td>
<td>asncmd</td>
</tr>
<tr>
<td>asnload</td>
<td>asnload (for SQL replication)</td>
</tr>
<tr>
<td>Replication Alert Monitor command</td>
<td>asnmcmd</td>
</tr>
<tr>
<td>asnmig8</td>
<td>asnmig8</td>
</tr>
<tr>
<td>Replication Alert Monitor program</td>
<td>asmon</td>
</tr>
<tr>
<td>asnplxfy</td>
<td>asnplxfy (Only for SQL Capture, not for Q Capture)</td>
</tr>
</tbody>
</table>
Table 9. Executable members in the SASNLOAD data set (continued)

<table>
<thead>
<tr>
<th>Application Load module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q Apply command asnqacmd</td>
</tr>
<tr>
<td>Q Apply program asnqapp</td>
</tr>
<tr>
<td>Q Capture programasnqcap</td>
</tr>
<tr>
<td>Q Capture commandasnqccmd</td>
</tr>
<tr>
<td>Module for sample stored procedure asnqdep</td>
</tr>
<tr>
<td>ASN.GET_QUEUE_DEPTH</td>
</tr>
<tr>
<td>Message format utility asnqmfmt</td>
</tr>
<tr>
<td>Message format utility asnqxfmt for event publishing messages</td>
</tr>
<tr>
<td>Replication and event publishing base code asnrbase</td>
</tr>
<tr>
<td>Table difference utility asntdiff</td>
</tr>
<tr>
<td>Trace facility asntrc</td>
</tr>
</tbody>
</table>

Sample jobs for replication and event publishing

The SASNSAMP data set contains sample jobs for SQL replication, Q replication, and event publishing.

Sample jobs for Q replication and event publishing

Sample jobs for Q replication and event publishing are used to operate the Q Capture and Q Apply programs, migrate your environment to Version 9, define WebSphere MQ objects, and other setup and operational tasks.

Table 10 describes the sample jobs in the SASNSAMP data set that pertain to Q replication and event publishing.

Table 10. Sample jobs for Q replication and event publishing

<table>
<thead>
<tr>
<th>Sample</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASNADMSP</td>
<td>Creates a stored procedure on the subsystem where the Q Capture or Q Apply program runs to enable the Replication Center and ASNCLP command-line program to select and validate WebSphere MQ objects. This program is an example of creating stored procedure ASN.ADMINIF on the subsystem where the Q Capture and Q Apply programs run. You must run this job if you want to list and check the MQ queues that are defined as replication queues. See [Chapter 8, &quot;Optional: Enabling the replication administration tools to work with WebSphere MQ&quot;] for more detail.</td>
</tr>
<tr>
<td>ASNQBNDL</td>
<td>Binds packages for the Q Capture, Q Apply, and Replication Alert Monitor programs</td>
</tr>
<tr>
<td>ASNQBNDR</td>
<td>Binds the Q Apply program to a remote system</td>
</tr>
<tr>
<td>ASNQCTLZ</td>
<td>Contains sample Q replication control tables for z/OS</td>
</tr>
<tr>
<td>Sample</td>
<td>Function</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ASNQFALL</td>
<td>Restores the Q replication control tables from WebSphere Replication Server Version 9 back to Version 8.2. This program sets ARCH_LEVEL back to Version 8.2, which you can do after migrating the control tables to Version 9.1 by running ASNQMZV9. Replication and event publishing Version 8.2 works with the new columns and tables added for Version 9.1, however you must set ARCH_LEVEL back to the previous level with ASNQFALV9.</td>
</tr>
<tr>
<td>ASNQDEFQ</td>
<td>Defines WebSphere MQ queues for Q replication</td>
</tr>
<tr>
<td>ASNQFA95</td>
<td>Sets ARCH_LEVEL back to Version 9.1, which you can do after migrating the control tables to Version 9.5 by running ASNQMZ95. Replication and event publishing Version 9.1 works with the new columns and tables added for Version 9.5, however you must set ARCH_LEVEL back with ASNQFA95.</td>
</tr>
<tr>
<td>ASNQJ001</td>
<td>Compiles, link-edits, and binds the Q Apply sample C++ stored procedure (JCL)</td>
</tr>
<tr>
<td>ASNQJ002</td>
<td>Compiles, link-edits, and binds the Q Apply sample SQL stored procedure (JCL)</td>
</tr>
<tr>
<td>ASNQMFMFT</td>
<td>Formats messages on a WebSphere MQ queue (JCL). ASNQMFMFT works only for compact messages in z/OS.</td>
</tr>
<tr>
<td>ASNQMSTP</td>
<td>Creates a stored procedure on the subsystem where the Q Apply program runs to enable the Replication Alert Monitor to monitor the number of messages on the receive queue or spill queue. This job is an example of creating the stored procedure ASN.GET_QUEUE_DEPTH on the subsystem where the Q Apply program instance runs. Run this job if you want to monitor the receive queue depth or the spill queue depth.</td>
</tr>
<tr>
<td>ASNQMZV9</td>
<td><strong>Mandatory for WebSphere Replication Server for z/OS Version 9:</strong> Migrates the Q Capture and Q Apply control tables from Version 8.2 to WebSphere Replication Server Version 9. This job alters adds columns to existing replication control tables, adds some new control tables, and updates the ARCH_LEVEL value to 0901 in some control tables. If you want to migrate from Version 8.2 to Version 9.5, then you must run ASNQMZ95 after running ASNQMZV9.</td>
</tr>
<tr>
<td>ASNQMZ95</td>
<td><strong>Mandatory when applying Version 9.1 APAR PK49430:</strong> The PTF for APAR PK49430 adds to z/OS Q Replication the functionality that is available in WebSphere Replication Server Version 9.5 or WebSphere Data Event Publisher Version 9.5 on Linux, UNIX, and Windows. This job alters adds columns to existing replication control tables, adds some new control tables, and updates the ARCH_LEVEL value to 0905 in some control tables. If you want to migrate from Version 8.2 to Version 9.5, then you must run ASNQMZ95 after running ASNQMZV9.</td>
</tr>
<tr>
<td>ASNQM2V8</td>
<td>Changes selected control table columns to VARCHAR(128) to support Version 8 new-function mode. Run this job after a DB2 V8 subsystem has been converted to V8 new-function mode.</td>
</tr>
</tbody>
</table>
Table 10. Sample jobs for Q replication and event publishing (continued)

<table>
<thead>
<tr>
<th>Sample</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASNQPROF</td>
<td>Sample user profile</td>
</tr>
<tr>
<td>ASNQSPC</td>
<td>Q Apply sample C++ stored procedure</td>
</tr>
<tr>
<td>ASNQSPS</td>
<td>Q Apply sample SQL stored procedure</td>
</tr>
<tr>
<td>ASNQSTPA</td>
<td>Stops the Q Apply program with the asnqcmd commands (BPXBATCH) (JCL)</td>
</tr>
<tr>
<td>ASNQSTPC</td>
<td>Stops the Q Capture program with the asnqccmd command (BPXBATCH) (JCL)</td>
</tr>
<tr>
<td>ASNQSTRA</td>
<td>Runs the Q Apply program (JCL)</td>
</tr>
<tr>
<td>ASNQSTRC</td>
<td>Runs the Q Capture program (JCL)</td>
</tr>
<tr>
<td>ASNQTOFF</td>
<td>Stops the trace facility for the Q Capture program (JCL)</td>
</tr>
<tr>
<td>ASNQTON</td>
<td>Starts the trace facility for the Q Capture program (JCL)</td>
</tr>
<tr>
<td>ASNQXFMT</td>
<td>Message format utility for EP messages. ASNQMFMT works only for compact messages in z/OS.</td>
</tr>
</tbody>
</table>

Sample jobs for SQL replication

Sample jobs for SQL replication are used to operate the Capture and Apply programs, migrate your environment to Version 8 and Version 9, and for other setup and operational tasks.

Table 11 describes the sample jobs in the SASNSAMP data set that pertain to SQL replication.

Table 11. Sample jobs for SQL replication

<table>
<thead>
<tr>
<th>Sample</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASNBNDDR</td>
<td>Binds the Apply program to a remote system</td>
</tr>
<tr>
<td>ASNBNDMU</td>
<td>Binds the migration program</td>
</tr>
<tr>
<td>ASNBNDSR</td>
<td>Binds packages for the Capture, Apply, and Replication Alert Monitor programs</td>
</tr>
<tr>
<td>ASNCMPLD</td>
<td>Makefile for the ASNLOAD exit program to run under Unix System Services for z/OS</td>
</tr>
<tr>
<td>ASNCTLZD</td>
<td>SQL script that creates Capture, Apply, and Monitor control tables</td>
</tr>
<tr>
<td>ASNDONE</td>
<td>Compiles and link edits JCL for the ASNDONE user exit</td>
</tr>
<tr>
<td>ASNLOAD</td>
<td>Source code for ASNLOAD user exit</td>
</tr>
<tr>
<td>ASNMIGFB</td>
<td>Falls back to DataPropagator™ V7 format from V8 format. Sample includes both Capture and Apply control server</td>
</tr>
<tr>
<td>ASNMIGZD</td>
<td>SQL script for migration to DB2 DataPropagator V8</td>
</tr>
<tr>
<td>ASNMIG1D</td>
<td>Runs DB2 DataPropagator V8 migration step 1. The sample uses DSNTEP2 to read SQL script ASNMIGZD to create the migration control tables</td>
</tr>
<tr>
<td>ASNMIG2C</td>
<td>Runs DB2 DataPropagator V8 migration step 2 for a control server migration. This job backs up the DB2 DataPropagator V7 Apply control tables.</td>
</tr>
<tr>
<td>ASNMIG2S</td>
<td>Runs DB2 DataPropagator V8 migration step 2 for a source server migration. This job backs up the DB2 Propagator V7 Capture control tables and CD tables.</td>
</tr>
</tbody>
</table>
Table 11. Sample jobs for SQL replication (continued)

<table>
<thead>
<tr>
<th>Sample</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASNMIG3C</td>
<td>Runs the DB2 DataPropagator V7 Apply control tables to V8.</td>
</tr>
<tr>
<td>ASNMIG3S</td>
<td>Runs DB2 DataPropagator V8 migration step 3 for a source server migration. This job migrates DB2 DataPropagator V7 Capture control tables and CD tables to V8.</td>
</tr>
<tr>
<td>ASNSMZV9</td>
<td>Adds four new control tables that are required for WebSphere Replication Server Version 9. The IBMQREP_COLVERSION and IBM_TABVERSION have the IBMQREP prefix because they are shared by Q replication if they are created under the same schema.</td>
</tr>
<tr>
<td>ASNM2V8</td>
<td>Changes selected control table columns to VARCHAR(128) to support Version 8 new-function mode. Run this job after a DB2 V8 subsystem has been converted to V8 new-function mode.</td>
</tr>
<tr>
<td>ASNSTPA</td>
<td>Stops the Apply program with the asncmd command (BPXBATCH) (JCL)</td>
</tr>
<tr>
<td>ASNSTPC</td>
<td>Stops the Capture program with the asnccmd command (BPXBATCH) (JCL)</td>
</tr>
<tr>
<td>ASNSTRA</td>
<td>Starts the Apply program with JCL batch</td>
</tr>
<tr>
<td>ASNSTRC</td>
<td>Starts the Capture program with JCL batch</td>
</tr>
<tr>
<td>ASNTRCON</td>
<td>Starts the trace facility for a given Capture, Apply or monitor program</td>
</tr>
<tr>
<td>ASNTRDMP</td>
<td>Dumps the current content of the trace facility buffer to a file</td>
</tr>
<tr>
<td>ASNTRFLW</td>
<td>Generates a FLW (flow) trace report to stdout</td>
</tr>
<tr>
<td>ASNTRFMT</td>
<td>Generates a FMT (format) trace report to stdout</td>
</tr>
<tr>
<td>ASNTROFF</td>
<td>Stops the trace facility</td>
</tr>
</tbody>
</table>

Sample jobs for replication and event publishing shared utilities

The samples jobs for shared utilities help configure and operate the Replication Alert Monitor and the asntdiff utility.

Table 12 describes the function of each sample for the shared utilities.

Table 12. Sample jobs for replication and event publishing shared utilities

<table>
<thead>
<tr>
<th>Sample</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASNQBNDT</td>
<td>Binds the asntdiff utility</td>
</tr>
<tr>
<td>ASNQM2V8</td>
<td>Changes selected control table columns to VARCHAR(128) to support Version 8 new-function mode. Run this job after a DB2 V8 subsystem has been converted to V8 new-function mode.</td>
</tr>
<tr>
<td>ASNSTPM</td>
<td>Stops the Replication Alert Monitor with the asnmcmd command (BPXBATCH) (JCL)</td>
</tr>
<tr>
<td>ASNSTRM</td>
<td>Runs the Replication Alert Monitor (JCL)</td>
</tr>
<tr>
<td>ASNTDIFF</td>
<td>Runs the asntdiff utility (JCL)</td>
</tr>
</tbody>
</table>
Chapter 12. Example environment setup for replication and event publishing on z/OS

Use the example environment variable definitions and output from the ls -la command to verify your replication and event publishing environment.

Here is an example definition that you can use in your /etc/profile file or the .profile file of individual user IDs. This example is for a user in the eastern time zone that reads messages in United States English. The product high-level directory name is user-defined prefix, the high-level qualifier for the product load library is DPROPR.V910.SASNLOAD and the DB2 for z/OS load library is DSN7.SDSNLOAD. See “Defining your environment” on page 10 for details on each environment variable setting.

```bash
export TZ=EST5EDT
export LANG=En_US
export NLSPATH=user-defined-prefix/usr/lpp/db2repl_09_01/msg/%L/%N
export PATH=user-defined-prefix/usr/lpp/db2repl_09_01/bin:${PATH}
export STEPLIB=DPROPR.V910.SASNLOAD:DSN7.SDSNLOAD
export TMPDIR=/u/CA00SRN/temp
```

You can use the ls -la command to see the replication and publishing programs that are enabled in your current environment setup and the message languages that are installed. Here is an example of the ls -la command that shows the enabled replication and event publishing programs for the above environment:

```bash
cd /usr/lpp/db2repl_09_01/bin
ls -la
```

Here is an example of the ls -la command that shows the message languages that have been installed for the above environment:

```bash
cd /usr/lpp/db2repl_09_01/msg
ls -la
```
Chapter 13. Time zone codes for the TZ environment variable

Use time zone codes as values for the TZ environment variable.

Table 13 matches the time zone code for the TZ environment variable with the time zone and the offset from Coordinated Universal Time (CUT).

<table>
<thead>
<tr>
<th>Time zone code</th>
<th>Time zone</th>
<th>CUT offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUT0GDT</td>
<td>Coordinated Universal Time</td>
<td>CUT</td>
</tr>
<tr>
<td>GMT0BST</td>
<td>United Kingdom</td>
<td>CUT</td>
</tr>
<tr>
<td>AZOREST1AZOREDT</td>
<td>Azores, Cape Verde</td>
<td>CUT -1</td>
</tr>
<tr>
<td>FALKST2FALKDT</td>
<td>Falkland Islands</td>
<td>CUT -2</td>
</tr>
<tr>
<td>GRNLNDST3GRNLNDT</td>
<td>Greenland, East Brazil</td>
<td>CUT -3</td>
</tr>
<tr>
<td>AST4ADT</td>
<td>Central Brazil</td>
<td>CUT -4</td>
</tr>
<tr>
<td>EST5EDT</td>
<td>Eastern United States, Colombia</td>
<td>CUT -5</td>
</tr>
<tr>
<td>CST6CDT</td>
<td>Central United States, Honduras</td>
<td>CUT -6</td>
</tr>
<tr>
<td>MST7MDT</td>
<td>Mountain United States</td>
<td>CUT -7</td>
</tr>
<tr>
<td>PST8PDT</td>
<td>Pacific United States, Yukon</td>
<td>CUT -8</td>
</tr>
<tr>
<td>AST9ADT</td>
<td>Alaska</td>
<td>CUT -9</td>
</tr>
<tr>
<td>HST10HDT</td>
<td>Hawaii, Aleutian Islands</td>
<td>CUT -10</td>
</tr>
<tr>
<td>BST11BDT</td>
<td>Bering Strait</td>
<td>CUT -11</td>
</tr>
<tr>
<td>NZST-12NZDT</td>
<td>New Zealand</td>
<td>CUT +12</td>
</tr>
<tr>
<td>MET-11METDT</td>
<td>Solomon Islands</td>
<td>CUT +11</td>
</tr>
<tr>
<td>EET-10EETDT</td>
<td>Eastern Australia</td>
<td>CUT +10</td>
</tr>
<tr>
<td>JST-9JSTDT</td>
<td>Japan</td>
<td>CUT +9</td>
</tr>
<tr>
<td>KORST-9KORDT</td>
<td>Korea</td>
<td>CUT +9</td>
</tr>
<tr>
<td>WAUST-8WAUDT</td>
<td>Western Australia</td>
<td>CUT +8</td>
</tr>
<tr>
<td>TAIST-8TAIDT</td>
<td>Taiwan</td>
<td>CUT +8</td>
</tr>
<tr>
<td>THAIST-7THAIDT</td>
<td>Thailand</td>
<td>CUT +7</td>
</tr>
<tr>
<td>TASHST-6TASHDT</td>
<td>Central Asia</td>
<td>CUT +6</td>
</tr>
<tr>
<td>PAKST-5PAKDT</td>
<td>Pakistan</td>
<td>CUT +5</td>
</tr>
<tr>
<td>WST-4WDT</td>
<td>Gorki, Central Asia, Oman</td>
<td>CUT +4</td>
</tr>
<tr>
<td>MEST-3MEDT</td>
<td>Turkey</td>
<td>CUT +3</td>
</tr>
<tr>
<td>SAUST-3SAUDT</td>
<td>Saudi Arabia</td>
<td>CUT +3</td>
</tr>
<tr>
<td>WET-2WET</td>
<td>Finland</td>
<td>CUT +2</td>
</tr>
<tr>
<td>USAST-2USADT</td>
<td>South Africa</td>
<td>CUT +2</td>
</tr>
<tr>
<td>NFT-1DFT</td>
<td>Norway</td>
<td>CUT +1</td>
</tr>
</tbody>
</table>
Chapter 14. DB2 authorizations required by replication and event publishing on z/OS

The user IDs that run replication and event publishing programs on z/OS require certain authorities and privileges.

**DB2 authorizations for the Q Capture and Capture programs**

You must grant the proper DB2 authorizations to operate the Q Capture and Capture programs.

*Table 14. DB2 authorizations for the Q Capture and Capture programs*

<table>
<thead>
<tr>
<th>Privileges</th>
<th>Objects</th>
</tr>
</thead>
</table>
| SELECT     | • All control tables on the DB2 subsystem that is used as the Q Capture or Capture control server  
• If you are replicating large object (LOB) data, the Q Capture program needs SELECT privilege on the source tables that contain LOB data.  
• DB2 catalog:  
  – SYSIBM.SYSTABLES table  
  – SYSIBM.SYSCATALOG table  
  – SYSIBM.SYSDUMMY* tables  
    (SYSIBM.SYSDUMMYA,SYSIBM.SYSDUMMYU AND SYSIBM.SYSDUMMYE)  
  • SYSIBM.SYSPLAN table  
  • SYSIBM.SYS PACKAGE table  
  • SYSIBM.SYSFIELDS tables |
| UPDATE     | All control tables on the DB2 subsystem that is used as the Q Capture or Capture control server |
| INSERT     | All control tables on the DB2 subsystem that is used as the Q Capture or Capture control server |
| DELETE     | All control tables on the DB2 subsystem that is used as the Q Capture or Capture control server |
| TRACE      | All |
| MONITOR1   | All |
| MONITOR2   | All |

**DB2 authorizations for the Q Apply and Apply programs**

You must grant the proper DB2 authorizations to operate the Q Apply and Apply programs.
### DB2 authorizations for the Replication Alert Monitor

You must grant the proper DB2 authorizations to operate the Replication Alert Monitor.

<table>
<thead>
<tr>
<th>Privileges</th>
<th>Objects</th>
</tr>
</thead>
</table>
| SELECT     | • All source tables if the Q Apply program or Apply program are loading the target tables  
• For SQL replication, all CD tables  
• All control tables on the DB2 subsystem that is used as the Q Apply server or Apply control server  
• DB2 catalog:  
  – SYSIBM.SYSRELS table  
  – SYSIBM.SYSTABLES table  
  – SYSIBM.SYSDUMMY* tables  
• SYSIBM.SYSPLAN table  
• SYSIBM.SYSPACKAGE table  
• The following Capture control tables:  
  – IBMSNAP_REGISTER table  
  – IBMSNAP_PRUNCNTL table  
  – IBMSNAP_PRUNE_SET table  
  – IBMSNAP_UOW table |
| UPDATE     | • All target tables  
• All control tables on the DB2 subsystem that is used as the Q Apply server or as the Apply control server  
• The following Capture control tables:  
  – IBMSNAP_REGISTER table  
  – IBMSNAP_PRUNCNTL table  
  – IBMSNAP_PRUNE_SET table  
  – IBMSNAP_UOW table |
| INSERT      | • All target tables  
• All control tables on the DB2 subsystem that is used as the Q Apply server or as the Apply control server |
| DELETE      | • All target tables  
• All control tables on the DB2 subsystem that is used as the Q Apply server or as the Apply control server |
### Table 16. DB2 authorizations for the Replication Alert Monitor

<table>
<thead>
<tr>
<th>Privileges</th>
<th>Objects</th>
</tr>
</thead>
</table>
| SELECT     | • All control tables on the DB2 subsystem that is used as the Q Capture server or Capture control server  
            • All control tables on the DB2 subsystem that is used as the Q Apply server or Apply control server  
            • All control tables on the DB2 subsystem that is used as the Monitor control server  
            • SYSIBM.SYSPLAN table  
            • SYSIBM.SYSPACKAGE table  
            • SYSIBM.SYSDUMMY* tables |
| UPDATE     | • All control tables on the DB2 subsystem that is used as the Monitor control server |
Chapter 15. DB2 packages and plans for replication and event publishing on z/OS

The replication and event publishing programs use several package collections and plans.

Table 17 shows the package collections and the replication and event publishing programs that use them.

Table 17. DB2 packages

<table>
<thead>
<tr>
<th>Collection</th>
<th>Replication and event publishing programs that use the collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASNCOMMON</td>
<td>• Capture</td>
</tr>
<tr>
<td></td>
<td>• Apply</td>
</tr>
<tr>
<td></td>
<td>• Q Capture</td>
</tr>
<tr>
<td></td>
<td>• Q Apply</td>
</tr>
<tr>
<td></td>
<td>• Replication Alert Monitor</td>
</tr>
<tr>
<td>ASNCAPTURE</td>
<td>Capture</td>
</tr>
<tr>
<td>ASNAPPLY</td>
<td>Apply</td>
</tr>
<tr>
<td>ASNQCAPTURE</td>
<td>Q Capture</td>
</tr>
<tr>
<td>ASNQAPPLY</td>
<td>Q Apply</td>
</tr>
<tr>
<td>ASNMONITOR</td>
<td>Replication Alert Monitor</td>
</tr>
</tbody>
</table>

Table 18 shows the packages that each plan must contain.

Table 18. DB2 plans

<table>
<thead>
<tr>
<th>Plan</th>
<th>These collections contain packages that the plan must include</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture plan (ASNTC910)</td>
<td>• ASNCOMMON</td>
</tr>
<tr>
<td></td>
<td>• ASNCAPTURE</td>
</tr>
<tr>
<td>Apply plan (ASNTA910)</td>
<td>• ASNCOMMON</td>
</tr>
<tr>
<td></td>
<td>• ASNAPPLY</td>
</tr>
<tr>
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The following rules apply to the syntax diagrams that are used in this information:
- Read the syntax diagrams from left to right, from top to bottom, following the path of the line. The following conventions are used:
  - The >>--- symbol indicates the beginning of a syntax diagram.
  - The ---> symbol indicates that the syntax diagram is continued on the next line.
  - The >--- symbol indicates that a syntax diagram is continued from the previous line.
  - The -->> symbol indicates the end of a syntax diagram.
- Required items appear on the horizontal line (the main path).

```
>>>---required_item
```

- Optional items appear below the main path.

```
>>>---required_item
       optional_item
```

If an optional item appears above the main path, that item has no effect on the execution of the syntax element and is used only for readability.

```
>>>---required_item
       optional_item
```

- If you can choose from two or more items, they appear vertically, in a stack.
  If you must choose one of the items, one item of the stack appears on the main path.

```
>>>---required_item
       required_choice1
       required_choice2
```

If choosing one of the items is optional, the entire stack appears below the main path.

```
>>>---required_item
       optional_choice1
       optional_choice2
```

If one of the items is the default, it appears above the main path, and the remaining choices are shown below.

```
>>>---required_item
       default_choice
       optional_choice1
       optional_choice2
```

- An arrow returning to the left, above the main line, indicates an item that can be repeated.
If the repeat arrow contains a comma, you must separate repeated items with a comma.

A repeat arrow above a stack indicates that you can repeat the items in the stack.

- Sometimes a diagram must be split into fragments. The syntax fragment is shown separately from the main syntax diagram, but the contents of the fragment should be read as if they are on the main path of the diagram.

Fragment-name:

- Keywords, and their minimum abbreviations if applicable, appear in uppercase. They must be spelled exactly as shown.
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- Separate keywords and parameters by at least one space if no intervening punctuation is shown in the diagram.
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