

Oracle® Transparent Gateway for Ingres II

Administrator's Guide

10g Release 2 (10.2) for HP-UX

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Oracle Transparent Gateway for Ingres II Administrator's Guide, 10g Release 2 (10.2) for HP-UX

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Primary Author: Amitai Sela

Contributing Author: Laurel Hale, Cynthia Kibbe, Kishan Peyetti

Contributor: Orit Curiel, Jacco Draaijer, Vira Goorah

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Preface

This manual describes the Oracle Transparent Gateway for Ingres II, which enables Oracle client applications to access Ingres II data through Structured Query Language (SQL). The gateway, with the Oracle database server, creates the appearance that all data resides on a local Oracle database server, even though the data can be widely distributed.

This preface covers the following topics:

- [Audience](#)
- [Documentation Accessibility](#)
- [Related Documents](#)
- [Conventions](#)

Audience

This manual is intended for Oracle database administrators who perform the following tasks:

- Installing and configuring the Oracle Transparent Gateway for Ingres II
- Diagnosing gateway errors
- Using the gateway to access Ingres II data

Note: You should understand the fundamentals of transparent gateways and the HP-UX operating system before using this guide to install or administer the gateway.

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Related Documents

For more information, see these Oracle resources:

- *Oracle Database New Features*
- *Oracle Call Interface Programmer's Guide*
- *Oracle Enterprise Manager Administrator's Guide*
- *Oracle Database Administrator's Guide*
- *Oracle Database Application Developer's Guide - Fundamentals*
- *Oracle Database Concepts*
- *Oracle Database Performance Tuning Guide*
- *Oracle Database Error Messages*
- *Oracle Database Globalization Support Guide*
- *Oracle Database Reference*
- *Oracle Database SQL Reference*
- *Oracle Net Services Administrator's Guide*
- *SQL*Plus User's Guide and Reference*
- *Oracle Database Heterogeneous Connectivity Administrator's Guide*
- *Oracle 2 Day DBA*
- *Oracle Database Security Guide*

Many of the examples in this book use the sample schemas of the seed database, which is installed by default when you install Oracle. Refer to *Oracle Database Sample Schemas* for information on how these schemas were created and how you can use them yourself.

Conventions

This section describes the conventions used in the text and code examples of this documentation set. It describes:

- [Conventions in Text](#)
- [Conventions in Code Examples](#)

Conventions in Text

We use various conventions in text to help you more quickly identify special terms. The following table describes those conventions and provides examples of their use.

Convention	Meaning	Example
Bold	Bold typeface indicates terms that are defined in the text or terms that appear in a glossary, or both.	When you specify this clause, you create an index-organized table .
<i>Italics</i>	Italic typeface indicates book titles or emphasis.	<i>Oracle Database Concepts</i> Ensure that the recovery catalog and target database do <i>not</i> reside on the same disk.
UPPERCASE monospace (fixed-width) font	Uppercase monospace typeface indicates elements supplied by the system. Such elements include parameters, privileges, datatypes, RMAN keywords, SQL keywords, SQL*Plus or utility commands, packages and methods, as well as system-supplied column names, database objects and structures, usernames, and roles.	You can specify this clause only for a NUMBER column. You can back up the database by using the BACKUP command. Query the TABLE_NAME column in the USER_TABLES data dictionary view. Use the DBMS_STATS.GENERATE_STATS procedure.
lowercase monospace (fixed-width) font	Lowercase monospace typeface indicates executables, filenames, directory names, and sample user-supplied elements. Such elements include computer and database names, net service names, and connect identifiers, as well as user-supplied database objects and structures, column names, packages and classes, usernames and roles, program units, and parameter values. Note: Some programmatic elements use a mixture of UPPERCASE and lowercase. Enter these elements as shown.	Enter sqlplus to open SQL*Plus. The password is specified in the orapwd file. Back up the datafiles and control files in the /disk1/oracle/dbs directory. The department_id, department_name, and location_id columns are in the hr.departments table. Set the QUERY_REWRITE_ENABLED initialization parameter to true. Connect as oe user. The JRepUtil class implements these methods.
<i>lowercase italic monospace (fixed-width) font</i>	Lowercase italic monospace font represents placeholders or variables.	You can specify the <i>parallel_clause</i> . Run <i>Uold_release</i> .SQL where <i>old_release</i> refers to the release you installed prior to upgrading.

Conventions in Code Examples

Code examples illustrate SQL, PL/SQL, SQL*Plus, or other command-line statements. They are displayed in a monospace (fixed-width) font and separated from normal text as shown in this example:

```
SELECT username FROM dba_users WHERE username = 'MIGRATE';
```

The following table describes typographic conventions used in code examples and provides examples of their use.

Convention	Meaning	Example
[]	Brackets enclose one or more optional items. Do not enter the brackets.	DECIMAL (<i>digits</i> [, <i>precision</i>])
{ }	Braces enclose two or more items, one of which is required. Do not enter the braces.	{ENABLE DISABLE}
	A vertical bar represents a choice of two or more options within brackets or braces. Enter one of the options. Do not enter the vertical bar.	{ENABLE DISABLE} [COMPRESS NOCOMPRESS]
...	Horizontal ellipsis points indicate either: <ul style="list-style-type: none"> That we have omitted parts of the code that are not directly related to the example That you can repeat a portion of the code 	CREATE TABLE ... AS <i>subquery</i> ; SELECT <i>col1</i> , <i>col2</i> , ... , <i>coln</i> FROM employees;
. . . .	Vertical ellipsis points indicate that we have omitted several lines of code not directly related to the example.	SQL> SELECT NAME FROM V\$DATAFILE; NAME ----- /fs1/dbs/tbs_01.dbf /fs1/dbs/tbs_02.dbf
Other notation	You must enter symbols other than brackets, braces, vertical bars, and ellipsis points as shown.	acctbal NUMBER(11,2); acct CONSTANT NUMBER(4) := 3;
<i>Italics</i>	Italicized text indicates placeholders or variables for which you must supply particular values.	CONNECT SYSTEM/ <i>system_password</i> DB_NAME = <i>database_name</i>
UPPERCASE	Uppercase typeface indicates elements supplied by the system. We show these terms in uppercase in order to distinguish them from terms you define. Unless terms appear in brackets, enter them in the order and with the spelling shown. However, because these terms are not case sensitive, you can enter them in lowercase.	SELECT last_name, employee_id FROM employees; SELECT * FROM USER_TABLES; DROP TABLE hr.employees;
lowercase	Lowercase typeface indicates programmatic elements that you supply. For example, lowercase indicates names of tables, columns, or files. Note: Some programmatic elements use a mixture of UPPERCASE and lowercase. Enter these elements as shown.	SELECT last_name, employee_id FROM employees; sqlplus hr/hr CREATE USER mjones IDENTIFIED BY ty3MU9;

Introduction

This chapter introduces the challenge faced by organizations when running several different database systems. It briefly covers Heterogeneous Services, the technology that the Oracle Transparent Gateway for Ingres II is based on.

To get a good understanding of generic gateway technology, Heterogeneous Services, Generic Connectivity, and how Oracle Transparent gateways fit in the picture, reading the *Oracle Database Heterogeneous Connectivity Administrator's Guide* first is highly recommended.

This chapter contains the following sections:

- [Overview](#)
- [Heterogeneous Services Technology](#)
- [Oracle Transparent Gateways](#)

Overview

Heterogeneous data access is a problem that affects a lot of companies. A lot of companies run several different database systems. Each of these systems stores data and has a set of applications that run against it. Consolidation of this data in one database system is often hard - in large part because many of the applications that run against one database may not have an equivalent that runs against another. Until such time as migration to one consolidated database system is made feasible, it is necessary for the various heterogeneous database systems to interoperate.

Oracle Transparent Gateways provide the ability to transparently access data residing in a non-Oracle system from an Oracle environment. This transparency eliminates the need for application developers to customize their applications to access data from different non-Oracle systems, thus decreasing development efforts and increasing the mobility of the application. Applications can be developed using a consistent Oracle interface for both Oracle and Ingres II.

Gateway technology is composed of two parts: a component that has the generic technology to connect to a non-Oracle system, which is common to all the non-Oracle systems, called Heterogeneous Services, and a component that is specific to the non-Oracle system that the gateway connects to. Heterogeneous Services, in conjunction with the Transparent Gateway agent, enables transparent access to non-Oracle systems from an Oracle environment.

Heterogeneous Services Technology

Heterogeneous Services provides the generic technology for connecting to non-Oracle systems. As an integrated component of the database, Heterogeneous Services can exploit features of the database, such as the powerful SQL parsing and distributed optimization capabilities.

Heterogeneous Services extend the Oracle SQL engine to recognize the SQL and procedural capabilities of the remote non-Oracle system and the mappings required to obtain necessary data dictionary information. Heterogeneous Services provides two types of translations: the ability to translate Oracle SQL into the proper dialect of the non-Oracle system as well as data dictionary translations which displays the metadata of the non-Oracle system in the local format. For situations where no translations are available, native SQL can be issued to the non-Oracle system using the pass-through feature of Heterogeneous Services.

Heterogeneous Services also maintains the transaction coordination between Oracle and the remote non-Oracle system, such as providing the two-phase commit protocol to ensure distributed transaction integrity, even for non-Oracle systems that do not natively support two-phase commit.

See Also: *Oracle Database Heterogeneous Connectivity Administrator's Guide* for more information about Heterogeneous Services.

Oracle Transparent Gateways

The capabilities, SQL mappings, data type conversions, and interface to the remote non-Oracle system are contained in the gateway. The gateway interacts with Heterogeneous Services to provide the transparent connectivity between Oracle and non-Oracle systems.

The gateway must be installed on a machine running either the Ingres database or the Ingres 32-bit client. This machine can be the same machine as the Oracle database or on the same machine as the Ingres database or on a third machine as a standalone. Each configuration has its advantages and disadvantages. The issues to consider when determining where to install the gateway are network traffic, operating system platform availability, hardware resources and storage.

Configuring the Gateway

After installing the gateway, perform the following tasks to configure the gateway for Ingres II:

- [Configuring the Gateway](#)
- [Configuring Oracle Net Services Listener for the Gateway](#)
- [Configuring the Oracle Database Server for Gateway Access](#)
- [Creating Database Links](#)
- [Configuring the Gateway for Multiple Ingres II Databases](#)

Configuring the Gateway

Perform the following tasks to configure the Oracle Transparent Gateway for Ingres II.

Task 1: Choose a System Identifier for the Gateway

The gateway system identifier (SID) is an alphanumeric character string that identifies a gateway instance. You need one gateway instance, and therefore one gateway SID, for each Ingres II database you are accessing. The SID is used as part of the file name for the initialization parameter file. The default SID is `tg4ingr`.

You can define a gateway SID, but using the default of `tg4ingr` is easier because you do not need to change the initialization parameter file name. However, if you want to access two Ingres II databases, you need two gateway SIDs, one for each instance of the gateway. If you have one Ingres II database and want to access it sometimes with one set of gateway parameter settings, and other times with different gateway parameter settings, you can do that by having multiple gateway SIDs for the single Ingres II database.

Task 2: Customize the Initialization Parameter File

The initialization parameter file must be available when the gateway is started. During installation, the following default initialization parameter file is created:

```
$ORACLE_HOME/tg4ingr/admin/inittg4ingr.ora
```

Where `$ORACLE_HOME` is the directory under which the gateway is installed.

If you are not using `tg4ingr` as the gateway SID, you must rename the initialization parameter file using the SID you chose in Task 1. This default initialization parameter file is sufficient for starting the gateway, verifying a successful installation, and running the demonstration scripts.

In the initialization parameter file, specify the Ingres II connection as follows:

```
HS_FDS_CONNECT_INFO=vnode::database_name
```

Where *vnode* is the virtual node which will be used by the Ingres II client to access a remote networked Ingres II server. You can retrieve a list of the available nodes on the machine by running the Ingres II `net_util` utility.

If you specify only *database_name*, omitting *vnode*, the gateway binds to the specified local database.

Also, in the initialization parameter file, specify the Ingres II database mode as follows:

```
HS_FDS_INGRES_MODE=mode
```

Where *mode* is the Ingres II database mode that was specified when the Ingres II database was installed; either `INGRES` or `ANSI` mode.

Additionally, set the Ingres II environment variable, as follows:

```
SET II_SYSTEM=ingres_parent_dir
```

Make sure that the files in the Ingres II parent directory are readable by every one and that users defined in the Ingres II database are defined with the correct permissions. If the correct permissions are not set, the following error occurs:

```
II_SS01007_PRIV_NOT_GRANTED
```

A number of initialization parameters can be used to modify gateway behavior. You might want to change the initialization parameter file later to meet system requirements.

See Also: [Appendix D, "Heterogeneous Services Initialization Parameters"](#) and the *Oracle Database Heterogeneous Connectivity Administrator's Guide* for more information about customizing the initialization parameter file.

Configuring Oracle Net Services Listener for the Gateway

The gateway requires Oracle Net Services to provide transparent data access. After configuring the gateway, configure Oracle Net Services to work with the gateway.

Task 1: Configure Oracle Net Services TNS Listener for the Gateway

Oracle Net Services uses the TNS listener to receive incoming connections from a Oracle Net Services client. The TNS listener and the gateway must reside on the same machine.

The TNS listener listens for incoming requests from the Oracle database server. For the TNS listener to listen for the gateway, information about the gateway must be added to the TNS listener configuration file, `listener.ora`. This file is located in `$ORACLE_HOME/network/admin`, where `$ORACLE_HOME` is the directory under which the gateway is installed.

Note: If Oracle Net Services is reinstalled, the original `listener.ora` file is renamed and a new `listener.ora` file is put into the `$ORACLE_HOME/network/admin` directory.

The following entries must be added to the `listener.ora` file:

- A list of Oracle Net Services addresses on which the TNS listener listens
- The gateway that the TNS listener starts in response to incoming connection requests

Example of Address to Listen On in listener.ora File

The Oracle database server accesses the gateway using Oracle Net Services and the TCP/IP protocol adapter. The following is the syntax of the connect descriptor entry in the `listener.ora` file:

```
LISTENER=
  (ADDRESS=
    (PROTOCOL=TCP)
    (HOST=host_name)
    (PORT=port_number))
```

Where:

Value	Description
<i>host_name</i>	is the name of the machine on which the gateway is installed.
<i>port_number</i>	specifies the port number used by the TNS listener. If you have other listeners running on <i>host_name</i> , the value of <i>port_number</i> must be different from the other listeners' port numbers.

Example of Gateway to Start in listener.ora File

To direct the TNS listener to start the gateway in response to incoming connection requests, add an entry to the `listener.ora` file with the following syntax:

```
SID_LIST_LISTENER=
  (SID_LIST=
    (SID_DESC=
      (SID_NAME=gateway_sid)
      (ORACLE_HOME=oracle_home_directory)
      (PROGRAM=tg4ingr)
      (ENVS=SHLIB_PATH=ingres_parent_dir/ingres/lib:
                                     oracle_home_directory/lib32)
    )
  )
```

Where:

Value	Description
<i>gateway_sid</i>	specifies the SID of the gateway and matches the gateway SID specified in the connect descriptor entry in the <code>tnsnames.ora</code> file.
<i>oracle_home_directory</i>	specifies the Oracle home directory where the gateway resides.
<i>tg4ingr</i>	specifies the Oracle Transparent Gateway for Ingres II.
<i>ingres_parent_dir</i>	specifies the value of the <code>II_SYSTEM</code> environment variable.

If you are already running a TNS listener that listens on multiple database SIDs, add only the following syntax to `SID_LIST` in the existing `listener.ora` file:

```
SID_LIST_LISTENER=
  (SID_LIST=
```

```

(SID_DESC=.
.
)
(SID_DESC=.
.
)
(SID_DESC=
(SID_NAME=gateway_sid)
(ORACLE_HOME=oracle_home_directory)
(PROGRAM=tg4ingr)
(ENVS=SHLIB_PATH=ingres_parent_dir/ingres/lib:
oracle_home_directory/lib32)
)
)

```

See Also: *Oracle Net Services Administrator's Guide* for information about changing the `listener.ora` file.

Task 2: Stop and Start the TNS Listener for the Gateway

The TNS listener must be started to initiate the new settings, as follows:

1. Set the `PATH` environment variable to access the commands in the directory `$ORACLE_HOME/bin` where the gateway is installed. If you have the Bourne or Korn Shell, enter the following:

```

$ PATH=$ORACLE_HOME/bin:$PATH;export PATH
$ SHLIB_PATH=$ORACLE_HOME/lib:$SHLIB_PATH; export SHLIB_PATH

```

If you have the C Shell, enter the following:

```

$ setenv PATH $ORACLE_HOME/bin:$PATH
$ setenv SHLIB_PATH $ORACLE_HOME/lib:$SHLIB_PATH

```

2. If the listener is already running, use the `lsnrctl` command to stop the listener and then start it with the new settings, as follows:

```

$ lsnrctl stop
$ lsnrctl start

```

3. Check the status of the listener with the new settings, as follows:

```

$ lsnrctl status

```

The following is an example of output from a `lsnrctl status` check:

```

LSNRCTL for HPUX: Version 10.2.0.1.0 - Production on 01-JUN-2005 09:16:17

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Connecting to (ADDRESS=(PROTOCOL=TCP) (HOST=204.179.99.15) (PORT=1551))
STATUS of the LISTENER
-----
Alias                listener
Version              TNSLSNR for HPUX: Version 10.2.0.1.0 - Production
Start Date           31-MAY-2005 10:16:17
Uptime                0 days 2 hr. 10 min. 25 sec
Trace Level           off
Security              OFF
SNMP                  OFF
Listener Parameter File /users/oracle/gateway/network/admin/listener.ora
Listener Log File    /users/oracle/gateway/network/log/listener.log

```

```

Listening Endpoints Summary...
  (DESCRIPTION= (ADDRESS= (PROTOCOL=TCP) (HOST=204.179.99.15) (PORT=1551)))
Services Summary...
Service "tg4ingr" has 1 instance(s).
  Instance "tg4ingr", status UNKNOWN, has 1 handler(s) for this service...
The command completed successfully

```

In this example, `tg4ingr` is the default SID value assigned during installation. You can use any valid ID for the SID, or keep the default.

Note: You must use the same SID value in the `tnsnames.ora` file, the `listener.ora` file.

Configuring the Oracle Database Server for Gateway Access

Before you use the gateway to access Ingres II data you must configure the Oracle database server to enable communication with the gateway over Oracle Net Services.

Configuring Oracle Net Services for the Oracle Database Server

To configure the server you add connect descriptors to the `tnsnames.ora` file. You cannot use the Oracle Net Services Assistant or the Oracle Net Services Easy Config tools to configure the `tnsnames.ora` file. You must edit the file manually.

See Also: *Oracle Database Administrator's Guide* for information about editing the `tnsnames.ora` file.

For the Oracle database server to access the gateway, it needs a service name entry or a connect descriptor name entry in the `tnsnames.ora` file to tell the Oracle database server where to make connections. By default, this file is in `$ORACLE_HOME/network/admin`, where `$ORACLE_HOME` is the directory in which the Oracle database server is installed. The `tnsnames.ora` file is required by the Oracle database server accessing the gateway, but not by the gateway.

Configuring `tnsnames.ora`

Edit the `tnsnames.ora` file to add a connect descriptor for the gateway. The following is an example of the Oracle Net Services entries using TCP/IP protocol needed for the Oracle database server to access the gateway:

```

connect_descriptor=
  (DESCRIPTION=
    (ADDRESS=
      (PROTOCOL=TCP)
      (HOST=host_name)
      (PORT=port_number)
    )
    (CONNECT_DATA=
      (SID=gateway_sid)
    )
    (HS=OK)
  )

```

Where:

Value	Description
<i>connect_descriptor</i>	<p>is the description of the object to connect to as specified when creating the database link, such as <code>tg4ingr</code>.</p> <p>Check the <code>sqlnet.ora</code> file for the parameter setting <code>names.directory_path = (TNSNAMES)</code></p> <p>Note: The <code>sqlnet.ora</code> file is typically stored in <code>\$ORACLE_HOME/network/admin</code>.</p>
TCP	is the TCP protocol used for TCP/IP connections.
<i>host_name</i>	specifies the machine where the gateway is running.
<i>port_number</i>	<p>matches the port number used by the Oracle Net Services TNS listener that is listening for the gateway. The TNS listener's port number can be found in the <code>listener.ora</code> file used by the TNS listener. See "Example of Address to Listen On in listener.ora File" on page 2-3.</p>
<i>gateway_sid</i>	<p>specifies the SID of the gateway and matches the SID specified in the <code>listener.ora</code> file of the TNS listener that is listening for the gateway. See "Task 1: Configure Oracle Net Services TNS Listener for the Gateway" on page 2-2 for more information.</p>
(HS=OK)	specifies that this connect descriptor uses the Oracle Heterogeneous Services option.

Creating Database Links

Any Oracle client connected to the Oracle database server can access Ingres II data through the gateway. The Oracle client and the Oracle database server can reside on different machines. The gateway accepts connections only from the Oracle database server.

A connection to the gateway is established through a database link when it is first used in an Oracle session. In this context, a connection refers to the connection between the Oracle database server and the gateway. The connection remains established until the Oracle session ends. Another session or user can access the same database link and get a distinct connection to the gateway and Ingres II database.

Database links are active for the duration of a gateway session. If you want to close a database link during a session, you can do so with the `ALTER SESSION` statement. The database and application administrators of a distributed database system are responsible for managing the necessary database links that define paths to the Ingres II database.

See Also: *Oracle Database Administrator's Guide* and *Oracle Database Heterogeneous Connectivity Administrator's Guide* for more information about using database links.

Gateway Password Encryption Tool

The gateway uses userids and passwords to access the information in the remote database. Some userids and passwords must be defined in the Gateway Initialization File to handle functions such as resource recovery. In the current security conscious environment, having plain-text passwords that are accessible in the Initialization File is deemed insecure. The `tg4pwd` encryption utility has been added as part of Heterogeneous Services' generic connectivity to help make this more secure. This utility is accessible by this gateway. The initialization parameters which contain sensitive values can be stored in an encrypted form.

See Also: *Oracle Database Heterogeneous Connectivity Administrator's Guide* for more information about using this utility.

Configuring the Gateway for Multiple Ingres II Databases

The tasks for configuring the gateway to access multiple Ingres II databases are similar to the tasks for configuring the gateway for a single database. The configuration example assumes the following:

- The gateway is installed and configured with the default SID of `tg4ingr`.
- The `ORACLE_HOME` environment variable is set to the directory where the gateway is installed.
- The gateway is configured for one Ingres II database named `db1`.
- Two Ingres II databases named `db2` and `db3` on a server named `ing20_hp` are being added.

Configuring the gateway for additional Ingres II databases is similar to configuring it for one database, and involves the following:

- Configuring the gateway.
- Configuring the Ingres II environment.
- Configuring Oracle Net Services for the gateway and the Oracle database server.

Multiple Databases Example: Configuring the Gateway

Choose Two System IDs for Each Ingres II Database

A separate instance of the gateway accesses the different Ingres II databases. Each instance needs its own gateway System ID (SID). For this example, the gateway SIDs are chosen for the instances that access the Ingres II databases:

- `tg4ingr2` for the gateway accessing database `db2`
- `tg4ingr3` for the gateway accessing database `db3`

Create Two Initialization Parameter Files

Create an initialization parameter file for each instance of the gateway by copying twice the original initialization parameter file:

```
$ORACLE_HOME/tg4ingr/admin/inittg4ingr.ora
```

Naming one with the gateway SID for `db2` and the other with the gateway SID for `db3`, as follows:

```
$ cd $ORACLE_HOME/tg4ingr/admin
$ cp inittg4ingr.ora inittg4ingr2.ora
$ cp inittg4ingr.ora inittg4ingr3.ora
```

Change the value of the `HS_FDS_CONNECT_INFO` parameter in the new files.

For `inittg4ingr2.ora`, enter the following:

```
HS_FDS_CONNECT_INFO=vnode::db2
```

For `inittg4ingr3.ora`, enter the following:

```
HS_FDS_CONNECT_INFO=vnode::db3
```

Note: If you have multiple gateway SIDs for the same Ingres II database because you want to use different gateway parameter settings at different times, follow the same procedure. You create several initialization parameter files, each with different SIDs and different parameter settings.

Multiple Databases Example: Configuring the Ingres II Environment

Set the Ingres II environment variables in both of the new initialization parameter files, as follows:

For `inittg4ingr2.ora`, enter the following:

```
SET II_SYSTEM=ingres_parent_dir
```

For `inittg4ingr3.ora`, enter the following:

```
SET II_SYSTEM=ingres_parent_dir
```

Multiple Databases Example: Configuring Oracle Net Services Listener

Add Entries to `listener.ora`

Add two new entries to the TNS listener configuration file, `listener.ora`. You must have an entry for each gateway instance, even when multiple gateway instances access the same database.

The following example shows the entry for the original installed gateway first, followed by the new entries:

```
SID_LIST_LISTENER=
(SID_LIST=
  (SID_DESC=
    (SID_NAME=tg4ingr)
    (ORACLE_HOME=oracle_home_directory)
    (PROGRAM=tg4ingr)
    (ENVS=SHLIB_PATH=
ingres_parent_dir/ingres/lib:oracle_home_directory/lib32))
  (SID_DESC=
    (SID_NAME=tg4ingr2)
    (ORACLE_HOME=oracle_home_directory)
    (PROGRAM=tg4ingr)
    (ENVS=SHLIB_PATH=
ingres_parent_dir/ingres/lib:oracle_home_directory/lib32))
  (SID_DESC=
    (SID_NAME=tg4ingr3)
    (ORACLE_HOME=oracle_home_directory)
    (PROGRAM=tg4ingr)
    (ENVS=SHLIB_PATH=
ingres_parent_dir/ingres/lib:oracle_home_directory/lib32))
)
```

Multiple Databases Example: Stopping and Starting the TNS Listener

If the listener is already running, use the `lsnrctl` command to stop the listener and then start it with the new settings, as follows:

```
$ lsnrctl stop
```



```
$ lsnrctl start
```

Multiple Databases Example: Configuring the Oracle Database Server for Gateway Access

To configure Oracle Net Services on the Oracle Database Server for multiple gateway instances:

Add two connect descriptor entries to the `tnsnames.ora` file. You must have an entry for each gateway instance, even if the gateway instances access the same database.

The following Ingres II example shows the entry for the original installed gateway first, followed by the two entries for the new gateway instances:

```
old_db_using=(DESCRIPTION=
  (ADDRESS=
    (PROTOCOL=TCP)
    (PORT=1541)
    (HOST=gtwhost))
  (CONNECT_DATA=
    (SID=tg4ingr))
  (HS=OK))
new_db2_using=(DESCRIPTION=
  (ADDRESS=
    (PROTOCOL=TCP)
    (PORT=1541)
    (HOST=gtwhost))
  (CONNECT_DATA=
    (SID=tg4ingr2))
  (HS=OK))
new_db3_using=(DESCRIPTION=
  (ADDRESS=
    (PROTOCOL=TCP)
    (PORT=1541)
    (HOST=gtwhost))
  (CONNECT_DATA=
    (SID=tg4ingr3))
  (HS=OK))
```

The value for `PORT` is the TCP/IP port number of the TNS listener that is listening for the gateway. The number can be found in the `listener.ora` file used by the TNS listener. The value for `HOST` is the name of the machine on which the gateway is running. The name also can be found in the `listener.ora` file used by the TNS listener.

Multiple Databases Example: Accessing Ingres II Data

Enter the following to create a database link for the `tg4ingr2` gateway:

```
SQL> CREATE PUBLIC DATABASE LINK INGR2 CONNECT TO
  2 user2 IDENTIFIED BY password2 USING 'new_db2_using';
```

Enter the following to create a database link for the `tg4ingr3` gateway:

```
SQL> CREATE PUBLIC DATABASE LINK INGR3 CONNECT TO
  2 user3 IDENTIFIED BY password3 USING 'new_db3_using';
```

Note: To encrypt the initialization parameters that would normally be stored in the initialization file in plain text, you must use the `tg4pwd` utility, as described in *Oracle Database Heterogeneous Connectivity Administrator's Guide*.

After the database links are established you can query the new Ingres II databases, as in the following:

```
SQL> SELECT * FROM ALL_USERS@INGR2;
```

Or

```
SQL> SELECT * FROM ALL_USERS@INGR3;
```

Ingres II Gateway Features and Restrictions

After the gateway is installed and configured, you can use the gateway to access Ingres II data, pass Ingres II commands from applications to the Ingres II database, perform distributed queries, and copy data.

This chapter contains the following sections:

- [Using the Pass-Through Feature](#)
- [Database Compatibility Issues for Ingres II](#)
- [Known Restrictions](#)
- [Known Problems](#)

Using the Pass-Through Feature

The gateway can pass Ingres II commands or statements from the application to the Ingres II database using the DBMS_HS_PASSTHROUGH package.

Use the DBMS_HS_PASSTHROUGH package in a PL/SQL block to specify the statement to be passed to the Ingres II database, as follows:

```
DECLARE
    num_rows INTEGER;
BEGIN
    num_rows := DBMS_HS_PASSTHROUGH.EXECUTE_IMMEDIATE@INGR('command');
END;
/
```

Where *command* cannot be one of the following:

- COMMIT
- ROLLBACK
- SAVEPOINT

The DBMS_HS_PASSTHROUGH package supports passing bind values and executing SELECT statements.

See Also: *PL/SQL Packages and Types Reference* and Chapter 3 of *Oracle Heterogeneous Connectivity Administrator's Guide* for more information about the DBMS_HS_PASSTHROUGH package.

Database Compatibility Issues for Ingres II

Ingres II and Oracle databases function differently in some areas, causing compatibility problems. The following compatibility issues are described in this section:

- [Naming Rules](#)
- [Data Types](#)
- [Queries](#)
- [Locking](#)

Naming Rules

Naming rule issues include the following:

- [Rules for Naming Objects](#)
- [Object Names](#)
- [Case Sensitivity](#)

Rules for Naming Objects

Oracle and Ingres II use different database object naming rules. For example, the maximum number of characters allowed for each object name can be different. Also, the use of single and double quotation marks, case sensitivity, and the use of alphanumeric characters can all be different.

See Also: *Oracle Database Reference* and Ingres II documentation.

Object Names

Names of Ingres II database objects are limited to a maximum of 32 characters. An object name can be composed of these characters:

- Numbers 0 to 9
- Lowercase letters a to z
- Uppercase letters A to Z
- Underscore character (_)
- Special characters "#", "@", and "\$"

Case Sensitivity

Ingres II handles letter case differently from Oracle. Ingres II uses these rules:

- Table owner names default to uppercase letters, unless the name is surrounded by double quote characters
- Column names, table names, view names, and so on, are always treated as lowercase letters

The Oracle database server defaults to uppercase unless you surround identifiers with double quote characters. For example, to refer to the Ingres II table called *emp*, enter the name with double quote characters, as follows:

```
SQL> SELECT * FROM "emp"@INGR;
```

However, to refer to the Ingres II table called *emp* owned by Scott from an Oracle application, enter the following:

```
SQL> SELECT * FROM "Scott"."emp"@INGR;
```

If the Ingres II table called *emp* is owned by SCOTT, a table owner name in uppercase letters, you can enter the owner name without double quote characters, as follows:

```
SQL> SELECT * FROM SCOTT."emp"@INGR;
```

Or

```
SQL> SELECT * FROM scott."emp"@INGR;
```

Oracle recommends that you surround all Ingres II object names with double quote characters and use the exact letter case for the object names as they appear in the Ingres II data dictionary. This convention is not required when referring to the supported Oracle data dictionary tables or views listed in [Appendix C, "Data Dictionary"](#).

If existing applications cannot be changed according to these conventions, create views in Oracle to associate Ingres II names to the correct letter case. For example, to refer to the Ingres II table *emp* from an existing Oracle application by using only uppercase names, define the following view:

```
SQL> CREATE VIEW EMP (EMPNO, ENAME, SAL, HIREDATE)
      AS SELECT "empno", "ename", "sal", "hiredate"
      FROM "emp"@INGR;
```

With this view, the application can issue statements such as the following:

```
SQL> SELECT EMPNO, ENAME FROM EMP;
```

Using views is a workaround solution that duplicates data dictionary information originating in the Ingres II data dictionary. You must be prepared to update the Oracle view definitions whenever the data definitions for the corresponding tables are changed in the Ingres II database.

Data Types

Data type issues include the following:

- [Ingres II Date Limit](#)
- [Default Date Values](#)
- [Data Type Conversion](#)

Ingres II Date Limit

The Oracle database server supports dates through December 31, 4712. Ingres II supports dates in the range of January 1, 1582 through December 31, 2382. If a date beyond the range of Ingres II is passed to the Ingres II database, an error is returned.

Default Date Values

When only a time value is given for a DATE data type field, Ingres II adds the current date to the time value, while the Oracle database server adds the date of the first day.

Data Type Conversion

Ingres II does not support implicit conversions between character data types and numeric data types. Such conversions must be explicit.

See Also: [Appendix A, "Data Type Conversion"](#) for more information about restrictions on data types.

Queries

Query issues include the following:

- [Empty Strings](#)
- [Empty Bind Variables](#)

Empty Strings

Oracle processes an empty string in a SQL statement as a null value. Ingres II processes an empty string as an empty string.

Comparing to an empty string

The Gateway passes literal empty strings to the Ingres II Server database without any conversion. If you intended an empty string to represent a null value, Ingres II does not process the statement that way; it uses the empty string.

You can avoid this problem by using NULL or IS NULL in the SQL statement instead of the empty string syntax, as in the following example:

```
SELECT * from "emp"@INGR where "ename" IS NULL;
```

Selecting an empty string:

- For VARCHAR columns, the gateway returns an empty string to the Oracle database server as NULL value.
- For CHAR columns, the gateway returns the full size of the column with each character as empty space (' ').

Empty Bind Variables

For VARCHAR bind variables, the gateway passes empty bind variables to the Ingres II database as a NULL value.

Locking

The locking model for an Ingres II database differs significantly from the Oracle model. The gateway depends on the underlying Ingres II behavior, so Oracle applications that access Ingres II through the gateway can be affected by the following possible scenarios:

- Read access might block write access
- Write access might block read access
- Statement-level read consistency is not guaranteed

See Also: Ingres II documentation for information about the Ingres II locking model.

Known Restrictions

If you encounter incompatibility problems not listed in this section or in "[Known Problems](#)" on page 3-7, please contact Oracle Support Services. The following section describes the known restrictions and includes suggestions for dealing with them when possible:

- [Transactional Integrity](#)
- [Transaction Capability](#)
- [COMMIT or ROLLBACK in PL/SQL Cursor Loops Closes Open Cursors](#)
- [Pass-Through Feature](#)
- [LONG BYTE and LONG VARCHAR Data Types](#)
- [SQL Syntax](#)
- [SQL*Plus COPY Command with Lowercase Table Names](#)
- [Database Links](#)
- [Stored Procedures](#)

The following restriction also applies:

- When negative numbers are used in a SUBSTR function, incorrect results are returned. This is due to the way the Gateway compensates for the lack of a SUBSTR function in Ingres II.

Note: If you have any questions or concerns about the restrictions, contact Oracle Support Services.

Transactional Integrity

The gateway cannot guarantee transactional integrity in the following cases:

- When a statement that is processed by the gateway causes an implicit commit in the target database
- When the target database is configured to work in autocommit mode

Note: Oracle strongly recommends the following:

- If you know that executing a particular statement causes an implicit commit in the target database, then ensure that this statement is executed in its own transaction.
 - Do not configure the target database to work in autocommit mode.
-
-

Transaction Capability

The gateway does not support savepoints. If a distributed update transaction is under way involving the gateway and a user attempts to create a savepoint, the following error occurs:

```
ORA-02070: database dblink does not support savepoint in this context
```

By default, the gateway is configured as COMMIT_CONFIRM.

COMMIT or ROLLBACK in PL/SQL Cursor Loops Closes Open Cursors

Any COMMIT or ROLLBACK issued in a PL/SQL cursor loop closes all open cursors, which can result in the following error:

```
ORA-1002: fetch out of sequence
```

To prevent this error, move the COMMIT or ROLLBACK statement outside the cursor loop.

Pass-Through Feature

If the SQL statements being passed through the gateway result in an implicit commit at the Ingres II database, the Oracle transaction manager is unaware of the commit and an Oracle ROLLBACK command cannot be used to roll back the transaction.

LONG BYTE and LONG VARCHAR Data Types

The gateway supports only INSERT and UPDATE of LONG BYTE and LONG VARCHAR data up to 31,900 bytes and 61,900 bytes, respectively, when using bind variables.

An unsupported SQL function cannot be used in an SQL statement which accesses a column defined as Ingres II data type LONG BYTE or LONG VARCHAR. See [Appendix B, "Supported SQL Syntax and Functions"](#) for more information.

You cannot use SQL*Plus to select data from a column defined as Ingres II data type LONG BYTE or LONG VARCHAR when the data is greater than 80 characters in length. Oracle recommends using Pro*C or Oracle Call Interface to access such data in a Ingres II database.

The gateway does not support the PL/SQL function COLUMN_VALUE_LONG of the DBMS_SQL package.

SQL Syntax

This section lists restrictions on the following SQL syntax:

- [WHERE CURRENT OF Clause](#)
- [CONNECT BY Clause](#)
- [ROWID](#)
- [EXPLAIN PLAN Statement](#)

See Also: [Appendix B, "Supported SQL Syntax and Functions"](#) for more information about restrictions on SQL syntax.

WHERE CURRENT OF Clause

UPDATE and DELETE statements with the WHERE CURRENT OF clause are not supported by the gateway because they rely on the Oracle ROWID implementation. To update or delete a row through the gateway, a condition style WHERE clause must be used.

CONNECT BY Clause

The CONNECT BY clause in a SELECT statement is not supported.

ROWID

The Oracle ROWID implementation is not supported.

EXPLAIN PLAN Statement

The EXPLAIN PLAN statement is not supported.

SQL*Plus COPY Command with Lowercase Table Names

You need to use double quotes to wrap around lower case table names.

For example:

```
copy from tkhouser/tkhouser@inst1 insert loc_tkhodept using select * from
"tkhodept"@holink2;
```

Database Links

The gateway is not a shared server process and cannot support shared database links. Each gateway session spawns a separate gateway process and connections cannot be shared.

Stored Procedures

The gateway does not support the procedure feature that allows the execution of stored procedures in a non-Oracle database.

Known Problems

This section describes known problems and includes suggestions for correcting them when possible. If you have any questions or concerns about the problems, contact Oracle Support Services. A current list of problems is available online. Contact your local Oracle office for information about accessing the list.

The following known problems are described in this section:

- [Encrypted Format Login](#)
- [Date Arithmetic](#)
- [Ingres II MONEY Data Type](#)
- [String Functions](#)
- [POSITION Function](#)
- [Schema Names and PL/SQL](#)

Encrypted Format Login

The Oracle database server no longer supports the `DBLINK_ENCRYPT_LOGIN` initialization parameter. Up to version 7.3, this parameter default `TRUE` value prevented the password for the login user ID from being sent over the network in the clear. Later versions automatically encrypt the password.

Date Arithmetic

The following SQL expressions do not function correctly with the gateway:

```
date + number
number + date
```

date - *number*
date1 - *date2*

Statements with the preceding expressions are sent to the Ingres II database without any translation. Since Ingres II does not support these date arithmetic functions, the statements return an error.

Ingres II MONEY Data Type

Incorrect negative values might be returned from a SELECT statement that retrieves data from columns defined as MONEY that contain negative values near the precision limit.

String Functions

If you concatenate numeric literals using the "||" or CONCAT operator when using the gateway to query a Ingres II database, the result is an arithmetic addition. For example, the result of the following statement is 18:

```
SQL> SELECT 9 || 9 FROM DUAL@INGR;
```

The result is 99 when using Oracle to query an Oracle database.

POSITION Function

The POSITION function is translated by the Oracle Transparent Gateway for Ingres II into the Ingres II LOCATE function. The Ingres II LOCATE function returns the first position of the specified string, unless the string is not found, in which case the maximum size of the field plus one is returned.

When the POSITION function is used with the MAX function, the result returned is the size of the field plus one when the string specified is not found in all the rows.

When the POSITION function is used with the MIN function, the result returned is the size of the field plus one when the string specified is not found in any of the rows.

Schema Names and PL/SQL

If you do not prefix an Ingres II database object with its schema name in a SQL statement within a PL/SQL block, the following error message occurs:

```
ORA-6550 PLS-201 Identifier table_name must be declared.
```

Change the SQL statement to include the schema name of the object.

Case Studies

The following case studies for Ingres II demonstrate some of the features of the Oracle Transparent Gateway. You can verify that the gateway is installed and operating correctly by using the demonstration files included on the distribution CD-ROM.

The demonstration files are automatically copied to disk when the gateway is installed.

This chapter contains the following sections:

- [Case Descriptions](#)
- [CD-ROM Contents](#)
- [Demonstration Files](#)
- [Demonstration Requirements](#)
- [Creating Demonstration Tables](#)
- [Case 1: Simple Queries](#)
- [Case 2: A More Complex Query](#)
- [Case 3: Joining Ingres II Tables](#)
- [Case 4: Write Capabilities](#)
- [Case 5: Data Dictionary Query](#)
- [Case 6: The Pass-Through Feature](#)

Case Descriptions

The cases illustrate:

- A simple query (Case 1)
- A more complex query (Case 2)
- Joining Ingres II tables (Case 3)
- Write capabilities (Case 4)
- A data dictionary query (Case 5)
- The pass-through feature (Case 6)

CD-ROM Contents

The distribution CD-ROM contains the following:

- Demonstration files
- One SQL script file that creates the demonstration tables in the Ingres II database
- One SQL script file that drops the demonstration tables from the Ingres II database

Demonstration Files

After a successful gateway installation, use the demonstration files stored in the directory `$ORACLE_HOME/tg4ingr/demo` where `$ORACLE_HOME` is the directory under which the gateway is installed. The directory contains the following demonstration files:

Demonstration Files	Demonstration Files
bldingr.sql	case4c.sql
case1.sql	case5.sql
case2.sql	case6a.sql
case3.sql	case6b.sql
case4a.sql	dropingr.sql
case4b.sql	-

Demonstration Requirements

The case studies assume these requirements have been met:

- The gateway demonstration tables are installed in the Ingres II database
- The Oracle server has an account named SCOTT with a password of TIGER
- The Oracle server has a database link called GTWLINK (set up as public or private to the user SCOTT) which connects the gateway to an Ingres II database as SCOTT with password TIGER2.

For example, you can create the database link as follows:

```
SQL> CREATE DATABASE LINK GTWLINK CONNECT TO SCOTT
      2 IDENTIFIED BY TIGER2 USING 'gtw_connect_descriptor';
```

- Oracle Net Services is configured correctly and running.
- The Ingres II environment variable, `II_SYSTEM`, is set correctly.

Creating Demonstration Tables

The case studies are based on the `GTW_EMP`, `GTW_DEPT`, and `GTW_SALGRADE` tables. If the demonstration tables have not been created in the Ingres II database, use the `bldingr.sql` script to create them. Enter the following:

```
$ bldingr.sql
```

The script creates the demonstration tables in the Ingres II database accordingly:

```
CREATE TABLE GTW_EMP (
EMPNO      INTEGER2 NOT NULL
ENAME      VARCHAR(10),
JOB        VARCHAR(9),
MGR        INTEGER2,
```

```

HIREDATE    DATE,
SAL         FLOAT4,
COMM        FLOAT8,
DEPTNO      INTEGER2)

CREATE TABLE GTW_DEPT (
DEPTNO      INTEGER1 NOT NULL,
DNAME       VARCHAR(14),
LOC         VARCHAR(13))

CREATE TABLE GTW_SALGRADE (
GRADE       INTEGER1,
LOSAL       NFLOAT4,
HISAL       FLOAT4)

```

Demonstration Table Definitions

The following table definitions use information retrieved by the SQL*PLUS DESCRIBE command:

GTW_EMP

Name	Null?	Type
EMPNO	NOT NULL	NUMBER(3)
ENAME		VARCHAR2(10)
JOB		VARCHAR2(9)
MGR		NUMBER(5)
HIREDATE		DATE
SAL		NUMBER(7,2)
COMM		NUMBER(7,2)
DEPTNO		NUMBER(5)

GTW_DEPT

Name	Null?	Type
DEPTNO	NOT NULL	NUMBER(5)
DNAME		VARCHAR2(14)
LOC		VARCHAR2(13)

GTW_SALGRADE

Name	Null?	Type
GRADE		NUMBER(3)
LOSAL		NUMBER(9,4)
HISAL		NUMBER(9,4)

Demonstration Table Contents

The contents of the Ingres II tables are:

GTW_EMP

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7369	SMITH	CLERK	7902	17-DEC-80	800		20
7499	ALLEN	SALESMAN	7698	20-FEB-81	1600	300	30
7521	WARD	SALESMAN	7698	22-FEB-81	1250	500	30

7566	JONES	MANAGER	7839	02-APR-81	2975		20
7654	MARTIN	SALESMAN	7698	28-SEP-81	1250	1400	30
7698	BLAKE	MANAGER	7839	01-MAY-81	2850		30
7782	CLARK	MANAGER	7839	09-JUN-81	2450		10
7788	SCOTT	ANALYST	7566	09-DEC-82	3000		20
7839	KING	PRESIDENT		17-NOV-81	5000		10
7844	TURNER	SALESMAN	7698	08-SEP-81	1500	0	30
7876	ADAMS	CLERK	7788	12-JAN-83	1100		20
7900	JAMES	CLERK	7698	03-DEC-81	950		30
7902	FORD	ANALYST	7566	03-DEC-81	3000		20
7934	MILLER	CLERK	7782	23-JAN-82	1300		10

GTW_DEPT

DEPTNO	DNAME	LOC
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

GTW_SALGRADE

GRADE	LOSAL	HISAL
1	700	1200
2	1201	1400
3	1401	2000
4	2001	3000
5	3001	9999

Case 1: Simple Queries

Case 1 demonstrates the following:

- A simple query
- A simple query retrieving full date information

The first query retrieves all the data from GTW_DEPT and confirms that the gateway is working correctly. The second query retrieves all the data from GTW_EMP including the time portion of the hire date because the default date format was set to DD-MON-YY HH24:MM:SS for the session by an ALTER SESSION command.

Case 2: A More Complex Query

Case 2 demonstrates the following:

- The functions SUM(*expression*) and NVL(*expr1*, *expr2*) in the SELECT list.
- The GROUP BY and HAVING clauses.

This query retrieves the departments from GTW_EMP whose total monthly expenses are higher than \$10,000.

Case 3: Joining Ingres II Tables

Case 3 demonstrates the following:

- Joins between Ingres II tables

- Subselects

The query retrieves information from three Ingres II tables and relates the employees to their department name and salary grade, but only for those employees earning more than the average salary.

Case 4: Write Capabilities

Case 4 is split into three cases and demonstrates the following:

- [DELETE Statement](#)
- [UPDATE Statement](#)
- [INSERT Statement](#)

DELETE Statement

Case 4a demonstrates bind values and subselect. All employees in department 20 and one employee, WARD, in department 30 are deleted.

UPDATE Statement

Case 4b provides an example of a simple UPDATE statement. In this example, employees are given a \$100 a month salary increase.

INSERT Statement

Case 4c is an example of a simple insert statement that does not provide information for all columns.

Case 5: Data Dictionary Query

Case 5 demonstrates data dictionary mapping. It retrieves all the tables and views that exist in the Ingres II database that begin with "GTW".

Case 6: The Pass-Through Feature

Case 6 demonstrates the gateway pass-through feature which allows an application to send commands or statements to Ingres II.

This case demonstrates:

- A pass-through UPDATE statement using bind variables.
- A pass-through SELECT statement.

UPDATE Statement

Case 6a provides an example of a pass-through UPDATE statement with bind variables. In this example, the salary for EMPNO 7934 is set to 4000.

SELECT Statement

Case 6b provides an example of a pass-through SELECT statement. The data that is returned from the SELECT statement is inserted into a local table at the Oracle database server.

Data Type Conversion

This appendix contains the following section:

- [Data Type Conversion](#)

Data Type Conversion

The gateway converts Ingres II data types to Oracle data types as follows:

Table A-1 Data Type Conversions

Ingres II	Oracle	Comment
BYTE	RAW	-
BYTE VARYING	RAW	-
C, CHAR	CHAR	-
DATE	DATE	DATE range is January 1, 1582 through December 31, 2382.
DECIMAL	NUMBER (p [, s])	If precision and scale are not specified, DECIMAL is converted to NUMBER(16)
FLOAT	FLOAT (49)	-
FLOAT4	FLOAT (23)	-
FLOAT8	FLOAT (49)	-
INTEGER	NUMBER (10)	NUMBER range is -2,147,483,647 to 2,147,483,647
INTEGER1	NUMBER (3)	-
INTEGER2	NUMBER (5)	NUMBER range is -32,767 to 32,767
INTEGER4	NUMBER (10)	NUMBER range is -2,147,483,647 to 2,147,483,647
LONG BYTE	LONG RAW	-
LONG VARCHAR	LONG	-
MONEY	FLOAT (49)	-
OBJECT_KEY	CHAR (16)	-
SMALLINT	NUMBER (5)	NUMBER range is -32,767 to 32,767
TABLE_KEY	CHAR (8)	-
TEXT	VARCHAR2	The length of a TEXT data type ranges from 1 to 2000 characters
VARCHAR	VARCHAR2	The length of a VARCHAR data type ranges from 1 to 2000 characters

Supported SQL Syntax and Functions

This appendix contains the following sections:

- [Supported SQL Statements](#)
- [Oracle Functions](#)

Supported SQL Statements

With a few exceptions, the gateway provides full support for Oracle DELETE, INSERT, SELECT, and UPDATE statements.

The gateway does not support Oracle data definition language (DDL) statements. No form of the Oracle ALTER, CREATE, DROP, GRANT, or TRUNCATE statements can be used. Instead, use the pass-through feature of the gateway if you need to use DDL statements against the Ingres II database.

See Also: *Oracle Database SQL Reference* for a detailed descriptions of keywords, parameters, and options.

DELETE

The DELETE statement is fully supported. However, only Oracle functions supported by Ingres II can be used.

See Also: ["Functions Supported by Ingres II"](#) on page B-2 for a list of supported functions.

INSERT

The INSERT statement is fully supported. However, only Oracle functions supported by Ingres II can be used.

See Also: ["Functions Supported by Ingres II"](#) on page B-2 for a list of supported functions.

SELECT

The SELECT statement is fully supported, with these exceptions:

- CONNECT BY *condition*
- NOWAIT
- START WITH *condition*

UPDATE

The UPDATE statement is fully supported. However, only Oracle functions supported by Ingres II can be used. Column values can be set only to expressions; they cannot be set with subqueries.

See Also: ["Functions Supported by Ingres II"](#) on page B-2 for a list of supported functions.

Oracle Functions

All functions are evaluated by the Ingres II database after the gateway has converted them to Ingres II SQL.

Functions Not Supported by Ingres II

Oracle SQL functions with no equivalent function in Ingres II are not supported in DELETE, INSERT, or UPDATE statements, but are evaluated by the Oracle database server if the statement is a SELECT statement. That is, the Oracle database server performs post-processing of SELECT statements sent to the gateway.

If an unsupported function is used in a DELETE, INSERT, or UPDATE, statement, the following Oracle error occurs:

```
ORA-02070: database db_link_name does not support function in this context
```

Functions Supported by Ingres II

The gateway translates the following Oracle database server functions in SQL statements to their equivalent Ingres II functions:

- [Arithmetic Operators](#)
- [Comparison Operators](#)
- [Group Functions](#)
- [String Functions](#)
- [Pattern Matches](#)
- [Other Functions](#)

Arithmetic Operators

Oracle	Ingres II
+	+
-	-
*	*
/	/

Comparison Operators

Oracle	Ingres II
=	=
>	>

Oracle	Ingres II
<	<
>=	>=
<=	<=
<>, !=, ^=	<>, !=
BETWEEN X AND Y	BETWEEN X AND Y
IS NOT NULL	IS NOT NULL
IS NULL	IS NULL
NOT BETWEEN X AND Y	NOT BETWEEN X AND Y

Group Functions

Oracle	Ingres II
AVG	AVG
COUNT	COUNT
MAX	MAX
MIN	MIN
SUM	SUM

String Functions

Oracle	Ingres II
	+
LENGTH	LENGTH
LOWER	LOWERCASE
SUBSTR (with 2 arguments – the arguments cannot be negative numbers)	shift('string', from)
SUBSTR (with 3 arguments – the arguments cannot be negative numbers)	left(shift('string', from), for)
UPPER	UPPERCASE

Pattern Matches

Oracle	Ingres II
LIKE 'a%'	LIKE "a%", MATCHES "a*"
LIKE 'a_'	LIKE "a_", MATCHES "a?"
LIKE 'a\%' ESCAPE '\'	LIKE "a\%" ESCAPE "\"
NOT LIKE	NOT LIKE

Other Functions

Oracle	Ingres II
ABS	ABS
COS	COS
EXP	EXP
LN	LOGN
MOD	MOD
NVL	IFNULL
POSITION	LOCATE
RTRIM	TRIM
SIN	SIN
SQRT	SQRT

Data Dictionary

The Oracle Transparent Gateway for Ingres II translates a query that refers to an Oracle database server data dictionary table into a query that retrieves the data from Ingres II system tables. You perform queries on data dictionary tables over the database link in the same way you query data dictionary tables in the Oracle database server. The gateway data dictionary is similar to the Oracle database server data dictionary in appearance and use.

This appendix contains the following sections:

- [Data Dictionary Support](#)
- [Data Dictionary Mapping](#)
- [Gateway Data Dictionary Descriptions](#)

Data Dictionary Support

The following paragraphs describe the data dictionary support of the Oracle Transparent Gateway for Ingres II.

Ingres II System Tables

Ingres II data dictionary information is stored in the Ingres II database as Ingres II system tables. All Ingres II system tables have names prefixed with “sys”. The Ingres II system tables define the structure of a database. When you change data definitions, Ingres II reads and modifies the Ingres II system tables to add information about the user tables.

Accessing the Gateway Data Dictionary

Accessing a gateway data dictionary table or view is identical to accessing a data dictionary in an Oracle database. You issue a SQL SELECT statement specifying a database link. The Oracle database server data dictionary view and column names are used to access the gateway data dictionary in an Oracle database. Synonyms of supported views are also acceptable. For example, the following statement queries the data dictionary table ALL_CATALOG to retrieve all table names in the Ingres II database:

```
SQL> SELECT * FROM "ALL_
CATALOG
"@INGR;
```

When a data dictionary access query is issued, the gateway:

1. Maps the requested table, view, or synonym to one or more Ingres II system table names. The gateway translates all data dictionary column names to their corresponding Ingres II column names within the query. If the mapping involves one Ingres II system table, the gateway translates the requested table name to its corresponding Ingres II system table name within the query. If the mapping involves multiple Ingres II system tables, the gateway constructs a join in the query using the translated Ingres II system table names.
2. Sends the translated query to Ingres II.
3. Might convert the retrieved Ingres II data to give it the appearance of the Oracle database server data dictionary table.
4. Passes the data dictionary information from the translated Ingres II system table to the Oracle database server.

Note: The values returned when querying the gateway data dictionary might not be the same as the ones returned by the Oracle SQL*Plus DESCRIBE command.

Direct Queries to Ingres II Tables

Queries issued directly to individual Ingres II system tables are allowed but they return different results because the Ingres II system table column names differ from those of the data dictionary view. Also, certain columns in an Ingres II system table cannot be used in data dictionary processing.

Supported Views and Tables

The gateway supports the following views and tables:

Supported Views and Tables	Supported Views and Tables
ALL_CATALOG	ALL_COL_COMMENTS
ALL_CONS_COLUMNS	ALL_CONSTRAINTS
ALL_INDEXES	ALL_OBJECTS
ALL_SYNONYMS	ALL_TAB_COLUMNS
ALL_TAB_COMMENTS	ALL_TABLES
ALL_USERS	ALL_VIEWS
DBA_CATALOG	DBA_COL_COMMENTS
DBA_OBJECTS	DBA_TAB_COLUMNS
DBA_TAB_COMMENTS	DBA_TABLES
DICTIONARY	DICTIONARY
DUAL	TABLE_PRIVILEGES
USER_CATALOG	USER_COL_COMMENTS
USER_CONS_COLUMNS	USER_CONSTRAINTS
USER_INDEXES	USER_OBJECTS
USER_SYNONYMS	USER_TAB_COLUMNS
USER_TAB_COMMENTS	USER_TABLES

Supported Views and Tables	Supported Views and Tables
USER_USERS	USER_VIEWS

No other Oracle database server data dictionary tables or views are supported. If you use a view not on the list, you receive the Oracle database server error code for no more rows available.

Queries through the gateway of any data dictionary table or view beginning with ALL_ can return rows from the Ingres II database even when access privileges for those Ingres II objects have not been granted. When querying an Oracle database with the Oracle data dictionary, rows are returned only for those objects you are permitted to access.

Data Dictionary Mapping

The tables in this section list Oracle data dictionary view names and the equivalent Ingres II system tables used. A plus sign (+) indicates that a join operation is involved.

Table C-1 Oracle Data Dictionary View Names and Ingres II Equivalents

View Name	Ingres II System Table Name
ALL_CATALOG	iitables
ALL_COL_COMMENTS	iicolumns+iitables
ALL_CONS_COLUMNS	iikeys
ALL_CONSTRAINTS	iiconstraints+iieref-constraints
ALL_INDEXES	iiindexes
ALL_OBJECTS	iitables+iiiprocedures
ALL_SYNONYMS	ii synonyms
ALL_TAB_COLUMNS	iicolumns+iitables
ALL_TAB_COMMENTS	iitables
ALL_TABLES	iitables
ALL_USERS	iitables
ALL_VIEWS	ii views
DBA_CATALOG	iitables
DBA_COL_COMMENTS	iicolumns+iitables
DBA_OBJECTS	iitables+iiiprocedures
DBA_TAB_COLUMNS	iicolumns+iitables
DBA_TAB_COMMENTS	iitables
DBA_TABLES	iitables
DICT_COLUMNS	iicolumns+iitables
DICTIONARY	iitables
DUAL	<i>(Defined in the Gateway)</i>
TABLE_PRIVILEGES	ii permits
USER_CATALOG	iitables

Table C-1 (Cont.) Oracle Data Dictionary View Names and Ingres II Equivalents

View Name	Ingres II System Table Name
USER_COL_COMMENTS	iicolumns+iitables
USER_CONS_COLUMNS	iicolumns+iitables
USER_CONSTRAINTS	iicolumns+iiintegrities+iitables
USER_INDEXES	iiindexes
USER_OBJECTS	iitables+iiprocedures
USER_SYNONYMS	iisynonyms
USER_TAB_COLUMNS	iicolumns+iitables
USER_TAB_COMMENTS	iitables
USER_TABLES	iitables
USER_USERS	iitables
USER_VIEWS	iiviews

Default Column Values

There is a minor difference between the gateway data dictionary and a typical Oracle database server data dictionary. The Oracle database server columns that are missing in an Ingres II system table are filled with zeros, spaces, null values, not-applicable values (N.A.), or default values, depending on the column type.

Gateway Data Dictionary Descriptions

The gateway data dictionary tables and views provide the following information:

- Name, data type, and width of each column
- The contents of columns with fixed values

They are described here with information retrieved by an Oracle SQL*Plus DESCRIBE command. The values in the Null? column might differ from the Oracle database server data dictionary tables and views. Any default value is shown to the right of an item, but this is not information returned by DESCRIBE.

Table C-2 ALL_CATALOG

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-
TABLE_TYPE	-	VARCHAR2(5)	"TABLE" or "VIEW"

Table C-3 ALL_COL_COMMENTS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-
COLUMN_NAME	-	VARCHAR2(30)	-

Table C-3 (Cont.) ALL_COL_COMMENTS

Name	Null?	Type	Value
COMMENTS	-	CHAR(1)	NULL

Table C-4 ALL_CONS_COLUMNS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
CONSTRAINT_NAME	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-
COLUMN_NAME	-	VARCHAR2(30)	-
POSITION	NOT NULL	NUMBER(5)	-

Table C-5 ALL_CONSTRAINTS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
CONSTRAINT_NAME	-	VARCHAR2(30)	-
CONSTRAINT_TYPE	-	VARCHAR2(1)	"R" or "P" or "U" or "C"
TABLE_NAME	-	VARCHAR2(30)	-
SEARCH_CONDITION	-	VARCHAR2(240)	-
R_OWNER	-	VARCHAR2(30)	-
R_CONSTRAINT_NAME	-	VARCHAR2(30)	-
DELETE_RULE	-	VARCHAR2(1)	NULL
STATUS	-	VARCHAR2(7)	"ENABLED"
DEFERRABLE	-	VARCHAR2(1)	NULL
DEFERRED	-	VARCHAR2(1)	NULL
VALIDATED	-	VARCHAR2(1)	NULL
GENERATED	-	VARCHAR2(1)	NULL
BAD	-	VARCHAR2(1)	NULL
RELY	-	VARCHAR2(1)	NULL
LAST_CHANGE	-	DATE	Date returned in Greenwich Mean Time (GMT)

Table C-6 ALL_INDEXES

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
INDEX_NAME	-	VARCHAR2(30)	-
INDEX_TYPE	-	VARCHAR2(1)	NULL
TABLE_OWNER	-	VARCHAR2(30)	-

Table C-6 (Cont.) ALL_INDEXES

Name	Null?	Type	Value
TABLE_NAME	-	VARCHAR2(30)	-
TABLE_TYPE	-	VARCHAR(7)	"TABLE" or "CLUSTER"
UNIQUENESS	-	VARCHAR2(9)	"UNIQUE" or "NONUNIQUE"
COMPRESSION	-	VARCHAR2(1)	NULL
PREFIX_LENGTH	-	NUMBER	0
TABLESPACE_NAME	-	VARCHAR2(1)	NULL
INI_TRANS	-	NUMBER	0
MAX_TRANS	-	NUMBER	0
INITIAL_EXTENT	-	NUMBER	0
NEXT_EXTENT	-	NUMBER	0
MIN_EXTENTS	-	NUMBER	0
MAX_EXTENTS	-	NUMBER	0
PCT_INCREASE	-	NUMBER	0
PCT_THRESHOLD	-	NUMBER	0
INCLUDE_COLUMN	-	NUMBER	0
FREELISTS	-	NUMBER	0
FREELIST_GROUPS	-	NUMBER	0
PCT_FREE	-	NUMBER	0
LOGGING	-	VARCHAR2(1)	NULL
BLEVEL	-	NUMBER	0
LEAF_BLOCKS	-	NUMBER	0
DISTINCT_KEYS	-	NUMBER	0
AVG_LEAF_BLOCKS_PER_KEY	-	NUMBER	0
AVG_DATA_BLOCKS_PER_KEY	-	NUMBER	0
CLUSTERING_FACTOR	-	NUMBER	0
STATUS	-	VARCHAR2(1)	NULL
NUM_ROWS	-	NUMBER	0
SAMPLE_SIZE	-	NUMBER	0
LAST_ANALYZED	-	DATE	NULL
DEGREE	-	VARCHAR2(1)	NULL
INSTANCES	-	VARCHAR2(1)	NULL
PARTITIONED	-	VARCHAR2(1)	NULL
TEMPORARY	-	VARCHAR2(1)	NULL
GENERATED	-	VARCHAR2(1)	NULL
SECONDARY	-	VARCHAR2(1)	NULL
BUFFER_POOL	-	VARCHAR2(1)	NULL

Table C-6 (Cont.) ALL_INDEXES

Name	Null?	Type	Value
USER_STATS	-	VARCHAR2(1)	NULL
DURATION	-	VARCHAR2(1)	NULL
PCT_DIRECT_ACCESS	-	NUMBER	0
ITYP_OWNER	-	VARCHAR2(1)	NULL
ITYP_NAME	-	VARCHAR2(1)	NULL
PARAMETERS	-	VARCHAR2(1)	NULL
GLOBAL_STATS	-	VARCHAR2(1)	NULL
DOMIDX_STATUS	-	VARCHAR2(1)	NULL
DOMIDX_OPSTATUS	-	VARCHAR2(1)	NULL
FUNCIDX_STATUS	-	VARCHAR2(1)	NULL

Table C-7 ALL_OBJECTS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
OBJECT_NAME	-	VARCHAR2(30)	-
SUBOBJECT_NAME	-	VARCHAR2(1)	NULL
OBJECT_ID	-	NUMBER	-
DATA_OBJECT_ID	-	NUMBER	0
OBJECT_TYPE	-	VARCHAR2(9)	"TABLE" or "VIEW" or "INDEX" or "PROCEDURE"
CREATED	-	DATE	Date returned in Greenwich Mean Time (GMT)
LAST_DDL_TIME	-	DATE	Date returned in Greenwich Mean Time (GMT)
TIMESTAMP	-	VARCHAR2(1)	NULL
STATUS	-	VARCHAR2(5)	"VALID"
TEMPORARY	-	VARCHAR2(1)	NULL
GENERATED	-	VARCHAR2(1)	NULL
SECONDARY	-	VARCHAR2(1)	NULL

Table C-8 ALL_SYNONYMS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
SYNONYM_NAME	-	VARCHAR2(30)	-
TABLE_OWNER	-	VARCHAR2(30)	-

Table C-8 (Cont.) ALL_SYNONYMS

Name	Null?	Type	Value
TABLE_NAME	-	VARCHAR2(30)	-
DB_LINK	-	VARCHAR2(1)	NULL

Table C-9 ALL_TAB_COLUMNS

Name	Null?	Type	Value
OWNER	NOT NULL	VARCHAR2(30)	-
TABLE_NAME	NOT NULL	VARCHAR2(30)	-
COLUMN_NAME	NOT NULL	VARCHAR2(30)	-
DATA_TYPE	-	VARCHAR2(106)	-
DATA_TYPE_MOD	-	VARCHAR2(3)	NULL
DATA_TYPE_OWNER	-	VARCHAR2(30)	NULL
DATA_LENGTH	NOT NULL	NUMBER	-
DATA_PRECISION	-	NUMBER	-
DATA_SCALE	-	NUMBER	-
NULLABLE	-	VARCHAR2(1)	"Y" or "N"
COLUMN_ID	-	NUMBER	-
DEFAULT_LENGTH	-	NUMBER	0
DATA_DEFAULT	-	LONG	NULL
NUM_DISTINCT	-	NUMBER	0
LOW_VALUE	-	RAW(32)	0
HIGH_VALUE	-	RAW(32)	0
DENSITY	-	NUMBER	0
NUM_NULLS	-	NUMBER	0
NUM_BUCKETS	-	NUMBER	0
LAST_ANALYZED	-	DATE	NULL
SAMPLE_SIZE	-	NUMBER	0
CHARACTER_SET_NAME	-	VARCHAR2(44)	NULL
CHAR_COL_DECL_LENGTH	-	NUMBER	0
GLOBAL_STATS	-	VARCHAR2(3)	NULL
USER_STATS	-	VARCHAR2(3)	NULL
AVG_COL_LEN	-	NUMBER	0

Table C-10 ALL_TAB_COMMENTS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-

Table C-10 (Cont.) ALL_TAB_COMMENTS

Name	Null?	Type	Value
TABLE_TYPE	-	VARCHAR2(5)	"TABLE" or "VIEW"
COMMENTS	-	VARCHAR2(1)	NULL

Table C-11 ALL_TABLES

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-
TABLESPACE_NAME	-	VARCHAR2(1)	NULL
CLUSTER_NAME	-	VARCHAR2(1)	NULL
IOT_NAME	-	VARCHAR2(1)	NULL
PCT_FREE	-	NUMBER	0
PCT_USED	-	NUMBER	0
INI_TRANS	-	NUMBER	0
MAX_TRANS	-	NUMBER	0
INITIAL_EXTENT	-	NUMBER	0
NEXT_EXTENT	-	NUMBER	0
MIN_EXTENTS	-	NUMBER	0
MAX_EXTENTS	-	NUMBER	0
PCT_INCREASE	-	NUMBER	0
FREELISTS	-	NUMBER	0
FREELIST_GROUPS	-	NUMBER	0
LOGGING	-	VARCHAR2(1)	NULL
BACKED_UP	-	VARCHAR2(1)	NULL
NUM_ROWS	-	NUMBER	0
BLOCKS	-	NUMBER	0
EMPTY_BLOCKS	-	NUMBER	0
AVG_SPACE	-	NUMBER	0
CHAIN_CNT	-	NUMBER	0
AVG_ROW_LEN	-	NUMBER	0
AVG_SPACE_FREELIST_BLOCKS	-	NUMBER	0
NUM_FREELIST_BLOCKS	-	NUMBER	0
DEGREE	-	VARCHAR2(1)	NULL
INSTANCES	-	VARCHAR2(1)	NULL
CACHE	-	VARCHAR2(1)	NULL
TABLE_LOCK	-	VARCHAR2(1)	NULL
SAMPLE_SIZE	-	NUMBER	0

Table C-11 (Cont.) ALL_TABLES

Name	Null?	Type	Value
LAST_ANALYZED	-	DATE	NULL
PARTITIONED	-	VARCHAR2(1)	NULL
IOT_TYPE	-	VARCHAR2(1)	NULL
TEMPORARY	-	VARHCAR2(1)	NULL
SECONDARY	-	VARCHAR2(1)	NULL
NESTED	-	VARCHAR2(1)	NULL
BUFFER_POOL	-	VARCHAR2(1)	NULL
ROW_MOVEMENT	-	VARCHAR2(1)	NULL
GLOBAL_STATS	-	VARCHAR2(1)	NULL
USER_STATS	-	VARCHAR2(1)	NULL
DURATION	-	VARHCAR2(1)	NULL
SKIP_CORRUPT	-	VARCHAR2(1)	NULL
MONITORING	-	VARCHAR2(1)	NULL

Table C-12 ALL_USERS

Name	Null?	Type	Value
USERNAME	-	VARCHAR2(30)	-
USER_ID	-	NUMBER	-
CREATED	-	DATE	SYSDATE

Table C-13 ALL_VIEWS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
VIEW_NAME	-	VARCHAR2(30)	-
TEXT_LENGTH	-	NUMBER	0
TEXT	NOT NULL	VARCHAR2(240)	-
TYPE_TEXT_LENGTH	-	NUMBER	0
TYPE_TEXT	-	VARCHAR2(1)	NULL
OID_TEXT_LENGTH	-	NUMBER	0
OID_TEXT	-	VARCHAR2(1)	NULL
VIEW_TYPE_OWNER	-	VARCHAR2(1)	NULL
VIEW_TYPE	-	VARCHAR2(1)	NULL

Table C-14 DBA_CATALOG

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-

Table C-14 (Cont.) DBA_CATALOG

Name	Null?	Type	Value
TABLE_TYPE	-	VARCHAR2(5)	"TABLE" or "VIEW"

Table C-15 DBA_COL_COMMENTS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-
COLUMN_NAME	-	VARCHAR2(30)	-
COMMENTS	-	VARCHAR2(1)	NULL

Table C-16 DBA_OBJECTS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
OBJECT_NAME	-	VARCHAR2(30)	-
SUBOBJECT_NAME	-	VARCHAR2(1)	NULL
OBJECT_ID	-	NUMBER	-
DATA_OBJECT_ID	-	NUMBER	0
OBJECT_TYPE	-	VARCHAR2(9)	"TABLE" or "VIEW" or "INDEX" or "PROCEDURE"
CREATED	-	DATE	Date returned in Greenwich Mean Time (GMT)
LAST_DDL_TIME	-	DATE	Date returned in Greenwich Mean Time (GMT)
TIMESTAMP	-	VARCHAR2(1)	NULL
STATUS	-	VARCHAR2(5)	"VALID"
TEMPORARY	-	VARCHAR2(1)	NULL
GENERATED	-	VARCHAR2(1)	NULL
SECONDARY	-	VARCHAR2(1)	NULL

Table C-17 DBA_TAB_COLUMNS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-
COLUMN_NAME	-	VARCHAR2(30)	-
DATA_TYPE	-	VARCHAR2(8)	-

Table C-17 (Cont.) DBA_TAB_COLUMNS

Name	Null?	Type	Value
DATA_TYPE_MOD	-	VARCHAR2(1)	NULL
DATA_TYPE_OWNER	-	VARCHAR2(1)	NULL
DATA_LENGTH	-	NUMBER	-
DATA_PRECISION	-	NUMBER	-
DATA_SCALE	-	NUMBER	-
NULLABLE	NOT NULL	VARCHAR2(1)	"Y" or "N"
COLUMN_ID	NOT NULL	NUMBER(10)	-
DEFAULT_LENGTH	-	NUMBER	0
DATA_DEFAULT	-	VARCHAR2(1)	NULL
NUM_DISTINCT	-	NUMBER	0
LOW_VALUE	-	NUMBER	0
HIGH_VALUE	-	NUMBER	0
DENSITY	-	NUMBER	0
NUM_NULLS	-	NUMBER	0
NUM_BUCKETS	-	NUMBER	0
LAST_ANALYZED	-	DATE	NULL
SAMPLE_SIZE	-	NUMBER	0
CHARACTER_SET_NAME	-	VARCHAR2(1)	NULL
CHAR_COL_DECL_LENGTH	-	NUMBER	0
GLOBAL_STATS	-	VARCHAR2(1)	NULL
USER_STATS	-	VARCHAR2(1)	NULL
AVG_COL_LEN	-	NUMBER	0

Table C-18 DBA_TAB_COMMENTS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-
TABLE_TYPE	-	VARCHAR2(5)	"TABLE" or "VIEW"
COMMENTS	-	VARCHAR2(1)	NULL

Table C-19 DBA_TABLES

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-
TABLESPACE_NAME	-	VARCHAR2(1)	NULL
CLUSTER_NAME	-	VARCHAR2(1)	NULL

Table C-19 (Cont.) DBA_TABLES

Name	Null?	Type	Value
IOT_NAME	-	VARCHAR2(1)	NULL
PCT_FREE	-	NUMBER	0
PCT_USED	-	NUMBER	0
INI_TRANS	-	NUMBER	0
MAX_TRANS	-	NUMBER	0
INITIAL_EXTENT	-	NUMBER	0
NEXT_EXTENT	-	NUMBER	0
MIN_EXTENTS	-	NUMBER	0
MAX_EXTENTS	-	NUMBER	0
PCT_INCREASE	-	NUMBER	0
FREELISTS	-	NUMBER	0
FREELIST_GROUPS	-	NUMBER	0
LOGGING	-	VARCHAR2(1)	NULL
BACKED_UP	-	VARCHAR2(1)	NULL
NUM_ROWS	-	NUMBER	0
BLOCKS	-	NUMBER	0
EMPTY_BLOCKS	-	NUMBER	0
AVG_SPACE	-	NUMBER	0
CHAIN_CNT	-	NUMBER	0
AVG_ROW_LEN	-	NUMBER	0
AVG_SPACE_FREELIST_BLOCKS	-	NUMBER	0
NUM_FREELIST_BLOCKS	-	NUMBER	0
DEGREE	-	VARCHAR2(1)	NULL
INSTANCES	-	VARCHAR2(1)	NULL
CACHE	-	VARCHAR2(1)	NULL
TABLE_LOCK	-	VARCHAR2(1)	NULL
SAMPLE_SIZE	-	NUMBER	0
LAST_ANALYZED	-	DATE	NULL
PARTITIONED	-	VARCHAR2(1)	NULL
IOT_TYPE	-	VARCHAR2(1)	NULL
TEMPORARY	-	VARHCAR2(1)	NULL
SECONDARY	-	VARCHAR2(1)	NULL
NESTED	-	VARCHAR2(1)	NULL
BUFFER_POOL	-	VARCHAR2(1)	NULL
ROW_MOVEMENT	-	VARCHAR2(1)	NULL
GLOBAL_STATS	-	VARCHAR2(1)	NULL
USER_STATS	-	VARCHAR2(1)	NULL

Table C-19 (Cont.) DBA_TABLES

Name	Null?	Type	Value
DURATION	-	VARHRCAR2(1)	NULL
SKIP_CORRUPT	-	VARCHAR2(1)	NULL
MONITORING	-	VARCHAR2(1)	NULL

Table C-20 DICT_COLUMNS

Name	Null?	Type	Value
TABLE_NAME	-	VARCHAR2(30)	-
COLUMN_NAME	-	VARCHAR2(30)	-
COMMENTS	-	VARCHAR2(1)	NULL

Table C-21 DICTIONARY

Name	Null?	Type	Value
TABLE_NAME	-	VARCHAR2(30)	-
COMMENTS	-	VARCHAR2(1)	NULL

Table C-22 DUAL

Name	Null?	Type	Value
DUMMY	NOT NULL	VARCHAR2(1)	"X"

Table C-23 TABLE_PRIVILEGES

Name	Null?	Type	Value
GRANTEE	-	VARCHAR2(30)	-
OWNER	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-
GRANTOR	-	VARCHAR2(30)	-
SELECT_PRIV	-	VARCHAR2(1)	NULL
INSERT_PRIV	-	VARCHAR2(1)	NULL
DELETE_PRIV	-	VARCHAR2(1)	NULL
UPDATE_PRIV	-	VARCHAR2(1)	NULL
REFERENCES_PRIV	-	VARCHAR2(1)	NULL
ALTER_PRIV	-	VARCHAR2(1)	NULL
INDEX_PRIV	-	VARCHAR2(1)	NULL
CREATED	-	DATE	SYSDATE

Table C-24 USER_CATALOG

Name	Null?	Type	Value
TABLE_NAME	-	VARCHAR2(30)	-

Table C-24 (Cont.) USER_CATALOG

Name	Null?	Type	Value
TABLE_TYPE	-	VARCHAR2(5)	"TABLE" or "VIEW"

Table C-25 USER_COL_COMMENTS

Name	Null?	Type	Value
TABLE_NAME	-	VARCHAR2(30)	-
COLUMN_NAME	-	VARCHAR2(30)	-
COMMENTS	-	VARCHAR2(1)	NULL

Table C-26 USER_CONS_COLUMNS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
CONSTRAINT_NAME	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-
COLUMN_NAME	-	VARCHAR2(30)	-
POSITION	NOT NULL	NUMBER(5)	-

Table C-27 USER_CONSTRAINTS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-
CONSTRAINT_NAME	-	VARCHAR2(30)	-
CONSTRAINT_TYPE	-	VARCHAR2(1)	"R" or "P" or "U" or "C"
TABLE_NAME	-	VARCHAR2(30)	-
SEARCH_CONDITION	-	VARCHAR2(240)	-
R_OWNER	-	VARCHAR2(30)	-
R_CONSTRAINT_NAME	-	VARCHAR2(30)	-
DELETE_RULE	-	VARCHAR2(1)	NULL
STATUS	-	VARCHAR2(7)	"ENABLED"
DEFERRABLE	-	VARCHAR2(1)	NULL
DEFERRED	-	VARCHAR2(1)	NULL
VALIDATED	-	VARCHAR2(1)	NULL
GENERATED	-	VARCHAR2(1)	NULL
BAD	-	VARCHAR2(1)	NULL
RELY	-	VARCHAR2(1)	NULL
LAST_CHANGE	-	DATE	NULL

Table C-28 USER_INDEXES

Name	Null?	Type	Value
INDEX_NAME	-	VARCHAR2(30)	-
INDEX_TYPE	-	VARCHAR2(1)	NULL
TABLE_OWNER	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-
TABLE_TYPE	-	VARCHAR2(7)	"TABLE" or "CLUSTER"
UNIQUENESS	-	VARCHAR2(9)	"UNIQUE" or "NONUNIQUE"
COMPRESSION	-	VARCHAR2(1)	NULL
PREFIX_LENGTH	-	NUMBER	NULL
TABLESPACE_NAME	-	VARCHAR2(1)	NULL
INI_TRANS	-	NUMBER	0
MAX_TRANS	-	NUMBER	0
INITIAL_EXTENT	-	NUMBER	0
NEXT_EXTENT	-	NUMBER	0
MIN_EXTENTS	-	NUMBER	0
MAX_EXTENTS	-	NUMBER	0
PCT_INCREASE	-	NUMBER	0
PCT_THRESHOLD	-	NUMBER	0
INCLUDE_COLUMN	-	NUMBER	0
FREELISTS	-	NUMBER	0
FREELIST_GROUPS	-	NUMBER	0
PCT_FREE	-	NUMBER	0
LOGGING	-	VARCHAR2(1)	NULL
BLEVEL	-	NUMBER	0
LEAF_BLOCKS	-	NUMBER	0
DISTINCT_KEYS	-	NUMBER	0
AVG_LEAF_BLOCKS_PER_KEY	-	NUMBER	0
AVG_DATA_BLOCKS_PER_KEY	-	NUMBER	0
CLUSTERING_FACTOR	-	NUMBER	0
STATUS	-	VARCHAR2(1)	NULL
NUM_ROWS	-	NUMBER	0
SAMPLE_SIZE	-	NUMBER	0
LAST_ANALYZED	-	DATE	NULL
DEGREE	-	VARCHAR2(1)	NULL
INSTANCES	-	VARCHAR2(1)	NULL
PARTITIONED	-	VARCHAR2(1)	NULL
TEMPORARY	-	VARCHAR2(1)	NULL

Table C-28 (Cont.) USER_INDEXES

Name	Null?	Type	Value
GENERATED	-	VARCHAR2(1)	NULL
SECONDARY	-	VARCHAR2(1)	NULL
BUFFER_POOL	-	VARCHAR2(1)	NULL
USER_STATS	-	VARCHAR2(1)	NULL
DURATION	-	VARHCAR2(1)	NULL
PCT_DIRECT_ACCESS	-	NUMBER	0
ITYP_OWNER	-	VARCHAR2(1)	NULL
ITYP_NAME	-	VARCHAR2(1)	NULL
PARAMETERS	-	VARCHAR2(1)	NULL
GLOBAL_STATS	-	VARCHAR2(1)	NULL
DOMIDX_STATUS	-	VARCHAR2(1)	NULL
DOMIDX_OPSTATUS	-	VARCHAR2(1)	NULL
FUNCIDX_STATUS	-	VARCHAR2(1)	NULL

Table C-29 USER_OBJECTS

Name	Null?	Type	Value
OBJECT_NAME	-	VARCHAR2(30)	-
SUBOBJECT_NAME	-	VARCHAR2(1)	NULL
OBJECT_ID	-	NUMBER	-
DATA_OBJECT_ID	-	NUMBER	0
OBJECT_TYPE	-	VARCHAR2(9)	"TABLE" or "VIEW" or "INDEX" or "PROCEDURE"
CREATED	-	DATE	Date returned in Greenwich Mean Time (GMT)
LAST_DDL_TIME	-	DATE	Date returned in Greenwich Mean Time (GMT)
TIMESTAMP	-	VARCHAR2(1)	NULL
STATUS	-	VARCHAR2(5)	"VALID"
TEMPORARY	-	VARCHAR2(1)	NULL
GENERATED	-	VARCHAR2(1)	NULL
SECONDARY	-	VARCHAR2(1)	NULL

Table C-30 USER_SYNONYMS

Name	Null?	Type	Value
OWNER	-	VARCHAR2(30)	-

Table C-30 (Cont.) USER_SYNONYMS

Name	Null?	Type	Value
SYNONYM_NAME	-	VARCHAR2(30)	-
TABLE_OWNER	-	VARCHAR2(30)	-
TABLE_NAME	-	VARCHAR2(30)	-
DB_LINK	-	VARCHAR2(1)	NULL

Table C-31 USER_TAB_COLUMNS

Name	Null?	Type	Value
TABLE_NAME	-	VARCHAR2(30)	-
COLUMN_NAME	-	VARCHAR2(30)	-
DATA_TYPE	-	VARCHAR2(8)	-
DATA_TYPE_MOD	-	VARCHAR2(1)	NULL
DATA_TYPE_OWNER	-	VARCHAR2(1)	NULL
DATA_LENGTH	-	NUMBER	-
DATA_PRECISION	-	NUMBER	-
DATA_SCALE	-	NUMBER	-
NULLABLE	NOT NULL	VARCHAR2(1)	"Y" or "N"
COLUMN_ID	NOT NULL	NUMBER(10)	-
DEFAULT_LENGTH	-	NUMBER	0
DATA_DEFAULT	-	VARCHAR2(1)	NULL
NUM_DISTINCT	-	NUMBER	0
LOW_VALUE	-	NUMBER	0
HIGH_VALUE	-	NUMBER	0
DENSITY	-	NUMBER	0
NUM_NULLS	-	NUMBER	0
NUM_BUCKETS	-	NUMBER	0
LAST_ANALYZED	-	DATE	NULL
SAMPLE_SIZE	-	NUMBER	0
CHARACTER_SET_NAME	-	VARCHAR2(1)	NULL
CHAR_COL_DECL_LENGTH	-	NUMBER	0
GLOBAL_STATS	-	VARCHAR2(1)	NULL
USER_STATS	-	VARCHAR2(1)	NULL
AVG_COL_LEN	-	NUMBER	0

Table C-32 USER_TAB_COMMENTS

Name	Null?	Type	Value
TABLE_NAME	-	VARCHAR2(30)	-

Table C-32 (Cont.) USER_TAB_COMMENTS

Name	Null?	Type	Value
TABLE_TYPE	-	VARCHAR2(5)	"TABLE" or "VIEW"
COMMENTS	-	VARCHAR2(1)	NULL

Table C-33 USER_TABLES

Name	Null?	Type	Value
TABLE_NAME	NOT NULL	VARCHAR2(30)	-
TABLESPACE_NAME	-	VARCHAR2(1)	NULL
CLUSTER_NAME	-	VARCHAR2(1)	NULL
IOT_NAME	-	VARCHAR2(1)	NULL
PCT_FREE	-	NUMBER	0
PCT_USED	-	NUMBER	0
INI_TRANS	-	NUMBER	0
MAX_TRANS	-	NUMBER	0
INITIAL_EXTENT	-	NUMBER	0
NEXT_EXTENT	-	NUMBER	0
MIN_EXTENTS	-	NUMBER	0
MAX_EXTENTS	-	NUMBER	0
PCT_INCREASE	-	NUMBER	0
FREELISTS	-	NUMBER	0
FREELIST_GROUPS	-	NUMBER	0
LOGGING	-	VARCHAR2(1)	NULL
BACKED_UP	-	VARCHAR2(1)	NULL
NUM_ROWS	-	NUMBER	0
BLOCKS	-	NUMBER	0
EMPTY_BLOCKS	-	NUMBER	0
AVG_SPACE	-	NUMBER	0
CHAIN_CNT	-	NUMBER	0
AVG_ROW_LEN	-	NUMBER	0
AVG_SPACE_FREELIST_BLOCKS	-	NUMBER	0
NUM_FREELIST_BLOCKS	-	NUMBER	0
DEGREE	-	VARCHAR2(1)	NULL
INSTANCES	-	VARCHAR2(1)	NULL
CACHE	-	VARCHAR2(1)	NULL
TABLE_LOCK	-	VARCHAR2(1)	NULL
SAMPLE_SIZE	-	NUMBER	0
LAST_ANALYZED	-	DATE	NULL

Table C-33 (Cont.) USER_TABLES

Name	Null?	Type	Value
PARTITIONED	-	VARCHAR2(1)	NULL
IOT_TYPE	-	VARCHAR2(1)	NULL
TEMPORARY	-	VARHCAR2(1)	NULL
SECONDARY	-	VARCHAR2(1)	NULL
NESTED	-	VARCHAR2(1)	NULL
BUFFER_POOL	-	VARCHAR2(1)	NULL
ROW_MOVEMENT	-	VARCHAR2(1)	NULL
GLOBAL_STATS	-	VARCHAR2(1)	NULL
USER_STATS	-	VARCHAR2(1)	NULL
DURATION	-	VARCHAR2(1)	NULL
SKIP_CORRUPT	-	VARCHAR2(1)	NULL
MONITORING	-	VARCHAR2(1)	NULL

Table C-34 USER_USERS

Name	Null?	Type	Value
USERNAME	-	VARCHAR2(30)	-
USER_ID	-	NUMBER	-
ACCOUNT_STATUS	-	VARCHAR2(4)	"OPEN"
LOCK_DATE	-	DATE	NULL
EXPIRY_DATE	-	DATE	NULL
DEFAULT_TABLESPACE	-	VARCHAR2(1)	NULL
TEMPORARY_TABLESPACE	-	VARCHAR2(1)	NULL
CREATED	-	DATE	SYSDATE
INITIAL_RSRC_CONSUMER_GROUP	-	VARCHAR2(1)	NULL
EXTERNAL_NAME	-	VARCHAR2(1)	NULL

Table C-35 USER_VIEWS

Name	Null?	Type	Value
VIEW_NAME	-	VARCHAR2(30)	-
TEXT_LENGTH	-	NUMBER	0
TEXT	NOT NULL	VARCHAR2(240)	-
TYPE_TEXT_LENGTH	-	NUMBER	0
TYPE_TEXT	-	VARCHAR2(1)	NULL
OID_TEXT_LENGTH	-	NUMBER	0
OID_TEXT	-	VARCHAR2(1)	NULL
VIEW_TYPE_OWNER	-	VARCHAR2(1)	NULL
VIEW_TYPE	-	VARCHAR2(1)	NULL

Heterogeneous Services Initialization Parameters

The Oracle database server initialization parameters in the `init.ora` file are distinct from heterogeneous services (HS) initialization parameters. Set HS parameters in the initialization parameter file using an agent-specific mechanism, or set them in the Oracle data dictionary using the `DBMS_HS` package.

This appendix contains information about the following Heterogeneous Services initialization parameters:

- [HS_FDS_CONNECT_INFO](#)
- [HS_FDS_INGRES_MODE](#)
- [HS_FDS_PARSER_TOKEN_SIZE](#)
- [HS_FDS_RECOVERY_ACCOUNT](#)
- [HS_FDS_RECOVERY_PWD](#)
- [HS_FDS_TIMEZONE](#)
- [HS_FDS_TRACE_LEVEL](#)
- [HS_FDS_TRANSACTION_LOG](#)
- [HS_FDS_TRANSACTION_MODEL](#)

See Also: *Oracle Database Heterogeneous Connectivity Administrator's Guide* for information on other available initialization parameters.

The HS initialization parameter file must be available when the gateway is started. During installation, the following default HS initialization parameter file is created:

```
$ORACLE_HOME/tg4ingr/admin/inittg4ingr.ora
```

where `$ORACLE_HOME` is the directory under which the gateway is installed.

HS Initialization Parameter File Syntax

The syntax for the initialization parameter file is as follows:

1. The file is a sequence of commands.
2. Each command should start on a separate line.
3. End of line is considered a command terminator (unless escaped with a backslash).

4. Each command can have one of the following forms:
 - a. `<param> = <value>`
 - b. `set <param> = <value>`
 - c. `private <param> = <value>`
 - d. `set private <param> = <value>`where:
`<param>` is an initialization parameter name.
`<value>` is the initialization parameter value.
'set' and 'private' are keywords.
5. The keywords 'set' and 'private' are reserved. You cannot use either as an initialization parameter name. The 'set' keyword indicates that the initialization parameter should be set as an environment variable in the agent. The 'private' keyword indicates that the initialization parameter should be private to the agent and should not be uploaded to the server. Most initialization parameters should not be private. If, however, you are storing something sensitive like a password in the initialization parameter file, then you may not want it uploaded to the server because the initialization parameters and values are not encrypted when uploaded. Making these initialization parameters private prevents the upload from happening.
6. An initialization parameter name is a string of characters starting with a letter and consisting of letters, digits and underscores. Initialization parameter names are case sensitive.
7. An initialization parameter value is either:
 - a. A string of characters that does not contain any backslashes, white space or double quotation marks (")
 - b. A quoted string beginning with a double quotation mark and ending with a double quotation mark. The following can be used inside a quoted string:
 - * backslash (\) is the escape character
 - * \n inserts a new line
 - * \t inserts a tab
 - * \" inserts a double quotation mark
 - * \\ inserts a backslashA backslash at the end of the line continues the string on the next line. If a backslash precedes any other character then the backslash is ignored.If there is a syntax error in an initialization parameter file, none of the settings take effect.

HS_FDS_CONNECT_INFO

Default Value	Range of Values
None	Not Applicable

Specifies the information needed to connect to the Ingres II database.

This is a required parameter, whose format is:

```
HS_FDS_CONNECT_INFO=vnode::database_name
```

Where:

vnode is the virtual node which will be used by the Ingres II client to access a remote networked Ingres II server. You can retrieve a list of the available nodes on the machine by running the Ingres II `net_util` utility. If you specify only *database_name*, omitting *vnode*, the gateway binds to the specified local database.

database_name is the name of the database.

HS_FDS_INGRES_MODE

Default Value	Range of Values
INGRES	INGRES or ANSI

Specifies the Ingres II database mode that was specified when the Ingres II database was installed.

The following values are valid:

- INGRES provides access to the Ingres II database, configured in INGRES mode.
- ANSI provides access to the Ingres II database, configured in ANSI mode.

HS_FDS_PARSER_TOKEN_SIZE

Default Value	Range of Values
1,000 Characters	Any positive integer value

Used for setting the parser token size in case the default size is not sufficient. The default value can be changed in cases when the following error occurs:

```
pcllex input buffer overflowed, try to increase the variable tokenSize in your environment.
```

With default value of 1000, the gateway could handle SQL statements close to 2M. Note that the SQL statements sent to the gateway could be very different from the SQL statements issued by the users. If in doubt, turn on gateway trace. Increase this parameter to handle larger SQL statements sent to gateways

HS_FDS_RECOVERY_ACCOUNT

Default Value	Range of Values
RECOVER	Any valid userid

Specifies the name of the recovery account used for the commit-confirm transaction model. An account with user name and password must be set up at Ingres II. For more information about the commit-confirm model, see the `HS_FDS_TRANSACTION_MODEL` parameter.

The name of the recovery account is case-sensitive.

HS_FDS_RECOVERY_PWD

Default Value	Range of Values
RECOVER	Any valid password

Specifies the password of the recovery account used for the commit-confirm transaction model set up at Ingres II. For more information about the commit-confirm model, see the HS_FDS_TRANSACTION_MODEL parameter.

The name of the password of the recovery account is case-sensitive.

HS_FDS_TIMEZONE

Default Value	Range of Values
0	Any value between -24 and +24

Sets the time (in hours) on the client to be the same as the time on the server, when the two times are different. For example, if the client time is 13:00 and the server time is 9:00 set HS_FDS_TIMEZONE=4. A negative number sets the number of hours ahead of the client.

HS_FDS_TRACE_LEVEL

Default Value	Range of Values
OFF	OFF, ON

Specifies whether error tracing is turned on or off for gateway connectivity.

The following values are valid:

- OFF disables the tracing of error messages.
- ON enables the tracing of error messages that occur when you encounter problems. The results are written to a gateway connectivity log file, in `$ORACLE_HOME/TG4INGR/LOG`.

HS_FDS_TRANSACTION_LOG

Default Value	Range of Values
HS_TRANSACTION_LOG	Any valid table name

Specifies the name of the table created in the Ingres II database for logging transactions. For more information about the transaction model, see the HS_FDS_TRANSACTION_MODEL parameter.

HS_FDS_TRANSACTION_MODEL

Default Value	Range of Values
COMMIT_CONFIRM	COMMIT_CONFIRM, READ_ONLY, SINGLE_SITE

Specifies the type of transaction model that is used when the Ingres II database is updated by a transaction.

The following values are valid:

- COMMIT_CONFIRM provides read and write access to the Ingres II database and allows the gateway to be part of a distributed update. To use the commit-confirm model, the following items must be created in the Ingres II database:
 - Transaction log table. The default table name is HS_TRANSACTION_LOG. A different name can be set using the HS_FDS_TRANSACTION_LOG parameter. The transaction log table must be granted SELECT, DELETE, and INSERT privileges set to public.
 - Recovery account. The account name is assigned with the HS_FDS_RECOVERY_ACCOUNT parameter.
 - Recovery account password. The password is assigned with the HS_FDS_RECOVERY_PWD parameter.
- READ_ONLY provides read access to the Ingres II database.
- SINGLE_SITE provides read and write access to the Ingres II database. However, the gateway cannot participate in distributed updates.

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