Installation and Configuration Manual

WAY4 Upgrade

03.50.30

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Contents

This document contains information for upgrading WAY4.

This document is intended for bank or processing center employees who are responsible for upgrading WAY4.

When working with this document, it is recommended to use the following resources from the OpenWay documentation series:

- "Dictionaries"
- "DB Manager Manual"
- "Redefinition Tool"
- "Administering WAY4 Datamart"
- "WAY4™ Main Technical Requirements".

The following notation is used in the document:

- Field labels in screen forms are shown in *italics.*
- Key combinations are shown in angular brackets, for example, <Ctrl>+<F3>.
- Names of screen form buttons and tabs are shown in square brackets, for example, [Approve].
- Sequences for selecting user menu items or context menu items are shown using arrows as follows: "Issuing → Contracts Input & Update".
- Sequences for selecting system menu items are shown using arrows as follows: Database => Change password.
- Variables that differ for each local instance, such as directory and file names, as well as file paths are shown in angular brackets, as in <OWS_HOME>.

Warnings and information are marked as follows:

Warnings about potentially hazardous situations or actions.

Messages with information about important features, additional options, or the best use of certain system functions.

1. Overview

The WAY4 upgrade process consists of the following steps:

1. Upgrading Applications.
2. Preparing WAY4 Cards Custom Objects.
3. Upgrading the WAY4 Cards Component.

2. Upgrading Applications

> To ensure that operation of WAY4 remains stable, it is recommended to upgrade supporting applications before upgrading to a new version of the WAY4 Cards component (see "Upgrading the WAY4 Cards Component"). Old versions of supporting applications are not compatible with a new WAY4 Cards version.
> WAY4 Web applications are an exception:their version must strictly correspond to the WAY4 Cards version. Supporting applications must be upgraded in step 6 (see "Upgrade Client Applications (6 of 7)") of the WAY4 Cards Upgrade wizard.

Supporting applications must be upgraded for the following reasons:

- To ensure the compatibility of interfaces between WAY4 components.
- o ensure the compatibility of applications and the software platform on which they operate (for example, Application Server).
- To support payment system release requirements.
- For PA DSS compliance.
- To improve the efficiency of WAY4 support.

When upgrading WAY4, all instances of the following applications/components must be upgraded:

- NetServer
- Access Server
- Application Server
- Transaction Switch
- WAY4U applications
- WAY4 Web
- 3-D Secure
- Scheduler
- Remote Access
- Health Monitoring
- Datamart

> This is a standard list and may differ from the list of applications/components actually installed.

3. Preparing WAY4 Cards Custom Objects

WAY4 Cards custom objects are provided as a separate delivery with installation instructions.

Modified objects must be put into the <OWS_WORK> directory. Objects that are not found there will be taken from the <OWS_HOME> directory (that is, they will be replaced with standard objects).
Unused custom objects should not be stored in the <OWS_WORK> directory. It is the responsibility of the user to ensure that objects in this directory correspond to those imported to the database (DB).

4. Upgrading the WAY4 Cards Component

The WAY4 Cards component is upgraded using the upgrade wizard (<OW_HOME>\install\Upgrade.bat). Before starting the upgrade wizard, it is recommended to do the following:

- Create a copy of the production system. A copy of the production system is created using standard Oracle tools (for example, RMAN).
- [Optional. If the Datamart product is used]. Run the Attach procedure from the WAY4 Datamart console (see the document "Administering WAY4 Datamart").
- Prepare the <OWS_WORK> directory for upgrade:
  - Export custom PL/SQL code.
  - Check that custom PL/SQL objects have not changed since they were last sent to OpenWay during the upgrade project. If in doubt, send a new slice of objects to the OpenWay representative who is responsible for upgrade.
  - Delete all cust_*.sql files from the directory <OWS_WORK>\db\scripts\install\owsowner\cust\.
  - Copy the custom objects that were exported from the DB to the directory <OWS_WORK>\db\scripts\install\owsowner\cust\.
  - Follow the instructions included with the delivery of custom objects (copy adapted cust files, delete outdated pipes, update opt*sql, etc.).
- Follow the recommendations to accelerate upgrade (see the section"Accelerating Upgrade of the WAY4 Cards Component").
- Run check scripts provided by OpenWay.
- [Optional. If the Housekeeping product is used]. Stop the Housekeeping Engine process (menu item "OpenWay → Housekeeping → Runtime → Stop Housekeeping").

> The Datamart and Housekeeping products are optional (not included in the basic delivery) and are supplied according to an additional agreement with OpenWay.

If DB Manager is used as the main client application, it is recommended to disable upgrade of WAY4 Manager (if Scheduler and Remote Access are not used). To do so, in the [Replacing] block of the DB.INI file from the <OW_WORK> directory, specify the parameter:

```
[Replacing]
Upgrade.isMigrateWay4m=N
```

If WAY4 Manager is used as the main client application, in the [Replacing] block of the DB.INI file, specify the following parameters:

```
[Replacing]
Upgrade.dbm=N
Upgrade.isMigrateWay4m=N
Upgrade.step.lmnu=n
```

4.1 Check scripts

Before upgrading the WAY4 Cards component, it may be necessary to run check scripts provided by OpenWay.

Check scripts are run on a copy of the production system before a test upgrade. Check scripts must be run from the <NEW_OWS_HOME> directory (directory with the new <OWS_HOME>).

Script location: directory <NEW_OWS_HOME>\db\scripts\oracle\check\checkdata\.

The fact of each check script run is saved in the process log.

Scenarios for running scripts:

- Run all check scripts. Run all check scripts. The scripts will be run for the installed WAY4 Cards component version and later (scripts are located in directories with the version name), as well as unversioned scripts (in the script directory itself):

```
<NEW_OWS_HOME>\db\ssp4.bat
connect=<OWS_OWNER>/<OWS_PASSWORD>@<HOST>:<PORT>:<SID>
<NEW_OWS_HOME>\db\scripts\oracle\check\checkdata.ss4 <Log_Folder>
```

    - <OWS_OWNER>/<OWS_PASSWORD>@<HOST>:<PORT>:<SID> – parameters for connecting to the test system of the current version (before upgrade) as the<OWS_OWNER> schema owner.
    - <Log_Folder> – directory for saving script results.
- Run check scripts for a specific task (for example, for the task CARDS-12345):

```
<NEW_OWS_HOME>\db\ssp4.bat connect=<OWS_OWNER>/<OWS_PASSWORD>@<HOST>:<PORT>:<SID>
<NEW_OWS_HOME>\db\scripts\oracle\check\checkdata.ss4 <Log_Folder> "CARDS-12345"
```

Launch line example:

```
C:\03_50_30_00\db\ssp4.bat connect=MyOwner/MyPassword@111.11.11.111:1521:orcl C:
\03_50_30_00\db\scripts\oracle\check\checkdata.ss4 C:\temp\check_script_res_50\
```

Example of launching scripts from the cards and kernel directories:

```
C:\03_50_30_00\db\ssp4.bat connect=MyOwner/MyPassword@111.11.11.111:1521:orcl C:
\03_50_30_00\db\scripts\oracle\check\checkdata.ss4 C:\temp\check_script_res_Cards\
"cards\\.*"
C:\03_50_30_00\db\ssp4.bat connect=MyOwner/MyPassword@111.11.11.111:1521:orcl C:
\03_50_30_00\db\scripts\oracle\check\checkdata.ss4 C:\temp\check_script_res_kernel\
"kernel\\.*"
```

4.2 Upgrading

Upgrade is performed in seven steps. The upgrade wizard shows its current status at all times and indicates when manual actions are required.

The upgrade wizard can be restarted at any step; it will continue from the last step that was successfully completed.

If error messages are received, it is recommended to contact OpenWay.

A list of the upgrade wizard's steps and necessary manual actions is provided below.

4.2.1 Prepare to Upgrade (1 of 7)

Preparation for upgrade. In this step, DB requirements are checked, preliminary checksums are collected, etc.

4.2.2 Add Structural Objects (2 of 7)

Addition of new objects to the DB structure. In this step, online services are briefly stopped for the first time. At the start of step 2, the upgrade wizard blocks WAY4 users; it is recommended to stop online applications in advance.

The last number of the Redo Log that can safely be applied to Backup/Standby is shown (see the figure). Then, synchronization between the DB should be stopped until the upgrade has been successfully completed (until the first successful online operation).

In this step, it is recommended to stop synchronization between the main and backup DB if a WAY4 High Availability solution is used (provided according to an additional agreement with OpenWay). If a WAY4 High Availability solution is not used, it is recommended to stop synchronisation after the DB structure has been changed (see "Upgrade Database Structure (4 of 7), Prepare Owner Scheme (5 of 7)".

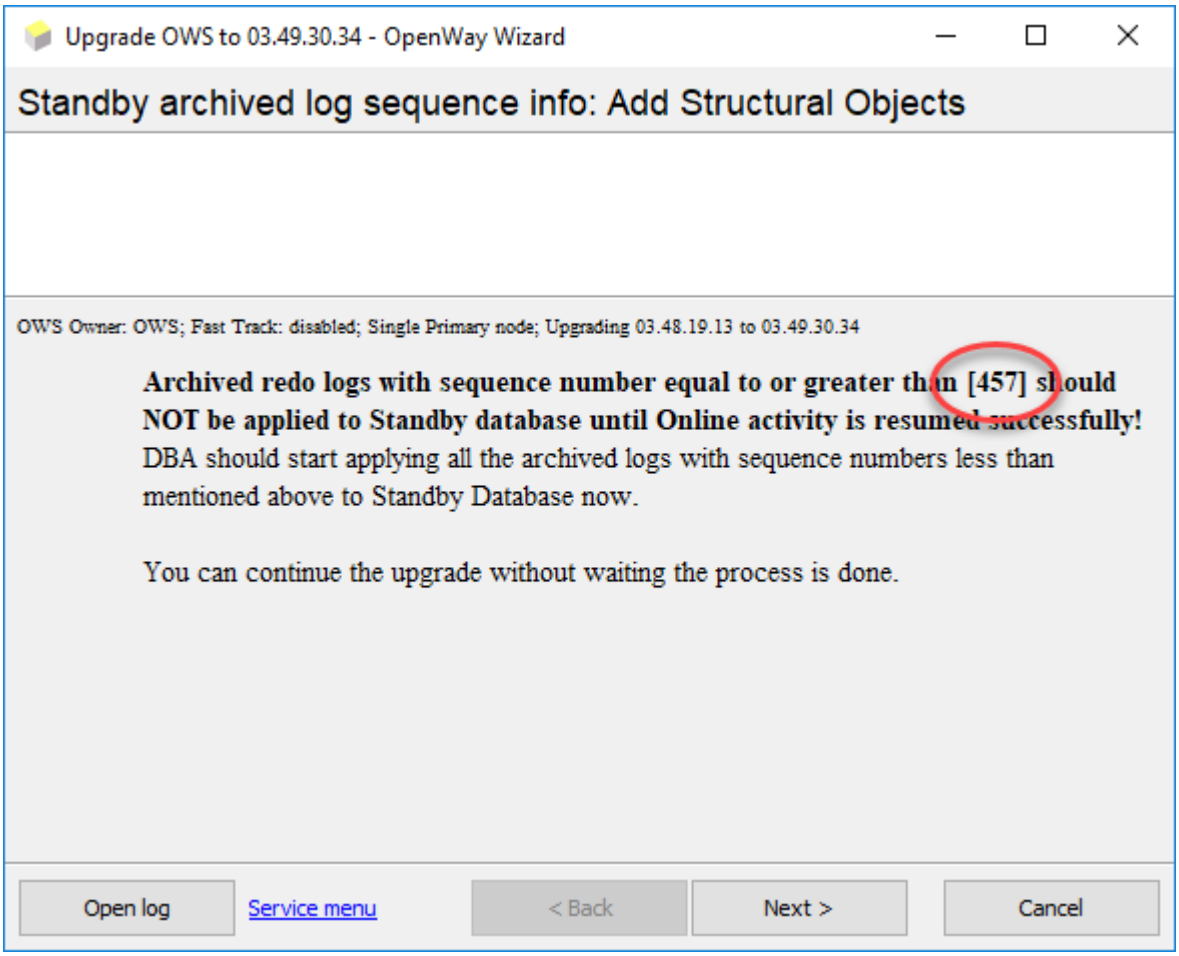

Fig. Redo log number and instructions for the DB administrator

4.2.3 Update new database objects (3 of 7)

Initialization of new DB objects. This is the longest step in system upgrade. In this step, the upgrade wizard populates new table columns with data and creates new indexes. Information about accelerating the process is provided in the section "Upgrade Database Structure (4 of 7), Prepare Owner Scheme (5 of 7)".

During step 3, WAY4 operates normally: online services operate, there are no additional limitations on performing back-office procedures. The WAY4 version has not changed yet.

In this step, the size of the DB may significantly increase. Based on the results of the test upgrade, changes in the DB size should be estimated and sufficient free space in the production DB should be allocated in advance.

4.2.4 Upgrade Database Structure (4 of 7), Prepare Owner Scheme (5 of 7)

Change in the DB structure, switch to the new objects that were added in step 2, installation of PL/SQL packages from the new version's <OWS_HOME> directory and from the new <OWS_WORK> directory.

These are the two most important steps in the upgrade process. At this time, operation of online services and back-office processes is not possible. At the start of step 4, the upgrade wizard blocks WAY4 users and closes active sessions of WAY4 applications. It is recommended to stop online applications in advance. The number of the last Redo Log file that can be safely applied in Backup/Standby is shown. Synchronization should then be terminated until successful completion of upgrade (until the first online operation has been performed successfully).

After new DB objects have been installed, final checksums must be checked.

After steps 4 and 5 have been completed, the system switches to the new version. Restore the operation of all online applications. Check that transactions are being made successfully and then restore synchronisation with Backup/Standby.

4.2.5 Upgrade Client Applications (6 of 7)

Upgrade of client applications. In this step, all online applications operate, but the majority of users are disconnected. At the start of the step, the upgrade wizard proposes skipping some jobs in order to save time. All jobs that are allowed to be skipped can be performed manually after upgrade has been completed.

4.2.6 On-line Post Upgrade Steps (7 of 7)

Final procedures. The step may take quite a long time, but its execution does not prevent WAY4 from operating normally.

4.2.7 Upgrade logs

During upgrade, the following logs are created:

- <USERPROFILE>\owXecutor-ddmmyyyyy.log –upgrade log.
- <OWS_TEMP>/check_pre_<OWNER>.html – result of comparing checksums before upgrade.
- <OWS_TEMP>/check_<OWNER>.html – resultof comparing checksums after upgrade.
- <USERPROFILE>\AppData\Local\Temp\temp_xecutor*.res – upgrade log for client applications.

4.3 Actions after upgrade

[Optional. If the Datamart product is used]. Run the Attach procedure from the WAY4 Datamart console (see the document "Administering WAY4 Datamart").

[Optional. If the Housekeeping product is used]. Run the Housekeeping Engine process (menu item "OpenWay → Housekeeping → Runtime → Start Housekeeping").

After the WAY Cards component has been upgraded, it may be necessary to take the following actions for managing data:

- Delete unused columns During upgrade, obsolete columns for large tables are not deleted, but are marked as unused. These columns must be later deleted.

- Recreate tables in an encrypted tablespace when encryption requirements have changed.
- Change table partitioning when Oracle Partitioning is used, and requirements have changed for partitioning WAY4 Cards system tables.

Table data is managed online using the Redefinition Tool utility (see the document "Redefinition Tool").

5. Accelerating Upgrade of the WAY4 Cards Component

To accelerate system upgrade, it is recommended to do as follows:

- Perform Housekeeping (clear unused data from the system).
- Estimate the duration of upgrade steps.
- Configure parallelism of processes for upgrade, creation of indexes and the step "Constraints Validation".
- Use "Fast Track Upgrade" mode.
- Use the WAY4 High Availability solution.

To minimize the time for which the DB (SYS) administrator's presence is required during upgrade, "Lazy Sys" mode can be used.

5.1 Housekeeping

To accelerate the upgrade procedure, it is recommended to perform Housekeeping of all possible unused data, since usually the duration of the upgrade procedure is proportional to the DB size.

5.2 Estimating the Duration of Upgrade

Each completed step of the upgrade wizard is logged to the upgrade log <USERPROFILE>\owXecutor-ddmmyyyyy.log.

Information about completed steps can be found in the log by using the "STEP:" keyword.

In each step, the system executes a certain set of commands. For each command executed, the duration of its execution is logged after the keyword "elapsed:". Commands whose execution takes more than 10 minutes have the keyword "elapsed:x".

5.3 Configuring Parallelism of Upgrade Processes

Usually the longest operations are "Update new table data", "Create new indexes" and "Create changed indexes".

For example, the "UPG.UPDATE.<Table_Name>" process updates tables in the event of structural changes; for example, field size or default value.

To accelerate scripts for updating data in "large" tables, it is recommended to use a process parameter template that allows the script to be run in parallel. When this setting is used, a table will be updated in

several parallel threads. To do so, run the menu item "OpenWay → Full → Configuration Setup → Main Tables → Process Parameters" and add the following settings:

- *Process Name* = UPG.UPDATE.<Table_Name>
- *Parameter Code* = PARALLEL
- *Parameter Value* = number of parallel threads

where <Table_Name> – is the name, in uppercase letters, of the table being updated.

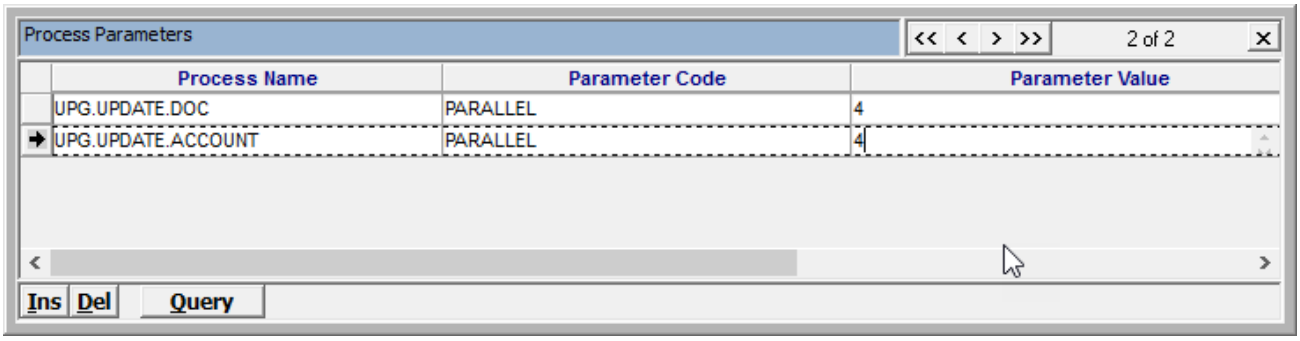

Fig. Example of configuring parallelism for data update processes

5.4 Creating Indexes

To accelerate creation of indexes, this process can be paralleled. To create indexes in parallel, in the [Replacing] section of the DB.INI file, add the parameter CreateIndex_<Tablespace_Name> and the number of parallel threads. For example:

```
[Replacing]
CreateIndex_OWLARGE_I=Parallel 4
```

New indexes are automatically created with the "invisible" property.

At the end of steps 4 and 5 (offline mode) when switching to new objects, the new indexes are transferred to the "visible" state, and parallelism is cleared for them (they are transferred to the "noparallel" state).

> Parallel creation of indexes should not be used for OWSTATIC_I, OWCONST_I tablespaces.

Parallel creation of indexes is only recommended for tablespaces with "large" indexes (more than 1 gigabyte). The following query can be used to find them:

```
select distinct tablespace_name from user_segments s
where s.segment_type like 'INDEX%'
and s.BYTES > 1024*1024*1024
and tablespace_name not in ('OWSTATIC_I','OWCONST_I','OWSTATIC_E_I','OWCONST_E_I')
```

5.5 Constraints Validation

To save time, the "Constraints Validation" operation can be skipped during the main process of system upgrade; to do so, specify the following parameter in the [Replacing] section of the DB.INI file:

```
[Replacing]
Upgrade.step.valfk=n
```

However, after upgrade has been completed, this procedure must be run using the standard script validatefkall.ssp:

```
<OWS_HOME>\db\ssp.bat connect=<OWS_OWNER>/<OWS_OWNER_PASSWORD>@<HOST>:<PORT>:<SID>
log=<LogFilePath>\validatefkall.log <OWS_HOME>\install\tools\validatefkall.ssp
```

A custom script can be used; for example, that uses parallel execution. The script must result in all constraints being in the "validated" state.

> When any non-standard script is used, it must have been tested in advance on a copy of the production system. Additional monitoring of the script's operation on a product system is also recommended to allow termination of the process to be forced if it is taking an excessively long time.

5.6 "Fast Track Upgrade" mode

Downtime during upgrade can be reduced when "Fast Track Upgrade" is enabled.

> The use of "Fast Track Upgrade" mode must be approved by OpenWay.

5.7 Using the WAY4 High Availability solution

Downtime during upgrade can be reduced by using the WAY4 High Availability solution. Regardless of whether "Fast Track Upgrade" mode is used, online services can be switched to use an additional node of the WAY4 High Availability solution during upgrade of the production node. If the upgrade wizard detects an additional node that synchronizes with the production node, it asks the user for permission to switch to standby mode just before the longest autonomous phase of upgrade. The upgrade wizard also asks the user for permission to switch back after the autonomous phase of upgrade has been completed (or for "Fast Track Upgrade" mode, after the active schema has been switched from <AUX_OWNER> to <OWS_OWNER>).

For more information about the WAY4 High Availability solution, contact OpenWay.

5.8 "Lazy Sys" mode

"Lazy Sys" mode is used to minimize the time for which the DB (SYS) administrator's presence is required during upgrade.

When "Lazy Sys" mode is used, it is not necessary to enter the DB administrator's password during upgrade. Each time before upgrade, several manual steps are performed.

When the mode is used, the following problems may occur:

- Warning that the checksum differs (additional system access privileges will be detected). The warning may appear at the start of upgrade and should be ignored.
- In the event of serious errors, intervention of the DB administrator will be required.

To enable "Lazy Sys" mode, add the following parameter to the [Replacing] section of the DB.INI file:

```
Upgrade.lazysys=Y
```

Before upgrading, as the SYS user, do the following in the <NEW_OWS_HOME> directory:

The following steps are performed each time before upgrading.

- Install (reinstall) the sys.ows_administer_user procedure:

```
<NEW_OWS_HOME>\db\ssp connect=sys@host:port:sid
<NEW_OWS_HOME>\db\scripts\oracle\install\sys\additional\ows_administer_user.ssp
<OWS_OWNER>
```

- Grant new system access privileges to the <OWS_OWNER> user:

```
<NEW_OWS_HOME>\db\ssp connect=sys@host:port:sid
<NEW_OWS_HOME>\db\scripts\oracle\install\sys\etc\grantsysprivs.sql <OWS_OWNER>
```

If "Fast Track Upgrade" mode will be used and an <AUX_OWNER> user has not been created, create this user with the following commands:

```
<NEW_OWS_HOME>\db\ssp connect=sys@host:port:sid
<NEW_OWS_HOME>\db\scripts\oracle\install\sys\creauxowner.sql <AUX_OWNER>
<AUX_OWNER_PASSWORD> <OWS_WORK>
<NEW_OWS_HOME>\db\ssp connect=sys@host:port:sid
<NEW_OWS_HOME>\db\scripts\oracle\install\sys\grantmuser.sql <AUX_OWNER>
```

The following error messages indicate that an <AUX_OWNER> user already exists in the DB:

- "User AUX_Owner already exists in the database".
- "User AUX_Owner already registered as an AUX_User for OWS_Owner=OWS_Owner".
- "Cannot register user AUX_Owner".

If an <AUX_OWNER> user already exists in the database, grant new system access privileges to the <AUX_OWNER> user:

```
<NEW_OWS_HOME>\db\ssp connect=sys@host:port:sid
<NEW_OWS_HOME>\db\scripts\oracle\install\sys\etc\grantsysprivs.sql <AUX_OWNER>
```

From this point onward (during upgrade when the upgrade wizard requests the DB administrator's username and password) the name and password of the <OWS_OWNER> can be entered.

To disable "Lazy Sys" mode, delete the parameter Upgrade.lazysys = Y from the DB.INI file.

6. System Performance in a New Version of WAY4 Cards

During upgrade of the WAY4 Cards component, the DB structure changes. Accordingly, to exclude possible problems related to DB performance,a procedure for updating Oracle statistics must be run after upgrade.

The statistics gathering process takes a significant amount of DB resources and time. Therefore, it is recommended to gather statistics on a copy of the production system and then transfer them to the production system.

The statistics gathering process is split into three phases:

1. Preparation of an up-to-date copy of the production system (there are various ways to perform this step).
2. Gathering statistics.
3. Transferring statistics from the test DB to the production DB.

6.1 Gathering Statistics

There is a standard script for gathering statistics, <OWS_HOME>\db\scripts\oracle\tools\gatherstats.ssp, that allows statistics to be gathered for all tables, or for a specific list.

Script parameters:

- TableList – list of tables (values are separated by a space or comma). By default, all the scheme's tables.
- DaysToIgnore – allows tables for which statistics have already been gathered in the last DaysToIgnore to be excluded from statistics gathering. The default value is 3 days. To gather statistics for the entire volume of data, specify "0".
- EstimationPercent – the default value is "100".
- IsCascade – gather statistics for indexes. The default value is "true" (statistics are gathered for indexes).
- Degree – parallelism degree for gathering statistics. The default value is null (no parallelism).
- UserName – by default, this is the current user.

OpenWay recommends the use of the default values.

Example of script use: statistics must be gathered for all tables and their indexes:

```
<OWS_HOME>\db\ssp.bat connect=<OWS_OWNER>/<OWS_OWNER_PASSWORD>@<HOST>:<PORT>:<SID>
log=C:<LogFilePath>\gather_stats.log
<OWS_HOME>\db\scripts\oracle\tools\gatherstats.ssp
```

6.2 Transferring Statistics from a Test DB to the Production DB

To transfer statistics from the test DB to the production DB, do as follows:

- In the test DB, create an export table and load the statistics that were gathered into it (scripts are run by the <OWS_OWNER> schema owner):

```
begin
  DBMS_STATS.create_stat_table(ownname => user , stattab =>'STATTAB');
  DBMS_STATS.export_schema_stats(ownname => user, stattab =>'STATTAB',statown =>
user);
end;
```

- Export the STATTAB table (table with saved statistics) using the Oracle exp utility:

```
exp <OWS_OWNER>/<OWS_OWNER_PASSWORD>@<TNS> tables=stattab file=stattab.dmp
```

- In the production DB, create a backup copy of existing statistics:

```
begin
  DBMS_STATS.create_stat_table(ownname => user , stattab =>'STATTAB_BAK');
  DBMS_STATS.export_schema_stats(ownname => user,stattab =>'STATTAB_BAK',statown =>
user);
end;
```

- Load the data from Item 2 (DMP file) to the production system:

```
imp <OWS_OWNER>/<OWS_OWNER_PASSWORD>@<TNS> file=stattab.dmp
```

The STATTAB table with data from the test system should appear in the production system.

- Apply the statistics in the production system:

```
begin
  DBMS_STATS.IMPORT_schema_stats(ownname=> user,stattab => 'STATTAB',statown =>
user);
end;
```

7. Troubleshooting

This section provides general recommendations for resolving issuers that may arise when upgrading the system, and recommendations for resolving known issues.

7.1 General recommendations

Carefully read the documentation for upgrading/fixing OpenWay software and perform all the steps as described. If errors reoccur, contact OpenWay.

Check checksums before upgrading. The most important checksums are for the following objects: "Grants", "Tables", "Table columns", and "Constraints". Before upgrading the system, there must be no discrepancies in checksums for these objects.

Before upgrading, ensure that the correct version and components for Oracle Client are installed on the workstation (see the document "WAY4™" Main Technical Requirements").

Ensure there are no DB sessions that contact <OWS_OWNER> schema objects. Otherwise, an ORA00054 error may occur during upgrade. The majority of users are blocked automatically, but <OWS_OWNER>, SYS, and SYSTEM users are not blocked.

7.2 Known issues

List of known issues:

- ORA-01925: maximum of N enabled roles exceeded.

  If the value of "N" is less than 148, change the DB parameter max_enabled_roles in the init.ora file:

```
max_enabled_roles = 148
```

  If a parameter file is used, run the command:

```
alter system set max_enabled_roles=148 scope=spfile
```

  Next, restart the DB. Repeat the operation that failed with an ORA-01925 error.

- Invalid parameter error when loadjava.bat is called in the step for updating Java objects.

  Check for the presence of the ORACLE_HOME\bin directory in the PATH environment variable.

- ORA-00600 when loadjava.bat is called in the step for updating Java objects.

  Increase the value of the java_pool_size parameter to at least 80 MB and reload Java objects.

- ORA-29516: Aurora assertion failure: Assertion failure at eoasga.c:597.

Reload Java objects. Possible cause: the SQLJ profile refers to a nonexistent class (that is loaded later than the profile).