Installation and Configuration Manual

WAY4™ Housekeeping

03.51.30

13/04/2020

Contents

The WAY4™ Housekeeping R2 module is used to delete historical data from the WAY4 database and to create backup data copies that can be restored later.

This document is intended for bank or processing centre employees responsible for configuring the Housekeeping module and describes the module's operating principles.

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

- "DB Manager User Management"
- "Running Processes in Parallel".
- "DB Manager Manual"
- "WAY4™ PA-DSS Implementation Guide"
- "Oracle® Database Administrator's Guide 12c Release 1" / "Oracle® Database Administrator's Guide 12c Release 2" / "Oracle® Database Database Administrator's Guide 18c"/"Oracle® Database Database Administrator's Guide 19c".

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 Housekeeping Operating Principles

If WAY4 has been in operation for a long time, it is inevitable that its database contains data whose storage is not required, as the period for using the data has expired.

Historical data must be regularly deleted as large volumes of data stored in the database decrease system performance. However, it must be possible to access deleted data, if required.

The Housekeeping R2 module has the following features:

- Tasks to delete and back up historical data are executed automatically according to a preconfigured schedule.
- Most errors occurring during task execution are processed automatically, including the "Snap shot too old" error.
- The main Housekeeping process is executed on the server, not on the administrator's workstation.
- The use of Batch interface technology in data processing allows the speed of task execution to be increased.
- Data processing can also be increased due to the execution of tasks in several streams.
- Deleted historical data stored in the archive is accessed using SQL expressions.

> The module provides the ability to delete historical data when several nodes are used on which WAY4 is installed; for example, when the High Availability solution is implemented. In this case, rules for deleting historical data can be configured individually for each node.

1.1 Housekeeping Architecture

The Housekeeping R2 module consists of the following components:

- Housekeeping Engine is a server process operating according to specific rules (see "Deleting Historical Data"), It deletes historical data from the WAY4 database and backs up historical data.

> The Housekeeping Engine process is implemented as an Oracle job. Therefore, if the database is stopped while the process is running, the process will continue working after the database is started again. If full backup of the database was made while the process was running, the backup copy is restored on another system, and the database is started, the process will be copied and continue working on this system.

- Archive is a special storage space for historical data deleted from the WAY4 database (see "Storing Historical Data").

- Administrator's Workstation is a workplace used to configure, manage and monitor the Housekeeping Engine (see "Housekeeping Setup", "Managing Housekeeping" and "Monitoring Housekeeping").

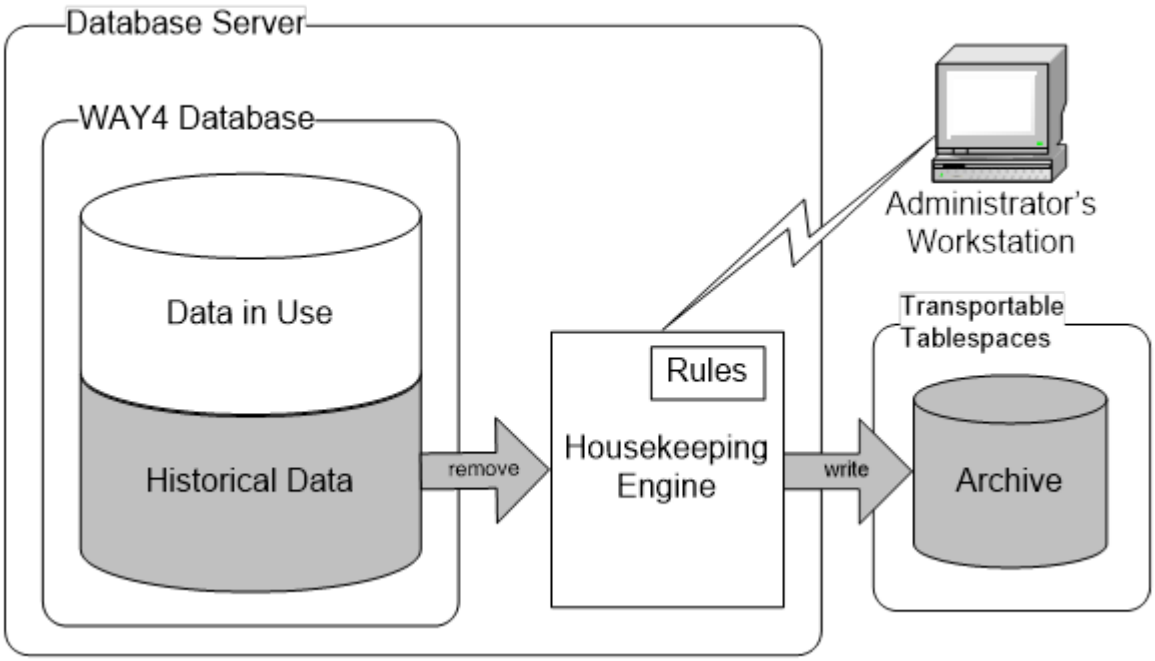


Fig. Housekeeping R2 operating principles

1.2 Deleting Historical Data

The Housekeeping Engine deletes historical data from the WAY4 database and saves its backup copy to a special space (see "Storing Historical Data") according to the following rules:

- Historical data are records that have had one of the following logical statuses for a prolonged time:
  - "Expired" – dynamic data whose effective period has expired (for example, documents or macrotransactions).
  - "Closed" – manually deleted records or the records of closed contracts.
  - "Inactive" – records stored as the history of changes (see the section "Logging Changes in Grid Form Records" of the document "DB Manager User Management").
- Tables to be analysed and rules for analysis are determined by OpenWay.
- Backup of records with the "Closed", "Expired" or "Inactive" status can be enabled or disabled for every table to be analysed.
- Historical data is deleted and backed up during execution of three types of Housekeeping Engine tasks:
  - "Purge Expired" – task for records for which the term of storage has expired.
  - "Purge Closed" – task for records with the "Closed" status.
  - "Purge Inactive" – task for records with the "Inactive" status.

- The following task types are used for tables using Oracle partitioning:
  - "Drop Partition" –deletes the oldest partitions. If a partition to be deleted still contains data, this data will be safely moved to another partition and will not be lost.
  - "Create Partition" – creates new partitions.
- Housekeeping Engine tasks are executed according to a preconfigured schedule.
- Some PA-DSS requirements are fulfilled by Housekeeping Engine tools, for example, timely deletion of cryptographic data from the database or copying the Oracle audit journal, executed with a "Process Audit Log" task.

1.3 Storing Historical Data

Housekeeping uses Oracle Transportable Tablespaces technology to archive data; this technology has the following advantages:

- Transportable tablespaces can be easily detached from the database.
- Transportable tablespaces can be easily attached to the original database or to any other database.
- Various technologies such as Oracle Recovery Manager (RMAN), Oracle Export Utility and Oracle Data Pump can be used to archive transportable tablespaces.
- It takes very little time to copy data through a server process using simple SQL expressions.

For more information about this technology, see the section "Transporting Tablespaces Between Databases" of the document "Oracle® Database Administrator's Guide 12c Release 1" / "Oracle® Database Administrator's Guide 12c Release 2" / "Oracle® Database Database Administrator's Guide 18c"/ "Oracle® Database Database Administrator's Guide 19c".

2 Housekeeping Setup

Housekeeping setup consists of initializing default values and if necessary, configuring custom rules for execution of Housekeeping Engine tasks. To do so, use the "OpenWay → Housekeeping → Configuration" user menu group items.

2.1 Initializing Values for Housekeeping Engine Task Execution Rules

Housekeeping Engine tasks are executed according to rules specified for each database table.

Rule parameters include the following:

- Parameters whose values may only be changed by OpenWay:
  - Types of Housekeeping Engine tasks (see "Deleting Historical Data").
  - The list of operations used to analyse and delete historical data for each of the tables according to the Housekeeping Engine task type.
- Customizable parameters with values specified by default (see "Custom Parametrization of Housekeeping Engine Tasks"):
  - List of tables from which the Housekeeping Engine will delete historical data.
  - List of rules for analysing these tables' records that will be classified as historical data.
  - List of rules for analysing other tables' records related to the records of these tables, that will also be classified as historical data.
  - Length of the time interval after which data will be classified as historical, as well as the frequency with which the Housekeeping Engine task will be executed.

> ⓘ It is recommended that custom values always be assigned to these parameters.

- The Housekeeping Engine's default configuration contains rules for deleting values that may not be stored pursuant to PA-DSS. The names of these rules have the postfix "secured". The maximum length of the time interval after which these data must be deleted is one calendar day. Note that it is not permitted to change the length of the time interval for these values.
- Parameters affecting the database server load when executing Housekeeping Engine tasks (see "Parameters for Executing Operations Determining the Load on the Database Server (DB Parms Custom)");
- Parameters specifying whether records with the "Expire" and "Inactive" status must be backed up to the archive for each table.

> Before starting the Housekeeping module, assign default values to the parameters by selecting the menu item "OpenWay → Housekeeping → Configuration → Import Standard Settings".

The default values of parameters are shown in forms accessed by selecting the menu items "Tables View", "DB Parms View" and "Expire Parms View" in the "OpenWay → Housekeeping → Configuration" menu group.

2.2 Custom Parametrization of Housekeeping Engine Tasks

If custom parametrization of Housekeeping Engine tasks is required, it should be done as follows:

- For each type of Housekeeping Engine task (see the section "Deleting Historical Data"), set up standard and/or create additional rules determining the length of the time interval after which data will be classified as historical, as well as the frequency with which Housekeeping Engine tasks will be executed (see the section "Housekeeping Engine Task Parameters (Expire Parms Custom)").
- Instead of the standard rules, assign these additional rules to the required tables (see the section "Configuring Rules for Housekeeping Engine Tasks (Rules Cust)").

Moreover, the following additional actions may be taken:

- For each required table, assign a rule specifying whether it is necessary to back up records with the "Expired" and "Inactive" statuses to the archive (see the section "Assigning Rules to Database Tables (Tables Cust)").
- For each required table, assign a rule specifying the values of parameters that affect the database server load while Housekeeping Engine operations are executed on this table's data (see the section "Parameters for Executing Operations Determining the Load on the Database Server (DB Parms Custom)").

For the new rules to take effect, initialize the steps by selecting the menu item "OpenWay → Housekeeping → Configuration → Make Steps".

2.2.1 Housekeeping Engine Task Parameters (Expire Parms Custom)

By default, data for all tables is considered historical after it has been stored in the database for one year and Housekeeping Engine tasks are executed once a month.

There are two ways to modify the values:

- Change default values – the new values will be used for all tables using default values.
- Create a new rule specifying the value of the time interval and frequency of execution and use it as a custom rule for the required tables (see "Configuring Rules for Housekeeping Engine Tasks (Rules Cust)").

Rules for deleting values that may not be stored pursuant to PA-DSS are an exception. The names of these rules have the postfix "secured". The maximum length of a time interval after which these data will be deleted is one day.

> ⚠ Note that it is not permitted to change the length of the time interval for these values. It should also be noted that pursuant to PA-DSS requirements, audit log data (the SY_AUDIT_LOG table) must be stored in the database for no less than three months (see the section "Database Server Requirements" of the document "WAY4™ PA-DSS Implementation Guide"). Rules for archiving data from this table must be configured with consideration for this requirement.

The "Expire Parms Custom" form is used to configure task parameters (OpenWay → Housekeeping → Configuration → Expire Parms Custom).

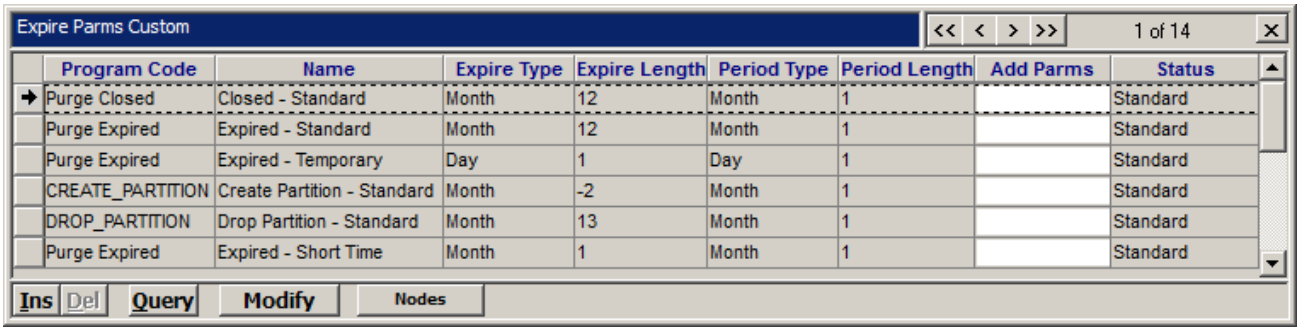


Fig. "Expire Parms Custom" form

This form contains the following fields:

- *Program Code* – type of Housekeeping Engine task (see "Deleting Historical Data").
- *Name* – rule name.
- *Expire Type* – units in which the time interval is measured (day, month, quarter, year), after which data will be classified as historical.
- *Expire Length* – length of the time interval.
- *Period Type* – units in which the frequency of Housekeeping Engine task execution are measured (day, month, quarter, year).
- *Period Length* – execution frequency value.
- *Add Parms* – field is reserved for forward compatibility.
- *Status* – rule status:
  - "Standard" – standard rule; default values are specified.
  - "Overriden" – standard rule, but custom values are specified.
  - "Custom" – custom rule.

To assign custom values to standard rules, select a rule and click the [Modify] button. The rule will be assigned the "Overriden" status, and the *Expire Type*, *Expire Length*, *Period Type* and *Period Length* fields will become editable.

If it is necessary to return to the default values, select a rule and click the [Restore] button.

> Note that the settings in the "Expire Parms Custom" form are used by default for all nodes on which WAY4 is installed. If it is necessary to use settings that differ from the default ones for a certain parameter in a certain node, use the [Nodes] button. Clicking this button opens the "Nodes for..." child form in which the corresponding node may be specified for the selected parameter and the values required for this node.

The [Ins] button of the "Expire Parms Custom" form is used to add custom rules. For the new rules to take effect, initialize the steps by selecting the menu item "OpenWay → Housekeeping → Configuration → Make Steps".

2.2.2 Configuring Rules for Housekeeping Engine Tasks (Rules Cust)

The "Rules Cust" form, opened by selecting the menu item "OpenWay → Housekeeping → Configuration → Rules Cust", is used to assign rules to tables specifying the time interval after which data will be classified as historical and the frequency of Housekeeping Engine task execution.

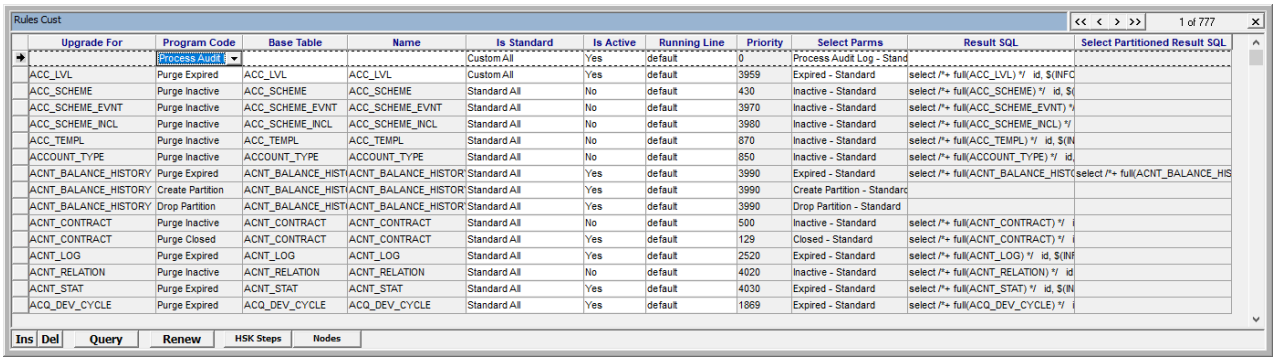


Fig. "Rules Cust" form

To assign a custom rule to a Housekeeping Engine task type, select the record with the name of the required task type in the *Program Code* field and the required table in the *Name* field; in the *Is Standard* field, select a value with the "Custom" prefix. The corresponding form fields will become editable.

Possible values:

- "Standard All" – default parameters.
- "Custom Params", "Standard SQL" – if this option is selected, the Select Parms field becomes editable. This field can be used to specify parameters for determining when data becomes historical for the selected table. These parameters are set earlier using the form "Expire Parms Custom" (see "Housekeeping Engine Task Parameters (Expire Parms Custom)").
- "Custom Params and SQL" – when this option is selected, the Select Parms and Result SQL fields become editable. The former makes it possible to specify parameters for determining when data becomes historical for the selected table. These parameters are set earlier using the "Expire Parms Custom" form. The latter is used to make changes in the template for executing the SQL expression generated for string selection.
- "Custom All" – the fields Select Parms, Result SQL and Program Code become editable.

Note that it is recommended to change standard rules with the approval of OpenWay, as such changes may lead to automatic upgrade of rules being impossible when upgrading the system.

Specifying the "No" value in the *Is Active* field prohibits the execution of a custom or standard rule.

The *Running Line* field specifies the name of the stream in which the task is being executed (see "Settings for Running Lines"). When filling in this field, consider the sequence in which dependent tasks are executed; for example, do not delete records from the DOC table (documents) before deleting from the M_TRANSACTIONS table (macrotransactions). Rules that depend on one another should be included in the same stream.

In the *Priority* field, specify the priority of the selected task. Usually, tasks are executed in the following order: first, those that are frequently executed, then overdue tasks, then tasks with a higher priority (in descending order of priority). This means that, for example, "Drop Partition" is executed later than "Purge Expired" since "Purge Expired" has a higher priority than "Drop Partition".

For the new rules to take effect, initialize the steps by selecting the menu item "OpenWay → Housekeeping → Configuration → Make Steps".

The [Ins] button is used to add custom rules. Custom rules are created with the agreement of OpenWay.

The [HSK Steps] button opens the "HSK Steps for <table name>" form. This form contains information about operations executed as part of this task for the current table.

The [Renew] button is used to initialize values for one (selected) table. The button can be used instead of the menu item "OpenWay → Housekeeping → Configuration → Make Steps" when rules are changed for a specific table.

> Note that the settings in the "Rules Cust" form are used by default for all nodes on which WAY4 is installed. If it is necessary to use settings differing from the default ones for a certain rule in a certain node, use the [Nodes] button. Clicking this button opens the "Nodes for..." child form in which the corresponding node can be specified for the selected operation and the values required for this node.

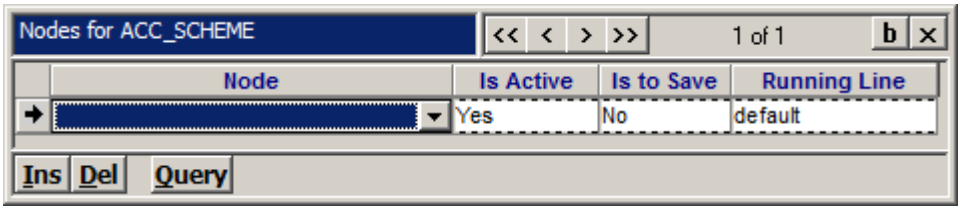


Fig. Setting a rule for a specific node

By selecting "Yes" in the *Is To Save* field, it is possible to redefine existing default settings and specify that data will be archived when the rule is executed. The recommended value for this field is "No".

2.2.3 Assigning Rules to Database Tables (Tables Cust)

To open the "Tables Cust" form, select the menu item "OpenWay → Housekeeping → Configuration → Tables Cust".

In the "Tables Cust" form, backup rules can be assigned to the required tables. Obsolete records with the "Expired" or "Inactive" status which otherwise will be deleted by the Housekeeping Engine are backed up. Other parameters are also available.

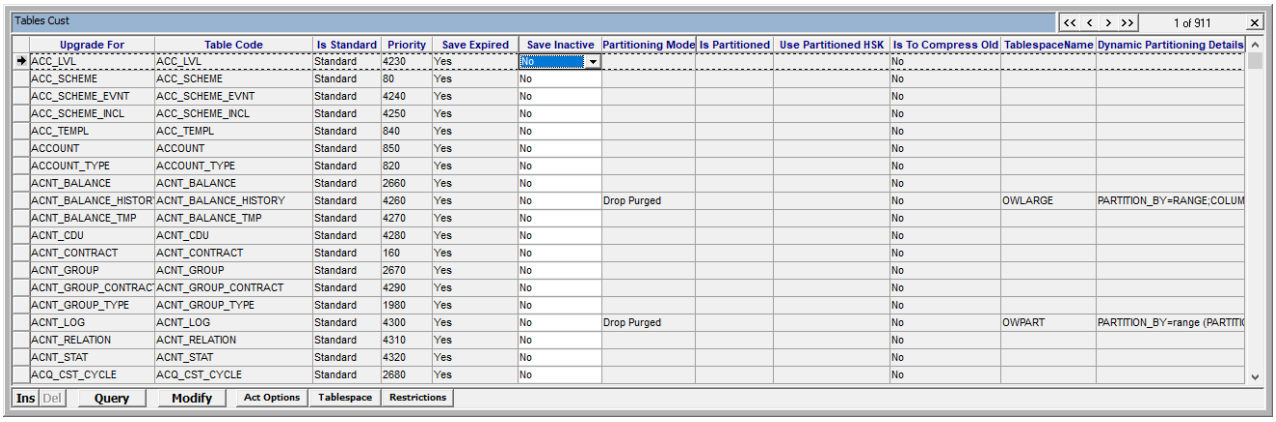


Fig. "Tables Cust" form

This form contains the following fields:

- *Upgrade for* – name of the table to which the rule is assigned.
- *Table Code* – table name.
- *Is Standard* – indicates whether a record was changed:
  - "Standard" – standard record (default record).
  - "Upgrade" – the record was changed. The *TablespaceName* and *Dynamic Partitioning Details* fields can be edited.
  - "Custom" – custom record.
- *Priority* – the priority for processing the table. Tables are processed in descending order of priority.
- *Save Expired* – flag specifying whether to back up historical data with the "Expired" and "Closed" status (if no value is specified, data will be backed up by default).
- *Save Inactive* – flag specifying whether to back up historical data with the "Inactive" status (if no value is specified, data will be backed up by default).
- *Partitioning Mode* – this field is used for tasks related to table partitioning. Possible values:
  - "Drop Purged" – before deleting partitions data must be deleted by the Housekeeping Engine.
  - "Drop with Data" – partitions are deleted together with data.
- *Is Partitioned* – indicates whether the table is partitioned.
- *Use Partitioned HSK* – reserved for forward compatibility.
- *Is To Compress Old* – reserved for forward compatibility.
- *Tablespace Name* – tablespace name.
- *Dynamic Partitioning Details* – tablespace parameters.

The [Ins] button is used to add custom rules.

To assign custom values to standard rules, select the rule's record and click [Modify]. The rule will be assigned the "Upgrade" status, and the fields*TablespaceName* and *Dynamic Partitioning Details* will become editable.

If it is necessary to restore the default values, select the rule's record and click [Restore].

- If the *Is Standard* field contains the value "Standard", values are restored for the fields *Partitioning Mode*, *TablespaceName* and *Dynamic Partitioning Details*.

- If the *Is Standard* field contains the value "Upgrade", values for the following fields are restored:
  - *Partitioning Mode*
  - *TablespaceName*, if the field is empty and a default value is filled in. A warning is additionally written to the message log, menu item "Full → Process Log → Messages".
  - *Dynamic Partitioning Details*, if the field is empty and a default value is filled in. A warning is additionally written to the message log, menu item "Full → Process Log → Messages".
- Regardless of the *Is Standard* field value:
  - If the *Save Expired* field is empty, the default value is restored.
  - If the *Save Inactive* field is empty, the default value is restored.
  - If the default value of the *Save Expired* field is "No":
    - The value of the *Save Expired* field is set to "No".
    - The value of the *Save Inactive* field is set to "No".
    - A warning is additionally written to the message log, menu item "Full → Process Log → Messages".

The same actions are performed when the menu item "OpenWay → Housekeeping → Configuration → Import Standard Settings" is selected.

To set rules for partitioning custom tables, do as follows:

- Click the [Ins] button. Fill in the *Partition Mode*, *Is Partitioned*, *TablespaceName* and *Dynamic Partitioning Details* fields for the rule.
- In the "Rules Cust" form, create rules for the "Create Partition" and "Drop Partition" tasks for the table (see"Configuring Rules for Housekeeping Engine Tasks (Rules Cust)").
- Run the menu item "OpenWay → Housekeeping → Configuration → Make Steps".

> To get the value of the *Dynamic Partitioning Details* field for a specific table, contact OpenWay. For tables that require partitioning, the RANGE_TYPE tag must be set. The delay between the creation of each partition is set in seconds by the PARTITIONING_PAUSE parameter. The default value is 3 seconds.

The [Act Options] button is used to open the "Act Options for <DB table name>" form.

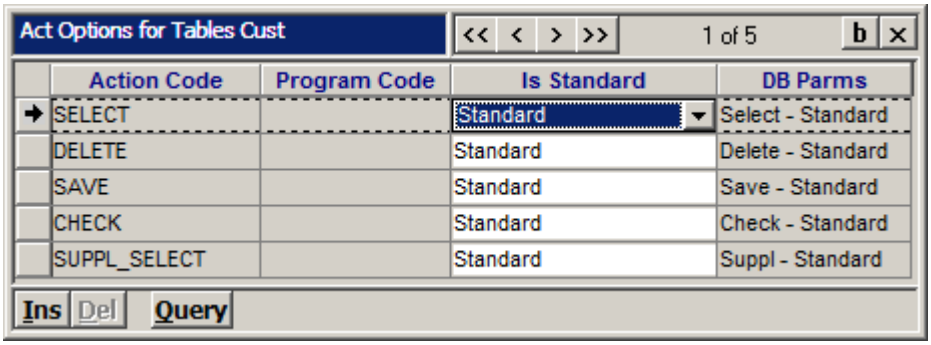


Fig. Relation of operations to parameters determining the DB server load

This form allows every operation connected with a table to specify a value in the *DB Parms* field, determining the load on the database server when executing the operation (see the section "Parameters for Executing Operations Determining the Load on the Database Server (DB Parms Custom)").

The [Tablespace] button allows a transportable tablespace to be specified for the table (see the section "Tablespace Group Transportable Tablespaces").

The [Restrictions] button is used to open the "Restrictions for <DB table name>" form in which restrictions can be set on operations with linked records.

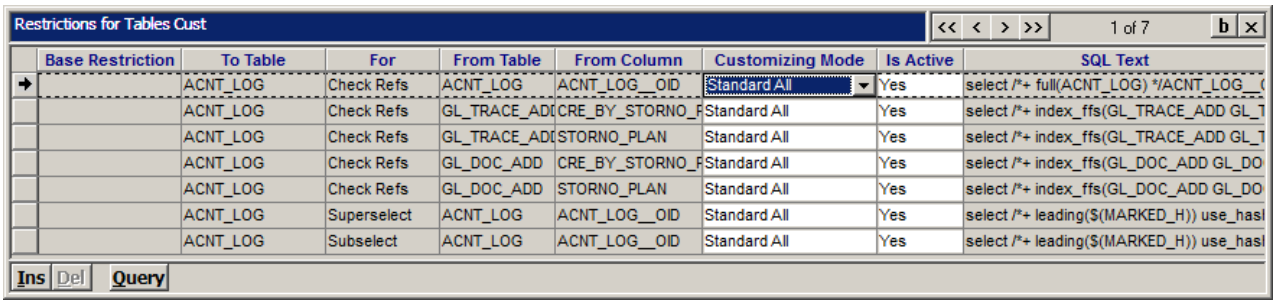


Fig. Configuring restrictions on operations with linked records

In the *To Table* field of this form, specify the name of the table on the records of which restrictions are being set.

In the *From Table* field, specify the name of the table containing records linked with those of the original table. The records of these tables are linked through a column (the name of which is specified in the *From Column* field) of the table specified in the *From Table* field.

Restriction types are set in the *For* field:

- "Subselect" – when deleting a record from the original table, linked records from the table specified in the From Table field are also deleted.
- "Check Refs" – before deleting records from the original table, a check is made for references to these records from the table specified in the From Table field; if such references are found, records from the original table are not deleted.

2.2.4 Parameters for Executing Operations Determining the Load on the Database Server (DB Parms Custom)

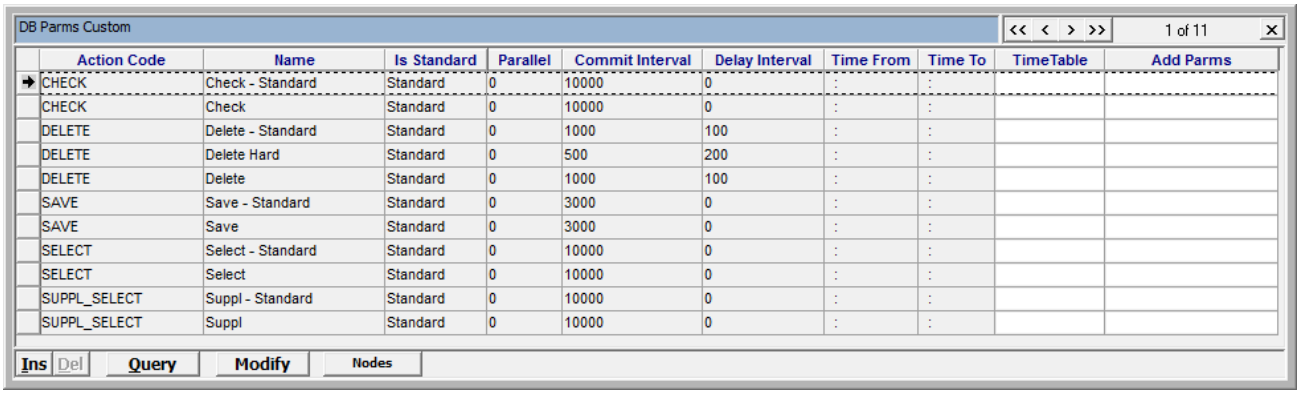
The "DB Parms Custom" form, opened by selecting the menu item "OpenWay → Housekeeping → Configuration → DB Parms Custom", is used to configure rules for executing operations. These rules are used to specify the values of parameters affecting the database server load. For example, some operations that significantly increase the database server load should be executed at night when the increased load will not affect the processing of other operations.

Note that the values of these parameters should only be modified if database server performance is low.

There are two ways to modify the parameter values of the rules for processing historical data in different tables:

- Change default values – the new values will be used for all tables using default values.

- Create a new set of parameters and specify this as a custom set for the required tables (see "Assigning Rules to Database Tables (Tables Cust)").


DB Parms Custom

<< < > >> 1 of 11

Action Code	Name	Is Standard	Parallel	Commit Interval	Delay Interval	Time From	Time To	TimeTable	Add Parms
CHECK	Check - Standard	Standard	0	10000	0	:	:		
CHECK	Check	Standard	0	10000	0	:	:		
DELETE	Delete - Standard	Standard	0	1000	100	:	:		
DELETE	Delete Hard	Standard	0	500	200	:	:		
DELETE	Delete	Standard	0	1000	100	:	:		
SAVE	Save - Standard	Standard	0	3000	0	:	:		
SAVE	Save	Standard	0	3000	0	:	:		
SELECT	Select - Standard	Standard	0	10000	0	:	:		
SELECT	Select	Standard	0	10000	0	:	:		
SUPPL_SELECT	Suppl - Standard	Standard	0	10000	0	:	:		
SUPPL_SELECT	Suppl	Standard	0	10000	0	:	:		

Ins Del Query Modify Nodes

Fig. "DB Parms Custom" form

This form contains the following fields:

- *Action Code* – type of operation executed with the table data:
  - "SELECT" – select data that will presumably be deleted.
  - "SUPPL_SELECT" – select data from child tables of the current table that will presumably be deleted.
  - "CHECK" – check for the existence of references to the selected data; if no references to the selected data are found, the data are marked for deletion; if references are found, data will not be deleted until the records referring to them are deleted.
  - "SAVE" – back up data marked for deletion.
  - "DELETE" – delete marked data.
  - "PROCESS_AUDIT_LOGS" – copy the audit log (for more information, see the document "Auditing Work with the Database in WAY4™").
  - "CREATE_PARTITION" – create partitions.
  - "MOVE_OLD_DATA" – move obsolete data.
  - "DROP_PARTITION" – delete partitions.
  - "COMPRESS_PARTITION" – compress partitions.
  - "SHRINK_COLS" – shrink collections.
- *Name* – name of operation execution rule.
- *Is Standard* – rule status:
  - "Standard" – standard rule; default values are specified.
  - "Overriden" – standard rule, but custom values are specified.
  - "Custom" – custom rule.
- *Parallel* – field reserved for forward compatibility.
- *Commit Interval* – number of elementary operations executed within one database transaction. For example, in the case of a "delete" operation, on the one hand, the higher the value, the faster the

operation is executed, and on the other hand, the size of the undo segment increases and consequently, the database load.

- *Delay Interval* – Housekeeping Engine process downtime after each executed transaction (milliseconds). On the one hand, the higher the value, the slower the operation is executed and on the other hand, the database server load decreases.
- *Time From* – time from which the operation may be executed, if the *Time Table* field is not filled in.
- *Time To* – time until which the operation may be executed, if the *Time Table* field is not filled in.
- *Time Table* – field to specify the time interval/intervals when the Housekeeping Engine process can be run.
- *Add Parms* – reserved for forward compatibility.

The *Time Table* field contains time intervals separated by a ";" character. Each interval consists of the following components:

- Sequence number of the day of the week or a letter to indicate working days ("W") and holidays/weekends ("H"), separated by a "," or "-" character.
- ":" character separating the specified day of the week from the time interval allowed for this day (in hours and minutes).
- Time intervals in hours and minutes in "HHMM-HHMM" format, separated by a "," character.

If a day/days of the week are set, but no time interval is specified, this means that there are no time restrictions on running the process during that day.

A sequence number's correspondence to a day of the week (for example, whether the first day of the week is Sunday or Monday) is determined by the value of the NLS_TERRITORY parameter set in the DB instance.

Examples of filling in the *Time Table* field:

Example 1.

```
1,3-5:0900-1300,1400-1800;6-7:1800-0100;
```

In this case, the process can be run on the first day of the week, and from the third to the fifth days of the week from 09:00 to 13:00 and from 14:00 to 18:00; on the sixth and seventh days of the week from 18:00 to 01:00 of the next day.

Example 2.

```
W:-1300,1400-1800;H:1800-0100;
```

In this case, the process can be started on working days until 13:00 and from 14:00 to 18:00; on weekends/holidays from 18:00 to 01:00 of the next day.

Usually processes are completed at the end of the interval. If no interval is set, then after running for 24 hours. The global parameter <ProcessName>.NON_STOP_HOURS makes it possible to set up the execution of lengthy processes (more than 24 hours) without interruption. The number of hours during which this process can be run uninterrupted is specified as the parameter's value. The default value is 24 hours.

To assign custom values to standard rules, select the required rule and click the [Modify] button. The rule will be assigned the "Overriden" status and the fields *Commit Interval*, *Delay Interval*, *Time From, Time To*, *Time Table* and *Add Parms* will be available for editing.

If it is necessary to return to the default values, select the required rule and click the [Restore] button.

The [Ins] button is used to add custom rules.

For the new rules to take effect, initialize the steps by selecting the menu item "OpenWay → Housekeeping → Configuration → Make Steps".

> Note that the settings in the "DB Parms Custom" form are used by default for all nodes on which WAY4 is installed. If it is necessary to use settings differing from the default ones for a certain operation in a certain node, use the [Nodes] button. Clicking this button opens the "Nodes for..." child form in which the corresponding node can be specified for the selected operation and the values required for this node.

2.2.5 Tablespace Group Transportable Tablespaces

In the Housekeeping module, Oracle Transportable Tablespaces technology is used to store historical data.

Settings for using this technology are configured in the "Tablespace Group" form, opened by selecting the menu item "OpenWay → Housekeeping → Configuration → Tablespace Group".

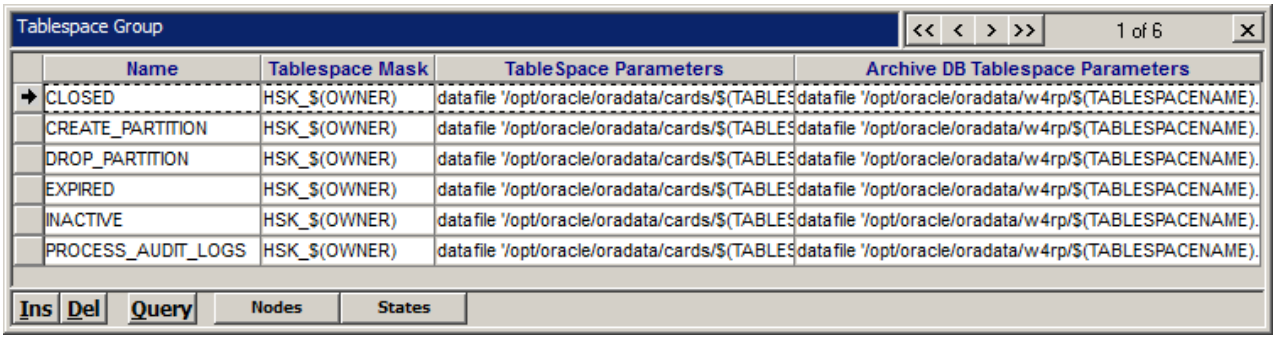


Fig. Configuring transportable tablespaces

This form contains the following fields:

- *Name* – name of tablespace group.
- *Tablespace Mask* – mask used to name the transportable tablespace in the database.
- *TableSpace Parameters* – transportable tablespace parameters.
- *Archive DB Tablespace Parameters* – parameters used to work with the archive database (contact OpenWay for additional information).

> Note that settings in the "Tablespace Group" form are used by default for all nodes on which WAY4 is installed. If it is necessary to use settings differing from the default ones for a tablespace group in a certain node, use the [Nodes] button. Clicking this button opens the "Nodes for..." child form in which the corresponding node can be specified for the selected tablespace group and the values required for this node
> Before upgrading the DB server to Oracle 19c, check the sizes of tablespace data files in the fields *TableSpace Parameters* and *Archive DB Tablespace Parameters*. The minimum supported data file size is 12 MB for tablespaces with a block size of 32 KB and 7 MB for tablespaces with a block size of 8 KB.

The name of the tablespace group is specified when rules are assigned to database tables (see "Assigning Rules to Database Tables (Tables Cust)"). This technology makes it possible to configure the storage of data from different database tables in different transportable tablespaces.

A tablespace is created using the following statement:

```
CREATE TABLESPACE <TTS_NAME>
<CUSTOM PART>
```

<TTS_NAME> is generated based on the value of the *Tablespace Mask* field in the "Tablespace Group" form. The following values are permissible when describing the mask:

- $(OWNER) – the first characters of the <OWS_Owner> name.
- $(PROGRAM) – the first characters of the Housekeeping program name (for example, EXP or Expire).
- $(CURRENTDATE) – the current date.

By default, the mask value is equal to "$(OWNER)$(PROGRAM)_$(CURRENTDATE)". A postfix consisting of an underline character "_" and the WAY4 version number is added to the tablespace name.

For example, the name of a tablespace generated on the basis of a mask by default may appear as follows: "OWSEXP_20120907_0334".

<CUSTOM PART> is specified in the *TableSpace Parameters* field. This part of the CREATE_TABLESPACE statement is used to create tablespace files, for example:

```
datafile 'D:\app\mydb\oradata\myway\$(TABLESPACENAME)_01.dbf' size 10m autoextend on
next 10m maxsize  32767m
```

When a tablespace is created, the name of this tablespace, for example "OWSEXP_20120907_0334_01", will be used instead of the value "$(TABLESPACENAME)".

To create tablespaces with big data files (BIGFILE), specify the comment /*BIGFILE*/ in the *TableSpace Parameters* field.

If a tablespace name must be entered manually, select the tablespace group and click the [States] button. As a result, the "States for ..." form will be displayed

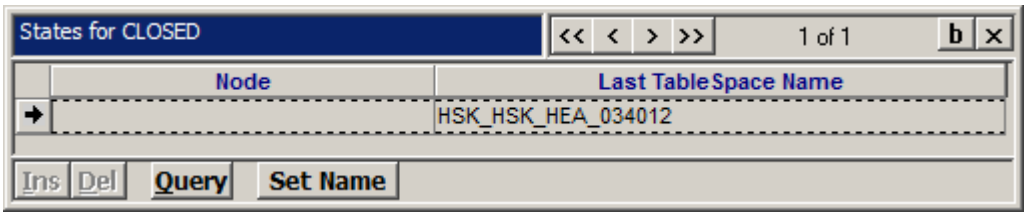


Fig. Tablespace state

The name of the last tablespace that was created is automatically specified in the *Last Table SpaceName* field of this form.

To manually enter the tablespace name, click the [Set Name] button and specify the required value in the *New Tablespace Name* field of the "Set Tablespace Name" form that opens.

Tablespace names must in uppercase and contain the WAY4 system version number (for example "TS_0349").

Basic commands for administering tablespaces are provided in "Administering Transportable Tablespaces".

2.2.6 Settings for Running Lines

The Housekeeping R2 module makes it possible to execute tasks in several streams by specifying during configuration of task execution rules the name of the stream in which the task must be executed (see the section "Configuring Rules for Housekeeping Engine Tasks (Rules Cust)"). Usually, the Housekeeping Engine works with one set of tables, executing one operation with one table at a time. When running lines are used, it becomes possible to separate the general list of processed tables into several sets that are unconnected according to referential integrity. Each stream processes its set of tables.

Use of running lines makes it possible to increase the speed of Housekeeping. An effect can only be achieved if the database server and disk subsystem have enough capacity.

Task execution streams are registered in the "Running Lines" form, opened by selecting the menu item "OpenWay → Housekeeping → Configuration → Running Lines".

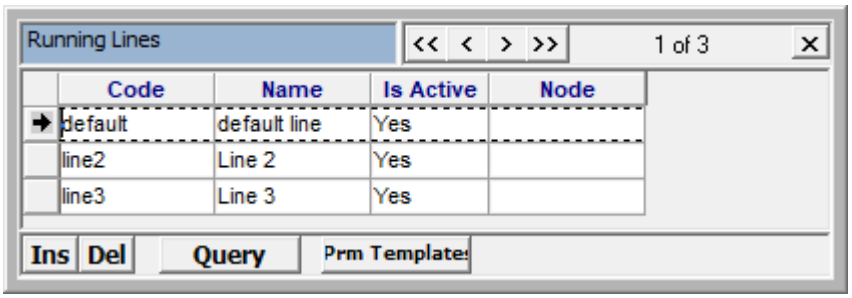


Fig. Registering task execution streams

In this form, register the required number of streams for parallel processing of tasks.

Clicking the [Prm Templates] button opens a form to set process parameters. For more information about setup and parameters that are used, see the document "Running WAY4™ Processes in Parallel".

Consult OpenWay representatives to determine rules for each stream.

2.3 Running Housekeeping Module Processes in Parallel

Housekeeping module processes can be run in parallel.

The following options are supported:

- Standard Parallel Run.
- Single SQL Query Mode.

2.3.1 Standard Parallel Run

In the standard mode for running a parallel process, the required number of Oracle jobs is created. Data are read directly from the table being processed, records are distributed between threads based on a hash expression (by default, records in one physical block of objects being processed will go into one thread).

The parameters for standard parallel run are described in the section "Standard Parallel Run" of the document "Running WAY4™ Processes in Parallel".

The parameters of the "HSK.main" process that are specific for parallel run are given in the table below.

To use distribution of records between threads based on the number of buckets (number of subpartitions in DM_RECORD_LF), the DM_RECORD_LF table must be repartitioned. For detailed information, see the section "Repartitioning the DM_RECORD_LF Table" of the document "Running WAY4™ Processes in Parallel".

Table Parameters of the "HSK.main" process that are specific for parallel run

Name	Description	Values	Default value
<TABLE_NAME>.LF	Operation mode with the DM_RECORD_LF collection: – A – previously set collection is used. – N –DM_RECORD is used instead of DM_RECORD_LF. – Y – each collection in a separate partition. – S – one common partition DM_RECORD_LF for all HSK collections for one table.	Y/N/A/S	A
<TABLE_NAME>.LF_BUCKETS	Number of buckets (number of subpartitions in DM_RECORD_LF). It is recommended that the number of threads be a multiple of the number of buckets (for example, 30 threads for 3 buckets).	Number	1

If the Housekeeping module will be run on a database server without the "Oracle Partitioning" option (including when Oracle Standard Edition is used), before starting the Housekeeping Engine, it is necessary to delete all "<TABLE_NAME>.LF" parameters for the "HSK.main" process in the "Process Parameters" form, menu item "Full → Configuration Setup → Main Tables → Process Parameters".

For the "HSK.CHECK" process, additional hints for the optimizer can be set in the form of process parameters:

- The process name is as follows: HSK.<PROGRAM_CODE>.CHECK.<TABLE_NAME> (where <PROGRAM_CODE> is the job type, <TABLE_NAME> is the table name).
- The parameter name can be obtained from the text of the SQL query in the *Result SQL* field of the "HSK Steps for <table name>" form called from the "Rules Cust" form with the [HSK Steps] button. Parameters have the following name: HINT_<LINK_TABLE_NAME>.<LINK_COLUMN> (where <LINK_TABLE_NAME> is the name of the table that refers to the table <TABLE_NAME>, <LINK_COLUMN> is the column name).

For example, for the process "HSK.EXPIRED.CHECK.SERVICE_APPROVED", the following parameters can be set:

- "HINT_SERVICE_APPROVED.PARENT_SERVICE"
- "HINT_DOC.TARGET_SERVICE"

- "HINT_DOC.SOURCE_SERVICE"
- "HINT_M_TRANSACTION.SOURCE_SERVICE"
- "HINT_M_TRANSACTION.TARGET_SERVICE"
- "HINT_GL_TRACE.CR_SERVICE"
- "HINT_GL_TRACE.DR_SERVICE"

The full list of parameters for setting hints for the "HSK.CHECK" process can be obtained using the following query:

```
select * from HSK_STEP t
where t.result_sql like '%HINT\_%' ESCAPE '\';
```

To disable/enable shrinking the DM_RECORD_LF collection, the process parameter "<TABLE_NAME>.SHRINK_COLS" with "Y/N" is used for the "HSK.main" process. By default, shrinking collections is enabled. In the process parameters MOVE_PART_ATTRS and UPD_INDEX_ATTRS, parameters are specified for moving subpartitions for the following SQL code:

```
SqlText := 'alter table ' || StorageTableLf
  || ' move subpartition ' || s.subpartition_name || ' ' || MOVE_PART_ATTRS
  || ' update indexes ' || UPD_INDEX_ATTRS;
```

2.3.2 Single SQL Query Mode

Single SQL query mode is used for processes where a query to select records for processing requires a significant amount of time and creates a large load on the system. Unlike standard mode, this mode makes it possible to execute such a query only once, instead of as many times as there are processes.

In this mode, the result of data selection is inserted into the table in an sql statement "insert from select" instead of processing data in parallel jobs. Data are inserted in the "append" and "nologging" modes, which substantially reduces the load on the system.

Single SQL query mode is supported for the following Housekeeping module processes:

- "HSK.SELECT"
- "HSK.SUPPL_SELECT"
- "HSK.SAVE"

Single query mode is not compatible with some WAY4 processes (for example the document acceptance process will fail if it is run simultaneously with the Housekeeping module process in single query mode for the DOC table). The specific list of these WAY4 processes must be examined.

Single SQL query mode only works for SQL queries that have the /*DMAPIVER 2 */ hint.

All parameters from standard mode are used in single SQL query mode, except the PARALLEL parameter. Insert is performed in one thread. If necessary, SQL statement performance can be enhanced by using Oracle Parallel Query.

The affected partition's indexes are disabled during insert. After insert, they are rebuilt.

Single SQL query mode is enabled by setting the SINGLE_SQL parameter to "Y". The mode works with the DM_RECORD_LF table only, i.e. the <TABLE_NAME>.LF parameter must be set to "S" or "Y".

The table below shows the process parameters that are specific to single SQL query mode.

Table Process parameters specific to single SQL query mode

Name	Description	Values	Default value
SINGLE_SQL	If "Y", single SQL query mode is activated.	Y/N	N
SELECT_HINT	Added as a hint to the main select operator or to the select part of insert select when selecting records from a table being processed. It is recommended for enabling Oracle Parallel Query.	/*+ any sql hints */	null
INSERT_HINT	Added as a hint to the insert operator when inserting records to DM_RECORD_LF. It is recommended for enabling Oracle Parallel Query.	/*+ any sql hints */	/*+ append */
REBUILD_INDEX_OPTS (for the "HSK.SELECT" and "HSK.SUPPL_SELECT" processes only)	Added in a tail of the alter index rebuild subpartition XXXX <Rebuild Index Options>.	String	null

3 Managing Housekeeping

In the Housekeeping R2 module, Housekeeping Engine server process tasks are executed automatically according to a predefined schedule. For this to happen, the administrator must do as follows:

- Set up a task execution schedule.
- Start the Housekeeping Engine process.
- If necessary, for example, to reinitialize parameters, stop the Housekeeping Engine process.

3.1 Configuring the Housekeeping Engine Task Execution Schedule (Global Parms)

To configure the schedule for executing Housekeeping Engine tasks, open the "Global Parms" form by selecting the menu item "OpenWay → Housekeeping → Runtime → Global Parms".

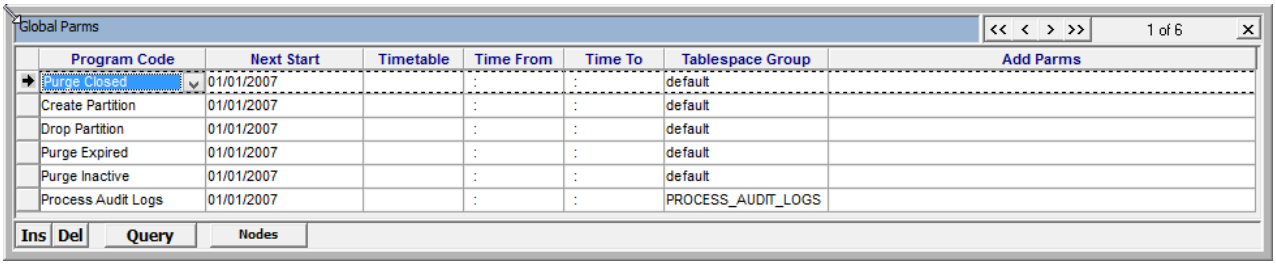


Fig. Form for configuring the Housekeeping Engine task execution schedule

This form contains the following fields:

- *Program Code* – type of Housekeeping Engine task (see "Deleting Historical Data").
- *Next Start* – date of next task start; note that when starting the parameter initialization process for the first time (see "Initializing Values for Housekeeping Engine Task Execution Rules"), all records in this field are assigned the value "00/00/0000". Therefore, before first starting the Housekeeping Engine, the next start date must be manually specified. Further, the start time will be determined by settings in the "DB Parms Custom" form (see "Parameters for Executing Operations Determining the Load on the Database Server (DB Parms Custom)"). If for some reason execution of Housekeeping Engine tasks must be suspended, this can be done by editing the value in this field.
- *Timetable* – field to specify the time interval/intervals when the Housekeeping Engine process can be run. This field contains time intervals separated by a ";" character. Each interval consists of the following components:
  - Sequence number of the day of the week or a letter to indicate working days ("W") and holidays/weekends ("H"), separated by a "," or "-" character.
  - ":" character separating the specified day of the week from the time interval allowed for this day (in hours and minutes).
  - Time intervals in hours and minutes in "HHMM-HHMM" format, separated by a "," character.

- If a day/days of the week are set but no time interval is specified, this means there are no time restrictions on running the process during that day. A sequence number's correspondence to a day of the week (for example, whether the first day of the week is Sunday or Monday) is determined by the value of the NLS_TERRITORY parameter set in the DB instance.

- *Time From* – starting time of task execution.
- *Time To* – ending time of task execution.

> Note that it is not recommended to edit the value in these fields. If it is necessary to execute specific operations on data that reduce system performance, at a strictly defined time assign custom values to the parameters in the "DB Parms Custom" form (see "Parameters for Executing Operations Determining the Load on the Database Server (DB Parms Custom)).

- *Tablespace Group* – name of the transportable tablespace group (see "Tablespace Group Transportable Tablespaces").
- *Add Parms* – reserved for forward compatibility.

Examples of filling in the *Timetable* field:

Example 1.

```
1,3-5:0900-1300,1400-1800;6-7:1800-0100;
```

In this case, the process can be run on the first day of the week, and from the third to the fifth days of the week from 09:00 to 13:00 and from 14:00 to 18:00; on the sixth and seventh days of the week from 18:00 to 01:00 of the next day.

Example 2.

```
W:-1300,1400-1800;H:1800-0100;
```

In this case, the process can be started on working days until 13:00 and from 14:00 to 18:00; on weekends/holidays from 18:00 to 01:00 of the next day.

3.2 Starting the Housekeeping Engine Process

The Housekeeping Engine process is started by selecting the menu item "OpenWay → Housekeeping → Runtime → Start Housekeeping".

3.3 Stopping the Housekeeping Engine Process

The Housekeeping Engine process is stopped by selecting the menu item "OpenWay → Housekeeping → Runtime → Stop Housekeeping". As a result, tasks being executed at the time the menu item is

selected will also be stopped. When the Housekeeping Engine is restarted, the interrupted tasks will automatically continue to executing starting with the operation being processed at the time of interruption.

3.4 Clearing Collections

When rules for a Housekeeping Engine task are changed, if there are already records selected for being processed by the old rule, the corresponding collections must be cleared.

For example, when the storage period is increased, if there are already records selected for deletion according to the old period, the following steps must be taken:

- Stop the Housekeeping Engine process using the menu item "OpenWay → Housekeeping → Runtime → Stop Housekeeping".
- Clear the collection. The "Collections" form opened by selecting the menu item "OpenWay → Housekeeping → Runtime → Collections" is used to clear collections. Select the required collection and click the [Clear] button.
- Initialize the steps of the task's parameters by selecting the menu item OpenWay → Housekeeping → Configuration → Make Steps".
- Start the Housekeeping Engine process by selecting the menu item "OpenWay → Housekeeping → Runtime → Start Housekeeping".

4 Working with the WAY4 Housekeeping Module during System Upgrade

When upgrading WAY4, proceed as follows:

- Stop the Housekeeping Engine process.
- Upgrade WAY4.
- Start the Housekeeping Engine process.

5 Monitoring Housekeeping

This chapter describes tools for monitoring Housekeeping operations.

5.1 "Rules TimeTable" Form

The "Rules TimeTable" form is used to monitor the execution of all types of Housekeeping Engine tasks for all tables. This form is opened by selecting the menu item "OpenWay → Housekeeping → Runtime → Rules TimeTable".

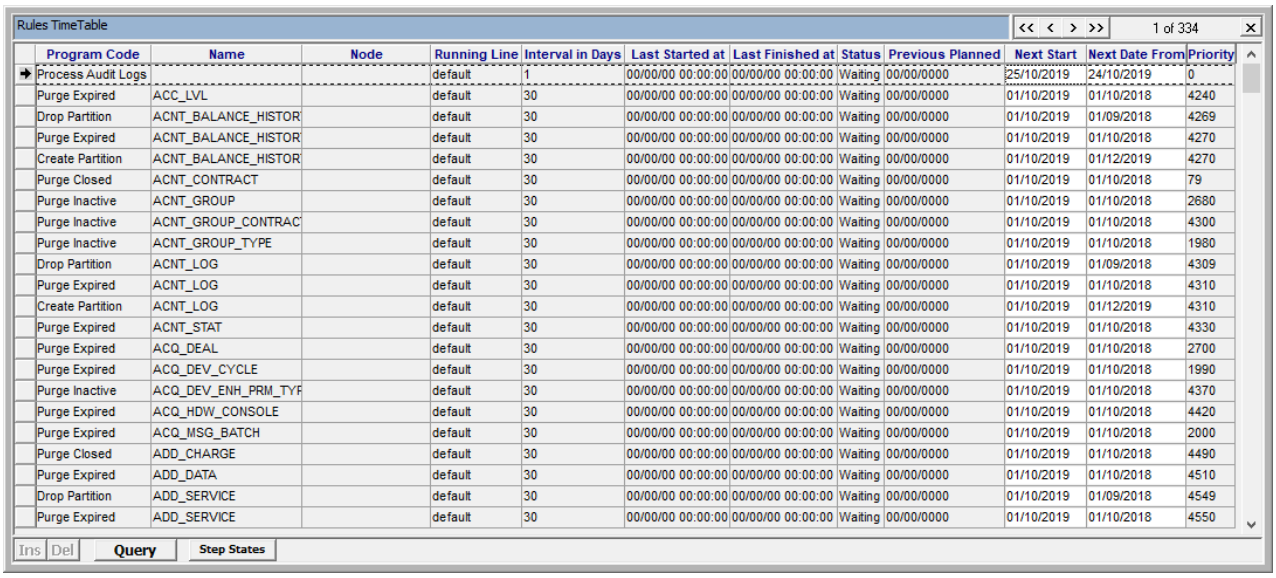


Fig. Form for monitoring execution of Housekeeping Engine tasks

This form contains the following fields:

- *Program Code* – task type.
- *Name* – name of DB table.
- *Node* – name of the node on which the task is executed.
- *Running Line* – name of the stream in which the task is executed (see "Settings for Running Lines").
- *Interval in Days* – interval for executing the task, in days.
- *Last Started at* – date when the task was last executed.
- *Last Finished at* – date on which the task was last finished.
- *Status* – task execution status:
  - "In Work" – task is currently being executed.
  - "Waiting" – task is waiting to be executed.
- *Previous Planned* – previous date on which the task was executed.
- *Next Start* – date when the task will be executed next.

- *Next Date From* – date used to classify data as historical; meaning data created or modified before this date is historical. For the "Create Partition" program, this is the maximum date until which data can be inserted.
- *Priority* – task execution priority. Usually, tasks are executed in the following order: first, those that are frequently executed, then overdue tasks, then tasks with a higher priority (in descending order of priority).

Although the *Next Start* and *Next Date From* fields are editable, it is not recommended to manually change their values. These values are updated automatically according to specific rules (see "Configuring Rules for Housekeeping Engine Tasks (Rules Cust)").
If a task must be run immediately with new parameters, do as follows:

- Stop the Housekeeping Engine process with the menu item "OpenWay → Housekeeping → Runtime → Stop Housekeeping".
- For the necessary table (tables), specify the following in the "Rules TimeTable" form:
  - In the *Next Date From* field, specify the new data (for example, up to which partitions are created for the "Create Partition" task or up to which data are considered to be obsolete for "Purge Expired").
  - In the *Next Start* field, a date in the past.
- Start the Housekeeping Engine process with the menu item "OpenWay → Housekeeping → Runtime → Start Housekeeping".

To determine that a process has completed and is waiting to be started again in the future, filter all records with the required name of the task type. The date in the *Next Start* field must be later than the current date. If there is even one record with a date that is earlier, the process has not been completed yet.

The [Step States] button is used to open the " Step States for <table name>", form, containing a list of operations executed by the Housekeeping Engine as part of this task.

Step States for PROCESS_LOG — 1 of 15

Step N	Status	Last Started at	Last Finished at	Action Code	Table Code	Ref Table	Result SQL	DB Parms	Additional Information
1	Waiting	28/05/19 11:32:52	28/05/19 11:32:52	SELECT	PROCESS_LOG	PROCESS_LOG	/*DMAPIVER 2 */select /*HINT full (t) */ t.id marked_id, dbm	Select - Standard	
2	Waiting	28/05/19 11:32:52	28/05/19 11:32:52	SUPPL_SELECT	PROCESS_LOG	PROCESS_LOG	/*DMAPIVER 2 */select /*HINT DM_FS $(MARKED_H) leadin	Suppl - Standard	
3	Waiting	28/05/19 11:32:52	28/05/19 11:32:52	SUPPL_SELECT	SY_PROC_PRM	PROCESS_LOG	/*DMAPIVER 2 */select /*HINT DM_FS $(MARKED_H) leadin	Suppl - Standard	
4	Waiting	28/05/19 11:32:52	28/05/19 11:32:52	SAVE	SY_PROC_PRM	SY_PROC_PRM	SAVE SY_PROC_PRM ...	Save - Standard	
5	Waiting	28/05/19 11:32:52	28/05/19 11:32:52	DELETE	SY_PROC_PRM	SY_PROC_PRM	DELETE SY_PROC_PRM ...	Delete - Standard	
6	Waiting	28/05/19 11:32:52	28/05/19 11:32:52	SHRINK_COLS	SY_PROC_PRM	SY_PROC_PRM		Shrink collections - Standard	
7	Waiting	28/05/19 11:32:52	28/05/19 11:32:52	SUPPL_SELECT	SY_PROC_AUX	PROCESS_LOG	/*DMAPIVER 2 */select /*HINT DM_FS $(MARKED_H) leadin	Suppl - Standard	
8	Waiting	28/05/19 11:32:52	28/05/19 11:32:52	SAVE	SY_PROC_AUX	SY_PROC_AUX	SAVE SY_PROC_AUX ...	Save - Standard	
9	Waiting	28/05/19 11:32:52	28/05/19 11:32:52	DELETE	SY_PROC_AUX	SY_PROC_AUX	DELETE SY_PROC_AUX ...	Delete - Standard	
10	Waiting	28/05/19 11:32:52	28/05/19 11:32:52	SHRINK_COLS	SY_PROC_AUX	SY_PROC_AUX		Shrink collections - Standard	
11	Waiting	28/05/19 11:32:52	28/05/19 11:32:52	CHECK	PROCESS_LOG	PROCESS_LOG	/*DMAPIVER 2 */select /*HINT_PROCESS_LOG.PROCESS_I	Check - Standard	
12	Waiting	28/05/19 11:32:52	28/05/19 11:32:53	SAVE	PROCESS_LOG	PROCESS_LOG	SAVE PROCESS_LOG ...	Save - Standard	
13	Waiting	28/05/19 11:32:53	28/05/19 11:32:53	DELETE	PROCESS_LOG	PROCESS_LOG	DELETE PROCESS_LOG ...	Delete - Standard	
14	Waiting	28/05/19 11:32:53	28/05/19 11:32:53	SHRINK_COLS	PROCESS_LOG	PROCESS_LOG		Shrink collections - Standard	
15	Waiting	28/05/19 11:32:53	28/05/19 11:32:53	FINISH	PROCESS_LOG	PROCESS_LOG			

Ins Del Query Process Log

Fig. List of operations executed in a task

The *DB Parms* field specifies the task execution rule defined for this table (see "Housekeeping Engine Task Parameters (Expire Parms Custom)").

The *Status* field may have one of the following values:

- "Waiting" – the operation is waiting to be executed.
- "Active" – the operation is being executed.
- "Posted" – the operation has been executed.

5.2 Process Log

The results of executing Housekeeping Engine tasks are logged in the process log (see the section "DB Manager Processes" of the document "DB Manager Manual").

The "HSK.main" value is specified in the *Process Name* field as the name of the main Housekeeping Engine process; operations executed as part of tasks are logged as child processes of the main process and have the prefix "HSK" in their names.

A record of the parameter initialization process (see "Initializing Values for Housekeeping Engine Task Execution Rules") contains the value "Renew HSK parms" in its name.

? Unknown Attachment

Fig. Logging execution of Housekeeping Engine tasks in the process log

> For quick identification of the reasons for failures and errors during Housekeeping Engine operation, it is recommended that an error report be provided to OpenWay (see the section ""Housekeeping Report"").

5.3 "Error Log" Form

The "Error Log" form, opened by selecting the menu item "OpenWay → Housekeeping → Runtime → Error Log", is used to analyse messages about errors that occurred during Housekeeping Engine operation.

Fig. Form with error messages

> If errors occur during Housekeeping Engine operation, contact OpenWay.

5.4 "Save Table Log" Form

The "Save Table Log" form, opened by selecting the menu item "OpenWay → Housekeeping → Runtime → Save Table Log" is used to obtain information about which transportable tablespaces store historical data from processed WAY4 database tables.

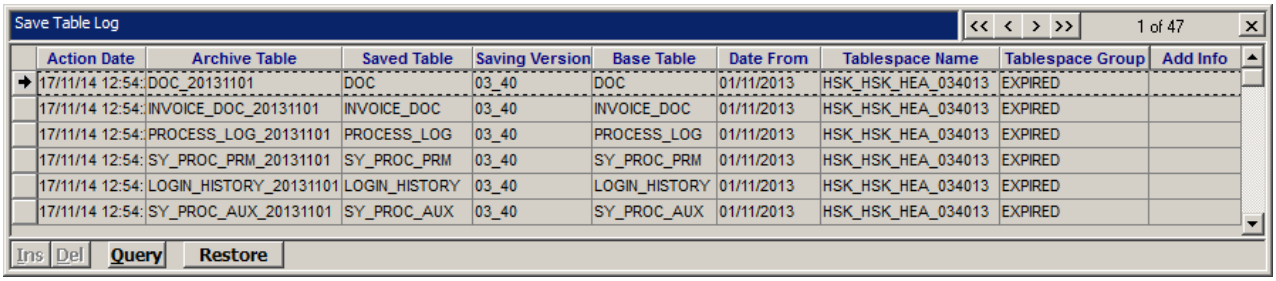


Fig. "Save Table Log" form

This form contains the following fields:

- *Action Date* – date of Housekeeping Engine task execution.
- *Archive Table* – name of table to which data is saved.
- *Saved Table* – name of table to which data is saved.
- *Saving Version* – WAY4 version to which saved data belongs.
- *Base Table* – name of the parent table for the table specified in the *Saved Table* field.
- *Date From* – date used to classify data as historical; meaning data created or modified before this date is historical.
- *Tablespace Name* – name of the transportable tablespace. Every time a Housekeeping Engine task is run, a tablespace is automatically created whose name also contains the date and time of its creation (see the section "Tablespace Group Transportable Tablespaces").
- *Add Info* – reserved for forward compatibility.

Since data are usually only archived on one WAY4 node, a field with the name of the node is not provided for.

The [Restore] button is used for emergency recovery of data that was deleted due to incorrect Housekeeping module settings. In this case, after settings have been corrected, these records will not be deleted or will be deleted later.

> After recovery, data remains in the archive tablespace and if settings are not changed, this data will be deleted again the next time the Housekeeping Engine is run. If there are dependencies between tables, restore records in the reverse order from which they were deleted.

Specifics of restoring data:

- Data can only be restored to the same version of WAY4 from which they were deleted.
- If the error "ORA-02291: integrity constraint violated" occurs when restoring data, the parent table's data must be restored first.

- The procedure for restoring dependent tables can be determined according to the value of the HSK_TABLE.PRIORITY field (the value of a parent table's priority is lower than that of child tables).

5.5 "Housekeeping Report"

To analyse the Housekeeping Engine module's operation, an HTML report is run using the menu item "OpenWay → Housekeeping → Runtime → Housekeeping Report". In the form that opens, set report parameters and click the [Proceed] button.

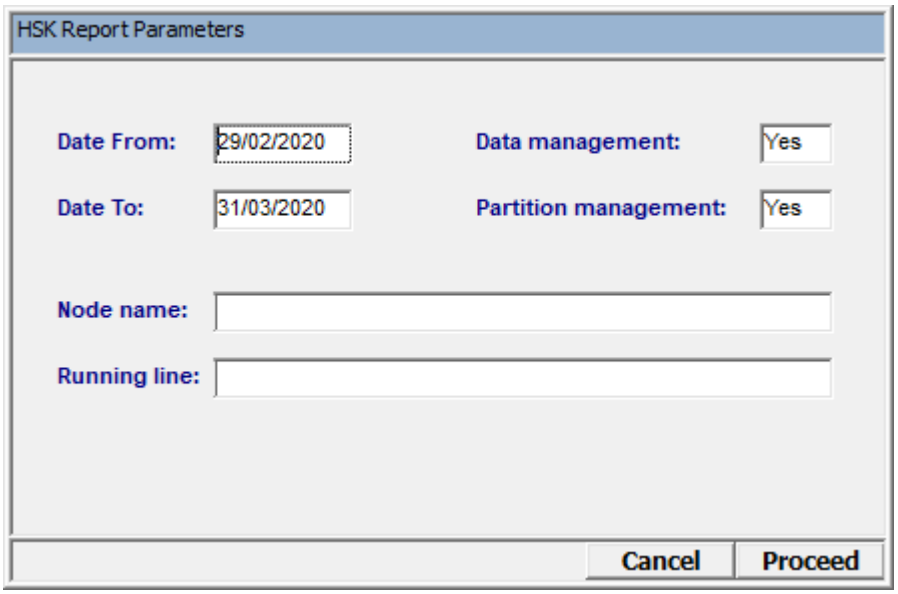


Fig. Form with report parameters

Report parameters:

- *Date From* – start date of the reporting period.
- *Date To* – end date of the reporting period.
- *Data management*:
  - "Yes" – generate a report for data management tasks ("Purge Expired", "Purge Inactive", etc.).
  - "No" – no
- *Partition management*:
  - "Yes" – generate a report for partition management tasks ("Create Partition", "Drop Partition").
  - "No" – no
- *Node name* – node name.
- *Running Line* – name of the stream in which the task is executed (see "Settings for Running Lines").

The report consists of three sections:

- Overall report – list of the 50 most recent processes that were run, specifying the number of starts, execution time, number of records processed, etc.

- Settings report – task time parameters: date after which a task can be started, frequency of task execution, etc.
- Chronological report – detailed information about the task execution progress.

6 DB.INI File Parameters for the Housekeeping Module:

Parameters for the Housekeeping module can be set in the DB.INI file (for example, WAY4 Cards, WAY4 Datamart).

During installation, parameters from the DB.INI file are automatically saved in the SYS_CONSTANTS table. When new parameters are added to the DB.INI file, or the values of existing parameters are changed, the changes must be loaded to the DB. The loaddbini.bat script is used to load DB.INI parameters.

DB.INI file parameters for the Housekeeping module:

- <TABLE_NAME>_PRT_DATERANGE – partition interval for the <TABLE_NAME> table partitioned by the date type field. Values:
  - "<N> months" – number of months
  - "<N> days" – number of days
- PARTITION_SIZE_<TABLE_GROUP> – partition interval for the _<TABLE_GROUP> table group partitioned by the date type field. For example, 1 days, 1 months.

7 Monitoring with WAY4 Health Monitoring Gen2

The Housekeeping R2 module can provide information about its operation with SNMP using the WA4 Health Monitoring Gen2 product:

- About Housekeeping Engine messages and metrics.
- About messages received as a result of the Housekeeping Engine's operation (for example, that partitions are missing or running out for a DB table).

This information is gathered by calling DB stored procedures. By default, the frequency of calling procedures that gather information about the Housekeeping Engine process (process with the "HSK.main" code) is one minute. By default, the frequency of calling procedures gathering information about results of the Housekeeping Engine's operation is 6 hours. A license for each of the following components is required for monitoring:

- "dbAgentsExecutor_hsk" – component responsible for monitoring results of the Housekeeping Engine's operation.
- "dbAgentsExecutor_hsk_process" – component responsible for monitoring the Housekeeping Engine process.

For more information about enabling and setting up monitoring, see the document "Administering WAY4 Health Monitoring Gen2".

The table shows parameters for monitoring the Housekeeping R2 module.

Table Parameters for monitoring the Housekeeping R2 module

Parameter	Parameter type	Group	Description
Housekeeping/ Default	Alert (trap)	hsk	Error about missing future partitions for tables partitioned by date or number ranges. If future partitions are missing, the error occurs in advance by the number of days set in the global parameter MISSING_FUTURE_PART_ERROR (the default value is 3 days).

Parameter	Parameter type	Group	Description
Housekeeping/ Default	Alert (trap)	hsk	Warning about missing future partitions for tables partitioned by a date range. If future partitions are missing, the warning occurs in advance by the number of days set in the global parameter MISSING_FUTURE_PART_WARNING (the default value is 10 days).
Housekeeping/ Default	Alert (trap)	hsk_process	Error if the "HSK.main" process is not started.
Housekeeping/ Default	Alert (trap)	hsk_process	Error for the "HSK.main" process or its subprocess.
Housekeeping/ Processed_rows	Metric	hsk_process	Number of records processed by the "HSK.main" process.

8 Administering Transportable Tablespaces

The main commands for managing transportable tablespaces (TTS) are as follows:

- Change the state of a TTS to read-only.

  To change the state of a TTS to read-only, run the following command as the SYS or <HSK_Owner> user:

```
ALTER TABLESPACE <TTS_NAME> READ ONLY
```

  Example:

```
ALTER TABLESPACE tbs1 READ ONLY;
ALTER TABLESPACE tbs2 READ ONLY;
....
```

- Export a TTS.

  Before export, change the state of the TSS to read-only. If its state was changed to read-write after export, it must be re-exported.

  Export the TTS using the Oracle expdp utility:

```
expdp \'sys@<database> AS SYSDBA\' directory=<dpump_dir> dumpfile=<tts.dmp>
logfile=<tts.log> transport_tablespaces=<TTS_name_1,TTS_name_2>
```

  Example:

```
CREATE OR REPLACE DIRECTORY dpump_dir AS '/u03/oradb';
GRANT READ, WRITE ON DIRECTORY dpump_dir TO sys;
expdp \'sys@prod AS SYSDBA\' directory=dpump_dir dumpfile=tts.dmp logfile=tts.log
transport_tablespaces=tbs1,tbs2
```

  Next, copy files to the storage location.

- Import a TTS.

  Move data files from the storage location to the DB server.

  Import the TTS using the Oracle impdp utility.

```
impdp \'sys@<database> AS SYSDBA\' directory=<dpump_dir> dumpfile=<tts.dmp>
logfile=<tts_imp.log> transport_datafiles=<datafiles>
```

Example:

```
impdp \'/ as sysdba\' directory=dpump_dir dumpfile=tts.dmp logfile=tts_imp.log
transport_datafiles='/db/datafile/file01.dbf'
```

The TTS is imported in read-only mode. Do not change its state to read-write.

- To delete a TTS with data files, run the following command as the SYS or <HSK_Owner> user:

```
DROP TABLESPACE <TTS_NAME> INCLUDING CONTENTS AND DATAFILES
```