HP Operations Orchestration

For Windows and Linux

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Purging OO Run Histories from Oracle Databases

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Contents

About Deleting Run Histories

This document is designed to provide a method for pruning old run history data for Central administrators and DBAs involved in the management of the data stored by Central systems.

This document is divided into three main sections:

1. Descriptions of the tables involved in storing historical run data in the HP OO database. See "HP OO Database Tables" on page 7.
2. The procedure for physically deleting old run history data. See "Physically Deleting Data" on page 9.
3. Appendices that contain information such as a diagram of the tables in the **Run** schema, how to upgrade older schemas, and performance implications.

   The code examples shown in the appendices and the script that calls the pruning process are included in text form in the file **Oracle_Run_History_Purge.zip** (which also contains this document). The code files are:

   - To call the pruning process:

     `oracle_oo_prune_run_history_call.sql`

   - For Appendix B: Upgrading older schemas:

     `oracle_oo_upgrade_history_schema.sql`

   - For Appendix C: Example cleanup stored procedure:

     `oracle_oo_prune_run_history_temp_tables.sql`

     `oracle_oo_prune_run_history_pkg.sql`

     `oracle_oo_prune_run_history_pkgb.sql`

   - For Appendix D: Example scheduling scripts:

     `oracle_oo_schedule_prune_run_history.sql`

Before deciding whether to implement the procedures in this document, read the entire document including "Appendix E: Performance Implications" on page 25.

Required knowledge

Oracle database knowledge is required.

HP OO Database Tables

The tables involved in capturing run history information belong to the OO database. See "Appendix A: Table Diagram" on page 11 for a diagram of the tables in the schema. The tables in the **Run** schema are:

- The **run** table
- The **run_history** table
- The **runstep_history** table
- The **property_history** table
- The **log_record** table
- The **flow_metrics** table

Run Table

The run table stores information about flows that have not yet finished running. Every time a run performs a checkpoint, its current frame stack (including context variables) is placed into a binary object and written to a row in this table. The primary key of the run table is the run id. As soon as a run finishes, the entry in the run table is removed and placed in the **run_history** table.

There are no foreign keys between this table and any other table.

Run_history Table

The **run_history** table stores run information that is used in reporting. There is one row in this table stored for every execution of a flow. The table stores general information about the run, such as its start time, end time, the number of its steps, and how the run ended.

Important: Deleting data from the **run_history** table causes the loss of reporting information. However, if storage space is critical, you can delete data from this table. Just be aware that flows deleted from the **run_history** table will no longer be visible in any reports.

Runstep_historyTable

The **runstep_history** table stores reporting information for each step. There is a one-to-many relationship between the **run_history** table and the **runstep_history** table, enforced by a foreign key relationship between the **runstep_history.run_history_id** and **run.oid** fields, which uses cascading deletes.

Important Deleting data from the **runstep_history** table causes the loss of reporting information for each step of a flow, but the general flow information is still available for reporting. You will not however, be able to "drill down" into the steps which were executed by a flow that has been pruned. However, if storage space is critical, you can delete data from this table. Deleting data from the **runstep_history** table also deletes any related records from the **property_history** table.

Note: Note: OO versions older than 7.20 require schema altering in order to properly support cascading deletes.See "Appendix B: Upgrading Older Schemas" on page 12.

Property_history Table

The property_history table stores a row for each input of a step. There is a foreign key relationship between the fields **property_history.runstep_hist_id** and **runstep_history.oid**, with cascading deletes.

Log_record Table

The **log_record** table stores a row for each step input that was designated to be recorded for reporting under a domain-term name. Essentially, it stores a subset of the data in the **property_history** table, but there is no foreign key relationship to the **runstep_history** table. If a run_history row is deleted, rows will also be deleted from the **runstep_history** and **property_history** tables, but the **log_record** table is left intact.

The data in the **log_record** table is used to plot dashboard charts, so deleting data from it will result in loss of dashboard information. This may or may not be a problem depending on how often you prune data. Since dashboard charts are meant to give a more "real-time" picture of what's going on with OO, deleting data from the **log_record** table for a period past where the data is useful for dashboards should be fine.

Flow_metrics Table

The flow_metrics table stores flow outcome counters. There is one entry for each flow, with counters broken down into **Resolved**, **Error**, **Diagnosed**, **No Action Taken**, and **Failed** outcomes, as well as the cumulative time taken by the flows.

This table is used to create the flow metrics bar:

Physically Deleting Data

To delete run histories, use the following approach

1. Upgrade the database schema if necessary (see "Appendix B: Upgrading Older Schemas" on page 12).
2. Establish a timestamp (date and time) when run histories older than it are deleted.
3. Determine how many run histories should be deleted.
4. Divide these run histories into batches to minimize the transaction size.
5. Starting with the oldest batch, delete the batches using one transaction per batch as follows:
    a. Begin the transaction.
    b. Delete data from the **run_history** table, if required.
    c. Update the **flow_metrics** table to reflect the deleted rows, if run histories were deleted.
    d. Delete data from the **runstep_history** table if data was not removed from the **run_history** table.
    e. Delete the rows for the deleted run steps from the **log_record** table, if necessary.
    f. Commit the transaction.

These steps, excluding the first one (upgrading), can be performed on a periodic basis from a scheduled job. An example stored procedure is provided in "Appendix C: Example Cleanup Stored Procedure" on page 14.

You can schedule the cleanup job, as explained in "Appendix D: Example Scheduling Scripts" on page 21.

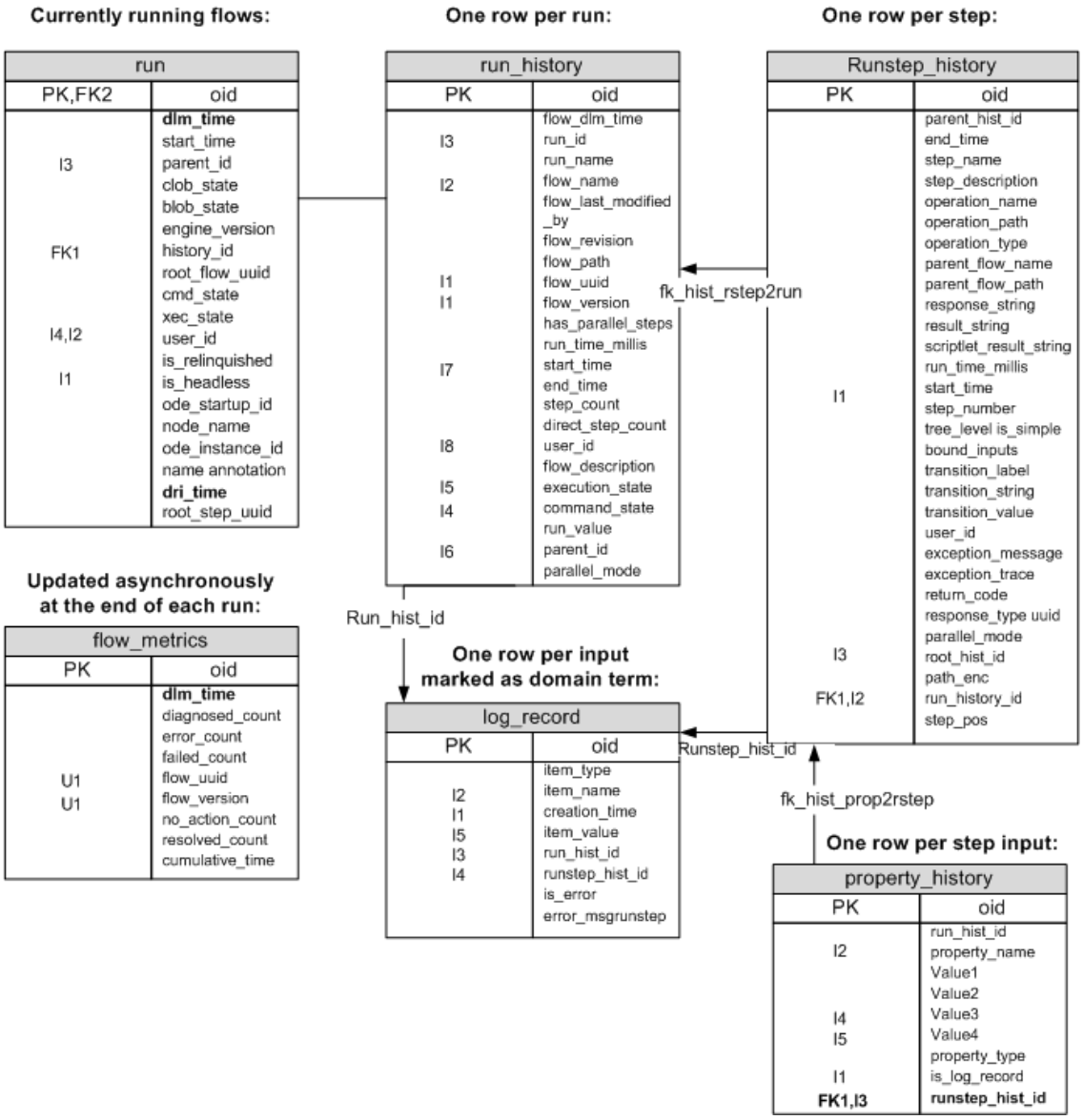
Because an orphaned flow is not considered completed, its related run history is not deleted by the purging scripts.

Appendices

The appendices in this section are meant to help you perform the necessary tasks involved in deleting run histories.

Appendix A: Table Diagram

7.50 Run Schema



Appendix B: Upgrading Older Schemas

The following script detects older versions of the schema (HP OO versions 7.0 and earlier) and alters the appropriate tables to support cascading deletes. We recommend that you use the text copy of this script contained in the file **oracle_oo_upgrade_history_schema.sql** instead of copying the code below, which has line breaks to make reading easier.

```
/*
 * This script looks at the version of the OO schema and if it
detects
 * a 7.0 or 7.10 system, it attempts to upgrade some constraints to
 * allow run history pruning.
 *
 * It will have no effect on systems that are not at version 7.0
 * or 7.10.
 */
set serveroutput on size 20000
/
declare
  need_alters number := 0;
begin
  dbms_output.enable;

  begin
    select 1 into need_alters
    from build_info
    where dri_time = (select max(dri_time) from build_info)
    and ((version like '7.0%') or (version like '7.10%'));
   exception
     when no_data_found then
        dbms_output.put_line('No data found in build_info for
versions 7.0 or 7.10 for the most recent date');
   end;

  if (need_alters > 0) then
    begin
      dbms_output.put_line('Upgrade needed, '||
       'preparing schema for pruning...');

      begin
        execute immediate 'alter table runstep_history '||
               'drop constraint FK_HIST_RSTEP2PARENT';
      exception when others then
        if (SQLCODE = -2443) then
          dbms_output.put_line('ignoring exception, '||
               'constraint FK_HIST_RSTEP2PARENT does not exist');
          null;
        else
```

```
          raise;
        end if;
      end;

      begin
        execute immediate 'create index idx_hist_prop_runhist_id'||
               ' on property_history(run_hist_id)';
      exception when others then
        if (SQLCODE = -955) then
          dbms_output.put_line('ignoring exception, '||
               'index idx_hist_prop_runhist_id exists');
          null;
        else
          raise;
        end if;
      end;

      execute immediate 'alter table runstep_history '||
       'drop constraint FK_HIST_RSTEP2RUN';

      execute immediate 'alter table runstep_history ' ||
        'add constraint fk_hist_rstep2run '||
        'foreign key (run_history_id) '||
        'references run_history(oid) '||
        'on delete cascade';

      execute immediate 'alter table property_history '||
       'drop constraint FK_HIST_PROP2RSTEP';

      execute immediate 'alter table property_history '||
        'add constraint fk_hist_prop2rstep '||
        'foreign key (runstep_hist_id) '||
        'references runstep_history(oid) '||
        'on delete cascade';

      dbms_output.put_line('Upgrade done.');

    exception when others then
      dbms_output.put_line('Upgrade failed: '||SQLCODE||',
'||SQLERRM);
      dbms_output.put_line('Change the script to remove failing
statements '||
        'if the effect of the statement is already accomplished');
    end;
  else
    dbms_output.put_line('Upgrade not needed!');
  end if;
```

```
end;
/
```

Appendix C: Example Cleanup Stored Procedure

The following stored procedure illustrates the points made in the deletion algorithm. It consists of three components:

- A temporary table
- A package header for the stored procedure
- A package body for the stored procedure

This appendix includes examples of the above components. We recommend that you use the text copies of these examples contained in the following files instead of copying the code below, which has line breaks to make reading easier.

- **oracle_oo_prune_run_history_temp_tables.sql**
- **oracle_oo_prune_run_history_pkg.sql**
- **oracle_oo_prune_run_history_pkgb.sql**

Example Temporary Table for the Stored Procedure

```
/*
 * This script creates the temporary tables necessary
 * for the execution of the HP_OO_PRUNE.prune_run_history
 * stored procedure.
 */
drop table oo_prune_table;
/
create global temporary table OO_PRUNE_TABLE(
      OID NUMBER(19,0) NOT NULL ENABLE,
         RUN_HISTORY_ID NUMBER(19,0),
      FLOW_UUID VARCHAR2(255),
         FLOW_VERSION NUMBER(19,0),
      EXECUTION_STATE NUMBER(10,0),
      RUN_TIME_MILLIS NUMBER(19,0)
) ON COMMIT PRESERVE ROWS;
/
```

Example Package Header for the Stored Procedure

```
/*
 * Stored procedure for pruning the run history schema.
 *
 * Running this procedure requires creation of two
 * global temporary tables. The script to create
 * these is provided separately.
 *
 * Backup is advised before running this procedure.
 */
create or replace package hp_oo_prune
  authid current_user
is
  procedure prune_run_history( keep_this_many_hours in number
default 2160
       , prune_batch_size in number default 1000
    , prune_run_history in varchar2 default 'false'
       , prune_dashboard in varchar2 default 'true'
       , verbose in number default 1
  );

end hp_oo_prune;
/
show errors;
/
```

Example Package Body for the Stored Procedure

```
create or replace
package body hp_oo_prune
is

-- private
PROCEDURE update_flow_metrics(
   verbose in varchar,
   v_delete_start_row in number,
   prune_batch_size in number)
IS
BEGIN
  if (verbose > 1) then
     dbms_output.put_line('Updating flow metrics...');
  end if;

  MERGE INTO flow_metrics fm
     USING (
```

```
       SELECT flow_uuid,
              flow_version,
              sum(case when execution_state = 0 then 1 else 0 end)
                as diagnosedCount,
              sum(case when execution_state = 1 then 1 else 0 end)
                as resolvedCount,
              sum(case when execution_state = 2 then 1 else 0 end)
                as noActionCount,
              sum(case when execution_state = 3 then 1 else 0 end)
                as errorCount,
              sum(case when execution_state = 2147483647 then 1
else 0 end)
                as failedCount,
              sum(run_time_millis) as cumulativeTime
       FROM oo_prune_table
       WHERE oid >= v_delete_start_row
         AND
             oid < v_delete_start_row + prune_batch_size
       GROUP BY flow_uuid, flow_version
     ) d
     ON (fm.flow_uuid = d.flow_uuid and fm.flow_version = d.flow_
version)
     WHEN MATCHED THEN
        UPDATE SET fm.diagnosed_count = fm.diagnosed_count -
d.diagnosedCount,
                   fm.resolved_count = fm.resolved_count -
d.resolvedCount,
                   fm.no_action_count = fm.no_action_count -
d.noActionCount,
                   fm.error_count = fm.error_count - d.errorCount,
                   fm.failed_count = fm.failed_count -
d.failedCount,
                   fm.cumulative_time = fm.cumulative_time -
d.cumulativeTime;

  -- delete the metrics for those flows that are left with 0's on
all counts.
  DELETE FROM flow_metrics
   WHERE diagnosed_count = 0
     AND failed_count = 0
     AND no_action_count = 0
     AND resolved_count = 0
     AND error_count = 0
     AND EXISTS (
        SELECT 1 FROM oo_prune_table p
          WHERE flow_uuid = p.flow_uuid
            AND
                oid >= v_delete_start_row
```

```
            AND
                oid < v_delete_start_row + prune_batch_size);

END update_flow_metrics;

-- private
PROCEDURE delete_batch(
  prune_batch_size in number,
  v_delete_start_row in number,
  prune_run_history in varchar2,
  prune_dashboard in varchar2,
  verbose in number)
IS
      v_batch_size number;
      v_min_oid number;
      v_max_oid number;
      v_delete_stop_row number;
BEGIN

     v_delete_stop_row := v_delete_start_row + prune_batch_size;

      select count(*), min(oid), max(oid)
        into v_batch_size, v_min_oid, v_max_oid
        FROM oo_prune_table
        WHERE oid >= v_delete_start_row
           AND
              oid < v_delete_start_row + prune_batch_size;

      if (v_batch_size = 0) then
        commit;
        return;
      end if;

      if verbose > 0 then
        DBMS_OUTPUT.PUT_LINE('Deleting next batch of size '
          || v_batch_size || ' from run_history ');
      end if;

      --PRUNE THE DASHBOARD INFO, IF REQUESTED
      IF prune_dashboard = 'true' THEN
         IF verbose > 1 THEN
            DBMS_OUTPUT.put_line('Deleting dashboard data...');
         END IF;

         DELETE
         FROM log_record l
         WHERE l.run_hist_id IN (SELECT run_history_id
                                 FROM oo_prune_table
```

```
                                WHERE oid >= v_delete_start_row
                                   AND
                                      oid < v_delete_stop_row);
      END IF;

      IF prune_run_history = 'true' THEN

         -- NOW DELETE THE BATCH FROM run_history
         if (verbose > 1) then
           dbms_output.put_line('Deleting '||v_batch_size
             ||' run histories (min_oid='||v_min_oid
             ||', max_oid='||v_max_oid||')');
         end if;

         DELETE
         FROM run_history r
         WHERE r.oid IN (SELECT run_history_id
                         FROM oo_prune_table
                         WHERE oid >= v_delete_start_row
                            AND
                               oid < v_delete_stop_row);

         -- CALCULATE THE LOST FLOW_METRIC COUNTS AND CUMULATIVE_
TIME,
         -- AND UPDATE FLOW_METRICS
         update_flow_metrics(verbose, v_delete_start_row, prune_
batch_size);
      ELSE

         DELETE
         FROM runstep_history r
         WHERE r.run_history_id IN (SELECT run_history_id
                         FROM oo_prune_table
                         WHERE oid >= v_delete_start_row
                            AND
                               oid < v_delete_stop_row);

      END IF;

      COMMIT;

END;

-- public
PROCEDURE prune_run_history( keep_this_many_hours in number default
2160
  , prune_batch_size in number default 1000
  , prune_run_history in varchar2 default 'false'
```

```
  , prune_dashboard in varchar2 default 'true'
  , verbose in number default 1
  )
IS
  v_ts_last_run TIMESTAMP(6);
  v_ts_delete_older_than run_history.start_time%TYPE;
  v_total_rows_to_del run_history.oid%TYPE;
  v_oo_prune_table_size PLS_INTEGER;
  v_delete_start_row PLS_INTEGER;
  v_delete_rows_left PLS_INTEGER;
BEGIN

  SELECT MAX(start_time)
      INTO v_ts_last_run
      FROM run_history;

   v_ts_delete_older_than := v_ts_last_run - keep_this_many_
hours/24;

   if (verbose > 0) then
    dbms_output.put_line('Preparing pruning table. '||
      'Will delete histories where start_time <= '|| v_ts_delete_
older_than);
   end if;


   INSERT INTO oo_prune_table
          SELECT rownum, oid, flow_uuid, flow_version, execution_
state, cast(run_time_millis as number)
          FROM (SELECT oid, flow_uuid, flow_version, execution_
state, run_time_millis
                FROM run_history
                WHERE (start_time < v_ts_delete_older_than)
                     AND
                     oid NOT IN (SELECT history_id FROM run)
                ORDER BY oid
                );


   select count(*)
     into v_oo_prune_table_size
     from oo_prune_table;

   if (verbose > 0) then
    DBMS_OUTPUT.PUT_LINE('Total rows to delete: ' || v_oo_prune_
table_size);
   end if;
```

```
   select min(oid)
      into v_delete_start_row
      from oo_prune_table;

   WHILE v_delete_start_row < v_oo_prune_table_size LOOP

      -- this is an autonomous transaction
      delete_batch(prune_batch_size, v_delete_start_row, prune_run_
history,
                                                    prune_dashboard,
verbose);

      -- assuming everything went ok with the delete, we can
calculate
      -- the rows left to delete
      v_delete_rows_left := v_oo_prune_table_size - v_delete_start_
row
                            - prune_batch_size + 1;

      if (v_delete_rows_left < 0) then
         v_delete_rows_left := 0;
      end if;

      if (verbose > 0) then
        dbms_output.put_line(''||v_delete_rows_left
          ||' histories left to delete...');
      end if;

      v_delete_start_row := v_delete_start_row + prune_batch_size;

   END LOOP;

   DBMS_OUTPUT.PUT_LINE('rows deleted: ' || SQL%ROWCOUNT);

   EXECUTE IMMEDIATE 'TRUNCATE TABLE OO_PRUNE_TABLE';

END prune_run_history;

end hp_oo_prune;


/

show errors;
/
```

Appendix D: Example Scheduling Scripts

The following script creates a schedule and job to run the database pruning script on a recurring basis. Values should be selected for all parameters in the user configuration section for your particular needs. We recommend that you use the text copy of this script contained in the file **oracle_oo_schedule_prune_run_history.sql** instead of copying the code below, which has line breaks to make reading easier.

See "Appendix E: Performance Implications" on page 25 for performance considerations, which should be taken into account when setting these parameters. As noted in the comments, you must run this script as an HP OO user who has CREATE JOB system rights.

```
/*
*   this script wil create a job to run prune_run_history on a
recurring
*   basis. it must be run by DHARMA_USER, and DHARMA_USER must be
granted
*   the right to create jobs:
*
*        GRANT CREATE JOB TO DHARMA_USER
*/

DECLARE

   v_prune_dashboard VARCHAR2(5);
   v_prune_run_history VARCHAR(5);
   v_prune_batch_size NUMBER;
   v_keep_this_many_hours NUMBER;
   v_verbose NUMBER;
   v_repeat_interval VARCHAR2(255);

BEGIN

       ------------------------------------------------------------------
-----------
       -- CHANGE VALUES BELOW TO SUIT YOUR NEEDS
       ------------------------------------------------------------------
-----------

       /* batch size. deletes will be commited to the database for this
many rows */
       v_prune_batch_size := 1000;

       /* The number of hours to keep in run_history. Anything older than
this many
          hours will be removed from the database.
       */
       v_keep_this_many_hours := 2;
```

```
   /* prune run history. If set to 'true', records will be removed
from the
        * run_history table. If set to false, the default value, records
will no
        * be removed from the run_history table, and data will only be
removed
        * from the runstep_history table.
        * Please see "About the OO 7.50 Run schema and tables" in the
        * documentation for further details. And be sure to understand
all
        * implications before setting this to true
        */
   v_prune_run_history := 'false';

       /* prune dashboards. If set to 'true', information will be removed
from the
        * log_record table. See "About the OO 7.50 Run schema and tables"
in the
        * documentation for further details.
       */
       v_prune_dashboard := 'false';

   -- verbosity level. 0=terse, 1=normal, 2=verbose
   v_verbose := 2;

   -- v_repeat_interval defines when the job will be run
   --    FREQ is the minimum amount of time between runs (DAILY =
once a day,
   --                                                     WEEKLY =
once a week,
   --                                                     etc...
   --    INTERVAL is the number of periods of FREQ between runs
   --         i.e. if FREQ=DAILY and INTERVAL=2, then it runs every
2 days
   --    BYHOUR, BYMINUTE, and BYSECOND define the time at which
the job is run
   --
   -- so the default below runs the job every day at 18:00
   v_repeat_interval :=
'FREQ=DAILY;INTERVAL=1;BYHOUR=18;BYMINUTE=0;BYSECOND=0';

   ------------------------------------------------------------------
-------------
   -- END USER CONFIGURABLE PARAMETERS
   ------------------------------------------------------------------
-------------
```

```
   -- drop the program if it exists, ignore the exception if it
doesn't
   BEGIN
      dbms_scheduler.drop_program('PRUNERUNHIST_PRG', TRUE);

   EXCEPTION
      WHEN OTHERS THEN
         NULL;
   END;
   -- create program
   dbms_scheduler.create_program(
         program_name=>'PRUNERUNHIST_PRG',
         program_action=>'HP_OO_PRUNE.PRUNE_RUN_HISTORY',
         program_type=>'STORED_PROCEDURE',
         number_of_arguments=>5,
         comments=>'call HP_OO_PRUNE.PRUNE_RUN_HISTORY',
         enabled=>FALSE);
   -- add the four attributes
   dbms_scheduler.define_program_argument(
         program_name => 'PRUNERUNHIST_PRG',
         argument_name => 'KEEP_THIS_MANY_HOURS',
         argument_position => 1,
         argument_type => 'NUMBER',
         default_value => v_keep_this_many_hours);
   dbms_scheduler.define_program_argument(
         program_name => 'PRUNERUNHIST_PRG',
         argument_name => 'PRUNE_BATCH_SIZE',
         argument_position => 2,
         argument_type => 'NUMBER',
         default_value => v_prune_batch_size);
   dbms_scheduler.define_program_argument(
         program_name => 'PRUNERUNHIST_PRG',
         argument_name => 'PRUNE_RUN_HISTORY',
         argument_position => 3,
         argument_type => 'VARCHAR2',
         default_value => v_prune_run_history);
   dbms_scheduler.define_program_argument(
         program_name => 'PRUNERUNHIST_PRG',
         argument_name => 'PRUNE_DASHBOARD',
         argument_position => 4,
         argument_type => 'VARCHAR2',
         default_value => v_prune_dashboard);
   dbms_scheduler.define_program_argument(
         program_name => 'PRUNERUNHIST_PRG',
         argument_name => 'VERBOSE',
         argument_position => 5,
```

```
         argument_type => 'NUMBER',
         default_value => v_verbose);

   -- now that all the arguments are defined, we should be able to
enable the
   -- program
   dbms_scheduler.enable('PRUNERUNHIST_PRG');



   -- drop the schedule if it exists, ignore the exception if it
doesn't
   BEGIN
      dbms_scheduler.drop_schedule('PRUNERUNHIST_SCHEDULE', TRUE);
   EXCEPTION
      WHEN OTHERS THEN
         NULL;
   END;

   dbms_scheduler.create_schedule(
         repeat_interval =>
            v_repeat_interval,
         comments =>
            'Schedule for periodic pruning of run_history',
         schedule_name => 'PRUNERUNHIST_SCHEDULE');


   -- drop the job if it exists, ignore the exception if it doesn't
   BEGIN
      dbms_scheduler.drop_job('PRUNERUNHIST_JOB', TRUE);

   EXCEPTION
      WHEN OTHERS THEN
         NULL;
   END;

   dbms_scheduler.create_job(
         job_name => 'PRUNERUNHIST_JOB',
         program_name => 'PRUNERUNHIST_PRG',
         schedule_name => 'PRUNERUNHIST_SCHEDULE',
         job_class => 'DEFAULT_JOB_CLASS',
         comments => 'periodically prune run_history',
         auto_drop => FALSE,
         enabled => TRUE);



END;
```

Appendix E: Performance Implications

Here are some recommendations for using the pruning code:

- Choose a pruning set size that is appropriate to your particular situation. This is important for maintaining the well being of your HP OO system. The number of hours retained should be calculated so that the pruning stored procedure deletes small amounts of history while allowing Central to make progress in running flows.

  Having a higher number for pruning set size can affect database performance, and as a result, flow execution performance metrics will decrease. Having a lower number for pruning set size increases the execution time of the database purging script, but maintains an overall better database performance. The chosen pruning set size should be the highest number for which database performance counters are yielding acceptable values. Depending on the database size, for big database sizes, it is recommended to stop Central, Scheduler services for the duration of the execution of the purging script.

- The stored procedure uses global temporary tables, allocated out of the temporary tablespace. The main pruning table contains IDs for the whole set size, not just for one individual batch. Make sure that there is enough space for it.

- In general, it is better to run the pruning procedure more often with small batches, than less frequently with larger batches. This helps both Central and Oracle's throughput, as the pruning jobs can be interleaved with normal processing jobs.

- Although this is beyond the scope of this document, note that proper allocation of disk space is important when considering the performance of the database. Having separate physical drives for the database file and the transaction log (separate from the operating system) is a good start.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