Workflow Performance Tuning in Release 12
Session ID 11770

Karen Brownfield
About the Speaker

• Oracle Ace ♠
• Oracle Certified Specialist (EBS and Fusion)
• Over 35 years System Design and Support
• Over 20 years E-Business Suite support
• 14 years Oracle Workflow design and support
• Former OAUG President
• Over 100 presentations at multiple venues
• Co-Author *The ABCs of Oracle Workflow for E-Business Suite Release 11i and Release 12*
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Audience Profile

• Job Role
  • DBA
  • System or Workflow Administrator
  • Functional
• Database Level
  • 10gR2
  • 11gR1
  • 11gR2

• EBS Version
  • Release 11i.10
  • ATG_PF.H RUP6
  • ATG_PF.H RUP7
  • Release 12.0.6
  • Release 12.1.n
  • Not EBS
The opposite of the ostrich is the rooster who is alert and awake early to see what is on the horizon. Rather than fear, he crows loudly a warning to be heeded by all.

Source: http://users.cybertime.net/~ajgood/ostrich.html
Workflow Analyzer

• 1369938.1 “Workflow Analyzer script for E-Business Suite Workflow Monitoring and Maintenance”
• Better than R12 Workflow Health Check Diagnostic or 11i Workflow Status and Purgeable Items or Workflow Performance
• SQL Script – Updated frequently
• Run as concurrent request – note 1425053.1
• FAQ – note 1452224.1
• Webcast recording – now avail from this note or 1386194.1
• Focuses on Administration and Performance
• https://blogs.oracle.com/oracleworkflow/entry/e_business_suite_proactive_support
This Workflow Analyzer script reviews the current Workflow Footprint, analyzes runtime tables, profiles, settings, and configurations for the overall workflow environment, providing helpful feedback and recommendations on Best Practices for any areas for concern on your system.

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**References**
Patch Current

- It’s not just the RUPs, one-offs are important
- Workflow is dependant on HR, AME
  - Diagnostics are important also
- Product workflow fixes are provided by product team, not ATG patches
- See Workflow SIG site for list of R12.1 patches
  - http://workflowsig.oaug.org/reference_info.html
  - There are performance patches in this list
- Workflow Analyzer lists some of these patches
Workflow Analyzer Overview

Workflow Runtime Data Table Gauge

Your overall Workflow HealthCheck Status is in need of Immediate Review!
The WF_ITEMS Table has obsolete workflow runtime data that is older than 3 years.

We reviewed all 172,224 rows in WF_ITEMS Table for Oracle Applications Release 12.1.3 Instance called... on ...
Currently 86% (148,584) of WF_ITEMS are OPEN, while 14% (23,640) are CLOSED items but still exist in the runtime tables.

Note: Once a Workflow is closed, its runtime data that is stored in Workflow Runtime Tables (WF_*) becomes obsolete. All the pertinent data is stored in the functional tables (FND_*, PO_*, AP_*, HR_*, OE_*, etc.), like who approved what, for how much, for who, etc... Remember that each row in WF_ITEMS is associated to 100s or 1000s of rows in the other WF runtime tables, so it is important to purge this obsolete runtime data regularly.
Clean up Errors

• Perform following query

```
SELECT COUNT (*)
, item_type
, activity_name
, MIN (item_begin_date)
, MAX (item_begin_date)
FROM wf_item_activity_statuses_v
WHERE activity_status_code = 'ERROR'
AND item_end_date IS NULL
GROUP BY item_type
, activity_name
ORDER BY 1 DESC, 5 DESC, 2;
```

• Play with Order By – try 5, 1, 2 also
Clean up Errors

- Triage – Most Recent, Highest Numbers
- It isn’t enough to clean up the errored workflows
Clean up Associated Error Item Types

• Perform following query

```sql
SELECT item_type,
       parent_item_type,
       DECODE (end_date, NULL, 'OPEN', 'CLOSED')
       error_type_status,
       COUNT (*)
FROM wf_items
WHERE parent_item_type is not null
  AND item_type in ('CUNNLWF', 'DOSFLOW', 'DOSFLOWE',
                     'ECXERROR', 'HRSSA', 'HRSTAND', 'HXCEMP', 'IBUHPSUB', 'OKLAMERR',
                     'OMERROR', 'PARMAAP', 'PARMATRIX', 'POERROR', 'WFSTD', 'XDPWFSTD',
                     'ZPBWFERR', 'WFERROR')
GROUP BY item_type,
       parent_item_type,
       DECODE (end_date, NULL, 'OPEN', 'CLOSED')
ORDER BY 4 DESC, item_type, parent_item_type;
```
Clean up Associated Error Item Types

<table>
<thead>
<tr>
<th>ITEM_TYPE</th>
<th>PARENT_ITEM_TYPE</th>
<th>ERROR_TYPE_STATUS</th>
<th>COUNT(*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFERROR</td>
<td>FTEPSUPD</td>
<td>CLOSED</td>
<td>16528</td>
</tr>
<tr>
<td>WFERROR</td>
<td>FTEPSUPD</td>
<td>OPEN</td>
<td>1571</td>
</tr>
<tr>
<td>WFERROR</td>
<td>REQAPPRV</td>
<td>CLOSED</td>
<td>1550</td>
</tr>
<tr>
<td>OMERROR</td>
<td>OEOH</td>
<td>OPEN</td>
<td>38</td>
</tr>
<tr>
<td>POERROR</td>
<td>REQAPPRV</td>
<td>CLOSED</td>
<td>35</td>
</tr>
<tr>
<td>ECXERROR</td>
<td>OKLLPLBO</td>
<td>CLOSED</td>
<td>10</td>
</tr>
<tr>
<td>PARMATRIX</td>
<td>PARMATRIX</td>
<td>OPEN</td>
<td>1</td>
</tr>
</tbody>
</table>

- Purge now closes WFERROR where calling activity is closed
  - WFERROR not the only Error Item Type
  - Can’t purge if children open
- Notice chains OEOH → OMERROR → WFERROR
  - OEOH → OEOL → WFERROR
Clean up Event Errors

- Perform following query

```sql
SELECT COUNT(*)
    , v.text_value
    , MIN(i.begin_date)
    , MAX(i.begin_date)
FROM wf_item_attribute_values v
    , wf_items i
WHERE v.item_key = i.item_key
    AND v.item_type = i.item_type
    AND v.item_type = 'WFERROR'
    AND v.NAME = 'EVENT_NAME'
    AND v.text_value IS NOT NULL
GROUP BY text_value
ORDER BY 4 DESC, 1 DESC, text_value;
```
Clean up Event Errors

- Find and fix what causes event to error
- Message to SYSADMIN can re-raise event if still needs processing, else abort WFERROR
- Event probably expired

<table>
<thead>
<tr>
<th>COUNT(*)</th>
<th>TEXT_VALUE</th>
<th>MIN(I.BEGIN_DATE)</th>
<th>MAX(I.BEGIN_DATE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>183</td>
<td>oracle.apps.inv.itemUpdate</td>
<td>2/26/2008 5:57:19 PM</td>
<td>2/18/2013 11:07:28 PM</td>
</tr>
<tr>
<td>2205</td>
<td>oracle.apps.ar.applications.CashApp.apply</td>
<td>6/24/2008 4:58:05 AM</td>
<td>2/12/2013 4:02:02 PM</td>
</tr>
<tr>
<td>3359</td>
<td>oracle.apps.ita.setup.record</td>
<td>2/26/2008 1:51:54 AM</td>
<td>2/12/2013 3:41:24 PM</td>
</tr>
<tr>
<td>203</td>
<td>oracle.apps.cs.rs.ServiceRequest.updated</td>
<td>8/14/2008 7:02:56 AM</td>
<td>1/29/2012 1:28:05 PM</td>
</tr>
<tr>
<td>7</td>
<td>oracle.apps.cs.rs.ServiceRequest.statuschanged</td>
<td>1/29/2012 1:28:00 PM</td>
<td>1/29/2012 1:28:05 PM</td>
</tr>
</tbody>
</table>
Clean up Event Errors

- Adjust wfrmttype.sql script
- Always test in non-production instance first
### Total OPEN Items Started Over 90 Days Ago

<table>
<thead>
<tr>
<th>OPENED</th>
<th>COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>272</td>
</tr>
<tr>
<td>2001</td>
<td>469</td>
</tr>
<tr>
<td>2002</td>
<td>920</td>
</tr>
<tr>
<td>2003</td>
<td>905</td>
</tr>
<tr>
<td>2004</td>
<td>1,727</td>
</tr>
<tr>
<td>2005</td>
<td>8,536</td>
</tr>
<tr>
<td>2006</td>
<td>7,711</td>
</tr>
<tr>
<td>2007</td>
<td>7,437</td>
</tr>
<tr>
<td>2008</td>
<td>120,012</td>
</tr>
<tr>
<td>2012</td>
<td>490</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>148479</strong></td>
</tr>
</tbody>
</table>

**Warning**
There are 148,479 OPEN item types in WF_ITEMS table that were started over 90 days ago.
Remember that once a Workflow is closed, its runtime data which is stored in Workflow Runtime Tables (WF_*) becomes obsolete.
All pertinent information is stored in the functional tables (FND_*, PO_*, AP_*, HR_*, DE_*, etc), like who approved what, for how much, for whom, etc... and that each single row in WF_ITEMS can represent 100s or 1000s of rows in the subsequent Workflow Runtime tables, so it is important to close these open workflows once completed so they can be purged.

**Action**
Ask the Question: How long should these workflows take to complete?
30 Days... 60 Days... 6 months... 1 Year?
There may be valid business reasons why these OPEN items still exist after 90 days so that should be taken into consideration.
However, if this is not the case, then once a workflow item is closed then all the runtime data associated to completing this workflow is now obsolete and should be purged to make room for new workflows.
Please review [Note 144806.1](#) - A Detailed Approach To Purging Oracle Workflow Runtime Data for details on how to drill down to discover the reason why these OLD items are still open, and ways to close them so they can be purged.
Purge!!!

- Need schedule for Temporary and for Permanent
- If Purgeable = 0, ensure child/parent workflows closed

11.5.10 Purgeable for PERM always 0
Purge Obsolete Workflow Runtime Data

• Schedule Nightly or at minimum Weekly
• Parameters
  • Leave Item Type/Item Key blank
  • Age – recommended at least 7, no more than 60
  • Persistence Type
    • One Schedule Temporary, one Permanent
  • Core Workflow Only – Set to Y
    • At least monthly, run w/ value set to N
  • Commit Frequency – leave at default – 500 (that’s 500 workflows, not 500 records)
  • Signed Notifications – Customer Choice
My Oracle Support Notes

- 337923.1 “A closer examination of the Concurrent Program Purge Obsolete Workflow Runtime Data”
- 132254.1 “Speeding Up and Purging Workflows”
- 298550.1 “Troubleshooting Workflow Data Growth Issues”
- 144806.1 “A Detailed Approach to Purging Oracle Workflow Runtime Data”
- 277124.1 “FAQ on Purging Oracle Workflow Data”

Note: Most referenced patches already included in 11i.10, R12
My Oracle Support Notes

- 458886.1 “How To Diagnose Issues Related To Purge Of Purchasing Workflow Data That Remain Even After Running The ‘Purge Obsolete Workflow Runtime Data’ Concurrent Program?”
  - Scripts to help close attached children
- 751026.1 “FNDWFPR – Purge Obsolete Workflow Runtime Data – OEOH / OEOL Performance Issues”
  - Scripts to help close attached children
- 398822.1 “Order Management Suite – Data Fix Script Patch”
- 405275.1 “How to Detect Data Corruption and Purge More Eligible OEOH/OEOL Workflow Items for Order Management Workflow”
My Oracle Support Notes

- 752383.1 "Purge Obsolete Workflow Runtime Data Concurrent Request (FNDWFPR) Is Not Purging Data"

```
SELECT c.item_type AS child,
       DECODE (c.end_date, NULL, 'OPEN', 'CLOSED') AS child_status,
       c.parent_item_type AS parent,
       DECODE (c.parent_item_type, NULL, 'NOPARENT',
               DECODE (p.end_date, NULL, 'OPEN', 'CLOSED')) AS parent_status,
       COUNT (*) AS count
FROM wf_items p, wf_items c
WHERE p.item_type(+) = c.parent_item_type
     AND p.item_key(+) = c.parent_item_key
GROUP BY c.item_type, DECODE(c.end_date, NULL, 'OPEN', 'CLOSED'),
         c.parent_item_type,
         DECODE (c.parent_item_type, NULL, 'NOPARENT',
                 DECODE (p.end_date, NULL, 'OPEN', 'CLOSED'))
ORDER BY c.item_type, c.parent_item_type;
```
My Oracle Support Notes

- 1378954.1 “bde_wf_process_tree.sql – For analyzing the Root, Children, Grandchildren Associations of a Single Workflow”
- 878032.1 “How To Use Concurrent Program “Purge Order Management Workflow””
  - 11i.10 – Patch 9845873
  - 12.1.2+ – included (not available for 12.0.x)
  - Purges closed lines even when header still open
  - “Attempt to Close” – purges OMERROR / WFERROR that are orphan or attached to no-longer-error nodes
From Workflow Analyzer

Product Specific Workflows

ONT - Order Management Workflow Specific Summary

Order Management is being used!
There are 1,652 Order Header (OEOH) workflow items found in WF_ITEMS.
Currently 78% (1,281) of OEOHs are OPEN, while 22% (371) are CLOSED, but still found in the runtime tables.

The following information is a sample of the more complete Order Management Review that you can get from running OMSuiteDataChk.sql, found in Note 353991.1.
The purpose of this script is to collect information related to data integrity in OM and Shipping products.

Show the status of the Order Management Workflows for this instance

Order Management Workflows

<table>
<thead>
<tr>
<th>Item Types</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEOH</td>
<td>1,652</td>
</tr>
<tr>
<td>OEOI</td>
<td>5402</td>
</tr>
<tr>
<td>OEOQ</td>
<td>2</td>
</tr>
<tr>
<td>OEOG</td>
<td>1</td>
</tr>
<tr>
<td>OEOQO</td>
<td>0</td>
</tr>
<tr>
<td>OEOQOP</td>
<td>0</td>
</tr>
<tr>
<td>OEOQOPR</td>
<td>0</td>
</tr>
</tbody>
</table>

SUMMARY of Workflow Processes by Item Type and Status

<table>
<thead>
<tr>
<th>ACTIVE</th>
<th>COMPLETED</th>
<th>PURGEABLE</th>
<th>ITEM_NAME</th>
<th>DISPLAY_NAME</th>
<th>PERSISTENCE_TYPE</th>
<th>PERSISTENCE_DAYS</th>
<th>ERROR</th>
<th>DEFERRED</th>
<th>SUSPENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>352</td>
<td>4,929</td>
<td>4,070</td>
<td>OEOI</td>
<td>OM Order Line</td>
<td>TEMP</td>
<td>0</td>
<td>77</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>336</td>
<td>1,267</td>
<td>1,267</td>
<td>OEOH</td>
<td>OM Order Header</td>
<td>TEMP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>222</td>
</tr>
</tbody>
</table>

Blended time: .01 seconds

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Attention
There are 7,167 Order Management Workflows found on this instance.

It is normal for Order Management Workflows to use WAITs and other looping activities to process delayed responses and other criteria.
Each revisit of a node replaces the previous data with the current activities status and stores the old activity information into a activities history table.
Looking at this history table (WF_ITEM_ACTIVITY_STATUSES_09) can help to identify possible long running workflows that appear to be stuck in a loop over a long time,
or a poorly designed workflow that is looping excessively and can cause performance issues.

There are no records showing the Order Management Purge Concurrent Request (DEXPWF) is currently being used!
This could also be true if Concurrent Manager Data is purged regularly.

Please review Note 878093.1 - How To Use Concurrent Programs: Purge Order Management Workflow.
This Note provides information on the use of “Purge Order Management Workflow” concurrent program, to purge closed workflows, specific to Order Management.
Purge – What Happens

- Aborts WFERROR where PARENT_ITEM_TYPE matches Item Type parameter and where linked activity (PARENT_CONTEXT) no longer in error status
  - But not POERROR, OMERROR or other error types
  - Purge Order Management Workflows with “Attempt to Close” = Y will try to close OMERROR/WFERROR
- Purges Item Types matching Item Type parameter if END_DATE is not NULL and not linked to open parent or child workflow
Purge – What Happens

• If “Core Workflow Only” = N
  • Purges WF_ACTIVITIES table where END_DATE is not NULL and ACTIVITY_ID is not referenced in active workflows
  • End-dates, then deletes notifications not referenced in WF_ITEM_ACTIVITY_STATUSES, _H
  • Example: notifications from finished concurrent programs
  • Purges ad-hoc roles where ORIG_SYSTEM = ‘WF_LOCAL_ROLES’ or ‘WF_LOCAL_USERS’ and not referenced in WF_ROLE_HIERARCHIES or WF_NOTIFICATIONS or WF_ITEMS.OWNER_ROLE
### Check for Orphaned Notifications

<table>
<thead>
<tr>
<th>MESSAGE TYPE</th>
<th>MESSAGE NAME</th>
<th>COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRC_NTF</td>
<td>IRC_MESSAGE</td>
<td>183</td>
</tr>
<tr>
<td>PONAOCT</td>
<td>NEGOTIATION_CLOSED_EARLY</td>
<td>20</td>
</tr>
<tr>
<td>HRWPM</td>
<td>HR_WPM_GENERIC_NTF_MSG</td>
<td>15</td>
</tr>
<tr>
<td>SERVEREQ</td>
<td>CS_SR_NTFY_OWNER_UPDATE_FAILED</td>
<td>15</td>
</tr>
<tr>
<td>OAM_BE</td>
<td>EX_MSG_ERROR</td>
<td>10</td>
</tr>
<tr>
<td>CS.MSGS</td>
<td>FYI_MESSAGE</td>
<td>7</td>
</tr>
<tr>
<td>EDRPSIGF</td>
<td>PSIG_EREC_MESSAGE_BLAF</td>
<td>5</td>
</tr>
<tr>
<td>CS.MSGS</td>
<td>ACTION_REQUEST_MSG</td>
<td>4</td>
</tr>
<tr>
<td>POAPPRV</td>
<td>PO_SUPPLIER_SIGNATURE</td>
<td>3</td>
</tr>
<tr>
<td>FNDCMMSG</td>
<td>SIMPLE_REQ_COMPLETION</td>
<td>1</td>
</tr>
<tr>
<td>FNDCMMSG</td>
<td>REQ_COMPLETION_W_URL</td>
<td>1</td>
</tr>
<tr>
<td>WFMMAIL</td>
<td>USER_PREF_UPDATE_REPORT</td>
<td>1</td>
</tr>
</tbody>
</table>

From Concurrent Requests

---

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If Catching up on Purging

• Purge by Item Type or Age to reduce time of each run
  • Commit keeps rollback from being an issue
• Run with “Core Workflow Only” = Y
• After catching up, run one more time with “Core Workflow Only” = N to purge old design data and orphaned notifications
  • Then only need “N” once/week (orphan notifications)
• While 10g, 11g automatically reset high water marks, export/import may still be recommended
Rebuild or not to Rebuild

Starting Point

After “Catch-up” Purge

More Activity
Regular Purges

More Activity
Regular Purges

After “Catch-up” Purge
Export/Import

More Activity
Regular Purges

More Activity
Regular Purges
From Workflow Analyzer

**Workflow Footprint**

![Workflow Footprint Diagram]

**Volume of Workflow Runtime Data Tables (in Megabytes)**

<table>
<thead>
<tr>
<th>Workflow Table Name</th>
<th>Logical Table Size</th>
<th>Physical Table Data</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>WF_COMMENTS</td>
<td>57</td>
<td>44</td>
<td>13</td>
</tr>
<tr>
<td>WF_DIG_SIGS</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>WF_ITEMS</td>
<td>15</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>WF_ITEM_ACTIVITY_STATUSES</td>
<td>145</td>
<td>60</td>
<td>85</td>
</tr>
<tr>
<td>WF_ITEM_ACTIVITY_STATUSES_H</td>
<td>889</td>
<td>830</td>
<td>59</td>
</tr>
<tr>
<td>WF_ITEM_ATTRIBUTE_VALUES</td>
<td>780</td>
<td>500</td>
<td>280</td>
</tr>
<tr>
<td>WF_NOTIFICATIONS</td>
<td>122</td>
<td>107</td>
<td>15</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>2009</strong></td>
<td><strong>1550</strong></td>
<td><strong>458</strong></td>
</tr>
</tbody>
</table>

**Physical Data**

**Logical Data**

**Attention**

The Workflow Runtime Tables logical space which is used for all full-table scans is only at 23% greater than the physical or actual tablespace being used. It is recommended at levels above 80% to resize these tables to maintain or reset the table HighWater Mark for optimum performance. Please have a DBA monitor these tables going forward to ensure they are being maintained at optimal levels.

Please review [Note 388672.1 - How to Reorganize Workflow Tables](#) on how to manage workflow runtime tablespaces for optimal performance.
Configure (Setup) Seeded Workflows

- Read the documentation
  - Setup
  - How the workflow behaves
  - My Oracle Support white papers, notes
- Setup not just Builder
  - Profile Options
  - Approvals Management Engine (AME)
  - Hierarchies
  - Other Screens
Background Engines

• Run Engine for Stuck separately
  • Parameters NULL, NULL, NULL, No, No, Yes
  • Run once/week or once/month
• Run Engine for Timed Out activities separately based on criticality of timeout
  • If average timeout = 1 day, run once/day
  • Parameters NULL, NULL, NULL, No, Yes, No
Background Engines

• Run Engine for Deferred activities separately based on criticality of activity
  • Except of OEOL, very few workflows need moving more than every 15 minutes
  • If Order volume him, run “targeted” engine for OEOL every 5 minutes
    • Parameters: Order Line, NULL, NULL, Yes, No, No
• Run generic every 15-60 minutes
  • Parameters: NULL, NULL, NULL, NULL, Yes, No, No
From Workflow Analyzer

- Note counts of Ready, run SQL and see if queue is steady or growing
  - Growing – decrease wait time for next execution of Background Engine
  - Low or Empty – increase wait time

---

Table: Verify Status of the Workflow Background Engine Deferred Queue Table

<table>
<thead>
<tr>
<th>CORR_ID</th>
<th>STATE</th>
<th>COUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPSOEOL</td>
<td>READY</td>
<td>1,006</td>
</tr>
<tr>
<td>APPSOEOH</td>
<td>READY</td>
<td>215</td>
</tr>
<tr>
<td>APPSEPBCYCLE</td>
<td>READY</td>
<td>11</td>
</tr>
<tr>
<td>APPSPACRMUDP</td>
<td>READY</td>
<td>5</td>
</tr>
<tr>
<td>APPSPAPRJEX</td>
<td>WAIT</td>
<td>8</td>
</tr>
</tbody>
</table>
Background Engines

• Activities in queue table WF_DEFERRED_TABLE_M
• Time to process = DEQ_TIME – ENQ_TIME where STATE=2
• 369537.1 “How to Monitor the FNDWFBG – Workflow Background Program”
• Scripts: what’s in queue, what will be dequeued next
• 466535.1 “How to Resolve the Most Common Workflow Background Engine Problems”
• Check MOS using “Background Process Performance” for notes for specific item type issues
Background Engine Runs a Long Time

- 18636.1 “WF 2.x: Workflow Background Process Performance Troubleshooting Guide”
  - Determine the Item Type Causing the Issue
    - Usually it’s the activity being processed, not the Background Engine
  - Check for Loops in Workflow – see next slide
- 560144.1 “11.5.10.4: Workflow Background Process Seems to Take Longer After Rup4”
  - Don’t use re-submit time < 5 minutes
  - AQ_TM_PROCESSES must be autotune or at least 1
    - Never set > 9
Check Top 30 Large Item Activity Status History Items

<table>
<thead>
<tr>
<th>ITEM_TYPE</th>
<th>ITEM_KEY</th>
<th>COUNT</th>
<th>BEGIN_DATE</th>
<th>END_DATE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPBCYCLE</td>
<td>General Expense-4009-3-MANAGE_SUBMISSION-11/16/2006-13-01-49</td>
<td>869,973</td>
<td>2006-11-16</td>
<td></td>
<td>Sales Order 66161, Line 2.1...</td>
</tr>
<tr>
<td>OEO</td>
<td>383239</td>
<td>273,478</td>
<td>2008-05-16</td>
<td></td>
<td>Sales Order 66161, Line 1.1...</td>
</tr>
<tr>
<td>OEO</td>
<td>383238</td>
<td>273,082</td>
<td>2008-05-16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WFERROR</td>
<td>WF5033144</td>
<td>113,838</td>
<td>2008-01-14</td>
<td>2008-02-18</td>
<td></td>
</tr>
</tbody>
</table>

Currently, the largest single activity found in the history table is for:
- item_type: EPBCYCLE
- item_key: General Expense-4009-3-MANAGE_SUBMISSION-11/16/2006-13-01-49

Warning
This workflow process is still open, so this may be a problem. It was started back on Nov 16, 2006, and has most recently looped thru its process on Feb 20, 2013.
So far this one activity for item_type EPBCYCLE and item_key General Expense-4009-3-MANAGE_SUBMISSION-11/16/2006-13-01-49 has looped 869,973 times since it started in Nov 16, 2006.

Action
This is a good place to start, as this single activity has been looping for 2,288 days, which is about 380 times a day.
Please review Note 144806.1 - A Detailed Approach To Purging Oracle Workflow Runtime Data on how to drill down and discover how to purge this workflow data.
From Workflow Analyzer

Note: Significance of the AQ_TM_PROCESSES for 10gR1+ (10.1) databases

Starting from 10gR1, Queue Monitoring can utilize a feature called "auto-tune". That means Queue Monitoring does not need AQ_TM_PROCESSES to be defined, it is instead able to adapt to the number of AQ background processes to the system load. However, if you do specify a value, then that value is taken into account but the number of processes can still be auto-tuned and so the number of running qXXX processes can be different from what was specified by AQ_TM_PROCESSES.

Oracle Workflow recommends to UNSET the AQ_TM_PROCESSES parameter as per DB recommendations to enable auto-tune feature.

Note: For more information refer to Note 746313.1 - What should be the Correct Setting for Parameter AQ_TM_PROCESSES in E-Business Suite Instance?

It should be noted that if AQ_TM_PROCESSES is explicitly specified then the process(es) started will only maintain persistent messages. For example if aq_tm_processes=1 then at least one queue monitor slave process will be dedicated to maintaining persistent messages. Other process can still be automatically started to maintain buffered messages. Up to and including version 11.1 if you explicitly set aq_tm_processes = 10 then there will be no processes available to maintain buffered messages. This should be borne in mind in environments which use Streams replication and from 10.2 onwards user enqueued buffered messages.

It is also recommended to NOT DISABLE the Queue Monitor processes by setting aq_tm_processes=0 on a permanent basis. As can be seen above, disabling will stop all related processing in relation to tasks outlined. This will likely have a significant affect on operation of queues - PROCESSED messages will not be removed and any time related, TM actions will not succeed, AQ objects will grow in size.

Note: There is a known issue viewing the true value of AQ_TM_PROCESSES for 10gR2+ (10.2) from the v$parameters table. Review the details in Note 428441.1 - Warning: Aq_tm_processes Is Set To 0" Message in Alert Log After Upgrade to 10.2.0.3 or Higher.

To check whether AQ_TM_PROCESSES Auto-Tuning is enabled, follow the steps outlined in Note 305662.1 - Master Note for AQ Queue Monitor Process (QMON) under Section : Significance of the AQ_TM_PROCESSES Parameter in 10.1 onwards.

11gR2+ (v4.09) Earlier DB, set 1-5
Background Engine Runs a Long Time

• 560144.1 “11.5.10.4: Workflow Background Process Seems to Take Longer After Rup4” (cont)
• JOB_QUEUE_PROCESSES at least 5
  • OAM recommends 10
  • Oracle seeds this to 2 – change it (ignore note 396009.1, updated Feb 2012)
• MOS note 1530928.1, dated Feb 2013, value of 2 causes Row Lock Contention on Mailer
• MOS note 578831.1 – explains how to monitor
• MOS note 271855.1 – if database prior to 11.2, perform regular rebuilds/coalesces on all dequeue indexes/IOTs associated with an AQ table
From Workflow Analyzer

Note: Significance of the JOB_QUEUE_PROCESSES for 11gR1+ (11.1) databases:

Starting from 11gR1, The init.ora parameter job_queue_processes does NOT need to be set for AQ propagations. AQ propagation is now likewise handled by DBMS_SCHEDULER jobs rather than DBMS_JOBS. Reason: propagation takes advantage of the event based scheduling features of DBMS_SCHEDULER for better scalability. If the value of the JOB_QUEUE_PROCESSES database initialization parameter is zero, then that parameter does not influence the number of Oracle Scheduler jobs that can run concurrently. However, if the value is non-zero, it effectively becomes the maximum number of Scheduler jobs and job queue jobs than can run concurrently. If a non-zero value is set, it should be large enough to accommodate a Scheduler job for each Messaging Gateway agent to be started.

Oracle Workflow recommends to UNSET the JOB_QUEUE_PROCESSES parameter as per DB recommendations to enable the scheduling features of DBMS_SCHEDULER for better scalability.

To update the JOB_QUEUE_PROCESSES database parameter file (init.ora) file:

job_queue_processes=10

or set dynamically via

alter system set job_queue_processes=10;

Remember that after bouncing the DB, dynamic changes are lost, and the DB parameter file settings are used.
To determine the proper setting of JOB_QUEUE_PROCESSES for Oracle Workflow, follow the queries outlined in Note 578831.1 - How to determine the correct setting for JOB_QUEUE_PROCESSES.
Advanced Queuing Performance

• 469009.1 “Troubleshooting Workflow Agent Listener’s failure to start”

• 741087.1 “High Logging Messages on WF_EVEN_OJMSTEXT_QH procedure”
  • Verify Profile options (issue is level 2, 3 messages)
    • FND: Debug Log Level – Unexpected (level 6)
      • Note: 1107970.1 recommends setting
        • FND: Debug Log Enables – Yes
        • FND: Debug Module = %
      • Schedule “Purge Diagnostic and Log Messages”
  • Set Log Level for each Listener to Error, then stop and restart Workflow Agent Listener Container
Advanced Queuing Performance

- Memory insufficient or Containers consuming all available memory
  - 444939.1 "How do you Change the Maximum Memory Size taken by Workflow Service Container"

- Retention
  - Increases performance if = 0, but destroys ability to tune, troubleshoot
  - Recommend 1 day – 86400 seconds
  - Only needed for WF_ERROR, WF_JAVA_ERROR, WF_DEFERRED, WF_JAVA_DEFERRED, WF_NOTIFICATION_IN/OUT
  - Dbms-aqadm.alter_queue(queue_name = ’<queue>’, retention_time=>86400);
Advanced Queuing Performance

• White paper “Application Development with Oracle Advanced Queuing” by Jeff Jacobs
• The basic solution is:
  • Add the index to CORRID column
  • Get the CBO to recognize it, which can be by generating an appropriate set of statistics or the various forms of SQL plan management.
WF_CONTROL

• Controls all other queues
• Run ‘Control Queue Cleanup’ every 12 hours
  • In every instance
• 469045.1 “Troubleshooting WF_CONTROL Agent Issues”
  • Discussion of this queue
• Scripts to run to ensure subscribers are valid and dead subscribers are removed properly
WF_DEFERRED Performance

- Subscriptions to Events Phase > 100
- Workflows started by events
- 334348.1 “Low Performance Processing Messages in WF_DEFERRED Queue”; 468650.1 “Troubleshooting WF_DEFERRED Agent Listeners Performance”
  - Use SQL to determine Events in queue
  - Identify if events not being dequeued in timely fashion
    - Time in queue > 2X sleep time for queue
  - Identify events with long processing time
  - Trace code and identify issues (bugs, tuning, etc)
WF_DEFERRED Performance

• 334348.1 “Low Performance Processing Message in WF_DEFERRED Queue”; 467650.1 “Troubleshooting WF_DEFERRED Agent Listeners Performance” (cont)
  • Identify Events with high volume
    • Create additional generic agent listeners
    • Create specific agent listeners
    • Increase ‘Inbound Thread Count’ (PROCESSOR_IN_THREAD_COUNT) by 1 until performance acceptable
  • Temporarily set retention time to 0
WF_DEFERRED Performance

• Queue may be corrupt
  • Receiving Errors “ORA-24033:No Recipients for Message”
  • Rebuild using instructions in note 286394.1 “How to rebuild the WF_DEFERRED queue”
Profile Options

• Account Generator: Run in Debug Mode
  • Except when experiencing an issue with Account Generator, set it to ‘No’
  • Make sure when problem fixed to purge workflows and reset (TEMP and PERM)
• PO: Workflow Processing Mode
  • If set to ‘Online’, screen does not return control to Buyer until workflow ends or notifications requiring response is encountered
    • Still requires background engine to complete
  • If Buyers cannot self-approve POs, set to ‘Background’
Profile Options

- HR: Defer Update After Approval
  - If set to ‘Yes’, all database commits are held until next Background Engine
  - 317002.1 “Approval Is Delayed In Defer Thread Activity”, 469617.1 “Appraisals Remain in Pending Approval Status”, and 466339.1 “Approved Enrollment Still In Requested Status When Class Status Is Normal”
  - Adjust AME FYI rules according to 472387.1 “FYI Notifications Closed Automatically and Not Showing Up on Worklist”
Notification Mailer

- If global preference is ‘Do not send me mail’ (QUERY)
- Use Framework Personalization – prohibit override from Preferences link
- Ensure records in FND_USER_PREFERENCES updated to QUERY
- Disable local subscription event oracle.apps.wf.notification.send.group

Remember!! Alert now uses the Mailer
Notification Mailer

• If global preference is ‘Do Not Send Me Mail’ and not running Alert
  • Don’t start Mailer
  • Set Startup mode for following listeners to Manual or On Demand
    • Workflow Deferred Notification Agent Listener
    • Workflow Inbound Notifications Agent Listener
  • Monitor WF_NOTIFICATION_IN, _OUT
  • Monitor WF_DEFERRED for oracle.apps.wf.notification.% events
Notification Mailer

• If Inbound Processing is not checked and not running Alert inbound processing
  • Set Startup mode for following listeners to Manual or On Demand
    • Workflow Inbound Notifications Agent Listener
  • Monitor WF_NOTIFICATION_IN
Notification Mailer

• Mailer only for Alert
  • 463777.1 “How to Disable all Workflow related Email Notifications Except for the Ones Sent from Oracle Alerts?”
• Create new Mailer
  • Set Correlation id = ALR:%
• Increase Inbound Polling Interval – Processor Min Loop Sleep (seconds) – ensure Processor Max Loop Sleep at least 5*Processor Min Loop Sleep
• Note 315748.1 “How to Change The Java Workflow Mailer Inbound Polling Interval”
Notification Mailer

- Processor Close on Read Timeout
  - 315748.1 – unclick for performance
  - 422870.1 – unless clicks, not removed from Process folder
  - 332152.1 – must be clicked if running multiple mailers using same SMTP Server (Outbound Name) or will get contention and locking
  - 437986.1 – must be clicked or messages get stuck in Inbox
Notification Mailer

• Mailer Log shows java.lang.OutOfMemoryError
  • 467516.1 “Users suddenly (sic) Stop Receiving Email Notifications”
  • Insufficient Heap Size (Xmx and Xms)
  • Edit $APPL_TOP/admin/adovars.env
    • Add/change following
      • APPSJREOPT="-Xms 128m-Xmx3072m"
  • Export APPSJREOPT
  • Bounce Concurrent Managers
Notification Mailer

- “You Have Insufficient Privileges”
- 414376.1 “"You Have Insufficient Privileges For The Current Operation" On Reqapprv Notif”
- Create dedicated user for the mailer
- Framework URL timeout = 120

0 is SYSADMIN
Notification Mailer

• Setup separate user to run the Mailer
  • Must be a workflow administrator
    • This forces Administrator to be a responsibility as SYSADMIN must ALWAYS be an administrator
  • Should only have following responsibilities
    • System Administrator
    • Responsibility used as workflow administrator
  • Should not be a user with other duties

• Why not SYSADMIN
  • Performance: SYSADMIN usually has too many of own emails due to WFERROR emails
  • Manageability: Enabling log for SYSADMIN includes many other functions than mailer thus hampering troubleshooting
Notification Mailer

• Tag Files
  • Out of Office, Undeliverable – set to Ignore
    • 388709.1 “Email Notification Failures Are Causing The Email Servers To Crash”
  • Uncheck Mailer parameter “Send warning for unsolicited e-mail”
    • 431359.1 “Setting up a Tag in the Mailer configuration files to handle unsolicited mail”
  • Uncheck Mailer parameter “Send e-mails for canceled notifications”
Workflow Statistics Programs

• The programs
  • Workflow Mailer Statistics Concurrent Program
  • Workflow Work Items Statistics Concurrent Program
  • Workflow Agent Activity Statistics Concurrent Program
• Run Once/Day
  • Admin must remember to refresh queries
• 787228.1 “Cannot Abort Old Open Items in Workflow Manager Because Errored Items are not Returned”
  • 12.0.4 – wf_item_types.num_error=0, won’t show
  • 12.0.6 – click refresh button and is re-calculated
Workflow Concurrent Managers

• Workflow Agent Listener Service (WFALSNRSVC) must be enabled and active – ALWAYS!!
• Workflow Mailer Service (WFMLRSVC) must be enabled if emailing notifications or running Alert
• Workflow Document Web Services Service (WFWSSVC) must be enabled to use Web Services
Pinning

• Objects “pinned” into memory so they do not need to be constantly reloaded from disk, flushed out of memory and reloaded
  • PIND
  • 301171.1 “Toolkit for dynamic marking of Library Cache objects as Kept (PIND)”
• Requires large SGA and memory
Run 64-bit Database

• Memory is critical, 32-bit can’t address enough
• Intelligent pinning – WF_ packages
• If not on 11gR2, Upgrade
  • Always monitor database desupport policies
  • Different from EBS desupport policies
Partition Tables

- Perform after Purge cleanup
  - Doing this replaces need to export/import
- Backup following tables
  - WF_ITEM_ACTIVITY_STATUSES
  - WF_ITEM_ACTIVITY_STATUSES_H
  - WF_ITEM_ATTRIBUTE_VALUES
  - WF_ITEMS
- Ensure have free space in same tablespace slightly more than currently used (incl. indices)
- Move to OATM first – 402720.1 “OATM Migration fails with ORA-14257 when moving list partitioned tables”
Partition Tables

- 260884.1 “How to Partition tables in OWF.G”, no longer wfupartb.sql
- Script $FND\_TOP/patch/<rel>/sql/WFPART.sql
  Sqlplus: <apps_user>/<passwd> @wfpart <fnd_user> <fnd_passwd> <apps_user> <apps_passwd> <utl_dir_location>
- Script only has to be performed once
- Uses DDL operations running in nologging mode – rollback not possible
  • Failure requires restore of tables
Partition Tables Issues

- WFPART.sql does not create required index WF_ITEM_ACTIVITY_STATUSES_N4 and WF_ITEM_ACTIVITY_STATUSES_H_N3
- 11i.10 – Patch 7252442
  - 749105.1 “Index WF_ITEM_ACTIVITY_STATUSES_N4 Is Not Created When Using wfpart.sql”
- R12 – Patch 8241676
  - 789528.1 “Missing Index WF_ITEM_ACTIVITY_STATUSES_H_N3 and WF_ITEM_ACTIVITY_STATUSES_N4 Using wfpart.sql”
  - Requires 12.0.6 or higher
Wffngen.sql

• Translates activity function calls into static calls
  • According to Oracle, 25% increase in performance
• Look for variable itemtypeList_t
  • Seeded := itemtypeList_t (‘WFSTD’, ’FNDFFWF’)
  • Add following item types (after configuration complete)
    • WFERROR, POERROR, OMERROR
  • Other workflows with high (current) count in WF_ITEMS
Item Attributes “As Needed”

• By default, when workflow initiated, runtime copy of each item attribute created
• 66% if item attributes have not value (and that excludes Event attributes)

```
SELECT COUNT (*) , v.item_type
FROM wf_item_attribute_values v , wf_item_attributes a
WHERE a.item_type = v.item_type
  AND a.NAME = v.NAME
  AND a.TYPE <> 'EVENT'
  AND v.text_value IS NULL
  AND v.number_value IS NULL
  AND v.date_value IS NULL
GROUP BY v.item_type
ORDER BY 1 DESC;
```
Item Attributes “As Needed”

• #ONDEMANDATTR
  • Process Activity Attribute
  • Assign to top-level runnable process activity
  • Can be any type, doesn’t need a value, workflow engine just detects the presence of this attribute
  • Do not assign an item attribute as the value
  • Runtime copy only created when SetItemAttr<> used
  • If referenced prior to this call, default value used
  • Experiment with a particular workflow
  • HRSSA, XDPWFSTD, OEOl, WFERROR, APEXP, POWFRQAG, REQAPPRV, etc
Order Management

• 130511.1 “PERFORMANCE Issues in OM, SE, QP”
  • Remove unnecessary activities
  • No sub-processes
  • Make Scheduling a deferred activity
• Consider seeded Line process: “Line Flow Generic: Performance”
  • Removes unnecessary activities and sub-processes, reducing WF data significantly
• Deferred Worklist Processing
  • Behavior when responding to notifications through worklist
    • Old – control not returned to screen until workflow ended or reached next deferred activity
    • New – control returned immediately, workflow continues when background engine runs again
  • Configurable by item type
  • RAC Affinity for item types whose processes are either launched and completed in one online session or deferred once and completed later by a background engine – WF_RAC_ENABLED_TYPES
Workflow Book

The ABCs of Workflow for Oracle E-Business Suite Release 11i and Release 12

Available from Amazon.com, Barnes & Noble (bn.com) Lulu.com
Questions?
Comments?

Karen.Brownfield@infosemantics.com