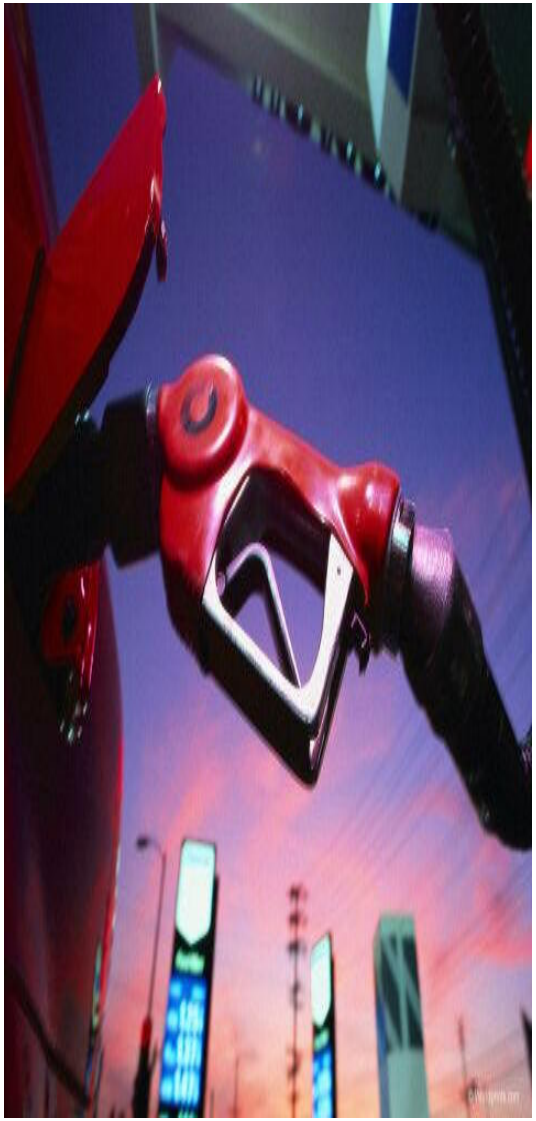


Fueling the Workflow Engine

By Dan Stober
Intermountain Healthcare
April 15, 2008

Agenda

1. Workflow Tables
2. Workflow Scripts and APIs
3. Error Handling
4. Coding to Implement Function Activities
5. Three Examples
6. Other code:
   - A Concurrent Program
   - Selector Functions
   - Document Type Attributes
7. Conclusion and Wrap Up - Questions

Objectives

1. **Learn how to custom procedures to be called from Workflow**
2. **Discover how to communicate back to the calling Workflow process**
3. **Understand the different types of procedures you can write for Workflow and their uses**
4. **See several examples**
5. **Know when to COMMIT and when not to**

Target Audience

- **Primarily: Developers**
  - **Some Experience with WF**
    - **Intermediate level**
    - **Knowledge of WF tables helpful**
  - **Proficient**
    - **PLSQL, SQL**
  - **Exposure, helpful**
    - **SQL**
- **Are you just curious?**

About the Presenter

- Attended California State Univ Fresno
- BS – Business, Accounting Specialty
- Software Engineer
  - Oracle EBS HR/Payroll - Since 2001
- Prior Presentations:
  - Oracle Open World – 2007, 2006
  - Collaborate – 2006 (2)
  - OAUG Live 2004
  - UTOUG Training Days – 2007 (2), 2008
- Perspective

Why Am I Here?

- Researching presentations and writing white papers makes me better
  - Read documentation thoroughly and test
  - Intentional breaking of application prepares me to understand it when I see it in production
- I learn something from an attendee at every presentation I do
  - Please! Feel free to contribute!
- I truly enjoy it!

Intermountain Healthcare

- Non-profit integrated health care system
- Based in Salt Lake City
- 22 Hospitals in two states
- 750 Employed physicians
- 30,000 employees
- Largest non-government employer in Utah
- An innovator in applying technology to Health Care
  - Decision Support
  - Care Protocols
  - Clinical Data Mining

Intermountain Healthcare

Intermountain℠ Healthcare

- 10g Database
- Oracle E-Business Suite – 11.5.10.2
  - HR – 1999
  - Payroll – 1999
  - Employee Self Service – 2002
  - Managers' Self Service (SSHR) - 2003
  - Advanced Benefits – 2004
  - Compensation Workbench – 2006
  - Release 12 – 2008?
- Oracle Workflow since 2003

Section 1

Start Your Engines!

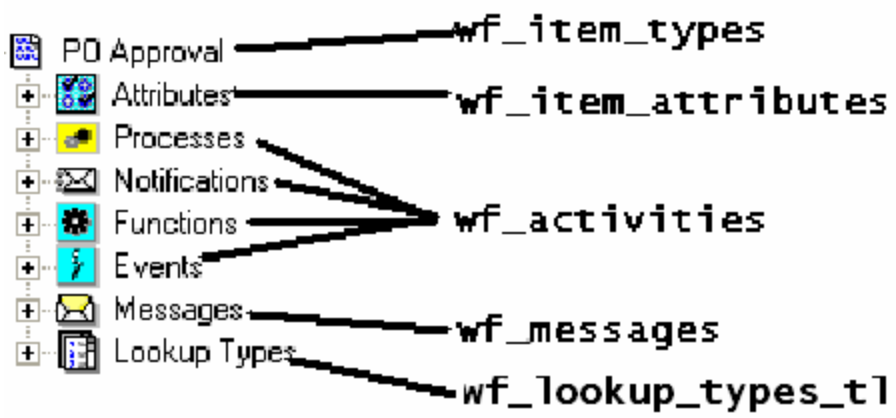
Understanding the Workflow Tables

Workflow Tables Dichotomy

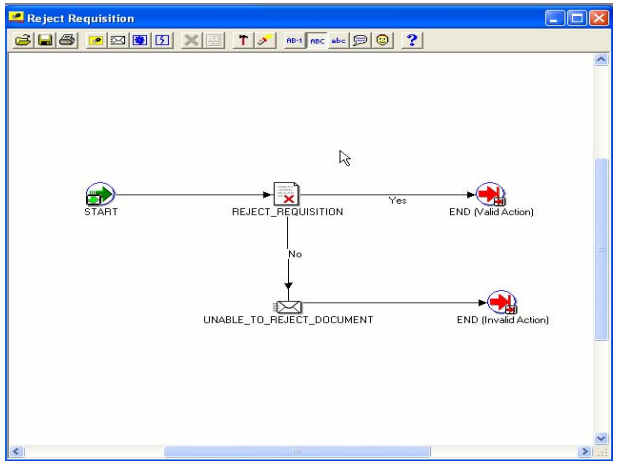
- Definition Tables
  - Roadmap to our process
  - Guide signs
- Runtime Tables
  - Vehicles on our routes

Workflow Definition Tables

- wf_item_types
- wf_item_attributes
- wf_activities
- wf_activity_attributes
- wf_activity_attr_values
- wf_messages
- wf_message_attributes
- wf_process_activities
- wf_activity_transitions
- wf_lookup_types_tl
- wf_lookups_tl



Process Activities & Transitions



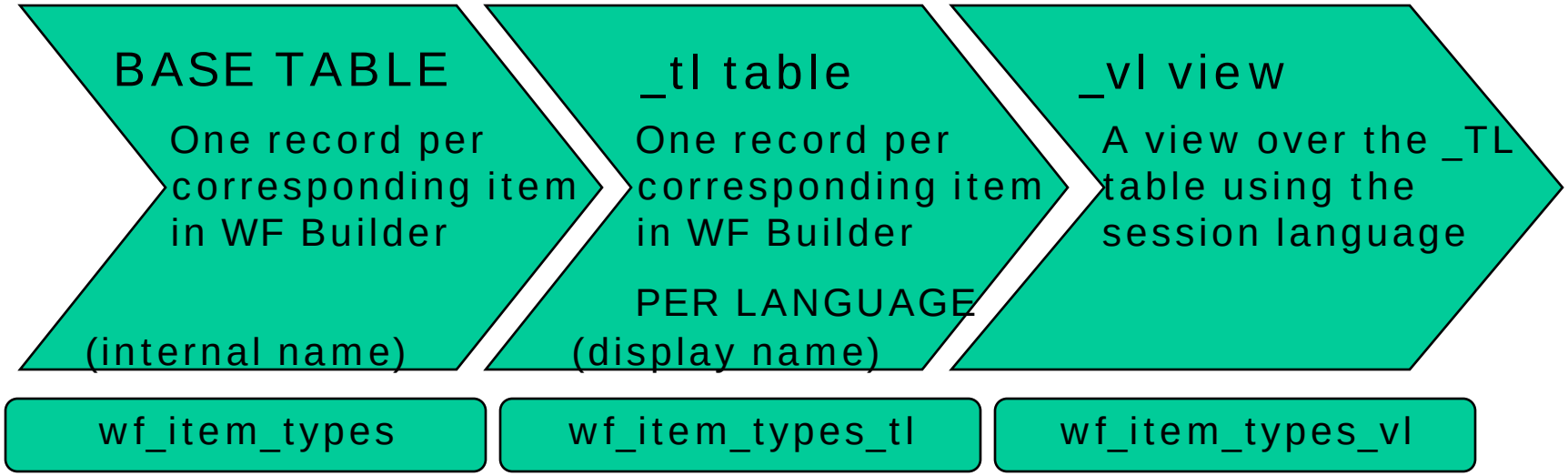
Wf_process_activities

- Activity included in process
- Start / end activity
- Instance label
- Instance ID (not depicted)

wf_activitiy_transitions

- Transition From activity
- Transition To activity
- Result for Transition (if any)

Definition Tables – Naming Scheme




```
SQL> select userenv('LANG') from dual
  2  /

USERENV('LANG')
---------------
US

1 row selected.

SQL>
```

** Lookups tables follow a slightly different scheme*

Workflow Tables

Definition Tables	Runtime Tables
wf_item_types	wf_items
wf_item_attributes	wf_item_attribute_values
wf_activities	wf_item_activity_statuses
wf_activity_attributes	wf_item_activity_statuses_h
wf_activity_attr_values	wf_notifications
wf_messages	
wf_message_attributes	
wf_process_activities	
wf_activity_transitions	
wf_lookup_types_tl	
wf_lookups_tl	

wf_item_activity_statuses

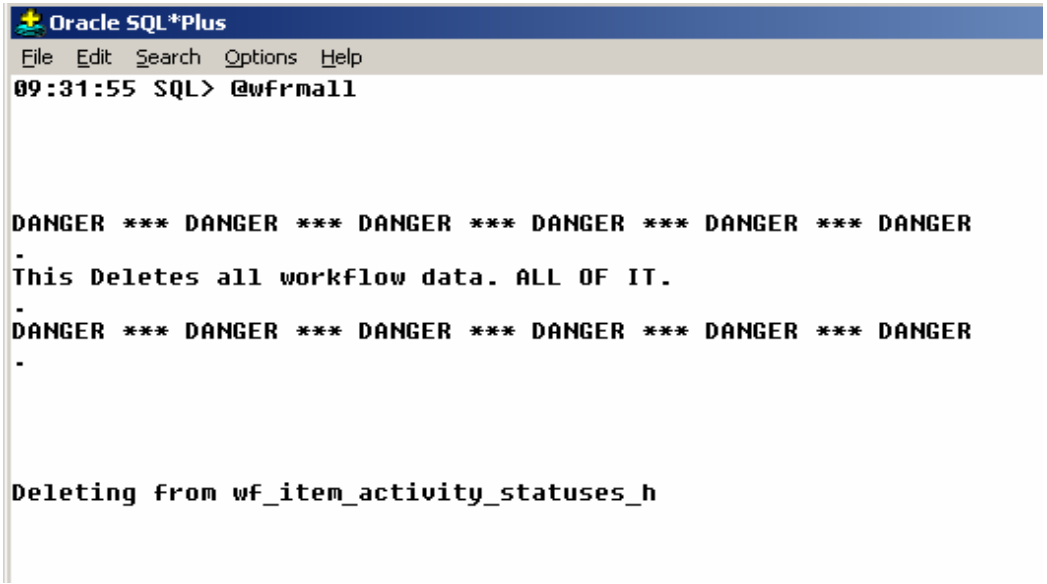
- The GPS Trail for vehicles on WF Hwy
- Which activities have been visited?
- What happened at each point?
- wf_item_activity_statuses_h – history

Section 2
Delivered Code

Workflow Scripts and APIs

Workflow Scripts

- Where are they?
  - `$FND_TOP/sql`
- Why use them?
  - Perform tasks for which there are no APIs
  - Learn from them
- Be careful!
  - Many scripts modify or delete data
  - Don't run it until you've read it



Workflow Scripts

- Reporting Scripts
  - wfstatus.sql
  - wfverchk.sql
  - wfprotck.sql
  - wfbkgchk.sql
- Data Cleanup Scripts
  - wfrmitt.sql
  - wfrmita.sql
  - wfchact.sql
  - wfchitt.sql
  - wfchacta.sql
  - wfchita.sql
  - wfchlut.sql
  - wfchluc.sql
  - wfverupd.sql

- See Metalink Note 108185.1

Workflow APIs

- Public API Packages
  - –WF_ENGINE
  - –WF_CORE
  - –WF_STANDARD
  - –WF_PURGE
  - –WF_NOTIFICATIONS
  - –WF_ITEM

Some APIs in wf_engine

- CreateProcess
- StartProcess
- LaunchProcess
- GetItemAttrXXXX
- SetItemAttrXXXX
- GetActivityAttrXXXX
- AddItemAttr
- AssignActivity

Initiate Processes - APIs

- Create and Start a process instance
- LaunchProcess combines functionality
- You choose item_key (unique)
- COMMIT required (generally)
- Must have selector function
  - or use third param
    in createProcess
    and launchProcess to specify the process

```
wf_engine.createProcess
  (  itemtype   IN VARCHAR2
  ,  itemkey    IN VARCHAR2
  ,  process    IN VARCHAR2
  ,  user_key   IN VARCHAR2
  ,  owner_role IN VARCHAR2);

 wf_engine.startProcess
  (   itemtype  IN VARCHAR2
  ,   itemkey   IN VARCHAR2);

          - - OR - -
wf_engine.launchProcess
  (  itemtype   IN VARCHAR2
  ,  itemkey    IN VARCHAR2
  ,  process    IN VARCHAR2
  ,  user_key   IN VARCHAR2
  ,  owner_role IN VARCHAR2);
```

Add Item Attribute

Other APIS to …

- Add an ItemAttribute
- Add an activityAttribute
- Update mutliple attributes
- Get info about attribute setup

Item Attribute Values: SET and GET

- Read and update attribute values
- Three varieties of each
  - Depending upon datatype of attribute
- "get" has Optional 4th parameter
  - ignore_notfound

wf_engine.setItemAttrText	wf_engine.getItemAttrText
wf_engine.setItemAttrNumber	wf_engine.getItemAttrNumber
wf_engine.setItemAttrDate	wf_engine.getItemAttrDate

- "___Text" version works on all of them
- Also, versions to make calls in bulk

wf_engine.setItemAttrTextArray	wf_engine.getItemAttrTextArray
wf_engine.setItemAttrNumberArray	wf_engine.getItemAttrNumberArray
wf_engine.setItemAttrDateArray	wf_engine.getItemAttrDateArray

```
wf_engine.setItemAttrText
(   itemtype  IN VARCHAR2
,   itemkey   IN VARCHAR2
,   aname     IN VARCHAR2
,   avalue    IN VARCHAR2 );

wf_engine.getItemAttrText
(   itemtype  IN VARCHAR2
,   itemkey   IN VARCHAR2
,   aname     IN VARCHAR2 )
RETURN VARCHAR2;
```

Activity Attribute Values: GET

- Read activity attribute values
  - From setup constant or item_attribute
- No APIs for SET functionality
- Additional Param is instance_id from WPA
- Three varieties
  - Depending upon datatype of attribute
- "get" has Optional 5th parameter
  - ignore_notfound

```
wf_engine.getItemAttrText
(   itemtype  IN VARCHAR2
,   itemkey   IN VARCHAR2
,   actid     IN NUMBER
,   aname     IN VARCHAR2 )
RETURN VARCHAR2;
```

wf_engine.getActivityAttrText
wf_engine.getActivityAttrNumber
wf_engine.getActivityAttrDate

- "___Text" version works on all of them
- No bulk (Array) APIs for activity attributes

Activity Attribute APIs

- Get info about an Activity Attribute
- itemkey is required
- actid is instance_id from wf_process_activities
- atype = Datatype
  - Specific to activity_id
- subtype
  - Send /Respond
- Format mask
- PLSQL Procedure

```
wf_engine.getActivityAttrInfo
  ( itemtype   IN VARCHAR2
  , itemkey    IN VARCHAR2
  , actid      IN NUMBER
  , aname      IN VARCHAR2
  , atype     OUT VARCHAR2
  , subtype   OUT VARCHAR2
  , format    OUT VARCHAR2 );
```

Activity Attribute APIs - GET

- Use these APIs to read an activity attribute value from a running process
- PLSQL Functions (Return)
- Three varieties depending upon datatype or attribute
  - getItemAttrText is generic
  - Formats may play havoc
- Optional parameter for ignore_notfound
  - Default FALSE

```
wf_engine.getActivityAttrText
(  itemtype  IN VARCHAR2
,  itemkey   IN VARCHAR2
,  actid IN NUMBER
,  aname     IN VARCHAR2)
   RETURN VARCHAR2;

wf_engine.getActivityAttrNumber
(  itemtype IN VARCHAR2
,  itemkey  IN VARCHAR2
,  actid    IN NUMBER
,  aname    IN VARCHAR2)
   RETURN NUMBER;

wf_engine.getActivityAttrDate
(  itemtype IN VARCHAR2
,  itemkey  IN VARCHAR2
,  actid    IN NUMBER
,  aname    IN VARCHAR2)
   RETURN DATE;
```

Activity Attribute APIs

- No SET APIs for Activity Attributes
- Activity attributes must be constants or based on item_attribute values

Assign Activity

```
wf_engine.AssignActivity
  (  itemtype     IN VARCHAR2
  ,  itemkey      IN VARCHAR2
  ,  activity     IN VARCHAR2
  ,  performer    IN VARCHAR2);
```

- Assigns a new performer to an activity
- If already notified, resends notif
- “Activity” - internal name of node
  - Or use instance_name if necessary

WF_ITEM package

- Available APIs
  - SetItemUserKey
  - GetItemUserKey
  - SetItemParent
  - SetItemOwner
  - Item_exist: Conflicting documentation
    - Metalink Workflow FAQ – Makes mention of it
    - Package specification – Private
- Makes use of cache (session variables) for performance

WF_CORE package

- Used for error handling
- Hold and pass session variables
- Hold and pass error message tokens
  - Tie to WF_RESOURCES
- Procedures
  - GetError
  - Context

Why use the APIs?

- Only supported method to update values

But even for retrieving data…

- APIs are much more efficient
  - Reduced context switches due to caching
- Oracle maintains the code

Section 3

Accidents will happen!

Error Handling in Workflow

How WF Handles Errors

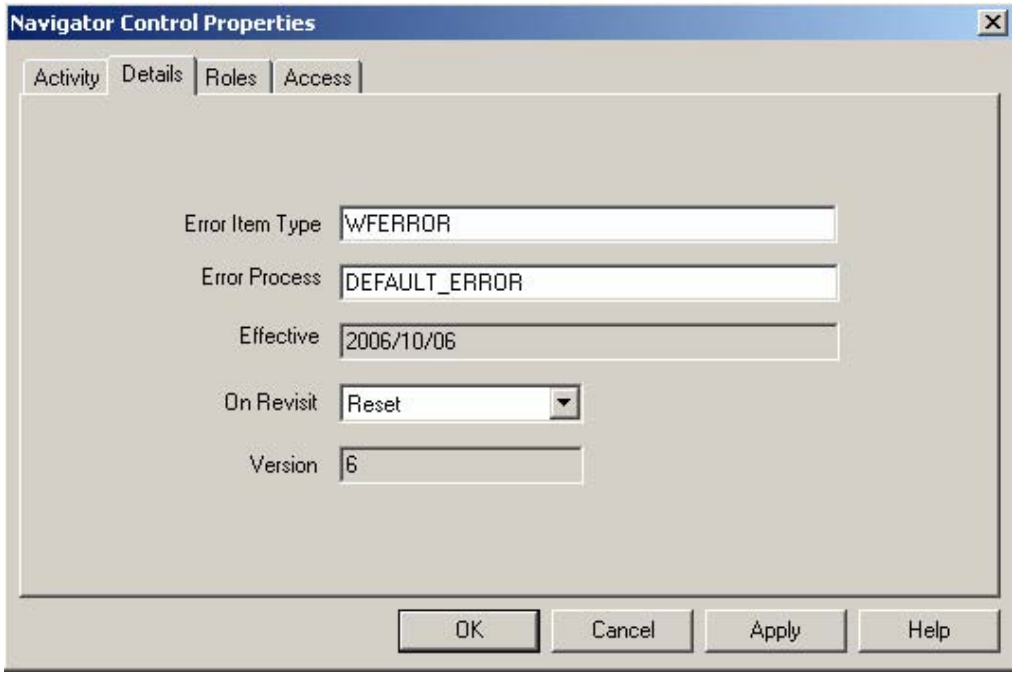
- Delivered Error Handler
  - WFERROR item_type
  - Making your own error process
- Error handling in your PLSQL
  - Anticipating and raising errors
  - WF_CORE

How WF Handles Errors

- SAVEPOINT before each activity
- Unhandled Exception in Activity causes ROLLBACK
  - “Unhandled” includes Exception Handler with RAISE
- WF Engine searches for defined error handler process
  - First in Activity
  - Then, in process
  - Finally, in any parent processes
- Executes Handler (ie: runs designated process)

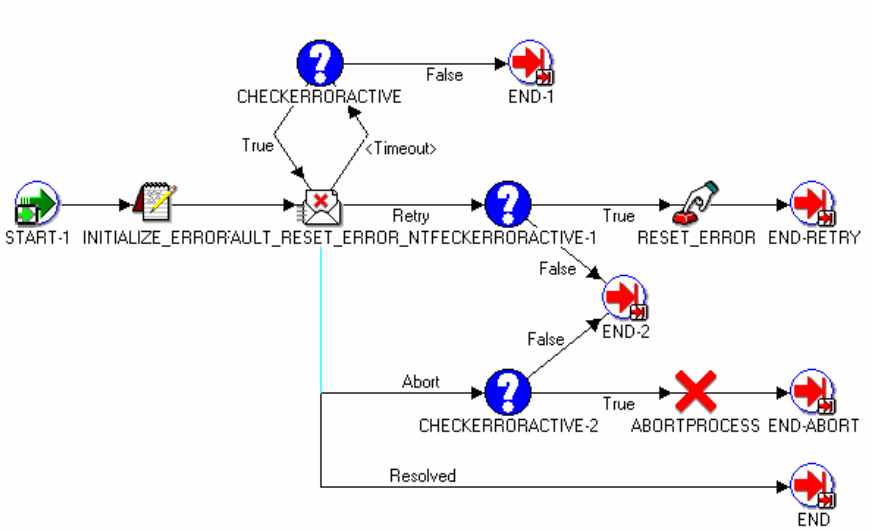
Defining WF Error Process

- Define:
  - by Process or…
  - by Individual Activity
- In WF Builder
- Properties of Activity
- On “Details” tab



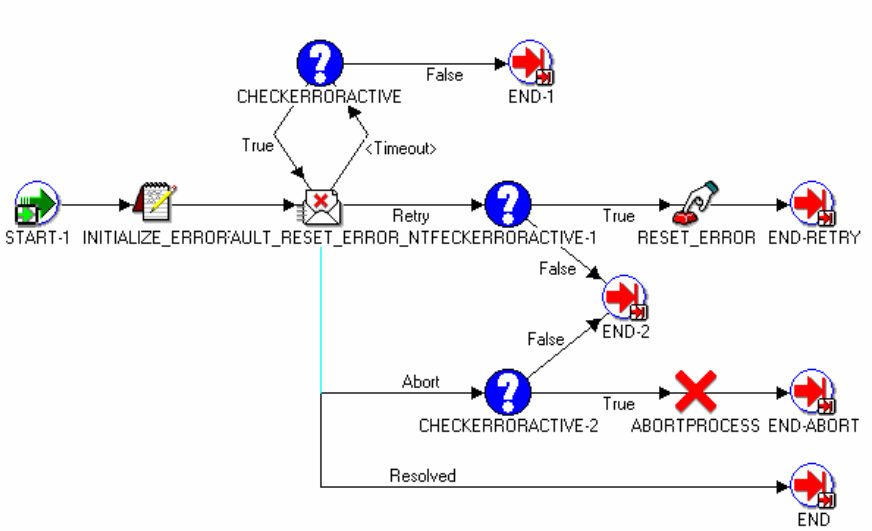
Delivered Process

- Item_type
  - WFERROR
- Process name
  - DEFAULT_ERROR
- System: Error
- Notifies SYSADMIN
  - Can be overridden
    - Create an attribute called #WF_ADMINISTRATOR
  - Calls wf_standard.initializeErrors



Delivered Process

- 20 attributes, including…
  - Error Item_type
  - Error Item_key
  - Error Activity ID
  - Error Message
  - Error Name
- Notifies SYSADMIN
  - Can be overridden
  - Create an attribute called WF_ADMINISTRATOR
  - Handled by wf_standard.initializeErrors



Create Your Own Error Process

- Developer need only create those attrs actually needed
- To reference attrs in notification message, must be created up front
  - Use internal_names
- WF Engine calls wf_standard.initialize_errors
- Set up your error process on item_type

  AND on individual activities

Raising Errors from PLSQL

Propogate exceptions that cannot be handled within PLSQL…

- In PLSQL Exception handler
  - Include call to wf_core.context
    - wf_core.context(package_name, pro, itemtype,itemkey,to_char(actid));
  - RAISE it to WF Engine

    RAISE statement is considered “Unhandled”

- ResultOut activity status is ‘ERROR’

  Allows you to specify a result_code, if desired

PLSQL Exception Handling

- Trap the Exception
- Record the Details
- Re-Raise the Exception

```
PROCEDURE my_wf_proc (itemtype  IN  VARCHAR2
                    , itemkey   IN  VARCHAR2
                    , actid     IN  NUMBER
                    , funcmode  IN  VARCHAR2
                    , resultOut OUT VARCHAR2 )
...
<  Executable statements >

EXCEPTION WHEN OTHERS THEN

   wf_core.context ('my_wf_proc' , NULL, itemtype,
                    itemkey, TO_CHAR(actid), funmode);

   RAISE;

END;
```

WF_CORE

- wf_core.context
- Serves as session variable
  - multi-dimensional
- Information about the exception is placed onto the error stack
- RAISE is still “unhandled”
- Oracle’s public APIs will populate WF_CORE

```
wf_core.context(pkg_name  IN VARCHAR2
             ,  proc_name IN VARCHAR2
             ,  arg1  IN VARCHAR2 DEFAULT '*none*'
             ,  arg2  IN VARCHAR2 DEFAULT '*none*'
             ,  arg3  IN VARCHAR2 DEFAULT '*none*'
             ,  arg4  IN VARCHAR2 DEFAULT '*none*'
             ,  arg5  IN VARCHAR2 DEFAULT '*none*'
             ,  arg6  IN VARCHAR2 DEFAULT '*none*'
             ,  arg7  IN VARCHAR2 DEFAULT '*none*'
             ,  arg8  IN VARCHAR2 DEFAULT '*none*'
             ,  arg9  IN VARCHAR2 DEFAULT '*none*'
             ,  arg10 IN VARCHAR2 DEFAULT '*none*');
```

```
EXCEPTION
 WHEN OTHERS THEN
    wf_Core.context(  pkg_name   => 'THIS_PACKAGE_NAME'
                    , proc_name  => 'THIS PROCEDURE_NAME'
                    , arg1       => itemtype
                    , arg2       => itemkey
                    , arg3       => TO_CHAR(actid)
                    , arg4       => funcmode);
    RAISE;
END;
```

How pkg name and proc name get used in error stack

```
SQL> /

ITEM_KEY RESULT            ACTIVITY STACK
-------- ------ ------------------------------------------------------------------------------
1        ERROR  djs_make_error.proc_name(DJS, 1, 171717, RUN,ORA-01476: divisor is equal to zero)
                            Wf_Engine_Util.Function_Call(djs_make_error, DJS, 1, 171717, RUN)

2        ERROR  .proc_name(DJS, 2, 171717, RUN,ORA-01476: divisor is equal to zero)
                            Wf_Engine_Util.Function_Call(djs_make_error, DJS, 2, 171717, RUN)

3        ERROR   djs_make_error.(DJS, 3, 171717, RUN,ORA-01476: divisor is equal to zero)
                            Wf_Engine_Util.Function_Call(djs_make_error, DJS, 3, 171717, RUN)


3 rows selected.
```

Section 4
Function Activities

Coding for WF Function Activities

Workflow Function Activities

- Often just called “functions”
- Implemented by procedures stored in the database
  - PLSQL
  - Java
- Usually return a “result”
- A Workflow *Function* is implemented by a PLSQL *Procedure*
  - In java it is a method

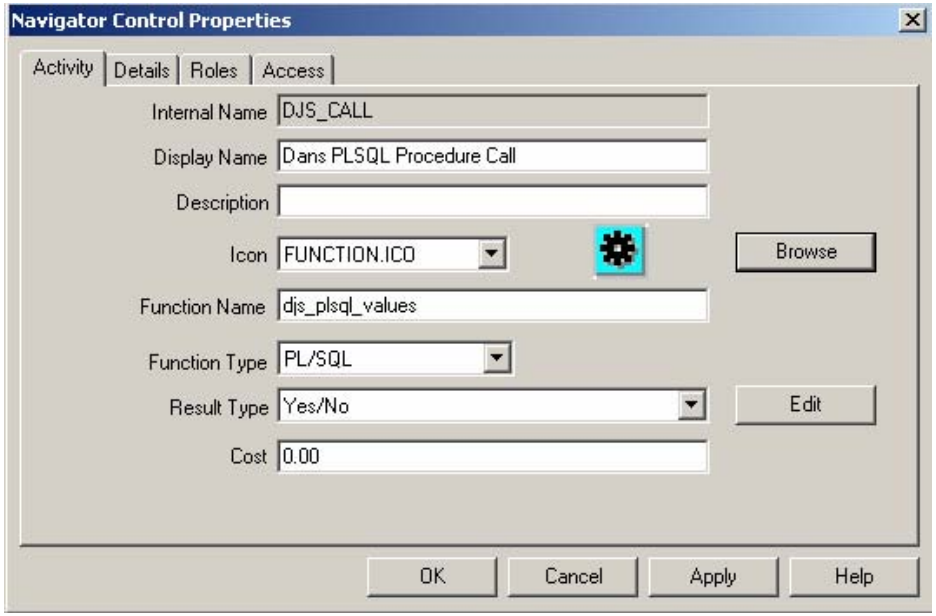
Creating Function Activities

Setup Steps:

- Create function activity within WF Builder
- Write underlying code to implement activity
- Ensure that the two are in synch
  - Function / procedure name
  - Result_type

Creating Function Activities

- Function Name
  - Name of the PLSQL procedure which implements the function
    - Usually:package.procedure
- Result Type
  - Ties to WF Lookup Type
  - Guides transition



PLSQL Approach

- Receive information from calling WF
  - Four inbound parameters
- Execute processing
  - Use Oracle's APIs
  - Query Database tables
  - Perform DML
  - Anything you would do in any PLSQL Program
    … except COMMIT!
- Pass information back to the calling node
  - Pass a value in the ResultOut parameter
  - Update values of item attributes

PLSQL Call Signature

- Implements WF Function activities
- PLSQL Procedure
- Name of procedure matches value from "Function Name" in WF Builder
  - Or name of procedure within a package

```
PROCEDURE xxxx
    (   itemtype          IN  VARCHAR2
    ,   itemkey           IN  VARCHAR2
    ,   actid             IN  NUMBER
    ,   funcmode          IN  VARCHAR2
    ,   resultout         OUT VARCHAR2 )
```

PLSQL Call Signature

- Parameters:
  - INBOUND
    - itemType
    - itemKey
    - actid
    - funcmode
  - OUTBOUND
    - resultOut
- Do I have to spell them this way?

```
PROCEDURE xxxx
    (   itemtype          IN  VARCHAR2
    ,   itemkey           IN  VARCHAR2
    ,   actid             IN  NUMBER
    ,   funcmode          IN  VARCHAR2
    ,   resultout         OUT VARCHAR2 )
```

itemType/itemKey

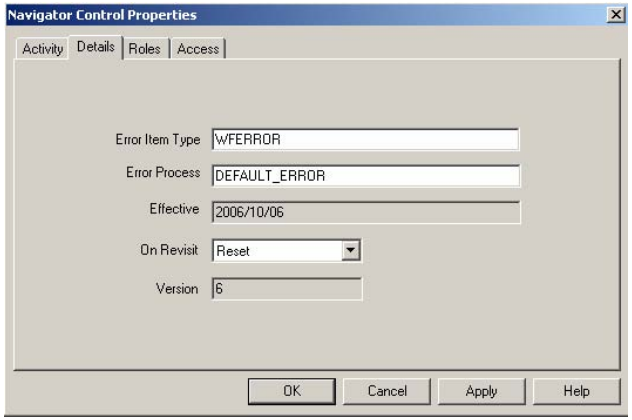
- Unique identifiers of a process instance
- Often, these are the only inbound parameters needed
  - API calls to get and set attribute values, eg.
  - wf_standard.noop doesn't use any of the parameters

actid

- Activity_id
  - Instance_id of calling node in wf_process_activities table
  - Ties to wf_transitions
  - Joins to wf_activity_attr_values
- Needed for Activity Attribute APIs
- Useful when you need to:
  - Determine which activity node made call
  - Determine name of calling process
  - Version of calling process

funcmode

- Function mode
- Frequently spelled “funmode”
- Constants from wf_engine pkg



Values from wf_engine_pkg

RUN	CANCEL
wf_engine.eng_run	wf_engine.eng_cancel
USUAL CALL	REWIND LOGIC

On revisit vs Funcmode	
Reset	**CANCEL** *then* **RUN**
Loop	**RUN**
Ignore	*Subsequent calls ignored (OR logic)*

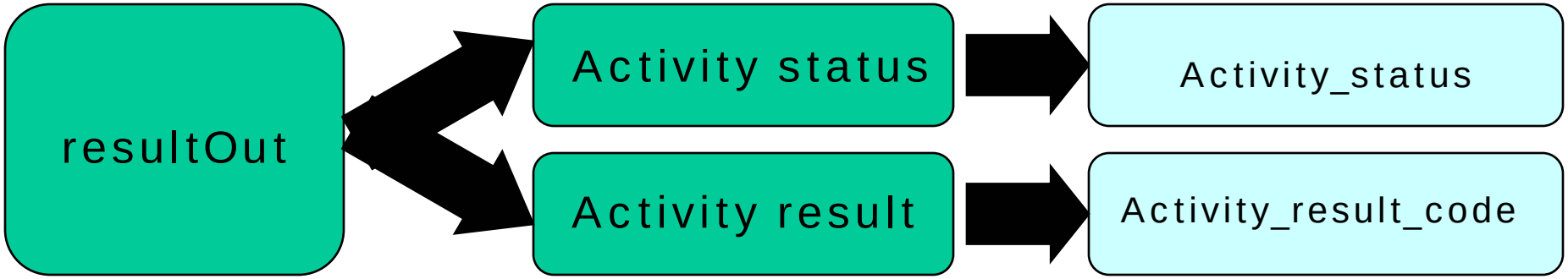
resultOut

1=2

A Single Parameter

Workflow Engine parses to two values

Values are stored in wf_item_activity_statuses



resultOut – Activity Status

Constants from the wf_engine package		
eng_completed	'COMPLETE'	Normal completion
eng_active	'ACTIVE'	Activity Running
eng_waiting	'WAITING'	Activity Waiting to Run
eng_notified	'NOTIFIED'	Notification Open
eng_suspended	'SUSPEND'	Activity Suspended
eng_deferred	'DEFERRED'	Activity Deferred
eng_error	'ERROR'	Complete with Error

- You'll probably only use:COMPLETE and ERROR
- wf_engine.eng_error will raise an error in process

resultOut – Result_Code

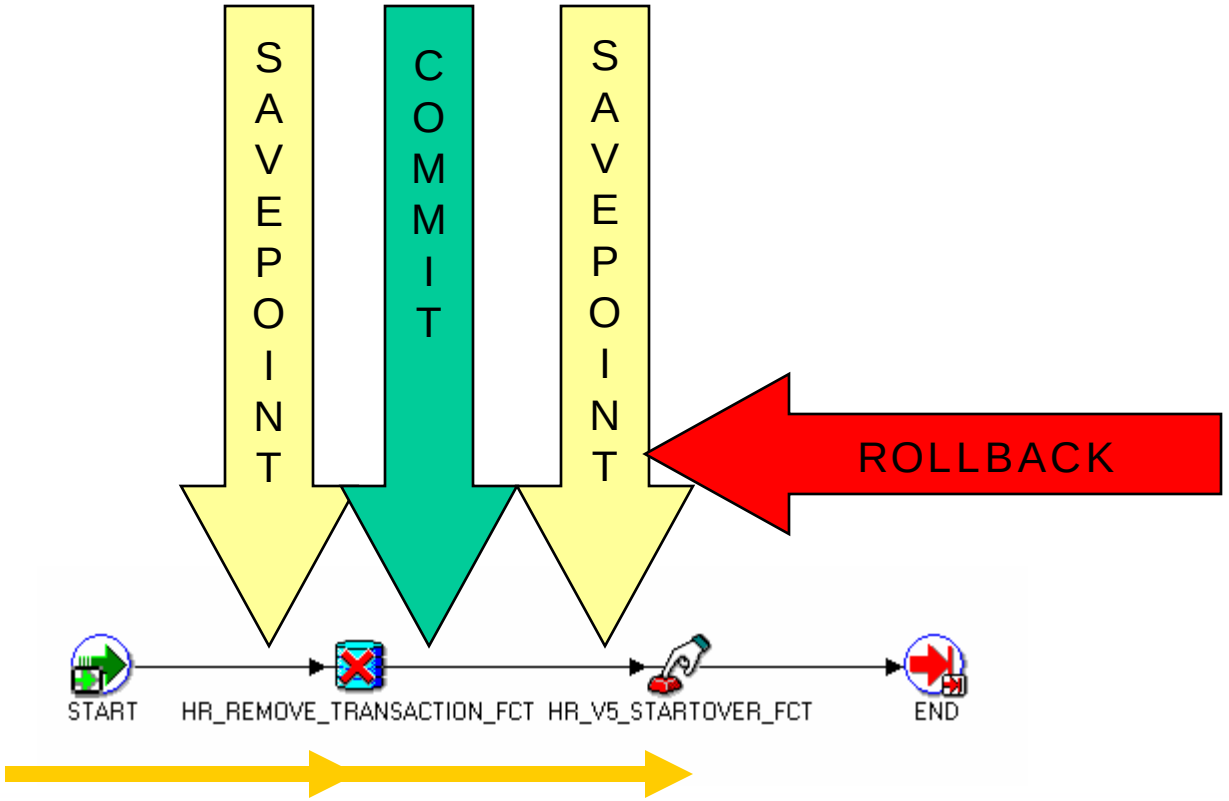
- Must be a valid member of the lookup defined as the result for the activity
  - Validity NOT enforced by Oracle
  - Match IS case sensitive – Upper case always
- Used by wf_transitions
- If activity result not in lookup, then process will become #STUCK

Parsing resultOut

- Expected format
  - PROCESS_STATUS:RESULT_VALUE
- If not in correct format, wf_engine still attempts to parse
  - Parse algorithm:
    1. Look for Colon :
    2. Check ResultOut vs known possible Status Codes
    3. Assume that ResultOut is Activity Result
- If no status_code, default is COMPLETE

When Do I COMMIT?

- Savepoint / Commit Illustration



Other considerations

- Versioning
- Parameter Name Spelling
- Commit
  - Savepoint and Rollback OK
  - DDL = Implicit Commit

Section 5
Shut Up and Drive!

Writing Code to Implement Function Activities

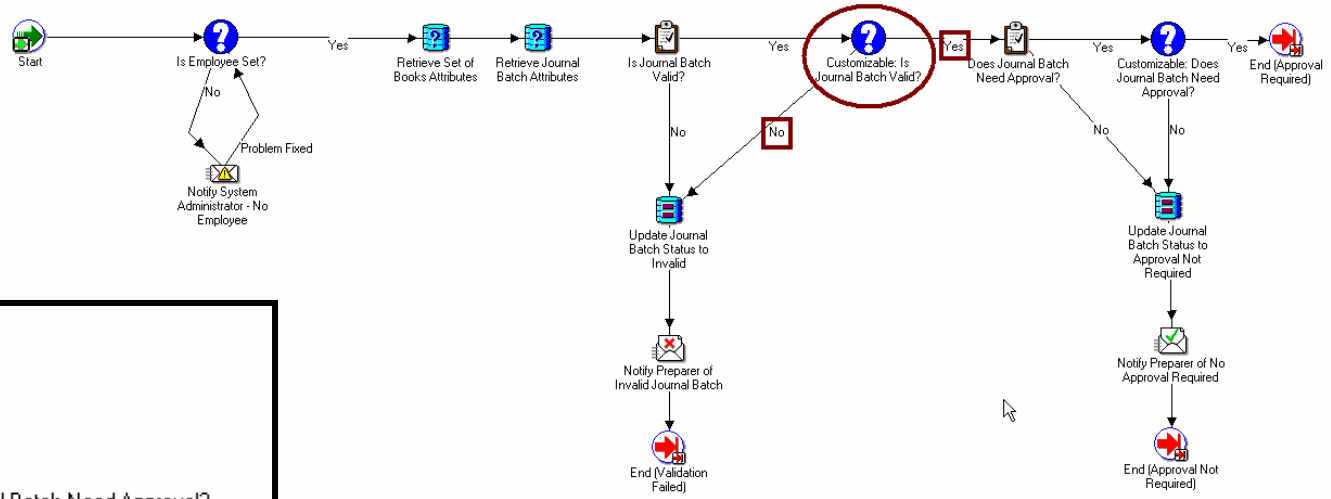
Three Demonstrations with Function Activities

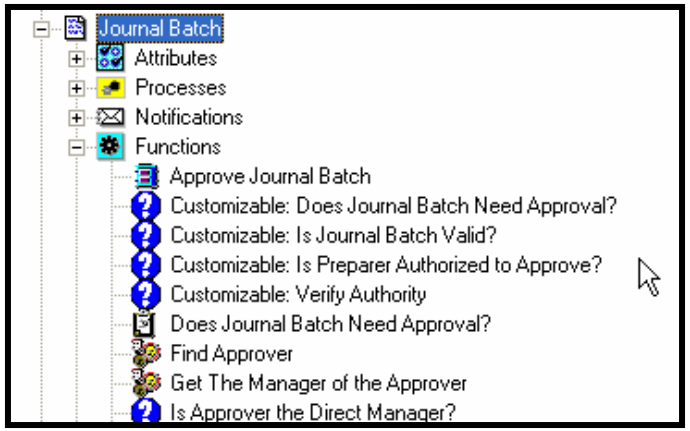
- GLBATCH
- Repeat Result
- Set Wait Date

Customizing GLBATCH

- Download Package gl_wf_customization_pkg
  - glwfcusb.pls
  - Spool from dba_source
- Identify procedure(s) to customize
- Make changes to desired procedure
- Compile package with edits
- Don’t forget to include the procedures that you did not customize!

Customizing GLBATCH





Customizing GLBATCH

```
 1 PACKAGE BODY APPS.GL_WF_CUSTOMIZATION_PKG AS
 2
 3 PROCEDURE is_je_valid(itemtype       IN VARCHAR2,
 4                       itemkey        IN VARCHAR2,
 5                       actid          IN NUMBER,
 6                       funcmode       IN VARCHAR2,
 7                       result         OUT NOCOPY VARCHAR2 ) IS
 8 BEGIN
 9   IF ( funcmode = 'RUN'  ) THEN
10     -- Additional code can be added here.
11     -- COMPLETE:Y (Workflow transition branch "Yes") indicates tha
12     --            batch is valid.
13     -- COMPLETE:N (Workflow transition branch "No") indicates that
14     --            batch is not valid.
15     result := 'COMPLETE:Y';
16   ELSIF (funcmode = 'CANCEL') THEN
17     NULL;
18   END IF;
19 END is_je_valid;
20
21
22 PROCEDURE does_je_need_approval  . . .
23
24 PROCEDURE can_preparer_approve . . .
25
26 PROCEDURE verify_authority . . .
27
28 END GL_WF_CUSTOMIZATION_PKG;
```

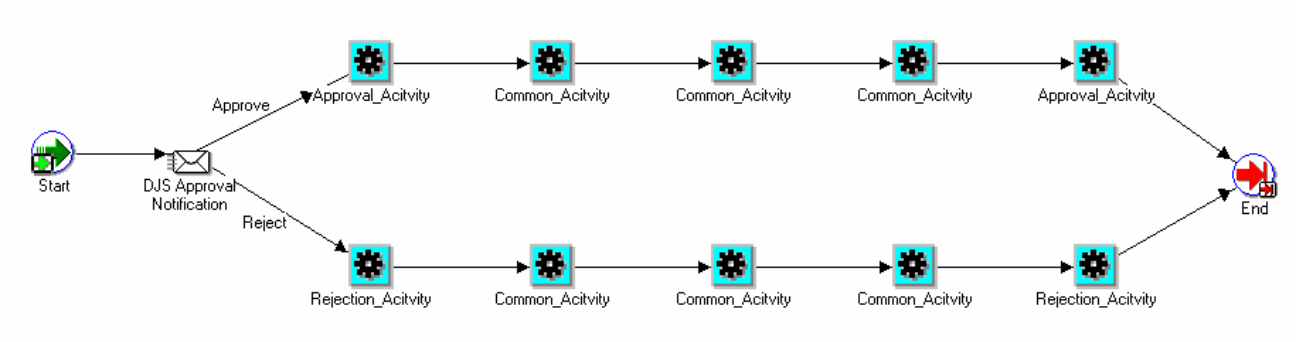

```
PROCEDURE is_je_valid(itemtype IN  VARCHAR2,
                      itemkey  IN  VARCHAR2,
                      actid    IN  NUMBER,
                      funcmode IN  VARCHAR2,
                      result   OUT NOCOPY VARCHAR2 ) IS
BEGIN
  IF ( funcmode = 'RUN'  ) THEN
  -- Additional code can be added here.
-- COMPLETE:Y (Workflow transition branch "Yes") indicates
-- that the journal batch is valid.
-- COMPLETE:N (Workflow transition branch "No") indicates
-- that the journal batch is not valid.
      result := 'COMPLETE:Y';
  ELSIF (funcmode = 'CANCEL') THEN
      NULL;
  END IF;
END is_je_valid;
```

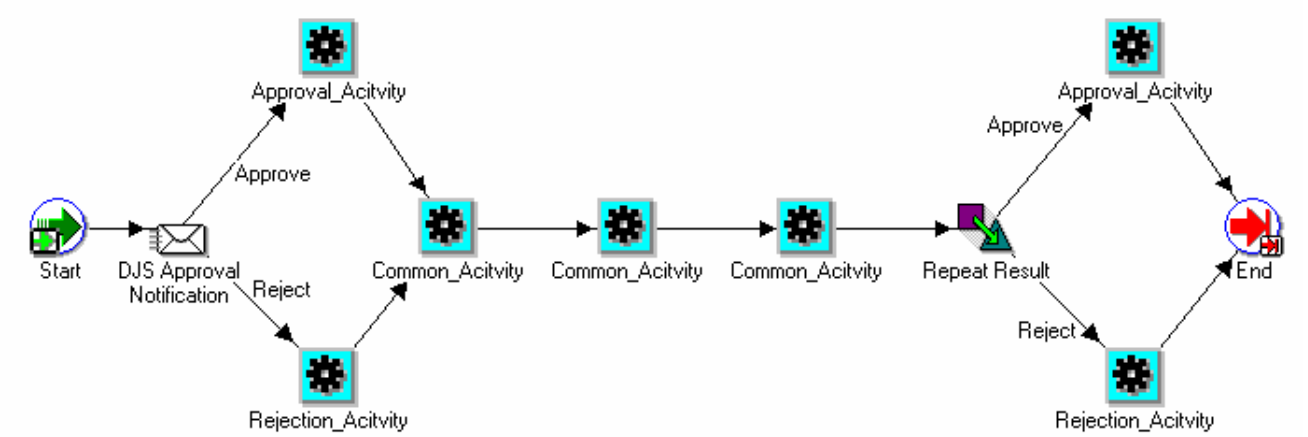
Customizing GLBATCH

```
 3 PROCEDURE is_je_valid(itemtype       IN VARCHAR2,
 4                       itemkey        IN VARCHAR2,
 5                       actid          IN NUMBER,
 6                       funcmode       IN VARCHAR2,
 7                       result         OUT NOCOPY VARCHAR2 )
 8   IS
 9
10      L_batch_id                gl_je_batches.je_batch_id%TYPE;
11      l_boolean_validity_check  BOOLEAN;
12
13 BEGIN
14   IF ( funcmode = 'RUN'  ) THEN
15
16
17      l_batch_id := wf_engine.getItemAttrNumber ( itemtype, itemkey, 'BATCH_ID'
18
19
20      l_boolean_validity_check   := my_custom_validity_check (l_batch_id);
21
22      IF l_boolean_validity_check THEN
23       result := 'COMPLETE:Y';
24      ELSE
25       result := 'COMPLETE:N';
26      END IF;
27
28   ELSIF (funcmode = 'CANCEL') THEN
29     NULL;
30   END IF;
31 END is_je_valid;
```

```
PROCEDURE is_je_valid(itemtype  IN VARCHAR2,
                      itemkey   IN VARCHAR2,
                      actid     IN NUMBER,
                      funcmode  IN VARCHAR2,
    l_boolean_validity_check   :=
                       my_custom_validity_check(l_batch_id);

    IF l_boolean_validity_check THEN
        result := 'COMPLETE:Y';
    ELSE
        result := 'COMPLETE:N';
    END IF;

ELSIF (funcmode = 'CANCEL') THEN
    NULL;
END IF;

END is_je_valid;
```

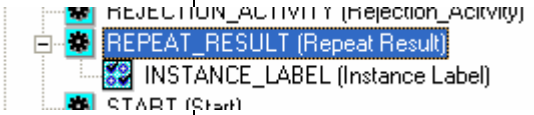
Repeat Result

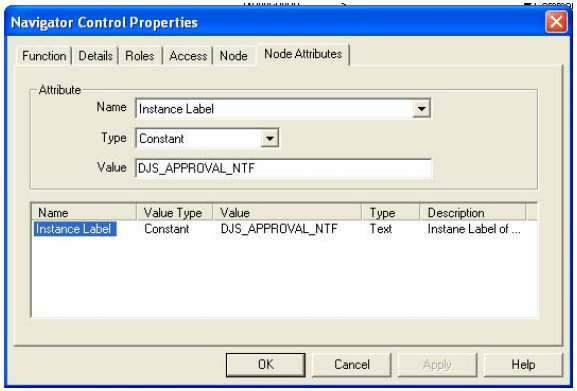




Repeat Result

```
23
24       -- Read the value contained in the attribute
25       l_instance_label_attr   :=  wf_engine.getActivityAttrText
26                                  (   itemtype            =>  itemtype
27                                  ,   itemkey             =>  itemkey
28                                  ,   actid               =>  actid
29                                  ,   aname               =>  'INSTANCE_LABEL'
30                                  ,   ignore_notfound     =>  TRUE            );
31
32       -- Get information about the process that the activity calling this is a part of
33        SELECT wpa.process_item_type
34           ,   wpa.process_name
35           ,   wpa.process_version
36          INTO l_process_item_type
37           ,   l_process_name
38           ,   l_process_version
39          FROM wf_process_activities wpa
40         WHERE wpa.instance_id = actid;
41
42      BEGIN
43
44       -- Then, get the instance_id of the activity whose value should be repeated
45        SELECT wpa.instance_id
46          INTO l_instance_id
47          FROM wf_process_activities wpa
48         WHERE wpa.process_item_type   = l_process_item_type
49           AND wpa.process_name        = l_process_name
50           AND wpa.process_version     = l_process_version
51           AND wpa.instance_label      = l_instance_label_attr;
52
53      EXCEPTION
54          WHEN no_data_found THEN
55          -- Either the activity attribute attribute does not exist or it contained a string that
56          -- is not an instance label in this process
57
58              RAISE e_activity_not_in_process;
59      END;
60
61      BEGIN
62          SELECT activity_result_code
63            INTO l_activity_result_code
64            FROM wf_item_activity_statuses
65            WHERE process_activity = l_instance_id
66              AND item_type        = itemtype
67              AND item_key         = itemkey
68              AND activity_status  = wf_engine.eng_completed;
69
70      EXCEPTION
71          WHEN no_data_found THEN
72
73                      RAISE e_no_completed_activity_found;
74      END;
75
76      resultOut := wf_engine.eng_completed || ':' || l_activity_result_code;
77
78  END IF; -- funcmode = wf_engine.eng_run
79
```





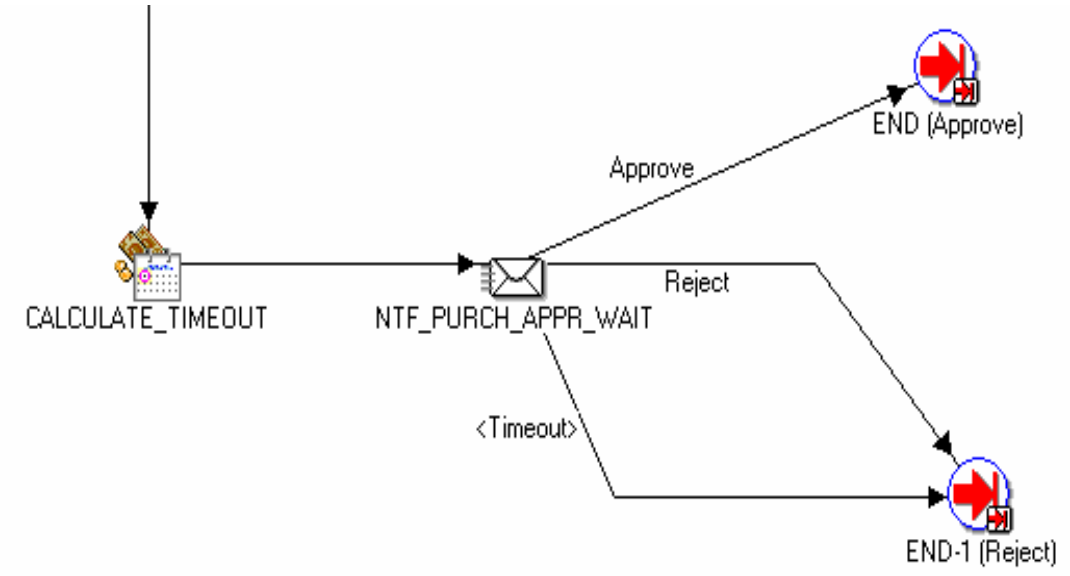

```
-- Read the value contained in the attribute
l_instance_label_attr   :=
        wf_engine.getActivityAttrText
(   itemtype            =>  itemtype
,   itemkey             =>  itemkey
,   actid               =>  actid
,   aname               =>  'INSTANCE_LABEL'
,   ignore_notfound     =>  TRUE            );
```

Repeat Result

```
23
24       -- Read the value contained in the attribute
25       l_instance_label_attr   :=  wf_engine.getActivityAttrText
26                                  (   itemtype            =>  itemtype
27                                  ,   itemkey             =>  itemkey
28                                  ,   actid               =>  actid
29                                  ,   aname               =>  'INSTANCE_LABEL'
30                                  ,   ignore_notfound     =>  TRUE            );
31
32       -- Get information about the process that the activity calling this is a part of
33        SELECT wpa.process_item_type
34           ,   wpa.process_name
35           ,   wpa.process_version
36          INTO l_process_item_type
37           ,   l_process_name
38           ,   l_process_version
39          FROM wf_process_activities wpa
40         WHERE wpa.instance_id = actid;
41
42      BEGIN
43
44       -- Then, get the instance_id of the activity whose value should be repeated
45        SELECT wpa.instance_id
46          INTO l_instance_id
47          FROM wf_process_activities wpa
48         WHERE wpa.process_item_type   = l_process_item_type
49           AND wpa.process_name        = l_process_name
50           AND wpa.process_version     = l_process_version
51           AND wpa.instance_label      = l_instance_label_attr;
52
53      EXCEPTION
54          WHEN no_data_found THEN
55          -- Either the activity attribute attribute does not exist or it contained a string that
56          -- is not an instance label in this process
57
58              RAISE e_activity_not_in_process;
59      END;
60
61      BEGIN
62          SELECT activity_result_code
63            INTO l_activity_result_code
64            FROM wf_item_activity_statuses
65            WHERE process_activity = l_instance_id
66              AND item_type        = itemtype
67              AND item_key         = itemkey
68              AND activity_status  = wf_engine.eng_completed;
69
70      EXCEPTION
71          WHEN no_data_found THEN
72
73                      RAISE e_no_completed_activity_found;
74      END;
75
76      resultOut := wf_engine.eng_completed || ':' || l_activity_result_code;
77
78    END IF; -- funcmode = wf_engine.eng_run
79
```

```
-- Get information about the process that
-- the activity calling this is a part of
SELECT wpa.process_item_type
   ,   wpa.process_name
   ,   wpa.process_version
INTO l_process_item_type
   ,   l_process_name
   ,   l_process_version
FROM wf_process_activities wpa
WHERE wpa.instance_id = actid;
AND wpa.process_name        = l_process_name
AND wpa.process_version     =
l_process_version
AND wpa.instance_label      =
l_instance_label_attr;

EXCEPTION
   WHEN no_data_found THEN
-- Either the activity attribute attribute
does not exist or it contained a string that
-- is not an instance label in this process

RAISE e_activity_not_in_process;
END;
```

Calculate Timeout Procedure



Set Wait Date Procedure

```
 1 PROCEDURE setWaitDate
 2   (   itemtype         IN  VARCHAR2
 3   ,   itemkey          IN  VARCHAR2
 4   ,   actid            IN  NUMBER
 5   ,   funcmode         IN  VARCHAR2
 6   ,   resultout        OUT VARCHAR2         )
 7
 8 IS
 9    l_ProcLaunchDate   DATE;
10    l_OneMonthLater    DATE;
11 BEGIN
12          -- Get the process launch date for the item_type and item_key that
13          -- were passed in.  Query the wf_items table directly.
14    SELECT wi.begin_date
15      INTO l_ProcLaunchDate
16      FROM wf_items   wi
17     WHERE wi.item_type = itemtype
18       AND wi.item_key  = itemkey;
19
20    -- Calculate the one month later date
21    l_OneMonthLater   := TRUNC(ADD_MONTHS(l_ProcLaunchDate, 1));
22
23    -- make allowance for weekends
24    IF TO_CHAR(l_OneMonthLater, 'D')    = 7 THEN        -- Saturday
25       l_OneMonthLater        := l_OneMonthLater +2;
26    ELSIF TO_CHAR(l_OneMonthLater, 'D') = 1 THEN        -- Sunday
27       l_OneMonthLater        := l_OneMonthLater +1;
28    END IF;
29
30    -- Write the calculated value to the attribute "WaitUntilDate"
31    setItemAttrDate (
32        itemtype         => itemtype
33    ,   itemkey          => itemkey
34    ,   aname            => 'WAITUNTILDATE'
35    ,   avalue           => l_OneMonthLater);
36
37   -- Mark the activity status COMPLETE.  No result code passed ba
38   resultout := wf_engine.eng_completed;
39
40 EXCEPTION
41   WHEN OTHERS THEN
42       wf_core.context ('djs_wf_demo', 'setWaitDate'
43             , itemtype, itemkey, to_char(actid), funcmode
44           , substr(sqlerrm, 1, 100) )
45       -- Mark the activity status ERROR.
46       resultout := wf_engine.eng_error;
47
48 END;
```

```
PROCEDURE setWaitDate
   (   itemtype         IN  VARCHAR2
    ,   itemkey         IN  VARCHAR2
    ,   actid           IN  NUMBER
    ,   funcmode        IN  VARCHAR2
    ,   resultOut       OUT VARCHAR2         )
BEGIN
 -- Calculate the one month later date  at 5:00 pm
    -- Mark the activity status COMPLETE.
    -- No result code passed back.
     resultOut := wf_engine.eng_completed;

   END IF;  -- if funcmode = wf_engine.eng_run
EXCEPTION
   WHEN OTHERS THEN
 -- Mark the activity status ERROR.
 wf_core.context (itemtype, itemkey, TO_CHAR(actid),funcmode);

 resultout := wf_engine.eng_error;
END;
```

Section 6
Other code

Reset Preferences - A Concurrent Program

Selector Functions

Document Type Attributes

Reset Preferences

- Concurrent program
- Designed to overcome flaw in mailer logic
  - Failed notif results in a user pref of ‘DISABLED’
- Finds all users with individual notif pref
  - Stored in fnd_user_preferences
- Removes those records and synchronizes
  - Two API calls
    - fnd_preference.remove -> Private
    - fnd_user_pkg.user_synch -> Public
  - Approved by Oracle support in OUR installation

Reset Preferences

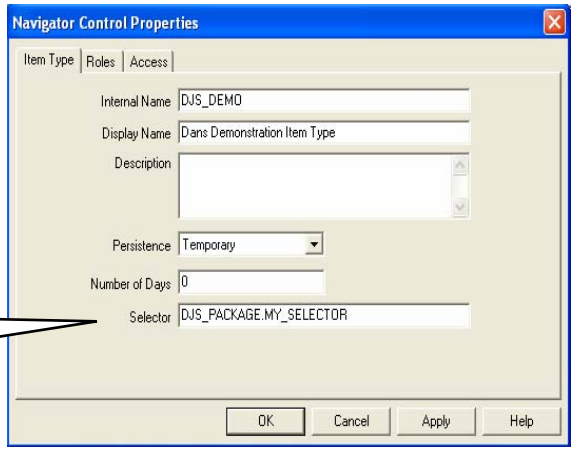
```
 1 PROCEDURE reset_notification_prefs
 2     (   p_errbuff        OUT VARCHAR2
 3     ,   p_retcode        OUT VARCHAR2)
 4
 5 AS
 6
 7    l_rec_count         NUMBER          :=0;
 8    l_err_count         NUMBER          :=0;
 9
10    l_savepoint_name    VARCHAR2(25);
11    l_err_loc           VARCHAR2(100);
12
13 BEGIN
14
15    FOR prefs_rec IN (SELECT *
16                        FROM applsys.fnd_user_preferences
17                       WHERE preference_name   = 'MAILTYPE'
18                         AND module_name       = 'WF'
19                         AND user_name         != '-WF_DEFAULT-'
20    ) LOOP
21
22        BEGIN
23
24            v_savepoint_name := prefs_rec.user_name;
25
26            SAVEPOINT l_savepoint_name;
27
28            l_err_loc       := 'API calls on user ' || prefs_rec.user_name;
29
30            fnd_preference.remove ( p_user_name     =>  prefs_rec.user_name
31                                  ,   p_module_name   =>  prefs_rec.module_name
32                                  ,   p_pref_name     =>  prefs_rec.preference_
33
34            fnd_user_pkg.user_synch(prefs_rec.user_name);
35
36            l_rec_count     :=     l_rec_count     + 1;
37
38        EXCEPTION
39            WHEN OTHERS THEN
40
41                ROLLBACK TO l_savepoint_name;
42
43                l_err_count     :=     l_err_count     + 1;
44                fnd_file.put_line(fnd_file.log, 'Error at ' || l_err_loc || '
45
46        END;
47    END LOOP;
48
49    COMMIT;
50
51    fnd_file.put_line(fnd_file.log, l_rec_count || ' user preference records
52
53
54    IF l_err_count   = 0 THEN
55
56        p_errbuff   := 'SUCCESSFUL COMPLETION. ' || l_rec_count || ' user pre
57        p_retcode   := 0;
58
59    ELSE
60
```

```
BEGIN

FOR prefs_rec IN (SELECT *
                    FROM applsys.fnd_user_preferences
                   WHERE preference_name   = 'MAILTYPE'
                     AND module_name       = 'WF'
                     AND user_name         != '-WF_DEFAULT-'
) LOOP

    BEGIN

        v_savepoint_name := prefs_rec.user_name;
        SAVEPOINT l_savepoint_name;

        l_err_loc       := 'API calls on user '
                                || prefs_rec.user_name;

        fnd_preference.remove
         ( p_user_name     =>  prefs_rec.user_name
         , p_module_name   =>  prefs_rec.module_name
         , p_pref_name     =>  prefs_rec.preference_name
         );

        fnd_user_pkg.user_synch(prefs_rec.user_name);

        l_rec_count     :=     l_rec_count     + 1;
```

Selector Functions

- PLSQL Procedure
- Tells WF engine which process to launch when none is specified.
- Optional property of Item Type
- Procedure returns name of process
  - In “resultOut” parameter
- Same procedure used for callback
  - “command” parameter is ‘RUN’ for selector
- Example: `generic_selector`
  - Returns name of only process in the item type

```
PROCEDURE xxxx
    (   item_type     IN      VARCHAR2
    ,   item_key      IN      VARCHAR2
    ,   activity_id   IN      NUMBER
    ,   command       IN      VARCHAR2
    ,   resultout     IN OUT  VARCHAR2 )
```



Define Selector Function Here

Selector Function

```
 1 PROCEDURE generic_selector
 2   (   item_type      IN     VARCHAR2
 3   ,   item_key       IN     VARCHAR2
 4   ,   activity_id    IN     NUMBER
 5   ,   command        IN     VARCHAR2
 6   ,   resultout      IN OUT VARCHAR2 )
 7 IS
 8
 9   l_process_name     wf_activities.name%TYPE;
10   l_process_count    PLS_INTEGER             :=0;
11
12 BEGIN
13    IF command = wf_engine.eng_run THEN
14
15       FOR proc_rec IN (SELECT name
16                          FROM wf_activities    wa
17                         WHERE wa.item_type   = item_type
18                           AND wa.type        = 'PROCESS'
19                           AND runnable_flag  = 'Y'
20                           AND SYSDATE BETWEEN wa.begin_date
21                           AND NVL(end_date, SYSDATE)
22       ) LOOP
23
24          l_process_name  := proc_rec.name;
25          l_process_count := l_process_count +1;
26
27       END LOOP;
28
29       IF l_process_count = 1 THEN
30        -- Only one process in this item_type, so return its name
31
32          resultout := l_process_name;
33
34       ELSE
35
36          resultout := NULL;
37
38       END IF;
39
40    END IF;
41
42 END generic_selector;
```

```
PROCEDURE generic_selector
 ( item_type      IN      VARCHAR2
FOR proc_rec IN (SELECT name
           FROM wf_activities    wa
              WHERE wa.item_type   = item_type
                AND wa.type        = 'PROCESS'
                AND runnable_flag  = 'Y'
                AND SYSDATE BETWEEN wa.begin_date
                                AND NVL(end_date, SYSDATE)
) LOOP
   l_process_name  := proc_rec.name;
   l_process_count := l_process_count +1;
END LOOP;

IF l_process_count = 1 THEN
-- Only one process in this item_type, so return its name
   resultout := l_process_name;
ELSE

   resultout := NULL;
END IF;
```

Why Use a Document Type Attribute?

"Regular" attributes

- TEXT, NUMBER, DATE
- Stored in DB table
  - wf_item_attribute_values
  - wf_activity_attr_values
- Limited to 4000 chars
- <HTML> markup not permitted

DOCUMENT attributes

- Populated by code
- Derived at runtime
- Virtually unlimited length
  - PLSQL VARCHAR2
  - PLSQL CLOB
- Ideal for <HTML> code with tables of unpredictable length

HTML Body

Here is a line from the Ordinary Attribute

Do <FONT COLOR="RED">NOT</FONT> PASS <B>GO</B> AND DO <U>NOT</U> COLLECT $200

And here is a line from the Document Attribute

Do NOT PASS **GO** AND DO NOT COLLECT $200

+++ HTML Body +++

Document Attribute Setup

1. Create a Document-type attribute for a message
2. Define a default value for the message attribute
   – Point to procedure as defined in step (4)
3. Include the attribute in the new message

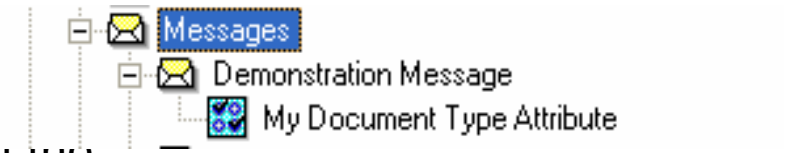
Steps Performed in Workflow Builder

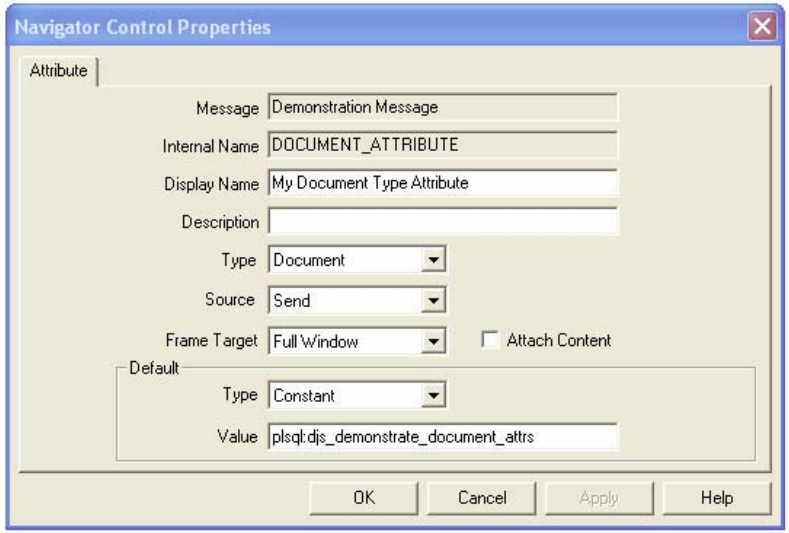
4. Write a procedure to be called by the Workflow Engine to populate your attribute and compile

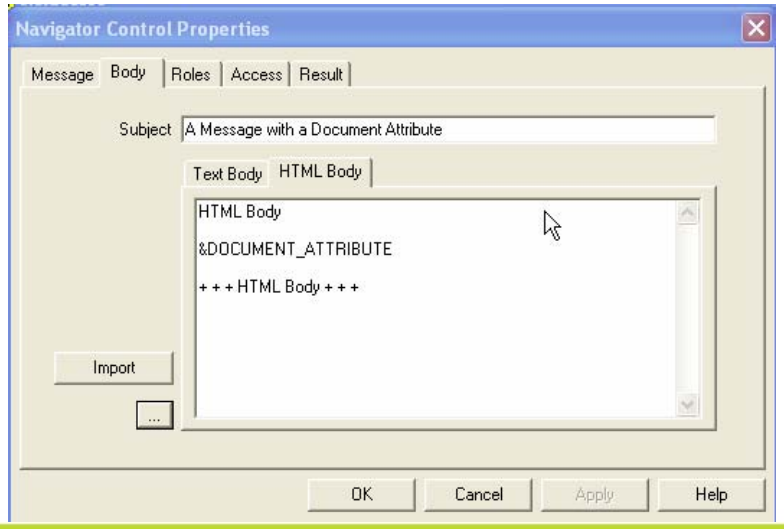
Step Performed in Database

Document Attribute Setup

- Create a message attribute
  - Type: Document
- Set the attribute's default value to the name of the PLSQL procedure to be called:
  - `plsql:my_package_name.my_proc_name`
  - `plsqlclob:my_package_name.my_proc_name`
- Include the attribute in message text







Write a PLSQL procedure

```
PROCEDURE your_custom_procedure
    (   document_id                    IN      VARCHAR2
    ,   display_type                   IN      VARCHAR2
    ,   document                       IN OUT NOCOPY VARCHAR2
    ,   document_type                  IN OUT NOCOPY VARCHAR2);
```

- document_id: allows developer to pass in info
- display_type: contains the notification style
- document: assign the entire stream of text to be contained in attribute
  - Can be VARCHAR2 or CLOB
  - IN OUT parameter
- document_type: MIME type for output

Document Attribute Code

```
 1 PROCEDURE djs_demonstrate_document_attrs
 2     (   document_id                    IN     VARCHAR2
 3     ,   display_type                   IN     VARCHAR2
 4     ,   document                       IN OUT NOCOPY VARCHAR2
 5     ,   document_type                  IN OUT NOCOPY VARCHAR2)
 6 IS
 7
 8    l_document_html VARCHAR2(32747);
 9
10 BEGIN
11
12     l_document_html :=
13           '<H1>These are the values in the<BR>WF Standard
14         || '<BR>Comparison Lookup Type:</H1>'
15         || '<TABLE BORDER="1">';
16
17     FOR lookup_rec IN ( SELECT lookup_code, meaning
18                         FROM wf_lookups
19                         WHERE lookup_type = 'WFSTD_COMPARISON' ) LOOP
20
21         l_document_html := l_document_html
22             || '<TR><TD>'  || lookup_rec.lookup_code
23             || '</TD><TD>' || lookup_rec.meaning
24             || '</TD></TR>';
25
26     END LOOP;
27
28     l_document_html := l_document_html
29           || '</TABLE>';
30
31     document := document
32           || l_document_html;
33
34 END djs_demonstrate_document_attrs;
```

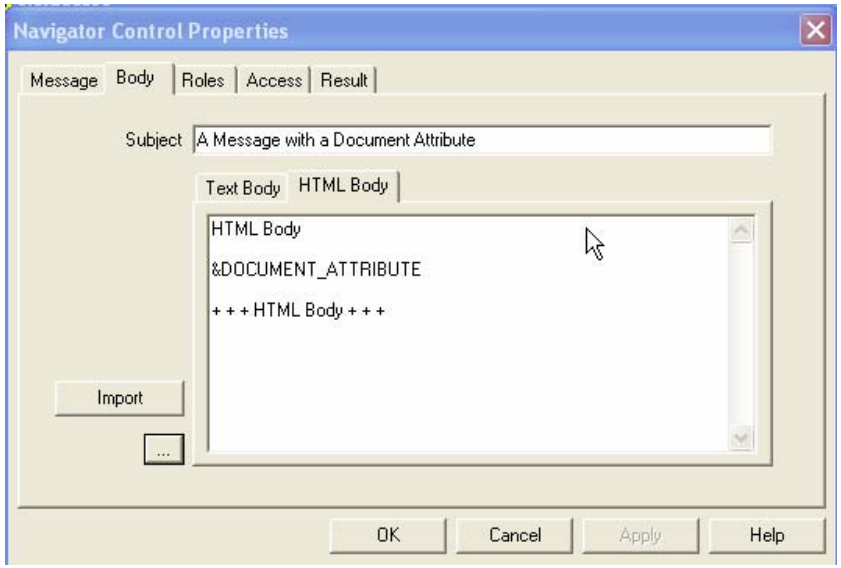
```
PROCEDURE djs_demonstrate_document_attrs

l_document_html :=
            '<H1>These are the values in the<BR>WF Standard'
        ||  '<BR>Comparison Lookup Type:</H1>'
        ||  '<TABLE BORDER="1">';

    FOR lookup_rec IN ( SELECT lookup_code, meaning
                        FROM wf_lookups
                       WHERE lookup_type = 'WFSTD_COMPARISON'
    ) LOOP

    l_document_html := l_document_html
            || '<TR><TD>'  || lookup_rec.lookup_code
            || '</TD><TD>' || lookup_rec.meaning
            || '</TD></TR>';

    END LOOP;

    l_document_html := l_document_html
           || '</TABLE>';

    document := document
            || l_document_html;
```

Document Attribute Code

```
 1 PROCEDURE djs_demonstrate_document_attrs
 2     (   document_id                    IN     VARCHAR2
 3     ,   display_type                   IN     VARCHAR2
 4     ,   document                       IN OUT NOCOPY VARCHAR2
 5     ,   document_type                  IN OUT NOCOPY VARCHAR2)
 6 IS
 7
 8    l_document_html VARCHAR2(32747);
 9
10 BEGIN
11
12     l_document_html :=
13           '<H1>These are the values in the<BR>WF Standard
14         || '<BR>Comparison Lookup Type:</H1>'
15         || '<TABLE BORDER="1">';
16
17     FOR lookup_rec IN ( SELECT lookup_code, meaning
18                         FROM wf_lookups
19                         WHERE lookup_type = 'WFSTD_COMPARISON' ) LOOP
20
21         l_document_html := l_document_html
22             || '<TR><TD>'  || lookup_rec.lookup_code
23             || '</TD><TD>' || lookup_rec.meaning
24             || '</TD></TR>';
25
26     END LOOP;
27
28     l_document_html := l_document_html
29           || '</TABLE>';
30
31     document := document
32           || l_document_html;
33
34 END djs_demonstrate_document_attrs;
```

```
PROCEDURE djs_demonstrate_document_attrs

l_document_html :=
            '<H1>These are the values in the<BR>WF Standard'
        ||  '<BR>Comparison Lookup Type:</H1>'
        ||  '<TABLE BORDER="1">';

    FOR lookup_rec IN ( SELECT lookup_code, meaning
                        FROM wf_lookups
                       WHERE lookup_type = 'WFSTD_COMPARISON'
    ) LOOP

    l_document_html := l_document_html
            || '<TR><TD>'  || lookup_rec.lookup_code
            || '</TD><TD>' || lookup_rec.meaning
            || '</TD></TR>';

    END LOOP;

    l_document_html := l_document_html
           || '</TABLE>';

    document := document
            || l_document_html;
```

Voilà!



HTML Body

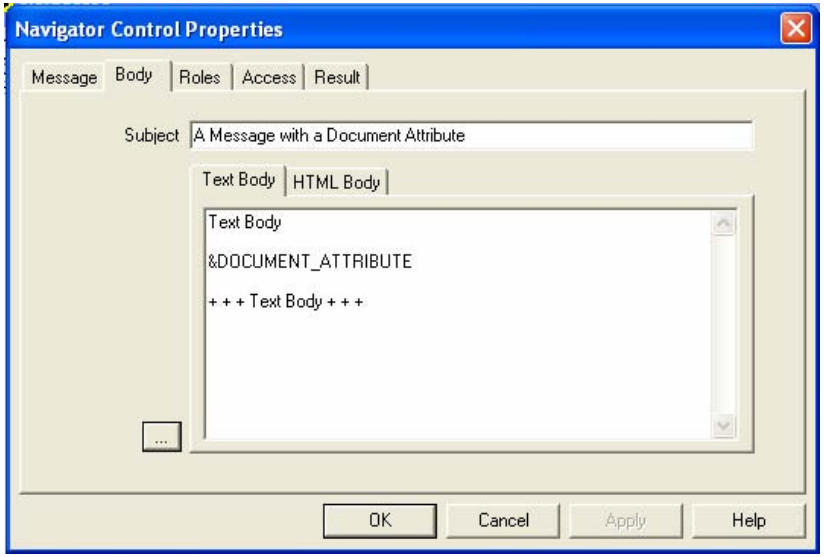
These are the values in the WF Standard Comparison Lookup Type:

EQ	Equal
GT	Greater Than
LT	Less Than
NULL	Null

+ + + HTML Body + + +

Display_type parameter

- In text-based notifications…
- HTML markup appears unescaped
- Solution: Display_type parameter
- Values - Constants
  - wf_notification.doc_text := 'text/plain';
  - wf_notification.doc_html := 'text/html';
- You must write code for each value




```
Text Body

<H1>These are the values in the<BR>WF Standard<BR>Comparison Lookup
Type:</H1><TABLE BORDER="1"><TR><TD>EQ</TD><TD>Equal</TD></TR><TR><TD>GT</TD><TD>
Greater
Than</TD></TR><TR><TD>LT</TD><TD>Less
Than</TD></TR><TR><TD>NULL</TD><TD>Null</TD></TR></TABLE>

+ + + Text Body + + +
```

Display_type Code

```
 1 PROCEDURE djs_demonstrate_document_attrs
 2    (   document_id                    IN     VARCHAR2
 3    ,   display_type                   IN     VARCHAR2
 4    ,   document                       IN OUT NOCOPY VARCHAR2
 5    ,   document_type                  IN OUT NOCOPY VARCHAR2)
 6 IS
 7
 8     l_document_html VARCHAR2(32747);
 9     l_document_text VARCHAR2(32747);
10
11 BEGIN
12
13     l_document_html :=
14           '<H1>These are the values in the<BR>WF Standard'
15           || '<BR>Comparison Lookup Type:</H1>'
16           || '<TABLE BORDER="1">';
17
18     l_document_text :=
19           'These are the values in the WF Standard '
20        || 'Comparison Lookup Type: || CHR(13) || CHR(10);
21
22     FOR lookup_rec IN ( SELECT lookup_code, meaning
23                           FROM wf_lookups
24                          WHERE lookup_type = 'WFSTD_COMPARISON' ) LOOP
25
26    l_document_html := l_document_html
27           || '<TR><TD>'  || lookup_rec.lookup_code
28           || '</TD><TD>' || lookup_rec.meaning
29           || '</TD></TR>';
30
31    l_document_text := l_document_text || CHR(13) || CHR(10)
32           || RPAD(lookup_rec.lookup_code, 6)
33           || lookup_rec.meaning;
34
35    END LOOP;
36
37    l_document_html := l_document_html
38          || '</TABLE>';
39
40    IF display_type = wf_notification.doc_html THEN
41
42        document := document
43               || l_document_html;
44
45    ELSIF display_type = wf_notification.doc_text THEN
46
47        document := document
48               || l_document_text;
49
50    END IF;
51
52 END djs_demonstrate_document_attrs;
```

```
l_document_text :=
   'These are the values in the WF Standard '
   || 'Comparison Lookup Type:'|| CHR(13) || CHR(10);
```

```
l_document_text :=
          l_document_text || CHR(13) || CHR(10)
          || RPAD(lookup_rec.lookup_code, 6)
          || lookup_rec.meaning;
```

```
IF display_type = wf_notification.doc_html THEN

     document := document
                    || l_document_html;

ELSIF display_type = wf_notification.doc_text THEN

     document := document
                    || l_document_text;

END IF;
```

Text based email...

```
 1 PROCEDURE djs_demonstrate_document_attrs
 2    (   document_id                    IN     VARCHAR2
 3    ,   display_type                   IN     VARCHAR2
 4    ,   document                       IN OUT NOCOPY VARCHAR2
 5    ,   document_type                  IN OUT NOCOPY VARCHAR2)
 6 IS
 7
 8     l_document_html VARCHAR2(32747);
 9     l_document_text VARCHAR2(32747);
10
11 BEGIN
12
13     l_document_html :=
13           '<H1>These are the values in the<BR>WF Standard'
14           || '<BR>Comparison Lookup Type:</H1>'
15           || '<TABLE BORDER="1">';
16
17     l_document_text :=
18        'These are the values in the WF Standard '
19       'Comparison Lookup Type: || CHR(13) || CHR(10);
20
21     FOR lookup_rec IN ( SELECT lookup_code, meaning
22                           FROM wf_lookups
23                          WHERE lookup_type = 'WFSTD_COMPARISON' ) LOOP
24
25    l_document_html := l_document_html
26           || '<TR><TD>'  || lookup_rec.lookup_code
27           || '</TD><TD>' || lookup_rec.meaning
28           || '</TD></TR>';
29
30    l_document_text := l_document_text || CHR(13) || CHR(10)
31           || RPAD(lookup_rec.lookup_code, 6)
32           || lookup_rec.meaning;
33
34    END LOOP;
35
36    l_document_html := l_document_html
37          || '</TABLE>';
38
39    IF display_type = wf_notification.doc_html THEN
40
41        document := document
42               || l_document_html;
43
44    ELSIF display_type = wf_notification.doc_text THEN
45
46        document := document
47               || l_document_text;
48
49    END IF;
50
51 END djs_demonstrate_document_attrs;
```

Text Body

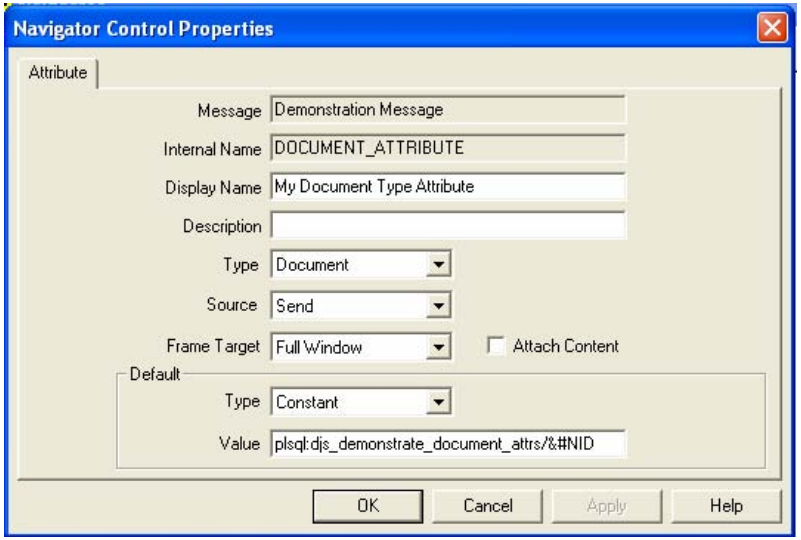
These are the values in the WF Standard Comparison Lookup Type:

EQ	**Equal**
GT	**Greater Than**
LT	**Less Than**
NULL	**Null**

+ + + Text Body + + +

Document_id parameter

- One inbound parameter: document_id
- Append to the end of procedure name
  - `plsql:my_package_name.my_proc_name/whatever`
- Use to pass and derive specific information about the process instance:
  - Pass text strings
  - Item attributes
    - &#NID for notification_id
    - Then, derive item_key, item_type



Document Attribute Code

```
 1 1 PROCEDURE djs_demonstrate_document_attrs
 2 CREATE OR REPLACE PROCEDURE djs_demonstrate_document_attrs
 3     (   document_id                    IN     VARCHAR2
 4     ,   display_type                   IN     VARCHAR2
 5     ,   document                       IN OUT NOCOPY VARCHAR2
   ,   document_type                  IN OUT NOCOPY VARCHAR2)
IS

   l_item_type  wf_items.item_type%TYPE;
   l_item_key   wf_items.item_key%TYPE;

BEGIN


    SELECT  wias.item_type
    ,   wias.item_key
    INTO l_item_type
    ,    l_item_key
    FROM applsys.wf_item_activity_statuses  wias
    WHERE wias.notification_id = document_id ;

    document := document
        || '<TABLE BORDER="1">'
        || '<TR><TD>Item Type is ' || l_item_type
        || '</TD><TD>Item Key is ' || l_item_key
        || '</TD></TR></TABLE>';

END;
```

HTML Body

Item Type is DJS_DEMO	Item Key is 164110

+++HTML Body+++

```
IS

   l_item_type  wf_items.item_type%TYPE;
   l_item_key   wf_items.item_key%TYPE;

BEGIN


    SELECT  wias.item_type
    ,   wias.item_key
    INTO l_item_type
    ,    l_item_key
    FROM applsys.wf_item_activity_statuses  wias
    WHERE wias.notification_id = document_id ;

    document := document
        || '<TABLE BORDER="1">'
        || '<TR><TD>Item Type is ' || l_item_type
        || '</TD><TD>Item Key is ' || l_item_key
        || '</TD></TR></TABLE>';

END;
```

Document Type Attributes

Issues:

- PLSQL not version controlled
  - Values derived at runtime - on the fly
- Handle Document parameter correctly: IN OUT
- Changes to code require a mailer bounce

Mailer Restart Required

```
ORA-04068: existing state of packages has been discarded
ORA-04061: existing state of package "<package_name>.<proc>" has been invalidated
```

- When using Document Type attributes with Notification Mailer
- Mailer runs in a continuous session
- See Metalink Note 303260.1
- Other errors may require a restart of ALL Workflow Services

One final tip: Debug w/ Anonymous Block

```
DECLARE
   l_resultOut   VARCHAR2(200);
BEGIN
    my_workflow_proc (itemtype  => 'DJS_DEMO'
                    , itemkey   => '123456'
                    , actid     => 81005
                    , funcmode  => 'RUN'
                    , resultOut => l_resultOut);
    dbms_output.put_line(l_out);
END;

DECLARE
    l_out         VARCHAR2(32767)  := '';
    l_mime_type   VARCHAR2(50)     := 'text/plain';
BEGIN
    my_package.my_proc ( document => '1206521'
                       , display_type  => 'text/html'
                       , document      => l_out
                       , document_type => l_mime_type );
    dbms_output.put_line(v_out);
END;
```

Section 7
It's a Wrap!

Conclusion and Wrap-Up

More Info on Metalink

- Workflow FAQ General
  Metalink Document 187735.1
- Workflow FAQ (More mailer questions)
  Metalink Document 48666.1
- Workflow FAQs and Patch Information
  Metalink Document 225453.1
- Frequently Asked Questions on Purging of Oracle Workflow Data
  Metalink Document 277124.1

More Info on Metalink

- White Paper :Getting Started with Workflow - Standalone 2.6.3

  Metalink Document 266612.1
- How to Create a New Workflow

  Metalink Document 47711.1
- Desupport Notice for Workflow Cartridge

  Metalink Document 391546.1
- Workflow Tables Data Growth Issues

  Metalink Document 298550.1

PDF Documentation

For Version 2.6.3 (11.5.9)

- Oracle Workflow Administrators Guide (Part Number B10283-01)
- Oracle Workflow API Reference (Part Number B10286-01)
- Oracle Workflow Developer's Guide (Part Number B10284-01)
- Oracle Workflow Users Guide (Part Number B-10285-01)

- Download these items from OTN
  - http://www.oracle.com/technology/software/index.html

- Oracle Workflow Product Documentation

  (includes links to more PDF documentation)

  Metalink Document 67183.1

Fora

- Oracle Workflow Forum (on OTN)
  - http://forums.oracle.com/forums/forum.jspa?forumID=72
- Workflow FAQ Forum – Matt Seale
  - http://smforum.workflowfaq.com/

Thank-you!

- Please complete session survey
- Dan Stober
  - dan.stober@imail.org
  - Reference this presentation in subject line

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