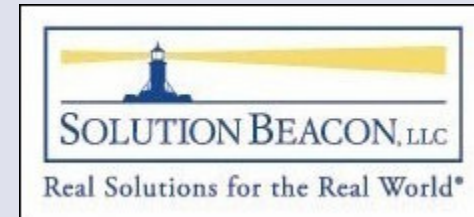


# **ABCs of Workflow Business Event Essentials**

Karen Brownfield  
Solution Beacon



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# Karen Brownfield Profile

- **25+ yrs experience in IT Industry**
- **16+ yrs experience Oracle Applications**
- **9 yrs experience Workflow**
- **OAUG Board of Directors 14 years, Former President**
- **Presenter of Training/Presentations multiple clients, conferences**
- **Solution Beacon** is a leading provider of resources to Government Agencies and Fortune 1000 companies specializing in the Oracle Applications marketplace, providing assistance in the following areas:
  - Release 11i Upgrades/Implementations
  - Oracle Apps Database Administration
  - Oracle Systems Architecture
  - Oracle Performance Tuning
  - Oracle Workflow

# Agenda

- Terminology
- Queues
- Definition
- Use in Workflow
- Event Structure
- Access via SQL

# Business Event Terminology

What?

Why?

How?

When?

Who?

Which?

Where?

# Business Event Terminology

- **What – the Event**
  - An occurrence in an internet or intranet application or program that might be significant to other objects in a system or to external agents
- **Example**
  - Creation of invoice or requisition
- **Similar to Alerts or Triggers**

# Business Event Terminology

- **Which** – Event Key
- Uniquely identifies the specific occurrence of event
- Analogous to item keys

# Business Event Terminology

- **Where** – the System
- Logically isolated piece of software on which either the Oracle Workflow Business Event System is installed or with which the Oracle Business Event System communicates
- Local system – database you are currently connected and operating in
- Events can involve multiple systems

# Business Event Terminology

- **When** – time event occurs and time at which subscription should execute

# Business Event Terminology

- **Why** – why is this event significant, i.e. what should happen – the subscription
- Subscriptions can
  - Execute code
  - Start workflows
  - Send message to an agent
  - Receive messages
- Events can have multiple subscriptions

# Business Event Terminology

- **Who** – Agents – Queues
- Queues - Tables with a data structure capable of handling the multi-dimensional aspects of the details that describe an event
  - Exist in pairs – one for inbound, one for outbound
- Agents – Front men for messages to/from other systems

## **Business Event Terminology**

- Agent Listeners – focuses on one or more specific events in a specific in-bound queue
- Container – Java concurrent process that wakes up periodically to process waiting data
- Propagation – method used by outbound queues to periodically process outbound messages

# Business Event Terminology

- Event Message
  - Standard Workflow structure for communicating business events, defined by the datatypes `WF_EVENT_T` or `AQ$_JMS_TEXT_MESSAGE`
  - Event message contains event data, event name, event key, addressing attributes, error information

# Business Event Terminology

- Event Data
  - Detail information needed to describe what occurred in the event
  - Can be included when raising event or specified in Generate function for the event
  - Subscriptions determine whether event data required.
  - Typically structured as an XML document

# Business Event Terminology

- Event Key
  - String that uniquely identifies an instance of an event
  - Together with Event Name and Event Data, fully communicate what occurred in the event

# Business Event Terminology

- Subscription
  - Registration indicating that a particular event is significant to a system and specifying the processing to perform when the triggering event occurs.
  - Subscriptions can:
    - Call custom code
    - Send event message to a workflow
    - Send/receive event message to/from an agent

## How?

- How defined
- How to use in workflow
- How to see data in queue tables
- Note: How to setup is covered in the paper

## Queues

- Process text or Java
  - Text structure – WF\_EVENT\_T
  - Java structure –  
SYS.AQ\$\_JMS\_TEXT\_MESSAGE
- Correspond to tables
- Purged based on retention time
  - Execute DBMS\_AQADM.ALTER\_QUEUE(  
Queue\_name => '<name of queue>'  
Retention\_time => <days>);

# Queues

Name	Payload Type	Default Retention	Startup Mode	Default Agent Listener	Description
WF_CONTROL	Java	1 day	Automatic	N/A	Workflow internal queue- do not use or alter
WF_JAVA_DEFERRED (added in R11i.10)	Java	1 day	Automatic	Workflow Java Deferred Agent Listener	Deferred subscription processing in middle tier

# Queues

Name	Payload Type	Default Retention	Startup Mode	Default Agent Listener	Description
WF_DEFERRED	Text	1 day	Automatic	Workflow Deferred Agent Listener	Deferred subscription processing
			Automatic	Workflow Deferred Notification Agent Listener	Processes only oracle.apps.wf.notification.% events

# Queues

Name	Payload Type	Default Retention	Startup Mode	Default Agent Listener	Description
WF_ERROR	Text	0 days	Automatic	Workflow Error Agent Listener	Error handling when subscription fails
WF_JAVA_ERROR (added in R11i.10)	Java	0 days	Automatic	Workflow Java Error Agent Listener	Error handling when subscription fails on middle tier

# Queues

Name	Payload Type	Default Retention	Startup Mode	Default Agent Listener	Description
WF_NOTIFICATION_IN	Java	1 day	Automatic	Workflow Inbound Notifications Agent Listener	E-mail notification responses
WF_NOTIFICATION_OUT	Java	1 day	Automatic	N/A	E-mail notifications

# Queues

Name	Payload Type	Default Retention	Startup Mode	Default Agent Listener	Description
WF_IN	Text	7 days	Manual	User defined	Inbound Text message
WF_OUT	Text	7 days	Manual	N/A	Outbound Text messages

# Queues

Name	Payload Type	Default Retention	Startup Mode	Default Agent Listener	Description
WF_JMS_IN	Java	7 days	Manual	Workflow Inbound JMS Agent Listener	Inbound Java message
WF_JMS_OUT	Java	7 days	Manual	N/A	Outbound Java messages

# Queues

Name	Payload Type	Default Retention	Startup Mode	Default Agent Listener	Description
WF_WS_JMS_IN	Java	7 days	Manual	Web Services IN Agent	Inbound web services messages
WF_WS_JMS_OUT	Java	7 days	Manual	Web Services OUT Agent	Outbound web services message

## Queues

- Internal – Do not use
  - WF\_DEFERRED\_QUEUE\_M
    - Table is WF\_DEFERRED\_TABLE\_M
  - WF\_OUTBOUND\_QUEUE
  - WF\_INBOUND\_QUEUE

# Queues

- EDI
  - ECX\_TRANSACTION
  - ECX\_INBOUND
  - ECX\_OUTBOUND
- Not Used
  - WF\_REPLAY\_IN
  - WF\_REPLAY\_OUT
- Obsolete after FND.G applied
  - WF\_SMTP\_0\_1\_QUEUE

## Define Event

- Must be Workflow Administrator
- Business Events | Events
- Query existing event or add new

# Define Event

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## Events

A business event is an occurrence in an internet or intranet application or program that might be significant to other objects in a system or to external agents. An event group is a type of event composed of a set of individual member events. Event groups let you associate any events you want with each other and reference them as a group in event subscriptions.

### Search

Enter search criteria and select the "Go" button to find your event definitions.

Name

Searching for "abc" returns "abcde" and "efgabc".

[▶ Show More Search Options](#)

**Results : No Search Conducted**

Select	Name	Display Name	Type	Status	Subscription	Update	Test
	No events found.						

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# Define Event

## Create Event

A business event is an occurrence in an internet or intranet application or program that might be significant to other objects in a system or to external agents.

Cancel Apply

\* Indicates required field

* Name	<input type="text"/>
* Display Name	<input type="text"/>
Description	<input type="text"/>
* Status	Enabled <input type="button" value="v"/>
Generate Function	<input type="text"/>
Java Generate Function	<input type="text"/>
* Owner Name	<input type="text"/>
* Owner Tag	<input type="text"/>
Customization Level	User

## Define Event

- Name – Internal – must be unique
- Suggested format
  - <company>.<family>.<product>. <component>.  
<object>.<action>
  - Oracle.apps.ap.event. invoice.approval
  - Oracle.apps.fnd. profile.value.update

## Define Event

- Display Name – brief description of event
- Description – full description of event
- Owner name / tag – application that owns event
- Customization Level
  - Core – only Oracle can change it
  - Limit – users can only enable/disable
  - User – any property can be updated

## Define Event

- Generate Function – PL/SQL procedure that can produce the complete event data from the event name, event key, and an optional parameter list
  - enter here if applies to all events, else enter at subscription level

## Define Event Group

- Same fields as Define Event except can't specify Generate Function
- Click Add Event button to add event to the group
- Note: Cannot add a group to a group

# Define Event Group

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### Create Group

An event group is a type of event composed of a set of individual member events. Event groups let you associate any events you want with each other and reference them as a group in event subscriptions.

\* Indicates required field

\* Name

\* Display Name

Description

\* Status

\* Owner Name

\* Owner Tag

Customization Level

**Events in Group**

Select Name	Display Name	Type	Status	Owner Name	Owner Tag
No events found.					

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# Define Event Group

## Add Events to Group: oracle.apps.fnd.bes.control.group

Select which of the following events will be members of the event group.

Enter search criteria and select the "Go" button to find your event definitions.

Name

Searching for "abc" returns "abode" and "efgabc".

[▶ Show More Search Options](#)

### Results : No Search Conducted

Select Name	Display Name	Type	Status	Owner Name	Owner Tag
No data exists.					

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- Define Group, then click 'Add Events to Group'
- Search Page displays
- Enter criteria to find events, press Go

# Define Event Group

## Add Events to Group: **kmb.apps.ap.supplier.group**

Select which of the following events will be members of the event group.

Enter search criteria and select the "Go" button to find your event definitions.

Name

Searching for "abc" returns "abode" and "efgabc".

[▶ Show More Search Options](#)

### Add Events

Select Event(s) and ...

[Select All](#) | [Select None](#)

Select	Name	Display Name	Type	Status	Owner Name	Owner Tag
<input type="checkbox"/>	kmb.apps.ap.supplier.header.create	New Supplier is created	Event	Enabled	Oracle Payables	SQLAP
<input type="checkbox"/>	oracle.apps.po.event.supplier_change	Supplier Change, and PO is Responded	Event	Enabled	Oracle Purchasing	PO
<input type="checkbox"/>	oracle.apps.po.suppliersignature	Supplier Signature Event	Event	Enabled	Oracle Purchasing	PO
<input type="checkbox"/>	sb.apps.ap.supplier.header.create	New Supplier is created	Event	Disabled	Oracle Payables	SQLAP

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- Click next to each event that should be in group
- Click Add to Group button, then Apply when finished

## Define Subscription

- Define Subscriber
- Define How a Subscription is Triggered
- Control How Subscription is Executed
- Define Action for a Subscription
- Document Identifying Information for a Subscription

# Add Subscription

## Events

A business event is an occurrence in an internet or intranet application or program that might be significant to other objects in a system or to external agents. An event group is a type of event composed of a set of individual member events. Event groups let you associate any events you want with each other and reference them as a group in event subscriptions.

### Search

Enter search criteria and select the "Go" button to find your event definitions.

Name



Searching for "abc" returns "abcde" and "efgabc".

[▶ Show More Search Options](#)

### Results: Events

Select Event(s) and ...

[Select All](#) | [Select None](#)

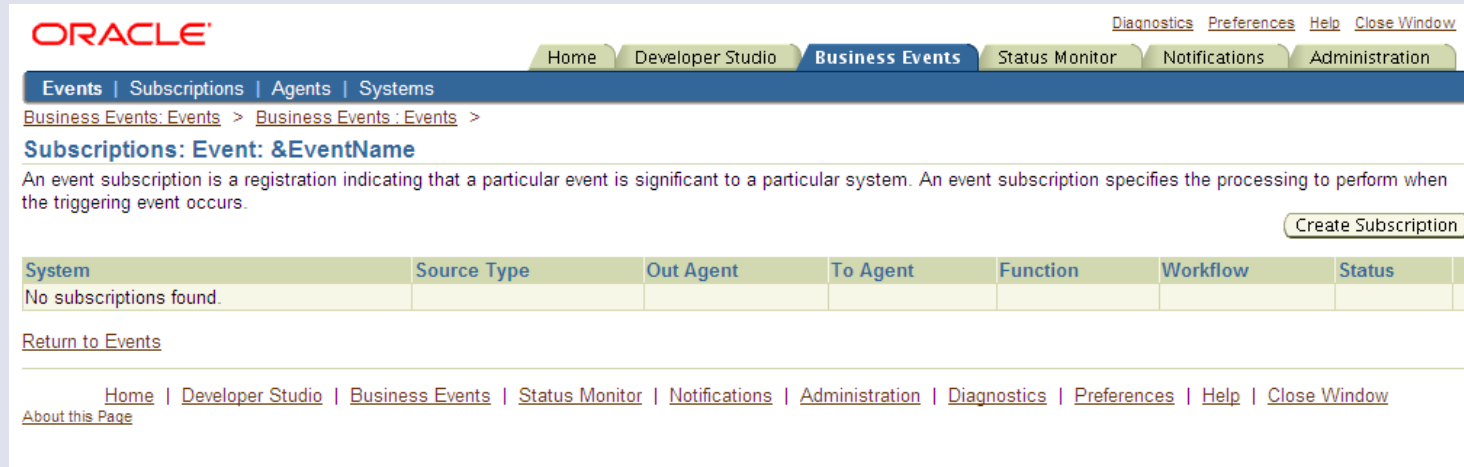
Select	Name ▲	Display Name	Type	Status	Subscription	Update	Test
<input type="checkbox"/>	kmb.apps.ap.supplier.header.create	New Supplier is created	Event	Enabled			

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# Add Subscription



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### Subscriptions: Event: &EventName

An event subscription is a registration indicating that a particular event is significant to a particular system. An event subscription specifies the processing to perform when the triggering event occurs.

[Create Subscription](#)

System	Source Type	Out Agent	To Agent	Function	Workflow	Status
No subscriptions found.						

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- Click Create Subscription

# Add Subscription


[Cancel](#) [Next](#)

### Create Event Subscription


An event subscription is a registration indicating that a particular event is significant to a particular system. An event subscription specifies the processing to perform when the triggering event occurs.


\* Indicates required field


**Subscriber**

\* System  

**Triggering Event**


\* Source Type  


\* Event Filter  

Source Agent  


**Execution Condition**


\* Phase   
Subscription with a phase 1- 99 are run synchronously , 100 and above are deferred.

\* Status  

\* Rule Data  

**Action Type**

\* Action Type    
The Action Type controls the behavior of the subscription

On Error  

[Cancel](#) [Next](#)

## Add Subscription – Subscriber




Subscriber

\* System  

- Subscriber is system where you want subscription to execute
- Defines action on exactly one system – so if processing involves sending data from one system to another, define subscription to send data on one system and subscription to receive data on other
- Select local system

# Add Subscription – Triggering Event


**Triggering Event**


* Source Type	Local 
* Event Filter	kmb.apps.ap.supplier.group 
Source Agent	<input type="text"/> 

- Specify Source Types to which subscription applies
  - Local – only to events raised on subscribing system
  - External – only to events received by inbound agent on subscribing system
  - Error – only to errored events dequeued from the WF\_ERROR queue

# Add Subscription – Triggering Event

**Triggering Event**

\* Source Type  

\* Event Filter  

Source Agent  

- Filter – Event or Group to which subscription belongs
- (Optional – usually left blank) Enter Source Agent – if one specified, subscription only executed if event specified in filter is received from that agent

# Add Subscription – Execution Condition

**Execution Condition**

\* Phase   
Subscription with a phase 1- 99 are run synchronously , 100 and above are deferred.

\* Status  ▼

\* Rule Data  ▼

- If multiple subscriptions, specify order through phase number (lowest goes first)
  - If same phase number, order of execution is random
- Phase number > 100 will cause subscription to be deferred
- Phase 0 reserved for Workflow seeded subscriptions

# Add Subscription – Execution Condition

**Execution Condition**

\* Phase   
Subscription with a phase 1- 99 are run synchronously , 100 and above are deferred.


\* Status  ▼

\* Rule Data  ▼

- Status is either Enabled or Disabled
- Rule Data
  - Key – subscription only requires the event key
  - Message – subscription requires complete event data

# Add Subscription – Action Type

**Action Type**

\* Action Type  

The Action Type controls the behavior of the subscription







On Error  ▼

**Search**

To find your item, select a filter item in the pulldown list and enter a value in the text field, then select the "Go" button.

Search By  ▼  %

**Results**

Select	Quick Select	Action Type	Description
<input type="radio"/>		Custom	Execute custom business logic
<input type="radio"/>		Launch Workflow	Launch the workflow specified in the subscription
<input type="radio"/>		Receive Trading Partner Message	Receive a message from your trading partner
<input type="radio"/>		Send to Agent	Send the event to the agent specified in the subscription
<input type="radio"/>		Send Notification	Send a notification using standard or your own message templates
<input type="radio"/>		Send Trading Partner Message	Generate a message and send the message to your trading partner

# Launch Workflow

## Create Event Subscription - Launch Workflow

An event subscription can be routed to a Workflow process. Please specify the Workflow Type and Workflow Process to be launched.

\* Indicates required field

### Action

\* Workflow Type

\* Workflow Process

Choose a Workflow Type, before choosing the Workflow Process for that Type

\* Priority

Additional Options

### Subscription Parameters

Select Object:

[Select All](#) | [Select None](#)

Select Name	Value
<input type="checkbox"/>	<input type="text"/>

Enter parameters and their values with no spaces

### Documentation

\* Owner Name

\* Owner Tag

Customization Level

Description

# Custom

## Create Event Subscription: Custom Subscription


Cancel Back Apply


### Action

The Rule Function controls the behavior of the subscription. Provide a Java Class name (<Package>.<Class>) for Java Rule Function and a PL/SQL stored procedure (<Package>.<Function>) for PL/SQL Rule Function.


Java Rule Function


PL/SQL Rule Function

Workflow Type  

Workflow Process  

Choose a Workflow Type, before choosing the Workflow Process for that Type

Out Agent  

To Agent  

\* Priority

### Subscription Parameters

Select Object:

Select All | Select None

Select Name	Value
<input type="checkbox"/> <input type="text"/>	<input type="text"/>

Enter parameters and their values with no spaces

### Documentation

\* Owner Name

\* Owner Tag

Customization Level

Description

# Testing Events

Results: Events Create Event Create Event Group

Select Event(s) and ... Delete

Select All | Select None

Select	Name ▲	Display Name	Type	Status	Subscription	Update	Test
<input type="checkbox"/>	kmb.apps.ap.supplier.group	All events for Supplier	Group	Enabled			
<input type="checkbox"/>	kmb.apps.ap.supplier.header.create	New Supplier is created	Event	Enabled			

- Query Event
- Click Test icon
- Can't test groups



# Testing Events

## Test Business Event

To test a business event enter an event key , a list of parameter name / value pairs ( optional ), and either paste in an XML Document or upload from the local file system and press submit.

\* Indicates required field

### Event Identifier

\* Event Name    
\* Event Key   
Send Date    
Send Date must be in the Format: DD-MON-RRRR

### Event Parameters

Select Object:

[Select All](#) | [Select None](#)

Select Label	Value
<input type="checkbox"/>	<input type="text"/>

### Event Data

Upload Option

XML Content

If XML content is greater than 4000 characters, Select "Upload XML" option.

# Testing Events

## Event Identifier

\* Event Name



\* Event Key

Send Date



Send Date must be in the Format: DD-MON-RRRR

- Enter Event Key
- (Optionally) Enter Send Data > SYSDATE to delay execution

# Testing Events

**Event Parameters**

Select Object:

[Select All](#) | [Select None](#)

Select Label	Value
<input type="checkbox"/> <input type="text"/>	<input type="text"/>

**Event Data**

Upload Option:

XML Content:

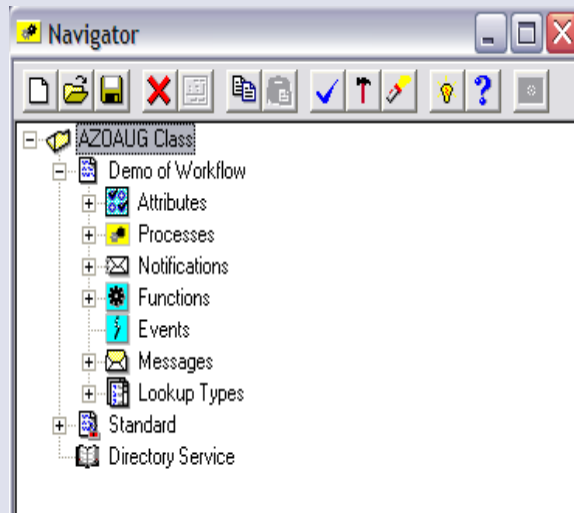
If XML content is greater than 4000 characters, Select "Upload XML" option.

- (Optionally) Enter Parameters
- (Optionally) Enter Event Data (can upload or type)

## Raise Events via PL/SQL

```
CREATE OR REPLACE TRIGGER kmb_raise_new_supplier_event
AFTER INSERT ON po_vendors
FOR EACH ROW
    WHEN new.vendor_type_lookup_code <> 'EMPLOYEE'
DECLARE
    match_date                VARCHAR2(20);
BEGIN
    SELECT TO_CHAR(SYSDATE, 'YYYYMMDDHH24MMSS')
        INTO match_date
    FROM DUAL;
    wf_event.raise('kmb.apps.ap.supplier.header.create',
        :new.vendor_id || ':' || match_date);
END;
```

# Using Events in Workflow



- Requires three extra parameters
  - Key and Name – Text
  - Data – Event



# Using Events in Workflow

- Internal Name
- Display Name
- Event Action
  - Receive
  - Send
  - Raise
- Event Filter


Navigator Control Properties

Activity Details Roles Access

Internal Name: START\_EVENT

Display Name: Start

Description:

Icon: EVENT.ICO  Browse

Event Action: Receive

Event Filter: kb.apps.ap.supplier.header.create

Cost: 0.00

OK Cancel Apply Help

## **Raise Event Activities**

- Raise Event Activity
  - Retrieves event name, key, event data
  - Raises event to Event Manager
- Event Manager then executes subscriptions

## Send Event Activities

- Retrieves event name, key, message, Out Agent, To Agent
- Sends message by placing on Out Agent queue, addressed to To Agent
- When received by To Agent, triggers subscriptions in To Agent's system

## Receive Event Activities

- When Receive event activity receives event, workflow engine:
  - Stores event name (text), event key (text), event message (event) in item type attributes specified for activity node
  - Creates item type attributes to store any additional parameters stored in event message
  - Continues thread of workflow

# Using Events to start Workflow

- From Diagrammer window
  - Click Node Tab
  - Start/End = Start

The screenshot shows the 'Navigator Control Properties' dialog box with the 'Node' tab selected. The 'Label' field contains 'START\_EVENT'. The 'Start/End' dropdown is set to 'Start'. The 'Comment' field is empty. The 'Timeout' section has a 'Type' dropdown set to 'No Timeout'. The 'Performer' section has a 'Type' dropdown set to 'Constant' and a 'Value' dropdown set to '<None>'. There is an 'Edit' button next to the 'Value' dropdown. At the bottom of the dialog are 'OK', 'Cancel', 'Apply', and 'Help' buttons.

# Using Events to start Workflow

- From Diagrammer window
  - Click Event Details tab
  - Add 3 attributes defined earlier

Navigator Control Properties

Event | Details | Roles | Access | Node | Event Details | Node Attributes

Receive message data in:

Event Name Event Name Edit

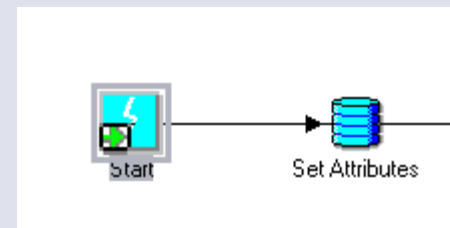
Event Key Event Key Edit

Event Message Event Data Edit

OK Cancel Apply Help

# Using Events to start Workflow

- From Diagrammer window
  - Delete standard Start node
  - Redraw lines

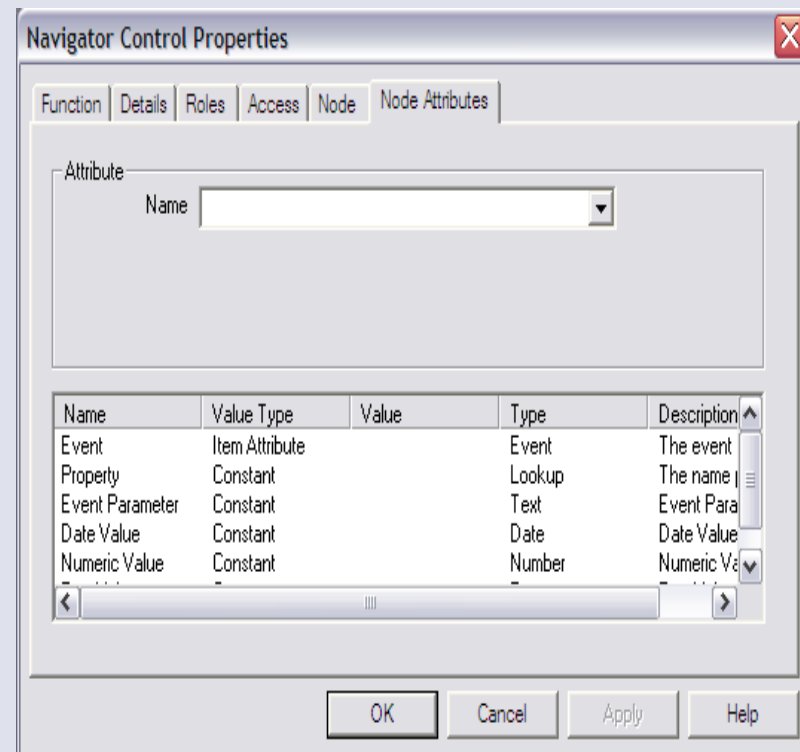


# Workflow Standard Activities

- Compare Property
- Get Property
- Set Property

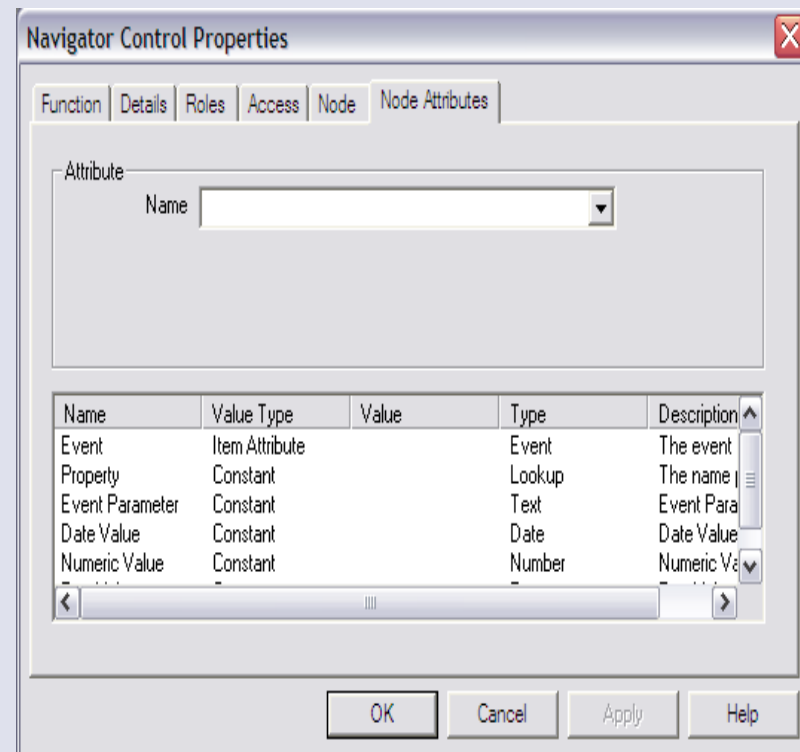
# Workflow Standard Activities

- Node Attributes
  - Event-An attribute with type of 'Event' that contains the event data
  - Property – Which part of the event data – uses a LOV
  - Event Parameter – If 'Property' is set to 'Event Parameter', which parameter – no LOV



# Workflow Standard Activities

- Node Attributes
  - Item Attribute – Either the source of the data (for 'Set'), or where the data will be placed (for 'Get')
  - Date, Numeric, Text Value – For the 'Compare' activity, the value to be compared with.



## Event Datatypes

- Agent Structure – WF\_AGENT\_T
- Parameter Structure – WF\_PARAMETER\_T
- Parameter List Structure –  
WF\_PARAMETER\_LIST\_T
- Event Message Structure – WF\_EVENT\_T

## **WF\_PARAMETER\_T**

- Named varying array (varray)
- Stores up to 100 parameters in form of name of parameter, value for parameter
- Each pair of name/value is stored in a WF\_PARAMETER\_LIST\_T datatype

## **WF\_EVENT\_T**

- Used to store event messages
- Contains header properties and event data payload
- Contains two WF\_AGENT\_Ts and WF\_PARAMETER\_T structures

## **WF\_EVENT\_T attributes**

- Priority
- Send\_Date – when avail to be dequeued
- Receive\_Date – when dequeued by agent listener
- Correlation\_ID – association with other messages
- Parameter\_List

## **WF\_EVENT\_T attributes**

- Event\_Name
- Event\_Key
- Event\_Data – set of additional details describing what occurred in the event – can be XML document
- From\_Agent
- To\_Agent

## **WF\_EVENT\_T attributes**

- Error\_Subscription – If error occurs when processing event, the subscription that was being executed when error occurred
- Error\_Message
- Error\_Stack

## **WF\_EVENT\_T APIs**

- Initialize – sets priority to 0, initialize EVENT\_DATA attribute to empty, all other attributes to null
  - Parameter – new\_wf\_event\_t – the object to initialize

## **WF\_EVENT\_T APIs**

- Set APIs – single parameter, the value for the attribute, type is specified after parameter name
  - SetPriority – number
  - SetSendDate – date
  - SetReceiveDate – date
  - SetCorrelationID – varchar2
  - SetEventName – varchar2
  - SetEventKey – varchar2

## **WF\_EVENT\_T APIs**

- Set APIs – single parameter, the value for the attribute, type is specified after parameter name
  - SetEventData – clob
  - SetErrorSubscription – raw
  - SetErrorMessage – varchar2
  - SetErrorStack – varchar2

## **WF\_EVENT\_T APIs**

- Set APIs – single parameter, the value for the attribute, type is specified after parameter name
  - SetFromAgent – wf\_agent\_t
  - SetToAgent – wf\_agent\_t
  - SetParameterList – wf\_parameter\_list\_t

## Other Event APIs

- AddParameterToList – adds new parameter name and value to list stored in **PARAMETER\_LIST** attribute
  - Parameter – Parameter\_name, Parameter\_value, parameter\_list
- GetValueForParameter – returns value for specified parameter
  - Parameter – Parameter\_name, parameter\_list

## Using SQL to Extract Data

- SQL Editor must be capable of viewing abstract data types
- If not will receive error message 'Data type is not supported'
- Note: 11.5.10.2 RUP3 added 'Any Data' type
  - Select \* no longer works (at least with TOAD 9.0)

# Using SQL – Status of Events in Queue

```
select corrid,  
       decode(state,  
              0, '0 = Ready',  
              1, '1 = Delayed',  
              2, '2 = Retained',  
              3, '3 = Exception',  
              to_char(state)) State,  
       count(*) COUNT  
from wf_error  
group by corrid, state;
```

# Using SQL – Contents of User\_data

```
select a.user_data.priority
      ,a.user_data.send_date, a.user_data.receive_date
      ,a.user_data.correlation_id
      ,a.user_data.event_name,a.user_data.event_key
      ,a.user_data.from_agent, a.user_data.to_agent
      ,a.user_data.error_subscription
      ,a.user_data.error_message,a.user_data.error_stack
      ,a.user_data.event_data
      ,a.user_data.parameter_list
from wf_error a
```




Thank you!

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