

# Using the PL/SQL Cartridge of the Oracle Application Server to Deploy Web Applications

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# Work Described in the Presentation

- n Performed when the author was employed by Lockheed Martin Energy Systems, Inc. (LMES) in DB Support
- n Author currently with Oak Ridge National Laboratory, operated by Lockheed Martin Energy Research, Inc.
- n DB Support is now part of Science Applications International Corporation (SAIC)
- n Applications supported are for LMES, LMER, and Bechtel Jacobs Corporation (BJC)



# Contents

- n Overview of applications
- n Description of OAS, Version 3/4 and how we configured and used OAS
- n Security Extensions
- n Other source connections and external files
- n Problems, some solutions, and lessons learned

# Reasons for Selecting OAS

- n Need to deploy to the Web
  - u Desired by users
  - u Needed for different user platforms
- n Easiest training for developers
  - u Knew Oracle PL/SQL or SQL
  - u Knew HTML and JavaScript
  - u Data already in Oracle tables

# Applications Now Deployed

- n Travel Information System (TIS)
- n Cylinder Information Database (CID)
- n Delivery Tracking System (DTS)

# Travel System Logon

Version 1.0/6

User Name:

Password:

OK

\*\*\*\*\* WARNING \*\*\*\*\*

This application has a 15 minute time-out.

Do not use the browser 'Back' and 'Forward' navigation buttons while running this application. Please use the application navigation controls; otherwise, the application may terminate.

\*\*\*\*\* WARNING \*\*\*\*\*

Developed by: [Information Technology Services](#)

# Travel System

## Main Menu

**Request**

**Settlement**

**Certification**

[Request](#)      [Settlement](#)      [Certification](#)

Developed by: Information Technology Services

**Request Form - Netscape** [ \_ ] [ □ ] [ × ]

File Edit View Go Communicator Help

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Location: 2T1,64V,Vr,F,e,F,v@wwBiFFsZ0u4T41&in\_FormParms=v41accDsuBBBBBB,V4v,64V4Z0T\_BBwwBiFFsZ0u4T30

**000000** **New Request** New

[Sub-form Help](#)

[New](#)

[Open](#)

[Main Menu](#)

**Badged Traveler:** Badge:  Name:

**Non-Badged Traveler:** Name:

Travel Type:  ▾

Reviewer Badge:  Name:

Depart Date:  Return Date:

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Document: Done

**Request Print - Netscape**

File Edit View Go Communicator Help

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Location: 2T1,64V,Vr,F.e,F,v@wwBIFesZ0u4T40&in\_FormParms=v41accD suaBcaca,u84v,64V4Z0T,SBwwBIFesZ0u4T82

**Request Print**

Continue Print

<b>Depart Date</b>	05-15-1999	<b>Depart City</b>	Knoxville
<b>Return Date</b>	05-19-1999	<b>Return City</b>	Knoxville
<b>Charge Number</b>	32030077	<b>Coordinating Traveler/Pickup</b>	
<b>Expenses Paid By Others</b>	NO	<b>Honorarium Expected</b>	NO
<b>Housing Form</b>	NO	<b>Company Prepaid Hotel Deposit</b>	NO

**Travel Type**  
Conference/Convention

**Primary Transportation**  
Plane    **Seating:** Window    **Leaving Departure Time:** 09:00 AM    **Returning Departure Time:** 06:00 PM

**Purpose**  
ASUG Meeting

**Who's Who**

Developed by: Information Technology Services

Document: Done

### Open Settlement

**Search Criteria**

Travel Order:  Badge:  Name:

Previous Two Months  All

[Main Menu](#)

**Search Results**

Action	Settlement No	Name	Badge	Depart Date	Business City	Status	
<a href="#">New</a>	104010	BEGOVICH, CL	013403	06-12-1999	FT LAUDERDAL	New	
<a href="#">View</a>	<a href="#">New</a>	103131-00	BEGOVICH, CL	013403	05-15-1999	DALLAS	Processed for Payment
<a href="#">View</a>		YG5227-00	BEGOVICH, CL	013403	04-10-1999	DENVER	Processed for Payment
<a href="#">View</a>		YG5227-01	BEGOVICH, CL	013403	04-10-1999	DENVER	Supl. Processed for Payment
<a href="#">View</a>	<a href="#">Edit</a>	YG5227-02	BEGOVICH, CL	013403	04-10-1999	DENVER	Supl. Started/Incomplete

**Netscape** File Edit View Go Communicator Help

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Bookmarks Netsite: [https://www-internal-lmes2.ornl.gov/cid/plsql/opr\\$ufa.CreateComposite?in\\_zipfile\\_name=C0001154j0](https://www-internal-lmes2.ornl.gov/cid/plsql/opr$ufa.CreateComposite?in_zipfile_name=C0001154j0) What's Related

## DOE UF6 Cylinder Information Database Production

**CID Directory** Approve CII Transmittal

[Home](#)  
[Reports](#)  
[Discoverer](#)  
[Online Inquiry](#)  
[Validation Tables](#)  
[Maintain Cylinder Data](#)  
[CII Download](#)  
[CII Upload](#)  
[Update Current Site](#)  
[Online Help](#)  
[System Documentation](#)  
[UF6 Project Directory](#)  
[Related Links](#)  
[Task List](#)

**Results**

**Site:** PGDP Site Seq: 0  
**Transmittal:** C0001154  
**Transmittal Description:** FY99 Post Tyd U01 row 5/7/99  
0 inspections have been approved.

**DOE UF6 Cylinder Information Production Database**

Document: Done

Maintenance Codes Listing - Netscape

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Bookmarks Netsite: [https://www-internal-lmes2.ornl.gov/cid/plsql/opr\\$ufa.PrtMaintCodes](https://www-internal-lmes2.ornl.gov/cid/plsql/opr$ufa.PrtMaintCodes) What's Related

**DOE UF6 Cylinder Information Database**

**Maintenance Activity Codes Listing as of 06-02-1999**

Maintenance Code	Maintenance Code Description	Status
M01	Damage Control Patch (soft-patch) Applied	A
M02	Permanent Welded Patch Applied	A
M03	Cylinder Painted	A
M07	Valve Replaced	A
M08	Packing Nut Repaired	A
M09	Port Cap Repaired	A
M11	Cylinder Plug Repaired	A
M12	Stem Tightened	A
M13	ID Plate Replaced	A
M14	ID Plate Reattached	A
M15	ID Tag Replaced	A

Document: Done



# Delivery Tracking

Choose a category below:

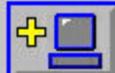
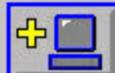
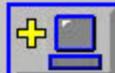
- [Delivery Inquiries](#)
- [Credit Card Orders](#)
- [Delivery Reports](#)
- [Other Reports](#)
- [System Administration](#)

[Sites](#) | [Help](#) | [PO Search](#) | [Back](#)

(X-10)



## System Administration

<b>Locations</b>			
	Add	Update/ Delete	List
<b>Employees</b>			
	Add	Update/ Delete	List
<b>Deliveries</b>			
	Add	Update/ Delete	

**Delivery Tracking Systems (DTS) - Netscape**

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Bookmarks Location: qa//tracking.home?InSite=X10&ThisUid=N0daccDv1MdL3sBDcDlJckqk16&sLevel=N0daccDv10e3sBDcDlJckqk38 What's Related

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## Delivery Tracking

Choose a category below:

- [Delivery Inquiries](#)
- [Credit Card Orders](#)
- [Delivery Reports](#)
- [Other Reports](#)
- [System Administration](#)

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## (X-10)



## Delivery Reporting Options

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- [Deliveries By Employee](#)
- [Deliveries By Location](#)
- [Location Delivery Summary](#)
- [Received/Delivered Item Detail](#)
- [Deliveries By Date](#)
- [Received/Delivered Item Summary](#)

Document: Done

**Netscape** File Edit View Go Communicator Help

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Bookmarks Netsite: <https://y12web3.ctd.ornl.gov/dts/dprod//delivery.deldetr> What's Related

## Delivery Tracking System Delivered Detail Report

Receipt Date	Delivery Date	Driver	Location#	Description	Barcode Label(GR#)	Elapsed Hours
05/18/1999 13:29	06/01/1999 08:45	L. HAWKINS	4500S00G63	4500S00G63	4700082402	211
05/21/1999 14:05	06/01/1999 12:45	J.BREWSTER	600000C201	600000C201	4700083527	143
05/24/1999 13:47	06/01/1999 14:47	K. THOMAS	7001	7001	4700083014	121
05/25/1999 09:19	06/01/1999 11:56	L. HAWKINS	Q012350	Q012350	4700083770	99
05/25/1999 10:15	06/01/1999 08:07	L. JOHNSON	4	7002 DP1	4700083801	94
05/25/1999 12:35	06/01/1999 12:30	W. TALIAFERRO	4	7002 DP1	4700083616	96
05/25/1999 14:11	06/01/1999 08:55	L. HAWKINS	162	ROOM 106 4508 DP1	4700083740	91
05/25/1999 14:18	06/01/1999 08:49	V.HARVEST	82	2525 DP1	4700080433	91
05/26/1999 09:07	06/01/1999 14:28	K. THOMAS	2621	2621	4700083705	77
05/26/1999 13:20	06/01/1999 11:24	K. THOMAS	3025 DP2	3025 DP2	4700084004	70
05/26/1999 13:21	06/01/1999 14:27	K. THOMAS	2621	2621	4700083606	73
05/26/1999 14:24	06/01/1999 08:09	K. THOMAS	7009	7009	4700082633	66
05/26/1999 14:24	06/01/1999 09:24	J.BREWSTER	98	3019 DP1	4700080438	67
05/26/1999 14:24	06/01/1999 10:54	K. THOMAS	67	2018 DP1	4700081246	69
05/26/1999 14:24	06/01/1999 11:05	K. THOMAS	3001 114A	3001 114A	4700083017	69
05/26/1999 14:24	06/01/1999 14:25	K. THOMAS	54	1503 DP1	4700083647	72
05/27/1999 07:53	06/01/1999 08:09	K. THOMAS	7009	7009	4700085086	48
05/27/1999 07:53	06/01/1999 08:10	K. THOMAS	7009	7009	4700085001	48

Document: Done

# Brief Description of OAS

- n Listener(s)
- n Oracle Application Server
- n Applications (Cartridges and DADs)
- n Database Objects

# Listeners

- n One or more listeners listen on a specific port to incoming requests
- n Interpret these requests according to virtual paths set up by OAS administrator
- n Can use listeners that are part of OAS or external listeners (Netscape and Apache)
- n Virtual path is used to direct input received by listener

# Administering OAS, Version 3

- n Setup listeners
- n Setup Database Access Descriptors (DADs)
- n Select a cartridge type (PL/SQL) and relate it to
  - u Listener(s)
  - u DAD

# Version 3

- n Web Request Broker specifies
  - u Virtual Paths
- n Cartridge specifies
  - u Type of cartridge (PL/SQL)
  - u DAD to use
  - u Port(s) to use; i.e., which listeners
  - u Error level
  - u Whether to install Developer's Toolkit PL/SQL packages
- n DAD specifies
  - u TNSname
  - u Method for logging on

# Our Listeners in Version 3.0

Listener	Port	Type of Listener	Used for
Admin	8888	OAS	Administration
Cossas	80	Netscape Enterprise	TIS
Sslsas	443	Netscape Enterprise	TIS, DTS, CID
Web1	8889	OAS	Oracle Forms Web Deployment (test)
Webp	8890	OAS	Oracle Forms Web Deployment (prod)

# Our DADs

DAD Name	Environment	DAD User ID	OS and Oracle Version
Hostdevl	Development	None	AIX Oracle 7.3.2.3
Hostqa	Testing	None	AIX Oracle 7.3.2.3
Traveldevl	Development	TIS's user ID	AIX Oracle 7.3.2.3
Travelqa	Testing	TIS's user ID	AIX Oracle 7.3.2.3



# Our DADs

<b>DAD Name</b>	<b>Environment</b>	<b>DAD User ID</b>	<b>OS and Oracle Version</b>
Travelprod	Production	TIS's user ID	AIX Oracle 7.3.2.3
Deltrkdevl	Testing	DTS's user ID	NT Oracle 7.3.3.6
Deltrkprod	Production	DTS's user ID	NT Oracle 7.3.3.6
Ciddevl	Development	None	Digital Unix Oracle 7.3.4
Cid	Production	CID's User ID	Digital Unix Oracle 7.3.4

# Our Cartridges

- n Named cartridges same as DAD and then related
- n Determined which listener(s) would be used with the each cartridge
- n Did not set up any additional virtual paths
- n Installed PL/SQL Dev. Toolkit under one schema and used public synonyms

# Administering OAS, Version 4

- n Setup DADs
- n Setup Application, selecting type of application (PL/SQL)
- n Set up a cartridge which consists of a DAD
- n Any listener can be used

# Application and Cartridge, Version 4

- n Application determines
  - u Tuning parameters
  - u Cartridges (recommended: one per application)
    - ü DADs
    - ü Virtual Path and Application MIME types
    - ü Error level
- n DADs determine
  - u Same as before

# Our Setup in Version 4

- n Applications
  - u Traveld, Travelq, Travel
  - u DTSq, DTS
  - u CIDd, CID
- n Cartridges and DADs related to each one dependent on database
- n Separation error levels, tuning depending on application and environment

# Security Extensions Required

Web Applications at Lockheed Martin Energy  
Systems/Research require

- n Logon verification
  - u Not using Oracle to logon
    - ü Difficult to keep access to PL/SQL routines
    - ü Don't want to require database account for all users
- n Timeout
  - u Requires timestamp on each Web screen
  - u Requires checking timestamp with each submit

# Logon Solution

- n A user logon validation server already existed and was approved by security
- n A PL/SQL HTML screen is displayed for the user to login
- n A call to routines in the DBMS\_PIPE package accesses a daemon that calls the validation client
- n Client references the validation server and returns results through a return pipe
- n User results are displayed with HTML screen

# Calling C Routines with DBMS\_PIPE

A Pro\*C daemon receives requests from an explicit (named) pipe and send results back through a implicit (public) pipe

- n On instance startup,
  - u explicit pipe is created
  - u daemon that receives explicit pipe requests is started
- n When used,
  - u user PL/SQL procedure calls DBMS\_PIPE procedures to pack and send requests to the daemon
  - u daemon accepts the requests and performs steps
  - u daemon returns the result through an implicit pipe
  - u user PL/SQL procedure uses DBMS\_PIPE procedures to receive and unpack the results

# DBMS\_PIPE

- n On instance shutdown,
  - u Delete the pipe
  - u Stop the daemon
- n Implicit pipe can be named using `dbms_pipe.create_unique_session_name`
  - u Generated name is same for a single process
  - u OAS can use the same process multiple times
  - u Therefore, appended a sequence number to avoid any conflicts of the implicit pipe names

# Timeout Solution

- n Use an encryption PL/SQL procedure
  - u Logon screen generates the first encrypted string
  - u Put it in either a hidden field or on the command line of the screen
- n When user submits the screen, a related PL/SQL procedure
  - u Unencrypts the information
  - u Validates information and timestamp

# Timeout and Validation String

- n Included in encryption string
  - u Date and time
  - u Application name
  - u Application key
  - u Checksum
- n Can include application information if developer chooses

# Encryption Method

- n Is not DES encryption
- n Receives and generates only ASCII characters in both directions
- n Was written by central DB Support to allow
  - u Sharing
  - u More security
- n Allows application to re-prompt user for password without losing any information if timeout has been exceeded

# Additional DBMS\_PIPE Routines

- n Logging on to SAP and receiving SAP information through RFCs
  - u Individual's HR information
  - u Their line managers
  - u Their finance managers
- n Copying files on the Oracle OS
- n Deleting files on the Oracle OS

# File Handling

- n Security of standard UTL\_FILE package allows any Oracle user to read/write files
- n Security layer was added to keep track of who could read/write files from different directories by keeping a table
  - u User Ids
  - u Directories
  - u Access

# OS File Handling by DBMS\_PIPE Daemon

- n Use same table to determine who had access to which directories
- n Oracle user had to be added to the security the developers had on a file system to copy from/to (used UNIX group access)
- n DBMS\_PIPE daemon needed to have the developer's group set when executable was created

# Problems Encountered with Listeners

- n Netscape listener had a conflict with default OAS listener in 3.0
- n Installed Netscape listener as root; needed to change protection of Oracle installed files
- n Could not install a listener as long as a process was listening on that same port
- n Macintosh Internet Explorer (certain version) had problems when OAS Listener was used

# Version 3 Problems

- n Getting DB logon screen with DADs that had stored usernames/passwords
- n WRB processes hanging and not being deleted
- n Number of WRB processes exceeding the maximum and causing the OAS to spin

# Migration from 3 to 4

- n Administration application changed
- n `owsctl` command has more options in version 4
- n severity of error messages at the application level in 4 vs cartridge level in version 3
- n Version 3 applications could be used without change in Version 4
- n Could not mix different versions of PL/SQL Developers Toolkit and OAS
- n OAS 4.0 installs PL/SQL Developers Toolkit under `oas_public`

# Version 4 Problems

- n Large loads cause the Netscape external listener to fail
- n Any configuration changes to Netscape caused us to unregister and reregister Netscape to OAS
- n SSL option of OAS does not set REMOTE\_USER

# Version 4 Settings

## Current Production Settings

- n Cartridge Server Hosts
  - u TIS: 5 to 40
  - u DTS: 1 to 3
- n Cartridge instances
  - u TIS: 40 to 50
  - u DTS: 1 to 5
- n Threads: 1 to 1

# Version 4 Current Major Problem

Only ONE process of the application executes at a time

- n User1 requests operation1
- n OAS handles operation1
- n User2 requests operation2
- n Operation2 waits until operation1 is complete

# Additional Version 4 Settings

- n Max Session Idle Time: 0 (Application Web Configuration)
- n Directory rescan
- n Non-collapsed version of Process Model

# Lessons Learned in Tuning

- n Set threads
  - u >3 caused application to spin
- n Watch timeout of database; sniped processes are not cleaned up nicely in Oracle 7.3.4
- n Restarting application is required when change number of arguments to existing PL/SQL procedure

# Future

- n Continue working on problems
- n Several more applications are in development and testing
- n Two different hosts are running OAS Version 4
- n Email to [clb@ornl.gov](mailto:clb@ornl.gov), [langleyk@saic.com](mailto:langleyk@saic.com)