

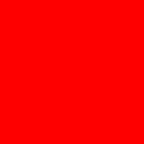
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**Reduce Problem Resolution Time with
Oracle Database 11g Diagnostic Framework**

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Agenda

- **What is the Oracle Database 11g Diagnostic Framework?**
- Working with fault diagnostics – the user experience
- Integration between different diagnostic solutions

Impacts of Poor Diagnostics

- When diagnostics don't work or are insufficient, it can have serious impacts on operations
- Loss of availability
 - If first-failure analysis isn't enough to resolve issues, customer may see repeated occurrences
- Loss of productivity
 - Restarting database for applying patches or setting events
 - DBA is tied up chasing diagnostics instead of normal work
 - Repeated round-trips often make the impact even worse!

Historical Challenges with Oracle Fault Diagnostics

- No organization
 - DBA must search around for relevant diagnostics to send
- No catalog of failures
 - Just a text stream (alert log) for history
 - DBA: Have I seen this failure before?
- Not always sufficient on first failure
 - DBA must reproduce the failure with debug switches
 - Cause of multiple round trips between customer and support
- Unmanaged
 - Diagnostic data grows forever (new trace files created, etc)
 - DBA must decide when and which files to delete
- Unrestrained
 - Floods of data from repeated occurrences of an error
 - DBA must perform emergency space management

Solution: New Comprehensive Diagnostic Framework, Introduced in Oracle Database 11g

- Organized
 - Diagnostic data is annotated and can be queried and correlated
 - DBA uses automated tools to find failure data
- Cataloged
 - Automated problem and incident management
 - DBA can query to see history of failures and which are duplicates
- First Failure Capture
 - DBA's work is done after sending initial diagnostic package
- Managed
 - Auto purging
 - DBAs don't have to monitor space usage of trace files
- Constrained
 - Flood control
 - One less worry for a DBA in time of crisis

Oracle Database 11g Diagnostic Framework

- Handles errors that are likely Oracle bugs, or require Oracle assistance in diagnosing

| Error type | Error example |
|------------------------|--------------------|
| Internal errors | ORA-600 |
| Signals and core dumps | ORA-7445 |
| Out-of-memory errors | ORA-4030, ORA-4031 |
| Corrupt blocks | ORA-1578 |

Current Product Coverage

- Oracle Database 11g
 - Server
 - OCI
 - Net
 - ASM
- Fusion Middleware 11g
 - SOA
 - WebCenter
 - WebLogic Server
- Exadata V1
 - Storage Cells
- Fusion Applications
- Support for more products and components coming
 - The goal is to use a standard solution everywhere

Key Concepts and Components

- Concepts
 - Incidents
 - Problems
- Components
 - Automatic Diagnostic Repository (ADR)
 - Incident Packaging Service (IPS)
- Solutions
 - Health Monitoring
 - Repair advisors
 - SQL Test Case Builder
- Interfaces
 - EM Support Workbench (SWB)
 - ADR Command Interpreter (ADRCI)

Concepts: Problems and Incidents

- **Problem** – code bug or configuration issue that causes execution failures
 - Oracle automatically reports problems for critical errors (ORA-600, ORA-7445, ORA-4031, ...)
 - Exists until corrected (e.g. by applying a patch)
 - Managed to resolution
- **Incident** – a single occurrence of a problem
 - Happens at a point in time, so there's a timestamp
 - Triggers diagnostic actions (dumps, checks)
 - Grouped into problems by a **problem key**, normally error code + arguments

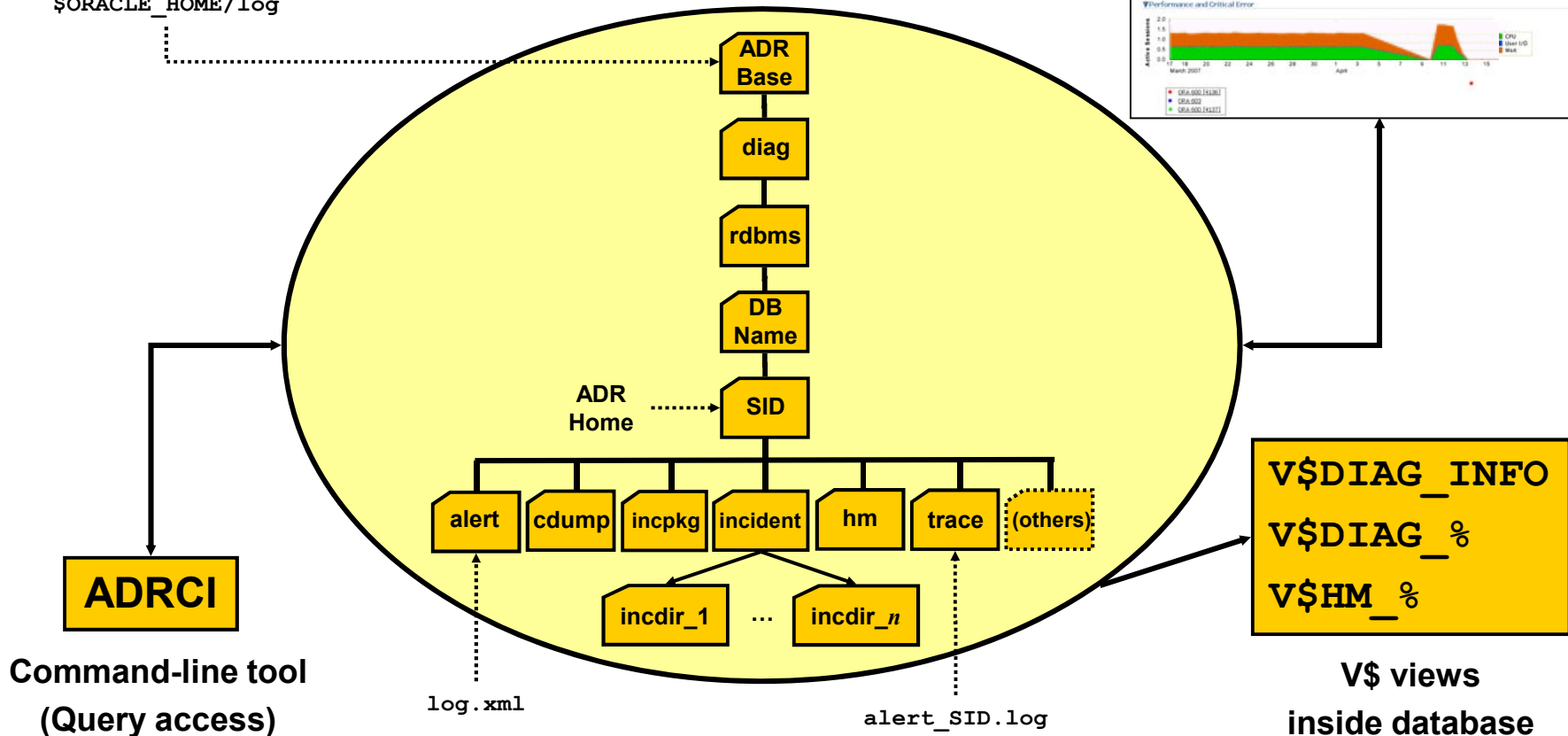
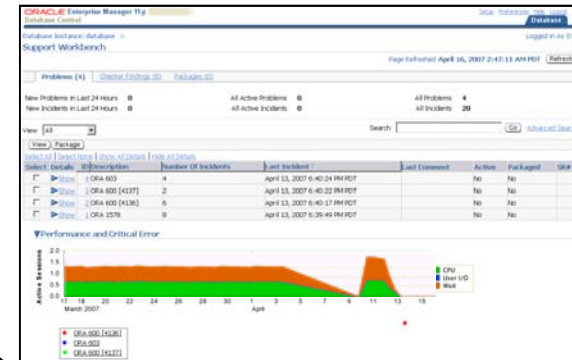
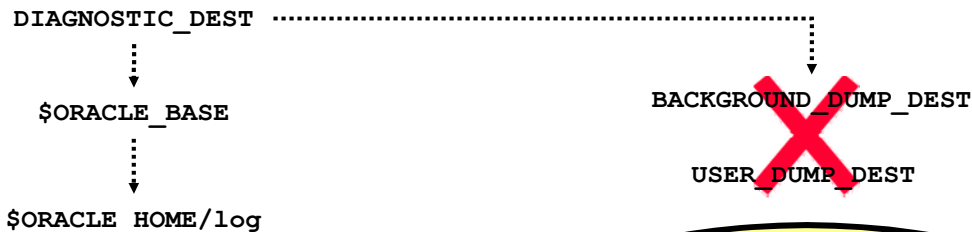
Components:

Automatic Diagnostic Repository (ADR)

- Stores diagnostic data in a directory hierarchy
 - Holds data for multiple Oracle products side-by-side
 - Each product instance has its own diagnostic workspace
- ADR data is highly structured
 - Formalizes incidents and problems and assigns them IDs
 - Metadata is kept for each incident and problem
 - Incident-related diagnostic data is placed in its own directory
 - Alert log and trace files are annotated and can be queried
- Self-Managing
 - Trace files purged after 1 month, incidents and metadata after 1 year
 - Incidents are flood-controlled (max 5 dumps per hour for a problem)
 - Recreates itself as needed

Automatic Diagnostic Repository (ADR)

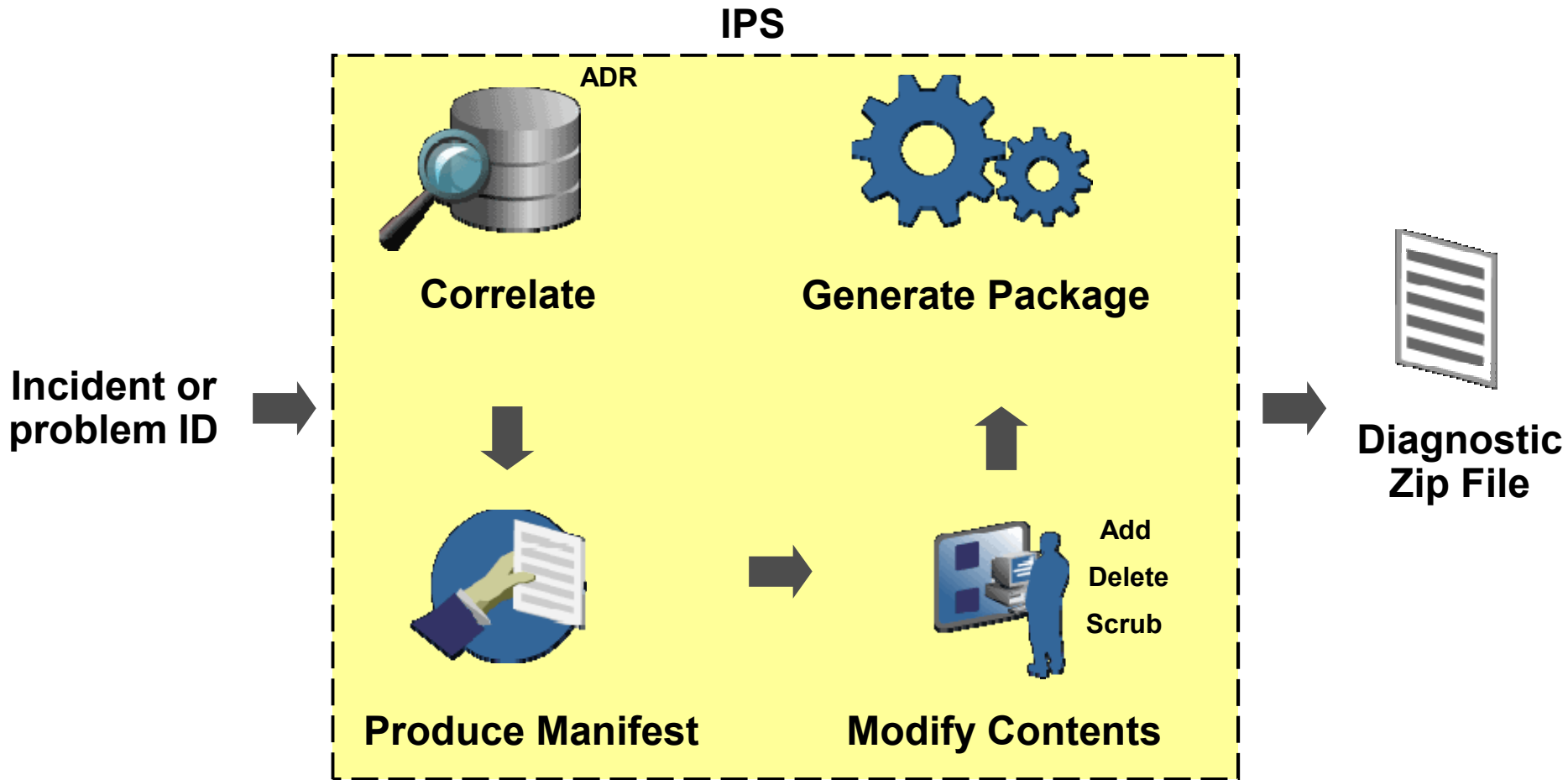
Support Workbench



Components: Incident Packaging Service (IPS)

- Gets fault diagnostics for an incident or a problem
- Packs a subset of ADR into a zip file
 - Automatically picks related incidents and trace files
 - Solves the problem of “what needs to be sent”
- Pushed to Oracle (through OCM) and unpacked there
 - Automatic push requires OCM (Oracle Configuration Manager) to be configured in connected mode
 - Unpacking creates a valid ADR for Oracle Support to review
- Recommends further diagnostic actions for DBA
 - For example “build SQL test case”
- Use of IPS is critical to speed up problem resolution!

Incident Packaging Service (IPS)



Solutions: Health Monitoring & Intelligent Repair and Diagnostics

- Health Monitoring provides a number of “health checks”
 - Dictionary, DB structure, Redo logs, Undo Segments, Data blocks
 - Can be “reactively” activated during incidents
 - E.g., when a corrupt block is detected, check nearby blocks too
- Data Recovery Advisor
 - Guided data recovery using diagnostic data and health check output
- SQL Test Case Builder
 - Automatically builds a SQL test case from incident dumps in ADR
- SQL Repair Advisor
 - Analyzes SQL statement-related incidents to isolate the cause
 - May recommend SQL Patch as work around

Agenda

- What is the Oracle Database 11g Diagnostic Framework?
- **Working with diagnostics – the user experience**
- Integration between different diagnostic solutions

Interfaces to ADR

- Support Workbench (part of EM)
- ADRCI (command-line interface)
- Database views
 - V\$DIAG_INFO
 - Other V\$DIAG_% views
 - V\$HM_% views

How does the DBA find out an incident occurred?

- Enterprise Manager will generate an alert
 - Can mail or page DBA, if configured
- Alert log also shows incidents
 - `ORA-07445: exception encountered: core dump [_dl_sysinfo_int80()+2] ...`
Incident details in:
`/oracle/log/diag/rdbms/y1/y1/incident/incdir_1738/y1_ora_8237_i1738.trc`
- Each incident entry in the alert log contains guidance text (from 11.2.0.2)
 - “Use ADRCI or Support Workbench to package the incident.
See Note 411.1 at My Oracle Support for error and packaging details.”

Graphical Interface: EM Support Workbench

- Central interface for complete diagnostics
- Support Workbench home page
 - View recent and historical problems
 - View diagnostic packages
 - View health checker findings
- Problem Details page
 - Perform guided resolution on the problem
 - Data Repair or SQL Repair advisor (if relevant)
 - Create diagnostic packages

EM Support Workbench – Alerts

The screenshot shows the Oracle Enterprise Manager interface. At the top, there are navigation tabs: Home, Targets, Deployments, Alerts (selected), Compliance, Jobs, Reports, and My Oracle Support. Below the tabs, there are status indicators: Targets Down, Critical (selected), Warning, Errors, Blacked Out, and Unknown Availability. The main heading is "Critical Alerts". A sub-header indicates "Page Refreshed Sep 22, 2010 12:20:04 AM PDT" and a "View Data" button set to "Manually".

Text below the heading: "Your managed targets listed below have metric severities that are in Critical status."

Search section includes:

- Target Type: All Targets
- Alert triggered within: 31 Day(s)
- Target Name: (empty)
- Ignore acknowledged alerts
- Buttons: Go, Clear Alert, Acknowledge

Table below the search section:

| Select | Target | Type | Alert Triggered | Message | Acknowledged | Last Collected Value | Last Collected Timestamp |
|--------------------------|----------|-------------------|--------------------------|---|--------------|----------------------|--------------------------|
| <input type="checkbox"/> | database | Database Instance | Sep 21, 2010 10:21:01 AM | Internal error (ORA-600[13011]) detected in /ade/aime oow swb demot/oracle/log/diag/rdbms/... | | Not available | Not available |

From EMGC Home Page:
Click the "Critical" link in the "All Target Alerts" section

EM Support Workbench – Main Page

ORACLE Enterprise Manager
Grid Control 11g

Home Targets Deployments Alerts Compliance Jobs Reports My Oracle Support

Hosts Databases Middleware Web Applications Services Systems Groups Virtual Servers All Targets

Database Instance: database >

Support Workbench

Page Refreshed September 22, 2010 12:24:08 AM PDT Refresh

Problems (1) Packages (0)

New Problems in Last 24 Hours **1** All Active Problems **1** All Problems **1**
New Incidents in Last 24 Hours **1** All Active Incidents **1** All Incidents **1**

View Last 24 Hours Search Go Advanced Search

View Package

Select All Select None Show All Details Hide All Details

| Select Details | ID | Description | Number Of Incidents | Last Incident | Last Comment | Active | Packaged | SR# |
|----------------|-----------------|-------------|---------------------|------------------------------------|--------------|--------|----------|-----|
| Show | ORA 600 [13011] | | 1 | September 22, 2010 12:17:52 AM PDT | | Yes | No | |

From "Critical Alerts" Page:
Click the database name link in the "Target" column

EM Support Workbench – Problem Details

ORACLE Enterprise Manager
Grid Control 11g

Home Targets Deployments Alerts Compliance Jobs Reports My Oracle Support

Hosts | Databases | Middleware | Web Applications | Services | Systems | Groups | Virtual Servers | All Targets

Database Instance: database > Support Workbench >

Problem Details: ORA 600 [13011]

Page Refreshed September 22, 2010 12:25:09 AM PDT Refresh

Summary

SR# -- Edit

Bug# -- Edit

Active Yes

Packaged **No**

Number of Incidents **1**

Last Dumped Incident

Timestamp September 22, 2010 12:17:52 AM PDT

Incident Source **System Generated**

User Impact

Investigate and Resolve

Quick Package

Diagnose

- Alert Log
- Related Problems Across Topology
- Diagnostics for Last Dumped Incident
- Search Knowledge Base

Collect and Send Diagnostic Data

- Generate Additional Dumps and Test Cases
- Package the Problem

Track and Close

- Check Service Request Status
- Close the problem

Incidents Activity Log

Status Open Incidents Data Dumped Yes Go

View Close

Select All | Select None | Show All Details | Hide All Details

| Select Details | ID | Description | Data Dumped | Active | Status | Timestamp |
|--------------------------|---------------------|--|-------------|--------|--------|------------------------------------|
| <input type="checkbox"/> | 937 | ORA-600 [13011] [62684] [4244221] [0] [4244221] [17] | Yes | Yes | Ready | September 22, 2010 12:17:52 AM PDT |

From Support Workbench Main Page:
Click the problem ID, or check the “Select” checkbox and click “View”

EM Support Workbench – Packaging

- Two flows that guide you through IPS packaging
- Quick package
 - Wizard for basic packaging steps
 - Cannot modify contents
- Advanced packaging
 - Allows Content Editing
 - Allows generation of additional user dumps
- Automated upload of diagnostic packages to Oracle
 - Requires OCM (Oracle Configuration Manager) in connected mode
- Automated service request creation
 - Requires OCM (Oracle Configuration Manager) in connected mode

EM Support Workbench – Quick Packaging

ORACLE Enterprise Manager
Grid Control 11g

Home Targets Deployments Alerts Compliance Jobs Reports My Oracle Support

Hosts Databases Middleware Web Applications Services Systems Groups Virtual Servers All Targets

Create New Package View Contents View Manifest Schedule

Quick Packaging: Create New Package

Cancel Step 1 of 4 Next

Target: **database**
Problems Selected: **ORA 600 [13011]**

Logged in As

Use quick packaging to generate an upload file for a single problem and send it to Oracle with default options. If Oracle Configuration Manager is not set up, the upload file will still be created but it will not be sent to Oracle.

My Oracle Support credentials are already registered. These credentials will be used for draft Service Request creation and package upload.

* Package Name:

Package Description:

Send to Oracle Support: Yes No

* Customer Support Identifier (CSI):

Country:

Create new Service Request (SR): Yes No

From Problem Details Page:
Click the “Quick Package” button

EM Support Workbench – Quick Packaging


ORACLE Enterprise Manager
Grid Control 11g


Home Targets Deployments Alerts Compliance Jobs Reports My Oracle Support

Hosts | Databases | Middleware | Web Applications | Services | Systems | Groups | Virtual Servers | All Targets

Processing: Packaging and Sending the Package: ORA600130_20100922002704 to Oracle

Processing package: ORA600130_20100922002704.
It may take several minutes. The package will be automatically sent to Oracle after it is generated if you opted to do so.

 Packaging in progress.
 Create new Service Request (SR)
Sending package to Oracle has not started.

 **TIP** This operation cannot be canceled. It will continue even if the browser window is closed.

ORACLE Enterprise Manager
Grid Control 11g

Home Targets Deployments Alerts Compliance Jobs Reports My Oracle Support

Confirmation

Upload file for package: ORA600130_20100922002704 has been successfully generated and sent to Oracle. Draft Service Request (SR) 3-2134105851 has been created. Please log on to MetaLink to finalize and submit this SR to Oracle Support. Draft SRs are available for update or submission for 30 days.

OK

From Quick Packaging Wizard:
Go to final step, "Schedule", and click the "Submit" button

My Oracle Support (MOS) – Viewing and Updating Service Requests

- Support Workbench creates MOS Service Requests
 - The SR is in a draft state until manually completed by the customer

The screenshot displays the Oracle Enterprise Manager interface for My Oracle Support. The top navigation bar includes 'Home', 'Targets', 'Deployments', 'Alerts', 'Compliance', 'Jobs', 'Reports', and 'My Oracle Support'. The main content area is titled 'Service Requests Home' and features a 'Create SR' button. On the left, there are two summary panels: 'Open Service Requests by Severity' and 'Open Service Requests by Status'. The main area shows a list of 'Draft Service Requests' with columns for 'Problem Summary', 'SR Number', 'Product', 'Product Vers...', 'Platform', 'Contact', and 'Last...'. Two draft requests are visible, both created through the OCM Client. A red circle highlights the 'Problem Summary' column for the first two rows.


| Problem Summary | SR Number | Product | Product Vers... | Platform | Contact | Last... |
|-------------------------------------|--------------|-------------------------|-----------------|-----------|-------------|-----------|
| Draft SR created through OCM Client | 3-2134105851 | For Product List - C... | DUMMY VERS... | GENERI... | Fabian G... | Today |
| Draft SR created through OCM Client | 3-2133505501 | For Product List - C... | DUMMY VERS... | GENERI... | Fabian G... | Yesterday |

My Oracle Support (MOS) – Viewing and Updating Service Requests

General Information

Problem Summary *

Problem Description *

Error Message Number  *Providing this helps with diagnosis*

AutoFill - Product Information

Fill using Manual entry Service Request Profile

Exit Wizard

EM Support Workbench – Advanced Packaging

ORACLE Enterprise Manager
Grid Control 11g

Home Targets Deployments Alerts Compliance Jobs Reports My Oracle Support

Hosts | Databases | Middleware | Web Applications | Services | Systems | Groups | Virtual Servers | All Targets

Database Instance: database > Support Workbench >

Customize Package: ORA600130_20100922002704

Page Refreshed September 22, 2010 12:39:45 AM PDT [Refresh](#)

The package can be customized to edit its contents, to generate and include additional diagnostic data or to scrub user data. Once the package is ready it can be sent to Oracle Support.

Summary

| | |
|---------------------------------------|---|
| Status | Sent to Oracle |
| Total Size (uncompressed) | 3.47 MB |
| Incremental Size (uncompressed) | 0.33 MB |
| Created | September 22, 2010 12:27:49 AM PDT |
| Description | N/A |
| Problems in Package | ORA 600 [13011] |
| Incidents Previously Excluded by User | 0 Include |
| Files Excluded by User | 0 Include |

Packaging Tasks

[Generate Upload File](#) [Send to Oracle](#)

Edit Contents

- [Add Problems](#)
- [Exclude Problems](#)
- [View Package Manifest](#)

Scrub User Data

- [Copy out Files to Edit Contents](#)
- [Copy in Files to Replace Contents](#)

Additional Diagnostic Data

- [Gather Additional Dumps](#)
- [Add External Files](#)
- [Create/Update Correlated Packages](#)

Send to Oracle Support

- [Finish Contents Preparation](#)
- [Generate Upload File](#)
- [View/Send Upload Files](#)

From Problem Details Page:
Click "Package the Problem" in the "Collect and Send Diagnostic Data" section

Command-line Interface: ADRCI

- ADR contents can be accessed through a command-line utility, ADRCI
- Appropriate when EM is not being used, or if logged in through a terminal
- ADRCI can display alert log entries, incident dumps, metadata about problems and incidents
- ADRCI also features IPS commands for packaging up ADR contents

Command-line Interface: ADRCI Examples

- `adrci> show incident`

```
INCIDENT_ID PROBLEM_KEY                CREATE_TIME
-----
185          ORA 7445 [expepr()+29] 2010-08-23 18:47:59.545000 -07:00
1 rows fetched
```

- `adrci> ips pack incident 185`

```
Generated package 1 in file ORA7445ex_20100823184912_COM_1.zip, mode
complete
```

- `adrci> show alert -tail -f`

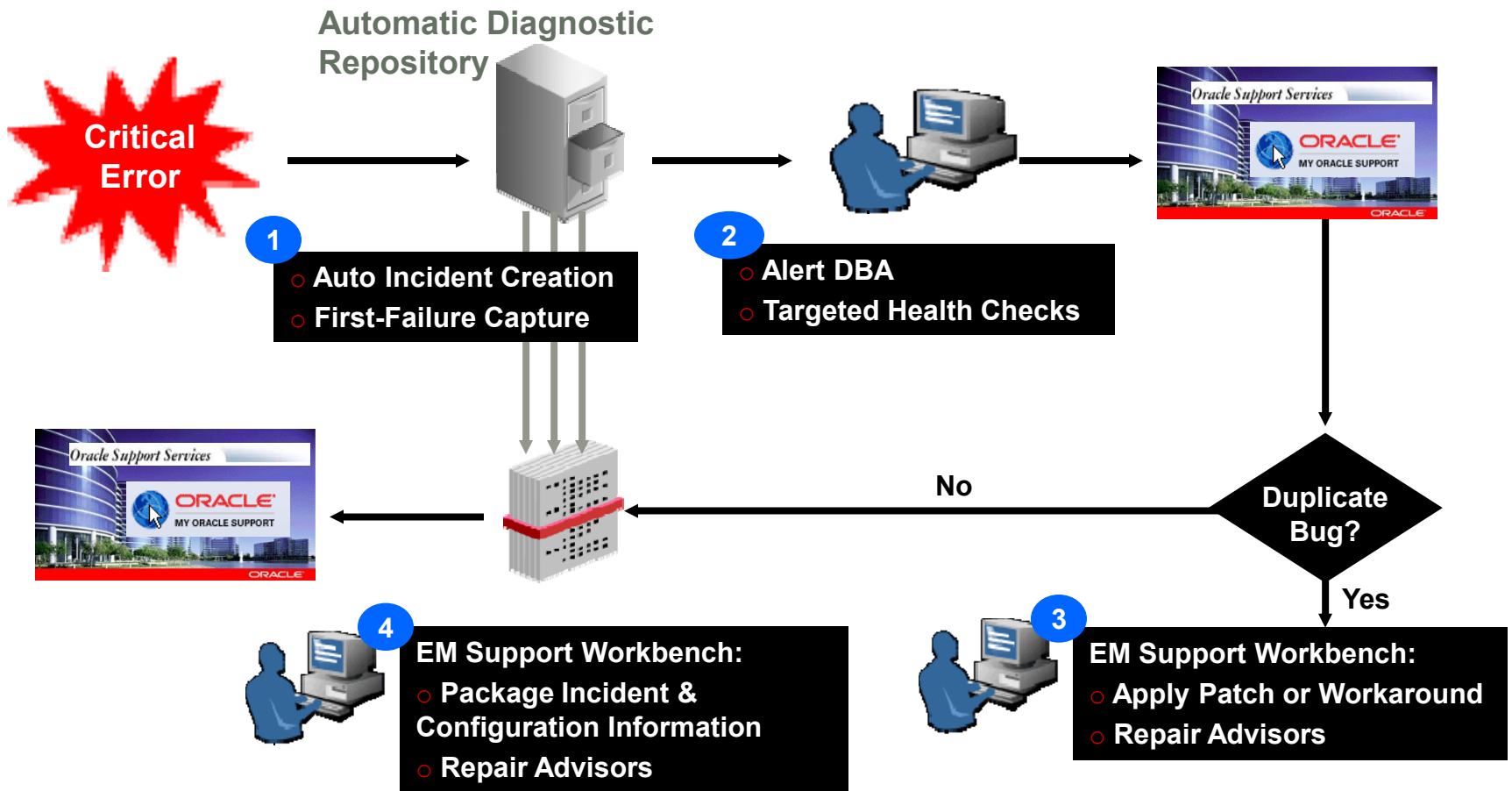
```
2010-08-23 18:33:14.250000 -07:00
Deleting process (pid: 21, osid: 28266, W000)
...
```

- `adrci> help`

```
HELP [topic]
```

- ...

Automatic Diagnostic Workflow



Reduce Time to Problem Resolution!

Agenda

- What is the Oracle Database 11g Diagnostic Framework?
- Working with diagnostics – the user experience
- **Integration between different diagnostic solutions**

Integration:

What About Oracle's Other Collection Tools?

- IPS is the primary tool for gathering fault diagnostics
- Existing diagnostic collection tools are integrated with IPS already, or are being integrated with IPS
- IPS calls different tools and includes their output in the package
 - Oracle Configuration Manager (OCM)
 - Remote Diagnostic Agent (RDA)
 - diagcollection.pl used by CRS
 - celldiag.pl used by Exadata Cells

Integration: Oracle Configuration Manager (OCM)

- Enhances My Oracle Support experience
 - Auto-populates SR configuration details
 - Configuration management
 - Configuration Health Checks
- OCM connects to Oracle to upload configuration data
 - Can also be configured in disconnected mode
- OCM in connected mode is required for several features
 - Automatic creation of pending Service Requests
 - Automatic upload of IPS packages

Integration: Oracle Configuration Manager (OCM)

- Configuration data is also important for diagnostic issues
 - We want to know the configuration at the time of an incident
- If OCM is in connected mode, IPS includes the OCM target ID
 - This allows Oracle analysts to match IPS package contents with the OCM configuration stored for this target
- If OCM is in disconnected mode, IPS will start an OCM collection, and include the output
- OCM in connected mode is recommended, since it allows much more automation

Integration: Remote Diagnostic Agent (RDA)

- RDA is a diagnostic tool that gathers additional diagnostics beyond what's collected by the products
 - Typically used when requested by Support in association with an SR
- RDA releases are much more frequent than product releases, so RDA has the most up-to-date diagnostics
 - Downloadable from My Oracle Support
 - New releases typically published quarterly
- When installed, RDA works as an extension of IPS
 - The main RDA script is called by IPS
 - Output is saved in an ADR directory
 - IPS calls RDA with incident details, allowing custom RDA run
 - RDA has specific modes for ORA-600 and ORA-4031 so far
 - This feature is available in RDBMS 11.2.0.2

Integration: Oracle Clusterware (CRS) Diagnostics

- There is a diagnostic script that gathers additional diagnostics for CRS: `diagcollection.pl`
 - Typically used when requested by Support in association with an SR
- On systems with CRS, IPS will call `diagcollection.pl` and include its output in the package

Integration: Exadata diagnostics

- Exadata diagnostics pose challenges
 - Exadata Cells are appliances, so you normally don't log in
 - Need to get OS logs in addition to product-specific data
- There is a diagnostic script that gathers additional diagnostics for Exadata cells: `celldiag.pl`
- On an Exadata Cell, IPS automatically calls `celldiag.pl` and includes the output in the package

Integration: How does this impact you?

- Support will ask you to upload IPS packages
- IPS is the primary tool for gathering fault diagnostics
- Learn the new tools and get familiar with the process!

Summary

- Automatic fault diagnostics reduce problem resolution time
- Use IPS for gathering fault diagnostics
- Support Workbench provides an easy-to-use interface for accessing diagnostics
- OCM provides configuration information for Support

Demogrounds Recommendations

| Demo | Location |
|---|---------------------------|
| Self-Managing Database: Automatic Performance Diagnostics | Moscone West Exhibit Hall |
| Oracle Real Application Testing: SQL Performance Analyzer | Moscone West Exhibit Hall |
| Oracle Real Application Testing: Database Replay | Moscone West Exhibit Hall |
| Self-Managing Database: Automatic Application & SQL Tuning | Moscone West Exhibit Hall |
| Self-Managing Database: Automatic Fault Diagnostics | Moscone West Exhibit Hall |
| Self-Managing Database: SQL Plan Management | Moscone West Exhibit Hall |
| Change Management & Data Masking for DBAs | Moscone West Exhibit Hall |

Further Reading

| Name | Location |
|---|---|
| Automatic Fault Diagnostics White Paper | http://www.oracle.com/technetwork/database/features/manageability/diagnosability-white-paper-ow07-131084.pdf |
| Managing Diagnostic Data (in DBA Guide) | http://download.oracle.com/docs/cd/E11882_01/server.112/e17120/diag.htm#adminChapterDiagnosability |
| ADRCI: ADR Command Interpreter (in Utilities) | http://download.oracle.com/docs/cd/E11882_01/server.112/e16536/adrci.htm#BABBBHGFC |