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

<table>
<thead>
<tr>
<th>Error type</th>
<th>Error example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal errors</td>
<td>ORA-600</td>
</tr>
<tr>
<td>Signals and core dumps</td>
<td>ORA-7445</td>
</tr>
<tr>
<td>Out-of-memory errors</td>
<td>ORA-4030, ORA-4031</td>
</tr>
<tr>
<td>Corrupt blocks</td>
<td>ORA-1578</td>
</tr>
</tbody>
</table>
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)

**DIAGNOSTIC_DEST**

- $ORACLE_BASE
- $ORACLE_HOME/log

**BACKGROUND_DUMP_DEST**

**USER_DUMP_DEST**

ADR Base

- diag
- rdbms
- DB Name

ADR Home

- SID

- alert
- cdump
- incpkg
- incident
- hm
- trace
- (others)

ADRCI

Command-line tool

(Query access)

V$DIAG_INFO

V$DIAG_%

V$HM_%

V$ views inside database

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)

- Incident or problem ID
- Correlate
- Generate Package
- Produce Manifest
- Modify Contents
- Add
- Delete
- Scrub
- Diagnostic Zip File
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
From EMGC Home Page:
Click the “Critical” link in the “All Target Alerts” section

<table>
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<tr>
<th>Select Target</th>
<th>Type</th>
<th>Alert Triggered</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>database</td>
<td>Database</td>
<td>Sep 21, 2010 10:21:01 AM</td>
<td>Internal error (ORA-600[13011]) detected in /ade/aime_oow_swib_de...</td>
</tr>
</tbody>
</table>
From “Critical Alerts” Page:
Click the database name link in the “Target” column
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
From Problem Details Page:
Click the “Quick Package” button
EM Support Workbench – Quick Packaging

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

General Information

- **Problem Summary**: Draft SR created through OCM Client
- **Problem Description**: ORA 600 [13011] [ProductName = Oracle Database Control, ProductVersion = 11.1.0.0.0]
- **Error Message Number**: (if applicable)

Providing this helps with diagnosis

AutoFill - Product Information

- Fill using: Manual entry
- Service Request Profile: Select a Profile

Exit Wizard  Save Draft
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

Critical Error

1. Auto Incident Creation
   - First-Failure Capture

2. Alert DBA
   - Targeted Health Checks

3. EM Support Workbench:
   - Package Incident & Configuration Information
   - Repair Advisors

4. EM Support Workbench:
   - Apply Patch or Workaround
   - Repair Advisors

Duplicate Bug?

No

Yes

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

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## Further Reading

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<td>Managing Diagnostic Data (in DBA Guide)</td>
<td><a href="http://download.oracle.com/docs/cd/E11882_01/server.112/e17120/diag.htm#adminChapterDiagnosability">http://download.oracle.com/docs/cd/E11882_01/server.112/e17120/diag.htm#adminChapterDiagnosability</a></td>
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