

ORACLE
Data Deep Dive
at AI World

Zero Downtime, No Rewrites: Oracle AI Database and App Continuity Enhancements

LRN2932

October 15th, 2025

Speakers

Anil Nair

Distinguished Product Manager,
Oracle Real Application Clusters

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Database Product Management

Safe harbor statement

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, timing, and pricing of any features or functionality described for Oracle's products may change and remains at the sole discretion of Oracle Corporation.



More than **100** local municipalities throughout Japan **run mission-critical workloads** on cloud services provided by RKKCS. With **Application Continuity**, RKKCS transparently **provides continuous services**, even during the regular **Autonomous Database maintenance windows**.

Yushi Koike

**Technical Division Manager,
Research and Development Department,
RKKCS Corporation**

Zero downtime, no application rewrites

Through continuous improvements

Faster Failover with Oracle RAC and Data Guard

Enhancements in every database release

- Most drivers are Application Continuity enabled
- Database-initiated session migration during draining
- RESET_STATE for all

Simplified Application Continuity adoption

- Resumable Cursors
- Customization for external actions
- Automatic keeping of original results



Oracle Maximum Availability Architecture (MAA) integration

Documented Application High Availability Levels

<https://docs.oracle.com/en/database/oracle/oracle-database/23/haovw/continuous-availability-applications.html>

30 Configuring Continuous Availability for Applications

Ensure that your applications are configured to quickly and automatically shift workload to available Oracle RAC instances or standby databases during planned maintenance and unplanned outages.

Application up time is maximized by following these recommendations when there are outages.

The primary audience for this document is application developers and application owners. Operational examples are included for database administrators and PDB administrators.

Topics:

- [About Application High Availability Levels](#)
- [Configuring Level 1: Basic Application High Availability](#)
- [Configuring Level 2: Prepare Applications for Planned Maintenance](#)
- [Configuring Level 3: Mask Unplanned and Planned Failovers from Applications](#)
- [Reference](#)

Milestone: Self-Service Application Continuity


Through collaboration with Oracle customers and partners



Gaia Oracle Service (GOS)

- 1 Private Oracle Cloud**
Opinionated. Rapid Provisioning. No-DBA model.
- 2 Customers**
Strategic platform for internal Oracle databases
60-70% cloud v. non-cloud in 3 years and on a great trajectory
Critical zero-downtime applications e.g. Debit, Payments etc.,
- 3 MAA**
Closely follows detailed MAA recommendations
All Production databases are RAC clusters and have at least one ADG Standby.
- 4 Security & Hygiene**
Mandatory application of Release Updates.
Opinionated security model.
- 5 Self-Service**
... means self-service! Full Repave capabilities, Rolling Patching, Switchover/Failover, Create/Stop/Start Services.

JPMORGAN CHASE & CO. 25



AC/TAC @Deutsche Bank (DB)

Goal @DB

- Zero Downtime planned maintenance
- Zero Downtime unplanned outages

Oracle @DB

- AC-TAC product team work closely with us
- Client business needs are well understood

Challenge @DB

- Every application is unique in itself
- How to analyze 2000+ applications
- How to scale project implementation

Program @DB

- Analyze application design
- Categorize them as Easy, Medium & Complex
 - Decision Matrix
- POC and Sign Off
- **Prepare Blue-Print to achieve AC-TAC – Self Service**

Deutsche Bank Identifier Harsh Gupta, Oracle Cloud World, 2024 36



Goal with
Oracle AI Database
26ai – **Transparent
Application Continuity
everywhere!**

Oracle AI Database 26ai continues the enhancements made in Oracle Database 23ai.

Selected Application Continuity features will be made available with Oracle Database 19c.

Ongoing commitment to reducing failover times

Oracle AI Database 26ai vs. Oracle Database 19c

<5 secs

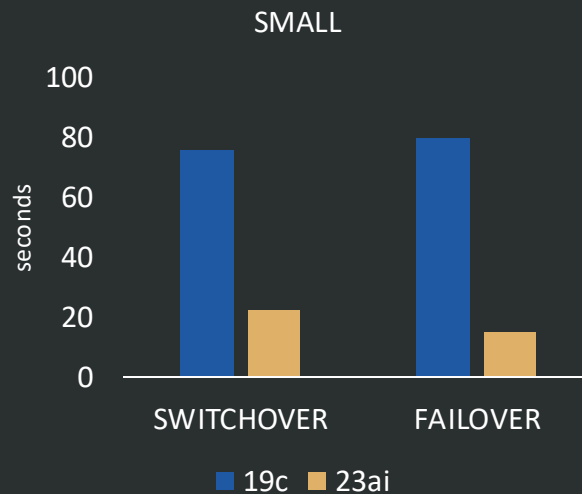
Recovery from outages
for defined workloads using
Oracle RAC 23ai

Defined workload: YCSB

- Number of threads: 30
- Record size: 4096K
- Update heavy workload
- Read/update ratio: 50/50
- Recovery time will vary depending on system load
- Requires MTTR tuning

<30 secs

Role transition time
with Oracle Data Guard 23ai
in many configurations



<https://blogs.oracle.com/maa/post/faster-data-guard-transitions-23ai>

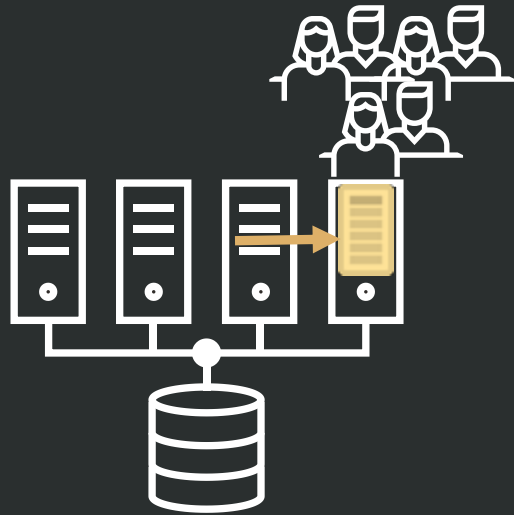
>40%

Faster failover for selects with
Transparent Application Continuity
repositioning cursors at failover

More in last year's presentation

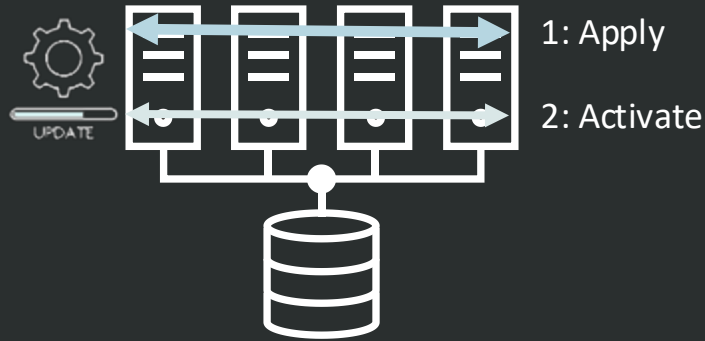


Driving toward zero downtime



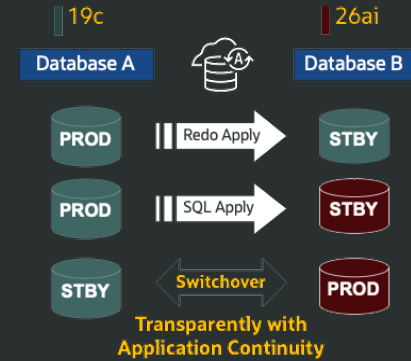
Oracle RAC Smart Connection Rebalance

Redirects active sessions to the same instance for optimized performance without interruption.



Oracle RAC Two-Stage Rolling Updates

Eliminates previously required downtime by enabling rolling application of new features and fixes with Oracle RAC.



Application Continuity DBMS_ROLLING Support

Hides upgrade-related database downtime from your users.

Draining is a database-inherent feature benefiting from services

Let the database decide when to relocate sessions during planned maintenance

Draining

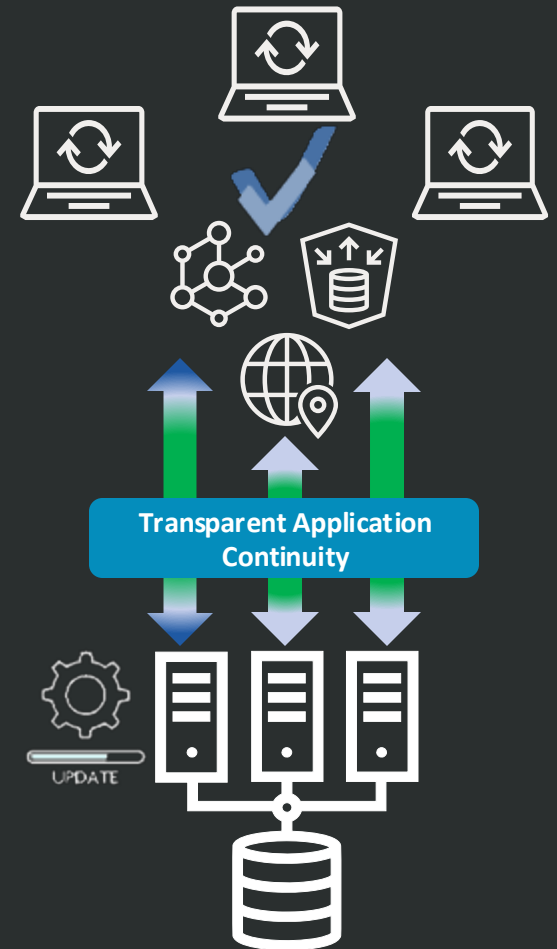
- Enables applications to finish ongoing work before maintenance. With Oracle AI Database 26ai, the drain timeout can be used per service or for a session.

Oracle AI Database

- Detects sessions that will not drain and can failover
- Proactively chooses to failover sessions based on rules
 - Bounds maintenance windows
- Most requests reach failover conditions quickly

Selected sessions continue with Application Continuity

- Minimizes ungraceful session terminations before timeout
- Reduces replay time on failover

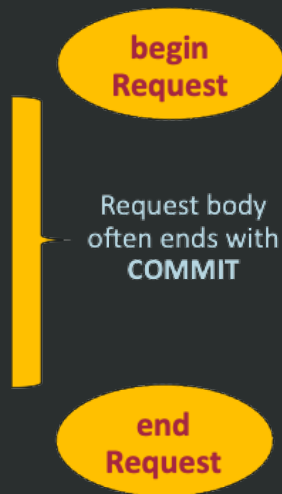


The conceptual secrets behind transparency

Request boundaries, in-band notifications, and connection tests

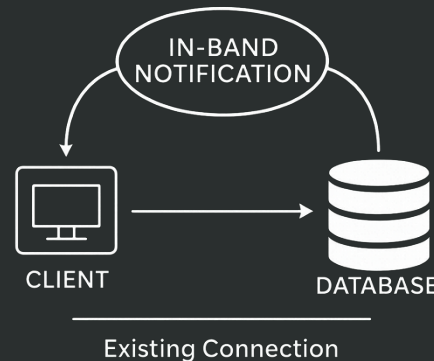
Request boundaries

are **marked** by developers or middle tiers explicitly or **rely on automatic detection**, allowing (Transparent) Application Continuity to safely capture, replay, and recover in-flight work after outages.



In-band notifications

are messages sent directly through the existing database connection to inform the client or connection pool about planned events such as maintenance, or switchover.



Default starting with Oracle Database 19c and later.

Connection tests

verify the health and validity of a database connection before it is handed out to an **application** or during its use in a **connection pool**.

Connection tests **are performed automatically** (via validate-connection, connection-check, or SQL test queries) either when borrowing a connection or returning it.



Enable Transparent Application Continuity everywhere

Using continuous enhancements toward **zero user interruption**

Autonomous
Transaction Support

Database Links
Failover

APEX & ORDS Failover
Support

True Cache
Support

RESET_STATE
for Everyone

Database Links
Draining

Precompiler Support

Original Function
Result Assurance

Application Protection – One Solution – Two Flavors

Application Continuity (AC)

- For planned maintenance and unplanned outages
- Available with Oracle RAC and Active Data Guard
- Oracle and 3rd party connection pools that are JDK-compliant (incl. JBoss, Hikari)
- Supports customizable handling of external actions (e.g. UTL_HTTP)



Transparent Application Continuity (TAC)

- For planned maintenance and unplanned outages
- Available with Oracle RAC and Active Data Guard
- Same as AC and discovered TAC boundaries
- Supports customizable handling of external actions with Oracle AI Database 26ai; default remains “disabled”
- Default on Oracle Autonomous AI Database

Customized protection for external calls and transactions

Enables **Autonomous Transactions and Database Links Failover**

External actions – outside the database’s direct control – may still take effect

- E.g. use of UTL_HTTP, UTL_FILE, UTL_TCP
- Audit, HEPA, statistics, database links calls
- Applies to the use of Autonomous Transactions, Database Links, PL/SQL Callouts

Customization enables selecting the appropriate protection level for applications

- The default for AC is “replay all”; TAC disables “replay all” by default

Examples: make Autonomous Transactions and Database Links replayable for service ‘myservice’

- Set on a per-service level or use the PL/SQL API for finer control
- Use with Oracle AI Database 26ai – 23.7 – or Database 19c – 19.27 – incl. client for Database Links Failover



```
SQL> execute dbms_app_cont_admin.set_replay_rules  
      (service_name => 'myservice', replayable => true,  
       dbms_app_cont_admin.Autonomous_Transactions);
```



```
SQL> execute dbms_app_cont_admin.set_replay_rules  
      (service_name => 'myservice', replayable => true,  
       dbms_app_cont_admin.database_links);
```

New and Low Code Support

Full Integration with APEX and ORDS

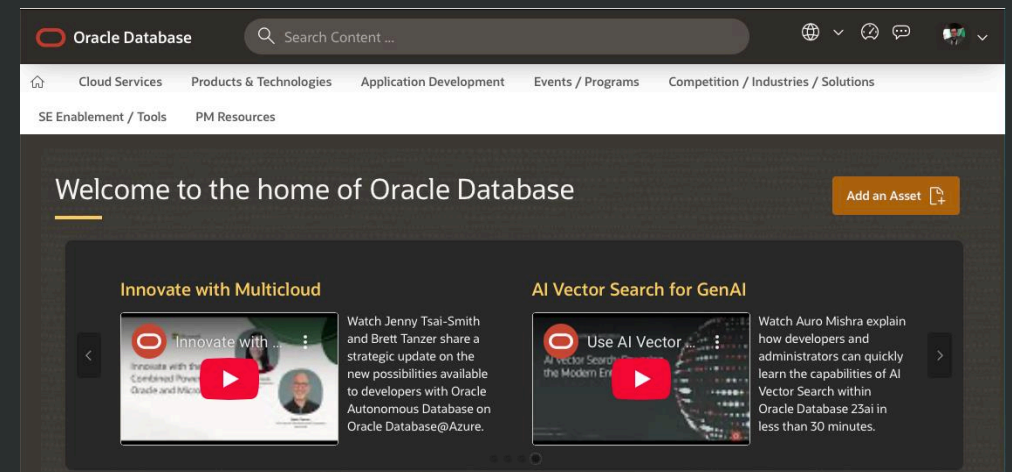
Oracle **APEX** is the world's most popular enterprise low-code application platform that enables you to build scalable, secure web and mobile apps, with world-class features, that can be deployed anywhere – cloud or on premises.

Oracle **REST Data Services (ORDS)** is the world's most popular enterprise solution for transforming Oracle Database data and logic into modern REST APIs, securely, efficiently, and at scale, and deployable from on-premises to cloud.

Transparent Application Continuity allows APEX developers to focus on functionality, as simple reports, charts, forms' entry/submit, and interactive reports (with atomic commits) replay on failover. For ORDS administrators, ORDS embeds a replay-enabled data source and has been optimized to use RESET_STATE (ORDS 25.4 and higher).

Use Oracle **AI Database 26ai** – 23.6 – including drivers to fully benefit from Autonomous Database and Database Links failover.

- For Oracle Database 19c, use RU 26 – 19.26 or higher
- Update your Oracle clients accordingly



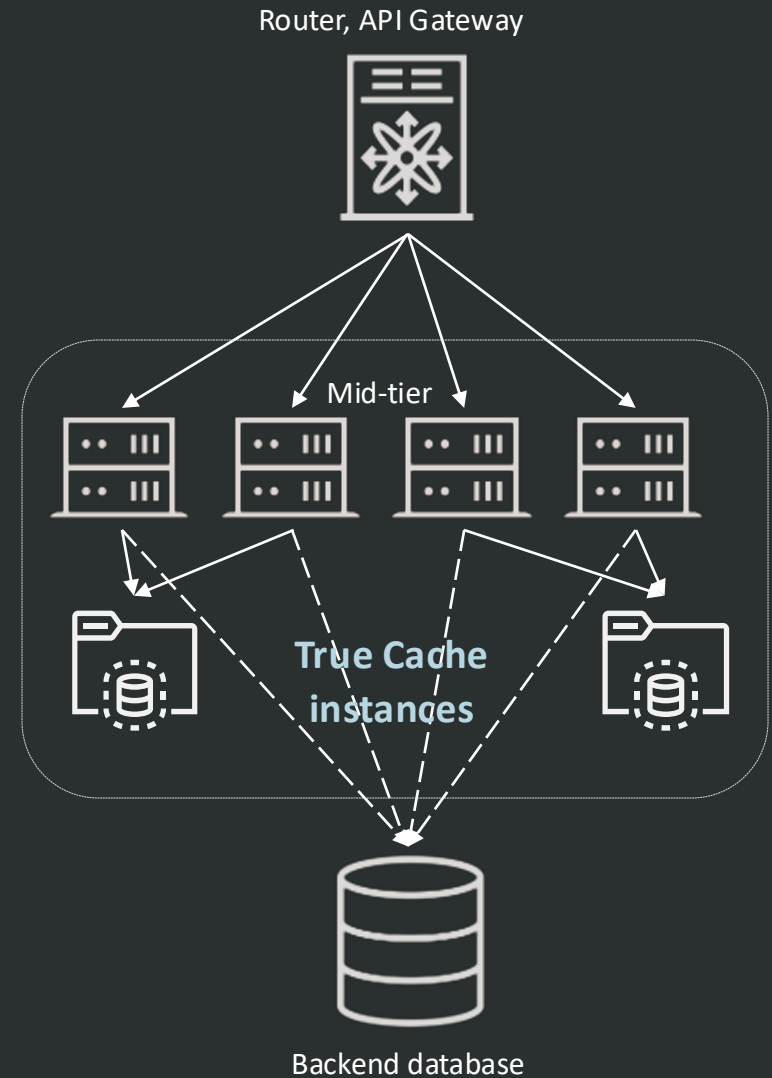
Better performance and failover

Application Continuity True Cache Support

Oracle True Cache extends Oracle AI Database 26ai into the mid-tier, delivering lightning-fast data access with full transactional consistency.

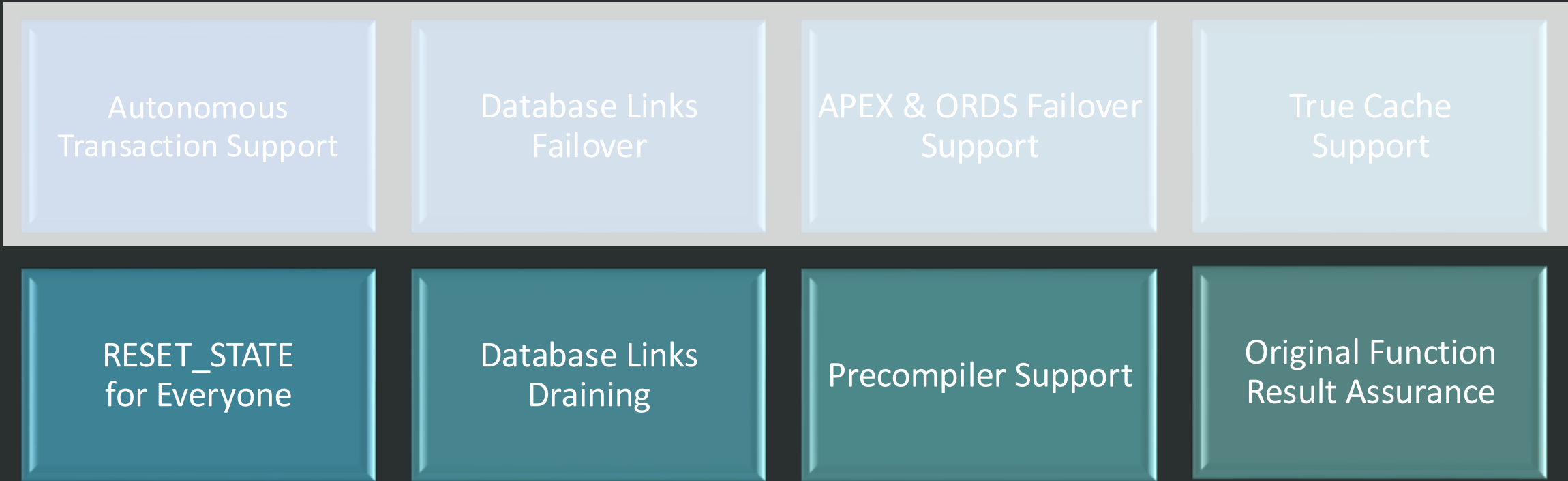
It accelerates applications, reduces database load, and ensures continuous service across cloud and on-premises environments.

Being a database-inherent feature, **Transparent Application Continuity** fully supports **True Cache**, just as it supports Oracle Data Guard.



Enable Transparent Application Continuity everywhere

Using continuous enhancements toward **zero user interruption**



RESET_STATE

Prevents applications from leaking state

Problem

- When an application returns a connection to the pool, cursors in FETCH and session state remain on that session, unless an action is taken to clear them. Application session state and cursors leak to later reuses.

With Oracle AI Database 26ai

- RESET_STATE restores the session state to login and cancels cursors in FETCH at the end of each request
- Oracle Database guarantees cleaning the state, which is otherwise left to developers
- Independent of (Transparent) Application Continuity

Benefits

- Prevents application security holes, reduces code, lowers DB CPU usage
- Broader protection with TAC – e.g. Microservices, APEX, ORDs, Fusion Apps, SwingBench
- Highly demanded customer feature – e.g. requested by banks, retail, government



RESET_STATE for everyone

Broadening the benefits for even more transparency

RESET to LEVEL1

- Automatic action at the end of request on the server
- Clears
 - Session states that are not capturable
 - cancels cursors
- TAC has clean state for boundaries
- Integrated into ORDS-APEX

- Available now with Oracle AI Database 26ai Standard Edition, Enterprise Editions, and Free

RESET to LOGIN

- Automatic action at end of request on client & server
- Clears session states not capturable
 - restores login state
 - cancels cursors and database links
- TAC has clean state for boundaries
- **Essential for all applications:**
 - Session states do not leak to next usage
- Integrated with ORDS & APEX 25.4
- Should be used by all shared services

- Soon available with SE, EE, Oracle FREE AI Database 26ai and respective drivers



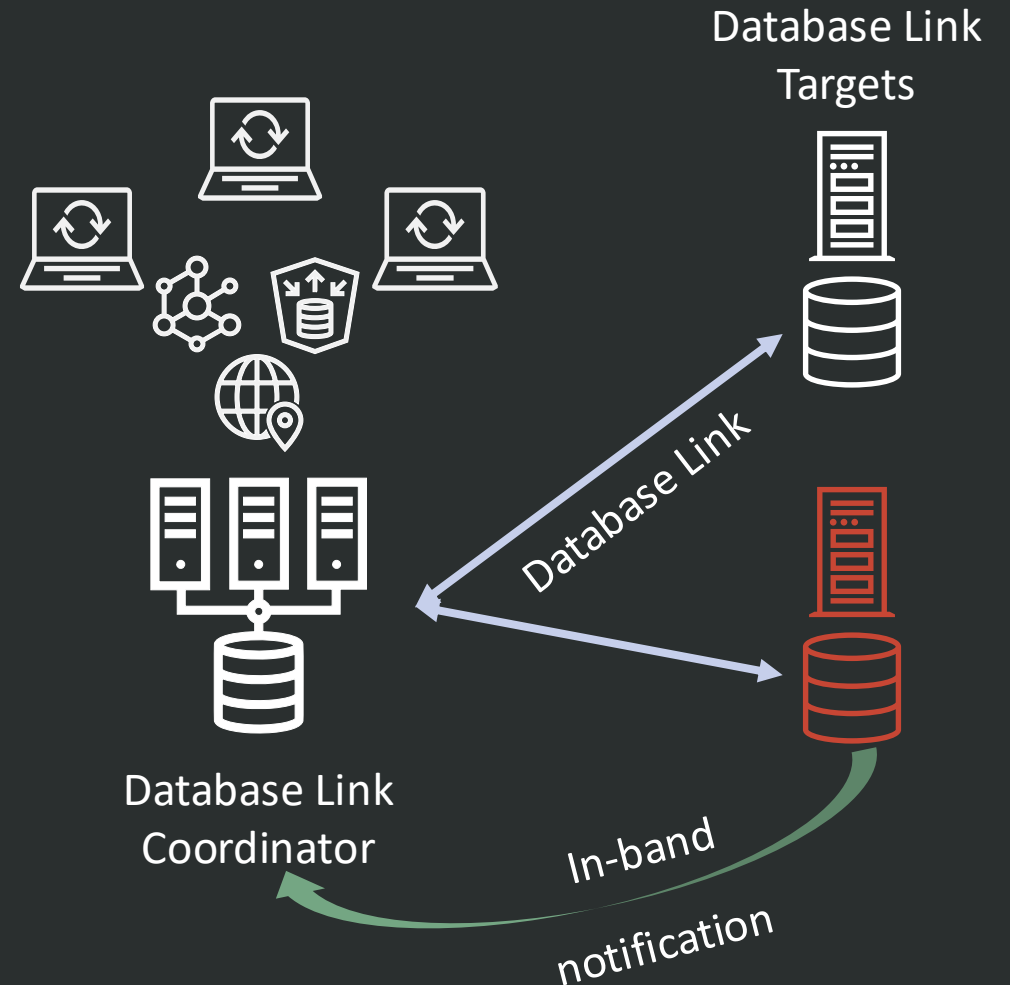
Bringing it all together – Database Links Draining

Inter-database transparency, in-band notification, client escalation

Database Links Draining

marks a database link for draining and uses in-band notification to inform the link coordinator that a database link target is about to undergo maintenance.

- Enables the link coordinator to initiate draining
- Default is to close database links at the end of request
 - In-band notification to the client is configurable
- For failures, AC replays; TAC set on service to replay
- Soon available with Oracle AI Database 26ai and 19c



Precompiler Support

Modernize your applications

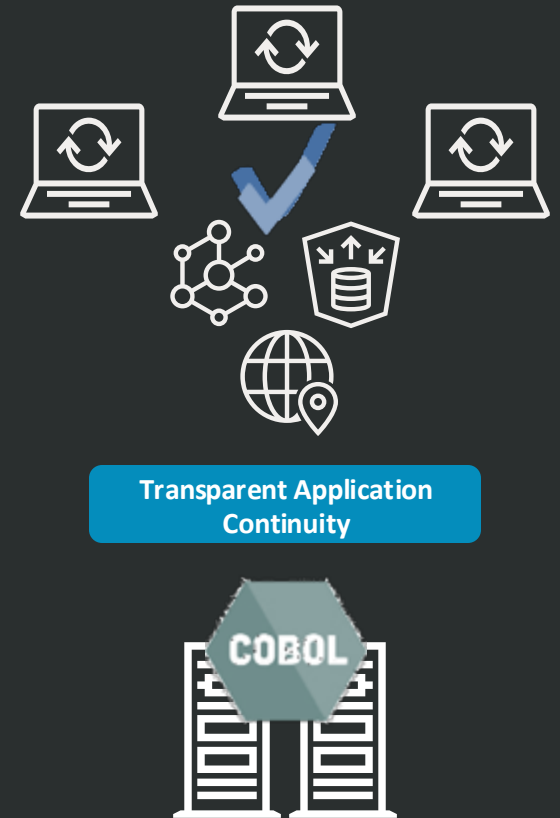
Precompilers let you embed SQL directly into application code. They convert embedded SQL into language-specific API calls, which are then compiled and linked with Oracle libraries to produce an executable that interacts with the database. They allow for:

- Simplified interaction: Embed SQL directly in application code.
- Improved performance: Less overhead than dynamic SQL.
- Easier maintenance: Modify database logic within the application code.

Oracle provides several precompilers, including Pro*COBOL and Pro*C/C++. They

- make it easier for applications to focus on the business logic
- without the need to write Oracle Call Interface code.
- Pair naturally with Oracle Call Interface to build highly available applications.

Precompiler support is available with Oracle AI Database 26ai
Oracle Call Interface (OCI) Clients and Oracle Database 19c and 23ai.



Do nothing with Original Function Result Assurance

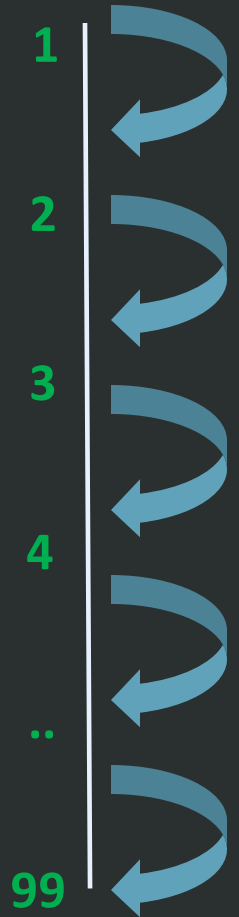
Sit down, relax, and let Transparent Application Continuity handle them

Some functions return different values each time (e.g. `sequence.nextval`, `sysimestamp`).

Sequences generate unique IDs to ensure integrity and simplify record management.

Oracle AI Database 26ai automatically captures and replays changing values

- Automated keeping of Original Function values
- includes support for Oracle RAC Ordered sequences



Seamless integration into your CI/CD pipeline

Monitor using AWR reports, use ACCHK for explicit assessments

- Connection Pool correctly configured?
 - Begin/End Request

Instance Activity Stats			
cumulative DB time in requests	577,879,345	1,554,086.64	12,505.77
cumulative DB time protected in requests	491,764,077	1,322,497.48	10,642.17
cumulative begin requests	415,508	1,117.42	8.99
cumulative end requests	415,533	1,117.49	8.99
cumulative time in requests	505,808,371	1,360,266.70	10,946.10
cumulative user calls in requests	518,067	1,393.23	11.21
cumulative user calls protected by Application Continuity	518,067	1,393.23	11.21

- Application Continuity enabled?
 - Protected calls = 0
 - Small number = Low protection
 - High number = Good Protection
- Run ACCHK for further analysis

```
EXTERNAL CON_ID : 0
CON_UID : 1
----- Event details per service -----
Service name : acdyn1.cdbtest.regress.rdbms.dev.us.oracle.com
Failover type : TRANSACTION
-----
Event Type Error Code Program Module Action SQL_ID Call Total
-----
DISABLE 41409 JDBC Thin Client JDBC Thin Client COMMIT 1
NOT_REENABLING 41459 JDBC Thin Client JDBC Thin Client COMMIT 1
NEVER_ENABLED 41462 JDBC Thin Client COMMIT 1
-----
Service name : sqlplus_ac1.cdbtest.regress.rdbms.dev.us.oracle.com
Failover type : TRANSACTION
-----
Event Type Error Code Program Module Action SQL_ID Call Total
-----
DISABLE 41409 sqlplus@slc15dnd (TN) SQL*Plus COMMIT 1
NOT_REENABLING 41459 sqlplus@slc15dnd (TN) SQL*Plus COMMIT 1
```

Instance & session statistics

More advice:

- Replay statistics, PLSQL session state
- External actions, canned sql using history
- External and CDB-level reports
- Report by Time Interval
- Backported to 19RU19

Key Takeaways

1

Application Continuity adoption has accelerated, empowering customers with self-service enablement.

2

Oracle AI Database 26ai enhances Transparent Application Continuity to provide continuous services, even during regular (Autonomous Database) maintenance windows.

3

Oracle AI Database 26ai aims to deliver Transparent Application Continuity everywhere — zero downtime, zero interruption.

Mission Critical Database AI World 2025 Sessions

Ascend to the Diamond Tier: Next-Gen Oracle Maximum Availability Architecture [LRN2926]

*Wednesday, Oct 15
8:00 AM - 8:45 AM PDT*

Zero Downtime, No Rewrites: Oracle Database and App Continuity Enhancements [LRN2932]

*Wednesday, Oct 15
11:00 AM - 11:45 AM PDT*

Oracle Active Data Guard and DBSAT: A Powerful Duo for Data Protection [THR3156]

*Wednesday, Oct 15
11:50 AM - 12:10 AM PDT*

Assuring Database Quality and Best Practices for Patch Deployment [LRN3327]

*Wednesday, Oct 15
2:15 PM - 3:00 PM PDT*

No Slides, All Demo: Disaster-Proofing Oracle Database@Azure with Data Guard [SHO3032]

*Wednesday, Oct 15
2:15 PM - 3:00 PM PDT*

Oracle Active Data Guard Deep Dive, Key Architectures, and Advances [LRN3177]

*Wednesday, Oct 15
3:30 PM - 4:15 PM PDT*

Extend Data Protection and Scalability with Oracle Active Data Guard 23ai [HOL1272]

*Thursday, Oct 16
9:00 AM - 10:30 AM PDT*

Multicloud Maximum Availability: Migration Best Practices & Proven Architectures [LRN3496]

*Thursday, Oct 16
11:30 AM - 12:15 PM PDT*





Thank you

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