Oracle GoldenGate
Technical Deep Dive

Y V Ravi Kumar
Oracle ACE
Oracle Certified Master (OCM)
Oracle ACE Spotlight – June 2016

New York Oracle User Group (NYOUG)
7th Dec 2016

Y V RAVI KUMAR

ABOUT ME

- ✓ **Oracle Certified Master (OCM) – May 2009**
- ✓ **Oracle ACE – May 2015**
- ✓ **Oracle ACE Spotlight for the month - Jun 2016**
- ✓ **"*Community Expert*" in DELL's Toad World**
- ✓ **"*Expert*" in Oracle Technology Network (OTN) community**

Oracle Speaker @

- *Oracle Technology Network (OTN)*
- *New York Oracle User Group (NYOUG)*
- *Independent Oracle User Group (IOUG)*
- *Sangam (Largest Oracle Event in India)*
- *All India Oracle User Group (AIOUG)*

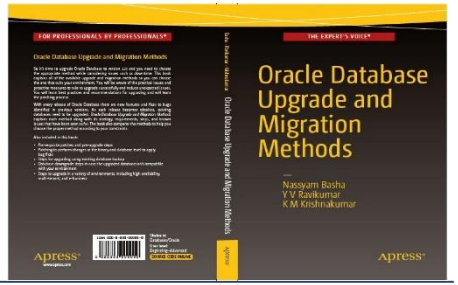
Author of 70+ articles

- Oracle Technology Network (OTN)
- *Toad World - Connected-Driven Innovation*
- *OTech Magazine*
- *All things ORACLE from Redgate*
- *UKOUG Library*

CO-FOUNDER OF ORAWORLD

ORACLE CERTIFICATIONS

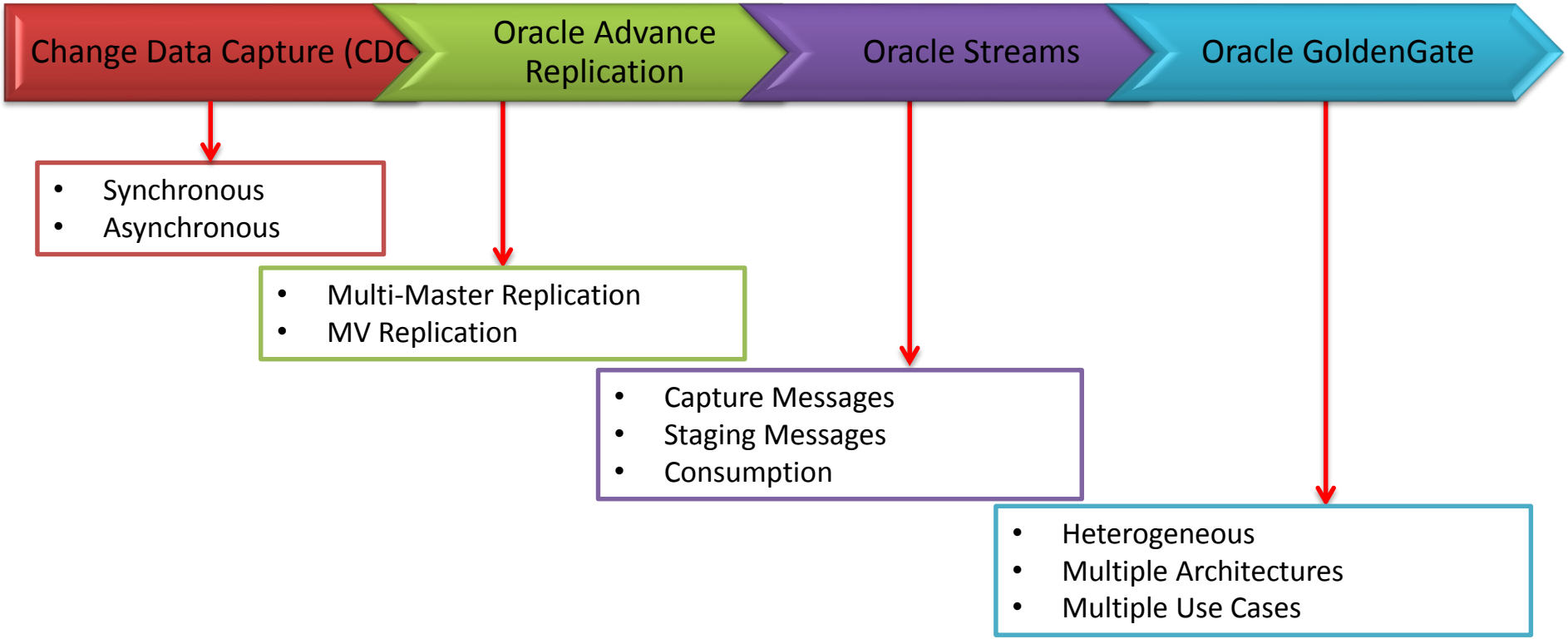
Oracle Database 10g: Certified Master (10g OCM)
Oracle Database 10g & 11g: Administering RAC Certified Expert
Oracle Database 11g: Performance Tuning Certified Expert
Oracle Exadata 11g Essentials
Oracle Golden Gate 10 Essentials
Oracle Database 11g: SQL Tuning Certified Expert
Oracle 9i & 10g: Managing Oracle on Linux Certified Expert
Oracle Certified Professional (OCP) – Oracle 12c, 11g, 10g, 9i and 8i
SUN Certified – Solaris System Administrator in SUN Solaris 9



ORACLE GOLDENGATE 11g/12c

Introduction

Quick History In Replication



Database Replication Options

INTRODUCTION

Oracle Golden Gate provides **low-impact capture, routing, transformation**, and delivery of database transactions across heterogeneous environments in near-real time.

Oracle Golden Gate enables the exchange and manipulation of data at the transaction level among multiple, **heterogeneous platforms** across the enterprise.

Oracle Golden Gate moves **committed transactions from redo logs** and maintains transaction integrity with sub-second latency

Oracle GoldenGate – Supported Platforms

Choice can be made from 2 types of **Oracle GoldenGate (OGG):**

Supported Databases

ORACLE

IBM DB2

Microsoft SQL Server

MySQL

TERADATA

SYBASE

Supported Operating Systems

solaris

IBM AIX

hp UX

Windows

redhat LINUX

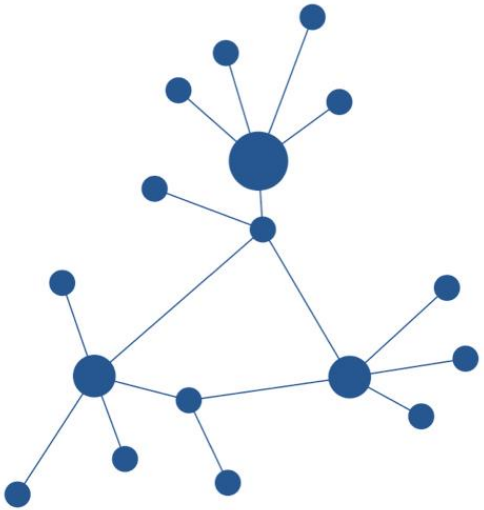
SUSE

IBM AIX, z/OS, iSeries, z/Linux

ORACLE

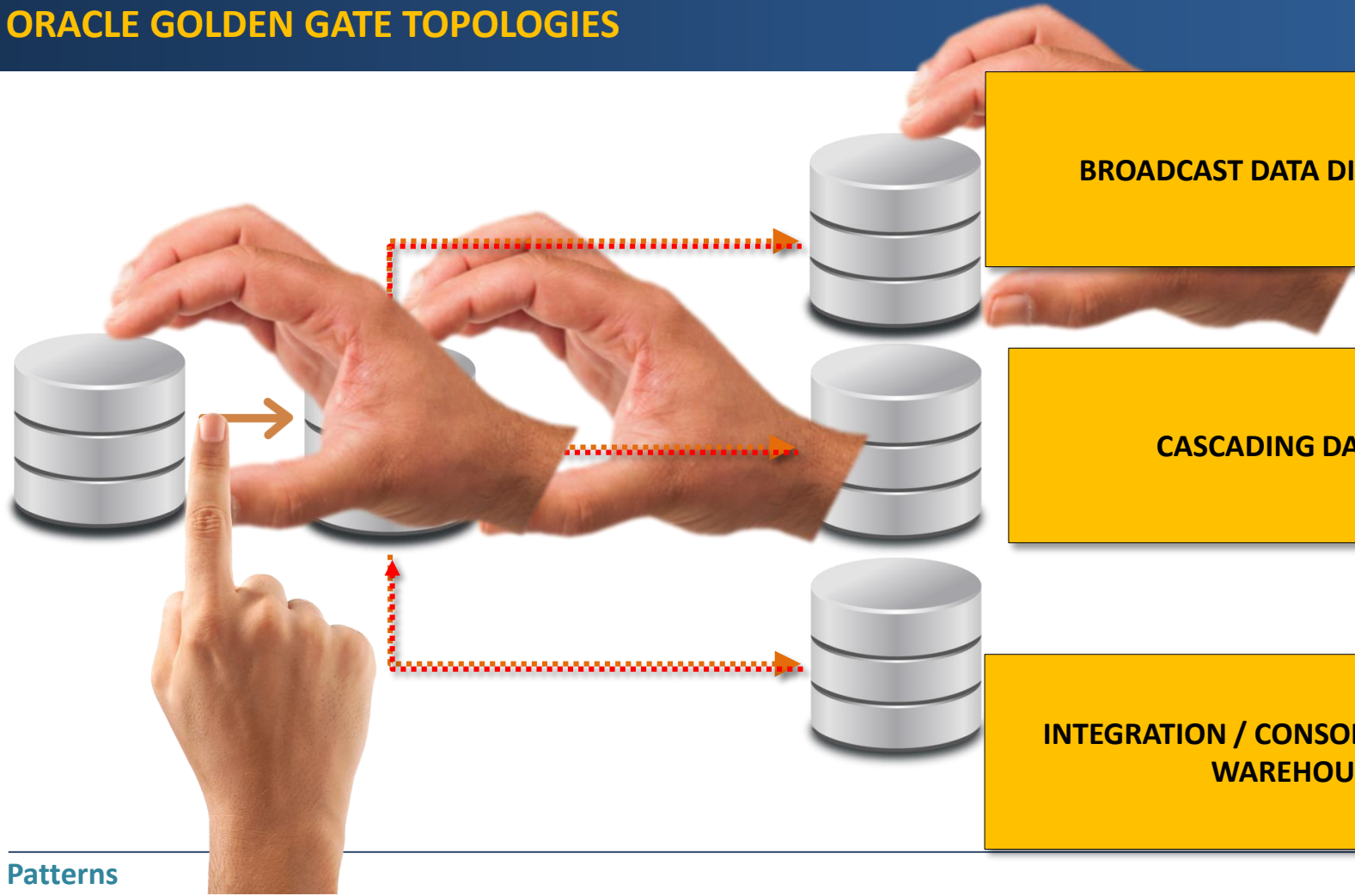
Always check the latest Certification Matrix

Topologies



ORACLE GOLDENGATE TOPOLOGIES

ORACLE GOLDEN GATE TOPOLOGIES



BROADCAST DATA DISTRIBUTION

CASCADING DATAMARTS

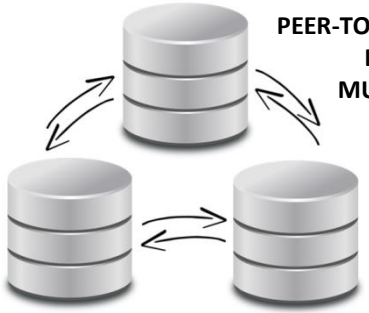
INTEGRATION / CONSOLIDATION DATA WAREHOUSE

ORACLE GOLDEN GATE TOPOLOGIES

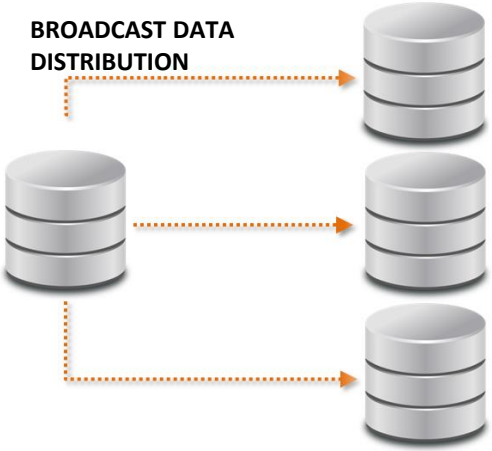
UNIDIRECTIONAL QUERY OFFLOADING

BIDIRECTIONAL STANDBY DB OR ACTIVE-ACTIVE FOR HIGH-AVAILABILITY

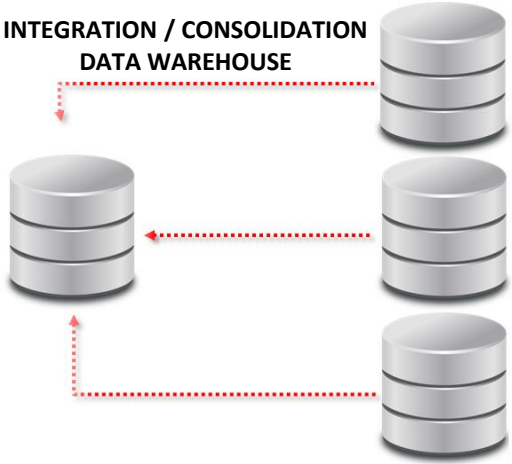
PEER-TO-PEER LOAD BALANCING, MULTIMASTER



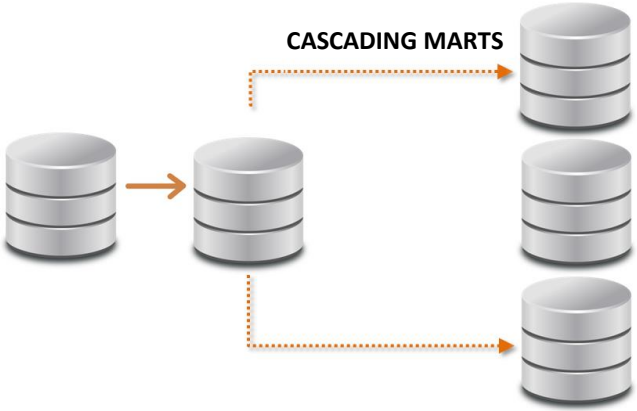
BROADCAST DATA DISTRIBUTION



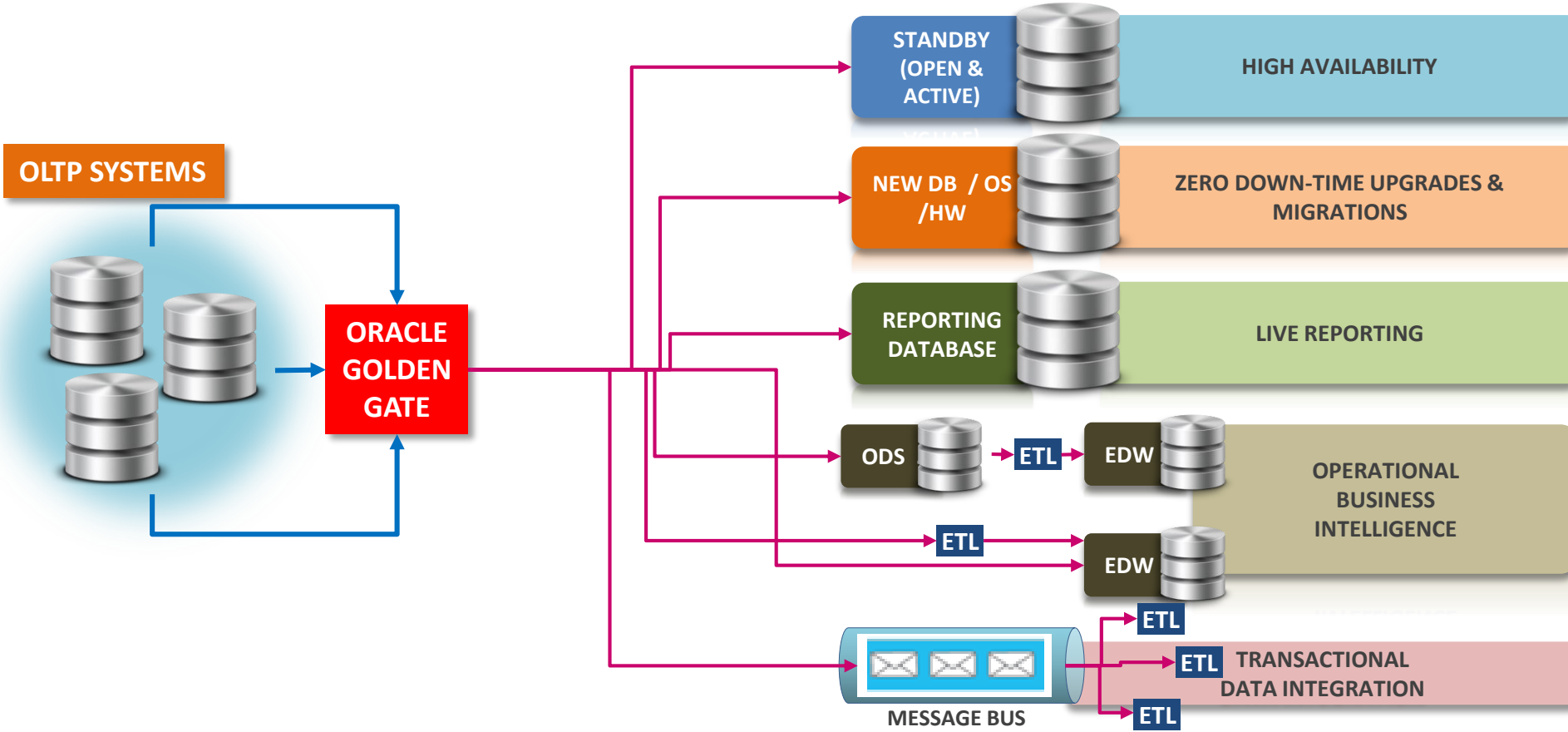
INTEGRATION / CONSOLIDATION DATA WAREHOUSE



CASCADING MARTS



ORACLE GOLDENGATE 12*c*



Benefits Of Oracle GoldenGate

- ✓ **High Availability (Standby Database)**
  - Load balancing
  - Application Specific HA
- ✓ **Zero Down-Time Upgrades and Migrations**
  - Consolidations
  - Database Migrations / Upgrades
    - Platform Migrations (e.g. HP-UX to Linux)
    - Database Upgrades
    - Homogeneous & Heterogeneous
  - Application Upgrades (e.g. Siebel 7 -> Siebel 8)
  - Application Releases (special use cases)
- ✓ Live Reporting (Reporting Database)
  - Off load reports to a separate system
- ✓ Operational Business Intelligence
- ✓ Transactional Data Integration

Benefits Of Oracle GoldenGate

- ✓ Oracle GG is a middleware product designed to work in a heterogeneous environment with different databases.
- ✓ Oracle GG moves only ***committed data*** across platforms where as Oracle database, which writes ***committed and uncommitted*** changes to the redo logs.
- ✓ Moves across a TCP/IP network and does not require Oracle Net.
- ✓ Oracle GG will not provide automatic failover like Oracle DG.
- ✓ Oracle GG uses its own Commit Sequence Number (CSN) to identify a transaction which based on the Oracle Database SCN (System Change Number).
- ✓ Complete data recoverability via trail files.

Oracle Golden Gate Solutions for Oracle Database

- Migrate from non-Oracle databases to Oracle 12c
- Upgrade Oracle Database versions 8i, 9i, 10g or 11g to 12c
- Upgrade or migrate the database server or operating system
- Perform database maintenance

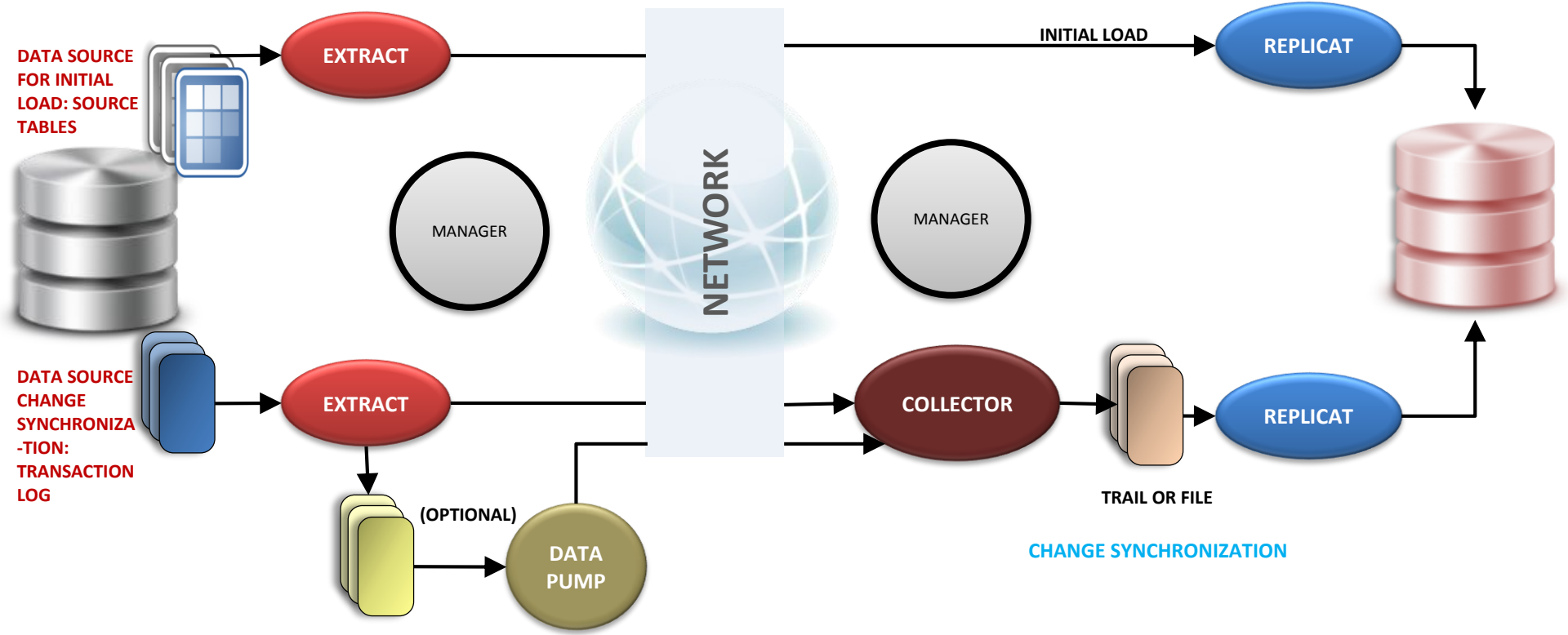
Oracle GoldenGate Solutions for Oracle Database

- ✓ Eliminate Down-Time During Oracle Database Upgrades
- ✓ Eliminate Unplanned Down-Time With Active Data Guard
- ✓ Improve Production System Performance
- ✓ Real-Time Reporting from a Lower-Cost System
- ✓ Increase ROI On Existing Servers and Synchronize Global Data
- ✓ Capture can be offloaded from the source DB to an intermediate host by copying the redo logs

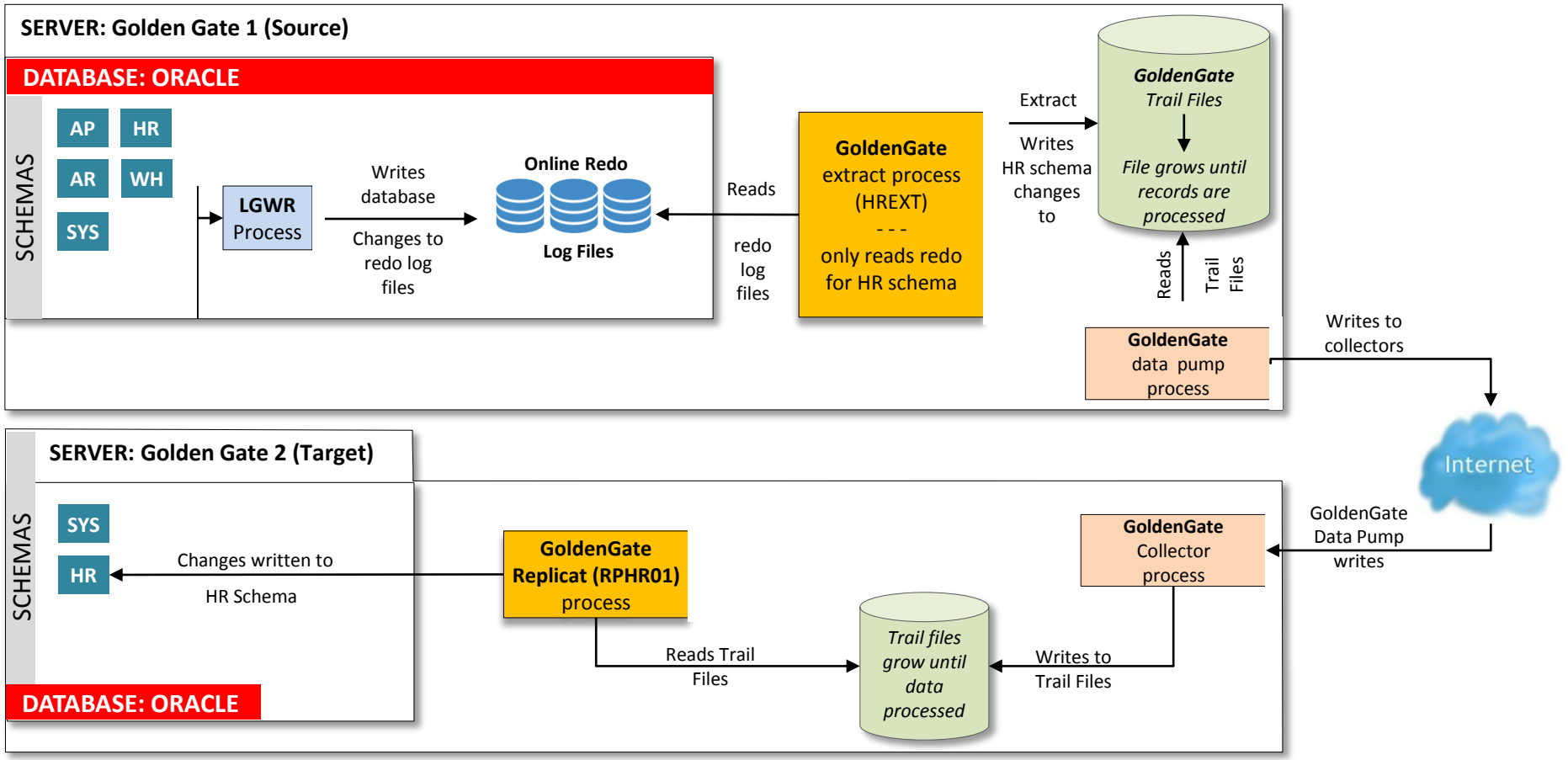
ORACLE GOLDENGATE

Components and Architecture

ORACLE GOLDEN GATE LOGICAL ARCHITECTURE



Oracle GoldenGate 12c – Source and Target



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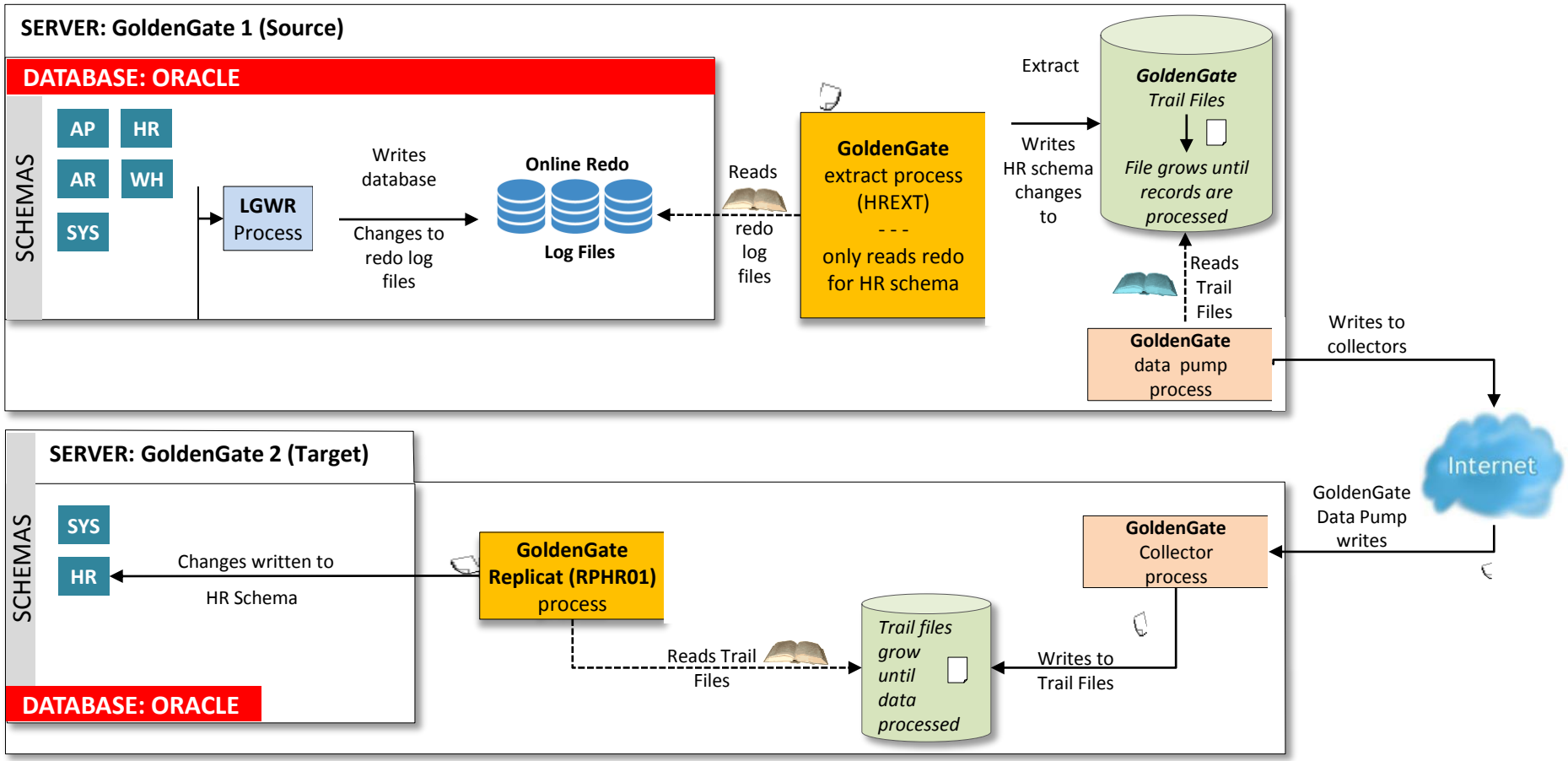
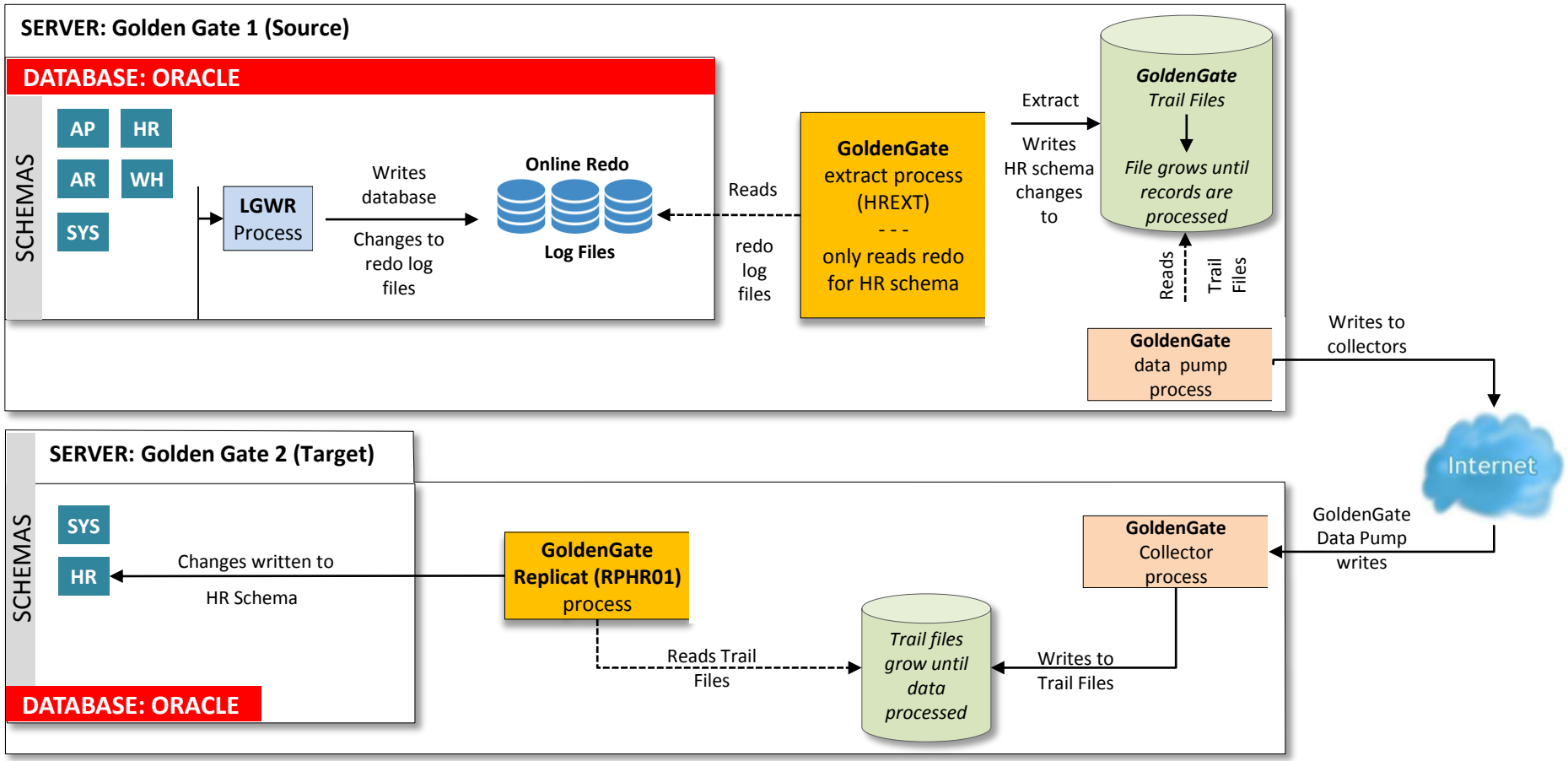
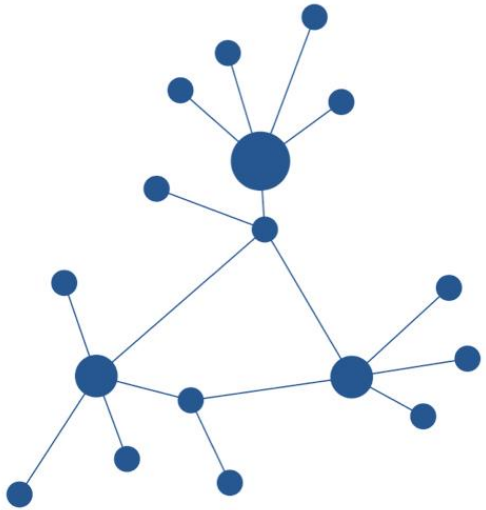


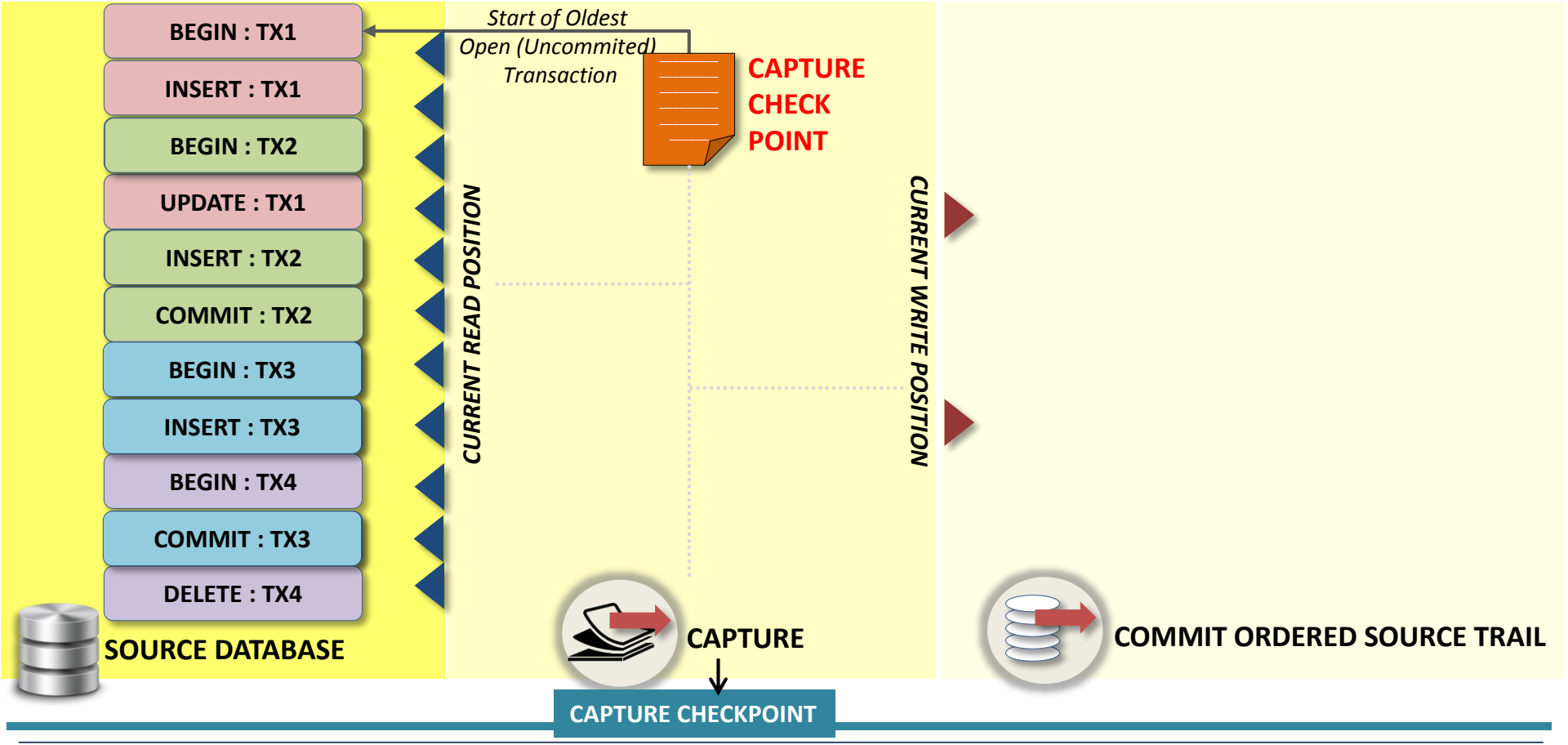
Oracle GoldenGate 12c – Source and Target



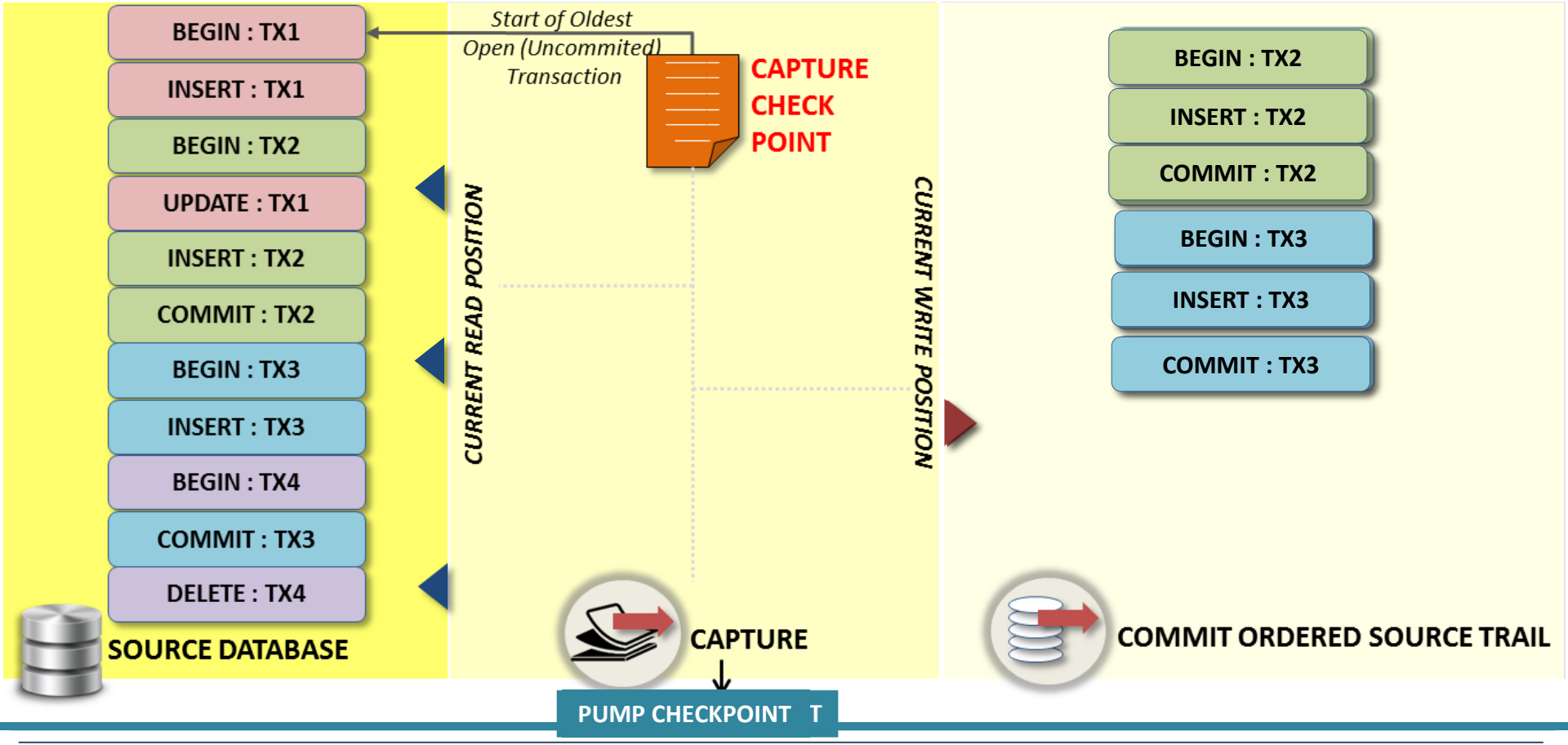
Checkpoints



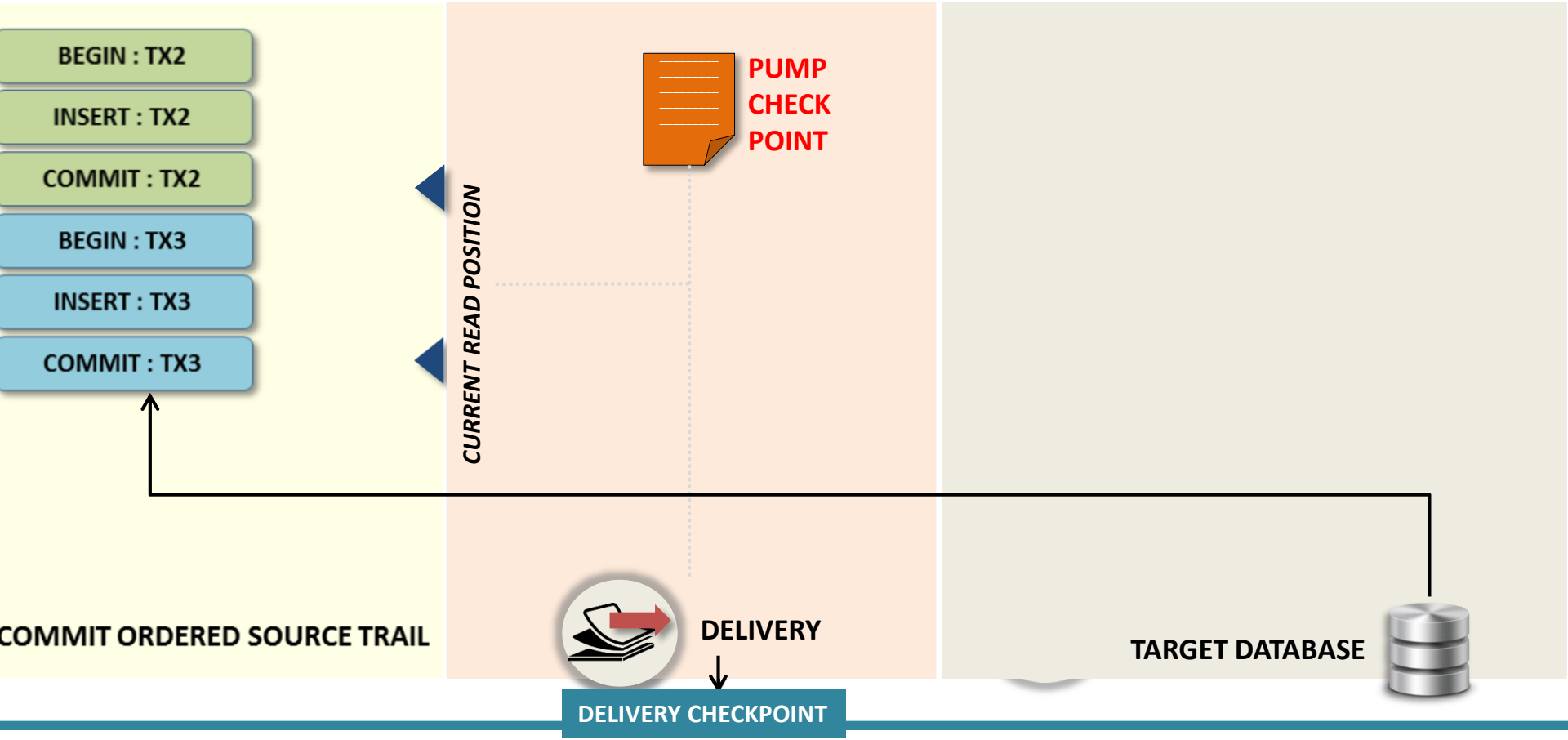
CHECKPOINTS - CAPTURE



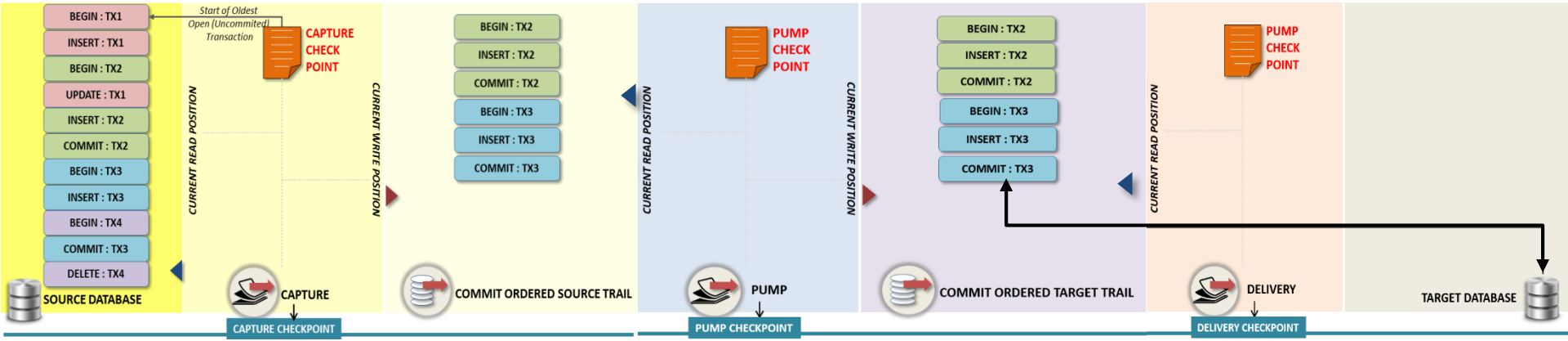
CHECKPOINTS - CAPTURE - PUMP



CHECKPOINTS - CAPTURE - PUMP - DELIVERY



CHECKPOINTS - CAPTURE - PUMP - DELIVERY



ELIMINATE DOWN-TIME DURING ORACLE DATABASE UPGRADES

ZERO DOWN-TIME DATABASE UPGRADES

APPLICATION

SWITCH OVER

REAL-TIME UPDATES

CAPTURE

DELIVERY

ORACLE
8i / 9i / 10g

ORACLE
11g

Route (LAN/WAN/Web/IP)

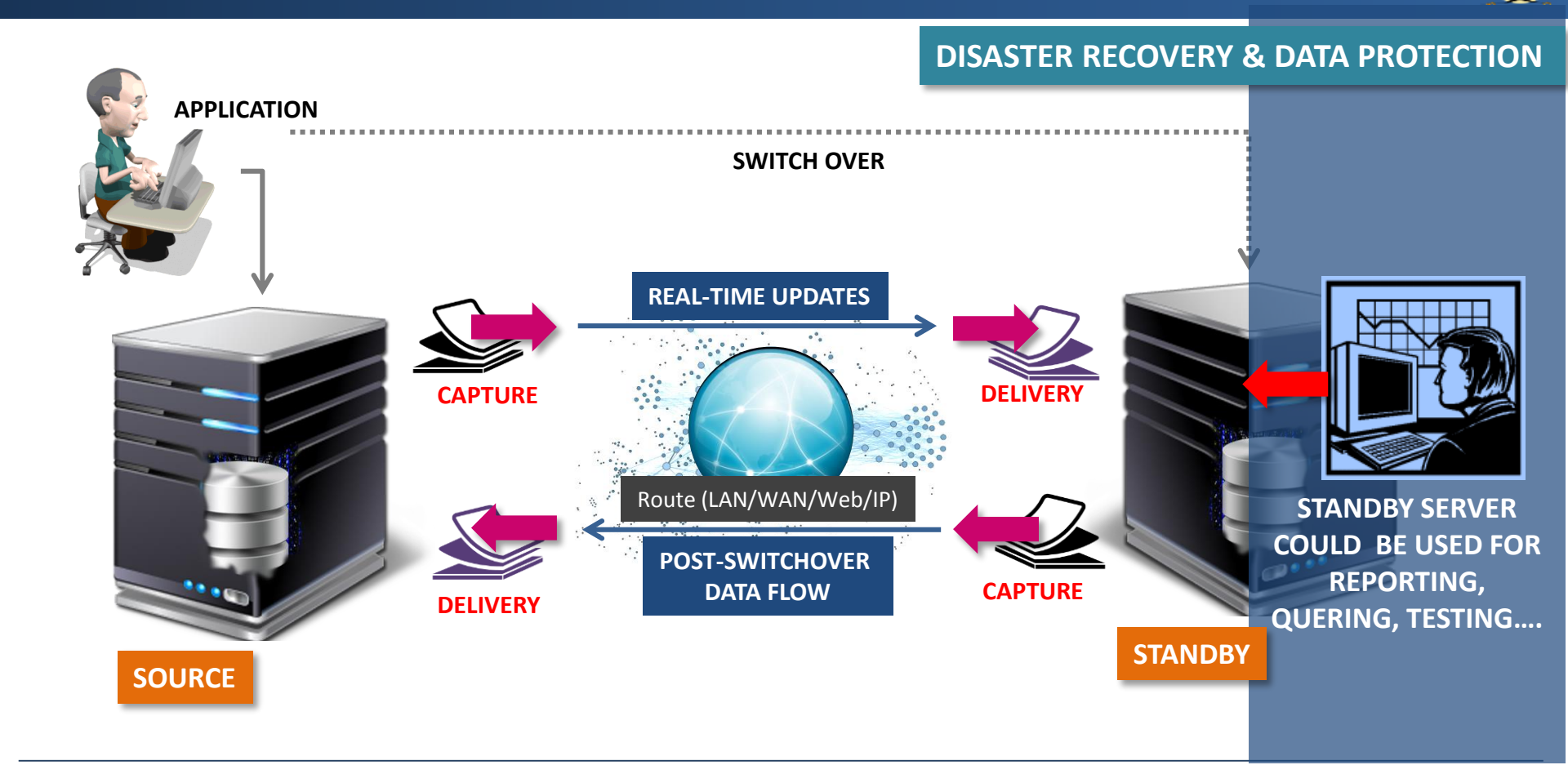
DELIVERY

CAPTURE

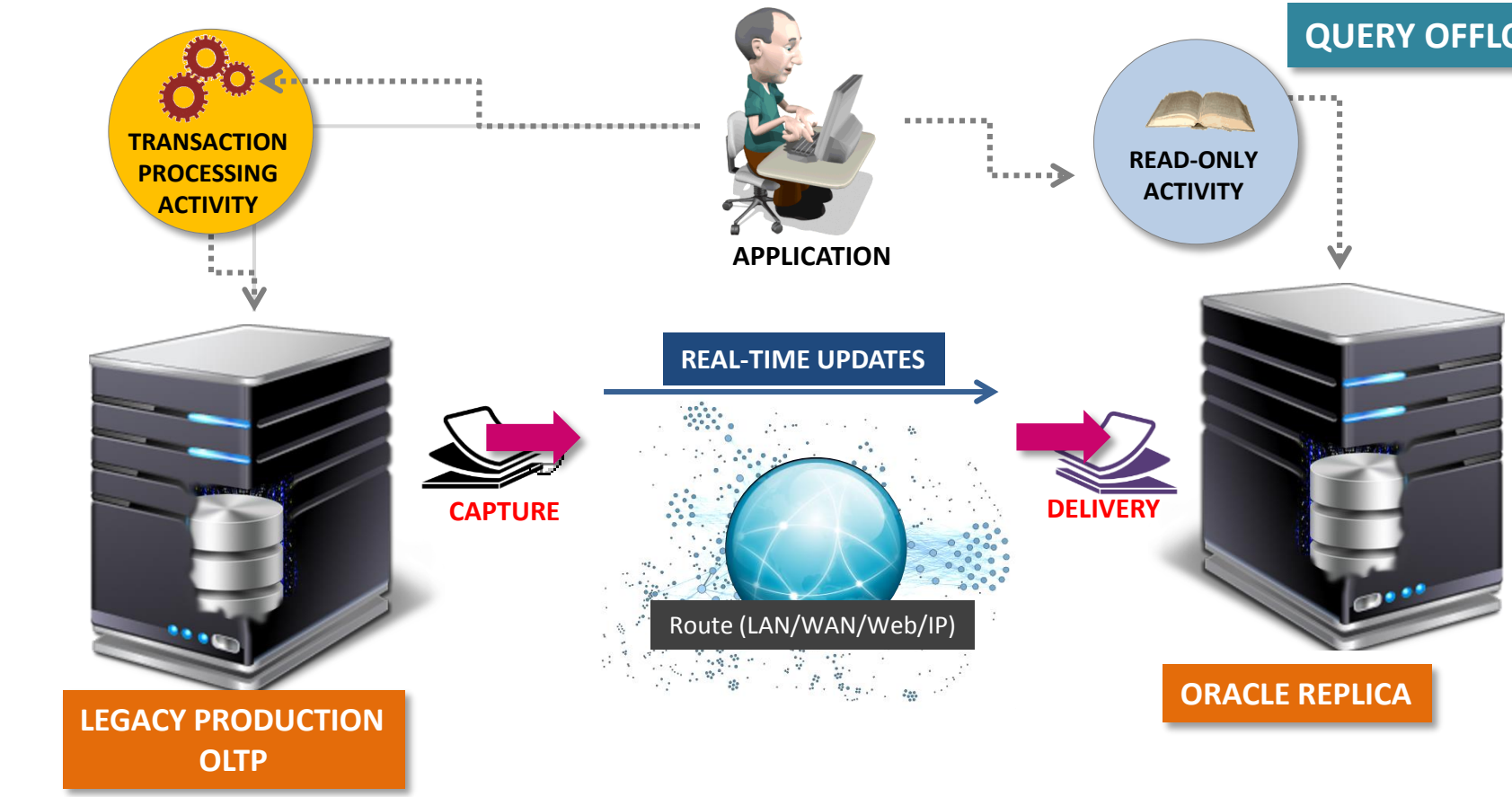
POST-SWITCHOVER
DATA FLOW

COMPARE & VERIFY

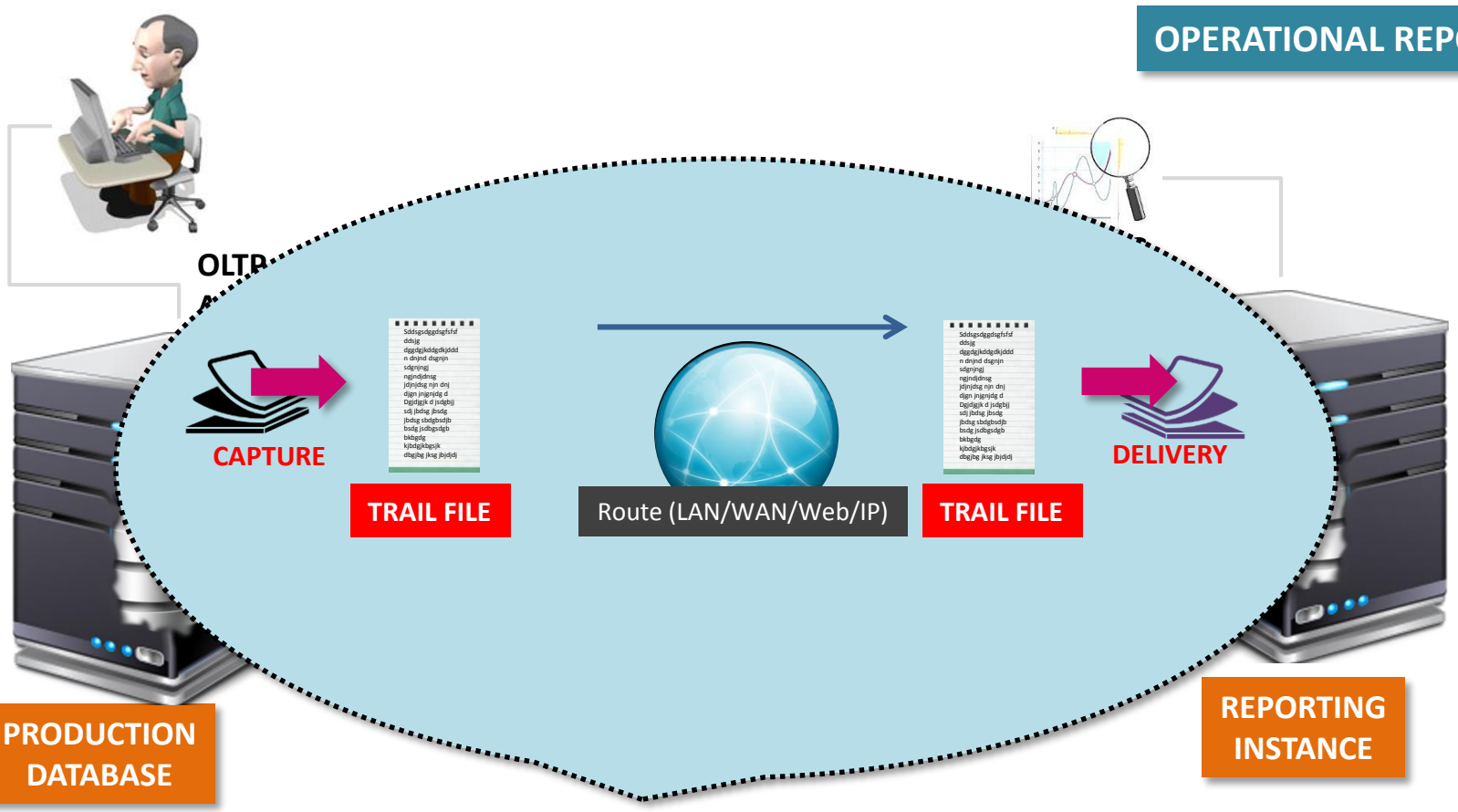
ELIMINATE UNPLANNED DOWN-TIME WITH ACTIVE DATA GUARD



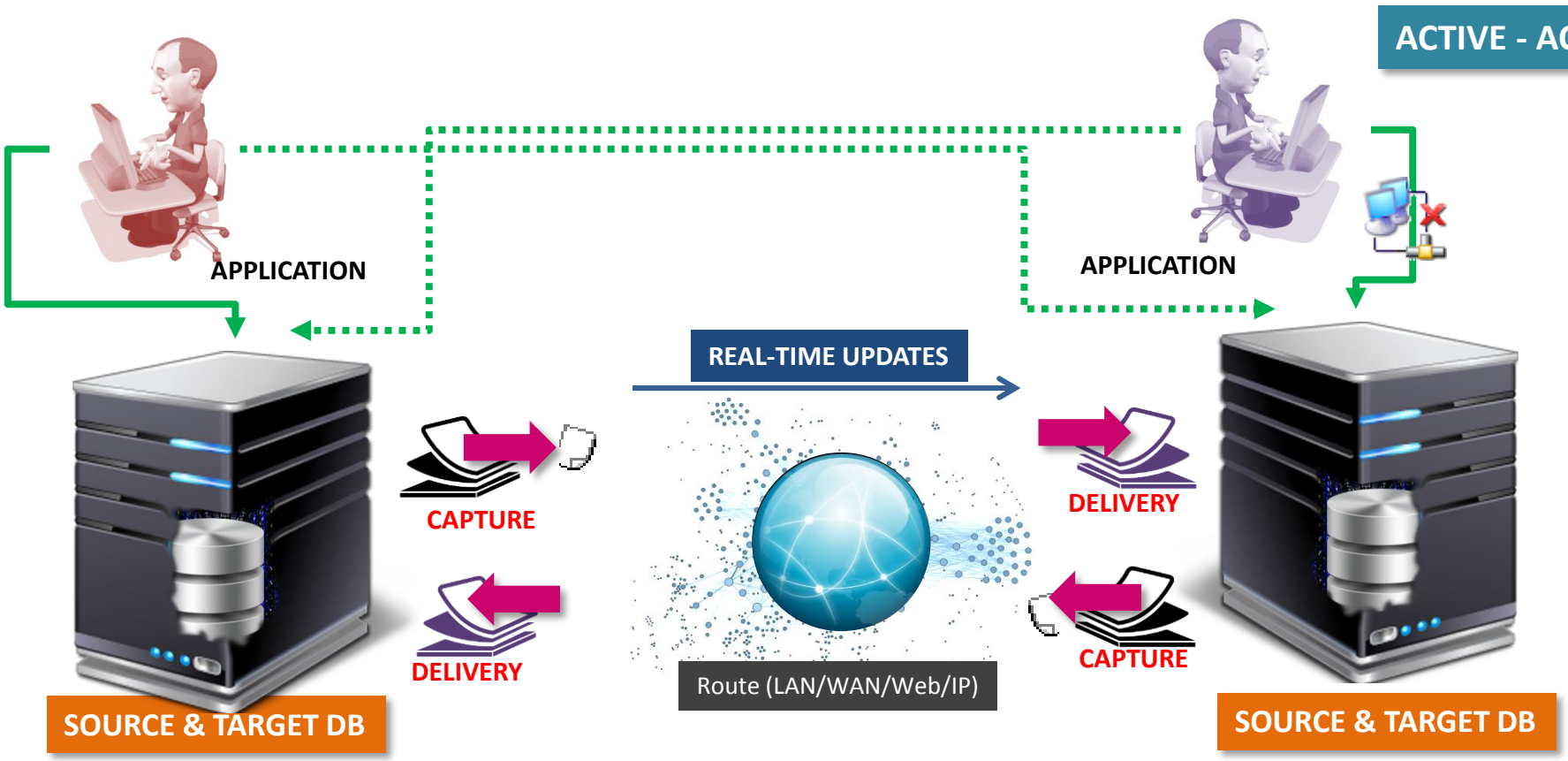
IMPROVE PRODUCTION SYSTEM PERFORMANCE & LOWER COSTS



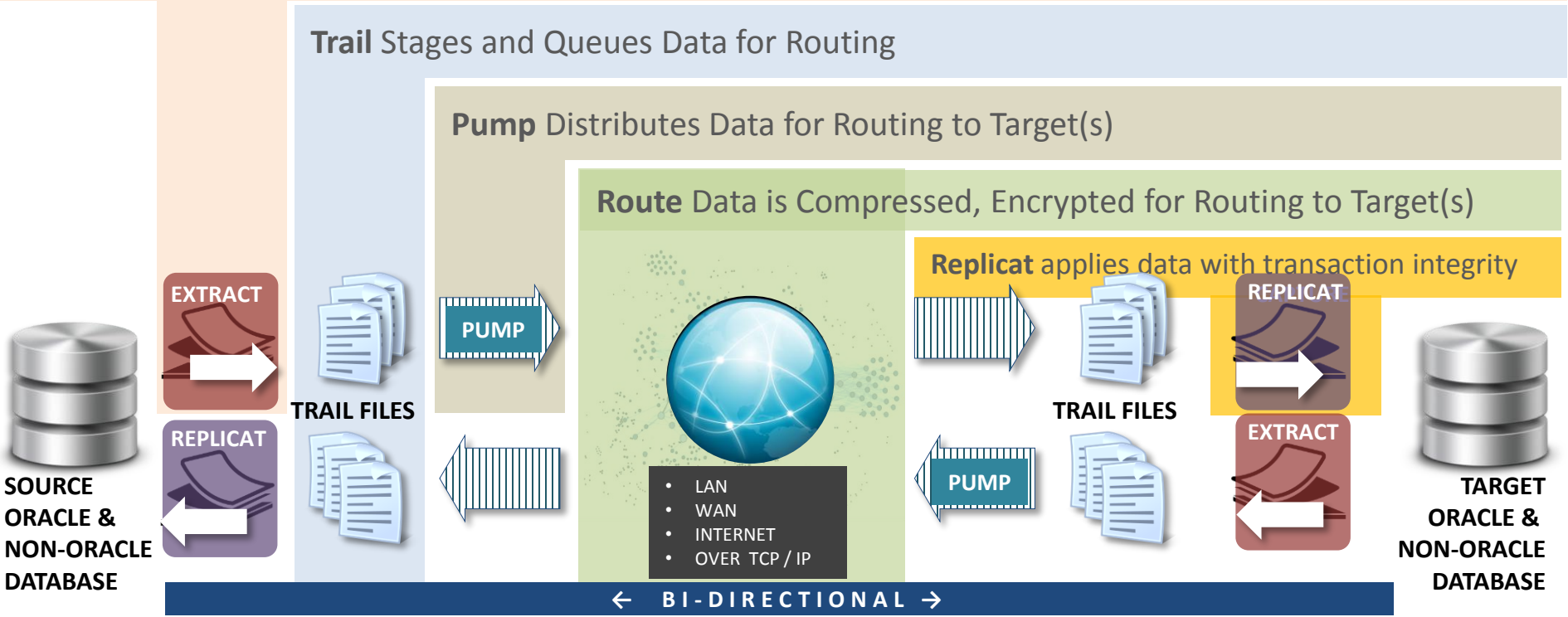
ORACLE GOLDENGATE FOR OPERATIONAL REPORTING



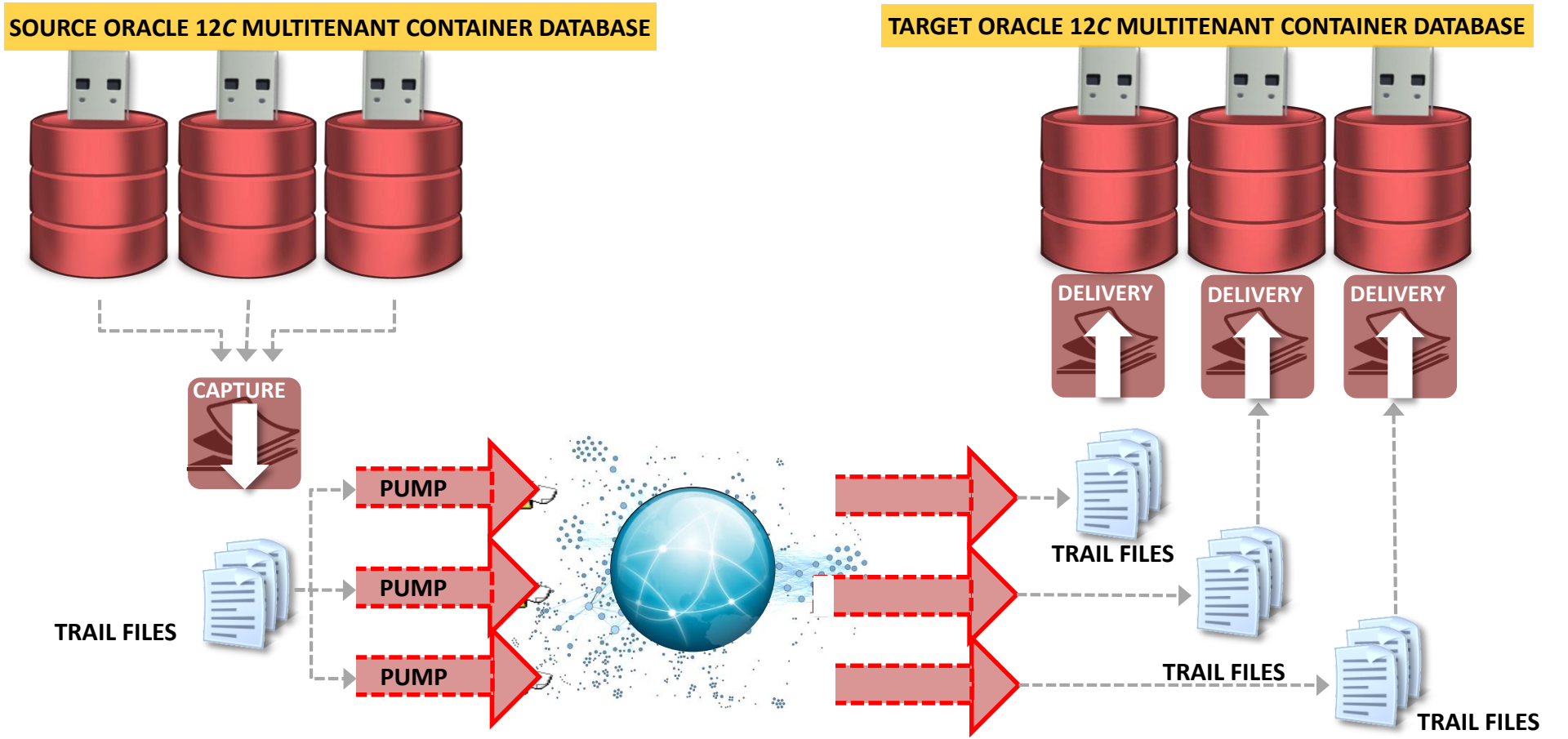
INCREASE ROI ON EXISTING SERVERS & SYNCHRONIZE GLOBAL DATA



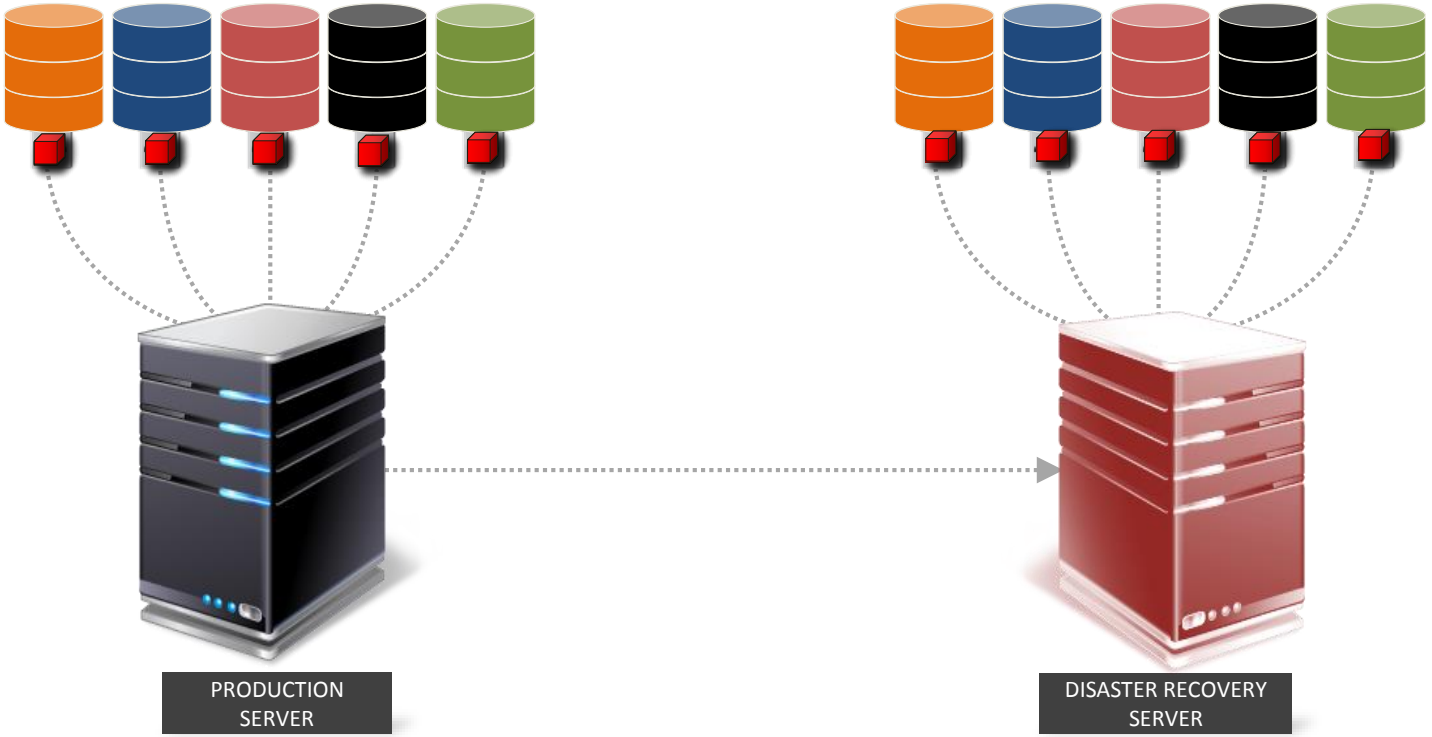
Extract
Committed transactions are captured (and can be filtered) as they occur by reading the *transaction logs*.



OPTIMIZED FOR ORACLE 12*c*

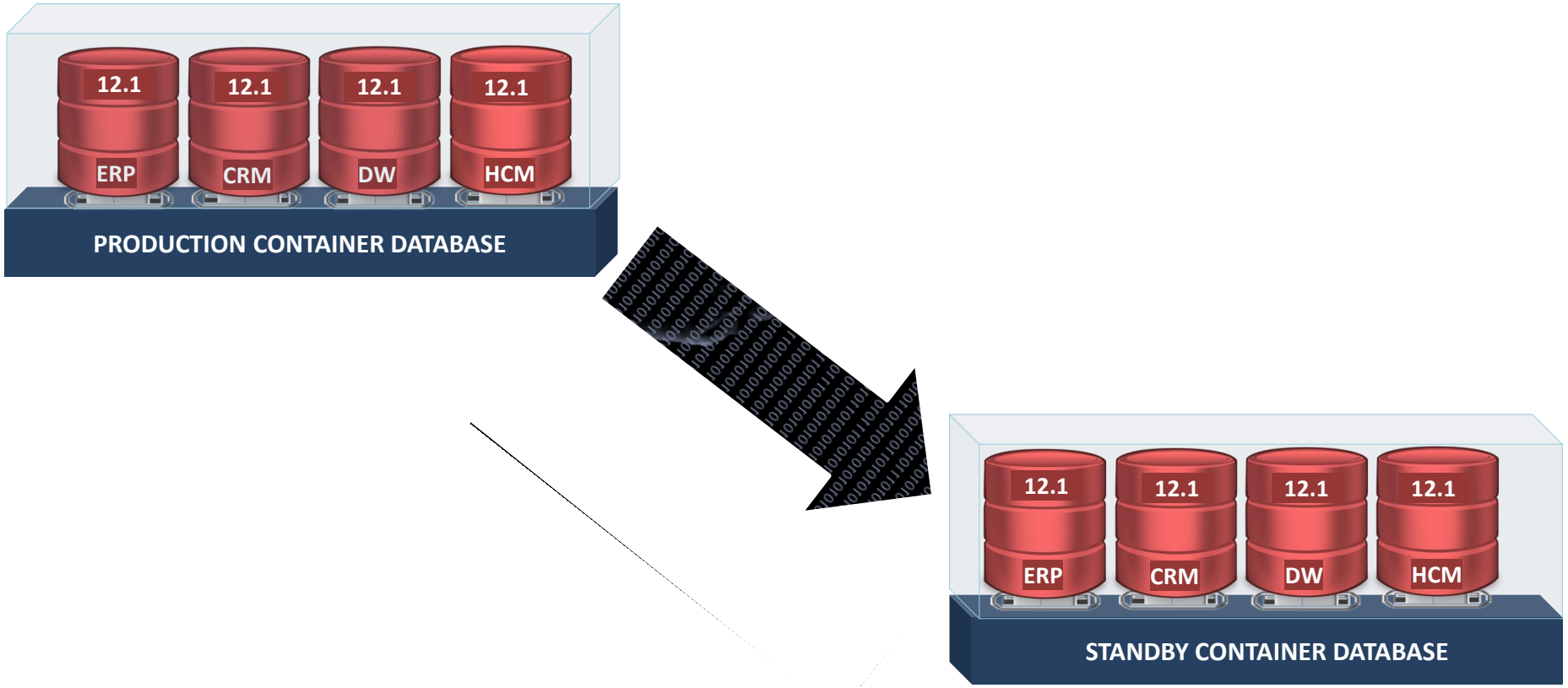


UPDATE DISASTER RECOVERY SITE – IN ONE OPERATION



MANAGE MANY DATABASES AS ONE

ONE STANDBY DATABASE COVERS ALL PLUGABLE DATABASES



ORACLE GOLDENGATE

Performance Tuning

Extract Flavours

Integrated Extract

- ✓ Is an Oracle GoldenGate Extract for Oracle databases (Database Release 11.2.0.3 and later)
- ✓ Is multithreaded **&** Supports more data types
- ✓ Relies on Oracle's internal log parsing and processing implementation
- ✓ Supports downstream topologies
- ✓ Is new with version 11.2.1.0.0
- ✓ Works with Logminer

Register Extract (capture) with database/logminer required

```
Example: GGSCI> register extract [ name ] database container [ (PDB) ]
```

Classic Extract

- ✓ Is traditional REDO log-based extract for Oracle
- ✓ Works for all DB platforms and versions

DDL Setup Scripts – Source and Target

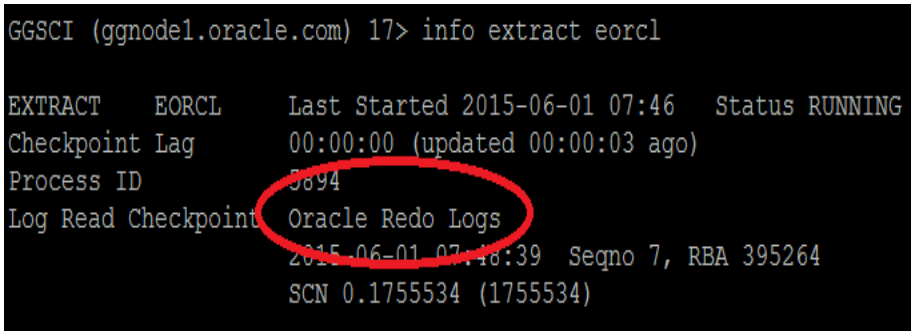
Classic Extract

- ✓ Oracle Database 11.2.0.3.0 Or earlier, or are running classic mode then the scripts need to be run from SQL *Plus as ***sysdba***
- ✓ Scripts to be executed
  - ✓ @marker_setup.sql
  - ✓ @ddl_setup.sql
  - ✓ @role_setup.sql
  - ✓ Grant role to user
  - ✓ @ddl_enable.sql
- ✓ DDL Trigger must be enabled

Integrated Extract

- ✓ No need to run the scripts
- ✓ Requires Oracle Database 11.2.0.4.0 or later
- ✓ DDL Trigger must be disabled for Integrated mode DDL replication

Identify Extract – Classic OR Integrated

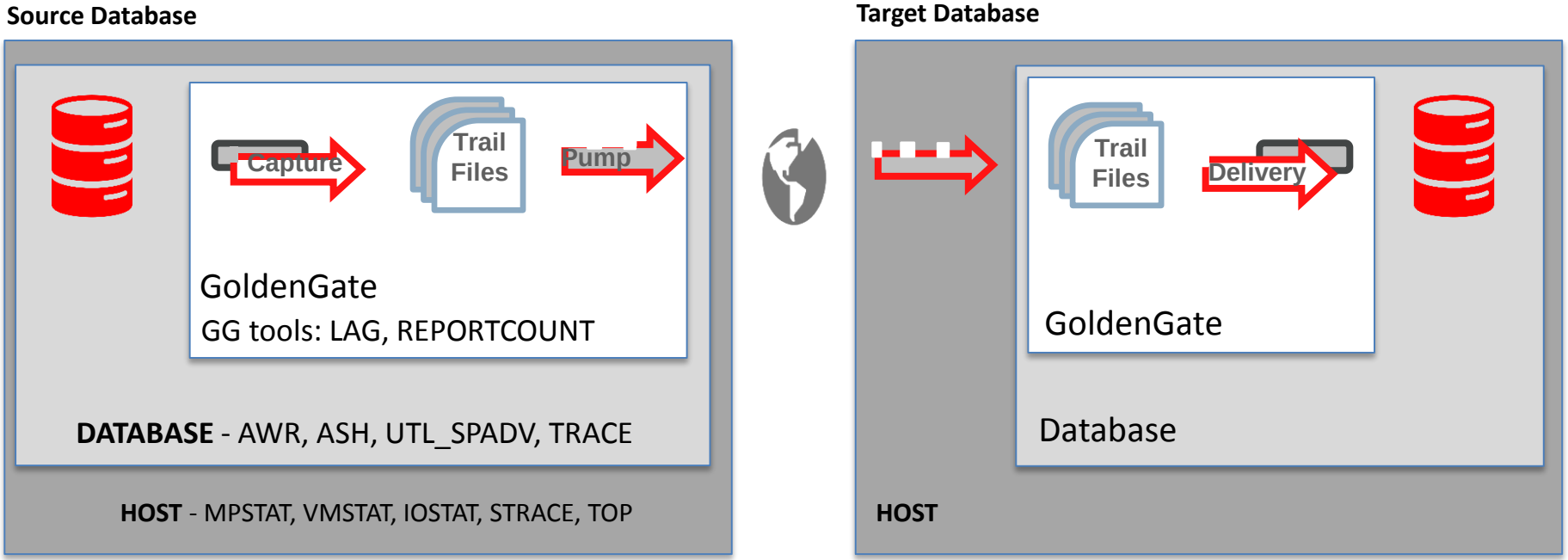


```
GGSCI (ggnode1.oracle.com) 17> info extract eorcl

EXTRACT    EORCL      Last Started 2015-06-01 07:46   Status RUNNING
Checkpoint Lag        00:00:00 (updated 00:00:03 ago)
Process ID            5894
Log Read Checkpoint   Oracle Redo Logs
                      2015-06-01 07:48:39  Seqno 7, RBA 395264
                      SCN 0.1755534 (1755534)
```

```
GGSCI (ggnode1.oracle.com) 28> info extract eorcl

EXTRACT    EORCL      Initialized  2015-06-01 07:51   Status STARTING
Checkpoint Lag        00:00:00 (updated 00:00:47 ago)
Process ID            6041
Log Read Checkpoint   Oracle Integrated Redo Logs
                      2015-06-01 07:51:50
                      SCN 0.1776853 (1776853)
```

```
GGSCI (ggnode1.oracle.com) 1> stop extract eorcl
GGSCI (ggnode1.oracle.com) 2> register extract eorcl database
GGSCI (ggnode1.oracle.com) 3> info eorcl upgrade

ERROR: Extract EORCL is not ready to be upgraded because recovery
SCN 1755571 has not reached SCN 1755605.

GGSCI (ggnode1.oracle.com) 4> alter extract eorcl tranlog begin now
GGSCI (ggnode1.oracle.com) 5> start extract eorcl
GGSCI (ggnode1.oracle.com) 6> info extract eorcl
GGSCI (ggnode1.oracle.com) 7> stop extract eorcl
GGSCI (ggnode1.oracle.com) 8> info eorcl upgrade
GGSCI (ggnode1.oracle.com) 9> alter extract eorcl, UPGRADE
INTEGRATED TRANLOG
GGSCI (ggnode1.oracle.com) 10> start extract eorcl
GGSCI (ggnode1.oracle.com) 11> info extract eorcl
```

Oracle GoldenGate Performance Areas



Install the UTL_SPADV Package (Integrated Extract and Integrated Replicat)

- ✓ UTL_SPADV PL/SQL package provides subprograms to collect and analyze statistics for the LogMiner server processes. The statistics help identify any current areas of contention such as CPU or I/O.
- ✓ Oracle Streams Performance Advisor (SPADV) enables monitoring of the integrated GoldenGate server processes which are used by integrated Extract and integrated Replicat, and provides information about how these processes are performing.
- ✓ SPADV statistics are collected and analyzed using the UTL_SPADV package.
- ✓ UTL_SPADV package, as the Oracle GoldenGate administrator user on the source database.

To install SPADV, execute the following steps:

a. Grant the following privileges to a designated Oracle GoldenGate administrator database user:
SQL> exec DBMS_GOLDENGATE_AUTH.GRANT_ADMIN_PRIVILEGE(-
'<db user name>');

b. Connect to the database with the user name that was granted permissions in Step a.

c. Run the utlspadv.sql script. For example:
SQL> @$ORACLE_HOME/rdbms/admin/utlspadv.sql

Gather Statistics using the UTL_SPADV Package

- ✓ Oracle recommends that you gather statistics for a 30-60 minute time period during which you are troubleshooting performance.
- ✓ It is also recommended to gather statistics during a 30-60 minute time period where performance is good, serving as a baseline comparison.

To gather statistics every 15 seconds, run the following SQL*Plus command as the Oracle GoldenGate administrator:

SQL> exec UTL_SPADV.START_MONITORING(interval=>15);

To stop statistics gathering, run the following command:

SQL> exec UTL_SPADV.STOP_MONITORING;

Run the following commands to determine if the monitoring job is currently running:

```
SET SERVEROUTPUT ON
DECLARE
is_mon BOOLEAN;
BEGIN
is_mon := UTL_SPADV.IS_MONITORING(
job_name => 'STREAMS$_MONITORING_JOB',
client_name => NULL);
IF is_mon=TRUE THEN
DBMS_OUTPUT.PUT_LINE('The monitoring job is running.');
ELSE
DBMS_OUTPUT.PUT_LINE('No monitoring job was found.');
END IF;
END;
/
```

Generating Report - UTL_SPADV Package

- ✓ It is also possible to create a static report of SPADV statistics after monitoring for a period of time. The report can be generated in text form much like the display of real-time statistics.

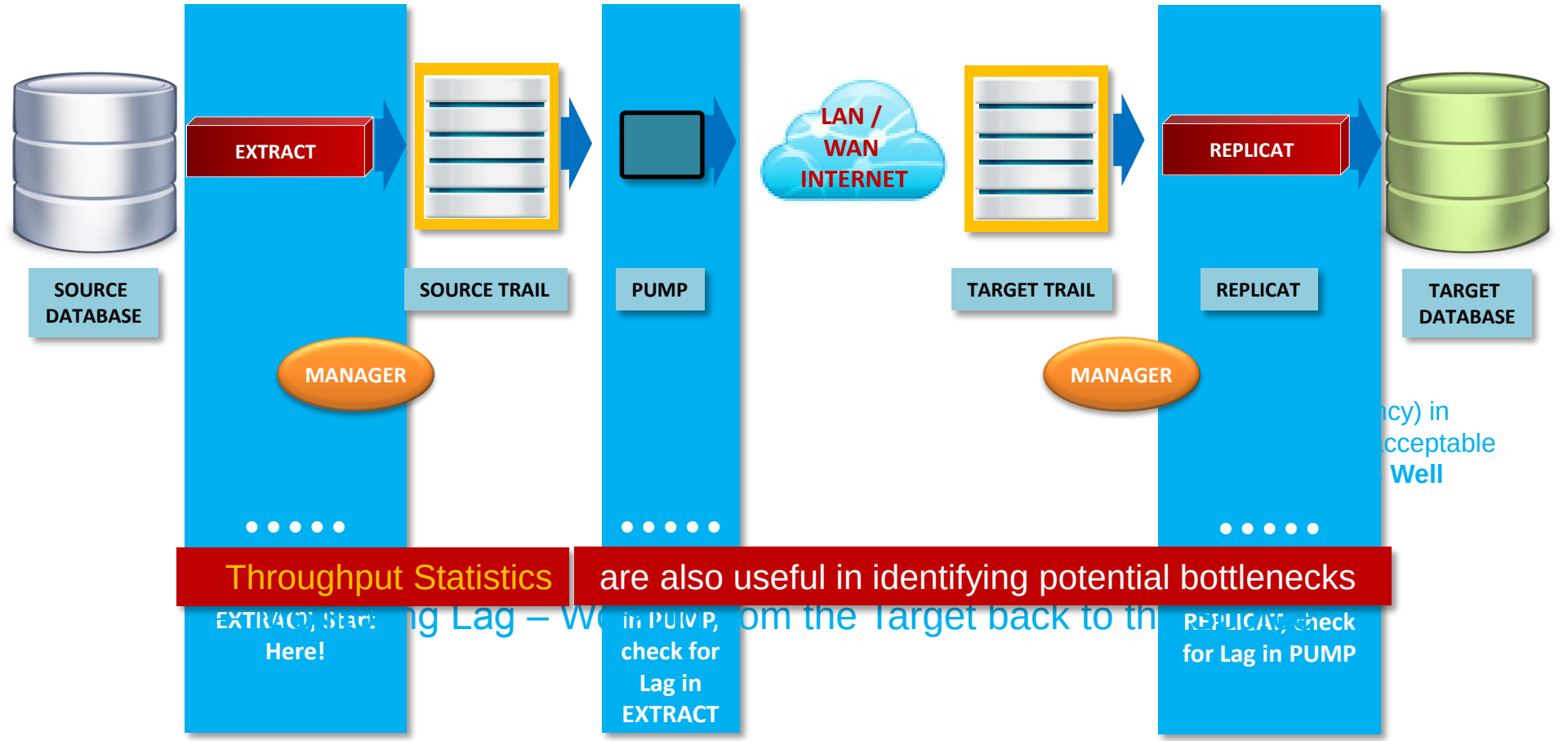
- ✓ To generate a text report, from SQL*Plus as the Oracle GoldenGate administrator, execute the following:

```
spool /tmp/spadv.txt

begin
utl_spadv.show_stats(path_stat_table=>'STREAMS$_PA_SHOW_PATH_STAT',
bgn_run_id=> 1,
end_run_id=> 9999,
show_legend=> TRUE);
end;
```

After the reports have been generated, Oracle recommends purging the SPADV statistics using the following
command:

```
SQL> exec UTL_SPADV.STOP_MONITORING(PURGE=>TRUE);
```

Identifying the Bottlenecks



Throughput Statistics are also useful in identifying potential bottlenecks

Q & A

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