
Edition-Based Redefinition

Zero Downtime Application Upgrades



presentation for:

Deutsche ORACLE-Anwendergruppe e.V. 2010

Daniel A. Morgan

- Oracle ACE Director 🏆
- University of Washington Oracle Instructor for 10 years
- The Morgan of Morgan's Library on the web
- Board Member: Western Washington OUG
- Member UKOUG
- Conference Speaker
 - OpenWorld, Collaborate, Kaleidoscope, Brazil, Canada, Chile, Costa Rica, Denmark, Estonia, Finland, Germany, Japan, New Zealand, Norway, Peru, Sweden, UK, US, Uruguay
- 11g Beta Tester



cd \$MORGAN_HOME



```
cd $MORGAN_HOME
```



October / November / December

- LAD Tour
 - Lima, Peru
 - Santiago, Chile
 - Montevideo, Uruguay
 - Sao Paulo, Brazil
 - Bogota, Columbia
 - Quito, Ecuador
 - San Jose, Costa Rica
- DOAG
- BGOUG
- UKOUG



Unconference: Tomorrow at 15:00 on VLDB Development

SQL ordered by Executions

- Total Executions: 29,717,627
- Captured SQL account for 77.4% of Total

Executions	Rows Processed	Rows per Exec	CPU per Exec (s)	Elap per Exec (s)	SQL Id	SQL Module	SQL Text
10,128,178	2,506,529	0.25	0.00	0.00	932srzg1krc33	ASN_07B_DIP(004110016)	SELECT NE_TIMEZONE FROM CMPM.E...
7,576,759	7,579,197	1.00	0.00	0.00	1h698sb62un99	asci_56_RANAPProtocolStats(016110006)	SELECT DISTINCT NE_TIMEZONE FR...
3,914,621	3,848,268	0.98	0.00	0.00	5tbzddgguu8cc	asci_56_RANAPProtocolStats(016110006)	SELECT SYS_VERSION FROM CMPM.T...
311,645	311,604	1.00	0.00	0.00	7gtztzv329wg0		select c.name, u.name from co...
301,428	301,325	1.00	0.00	0.00	36s446f9cnwhw		SELECT C.NAME FROM COL\$ C WHER...
200,692	200,669	1.00	0.00	0.00	4vs91dcv7u1p6	OMS	insert into sys.aud\$(sessioni...
65,044	65,035	1.00	0.00	0.00	fz9xwpt2cvt0k		SELECT par_type, param_clob, ...
64,949	3,945,482	60.75	0.00	0.00	f5ra7dru5fk5n	XML_P7R_RNC_RCS(003110008)	SELECT NAME, PATH, READ, WR...
64,801	64,807	1.00	0.00	0.00	fhzi09a7fmrnb	XML_V7I_IN_LP_DC(00811000V)	SELECT DBTIMEZONE, LENGTH(DBT...
64,632	64,542	1.00	0.00	0.00	15inrrb6016nd	XML_V7I_IN_LP_DC(00811000V)	SELECT SESSIONTIMEZONE, LENGT...

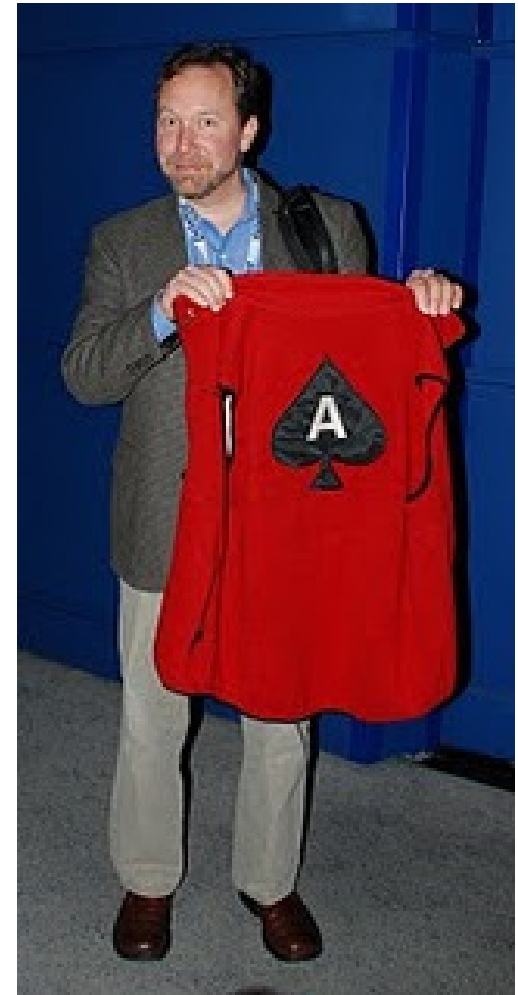
How large is "very large"?

Id	Operation	Name	Rows	Bytes	TempSpc	Cost (%CPU)	Time	Pstart	Pstop
0	SELECT STATEMENT		1	78		14T(100)	999:59:59		
1	TEMP TABLE TRANSFORMATION								
2	LOAD AS SELECT								
3	PARTITION RANGE ALL		22M	1111M		38153 (11)	00:01:34	1	29
* 4	TABLE ACCESS FULL	ELEMENT_DETAIL	22M	1111M		38153 (11)	00:01:34		
5	LOAD AS SELECT								
6	PARTITION HASH ALL		337K	9231K		3514 (15)	00:00:09	1	16
* 7	TABLE ACCESS FULL	MARK_NETW_HIERARCHY	337K	9231K		3514 (15)	00:00:09		
8	SORT AGGREGATE		1	78					
9	MERGE JOIN		471P	15E		14T(100)	999:59:59		
10	MERGE JOIN		10P	616P		694G (81)	999:59:59		
11	MERGE JOIN		231T	10P		377G (64)	999:59:59		
12	SORT JOIN		334T	11P	28P	377G (64)	999:59:59		
13	MERGE JOIN CARTESIAN		334T	11P		140G (14)	999:59:59		
* 14	HASH JOIN		989M	23G	534M	96010 (38)	00:03:56		
15	VIEW		22M	277M		16808 (12)	00:00:42		
16	TABLE ACCESS FULL	SYS_TEMP_OFDA7485B_6A66C42E	22M	1111M		16808 (12)	00:00:42		
17	VIEW		22M	277M		16808 (12)	00:00:42		
18	TABLE ACCESS FULL	SYS_TEMP_OFDA7485B_6A66C42E	22M	1111M		16808 (12)	00:00:42		
19	BUFFER SORT		337K	4286K		140G (14)	999:59:59		
20	VIEW		337K	4286K		142 (14)	00:00:01		
21	TABLE ACCESS FULL	SYS_TEMP_OFDA7485C_6A66C42E	337K	3956K		142 (14)	00:00:01		
* 22	SORT JOIN		337K	4286K	12M	844 (14)	00:00:03		
23	VIEW		337K	4286K		142 (14)	00:00:01		
24	TABLE ACCESS FULL	SYS_TEMP_OFDA7485C_6A66C42E	337K	3956K		142 (14)	00:00:01		
* 25	SORT JOIN		22M	277M	855M	65084 (16)	00:02:40		
26	VIEW		22M	277M		16808 (12)	00:00:42		
27	TABLE ACCESS FULL	SYS_TEMP_OFDA7485B_6A66C42E	22M	1111M		16808 (12)	0		
* 28	SORT JOIN		22M	277M	855M	65084 (16)	00:02:40		
29	VIEW		22M	277M		16808 (12)	00:00:42		
30	TABLE ACCESS FULL	SYS_TEMP_OFDA7485B_6A66C42E	22M	1111M		16808 (12)	0		

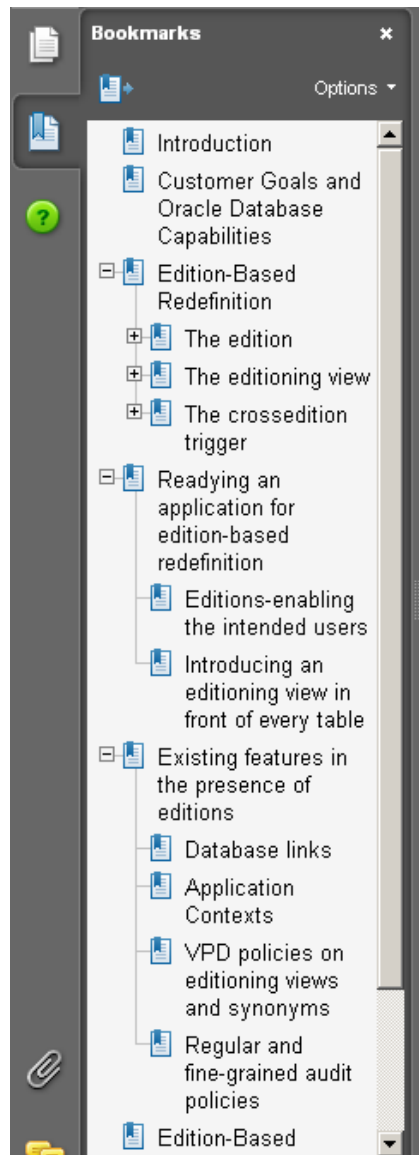
Stanley



Stanley



Bryn Llewellyn's White Paper



An Oracle White Paper
July 2009

Edition-Based Redefinition

a new capability in Oracle Database 11g Release 2
to support online application upgrade

Morgan's Library: www.morganslibrary.org



Morgan's Library

[www](#) [library](#)

Morgan's 2010 - 2011 Calendar

May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
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EMEA Harmony Conference

Tallinn, Estonia
May 20-21, 2010



A joint conference of the Estonian, Finnish, Latvian and Russian user groups
EMEA Harmony will focus on Technology, Middleware and BI
Featured speakers include Tom Kyte, Mogen Norgaard, Tanel Poder, and Dan Morgan





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The Mad Dog ACE



Morgan



aboard USA-71

Training Events

-  [EMEA Harmony](#) - May 20 - 21, Tallinn, Estonia
-  [NoCOUG](#) - August 2010,
-  [AIOUG](#) Sep 3 - 4, Hyderabad, India
-  [OOOW](#) - Sep 19 - 23, San Francisco CA
-  [LAD Tour](#) - October
-  [DOAG](#) - Nov 16 - 18, Nurnberg, Germany
-  [UKOUG](#) - Nov 29 - Dec 1, Birmingham UK

Library News

- [Morgan's Notepad vi \(Blog\)](#) UPDATED
- [Join the Western Washington OUG](#)
- [Morgan's Oracle Podcast](#)
- [DBA Best Practice Guidelines](#)
- [Bryn Llewellyn's PL/SQL White Paper](#)
- [Bryn Llewellyn's Editioning White Paper](#)
- [Troubleshooting Performance](#)

Oracle Events



[EMEA Harmony - Tallinn Estonia - May 20-21](#)

ACE News

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Bryn Llewellyn's Presentations

DOAG Konferenz + Ausstellung: Konferenzplaner 18.11.2010

Konferenzprogramm: → 16.11.2010 | → 17.11.2010 | → 18.11.2010 | → 19.11.2010 | → Mein Konferenzplan

Suche Aut

Streamlinks: Datenbank Data Warehouse Development Hochschulcommunity Infrastruktur (inkl. Sun) Java Keynotes MySQL Oracle & SAP App

Konferenzprogramm am 18.11.2010

Zeit / Raum	09:00 - 09:45	10:00 - 10:45	11:00 - 11:45	12:00 - 12:45	13:00 - 13:45
Budapest	Edition-based redefinition: the key to online application upgrade Bryn Llewellyn, Oracle Corporation	Performance Analyse - oder: Was macht eigentlich mein Solaris? Joerg Moellenkamp, Oracle Deutschland		Mit Oracle Solaris 11 Express nach Oracle Solaris 11 Franz Haberhauer, Detlef Drewanz, Oracle Deutschland	Oracle Support Best Practices für Hardware und Solaris Roland Weigel, Oracle Deutschland
Shanghai	Compression for SAP, better then expected Stefan Menschel, Oracle Deutschland	SAPInst & Oracle 11.2: Compression, ASM, SMIGR_CREATE_DDL Uwe Specht, SAP AG		SAP und Oracle RAC virtualisiert in Solaris Containern Michael Ahrens, Oracle Deutschland Datenbank Software GmbH	Doing SQL from PL/SQL: best and worst practices Bryn Llewellyn, Oracle Corporation ag

Tom Kyte on Edition Based Redefinition

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ARCHITECTURE
Enterprise Architecture

TECHNOLOGY: Ask Tom

A Closer Look at the New Edition

By Tom Kyte

BOOKMARK

As Published In
ORACLE
MAGAZINE
January/February 2010

TAGS
asktom, All

Our technologist redefines and defers with Oracle Database 11g Release 2.

Instead of using the usual question-and-answer format of the Ask Tom column, I'm going to continue in this issue to explore some of the many new features of Oracle Database 11g Release 2. This time I'll be looking at two features:

- Edition-Based Redefinition
- Deferred Segment Creation

The Killer Feature: Edition-Based Redefinition

I consider Edition-Based Redefinition the killer new feature of Oracle Database 11g Release 2. In short, it's the ability to perform an online application upgrade of *your* application. It's also a huge feature—so huge that it'll take at least three columns to describe it. I'll start with how to use Edition-Based Redefinition to "patch" systems. Next time, I'll show how to use Edition-Based Redefinition to minimize downtime during a full-blown application upgrade that includes physical schema changes. Last, I'll show how to *remove* downtime during that same full-blown application upgrade.

EBR Basics

We all have our favorite customers: This is mine ... on a good day



Approach new experiences with care



Mistakes can be expensive



Delusions of Competency Quiz

- Does DBA_OBJECTS show all database objects?
- Can you create a before insert table trigger on a view?
- Can two different procedures, with the same name, co-exist in the same schema?
- Can you replace a PL/SQL object without down-time while it is in use?
- Can all views be created with a WHERE clause?
- Can you control the firing order of a triggers?
- Can a database have an object without an owner?
- Do you know how to grant USE?

Why Should We Care?

- High availability
 - Amazon and Google are up 7 x 24 x 365
 - Your customers expect the same from you
- Different technologies help us achieve our HA goals

Resource	Solution
Data Center	Data Guard
Server	RAC
Storage	ASM, RAID, Resumable Transactions
Network	VLANs, Multiplexing, Bonding
Corruption	RMAN
Software	Rolling Patches
Tables & Indexes	Online Redefinition/Create/Alter
PL/SQL Objects	<u>Not available ... until 11gR2</u>

EBR From 10,000m

- Provides high availability during patching and upgrades and will not:
 - perturb current application users
 - corrupt data

- Provides high availability during upgrades that will:
 - reflect pre-upgrade transactions after upgrade
 - seamlessly rolls changes forward and backward
 - be safe
 - be secure
 - be fully supported by Oracle
 - be free (all editions with no extra licensing cost)

EBR From 10,000m

- Patching is single object change
- Application upgrades are evolutionary not revolutionary
 - The general ledger does not become an HR app
- Data structures are stable
 - Add a few columns, drop a few columns, change some data
 - Maybe add or drop some indexes
- What happens in Version 2 must not affect Version 1

EBR from 1,000m

- A revolutionary new capability
 - Code changes are installed in the privacy of an edition
- Editionable object types
 - PL/SQL objects of all kinds (packages, procedures, functions, types, triggers)
 - Synonyms
 - Views
- All foreground processes use an edition
- Background processes that issue SQL statements, for example MMON, use an edition
- Utilizes three new kinds of database object
 - Edition
 - Editioning View
 - Crossedition Trigger

EBR from 1,000m

- Non-Editable object types: Everything that is not a
 - PL/SQL object
 - Synonyms
 - Views
- That means
 - Tables
 - Materialized Views
 - Indexes
 - Constraints
 - Clusters
 - Database Links
 - Jobs
 - Types used in object table definitions
 - Functions used to create function based indexes

Non-negotiable Warning

- Every database from 11.2.0.1 onwards, whether brand new or the result of an upgrade from an earlier version, non-negotiably, must have at least one edition
- Every foreground database session, at every moment of its lifetime, non-negotiably, uses a single edition
- Some background sessions, for example MMON, are always tied to an edition
- This is not like the recyclebin with an underscore parameter you can use to disable it

```
SELECT username, schemaname, program, session_edition_id
FROM v$session
WHERE session_edition_id <> 0;
```

EBR from 100m

- **Edition** (if only replacing PL/SQL, synonyms, and views)
 - All pre-upgrade editioned objects are part of a parent edition. The default parent is ORA\$BASE
 - New editions must be the child of the parent edition and copy editionable objects from the parent
 - All post-upgrade editioned objects are part of the child edition
 - A non-schema object identified solely by its name

- **Editioning View** (if modifying tables)
 - Exposes a different projection of a table into each edition
 - Data changes are made safely by writing only to new columns or new tables not seen by the old edition
 - Allows different "table" triggers to fire in each edition

EBR from 100m

- Crossedition Trigger (if migrating data forward and backward)
 - A new trigger type specific to editioning
 - Propagates data changes made by the parent edition into the child edition's columns, or (in hot-rollover) *vice-versa*
 - Distinct from application code
 - Always created in the child edition
 - Two types
 - FORWARD (fired by code running in the parent edition)
 - REVERSE (fired by code running in the child edition)
 - Two firing orders
 - FOLLOWING
 - PRECEDING

Edition and Editioning View DDL

```
CREATE EDITION new_app_version  
[AS CHILD OF <parent_edition>];
```

```
CREATE OR REPLACE EDITIONING VIEW person AS  
SELECT empno, ename, job, hiredate, deptno AS DEPT#  
FROM emp;
```

An editioning view can NEVER be more complex than this

1. must be owned by the table owner
2. must be on a single table (no joins)
3. you can alias columns
4. you can not use any functions
5. You can not have a WHERE clause
6. you can not use GROUP BY or HAVING
7. you can not use ORDER BY

Crosseditioning Trigger DDL

```
CREATE OR REPLACE TRIGGER Contacts_Fwd_Xed
BEFORE INSERT OR UPDATE ON Contacts_Table
FOR EACH ROW
FORWARD CROSSEDITION
DISABLE
BEGIN
    Set_First_And_Last_Name(:NEW.Name_1, :NEW.First_Name_2, :NEW.Last_Name_2);
    Set_Country_Code_And_Phone_No(:NEW.Phone_Number_1, :NEW.Country_Code_2, :NEW.Phone_Number_2);
END Contacts_Fwd_Xed;
/
```

```
CREATE OR REPLACE TRIGGER Contacts_Rvrs_Xed
BEFORE INSERT OR UPDATE ON Contacts_Table
FOR EACH ROW
REVERSE CROSSEDITION
DISABLE
BEGIN
    :NEW.Name_1 := :NEW.Last_Name_2||', '||:NEW.First_Name_2;
    :NEW.Phone_Number_1 :=
        CASE :New.Country_Code_2 WHEN '+1' THEN
            REPLACE(:NEW.Phone_Number_2, '-', '.')
        ELSE
            '011.'||LTRIM(:NEW.Country_Code_2, '+')||'. '|| REPLACE(:NEW.Phone_Number_2, '-', '.')
        END;
END Contacts_Rvrs_Xed;
/
```

Edition Aware Objects

- AUD\$ (obj\$edition)
- DBA_EDITIONING_VIEW_COLS
- DBA_EDITIONING_VIEW_COLS_AE
- DBA_EDITIONING_VIEWS
- DBA_EDITIONING_VIEWS_AE
- DBA_EDITIONS (edition_name, parent_edition_name)
- DBA_ERRORS_AE (editioning_name)
- DBA_OBJECTS (edition_name)
- DBA_OBJECTS_AE (edition_name)
- DBA_SOURCE_AE (edition_name)
- DBA_TRIGGERS
- DBA_TRIGGER_ORDERING
- DBA_USERS (editions enabled)
- DBA_VIEWS (editioning_view)
- FGA_LOG\$ (obj\$edition)
- UTL_RECOMP_ALL_OBJECTS (edition_name)
- V\$LOGMNR_CONTENTS (edition_name)
- V\$SESSION (session_edition_id)

AE = All Editions

Edition Aware Packages

- DBMS_EDITIONS_UTILITIES
 - SET_EDITIONING_VIEWS_READ_ONLY
- DBMS_METADATA_UTIL
 - GET_EDITIONID
- DBMS_PARALLEL_EXECUTE
 - RESUME_TASK
- DBMS_PARALLEL_EXECUTE
 - RUN_TASK
- DBMS_SERVICE
 - CREATE_SERVICE
 - MODIFY_SERVICE
- DBMS_SESSION
 - SET_EDITION_DEFERRED
- DBMS_SQL
 - PARSE
- DBMS_UTILITY
 - VALIDATE

11.2.0.2 Enhancements

```
dbms_service.create_service(  
  service_name      IN VARCHAR2,  
  network_name      IN VARCHAR2,  
  goal              IN NUMBER    DEFAULT NULL,  
  dtp               IN BOOLEAN   DEFAULT NULL,  
  aq_ha_notifications IN BOOLEAN DEFAULT NULL,  
  failover_method   IN VARCHAR2  DEFAULT NULL,  
  failover_type     IN VARCHAR2  DEFAULT NULL,  
  failover_retries  IN NUMBER    DEFAULT NULL,  
  failover_delay    IN NUMBER    DEFAULT NULL,  
  clb_goal          IN NUMBER    DEFAULT NULL,  
  edition           IN VARCHAR2  DEFAULT NULL);  
  
dbms_service.modify_service(  
  service_name      IN VARCHAR2,  
  goal              IN NUMBER    DEFAULT NULL,  
  dtp               IN BOOLEAN   DEFAULT NULL,  
  aq_ha_notifications IN BOOLEAN DEFAULT NULL,  
  failover_method   IN VARCHAR2  DEFAULT NULL,  
  failover_type     IN VARCHAR2  DEFAULT NULL,  
  failover_retries  IN NUMBER    DEFAULT NULL,  
  failover_delay    IN NUMBER    DEFAULT NULL,  
  clb_goal          IN NUMBER    DEFAULT NULL,  
  edition           IN VARCHAR2  DEFAULT NULL,  
  modify_edition    IN BOOLEAN   DEFAULT FALSE);
```

Invisible Indexes

- A real index, invisible to the cost-base optimizer

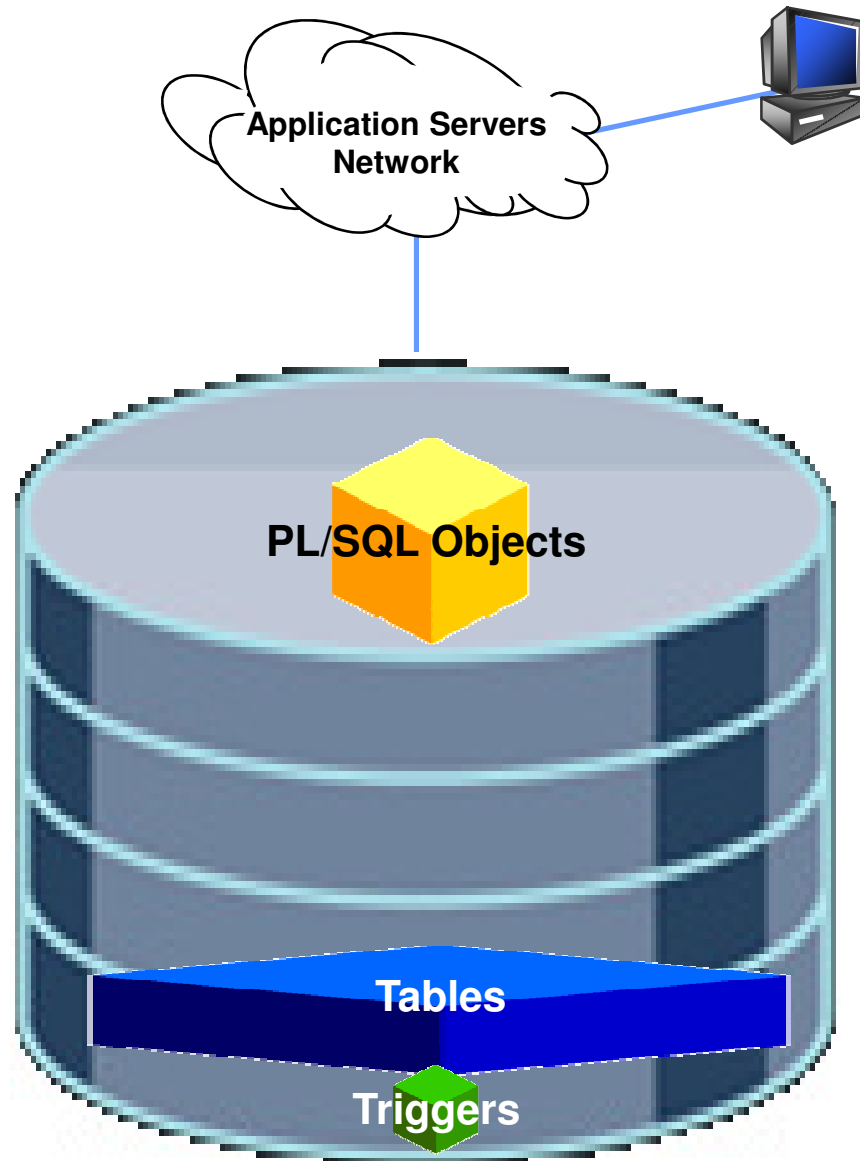
```
CREATE INDEX ix_mobile_net_lat
ON mobile_net_tab(latitude)
INVISIBLE;
```

```
CREATE OR REPLACE TRIGGER enable_invisible_indexes
AFTER LOGON ON SCHEMA
DECLARE
    parent_edition all_editions.edition_name%TYPE;
BEGIN
    SELECT parent_edition_name
    INTO parent_edition
    FROM all_editions
    WHERE edition_name = (
        SELECT sys_context('USERENV', 'CURRENT_EDITION_NAME') FROM dual);

    IF parent_edition IS NOT NULL THEN
        execute immediate 'ALTER SESSION SET "optimizer_use_invisible_indexes" = TRUE';
        dbms_output.put_line('enabled');
    END IF;
END enable_invisible_indexes;
/
```

EBR Implementation

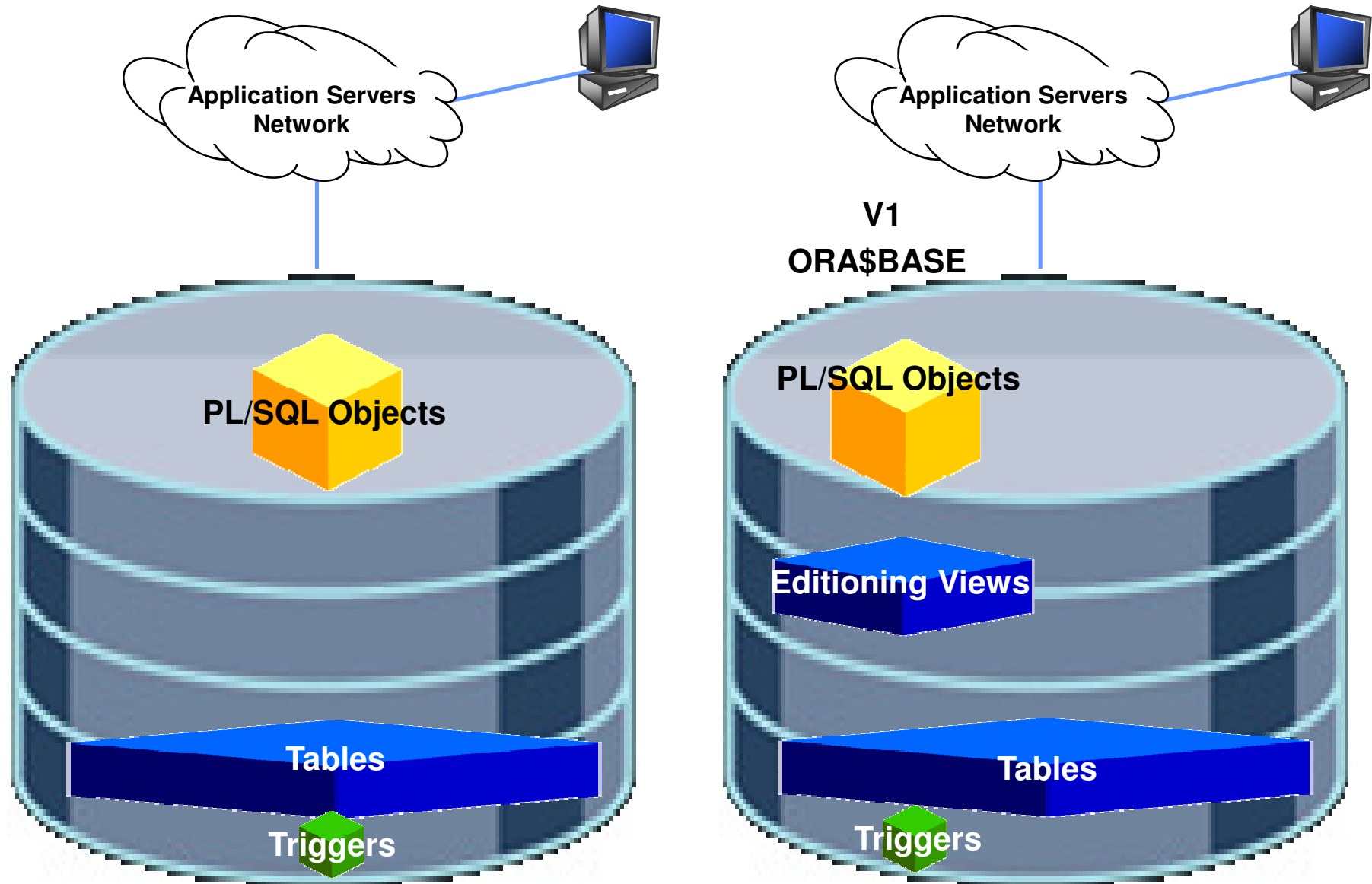
Application Version 1



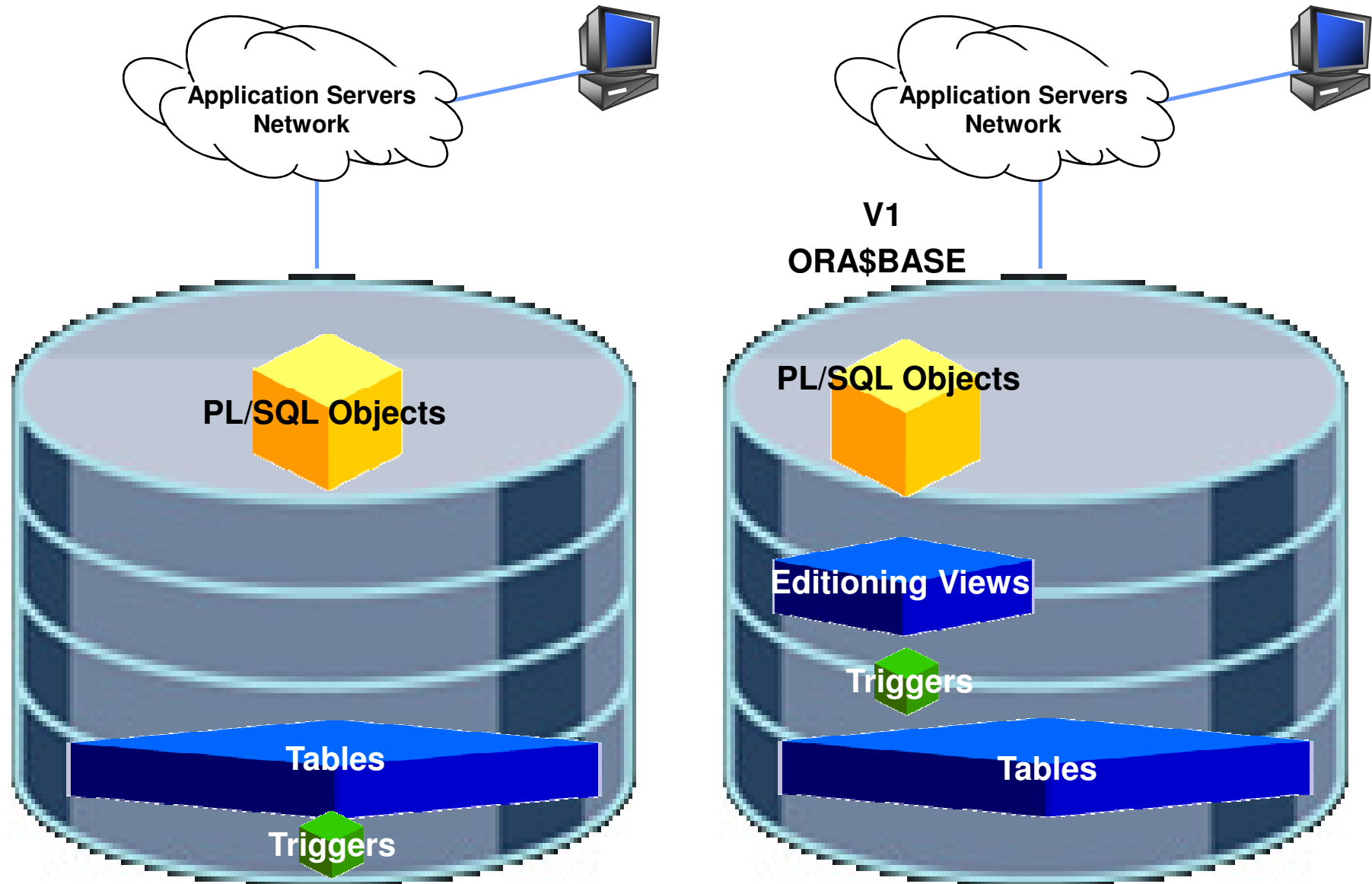
Move into separate schemas tables, views, and indexes that rely on PL/SQL objects

A non-editioned object cannot depend upon an editioned object

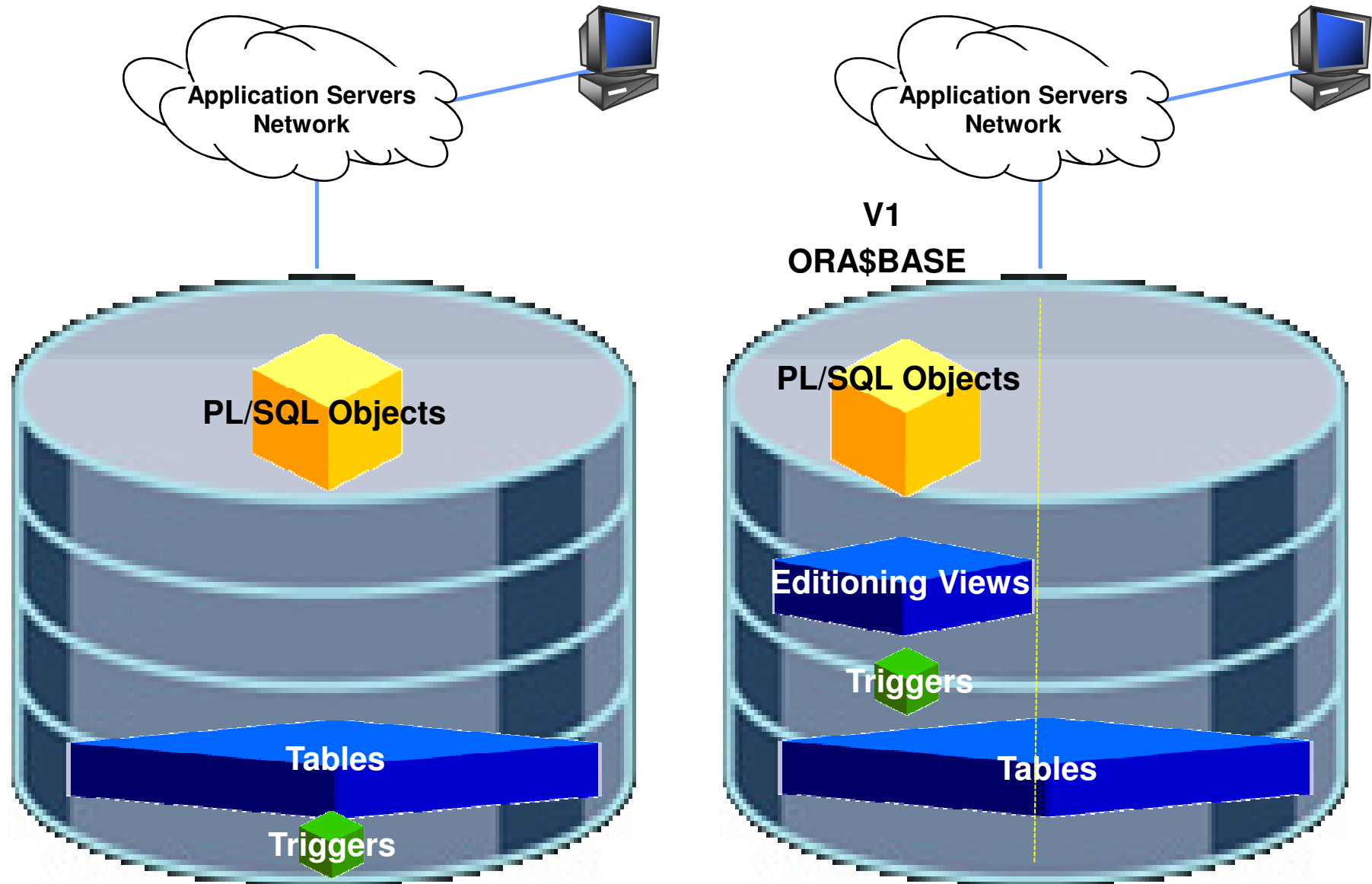
Take Your Last Outage: Create Editioning Views



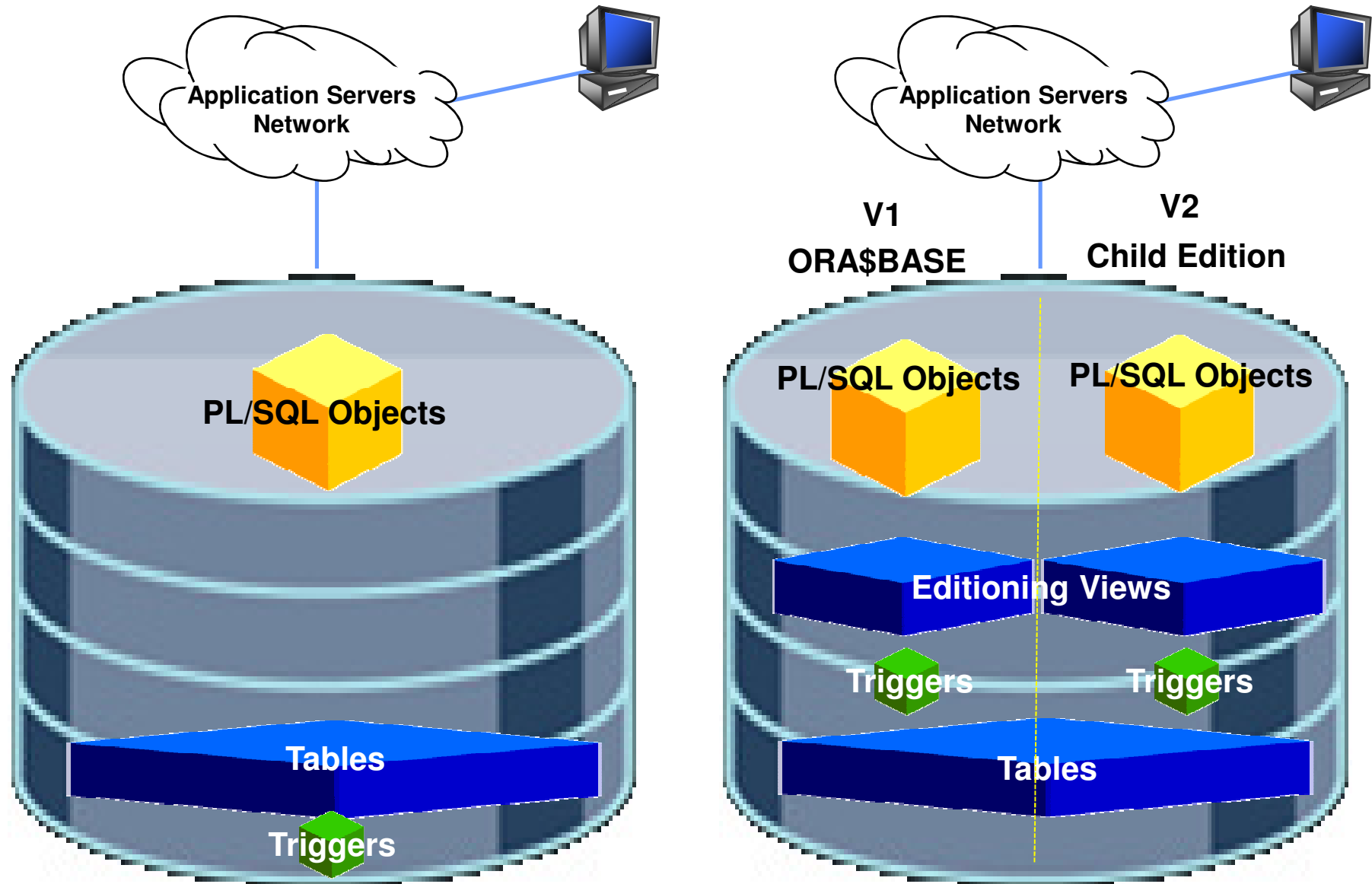
Take Your Last Outage: Relocate Table Triggers



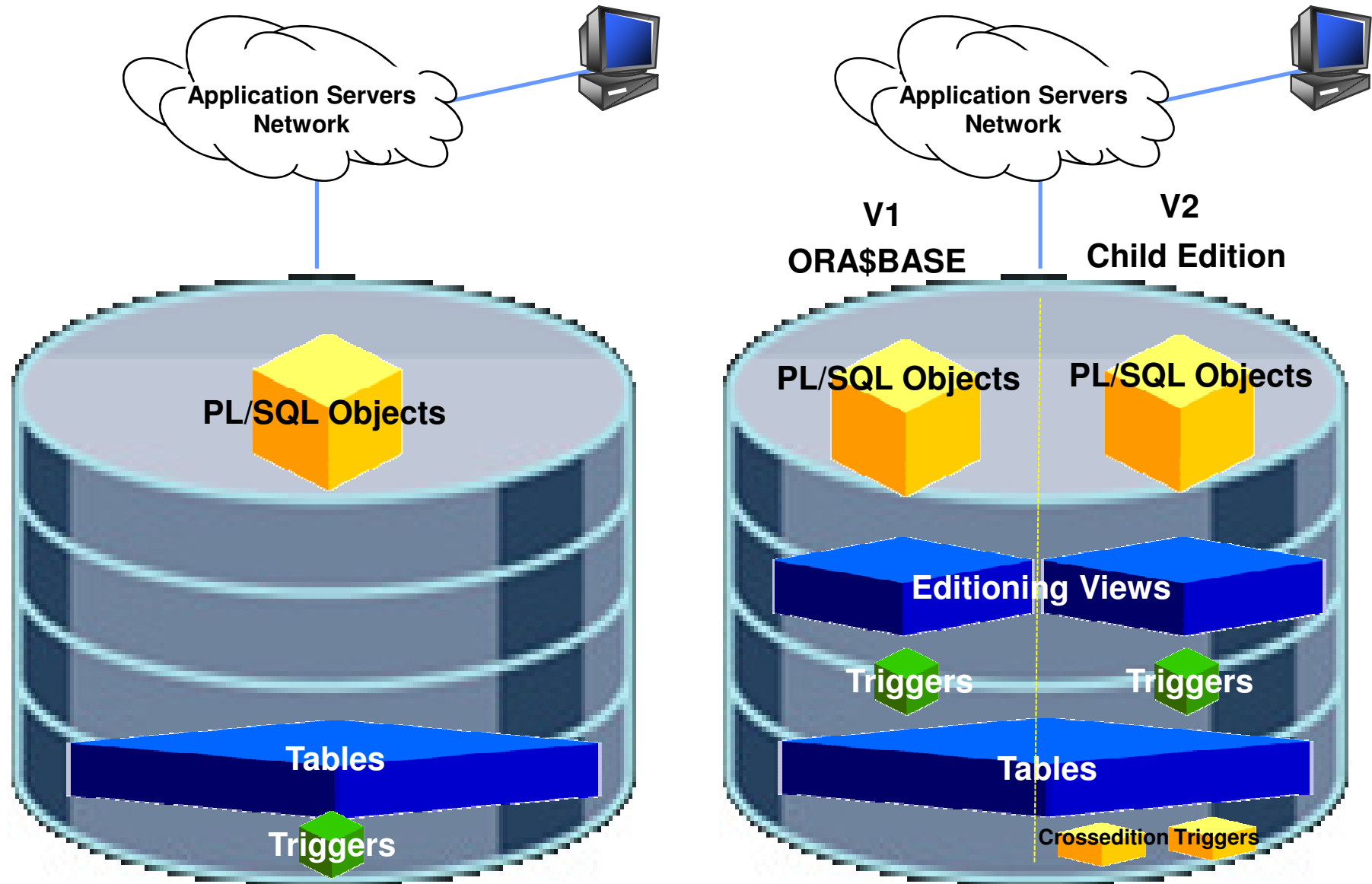
Take Your Last Outage: Create Edition



Take Your Last Outage: Objects Replicated by Pointer



Take Your Last Outage: Objects Replicated by Pointer



Clean-up

- When retiring the pre-upgrade edition revoke USE
- Dropping a parent edition can be done for elegance but is not required
- The natural state of affairs you get a new addition and they accumulate and they do no harm

Morgan's Library Demos

<u>DDL Statements</u>	11gR2	20-Dec-2009	-
<u>Deadlocks</u>	11gR2	09-Sep-2010	UPDATED
<u>DECODE Function</u>	11gR2	21-Apr-2009	-
<u>Deferrable Constraints</u>	11gR2	09-Sep-2009	-
<u>Delete Statement</u>	11gR2	10-Sep-2009	-
<u>Descending Indexes</u>	11gR2	22-Aug-2010	UPDATED
<u>DICOM</u>	11gR1	17-Jun-2010	-
<u>Dimensions</u>	11gR2	10-Sep-2009	-
<u>Directories</u>	11gR2	01-Nov-2009	-
<u>Disassociate Statistics</u>	11gR2	10-Sep-2009	-
<u>DIUTIL</u>	11gR2	10-Sep-2009	-
<u>DML Statements</u>	11gR2	10-Sep-2009	-
<u>Dumping Oracle</u>	11gR2	20-Jul-2010	-
<u>Dynamic Performance Views</u>	11gR2	15-Jun-2010	-
<u>E-Business Suite</u>	11.5.10	20-Sep-2007	-
<u>Edition Based Redefinition</u>	11gR2	18-Sep-2010	UPDATED
<u>Editioning Demo 1: Editions</u>	11gR2	15-Apr-2010	-
<u>Editioning Demo 2: Editioning Views</u>	11gR2	21-Mar-2010	-
<u>Editioning Demo 3: Crossedition Triggers</u>	11gR2	02-Mar-2010	-
<u>Editioning Demo 4: Online Table Update</u>	11gR2	22-Mar-2010	-
<u>Editioning Demo 5: Invisible Indexes</u>	11gR2	09-May-2010	-
<u>Editioning Demo 6: Conversion Automation</u>	11gR2	22-Sep-2010	NEW
<u>Editioning Views</u>	11gR2	24-Feb-2010	-
<u>Editions</u>	11gR2	12-Mar-2010	-
<u>Encrypted Tablespaces</u>	11gR2	28-Sep-2009	-
<u>Environment Variables</u>	11gR2	11-Sep-2009	-
<u>Errors</u>	11gR2	11-Sep-2009	-
<u>Events</u>	11gR2	28-Aug-2010	UPDATED
<u>Exadata</u>	11gR2	24-Dec-2009	-
<u>Exception Handling</u>	11gR2	16-Mar-2010	-
<u>Excluded Nodes</u>	11gR2	27-Sep-2008	-
<u>Exists</u>	11gR2	11-Sep-2009	-
<u>Explain Plan</u>	11gR2	21-Jan-2010	-

Health Warning

Due to complaints made to the European Union's
Directorate General of Health and Consumer Protection ...



you are now entering ...

... a ...



Questions

ERROR at line 1:

ORA-00028: your session has been killed



All demos at morganslibrary.org

- **Library**
- **How Can I?**

Thank you