Edition Based Redefinition

Zero Downtime Application Upgrades

presentation for:
Oracle OpenWorld 2010

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No one from Oracle has previewed this presentation.

No one from Oracle knows what I'm going to say.

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This presentation will be live in SQL*Plus ...
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- Board Member: Western Washington OUG
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- Conference Speaker
  - OpenWorld, Collaborate, Kaleidoscope, Canada, Chile, Denmark, Estonia, Finland, Germany, Japan, New Zealand, Norway, Sweden, UK & US
- 11g Beta Tester

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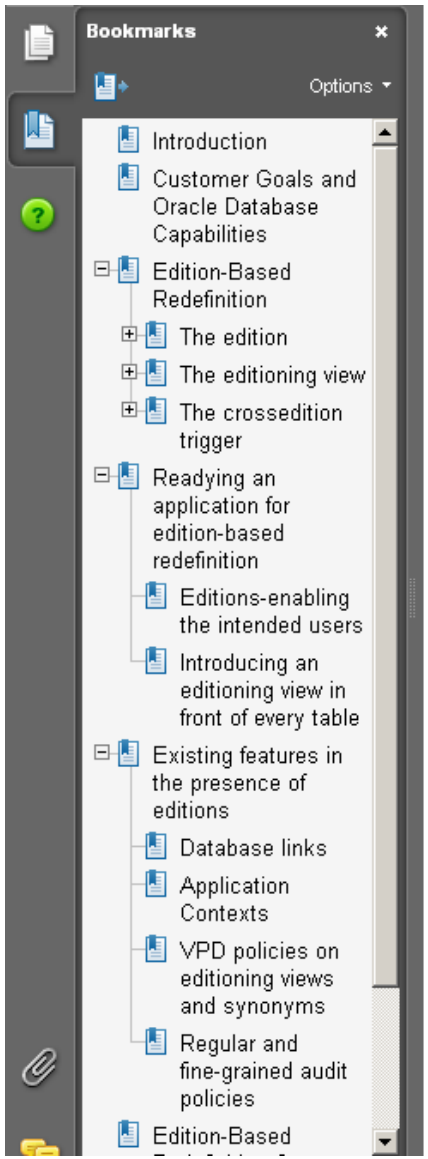
Bryn Llewellyn's White Paper



An Oracle White Paper
July 2009

Edition-Based Redefinition

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

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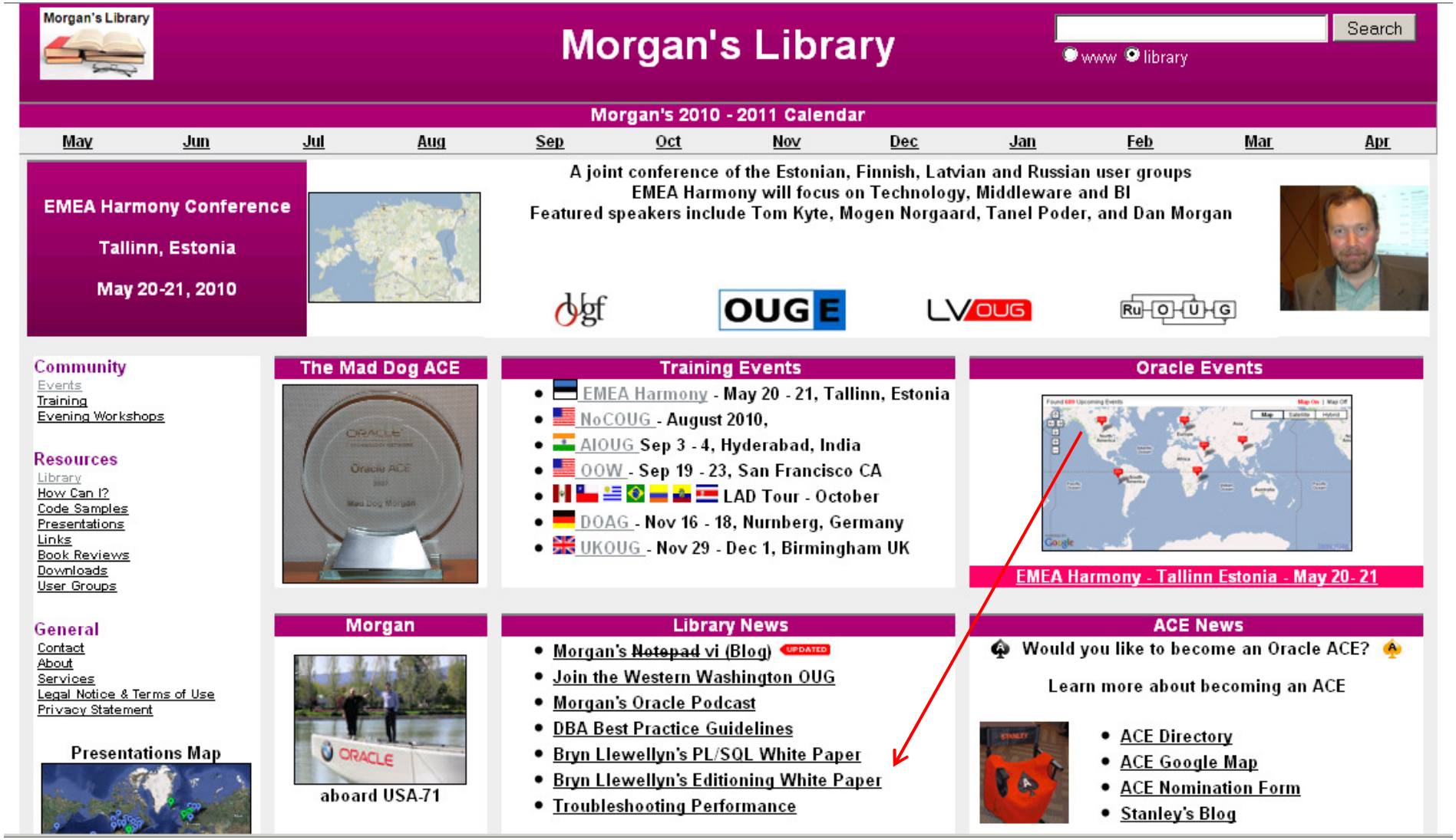
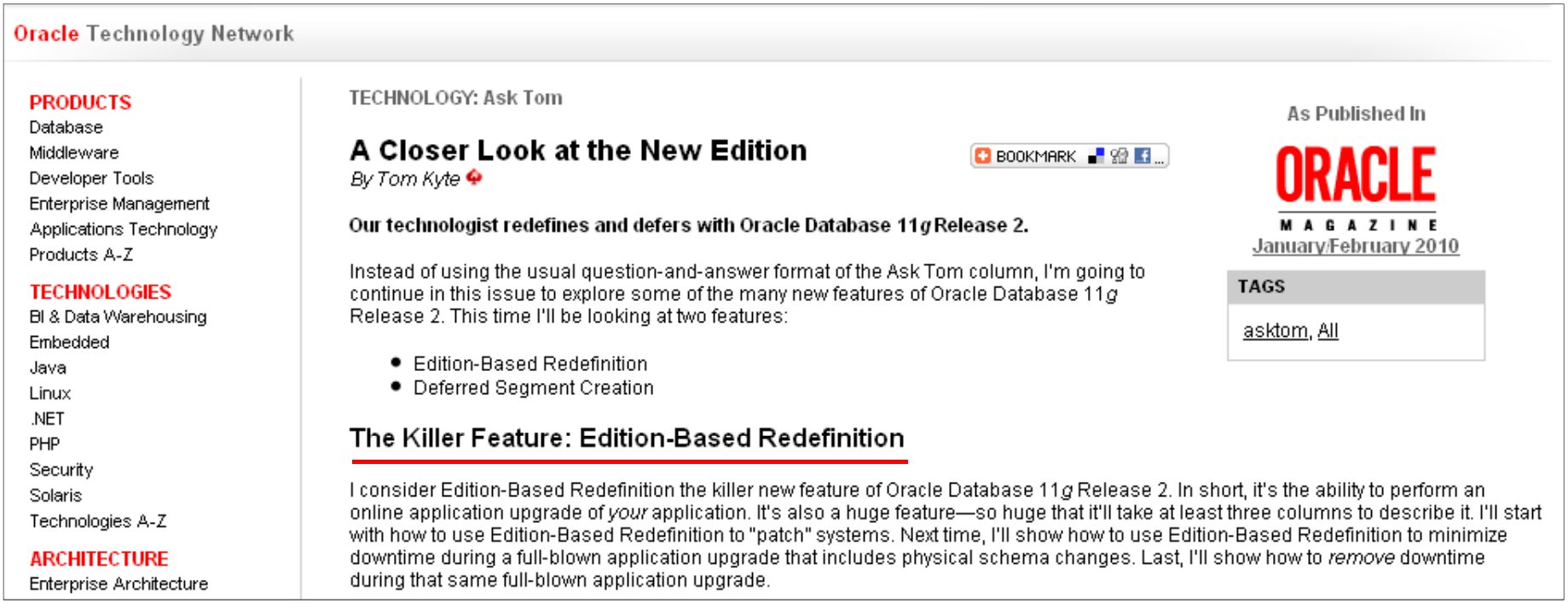


Tom Kyte on Edition Based Redefinition



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TECHNOLOGY: Ask Tom

A Closer Look at the New Edition

BOOKMARK

By Tom Kyte

Our technologist redefines and defers with Oracle Database 11*g* 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 11*g* 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 11*g* 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.

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January/February 2010

TAGS
asktom, All

EBR Basics

Mythology & Dinosaurs

- Most Oracle DBAs and Developers use Database 11g exploiting all of the features of version 8.0.5

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 actualize a stored procedure?
- 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	Not available ... until 11gR2

EBR From 50,000 ft.

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

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

EBR From 50,000 ft.

- Application changes 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 V2 must not affect V1

EBR from 5,000 ft.

- A revolutionary new capability
  - Code changes are installed in the privacy of an edition
- Editionable object types
  - PL/SQL objects of all kinds
  - 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

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

EBR from 500 ft.

- Edition (if only replacing PL/SQL, synonyms, and views)
  - All pre-upgrade editionable objects are part of a parent edition. The default parent is ORA$BASE
  - New editions must be the child of the parent edition and inherit (by pointer) editionable objects from the parent
  - All post-edition editionable 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 500 ft.

- 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;
```

```
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. you can alias columns

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 Enabled 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 Enabled 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

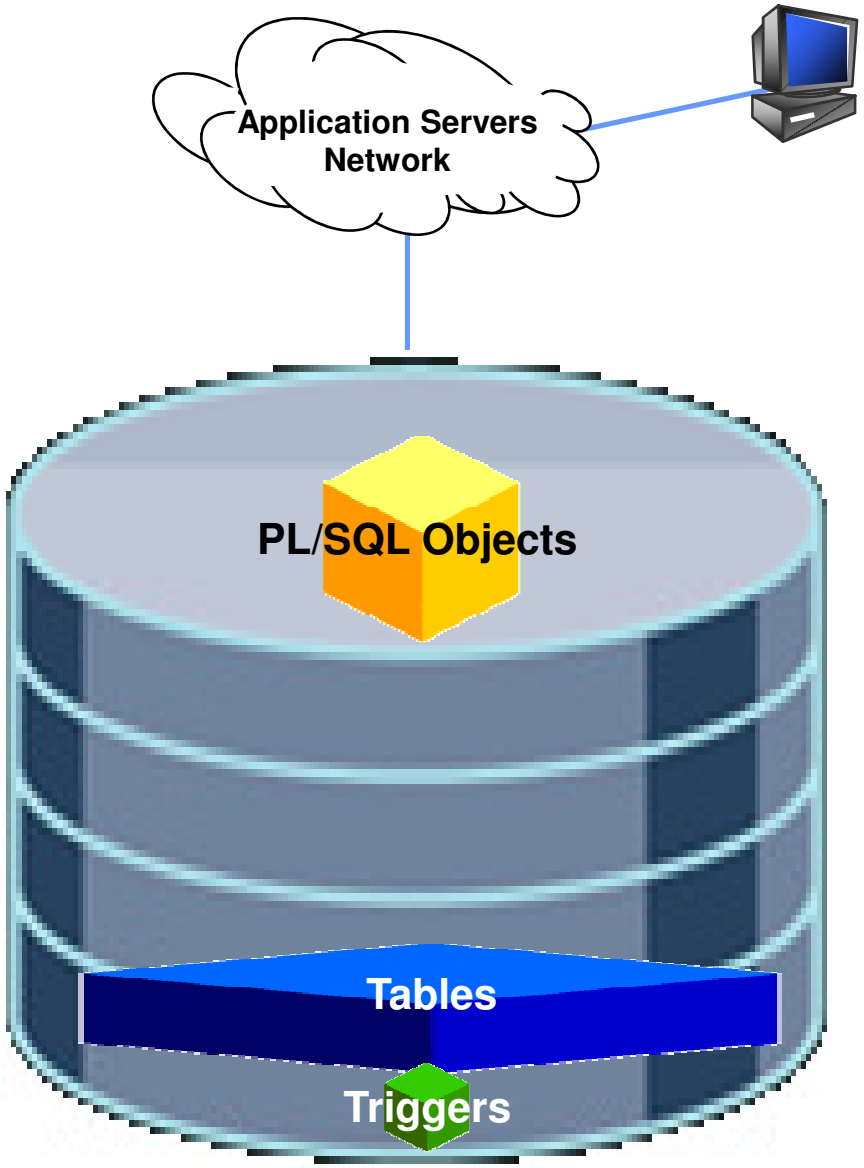
Invisible Indexes

- A real index, invisible to the cost-base optimizer, for a default session

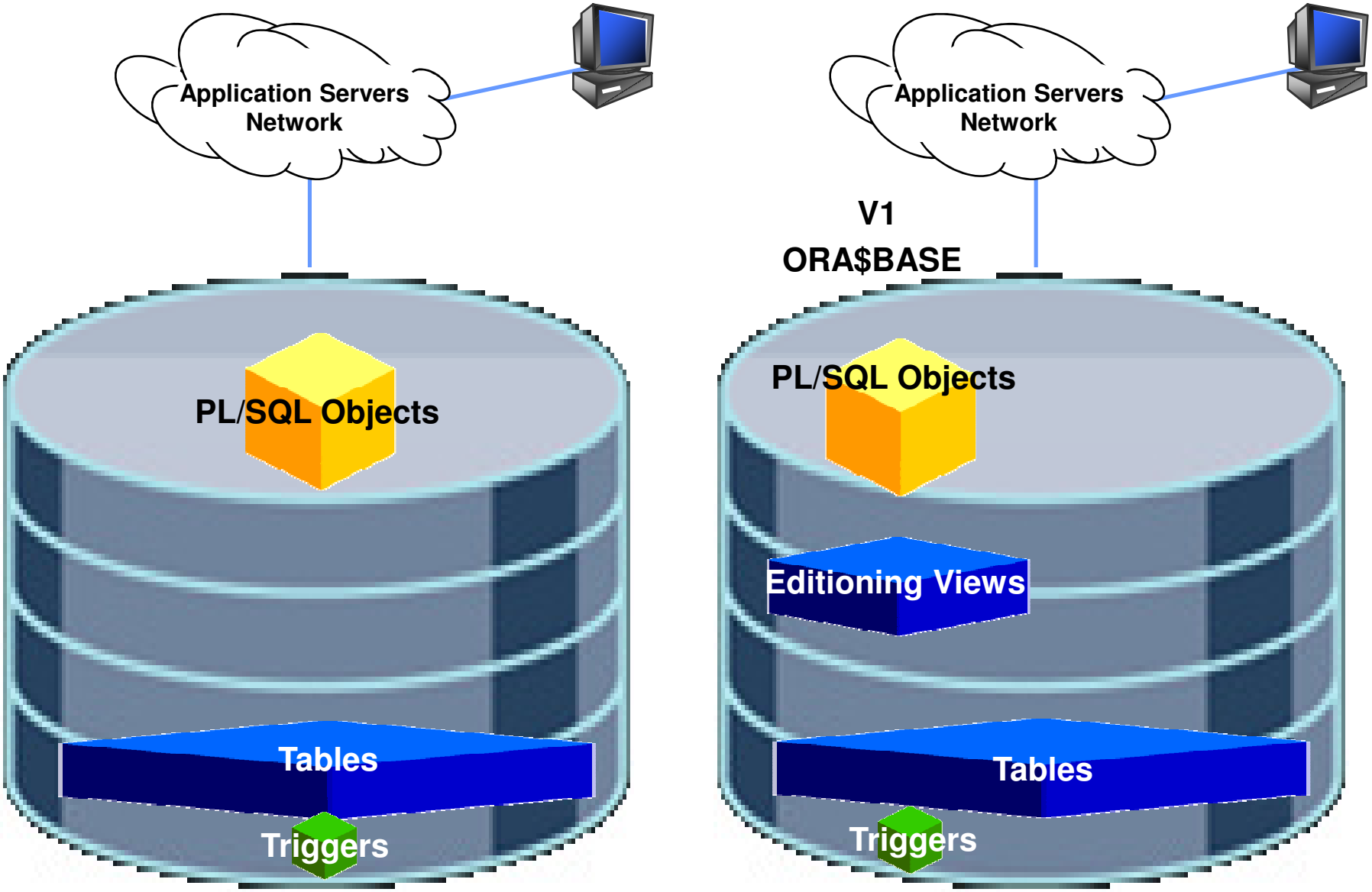
```
CREATE INDEX ix_mobile_net_lat
ON mobile_net_tab(latitude)
INVISIBLE;


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

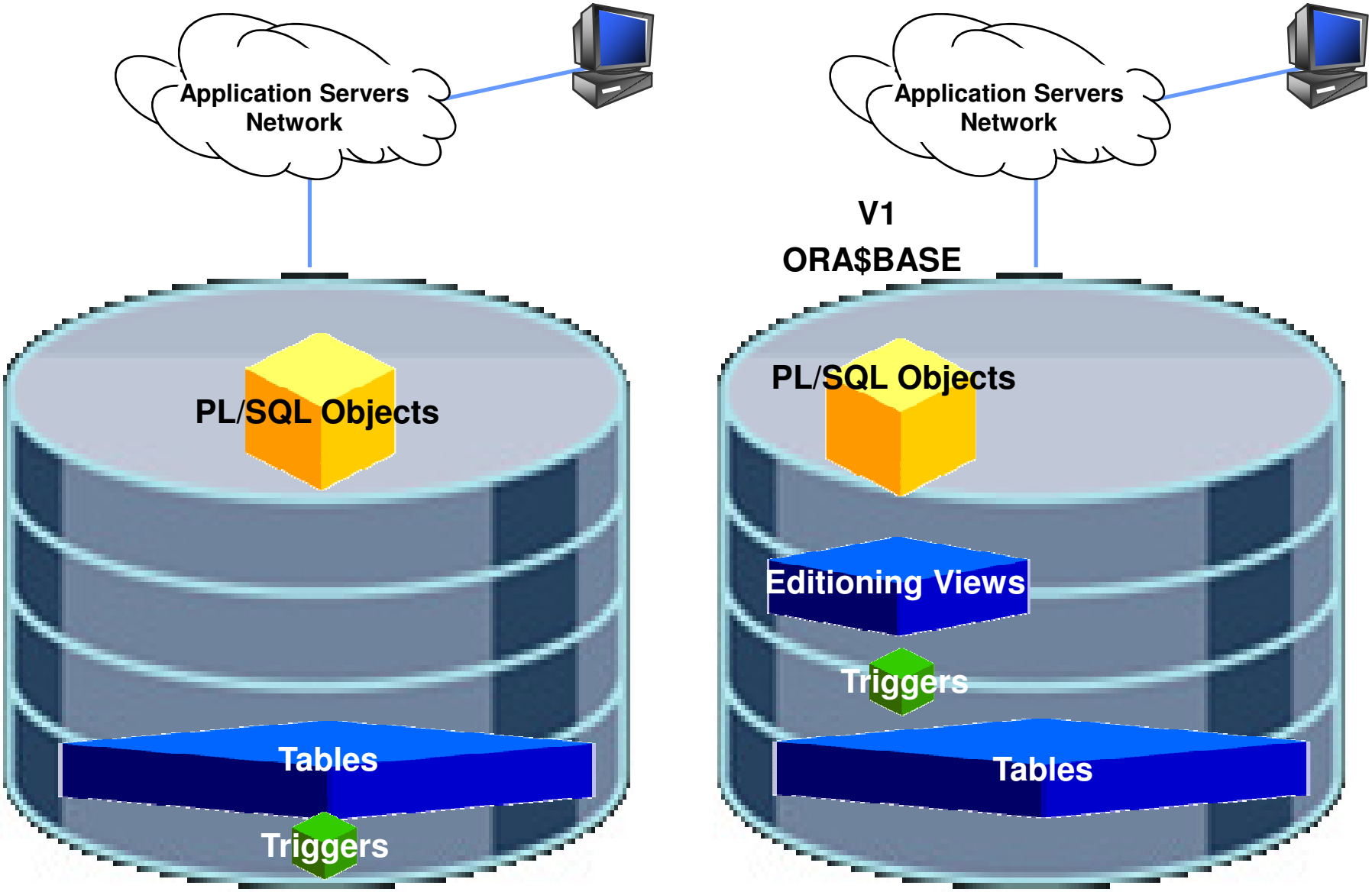
Application Version 1



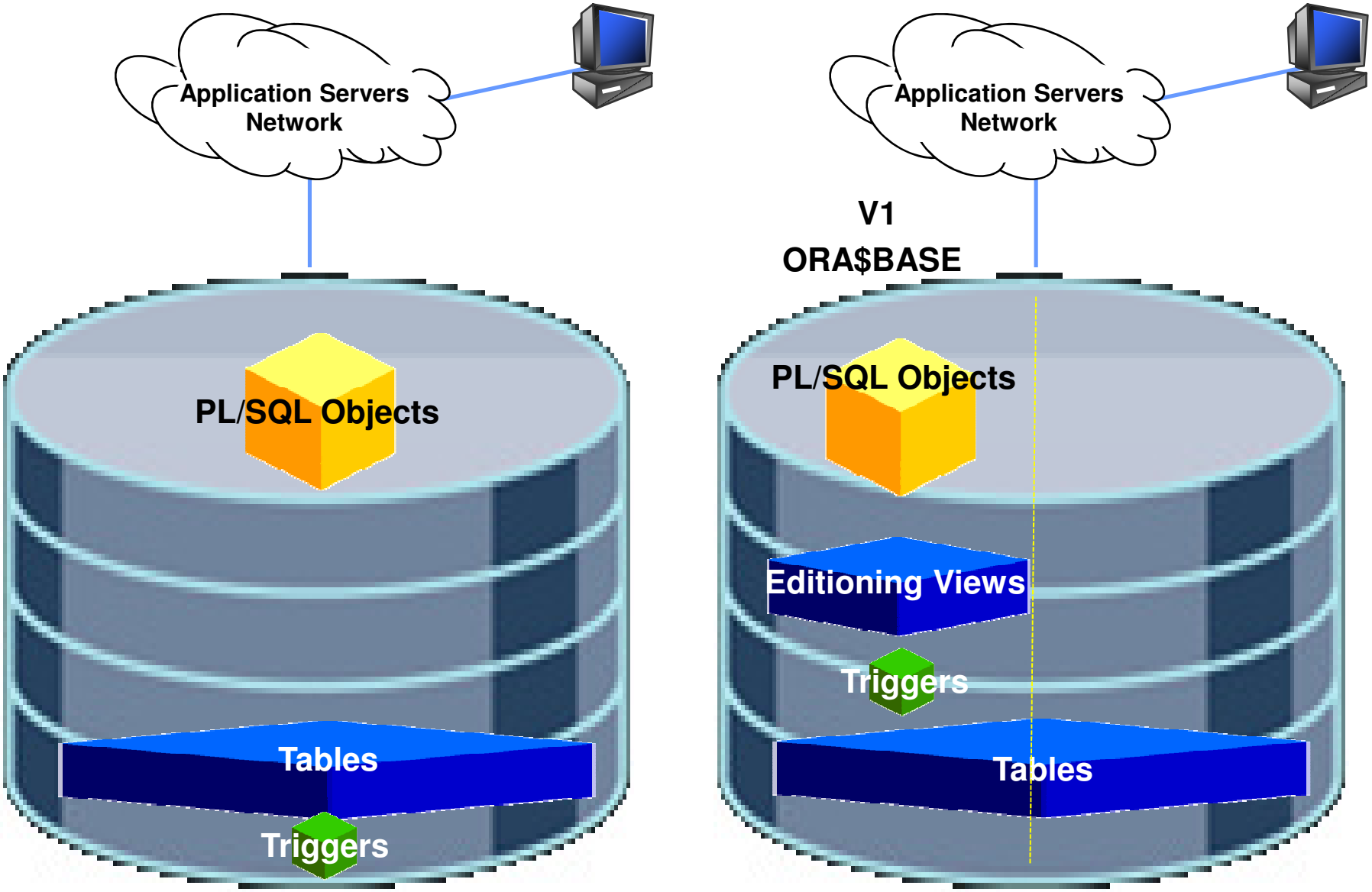
Take Your Last Outage: Create Editioning Views



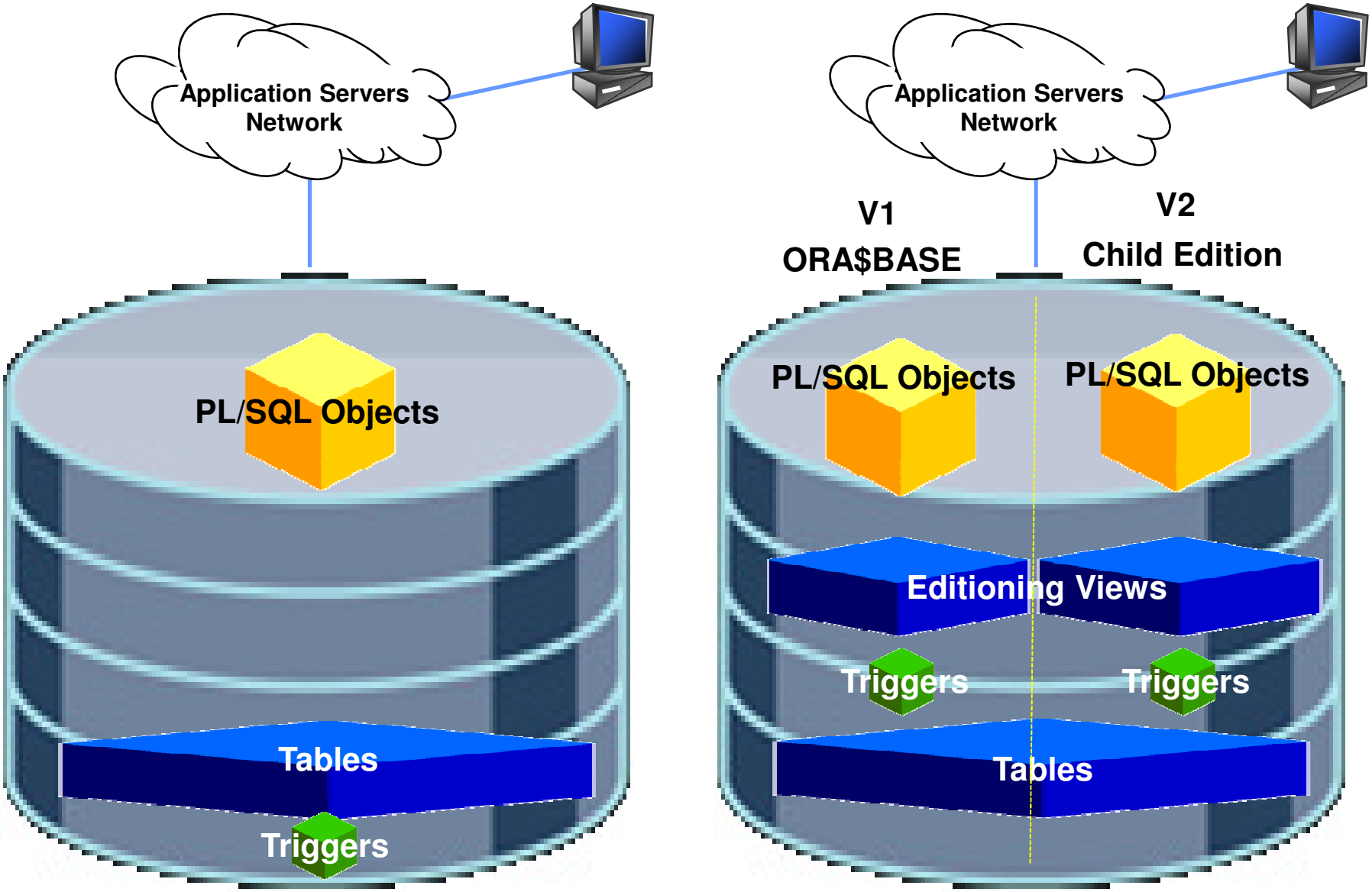
Take Your Last Outage: Relocate Table Triggers



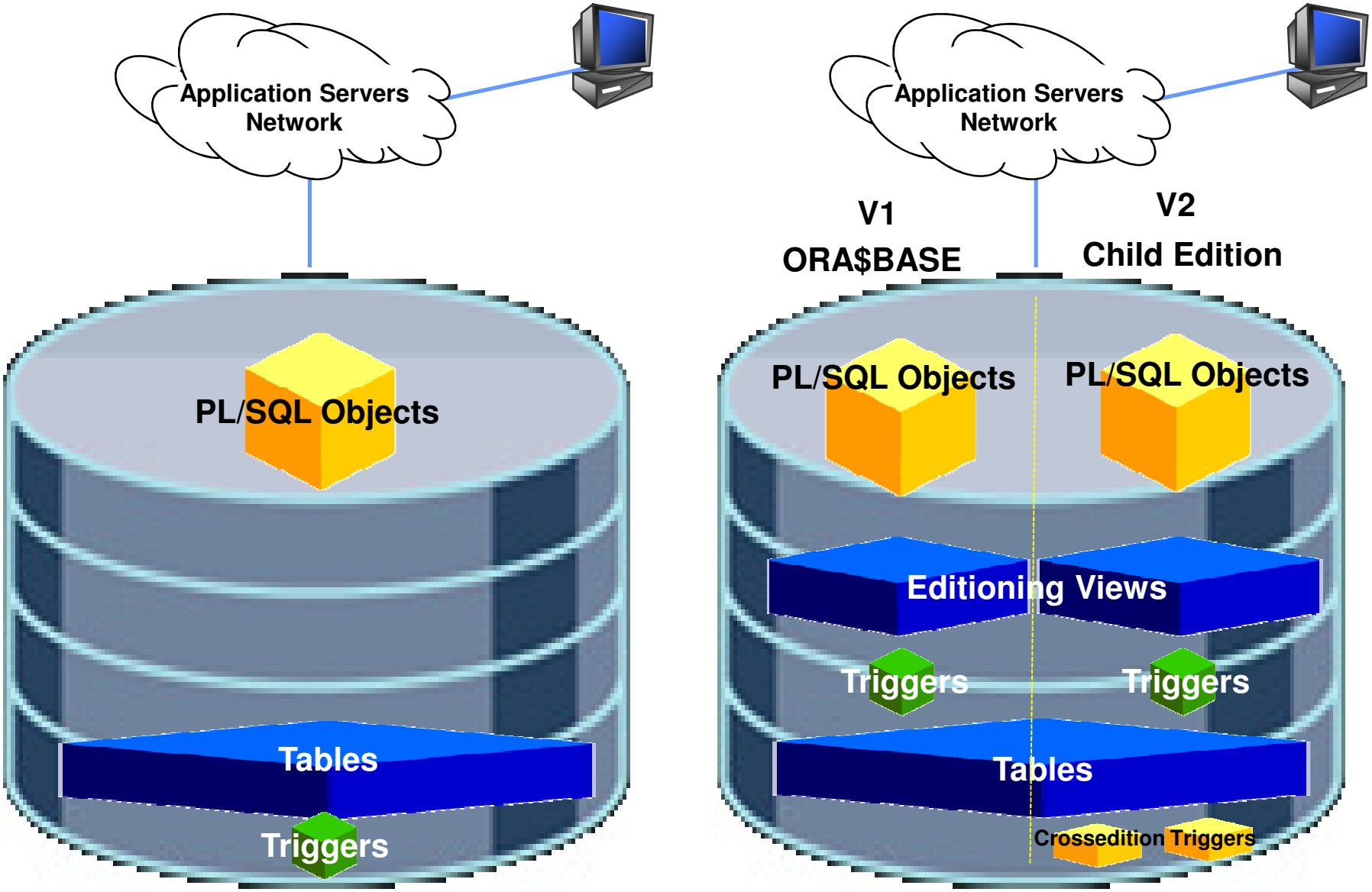
Take Your Last Outage: Create Edition



Take Your Last Outage: Objects Replicated by Pointer



Take Your Last Outage: Objects Replicated by Pointer



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);
```

Health Warning

Due to formal complaints made to the US Center for Disease Control and European Union's Directorate General of Health & Consumer Protection ...

you are now entering ...

... a ...

Wish List

What I'd like to see in Database 12cR1

- Indexes visible in ONE, ALL or NO editions
- Constraints that are enforced in ONE or ALL editions
- Relax the rules on using editionable objects as components of non-editionable objects

What I'd like to not see:

```
SQL> sho user
USER is "SYS"
SQL> SELECT sys_context('USERENV', 'CURRENT_EDITION_NAME') FROM dual;

SYS_CONTEXT('USERENV','CURRENT_EDITION_NAME')
------------------------------------------------------------------------
DEMO_ED

SQL> conn hr/hr
ERROR:
ORA-38802: edition does not exist

Warning: You are no longer connected to ORACLE.
SQL>
```

Logically I should be connected to the default edition

Morgan's Library Demos

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

Questions

ERROR at line 1:
ORA-00028: your session has been killed

All demos at morganslibrary.org

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

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Thank you