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# Edition Based Redefinition

## Zero Downtime Application Upgrades

Presentation for



16 October, 2010

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Edition Based Redefinition in Oracle Database 11gR2

# Daniel A. Morgan

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



# cd \$MORGAN\_HOME

---



```
cd $MORGAN_HOME
```

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# October / November / December

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- LAD Tour

- Lima, Peru
- Santiago, Chile
- Montevideo, Uruguay
- Sao Paulo, Brazil
- Bogota, Columbia
- Quito, Ecuador
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- DOAG

- BGOUG

- UKOUG



# Stanley

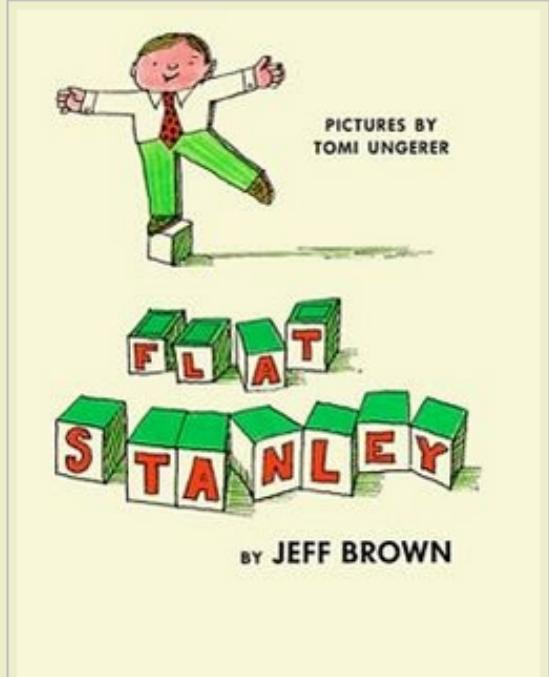
## WTF is the Ace Vest?; Stanley's Travels

TUESDAY, JANUARY 20, 2009

### » How did Stanley get Flat?

Stanley was named after 'Flat Stanley' a children's book character who is flattened by books but then as he can be put in an envelope travels the world sending back stories of his travels.

School children have adopted the story in what is known as the 'Flat Stanley Project'. The project was started in 1995 by Dale Hubert, a grade three schoolteacher in London, Ontario, Canada. It is meant to facilitate letter-writing by



PICTURES BY  
TOMI UNGERER

BY JEFF BROWN

#### For more Stanley information

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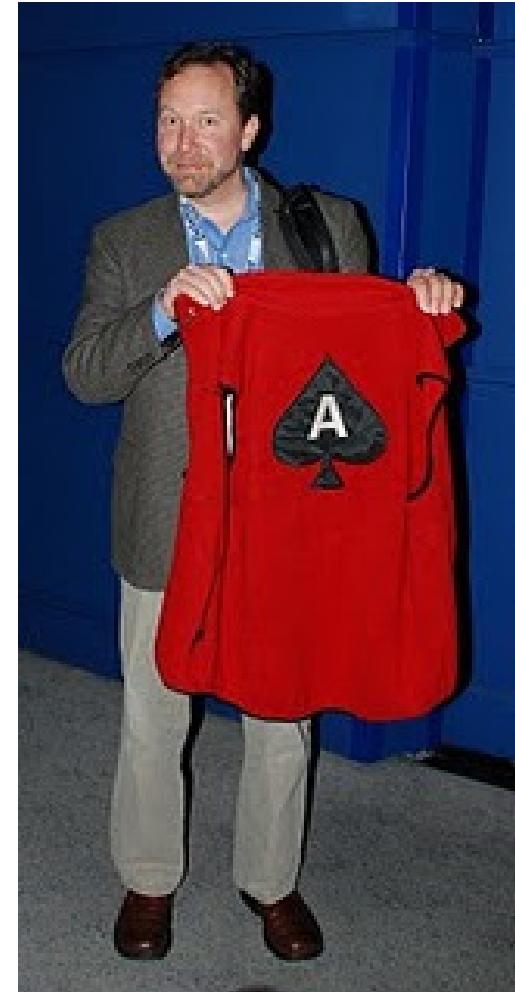
# Stanley

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# Stanley

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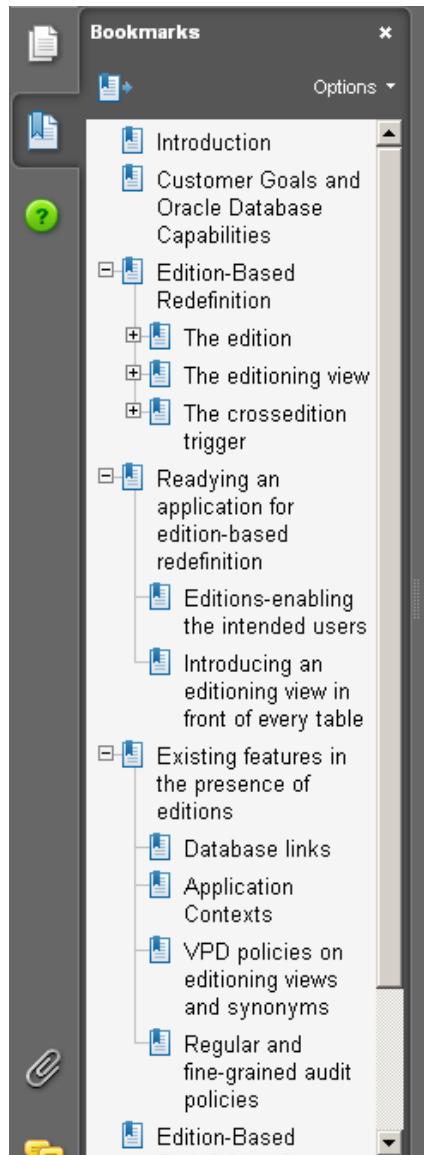


# Stanley

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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

# Morgan's Library: [www.morganslibrary.org](http://www.morganslibrary.org)

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Search

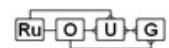
**Morgan's 2010 - 2011 Calendar**

May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
<b>EMEA Harmony Conference</b> 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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- [EMEA Harmony](#) - May 20 - 21, Tallinn, Estonia
- [NoCOUG](#) - August 2010,
- [AIOWUG](#) Sep 3 - 4, Hyderabad, India
- [OOW](#) - Sep 19 - 23, San Francisco CA
- [LAD Tour](#) - October
- [DOAG](#) - Nov 16 - 18, Nurnberg, Germany
- [UKOUG](#) - Nov 29 - Dec 1, Birmingham UK

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# Tom Kyte on Edition Based Redefinition

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TECHNOLOGY: Ask Tom

## A Closer Look at the New Edition

By Tom Kyte 

**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.

As Published In

**ORACLE**  
MAGAZINE  
January/February 2010

**TAGS**  
[asktom](#), [All](#)

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# EBR Basics

We all have our favorite customers: This is mine

... on a good day



Store  
More  
Data

Maintain  
Performance

Honor  
the same  
Service  
Level  
Agreement

What's the  
big deal?

# Mythology & Dinosaurs

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



# Delusions of Competency Quiz

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- 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	<u>Not available ... until 11gR2</u>

# EBR From 10,000m

---

- 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 10,000m

---

- 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 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 views

# 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 100m

---

- **Edition** (if only replacing PL/SQL, synonyms, and views)
  - All pre-upgrade editable 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) editable objects from the parent
  - All post-edition editable 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;
```

```
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);

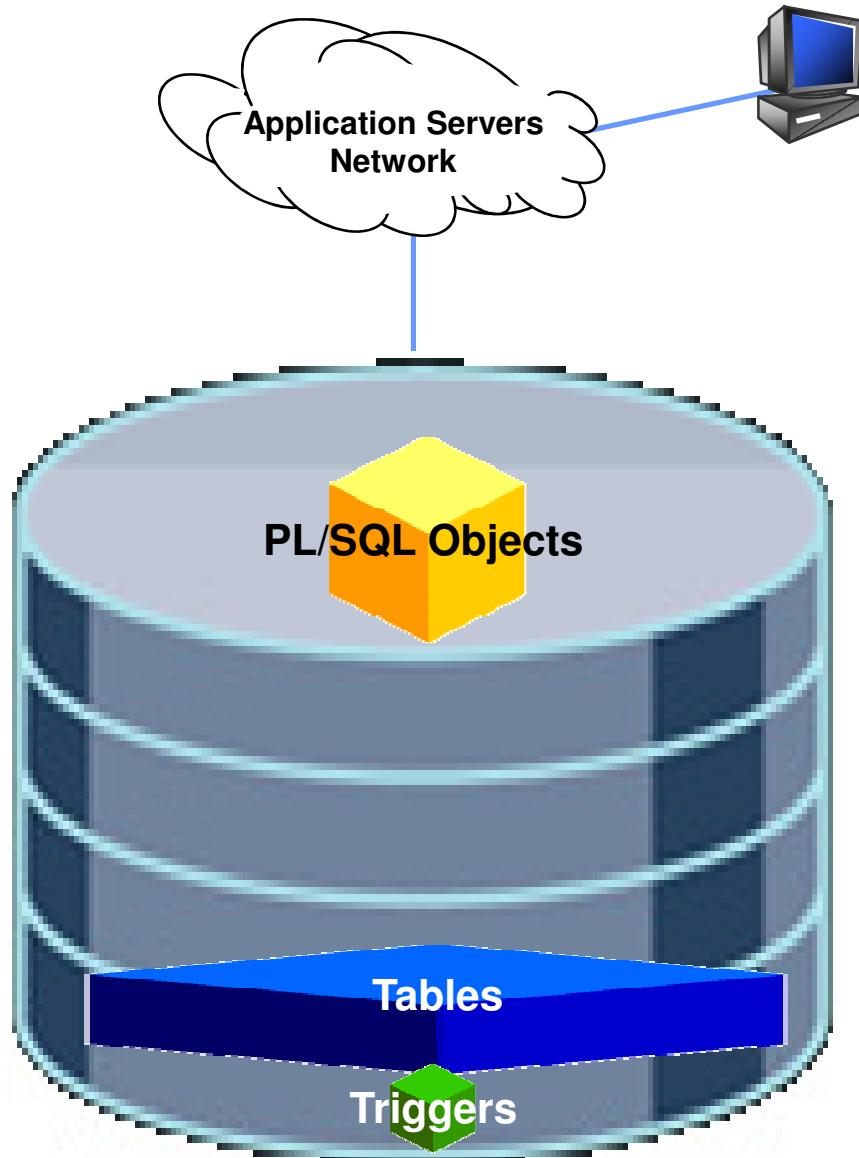
  IF parent_edition IS NOT NULL THEN
    execute immediate 'ALTER SESSION SET "optimizer_use_invisible_indexes" = TRUE';
    dbms_output.put_line('enabled');
  END IF;
END enable_invisible_indexes;
/
```

---

# EBR Implementation

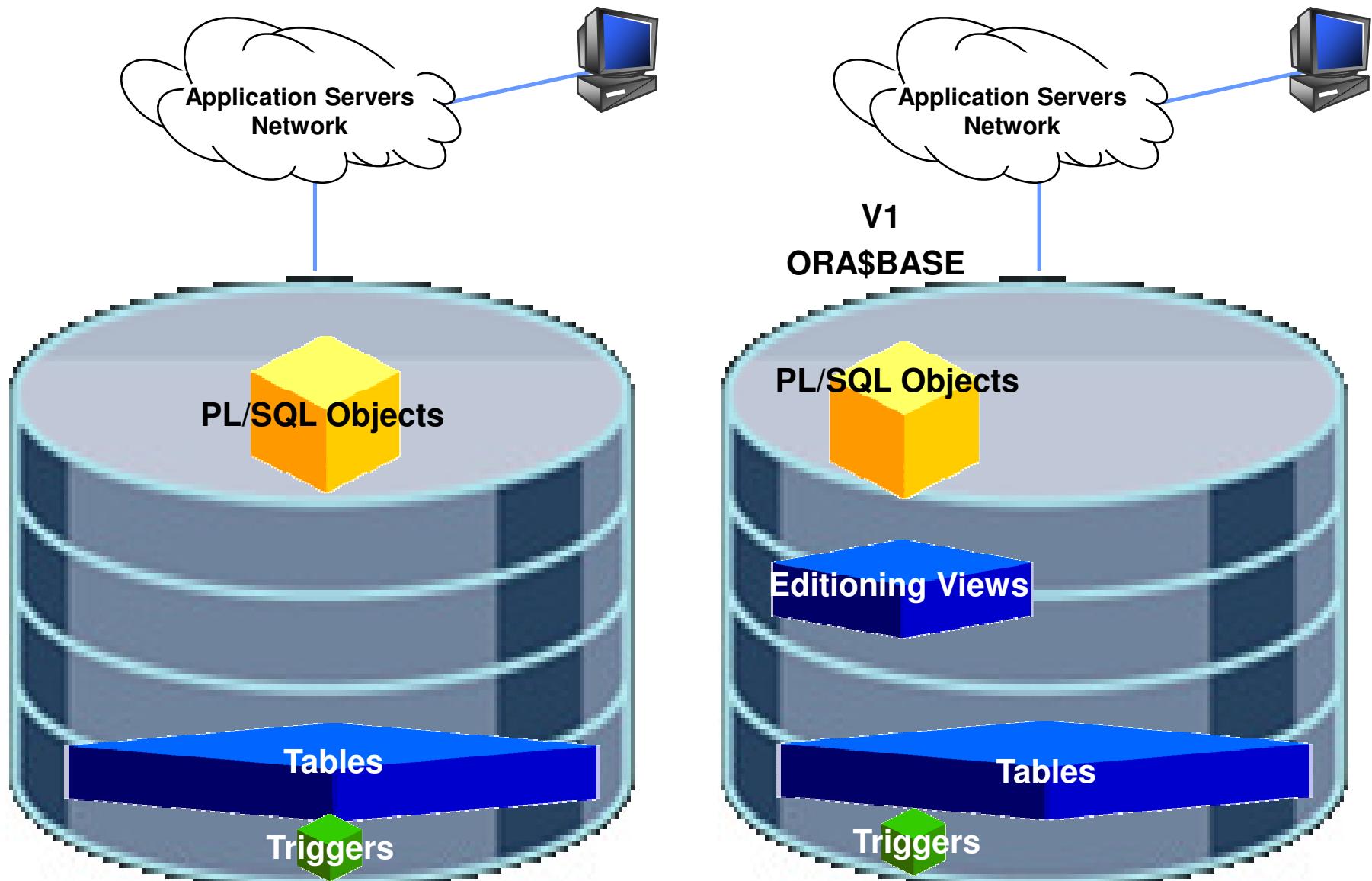
# Application Version 1

---

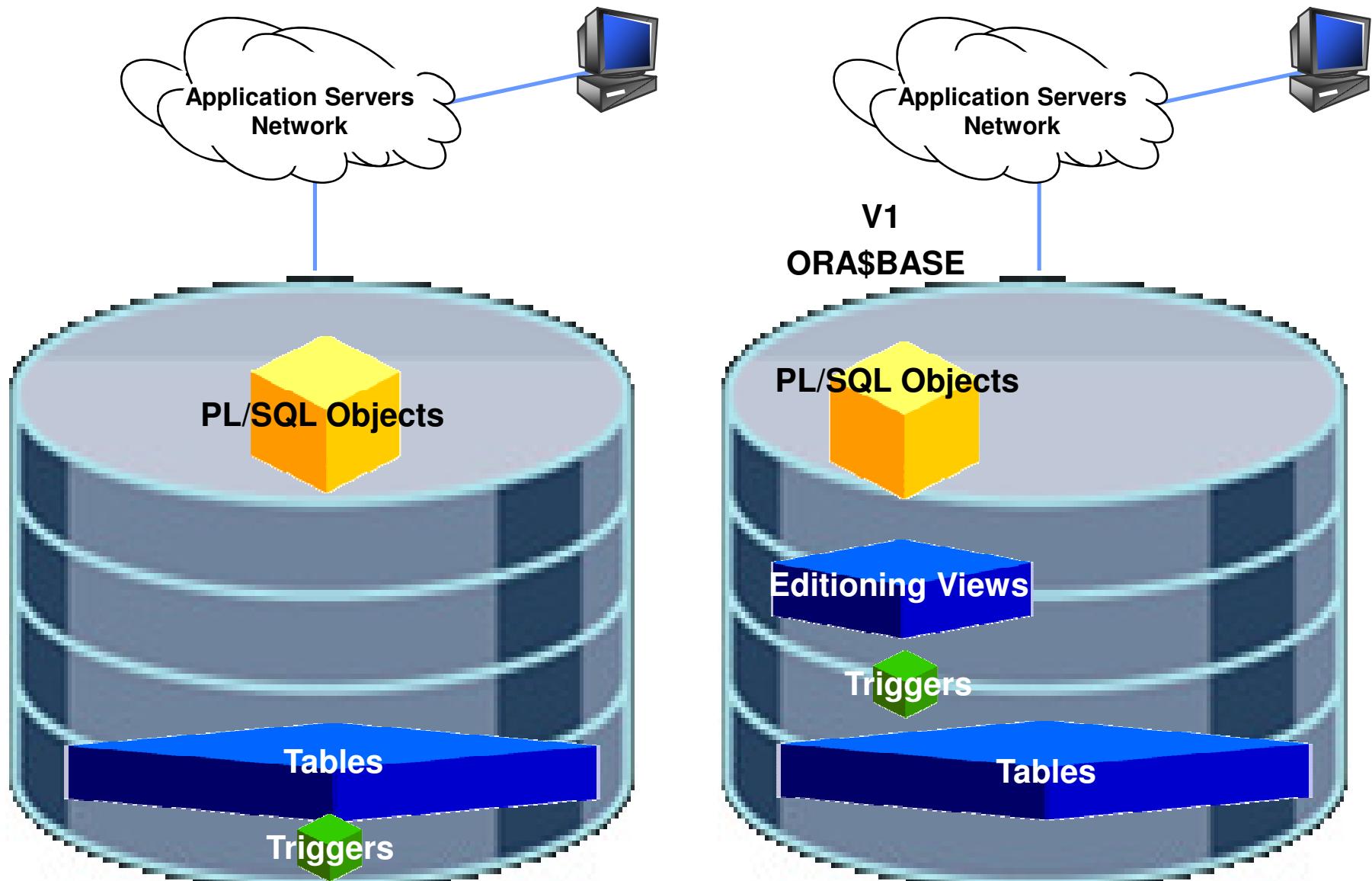


Move into separate schemas tables, views, and indexes that rely on PL/SQL objects

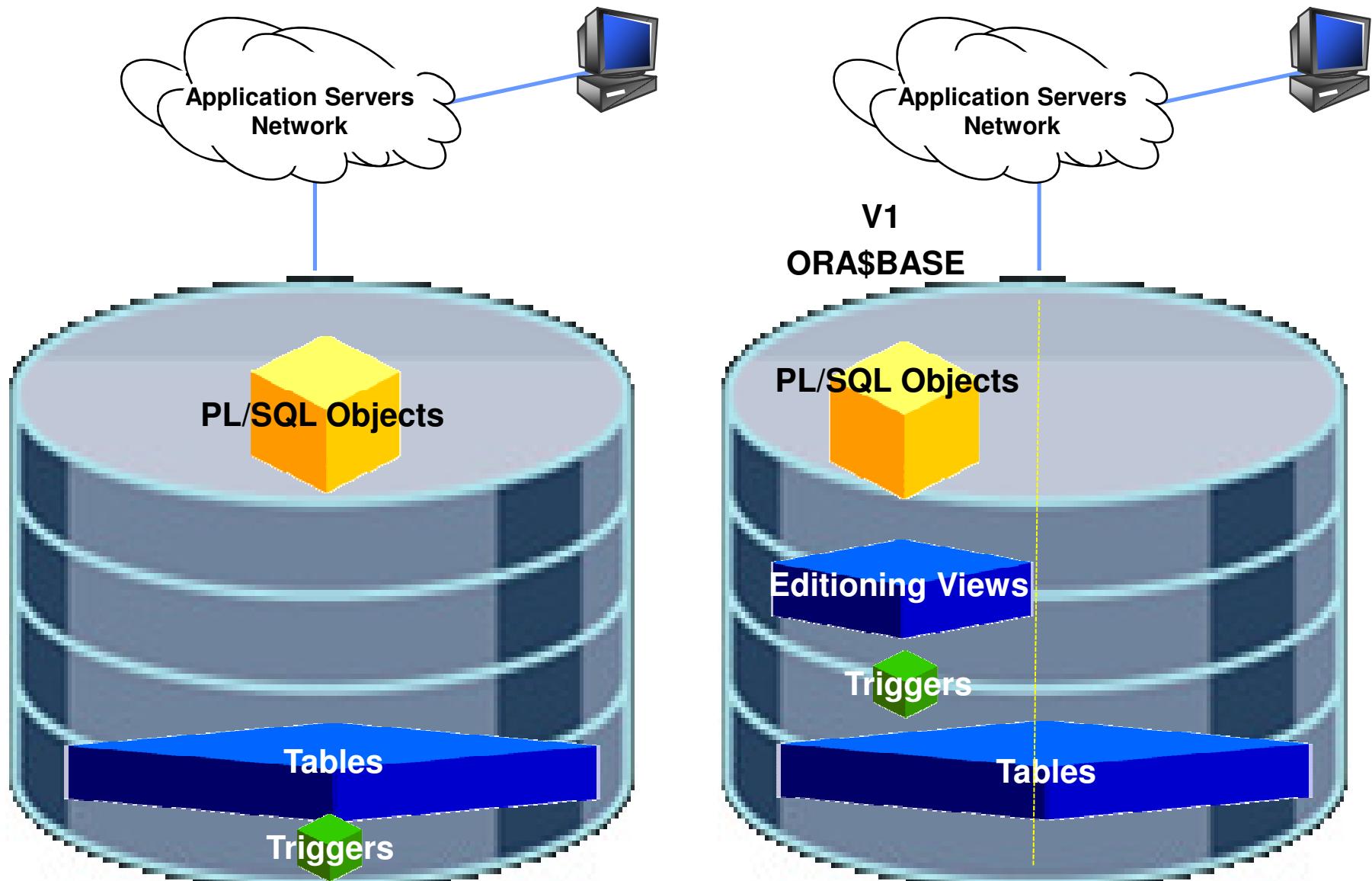
# Take Your Last Outage: Create Editioning Views



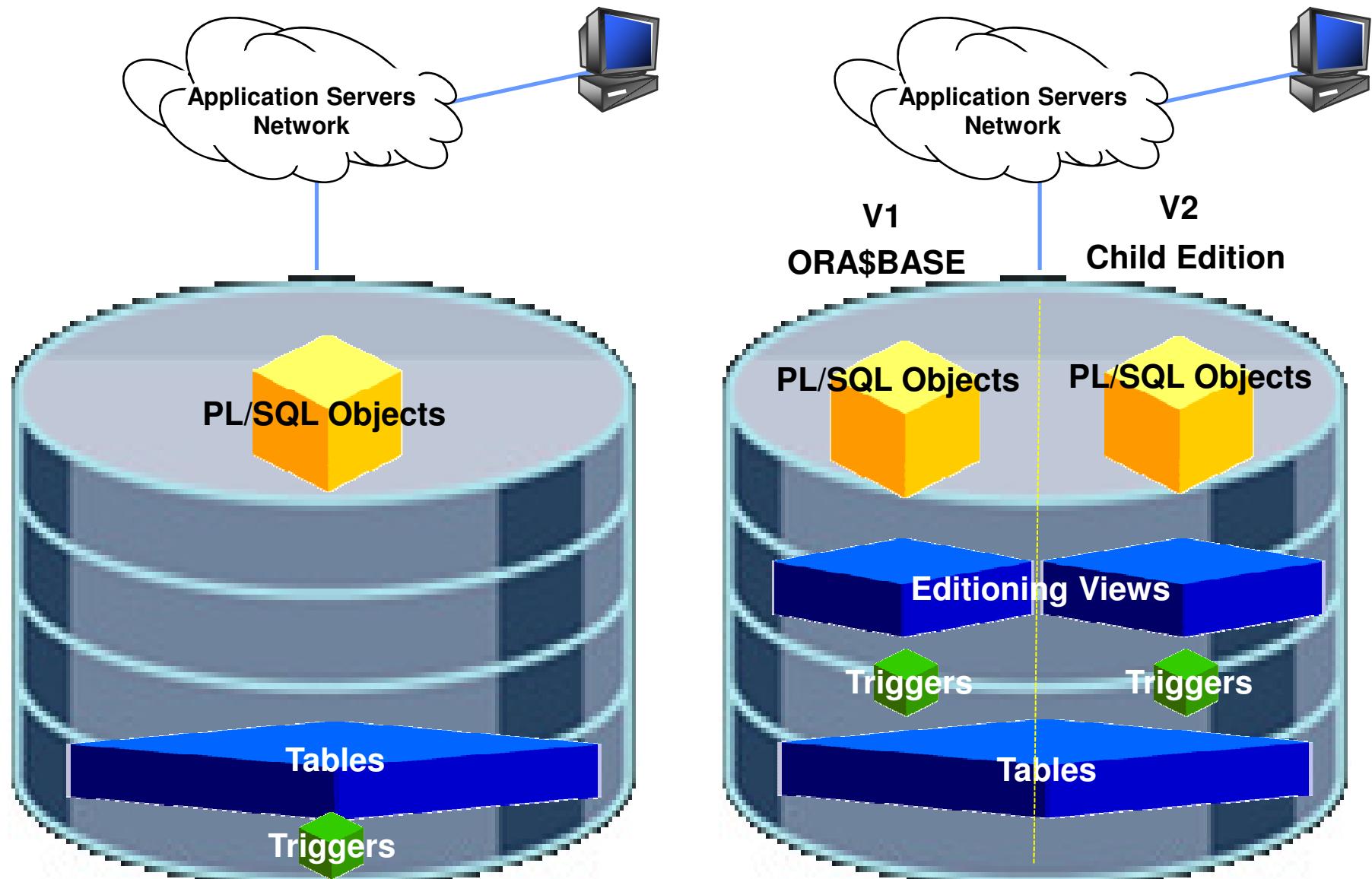
# Take Your Last Outage: Relocate Table Triggers



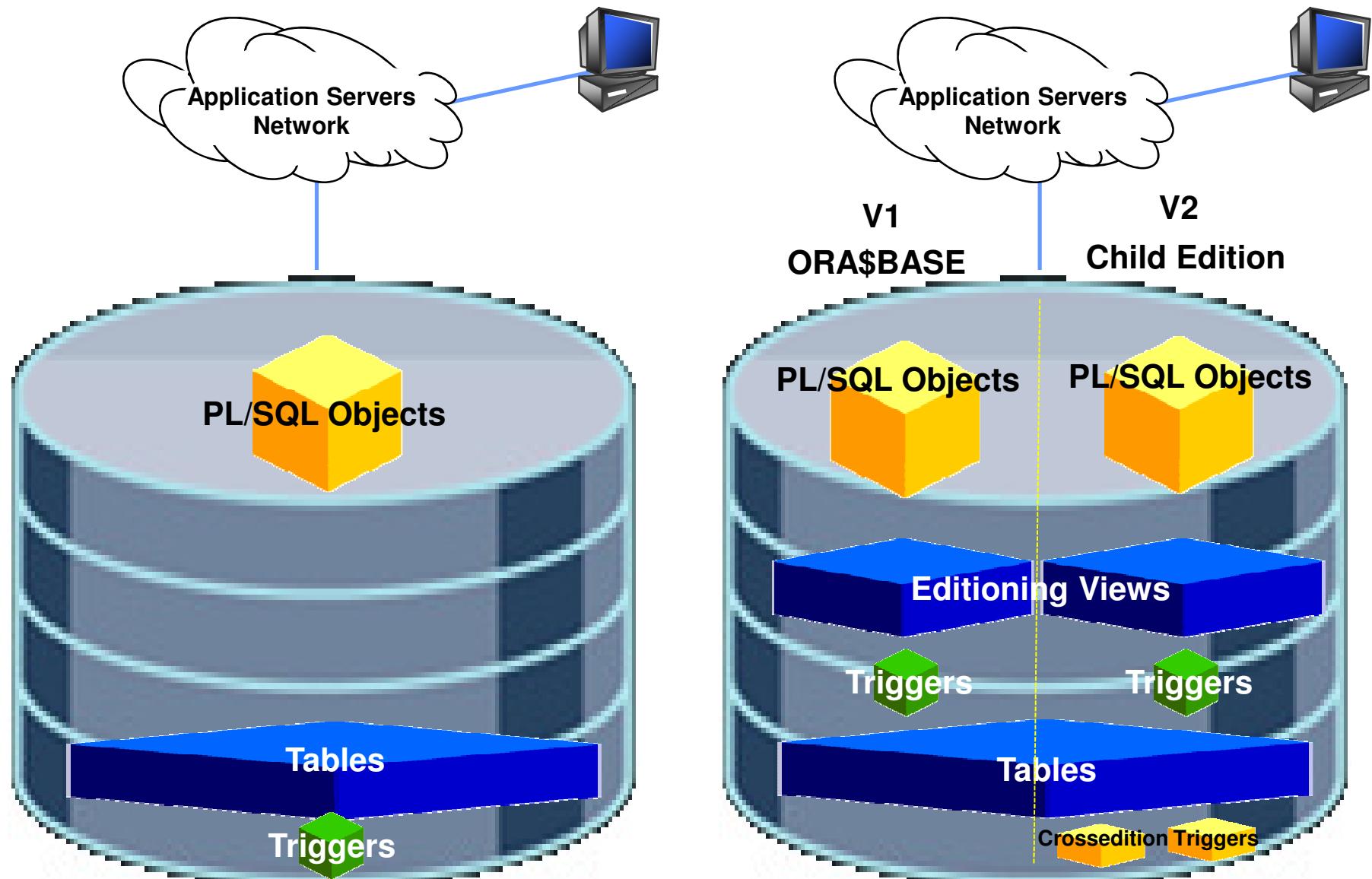
# Take Your Last Outage: Create Edition



# Take Your Last Outage: Objects Replicated by Pointer



# Take Your Last Outage: Objects Replicated by Pointer



## 11.2.0.2 Enhancements

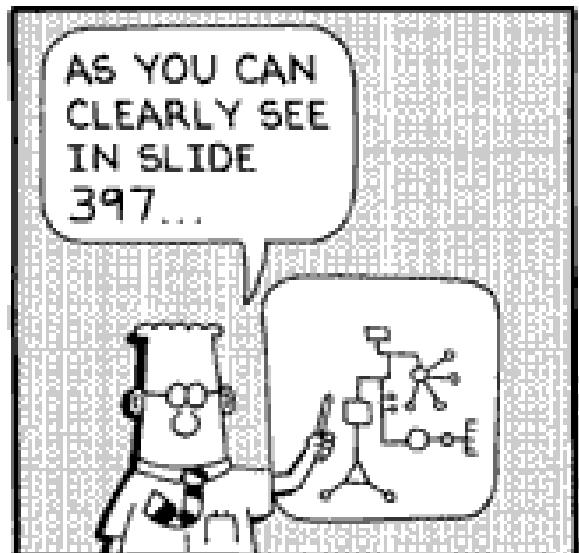
---

```
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);
```



Due to a formal complaints made to the Ministry of Public Health ...



you are now entering ...

... a ...

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# 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	29-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	-

# Questions

---

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



**All demos at [morganslibrary.org](http://morganslibrary.org)**

- **Library**

**Thank you**