What you need to know about Edition Based Redefinition

Western Washington Oracle Uses Group

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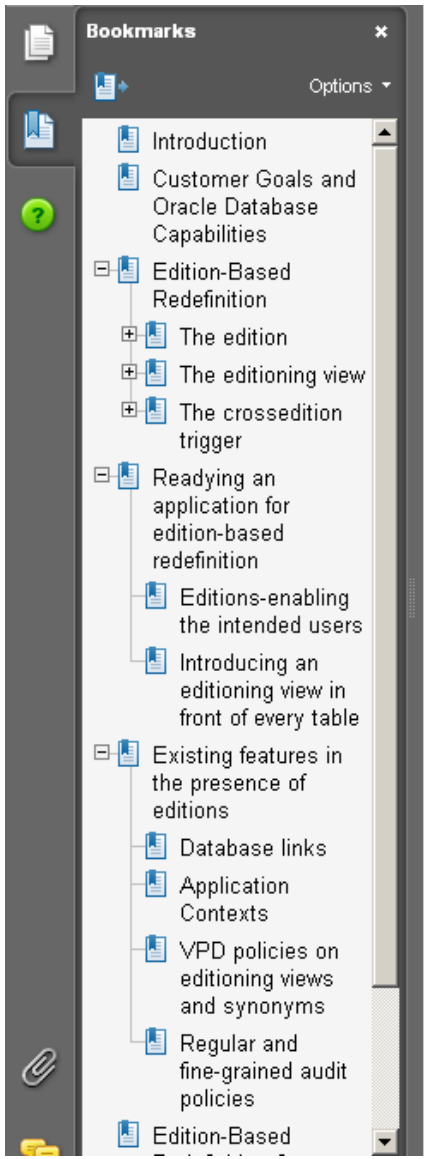
  - OpenWorld, Collaborate, Kaleidoscope, Brazil, Bulgaria, Canada, Chile, Costa Rica, Denmark, Estonia, Finland, Germany, Japan, New Zealand, Norway, Peru, Sweden, UK, US, Uruguay
- 12g Beta Tester

Bryn Llewellyn's White Paper

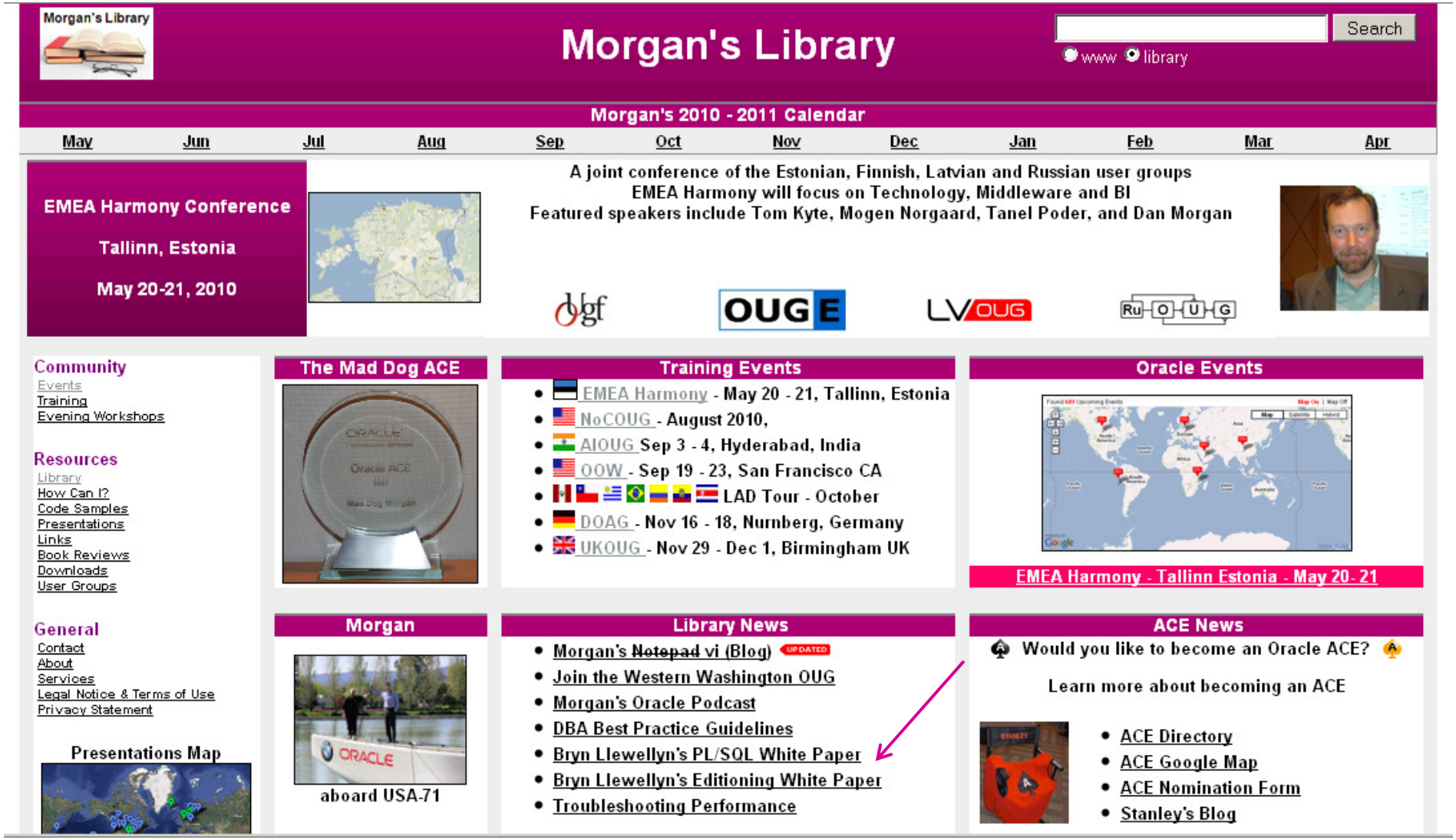


An Oracle White Paper
July 2009

Edition-Based Redefinition

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

Morgan's Library: www.morganslibrary.org



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

We learn to approach new experiences with care

because innocent 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 triggers firing orders?
- Can a database have an object without an owner?
- What does it mean to grant USE?
- Name an Oracle process that is editioned

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 possible before 11gR2**

Online Redefinition

What is Online redefinition?

- In any database system, it is occasionally necessary to modify the logical or physical structure of a table to
  - accommodate application changes
  - improve the performance of queries or DML
  - manage storage
- Online Redefinition provides a mechanism for making table structure modifications without significantly affecting table availability
- When a table is redefined online, it is
  - accessible to both queries and DML
  - locked in the exclusive mode only during a very small window that is independent of table size and redefinition complexity
  - completely transparent to applications and users
- Requires an amount of free space that is approximately equivalent to the space used by the table being redefined
- In the Oracle database since version 9.0.1 (2001)

Features of Online Redefinition

- Online table redefinition zero downtime provides
  - Modification of storage parameters of a table or cluster
  - Relocation of a table or cluster to a different tablespace
  - Add, modify, or drop one or more columns in a table or cluster
  - Redefinition of a column's data type or size
  - Column renaming
  - Changes to the data in one or more columns
  - Add or drop partitioning support (non-clustered tables only)
  - Change partition structure
  - Change physical properties of a single table partition, including moving it to a different tablespace in the same schema
  - Changes to physical properties of a materialized view log
  - Addition of parallel query support
  - Re-creating a table or cluster to reduce fragmentation

Online Redefinition Steps

- To redefine a table online
  - Choose the redefinition method: by key or by rowid
  - Verify that the table can be redefined online by invoking the built-in CAN_REDEF_TABLE procedure
  - Create an empty interim table with all of the desired logical and physical attributes
  - The entire process, thereafter, is completely automated as shown in the working code on the following slide

Redefinition Sample Code

The following sample is 100% of the code required to take a table named EMP, rename the ENAME column to NAME and change it from VARCHAR2(10) to VARCHAR2(100), drop the JOB and MGR columns, rename the SAL column to SALARY while changing its data type from NUMBER(7,2) to NUMBER, and multiplying the column values by 1.1, drop the COMM column, sort the resulting data into the EMP table by employee number, and change the code of the BU1_HIREDATE trigger

```
BEGIN
  dbms_redefinition.can_redef_table('UWCLASS', 'EMP', dbms_redefinition.cons_use_pk);

  dbms_redefinition.start_redef_table('UWCLASS', 'EMP', 'INT_EMP', 'EMPNO EMPNO,
    ENAME NAME, SAL*1.10 SALARY, HIREDATE HIREDATE, DEPTNO DEPTNO',
    orderby_cols=>'EMPNO');

  dbms_redefinition.register_dependent_object('UWCLASS', 'EMP', 'INT_EMP',
    dbms_redefinition.cons_trigger, 'UWCLASS', 'bu1_hiredate', 'bu2_hiredate');

  dbms_redefinition.copy_table_dependents('UWCLASS', 'EMP', 'INT_EMP', 0,
    copy_constraints=>TRUE, num_errors=>retval);

  dbms_redefinition.sync_interim_table('UWCLASS', 'EMP', 'INT_EMP');
  dbms_redefinition.finish_redef_table('UWCLASS', 'EMP', 'INT_EMP');
END;
 /
```

... all without an outage or loss of service

EBR Basics

EBR From 10,000ft

- 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 10,000ft

- 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 1,000ft

- 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 1,000ft

- Non-Editionable 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 100ft

- 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 100ft

- 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_Num_1, :NEW.Country_Code_2, :NEW.Phone_Num_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_Num_2, '-', '.')
     ELSE
       '011.'||LTRIM(:NEW.Country_Code_2, '+')||'.'|| REPLACE(:NEW.Phone_Num_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

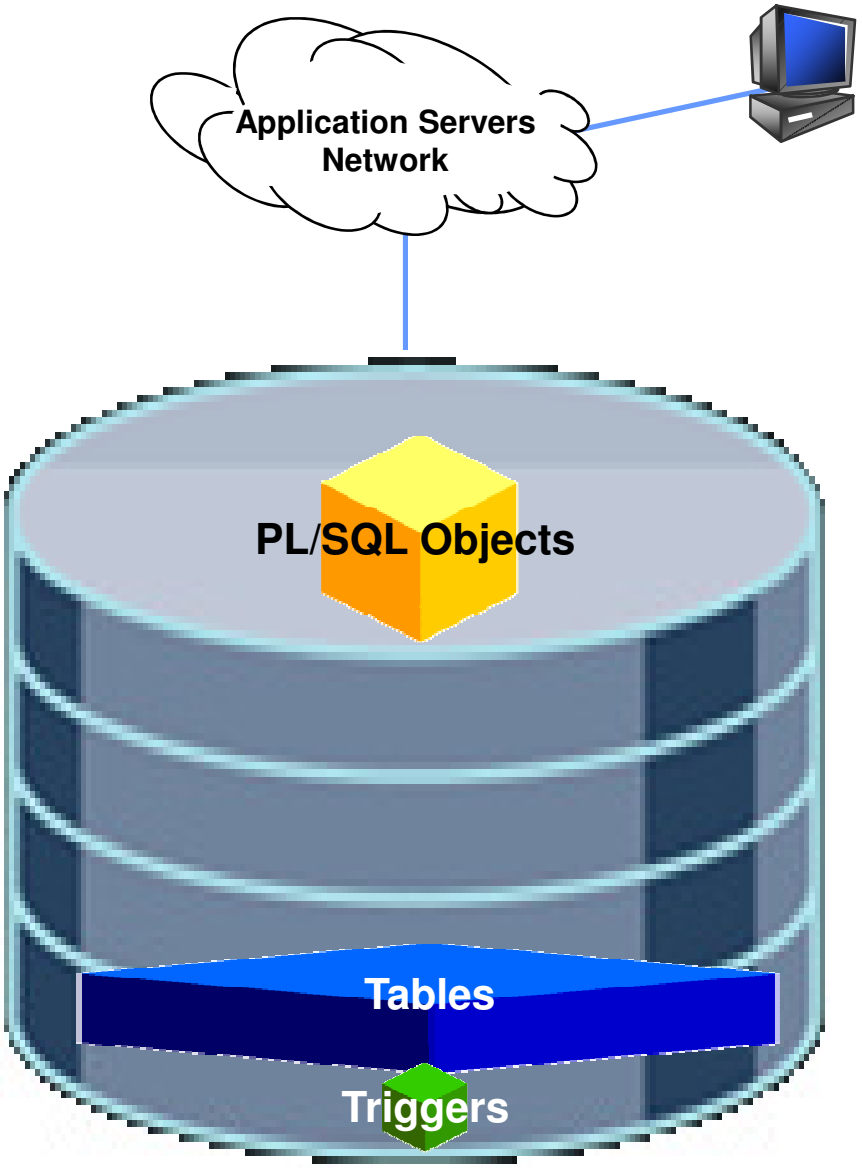
11.2.0.2 Enhancements

```
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);
```

EBR Implementation

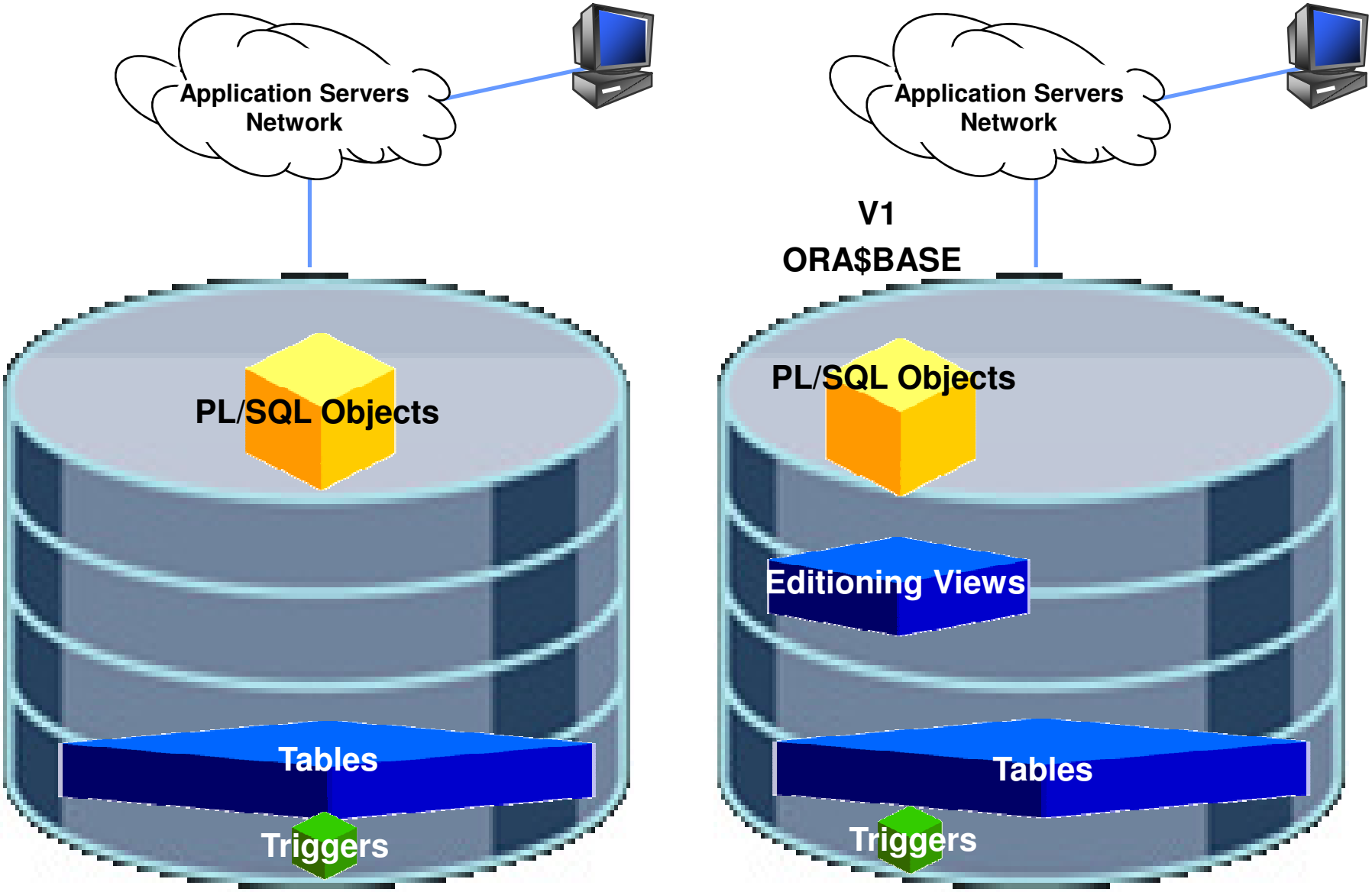
Application Version 1



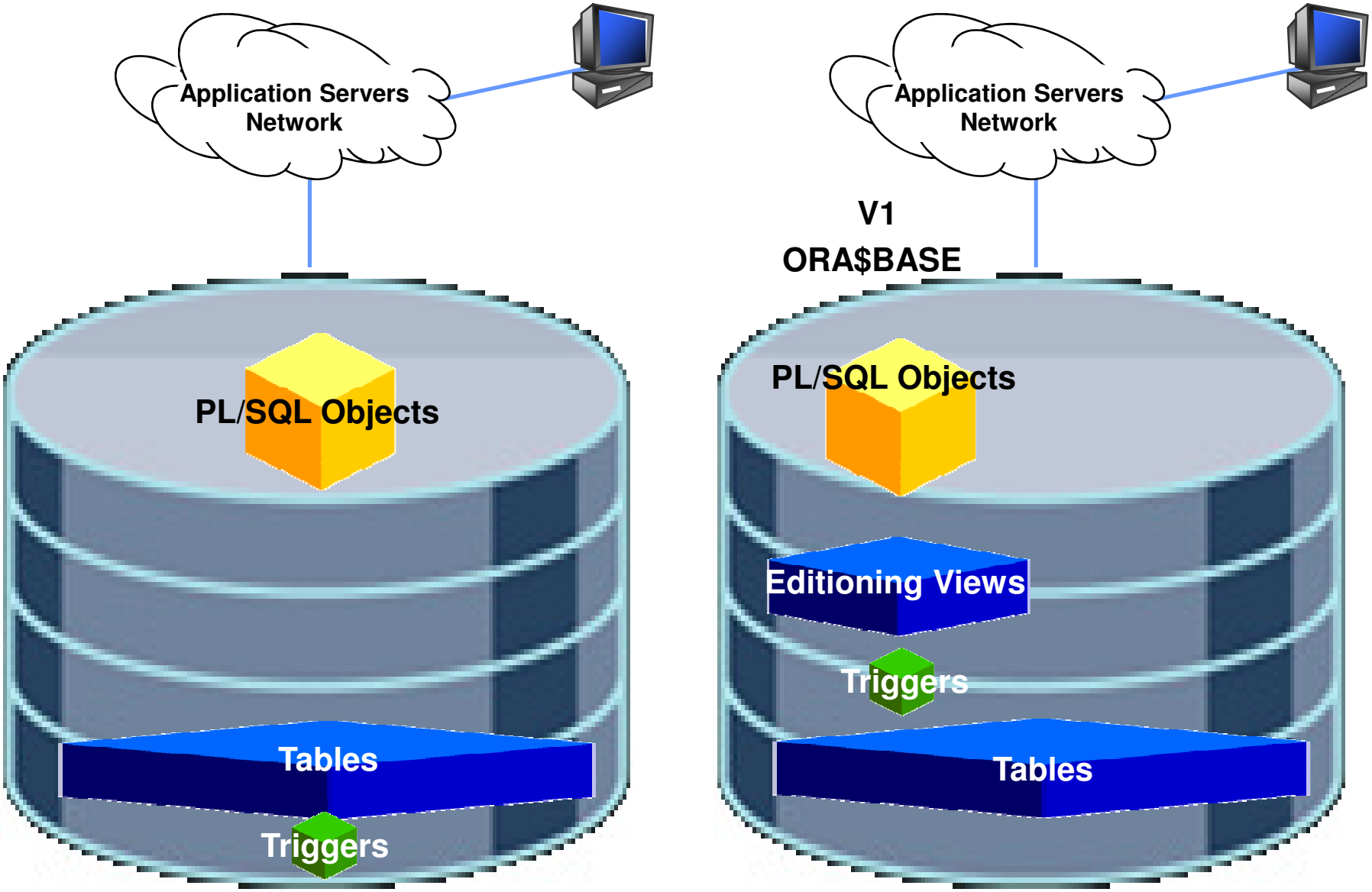
Move into separate schemas tables, views, and indexes that rely on PL/SQL objects

A non-editioned object cannot depend upon an editioned object

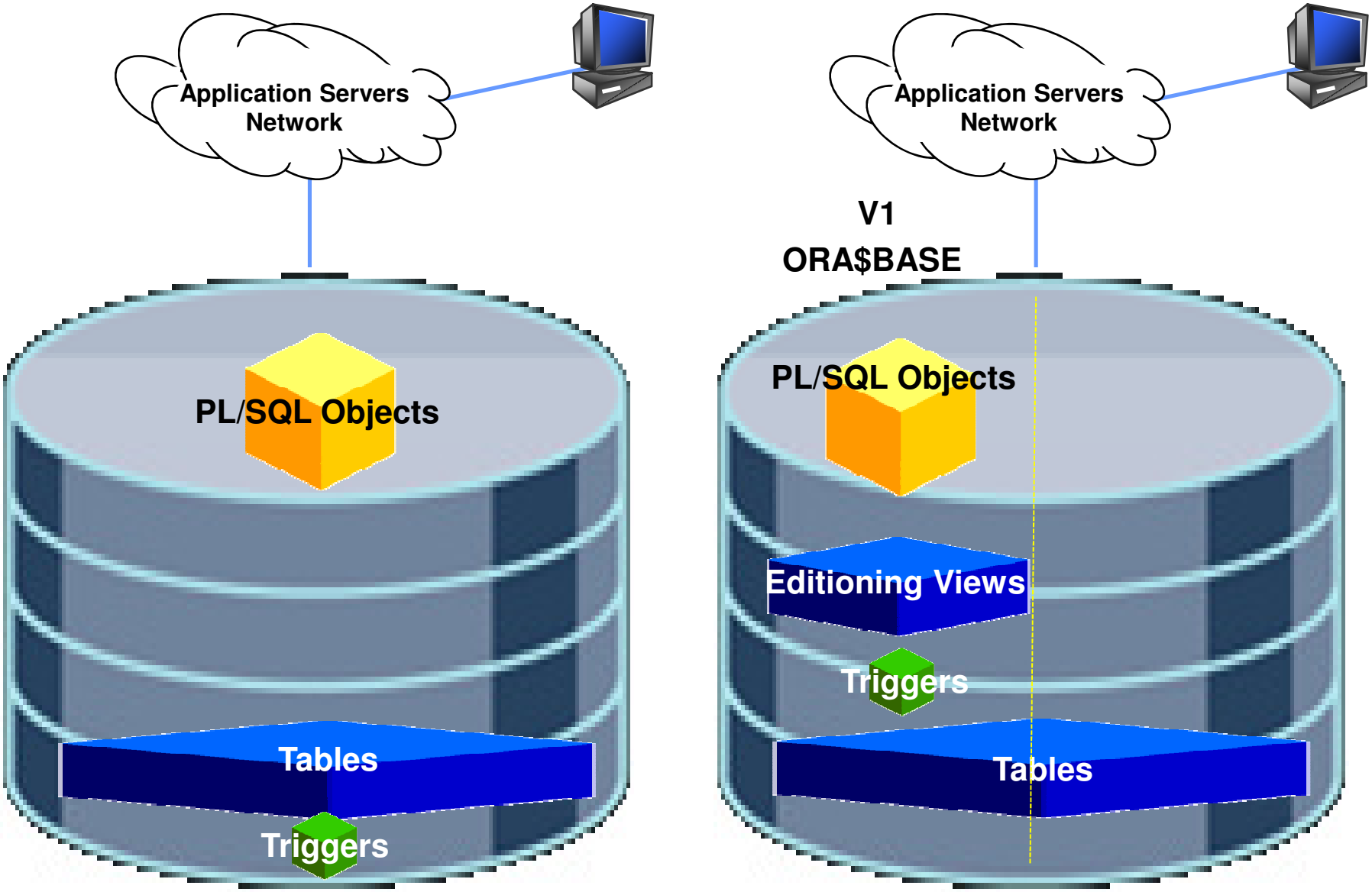
Take Your Last Outage: Create Editioning Views



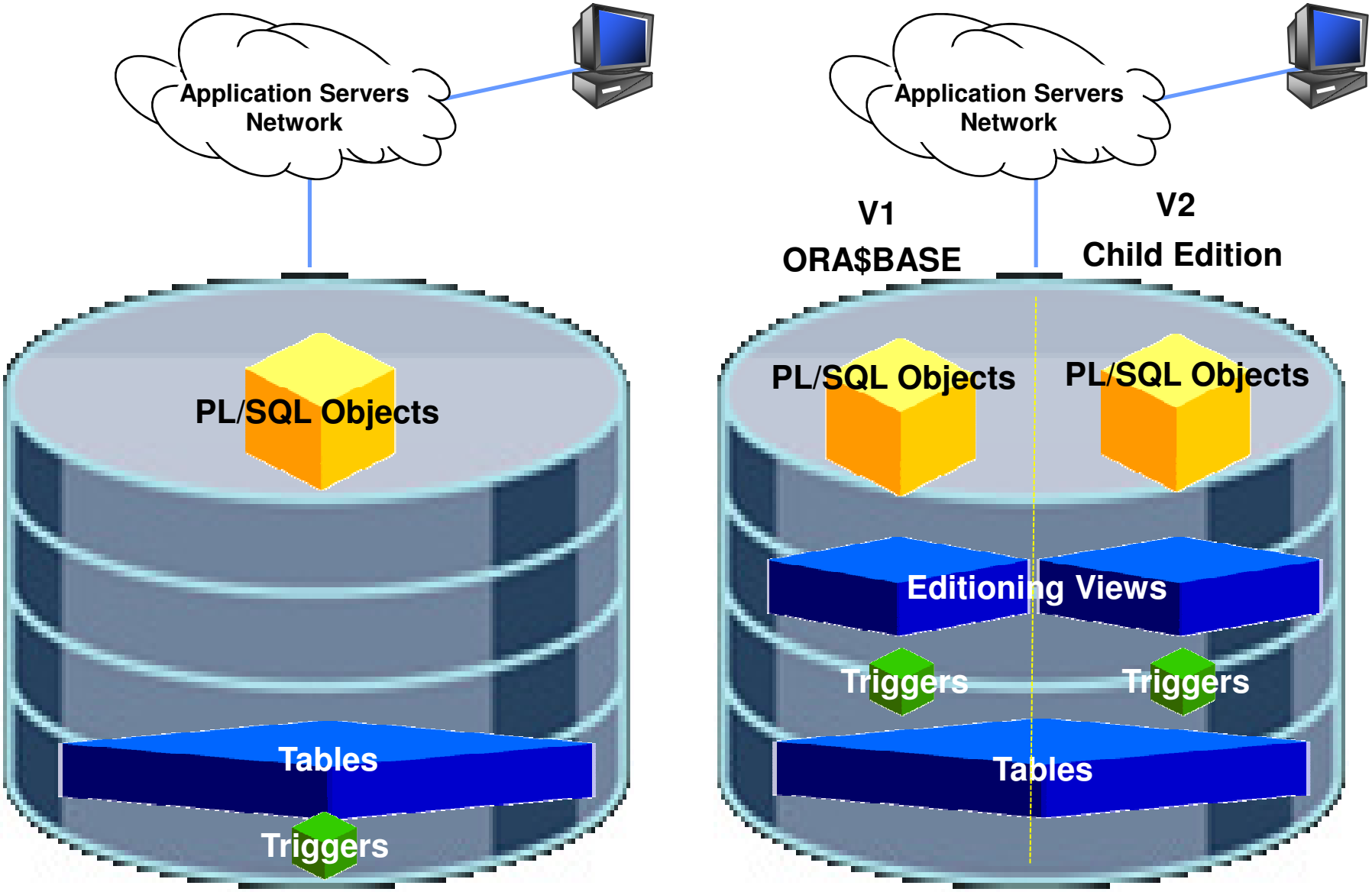
Take Your Last Outage: Relocate Table Triggers



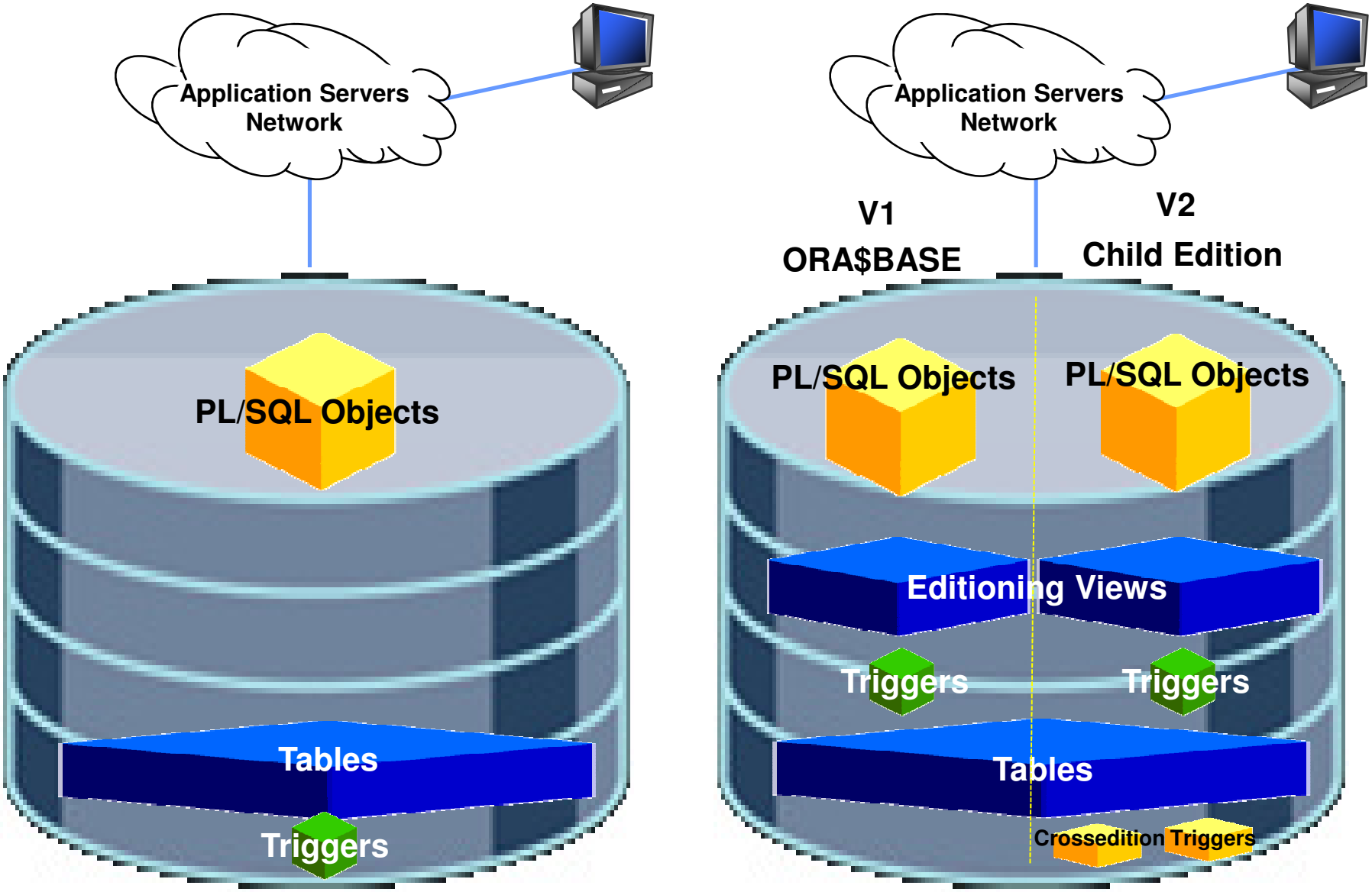
Take Your Last Outage: Create Edition



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 is that you add new additions and they accumulate and they do no harm

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	-

Health Warning

Due to complaints made to OSHA, and Washington Attorney General's Consumer Protection Division ...

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