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# Edition Based Redefinition


Zero Downtime Application Upgrades



presentation for:  
**NoCOUG Summer 2010**

# 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, Sweden, UK & US
- 11g Beta Tester



# cd \$MORGAN\_HOME




```
cd $MORGAN_HOME
```

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



## Morgan's Library


www library

### Morgan's 2010 - 2011 Calendar

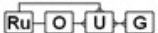




May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr

#### 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



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- [EMEA Harmony](#) - May 20 - 21, Tallinn, Estonia
- [NoCOUG](#) - August 2010,
- [AIOUG](#) 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

#### Oracle Events



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#### Morgan



aboard USA-71


#### Library News

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- [Bryn Llewellyn's Editioning White Paper](#)
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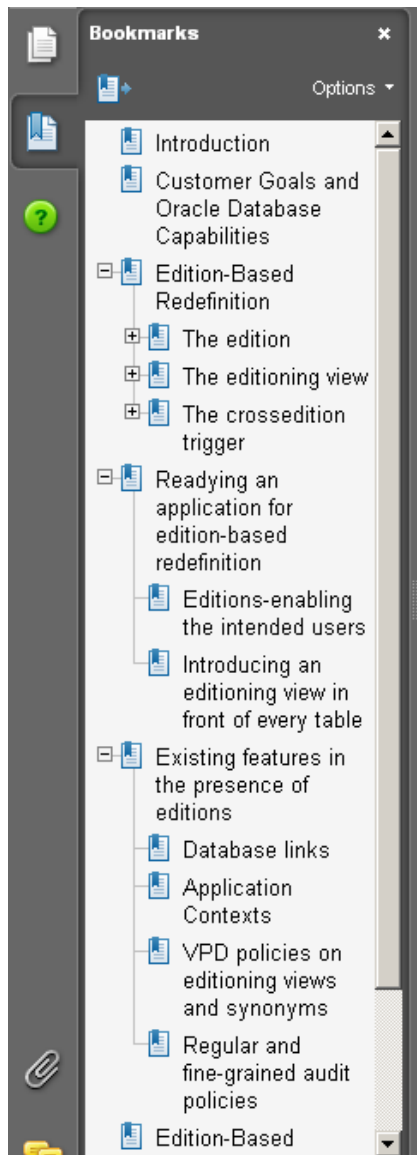


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Edition Based Redefinition in Oracle Database 11gR2

# 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

# Tom Kyte on Edition Based Redefinition

Oracle Technology Network

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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.

# OpenWorld Unconference

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## Oracle OpenWorld *Unconference*

Session ID	Title & Description
Unconference 21-Sep-2010 09:00 - 10:00	Title: Developer Coding Strategies for Very Large Databases <b>Track:</b> <u>Unconference</u> <b>Location:</b> Hotel Parc 55: Mason Room
S313426 21-Sep-2010 11:00 - 12:00	<b>Title:</b> Edition-Based Redefinition: Live in SQL*Plus <b>Track:</b> Database <b>Location:</b> Moscone South #302





# Mythology & Dinosaurs

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- Most Oracle DBAs and Developers are using Oracle 11g as though it was 8.0.5



- Maximum value comes from leveraging what is new

# 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 views with the same name exist in a 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 set the firing order of table triggers?
- Do you know how to actualize a stored procedure?
- What does it mean to grant USE to a schema?

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# EBR Basics

# Why Should We Care?

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- High availability
  - Amazon and Google are up 7 x 24 x 365
  - Our customers expect the same from us
- 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, Flashback
Software	Rolling Patches
Tables & Indexes	Online Redefinition/Create/Alter
Application Upgrades	N/A (not available ... until now with EBR)

# EBR at 50,000 ft.

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- A single technology that provides high availability during upgrades that will not:
  - Perturb users
  - Corrupt data
  
- A single technology that 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 (no extra licensing cost)

# EBR at 50,000 ft.

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- Changes to applications are evolutionary not revolutionary
- Data structures are stable
  - Add or drop a few columns, change a data type, alter some data
  - Maybe add or drop some indexes
- Only changing editionable objects
  - Implement a new edition
- Adding or removing columns from existing tables
  - Implement a new edition and editioning views
- Need to populate data between application versions
  - Implement a new edition and cross-edition triggers

# EBR at 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
- Introduces to the database three new object types
  - Edition
  - Editioning View
  - Crossedition Trigger
- As of 11gR2 editioning is mandatory for all Oracle databases whether a new installation or an upgrade

# EBR at 500 ft. - Three New Object Types

---

- **Edition** (only replacing PL/SQL, synonyms, and views)
  - All pre-upgrade editionable objects are part of a parent edition
  - New editions inherit (by pointer) editionable objects from the parent edition
  - All post-edition editionable objects are part of the child edition
- **Editioning View** (modifying table structures)
  - Exposes a different projection of a table into each edition
  - Allows each edition to see only its own columns
  - 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
- **Crossedition Trigger** (migrating data forward and backward)
  - Propagates data changes made by the parent edition into the child edition's columns, or (in hot-rollover) *vice-versa*



# EBR at 50 ft. - Editions

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- A nonschema object, uniquely, identified by only its name
- Like another non-schema object, the directory, is listed in `DBA_OBJECTS` as owned by `SYS` but has no owner
- Every database from 11.2 onwards, whether brand new or the result of an upgrade from an earlier version, non-negotiably, has at least one edition
- The default edition name is `ORA$BASE`
- Every foreground database session, at every moment throughout its lifetime, non-negotiably, uses a single edition
- A new edition must be the child of an existing edition
- A child edition is all that is required if an upgrade involves only synonyms, views, and PL/SQL objects

# EBR at 50 ft. - Edition Privileges

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- System Privileges
  - CREATE ANY EDITION
  - ALTER ANY EDITION
  - DROP ANY EDITION
- Object Privileges
  - USE (not granted by default)
- Roles
  - All three system privileges are granted to the DBA role (only)
  - USE is not, by default, granted to any user or role
- Enable Editioning
  - **ALTER USER <user\_name> ENABLE EDITIONS;**
  - **ALTER SESSION SET EDITION = <edition\_name>;**

# EBR at 5 ft. - Edition Enabled Data Dictionary Views

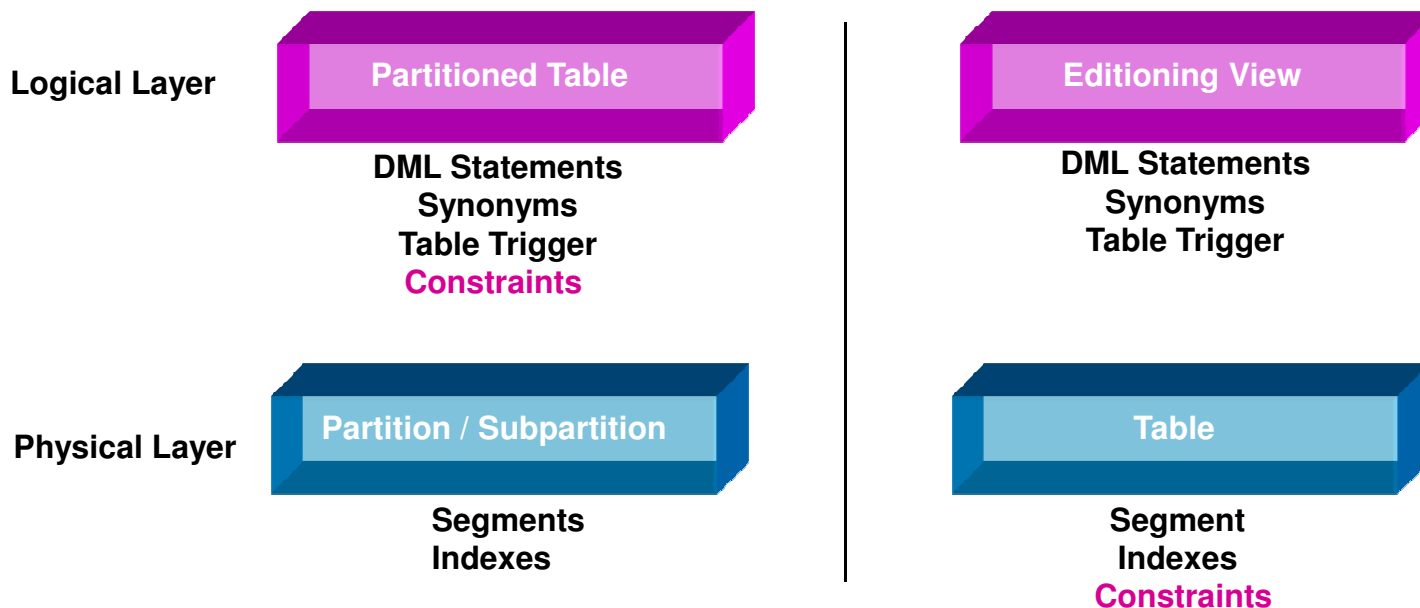
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- AUD\$ (obj\$edition)
- DBA\_EDITIONS (edition\_name, parent\_edition\_name)
- DBA\_OBJECTS (edition\_name)
- DBA\_OBJECTS\_AE (edition\_name)
- DBA\_SOURCE\_AE (edition\_name)
- DBA\_USERS (editions enabled)
- FGA\_LOG\$ (obj\$edition)
- UTL\_RECOMP\_ALL\_OBJECTS (edition\_name)
- V\$LOGMNR\_CONTENTS (edition\_name)
- V\$SESSION (session\_edition\_id)

**AE = All Editions**

# EBR at 500 ft. - Editioning Views

- A view that you may think of a partitioned table that can only have a single partition
  - Both must present all data "as is" ... no filters, no joins, no functions, no operators, no group by no having no order by no distinct no concatenations: just no ... no ... no and no
  - Your only choice is which columns to select (project)



If you can not do it when partitioning a table you can not do it in an editioning view

# EBR at 5 ft. - Editioning Views in the Data Dictionary

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- DBA\_EDITIONING\_VIEW\_COLS
- DBA\_EDITIONING\_VIEW\_COLS\_AE
- DBA\_EDITIONING\_VIEWS
- DBA\_EDITIONING\_VIEWS\_AE
- DBA\_ERRORS\_AE (editioning\_name)
- DBA\_OBJECTS\_AE (editioning\_name)
- DBA\_VIEWS (editioning\_view)

**AE = All Editions**

# EBR at 5 ft. - Editioning View DDL

---

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

**An editioning view can NEVER be more complex than this**

- No aggregation or concatenation
- No Joins
- No WHERE clause
- No GROUP BY clause
- No ORDER BY clause

# EBR at 50 ft. - Crossedition Triggers

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- A new type of trigger specific to editioning
- Distinct from application code
- Can only be created on a table (not on an editioning view)
- Populates pre-upgrade transactions into the post-upgrade edition (or) post-upgrade transactions into the pre-upgrade edition
- Two types
  - FORWARD
  - REVERSE
- Control trigger firing order control with [FOLLOWING and PRECEDING] keywords
- Nothing we do should affect the current application so crossedition triggers are always created in the child

# EBR at 50 ft. - Crossedition Trigger Firing Rules

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- Assumptions
  - All DDL is performed in the child edition so as not to disturb the working production application
  - All DDL to editioned objects is done in the post-upgrade edition
  - Pre-upgrade column changes are only changed in the parent
  - Post-upgrade columns are only changed in the child
- Forward Crossedition Triggers
  - Only fired by code running in the parent edition
  - Transforms from the old representation to the new
- Reverse Crossedition Triggers
  - Only fired by code running in the child edition
  - Transforms from the new representation to the old



# EBR at 5 ft. - Crossconditioning 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;
/
```

# EBR at 5 ft. - Editioning Views in the Data Dictionary

---

- DBA\_TRIGGERS
- DBA\_TRIGGER\_ORDERING
- DBA\_ERRORS\_AE (editioning\_name)
- DBA\_OBJECTS\_AE (editioning\_name)

**AE = All Editions**

# Other Editioning Related Objects

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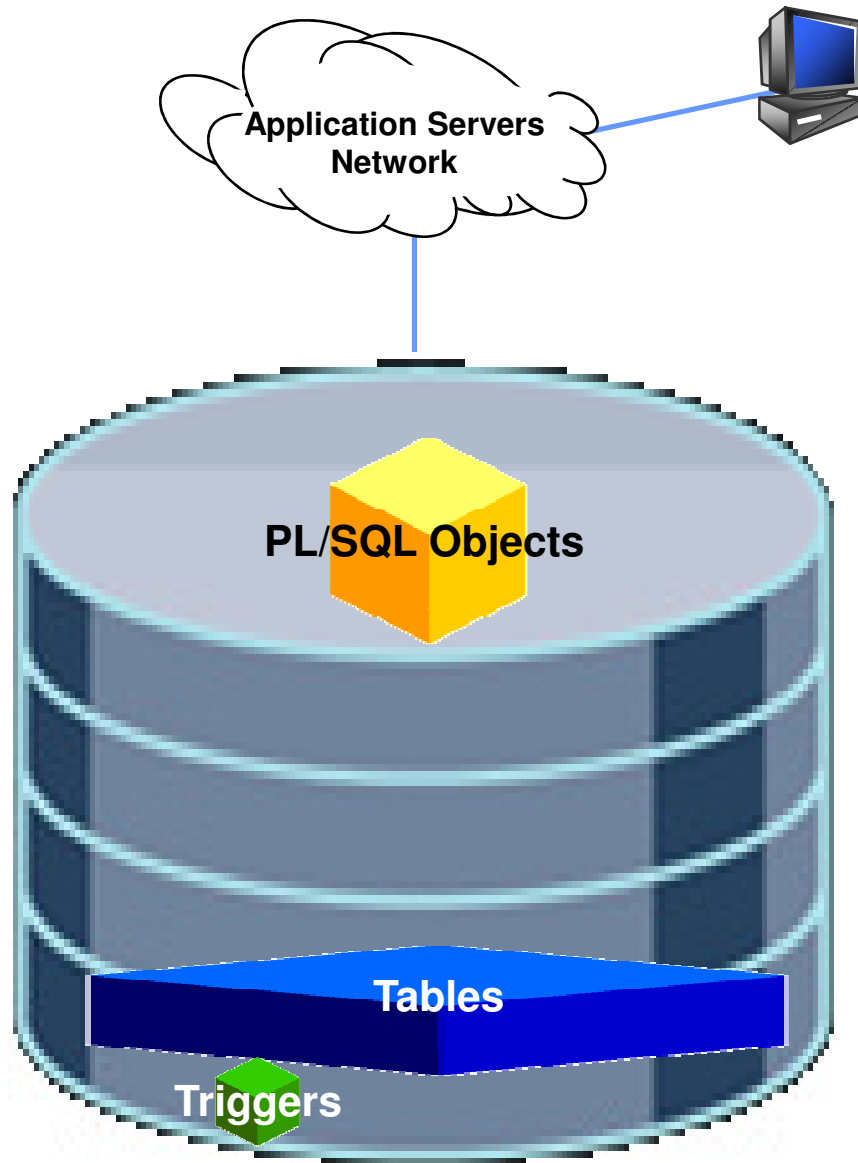
- DBMS\_EDITIONS\_UTILITIES
  - SET\_EDITIONING\_VIEWS\_READ\_ONLY
- DBMS\_METADATA\_UTIL.GET\_EDITIONID
- DBMS\_PARALLEL\_EXECUTE.RESUME\_TASK
- DBMS\_PARALLEL\_EXECUTE.RUN\_TASK
- DBMS\_SESSION.SET\_EDITION\_DEFERRED
- DBMS\_SQL.PARSE
- DBMS\_UTILITY.VALIDATE
- Invisible Indexes
- SYS\_CONTEXT Function

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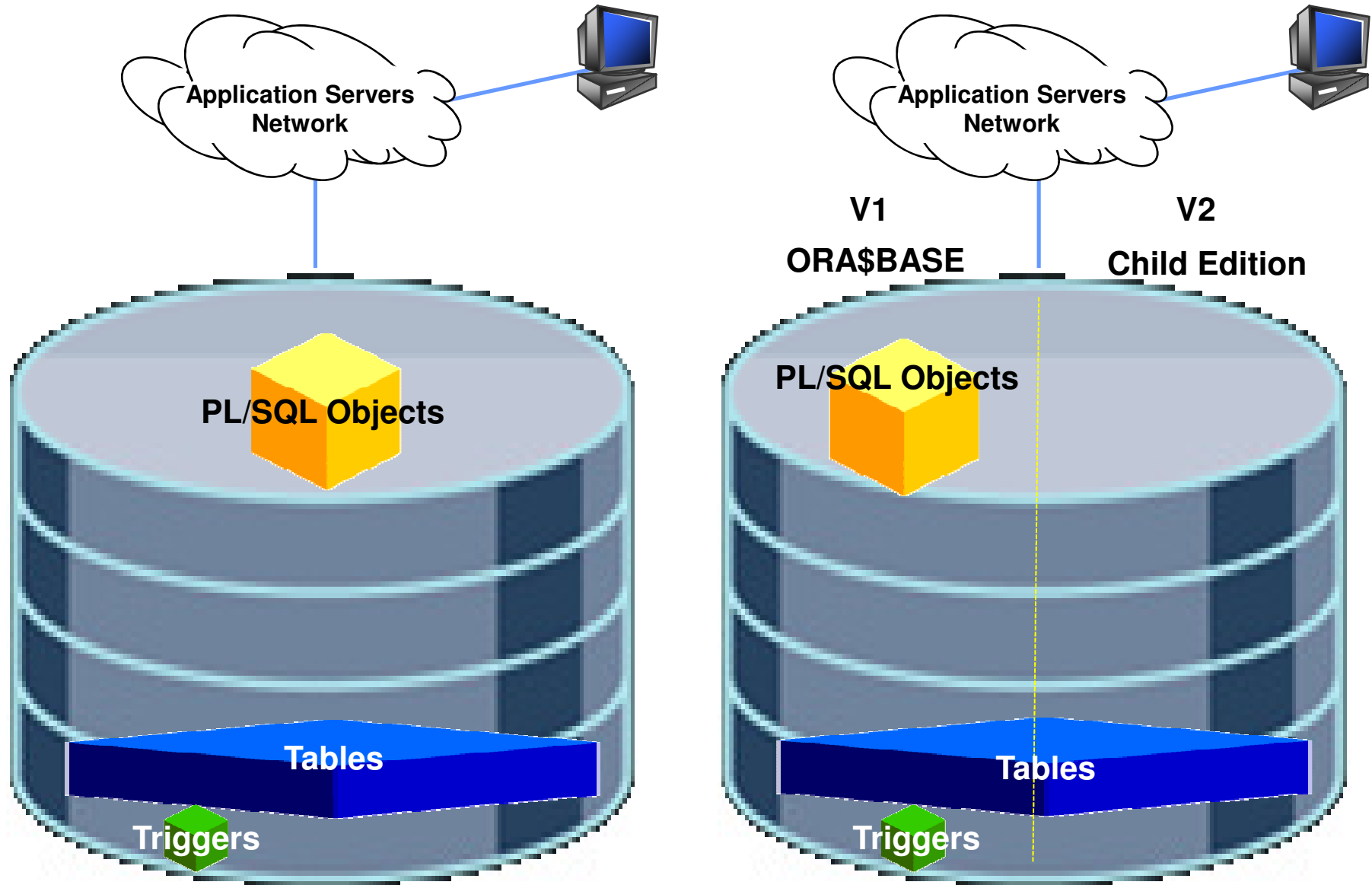
# EBR Implementation

# Application Version 1

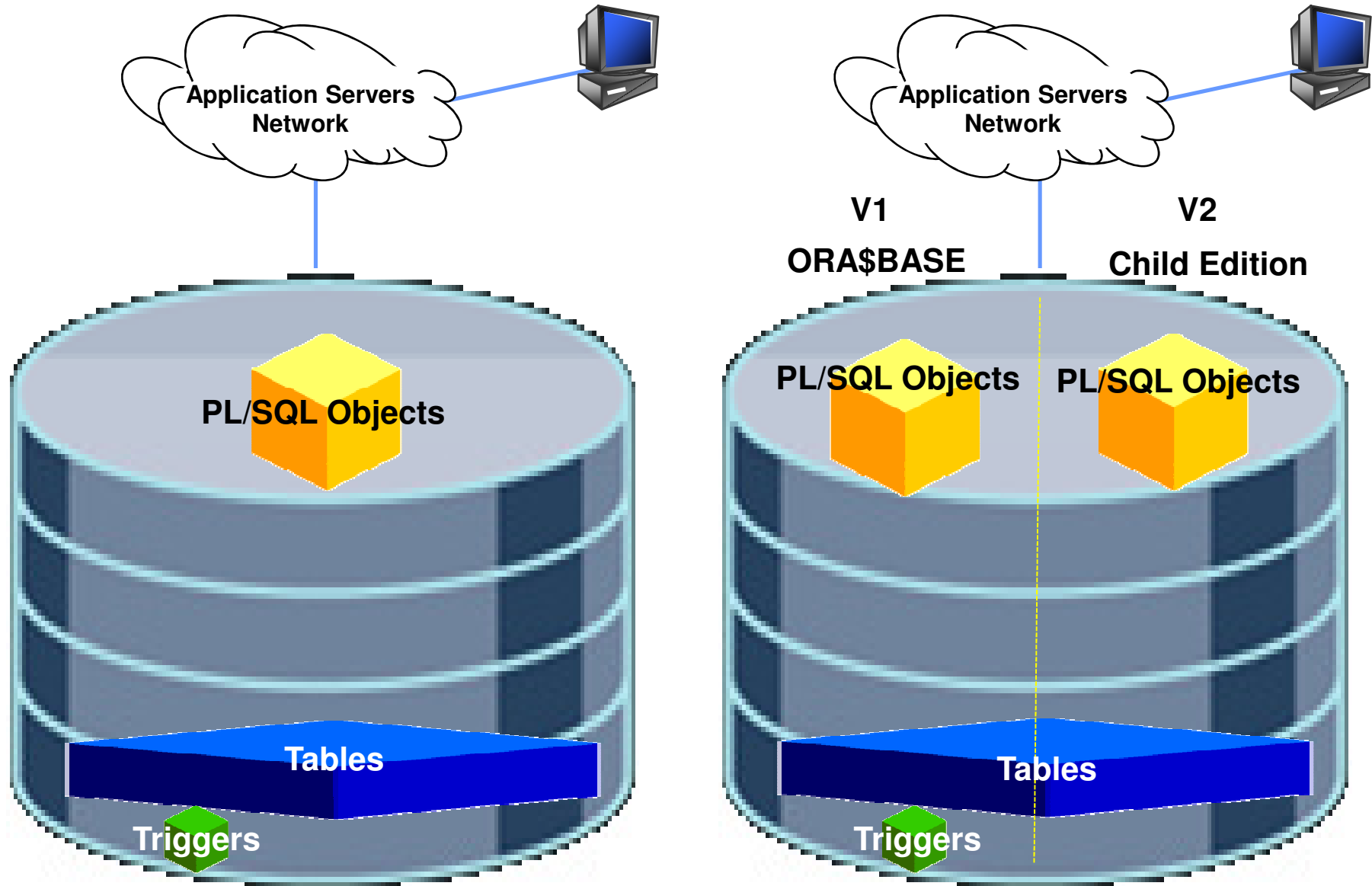
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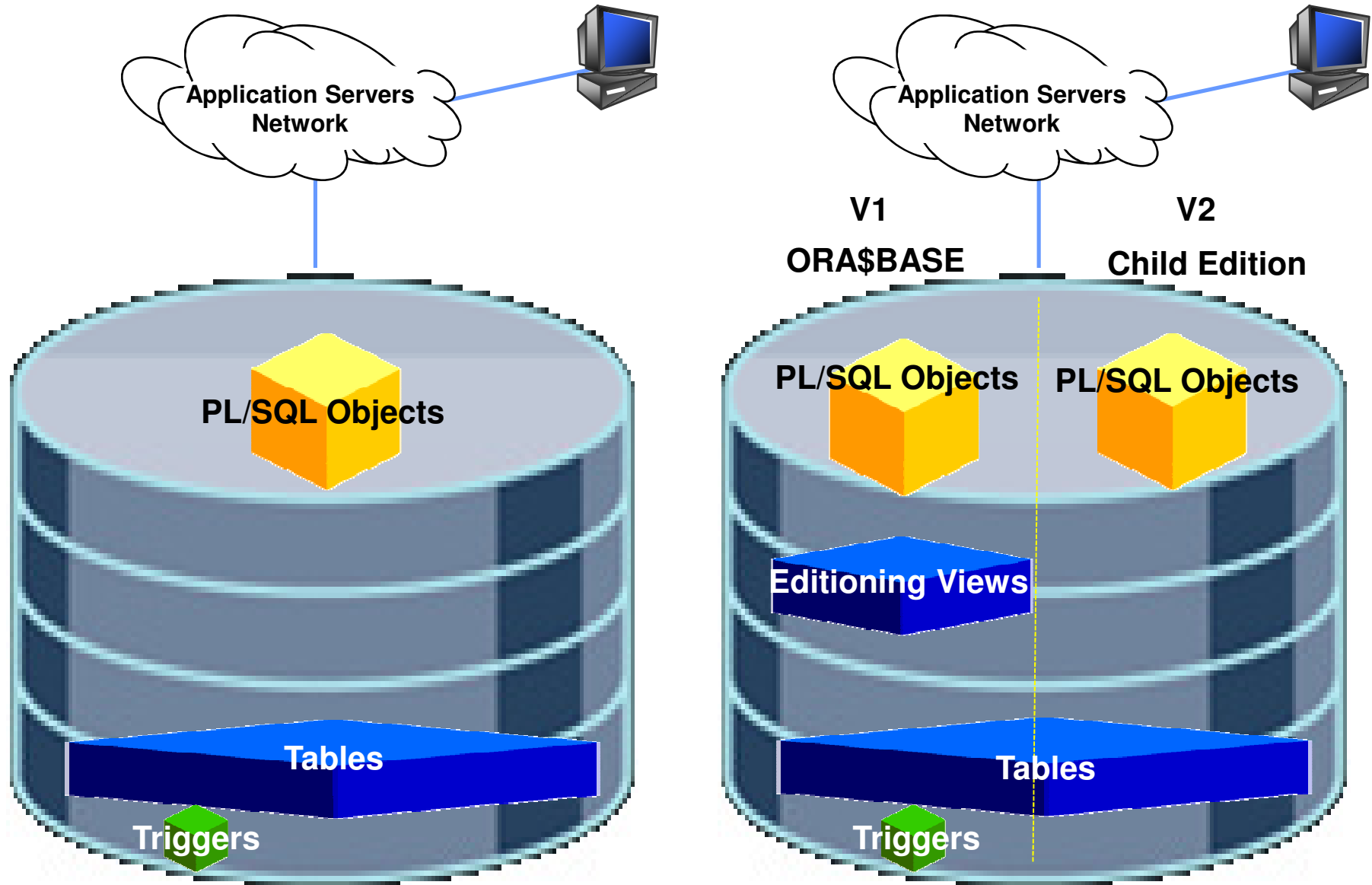
# Create Child Edition



# Create Child Edition

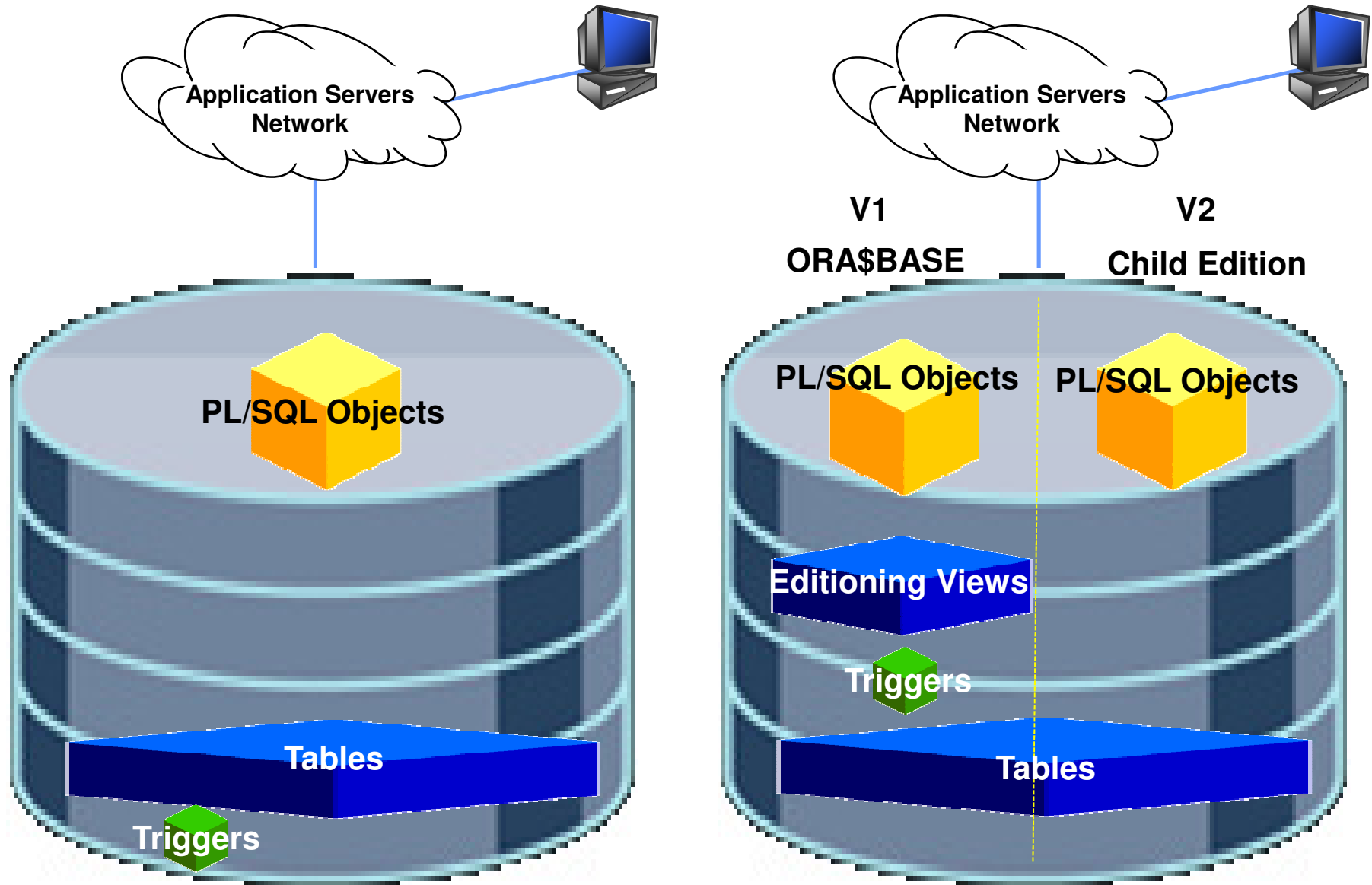


# Create Child Edition

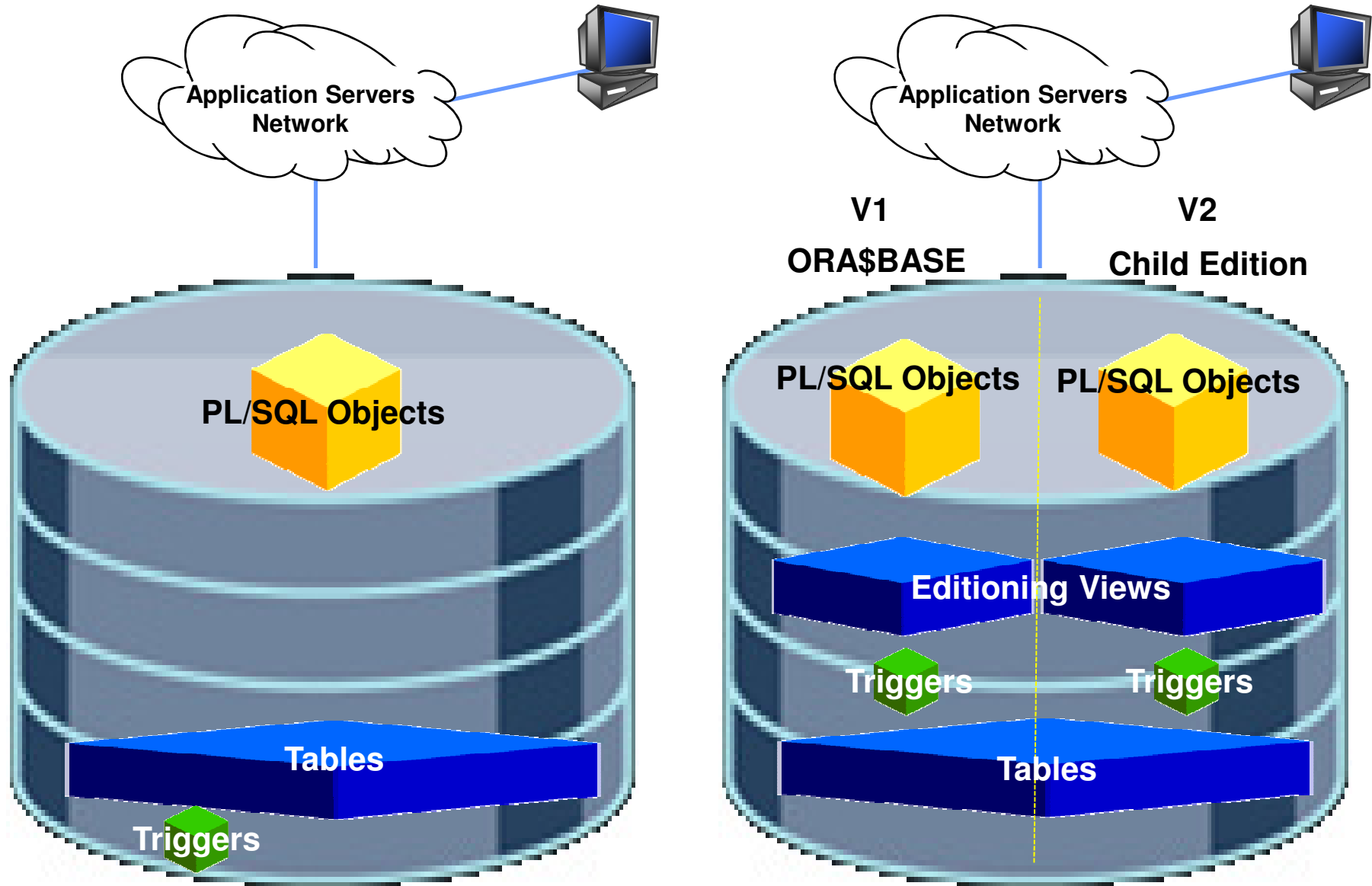




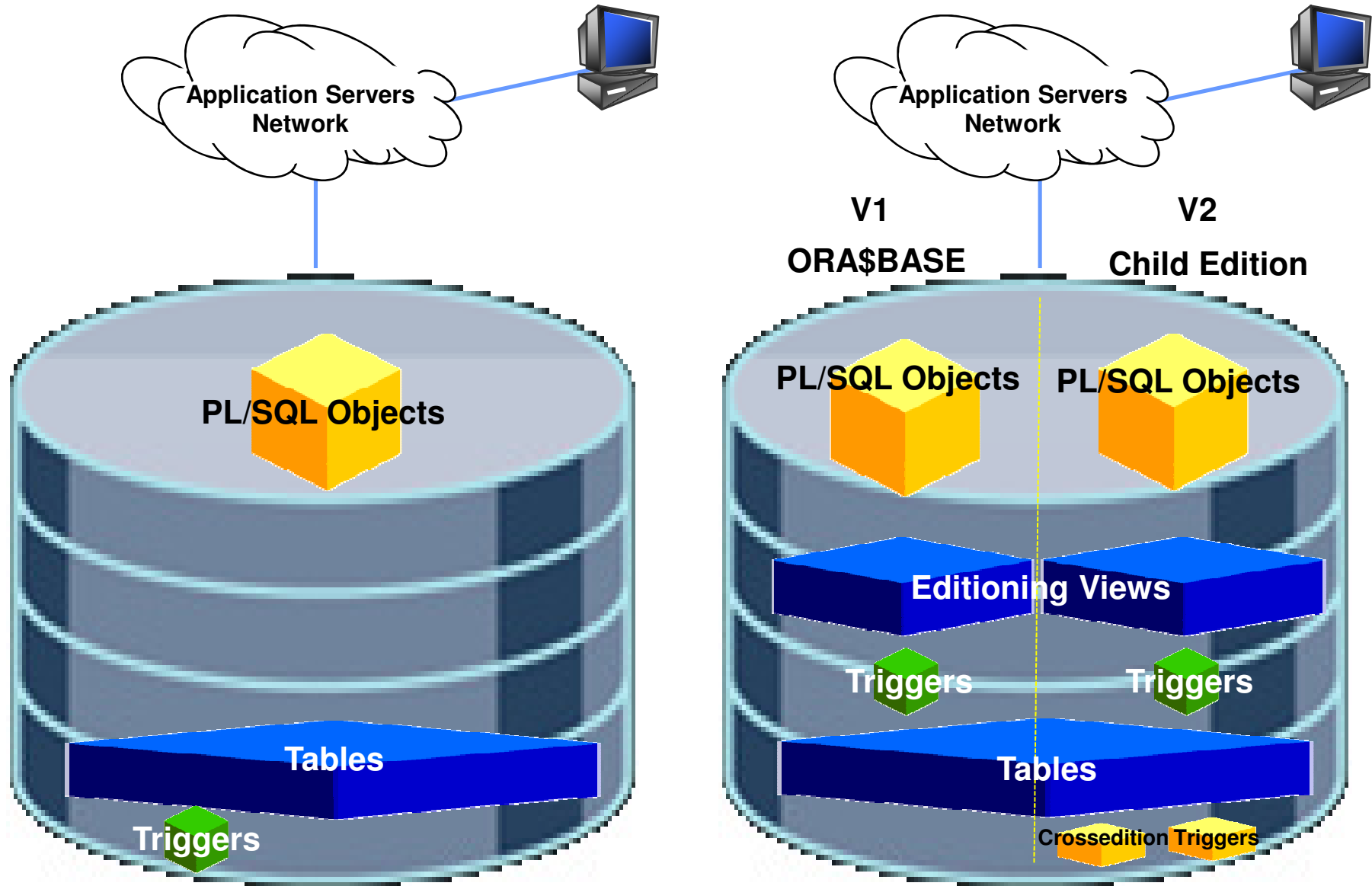
# Create Child Edition



# Create Child Edition



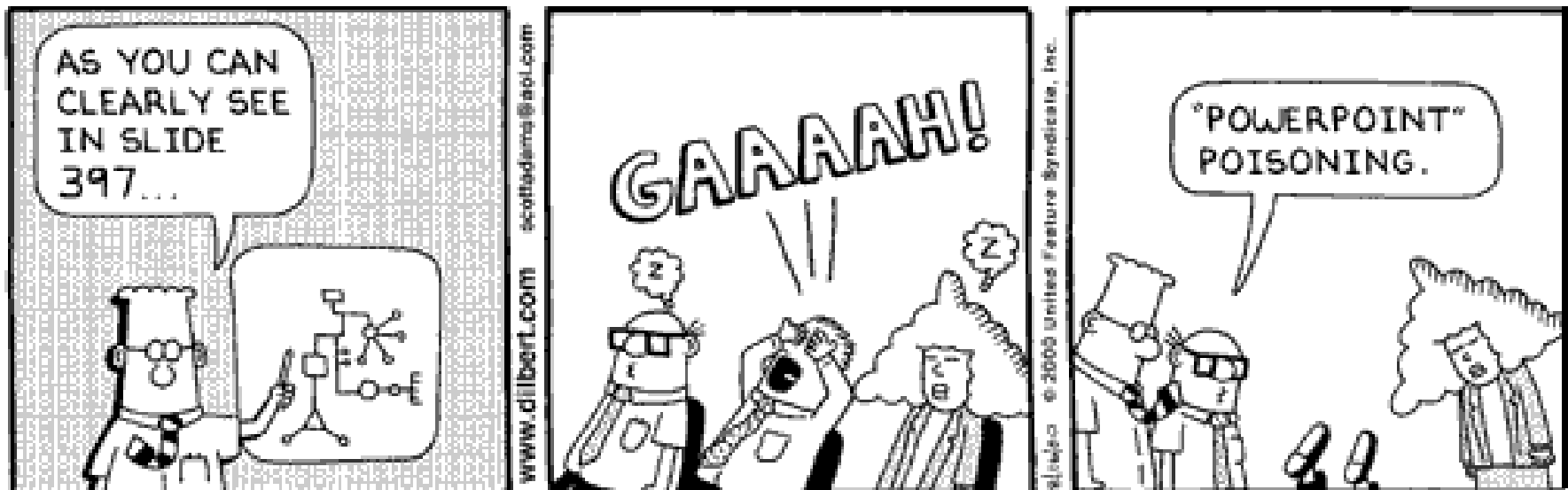
# Create Child Edition



# Health Warning

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Due to complaints made to the EPA, OSHA, and the office of the Surgeon General ...



you are now entering ...

... a ...

---



# Questions

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**ERROR at line 1:**

**ORA-00028: your session has been killed**



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

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- **How Can I?**

**[damorgan11g@gmail.com](mailto:damorgan11g@gmail.com)**

**Thank you**