



# Advancements in IMS Application Development: Testing your IMS Application

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## IMS Simplification

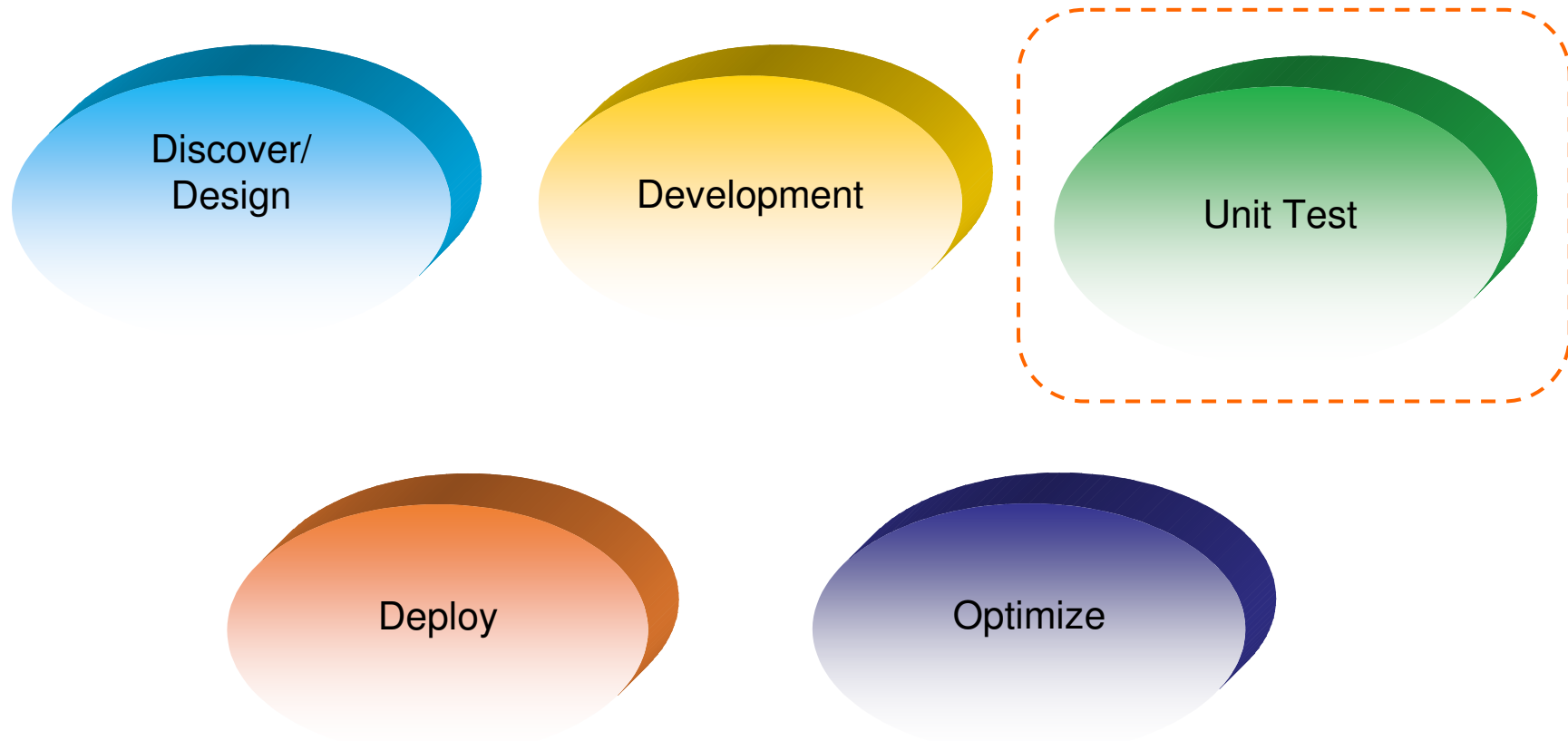
Reduce skills, time and cost required to manage IMS systems and to develop IMS applications

- ✓ Using industry standards
- ✓ Consistent look and feel
- ✓ **Integration**



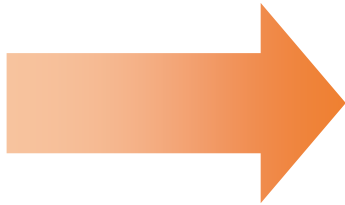


# IMS Application Development Cycle





# Testing an IMS Application



## **Problem - High development and maintenance costs**

*Easier to access development and test systems*  
*Hard to access systems in a timely manner*  
*Make more cycles available for production use*  
*Reduce complexity of setting testing systems*

Rational Developer for z Unit Test



## **Problem – How to define a test bed with meaningful and secure data ?**

*Test data that simulates real data*  
*Cloning production databases is inefficient (too much data, time consuming)*  
*Cloning does not address sensitive data*

Optim Test Data Manager Solution for z/OS



# Mainframe development environment with RDz and ISPF

*RDz provides relief...but customers want more*



## Modern IDEs add value:

- Productivity enhancing tooling; more attractive tooling for new developers
- Ability to offload some development MIPS usage
- Integration with complete application lifecycle tools

## But challenges remain:

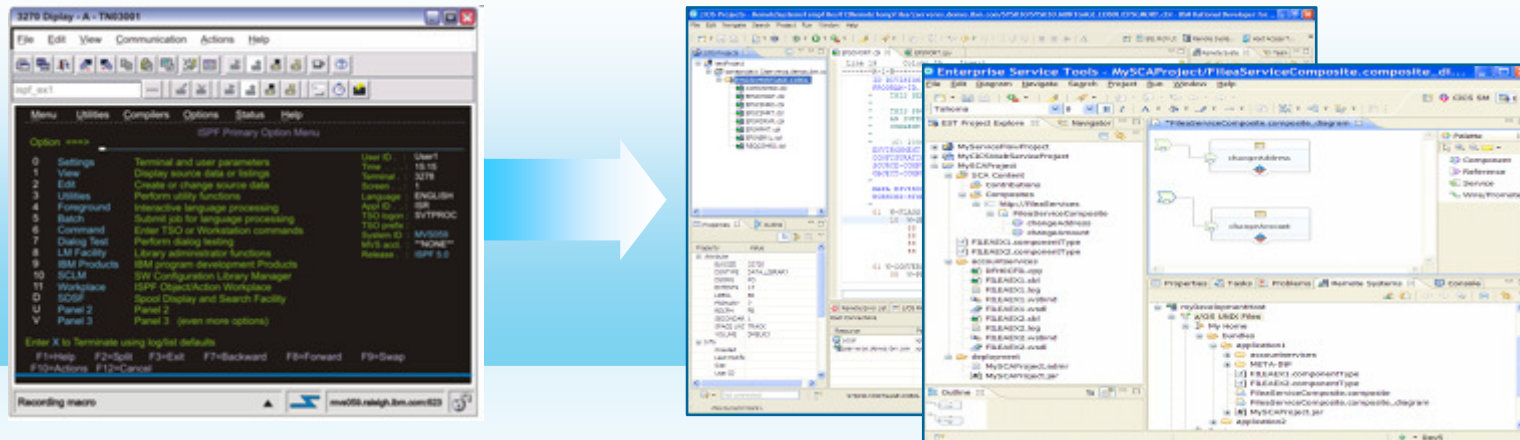
- Business pressures to manage mainframe MIPS usage for development
- Unit test delays caused by dependencies on operations team





# Rational Developer for System z

## *Eclipse-based tools to develop and maintain enterprise applications spanning multiple platforms and languages*



- ✓ 50%-80%<sup>1</sup> reduction in host CPU usage with workstation syntax checking
- ✓ 15% or more improvement in developer productivity<sup>1</sup>
- ✓ Tools with which to attract new talent

▪ Rational Developer for System z

*“RDz offers a uniform, open programming environment for both J2EE and PL/I developers. RDz accelerates PL/I development with its local syntax checker and debugging tool.”*

- [Dr. Axel Lömker, KfW Bankengruppe](#)



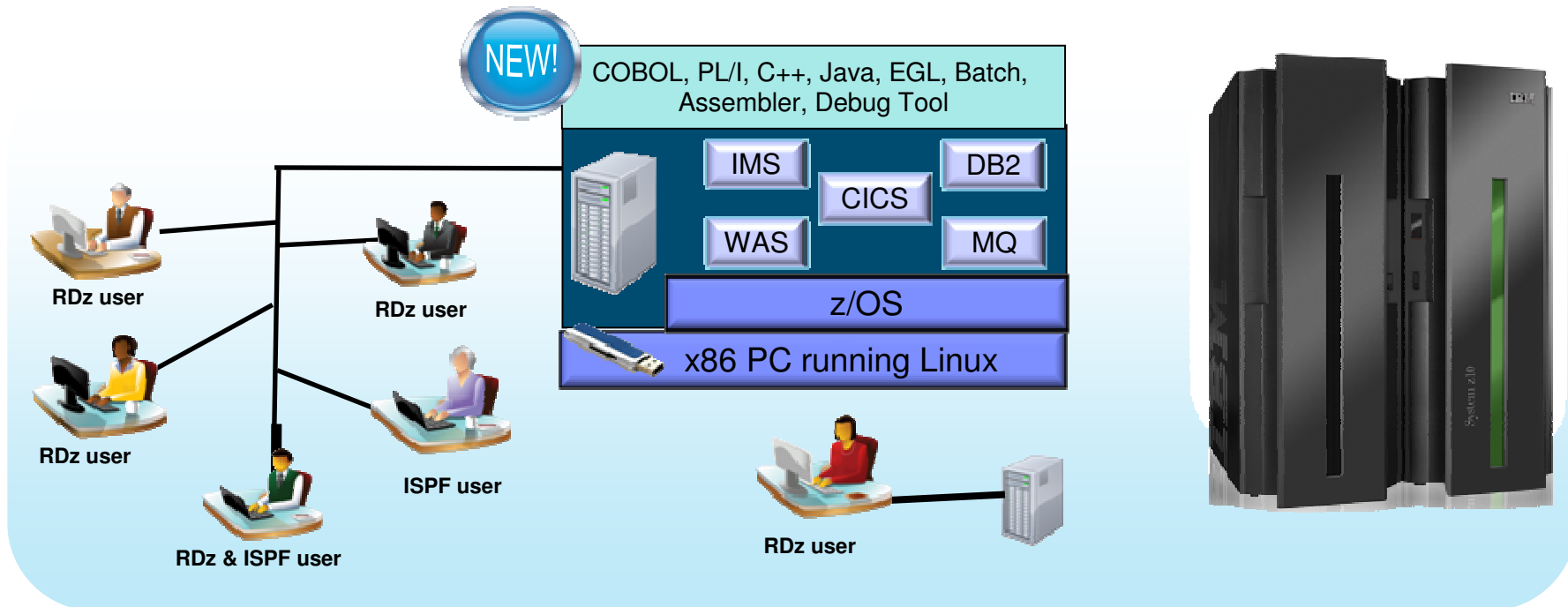
<sup>1</sup> Aggregation of results from a productivity study conducted by IBM System z customers





## \*NEW\* RDz Unit Test Feature

*The ultimate in modern application development for System z*



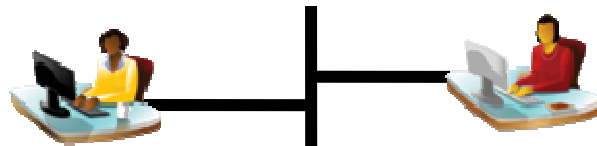
- Liberate developers to rapidly prototype new applications
- Develop and test System z applications anywhere, anytime!
- Free up mainframe development MIPS for production capacity
- Eliminate costly delays by reducing dependencies on operations staff

Note: This Program is licensed only for development and test of applications that run on IBM z/OS. The Program may not be used to run production workloads of any kind, nor more robust development workloads including without limitation production module builds, pre-production testing, stress testing, or performance testing.



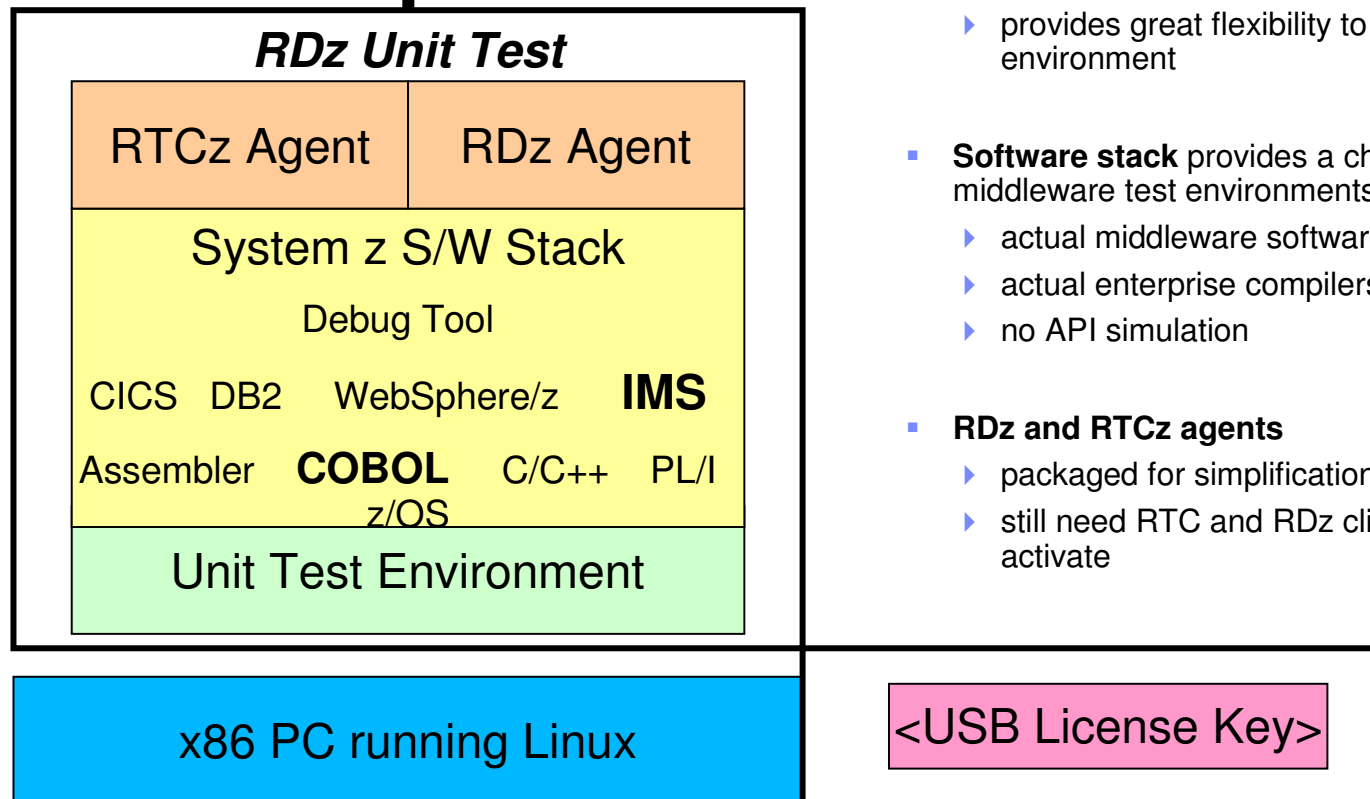


# RDz Unit Test Offering Description



## The RDz Unit Test Feature consists of:

- **Unit Test Environment (based on zPDT)**
  - ▶ Unit Test Environment can provide a System z development platform on a PC
  - ▶ capable of running z/OS
  - ▶ provides great flexibility to run a customized environment
  
- **Software stack** provides a choice of IBM middleware test environments
  - ▶ actual middleware software (including z/OS)
  - ▶ actual enterprise compilers
  - ▶ no API simulation
  
- **RDz and RTCz agents**
  - ▶ packaged for simplification
  - ▶ still need RTC and RDz client license(s) to activate





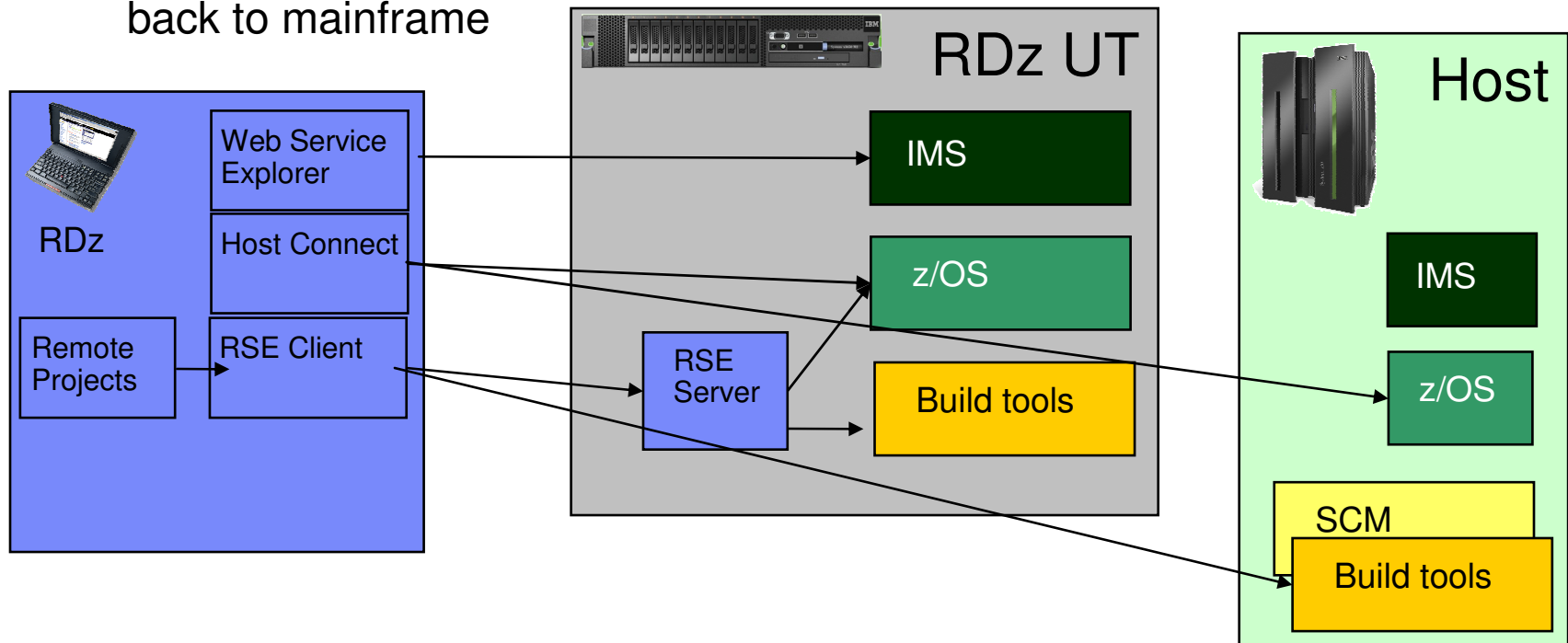
## RDz UT Usage Scenarios – Common threads

- Where do builds take place?
  - ▶ Compilations can be done in RDz UT or the mainframe
  - ▶ Production builds should always take place on mainframe
  
- Where does source code reside?
  - ▶ This is a major design point.
    - Moving data can be manual, semi-automated or fully distributed.
  
- How does one move source or data from/to RDz UT?
  - ▶ Move data from/to RDz UT much like you would to an LPAR
    - RDz drag and drop, FTP, sftp, XMIT, NFS, DFS, etc
    - Non-VSAM files need format conversion before & after transfer
    - RDz UT provides facilities for transferring whole disks to RDz UT



## RDz UT based build

- **Development on RDz UT with host-based SCM:**
  - Copy code and data to RDz UT as needed
  - Use RDz or other methods to run a standard compile/debug cycle
  - When tests and changes are complete, merge changes back to mainframe





# Testing an IMS Application



## **Problem - High development and maintenance costs**

*Easier to access development and test systems*  
*Hard to access systems in a timely manner*  
*Make more cycles available for production use*  
*Reduce complexity of setting testing systems*

Rational Developer for z Unit Test



## **Problem – How to define a test bed with meaningful and secure data ?**

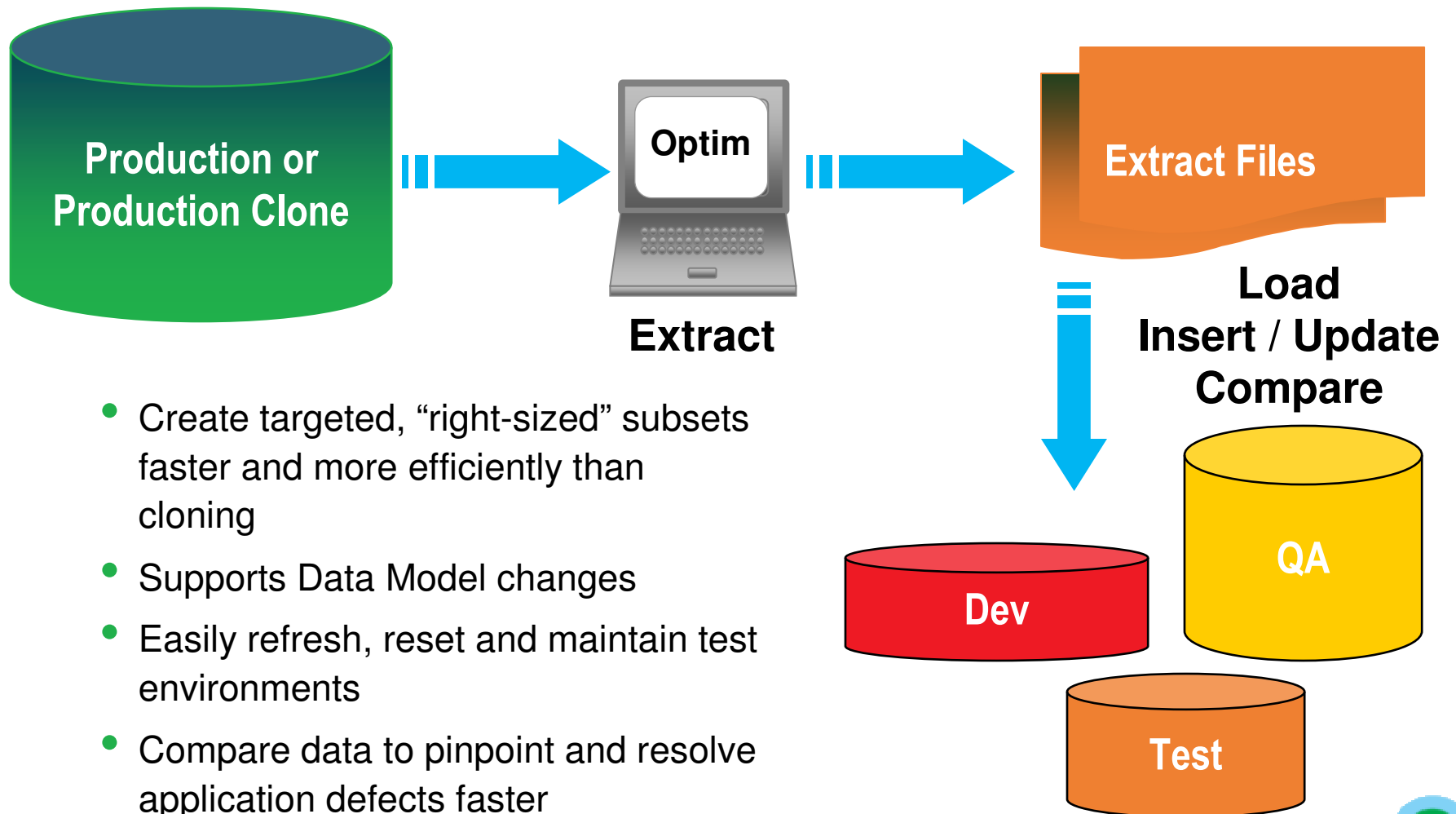
*Test data that simulates real data*  
*Cloning production databases is inefficient (too much data, time consuming)*  
*Cloning does not address sensitive data*

Optim Test Data Manager Solution for z/OS





# Optim™ Test Data Management for z/OS



- Create targeted, “right-sized” subsets faster and more efficiently than cloning
- Supports Data Model changes
- Easily refresh, reset and maintain test environments
- Compare data to pinpoint and resolve application defects faster
- Accelerate release schedule





## Optim™ Test Data Management: Best Practices

*TDM refers to the need to manage data used in testing and other non-production environments*

- Extract related subsets of production data that are targeted to functionality under test
- De-identify / mask related test data to protect privacy
- Quickly and easily refresh test environments
- Edit data to create error and boundary conditions
- Compare “before” and “after” images of test data

**Benefits: Improving application quality & customer satisfaction**

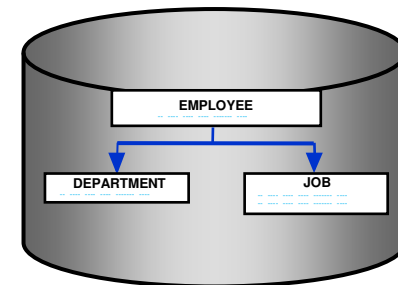






## What Is IMS Data to Optim?

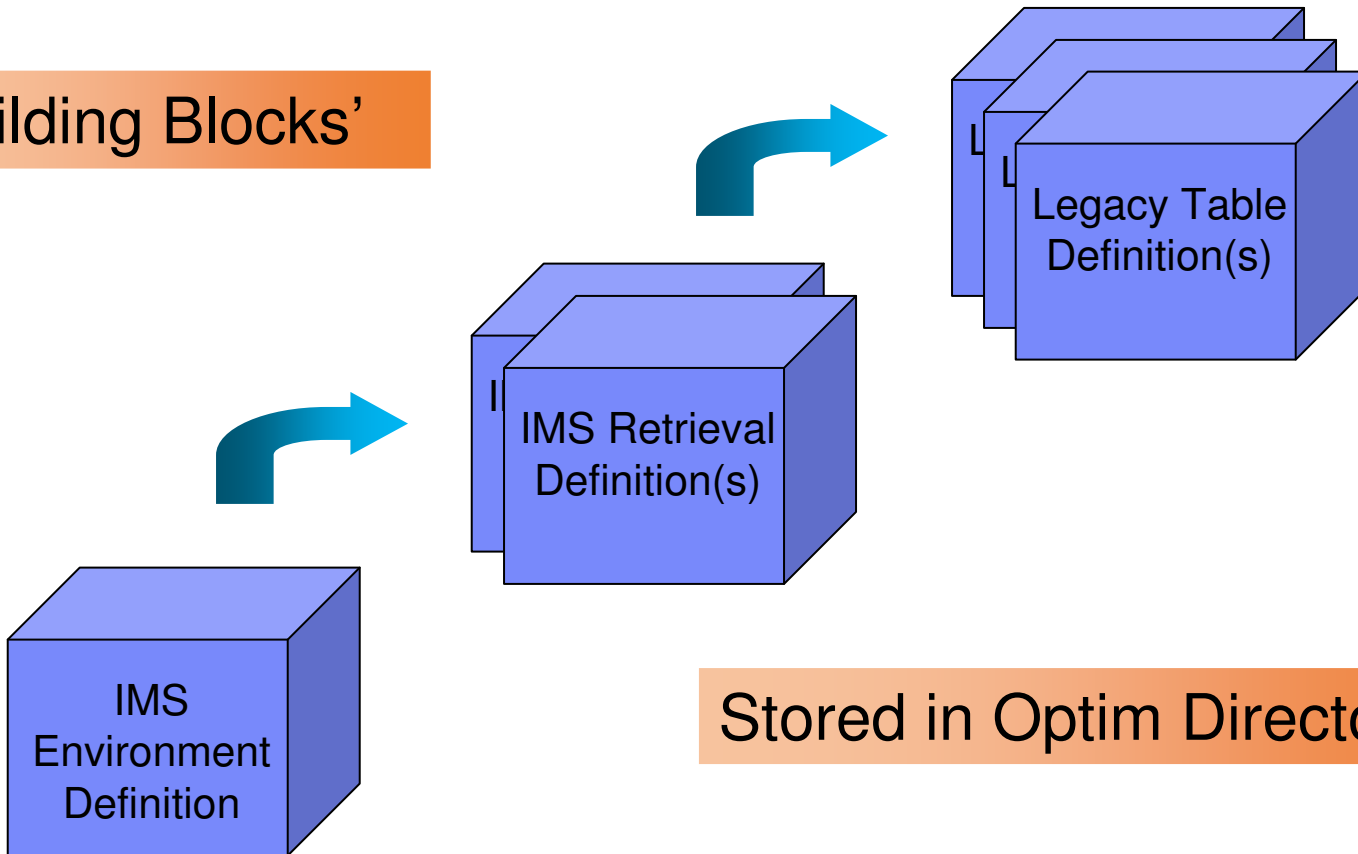
- IMS = Hierarchical Database
  - Database consists of segments
  - Segments are related (physically)



- Optim uses a relational model of tables, rows and columns
- Optim Distributed uses Middleware to access IMS. More tied to relational model.
- Optim z/OS uses native (DL/I) access to IMS data.

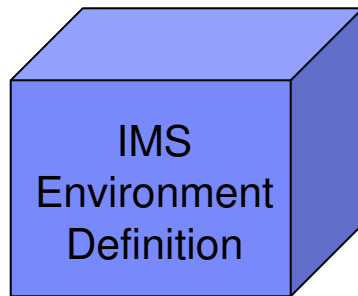
# Overview of Optim z IMS Definitions

'Building Blocks'

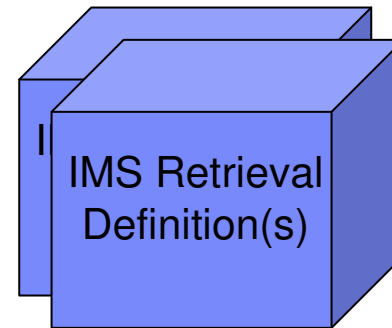




## Optim z IMS Definitions: Environment Definition



- One for each IMS environment to be accessed by Optim
- Identifies the IMS Load Libraries, the IMS DBD and PSB Libraries, and the location of the data, online or offline to IMS
- Allows Optim to access IMS data through the proper libraries

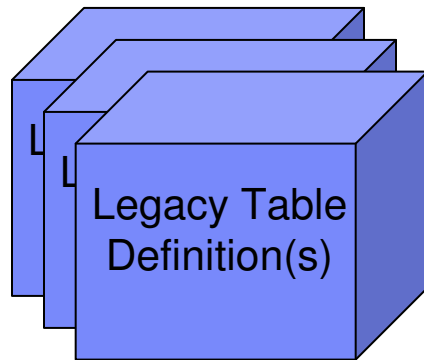


- Provides defaults for processing IMS data
- Associates an Optim Environment Definition with an IMS DBD
- Specifies DBD information such as the PSB name, PCB number, DD name, and the IMS dataset name

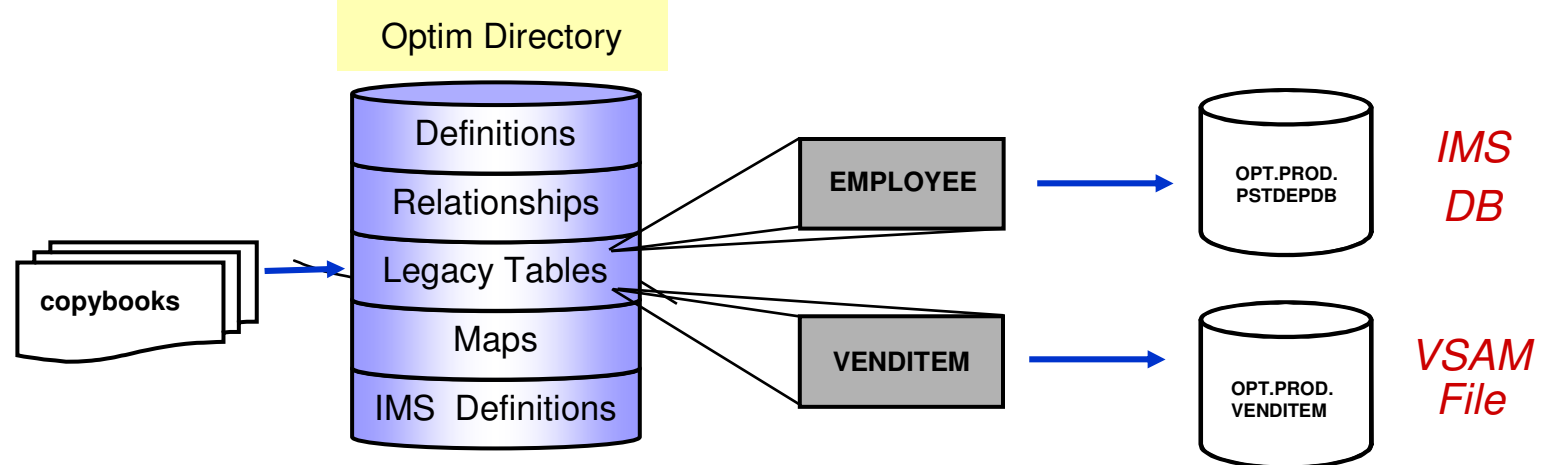




# Optim z IMS Definitions: Legacy Table Definitions



- Describes physical layout of segment
- Create from COBOL or PL/1 copybook
  - Associated with IMS segment
  - Definition stored in the Optim Directory
- Relate to other tables (DB2 or Legacy) via Optim Relationship
- Segment treated as virtual DB2 table by any Optim process





# Create/maintain Optim z definitions

```

----- IBM's Optim -----
OPTION ==> 6 <-----
0  OPTIONS      - Site and User Options      SQLID ==> userid
1  BROWSE TABLE - Browse a DB2 Table          SUBSYS ==> DD8F
2  EDIT TABLE  - Edit a DB2 Table
3  BROWSE USING AD - Browse DB2 Tables Using Access Definition
4  EDIT USING AD - Edit DB2 Tables Using Access Definition
5  ADS          - Create or Modify Access Definitions
6  DEFINITIONS  - Maintain Optim Definitions (Keys, Maps, ...)
7  MIGRATION    - Data Migration - Extract, Insert, Update, ...
8  COMPARE      - Compare Two Sets of Data
9  ARCHIVE      - Archive and Restore Data

T  TUTORIAL
C  CHANGES
X  EXIT
P  LICENSING

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```

```

----- Choose a Definition Option -----
OPTION ==> 7 <-----
1  PRIMARY KEYS - Maintain Primary Keys      SQLID ==> userid
2  RELATIONSHIPS - Maintain Relationships      SUBSYS ==> DD8F
3  COLUMN MAPS  - Maintain Column Maps
4  TABLE MAPS  - Maintain Table Maps
5  ADS          - Maintain Access Definitions
6  LEGACY TABLES - Maintain Legacy Tables for Non-DB2 Data
7  IMS ENVIRONMENT - Maintain IMS Environment Definitions
8  IMS RETRIEVAL - Maintain IMS Retrieval Definitions

E  EXPORT      - Export Optim Object Definitions
I  IMPORT      - Import Optim Object Definitions

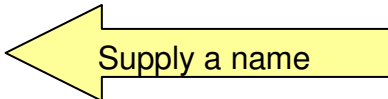
```





# Creating an IMS Environment Definition

```
----- Choose an IMS Environment -----  
Command ==>  
  
IMS Environment:  
Environment Name ==> PSTLSP  
  
Use '_' for DB2 LIKE character ==> NO    Y-Yes, N-No  
  
SUBSYS: DSNA
```



```
----- Define IMS Environment PSTLSP -----  
-----  
Command ==>                               Scroll ==>  
PAGE                                         SUBSYS:  
  
DSNA  
IMS Program Libraries    ==> 'IMS.DEMO.RESLIB'  
                        ==>  
                        ==>  
  
IMS DBD and PSB Libraries ==> 'IMS.DEMO.DBDLIB'  
                        ==> 'IMS.DEMO.PSBLIB'  
                        ==>  
                        ==>  
  
DFSVSAMP DSN/Member Name ==> 'IMS.DEMO.PROCLIB(DFSVSM00)'  
  
If data is online to IMS, enter the IMS System ID ==>    AGN ==>
```





# Creating an IMS Retrieval Definition

```
----- Choose a Definition Option -----
OPTION  ==> 8
1 PRIMARY KEYS - Maintain Primary Keys
2 RELATIONSHIPS - Maintain Relationships
3 COLUMN MAPS - Maintain Column Maps
4 TABLE MAPS - Maintain Table Maps
5 ADS - Maintain Access Definitions
6 LEGACY TABLES - Maintain Legacy Tables for Non-DB2 Data
7 IMS ENVIRONMENT - Maintain IMS Environment Definitions
8 IMS RETRIEVAL - Maintain IMS Retrieval Definitions
E EXPORT - Export
I IMPORT - Import

SQLID ==> PSTLSP
SUBSYS ==> DSNA
```

```
----- Choose an IMS Retrieval Definition -----
Command ==>
SUBSYS: DSNA

IMS Retrieval Definition:
Environment Name ==> PSTLSP
IMS DBD Name ==> PSTDEPDB
Use '_' for DB2 LIKE character ==> NO Y-Yes, N-No
```

The Retrieval Definition connects the IMS database to be accessed with the appropriate IMS environment



# Specifying the IMS DBD: 'Legacy IMS Tables'

```

----- Specify Copybooks for Legacy Table: DDS0485.EMPLOYEE1 -----
Command ===>                                     SCROLL ===> CSR

INSTRUCTIONS: Specify the name(s) of the Copybook members containing the record
              description to be used for this Legacy Table. All members will
              be concatenated before being parsed.

Legacy Table Type ===> i    I-IMS  F-File (VSAM or Sequential)

Copybook Language ===> C    C-COBOL P-PL/I

Copybook (s)  ===> 'OPTIM.V6R1.INSTALL(SAMPBKOR)'
               ===>
               ===>
               ===>
               ===>

```

```

----- Modify Legacy Table: DDS0485.EMPL ----- DATA SOURCE UPDATED
Command ===> _                                     Scroll ===> CSR

Associated IMS DBD Name ===> PSTDEPDB             Segment ===> EMPLOYEE
User defined I/O Exit   ===>
Cmd Level/Field Name   Type      Len   Occur Column Name
-----
*** ***** TOP *****
 1 EMPLOYEE                51      EMPLOYEE
 5 EMPNO                   CHR    6      EMPNO
 5 FRSTNAME                 CHR   15      FRSTNAME
 5 INITIAL                  CHR    1      INITIAL
 5 LASTNAME                 CHR   15      LASTNAME
 5 HIREDATE                 CHR    8      HIREDATE
 5 MANAGER                  CHR    6      MANAGER
*** ***** BOTTOM *****

```

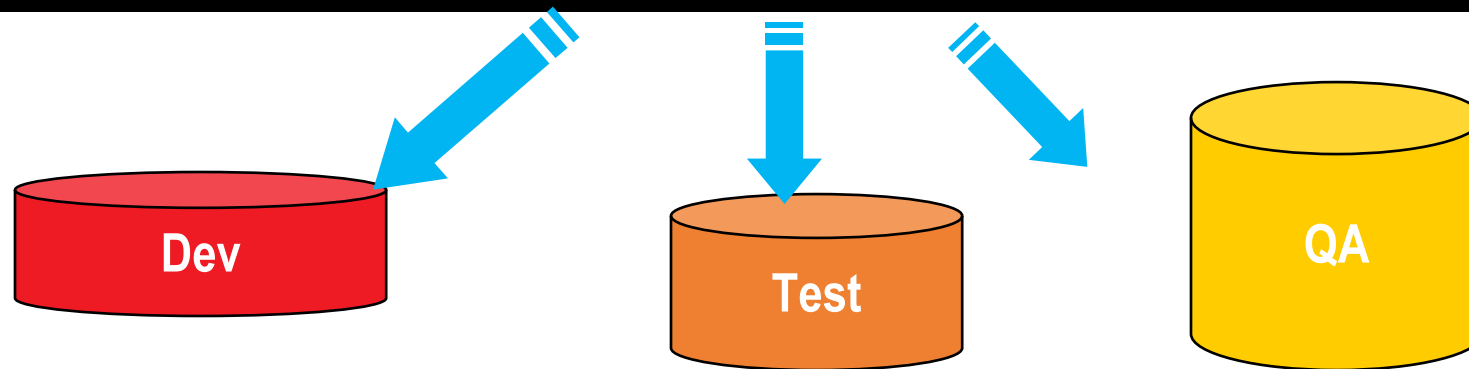






# Extracting Data: Multiple uses for the same Extract

```
----- Specify EXTRACT Parameters and Execute -----  
Command ==>  
  
Current AD Name      : DDS0485.DEMO.AX1  
Extract File DSN ==> 'DDS0485.EXTRACT.IMSDEMO'  
Extract              ==> B          (D-Data,  
                                   O-Object Definitions,  
                                   B-Both)  
  
If Extracting Data:  
  Limit Number of Extract Rows ==> 999999 (1-999999, Blank-Site Limit)  
  Perform Convert with Extract ==> N      (Y-Yes, N-No)  
  Extract With Uncommitted Reads ==> N   (Y-Yes, N-No)  
  Run Process in Batch or Online ==> O    (B-Batch, O-Online)  
    If Batch, Review or Save JCL ==> R    (N-No, R-Review, S-Save)  
  Process Report Type ==> D              (D-Detailed, S-Summary)
```





# Masking the data

```
-----DDS0485.EMPLOYEE-----      -----DDS0485S.EMPLOYEE-----
Cmd      Source Column      Data Type      Num Destination Column Data Type      Status
----->>----->>-----
*
  Command      ===>
  Source Column  ===> HIREDATE      >
  Destination Column : HIREDATE      >
  Input Date Format  ===> MM/DD/YY
  Output Date Format  ===>
  Aging Rule      ===>
  Rule Table      ===>
  Pivot Year      ===>          (00 - 99)
  Specify Explicit Date or Aging Amount
  Explicit Date    ===>          YYYY/MM/DD
  Aging Amount
  Years           ===>          (-2500 to +1581)
  Months         ===>          (-30000 to +30000)
  Weeks          ===> -2          (-30000 to +30000)
  Days           ===> +3          (-99999 to +99999)
  Business Rules  ===>          (0 to 30000)
  Propagate Aging  ===> N          Y-Yes, N-No
*****
EQUAL
EQUAL
EQUAL
LITERAL
EQUAL
EXPR
EQUAL
*****
```

```
-----DDS0485.DEPARTMENT-----      -----DDS0485S.DEPARTMENT-----
Cmd      Source Column      Data Type      Num Destination Column Data Type      Status
----->>----->>-----
*** ***** TOP *****
  DEPARTMT      CH(66)          1 DEPARTMT      CH(66)          EQUAL
  DEPTCODE      CH(3)           2 DEPTCODE      CH(3)           EQUAL
  HASH_LOOKUP(DEPTCODE,
  LOCATION      CH(30)         4 LOCATION      CH(30)          EQUAL
  LOCCODE       CH(3)           5 LOCCODE      CH(3)           EQUAL
*** ***** BOTTOM *****
```





## Recent Optim IMS and Legacy Support enhancements

- Support multiple record layouts for an IMS segment
- Batch Legacy Table definition utility
- Date/Time/Timestamp data types in Legacy Table Defs
- IMS Compression Exit
- IMS Sequential Dependent (SDEP) Segment Support
- Improvements in unkeyed segment support (over time)
  
- Working on: Legacy Compare
- Working on: Support for data transformation in Legacy Table arrays.  
First: fixed arrays. Later: variable length arrays.
- Working on: Relationship exits