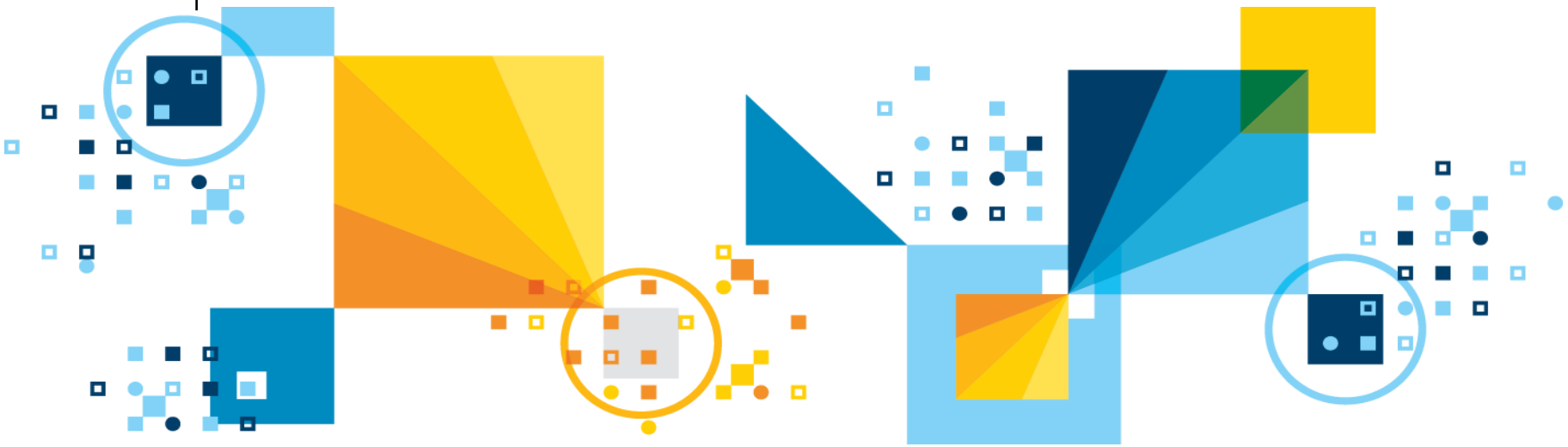
Migration to DB2

Module ID | 10112

Length | 1.5 hours + 1 hour Hands on Lab



For questions about this presentation contact askdata@ca.ibm.com

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Module Information

- You should have completed or acquired the necessary knowledge for the following modules in order to complete this module:
  - DB2 Fundamentals

- After completing this module, you should be able to:
  - Describe Oracle Compatibility Built into DB2
  - Be able to perform the following tasks:
    - Database Migration by Data Conversion Workbench

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Module Content

- Breaking Free From Oracle with DB2 10
- Migrating to DB2

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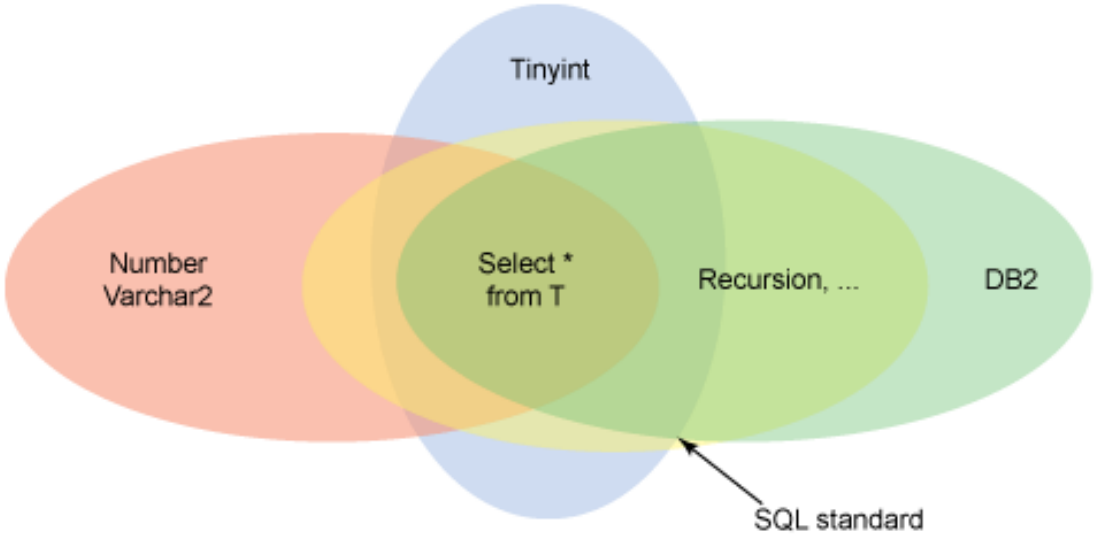
Migration Challenges

Transact-SQL

Oracle SQL and PL/SQL



DB2's SQL/PL (based on SQL/PSM)

- Applications are locked to the chosen RDBMS
  - Moving to a different RDBMS requires extensive rewrite of code
  - Your team's skill set cannot be leveraged
- DB2 10 further enhanced the revolutionary compatibility feature introduced in DB2 9.7

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Average PL/SQL Compatibility Moves above 99%

Out-of-the-box support for Oracle's SQL and PL/SQL dialects

- *compatible system functions, SQL, concurrency control*
- *Extended data type support*
- *and more…*

Continuous effort to increase compatibility

- *Worked with a large breadth of companies across industries to determine compatibility requirements*

9.7.1	SUB STRB	Increase compatibility
9.7.1	UDF Parameters: INOUT	Increase compatibility
9.7.1	FORALL/BULK COLLECT	Increase compatibility
9.7.1	Improve BOOLEAN	Increase compatibility
9.7.1	Conditional Compilation	Enhancement
9.7.1	Basic DPF Support	Broaden coverage
9.7.1	OCI Support	Broaden coverage
9.7.2	UDF Parameters: DEFAULT	Increase compatibility
9.7.2	Obfuscation	Enhancement
9.7.2	NCHAR, NVARCHAR, NCLOB	Increase compatibility
9.7.3	NUMBER Performance	Performance
9.7.3	Runtime "purity level" Enforcement	Increase compatibility
9.7.3	RATIO_TO_REPORT Function	Increase compatibility
9.7.3	RAISE_APPLICATION_ERROR	Increase compatibility
9.7.3	Small LOB Compare	Increase compatibility
9.7.4	Multi-action Trigger & Update Before Trigger	Increase compatibility
9.7.4	Autonomous Tx Improvements	Increase compatibility
9.7.4	LIKE Improvements, LISTAGG	Increase compatibility
9.7.4	ROW & ARRAY of ROW JDBC Support	Increase compatibility
9.7.5	Pro*C Support	Increase compatibility
9.7.5	Nested Complex Objects	Increase compatibility
10	Local Procedure Definitions	Increase compatibility
10	Local Type Definitions	Increase compatibility
10	PL/SQL Performance	Performance

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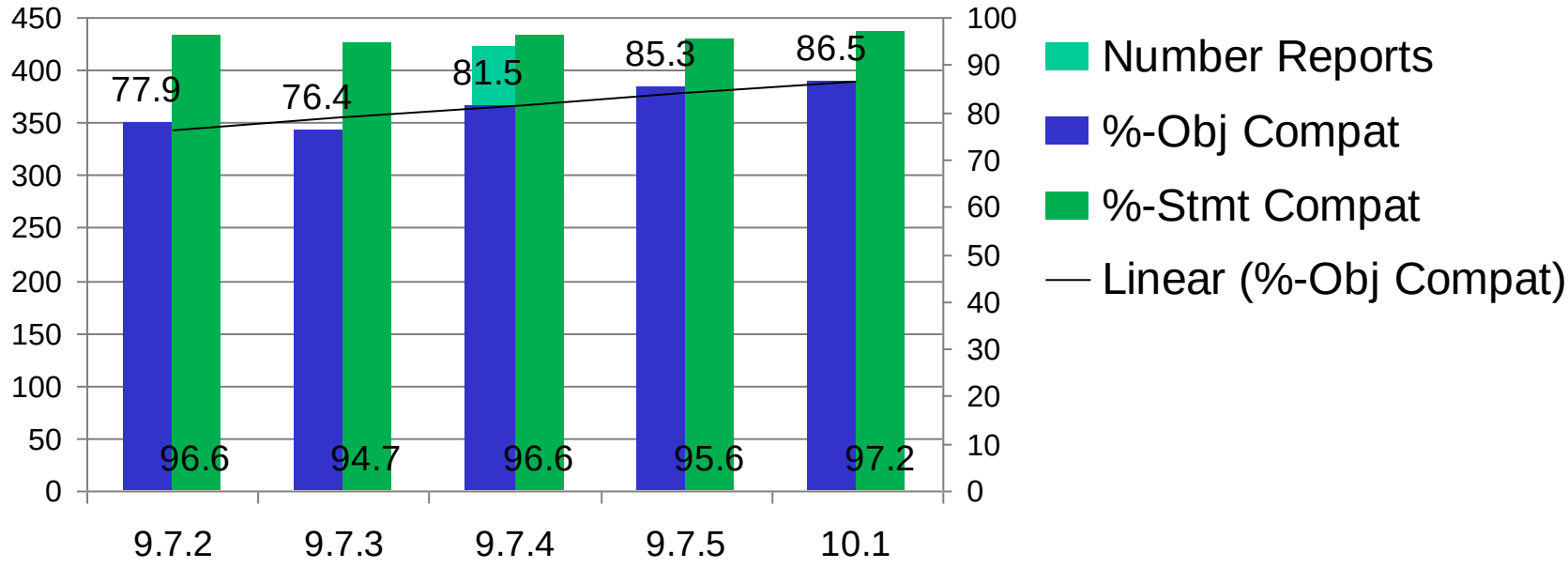
Application Compatibility Over Time



- Data is based on DCW (Database Conversion Workbench) DB2 reports in the database
- Compatibility is improved
  - More and more complex applications
- DB2 10.5 provides > 99% compatibility

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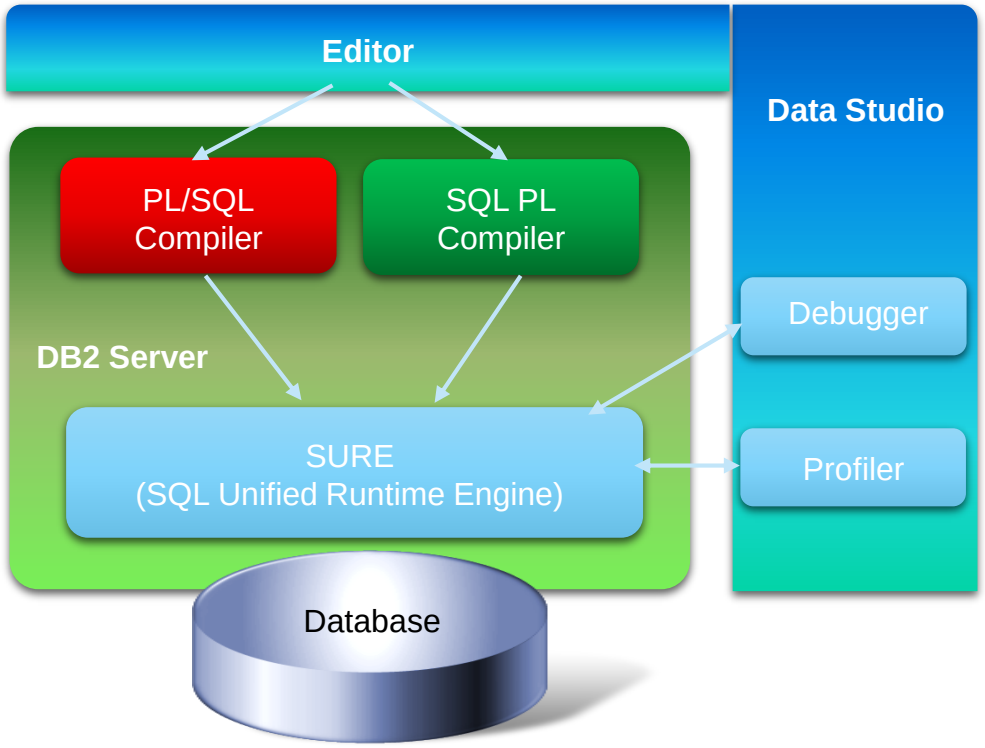
Support to Oracle SQL Dialect and PL/SQL

- Native PL/SQL Support: The DB2 engine includes a PL/SQL compiler
  - No translation. No emulation
  - Source level debugging and profiling

- Several benefits
  - Reduce the time and complexity of enabling applications
  - Developers can continue working in their language
  - One source code runs against both Oracle and DB2
  - Both PL/SQL and SQL PL perform at the same level



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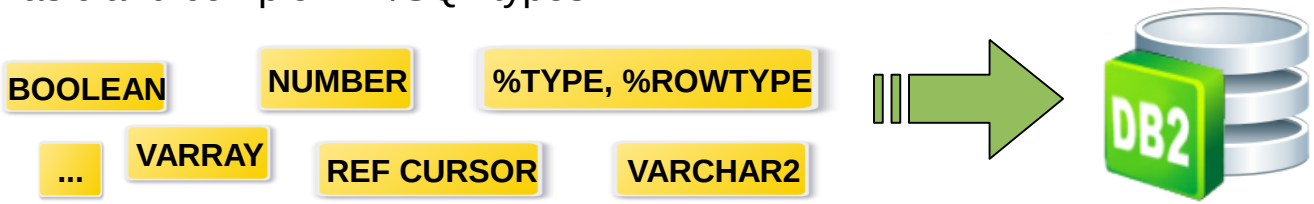
Extended and More Flexible Language

- **New data types add support to non-standard Oracle types**
  - Basic and complex PL/SQL types



- **SQL restrictions have been lifted, to enhance compatibility**
  - Accommodate larger strings (varchar2 up to 1MB)
  - Internationalization via character-based semantics
- **Synonyms for syntax to accommodate other RDMSes**
- **Implicit Casting and Type Resolution**
  - Strings and numbers can be compared, assigned, and operated on in a very flexible fashion
  - Untyped NULLs and parameter markers can be used in many more places
    - DB2 defers the type resolution until a value is assigned

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Additional Indexing

- Function-based indexes
  - Searching for computed values in a table instead of using Generated Columns
  - E.g. “Find employees without worrying about the case of their names”
    - `CREATE INDEX emp_name ON emp(UPPER(name));`
      `SELECT salary`
      `FROM emp`
      `WHERE UPPER(name) = 'MCKNIGHT';`

Name	Salary	Manages
McKnight	50000	Sales
Miller	25000	-
Van Gogh	45000	Finance
Chan	37000	-

- Indexes excluding `NULL` keys
  - Enforce uniqueness only for `non-NULL` keys and exclude all `NULL` keys from Index
  - Compress index for `all-NULL` keys
  - Helps facilitate Oracle application migrations
    - `CREATE UNIQUE INDEX emp_manages`
      `ON emp(manages) EXCLUDE NULL KEYS`

- Random key indexes
  - Avoid hot index page for incrementally issued keys
    - `CREATE UNIQUE INDEX order_id ON order(id RANDOM);`

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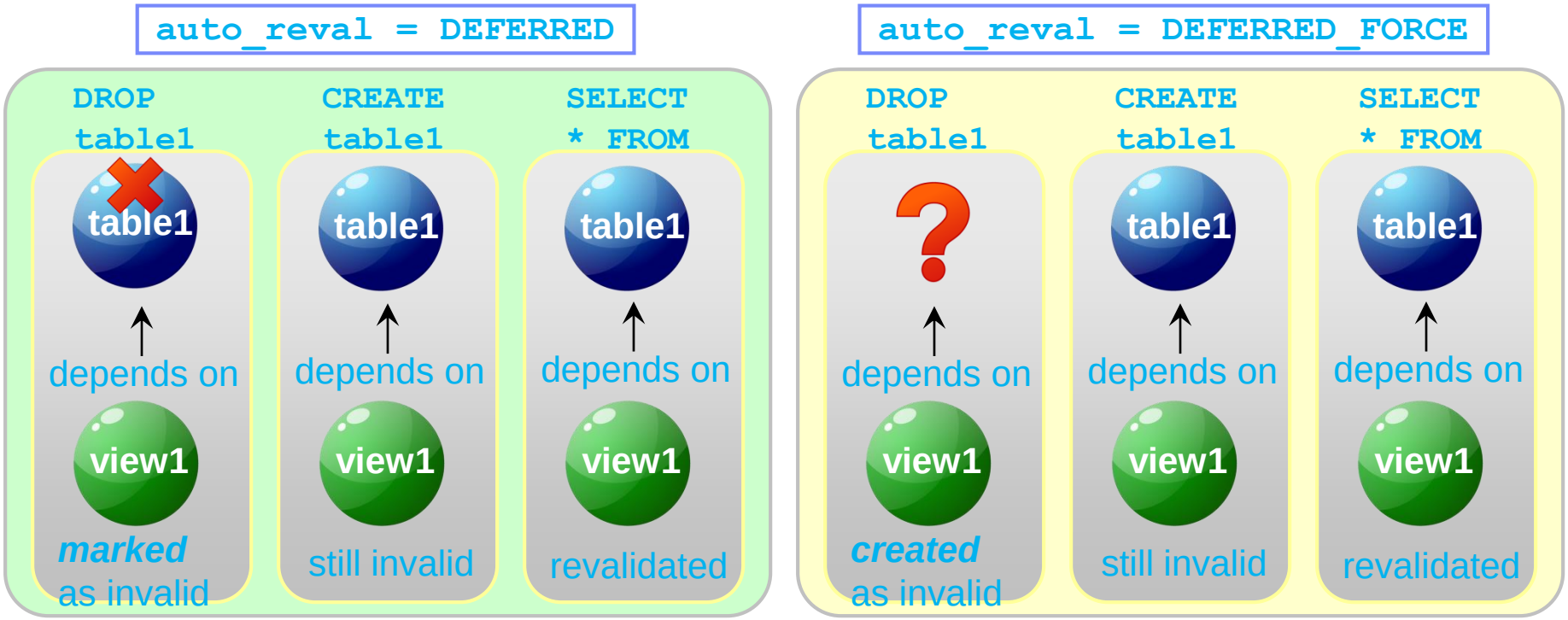
Automatic Revalidation

- It is a mechanism whereby database objects that have been invalidated undergo revalidation automatically
  - By default, validation is **DEFERRED** until the next time an invalid object is used
  - Configured by DB configuration parameter **AUTO_REVAL**
    - ***DEFERRED_FORCE***: same as **DEFERRED**, but additional **CREATE** with error feature is enabled



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Oracle Compatibility Built into DB2
Lower Transition Cost and Less Risk

Concurrency Control	→	**Native support**
Oracle SQL dialect	→	**Native support**
PL/SQL	→	**Native support**
PL/SQL Packages	→	**Native support**
Built-in package library	→	**Native support**
Oracle JDBC extensions	→	**Native support**
OCI	→	**Native support**
Oracle Forms	→	**Through partners**
SQL*Plus Scripts	→	**Native support**
RAC	→	**DB2 pureScale**

Changes are the exception. Not the rule.

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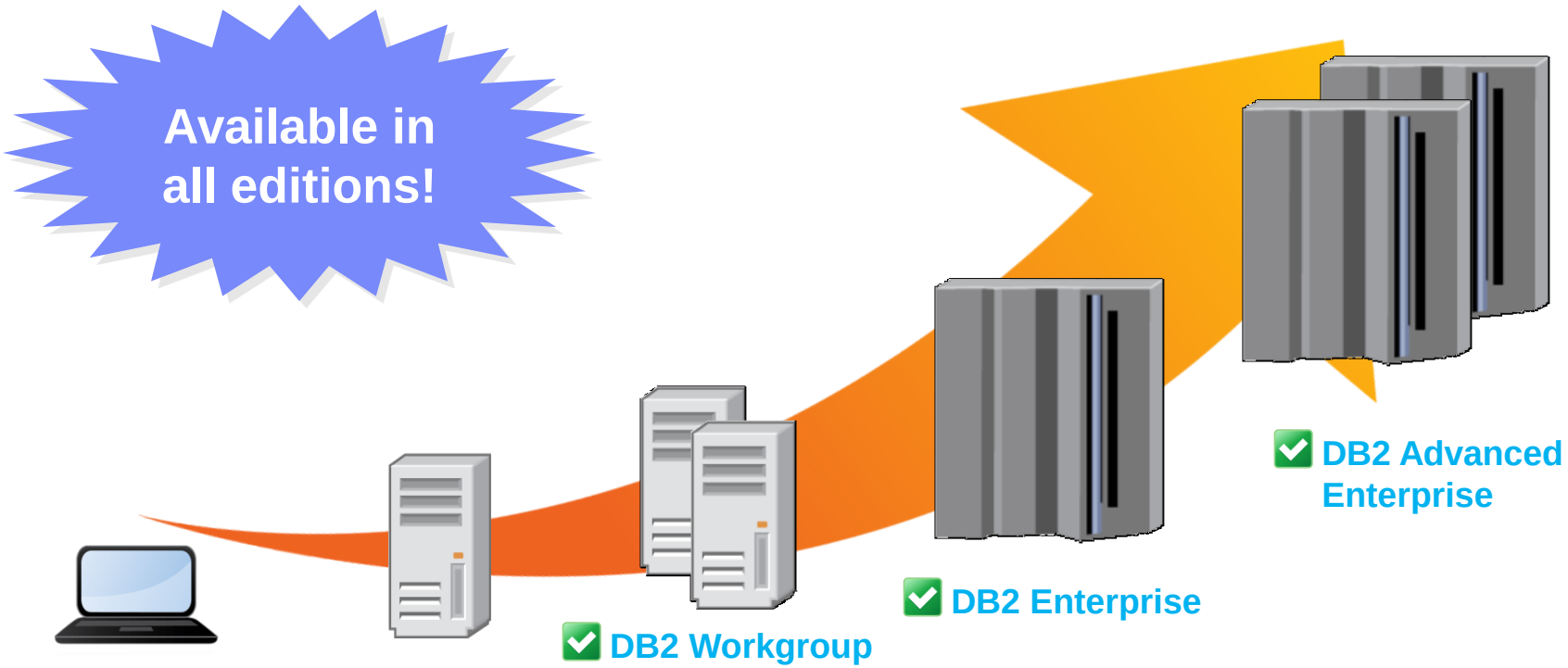
Which DB2 Editions Support Oracle Compatibility?



Also available for column-organized tables

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Configuring Compatibility Mode

- DB2 Oracle DB Compatibility Features
  - Registry variable: **DB2_COMPATIBILITY_VECTOR**, set with **db2set**
    - Accepts hexadecimal values (NULL or 00 to FFF)
    - Recommended value for Oracle migration is **ORA** (same as 0x10FFF)

Bit Position	Compatibility Feature	Comment
1 (0x01)	ROWNUM	Synonym for ROW_NUMBER() OVER()
2 (0x02)	DUAL	Enables the DUAL dummy table
3 (0x04)	Outer join operator	Enables support for the outer join operator, which is the plus sign (+).
4 (0x08)	Hierarchical queries	Support for hierarchical queries using the CONNECT BY clause.
5 (0x10)	NUMBER	Support for the NUMBER data type and associated numeric processing
6 (0x20)	VARCHAR2	VARCHAR2 and NVARCHAR2 data types and associated character string processing
7 (0x40)	DATE	Enables the interpretation of the DATE data type as the TIMESTAMP(0) data type
8 (0x80)	TRUNCATE TABLE	Alternative semantics for the TRUNCATE statement
9 (0x100)	Character literals	CHAR or GRAPHIC data type, instead of the VARCHAR or VARGRAPHIC data type
10 (0x200)	Collection methods	Enables the use of methods to perform operations on arrays, such as `first`, `last`, `next`, and `previous`. Enables the use of parentheses in place of square brackets in references to specific elements in an array; Eg:array1(i) refers to element i of array1.
11 (0x400)	Data dictionary-compatible views *	Data dictionary-compatible views are created when the database is created
12 (0x800)	PL/SQL Compilation	Enables compilation and execution of PL/SQL statements
13 (0x1000)	Insensitive cursors	Enables cursors that are defined with WITH RETURN to be insensitive if the select-statement does not explicitly specify FOR UPDATE.
14 (0x2000)	INOUT parameters	Specification of DEFAULT for INOUT parameter declarations
17 (0x10000)	SQL data-access-level enforcement	Enables routines to enforce SQL data-access levels at run time.

* Must be set **BEFORE** database creation

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Creating a DB2 Database with Oracle Compatibility

- Create target DB2 database enabling all compatibility features

```
db2set DB2_COMPATIBILITY_VECTOR=ORA
db2stop force
db2start
db2 "CREATE DATABASE dbName AUTOMATIC STORAGE YES
        ON <storagePath1> PAGESIZE 32 K"

-- Recommended but not required
db2 UPDATE DB CFG FOR dbName
     USING AUTO_REVAL deferred_force
           DECFLT_ROUNDING round_half_up
```

Enables all Oracle DB compatibility features

Recommended to accommodate large row length

Adjust rounding behaviour to match that of Oracle

If you want to deploy objects out of dependency order

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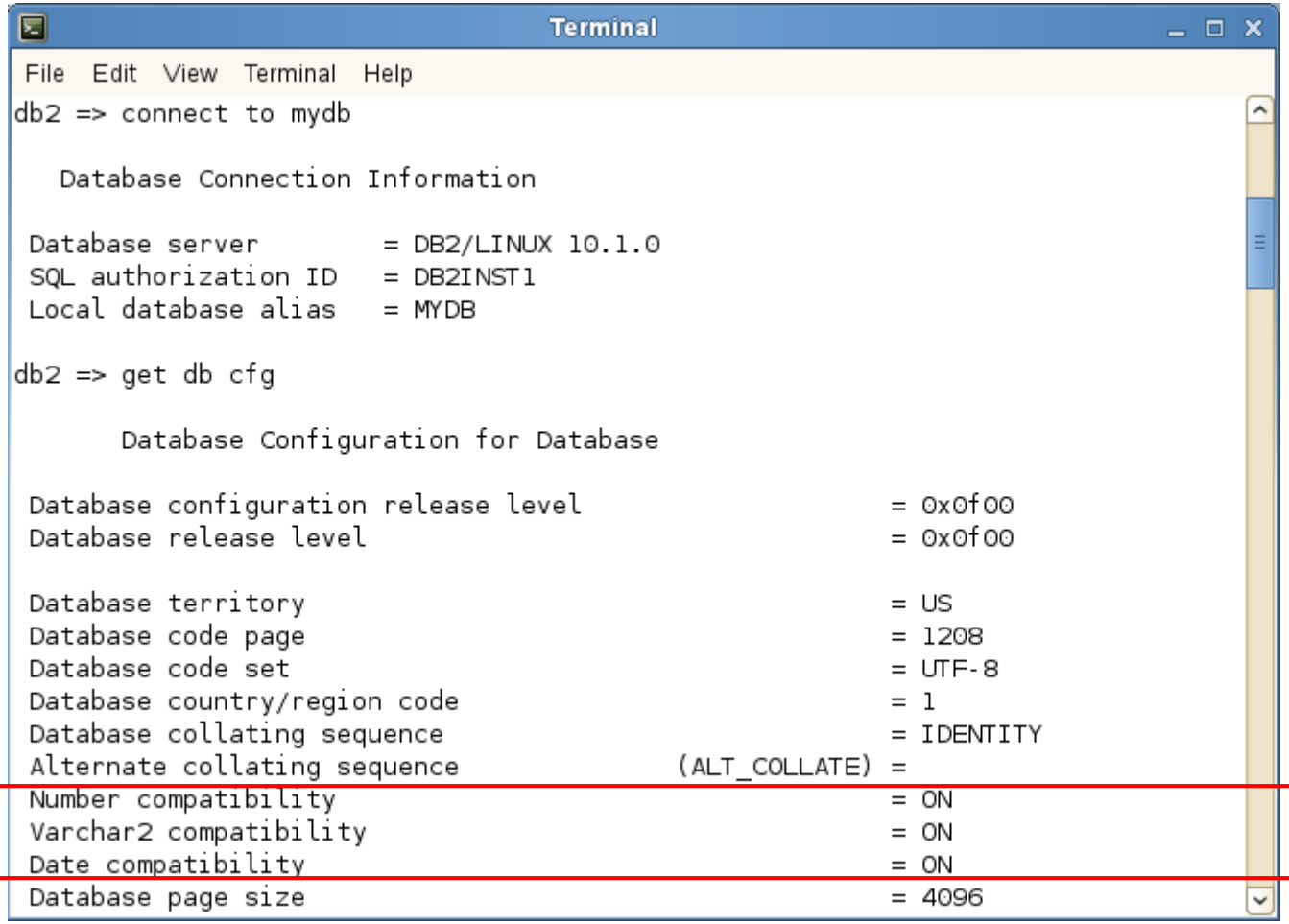
Checking Enabled Compatibility Features

- Database Configuration Parameters

`get database cfg`



Example using CLP

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Terminology Mapping – Oracle to DB2

Oracle	DB2
active log	active log
alert log	`db2diag` log files and administration notification log
archive log	offline archive log
noarchive log mode	circular logging
archive log mode	log archiving
redo log	transaction log
Inactive log	Online archive log
background_dump_dest	diagpath
data block	data page
large pool	utility heap
library cache	package cache
program global area (PGA)	application shared memory and agent private memory
data buffer cache	buffer pool
system global area (SGA)	instance shared memory and database shared memory
user global area (UGA)	application global memory
instance	instance or database manager
ORACLE_SID environment variable	DB2INSTANCE environment variable
`init.ora` file and Server Parameter File (SPFILE)	database manager configuration file and database configuration file
SYSTEM table space	SYSCATSPACE table space
data dictionary	system catalog
data dictionary cache	catalog cache
data file	container
segment	storage object
database link	nickname
dynamic performance views	snapshot monitor SQL administrative views
global index	non- partitioned index
local index	partitioned index
materialized view	materialized query table (MQT)
Oracle Call Interface (OCI) Oracle Call Interface (OCI)	DB2CI, Call Level Interface (CLI)
Procedural Language/Structured Query Language (PL/SQL)	SQL Procedural Language (SQL PL)
role	role
`startup nomount` command	db2start command

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Oracle Data Dictionary–compatible Views

- DB2 stores metadata regarding the database in its System Catalog:
  - Contains metadata in the form of tables and views
  - Database manager creates and maintains two sets of catalog views
    - SYSCAT views
    - SYSSTAT views
- Oracle data dictionary plays the same role as DB2's System Catalog
- With SQL Compatibility, DB2 supports Oracle data dictionary-compatible views
  - Automatically created when you create the database
  - Query dictionary views as you would in Oracle

```
connect to mydb
select * from dictionary
Select * from user_sys_privs
```


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PL/SQL Packages in DB2

- Oracle PL/SQL Packages are similar to DB2 Modules
  - a collection of other database objects such as functions, procedures, types, and variables
- View information about packages
  - **SYSCAT.MODULES**: Module information
  - **SYSCAT.MODULEOBJECTS**: Objects contained in the module information

```
select char(modulename,5) modulename,dialect,moduletype from syscat.modules where modulename in ('PKG1','MOD1')

MODULENAME DIALECT    MODULETYPE
---------- ---------- ----------
MOD1       DB2 SQL PL M
PKG1       PL/SQL     P

  2 Record were selected.

select char(objectmodulename,10) objectmodulename,char(objectname,20) objectname,objecttype,published from syscat.moduleobjects
where objectmodulename = 'PKG1' order by 1

OBJECTMODULENAME OBJECTNAME           OBJECTTYPE PUBLISHED
---------------- -------------------- ---------- --------
PKG1             VAR1                 VARIABLE   Y
PKG1             GET                  FUNCTION   Y
PKG1             PRINT                PROCEDURE  Y
PKG1             PLUS                 PROCEDURE  Y

  8 Record were selected.
```

M: DB2 Module
P: PL/SQL Package

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Built-in Packages in DB2 10

Feature	Description
DBMS_ALERT	Cross session semaphoring
DBMS_DDL	Obfuscate DDL objects
DBMS_JOB	Job Scheduler, procedures for management
DBMS_LOB	Capability to operate on large objects
DBMS_OUTPUT	“print debugging” and simple reporting
DBMS_PIPE	Cross session data pipe
DBMS_SQL	Set of procedures to execute Dynamic SQL
DBMS_UTILITY	Misc. functions and procedures
MONREPORT	Monitoring data and generating text reports
UTL_DIR	Routines for maintaining directory aliases
UTL_FILE	Server side I/O API
UTL_MAIL	Server API to email
UTL_SMTP	Server API to SMTP

- and more in **DB2 Add-On Modules** for Oracle Database Compatibility

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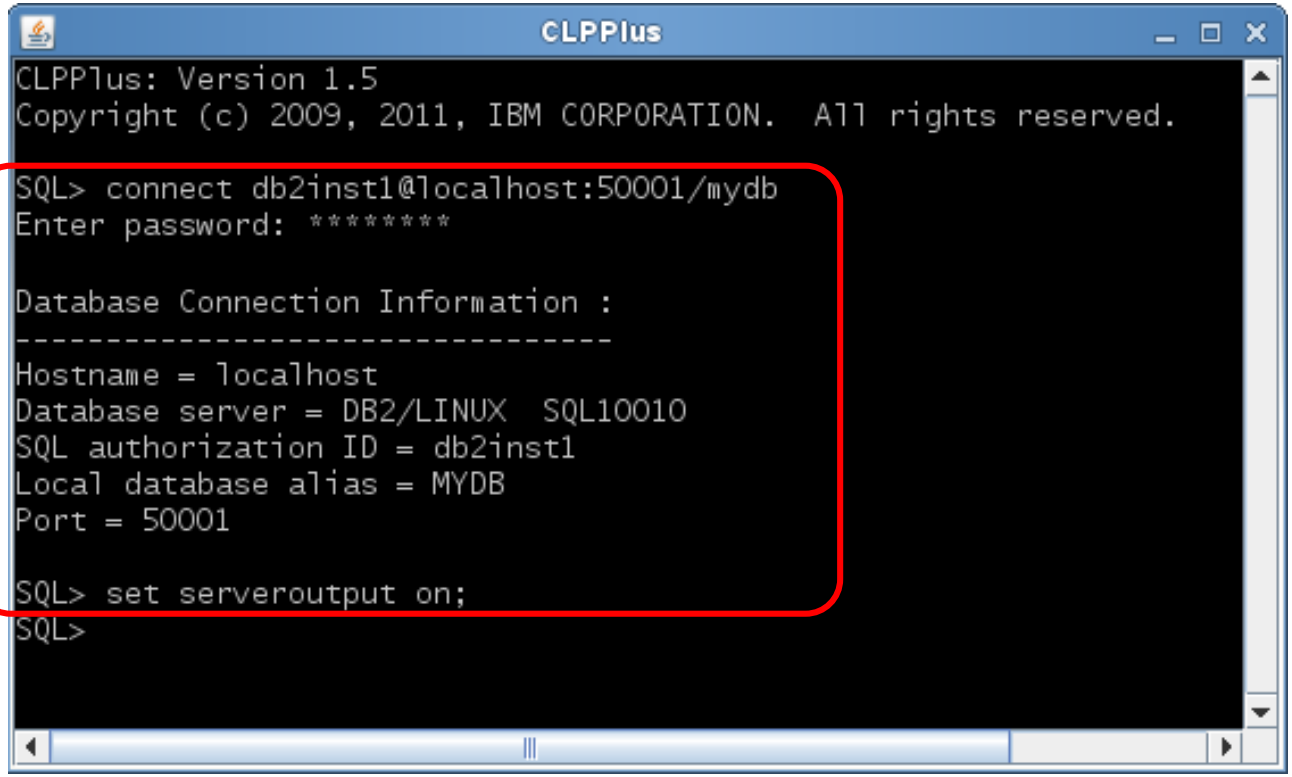
Running PL/SQL Code in DB2

- You can use any of the DB2 interfaces to run PL/SQL code
  - CLPPlus and programming interfaces (JDBC, .NET, etc)
  - DB2 automatically detects the syntax in use



CLPPlus example

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Module Content

DB2 Migration Tool: Data Conversion Workbench

Migration Roadmap

- Assessment
- Database Migration
- Data Movement
- Functional Verification

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IBM Data Conversion Workbench (DCW)

- DCW – An easy to use framework that can help you:
  - move your Oracle databases to DB2
  - migrate DB2 databases from one version or environment to another
- Provided as a no-charge plug-in to add migration capabilities to Data Studio
- DCW is comprised of several tools and wizards that will guide users through well-defined, best-practices migration steps

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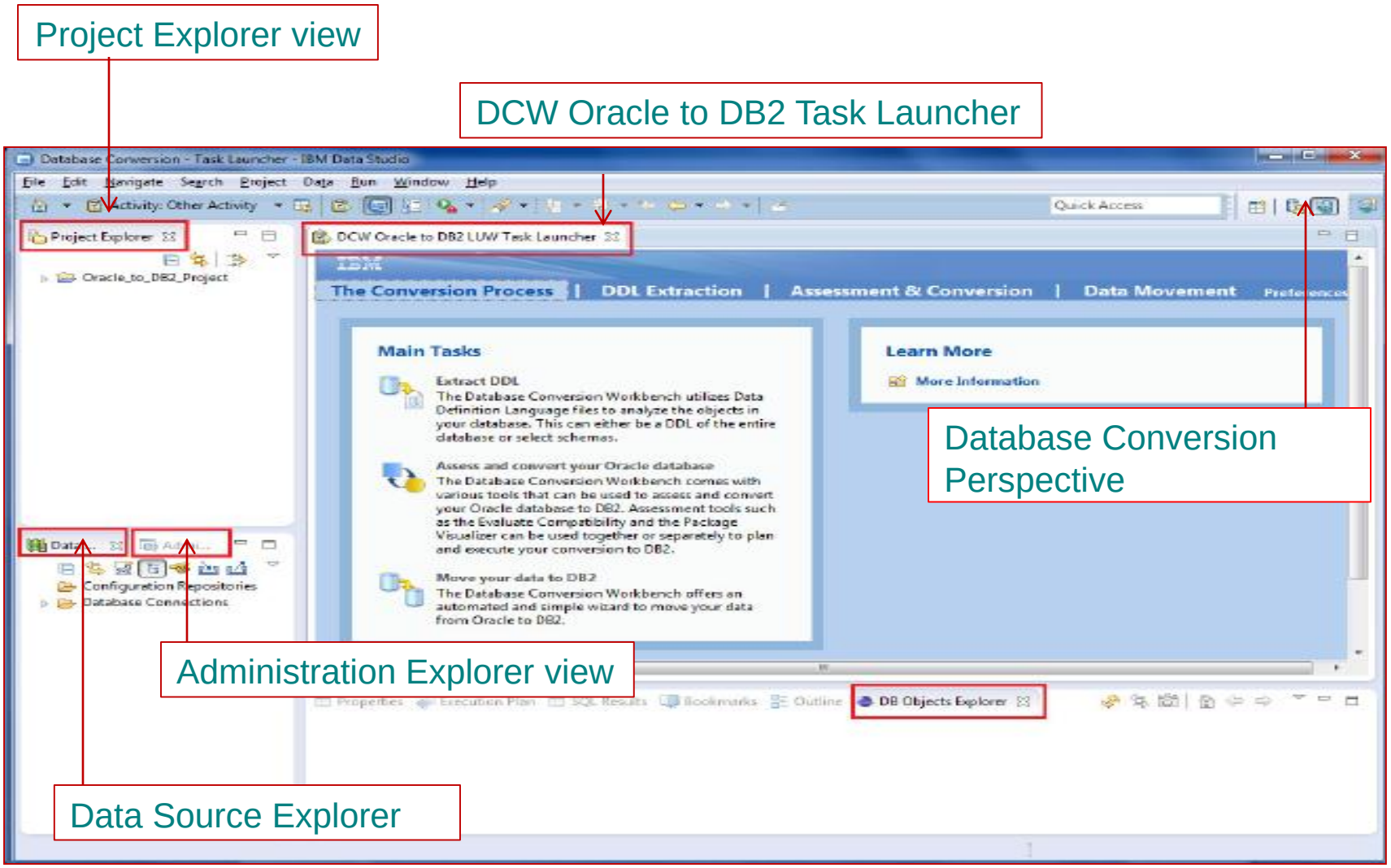
IBM Data Conversion Workbench (DCW) – Conversion Perspective



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IBM Data Conversion Workbench (DCW) – Tool Suite

- DCW Task Launcher - An integrated help guide which provides step by step instructions through the conversion process.
- DDL Extraction - Extracts DDL from the source database which is used by DCW to analyze the source database objects and provide an estimate on compatibility and work effort.
- Compatibility Evaluation - Provides a report of the estimated compatibility ratio of Oracle SQL and PL/SQL statements with DB2 and identifies code that must be fixed manually
- Code Conversion - Auto-converts Oracle syntax to DB2 compatible syntax.
- Split DDL - DCW can convert a single DDL file into multiple files, organized by object types.
- Package Visualizer - Generates a dependency graph of objects in the source database.
- Data Movement - Extracts and loads data from the source database to the target DB2 database.
- Assessment Report for Conversion to DB2 pureScale – Identifies features in use at the source database that are not yet supported in a DB2 10.1+ pureScale environment. DCW prepares a report that outlines such cases along with recommended solutions.

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IBM Data Conversion Workbench (DCW) – Reference

DCW Download site →
http://www.ibm.com/services/forms/preLogin.do?source=swg-idcw

Data Studio Download site →
http://www.ibm.com/developerworks/downloads/im/data/

developerWorks DCW Community site →
https://www.ibm.com/developerworks/community/groups/service/html/communityview?lang=en&communityUuid=05901c97-75b2-47a1-9c32-25f748855913

DCW Installation and User Guides →
https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/W252c18693c7e_432e_ad40_03c3417db6b1/page/DCW%20User%20Guides

DCW for Data Studio Forum →
https://www.ibm.com/developerworks/community/forums/html/forum?id=8e1f5a1c-499a-4793-9782-be8aba0bb974

Redbook: Oracle to DB2 Conversion Guide →
http://www.redbooks.ibm.com/abstracts/sg247736.html?Open

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Migration Roadmap



tools accuracy rapid

Step 1- Assessment

- 1a - Understand the environment to be migrated and the benefits
- 1b - Extract database DDL, PL/SQL from source
- 1c - Evaluate compatibility and estimate effort

automation tools minimal changes for standard interfaces


Step 2- Database Migration

- 2a - Use DCW to convert code
- 2b - Create DB objects (tables, functions, SPs, etc) in target DB2
- 2c - Manually convert objects not converted by DCW

tools automation


Step 3- Data Movement

- Move data using DCW Data Movement tools

Step 4- Application code migration and functional verification

- 4a - Migrate application(s)
- 4b - Execute regular set of tests for the application(s)

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Migration Roadmap – Step 1 - Assessment



tools accurate rapid

- Step 1a - Understand the environment to be migrated and the benefits
  - Porting Assessment Questionnaire (PAQ)
    - Gather details about applications and databases to be migrated. Eg: What DB interface (JDBC, ADO.NET, etc) ?
    - Work with IBM Representative to identify and quantify benefits of converting
- Step 1b - Extract database DDL and PL/SQL from source
  - DCW – DDL Extraction and Import tools
    - Extract DDL and PL/SQL from source (Oracle) database
      - via direct connection to Oracle database from DCW
      - via generated extract ion SQL script
    - Import Oracle DDL and PL/SQL into DCW framework
- Step 1c – Evaluate compatibility and estimate effort
  - DCW – Compatibility Evaluation tool
    - Generate the Compatibility Evaluation Report
      - Reports % Oracle DDL and PL/SQL statements that are compatible with DB2
      - Identifies code that uses features not supported in DB2 10.1 or 10.5
      - Suggests workarounds to fix the incompatible code
    - Work with IBM Migration SMEs to estimate effort

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Step 1a – Assessment (details): Understand the environment to be migrated

- Porting Assessment Questionnaire (PAQ) available from IBM Representative

  Gather metrics and technical details about applications and the database environment

2 - Application Information (approximate counts/estimates are acceptable)

Name of application and version under consideration for enabling to DB2	
What application servers are currently supported (if any)	
What third-party integrated components are used (if any)	
What type of workload is expected	◯ **OLTP** ◯ **OLAP/BI** ◯ **DSS** ◯ **Mixed** If **OLAP/BI** or **Mixed**, is any special OLAP/BI functionality required

3 - Database Information (approximate counts/estimates are acceptable)

General	
What is the approximate database size	**Average** Size: GB **Largest Known** Size: GB
If more than one database is used by the application, please describe how	
If the database is partitioned across multiple servers, please describe architecture	
Describe any data loading requirements (data movement scripts, special loading utility, automatic data generation programs, etc.)	
Does the database store Unicode data	◯ **Yes** ◯ **No**

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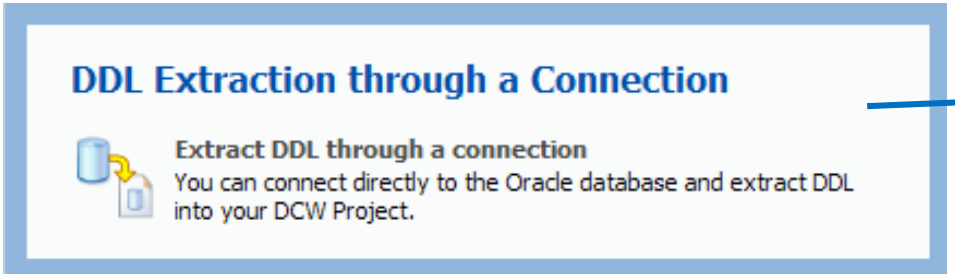
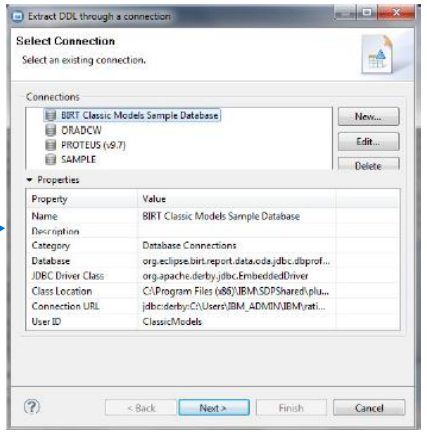
Step 1b – Assessment: Extract database DDL and PL/SQL from source

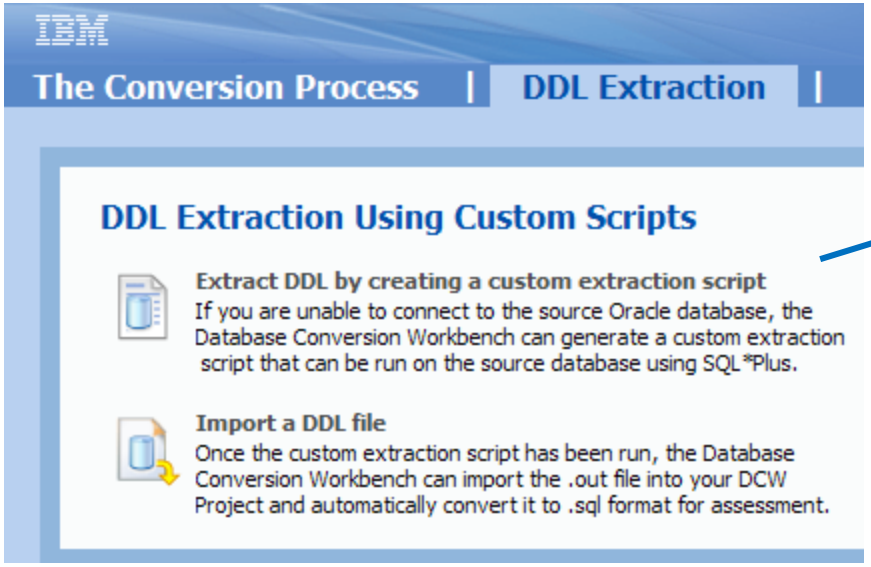
DCW wizards will walk users through processes to extract DDL and PL/SQL from source (Oracle) database … one of two ways:

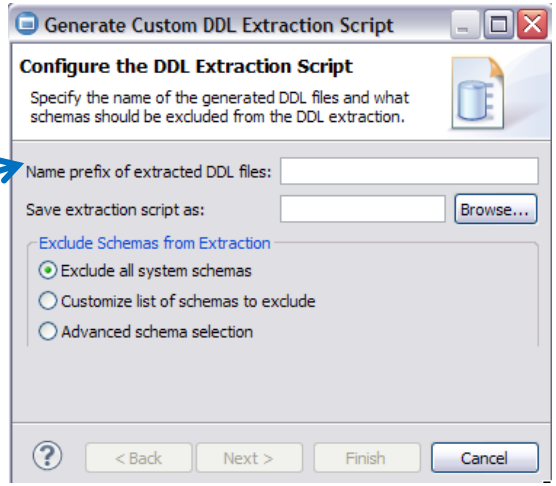
1. **via a connection from Data Studio to Oracle database**





2. **generation of custom extraction script to be run against Oracle database**





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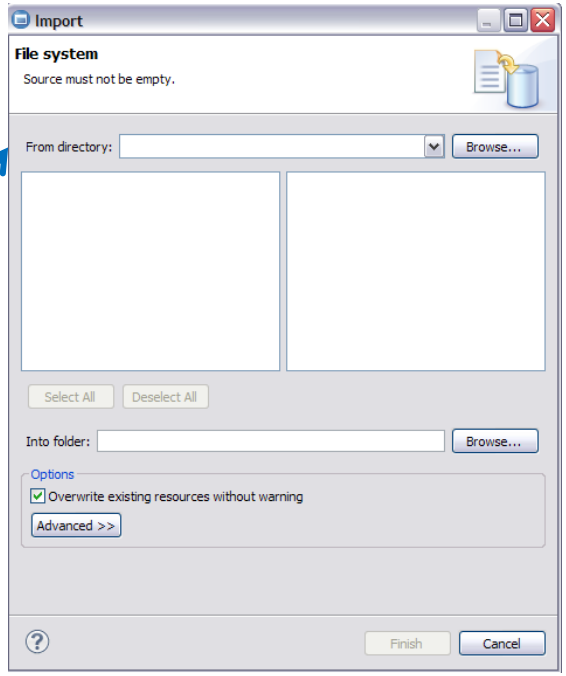
Step 1b – Assessment: Import database DDL and PL/SQL into DCW

- After user has obtained the source DDL and PL SQL, DCW Import wizard will walk user through process to import file into DCW

- The DDL file is imported into a DCW Project, and automatically converted to a .sql extension.



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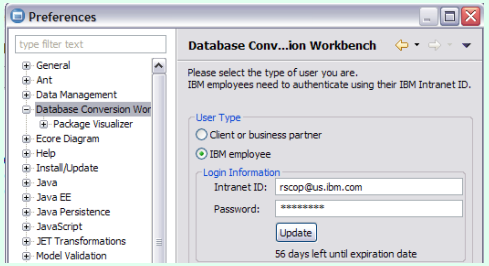
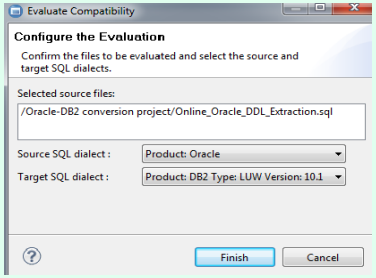
Step 1c – Assessment: Generate the DCW Evaluation Report

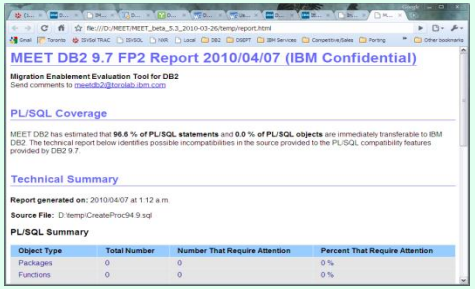
For IBMers:



Set IBM intranet id/pwd in Data Studio Preferences

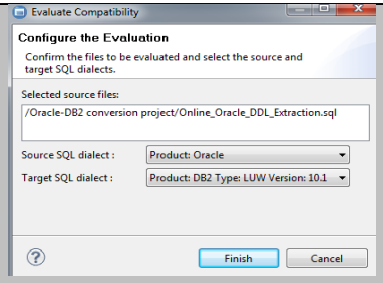


Run DCW *Evaluate Compatibility* wizard



View report in DCW or browser

For Clients and Business Partners:

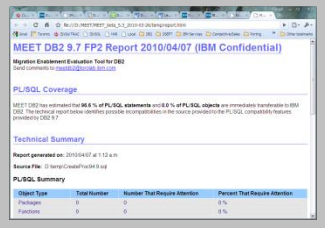


Run DCW *Evaluate Compatibility* wizard

DCW will generate an .xmle file

askdcw@ca.ibm.com

email: Encrypted file



IBM will email decrypted and formatted report to user

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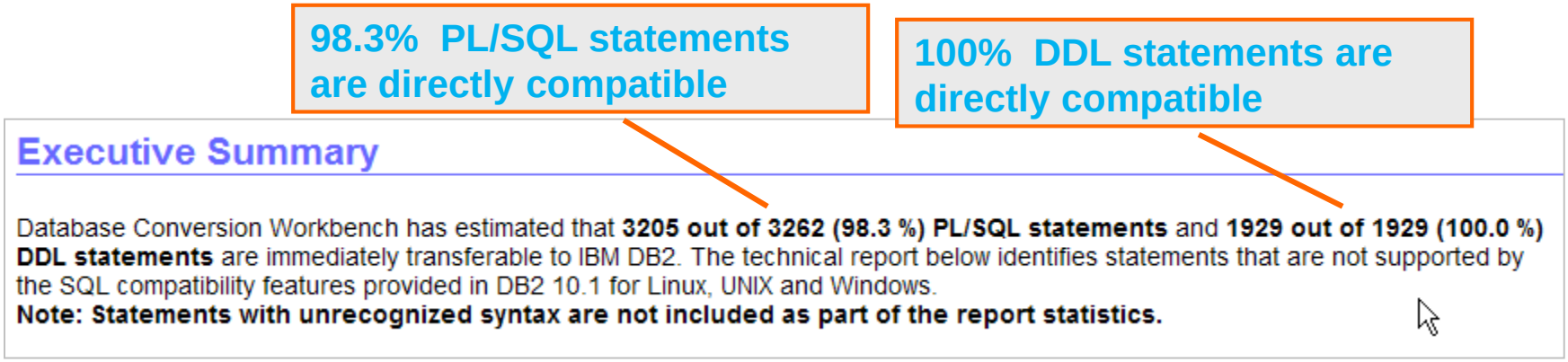
Step 1c - DCW Evaluation Report – Components

- **Executive Summary** - Overall % compatibility

- **Technical Summary** – Break-down of number of DDL and PL/SQL statements analyzed, and number and % that require attention

- **Detailed Technical Report -** Lists unsupported Oracle statements that require attention, the line number in the source SQL file and recommended solutions

- **Unrecognized Syntax** – Lines of code (if any) that were not recognized by DCW



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Step 1c - DCW Evaluation Report – Technical Summary

Technical Summary

PL/SQL Summary

Object Type	Total Number	Number That Require Attention	Percent That Require Attention
Package Heads	8	4	
Package Body	7	7	
Functions	9	3	
Procedures	17	14	
Triggers	20	0	0.0 %
Total Objects	61	28	45.9 %
Statements	381	16	4.19 %

PL/SQL summary organized by object type

Note: The calculation of PL/SQL statements does not include the objects (packages,triggers,functions and procedures) but it does consider all the statements within them.

DDL Summary

The Database Conversion Workbench can automatically conve
covered by the Databse Conversion Workbench.

DDL summary organized by statement type

Statement Type	Total Number	Number That Require Attention	Percent That Require Attention
Create type	0	0	0.0 %
Create sequence	39	0	0.0 %
Other DDL	147	0	0.0 %
Create index	101	2	1.98 %
Create view	29	7	24.13 %
Create table	97	97	100.0 %
Statements	413	106	25.66 %

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Step 1c - DCW Evaluation Report – Technical Details

PL/SQL Grouped By Features (Count: 9)

Show Details | Hide Details

Feature	Description	#
EXECUTE IMMEDIATE STATEMENT	Unable to validate the syntax of dynamic SQLs.	4
AUTHID CURRENT_USER/DEFINER	AUTHID CURRE	1
Solution:	You may skip this in DB2.	
Line 7038	[plsqlFunctionDeclaration] "[redacted]"	CREATE OR REPLACE FUNCTION "[redacted]" (query IN varchar2) return number authid current_use… dbms_sql.open_cursor; l_s… …arse (l_theCursor, query, dbm… …; then l_status := dbms_sql.last… dbms_sql.close_cursor(l_theCursor); return l_status; end;
Built-In Packages	Although these packages are supported in general, some methods are exceptions.	1
DBMS_UTILITY	DBMS_UTILITY package is not supported.	1
USERENV	Calls to USERENV are not s…	2
SYS SCHEMA/DATA DICTIONARY	Sys schema calls and Data D…	1
DBMS_STATS	DBMS_STATS package is not supported.	1
LAST	LAST function is not supported.	1
SYSTEM CATALOG VIEWS	Calls to some system catalog views are not supported.	1

Feature not supported

Suggested solution

List of occurrences

Click on each issue to see detail

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Migration Roadmap



Step 1- Assessment

tools accuracy rapid

1a - Understand the environment to be migrated and the benefits

1b - Extract database DDL, PL/SQL /from source

1c - Evaluate compatibility and estimate effort

tools automation


minimal changes for standard interfaces

Step 2- Database Migration

2a - Use DCW to convert code

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tools automation


Step 3- Data Movement

Move data using DCW Data Movement tools

Step 4- Functional Verification

– Execute regular set of tests for the application(s)

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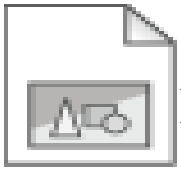
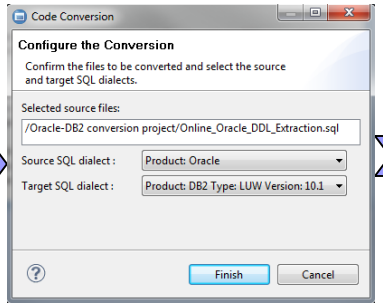
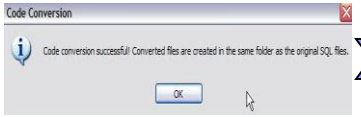
Step 2a – Database Migration: DCW Wizards for Code Conversion



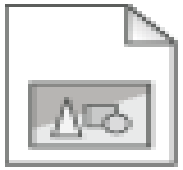
Source Database DDL, PL/SQL .sql File (from Step 1)



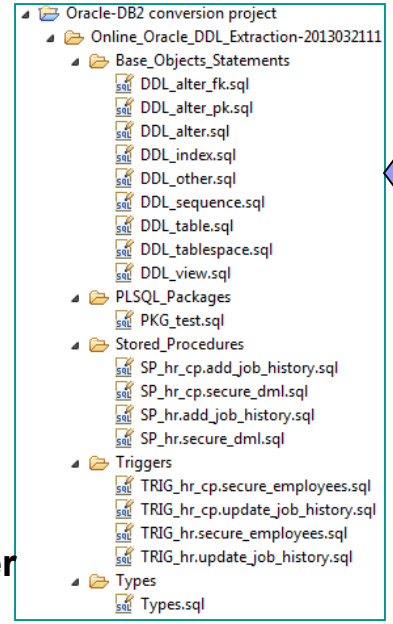
Run DCW *Auto-conversion* wizard



Conversion Success message

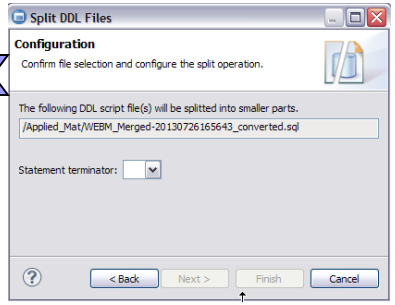


Converted DDL/PL SQL .sql file



Converted code is placed in DCW project folder … in separate, smaller, workable files

'@' is the default statement delimiter



(OPTIONAL … but recommended) Run DCW *Split DDL* function

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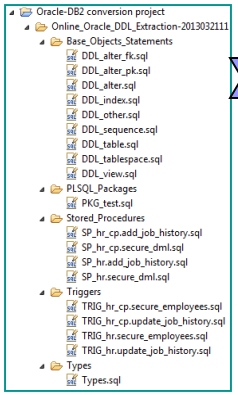
Step 2b – Database Migration: Manually review objects converted by DCW

DCW will flag statements that need attention or need to be evaluated in the converted code SQL files



Review Converted SQL files for ***"requires attention"*** statements: Code marked as "requires attention" ➔ statements that have been converted to DB2 compatible syntax but needs to be reviewed by user to insure valid runtime results.

Example:

```
"column_name" /*requires attention: "Precision  is
   limited to 31" begin*/ NUMBER(31)  /*requires
   attention end*/
```

DCW automatically converts NUMBER(N) where N > 31 to NUMBER (31). Original statement above: NUMBER(38). In most cases this is not a problem but users need to be aware that change has been made.

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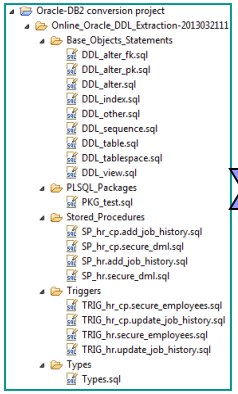
Step 2c – Database Migration: Manually convert objects not converted by DCW (cont.)



Review Converted SQL files for ***"DCW Evaluation Issue"*** statements:

- Code marked as "DCW Evaluation Issue" ➔ statements that are potentially incompatible with DB2 and needs to be reviewed by user.
- Evaluation Issues are outlined in DCW Evaluation Report with many recommended solutions

Examples:

/* *** DCW Evaluation Issue "PLSQL_EXECUTE_IMMEDIATE".Corresponding line no in the source file:1234 *** */

Feature	Description
EXECUTE IMMEDIATE STATEMENT	Unable to validate the syntax of dynamic SQLs.

Recommendation to evaluate all "EXECUTE IMMEDIATE" statements.

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Step 2c – Database Migration: Create DB2 database

Create the DB2 database with compatibility features

Enables all Oracle DB compatibility features

```
db2set DB2_COMPATIBILITY_VECTOR=ORA
db2stop force
db2start
db2 "CREATE DATABASE dbName AUTOMATIC STORAGE YES
        ON <storagePath1> PAGESIZE 32 K"

-- Recommended but not required
db2 UPDATE DB CFG FOR dbName
     USING AUTO_REVAL deferred_force
           DECFLT_ROUNDING round_half_up
```

Not needed with DB2 10.5 and Extended Row Size feature ==> PAGESIZEs no longer required to accommodate largest row length

If you want to deploy objects out of dependency order

Adjust rounding behaviour to match that of Oracle

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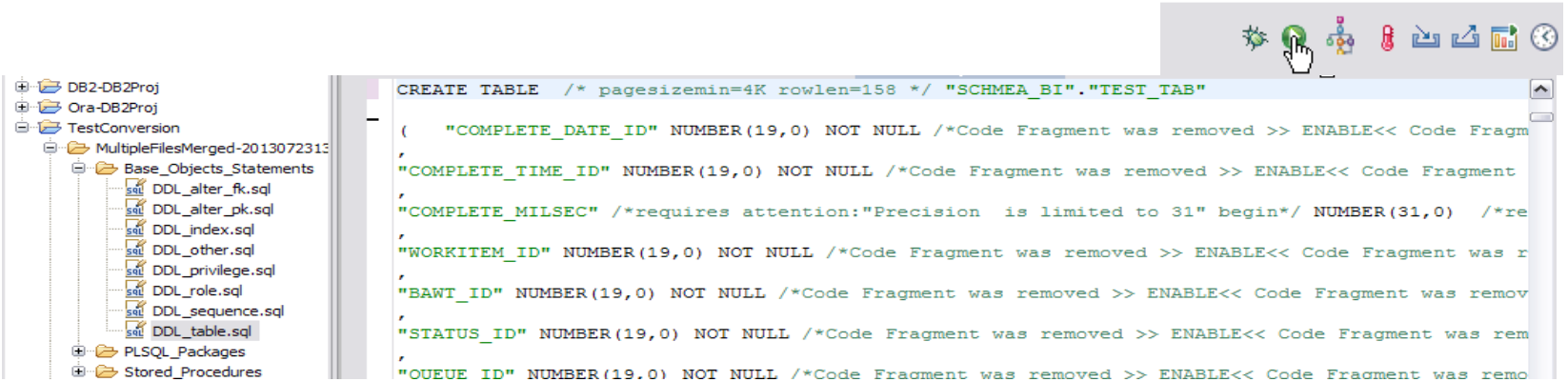
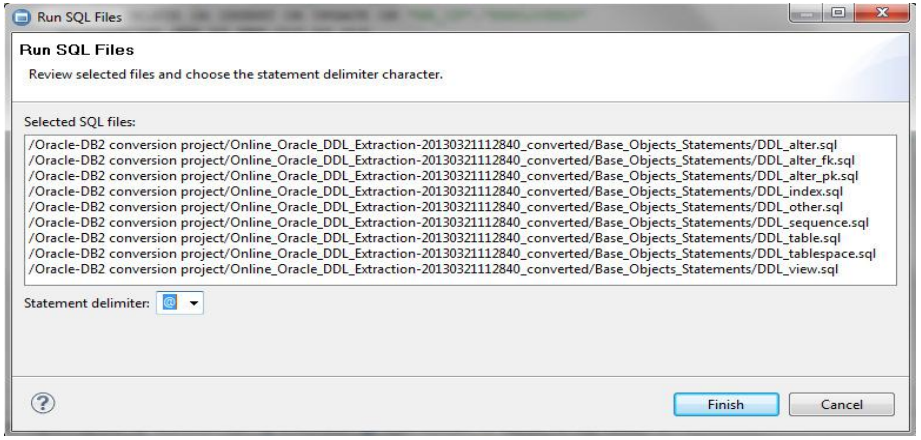
Step 2c – Database Migration: Deploy database objects in DB2

Use Data Studio to run DDL files individually from the Split DDL folders to create table spaces, tables, views, etc. on the target DB2 database using Data Studio



-OR –

Execute multiple DDL files by using **DCW Run SQL** Files function



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Migration Roadmap



tools accuracy rapid

Step 1- Assessment

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tools automation minimal changes for standard interfaces



Step 2- Database Migration

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tools automation


Step 3- Data Movement

- Move data using DCW Data Movement tools

Step 4- Application code migration and functional verification

- 4a - Migrate application(s)
- 4b - Execute regular set of tests for the application(s)

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Step 3 – DCW Data Movement

- Moving Oracle data to DB2 – several options:
  1. Extract data from Oracle into files and load data from files into DB2
  2. Using pipes (for larger databases … data is not stored in intermediate files)
  3. Data movement using Federation
  4. Change Data Capture (CDC) replication
- DCW Wizards are available for all 3 data movement options

  Right-click on the DCW Project and navigate to *Database Conversion* > *Extract Data*... then select the data movement wizard of choice
- All options require connections to both the source Oracle database and target DB2 database
- Data movement can be stopped at any time and resumed later by re-invoking the DCW data movement wizard
- Logs with error messages and row counts are stored in *Data Movement* folder in DCW project

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Step 4a - Application Code Migration

minimal changes for standard interfaces

- **Configure DB2 access interface**
  - Standardized interfaces: JDBC, ADO.NET, PDO, etc.
    - Focus on changing connection strings/configuration. E.g.:

```
 Class.forName("oracle.jdbc.driver.OracleDriver")
DriverManager.getConnection("jdbc:oracle:thin:@server.com:1521:db1")
```

```
 Class.forName("com.ibm.db2.jcc.DB2Driver")
DriverManager.getConnection("jdbc:db2://server.com:50000/db1")
```

  - Application that use Oracle's OCI can leverage DB2CI:
    - DB2CI is an OCI compatible client that supports 150+ OCI functions
  - Other interfaces... might require more work (E.g.: Pro*C)
- **No concurrency problems: Currently Committed** isolation level provides same behavior as Oracle's statement level isolation.

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Step 4b – Execute regular set of tests for the application(s)

Test!

Test!

Test!

Migration is complete!!!

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The next steps…

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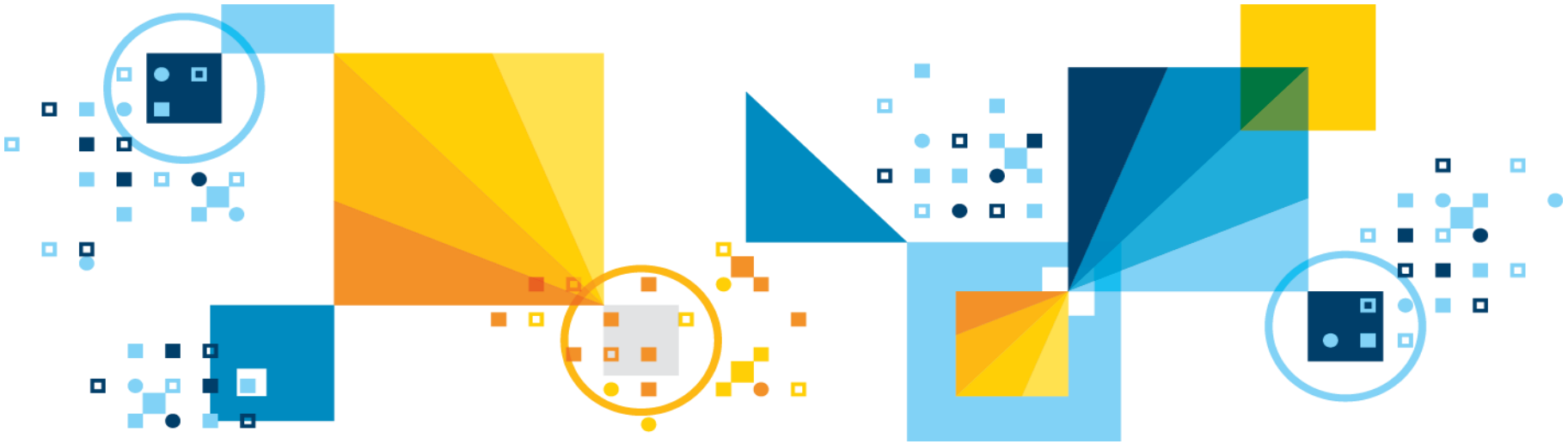
The Next Steps…

- Complete the Hands on Lab for this module
  - Log onto SKI, go to “My Learning” page, and select the “In Progress” tab.
  - Find the module
  - Download the workbook and the virtual machine image
  - Follow the instructions in the workbook to complete the lab
- Complete the online quiz for this module
  - Log onto SKI, go to “My Learning” page, and select the “In Progress” tab.
  - Find the module and select the quiz
- Provide feedback on the module
  - Log onto SKI, go to “My Learning” page
  - Find the module and select the “Leave Feedback” button to leave your comments

Questions?
askdata@ca.ibm.com



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