Db2 Level up

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Disclaimer

- All procedures presented have been designed and developed for educational purposes only

- This presentation is based on my own experience and knowledge

- Use information and ideas at your own risk

Agenda

- Beginning of the Story
- Continuous Delivery
- Application compatibility
- Data Server Clients and Drivers
- Questions

Beginning of the Story

Load module size generated by DSNELI will change?

DO we need to have our Drivers upgraded to new version before we can have all our packages on a version Higher than the current ?

Our Application is doing Casting , new APPLCOMPAT is supporting the Casts similar to DB2 V10?
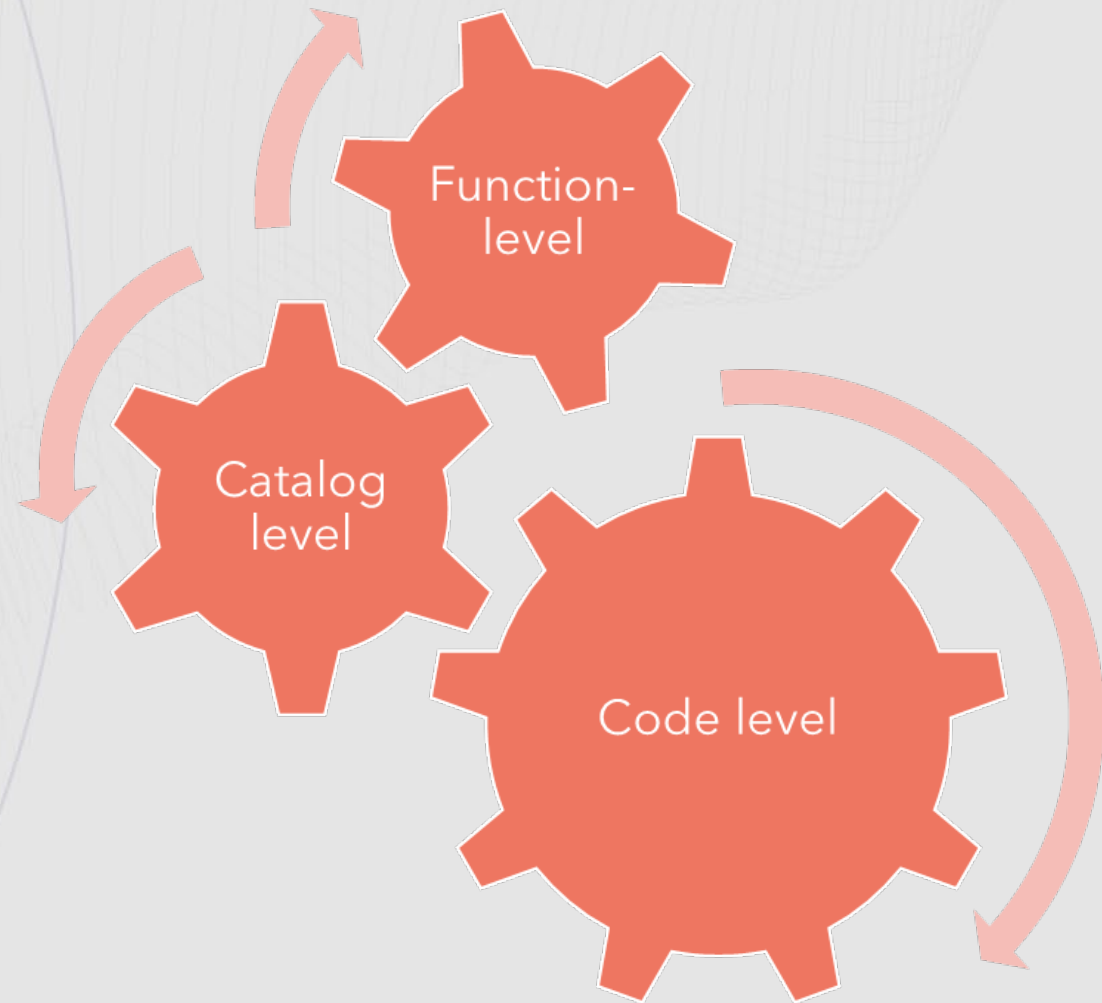
Agenda

- Beginning of the Story
- **Continuous Delivery**
  - **Continuous Delivery Concept**
  - Continuous delivery and function levels DB2 12 ,13
- Application compatibility level
- Data Server Clients and Drivers
- Questions

Continuous Delivery Concept [1|4]

- New functionality is not delivered in releases

- Continuous manner in the Db2 service stream

- As before Db2 APARs, PTFs,…

- They contain both fixes and new features

- Instead of delivering a **huge batch of new features every 3 years** through a new Db2 version, we are delivering **smaller batches of new functionality 3-4 times per** year via new Db2 function levels.

Continuous Delivery Concept [2|4]

Before you can activate
a function level, the Db2
subsystem, or all Db2 data sharing
members, must be at a sufficient
code level,
and the Db2 catalog must be
updated to the required Db2
catalog level.

Function-level

Catalog level

Code level

Continuous Delivery Concept [3|4]

- How to control when new functionality is deployed

  - Code Level
    - Contains the Db2 code changes and introduces fixes

  - Catalog Level
    - Catalog changes that are required for specific function levels

  - Function Level
    - Introduces new Db2 features and functionality

Continuous Delivery Concept [4|4]

CODE LEVEL

Upgrade Db2 Libraries

Catalog LEVEL

Db2 catalog must be updated to the required Db2 catalog level.

Function Level

A particular function level might enable one or several enhancements.

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    - **Code level**
    - **Catalog level**
    - **Function-level**
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Code Level

- Code Level for a corresponding function level :
  - The necessary APAR
  - Any prerequisite new function code
  - Defect fixes
  - Other service items

- New function levels are delivered in the same service stream as other maintenance items

- Code level is likely to increase as you routinely apply maintenance to a subsystem or member.

Catalog Level

• Change in DB2 Catalog and Directory

• The catalog level is updated when you submit a **CATMAINT** utility job
  by tailoring and running the DSNTIJTC sample job

ACTIVATE command: ==Activation of a== Function Level

- ==ENABLES== particular set of new Db2 capabilities and enhancements

- Virtual storage enhancements

- Subsystem parameters

- Optimization enhancements

- SQL capabilities

Code , Catalog, Function levels identifiers

- Specified by nine-character strings that correspond to the Db2
  - Version,
  - Release,
  - *Modification value*
- The format is VvvRrMmmm,
  - vv is the version,
  - r is the release,
  - mmm is the *modification level*. For
- example, V13R1M503 identifies *function level* 503.

DISPLAY Group command

*** BEGIN DISPLAY OF GROUP(........) CATALOG LEVEL(V12R1M500),   **Catalog level**

CURRENT FUNCTION LEVEL(V12R1M500),

HIGHEST **ACTIVATED** FUNCTION LEVEL(V12R1M500),

 HIGHEST **POSSIBLE** FUNCTION LEVEL(V12R1M501),   **Function Level**

 PROTOCOL LEVEL(2),

 GROUP ATTACH NAME(....),

--,

DB2   SUB   DB2 SYSTEM IRLM,

MEMBER ID SYS CMDPREF STATUS LVL   NAME   SUBSYS IRLMPROC,

--------   ---   ----   --------   -------- ------ -------- ---- --------,

 0   DSNX   -HX   ACTIVE 121510 SYHX   IRLM   DSNXIRLM,

--,   **Code level**

SPT01 INLINE LENGTH: 32138,

*** END DISPLAY OF GROUP(.......),

DSN9022I -HX DSN7GCMD 'DISPLAY GROUP ' NORMAL COMPLETION,

***,

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Db2 12 function levels use catalog levels

Catalog Level

- V12R1M500
- V12R1M502
- V12R1M503
- V12R1M505
- V12R1M507
- V12R1M509

Function Level

- FL 501
- FL 502
- FL 505
- FL 506
- FL 507
- FL 508
- FL 509
- FL 510

Continuous delivery and function levels DB2 12 [1|2]

FL501

LISTAGG Built in Function

FL502

Casting Explicit numeric values to Graphic

FL505

Rebind Phase in overcoming deterrent to rebinding

FL506

Application portability improvements

FL507

 Create or replace stored procedures

Continuous delivery and function levels DB2 12 [2|2]

- **FL-508**
  - Multi Table tablespace conversion to UTS – Partition by Growth
  - Fast Traversal BLOCK expansion to support non-unique indexes to extend performance and Reduce cost
- **FL509**
  - Audit policies
  - High availability for accelerator-only tables
  - Specification of a compression algorithm at the object level
  - Temporal RI enhancement to allow UPDATE or DELETE on a parent table
- **FL510** is required before you can migrate a Db2 12 environment to Db2 13. It does not introduce any new features or capabilities, or catalog changes, in Db2 12

Db2 13 function levels use the catalog levels

Catalog Level

- V13R1M100
- V13R1M501

Function Level

- FL 100
- FL 500
- FL 501
- FL 502
- FL 503

Db2 13 function levels use the catalog levels

Catalog Level	Catalog Object	Function Level
V13R1M100		FL100
V13R1M100		FL500
V13R1M501	SYSCOPY, SYSINDEXSPACESTA ,...	FL501
V13R1M501	SYSPACKAGE, SYSCOPY	FL502
V13R1M501	SYSCOLUMNS	FL503

New capabilities in Db2 13 [1|4]

- NOT depend on Db2 13 catalog changes

- Depend on Db2 13 catalog changes

Function levels DB2 13 [2|4]

NOT depend on
Db2 13 catalog changes

FL100
FL500

Depend on Db2
13 catalog
changes

FL501

FL502

FL503

Function levels DB2 13 [3|4]

FL-100 (V13R1M100)

Default value of the PAGESET_PAGENUM is RELATIVE

Changes to DBAT termination

Improved logic for INSERT operations
Index look-aside optimizations

Enhanced sort optimizations

FL 501 (V13R1M501)

Collection of real-time and historical information about utility execution

Real-time statistics support for index splits

Allow applications to specify a deadlock resolution priority

FL-500 (V13R1M500)

The type of owner for a plan, package, can be a role or an authorization ID.

SQL Data Insights (SQL DI), an integrated solution that brings deep learning AI capabilities

Online conversion of tables from (PBG) TO (PBR)

Increased control for applications over how long to wait for a lock

Profile table enhancements for application environment settings

Delete an active log data set from the BSDS while Db2 is running

Change REORG INDEX SHRLEVEL REFERENCE or CHANGE so the NOSYSUT1 keyword is the default

Function levels DB2 13[4|4]

FL- 502

Db2 controlled sysplex workload balancing (WLB)

Infrastructure for statement-level invalidation.
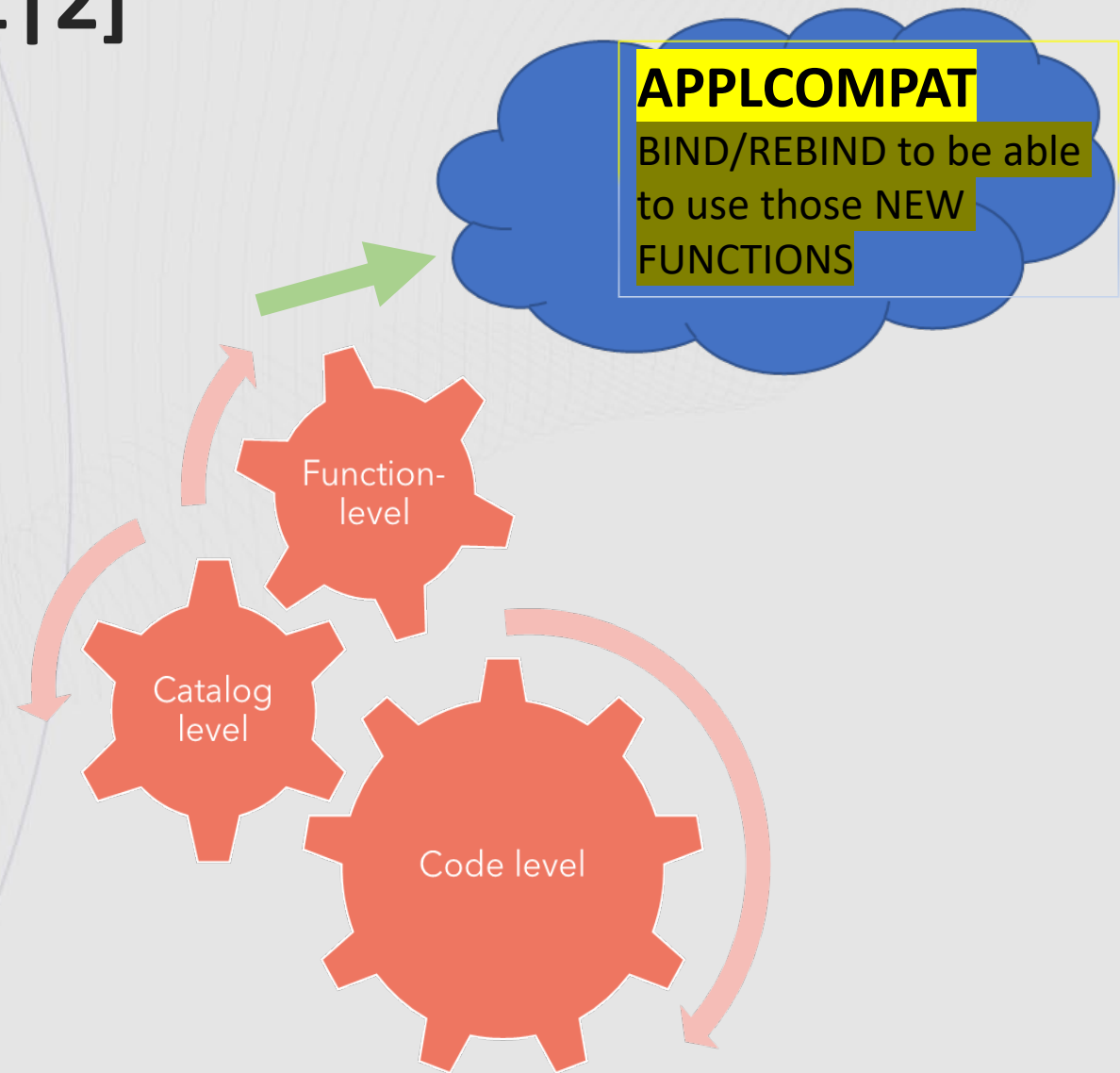
FL 503

Improved default behavior for added ROW CHANGE TIMESTAMP columns in existing rows

Accelerator-only support for queries with IN list predicates with more than 32K elements

optimize-clause support for SELECT INTO statements.

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  - **What is APPLCOMPAT**
  - **Why we need APPLCOMPAT**
  - How to manage APPLCOMPAT
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What is APPLCOMPAT [1|2]

- APPLCOMPAT ,ZPARM
  - For system LEVEL

- APPLCOMPAT bind option
  - For Application

APPLCOMPAT
BIND/REBIND to be able to use those NEW FUNCTIONS

Function-level

Catalog level

Code level

What is APPLCOMPAT [2|2]

- Determines the SQL level

- Activates new SQL syntax

- Freezes the SQL syntax

Why we need APPLCOMPAT ? [1|2]

- When we have a legacy application and NOT sure What SQL Statements had over the years , what would we expect by using NEW Db2 FUNCTION LEVEL? And NEW APPLCOMPAT?

- Always is concern that some thing is NOT working properly !

- Expecting Incompatibilities

Why we need APPLCOMPAT ? [2|2]

- It **enables** the use of SQL functionality introduced with a Db2 version for example, the AI_SIMILARITY Function

- Protects a program from SQL incompatibility.
  - Staying in LOWER APPLICATION LEVEL

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  - What is APPLCOMPAT
  - Why we need APPLCOMPAT
  - **How to manage APPLCOMPAT**
    - Find out the value of APPLCOMPAT
    - How to change APPLCOMPAT?
    - **Managing APPLCOMPAT incompatibilities**
- Data Server Clients and Drivers
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Find out the value of APPLCOMPAT

- For static SQL statements, the APPLCOMPAT column of the SYSIBM.SYSPACKAGE catalog table stores the application compatibility setting.

- For Dynamic SQL statements, the CURRENT APPLICATION COMPATIBILITY special register stores the application compatibility setting.

SELECT CURRENT APPLICATION COMPATIBILITY

FROM SYSIBM.SYSDUMMY1;

How to change APPLCOMPAT

- For Static SQL, BIND or REBIND PACKAGE

- For DYNAMIC SQL , SET CURRENT APPLICATION COMPATIBILITY
  - Change the Db2 application compatibility level in effect for subsequent SQL statements that you or a program might issue

  - Only change that level to a value BELOW the APPLCOMPAT value of the package being used

- Cannot dynamically go to a level higher than the package's APPLCOMPAT value.

Managing application incompatibilities [1|3]

- ATTEMPT TO USE A FUNCTION WHEN THE APPLICATION

COMPATIBILITY SETTING IS SET FOR A PREVIOUS LEVEL

SQLCODE=-4743, SQLSTATE=56038

- SQLCODE -30025. Applications that do not specify this property accept possibly inconsistent results from the server.

Managing application incompatibilities [2|3]

- Start a trace for IFCID 0376 to report incompatibility information about the packages.

- For example, issue the following START TRACE command:

  - -START TRACE(PERFM) CLASS(32) IFCID(376)
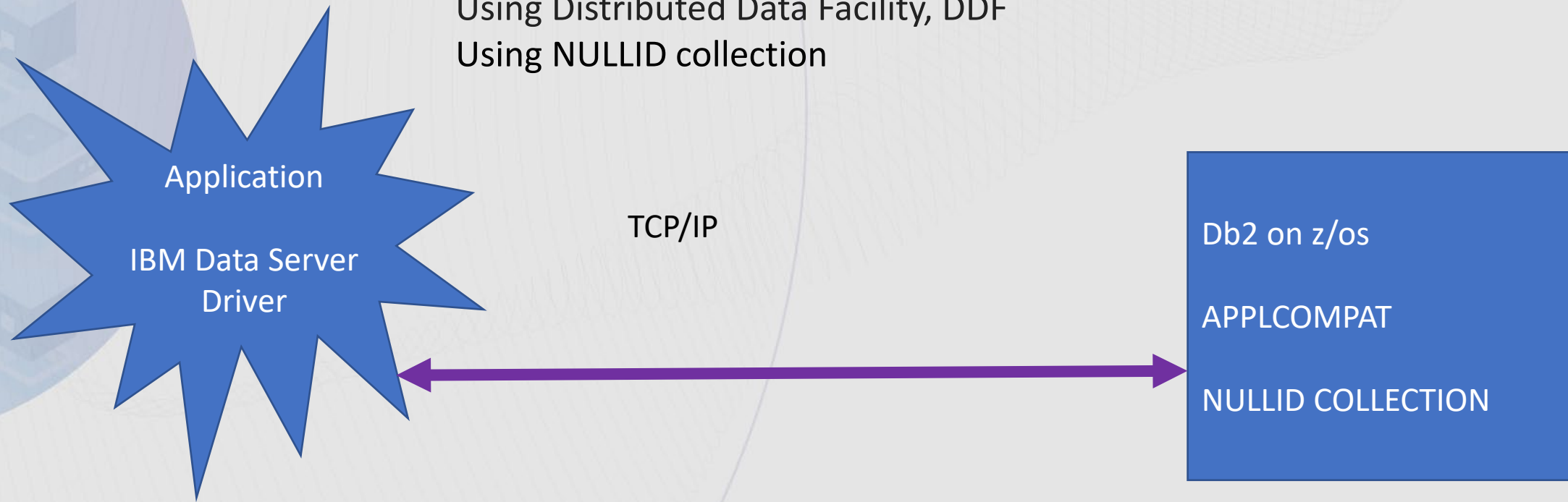
Managing application incompatibility [3|3]

- Use of the **PLANMGMT bind option** so that you can revert to a previous package copy if a regression occurs.

- Rebind distributed packages in **separate collections** and switch the applications to using the new collections.

- Using **profile tables** to control which Db2 for z/OS application compatibility levels to use for specific data server client applications

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IBM Data Server Driver[1|4]

Applications accessing Db2 via the IBM Data Server Driver
DRDA requester applications
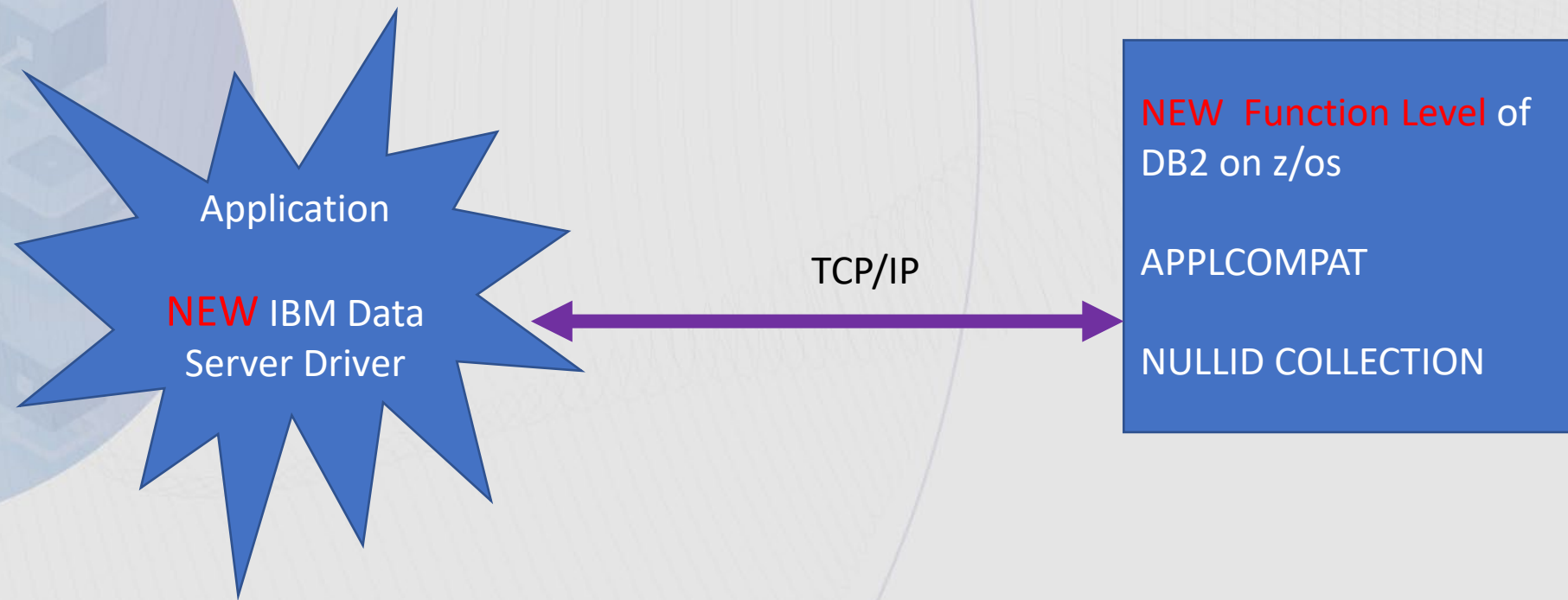Using Distributed Data Facility, DDF
Using NULLID collection

Application

IBM Data Server
Driver

TCP/IP

Db2 on z/os

APPLCOMPAT

NULLID COLLECTION

IBM Data Server Driver[2|4]

- JDBC driver (JCC) version corresponds with each DB2 for z/OS release

Db2 for z/os	Minimum JCC4 Version	Maximum JCC4 Version
V11	4.17.28 (v10.5 FP2)	4.32.46
V12	4.23.42 (v11.1 M2 FP2)	4.32.46
V13	4.31.10 (v11.5 M7 FP0)	4.32.46

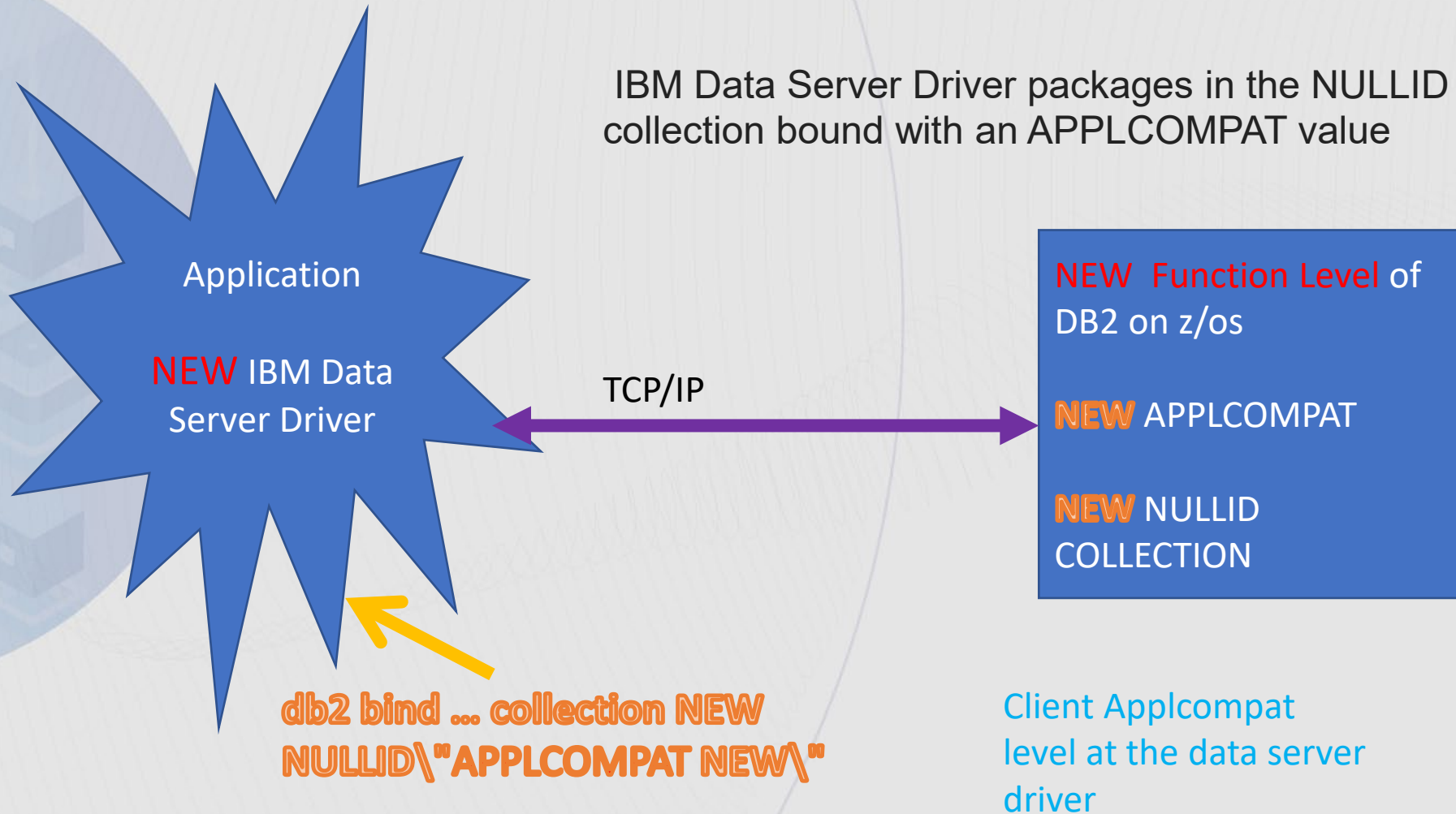# IBM Data Server Driver[3|4]

Data Server Driver, Data Server Client and DB2 Connect levels required for continuous delivery.

Application

NEW IBM Data Server Driver

TCP/IP

NEW Function Level of DB2 on z/os

APPLCOMPAT

NULLID COLLECTION

IBM Data Server Driver[4|4]

IBM Data Server Driver packages in the NULLID collection bound with an APPLCOMPAT value

Application

NEW IBM Data Server Driver

TCP/IP

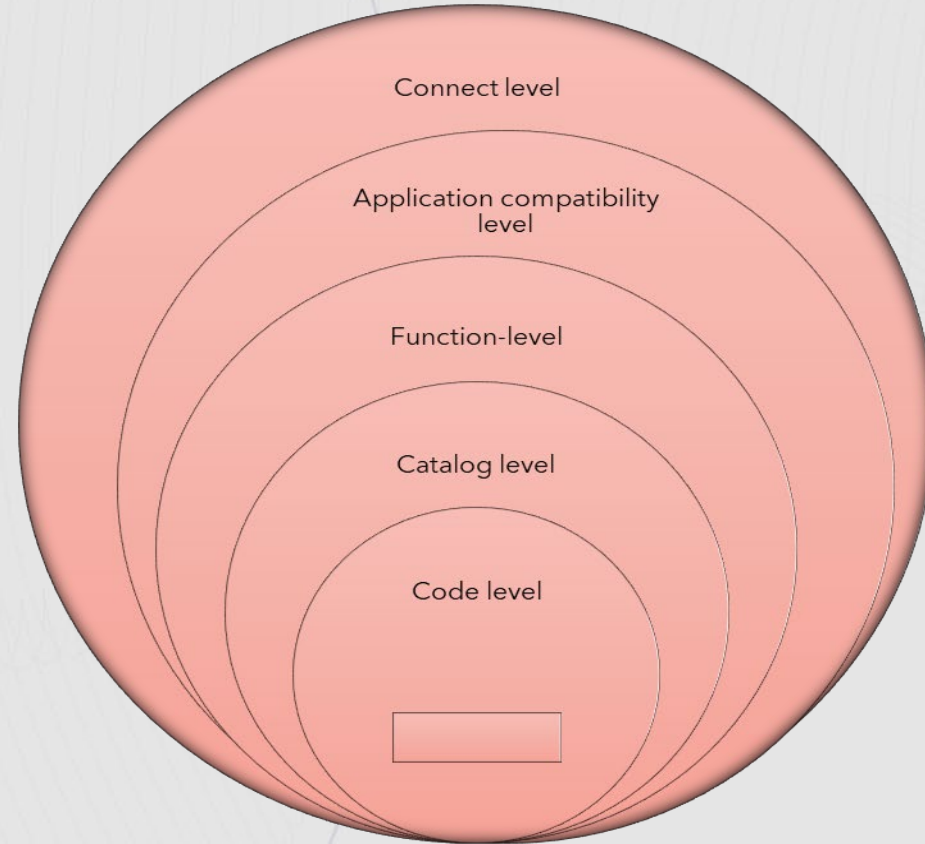NEW Function Level of DB2 on z/os

NEW APPLCOMPAT

NEW NULLID COLLECTION

db2 bind ... collection NEW NULLID\"APPLCOMPAT NEW\"

Client Applcompat level at the data server driver

Conclusion

Connect level

Application compatibility level

Function-level

Catalog level

Code level

Resources

- [Overview of what's new in Db2 13 - IBM Documentation](#)

- [http://robertsdb2blog.blogspot.com/2021/04/db2-for-zos-dealing-with-application](#)

- [http://robertsdb2blog.blogspot.com/2019/06/db2-for-zos-talking-about-applcompat.htm](#)

- [SQL changes in Db2 13 - IBM Documentation](#)

- [VnnRnMnnn application compatibility levels - IBM Documentation](#)

- [VnnRnMnnn application compatibility levels for data server clients and drivers - IBM Documentation](#)

- [Db2 13 function levels - IBM Documentation](#)

- [https://www.ibm.com/docs/en/db2-for-zos/13?topic=aclid-vnnrnmnnn-application-compatibility](#)

- [Robert's Db2 blog: July 2019 (robertsdb2blog.blogspot.com)](#)

- [https://help.sap.com/docs/db2-for-zos/database-administration/db2-continuous-delivery](#)

- [https://www.ibm.com/docs/en/db2-for-zos/13?topic=13-catalog-changes](#)

- [Application compatibility levels in Db2 - IBM Documentation](#)

- [Managing application incompatibilities - IBM Documentation](#)

- [Using profile tables to control which Db2 for z/OS application compatibility levels to use for specific data server client applications - IBM Documentation](#)

- [DB2 JDBC Driver Versions and Downloads for Db2 z/OS. (ibm.com)](#)

- [SQL changes in Db2 13 - IBM Documentation](#)

Questions

Thank You

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