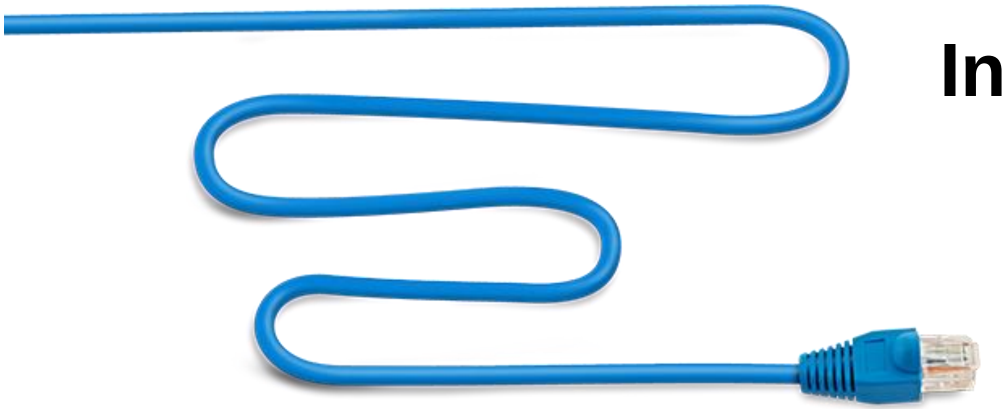
WHAT YOU *MUST* KNOW ABOUT DISTRIBUTED ACCESS TO DB2 FOR Z/OS – PART 1

Cristian Molaro, Belgium

Independent consultant

IBM GOLD Consultant

IBM Champion IM



cristian@molaro.be

@cristianmolaro

About the speaker

- **Cristian Molaro,** MConsulting Bvba, Belgium
  - Independent DB2 specialist and an IBM Gold Consultant
  - Recognized by IBM as an Information Champion in 2009, 2010, 2011, 2012, 2013, and 2014
  - Recognized by IBM as "TOP" EMEA Consultant in 2011 / 2013
  - Co-author of 9 IBM Redbooks related to DB2. Holder of the merit badge “Platinum IBM Redbook Author”
  - 12 books published about DB2 for z/OS and DB2 for LUW
- Reachable at
  - cristian@molaro.be
  - be.linkedin.com/in/cristianmolaro/

DISCLAIMER

PLEASE BE AWARE THAT THE ACTUAL PROGRAMMING TECHNIQUES, ALGORITHMS AND ALL NUMERICAL PARAMETERS USED IN EXAMPLES GIVEN IN THIS PRESENTATION ARE SUBJECT TO CHANGE AT SOME FUTURE DATE EITHER BY A NEW VERSION OF DB2, A NEW RELEASE, A SMALL PROGRAMMING ENHANCEMENT (SPE) OR A PROGRAMMING TEMPORARY FIX (PTF).

THE INFORMATION CONTAINED IN THIS PRESENTATION HAS NOT BEEN SUBMITTED TO ANY FORMAL REVIEW AND IS DISTRIBUTED ON AN “AS IS” BASIS WITHOUT ANY WARRANTY EITHER EXPRESS OR IMPLIED. THE USE OF THIS INFORMATION OR THE IMPLEMENTATION OF ANY OF THESE TECHNIQUES IS A CUSTOMER RESPONSIBILITY AND DEPENDS ON THE CUSTOMER’S ABILITY TO EVALUATE AND INTEGRATE THEM INTO THE CUSTOMER’S OPERATIONAL ENVIRONMENT. WHILE EACH ITEM MAY HAVE BEEN REVIEWED FOR ACCURACY IN A SPECIFIC SITUATION, THERE IS NO GUARANTEE THAT THE SAME OR SIMILAR RESULTS WILL BE OBTAINED ELSEWHERE. CUSTOMERS ATTEMPTING TO ADAPT THESE TECHNIQUES TO THEIR OWN ENVIRONMENTS DO SO AT THEIR OWN RISK.

DB2 IS A TRADEMARK OF INTERNATIONAL BUSINESS MACHINE CORPORATION. THIS PRESENTATION USES MANY TERMS THAT ARE TRADEMARKS. WHEREVER WE ARE AWARE OF TRADEMARKS THE NAME HAS BEEN SPELLED IN CAPITALS.

Agenda

Objective

- To review topics that you ***must*** know about distributed access to DB2 for z/OS

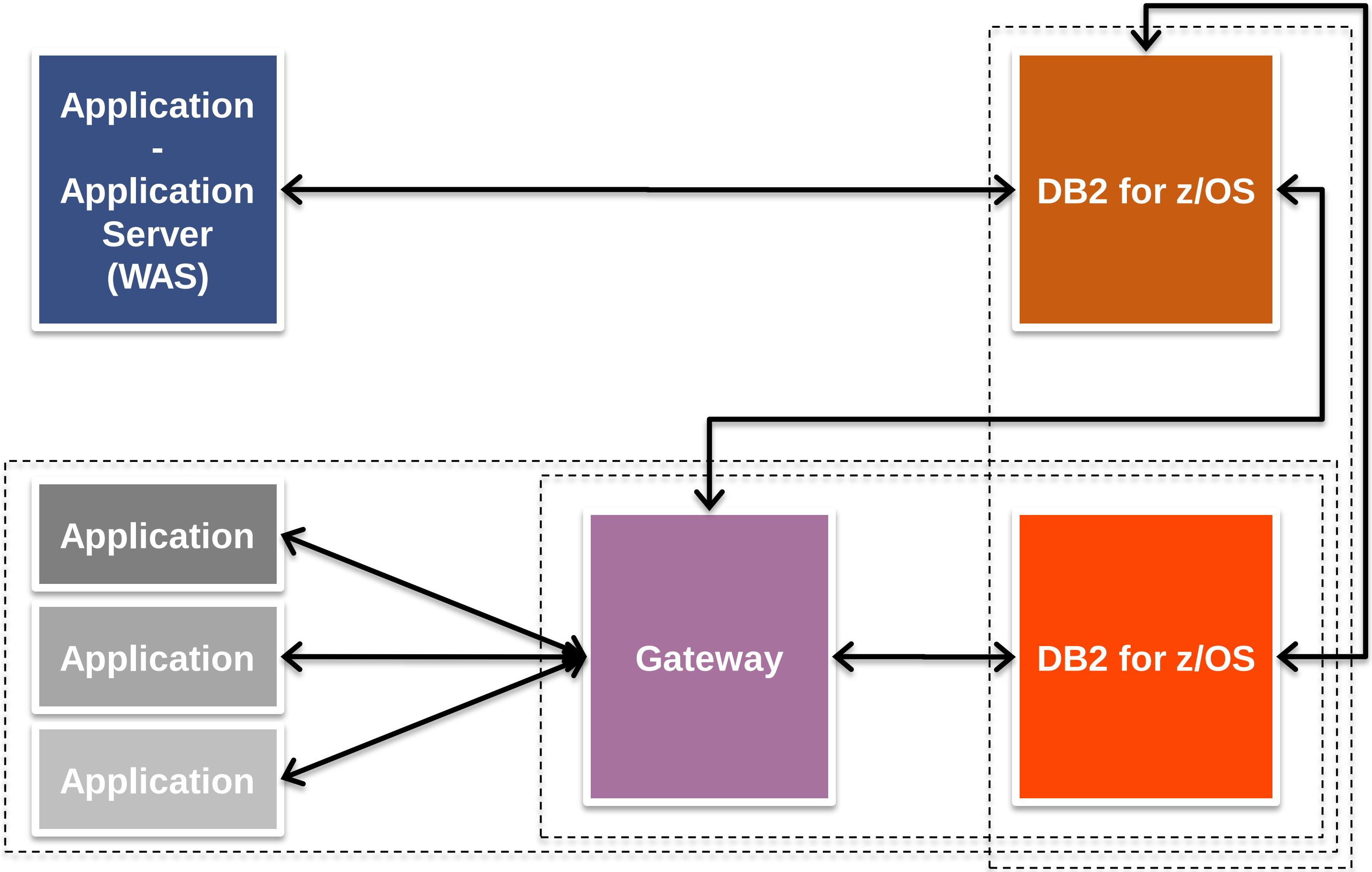
Contents

- Connectivity topics
- Accounting and SMF
- High performance DBATs
- And there is more
- In Part 2:
  - Data Sharing considerations
  - Specialty engines
  - What is new in DB2 11
  - Problem determination

CONNECTIVITY TOPICS

Distributed access to DB2

- Configuration examples



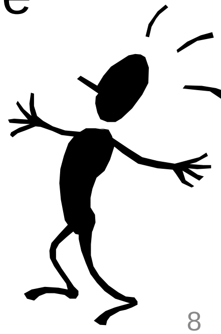
Distributed Relational Database Architecture levels

- Communication will be done using the lowest DRDA level supported by the Client / Server
- Working with down-level clients?
  - An old client will work but probably with a subset of the DRDA capabilities of the DB2 server
  - Clients and servers are supported independently
- **BUT:** feedback from IBM DDF Level 2 Support area shows:
  - Typical problem: distribution protocol errors or errors with certain DDM code points
  - Special register settings not taking effect after connection reuse
  - Many (sometimes undetermined) problems solved after updating clients

IMPORTANT: Keep clients up to date

Database access threads processing modes

- **ACTIVE MODE:** A DBAT is always active from initial creation to termination
- **INACTIVE MODE**: A DBAT that is not currently processing a unit of work is called a pooled thread, and it is disconnected
  - When a DBAT in INACTIVE MODE is active, it processes requests from client connections within units of work
  - When a DBAT is pooled, it waits for the next request from a client to start a new unit of work
- **CONDBAT**: Max. # of distributed connections into DB2 system
  - Includes inactive and active connections, may be large
  - DB2 queues DBAT requests to become active up to CONDBAT
- **MAXDBAT**: Max # database access threads (DBATs) that can be active concurrently
  - In many installations, max. value determined by available storage in DBM1 → check IFCID 225

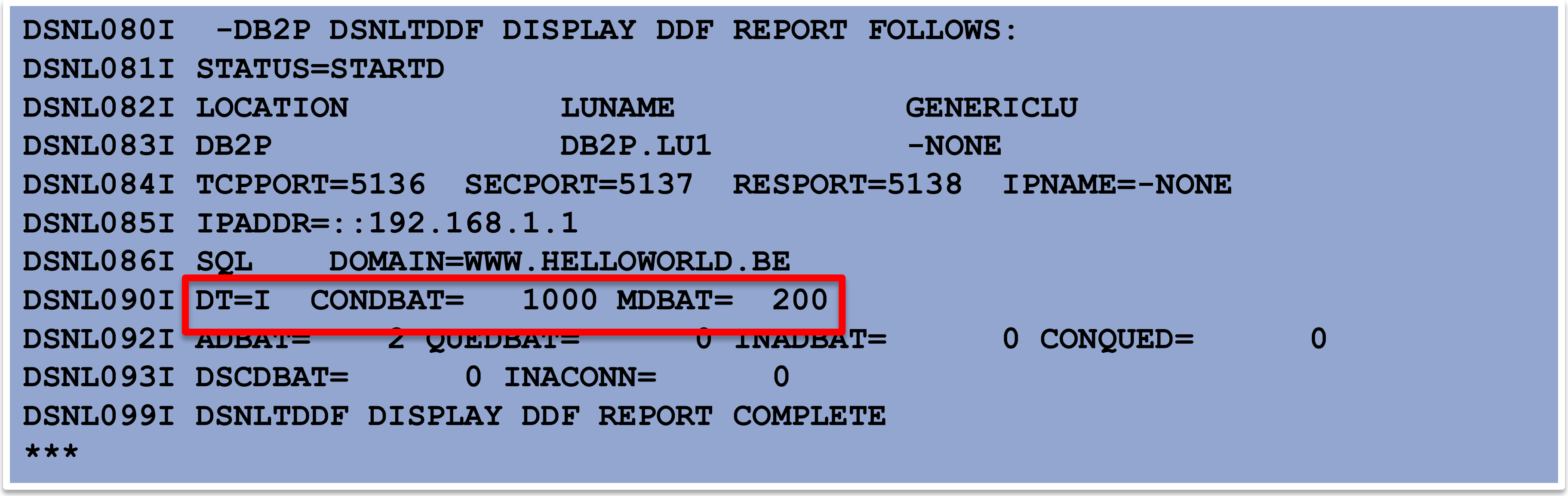


Use INACTIVE threads

- Enable inactive thread support
  - CMSTAT=INACTIVE
  - Allows DB2 for z/OS pooling:
    - Reduction in CPU utilization
    - Reduction in Memory utilization
- To allow DDF threads to become INACTIVE
  - Avoid holding resources
    - WITH HOLD cursors not closed
    - DTT not dropped
    - Application using packages bound using KEEPDYNAMIC

IMPORTANT: Resources held across a COMMIT would prevent the connection and associated DB2 thread from being **POOLED**

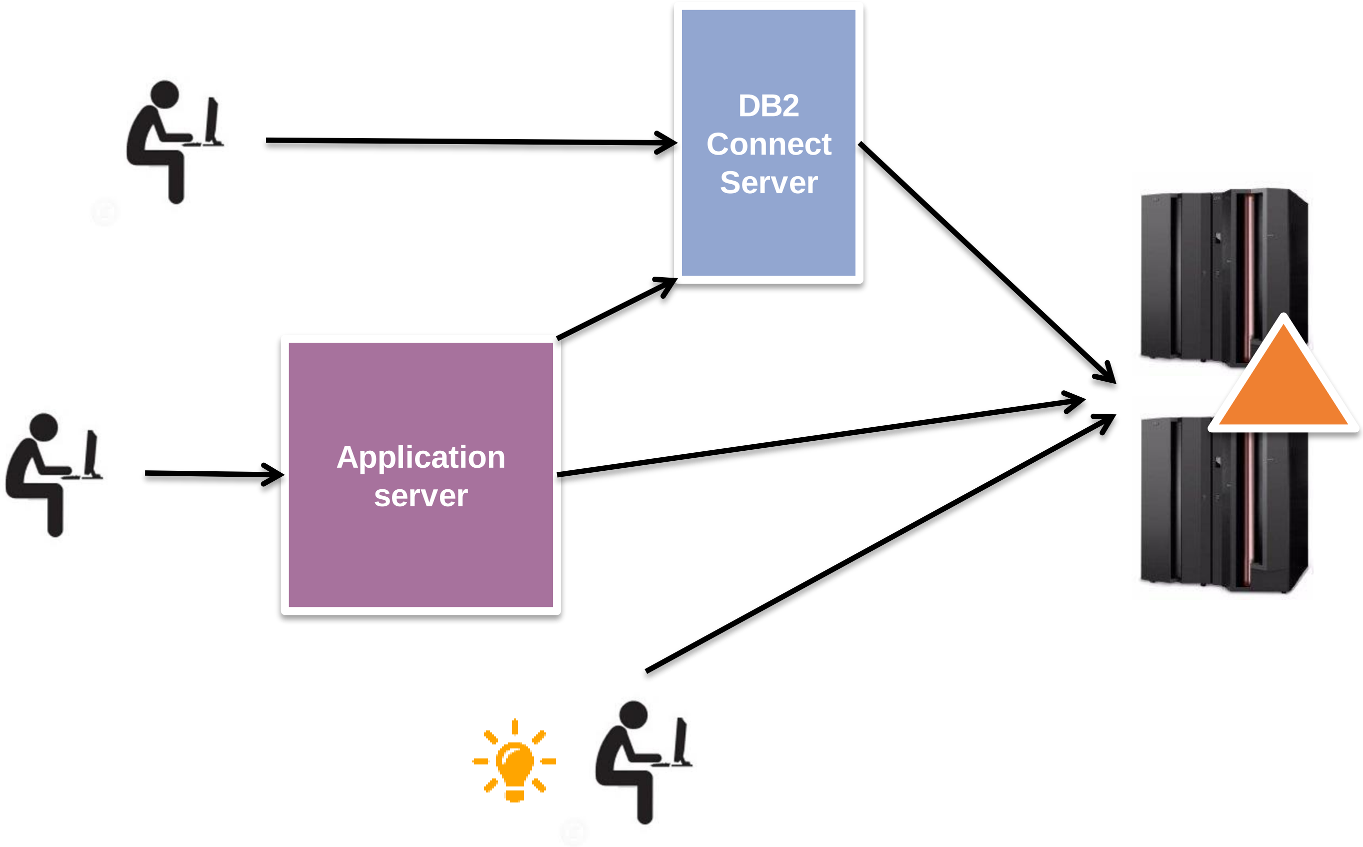
DIS DDF command



```
DSNL080I  -DB2P DSNLTDDF DISPLAY DDF REPORT FOLLOWS:
DSNL081I STATUS=STARTD
DSNL082I LOCATION           LUNAME            GENERICLU
DSNL083I DB2P               DB2P.LU1          -NONE
DSNL084I TCPPORT=5136  SECPORT=5137  RESPORT=5138  IPNAME=-NONE
DSNL085I IPADDR=::192.168.1.1
DSNL086I SQL    DOMAIN=WWW.HELLOWORLD.BE
DSNL090I DT=I   CONDBAT=   1000 MDBAT=   200
DSNL092I ADBAT=      2 QUEDBAT=      0 INADBAT=      0 CONQUED=      0
DSNL093I DSCDBAT=      0 INACONN=      0
DSNL099I DSNLTDDF DISPLAY DDF REPORT COMPLETE
***
```

- DT=I   --> DDF configured with INACTIVE threads
- CONDBAT --> MAX REMOTE CONNECTED
- MDBAT   --> MAX REMOTE ACTIVE
- ADBAT   --> Current # of DBATs, active and disconnected
- QUEDBAT --> Count # times MDBAT was reached, only reset at restart
- INADBAT --> Current # of inactive DBATs, DISPLAY THREAD TYPE(INACTIVE)
- CONQUED --> Current # of queued connections
- DSCDBAT --> Current # of disconnected DBATs= DBAT pool threads
- INACONN --> Current # of inactive connections

DB2 Connect Configurations

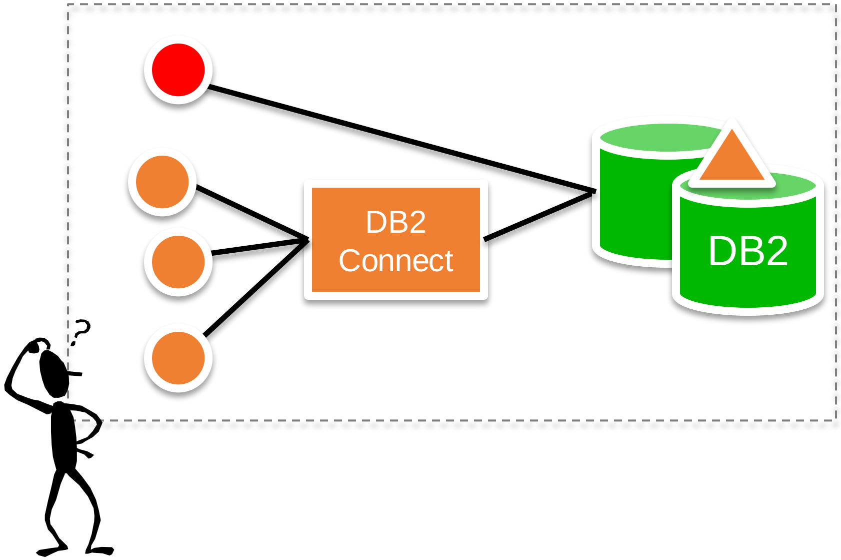


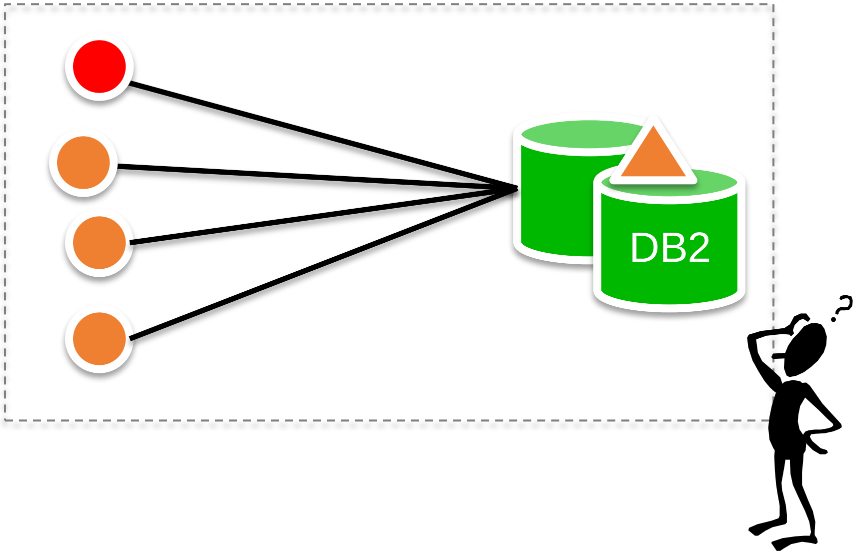
IMPORTANT: DB2 Connect licensing is required in **ALL** configurations

Some DB2 Connect reserved functionalities

IMPORTANT: There is no mechanism available to DDF or WLM to classify a workload **BEFORE** connection: critical and low priority workloads compete for DBATs

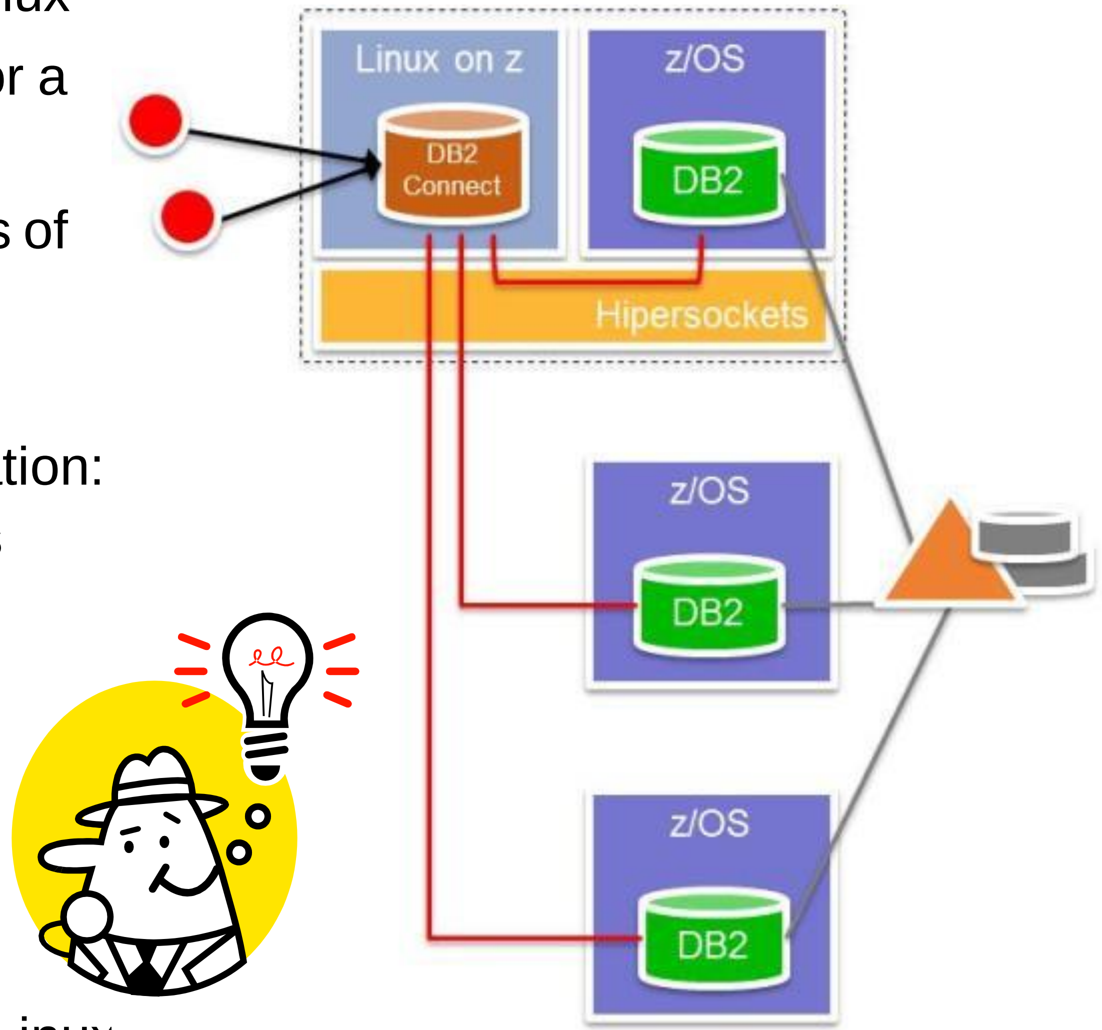
- DB2 Connect:
  - Provides gateway, connection concentration and a larger scope for WLB and Pooling
  - Simplification of upgrades and maintenance





DB2 Connect and Hipersockets

- DB2 Connect + zVM + zLinux
- Probably the best option for a DB2 Connect server
- Get availability advantages of System z at IFL price
- Hipersockets support
- Promotes server consolidation: reduces Data Center costs



- Even better?
  - Application server in zLinux

db2 ping

- Tests the network response time of the underlying connectivity between a client and a database server
- Can simulate ≠ packages sizes (bytes) for REQUEST and RESPONSE

```
C:\..\SQLLIB\BIN>db2 ping PRODDB request 100 response 32000 10 times

Elapsed time: 4256 microseconds
Elapsed time: 4507 microseconds
Elapsed time: 4240 microseconds
Elapsed time: 5034 microseconds
Elapsed time: 3998 microseconds
Elapsed time: 4009 microseconds
Elapsed time: 4030 microseconds
Elapsed time: 4071 microseconds
Elapsed time: 4096 microseconds
Elapsed time: 4053 microseconds
```

- Requires to be connected to the target database
  - For testing if you can reach the server
    - Ping / traceroute OS commands

DB2 for z/OS Timeouts

- Example: a remote client connects to DB2, does some work, and then does not go inactive (likely no COMMIT):

```
STC09109  DSNL027I  _DBXP SERVER DISTRIBUTED AGENT WITH
                     LUWID=GA65B414.PA09.1111C8065156=43494
                      THREAD-INFO=TOTO123:MACBOOK01:TOTO123:javaw.exe
                      RECEIVED ABEND=04E
                      FOR REASON=00D3003B
```

- IDTHTOIN
  - Time, in seconds, an active server thread remains idle before it is cancelled
  - Inactive connections are not subject to idle thread timeout
  - In general, default works well
- Client may receive **SQL30081N** which would indicate that the remote connection was terminated

Client timeouts

- **SQL_ATTR_QUERY_TIMEOUT**
  - The client side equivalent of IDTHTOIN
- Set a timeout value for SQL queries ran through the ODBC API
- A timeout value of 0 disables the timeout

```
STC09109  DSNL511I  _DBXP DSNLIENO TCP/IP CONVERSATION FAILED
                     TO LOCATION 10.100.1.123
                     IPADDR=10.100.1.124 PORT=1248
                     SOCKET=RECV RETURN CODE=1121 REASON CODE=00000000
```

- **QueryTimeoutInterval** is the delay, in seconds, between checks for a query timeout
  - May be set larger than SQL_ATTR_QUERY_TIMEOUT
  - It is a db2cli.ini keyword

How to catalog a DB2 for z/OS SSID with Client 10

- DB2 10 for LUW does not provides the Configuration Assistant

```
DSNL080I  -DZA1 DSNLTDDF DISPLAY DDF REPORT FOLLOWS:
DSNL081I STATUS=STARTD
DSNL082I LOCATION           LUNAME            GENERICLU
DSNL083I CRISDDF            USIBMT6.DDFDZA1   -NONE
DSNL084I TCPPORT=446   SECPORT=448   RESPORT=4461  IPNAME=-NONE
DSNL085I IPADDR=::10.50.1.1
DSNL086I SQL    DOMAIN=CRIS59
DSNL105I CURRENT DDF OPTIONS ARE:
DSNL106I PKGREL = BNDOPT
DSNL099I DSNLTDDF DISPLAY DDF REPORT COMPLETE
```

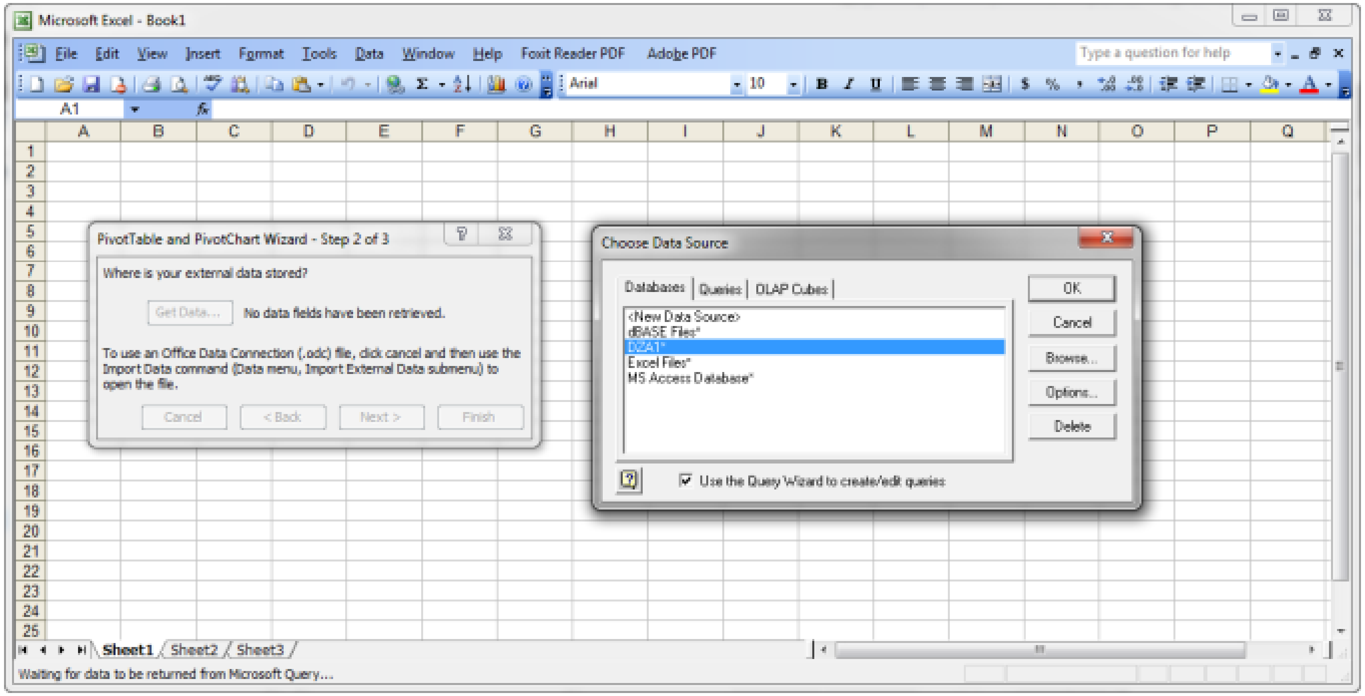
```
catalog tcpip node CM09 remote 10.50.1.1 server 446 ostype mvs
```

```
catalog db CRISDDF as DZA1 at node CM09 authentication
SERVER_ENCRYPT
```

```
catalog odbc data source DZA1
```

Pivot table + ODBC to connect to DB2 for z/OS

```
db2 => list odbc data sources
               User ODBC Data Sources
Data source name                 Description
-------------------------------- ----------------------------------------
MS Access Database               Microsoft Access Driver (*.mdb)
Excel Files                      Microsoft Excel Driver (*.xls)
dBASE Files                      Microsoft dBase Driver (*.dbf)
DZA1                             IBM DB2 ODBC DRIVER - DB2COPY1
```


Microsoft Excel - Book1
File Edit View Insert Format Tools Data Window Help Foxit Reader PDF Adobe PDF
Type a question for help
Arial
10
A1
Sheet1 Sheet2 Sheet3

PivotTable and PivotChart Wizard - Step 2 of 3

Where is your external data stored?

Get Data... No data fields have been retrieved.

To use an Office Data Connection (.odc) file, click cancel and then use the Import Data command (Data menu, Import External Data submenu) to open the file.

Cancel | < Back | Next > | Finish

Choose Data Source

Databases | Queries | OLAP Cubes

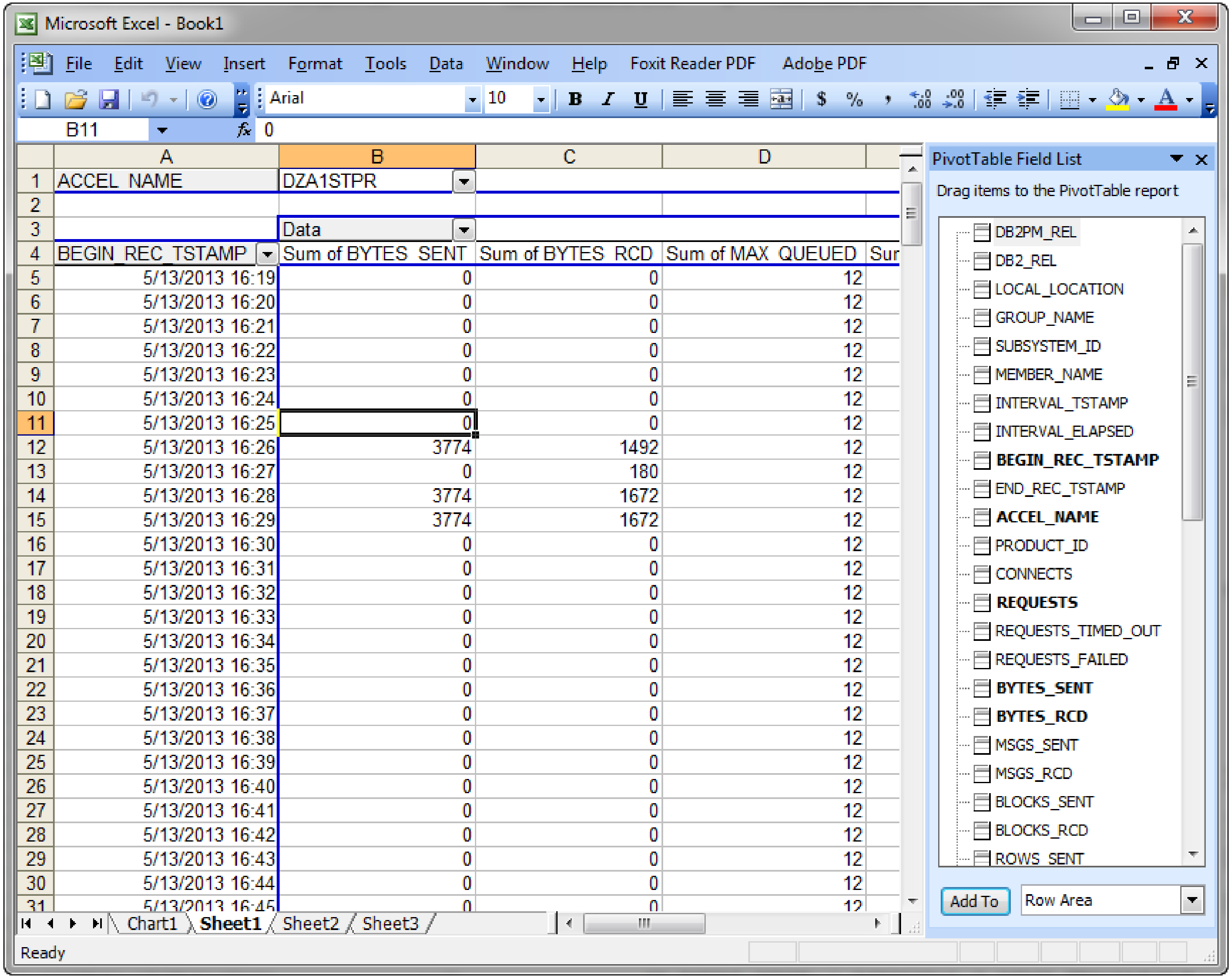
<New Data Source>
dBASE Files*
DZA1*
Excel Files*
MS Access Database*

OK | Cancel | Browse... | Options... | Delete

☑ Use the Query Wizard to create/edit queries

Waiting for data to be returned from Microsoft Query...

Ad-hoc reporting from a Performance Warehouse



B11 fx 0

	A	B	C	D	
1	ACCEL_NAME	DZA1STPR			
2					
3		Data			
4	BEGIN_REC_TSTAMP	Sum of BYTES_SENT	Sum of BYTES_RCD	Sum of MAX_QUEUED	Sur
5	5/13/2013 16:19	0	0	12	
6	5/13/2013 16:20	0	0	12	
7	5/13/2013 16:21	0	0	12	
8	5/13/2013 16:22	0	0	12	
9	5/13/2013 16:23	0	0	12	
10	5/13/2013 16:24	0	0	12	
11	5/13/2013 16:25	0	0	12	
12	5/13/2013 16:26	3774	1492	12	
13	5/13/2013 16:27	0	180	12	
14	5/13/2013 16:28	3774	1672	12	
15	5/13/2013 16:29	3774	1672	12	
16	5/13/2013 16:30	0	0	12	
17	5/13/2013 16:31	0	0	12	
18	5/13/2013 16:32	0	0	12	
19	5/13/2013 16:33	0	0	12	
20	5/13/2013 16:34	0	0	12	
21	5/13/2013 16:35	0	0	12	
22	5/13/2013 16:36	0	0	12	
23	5/13/2013 16:37	0	0	12	
24	5/13/2013 16:38	0	0	12	
25	5/13/2013 16:39	0	0	12	
26	5/13/2013 16:40	0	0	12	
27	5/13/2013 16:41	0	0	12	
28	5/13/2013 16:42	0	0	12	
29	5/13/2013 16:43	0	0	12	
30	5/13/2013 16:44	0	0	12	
31	5/13/2013 16:45	0	0	12	

PivotTable Field List

Drag items to the PivotTable report

- DB2PM_REL
- DB2_REL
- LOCAL_LOCATION
- GROUP_NAME
- SUBSYSTEM_ID
- MEMBER_NAME
- INTERVAL_TSTAMP
- INTERVAL_ELAPSED
- **BEGIN_REC_TSTAMP**
- END_REC_TSTAMP
- **ACCEL_NAME**
- PRODUCT_ID
- CONNECTS
- **REQUESTS**
- REQUESTS_TIMED_OUT
- REQUESTS_FAILED
- **BYTES_SENT**
- **BYTES_RCD**
- MSGS_SENT
- MSGS_RCD
- BLOCKS_SENT
- BLOCKS_RCD
- ROWS_SENT

DB2 Security options

- TCP/IP Already Verified (TCPALVER) subsystem parameter
  - Controls whether DB2 accepts TCP/IP connection requests that contain **only** a user ID
  - **TCPALVER=NO** → **strongly** recommended
  - **TCPALVER=YES** → RACF will not perform password checking unless the connection request sends the password
    - Potential security exposure!
  - **TCPALVER=SERVER_ENCRYPT:** new in DB2 10

IMPORTANT: Do not send a clear text password through the network!

- Consider using one of the following security options:
  - RACF PassTicket
  - Kerberos ticket
  - DRDA encrypted passwords

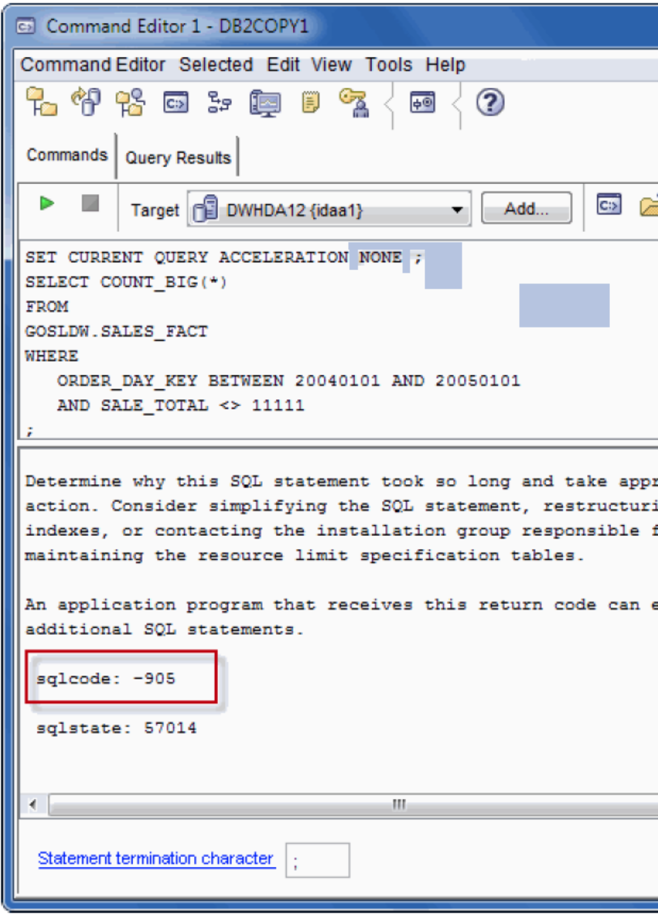
TIP: db2 catalog db DB9A at node NODE1 authentication SERVER_ENCRYPT

Resource Limit Middleware Table (RLMT)

- The resource limit tables can be used to limit the amount of resources used by dynamic queries that run on middleware servers
- Queries can be limited based on:
  - Client information, including the application name, user ID, workstation ID
  - IP address of the client

```
-DIS THD(*)
SERVER RA * 34 db2jcc_appli IDAA1 DISTSERV 008A 146248
V437-WORKSTATION=cmothink, USERID=idaa1,
     APPLICATION NAME=db2jcc_application
V441-ACCOUNTING=Cris
V445-G998D43D.I775.C924C6B7E632=146248 ACCESSING DATA FOR
 ( 1)::FFFF:9.152.212.61
V447--INDEX SESSID              A ST TIME
V448--( 1) 10512:10101          W R2 1204913244630
```

```
INSERT INTO
SYSIBM.DSNRLMT01
( RLFFUNC, RLFIP, ASUTIME)
VALUES
( '8', '9.152.212.61',150000);
```


Command Editor 1 - DB2COPY1
Command Editor Selected Edit View Tools Help
Commands
Query Results
Target
DWHDA12 {idaa1}
Add...
Statement termination character
;

```
SET CURRENT QUERY ACCELERATION NONE ;
SELECT COUNT_BIG(*)
FROM
GOSLDW.SALES_FACT
WHERE
   ORDER_DAY_KEY BETWEEN 20040101 AND 20050101
   AND SALE_TOTAL <> 11111
;
```

```
Determine why this SQL statement took so long and take appr
action. Consider simplifying the SQL statement, restructuri
indexes, or contacting the installation group responsible f
maintaining the resource limit specification tables.

An application program that receives this return code can e
additional SQL statements.

 sqlcode: -905

 sqlstate: 57014
```

WLM client information

- DB2 server systems have implemented the concepts of:
  - End user IDs
  - End user workstation names
  - End user application names
  - Accounting data
- Much of this information is externalized in various forms:
  - The **DSNV437I** message of the DISPLAY THREAD command
  - THREAD-INFO data in various messages such as **DSNT375I**
  - DB2 accounting records

```
DSNL027I  -PRD1 SERVER DISTRIBUTED AGENT WITH 778
           LUWID=C9DE5919.F7D7.C5C2D6F15029=636
           THREAD-INFO=CRIS:TotoMac:Toto:TestFromMac:*:*:*
           RECEIVED ABEND=04E
           FOR REASON=00D3003B
DSNL028I  -PRD1 C9DE5919.F7D7.C5C2D6F15029=636 779
           ACCESSING DATA FOR
             LOCATION ::10.50.1.12
             IPADDR ::10.50.1.12
```

WLM client information

- Cannot use SQL for setting values
- Can use SQL for inquiring values:

```
SELECT
SUBSTR(CURRENT CLIENT_ACCTNG,1,15),
SUBSTR(CURRENT CLIENT_APPLNAME,1,15),
SUBSTR(CURRENT CLIENT_USERID,1,15),
SUBSTR(CURRENT CLIENT_WRKSTNNAME,1,15)
FROM SYSIBM.SYSDUMMY1;
```

- The value of these special register can be changed by using:
  - SQLE_CLIENT_INFO_USERID (sqleseti)
  - DB2Connection.setDB2ClientUser(String info)
  - The RRS DSNRLI SIGNON, AUTH SIGNON, CONTEXT SIGNON, or SET_CLIENT_ID function
  - The **WLM_SET_CLIENT_INFO** stored procedure

WLM_SET_CLIENT_INFO

SYNTAX:

```
>>-WLM_SET_CLIENT_INFO--(--+-client_userid-+--,--+-client_wrkstnname-+--,-->
                           '-NULL----------'     '-NULL--------------'
>--+-client_applname-+--,--+-client_acctstr-+--)-----------------><
   '-NULL------------'     '-NULL-----------'
```

- Korn shell script example

```
#!/usr/bin/ksh
....
client_uid="cristian"
client_wrkst="Office Desktop"
client_appl="RC01"
client_acc="RC01”
....
db2 +o "Connect to " $MFDB2  " user " $HOSTuser " using " $HOSTpasswd
db2 "CALL SYSPROC.WLM_SET_CLIENT_INFO('"$client_uid"','"$client_wrkst"',
                                      '"$client_appl"’,'"$client_acc"');"
db2 -xtof /home/cognos/scripts/queries/RC01
....
# End program
```

WLM_SET_CLIENT_INFO cost

```
TIMES/EVENTS  APPL(CL.1)  DB2 (CL.2)
------------  ----------  ----------
ELAPSED TIME    0.015367    0.004823
 NONNESTED      0.007966    0.000505
 STORED PROC    0.007402    0.004319
 UDF            0.000000    0.000000
 TRIGGER        0.000000    0.000000

CP CPU TIME     0.001771    0.001340
 AGENT          0.001771    0.001340
  NONNESTED     0.000509    0.000397
  STORED PRC    0.001262    0.000943
  UDF           0.000000    0.000000
  TRIGGER       0.000000    0.000000
 PAR.TASKS      0.000000    0.000000
```

Up to 20 mSecs in first exec

```
echo "Connecting to "  $MFDB2
db2 +o "Connect to " $MFDB2  " user "
                      $HOSTuser " using "
                      $HOSTpasswd

db2 "CALL SYSPROC.WLM_SET_CLIENT_INFO(
                      '"$clientuid"',
                      '"$clientwrktn"',
                      '"$clientapp"',
                      '"$report"');"
db2 -xto $stmt1
db2 -xtof /home/cognos/scripts/RI09
db2 +o terminate
```

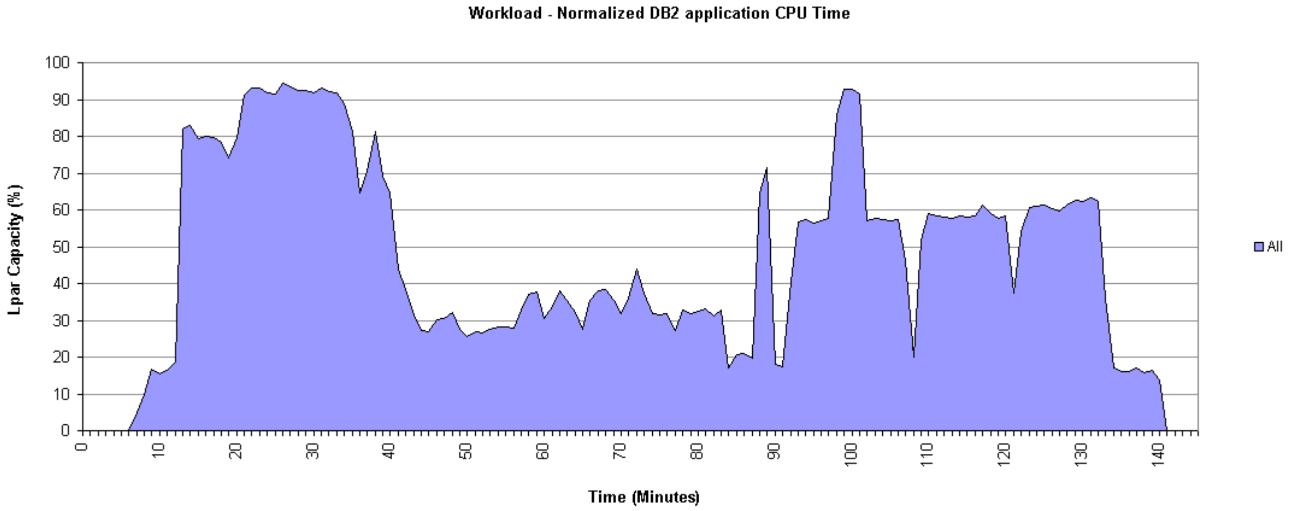
```
DSNADMSI             VALUE                DSNADMSI                     TIMES   DSNADMSI                   TIME
------------------   ------------------   ------------------    ------------   ------------------  ------------
TYPE                 PACKAGE              ELAPSED TIME - CL7        0.000012   LOCK/LATCH              0.000000
LOCATION             DWHDA12              CP CPU TIME               0.000010    IRLM LOCK+LATCH        0.000000
COLLECTION ID        DSNADMSI               AGENT                   0.000010    DB2 LATCH              0.000000
PROGRAM NAME         DSNADMSI               PAR.TASKS               0.000000   SYNCHRONOUS I/O         0.000000
CONSISTENCY TOKEN    0E5F1F0D09F14040     SE CPU TIME               0.000000   OTHER READ I/O          0.000000
ACTIVITY TYPE        STORED PROC          SUSPENSION-CL8            0.000000   OTHER WRITE I/O         0.000000
ACTIVITY NAME        WLM_SET_CLIENT_I#1     AGENT                   0.000000   SERV.TASK SWITCH        0.000000
SCHEMA NAME          SYSPROC                PAR.TASKS               0.000000   ARCH.LOG(QUIESCE)       0.000000
SUCC AUTH CHECK      NO                   NOT ACCOUNTED             0.000001   ARCHIVE LOG READ        0.000000
NBR OF ALLOCATIONS                    1                                        DRAIN LOCK              0.000000
SQL STMT - AVERAGE                 1.00   CP CPU SU                        1   CLAIM RELEASE           0.000000
SQL STMT - TOTAL                      1     AGENT                          1   PAGE LATCH              0.000000
NBR RLUP THREADS                      1     PAR.TASKS                      0   NOTIFY MESSAGES         0.000000
```

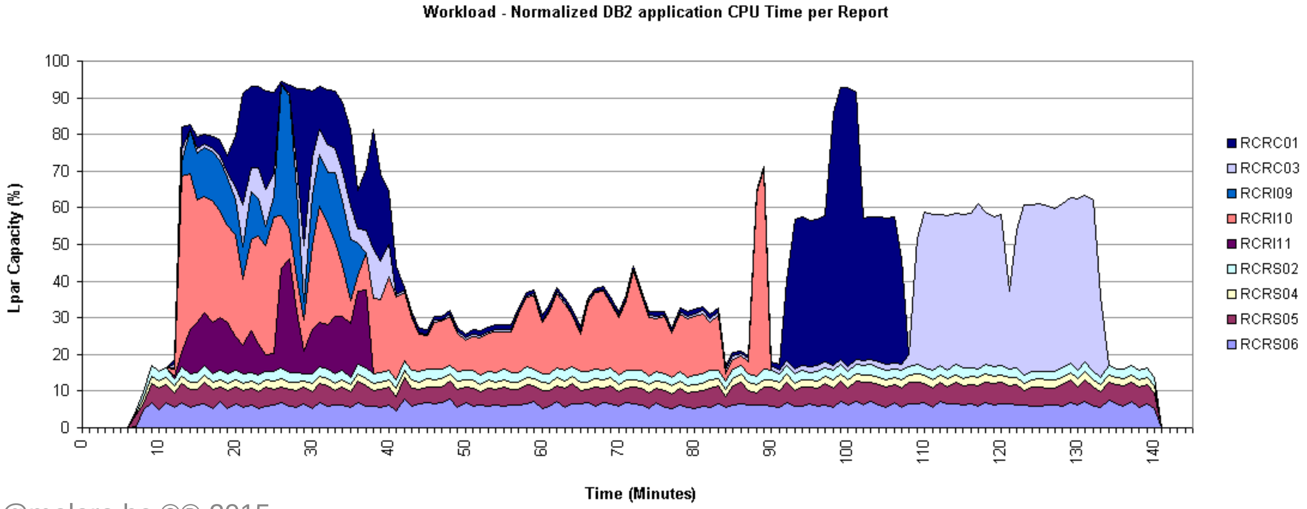
Accounting information and WLM

- Client info can be used to clasiffy work in WLM
- WLM Classification rules
  - For work type DDF: DDF Accounting information is the value of the DB2 accounting string associated with the DDF server thread

```
* Subsystem Type DDF - Distributed Workload

     Classification:

       Default service class is SCDDFLOW
       There is no default report class.

         Qualifier  Qualifier      Starting       Service  Report
       # type       name           position       Class    Class
       - ---------- -------------- ---------      -------- --------
       1 SI         DA12*                         SCREPLO  RCUNKWN
       2 . AI       . RC01*          56           SCREPLO  RCRC01
       2 . AI       . RS02*          56           SCREPHI  RCRS02
       2 . AI       . RC03*          56           SCREPLO  RCRC03
       2 . AI       . RS04*          56           SCREPHI  RCRS04
       2 . AI       . RS05*          56           SCREPHI  RCRS05
       2 . AI       . RS06*          56           SCREPHI  RCRS06
       2 . AI       . RI09*          56           SCREPMD  RCRI09
       2 . AI       . RI10*          56           SCREPMD  RCRI10
```

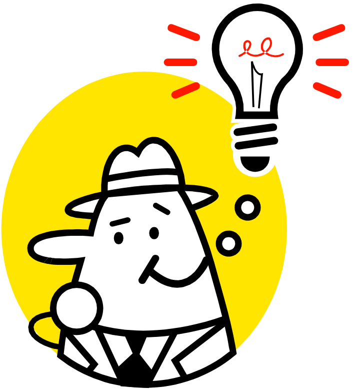
Can you tell the difference?

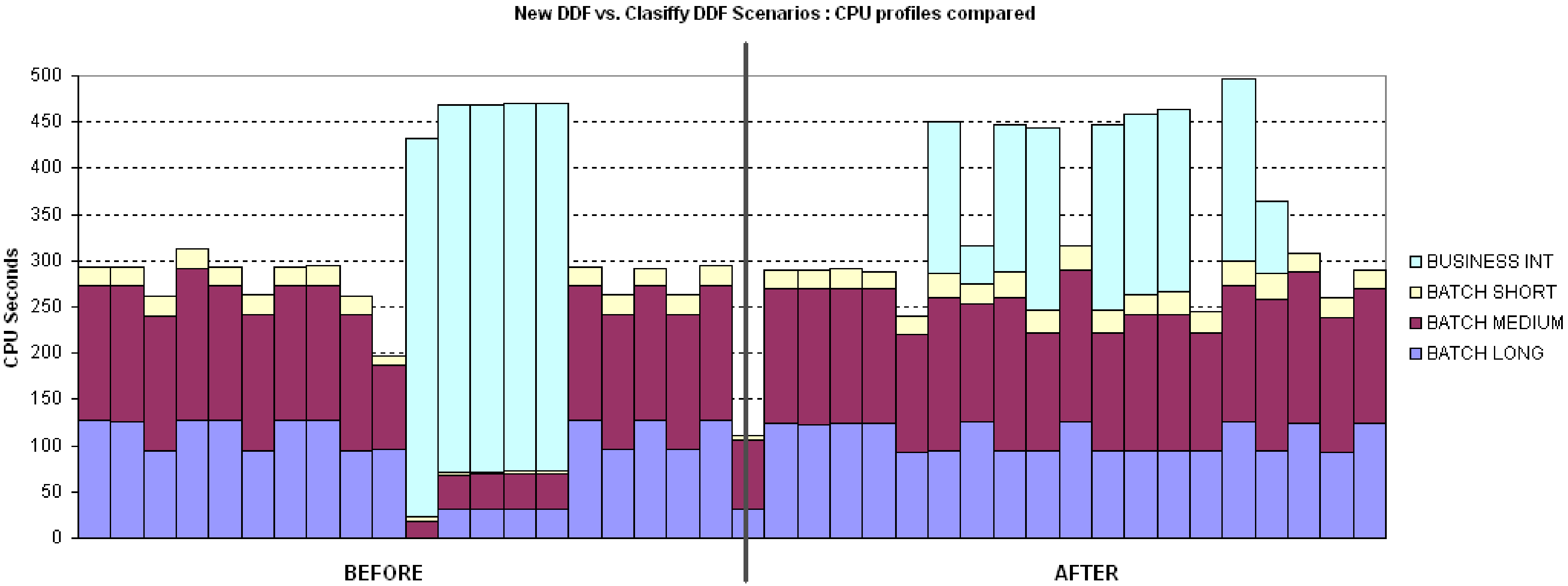




Protecting the work that matters

- WLM can help to
  - Protect critical workloads
  - Provide consistent response times
- Example:





DDF and Classification Rules

- Classification rules used to assign the incoming work to a
  - Service Class
  - Reporting Class (optional)
- If you do not implement classification rules for DDF
  - All DDF workload is classified and executed under the service class…

SYSOTHER

- System provided service class for all work not associated with a service class
- It is assigned a ***discretionary goal***
- ***Discretionary work is run using any system resources not required to meet the goals of other work***

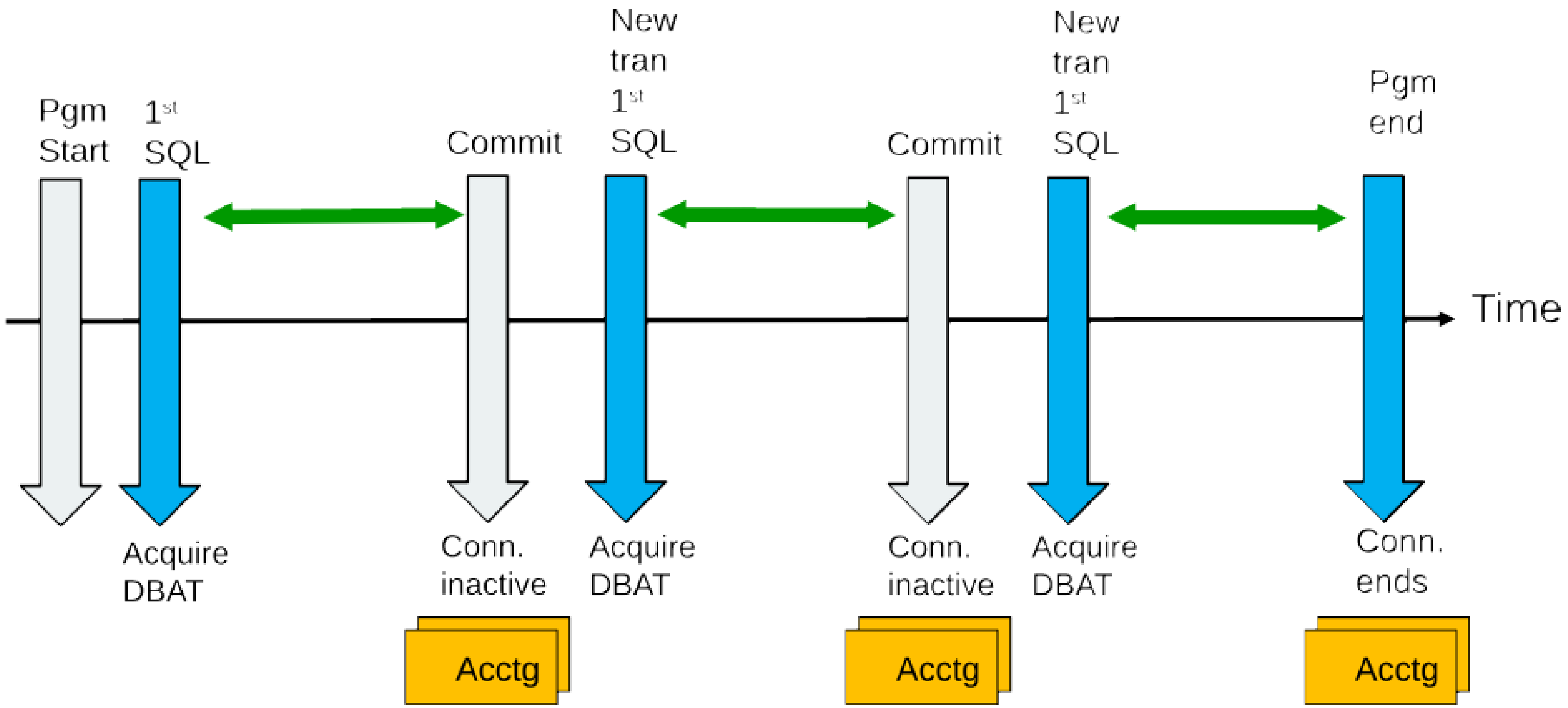
ACCOUNTING AND SMF

DB2 Accounting rollup

- DB2 writes an accounting record when a DDF thread:
  - Ends
  - Is made inactive
  - Does not go inactive because using KEEPDYNAMIC(YES)
  - Or a sign-on occurs for an RRSAF thread
- This has the potential to create a **huge** amount of records
- zParm ACCUMACC controls whether and when DB2 accounting data is accumulated for DDF and RRSAF threads
  - ACCUMACC=NO, default no effect
  - ACCUMACC = n, (n defines the accumulation interval)
- zParm ACCUMUID defines the aggregation criteria
  - Value from 0 to 17
  - ACCUMUID=1 → End user ID

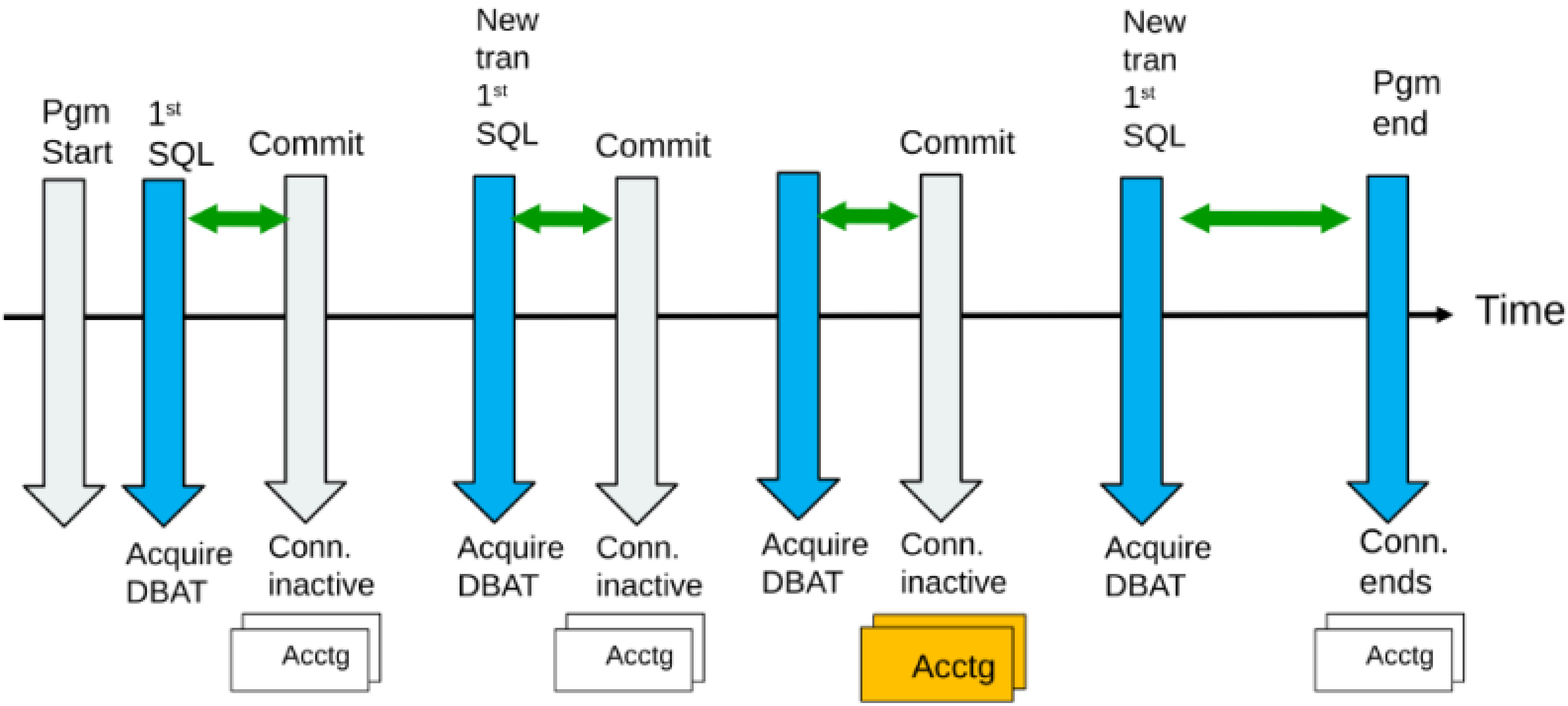
Accounting interval and distributed threads

- Accounting record cut when the connection goes inactive
  - CMTSTAT = INACTIVE



Accounting rollup

- Accounting rollup accumulates accounting information
  - DDF and RRS only



DB2 10 introduces SMF compression

- Controlled by new system parameter SMFCOMP
  - OFF (default): SMF trace records are not compressed
  - ON: Trace records written to SMF are compressed
- The z/OS compression service CSRCESRV compresses everything after the SMF header
- Data Sharing environment: SMFCOMP has member scope
- Performance measurements
  - Minimal overhead; **~ 1%** with Accounting Class 1, 2, 3, 7, 8, 10
  - The disk savings for DB2 SMF data set can be significant with compression rate of **60% - 80%**
- APAR PM27872
  - Decompression routine DSNTSMFD
  - Sample JCL DSNTEJDS

TIP: SMF Compression is preferable to Accounting Rollup

HIGH PERFORMANCE DBATS

Benefits of HP DBAT + RELEASE(DEALLOCATE)

- DB2 10 High Performance DBAT support reduces CPU consumption by:
  - Supporting RELEASE(DEALLOCATE)
  - Avoid repeated package allocation/de-allocation
  - Avoids acquiring and releasing parent (IS, IX) locks frequently
  - Avoids the processing necessary to go INACTIVE and then back to ACTIVE
  - More noticeable CPU reduction for short transactions
- Behavior
  - DBAT will stay associated with connection at UOW boundaries if there is at least one RELEASE(DEALLOCATE) package allocated
  - DBAT will be terminated after 200 uses
  - Normal idle thread time-out IDTHTOIN detection will be applied to these DBATs

TIP: No benefit and not support for ACTIVE threads (CMSTATS=ACTIVE)

TIP: No benefit for KEEPDYNAMIC YES

RELEASE(COMMIT) vs RELEASE(DEALLOCATE)

Total CPU per transaction	V9	V10 PKREL(COMMIT)	Delta (%)	V10 PKREL(BNDOPT)	Delta (%)
SQCL	2114	1997	-5.5	1918	-9.3
SPCB	1221	1124	-7.9	1056	-13.5
JDBC	2152	2017	-6.3	1855	-13.8
SQLJ	1999	1761	-11.9	1689	-15.5
SPSJ	1759	1642	-6.7	1550	-11.9
SPNS	1472	1304	-11.4	1180	-19.8

- Total CPU per txn = System Services Address Space + Database Services Address Space + IRLM + DDF Address Space CPU
- CPU time in microseconds.

Exploiting High Performance DBATs

- To enable:

```
REBIND with RELEASE(DEALLOCATE)
```

```
-MODIFY DDF PKGREL (BNDOPT)
```

```
STC12396  DSNL300I  -DB0A DSNLTMDF MODIFY DDF REPORT FOLLOWS:
          DSNL302I PKGREL IS SET TO BNDOPT
          DSNL301I DSNLTMDF MODIFY DDF REPORT COMPLETE
```

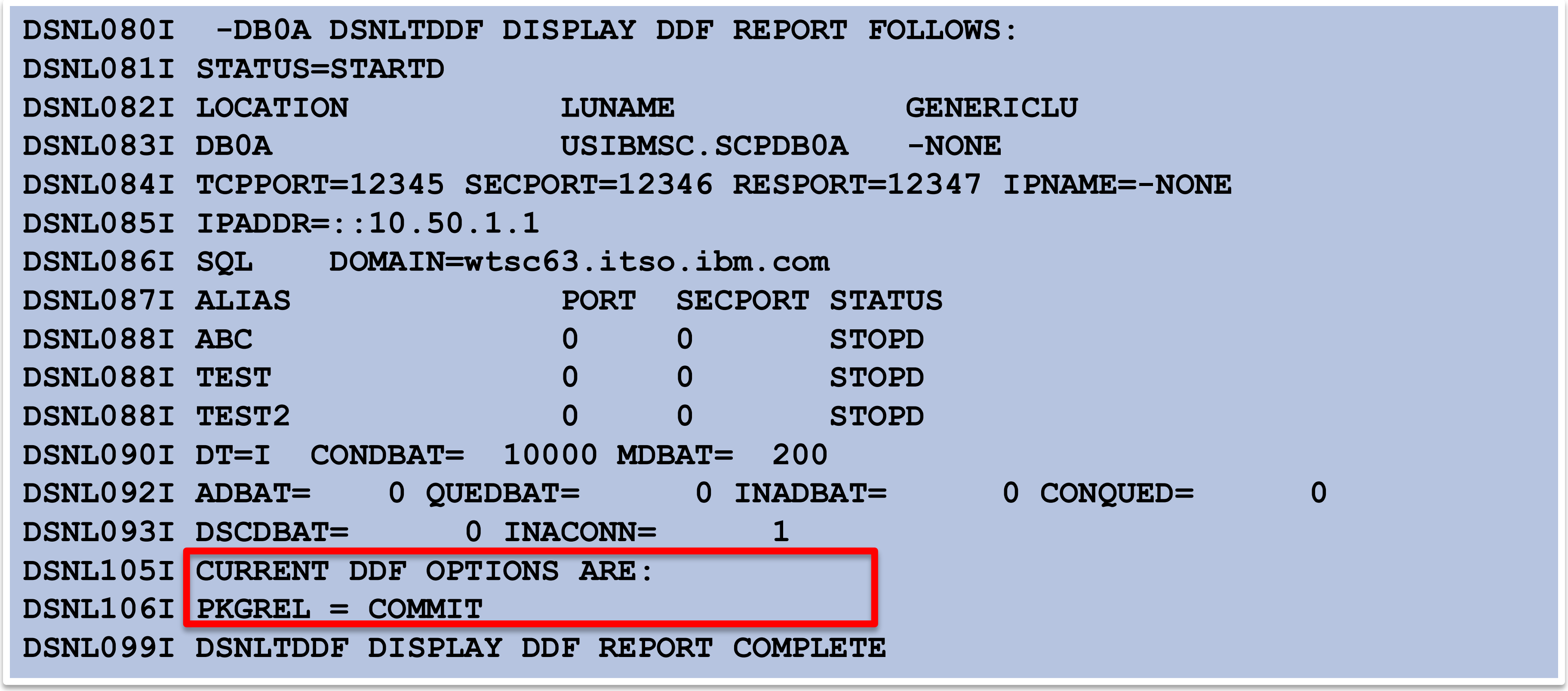
- To disable:

```
-MODIFY DDF PKGREL (COMMIT)  to overlaid BNDOPT option
```

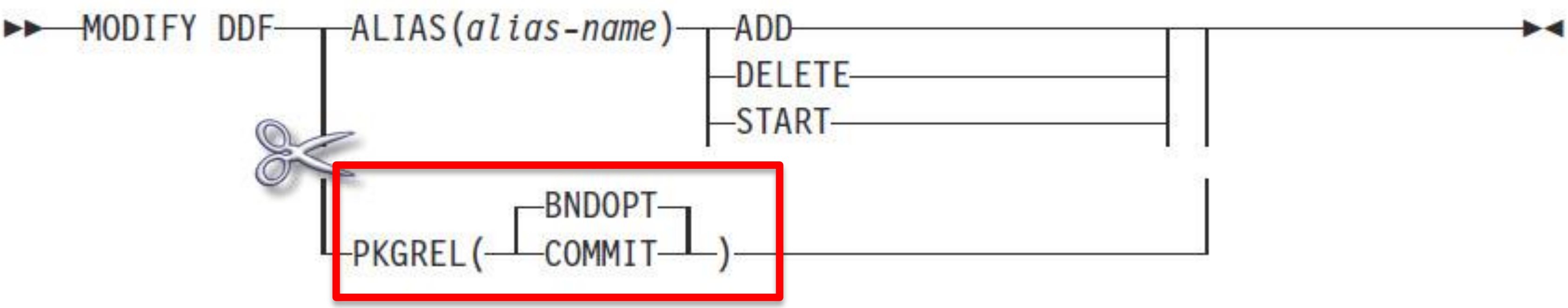
- To monitor:
  - Statistics GLOBAL DDF activity report

```
GLOBAL DDF ACTIVITY            QUANTITY
---------------------------   ---------
CUR ACTIVE DBATS-BND DEALLC        5.39
HWM ACTIVE DBATS-BND DEALLC       10.00
```

DIS DDF DETAIL in DB2 10



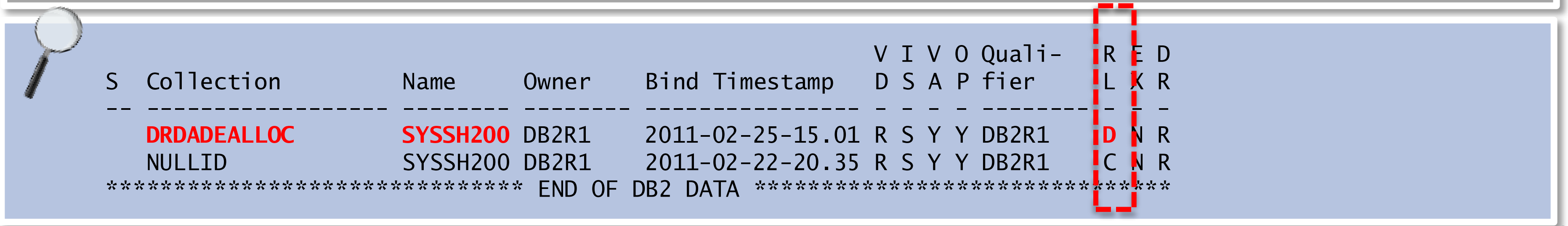
```
DSNL080I  -DB0A DSNLTDDF DISPLAY DDF REPORT FOLLOWS:
DSNL081I STATUS=STARTD
DSNL082I LOCATION           LUNAME            GENERICLU
DSNL083I DB0A               USIBMSC.SCPDB0A   -NONE
DSNL084I TCPPORT=12345 SECPORT=12346 RESPORT=12347 IPNAME=-NONE
DSNL085I IPADDR=::10.50.1.1
DSNL086I SQL    DOMAIN=wtsc63.itso.ibm.com
DSNL087I ALIAS              PORT  SECPORT STATUS
DSNL088I ABC                0     0       STOPD
DSNL088I TEST               0     0       STOPD
DSNL088I TEST2              0     0       STOPD
DSNL090I DT=I  CONDBAT=  10000 MDBAT=  200
DSNL092I ADBAT=    0 QUEDBAT=      0 INADBAT=      0 CONQUED=      0
DSNL093I DSCDBAT=      0 INACONN=      1
DSNL105I CURRENT DDF OPTIONS ARE:
DSNL106I PKGREL = COMMIT
DSNL099I DSNLTDDF DISPLAY DDF REPORT COMPLETE
```



Implement gradually or selectively

- BIND a new set of packages with RELEASE(DEALLOCATE)
- SYSSHxyy
  - S: Represents a small package (65 sections)
  - H: Represents WITH HOLD
  - x: Indicates the isolation level
    - 1=UR, 2=CS, 3=RS, 4=RR
  - yy: The package iteration 00 through FF

```
BIND PACKAGE(DRDADEALLOC)
            QUAL(DB2R1)
            OWNER(DB2R1)
            COPY(NULLID.SYSSH200)
            SQLERROR(NOPACKAGE)
            ISOL(CS)
            REL(D)
            CURRENTD(N)
            ACTION(REPLACE)
            KEEPDYNAMIC(N)
```



```
                                                         V I V O Quali-    R E D
S  Collection         Name     Owner    Bind Timestamp   D S A P fier      L K R
-- ------------------ -------- -------- ---------------- - - - - -------- - - -
   DRDADEALLOC        SYSSH200 DB2R1    2011-02-25-15.01 R S Y Y DB2R1    D N R
   NULLID             SYSSH200 DB2R1    2011-02-22-20.35 R S Y Y DB2R1    C N R
******************************* END OF DB2 DATA *******************************
```

Release Deallocate Enhancements in DB2 11

DB2 11

- RELEASE(DEALLOCATE) Bind/Rebind option
  - Avoid package allocation overhead
  - CPU savings with transactions with frequent commits
- Concerns
  - REBIND, DDL and online REORG cannot break-in with local persistent threads using RELEASE(DEALLOCATE)
- DB2 11
  - Allows REBIND/DDL, and online REORG to break in "committed" persistent threads with REL(DEALLOC)

```
****************************************************************
* USERS AFFECTED: All users of DB2 10 and 11 for z/OS.         *
****************************************************************
* PROBLEM DESCRIPTION: Bind requests are unable to break-in    *
*                      when an idle thread connected to        *
*                      DB2 holds a package lock.               *
****************************************************************
```

PM95929: BREAK INTO PERSISTENT THREAD DOES NOT BREAK LOCALLY ATTACHED THREAD WITH RELEASE(DEALLOCATE) FOR BIND AND DDL

TIP: More aggressive adaptation of RELEASE(DEALLOCATE) is possible

Break-in into High Performance DBATs

- To enable HP DBATs in DB2 10 and DB2 11:
  - Create a collection of packages with RELEASE(DEALLOCATE)
    - Do NOT bind NULLID col. with RELEASE(DEALLOCATE)
  - Modify client applications to request packages from a different collection via CURRENTPACKAGESET
  - Issue `–MODIFY DDF PKGREL(BNDOPT)`

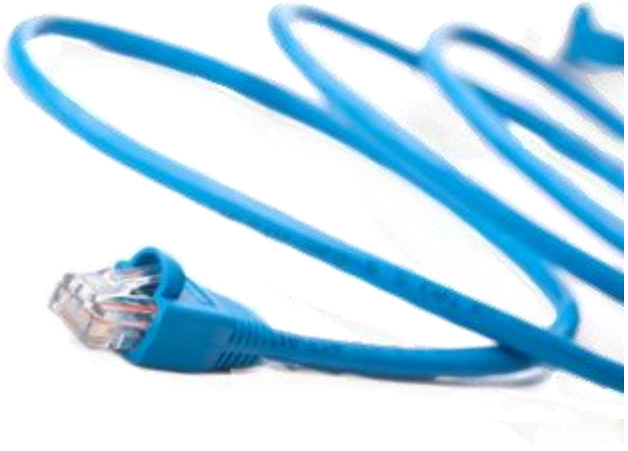
- To disable
  - Issue `–MODIFY DDF PKGREL(COMMIT)`
  - Existing running DBATs will be terminated on next COMMIT
  - Idle DBATs waiting for a new transaction will be terminated during the next two minutes DDF
  - New DBATs will only allocate packages in RELEASE(COMMIT)
- **DB2 11 break-in**
  - Automatically done on next COMMIT if waiter on a package lock

DB2 11

CLOSING

There is *more* that you *must* know!

- Automatic client reroute and work load balancing
- Stored procedures
- Autocommit implications
- Tracing distributed applications
- Application development best practices
- Security topics
- Trusted contexts and roles
- …
- In the appendix
  - Data Sharing considerations
  - Specialty engine considerations
  - What is new in DB2 11?
  - Problem determination



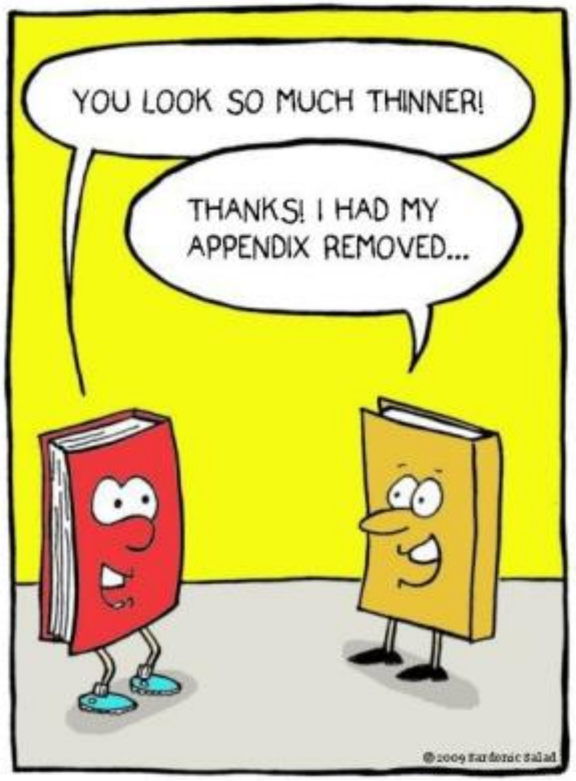
This was our Agenda

➔Objective

- To review topics that you ***must*** know about distributed access to DB2 for z/OS

➔Contents

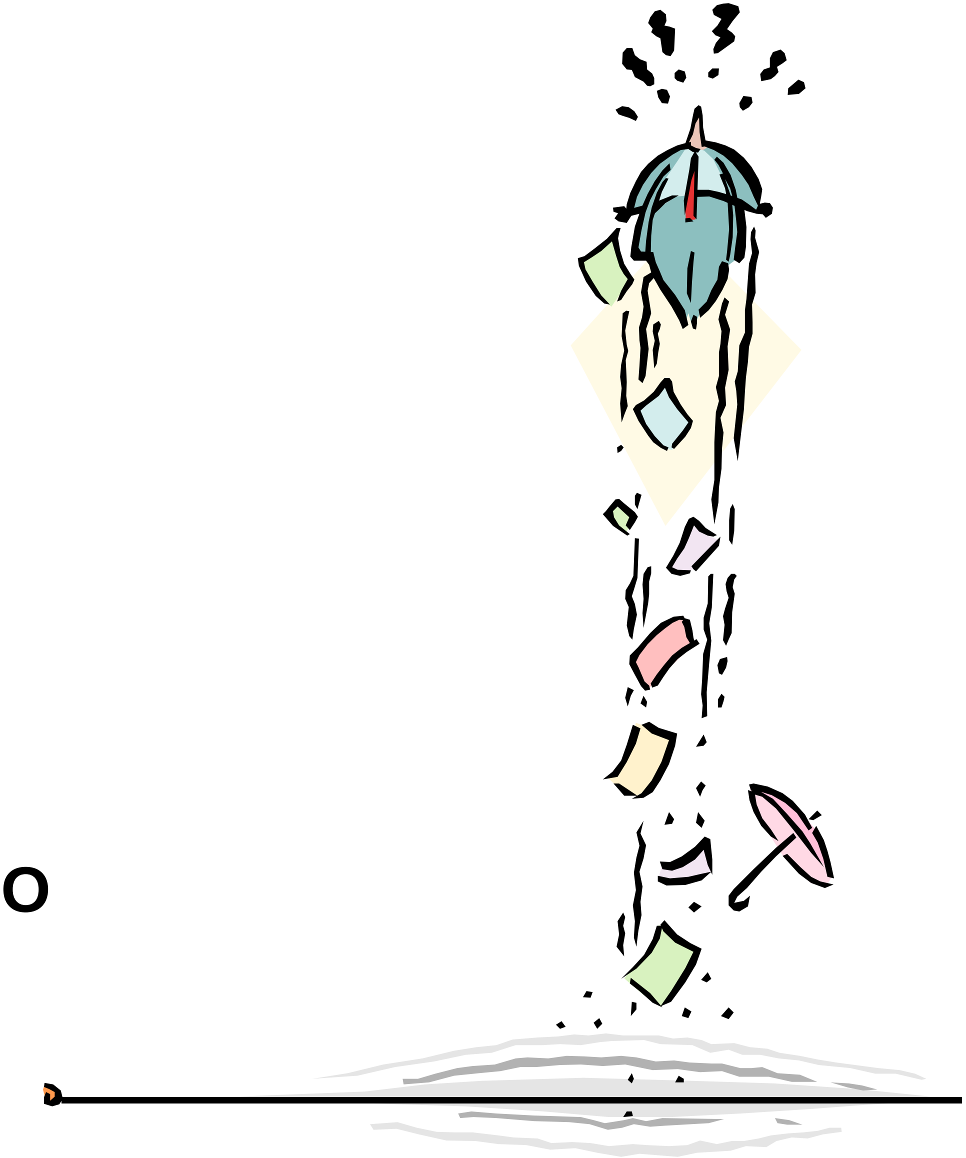
- Connectivity topics
- Accounting and SMF
- High performance DBATs
- And there is more
- **In Part 2**
  - Specialty engines
  - What is new in DB2 11
  - Problem determination


YOU LOOK SO MUCH THINNER!
THANKS! I HAD MY APPENDIX REMOVED...
© 2009 sardonic salad

Questions?

CRISTIAN@MOLARO.BE

THANKS!



CRISTIAN MOLARO

✉ cristian@molaro.be

@cristianmolaro