



Db2 for z/OS System Profile Monitoring: Overview and Db2 13 Enhancements

September 19, 2023

Mark Rader
IBM Z Washington Systems Center
mrader@us.ibm.com



Db2 System Profile Monitoring – Agenda

- Challenges relating to DDF activity
- Use case overview
 - Adaptation of customer experience presentation
- Details of Db2 System Profile Monitoring for DDF activity
 - Connections, threads, idle thread timeouts
- Other capabilities of Db2 System Profile Monitoring
- Db2 13 enhancements for Db2 System Profile Monitoring
 - Locking, deadlocks, release and local thread support
 - Monitoring connections for security

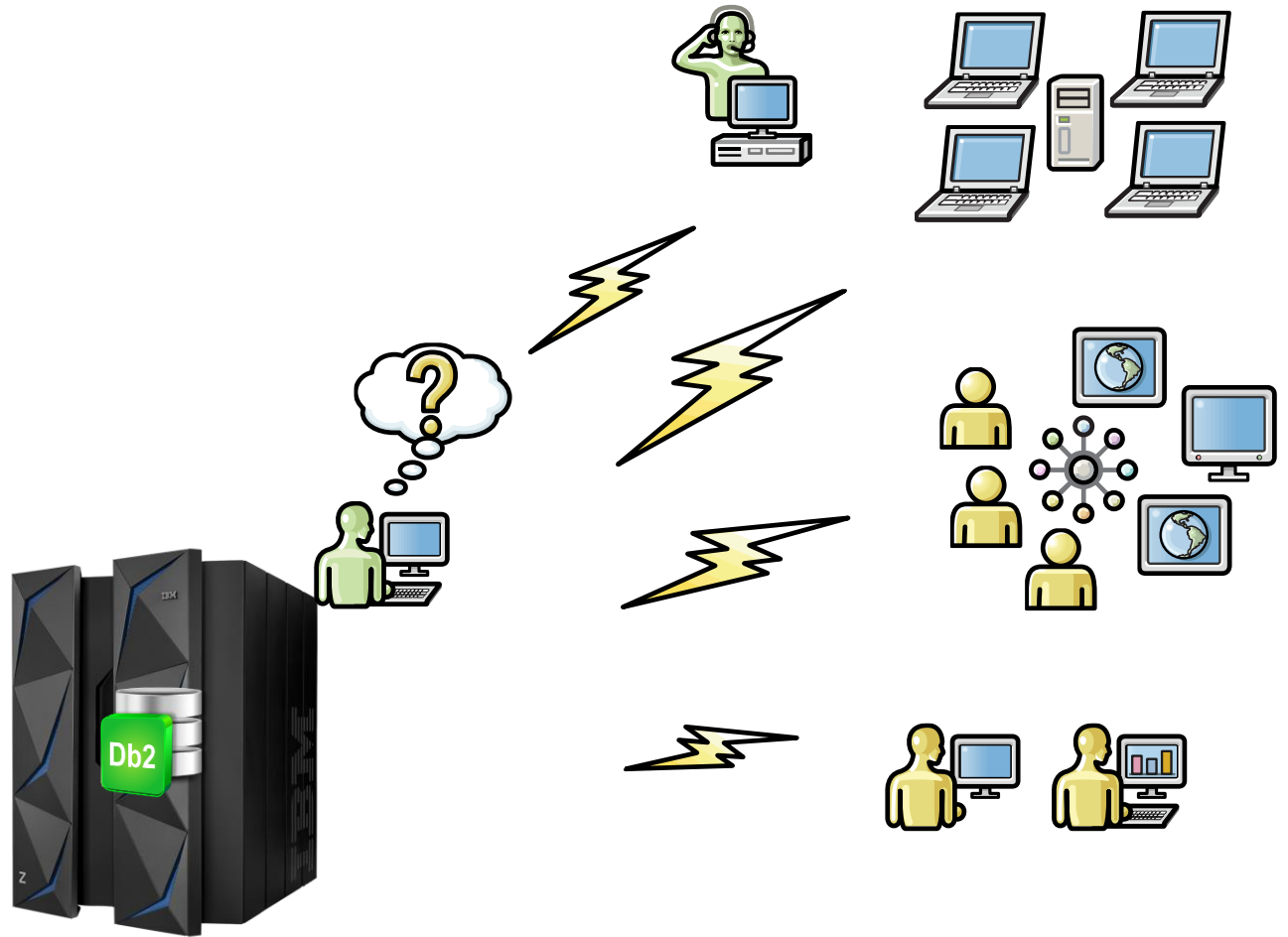
Challenges relating to DDF activity

— Resources to manage

- Connections
- Threads
- Timeouts
- Special registers, global variables

— Clients to support

- Priorities, demands
- Variety of applications

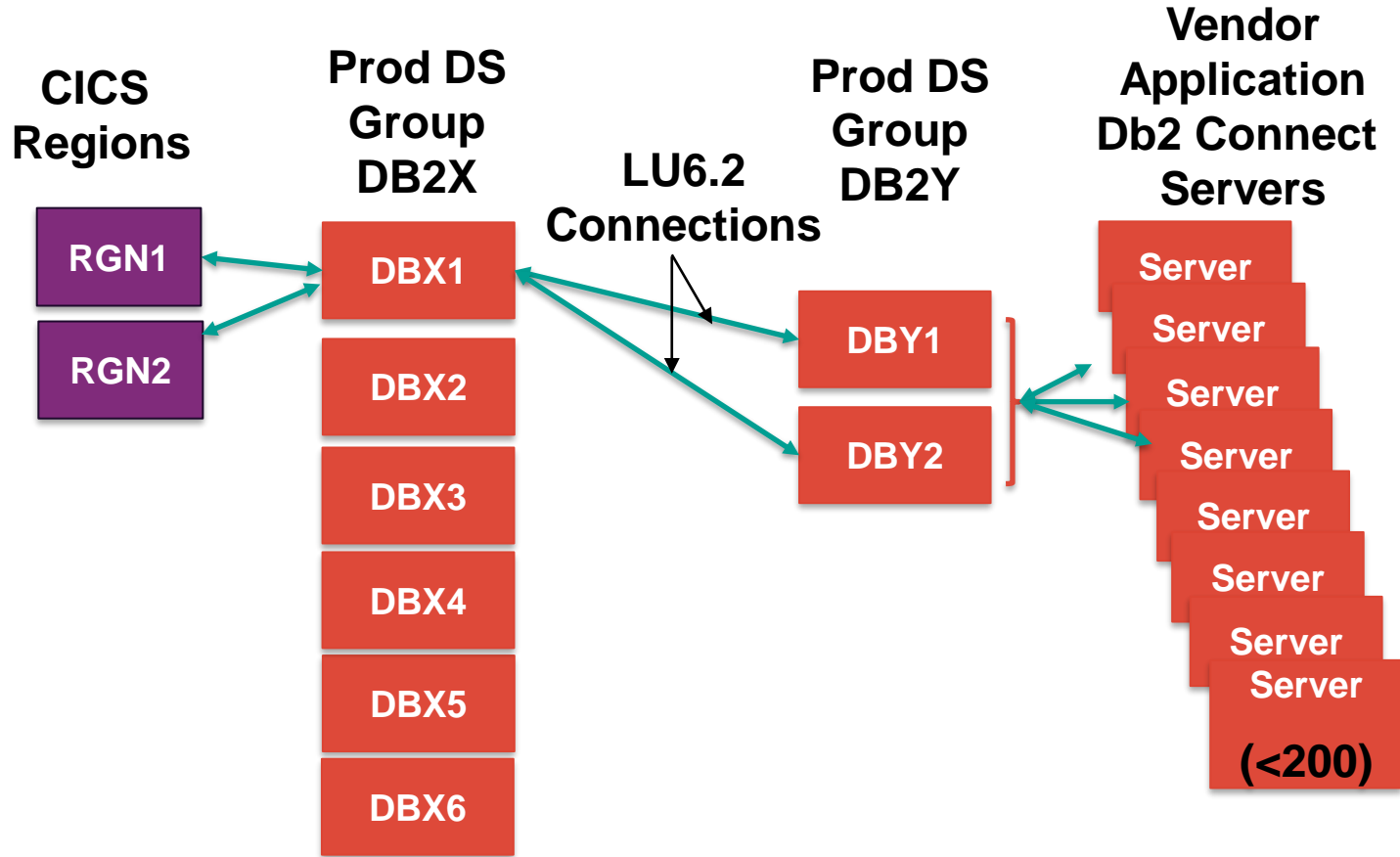


Db2 System Profile Monitoring – example use cases

- Prevent denial of service attack
- Manage migration to new driver level
- Reserve threads for critical applications
- Set special registers or global variables
 - Including accelerator, transparent archiving enablement
- Non-distributed: anticipate PROD access paths in TEST
 - Model production values of RIDPOOL, SORTPOOL, BP allocations

Customer experience with Db2 System Profile Monitoring

Configuration – simplified view



Db2 configuration settings

- DB2X (traditional)
 - MAXDBAT=200
 - IDTHTOIN=0 → not really relevant to initial problem

- DB2Y (app server)
 - MAXDBAT=350 (350+350=700 in Data Sharing Group)
 - IDTHTOIN=600
 - MAXDBAT ** Set in V8
 - MAXDBAT ** V9

- Db2 Connect Servers
 - MAX Connections=200 each (8*200=1600 total possible)

DB2Y – What could go wrong?

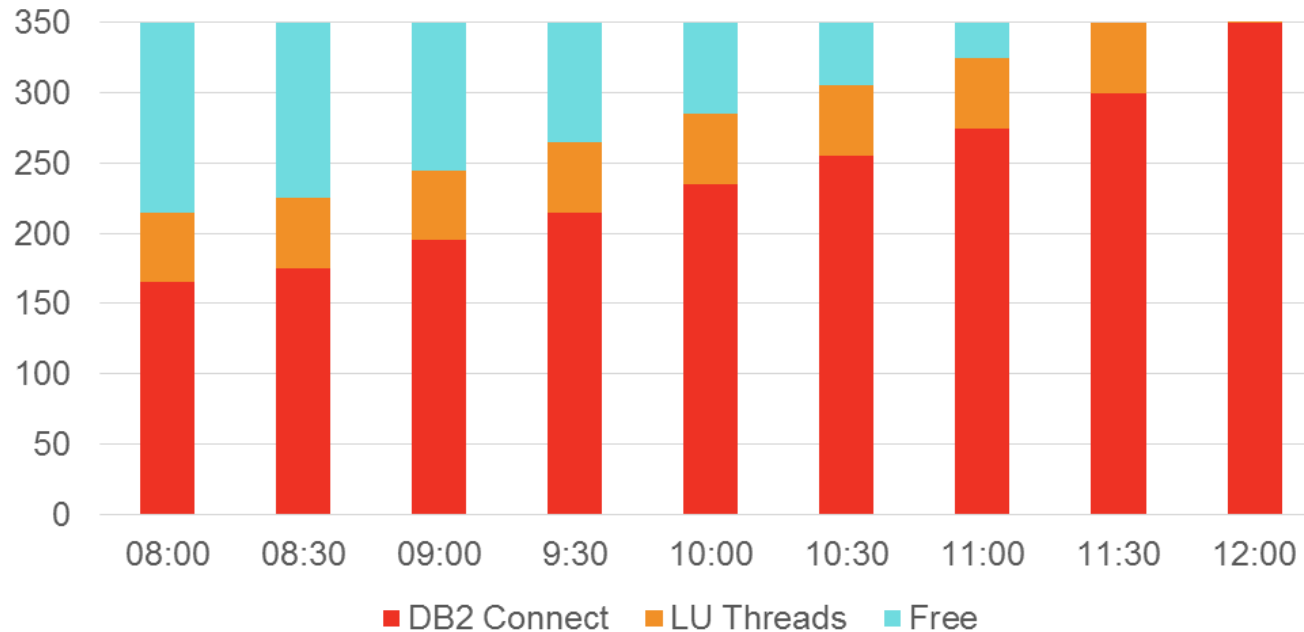
- Diligent monitoring of AVG and MAX threads
 - Anticipated need for 3-way data sharing
- Occasional spike in threads
 - DB2Y members would spike to 350 for short periods
- Prior to 2014, customer looked at options
 - Evaluate DB2X -> DB2Y access
 - Expand DB2Y to 3-way
 - Replicate data from DB2Y to DB2X to eliminate LU6.2 traffic
- Few problem occurrences considered not worth the “cost” of any changes

DB2Y – What just happened ?!?!

- Db2 V8/V9 – MAXDBAT = 350
- Upgrade to Db2 10 in 2013 ... increase MAXDBAT??
 - Reviewed potential to increase MAXDBAT
- Dec 2013 – Server Problem: threads started, but did not end
 - DBY1 and DBY2 both went to MAXDBAT
- What happens when MAXDBAT reached??
 - Connections from DBX1/CICS get squeezed out
 - CICS begins to hit MAXTASK and DB2X sees slowdown

DB2Y threads

- When TCP/IP threads do not end
 - IP thread count grows
 - LU6.2 threads get “squeezed” out



- Time not to scale; could happen in a few minutes.

DB2Y – first reaction

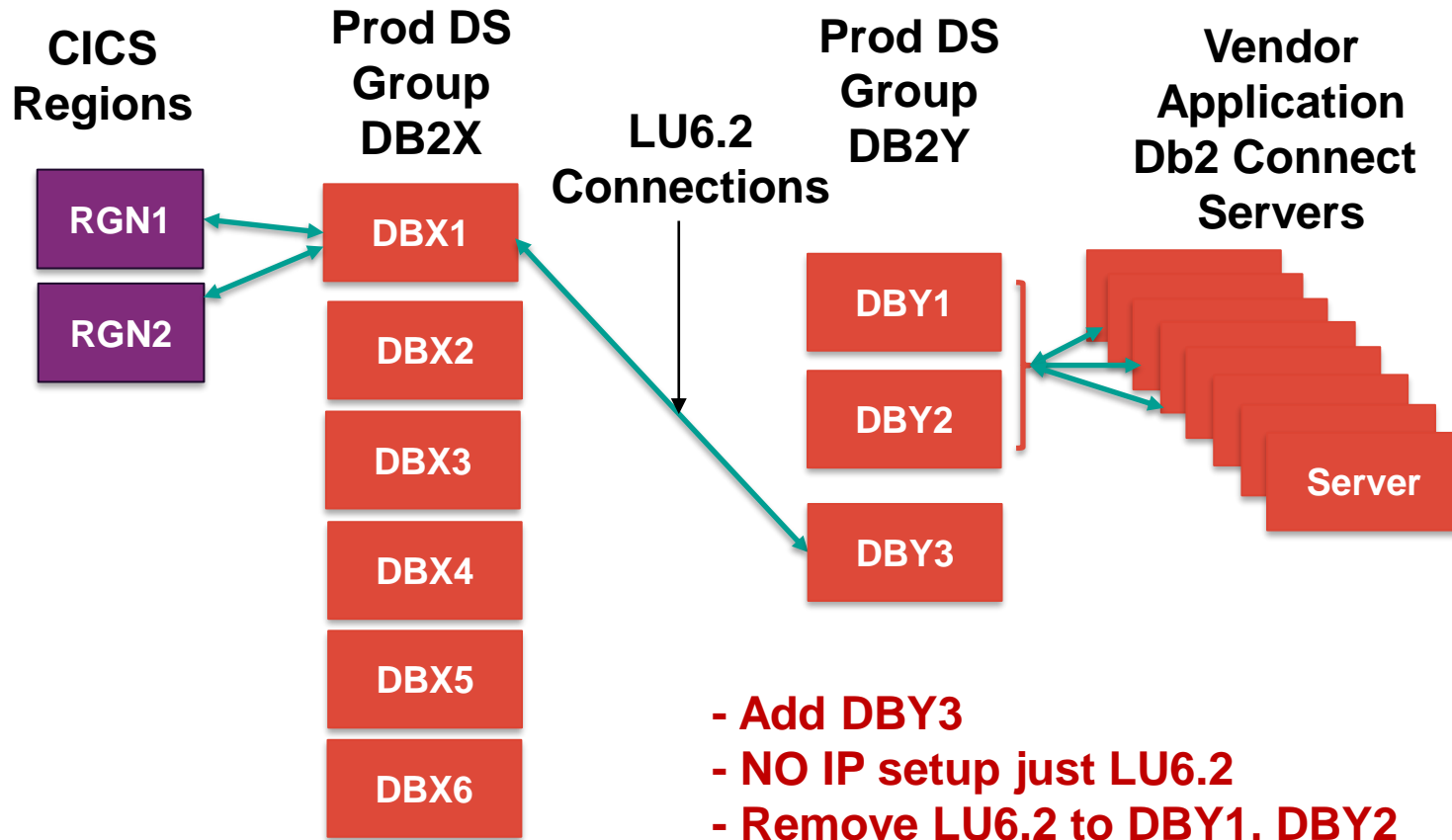
- MAXDBAT analysis ... increase MAXDBAT
 - Option 1 -> increase MAXDBAT dynamically
 - Relieved pressure for short time
 - Option 2 -> Lower Idle Thread Timeout 10 min -> 2 min

- MAXDBAT=450
- MAXDBAT=700
- MAXDBAT=800
- MAXDBAT=1000
- MAXDBAT=1200

DB2Y – problems... again

- Application issue
 - Caused DB2Y to hit MAXDBAT
 - MAXDBAT on DB2Y ... caused MAXTASK in CICS
 - MAXTASK caused massive slowdowns
- Application issues, therefore DBA staff could not address
- Time for another look at options
 1. Replicate data from DB2Y to DB2X to eliminate LU6.2
 2. Expand DB2Y to 3-way (or 4-way) and put LU 6.2 to 'DBY3' (and 'DBY4'), keep IP traffic to DBY1 and DBY2
 3. CALL IBM

Alternate configuration considered



Options reconsidered

- 1. Data replication from DB2Y->DB2X
 - Rejected: NOT an OPTION!!
- 2. Starting DBY3 was contemplated
 - Meant another subsystem member
 - Might require -
 - Creating Subsystem Alias
 - REBINDing PLANS
 - Modifying COBOL that issued CONNECT
 - Modifying ALIAS with 3-part name to DB2Y

Option #3

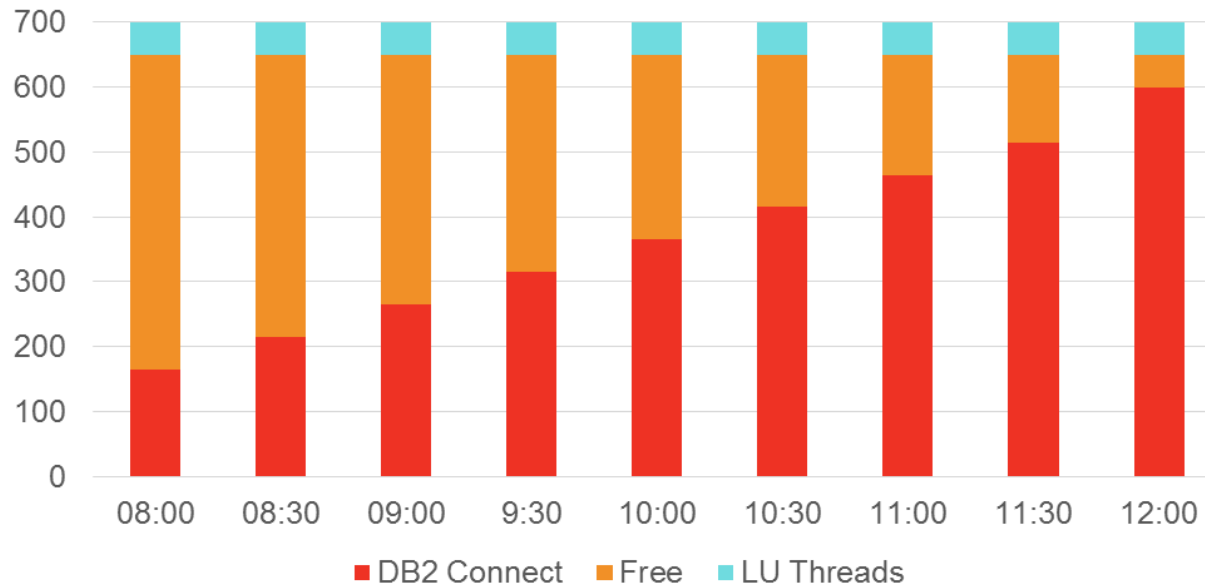
- Contacted IBM and got meeting set up
- After listening to the problem, solution was to use Db2 PROFILES
- Skeptical to say the least -> Too Simple
- If this worked, it would mean
 - No new subsystem
 - No VIEW or ALIAS changes
 - No subsystem ALIAS
 - No COBOL changes
- TOO GOOD TO BE TRUE

Db2 profiles - production

- MAXDBAT = 700
- Defined tables then set up profile for COLLECTION=NULLID with “maxdbat”=600
 - MONITOR THREADS, EXCEPTION, 600
 - GOAL – “reserve” 100 threads for LU 6.2 (from CICS)
- Set ZPARM IDTHTOIN from 600 -> 115
 - Application saw no impact from lower idle thread timeout during incident
- Within 2 weeks, another server issue
 - This time, no impact to CICS
 - **Successful Production solution!!**

DB2Y Threads

- When TCP/IP threads do not end
 - IP threads count grows
 - Make sure LU6.2 threads don't get "squeezed" out



- Time not to scale; could happen in a few minutes

Db2 profiles - production

- PROFILE configuration working perfectly
- Minor problem with idle thread timeout reduction
 - Timeout 'catching' weekly tasks
- Time to rethink reduction??

- **Solution.... Update profile tables!!!**
- Add PROCESS IDs to a profile and assign higher IDLE THREAD TIMEOUT value

Db2 profiles - summary

- Allowed us to control number of threads (by COLLID)
- Allowed us to set lower IDLE THREAD timeout for subsystem
- Allowed us to set higher IDLE THREAD timeout for specific IDs
- Benefit
 - No new subsystems
 - No application changes
 - Reduce risks to CICS regions
 - No software to purchase and/or install
- Lower IDLE THREAD Timeout -> Lower # threads active

Customer experience with Db2 System Profile Monitoring

— End of customer presentation

Details: Db2 System Profile Monitoring

— Profiles allow customers to:

- Monitor remote threads and connections (TCP/IP)



- MONITOR CONNECTIONS
- MONITOR THREADS
- MONITOR IDLE THREADS

- Set or disable optimization parameters for SQL statements
- Model your test environment after production
- Set thresholds for Query Acceleration
- Set special registers for distributed clients (since Db2 11)
- Set global variables (since Db2 12)
- Extend profile support for some capabilities to local threads (since Db2 13)

Overview: Db2 System Profile Monitoring (1|2)

— SYSIBM.DSN_PROFILE_TABLE

- Defines profile and filtering (e.g. LOCATION, PRDID, AUTHID, etc.)
 - Only certain filtering combinations allowed
 - Scope varies by monitoring function specified in Attributes table
- The PROFILE_ENABLED column indicates whether Db2 activates the profile when you start monitoring

SYSIBM.DSN_PROFILE_TABLE

PROFILEID	ROLE	AUTHID	LOCATION	PRDID	COLLID	PKGNAME	PROFILE_ENABLED
20		SRVR01					Y
21				JCC03570			Y
22			TEST.SVL.IBM.COM				Y

Overview: Db2 System Profile Monitoring (2|2)

— SYSIBM.DSN_PROFILE_ATTRIBUTES table

- Defines actions (e.g. MONITOR CONNECTIONS, MONITOR THREADS, MONITOR IDLE THREADS, etc.)
- Columns include KEYWORDS, ATTRIBUTE1, ATTRIBUTE2, ATTRIBUTE3
- One or more attribute rows are required
 - Attribute rows control the actions that Db2 applies

SYSIBM.DSN_PROFILE_ATTRIBUTES

ProfileID	Keywords	Attribute1	Attribute2	Attribute3	Attribute Timestamp
20	MONITOR THREADS	EXCEPTION	10		2019-12-19...
21	MONITOR IDLE THREADS	WARNING	180		2019-12-19...
22	MONITOR CONNECTIONS	EXCEPTION	45		2019-12-19...
22	MONITOR THREADS	EXCEPTION	20		2019-12-21...

Monitoring DDF resources with profiles

Profile table: filtering criteria for DDF (1|2)

Client IP address or client domain name

1. Client IP address or domain name (defined in LOCATION column)

Client Product ID

2. Client Product ID (defined in PRDID column)

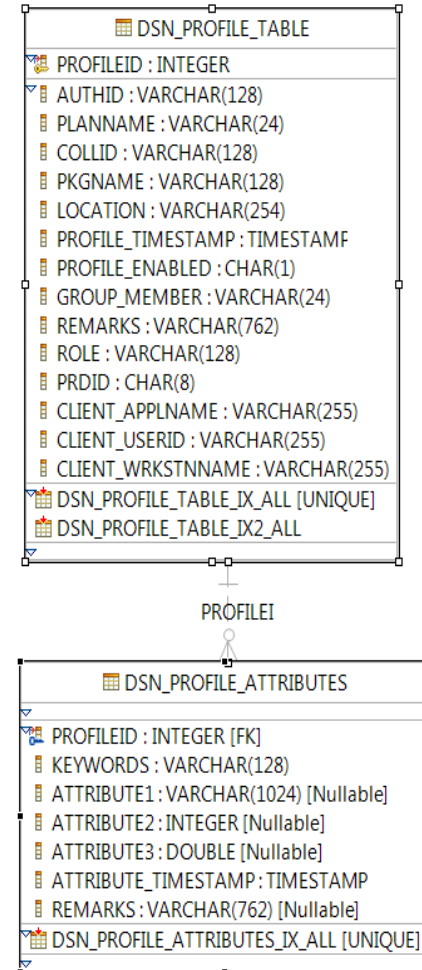
Role name, Authorization ID

3. Role name + Authorization ID (defined in ROLE and AUTHID columns)
4. Role name (defined in ROLE column)
5. Authorization ID (defined in AUTHID column)

Collection ID, Package name

6. Collection ID + Package name (defined in COLLID and PKGNAME columns)
7. Collection ID (defined in COLLID column)
8. Package name (defined in PKGNAME column)

IMPORTANT: Criteria in these colored categories are mutually exclusive in a profile row.
Choose one category per profile row.



Profile table: filtering criteria for DDF (2|2)

Location name or Location alias

9. Server location name or server location alias that Client tries to connect to (defined in LOCATION column)

Client Application Name

10. End Client Application name (defined in CLIENT_APPLNAME column)

Client User ID

11. End Client User ID (defined in CLIENT_USERID column)

Client Workstation Name

12. End Client workstation name (defined in CLIENT_WRKSTNNAME column)

IMPORTANT: Criteria in these colored categories are mutually exclusive in a profile row. Choose one category per profile row.

DSN_PROFILE_TABLE	
PROFILEID	INTEGER
AUTHID	VARCHAR(128)
PLANNAME	VARCHAR(24)
COLLID	VARCHAR(128)
PKGNAME	VARCHAR(128)
LOCATION	VARCHAR(254)
PROFILE_TIMESTAMP	TIMESTAMP
PROFILE_ENABLED	CHAR(1)
GROUP_MEMBER	VARCHAR(24)
REMARKS	VARCHAR(762)
ROLE	VARCHAR(128)
PRDID	CHAR(8)
CLIENT_APPLNAME	VARCHAR(255)
CLIENT_USERID	VARCHAR(255)
CLIENT_WRKSTNNAME	VARCHAR(255)
DSN_PROFILE_TABLE_IX_ALL [UNIQUE]	
DSN_PROFILE_TABLE_IX2_ALL	

PROFILEI

DSN_PROFILE_ATTRIBUTES	
PROFILEID	INTEGER [FK]
KEYWORDS	VARCHAR(128)
ATTRIBUTE1	VARCHAR(1024) [Nullable]
ATTRIBUTE2	INTEGER [Nullable]
ATTRIBUTE3	DOUBLE [Nullable]
ATTRIBUTE_TIMESTAMP	TIMESTAMP
REMARKS	VARCHAR(762) [Nullable]
DSN_PROFILE_ATTRIBUTES_IX_ALL [UNIQUE]	

Attributes table: KEYWORDS column (1|3)

— MONITOR CONNECTIONS

- Relates to CONDBAT
- Total number of remote connections from TCP/IP requesters, including current active connections and inactive connections
- Filtering on Profile table LOCATION column only: IP Address or Domain Name

ProfileID	Keywords	Attribute1	Attribute2	Attribute3	Attribute Timestamp
20	MONITOR THREADS	EXCEPTION	10		2019-12-19...
21	MONITOR IDLE THREADS	WARNING	180		2019-12-19...
22	MONITOR CONNECTIONS	EXCEPTION	45		2019-12-19...
22	MONITOR THREADS	EXCEPTION	20		2019-12-21...

Attributes table: KEYWORDS column (2|3)

— MONITOR THREADS

- Relates to MAXDBAT
- Total number of concurrent active remote threads that use TCP/IP on the Db2 subsystem or member
- Filtering on Profile table columns (exclusive OR):
 - LOCATION column (IP Address, domain name, location or location alias), *OR*
 - PRDID, *OR*
 - ROLE and/or AUTHID, *OR*
 - ★ ○ COLLID and/or PKGNAME, *OR*
 - One of CLIENT_APPLNAME, CLIENT_USERID, or CLIENT_WORKSTNNAME

ProfileID	Keywords	Attribute1	Attribute2	Attribute3	Attribute Timestamp
20	MONITOR THREADS	EXCEPTION	10		2019-12-19...
21	MONITOR IDLE THREADS	WARNING	180		2019-12-19...
22	MONITOR CONNECTIONS	EXCEPTION	45		2019-12-19...
22	MONITOR THREADS	EXCEPTION	20		2019-12-21...

Attributes table: KEYWORDS column (3|3)

— MONITOR IDLE THREADS

- Relates to IDTHTOIN in DSNZPARM
- Approximate time (in seconds) that an active server thread is allowed to remain idle
 - A zero value means that matching threads are allowed to remain idle indefinitely
- Same filtering as Monitor Threads
- Can be set independently of IDTHTOIN – higher or lower
 - If Attribute table row indicates WARNING, then IDTHTOIN value in DSNZPARM does not apply to this profile at all
 - Consider adding EXCEPTION row for such a profile id with a higher value for idle thread

ProfileID	Keywords	Attribute1	Attribute2	Attribute3	Attribute Timestamp
20	MONITOR THREADS	EXCEPTION	10		2019-12-19...
21	MONITOR IDLE THREADS	WARNING	180		2019-12-19...
22	MONITOR CONNECTIONS	EXCEPTION	45		2019-12-19...
22	MONITOR THREADS	EXCEPTION	20		2019-12-21...

Attributes columns (1|2)

— ATTRIBUTE1 – specifies how Db2 responds with a threshold exceeded

- Action taken:
 - WARNING - A console message is issued at most every five minutes
 - EXCEPTION - Db2 takes action (the connection rejected, or thread queued, or thread canceled), and a message is issued
- Messaging:
 - DIAGLEVEL1 (default) with minimal information in message DSNT771I
 - DIAGLEVEL2 includes PROFILEID and reason code in message DSNT772I
 - DIAGLEVEL3 includes PROFILEID, LUWID and reason code
Messages DSNT773I or DSNT774I

- For example: WARNING_DIAGLEVEL2

ProfileID	Keywords	Attribute1	Attribute2	Attribute3	Attribute Timestamp
20	MONITOR THREADS	EXCEPTION	10		2019-12-19...
21	MONITOR IDLE THREADS	WARNING	180		2019-12-19...
22	MONITOR CONNECTIONS	EXCEPTION	45		2019-12-19...
22	MONITOR THREADS	EXCEPTION	20		2019-12-21...

Attributes columns (2|2)

— ATTRIBUTE2 - specifies the threshold value

- Number of connections or threads
- Number of seconds for idle threads

— Together Keywords, Attribute1, and Attribute2 indicate what Db2 will do

- Example: MONITOR THREADS, EXCEPTION, 0
- Result: no DBATs for this profile

ProfileID	Keywords	Attribute1	Attribute2	Attribute3	Attribute Timestamp
20	MONITOR THREADS	EXCEPTION	10		2019-12-19...
21	MONITOR IDLE THREADS	WARNING	180		2019-12-19...
22	MONITOR CONNECTIONS	EXCEPTION	45		2019-12-19...
22	MONITOR THREADS	EXCEPTION	20		2019-12-21...

Using profiles: example definitions

SYSIBM.DSN_PROFILE_TABLE

ROLE	AUTHID	LOCATION	PRDID	COLLID	PKGNAME	PROFILEID	PROFILE_ENABLED
	SRVR01					20	Y
			JCC03570			21	Y
		TEST.SVL.IBM.COM				22	Y

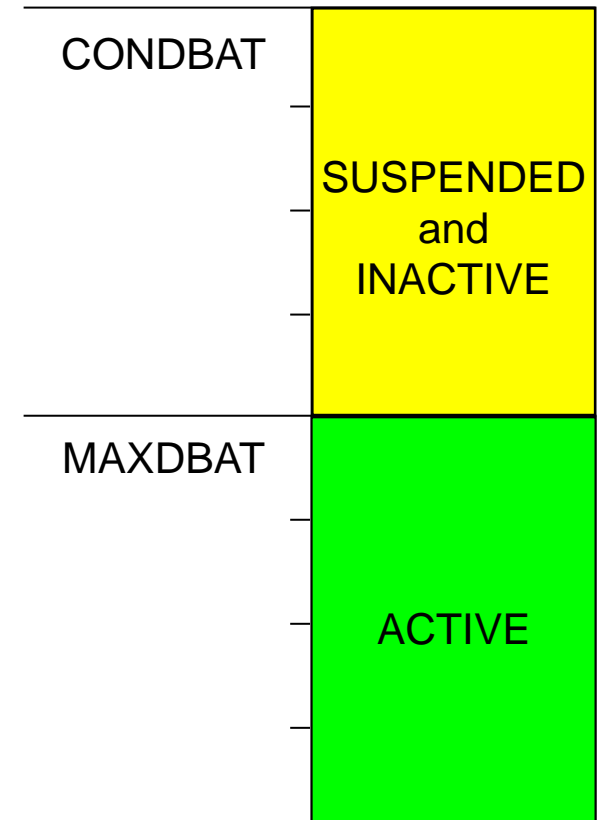
SYSIBM.DSN_PROFILE_ATTRIBUTES

ProfileID	Keywords	Attribute1	Attribute2	Attribute3	Attribute Timestamp
20	MONITOR THREADS	EXCEPTION	10		2011-12-19...
21	MONITOR IDLE THREADS	WARNING	180		2011-12-19...
22	MONITOR CONNECTIONS	EXCEPTION	45		2011-12-19...
22	MONITOR THREADS	EXCEPTION	20		2011-12-21...

Monitor threads and connections (1|5)

— Results: Without Profiles enabled

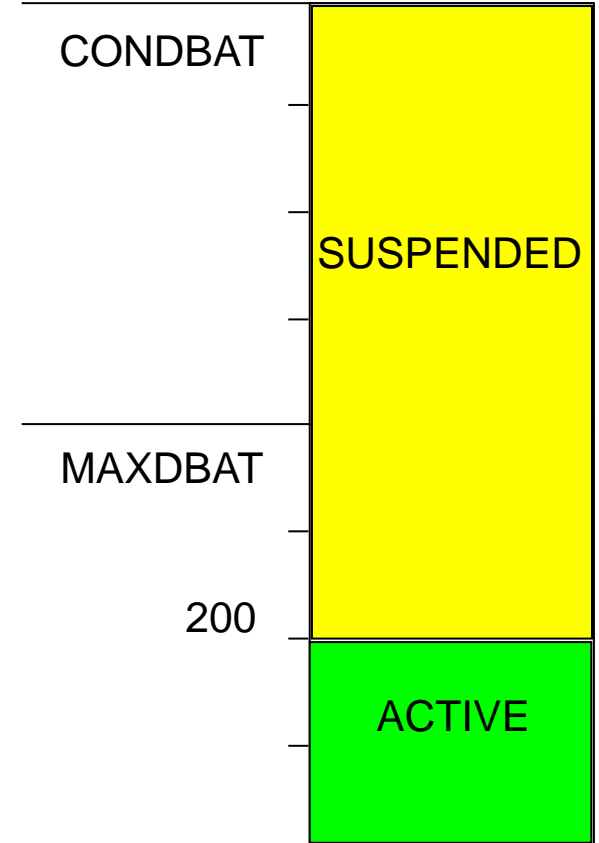
- Number of active threads controlled by MAXDBAT
- Number of connections controlled by CONDBAT
 - Includes connections that are suspended (queued) or inactive
- These values apply at the subsystem level and remain in effect
- Implementing Db2 System Profile Monitoring does not change this behavior



Monitor threads and connections (2|5)

— Results: Profile enabled on IP Address or Domain Name filter

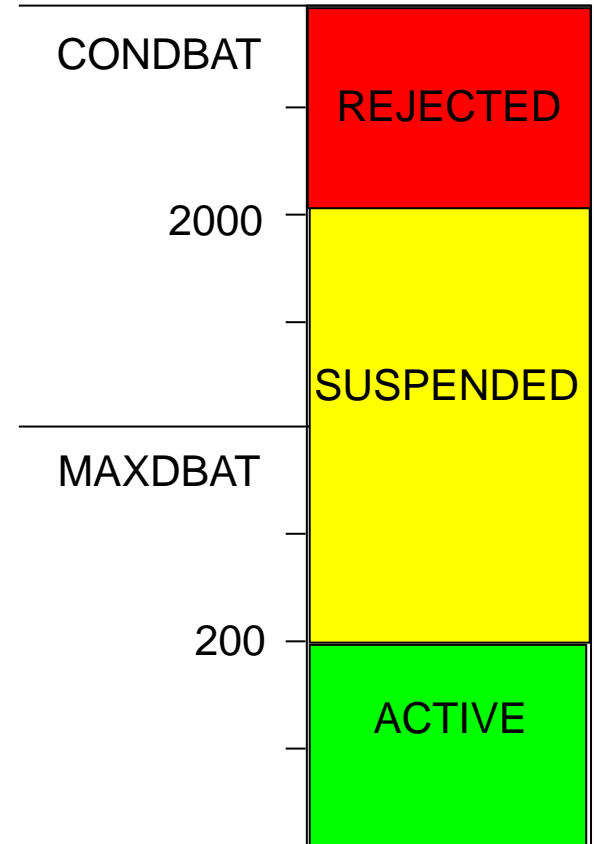
- Keywords: MONITOR THREADS
 - Attribute1: EXCEPTION
 - Attribute2: 200
- Any thread requests for this profile in excess of 200 are suspended (queued)



Monitor threads and connections (3|5)

— Results: Profile enabled on IP Address or Domain Name filter

- Keyword: MONITOR THREADS
 - Attribute1: EXCEPTION
 - Attribute2: 200
- Keywords: MONITOR CONNECTIONS
 - Attribute1: EXCEPTION
 - Attribute2: 2000
- Any thread requests for this profile between 200 and 2000 are suspended (queued)
- Thread requests for this profile in excess of 2000 are rejected with -30081 Communications Error

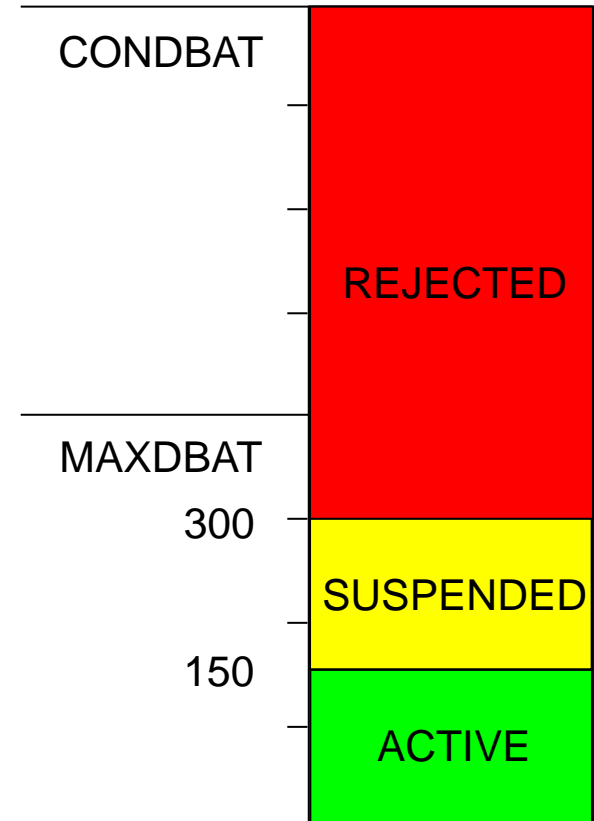


Monitor threads and connections (4|5)

— Results: Profile enabled on any other filter
(not IP Address or Domain Name)



- Keywords: MONITOR THREADS
 - Attribute1: EXCEPTION
 - Attribute2: 150
- Threads for this profile in excess of 150 are suspended (queued)
 - Until 150 are suspended
- Threads for this profile in excess of 300 are rejected with -30041
 - PH12041 (4/30/2020) allows value in ATTRIBUTE3 to limit suspended (queued) connections to value between 0 and ATTRIBUTE2



Monitor threads and connections (5|5)

—Example with multiple KEYWORDS

- PROFILEID 21 is associated with three keywords:
 - MONITOR THREADS – issue a message and suspend thread requests beyond 150 active DBATs
 - MONITOR CONNECTIONS – issue a message when there are more than 200 connections, but continue to service the connection requests
 - MONITOR IDLE THREADS – issue a message and terminate threads idle for more than 30 seconds

PROFILE ID	LOCATION	ROLE	AUTHID	PRDID	COLLID	PKGNAME
21	DEMOMVS.DEMOPKG.IBM.COM	null	null	null	null	null

PROFILE ID	KEYWORDS	ATTRIBUTE1	ATTRIBUTE2	ATTRIBUTE3	ATTRIBUTE_TIMESTAMP
21	<u>MONITOR THREADS</u>	EXCEPTION	150	NULL	2011-12-19.....
21	<u>MONITOR IDLE THREADS</u>	EXCEPTION	30	NULL	2011-12-17.....
21	<u>MONITOR CONNECTIONS</u>	WARNING	200	NULL	2011-1-21.....

Other features of Db2 System Profile Monitoring

- SQL optimization parameters
- Modeling PROD in TEST
- Setting Accelerator thresholds
- Setting Special Registers

Setting Special Registers or Global Variables for DDF clients (1|2)

- Profiles use same filtering criteria as for monitoring threads and idle threads
- KEYWORDS values: SPECIAL_REGISTER or GLOBAL_VARIABLE
 - ATTRIBUTE1 contains the 'SET' statement
 - E.g. SET CURRENT APPLICATION COMPATIBILITY = 'V11R1'
- Precedence of the SET for special register or global variable:
 - 1) Special register explicitly set by the application
 - 2) Special register set through Profile Support, as above
 - 3) Special register set on the connection property level or data source level

Setting Special Registers for DDF clients (2|2)

- CURRENT ACCELERATOR
- CURRENT APPLICATION COMPATIBILITY
- CURRENT DEBUG MODE
- CURRENT DECFLOAT ROUNDING MODE
- CURRENT DEGREE
- CURRENT EXPLAIN MODE
- CURRENT GET_ARCHIVE
- CURRENT LOCALE LC_CTYPE
- CURRENT MAINTAINED TABLE TYPES FOR OPTIMIZATION and CURRENT MAINTAINED TABLE TYPES
- CURRENT OPTIMIZATION HINT
- CURRENT PACKAGE PATH
- CURRENT PATH and PATH and CURRENT FUNCTION PATH
- CURRENT PRECISION
- CURRENT QUERY ACCELERATION
- CURRENT REFRESH AGE
- CURRENT ROUTINE VERSION
- CURRENT RULES
- CURRENT SCHEMA and SCHEMA
- CURRENT SQLID
- CURRENT TEMPORAL BUSINESS_TIME
- CURRENT TEMPORAL SYSTEM_TIME
- ENCRYPTION PASSWORD
- SESSION TIME ZONE and TIME ZONE

Setting Db2 global variables

— Db2 12 supports setting the following global variables in system profile tables

- SYSIBMADM.GET_ARCHIVE
- SYSIBMADM.MOVE_TO_ARCHIVE
- SYSIBM.TEMPORAL_LOGICAL_TRANSACTIONS
- SYSIBM.TEMPORAL_LOGICAL_TRANSACTION_TIME

— SYSIBM.DSN_PROFILE_ATTRIBUTES table changes

- KEYWORDS value 'GLOBAL_VARIABLE'
- Example: SET SYSIBMADM.MOVE_TO_ARCHIVE = 'N'

Wildcard support for some Profile table columns

- Use wildcard characters in some profile columns to allow matching against a range of AUTHIDs, or product IDs, or IP addresses
 - AUTHID column: use characters ending in * to match any AUTHID beginning with those characters
 - USER* in AUTHID would match any authid beginning 'USER', including USER with no trailing characters
 - PRDID column: multiple product identifiers that began with the same characters could match a single profile definition
 - DSN* would match to any version of a Db2 for z/OS requestor
 - LOCATION column supports wildcard matching of IP addresses as described on the next page

- Note: wildcard support does not apply to MONITOR IDLE THREAD until PH23341

Wild card support: examples

PROFILEID	LOCATION	ROLE	AUTHID	PRDID	COLLID	PACKAGE
18	null	null	null	DSN*	null	null
19	null	null	USER*	null	null	null
20	9.30.222.0/24	null	null	null	null	null
21	2001:DB8:ABCD:0012::/64	null	null	null	null	null
22	0.0.0.0	null	null	null	null	null

- LOCATION='9.30.222.251' matches Profile 20
 - As would any IPv4 address beginning with 9.30.222
- LOCATION='2001:DB8:ABCD:0012:0000:0000:0000:1234' matches profile 21
 - As would any IPv6 address beginning with 2001:DB8:ABCD:0012
- LOCATION='192.168.0.103' matches profile 22, as does any other IP address that does not match on LOCATION in other DSN_PROFILE_TABLE rows
 - LOCATION column for profile 22 can be "::0" or "0.0.0.0"
- The value after '/' in profiles 20 and 21 represents number of bits in the address

PH30780 (Dec 2020)

— Prior behavior:

- System profile monitoring can limit connections and threads
 - For unknown applications on an individual IP address basis
- Not possible to limit cumulative connections and threads from ALL unknown locations

— Potential issues:

- An excessive number of unknown locations can exceed system limits for connections or threads, causing an outage
- No ability to limit the total number of dynamic or unknown applications from accessing Db2 concurrently
 - Potential availability issue

— Solution overview

- MONITOR **ALL** CONNECTIONS
 - Db2 monitors the total cumulative number of remote connections from all (except otherwise specified) remote requestors
 - Including active connections and live inactive connections
- MONITOR **ALL** THREADS
 - Db2 monitors total cumulative number of concurrent active threads from all (except otherwise specified) remote requestors
- If either above keyword is specified, the profile filtering criterion in the LOCATION column in the DSN_PROFILE_TABLE must contain one of the following values:
 - “*”
 - “::0”
 - “0.0.0.0”

Db2 13 enhancements for System Profile Monitoring

Profile table support for local threads

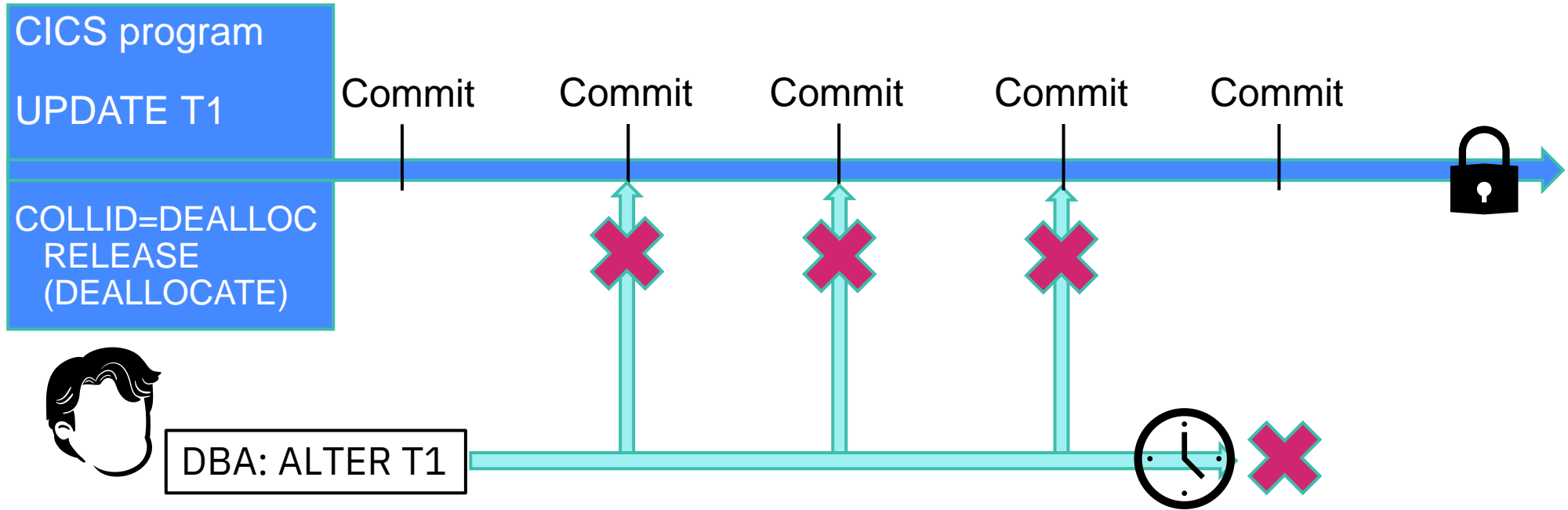
— Current behavior

- Profile tables can be used by DBA to set special registers and global variables
 - Distributed threads only
- Local applications cannot easily change:
 - Special registers
 - Global variables
- Application developer required to make changes to local applications

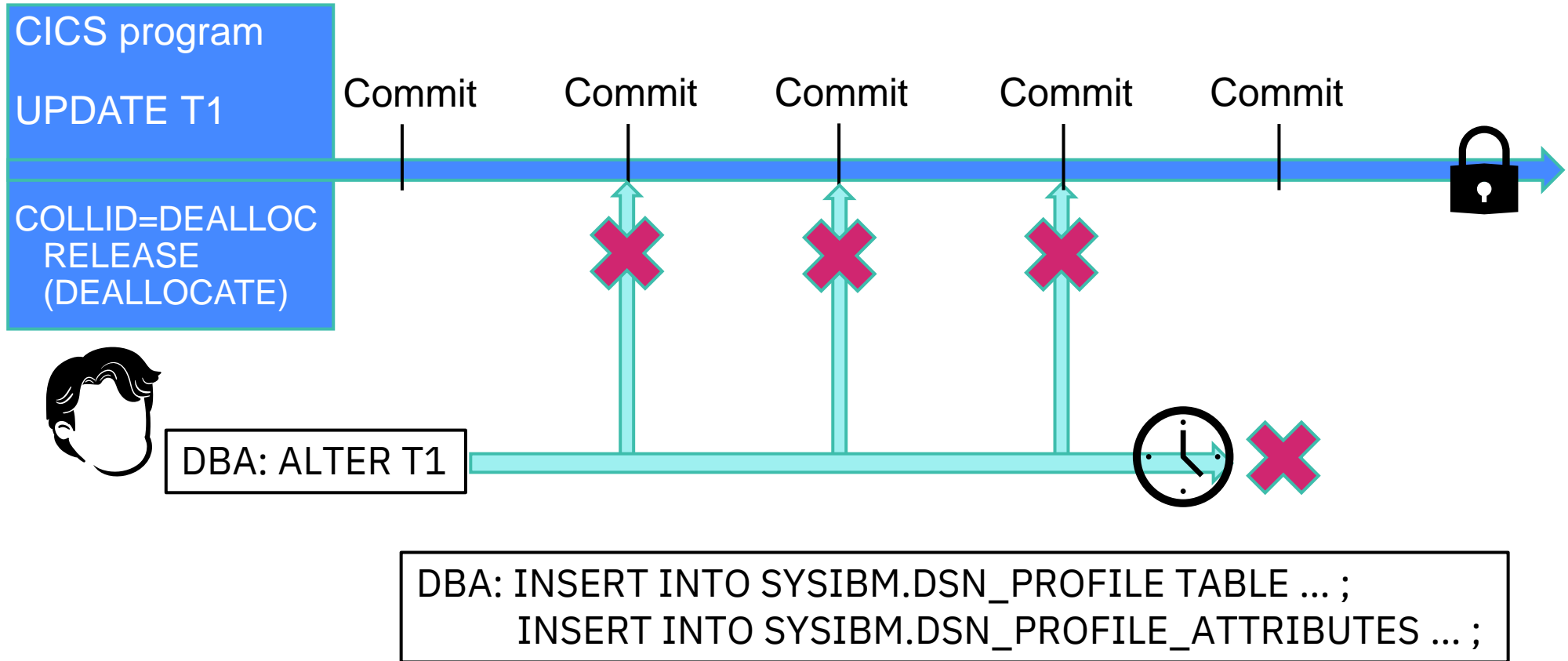
— New behavior

- Profile tables enhanced
 - Local thread support in some situations
 - New special register:
CURRENT LOCK TIMEOUT FL 500
 - New built-in global variable:
SYSIBMADM.DEADLOCK_RESOLUTION_PRIORITY FL 501
 - New keyword:
RELEASE_PACKAGE FL 500

Challenge scenario – release deallocate



Solution scenario (1|3) – release deallocate



Solution scenario (2|3) – release deallocate

INSERT INTO SYSIBM.DSN_PROFILE_TABLE...

PROFILEID	COLLID	PROFILE_ENABLE
99	DEALLOC	Y

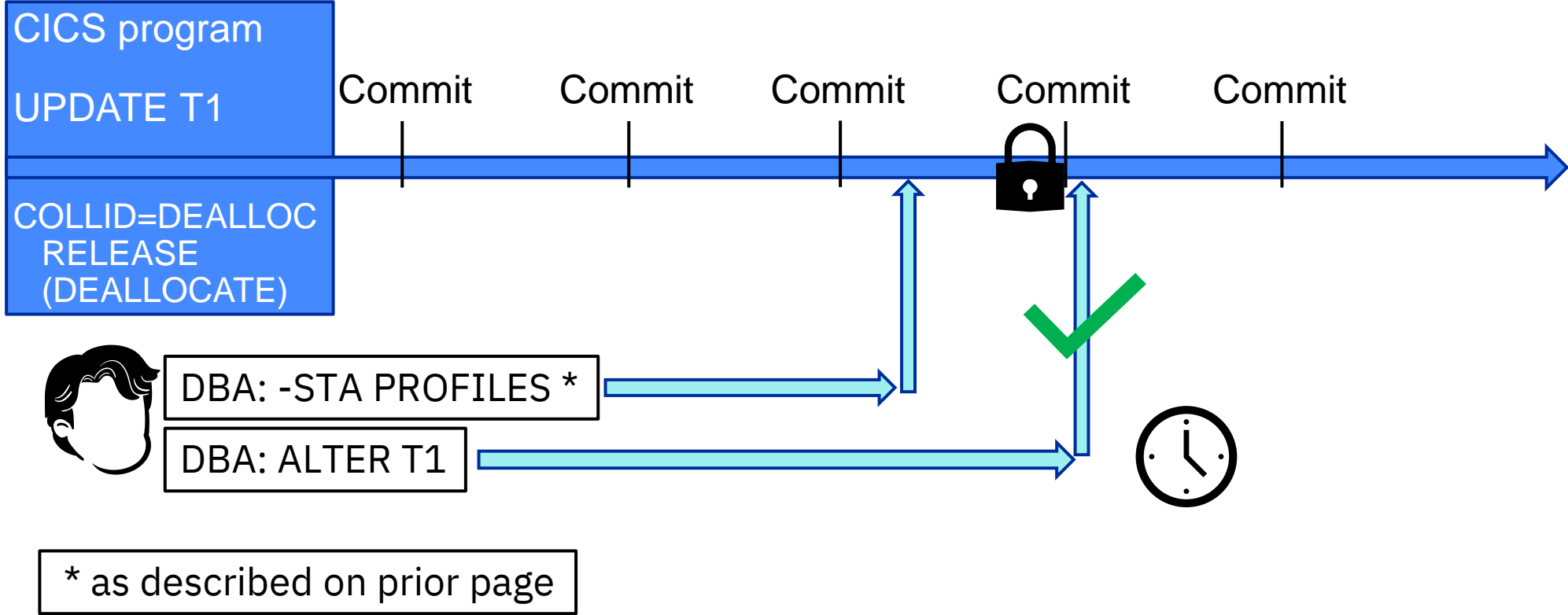
INSERT INTO SYSIBM.DSN_PROFILE_ATTRIBUTES...

PROFILEID	KEYWORD	ATTRIBUTE1	ATTRIBUTE2
99	RELEASE_PACKAGE	COMMIT	2

ATTRIBUTE1 **COMMIT** overrides the RELEASE setting for the collection

ATTRIBUTE2 determines scope: **NULL** – distributed only; **1** – local only; **2** – local and distributed

Solution scenario (3|3) – release deallocate



* as described on prior page

Profile support – SYSIBM.DSN_PROFILE_ATTRIBUTES table

KEYWORDS	ATTRIBUTE1	ATTRIBUTE2
GLOBAL_VARIABLE	SET SYSIBMADM.DEADLOCK_RESOLUTION_PRIORITY = <i>value</i> FL 501	NULL 1 2
RELEASE_PACKAGE	COMMIT FL 500	NULL 1 2
SPECIAL_REGISTER	SET CURRENT LOCK TIMEOUT = <i>value</i> FL 500	NULL 1 2

ATTRIBUTE2 determines scope: **NULL** – distributed only; **1** – local only; **2** – local and distributed

– Deadlock resolution and current lock timeout:

- Remote threads: profiles are evaluated and SET statements are processed only when **first** package is loaded and when first non-SET SQL statement is executed
- Local threads: profiles are evaluated and SET statements are processed when **each** package is loaded

– RELEASE_PACKAGE

- Profiles evaluated when **each** package is loaded

Profile support for local threads

Db2 DDF address space must be loaded to use system profile monitoring, even if only monitoring local threads

- Subsystem parameter DDF must be set to AUTO or COMMAND
 - For local thread support, *ssnm*DIST must be started, but –STA DDF not required

Profiles for local threads specified in SYSIBM.DSN.PROFILE_TABLE columns

- Option 1: AUTHID, ROLE, or both
- Option 2: COLLID, PKGNAME, or both
- Option 3: **One** of CLIENT_APPLNAME, CLIENT_USERID, or CLIENT_WORKSTNNAME
- Column choice options are mutually exclusive; each profile can only have values for one of the three options

Monitoring connections for security (1|4)

— Current behavior

- Distributed thread security behavior determined by single subsystem parameter (DSNZPARM) TCPALVER
 - YES – new connection accepted with user ID only
 - CLIENT – alternative to YES
 - NO – user ID and password required, or PassTicket or Kerberos
 - SERVER – alternative to NO
 - SERVER_ENCRYPT – user ID and password required, or Kerberos tickets, plus one of:
 - User ID and password AES-encrypted
 - Connection on AT-TLS port, e.g. SECPORT

— Address several security use cases

- There may be different requirements for different Db2 access types
- Case 1: JDBC clients require multi-factor authentication (MFA) or client certificates
- Case 2: REST access from z/OS Connect only needs the z/OS Connect userid and password
- Case 3: Db2 for z/OS access as defined with TCPALVER
- Case 4: any other access needs a client certificate

Monitoring connections for security (2|4)

- APAR PH48764 (April 2023) introduces the capability to discover and enforce the use of approved authentication and encryption methods by Db2 clients using profiles
- New actions added to the KEYWORDS column of the DSN_PROFILE_ATTRIBUTES table
 - **MONITOR *product-type* CONNECTIONS FOR SECURITY**, where *product-type* can be REST, JDBC, CLI, DB2CONNECT, DSN or *
- Specify the attributes of the profile in the ATTRIBUTE n columns
 - ATTRIBUTE1 specifies the action and console message (warning or exception)
 - ATTRIBUTE2 specifies the desired authentication mechanism (basic, MFA, client certificate, etc.)
 - ATTRIBUTE3 specifies whether the connection must be secured with an AT-TLS policy
- The new keyword values can only be specified for profiles using the default location filtering criteria
 - LOCATION column of the DSN_PROFILE_TABLE contains either '*', ':::0', or '0.0.0.0'

Monitoring connections for security (3|4): use case example

DSN_PROFILE_TABLE

PROFILEID	LOCATION	ROLE	AUTHID	PRDID	COLLID	PKGNAME
101	::0	null	null	null	null	null

DSN_PROFILE_ATTRIBUTES

PROFILEID	KEYWORDS	ATTRIBUTE1	ATTRIBUTE2	ATTRIBUTE3
101	MONITOR JDBC CONNECTIONS FOR SECURITY	EXCEPTION_ DIAGLEVEL3	6	null
101	MONITOR REST CONNECTIONS FOR SECURITY	EXCEPTION_ DIAGLEVEL2	1	null
101	MONITOR DSN CONNECTIONS FOR SECURITY	EXCEPTION	null	null
101	MONITOR * CONNECTIONS FOR SECURITY	EXCEPTION	4	null

- EXCEPTION or WARNING imply DIAGLEVEL1, which does not include profile information
- DIAGLEVEL1 or DIAGLEVEL2 produces at most 1 message per 5 minutes
- DIAGLEVEL3 issued for each occurrence

Monitoring connections for security (4|4): reference

— product-type' in

- REST
- JDBC
- CLI
- DB2CONNECT
- DSN
- * (applications other than specified above)

— ATTRIBUTE1 - message and action

- EXCEPTION | EXCEPTION_DIAGLEVEL1 – fail request
- EXCEPTION_DIAGLEVEL2 – fail request
- EXCEPTION_DIAGLEVEL3 – fail request
 - Issue [DSNT776I](#) for every exception
- WARNING or WARNING_DIAGLEVEL1 – allow request
- WARNING_DIAGLEVEL2 – allow request
- WARNING_DIAGLEVEL3 – allow request
 - Issue [DSNT775I](#) for every warning

Summary of Db2 System Profile Monitoring

- Customers can use Db2 System Profile Monitoring to
 - Manage DDF resources at a more granular level than the system parameter (DSNZPARM) settings, potentially avoiding serious application impacts
 - Connections
 - Threads
 - Idle thread timeout
 - Set optimization parameters, model PROD in TEST, influence query acceleration
 - Set special registers for DDF clients
 - Set global variables for DDF clients (starting in Db2 12)
 - Support local threads and monitor connections for security (Db2 13)

Thank you!

— Mark Rader

- mrader@us.ibm.com