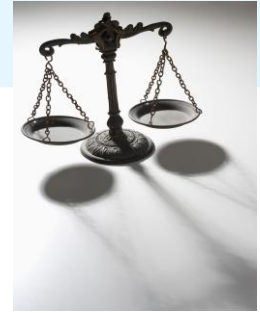


Db2 for z/OS:  
You can do THAT with  
system profile  
monitoring???



# We hold these truths...

- All threads are created equal...
  - Well, CTHREAD for allied threads
  - ...and MAXDBAT for distributed threads
- One DSNZPARM
  - Surely one value is sufficient for every application process, right?
  - At least you can have different DSNZPARM modules for each member of the Db2 data sharing group
- What if there were more granularity?



# Agenda

- Quick overview of Db2 system profile monitoring
  - SYSIBM.DSN\_PROFILE\_TABLE
  - SYSIBM.DSN\_PROFILE\_ATTRIBUTES
- Distributed (DDF) use cases
- Local – yes, local! – use cases
- Performance use case?
- Other Db2 13 for z/OS changes
- Questions
- Summary

# Overview

You can create profiles to monitor and control various aspects of a Db2 subsystem in specific application contexts

- Originally for remote applications that use TCP/IP connectivity to access Db2 for z/OS

- Threads
- Connections
- Idle threads
- User IDs
- Application packages
- ...and more!

# Profiles

The DSN\_PROFILE table rows define the filtering criteria for profiles...

SYSIBM.DSN\_PROFILE\_TABLE

PROFILE ID	LOCATION	ROLE	AUTHID	PRDID	COLLID	PKGNAME	PROFILE_ENABLED
11	Null	Null	SRVR1	Null	Null	Null	Y
12	Null	ROLE_DBA	USER*	Null	Null	Null	Y
13	TEST.SVL. IBM.COM	Null	Null	Null	Null	Null	Y
14	Null	Null	Null	JCC04030	Null	Null	Y

# Profiles

The DSN\_PROFILE table rows define the filtering criteria for profiles, and DSN\_PROFILE\_ATTRIBUTES rows specify the actions to take when a profile's criteria are met

SYSIBM.DSN\_PROFILE\_TABLE

PROFILE ID	LOCATION	ROLE	AUTHID	PRDID	COLLID	PKGNAME	PROFILE_ENABLED
11	Null	Null	SRVR1	Null	Null	Null	Y
12	Null	ROLE_DBA	USER*	Null	Null	SYSIBM.DSN_PROFILE_ATTRIBUTES	
13	TEST. IBM.	PROFILE ID	KEYWORDS	ATTRIBUTE1	ATTRIBUTE2	ATTRIBUTE3	ATTRIBUTE_TIMESTAMP
14		11	MONITOR THREADS	EXCEPTION	10	Null	2021-12-19...
		12	MONITOR IDLE THREADS	WARNING	180	Null	2021-12-28...
		13	MONITOR CONNECTIONS	EXCEPTION	45	Null	2022-01-25...
		14	MONITOR THREADS	EXCEPTION	20	30	2022-02-04...

# Profiles

Attribute1 specifies how Db2 will respond when a threshold is hit

SYSIBM.DSN\_PROFILE\_TABLE

PROFILE ID	LOCATION	ROLE	AUTHID	PRDID	COLLID	PKGNAME	PROFILE_ENABLED
11	Null	Null	SRVR1	Null	Null	Null	Y
12	Null	ROLE_DBA	USER*	Null	Null	SYSIBM.DSN_PROFILE_ATTRIBUTES	
13	TEST. IBM.	PROFILE ID	KEYWORDS	ATTRIBUTE1	ATTRIBUTE2	ATTRIBUTE3	ATTRIBUTE_TIMESTAMP
14		11	MONITOR THREADS	EXCEPTION	10	Null	2021-12-19...
		12	MONITOR IDLE THREADS	WARNING	180	Null	2021-12-28...
		13	MONITOR CONNECTIONS	EXCEPTION	45	Null	2022-01-25...
		14	MONITOR THREADS	EXCEPTION	20	30	2022-02-04...

# Profiles

Attribute2 specifies the threshold value as an INTEGER

Attribute3 specifies any further attributes, if needed, as a FLOAT

SYSIBM.DSN\_PROFILE\_TABLE

PROFILE ID	LOCATION	ROLE	AUTHID	PRDID	COLLID	PKGNAME	PROFILE_ENABLED
11	Null	Null	SRVR1	Null	Null	Null	Y
12	Null	ROLE_DBA	USER*	Null	Null	SYSIBM.DSN_PROFILE_ATTRIBUTES	

PROFILE ID	KEYWORDS	ATTRIBUTE1	ATTRIBUTE2	ATTRIBUTE3	ATTRIBUTE_TIMESTAMP
11	MONITOR THREADS	EXCEPTION	10	Null	2021-12-19...
12	MONITOR IDLE THREADS	WARNING	180	Null	2021-12-28...
13	MONITOR CONNECTIONS	EXCEPTION	45	Null	2022-01-25...
14	MONITOR THREADS	EXCEPTION	20	30	2022-02-04...

# Profiles

## SYSIBM.DSN\_PROFILE\_TABLE

PROFILE ID	LOCATION	ROLE	AUTHID	PRDID	COLLID	PKGNAME	PROFILE_ENABLED
11	Null	Null	Null	Null	PKG_A1	Null	Y
12	Null	ROLE_DBA	USER*	Null	Null	Null	Y
13	TEST.SVL. IBM.COM	Null	Null	Null	Null	Null	Y
14	Null	Null	Null	JCC04030	Null	Null	Y

## SYSIBM.DSN\_PROFILE\_ATTRIBUTES

PROFILE ID	KEYWORDS	ATTRIBUTE1	ATTRIBUTE2	ATTRIBUTE3	ATTRIBUTE_TIMES_TAMP
11	MONITOR THREADS	EXCEPTION	10	Null	2021-12-19...
12	MONITOR IDLE THREADS	WARNING	180	Null	2021-12-28...
13	MONITOR CONNECTIONS	EXCEPTION_ DIAGLEVEL1	45	Null	2022-01-14...
14	MONITOR THREADS	EXCEPTION	20	30	2022-02-08...

# Distributed (DDF) use cases for profiles

# Why use profiles to monitor DDF resources?

A single subsystem value means resources cannot be allocated by business area or priority

- Vice President's request for connection or thread is equal to summer intern's request
- Numerous low priority threads can reduce access for high priority threads

Customers may be forced to use other means to prioritize or manage thread and connection requests

- E.g. Db2 Connect Server (gateway) instead of direct connections
- Or different Db2 members of a data sharing group for different priorities

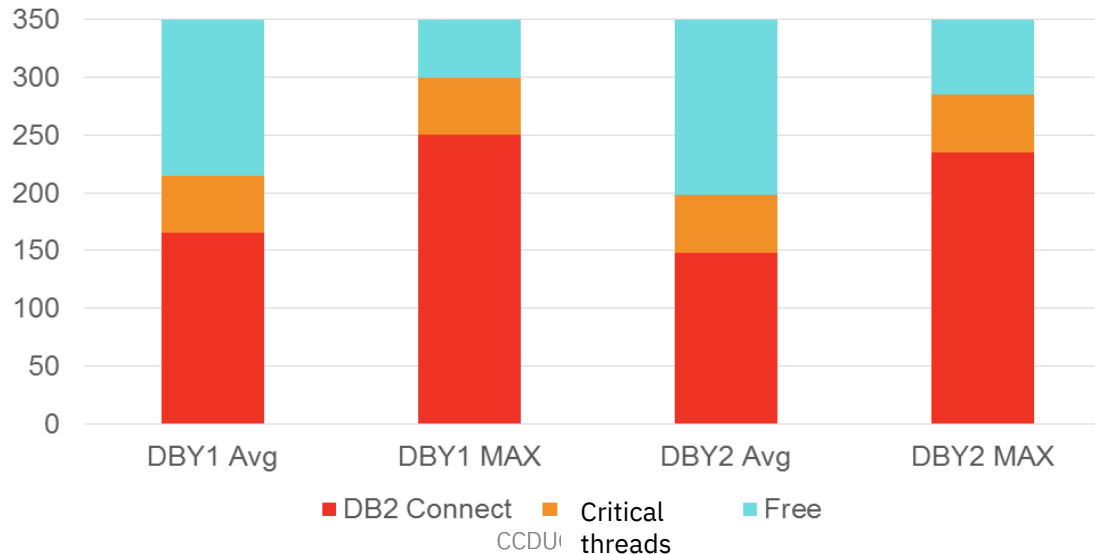
Single idle thread timeout may not reflect behavior of all application threads

- E.g. entire subsystem may disable idle thread timeout because a single application cannot tolerate an idle thread timeout

# Customer use case: DB2Y threads

Trends for DB2Y data sharing group

- DBY1 - Avg Threads=165 - Max 250
- DBY2 – Avg Threads=148 - Max 235



# Background of ‘self-inflicted denial of service’

## 2-member data sharing group

- Db2 Connect threads driven by an app server
  - Occasionally DBATs spiked; no way to control the application
- “Critical” workload also using DBATs

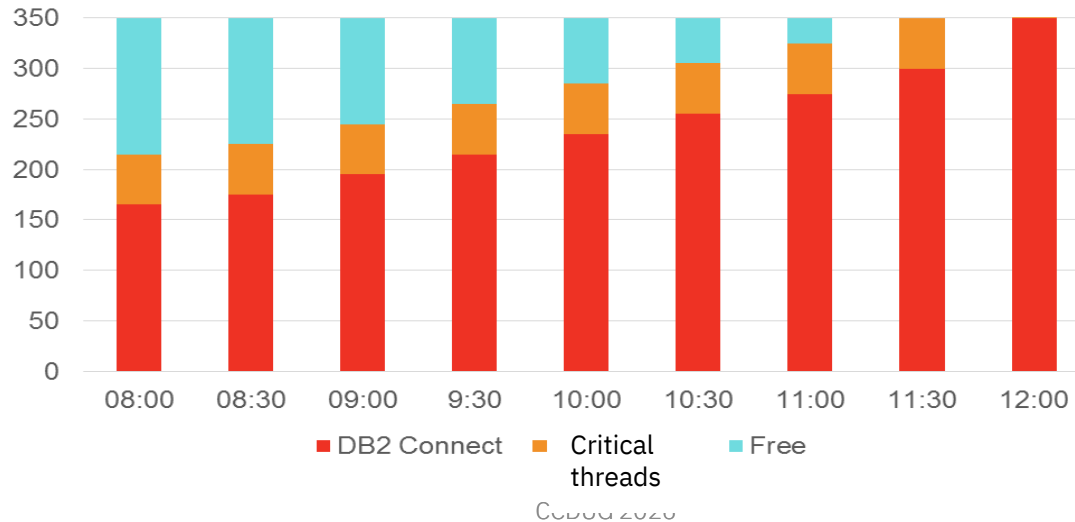
If Db2 Connect threads spike for a long time, well-behaved threads cannot get a DBAT

- Well-behaved DBATs commit and deallocate
- Next request may encounter MAXDBAT!

# DB2Y threads

When TCP/IP threads do not end

- IP thread count grows
- Critical threads get "squeezed out"



# Solution to ‘self-inflicted denial of service’

Define profile for “Db2 Connect” workload

- In customer case used NULLID collection
  - Other options possible

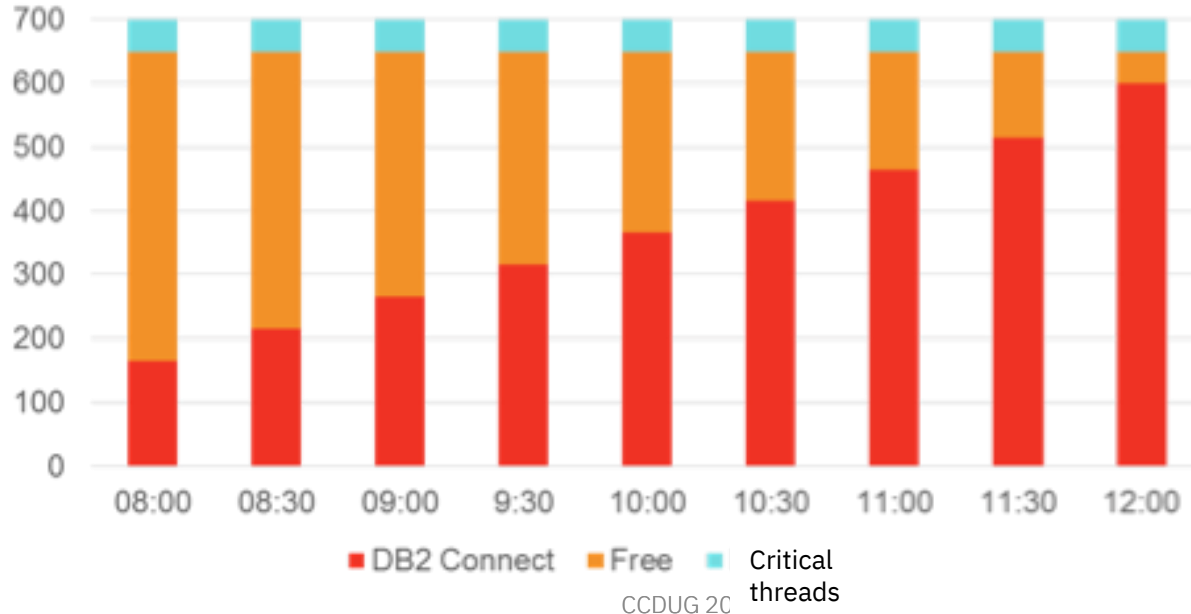
Define attribute row for that profile

- KEYWORDS: MONITOR THREADS
- ATTRIBUTE1: EXCEPTION
- ATTRIBUTE2: 600
- No Db2 Connect DBATs past 600

Critical threads guaranteed available DBATs!

# DB2Y threads

Now when Db2 Connect threads spike, critical threads are guaranteed enough DBATs



# Use case: special idle thread timeout

One application cannot (or choose not to) tolerate idle thread timeout

- Customer has to disable idle thread timeout for all applications
  - DSNZPARM IDTHTOIN = 0
- Likely many threads holding resources to no benefit for long time

Solution: define profile for that one application, and attribute as follows:

- KEYWORDS: MONITOR IDLE THREADS
- ATTRIBUTE1: WARNING
- ATTRIBUTE2: 0
- Then change DSNZPARM IDTHTOIN to 120 (default)

# Use case: setting 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' is available
- ATTRIBUTE1 accepts SET statement for global variables
- SET statement requires equal sign (=) between the global variable and the value assigned
- Example: SET SYSIBMADM.MOVE\_TO\_ARCHIVE = 'N'

# Performance use case

# Modeling PROD in TEST

- Just copy production statistics to TEST and run EXPLAIN, right?
- DSNZPARMs:
  - SIMULATED\_CPU\_COUNT and SIMULATED\_CPU\_SPEED
- Profile with PROFILE ID = xxxx
- Attributes table KEYWORDS
  - SORT\_POOL\_SIZE
  - MAX\_RIDBLOCKS
  - BPNAME
    - BP0, BP1, ..., BP8K1, etc.
- ATTRIBUTE2 specifies the PROD value
- EXPLAIN will reflect “PROFILEID xxxx” concatenated into REASON column of DSN\_STATEMENT\_TABLE

# Local use cases for profiles

# 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

# 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

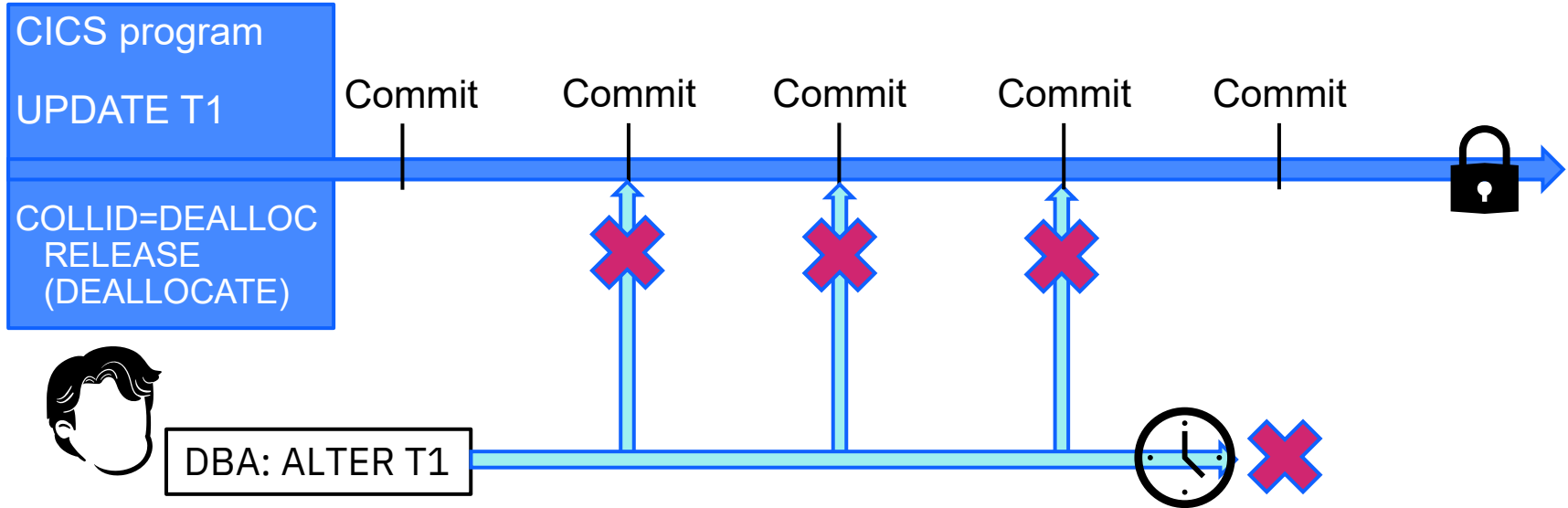
– Deadlock resolution and current lock timeout:

- 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

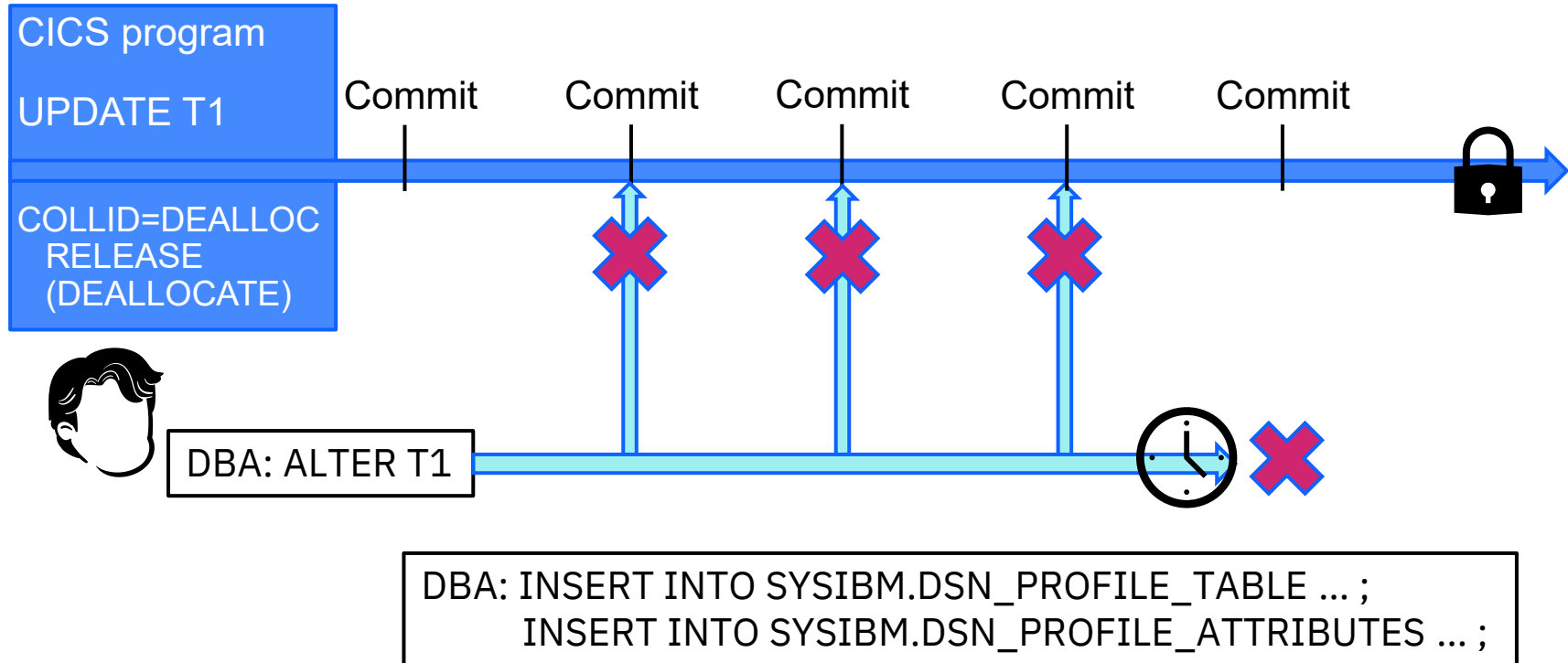
– RELEASE\_PACKAGE

- Profiles evaluated when *each* package is loaded

# Challenge scenario – release deallocate



# Solution scenario (1|3) – release deallocate



# Solution scenario (2|3)– release deallocate to commit

INSERT INTO SYSIBM.DSN\_PROFILE\_TABLE...

PROFILEID	COLLID	PROFILE_ENABLED
99	DEALLOC	Y

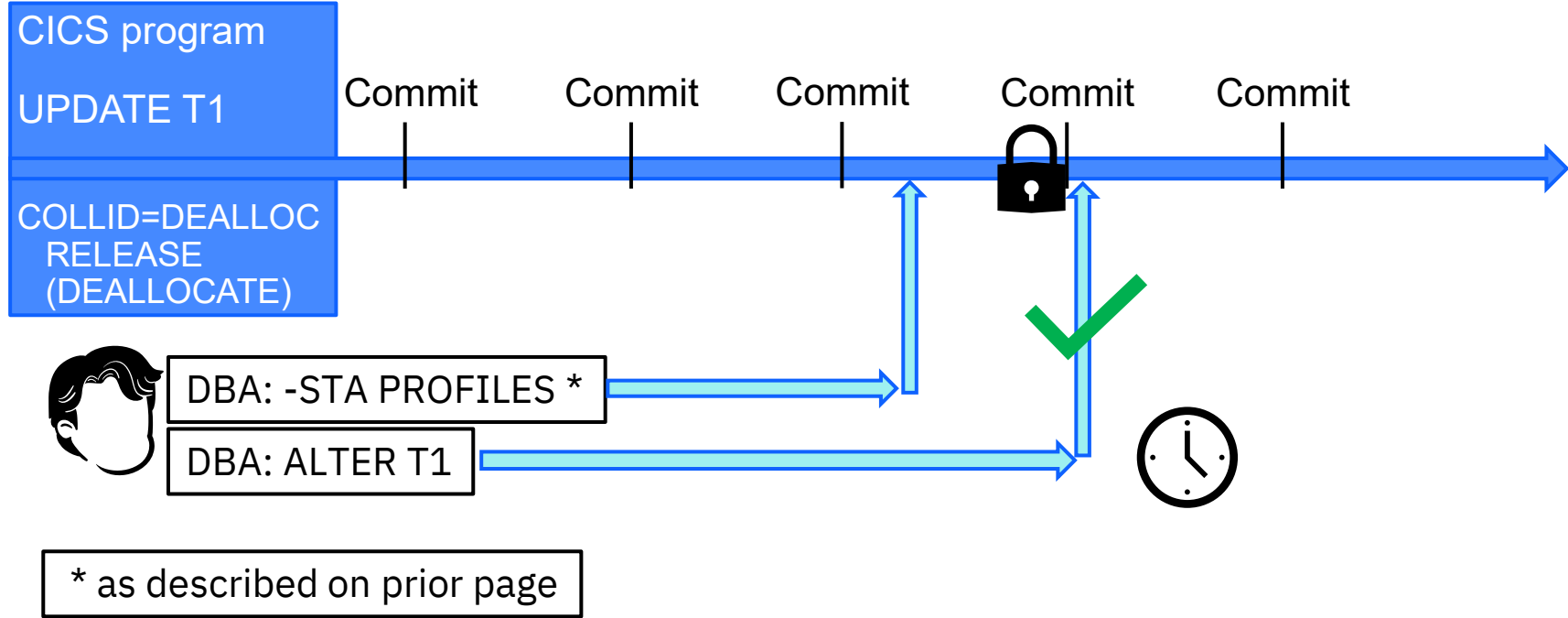
INSERT INTO SYSIBM.DSN\_PROFILE\_ATTRIBUTES...

PROFILEID	KEYWORDS	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



# Other Db2 13 changes for profiles

# Increased profile support for local applications

Additional *local* thread support with profile tables:

- 23 existing special registers
- 6 existing global variables

*ATTRIBUTE2* column value has new options:

- 1 (local threads only) or 2 (local and remote threads)
- Previously *ATTRIBUTE2* had to be *NULL*
  - Remote threads only

# Use case example

DSN\_PROFILE\_TABLE

PROFILEID	LOCATION	ROLE	AUTHID	PRDID	COLLID	PKGNAME
101	null	null	USER01	null	null	null
102	null	null	null	null	null	DSNTEP4

FL 508

DSN\_PROFILE\_ATTRIBUTES

PROFILEID	KEYWORDS	ATTRIBUTE1	ATTRIBUTE2
101	SPECIAL_REGISTER	SET CURRENT DEGREE = 'ANY'	2
102	GLOBAL_VARIABLE	SET SYSIBMADM.MAX_LOCKS_PER_TABLESPACE = 500	1

- USER01 matches PROFILEID 101; USER01 *local AND remote threads* will use CURRENT DEGREE = 'ANY'
- PROFILEID 102 sets SYSIBMADM.MAX\_LOCKS\_PER\_TABLESPACE to 500 for jobs run under DSNTEP4 for *local threads only*
  - ATTRIBUTE 2: setting the ATTRIBUTE2 column value to 1 applies for local threads only or 2 for local and remote threads

# More granular specification of security requirements for DDF applications

Security requirements vary for different Db2 for z/OS client-server applications

- One “big switch” variety in zPARMs – TCPALVER

Problems with “big switch” controls:

- Inflexible – All or nothing, especially if you’re trying to make a change
- Risk – Application disruptions if some applications don’t get it right the first time

# The Db2 13 solution

Db2 13 extends the profile table support for specific security requirements in a *granular way* for *DDF applications*

– APARs [PH48764](#) and [PH57811](#)

Different security requirements can be specified for *different categories* of Db2 client-server applications (e.g., JDBC, ODBC, REST) *and for specific application servers within a category*

# Granular client-server application security control

- Example:

[SYSIBM.DSN\\_PROFILE\\_TABLE](#)

PROFILEID	LOCATION	ROLE	AUTHID	PRDID	COLLID	PKGNAME
101	1.2.3.4	null	null	null	null	null

[SYSIBM.DSN\\_PROFILE\\_ATTRIBUTES](#)

PROFILEID	KEYWORDS	ATTRIBUTE1	ATTRIBUTE2	ATTRIBUTE3
101	MONITOR JDBC CONNECTIONS FOR SECURITY	EXCEPTION	1	1

- What this set-up means:
  - JDBC-using app running on app server at address 1.2.3.4 **must** (ATTRIBUTE1) authenticate with an **ID and a password or passphrase** (ATTRIBUTE2) and must use **SSL encryption** (ATTRIBUTE3)
    - \* Other category choices: **CLI** (usually referring to ODBC driver), **REST**, **DSN** (referring to another Db2 for z/OS system), **DB2CONNECT** (referring to Db2 Connect “gateway” server), and **\*** (meaning, “Otherwise...”)
  - Security requirement for categories not referenced is based on value of **TCPALVER** in ZPARM

Reference info: <https://www.ibm.com/docs/en/db2-for-zos/13?topic=support-discovering-controlling-secure-tcpip-connectivity-profile-tables>

# How this changes the game

**Flexibility:** Easy to implement different security requirements for different client-server applications

Phased implementation of new security controls for client-server applications

- If you want to go from password-based to certificate-based client authentication, you can do that **starting with one application running on one app server**
- When you have it working for that one application, **you have a template** that can be used to implement the change for other applications
- **Reduces risk** versus “big switch” approach

*Now we have lots of switches...*



# Monitor connections: AUTHID support (PH63652)

- Example:

## SYSIBM.DSN\_PROFILE\_TABLE

PROFILEID	LOCATION	ROLE	AUTHID	PRDID	COLLID	PKGNAME
101	1.2.3.4	null	null	null	null	null
102	null	null	*	null	null	null
103	null	null	USER24	null	null	null

## SYSIBM.DSN\_PROFILE\_ATTRIBUTES

PROFILEID	KEYWORDS	ATTRIBUTE1	ATTRIBUTE2	ATTRIBUTE3
101	MONITOR JDBC CONNECTIONS FOR SECURITY	EXCEPTION	1	1
102	MONITOR REST CONNECTIONS FOR SECURITY	EXCEPTION_DIAGLEVEL2	4	null
103	MONITOR REST CONNECTIONS FOR SECURITY	WARNING_DIAGLEVEL3	4	null

- What this set-up means: (PROFILEID 101 scenario remains the same)
  - USER27 using REST from 1.2.3.4 matches PROFILEID 102; must use client certificates
    - DSNT771I at most once every 5 minutes for any AUTHID other than USER24
  - USER24 using REST from 1.2.3.4 (or 2.4.6.8 or other) matches PROFILEID 103; should use client certificates
    - DSNT775I every time a client certificate is not used

# Questions?

# Summary

- Db2 system profile monitoring gives you greater granularity than DSNZPARM values in many cases
- Profiles started as ways to manage distributed applications
  - Connections, threads, timeouts
  - Special registers and global variable
- Profile enhancements have been added to local applications
- More is coming!

# Thank you!

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A large, 3D-rendered white IBM logo is centered on the page. The letters are thick and blocky, with a slight shadow cast to the right, giving it a three-dimensional appearance.