

2012

IBM System z Technical University

Enabling the infrastructure for smarter computing

CICS TS V5.1 : Scalability and Core Foundations

Session zAI13



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Announcing the new CICS TS V5.1 release

Operational Efficiency

- *Greater capacity* - achieve cost savings through consolidation
- *Managed operations* - control critical resource thresholds with policies
- *Increased availability* - reduce the need for planned downtime
- *Deeper insight* - extend performance and compliance information



100+
requirements
satisfied!

Service Agility

- *First-class applications* - create agile services from existing assets
- *First-class platforms* - create agile service delivery platforms
- *Modern interfaces* - build rich web experiences for critical applications
- *Foundational enhancements* - extend core capabilities

... with Cloud Enablement

Consistent with the IBM Cloud Computing strategy
Positioning customers for the next transformational era in technology
Moving towards a cloud oriented service delivery platform

Agenda

■ CICS Transaction Server V5.1

– Core Foundations

- SPI audit
- Security
- Communications
- Installation and Startup
- Monitoring and Statistics

– Scalability

- Open Transaction Environment
- Virtual Storage Constraint Relief
- Greater Use of 64-bit Storage
- Increased max task limit

■ Summary

Core Foundations and Scalability items addressing:



– Greater Capacity



– Increased availability



– Deeper Insight



– Foundation enhancements

SPI Command Auditing



- SPI commands (SET, PERFORM, ENABLE, DISABLE, and RESYNC) now audited for better accountability of configuration changes
 - DFHAP1900 *date time applid netname userid transid command* RESP(response) RESP2(n)
 - Issued after command completes, for example...
 - DFHAP1900 09/17/2012 09:47:53 IYK2Z2G1 IYCWT195 CICSUSER CEMT SET FILE(FILEA) NOWAIT OPENSTATUS(CLOSED) RESP(NORMAL) RESP2(0).
 - DFHAP1900 09/17/2012 09:48:03 IYK2Z2G1 NONE CICSUSER CONL SET FILE(FILEA) BUSY(NOWAIT) ENABLESTATUS(ENABLED) OPENSTATUS(OPEN) RESP(NORMAL) RESP2(0).
 - Commands audited ...
 - SET, PERFORM, ENABLE, DISABLE, RESYNC
 - Except for PERFORM SHUTDOWN that already have audited messages DFHTM1715 / DFHTM1703
 - Sent to new TD queue CADS (indirect to CSSL by default)
 - Can turn off function by redirecting CADS to a dummy destination
 - Changes to some resources (e.g. TERMINAL, NETNAME) not audited

Notes ...

Some system programming interface commands are now audited. This feature provides useful information about configuration changes for problem diagnosis.

The system programming interface commands SET, PERFORM, ENABLE, DISABLE, and RESYNC are audited. When these commands are issued, message DFHAP1900 is written to the CICS® job log. The message contains information about the parameters used in the command.

There are two methods to monitor message DFHAP1900:

- XMEOUT exit. See Message domain exit XMEOUT

- System event capture. This facility can also be used to trigger an event when the message is logged.

When you use CEMT, WUI or Explorer operator commands with generic parameters, each command is audited as if it was entered separately. For example, if you have 2000 programs and enter the command CEMT SET PROGRAM(*) ENABLE, 2000 separate messages are logged. Similarly, if you enter the command CEMT SET PROGRAM(*) NEWCOPY when you are not authorized for SET PROGRAM, 2000 RACF® failure messages are logged. So many messages could flood the CSSL queue so audit messages should be redirected to another queue. As each command is logged as if it were entered separately, you can search the log for a single program name to aid problem determination.

When using CPSM, the user ID in the audit message in the MAS depends on the security settings in MAS, WUI and CMAS. If security is not active in the Web User Interface, users can logon through the Web User Interface using any string value for a user ID. The default user ID of MAS or CMAS is displayed in the audit message, and therefore cannot be used to identify the user that entered the command.

Core Foundations – Security ...



- Logging on with VERIFY command can now use full RACF verification at least once a day
 - Ensures user IDs are always ready for audit, recorded as being used, and retained in your system
 - SIT parm SECVFYFREQ=USRDELAY
 - Applies to HTTP basic authentication for web support, Webservices & IPIC authentication & use of VERIFY API commands

- Distributed identities are now propagated for START command
 - Auditors can use the distributed identity associated with started tasks to find the identity of the user

Notes ...

You can now specify that a full verification request takes place at least once a day when users log in to the CICS region. This process ensures that user IDs record their most recent usage date for requests made over IP.

When a user logs in to CICS by a method that uses password verification, like the EXEC CICS VERIFY PASSWORD or EXEC CICS VERIFY PHRASE command, instead of a full verification request like the EXEC CICS SIGNON command, the login process is faster. However, with the faster login methods, RACF does not record the login as the last access for the user ID, and does not write audit information for the user ID. User IDs that are always used with the faster login methods can therefore appear to be unused, and could be revoked.

CICS uses password verification for improved performance in the following login processes:

- HTTP basic authentication with CICS web support
- Web services authentication
- IP interconnectivity (IPIC) authentication

You might also have your own login processes that use the EXEC CICS VERIFY PASSWORD or VERIFY PHRASE command.

If you have users who generally use login processes with password verification, you can now specify the system initialization parameter SECVFYFREQ=USRDELAY in the CICS region, to require that CICS makes a full verification request at least once a day for each user ID that is used to log in to the CICS region. The full verification request uses the RACROUTE REQUEST=VERIFYX macro, instead of the RACROUTE REQUEST=EXTRACT macro that is used for password verification. In RACF, the full verification request updates the user statistics for audit purposes, and updates the date and time of last access for the user ID so that it is recorded as being in use.

Operators and auditors can see the distributed identity of the user for started tasks.

Identity propagation was introduced in CICS® TS 4.1. With this feature, the client identity contained a distributed identity (usually an X.500 ID) and a realm to be propagated to CICS in an Extended Context Identity Reference (ICRX). The ICRX was contained in IPIC DPL requests from CICS Transaction Gateway and web services requests. CICS associated the distributed identity with a RACF® user ID using RACMAPs. The ICRX was propagated in CICS in DPL requests using MRO or IPIC. However if the transaction issued a START request, only the RACF user ID was propagated.

In CICS TS 5.1 the ICRX is also propagated for transactions issuing START commands which do not specify a USERID, TERMID or RTERMID. If any of these are specified, CICS does not propagate the ICRX.

Core Foundations – Security ...



- SSL certificates and environment can be refreshed online for improve 24x7 operation
 - New **PERFORM SSL REBUILD** command
 - After updating key ring with new certificate
 - After LDAP server is restarted

- SSL ciphers used are now recorded in SMF 110 CMF performance class records for better performance analysis

Notes ...

CICS support for Secure Sockets Layer (SSL) is enhanced, with a new PERFORM SSL REBUILD command to refresh certificates used for SSL handshakes without performing a restart, and SSL cipher codes negotiated at run time are now recorded in SMF 110 performance records. It is possible to specify that a full verification request takes place at least once a day when users log on to the system, to ensure that IDs are always ready for audit, recorded as being used, and retained

Core Foundations – Event Processing ...



- EXEC CICS WRITE OPERATOR command Event enabled
 - CICS event processing is expanded to enable the filtering and capturing of EXEC CICS WRITE OPERATOR commands, encompass the majority of CICS messages, and include predefined information specified in the capture specification.

- Multiple Event Processing Adaptors
 - You can emit an event to several event consumers using the new event processing adapter sets.

Notes ...

CICS® event processing support is expanded to include a WRITE OPERATOR command capture point, a MESSAGE capture point for CICS messages, static data captured from the event binding, searching for system events using the CICS Explorer®, and the ability to emit an event using multiple EP adapters.

Using the EP Adapter Set editor, you can now specify multiple EP adapters and configure an EP adapter set. You can then choose to emit events either to an EP adapter or an EP adapter set in the event binding editor.

Core Foundations – Communications ...



- CICS-WebSphere MQ DPL Bridge
 - Supports a Channel/Container based interface
 - Flexible, not restricted to 32 KB
 - Transaction CKBC, defined in group DFHMQ
 - Place request WMQ message into DFHREQUEST container
 - Link with channel DFHMQBR_CHANNEL
 - Target can return a response in DFHRESPONSE container

Notes ...

The CKBC category 2 transaction code is used by the CICS-WebSphere MQ DPL bridge so data can now be passed as a container. Containers are not restricted to the maximum 32 KB size of a COMMAREA, so this enhancement gives users greater flexibility.

To use channels and containers, you must specify either the new CKBC transaction code, or your own transaction code modeled on CKBC, to run program DFHMQB3. This program passes and receives data by using the DFHMQBR_CHANNEL channel and the DFHREQUEST and DFHRESPONSE containers.

You can continue to use existing CICS-WebSphere MQ DPL bridge facilities without changing your programs or configuration. For example, to use COMMAREA, either allow the transaction code to default to CKBP, or specify CKBP (or a transaction code modeled on CKBP), to run program DFHMQB0 and pass and receive data by using the COMMAREA.

Core Foundations – Communications ...



- Full support of execution diagnostic facility (CEDF and CEDX) with IPIC connections
 - Function Shipping, DPL, Transaction Routing
- New sample programs for autoinstall of IPIC connection resources for easier configuration

- IPIC heartbeat messages to systems that can respond to them.
 - This ability to respond allows the integrity of the connection to be assessed and maintained by CICS regions through periods of inactivity.

- EXCI Batch programs can now call CICS regions in different XCFGROUPs dynamically
 - EXCI URM DFHXCURM can change the value of XCFGROUP to be used
 - Enables moving CICS regions to their own XCFGROUP without re-coding batch programs

Notes ...

Use of EDF over an IPIC connection is supported on Version 5 Release 1 or later regions. To debug a remote transaction, you can run EDF in the local region to step through a program that is executing remotely, by using transaction routing over IPIC. To use EDF over IPIC both the local and remote regions must be at CICS TS 5.1 or later. Work that was attached due to a function shipping or DPL request received over an IPIC connection can also be debugged using EDF. The region on which the function shipping or DPL request was received must be at CICS TS 5.1 or later.

Version 5 Release 1 provides new sample programs to demonstrate autoinstall of IPIC connections ("IPCONN") according to a template IPCONN. Two sample programs are supplied. The assembler module is called DFH\$ISAI and the COBOL module is called DFH0ISAI. The programs are part of the DFHISCIP CICS-supplied group. They show a technique of customizing autoinstall of an IPCONN such that the IPCONN name and APPLID are generated according to a template IPCONN which has been previously installed.

In CICS® TS 4.2 and earlier releases, you use the XCFGROUP parameter to set the name of the cross-system coupling facility (XCF) group to be joined by the client program. The EXCI module DFHXCURM is called on allocate_pipe requests and for responses that can be tried again. The DFHXCURM parameter URMICIS, contains the generic APPLID of the target CICS system as specified in the CICS_applid parameter of the Allocate_Pipe command, or on the APPLID parameter of the EXEC CICS LINK command. DFHXCURM can change the value of the CICS_applid parameter and can store information about the CICS regions which are not available. This information can be used on the next allocate_pipe request. The user can specify a global parameter XCFGROUP in the DFHXCOPT table, the EXCI equivalent of the SIT, to be used on all allocate_pipe requests. In CICS TS 5.1, a new parameter, URMXCFG is introduced to dynamically change the value of XCFGROUP parameter to be used on an allocate_pipe request.



- CICS TS V5.1 introduces a number of enhancements to make operations easier and more transparent
- For example ...
 - the default values for several CICS startup parameters are changed to adopt best practice
 - or are removed altogether where CICS is now able to automatically make adjustments at run time

Notes ...

Some CICS® configuration and default values are changed to provide best operational practices and to reduce the amount of manual configuration required by system programmers.

Core Foundations – System Parameter Simplification



- System Initialization Parameter Simplification
 - MAXOPENTCBS
 - Parameter obsolete
 - Set internally to a value of $((MXT * 2) + 32)$
 - MAXXPTCBS
 - Parameter obsolete
 - Set internally to a value of MXT
 - MAXJVMTCBS
 - Parameter obsolete, support for pooled JVMs has been removed
 - CEMT and EXEC CICS INQ/SET DISPATCHER
 - MAXOPENTCBS and MAXXPTCBS settings
 - Available on INQUIRE DISPATCHER only
 - SPI SET will return RESP(0) but do nothing

Notes ...

Before CICS TS for z/OS, Version 5.1, you used the MAXOPENTCBS and MAXXPTCBS system initialization parameters to set limits for the number of open TCBs in the CICS region. MAXOPENTCBS specified the maximum number of open TCBs in the pool of L8 and L9 mode TCBs, which are used for OPENAPI application programs and task-related user exits that are enabled with the OPENAPI option. MAXXPTCBS specified the maximum number of open TCBs in the pool of X8 and X9 mode TCBs, which are used for C and C++ programs compiled with the XPLINK option.

CICS now automatically sets and changes the limits for open TCBs in these TCB pools when you set or change the maximum number of tasks (MXT or MAXTASKS) specified for the CICS region. For the limit on the L8 and L9 mode open TCB pool, CICS uses the following formula: $(2 * \text{MXT Value}) + 32$ For the limit on the XP TCB pool, CICS uses a value equal to the MXT value for the CICS region.

Core foundations – System Parameter Simplification



- ICVTSD – Terminal Scan Delay
 - Default changed from 500ms to 0ms
- Priority Aging – PRTYAGE
 - Default changed from 32768ms to 1000ms
- AKPFREQ – Activity Keypoint Frequency
 - Minimum lowered from 200 to 50
- DSALIM
 - Default value unchanged at 5MB
- EDSALIM
 - Default value changed from 48MB to 800MB (megabytes)
- MEMLIMIT (specified in JCL)
 - Minimum required is now 6 GB

Notes ...

Before CICS TS for z/OS, Version 5.1, the default value for the ICVTSD system initialization parameter, which specifies the terminal scan delay time, was 500 milliseconds. In CICS TS for z/OS, Version 5.1, the default value is 0. The terminal scan delay facility was used in earlier releases to limit how quickly CICS dealt with some types of terminal output requests made by applications, in order to spread the overhead for dealing with the requests. Specifying a nonzero value was sometimes appropriate where the CICS system used non-SNA networks. However, with SNA and IPIC networks, setting ICVTSD to 0 is appropriate to provide a better response time and best virtual storage usage.

The default value of the priority aging factor, which is set by using the PRTYAGE system initialization parameter, is reduced from 32768 milliseconds (32.786 seconds) to 1000 milliseconds (1 second). Therefore, by default, the priority of long-running tasks that are on the ready queue will increase more rapidly.

The minimum value in the activity keypoint frequency range is reduced from 200 to 50. The activity keypoint frequency is set by using AKPFREQ system initialization parameter. The reduced minimum value means that completed log task records can be deleted more frequently, which reduces the DASD dataspace usage. Therefore, the primary system logstream remains at a reasonable size.

The EDSALIM system initialization parameter specifies the upper limit of the total amount of storage within which CICS can allocate the individual extended dynamic storage areas (EDSAs) that reside in 31-bit (above-the-line) storage. Before CICS TS for z/OS®, Version 5.1, the default value for this system initialization parameter was set at the minimum required to start a CICS region, which is 48 MB. The default value is now increased to 800 MB, which enables a CICS region started with the default value to process a reasonable workload. You can tune the EDSALIM value in a running CICS system.

Core Foundations – Simplification



- **STATINT – Statistics Collection Interval**
 - Default changed from 030000 to 010000 (hhmmss)

- **TCTUALOC – Terminal User Area Location**
 - TCT User Area Location
 - Default changed from TCTUALOC=BELOW to TCTUALOC=ANY

- **TRTRANSZ – Transaction Dump Trace Table Size**
 - Default increased from 16K to 1024K (1MB)
 - Trace table is in 64-bit storage
 - Giving much better chance of tracing the error before a dump

Notes ...

To improve the ability of customers to help themselves by more likely enabling them to be collecting valuable CICS system and resource data in a timely manner the default stats interval has been reduced to 1hr.

The TCTUALOC system initialization parameter specifies where terminal user areas (TCTUA) are to be stored. Before CICS TS for z/OS, Version 5.1, the default setting specified that terminal user areas were always stored in 24-bit (below-the-line) storage. The default setting is now ANY, which means that CICS uses 31-bit (above-the-line) storage to store terminal user areas whenever possible, and 24-bit (below-the-line) storage as an alternative.

Before CICS TS for z/OS, Version 5.1, the default value of the TRTRANSZ parameter was 16 KB. The default value is now increased to 1024 KB. This value provides a larger transaction dump trace table, which might contain more useful trace information. Check your current setting for the z/OS parameter MEMLIMIT, which limits the amount of 64-bit storage that the CICS address space can use. Your setting for TRTRANSZ must remain within MEMLIMIT, and you must also allow for other use of 64-bit storage in the CICS region.

Core Foundations – Installation and Startup ...



- Dynamically install the CICS TYPE 3 supervisor call (SVC) using new utility DFHCSVCU
 - No need to IPL z/OS therefore more flexible and faster to install CICS

- New regular status messages are issued during startup if VSAM RLS data sets require lost locks recovery processing

- Local and Global catalogs version verification is now performed during startup
 - Allows for better diagnostics if CICS brought up with an old dataset

Notes ...

A new utility, DFHCSVCU, is provided to dynamically install the CICS Type 3 supervisor call (SVC) without the requirement to re-IPL the z/OS system. This program simplifies the CICS installation process so that less time is required when you next upgrade your systems. Note: You can use the DFHCSVCU utility program only if you have the required authorization.

CICS® now provides regular status updates while lost locks recovery is taking place. A new message displays the number of data sets that have completed lost locks recovery, and the total number of data sets that require lost locks recovery. These regular updates ensure that users are aware of the progress that is being made during the time of the recovery. The lost locks condition is created when a coupling facility lock structure fails and cannot be rebuilt by VSAM. The lost locks condition can occur only for data sets opened in RLS mode.

The Global Catalog (GCD) must be initialized using the latest version of the recovery manager utility program, DFHRMUTL, for successful initialization. If you use a previous version, initialization fails and message DFHRM0100 is issued that explains the reason for the failure, and advises the use of the latest version of DFHRMUTL for successful initialization. The Local Catalog (LCD) must be initialized with the latest version of DFHCCUTL, or message DFHCC0107 is issued, explaining why initialization has failed.

Core Foundations – Application Enablement ...



- PUT CONTAINER command has new APPEND option
 - Enables containers to “grow” without having to delete/recreate

- GET CONTAINER command has new BYTEOFFSET option
 - Retrieve a section of container data beginning at offset

- Enhancements to XML data mappings
 - CICS XML and web services assistants now support mapping overrides to improve the readability of generated COBOL language structures.
 - New option to specify that any underscore in the XML is converted to a hyphen in the generated COBOL language structures.

Notes ...

The APPEND option on PUT CONTAINER specifies that the data passed to the container is appended to the existing data in the container. If this option is not stated, the existing data in the container is overwritten by the data passed to the container.

The BYTEOFFSET option on GET CONTAINER specifies the offset in bytes where the data returned starts. For CHAR containers, the BYTEOFFSET value is used as an offset into the data in the requested codepage. If you use a codepage with multibyte characters, depending on the BYTEOFFSET value you specify, the data returned might have partial characters at the beginning, end, or both. In this situation, your application program must be able to handle and interpret the data returned. If the value specified is less than zero, zero is assumed.

The CICS XML and web services assistants now support mapping overrides to improve the readability of generated COBOL language structures.

The assistant batch jobs DFHWS2LS and DFHSC2LS now support a new option on the MAPPING-OVERRIDES parameter. The new option, UNDERSCORES-AS-HYPHENS, specifies that any underscore in the XML is converted to a hyphen in the generated COBOL language structures. The default behavior is to use an X character. Using this override can improve the readability of the output language structures. This parameter applies only to the COBOL language.

Scalability – Instrumentation



- CICS statistics and monitoring provide vital information about the health of the system and the workloads.
- CICS TS V5.1 statistics now include more data about the load, capacity, and performance of the system.
- The data provided by monitoring can help you to assess performance more accurately, including potential bottlenecks.
- Together these enhancements enable you to make more informed decisions about hardware and software upgrades, and application deployments.

Notes ...

CICS statistics are enhanced to provide more information that relates to the load, capacity, and performance of the system. This information can aid decisions about vertical and horizontal scalability.

CICS monitoring provides additional performance data and system information to help you to assess the performance of your CICS regions accurately, identify potential bottlenecks, and make informed decisions about hardware and software upgrades and application deployment.

Instrumentation Enhancements – Monitoring



- Physical hardware environment
 - CEC Machine Type and Model ID
 - e.g. 2097-740
- Transaction performance related to CICS region load
 - Current active task count and maxtask setting
- Improved transaction wait (suspend) analysis
 - MRO/ISC Allocate Waits
 - IPIC Allocate Waits
 - RO TCB and SO TCB Mode Delays
 - Intrapartition and Extrapartition TD Lock Waits
 - File Control Exclusive Control Waits
 - VSAM File String Waits

Notes ...

The new CECMCHTP and CECMDLID fields in the DFHTASK performance class group for a transaction show the CEC machine type and CEC model number for the physical hardware environment where the CICS region is running. CEC (central electronics complex) is a commonly used synonym for CPC (central processing complex), which refers to a collection of physical hardware including main storage, one or more central processors, timers, and channels.

You can use this information with the IBM® Large Systems Performance Reference (LSPR) ratios to make an accurate assessment of CICS performance and relative processor capacity, particularly when considering upgrades to your z/OS® hardware.

The new MAXTASKS field in the DFHTASK performance class group for a transaction records the current setting for the maximum number of tasks for the CICS region. The CURTASKS field records the current number of active user transactions in the system at the time the user task was attached. This data helps with assessing the relationship between the task load during the life of a transaction, and the performance of the transaction.

Instrumentation Enhancements – Monitoring



- zAAP/zIIP Specialty Processor Transaction CPU time
 - Existing CMF Performance Class Field ...
 - a) “USRCPUT” → Total CPU time used on a standard CP, System z Application Assist Processor (zAAP), or System z Integrated Information Processor (zIIP) Total CPU time including zAAP/zIIP
 - New CMF Performance Class Fields ...
 - b) “CPUTONCP” → Total CPU time on standard CP
 - c) “OFFLCPUT” → Total Offload CPU time on standard CP (Offload eligible but ran on standard CP)
 - From the new metrics the following can also be derived ...
 - d) Total CPU time on zAAP/zIIP = (USRCPUT – CPUTONCP)
 - e) Total CPU time on CP that was not offload = (CPUTONCP – OFFLCPUT)
 - f) Total CPU time offload eligible = (OFFLCPUT + d)
 - Requires ...
 - z/OS R13 APAR OA38409 and IBM System z9 or later

Notes ...

The new CPUTONCP and OFFLCPUT fields in the DFHTASK performance class group for a transaction can be used to calculate the processor time that a task spends on a zIIP or zAAP specialty processor, and also show you the processor time that the task could have spent on a specialty processor.

- Field 436, CPUTONCP, shows the total task processor time spent on a standard processor. To calculate the task processor time spent on a specialty processor, subtract the time recorded in this field from the time recorded in field 008, USRCPUT.
- Field 437, OFFLCPUT, shows the total task processor time that was eligible for offload to a specialty processor, but actually ran on a standard processor. To calculate the total task processor time that was not eligible for offload, subtract the time recorded in this field from the time recorded in field 436, CPUTONCP.
- To calculate the total task processor time that was either actually spent on a specialty processor, or eligible to be spent on a specialty processor, use the following equation: $(OFFLCPUT + (USRCPUT - CPUTONCP))$

Note: The times shown in the CPUTONCP and OFFLCPUT fields are only available when running on a system that supports the Extract CPU Time instruction service that is available on IBM System z9® or later hardware. For z/OS, Version 1 Release 13, the PTF for APAR OA38409 must also be applied.

Instrumentation Enhancements – Monitoring ...



- **SSL CIPHER code**
 - SSL ciphers used are now recorded in SMF 110 CMF performance class records for better performance analysis
- **Application Context**
 - Application name
 - Platform name
 - Operation name
 - Major, Minor, and Micro version numbers
- **Policy**
 - Policy threshold exceeded count
- **Monitoring RMI Data Collection Option**
 - Additional performance metrics on CICS Resource Manager usage
 - Default changed from RMI=NO to RMI=YES

Notes ...

A single cipher is negotiated during an SSL handshake between a server and a client. That cipher is used for all subsequent traffic on the SSL connection. CICS now displays the code for the cipher suite in the performance data field SOCIPHER in the DFHSOCK group. You can use this information to identify any cipher suites that are offered by the CICS region but are not being selected for SSL connections. You can also identify any less efficient or less secure cipher suites that are being selected for SSL connections but that you would prefer to eliminate.

The default value for the MCT Resource Manager Interface (RMI) parameter has changed from RMI=NO to RMI=YES. With the new setting, additional monitoring performance data is collected by default for the resource managers used by your transactions.

Instrumentation Enhancements – Monitoring ...



- Resource Class data enhancements
 - File entry
 - File Exclusive control conflict wait time
 - VSAM string wait time

- Exception Class data enhancements
 - Storage Waits in GCDSA, GUDSA, and GSDSA

Notes ...

New monitoring fields in the DFHSTOR performance class group provide data on the use of 64-bit (above-the-bar) storage by user tasks, in the CICS GDSAs. The following information is provided:

- A GETMAIN request count and high water mark for user storage obtained by a user task in the GCDSA and in the GUDSA.
- A GETMAIN request count, amount of storage obtained, and amount of storage freed, for shared storage obtained by a user task in the GCDSA or GSDSA.

Resource identifiers for waits for storage in the GUDSA and GSDSA are also added to the exception class data.

Instrumentation Enhancements – Statistics ...



- Storage Manager Statistics
 - New GxDSAs for 64-bit storage
 - DSA statistics
 - Domain Subpool statistics
 - Task Subpool statistics
- Loader Global Statistics
 - New statistics on RO TCB program load requests and load time
- Dispatcher Global Statistics
 - TCB Pools and TCB Modes
 - JVM TCB Pool and J8/J9 TCB Modes Obsolete
- URIMAP Resource Statistics
 - Usage → JVMSERVER
- Statistics Data Interval Collection Option
 - Default changed from STATINT=030000 to 010000 (hhmmss)
 - Statistics Recording option STATRCD=NO|YES – default unchanged
 - More timely statistics data collection – peak hour analysis

Notes ...

CICS® statistics are enhanced to provide more information that relates to the load, capacity, and performance of the system. This information can aid decisions about vertical and horizontal scalability.

Driving operational efficiencies - Greater capacity



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Vertical Scaling

- Relieve region storage constraints
- Further virtual storage constraint relief
- Maximum task limit has been doubled
- Further threadsafe support to reduce TCB switching and increase workload capacity



Run more, more easily

Horizontal Scaling

- Instrumentation enhancements – understand how the platform is scaling
- Standardization and simplification

‘right-size’ and simplify CICS

topologies

HORIZONTAL SCALING



Notes ...

Greater capacity is delivered through significant vertical and horizontal scalability enhancements. Fewer regions can now run the same workload. They provide the opportunity for cost savings through consolidation. Reducing the number of regions can deliver savings in both CPU consumption and administration overheads.

Open Transaction Environment – Threadsafe



- Threadsafe Transient Data Commands
 - Commands that access Transient Data (TD) are now threadsafe
 - EXEC CICS READQ TD, WRITEQ TD, and DELETEQ TD
- TD Global User Exits must be threadsafe
 - XTDEREQ, XTDEREQC
 - XTDIN, XTDOUT, and XTDREQ
- TD function Shipping over IPIC will use an Open TCB
 - Also drive mirror on open TCB
- System initialization parameter TDSUBTASK obsolete
 - If on QR TCB TD will switch to FO TCB, If on an open TCB it uses the open TCB
- Existing SPI commands commonly used in some applications now threadsafe
 - EXEC CICS SET TASK
 - INQUIRE and SET TRACEDEST / TRACEFLAG / TRACETYPE

Notes ...

The CICS® transient data facility and more API and SPI commands have been made threadsafe, to increase throughput and reduce CPU usage for threadsafe applications that make use of them.

The CICS transient data facility, comprising the WRITEQ TD, READQ TD and DELETEDQ TD commands, is now threadsafe, so CICS can process these transient data requests on an open TCB. Transient data requests are also threadsafe when you function ship them to a remote region over an IPIC connection.

To optimize TCB switching and gain the performance benefits of the open transaction environment, global user exit programs that run at the transient data exits XTDEREQ, XTDEREQC, XTREQ, XTDIN, and XTDOOUT must be coded to threadsafe standards and defined to CICS as threadsafe.

Because the CICS transient data facility is now threadsafe, the TDSUBTASK system initialization parameter is no longer required. This system initialization parameter specified whether CICS used the FO TCB to write to a particular type of extrapartition transient data queue.

Existing SPI commands made threadsafe in this release

- INQUIRE TRACEDEST
- INQUIRE TRACEFLAG
- INQUIRE TRACETYPE
- SET TASK
- SET TRACEDEST
- SET TRACEFLAG
- SET TRACETYPE

Open Transaction Environment – Threadsafe



- CICS program LOADs when running on an Open TCB
 - When running on an open TCB and a CICS program load is requested there is no longer a TCB switch to the RO TCB
 - EXEC CICS LINK, LOAD, XCTL, ...
 - Updated Loader global statistics
 - New statistics on RO TCB program load requests and load time
 - Global User Exits must be threadsafe
 - XLDLOAD, XLDELETE, and XRSINDI
 - CICS RO TCB will still be used for ...
 - CICS program LOADs when NOT running on an Open TCB
 - DFHRPL and LIBRARY Dataset Management
 - Benefits ...
 - Reduced contention for the single CICS RO TCB
 - Reduced pathlength – RO TCB switch eliminated
 - Significantly increased potential CICS program LOAD capacity

Notes ...

When an application that is currently running on an open TCB issues a command that loads a program, CICS® no longer switches to the RO (resource-owning) TCB to load the program. Instead, CICS carries out the program load on the open TCB.

If an application that is not running on an open TCB loads a program, the RO TCB is still used. The RO TCB is also used if a data set containing programs needs to be opened or closed.

The new process has several benefits that might produce improvements in performance and throughput for applications in your CICS system:

- Reduction in TCB switching
- Increased concurrency for program loading operations
- Increased availability of the RO TCB

Open Transaction Environment – Threadsafe



- Removed TCB switch for Java applications accessing DB2
 - Java applications that use JDBC or SQLJ will not require a TCB switch to L8
 - Java programs will perform better due to reduced TCB switching

- Reduction in TCB switching requirements
 - The problem – T8/X8 applications switch TCBs to access DB2
 - T8 – Java applications in a JVM Server using JDBC or SQLJ
 - X8 – CICS-key XPLink programs (C/C++)
 - TCB switch to L8 no longer needed to access DB2
 - Supports inter-language program LINKs
 - End of task syncpoint will still use an L8
 - Required PTFs for DB2 V9 (UK78500) and V10 (UK78499)

Notes ...

Applications can now access JDBC and SQLJ from the T8 TCB instead of forcing a move to L8 TCB.

The CICS-DB2 task-related user exit has been changed to take advantage of an enhancement to the RMI that allows TRUEs to run on any key 8 TCB, not just L8 and to be able to move its thread from one TCB to another. With this enhancement, the same thread can be used by Java and non Java application programs in the same transaction.

A new option `REQUIRED` on the `ENABLE PROGRAM` command is used to specify that a task-related user exit must run on an open TCB. If `OPENAPI` is specified with `REQUIRED`, then an L8 TCB is used. If `OPENAPI` is not specified, then any key 8 open TCB is used.

The change in TCB switch behavior affects the results you see in CICS monitoring and statistics. TCB usage for Java DB2 applications is changed in that DB2 CPU time is now accumulated against a T8 TCB. End of task syncpoint processing will still be accumulated on an L8 TCB.

Virtual Storage Constraint Relief (VSCR)



- 24-bit Virtual Storage Constraint Relief
 - Reduce pressure on below the line storage
 - Reduce below the line Short-on-storage conditions
 - Provide for greater capacity for workload growth
- 24-bit Virtual Storage Constraint Relief ...
 - Control blocks, Modules, and stack storage moved above the line
 - Syncpoint, Transient Data, Journal Control, ...
 - Transient Data access method buffers – Extrapartition transient data
 - Moved from 24-bit to 31-bit
 - Reduce below-the-line storage used by CICS supplied transactions
 - Redefined with TASKDATALOC(ANY)
 - For example ...
 - CEMT, CEOT, CESN, CESF, CETR, CMSG, CRTE, ...
 - CWTO, CIEP, CSNC, and the Mirror transactions ...
 - CEDF and CECI processing

Notes ...

Several elements of the CICS® infrastructure now use 31-bit (above-the-line) storage in the CICS region, in place of 24-bit (below-the-line) storage. Lowering the demands on 24-bit storage helps avoid short-on-storage conditions and can reduce the need for additional CICS regions.

The CICS runtime environment is improved in the following ways:

- The need for additional CICS regions to resolve demands on 24-bit storage is reduced.
- Problems caused by short-on-storage conditions in 24-bit storage are avoided.
- CICS regions can carry out simultaneous processing of a greater number of tasks that use these CICS infrastructure items.

Virtual Storage Constraint Relief (VSCR)



- 24-bit Virtual Storage Constraint Relief ...
 - Mirror transactions ...
 - Supplied mirror transaction defined with TASKDATALOC(ANY)
 - Will use 31-bit task storage
 - AEZA or AZEC abend will occur if you DPL to an AMODE(24) program!
 - Define your own mirror transaction with TASKDATALOC(BELOW)
 - Change the application to be AMODE(31)
 - Change to the COMMAREA location on EXEC CICS XCTL PROGRAM()
 - Prior to CICS TS V5.1 ...
 - COMMAREA on XCTL always copied to 24-bit
 - CICS TS V5.1 ...
 - COMMAREA on XCTL remains in 31-bit
 - > Copied to 24-bit or 31-bit storage depending on target program
 - Same behaviour as EXEC CICS LINK PROGRAM()

Virtual Storage Constraint Relief (VSCR) – Notes

The CICS-supplied mirror transactions use 31-bit storage (above 16 MB but below 2 GB). If an EXEC CICS LINK command is issued over DPL for an AMODE(24) application, an AEZA or AEZC abend will occur. To avoid this situation, do one of the following:

1. Define your own mirror transaction that uses 24-bit storage. For example, you can copy a CICS-supplied mirror transaction, then specify the TASKDATALOC(BELOW) attribute.
2. Modify the application so that it is AMODE(31) and update the appropriate program definition.

Communication areas (COMMAREAs) used with an XCTL command, when the receiver is AMODE(31) will now reside in 31-bit storage not 24-bit storage.

Virtual Storage Constraint Relief (VSCR) ...



- 24-bit Virtual Storage Constraint Relief ...
 - User Exit Global Work Area
 - New GALLOCATION parameter on the ENABLE PROGRAM command
 - Specifies the location of the storage that CICS provides as a global work area for this exit program. You must also specify the GALENGTH option to create the global work area.
 - LOC24 → The global work area is in 24-bit storage.
 - > This is the default location.
 - LOC31 → The global work area is in 31-bit storage.

- IPCS VERBX DFHPD680 now runs RMODE(ANY)

Notes ...

When you enable a global user exit program or task-related user exit program, you can now select the location for the storage that CICS provides as a global work area for the exit. The global work area can be in 24-bit storage or in 31-bit storage.

Scalability – Greater Use of 64-bit Storage



- 31-bit Virtual Storage Constraint Relief ...
 - Reduce pressure on above the line storage
 - Reduce above the line Short-on-storage situations
 - Provide for greater capacity for workload growth

- Greater Use of 64-bit Storage ...
 - CICS Domain control blocks moved from 31-bit to 64-bit ...
 - Console Queue Domain – Selected storage subpools
 - Loader Domain – Selected storage subpools
 - Storage Manager Domain – Additional control blocks moved into 64-bit
 - New components exploiting 64-bit storage ...
 - e.g. Managed Platform, Application Context
 - 64-bit CICS Assembler Application Support
 - Non-Language Environment Assembler Only!

Notes ...

Several CICS® facilities now use 64-bit (above-the-bar) storage in the CICS region, in place of 31-bit (above-the-line) storage. These changes increase the virtual storage available for your existing and new applications to operate in 31-bit storage.

The CICS runtime environment is improved in the following ways:

- The need for additional CICS regions to resolve demands on 31-bit storage is reduced.
- Problems caused by short-on-storage conditions in 31-bit storage are avoided.
- CICS regions can carry out simultaneous processing of a greater number of tasks that use these CICS facilities.
- CICS trace**
 - CICS now uses 64-bit storage for the internal trace table, so some messages and trace points are changed.
 - The default size of the transaction dump trace table, set by using the TRTRANSZ system initialization parameter, is increased from 16 KB to 1024 KB.
- Console queue processing**
 - CICS now uses 64-bit storage for the console queue processing trace table and the console queue transaction entry table. These tables were previously in 31-bit storage taken from the ECDSA.
- Storage allocation control blocks**
 - CICS now uses 64-bit storage for the storage element descriptor (SCE) and free storage descriptor (SCF) control blocks, which control storage allocation. Use of 24-bit and 31-bit storage is reduced, especially in systems with a lot of storage allocation activity, for example, systems with subpools that keep an element chain and that have many small records.
- Loader control blocks**
 - CICS now uses 64-bit storage for the Active Program Element (APE), Current Program Element (CPE), and CSECT descriptor control blocks in the loader domain. These control blocks were previously in 31-bit storage, and could occupy a significant amount of storage.
 - To provide access to the 64-bit storage, the size of the tokens used on the PROGRAM_TOKEN and NEW_PROGRAM_TOKEN options on the XPI calls ACQUIRE_PROGRAM, DEFINE_PROGRAM, and RELEASE_PROGRAM has increased from 4 bytes to 8 bytes. You must change and recompile global user exit programs that use these options. Exit programs that do not use the PROGRAM_TOKEN or NEW_PROGRAM_TOKEN option are not affected.

Greater capacity - 64-bit CICS Application Support for big data



- 64-bit CICS Assembler Application Support – AMODE(64)
 - AMODE(64) Non-Language Environment Assembler Only!
 - Provides application support to access large data objects
 - Application can cache large amounts of data above the bar
 - Application must copy data into 31 bit storage if used on CICS api
 - For example as FROM data when writing to a file
 - Application can use containers to pass data
 - CICS keeps the container data in 64 bit storage
 - CICS passes the data to applications in 31 bit/64 bit storage as appropriate

Notes ...

The use case for amode 64 assembler applications is to allow caching of user data in 64 bit storage.

Data can be passed to other amode 64 assembler applications via containers, or to amode 31 applications via containers.

For CICS API requests, the FROM data must be 31bit storage, for example if the data was to be written to a vsam file

64-bit CICS Application Support ...



- 64-bit CICS Assembler Application Support – AMODE(64)
 - Only the [CICS Command Level Programming Interface](#) is supported!
 - No support for CICS Resource Manager APIs ...
 - e.g. DB2, WebSphere MQ, IMS DBCTL, etc, ...
 - 64 bit CICS api
 - CICS Managed 64-bit Storage – CICS, USER, SHARED ...
 - EXEC CICS GETMAIN64 and FREEMAIN64 for 64-bit storage
 - Task and Shared Storage
 - Channels and Containers ...
 - EXEC CICS GET64 CONTAINER
 - retrieves data from a named container into 64-bit storage
 - EXEC CICS PUT64 CONTAINER
 - places data from 64-bit storage in a named container
 - 31 bit CICS API and SPI
 - CICS switches to amode(31) for existing CICS API & SPI

Notes ...

CICS TS supports non-Language Environment (LE) assembler language programs that run in 64-bit addressing mode (AMODE(64)), thus providing 64-bit application support to access large data objects.

New API commands, a new CICS-supplied procedure and new CICS executable modules are supplied to provide 64-bit application support. CICS storage manager, program manager, loader domain, CICS-supplied macros, CECI, and CEDF are changed to provide 64-bit application support. New dynamic storage areas (DSAs) are available in 64-bit storage.

The following commands can be issued in amode(64) and provide the ability to cache data in 64 bit storage:

```
EXEC CICS GETMAIN64
```

```
EXEC CICS FREEMAIN64
```

```
EXEC CICS GET64 CONTAINER
```

```
EXEC CICS PUT64 CONTAINER
```

Requests to resource managers are not supported in amode(64) assembler programs.

64-bit CICS Application Support ...



- AMODE(64) CICS Application Program Support
 - Use of existing CICS API switches to amode(31)
 - EXEC CICS LINK, LOAD, XCTL, RETURN to/from any AMODE
 - Changes to existing EXEC CICS API commands ...
 - EXEC CICS LOAD PROGRAM() ENTRYPOINT()
 - EXEC CICS ASSIGN ASRAREGS64() and ASRAPSW16()
 - EXEC CICS INQUIRE PROGRAM() ENTRYPOINT()
- *“There is no performance advantage to be gained with AMODE(64) unless you are going to update the application to exploit 64-bit virtual storage”*

Notes ...

All CICS API commands other than GETMAIN64, FREEMAIN64, GET64 CONTAINER and PUT64 CONTAINER will switch to amode(31) to process the request.

Amode(64) applications can interact with other amode CICS applications using CICS program control commands

64-bit CICS Application Support ...



- AMODE(64) CICS Application Program Support
 - Recommend using Relative Addressing – default for AMODE(64)
 - But this is not mandatory
 - EXEC CICS API Commands that are Not Supported ...
 - EXEC CICS HANDLE/IGNORE CONDITION
 - > Use RESP/RESP2
 - EXEC CICS HANDLE ABEND LABEL
 - > EXEC CICS HANDLE ABEND PROGRAM() is supported
 - AMODE(64) Assembler Programs are NOT supported as ...
 - Global or Task User Exit Programs (GLUEs and TRUEs)
 - User Replaceable Programs (URMs)
 - Make sure you use the correct EXEC API Stub – DFHEAG

Notes ...

We recommend amode(64) applications use relative addressing.

Handle and ignore condition commands are not supported, so use RESP and RESP2 on the commands instead. Likewise HANDLE ABEND LABEL is not supported, but HANDLE CONDITION PROGRAM is supported.

Support for non-LE assembler programs running amode(64) is provided for application programs only. No support is provided for Global or task related user exits or user replaceable modules.

CICS provides a new stun DFHEAG which must be linkedited with amode(64) applications.

Scalability – System Parameter Simplification



■ MAXTASK

- Maximum tasks limit increased from 999 to 2000
- Default value changed from 5 to 500
- Minimum increased from 1 to 10
- Single region capacity being constrained by CICS maxtask limit
- Primarily for Terminal and File Owning Regions (TORs and FORs)
 - Single TOR routing to multiple Application Owning Regions (AORs)
 - Single FOR servicing multiple Application Owning Regions (AORs)
- Value now used to set some of the MAXxxxTCBS parameters
 - MAXOPENTCBS and MAXXPTCBS
 - MAXOPENTCBS – Now calculated as $(2 * \text{MXT Value}) + 32$
 - MAXXPTCBS – Now calculated as (MXT Value)
 - MAXOPENTCBS, MAXXPTCBS, MAXJVMTCBS ...
 - System Initialization Parameters are obsolete!

Notes ...

The maximum number of user tasks that can exist in a CICS® region at the same time is increased from 999 to 2000. The minimum value is increased from 1 to 10, and the default value is increased from 5 to 500. The changes mean that a CICS region operates more efficiently with the default setting and can process more workload, so the need to increase the number of CICS regions is reduced.

These changes apply to the MXT system initialization parameter, the MAXTASKS option of the SET SYSTEM and CEMT SET SYSTEM commands, and the MAXTASKS value in CICSplex® SM.

You must ensure that enough storage is available to support the maximum number of tasks value. When you increase the maximum number of tasks for a CICS region, measure performance to ensure that the response time and other time components (such as dispatch time and suspend time) for your transactions remain acceptable. In some systems, an increase in concurrent tasks might increase resource contention to a level that causes additional delays for transactions. In the performance class data for a transaction, the new MAXTASKS field records the current setting for the maximum number of tasks for the CICS region, and the CURTASKS field records the current number of active user transactions in the system at the time the user task was attached. This data helps you to assess the relationship between the task load during the life of a transaction, and the performance of the transaction.

Scalability – z/OS

- z/OS R13
 - Minimum z/OS release requirement
- SDUMP Performance
 - Provided in z/OS R12 & above
- z/OS JCL DD statement – SPIN parameter
 - SPIN= on DD card
 - Use the SPIN parameter to specify that the output for the SYSOUT data set is to be made available for processing
 - CICS 24x7 ...
 - Can be used to make the Transient Data Message logs available for processing without the need to shutdown and/or close/deallocate the transient data queue datasets
- Language Environment APAR PM57053
 - Reduces LE's use of 24 bit storage (SDSA)

Notes ...

z/OS 1.13 is the minimum level required to run CICS TS 5.1. CICS TS will not initialise on anything earlier.

CICS can benefit from enhancements to SDUMP performance made in z/OS 1.12

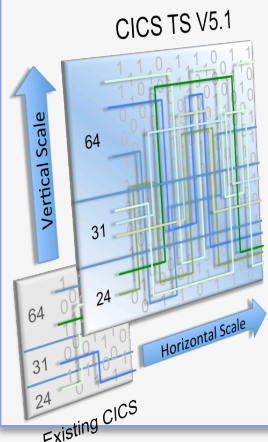
z/OS 1.13 provides enhanced support for use of SPIN on the DD card for spool datasets which allows capture for example of MSGUSR data and reuse without having to bring down CICS.

LE apar PM57053 reduces the amount of 24bit storage required by LE in a CICS environment.

Summary: CICS TS 5.1 - Driving Operational Efficiency



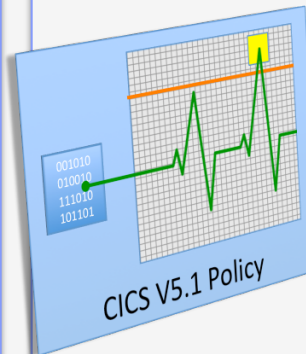
Greater Capacity



- Doubling the MAXTASK limit to 2,000
- Increased 64-bit and reduced 24-bit storage usage
- Greater parallelism from threadsafe API and SPI
- Greater system parallelism through optimized TCB usage
- Performance improvements from 64-bit Java 7
- Greater access to 64-bit storage from Assembler programs



Managed Operations



- Automated control over critical system resources
- Set data access thresholds on SQL or file access
- Set program loop thresholds on EXEC LINK
- Set storage request thresholds
- Set CPU time thresholds
- Policies can issue messages, abending tasks, or create events



Increased Availability



- Upgrade CICS versions and releases without requiring a z/OS restart
- Refresh Secure Sockets Layer (SSL) certificates
- Keep IPIC connections up and running
- Support more IBM GDPS/AA solutions
- Dynamically specify cross-system coupling facility groups
- Better reflect current best practices with updated and simplified defaults



Deeper Insight



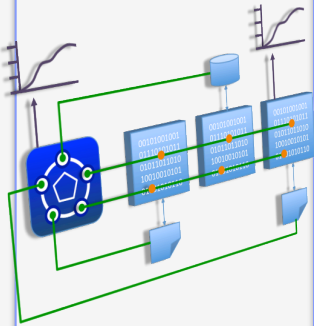
- Auditing of SPI commands that alter the system
- Improved auditing of user IDs that make requests over IP
- Extended identity propagation to include started tasks
- Cipher suites used for SSL connections to be stored in the performance records
- Calculate the actual and potential use of specialty processors
- Regular status updates provided while lost locks recovery is taking place

Summary : CICS TS 5.1 - Increasing Service Agility



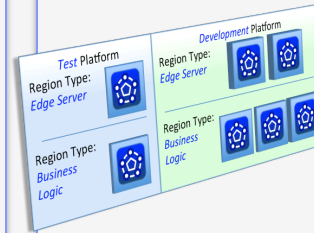
First-class Applications

- Manage disparate resources as a single entity
- Rapidly move through the application lifecycle
- Automate dependency management
- Ensure rigorous yet flexible provisioning
- Measure entire application resource usage
- Dynamically manage applications with policies



First-class Platforms

- Group new and existing regions as platforms
- Decoupling applications from the region topology.
- automatic resource deployment and validation
- De-provision resources when requested
- Deploy applications to regions within a platform
- Dynamically manage platforms with policies



Modern Interfaces

- A production-ready web container
- Deploy lightweight Java servlets and JSPs
- Local access to CICS applications and data
- Roll-out of interface updates through OSGi
- Integration with applications and platforms
- Built on WebSphere Application Server Liberty profile for compatibility



Foundational Enhancements

- CICS supports "one-to-many" event emission
- Greater-than-32KB across MQ (DPL) bridge
- Enhancements to IPIC add IMS support
- Reduced application storage needs with GET and PUT container
- Backup and restore entire CICSplex System Manager (CICSplex SM) systems
- Automatic adjustment of the CICS clock for daylight saving time changes





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