CICS Scalability

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Abstract

Increased operational efficiency is a fundamental component of CICS TS V5.1. Significant improvements to the horizontal and vertical scalability of CICS are delivered through a number of enhancements, ranging from improved support for OTE (threadsafe), greater use of 64-bit storage, optimized TCB usage, and changes to a region's MAXTASK - to name a few. This session will provide a summary of the improvements in CICS version 4, as well as a detailed look at the enhancements and benefits available in CICS TS V5.1.

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

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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

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

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

Core Foundations – Event Processing …

Application events now support EXEC CICS WRITE OPERATOR commands

System events support message capture point
encompass the majority of CICS messages

Events can 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.

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

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-

Core Foundations – Installation and Startup …

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

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*

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

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

Core Foundations – Installation and Startup …

DFHCSVCU utility updates or adds a single entry in the SVC table

> First issue SETPROG LPA,ADD,MODNAME=module,DSNAME=dataset

> 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

> DFHFC0557 APPLID CICS IS IN THE PROCESS OF RECOVERING DATA SETS THAT REQUIRE LOST LOCKS PROCESSING, nnnn OF nnnn COMPLETED

Local and Global catalogs version verification is now performed during startup

> Allows for better diagnostics if CICS brought up with an old dataset

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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.*

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.

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

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*

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

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

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

Driving operational efficiencies - Greater capacity

VERTICAL SCALING

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

Contract *Grow*

*Run more, **more easily***

Horizontal Scaling

Instrumentation enhancements – understand how the platform is scaling

Standardization and simplification

'right-size' and simplify CICS topologies

H O R I Z O N T A L   S C A L I N G

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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

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*

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)

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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*

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*

Virtual Storage Constraint Relief (VSCR) …

24-bit Virtual Storage Constraint Relief …

User Exit Global Work Area

- *New GALOCATION 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)

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!*

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*

64-bit CICS Application Support …

64-bit CICS Assembler Application Support – AMODE(64)

Only the <u>CICS Command Level Programming Interface</u> 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*

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*"

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 <u>Not Supported</u> …

  - *EXEC CICS HANDLE/IGNORE CONDITION*
    » *Use RESP/RESP2*
  - *EXEC CICS HANDLE ABEND LABEL*
    » *EXEC CICS HANDLE ABEND PROGRAM() <u>is</u> <u>supported</u>*

AMODE(64) Assembler Programs are <u>NOT</u> supported as …

- *Global or Task User Exit Programs (GLUEs and TRUEs)*
- *User Replaceable Programs (URMs)*

<u>Make sure you use the correct EXEC API Stub – DFHEAG</u>

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 * MXT Value) + 32*
  - *MAXXPTCBS – Now calculated as (MXT Value)*
- *MAXOPENTCBS, MAXXPTCBS, MAXJVMTCBS …*
  - *System Initialization Parameters are obsolete!*

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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)
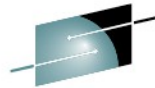
Summary: CICS TS 5.1 - Driving Operational Efficiency

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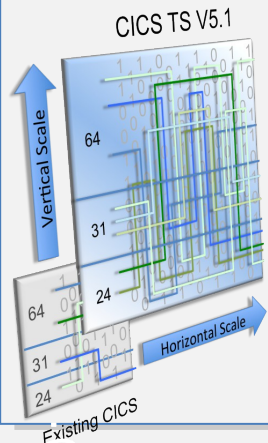
- Doubling the MAXTASK limit to 2,000
- Increased 64-bit and reduced 24-bit storage usage
- Greater parallelism from threadsafe API and SPI
- Greater system parallelism through optimized TCB usage
- Performance improvements from 64-bit Java 7
- Greater access to 64-bit storage from Assembler programs

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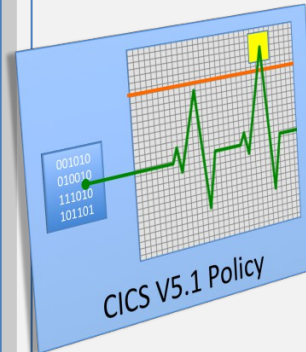
- Automated control over critical system resources
- Set data access thresholds on SQL or file access
- Set program loop thresholds on EXEC LINK
- Set storage request thresholds
- Set CPU time thresholds
- Policies can issue messages, abending tasks, or create events

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

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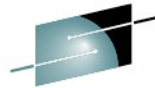
# Summary : CICS TS 5.1 - Increasing Service Agility

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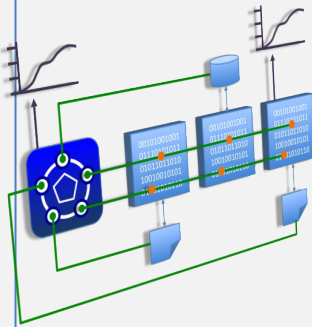
- Manage disparate resources as a single entity
- Rapidly move through the application lifecycle
- Automate dependency management
- Ensure rigorous yet flexible provisioning
- Measure entire application resource usage
- Dynamically manage applications with policies

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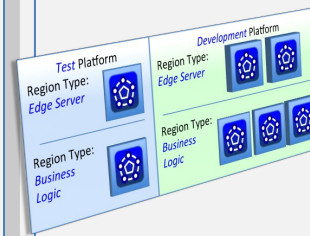
- Group new and existing regions as platforms
- Decoupling applications from the region topology.
- automatic resource deployment and validation
- De-provision resources when requested
- Deploy applications to regions within a platform
- Dynamically manage platforms with policies

Test Platform
Region Type: *Edge Server*
Region Type: *Business Logic*

Development Platform
Region Type: *Edge Server*
Region Type: *Business Logic*

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

CICS Transaction Server Core Capabilities

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