



Virtual CICS user group: Newsletter 65

Welcome to the Virtual CICS user group newsletter. The Virtual CICS user group at virtualcics.hostbridge.com is an independently-operated vendor-neutral site run by and for the CICS user community.

Virtual CICS user group presentation

The latest webinar from the Virtual CICS user group was entitled, "Debugging CICS Storage Violations using IPCS". It was presented by Ezriel Gross, Principal Solutions Advisor at Rocket Software.

Ezriel Gross is a Principal Solutions Advisor for Rocket Software specializing in IBM CICS Tools. He was formally the CEO of Circle software (acquired by Rocket Software in 2019), where he specialized in hands-on classes and consulting in CICS, DB2, and MQSeries. Ezriel was a Gold Consultant for many years and is currently an IBM Champion. His specialties include: Web Services, Web Support, Performance / Tuning, Internals, CICSplex SM,

Figure 1: CICS V5 address space

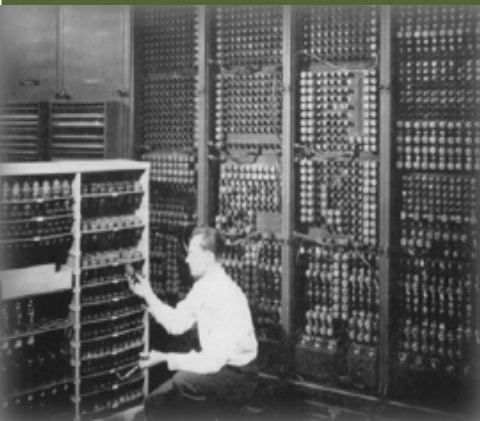
2 ⁶⁴	16 Exabytes	High User Region
2 ⁴⁹	512 Terabytes	Default Shared Memory Addressing
2 ⁴¹	2 Terabytes	Common Area
		Lower User Region
2 ³⁸	288 Gigabytes	Local System Area
2 ³⁵	32 Gigabytes	Reserved for Java
2 ³²		The Bar
2 ³¹	2 Gigabytes	Extended User Region
2 ²⁴		User Region

DevOps, and Liberty as they relate to CICS. He recently co-architected the C\PROF product, a tool that captures CICS trace without running in a CICS region.

Ezriel Gross started his presentation by looking at CICS storage management.

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Virtual CICS
USER GROUP

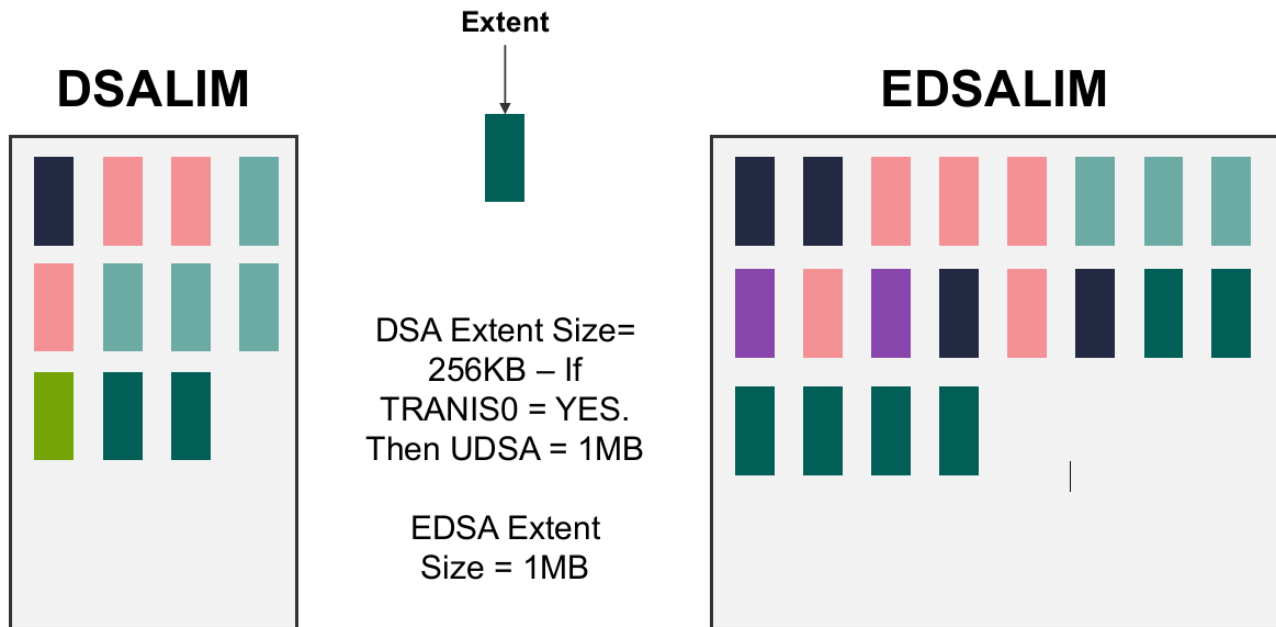


Figure 2: DSA Extents

Figure 1 shows an address space. Ezriel said that a 64-bit address space is 8 billion times the size of a 2-gigabyte address space. MEMLIMIT limits the amount of usable virtual storage available to an address space in the above the bar low and high user regions. REGION limits the amount of virtual storage available in the below the bar user region and extended user region.

CICS initialization sets GDSALIM to the MVS MEMLIMIT value. If MEMLIMIT is below 10GB, CICS will abend with DFHSM0602. CICS Initialization reserves 31-bit virtual storage based on EDSALIM. CICS Initialization reserves 24-bit virtual

storage based on DSALIM.

DSA Extents are illustrated in Figure 2. Ezriel then went on to describe the various DSA control blocks and their relationship with each other.

He then looked at domain subpools and task subpools, saying that domain subpools tend to get allocated early on in CICS initialization and remain allocated for the life of CICS. The domain subpool ids are not fixed and can change on any run of CICS. Ezriel then described the life of task storage, saying that task subpools are dynamically created and deleted for each task in the system as required. And the task subpool ids are fixed for any run of CICS.

CICS manages storage in DSAs above the bar, above the line, and below the line. Only the User and CICS DSAs can contain task lifetime storage with storage violation detection facilities.

CICS will allocate six task subpools for every task in the system. Each subpool is for either the User or CICS DSA in all locations. These subpools are exclusive to the task for transaction storage requests. The subpool names are eight characters long, a letter followed by the task number. The subpool name is reused for the Storage Check Zone (SCZ).

The letters used are: M for a CICS macro below the line; C for CICS above the line; B

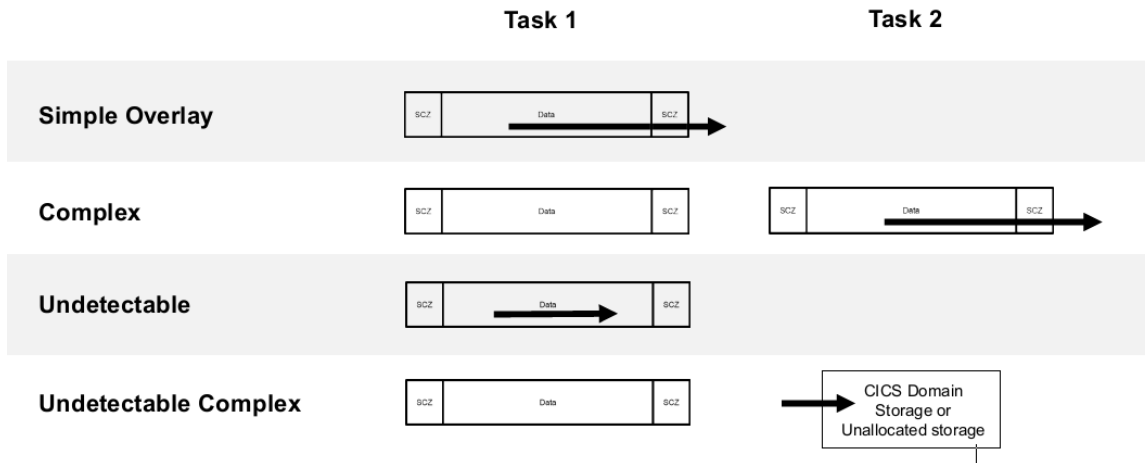


Figure 3: Types of storage violation

for a user below the line; U for a user above the line; G for CICS above the bar; and H for a user above the bar.

Allocated task storage will contain an extra eight bytes on the front and back end. These areas are known as Storage Check Zones or SCZs. They are used to assist with storage violation detection. CICS will only check for storage overlays when the areas are being freed. If the front and back SCZs do not match the SCA, then a storage violation is detected. An SVC dump may be produced, if set in the CICS dump tables. If the SIT parameter STGRVCY = YES is coded, CICS will fix the storage area. Otherwise, the storage and task are frozen for the life of that CICS run.

Figure 3 shows the different types of storage violation.

Possible causes of storage violations include: user programs with incorrect lengths; incorrect index / subscript value; accessing storage without proper addressability; and hand-posting ECBs for cancelled or terminated tasks.

CICS loads programs that are reentrant in the ERDSA or RDSA, based on the DATAllocation parameter in the program definition. Non-reentrant programs are loaded in either the ESDSA or the SDSA. CICS key programs are loaded in the ECDSA / CDSA when non-reentrant.

Subsystem storage protection separates user storage from CICS key storage. It works with the EXECKey= USER | CICS parameter on a program definition. It prevents a user program from overlaying CICS key storage.

CICS command protection is used to ensure that CICS is not given an invalid address in a command, which could overlay an area that did not belong to the user. CICS checks the first byte of an INTO area to make sure the user has access to it. CICS checks the address provided for SET commands as well. Ezriel reminded the user group that storage protection(s) will only help, they do not solve all violations.

Ezriel then went on to describe storage manager internals. His highlighted points were that the address in an SCE points to the SCZ matching the subpool name. The GETMAIN address points to the first byte of the user area (@SCZ + 8). Because an SCZ is appended on the front and back end of user storage, the size of the GETMAIN will be at least 16 bytes longer. GETMAINS are rounded on a 16-byte boundary, and the minimum GETMAIN is 32 bytes. There are no chain pointers in SCZs, so there is nothing to break like the old SAAs. CICS checks virtual storage on FREEMAIN or task end. If the front and backend SCZs do not match the SCA value, a storage violation is detected. A task may end normally or it may ABEND. If it ABENDs, look at the transaction dump.

Lastly, Ezriel Gross looked at storage violation dump analysis. His main points were:

- Storage violations are still the most common failure type for CICS.
- Use the storage protection features available in CICS to reduce the detectable and undetectable storage violations.
- When they occur, try to identify the entire violation

area to see whether the data is recognizable from an application perspective.

- Try to identify all programs that ran from the time of the GETMAIN until the violation, one of them must be the culprit.
- Use the storage violation trap, CSFE, sparingly to help identify the failure closer to when the overlay occurred.
- When all else fails, IBM is always ready to help!

A copy of Ezriel Gross' presentation is available for download from the Virtual CICS user group website at virtualcics.hostbridge.com/presentations/CICSDebugIPCSNov21.pdf.

You can see and hear the whole user group meeting at <https://youtu.be/DgQITLWvj6c>.

Meeting dates

The following meeting dates have been arranged for the Virtual CICS user group:

- On 11 January next year, we have Wendell Lovewell, Developer at MacKinney Systems, who will be discussing, "CICS application development, diagnosis, and tuning".

- The following meeting is on 18 March, when Joe Winchester, IBM Senior Technical Staff Member from Hursley, will be discussing "CICS and open source tooling, with a focus on Zowe".

We are using Zoom for the user group meetings.

CICS articles and blogs

CICS Security, TLS Develop a JMS application for CICS Liberty by Phil Wakelin on the tutorials section of the IBM Developer website (6 October 2021). You can find the article at: <https://developer.ibm.com/tutorials/develop-jms-applications-for-ibm-cics-liberty/>.

About the Virtual CICS user group

The Virtual CICS user group was established as a way website, at virtualcics.hostbridge.com, provides a central point for coordinating meetings, and provides articles, discussions, links, and other resources of interest to IBM CICS practitioners. Anyone with an interest in CICS is welcome to join the Virtual CICS user group and share in the knowledge exchange. For further information, contact trevor@itech-ed.com.