Virtual Storage – E46

CICS Transaction Server for VSE/ESA

IBM GLOBAL SERVICES

Session: E46
CICS TS Virtual Storage Management and Tuning

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CICS TS for VSE/ESA
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# Topics

- CICS TS Basic Structure
- CICS TS Storage Organization
- 31-bit Virtual Storage Exploitation
  - VSE components
  - CICS TS components
  - CICS applications
- Summary
CICS TS Basic Structure

- CICS Transaction Server for VSE/ESA 1.1
  - Restructured CICS product
    - New domain structure
  - Based on CICS for MVS/ESA 4.1 + function from CICS TS for OS/390
    - Code base ported from OS/390
    - Uses OS/390 “family” API
  - More 31-bit storage exploitation
  - More protection from storage overlay

CICS TS Basic Structure...

- Restructure of CICS into domains
  - More 31-bit exploitation
  - Standardized interfaces
  - Improved CICS code quality
  - Better serviceability and problem determination
  - Enhances CICS use of extended architecture
  - Object code only (OCO) modules
CICS TS Basic Structure…

- CICS TS Partition Storage Organization
  - Most of CICS nucleus above 16 MB line
  - All major CICS control blocks above 16 MB line
  - 8 Dynamic Storage Areas (DSA)
    - 4 DSAs above 16 MB line in extended (31-bit) DSA (EDSA)
    - 4 DSAs below 16 MB line in 24-bit DSA
CICS Storage Organization

- VSAM buffers & 31-bit control blocks
- CICS 31-bit storage
- CICS Non-nucleus modules and control blocks (2.3MB)
- CICS Extended DSA (EDSA)
  - (EUDSA, ERDSA, ESDSA, ECDSA)
  - available 31-bit GETVIS
- available 24-bit GETVIS
- ICCF and Interactive Partitions
- 24-bit VSAM control blocks, etc.
- CICS 24-bit storage
- CICS Non-nucleus modules and control blocks (.5MB)
- CICS DSA (DSA)
  - (UDSA, RDSA, SDSA, CDSA)
- CICS extended DSA (EDSA)
  - (EUDSA, ERDSA, ESDSA, ECDSA)

CICS Storage Organization...

- Dynamic Storage Areas
  - CDSA and ECDSA (CICS DSA)
    - CICS-key storage
    - Non-reentrant programs
    - Control blocks
    - Task-lifetime storage
      - TCA, EIB, EIS, etc.
  - USDA and EUDSA (User DSA)
    - User-key storage
    - Task-lifetime storage
      - TWA, working storage, etc.
CICS Storage Organization...

**Dynamic Storage Areas...**
- SDSA and ESDSA (Shared DSA)
  - User-key storage
  - Non-reentrant programs
  - EXEC CICS GETMAIN...SHARED storage
- RDSA and ERDSA (Read-only DSA)
  - Key-0 storage
  - All SVA-eligible programs not in SVA

**Dynamic Storage Areas...**
- Initial allocation from system initialization parameters (cold start)
  - EDSALIM, DSALIM
  - ECDASZE, ERDASZE, ESDASZE, EUDSASZE
  - CDSASZE, RDSASZE, SDSASZE, UDSASZE
- From local catalog on non-cold start, overridden by system initialization options
CICS Storage Organization...

- Dynamic Storage Areas...
  - SIT EDSALIM
    - Maximum size of CICS 31-bit DSAs
    - Define in 1M multiples
    - Minimum size 10MB, default 20MB
  - SIT DSALIM
    - Maximum size of CICS 24-bit DSAs
    - Define in 256K multiples
    - Minimum size 2MB, default 5MB

- Dynamic Storage Areas...
  - No SIT options, startup overrides only
    - ECDSASZE, ERDSASZE, ESDSASZE, EUDSASZE
    - Defines size of DSAs in 31-bit GETVIS
    - CDSASZE, RDSASZE, SDSASZE, UDSASZE
    - Defines size of DSAs in 24-bit GETVIS
    - Use default size 0
    - CICS acquires DSA storage dynamically
    - Additional increments defined as extents
  - DSAs managed using 4K page size
Storage Protection
- Protects CICS code and control blocks from accidental overwrite
  - CICS-Key = partition key
  - User-Key = key 9
- Initialization parameter STGPROT=YES|NO
  - CICS TS cannot run in F4 if STGPROT=YES due to key conflict
  - F4 default is CICS/VSE 2.3 coexistence partition

Storage Protection
- CICS key storage
  - CICS programs and control blocks
  - Execution (PSW) key = CICS key
- User key storage
  - User application programs and control blocks
  - Execution (PSW) key = User key
- User applications
  - Read/Write
- CICS
  - Read/Write
  - Execution (PSW) key = CICS key
CICS Storage Organization...

- **Storage Protection...**
  - Requires ESA/390 Subsystem Storage Protection facility
    - IBM Multiprise 2000 and 3000
    - IBM Parallel Enterprise Servers G3, G4, G5, G6
    - IBM 9672 Parallel Enterprise Server
    - Integrated Server 3006
    - P/390 systems
    - Some ES/9021, ES/9121, and ES/9221 models

- **Read-Only Protection**
  - Read-only access to SVA-eligible phases not in SVA
  - Initialization parameter
    - \texttt{RENTPGM=(PROTECT|NOPROTECT)}
    - \texttt{PROTECT} - RDSA and ERDSA key zero storage
    - \texttt{NOPROTECT} - RDSA and ERDSA CICS-key storage
  - Does not depend on Subsystem Storage Protection facility
31-Bit Exploitation
VSE Components

- VSE/VSAM support with CICS
  - Index and data buffers
    - Allocated in 31-bit partition GETVIS if available
  - Local Shared Resource (LSR) pool buffers
    - Index and data buffers are managed separately if defined with CICS TS CEDA DEFINE LSRPOOL
  - Non-Shared Resource (NSR) file buffers
    - FCT or RDO BUFNI and BUFND values
  - Increase buffers to reduce I/O

31-Bit Exploitation
VSE Components...

- VSE/VSAM support with CICS...
  - CICS system datasets
    - VSAM buffers allocated in 31-bit storage
    - CICS Catalog Datasets DFHGCD and DFHLCD
      - Specify buffering parameters on DLBL
    - CICS Restart Dataset DFHRSD
      - Specify buffering parameters on DLBL
    - CICS Temporary Storage and Transient Data files
      - SIT TS=(buffers, strings)
      - SIT TD=(buffers, strings)
31-Bit Exploitation
VSE Components...

- VSE/VSAM support with CICS...
  - DL/I database VSAM buffer usage
    - HIDAM KSDS, HDAM and HIDAM secondary index, HISAM KSDS, SHISAM KSDS (index buffers)
    - HISAM ESDS and SHISAM KSDS (data buffers)
    - Allocated in 24-bit partition GETVIS (default)
    - Change DLZACT to allocate buffers in 31-bit partition GETVIS
  - DLZACT TYPE=CONFIG HSMODE=ANY

31-Bit Exploitation
VSE Components...

- LE/VSE Options
  - Runtime options
    - ALL31(OFF), STACK(BELOW) for 24-bit applications
    - ALL31(ON), STACK(ANY) for full 31-bit support
      - Program must be linkedited AMODE(31)
      - Use CEEUOPT for programs that are AMODE(24)
  - Compile options
    - DATA(24) for working storage in 24-bit storage
    - DATA(31) for working storage in 31-bit storage
31-Bit Exploitation
VSE Components...

- Shared Virtual Area (SVA)
  - Most CICS TS modules and programs are RMODE(ANY)
  - SIT SVA option controls use of SVA for modules
    - SIT SVA=YES uses CICS TS modules in SVA
    - SIT SVA=NO loads CICS TS modules in read-only DSA
  - CICS program definition controls use of SVA
    - DEFINE PROGRAM... USESVACOPY(NO)

31-Bit Exploitation
CICS Components

- Most CICS control blocks allocated in 31-bit partition storage
  - Resource definitions and tables except JCT and sequential terminals in TCT
  - BMS mapsets
    - Linkedit BMS mapsets RMODE(ANY)
  - TCA, TWA, EIB, EIS
  - Transparent to application programs
31-Bit Exploitation
CICS Components…

- Dynamic backout buffers
  - Specify size in SIT DBUFSZ

- Trace tables
  - Allocated in 31-bit partition storage
  - CICS internal trace table
    - SIT TRTABSZ=16 (256 KB in VSE supplied SIT tables)
  - CICS transaction trace table
    - SIT TRTRANSZ=16 (512 KB in VSE supplied SIT tables)

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31-Bit Exploitation
CICS Components…

- CICS Data Tables
  - Data in memory for VSAM files
    - High performance file access for files with high READ and BROWSE activity
  - Allocated in 31-bit partition storage in CICS/VSE
  - Allocated in VSE Data Space in CICS TS
31-Bit Exploitation
CICS Components…

Data Table Support

<table>
<thead>
<tr>
<th>31-Bit Shared Area</th>
<th>24-Bit Shared Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Table</td>
<td>Application</td>
</tr>
<tr>
<td>Application</td>
<td>Data Table</td>
</tr>
<tr>
<td>FCT</td>
<td>FCT</td>
</tr>
<tr>
<td>CICS/VSE</td>
<td>CICS TS</td>
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<tr>
<td></td>
<td>Cross memory</td>
</tr>
<tr>
<td></td>
<td>services</td>
</tr>
<tr>
<td></td>
<td>Reads</td>
</tr>
</tbody>
</table>

31-Bit Exploitation
CICS Applications

- How to control 31-bit DSA usage
  - Transaction definition
  - Program definition
  - EXEC CICS GETMAIN requests
  - Program’s addressing mode (AMODE) and residency mode (RMODE)
  - SIT options
31-Bit Exploitation CICS Applications

- Controlling DSA usage with transaction definition parameters
  - Controls DSA used for task lifetime storage
    - TASKDATALOC(value)
      - BELOW  USDA or CDSA
      - ANY    EUDSA, ECDSA, USDA, or CDSA
        - Program must be linked AMODE(31)
    - TASKDATAKEY(value)
      - USER   USDA or EUDSA
      - CICS   CDSA or ECDSA
31-Bit Exploitation
CICS Applications…

- Controlling DSA usage with program definition parameters
  - Controls DSA used for EXEC commands with SET option
    - DATALLOCATION(value)
      - BELOW USDA or CDSA
      - ANY EUDSA, ECDSA USDA, or CDSA
        - Program must be linked AMODE(31)

- Controlling DSA usage with program definition parameters ...
  - Controls DSA used for loading non-reentrant programs
    - EXECKEY(value) and program linked RMODE(24)
      - USER SDSA (24-bit)
      - CICS CDSA (24-bit)
    - EXECKEY(value) and program linked RMODE(ANY)
      - USER ESDSA (31-bit)
      - CICS ECDSA (31-bit)
Controlling DSA usage with program definition parameters ...
- Controls DSA used for loading reentrant programs
  - Program linked RMODE(24) and SVA-eligible
    - RDSA (24-bit)
  - Program linked RMODE(ANY) and SVA-eligible
    - ERDSA (31-bit)

Controlling DSA usage by applications
- EXEC CICS GETMAIN options
  - Requested storage acquired in 24-bit DSA
    - LENGTH option
    - FLENGTH BELOW option
    - FLENGTH option in program linked AMODE(24)
  - Requested storage acquired in 31-bit DSA
    - FLENGTH option in program linked AMODE(31)
31-Bit Exploitation
CICS Applications…

- Controlling DSA usage by application request
  - EXEC CICS GETMAIN options
    - Override TASKDATAKEY
      - USERDATAKEY without SHARED option
        - UDSA (24-bit) or EUDSA (31-bit)
      - USERDATAKEY + SHARED option
        - SDSA (24-bit) or ESDSA (31-bit)
    - CICSDATAKEY
      - CDSA (24-bit) or ECDSA (31-bit)

- Controlling DSA usage with SIT options
  - TCT User Area (TCTUA)
    - SIT TCTUALOC=BETWEEN|ANY
      - BELOW  UDSA or CDSA
      - ANY    EUDSA, ECDSA, UDSA or CDSA
        - Programs referencing TCTUA must be AMODE(31)
    - SIT TCTUKEY=USER|CICS
      - USER   SDSA (24-bit) or ESDSA (31-bit)
      - CICS   CDSA (24-bit) or ECDSA (31-bit)
## 31-Bit Exploitation CICS Applications

<table>
<thead>
<tr>
<th>CICS 31-bit Extended DSA (EDSA)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task Storage</strong></td>
</tr>
<tr>
<td>TCA, TWA, EIB, etc.</td>
</tr>
<tr>
<td>(TASKDATALOC(ANY))</td>
</tr>
<tr>
<td><strong>Working Storage</strong></td>
</tr>
<tr>
<td>(DATA(31))</td>
</tr>
<tr>
<td>GETMAINed Storage</td>
</tr>
<tr>
<td>(AMODE(31))</td>
</tr>
<tr>
<td>EXEC CICS SET(address) storage</td>
</tr>
<tr>
<td>(DATALOCATION(ANY))</td>
</tr>
<tr>
<td><strong>COMMAREA</strong></td>
</tr>
<tr>
<td><strong>TCT User Area</strong></td>
</tr>
<tr>
<td>TCTUALOC(ANY)</td>
</tr>
<tr>
<td><strong>BMS mapset</strong></td>
</tr>
<tr>
<td>RMODE(ANY)</td>
</tr>
<tr>
<td><strong>Application program</strong></td>
</tr>
<tr>
<td>AMODE(31), RMODE(ANY)</td>
</tr>
</tbody>
</table>

| CICS 24-bit DSA (DSA) |

| CICS TS DFHSIP (4K) |

### CICS Transaction Server Partition – 31-bit application storage layout

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## Summary

- More VSCR in CICS TS
- Significant savings after migration without change
- More savings possible with changes
  - AMODE(31) and RMODE(ANY) for applications
  - Application GETMAIN requests
  - CICS TS transaction and program definition changes