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Z390 Portable Mainframe Assembler and Emulator Overview, VSAM, and CICS

February 25, 2008

Session 8194 4:30 Coronado E

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www.z390.org

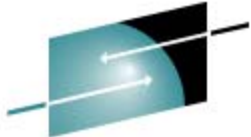
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Z390

ASM



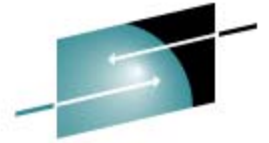
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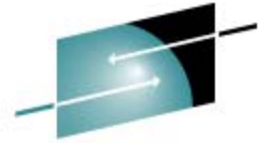




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Trademark Acknowledgements

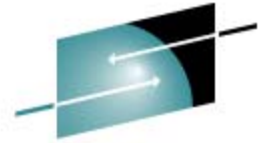
- **IBM Corporation – z/OS, HLASM, CICS, VSAM**
- **Microsoft – Windows Vista, XP, and 2000**
- **Sun Microsystems – J2SE, J2RE**



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z390 Presentation

- **Overview**
- **Macro Processor**
- **Assembler and Linker**
- **Emulator**
- **Hello World Demo**
- **What's new since August 2007 SHARE**
- **CICS Support V4 by Melvyn Maltz**
- **Questions and Answers**



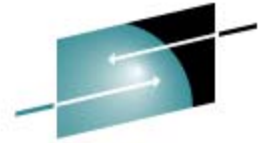
z390 Overview

- **z390 Open Source Java Project**
- **Execute HLASM compatible macro code**
- **Assemble HLASM compatible programs**
- **Link object code into z390 load modules**
- **Execute load modules on J2SE platforms:**
 - **Windows XP and Vista**
 - **Linux**

z390 Open Source Project



- **z390 project www.z390.org downloads**
- **InstallShield for Windows, file image for Linux**
- **Java source and z390.jar executable**
- **Documentation included and available online**
- **Demos and regression tests included**
- **Track problems and enhancements online**
- **Join z390 project and contest email groups**



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z390 Macro Processor

- **Expands macro code into BAL source code**
- **Extensions to AREAD and PUNCH for file I/O**
- **Library with MVS compatible common macros**
- **VSE and BS2000 common macro support**
- **Built in parser for EXEC CICS and EXEC SQL**
- **SOA client server application generator**
- **Macro processor and assembler parallel tasks**
- **Options for macro execution trace and statistics**

z390 Assembler and Linker



- **Assemble BAL source code to object code**
- **Support assembly of all POP opcodes**
- **Link multiple object files into load module**
- **Options for command input and auto-link**
- **Options to set AMODE and RMODE**
- **Options for listing, trace, and statistics**
- **Constantly working to improve HLASM compatibility – submit RPI's for bugs found**

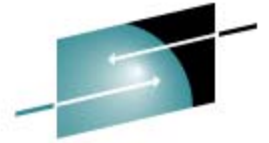
z390 Emulator (1 OF 2)

- **Execute z390 modules on any J2SE platform**
- **Execute all problem state instructions**
- **z390 macro generated SVC support includes:**
 - **GETMAIN, FREEMAIN, LINK, LOAD, DELETE**
 - **WTO, WTOR, TGET, TPUT, TIME, ESPIE,**
 - **QSAM/BSAM DCB OPEN, CLOSE, GET, PUT, READ, WRITE, CHECK**
 - **VSAM ACB RPL OPEN, CLOSE, GET, PUT, POINT, GENCB, MODCB, TESTCB**
- **Options for interactive TEST and TRACE**

z390 Emulator (2 of 2)

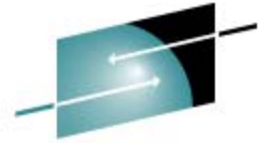


- **CMDPROC macro and svc for multi-tasking**
- **CTD and CFD macros to convert HFP, BFP, and DFP floating point to decimal scientific form**
- **TN3270 screen I/O using TGET, TPUT**
- **TCPIO macro and svc to support TCP/IP sockets**
- **SOA application generator with demo**
- **2 GHZ Intel dual processor executes 2.5+ MIPS**



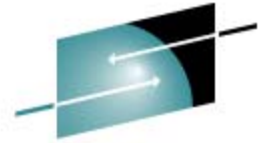
z390 Hello World Demo

- **To install and run z390 demo on Windows**
- **Download and install J2RE 6.0+**
- **Download and install z390 v1.4+**
- **Double click on z390 icon to start GUI**
- **Enter the command: ASMLG DEMO\DEMO**
- **Watch start, “Hello World”, and stop**
- **Enter: notepad demo\demo.log to view log**



Hello World Demo source file (MLC)

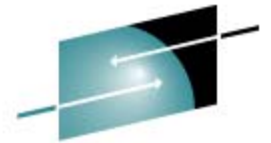
- **DEMO SUBENTRY**
- **WTO 'HELLO WORLD'**
- **SUBEXIT**
- **END**



Hello World Demo source BAL

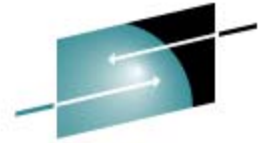
- **DEMO CSECT**
- **.....**
- **BRAS 1,*+(WTO#2_EOT-*+1)/2*2**
- **DC AL2(WTO#2_EOT-*,0),C'HELLO
WORLD'**
- **WTO#2_EOT EQU ***
- **SVC 35**
- **.....**
- **END**

Hello World Assembler Listing (PRN)



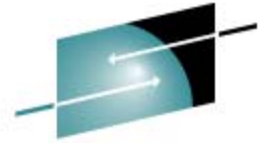
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-
• **00005A A715000A 27 BRAS**
• **00005E 000F0000C8C5D3D3 28 DC**
• **00006D 00006D 29 WTO#2_EOT**
EQU *
• **00006E 0A23 30 SVC 35**
•
• **END**



Hello World hex object file (OBJ)

- **.ESD ESD=0001 LOC=00000000 LEN=00000088
TYPE=CST NAME=DEMO**
- **....**
- **.TXT ESD=0001 LOC=00000050 LEN=10
50F0D00850D0F00418DFA715000A000F**
- **.TXT ESD=0001 LOC=00000060 LEN=0D
0000C8C5D3D3D640E6D6D9D3C4**
- **.TXT ESD=0001 LOC=0000006E LEN=10
0A2341F0000058D0D004980CD01458E0**
- **..... (Note this format requires option OBJHEX)**



Hello World Linker Listing (LST)

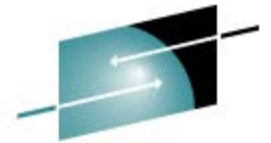
- **LZ390I V1.3.00a Current Date 01/16/07 Time 19:16:00**
- **LZ390I program = demo\demo.OBJ**
- **LZ390I options = bal objhex nolistcall**
- **LZ390I ESD=DEMO LOC=00000000
LEN=00000088**

Hello World Execution Log



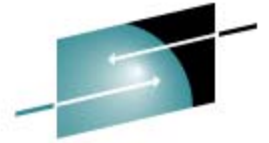
- **EZ390I V1.3.00a Current Date 01/16/07 Time 19:16:00**
- **EZ390I program = demo**
- **EZ390I options = bal objhex nolistcall**
- **HELLO WORLD**
- **EZ390I Stats total instructions = 13**
- **EZ390I Stats current date 01/16/07 time 19:16:00**

Hello World Execution Trace file (TRE)



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- ,,,,,,
- **800FFFD2 0 A715000A BRAS R1=00002300
S2(000FFFE6)=0A23 SVC**
- **800FFFE6 0 0A23 SVC I1=23 WTO
R1=ADDR(AL2(LEN),AL2(FLAGS),C'MSG')**
- **EZ390I HELLO WORLD**
- **800FFFE8 0 41F00000 LA RF=00000000
S2(00000000)**
- ,,,,,,



Hello World Interactive TEST log

- **test cmd: g svc**
- **test break on g svc**
- **800FFFE6 0 0A23 SVC I1=23 WTO
R1=ADDR(AL2(LEN),AL2(FLAGS),C'MSG')**
- **test enter command or h for help**
- **test cmd: g**
- **HELLO WORLD**

What is New since August 2007 – VSAM Catalog (1 of 6)



- **VSAM Catalog**
 - **Use DEFINE macro to define ESDS, RRDS, and KSDS files**
 - **Assemble and link DEFINE macros to create loadable catalog table.**
 - **OPEN ACB loads catalog defined via DDNAME.**
 - **VSAM file name is specified as suffix on DDNAME or ACB name is used.**

What is New since August 2007 - VSAM ESDS Data Files (2 of 6)



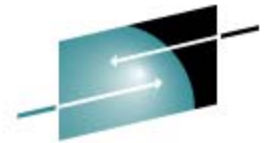
- **VES flat data record files used for entry sequenced, relative record, and keyed sequential files:**
 - **VSAM records up to 2 GB supported**
 - **Files up to $2^{63} - 1$ bytes supported**
 - **Variable length records have full word length stored before and after data for use in forward and backward access**
 - **32 bit RBA and 64 bit XRBA support for direct access to ESDS and KSDS records**

What is New since August 2007 - VSAM RRDS Files (3 of 6)

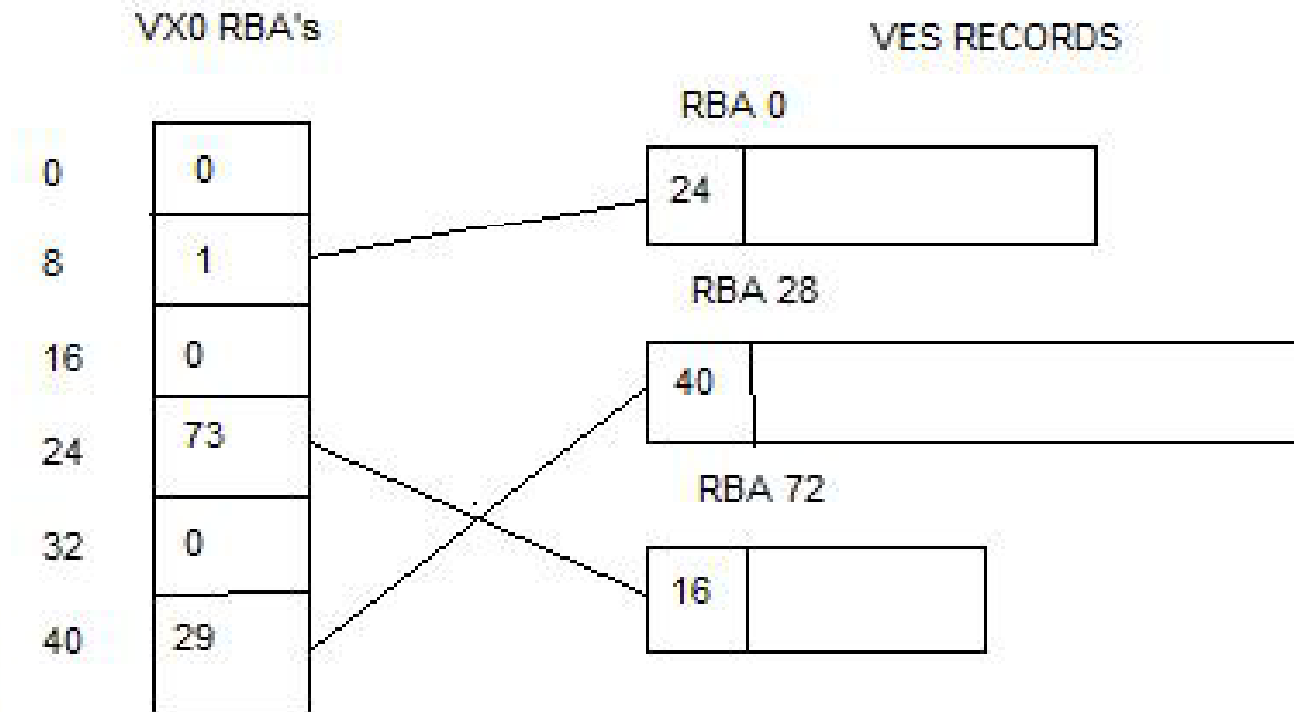


- **RRDS flat index files contain 8 byte XRBA fields**
 - RRDS index contains non zero XRBA pointer to each record in VES data file (1 is added to each XRBA for record)
 - RRDS index contains zero XRBA for each relative record entry not yet written (or deleted) up to last record entry written.
 - If XRBA greater than current index file length that also indicates no record yet

What is New since August 2007 - VSAM RRDS File Structure Diagram



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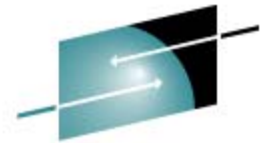


What is New since August 2007 - VSAM KSDS Files (4 of 6)

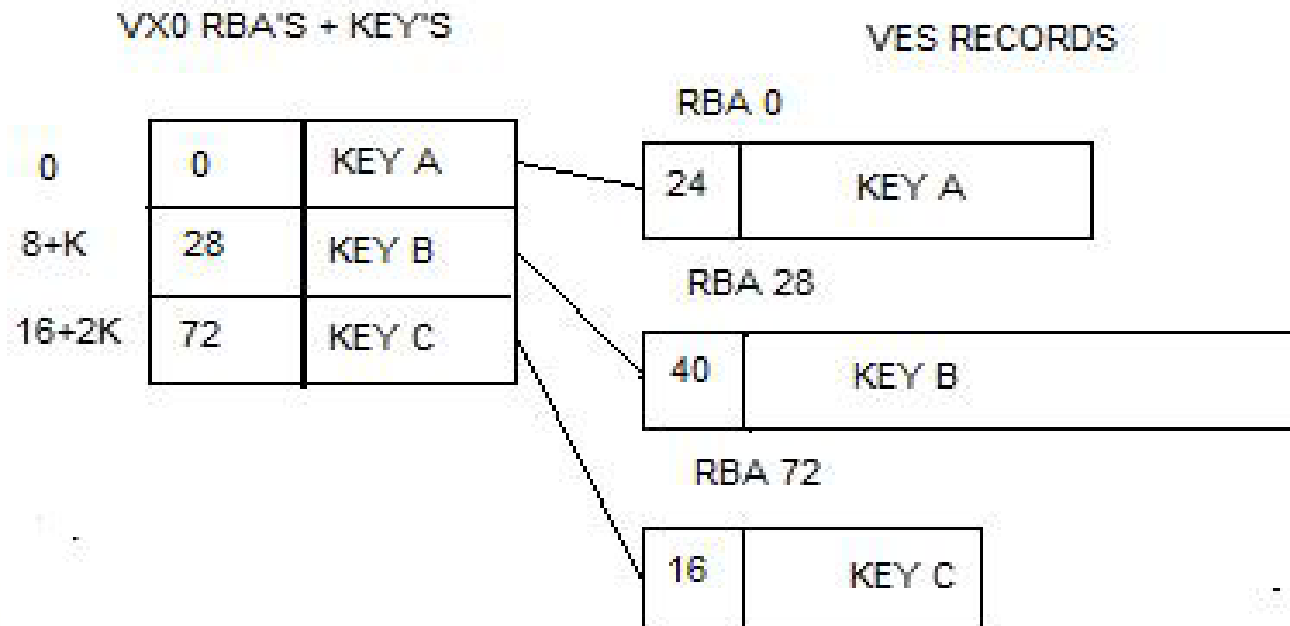


- **KSDS flat index files contains XRBA and key fields**
 - Each index entry contains XRBA pointer to record in VES data file or negative XRBA pointer to inserted KSIT record in VES data file.
 - KSIT contains XRBA pointers to inserted KSIR records added to end of VES data file including balanced binary tree pointers for random access plus forward and backward pointers for sequential access

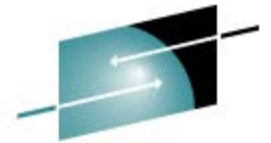
What is New since August 2007 - VSAM KSDS File Structure Diagram



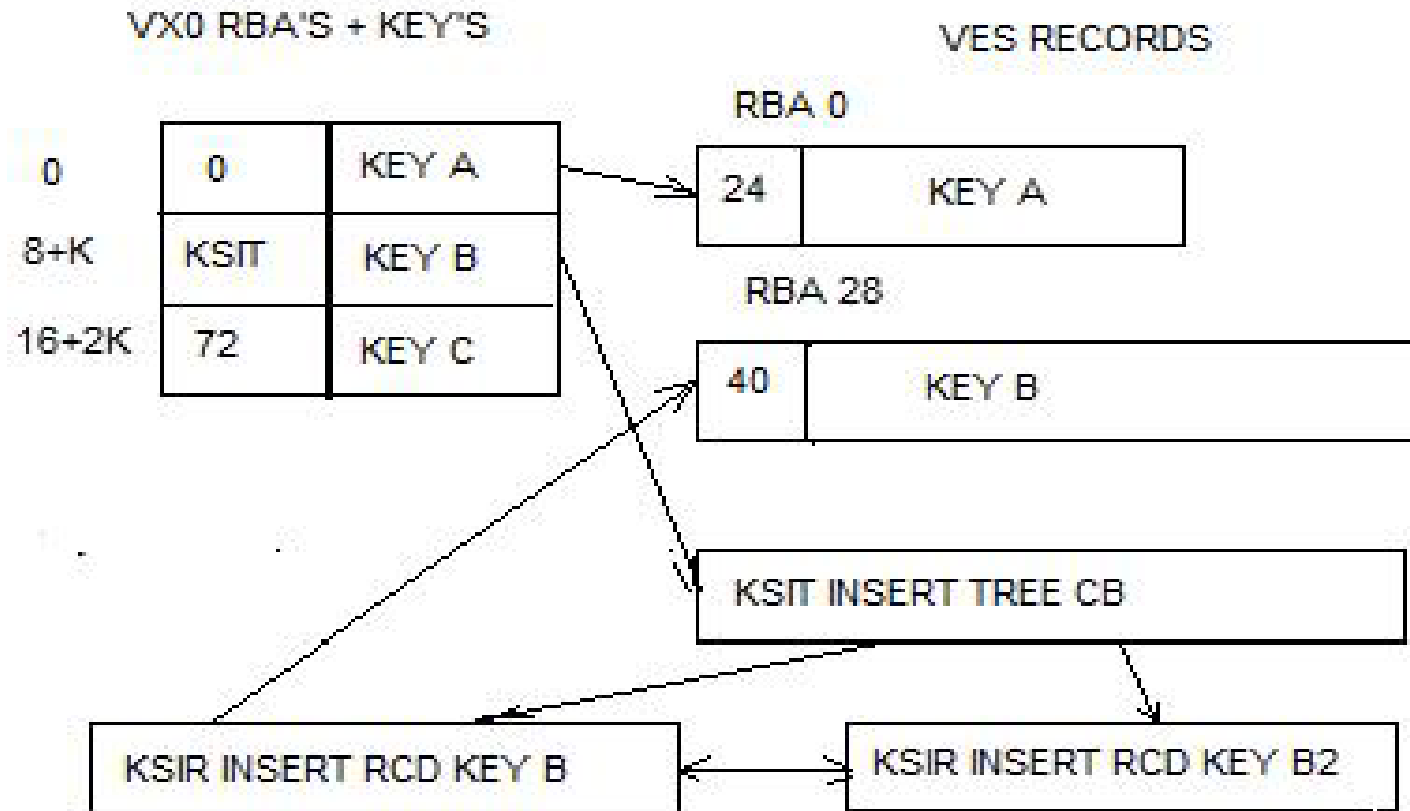
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What is New since August 2007 - VSAM KSDS Insert Diagram



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What is New since August 2007 - VSAM KSDS Access (5 of 6)



- **KSDS random and sequential POINT and GET**
 - Perform binary search on KSDS index
 - When KSIT pointer found instead of record pointer, search the KSIT binary tree
 - For sequential access find starting key and then step through index entries to get record or KSIT XRBA
 - If KSIT found, then get first or last KSIR entry and step through KSIR record pointers to retrieve inserted records

What is New since August 2007 - VSAM Utilities (6 of 6)



- **VSAM Utilities**
 - REPRO.MLC is a z390 structured assembler program which will load or unload any VSAM file to sequential QSAM or VSAM ESDS file. Reload eliminates KSIT insert records in KSDS files.
 - BLDINDEX.MLC is a z390 structured assembler program which loads alternate indexes from primary VES data file.
 - KSIT, KSIR, and BLDINDEX are still in development status as of 01/15/08.

CICS Support V4 by Melvyn Maltz



- Melvyn Maltz
 - Worked closely with IBM on CICS
 - Major z390 contributions:
 - Documentation
 - Testing and debugging
 - UNREF utility
 - CICS Support V4 with VSAM Browsing
- Please welcome Melvyn Maltz

Z390 Portable Mainframe Assembler and Emulator CICS Compatible Support

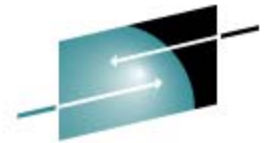


Melvyn Maltz
Automated Software Tools

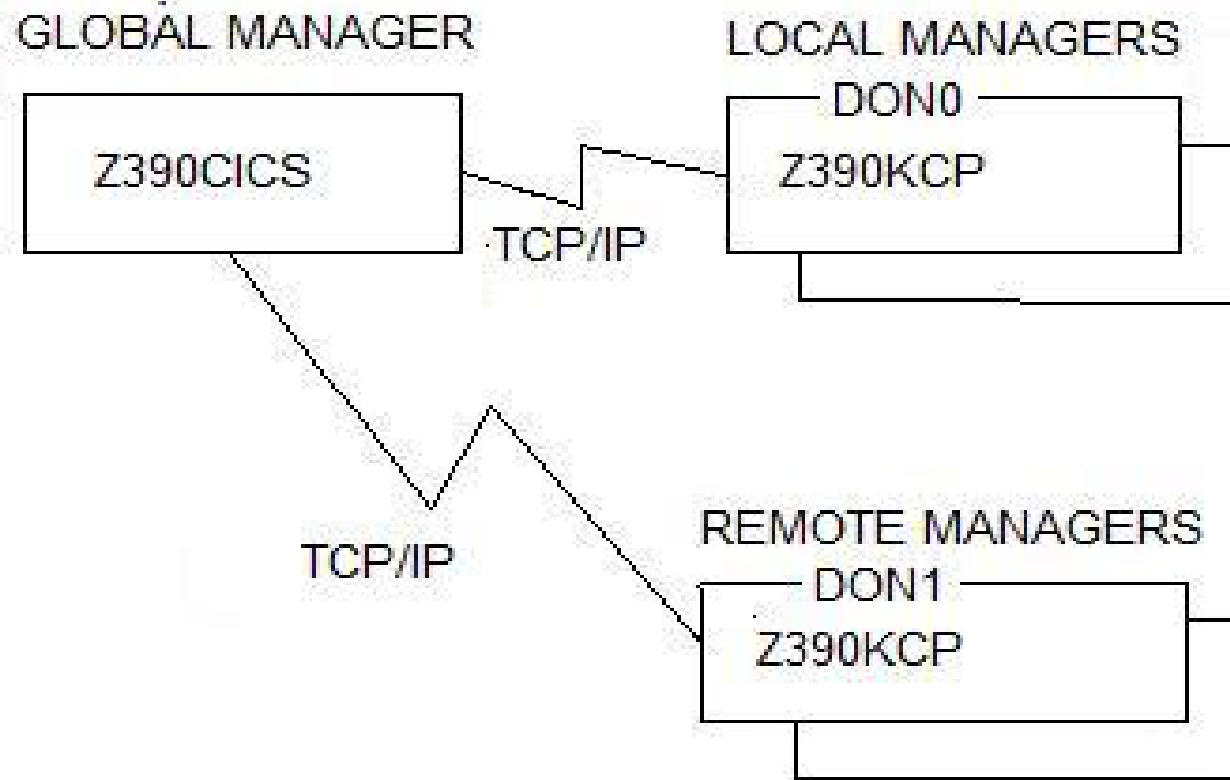
February 25, 2006
Session 8194



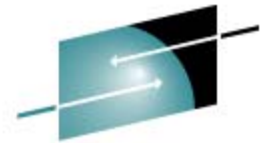
CICS Overview



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CICS GUI Screen



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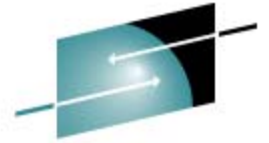
File Edit View Help

```
ZZZZZZZZ 33333 999999 00000 // CCCCC IIII CCCCC SSSSS
  Z 3 3 9 9 0 0 C C II C S S
    Z 3 9 9 0 0 C C II C S S
      Z 3 9 9 0 0 C C II C S
        Z 333 999999 0 0 C C II C SSSSS
          Z 3 9 9 0 0 C C II C S
            Z 3 9 9 0 0 C C II C S S
              Z 3 3 9 9 0 0 C C II C S S
ZZZZZZZZ 33333 9999 00000 // CCCCC IIII CCCCC SSSSS
```

Version 4

Command: Status:

Screen View Ready for input



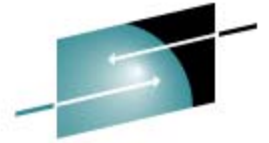
CICS General Commands

- HANDLE AID key() key
- HANDLE CONDITION
condition() condition
- IGNORE CONDITION condition
- POP HANDLE
- PUSH HANDLE

CICS Terminal Control

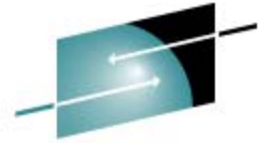


- RECEIVE INTO() LENGTH() NOHANDLE
- SEND FROM() LENGTH()
- only basic 3270 data streams supported at present.
- Graphics support is coming.
- BMS not supported yet, a top priority.



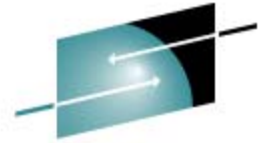
CICS Storage Control

- FREEMAIN DATA()/DATAPOINTER()
- GETMAIN SET() LENGTH()/FLENGTH()
INITIMG().



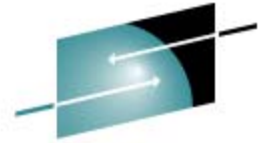
CICS Program Control (1 of 2)

- ABEND ABCODE() CANCEL NODUMP
- HANDLE ABEND
CANCEL/RESET/LABEL()/PROGRAM()
- LINK PROGRAM() COMMAREA()
LENGTH()
- LOAD PROGRAM() ENTRY()/SET()
LENGTH() FLENGTH()
- RELEASE PROGRAM()



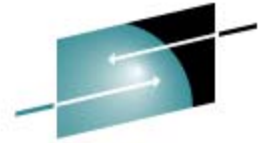
CICS Program Control (2 of 2)

- RETURN TRANSID() COMMAREA()
LENGTH()
- XCTL PROGRAM() COMMAREA()
LENGTH()
- CONTAINERS/CHANNELS under
investigation



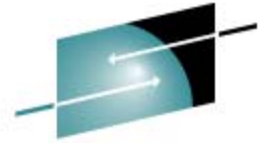
CICS Interval Control

- ASKTIME ABSTIME()
- DELAY INTERVAL()/TIME() AT/UNTIL
HOURS() MINUTES() SECONDS()
- FORMATTIME all parameters
- START, RETRIEVE, CANCEL coming soon



CICS Dump Control

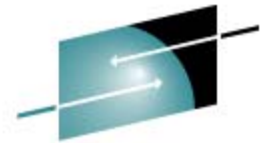
- DUMP TRANSACTION DUMPCODE()
COMPLETE
FROM() LENGTH()/FLENGTH()
SEGMENTLIST() LENGTHLIST()
NUMSEGMENTS()



CICS Temp Storage Control

- DELETEQ TS QUEUE()/QNAME()
- READQ TS QUEUE()/QNAME()
 INTO()/SET() LENGTH() NUMITEMS()
 ITEM()/NEXT
- WRITEQ TS QUEUE()/QNAME()
 FROM() LENGTH() NUMITEMS()
 ITEM() REWRITE
- CEBR

CICS Temporary Storage Screen A



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TERMINAL DON0 01/03/08 22:40:14

File Edit View Help

```
CEBR                                                    EBCDIC
```

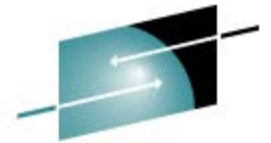
QNAME-----	ITEMS		QNAME-----	ITEMS		QNAME-----	ITEMS
MYQUEUE1	16						
MYQUEUE2	50						
□□□□	80						
VSM1	31						
VSM2	27						
VSM3	21						

CURSOR SELECT QNAME : PF2=EBCDIC/ASCII/HEX : CLEAR TO END

Command: Status:

Screen View

CICS Temporary Storage Screen B



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File Edit View Help

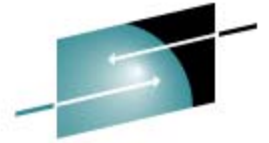
```
CEBR VSML          REC  17 OF   31   COL   1 OF   50  EBCDIC
ENTER COMMAND ==>

00017 abcdefgh
00018 abcdefghi
00019 Bill  Brewer
00020 abcdefghi
00021 abcdefgh
00022 Jan   Stewer
00023 abcdefghij
00024 abcdefg
00025 Peter Gurney
00026 Jan   Stewer
00027 Peter Gurney
00028 Peter Davy
00029 Tom   Cobley
00030 Harry Hawk
00031 Daniel Whiddon
***** BOTTOM OF QUEUE *****

PF1 : HELP          PF2 : EBCDIC/ASCII/HEX    PF3 : RETURN TO QNAMES
PF4 : VIEW TOP
PF7 : SCROLL BACK HALF  PF8 : SCROLL FORWARD HALF
PF10: SCROLL BACK FULL
```

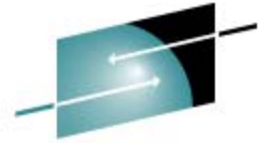
Command: Status:

Screen View Ready for input



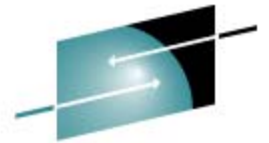
CICS File Control (1 of 4)

- READ FILE()/DATASET() INTO()/SET()
LENGTH()/FLENGTH()
RIDFLD() RBA/XRBA/RRN/GENERIC
GTEQ/EQUAL KEYLENGTH()



CICS File Control (2 of 4)

- **STARTBR FILE()/DATASET()**
RIDFLD() RBA/XRBA/RRN/GENERIC
GTEQ/EQUAL KEYLENGTH() REQID()
- **RESETBR FILE()/DATASET()**
RIDFLD() RBA/XRBA/RRN/GENERIC
GTEQ/EQUAL KEYLENGTH() REQID()
- **ENDBR FILE()/DATASET() REQID()**

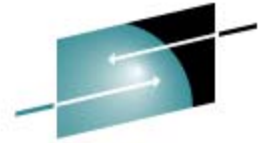


CICS File Control (3 of 4)

- READNEXT FILE()/DATASET()
INTO()/SET() LENGTH()/FLENGTH()
RIDFLD() RBA/XRBA/RRN
KEYLENGTH() REQID()
- READPREV FILE()/DATASET()
INTO()/SET() LENGTH()/FLENGTH()
RIDFLD() RBA/XRBA/RRN
KEYLENGTH() REQID()

CICS File Control (4 of 4)

- We have extended the facilities...
 - Big file sizes (XRBA)
 - Big record lengths (FLENGTH)
 - Can read an ESDS, fixed or variable, backwards or forwards.
 - Only read and browse of ESDS, RRDS and KSDS supported.
 - Read through AIX is coming (ESDS and KSDS).
 - Update is scary, but it's coming..



CICS Supplied Transactions

- Many test transactions
- CEBR
- CEMT I TERm CEMT S TER OUT
- CEMT I TRAn CEMT P SHU
- CEMT I FILE CEMT P SHU IMM
- CEMT I SYS
- CEMT conversational mode coming soon.

CICS Seq. Terminal Support (1 of 2)



- Regression test your transactions.
 - Run a transaction with trace on
 - Run the extract program Z390SEQ to build the data streams
 - Sequence all of your data streams
 - Set INI parameters for a simulation run
 - Run the simulation, you can see it happen on Screen
 - Your whole life will flash before your eyes

CICS Seq. Terminal Support (2 of 2)



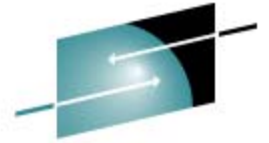
- Regression test your transactions.
 - Run the comparator Z390COMP, review the output
 - Refine the comparator by building an exclusion file for variable data like dates and times.

CICS Documentation (1 of 2)



- There's a lot of it.
 - None of it is meant to replace IBM's Manuals.
 - The information given refers to Z390/CICS, its implementation, workings, extensions and command/parameter support.

CICS Documentation (2 of 2)



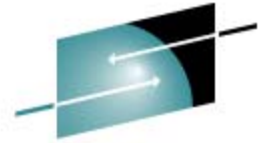
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- Readme
- Application Programming Guide
- Diagnosis Reference
- History
- Sequential Terminal Support
- Supplied Transactions
- System Programmer's Guide
- VSAM Guide

Z390/CICS Questions and Answers

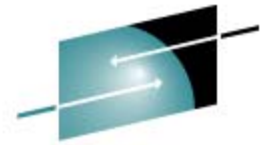


- Does this mean I have to do CICS work at home and on the road now?
- Can my laptop actually be the CICS server supporting multiple local terminals plus remote terminals on wireless TCP/IP network?
- Can I really expand CICS VSAM files beyond 4 GB with record lengths over 16 MB?



z390 Questions and Answers

- **What is the primary use of z390?**
- **Why is z390 open source?**
- **How is the Java source maintained?**
- **What are the minimum requirements?**
- **What limitations are there?**
- **Who is using z390?**
- **What additional plans are there for z390?**



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