TRACK for VM

What's happening
in *your* Virtual Machine?
Bigger, better, and still free!

Session 9123

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Nationwide Insurance

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Illuminations from adding 64-bit support…

- Real programmers…
  - are those that can sleep in front of terminals with their eyes open.
  - don't work from 9 to 5. If any real programmers are around at 9am it's because they were up all night.
  - add function by deleting code.
- There are two ways of constructing a software design: One way is to make it so simple that there are obviously no deficiencies, and the other way is to make it so complicated that there are no obvious deficiencies. The first method is far more difficult.
- A complex system that works is invariably found to have evolved from a simple system that worked.
- Teaching CMS (32 bit) to "talk to" CP in 64 bit mode was a little like teaching a cat to bark like a dog. Not totally impossible but quite frustrating at times. (Martha McConaghy says her cat wouldn't stoop that low.)
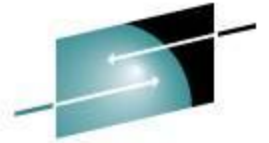
Topics

- What is TRACK?
- A little history
- Where to find it
- Documentation
- Installing
- Using
- Futures

What is TRACK?

- TRACK examines one or more virtual machines as they execute. It is a full screen program that is PF key driven and displays information in a number of different panels. It shows selected information from the TRACKed user's VMDBK, real and virtual storage, all of a user's devices, details about one device, open console page along with certain information about a CMS user's virtual machine, such as accessed disks, open files, filedefs, etc.

- There are many other panels and commands available!

A little history of TRACK

- Developed by Serge Goldstein from Princeton University's Computing Center (PUCC)
  - Around the mid 1980's
- Picked up by Ross Fried at City University of New York (CUNY)
- Other contributor(s)…
  - Perry Ruiter (then with BC Systems, now with IBM Canada)
  - Dave Jones from Sine Nomine Associates
  - Dan Martin now with Rocket Software
- Currently maintained by Jim Vincent. (See last page for contact info)

Where to find TRACK

- The *new* TRACK for VM web site!
  - http://vm.marist.edu/track/
    Graciously hosted by Marist College

- Currently "**TRACK for z/VM 5.3**" is available.
  - This will support all VM versions from XA through z/VM 5.3.0 in any mode (32 or 64 bit)*

- The web site will be the location to find new updates, news, babblings, etc, about TRACK

- Postings to the VMESA-L listserv will also be used

* z/VM 5.1.0 and beyond only support 64 bit mode

Where to find TRACK
http://vm.marist.edu/track/
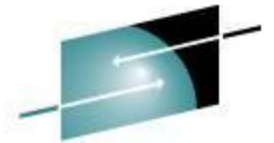
Contact Me

Powered by z/VM

Track for VM
With 64-bit Support!

The one tool you can't live without!

🔴 **Download Page**
🔴 **About TRACK**

Announcing TRACK z64 Version 4.0!

This newest version of TRACK supports **all** VM systems from VM/XA through z/VM Version 4 in 32 or 64-bit mode! To download the new TRACK code, click on the Download Page link on the left side navigation.

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z/VM 64 bit support - Please Note!
In order for TRACK for 64-bit to work you must have APAR VM63049 on your system (V3.1.0 through V4.3.0). It is NOT currently on any RSU but **is** included with z/VM V4.4.0. This APAR corrects a defect in the 64-bit address calls to Diagnose 4, which is used heavily by TRACK. Without this APAR applied to 64-bit z/VM systems, TRACK will fail when attempting to get data from CP.

Some TRACK z64 Version 4.0 Highlights

➤ Full 64-bit support.

➤ VMD panel switches to "long" format for ESAME guests. This shows the PSW and Regs as 16 byte fields.

➤ All panels will handle storage from 1MB to 16EB (That's 16 Exabytes, or 2**60. A boat-load of storage no matter how you look at it!)

➤ FORMAT panel will handle some AIF (HCPESAME and HCPES390) and AGO statements to help show the proper fields for the DSECT. Also handles the "L", "AD", and "FD" extended format fields.

➤ New ASCII ON|OFF command that switches all storage display panels between EBCDIC and ASCII for the data values. Handy for Linux guests!

➤ Support for **all** zArchitecture instructions on the disassembly panel.

More to come... This is all a work-in-progress, including this web site. I am still working on some additional enhancements and support that will be coming soon. I am planning on adding screen-shots of the TRACK panels as a visual guide on using TRACK, and a FAQ section also.

Where to find the 'original' TRACK (for historical purposes only)

- Marist's VM Workshop tape has the original source
  - http://www.marist.edu/~workshop on the 1995 tools tape
    - http://www.marist.edu/~workshop/tolidx95.html
      Or more specifically, the TRACKXA VMARC:
    - http://www.marist.edu/~workshop/trackx95.vmarc
- This version supports VM XA and ESA versions through VM/ESA 2.4.0
  - Note, it does NOT contain the original SP/HPO version
- If you have a **non**-z/VM system and don't want the clutter of 64 bit support then you can download this version and save a little DASD space.

TRACK documentation

- TRACK has very well documented commands and functions

  - README FIRST and TRACK MEMO will get you started

    - Includes the install instructions and other notes of interest

  - 34 CMS HELP files included in the package

    - A TRACK MENU helps navigate them

  - What about a MANUAL?

    - Got one! PDF is on the web site

TRACK pre-install requirements

- **z/VM 64 bit support - Please Note!** In order for TRACK for 64-bit to work you must have APAR VM63049 on your system (V3.1.0 through V4.3.0). It is NOT currently on any RSU but **is** included with z/VM V4.4.0+. This APAR corrects a defect in the 64-bit address calls to Diagnose 4, which is used heavily by TRACK. Without this APAR applied to 64-bit z/VM systems, TRACK will fail when attempting to get data from CP.

- **Some Assembly Required:** Assembling TRACK for *any* z/VM system will require you to have the latest IBM High Level Assembler (V1.4.0+). It contains the support for the 'double' size data symbols that are used in CP MACLIB members even if you are in 32 bit mode.
  - DIGNUS offers a worthy alternative!

Pre-built TRACK modules available

- If you don't have the IBM High Level Assembler, there are **unsupported**, pre-built TRACK modules in the download VMARC package

    - TRACKV53 MODULE - z/VM Version 5.3 in 64 bit mode
        - Soon to be the only one built with new updates, +5.4
    - TRACKV52 MODULE - z/VM Version 5.2 in 64 bit mode
        - This will be re-built with new updates "for a while"
    - TRACKV51 MODULE - z/VM Version 5.1 in 64 bit mode
    - TRACKZ64 MODULE - z/VM Version 4+ in 64 bit mode
    - TRACK32 MODULE - z/VM Version 4 in 32 bit mode
    - TRACKV31 MODULE - z/VM Version 3 in 32 bit mode

Pre-built TRACK modules available

- I highly recommend Assembling your own TRACK modules if you can

  – Stuff happens… CP data areas change

- Assembling your own will ensure TRACK will work correctly for your system

- The pre-built modules are NOT supported!

- They are quite handy for those folks that have z/VM in house running on IFLs and don't have an assembler available

Installing TRACK

- Start with the README FIRST and TRACK MEMO file

- Installation will depend on your current level of VM

- TRACK is mostly assembler and very dependent on CP source code (MACLIBs)

- Installed and maintained using the standard VM update scheme
  - Xedit Update files, AUX files, etc.

Installing TRACK (more…)

- CNTRL files help you manage which version of TRACK is built
  - One for each level of VM supported
    - **TRACKV53   z/VM 5.3.0 64-bit systems**
    - TRACKV52   z/VM 5.2.0 64-bit systems
    - TRACKV51   z/VM 5.1.0 64-bit systems
    - TRACKZ64   z/VM 64-bit systems
    - TRACKZVM   z/VM Version general mods (32 bit only)
    - TRACKV31   z/VM Version 3 Release 1.0 specific mods
    - TRACKV23   ESA Version 2 Release 3.0 specific mods
    - TRACKV22   ESA Version 2 Release 2.0 specific mods
    - TRACKV21   ESA Version 2 Release 1.0 specific mods
    - TRACKXC   ESA 2.2 specific mods
    - TRACKXA   ESA 2.1 specific mods
    - TRACKE22   ESA 2 specific mods
    - TRACKE21   ESA 1.1 specific mods
    - TRACKES2   ESA specific mods
    - TRACKESA   Base (unversioned) updates

Installing TRACK (more…)

- Select the right CNTRL file for the release of VM you have
- Verify your current CP control file entry, TEXT MACS to the TRACKVxx CNTRL file you are going to use (HCPVM or HCPVME)
  - Be sure TRAMAC is prefixed on the MACLIB list
  - Not using the right MACLIBs will cause bad things to happen to good people

Installing TRACK (more…)

- You may need to modify some of the AUX files
  - Generally for a current VM, what is there is fine
  - Most updates were for older releases that fixed some things before they were included in the base CP code
  - Be sure to review the TRACK MEMO in the "Modifications" section for updates you may want to include
- Build TRAMAC MACLIB
  - VMFMAC TRAMAC TRACKVxx
    - TRACKVxx is the name of the CNTRL file you will be using

Installing TRACK (more…)

- Assemble all the parts!
  - Nice little EXEC provided to help you do that
  - TRKASM EXEC VMFHLASM TRACKVxx
    - TRACKVxx is the name of the CNTRL file you will be using
- Modify the load list if you want
  - Handy if you want a 'lite' version of TRACK but these days, storage is cheap so build the whole thing!
- Build the TRACK module
  - TRKGEN TRACK TRACKVxx
    - TRACKVxx is the name of the CNTRL file you will be using
    - You can change the name of the module if you want
      - TRKGEN *modulename* TRACKVxx

Installing TRACK (almost done!)
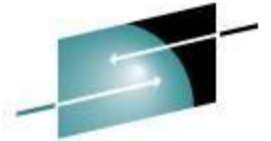
- Copy the TRACK MODULE and all HELP files to a tools disk

- Keep all the files somewhere – you will be updating them as your VM level changes or more updates are made available

Using TRACK - requirements

- Required CLASSes
  - You will need CLASS E to use Diag 004 (read CP real storage) and CP LOCATE
  - You will need CLASS D for Diag 290 for view open spool data (optional; z/VM 5.2+ only)
  - You will need CLASS A for the CP LOCK/UNLOCK commands (optional)
  - If you moved these commands to different privileges, adjust accordingly...
- Note – although you need high privileges, TRACK never modifies storage in any way
  - It will only LOCK virtual pages as needed and UNLOCK them immediately if they were not locked in the first place

Using TRACK – a little help

- Nifty front-end routine ZTRACK EXEC included in VMARC

  – Checks for the required privilege classes

  – Executes the correct TRACK module based on the level of z/VM you are running

    - Handy if you have both a 32 and 64 bit system you want to use TRACK on or sharing a tools disk on multiple VM systems with different levels of CP

  – Modify the code to fit your needs

Using TRACK - notes

- 64 bit support in TRACK needed some panel changes/rearrangements

- Some of the panels will look a bit different depending on what mode you are in (32 vs 64 bit)

  – Registers and data locations expand to 16 bytes for 64 bit

  – Some data condensed to allow room (see VST/RST panels for example)

    - Offset field is only 7 bytes, yet offset could be much more than that

Using TRACK - notes

- z/VM 5.2 required a new switch for CP storage
  - Default mode is Host Logical
  - New command:
    - HOSTREAL ON|OFF|?
      - ON makes TRACK look at Host REAL storage
      - OFF looks at Host Logical storage
      - ? Displays the current setting
  - RST will show [LOGICAL] or [REAL] above the addresses
  - Watch for possible storage errors; if you are set to Logical, Diag 4 may not get what you expect
    - FORMAT, DBK, etc…

Really Using TRACK!

- The simplest invocation: TRACK userid
  - Example: TRACK OPERATOR
- Tap ENTER on any panel to update/refresh the contents
  - Or use the AUTO command to set an automatic update time and limit of updates, then use PF2 (AUTO)
  - Use "AUTO .5" for half-second, almost real-time updates
  - Sit back and watch!
    - Popcorn and 'adult foamy beverage' optional

VMD Panel – 32 bit guest

```
Q - VMB

File  Edit  Font  Transfer  Macro  Options  Window  Help

TRACK 2 USERS: VMTEST              ****    VMD    ****   z64 V4.3++ 14:08:43   02/21/06
========================================================================================
VMDBK @ 05B43000 MP01 Class   = ABCDEFG                                  Share= 1500    R
Logon= 02/18/06 21:25 Virtcpu = 066:52.60 Totcpu = 104:07.44          Lastio= D30A
Storage=      256M       Account = *SERVC      Console= DISC
Last CP= LINK           Locked= 165           Resident= 22532          WSS= 36401
PSW= 0706400080000000 0000000000000000     Stat   = EC ENABLED  WAIT SUPR DAT
CPUaddr= 00    #CPUs= 02      Mach= ESAME     Amode= 64-bit      370accom= OFF
Sio= 55941007 Pr= 146         Pun= 0         Read   = 0          Dist = 03-25-02
Rstat=                                       Slist: 37 - Dispatch List
Qstat=
Ostat= IN-USERCT DISC
Com = ????????   Exec = ????????   Mod = ????????   Tran= ????????
Ipl = IPL D309 CLEAR LOADPARM 001F
R0-3= CC23000500000000 0000000060000000 0000000000000000 0000000000000000
 4-7= 0000000000000000 0000000000127254 0000000080126D7C 0000000000D799F0
 8-B= 000000000000E000 00000000002B7830 0000000000003000 0000000000002000
 C-F= 0000000042C9D0 000000000000E000 00000000002B7990 000000000003B3A00

========================================================================================
CR=Upd CLEAR=Subset  ==> _

2=Auto 3=Quit 4=Prt 5=File   1=RST 9=VMD 10=VST 11=DEV 12=DBK   7=Prev 8=Next
MA         0.5 02/21/06.052 02:08PM vmb.ent.nwie.net         a    30,26
```

VMD Panel – 64 bit guest

Using TRACK

- Let's look at the CMS settings
  - Type CMS on the command line
  - CMS panel can be customized to show any or all of the sections – in any order!
    - Handy to see DISKS and SFS directories accessed
  - CMS XEDIT will show the current Xedit data
  - CMS STACK shows what data is currently stacked by buffer number

CMS Panel (default)

CMS Panel (custom: TRACK user CMS DISKS SFS)

CMS Panel (custom: TRACK user CMS XEDIT)

CMS Panel (custom: TRACK user CMS STACK)

Using TRACK

- For examples, I will cycle through the following in order:
  - CONS (open console)
  - DEV (via PF11 – virtual devices)
  - NAM ('query names')
  - PFX (prefix page)
  - RST (real storage) and VST (virtual storage)
    - Both with "Disassembly mode" and ASCII display toggle
- Note that these are only a sampling of what TRACK can do!

CONS Panel – last active open console block

```
Q - VMB
File  Edit  Font  Transfer  Macro  Options  Window  Help

TRACK  4 USERS: HTTPD                    ****    DEV    ****    z64 V4.3++ 14:17:06    02/21/06
=================================================================================================
TERM 0009    3215           SPOL 000C 2540R         SPOL 000D 2540P         SPOL 000E 3800
DASD 0119    3390           DASD 011A  3390          DASD 0181  3390          DASD 0190  3390
DASD 0191    3390           DASD 0193  3390          DASD 019D  3390          DASD 019E  3390
DASD 01B0    3390           DASD C191  3390          DASD F191  3390

(Chan= 4    Ctls= 7     Devs= 15    )==================================================
CR=Upd CLEAR=Subset    ==> _

2=Auto 3=Quit 4=Prt 5=File   1=RST 9=VMD 10=VST 11=DEV 12=DBK   6=ByC 7=ByA 8=ByT
MA                     0.0 02/21/06.052 02:17PM vmb.ent.nwie.net          a    30,26
```

DEV Panel – all virtual devices for the user

```
Q - VMB                                                        [_][□][X]

File  Edit  Font  Transfer  Macro  Options  Window  Help

TRACK 4 USERS: HTTPD            ****    NAM    ****   z64 V4.3++ 14:17:30    02/21/06
===================================================================================
  ADAMSJ9    3C187000   ADSMSERV  1C718000   AFRINA    6F3B2000   AIENDLS   037FA000
  ANDERSG    462BC000   ANDERSM   57CC5000   AOLASSUR  6DEFE000   ARATAJ    512E8000
  ASDSINK    24732000   ASHBYG    53A96000   AWTREYD   450D2000   BARLOWR   6EF10000
  BARLOWRT   73602000   BATHINB   57F60000   BAUMGAJ1  7B99B000   BEERYR    77180000
  BERRYJ4    4D705000   BHARGAP   047C1000   BLUMBEB   65C6B000   BOLLISH   4A821000
  BOTCHAK    1C8A5000   BOYSELS   64506000   BRASCHJ   4AF3D000   BROWNE2   2B8F1000
  BUSHL4     46BD3000   CALDWEB   6C96F000   CALLUP    2F269000   CAMMELA3  4AB52000
  CFCC1      1E486000   CFCC2     1DEC1000   CFCONSOL  1BB3B000   CHANDRD1  3ADC9000
  CHATMAL2   1852A000   CHILAKS   4A016000   CHILAMS   56D4E000   CHILSOR1  7F83B000
  CHINTAM    2A988000   CHODISS   412B8000   CLARKJ46  75176000   COOKD1    45477000
  COYNEC1    08D81000   CPRSINK   24785000   CRUMR1    64F2B000   DAIJ      6E01C000
  DASARIV1   70267000   DATASYNC  1C73E000   DAVISD42  45AEA000   DHULIPR   144B2000
  DISKACNT   0DB3F000   DORAISS   34F83000   DUGGANE   6D842000   EDWARDR1  029AF000
  EDWINM     18D7C000   EREP      10ED7000   ESAMBAV   6D840000   ESASERVE  1BB36000
  ESATCP     1BB33000   ESAWRITE  1D052000   ESPLANJ   09D9A000   ESTEPC    41A10000
  EYREY1     716DE000   FARLERP   7076B000   FARRIES   50BD1000   FENDRUA   20E90000
  FIROBEC    04953000   FISHERK   4874E000   FOLMARS1  3DACD000   FPTRSNK1  1C6F5000
  FTPSERVE   1D1ED000   F000SNK1  1C6E0000   F330SNK1  44DBE000   F370SNK4  247BC000
  F690SNK1   64A75000   GALLAGB   013F6000   GARRARC   50AF2000   GATTINA1  4E5D4000
  GENSURT1   71899000   GOGINEA1  41E5C000   GRABERS   52B8B000   GRACED1   4D755000
  GROSSMC    43C1C000   GRUEVSV   69340000   GUSTINK   31970000   HARDEND3  38B46000
  HARIKRT    25274000   HARPERC   74DEE000   HELDR     065CC000   HIDRO     1C572000
  HOGUEM4    6A1B2000   HOLTK     69BBF000   HOUSEHK   6685B000   HOWIEJ    2B7FF000
  HOWILES    49ACF000   HTTPD     42033000   HTTPDNDC  1DE62000   HTTPDTAS  1DC39000
  HTTPDTTL   1DB3A000   HTTPDTW2  48D18000   HTTPDTW3  09865000   HTTPDW5   2C83F000
  HTTPD2     1D868000   HTTPD2W4  4F757000   HTTPD4    1D96A000   HTTPD6    1C683000
*** MORE ***=Users= 300        ====================================================
CR=Upd CLEAR=Subset   ==> _

2=Auto 3=Quit 4=Prt 5=File  1=RST 9=VMD 10=VST 11=DEV 12=DBK  6=ByN 7=ByA 8=Trk
MA                      0.0 02/21/06.052 02:17PM vmb.ent.nwie.net        ⇧ a   30,26
```

NAMES Panel – lists all logged on userids

PFX Panel – prefix page storage mapping

File Edit Font Transfer Macro Options Window Help

```
TRACK 4 USERS: HTTPD            ****   RST   ****   z64 V4.3++  14:30:20    02/21/06
===================================================================================
Base address = 0000000000A75B80                    3G Real Storage
  [ LOGICAL ]        Offset                  Hex                      Ebcdic
0000000000A75B80   000000   00E5E5E5 00000000 00000000 C8C3D7C7  * VVV        HCPG*
0000000000A75B90  +000010   C6E24040 017AC5D4 C5F2F0F5 0000F0F5  *FS    :EME205  05*
0000000000A75BA0  +000020   61F1F961 F0F57AF1 F84BF5F6 D9C50000  */19/05:18.56RE  *
0000000000A75BB0  +000030   00000000 0032A361 003F8C78 802E6EC8  *        t/      >H*
0000000000A75BC0  +000040   00000020 80155438 80156DE0 00A7AC90  *              _  x  *
0000000000A75BD0  +000050   002EDA80 00ADEBA0 002EEA90 00000010  *                    *
0000000000A75BE0  +000060   80A7DAA0 80A7DB18 00B2EF70 00A7DCE8  * x     x        x Y*
0000000000A75BF0  +000070   803A3030 803A3178 003A1FF8 000000C0  *                8   *
0000000000A75C00  +000080   00A7ABC0 00ADEC10 8016A668 800CC7A8  * x             w  Gy*
0000000000A75C10  +000090   000CB1B8 8016A6B8 00156040 40000000  *          w   -     *
0000000000A75C20  +0000A0   00E5C3C4 00317E60 C0C0FFFF FFACBFEF  * VCD   =-        *
0000000000A75C30  +0000B0   81304780 C0D49140 80004780 C17258B0  *a      Mj        A  *
0000000000A75C40  +0000C0   80045820 C03858F0 C03C0CEF 58B0D044  *       0           *
0000000000A75C50  +0000D0   47F0C172 91308001 4770C172 91038067  * 0A j     A j   *
0000000000A75C60  +0000E0   4780C172 91108013 4710C172 4100000D  *  A j     A     *
0000000000A75C70  +0000F0   5810C040 58FB0858 50F00AF8 58F0C044  *           &0 8 0  *
0000000000A75C80  +000100   0CEF58F0 C0480CEF 1861D203 60188B858 *     0       /K -  *
0000000000A75C90  +000110   40006006 96806010 96FE6011 96026004  *   - o - o - o -  *
0000000000A75CA0  +000120   50B0600C 5840801C 50406000 5060801C  *&        & - &-  *
0000000000A75CB0  +000130   5820C04C 58B08004 58F0098C 0CEF9610  *    <      0    o  *
0000000000A75CC0  +000140   80679640 806894FC 806794F7 80194530  *  o    m    m7    *
0000000000A75CD0  +000150   C96EBF1F 80084780 C17294BF 101D9180  *I>       A m    j *
0000000000A75CE0  +000160   101D4710 C16E9540 10124770 C1729608  *    A>n     A o *
0000000000A75CF0  +000170   806858FD 00140DEF 00E5C3C4 00317E60  *         VCD   =-*
===================================================================================
CR=Upd CLEAR=Subset   ==> _

2=Auto 3=Quit 4=Prt 5=File   1=RST 9=VMD 10=VST 11=DEV 12=DBK   6=dis 7=bak 8=for
MA                    0.0 02/21/06.052 02:30PM vmb.ent.nwie.net         a   30,26
```

RST Panel – real storage display

File Edit Font Transfer Macro Options Window Help

```
TRACK 4 USERS: HTTPD              ****   RST   ****    z64 V4.3++ 14:31:41    02/21/06
========================================================================================
Base address = 0000000000A75C2E                 3G Real Storage
  [ LOGICAL ]           Hex data     Ins    Operands (in hex)                  Ebcdic     E
0000000000A75C2E      BFEF8130      ICM    R14,B'1111',304(R8)             *     a      *
0000000000A75C32      4780C0D4      BZ     212(,R12)                       *       M    *
0000000000A75C36      91408000      TM     0(R8),X'40'                     * j         *
0000000000A75C3A      4780C172      BZ     370(,R12)                       *     A      *
0000000000A75C3E      58B08004      L      R11,4(,R8)                      *           *
0000000000A75C42      5820C038      L      R2,56(,R12)                     *           *
0000000000A75C46      58F0C03C      L      R15,60(,R12)                    *   0       *
0000000000A75C4A      0CEF          BASSM  R14,R15                         *           *
0000000000A75C4C      58B0D044      L      R11,68(,R13)                    *           *
0000000000A75C50      47F0C172      B      370(,R12)                       *   0A      *
0000000000A75C54      91308001      TM     1(R8),X'30'                     * j         *
0000000000A75C58      4770C172      BNZ    370(,R12)                       *     A     *
0000000000A75C5C      91038067      TM     103(R8),X'03'                   * j         *
0000000000A75C60      4780C172      BZ     370(,R12)                       *     A     *
0000000000A75C64      91108013      TM     19(R8),X'10'                    * j         *
0000000000A75C68      4710C172      BO     370(,R12)                       *     A     *
0000000000A75C6C      4100000D      LA     R0,13                           *           *
0000000000A75C70      5810C040      L      R1,64(,R12)                     *           *
0000000000A75C74      58FB0858      L      R15,2136(R11)                   *           *
0000000000A75C78      50F00AF8      ST     R15,2808                        * &0 8      *
0000000000A75C7C      58F0C044      L      R15,68(,R12)                    *   0       *
0000000000A75C80      0CEF          BASSM  R14,R15                         *           *
0000000000A75C82      58F0C048      L      R15,72(,R12)                    *   0       *
0000000000A75C86      0CEF          BASSM  R14,R15                         *           *
========================================================================================
CR=Upd CLEAR=Subset   ==> _

2=Auto 3=Quit 4=Prt 5=File   1=RST 9=VMD 10=VST 11=DEV 12=DBK   6=dis 7=bak 8=for
MA                    0.0 02/21/06.052 02:31PM vmb.ent.nwie.net         ⇧ a    30,26
```

RST Panel – real storage disassembled

File Edit Font Transfer Macro Options Window Help

```
TRACK 5 USERS: VINCENJT        ****     VST     ****     z64 V4.3++ 14:32:20      02/21/06
==========================================================================================
Base= 0000000000020000    Real address= 00000000B6955000
Vaddr                Offset                    Hex                          Ebcdic
0000000000020000     000000   47F0F00C E3D9D2E4 E2D94040 90ECD00C  * 00 TRKUSR        *
0000000000020010    +000010   45F0F05C FFFFFFFF 0000A6D0 80026D1C  * 00*        w   _ *
0000000000020020    +000020   4002070C 00026D08 00000400 00065000  *                 & *
0000000000020030    +000030   00066000 00000000 00E70EC0 00000000  *   -    _   X      *
0000000000020040    +000040   00023D40 00022D40 90020B90 00022014  *                   *
0000000000020050    +000050   00021014 00EE1548 00E70EC0 50F0D008  *           X    &0 *
0000000000020060    +000060   50D0F004 18DF41AD 080041AA 0800419A  *& 0               *
0000000000020070    +000070   08004199 08009101 93C047E0 D07841F0  *     r   j  l     0*
0000000000020080    +000080   000211FF 50F0AFC8 47F0AF1C D5071008  *        &0 H 0   N *
0000000000020090    +000090   93CC4780 D0F4D507 10089074 4770D178  *l     4N          J*
00000000000200A0    +0000A0   47F0D0F4 4510D0BC E3E8D7D3 C9D54040  * 0 4      TYPLIN   *
00000000000200B0    +0000B0   010200B8 C2000017 E4C9C440 8885A740  *      B    UID hex *
00000000000200C0    +0000C0   8481A381 4089A240 8995A581 93898400  *data is invalid    *
00000000000200D0    +0000D0   0ACA0002 00D647F0 D0F40700 4510D0EC  *        0 0 4      *
00000000000200E0    +0000E0   E3E8D7D3 C9D54040 010200F0 C200000F  *TYPLIN      0B     *
00000000000200F0    +0000F0   E4C9C440 89A240A3 96964093 96958700  *UID is too long  *
0000000000020100    +000100   0ACA0002 01060700 4510D12E E3E8D7D3  *             J TYPL*
0000000000020110    +000110   C9D54040 0102011C C2000025 E2A895A3  *IN        B    Synt*
0000000000020120    +000120   81A74089 A27A40E3 D9C1C3D2 40A48984  *ax is: TRACK uid*
0000000000020130    +000130   404CA283 99858595 6E404C4D 9697A3A2  * <screen> <(opts*
0000000000020140    +000140   6E000ACA 00020148 4510D166 E3E8D7D3  *>           J TYPL*
0000000000020150    +000150   C9D54040 0102015C C200001E C6969940  *IN      *B    For *
0000000000020160    +000160   8485A381 8993A26B 4089A2A2 A4857A40  *details, issue: *
0000000000020170    +000170   C8C5D3D7 40E3D9C1 C3D20ACA 00020180  *HELP TRACK        *
==========================================================================================
CR=Upd CLEAR=Subset   ==> _

2=Auto 3=Quit 4=Prt 5=File   1=RST 9=VMD 10=VST 11=DEV 12=DBK  6=dis 7=bak 8=for
MA                       0.0 02/21/06.052 02:32PM vmb.ent.nwie.net          a    30,26
```

VST Panel – virtual storage display

Q - VMB

File Edit Font Transfer Macro Options Window Help

```
TRACK 5 USERS: VINCENJT        ****    VST    ****    z64 V4.3++ 14:46:56    02/21/06
========================================================================================
Base= 000000000002005C   Real address= 00000000B695505C
Vaddr                 Hex data       Ins    Operands (in hex)                    Ebcdic
000000000002005C      50F0D008       ST     R15,8(,R13)                       * &0      *
0000000000020060      50D0F004       ST     R13,4(,R15)                       * & 0     *
0000000000020064      18DF           LR     R13,R15                           *         *
0000000000020066      41AD0800       LA     R10,2048(R13)                     *         *
000000000002006A      41AA0800       LA     R10,2048(R10)                     *         *
000000000002006E      419A0800       LA     R9,2048(R10)                      *         *
0000000000020072      41990800       LA     R9,2048(R9)                       *   r     *
0000000000020076      910193C0       TM     960(R9),X'01'                     * j l     *
000000000002007A      47E0D078       BNO    120(,R13)                         *         *
000000000002007E      41F00002       LA     R15,2                             *   0     *
0000000000020082      11FF           LNR    R15,R15                           *         *
0000000000020084      50F0AFC8       ST     R15,4040(,R10)                    * &0 H    *
0000000000020088      47F0AF1C       B      3868(,R10)                        *   0     *
000000000002008C      D507100893CC   CLC    8(8,R1),972(R9)                   * N    l  *
0000000000020092      4780D0F4       BE     244(,R13)                         *       4 *
0000000000020096      D50710089074   CLC    8(8,R1),116(R9)                   * N       *
000000000002009C      4770D178       BNE    376(,R13)                         *     J   *
00000000000200A0      47F0D0F4       B      244(,R13)                         *   0 4   *
00000000000200A4      4510D0BC       BAL    R1,188(,R13)                      *         *
00000000000200A8      E3E8           DC     X'E3E8'                           * TY      *
00000000000200AA      D7D3C9D54040   XC     2517(212,R12),64(R4)              * PLIN    *
00000000000200B0      0102           UPT                                      *         *
00000000000200B2      00B8C2000017   DC     X'00B8C2000017'                   *    B    *
00000000000200B8      E4C9C440       DC     X'E4C9C440'                       * UID     *
========================================================================================
CR=Upd CLEAR=Subset   ==> _

2=Auto 3=Quit 4=Prt 5=File    1=RST 9=VMD 10=VST 11=DEV 12=DBK  6=dis 7=bak 8=for
MA█                  0.0 02/21/06.052 02:47PM vmb.ent.nwie.net        ⇑ a    30,26
```

VST Panel – virtual storage disassembled

VST Panel – virtual storage in ASCII

Using TRACK

- Internal TRACK command
  - Track userid <command> <(<NEW> <DUMP fn>>
  - For example,
    - Track operator
    - Track pvm (new
    - Track pvm format nucon v0
    - Track pvm format nucon v0 (new
    - Track pvm con (new
    - Track pvm ret off
    - T pvm track rscs
    - Track pvm t rscs c
    - Track pvm aup
    - Track * (new
    - Track = VMD

Using TRACK

- The internal TRACK command adds the userid to TRACK along with the one(s) you are already TRACKing
  - The "new" option starts a new instance of the tracked user so you can toggle between two different panels for the same userid
  - Enter **T**RACK on the command line by itself to toggle through them all one-by-one
- FORMAT – another of many cool commands and very powerful/helpful
  - Allows you to display storage (real, virtual) as mapped by a DSECT

Using TRACK - FORMAT

- Read the FORMAT HELP for all the details!
  - FORMAT with CP DSECTs
    - You need to have access to MAINT's 193 disk for the MACLIBs
    - Usually best to specify the MACLIB explicitly
      - FORMAT VMDBK 0E8F0000 HCPOM1
- A couple of specific examples…
  - TRACK OPERATOR FORMAT NUCON V0
  - TRACK * FORMAT VMDBK 00002000 HCPOM1
  - FORMAT allows a "point and shoot" option (V4.2)
    - Type the FORMAT command you need using a * as the address
    - Place your cursor on the address you want to use that is displayed on the panel
    - Tap Enter
      Ex: FORMAT VMDBK * HCPOM1 MACLIB

```
Q - VMB

File  Edit  Font  Transfer  Macro  Options  Window  Help

TRACK 7 USERS: PVM                ****   FRM   ****   z64 V4.3++ 14:50:18   02/21/06
==================================================================================
  [ LOGICAL ]       Off  NUCON    DSECT ,
                         &T       SETC 'V'
                         &T       SETC 'A'
00000005682C000  000  IPLPSW   D  03EC000000045AE0  Initial program loading PSW
00000005682C008  008  IPLCCW1  D  00EED898B0045ABC  Initial program loading CCW1
00000005682C010  010  IPLCCW2  D  00007AE800000600  Initial program loading CCW2
                         ORG  IPLPSW
00000005682C000  000  RSTNPSW  D  03EC000000045AE0  Restart new PSW
00000005682C008  008  RSTOPSW  D  00EED898B0045ABC  Restart old PSW
00000005682C010  010  ACMSCVT  F  00007AE8          Address of simulated OS CVT
00000005682C014  014  ASYSREF  F  00000600          Address of nucleus address tab
00000005682C018  018  EXTOPSW  D  FF0610400023668   External old PSW
00000005682C020  020  SVCOPSW  D  FFE400B85045B0A   Supervisor call old PSW
00000005682C028  028  PGMOPSW  D  0000000000000000  Program old PSW
00000005682C030  030  MCKOPSW  D  030C30000003842E  Machine-check old PSW
00000005682C038  038  IOOPSW   D  FFE40009045D4E    Input/output old PSW
00000005682C040  040  CSW      D  00001AF00C000000  Channel Status Word
00000005682C048  048  CAW      F  E0E01000          Channel Address Word
00000005682C04C  04C  NUCRSV1  F  00000000          Reserved for hardware use
00000005682C050  050  TIMER    F  FFFF7600          Interval timer
00000005682C054  054  NUCRSV2  F  00000000          Reserved for hardware use
00000005682C058  058  EXTNPSW  D  000400000022918   External new PSW
00000005682C060  060  SVCNPSW  D  0004000000227F0   Supervisor call new PSW
00000005682C068  068  PGMNPSW  D  000400000024A00   Program new PSW
00000005682C070  070  MCKNPSW  D  000800080F3ED70   Machine-check new PSW
00000005682C078  078  IONPSW   D  000400000023280   Input/output new PSW
Block display is incomplete ... un-parsable statement found in DMSGPI   MACLIB
CR=Upd CLEAR=Subset  ==> _

2=Auto 3=Quit 4=Prt 5=File  1=RST 9=VMD 10=VST 11=DEV 12=DBK  6=Fnd 7=bak 8=for

MA        0.1 02/21/06.052 02:50PM vmb.ent.nwie.net        a    30,26
```

FORMAT Panel – TRACK PVM FORMAT NUCON V0

```
Q - VMB

File  Edit  Font  Transfer  Macro  Options  Window  Help

TRACK 1 USER : VINCENJT        ****    FRM    ****    z64 V4.3++ 14:51:39    02/21/06
==========================================================================================
                                    000000000000
0000000000002200  200  VMDUSER   C  SYSTEM              USER LOGON IDENTIFICATION
0000000000002208  208  VMDACTID  C  SYSTEM              ACCOUNTING USER IDENTIFICATION
0000000000002210  210  VMDALGID  C                      USERID CAUSING THIS USER'S LOG
0000000000002218  218  VMDACTNO  C  SYSTEM              USER ACCOUNTING NUMBER
0000000000002220  220  VMDDIST   C                      USER DISTRIBUTION CODE
0000000000002228  228  VMDGRPN   C                      RACF ACI GROUP NAME
0000000000002230  230  VMDTODON  F  00000000            SESSION LOGON TOD, BITS 0-31
0000000000002234  234  VMDATODN  F  BE65D08F            VALUE OF VMDTODON AT LAST 'ACN
0000000000002238  238  VMDATTIM  F  7FFFFBCD            VALUE OF VMDTTIME AT LAST 'ACN
0000000000002240  240  VMDAVTIM  F  00000000            VALUE OF VMDVTIME AT LAST 'ACN
0000000000002248  248  VMDADIST  C                      Accounting DISTRIBUTION field
0000000000002250  250  VMDSIGCT  F  00000000            Count of SIGA instructions
0000000000002254  254  VMDCCSIO  F  00000000            Count of completed virtual I/O
0000000000002258  258  VMDACPGW  F  000172D6            TOTAL NUMBER OF PAGE/SPOOL WRI
000000000000225C  25C  VMDACPGR  F  000101E7            TOTAL NUMBER OF PAGE/SPOOL REA
0000000000002260  260  :L1       D  0000000000000000    RESERVED FOR IBM USE
0000000000002268  268  :L2       D  0000000000000000    RESERVED FOR IBM USE
0000000000002270  270  VMDLACTM  F  00000000            Last time active, for IND ACT
0000000000002278  278  VMDDIAST  X  00                  DIAGNOSE STATUS BYTE
* BITS DEFINED IN VMDDIAST
                       VMDDIA4C  EQU X'80'              DIAG4C WAS LAST ACCOUNT RECORD
                       VMDUDST   EQU X'40'              Indicate user spool distributi
0000000000002279  279  VMDACFL   X  00                  Accounting Flag byte.
* BITS DEFINED IN VMDACFL
                       VMDNETA   EQU X'80'              This indicates Network
==========================================================================================
CR=Upd CLEAR=Subset   ==> _

2=Auto 3=Quit 4=Prt 5=File  1=RST 9=VMD 10=VST 11=DEV 12=DBK  6=Fnd 7=bak 8=for
MA                     0.0 02/21/06.052 02:51PM vmb.ent.nwie.net          a    30,26
```

FORMAT Panel – TRACK * FORMAT VMDBK 00002000 HCPOM1

FORMAT Panel – FORMAT mapping of flags

Using TRACK

- There is so much more to TRACK
  - Most commands have a ton of options!
- Okay okay… just ONE more then you have to go to bed!
  - DEV – you can check on IO pendings or active
    - track tcpip dev class * io pending
   - track tcpip dev class * io active

DEV Panel – showing pending interrupt device(s)

Advanced TRACK features - Macros

- TRACK Macros
  - You can design your own macros to enhance how TRACK functions
  - Build your own "panels"
- Some of the included TRACK macros:
  - QIUCV displays IUCV paths for user, CP, or a specific CP system service – but this is now an internal panel!
  - STORMAP maps all virtual storage and shows allocated subpools
 - NUCXMAP lists all nucleus loaded extensions
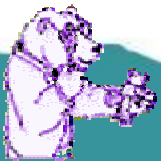
Advanced TRACK features - Macros

- TRACK Macro sub-commands:
  - **READSTRG <H>address <flag> <length> <(VAR <var>>**
    Read virtual or real storage
  - **TRACKEE <USER|VMDBK> <(VAR <var>>**
    Get the userid or VMDBK of the TRACKed user
  - **REGS <Gn|Rn Cn An Fn> <(VAR <var>>**
    Return the TRACKed user's registers
  - **CMSG string**
    Write contents of string to TRACK command line
  - **NOTE string**
    Write contents of string to the console
    (use REXX Say instead)
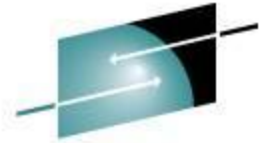
Advanced TRACK features - Macros

- A TRACK MACRO: MYVMD

```
/* Test the TRACK macro facility */
Numeric Digits 16
'TRACKEE VMDBK'
Say 'TRACKEE returned:' result

Parse Value Diag(8,'Q CPLEVEL') with system .
If system = 'z/VM'
  Then vmduseroff = '200'
  Else vmduseroff = '080'

me = d2x(x2d(result) + x2d(vmduseroff))
Say '... VMDUSER is located at:' me
'READSTRG H'me '8 (VAR VMDUSER'
Say 'VMDUSER is:' vmduser
vmduser = x2c(vmduser)
Say 'VMDUSER field for this VMDBK is "'vmduser'"'
Exit
```
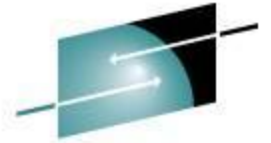
Advanced TRACK features - Macros

- Two ways to execute
  - TRACK * MACRO MYVMD
    - Inits TRACK environment, calls MYVMD and exits TRACK – no panel is displayed
  - TRACK * MYVMD
    - Inits TRACK, calls MYVMD and remains in TRACK panel
- Either MACRO MYVMD or just MYVMD can also be entered on the TRACK command line. The same actions will occur as above except for MACRO: If more than one userid is being TRACKed, only the current userid is dropped and you remain in the TRACK panel for the other userids.

Advanced TRACK features - Macros

- Running MYVMD TRACK on my userid produces:

```
TRACKEE returned: 6CA00000
... VMDUSER is located at: 6CA00200
VMDUSER is: E5C9D5C3C5D5D140
VMDUSER field for this VMDBK is "VINCENJ "
```

Advanced TRACK features – FILE opt

- New FILE option in TRACK z64 V4.2
  TRACK userid track-parms (FILE
  - Saves the contents of the screen into a file on the A disk called "userid TRACKFIL" and then exits TRACK
  - No TRACK panel(s) are displayed
  - Data written is 60 lines by 80 LRECL and contains the 3270 data stream used to display the panel; **no** non-display character translations are done
  - Data is appended to the file if the file exists already
  - File is automatically CLOSED when TRACK exits

Advanced TRACK features – FILE opt

- New FILE option – why?
  - What could you possibly do with this file?
  - Just imagine the possibilities...

Make TRACK available via the Web!

TRACK futures

- There is always something more to add to TRACK! Here is a sampling of my to-do list (it is always changing)
  - Oops… exception when using VST and >2G virtual machine (hopefully fixed by *now*)
  - Linux panels … tbd
  - Redesign and improve HELP files
  - Maybe…
    - EXECINFO to CMS panel (show REXX processing)
    - STORMAP panel

Keeping VM on TRACK!

- TRACK is a very powerful tool for the VM Systems Programmer

- Extremely handy for debugging virtual machine or system problems

- Makes displaying virtual and real storage/devices a snap

- Once you get used to it, navigating through and checking key areas in a userid or storage area for problems will become second nature

- Use it!

Contact Info

Light travels faster than sound, that's why people seem bright until you hear them...

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