





# TRACK for VM

# What's happening in your Virtual Machine? Review & Lab

James Vincent
August 2012
VM Workshop 2014
given by
Dave Jones



#### **Topics**



- What is TRACK?
- A tiny bit of history
- A few details for your reference
  - Documentation, installing, usage
- HANDS ON





#### 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 ITC
  - Dan Martin now with Rocket Software
- Currently maintained by Jim Vincent. (See last page for contact info)

te your sessions evaluation online at SHARE.org/AnaheimEval

#### 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 6.3" is available.
  - This will support all VM versions from XA through z/VM 6.3.0
  - 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





#### **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





#### Pre-built TRACK modules available



- There are <u>unsupported</u>, pre-built TRACK modules in the download VMARC package
  - 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!





#### **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.







- CNTRL files help you manage which version of TRACK is built
  - One for each level of VM supported
    - TRACKV63 z/VM 6.3.0 systems
    - TRACKV62 z/VM 6.2.0 systems
    - TRACKV54 z/VM 5.4.0 and 6.1.0 systems
    - TRACKV53 z/VM 5.3.0 64-bit systems
    - ...etc...







- 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







- 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







- 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**



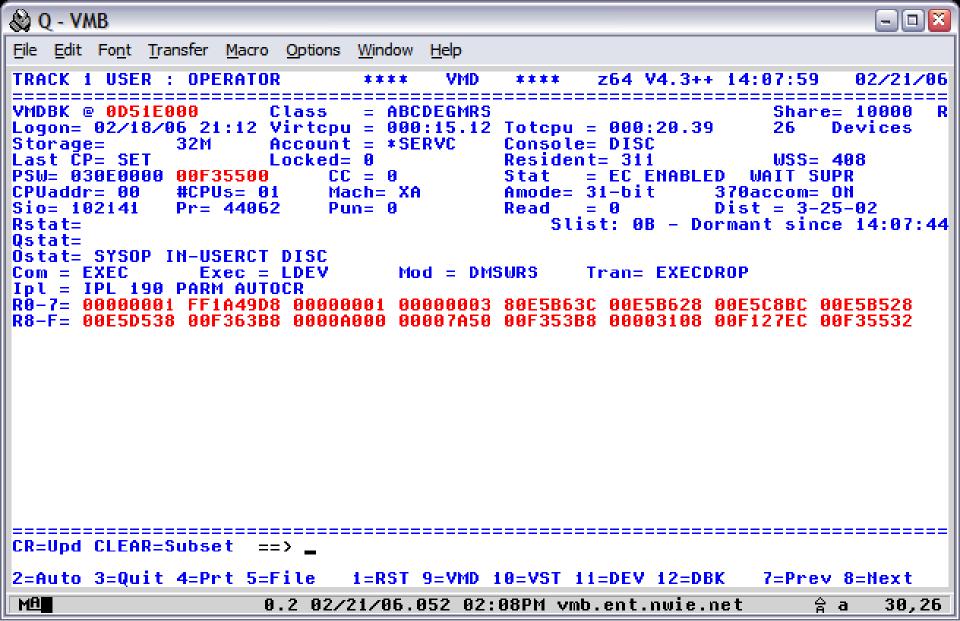
- z/VM 5.2 required a new switch for CP storage
  - Default mode is Host Logical
  - New command:
    - HOSTREAL ON|OFF|?
      - ON makes TRACK look at Host REAL storage
      - OFF looks at Host Logical storage
      - ? Displays the current setting
  - RST will show [ LOGICAL ] or [ REAL ] above the 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!



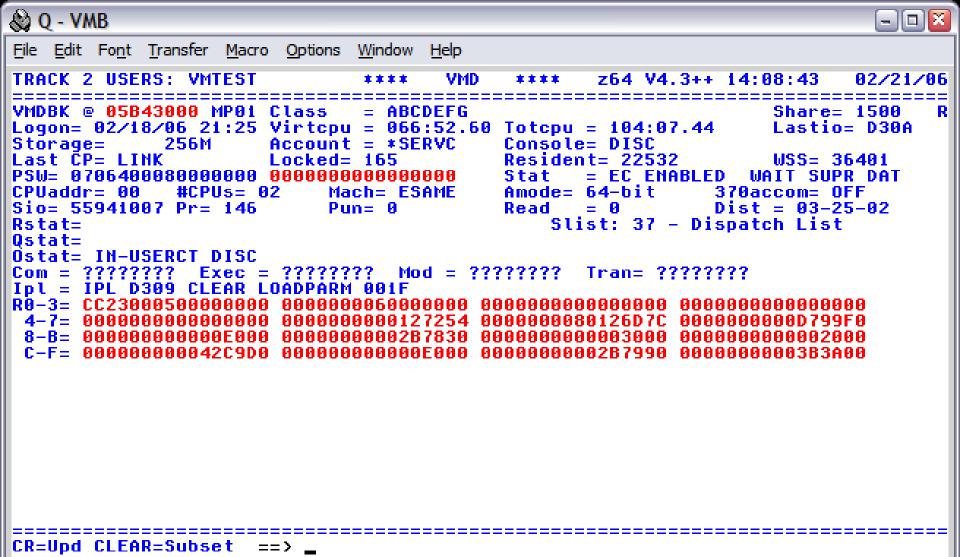
- The simplest invocation: TRACK userid
  - Example: TRACK OPERATOR
- Tap ENTER on any panel to update/refresh the contents
  - Or use the AUTO command to set an automatic update time and limit of updates, then use PF2 (AUTO)
  - Use "AUTO .5" for half-second, almost realtime updates
  - Sit back and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









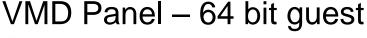


2=Auto 3=Quit 4=Prt 5=File 1=RST 9=VMD 10=VST 11=DEV 12=DBK 7=Prev 8=Next

MA 0.5 02/21/06.052 02:08PM vmb.ent.nwie.net

30,26







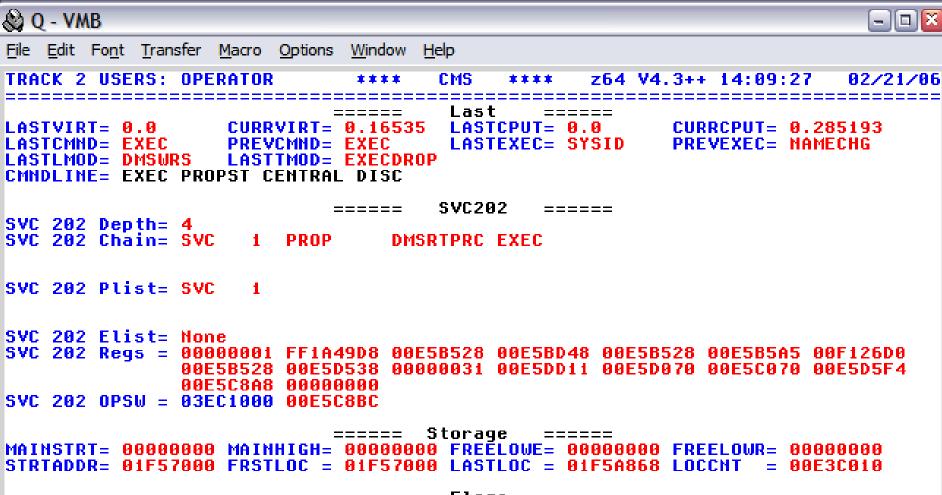
# **Using TRACK**



- 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







===== Flags =====

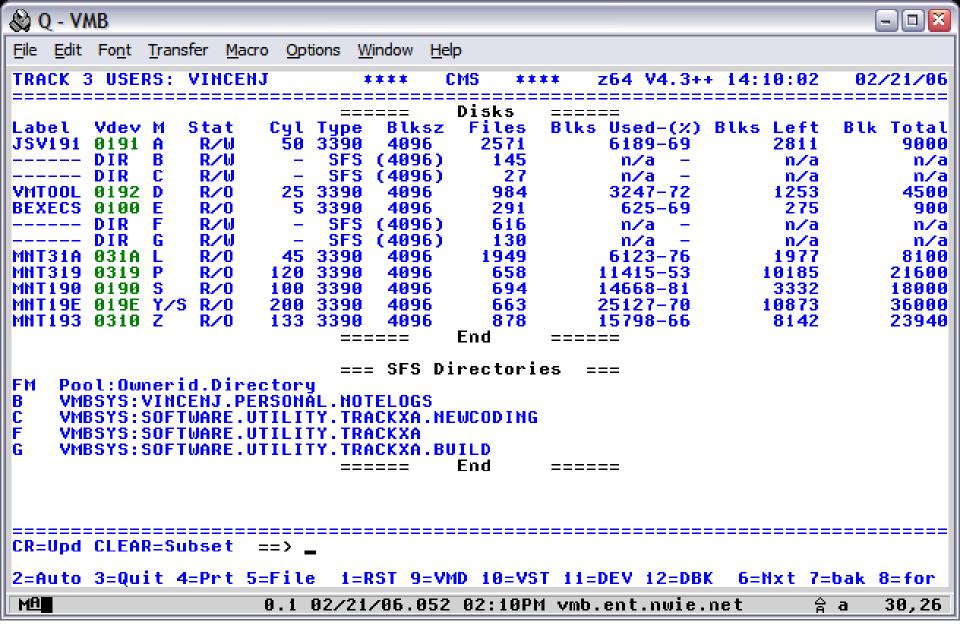
```
CR=Upd CLEAR=Subset ==> _
```

MSGFLAGS=

MA 0.0 02/21/06.052 02:09PM vmb.ent.nwie.net 숡a 30,26







After scanning the TRACK HELPCMS file, you should come HELPCMS file.

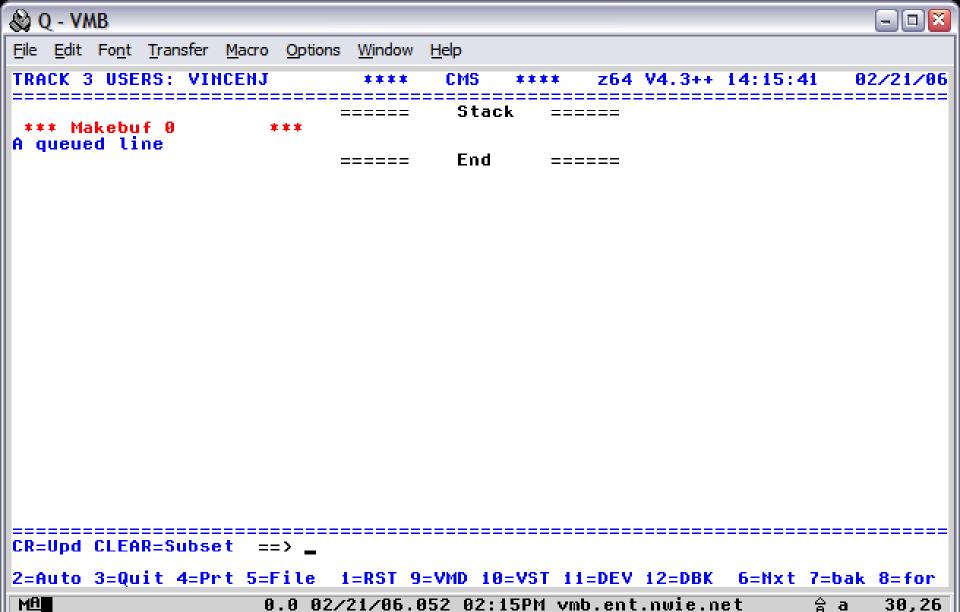
CR=Upd CLEAR=Subset ==> \_

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

MA 0.0 02/21/06.052 02:10PM vmb.ent.nwie.net



30,26





# **Using TRACK**



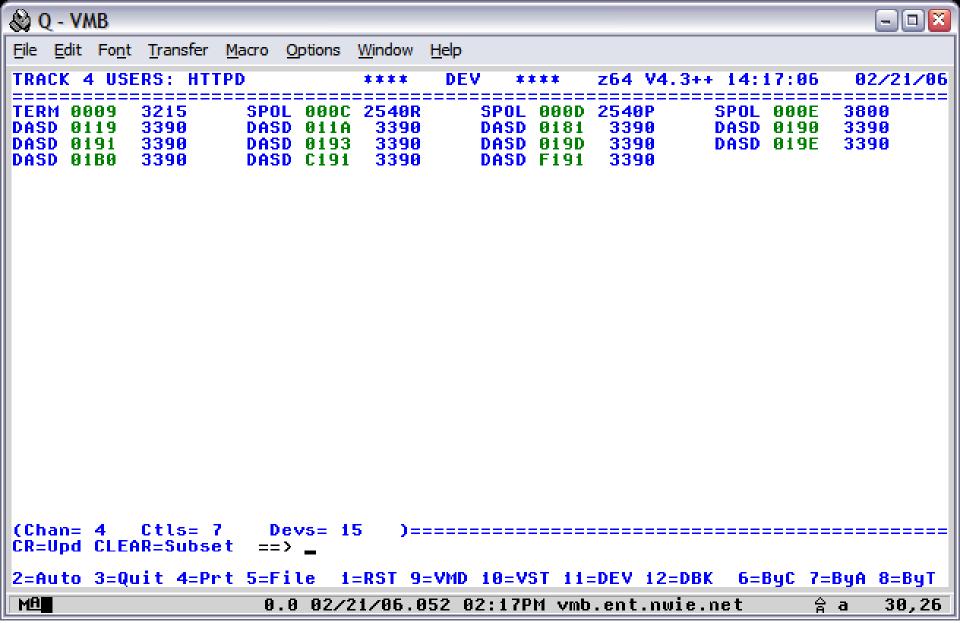
- For examples, I will cycle through the following in order:
  - CONS (open console)
  - DEV (via PF11 virtual devices)
  - NAM ('query names')
  - PFX (prefix page)
  - RST (real storage) and VST (virtual storage)
    - Both with "Disassembly mode" and ASCII display toggle
- Note that these are only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





```
File Edit Font Transfer Macro Options Window Help
TRACK 4 USERS: HTTPD
                                   CON
                                         **** z64 V4.3++ 14:16:25
                                                                    02/21/06
    www.vmb.ent.nwie.net/callup' 'Mozilla/4.0 (compatible; M.
                      99 VIWLOGO773I 29351 .SIE 6.0: Windows NT 5.1: .NET CLR 1
 20 14:16:20 HTTPD
     .1.4322)'.
 21 14:16:20 HTTPD
                      6F VIWHTP0871I Connection 13914 closed, connection wait t
    imed out.
                      99 VIWHTT0800I 29352 172.29.47.49:10542::192.168.122.8:80
 22 14:16:20 HTTPD
     GET /images/workgrp.gif HTTP/1.1.
 23 14:16:20 HTTPD
                      99 VIWLOG0771I 29352 .172.29.47.49 - - [21/Feb/2006:19:16
     :20] 'GET /images/workgrp.gif HTTP/1.1' 304 95 'http://w.
                      99 VĬWĹOĞ0772I 29352 .ww.vmb.ent.nwie.net/callupd?id=ROFN
 24 14:16:20 HTTPD
    +DIRECTRY+C6+06000&caller=callup.html' 'Mozilla/4.0 (com.
                      99 VIWLOG07731 29352 .patible: MSIE 6.0: Windows NT 5.1:
 25 14:16:20 HTTPD
     .HET CLR 1.1.4322)'
 26 14:16:20 HTTPD
                      99 VIWHTP0871I Connection 13956 closed, client closed soc
    ket.
 27 14:16:23 HTTPD
                      92 VIWHTP0871I Connection 13949 closed, client closed soc
    ket.
 28 14:16:24 HTTPD
                      96 VIWHTT0800I 29353 10.197.20.133:3445::192.168.122.8:80
     GET /callund?id=NATIONUS+DIRECTRY+C6+12209&caller=callun
 29 .html HTTP/1.1.
 30 DMSACP723I C (310) R/O
 31 14:16:24 HTTPD
                      96 VIWL0G0771I 29353 .10.197.20.133 - - F21/Feb/2006:19:1
    6:241 'GET /callupd?id=NATIONUS+DIRECTRY+C6+12209&caller.
 tp://www.vmb.ent.nwie.net/callup' 'Mozilla/4.0 (compatib.
                      96 VIWLOG07731 29353 .le: MSIE 6.0: Windows NT 5.0)'.
CR=Upd CLEAR=Subset ==> _
2=Auto 3=Quit 4=Prt 5=File
                          1=RST 9=VMD 10=VST 11=DEV 12=DBK
                                                            7=Back 8=Forward
MA
                    0.0 02/21/06.052 02:16PM vmb.ent.nwie.net
                                                                        30,26
```

CONS Panel – last active open console block





DEV Panel – all virtual devices for the user

in Anahesm

2=Auto 3=Quit 4=Prt 5=File 1=RST 9=VMD 10=VST 11=DEV 12=DBK 6=ByN 7=ByA

48D18000

4F757000

0.0 02/21/06.052 02:17PM vmb.ent.nwie.net 30,26

HTTPDTU3

09865000

1D96A000

HTTPDW5

HTTPD6



HTTPDTTL

HTTPD2

MA

1DB3A000

MORE \*\*\*=Users= 300

CR=Upd CLEAR=Subset

1D868000

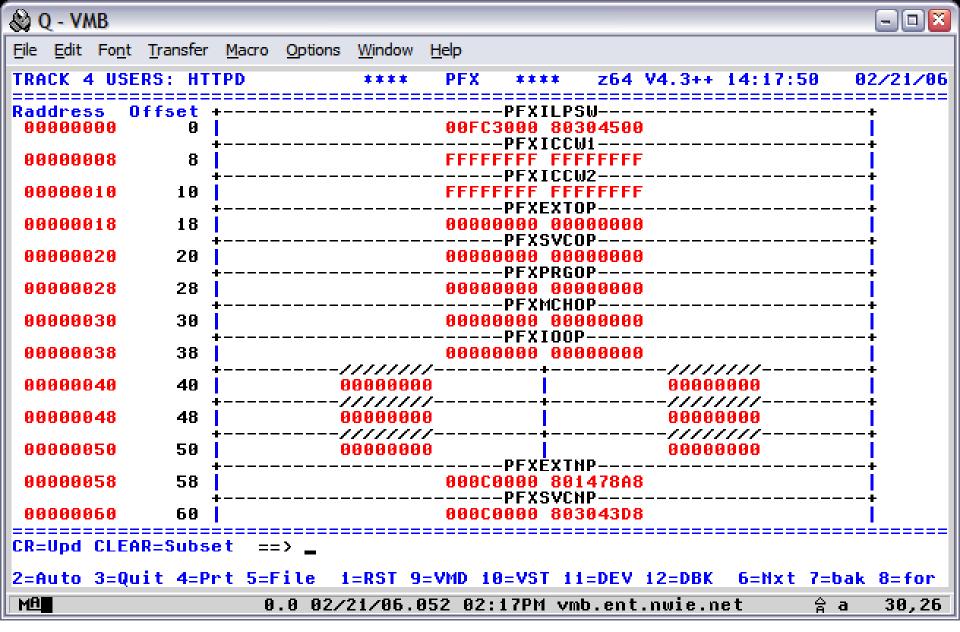
HTTPDTU2

HTTPD2W4



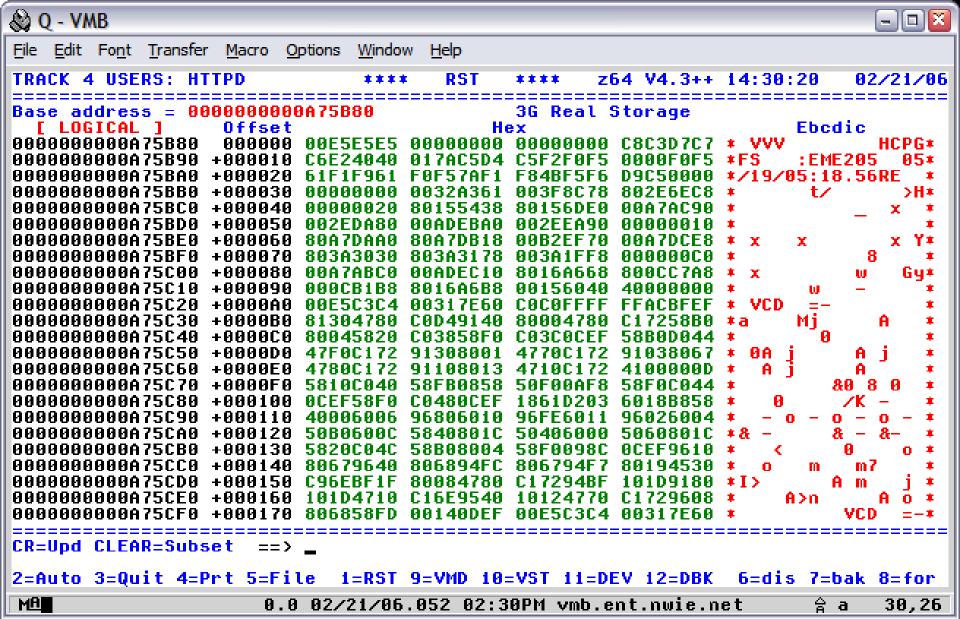
2C83F000

10683000



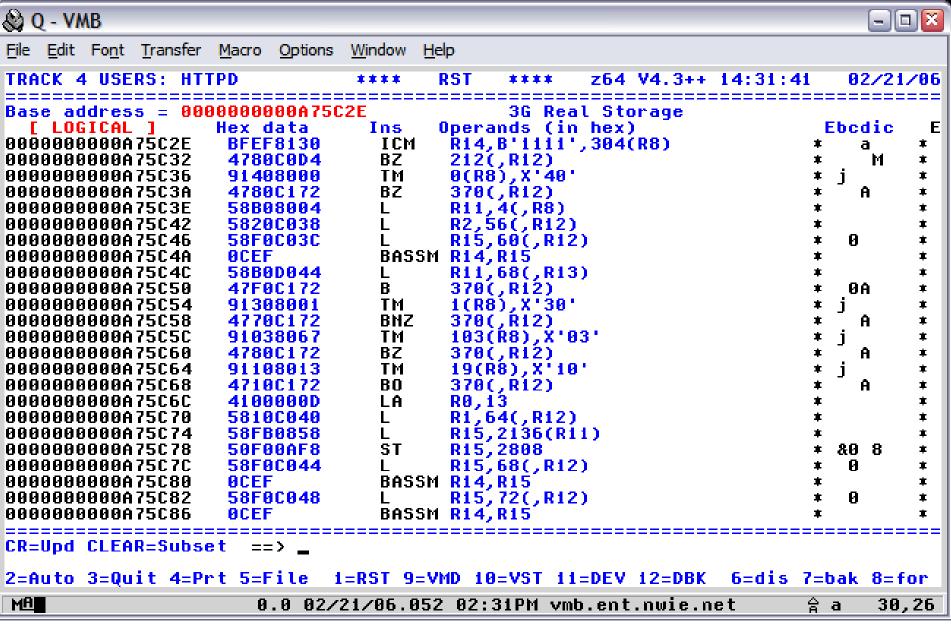






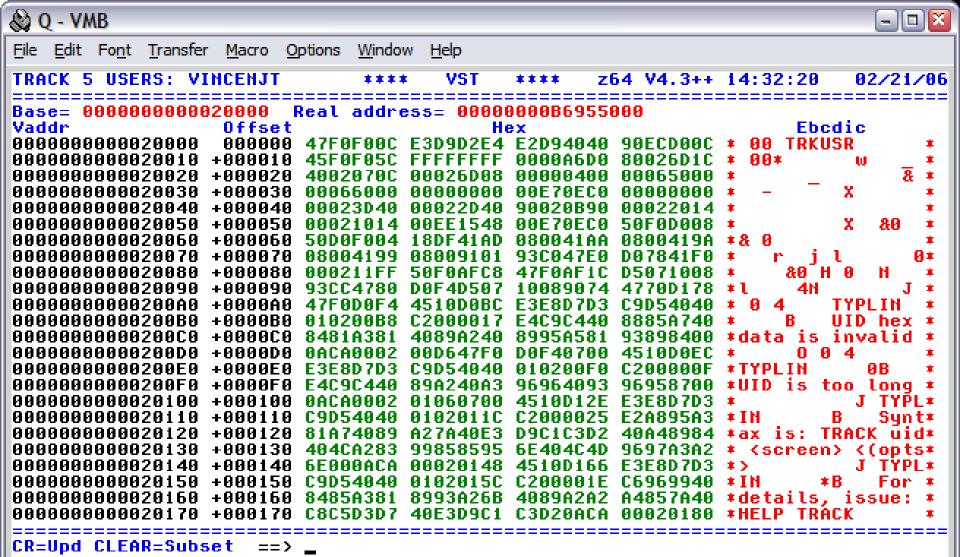
RST Panel – real storage display





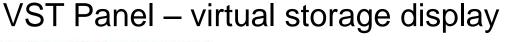




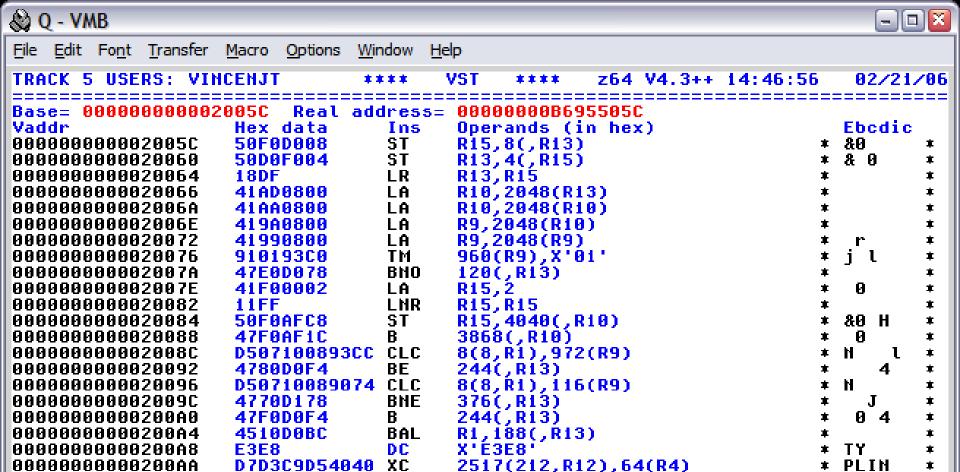


2=Auto 3=Quit 4=Prt 5=File 1=RST 9=VMD 10=VST 11=DEV 12=DBK 6=dis 7=bak 8=for

MA 0.0 02/21/06.052 02:32PM vmb.ent.nwie.net 30,26







UPT

DC

X'00B8C2000017'



0102

00B8C2000017

000000000000200B0

000000000000200B2

000000000000200B8

MA



\*

ASCII display is ON 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

72743D30

30782530

666C6167

VST Panel – virtual storage in ASCII

0.0 02/21/06.052 02:49PM vmb.ent.nwie.net

20736F63 6B2C206D 61702C20 \*

732C2069

20737065 65643D25 646E732C \*x/x. speed=/dns.\*

78253034 782C2073 \* start=0x%04x,

3478295C 6E222C0A \*top=0x%04x) n",

6F2D3E73 \*io->flags.



30,26

sock, map,

7825782C

20737461

746F703D

09202020

696F2D3E

+000130

+000140

+000150

+000160

+000170

0000000011FFFDE0 0000000011FFFDF0

0000000011FFFE00

0000000011FFFE10

MA

# **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 TRACK 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



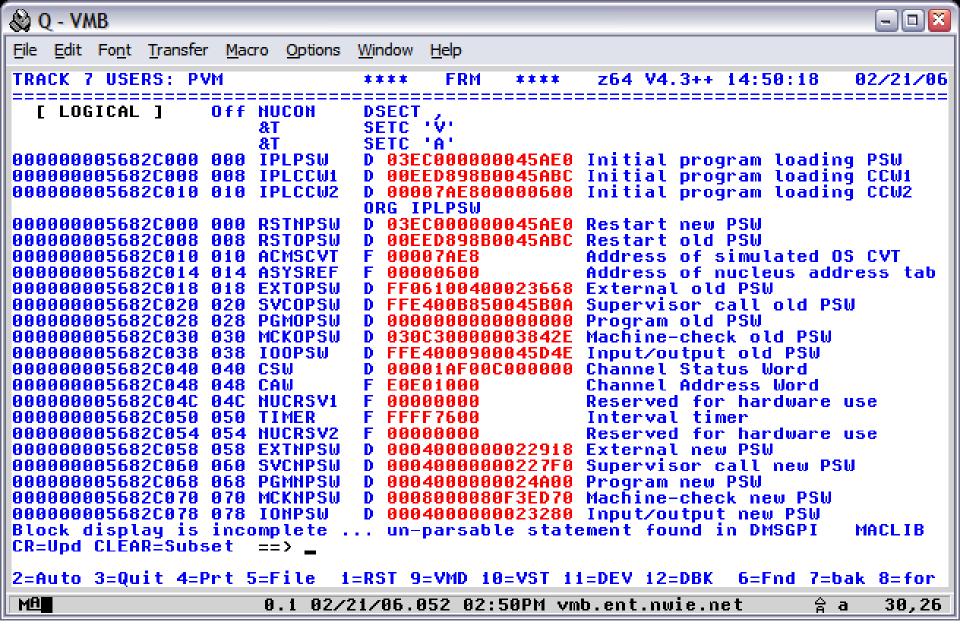


## **Using TRACK - FORMAT**



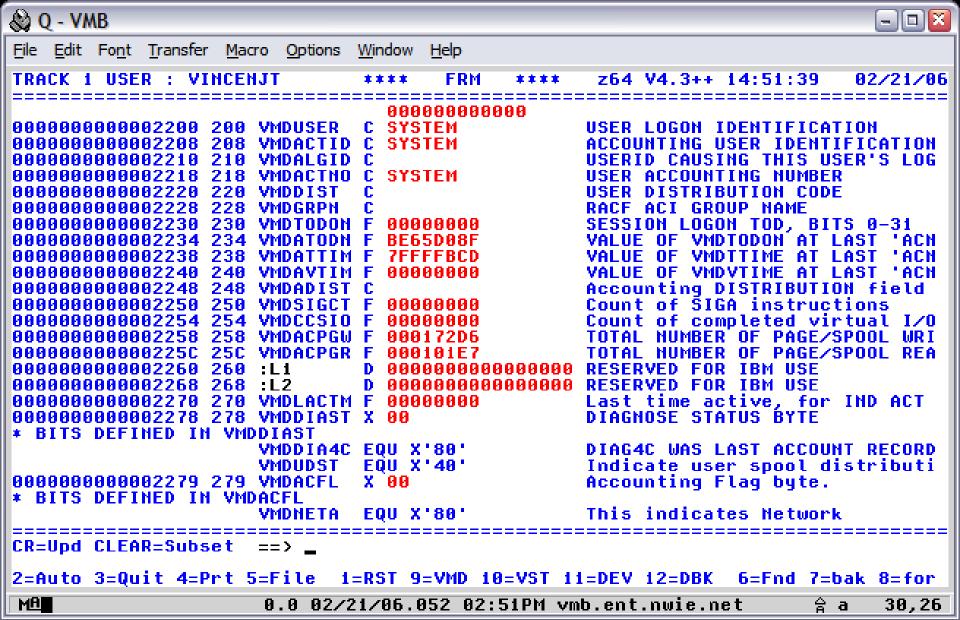
- Read the FORMAT HELP for all the details!
- FORMAT with CP DSECTs
  - You need to have access to MAINT's 193 disk for the MACLIBs
  - Usually best to specify the MACLIB explicitly
    - FORMAT VMDBK 0E8F0000 HCPOM1
- A couple of specific examples...
  - TRACK OPERATOR FORMAT NUCON V0
  - TRACK \* FORMAT 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 EnterEx: FORMAT VMDBK \* HCPOM1 MACLIB



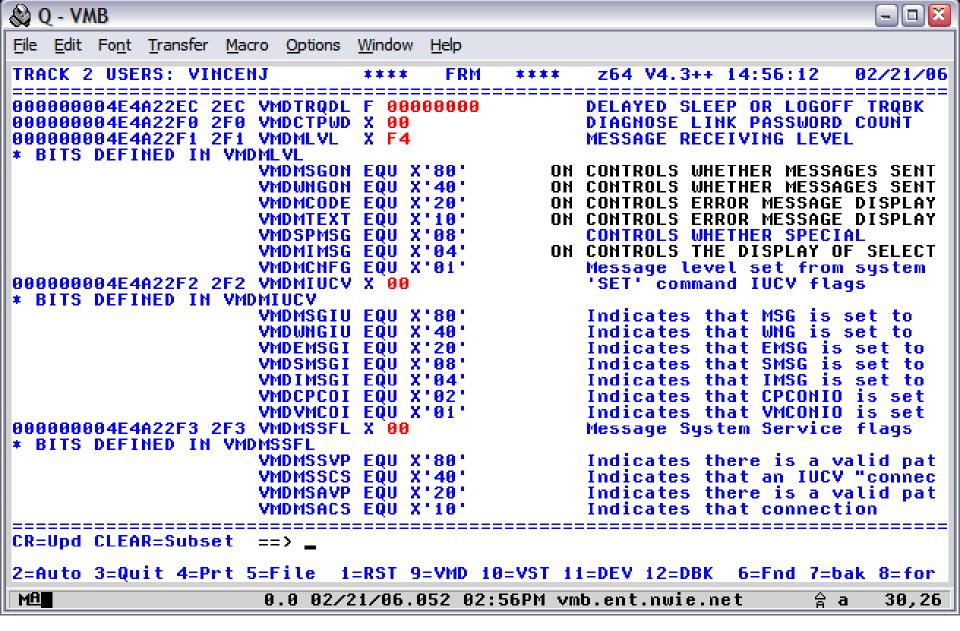


## FORMAT Panel – TRACK PVM FORMAT NUCON VO

in Anaheem



### FORMAT Panel — TRACK \* FORMAT VMDBK 00002000 HCPOM1



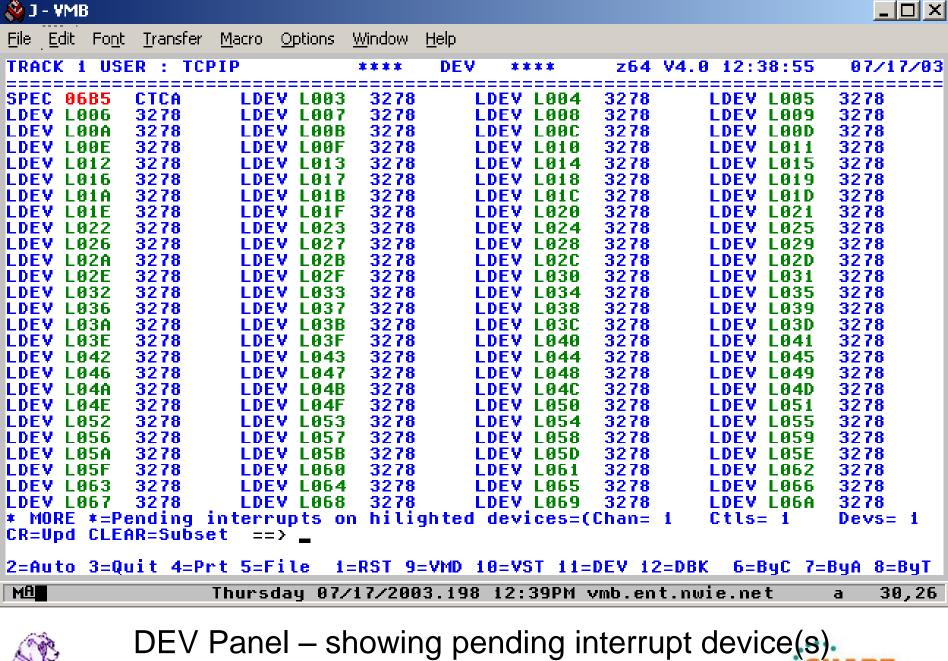
in Anaheim

# **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





your sessions evaluation online at SHARE.org/AnaheimEval

•• in Anah43m



- 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



- 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)



#### 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





- 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.







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; <u>no</u> non-display character translations are done
  - Data is appended to the file if the file exists already
  - File is automatically CLOSED when TRACK exits



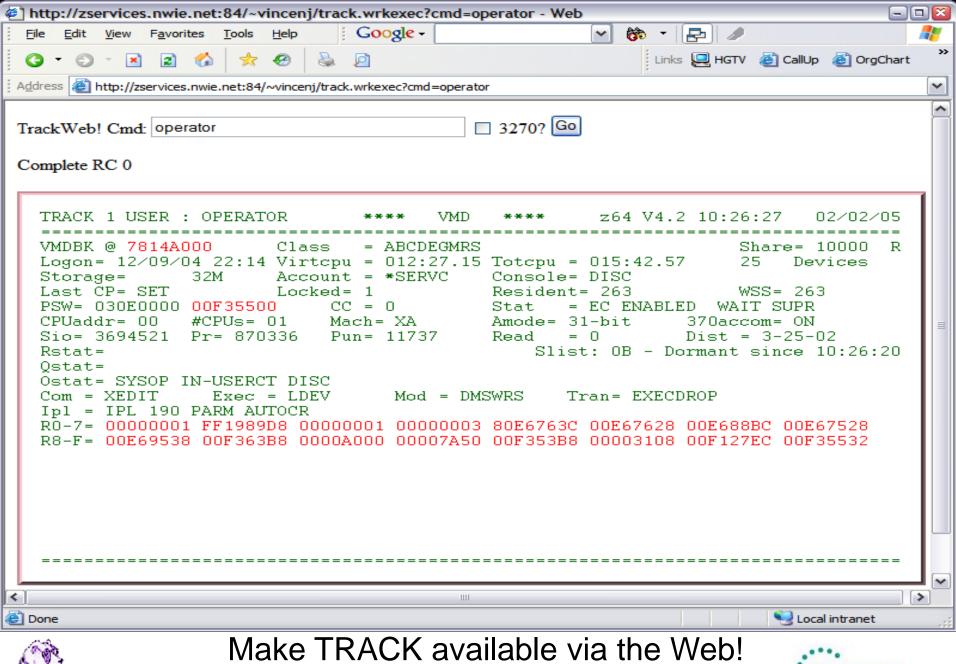


## Advanced TRACK features – FILE opt



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









# **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!

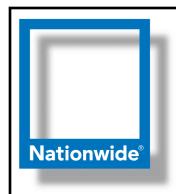


## **Contact Info**



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





James Vincent Sr. z/VM Systems Programmer

Phone: (614) 249-5547

Internet: James.Vincent@nationwide.com

