



Hercules – "mainframe iron in software" Jeff Savit



Disclaimer

• Everything in this presentation is Jeff's opinion, and not that of his employer or anybody else, probably.

- So, what else is new?

 Also, I am not a lawyer, so don't take anything I say as gospel if it has a legal implication. Or, even if it doesn't



What is Hercules?

- Software implementation (emulator) of mainframe hardware:
 - S/370, ESA/390, z/Architecture
 - a variety of I/O devices
- About 110 kloc of multi-threaded C
- Open sourced, portable, based on gcc
 - By Roger Bowler, Jay Maynard, Jan Jaeger, Greg Smith, Volker Bandke, David "Fish" Trout, and other volunteers



Why?

- If you don't have access to the Real Thing
- If you have access to the Real Thing, but inoffice time just isn't enough
- Development
- Hobbyist "retrocomputing"
- Major geek value: surprise your friends by showing them MVS on your laptop



Hercules Runs on:

- Windows 98, NT, 2000 using Cygwin
 - Provides Unix APIs Herc uses, esp: threads
 - Go to sources.redhat.com/cygwin
- Linux (including Linux/390)
 - So, you can run Linux under Hercules under Linux under...
- Solaris
- iMac OS/X
- (Rumored) Alpha, OS/2



Emulated Architectures

- S/370
 - Uniprocessor only
- S/390, ESA
- z/Architecture (64-bit)
- Architecture selected via configuration file or console command



Emulated Devices

- Local non-SNA 3270
- Printer/console (1052, 3215)
- Card reader/punch (2501, 2540, 3505, 3525)
- Printer (1403, 3211)
- Tape (3420, 3480)
- DASD: (3310, 3370, 9336; 2311, 2314, 3330, 3350, 3375, 3380, 3390)
- CTCA and networking (special cases)



Compressed CKD disks

- Optional: Compressed CKD disks
 - Stores track images for non-null tracks only
 - Actual track contents stored, not max track size
 - Track compressed via bzip2 or zlib
 - Can specify readahead, full track I/O, cache, lazy writes, etc
- Shadow files for data integrity:
 - Base file and N shadow files containing deltas
 - All changes to current shadow file, others R/O
- Utilities to convert, validate



Tapes

• Can be any of:

- AWS tapes (like on P/390)
- HET (Hercules Emulated Tape); like AWS, but with compression
- OMA (Optical Media Attach) files with .tdf files to specify contents
- "Real" SCSI tape drives, on Wintel, at least
- Emulated 3420, 3480



CTCA

- Can use to connect multiple instances of Hercules via vmnet
- Can use to connect guest S/390 OS IP stack to host's stack via TUN/TAP driver
 - Use for TCP/IP and for Herc-to-Herc comm
 - Point to point connection
 - Linux and Solaris/86 only, today
 - Windows version being tested now



Config file

- CPUSERIAL 000611
- CPUMODEL 3090
- MAINSIZE 64
- XPNDSIZE 20
- CNSLPORT 3270
- NUMCPU 1
- ARCHMODE ESA/390
- LOADPARM 0120....
- SYSEPOCH 1900
- TZOFFSET -0500
- oC 3505 icl.txt ascii trunc



Config file, continued

- OSTAILOR OS/390
- PANRATE FAST
- 000C 3505 jcl.txt ascii trunc
- 000D 3525 pchood.txt ascii
- **-** 000E 1403 prt00e.txt
- **-** 001F 3270
- 0120 3380 mvsv5r.120
- **-** 0121 3380 mvsv5d.121
- 0122 3380 mvswk1.122



What OSes run on Hercules

- Freely downloadable OSes:
 - OS/360
 - MVS 3.8
 - VM/370 Release 6
 - Linux for S/390 or zSeries
- Licensed IBM OSes are known to work:
 - MVS/XA, OS/390, z/OS
 - VM/ESA, z/VM
 - VSE/ESA



Performance

- Quite respectable, actually
 - Rough ROT: 1+ MIPS per 100Mhz
 - Very variable based on actual instruction
 - SS instructions slow, for example
 - 20+ MIPS reported for dual Athlon 1.7Ghz
 - 200 Mhz Pentium with 32MB RAM ok low end
- Multiple CPU support very new
 - Real SMP useful for running CPU threads separate from panel, I/O, and timer threads
- Performance being tweaked all the time



Licensing Software

- I don't know, really
- It is claimed that you can license IBM software to run on Hercules via:
 - Run as disaster recovery machine for licensed
 P/390 or mainframe
 - Get an OTC or LTU license. I don't know how
- Controversial subject. One guy actually got kicked off the Hercules mailing list!
- Mentioned in SG255987 (Linux for S/390 Redbook) so there's some IBM notice of it



Operation

- Download and install
 - Self-extracting EXE for Windows, but you have to install Cygwin for it to run
 - RPM for Linux
 - Autoconf/Automake to rebuild
- Build a config file
- Start it in a command-line window
 - Brings up command/display panel
- Connect a telnet/tn3270 client to localhost at designated port in config file



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Looks like (with Fish WinGUI)

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Looks like... on iMac G4

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Conclusions/Notes

- You can run a 360/370/390 on your PC
 - Faster than any real 360/370 ever was; breaks some timing loops on older OSes!
- Not sure if you can use it for "real work"
 - Legal issues
 - Not the authors' intention anyway
- Impressive "feels like the real thing"
- Shocking proof of Moore's Law



Resources

- www.conmicro.cx/hercules
- www.i-foo.com/hercules
- www.jaymosely.com
- www.bsp-gmbh.com/hercules/
- penguinvm.princeton.edu/hercules/
- ftp://source.rfc822.org/pub/mirror/hercul es/mvs38j/
- groups.yahoo.com: see hercules-390 list, and also H390-VM





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