

412 Project Suggestions (Overview)

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Movie Night

“War Games”

- Thursday, August 28th
- 19:00, Wean 7500
- \$1 pizza contribution
- Presented by the CMU Computer Club

Disclaimer

- Most entries on *my* list are Plan 9 projects
- You don't have to do a Plan 9 project
- Going over the list is designed mainly to spark inspiration (at this point)
- For today, think of Plan 9 as just a platform with an unusual number of low-hanging-fruit projects
 - Plus it has shock value at parties

Plan 9 “Kernel” Projects

- PlayStation 3
- MIPS32 or MIPS64 laptop
- Partial SPARC-64 (non-laptop) port
- Nokia 770/8xx tablet
- SMART
- SpeedStep
- USB (e.g., Ethernet)
- 802.11b \Rightarrow a/g/n

PlayStation 3 Port

- Processor: IBM Cell “Broadband Engine”
 - A slow-ish PowerPC plus 7 co-processors
- Platform
 - Third-party OS's run under a hypervisor
 - “Yellow Dog Linux” is fallback documentation
- Related work
 - Partial port of Inferno to Cell via 2007 GSoC

MIPS32/64

- Plan 9 used to run on MIPS32
- A MIPS64 port is in progress
 - Compiler “nearly done”
 - Kernel partly done
 - ...both by external mentor (who has “more insight than time”)
- Why?
 - Clean RISC architecture, embedded h/w
 - Three existing laptops... plus one supercomputer...

SPARC-64 Port

- Plan 9 used to run on sparc-32 (2e)
- A 4e sparc-32 port is in progress
- Also a 4e sparc-64 port (further along)
- Machine in use: Ultra-2 (I have one)
- Plan
 - Get Ultra-2 running here (good infrastructure)
 - Work toward a more modern machine (SB-100/150)
- Why? “Niagara”

Nokia 770 / N800

- The device
 - Size of a paper-back book
 - ARM, RAM, Flash, 802.11, touch screen
 - Running Linux (e.g., some documentation)
- Plan 9 runs on (old) Compaq iPaq, also ARM
 - I can borrow some from Satya

SMART

- Talking to your disk about health
 - Temperature, shock, error rates
- Lots of documentation, lots of code
- Plan 9: each disk is already a file system
 - /dev/sdC0
 - /ctl
 - /data, /raw
 - /dos, /freebsd1
- Goal: add SMART to existing disk fs

Processor Speed Control

- Processors are hot these days – scalding!
- Conceptually easy to slow when load is low
 - Check length of run queue
 - My 1.6 GHz laptop frequently runs at 150 MHz
- “The nice thing about standards is there are so many to choose from”
 - Pentium M (early), Pentium M (modern), ...
- Goal: kernel device, user-space daemon

USB Kernel Hacking

- USB has three flavors
 - UHCI – Intel (“Universal”), 1.0
 - OHCI – Apple/Nvidia (“Open”), 1.0
 - EHCI – terrifying parallel universe
- Plan 9 supports UHCI, OHCI
 - EHCI would probably be terrifying

USB Non-kernel Hacking

- There are *lots* of USB devices (that's the point)
 - Memory-card readers
 - Wireless (and wired!) network interfaces
 - RS-232 serial port adaptors
- Plan
 - Pick one, make it work well
 - One 802.11 device has a nice OpenBSD driver
 - Warm-up: some kind of device-tree browser

802.11 PCI/PCIe

- Currently: solid 802.11b support for “Wavelan” (AT&T/Lucent/Agere/Avaya “Orinoco”) cards
- I believe reasonable and documented g hardware exists
- “Framework” work – some done, some to do

Plan 9 “File System” Projects

- Extensions to cdfs, the cd-burner file system
 - “Burn-free” buffer-underrun protection?
 - Add DVD-RAM support
- PalmOS file system
 - Partial code exists

Plan 9 Security: PubCookie

- “PubCookie” web authentication
 - Like AFS – once you have it, you wonder how you lived without it
 - Crypto experience in real world
- Potentially interesting
 - Compare resulting code against Apache module
 - If extra time: provide auth server too

Plan 9 Security Projects

- X.509 certificate file system
- Add AES to existing SSL file system
- Disk encryption
- Work on WPA
 - Some work in progress by a reasonable person
- SSH v2 (for native client)
 - This is “85% done” - investigate, extend

Plan 9 Language Projects

- Squeak
 - Open source Smalltalk VM, written in Smalltalk
 - Basis for exciting distributed applications
 - Architected for portability
 - Local enthusiast available to mentor

QEMU for Plan 9

- QEMU is ... odd
 - Emulation, but not via an interpreter
 - Binary translation, but without knowing target machine language
- Status of QEMU for Plan 9
 - Christoph Lohmann ported some infrastructure
 - Wes Filardo did 95% of code translator...
 - QEMU rewrote code translator from scratch!

QEMU for Plan 9

- Why?
 - You'll really understand binary translation
 - (one of the VMware mysteries)
 - Better understanding of PC hardware
 - Interesting networking code to do, too

“Platform” Projects

- May or may not be Plan 9
 - LinuxBIOS
 - Xen
 - Port Plan 9 to latest Xen
 - Plan 9 “domain 0” for Xen
 - Other projects
- Soekris (mini-PC) boxes
 - Maybe some porting; bridge

“Platform” Projects

- “Odd boxes”
 - PowerPC
 - Kuro Box
 - PegasosPPC.com “Open Desktop Workstation”
 - OpenFirmware+PPC...we have some code like that...
 - CerfCube – 3-inch cube with a PPC machine inside
 - NSLU2 or other ARM machine
 - Linux runs on them, P9 runs on some ARM machines

MadWifi

- Distribute CMU MadWifi work
 - Two existing research projects, “demo quality” code
 - CHARM rate-selection algorithm
</afs/cs/project/cmcl/archive/2008/RateFinal.pdf>
 - FlexMAC pluggable MAC layer
 - <http://www.ece.cmu.edu/~meihsual/wint05-lu.pdf>
 - Re-write, operational validation (multiple cards, real environment), prep for distribution
 - Series of mini-projects, local mentorship, gateway to research project

Other Projects

- Work on Darwin OpenAFS cache manager
 - Working code base, with rough edges
 - Local mentor available
- FreeBSD S4OS
 - Goal: suspend-to-disk
 - Well understood, but not easy
 - Grading will be scaled appropriately

Other Projects

- Click “modular router” project
 - Target: Soekris tiny router box (start: simics)
 - Goal: point-and-click DSL link scheduler
- [insert your project here]
- Linux – kernelnewbies.org
- FreeBSD – freebsd.org
- NetBSD – you get the idea
- “Finish” Plan 9 port on PPC iMac

“Dave's Top Picks”

- MadWifi wireless work
- Darwin OpenAFS cache manager
- Plan 9 on MIPS laptop
- Plan 9 WebISO or X.509 file system
- Plan 9 user-space USB driver (TEW-429UB)
- FreeBSD S4OS

Next Steps

- Read the Amoeba/Sprite paper for Friday
- Please add “candidate projects” page to wiki
- Turn things over in your mind...
 - Linux/BSD projects abound
 - May be higher turmoil
 - We have Plan 9 “mini-projects” for warm-up
- Multiple ways to coherence
 - Pick an OS, pick a type of project, pick a partner
 - Any constraint will help you focus