

# 412 Project Suggestions (Overview)

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# Movie Night

“Tron”

- Wednesday, August 26<sup>th</sup>
- 19:00, Wean 7500
- 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
- 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
  - Initial investigation during Fall '08 15-412

# 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”

# 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 (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
- UDF file-system support
  - UDF is like ISO9660 but “more so”
  - Three steps
    - Reader (“nice exercise”)
    - One-shot creator (not too hard)
    - Live writer (“future work”)

# Plan 9 “VM client” Projects

- VMware defined a “smart client” API
  - Share cut&paste buffer between guest & host
  - Mouse management
  - Old API: NDA, no longer works perfectly
  - New API: public, not supported yet...
- Microsoft released “make Linux run better in Hyper-V” code
  - Maybe other OS's could run better, too...

# 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
- OpenPGP-message file system
- Add pre-auth to p9sk1 (“isomorphic to” krb4)
  - Key ingredient: sign-off from a security expert
- Add AES to existing SSL file system
- Disk encryption
- Work on WPA
  - Some work in progress by a reasonable person

# 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”
  - Palm Pre (custom kernels can be built)
  - 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

# OS X / Darwin

- Work on Darwin OpenAFS cache manager
  - Working code base, with rough edges
  - Local mentor available
- Upgrade OS X ext2 support to ext3 (journal)
- (Some) support for ELF binaries on OS X?

# NetWatch

- NetWatch is “fun stuff” hidden in SMM
- Useful directions
  - Port to another motherboard
  - Emulate a (small) IDE disk

# Other Projects

- FreeBSD S4OS
  - Goal: suspend-to-disk
  - Well understood, but not easy
    - The trail is littered with corpses
  - 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](http://kernelnewbies.org)
- FreeBSD – [freebsd.org](http://freebsd.org)
- NetBSD – you get the idea
- “Finish” Plan 9 port on PPC iMac

# “Dave's Top Picks”

- Plan 9 on MIPS (laptop eventually)
- Plan 9 on PS3
- Plan 9 WebISO or X.509 file system
- Plan 9 UDF/X.509/OpenPGP file systems
- Darwin OpenAFS cache manager
- 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