Embedded Linux BOF

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Overview

• What's happened over the last year?
• Kernel
• Other software
• Interesting products
Overview (cont.)

- Distributions
- Licensing
- Initiatives
- A problem discussion
- Open discussion
Kernel – Major features

• Embedded features in last year:
  – from 2.6.16 to 2.6.21+

• Clock events

• High resolution timers

• Tickless (dynamic ticks)

• Generic interrupt code
Kernel - interesting patches

- Regulatory domains
  - Ability for kernel to police regulatory compliance (for radio usage)
Kernel - interesting patches

- Pagemap instrumentation
  - Allows for detailed look at system memory utilization
  - Queued in mm
  - Matt Mackall will discuss in CELF BOF Friday night at Westin
Tech areas:

- Security
- RealTime
- Bootup Time
- Size
- Power Management
- Multimedia
Security

• SELinux vs. AppArmour vs. Tomoyo
  – Big fights on kernel mailing list about pathname-based vs. label-based security.
  – Will a pathname-based security system ever make it into the kernel?
Real time - mainline status

- RT-preempt is continuing its (apparently) inexorable march to mainline
- Have been following Thomas' timeline:
  - July 2006: (2.6.18) pifutexes, generic interrupt layer (ARM, PPC), lock dependency validator
  - October 2006: (2.6.19) generic interrupt layer (i386, x86_64, MSI)
  - February 2007: (2.6.21) high res timer / dynticks core code + i386 support
- Future timeline (hoped for):
  - 2.6.23: threaded interrupt handlers
  - 2.6.24: sleeping spinlocks core
  - 2.6.25: real time core code (i386, x64_86)
  - .... more architectures
RT testing

• RT-preempt testing done by several CELF companies
• Document by CELF is in progress
  – Realtime testing best practices
• Some information will be presented at the CELF BOF
  – Friday 7:00 pm at Westin, 4th floor
Bootup time

• Fast resume boot techniques are in production
  – e.g. Sony camcorder uses snapshot boot
• MIPS prelinking project
• Dave Jones excellent talk from OLS 2006
  – Results after 1 year: things got worse
    • See Dave Jones blog for June 13 for details
    • Dave says “Looks like there's still mileage in that talk after all.”
Size

- Bigger problem than kernel size is application size!
- Linux-tiny
  - Highest reduction patches already integrated (as of about 2.6.11)
  - Not actively maintained in last year
  - Any takers??
Size (cont.)

- Busybox/Toybox status??
  - Toybox is new clean-room implementation of small utility suite by Rob Landley
- uClibc
  - Could be a refuge from LGPL v3
- LSB profile for embedded
  - Discussed at Collaboration summit
Power Management

- PM framework stuff for embedded stalled
- There's a PM BOF later this week
- Any quick report from PM summit?
Multimedia

• Linux Sound currently a mess
  – See presentation by Lennart Poettering on Saturday

• Gstreamer gaining traction in handheld space
Distributions

• OpenEmbedded
  – Still chugging along, CELF has funded some work

• Embedded Debian
  – Don’t know status

• Fedora for ARM
  – New project
License issues

• Non-GPL loadable modules:
  – Discussion on LKML in December on technical measures to prevent loading proprietary loadable modules

• Ndlswrapper detection and thwarting

• GPLv3
  – Apparently not the kernel
  – Waiting to see timing for LGPLv3
License issues – GPLv3

• Apparently kernel will stay GPLv2
  – Kernel developers issued joint statement about problems with GPLv3
  – Hard to overcome practical problems with re-licensing

• Glibc will be major issue (if you care about DRM)
  – LGPLv3 schedule unknown
  – There are workarounds to make sure GPLv3 software is not used as part of DRM scheme
Interesting Products

• Sony PS3
• Sony HD Camcorders and Digital Still Cameras
  – DSC-G1 = a sweet product (if I say so myself)
• Wireless, with DLNA
• Motorola phones
  – Linux phone coming to US by end of 2007
Interesting Products

• TrollTech Green Phone
• Nokia N800 - next gen. Internet tablet
• Calao Linux in USB-key form factor
• Neuros - Audio recorder
• Sonos Zoneplayer - audio server with remotes
Interesting Products (cont.)

- LearningSoft Indigo - educator testing aid
- SysMaster Tornado - VOIP with PBX, settop box
- Hammer Storage - NAS products
- Many more - see Linuxdevices.com device showcase
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Initiatives

- Organizations
- Projects
New Organizations

• OSDL + FSG = The Linux Foundation (TLF?)
• LiMo = Linux in Mobile organization
• GMAE = Gnome Mobile and Embedded
Projects

• OpenMoko
• Ubuntu mobile
• OpenEmbedded
• Maemo
Embedded Wiki

• CELF is building an Embedded Linux wiki
  – Come to the Embedded Wiki BOF for details
  – Will be fun – trust me!

• If you can't make it to BOF, see http://elinux.org/
Community Gripes with Embedded folks

• Lack of participation
  – “Drop a patch and disappear”
  – Have been trying to improve this for years
  – CELF has a document targeted at middle management in Japan

• Worth polishing in English??
Version Gap

- Problem: Embedded developers are using very old versions of Linux software, and it's hard to participate.
  - Example: Most Sony TV's ship with 2.4 (although some cameras ship with 2.6.11!)

- Normal development cycle:
  - Lock down OS early
  - Write software on top, do QA testing
  - Follow bugfixes in mainline, and backport them
  - Publish tarball at product release
    - Integrated patches – Yuk!

- Cumulative version gaps
  - Arch is behind mainline
  - Dev. Board port is behind arch
  - Custom board port is behind dev. board port
Version Gap ideas

• Any way to fight the version gap?

• Possible solutions:
  – Two versions: research (at top of tree) and product
  – Track mainline during development cycle (Nokia seems to do this at least partially)
    • Argument against it is QA – testing on mainline dwarfs private testing, but doesn't necessarily cover our use cases
  – Forward-port fixes as they are encountered (but requires up-to-date board ports for testing)
  – Use a “proxy”, like MontaVista or an internal R&D group, to push stuff upstream
Open Discussion