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
  - Paper is at:
    http://ols2006.108.redhat.com/reprints/jones-reprint.pdf
  - 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

- Ndiswrapper 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

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 targetted 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 to 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