



# ***CE Linux Forum***

## **Embedded Linux Update March, 2010**

**Tim Bird**

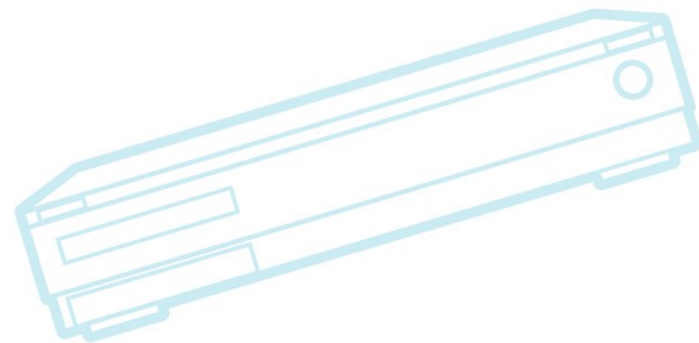
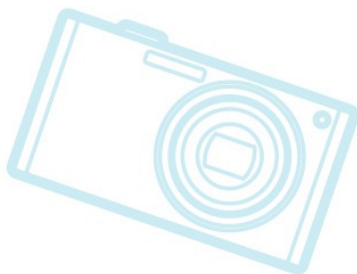
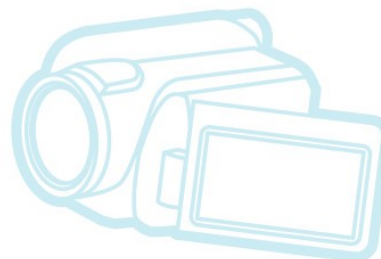
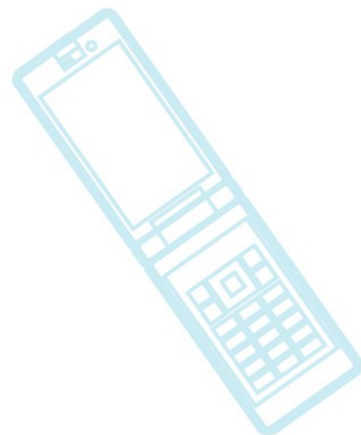
**CELF Architecture Group Chair**



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# Outline

- Kernel Versions
- Technology Areas
- Embedded Distributions
- Resources

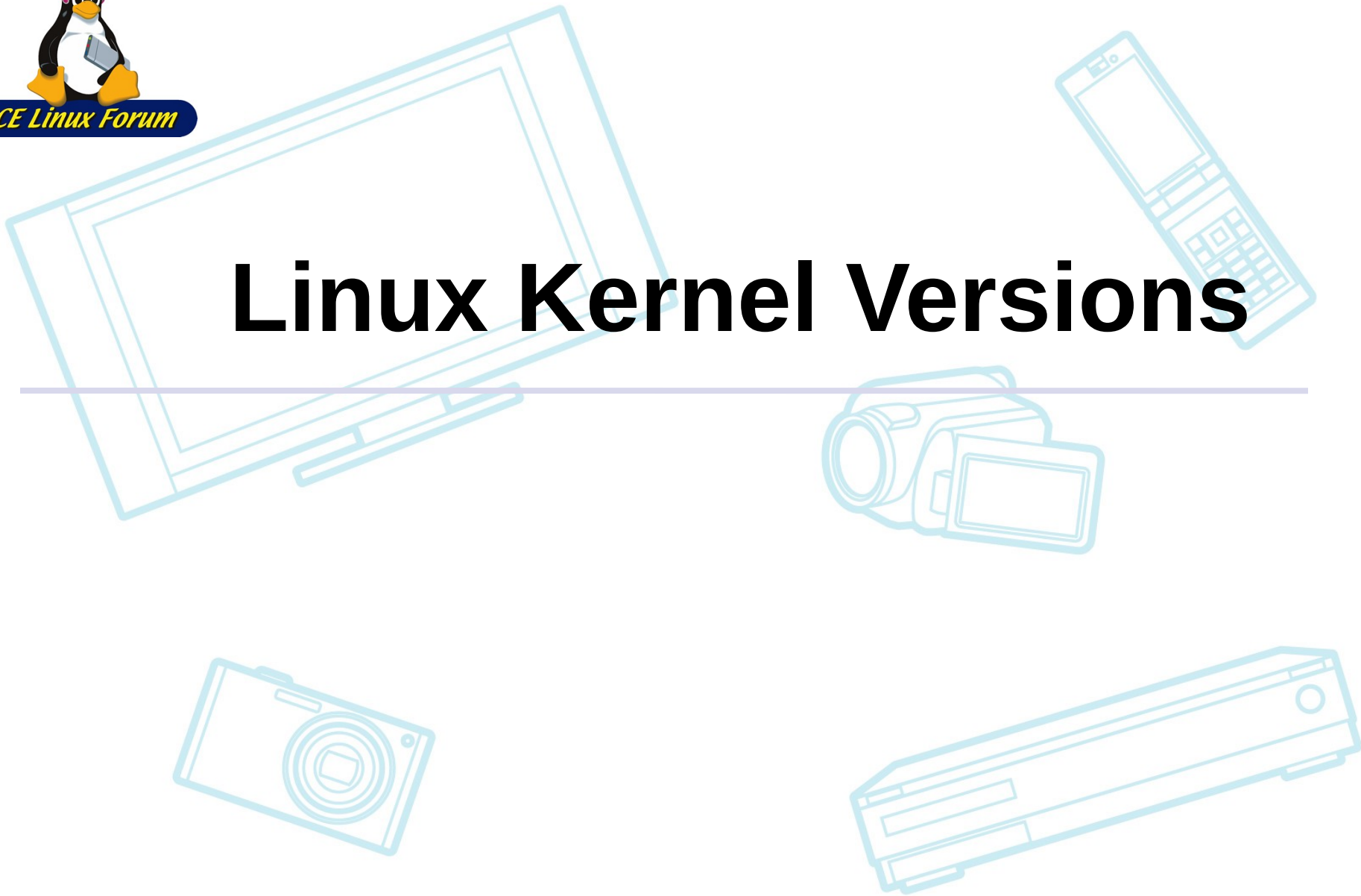




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# Linux Kernel Versions

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# Kernel Versions

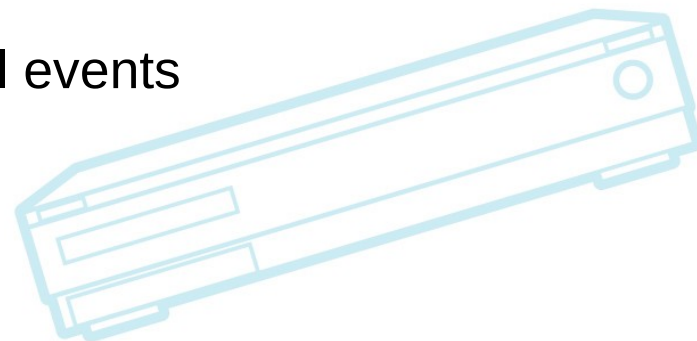
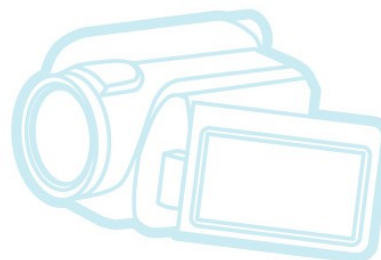
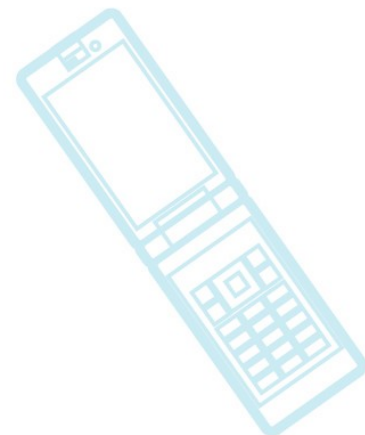
- Linux v2.6.28 – 24 Dec 2008
- Linux v2.6.29 – 23 Mar 2009
- Linux v2.6.30 – 10 June 2009
- Linux v2.6.31 – 9 Sep 2009
- Linux v2.6.32 – 2 Dec 2009
- **Linux v2.6.33 – 24 Feb 2010**
- **Linux v2.6.34 (merge window open)**



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# Linux v.2.6.33

- devtmpfs
  - Dynamic, fast population of /dev
  - Very good for embedded!
  - <http://lwn.net/Articles/331818/>
- LZO kernel compression
- New scheduler tracepoints
- Timechart tool
  - New tool to create SVG chart of kernel events
  - See <http://blog.fenrus.org/?p=5>
- New info in /proc/meminfo
  - Good for finding OOM problems





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# Patches to watch

- kbuild: kconfig CROSS\_COMPILE option
  - Puts ARCH and CROSS\_COMPILE into files in build directory
  - Makes it easier when building for multiple architectures
  - Mainline effort stalled, was recently re-submitted again
- Speed up symbol resolution during module loading
  - Sorts symbol table and avoid linear lookup cost per symbol when loading a module
  - Developer, Alan Jenkins, reports saving 20% of time on coldboot
  - Depends on modules being loaded
  - Did not make it into 2.6.33



# Patches to watch (cont.)

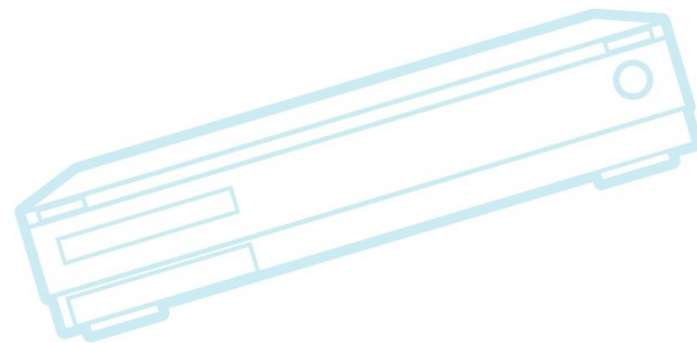
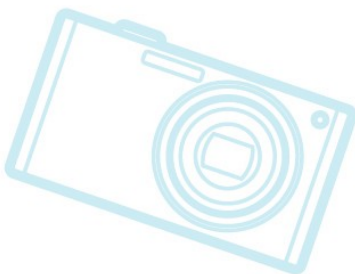
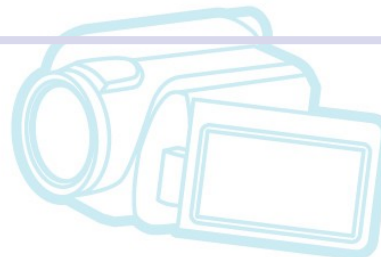
- CONFIG\_PRINTK\_VERBOSITY
  - Allows compiling out printk messages below a certain printk level
- Generic clock frameworks
- Generic-asm
  - Simplifications and cleanup of architecture support
  - Was discussed at Kernel Summit



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# Technology Areas

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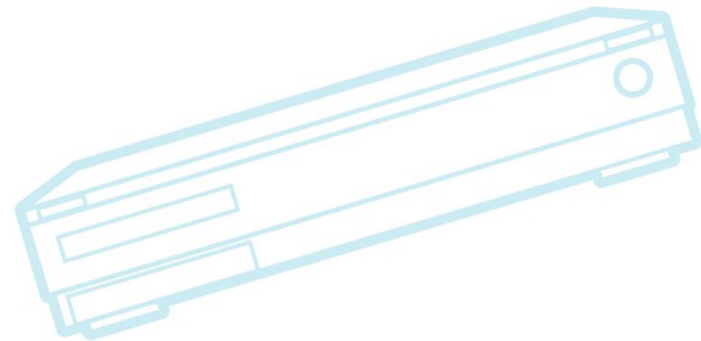
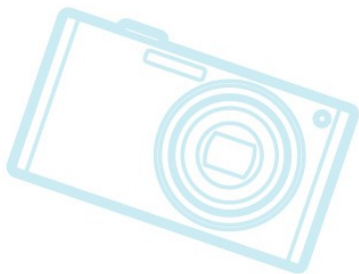
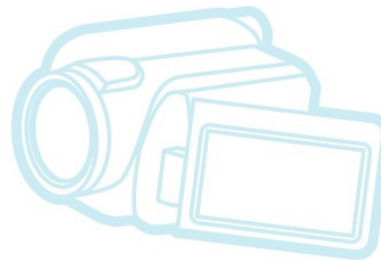
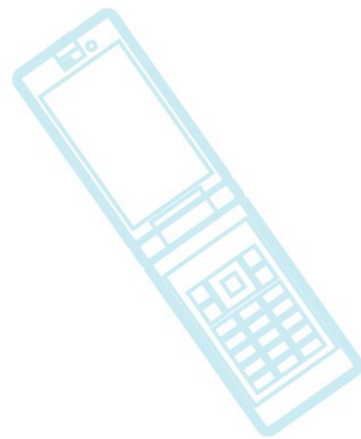




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# Technology Areas

- File Systems
- Real-time
- System Size
- Tracing





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# File Systems

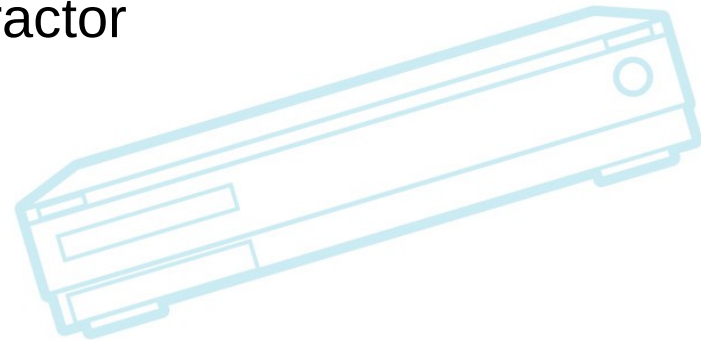
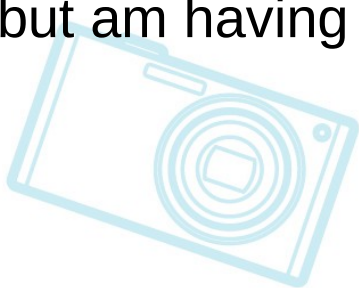
- SquashFS
  - Patches for LZMA support were submitted to kernel mailing list Dec 7.
  - See V2 patches submitted December 10
    - See <http://lkml.org/lkml/2009/12/10/456>
  - It missed the 2.6.33 merge window
    - But should be in good shape for 2.6.34
  - Support for LZO compression is a candidate for CELF funding in 2010



# File systems (cont.)

- UBIFS

- Toshiba has good report on UBIFS performance and issues:
  - I don't have link to JLS presentation, but Jamboree presentation is at [http://elinux.org/images/f/f8/CELFJamboree30-UBIFS\\_update.pdf](http://elinux.org/images/f/f8/CELFJamboree30-UBIFS_update.pdf)
- Have a candidate project to fund UBIFS mount-time speedups, but am having trouble finding a contractor





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# Real-time

- RT-Preempt
  - Interrupt threads - Mainlined 2.6.30
    - Tutorial at ELC about interrupt threads and how to use them
  - Sleeping Spinlocks
    - Spinlock name cleanup is merged (23 patches) for 2.6.33
      - See <http://lkml.org/2009/12/6/162>
    - Macros for doing switch from spinlocks to semaphores remains to be merged
  - Some issues remain with “Big Kernel Lock”
    - CELF may fund work here in 2010



# System Size / Memory

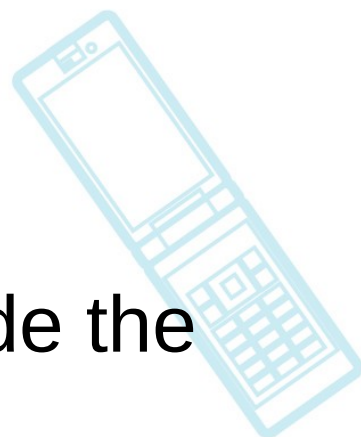
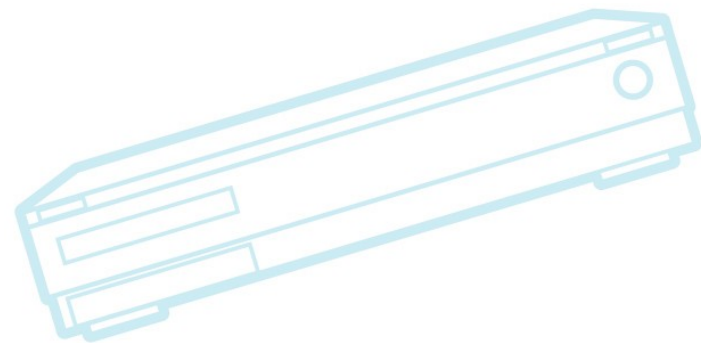
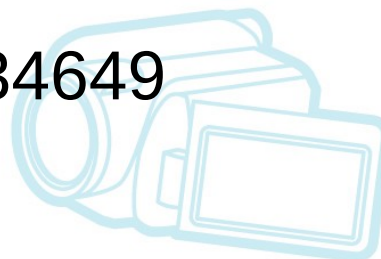
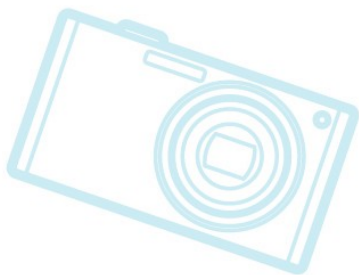
- Compression
  - LZO kernel image compression
    - See <http://lwn.net/Articles/350985>
    - Compression not so great, but faster than others
  - Was submitted to LKML again in November
    - See <http://lkml.org/lkml/2009/11/11/129>
  - It was merged in 2.6.33



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# System Size / Memory

- Ramzswap – (aka compcache) made the 2.6.33 merge window
  - See <http://lwn.net/Articles/334649>





# Tracing

- Ftrace

- New stuff in 2.6.33:

- Regular expression support in tracing filters
- Tracing of accesses and modifications to arbitrary kernel variables
- Dynamic probes for ftrace
  - Perf tool can place and use dynamic tracepoints

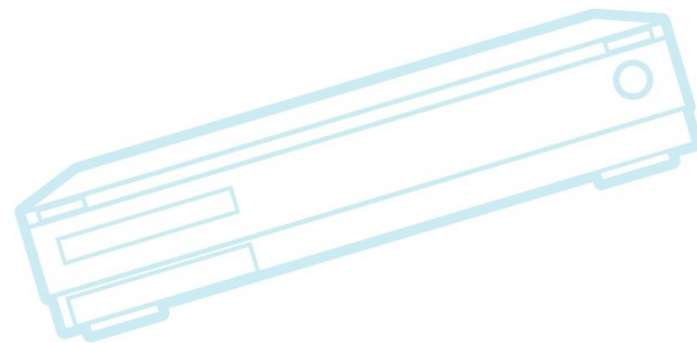
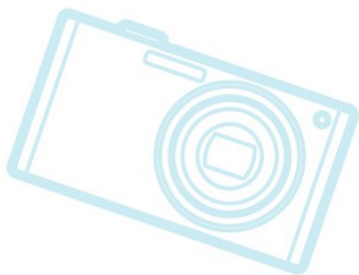
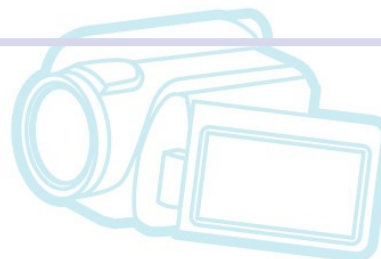
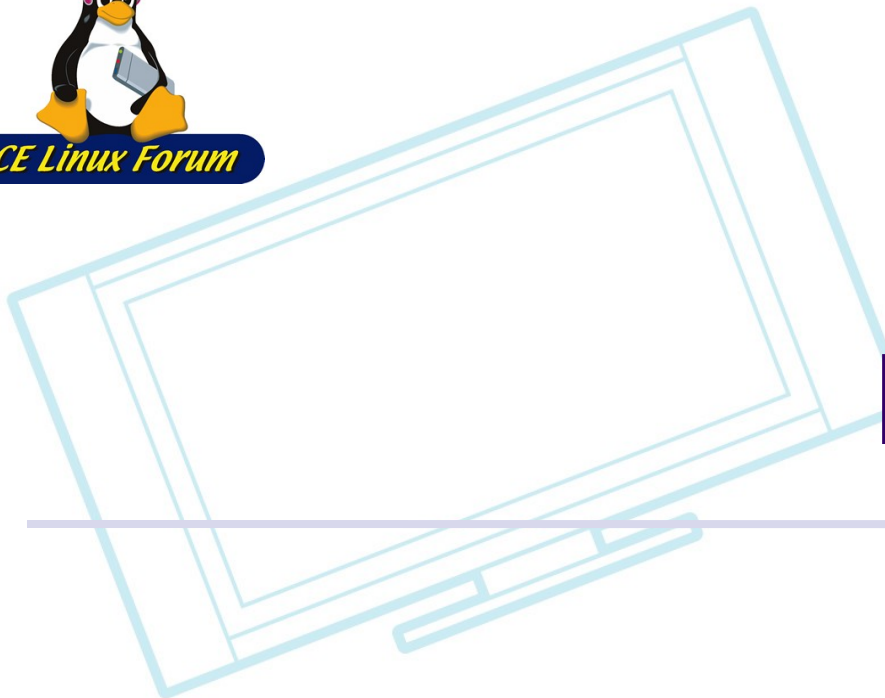
- Perf

- Perf tool now has “diff” mode which shows change in performance between two runs



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# Embedded Distributions







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# Android

- Android 2.0 SDK (Eclair) released (28 Oct 2009)
- Number of devices **still** increasing
  - Non-phones starting to appear
- Android patches removed from mainline kernel (2.6.33)
  - Patches lived in drivers/staging for a while, but they're gone now
  - **Greg Kroah-Hartman will talk about this at ELC!!**



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# Meego!!

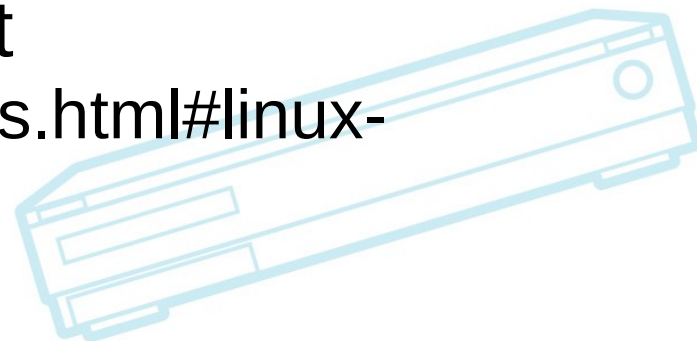
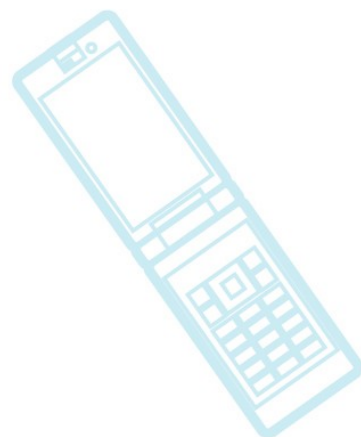
- Moblin + Maemo = Meego
- Intel and Nokia joining forces to create single embedded distribution
- Ari Jaaski of Nokia, will talk about this at the Collaboration Summit
  - ELC will have sessions on work done for Moblin, how to program Maemo
  - Collaboration Summit will have a whole track on Meego



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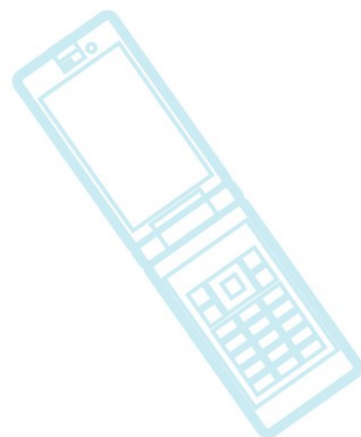
# Resources

- LWN.net
  - <http://www.lwn.net/>
  - If you are not a subscriber, please do so
  - This is an invaluable community resource that needs your support
- eLinux wiki
  - <http://elinux.org/>
- Linux-embedded mailing list
  - <http://vger.kernel.org/vger-lists.html#linux-embedded>





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**Thanks!**

