Android OS for Servers?

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http:/www.linaro.org
Android™ OS for what?

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What is the Android OS?

- Linux™ kernel
- Android patches
- Bionic libc
- Other libraries
- Dalvik vm
- Application frameworks
- Apps
What is the Android OS?

- Linux™ kernel
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- Bionic libc
- Other libraries
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What's in the Android Patches?

- Ashmem
- Binder
- Pmem
- Logger
- Early suspend
- Wakelocks
- Alarm Timer
- LowMemoryKiller
- Paranoid network
- Yaffs2 fs
- Ram_console
- Apanic
- Adb gadget driver
- Gpio patches
- Lots of other small fixes and hacks for arm, mmc, Bluetooth™, etc.
What's in the Android Patches?

- ~249 patches in total for the 2.6.38 tree
  - 3.3 megs of patches
- Each patch (well, mostly) represents a limitation that the Android developers found in the Linux kernel
Goals of Android Patches:

• Fix bugs, enable new hardware
• Improve power management
• Improve error reporting
• Increase security
• Improve performance
Fixing bugs/Enable new hardware

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Power management

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Error reporting

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Security

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Improve performance

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When will it all be merged?

• It is already going upstream
  • 100 commits with @android.com authors already in mainline *
  • Over half of those are from 2011 already
  • Mostly ARM support
• However, some items have met quite a bit of resistance

* As of 3/22/2011, excluding reverted “Staging” patches
Talked about at length on lkml

*Includes variants like wake_lock and alarntimer
Background on wakelocks

- Suspend mode powers down all hardware except memory
- One approach for optimized power management would be to suspend whenever idle
- Wakelocks are the primitive used to determine if the system is in use
Hindsight 20/20

- Wakelocks are a lot of change to solve a problem isn’t thought of as a major issue with the upstream kernel.
- Mainline community mostly focused on runtime power optimization.
- Misunderstanding of both the problem and solution devolved into a take-it-or-leave-it situation, with sour feelings on both sides.
Even so...

- Community is still moving forward
- `pm_stay_awake/pm_relax` kernel infrastructure has been merged
  - Similar to wakelocks
  - Unclear if sufficient for Android
- Android developers have even hinted that they may drop early suspend in the future
So back to servers...

- How do I suspend my system to save power, and still have my nightly backups run?
  - `/dev/rtc/rtcN allows for this, but it's messy
  - Just want a timer that fires regardless if the system is suspended or not, which then kicks off a chron job

- Need: Easy to use, programmatic way to wake a system

- Android Alarm Timer provides this
Android Alarm Timers

• Driver that provides a chardev interface
• /dev/alarm
• Use ioctl to read time and set alarms
• Duplicates some of the timekeeping interface, using new names and terminology
Posix Alarm Timers

- Different from Android Alarm Timers, in that it uses the Posix clock/timers API instead of /dev/alarm ioctl interface
  - `clock_nanosleep(CLOCK_REALTIME_ALARM,...)`
- Use the RTC hardware to allow for timers that fire regardless of if the system is suspended or not
- Allows for multiple events to be multiplexed upon a single RTC device
Posix Alarm Timers

• While the user-level interface is different than the Android Alarm Timers, the back end will be able to be shared

• Still a few open questions to decide:
  • What capabilities will be needed to set an Alarm timer?
  • What policy will there be to control alarm timers? (ie: avoid laptop overheating while in a bag)
Posix Alarm Timers

- Regardless of interface details, Alarm Timer functionality can allow servers and desktops to go to sleep and save electricity, while still allowing work scheduled in the future to run.

- Could combine with wake-on-directed-packet functionality to allow web/interactive servers to suspend when idle.
Posix Alarm Timers

• More interesting future question:
  • Once we can programmatically wake a system, can we programmatically make it sleep?
  • How would we know if was safe to suspend the system?
    – Might need some way to inhibit suspend...
LowMemoryKiller

• As opposed to the Out-Of-Memory (OOM) killer

• Kill applications before system observes negative effects prior to OOM state

• Obviously useful for servers
  • Web service vs. low-priority background jobs
  • Multiple VM guests with different priorities
Similar works in progress

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Other efforts
What about those fixes?

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Trivial tree

• Try to address the concern that good fixes in the Android tree were being overlooked due to controversy surrounding other unrelated Android patches
• Picking small changes that do not introduce major functionality
• Broken up into branches by “topics”
  • ARM, sched, mmc, Bluetooth, etc.
• Sending small patch queues to topic maintainers/lists for review
Trivial tree difficulties

- Not much uptake so far. Most patches considered by maintainers as short-term fixes, rather than comprehensive solutions
- Not being the patch author, it's difficult to advocate for random patches in random subsystems
  - Can only try to facilitate the discussion
- Slow going, as keeping all the topic branches current is difficult
Linaro™ Android Platform

- Upstream focused Android community for ARM
- Linaro toolchain packages for Android
- Sophisticated infrastructure with cloud based build service and ARM board farm for automated testing, validation and benchmarking
- Melting pot for upstreaming of member SoC platform code
Linaro™ Android Platform

- Installable images and public code for low-cost Linaro member SoC boards
- Combining latest publicly available AOSP platform code with latest Linaro kernel and toolchain along with member SoC platform code
- Releasing monthly
- If you are interested in helping, please come talk to us in #linaro-android on freenode!
Summary

Development goals on embedded and server are really not so different.
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Questions?