Android OS for Servers?

John Stultz
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http:/www.linaro.org

Android™ OS for what?

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http://www.openclipart.org/detail/mainframe-by-kattekrab

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What is the Android OS?

- Linux™ kernel
- Android patches
- Bionic libc
- Other libraries
- Dalvik vm
- Application frameworks
- Apps

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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.

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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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- **Paranoid network**

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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

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Talked about at length on lkml
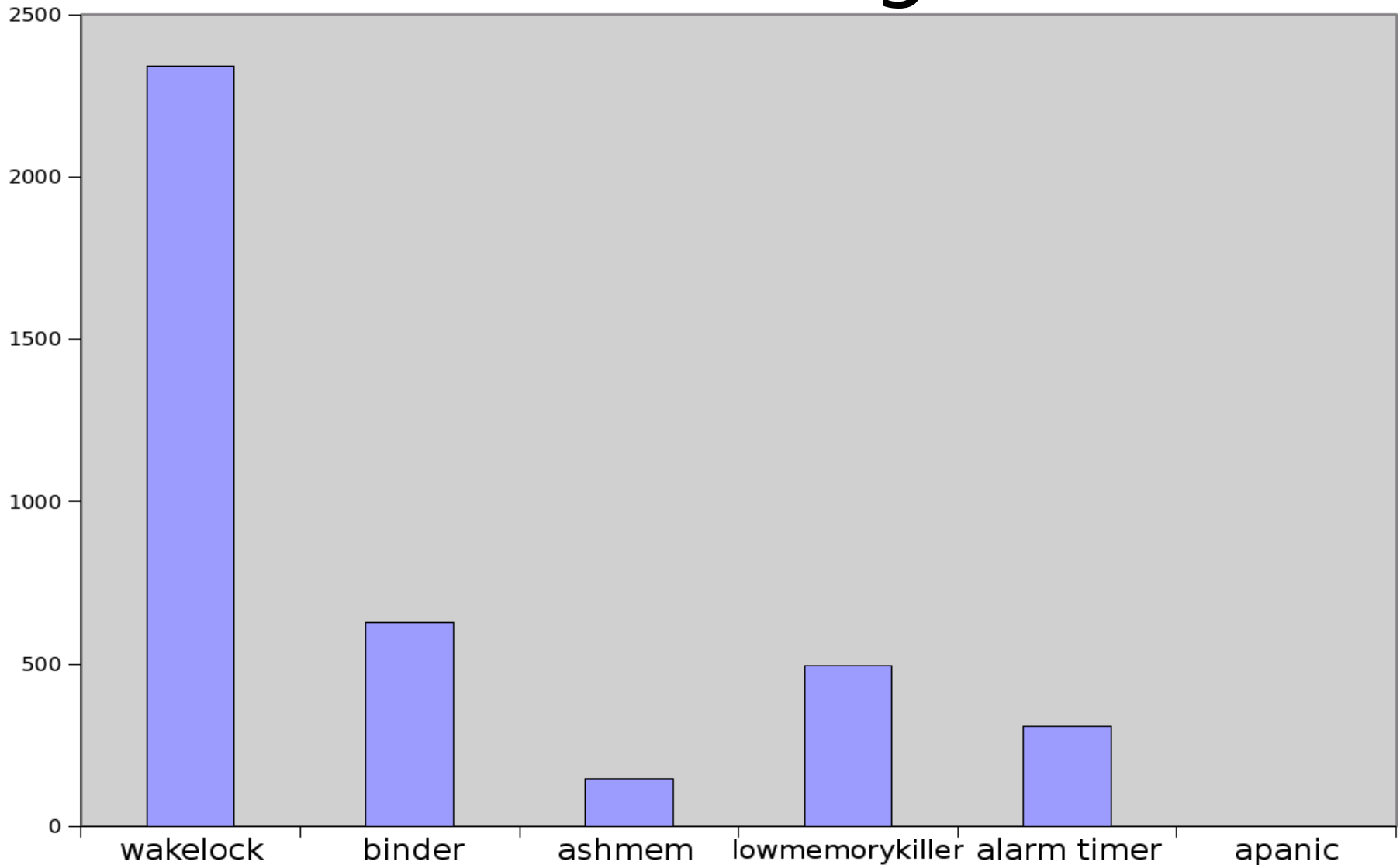
*Includes variants like wake_lock and alarmtimer

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 its 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 ioctls to read time and set alarms

- Duplicates some of the timekeeping interface, using new names and terminolgy

Posix Alarm Timers

- Different from Android Alarm Timers, in that it uses the Posix clock/timers API instead /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, its 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?