big.LITTLE Support in Android

Todd Kjos & Tim Murray
Google
Background

• Historically, no special support for big.LITTLE in Android
• Left to vendors to figure out how to support it
• big.LITTLE increasingly prevalent with ARMv8 transition
• Lots of different configs (A53/A57, A53/A72, A53/A53/A72...)
What We've Seen

- Most vendors use HMP patchset + modifications
- Tunings generally minimize use of A57s except for very obviously heavy tasks by default (large window, large upmigrate)
- Lots of special touchboost-like events to tune for specific actions (scroll, zoom, launch new app, ...)

Good Perf/W Curve

Perf/W Curves - SoC 1

Absolute Performance
Not as Good Perf/W Curve
Problems

- Basically impossible to tune
- Unimportant work can end up on the big cores
- No guarantee that work you really care about will end up on big cores when necessary
Improvements in Marshmallow

- Android Marshmallow brings better support for big.LITTLE using cpusets and new hooks
- Basic idea: ActivityManager knows a lot about relative importance of apps, so use that to better inform the scheduler
cpusets in Android

- Two cpusets set up at init: foreground and background
- Foreground should contain all cores, background contains a small subset (generally one little core)
- cpuset configuration is in device-specific init.rc files
ActivityManager and cpusets

- ActivityManager keeps track of foreground and background apps
- Any app that is considered foreground gets put in foreground cpuset, similar for background
- Significantly reduces likelihood of random work ending up on big cores