The Future of Mobile

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Most Successful Technology Ever

- 3-4B cellphone users worldwide
  - Vastly outpaces TV, PCs,
- 1.13 billion phones sold in 2009
  - 36 per second
  - Versus 15 billion shoes per year
  - Versus 0.3 billion PCs
- 174M were smart phones
  - 15% (up from 12.8% in 2008)
  - Smart phones will pass PCs in the near future
What’s in an iPhone?
What’s in an iPhone (3GS)

- 600 MHz ARM processor
  - About 1200 MIPS for 300mW
  - 256MB ram, 16 GB flash
  - Roughly a 1999 Pentium III ~ 1350 MIPS for 37W
- PowerVR graphics core
  - 7M triangles/sec, 250M pixels/sec
- Mac OS X
  - same as Mac, iPad, iPod Touch
- Sensors:
  - Camera, mic, GPS, compass, proximity, ambient light, ambient noise, 3D accelerometer, touchscreen, temperature
- WiFi, GSM, Bluetooth, USB
What’s in an iPhone? (3GS)
Supercomputer

- “Access is the Killer App”
  - Access to the cloud >> any device
- Cellphones are pocket supercomputers
  - Every search
  - Image recognition, object recognition:
    - Red laser
    - Google Goggles
  - Sound recognition: dictation, translation… Shazam
Replace the PC?

- Cellphone accessories:
  - Big screen (~200M sold per year)
    - … with wireless access (Wireless USB coming)
  - Keyboard
    - Or just use voice + supercomputer?
  - Extra processing and disk space?
    - Maybe…. Or just use the cloud
    - Likely want local graphics acceleration
    - PC as a cellphone accessory

- My bet:
  cellphone wins… maybe it already has
Developing Regions

- Cellphones are everywhere
- Many advantages:
  - Small, portable, with self-contained power
  - Voice works for all languages (but not text)
  - Easy to use, culturally accepted
- +10% mobile penetration => GDP up 0.8%
  - Causal, not just correlation
  - Greatest development project ever?
- PCs may not ever get great penetration
Urban vs. Rural

- Value of the cellphone limited by coverage
  - Even more true with the Cloud
- Cellular is an urban phenomenon
  - Rural areas generally left out
  - ... basestation costs limit rural deployment

- This is the real “digital divide”
  - Not between nations
  - ... but between urban and rural (even in the US)
CellScope: Cellphone Microscope

- Cellphone camera + big lens = microscope
- Diagnosis:
  - Image recognition on the phone?
  - ... in the cloud?
  - ... by a remote expert?
- Clinical quality:
  - Malaria,
  - TB already verified as detectable
SmartPhone Diagnostic Device

- Idea: collection of very simple sensors that connect to the audio jack
  - Easy: heart rate, respiratory rate, temperature
  - Medium: blood oxygen, ECG
  - Hard: blood pressure

- Goal: much cheaper, easy to use diagnostic device
  - Phone converts raw data into readings
  - Can also forward raw data over GSM
Conclusion

- Smart phones =
  - PC + sensors + connectivity + portability
- Access is the killer app
  - The real win is phone+Cloud
- Cellphones are transforming development
  - Driving increased quality of life for the poor
  - The first high-tech solution to cross over
- Rural access must be a priority
Backup
What’s in an iPhone?

- Phone
- Address book
- Watch
- Alarm clock
- Calculator
- Pager
- Timer
- Stopwatch
- Flashlight
- MP3 Player
- Camera
- USB drive
- Remote control
- Voice recorder
- Radio
- Video camera
- Video player
- TV
- GPS + Maps
- Compass
- Gameboy or PSP
details

- 1 GHz Snapdragon ARM
  - 2000 MIPS at 500mW
  - 22 M triangles/sec for graphics
- iPhone 3GS at 600 MHz = 1200 MIPS
- 386DX, 16MHz, 20 MIPS, 1985
- Intel Pentium III, 1,354 MIPS at 500 MHz, 1999, 37W