WHAT IS INSIDE A SMARTPHONE

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Outline of topics

• What is the hardware architecture of a smartphone?
• What are the important peripheral devices in a smartphone?
• An example
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What is the hardware architecture of a smartphone?
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Smartphone hardware architecture

• A system-on-chip architecture with three primary components
  – An application processor executing the end-user’s application software with assistance from the middleware and operating system (OS)
  – A modem or baseband processor with its own operating system components responding to the baseband radio activities (transmission and reception of audio, video, and other data contents)
  – A number of peripheral devices for interacting with the end-user
Outline of topics

• What is the hardware architecture of a smartphone?
  ➢ What are the important peripheral devices in a smartphone?

• An example
Peripheral devices

• These are the I/O devices through which the end-user interacts with the smartphone
  – The OS needs to have the driver software installed for each such device
  – Typical peripheral devices
    • LCD and touchscreen
    • Keyboard
    • Camera
    • GPS
    • Speaker and audio output for headset/earphone
    • Microphone
    • Bluetooth and Wifi
    • HDTV
Outline of topics

• What is the hardware architecture of a smartphone?
• What are the important peripheral devices in a smartphone?

➢ An example
Processors in smartphones

• Need to balance performance, power consumption, and cost

• ARM-based processors are very common
  – Optimized for battery life as well as performance
  – Remarkably low area and transistor count
    • Important for small form factors and low energy drain

• Modem processor is either a separate ARM core or a DSP extension of the application processor ARM core
  – Some architectures use a modem accelerator along with the application processor core
Processors in smartphones:
A typical ARM-based smartphone hardware

Dual-core ARM Cortex-A9 app. processor

Photo courtesy: www.arm.com
Processors in smartphones:
A typical ARM-based smartphone hardware

ARM Mali GPU
and video codec

Photo courtesy: www.arm.com
Processors in smartphones: A typical ARM-based smartphone hardware

ARM Cortex-R4 3G/4G modem processor

Photo courtesy: www.arm.com
Processors in smartphones:
A typical ARM-based smartphone hardware

SIM interface and control

Photo courtesy: www.arm.com
Processors in smartphones: A typical ARM-based smartphone hardware

Storage and storage interface

Photo courtesy: www.arm.com
Processors in smartphones: A typical ARM-based smartphone hardware

Peripherals and ARM peripheral CPUs

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Thank you!