Mobile Security
14-829 – Fall 2013

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Class #2 – Mobile Device Components & Security Challenges

Carnegie Mellon University
Silicon Valley

Registration

- This course has three different course numbers: 14-829, 18-638, and 96-835
  - It's important that you register for the right one

```
if location == Pgh
   if dept == ECE
      reg = 18-638;
   else
      reg = 14-829;
else if location == SV
   reg = 96-835;
```

  - **If not, we may drop you without notice**

Waitlists

- If you're currently registered for this class, but not planning to stay: **please drop**

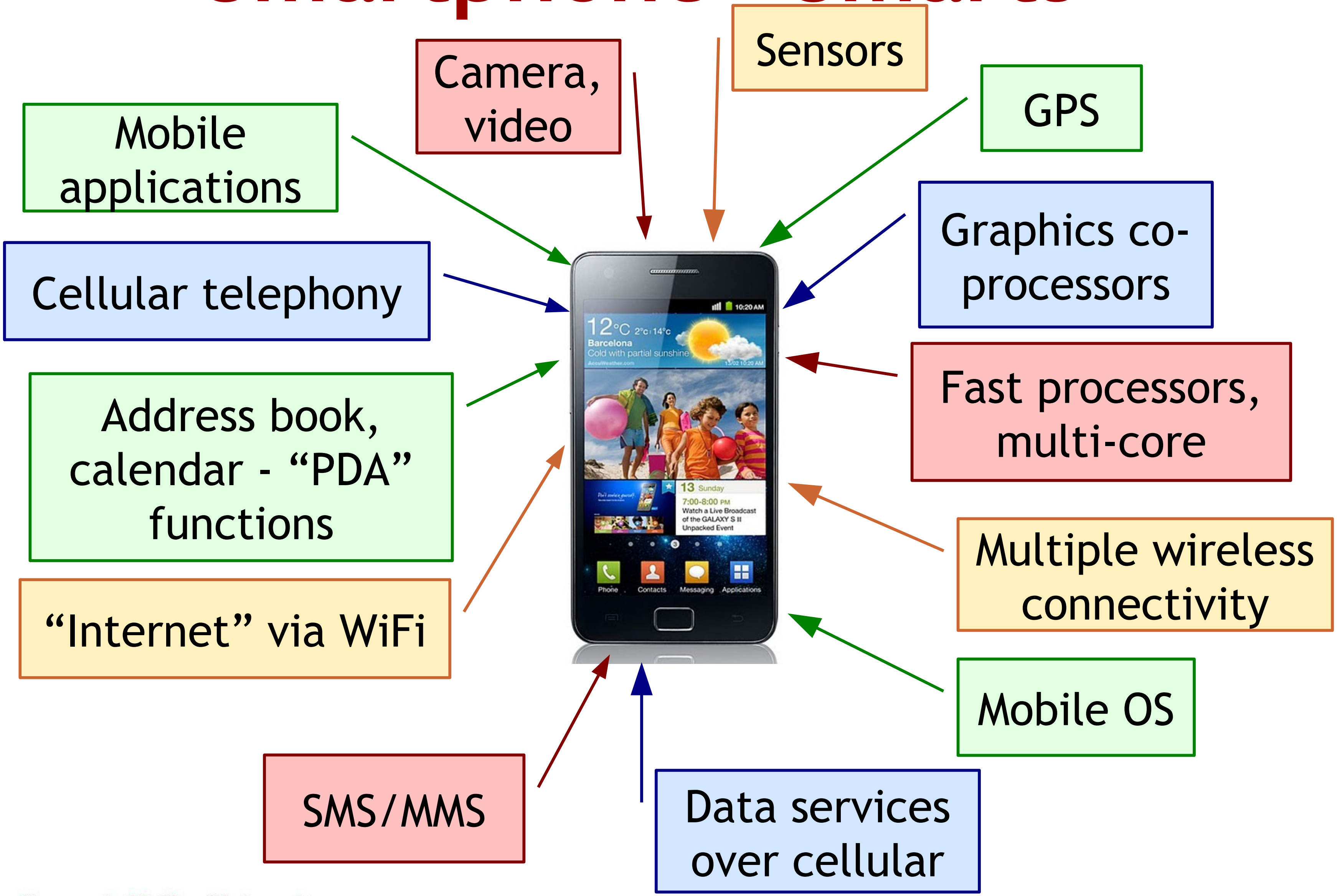
- If you're currently on the waitlist:
  1) Make sure you're on the correct waitlist (see the previous slide)

  2) Send me an email telling me **why** you want to get in and **what prereqs/qualifications** you have
     - Email: **tague@cmu.edu**

What is a Smartphone?

- A phone that is smart:
  - Non-phone capabilities
- Computer that calls
- ???????
-

Smartphone “Smarts”



Mobile applications

Camera, video

Sensors

GPS

Cellular telephony

Graphics co-processors

Fast processors, multi-core

Address book, calendar - “PDA” functions

“Internet” via WiFi

Multiple wireless connectivity

Mobile OS

SMS/MMS

Data services over cellular

So a Smartphone is...

Left on Biddle St
GARMIN nüvi
Nikon
D70
12°C
Barcelona
Cold with partial sunshine
Phone
Contacts
Messaging
Applications

Smartphone Components

Communication / networking

Computation / processing

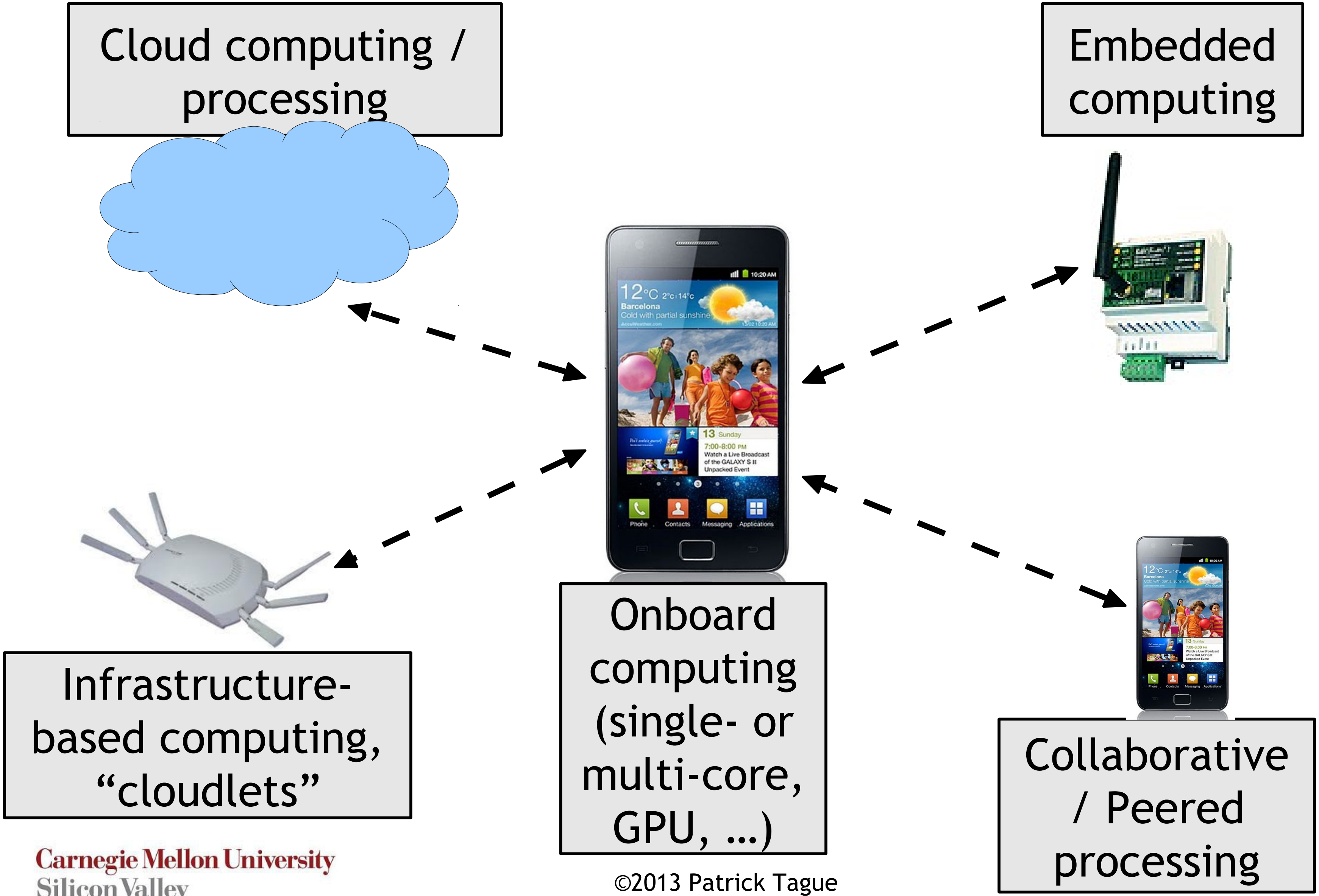
Sensing / actuating / control

Entertainment / gaming

…

System Interactions

Mobile Computing



Cloud computing / processing

Embedded computing

Infrastructure-based computing, “cloudlets”

Onboard computing (single- or multi-core, GPU, …)

Collaborative / Peered processing

Mobile Operating Systems

- In order to deal with the variety of systems, services, and applications, elaborate operating systems became necessary
  - Aliyun, Android, bada, BlackBerry, Boot2Gecko, Brew, GridOS, iOS, Linux, Maemo, MeeGo, MXI, Palm, QNX, Symbian, Windows (Mobile / Phone / 8), webOS
  - Each operating system has different standards, services, styles, behaviors, foci, interactions, etc.
  - Each operating system has different vulnerabilities...

Mobile Applications

- Mobile and web apps have emerged as the glue that binds all of the services and systems together to provide the mobile experience
- Apps have become a “service mash-up” with no limits in sight

Risks and Realities

- When the Internet was born, nobody envisioned the threats we would face in coming decades
- We like to say *“We learn from our mistakes, and we won't make them again”*...
- Not surprising...

  Nobody envisioned the threats we would face in the mobile domain

As it turns out...

- Mashing together all of these services on one device...
  - Yeah, maybe we should have thought that one through a bit more...
  - The mashup of apps, protocols, services, and features of modern smartphones has opened the door to threats that nobody completely understands.
  - The complex system-of-system mobile architecture continues to expose new threats, and probably still hides several other ones...

Examples

- Malware distribution has diversified
- Social networking apps can steal your private information
- Web browsers can interact with apps to subvert web-only or app-only protections
- Standard WiFi operations expose sensitive context information
- Sensors on your phone can leak your password
- Others?

Looking Forward

- During the semester, we'll study various aspects of security and privacy in smartphone systems
  - There's no way we can talk about everything!
  - This is where mobile app audits and course projects come into play: you have the freedom to expand topic coverage in whatever way you like

Assignments

Assignment #1 Posted

- Programming assignment, requires Android development

- Due on September 30 (via BB)

- Specifically, you'll be creating a malicious application to see just how difficult it is
  - Remember: ethics

- See the course website for full details

Assignment #2

- Will also be a programming assignment, but will have more structure/requirements

- Due on October 28

- Most likely, what you do in Assignment #1 will affect your work in Assignment #2...consider this fair warning

- Stay tuned to the course website for full details

Mobile Application Audit

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Mobile App Audit

- Choose an app
  - Either something that exists or something new
  - Should be "feature-rich" (trust me, this is for your own benefit)
  - You get to take the role of the app developer

- Think about how each topic affects your app
  - How does your app address vulnerabilities / threats due to use of particular services, interfaces, protocols, etc.?
  - How could you redesign your app to make it "more secure"?

What App to Choose?

- Make sure the app you choose (or imagine) has a rich set of features that incorporate a variety of mobile services (i.e., a "service mash-up")
  - Internet connectivity (xG, WiFi, …)? Location (GPS, AGPS, WiFi, …)? Payment? Bluetooth? ZigBee? Data storage? Cloud services? …????
- Everyone should choose/imaging their own app
  - The audit is an individual assignment, not a team project – you can discuss with others, but all work should be your own

Questions about Audit?

Take a few minutes to think about the audit...ask questions...plan...

Course Projects

- Although the project proposal isn't due until October 14, form groups and choose topics soon!
- Why?
  - Each team has to present a ~20 minute survey on their topic area before October 9 (≤ 3/day)
- How to choose a topic?
  - Relevant to the course
  - Interesting to modern smartphone users
  - Advance the state-of-the-art
- How to form a group?
  - Talk to people, find common interests, coffee

Think about Projects! Questions about Projects?

Take some time now to talk to others, think about topics, ask questions, come up to the lectern to make a pitch, etc.

No need to limit teams to one campus or the other, distributed teams work great!

Sept 4:
Basics of Telecom Security from 1G → 4G and Beyond

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