

#### **IoT Remote Sensing Architecture**

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## **Architecture's Common Meaning**

# Usually "architecture" connotes something readily visible...





# **Information Systems Architecture**

- ...but in the context of information systems engineering it refers to to the major separable parts of a system and the way they communicate and control each other
  - Some components may not be visible because they are too small, too widely dispersed, or are not physical objects
  - The rules they follow to exchange data can require lengthy documentation
- So we often use abstract diagrams and refer to protocol specifications



#### **Example: Internet Architecture**

As an example, the public Internet consists of thousands of connected routers that exchange information using routing protocols





#### **Example: Internet Architecture**

- The example is a "high level" architecture
  - Though there is a lot of detail the Internet itself is not usually considered a part of a larger system
- Too much detail is sometimes distracting
  - We can encapsulate an architecture into a higher level abstraction
  - For example, the Internet is often represented as a "cloud"



#### **Example: Software Architecture**

Software architectures show how different programs of pieces of code call and share information between each other





## **Example: Software Architecture**

- Software components can communicate several different ways, i.e.
  - Protocols much like separate devices
  - Application Protocol Interfaces (APIs) the way a piece of software passes information to and receives information from another piece
- This would be consider a mid-level architecture
  - A "Low-level" architecture could describe small sub-units of the code
  - -Too detailed for today's project



## **Goal Of Our Project**

 Measure something at one location and view it (over the Internet) at another



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1. Read

## Why This Is Useful

- This "remote sensing" is at the heart of many other IoT applications
  - -Home automation monitors for fire, intrusions, flooding
  - -Industrial safety: monitoring fire, hazardous materials
  - -Medical monitoring of blood glucose, heart, etc.
  - -Environmentalists monitor water levels and quality
  - -Geologists measure movement and seismic activity
  - -Transportation engineers monitor traffic and congestion
- It's a good model to understand



#### **One Architectural Approach**

One way to achieve this is to have a browser connect directly to the measuring device



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# **Problems With Direct Approach (1)**

Many devices on the Internet do not have a permanent address



\*Dynamic DNS services are available, but free ones do not scale



# **Problems With Direct Approach (2)**

Many interesting applications benefit from large numbers of sensors



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# **Problems With Direct Approach (3)**

Some devices live behind firewalls and/or "Network Address Translation"



# **Problems With Direct Approach (4)**

- IoT devices are designed to be very, very cheap!
  - Many can barely function as a basic web server, let alone provide strong encryption or secure themselves against attack!



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# **Chosen Architectural Approach**

To avoid all these problems the weather station will send measurements to a server





# **Chosen Architecture Comparison**

- While this approach has disadvantages...
  - -Requires a server
  - -Adds delay between measurement and read
- …the benefits far outweigh them
  - -Addresses all problems identified with simple approach
  - -Central server can aggregate and compare data
  - Allows a much richer user interface than a low-cost IoT device could generate
    - Web 2.0 features, graphs/images, etc



# In Case You're Wondering...

- > What if we need to control an IoT device?
  - -Make a specific device beep or blink
  - -Update firmware
- > Devices can poll the server for commands
  - -Each device will have a unique identifier
  - Instructions for each can be stored on the server in a special location
  - -Adds delay depending on poll interval



# **Questions?**

