IRA A. FULTON SCHOOLS OF engineering

school of computing, informatics, & decision systems engineering

Introduction to Engineering Using Robotics Experiments

Lecture 13
IoT and Augmented Reality

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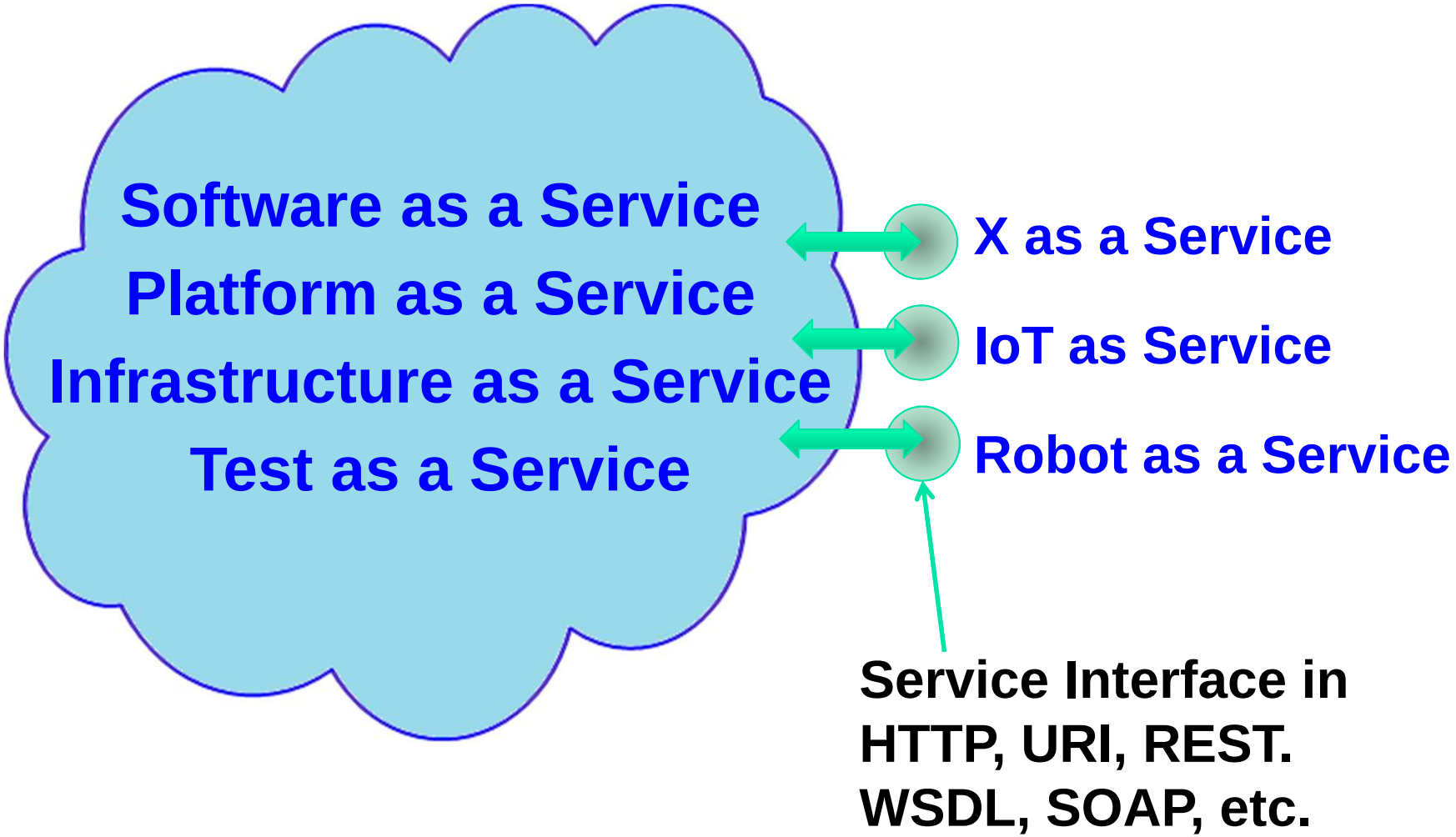
Cloud Computing and IoIT as a Service

- Software as a Service
- Platform as a Service
- Infrastructure as a Service
- X as a Service
  - IoT as a Service
    - ✓ Cyber Physical Devices
    - ✓ Device as a Service
    - ✓ Robot as a Service (RaaS)

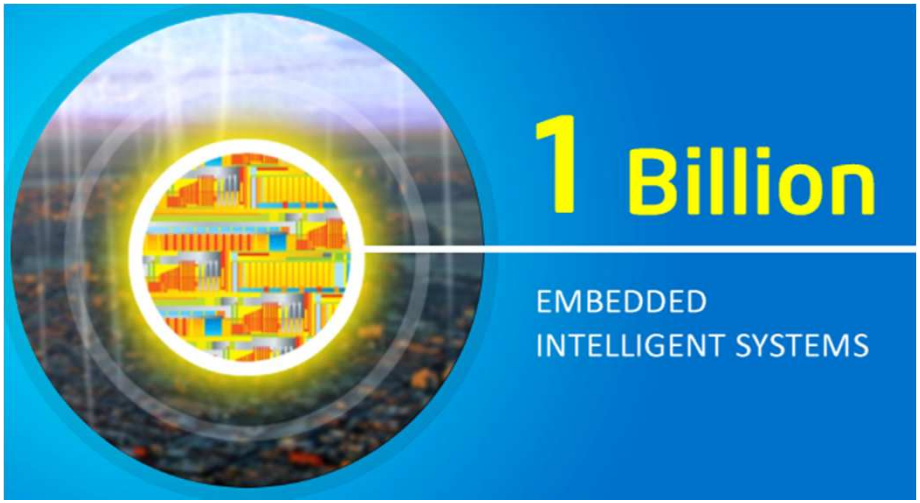
Device Integration in Cloud Computing




Shift from
Embedded to
INTELLIGENT
Intel Embedded Research
& Education Summit
February 22-24, 2012,
IOT Group 2013
Intelligent
Intel Embedded System
Group
Chandler, Arizona
Source:
http://embedded.communities.intel.com/servlet/JiveServlet/downloadBody/7148-102-1-2394/Accelerating-the-Transition-to-Intelligent-Systems.pdf
http://blogs.intel.com/embedded/2012/02/ieres-2012-day-1/
intel

Accelerating the Transition to Intelligent Systems

10 billion potential business



At least 32-bit processing power

http://blogs.intel.com/embedded/2012/02/ieres-2012-day-1/

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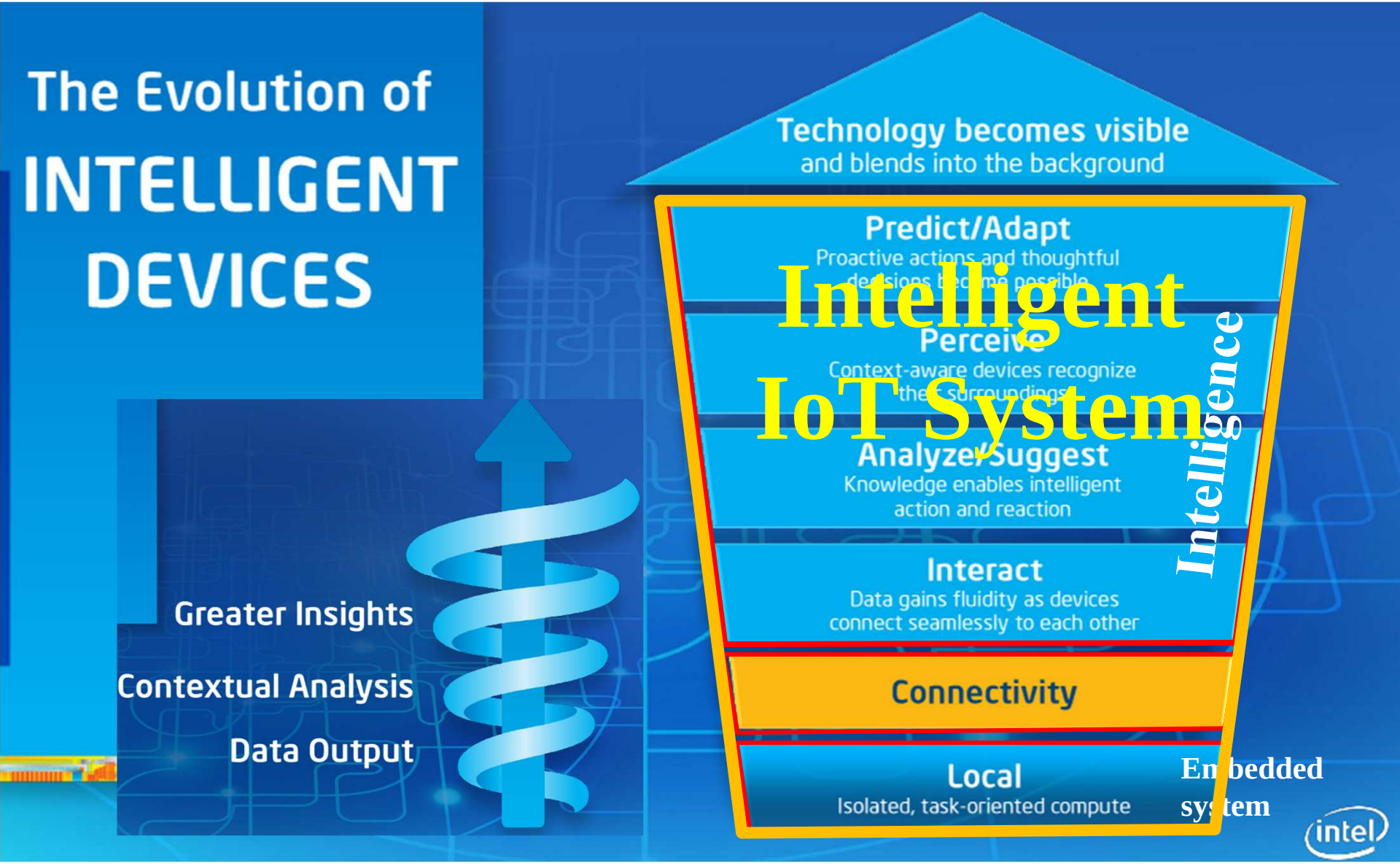
The Evolution of Intelligent Devices

http://blogs.intel.com/embedded/2012/02/ieres-2012-day-1/



Intel Architecture for IoT: Areas of Focus

http://blogs.intel.com/embedded/2012/02/ieres-2012-day-2/

- 2011 Intel IoT Focus:
  Simple, Safe, Scalable architecture for Connected Devices
- 2012 Intel IoT Focus:
  Immediate problem areas refined:
  - Device Identity
  - Device Integrity
  - Application Integrity
  - Integrity Management

  } **Security at Device Level**

- 2013/2014 release of IoT processors:
  - Galileo: integrating processor and Arduino
  - Baytrail processor: Multicore SoC Family for Mobile Devices
- 2015 IoT processors :
  - Edison: New version of Galileo
  - Curie: A more energy-efficient IoT unit

Galileo: Integrating Processor and Arduino

- Intel's Quark SoC X1000 Application Processor, designed for the IoT. It's smaller and more power-efficient than Intel's Atom processor;
- The Galileo is the first Arduino board based on Intel architecture, with 14 digital I/O pins, 6 analog inputs, a serial port, and an ICSP header for serial programming of IoT.
- 100Mb Ethernet to connect to Internet
- Mini-PCIe: allows you to connect standard mPCIe modules like WiFi, Bluetooth, and SIM card adapters for different devices.
- Real Time Clock (RTC) for real time applications
- Built-in microSD
- Linux

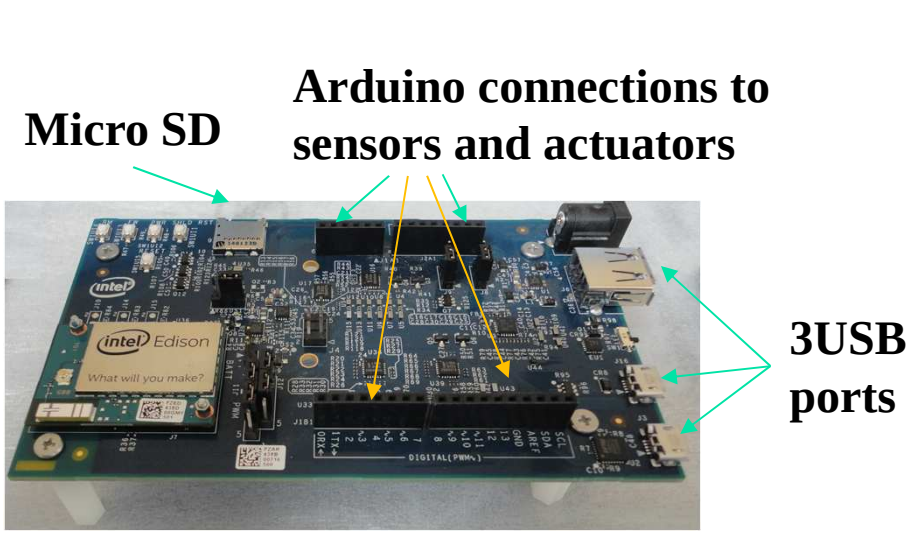
Bay Trail: Multicore SoC Family for Mobile Device

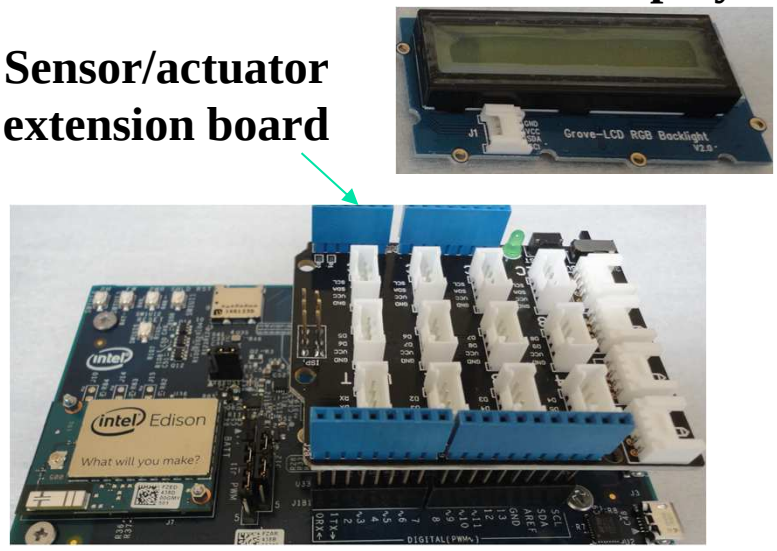
A Bigger Brother of Quark

- Bay Trail is based on a new low-power, high-performance microarchitecture “Silvermont”, announced in May 2013.
- Bay Trail” is Intel’s first tri-gate 3-D 22nm quad core SoC and its most powerful processor to-date for tablets and other sleek devices that provide a balance of performance, features and battery life.
- “Bay Trail-T” is the next-generation 22nm quad-core Intel Atom SoC for tablets and 2 in 1 devices.
- “Bay Trail-M” and “Bay Trail-D” processors will be for entry-level laptops, 2 in 1s, desktops, and all-in-one systems that will be branded Intel Pentium and Intel Celeron.
- Example: To be used in Google’ Nexus 8 and run Android OS

Intel Edison 2015

- The new version of Galileo, with lower power consumption and better performance.
- It integrates a 32-processor with an Arduino board.
- Built-in WIFI and Bluetooth.
- A sensor/actuator extension kit can give Edison instant interaction with the physical world.



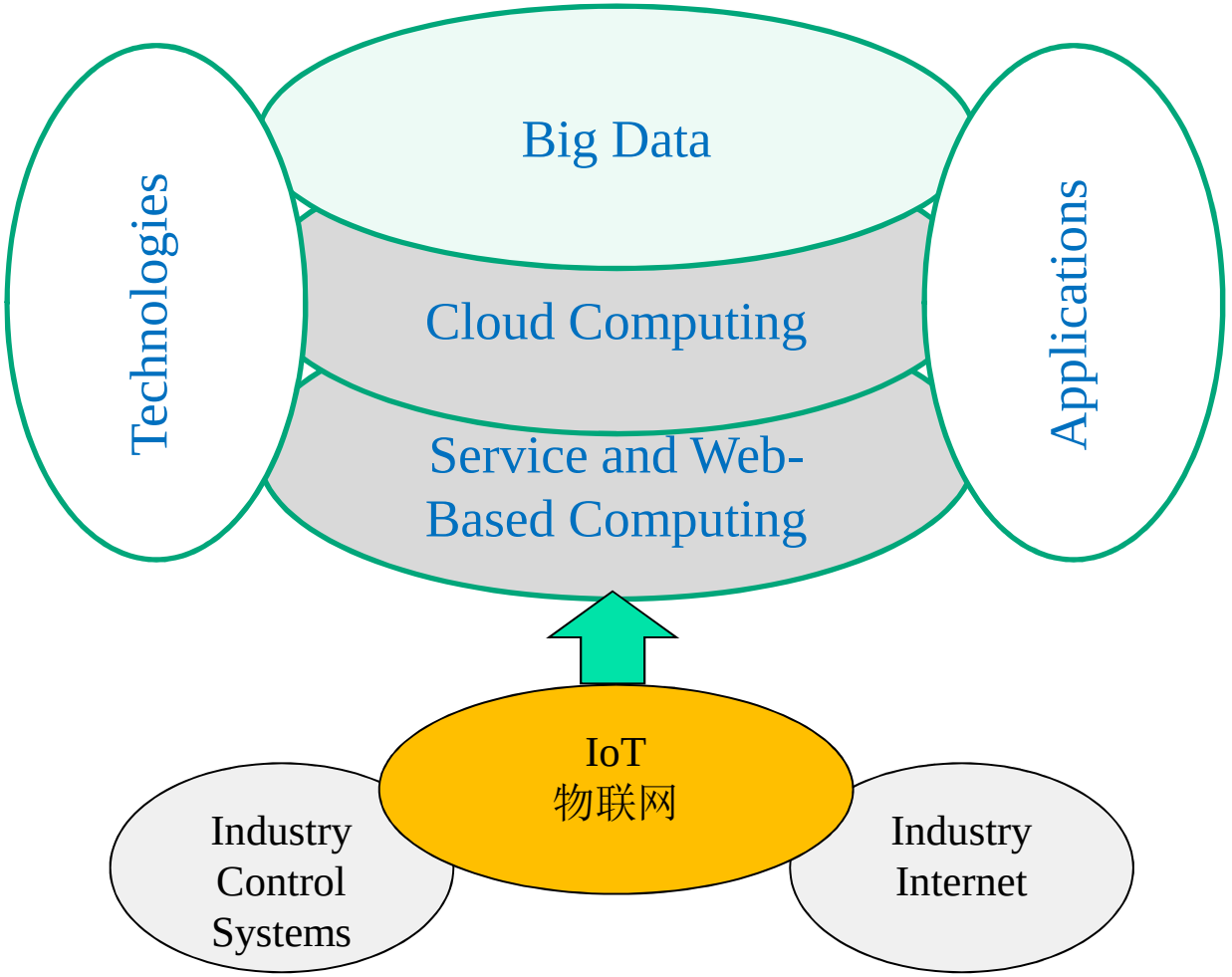


Edison Capacity

- High performance supports complex data collection in a low power package, including:
  - a dual core, dual threaded Intel Atom CPU at 500MHz,
  - a 32-bit Intel Quark microcontroller at 100 MHz
- Integrated Wi-Fi, Bluetooth, Low-Energy* (LE), memory, and storage;
- 40 multiplexed General Purpose IO interfaces with expansion board options for total project design and flexibility

Augmented Reality

- IoT extended virtual world to real world!
- Can we extend the capacity of the reality on the other hand?



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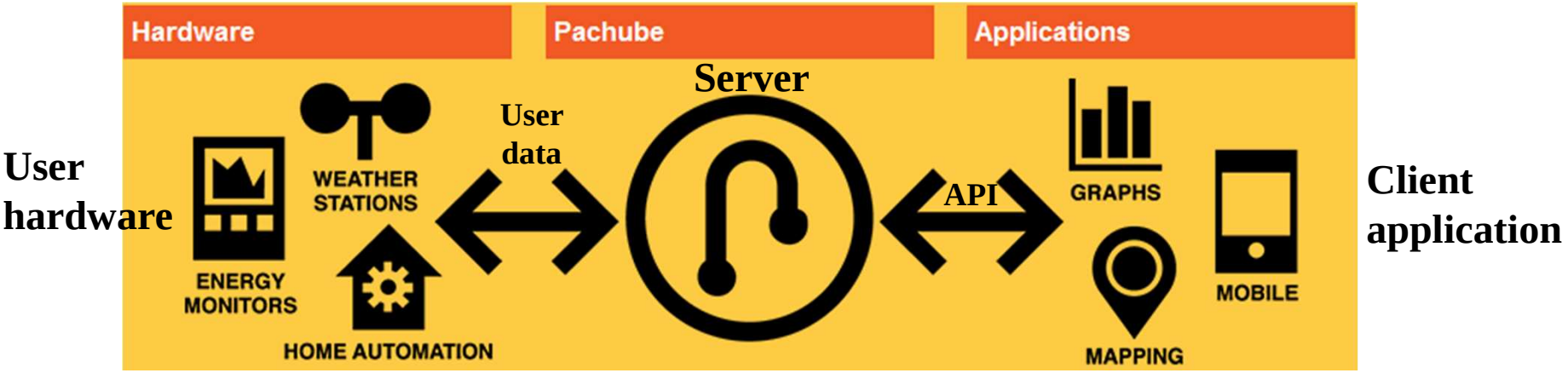
Current Efforts in Device Integration (1)

Augmented Reality

- **Pachube** (https://pachube.com)
  - Data infrastructure for users to build their Internet of Things: Users send data to Pachube & use API to access;
  - Manage real-time data from sensors, devices, and environments



Current Efforts in Device Integration (1)

Augmented Reality

- **Wikitude** World Browser (http://www.wikitude.com/)
  - Organize and display information about users' surroundings in a mobile camera view (virtual world).
  - Similar to Pachube, but focus on photos and videos;
  - Case 1: Create your own virtual word with your photos and videos and share it with family and friends;
  - Case 2: Use public photos and videos to create new virtual world;
  - Case 3: For a point of interest (restaurant, park, etc.), find its virtual world and comments .

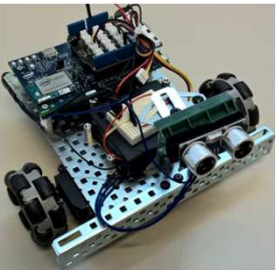
Current Efforts in Device Integration (1)

Augmented Reality

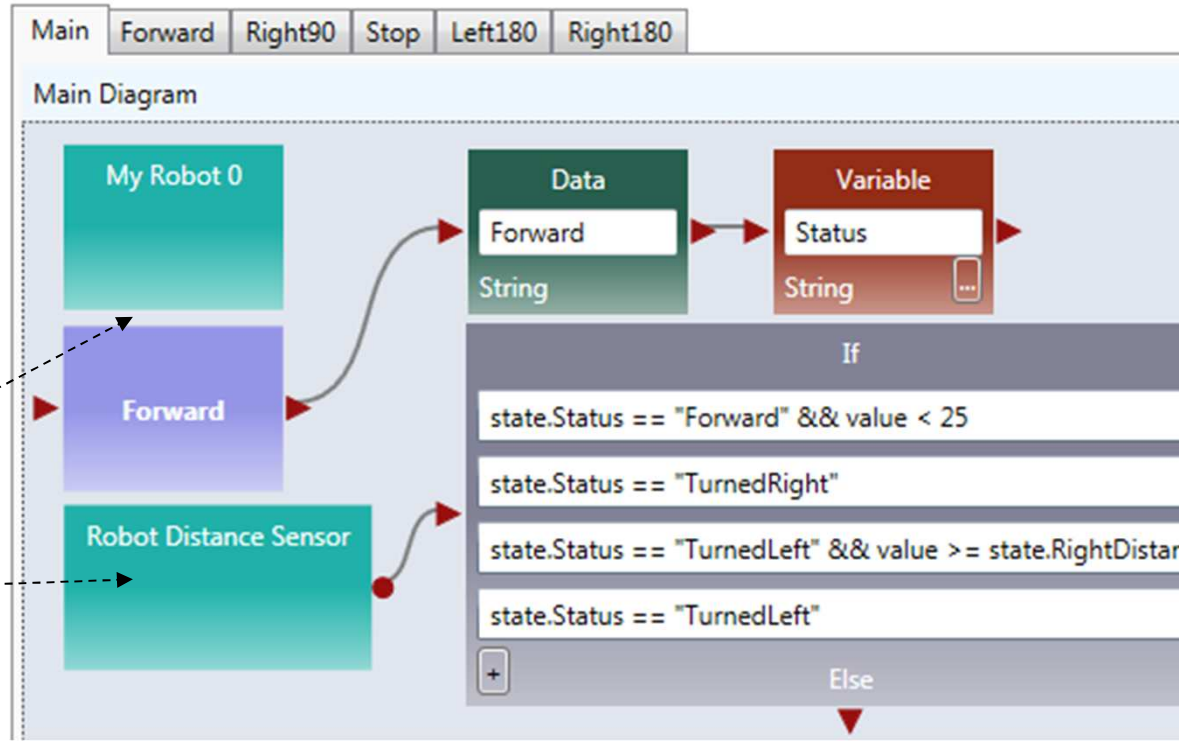
- **Monocle Apps of Yelp**
  - Implementing Augmented Reality in mobile phone apps;
  - These apps combine data collected by the phone's compass, camera, and GPS system, as well as virtual data available online, to create the real physical world;
  - You can see things like the location of Twitter users and local restaurants in the physical world, even if they are miles away.

Continue with your Robot Programming

EV3 Robot



Edison Robot



Program your robot to navigate through the maze

1. Using EV3 robot using the Bluetooth or Wi-Fi connection
2. Change the robot to Edison robot

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