Tutorials: Opening Session

Day 1: 315PM

Tasks for Participants

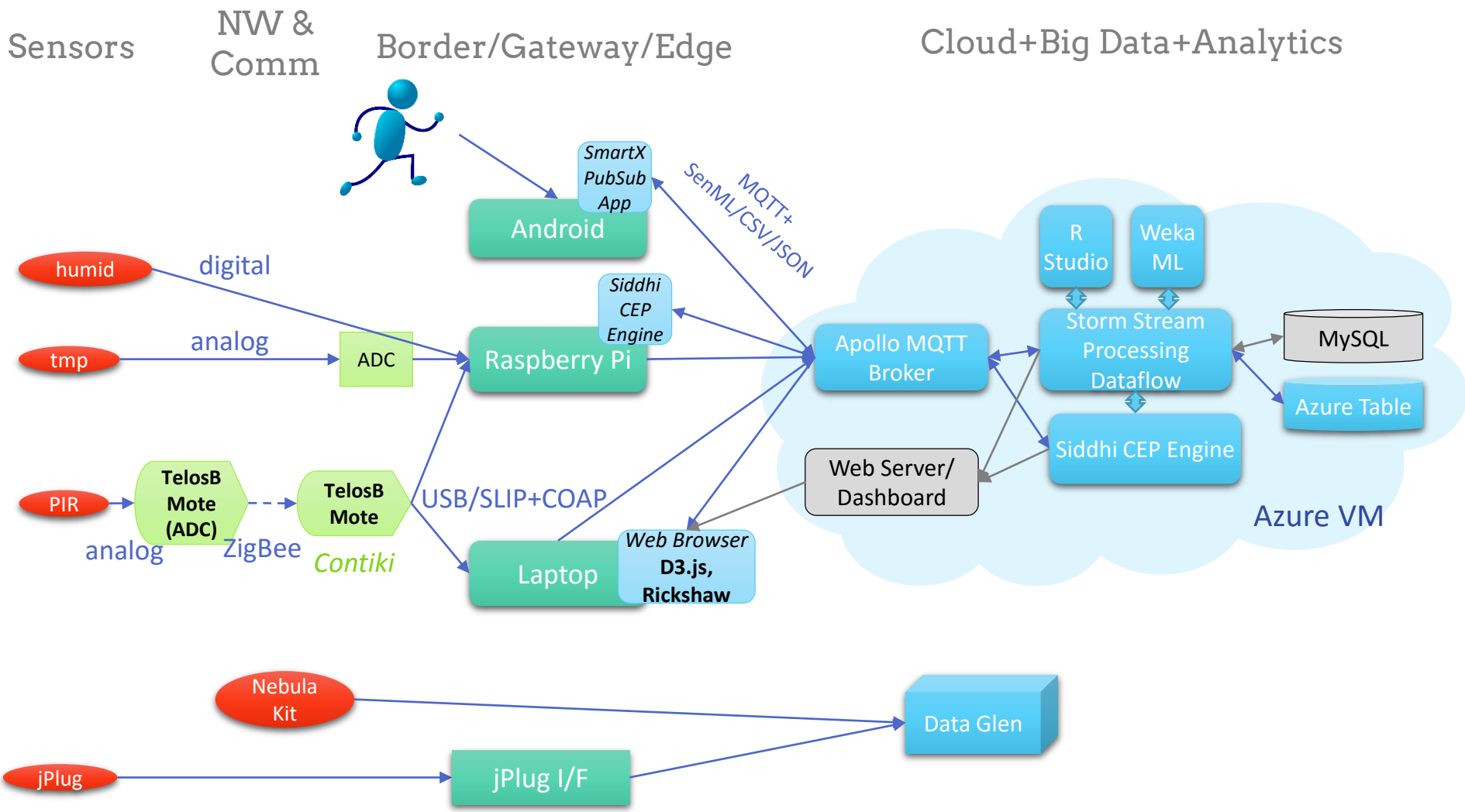
By this morning

- Subscribe to Mailing list
  - https://groups.google.com/forum/#!forum/iot_summer_school_2016
- Get connected to guest WiFi at IISc
- Have your Laptop with following software installed
  - Git or GitHub client & SSH Client
  - SW&A track
    - Java IDE such as Eclipse, IntelliJ, Java JDK 7 or later, Apache Maven
    - Python, R Studio, Android Studio (optional)
  - S&C Track
    - Ubuntu OS prefered
- GitHub
  - Request commit access to summer school GitHub site
  - **https://github.com/dream-lab/iot-school**
  - Clone the GitHub common folder to your laptop
  - https://github.com/dream-lab/iot-school/tree/master/common

Tutorials

- Learn the standards, tools, technologies in an IoT fabric
  - Sensors
  - Communication
  - Data processing & Analytics
  - Cloud & Edge devices
- Start from first principles in designing your own IoT environment
- Learn about existing integrated platforms
- Two tracks over Day 1 & 2 afternoons
  1. Sensors & Communication
  2. Software & Analytics

Technology Mapping in IoT



Tutorials & IoT Stack

Analytics & Visualization	• Weka ML Library **[D2]** • R Statistics Environment **[D2]** • D3 & Rickshaw JS Visualization **[D2]** • Data Glen IoT Platform **[D2]**
Data Processing	• Publish Subscribe Broker using MQTT, COAP, Data formats **[D1]** • Complex Event Processing for pattern detection **[D1]** • Stream processing dataflows on Storm **[D2]** • Azure Cloud VM, Raspberry Pi/Android Edge device **[D2/*]**
Communi-cation	• Android BLE **[D1]** • Wireless Sensor Networks, RPL, Pi border router **[D2]** • IPv6, 6LoWPAN, **[D2]** • COAP, MQTT standards **[D2]**
Sensing	• Sensors, datasheets, ADC boards, interfaces, protocols **[D1]** • Acquiring data using Pi & Contiki **[D1]** • JouleJotter & jPlug **[D1]** • Nebula IoT Kit **[D1]**

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Sensing & Communication Track [Room 202]

Day 1, Mon 20 June from 3-630PM

- Joint session of both tracks: Introduction to the Tutorials *(Yogesh, CDS)* [15mins]
- Practical Sensing *(Ashish, RBCCPS)* [60mins]
  - Types of sensors, properties, interfacing techniques, protocols
- Acquiring sensor data *(Akshay and Anand, ECE)* [40 mins]
  - Getting data from Sensor to Pi, and Sensor to Contiki to Pi
  - Hands on: Read data from sensor thru Laptop/Pi and Contiki
- Android and BLE *(Vasant, RBCCPS)* [20mins]
- JouleJotter Power Metering *(Abhirami & Yashaswini, ESE)* [15mins]
- jPLug Power Metering and Nebula Sensor kits *(Tanuja, Data Glen)* [30mins]
- Joint session for tracks: Team formation, project idea discussion *(Yogesh, CDS)* [30mins]

Sensing & Communication Track [Room 202]

Day 2, Tue 21 June from 330-630PM

- Joint session of both tracks: Using Pi & Azure VM by teams *(Anshu & Vyshak, CDS)* [30mins]
- Wireless Networking and Communication standards *(Akshay and Anand, ECE)* [150mins]
  - Power, standards, motes/WSN, 6lowpan, mesh NW
  - IPv6, routing, RPL, CoAP, MQTT
  - Hands on: Transmitting data through sensor network to border router (Pi)

Software & Analytics Track [Room 102]

Day 1, Mon 20 June from 3-630PM

- Joint session of both tracks: Introduction to the Tutorials *(Yogesh, CDS)* [15mins]
- Connecting to Azure VM & accessing GitHub *(Anshu, CDS)* [30mins]
- IoT Software Fabric & Event-based Architecture *(Vyshak, CDS)* [75mins]
  - COAP, Publish-Subcribe, MQTT & SenML
  - Hands on: Run MQTT Pub-Sub samples from personal laptop or Azure VM
- Complex Event Processing *(Rajrup, CDS)* [60mins]
  - Hands on: Run Siddhi CEP engine samples from personal laptop or Azure VM
- Joint session for tracks: Team formation, project idea discussion *(Yogesh, CDS)* [30mins]

Software & Analytics Track [Room 102]

Day 2, Tue 21 June from 330-630PM

- Joint session of both tracks: Using Pi & Azure VM by teams *(Anshu & Vyshak, CDS)* [30mins]
- Stream processing using Apache Storm *(Anshu, CDS)* [60 mins]
  - Hands on: Run Apache Storm IoT topology from Azure VM
- Pub-Sub on Android using IISc Notification Platform *(Abhilash, CDS)* [30mins]
  - Hands on: Run chat app from personal Android phone
- Analytics & Visualization Tools *(Rajrup, CDS)* [30mins]
  - R Analytics, Weka, Rickshaw
- Data Glen IoT Platform *(Tanuja, Data Glen)* [30mins]

Things to Consider

- Understand how all the pieces come together
  - Apply them to use cases for the specific tools you learn
- Idea is key…where is the spark, innovation
  - Think about "quality of life" benefits, social impact
- Think outside the box
  - How you will use the sensors, tools for feedback loop…*Sensor and actuator may be different!*
  - What can you crowd source?
  - Can you do more with diverse (open) data sources
  - How can edge & Cloud work together
- Go to different tracks, get diversity of ideas, find new students to work with!!

Track Selection

- ~50:50 to each track
  - Necessary to form balanced teams
- How many from CS/IT majors?
- How many from ECE/EE majors?
- How many from other majors?

- Suggestion
  - CSE/IT ➲ SW & Analytics Track
  - ECE/EE/other engineering ➲ Sensing & Comm Track

IoT Hackaton

- Monday PM – Saturday AM
- Apply the learning to a practical IoT application
  - Come up with ideas using IoT technology for societal benefit. Bootstrapping ideas provided.
  - Use sensors & communication devices provided to design your hardware solution
  - Use edge devices & Cloud along with Big Data platforms for analytics and visualization
- Work as a team across disciplines
- Mentors to guide you, mailing list for technology support
- Publish your solution on GitHub for broader impact
- *Present your work & compete for top honors!*

Tasks for Participants

By start of Day 2

- Pick a team (2 from Sensing/Comm, 2 from SW/Analytics) and a team name.
- Create a folder with your team name on GitHub under https://github.com/dream-lab/iot-school/tree/master/teams. Create a file "members.txt" in your team folder with the name, affiliation and email address of your team members.
- Pick up Raspberry Pi and Azure VM account information for your team

By end of Day 2

- Pick a project topic to work on. Pick up sensors required for your project. Identify mentor for your project.

Thank you!

github.com/dream-lab/iot-school