Senior Lab Projects for Teaching the Internet of Things in a Software Engineering Program

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Talk Outline

• Introduction – Why is this important?
• Internet of Things – An overview
• Perspectives on IoT in Education
• Senior Projects for IoT
• Conclusion
Increase of the connected devices per person [1]
Past and present projections of the number of interconnected devices [2]
Traditional Feedback Control Systems expanded into Cyberphysical Systems

Diagram:
- User Interface
- Communication Interface
- Real-Time Computer (Controller)
  - Controller Commands
- Plant (Controlled Object)
  - Disturbances
  - Measured and controlled variables
  - Desired Value
Basic Components of a Real-Time Embedded/Cyberphysical System

- Sensor/Actuator component
- User Interface component
- Communication Link component
- Database component
- Processing component
- Timing component.
Overall Architecture of the Internet of Things
IEEE P2413 IoT
Application Framework [3]

Universal Thing Description:
* Who am I? * Who makes me?
* What can I do? * What language do I talk?
* Who is asking? * Where to get more info?
Using Cloud to Build IoT Systems
Perspectives in Engineering Education

The impact of the Internet of Things is likely to be revolutionary in all areas of education. This will be a consequence of speed of deployment, ubiquity, global scale, low cost and connectivity of billions of intelligent sensors and actuator devices generating unprecedentedly huge amounts of data. The interconnectivity and cutting across silos will place more demand on hybrid skills throughout ICT and beyond. British Computer Society [4]
3D Printer
Factory Made w/o Connectivity
3D Printer
Raspberry Pi Controller

Lulzbot 3D Printer

Rock server tunnels incoming internet connections to the Raspberry Pi through a reverse proxy.

Raspberry Pi Server
Webpage for monitoring printer

Raspberry Pi Camera

Internet

Rock Server
Smart Home with Access from iOS
ESP8266 Microcontroller Board
Smart Home with Access from iOS
iPhone Connectivity w/ Appliance
GPS Tracker

FIONA 808 Board
GPS Tracker
Remote User Connectivity
Remote Robot Access
AL5A Robotic Arm
Remote Robot Access

Connectivity of the Camera
Online Health Monitoring
General Configuration
Online Health Monitoring
Remote Access to Results
Wireless Sensor Network

xBee Based Device with Sensors
Wireless Sensor Network
Weather Parameters in the Cloud

Historical Weather

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Weather

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Summary and Conclusion

• Six student projects were presented
• Emphasis on compatibility with architecture of IoT and on practical aspects of usability
• Demonstrated the value of the technology and proved that such projects are feasible
Acknowledgments

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References


