GHTC 2018

IoT architecture for humanitarian services

October 18, 1:30-5:30 pm

This workshop is included with conference registration. There will be no additional charge.

Abstract

In this 4-hour workshop we discuss potentials of Internet-of-Things (IoT) technologies in addressing humanitarian challenges in developing countries. We explore many examples of IoT applications, use-cases, and benefits such as improving agricultural production by alerting farmers about weather patterns, healthcare by remotely conducting remote diagnosis of diseases, livestock care by using of RFID tags, public health and safety by monitoring water sanitation and fire. In the second part, we describe the main IoT building blocks: (1) sensor types and their interfaces, including UART, SPI and I2C; (2) common microcontroller platforms including STM32 Nucleo, Samsung ARTIK, PIC MCU, etc.; (3) connectivity requirements and wireless technologies such as ZigBee, Wi-Fi, LoRa, Bluetooth Wireless 4 .0 LE, RFID, and NFC in terms of range, bandwidth, and battery life; (4) cloud computing and storage platforms such as AWS, IBM Blue mix, Microsoft Azure, GE Predix, etc. We also elaborate on power harvesting methods and the importance of power management for IoT-based networks and ways to optimize node life-time. We conclude the workshop with live demonstration of several IoT-based systems each having different design criteria and power constraints. The audience can interact with the systems and explore their capabilities and limitations.

Learning Objectives

The primary motivations of the tutorial are as follows:

i) Learn the concept and architecture of IoT
ii) Understanding IoT components
iii) IoT related protocols
iv) Wireless technologies used in IoT enabled systems
v) Explanation on IoT domain related to Hardware, Sensors and connectivity protocols.
vi) Walking through various connectivity methodologies.
vii) Importance of various IoTcloud platforms.
viii) Creating social awareness with demonstrating various real-time applications

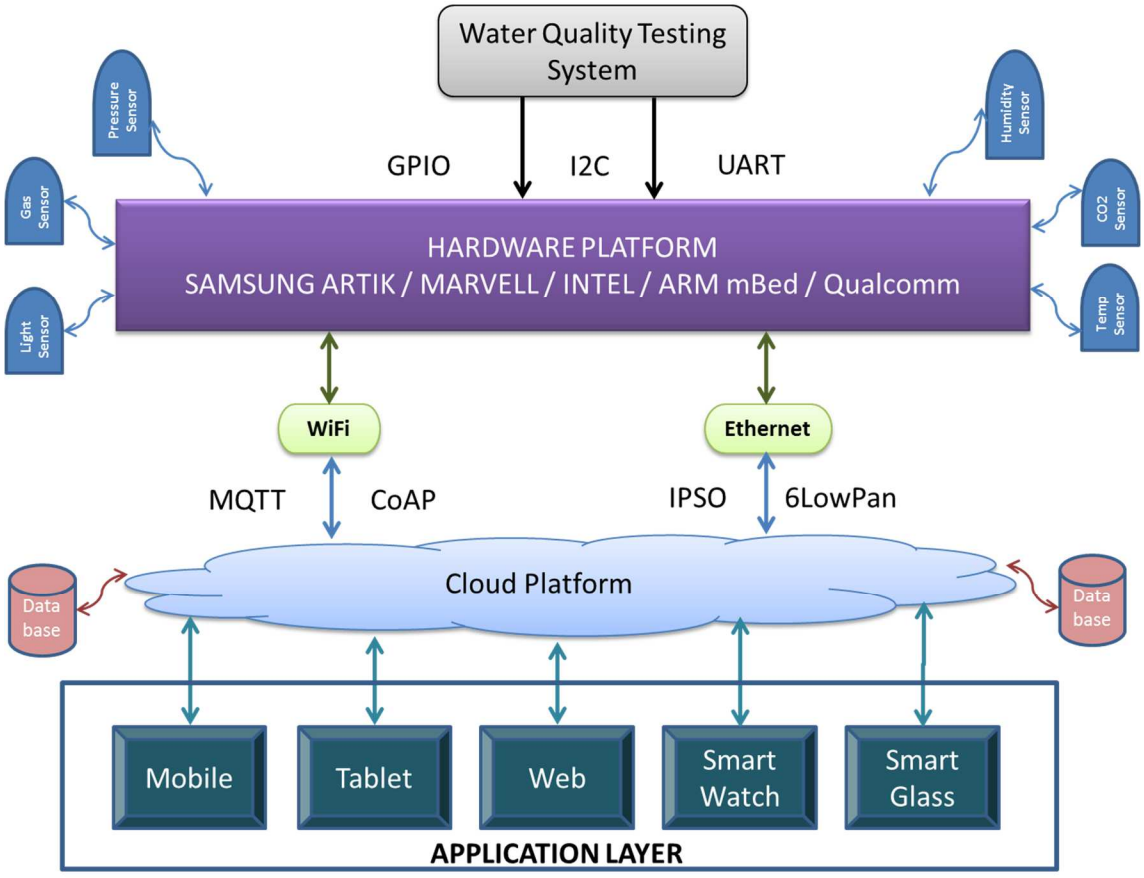
Schedule

- 1.30 to 2.25 pm Session 1: Introduction to Internet of Things (IoT), Architecture & Building blocks
- 2.25 to 3.20 pm Session 2: Networking Technologies, IoT Protocols, Hardware, Wireless & Sensors

- 3.20 to 3.40 pm Break
- 3.40 to 5.00 pm Session 3: IoT Cloud platforms, Analytics,Security & Demo
- 5:00 to 5.30 pm Session 4: Use Cases, Real time projects & QA -

Description

The tutorial is designed to introduce low cost, reliable and real-time solutions for IoT enabled monitoring and control systems, such as Remote Water Testing, or air quality monitoring systems (as shown below). In today's world cloud enabled systems are considered as smart systems due to their capability of sensing, data processing, decision making and communicating with the cloud.



The participants will learn how sensors are connected to the hardware platform and how the hardware platform fetches data from sensors and pass it to cloud using various connection methodologies. The participants will identify the need for various IoT enabled monitoring systems.

Also the tutorial will introduce various sensors used in monitoring systems, IoT hardware platforms, networking topologies, protocols (CoAP, 6LoWPAN, REST, MQTT, HTTP etc.) and cloud platforms.

Participants will go through few case studies, schematics, design methodologies and infrastructure details. Participants will be proposed to design and execute a real-time parameter Monitoring project based on the learned concepts and principles and expected to complete the project within additional off-time tutorials days.

Who Should Attend?

Students at all levels (B.Tech. /M.Sc./M.Tech./Ph.D.) or Faculty from reputed academic institutions and technical institutions.

5.0 Length

Half day

6.0 Presenters Curriculum Vitae

Shivakumar Mathapathi, *Co-Founder and CTO, Dew Mobility*
Team Lead – Global City team challenges hosted by National Institute of Standards & Technology, USA
Industry Advisor- Senior Design Project- Department of Electrical Engineering, Santa Clara University, CA
Capstone Industry Advisor- MSIS- Smart City project- Santa Clara University, CA, USA
Guest Lecture – IoT course – School of Engineering – Santa Clara University, CA USA.
Mentor: Senior Design Project - Sonoma State University, CA, USA.

Mr. Shivakumar Mathapathi has over 25 years of experience in product development, design and faculty. Mathapathi is a seasoned technologist, entrepreneur, instructor and practitioner on the Internet of Things (IoT) with extensive experience as lead faculty, lab-practice and mentorship in executing smart city, smart agriculture, assisted living and other IoT related projects. He has designed study programs and academic syllabus for The IoT course, a Masters curriculum (4 units) taught at Santa Clara University and California Polytechnic State University. He led capstone design project at Cal Poly (part of California Stata University) to design and develop IoT cloud platform needed for smart city.

Mr. Mathapathi has contributed to build the ecosystem and establish innovation pathways for the OpenIoT project, a blueprint and awarded Open Source project in the Internet of Things for smart Cities sponsored by the European commission. He is focused on academic research and Innovation and he is involved in architecture design and development of smart city projects such as smart trash monitoring, Flood monitoring and smart trail traffic monitoring –designed for the City of San Luis Obispo. California.

Mr. Mathapathi is also a team lead for Global City team Challenge (GCTC) project hosted by the National Institute of Standards and technology (NIST) under the Department of Commerce, USA. GCTC team comprises of Sonoma State University, Santa Clara University, City of San Leandro, City of Galway (Ireland) and City of Rohnert Park, CA.

Mr. Mathapathi has designed IoT development kit (patent file pending) .The Kit enables design proof of concept (PoC) for IoT application. The kit consists of various sensors viz Temperature, Humidity, Air quality (CO2), Light, pressure and Gas sensors connected to AWS (Amazon) IoT cloud platform.

Farid Farahmand received his PhD in 2005 and is currently the Chair of the Engineering Science Department (Electrical Engineering) at Sonoma State University in California, U.S.A. He is also the director of Advanced Internet Technology in the Interests of Society Laboratory. Prior to his academic position at Sonoma State, Dr. Farahmand worked as the research scientist at Alcatel-Lucent Corporate Research and was involved in development of terabit optical routers. Farid has received multiple Fulbright Fellowships, and he has been a Fulbright Scholar since 2014. Dr. Farahmand holds multiple international patents, numerous reference conference articles and journal publications, and several book chapters, on the subjects of wireless communications, Internet-of-Things, optical networking, green networking, and delay tolerant networks. He has also authored many educational papers focusing on eLearning and Active Learning in classrooms. Farid is actively involved in many conferences and serves as the reviewer and co-editor to a number of technical conferences and journals. He is a member of IEEE, ASEE, and Engineers Without Borders-USA.