USEEW3 - Industrial Internet of Things

Mis à jour le 03-07-2024

Code : USEEW3

Unité spécifique de type cours

6 crédits

Responsabilité nationale : EPN05 - Informatique / Stefano SECCI

Présentation

Prérequis

General knowledge of telecommunications networks and Internet. Basic principles of wireless communications.

Objectifs pédagogiques

Expertise in the technological and design aspects that characterize the communication systems in the industrial environment, proficiency in the protocols and solutions necessary for the integration of heterogeneous technologies in an Industrial Internet of Things (IIoT) platform, essential skills for managing the nodes of an IIoT system and for collecting and processing data, knowledge of the most common wireless communication technologies in the industrial world and the IoT

Programme

Contenu

The course presents the technical issues related to communication in an industrial environment and to IIoT technologies, protocols and architecture. The presentation highlights the main differences between the performance requirements in commercial and in industrial networks. An introduction of the application layer protocols is given for providing a general overview of a complete IIoT system.

During the course seminars and workshops will be provided on research topics related to the course.

Topics:

- Introduction to IoT and IIoT: Basic concepts of IIoT and Industry 4.0. Performance parameters of industrial networks - Overview of technologies for industrial networks.
- Wireless communication technologies for IoT: LoRaWAN, Bluetooth and Bluetooth Low Energy, the IEEE 802.15.4 standard, ZigBee.
- Protocols for the integration of heterogeneous technologies: adaptation layer protocols (e.g. 6LowPAN, SCHC), requirements for routing protocols in WSN and IoT, the RPL protocol. IoT application layer protocols for IoT (e.g. MQTT, the CoAP)
- Lab Activity: configuration of an IoT system (e.g. using MQTT application based on Docker, Contiki OS and Cooja, LoRa devices).

Complementary content:

- Cellular technologies for IIoT: LTE and 5G IIoT.
- Industrial Wired Communication Technologies: Fieldbus overview. Evolution towards Industrial Ethernet. Functions and protocols of IEEE Time Sensitive Networking technology.

Modalités de validation

- Contrôle continu
- Projet(s)
- Mémoire
- Examen final

Description des modalités de validation

Oral/written exam and project/assignment/lab reports.

Bibliographie

Titre	Auteur(s)
IoT Networking, Ed. Pearson, 2023	Riccardo Melen - Vittorio Trecordi

6LoWPAN: the wireless embedded internet. Chichester, West Sussex, U.K. ; Hoboken, NJ: John Wiley & Sons, 2009. ISBN 9780470747995.	Shelby, Zach; Bormann, Carsten
Sensors everywhere: wireless network technologies and solutions. [S.l.]: Fundación Vodafone España, cop. 2010. ISBN 9788493474058.	Gómez, C; Paradells Aspas, Josep; Caballero Herrero, José Eugenio
Industrial Communication Technology Handbook, 2nd edition, CRC Press, December 2017	Richard Zurawski