



Cybersecurity through Digital Twins for the Industrial Internet of Things

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Keywords

Industrial Internet of Things ; Cybersecurity ; Digital Twins ; Anomaly Detection

Context

Critical applications now commonly use industrial networks to connect a large set of electronic devices to digitalize the production line. In particular, the detnet IETF working group aims at defining how to support real-time flows in the network [1]. Resources are reserved to cope with the worst case (e.g. latest time of arrival). The achievements of the PhD student are expected to fit in the RAW working group at the IETF (<https://datatracker.ietf.org/wg/raw>). We are already involved in this group to design efficient algorithms and protocols for deterministic wireless networking. We have defined scenarios [2] and management features [3] that must be supported by real-time wireless networks.

A large collection of wireless sensors and actuators may be disseminated in the environment to create a Cyber Physical System (CPS). In particular, IoT is a key enabler for the Industry 4.0 [4] to make the production lines reactive. Unfortunately, wireless environments are known to be lossy, with time-variant characteristics. Even worse, interference is very common in the unlicensed band, with even radio jamming attacks [5].

Scientific Objectives

Digital twins is a popular concept for Industry 4.0 [6]. They model real processes in the CPS, for e.g., predictive maintenance. More recently, they have been proved to be also useful for 5G and 6G networks [7]. We can plug more easily artificial intelligence algorithms in the network architecture.

We will explore how digital twins could improve the efficiency of a wireless network infrastructure. They will allow us to construct models of the network, to execute Machine Learning algorithms to detect anomalies, attacks, unexpected behaviors [8]. We expect to make the network smart enough to reach to changes in the environment or even attacks.

Skills

The expected skills are :

- Excellent programming skills in C, and embedding programming ;
- Distributed algorithms ;
- Wireless networks (protocols and radio propagation), energy efficiency ;
- Applicants should possess good verbal and written English skills. French is **not** a requirement ;
- Holding an MSc in Computer Science (CS) or Electrical and Computer Engineering (ECE), or Electrical and Computer Engineering (ECE) is mandatory.

Application

- Please send an email to reseaux-pos-2023@icube.unistra.fr comprising :
- a detailed CV ;
 - your possible list of publications if applicable ;
 - the grades for the last three years, with your position after the final exams ;
 - a cover letter.

Références

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