Internship proposal (industrial research): *IoT Network Monitoring as a Service*
Profile: Master 2 or engineering school
Supervisors: Rémi Varloot & Ludovic Noirie (Nokia Bell Labs France)
                 E-Mail: remi.varloot@nokia-bell-labs.com, ludovic.noirie@nokia-bell-labs.com
Location: Nokia Bell Labs France @ Nokia Paris Saclay (Nozay, south of Paris).
Dates: Starting February/March 2021, duration 5~6 months

Nokia is a global leader in the technologies that connect people and things. With state-of-the-art software, hardware and services for any type of network, Nokia is uniquely positioned to help communication service providers, governments, and large enterprises deliver on the promise of 5G, the Cloud and the Internet of Things. Serving customers in over 100 countries, our research scientists and engineers continue to invent and accelerate new technologies that will increasingly transform the way people and things communicate and connect.

Powered by the innovation of Nokia Bell Labs, the company is at the forefront of creating the technologies that are increasingly at the heart of our connected lives. Nokia Bell Labs mission is to define the future of communications and networking and deliver disruptive innovations that redefine human existence and business realities.

The internship will take place within the IoT-Control research department in Nokia Bell Labs France, the French Nokia Bell Labs center located in Nokia Paris Saclay, in Nozay, just south of Paris.

After having showcased the potential of network traffic analysis in local networks for applications such as device type identification [1,2] and service automation [3], our team has designed and implemented the IoT Network Monitoring platform to simplify the deployment of such applications, namely by automating most of the deployment process [4]. We now wish to expand the possibilities offered by this solution, namely by adapting it to a wider range of machine learning algorithms (e.g. supervised learning, federated learning, reinforcement learning) and developing new functionalities based on network traffic analysis.

The intern will participate in this research study with Nokia Bell Labs researchers. They will:

- Contribute to the design of new features for the IoT Network Monitoring platform, focusing on but not limited to extending the ease-of-use for machine learning algorithms;
- Help implement, test and showcase these new features, either in a virtualized environment or on a testbed in our lab;
- Conceive new monitoring applications based on the collection and analysis of network traffic and deploying them using the IoT Network Monitoring platform.

Recommended skills:

- Computer Science: network architectures, LAN (Eth/Wi-Fi), IP network protocol stack, SDN, NFV…
- Programming: JavaScript, Python…
- Systems/Software: Linux, Virtual Machines, Docker containers, GNS3, Open vSwitches…

References:

[1] Nesrine Ammar, Ludovic Noirie, Sébastien Tixeuil, "Autonomous IoT Device Identification Prototype," Network Traffic Measurement and Analysis Conference (TMA 2019, best demo award), June 2019, Paris, France. http://dx.doi.org/10.23919/TMA.2019.8784517.

[2] Nesrine Ammar, Ludovic Noirie, Sébastien Tixeuil, "Autonomous Identification of IoT Device Types based on a Supervised Classification," International Conference on Communications (ICC 2020), June 2020, Virtual conference, Ireland. https://dx.doi.org/10.1109/ICC40277.2020.9148821.

[3] Ajay Krishna, Michel Le Pallec, Radu Mateescu, Ludovic Noirie, Gwen Salaün, "IoT Composer: Composition and Deployment of IoT Applications," ICSE 2019 - IEEE/ACM 41st International Conference on Software Engineering (ICSE 2019): Companion Proceedings, May 2019, Montreal, Canada. http://dx.doi.org/10.1109/ICSE-Companion.2019.00028 .

[4] Publication pending, see Lincs presentation (https://www.lincs.fr/events/interns-talks-1-monitoring-as-a-service-for-iot-networks-and-2-structured-and-interactive-summarization-provisional-title/)