

Titre d'emploi: CIFRE Thesis / Software Engineer 5G core network

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EXFO

Job title: CIFRE Thesis / Software Engineer 5G core network
Division/function: Research & Development (DF0007)
Business unit / department: Monitor Wireless Prot &NFV (BU0064)
Country: France
State: Bretagne
City(ies): Rennes

EXFO develops smarter network test, monitoring and analytics solutions for the world's leading telecommunications service providers, network equipment manufacturers and webscale companies—and we love what we do! With nearly 1,900 employees in more than 25 countries, EXFO is no. 1 worldwide in fiber optic test solutions and has the largest active assurance deployment. Our broad portfolio of intelligent hardware and software solutions enable our customer's network transformations related to fiber, 5G, virtualization and big data analytics. We're always looking for top talent to help us lead the way in a thriving industry with boundless opportunities.

The b<>com Institute for Research and Technology is a technology pioneer and provider for companies that want to digitally boost their competitive edge. b<>com addresses several industries: culture & creation, digital infrastructures, health, defense and industry 4.0. Its laboratories bring together talented people from a variety of disciplines and cultures in areas like artificial intelligence, immersive video and audio, content protection, 5G networks, the Internet of Things, and cognitive technologies. b<>com's researchers and engineers, drawn from the ranks of industry and academia, work at its Rennes campus and at its sites in Paris, Brest, and Lannion. If you enjoy new technologies and leading the evolution, we have an opportunity for you to participate to an innovative project lead by b<>com with EXFO partnership. This is based in Rennes (France).

IMT Atlantique is a leading engineering school in France located in Brest Nantes and Rennes, with more than 2000 students and around 300 permanent teacher and research positions. IRISA is the largest French research lab in the field of information technology and information technology. Common to IRISA and IMT Atlantique, ADOPNET (Advanced Technologies for Operated Networks) research team contributes to the specification of architectures, protocols, control and monitoring mechanisms for the next generation networks. The goal is to build networks that are flexible, adaptive, energy-efficient, secure, and able to deliver content on a large scale to various types of terminals. ADOPNET, in particular, addresses the convergence of access networks, the combination of radio and optical technologies, and adaptive software-based content delivery networks.

Job description & Context

This position consists of 3-year PhD grant is proposed for highly motivated candidates interested in completing a PhD thesis on 5G core networks. This PhD may lead to an open-ended contract afterwards in the EXFO R&D in charge of developing cloud native monitoring products.

The candidate will be registered to IMT Atlantique doctoral school. He will be integrated into the IRT b<>com Advanced Connectivity lab based in Rennes and contributing to IRISA Adopnet research team.

Scientific project and objectives

With the explosion of the Internet of Things and the proliferation of services offered by the giants of the web (GAFA, Netflix and other Over The Top (OTT) actors), the use of telecom networks is continuously increasing. The mobile data traffic continues to grow rapidly, a possible order of magnitude is 50% increase of mobile data volume each year.

This explosion in data volume is a key factor for the development of 5G technologies that should significantly improve the speed of data transmission as well as the reliability of connected objects.

The 5G wireless networks introduce a new concept to support several isolated logical networks, called slices, over the same network infrastructure. Each 5G slice can be tailored to support specific service with its own requirements in terms of quality of service.

This 5G network with many and diverse services requires a tailor-made, on-demand and autonomous behavior orchestrating efficiently the slices and adjusting the network closer to the customer. This Zero touch orchestration paradigm raises new and important challenges in terms of infrastructure and resource management at the network-core level.

The scientific challenges that we would like to address within this thesis are related to effectively implement slices in the 5G core network.

What will you do?

- Evaluate solutions for a full automatization of slices instantiation and modifications, as close as possible to the concept of self-organizing networks (SON, Self-Organizing Networks) and Zero Touch management.
- Propose a model for the deployment and orchestration of 5G slices in the cloud native core network.
- Evaluate the benefits and effectiveness of this slice deployment in theory and in practice through the realization of a proof of concept. One possible use case is a set of Network Functions implementing Cloud-Native probing system.
- Contribute to detail the possible slices and their realization over the physical infrastructure with QoS and isolation constraints.
- Enhance the orchestration framework with features of prediction of necessary resources for incoming slices and the ability of dynamically adjusting allocated resources. This includes solutions that can be applied when a slice has excessive use of resources. Machine learning methods can be very suitable for this dynamic and complex resource management and prediction.

What we're looking for

Requirements :

- Master's degree in computer science (or in a highly related area) by the starting date of the PhD
- Self-starter with strong analytical and problem-solving skills
- Ability to adapt quickly to an existing, complex environment
- Teamwork and good communication skills, both verbal and written English

Technical skills :

- **Virtualization & Automation:**
 - Good Virtualization knowledge (**Linux/KVM, VMware vSphere**, etc), virtual switching and acceleration (OpenVswitch, DPDK, SRIOV, Direct-IO)
 - Strong background in Cloud computing management platforms; experience with **OpenStack, Docker** or **Kubernetes** would be a real plus
 - Experience with cloud automation tools and technologies such as **Ansible, Heat, NetConf, YANG**
- **Networking:**
 - 4G/5G network architecture, TCP/IP, Tunneling and Encapsulation: MPLS, VXLAN, GRE, UDP
 - Knowledge of **Software Defined Networking** ; proven hands-on experience with SDN Controllers would be appreciated (**OpenDaylight, ONOS, Juniper Contrail**, etc)
- **Software:**
 - Proficient with Linux environments (**Ubuntu, RedHat/CentOS**, etc)
 - Solid scripting development skills (**Shell, Python**, etc)
 - Strong programming skills, experience with **Python or C/C++**
 - **Optimization techniques** and **machine learning** knowledge are a real plus
 - MicroServices approach for Cloud Native environment, **REST API development**

Why working for us?

Joining EXFO in the scope of Research project with b<>com is a great opportunity that can help you pave your career path towards the most significant evolution in carrier network infrastructure specifically focusing on network virtualization and 5G. This job also provides suitable work surroundings that is based on agility/Devops cultural perspectives.

If you recognize yourself in our values, you are highly motivated and you like challenges, then join our team!

EXFO is an equal opportunity employer.

Thanks for your interest in EXFO.
If you have questions, please write us at careers@EXFO.com
We look forward to hearing from you soon.

