

M2CNS-SR R&D Projects

Date: September 13th, 2024

To apply to these R&D projects you need to send an application letter (motivation for the topics) + CV to the projects by priority

Please indicate the priority of the projects you apply to and the name of your colleague with whom you want to form a group.

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A- R&D Projects in Autonomic Network UE:

B- R&D Projects in SDN UE:

C- R&D Projects in QoS UE:

A- R&D Projects in Autonomic Network UE:

1) About using Blockchain Technology to secure Genomic data sharing.

Genomic data is foreseen to be revolutionary in improving the health and well-being of humans. It has been applied in different use cases, such as biomedical, clinical, and research. Among the main characteristics that genomic data might be helpful to are the ability to use them in diagnostic testing, which enables testing if an individual is affected and might be exposed in the future to specific diseases; determining to parent among two individuals and developing efficient drugs and therapies by using pharmacogenetics tests. However, besides these benefits of these genomic data, using these data raises many issues such as who, how and for which purpose these data are used. In this context, Blockchain is a promising technology to provide address these issues. The objective is therefore to advance the knowledge and thinking process about how to use blockchain technology to enforcing trust, transparency, traceability, privacy-preservation and availability of genomic data among different stakeholders.

2) Autonomic deployment of IoHT (Internet of Healthcare Things) AI based applications in, a Virtualized environment: eHealth IoT monitoring Use Case

The IoT and Industry 4.0 led digital revolution is also impacting significantly the healthcare sector allowing to evolve to advanced medical sensors from the already prevalent wearable IoT e-health devices. Also, recent advances in Information Technology (IT) has enabled the emergence of numerous health data tracking application allowing individuals to monitor their own healthcare. However, the lightweight IoT devices having limited batteries and processing capabilities are incapable of supporting advanced healthcare data privacy and security. As the conventional security schemes are inapplicable for such systems, this requires new distributed, lightweight and scalable safeguard to address it. AI technology has progressed in an amazing manner these last years and is transforming all areas of the society. This project aims to study the challenges that are faced by IoHT, understand the technical and analytical problems to address, select one or two problems and derive a solution, that should be implemented and tested.

3) Intent Based Security Configuration and Reconfiguration Kubernetes based Clusters:

Intent-Based Networking (IBN) is designed to automate networking processes. Managing and overseeing tasks in upcoming communications. By using networking concepts, Policies and AI, it is possible to improve the efficiency with IBN. IBN uses a closed-loop architecture to decrease human involvement and increase strength. However, there are still numerous challenges to address. The

objective of this project is to study the benefit of using IBN to enhance the security of containerized environments (kubernetes in this case). Kubernetes is an open-source software system that helps practitioners in automatically deploying, scaling, and managing containerized applications. Malicious users can perform potential security threats on kubernetes that need to be mitigated with appropriate mitigation strategies to secure the Kubernetes clusters.

B- R&D Projects in SDN UE:

1) Optimization and Monitoring of Video delivery in Hierarchical Edge/Fog Computing using SDN : Video streaming use case

Video streaming and computer games are among the most popular and highest bandwidth consuming media in the Internet hence these applications have very strict requirements in terms of data rate and delay that make their deployment very costly for operators. Edge computing is the name of a set of new technologies, such as cloudlets, micro data centers, fog, and mobile edge computing. It aims to provide storage and computational resources near to user at the network edge, to minimize latency and response time. Edge Computing provides users with ultra-low latency content delivery and powerful computing services without interacting with far end servers. The objective of this project is to study this technology, propose a model of the architecture and evaluate the performance gain of the delivery of video using a hierarchy of edge computers connected together until the end user terminal versus the delivery of video directly from far end servers.

2) Intelligent Orchestration of deployment, migration and load balancing of Containerized Applications in a distributed Cloud Infrastructure.

Containerization is a lightweight virtualization technology that providing high environmental consistency, operating system distribution portability, and resource isolation. Existing mainstream cloud providers have adopted container technologies in their distributed system infrastructures for automated application management. To handle the automation of deployment, maintenance, and networking of containerized applications, container orchestration is proposed as an essential research problem. However, the highly dynamic and diverse feature of cloud workloads and environments considerably raises the complexity of orchestration mechanisms. Machine learning algorithms are accordingly employed by container orchestration systems for behavior modelling and prediction of multi-dimensional performance metrics. Such insights could further improve the quality of resource provisioning decisions in response to the changing workloads under complex environments.

C- R&D Projects in QoS UE:

1) Tooled methods for the deployment of secure services in the Internet of Vehicles (IoV).

The objective is to design and implement an automated design and analysis chain to increase confidence in the software that will be deployed in future ecosystems: connected vehicles, edge and cloud computing, to guarantee compliance with - vis-à-vis functional and non-functional specifications (system and communication), to take into account uncertainties (linked to vehicle mobility, the change in communications processing resources, critical services in progress, etc.) to detect vulnerabilities . The project will have an analytical part and a practical implementation part in the connected vehicles SUMO simulator coupled with NS3 network simulator.