



Management and Orchestration in 5G Environment



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RESEARCH TOPIC

The research activity was mainly focused on 5G networks, an architectural revolution as compared to previous technologies, thanks to the increasingly use of cloud-based networking paradigms like **Software Defined Network (SDN)**, **Network Function Virtualization (NFV)** and **Multi-Access Edge Computing (MEC)**.

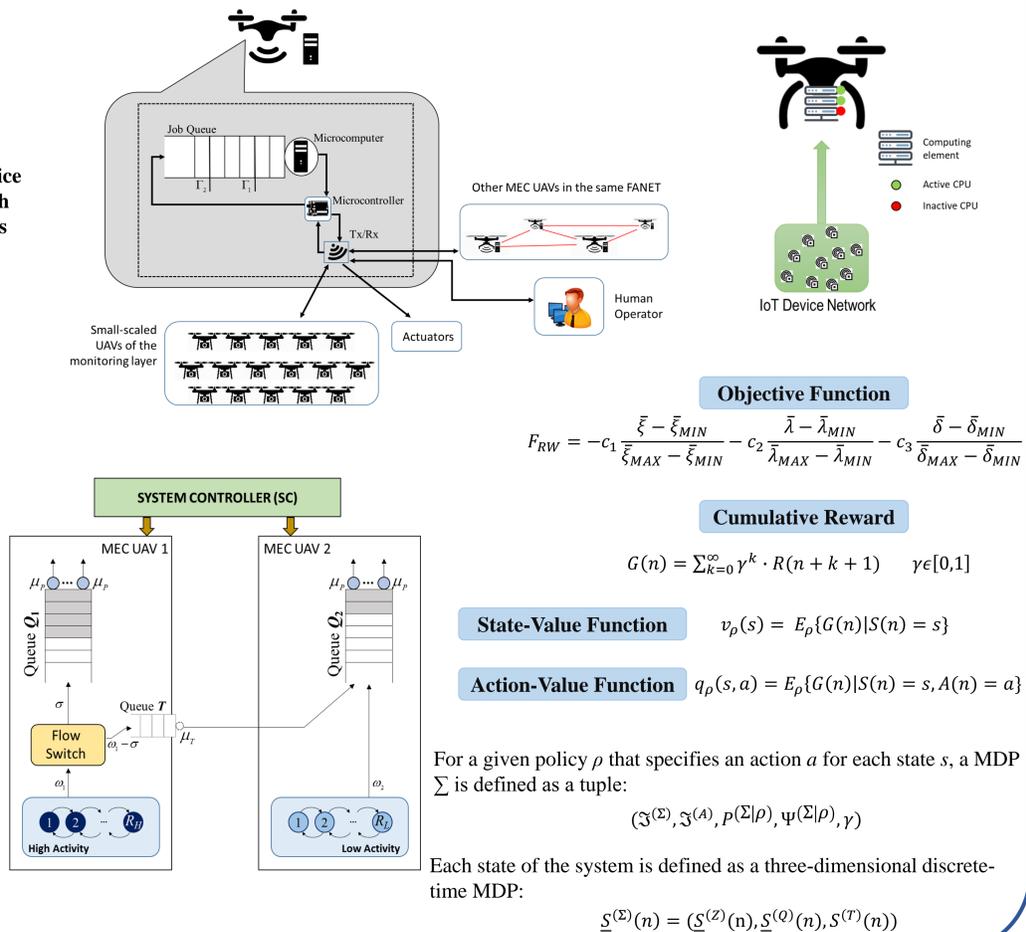
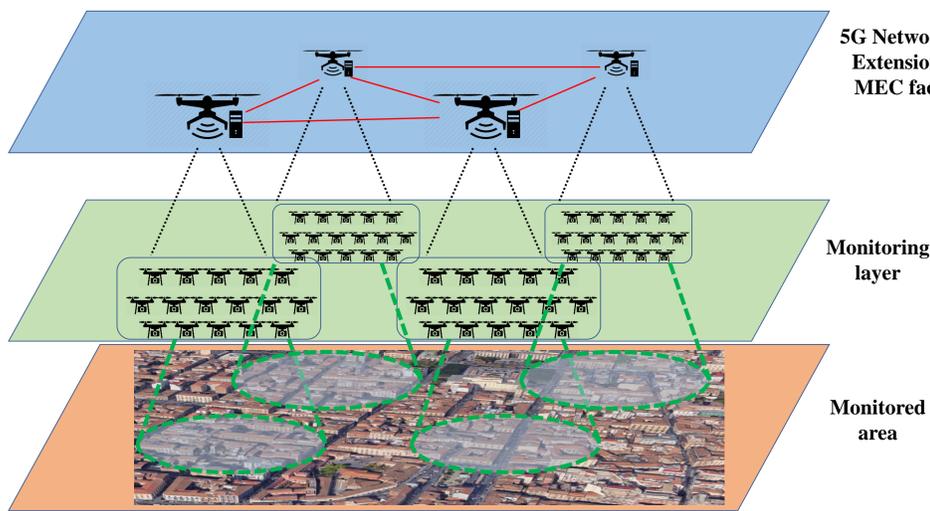
A key feature of 5G is **network slicing** that consists in the creation of a dedicated virtual network architecture with the aim of providing specific functionalities for certain services sharing the same resources of the real available physical network.

MEC UAVs extending Network Slice with Reinforcement Learning

This activity proposes to extend a **5G Network Slice Edge** with a fleet of UAVs, each providing computing facilities, and for this reason referred to as **MEC UAV**.

In the realized framework, MEC UAVs of the same fleet can apply a cooperation algorithm based on job offloading, aiming at minimizing power consumption due to active computers providing MEC, job loss probability and queueing delay.

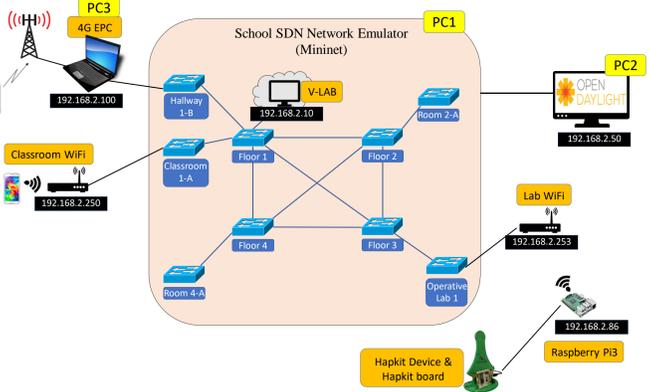
To choose whether to do offloading or not, the number of offloaded jobs and the number of active computing elements, a **Reinforcement Learning (RL)** approach is used to support the System Controller in each decision.



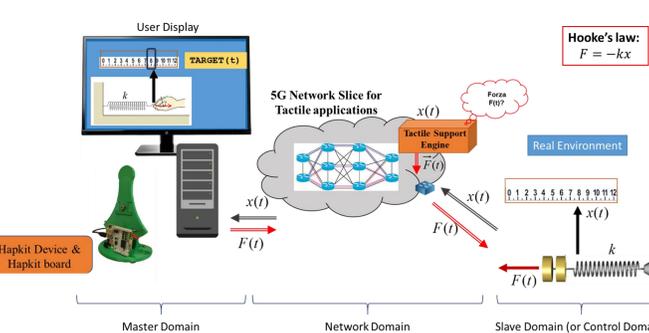
TACTILE INTERNET Scenario

Tactile Internet is a network slice providing guarantees of e2e delay not greater than 1 ms with the aim of providing services with interaction latency typically required for tactile steering and control of real and virtual objects without creating cyber-sickness.

Scenario 1



Scenario 2

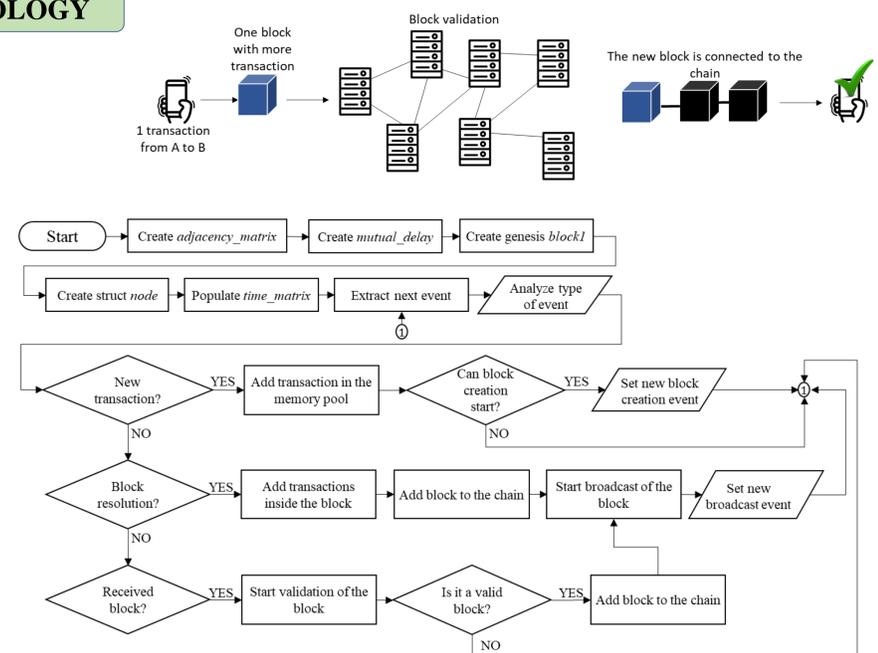


BLOCKCHAIN TECHNOLOGY

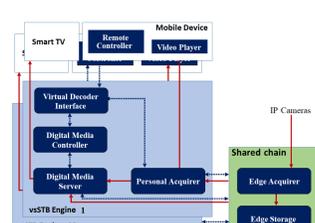
Blockchain is a decentralized transaction management technology on a distributed database. Recorded data are confirmed by the network nodes. Information about each completed transaction is shared and available for all nodes.

Blockchain users must solve a proof-of-work to add blocks to the chain. Resolving it requires substantial resources in terms of CPU and energy, resources that mobile devices cannot have and manage.

This activity has the final purpose of using blockchain technology, with appropriate adaptations, for the creation of smart contracts to negotiate the allocation of resources in the 5G environment

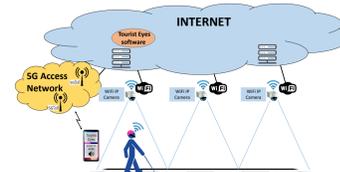


TRIANGLE Project



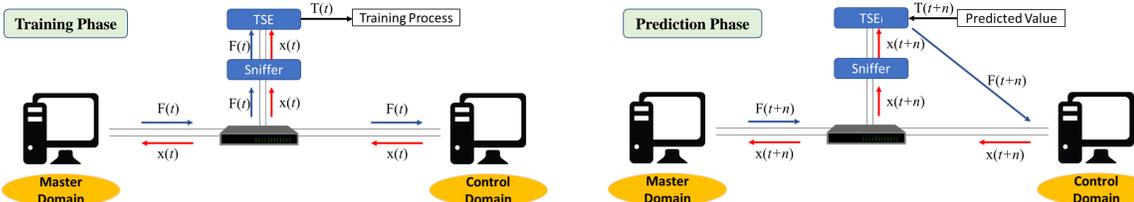
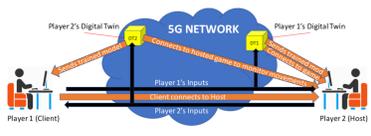
DiMoViS (in collaboration with Scuola Superiore Sant'Anna of Pisa) reproduced a small Proof of Concept (PoC) of a bigger capillary video surveillance platform over a 5G network infrastructure with a huge number of IP cameras.

5GINFIRE Project



Tourist Eyes (in collaboration with ONLUS vEyes) has the objective of providing blind tourists, visiting a smart city, with a framework for supporting their activities.

5Gamer is an experiment aiming at demonstrating the gain received by online games when supported by 5G technologies. The experiment is a very basic game, a Pong reproduction, with the addition of network and Machine Learning (ML) functionalities.



PUBLICATIONS:

<https://www.dieei.unict.it/dottorandi/christian.grasso>



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