

DISTRIBUTED MANAGEMENT OF NETWORK SLICES IN BEYOND 5G



CONTENTS

02
Overview

02
Meeting

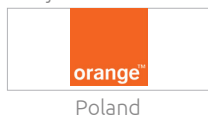
03
Publications

04
Factsheet

05
Deliverables

05
Contact

CONSORTIUM



OVERVIEW

As 5G technology is maturing, and in view of new pervasive mobile services of different vertical industries, it will be a necessity to support massive numbers of coexisting network slices, with different performance requirements, functionality, and timespans. This puts significant strain on the management and orchestration system that traditional centralized designs, as in Cloud Computing and NFV, fail to cope with.

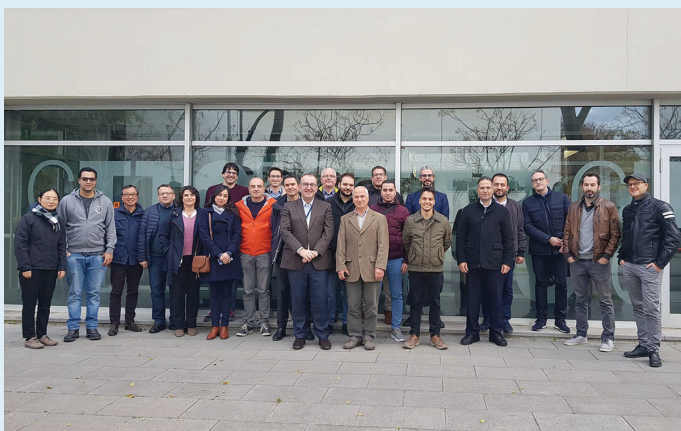
MonB5G aims at deploying a novel autonomous management and orchestration mechanism framework by heavily leveraging distribution of operations together with state-of-the-art Artificial Intelligence (AI) based mechanisms. The developed system is based on a hierarchical approach that allows the flexible and efficient management of network tasks, while at the same time, introduces a diverse set of centralization levels through an optimal adaptive assignment of monitoring, analysis, and decision-making tasks. The MonB5G approach focuses on the design of a hierarchical, fault-tolerant, automated data driven network management system that incorporates security as well as energy efficiency as key features, in order to orchestrate a massive number of parallel network slices and significantly higher types of services in an adaptive and zero-touch way.

The MonB5G project will last three years and will deliver a proof-of-concept providing a hierarchical, fault-tolerant, automated data driven network management system that incorporates security as well as energy efficiency. Demonstration will be carried out in two experimental platforms:

- (i) CTTC's 5G testbed in Barcelona, Spain.
- (ii) Eurecom's 5G trial facility in Sophia Antipolis, France.



MEETINGS



PROJECT KICK-OFF MEETING

On the 3rd and 4th of December 2019, 25 representatives of the consortium of MonB5G ('Distributed Management of Network Slices in Beyond 5G) assembled in Barcelona, Spain to formally kick off this Research & Innovation Action, funded by the Horizon 2020 EU Framework Programme. The project is coordinated by the SMARTECH Department of the Telecommunications Technological Centre of Catalonia (CTTC), which hosted the meeting that brought together the project's 12 partners from 8 European countries.

PLENARY MEETING

On 31st March and 1st April 2020, the 2nd plenary meeting was held virtually due to COVID-19 pandemic. The aim of the meeting was to review the project's progress, discuss upcoming milestones and project plan

PUBLICATIONS

European 5G Annual Journal (5th Edition)
Date of acceptance 3rd January 2020

Contact person:
Christos Verikoukis, Ph.D.
Fellow Researcher
Telecommunications Technological Centre of Catalonia
Av. Carl Friedrich Gauss 7
08860 Castelldefels
cveri@cttc.es



Content about the Project:
Project description and overall objective
Specific Objectives
Demos and Proof-of-Concept

Mon5G Overview

Project description and overall objective

Mon5G aims at deploying a novel autonomous management and orchestration mechanism framework by heavily leveraging distribution of operations together with state-of-the-art Artificial Intelligence (AI) based mechanisms. The developed system is based on a hierarchical approach that allows the flexible and efficient management of network tasks, while at the same time, introduces a diverse set of centralization levels through an optimal adaptive assignment of monitoring, analysis, and decision-making tasks. The Mon5G approach focuses on the design of a hierarchical, fault-tolerant, automated data driven network management system that incorporates security as well as energy efficiency as key features, in order to orchestrate a massive number of parallel network slices and significantly higher types of services in an adaptive and zero-touch way.

Traditional Centralized Management Architecture

Mon5G Distributed Management Architecture

Figure 1 Mon5G vision

Specific Objectives

To achieve the overall objective of Mon5G, a series of specific objectives have been specified:

O1: Devise a distributed management plane to handle the deployment of a massive number of network slices

O2: Define network slice service-level KPIs that consider not only a single Virtual Network Function (VNF), but all the network slice components, i.e., VNFs, Physical Network Functions (PNFs) and networking components

O3: Devise data-driven management system components (i.e., Monitoring System, Analytics Engine, Decision Engine), based on State-of-the-Art federated learning AI techniques

O4: By combining the Intent-based policy definition and the cognitive management entities, Mon5G will target multi-domain zero-touch network configuration of sliced 5G and beyond networks

O5: Define decision algorithms tailored to the Radio Access Network (RAN). The envisioned decisions should allow to update the RAN configuration, when the latter is detected as the root cause of network slice performance degradation or when considered necessary to meet the heterogeneous performance requirements of multiple coexisting slices

O6: Elaborate advanced security schemes and plans to empower secure smart network slice LCM

O7: Provide AI-assisted techniques to optimize energy efficiency in all technological domains (i.e., Cloud, RAN, Core and Multi-access Edge Computing)

O8: Dissemination, standardization, and exploitation of technologies developed in the Mon5G project. Special focus is given to push the solutions regarding the cognitive Analytics and Decision Engines to ETSI ZSM and ENI bodies

Demos and Proof-of-Concept

Proof of Concept 1: Zero Touch Network and Service Management with end-to-end SLAs	
Experimental Scenarios (ESs)	
ES1: Zero-Touch multi-domain service management with e2e SLAs	ES2: Elastic e2e slice management
Key Performance Indicators (KPIs)	
<ul style="list-style-type: none"> Reduce the number of SLA performance violations by 20% Improve network energy efficiency by a factor of 10 Reducing Static Slicing overhead will result in 30% higher utilization (will be achieved with dynamic reconfiguration techniques) Compared to Static Slicing, demonstrate the same or better SLA tolerances (or risk of missing SLAs) when dynamic slicing techniques are used 10x reduction in signaling / monitoring overhead with the use of federation techniques 	
Proof of Concept 2: AI-assisted policy-driven security monitoring and enforcement	
Experimental Scenarios (ESs)	
ES1: Attack identification and mitigation	ES2: Robustness of learning algorithms in the face of attacks
Key Performance Indicators (KPIs)	
<ul style="list-style-type: none"> 10x faster identification of security attack/anomaly 10x faster attack remediation and reconfiguration in the order of 10s End to end slice availability > 99% Per slice component availability > 99.999% Slice isolation: <5% performance degradation during attacks on coexisting slices. Full protection against cross-slice confidentiality and traffic steering attacks at the mobile edge False positive rate in attack classification below 1% Learning robustness: Precision, recall, fall-out, Area Under Curve values above/below specific thresholds vs. specific ratios of misreporting slice components 	



www.monb5g.eu



ABOUT

MonB5G will provide zero-touch management and orchestration in the support of network slicing at massive scales for 5G LTE and beyond. It proposes a novel autonomic management and orchestration framework, heavily leveraging distribution of operations together with state-of-the-art data-driven AI-based mechanisms.

Project Start: 01/11/2019
 Budget: € 5.572.491,25 €
 Instrument: ICT-20-2019-2020
 Duration: 36 Months
 Partners: 12



OBJECTIVES

- 01 Distributed management plane to support massive deployment of network slices
- 02 Definition of novel end-to-end (e2e) slice Key Performance Indicators (KPIs) and development of AI-based mechanisms for their accurate prediction from multi-level metrics
- 03 Data-driven management system based on federated learning
- 04 Zero touch network configuration
- 05 Decision Engine decisions tailored to the RAN
- 06 AI-driven slice security management via robust and efficient trust-based mechanisms
- 07 AI-driven energy efficient network management
- 08 Dissemination, standardization and exploitation of MonB5G

USE CASES

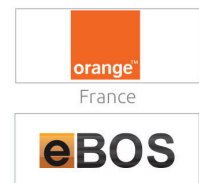
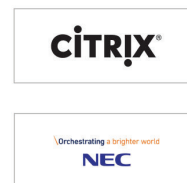
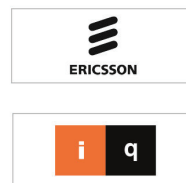
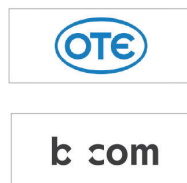
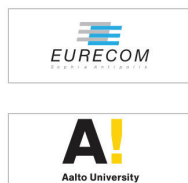
Zero-Touch Network and service management with end-to-end SLAs

It leverages the highly distributed MonB5G mechanisms to provide automated, zero-touch service management across domains, enabling Network Operators and MVNOs to avoid domain silos and ensure end-to-end cross-domain SLAs.

AI-assisted policy-driven security monitoring & enforcement

It demonstrates the efficiency of MonB5G when relying on AI to ensure legacy/new security threats detection in addition to their respective mitigation actions, and the proper enforcement of the AI-based techniques through novel trust-based evaluation mechanisms.

CONSORTIUM



PROJECT MANAGEMENT BOARD

Project Coordinator (PC):
Christos Verikoukis (CTTC)

Project Manager (PM):
Angelos Antonopoulos (CTTC)

Technical Manager (TM):
George Agapiou (OTE)

Innovation Manager (IM):
George Tsolis (CTXS)



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 871780

@monb5g

monb5g

DELIVERABLES

Deliverable	Lead Beneficiary	Submission Date
D1.9 Initial Report on information on cumulative expenditure	CTTC	December 2019
D7.1 Factsheet and project presentation	EBOS	December 2019
D7.2 Website development and creation of social accounts	EBOS	December 2019
D1.1 Project Quality Assurance and Documentation Standards	CTTC	January 2020
D1.2 Data Management Plan	CTTC	April 2020

CONTACT

✉ info@monb5g.eu

🌐 www.monb5g.eu

🐦 <https://twitter.com/monb5g>

🌐 <https://www.linkedin.com/company/monb5g/>

