Allbesmart LDA – a 5G company

Paulo Marques

February 2020 , Fed4FIRE+, Porto Road Show

www.allbesmart.pt

GET TO KNOW FED4FIRE+

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Outline

- **Allbesmart LDA - Who we are**
- **Business areas and added value through Fed4FIRE+**
  - **WiFi deployments in smart cities**
    - Experiment using City Lab testbed from imec
  - **Mobile networks analytics**
    - Experiment using PerformLTE fom University of Malaga
  - **Vehicular communications (V2X)**
    - Experiment using the Smart Highway from imec

Allbesmart LDA

- ALLBESMART is a SME funded in 2015 specialized in wireless connectivity and IoT solutions.
- The team has more than 10 years' experience on telecommunication projects at international level.
- With a strong network of research partners and scientific background, we put a component of innovation in all solutions, exceeding customer expectations.

Where we are

Business Area : Deployment of WiFi networks in smart cities projects

Deployment of WiFi networks

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Instituto Politécnico de Castelo Branco

Deployment of WiFi networks– WiFi analytics

Estatísticas de Acessos Visit Portugal Free Wi-Fi

Clientes Visit Portugal Free Wi-Fi

Submeter Relatório

CLIENTES ÚNICOS HOJE	CLIENTES ÚNICOS JANEIRO	CLIENTES ÚNICOS TOTAL	TOTAL DE SESSÕES
10	389	1742	10578

Respostas "É a sua primeira vez em Castelo Branco?"

Sim	206
Não	205
Sou residente	1257

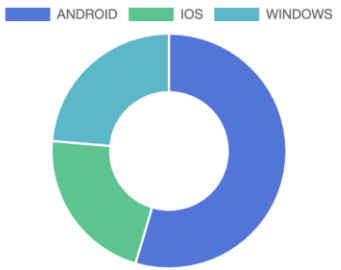
Respostas "A sua visita a Castelo Branco foi em?"

Lazer	197
Negócios	146
Visita a família/amigos	68

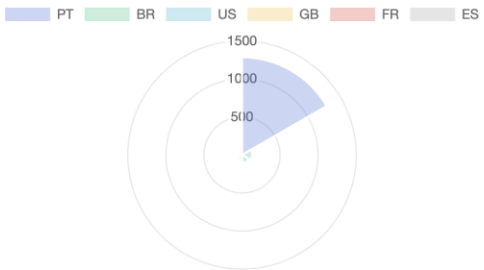
Sessões Por Intervalo

8h - 12h	367
12h - 20h	943
20h - 8h	358

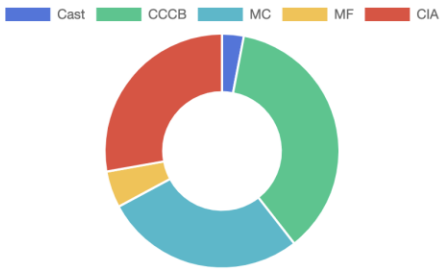
Clientes Por Sistema Operativo



Clientes Por País



Clientes Por Local



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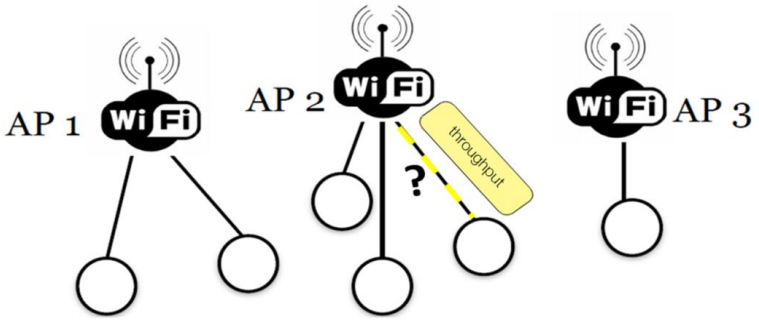
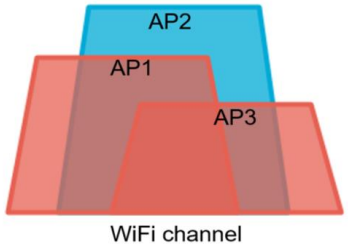
Added value from Fed4FIRE+ on the WiFi buisness

Prediction of WiFi links performance

- **Accurate prediction of wireless performance links can be very useful to optimize radio planning which is an important business activity for ALLBESMART.**
- **The main goal of this experiment is the validation of Machine Learning algorithms for predicting the performance of Wi-Fi radio links in multi node scenarios.**
  - The Wi-Fi links performance depends in a highly complex way on the actual topology, channel qualities, spectral configurations, etc.
  - It is especially hard to predict in quantitative terms how a given configuration will perform.





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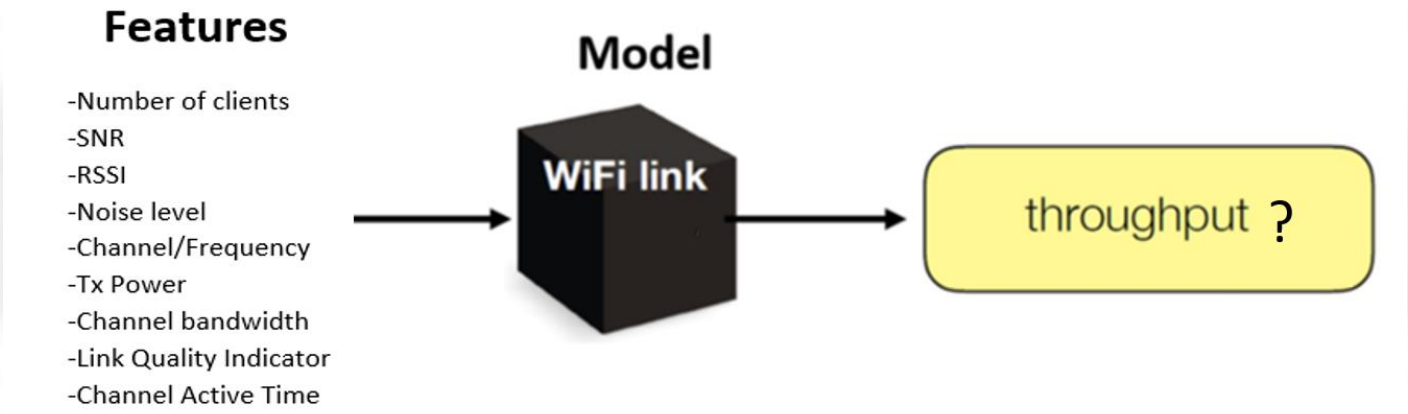
Prediction of WiFi links performance

- **We have used Machine Learning techniques to learn implicit performance models, from a limited number of real-world measurements.**



Prediction of WiFi links performance - Experiment setup

City of Things – CityLab – Antwerp – imec

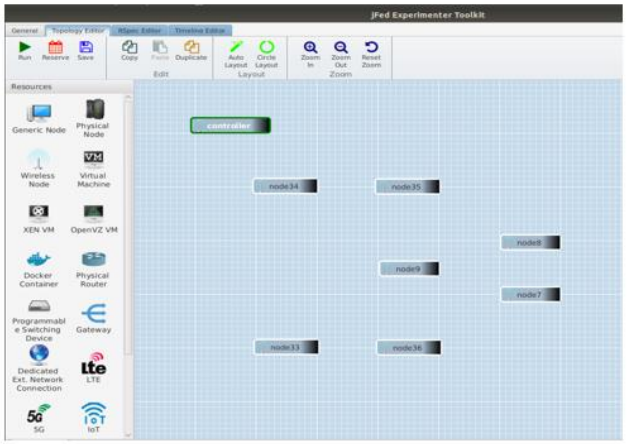


Fig.1:jFed toolkit used to remotely setup the experiment.

Fig.2 Gateway deployment in the city of Antwerp for wireless experimentation.

Fig.3 Layout of the CityLab wireless testbed used in this experiment.

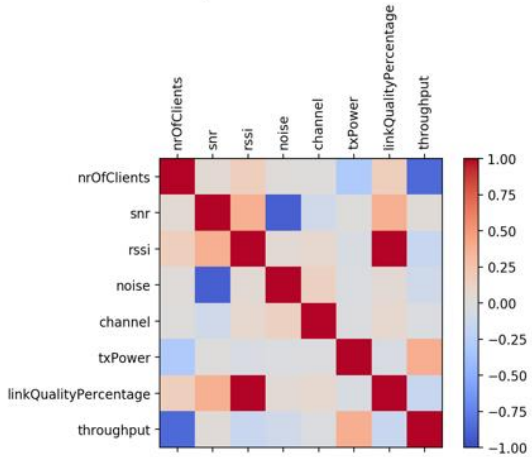
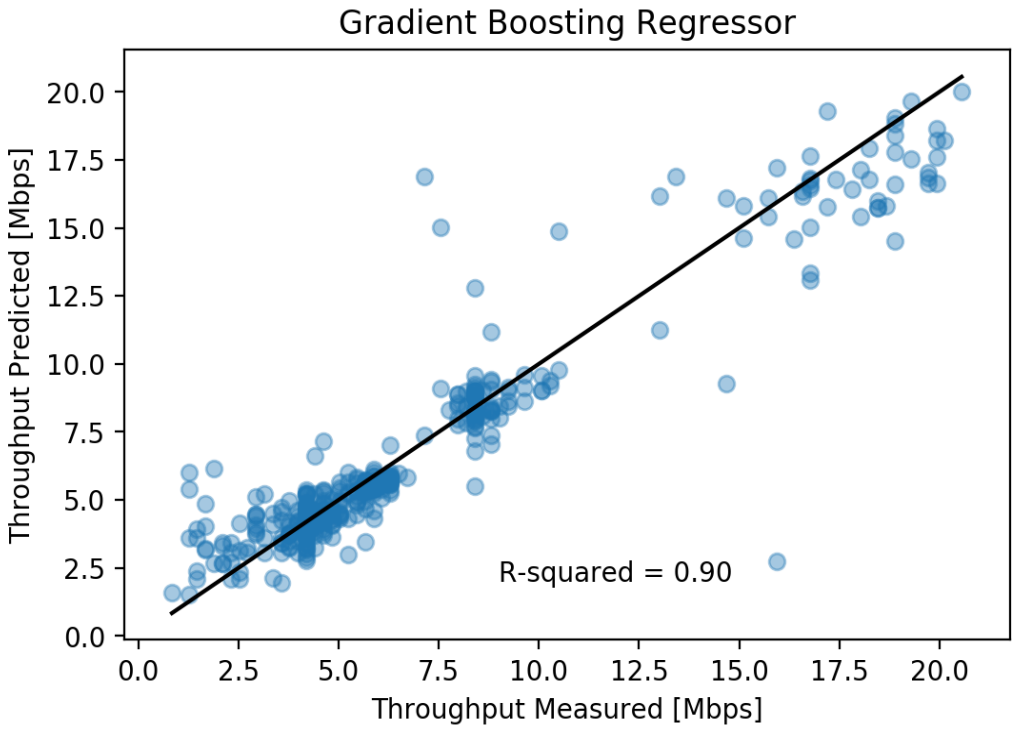


Fig.4 Correlation matrix between all the measured features of the Wi-Fi links.

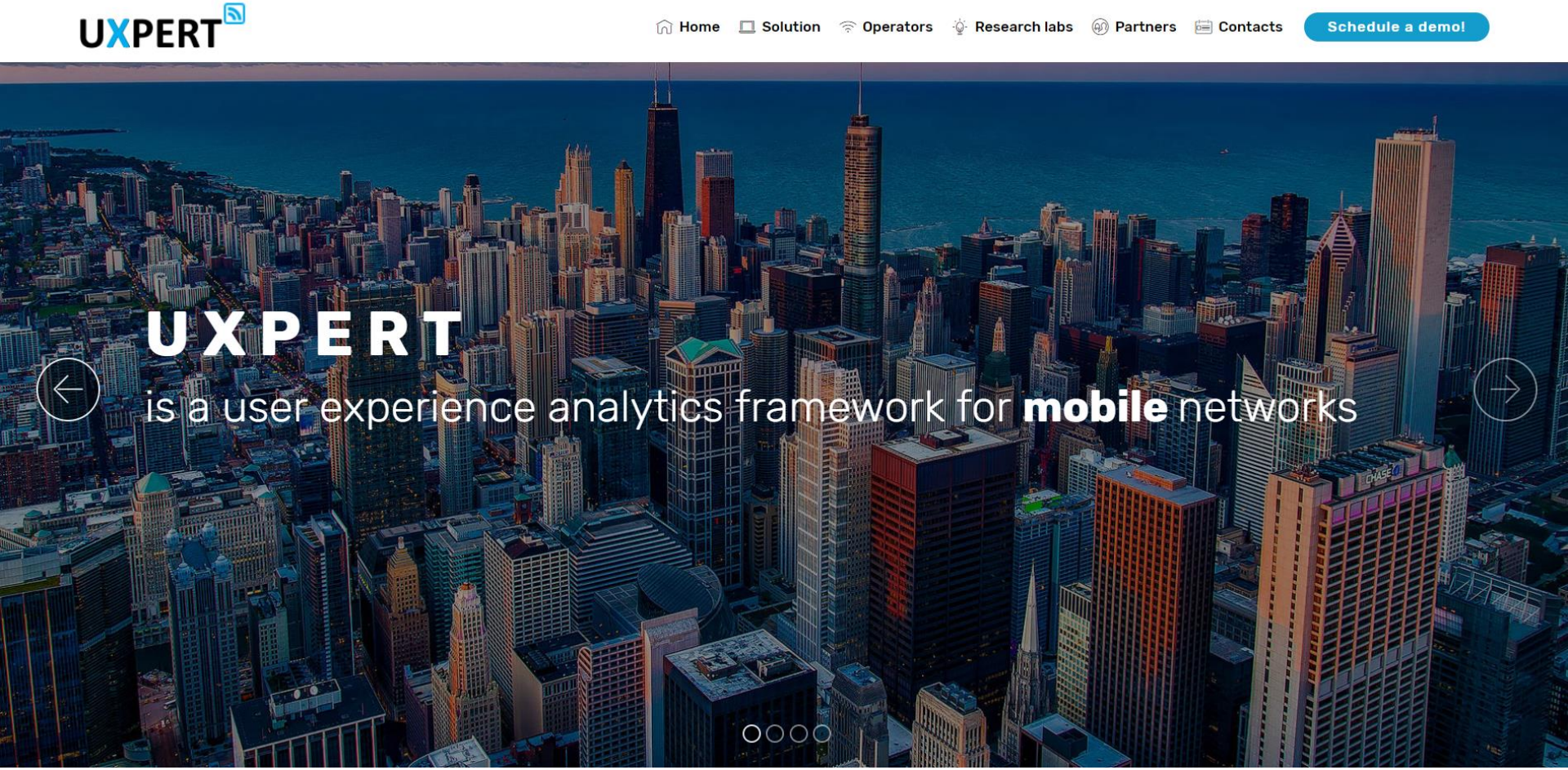
- We observed that abstract “black box” models built using Machine Learning techniques, without any deep knowledge of the complex interference dynamics of IEEE 802.11 networks, can estimate the link throughput with very good accuracy, reaching a value of R2-score of 90% with the Gradient Boosting Regressor.
  - The closer the points are to the diagonal, the better the prediction accuracy.



Impact

- The company acquired new competences on radio network planning in dense WiFi scenarios which are difficult to replicate without Fed4FIRE+ tools.
- Algorithms validated in the Fed4FIRE+ CityLab testbed to forecast the wireless link throughput are included in the UXPERT network analytics framework.

Business area: UXPERT - User Experience Analytics Framework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Partners
Contacts
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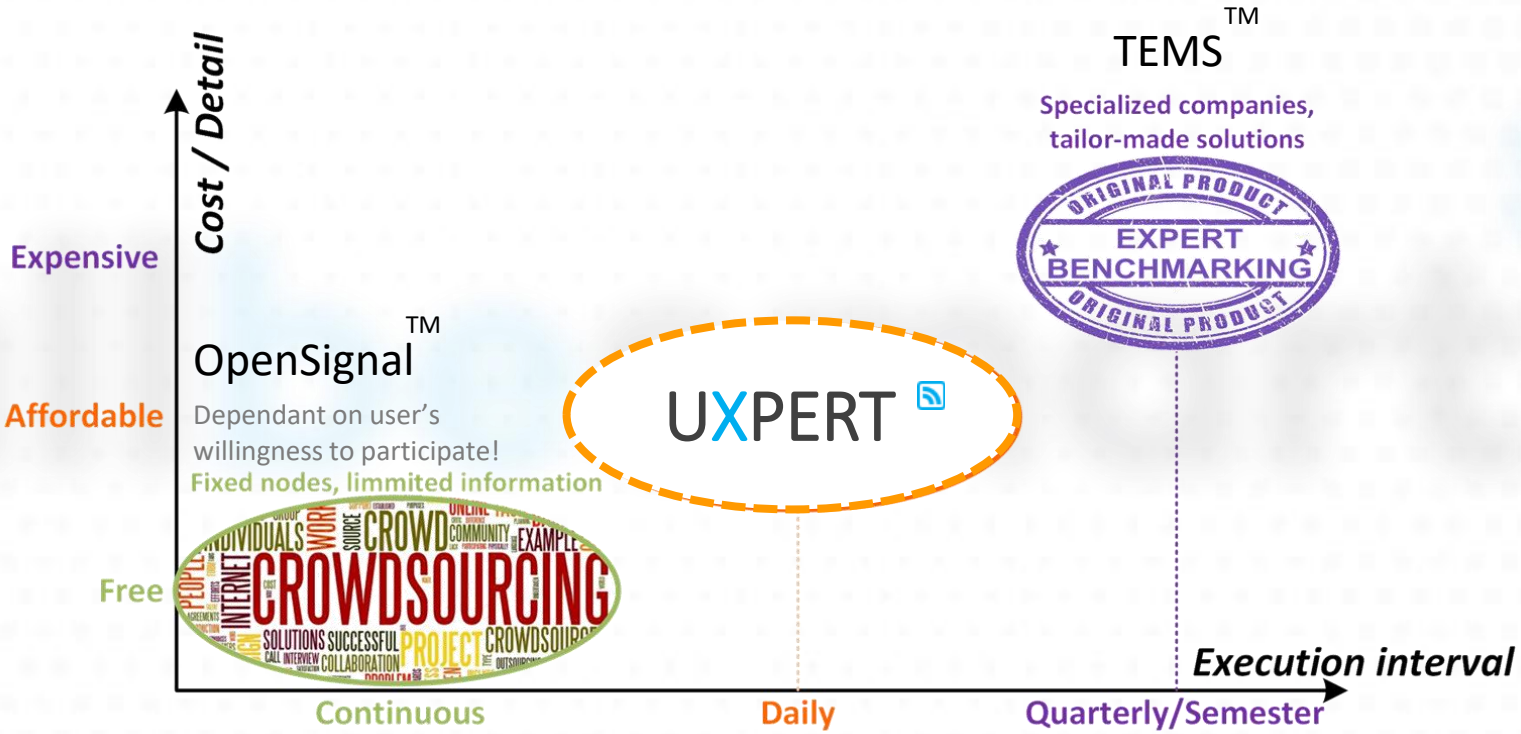
UXPERT
is a user experience analytics framework for mobile networks

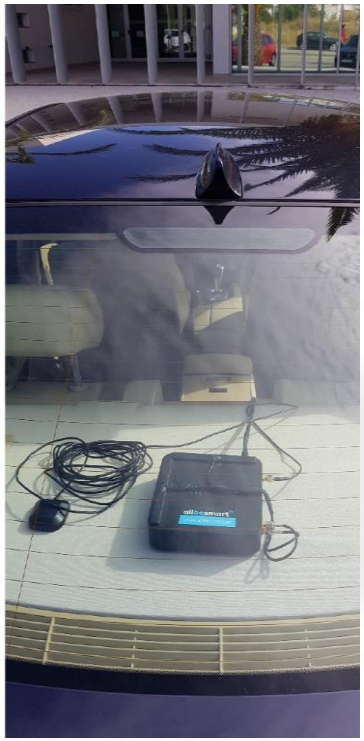
UXPERT – motivation

- Mobile Network Operators do not have control of the great majority of services used by the end user
  - YouTube, Facebook, etc.
  - Most of these services are free of charge and with limited responsibilities
- This creates a notion in the mind of the end user that the sole responsible for the availability and quality of the experience is the carrier, which in fact has no ability to improve or alter any aspect of the service.
- One of the biggest challenges MNOs face is to understand and measure the subscriber's network experience
- With virtual probes and CDRs (Call Detailed Records) is not possible to perform user experience benchmarking among competitors
- UXPERT evaluates the network performance in order to optimize the customer experience.

UXPERT – market positioning

- UXPERT positioning on the mobile network benchmarking and drive tests solutions



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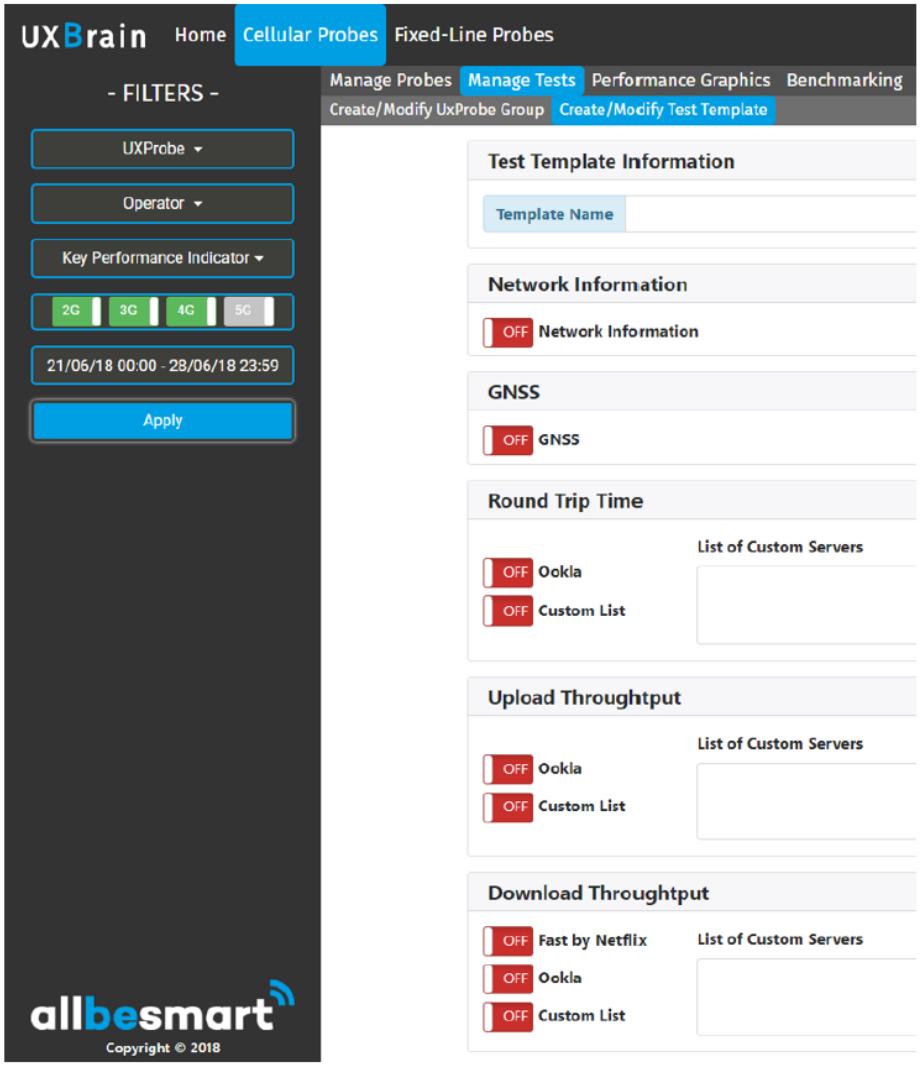
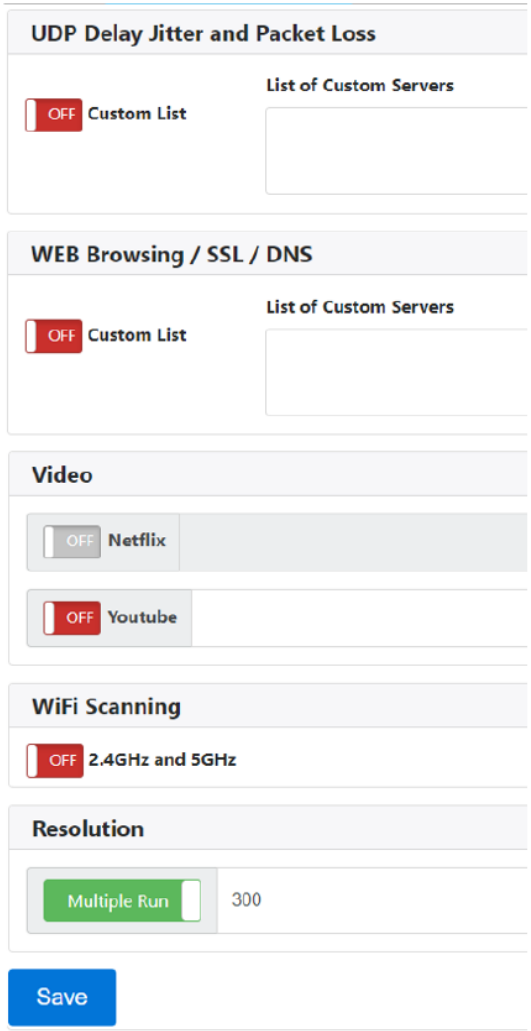
UXPERT
provides end-to-end
QoE benchmarking
uXProbe Stationary
uXProbe Mobile
RF (Uu)
Access
Distribution
S-GW
PDN GW
eNB to SGW
SGW to PGW
Core
SGi PGW to PGW
Distribution
S-GW
PDN GW
Access
eNB
SGW to eNB
RF (Uu)
uXProbe Application Server

UXPERT – added value

- Fully automated set of network benchmarking tests
- On-the-fly updates and remote configuration of radio probes
- KPIs: RSSI, RSRQ, RTT, CQI, DL and UL throughput, CSV format for third-party data analytics
- End-to-end QoE measurements based on standards (W3C, IEEE, ITU)
- Web browsing, audio and video (Youtube, etc)
- Small form and highly flexible probes (mobile phone or mini-PC with SIM card)
- Decrease the costs of drive tests in 70%

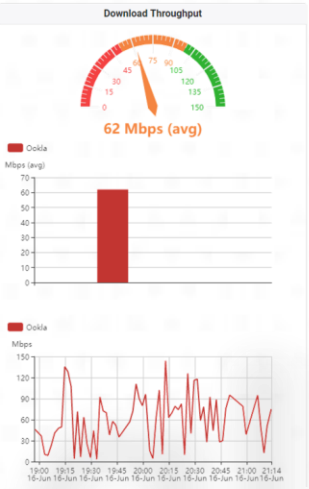
UXPERT – remote probe configuration – test template



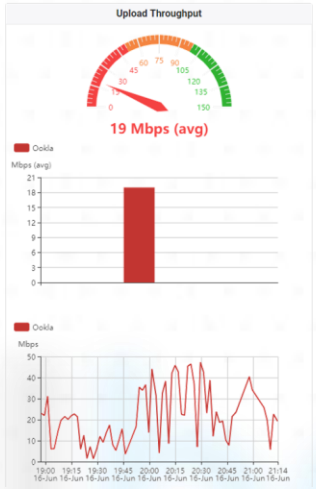


UXPERT – 4G benchmarking with a stationary probe in Campo Pequeno (Lisbon)

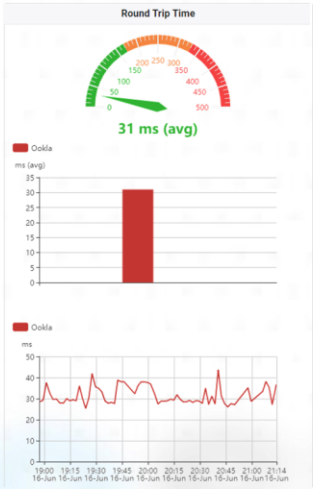
OP1



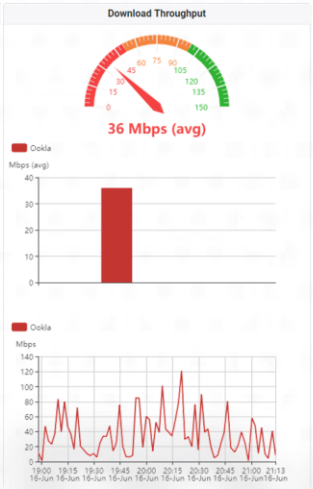
OP1



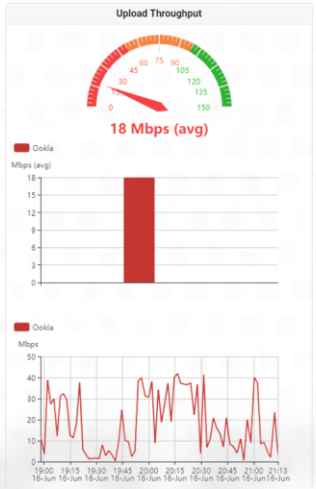
OP1



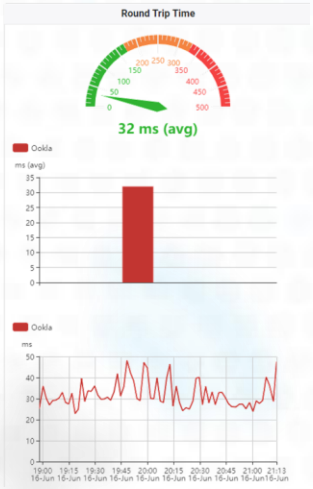
OP2



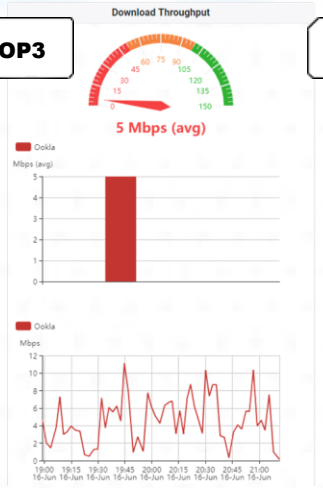
OP2



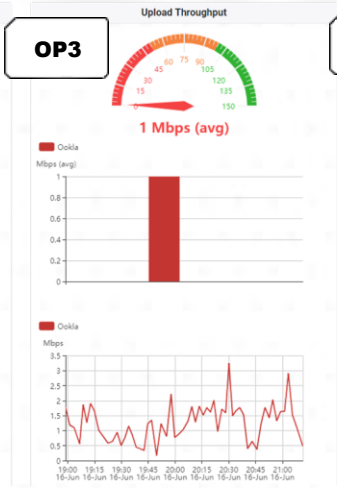
OP2



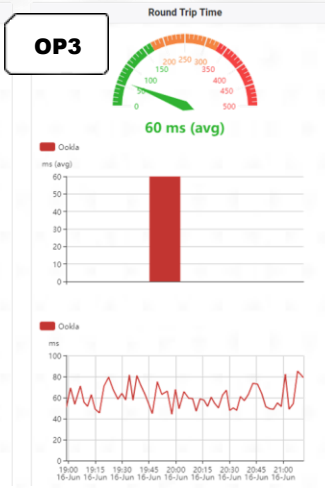
OP3



OP3



OP3



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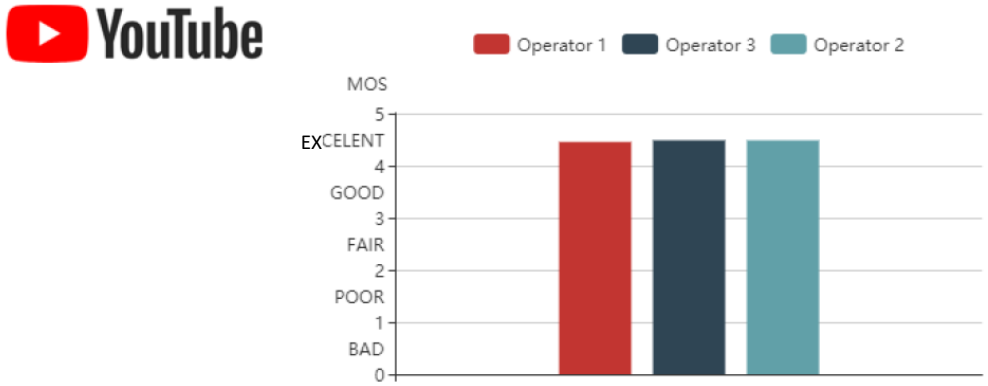
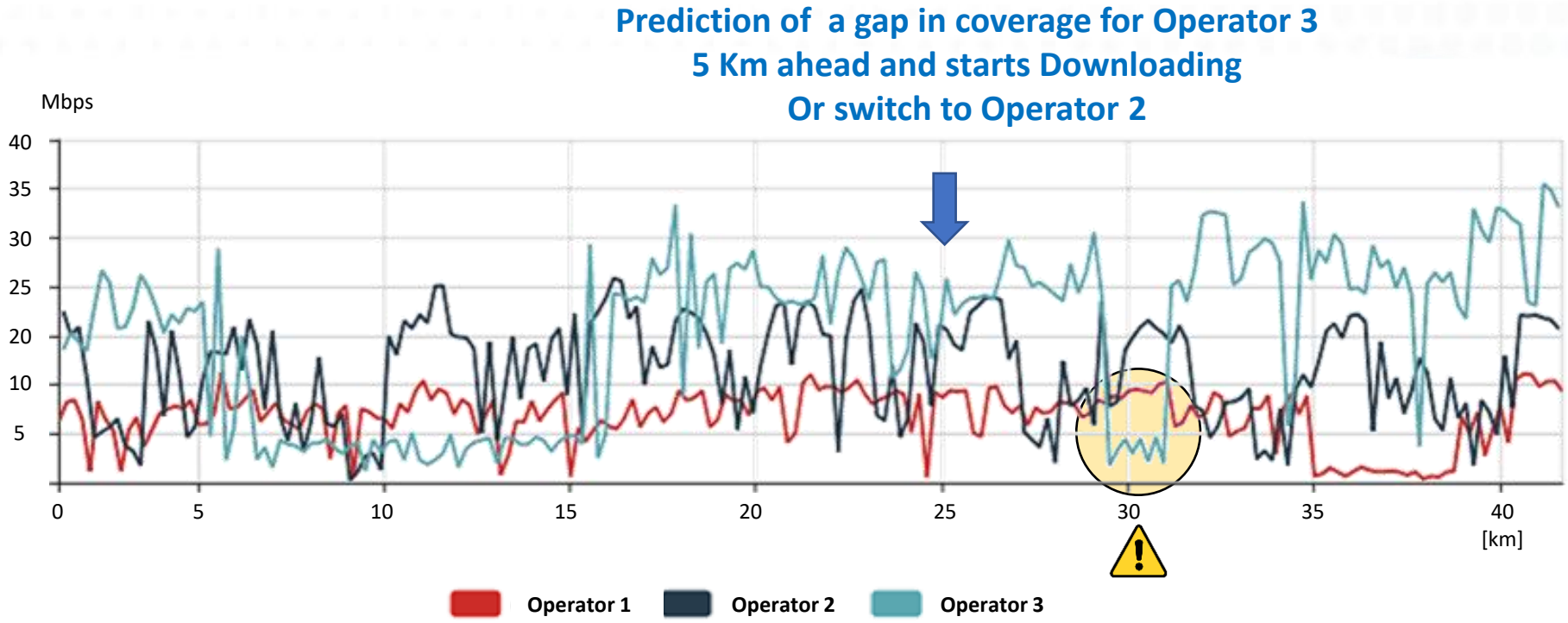
UXPERT – QoE Video and Web browsing benchmarking



Proactive connectivity prediction

- **Example-A23 highway Castelo Branco → Lisbon**
  - If the vehicle forecast an upcoming area with poor cellular connectivity, it can pre-download the information it needs, ensuring a better driver experience and the least impact on the cellular network.



Added value from Fed4FIRE+ on the LTE network analytics

Experiment setup using PerformLTE (University of Malaga)

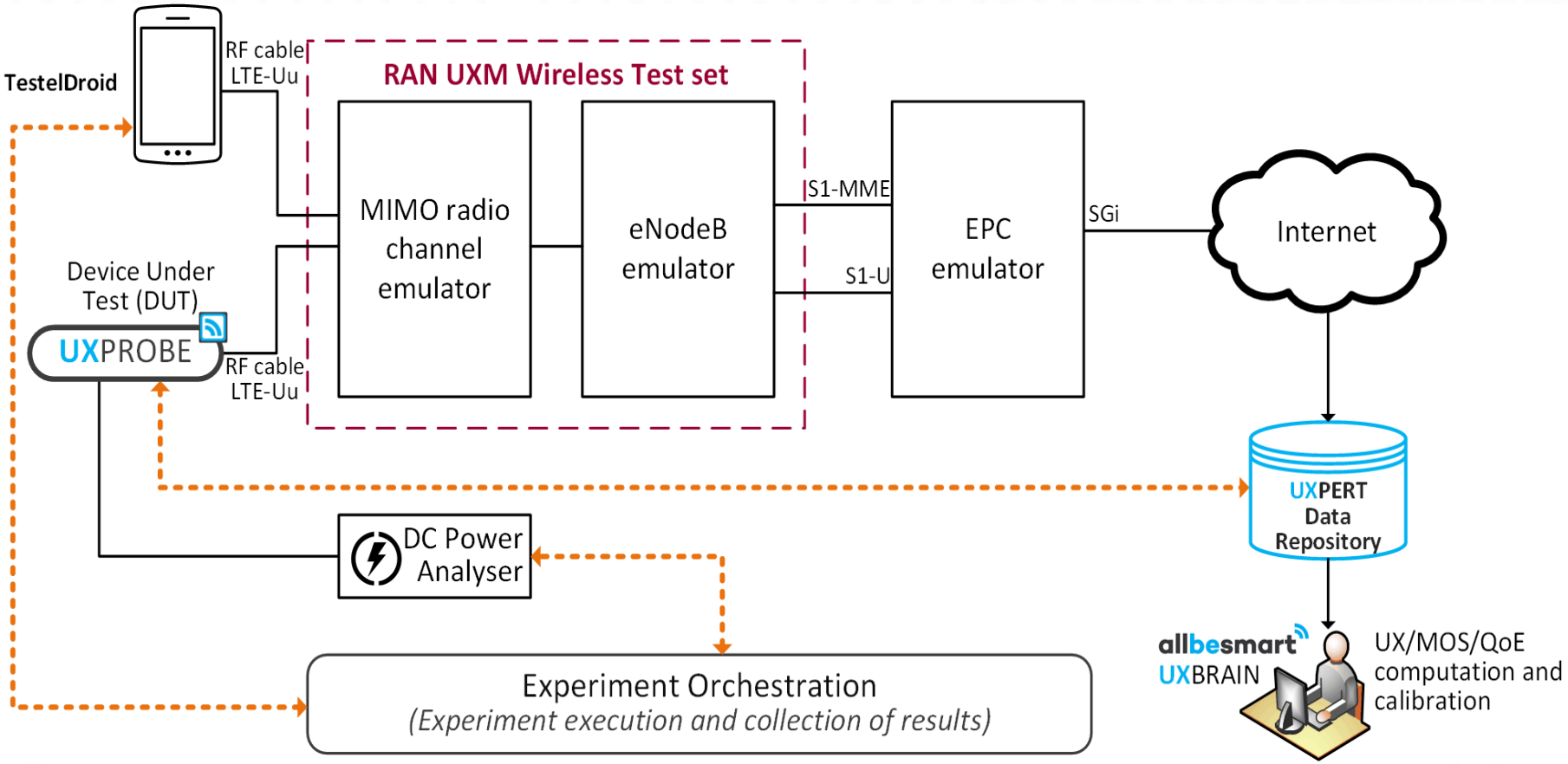


Figure 1: Reference architecture, using the PerformLTE testbed

Experiment setup using PerformLTE (University of Malaga)

- **In-lab calibration of UXPERT using state-of-the-art measuring equipment from PerformLTE. Four different scenarios were tested:**

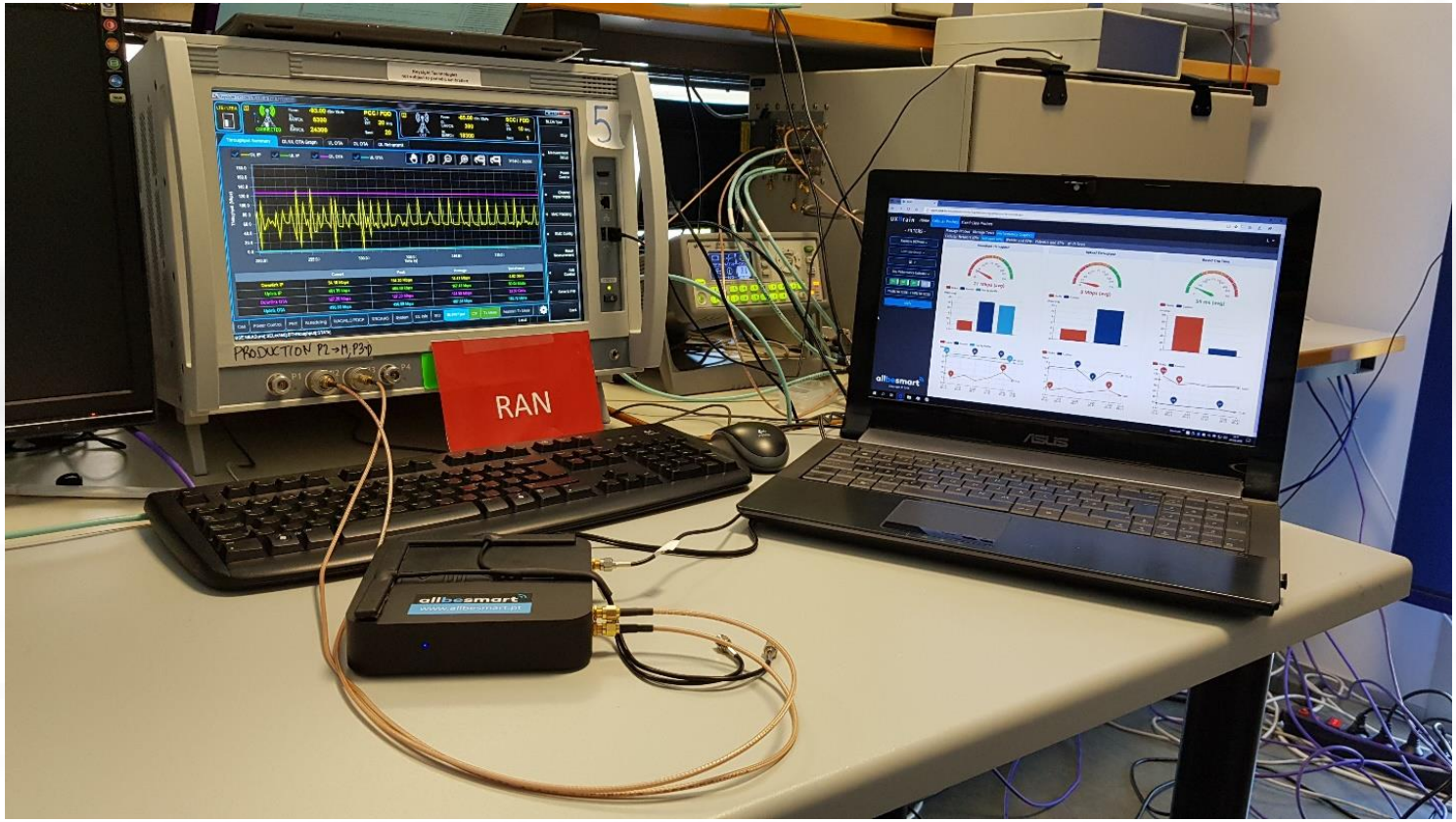


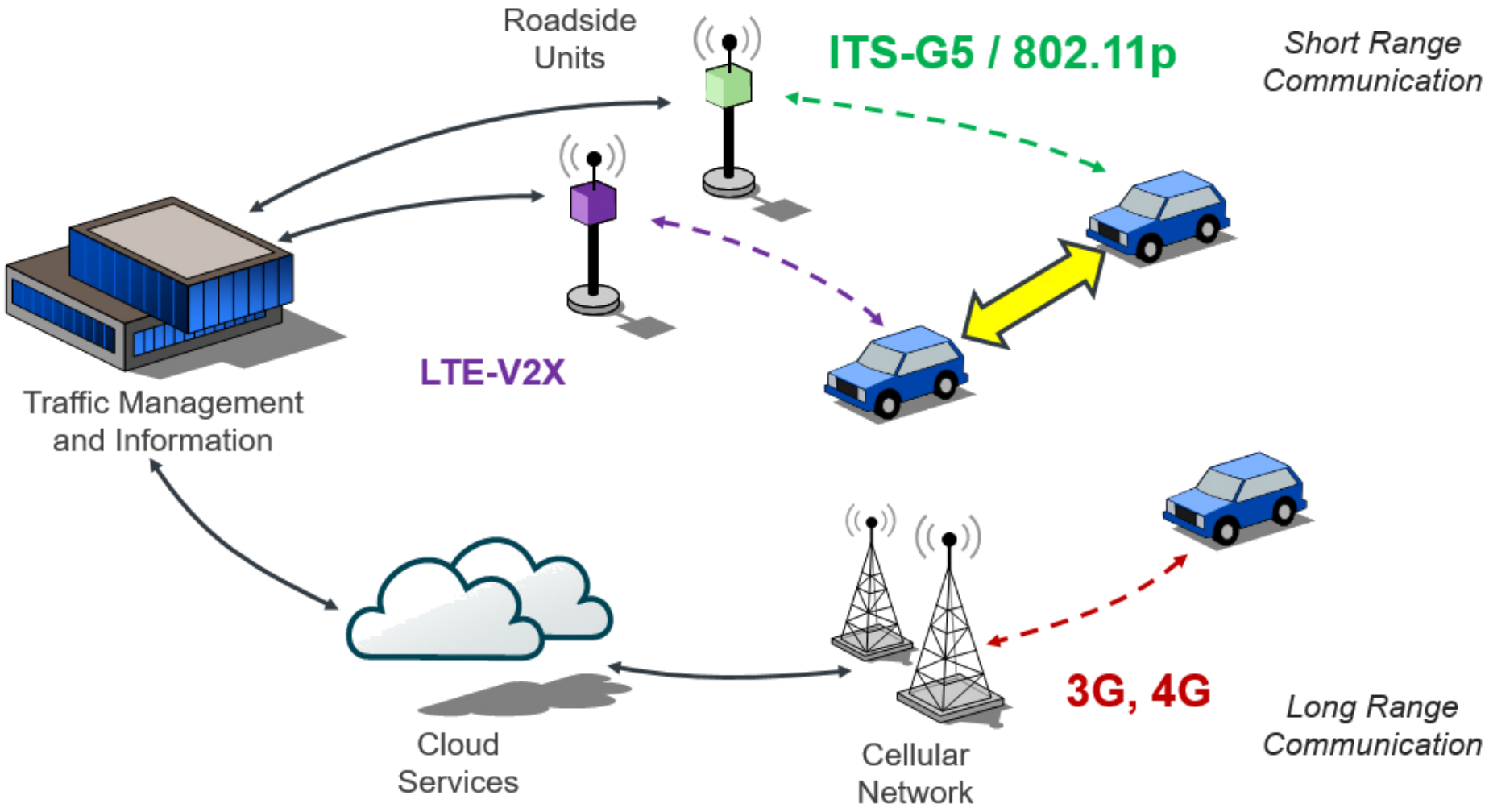
Figure 2: UXPERT integrated in Perform LTE testbed.

Impact

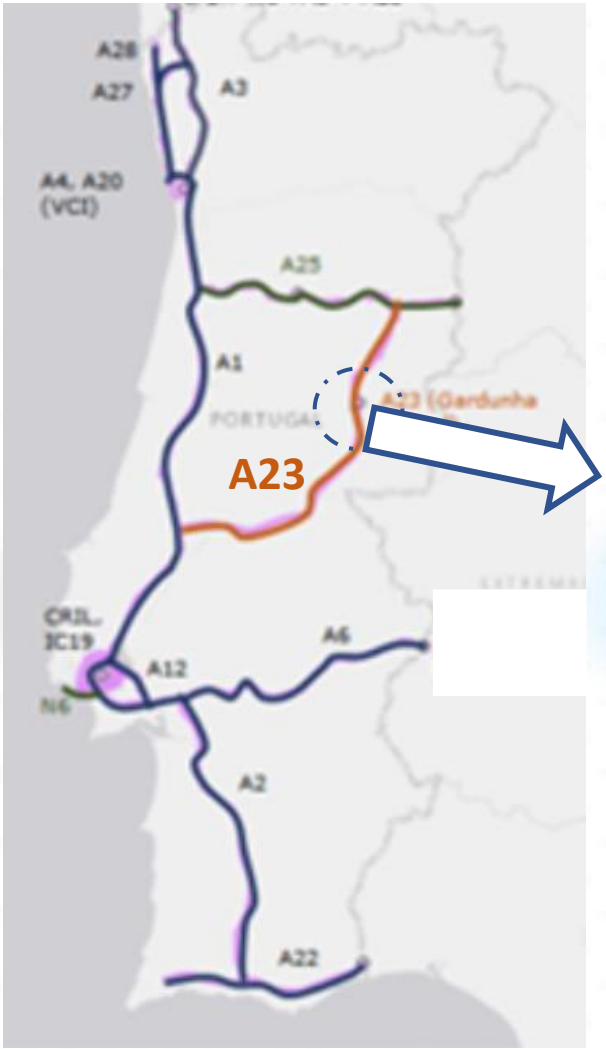
- ALLBESMART doesn’t have access to the range of LTE network equipment and system emulator available in PerformLTE, therefore this experiment was a crucial step in our UXPERT product development process.
- This Fed4FIRE+ experiment has enabled us to speed up our UXPERT prototype demonstration in operational environment (TRL7), complete it and qualify it for commercial adoption (TRL8).
- This is an important step towards the certification of UXPERT as a framework ready to be adopted by Mobile Network Operators (MNOs).

Business area: Vehicular Communications (C-V2X)

Wireless technologies for Intelligent Transport Systems (ITS)



Allbesmart has deployed a ITS-G5 pilot in the A23 highway for GLOBALVIA



GLOBALVIA®

A23 - Beira Interior

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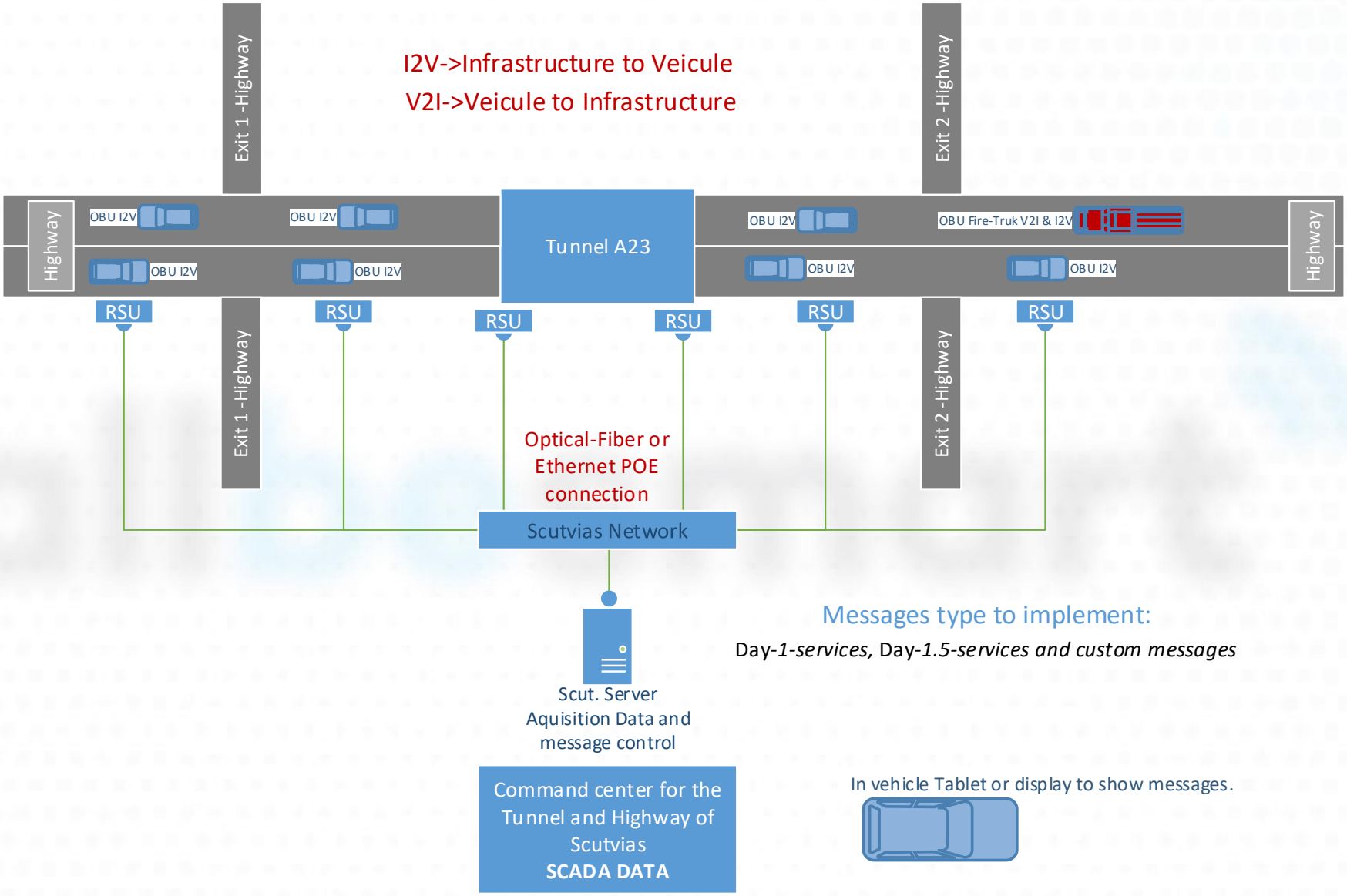
Pilot in the A23 highway – architecture



Messages type to implement:

Day-*1-services,* Day-*1.5-services and custom messages*

In vehicle Tablet or display to show messages.

RSU

OBU

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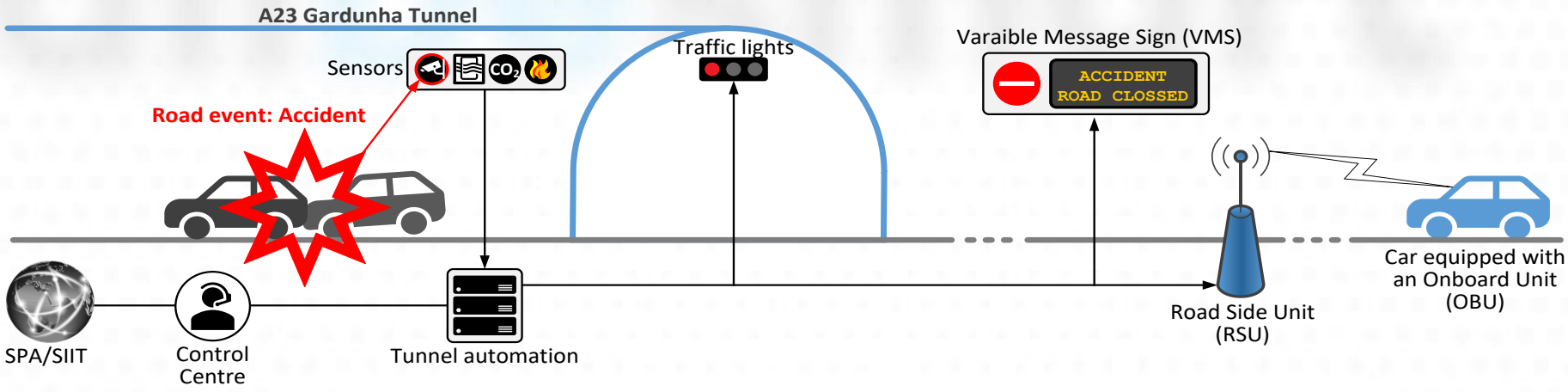
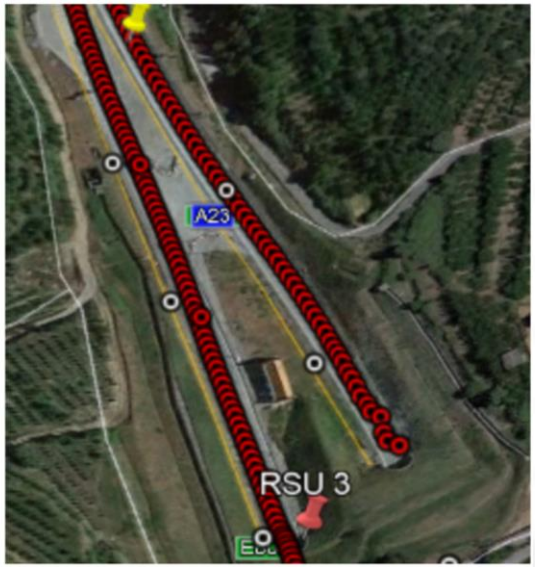
Pilot in the A23 highway

- **C-ITS services implemented, tested and demonstrated:**
  - Emergency Vehicle Approaching
  - Traffic Jam Ahead Warning
  - Road Works Warning



Allbesmart has deployed a pilot of C-ITS services in the A23 highway



Added value from Fed4FIRE+ interoperability tests in the Smart Highway in Antwerp (imec)

Smart Highway testbed in Antwerp (Belgium) provided by imec

Real life, real time, large scale…

… testing and validating

V2X testbed

1. Test bed infrastructure
   - LTE-V innovative technologies
   - Installation RSUs (and OBUs)
2. Hybrid communication
3. Multi-access Edge Computing
4. Smart localization
5. Driver monitoring

Parallel studies

6. Security and data protection
7. Regulation and policy
8. Cost & business modelling
9. Traffic modelling
10. Impact assessment

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Pilot of C-ITS services in the Smart highway (E313) in Antwerp – Belgium

Thanks !

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