NOV. 2020 | ISSUE 1

5G-TOURS NEWSLETTER

The official 5G-TOURS project newsletter

5G-TOURS

5G-TOURS is 5G-PPP Project
European Commission Call H2020-ICT-2018-2020
Grant number 856950

A welcome from the 5G-TOURS coordinator

Silvia Provvedi

Welcome to this first edition of the 5G-TOURS newsletter, in which project achievements, innovation stories, relevant events are highlighted.
Tourism, Health and Transport are three high value, economic domains for Europe and have been chosen by the 5G-TOURS consortium to demonstrate the advantages of 5G technology through a number of innovative use cases in precommercial trials environments. In this context, the project challenges span from technology proving to validation of a business models supporting the European Vision of '5G empowering vertical industries'. This first edition focuses on 6 of 13 innovative use cases.
Enjoy the reading!

WHAT'S INSIDE THIS ISSUE?

Introduction to 5G-TOURS..2
5G-TOURS methodology....3
5G-TOURS use cases.....4
Future events.....13

Introduction to 5G-TOURS

The goal of 5G-TOURS is to get the European 5G Vision of "5G empowering vertical industries" [5GPPP16] closer to commercial deployment with highly innovative use cases involving cross-industry partnerships.

5G-TOURS motivation to demonstrate the ability of 5G to support multiple vertical use cases concurrently on the same infrastructure.

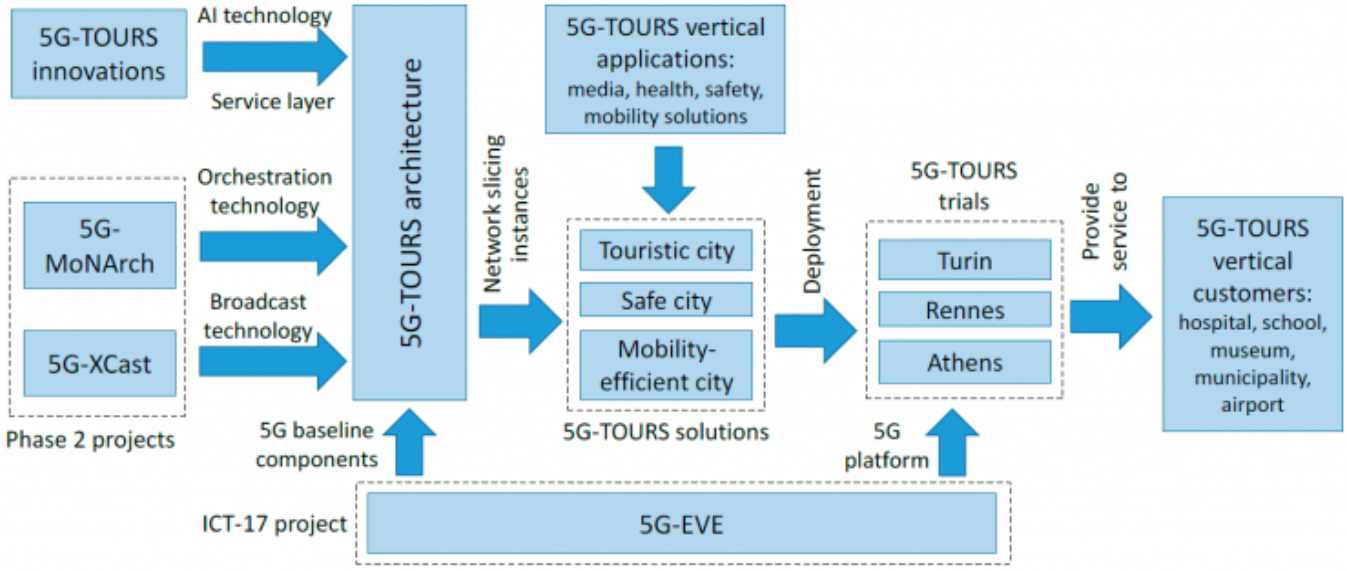
5G-TOURS vision is to improve the life in the city for the citizens and tourists, making cities more attractive to visit, more efficient in terms of mobility and safer for everybody.

The ultimate goal of 5G-TOURS is to bring 5G deployments to a real use. To this end, a set of use cases have been defined to provide services to the vertical customers involved in the consortium, which include a school, a museum, a hospital, a municipality and an airport. The different use cases have been grouped around three themes, the touristic city, the safe city and the mobility-efficient city, which will be deployed in three of the nodes provided by the 5GEVE platform. Specifically, the touristic city use cases will be deployed in the Turin node, the safe city use cases will be deployed in the Rennes node and the mobility-efficient use cases will be deployed in the Athens node. In these nodes, 5G-TOURS will rely on the mobile network infrastructure provided by 5G-EVE, deploying the required mobile network innovations and vertical solutions on top of this infrastructure.

The goal of 5G-TOURS is to move closer to the realisation of the European 5G vision of "5G empowering vertical industries" closer to commercial reality by deploying 13 highly innovative use cases involving citizens and tourists in 3 types of cities

5G-TOURS methodology

The main steps considered in the approach followed by 5G-TOURS are (i) the design and deployment of an architecture composed of the pre-commercial components brought by the 5G-EVE platform along with the innovations coming from Phase 2 projects and 5G-TOURS itself, (ii) the implementation of the 5G-TOURS solutions that combine the use of the appropriate network slicing instances of the architecture and the vertical solutions relying on 5G communication are needed for the use cases, and (iii) the deployment of trials to evaluate the 5G-TOURS vertical solutions on top of the 5G-EVE nodes.



While the 5G-TOURS architecture will be based on the pre-commercial mobile network deployment provided by the 5G-EVE platform, in order to provide the functionality required for trialing the use cases envisaged in 5G-TOURS, some additional functionalities are needed beyond those provided by 5G-EVE: (i) orchestration solutions that adapt the deployment of network slices to meet the requirements of the addressed verticals use cases; (ii) broadcasting techniques to satisfy the needs of the media-related use cases; (iii) artificial intelligence mechanisms that allow to dynamically manage and configure the different functions in large-scale deployments such as the ones considered in 5G-TOURS, and (iv) a service layer that allows to provide verticals with an interface that meets the specific needs of the vertical customers addressed by 5G-TOURS.

The resulting 5G-TOURS architecture will rely on the baseline network components specified by 5G-EVE and will use the interfaces provided by these components in order to interoperate with the 5G-TOURS innovations, which will be implemented on top of the pre-commercial platform. For those innovations that have already been implemented in Phase 2 projects (orchestration and broadcast), 5G-TOURS will bring the existing solutions from the corresponding projects (namely 5G-MoNArch and 5G-XCast, respectively), adapting them as needed. The remaining innovations will be designed and implemented by 5G-TOURS.

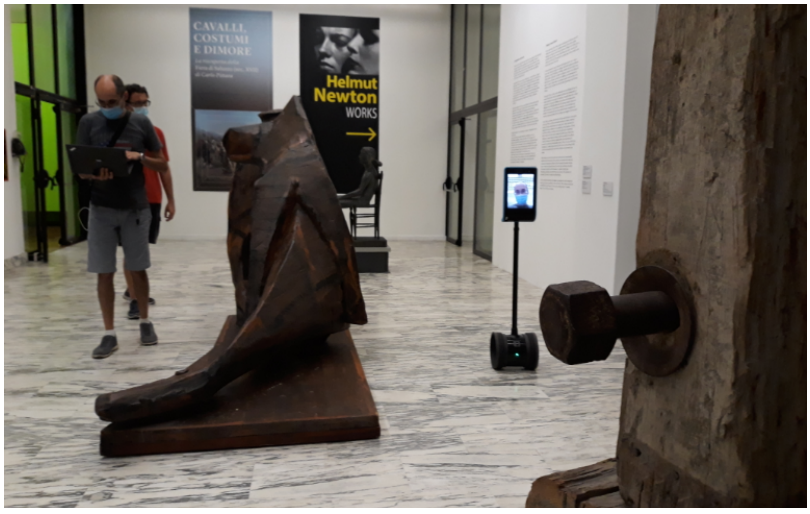
The design of the various innovations addressed by 5G-TOURS will be compliant with ongoing standardization efforts and will be fed into the standards in order to push their eventual adoption in commercial products.

Leveraging on the 5G-TOURS mobile network architecture, the project will address the implementation of the use cases comprised within its vision of the touristic city, the safe city and the mobility-efficient city. This will require the instantiation of network slices that provide the desired network services, along with the implementation of vertical solutions that use these network services to provide the functionalities required by the use cases. Such vertical solutions comprise among others, media applications, e-health devices for monitoring and intervention, sensors and applications for smart mobility, etc. Note that the consortium includes a number of vertical solution providers that will take care of developing these applications and integrating them with the underlying network end-devices.

To learn more about the 5G-TOURS project approach and the use cases please watch an official 5G-TOURS cartoon: **https://www.youtube.com/watch?v=OIKJBMyd02o**

Telepresence use case

An important component of the experiments within museums involved the creation of use cases focused on Telepresence.
In the conception of the use case, the city of Turin, the Fondazione Torino Musei (FTM) together with TIM and Ericsson, focused on trying to create experiences capable of increasing a cultural spaces accessibility and inclusiveness.
The telepresence use case will be performed both at Galleria d'Arte Moderna (GAM) and Palazzo Madama museum in Turin. Imagine having the possibility to visit inaccessible areas of the museum, or to be part, as a student, of new educational experiences such as a "treasure hunt" guided tour discovering paintings, sculptures and learning about artists, techniques and curiosities directly from your classroom. This will be feasible thanks to 5G network deployed by TIM and Ericsson.
This year surprised us due to the worldwide COVID-19 emergency. Because of this, laboratory tests have been transformed into "home based tests": this enabled us to avoid delays in the development process despite the general challenges.
The first on-site drive tests robot took place in July, after the lockdown period: it coincided with the reopening of the museums and was performed in an atmosphere of renewed hope.
A curiosity. Since the first trials, one thing has been clear and funny at the same time: the tendency to humanise the robot. Technicians and FTM operators talked to him as a child suggesting speed and giving him advice regarding the path to follow. It can be said that he is already part of the team!
Moreover, testing the robot in such a delicate environment, full of art pieces, was particularly stressfull and for sure not an easy task for the developers.



Telepresence allows a user to appear to be present, feel like he/she is present in a space the person does not physically inhabit

With 5G technologies, mobile operators will offer new services allowing broadcasters and media companies to use new tools to produce TV content

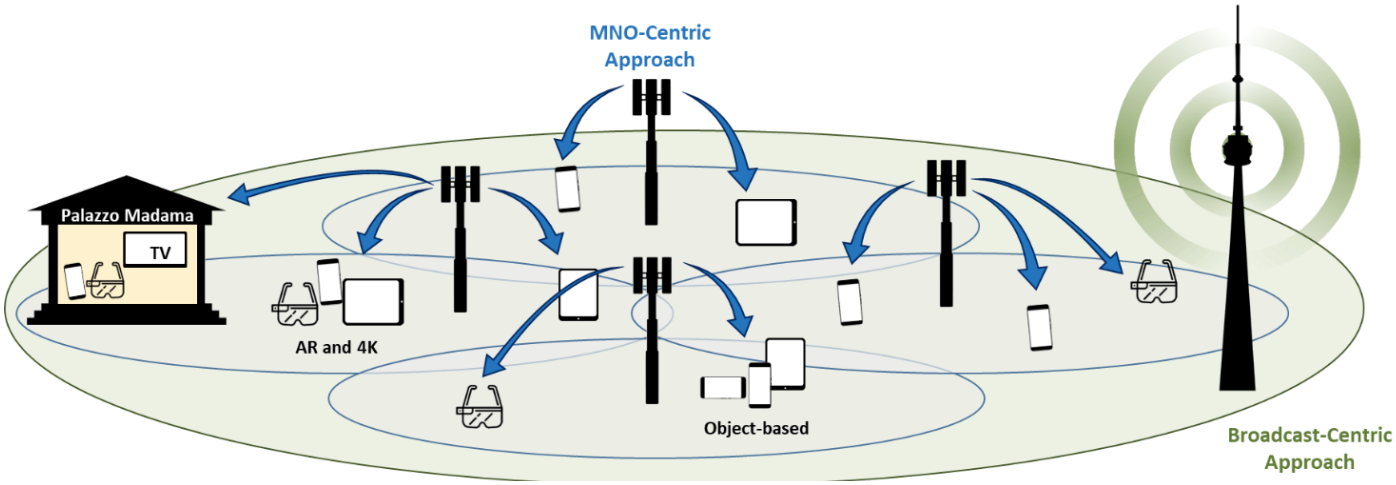
High quality video services distribution

Point-to-multipoint techniques are traditionally used to satisfy the needs of high-quality video distribution to a multitude of users. Since the use of unicast transmissions to this end would be highly inefficient, the support of broadcast and multicast is essential. In that sense, 5G Broadcast will fulfil all of these requirements and it is expected to impact the business model of broadcasters and media companies.

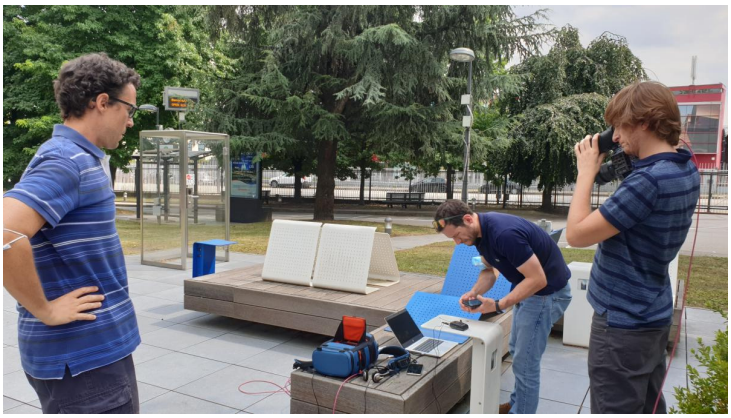
This use case targets the distribution of enhanced high-quality video services for tourists, citizens and students providing immersive functionalities to enrich their touristic and/or educational experiences, by using the 5G-broadcast capabilities of the 5G-TOURS architecture.

This use case is in turn divided into two sub-use cases, one of them aligned with 3GPP tracks, and a the second one on 5G core multicast development. The sub-use cases are:

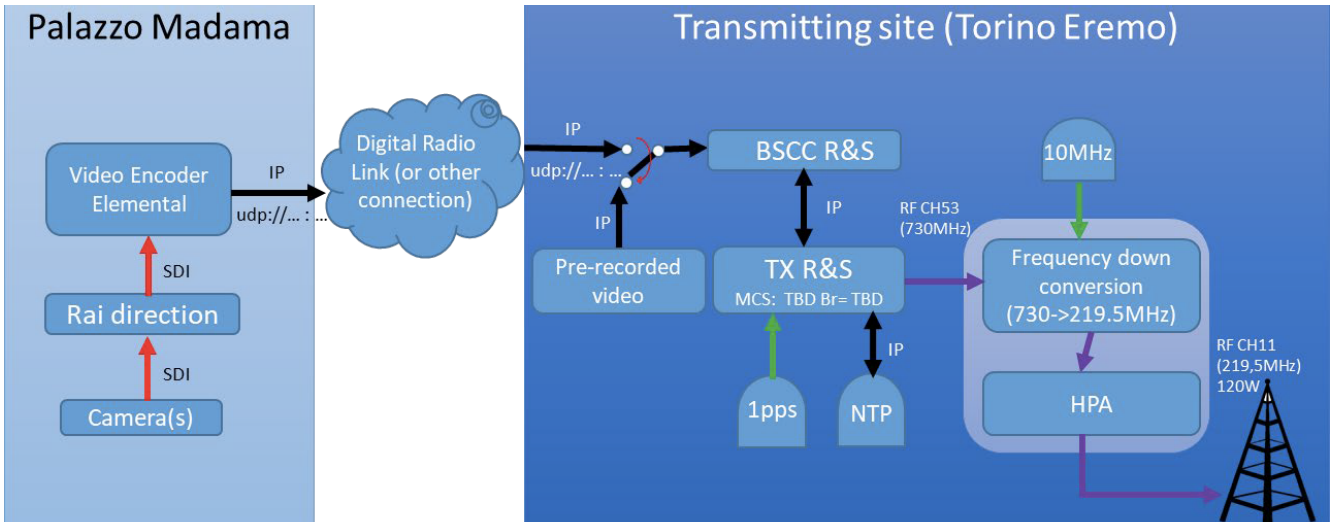
A. 5G Broadcast delivery to massive audiences in a Broadcast-Centric way: Receive-only content to all users at once, using RAI's High-Power High-Tower (HPHT) infrastructure. Users will be able to appreciate the new technology directly on their own mobile phone equipped with a special app.



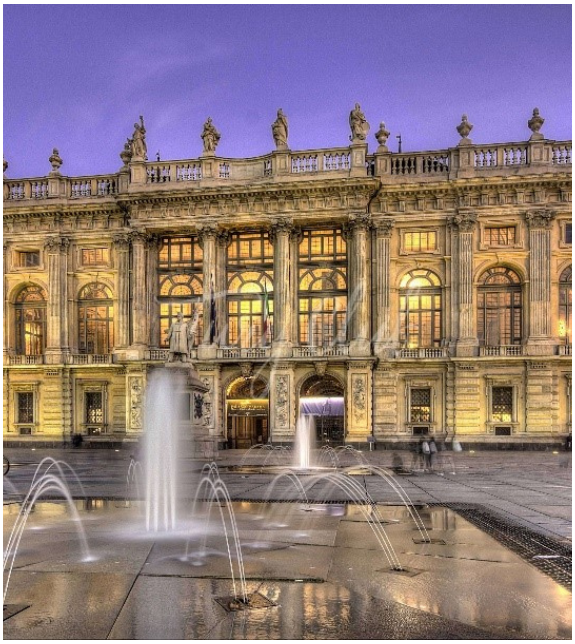
With 5G technologies, mobile operators will offer new services allowing broadcasters and media companies to use new tools to produce TV content



This is divided into two phases:
1) Phase 1: Rel-14, indoor scenario (Palazzo Madama) and multicast distribution to a large panel of users of live and/or pre-recorded video content.
2) Phase 2: Rel-16 mobile in-car scenario in the city centre and unicast distribution in the car of live and/or pre-recorded video content.
B. 5GC Multicast development Implementation of the Rel-17 Network Functions needed to support Multicast communications by the 5G Core. Based on 5G-Xcast and 3GPPP FS_MBS initial designs, the biggest change with respect to eMBMS will be the movement of all service layer related functionalities OUTSIDE the 5G Core, so that the latter just delivers the content to the relevant transmitters and manages the multicast tunnels, i.e. Transparent Multicast.



Remote and distributed video production



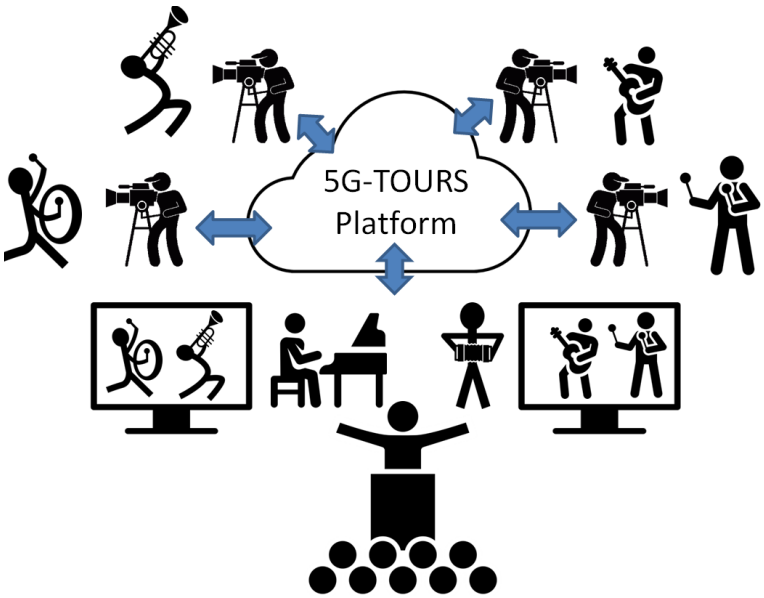
Remote and distributed video production is one of the most exciting and challenging of 5G use cases. As a much more efficient method of producing live sports, news, entertainment and events coverage than traditional outside broadcasts, it will allow broadcasters to deploy fewer camera operators to events (although many more cameras) and staff to work on multiple events a day, being located in a centralized studio.

This use case is designed to get an inside track on some of the multi-camera remote production capabilities, challenges and possibilities to come during the very early phases of 5G deployment. the main objective of the use case is to exploit the 5G TOURS network features for remote television production, analyzing how 5G networks could support various scenarios in which high-quality video is generated and transmitted.

In a distributed TV video production context, the content needs to be produced by mixing local and remote audio and video contributions in the TV studio. The remote contributions are thus delivered to the main editing site via the 5G network in real time.

The challenging implementation for the use case is the Itinerant Orchestra experiment in which some musicians located in the main concert hall play together with some other itinerant musicians walking in the streets while approaching the concert hall.

Each itinerant musician is followed by one (or more) cameraman shooting their performance and providing cues to stay in synch with the main orchestra performance. The high-quality AV signal is transmitted via the 5G network to the main editing facility where it is properly processed and mixed with both the rest of the itinerant musicians and the orchestra located in the concert hall.



Remote and distributed video production is one of the most exciting and challenging of 5G use cases

The spectators in the concert hall will watch the itinerant musicians playing and walking in the streets (as real time virtual presence) on one or more LED walls and listen to their performance via an amplification system, mixed with the local orchestra, until they enter the concert hall and join the orchestra.
In July 2020, RAI, TIM and LiveU performed the first remote television production tests over the 5G network. The first part of the test was a functional test in TIM labs in order to verify functionalities of the receiving server with video streaming from Israel. The second part of the test was performed with a LiveU backpack, using tethering on a Samsung S10 5G smartphone, provided by Samsung, to transmit over the TIM 5G commercial network deployed using Ericsson equipment in order to verify the whole transmission chain.
This is an important step to target the multi-site musical concert called “Itinerant Orchestra” trial planned in the autumn, in Turin, in Palazzo Madama, in which the event is a concert performed by a six elements orchestra located in the "Sala delle feste" hall and four itinerant saxophonists walking in the streets while approaching the concert hall.
The composer Andrea Molino is composing a specific composition for this event in order to emphasize the use of new technologies in the music world. Andrea Molino’s main field of interest is innovative, multimedia oriented music theatre; an important role is played by the involvement of new communication technology as a central element of the theatrical and musical language.
The event in December will be located in Palazzo Madama and its premises, it is an architectural and historical complex located in the central Piazza Castello in Turin. It is an UNESCO World Heritage Site, as part of the Savoy Residences serial site.
Today the building hosts the Civic Museum of Ancient Art and represents itself as a summary of all the historical age of Turin.

Remote and distributed video production is one of the most exciting and challenging of 5G use cases

Introducing remote production over 5G networks for television content can revolutionize the typical workflow of broadcaster and media companies. This trial is extremely challenging and requires very low and stable delays, an ultra-reliable capability and a very large bandwidth capacity in order to reach a good final result.

The main technical service level objectives of this use case are:

· improving video quality of multiple live connections (real-time transmission);

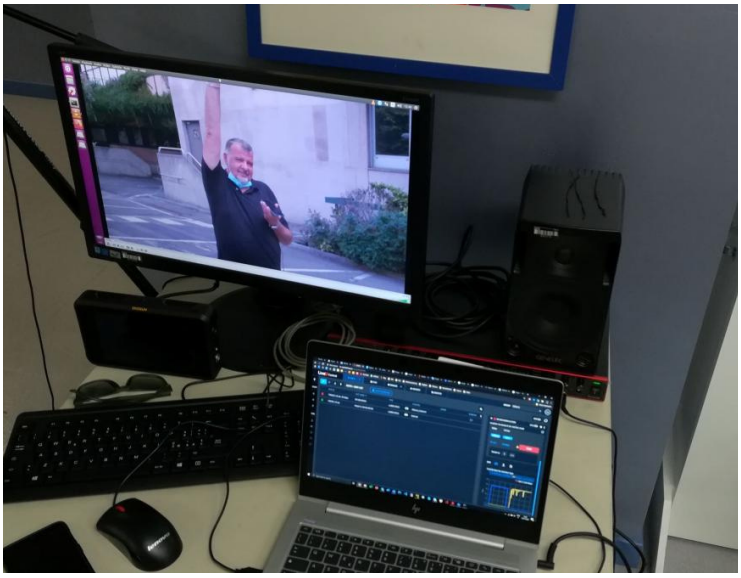
· enabling mobile units to utilize more bandwidth (provisioning of a specific slice with a guaranteed QoS);

· grant low delays and data flows synchronization.

· supporting the work flow typically used from broadcasters and media companies.

The purpose of the use case is to contribute to the valorization of cultural events taking place within the territory of the city introducing a new way to cover live events, while at the same time build a more efficient and cost-effective way to produce television content. This aspect will also improve local, national and international tourism with social and economic utility for cities.

The main target users of the use case will be media companies that are massively involved in content creation. The personnel involved in the production of a television program include creative talents such as actors, directors, writers, and producers as well as technical crew members such as camera operators, electrical technicians, and sound technicians.



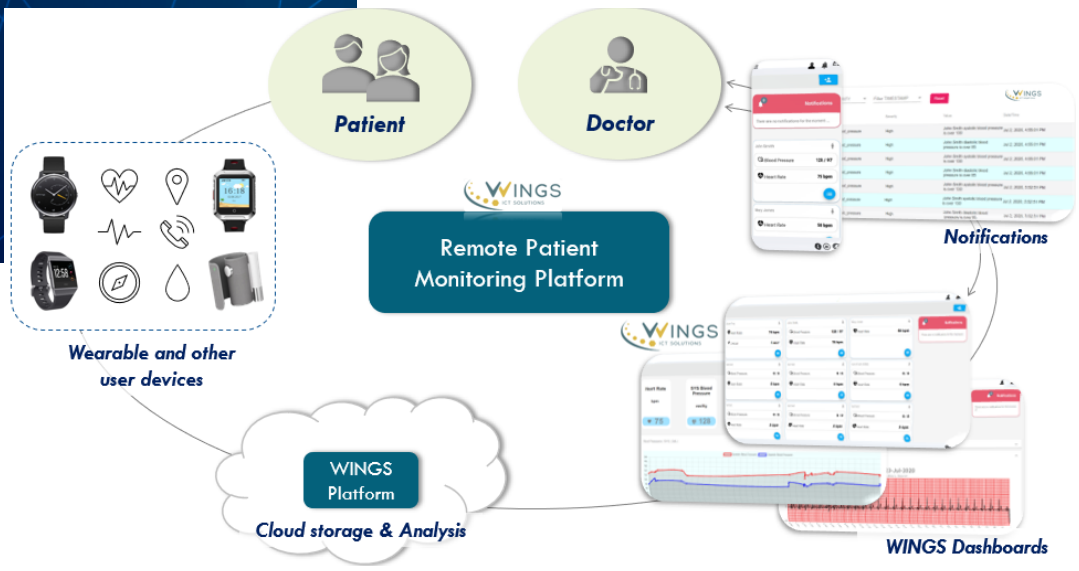
Introducing remote production over 5G networks for television content can revolutionize the typical workflow of broadcaster and media companies

The Safe City aims to demonstrate how multiple vertical industries can simultaneously use the same 5G architecture and services to deliver advanced use cases to citizens

Remote Health Monitoring and Emergency Situation notification

This UC addresses solutions for remote health monitoring of people, especially when already diagnosed with a critical disease still compatible with home care (e.g. some form of cardiovascular disease, hypertension, diabetes, etc.). The main features offered by this UC involve: (a) remote health monitoring services of main vital-signs, and (b) quick, reliable notifications to users, family members, health care professionals and the ambulance dispatch centre in case of a health incident or a health emergency prediction. The UC leverages wearable devices tracking a tourist's vital signs and having them aggregated inside an IoT based platform named STARLIT (Smart living platform powered by Artificial intelligence & robust IoT connectivity), provided by WINGS. Also, Philips is involved to the realisation of this UC.

STARLIT's outcome is the identification or the prediction of a health-related emergency which is followed by the immediate notification of the designated family members, health care professionals and nearest emergency care dispatch centre.



More specifically, the remote patient monitoring system comprises of:

(A) A dashboard designed for providing the user, family members, health care professionals and the ambulance dispatch centre user with visualization of health monitoring data, notifications, and alerts.

The alerts/notifications are raised in case of: (a) heart rate, blood pressure or oxygen saturation are critical or are out of range (based on certain predefined thresholds) and (b) recorded values show a trend towards a potential problematic situation leading to health emergencies.

The system supports the detailed recording of multiple patients and video calls with patients if deemed necessary by medical staff.

(B) Intelligence for the (a) identification of current issues, (b) forecasting of future issues and health emergencies and (c) notification of users, family members or healthcare professionals. Wearable devices (Withings Move ECG, Withings BPM Core, Fitbit Ionic Watch, Huaten- Global (A20s) and Beurer PO 60 Bluetooth pulse oximeter) used for the heart rate, blood pressure, cardiac rhythm (electrocardiogram/ECG) and oxygen saturation monitoring.

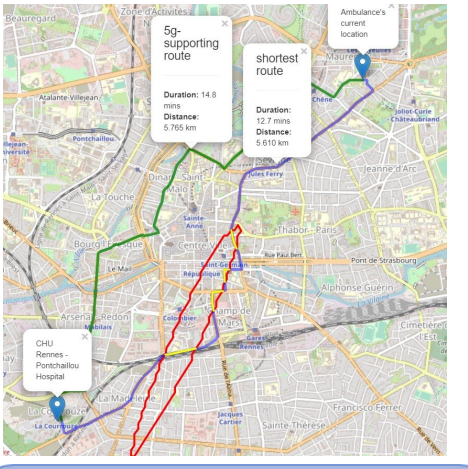
Optimal ambulance routing

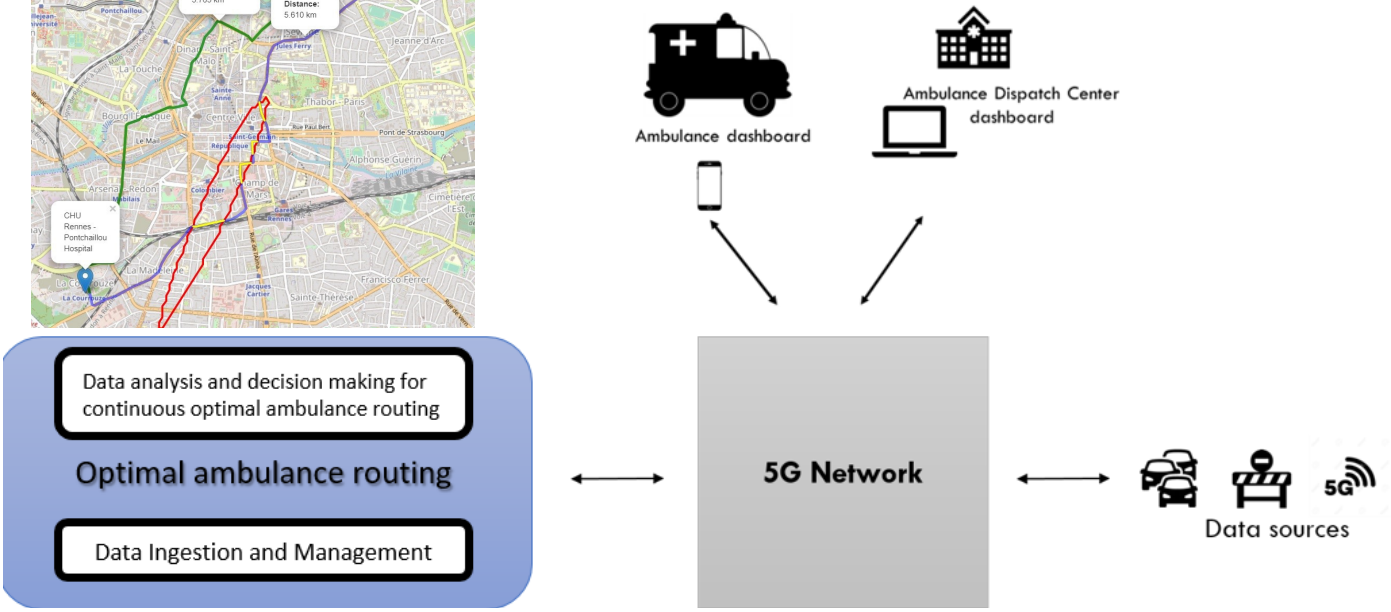
This use case addresses the problem of transporting a patient from the site of the emergency to the appropriate hospital/medical centre as fast and as efficiently as possible, based on the traffic conditions and regulations, as well as on the patient status and individual needs. While optimal ambulance positioning and routing has been addressed extensively from a decision making perspective and a more theoretical aspect, the emergence of technologies such as 5G enables the fast and reliable acquisition of data based on changing factors of an urban or suburban environment such as traffic regulations, changing road graph, population mobility, and hospital capabilities, and availability to be exploited by AI powered decision making for dynamic optimal ambulance routing. Moreover, one of the scenarios considered, demonstrates how measurements of network coverage can be utilised to ensure routing through areas and corridors that support 5G. This scenario could be useful in case the emergency incident demands rich data exchange throughout the route e.g. high definition (HD) video streaming. In the following figure the high-level architecture of the system is depicted.

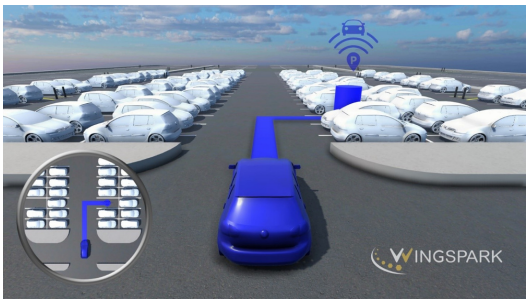
In the following scenario, the ambulance is requesting a route towards the medical centre, with the time and the 5G - coverage being equally important. Under these terms, the algorithm performs a combined cost – minimization approach, in which it assesses the cost of the fastest route and the route ensuring 5G – coverage with equal weights and selects the route with the minimum cost. The suggested route can be seen in the image below.

The route which ensures 5G-coverage is selected as the suggested route (green), as the cost of the shortest route due to the parts not providing 5G coverage is considered bigger than the gain in terms of time – the weighting factors can be adjusted.

5G enables the fast and on-the-go acquisition of data from various sources that can affect the route and travel time of an ambulance for optimal ambulance routing







Smart airport parking management

In this UC, Athens International Airport (AIA) parking customers obtain real time information on available and occupied spaces through 5G-enabled parking sensors and are able to locate available parking spaces directly through a 3D mobile application that guided them via the optimal route. Also, a smart parking management system is provided that includes real time monitoring and historical data management on the parking use for the airport administrative users. The smart parking management contributes to the emission reduction by reducing unnecessary vehicle movements to locate a parking space. This process will also add to the travelling efficiency of tourists through targeted parking spot suggestions.

This is a solution that relies on the mMTC capabilities provided by 5G, within 5G-TOURS network developed by OTE and NOK-GR at Athens International airport premises.

A large number of sensors installed at each individual parking position using the mMTC functionality provided by 5G will help to facilitate the parking process within an airport

A large number of sensors installed at selected individual parking spots, helps keep track of available and occupied spots in real time, facilitating the parking process within the Athens airport.

WINGS Smart Parking Platform comprises of:

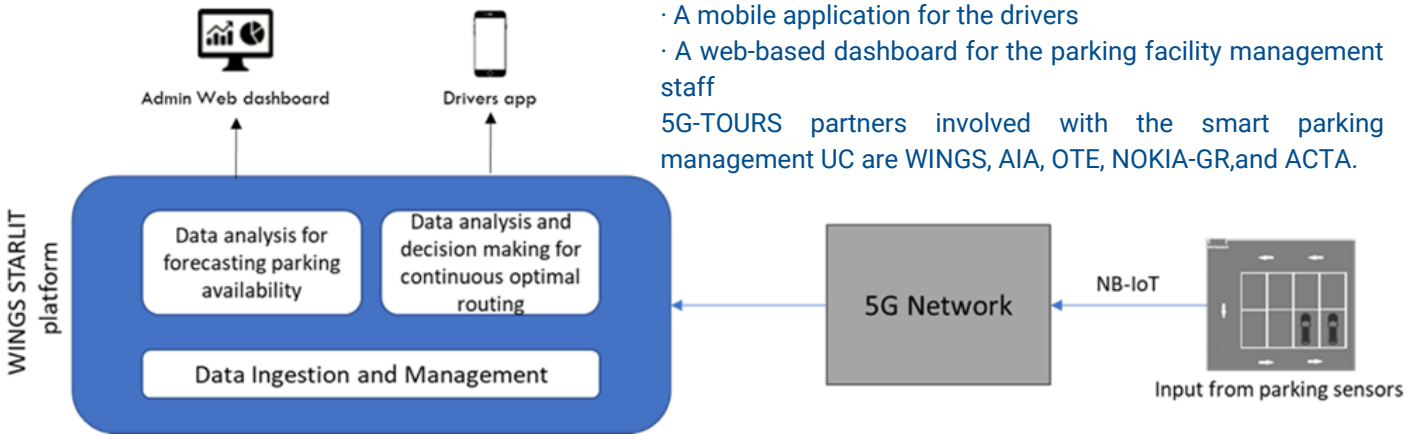
· WINGS Parking Occupancy Sensors, for vehicle detection

· Intelligent algorithms for forecasting parking availability at a dedicated time, calculation of the available parking slot according to the criteria specified by the user, optimal routing of the user to the spot

· A mobile application for the drivers

· A web-based dashboard for the parking facility management staff

5G-TOURS partners involved with the smart parking management UC are WINGS, AIA, OTE, NOKIA-GR,and ACTA.



Future 5G-TOURS events

IEEE Globecom 2020 5G-TOURS WORKSHOP

In addition to exciting technical symposia, tutorials, industry panels and exhibitions, IEEE GLOBECOM 2020 will feature a series of half and full-day workshops. The aim of the conference workshops is to emphasize emerging topics that are not specifically covered in the main symposia.

5G-TOURS workshop title: Early deployments of 5G networks features and performance.

Date: FRIDAY, 11 DECEMBER 2020

5G-TOURS WEBINARS SERIES

For your information, 5G-TOURS will host the second webinar series to show the outcomes and achievements from the various work packages and working groups in the project.

Webinars titles:

- Wireless Operating Room Powered by 5G
- Emergency services reformation using 5G
- Smart Parking management powered by 5G

Date: December 2020 - January 2021

More information: http://5gtours.eu/

http://5gtours.eu/

https://twitter.com/5gtours

https://www.linkedin.com/groups/8853316/

https://www.researchgate.net/project/5G-TOURS

5G-TOURS is 5G-PPP Project
European Commission Call H2020-ICT-2018-2020
Grant number 856950

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