UNIVERSITAT POLITÈCNICA DE VALÈNCIA

IBC 2019 FOBTV Meeting

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5G-Broadcast Trials in 5G-TOURS

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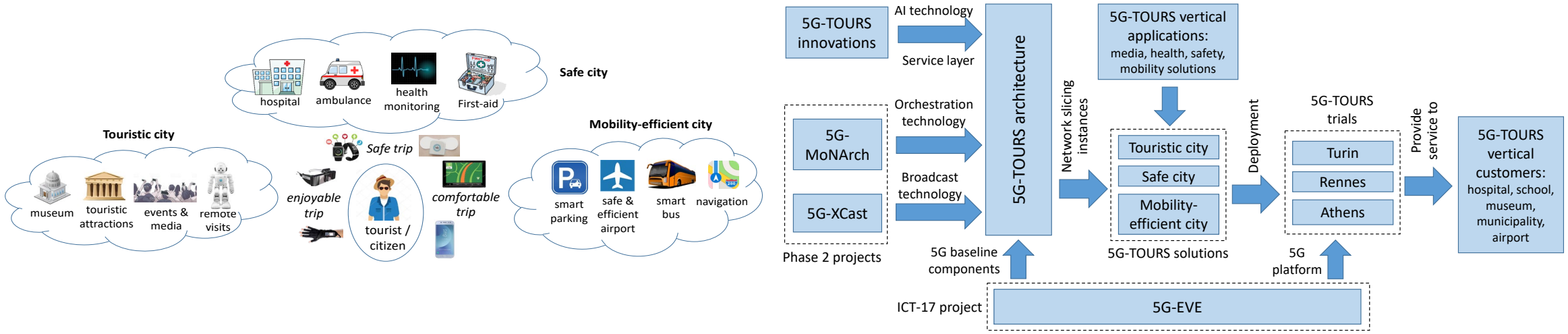
Overview

1. 5G-TOURS Overall vision
2. 5G-TOURS partners
3. 5G-TOURS Cities
4. Application of 5G-Broadcast to 5G-TOURS use cases
    1. High quality video services distribution
    2. Augmented tourism experience
    3. Remote and distributed video production

1. 5G-TOURS Overall vision

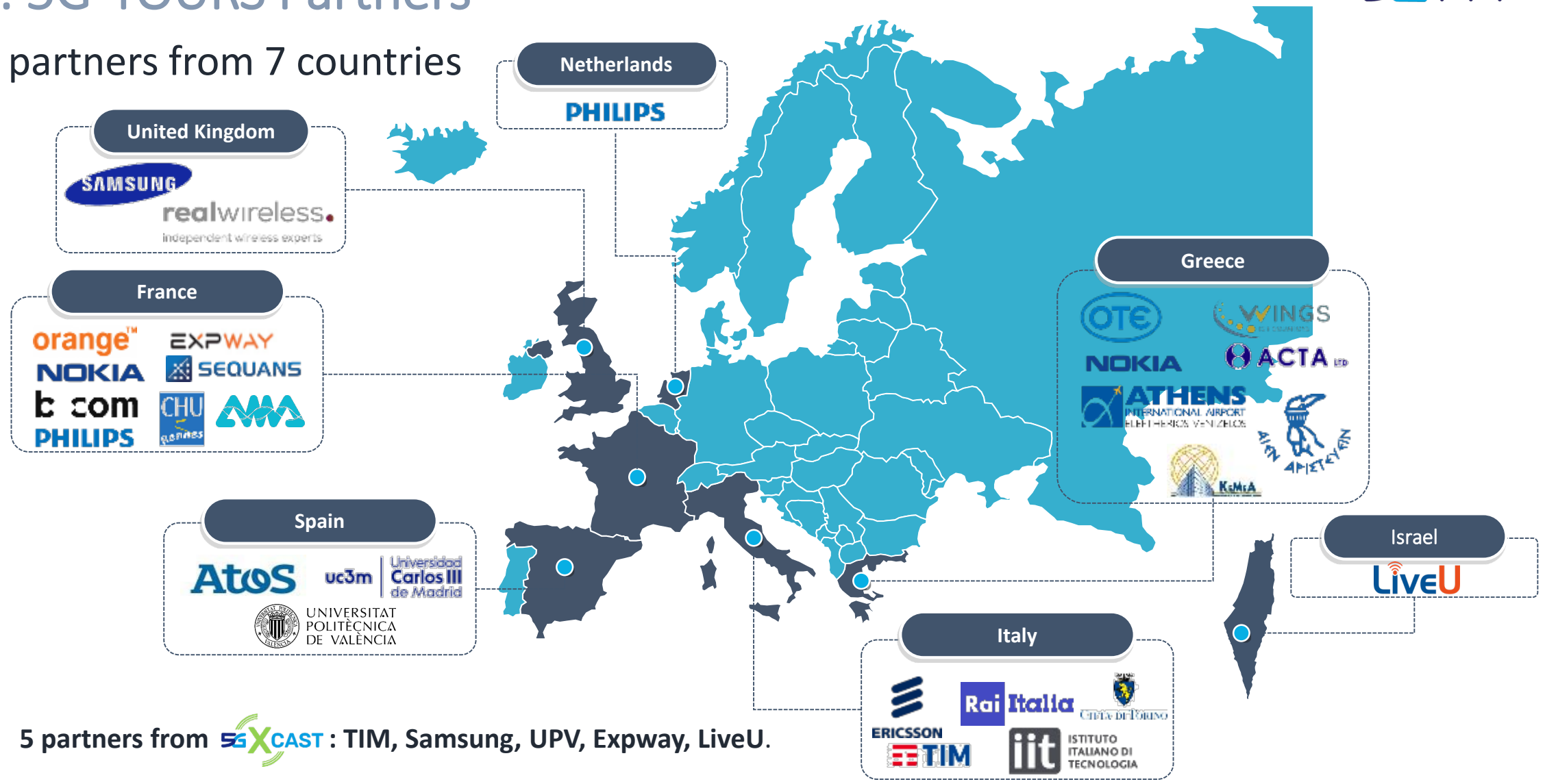
5G smarT mObility, media and e-health for toURists and citizenS

- 5G PPP Phase 3 project from EU H2020 ICT-19-2019 call
- Starting and end date: June 2019 – May 2022 (36 months).
- **Vision**: 5G-TOURS aims to demonstrate the ability of 5G to Improve the quality of life of citizens and tourists, making cities more attractive to visit, more efficient in terms of mobility and safer for everybody.
- **Approach**: *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. *Implement the 5G-TOURS solutions* combining the use of the network slicing instances of the architecture and the vertical solutions relying on 5G communication that is needed for the use cases. *Deployment of trials* to evaluate the 5G-TOURS vertical solutions on top of the 5G-EVE nodes.



2. 5G-TOURS Partners

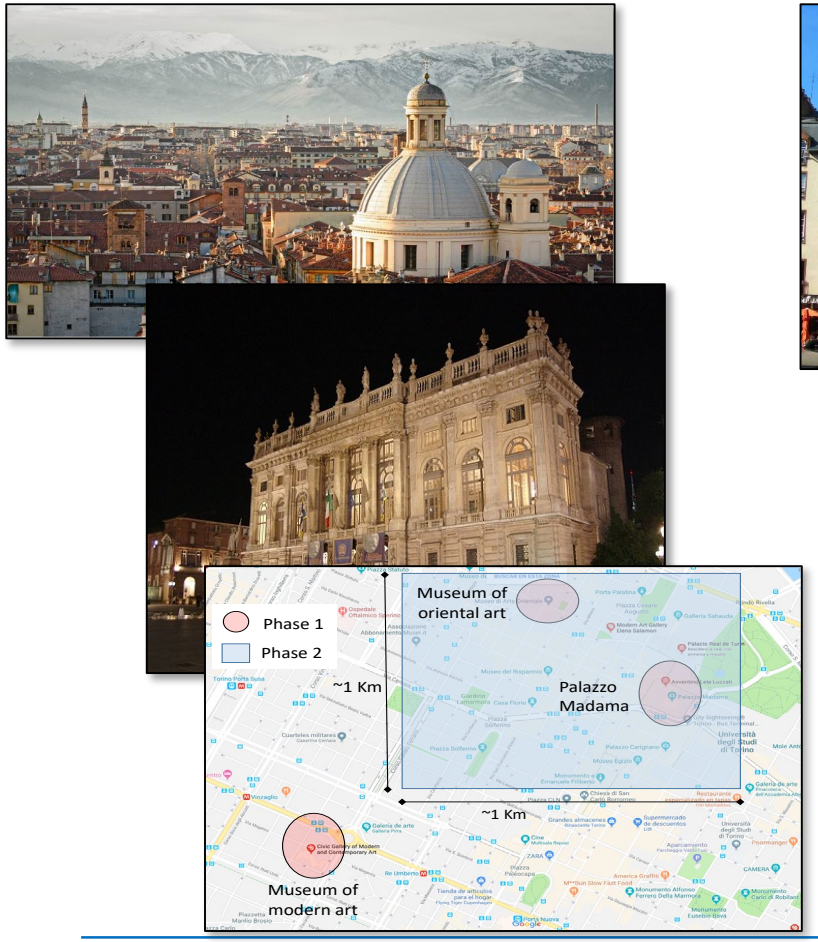
- 27 partners from 7 countries



- **5 partners from 5GXCAST : TIM, Samsung, UPV, Expway, LiveU.**

3. 5G-TOURS Cities

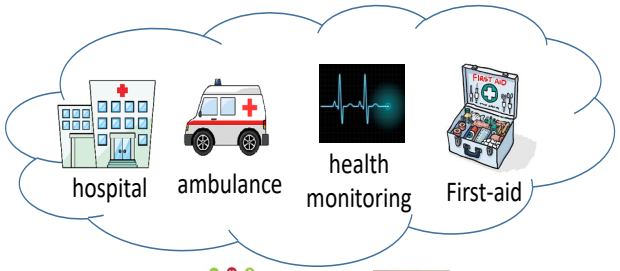
- 5G-TOURS technical solutions will be validated around three themes:
  - The touristic city (Turin, IT)
  - The safe city (Rennes, FR)
  - The mobility-efficient city (Athens, GR)



3. 5G-TOURS Cities

- 5G-TOURS technical solutions will be validated around three themes:
  - **The touristic city (Turin, IT)**: Comprises a set of use cases for improving the touristic experience at a city with media applications to complement visits at touristic attractions.
  - **The safe city (Rennes, FR):** Comprises a set of use cases that provide travellers, but also citizens with the warranty that, even in case of trouble, they will recover thanks to the proper management of an emergency situation.
  - **The mobility efficient (Athens, GR):** The use cases depict how airport processes can be improved leveraging the offering of 5G both from the side of the visitors and of the airport management.

Touristic City (Turin, IT)
Augmented tourism experience
Telepresence
Robot-assisted museum guide
High quality video services distribution
Distributed video production



Safe city (Rennes)
Remote health monitoring & emergency mgmt.
Teleguidance for diagnostics and intervention support
Wireless operating room
Optimal ambulance routing

Mobility-efficient city (Athens)
Smart parking management
Video-enhanced ground-based moving vehicles
Emergency airport evacuation
AR/VR-enhanced educational bus excursion

4. Application of 5G-Broadcast to 5G-TOURS Use Cases (Turin)

- Two use cases related with downlink media distribution (unicast/multicast/broadcast)
- One use case related to uplink content production

Use case	Vertical customer	Slice type(s)	KPI requirements	Improvements provided	Vertical solutions
High quality video services distribution	TV broadcaster	eMBB	User data rate of 25 Mb/s, several users/m^2	Improved video user's experience	App for content / video distribution
Augmented tourism experience	Museum	eMBB, URLLC, mMTC	User data rate up to 500 Mb/s, latency < 10 ms	Improving visitor's experience	XR application (AR/VR/MR)
Distributed video production	TV broadcaster	eMBB, URLLC	Latency < 5 ms Reliability > 99.99%	Concert by distributed orchestra	Media production backpack

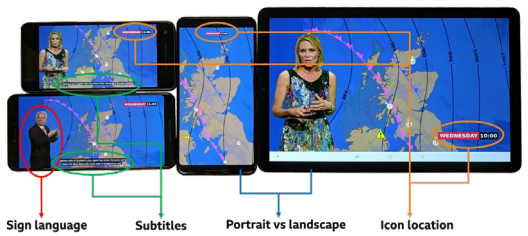
- Depending on the use case, different broadcast technologies will be showcased:
  - AR/VR MooD
  - High Quality video distribution
  - Very Low latency, high throughput uplink for production

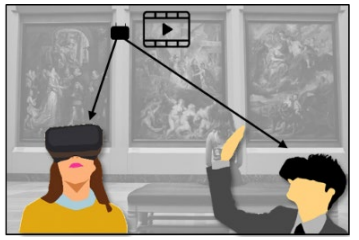
4 Use Case 4: High quality video services distribution

- **Overview:** 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.
- ***Objective***: distribution of audio-visual (A/V) content and services to a potentially unlimited number of users. The A/V content can be either 4K object-based broadcast videos for smartphones and TVs or immersive media for AR/VR devices.

Object-based content: the content is divided into objects such as video elements, audio elements, captions, subtitles, music type, etc. and delivered to users with different requirements and/or preferences. It provides a personalized experience for e.g. tourists from different countries that speak different languages. See BBC Demo at ***Booth 8.F08***

5G-Xcast – D6.2: "Development of Showcases and Demonstrators"



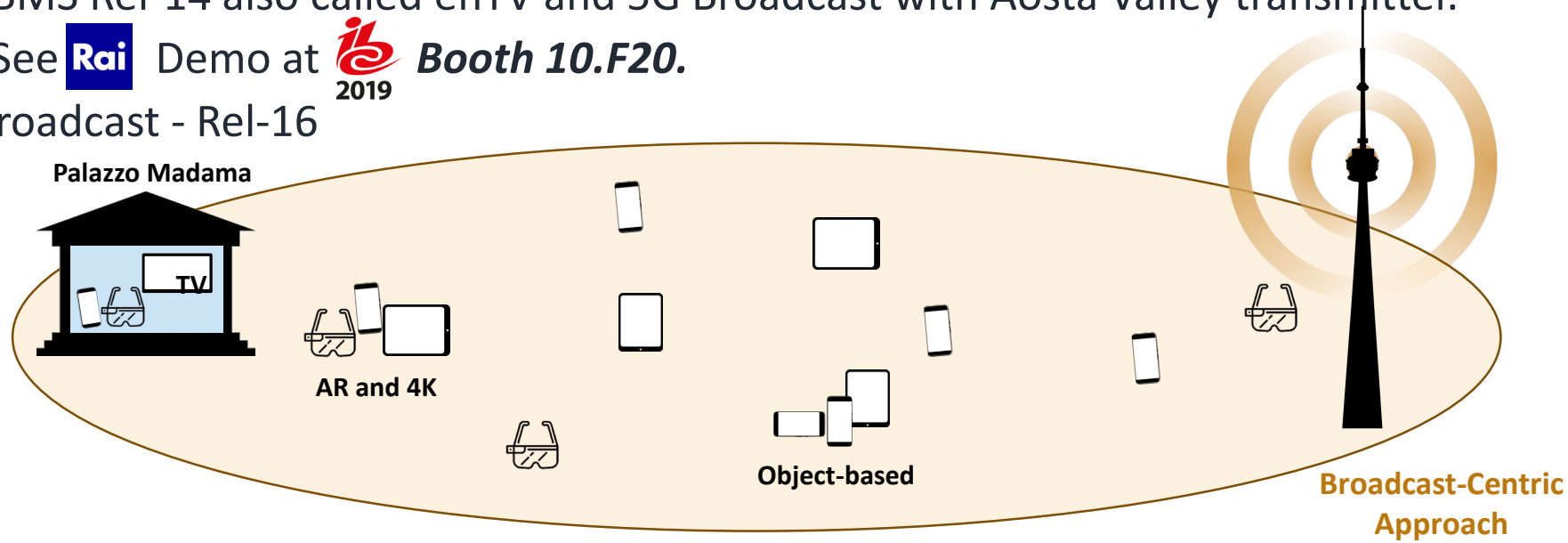


Metric	Required value
Latency	≤ 10 ms (A/R services)
Reliability	99.9999%
Mobility	250 Km/h
Coverage	Turin city (radio ~15 km)
Data rate per user/device	≥ 25 Mbps

4 Use Case 4: High quality video services distribution

The project will explore two possibilities for the efficient delivery of such content:

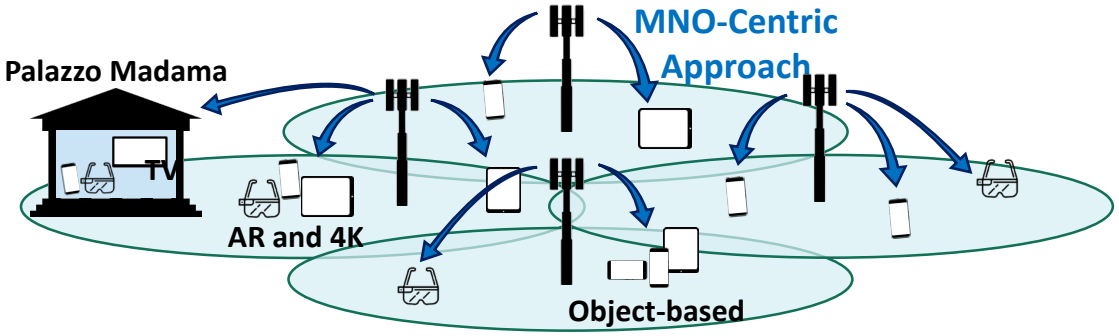
1. **5G Broadcast delivery to massive audiences**
   - To transmit the content to all users at once as a broadcast-centric receive-only approach using High-Power High-Tower (HPHT) broadcaster's infrastructure.
   - The trials will be divided into two stages:
     1. FeMBMS Rel-14 also called enTV and 5G Broadcast with Aosta Valley transmitter.
        1. See Rai Demo at IBC 2019 ***Booth 10.F20.***
     2. 5G Broadcast - Rel-16



4 Use Case 4: High quality video services distribution

The project will explore two possibilities for the efficient delivery of such content:

2. **Mixed unicast/broadcast services in cellular networks**
   - The content is transmitted via the cellular 5G network in a mixed mode where multicast/broadcast and unicast share resources
   - It allows to distribute immersive contents to a large number of users, where part of the content needs to be personalized and there is also information being delivered by the user in the uplink.



   - The trials will be divided in several stages of implementation and demonstration:
     1. 5G NSA with eMBMS capabilities.
     2. Unicast/multicast switching → Mood between 5G NR and eMBMS.
     3. Potential implementation of 5G SA with eMBMS capabilities, like the theoretical 5G-Xcast approach

4 Use Case 4: High quality video services distribution

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- **5G Broadcast delivery to massive audiences**
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    2. 5G Broadcast - Rel-16

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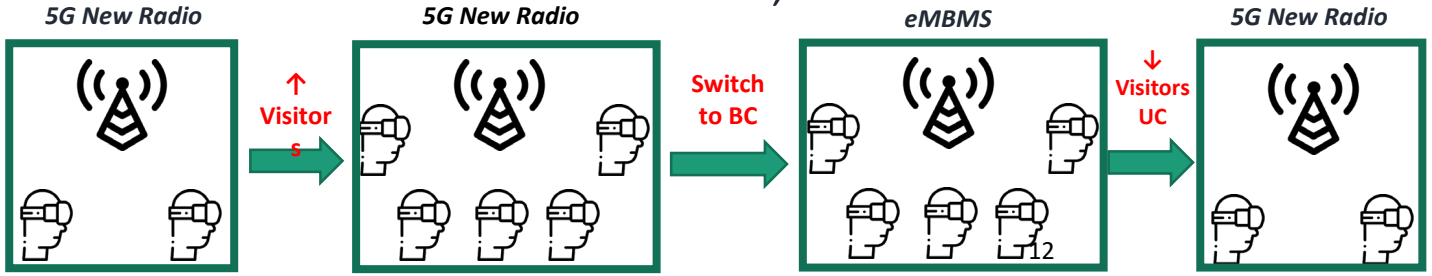
4 Two additional use cases:
Use Case 1 – Augmented tourism experience

- Use of immersive AR/VR devices to enhance and augment the museum visitor experience (high throughput/low latency).
- Application to the Augmented Tourism:
  - The museum infrastructure controls number of connected VR devices.
  - As number of visitors increases, broadcast sessions are launched and VR equipment switches.



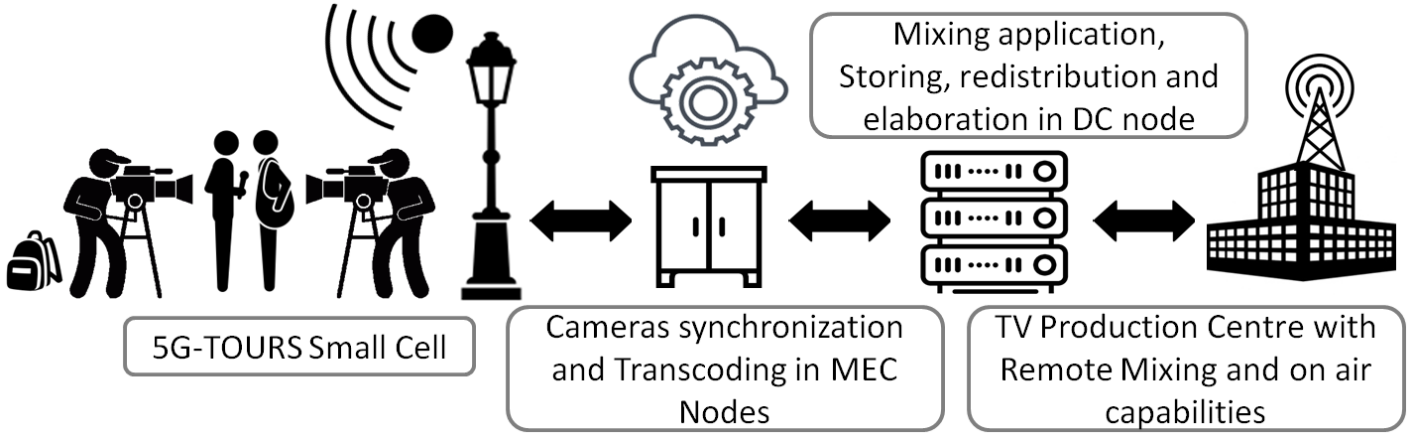
- Broadcast enabler showcase: **Multicast operation on Demand (MooD)**
  - See ENENSYS EXPWAY MooD Demo at ***Booth 2.B51***

Technical requirements

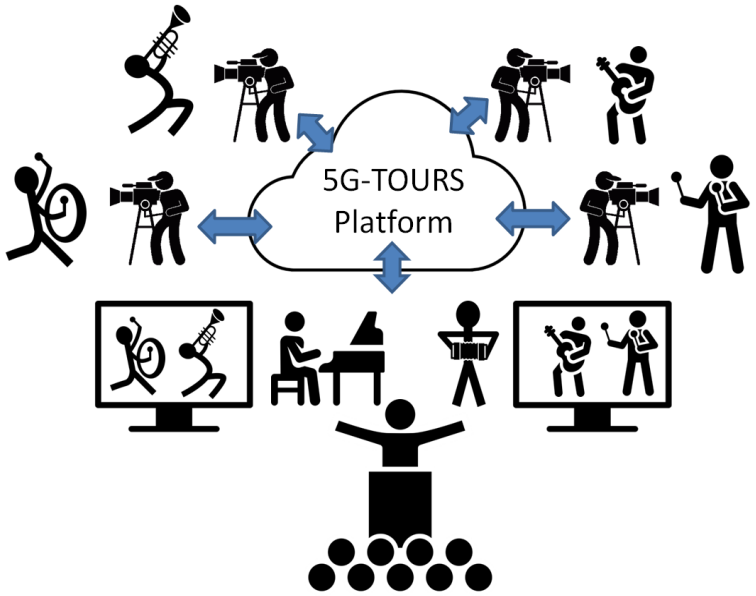
Metric	Required value
Latency	≤ 15ms E2E
Reliability	99.999%
Density	TBD (~tens per 1km^2)
Mobility	N/A
Coverage	0.5 km^2
Data rate per user/device	≤ 15ms E2E

4. Two additional use cases:
Use Case 5 – Remote and distributed video production

- Analyze how 5G networks could support remote television production scenarios in which HQ video (e.g. 4K, 8K) is generated and transmitted.
- The use case will be developed in to two trials:
  - UC5.a – TV remote production



- UC5.b – The itinerant orchestra



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THANK YOU!

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http://5gtours.eu/

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