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IEEE 5G Summit – Trento

The Role of Broadcast in 5G New Radio and Beyond

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Contents

- Overview
- The role of broadcast in 5G
 - Use cases
 - Technical analysis
 - Broadcast beyond 5G Rel-15
- The 5G-Xcast project
 - Scope and consortium
 - Dissemination



5G - Overview

- **5G** is a new way of thinking about connectivity.
 - The **5G vision** is driven by new use cases, vertical industries and business models that will emerge in the near future.
 - Media / Automotive / IoT
- Designed to meet very challenging technical requirements:



Data Rate
20 Gbit/s
(user 100 Mbit/s)



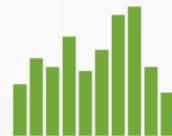
Mobility
500 km/h



Connection density
 10^6 devices / km²



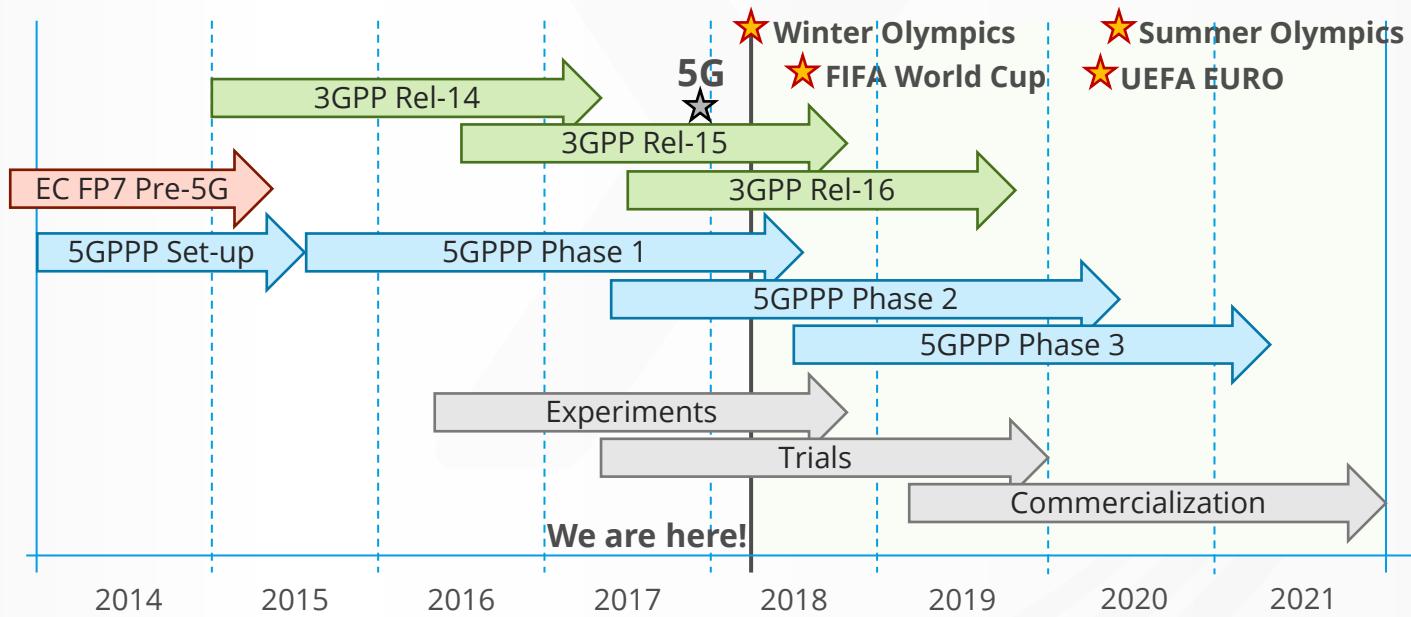
Latency
1 ms



Spectrum efficiency
3x

5G - Where are we?

- 5G Release-15 was first completed by 3GPP in December 2017.
- 3GPP plan and 5GPPP coordination:



Contents

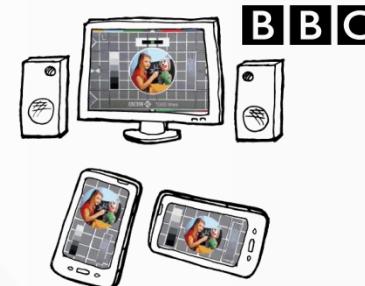
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The Role of Broadcast in 5G

- 5G is expected to provide new capabilities to satisfy user demands.
 - Over **78%** of the world's mobile data traffic will be **video** by 2021.
- 5G will bring the means to deliver new immersive audio-visual media.



4K/8K UHDTV content.
High-Dynamic Range (HDR)
High Frame Rate (HFR)



Object-based content



Virtual / Augmented /
Mixed Reality



360° video

The Role of Broadcast in 5G

- Innovative **5G** use cases require broadcast transmissions!
Broadcast allows an infinite number of users to receive the same content at the same time, using just a fixed number of resources.
- Big potential in convergence of fixed and mobile broadband networks for large-scale media delivery.
- Point to multipoint as a delivery optimization tool, rather than a service.
- Broadcasters interest in **3GPP** technologies has increased recently.
 - **4G** LTE Rel-14 has incorporated many requirements, but suffers from the **eMBMS legacy**.

Use Cases in 5G Broadcast

- Broadcast transmissions are key in many **5G** use cases:

MULTIMEDIA & ENTERTAINMENT



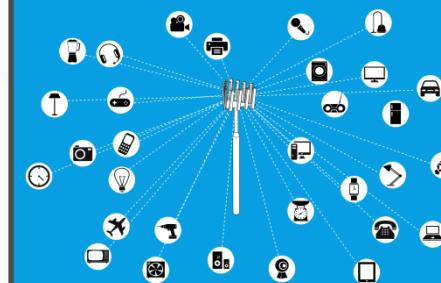
UHDTV delivery
VR and AR

CONNECTED CARS



Infotainment
Safety

INTERNET OF THINGS



Software Updates
Common Control
Messages

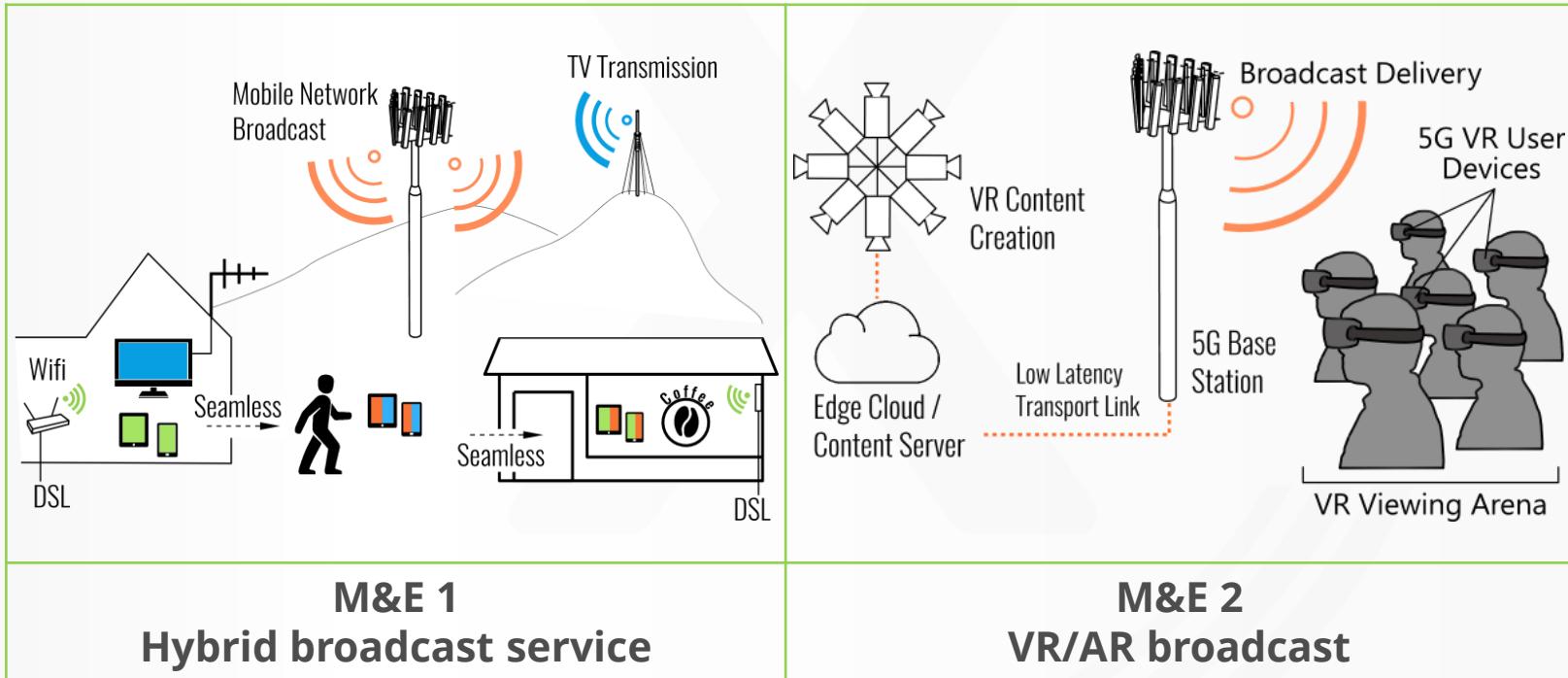
PUBLIC WARNING AND SAFETY



Public Warning Systems
Tsunami Alert

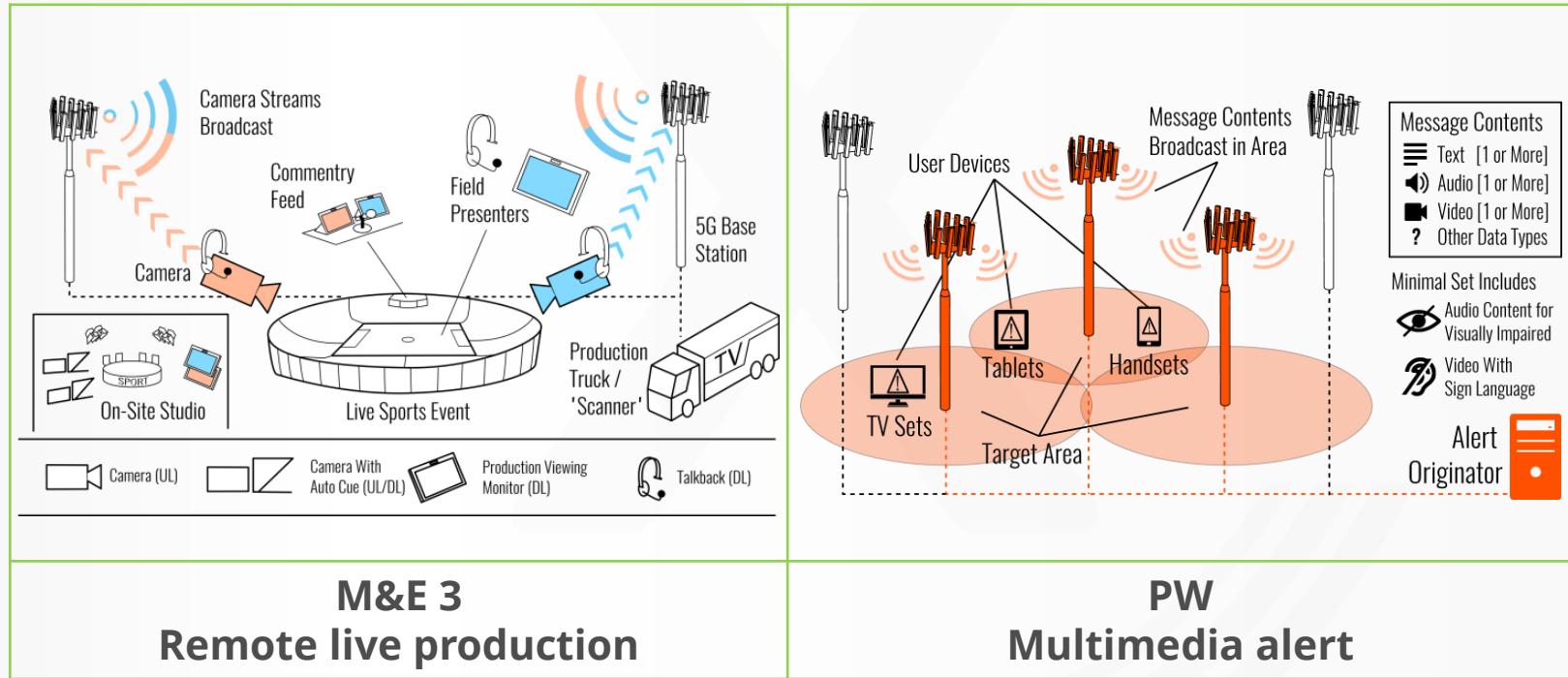
Use Cases in 5G Broadcast

- Examples of potential use cases identified:



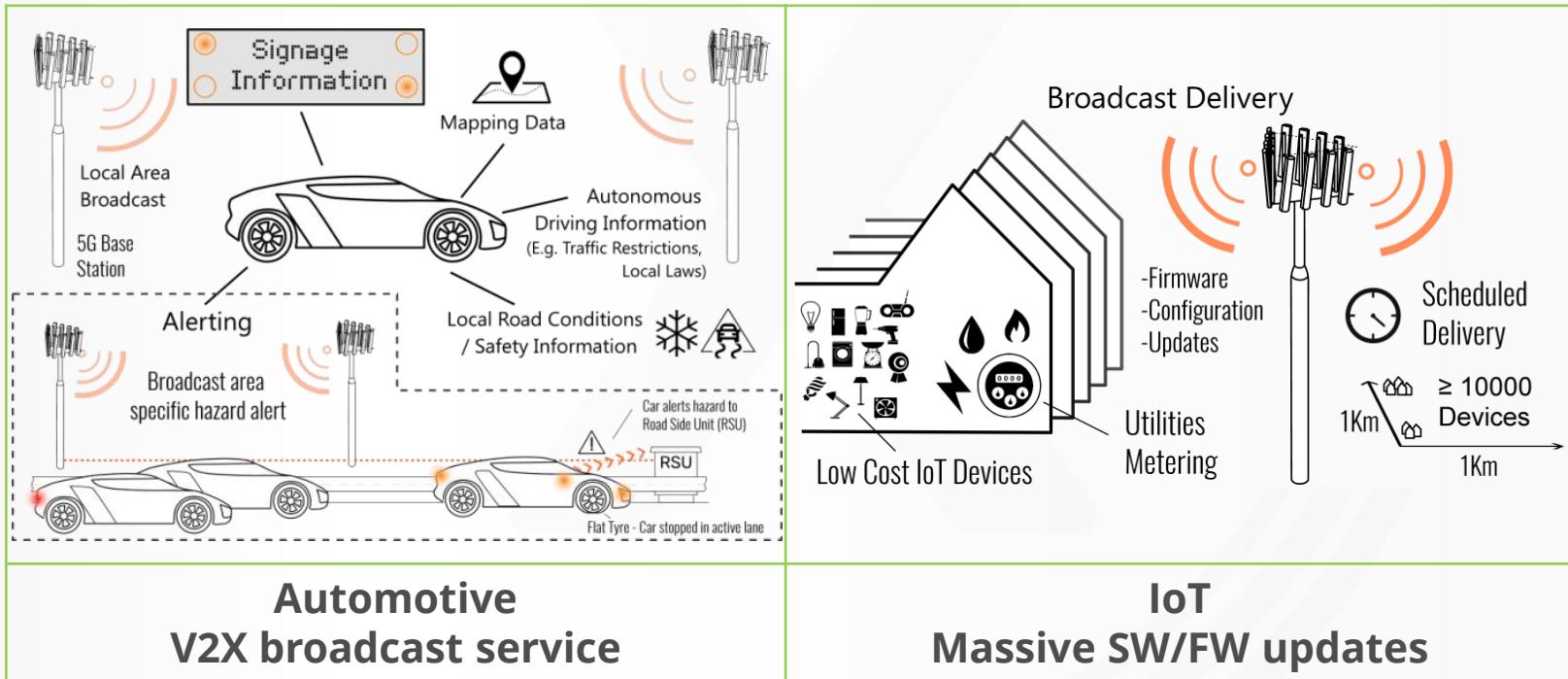
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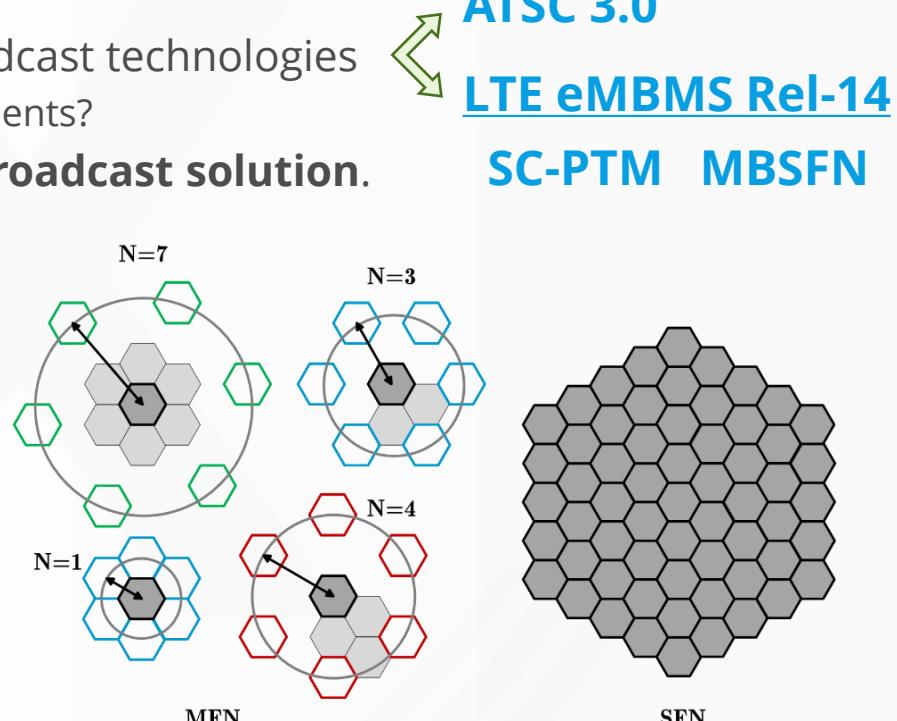
Use Cases in 5G Broadcast

- Examples of potential use cases identified:



Technical Analysis - SoA

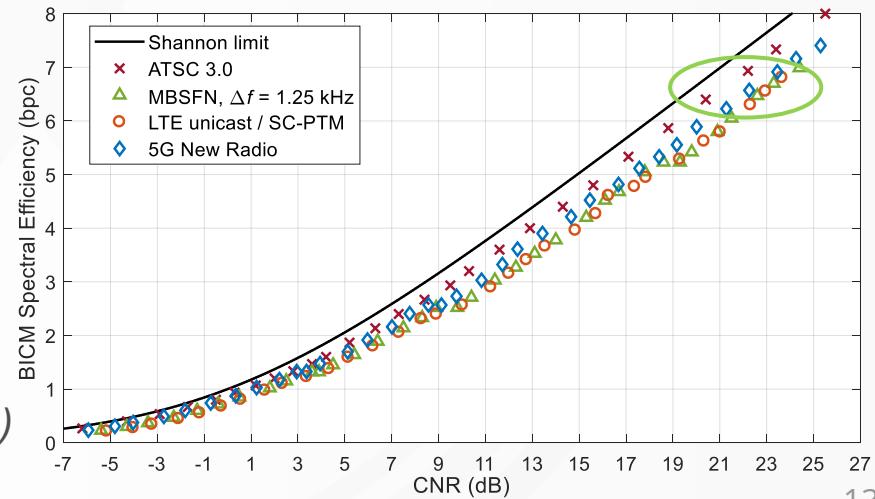
- Gap analysis:
 - Evaluation of **state-of-the-art** broadcast technologies
 - Do they fulfil the IMT-2020 requirements?
 - Benchmark to compare with a **5G broadcast solution**.
 - **Air interface & RAN:**
 - Limitations
 - Analysis and inspection
 - Link-level evaluation
 - System-level evaluation
 - Coverage (MFN & SFN)
 - **Content delivery:**
 - Video services & business models
 - Media delivery technologies



Technical Analysis - 5G New Radio

- 5G New Radio:
 - It is also necessary to evaluate the 5G Rel-15 **unicast** specification from **3GPP**...
 - ... to propose the future **5G broadcast** solution.
 - Considering **use cases** already defined.
 - From 3 different **perspectives**:
 - Air interface & RAN
 - Core network
 - Content delivery

5G New Radio Performance in AWGN (SISO)



Broadcast beyond 5G Rel-15

3GPP

- Several proposals to start a new **Study Item**.
 - Samsung, Qualcomm, LG Electronics, BBC...
 - :(Due to the lack of time units for **Rel'15**, it could not be considered.
 - : Revisit these proposals as soon as time units in **Rel'16** become available.

5GPPP

- 5G-Xcast will propose the inclusion of broadcast as part of a future New Radio specification.

Broadcast will become an integral part of 5G systems in the near future.

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Scope

TITLE

Broadcast and Multicast Communication Enablers for the Fifth-Generation of Wireless Systems

USE CASES

The project has identified and defined requirements and KPIs for M&E, Automotive, IoT and PWS

AIR INTERFACE & PTM RAN

Comprehensive and holistic, design will include the radio interface, RAT protocols and RAN architecture

CONVERGED CORE NETWORK

Combining fixed, mobile and broadcast networks. Using mix of unicast / broadcast / multicast / caching capabilities



Scope



CONTENT FRAMEWORK

Network-agnostic. Combines unicast, multicast, broadcast and caching for dynamic network resource optimization.

PROOF OF CONCEPT x3

- Object-based broadcasting
- Hybrid broadcast service
- Public warning

TEST-BED x3

- Surrey, UK
- Munich, Germany
- Turku, Finland

DEMO





Consortium

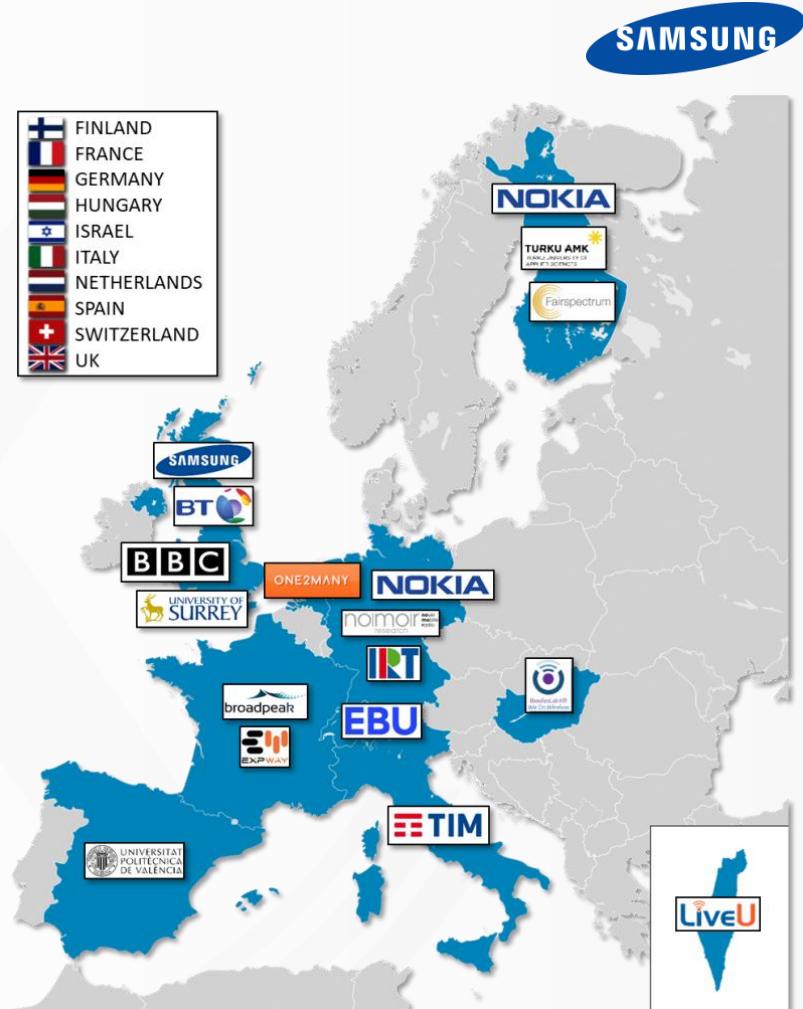
- 18 partners from 9 countries
 - 2 broadcasters & associations
 - 5 telecom operators & vendors
 - 8 SMEs
 - 3 universities

PM | UPV (Spain)

TM | Nokia (Finland)

IM | Samsung (UK)

- Advisory board:





Dissemination

WEBSITE

USE CASES

5G-Xcast will be the first 5G-PPP project to focus on the holistic implementation of multicast/broadcast as a critical technology element in 5G systems in addition and as a complement to unicast. 5G-Xcast technologies will be also fundamental to progress towards the vision of a converged 5G infrastructure for fixed and mobile accesses, including terrestrial broadcast, to audio-visual media content. The project will take a holistic approach to harmonize the media delivery among the three considered types of networks and to provide an optimised and seamless media user experience.

> Provide efficient, scalable and sustainable solutions for a large-scale distribution of media services fully consistent with the core 5G specifications, contributing to the definition of 5G and its standardization in 3GPP.

> Facilitate seamless integration of fixed, mobile and terrestrial broadcast networks into a unified heterogeneous and flexible 5G infrastructure, enabling better use of network resource, easier evolution paths to future functionalities and services and improved QoE.

> Enable new sustainable business models, new applications and services, and a graceful migration of media and entertainment services from the legacy networks to 5G.

IMPACT

<http://5g-xcast.eu/>



SOCIAL MEDIA

5G-Xcast 5GPPP Project
119 followers
1mo

Learn more about IRT and how the worlds first SFN eMBMS testbed at 700MHz will be used in 5G-Xcast: [see more](https://lnkd.in...)

5G-Xcast Testbed - IRT SFN Broadcast Field-trial
youtube.com

7 likes

Like **Comment** **Share**

5G-Xcast 5GPPP Project
119 followers
1mo

Come snow storms and high winds, nothing stops the 5G-Xcast consortium!
... see more





Dissemination

YOUTUBE CHANNEL



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5Gxcast View as: Yourself ▾

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Stay Tuned!

- Videos released periodically.
- Upcoming ideas:
 - Uses cases definition
 - State of the art technologies
 - 5G-Xcast RAN & air interface
 - 5G-Xcast core network
 - Showcase & demonstration.

5G-XCast Testbed - IRT SFN Broadcast Field-trial
1 month ago • 904 views
This video introduces the IRT (Institut für Rundfunktechnik) testbed and how it will be used within the 5G-Xcast project.

5G-XCast Testbed - 5GIC University of Surrey
1 month ago • 165 views
This video introduces the 5GIC testbed and how it will be used within the 5G-Xcast project.

5G-XCast Introduction Video
4 months ago • 1,421 views
5G-Xcast is a 5GPPP Phase II project focused on Broadcast and Multicast Communication Enablers For the Fifth Generation of Wireless Systems. <http://5g-xcast.eu/>



Thank You



Any Questions?
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