IEEE 5G Summit

Broadcast and Multicast Communication Enablers for 5G

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Contents

DESIGNED FOR
NEW VERTICAL
INDUSTRIES

DRIVEN
BY NEW
USE CASES

5G

5G-PPP White Paper, "5G Vertical Sectors," Feb. 2016

Contents

5G & Broadcast

BROADCAST / MULTICAST PTM TRANSMISSIONS ARE KEY IN MANY 5G USE CASES

MULTIMEDIA & ENTERTAINMENT

UHDTV delivery

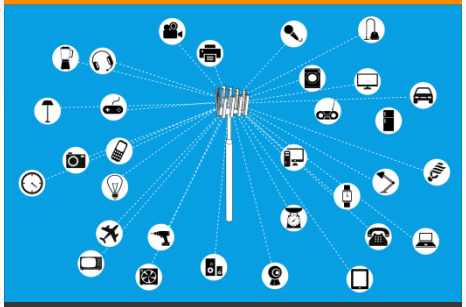
VR and AR

CONNECTED AUTOMOTIVE

Infotainment

Safety

INTERNET OF THINGS



Software Updates

Common Control Messages

PUBLIC WARNING AND SAFETY

Public Warning System

Tsunami and Earthquake Alert

5G and Broadcast

5G for large-scale media delivery?

- MNOs are increasingly entering the pay TV market
- Tablets and TVs have increased potential to become 5G connected
- Spectrum now available for 5G used to be for UHF broadcasting

5G is expected to provide the main means to **deliver new immersive audio-visual media** including their consumer interactivity

Contents

- 5G Drivers
- Broadcast in 5G
- The Media & Entertainment Challenge
- The 5G-Xcast Project
- Outlook on 5G Broadcast

Media & Entertainment Challenge / User Devices

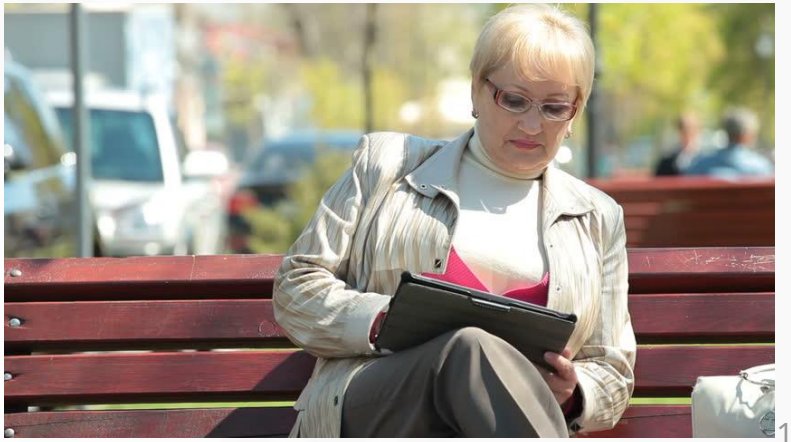
Media & Entertainment Challenge / User Devices

GREATER
PROCESSING
POWER

S8: 2960 x 1440 resolution
Octa-core (2.35GHz Quad + 1.9GHz Quad)

LARGER
HIGH-RES
DISPLAYS

Media & Entertainment Challenge / User Environment



Media & Entertainment Challenge / Distribution

GOAL > Deliver the content and services to all interested users

> AT >
the right time
the right place
the required quality
the right price point

> ON > the right device

A Balance of
- Optimising the user experience
- Network resource management
- Business objectives
- Regulatory requirements and constraints

Contents

- 5G Drivers
- Broadcast in 5G
- The Media & Entertainment Challenge
- The 5G-Xcast Project
  - Technical Challenges
  - Vision
- Outlook on 5G Broadcast

Technical Challenges / Our Focus

USE CASES

Identify and define requirements and KPIs for: **M&E, Automotive, IoT** and **PWS** verticals.

BROADCAST 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 transport** and **caching** capabilities.

Technical Challenges / Our Focus

CONTENT DISTRIBUTION FRAMEWORK

Network-agnostic, Combining unicast, multicast, broadcast and caching for **dynamic network resource optimisation**. **Simple interface** between content service provider and network operator

PROOF-OF-CONCEPT PROTOTYPES

For the **5G-Xcast Radio, transport** and **application layer** key components

Proof of concepts / Demonstrators & Test beds

x3 **Demonstration Use Cases**
Object-based broadcast service, hybrid broadcast service and PWS

x3 **Test-beds**
5GIC (Surrey, UK); IRT (Munich, Germany); TUAS(Turku, Finland)

DEMOs European Championships 2018 (Showcase), IBC 2018, MWC 2019

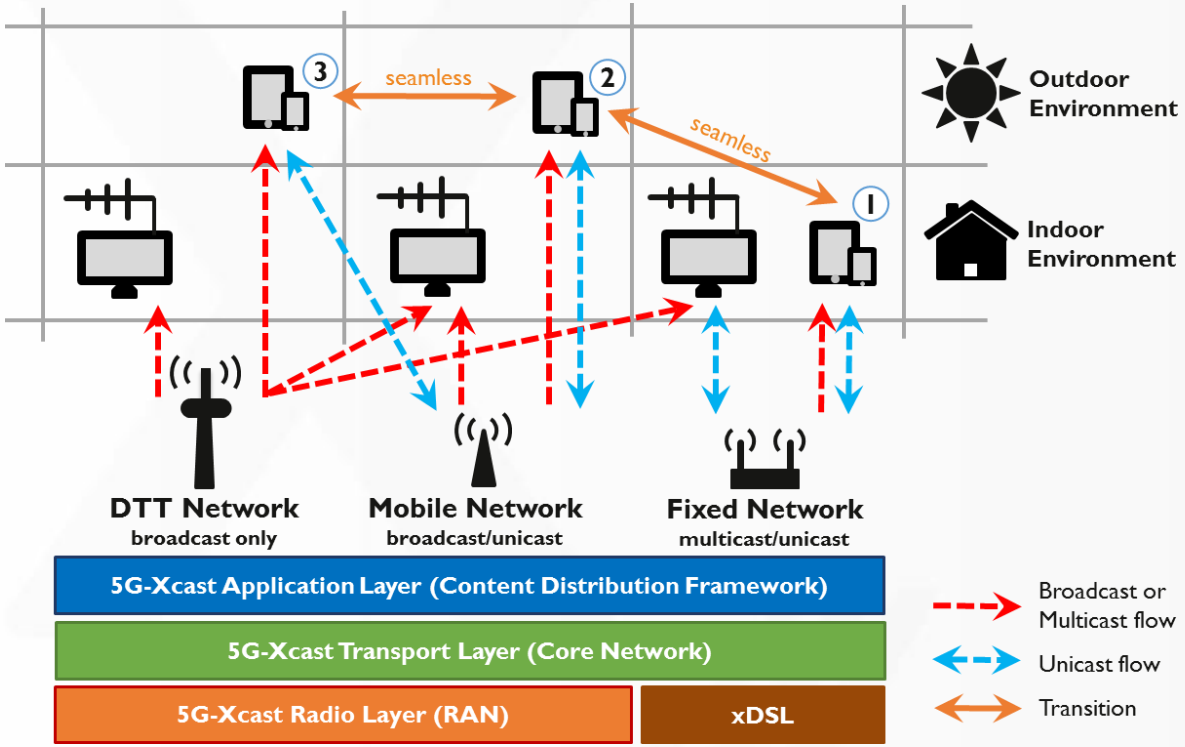
CHANGE OF PARADIGM

Treat **multicast, broadcast and caching** as **built-in internal network delivery optimisations** not as a service to be offered to content service providers.

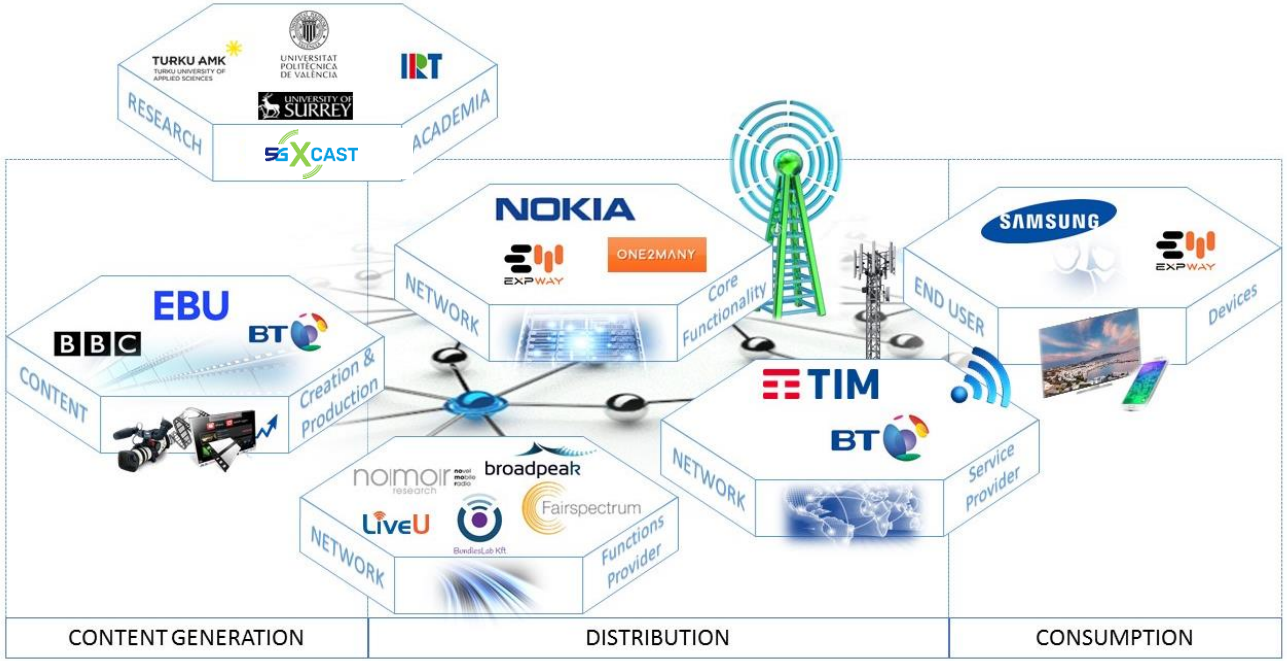
Network slice broadcast service that would use PTM capabilities.

5G XCAST Convergence Vision

The **converged media delivery architecture of 5G-Xcast over fixed broadband, mobile broadband and terrestrial broadcast networks** allows a **seamless, uninterrupted service** to be offered to the users as they move.



Media & Entertainment Value Chain



5G-Xcast External Advisory Board

- Communications Research Center (**CRC**), Canada
- **Qualcomm**, USA
- National Engineering Research Center (**NERC**), China
- Nippon Hōsō Kyōkai (**NHK**), Japan
- WISSEA, China

- (**SWR**)Südwestrundfunk, Germany
- **Avanti**, UK
- **Ericsson**, Germany
- **TDF**, France
- **Technical University of Braunchsweig (TUBS),** Germany
- **Teracom**, Swden
- **Thales Alenia Space**, France
- **Dutch Ministry of Security and Justice** (MSJ), The Netherlands
- Electronics and Telecommunications Research Institute (**ETRI**), South Korea

Expressed Interest: Sony, Digita, Cellnext, RAI

LIVE

Stay Tuned!

www.5g-xcast.eu

@5Gxcast

Thank You

Any Questions ?

5G Broadcast Outlook & Summary

- 5G Broadcast **not included** in first 5G release (Rel'15)
- Innovative 5G **use cases require PTM** transmissions
- **PTM transmissions** as **delivery optimization tool** (together with caching)
- Broadcasters interest in 3GPP technologies has increased recently
- Big Potential in **convergence of fixed and mobile broadband networks for large-scale media delivery**

Back-Up Slides

- 5G-Xcast Basic Information

Where we are now?

AV media services

Distribution infrastructure

The audience

TV channels
radio channels

on-demand
time shifted
interactive
personalised
multi-view
. . .

hybrid TV
second screen
cross-platform
social media
text
. . .

user
generated
content

virtual
reality
augmented
reality
. . .

Broadcast

Terrestrial

Satellite

Cable

Broadband

Fixed networks
* IPTV
* OTT

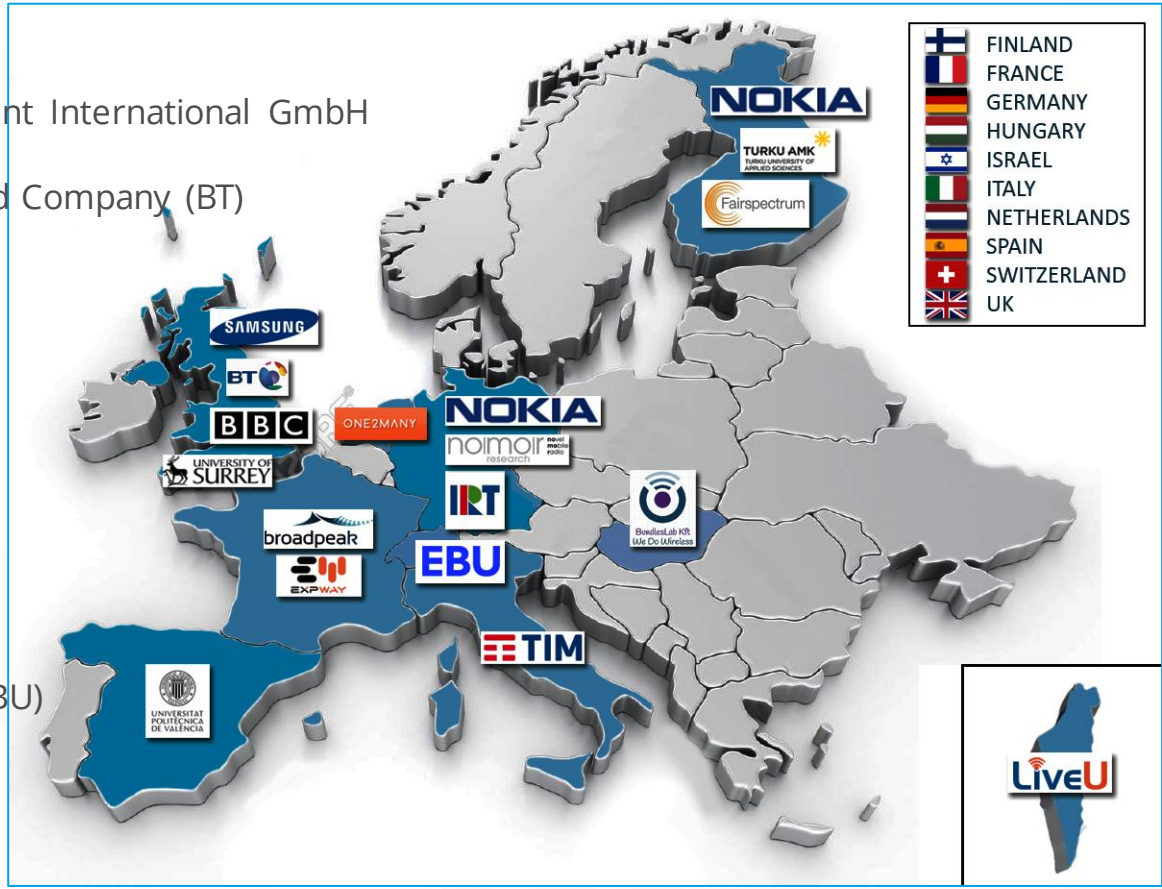
Mobile networks
* 3G, 4G

5G-Xcast Main Objectives

Nr.	Objective
1	To **develop broadcast and multicast point to multipoint (PTM) capabilities for 5G** considering M&E, automotive, IoT and PWS use cases, and **evaluate 5G spectrum allocation options for 5G Broadcast network deployments**.
2	To design a dynamically adaptable **5G network architecture** with **layer independent network interfaces** capable of **dynamically and seamlessly switching between unicast, multicast and broadcast** modes or use them in parallel and **exploiting built-in caching** capabilities.
3	To **experimentally demonstrate the 5G key innovations** developed in the project for the M&E and PWS verticals.

5G-Xcast Consortium

- Universitat Politècnica de València (UPV)
- Nokia Solutions and Networks OY
- Nokia Solutions and Networks Management International GmbH
- British Broadcasting Corporation (BBC)
- British Telecommunications Public Limited Company (BT)
- Broadpeak
- BundlesLab Kft
- Expway
- Fairspectrum OY
- Institut für Rundfunktechnik GmbH (IRT)
- LiveU Ltd.
- Nomor Research
- One2Many
- Samsung Electronics (UK) Limited
- Telecom Italia
- Turun Ammattikorkeakoulu OY (TUAS)
- Union Européenne de Radio Télévision (EBU)
- University of Surrey 5GIC



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- Südwestrundfunk (**SWR**), Germany
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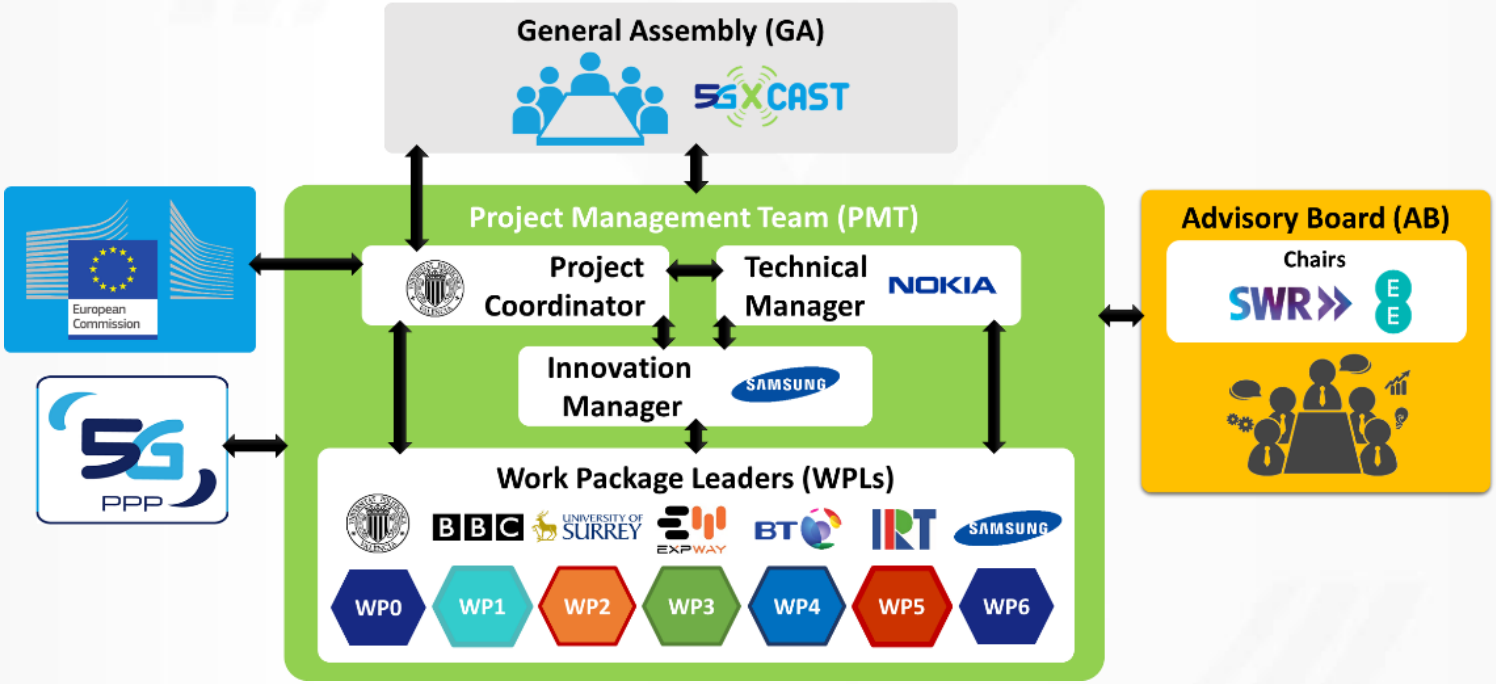
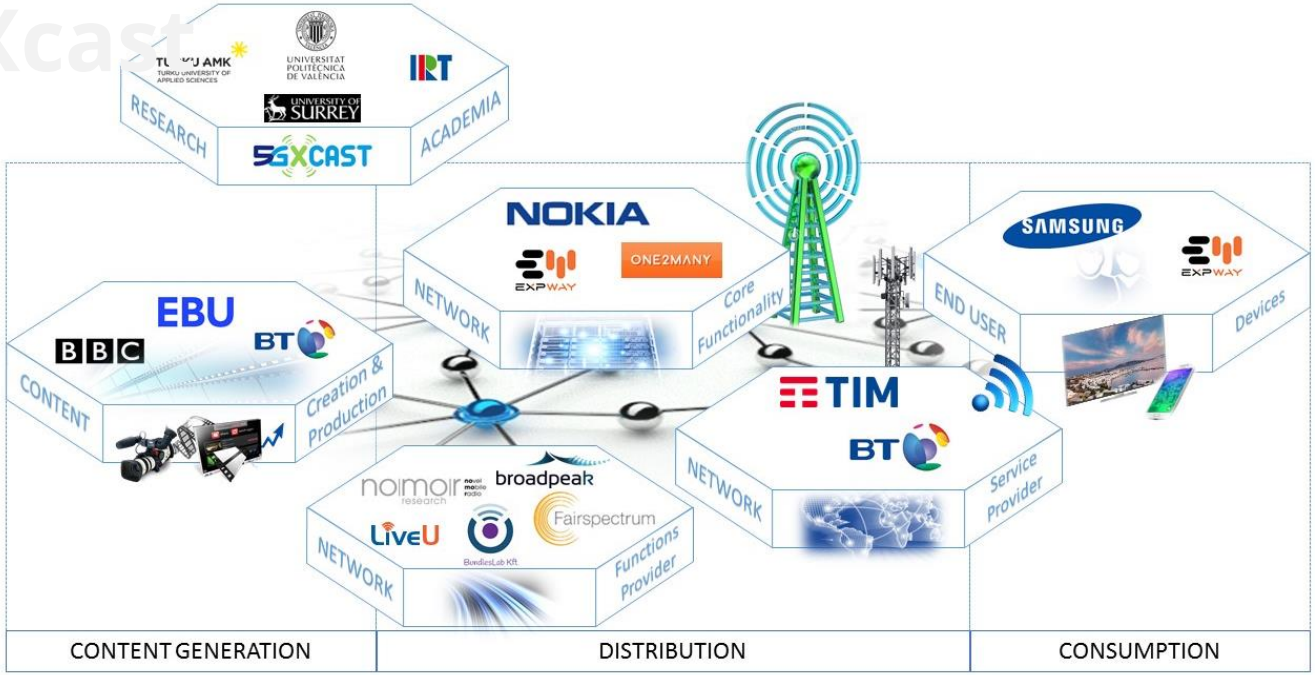
- Qualcomm, USA
- National Engineering Research Center (**NERC**), China
- Nippon Hōsō Kyōkai (**NHK**), Japan
- WISSEA, China
- Finnish Communications Regulatory Authority (**FICORA**), Finland

5G-Xcast Management Structure



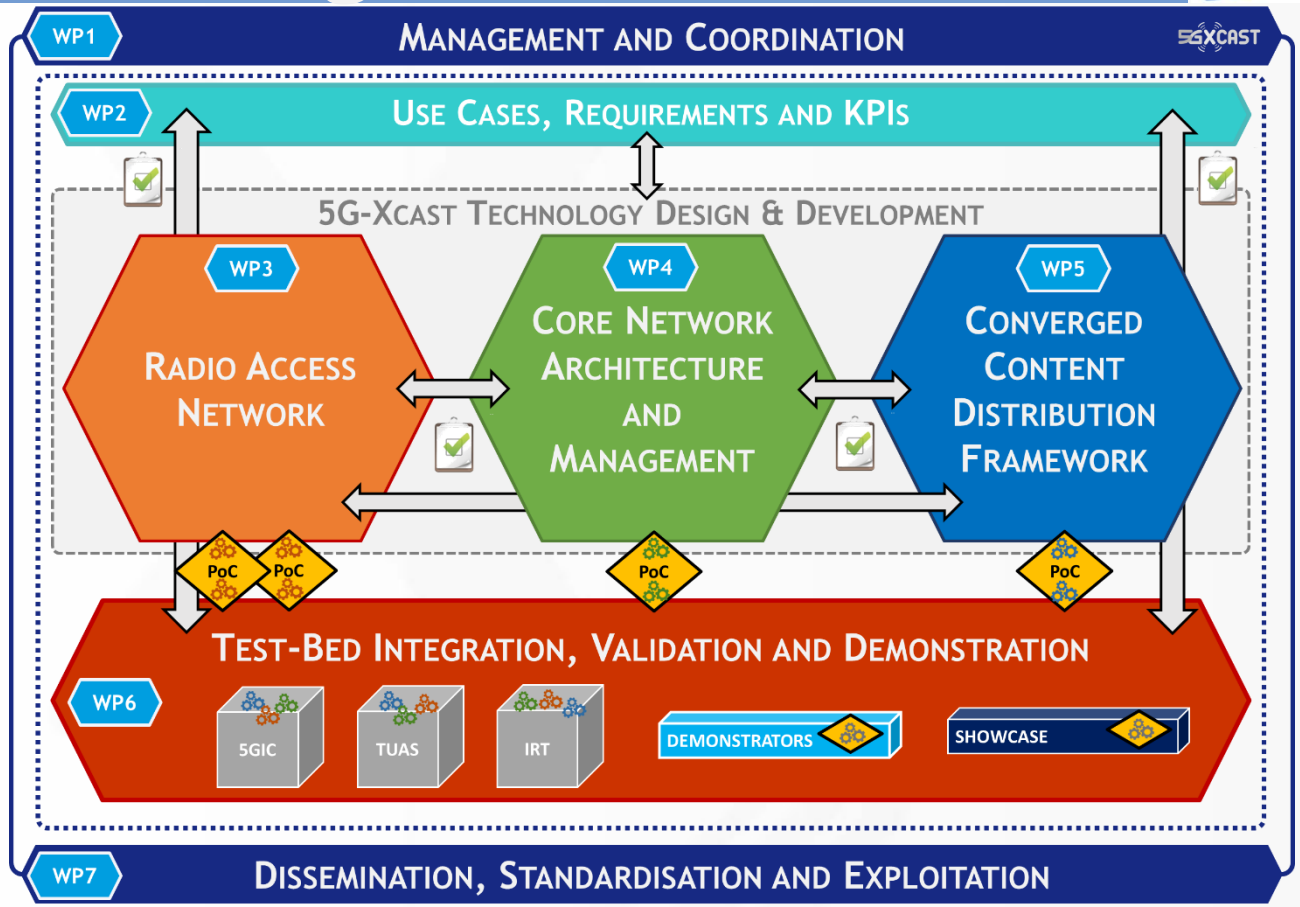
Media & Entertainment Value Chain in 5G-Xcast



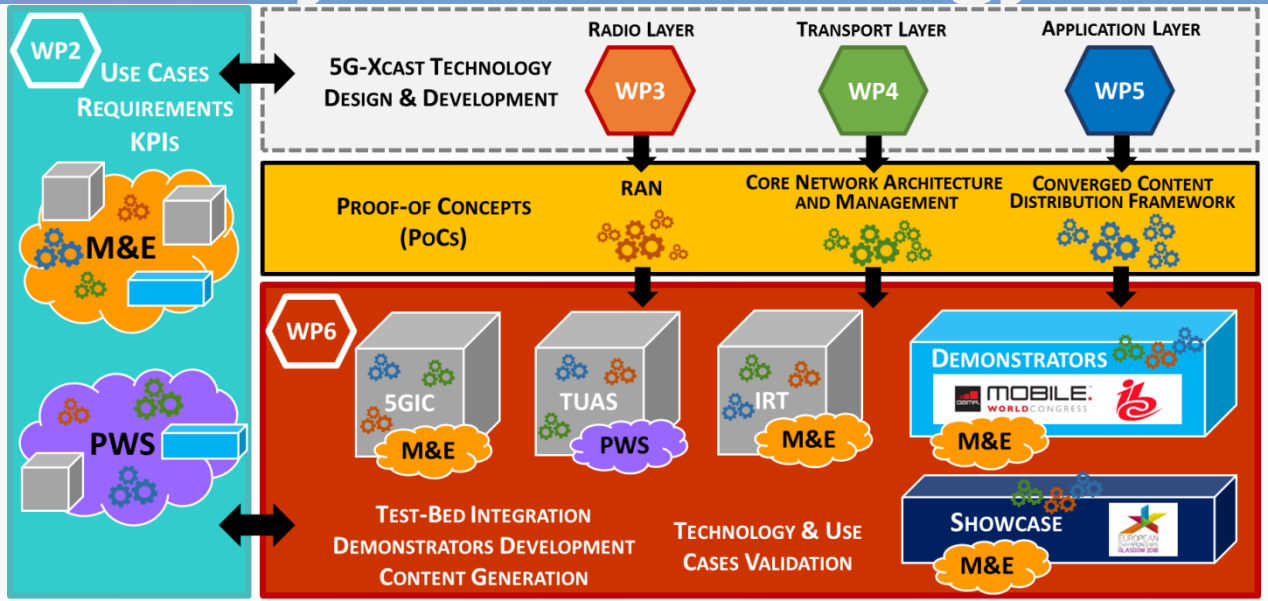
- External Advisory Board: the public service broadcasters **SWR** (Germany) and **NHK** (Japan), the MNO **EE** (UK), the broadcast network operators **TDF** (France) and **Teracom** (Sweden), the telecom vendor **Ericsson** (Germany), the CE manufacturer **Qualcomm** (USA), and the satellite service provider **Avanti** (UK), the aerospace manufacturer

5G-Xcast Work Packages (WPs) Structure

- WP Leaders
  - WP1 **UPV**
  - WP2 **BBC**
  - WP3 **5GIC**
  - WP4 **Expway**
  - WP5 **BT**
  - WP6 **IRT**
  - WP7 **Samsung**



5G-Xcast Project Methodology

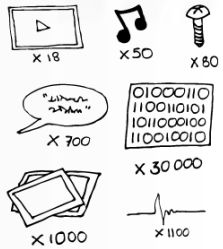


- **x3 demonstration use cases**: **object-based broadcast service**, **hybrid broadcast service (HbbTV)** and **PWS**
- **x3 5G test-beds**: **5GIC** (Surrey, UK), **IRT** (Munich, Germany), **TUAS** (Turku, Finland)
- **Demonstrations**: European Championships 2018 (showcase), IBC 2018, MWC 2019

Use Case: Object-based Broadcast

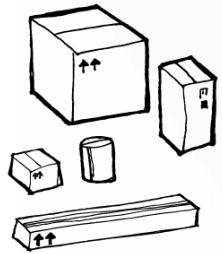
BBC

1



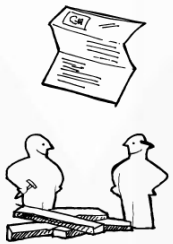
The programme is made in the traditional way.

2



The programme is turned into a collection of media objects along with some metadata to describe how it should be assembled. All of this data is broadcast to everyone.

3



The device inside the viewer's home re-assembles the media objects according to the metadata.

4

The objects can be assembled differently (based on the original metadata). optimising the experience depending on local factors relating to the device, environment and viewer.

- http://www.bbc.co.uk/rd/about/vision