IEEE 5G Summit

Broadcast and Multicast Communication Enablers for 5G

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Contents

• 5G Drivers
• Broadcast in 5G
• The Media & Entertainment Challenge
• The 5G-Xcast Project
• Outlook on 5G Broadcast
DRIVEN BY NEW USE CASES

5G

DESIGNED FOR NEW VERTICAL INDUSTRIES
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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
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Media & Entertainment Challenge / User Devices
Media & Entertainment Challenge / User Devices

The Evolution of Samsung Galaxy

Samsung GALAXY S

SAMSUNG DISPLAY RESOLUTION

MARCH 2010
4" Super AMOLED
480 x 800 pixels
5MP (2560 x 1920 pixels)
720p at 30fps

FEBRUARY 2011
4.3" Super AMOLED Plus
480 x 800 pixels
8MP (3264 x 2448 pixels)
1080p at 30fps

MAY 2012
4.8" HD Super AMOLED
720 x 1280 pixels
8MP (3264 x 2448 pixels)
1080p at 30fps

MARCH 2013
5" Full HD Super AMOLED
1080 x 1920 pixels
13MP (4128 x 3096 pixels)
1080p at 30fps

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

LARGER HIGH-RES DISPLAYS

5.8"
6.2"

GREATER PROCESSING POWER
**Media & Entertainment Challenge / Distribution**

**GOAL**
Deliver the content and services to all interested users

**> AT >**
- the right time
- 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
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
Demonstration Use Cases
Object-based broadcast service, hybrid broadcast service and PWS

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.
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

- (SWR) Südwstrundfunk, Germany
- Avanti, UK
- Ericsson, Germany
- TDF, France
- Technical University of Braunchsweig (TUBS), Germany
- Teracom, Sweden
- Thales Alenia Space, France
- Dutch Ministry of Security and Justice (MSJ), The Netherlands
- Communications Research Center (CRC), Canada
- Qualcomm, USA
- National Engineering Research Center (NERC), China
- Nippon Hōsō Kyōkai (NHK), Japan
- WISSEA, China

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

Fixed networks
- IPTV
- OTT

Mobile networks
- 3G, 4G

Broadcast

Terrestrial

Satellite

Cable

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

virtual reality
augmented reality
<table>
<thead>
<tr>
<th>Nr.</th>
<th>Objective</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>To <strong>develop broadcast and multicast point to multipoint (PTM) capabilities for 5G</strong> considering M&amp;E, automotive, IoT and PWS use cases, and <strong>evaluate 5G spectrum allocation options for 5G Broadcast network deployments</strong>.</td>
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<td>2</td>
<td>To design a dynamically adaptable <strong>5G network architecture</strong> with <strong>layer independent network interfaces</strong> capable of <strong>dynamically and seamlessly switching between unicast, multicast and broadcast modes</strong> or use them in parallel and <strong>exploiting built-in caching capabilities</strong>.</td>
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<td>3</td>
<td>To <strong>experimentally demonstrate the 5G key innovations</strong> developed in the project for the M&amp;E and PWS verticals.</td>
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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 Ammattikorkeakoulou OY (TUAS)
- Union Européenne de Radio Télévision (EBU)
- University of Surrey 5GIC
5G-Xcast External Advisory Board

- Südwestrundfunk (SWR), Germany
- Avanti, UK
- Ericsson, Germany
- TDF, France
- Technical University of Braunschweig (TUBS), Germany
- Teracom, Sweden
- Thales Alenia Space, France
- Dutch Ministry of Security and Justice (MSJ), The Netherlands
- Electronics and Telecommunications Research Institute (ETRI), South Korea
- Communications Research Center (CRC), Canada
- Qualcomm, USA
- National Engineering Research Center (NERC), China
- Nippon Höso Kyôkai (NHK), Japan
- WISSEA, China
- Finnish Communications Regulatory Authority (FICORA), Finland
5G-Xcast Management Structure
- 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 **Thales Alenia Space**
5G-Xcast Work Packages (WPs) Structure

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

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