5G XCAST

Broadcast and Multicast Communication Enablers
for the Fifth Generation of Wireless System

5G PPP

European Commission

5G-XCAST WILL OPEN THE DOOR TO A NEW AGE OF IMMERSIVE MEDIA DELIVERY FOR EUROPE

MAIN OBJECTIVES

Point-to-multipoint capabilities
To develop broadcast and multicast capabilities for the standalone 5G New Radio and 5G Core Network.

Adaptable and converged network architecture
Design a 5G converged network architecture combining fixed, mobile and terrestrial networks to dynamically and seamlessly switch between unicast, multicast and broadcast modes or use them in parallel.

Innovative use cases demonstration
Develop proof-of-concept prototypes at Radio Access Network (RAN), core and content distribution level and experimentally demonstrate key innovations deve-loped in the project for the media and public warning verticals.

USE CASES

MEDIA & ENTERTAINMENT

▶ Hybrid broadcast service
▶ Virtual/augmented reality broadcast
▶ Remote live production

INTERNET OF THINGS

▶ Massive software and firmware updates

PUBLIC WARNING

▶ Multimedia public warning alert
▶ Multimedia amber alert

AUTOMOTIVE

▶ V2X broadcast service

5G-XCAST RADIO ACCESS NETWORK

5G-Xcast will design the point-to-multipoint air interface, RAN logical architecture and RAT protocols of two new modes based on 5G NR:

MIXED MODE

▶ Switched unicast, multicast and broadcast.
▶ Requires feedback from UEs.
▶ High commonalities with unicast.
▶ 2 types of operation for single and multiple cells in Single Frequency Network (SFN) operation.

TERRESTRIAL BROADCAST

▶ Point-to-area broadcast.
▶ Downlink only.
▶ Local, regional and nationwide SFN areas.
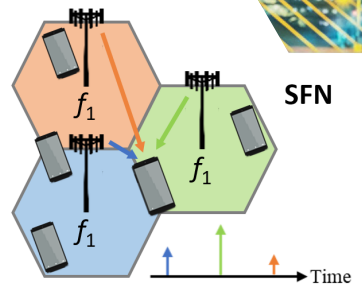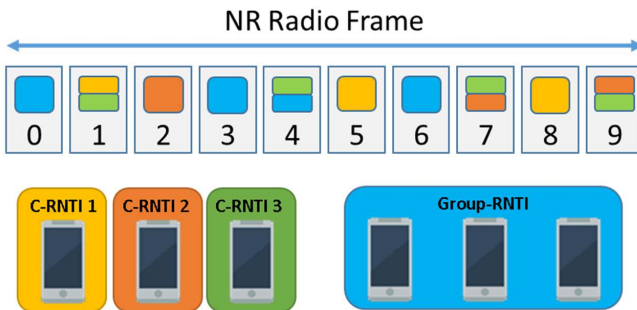
Group identifier for point-to-multipoint and SFN transmission concept.

▶ 5G-Xcast has analysed the performance of eMBMS enTV Rel'14 as benchmark and it will actively participate in the 3GPP Rel´16 Study Item about LTE-based 5G Broadcast.

▶ 5G-Xcast will also analyse 5G NR against the Key Performance Indicators (KPI) and requirements specified in the IMT-2020 guidelines.

5G-XCAST CONVERGED CORE NETWORK

▶ Add support to multicast and broadcast in 5G core, with network functions in both user and control planes.

▶ Combination of fixed, mobile and broadcast networks to realise the 5G converged core network.

▶ Flexible session control and resource management to meet the needs of new and diverse 5G use cases.

5G-XCAST CONTENT DISTRIBUTION FRAMEWORK

5G-Xcast will produce a network-agnostic content distribution framework to optimise network resources dynamically, whilst:

▶ Keeping the interface between the content service provider and the network operator as simple as possible.
▶ Treating multicast, broadcast and caching as built-in internal network optimisations, not as a service.
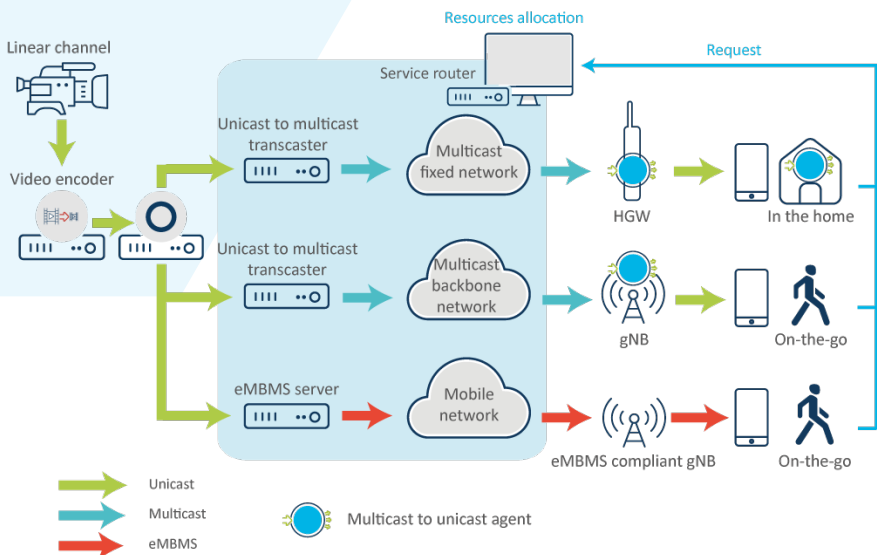
Unicast/multicast/broadcast convergent video delivery

Munich Test-Bed, Germany
HYBRID BROADCAST SERVICE

IRT, in collaboration with Nokia and BR, operates an eMBMS single frequency network with urban and rural coverage in the city and the surroundings of Munich. The test-bed will further evolve to realise comprehensive Hybrid Broadcast use cases.
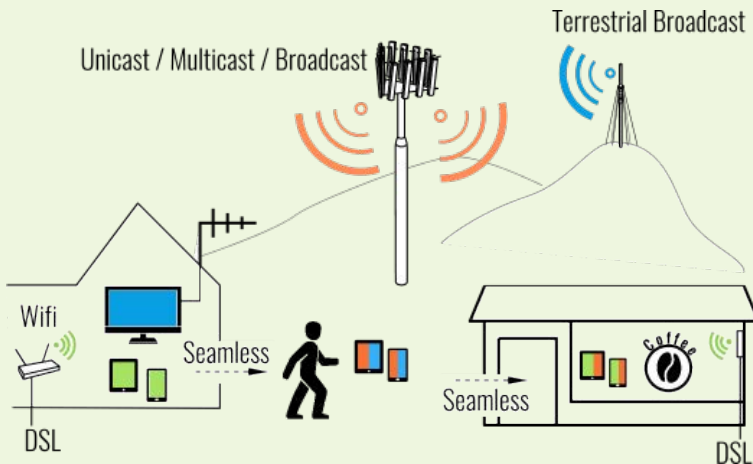
Innovations investigated:

▶ Enriched user experience with the simultaneous delivery of linear TV and on-demand services.
  ▪ Showcase at European Championships 2018 in collaboration with EBU.

▶ Provision of multi-link connectivity to enable seamless transition between different networks with LiveU and Bundleslab.

▶ MBMS operation on Demand (MooD) permits shifting users from unicast to broadcast depending on the traffic load with Expway and Nokia.

Turku Test-Bed, Finland
PUBLIC WARNING SYSTEMS

Turku University of Applied Sciences has developed a Test-Bed for trialling LTE/5G technologies and applications (5GTNT, 5G Test Network Turku).

Two sets of trials are performed, demonstrating transmission of:
- Transmission of public warning messages (amber alert and multimedia public warning alert).
- Dynamic spectrum utilisation.

Components developed by One2many for public warning and Fairspectrum for spectrum management are integrated to the Test-Bed.
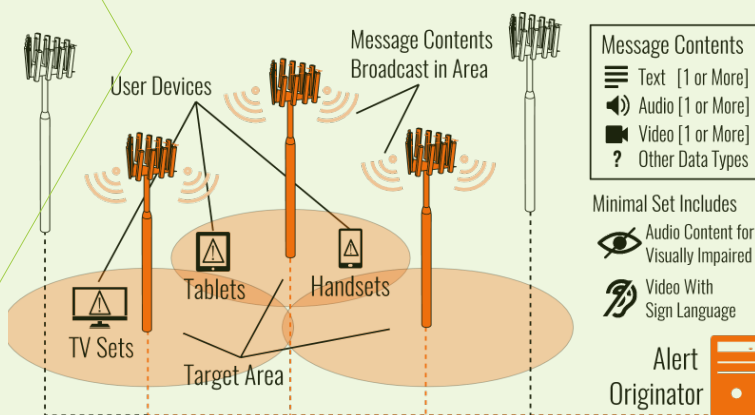
Innovations investigated:
- Provision of multimedia public warning messages via point-to-multipoint.
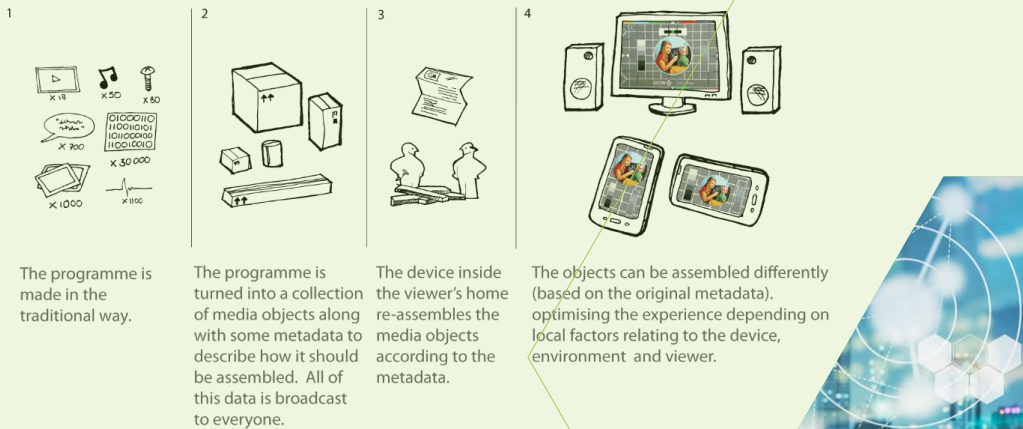- Dynamic spectrum utilisation between different actors.

Surrey Test-Bed, UK
OBJECT-BASED BROADCASTING

The 5G Innovation Centre at the University of Surrey will develop a test-bed that involves both RAN and core networks.

This test-bed will experimentally demonstrate the use of the object-based broadcasting in collaboration with the BBC R&D.

OBJECT BASED BROADCASTING

The programme is made in the traditional way.

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.

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

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.

Innovations investigated:

▶ Delivery of different elements over broadcast or multicast or unicast or a combination of them.
  - BBC R&D's Dynamic Adaptive Streaming over Multicast (DASM) protocol will be used to enable multicast delivery.

▶ BBC R&D Forecaster model as programme composed of different objects:
  - Some objects will be used by a majority of users, such as the main video stream.
  - Others, such as the subtitles, may be of interest to a smaller subset of users.

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ONE2MANY

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