5G Opportunities for broadcasters
Webcast, 15 November 2018

Darko Ratkaj
European Broadcasting Union

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Contents

1) About 5G
2) Why 5G is relevant for the media industry
3) What is the EBU doing about 5G
What is 5G?

- ‘5G’ is the fifth generation of cellular mobile communications systems.
  - Previous generations: 4G (LTE/WiMax), 3G (UMTS/CDMA), and 2G (GSM)
- 5G performance is expected to be technically superior to all previous generations in terms of
  - achievable data throughput
  - latency
  - system capacity
  - reliability
  - device density
  - mobility
  - energy efficiency
  - [costs]
- 5G is standardised in 3GPP.
  - The first 5G specifications are included in Release15
- Many on-going tests and trials, first commercial deployments expected soon.
Framework for 5G

Recommendation ITU-R M.2083:

‘IMT Vision - Framework and overall objectives of the future development of IMT for 2020 and beyond’

\[ IMT = \text{International Mobile Communications} \]

Use cases targeted by IMT-2020

ITU-R Report M.2400

Enhanced mobile broadband

- Gigabytes in a second
- 3D video, UHD screens
- Work and play in the cloud
- Augmented reality
- Industry automation
- Mission critical application
- Self driving car

Future IMT

- Smart home/building
- Smart city
- Voice

Massive machine type communications

Ultra-reliable and low latency communications
### Minimum performance requirements

ITU-R Report M.2400

<table>
<thead>
<tr>
<th>Technical parameter</th>
<th>Target value</th>
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<tbody>
<tr>
<td>Peak data rate</td>
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<tr>
<td>Uplink:</td>
<td>10 Gbit/s</td>
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<tr>
<td>Downlink:</td>
<td>20 Gbit/s</td>
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<tr>
<td>User experience data rate</td>
<td></td>
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<tr>
<td>Uplink:</td>
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<td>Downlink:</td>
<td>100 Mbit/s</td>
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<tr>
<td>User plane latency</td>
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<td>For eMBB:</td>
<td>4 ms</td>
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<tr>
<td>For URLLC:</td>
<td>1 ms</td>
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<td>Control plane latency</td>
<td>20 ms</td>
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<td>Reliability</td>
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<tr>
<td></td>
<td>1-10⁻⁵</td>
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<td>Mobility</td>
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<td>up to 500 km/h</td>
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### Global efforts to move IMT-2020 from vision to reality

**Industry**

- Ericsson
- Huawei
- Nokia
- Qualcomm
- Samsung
- Verizon

**Promotion**

- GSA
- 5G Americas
- 5GMMF
- 5G Forum

**Regulatory and policy**

- ITU
- OAS
- ARIA
- ETSI

**Standards**

- 3GPP
- 5GPPP
- 5G India Forum
- 5G Brasil

**Verticals**

- Media & entertainment
- Energy
- Manufacturing
- Health
- PPDR
5G in the context of IMT-2020

Detailed Timeline & Process For IMT-2020 in ITU-R

5G standardisation roadmap

Source: 3GPP RAN Chairman, June 2018
Targeted 5G use cases

<table>
<thead>
<tr>
<th>Broadband access in dense areas</th>
<th>Broadband access everywhere</th>
<th>Higher user mobility</th>
<th>Massive Internet of Things</th>
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</thead>
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<tr>
<td>Pervasive Video</td>
<td>50+ MBPS Everywhere</td>
<td>High Speed Train</td>
<td>Sensor Networks</td>
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<td>Extreme real-time communications</td>
<td>Lifeline communications</td>
<td>Ultra-reliable communications</td>
<td>Broadcast-like services</td>
</tr>
<tr>
<td>Tactile Internet</td>
<td>Natural Disaster</td>
<td>E-Health Services</td>
<td>Broadcast Services</td>
</tr>
</tbody>
</table>

What 5G is about

- Smart wearables
- Smart mobility
- Smart parking
- Smart-to-car communication
- Water quality
- eHealth
- Traffic priority
- Domotics
- Connected house
- Security & Surveillance
- Entertainment: Apps beyond imagination
- Smart Grids

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How can 5G support many diverse use cases at the same time?

The issue

- Different industrial sectors have specific but very diverse technical, operational, commercial, and regulatory requirements
- Traditionally, these requirements would be met by dedicated (purpose-built) networks, or dedicated components in the telecom networks.
- If all targeted use cases must be supported by the same telecommunications infrastructure at the same time, the traditional approach is inefficient and, ultimately, not viable.

5G solution

- A flexible network architecture based on the principles of software defined networking (SDN) and network functions virtualisation (NFV)
- This type of architecture allows a creation of logical (virtual) networks
- Each logical network can be configured to meet a specific set of requirements.
- Multiple logical networks can be deployed on the same physical network.
- Such logical networks are called ‘network slices’.

The issue

Technically speaking, "the network" will no longer exist.

Instead, there will be a number of virtual networks, operated in parallel, based on a shared physical infrastructure.

The advantage: these networks – called "slices" – can have widely different, and even contradictory, properties. Each slice is designed to meet the specific requirements of a particular use case.

Network slicing enables network operators to make the infrastructure – or parts of it – application-specific and available on demand, as a separate network with specific properties, such as a guaranteed data capacity or latency.

Mobile network operators’ perspective

GSMA:
As with each preceding generation, the rate of adoption of 5G and the ability of operators to monetise it will be a direct function of the new and unique use cases it unlocks.
Thus the key questions around 5G for operators are essentially:

a. What could users do on a network which meets the 5G requirements that is not currently possible on an already existing network?

b. How could these potential services be profitable?

5G in the media sector
5G system performance targets

Disclaimer:
- The indicated values are targets for 5G research and standardisation.
- 5G networks will not be able to meet all these targets at the same time.

Motivation for media companies to consider the adoption of 5G

**New capabilities**
- New formats
  - UHD-HDR-HFR,
  - VR, AR, 360 deg
  - Immersive Audio
- All-IP workflows
- Automated production
- New types of service
- Extended reach
  - personal devices
  - vehicles
  - particular audiences
- ...

**Increased efficiency**
- Operational flexibility
  - Remote production
  - Short set-up time
- Reduced costs
- Reduced complexity
  - No wires
  - Less processing needed
  - Less equipment needed
- ...

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Potential impact of 5G in the media sector

THE NEXT CENTURY

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5G in content production

THE NEXT CENTURY

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Motivation to use 5G in content production

- **4G/LTE is already widely used for news gathering**
- **Content production is complex and expensive**
  - stringent technical and operational requirements
  - currently requires specialised equipment (hardware and software)
- **5G performance targets are attractive**
  - low latency
  - very high throughput
  - high reliability
  - guaranteed bandwidth
  - standard interfaces
- **5G could enable**
  - increased operational flexibility and efficiency
  - new use cases that currently are not possible
  - cost reduction

Remote production – conventional setup

- **Cordless camera**
- **Camera transmitter**
- **Video relays**
- **Production vehicles (OB van)**
- **Satellite**
- **Studio**

- handheld
- portable
- temporary point-to-point
- on-board
- vehicular
- airborne
Remote production – 5G enabled setup

Cordless camera

handheld

on-board

Studio

Key requirements in content production

5G should provide

- Sufficiently high throughput
- Low latency
- Low packet loss
- High-accuracy synchronisation
- Guaranteed QoS
- Bookable, short set-up time
- Control over connectivity
- Standard interfaces
- Functionality on device
- Local comms, device-to-device
- Redundancy
- Lower cost than the alternatives

Many open questions

- Security
- Contention
- Latency
- Coverage
- Reliability
- Network ownership
- Access to backhaul
- Power consumption
- …

Will 5G be able to meet these requirements?
EBU project group on 5G in Content Production

- Open to EBU Members and external participants
- Main tasks:
  - Define use cases for 5G in content production and contribution
  - Define technical and operational requirements for 5G in content production and distribution
  - Submit the use cases and requirements to the 3GPP study on Audio-Visual Service Production (AV_PROD)
- Disseminate information to EBU Members

https://tech.ebu.ch/groups/5gcp

3GPP study on audio-visual service production (AV_PROD)
Conducted in the 3GPP Working Group SA1

Initial set of use cases submitted in November 2018

- Single camera Outside Broadcast uncompressed contribution (S1-183059)
- Single camera Outside Broadcast compressed contribution (S1-183060)
- Professional TV Production Contribution from a Multi-Camera Outside Broadcast using Uncompressed Video (S1-183061)
- Simple Live Sports Commentary (S1-183062)
- Non-public 5G network deployment (S1-183063)
- Audio Streaming in Professional Live Performances (S1-183172)
- Live production with integrated audience services (S1-183173)
- Intercom system for large live events (S1-183174)

The results of the study will be published in March 2019 in TR22.827
5G in content distribution

Many kinds of audiovisual media content and services

TV channels
radio channels

on-demand
interactive

hybrid TV
second screen
cross-platform

user generated
content

virtual reality
augmented
reality

live / linear

on-demand / nonlinear

combined linear + nonlinear

UGC

everging formats
The user context
The distribution challenge

The goal: **Delivery of the whole range of content and services**
- to all interested users
- at the right time
- at the right place
- on the right device
- with the desired quality
- for the right price

**Balancing act between**
- Optimising the user experience
- Resource management
- Business objectives
- Regulatory requirements and constraints

Public broadcasters are subject to additional regulatory requirements:
- Universal availability (on all relevant platforms, everywhere, different user devices)
- Free to view / listen (no recurring charges for access to services)
- The ability to reach the population in emergency situations
- Regulated business models

The user experience

**Content choice**
- ‘Better pixels’
  - UHD (higher resolution)
  - WCG (more colours)
  - High dynamic range
  - High frame rate
  - High quality audio

**Quality**
- Devices
  - Screen quality
  - Battery life
- Networks
  - Coverage
  - Capacity
  - Latency
  - Reliability
  - Security

**Convenience**
- Any time
- Anywhere
- On any device
- Ease of access
- User interface
  - Service discovery
  - Navigation
  - Selection
- Personalised
- Trusted services

**Costs**
- Cost of
  - Device
  - Service
  - Access
### Distribution options

**AV media services**

- TV channels
- Radio channels
- on-demand
- time shifted
- interactive
- personalised
- multi-view
- social media
- hybrid TV
- second screen
- cross-platform
- virtual reality
- augmented reality
- user generated content
- time shifted
- interactive
- personalised
- multi-view
- on-demand
- social media
- virtual reality
- augmented reality
- user generated content
- on-demand
- time shifted
- interactive
- personalised
- multi-view
- social media
- virtual reality
- augmented reality
- user generated content

**Distribution infrastructure**

- Broadcast
  - Terrestrial
  - Satellite
  - Cable
- Broadband
  - Fixed networks
    - *managed (IPTV)
    - *unmanaged (OTT)
  - Mobile networks (3G, 4G)
    - *unmanaged

**The audience**

---

### The role of 5G in media distribution – *the initial scenario?*

**AV media services**

- TV channels
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**Distribution infrastructure**

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**The audience**

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The role of 5G in media distribution – a probable scenario?

AV media services

Distribution infrastructure

The audience

The role of 5G in media distribution – an ultimate scenario?

AV media services

Distribution infrastructure

The audience
**3GPP standardisation**

- **Release 15 mostly complete** *(final specifications in Q1/2019)*
- **Scope and timeline of Release 16 agreed** *(due in Q1 / 2020)*
- **As of Release 15 all 3GPP technologies are labelled** \(5G\)
  - This is also the first release to include 5G New Radio (5G NR), alongside LTE
- **Two parallel strands of development: LTE and 5G NR**
  - **LTE:**
    - Includes both unicast and eMBMS *(evolved Multimedia Broadcast Multicast Services)*
    - Enhancements to eMBMS in Release 14 (Q3/2017)
    - The work continues with *‘Study on LTE-based 5G Terrestrial Broadcast’*
      - Report due in March 2019. To be followed by normative work.
  - **5G NR:**
    - Terrestrial networks
    - Non-terrestrial (satellite networks)
    - Only unicast (at least until and including Release 16)
      - 5G NR based broadcast and unicast might be included in future releases

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**Enhanced LTE eMBMS in 3GPP Release 14**

- Large inter-site distances
- Dedicated eMBMS carrier
- Shared eMBMS network
- Stand-alone eMBMS network
- Free-to-air services
- Receive-only devices
- Transport-only mode
- Support to standard TV formats
- Standardised xMB interface
- New MBMS-API

*The work continues...*
Recent LTE trials by broadcasters

The LTE trial in Munich, Germany
By IRT and EBU

- Live TV
- On-demand content
- Supplementary data

Glasgow / Berlin
Munich

LTE transmitters on broadcast towers in an SFN configuration

Live TV and on-demand content received free-to-air on TV sets and smartphones.

• Live TV
• HbbTV

Live TV

LTE unicast

EUR(O)VISION

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**LTE eMBMS features shown in the IRT trial**

- Large inter-site distances
- Dedicated eMBMS carrier
- Shared eMBMS network
- Stand-alone eMBMS network
- Free-to-air services
- Receive-only devices
- Transport-only mode
- Support to standard TV formats
- Standardised xMB interface
- New MBMS-API

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**The LTE broadcast trial in the Aosta Valley, Italy**

- LTE broadcast from a high-power-high-tower network in an SFN configuration
- Live TV Reception in Aosta Valley, Italy and Berlin
- Free to air reception of live TV programmes on mobile devices
LTE eMBMS features shown in the RAI trial

- Large inter-site distances
- Dedicated eMBMS carrier
- Shared eMBMS network
- Stand-alone eMBMS network
- Free-to-air services
- Receive-only devices
- Transport-only mode
- Support to standard TV formats
- Standardised xMB interface
- New MBMS-API

LTE eMBMS tests and trials by European broadcasters

EBU
OPERATING EUROVISION AND EURORADIO

TR 044
TRIALS TESTS AND PROJECTS RELATING TO 4G/5G BROADCAST SUPPORTED BY EUROPEAN PSB

TECHNICAL REPORT

Contents
1. Introduction ........................................... 5
2. Trials, Tests and Projects .................................. 6
  2.1 Germany: “5G Today” ........................................... 6
  2.2 United Kingdom: “5G Rural First” ......................... 9
  2.3 Finland: “Wireless for Verticals - WVF” .................. 8
  2.4 Finland: “5THER Project” ...................................... 10
  2.5 Finland: “5G eMBMS Demo” ................................. 10
  2.6 Norway: Trial of LTE-B in rural Norway .............. 10
  2.7 Italy: Stand-alone 4G/LTE broadcast network in Aosta Valley ........................................... 12
  2.8 5G-Kast project ........................................... 13
  2.9 Germany: “4W” ........................................... 14
  2.10 France: “Tower Overlay” ................................. 15
  2.11 Germany: “Tower Overlay Improving mobile network” ........................................... 16
  2.12 Italy: “Tower Overlay” ...................................... 18
2. Relevant Initiatives ........................................... 20
  3.1 EBU Project Team MTS ........................................... 20
  3.2 ETSI 5G MBC ........................................... 20
3. References ........................................... 21
4. List of acronyms ........................................... 22

https://tech.ebu.ch/publications/tr044

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

**Objectives:**

1. Develop broadcast and multicast point-to-multipoint capabilities for 5G considering M&E, automotive, IoT, and PWS use cases, and evaluate spectrum options for 5G broadcast network deployments.
2. Design a dynamically adaptable 5G network architecture with layer-independent network interfaces to dynamically and seamlessly switch between unicast, multicast, and broadcast modes or use them in parallel and exploit built-in caching capabilities.
3. Experimentally demonstrate the 5G key innovations developed in the project.

- **18 project partners** including telecom operators and equipment vendors, broadcasters, R&D organisations, SMEs, and academia. Globally representative Advisory Board.
- Builds on the state-of-the-art mobile and fixed broadband, and broadcast technologies
- Synergies between M&E, Public Warning Systems, Automotive, and IoT applications.

[https://5g-ppp.eu/5g-xcast](https://5g-ppp.eu/5g-xcast)

5G opportunities for broadcasters
How can 5G be successfully deployed

- Most of 5G development to date was on technical features (data rates, latency, capacity, mobility, user density, …)
- Efforts are being made to gather the requirements from the potential industrial users (the ‘verticals’)
- A number of ‘non-technical’ issues are yet to be addressed
  - How to achieve large network coverage?
  - Network ownership (e.g. public vs, private networks, neutral host model)
  - Suitable business models and the role of network slicing
  - Role of 5G network operators in vertical use cases
  - Regulatory conditions
  - Costs
  - Time frame for network build out
  - Priorities for future developments

Where are these issues being discussed?

EBU project group on 5G Deployments

To study 5G network deployment aspects, such as
- Network slicing
- Private vs public 5G network
- 5G deployment on non-cellular infrastructure (HPHT, satellite)
- Complementary use of cellular and non-cellular 5G networks
- Business arrangements
- Regulatory aspects
- Time line

Open to EBU Members and external participants

https://tech.ebu.ch/groups/5gdeployments
How can the media sector benefit from 5G

- **Improved technical performance at the level of network infrastructure**
  - At the system level both 4G and 5G might be able to meet the requirements
  - Network performance, coverage, and availability are currently not guaranteed

- **Operational benefits**
  - New functionalities
  - Increased efficiencies
  - Support for best practices and industry standards
  - Unconstrained access to the audience and audience data

- **Strategic perspective**
  - Sustainability and scale
  - Service-driven development with a long-term perspective
  - Interoperability of cellular and other network infrastructures, including broadcast and satellite
  - Innovative business models
  - Appropriate regulatory environment

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**Thank you**

for your attention!

Darko Ratkaj
ratkaj@ebu.ch
Questions?

Darko Ratkaj
Technology & Innovation department
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