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5G Opportunities for broadcasters

Webcast, 15 November 2018

Darko Ratkaj
European Broadcasting Union

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Today's Guest Speaker

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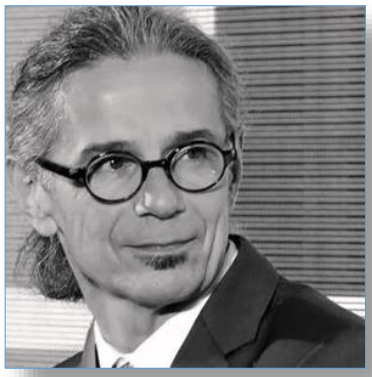
Darko Ratkaj

Technology & Innovation department

EBU



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Your Host

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Joel E. Welch

Director of Education
SMPTE

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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

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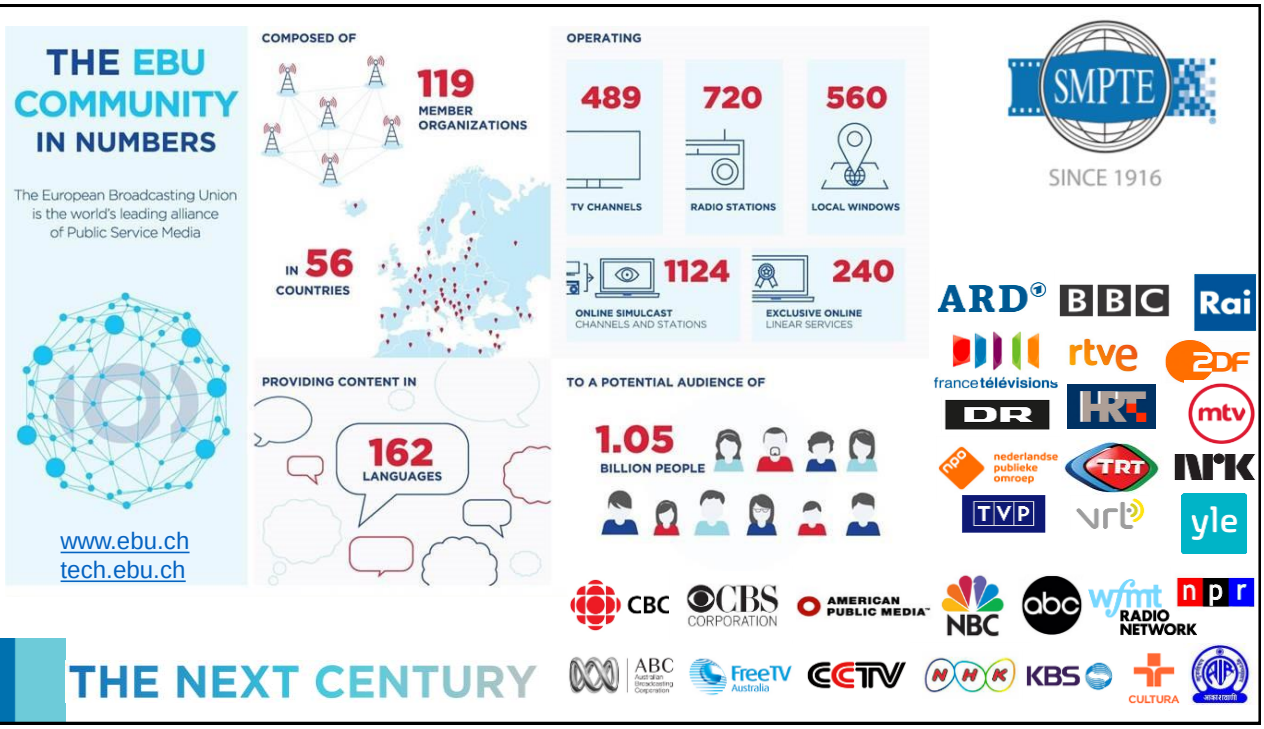

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What do we know about 5G

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What is 5G?

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- **'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.

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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 = International Mobile Communications

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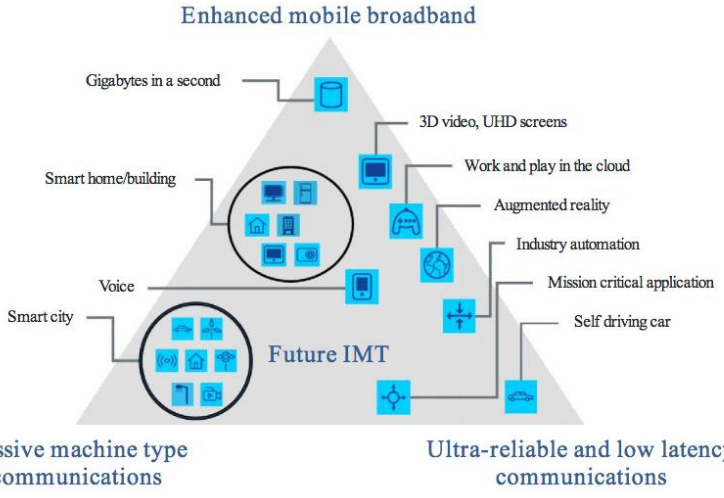
Use cases targeted by IMT-2020

ITU-R Report M.2400



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Minimum performance requirements

ITU-R Report M.2400

Technical parameter	Target value
Peak data rate	Uplink: 10 Gbit/s Downlink: 20 Gbit/s
User experience data rate	Uplink: 50 Mbit/s Downlink: 100 Mbit/s
User plane latency	For eMBB: 4 ms For URLLC: 1 ms
Control plane latency	20 ms
Connection density	1 000 000 devices per km^2
Area traffic capacity	Downlink: 10 Mbit/s/m^2
Reliability	$1\text{-}10^{-5}$
Mobility	up to 500 km/h

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Global efforts to move IMT-2020 from vision to reality

Industry

ERICSSON, HUAWEI, NOKIA, QUALCOMM, SAMSUNG, verizon, AT&T, vodafone, orange, 中国移动 China Mobile, Telefónica, Telstra, docomo, GSA, GSMA, ngmn

Promotion

5G americas, 5G IMF, 5G Forum, IMT-2020, 5G PPP, 5G BRASIL, 5G India Forum

Regulatory and policy

ITU, OAS, ASMG, APT, CEPT, European Commission, acma

Standards

3GPP, atis, ARIB, CCSA, TTC, ETSI, TTA, tsdsi, IEEE 5G

Verticals

5GAA Automotive Association

Media & entertainment

Energy

Manufacturing

Health

PPDR

. . .

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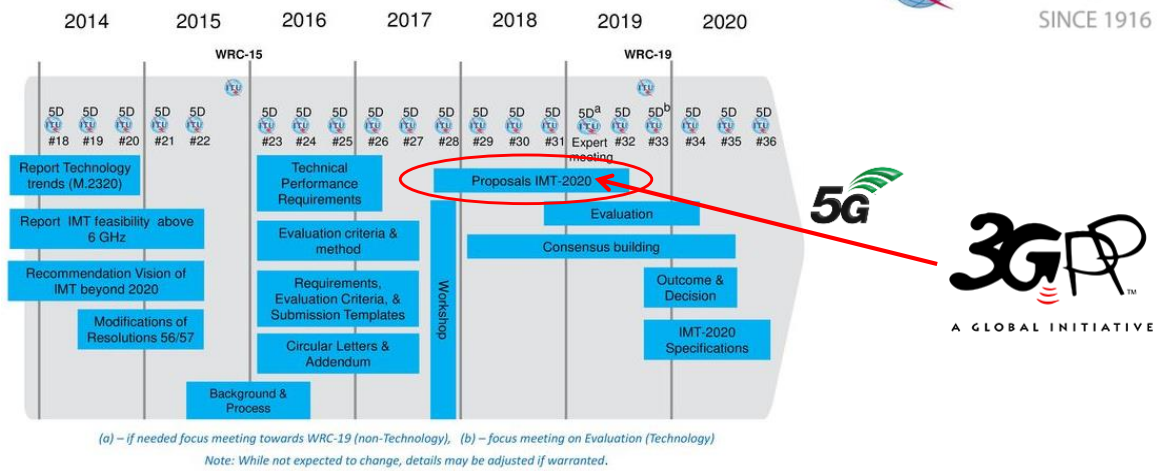
5G in the context of IMT-2020



(a) – if needed focus meeting towards WRC-19 (non-Technology), (b) – focus meeting on Evaluation (Technology)

Note: While not expected to change, details may be adjusted if warranted.

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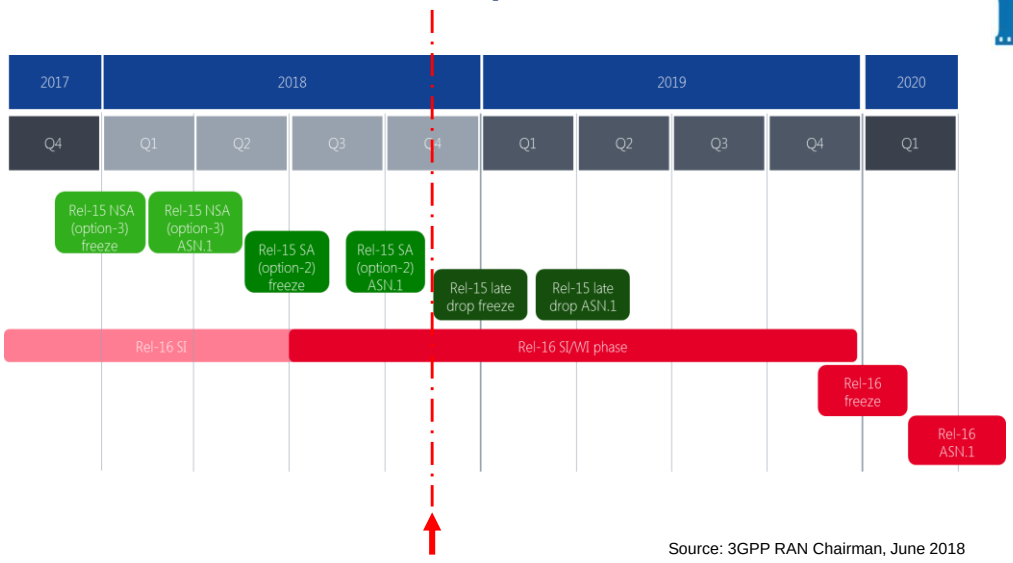
5G standardisation roadmap



Source: 3GPP RAN Chairman, June 2018

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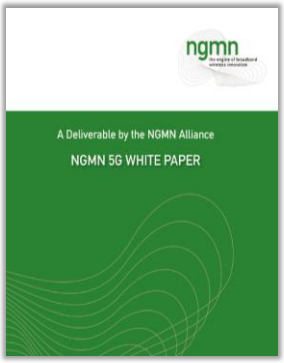
Targeted 5G use cases

Broadband access in dense areas	Broadband access everywhere	Higher user mobility	Massive Internet of Things
PERVASIVE VIDEO 	50+ MBPS EVERYWHERE 	HIGH SPEED TRAIN 	SENSOR NETWORKS 
Extreme real-time communications	**Lifeline communications**	**Ultra-reliable communications**	**Broadcast-like services**
TACTILE INTERNET 	NATURAL DISASTER 	E-HEALTH SERVICES 	BROADCAST SERVICES 



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What 5G is about

European Commission

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

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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**'.

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5G network 'slicing'

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Deutsche Telekom

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.

https://www.telekom.com/en/company/details/network-slicing-485776

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Mobile network operators' perspective

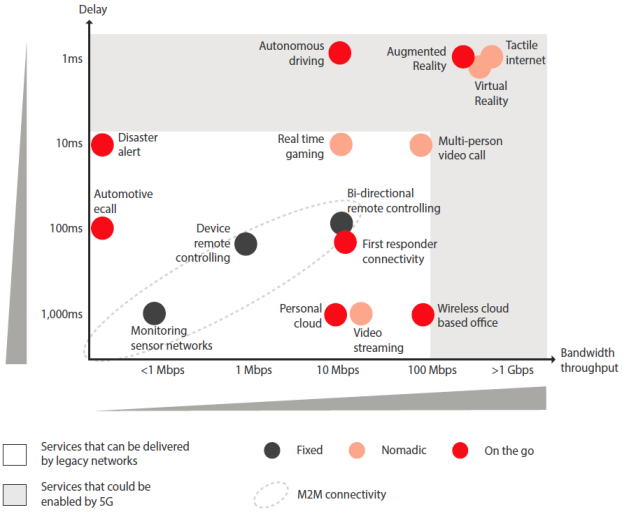
GSMA:

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?*



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5G in the media sector

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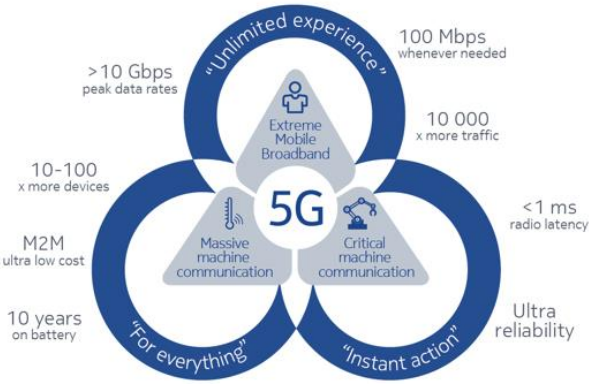
5G system performance targets



Source: Nokia https://networks.nokia.com/5g/get-ready

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.*

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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
- …

REALITY CHECK AHEAD

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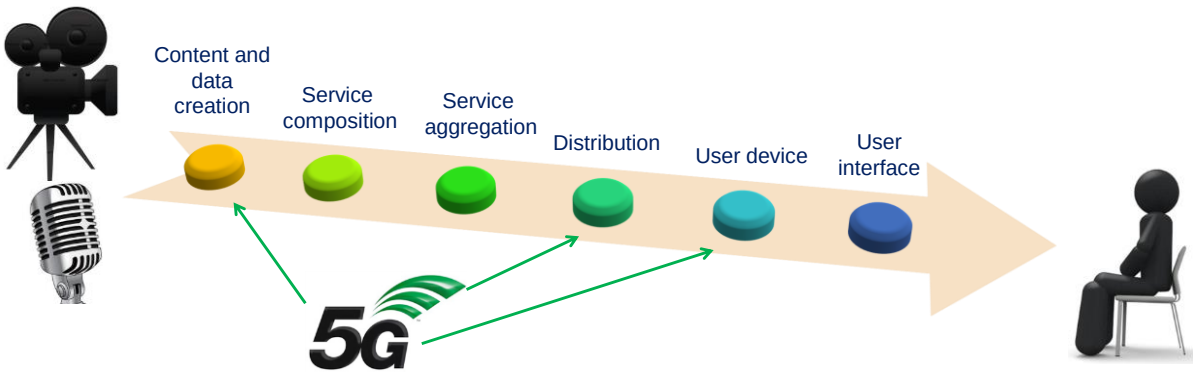
Potential impact of 5G in the media sector



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5G in content production

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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

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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

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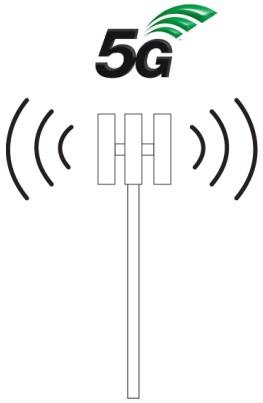
Remote production – 5G enabled setup

Cordless camera

handheld

on-board



Studio

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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

Will 5G be able to meet these requirements?

Many open questions

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

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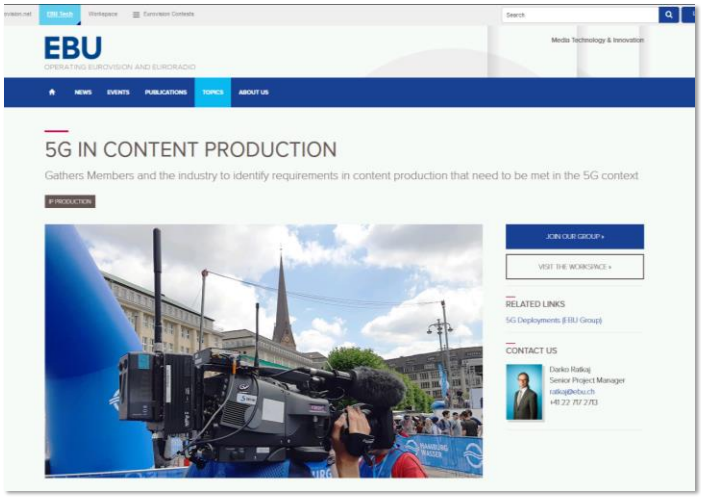
EBU project group on 5G in Content Production



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

- 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

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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

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5G in content distribution

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Many kinds of audiovisual media content and services

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TV channels radio channels	on-demand time shifted interactive . . .	hybrid TV hybrid radio second screen cross-platform . . .	user generated content	virtual reality augmented reality . . .
live / linear	*on-demand / nonlinear*	*combined linear + nonlinear*	*UGC*	*emerging formats*

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Devices, devices…

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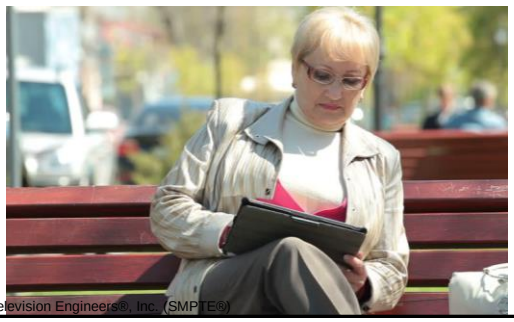
The user context



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

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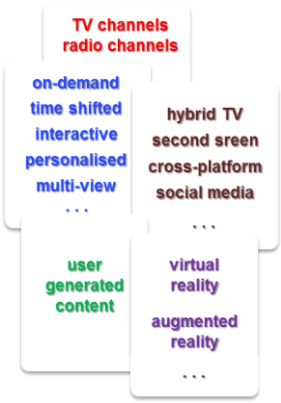
The user experience

Content choice



Quality

- 'Better pixels'
  - UHD (higher resolution)
  - WCG (more colours)
  - High dynamic range
  - High frame rate
  - High quality audio
- 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

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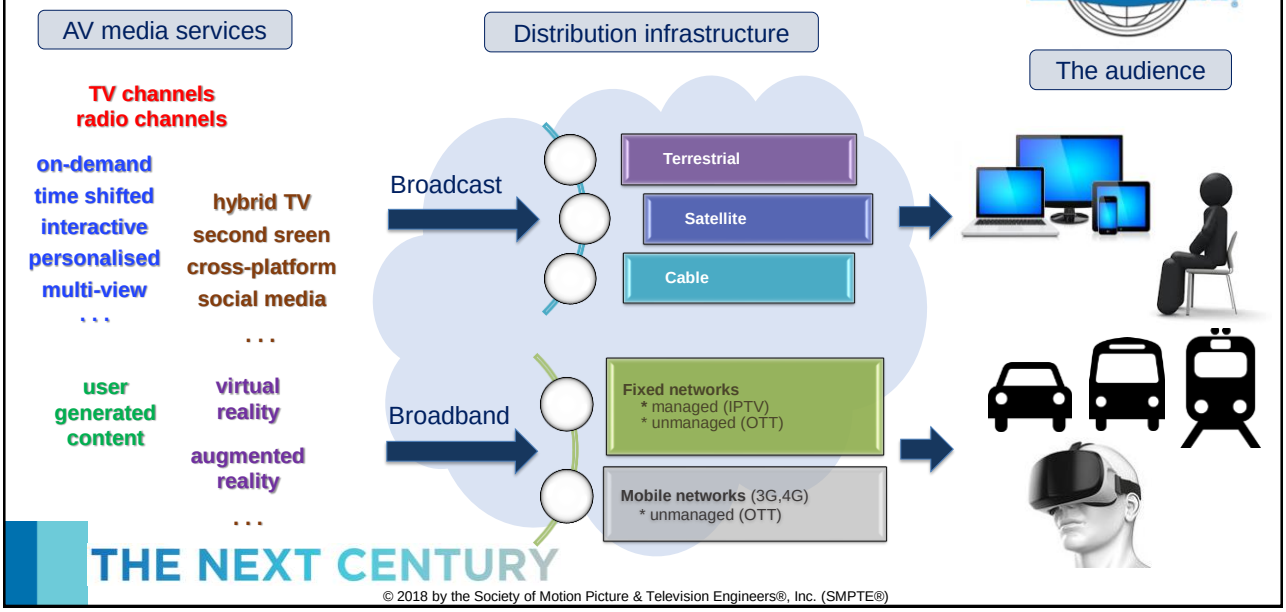
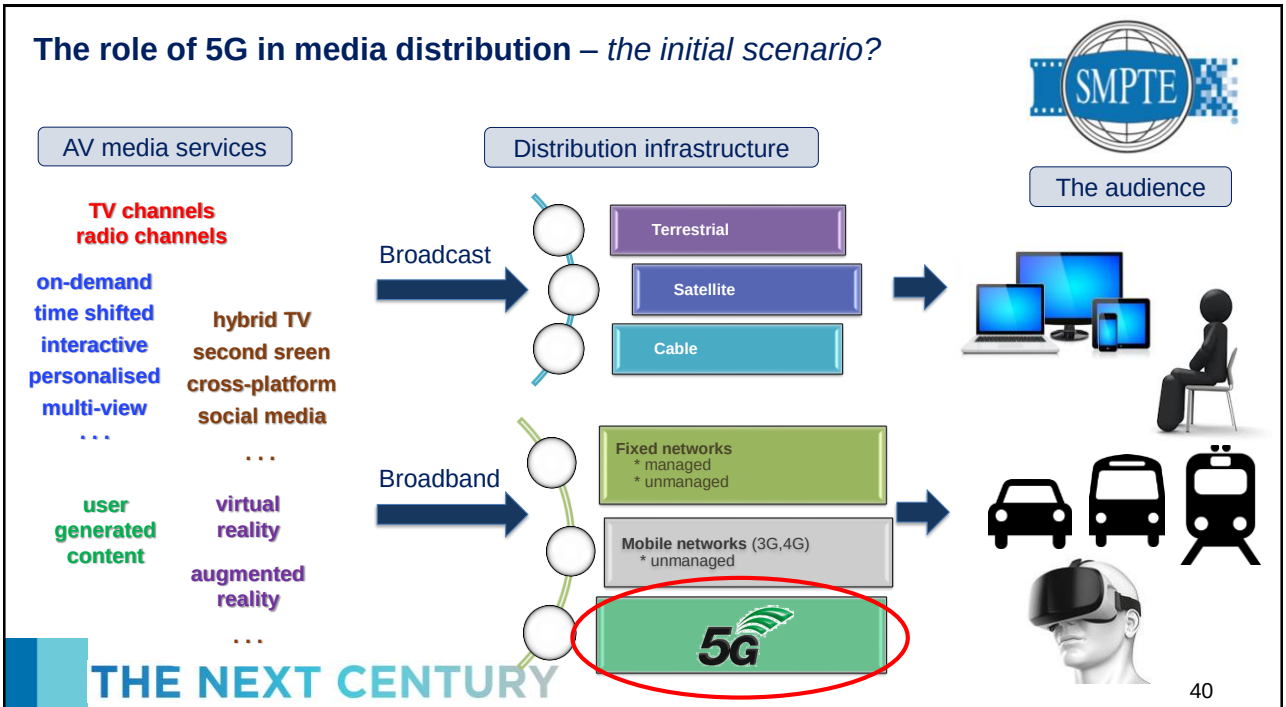
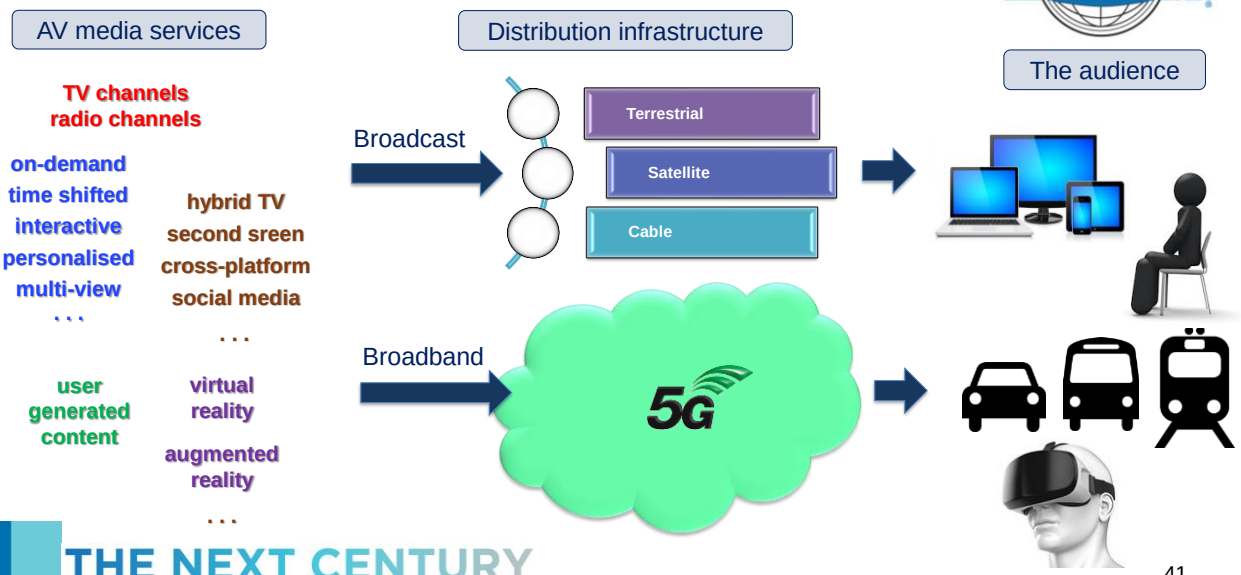
Distribution options



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



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



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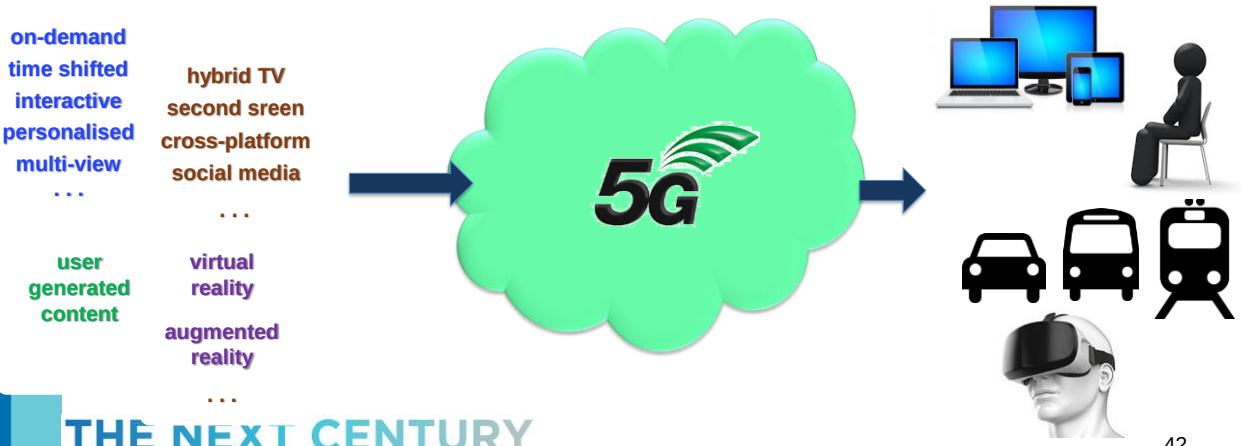
The role of 5G in media distribution – *an ultimate scenario?*



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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 (**e**volved **M**ultimedia **B**roadcast **M**ulticast **S**ervices)*
    - 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

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Recent LTE trials by broadcasters

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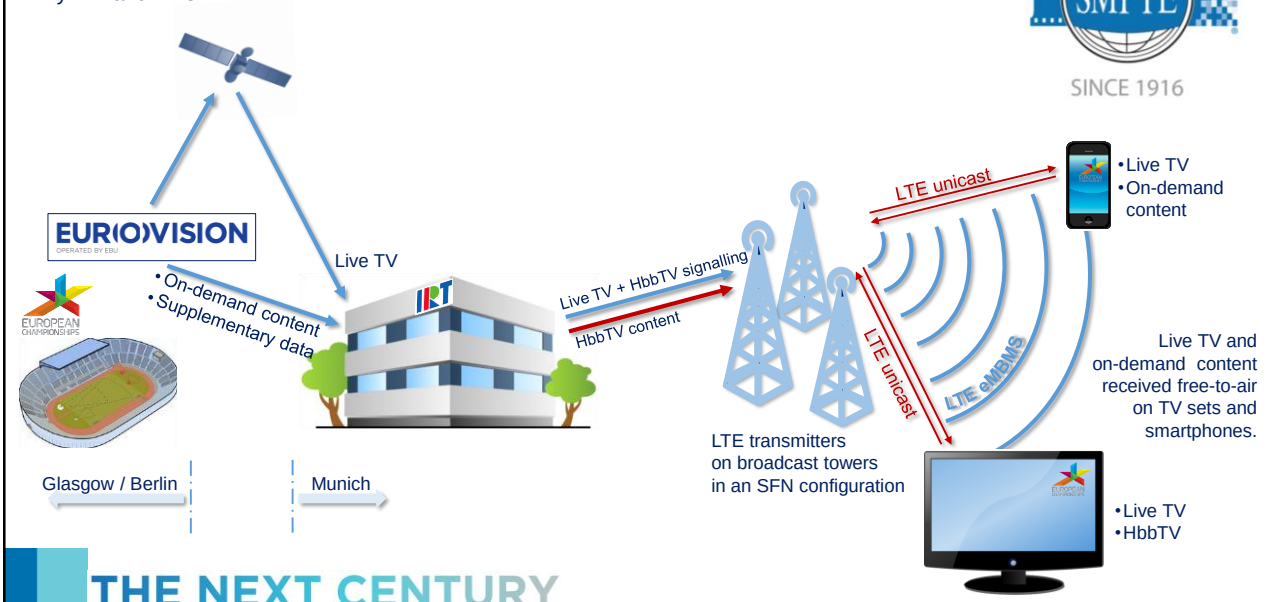
The LTE trial in Munich, Germany

By IRT and EBU



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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

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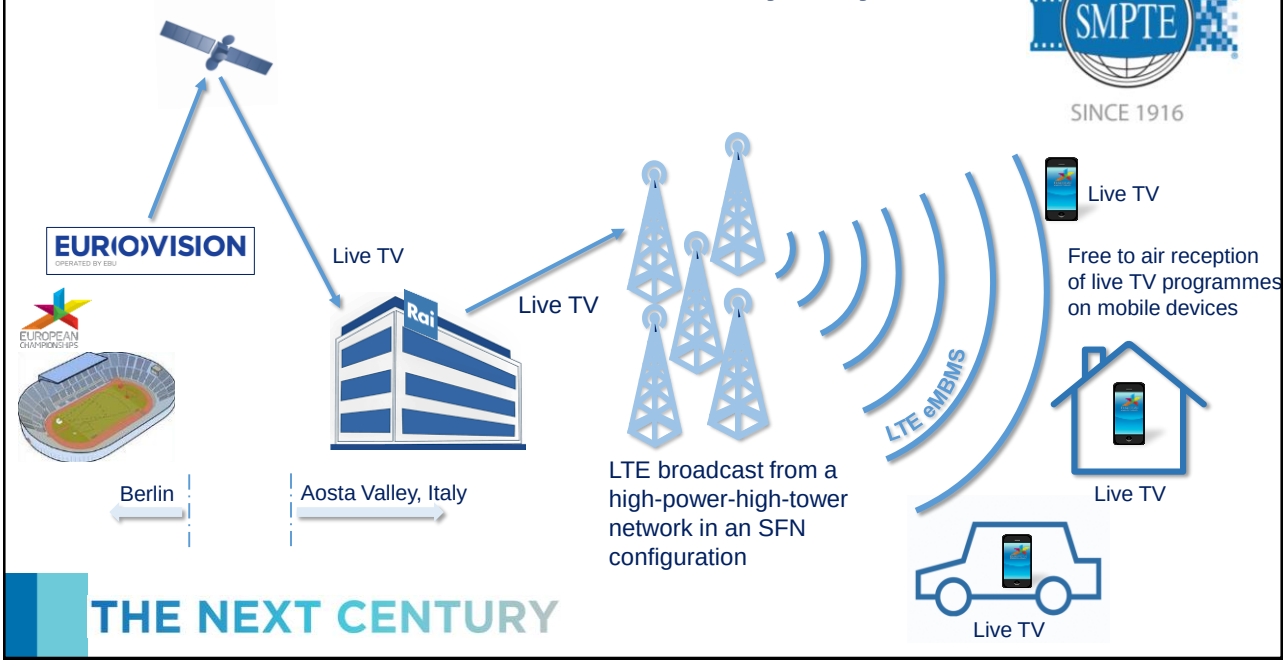

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LTE eMBMS features shown in the RAI trial

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		

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LTE eMBMS tests and trials by European broadcasters

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TR 044

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

TECHNICAL REPORT

TR 044 PSB 4G/5G Broadcast Trials, Tests & Projects

Contents

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

Horizon 2020 Project

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

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- ***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

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5G opportunities for broadcasters

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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?

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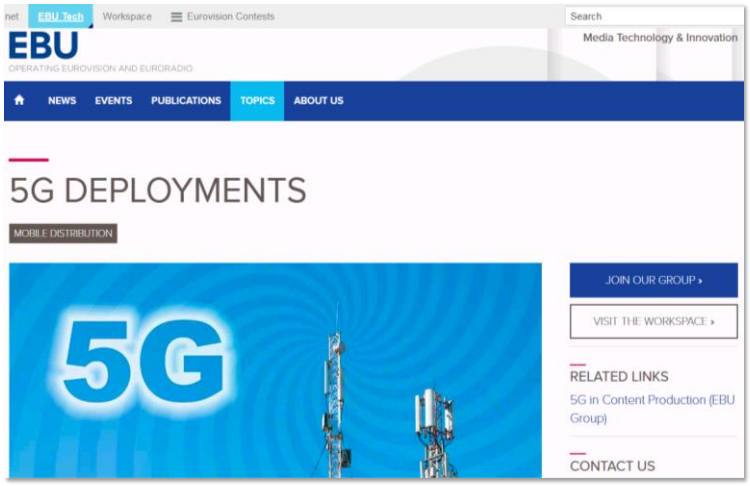
EBU project group on 5G Deployments



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

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

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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

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Questions?

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Technology & Innovation department

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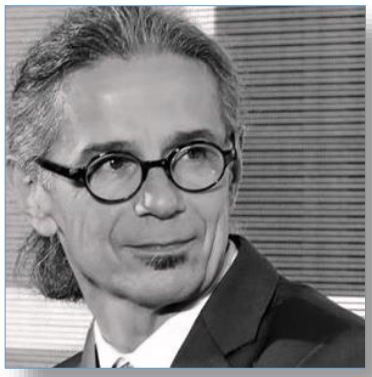

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THE NEXT CENTURY