# The Broadcasting in the Dawn of 5th Generation Wireless Networks
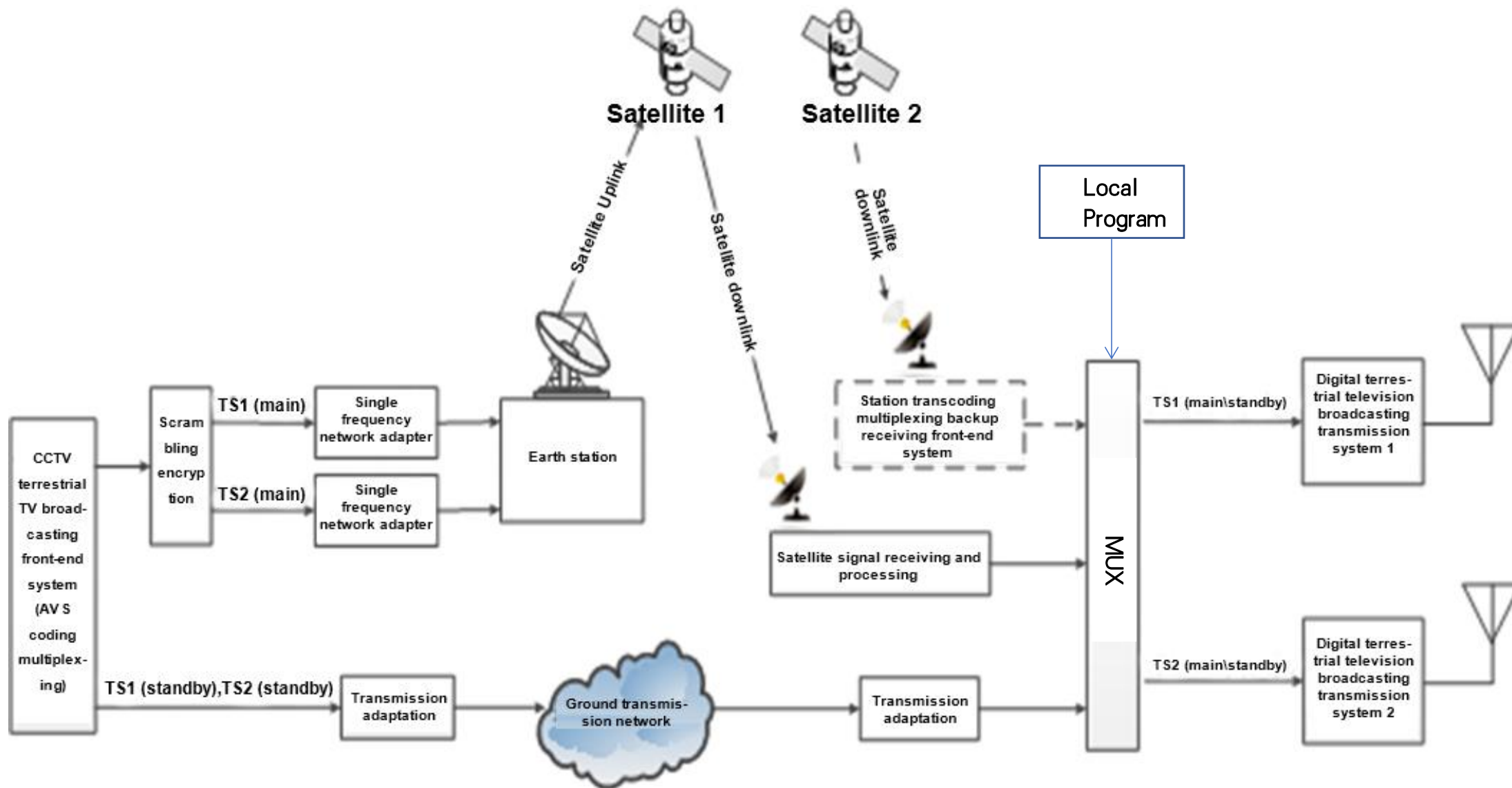
**Qingjun Zeng**
**China Broadcasting Network Co. (CBN)**

## DTMB（Digital Terrestrial Broadcast）

# Emerging Demand for Broadcasting Services

➤ **Better Signal Coverage:** Acceptable signal coverage needed in indoors and high-speed scenarios.

➤ **Better Device Coverage:** Broadcasting services should be adaptable to the majority of future consumer devices based on 5G and WiFi connection, ranging from mobile phone to wearable devices.

➤ **Better Content Coverage:** Besides traditional live TV, should be capable to broadcast Internet multi-media contents or other data formats needed for public services.

➤ **Advancement of Technology:** Mature ecosystem and rapid evolution of technology are required by new demand for broadcasting.

# Prospective techniques enabling new broadcast services

➤ **HTTP-Based live streaming is emerging to take over traditional broadcast**

- HTTP-Based streaming platform: Adaptable to multi-screen, All devices, Anytime, Anywhere
- Enhance interactive experience and support new live broadcast service features
- Based on standard server hardware architecture design, using open-source Internet protocols.
- Robust Internet ecosystem, massive media resources and rich terminal forms.
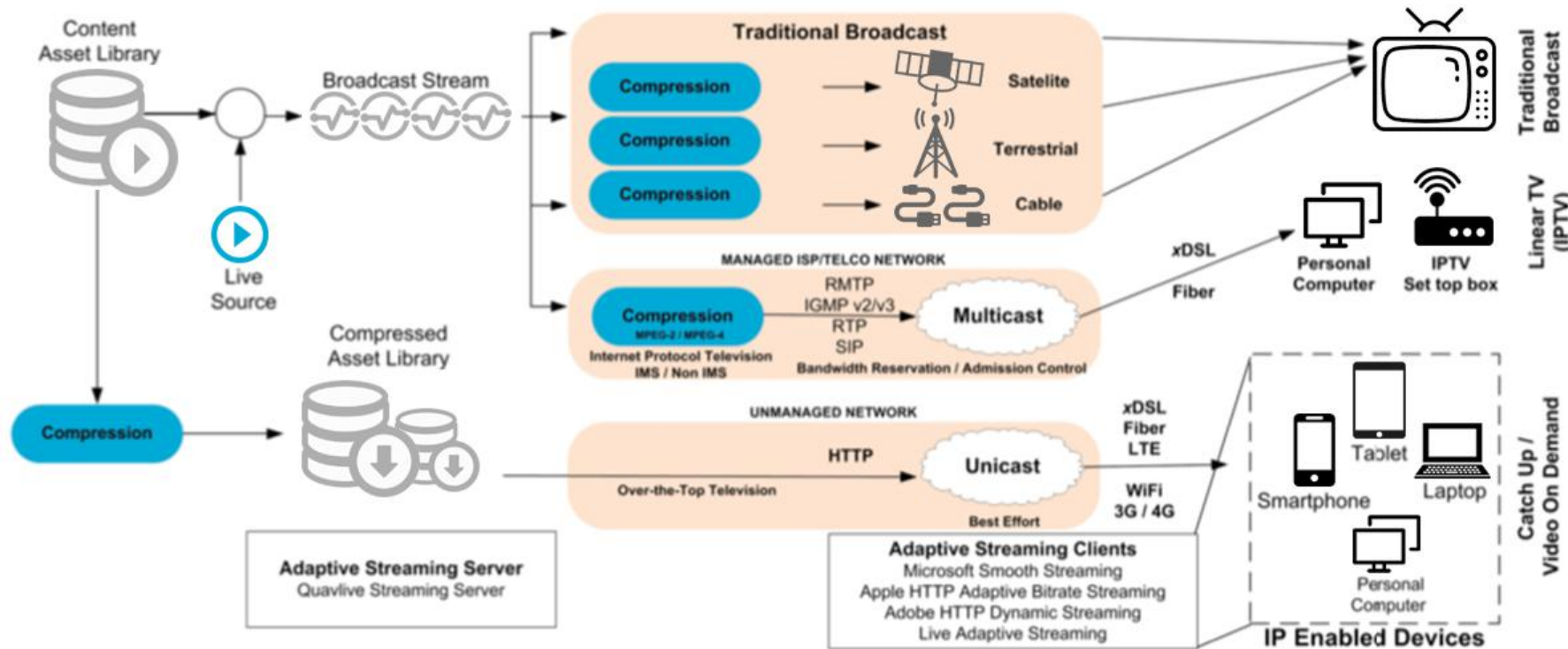


**Internet Protocol Based Streaming Platform**

xDSL: x Digital Subscriber Line

# Prospective techniques enabling new broadcast services



> **5G NR MBS (Multicast/Broadcast Services) will evolve into a kind of universal flexible broadcast technique serving all screens.**

### Business Cases

- Traditional TV channel broadcasting service
- New interactive video broadcasting service
- Converged information broadcasting service

**5G NR MBS**
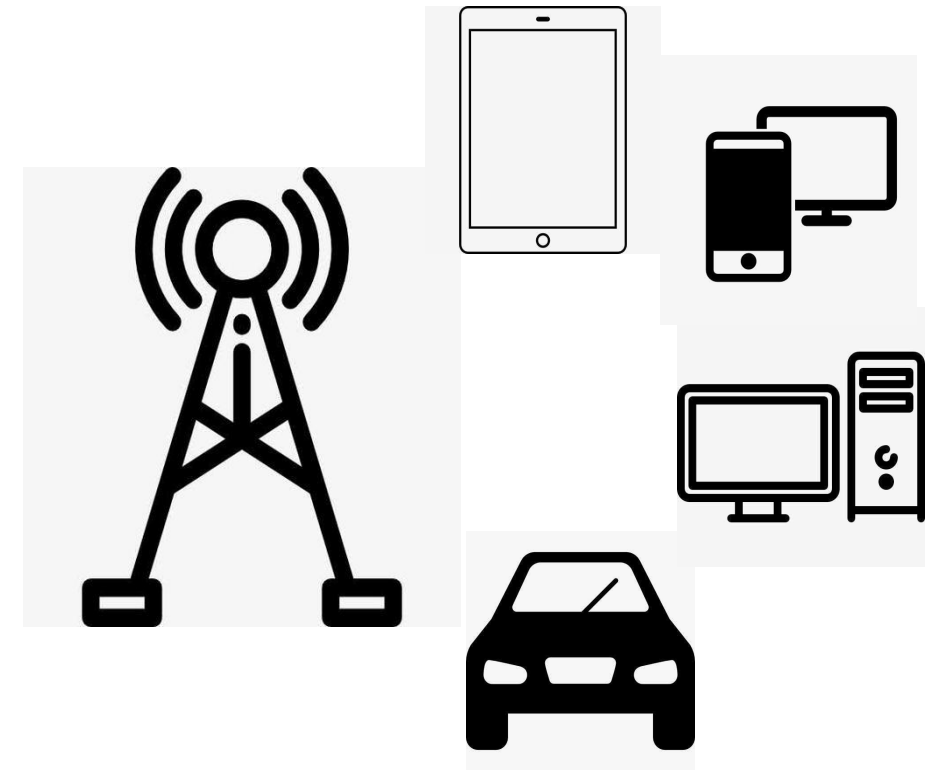
# 5G NR Multicast/Broadcast Services

➢ **Devices:** Broadcasting is no longer limited to TV, but in the form of a universal service application that runs on all types of devices such as mobile phones, tablets, wearable devices, and car consoles. It is a ubiquitous business on all smart devices, any time, anywhere.

➢ **Business cases:** Not only traditional live TV services, but also provide new interactive video broadcasting services, integrated Multi-media broadcasting services and other new services；

➢ **Signal coverage:** Achieve good signal coverage with regular cell and high-tower coverage in remote areas as well as indoors in metro areas and high speed moving vehicles.

# 5G NR Multicast/Broadcast Services



Integrated end-to-end NR MBS solution
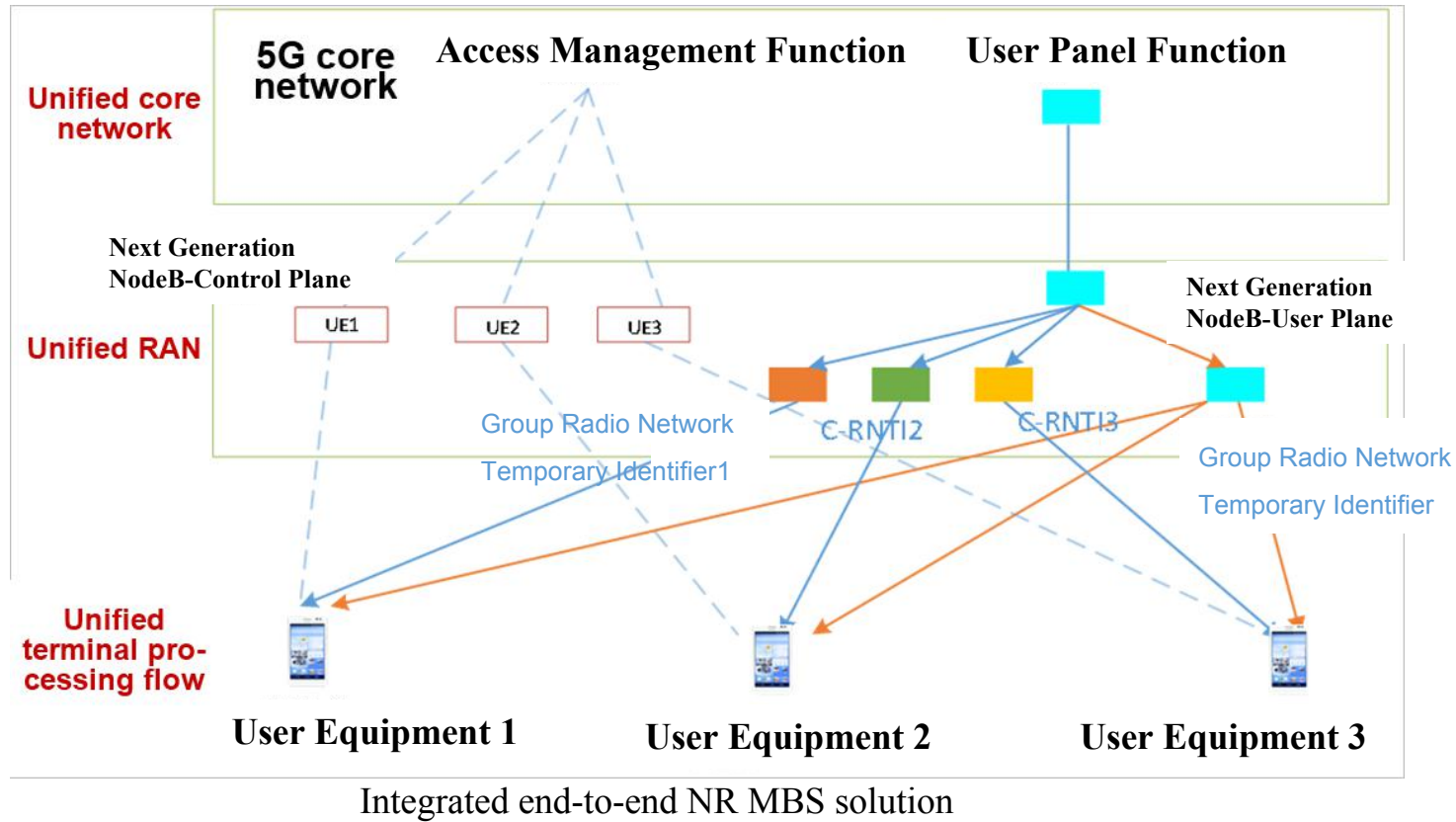
The 5G NR Multicast/Broadcast has following advantages:

➢ Based on the NR unicast solution, no need to change the regular 5G UE hardware design.

➢ Flexible to serve all scenarios ranging from remote areas to metro hotspot or fast-moving use cases.

➢ Support IDLE/INACTIVE State, no-SIM card receiving

➢ Support dynamic unicast/multicast switching

➢ Support both regular cell and high-tower coverage

# Broadcast is essential to Rel-17 NR MBS

➢ CBN proposed two papers in 3GPP #89 RAN and SA Plenary meetings in September, discussing the importance of supporting broadcast in Rel-17 NR MBS. The support of broadcast services in NR MBS has been confirmed explicitly by both plenaries.

➢ NR MBS with only multicast is just a feature improving network efficiency. With Broadcast, NR MBS creates new business models serving more scenarios, as well as enabling the 5G refarming of the broadcast-dedicated spectrum in many countries.

# NR Broadcast: Enable new business cases

➢Public Services

Government and public service entities have urgent demand for 5G-enabled innovative ways of communicating with citizens. Broadcast shall be adopted to more efficiently deliver real-time emergency multi-media notifications to a wide variety of devices under the scope of public safety (like disaster warning, security, pandemic control, etc.).

➢Multimedia Live Streaming in crowed activities(Concerts/Sport Games)

Innovative broadcast services like Multi-angle live viewing, game statistics broadcasting, XR enhanced viewing, etc. Broadcast mode is essential for such high-bitrate-high-concurrency services. **CBN is planning to showcase innovative NR MBS broadcast services in Beijing Olympic Winter Games 2022.**

# NR Broadcast: Enable new business cases

➢Massive IoT

　Identical content needs to be distributed to a massive number of devices like smart home appliances. It is inefficient to use unicast/multicast for this, but ideal for broadcast. It makes OTA (over-the-air) firmware upgrades/group messaging/etc. much more efficient.
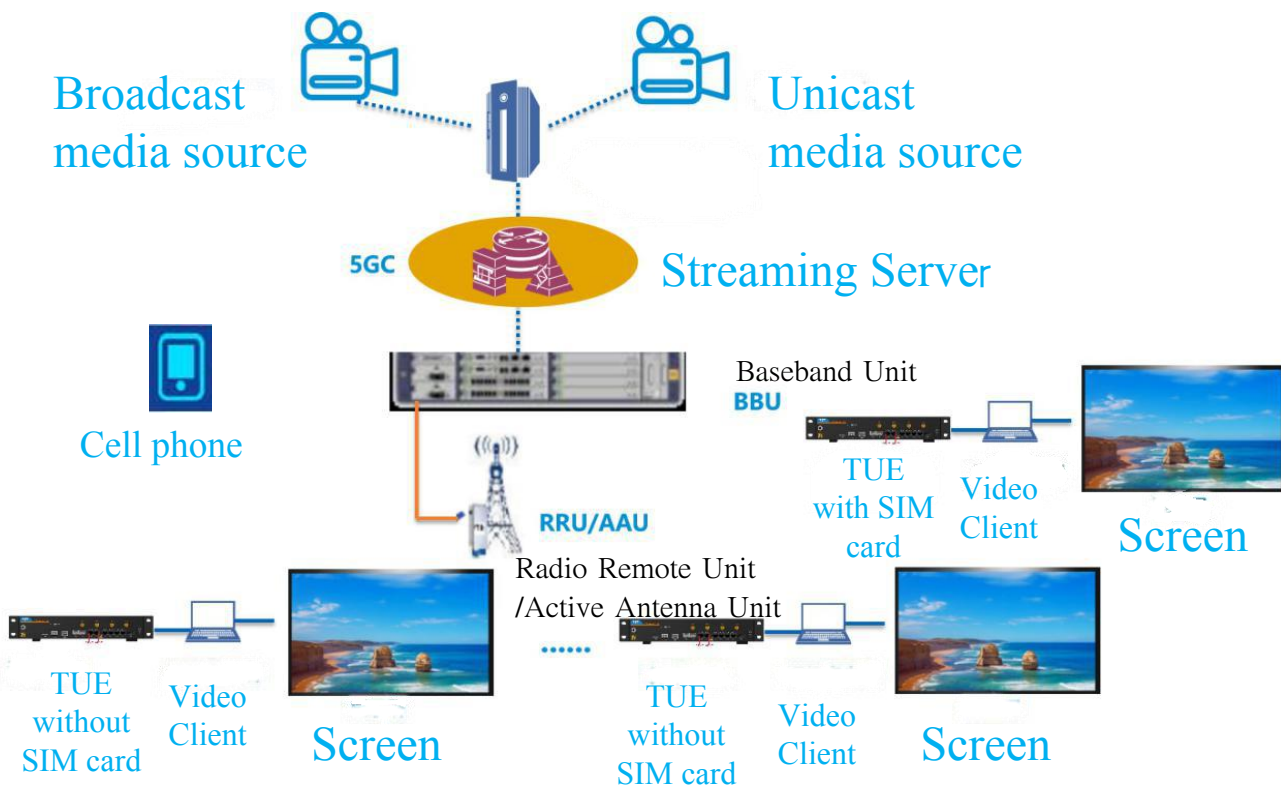
➢V2X

　Broadcast enables vehicles to efficiently communicate with the network and its surroundings, making the network to more efficiently deliver real-time information, such as software and traffic updates, as well as the emergency Multi-media notifications to the vehicle driver/passengers.

# 5G NR Multicast/Broadcast Trial
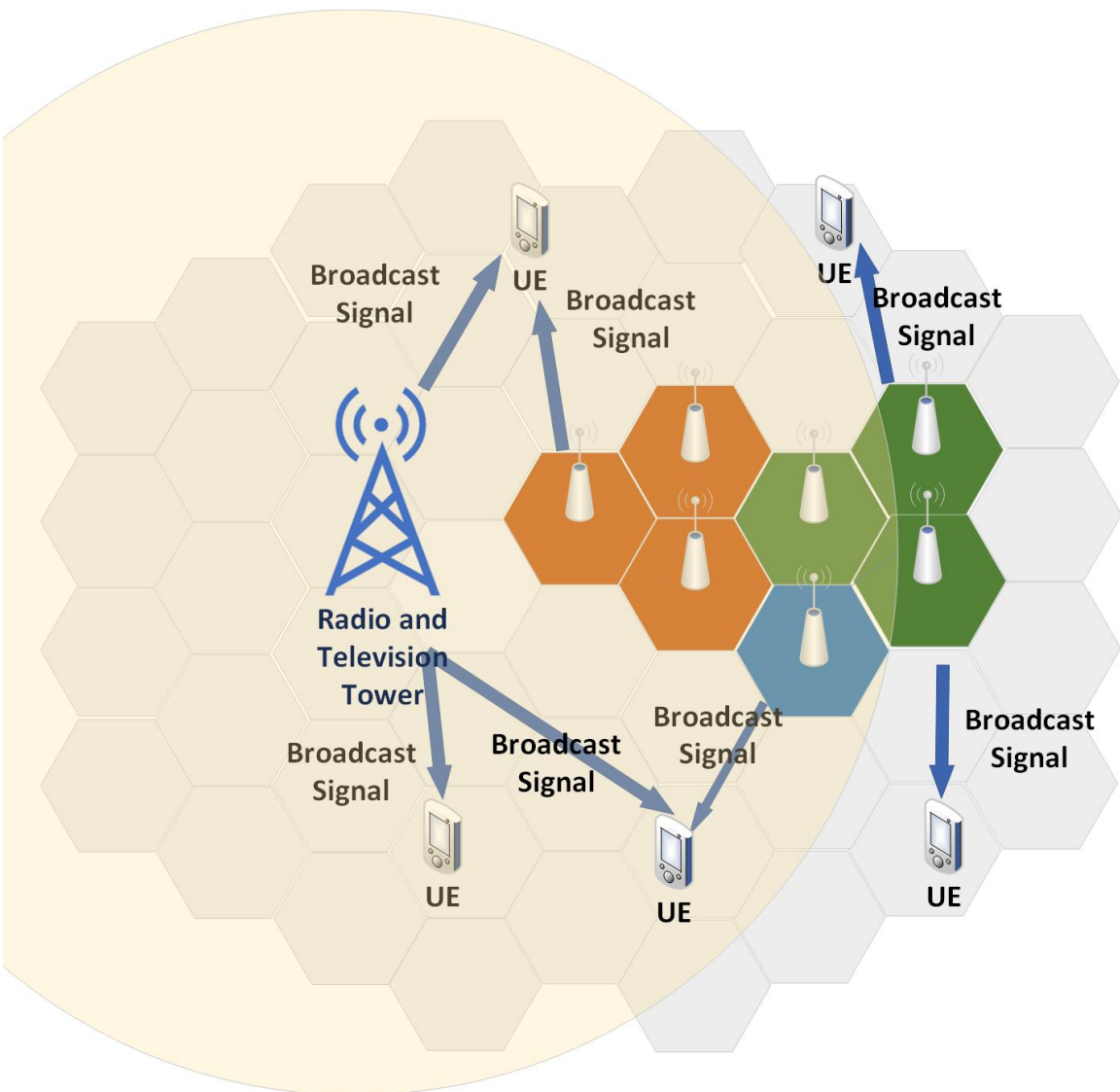
**Key features to verify**

➢ 5G NR unicast/multicast/broadcast flexible switching feature.

➢ The non-SIM Card receiving function in FTA mode.

➢ Dynamic and differentiated cell-based broadcast feature

➢ Collaborative coverage with High-tower and regular gNB

➢ Frenquency arrangment optimization for various scenarios:

    1. High-tower coverage and regular cell overlap

    2. Adjacent regular cells with same broadcast service

    3. Adjacent regular cells with different broadcast services

# 5G NR Multicast/Broadcast Trial



Broadcast media source

Unicast media source

5GC

Streaming Server

Cell phone

Baseband Unit
BBU

TUE
with SIM
card

Video
Client

Screen

RRU/AAU

Radio Remote Unit
/Active Antenna Unit

TUE
without
SIM card

Video
Client

Screen

TUE
without
SIM card

Video
Client

Screen

Scenario 1: Test User Equipment/Customer Premise Equipment+ Set-top Box

（Regular  Unicast）

Base Station
（Broadcast）

Cell  phones

Core Network of Other Operators

Core Network of CBN

Gateway     Service Center     Source Codec
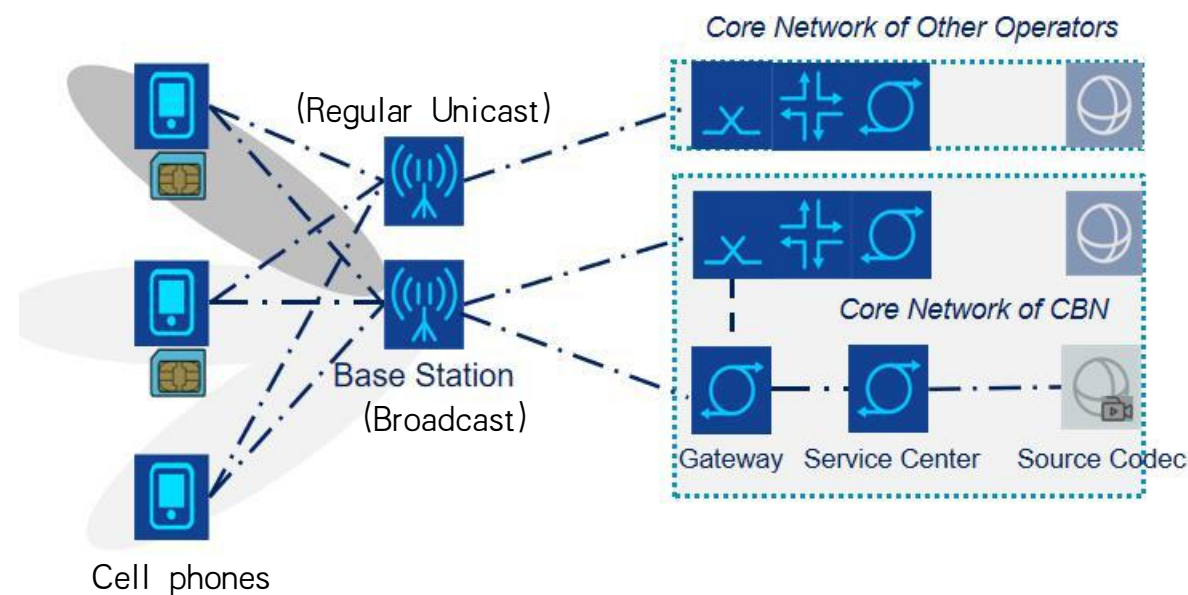
Scenario 2: Broadcasting on Cell Phones
from multiple operators

# 5G NR MBS Trial

**User Equipment**   **Radio Access Network**   **Core Network**   **Video server**

*Logical Function*

Back-ground UE

Unicast Data Radio Barrier

DRB **C-RNTI**

Cell Radio Network Temporary Identifier

G-RNTI

Group Radio Network Temporary Identifier

Demo UE

Default Qos Flow

Proprietary Qos Flow

PDU session

PDU session

PDU session

Protocol Data Unit

Video streaming

Video streaming

Video streaming

System Architecture

1st Step: Set up the unicast data radio barrier and get Cell Radio Network Temporary Identifier by Background UE

2nd Step: Generate the multicast/broadcast stream to Demo UEs (using the G-RNTI which is then same as C-RNTI above)

# CBN's 5G Broadcast Network
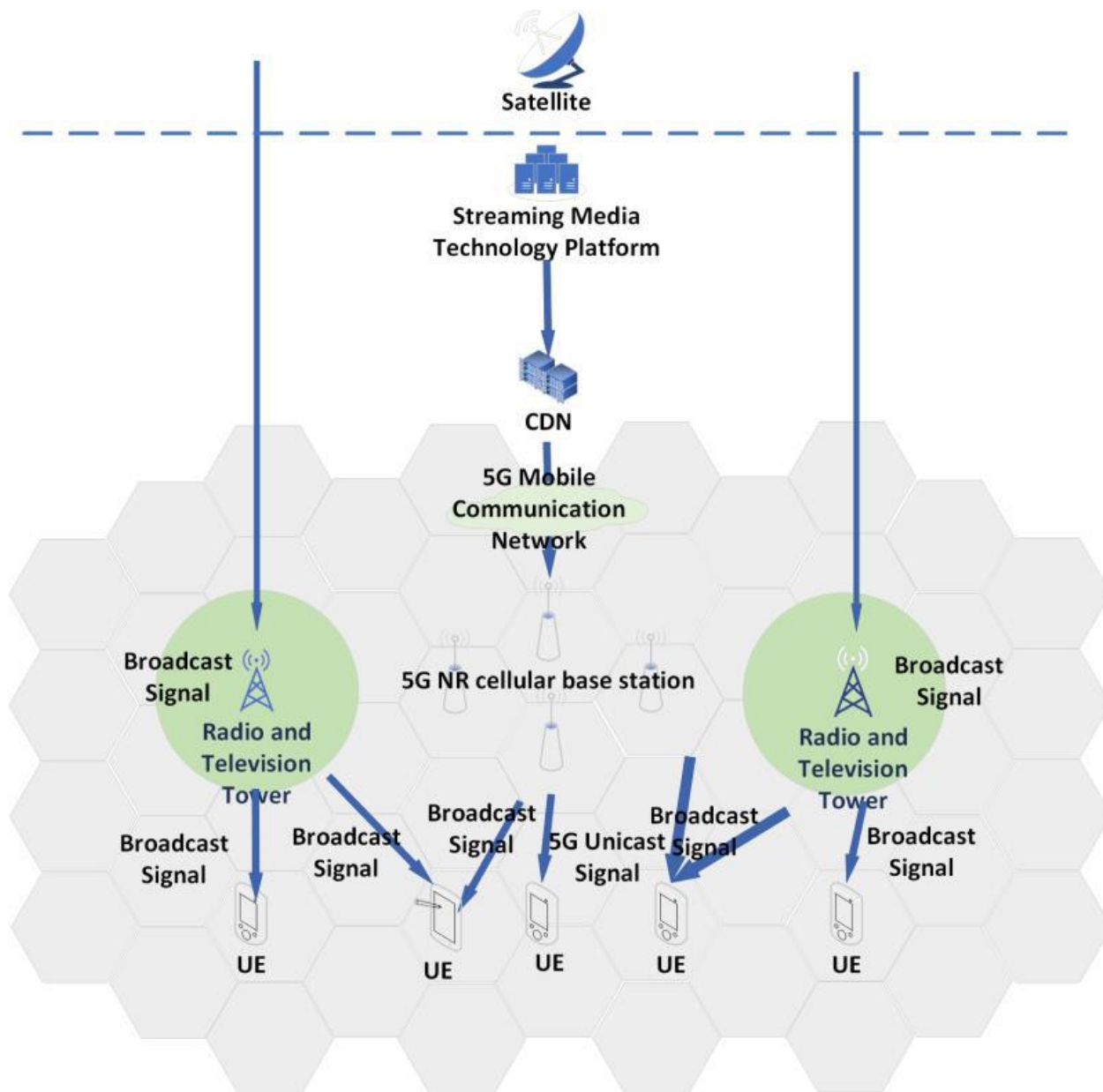


CDN: Content Delivery Network

NR: New Radio

UE: User Equipment

# CBN Contributes to 5G NR MBS Standard

➢ CBN completed the submission and discussion of 5G broadcast proposals at the 88th&89th 3GPP RAN and SA plenary meetings, promoting 5G NR broadcasting mode.

➢ 23 out of 25 involving companies confirmed the broadcasting support in Rel-17 NR MBS.

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3GPP TSG RAN Meeting #88e
Electronic Meeting, June 29 - July 3, 2020
Agenda item: 9.10.8

## Motivation on support of Free-to-Air mode in Rel-17 NR Multicast and Broadcast Services

CBN, ABS, ABP, CUC, EBU, IRT, Huawei, OPPO
Qualcomm Incorporated, Reliance Jio, ZTE

RP-201240

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3GPP TSG SA Meeting #89e
Electronic Meeting, Sep 15 - Sep 21, 2020
Agenda item: 2.2

## The Importance of Maintaining Broadcast Services in Rel-17 NR MBS

CBN, ABS, ABP, China Telecom, China Unicom, IRT, Reliance Jio

SP-200814

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3GPP
A GLOBAL INITIATIVE

# CBN 5G and Cable hybrid network

> **Evolved TV services based on <u>HTTP protocols</u> over <u>hybrid network</u> and <u>smart devices</u>**
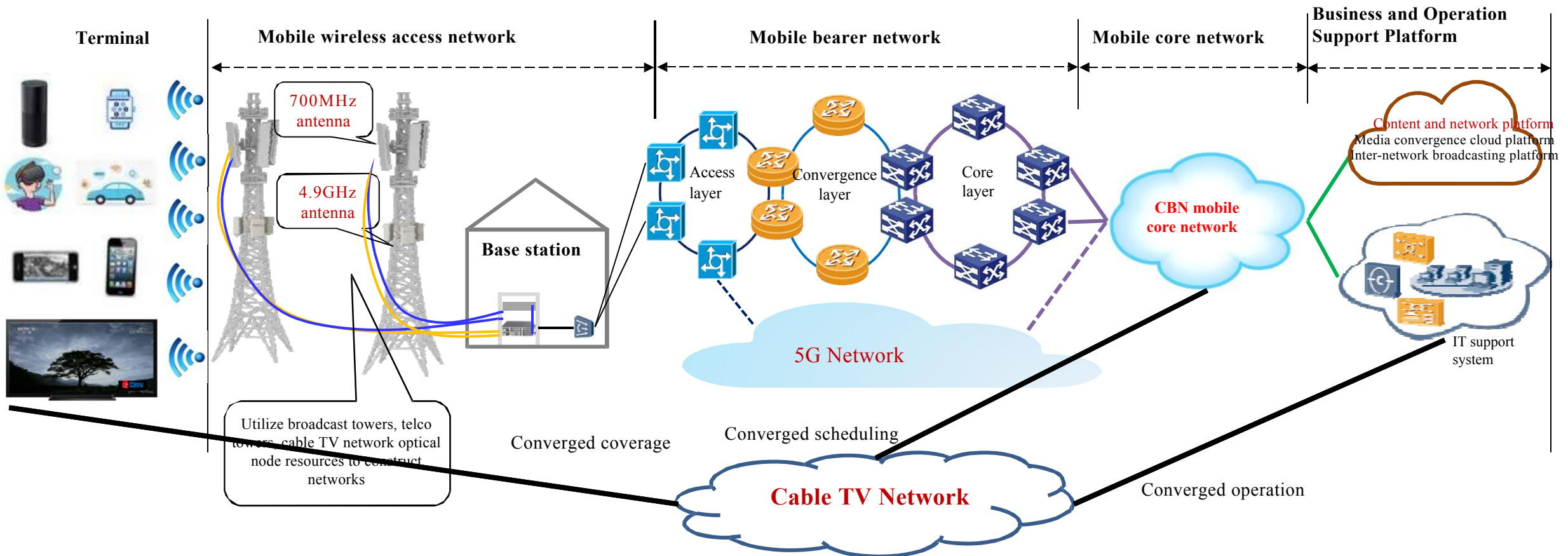
**HTTP-based streaming & 5G NR Multicast/Broadcast ensure new TV services:**
**All devices, All content, Any time, Any where**

- Mobile Access: 5G（700MHz、3.3GHz、4.9GHz、mmWave）

- Wired Access: Cable+FTTx, All-IP based cable TV services, broadband access

- Media: Converge the traditional media and emerging new media by content aggregation and "hybrid" distribution

- Maximized Coverage: Serve customers from household customers to individual customers, serve devices from TV to cell phones/tablet/laptop/smart devices etc.

# CBN 5G and Cable hybrid network
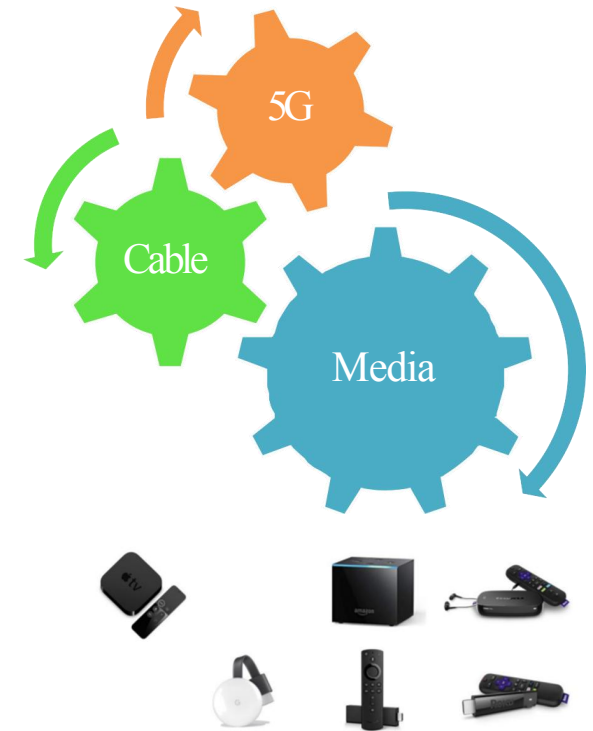
➤ **Overall planning of the CBN Convergent Service Platform based on 5G and Cable hybrid network**

# CBN 5G and Cable hybrid network

**CBN**

**Application Service Layer** | Wired/Mobile Broadband | 4K/8K Multi-screen video | Voice/SMS | Smart home /community/city | ....... | Internet of Things

**Cloud network service plane**

**Business collaboration and orchestration**

**AI Platform**

Virtual network function | Resource management | Network control | Cloud business | ......

**Mobile core network**

**Cable TV Cloud Platform**

**Control layer +AI**

Converged control panel

**CBN Cloud**

Beijing

Xian | Nanjing

Cloud OS

**5G**

Core Network

**Cable Network**

Mobile Core Network

Front end

Bearer Network

Optical node

Access Network

User

**CBN 5G and Cable integrated access**

| Mobile Devices | PC/Tablet | VR/AR | TV | Home monitoring | Home entertainment/ education | Home automation | Smart security |

# Thank You!