

The New Broadcasting Based on 5G NR Technology

Shuang Li, China Broadcasting Network Co.

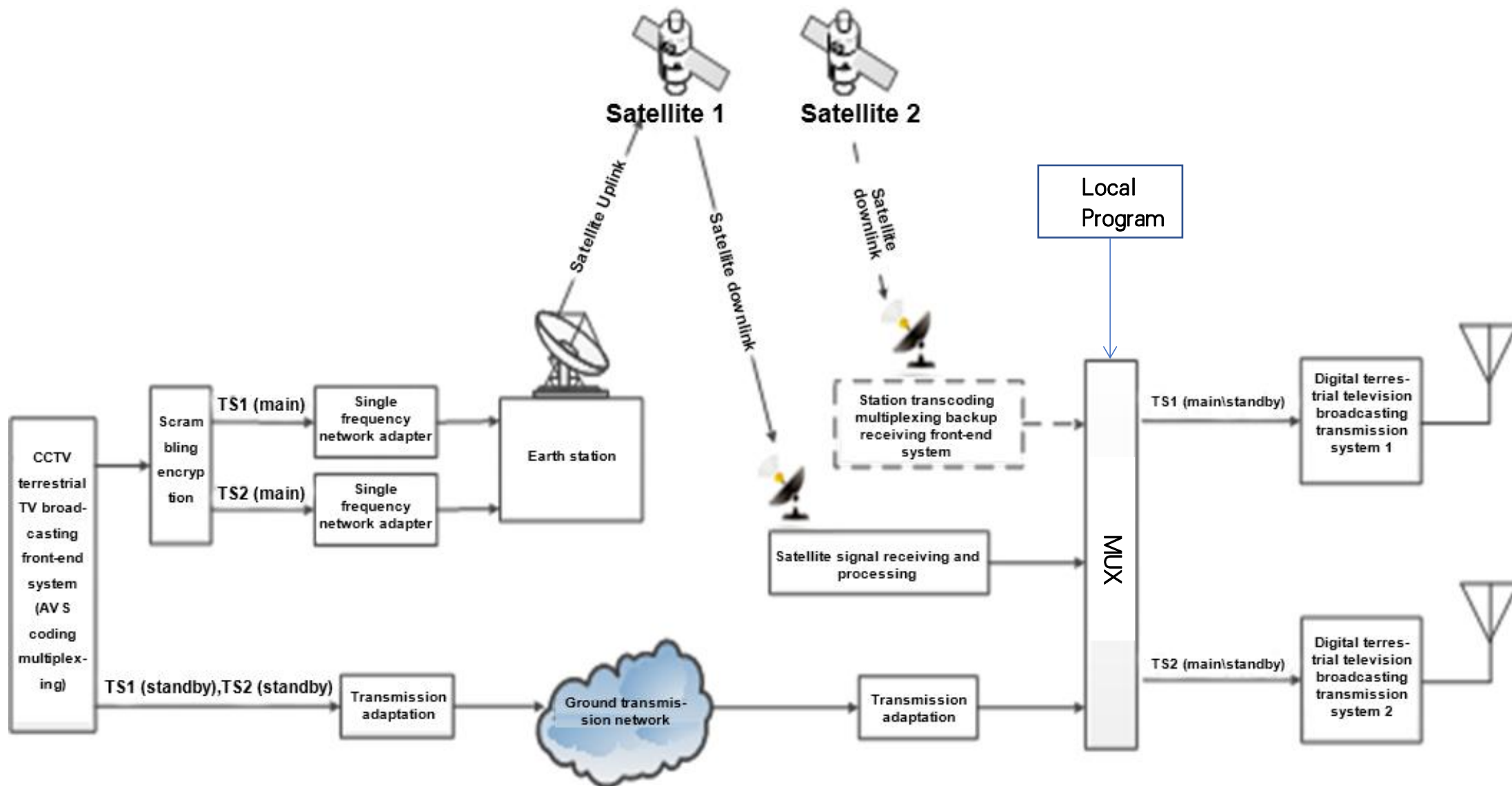
2020.11

- **China Broadcasting Network (CBN) – Chinese cable TV & 5G network operator, established in May, 2014**
 - Granted 5G license in June, 2019. One of the four 5G carriers in China.
 - The sole network operator in China authorized by the government to operate nationwide cable TV network as well as 5G network providing cable TV, mobile, fixed broadband, satellite communication services.
 - Announced the nationwide construction of the world's first 700MHz 2x30MHz 5G SA network cooperating with CMCC in May, 2020.

Current Status of Broadcasting Services in China



DTMB (Digital Terrestrial Broadcast)



Technology innovation needed for emerging video demand



◆ Users have formed **mobile**, **interactive**, and **fragmented** video viewing habits. They use mobile phones, tablets, wearable and other smart devices to watch videos. Live video streaming is demanded **anytime, anywhere based on mobile networks** in all scenarios such as urban buildings, high-speed traffic, and remote outdoor areas, etc.



940 million

As of June 2020, the number of Internet users in China has reached 940 million, Internet video users have reached 888 million, and short video users have reached 818 million.



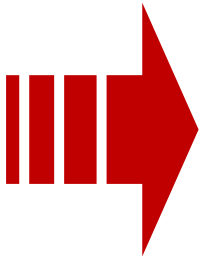
47.9%

The duration of mobile applications related with audio&video services accounted for 47.9% of the total duration, significantly exceeding the duration of other applications in China.



70%+

Overseas, YouTube's monthly live viewers exceeded 2 billion in 2019, and more than 70% of the views came from mobile devices.



- ✓ In order to meet the new needs of users for video services and multimedia information services under the new situation, the Broadcasting industry needs to accelerate technological innovation and complete the service restructuring evolving to **mobile**, **interactive**, and **ubiquitous** services.
- ✓ In terms of core functions, broadcasting should adhere to the **mobile-first strategy** and comprehensively enhance broadcasting public service capabilities.

Emerging Demand for Broadcasting Services

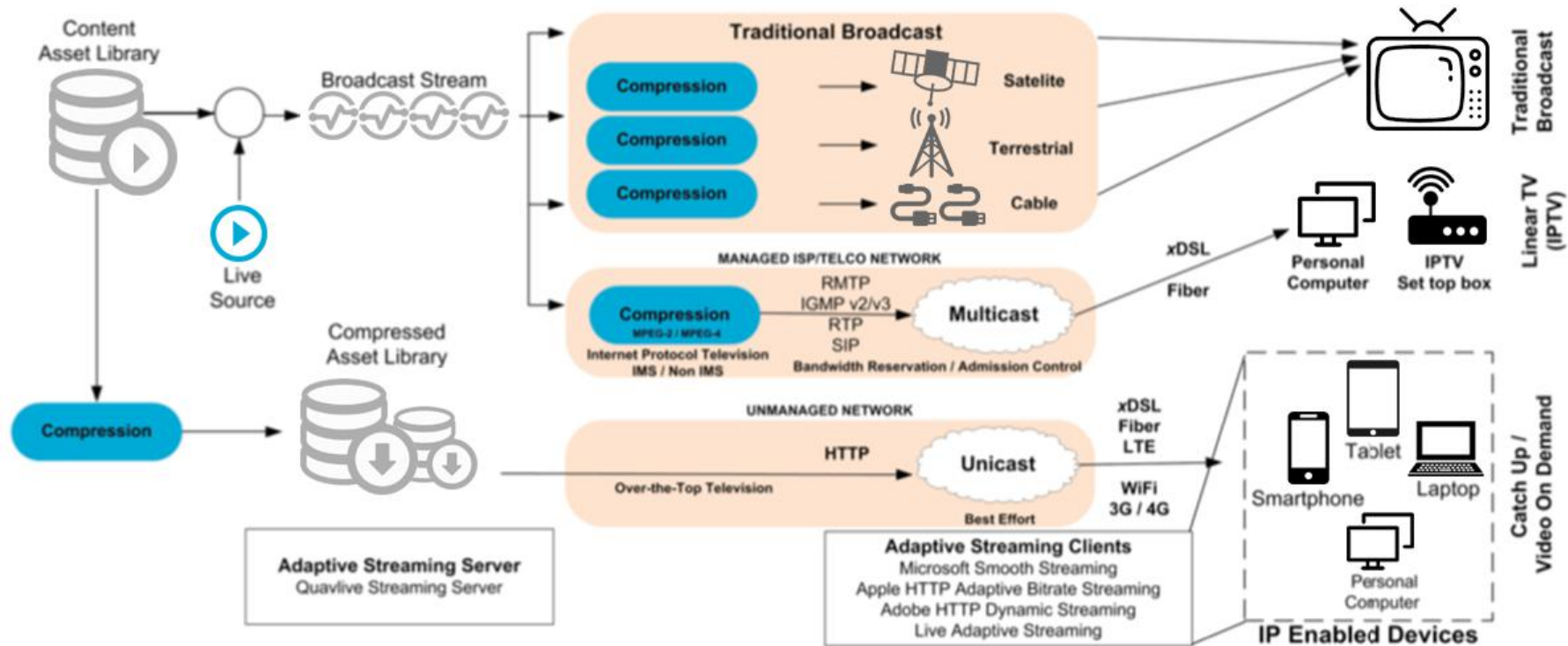


- **Better Signal Coverage:** Acceptable signal coverage needed in indoors and high-speed scenarios.
- **Better Device Coverage:** Broadcasting services should be adaptable to the majority of future consumer devices based on 5G and WiFi connection, ranging from mobile phone to wearable devices.
- **Better Content Coverage:** Besides traditional live TV, should be capable to broadcast Internet multimedia 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.

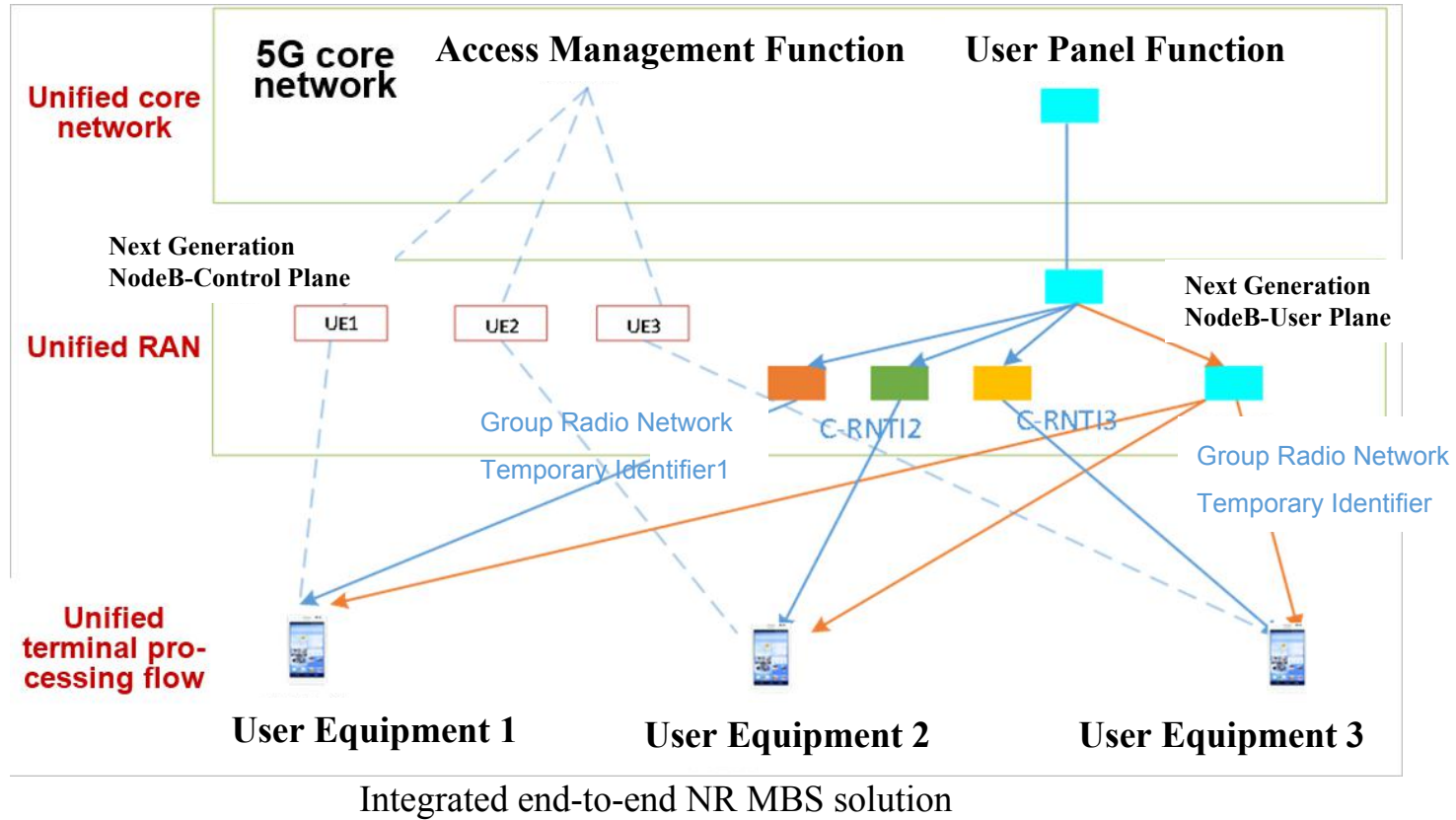


Internet Protocol Based Streaming Platform

xDSL: x Digital Subscriber Line

- **5G NR MBS (Multicast/Broadcast Services) will evolve into a universal flexible broadcast technique serving all screens.**
 - 5G NR Multicast and Broadcast working item was successfully established at the 3GPP plenary meeting in December 2019 (CBN allied with our industry partners to jointly support and promote)
 - 5G NR Broadcasting can flexibly achieve dynamic and seamless switching between unicast services and broadcast/multicast services;
 - Flexible servicing abilities, good two-way interaction, accurate push of broadcast and multicast services based on location, suitable for expanding new multimedia broadcast services such as public safety and emergency broadcast;
 - Widely adapted to various types of 5G general-purpose terminals, and obtained extensive support from major global industry manufacturers;
 - Deeply and continuously cover various complex scenarios, with coordinated mixed network based on 5G cellular base stations and existing TV broadcasting high towers;
 - After supporting the Free-to-Air mode, the SIM-less receiving mode will be realized offering better public services.

5G NR Multicast/Broadcast Services



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

5G broadcasting enables new services



Traditional linear TV broadcasting service

- Provide basic live broadcast of traditional linear TV channels on mobile smart terminals.
- Featuring wide-area converged coverage based on radio and television transmission towers and 5G cellular base stations.

New interactive video broadcasting service

- The principle business form of 5G broadcasting. Mainly based on 5G cellular base stations, intelligently and dynamically provide cellular broadcast/multicast services for live video content including linear TV channels, various Internet live broadcasts, audio and video on demand, and 4K/8K/AR/VR video services.

Converged multimedia information broadcasting service

- This new convergent broadcast service fully utilizes the advantages of 5G network's low latency and massive connections feature, supports new multimedia information broadcast applications such as public safety, emergency interactive broadcasting, V2X and IoT.
- Extend new broadcasting scenarios and improve 5G network efficiency. Create new opportunities for broadcasting.

Progress on 3GPP 5G MBS Standards



- CBN submitted proposals (RP-201765, SP-200814) to support 5G NR broadcasting at the 89th 3GPP RAN and SA plenary meetings in Sept 2020.

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

3GPP TSG RAN Meeting #89e
Electronic Meeting, Sep 14 - Sep 18, 2020
Agenda item: 9.8.8



Importance of Maintaining Broadcast Services in Rel-17 NR MBS

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

RP-201765

Progress on 3GPP 5G MBS Standards



- CBN took the lead in proposing new application scenario design for 5G broadcast, and completed relevant discussions on supporting broadcasting in NR MBS, which was reviewed and agreed by the plenary meetings.

NR Broadcast: Enable new business cases



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 crowded 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.

• 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.

- The RAN/SA Plenary Meetings sent liaison statements to relevant working groups, which stated explicit support for broadcasting in 5G MBS.

3GPP TSG RAN meeting #89e Electronic Meeting, September 14 - 18, 2020

RP-202012

Title: Reply LS on RAN impact of FS_5MBS Study
Response to: LS (S2-2006044/RP-201437) on "RAN impact of FS_5MBS Study" from SA2
Release: Release 17
Work Item: FS_5MBS, NR_MBS-Core
Source: RAN
To: SA, SA2
Cc: RAN2, RAN3

3GPP TSG SA meeting #89e Electronic Meeting, September 15 - 21, 2020

SP-200810

Title: Reply LS on RAN impact of FS_5MBS Study
Response to: LS (S2-2006044/SP-200652) on "RAN impact of FS_5MBS Study" from SA2
Release: Release 17
Work Item: FS_5MBS, NR_MBS-Core
Source: SA
To: RAN, SA2
Cc: RAN2, RAN3

1. Overall Description:

Regarding the following question, that SA2 asked RAN to feedback on:

SA2 is debating whether broadcast (i.e. without the network's awareness about UEs receiving broadcast contents and for other use cases than the ones excluded already for Rel-17) should be further down-scoped in Rel-17 for remaining broadcast requirement in the SID. Some companies have provided solutions on broadcast (which are documented in the TR). SA2 would like to ask SA, RAN, RAN2 and RAN3 for feedback on broadcast support in Rel-17.

RAN would like to clarify that NR-based broadcast is within the scope of RAN WI for NR MBS in Rel-17, as per the WID approved in RP-201038. According to the discussion at RAN#89e, it is concluded that the scope of RAN WI for NR MBS in Rel-17 is kept as was.

2. Actions:

To TSG SA and SA2

ACTION:

RAN would like to ask TSG SA and SA2 to take the above answer into account.

1. Overall Description:

Regarding the following question, that SA2 asked SA to feedback on:

SA2 is debating whether broadcast (i.e. without the network's awareness about UEs receiving broadcast contents and for other use cases than the ones excluded already for Rel-17) should be further down-scoped in Rel-17 for remaining broadcast requirement in the SID. Some companies have provided solutions on broadcast (which are documented in the TR). SA2 would like to ask SA, RAN, RAN2 and RAN3 for feedback on broadcast support in Rel-17.

SA would like to clarify that NR-based broadcast is within the scope of SA SID for "Study on architectural enhancements for 5G multicast-broadcast services", as per the SID approved in SP-200092.

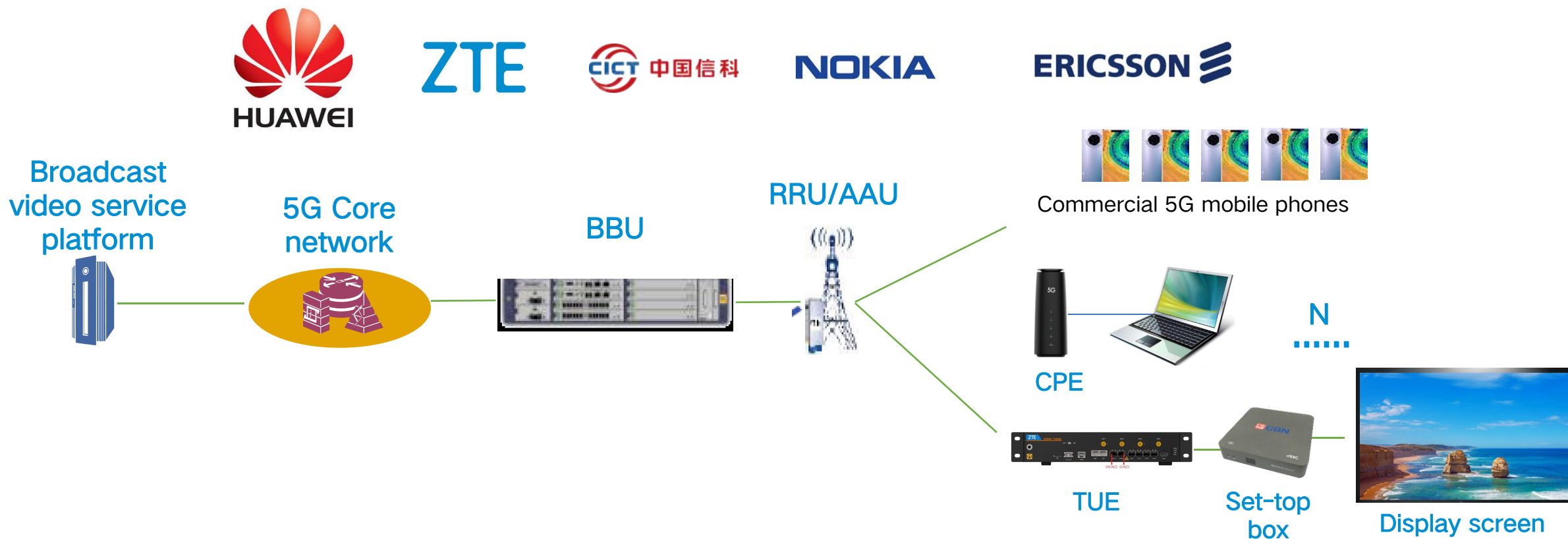
2. Actions:

To TSG RAN and SA2

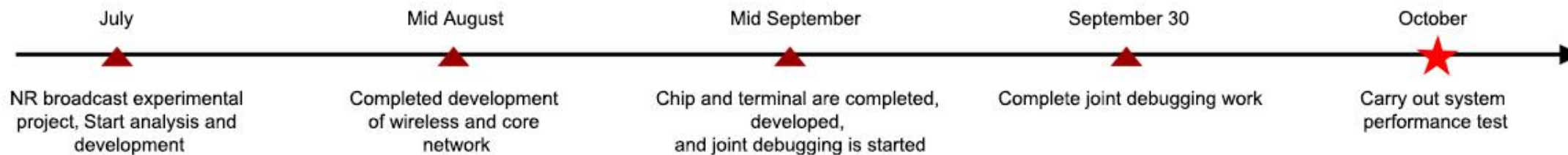
ACTION:

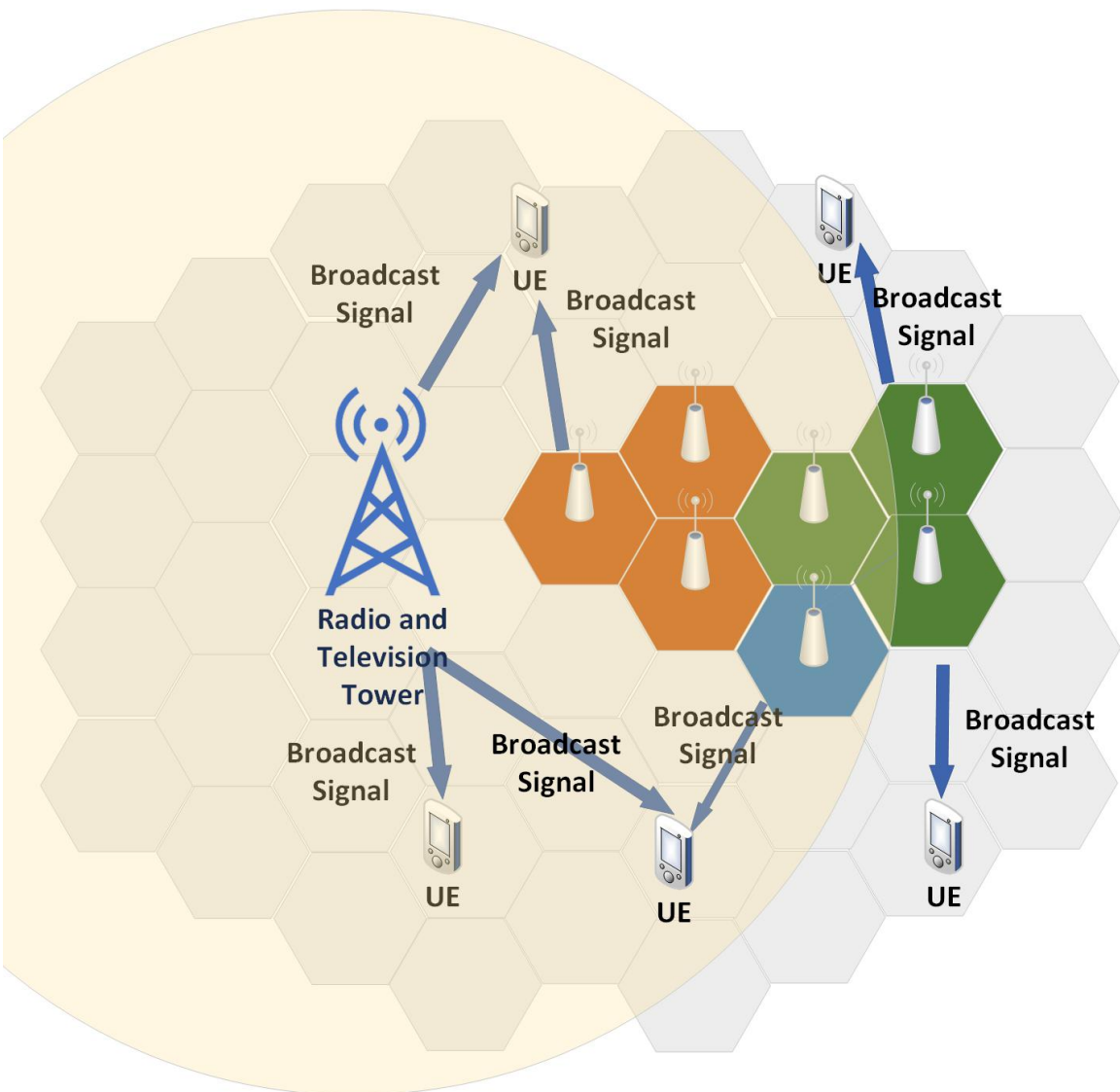
SA would like to ask TSG RAN and SA2 to take the above answer into account.

NR broadcast trial with industrial partners



➤ Prototype experiment system development timeline

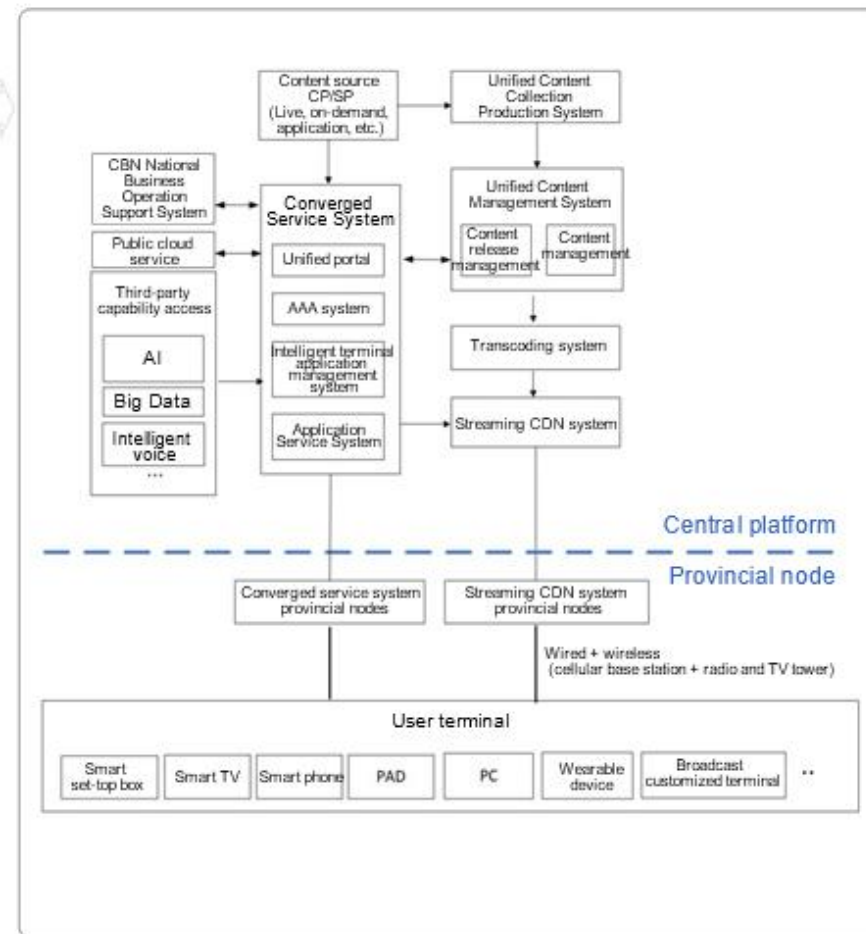
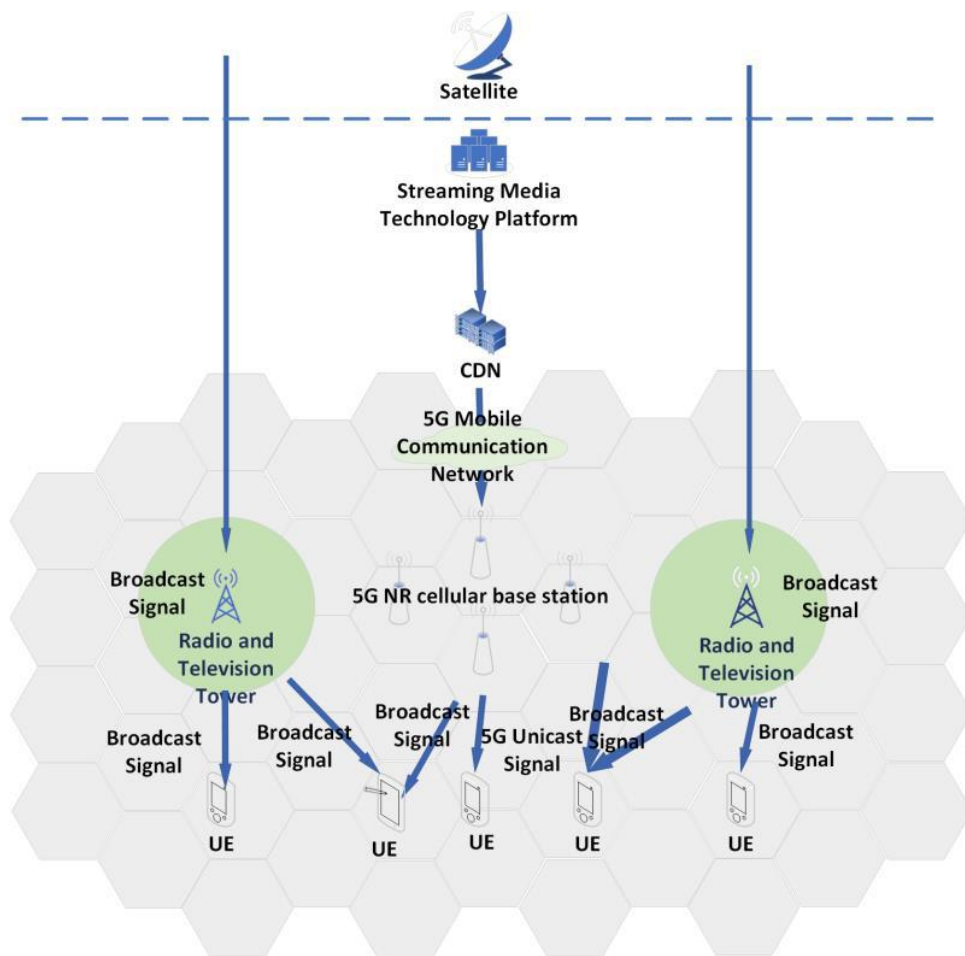




Key features to verify

- 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
- Frequency arrangement 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

CBN 5G broadcast network architecture



- The 5G broadcast network is constructed jointly with mobile cellular base stations and radio and television transmission towers. It provides a new converged media 5G broadcast service featuring all-terminal, all-scenario, and all-content integration with wired and wireless connection, multi-screen services for 5G mobile and cable TV customers in China.

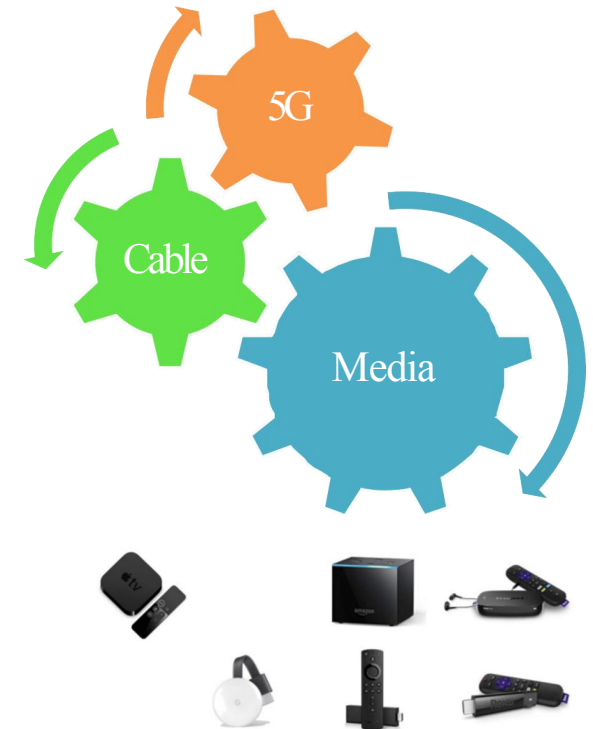
- CBN Convergence Service Platform serves as an integrated service platform for 5G broadcasting, providing users with diversified new 5G broadcasting services, and further promoting the interconnection and intelligent collaboration coverage of wired, wireless and satellite transmission networks.

➤ Evolved TV services based on HTTP protocols over hybrid network and smart devices

5G NR Multicast/Broadcast & HTTP-based streaming 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.





Thank you