JLabs
Japan Cable Laboratories

Cable television services to use 5G radio system

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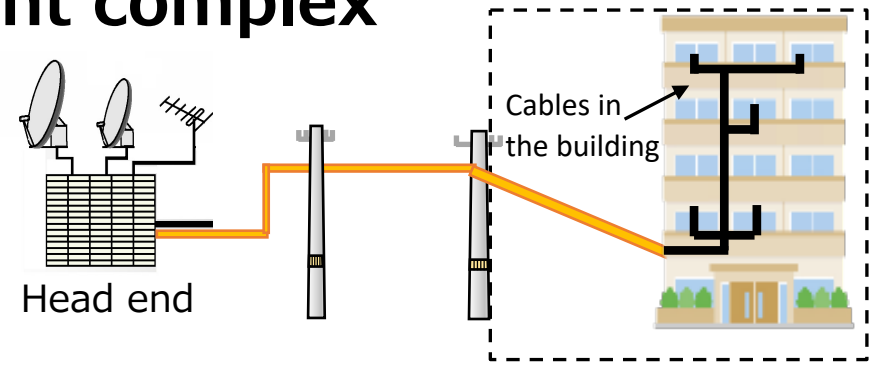
Contents

Issues (with cable television system)

Issues in the environment surrounding cable television in recent years.

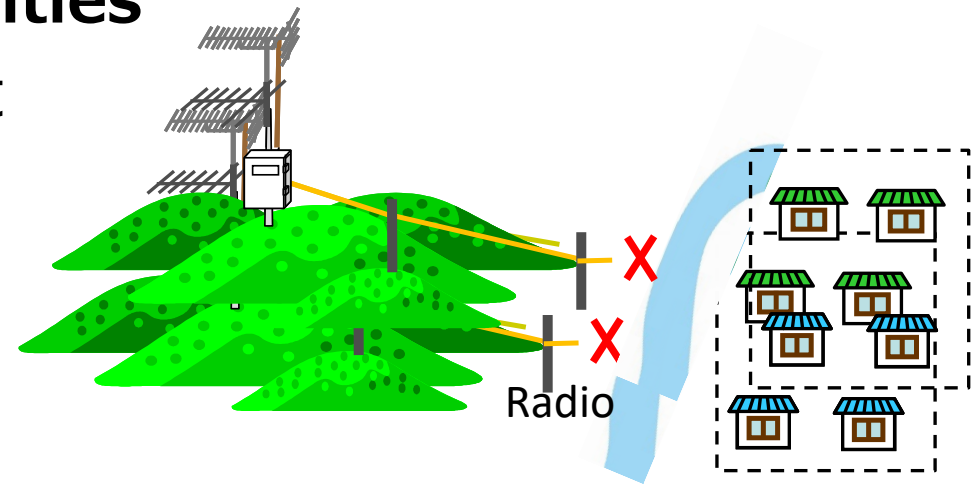
1. Aging of indoor cables in old apartment complex

Improve the viewing environment.
Make facilities and cables in the building more broadband capable.



2. Aging of community broadcasting facilities

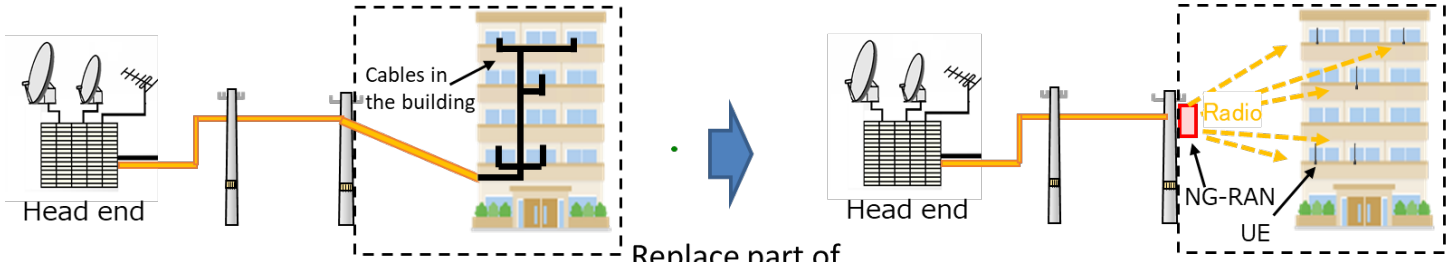
A large amount of equipment renewal cost due to aging
Even more cost to extend them to remote areas.



Solutions

- Use of wireless communication as well as fixed-line communication
- The latest 5G is expected to play this role.

1. Aging of indoor cables in old apartment complex



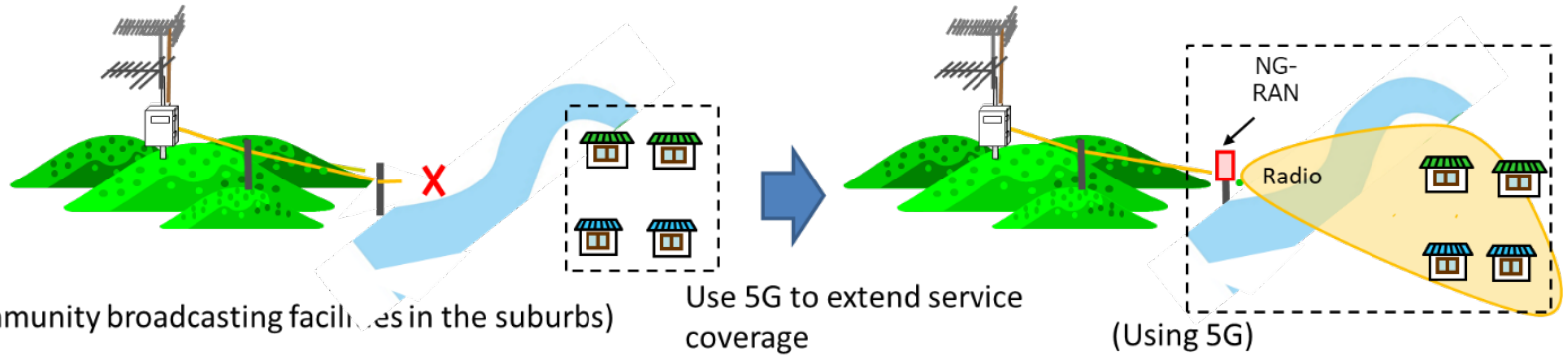
(With cables in the building)

Replace part of the transmission line with 5G

(Using 5G)

Each unit in the complex can receive cable television signals over 5G radio from the nearest 5G base station.

2. Aging of community broadcasting facilities



(Community broadcasting facilities in the suburbs)

Use 5G to extend service coverage

(Using 5G)

Extend cable television services in remote areas.

Also true for the developing countries.

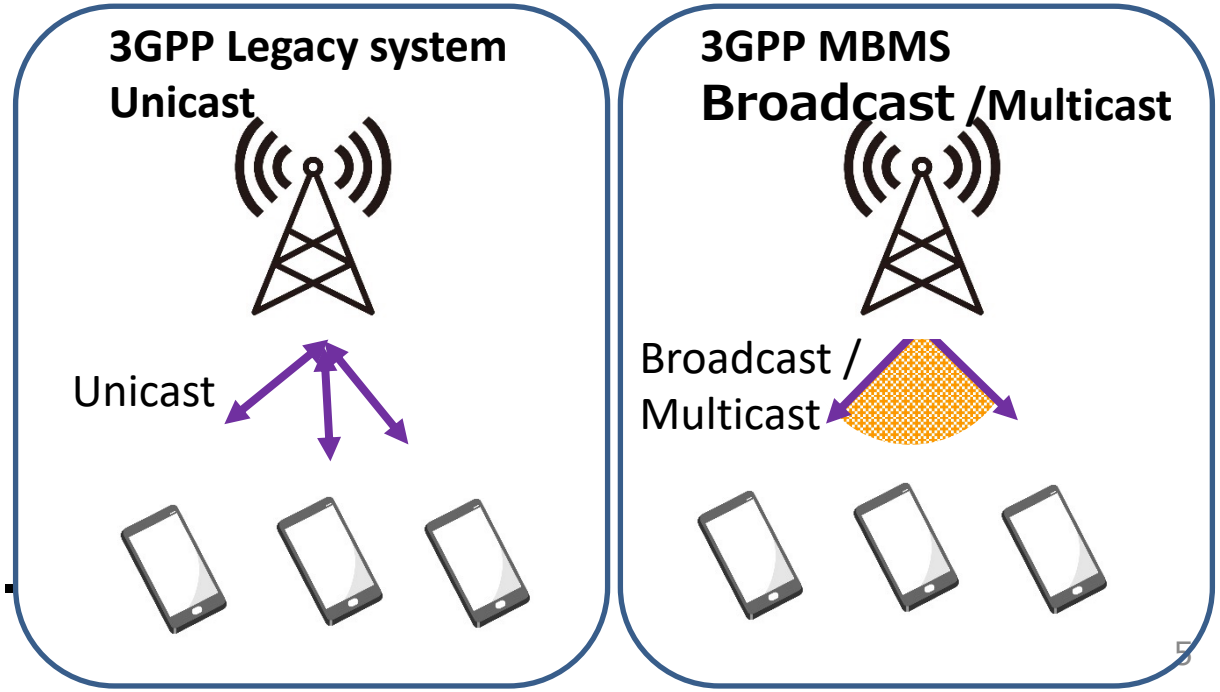
5G and MBMS

- IMT-2020 radio system, a.k.a. 5G

Three requirements of 5G

  - eMBB (enhanced Mobile Broadband)
  - URLLC (Ultra-Reliable and Low Latency Communications)
  - mMTC (massive Machine Type Communication)

- MBMS (Multimedia Broadcast and Multicast Service)
  - Data from a single source entity to multiple endpoints.
  - In 5G, it is considered as MBS (Multicast and Broadcast Services).



Considerations

1. Consideration for wireless bandwidth

Wireless bandwidth resources are limited compared to fixed communication.

Efficient use of wireless bandwidth is required for distribution of cable television channels while maintaining the quality of service.

2. Consideration for wireless quality

The surrounding environment can affect the reception and transmission of 5G radio signals. Wireless quality changes due to obstacles and the effects of weather such as rain. If the received signal strength deteriorates, packet loss can occur, which affects the video quality.

Requirements

1. **Efficiency**
   to utilize the limited radio bandwidth in the best way in order to provide multi-channel broadcasting.
2. **Robustness**
   against fluctuations in radio signal quality so as not to cause deterioration in video quality.
3. **Reliability**
   to ensure the continuation of service at the time of bad reception conditions of 5G radio system.
4. **Low Latency**
   to minimize the amount of delay as low as digital broadcasting using RF.

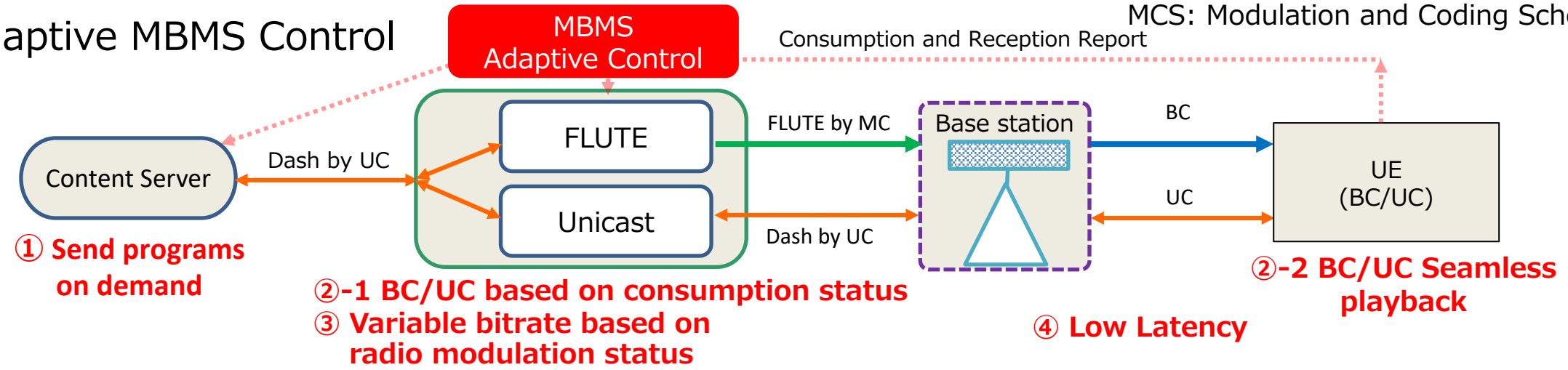
Adaptive MBMS Control

Four functional components to deal with the four requirements.

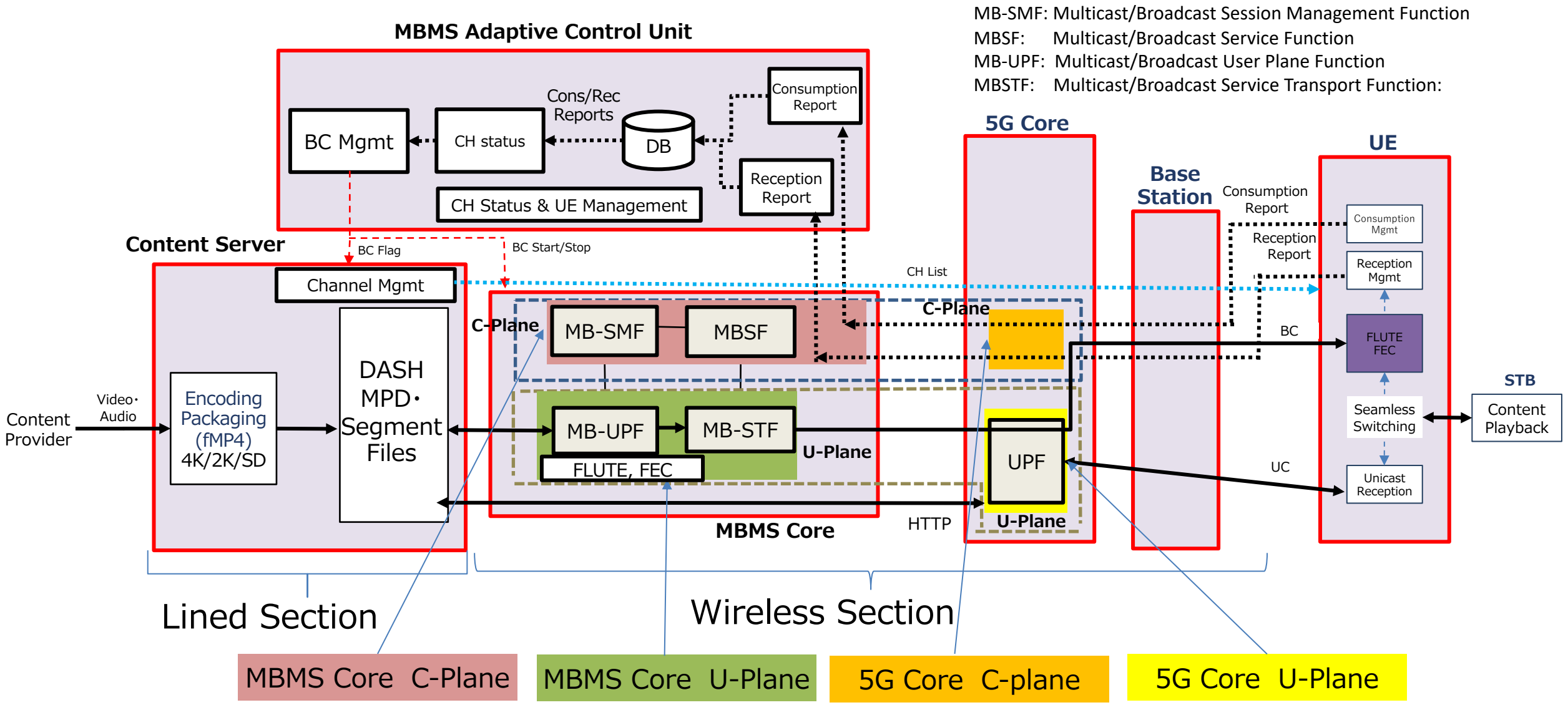
(1) On-demand program distribution
(2) BC/UC adaptive distribution
and seamless switching between BC/UC at UE.
(3) MCS-linked variable bitrate encoding
(4) Chunk Transfer Encoding (CTE) called LL-MPEG DASH

UC: Unicast, MC: Multicast, BC Broadcast
MCS: Modulation and Coding Scheme

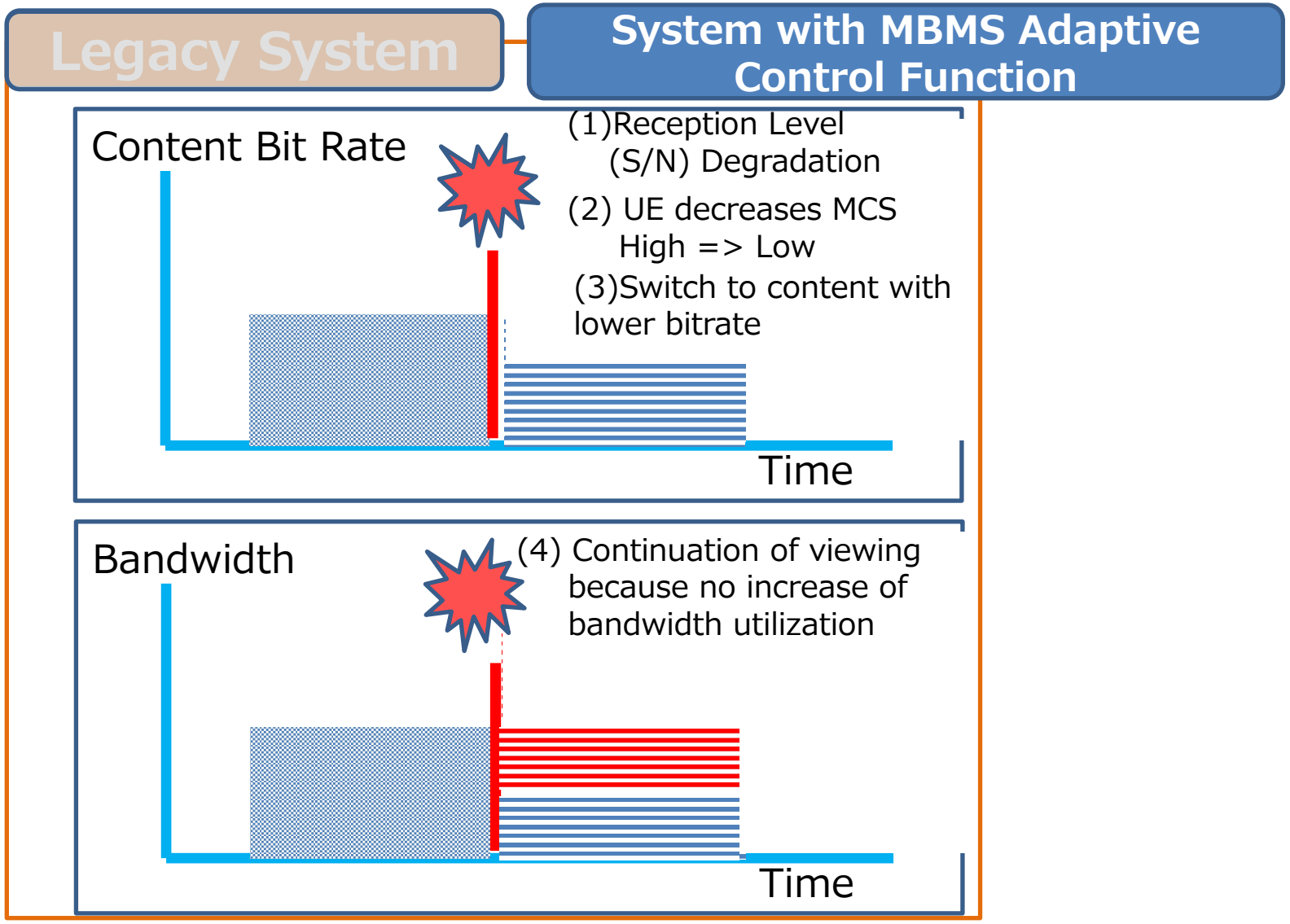
- Adaptive MBMS Control



System Architecture

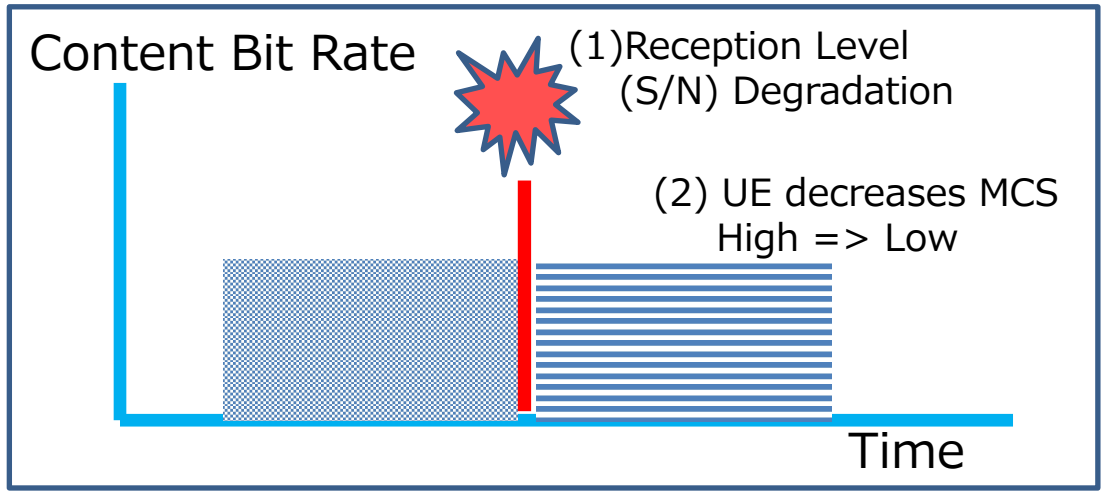


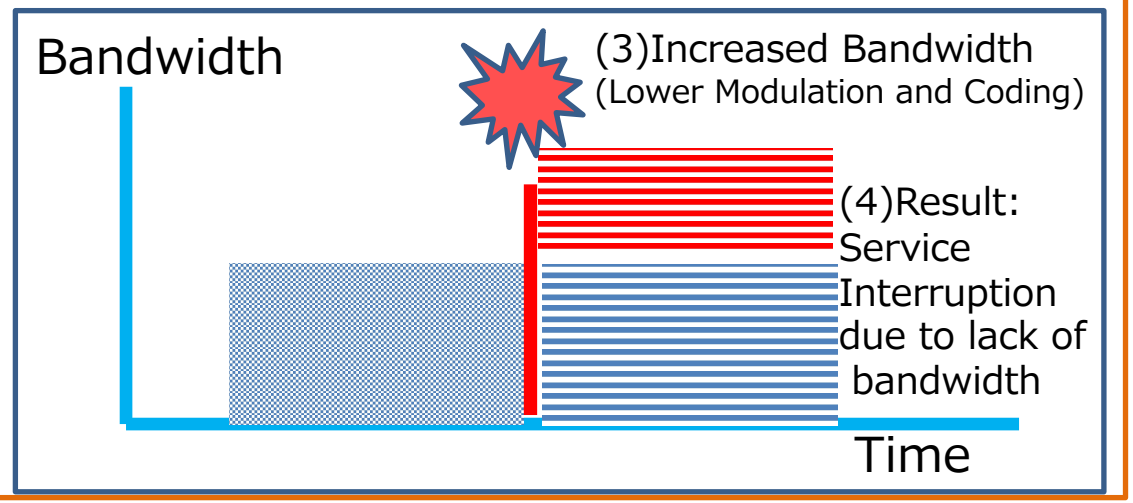
MCS-linked variable bitrate encoding



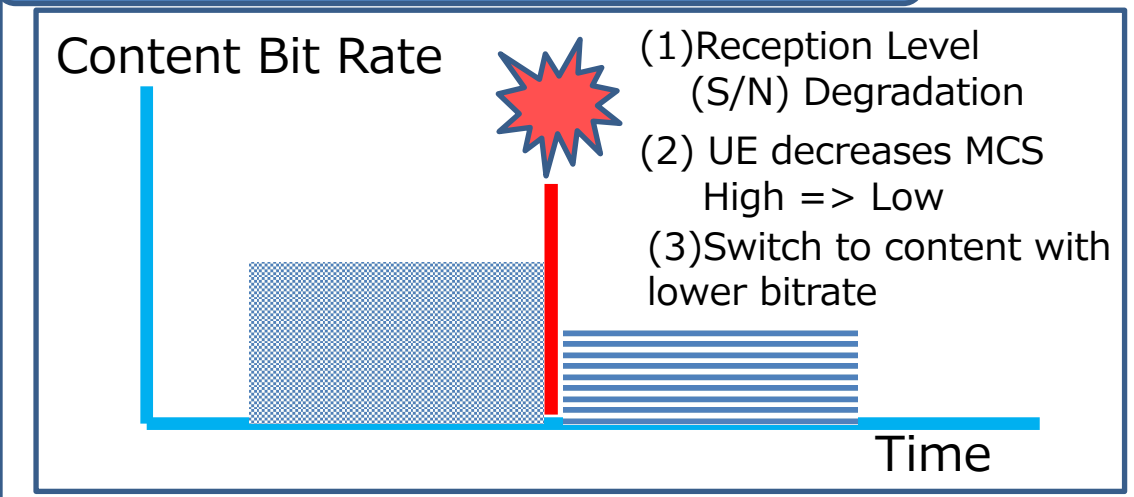
MCS-linked variable bitrate encoding can avoid increase in used bandwidth and interruption of service at the time of bad reception conditions

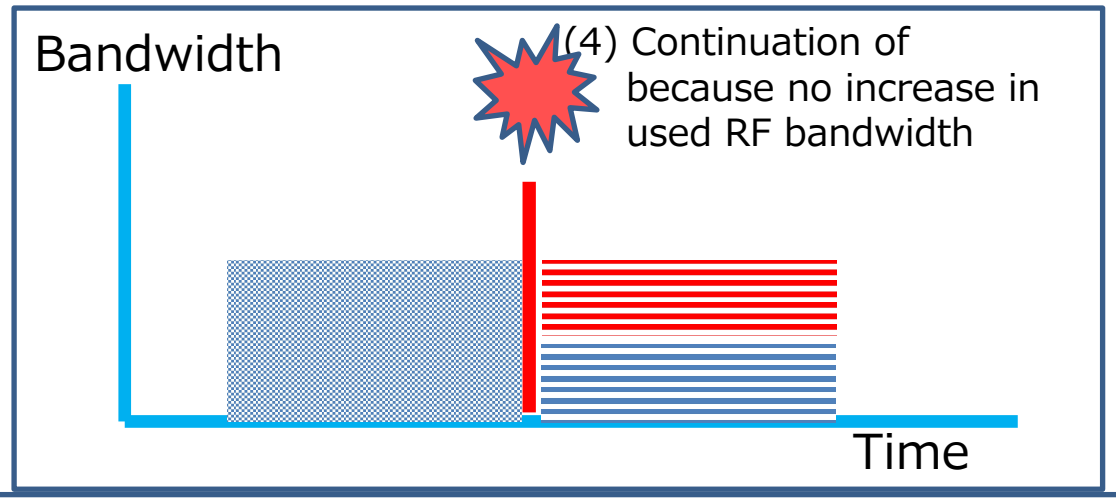
Legacy System





System with MBMS Adaptive Control Function





Summary

- Using 5G radio system for cable television to solve issues in old apartment complex, community broadcasting facilities, and developing countries.
- Four requirements
- Four functional components to deal with the four requirements
- Adaptive MBMS Control is one technology to enable IP broadcasting transmission effectively by 5G.
- MCS-linked variable bitrate encoding can avoid increase in used bandwidth and interruption of service at the time of bad reception.

Note:
The adaptive MBMS is funded by 2021 5G research project of Ministry of Internal Affairs and Communications .

Reference: ITU-T SG9
J.cable_5G-req: Requirements for cable television services to use 5G radio system
J.cable_5G-arch: System architecture for cable television services to use 5G radio system