

Cable Television in Japan

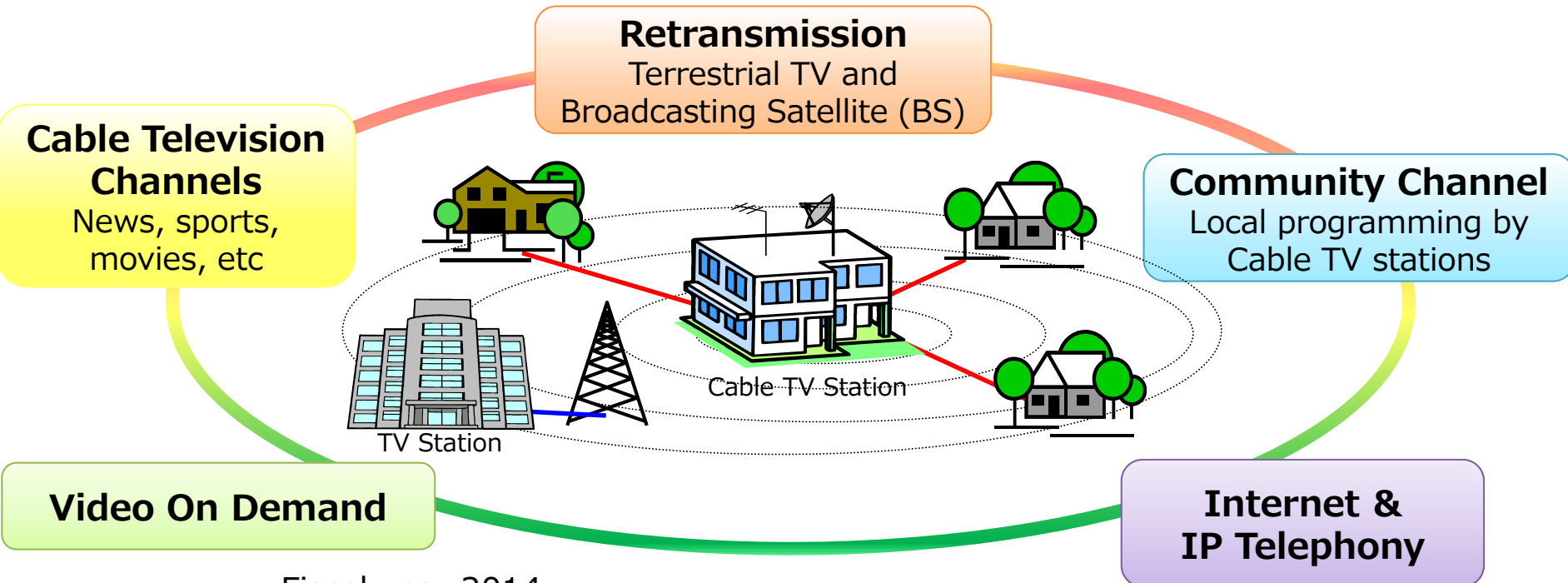
May 26, 2017

Japan Cable Laboratories

Overview of Japanese Cable Television industry

Japanese Cable Television

- The first Japanese cable television station began operation in 1955, two years after Japan Broadcasting Corporation (NHK) started television broadcasting, to retransmit NHK programs to a spring resort 150 kilometers north of Tokyo.
- As of March 2015, cable television reaches 52.2% of Japanese households, with 29.2 million subscribers (households), of which 9.8 million subscribe to paid channels

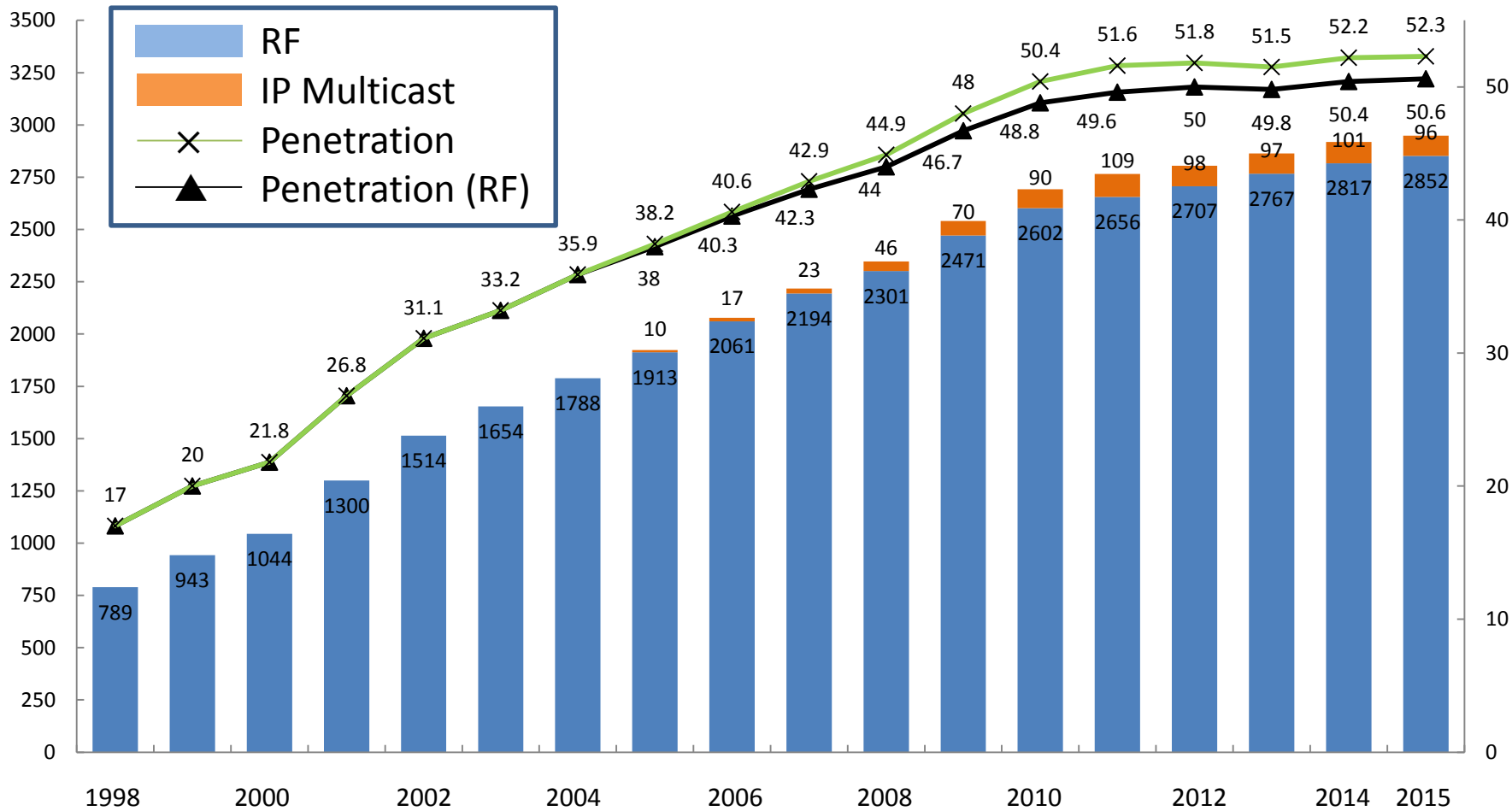


Fiscal year 2014
 Number of Commercial Operators: 294
 Total Commercial Revenues: 497.5 billion JYen

Yearly Increase of Cable Television Subscribers

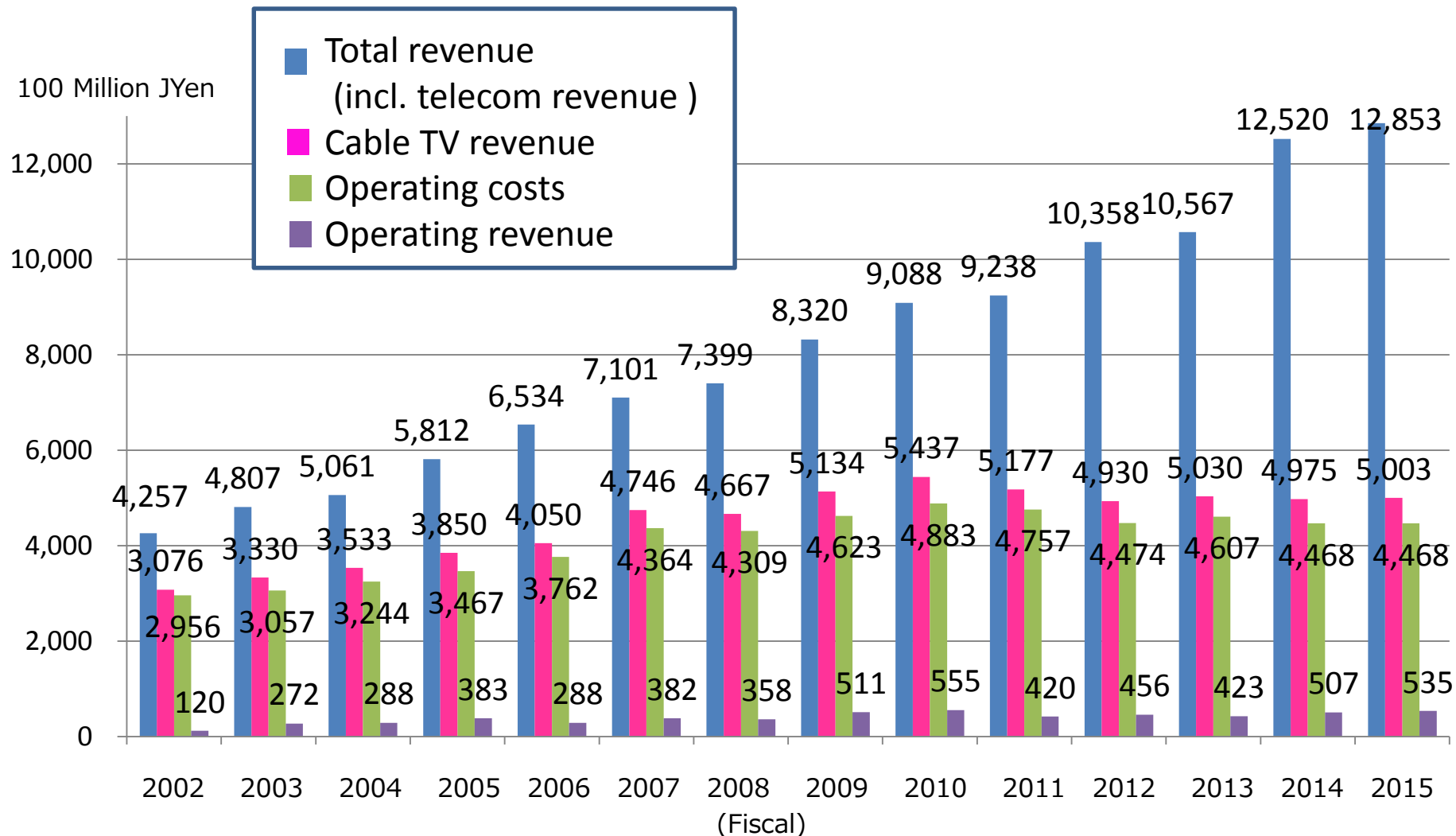
[10K households]

[Penetration %]



(Source: MIC)

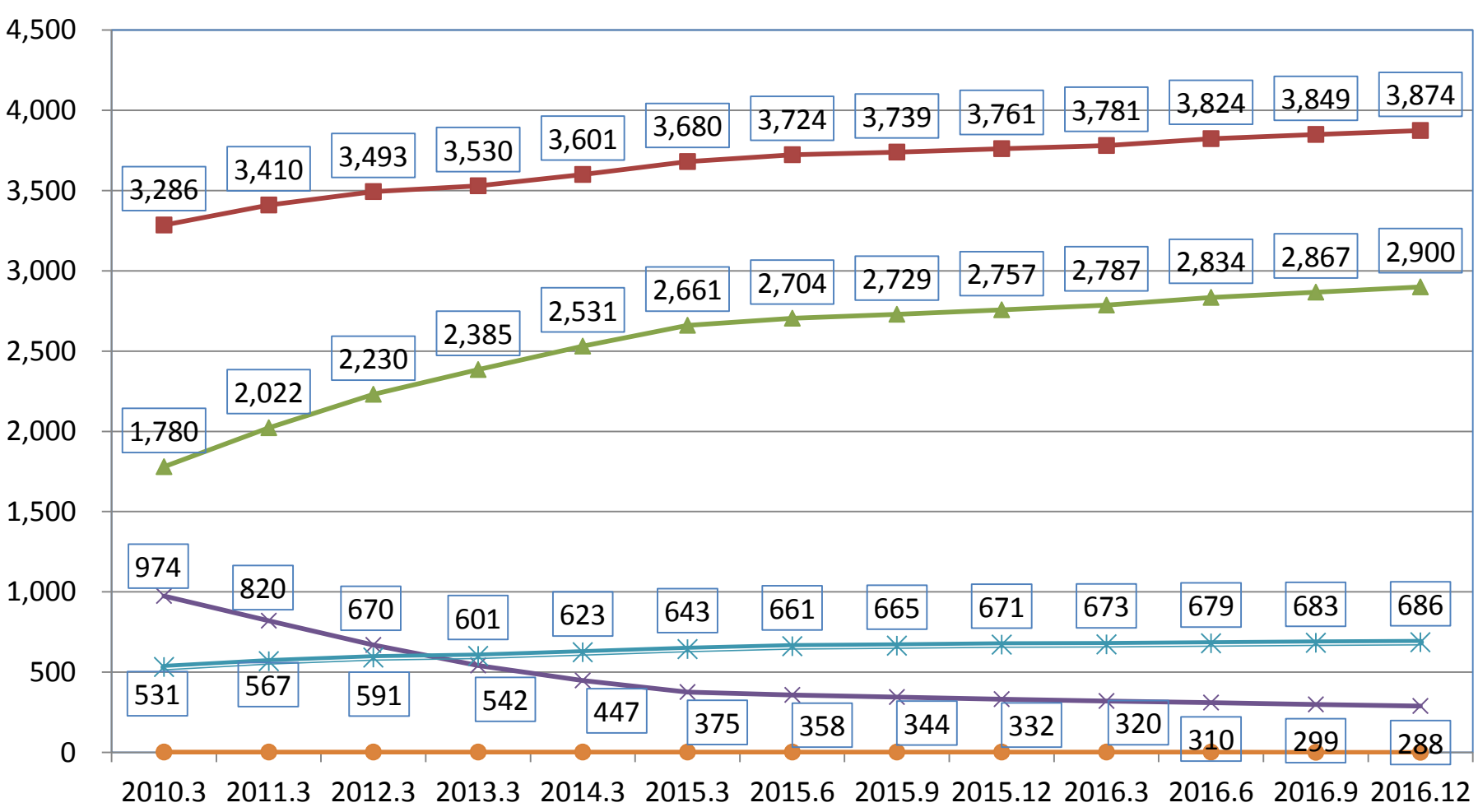
Yearly Increase of Cable Television Revenue



(Source: MIC)

Broadband Services Subscribers

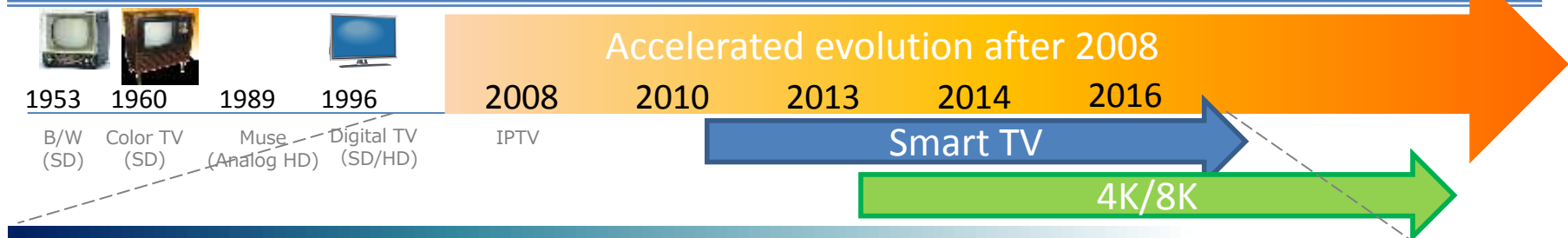
(10k subscribers)



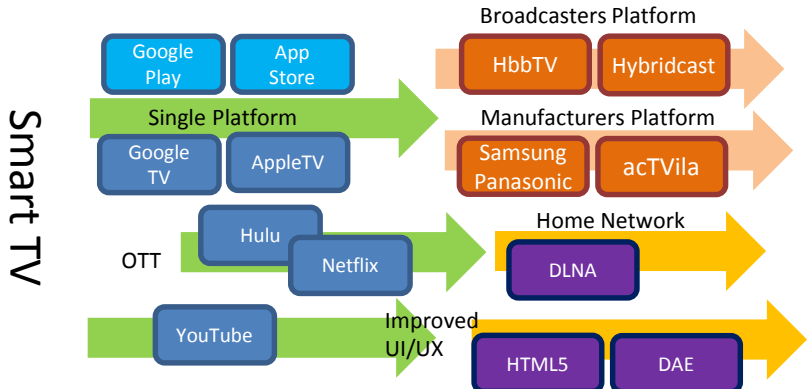
(Source: MIC)

Evolution of Japanese Cable STB and Services

Evolution of Cable STB in Japan



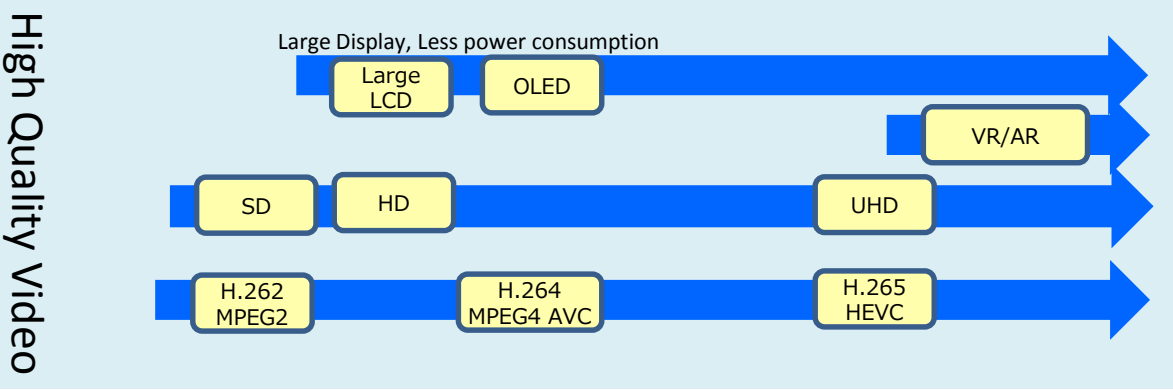
1st Generation Digital STB



2nd Generation STB

Smart TV compatible

- Downloadable applications
- Interactive with smartphones and home network
- ITU-T J.295/296 (Hybrid Cable STB)

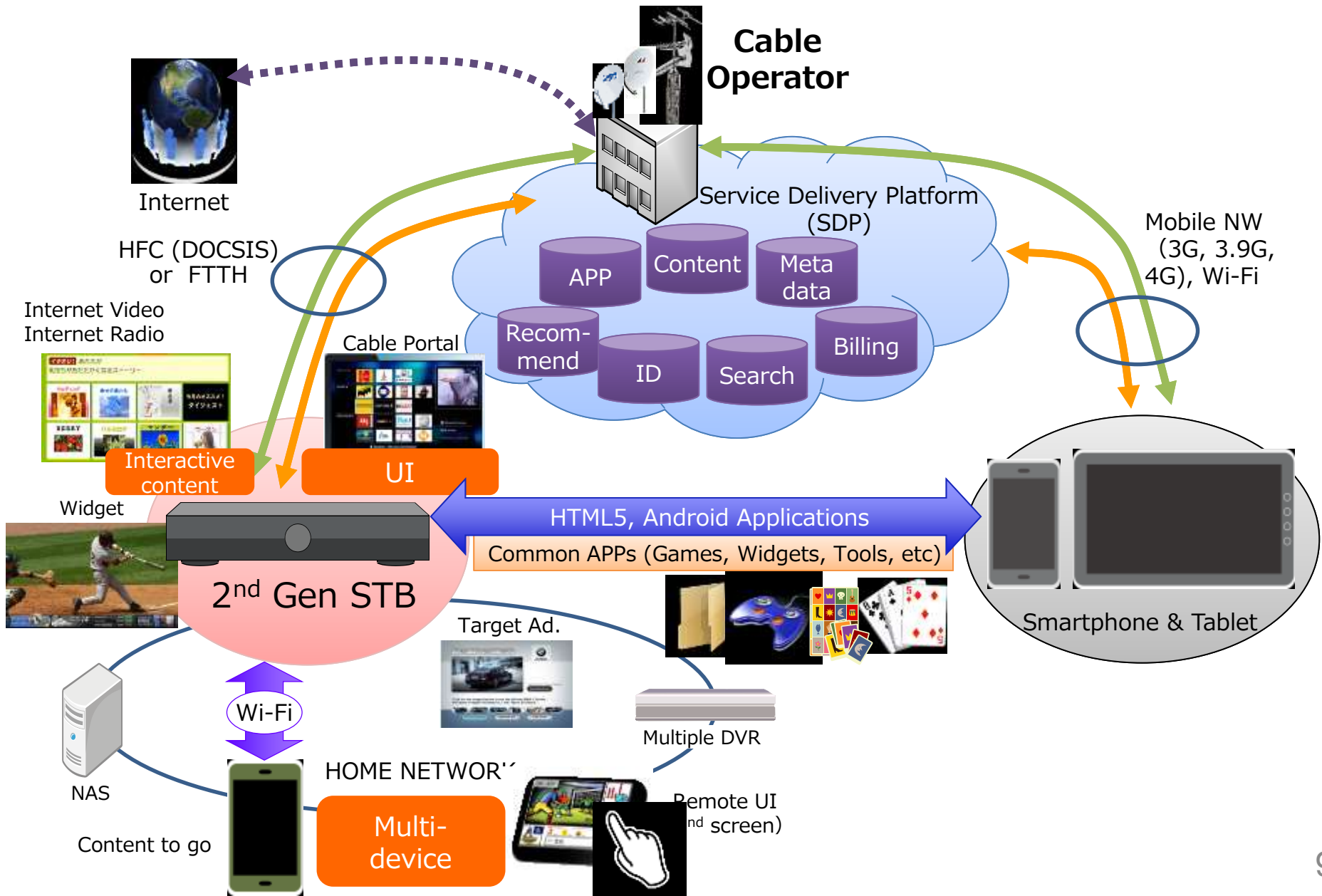


3rd Gen STB

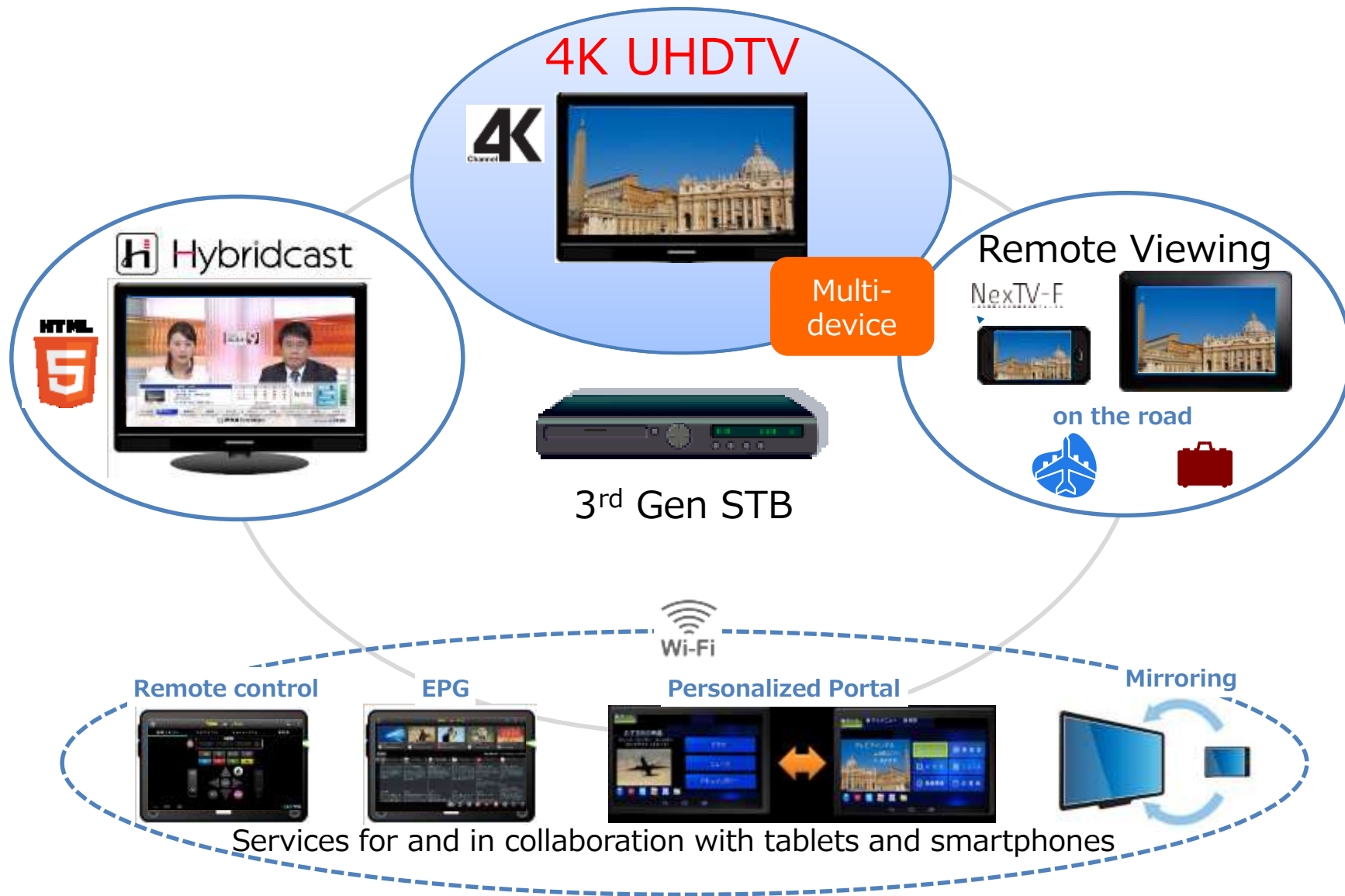
4K UHD TV

- 4K Video
- 5.1ch audio
- ITU-T J.297 (4K Cable STB)

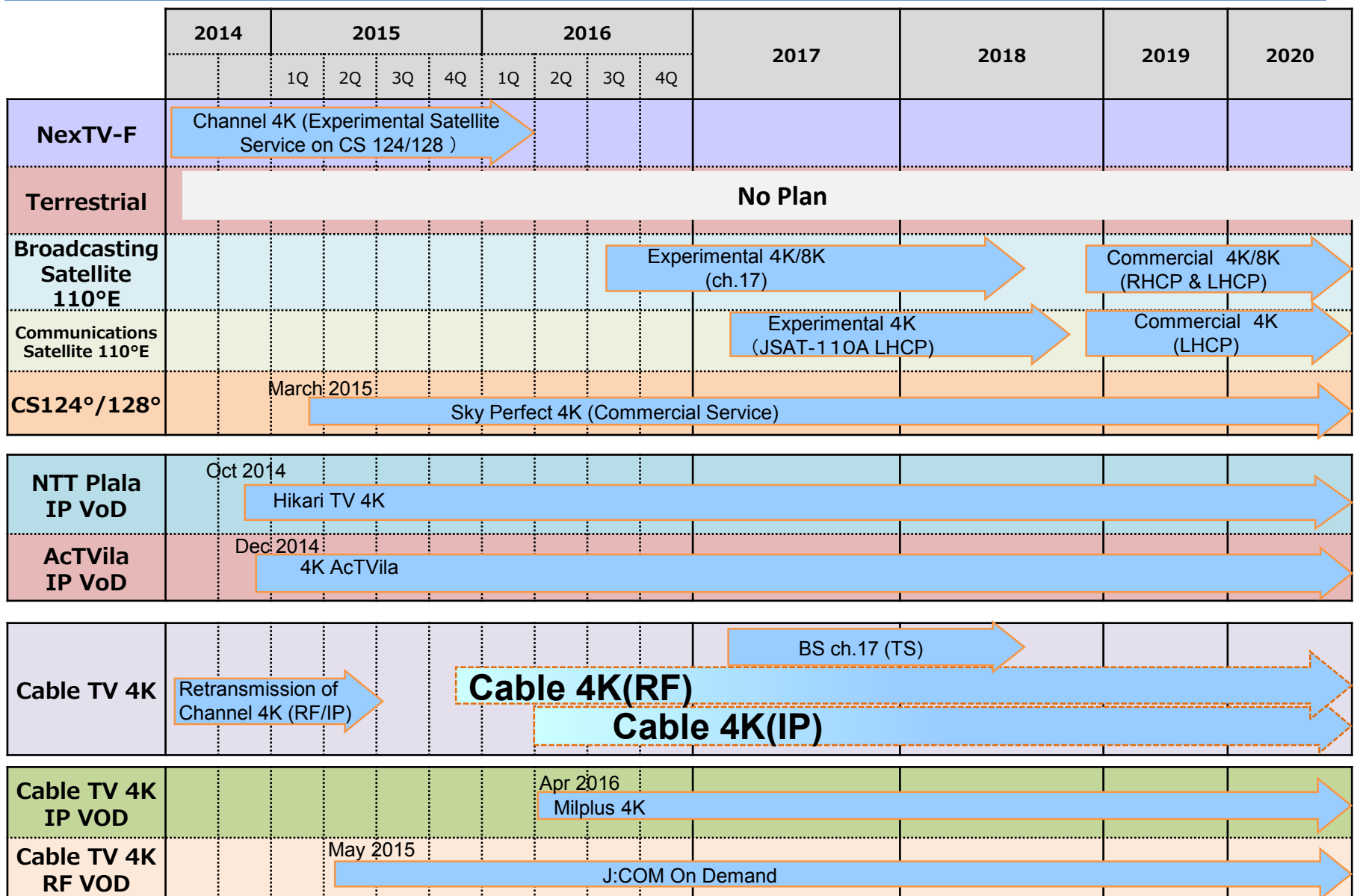
Smart TV services with 2nd Gen STB



3rd Generation STB



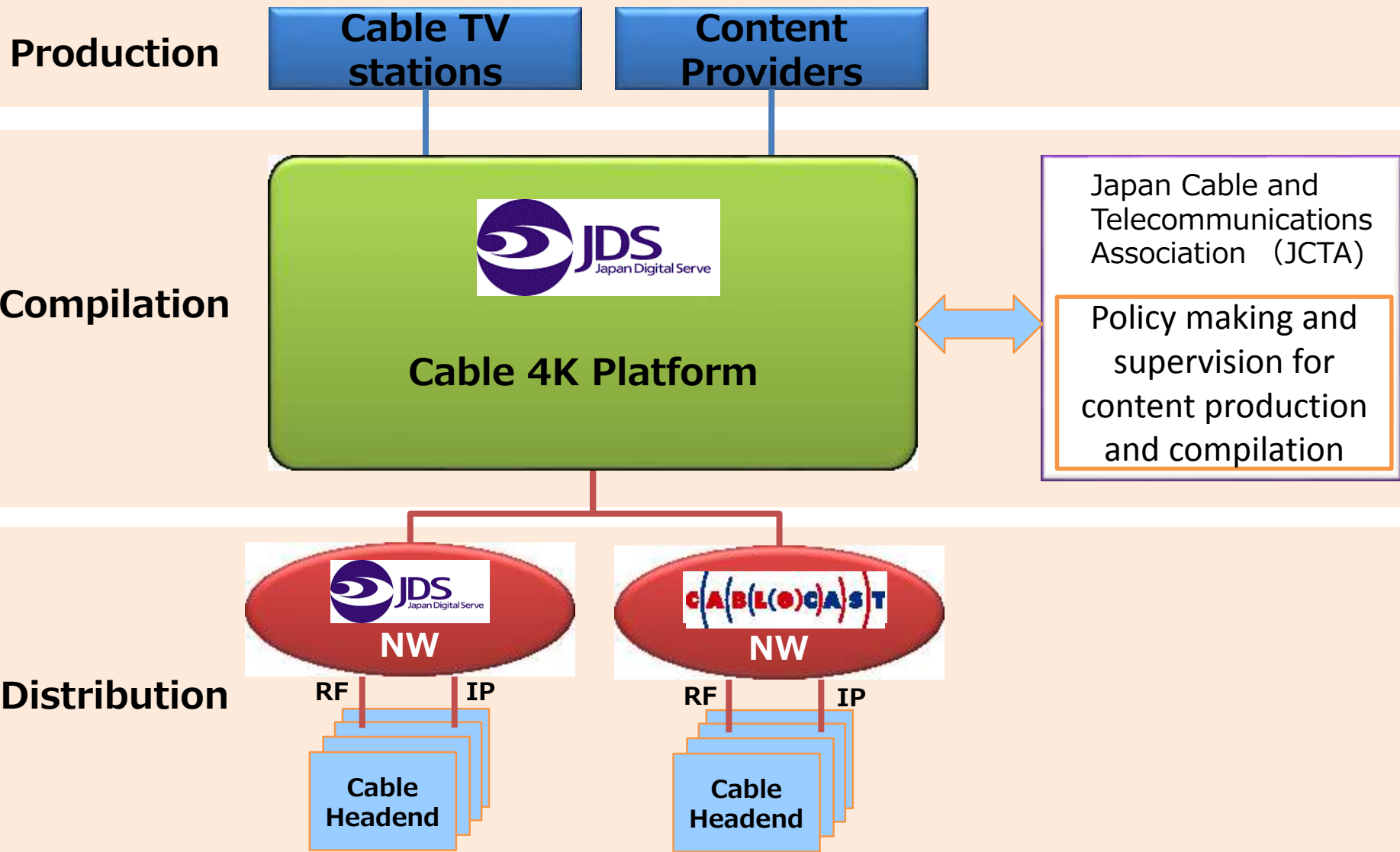
4K Services in Japan



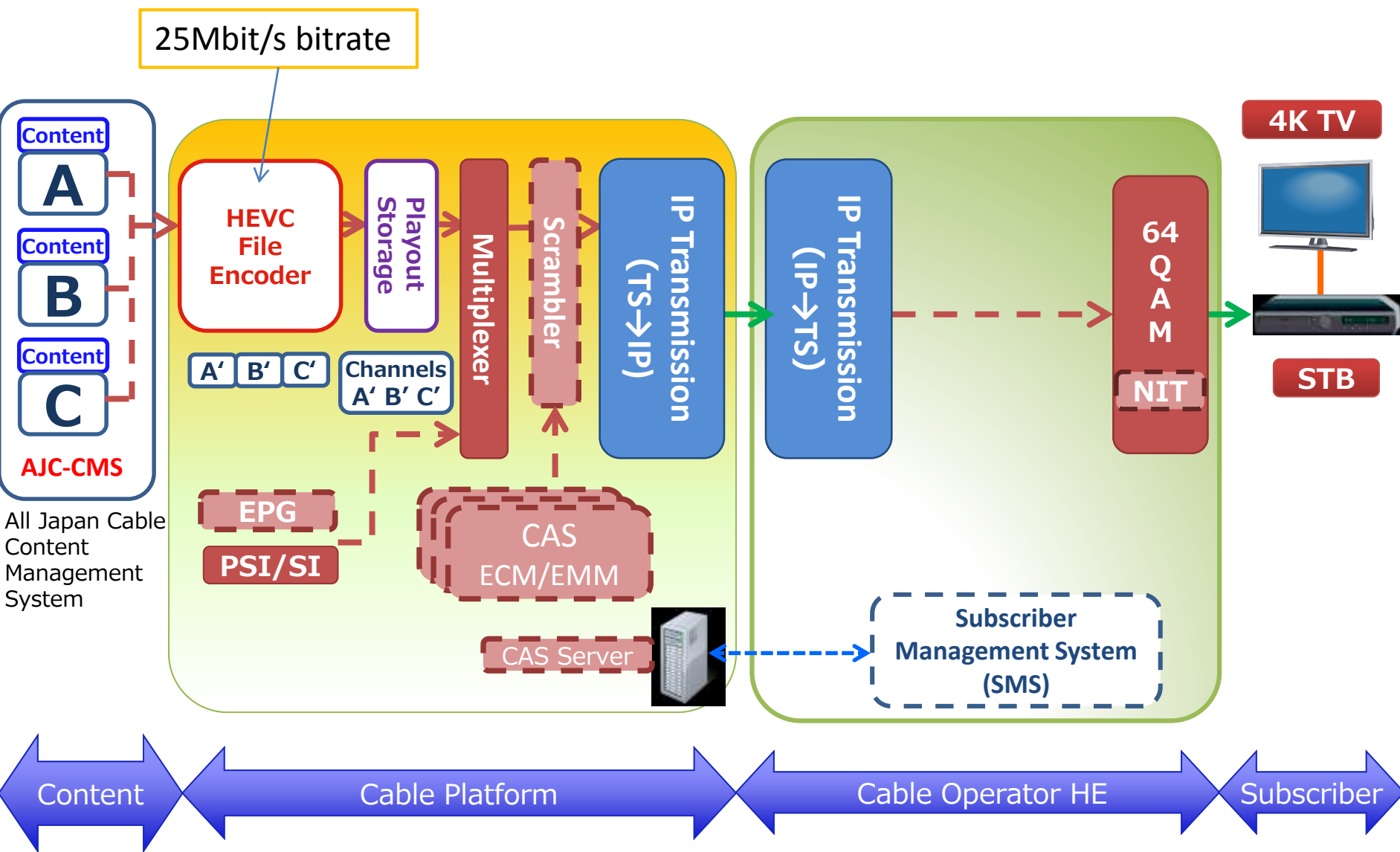
4K services supported by 3rd Gen. STB

- Cable 4K RF & IP
 - Cable 4K RF with 64 bit encryption
 - Cable 4K IP with Marlin CAS/DRM (AES128 encryption)
- New cable channels with AES 128 encryption (ACAS)
 - In anticipation of Hollywood 4K movies
- Retransmission of Advanced Satellite Broadcasting
 - AES 128 encryption (ACAS)
 - MMT (MPEG Media Transport) in place of MPEG2 TS
- IP VoD
 - MPEG DASH
 - Common Encryption Scheme (CENC) (ITU-T J.1005/1006)

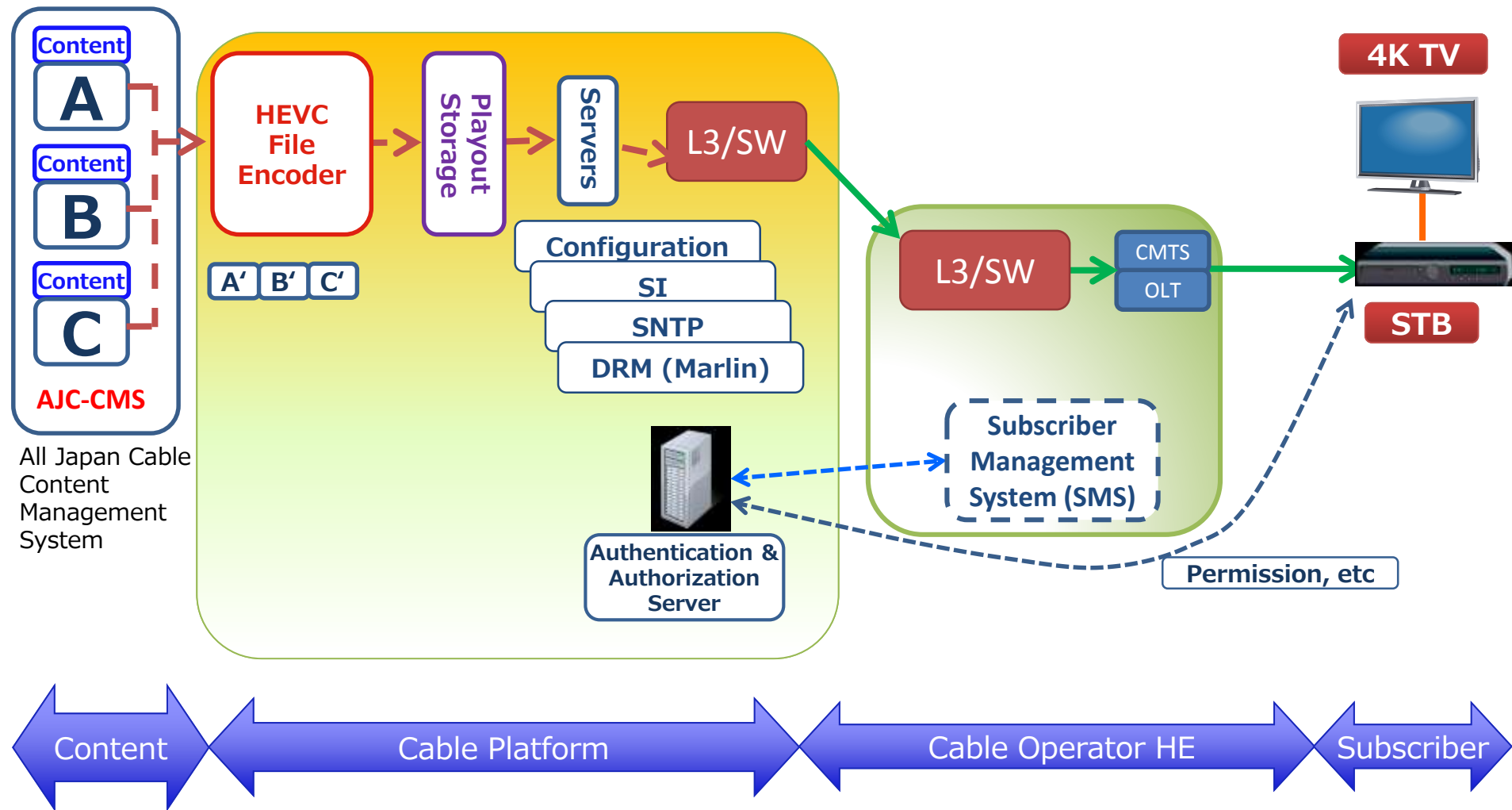
Cable 4K Content Distribution Scheme



Cable 4K RF Transmission System



Cable 4K IP Transmission System



New cables channels with AES128

- Use of ACAS (AES 128 Encryption)
 - This is in response to US MovieLabs Specification for Enhanced Content Protection, which defines the following, among others:
 - Use of a cypher of AES 128 or better
 - Can revoke and renew versions of client component
 - Provision of hardware root of trust (HROt)
 - The same CAS system as the Advanced Satellite Broadcasting (next slide)

- Use of H.265 HEVC and H.264/AVC
 - This enables up to four times more efficient bandwidth usage than the existing cable channels.

Retransmission of advanced satellite service

- Ten (10) 4K channels on Japanese Broadcasting Satellite (BS) starting in December 2018
 - Ten (10) 4K channels (6 on right-hand circular polarization (RHCP), 4 on left-hand circular pol (LHCP))
 - One (1) 8K channel on LHCP

- New equipment required to carry those services over cable:
 - HE and STB to send and receive MMT (MPEG Media Transport) replacing MPEG-2 TS
 - CAS system with 128bit AES (ACAS)
 - HDR TV (HLG)
 - For 8K, HE and STB capable of channel bonding scheme as defined in Annex A of ITU-T J.183

MMT (MPEG Media Transport)

- **ISO/IEC 23008 (March 2014)**
MPEG-H: High efficiency coding and media delivery in heterogeneous environments
- MMT is defined as Part 1 of MPEG-H
- MPEG-H suite includes HEVC (H.265) as Part 2

Part 1: MPEG Media Transport (MMT)

Part 2: High Efficiency Video Coding (HEVC)

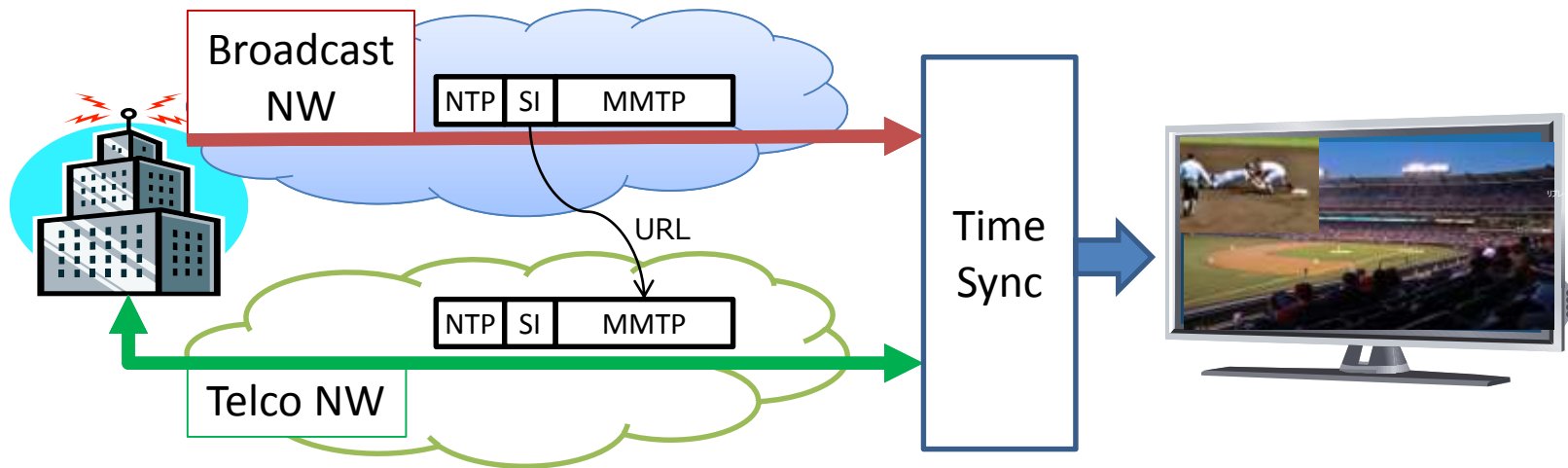
Part 3: 3D Audio

Part 10: FEC Codes for MPEG Media Transport

Part 11: Composition coding for MMT

Advantage of MMT

- MMT has the following features which overcome the shortcomings of MPEG-2 TS:
 1. Can synchronize streams from different sources (e.g. streams from broadcasting and broadband), using NTP
 2. Uses variable length packets – suitable for transporting high bit rate streams or large size files

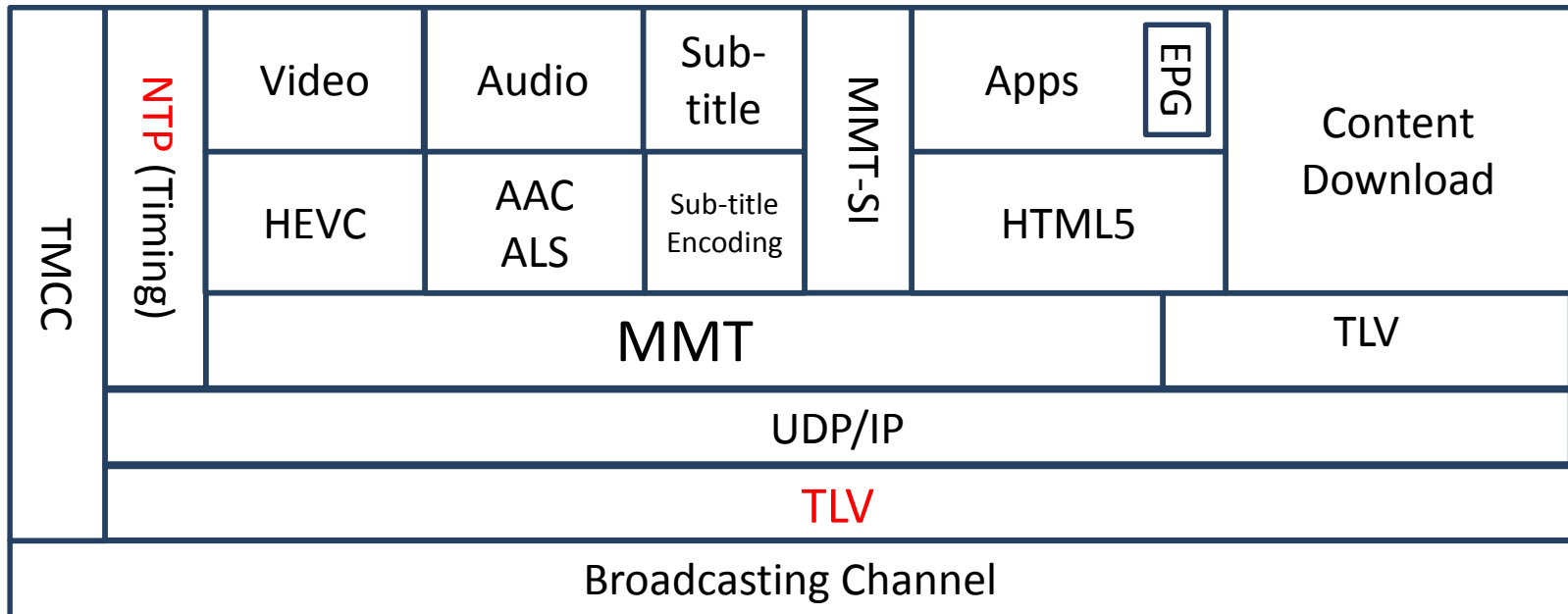


Example : Main video via broadcasting network, while videos from different cameras via telco network

MMT Protocol Stack

- MMT packets are annexed to IP header
- IP packets are multiplexed* using TLV (Type Length Value) for transmission over digital broadcasting channel

*ITU-R BT.1869

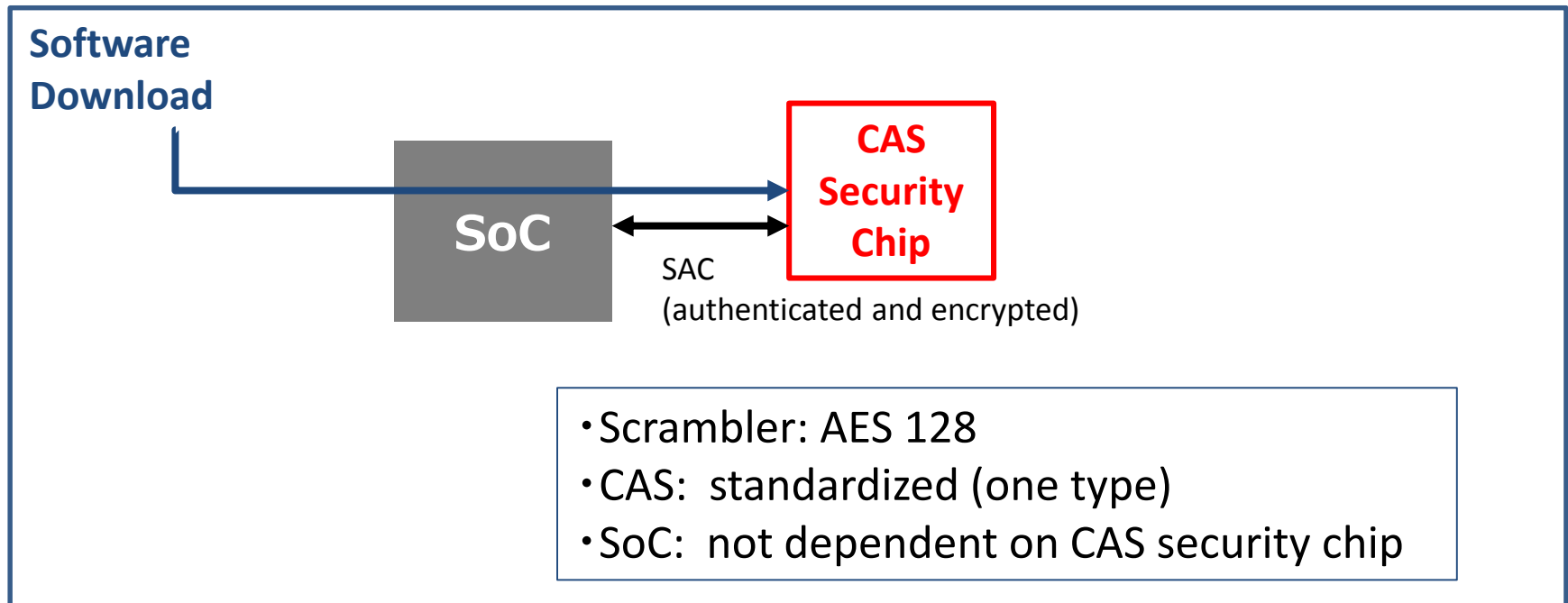


Source : ARIB STD-B60 “Media Transport on Digital Broadcasting”

TMCC: Transmission and Multiplexing Configuration and Control
(ISDB system parameters; not on cable channel)

Broadcasters' CAS Security Chip (ACAS)

- HRoT by means of a dedicated hardware chip
- Path between SoC and the CAS chip is securely encrypted
- CAS software renewable by software download



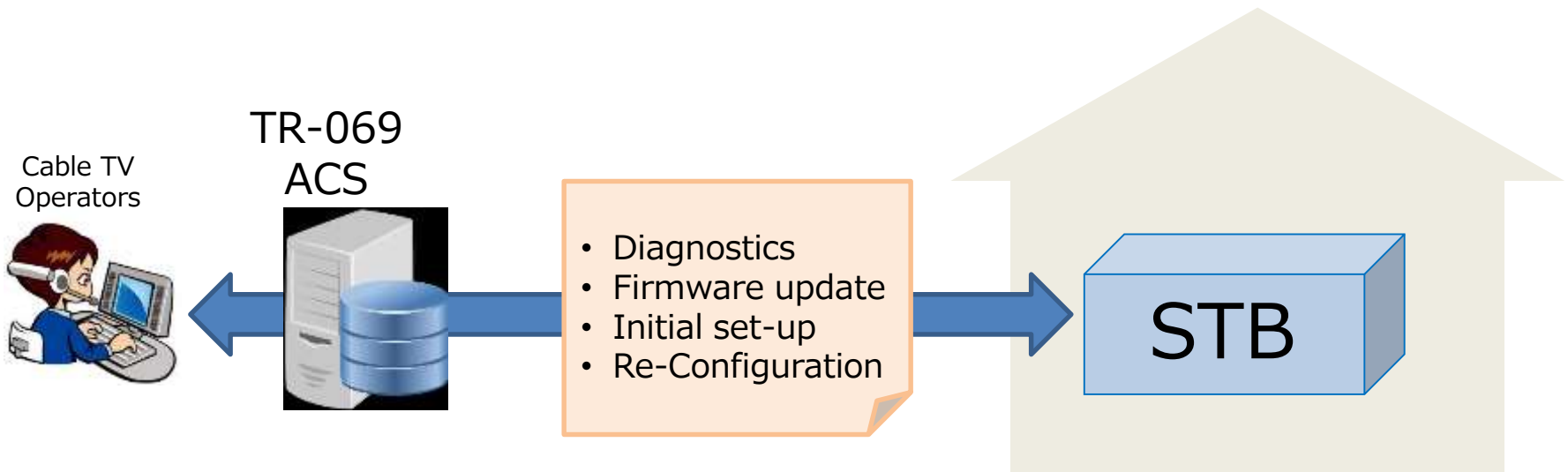
HDR (High Dynamic Range)

- HDR is a technology to extend the luminance of video signal
- Two main standards to define HDR transfer functions
 - HLG :Hybrid Log Gamma
 - PQ: Perceptual Quantization
- Japanese broadcasters will use HLG for the time being, with PQ for further study



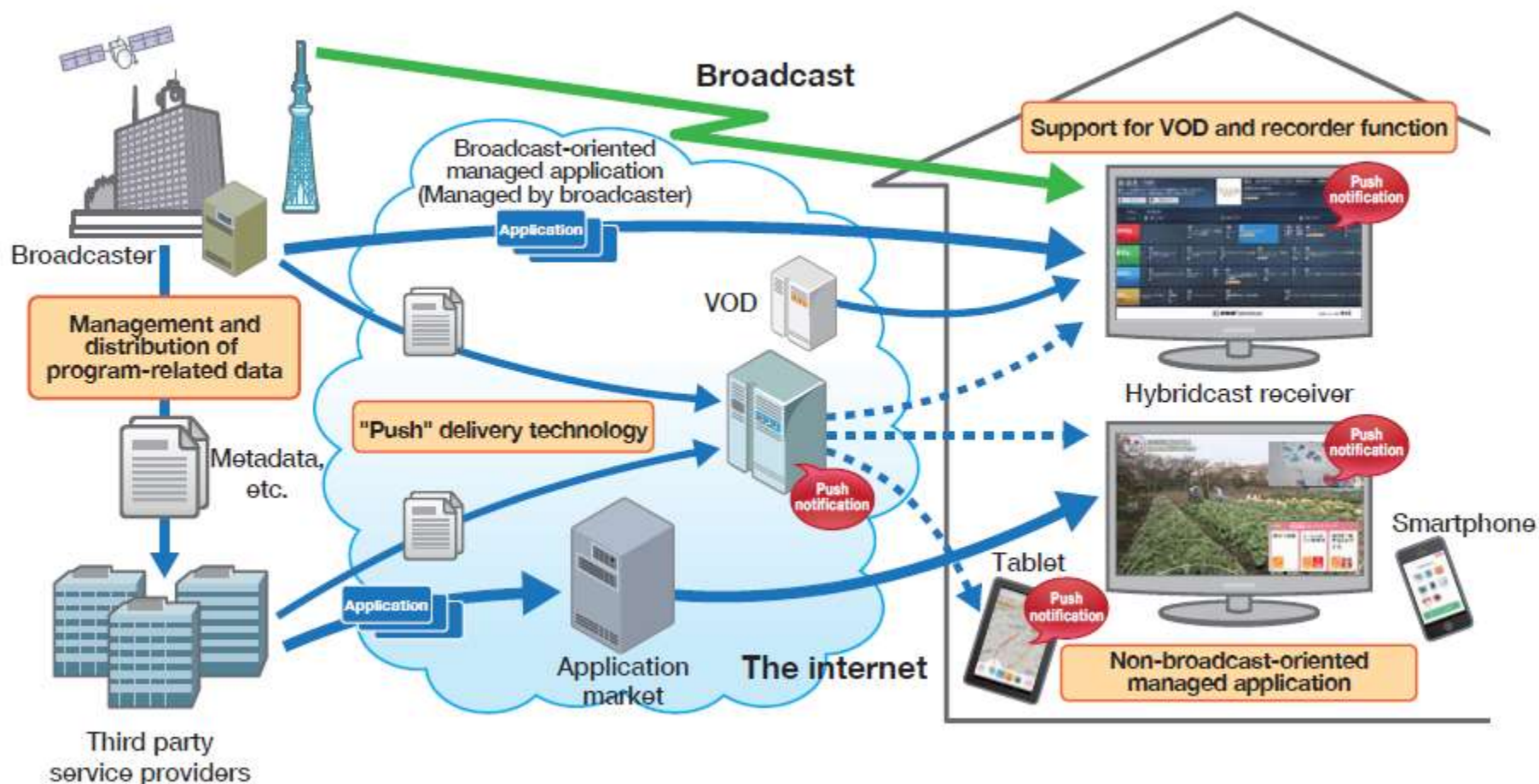
ACS (Auto Configuration Server)

- Using broadband Forum TR-069 (Technical Report 069: CPE WAN Management Protocol), cable operators can remotely configure and maintain STBs
 - Remote configuration
 - Diagnostics
 - Firmware update
 - Collection of audience measurement data



Hybridcast™

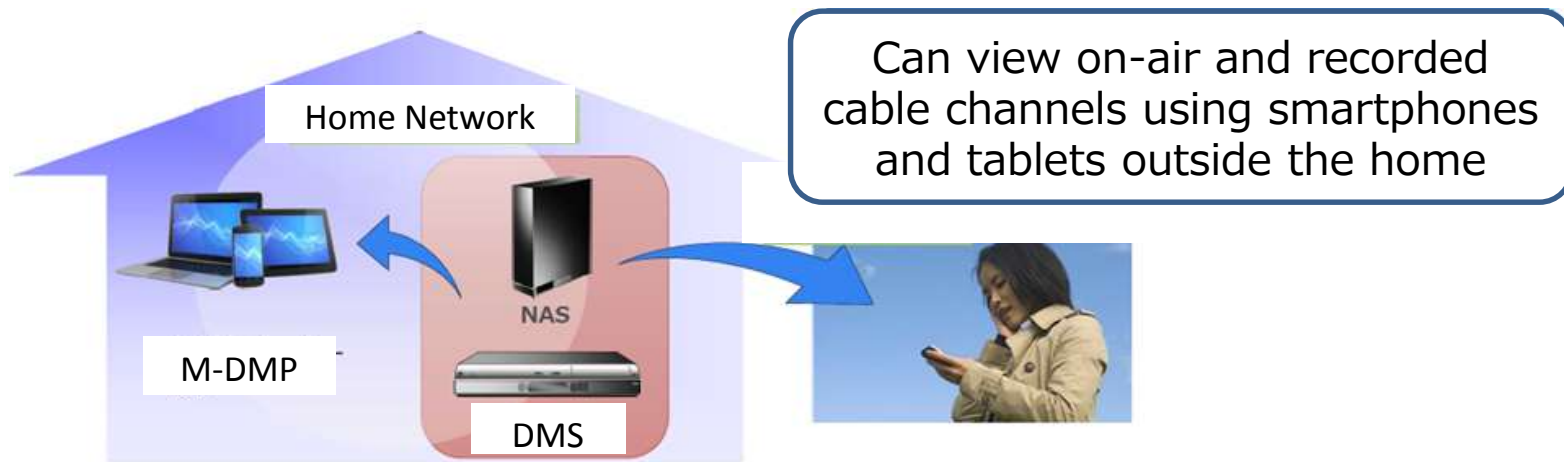
- Hybridcast is a Japanese equivalent of Europe's HbbTV (Hybrid Broadcast Broadband TV)



From NHK Science and Technology Research Laboratories web site

Remote Viewing

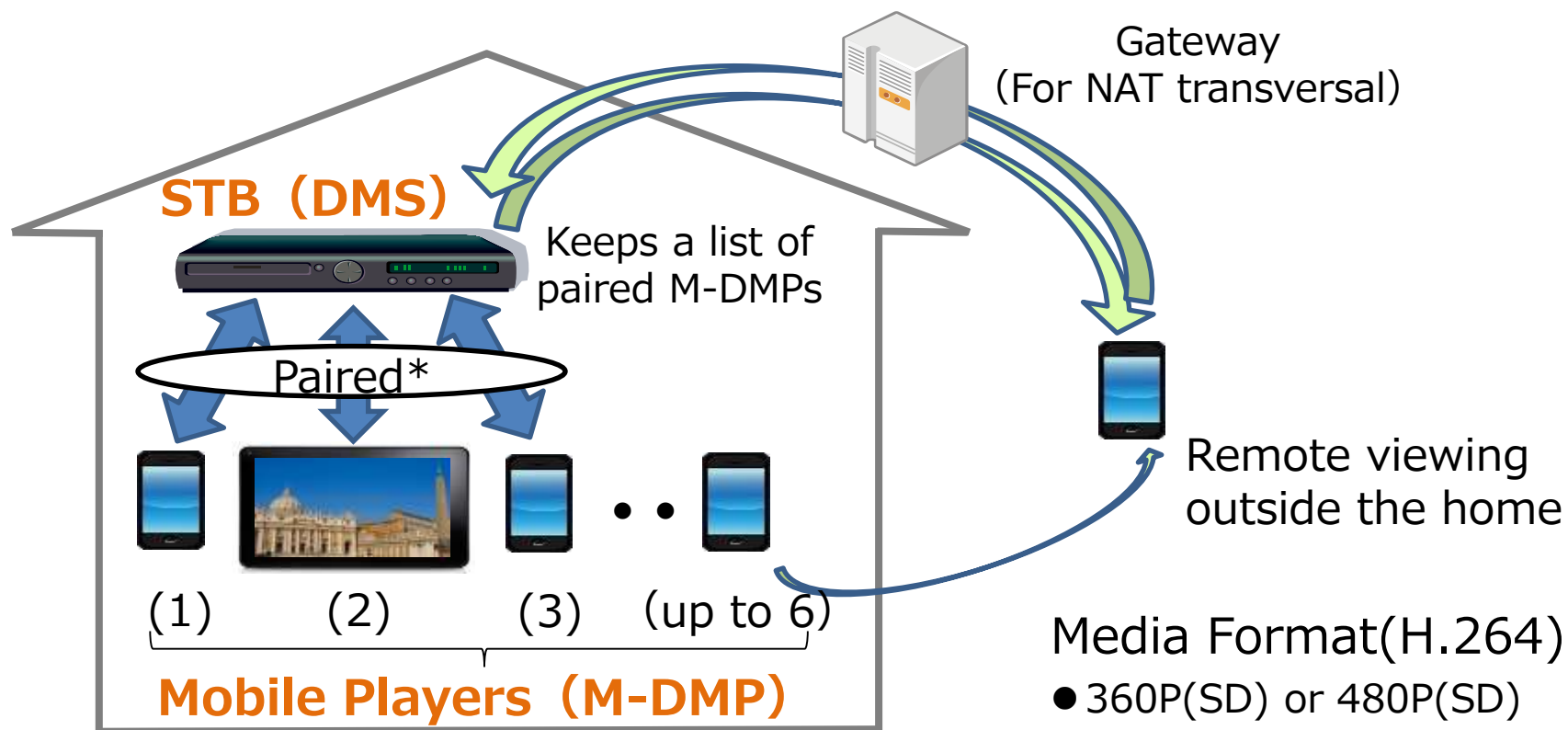
- Remote viewing is a service which enables Mobile Digital Media Players (M-DMP) such as smartphones and tablets outside the home, to view broadcasting content (real time and recorded) from Digital Media Servers (DMS) such as TV, STB and recording devices inside the home
- Requirements for remote viewing has been developed in consultation with Japanese broadcasters, and now documented in ARIB TR-B14 (in Japanese)



*Next Generation Television & Broadcasting Promotion Forum

Remote Viewing

- Mobile players must be paired with a digital media server (DMS) such as STB inside the home, before it is carried outside the home. Up to six players can be paired with a DMS but only one player can use this service at a time.

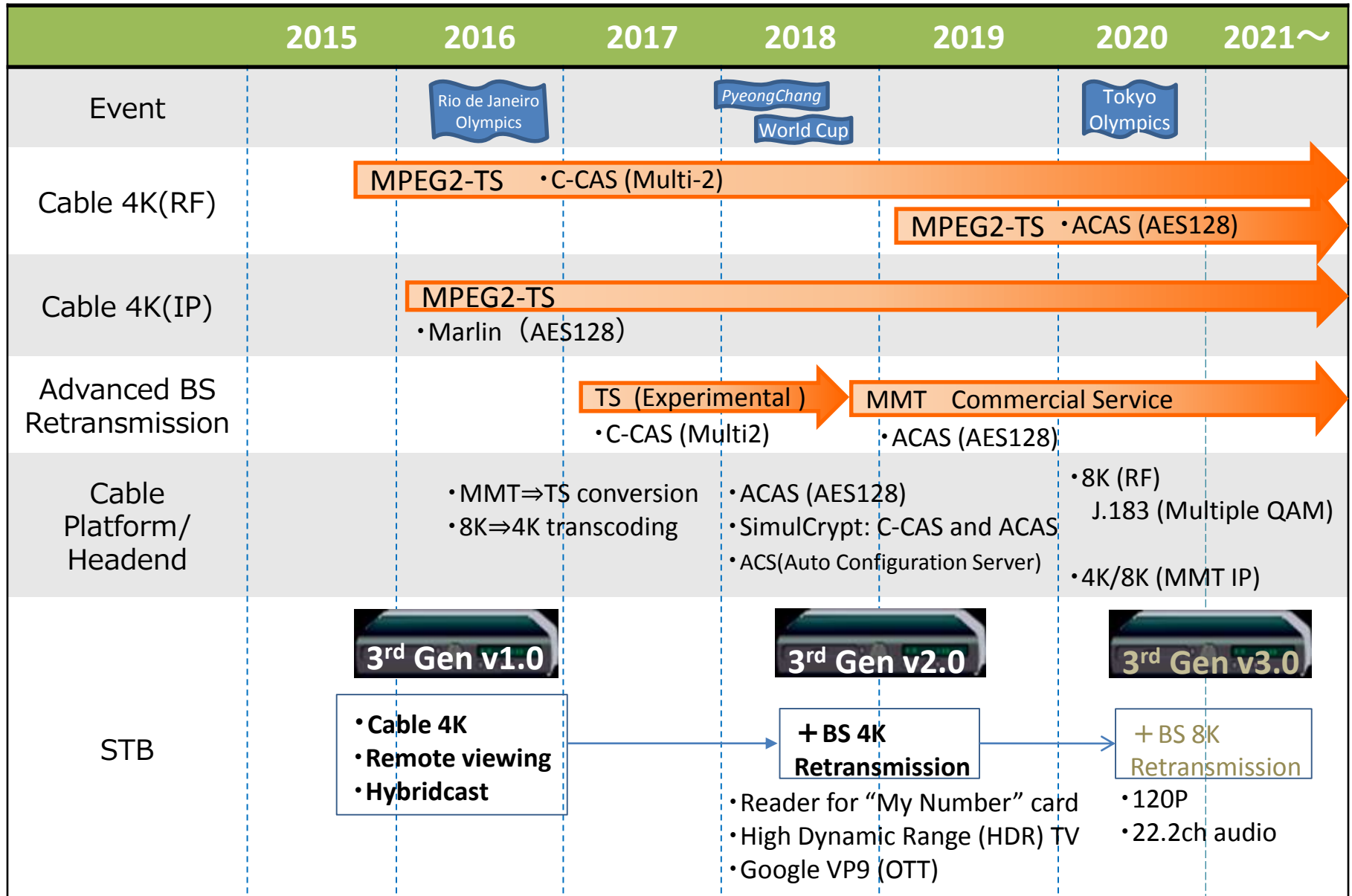


*Must be paired every three months

Media Format(H.264)

- 360P(SD) or 480P(SD)
- Optionally: 180P(SD), 720P(HD), 1080P(HD)

Cable STB Roadmap





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