Satellite Markets and Technology Trends 2017

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Satellite Broadcasting

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Outline

• What is Broadcasting?
• Information Engineering
  – Physical layer
  – Delivery
• Content/Media
  – What is it?
  – Value chain
  – Platforms
  – Industry
• Classification
• Services
• Summary
• RR 1.38 broadcasting service: A radiocommunication service in which the transmissions are intended for direct reception by the general public. This service may include sound transmissions, television transmissions or other types of transmission.
  – Radio Regulations (RR) of ITU
Information Engineering

- Channel capacity
- Shannon limit
- Sharing medium - Media Access Control - MAC
- TV – TDM
- DTH – FDM
- Mobile – CDM
- Fibre – WDM
- Air interface - LDM – Layered Division Multiplexing
- Air interface - WiB - a new system concept for digital terrestrial television (DTT) - wideband reuse-1

\[ C = B \log_2 \left( 1 + \frac{S}{N} \right) \]
Casting – Information delivery

- **Unicast** is the term used to describe communication where a piece of information is sent from one point to another point. In this case there is just one sender, and one receiver.

- **Multicast** is the term used to describe communication where a piece of information is sent from one point to a set of other points.

- **Broadcast** is the term used to describe communication where a piece of information is sent from one point to all other points. In this case there is just one sender, but the information is sent to all receivers.
Network Architecture

• internet - network of networks - enables P2P Communication (The Internet - public internet)

• Mobile/Cellular are networks - enables P2P Communication via BS (Base Station)

• Both above networks are not designed for broadcasting

• Mobile/Cellular networks - for unicasting
• Internet – for unicasting and multicasting
• Broadcasting NWs has been designed to broadcast – Radio, Television and Data Broadcasting (NWs are broadcast networks by design)
  – Generally, Architecture is high tower high power (with small Tx)
Content (Media)

- Radio
- Television
- New Media – Social media, VR, AR, ….etc.
- Text
- Voice
- Sound
- Video
- Film
- …..
• Complete chain from capture to receiver need to be digital to realise the full advantage of digital

• Visuals and audio are acquired using digital cameras
• Source and Channel encoding are done on video and audio data
• Digital receiver receives digitally processed signals
How to deliver and access media/content?

- Over-the-air (OTA) – most efficient
- Over-the-cable (OTC) – most secured
- Over-the-broadband or Over-the-top (OTT) – growing form of delivery

- How to access content?
  - Free-to-access
  - Pay-to-access
Content (Media) Delivery Platforms

- Terrestrial
- Satellite
- Cable
- IP/Broadband
Platforms - Quality Assured

Terrestrial, Cable, Satellite and now IP [Courtesy of NHK]
Media (Content) Industry

- Demographics – mixed – young and aging nations
- Geography – borderless – satellite and OTT
- Economic development
- Disposable income
- Growth
- Innovation
- NGTV - UHDTV (UHDTV-1 and UHDTV-2)
- NG Transmission standard? ISDB-S3, DTT 3.0
## Classification

<table>
<thead>
<tr>
<th>(Semi interactive) traditional broadcast networks</th>
<th>Video service with managed QoS</th>
<th>Video service with unmanaged QoS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td><img src="#" alt="Linear TV" /></td>
<td><img src="#" alt="Linear TV" /></td>
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<tr>
<td><img src="#" alt="DTTB/Sat" /></td>
<td><img src="#" alt="DTTB/Sat" /></td>
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<tr>
<th>(Interactive) integrated networks</th>
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<tbody>
<tr>
<td>Wired IBB</td>
<td><img src="#" alt="Linear VoD" /></td>
<td>OTT</td>
</tr>
<tr>
<td><img src="#" alt="DTTB Internet" /></td>
<td><img src="#" alt="DTTB Internet" /></td>
<td><img src="#" alt="OTT" /></td>
</tr>
<tr>
<td>Wireless IBB</td>
<td><img src="#" alt="Linear VoD" /></td>
<td><img src="#" alt="OTT - wireless" /></td>
</tr>
<tr>
<td><img src="#" alt="MTV 3/4G" /></td>
<td><img src="#" alt="MTV 3/4G" /></td>
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<th>(Fully interactive) duplex networks</th>
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</thead>
<tbody>
<tr>
<td>IPTV/HFC</td>
<td><img src="#" alt="Linear VoD" /></td>
<td><img src="#" alt="Linear VoD" /></td>
</tr>
<tr>
<td>CDN+Internet</td>
<td><img src="#" alt="CDN+Internet" /></td>
<td><img src="#" alt="CDN+Internet" /></td>
</tr>
<tr>
<td>Internet TV</td>
<td><img src="#" alt="Internet TV" /></td>
<td><img src="#" alt="Internet TV" /></td>
</tr>
<tr>
<td>OTT</td>
<td><img src="#" alt="OTT" /></td>
<td><img src="#" alt="OTT" /></td>
</tr>
<tr>
<td>Wireless OTT</td>
<td><img src="#" alt="Wireless OTT" /></td>
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DTV Standards

• ATSC - Advanced Television System Committee in USA
  – Currently in USA and Canada
  – Mainly Terrestrial standard, extended to other forms such as cable

• ISDB – Integrated Services Digital Broadcasting
  – Mainly in Japan, Brazil and some other south American countries
  – Extended to forms such as terrestrial, cable and satellite standard

• DVB – Digital Video Broadcasting
  – Most of the countries in the world
  – Developed through a consortium known as DVB in Europe
  – Many variants or forms of DTV operations

• DTMB – Digital Television Broadcasting System - China
Multimedia delivery techniques

Current multimedia delivery techniques across managed and unmanaged IP networks
An unified architecture

Unified architecture
Broadcasting in IP World

**MULTI-MEDIA TRANSPORT**

**PRODUCTION & CONSUMPTION**

**IEEE AND/OR 3GPP PHYSICAL LAYERS**

**BROADBAND INFRASTRUCTURE**

**IP**

**TCP (Bidirectional)**

**HTTP**

**DASH** (Dynamic Adaptive Streaming over HTTP)

**MPEG-2 SYSTEM Multiplexing**

**MPEG-2 Transport Stream**

**DATA LINK**

**IEEE AND/OR 3GPP PHYSICAL LAYERS**

**BROADCAST SATELLITE**

**BROADCAST CABLE**

**BROADCAST TERRESTRIAL**

**MPEG**

**AUDIO/VIDEO**

**H26X, OTHERS**

**DVBSIT**

**DVBS**

**DVBC**

**DVBT**

**HTML**

**TV APPLICATION** (interaction layer)
Broadcasting in UHD-2 world

Test broadcasting started on Aug. 1st, 2016

Specifications of UHD-2 8K Satellite Broadcasting

<table>
<thead>
<tr>
<th>Modulation</th>
<th>(\pi/2)-shift BPSK, QPSK, 8PSK, 16APSK, 32APSK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>12-GHz band</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>34.5 MHz</td>
</tr>
<tr>
<td>Compression</td>
<td>Video : HEVC Audio : MPEG-4 AAC</td>
</tr>
<tr>
<td>Bit rate</td>
<td>About 100 Mbit/s</td>
</tr>
</tbody>
</table>

[Courtesy of NHK]
# UHD-1 and UHD-2

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
<th>Broadcast Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Sochi Olympics</td>
<td>SHV Broadcast 4K/8K</td>
</tr>
<tr>
<td>2016</td>
<td>Rio Olympics</td>
<td>Test Satellite Broadcasting</td>
</tr>
<tr>
<td>2018</td>
<td>PyeongChang Olympics</td>
<td>Satellite Broadcasting</td>
</tr>
<tr>
<td>2020</td>
<td>Tokyo Olympics</td>
<td>Satellite Broadcasting</td>
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Commencement of 4K/8K broadcasting

- Start date: Dec. 2018
- Operation: BS, CS
- Service channel: 8K/60p 1ch, or 4K/60p 1ch for each broadcaster
- Gamut: WCG (BT. 2020), HDR(HLG) or BT. 709, SDR
- Broadcasters: NHK, 10 BS/CS commercial broadcasters
- Receiver: Consumer 4K/8K TV
Progress on SHV technology

2012
4K cable TV
4K IPTV

2016
4K/8K test broadcasting

2018
4K/8K broadcasting
Winter Olympics in Pyeongchang

2020
Summer Olympics in Tokyo
Summary

- Broadcasting is still the most efficient way to deliver content to masses
- Satellite broadcast play a vital role in the media delivery portfolio
- ISDB-S3 has been standardised as a technology for UHD-2
- Services are continually evolving DTH markets especially for UHD-1
Thank you for your patience
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