Statistical multiplexing of DASH segments in ATSC 3.0 system

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NEXT GEN TV?

- New Broadcast TV standards (ATSC 3.0)
- Hybrid Over The Air and Broadband
- Voluntary adoption
- No new spectrum
The Journey

ATSC 1.0

Challenges
1. No new spectrum
2. Mandatory Simulcast of ATSC 1.0 & 3.0 during 5 years (equivalent experience!)

Road Ahead
Channel Sharing & Lighthouse Concept

ATSC 3.0
NEXTGEN TV

Goals
1. Build consumer interest and excitement in ATSC 3.0
2. Maintain consumer satisfaction throughout the simulcast period
Finding the right balance might impact the user experience, unless...

- Adjust ATSC-1.0 service bit rates
- Eliminate some ATSC-1.0 sub-channels
- Use extra data capacity not currently being used in some ATSC-1.0 channels
- Employ latest modern compression and statistical multiplexing algorithms
... you have the right tools in the toolbox

01 Coding Efficiency
Core to clearing capacity for the lighthouse deployments is ATSC-1 stations to leverage best practices for core codec compression optimization

02 Picture Quality
Optimization based on picture quality is most efficient means to also adhering to FCC guidelines for maintaining consumer experience.

03 Rate Control
Core codec optimizations to be combined with maximum benefits of bit conservation of statistical multiplexing where, not all statistical multiplexors are alike

04 Innovation
Statistical multiplexing in the DASH domain requires new generation features.

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Optimize ATSC 1.0 Channels

to free up spectrum for the ATSC 3.0 Lighthouse

Advances in MPEG-2 core codec + Benefit from the latest Statistical Multiplexing techniques

up to 50% bandwidth savings while keep the same viewing experience

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ATSC 3.0 Lighthouse

More channels, better experience, interactive and personalized

Up to 4 sports channels using a traditional Constant Bitrate Encoding approach

HEVC DASH Statistical Multiplexing for ATSC 3.0
ATSC 3.0 Statistical Multiplexing – HEVC DASH

<table>
<thead>
<tr>
<th></th>
<th>1080p60 services In 22Mb/s</th>
<th>Constant Bit Rate</th>
<th>Variable Bit Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Now</td>
<td>4</td>
<td>6</td>
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</tr>
</tbody>
</table>

- HEVC Encoder
  - Encode
  - Encode
  - Encode
- MPEG-TS
- SDI
- SDI over IP

- MPEG-TS
- Adaptive TS
- DASH Packager
  - Package
  - Watermark
  - DRM
- Route Server
  - Encapsulate
- Broadcast Gateway
  - Schedule
  - BB Framing
- Origin Server
- CDN
- PHY
  - Modulate
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## ATSC 3.0 Statistical Multiplexing – Outcome

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- Migrate all main channels to ATSC-3.0
- Stunning experience with HEVC HD and AC-4 audio
- Launch new ATSC 3.0 services to attract more viewers

**Diagram:**
- Comparison of channel distribution across different stations and bit rate types.
- Station 1: Blue, Station 2: Blue + Grey, Station 3: Red, Station 4: Yellow, Station 5: Black + Red + Yellow

**Chart:**
- Year 2019 vs Year Now for channel distribution and bit rate types.
Launch new ATSC 3.0 services to attract more viewers

Accelerate 3.0 deployment

ATSC 3.0 tipping point
Maintain ATSC 1.0 experience
Increase customer experience
Accelerate time to ATSC 3.0 revenue
Conclusions

ATSC 1.0
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NEXTGEN TV

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