ATSC 3.0
An Introduction

Madeleine Noland, President, ATSC

JANUARY 16, 2019
NEXTGEN TV SUMMIT
SMPTE – SBE – WETA
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and the support of our host, WETA Television
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[telestream logo]

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Tom Hackett Diversified Systems
Melissa Davis Evertz
Louise Shidler Chesapeake Systems

Maciej Ochman CPB
James Snyder US Library of Congress
Nephi Griffith BMG
Greg Smalfelt Ch 16 Fairfax
Alex Snell BCI Digital
Peter Wharton Happy Robotz

WITHOUT THEIR VOLUNTEER EFFORTS THIS SUMMIT WOULD NOT BE POSSIBLE
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<td>Michael Bouchard, VP Technology Strategy, ONE Media / Sinclair</td>
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<td>Stacey Decker, CTO, Public Media Group</td>
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Key Advancements in 3.0

- **Additional capacity**: More channels, more pixels
- **Better reception**: Indoor, vehicles, mobile
- **Hybrid OTA and OTT**: All IP-based system
- **Enhanced consumer experience**: Improved video and audio quality, improved accessibility, interactivity, advanced emergency alerting
- **New business models**: Advanced advertising, PPV and subscription services, service usage reporting, datacasting

Powered by ATSC 3.0
Bit Interleaving, Coding, and Modulation Performance

- Shannon Limit
- ATSC 3.0, QPSK
- ATSC 3.0, 16QAM
- ATSC 3.0, 64QAM
- ATSC 3.0, 256QAM
- ATSC 3.0, 1024QAM
- ATSC 3.0, 4096QAM
- ATSC 1.0

A/53

Low Capacity, More Robust

High Capacity, Less Robust
ATSC 3.0 Single Frequency Networks

- HPHT and LPLT
- Extends coverage into shadow areas
- Enables mobile
- Increases robustness/capacity

Radio Horizon

Powered by ATSC 3.0
ATSC 3.0 Mobility

Showcase for ATSC3.0 UHD Mobile During PyeongChang 2018 Winter Games

HD mobile on the autonomous shuttle (NAB-2018, Las Vegas)
ATSC 3.0 Transport Layer – IP Backbone

IP Transport is used for broadcast delivery of both streaming and file content

Broadcast

- MPU Player/Decoder
- EME/CNEC (MPU (ISO BMFF))
- MMTP
- LLS (SLT)
- HTTP Proxy

Broadband

- DASH Player/Decoder
- EME/CNEC (DASH Segment (ISO BMFF))
- NRT File Delivery

Applications (HTML5/JavaScript)

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NEXTGENTV

POWERED BY ATSC 3.0
ATSC 3.0 Security Features

Studio-to-Transmitter Link
- Secure path to the transmitter

Signed Signaling Tables and Apps
- Receivers can validate the source of the emission

Content Encryption
- Protects content
- Enables new business models such as:
  - Subscription services
  - “Freemium” services (i.e., content is free, but viewers must register)
  - Pay-per-view
  - Based on CENC
ATSC 3.0 Video

Resolutions up to $3840 \times 2160$

Spatial scalability (SHVC)

High Frame Rate

- Up to 100, 120, 120/1.001 (plus lower framerates)
- Temporal sub-layering enables backward compatibility
- Plus temporal filtering for optimizing both the SFR and HFR pictures

High Dynamic Range

- PQ & HLG transfer functions (plus SDR)
- Metadata for PQ

Wide Color Gamut

- Wide Color Gamut BT.2100 (plus BT.709 for SDR)
- $Y'$$C_B$$C_R$ non-constant luminance
- $IC_I$$C_P$ constant luminance (for PQ)
- Full Range coding (for PQ)
- SL-HDR1 for delivering SDR/709 stream that SL-HDR1-capable decoders can render as HDR/2020
ATSC 3.0 Audio

Two Next Gen Audio Systems
- MPEG-H
- Dolby AC-4

Dialog Enhancement

User-selectable Audio Tracks
- Alternate languages
- Alternate sports commentary
- Video description services

Immersive Sound
- Sensation of sound comes from all around and above the listener
- Works on soundbars, headphones, and a variety of speaker configurations

Dynamic Range Control

Improved Coding Efficiency
- Four complete presentations can be sent at ~384kbps
- E.g., English and Spanish dialog with English and Spanish VDS
ATSC 3.0 Interactivity

Describes the conceptual application operating environment

Standard W3C User Agent – HTML5, CSS & JavaScript

Supports seamless, secure delivery of interactive content from broadcast and broadband

Provides a separate, unique context for each application

Defines a WebSocket API to manage the receiver features

The system is based on standard web technologies. It works in a browser.
ATSC 3.0 Advanced Emergency Information

Deliver rich media such as video, web pages, etc.

Target messages by geo-location and more

Update or recall messages as needed
Datacasting as a Service

ATSC 3.0 is a large digital data delivery pipe

Operation as a wireless nationwide data delivery network is possible

Terrestrial broadcast can compete with other data delivery networks on price and service level for one-to-many use cases

It’s not just about television any more
Thank you

ADVANCED TELEVISION SYSTEMS COMMITTEE
INFO@ATSC.ORG
MNOLAND@ATSC.ORG
FROM THE SMPTE WASHINGTON DC SECTION

THANK YOU