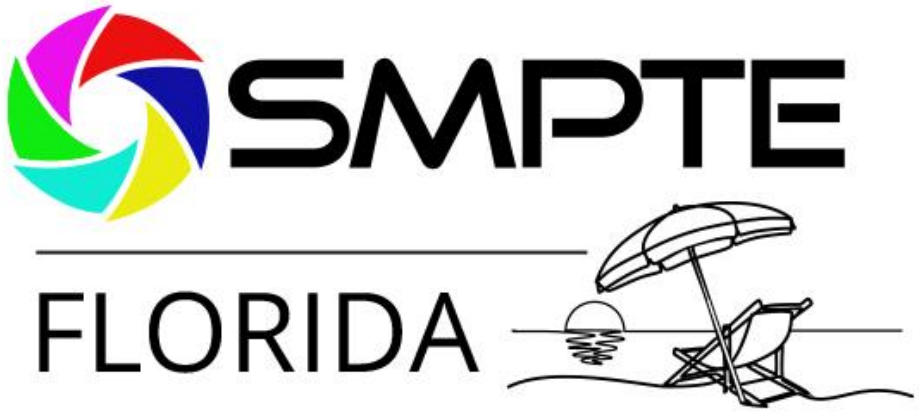
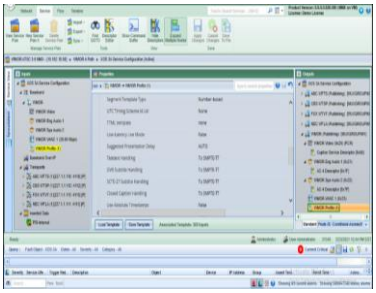


The home of media professionals, technologists, and engineers

1

2



ATSC 3.0 Next Gen TV in Florida

Agenda

- Opening Remarks by Frank Torbert, SMPTE Section Chair
- Overview – Joe Addalia, Hearst Television & SMPTE Florida Mgr.
- Planning and Coordination – Brian Darragh, WMOR-TV
- Intra-market Connectivity – Alan Young, LTN Global Comm.
- Encoding and VQ – Joel Wilhite, Harmonic
- High Dynamic Range – Ian Macaulay Dolby
- New Audio Features – Larry Schindel, Linear Acoustic
- Signaling and DASH – Dave Catapano, Triveni
- Using the Internet for a STL– Phil Whitebloom, VideoFlow
- A3SA and A3FA, What are they? – Pete Van Peenen, Pearl TV

SMPTE FLORIDA
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3

Overview

Joe Addalia– Hearst Television

4

ATSC 3.0 Next Gen TV in Florida

Overview

- Features
  - Great Pictures: HDR, WCG and 4K
  - Superior Audio: Immersive Surround, Enhanced Dialog
  - Secure Broadcasting
  - Non-Real-Time: Merges Internal and OTA Delivery
- How Do We Get There
  - No Second Channel
  - ”Lighthouse” Concept
    - One Channel to Carry the Load
    - Expand to Group of Channels
    - Ultimately Leading to a 1.0 Lighthouse
- https://www.watchnextgentv.com

Tampa DMA Lighthouse

Brian Darragh, WMOR-TV – Hearst Television

WMOR-TV Tampa, Florida

Tampa DMA Lighthouse

- WMOR was set up in a good position to support the ATSC 3.0 conversion, repack enhancements include new Gates Air ULXTE 100, pair of Maxciva Exciters, New Main Antenna, and Aux Antenna system.
- As an Independent TV Station (ATSC 1.0) WMOR has a very strong UHF OTA Signal that supports many cost-conscious OTA Viewers, a vocal MeTV Audience and Estrella TV.
- Special Thanks to Tom Mikkelsen of Bitpath for scheduling all the planning meetings, documenting the changing status, and making this a Tampa Market project not a WMOR project.

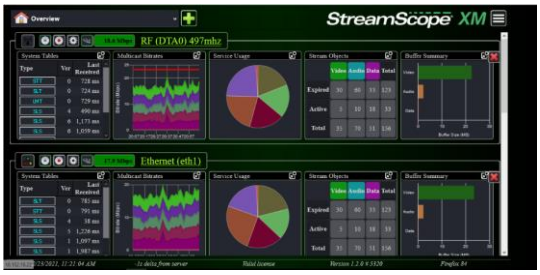
WMOR-TV Tampa, Florida

December 1, 2020 ATSC 1.0 OTA Signal

- Task: Send all our streams to 3 different television stations and they will mux them into their current pools and transmit them Over The Air in ATSC 1.0.
  - The Three ATSC 1.0 services delivered to the 3 partner stations.
    - Bit rates, Closed Captions, SAP channel, CALM Compliance
    - “Do No Harm” to the current broadcasts
  - New source monitoring infrastructure designed and installed.
  - Intercompany communication trees needed to be documented.

WMOR-TV Tampa, Florida

ATSC 3.0 Lighthouse, Trust but Verify



- Establish methods to monitor Signals
  - Incoming LTN IP Stream
  - GuideBuilder output
  - Gateway output
- Test and Convert the “New Rig” into a “New Signal”
  - Very few tuners can decode
  - All test gear is new and cutting edge (may not work)
  - Current only method to view decoded captions is on a television.
- Role is sort of a referee!
- All the outbound ATSC 3.0 services must have the same “Standards and Practices” as ATSC 1.0 + New Features

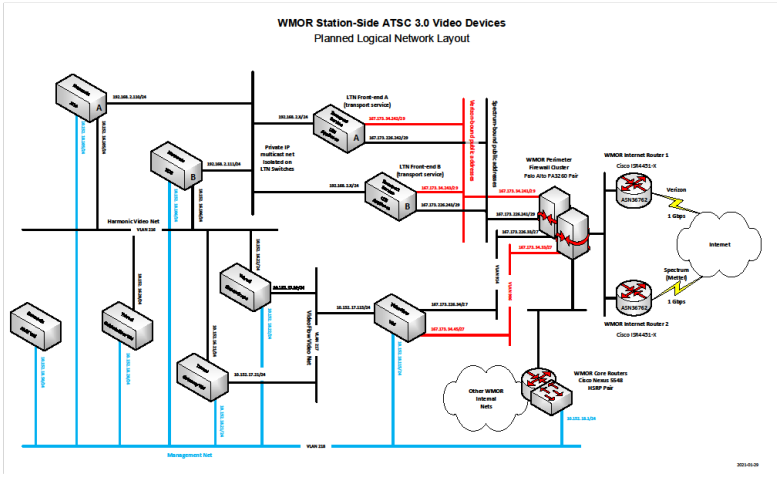
WMOR-TV Tampa, Florida

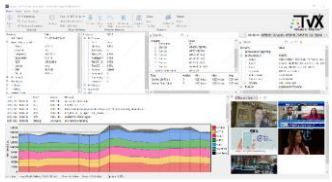
Post Deployment Items to Note

- First issue viewer education phone calls and emails (mostly from MeTV Audience) about rescan and antenna selection. Broadcast is now dependent on the partner signal gain and coverage.

- The gift that keeps giving, like herding cats, seems every change made to the systems can trigger an increase in errors, basically having to start over the trouble shooting process.

- Cannot rest on a version of software, constantly changing and trying to implement new features.



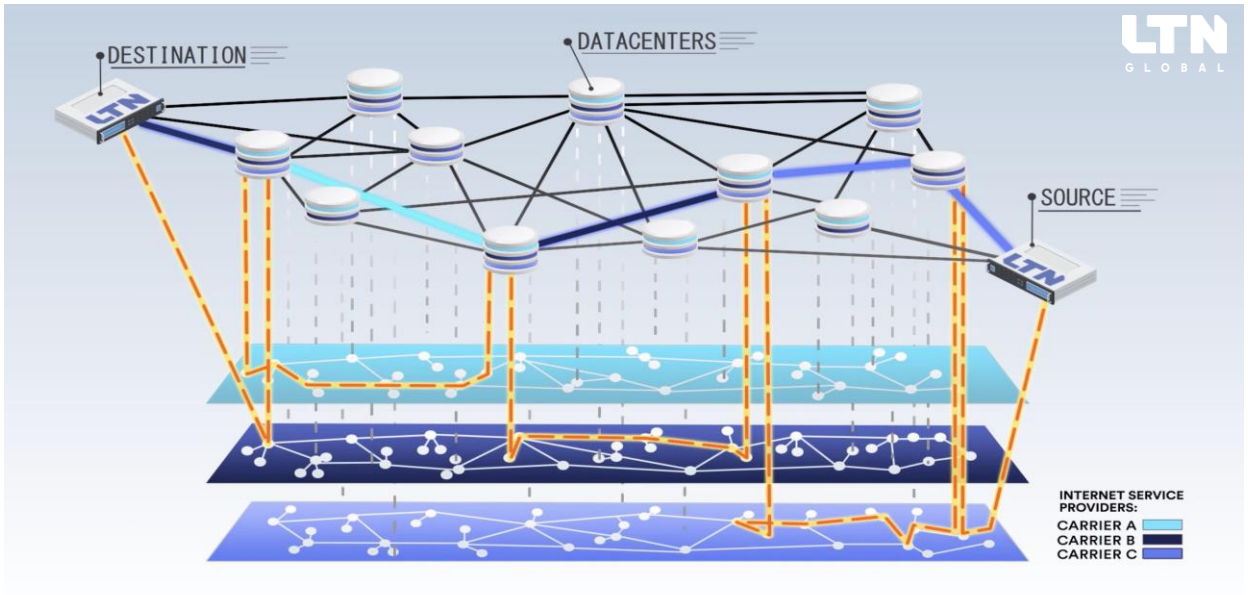


Intra-Market Connectivity

Alan Young
LTN Global Communications

Robust intra-market connectivity is a must

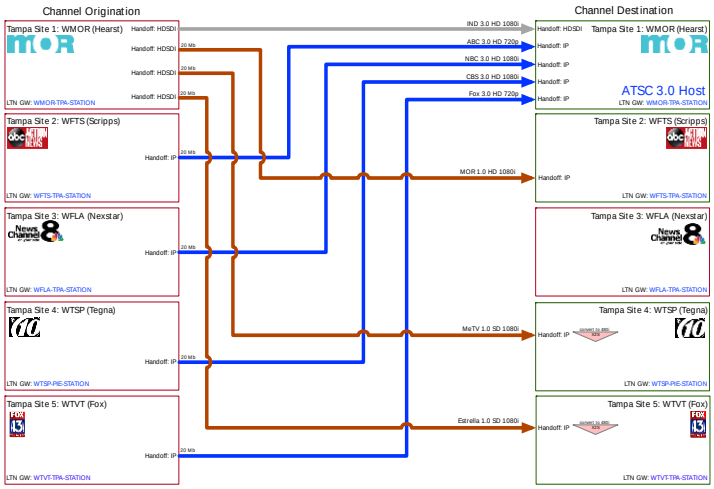
- ATSC 1.0 feeds from the ATSC 3.0 host need to be distributed to the other stations in the market; all stations in the market need to distribute their feeds to the ATSC 3.0 host for broadcast
- This all needs to be done with very high reliability and low latency in a cost-efficient manner, so LTN provides a fully managed, end-to-end intra-market connectivity service over our all-IP network — ***11 markets have been completed and seven more are in the pipeline***
  - Baseband video is encoded into IP and vice versa as required
  - All equipment is provided and managed by LTN
- LTN's intra-market connectivity service uses the internet but does not *rely* on the internet
  - FEC/ARQ on every hop results in ***low latency***
  - Dynamic Multicarrier Routing results in ***very high reliability***
  - 'Plain old internet' (ISP) last-mile connectivity results in ***cost efficiency***



Tampa market

Deployment date Dec 1, 2020

- Approximately two weeks prior to launch, all parameters for LTN Transport services were finalized
- Late-stage onboarding process focused on testing bandwidth and end-to-end connectivity
- LTN provided a launch day multi-viewer that included video, audio bars, and closed captioning for all channels
- LTN architecture, project management and onboarding teams were all actively engaged in launch-day activities
- LTN engineers actively participate in weekly post-launch calls as required



The Road Trip
ATSC 3.0 + 1.0

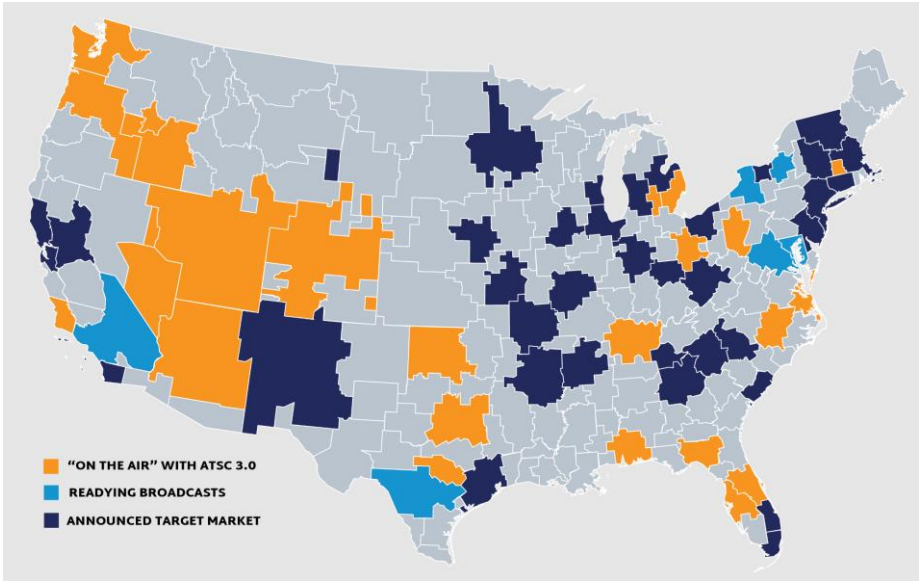
THE PATH LEAST / LAST TRAVLED

Joel Wilhite, Harmonic

ATSC 3.0

The march forward continues

www.atsc.org



ATSC 3.0

The ATSC 3.0 Feature Set/ Roadmap

Repack set the stage for spectrum consolidation leading up to the installation of ATSC 3.0 and will include technology to support new and innovative use cases. The reason for this is ATSC 3.0 leverages 3 main elements…

Transmission Technology – 3.0 specification **A/321** and **A/322** make a very compelling case making VHF making it useful again, includes **station bonding** and supports **SFN** and **MIMO** so the doors are open to ultra portability, and could run on a smart phone equipped with 5G. The horsepower of the specification follows the Shannon curve.

Information Technology – 3.0 is based on **DASH** and or MMT but in either case, the DASH specification is used for Internet streaming and now for broadcast delivery too. CMAF and CPIX are in the pipeline

Technology Advantages – HEVC, HDR, DRM, DAI, HFR, UHD 4k, Hybrid Delivery, Watermark, 5.1.4 audio, and of course EAS, AEAS, ABR multiplexes, Datacasting…

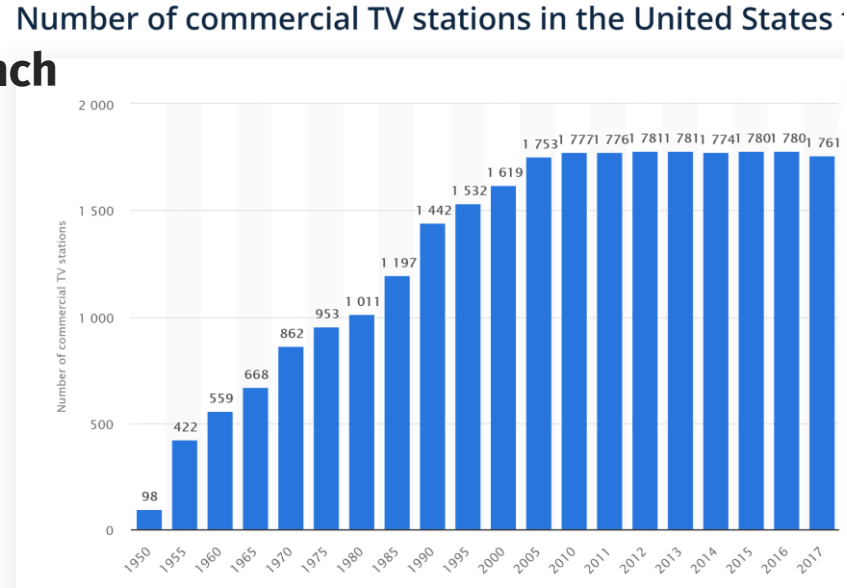
This is your new portable television… in HDR too!

Please note – we know consumers who still run “coupon receivers” to this day.

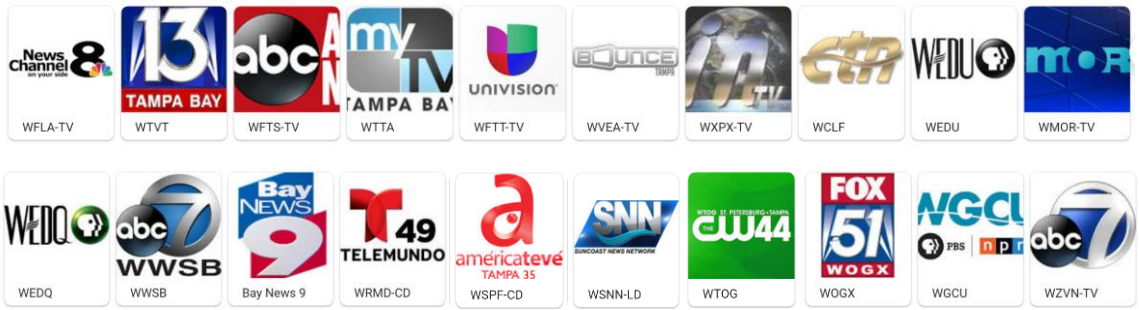
ATSC CHANNEL SHARE

Spectrum Crunch

For 55 years, the growth of the television market was predictable. But then in 2009 the trend stopped cold with the completion of the reverse auction and repack.

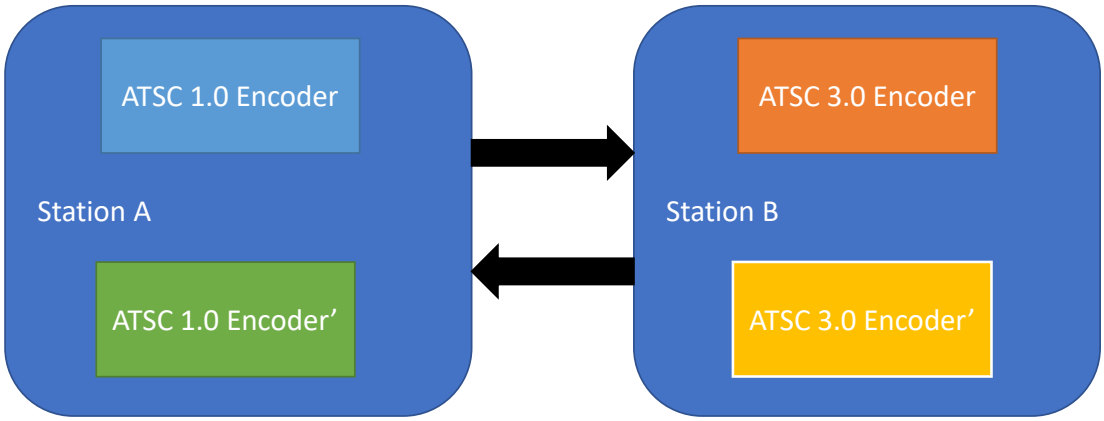


Channel sharing makes 3.0 fit in Tampa...



Now think about the New York, Los Angeles and Chicago?

Channel Share



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HDR in ATSC 3.0

Ian Macaulay, Dolby

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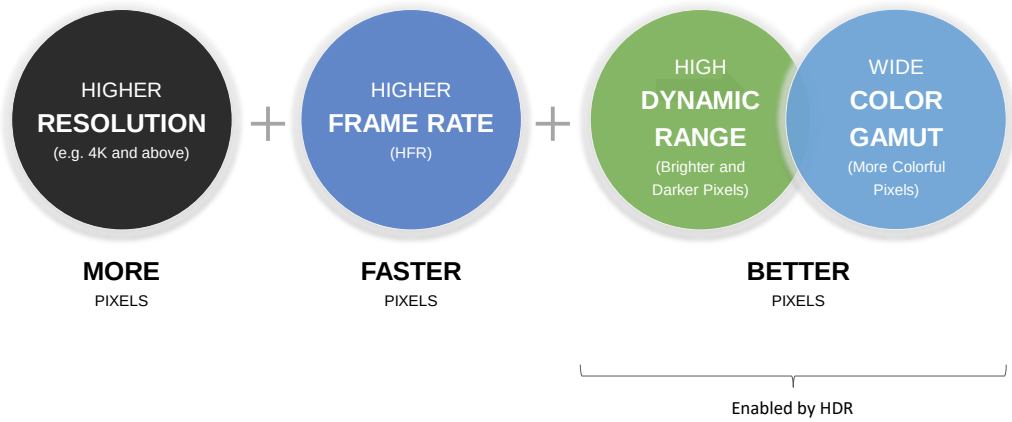
What is HDR?



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HDR Options in 3.0

SMPTE 2084 + 2086 (also known as HDR10)

SMPTE 2094-10* = HDR10 with Dynamic Metadata (also known as Dolby Vision)

*2094-10 is also known as DM App#1 (Dynamic Metadata Application #1)

The Metadata is there to preserve creative intent

Creative Intent

With Metadata

HDR with no Metadata

Presently not much source content in HDR for ATSC

How to bridge to future of plentiful source content?

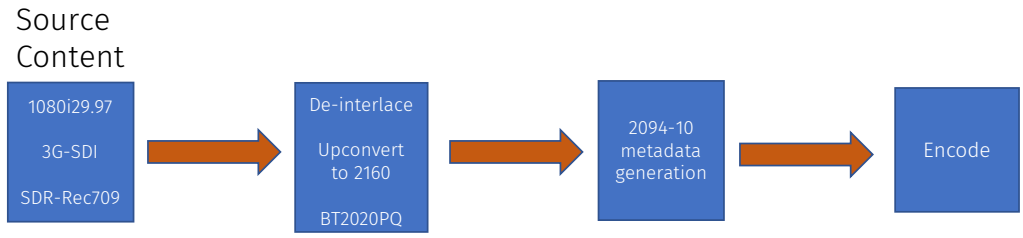
The metadata preserves creative intent for SDR as well as it does for HDR

Use the HDR tools to deliver better SDR as a bridge to more HDR source content!

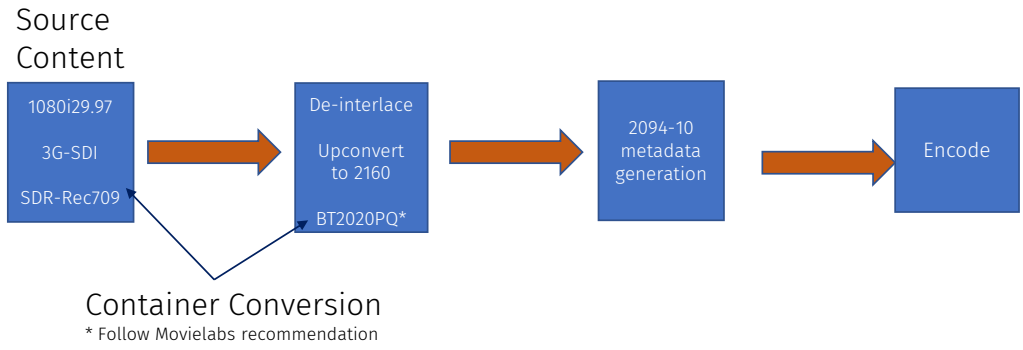
CONSISTENT SDR VIDEO PLAYBACK ACROSS DEVICES

With Metadata

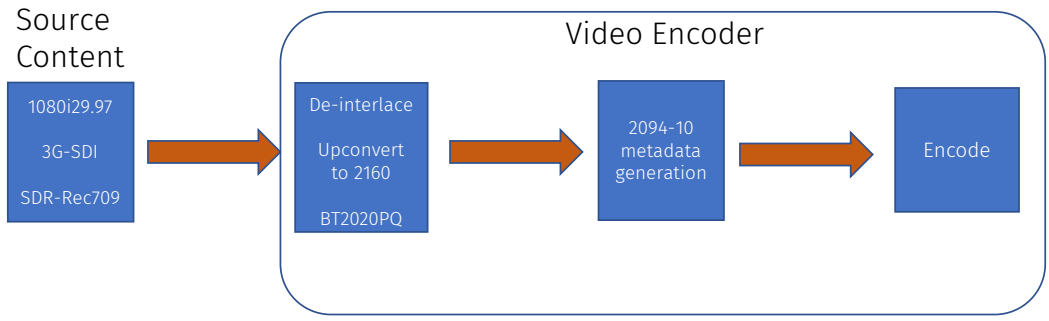
HDR workflow is very simple



HDR workflow is very simple



HDR workflow is very simple



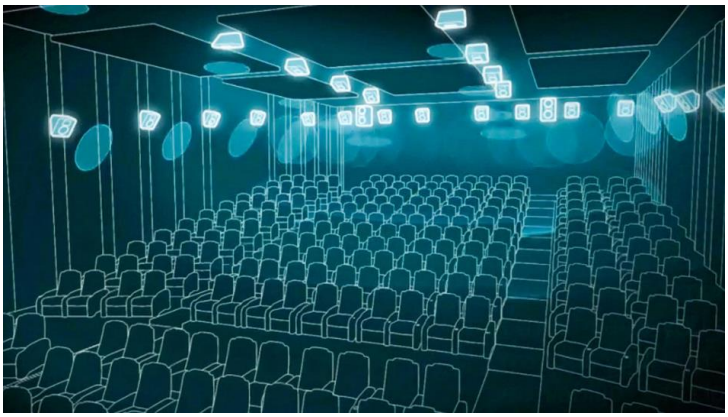
Audio in ATSC 3.0

Larry Schindel, Linear Acoustic

AUDIO IN ATSC 3.0

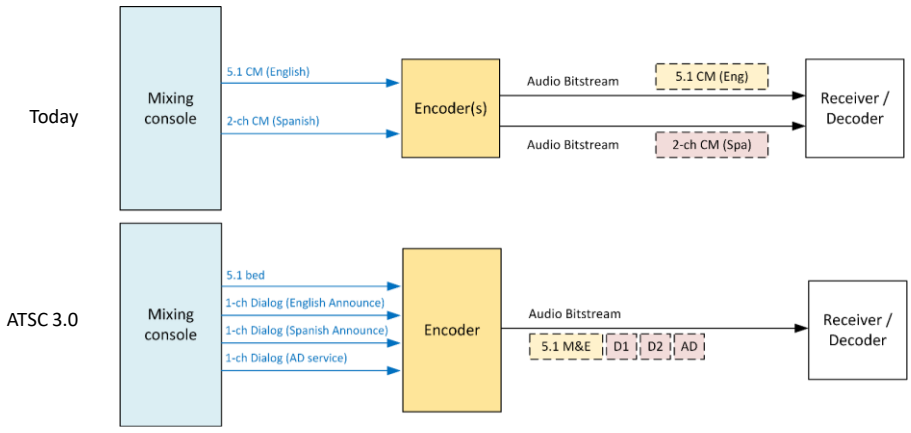
Key New Features Supported in ATSC 3.0

- Channel-based and Object-based audio
- Immersive Audio (Dolby® Atmos)
- Personalized audio
- Dialogue enhancement (VOICE +)
- Loudness control



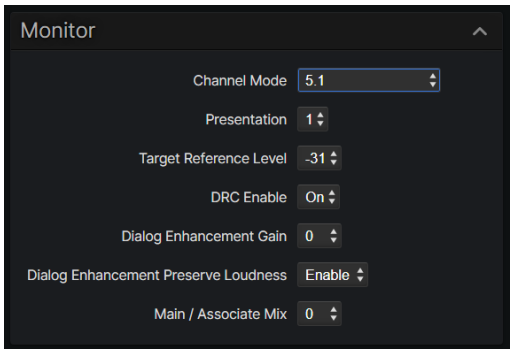
AUDIO IN ATSC 3.0

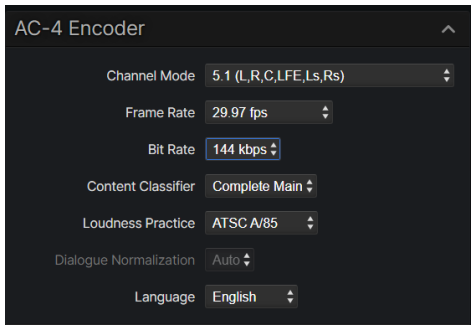
Personalization

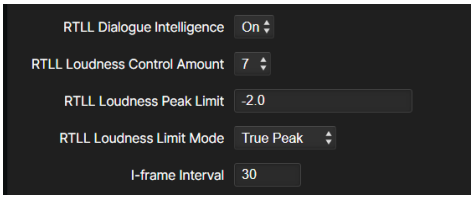


AUDIO IN ATSC 3.0

VOICE+, Loudness, Dolby AC-4







DATA RATE COMPARISON

Dolby AC-4 vs Dolby Digital (AC-3)

Channel Configuration	Recommended AC-4 Data Rate	Equivalent AC-3 Data Rate
Stereo (2.0) CM	64 kbps	192 kbps
5.1 CM	144 kbps	448 kbps
Stereo CM + Stereo CM/AD	128 kbps	384 kbps (192 + 192)
5.1 CM + Stereo CM/AD	208 kbps	640 kbps (448 + 192)

CM = Complete Main service AD = Audio Description service

Internet Experience Personalized & Dynamic

Dave Catapano, Triveni

Applications

Internet Experience
Personalized & Dynamic

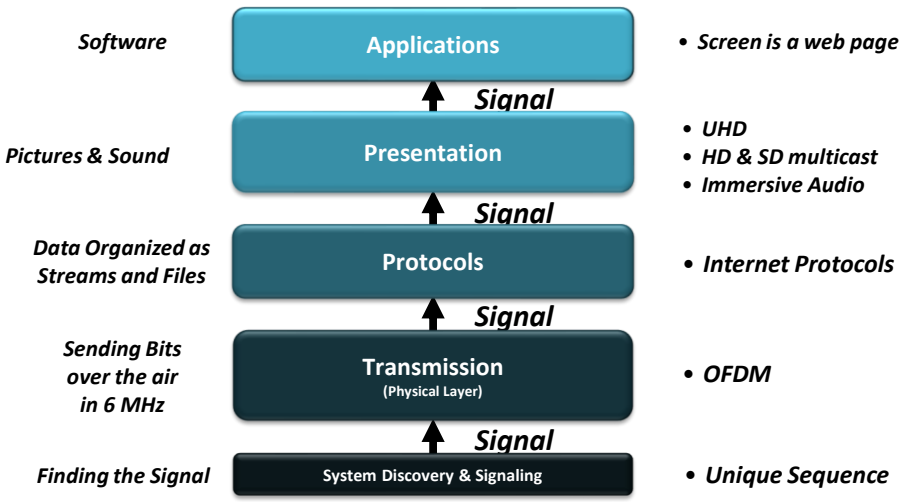
ATSC 1.0

- Pictures, Graphics and Sound are "burned in"
- Same experience for entire audience

ATSC 3.0

- HTML5/Internet overlay graphics
- Hybrid delivery - merge broadcast & internet
- Dynamic Ad Insertion
- Personalized Graphics
- Interactivity
- Synchronized second-screen applications

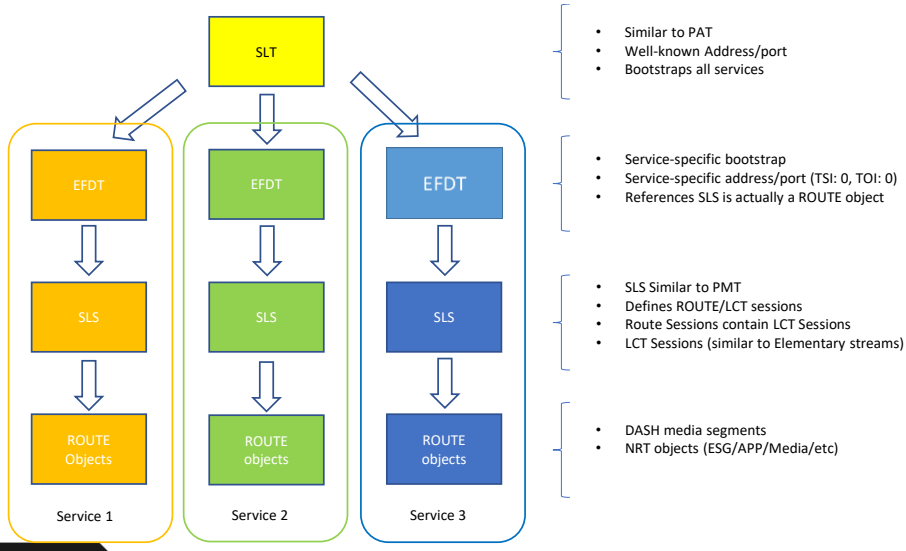
Overview - ATSC 3.0 System Layers



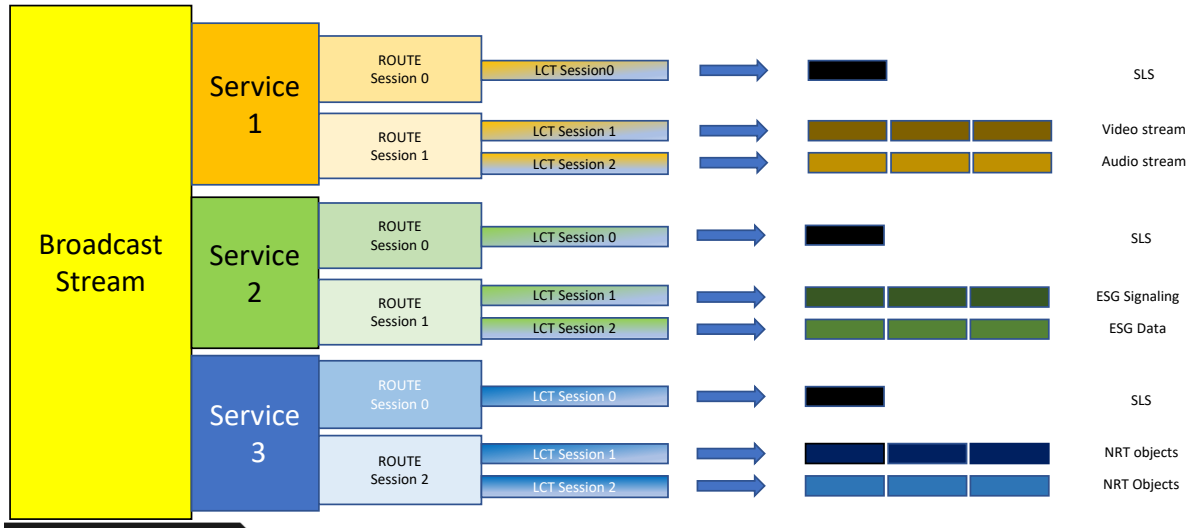
ROUTE, MMTP & HTTP Transports

- ROUTE = Real-time Object delivery over Unidirectional Transport
  - ROUTE ← FLUTE ← LCT ← ALC
  - Allows source stream and repair (FEC) stream
  - All data streams including Essence streams
- MMTP = Multimedia Multiplexing Transport Protocol
  - MPUs wrap ISO BMFF files with metadata for broadcast delivery
  - Essence streams only
- HTTP = Hypertext Transport Protocol
  - Pull data using TCP/IP session

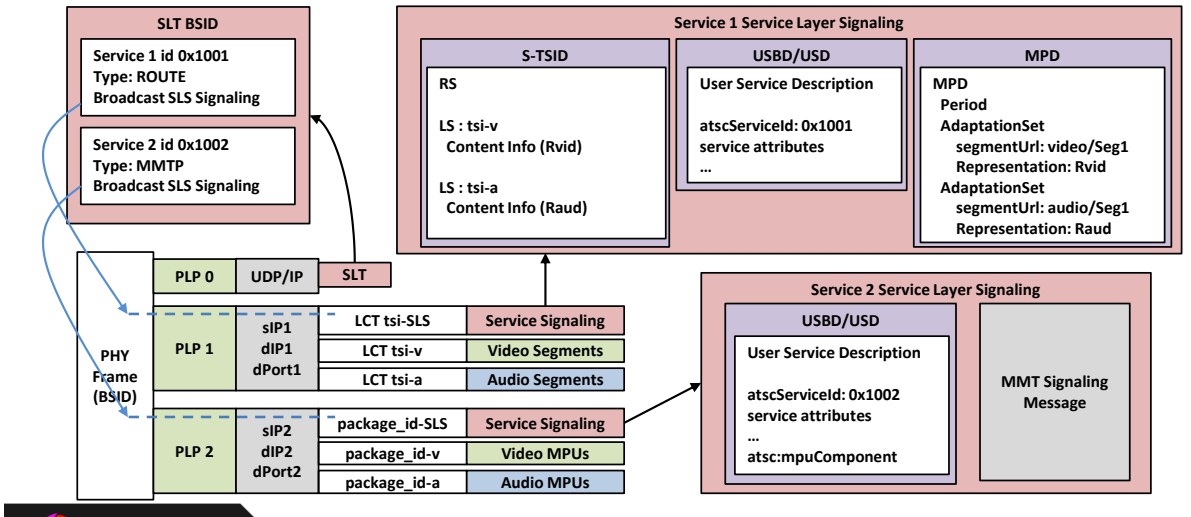
ATSC 3.0 to 1.0 Signaling Comparisons



ATSC 3.0 Service Structure view



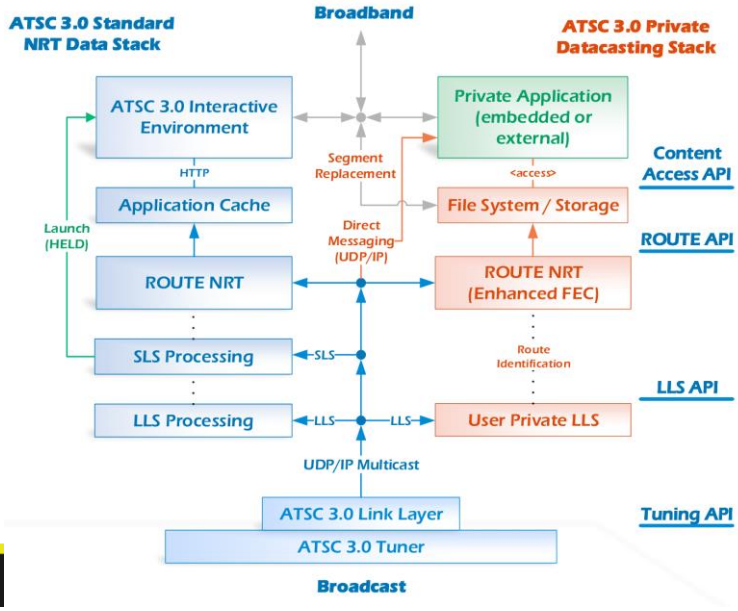
Example Bootstrap & Service Discovery



Public / Private Data Signaling using ATSC 3.0

- ATSC 3.0 Broadcast Applications / NRT
  - Signaling defined in A/331 (224.0.23.60:4937 -> STL, STT, AEAT, SMT, CDT, etc)
  - Signaling (LLS/SLS) is cryptographically signed (A/360)
  - PHY layer signaling of LLS flag and AEAT wakeup
  - Enables signaling / delivery of HTML5 applications delivered either via broadband and/or broadcast
- Private Data Signaling / Delivery
  - Business specific use case / implementation
  - Signaling / delivery protocol can be done in proprietary manner
  - ATSC standard recommends usage of LLS table type FF - UserDefined
    - Enables benefits of PHY layer signaling (ideal for service discovery on battery powered devices)
    - Leverages signaling security model
    - Reuse / extend as needed (ROUTE Source/Repair, FDT, etc)
    - Different classes of data have different signaling requirements (files, messaging, streaming)

Public/Private Data using common bootstrap



Ensuring that the Tampa STLTP Connection is Reliable

Phil Whitebloom, VideoFlow

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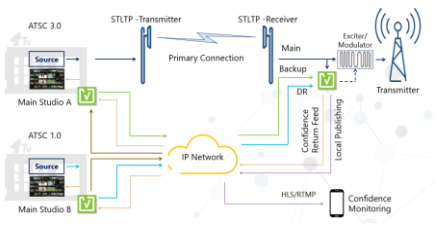
www.video-flow.com

VideoFlow

VideoFlow moves your video/audio/data content over **any** lossy IP network reliably, securely and with the highest quality. Yes, even over POI (plain old internet).

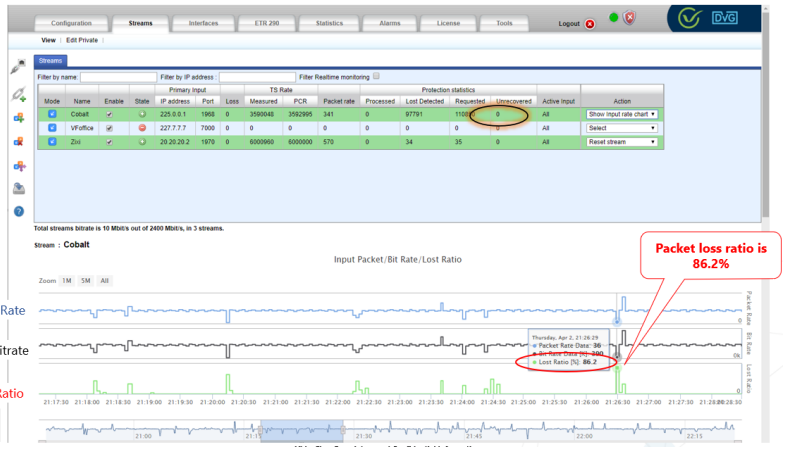


High Quality	Reliability	Connectivity	Security	Operational Efficiency
Jitter elimination	Stream redundancy	Point-to-Point	Cybersecurity EBU R-143 compatible	Remote site configuration & management
Configurable delay	Link redundancy	Point-to-Multipoint	Integrated Firewall	Alarms notifications
SMPTE 2022 FEC	SMPTE 2022-7	Multipoint-to-Point	Endpoint authentication	Confidence return feed
ARQ	Device redundancy	Bidirectional	Encrypted VPNs	Confidence monitor feed
VideoFlow, RIST, SRT, and ZIXI	Disaster recovery	Video over IP switching	AES128, AES256	ETR290 stream monitor in real-time (QoE)
Hybrid ARQ/FEC	Input Failover	Stream duplication	DTLS	Real-time network monitoring (QoS)
Prioritized Packet Flow	Output Failover	Unicast/Multicast	PSK	Integrated network test tools
Null packets deletion & restoration	High Availability	VLAN tagging	IPSec	Built-in encoder/transcoder
Out-of-band video quality protection	Dynamic load share	UDP VPN	Identity-based protection	Integrated Demux
	Controlled Adaptive Rate	GRE		
	Multi-Profile Distribution	NAT traversal		
	MPTS Dynamic Rate	Multi ISP		
	Stream Priority Delivery	Multi DHCP		
	Stream activation trigger			

The VideoFlow toolset isolated multiple issues throughout the “chain”. It was able to diagnose issues that were impacting multiple components in the system.

Ensuring that the Tampa STLTP Connection is Reliable

86% packets lost | 100% packets recovered | 100% packets received



VF Customer Example

Native STLTP Transport

ATSC A324 specification has modified and repurposed RTP header fields:

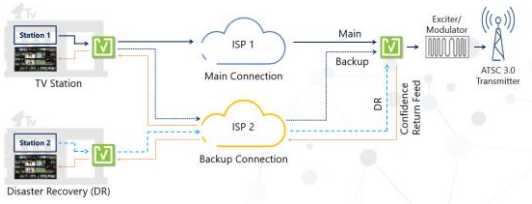
- Marker
- TimeStamp
- SSRC – now called offset
- Payload type
- SMPTE2022 FEC using the above values

Added capabilities:

1. VideoFlow can run the STLTP across multiple paths in a bonded or load share configuration that provides higher delivery resilience (SRT is missing this capability).
2. VideoFlow UDPVPN authentication and encryption is using AES256 + dynamic key rotation (every minute) for extra security.
3. VideoFlow UDPVPN allows for inband command and communication with 3'rd party devices that are attached to the VideoFlow instance (like exciter and monitoring equipment)
4. VideoFlow support Multicast for coming SFN deployments, with optimized VideoFlow's patented 'FEC on Demand' to reduce recovery overhead.

- STLTP FEC In/Out
- Path redundancy
- Dynamic Loadshare
- Disaster recovery (DR)

- Integrated firewall
- Operational Efficiency
  - Confidence feed return
  - Network statistics in real time
  - Secured remote site management



Applications & Security

Pete Van Peenen, Pearl TV

Enabling Broadcaster Applications

Application Framework Alliance (A3FA)

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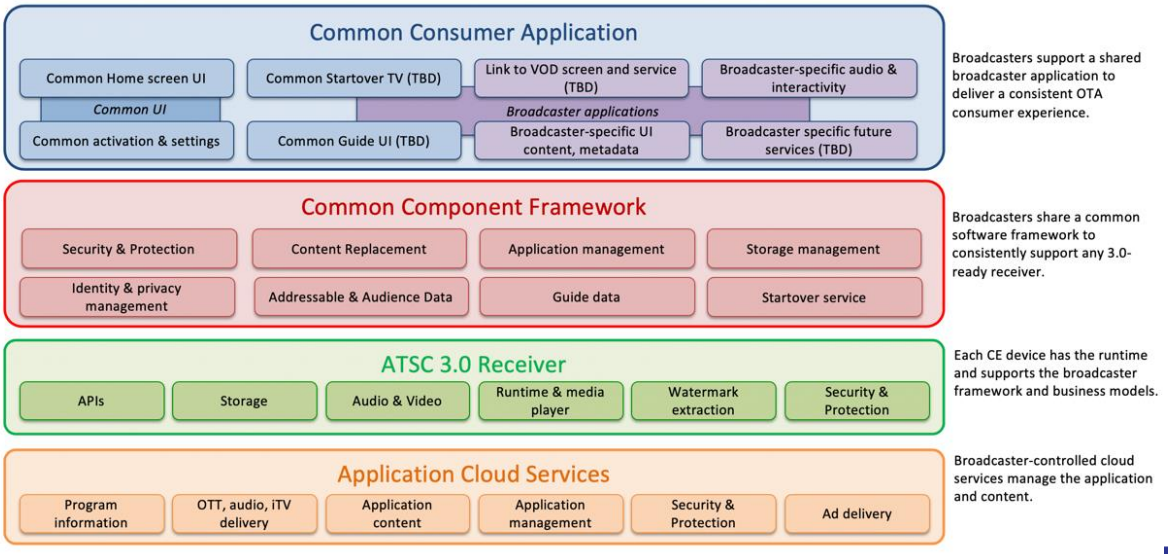
Broadcaster Application Framework

- Common 'plumbing', making it easier to develop applications
  - App developer does not need deep knowledge of ATSC 3.0 standards (or even broadcast technology)
  - Broadcasters can focus on features to enrich the viewing experience
  - Enable innovation
  - Develop new kinds of value-added experiences
  - Test consumer value propositions
- Provides consistency in user navigation and overall app behavior
- Minimize CE device test burden
- Minimize development and support costs

Architecture



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9.36 PM
33-1 KHUM
Hummingbird AZ
On Now
Up Next
News Feed
Weather Feed
Settings
Online
Powered by Pheonix Model Market Partnership
Basic 2020 white label menu "out-the-box"
ILLUSTRATIVE COMMON MENU

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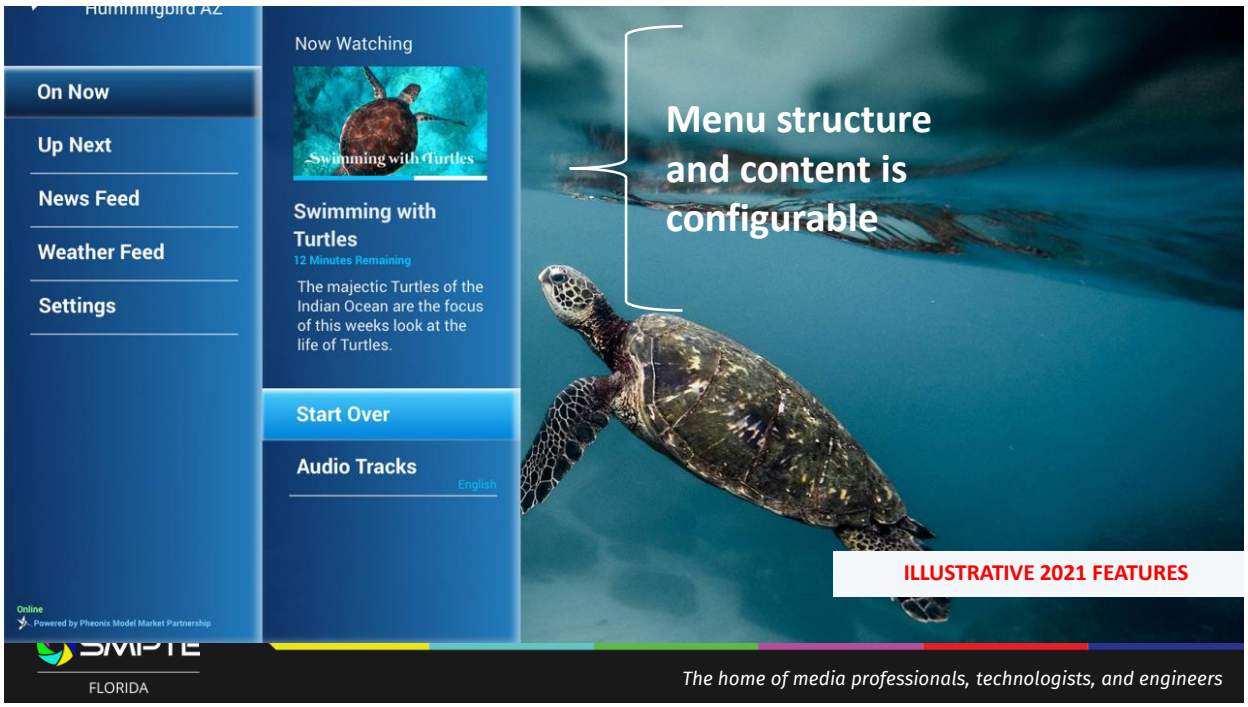
On Now
Up Next
News Feed
Weather Feed
Settings
Online
Powered by Pheonix Model Market Partnership
Now Watching
Swimming with Turtles
Swimming with Turtles
12 Minutes Remaining
The majectic Turtles of the Indian Ocean are the focus of this weeks look at the life of Turtles.
Start Over
Audio Tracks
English
Menu structure and content is configurable
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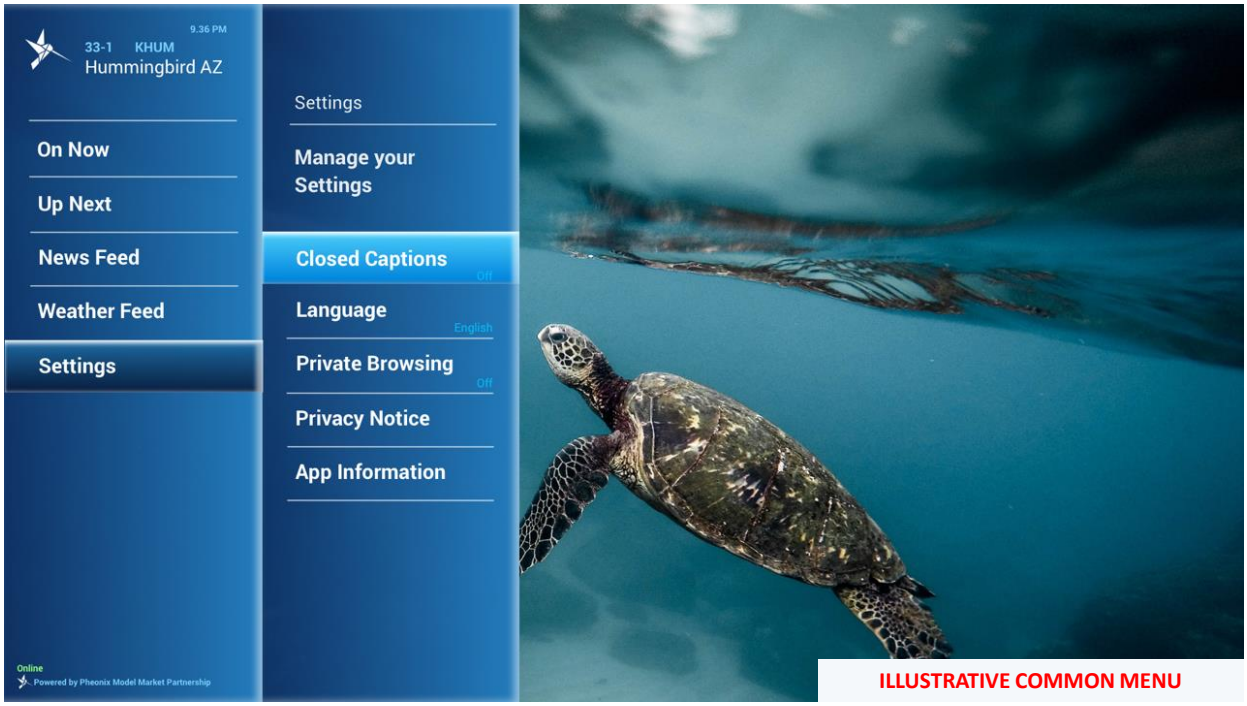

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Protecting content and services

ATSC 3.0 Security Authority (A3SA)

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What Happens Every Day on the Internet

- Web sites use encryption to secure communications between web browsers and servers
  - SSL certifi… …ed to authent…
  - Client ce… …s are digitally…
  - Session…
- App stores…
  - Digitally…
- Streaming v… …secured
  - Encryption and licenses prevent unauthorized viewing/copying
    - Netflix, YouTube (live and VOD)

NextGen TV needs the same types of protection!

ATSC 3.0 Standards Support Security

- For service protection, the standards are prescriptive in the use of X.509 digital certificates
- When it comes to Content Security, standards only specify the underlying technologies:
  - **EME** (Encrypted Media Extensions)
  - **A/344 Web Socket APIs**
  - **CENC** (Common Encryption)
  - **DASH** (Dynamic Adaptive Streaming over HTTP)

NextGen TV: Content Security and Service Protection

Content Security

Encrypts Content
Protects against unauthorized re-distribution
Issues and applies licenses and cryptographic keys
Optional – underlying technology specified in A/360

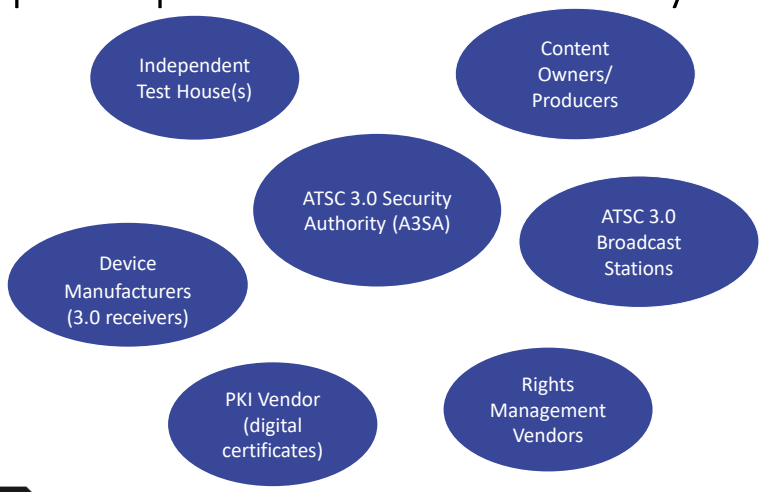
Service Protection

Issues & validates Digital Certificates
Protects against spoofing, hacking, signal intrusion
Allows receivers to verify that the apps & signaling were broadcast by a trusted broadcaster and have not been changed.
Required - Specified in A/360 and A/331
required for signing signaling & apps

In comes the ATSC 3.0 Security Authority …

- Coordinating body for ATSC 3.0 content security and service protection
  - Defines requirements for content security (including security against viruses and hacking)
  - Defines supplementary compliance and robustness rules
    - Building on existing rules
  - Creates, establishes and maintains agreements with ecosystem participants
  - Serves as funder of and policy authority for the Public Key Infrastructure
    - Enables all broadcasters to authenticate their ATSC 3.0 services, as required by ATSC
    - Enables receiver manufacturers to authenticate their A3SA-enabled receivers
  - Maintains criteria for device certification/validation/revocation
    - Approves test procedures and test companies (and self-test requirements)
  - Authorizes ATSC 3.0 receivers to access Group and Individual rights management licenses

Who participates in the A3SA Ecosystem?



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ATSC 3.0: Next Gen TV in Florida

QUESTIONS

NEXTGENTV

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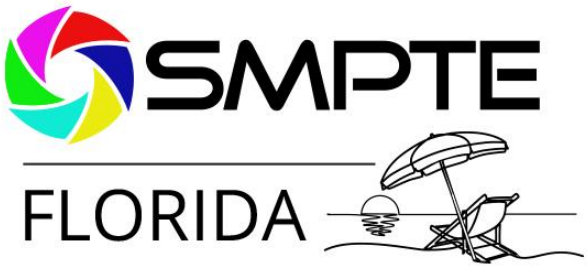

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Thank you!

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