



End User experience improvements and Broadcaster advantages



Arlington - January 16th, 2020
Richard Lhermitte

nextgentv **SUMMIT**

Produced by SMPTE and SBE with support from the NAB and ATSC



and the support of our host, WETA Television



JANUARY 16, 2020



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WITHOUT THEIR VOLUNTEER EFFORTS THIS SUMMIT WOULD NOT BE POSSIBLE

Morning Program



Afternoon Program

8:00 AM - 9:00 AM	Registration and continental breakfast
8:55 AM - 9:00 AM	Welcome from SMPTE, SBE and AES Fred Willard, SBE Washington Kishore Persaud, SBE Baltimore
9:00 AM - 9:05 AM	Introduction Peter Wharton, SMPTE Membership VP Chris Lane, Chief Engineer, WETA
9:05 AM - 9:35 AM	NextGen TV: Transforming the Consumer Experience Lynn Claudy, SVP Technology, NAB and Chairman, ATSC Board of Directors Madeleine Noland, President, ATSC
9:35 AM - 10:00 AM	Creating New Opportunities with NextGen TV Joonyoung Park, VP and Fellow, DigiCAP
10:00 AM - 10:35 AM	Improved Television Reception for Consumers <i>Implementing NextGen TV Distribution Systems</i> John Lynch, ERI Jeff Andrew, Osborn Engineering
10:35 AM - 11:15 AM	Benefits of a Converged Broadcast and IP Platform Lynn Claudy, SVP Technology, NAB and Chairman, ATSC Board of Directors Content Reception Enhancements Richard Lhermitte, VP Solutions and Market Dev, ENENSYS TeamCast
11:15 AM - 11:30 AM	Morning Break
11:30 AM - 11:50 AM	Consumer Applications for Combined 5G & NextGen TV Networks Josh Arensberg, M&E Business Development, Verizon Media
11:50 AM - 12:15 PM	Case Study: Hybrid Services at "Chicago 3.0" Jean Macher, Harmonic
12:15 PM - 01:20 PM	Buffet Lunch ▶

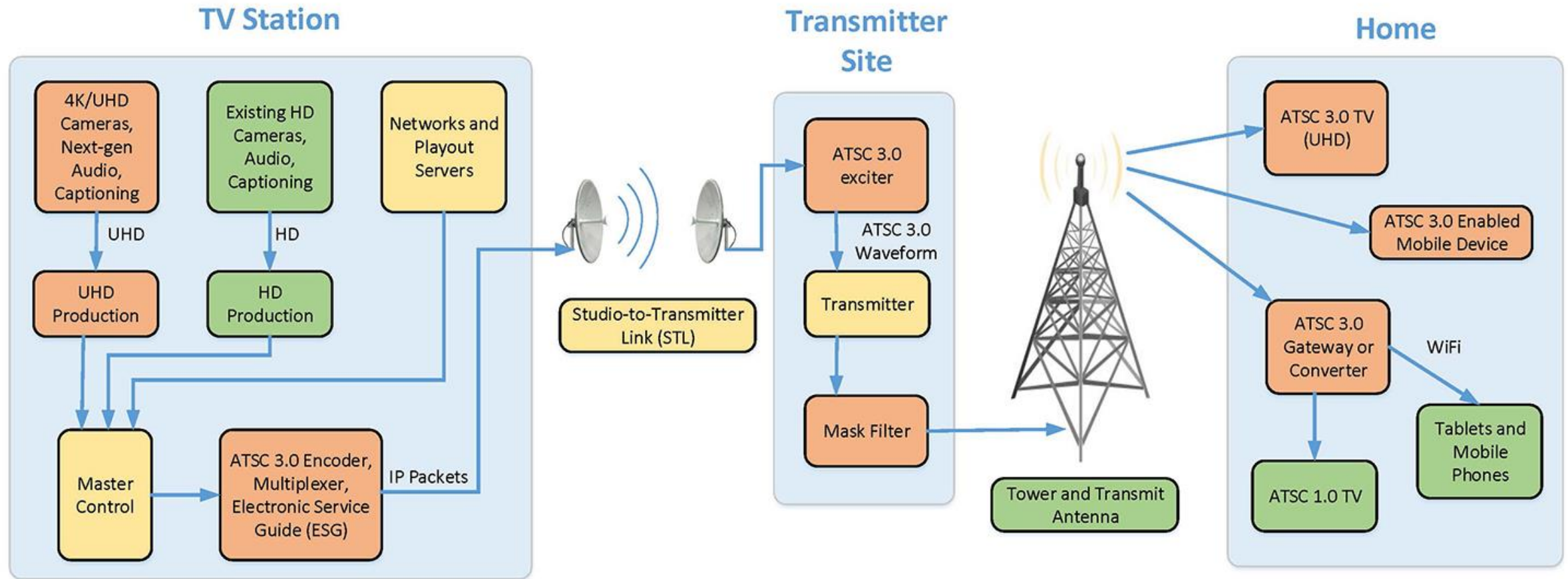
01:25 PM - 01:45 PM	Protecting the NextGen TV Consumer <i>Advanced EAS and AWARN Capabilities</i> John McCoskey, SpectraRep
01:45 PM - 02:15 PM	Monetizing the NextGen TV Consumer <i>Addressable Advertising and Analytics</i> Rick Ducey & Mark Fratrik, BIA
02:20 PM - 03:20 PM	Personalizing the Consumer Experience <i>Interactive and Personalized Features</i> Mark Corl, Triveni Digital Greg Jarvis, Fincons So Vang, NAB Pete Van Peenan, Pearl TV
03:25 PM - 03:40 PM	Afternoon Break
03:40 PM - 04:10 PM	The Consumer Out-of-Home Experience <i>Mobile & Automotive Applications and FeMBMS (5G Broadcast)</i> Thomas Janner, Product Management & R&D Director, Rhode & Schwarz
4:10 PM - 4:35 PM	The ATSC 3.0 Roadmap Lynn Claudy, SVP Technology, NAB and Chairman, ATSC Board of Directors Madeleine Noland, President, ATSC
4:35 PM - 5:00 PM	The Consumer Technology Roadmap Brian Markwalter, SVP Research and Standards The Consumer Technology Association
5:00 PM - 6:00 PM	Station Group and Industry Deployment Plans <i>Advanced Capability Implementation Strategies</i> Skip Pizzi, VP Technology Education & Outreach, NAB (Moderator) Michael Bouchard, VP Technology Strategy, ONE Media / Sinclair Stacey Decker, CTO, Public Media Group Sasha Javid, COO, The Spectrum Co
6:00 PM - 8:00 PM	Cocktail Reception Busboys and Poets 4251 S. Campbell Ave., Shirlington <i>Heavy Hors d'oeuvres and open bar</i> ▶

Agenda


- Content preparation and compression
- Protocol / Delivery for OTA & OTT Convergence
- Reception enhancement with ATSC 3.0 Physical layer


The ATSC 3.0 logo, with "ATSC" in black and "3.0" in blue, separated by a blue circular graphic element.

Broadcast Overall Architecture



Legend

 Existing usable components

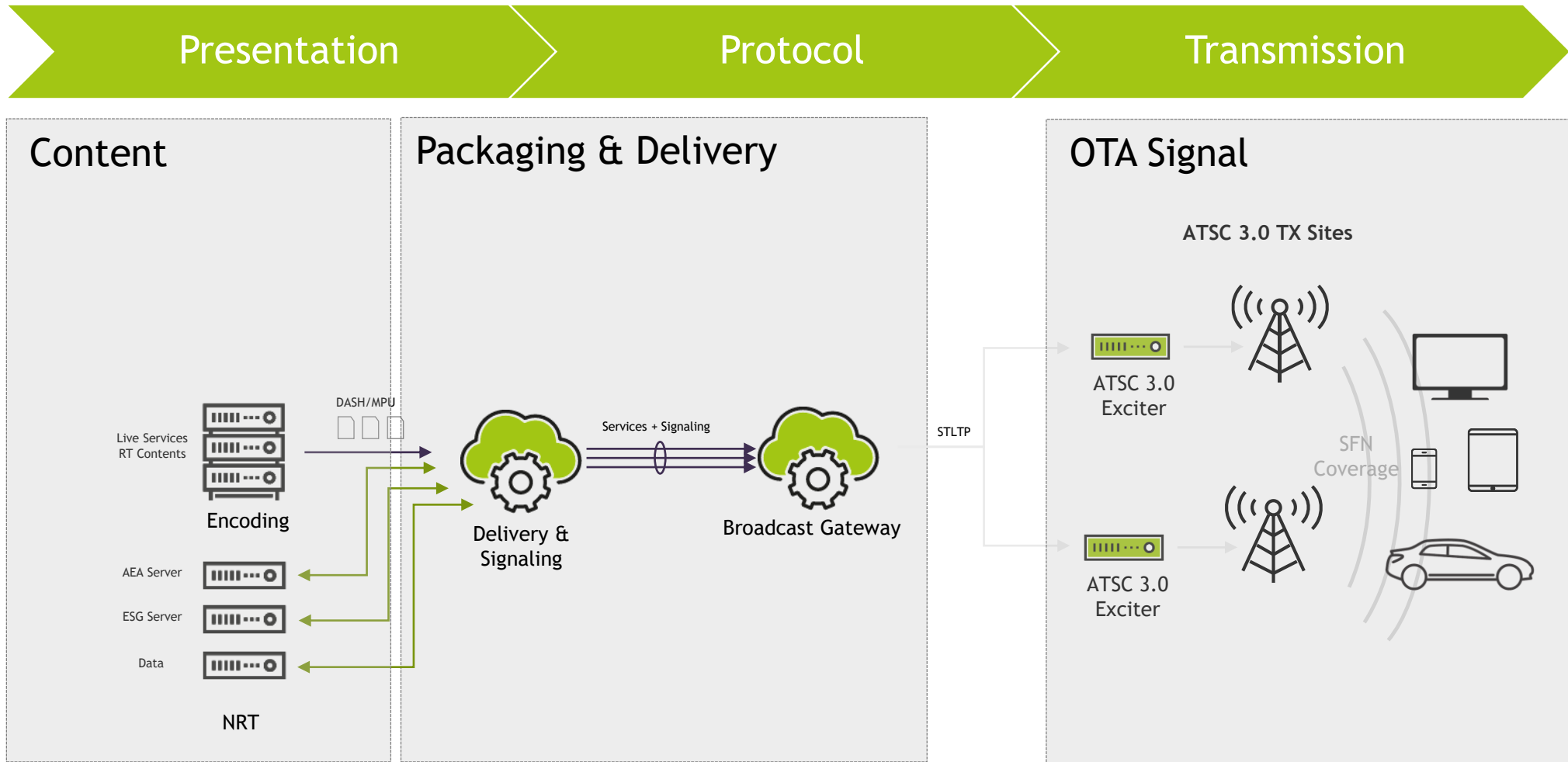
 May need upgrade

 New components

PILOT
NAVIGATING BROADCASTING'S FUTURE

ATSC 3.0 Delivery workflow

Content, Packaging & Delivery, OTA Signal





Content preparation

Compression

■ Advanced Audio & Video compression

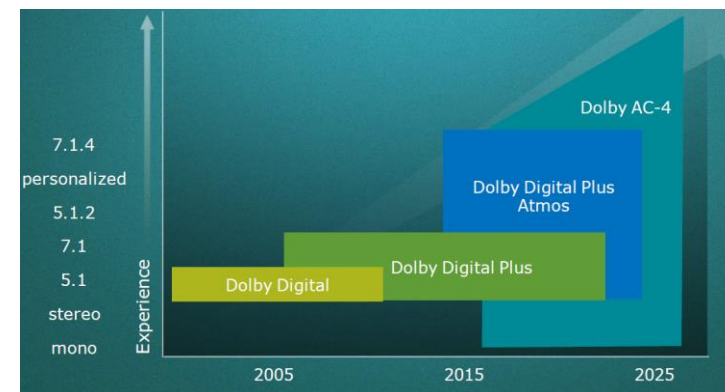
- Video = HEVC (H265)
- Audio = AC4 or MPEG-H

■ Using less bandwidth

Video Comparison (1080p @ 23,976)

Video Codec	Distribution	Bitrate (Mbps)	2 hrs (GB)	Qf
MPEG2	DVD (typical)	32.0	26.8	.64
	Online (max.)	16.7	14.0	.34
H.264	Blu-Ray (typical)	25.0	21.0	.50
	Online (max.)	10.0	8.4	.20
	Broadcast (typ.)	6.0	5.0	.12
H.265	Online (max.)	6.0	5.0	.12
	Broadcast (typ.)	4.0	3.4	.08

Audio Comparison



- Improve audio & video quality for a Better end user experience
- More Content on one RF Channel

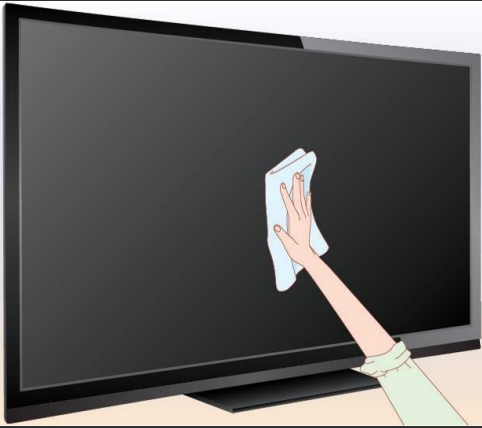
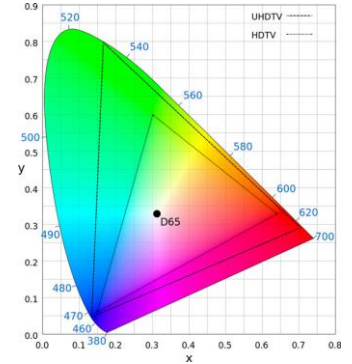
Dolby

Video preparation

End User Advantages

■ Better image quality

- SD, HD and UHD using HEVC
- High Frame rate
- High Dynamic Range & Wide Color Gamut



Audio preparation

End User Advantages

■ Audio with Dolby AC4 or MPEG-H

- Immersive audio: sound from any directions
- Object based:
 - User choose what he want to listen
 - Sound is restituted at home according to user audio system
 - Efficiently transmitted: no audio / sound duplications



Base Audio Bed

Static audio elements, with stirring base tones and rich audio textures



Sound "Objects"

Moving around and above you in multi-dimensional space...adds a **height dimension** not ever before present!



Real Sound Simulation

Multi-dimensional audio that fully immerses you in the scene!

Dolby

Audio preparation

Broadcaster Advantages



MPEG-2 TS: Audio Elementary Stream

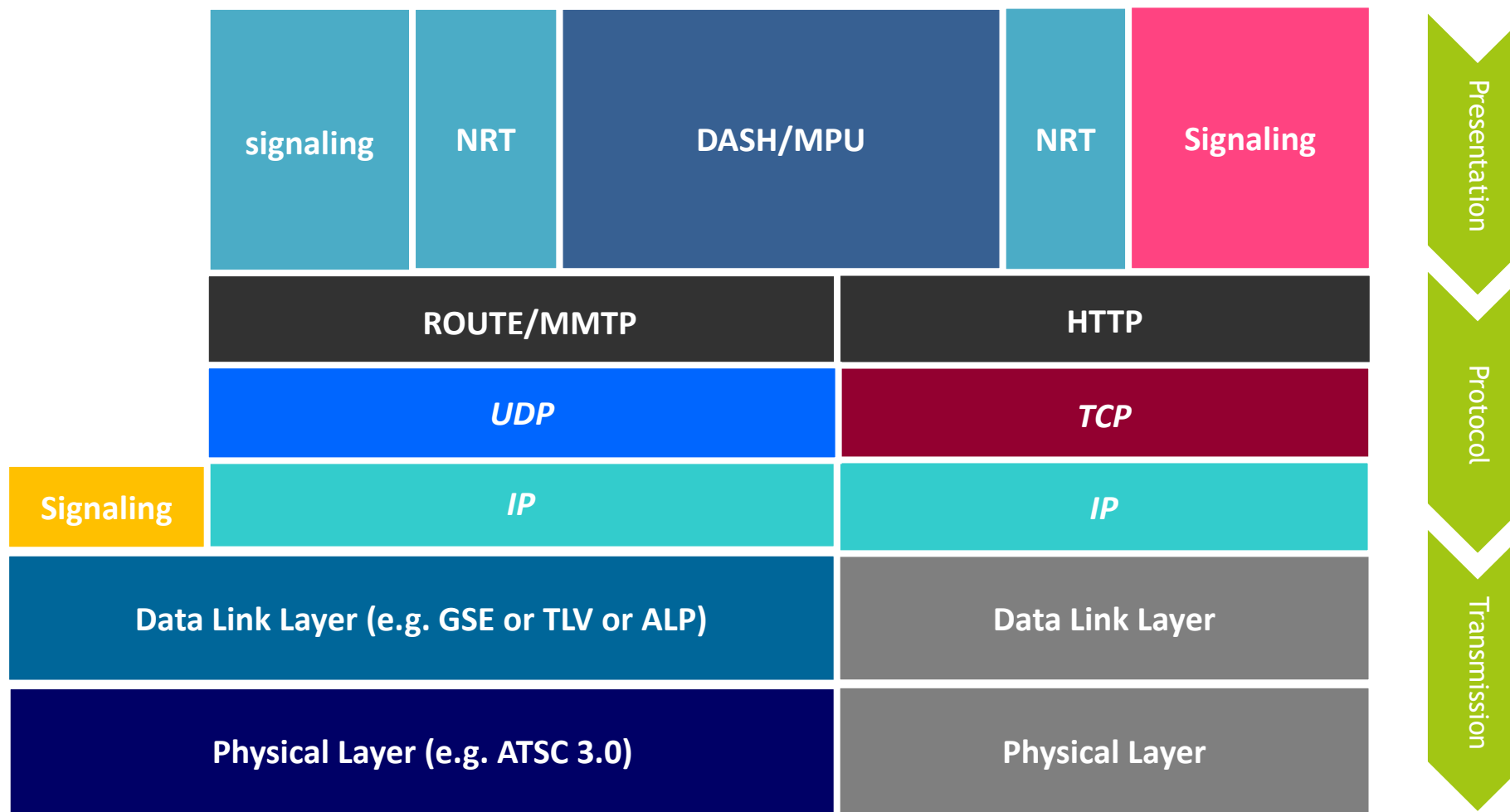
Signaling Information	Audio Programme Components				
	M&E	Dialogue EN	Dialogue IT	AD IT	Team Radio
Default Preselection (English)	M&E	Dialogue EN	Dialogue IT	AD IT	Team Radio
Italian Preselection	M&E	Dialogue EN	Dialogue IT	AD IT	Team Radio
Italian Audio Description Preselection	M&E	Dialogue EN	Dialogue IT	AD IT	Team Radio
English Team Radio Preselection	M&E	Dialogue EN	Dialogue IT	AD IT	Team Radio
M&E Only Preselection	M&E	Dialogue EN	Dialogue IT	AD IT	Team Radio

Franhauffer

MME = Main or Music & Effects

ATSC3.0 Protocol stack

Presentation, Protocol, Transmission





OTA OTT Convergence

Linear TV Delivery

- **ATSC 3.0 decided that the linear TV will be**
 - Package as OTT
 - Using ISO BMMF Segments: DASH or MPU
 - **CE device could then receive content through**
 - ATSC 3.0 air interface
 - And / or through Broadband connection
-
- Easy Mix OTA, OTT, VOD on same device
 - Deliver additional component through Broadband
 - Deliver additional content through Broadband



Multi receiver

ATSC 3.0 on connected devices

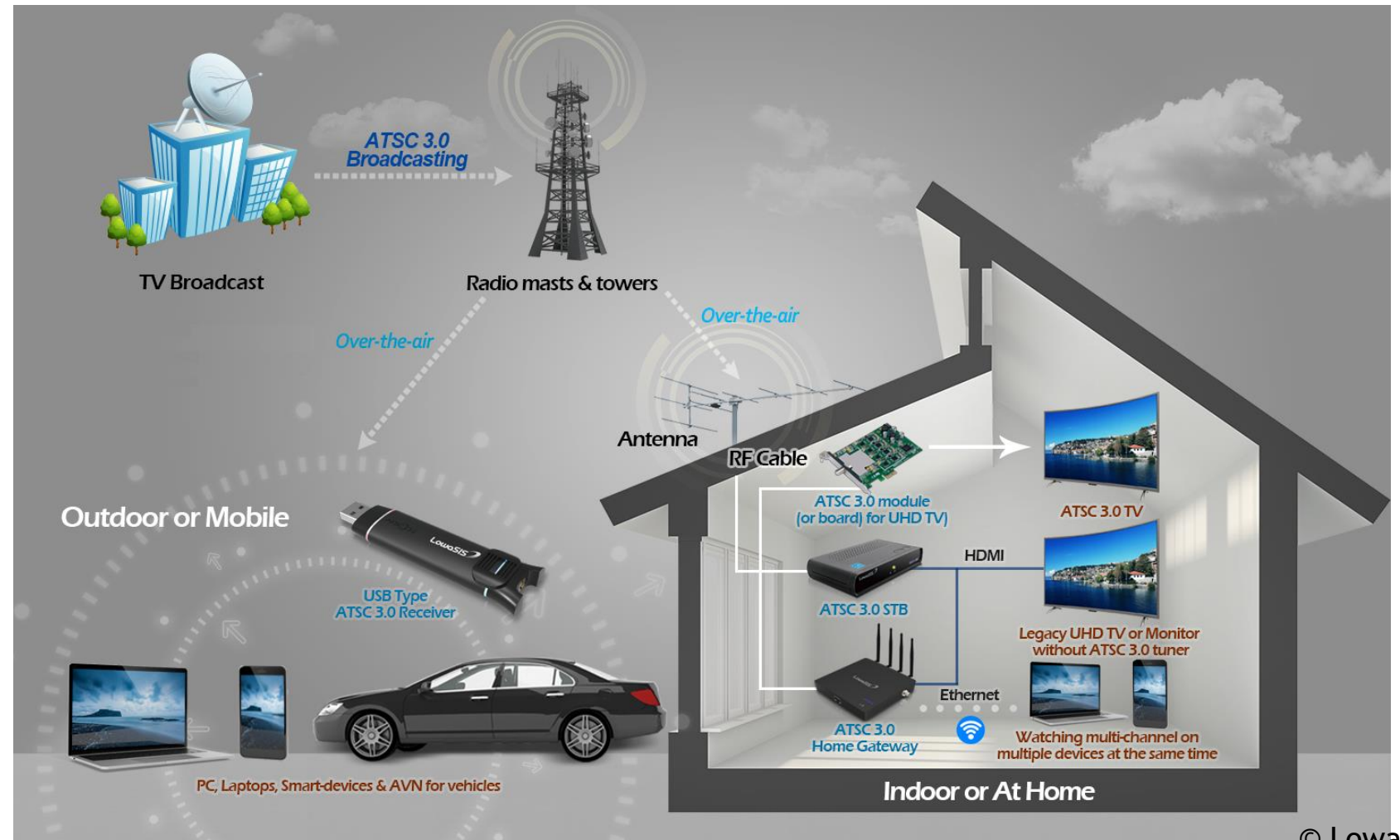


- DASH as content packaging
- ROUTE as file delivery
- CE devices will receive segments
 - That could be decoded by any OTT player
 - Embedded in the CE device
 - Or store locally and access using any OTT local player



NextGen TV for connected devices

ATSC3.0 for all CE with DASH delivery

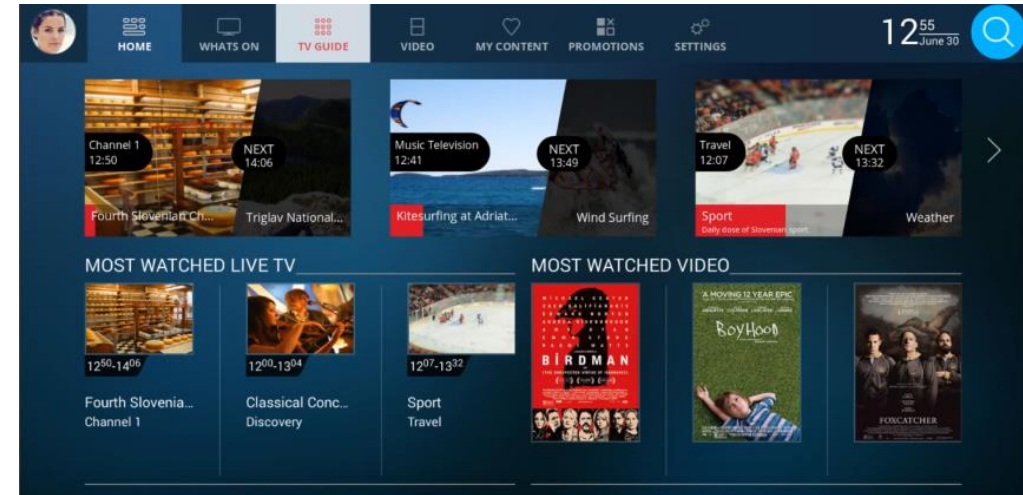


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Content enrichment

Interactivity

- Interactivity based on
 - HTML5 & Java script based
 - With dedicated TV Service API



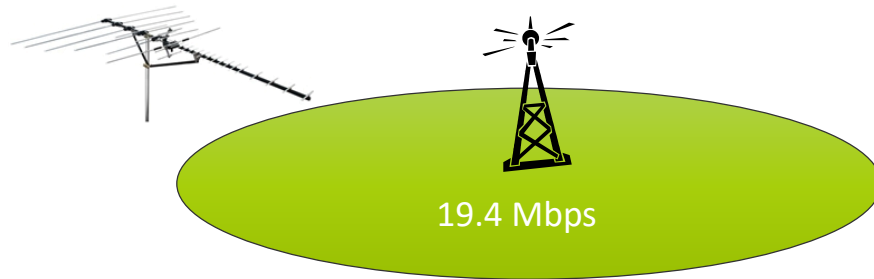
- Create easily a portal / universe around the linear service
- Mix OTA, OTT, VOD on same device
- Include additional information and videos around primary Live TV services

Physical Layer

ATSC 1.0 & ATSC 3.0 Comparison

■ ATSC 1.0 physical layer

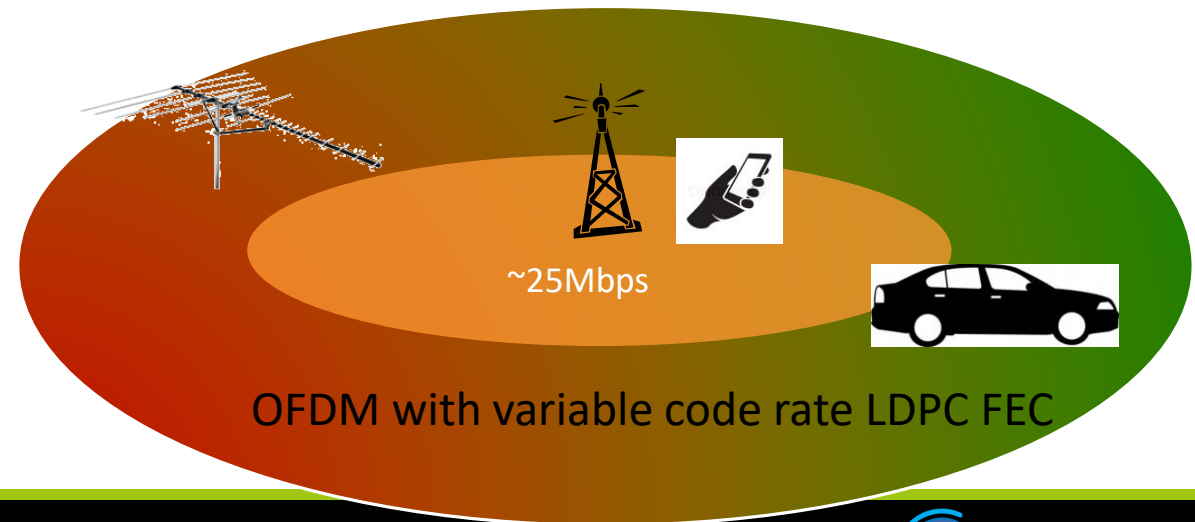
- 8 level Vestigial Sideband modulation
- Reed-Solomon Forward Error Correction (FEC)
- One bit rate – 19.39 Mbps
- One coverage area – 15 dB CNR (rooftop)
- Gap-filling with echo-cancellation considerations
- Service flexibility – HDTV, multicast, data



8-VSB with fixed (188,210) RS FEC

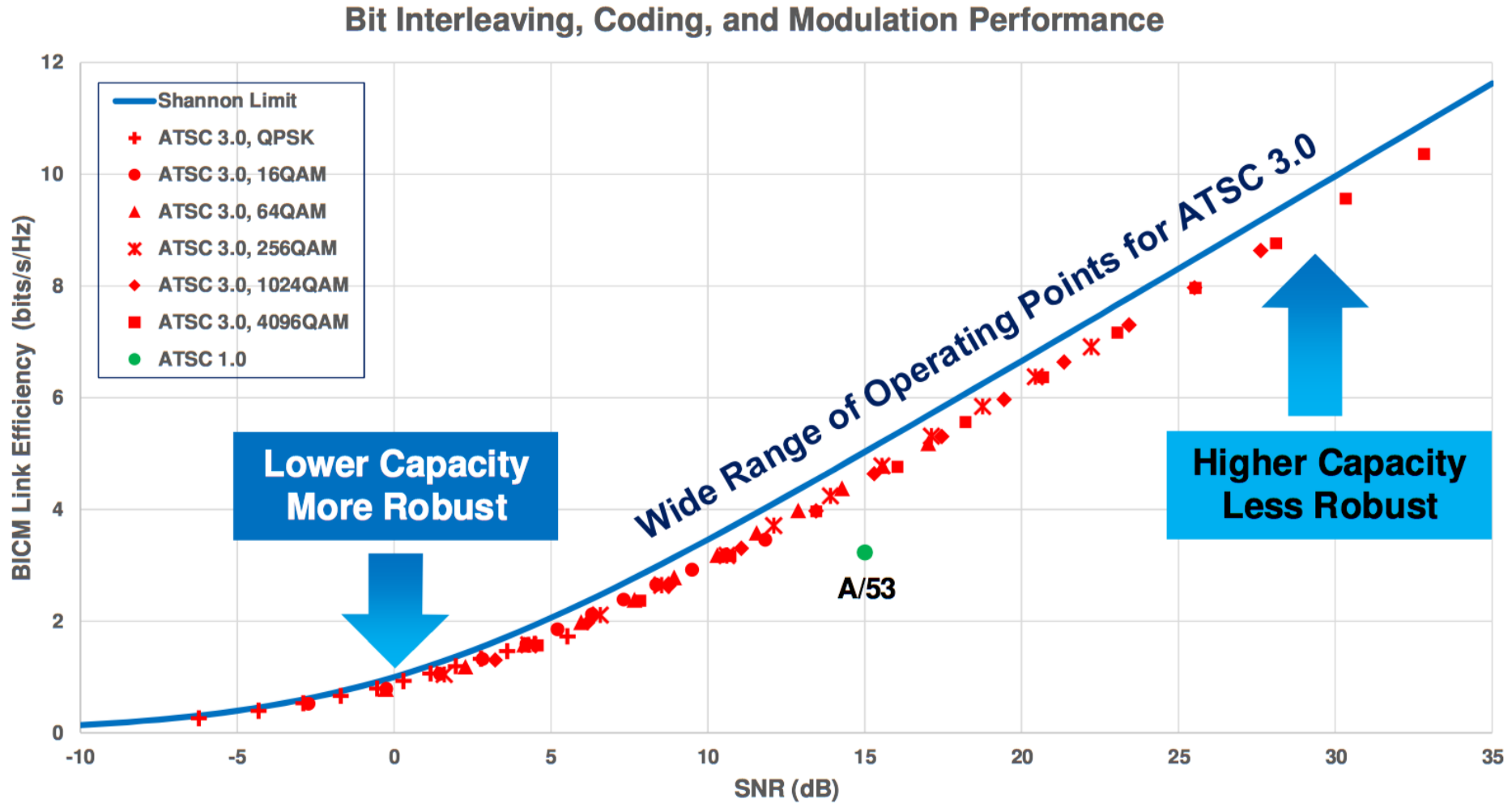
■ ATSC 3.0 physical layer

- Orthogonal Frequency Division Multiplexing Modulation
- LDPC FEC (more powerful correction, sharper roll-off)
- More bps/Hz – near theoretical limit
- Flexible bit rate and coverage area choices
- Enable on-channel repeaters and SFN for robust indoor and mobile reception with power-add considerations
- Multiple simultaneous “**Physical Layer Pipes**”



Modulation Performance

OFDM Based



ATSC3.0 air interface

Bandwidth - Robustness

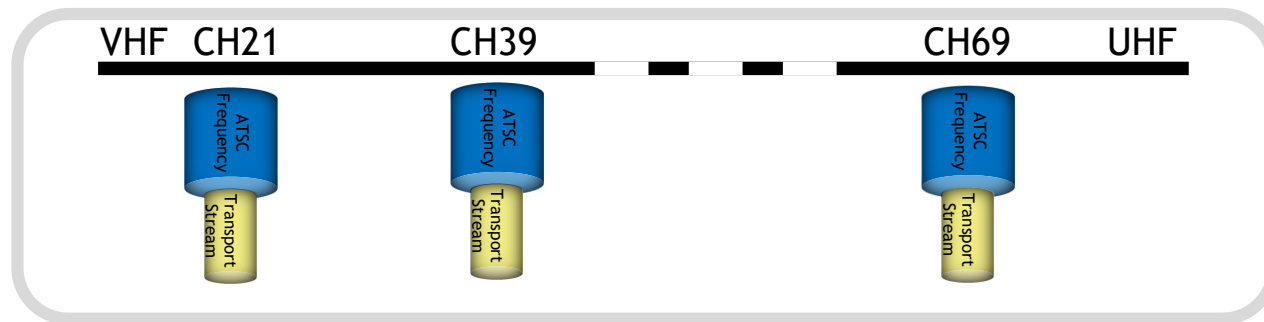


- **Better robustness =**
 - Better indoor reception for all TV at home =
 - Better end user satisfaction
- **Increase coverage = more TV viewer**
- **Additional bandwidth = additional services**
 - Linear services
 - Push of content

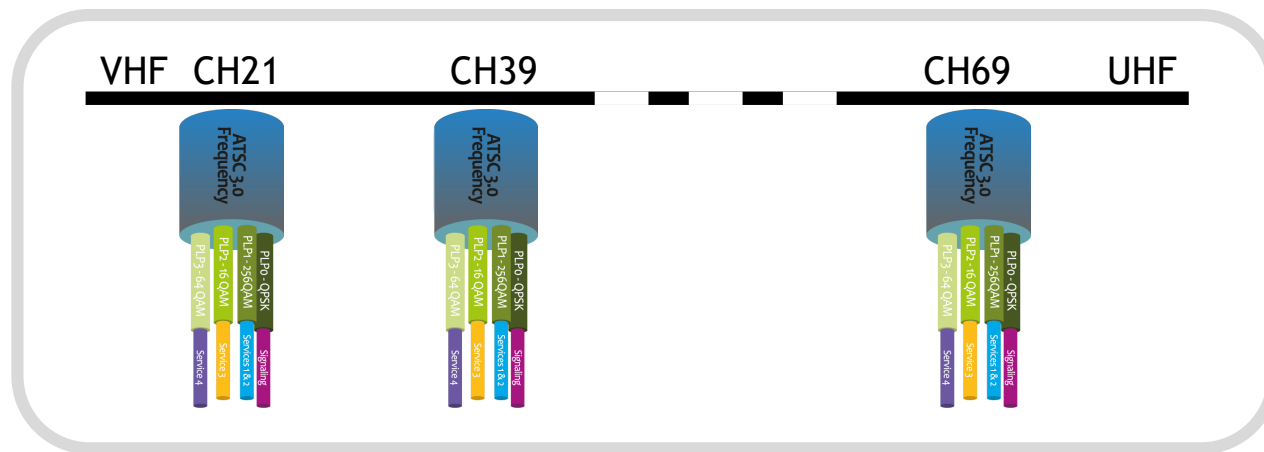


Physical Layer Pipe - 3

Main concept



→ ATSC1 =
1 Multiplex / TS per RF channel



→ ATSC3.0 MPLP =
several Multiplexes per RF channel



MultiPLP - QoS classes scenario

Addressing different receivers



UHD Service



SD Service



Radios

PLP #1

- 64 QAM
- 64800 LDPC
- 1/15 FEC

PLP #2

- 16 QAM
- 64800 LDPC
- 5/15 FEC

PLP #3

- QPSK
- 64800 LDPC
- 5/15 FEC

6 MHz, TDM, 16k FFT, 64QAM,
64800 LDPC, 148us GI

8.70 Mbps

14.28 dB⁽¹⁾

17.44 dB⁽²⁾

PLP 1 HD/ 3D services

2.97 Mbps

2.82 dB⁽¹⁾

4.32 dB⁽²⁾

PLP 2 SD indoor services

0.66 Mbps

-1.70 dB⁽¹⁾

-0.55 dB⁽²⁾

PLP 3 mobile/radio
services

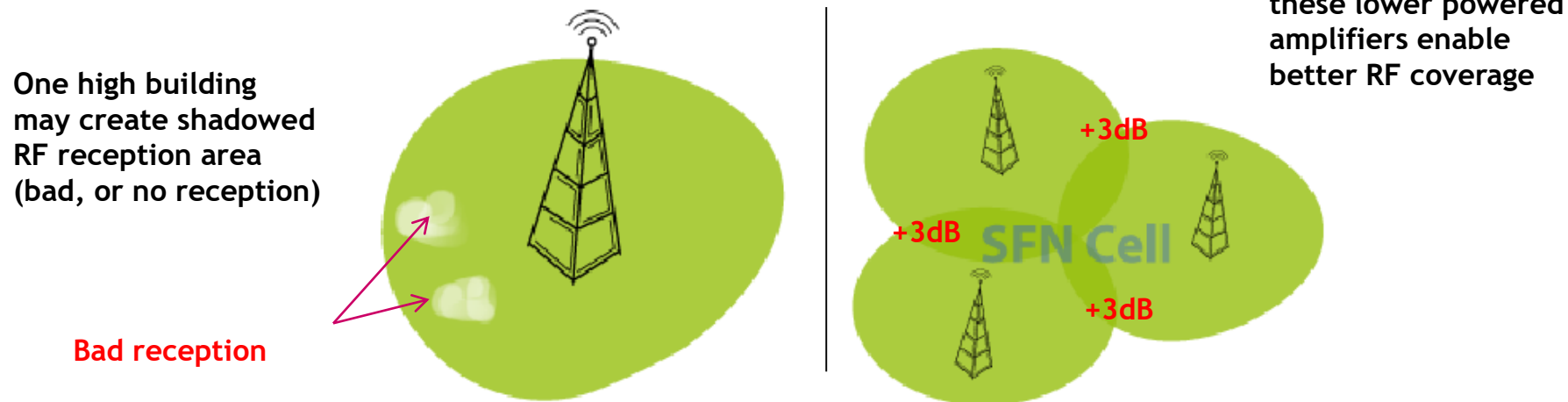
⁽¹⁾AWGN

⁽²⁾Rayleigh

Single Frequency Network (SFN)

Topology and advantages

- **Better RF coverage**
 - Several lower amplifiers instead of only one highly powered transmitter
- **Increase power reception**



- OFDM is more tolerant to multipath and echos compare to 8VSD
- Single Frequency Networks (SFN) employs multiple transmitters to cover a service area

➤ Better coverage

➤ Increase coverage

Thank You

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FROM THE SMPTE WASHINGTON DC SECTION

THANK YOU