

The logo for NABSHOW EXPRESS is displayed in white text on a black background. The word "NABSHOW" is in a large, bold, sans-serif font, with a registered trademark symbol (®) to its upper right. Below "NABSHOW" is the word "EXPRESS" in a smaller, all-caps, sans-serif font. To the left of the "A" in "NABSHOW" are three parallel, slanted lines of varying lengths, creating a stylized graphic element.

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The text "ATSC: Beyond Standards and a Look at the Future" is centered on the page in a white, sans-serif font. The background of the entire slide is black, featuring a series of colorful, overlapping, slanted rectangular lines in shades of blue, purple, yellow, and red, creating a dynamic, geometric pattern.

ATSC: Beyond Standards and a Look at the Future

ATSC: Beyond Standards and a Look at the Future



Lynn Claudy
SVP, NAB

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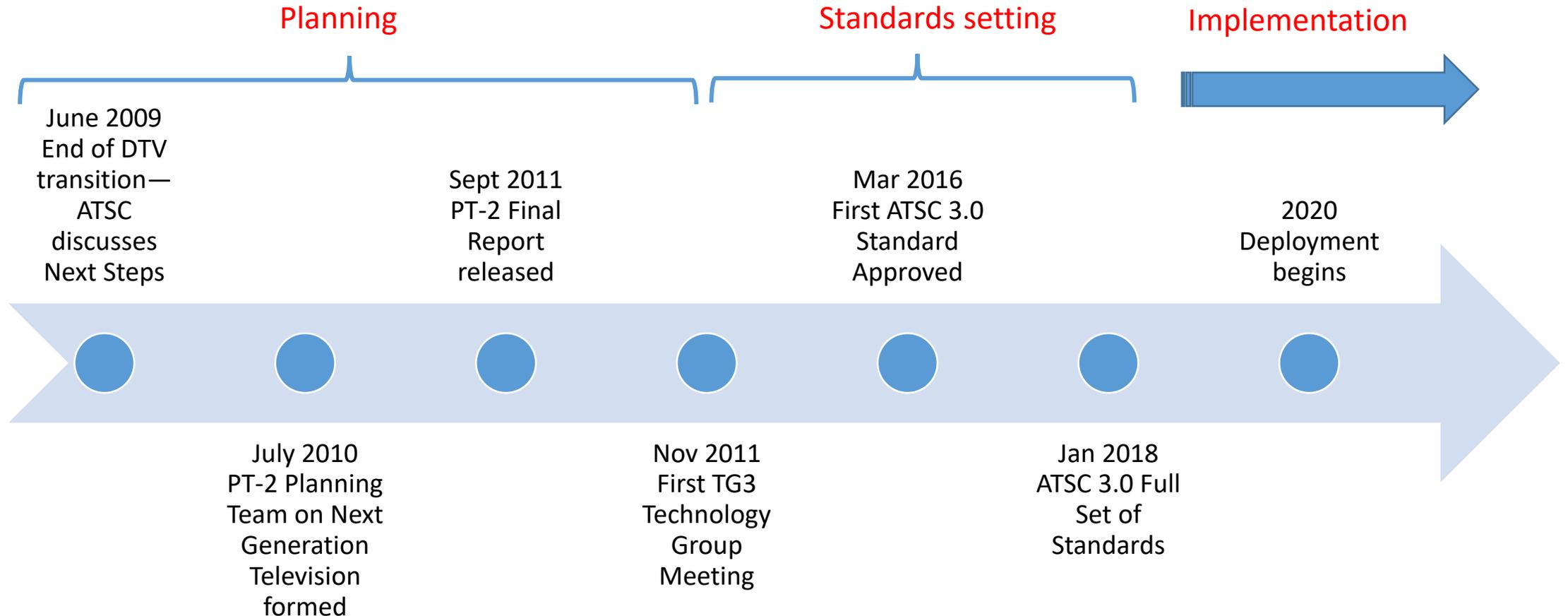
Madeleine Noland
President

Advanced Television Systems Committee

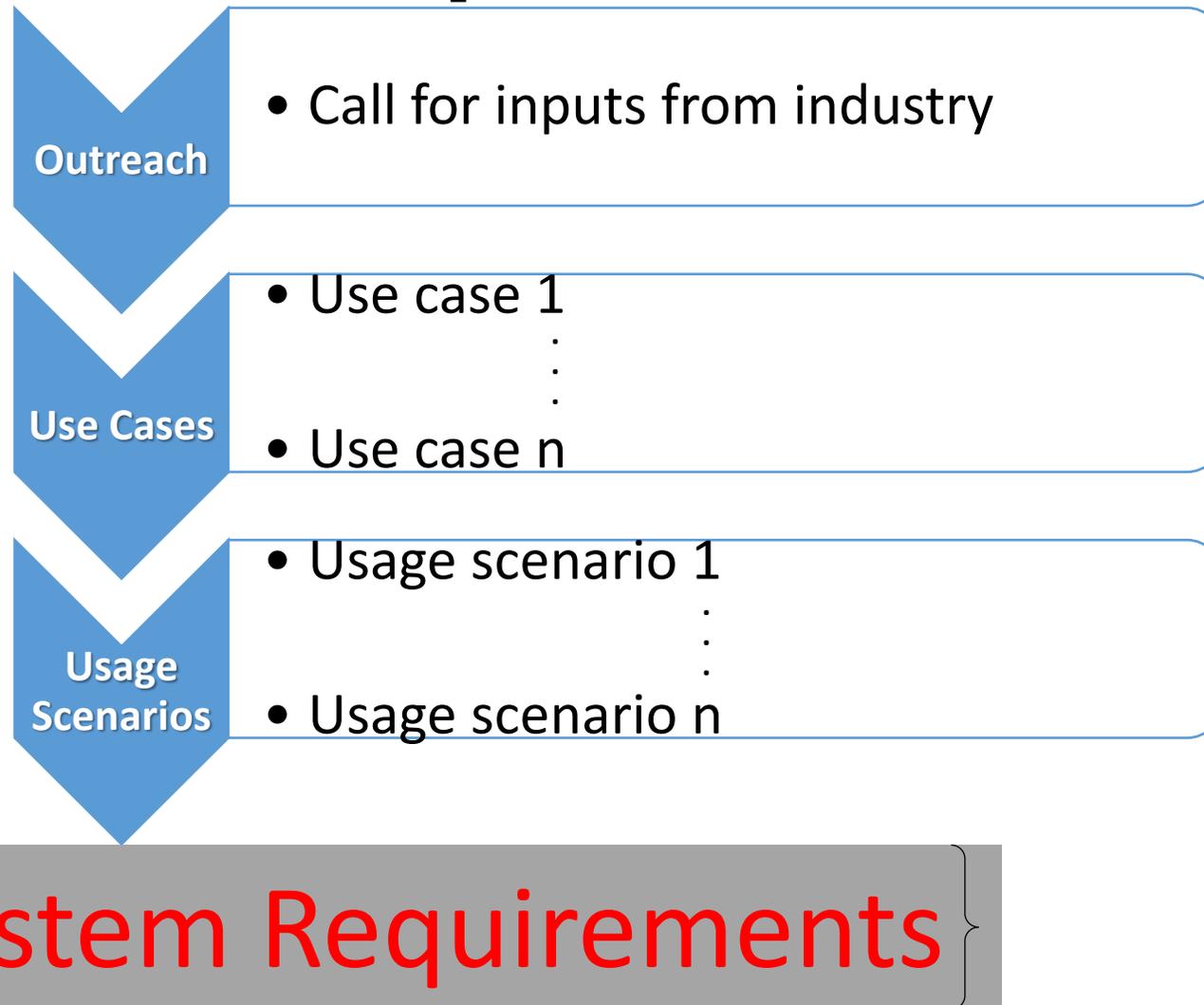
Topics

- ATSC 3.0's Path to Standardization
- Capabilities of ATSC 3.0 for Future Extensions
- ATSC Organizational Structures for Future Advancements
- Results from Planning Team 4 on Future Video Technologies

“What is past is prologue.” -- Shakespeare

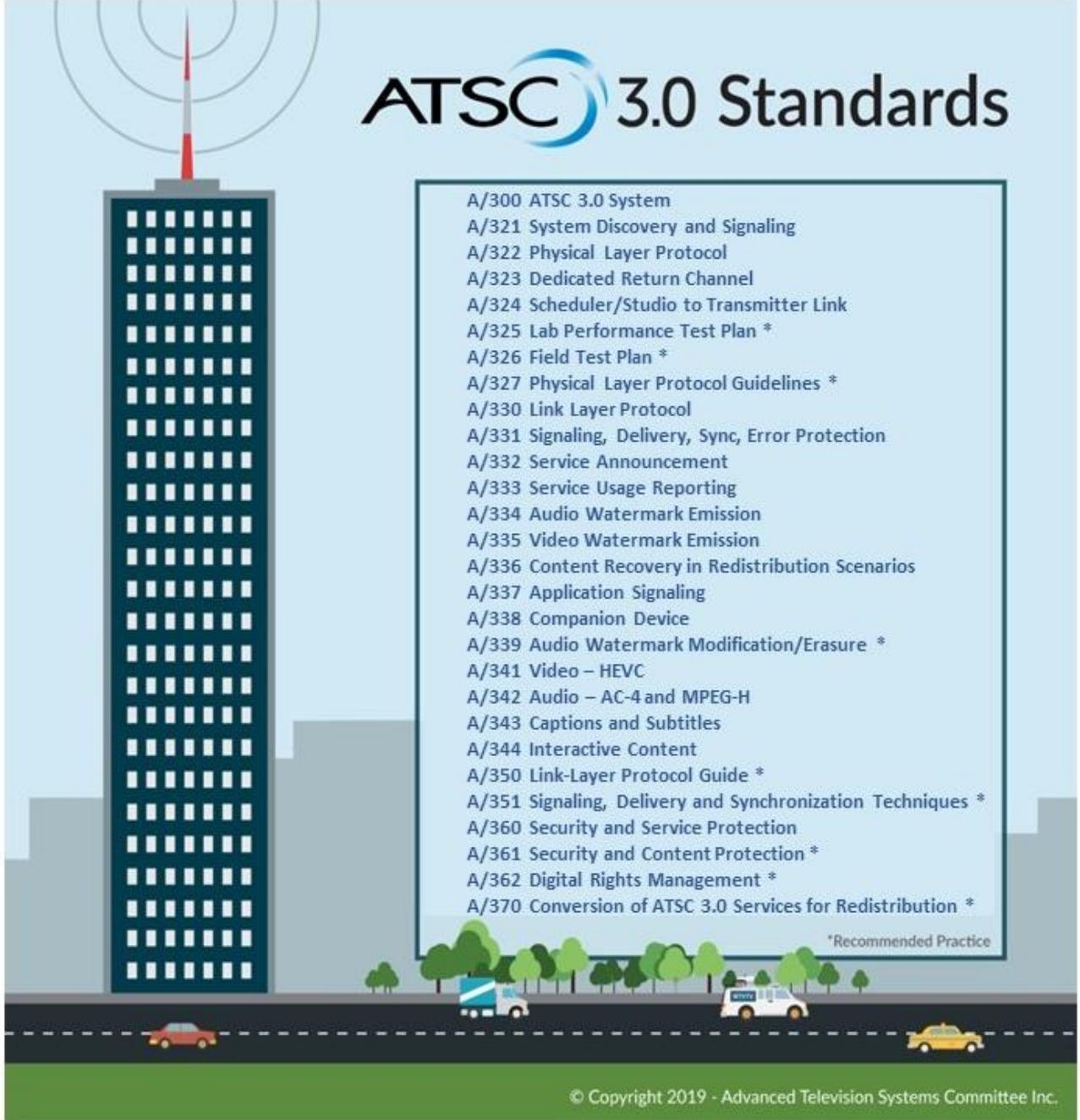


ATSC 3.0 Development Process



The Current ATSC 3.0 Suite of Standards

- 19 Standards
- 9 Recommended Practices
- Continues to Grow

A graphic titled "ATSC 3.0 Standards" featuring a stylized cityscape with a tall blue skyscraper on the left and a road with cars at the bottom. A large white box on the right contains a list of 37 standards and recommended practices. The ATSC logo is in the top right corner.

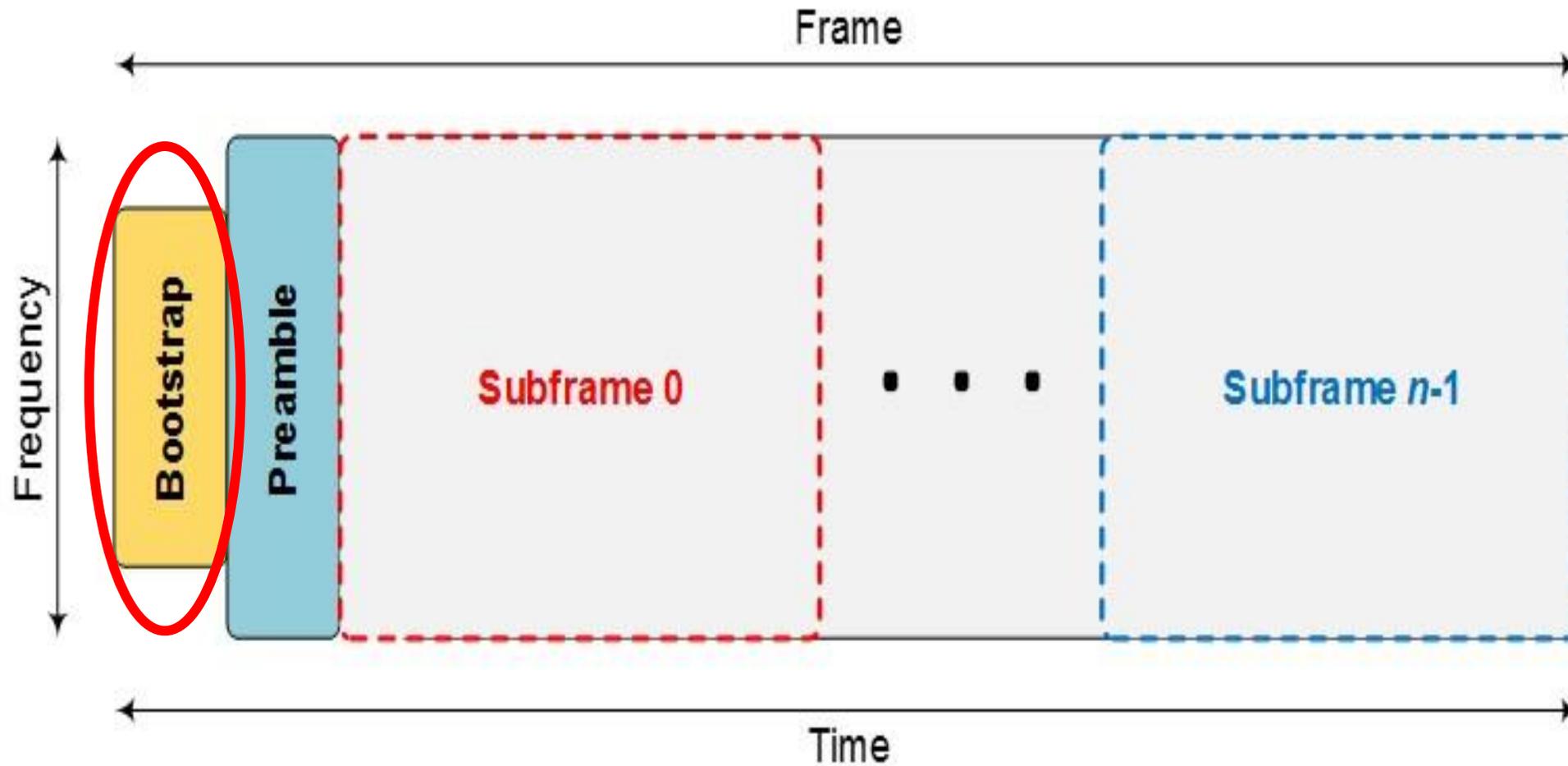
ATSC 3.0 Standards

- A/300 ATSC 3.0 System
- A/321 System Discovery and Signaling
- A/322 Physical Layer Protocol
- A/323 Dedicated Return Channel
- A/324 Scheduler/Studio to Transmitter Link
- A/325 Lab Performance Test Plan *
- A/326 Field Test Plan *
- A/327 Physical Layer Protocol Guidelines *
- A/330 Link Layer Protocol
- A/331 Signaling, Delivery, Sync, Error Protection
- A/332 Service Announcement
- A/333 Service Usage Reporting
- A/334 Audio Watermark Emission
- A/335 Video Watermark Emission
- A/336 Content Recovery in Redistribution Scenarios
- A/337 Application Signaling
- A/338 Companion Device
- A/339 Audio Watermark Modification/Erasure *
- A/341 Video – HEVC
- A/342 Audio – AC-4 and MPEG-H
- A/343 Captions and Subtitles
- A/344 Interactive Content
- A/350 Link-Layer Protocol Guide *
- A/351 Signaling, Delivery and Synchronization Techniques *
- A/360 Security and Service Protection
- A/361 Security and Content Protection *
- A/362 Digital Rights Management *
- A/370 Conversion of ATSC 3.0 Services for Redistribution *

*Recommended Practice

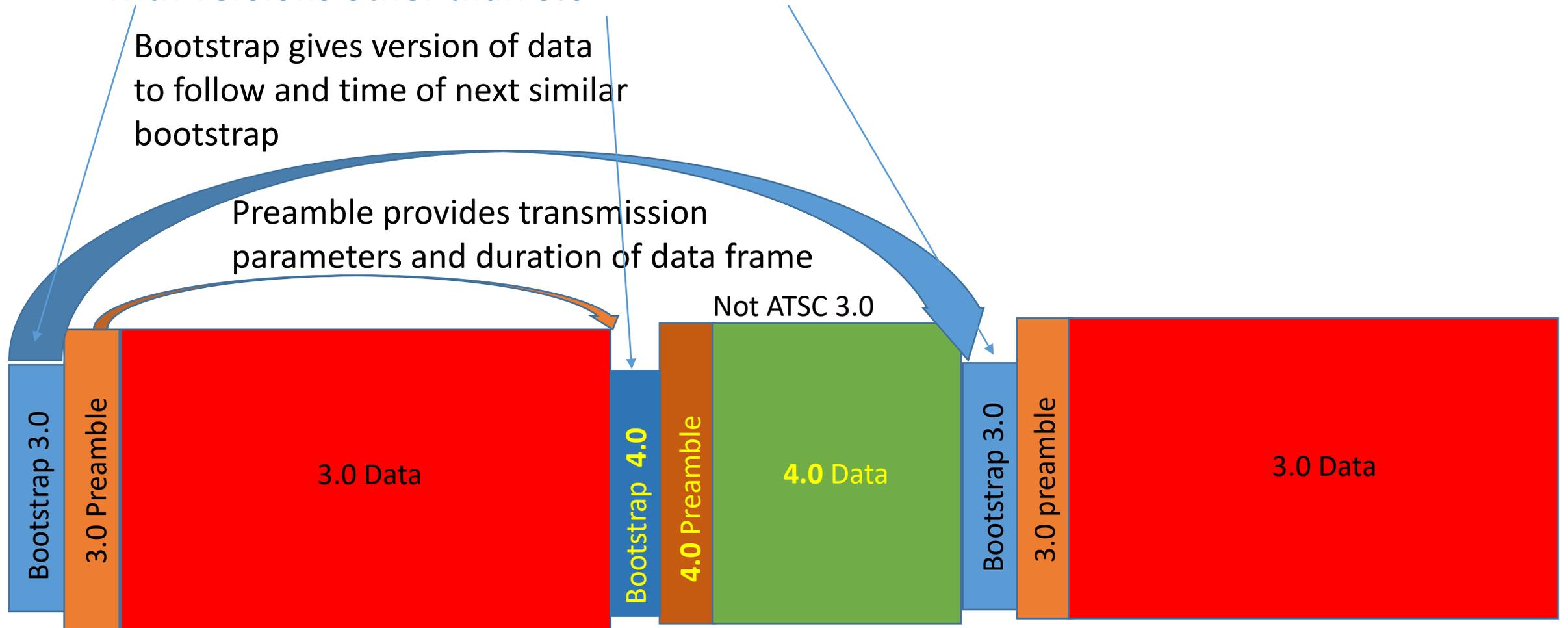
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Physical Layer Frame Structure



ATSC 3.0 Bootstrap Signal: the universal entry point

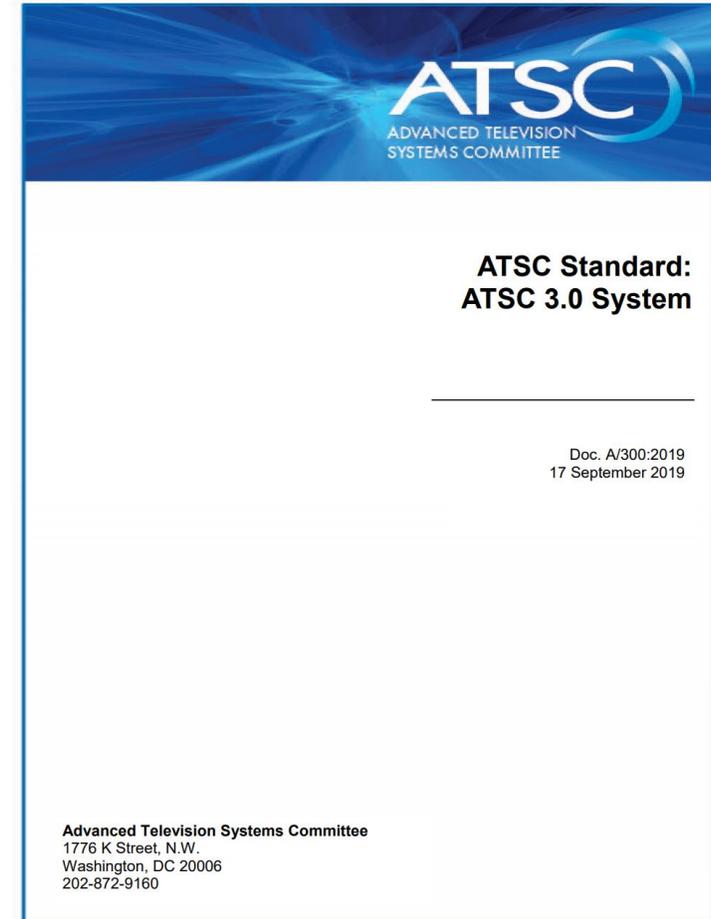
The format of the bootstrap signal will NEVER change— everything else may change with versions other than 3.0



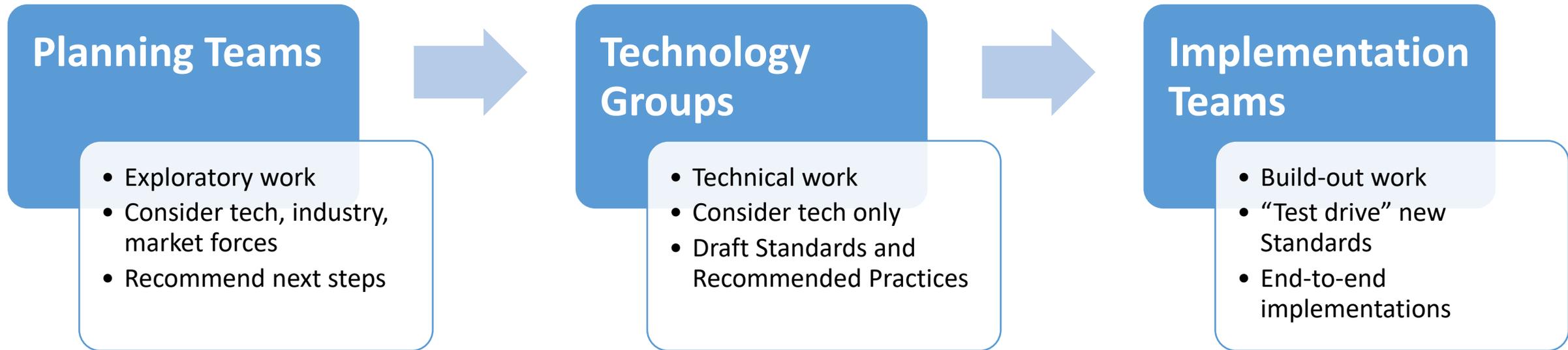
ATSC 3.0 Capabilities for Future Expansion

Document Version Control

- A/300:2020 “ATSC 3.0 System”
- Each ATSC Standard Progresses and is upgraded at its own pace
- A/300:xxxx normatively references a particular version of each of the standards for that year
- A/300 updated on an approximate annual basis



ATSC Group Structure



ATSC Planning Teams

- PLANNING TEAM 4 – FUTURE BROADCAST ECOSYSTEM TECHNOLOGIES
 - “The Planning Team on Future Broadcast Ecosystem Technologies (PT4) will assess the potential advantages and range of improvements that new ... technologies might provide to the future Broadcast Ecosystem...”
 - <https://www.atsc.org/subcommittees/planning-team-4-future-video-technologies/>
- PLANNING TEAM 5 – AUTOMOTIVE APPLICATIONS
 - “The Planning Team on Automotive Applications (PT5) will assess opportunities and challenges related to delivery of ATSC 3.0 services (including video, audio and other data) to vehicles...”
 - <https://www.atsc.org/subcommittees/planning-team-5-automotive-applications/>
- PLANNING TEAM 6 – GLOBAL RECOGNITION
 - “PT-6 will consider and recommend specific action items for encouraging global recognition of ATSC 3.0 as a leading international DTT standard”
 - <https://www.atsc.org/subcommittees/planning-team-6-global-recognition-of-atsc-3-0/>
- PLANNING TEAM 7 – ATSC 3.0 SERVICE EVOLUTION ROADMAP
 - “ATSC Planning Team 7 (PT-7) on ATSC 3.0 Service Evolution Roadmap will develop an ATSC 3.0 service evolution roadmap for the deployment of features enabled by A/300:2019/2020...”
 - <https://www.atsc.org/subcommittees/planning-team-7-on-atsc-3-0-service-evolution-roadmap/>
- PLANNING TEAM 8 – CORE NETWORK TECHNOLOGIES FOR BROADCAST
 - “PT-8 will study the core network concept and consider how it may apply to ATSC 3.0 digital terrestrial broadcasting.”
 - <https://www.atsc.org/subcommittees/planning-team-8-core-network-technologies-for-broadcast/>

PT-4 Future Technologies

Study on Evolution of Video Technology

- PT-4 studied “how” new technologies can be launched and also “why” they would be launched, with focus on video technology
- Future Codec Projections
 - efficiency, capabilities, timeline, ...
- Future Video Formats/Services
 - resolution (8k), frame rate, point clouds, AR, VR, ...
- Industry Evolution
 - broadcast signals, receivers, MVPD systems, OTT ...

PT-4 Video Report

Evolution Retrospective – ATSC 1.0 and 3.0



ATSC 1.0 – “Extensibility”

A/72 AVC Codec and A/153 Mobile DTV were standardized for ATSC 1.0, but the commercial reality was that ATSC 1.0 in practice didn't evolve.

ATSC 3.0 – “Evolve-ability”

ATSC 3.0 has all the flexibility of ATSC 1.0 and then some

It provides new PHY Layer extensibility

And thorough signaling at each layer

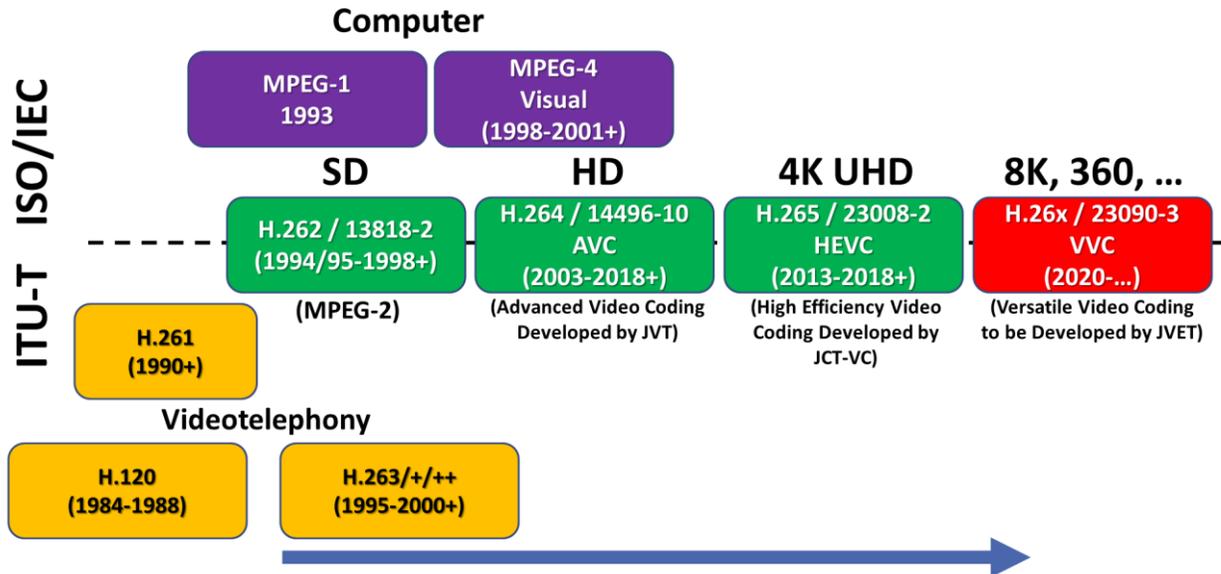
“Evolvability” facilitates launching new technologies, but it does NOT inherently solve business issues associated with non-backward-compatible transitions in the marketplace

Technical evolvability of a standard does NOT guarantee evolution of the market

Video Codec Evolution

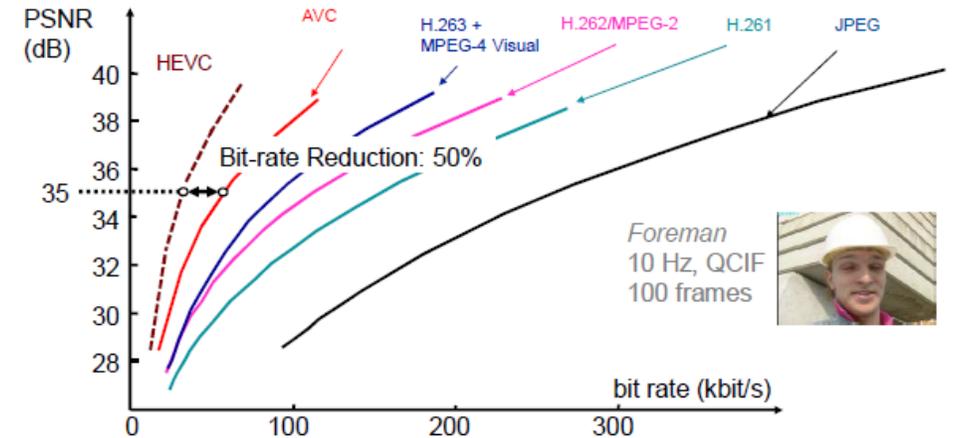
- History suggests that each new codec generation reduces bit rate by ~40-50%

History of international video coding standardization (1995 ~ 2020)



Versatile Video Coding - The Next-Generation Video Standard of the Joint Video Experts Team
 Gary Sullivan | Jens-Rainer Ohm | Mathias Wien | July 31, 2018

Performance history of standard generations



15 Versatile Video Coding - The Next-Generation Video Standard of the Joint Video Experts Team
 Gary Sullivan | Jens-Rainer Ohm | Mathias Wien | July 31, 2018

- History suggests that new codec generations develop on ~7-9 year cycles

Video Codec Adoption

- History suggests that improvements in codec efficiency alone may be insufficient to trigger market adoption in some ecosystems

While receivers might be able to be updated to accommodate a new codec, eventually the ability to incorporate new codecs in deployed receivers will be limited by underlying hardware

Consider that codec efficiency offers benefits to service providers and distributors, but there is no compelling benefit to consumers or receiver manufacturers for efficiency gains alone (except the ability to provide more of the same services)

*The codec conundrum: new codecs ALONE don't drive the marketplace ...
But new codec adoption is essential to remain competitive.*

The Entire Ecosystem Influences Codec Adoption

- Production Capabilities
 - If a new video format or service type supports a codec's success, content production systems and content creators will have to keep pace
- Receiver Capabilities
 - The existing receiver base typically has the largest audience potential
 - That said, consumer device capabilities often out-pace content production / distribution capabilities
- Content Distribution Systems
 - The plumbing between the Production and Receiver might be the most complex part of the ecosystem
- Consumers
 - WIIFM? Better compression alone might not be perceivable to consumers
- Standards Development / Invention
 - Could this be the easiest part?

A new codec can be part of a NEW DEPLOYMENT WIN for all players in the ecosystem.

And much, much more ATSC activity...

- Technology groups continue to draft recommended practices and hone the standards for ATSC 3.0
- Implementation teams explore uses of completed standards including advanced emergency messaging and conformance test development
- Planning teams continue to explore what the “next big thing” might be

ATSC as a Resource

- Technical documents <https://www.atsc.org/documents/>
 - Standards and Recommended Practices
 - Full report from PT-4 on video technologies
 - Advanced Emergency Information Implementation Guide
 - Initial AC-4 Implementation Technology Report
- Join the conversation
 - Membership info <https://www.atsc.org/members/>
 - Descriptions of all the groups <https://www.atsc.org/subcommittees/>
- Stay abreast of ATSC 3.0 deployments and developments
 - Third party resources <https://www.atsc.org/nextgen-tv/resources/>
 - Deployment tracker <https://www.atsc.org/nextgen-tv/deployments/>
- **Deploy | Converge | Evolve** – the ATSC 3.0 Progress Report Spring 2020
 - Read all about updates from the field; find it at [atsc.org](https://www.atsc.org)

This paper
“ATSC: Beyond Standards and a Look at the Future”
by Lynn Claudy (NAB), Madeleine Noland (ATSC) and Jerry Whitaker (ATSC)
is available in the 2020 BEIT Conference Proceedings

Purchase access at nabpilot.org/proceedings