Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

The Future of Television Initiative Report

January 17, 2025

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Introduction

I. Overview

In April 2023, Federal Communications Commission Chairwoman Jessica Rosenworcel announced the formation of the Future of Television Initiative, a public-private initiative led by the National Association of Broadcasters (NAB) to guide the next steps of the transition to ATSC 3.0. The Future of Television Initiative gathered industry, government*, and public interest stakeholders to work on a roadmap for the transition to ATSC 3.0.[1] In announcing this Initiative, Chairwoman Rosenworcel noted that "a successful transition will provide for an orderly shift from ATSC 1.0 to ATSC 3.0 and will allow broadcasters to innovate while protecting consumers, especially those most vulnerable."

Three working groups were established to address different facets of the transition:

- Working Group 1 (Backwards Compatibility, Tuner Availability and Consumer Issues): Determine the range of possible solutions, including technical solutions, for the lack of backwards compatibility and ways to fund those possible solutions and mitigate consumer impacts.
    - Participants: TelevisaUnivision, Public Knowledge, Advanced Television Systems Committee, Inc. (ATSC), Consumer Technology Association (CTA), LG, Vizio, Silicondust, Scripps, Nuvyyo (Tablo), Weigel Broadcasting Co., Block Communications, Fox, America's Public Television Stations (APTS), PBS, Pearl TV (Pearl), NCTA – The Internet and Television Association (NCTA), Disney, NAB, Federal Communications Commission (FCC)

- Working Group 2 (Completing the Transition): Establish conditions for completing the transition and resolving the hurdles remaining to reach that point.
    - Participants: CTA, ONE Media, Low Power TV Broadcasters Association, NCTA, ACA Connects – America's Communications Association (ACA), DISH, Paramount, Nexstar, Capitol Broadcasting Company, PBS, APTS, Harmonic, Consumer Reports, Best Buy, Pearl, PBS North Carolina, Sony, Samsung, NAB, FCC

- Working Group 3 (Post-Transition Regulation): Consider the rules that should govern ATSC 3.0 after the transition.
    - Participants: CTA, NCTA, ACA, DirecTV, APTS, PBS, Advanced Television Broadcasting Alliance (ATBA), Public Knowledge, Gray, Hearst, NBCUniversal, Pearl, American Council of the Blind, Gallaudet, MMTC, NAB, FCC

[1] The Future of Television Initiative is not governed by the Federal Advisory Committee Act (FACA).

II. Process

The Future of Television Initiative was formally announced in April 2023 at the 2023 NAB Show. NAB moderated monthly working group meetings from June 2023 through July 2024. During the meetings, participants were encouraged to identify issues they believe need to be addressed to ensure a smooth transition to ATSC 3.0. Working Group participants shared their viewpoints on such issues and worked to reach agreement or narrow the scope of disagreement where possible.[2] Through this process, participants were able to better understand the goals and concerns of other stakeholders and refine their views taking into account this improved understanding.

This Report summarizes the discussions of each Working Group and the viewpoints held by participants on the issues the Working Groups addressed.[3] NAB led the drafting process and Working Group participants were able to provide comments to ensure that the views on relevant issues that they presented during Working Group discussions were properly represented before the Report was finalized. Unless so stated, statements in the Report should not be attributed to any specific Working Group participant(s). It is anticipated that this Report will provide the Commission with a better understanding of the remaining issues and concerns of stakeholders and put the Commission in a better position to continue with the rulemaking proceedings necessary to complete a successful transition to ATSC 3.0. It should also aid and focus the efforts of industry stakeholders as they work together to deploy ATSC 3.0.[4] The Working Groups also worked to reach consensus on potential recommendations for next steps that should be taken by industry and/or the FCC to move the transition forward. To the extent consensus was reached on a specific recommendation, these recommendations are included in each Working Group's section of the Report.

**Federal Communications Commission staff participated in the Working Groups but did not contribute to the preparation of this report.*

[2] References throughout this report to "participants" or "Working Group participants" do not include FCC staff.

[3] The Report may not reflect all views held by participants regarding ATSC 3.0. It is intended to capture participants' views on the specific issues discussed by the Working Groups.

[4] ATSC 3.0 deployment is ongoing. Information provided in the Report regarding the status of the consumer device market and ATSC 3.0 deployment is current as of December 31, 2024.

Working Group 1 – Backwards Compatibility

I. Purpose and Scope

Working Group 1 was established to determine the range of possible solutions, including technical solutions, for the lack of backwards compatibility between the ATSC 3.0 and ATSC 1.0 standards. It also examined ways to fund possible solutions and to mitigate negative impacts to current viewers of over-the-air television.

The scope of this Working Group was limited to solutions to ensure viewers do not lose access to ATSC 1.0-equivalent television service during or following the transition. Issues pertaining to any potential regulation of ATSC 3.0 were addressed by Working Group 3.

II. Issues

Over the course of several meetings, the following issues were discussed:

- Solutions to address backwards compatibility (e.g., tuner availability, converter devices) and the challenges to these solutions
- Methods to ensure widespread access to backwards compatibility solutions while protecting consumers
- Minimizing negative consumer impact: loss of traditional television service, inconvenience, costs
- Availability and pricing[5] of consumer equipment (televisions, handsets, etc.), and
- Consumer education responsibilities and plans.

III. Summary

Nearly all Working Group participants identified consumer adoption of ATSC 3.0 television sets and converter devices as the most viable long-term solutions to address the lack of backwards compatibility between ATSC 3.0 and ATSC 1.0 consumer equipment. As discussed in further detail below, participants discussed concerns regarding the availability and affordability of converter devices with basic functionality. Participants also discussed certain features and functionalities of different converter devices, including the ability to function without need for an internet connection and to decrypt protected content. All participants recognized the importance of minimizing the costs to consumers when developing proposed solutions. All but one broadcast participant also agreed that there are costs to standing still. They explained that content providers seek out platforms that can deliver the highest quality experience; if broadcasters cannot offer a similar quality as other platforms, broadcasters may have difficulty obtaining the quality programming viewers enjoy today. The Working Group heard from participants about the progress being made as the rollout of ATSC 3.0 continues and consumer awareness of its benefits grows, and the Working Group recommends that both

[5] The Working Group was informed of the nature and importance of the United States antitrust laws and the need to strictly adhere to such laws at all times. Accordingly, Working Group participants did not share or discuss competitively sensitive information.

industry and the FCC explore voluntary market-based solutions and other mechanisms to further minimize or eliminate the costs to consumers of ATSC 3.0 converter devices.

IV. Backwards Compatibility Solutions

The Working Group identified and evaluated four potential solutions to address the lack of backwards compatibility and ensure that consumers retain access to traditional television service post-transition: (i) changes to the ATSC 3.0 technical standard; (ii) ATSC 3.0 television sets; (iii) ATSC 3.0 converter devices; and (iv) nightlight service.

A. Changes to the ATSC 3.0 Technical Standard

The Working Group evaluated the feasibility of modifying the ATSC 3.0 standard to be backwards compatible with ATSC 1.0 equipment. ATSC, consumer equipment manufacturers, and nearly all broadcast participants agreed that changing the standard would undermine many of the significant potential consumer benefits that ATSC 3.0 offers, due to fundamental differences between the two technologies.

ATSC 3.0 is designed to meet modern television consumers' demands for advanced features including 4K resolution, High Dynamic Range (HDR), immersive audio, on-demand viewing across fixed and mobile devices, and increased content options. Many streaming platforms already offer these capabilities. For broadcasters to remain competitive and to continue to offer high-quality, free, over-the-air television, they must also be able to deliver these features. A few participants noted that some of these advanced features could be achieved using ATSC 1.0 and do not require ATSC 3.0.

ATSC participants stated that ATSC 3.0 can support all of these advanced features due to a key advancement in its physical layer design.[6] ATSC participants explained that in contrast to ATSC 1.0's single-carrier design, ATSC 3.0 uses a multi-carrier physical layer design that offers several advantages.[7] The multi-carrier approach offers the potential for ATSC 3.0 to be more resilient to interference, improving reception for viewers. ATSC 3.0 also has the potential to come close to the Shannon Limit, the maximum data capacity of spectrum relative to the robustness of the signal.[8] It allows broadcasters to deliver a variety of services simultaneously within the same channel. As broadcast technology continues to develop, ATSC 3.0 can deliver both existing and new services in the same channel at the same time.[9]

ATSC participants explained that to be compatible with ATSC 1.0 receivers, ATSC 3.0 would need to revert to a single-carrier design.[10] This would come at the significant cost of limiting the advanced services and improved viewing experiences that ATSC 3.0 aims to offer.[11] Moreover, a backwards compatible standard was tried and proved to be unsuccessful. Several

[6] ATSC Presentation to Working Group 1, at 4, 6 (Aug. 14, 2023) (Attachment A).
[7] *Id*.
[8] *Id*. at 4-6.
[9] *Id*. at 6.
[10] *Id*. at 7.
[11] *Id*.

years ago, the FCC, ATSC, and the U.S. State Department promoted a suite of enhancements known as ATSC 2.0 that could deliver some advanced features while still working with existing sets. Ultimately, that effort failed because it lacked sufficient capacity to deliver many of the key potential consumer benefits that ATSC 3.0 offers and could not accommodate future upgrades.[12] Due to the tension between the inherent limits of ATSC 1.0 and similar first-generation television systems and modern viewers' demands, other markets including Brazil, Europe, Japan, and Korea have also selected standards that incorporate second generation television capabilities but are not backwards compatible.[13]

B. ATSC 3.0 Television Sets

NEXTGEN TV-certified television sets offer a streamlined way for consumers to continue to receive television service as broadcasters transition to ATSC 3.0. The Consumer Technology Association (CTA) established the NEXTGEN TV certification program to help consumers easily identify televisions and devices that are compatible with the ATSC 3.0 broadcast standard.[14] Televisions that are certified under this program bear the NEXTGEN TV logo, indicating that they have been verified to receive, decode, and display ATSC 3.0 signals accurately.[15] NEXTGEN TV sets support ATSC 1.0 signals, as well as the core features of the ATSC 3.0 standard, and are also designed to accommodate future advancements and updates in broadcasting technology.

Over 100 NEXTGEN TV models are available from several major television manufacturers, including Samsung, Sony, TCL, and Hisense.[16] The ATSC 3.0 television market is still in its early stages, and equipment manufacturers and nearly all broadcast participants expressed optimism about its growth as broadcasters and consumers increasingly embrace the new standard. Overall sales of NEXTGEN TV sets surpassed 10 million units in December 2023, and an estimated 15,000 new NEXTGEN TV sets are sold each day. According to CTA, 4.5 million, or 10% of all TV sets shipped to U.S. retailers in 2024 were ATSC 3.0 compatible. As shown below, CTA projects that number to grow to 21 million units shipped in 2026 and reach 28 million in 2027.

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[12] *Id*. at 3.
[13] *Id*.
[14] CTA, *NEXTGEN TV is the Future of TV*, https://www.cta.tech/Membership/Member-Groups/Video-Division/NEXTGEN-TV.
[15] *Id*.
[16] https://www.watchnextgentv.com/

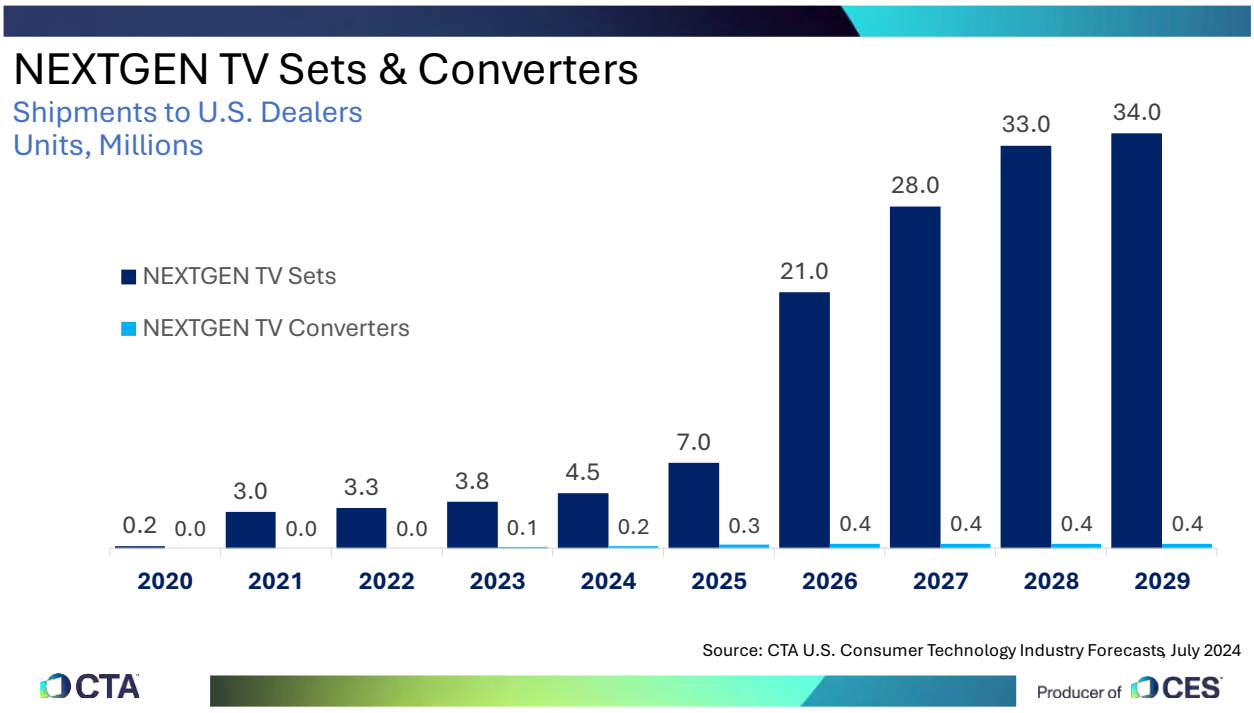

Figure 1: CTA Forecasts, July 2024

The Working Group identified lack of consumer awareness of the benefits of ATSC 3.0, lack of availability of unique content and services for prospective buyers of NEXTGEN TVs, and the implementation of ATSC 3.0 in higher cost television models as the primary impediments to the more widespread adoption of ATSC 3.0 television sets. However, many Working Group participants agreed that as broadcasters and manufacturers continue to unveil ATSC 3.0's new advanced features, increased consumer awareness and the incorporation of ATSC 3.0 in lower-cost models likely will increase adoption and lead to lower prices over time.

C. ATSC 3.0 Converter Devices

ATSC 3.0 converter devices are designed to receive and decode ATSC 3.0 signals for display on ATSC 1.0 television sets. Some participants noted that because these devices cost much less than an ATSC 3.0 television set, they can bridge the gap for consumers that are unwilling or unable to purchase a new television. Converter devices from several manufacturers including ADTH, Zinwell, and Zapperbox are commercially available and range in price from $90-$250.[17]

The converter device market is still in its nascency, with certified devices first becoming available in 2023. While current sales are small, CTA projects a 50% increase in 2025, before

[17] https://www.walmart.com/ip/ADTH-NextGen-TV-Box-Watch-Free-OTA-ATSC-3-0-1-0-in-4K-UHD-resolution/5297873740; https://www.channelmaster.com/products/nextgen-tv-receivers-zinwell-nextgen-tv-box; https://zapperbox.com/products/zapperbox-m1?srsltid=AfmBOop90RLZDPCceaV6SsJDi8EBu0A0ho2eVAdj-nTymJqQfhQcgPZP

leveling off to around 400,000 units per year in 2026. Equipment manufacturers and most broadcasters agree that as more consumers and broadcasters transition to ATSC 3.0, the market will grow, increasing the number of options and overall affordability for consumers.

Participants discussed several functionalities of converter devices that are available at different price points, including, (i) security features; (ii) functionality absent an internet connection; (iii) DVR functionality; and (iv) analog compatibility.

1. Security Features

The ATSC 3.0 standard, like other IP-based transmission standards, supports new security features designed to protect the integrity of broadcast signals and assure consumers receive verified and secure content. Many broadcasters have started using these features, and it is important that converter devices can support secure channels once all broadcasters are securing channels with signal signing. Much like websites, ATSC 3.0 uses cryptographic technology to ensure that all broadcast signals sent to a viewer's device are signed and certified as authentic.[18] This can prevent signal hijacking and the proliferation of malware on consumers' receivers.[19]

This cryptographic technology also enables broadcasters to employ Digital Rights Management (DRM) to protect content against theft or piracy.[20] Most broadcasters in the group stressed that piracy of broadcast content is a significant business concern and makes broadcasting a less desirable distribution platform, especially for high value programming. Many other content distribution platforms, including most ad-supported services, offer content protection. Nearly all broadcast participants agreed that for broadcasters to be able to obtain high value programming, including HDR content, they must be able to provide similar protection, or programming providers will take that content to other platforms. Enabling broadcasters' use of DRM helps ensure that viewers of free, over-the-air television maintain access to high quality content.

The ATSC 3.0 Security Authority (A3SA) enables the security features of the ATSC 3.0 standard to protect broadcast signals and content.[21] It also administers licensing agreements for ATSC 3.0 security technologies to ensure that manufacturers of ATSC 3.0 receivers and transmitters comply with the standards. Licensed receivers can easily display protected content in a manner that is transparent to the user. A3SA also coordinates with the CTA NEXTGEN TV logo program so that manufacturers who use the logo are aware that broadcast content may be encrypted. CTA logo applicants are required to certify that they have contacted A3SA to ensure that their devices will be able receive and display content that has been transmitted pursuant to A3SA's protocols.[22]

[18] A3SA Presentation to WG 1, at 2-3 (Aug. 21. 2023) (Attachment B).
[19] *Id*. at 3.
[20] *Id*.
[21] *Id*. at 4.
[22] *Id*. at 6.

Although some converter devices that were released early in the transition do not have the required licenses to support DRM, now there are devices available from multiple manufacturers, including ADTH, Zinwell, and Zapperbox that support DRM, and many additional devices are in development.[23]

Some participants expressed concern that A3SA licenses are available only for a period of 10 or 30 years. Public interest participants voiced concerns that the 10-30 year license term could lead to increased costs for consumers and that the need for certification could result in a reduced number of devices. In their view, devices that incorporate DRM support may be more expensive due to licensing fees, certification costs, and the need for specialized hardware. Public interest participants also expressed that the need for periodic DRM updates could create ongoing costs and maintenance issues, potentially rendering older devices obsolete. Industry representatives indicated that the license terms are commonplace in the industry and sufficiently long. Other participants noted that the duration of license terms likely will be a marketing consideration as devices with varying functionalities and price points will be marketed to different types of consumers.

2. DRM Support for Unconnected Devices

The Working Group evaluated whether converter devices can support DRM without need for an internet connection and determined that not all converter devices require an internet connection to support content protection. Converter devices require a security key to decrypt protected content. These keys can either be stored or persistent. Stored keys are located on the device such that, once the device is set up, it does not require an internet connection to decrypt content.[24] Unlike stored keys, persistent keys are not kept permanently on the device and instead are retrieved periodically from a secure server. This method requires the device to have an internet connection to continue accessing the encrypted content.[25] A3SA supports devices with both types of security keys.[26]

Converter devices like the Zinwell NextGen TV Box are currently on the market and verified to operate securely without an internet connection.[27] ZapperBox is actively working on software updates for their converter devices to support content security without needing an internet connection, providing more options for consumers who cannot or prefer not to connect their devices to the internet.[28]

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[23] *Id*. at 5.
[24] *Id*. at 17.
[25] *Id*. at 16.
[26] *Id.* at 16-17.
[27] Zinwell NextGen TV Box, Channel Master (accessed Nov. 12, 2024), https://www.channelmaster.com/products/nextgen-tv-receivers-zinwell-nextgen-tv-box (list of features states that it decodes encrypted content with or without an internet connection).
[28] Frequently Asked Questions, Zapperbox (accessed Nov. 12, 2024), https://zapperbox.com/pages/faqs.

3. DVR Support

Early in the Working Group's discussions, some participants raised concerns about the lack of converter device support of DVR functionality for DRM-protected content. Two developments occurred that may have resolved this issue. First, in August 2023, A3SA released broadcast encoding rules designed to ensure that DVR functionality will be preserved.[29] These rules guarantee that consumers can record and play back content without limitations on features like "trick play" (i.e., pause, rewind, or fast-forward), the length of time that recordings can be retained, or the use of analog outputs. Second, A3SA released specifications for DVRs and home gateway devices that were developed in consultation with manufacturers.[30] Devices are available on the market that support DVR functionality now, and other manufacturers are planning to incorporate this functionality in the future.[31]

4. Analog Compatibility

Some Working Group members expressed the need for converter devices that are compatible with analog outputs. Although HDMI has been standard since 2007, making it sufficient for most consumers, there may be a very small number of viewers with analog televisions that will require devices that do not rely on an HDMI connection. The Working Group confirmed that ADTH's converter device is analog-compatible.[32] In addition, ATSC representatives noted that other markets that have adopted ATSC 3.0, such as Jamaica, require analog-compatible devices, and it is expected that more devices will become available to meet that demand.

D. Temporary Nightlight Service

The Working Group also discussed how a temporary "nightlight" service that continues to offer primary ATSC 1.0 programming streams for a limited period following the transition might provide a bridge and minimize disruption for viewers as they adapt to the new standard. Some Working Group participants noted that the nightlight service would likely need to be provided at a reduced resolution (e.g. anamorphic SD or widescreen SD). The suggestion of a nightlight service that provides programming differs from the nightlight service provided during the digital television transition in 2009. In that case, broadcasters that were operating on "in-core" channels that were not immediately needed for DTV service

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[29] Attachment B at 7. These encoding rules are not specific to converter devices and will also impact DVR functionality for viewers with NEXTGEN TV sets or who receive broadcast content through an MVPD. A3SA retains the right to alter its rules in the future. The current rules apply only to ATSC 3.0 broadcasts that are simulcasts of ATSC 1.0 broadcasts.
[30] Phil Kurz, *A3SA Releases Specification Aimed at Enabling ATSC 3.0 DVR Development*, tvtechnology.com (Feb. 26, 2024), https://www.tvtechnology.com/news/a3sa-releases-specification-aimed-at-enabling-atsc-30-dvr-development.
[31] Home Page, Zapperbox (accessed Nov. 12, 2024), https://zapperbox.com/.
[32] https://support.adth.com/en/support/solutions/articles/43000712669-connecting-to-an-analog-tv-with-an-rca-cable

were able to operate for an additional thirty days for the purpose of broadcasting public service announcements about the DTV transition and emergency information.[33]

V. Minimizing Consumer Costs

The Working Group explored options to reduce or eliminate costs for consumers who rely exclusively on over-the-air television to ensure that they can continue to receive traditional television service. Public interest participants expressed their belief that viewers should not bear the costs of transitioning to ATSC 3.0, and that the FCC should ensure consumers are protected, possibly through the provision of free converter devices.

Broadcasters recognize the importance of ensuring that vulnerable consumers are able to continue to access free, over-the-air television service. Nearly all broadcast participants agreed that the industry has every incentive to ensure that no station loses a single viewer as a result of the transition. There is no business model where broadcasters benefit from eliminating viewers, especially since broadcasters have no direct financial relationship with consumers and thus cannot simply make up any customer (i.e., viewer) loss by increasing prices on those retained. These broadcast participants further explained that they support ATSC 3.0 to simply keep up with competing technologies and not because it presents windfall opportunities, and as such, the industry itself is not in a position to fully or nearly fully fund the cost of ATSC 3.0 converter devices.

While minimizing costs and negative consumer impact is a priority for all stakeholders, most broadcast participants emphasized that the Commission should view the notion that the ATSC 3.0 transition should come at zero cost to the consumer in historical context. The Working Group discussed previous technology transitions and broadcasters noted that wireless providers have upgraded their systems from 1G to 2G in the 1990s and then to 3G in the 2000s to 4G in the 2010s, and now to 5G without any mandate to subsidize the costs of consumers upgrading their equipment. Moreover, in the most analogous prior broadcast technology transition, the nation's transition to digital television in 2009, consumers who had not bought a digital TV had to purchase converter boxes to enable their analog televisions to receive digital signals. The federal government funded a coupon program to subsidize viewers' purchases of these devices. The coupon program was not designed to and often did not cover the full cost of a converter device. Most broadcast representatives noted that if the government is seeking to completely or nearly completely insulate consumers from any costs due to the transition, Congress should create a fund for consumers similar to the one it developed for the transition to digital television. Such a fund could also cover costs associated with helping small broadcast stations and small MVPDs transition to ATSC 3.0. However, these efforts would extend beyond what was required for nearly every other technology transition, including the commercial wireless industry moving from 3G to 4G and from 4G to 5G. In those instances, consumers were required to pay substantial sums to ensure their devices were compatible with the latest technologies and so that their existing devices did not become

[33] I*mplementation of Short-term Analog Flash and Emergency Readiness Act; Establishment of DTV Transition "Analog Nightlight" Program*, Report and Order, 24 FCC Rcd 6966 (2009).

obsolete or at least could take advantage of new consumer benefits. Broadcasters also noted that these transitions happen more often than broadcast-standard transitions, as the transition to ATSC 3.0 is only the second transition of its kind since the advent of free, over-the-air television and is designed to be future-proof. Broadcasters also cautioned that there are costs to standing still. Content providers seek out platforms that can deliver the highest quality experience; if broadcasters cannot offer a similar quality as other platforms, broadcasters may have difficulty obtaining the quality programming viewers enjoy today.

Others in the Working Group noted some differences between the ATSC 3.0 transition and the technology transitions discussed above. For instance, MVPD participants stated that the digital broadcast transition was mandated by the government, whereas the ATSC 3.0 transition is voluntary. MVPD participants also noted that during the transitions from one digital wireless generation to the next, the wireless providers maintained the older technologies for a number of years after deploying new services, allowing consumers to decide when they might make the transition. Such participants explained that these additional years maintaining older technologies are especially notable as the life cycle of mobile handsets is much shorter than the life cycle of mobile standards. Most broadcast representatives and other participants emphasized, however, that this was done on an entirely voluntary basis and wireless providers were free to retire older digital technologies when it made sense for their business regardless of whether some number of consumers would be left behind. Such participants also noted that wireless carriers have the necessary spectrum capacity to operate multiple non-backward compatible systems simultaneously (3G, 4G and 5G, for example), whereas broadcasters operate within a single 6 MHz allocation. As such, the mobile operator transition scenario may not apply to television broadcast transitions in this respect.

The Working Group also evaluated market-based strategies to reduce the cost of ATSC 3.0 converter devices. Nearly all participants indicated that broadcasters' and retailers' efforts to educate and make consumers aware of the benefits of ATSC 3.0 could help increase demand for these devices, enabling manufacturers to achieve higher production volumes and drive down costs through economies of scale. The Working Group also discussed the desirability of a robust market of low-cost devices with simplified features that would be more affordable for consumers. Specifically, the group discussed the desirability of a minimal cost "lifeline" device that contains only those core functionalities necessary to receive and decode both ATSC 1.0 and ATSC 3.0 signals.

The Working Group also discussed whether setting a date for the voluntary transition to ATSC 3.0 might affect consumer costs. Most broadcasters, ATSC participants, and some equipment manufacturers concurred that establishing a firm date for broadcasters to voluntarily cease simulcasting in ATSC 1.0 and begin transmitting in ATSC 3.0 exclusively could provide certainty to manufacturers, retailers, and consumers and stimulate both supply and demand in the market, leading to lower prices. Some equipment manufacturers noted that such deadlines, however, must provide a mechanism to ensure that desirable new content and services delivered via ATSC 3.0 already have stimulated consumers' interest in ATSC 3.0 and their purchase of ATSC 3.0 receivers sufficiently to allow a responsible voluntary ATSC 1.0 shutoff. Such equipment manufacturers further noted their view that conditions to enable this

shut-off must be driven by consumer demand and adoption, not by government mandates. MVPD participants stated that, in their view, it is premature to establish either a voluntary or mandatory ATSC 1.0 sunset date and that the Commission has stated that it will initiate a proceeding to consider the sunset of certain ATSC 1.0 requirements in 2026.

In addition to the cost of equipment itself, the Working Group discussed other costs that consumers may incur in connection with the installation of converter devices. During the digital television transition, Congress appropriated funds to the FCC to educate consumers and assist them in installing and configuring their converter boxes. Most participants in the Working Group agreed that installation and configuration costs will be lower for this transition for two reasons. First, installing converter devices will require fewer steps because consumers do not need to replace existing antennas. Second, unlike in 2009, most consumers have experience plugging HDMI devices into their televisions and over-the-air viewers are familiar with the process of scanning for channels. One participant noted that the costs could be higher for this transition because, in their view, some converter devices may be more difficult for some consumers to set up and there are more over-the-air viewers now then there were during the digital television transition. Most broadcaster participants explained that broadcasters historically have provided support to consumers that need help to view their signals at no cost and have every incentive to do so here.[34]

VI. Consensus Recommendations

Most Working Group participants agree that the market for lower cost converter devices is growing and will enable viewers to receive ATSC 3.0 signals on existing ATSC 1.0 television sets. Working Group participants also recognize, however, that the cost of ATSC 3.0 converter devices may make it difficult for vulnerable viewers to transition to ATSC 3.0. The Working Group therefore recommends that industry and the FCC continue to explore strategies and sources of funding[35] that could help eliminate or at the very least lower the costs of devices to consumers.

[34] Other costs, including consumer internet costs and costs associated with potential future subscription services or other variable costs were raised but determined to be out of scope by nearly all Working Group participants when it comes to addressing the lack of backwards compatibility with the ATSC 1.0 standard. While an internet connection may be necessary to obtain some of the advanced features that ATSC 3.0 offers, it is not necessary to receive ATSC 1.0-equivalent service. Similarly, other variable costs that consumers may incur to receive services that go beyond a free, over-the-air video stream would also be outside the scope of minimizing the costs of backwards compatible solutions.

[35] The Consumer Technology Association's (CTA) policy is not to seek government funding. MVPD participants took no position on government funding.

Working Group 2 – Conditions for Completing Transition

VII. Purpose and Scope

Working Group 2 was assembled to establish conditions for completing the transition to NEXTGEN TV broadcasting and resolve hurdles remaining to reach that point.

VIII. Issues

The issues identified at the outset of the Working Group 2 process included:

- Minimizing negative consumer impact
- Availability and pricing of consumer equipment
- Consumer education responsibilities and plans
  - Simulcasting: under what conditions it may end and whether it would continue to be permissible
- Managing ATSC 1.0 and ATSC 3.0 capacity as more stations transition, and
- Tuner and labeling standards.

While there was some overlap between Working Group 1 and Working Group 2, particularly for the first two issues outlined above, this Working Group focused primarily on voluntary market-driven consumer adoption of NEXTGEN TV, while Working Group 1 focused on the needs of consumers who do not choose to adopt NEXTGEN TV-compatible equipment prior to a transition date.

IX. Summary

As of mid-2024, broadcasters have launched at least one NEXTGEN TV service in 75 markets, reaching slightly over 75% of the U.S. population. However, broadcast participants stated that due to market conditions as well as the simulcasting requirement, most television capacity remains dedicated to ATSC 1.0 transmission. This Working Group discussed several factors that impact the readiness of consumers, manufacturers, and broadcasters to complete the transition.

The Working Group explored factors that impact the availability and pricing of consumer equipment that can receive NEXTGEN TV signals, how consumers are educated about the availability and capabilities of such equipment, and what motivates consumers to obtain such equipment. These discussions highlighted the need for broadcasters to continue to offer compelling new services in ATSC 3.0, such as 4K video, HDR video, enhanced audio, and interactive applications, to motivate consumers to seek out new receivers.

The Working Group also explored options for managing ATSC 1.0 and ATSC 3.0 capacity during the transition to expand capacity for NEXTGEN TV without reducing ATSC 1.0 programming. Each option explored presented some trade-offs but may be a valuable option to increase the services available to consumers.

Finally, the Working Group discussed whether establishing a date for the sunset of the simulcasting requirement could help align the various industries and improve consumer readiness.

A. Minimizing Negative Consumer Impact

A joint goal of all parties is to ensure that consumers can continue to receive broadcast signals, by one or more of a NEXTGEN TV-capable television set, a converter device such as a dongle or set-top box, or MVPD carriage of NEXTGEN TV signals. This Working Group considered the drivers of each of these approaches without any government mandates.

With respect to consumer adoption, factors discussed included:

- What drives consumer demand for new features?
- What motivates manufacturers to include features in television models?
- How do retail outlets choose what to order, sell, and promote?

These three questions are all closely interrelated. Retailers respond to consumer demand; manufacturers respond to retailer demand; and consumers respond to features and capabilities that they can see.

Service improvements drive consumer interest. When broadcasters can offer a noticeably superior product with Next Gen Television, consumers will demand it from retailers and manufacturers. Although some of the benefits of NEXTGEN TV, including the ability to deliver 4K video over-the-air are not widely achievable given the bandwidth constraints during the transition, there are things that broadcasters can do and are beginning to do that leverage NEXTGEN TV features in a way that may drive consumer interest.

For example, broadcasters are beginning to offer video in 1080p and high-dynamic range (HDR). This offers a visibly enhanced picture quality. During the course of the Future of Television Initiative, several sporting events were produced in native HDR formats and that trend is expected to continue. Manufacturers noted that audio quality generally does not tend to be a big driver of consumer adoption of television sets, however audio features like the ability to choose between hometown versus visiting sports announcers could stimulate consumer interest. Broadcasters emphasized, however, that NEXTGEN TV's AC-4 audio provides significant consumer-facing benefits including consistent loudness, dialogue enhancement, and immersive audio features that their research shows is desired by viewers.

Broadcasters can also drive consumer interest through interactive features unique to NEXTGEN TV. Many broadcasters are offering interactive apps to provide easy access to recent news stories, weather, or other hyper-local content. For example, Pearl has created the Run3TV platform to help broadcasters develop interactive applications to enhance the viewing experience that are delivered seamlessly in the live broadcast and across all devices. Earlier this year, NBCUniversal launched an interactive app on its NBC and Telemundo-owned stations across the country that enhances the viewing experience by incorporating local news, hyper-local weather, traffic updates, and other community-specific content into network

programming such as The Today Show. These apps also allow viewers to restart a program from the beginning if they tune in after it starts.

Other service improvements discussed included potentially superior indoor reception compared to ATSC 1.0 as well as enhanced mobile reception.

Deadlines focus efforts but do not directly drive consumer adoption. Manufacturers maintain that consumers *do not* respond to deadlines as a primary motivator. Nevertheless, manufacturers agree that having a deadline or target date is helpful in both product planning and communication to the public. Consumer electronics participants and low power broadcast participants noted that such deadlines must provide a mechanism to ensure that desirable new content and services delivered via ATSC 3.0 have already stimulated consumers' interest in ATSC 3.0 and their purchase of ATSC receivers sufficiently to allow a responsible ATSC 1.0 shutoff. Those participants added that the conditions to enable this shut-off must be driven by consumer demand and adoption, not by government mandates. MVPD participants expressed their belief that it is premature to establish either a voluntary or mandatory ATSC 1.0 sunset date, and noted that the Commission has stated that it will initiate a proceeding to consider the sunset of certain ATSC 1.0 requirements in 2026.

B. Availability and Pricing of Consumer Equipment

Over the course of the Future of Television Initiative, the Consumer Technology Association provided several updates on device sales and projections, both of NEXTGEN TV-capable televisions and accessory devices.

Before the launch of the Future of Television initiative, there were no NEXTGEN TV-certified converter devices available at retail (one non-certified gateway device was available). Since then, several products have been launched, including devices from ADTH and Zinwell. An A3SA-certified DVR from Zapperbox was also launched.

As of September 2024, Hisense, Samsung, Sony, and TCL are offering more than 100 NEXTGEN TV models. LG, which had previously made NEXTGEN TV models, suspended introduction of new NEXTGEN TV models in 2024 because of a patent infringement lawsuit while its appeal is pending.

CTA presented data and forecasts regarding NEXTGEN TV sales to the Working Group on several occasions. CTA estimates that 10% of total TV shipments in 2024 will have NEXTGEN TV tuners. Their forecast indicates that in 2026, 21 million NEXTGEN TV sets will ship, in addition to about 400,000 converter devices. This is compared to about 41 million annual television sales. These projections are based on current market conditions and do not consider the possibility of a transition deadline or target date being established.

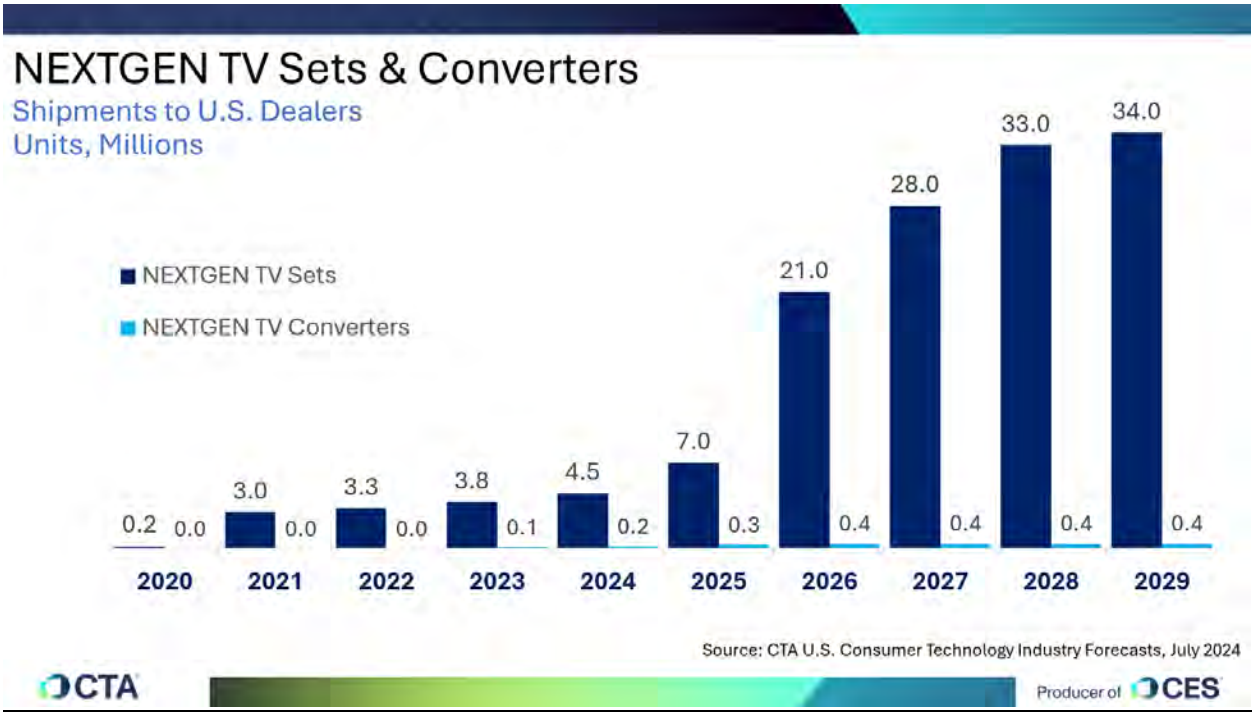

Figure 2: CTA Forecasts, July 2024

C. Consumer Education Responsibilities and Plans

The NEXTGEN TV logo, administered by the Consumer Technology Association, is the primary consumer-facing means of identifying devices that are ATSC 3.0 compliant. Some manufacturers include the logo on boxes or tear sheets. Broadcasters have promoted "look for the logo" when advertising Next Gen features.

The Working Group discussed additional ways to improve consumer awareness of Next Gen TV, including the possibility of including a NEXTGEN TV logo on screen in the ATSC 3.0 transmissions. NAB, CTA, and ATSC are working on best practices around promotion. Pearl TV has developed a consumer-facing website to educate viewers on the features and availability of NEXTGEN TV.[36] It was reported in the February 2024 meeting that broadcasters have engaged in a national advertising campaign in which close to $40 million in promotional spots aired both on-air and digitally promoting the NEXTGEN TV logo and features. Now that NEXTGEN TV signals are available in over 75% of the country, national advertising and labeling efforts are becoming more effective.

Broadcasters will continue to take the lead in educating consumers about the availability of NEXTGEN TV signals and continue to work closely with manufacturers and retailers to ensure that point of sale information is clear and consistent.

[36] www.watchnextgentv.com

D. Simulcasting

FCC rules require that stations wishing to transmit in ATSC 3.0 arrange to host their primary video programming in ATSC 1.0 on another broadcast station in their market and that the programming delivered over ATSC 1.0 be "substantially similar" to the programming delivered in ATSC 3.0.[37] Although the "substantially similar" requirement is scheduled to sunset on July 17, 2027, there is no date set for the end of simulcasting in the Commission's rules.

The Group discussed the market conditions that could permit simulcasting to end. Discussions focused on a voluntary end to simulcasting, primarily focused on full-power broadcasters. Consideration of a mandatory sunset of ATSC 1.0 transmissions was reserved for the post-transition regulatory discussion contained in Working Group 3.

Full-power broadcasters indicated they were unlikely to choose to end ATSC 1.0 transmissions until most consumers can receive NEXTGEN TV transmissions, whether on NEXTGEN TV televisions, converter devices, or via MVPD carriage. Broadcasters identified ubiquitous affordable dongles as a precursor to such a transition. Broadcasters and device manufacturers agreed that having a target date for a transition would help align product development cycles and messaging to ensure that consumers will have access to these devices. Consumer electronics participants and low power broadcast participants again emphasized that any consideration of a deadline must provide a mechanism to ensure that desirable new content and services delivered via ATSC 3.0 already have stimulated consumers' interest in ATSC 3.0 and their purchase of ATSC 3.0 receivers sufficiently to allow a responsible ATSC 1.0 shutoff and that the conditions to enable this shut-off must be driven by consumer demand and adoption, not by government mandates.

Examples from past transitions, particularly the DTV transition, were considered. The DTV transition was initially set up with a "soft deadline" based on market conditions and was later switched to a "hard date" that was established by Congress together with a program that provided government-funded coupons for the purchase of converter boxes. MVPD participants reiterated their position that it is premature to establish either a voluntary or mandatory ATSC 1.0 sunset date and noted that the Commission has stated that it will initiate a proceeding to consider the sunset of certain ATSC 1.0 requirements in 2026.

E. Managing Capacity During the Transition

During the transition to NEXTGEN TV broadcasting, unlike most other similar transitions, broadcasters do not have access to extra spectrum to launch this new service. Instead, broadcasters team up, with typically one broadcaster in a market providing an ATSC 3.0 signal (the "lighthouse") that hosts up to five other stations' NEXTGEN TV program streams, while the remaining broadcasters continue to offer ATSC 1.0 signals on their channel and host the lighthouse's programming in ATSC 1.0 format (see *Figure 3*). Large markets with more stations that want to transition may have two stations transmitting in ATSC 3.0. This ensures that viewers continue to receive access to ATSC 1.0 signals.

Delivering programming in both formats simultaneously takes enormous capacity and creates significant constraints on what services all participating broadcasters can offer. The

[37] 47 C.F.R. §§ 73.624(b)(3), 73.3801(b).

nationwide delivery of all programming in both ATSC 1.0 and ATSC 3.0 simultaneously with available spectrum is simply not possible. The ATSC 3.0 "lighthouse" can offer only a small fraction of the features that will be possible after the transition. Migrating additional stations to ATSC 3.0 opens more capacity for improved service but reduces the capacity available for ATSC 1.0 signals – making it much more difficult to continue to offer the quality and variety of content available today. Low power broadcast participants observed that in some cases there may be low power stations that are willing and able to partner with full-power stations to host some of the content during the transition. Full power broadcast participants noted that this is already occurring in several markets, but coverage differences can make it difficult to find a suitable hosting partner that preserves service to viewers and complies with the FCC rules.

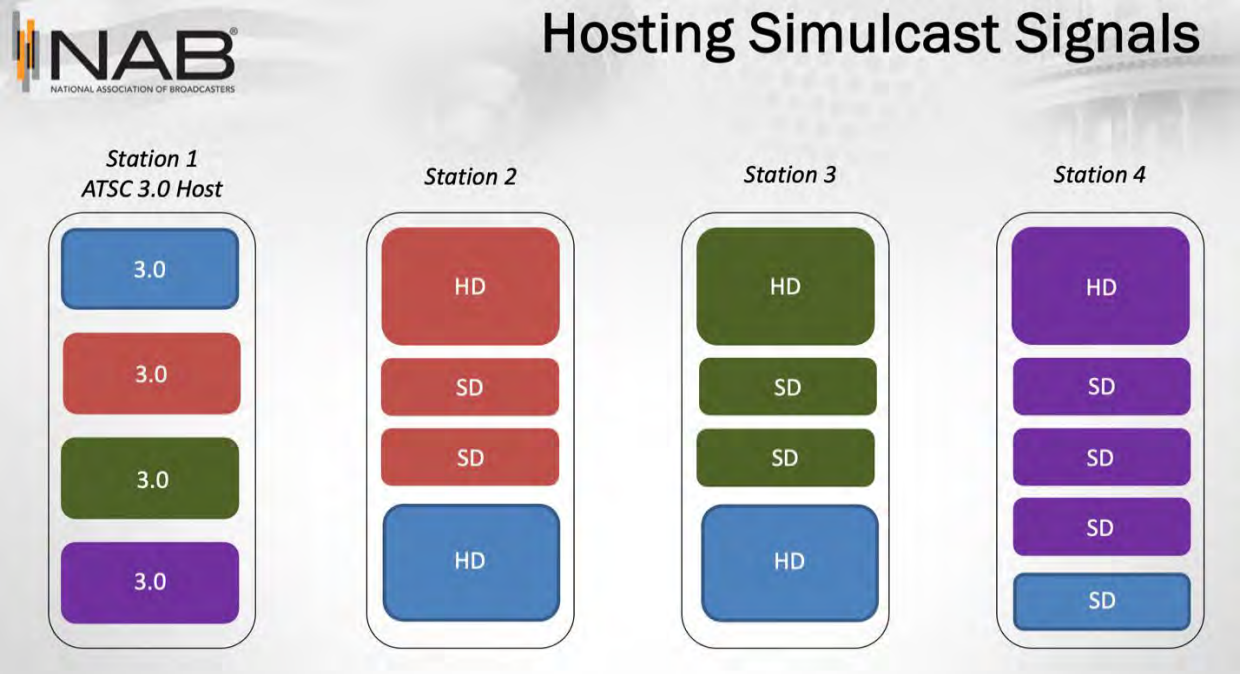

Figure 3: Presented at June 2023 FOTVI WG-2 Meeting

Interim technologies are not a panacea for minimizing disruption. Several alternative technologies were discussed as potential solutions to maintain service to viewers with ATSC 1.0-compatible equipment while enabling more capacity to be dedicated to ATSC 3.0 transmissions. Two options were discussed in depth: advanced video coding (AVC, also referred to as MPEG-4) and anamorphic/wide-screen standard definition video.

Some broadcasters are already using advanced video coding to deliver non-primary video streams as it enables them to offer roughly twice as many high-definition video program streams on a single ATSC 1.0 signal compared to MPEG-2. Broadcast participants shared their experience that most – if not all– televisions that are marketed as "Smart TVs" are capable of seamlessly decoding AVC video in an ATSC 1.0 signal. Some stations have begun transmitting their multicast program streams using AVC and have received few viewer complaints as a result. However, any consumer that is still using a sixteen-year old DTV

converter device or similarly aged early DTV television set would not be able to receive AVC-encoded video without upgrading.

Meanwhile, all DTV receivers can decode anamorphic or wide-screen standard definition content. Unlike normal standard definition content, anamorphic or wide-screen SD would fill the entirety of an HDTV screen without "pillar bars" surrounding the content. Thus, it would be less jarring than a traditional SD broadcast without requiring the bandwidth of a high-definition signal. Nevertheless, the content would still be lower resolution and many – if not most – consumers would be able to notice a degradation in quality.

F. Tuner and Labeling Standards

In 2019, CTA announced the introduction of a NEXTGEN TV logo, in partnership with ATSC and NAB. Devices bearing the NEXTGEN TV logo have gone through a testing and certification process that verifies that the devices are compliant with a suite of tests encompassing the portions of the ATSC 3.0 standard that are essential for Next Gen Television reception.

Additionally, nearly all devices that bear the NEXTGEN TV logo carry certificates from the ATSC 3.0 Security Authority (A3SA), which allow them to use cryptographic certificates both to verify the authenticity of content and applications received by the device and to secure any content that may be protected using the ATSC 3.0 security standard. A3SA's verification test suite is currently separate from the NEXTGEN TV test suite, but most devices go through the processes simultaneously. Discussions are underway to unify the testing programs.

X. Consensus Recommendations

Broadcasters should establish best practices for consumer notification and education. Using common language around the provision of new features would help consumers understand what to expect from NEXTGEN TV.

Working Group 3 – Post-Transition Regulation

I. Purpose and Scope

Working Group 3 was established to consider and evaluate whether any regulatory changes are necessary after the transition to ATSC 3.0.

II. Issues

The Working Group addressed the following issues:

- Multichannel Video Programming Distributor (MVPD) carriage of 3.0 signals
- Existing public interest obligations of broadcasters and potential regulatory changes to reflect ATSC 3.0 transmission
- Privacy and security for viewers and viewing information
- Accessibility of ATSC 3.0 programming, and
- Whether all ATSC 1.0 transmission must eventually end.

III. Summary

Working Group participants agreed that the transition to ATSC 3.0 in and of itself should not change the applicability of many existing regulations, including those pertaining to retransmission consent, accessibility, children's programming, political advertising, public file, EAS, and localism. Participants generally agreed that broadcasters should not face different privacy regulations than other entities that collect the same types of information. The Working Group also had constructive dialogue on areas where viewpoints diverged. As discussed in further detail below, MVPD participants identified certain technical challenges MVPDs face in carrying ATSC 3.0 signals, which, in their view, may necessitate changes to or clarification of carriage rules. Broadcast participants emphasized their commitment to working with MVPD partners and noted that a number of these technical challenges may be addressed in SCTE/DVS standards and ATSC recommended practices, some of which have already been released by SCTE, and the FCC should review these standards and practices once they are released to determine what technical challenges remain and may need to be addressed. Public interest participants believe that some of broadcasters' public interest obligations may require change to reflect ATSC 3.0 transmission and the advanced capabilities that ATSC 3.0 offers. Broadcast participants emphasized that ATSC 3.0's advanced capabilities offer numerous potential public interest benefits and that regulations that constrain broadcasters' ability to explore the full potential of ATSC 3.0 should not be reflexively imposed to prevent hypothetical harms that have not yet materialized.

IV. MVPD Carriage of 3.0 Signals

Broadcast television signals are carried by MVPDs pursuant to either mandatory carriage (i.e., "must-carry") or retransmission consent. Under the mandatory carriage provisions of the Communications Act and FCC rules, if a qualifying station elects must-carry, MVPDs are required to carry that station's signal without compensation to the broadcaster.

Retransmission consent, on the other hand, allows broadcasters and MVPDs to engage in good faith negotiations for the prices, terms, and conditions of MVPDs' right to carry broadcast signals. Noncommercial educational stations may only elect must-carry and do not have the ability to elect retransmission consent.

At the outset, the Working Group reviewed the FCC's existing carriage rules and agreed that based on currently available information, several may not require modifications post-transition to accommodate the change in broadcast technology to ATSC 3.0, including those pertaining to significantly viewed signals, channel positioning, compensation for carriage, retransmission consent, and several definitions.[38]

MVPD participants also identified certain technical challenges MVPDs face in carrying ATSC 3.0 signals which in their view may necessitate changes to or clarification of carriage rules. MVPDs explained that their views are based on information currently known about the ATSC 3.0 transition, technology use-cases, and related standards and is therefore subject to change as circumstances evolve. In addition, as individual MVPDs may differ significantly in how digital television is carried on their systems, technical challenges and limitations may vary across the MVPD ecosystem.

A. MVPD Perspective on Technical Challenges Presented by ATSC 3.0 Carriage for MVPDs

The below lays out the MVPD perspective on technical issues raised by potential must carry requirements for ATSC 3.0 signals. This paper does not address other issues surrounding must-carry. MVPDs note that many of these issues will also arise in the context of retransmission consent negotiations but stress that how these issues may be resolved — if at all — in the context of complex bilateral carriage negotiations is not necessarily indicative of how the issues should be resolved in the context of must carry.

MVPD Participants Assert that ATSC 3.0 Carriage Would Require New Equipment and Other Costs. ATSC 3.0 is not backwards compatible with MVPD digital video systems. Accordingly, MVPD participants stated that all MVPDs will need to purchase new equipment and incur other costs to transcode ATSC 3.0 signals to signals compatible with their systems and that these costs will be incurred regardless of whether the MVPD down-converts the signal or passes through the ATSC 3.0 signal in its native format to customers. DBS carriers and other MVPD participants stated that they lack the capacity to pass through the ATSC 3.0 signal in its native

[38] *See* 47 C.F.R. § 76.54 (Significantly viewed signals method to be followed for special showings); 47 C.F.R. § 76.57 (Channel positioning (cable)); 47 C.F.R. § 76.66(i) (Channel positioning (satellite)); 47 C.F.R. § 76.61 (Disputes concerning carriage (cable); 47 C.F.R. § 76.66 (m) (Disputes concerning carriage (satellite)); 47 C.F.R. § 76.64 (Retransmission consent); 47 C.F.R. § 76.65 (Good faith and exclusive retransmission consent complaints (applicable to all MVPDs and broadcasters)); 47 C.F.R. § 76.56 (Signal carriage obligations (cable)); 47 C.F.R. 76.66 (b), (d), (h), and (o) (Signal carriage obligations (satellite)); certain definitions found at 47 C.F.R. § 76.55 (cable) and 47 C.F.R. § 76.66 (a), (e). (g) (satellite).

format, meaning that costs incurred likely will not benefit their customers.[39] Such participants assert that this is not, as broadcasters suggest below, "reliance on outdated equipment" to "degrade" broadcast signals.[40] Rather, MVPD participants stated that not all MVPDs can pass through ATSC 3.0 in native format, and not all those that can will conclude that any subscriber benefits merit the expense. MVPD participants stated that any potential rules should take these costs into account.

Costs Associated with the Reception and Processing of ATSC 3.0 Signals Regardless of the Manner of Delivery.

New transcoders. One transcoder will be required per broadcast station per location (a cable headend or Direct Broadcast Satellite (DBS) remote, local over-the-air (OTA) reception site). Consequently, MVPD participants stated that the cost of the necessary equipment to perform this transcoding may be significant, particularly for smaller MVPDs serving many distributed locations.[41] Moreover, MVPD participants stated that the specific features any one MVPD may require, the volume of transcoders they may purchase, and the discounts, if any, they are able to negotiate – all of which affect cost – may vary widely across MVPDs. Further, MVPD participants contend that any assumption that the cost of transcoders will decrease significantly as time progresses and more transcoders are purchased is purely speculative at this time. In addition, MVPD participants also noted that this cost is not necessarily one that

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[39] Thus, MVPD participants contend that broadcast statements that ATSC 3.0 equipment upgrades can result in a higher-quality viewing experience for MVPDs subscribers, *see below section entitled* "Broadcast Perspective on the Technical Challenges Raised by MVPDs," are inapplicable to those who cannot offer such signals in native format. In addition, with respect to broadcast claims about DBS capacity constraints below, MVPD participants emphasized:

- MVPD participants contend that any carriage of ATSC 3.0 in "native" format will, by definition, be unavailable to satellite customers without ATSC 3.0-compatible set-top boxes (that is, essentially all of them). MVPD participants assert that until each such box is replaced, therefore, carriage of non-downconverted ATSC 3.0 signals must, by definition, be *in addition to* carriage of downconverted signals. MVPD participants assert that it thus does not matter that ATSC 3.0 "does not inherently require higher bandwidth capacity."
- In any event, MVPD participants assert that one of the features of ATSC 3.0 is that it allows stations to change the amount of bandwidth they choose to devote to any one stream or group of streams, essentially on the fly. Thus, MVPD participants stated that a station that chooses "to launch multiple HD streams but not a 4K stream" can change its mind. (MVPD participants also note that the total bandwidth required by "multiple HD streams" might be the same as that required by single "4K stream" in the first place.)

[40] DIRECTV, for example, has recently replaced its transcoders.

[41] MVPD participants contend that these costs could amount to hundreds of thousands of dollars, even for a cable operator with only a few thousand subscribers. MVPD participants stated that a per-subscriber expense of that magnitude would be difficult to bear and could be a factor that drives smaller cable operators to consider exiting the video business.

MVPDs would otherwise incur, as not all MVPDs currently transcode ATSC 1.0 signals and even those MVPDs that do transcode may not have plans to upgrade or replace equipment on a timeline that corresponds to the ATSC 3.0 transition in markets they serve.

New receivers. MVPD participants stated that because ATSC 3.0 replaces 8VSB modulation with orthogonal frequency division multiplexing, new receivers would be needed.

Demultiplexers. MVPD participants noted that MVPDs may have to separate out multiple streams of programming from a single ATSC 3.0 station, which would require demultiplexers. MVPDs also stated that they may also have to separate out broadcast material intended for retransmission from non-broadcast material not intended for retransmission. This may require the use of demultiplexers, although MVPD participants are unaware of any existing technology that could separate broadcast from non-broadcast material.

Costs Associated with Over-the-Air Reception of ATSC 3.0 Signals. MVPD participants stated that MVPDs would incur additional costs to receive ATSC 3.0 signals over-the-air. For example, MVPD participants stated that demodulators capable of converting ATSC 1.0 are incapable of converting ATSC 3.0 signals to a bitstream. MVPDs would have to purchase additional demodulators to accommodate such reception.[42]

MVPD Participants Assert that Good Quality Signal Requirements Would Have to Be Updated for ATSC 3.0. The Commission's rules provide that a local commercial television station asserting must carry rights is required to deliver a good quality signal to the principal headend of a cable system.[43] MVPD participants explained that good quality signal reception means that the MVPD can reliably demodulate, decode, and transcode the OTA broadcast signal to redistribute the primary video channel. MVPD participants believe that the current definition of good quality signal reception for ATSC 1.0 in the Commission's rules (−61dBm)[44] would have to be adjusted for ATSC 3.0. MVPD participants stated that defining a signal level sufficient for reliable demodulation of the OTA RF signal is not necessarily sufficient to enable redistribution of the primary ATSC 3.0 video channel by an MVPD. MVPD participants contend that compliant IP encapsulation, ROUTE or MMT transport, HEVC encoding (or subsequent video coding standard), and AC-4 audio encoding of the primary video channel are also relevant to the quality of signal reception by MVPDs, and modulation codes for reliable demodulation must also be identified.[45]

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[42] In addition to these costs, MVPD participants contend that MVPDs may also incur patent royalty fees related to ATSC 3.0 equipment. *See, e.g.*, American Television Alliance Comments, GN Docket No. 16-142, at 13 (filed May 9, 2017) (discussing potential patent costs).

[43] *See* 47 C.F.R. § 76.55(c)(3); 47 U.S.C. § 534(b)(10)(A).

[44] *See id*.

[45] MVPD participants stated that compliant IP encapsulation, ROUTE or MMT transport, HEVC encoding (or subsequent video coding standard), and AC-4 audio encoding of the primary video channel are also necessary for non-OTA (e.g., fiber-based) delivery of the primary video channel to the MVPD.

To the extent the Commission were to adopt ATSC 3.0 must-carry, MVPD participants stated that ATSC would likely need to develop a Recommended Practice for ATSC 3.0 akin to A/78, which is currently used for evaluating transport streams in ATSC 1.0. MVPD participants stated that any such Recommended Practice could be incorporated by reference in any must carry requirements for a good quality signal and should include decodability requirements for any alternative signal delivery methods (e.g., fiber) that a station may utilize as well.

MVPD Participants Assert that the Rules for Material Degradation Would Have to Account for the Capabilities of MVPD Systems. Section 614 of the Communications Act requires that cable operators carry broadcast signals "without material degradation," and instructs the Commission to "adopt carriage standards to ensure that, to the extent technically feasible, the quality of signal processing and carriage provided by a cable system for the carriage of local commercial television stations will be no less than that provided by the system for carriage of any other type of signal."[46] MVPD participants stated that in keeping with this statutory provision, the Commission has over the years revised the standard for avoidance of material degradation to account for changes in technology. ATSC 3.0 enables broadcasters to enhance the audio and video capabilities of their programming in a number of ways. MVPD participants stated that these features, however, may exceed the capabilities and capacity of an MVPD's digital video system. For example, DBS providers stated that in most cases they do not have the capacity to add bandwidth-intensive 3.0 signals of local stations on their spot beams. Other MVPDs, including smaller cable operators, stated that they will also have capacity constraints. Such participants stated that to manage constraints, transcoding and down-converting an ATSC 3.0 primary video channel for carriage will be necessary and could impact audio and video features. MVPD participants stated that since this type of degradation is unavoidable, it should not be considered material degradation of the primary video channel under any possible rules.

MVPD participants also contend that such issues are not present in ATSC 1.0, as ATSC 1.0 broadcast signals have not changed significantly over time. ATSC 3.0 is the first change in digital broadcast signals that is not backward compatible and that introduces features that cannot be supported by MVPD systems. MVPD participants stated that, in contrast, MVPD set-top box and television set advancements over time have maintained backward compatibility. MVPD participants further stressed that they should not be required to incur the significant cost burden and customer disruption that accompany large-scale set-top box replacement and network evolutions in order to accommodate broadcasters' voluntary choice to transition to a non-backward compatible technology.

Video Formats. Not all MVPD set-tops support video formats such as 4K video resolution, High Efficiency Video Coding (HEVC), Scalable High Efficiency Video Coding (SHVC), High-Dynamic Range (HDR), and Wide Color Gamut (WCG). MVPD participants stated that in these instances, the transcoding process will down-convert the primary video channel to an encoding and resolution format supported by the MVPD's set-tops. MVPD participants asserted that this

[46] 47 U.S.C. § 534(b)(4)(A).

process will necessarily degrade the video quality (e.g., in resolution, dynamic range, and color gamut) to fit the capabilities of the MVPD's system.

For example, SHVC is an extension of the HEVC standard that allows video to be encoded in scalable layers. MVPD participants explained that a broadcaster, using SHVC, could transmit the signal for a programming channel OTA in HD (1080p) while also streaming a 4K UHD enhancement layer over broadband, which could then be combined in a connected NextGen TV to create a 4K UHD signal. MVPD participants stated that any NextGen TVs that are not connected to broadband would display only the HD video signal for the channel. MVPDs do not support SHVC. Therefore, in this scenario, MVPD participants stated that the MVPD may only be able to deliver the HD version of the video.[47] In addition, not all MVPD set-tops support 4K video resolution or HDR or WCG and therefore, in this scenario, MVPD participants stated that the MVPD may only be able to deliver HD video resolution with SDR and reduced color gamut.

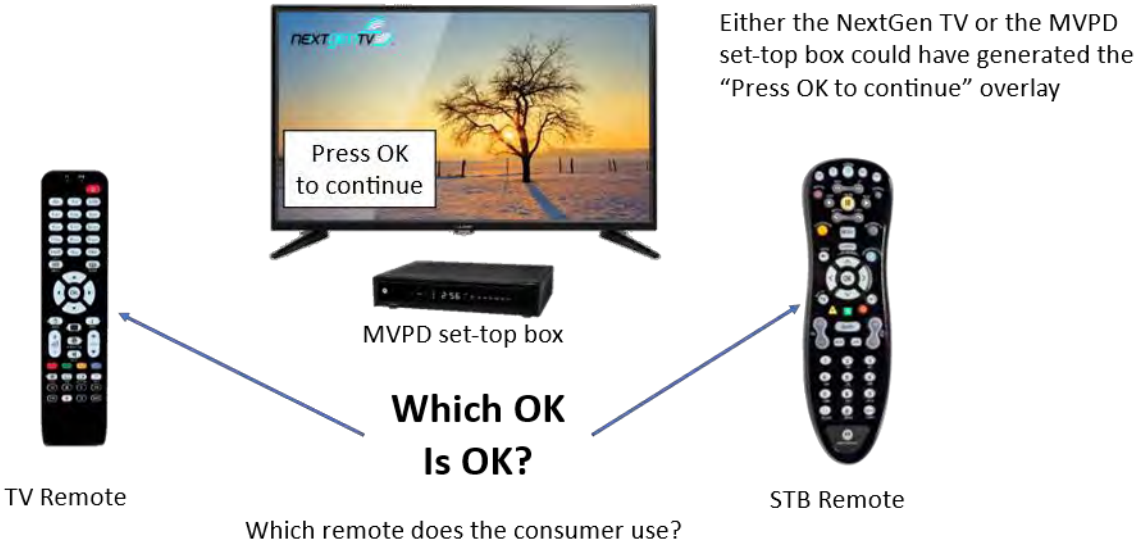
Audio Formats, Including Secondary Audio. Not all MVPD set-tops support AC-4 audio encoding or all the features and capabilities that are present in AC-4. MVPD participants explained that in these instances, the transcoding process will down-convert the audio to a format supported by the MVPD's set-tops.[48] As a result, MVPD participants stated that there would be limits for some MVPD set-tops on the number of audio channels they can support, which may result in fewer secondary audio choices, and dialog enhancement features present in AC-4 may not be available. MVPD participants noted that to the extent accessibility features are included in these additional audio tracks and enhancements, some MVPD set-tops would not be capable of making these accessibility features available. MVPD participants stated that this may be especially true for DBS, which may lack capacity for certain audio formats.

MVPD Participants Assert that ATSC 3.0 Should Not Expand the Concept of Program-Related Material. ATSC 3.0 introduces multiple additional mechanisms for transporting data to the ATSC 3.0 receiver, including within the audio and video streams and through separate data transport mechanisms and watermarking (see below). MVPD participants stated that these new data transport mechanisms should not expand the concept of program-related material to the extent the Commission were to adopt ATSC 3.0 must-carry rules; rather, carriage should continue to conform to current must carry regulation in this respect.

MVPD Participants Assert that Watermarking Would Present Issues for Consumers and MVPDs. Broadcasters transmitting in ATSC 3.0 may use watermarks to enable certain additional content and features, including applications and audio content delivered via a NextGen TV receiver.[49] MVPD participants expressed concerns that such watermarks could be passed through to MVPD subscribers without the MVPD's involvement or knowledge and

[47] While MVPDs are not aware of any current deployment of SHVC to transmit a primary video stream, the feature remains part of the ATSC 3.0 standard.
[48] MVPD participants stated that AC-3 is the most commonly supported format, as it is the audio codec specified in ATSC 1.0.
[49] The ATSC 3.0 standard for watermarking is specified by the ATSC standard: *Content Recovery in Redistribution Scenarios* Doc. A/336:2023-08 August 11, 2023.

could therefore allow a broadcaster to automatically launch supplemental content or features for those MVPD subscribers that own NextGen TVs, regardless of whether the MVPD itself passes those features through. MVPD participants believe this could frustrate and confuse MVPD subscribers for several reasons. For instance, MVPD participants stated that supplemental content and features delivered in this manner could be at odds with a consumer's choices made via the MVPD set-top box (e.g., preferred language and/or audio). MVPD participants contend that as the application running on the MVPD set-top box will be unaware of what is being presented to the consumer via the NextGen TV receiver, it could result in display of conflicting content. Moreover, MVPD participants stated that a consumer using an MVPD's service will likely believe that any supplemental content is being generated by the MVPD set-top box and thus controlled by that remote control, when in fact the content is being generated by the NextGen TV receiver and is controlled by the NextGen TV remote. The following diagram depicts an example of the potential confusion described by MVPDs.



MVPD participants noted that this situation is unlike when a consumer must use different remotes depending on the input they have chosen on their television because here, the consumer is watching via the MVPD set-top box input on the television and has not selected a different input when the broadcast supplemental content appears. Accordingly, MVPD participants believe consumers will likely expect to use the MVPD remote to interact with the supplemental content, and will likely believe that their MVPD set-top box or remote is malfunctioning when they cannot use it to interact with the content.[50] MVPD participants stated that the resulting customer dissatisfaction and calls to MVPD customer support would be difficult, if not impossible, for the MVPD to resolve. MVPD participants stated that it is therefore essential that MVPDs be permitted to remove any watermarking that is not legally

[50] Indeed, MVPDs contend that even if the broadcast interactive content explicitly notifies the consumer to use to the NextGen TV remote, the consumer may not understand what that means or even be able to locate the relevant remote.

required to be present.[51] Significantly, MVPD participants contend that watermarks are not necessary for broadcasters to deploy advanced features such as targeted emergency alerts, accessibility enhancements, interactivity, and the ability to restart programming.[52] Accordingly, MVPD participants contend that the ability for MVPDs to remove watermarks will protect MVPD subscribers while maintaining broadcasters' ability to deploy these advanced features over ATSC 3.0.

MVPD Participants Assert that the ATSC 3.0 Transition Would Raise Dual Carriage and MVPD Spectrum Constraint Concerns. The modulation used in ATSC 3.0 increases the available bitrate for broadcast signals over ATSC 1.0. As a result, MVPDs stated that more bandwidth may be required for primary video channels in ATSC 3.0, especially if the channels are broadcast in higher resolutions such as 4K. MVPD participants contend that this could strain the spectrum resources available on an MVPD's system (as noted above, DBS providers would need to down-convert ATSC 3.0 signals in most, if not all, cases due to capacity constraints).[53] MVPD participants stated that this burden would be exacerbated if MVPDs, as a practical matter or pursuant to the adoption of an FCC rule, must carry ATSC 3.0 signals *in addition* to carriage of a simulcast ATSC 1.0 signal and/or down-converted ATSC 3.0 signal to accommodate the majority of MVPD subscribers that do not have set-top boxes capable of decoding ATSC 3.0 audio and video content. MVPD participants stated that for some MVPDs, such as DBS, dual carriage is simply not possible due to bandwidth limitations on their systems. MVPD participants stated that for other MVPDs that offer video, voice, broadband and other services over the same physical network, mandates that increase bandwidth requirements for ATSC-originated programming necessarily have an opportunity cost for other services on a multi-service network.

MVPDs understand that SCTE has recently released standards[54] and ATSC is in the process of developing recommended practices that address redistribution of ATSC 3.0 signals by MVPDs. MVPDs will review the ATSC recommended practices once released. However, MVPDs note that not all standards can be implemented on all existing distribution platforms, as new standards have the potential to be beyond the technical capabilities of the existing platforms.

B. Broadcast Perspective on the Technical Challenges Raised by MVPDs

Broadcast participants emphasized that ATSC 3.0 introduces significant advancements that serve the public interest and directly enhance the viewer experience. Broadcast participants

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[51] A means by which MVPDs could remove watermarks has been described in ATSC Recommended Practice A/370.

[52] Although broadcasters contend that watermarks are necessary to deploy these features via an MVPD set top box that is not ATSC 3.0 compatible, MVPDs note that the must carry rules do not require MVPDS to carry any and all features that broadcasters may choose to deploy.

[53] As discussed above, MVPDs stated that transcoding a high bandwidth feed to a lower bandwidth in order to lessen capacity strain could lead to quality degradation.

[54] "Linear Contribution Encoding Specification", SCTE 277 2024, https://account.scte.org/standards/library/catalog/scte-277-linear-contribution-encoding-specification/.

asserted that, by upgrading their infrastructure to enable access to these premium, over-the-air enhancements, MVPDs can offer their subscribers a higher quality viewing experience. Broadcast participants acknowledged that MVPDs will face costs when upgrading their transcoding equipment to support ATSC 3.0 and decrypt DRM-protected content. Commercial ATSC 3.0 transcoders are available, and A3SA offers a certification program for transcoding devices to ensure that they can receive over-the-air ATSC 3.0 signals and decrypt DRM-protected content effectively. Broadcast participants contend that the cost of ATSC 3.0 transcoders on a per service basis is similar to ATSC 1.0 transcoders with the same features. To the extent that small cost differences currently exist, broadcast participants contend that they are due to the relatively small volume of ATSC 3.0 transcoders currently being sold. Once MVPDs begin purchasing ATSC 3.0 transcoders at a higher volume, broadcasters expect such cost differences to disappear. Broadcast participants stressed that establishing a clear timeline for the transition to ATSC 3.0 would allow MVPDs to plan, budget, and manage the associated costs of ATSC 3.0 equipment in a structured way and would also help avoid the dual carriage concerns MVPDs raised.

Broadcast participants also contend that some of the technical issues identified by MVPDs are not unique to ATSC 3.0 and therefore do not require the FCC to modify existing rules to address such issues. For example, MVPDs assert that not all MVPD set-top boxes support certain video formats and therefore the transcoding process will degrade video quality to fit the capabilities of the MVPD system. However, broadcast participants stated that this is not an issue unique to ATSC 3.0. Digital cable set-top boxes, broadcast signals, and TV sets often have technological disparities over time as technology evolves. Broadcasters asserted that this would continue to be the case in ATSC 1.0 and therefore rule changes are not necessary to reflect new issues presented by ATSC 3.0. Moreover, broadcast participants believe that MVPDs should not be able to use their reliance on outdated equipment as justification to materially degrade broadcast signals going forward.

Regarding DBS capacity constraints, broadcast participants noted that such constraints are not as inevitable as MVPDs suggest. ATSC 3.0 does not inherently require higher bandwidth capacity, and not all ATSC 3.0 signals will come with a higher bandwidth version of a stream than the ATSC 1.0 signal. For example, a station could choose to launch multiple HD streams but not a 4K stream. Coding efficiencies may also reduce bandwidth demands.

Broadcasters are committed to working closely with MVPDs to prevent any consumer confusion that could arise from broadcaster applications and disagree that the potential for consumer confusion should result in rules that permit MVPDs to strip watermarks out of broadcast signals. ATSC 3.0 watermarks embed data that enable critical features of ATSC 3.0, such as targeted emergency alerts, accessibility enhancements, interactivity, and other consumer-friendly features including the ability to restart programming. Broadcasters maintain that MVPDs' assertions to the contrary are inaccurate. While watermarks are not necessary to launch these features over-the-air to an ATSC 3.0 television set, they are necessary to deploy these features via an MVPD set-top box that is not ATSC 3.0 compatible. Thus, absent the watermark, MVPD consumers will not be able access these advanced features. Broadcast participants believe that it would be inappropriate to permit MVPDs to

strip these features and thereby exclude competing applications on their platforms. Broadcasters stated that any initial consumer confusion can and should be addressed through proactive consumer education and clear labeling on NEXTGEN TV interfaces rather than sacrificing innovative content that will ultimately enhance consumer satisfaction in the long run.

Broadcast participants agree that many of these issues will be discussed, and potentially resolved in the context of retransmission consent negotiations since broadcasters believe many of the issues of concern apply in both the retransmission consent and must carry contexts. Additionally, as noted above, SCTE has recently released standards and ATSC is in the process of developing recommended practices that address redistribution of ATSC 3.0 signals by MVPDs that may address the technical challenges faced by MVPDs, including issues such as transcoding, signal compatibility, and the integration of advanced features. Broadcast participants expect that the ATSC recommended practices will be released in the coming months.

V. Public Interest Obligations

A. Public Interest Benefits of ATSC 3.0

Most participants acknowledged that ATSC 3.0's advanced features and capabilities enable significant public interest benefits including enhancements in video and audio quality, improved signal reception, upgraded accessibility features, more effective emergency alerts, and enriched educational programming. Public broadcasters highlighted their intent to leverage ATSC 3.0's capabilities to enhance educational content by incorporating interactive elements such as educational games, interactive timelines, and access to additional or supplemental information. Public broadcasters also highlighted their use of ATSC 3.0's datacasting capabilities to serve their public safety mission. Broadcasters' use of interactive applications could also allow viewers to engage with weather and emergency alerts, receiving highly localized and potentially life-saving information during disasters or other emergencies. Broadcasters further emphasized that ATSC 3.0 safeguards the public's interest in maintaining a robust free, over-the-air television service by enabling them to effectively compete with streaming and other platforms where these enhanced features have become the norm. Broadcasters also noted that the Broadcast Positioning System (BPS) is an innovative feature enabled by ATSC 3.0 that allows broadcasters to transmit precise timing data alongside their broadcast signals, thereby offering a more secure alternative to traditional GPS systems that also would serve the public interest.

Broadcasters outlined some of the progress that has been made to date in delivering these benefits to viewers. Approximately 76% of U,S. households (i.e. 93 million households) live in areas that have ATSC 3.0, unlocking new benefits. Over 70 million of those viewers now have access to live sporting events and other programming in HDR with immersive sound. Broadcasters have also introduced features typically associated with streaming and other paid services, such as the ability to "pause" and "start over" live broadcasts. Viewers can now interact with applications that provide personalized and localized information. Pearl has created the Run3TV platform to help broadcasters develop interactive applications to

enhance the viewing experience that are delivered seamlessly in the live broadcast and across all devices. In 2024, NBCUniversal launched an interactive app on its NBC and Telemundo-owned stations across the country that enhances the viewing experience by incorporating local news, hyper-local weather, advanced emergency alerting, and other community-specific content into network programming such as The Today Show.

B. Public Interest Obligations of Broadcasters Post-Transition

Broadcasters and public interest participants agreed that broadcasters' existing public service obligations should continue post-transition to ATSC 3.0. Broadcasters remain committed to providing a free, over-the-air service to their viewers without the need for an internet connection and agree that the transition to ATSC 3.0 does not necessitate changes to existing children's programming, political advertising, public file, accessibility, EAS, and localism obligations.

Public interest participants outlined areas they believe potential changes to broadcasters' public interest obligations to reflect ATSC 3.0 transmission should be explored, including:

- Enhanced capabilities: ATSC 3.0's technical advancements offer opportunities to enhance public interest obligations. The FCC should explore how these capabilities can improve emergency alerts, accessibility, and localism.
- Educational Content: The FCC should encourage broadcasters to leverage ATSC 3.0's multicast streams and hybrid broadcast/broadband services to offer additional educational content, enriching the programming available to the public.
- New Accessibility Features: With ATSC 3.0's potential for new accessibility features, the FCC should consider mandating these enhancements to ensure broadcasters better and more consistently serve viewers with disabilities.
- Public Inspection File Innovations: The FCC should evaluate what new categories of ATSC 3.0-specific information should be included in public inspection files and how to enhance their accessibility in the digital age.
- Fair Use Rights: The FCC must ensure that ATSC 3.0 or A3SA requirements/restrictions does not interfere with viewers' rights to record and use broadcast programming for fair use purposes such as time-shifting and excerpting material for commentary or news reporting.
- Ensuring Quality and Receivability of Broadcast Signals: Minimum Modulation and Coding (ModCod) configurations should be specified to ensure that the primary video broadcast signal remains as robust and equivalent as a station's ATSC 1.0 signal, even as additional services or data streams are layered on. This involves choosing ModCod settings that maintain a strong error-free signal that can be reliably received by viewers using standard equipment. Broadcasters should leverage the capabilities of ATSC 3.0 to improve service robustness and coverage particularly in underserved or challenging reception areas.

Public interest participants also expressed concern that ATSC 3.0 could result in the advent of new business models that could alter the broadcasting landscape in ways that may be hard

to predict. Public interest participants therefore believe that if too little is known about potential future trends stimulated by a transition to ATSC 3.0 to take concrete action regarding potential categories of future transactions or business models, the FCC should expressly retain jurisdiction to impose additional conditions on the use of the ATSC 3.0 standard and to examine potential implications of ATSC's deployment including changes in how broadcasters comply with their public interest obligations and potential future transactions that threaten competitive or other public interest harms.

Broadcasters accept that the FCC should monitor for any changes that occur post-transition to ATSC 3.0 that may affect the public interest. However, broadcasters cautioned that the transition to ATSC 3.0 should not automatically trigger additional regulatory obligations, especially while the transition is in midstream, since imposing such requirements could stifle innovation, reduce operational flexibility, and ultimately harm consumers' access to free, over-the-air television. Broadcasters stated that regulations that preemptively dictate how ATSC 3.0 should be implemented, based on hypothetical risks that may never emerge, could hinder broadcasters' ability to explore the full potential of the new technology. Additional regulatory burdens are unlikely to result in enhanced educational programming and may erode broadcasters' capacity to deliver quality content. Specifically, broadcasters stated that burdensome compliance mandates could divert resources away from developing new applications and experimenting with features that could benefit viewers and ultimately limit broadcasters' ability to invest in high-quality programming and local journalism. Consumer equipment manufacturers similarly agreed that the FCC should not be mandating additional accessibility enhancements or specifying ModCod configurations.

VI. Accessibility

The Working Group discussed the importance of ATSC 3.0 content remaining accessible to viewers with disabilities and agreed that existing accessibility requirements should continue to apply post-transition to ATSC 3.0. The Working Group also formed a subgroup to discuss additional accessibility features that participants indicated would be helpful to make television programming more inclusive, including:

- Multiple audio tracks so that audio description does not compete with other language tracks
- Improved audio quality for audio description
- Improved captioning with more options for viewers that prefer abbreviated captions such as children and those whose first language is not English
- Access for those whose first language is American Sign Language (ASL) through the incorporation of ASL

Broadcasters noted that ATSC 3.0's use of the AC-4 audio codec allows broadcasters to carry multiple audio streams within a single broadcast signal, enabling them to offer multiple audio tracks, including audio description and secondary language tracks. AC-4's enhanced audio capabilities also transmit audio description with the same quality as the primary audio track and allows for dialogue enhancement to make it easier to understand for people who are

hearing impaired and viewers in noisy environments. These features were demonstrated and extended to an MVPD distribution platform at the NAB 2023 Show using low cost, off-the-shelf equipment. However, MVPD participants cautioned that not all MVPD set-top boxes support AC-4 and therefore may not be able to pass through the advanced audio features, as discussed in detail above. In addition, DBS providers stated that they face capacity constraints that could impact their ability to pass through such features.

ATSC 3.0 has the potential to offer other accessibility improvements as application development continues. Broadcasters explained that they are still in the early stages of unlocking these potential improvements and benefits.

VII. Privacy

The Working Group examined whether ATSC 3.0's new features and capabilities warrant new or different privacy regulations to protect viewers' information. Currently, broadcasters are subject to a variety of federal and state privacy laws that will continue to apply to ATSC 3.0. Participants agreed that there are no new privacy concerns for viewers who receive ATSC 3.0 exclusively over-the-air without an internet connection, as user data cannot be collected without a return path.

However, viewers with an internet connection can take advantage of ATSC 3.0's interactive and personalized services, which may require the collection of user data to customize content and enhance the viewing experience. Broadcasters noted that the type of data they might collect is already gathered by many other service providers, and to compete effectively, broadcasters require a level playing field with equipment manufacturers and other video service providers. Several participants advocated for parity of rules among broadcasters, other video services, equipment manufacturers, and other entities in the video programming ecosystem. MVPD participants expressed that they generally favor regulatory parity across all video providers, including with regard to privacy protections for consumers. Public interest participants also expressed support for privacy rules that are like existing cable privacy regulations or other video-specific obligations (e.g., VPPA).

VIII. ATSC 1.0 Sunset

Some broadcasters support a full industry-wide transition. The Working Group also discussed whether all ATSC 1.0 transmission should end after broadcasters are permitted to stop transmitting in ATSC 1.0 voluntarily. Broadcasters, MVPDs, and other participants generally concurred that this issue will be better informed if and when a voluntary sunset date is set. MVPD participants further expressed their belief that it is premature to establish either a voluntary or mandatory ATSC 1.0 sunset date and noted that the Commission has stated that it will initiate a proceeding to consider the sunset of certain ATSC 1.0 requirements in 2026.

IX. Consensus Recommendations

As noted above, SCTE has recently released standards and ATSC is in the process of developing recommended practices that address redistribution of ATSC 3.0 signals by MVPDs.

Industry and the FCC should review these standards and practices to determine what challenges remain and whether regulatory action may be necessary.

ATTACHMENT A

ATSC 3.0

FOTVI WG1 – BACKWARD COMPATIBILITY

AUGUST 14, 2023

MADELEINE NOLAND, ATSC PRESIDENT

MNOLAND@ATSC.ORG

POWERED BY ATSC 3.0

Agenda

Consumer Demands on the TV Experience

ATSC 2.0

Short tutorial on two technical concepts

- Single vs. Multiple Carrier design
- Reaching the theoretical limit of spectrum efficiency

ATSC 3.0

Consumer Demands on the TV Experience

Consumers are moving to services and receivers that deliver 4K UHD

They are moving to services that enable on-demand viewing…

…On a variety of devices (TVs, phones, computers, tablets)

…In a variety of settings (at home, on the go)

…With 4K/HDR pictures and immersive sound

…And lots of content choices

…With recommendation engines to help them sort through the choices

Streaming services are delivering these benefits, and consumers are shifting screen time to streaming services

Broadcasters must also deliver these benefits in order to maintain the high level of service that the public expects from free-to-air television

ATSC 2.0

ATSC 2.0 attempted to meet consumer demand with a backward compatible system

- Interactivity for on-demand options and more
- Mobile services to reach more devices at home or on the go
- And advanced video coding to make room for more services

It was a good system, and it was promoted by ATSC, the FCC and the US State Department, but it wasn't enough

Why was ATSC 2.0 unsuccessful?

- There was not enough capacity to offer a competitive mobile service and more content for fixed services and better video quality
- 4K/HDR was not possible

The U.S. is not alone

- Brazil developed a 2.0 and even a 2.5 system (backward compatible); they are now specifying "TV 3.0" (non-backward compatible) and plan to launch in 2025
- Europeans went straight to a non-backward compatible 2nd generation system (DVB-T2 adopted by over 100 countries)
- Japan is currently specifying a non-backward compatible 2nd generation system (Advanced ISDB-T, currently in design phase)

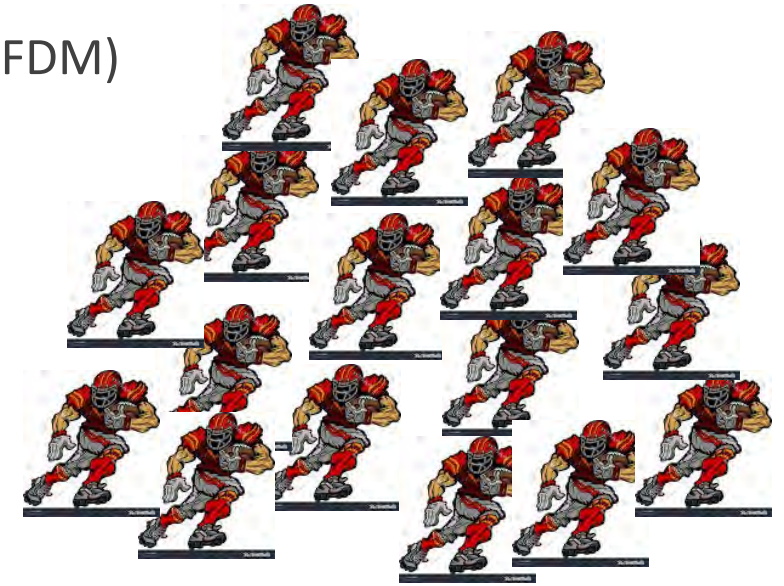
Systems that are Backward compatible with 1st generation DTV have proven insufficient to meet modern consumer expectations for TV

Tutorial #1: Single Carrier vs. Multiple Carrier Design

ATSC 1.0 and 2.0 use a Single-Carrier physical layer design (8VSB)

ATSC 3.0 uses a Multi-Carrier physical layer design (OFDM)

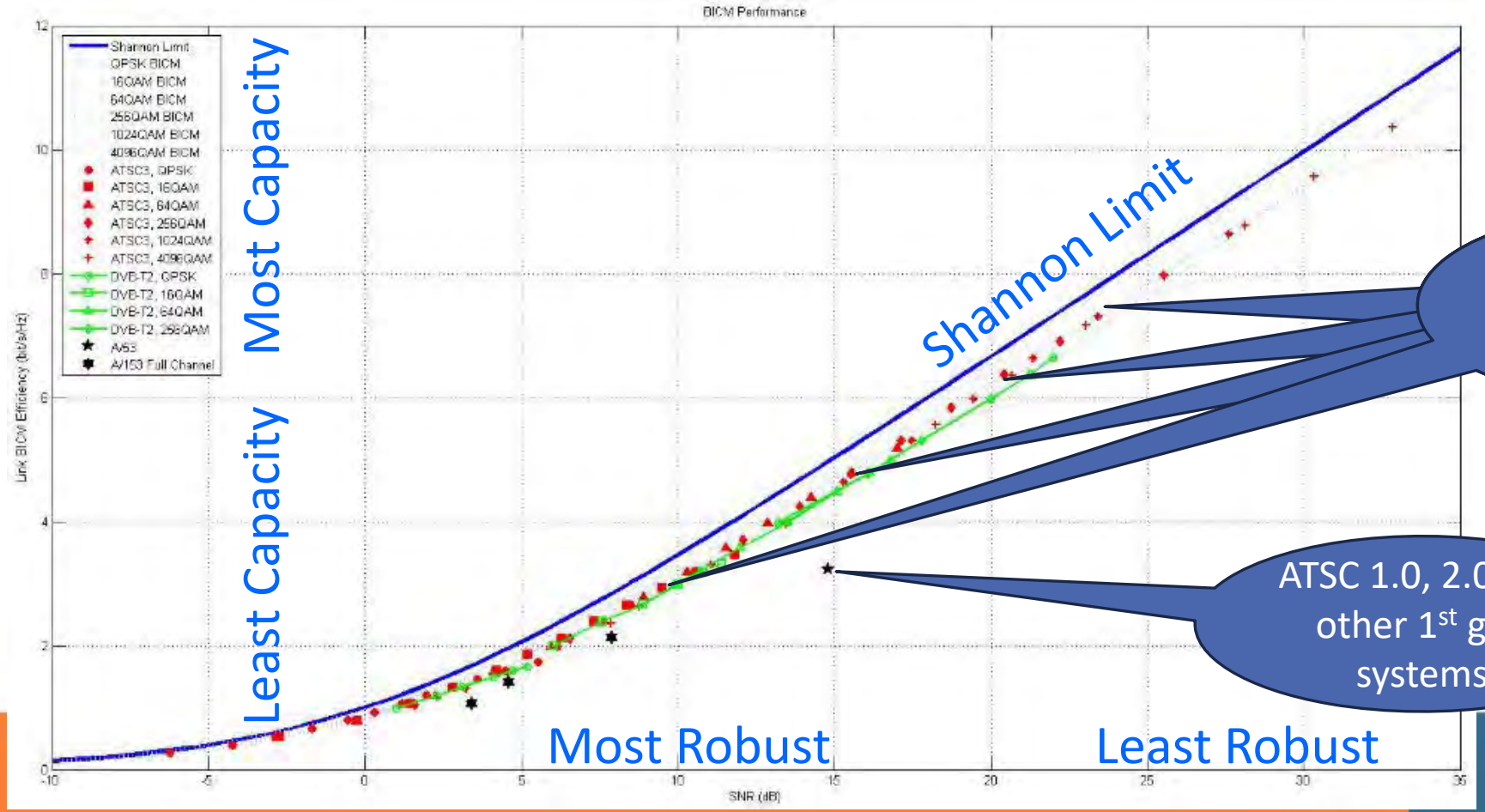
8VSB relies on one robust carrier. If interference disrupts the carrier, reception fails and the consumer loses picture and sound.



OFDM relies on multiple carriers. As long as enough carriers reach the receiver, consumers get solid reception.

Tutorial #2: Reaching the Theoretical Limit of Efficiency

The Shannon Limit is the theoretical limit to the amount of data a spectrum band can carry relative to the robustness of the signal



POWERED BY ATSC 3.0

Consumer Benefits of these Technical Designs

Multiple carriers are more resilient to interference; reception is noticeably better

Multiple carriers allow broadcasters to offer a wide range of services in the same channel at the same time:

- From SD to 4K/HDR
- From large screens to small screens
- From in-home (stationary) to in-car (highway speeds) entertainment

Multiple carriers enable future-proofing – some carriers bring legacy services while others bring new services in the same channel at the same time

- Legacy 3.0 receivers can present legacy 3.0 services
- New receivers can present the new services

No consumers left behind during evolutionary periods

Reaching the Shannon Limit enables more capacity/services ***and*** future-proofing

- No country is seeking to eclipse 2nd generation efficiency

Broadcasters keep up with changing consumer demands

ATSC 1.0 Receiver Architecture

ATSC 1.0 receiver hardware is purpose-built to tune and demodulate ATSC 1.0 signals

- This includes everything in the transmission: the single-carrier architecture, MPEG-2 transport stream, MPEG-2 video, etc.
- They can only be updated to accommodate ATSC 3.0 transmissions with an accessory device (e.g., STB)

ATSC 3.0 receivers are purpose-built for the flexibility of a multi-carrier system

- They can tolerate future innovations in ways that ATSC 1.0 receivers cannot

The only way to make ATSC 3.0 transmissions backward compatible with ATSC 1.0 receivers is to repeat the ATSC 2.0 approach, which does not deliver sufficient consumer benefits to be successful and is not future-proof

- ATSC 2.0 necessarily would be a single-carrier system operating well below the Shannon Limit
- The 3.0 multi-carrier system cannot be “tweaked” to be compatible with the single carrier 1.0 system

Considering a Non-Backward Compatible System – Why Now?

ATSC 2.0 showed that a backward compatible system would not be able to meet consumer demands

Any approach that is backward compatible with 1.0 receivers would ultimately need to be replaced by a non-backward compatible upgrade

ATSC 3.0 delivers key consumer benefits and is futureproof in ways that ATSC 1.0 and 2.0 are not

- 4K/HDR pictures
- More robust reception, indoors and outdoors, fixed and mobile
- IP-based transmission simplifying OTA/OTT hybrid services such as on-demand, start-over viewing and more
- Cybersecurity features including signal protection, application certificate authentication, and content protection
- 500% increase in capacity
- Advanced emergency messaging
- More accessibility options

ATSC 3.0 is virtually at the Shannon Limit; there is almost no room for improvement over 3.0

With no revolutionary physical layer technical innovations on the horizon and increasing pressure from consumer demands, broadcasters believe that now is the right time to make the leap

By upgrading to ATSC 3.0, the industry is demonstrating its commitment to delivering high-quality free-to-air TV services for generations to come

Thank you

ATTACHMENT B

Maximizing Trust in the NEXTGEN TV Ecosystem

FOTVI WG1

A3SA™

A3SA 3.0 Security Authority, LLC August 21, 2023

What Happens Every Day on the Internet: Security

Security has become fundamental to today's internet video services. It's demanded by content providers, relied upon by (but invisible to) consumers, and well-accepted by device/app providers

Key Mechanisms:

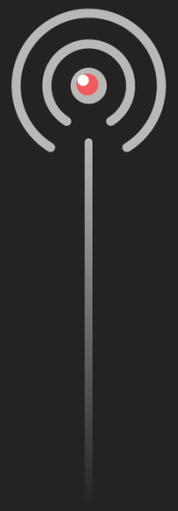
Web Browsers use digital signatures to authenticate websites and encryption to secure communications between web browsers and servers

App stores secure apps and app delivery through digital signatures

Video streaming apps secure content during transmission via encryption, including streamed content that is free to view

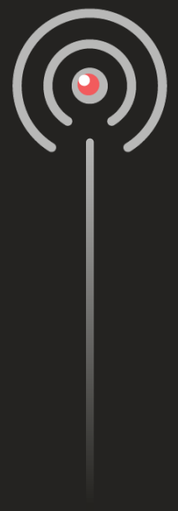
The ATSC 3.0 Standard Allows OTA Broadcasters to Offer Internet-Style Security Features for the First Time

As with Internet streaming services, both content providers and viewers will benefit from the improved trustworthiness of the OTA broadcast distribution channel



Signal Signing

ensures that the signal being received is from an FCC licensed broadcaster and the information received has not been tampered with



Broadcast Application Signing

prevents rogue malware from loading and executing on NEXTGEN TV devices

Content Security

utilizes similar encryption technology to that used by internet content services, including content that is free to view

Who We Are

- Founded in 2019 to enable both the signal security and content security features of the ATSC 3 Standard-- including on upgrade accessories
- Enabled the release of the first certified commercial devices in 2020, and millions more since then
- Enabled the first signal and app signing in 2022, and encrypted broadcasts earlier this year

Members

CBS

Disney/ABC

Fox

NBCU

Univision

Pearl TV

Deployment Status — Receiver Types

- CTA projects 10million+ TVs total sold by end of this year
- 3 upgrade accessory products (from ADTH/Tolka, BitRouter, and Zinwell) available soon
- Many additional device makers in development

Devices Released/Coming Soon


USB Dongles


STBs


HDMI Dongles


Gateways


Televisions

Add'l Feature Support Plans:

DVR (by EOY or early 2024)

Out of Home Viewing (during 2024)

Expect all spec and test development to be completed by EOY 2024

Coordination with CTA Logo Program

- **The CTA logo program has referenced A3SA and its encryption protocols since 2019**
- **CTA logo applicants are expressly notified that ATSC 3.0 broadcasts may be encrypted pursuant to A3SA protocols, that viewers may be unable to view programming without the ability to decrypt, and that additional testing may be required**
- **CTA logo applicants are required to certify that they have contacted A3SA**

The Stage is Set for Closer Coordination

Both programs use the same test developer

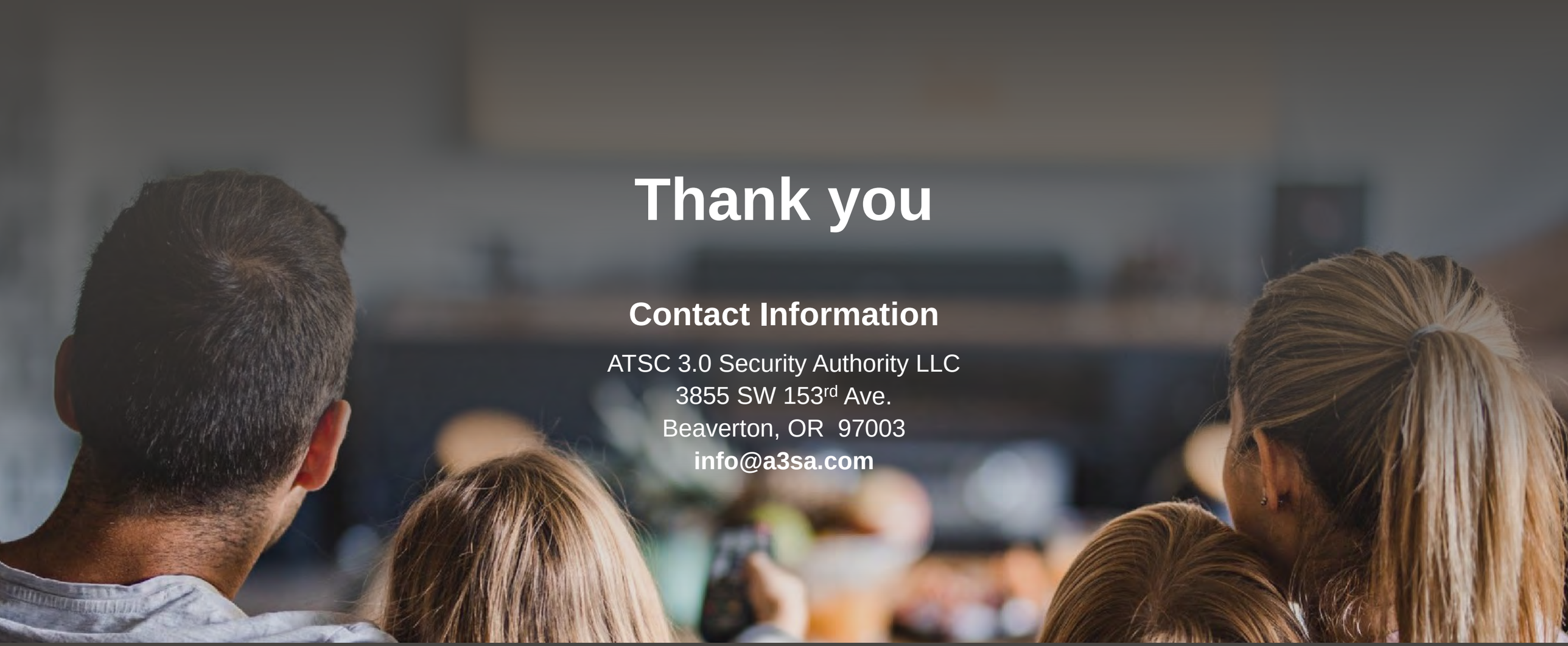
Both programs use the same test runner software

Integrated testing will be relatively straightforward

Broadcast Encoding Rules

To provide extra reassurance for viewers of ATSC 3.0 content, A3SA has approved a set of “encoding rules” for encrypted broadcasts that are simulcast with ATSC 1.0 broadcasts

- Viewers must be allowed to decrypt and record these broadcasts even if they are using a less secure device that requires an internet connection
- Viewers must be allowed to make an unlimited number of copies of these broadcasts
- Such copies cannot have retention limits
- Viewers must be allowed to use “trick play” features such as pause, rewind, fast-forward, and ad-skipping
- Viewers must be allowed to use any authorized digital output (i.e., no selectable output control)
- Viewers must be allowed to use analog outputs to connect to legacy TVs (i.e., no prohibition or required down-resolution)



Thank you

Contact Information

ATSC 3.0 Security Authority LLC
3855 SW 153rd Ave.
Beaverton, OR 97003
info@a3sa.com

A3SA™

Appendix

A3SA™

Who We Are

The A3SA's Technical Contributors Working Group (TCWG) provides a forum for existing and future participants in the ATSC 3 ecosystem to contribute to the development of the ecosystem

- **Receiver manufacturers**
- **Broadcasters**
- **Security vendors**
- **Professional broadcast equipment manufacturers**
- **Technical solution providers**

TCWG Participants

BitRouter

CBS

DigiCAP Co., Ltd

Disney

DTV Innovations, LLC

Fox

Gray Media Group, Inc.

Inca Networks Incorporated dba WISI America

LG Electronics U.S.A., Inc.

NBCUniversal

Nuvyyo, Inc

Pearl TV LLC

Samsung Electronics Co. Ltd.

Sinclair Broadcast Group, Inc.

Sony Electronics Inc.

Tolka Telecommunications Corporation

Adopter Licensees

BitRouter

DS Broadcast, Inc

Hisense USA Corp

iWedia S.A.

LG Electronics USA Inc.

LowaSIS, Inc.

MediaTek Inc.

Nuvyyo, Inc.

Samsung Electronics Co., LTD

Sencore, Inc

Silicondust USA, Inc.

Sony Electronics Inc.

Shenzhen TCL New Technology Co., LTD

Tolka Telecommunications Corporation

Triveni Digital, Inc.

Zinwell Corporation

Broadcaster Licensees

ABC, Inc

CBS Broadcasting Inc.

CMG Media Corporation

Fox Television Holdings, LLC

Graham Media Group, Inc

Gray Media Group, Inc.

Hearst Television, Inc

Meredith Corporation

NBCUniversal Media, LLC

Nexstar Media, Inc.

NPG of California, LLC

Scripps Media, Inc.

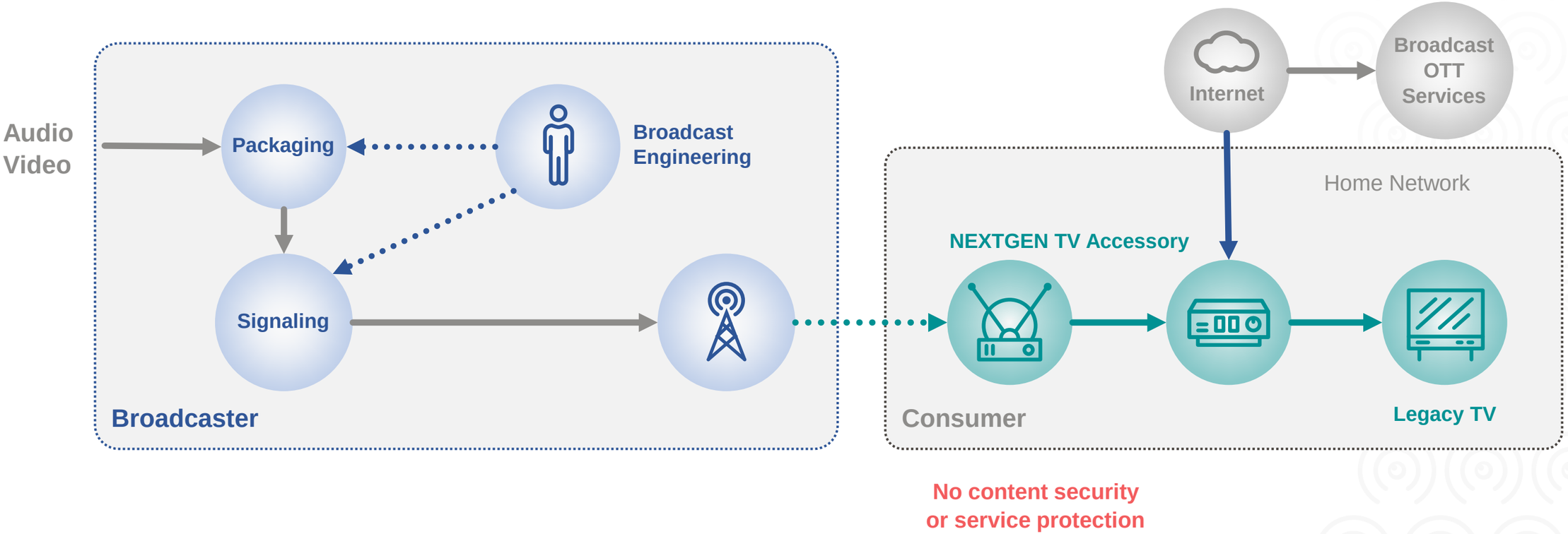
Sinclair Broadcast Group, Inc.

Tegna, Inc

Univision Local Media, Inc

WPLG, Inc.

How It Works — Connected Mode

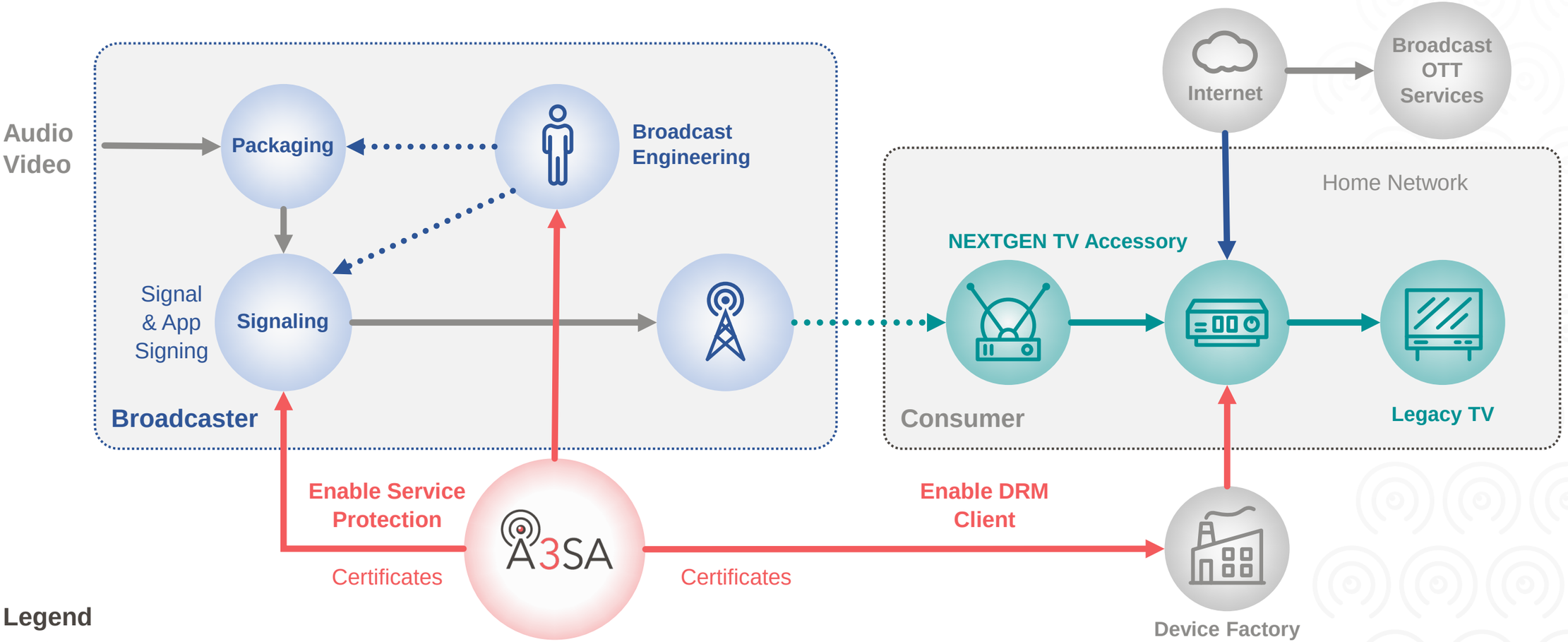


No content security or service protection

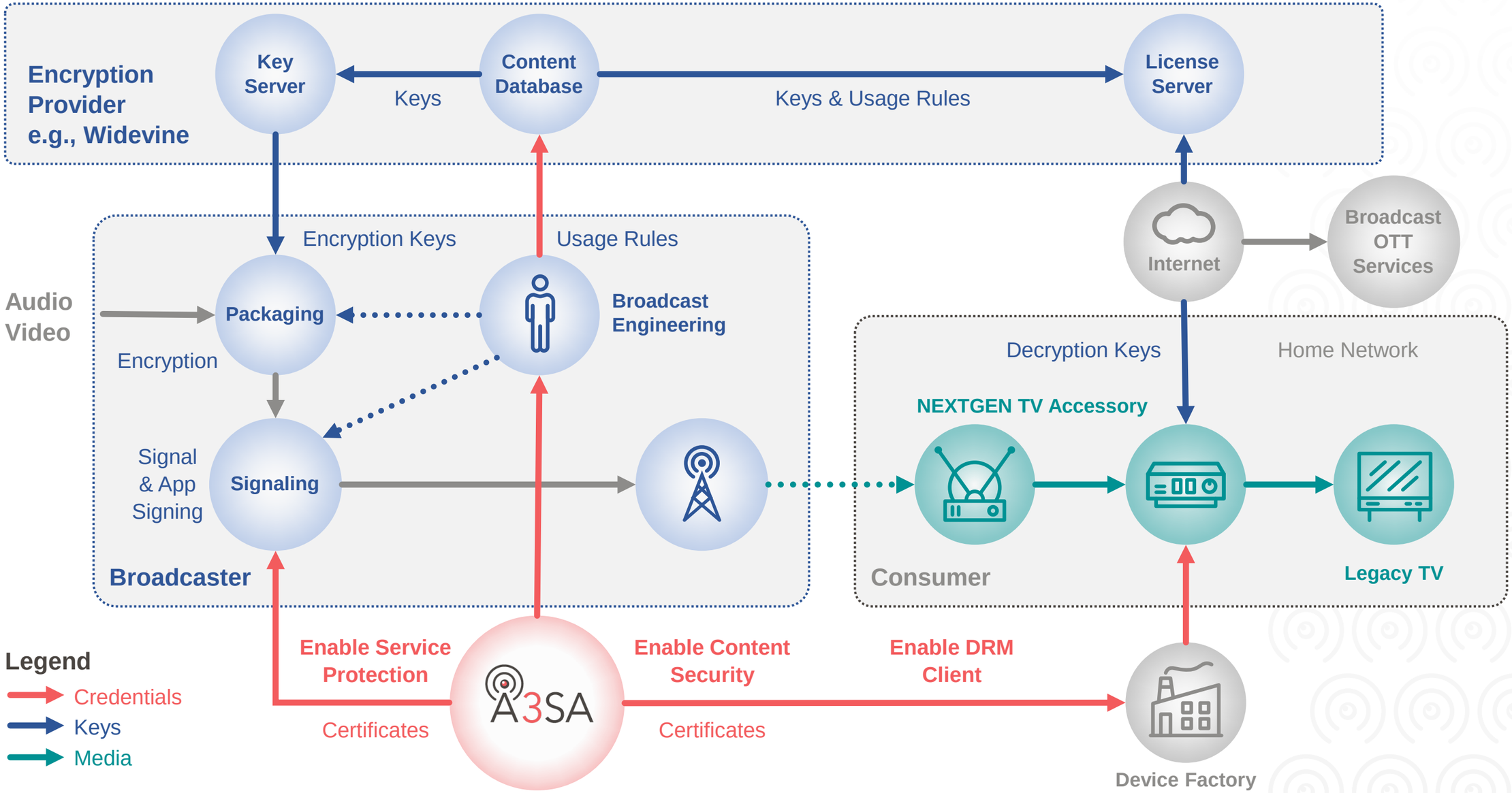
Legend

- Credentials
- Keys
- Media

How It Works — Connected Mode



How It Works — Connected Mode



How It Works — Unconnected Mode