May 16, 2023

The Media Institute Communications Forum Luncheon

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Hello, and thank you for attending today's luncheon and thanks to Chairman Wiley, President Kaplar and The Media Institute for the generous invitation to speak today.

As many of you know, the Advanced Television Systems Committee, more commonly known as "ATSC," is a standards development organization – or SDO. We love our acronyms in standards development. But I promise not to get too technical today – mostly.

I'm sure that many in this room are eager to hear what the President of ATSC thinks about the recent news from the FCC – and the "Future of Television Initiative" that the NAB and FCC are launching. I do have some thoughts on that, which I will come to in a few minutes.

But first I think it would be helpful to ground everyone on what ATSC and ATSC 3.0 actually are – and how other countries are using this unique broadcast technology, or are planning to do so.

The history is pretty important to understand the significance of what's ahead. And the history actually starts with a birthday celebration!

Almost exactly 40 years ago, the Advanced Television Systems Committee was formed to look ahead. Michael Jackson was tearing up the charts. The first truly portable cell phones came to market.

ATSC was established in May of 1983 to develop an improved broadcasting system. We weren't even sure it would be digital at the time. Most everyone here remembers when the ATSC Digital TV Standard, based on the Digital HDTV Grand Alliance system shepherded by Dick Wiley, was eventually adopted by the FCC (in 1996)That's when what is now called ATSC 1.0 was born and launched into the market.It took two years for the first consumer receivers to reach retail stores, as broadcasters began the process of upgrading from analog to digital. And 11 years after the first HDTV sets were sold, most analog broadcasting came to an end. Yes, it really took that long. Things are going a lot faster, now.

. ATSC 1.0 was a key part of the government-mandated DTV transition designed to reduce the amount of spectrum used for television services and to move from analog to digital broadcasting. Post-transition, the vacated spectrum was reallocated to public safety and auctioned for new cellular network services that were just coming to fruition at the time.

ATSC 1.0 has been a very successful standard, serving North America, South Korea, and other countries, with HD video and the ability to carry more than one service in one RF channel allocation. It has worked beautifully for more than 2 decades. , During that time consumer habits have changed, influenced at least in part by the rapid development of cellular services that benefited from the original digital switchover. People are watching video on more devices than ever, on-demand viewing has become commonplace, and new technology advancements have improved the TV viewing experience.

In response to these trends, ATSC embarked on a project to develop a new, modern so-called "next generation" broadcast system, which would become the ATSC 3.0 family of standards. The new system would

offer even better video and audio, richer emergency messaging, hybrid over-the-air & over-the-top services, new business opportunities, stronger signals, more capacity, mobile reception, content and signal security, flexibility, and – perhaps most importantly – evolvability.

All this would come at a price, though, which was that the new system necessarily would be non-backward compatible. It would not be able to co-exist in the same frequency band with ATSC 1.0 services, and existing ATSC 1.0 receivers would not be able to render the new services. As a non-backward-compatible, voluntary, market-driven conversion ATSC knew one thing: for ATSC 3.0 to be successful – it had better be THAT good.

We all understand better TV: 4K video, richer color, brighter brights and darker darks, immersive sound, and more. But in many ways, it's the physical layer: the manipulation of the radio waves, and the transport layer: moving to Internet Protocol or IP, that make ATSC 3.0 special. OK – now I'm going to get just a little bit technical.

The physical layer design is basically the transmission system. It significantly increases the capacity of the signal – more bits going through the same bandwidth AND/OR stronger signals reaching more people in more places – indoors, greater distances, and on the go. I say AND/OR because this system is flexible. Broadcasters have – well – "more," and they can use their "more" on better signal strength OR more data OR both. Consider a 4K service that requires a lot of data. This could be a weaker signal intended for fixed antennas and big screens. They could have a mobile service. This would need to be a more robust signal but standard def resolution works for smaller screens, so less data is needed. There are thousands of possible configurations, and the standard allows for up to 64 different

configurations to be used at the same time. Compare this with ATSC 1.0 which allows only one configuration.

In other words, ATSC 1.0 is based on a single carrier system, while ATSC 3.0 is a multi-carrier system. Think about it this way: imagine a football team with one HUGE player on offense. His job is to carry the ball (the TV signal) over the goal line (to the receiver) despite the defense (signal interference). He is very hard to stop, but if the defense gets in the way enough to stop the one carrier, the signal is lost. Now imagine a football team with many smaller players, each with a ball all swarming toward the goal line using different strategies and routes. The defense may stop some of them, but as long as a critical mass of them make it across the goal line, reception is strong. This multi-carrier system is also important for evolvability. When ATSC members realized that a non-backward compatible system was needed, they set a requirement that the new system would allow for graceful and gradual adoption of new technologies without the need for another completely non-backward compatible transition. Returning to our analogy, you can imagine a portion of the football players carrying 3.0 footballs and a portion carrying something new. The 3.0 receivers will continue to get services while newer receivers could render both 3.0 and the new services.

Another major change in ATSC 3.0 is that it is the world's first IP-based digital terrestrial broadcast system, meaning the data layer uses Internet Protocol, which is the same digital "language" used for Internet communications . And that means that broadcast and broadband services can be interchangeably combined or converged.. Basically, in a digital world, all data is 1's and 0's – video, audio, captions, file updates, map data, everything. So now, broadcasters can transmit more than television services, and this opens new business models powered by datacasting, since Internet Protocol is used for any and all data. The IP-based system allows us to envision a new nationwide wireless data

delivery network. Not every use case is perfect for broadcast datacasting, because ATSC 3.0 remains a one-way, downlink only system. Any return data must travel over a different network, such as the internet or cell networks. These additional networks are often available, such as in a connected car or connected television.

Before I go on, I'd like to address some of the myths about NextGen TV, just to level set.

- You do not need an internet connection to watch NextGen TV. If you have an internet connection, then some enhanced services will be possible, but you don't need it.
- NextGen TV is free, regardless of whether the content is encrypted. Devices that have the NextGen TV logo come equipped to present both encrypted and unencrypted services. Consumers do not have to do anything special or different. It is seamless for the audience.

These flexible characteristics make ATSC 3.0 very attractive here in the U.S. and elsewhere in the world. Around the globe, different countries have different motivations and different primary use cases.

- South Korea had a government mandated launch in 2017 using a swath of newly allocated spectrum with the primary use case of 4K over-the-air broadcasting in time for the 2018 Winter Olympics. They were the first country to launch ATSC 3.0.
- The U.S. is in the midst of an industryr-driven launch that started in 2020 with the primary use case of successfully competing in the new media landscape by offering better TV services and developing new businesses with non-TV services – datacasting services.
- Jamaica has started a mandatory transition as the first country moving directly from analog to 3.0. They are most interested in

having multiple services in a given RF band for more content and distance education, especially in the wake of COVID, when broadcasters struggled to deliver education content for all the grades and schools with only one service per RF allocation.

- Trinidad & Tobago are following suit, and other Caribbean nations are considering options.
- Brazil is about to undergo a mandated transition. They are in the process of selecting technologies for their new system, dubbed “TV 3.0”. Most of the components of have been selected from ATSC 3.0 so far. Their primary use case is better television and ultra-efficient use of spectrum. Remember that broadcasters can balance capacity versus throughput. While South Korea is optimizing throughput even and experimenting with 8K broadcasts, Brazil is optimizing for robustness. Imagine 2 broadcasters operating in adjacent markets, each with the same spectrum allocation, and transmitting different content, of course. Now imagine a home located on the border between the two markets with a simple non-directional receive antenna. They want the receiver to be able to tune to both services, distinguishing between the two even though they’re roughly equal strength and in the same channel. This allows them to reuse spectrum that might otherwise need to be vacant of TV services. Very efficient.
- India’s public broadcaster needs to offer direct-to-mobile services. There are 1.2 billion cell phones in India and people watch both time-shifted and linear television on their phones. This presents a growing congestion problem for the mobile network operators and a consumer device problem for the broadcaster. Both parties are motivated to find a solution for direct-to-mobile broadcasting so that mobile operators can offload linear video traffic and the broadcaster can reach the people on their preferred device. They

are currently experimenting with ATSC 3.0. They have signals on the air in Delhi and Bengaluru, and they have transposed ATSC 3.0 to local technical standards. India has not made any decisions about whether to go to a new system, and if so to which one.

- Canada will likely be interested in 5G-3.0 converged services. Companies like Bell Media and Rogers are vertically integrated, with both broadcast and cellular offerings. Similar to India, they are experimenting with ATSC 3.0 but have not made any decisions about whether to upgrade from the legacy digital system.
- Mexico is also seeking to light up an experimental transmitter with distance education as a primary use case. This is in the early stages, but if I was a betting person, I would expect they will have experimental 3.0 signals on the air within the next 12-18 months.

Returning to the U.S., Chairwoman Rosenworcel's announcement at the NAB Show last month was welcome news. She announced the formation of the "Future of TV, "a new public-private initiative to consider how to complete the transition to 3.0. This was HUGE news, and to put that in perspective, I'd like to paint the picture that brought us to that point.

In 2017 the FCC authorized permissive use of ATSC 3.0 broadcasts on a voluntary basis. There were provisions, of course, including that ATSC 1.0 services would be simulcast at least for a period of time. Without additional spectrum for a non-backward compatible transition, the only way to simulcast 1.0 and 3.0 is for broadcasters in a given market to partner together. One would convert their transmission to ATSC 3.0 to carry their own and all the partners' 3.0 services, while the partners stay on 1.0 and together they host all the 3.0 station's 1.0 services.

Broadcasters have already successfully launched NextGen TV services in about 70 markets to cover about two thirds of U.S. households. And

consumer electronics manufacturers have also achieved a great deal. Americans are buying 40 million TV sets a year, and this year they will buy 5 million sets with integrated ATSC 3.0. That's 14,000 NextGen TV sold every day – almost 600 every hour. And those numbers will grow as affordable upgrade accessory receivers like this one [new Atlanta DTH set-top box] come on the market. This is the first accessory device that has passed the industry certification process to use the NextGen TV logo. You can pre-order yours for just $80. Consider that the first similar ATSC 1.0 set-top boxes were over 10 times more expensive in today's dollars.

This channel-sharing transition method has been working well, but at this point, broadcasters have picked most of the low-hanging fruit. Now the really hard markets remain, which includes some of the very large markets where spectrum is VERY tight. We need to transition these large markets in order to keep up the momentum with device sales. And we also need to figure out the very small markets – some of which only have one station, so there is no one to partner with. The other challenge is that even in markets that have launched, most of the bandwidth is still being used for ATSC 1.0. Imagine a 5-station partnership, with one station on 3.0 and the others hosting the 1.0 services. In essence, 80% of the spectrum is being used for 1.0. ATSC 3.0 will not be able to really shine until more of that pie is shifted from 1.0 to 3.0. How to get from here to there?

This is what the Chairwoman's goal is. Gather the right public and private minds together to solve these questions. She envisioned 3 working groups: 1) Backward compatibility and how to ensure that no consumer is left behind; 2) Under what circumstances can we ultimately sunset the legacy 1.0 system; and 3) What is the regulatory environment in a post-transition world?

I'd like to explore a couple of details about the first 2 groups.

First, backward compatibility and no consumer left behind. Are these two systems really incompatible? Can't 1.0 receivers be updated or 3.0 be configured so that 1.0 receivers can understand it? As I mentioned earlier, the only way to design a system good enough to inspire a voluntary transition was to make it REALLY good, and that just wasn't possible to do and still maintain backward compatibility. Take the physical layer, for example. Remember the analogy of the two football teams – the single carrier and the multiple carrier approach. These are fundamentally different. They cannot co-exist in the same spectrum band – or more precisely – the single carrier system cannot accommodate anything other than its specific single carrier. The multiple carrier system – 3.0 – can accommodate change, which is one of the reasons it's an evolvable standard, unlike 1.0.

So, we need to get devices in everyone's home. How can we inspire even more sales? How can we accommodate people who cannot afford or do not want to purchase a new device? Everyone is motivated to answer this question. Broadcasters have no interest in completing the move to 3.0 without their audience. Let's go back to the scenario of a market that only has one broadcaster. Channel sharing is impossible. The only way to transition is to flash cut, but there are no regulations that allow that or offer any path forward. PBS New Mexico is facing exactly this question. There are rural and tribal lands in the northern part of the state that have only the PBS station. In this case PBS could approach its supporters and stakeholders to fund set-top boxes for everyone and then flash cut. This would require regulatory attention, but it could be in essence a pilot program, showing how the final transition could ultimately be accomplished.

This takes us to the Chairwoman's second group: How can we sunset legacy 1.0? What are the criteria for turning off 1.0 in a market? Broadcasters are not alone with these questions. Cellular operators sunset 2G and 3G, and consumers needed to get new phones. Should the TV transition be a market-by-market shift, or should there be a target that the nation as a whole needs to reach? What does the transition look like in the interim? Can we reduce the spectrum used by 1.0 over time?

The industry welcomes the renewed focus by the FCC as good news. These are just examples of the complex transition issues that need to be managed. We need to chart the path forward together, which is exactly what these groups will enable.

Broadcasters also have their eyes on the future. Just as 6G is already in design phase, ATSC is busy staying ahead of market needs. Standardization takes time, and if we are just starting a project when the market needs a solution, we are too late. So ATSC members are busy working on new improvements and ideas that will keep broadcasting strong for decades to come. As we expand our thinking to include both TV and non-TV uses for the broadcast system, it's about building networks that can carry huge amounts of wireless data on swaths of spectrum that easily penetrate walls and carry across dozens of miles.

And this new broadcast network can be connected to other networks such as the internet or the cell system, with the development of a new Broadcast Core Network. ATSC Technology Group is currently specifying this new system that could serve to attract enterprise customers for data distribution services and enable coordinated services across multiple networks.

Work is underway to enable tower-to-tower communications, which may be a very promising way to get data to towers as an alternative to microwave connections or fiber runs. Picture one high-power high-tower distributing the data to a group of smaller towers in a single frequency network. This group is also working on full-duplex transmissions where data can go both ways in the same RF band. This two-way capability enables development of a mesh network of data distribution to and among tower transmitters.

At the 2023 NAB Show, two papers were presented exploring ATSC 3.0 as a redundant GPS network that can kick in in the event of a disruption in the primary GPS signal – potentially a matter of national security. And I was recently asked how ATSC envisions synergy between broadcasting and 6G. Good question. All I can say about that right now is: Stay tuned!

The U.S. is in a position to take a global leadership role in next-gen broadcasting. The FCC can demonstrate how to achieve a channel-sharing transition. We are not the only country facing this. We already know that Brazil will also have to have a channel-sharing transition. We can develop and export new business models with datacasting.

But, it DOES come down to having a really top quality television service as a prerequisite to everything else. We need consumers to love the TV service so that they'll be motivated to convert to 3.0 devices so that we can ultimately reduce and then sunset the legacy 1.0 system so that 3.0 services can finally occupy the full TV spectrum allocation, which will allow us to do all these other things.

Here's to the future of broadcasting! Thank you.