Network and Communication Technologies; Vol. 8, No. 2; 2023
ISSN 1927-064X E-ISSN 1927-0658
Published by Canadian Center of Science and Education

Future Hybrid Technology for Pay TV Platform

Abu Toha Md Anowarul Azim[1]

[1] Chief Technology Officer, Independent Television Ltd. Dhaka, Bangladesh

Correspondence: Abu Toha Md Anowarul Azim, MSc in Computer Science, Chief Technology Officer, Independent Television Ltd. Dhaka, Bangladesh. ORCID ID: https://orcid.org/0009-0001-0474-9460. E-mail: azim.azim@outlook.com

Received: December 3, 2023 Accepted: December 20, 2023 Online Published: December 28, 2023

doi:10.5539/nct.v8n2p35 URL: https://doi.org/10.5539/nct.v8n2p35

Abstract

The main objective of this study is to analyze the potentiality of new technology of TV broadcasting and video distribution systems and how to adapt to the new trend of video viewing experience and design a future generation TV for the Bangladesh Pay TV industry. This research is based on Bangladesh and the interest of Bangladesh's Pay-TV industry delves into a novel approach aimed at mitigating these challenges by harnessing terrestrial or mobile networks for video broadcasting, thereby upgrading the old-fashioned broadcasting system or diminishing reliance on conventional internet-based streaming for mobile. This study adapts to the latest practice and implementation of ATSC 3.0 Terrestrial broadcasting and video streaming technology enhancement and business success along with emerging 5G network feasibility. ATSC 3.0 terrestrial broadcasting for mobile users has a significant impact on view experience, and seamless video transmission without the usage of internet data, especially in rural areas of the country where the 4G network is very limited. Local Gateway Node will receive ATSC 3.0 live TV and locally added offline video or streaming apps injected through API to deliver household through private CDN. This study offers a comprehensive technical feasibility, benefits, and implications of this innovative approach, upgradation of terrestrial broadcasting system highlighting its potential to revolutionize video delivery to mobile users. This study analyzes the technology evolution and adaptability with the recent trend of video content viewing experience, the importance of this study is significant for Bangladesh's pay-TV market to secure the future business.

Keywords: ATSC 3.0, Over The Top (OTT), Terrestrial Broadcasting, 5G, video streaming, Mobile TV

1. Introduction

Globally the meteoric rise in the usage of mobile devices for video streaming and content consumption has ushered in a new era of media delivery. However, the unprecedented surge of mobile video consumption has exacerbated concerns about network congestion, declining data speeds, and the sustainability of internet-based streaming. This study presents an innovative solution to these challenges by investigating the feasibility of IP-based video broadcasting over terrestrial broadcasting, thereby reducing the reliance on Internet data. This study primarily focused on evaluating the appropriate technology to be developed to help the Pay TV industry of this country in two ways: 1. Build a technology infrastructure adapted to present and future customers' nature and habits, 2. Deliver high-quality video content without network congestion and offload the internet bandwidth cost.

The evolution of Next Gen TV broadcasting across the world is the main inspiration of this study is mostly focused on the necessity and the importance of Next Gen TV broadcasting in Bangladesh. Bangladesh is a highly densely populated country and around 183 million mobile users till April 2022 are living in this country and more than 113 million mobile internet users. Due to changes in habits, people are more interested in “On the Go” content on the smartphone however the viewing experience is terrible due to internet congestion and limited coverage of the existing 4G network, while there is an unutilized terrestrial network backbone with VHF & UHF frequency bands own by Government Broadcaster “Bangladesh Television (BTV).

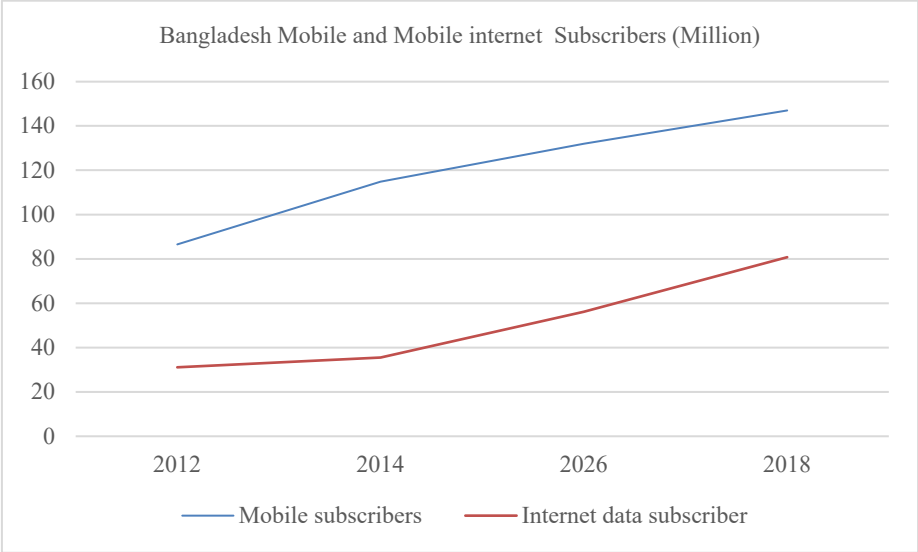

Figure 1. Bangladesh Mobile and Mobile Internet Subscribers

Source: Business Insider Bangladesh and Future Startup

There is a potential market and demand for NextGen ATSC3.0 broadcasting in the country to deliver the content to mobile devices directly and offload the Internet Bandwidth. In addition, the upcoming 5G is also featured on how 5G terrestrial broadcasting will potentially take an important role to adopt the viewers with next Gen TV.

Traditional terrestrial broadcasting or Over the Air (OTA) is a method of broadcasting over VHF or UHF frequency, signals are transmitted from a station to receivers, such as televisions and radios. In the 4G era of this country, terrestrial broadcasting can still benefit in terms of quality transmission. Since Terrestrial broadcasting network is already widely established in the country, especially in remote areas where the 4G network is limited and access to high-speed internet is very difficult, terrestrial broadcasting is reliable and effective.

Existing research is focused on using unutilized terrestrial networks to optimize IP-based video streaming, emphasizing advancements in efficient codecs, and adaptive streaming protocols for handheld smartphone users. While these improvements have extended the usage of wireless networks (terrestrial/5G), there has been a dearth of exploration into harnessing the dedicated frequency spectrum of mobile networks for video broadcasting by using ATSC 3.0 Standard broadcasting methods.

In terms of technological advancement and reliability, ATSC 3.0 is considered the most viable technology over DVB-T2, while the mobile network of the country is still 4G. This solution is technology agnostic and supports the above-mentioned standard with more flexibility for end users. Transmission requirements are specific for terrestrial broadcasting within specific frequency and modulation techniques. Video compression and codec is also another consideration for transmission evaluation, from the beginning it requires robust error correction and resilience mechanisms to handle transmission and reception reliability. Choosing a video standard and codec is very important to ensure quality. Multicast transport stream with High Efficient Video Coding (HEVC) is considered for linear broadcasting for high data throughput. For Unicast, MPEG-DASH is an appropriate standard with an adaptive bit video stream. Ensuring a good quality viewing experience for linear service requires a low latency network and adaptive video bit rate with a multi-profile stream for multi-screen adaptability. In addition, there are a lot of other features available because of video broadcasting evolvement, Interactive service, Global or targeted Broadcast messages, alert systems, targeted advertisement, various analytics in terms of viewership, network performance, etc, Conditional Access System (CAS) or Digital Right Management (DRM) is important to ensure content security or content piracy control. This technology is more effective and useful in those remote areas where internet connectivity is limited or unreliable. This is less susceptible to disruptions caused by weather, natural disasters, or other factors that can affect internet connectivity. It provides a stable and reliable platform for broadcasting critical information, such as emergency alerts. Terrestrial broadcasting infrastructure is already established in the country and upgrading it to support 5G technology in the future will be less costly than building new infrastructure.

a. TSC 3.0

ATSC 3.0, also known as NextGen TV, ATSC3.0 is cutting-edge technology, especially for Ultra High Definition (UHD) delivery and High Dynamic Range (HDR) content. ATSC 3.0 blends traditional broadcasting and broadband for internet-based content delivery. The standard supports mobile data offloading, reducing mobile network congestion by delivering content through broadcast channels.

b. DVB-T2 System

Digital Video Broadcasting - Terrestrial 2 (DVB-T2) is a European technology evolution from its predecessor, DVB-T uses advanced modulation and coding techniques, including Coded Orthogonal Frequency Division Multiplexing (COFDM).

c. 5G network

From the 2G to cutting-edge 5G has defined 5G Broadcast (LTE-based 5G Terrestrial Broadcast) as a new terrestrial broadcast system ready to deliver video over various frequency bands, sub-6 GHz and millimeter-wave bands in 16-QAM, 64-QAM, and 256-QAM modulation techniques.

d. ATSC 3.0 vs 5G

In the future, the idea of using an ATSC 3.0 broadcast standard with 5G convergence may be sustainable business growth. Since 5G broadband for unicast and ATSC 3.0 on multicast, the blending of these two technologies may have a strong impact on the market. Recently experts have been working on including 5G in the ATSC 3.0 physical layer and the 3GPP is examining how 5G wireless telecom would work from “one-to-one communications” to a “one to more”. On the other hand, ATSC 3.0 is compatible with 5 MHz spectrum. Verizon and Sprints are working on adopting ATSC 3.0 with CDMA network, in further it may go deeper like 600 MHz spectrum to AWS4 and ATSC 3.0 will fit somewhere.

	ATSC 3.0	**5G**
Spectrum	600MHz	Regulated and non-regulated frequencies including 1-6GHz and 26, 30, 40, and 60GHz bands could be used
Technology	Broadcast	unicast
Video features	Multi-channel linear	On-demand broadband video

Source: TV Technology, USA.

e. Hybrid network of OTT & NextGen TV

Another breakthrough may de-risk the trend of “cutting cord” in the cable TV industry. The “local Gateway Node” Own by various Pay TV operators across the country will play a key role as a supper aggregator to receive ATSC 3.0 signal by adding locally hosted offline content and injecting other OTT(Over The Top) content from the internet and delivering to portable device and household. This is a single sign-off platform for pay-TV operators for their subscribers to access Pay TV content and all streaming services with a single payment wallet. This platform will provide content through the Pay TV operator’s existing distribution network by using the Local Internet Exchange (IX) system to avoid Internet data costs. In this case, all linear channels along with the contents from streaming service provider (OTT) would be connected to the Pay TV apps through APIs and hosted their media/content asset management system caching server in Pay TV's data center for content delivery through private content delivery network (CDN). This is the platform to help OTT grow and save the cable TV industry.

f. Conceptual diagram and components

Traditional Video acquisition, processing, and other integration applications of a pay TV or OTT/streaming operator will remain the same, however, they need to upgrade the distribution chain to comply with this technology standard. This study highly recommends the ATSC 3.0 standard, therefore Encoding and multiplexing system shall be ready to deliver IP transport to the ATSC transmitter via satellite or Fiber backbone NTTN (National Wide Telecommunications Transmission Network). ATSC 3.0 uses an efficient physical layer with orthogonal frequency-division multiplexing (OFDM) modulation. To receive from the Terrestrial broadcast network, the signal Smartphone device must be integrated with the ATSC 3.0 receiver and capable of decoding

the ATSC 3.0 signal. In addition, A local Gateway Node may be used to receive the same signal and add local hosted offline content, OTT streaming content through API, and deliver to portable devices over a Wi-Fi network or intranet to reach households. (Figure 2)

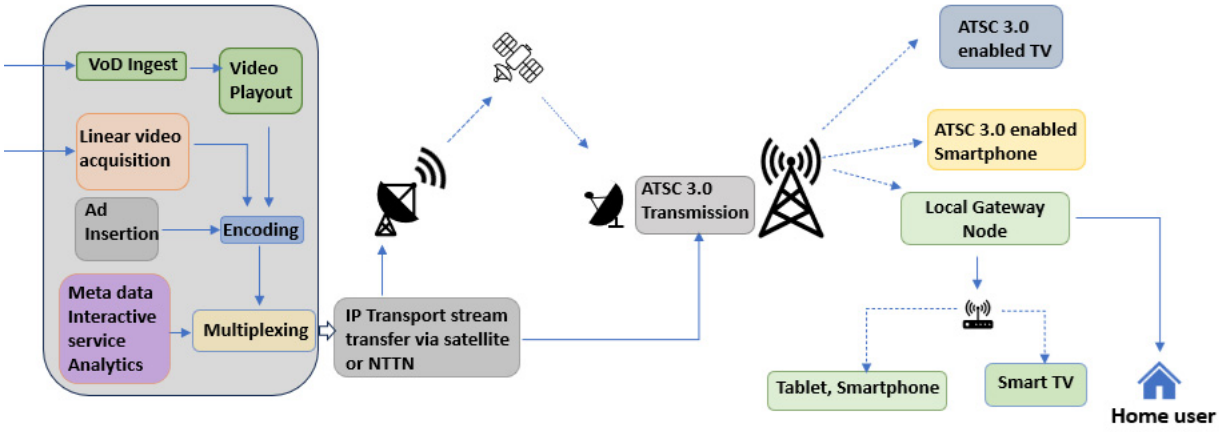

Figure 2. Conceptual diagram

e. Local Gateway Node

Local Gateway Node might be used in an Intranet network, Hotel, Apartment, community hall, or any other public place. This system consists of an Integrated Decoder and demodulator to receive ATSC 3.0 signal, Offline video storage, and Video Server with integration of HTML player, Transcoder, unicast transport stream, and local Server-Side Ad insertion (SSAI). In the Local Gateway Node, digital video content is to be received, demodulated, decoded from terrestrial networks, and streamed in unicast multi-profile formats over the WLAN/Wi-Fi.

Local offline video storage serves the local content. In addition, the Local Gateway Node can Inject Internet OTT content through APIs and deliver through Wi-Fi or Intranet and reach households (Figure 3).

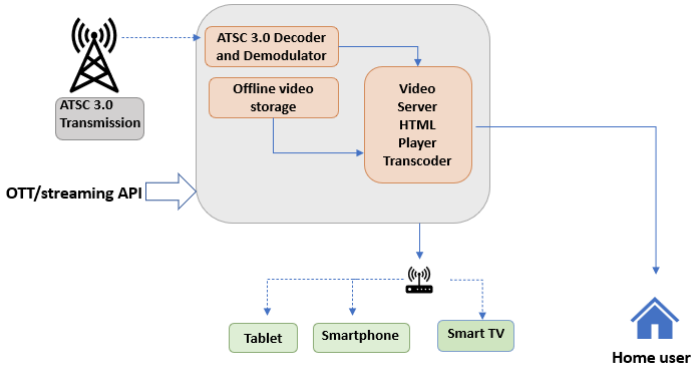

Figure 3. Local Gateway Node

2. Method

The concept is designed with handheld smartphones as the primary target platform, it focuses on delivering adaptive content based on the screen sizes, resolutions, and capabilities of smartphones and tablets allowing users to access multimedia content seamlessly. It utilizes over-the-air (OTA) transmission to deliver content directly to mobile devices. This approach eliminates the need for continuous internet connectivity, It can combine OTA broadcast with broadband internet delivery, providing a hybrid approach with high-quality audio, video delivery, and interactive applications.

To investigate the feasibility and the merits of video broadcasting over terrestrial mobile network frequencies, a controlled experimental framework is required. Initially, an unutilized VHF frequency of Bangladesh Television (BTV) or a specific frequency band would be assigned by the Bangladesh Telecommunication Regulatory

Commission (BTRC), and mobile devices equipped with compatible receiver hardware to be required. The neighborhood country India already has started experiments on the same type of project and their initial assessment result is promising which is considered as a reference for this study since, comparative analysis with internet IP streaming in terms of quality and data rate, frequency band, modulation, error correction, security and reliability, network coverage and an intricate evaluation of user experience parameters all are the key factor to choose the technology framework.

3. Result & Discussion

The concept of this emerging technology will evolve the traditional broadcasting industry of this country and it will be adapted to the transition of video viewing experiences. In the future, this terrestrial technology might be providing many more enhanced services or applications along with videos. Viewers will access content 'on the go' through a high-speed backbone without relying on a stable internet connection. In the future, terrestrial broadcasting may also be integrated with other broadcasting technologies, such as DVB-S2, Internet, return path, etc. to provide more flexibility and diversification.

Terrestrial broadcasting is still superior compared to new technologies or the 4G era of the country, even after 3-4 years while 5G technology offers high-speed internet access to users but with limited coverage, signal strength, and data caps. On the other hand, Terrestrial broadcasting could offer wider coverage and high-quality broadcasting.

Terrestrial spectrum is more efficient than 4G. Though 5G technology may offer other latest technology benefits in the future, terrestrial will still be superior in coverage, and high-quality content distribution without internet buffering.

Finally, the local gateway node integrates with an internet-based OTT platform and forms an aggregated ecosystem which may lead to create new era in Bangladesh's Pay TV industry.

On the other hand, there are several challenges to be faced by the industry with the adaption of any new technology like spectrum, higher costs for terrestrial broadcasters, and the reluctance of the regulations. Furthermore, the need for investment infrastructure, to invest in new equipment which can be very costly. The main challenge of terrestrial broadcasting is limited capacity, and it is a one-way communication channel unless the streaming protocol/application or interactive method is part of this ecosystem. Since terrestrial broadcasting networks are based on fixed infrastructure, they will not be able to adapt to the evolution of the industry and the needs and preferences of the customer. In addition, in the present regulatory system of Bangladesh, only state broadcasters BTV is allowed to use terrestrial frequency bands as a result the usage of this technology to reach every corner of the country will be very limited until the government makes this spectrum available for the private sector. Presently telco operators must pay very high tariffs for their 3G/4G spectrum, likewise, the expansion of terrestrial broadcasting services might be challenging. The main advantage of this technology is to deliver "On the Go" video content directly to mobile phones without using internet data, as a result, telecom operators are concerned about losing revenue from video consumption.

4. Conclusion

Terrestrial broadcasting over IP-based distribution for mobile users emerges as a pioneering solution to address the multifaceted challenges created by the rapid proliferation of mobile video consumption. By capitalizing on unutilized frequency bands, this approach offers a substantial reduction in the Internet, leading to better user experience and more utilization of network resources. While hurdles about scalability, regulatory alignment, and standardization persist, this research underscores the profound potential of optimizing video delivery, heralding a paradigm shift in the quality and sustainability of mobile video service. With rapid technological advancement, mobile devices have become an integral part of life. Mobile users are already used to watching content from various OTT or steaming platforms by consuming internet data. The selection of appropriate technology such as ATSC 3.0, 5G Multimedia Broadcast/Multicast Service (MBMS) based on 3GPP, and adding an offline Video-on-Demand (VoD) storage platform to build a hybrid platform will play a key role in making this project success.

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