2021 Broadcasting Trends in the USA

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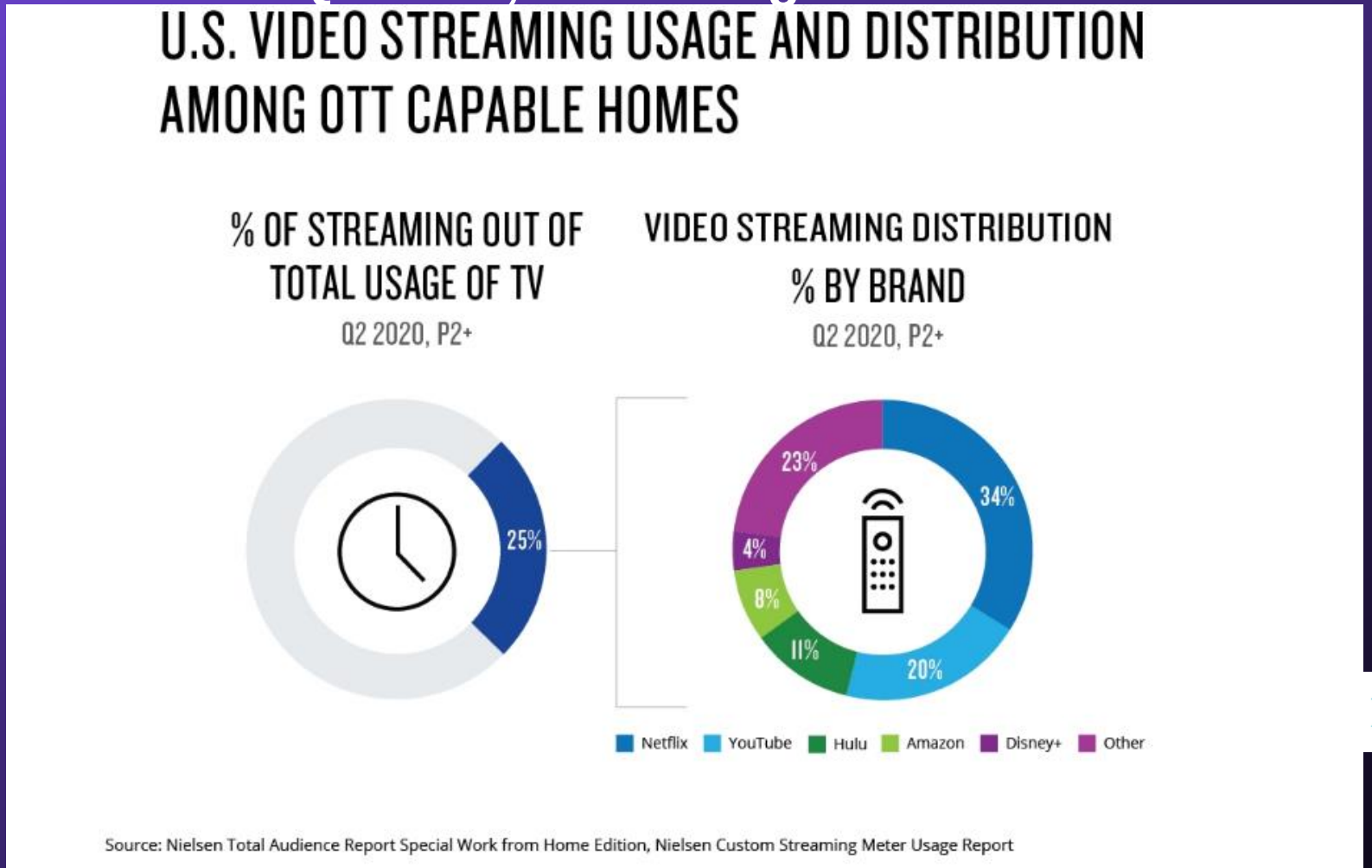
Broadcasting Trends in the USA

- Streaming
- Next Generation TV - ATSC 3.0
- 4K UHDTV
- High Dynamic Range (HDR)
- IP Production

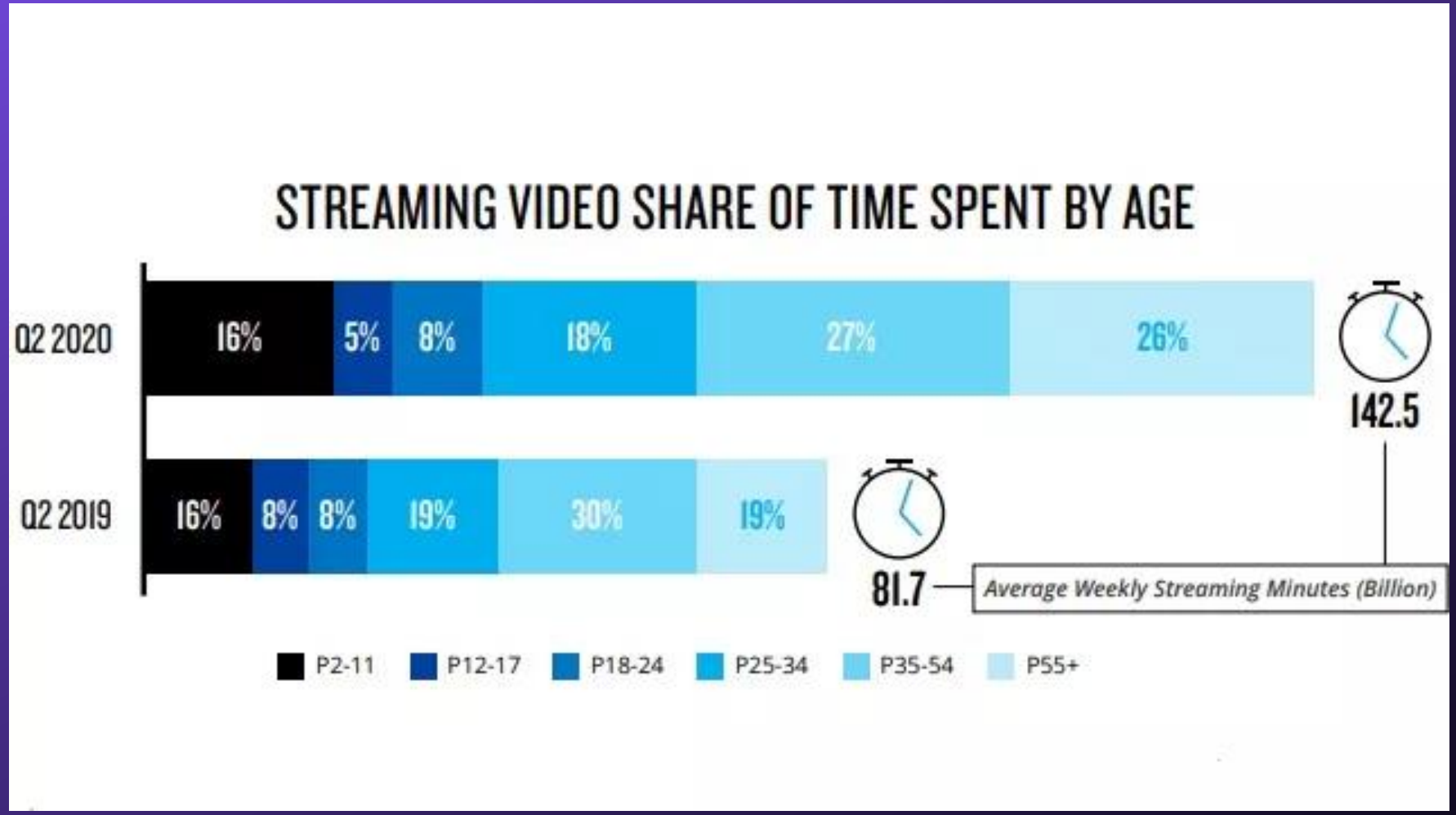
Streaming in the USA

- Per the audience research firm, Nielsen Company, Feb 2020 *Total Audience Research Report*, 19 % of all TV usage is streaming services.
- At the end of the Q2 2020, streaming has increased to **25% of TV usage**.



Streaming in the USA

- Older demographics (P55+) are embracing streaming services.



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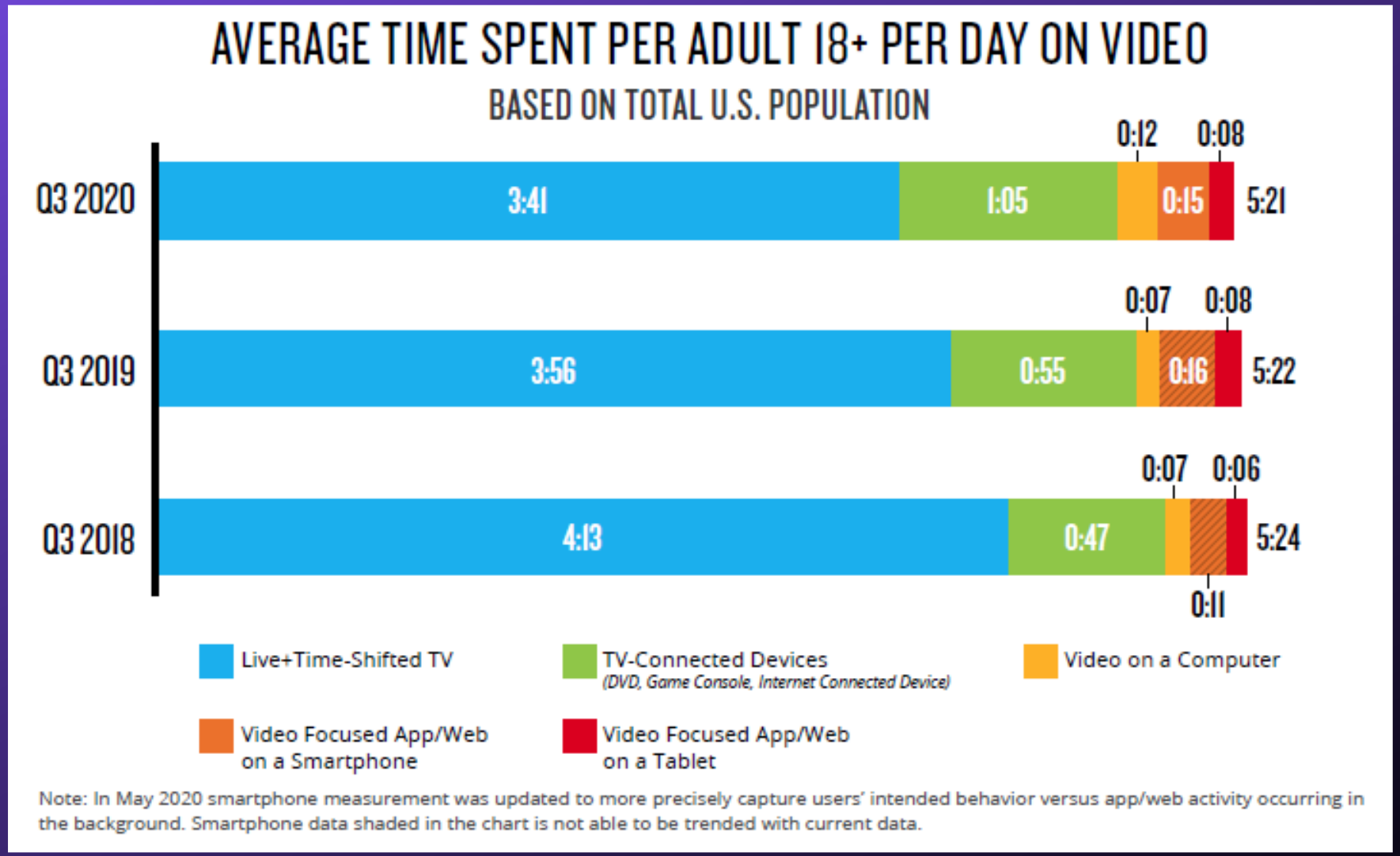
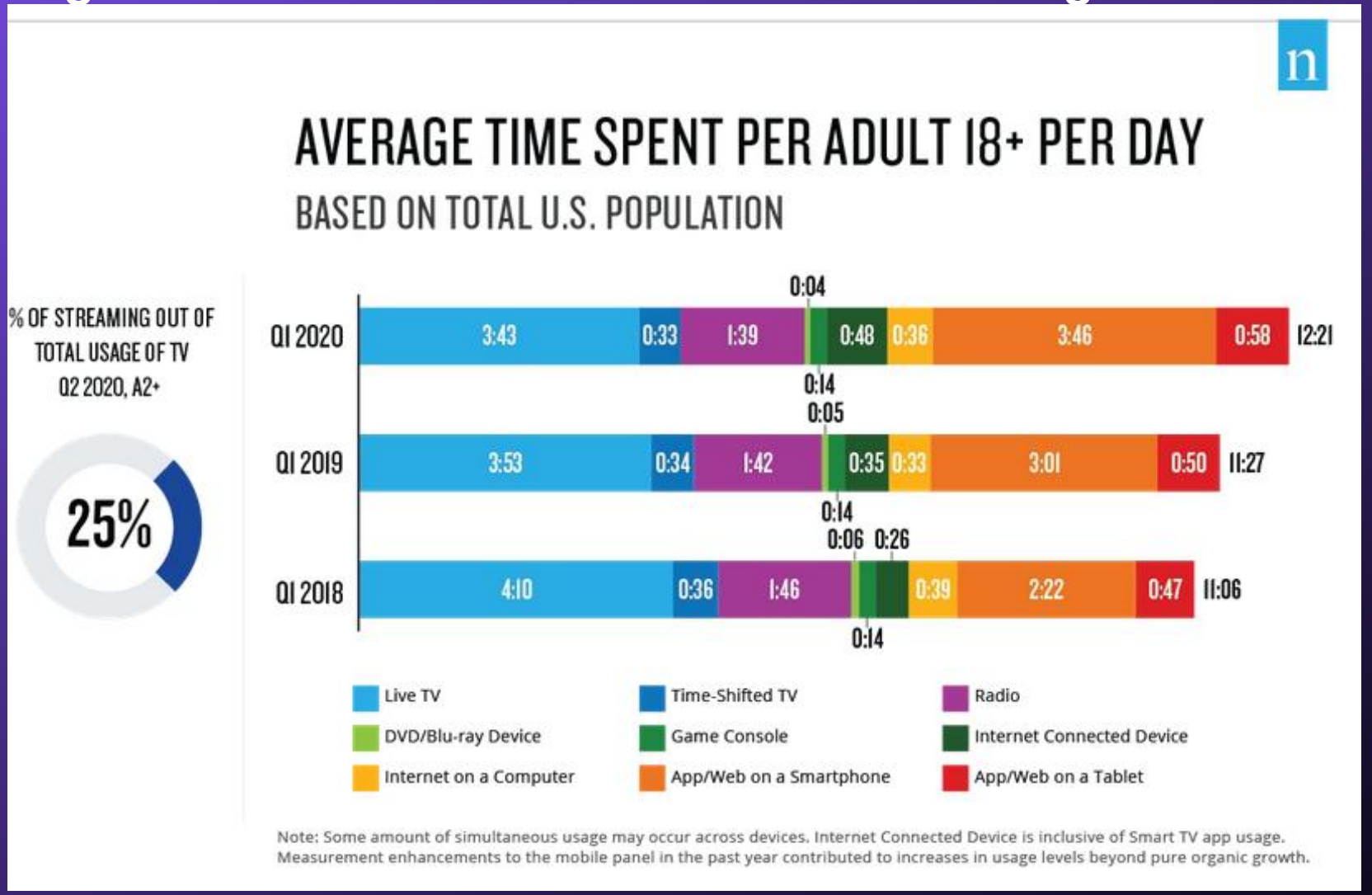
Streaming in the USA

- Live + time shifted TV viewing continues to decrease.



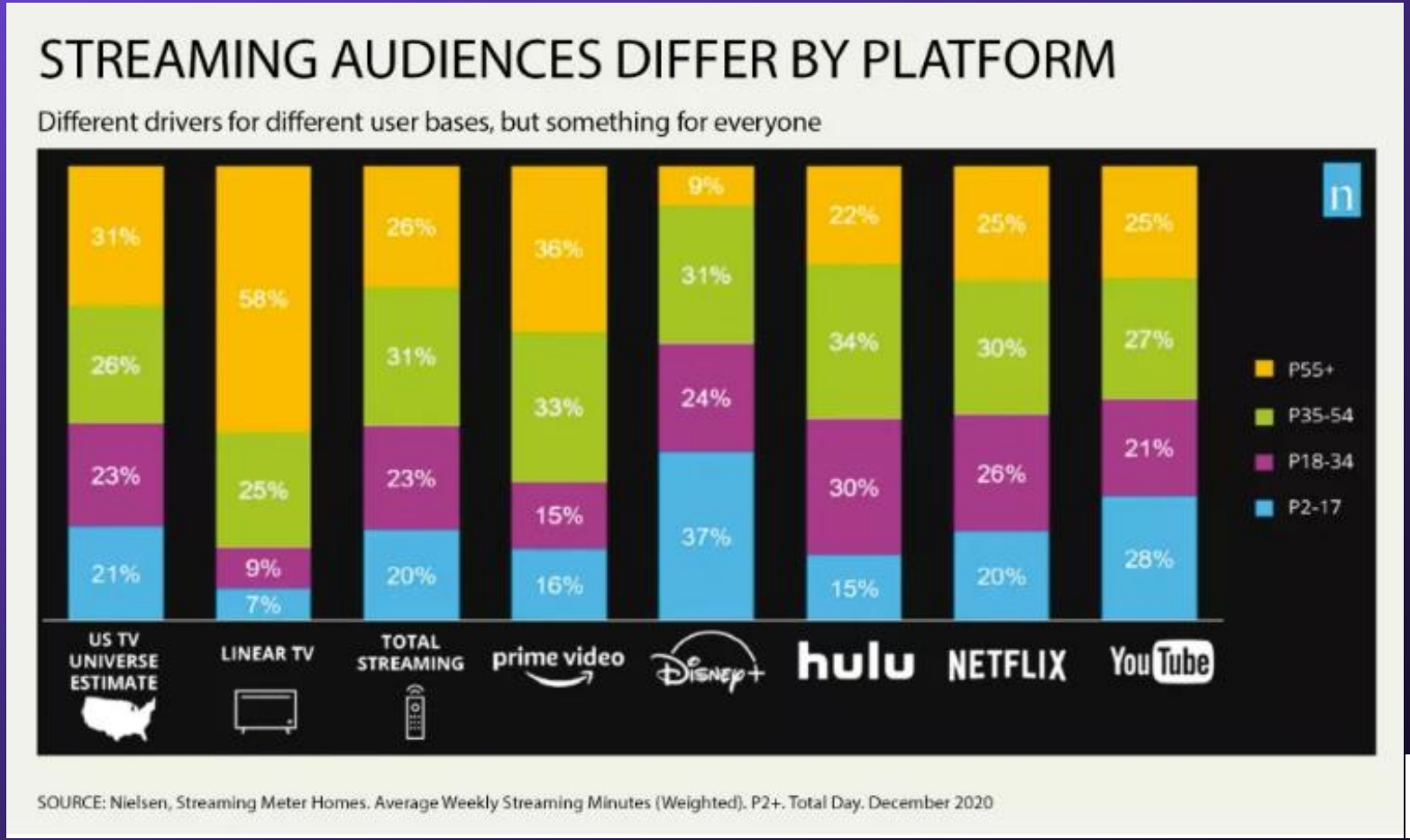
Streaming in the USA

- Streaming now accounts for 25% of all TV viewing.



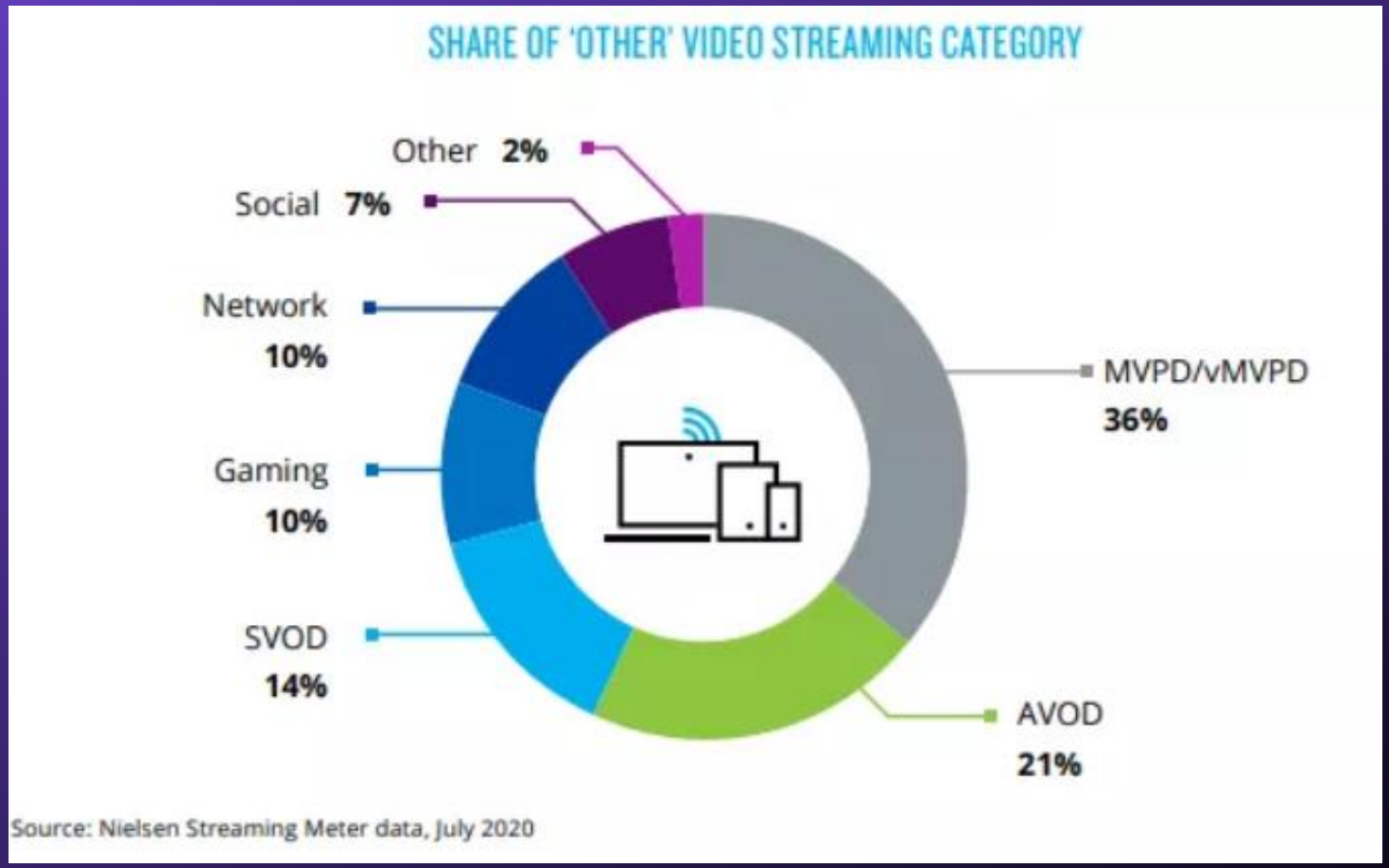
Streaming in the USA

- The total streaming audiences across all age categories were very similar to the segmentation of traditional (broadcast and cable) viewing. However, the assessment also showed that older viewers (age 55 and up) are now among the biggest users of linear, rather than on-demand, streaming services — reflecting their comfort level with linear, ad-supported formats.



Streaming in the USA

- Ad-supported Video on Demand (AVOD) accounts for nearly 5% of time spent streaming.
- In a new report, titled *Beyond SVOD*, Nielsen noted that when it measured streaming in July 2020, time spent viewing video sources "Other" than the big subscription VOD (SVOD) services -- Netflix, YouTube, Hulu, Amazon, Disney Plus--accounted for a 23% share and minutes spent viewing rose by 57%.



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Streaming in the USA

- All the major Broadcast and Cable Networks now offer a direct to consumer streaming service.
- Many networks are removing their content from Netflix and making it available on their own streaming service, including Disney/ABC, Fox, NBCU, ViacomCBS, Showtime, HBO, etc.
- Fox jumped into streaming by agreeing to buy Tubi. Pricetag is $440 million. (Tubi is a streaming service based in San Francisco, California, United States, that launched in 2014. It is a free, ad-supported service, with advertisements shown during un-skippable commercial breaks during programming.)

Streaming in the USA

- Disney+ signed up over 10 million subscribers in the first week. The worldwide subscriber numbers as of March 2021 have grown to over 100 million and are forecasted to reach 230-260 million subscribers by 2024, surpassing Netflix.
- Disney+ went live in the U.K., Ireland, Germany, Italy, Spain, Austria and Switzerland on March 26, 2020; Disney also confirmed a delayed debut in France on April 7. This is the largest multi-country launch for the service so far. Disney + was asked to limit the bandwidth by 25% during the "work at home" requirement imposed by the Coronavirus.

Streaming in the USA

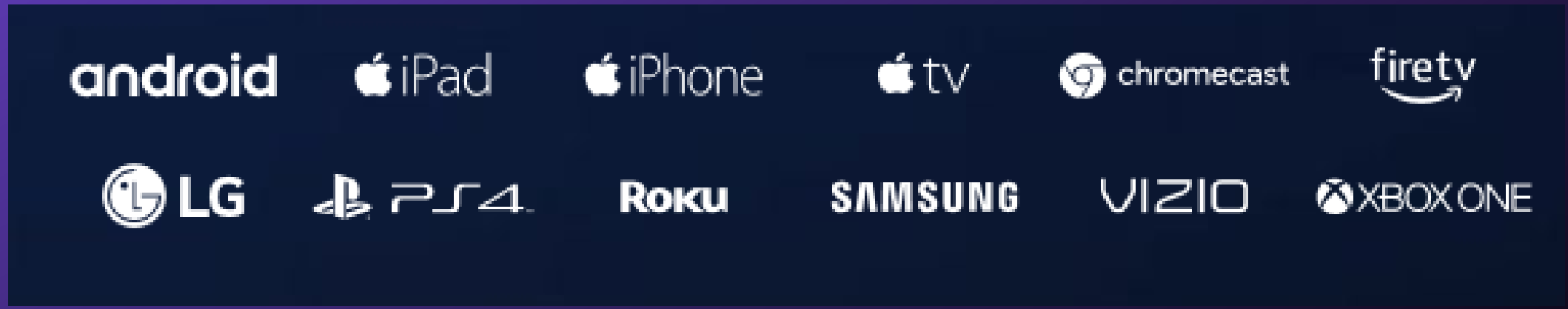
- Viacom/CBS has rebranded CBS ALL ACCESS as Paramount+ and added content from their cable channels: BET, Comedy Central, MTV, Smithsonian, and Nickelodeon.
- Paramount + has nearly 30 million global subscribes.
- Subscribers have been growing at a 60% rate, year over year.
- Pluto TV is ViacomCBS's free ad supported streaming (FAST) service that has over 250+ channels and thousands of movies. https://pluto.tv/live-tv/paramount-movie-channel?utm_source=homepage

Streaming in the USA

- Paramount + is offering first run exclusive programming to drive subscriber growth.

Streaming in the USA

- Paramount + also provides the live local CBS TV stations in 200 cities.
- In addition to first run TV series, Paramount + offers over 20,000 TV episodes and movies, as well as Sports and local news.
- Paramount + is available on a wide variety of mobile phones, tablets, gaming platforms, TV sets and other in-home devices.



Streaming in the USA

- The following CBS owned stations are offering a 24 hour a day, 7 day a week local news stream- CBSN. It is available for free as a stand-alone service and/or part of the Paramount+ Subscription:
  - New York, Los Angeles, Boston San Francisco, Chicago, Dallas-Fort Worth, Philadelphia, Minneapolis-St. Paul, Denver.
- CBS is also offering 24 /7 CBS Sports HQ and a Hollywood news magazine stream, " ET Live".

Streaming in the USA

- Cost per month for streaming services.

Service	Price /mth with comm	Price /mth without comm
Amazon Prime Video	$8.99	
HBO MAX	-	$14.99
Hulu +Disney+ ESPN	$13.99	$19.99
Netflix (standard)	$13.99	-
Disney +	$8.00	-
Paramount + Paramount + (premium)	$5.99 $10.00	$9.99
Apple TV	$4.99	-
NBCU Peacock (Ad supported)	(1) Free limited programming; (2) Ad-supported complete version, free to existing Comcast customers; (3) $4.99 non-Comcast customers	$9.99
ABC	Linked to TV provider subscription	

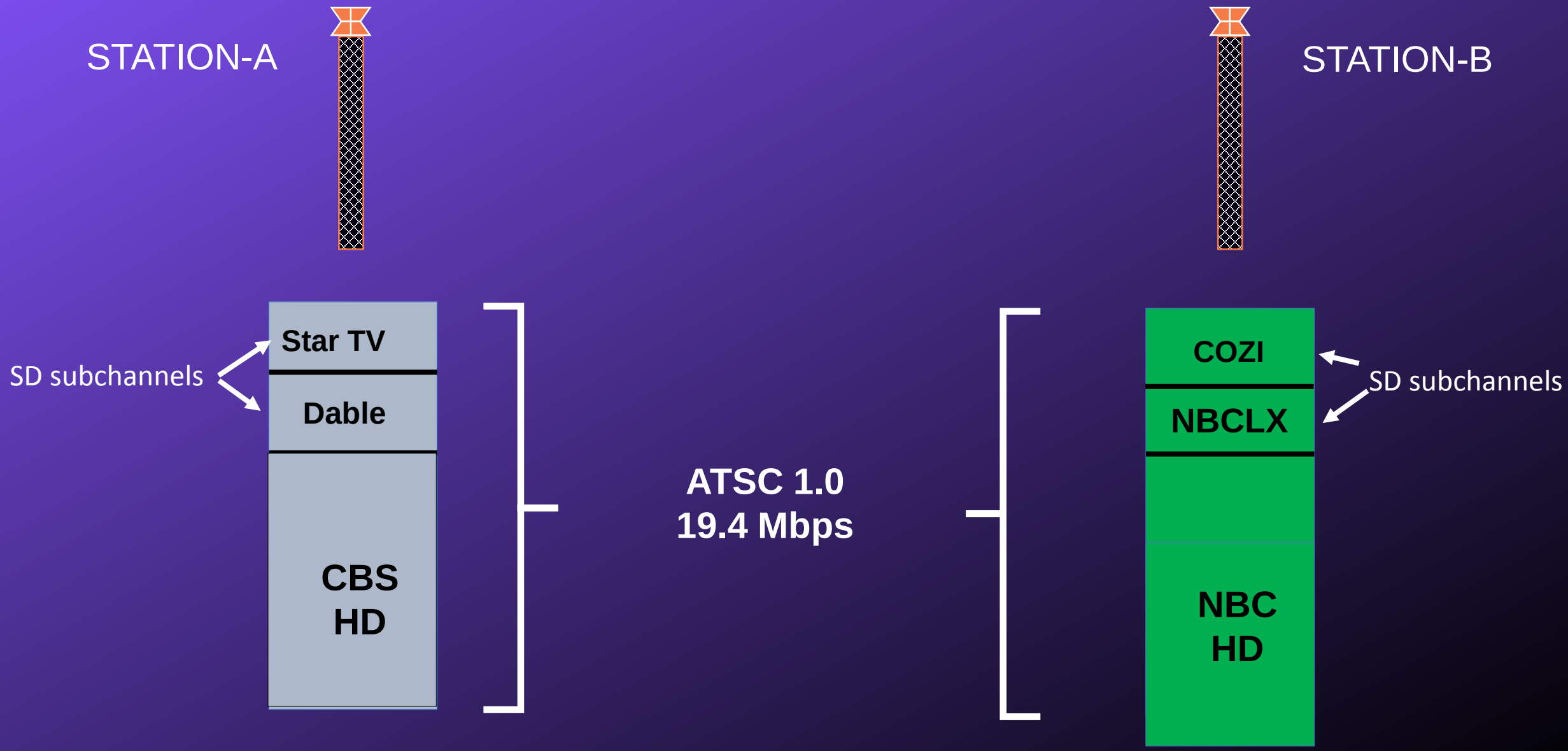
Streaming in the USA

- One major challenge for all streaming services is customer retention. Subscribes cancel their subscription after watching a show of interest and then sign up with another service. This subscriber “Churn” has been changing during the pandemic.
- Pre-pandemic churn rates were 20%, then went down during the early months of the pandemic, then shot up to 85% and have now leveled off at 35 - 37%.

Next Generation TV- ATSC 3.0 in the USA

- While the Federal Communications Commission (FCC) has approved the use of the ATSC 3.0 modulation standard, they have not provided any new spectrum to broadcast the new TV signal.
- The FCC has not mandated a transition to ATSC 3.0, so it is a voluntary local TV station decision.
- The FCC has not required TV manufacturers to include this new technology in the TV sets. It is a voluntary receiver manufacturer decision. 20 different TV models from three manufacturers—LG, Samsung and Sony, will be available with built-in tuners.
- The FCC has not required the Cable and Direct Broadcast Satellite providers to carry the ATSC 3.0 signal or its enhanced features, such as HDR, 4K , targeted Ads, etc.
- The business plan to support this new technology needs to be clarified.
- As of March 2021, ATSC 3.0 is on the air in 25 markets with another 4 markets (Baltimore, Los Angeles, San Antonio, Texas, and Washington, D.C.) having submitted applications to the FCC to transmit in ATSC 3.0. Pre- COVID, the National Association of Broadcasters (NAB) had predicted there would be 40 cities on the air by the end of 2020.

Simplified Transition from ATSC 1.0 to ATSC 3.0 with no new spectrum
(current situation)



Transition from ATSC 1.0 to ATSC 3.0 with no new spectrum

STATION-A
"HOST"
ATSC-1.0

NBC station-B would place their programming on the CBS station-A to support existing ATSC 1.0 TV receivers.

CBS station-A would place their programming on NBC station-B for the new ATSC 3.0 receivers

It is unclear what will happen to the subchannels. In a given market, there may be 30 subchannels.

STATION-B
ATSC-3.0

Start TV ??

Dable ??

NBC 1080 HD

CBS 1080 HD

ATSC 1.0
19.4 Mbps

ATSC 3.0
23 Mbps

CBS 1080 HD

NBC 1080 HD

COZI ??

NBCLX ??

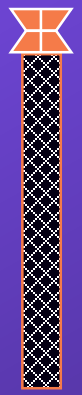
It is unclear what will happen to all the current (32) OTA ATSC 1.0 SD Sub-Channel Networks

Next Generation TV- ATSC 3.0 in the USA

- In order to broadcast all the major Networks in each city, it will be necessary to have at least two ATSC 3.0 stations per market.
- The Phoenix, Arizona market is an example of a two station multiplex:
  - KFPH carries CBS, PBS, NBC, Univision, UniMas.
  - KSAW carries FOX, ABC, MyNetwork, CW.
- As of 4/16/2021, the following markets have two ATSC 3.0 stations on the air:
  - Phoenix, AZ
  - Portland, OR
  - Seattle, WA
  - Denver, CO
  - Raleigh, NC
  - Nashville, TN

Two Lighthouse ATSC 3.0 stations per Market will be Required

STATION-A
ATSC-3.0

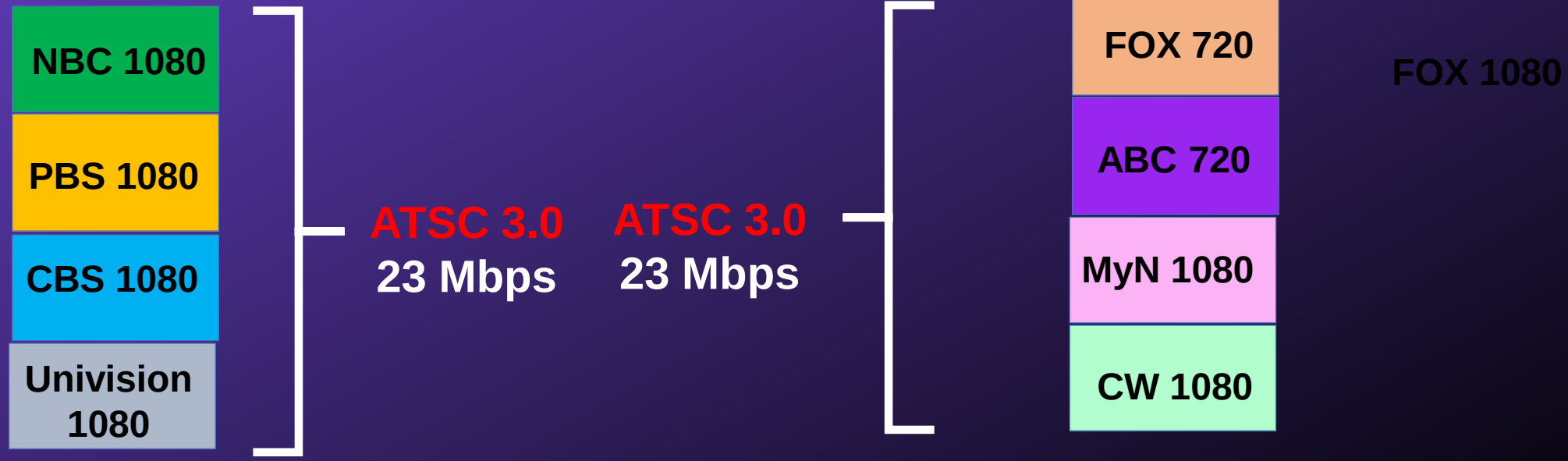


In order to broadcast all the major Networks in each city, it will be necessary to have at least two ATSC 3.0 stations per market.

Because the video compression format (HEVC) used in ATSC 3.0 is more bit efficient, it is possible to have more HD signals per transmitter.

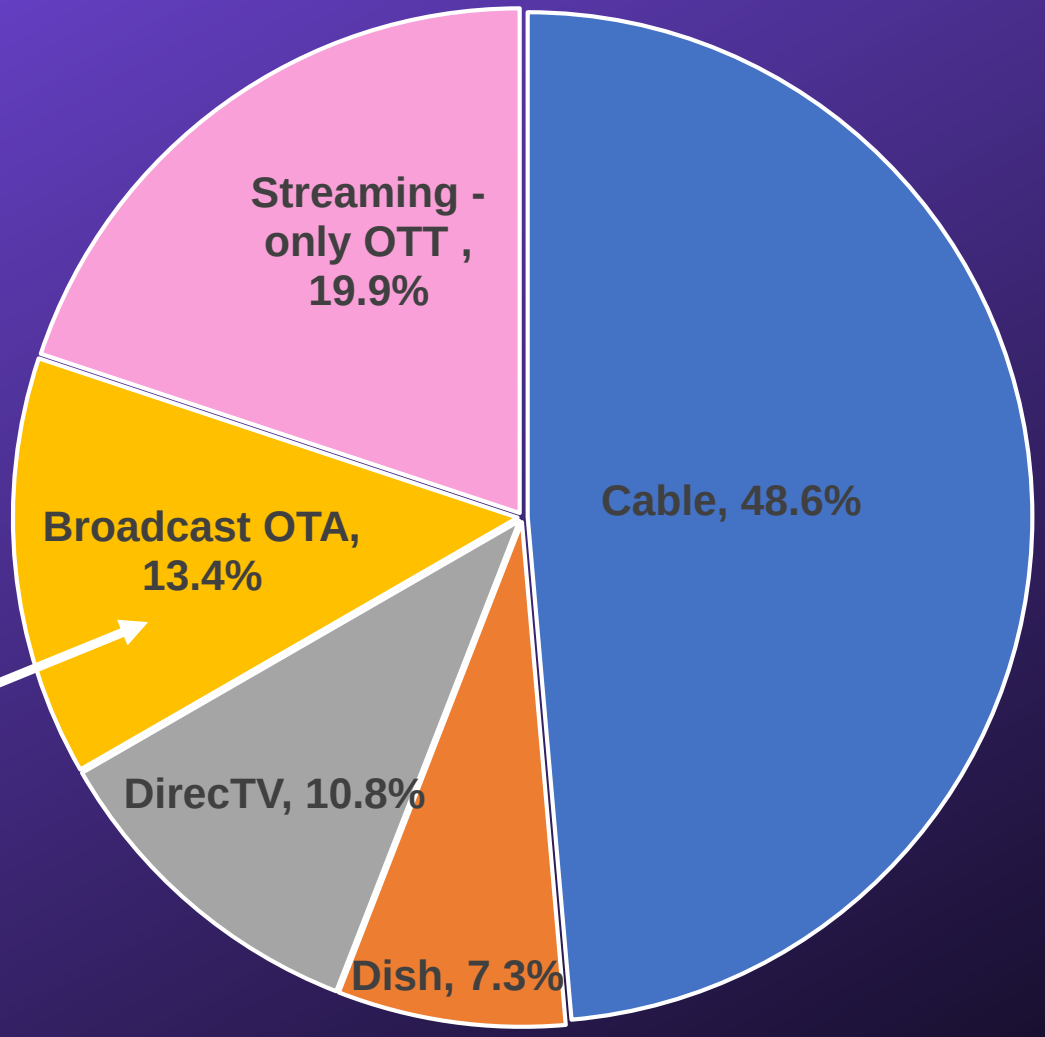
In this example, both Station-A and Stations-B have a 4 channel HDTV multiplex.

STATION-B
ATSC-3.0



Next Generation TV- ATSC 3.0 in the USA

TV Service Providers by % for 120 million US TV HouseHolds



Potential ATSC 3 audience without cable and satellite carriage .

Next Generation TV- ATSC 3.0 in the USA

- Nielsen estimates there are currently 120.6 million US TV Households. That equates to 307.3 million people. (i.e. 2.54 people per USHH).
- It is also estimated that 13.4% of the USHH receive their TV signals via Over-The-Air (OTA) reception.
- Since ATSC 3.0 is not carried by cable or satellite distributors, it is only available to OTA viewers.
- As of 4/15/2021, the number of markets with at least one ATSC 3.0 station on the air, equates to 22% of USHH, but not all the major Networks are available.

  Therefore, the potential ATSC 3.0 USHH can be computed by:

  22.0% X 13.4% = 2.94% of US HH.
- Markets that have two ATSC 3.0 stations on the air and are carrying all major Networks (ABC,CBS,FOX,NBC,CW,PBS,Univision) account for 5.34% of USHH.

  Therefore, the potential full service ATSC 3.0 USHH can be computed by:

  5.34% X 13.4% = 0.72% of USHH.

Next Generation TV- ATSC 3.0 in the USA

- The transition plan does not provide for any 4K UHDTV.
- All stations would broadcast in the 1920 x 1080 / 59.94 or 1280 x 720 / 59.94 P Progressive video format.
- There may be some HDR services available.
- Cable and Satellite providers have indicated they do not plan to carry the ATSC 3.0 signals. Since the cable and satellite audience accounts for 67% of US TV Households, only a small percentage of the viewers will be able to see the ATSC 3.0 broadcasts. (≈13% of USHH)
- The question is: “Has the ATSC 3.0 Technology been overtaken by streaming services that can roll out 4K, HDR, and targeted Ads much faster and are available on the mobile 3G, 4G , 5G cellular networks, on millions of existing streaming TVs, gaming consoles, tablets and PCs ?”

HDR Trends in the USA

- One of the challenges with High Dynamic Range (HDR) production and distribution is there are a multiplicity of HDR formats.
  - Hybrid Log-Gamma (HLG) ITU BT.2100.
  - HDR 10 (PQ) SMPTE ST 2084-ITU BT.2100.
  - HDR 10 +
  - HDR +
  - S-LOG (Sony)
  - SL-HDR-1
  - Dolby Vision IQ (Ambient light sensor + dynamic metadata).
- Multiple HDR formats are creating confusion in the marketplace and conversions between HDR formats can create issues.
- A method to automatically adjust the TV to the HDR format needs to be developed or the industry needs to standardize on a single format.
- Not all TVs support all the HDR formats.

4K / HDR Trends in the USA

- Over The Top (OTT) streaming services are currently the primary method for 4KHDR distribution in the USA.

Streaming Service	# of 4K Titles	HDR Format	# of 4K Titles in HDR	% of 4k Titles in HDR
Amazon Prime	590	HDR10+/Dolby Vision		35%
Apple iTunes	707	HDR10+/Dolby Vision		74%
Disney+	136	HDR10/Dolby Vision	104	14%
Fandango Now	284	HDR10		0%
Fubo TV	Note:1	HDR10		
Google Play	447	HDR10+/HDR10/Dolby Vision	426	95%
HBO MAX	21	HDR10+/Dolby Vision	21	100%
Hulu		none		
Netflix	851	HDR10/Dolby Vision	360	42%
Paramount+	45	Dolby Vision	4	
Peacock	Note:1			
Vudu	713	HDR10/Dolby Vision	531	74%
YouTube	170	HLG/HDR10+/HDR10/Dolby Vision	?	

Note:1 on the road map

4K / HDR Trends in the USA

- Since 4K UHDTV signals require more data bandwidth than HD signals, none of the ATSC 3.0 stations are carrying 4K UHDTV over the air on their multicast channels.
- Cable distribution of 4K UHDTV is very limited to a few live sporting events.
- For the summer Olympics, NBC is making a 4K HDR signal available to all of the cable networks, satellite providers and online streaming platforms that carry NBC programming. However, so far only a handful have said they will be offering it to viewers, such as Comcast, Dish Network, and DirecTV. The 4K HDR signal will not be live and offered on a delayed basis.
  - Many of the 4K HDR signals will be down converted from the NHK ‘s Super Hi-vision 8K (7,680 x 4,320) HDR (HLG) format.

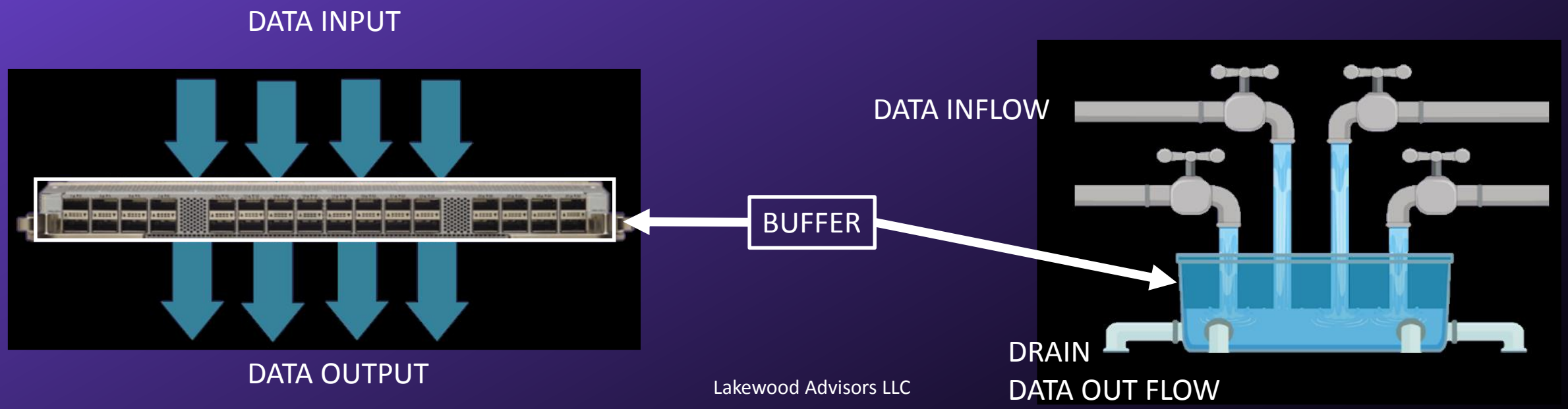
IP Production in the USA

- There are two primary IP production formats SMPTE 2022 and SMPTE 2110.
- Large mobile unit (OB) vendors such as, NEP, Game Creek are building only IP based production OB vans.

- NBC's coverage of the 2021 Olympics in Japan will be based on a Grass Valley IP router.
- The Canadian Broadcasting Corporation's (CBC) new Broadcast Center is based on IP audio/ video distribution.

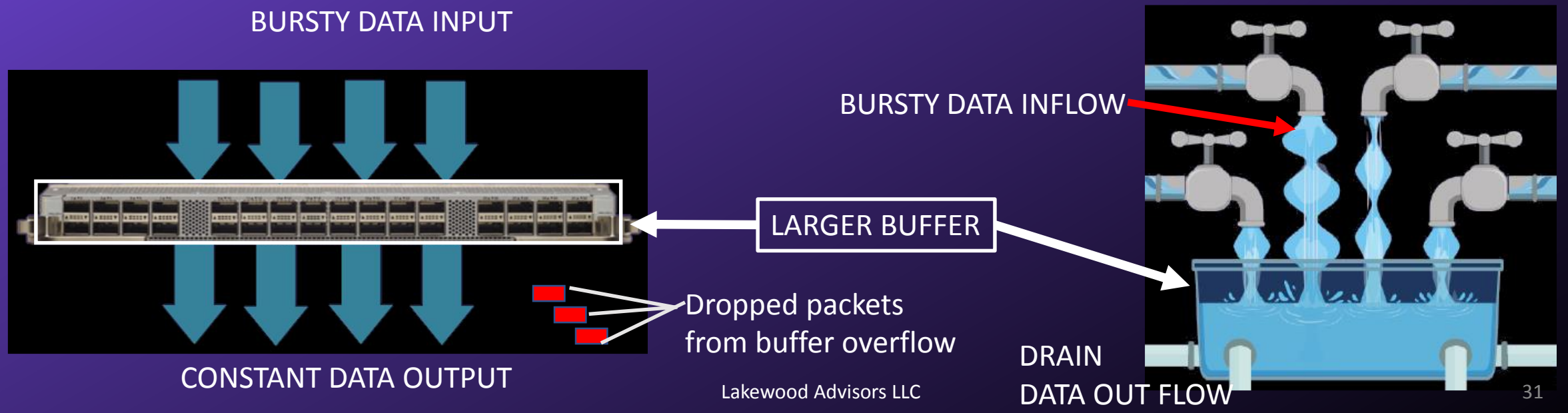
SDI vs IP Production

- One of the differences between Serial Digital Interface (SDI) and Internet Protocol (IP) switching is that SDI switching is “non-blocking” with guaranteed through-put from the source to the destination.
- With IP switching it is necessary to manage the amount of data transmitted by the sender to the receiver, as well as understanding the buffer size in the ethernet switch. In this diagram, the data inflow rates are constant.



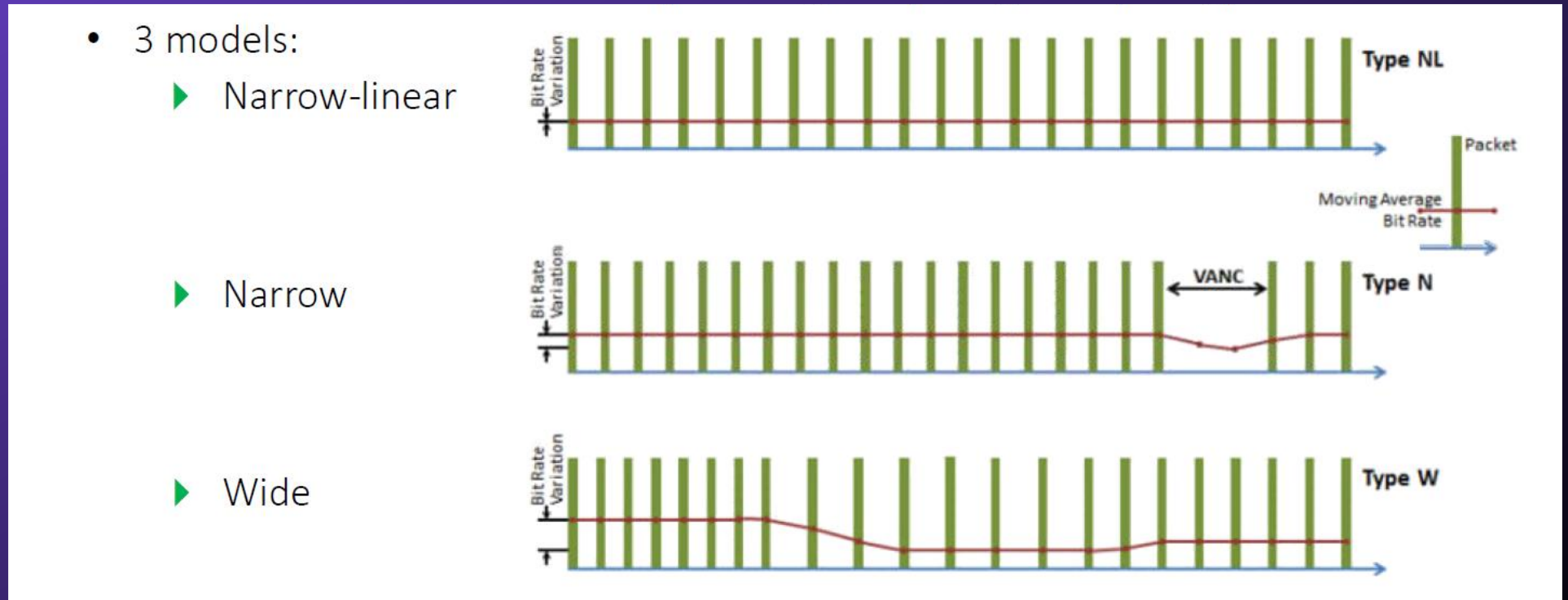
SDI vs IP Production

- Data input flows can increase and decrease creating “bursts “ of transmitted data.
- Random and unregulated traffic patterns may temporarily overflow buffers, even if average bandwidth is not exceeded.



SMPTE ST 2110-21 Video – Traffic Shaping and Delivery Timing

- In order to address different types of data flows from the sender, SMPTE defined sender - drain behavior (packet egress pacing and spacing) and (receiver) buffer requirements.
- •There are 3 models or Types of sender traffic shaping:
  - Narrow-linear (**NL**) Sender– packet are drained evenly distributed across the frame period .
  - Narrow (**N**) Sender– packet drain closely follows SDI signal timing (no packets during VBI and VANC) .
  - Wide (**W**) Sender– allows increased “burstiness” (accommodates Software -based senders).
  - The moving average is shown by the redline. Please refer to the SMPTE standard for the mathematical formulas.



IP Production in the USA

- Canadian Broadcasting Corporation (CBC) Lessons learned:
  - Each individual (or enterprise) has a different definition of COTS (Commercial Off-The Shelf).
  - Specialized ST2110 hardware based Network Interface Cards (NIC) work very well.
  - With reference to the SMPTE 2110-21 Types: N (or even W) profiles are difficult to achieve in software.
  - The best software based senders meet the N –Profile(Narrow) 99.9% of the time, however, they exceed the profile 0.1 % of the time , which can cause intermittent issues. The W- Profile is easier to meet. However, in practice, the software exceeds the W-profile a small percentage of the time. (i.e. packets arrive late). As a result, the W-profile sender never achieved market acceptance and most manufacturers do not use software based sender and instead use purpose-built NICs.
  - First generation gateways (those that were shipped as ST2022-6) are very limited in terms of functionality (# of audio streams, ability to support W senders, …).
  - "Precision Time Protocol (PTP) is hyper critical … and the initial CBC design created an internal Distributed Denial of Service (DDoS)! It's a bad idea to slave a grandmaster to Black Burst sync. Some gateways requires both PTP and Black Burst sync."
  - CBC's project ran over budget.

IP Production in the USA

- While pure–software based senders never achieved market acceptance, there are some NIC-assisted transmitters, such as Mellanox ConnectX that uses a special driver.
- The third alternative for software based products is to use a purpose – built Network Interface Card (NIC), such as the AJA KONA-IP that can support one or two HD signals or at the high end, the Matrox X.MIO5 Q25 that can support one or two UHD signals.

IP Production in the USA

- CBS updated their Washington News Bureau to an IP infrastructure (SMPTE-2110). However, there are very few IP sources and destinations, so there are many SDI to IP and IP to SDI gateway converters. Even with redundant IP routers, major air losses have occurred resulting in a complete loss of the Evening News broadcast to major markets.

https://variety.com/2020/tv/news/cbs-evening-news-technical-issue-norah-odonnell-mark-zuckerberg-1234611340/

- Comcast / Telemundo Center in Miami is a 13,000 x 13,000 IP router and distribution system. (SMPTE 2110).

- Comcast Lessons learned:
  - Each SDI to IP (Encapsulation) and IP to SDI (Decapsulation) is a separate process that must be managed. (i.e. audio / video lip sync)
  - Redundant paths are essential.
  - Deployed separate networks: ST2110, Revenna for Communications, Dante for audio sources.
  - Segmented IP production Network from IP Acquisition Network.
  - The project ran over the budget and was delayed.

IP Production Benefits / Challenges

- IP Production is very flexible and easily expanded.
- When interconnecting two or more OB VANs, IP address space can be difficult to coordinate or require Network Address Table (NAT) mapping that can add path timing delays. Other issues that need to be managed closely to protect the IP Network from system wide failures are “Broadcast storms” and duplicate IP addresses, managed data flows, Precision Time Protocol (PTP) attacks.
- IP equipment is currently more expensive than SDI and has not yet provided the predicted cost savings by using Common Off The Shelf (COTS) hardware that should have provided cost savings from economies of scale.
- When installing and testing IP Systems, it takes 2 to 3 times longer.
- The “cost of ownership” should include testing time for continuing software upgrades.
- Engineering and Maintenance Staff will require additional training.
- IP production systems are susceptible to “hackers”. Additional time and equipment must be budgeted for Cybersecurity. Ex. Protection from the Russian Fancy Bear.

- Must implement on-going software upgrades and testing to correct cybersecurity threats . “Patches”. Triple level firewalls, Active directory, Penetration tests, failover testing, dual IP meshed routing.
- An off-line test facility is highly recommended.

Thank you

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