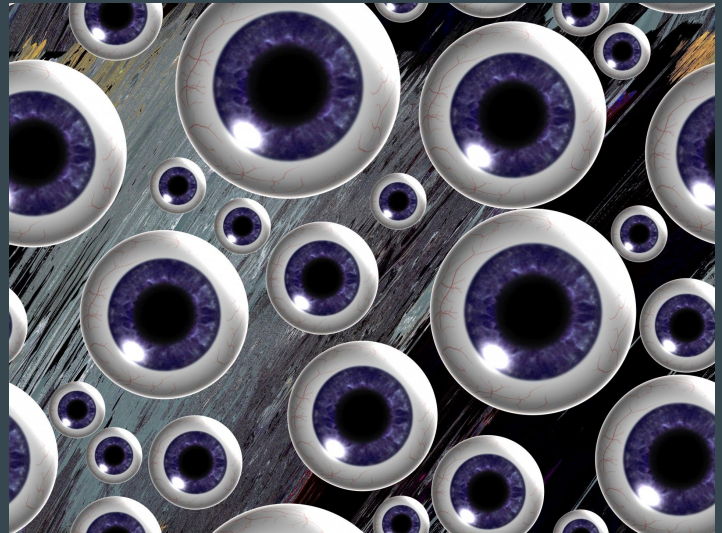
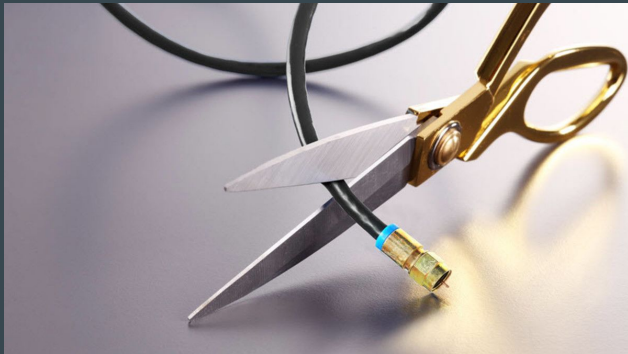


OTT & Social Media PEG Impact

- Cord Cutting
- Opportunity to Expand Viewership
- Enables Viewership Stats
- HD to the TV
- Interactivity
- Monetization
- Mobile Viewing



OTT is Mainstream

STREAMING HAPPENS ALMOST EVERY DAY IN EVERY HOME



**Number of homes that
streamed content in a
month on CTV in the U.S.**

+4.4M HOMES
VS MAY 2022



**Time spent streaming
on CTV for households
in the U.S.**

+2B HOURS
VS MAY 2022



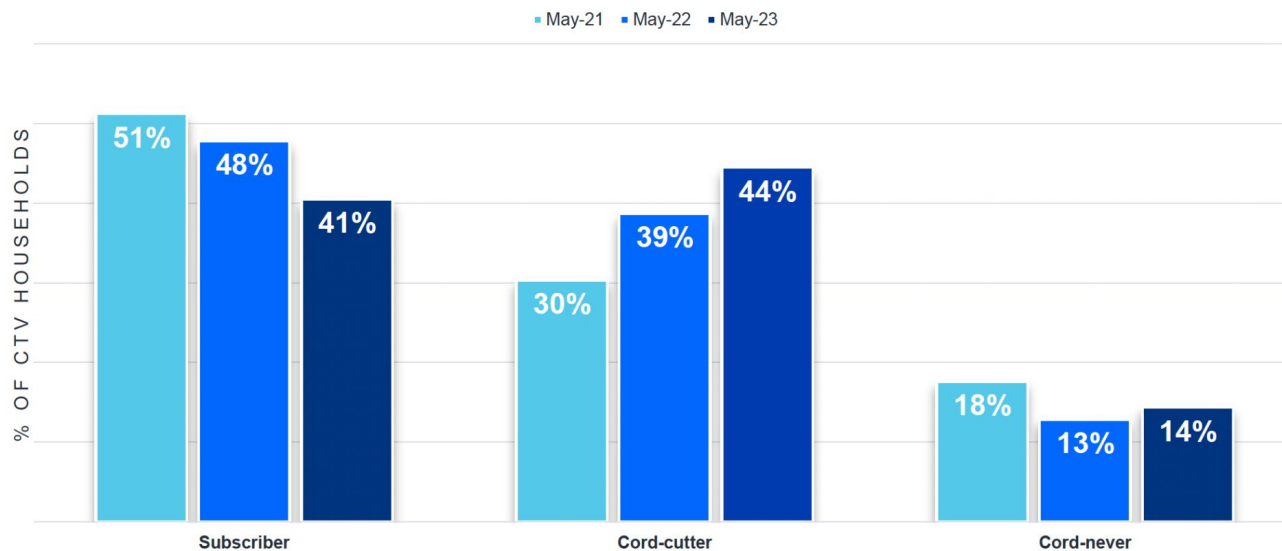
**Average viewing days
per household spent
streaming on CTV**

+ .8 DAYS
VS MAY 2022

Cord Cutting Growing

CORD-CUTTERS HAVE ECLIPSED TRADITIONAL TV SUBSCRIBERS

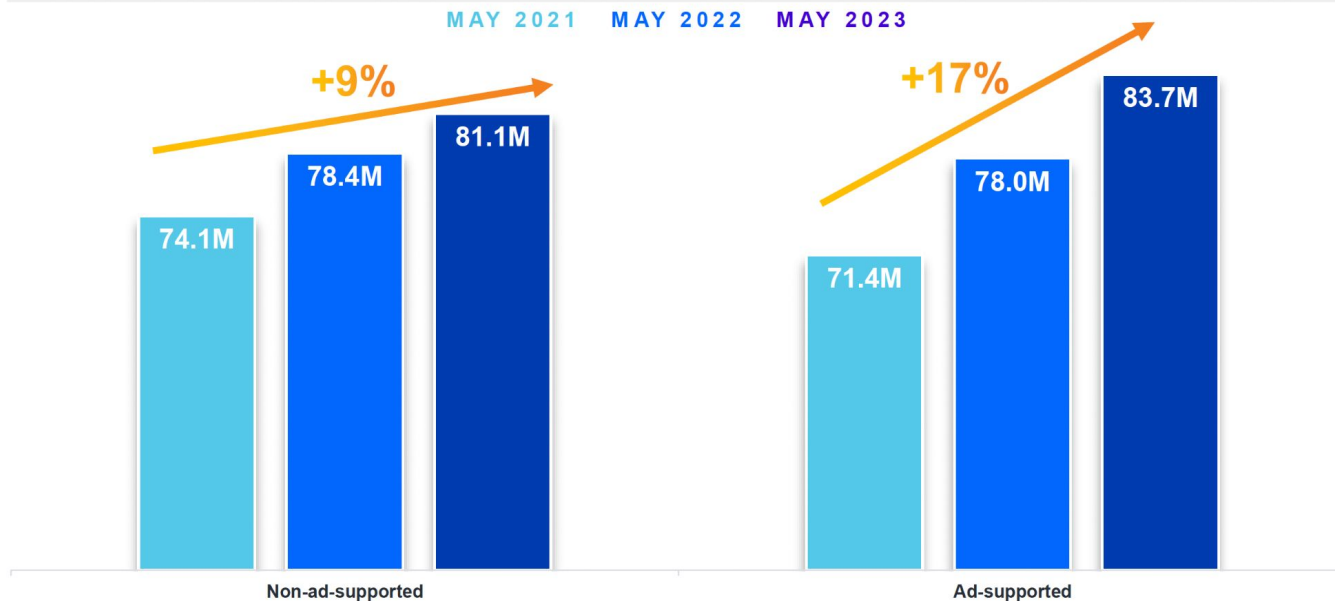
Nearly 60% of CTV HHs are now Cordless



Ad-Supported Streaming Growth

AMERICANS ARE ADOPTING AD-SUPPORTED STREAMING SERVICES AT A FASTER RATE THAN NON-AD SUBSCRIPTION-BASED SERVICES

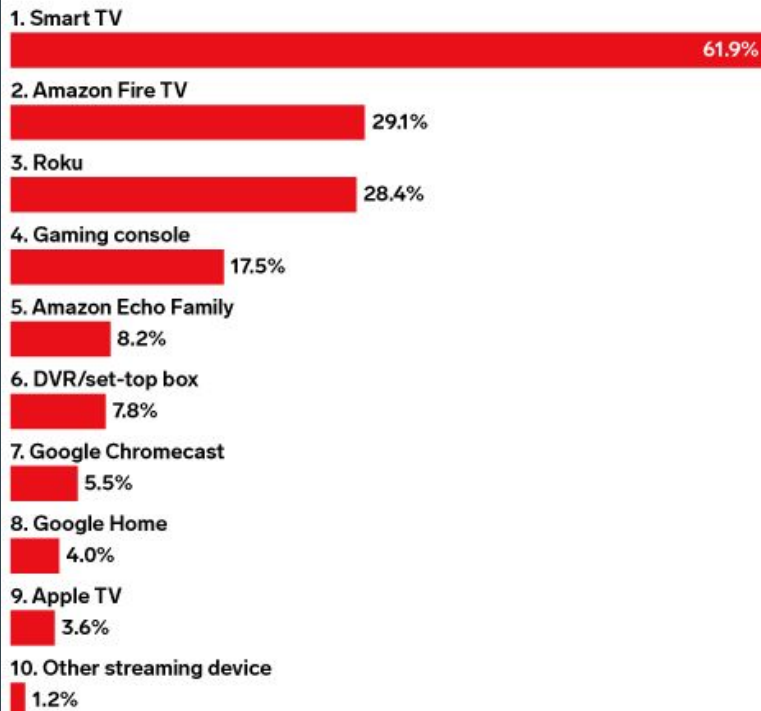
CTV HOUSEHOLDS STREAMING NON-AD-SUPPORTED VS. AD-SUPPORTED SERVICES



CTV Platforms

Top 10 Connected TV (CTV) Devices Among US CTV Households, Jan 2023

% of CTV households



Source: Comscore CTV Intelligence, "The New State of TV," May 11, 2023

Monetization



Types of Monetization

- Ad Supported
- Subscription
- Transactional
- Donations
- Partner
- **Underwriting**



Closed Captioning Provided By

Community Media Programming Monetization Considerations

- What classes of programming will Community Media monetize?
- Government Meetings
 - Off limits? other than Pay To Download/Own (equivalent of DVD days)?
 - Social Media only?
- Sports
 - Possible rights issues, with school district athletic agreements
- Studio Programming
- Contributed Programming
 - Revenue Sharing

Overview of Platforms & Providers

...

OTT Providers

Includes LIVE

- YouTube TV
- Hulu TV
- Amazon Prime Video
- Sling TV
- DirecTV Stream
- Philo
- Fubo TV
- Pluto TV

On-demand

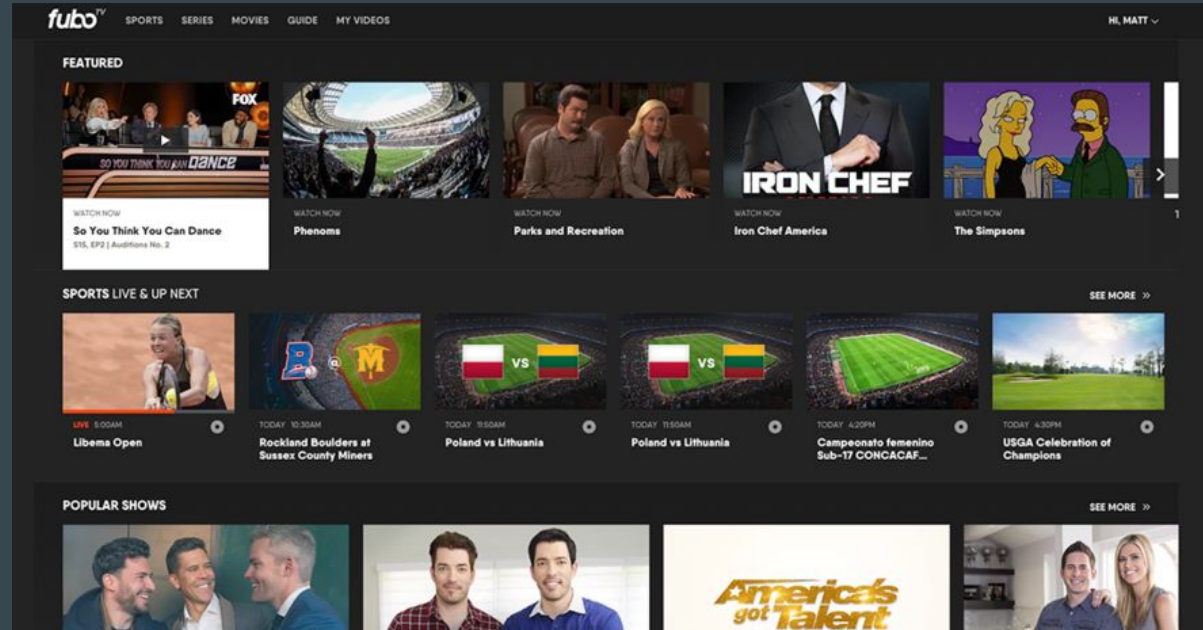
- Netflix*
- Individual Networks
- Custom Channels
 - Amazon Channels
 - Roku Subscription
 - Hulu Add-ons
 - Apple TV / App Store

OTT Advantages

- User Experience (UX)
- Interface Consistency
- Recommendations
- Personalization
- Cloud DVR
- Ad Flexibility
- Measurement
- Access Anywhere

vs.

- Quality of Service (QoS)
- Owning the Pipes



OTT & Mobile App Platforms



Example Apps

...

Mobile App - App Store



App Store Preview



NNPS-TV 9+

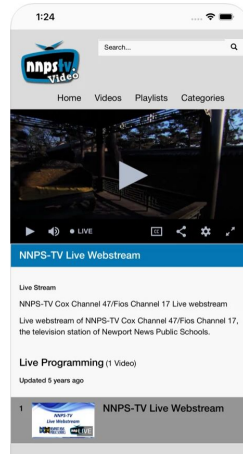
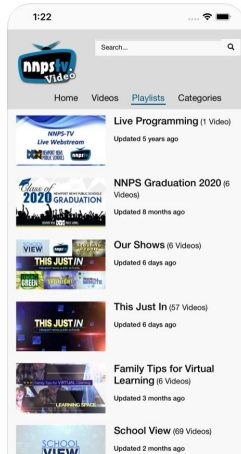
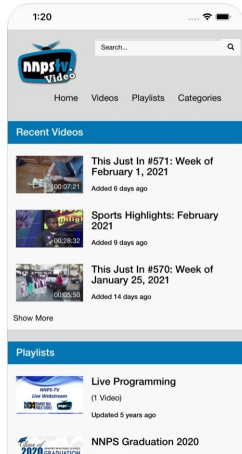
Newport News Public Schools TV

Designed for iPad

Free

[View in Mac App Store](#)

Screenshots [iPad](#) [iPhone](#) [Apple TV](#)



Example Amazon Fire TV & Amazon.com

The image shows the top navigation bar of the Amazon.com website. On the left is the Amazon Prime logo. In the center is a search bar with the text "Apps & Games" and a magnifying glass icon. To the right of the search bar are links for "Hello, Jesse", "Account & Lists", "Returns & Orders", "Prime", and a shopping cart icon with a "1" inside. Below the search bar, there is a delivery location dropdown set to "Princeton 08540" and a list of navigation links: "Whole Foods", "Pantry", "Gift Cards", "Browsing History", "Help", "Jesse's Amazon.com", "New Releases", "Best Sellers", "Today's Deals", and "Get orders together in fewer boxes". At the bottom of this section are more category-specific links: "Appstore for Android", "Amazon Coins", "Fire Tablet Apps", "Fire TV Apps", "Games", "Appstore Family", "Your Apps & Subscriptions", and "Help".

This block shows a product listing for the "Public Media Network" app on Amazon.com. On the left, there is a vertical strip of small app icons. The main image is a large black square with the "public media network" logo in green and blue. Below the image is the text "Click image to open expanded view". To the right of the image, the app title "Public Media Network" is visible, along with a "PillPack" banner that says "Your medication, delivered". Below the title, there is a "Rated: Guidance S" and a five-star rating. Further down, it says "Price: Free Download" and "Sold by: Amazon.com". There are also sections for "Available instantly" and "Works with: Google Assistant". At the bottom, it says "This app needs..." followed by "Access information" and "Access information" with a "See all Applications" link. A "Contact Developer" link is also present.

This block shows the Amazon Fire TV interface. At the top, there is a search bar and a "public media" logo. Below the search bar is a list of "Live TV" channels, including "public media civic", "public media community", "public media discover", "public media engage", "public media spiritual", and "public media discover". To the left of the grid is a sidebar menu with a search icon and a list of categories: "Live TV", "Recent Videos", "City of Kalamazoo Meetings", "Community in Focus", "Comstock Charter Township", "Critical Issues, Alternative...", "The Electronic Theatre Pre...", "Kalamazoo Public Schools", "Kalamazoo Symphony Or...", "Gilmore Keyboard Festival", "Inside the Alley", "Kalamazoo Charter Towns...", "Kalamazoo County Board", "KIA Unreel'd", "Let's Talk Books", "Oshtemo Charter Township", "Portage Schools Board of E...", "Road Commission of Kala...", "Special Presentations", "Spotlight in the Zoo", "Summertime Live! Concert...", and "Arts Council of Greater Kal...". The main area is a grid of video thumbnails. The top row shows the "public media" channels. Below that, there are thumbnails for "Comstock" and "PMNA". The grid continues with various live video feeds, including a meeting of the "City of Kalamazoo" and a "Public Media Network" meeting. At the bottom, there are thumbnails for "Conjuring Venice" and "The Conjuring Venice". The interface is dark-themed and includes a navigation bar at the very bottom with back, home, and app store icons.

Apple TV - Example Series Episodes & Playlists

This Just In

'This Just In' is a weekly show that quickly highlights some of the exciting happenings in the NNPS school district. See the various 'This Just In' archives playlists for older shows from May 2016 through 2019.



60 Videos



This Just In #574: Week of February 22, 2021
3 days ago



This Just In #573: Week of February 15, 2021
10 days ago



This Just In #572: Week of February 8, 2021
17 days ago



This Just In #571: Week of February 1, 2021
24 days ago

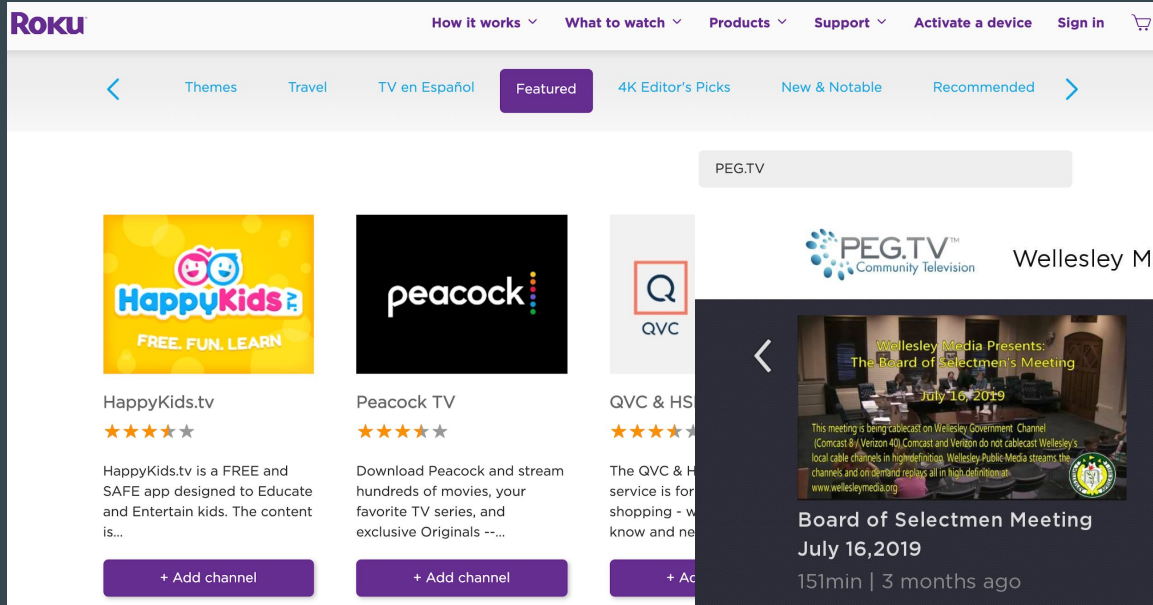


This Just In #570: Week of January 25, 2021
about 1 month ago



This Just In #569: Week of January 18, 2021
about 1 month ago

Example Roku & Roku Channel Store



The screenshot shows the Roku Channel Store interface. At the top, the Roku logo is on the left, and navigation links for 'How it works', 'What to watch', 'Products', 'Support', 'Activate a device', and 'Sign in' are on the right. Below this is a horizontal menu with categories: 'Themes', 'Travel', 'TV en Español', 'Featured' (highlighted in purple), '4K Editor's Picks', 'New & Notable', and 'Recommended'. A search bar for 'PEG.TV' is visible. The main content area displays three channel cards: 'HappyKids.tv' with a yellow background and 'FREE. FUN. LEARN' text; 'Peacock TV' with a black background and the Peacock logo; and 'QVC & Home Shopping' with a white background and the QVC logo. Each card includes a star rating and a '+ Add channel' button.



This screenshot shows the Roku Channel Store page for PEG.TV. The header includes the PEG.TV logo, 'Wellesley Media Corporation', the time '4:51 pm', and a 'Favorites' icon. The main content area features a large video player for 'Wellesley Media Presents: The Board of Selectmen's Meeting July 16, 2019'. The video player includes a description: 'This meeting is being broadcast on Wellesley Government Channel (Comcast 91 / Verizon 40). Comcast and Verizon do not broadcast Wellesley's local cable channels in higher areas. Wellesley Public Media streams the channels and on demand replays all in High Definition at www.wellesleymedia.org'. Below the video player, the title 'Board of Selectmen Meeting July 16, 2019' and duration '151min | 3 months ago' are displayed. To the right of the video player is a 'Chapters (1 of 6)' list with four visible items: 'Vote Town Election Dates' (20min), 'Vote Fire Department Promotions' (4min), 'DPW Repairing Church Street' (41min), and 'Vote 2019 Wellesley Place Affordable R...' (83min). Each chapter has a 'SHOW MORE' link.

Example Website Video Player

PHILLYCAM

Watch ▾ Listen ▾ Create

Watch


Share / Save [f](#) [t](#) [r](#)

Watch us on [Xfinity 66/966HD/967](#) | [Verizon 29/30](#) | [Roku](#) | [Apple TV](#) | [PhillyCAM TV](#)



Automatic Publishing From Playout



 <https://yoursite.org>



MEDIA EXCHANGE

Configuration / Workflow Rules

Workflow Rules

Name	Active?	Actions
All Meetings - Local Archive	✓	  
Daily News - Publish, Share	✓	  
Football - Publish	✓	  
Town Meetings - Publish, Archive.org, Share	✗	  

+

Automated Social Streaming



Streaming Rules

Name	Active?	Actions
Gaming to Twitch	✓	  
Meetings to YouTube & Facebook	✓	  
Sports to YouTube	✓	  

Promote Apps and Where to Watch

Add the app of your choice to start streaming or viewing [on demand](#) right now

Roku:

Search the Roku Channel Store for "Public Media Network" and add the app.

[Click here](#) to sign-in to your Roku account and add Public Media Network to your lineup.

Apple TV:

Search the Apple TV App Store for "Public Media Network" to download your app and add it to your Apple TV device.

[Click here](#) to go to the app in the Apple Store.

Fire TV:

Search the Amazon App Store for "Public Media Network" to download the app and add it to your Fire TV device.

[Click here](#) to go to the app in the Amazon App Store.

Apple iOS mobile device:

Search the Apple App Store for "Public Media Network" to download the app and add it to your Apple mobile device.

Android mobile device:

Search the Google Play Store for "Public Media Network" to download the app and add it to your Android mobile device.

[Click here](#) to go to the app in the Google Play Store.



Discover your local
community on
Public Media Network

Watch on your favorite device

Charter 187-191
AT&T UVerse 99
Roku, Apple TV, Fire TV
Mobile

www.publicmedianet.org

STREAMING:

▪ You can stream APTV's TV channels and watch our programs on-demand on our:

- [Streaming Hub](#)
- [YouTube Channel](#)
- [Roku app*](#)
- [Apple TV app*](#)

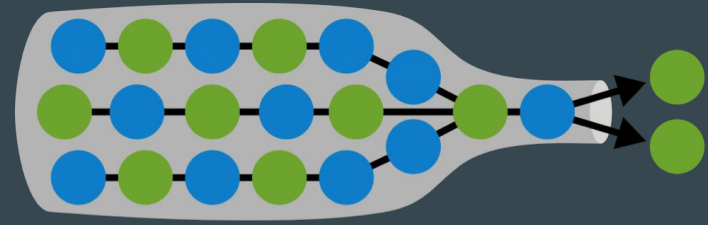
▪ * to find our streaming Apps click the links above, or search "APTV" on the Roku or Apple TV App Stores



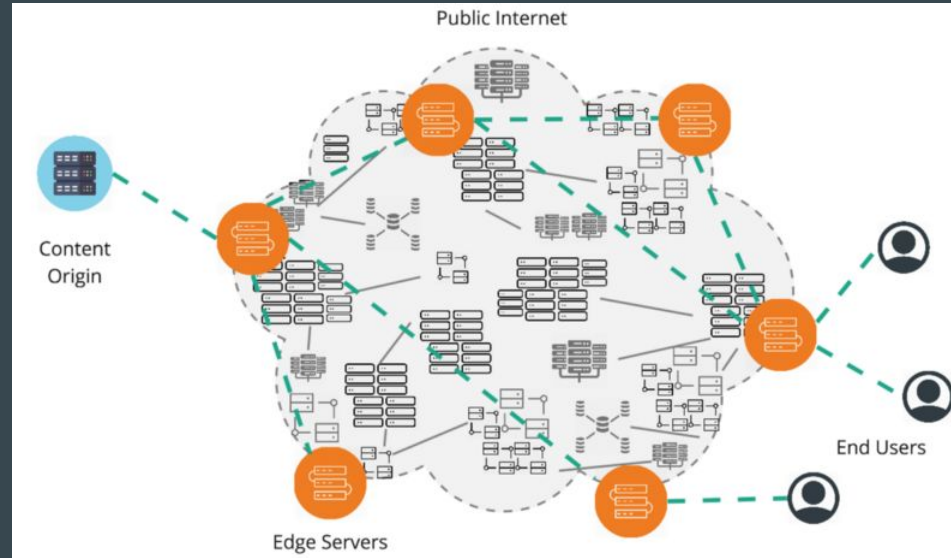
Distribution Technology Primer

...

Content Delivery Network (CDN)

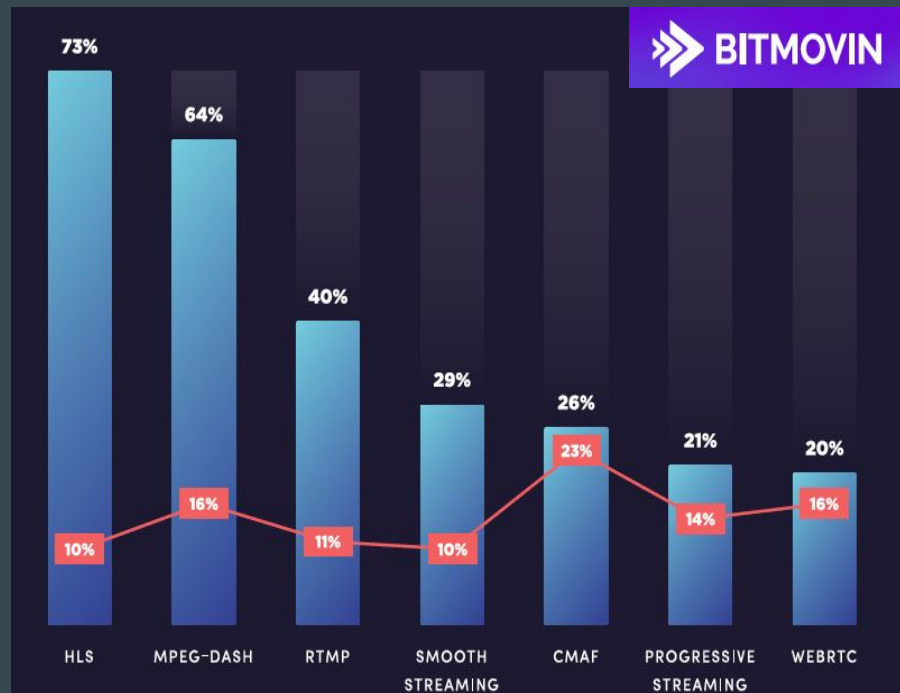


- Why not just deliver streaming video from your facility?
- Bandwidth & Bottlenecks
- Example - if you have 50Mbps Internet Upload (out to Internet)
 - Adaptive Live Stream - Add Up the Rates
 - 1920x1080 at 2.5Mbps
 - 640x360 @ 1.25Mbps
 - 416x234 @ 256Kbps
 - 4Mbps total
 - MAX 12 simultaneous viewers!
 - And no room for anything else!
- Deliver Once to CDN (4Mbps)
- CDN does the rest
- Lowers Latency by copying close to viewer
- Push vs. Pull, Firewall
- Akamai, Lumen, CloudFront, Fastly...



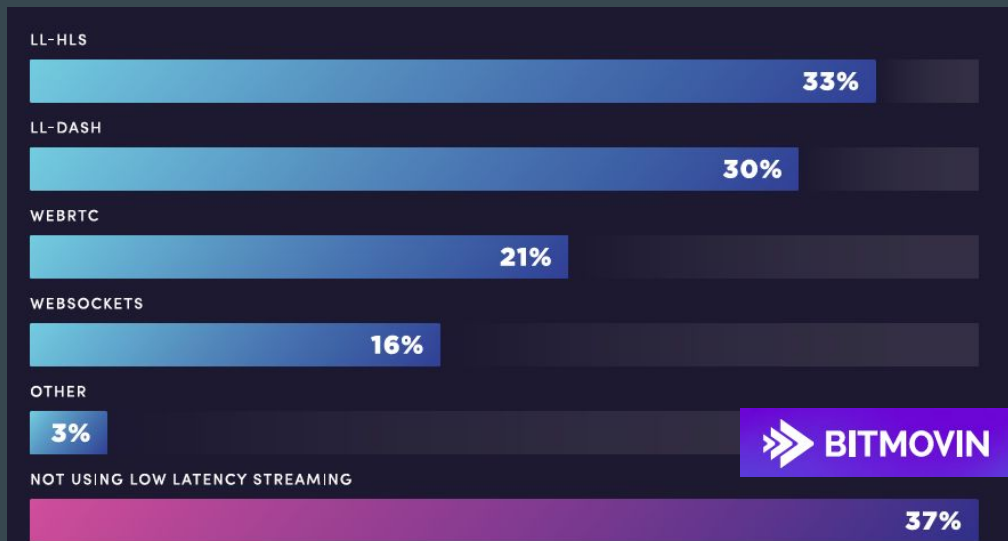
Streaming Protocols

- How streaming is delivered over Internet or Network
- Delivery Protocols
 - HLS, DASH, CMAF, WebRTC
 - Transport (TS) vs. Fragmented MP4 (fMP4)
- Ingest Protocols
 - RTMP, HLS, DASH, WebRTC
- Adaptive Bit Rate (ABR)
 - Multiple resolution/bitrate versions
 - Seamless switch based on client bandwidth
 - Goal is to avoid buffering
 - What you see watching Netflix when quality shifts
- Latency Considerations



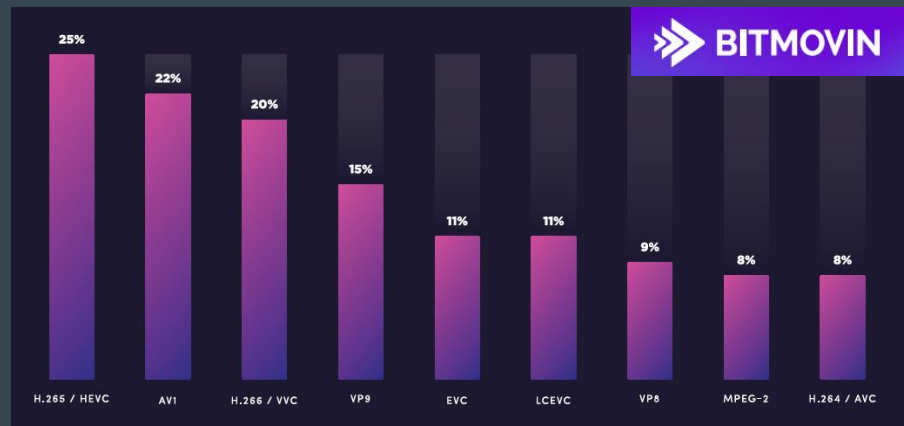
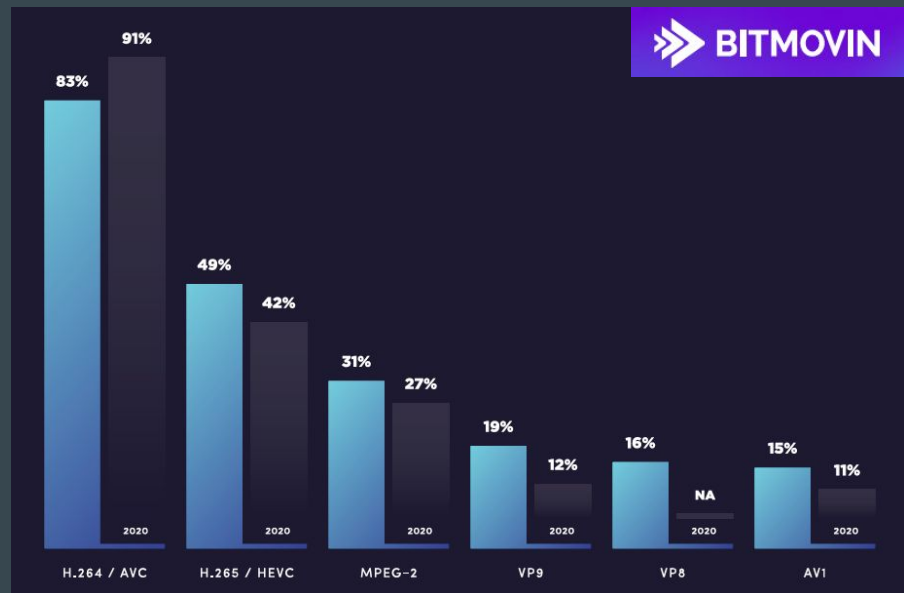
Low Latency Protocols

- HLS won out for simplicity, broad compatibility with Web/Internet infrastructure
 - Web Servers, Web Protocols, Web Browsers (HTML5), ABR Support
- Prioritized View Quality and Experience over Latency
- But HLS naturally leads to higher latency 30-60s fairly common
 - Segment sizes, Playlist Sizes, HTTP
- Newer Low Latency Protocols
 - LL-HLS, DASH-LL 3-5s
 - WebRTC < 1s

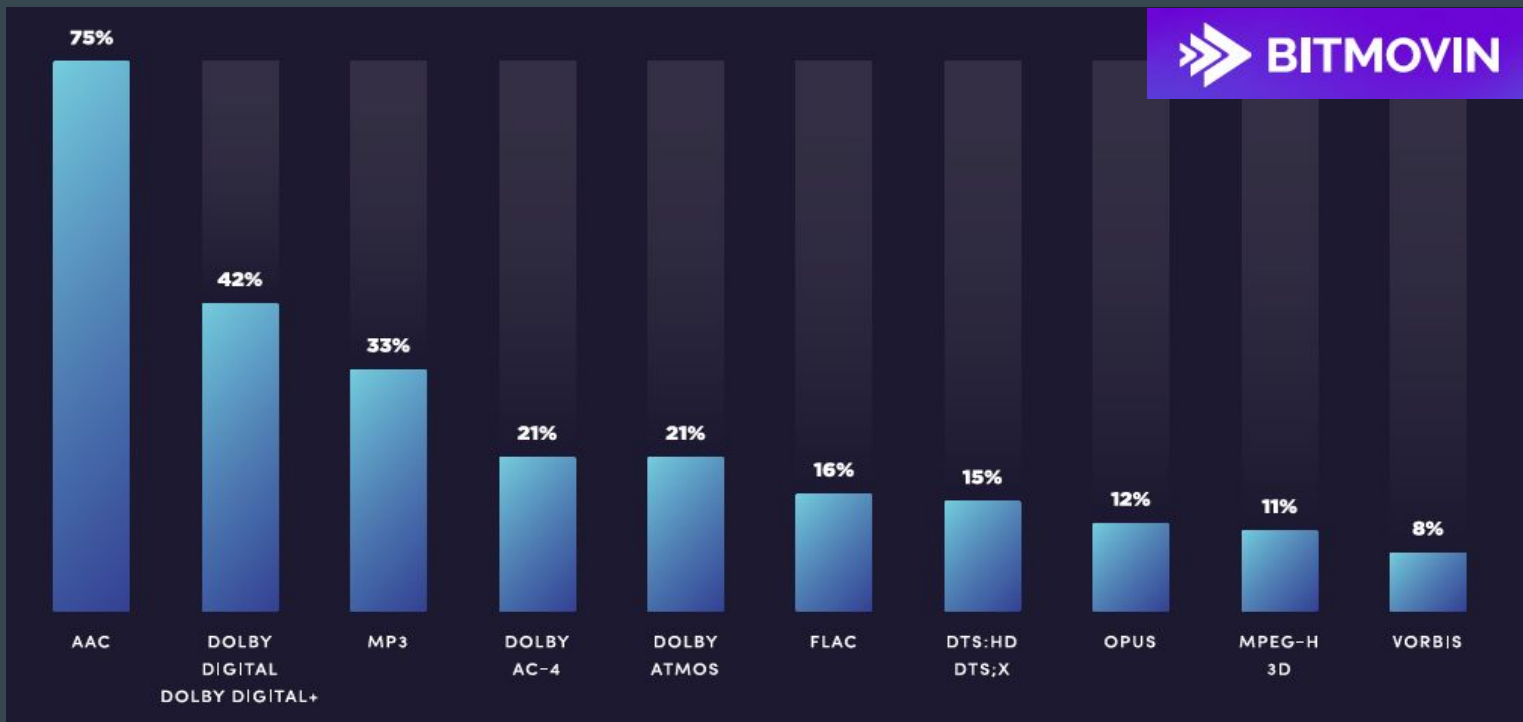


Video Codecs

- Codec - coder-decoder
- Encoder compresses
- Decoder decompresses
- MPEG-2 → AVC/H.264 → HEVC/H.265
 - About 50% more efficient each step
- AV1 around 20% more efficient vs. HEVC
- Spatial + Temporal Compression
 - Spatial - kind of like JPEG on each frame
 - Temporal - “macroblocks”
- Licensing
- [Browser / HTML5 Video Compatibility](#)
- Vs. Containers
 - Transport, MP4, MOV, AVI, WebM, Matroska



Audio Codecs



Encoders, Transcoders

- Encoders
 - “Uncompressed” video in - SDI, Analog, NDI*
 - Input → Encode → Output
 - Compressed video out
 - Live
 - Compressed IP/streaming video out
 - RTMP, HLS, Transport etc...
 - Streaming, Contribution
 - File
 - Compressed Digital File
 - MPEG TS, MP4 etc..
- Transcoders
 - Compressed video in / Compressed video out
 - Input → Decode → Encode → Output
 - Changes format - codec, resolution, bitrate etc...
 - Live - IP/streaming video in & out
 - File - Compressed Digital File in & out



Backhaul

- Remote Site → Master Control
- Ethernet, Microwave, Cellular, Baseband
- IP - LAN vs. Internet
- Fixed vs. Mobile Remote
- Internet / Noisy Networks, Low Latency
 - **SRT, RIST**, LRT, Zixi, ARQ
 - Forward Error Correction (FEC)
 - “Push” delivery with “Handshake” retry
 - UDP vs. TCP
- Station Bandwidth (Ingress)
- YouTube, Facebook as backhaul



SRT

SECURE
RELIABLE
TRANSPORT



RIST Forum

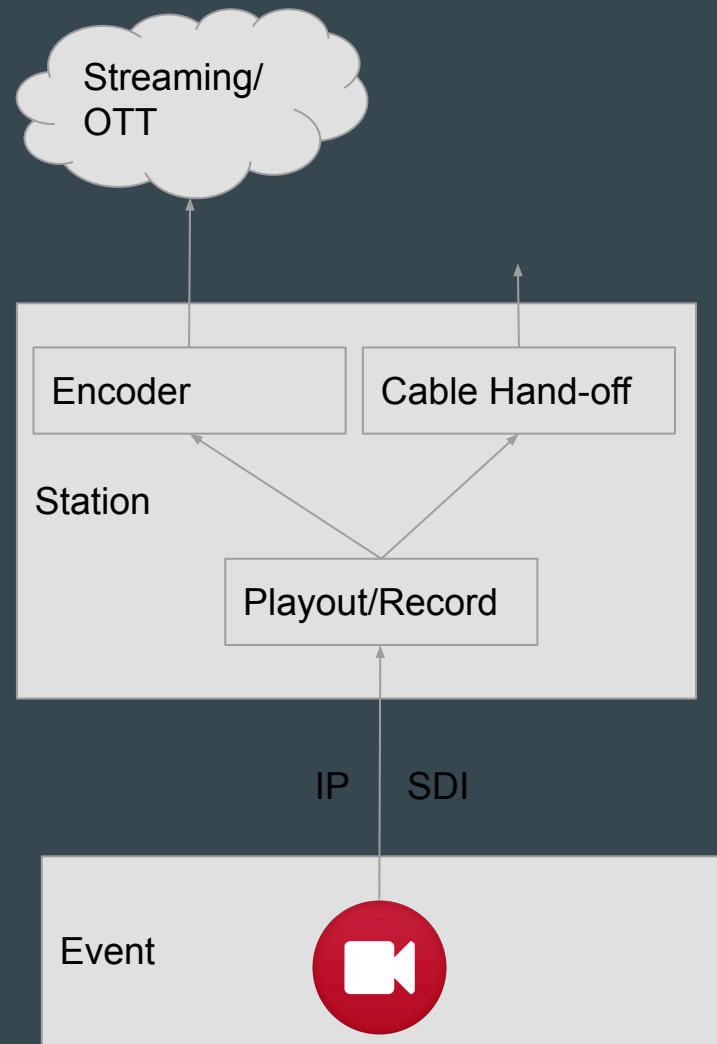
Live Streaming 24x7

- Encode Channel output
- Station Bandwidth
- CDN
- Set and forget



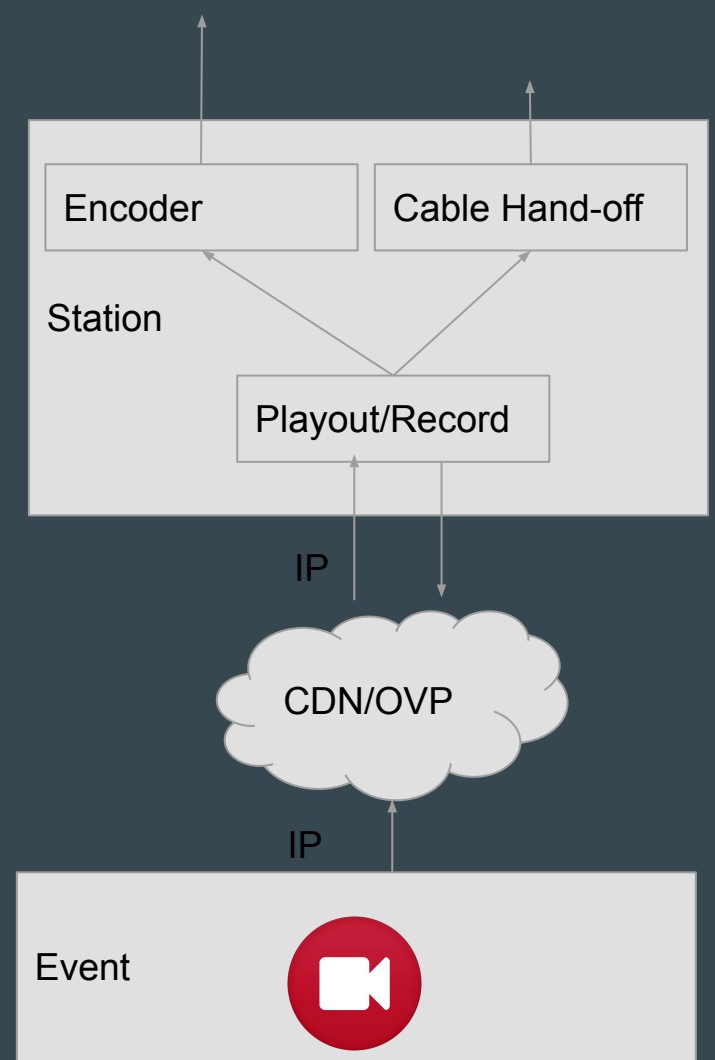
Live Event → Station → Cloud

- Encoder at event location
- Scheduled, Manually & Auto Triggered
- Start/Stop (Encoder, Automation)
- Record locally (backup)
- Record Master Control
- Publish for VOD
- Service Auto Capture Live for VOD



Live Event → Cloud → Station

- Encoder at event location
- Scheduled, Manually & Auto Triggered
- Start/Stop (Encoder)
- Record locally (backup)
- Service Auto Capture Live for VOD
- Playout / Record from Cloud



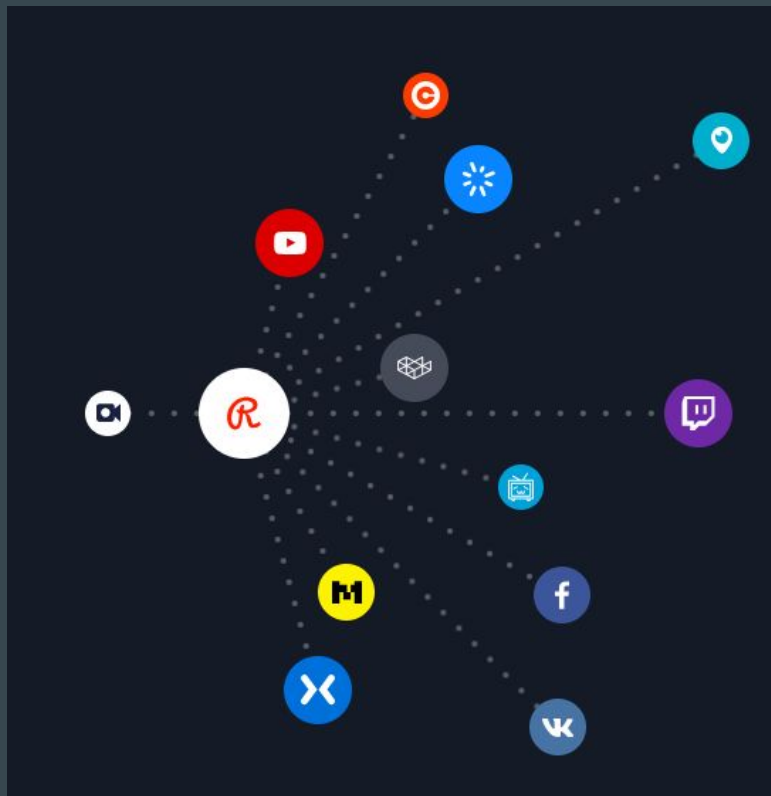
Multiple Destinations

- Brute force - Multiple Encoders
- Single Encoder, Multiple Streams
- Single Encoder, Local Distributor
- Single Encoder, Cloud Distributor
- Bandwidth Considerations



Simulcasting

- Wowza
- restream.io
- switchboard.live
- castr.io
- LiveU Matrix
- Teradek Core
- Wirecast Restream
- Playout Vendor Solutions
- On Premise vs. Cloud
- Transmux vs. Transcoding
- Adaptive Bit Rate (ABR)

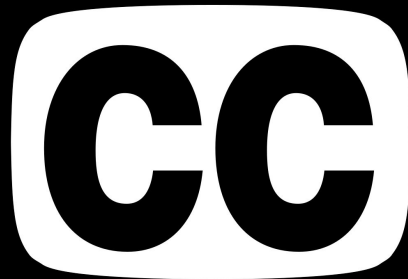


Live Streaming for Program Distribution

- PEG Peer to Peer
- Tune into neighboring station's relevant events
- Ditch the Satellite Receivers and related fees
- Classic Arts
- Free Speech TV
- Democracy Now! (New - 8AM daily live stream)
- NASA TV
- YT Live
- FB Live
- Licensing



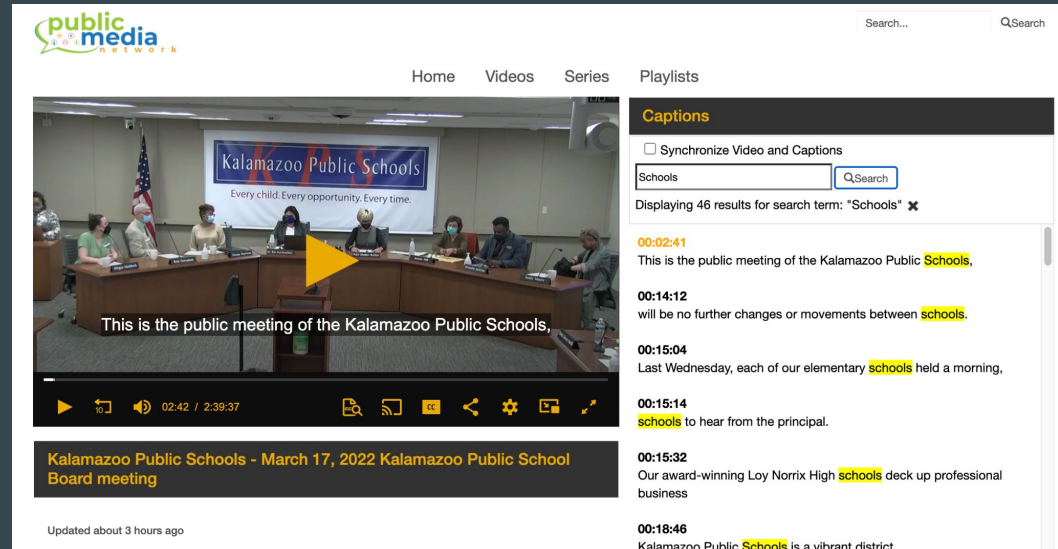
Captioning



- Most OTT & Social platforms support captioning
- Files
 - With embedded “608/708” captions (baked in), normally preserved on upload
 - Already have sidecar captions (text file), can be uploaded with the file
 - No captions - platforms can automatically generate (AI captioning)
- Live
 - With embedded “608/708” captions (baked in), normally preserved when streamed live
 - No captions - platforms can automatically generate (AI captioning)
- AI captioning continues to improve, from Free to Affordable
- Human captioning services also exist for File & Live, much more expensive
- CC quality can differ based on underlying AI engine, and quality of the audio

Captioning - Beyond Accessibility

- Captions open up new user experience and searchability
- Caption Transcript Search - like “Google” for meetings
- Next Up: Searching the Video Images themselves!
- Browser search for YouTube



The screenshot shows a YouTube video player interface. The video content is a meeting of the Kalamazoo Public Schools Board, with a banner in the background that reads "Kalamazoo Public Schools" and "Every child. Every opportunity. Every time." The video player has a play button in the center and a caption overlay at the bottom that reads "This is the public meeting of the Kalamazoo Public Schools,". The video player controls show a progress bar at 02:42 / 2:39:37. The video title is "Kalamazoo Public Schools - March 17, 2022 Kalamazoo Public School Board meeting".

On the right side of the interface, there is a search bar with the text "Search..." and a "QSearch" button. Below the search bar, there is a "Captions" section with a checkbox for "Synchronize Video and Captions". A search input field contains the word "Schools" and a "QSearch" button. Below the search input, it says "Displaying 46 results for search term: 'Schools' ✕".

The search results are listed below the search input:

- 00:02:41**
This is the public meeting of the Kalamazoo Public **Schools**,
- 00:14:12**
will be no further changes or movements between **schools**.
- 00:15:04**
Last Wednesday, each of our elementary **schools** held a morning,
- 00:15:14**
schools to hear from the principal.
- 00:15:32**
Our award-winning Loy Norrix High **schools** deck up professional business
- 00:18:46**
Kalamazoo Public **Schools** is a vibrant district.

Artificial Intelligence (AI) Applications

