

[LIVE] without limits

MediaKind

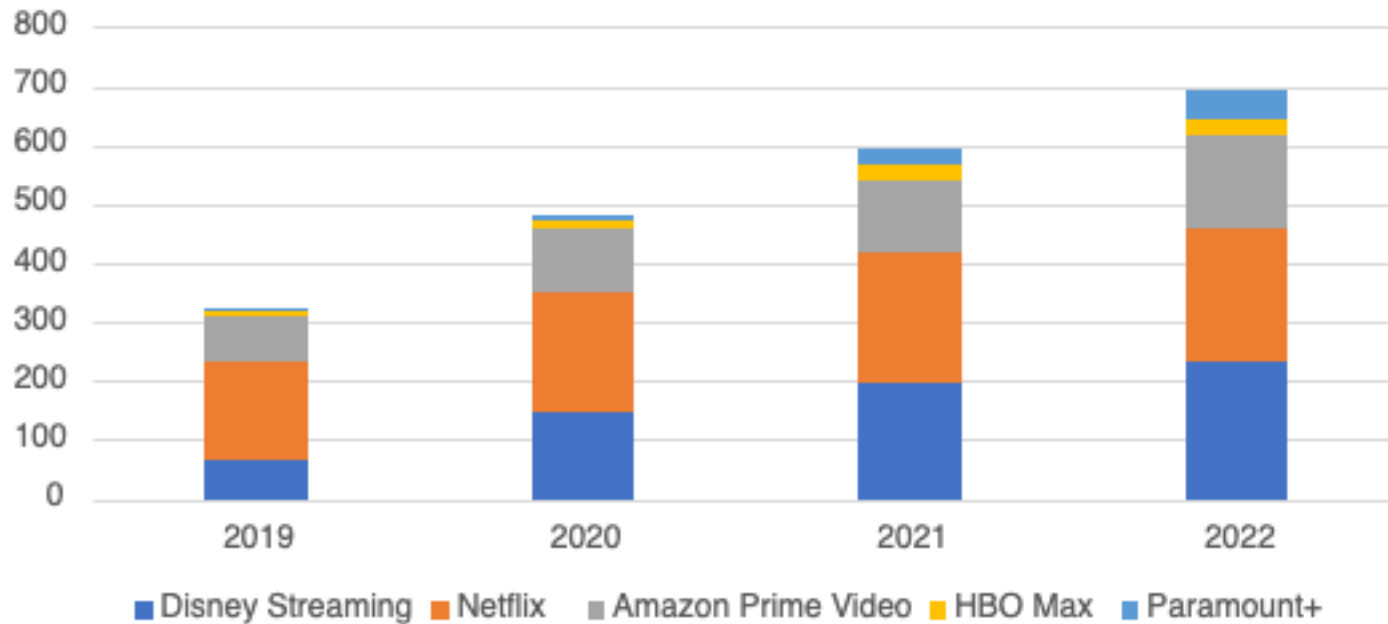
Realtime Media Delivery over the Internet

With application to managed networks

Olie Baumann, MediaKind

Media Consumption is Changing

Streaming Service Subscribers (M)



Source: OMDIA Media & Technology Digest

Consumer Experience



- The user experience
 - Channel Tune Time
 - Latency
 - Picture Quality
 - Robust playback
- Operational Considerations
 - Bring Your Own Device
 - Network efficiency

	Channel Tune Time	Latency	Video Quality	Robustness	Device	Network Utilisation
PayTV: IPTV, Cable, Satellite	Instant - Fast	8-12s	High	High	STB	Broadcast / Multicast
Streaming	Slow (5s +)	20-30s	Very High	Medium - High	STB, SmartTV, Mobile, Streaming Device	Unicast

Consumer Experience



- The user experience

- Channel Tune Time
- Latency
- Picture Quality
- Robust playback

- Operational Considerations

- Bring Your Own Device
- Network efficiency

	Channel Tune Time	Latency	Video Quality	Robustness	Device	Network Utilisation
PayTV: IPTV, Cable, Satellite	Instant - Fast	8-12s	High	High	STB	Broadcast / Multicast
Streaming	Slow (5s +)	20-30s	Very High	Medium - High	STB, SmartTV, Mobile, Streaming Device	Unicast

Consumer Experience



- The user experience

- Channel Tune Time
- Latency
- Picture Quality
- Robust playback

- Operational Considerations

- Bring Your Own Device
- Network efficiency

	Channel Tune Time	Latency	Video Quality	Robustness	Device	Network Utilisation
PayTV: IPTV, Cable, Satellite	Instant - Fast	8-12s	High	High	STB	Broadcast / Multicast
Streaming	Slow (5s +)	20-30s	Very High	Medium - High	STB, SmartTV, Mobile, Streaming Device	Unicast

Consumer Experience



- The user experience

- Channel Tune Time
- Latency
- Picture Quality
- Robust playback

- Operational Considerations

- Bring Your Own Device
- Network efficiency

	Channel Tune Time	Latency	Video Quality	Robustness	Device	Network Utilisation
PayTV: IPTV, Cable, Satellite	Instant - Fast	8-12s	High	High	STB	Broadcast / Multicast
Streaming	Slow (5s +)	20-30s	Very High	Medium - High	STB, SmartTV, Mobile, Streaming Device	Unicast

Consumer Experience



- The user experience
 - Channel Tune Time
 - Latency
 - Picture Quality
 - Robust playback
- Operational Considerations
 - Bring Your Own Device
 - Network efficiency

	Channel Tune Time	Latency	Video Quality	Robustness	Device	Network Utilisation
PayTV: IPTV, Cable, Satellite	Instant - Fast	8-12s	High	High	STB	Broadcast / Multicast
Streaming	Slow (5s +)	20-30s	Very High	Medium - High	STB, SmartTV, Mobile, Streaming Device	Unicast

Consumer Experience



- The user experience
 - Channel Tune Time
 - Latency
 - Picture Quality
 - Robust playback
- Operational Considerations
 - Bring Your Own Device
 - Network efficiency

	Channel Tune Time	Latency	Video Quality	Robustness	Device	Network Utilisation
PayTV: IPTV, Cable, Satellite	Instant - Fast	8-12s	High	High	STB	Broadcast / Multicast
Streaming	Slow (5s +)	20-30s	Very High	Medium - High	STB, SmartTV, Mobile, Streaming Device	Unicast

Consumer Experience



- The user experience

- Channel Tune Time
- Latency
- Picture Quality
- Robust playback

- Operational Considerations

- Bring Your Own Device
- Network efficiency

	Channel Tune Time	Latency	Video Quality	Robustness	Device	Network Utilisation
PayTV: IPTV, Cable, Satellite	Instant - Fast	8-12s	High	High	STB	Broadcast / Multicast
Streaming	Slow (5s +)	20-30s	Very High	Medium - High	STB, SmartTV, Mobile, Streaming Device	Unicast

The Challenge



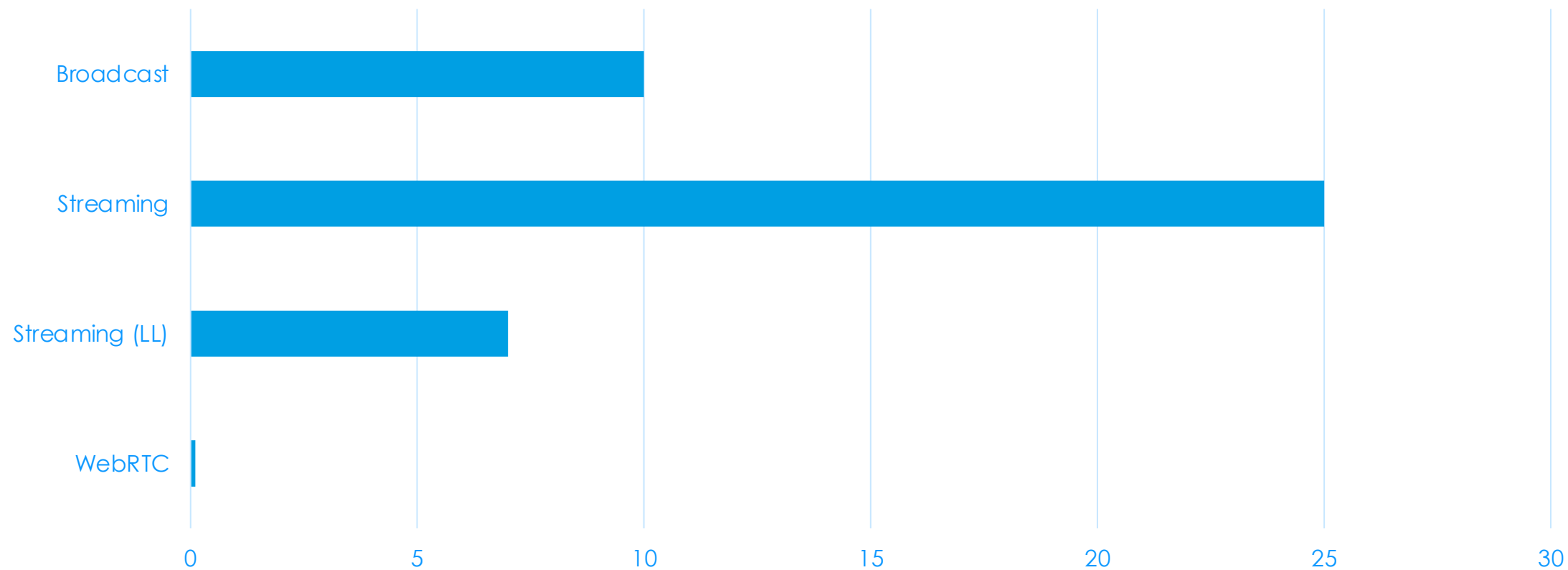
- Provide a great user experience
 - Picture Quality
 - Fast Channel Change
 - Low Latency
 - Robust playback
- On several clients
 - Operator STB
 - Browsers
 - Mobile (iOS, Android)
 - WebOS, Roku, FireTV, TVOS....
- Making efficient use of the network
 - OTT / Unicast
 - Managed / Multicast
- Protecting premium content
 - DRM
- At Scale



Latency by Delivery Mechanism



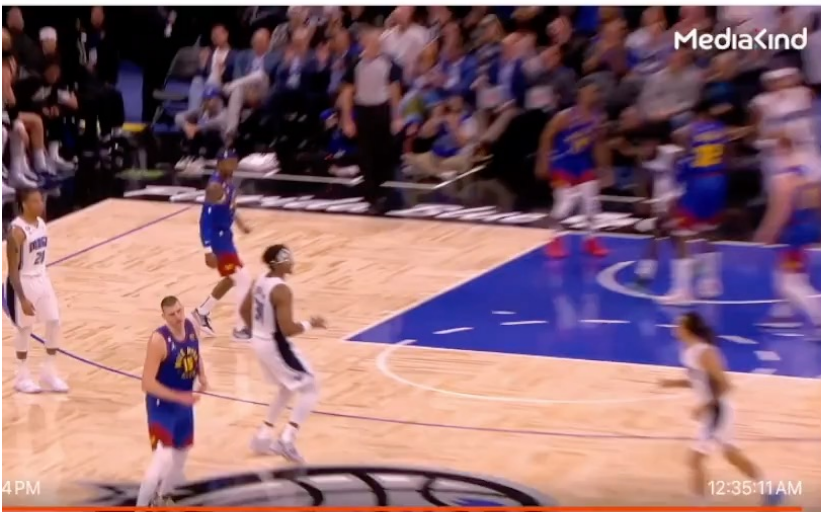
Latency in Video Delivery



Consumer Interaction



Kind



MediaKind

4 PM 12:35:11 AM

MK-SDK Metrics

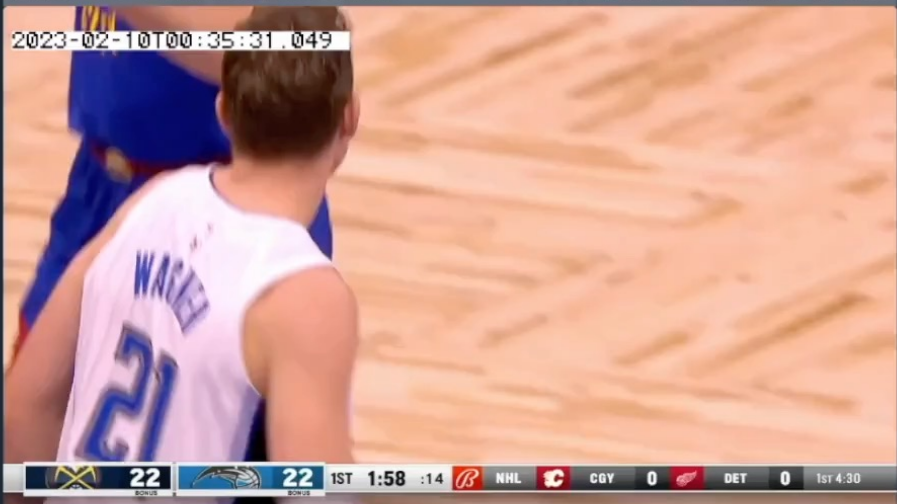
tate: Playing	Startup Time (sec): 2.69	Playback Speed: 1x
l Load Time: 0	Player Startup: 0.506	Video Startup: 1.550
ency(sec): 24.00	Video Buffer(sec): 12.90	Audio Buffer(sec): 12.94
Ratio: 1.8	Video Bandwidth (Mbps): 14.23	Audio Bandwidth (Mbps): 0.34
art: 1675982114.96	Seek End: 1675989311.37	Seek Duration: 1h,59m,56s
l Frames: 62	Frame Rate (sec): 59.94	Resolution: 1920x1080
odec: mp4a.40.5	Closed Captions: Disabled	Video Codec: avc1.64002A
t Playback Video: v0_121-0-T-713041066.m4s [1675989306.13]		
t Playback Audio: v3_221-0-T-713042343.m4s [1675989306.20]		

Wave Demo

WAVE

2023-02-10T00:35:33.815Z enc 2.862s cam 4.785s

2023-02-10T00:35:31.049



WAVE 21

22 22 1ST 1:58 :14 NHL CBY 0 DET 0 1st 4:30

Livepoint Control

500

100

Engage

Basketball / NBA

Denver Nuggets @ Orlando Magic

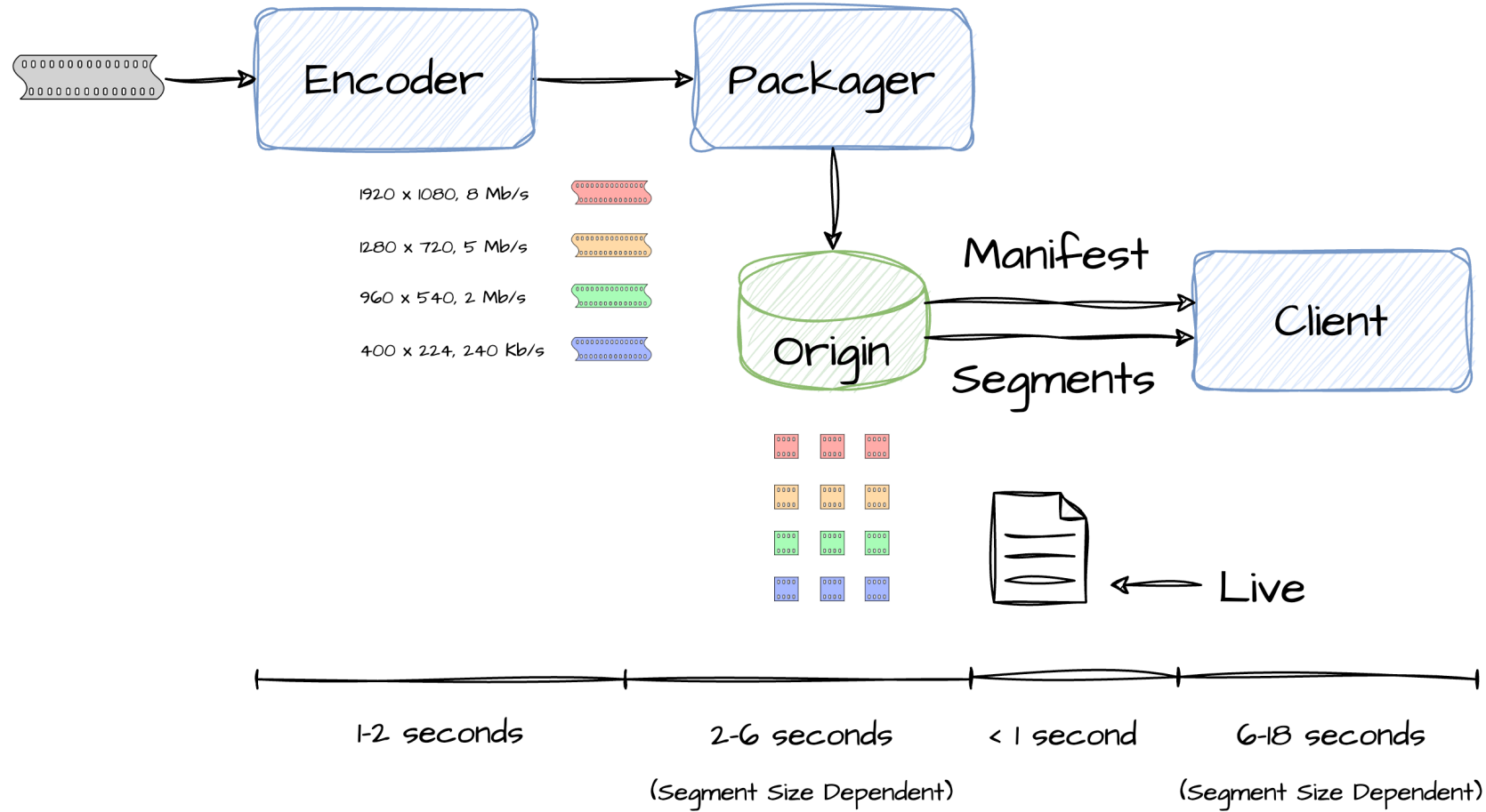
Denver Nuggets 21 21

Orlando Magic 22 22

LIVE 1st - 01:58

Betslip

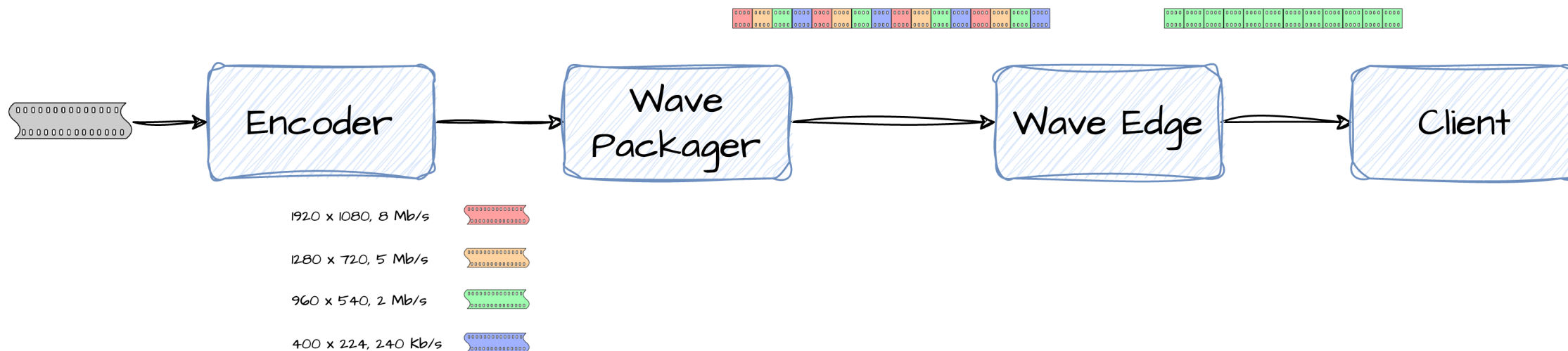
Latency

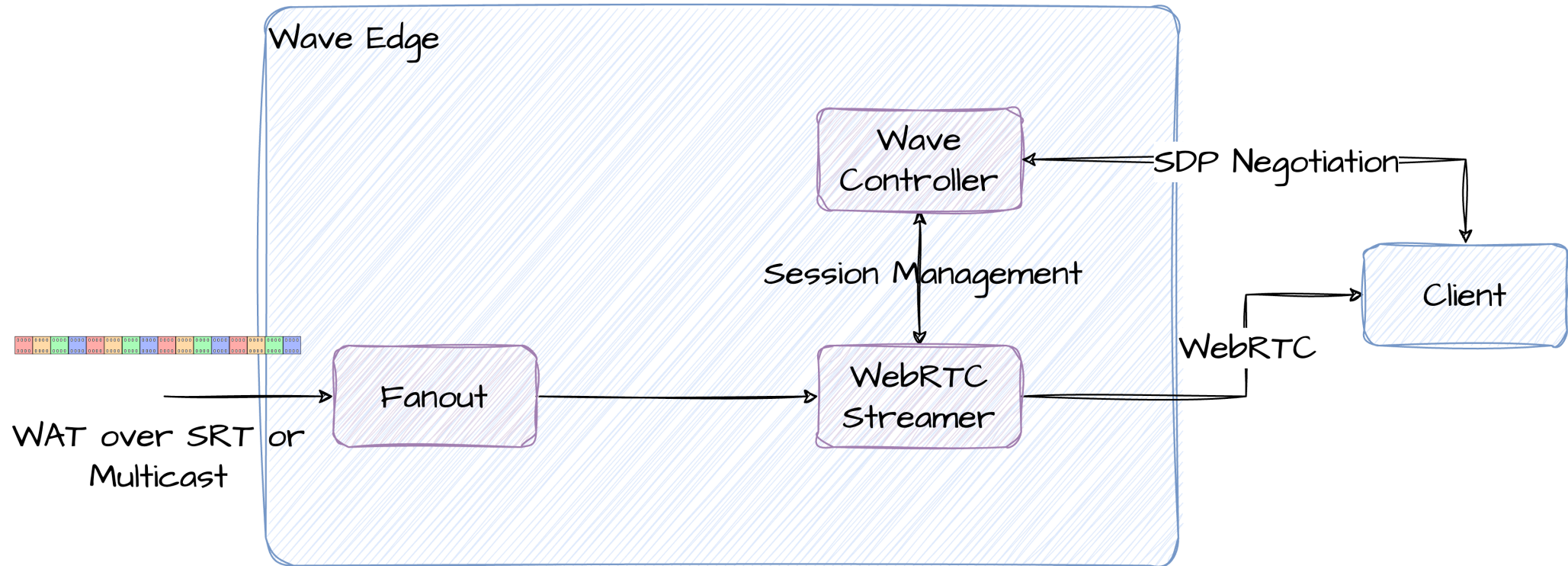


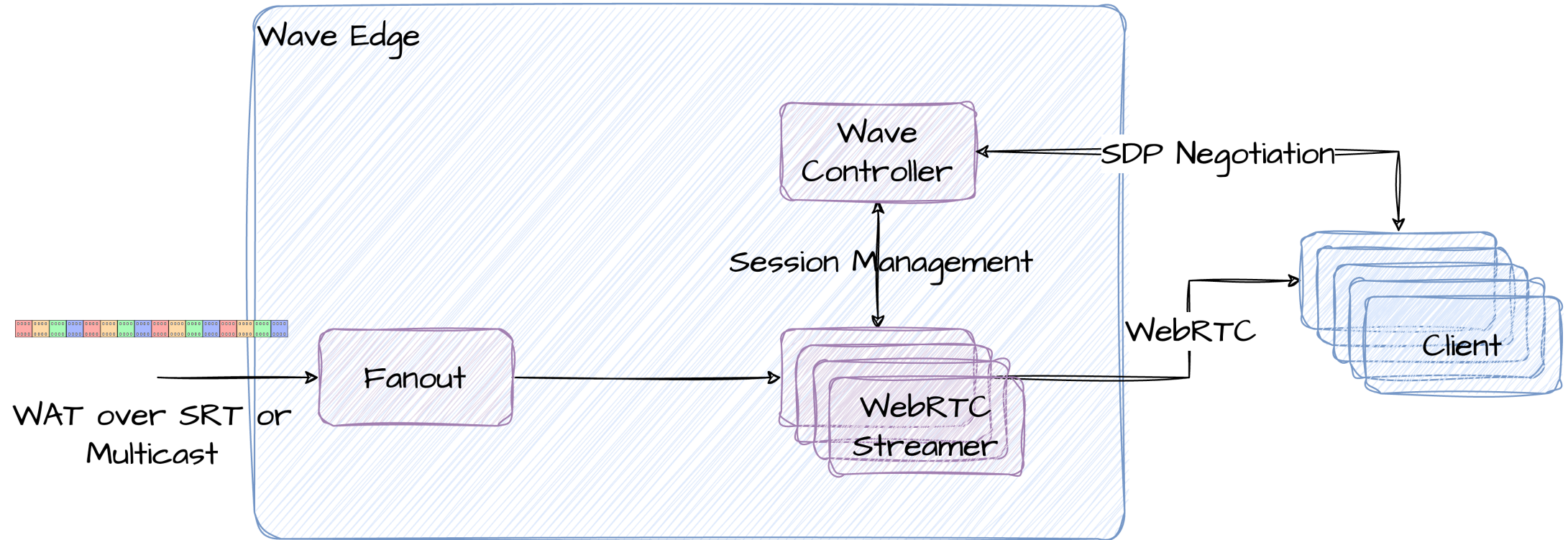
- Developed by Google c. 2010
- Primarily for Video Conferencing
- **Latencies in the 100s ms**
- UDP, not HTTP / TCP based
- **Supported in most browsers**
- **Open-source libraries**

- WebRTC has two APIs
 - **Media API**
 - Specific to Audio and Video
 - Includes per-client encoding – Poor Scaling
 - Using Baseline Profile – poor PQ
 - **Data Channels**
 - For arbitrary data

Wave Adaptive Transport (fMP4 in Flatbuffers)

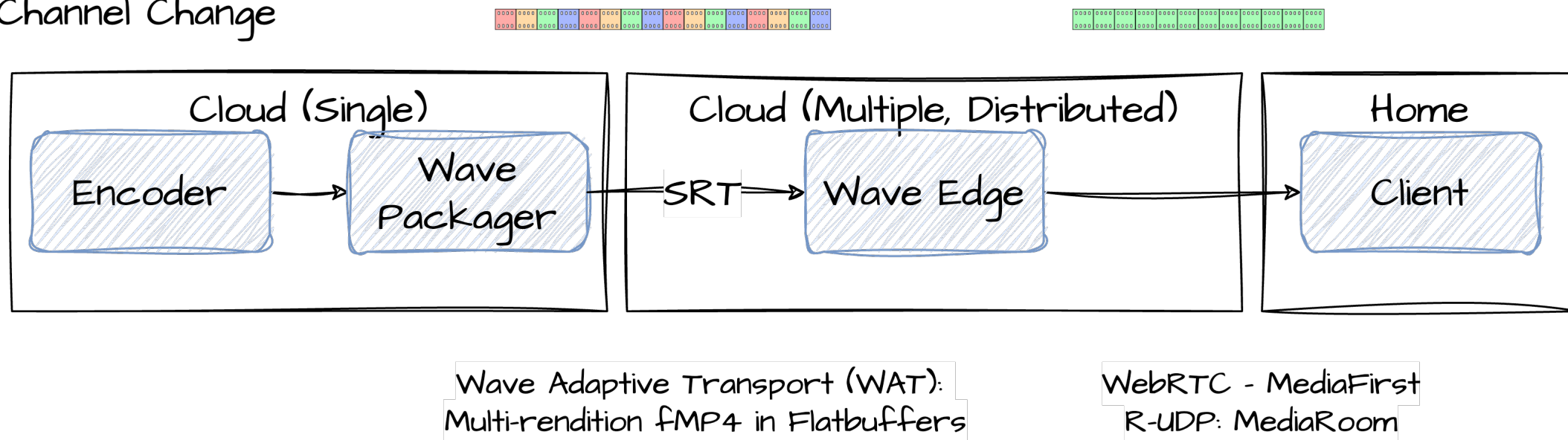






Wave for Ultra-Low Latency OTT

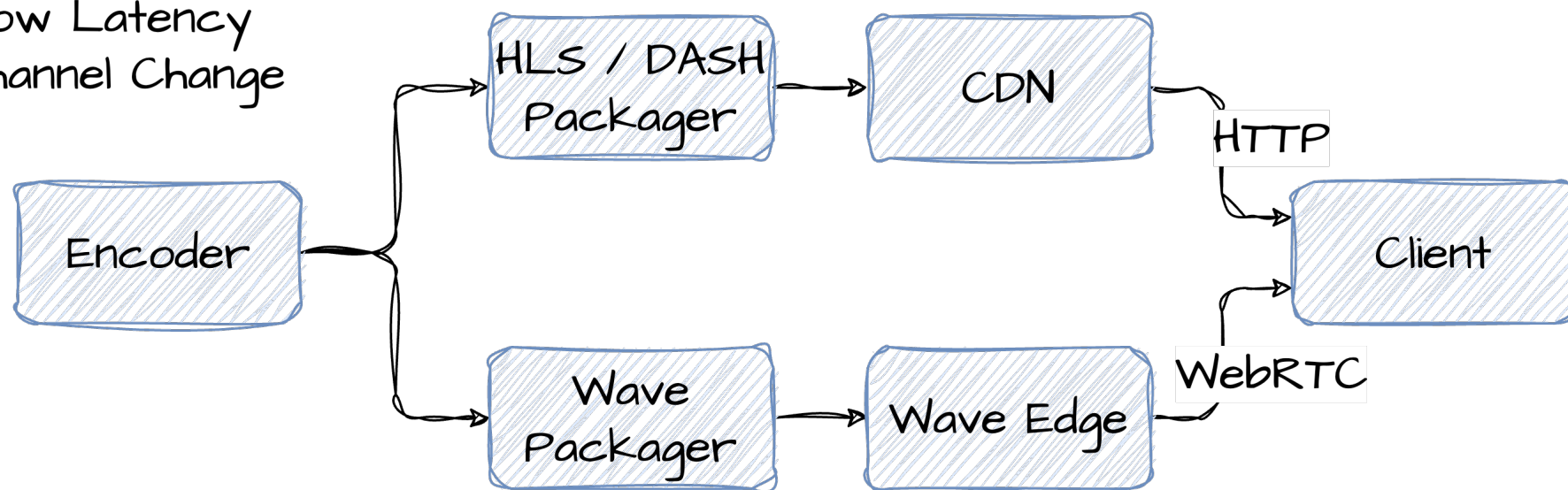
OTT:
Ultra Low Latency
Fast Channel Change



Wave for Ultra-Low Latency OTT

OTT:

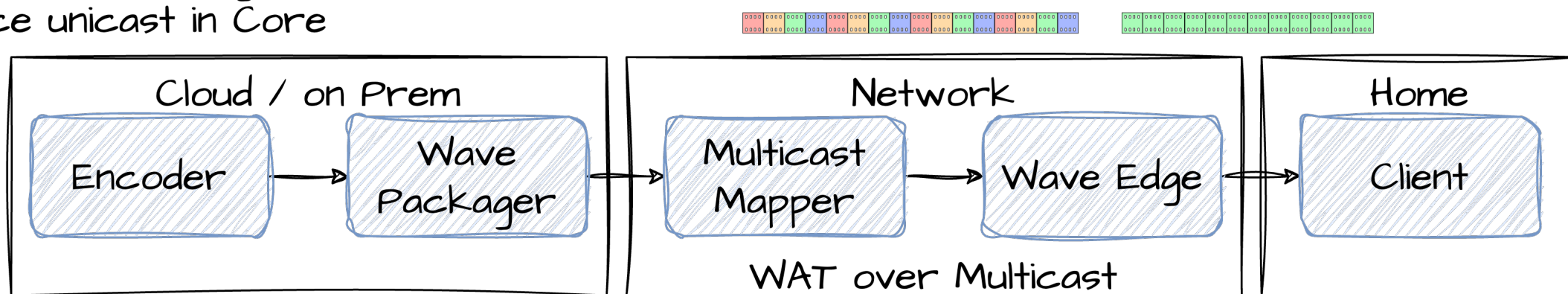
Ultra Low Latency
Fast Channel Change



Wave Adaptive Transport (WAT):
Multi-rendition fMP4 in Flatbuffers

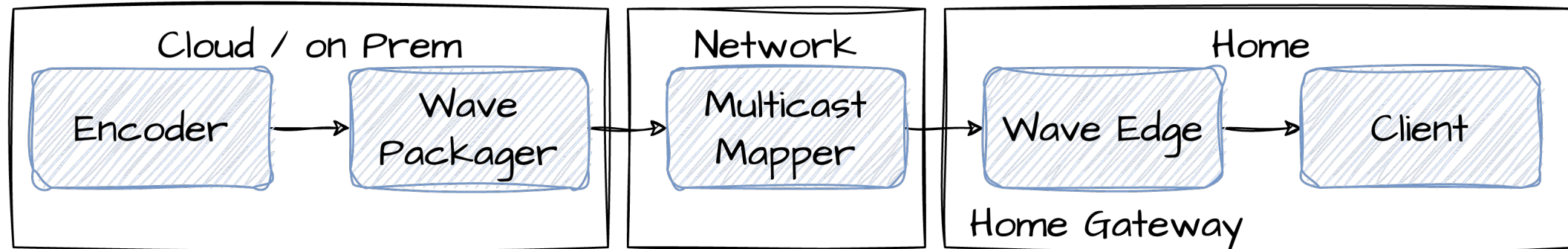
Wave for ABR Transport to the Edge

MultiCast to the Edge:
Ultra Low Latency
Fast Channel Change
Reduce unicast in Core



Wave for ABR Transport to the Edge

MultiCast to the Edge:
Ultra Low Latency
Fast Channel Change
Reduce unicast in Access Network



WAT over Multicast

Consumer Experience



- The user experience
 - Channel Tune Time
 - Latency
 - Picture Quality
 - Robust playback
- Operational Considerations
 - Bring Your Own Device
 - Network efficiency

	Channel Tune Time	Latency	Video Quality	Robustness	Device	Network Utilisation
PayTV: IPTV, Cable, Satellite	Instant - Fast	8-12s	High	High	STB	Broadcast / Multicast
Streaming	Slow (5s +)	20-30s	Very High	Medium - High	STB, SmartTV, Mobile, Streaming Device	Unicast
Wave	Fast	2s	Very High	Medium - High	STB, SmartTV, Mobile, Streaming Device	Unicast / Multicast

Conclusions



- WebRTC
 - Widely supported on target devices
 - Allows UDP-based push of AV data, reducing latency
 - Using data channels
 - Permits encryption using standard DRM schemes
 - Removes the per-user encode, so it scales
 - Maintains broadcast quality video
- Wave Adaptive Transport
 - Fragmented MP4, serialized in FlatBuffers
 - Can be delivered over SRT or Multicast

[LIVE] without limits

MediaKind