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

### PayTV: IPTV, Cable, Satellite

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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

- Broadcast
- Streaming
- Streaming (LL)
- WebRTC
WebRTC

- 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 Edge

WAT over SRT or Multicast

Fanout

WebRTC Streamer

Wave Controller

Session Management

SDP Negotiation

WebRTC

Client
Wave for Ultra-Low Latency OTT

OTT:
Ultra Low Latency
Fast Channel Change

Cloud (Single):
- Encoder
- Wave Packager

Cloud (Multiple, Distributed):
- SRT
- Wave Edge

Home:
- Client

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

WebRTC - MediaFirst
R-UDP: MediaRoom
Wave for Ultra-Low Latency OTT

OTT:
Ultra Low Latency
Fast Channel Change

Encoder → HLS / DASH Packager → CDN → HTTP

WebRTC

Wave Packager → Wave Edge

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

Cloud / on Prem
- Encoder
  - Wave Packager

Network
- Multicast Mapper
  - Wave Edge
  - Home Gateway

Home
- Client

WAT over Multicast
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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