

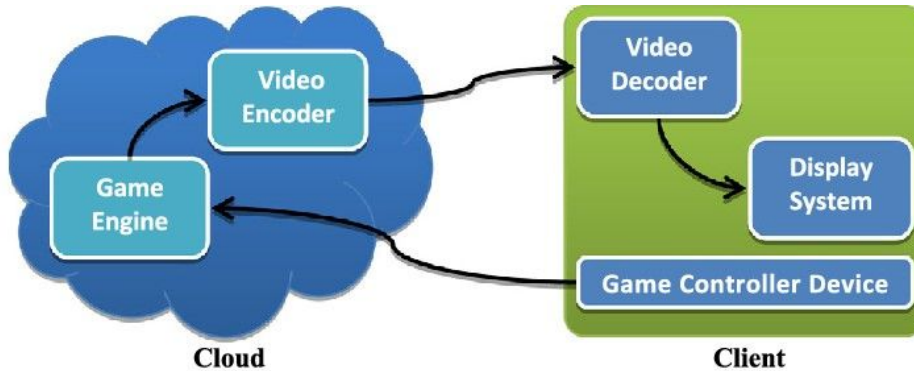
Current status of Cloud Gaming by



Agenda

- What is Cloud Gaming
- What are the differences from the normal video streaming
- Current Standardization Activities - W3C WebRTC WG
- macOS/iOS Topics

What is Cloud Gaming?



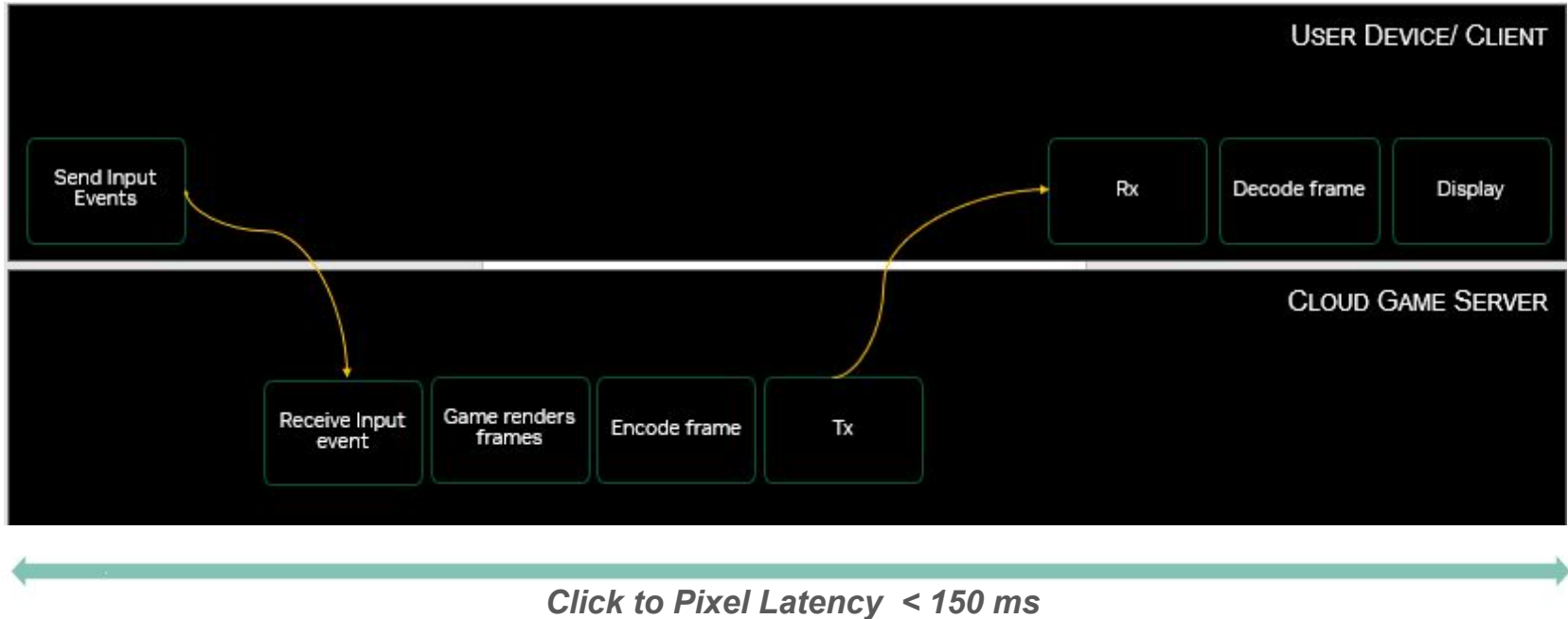
[Image from: A game attention model for efficient bit rate allocation in cloud gaming](#)

No need for new consoles, a computer upgrade - all you need is streaming capable devices and cloud gaming services.

[Take a trip to the Forgotten Realms with your Chromebook and GeForce NOW](#)

What is Cloud Gaming?

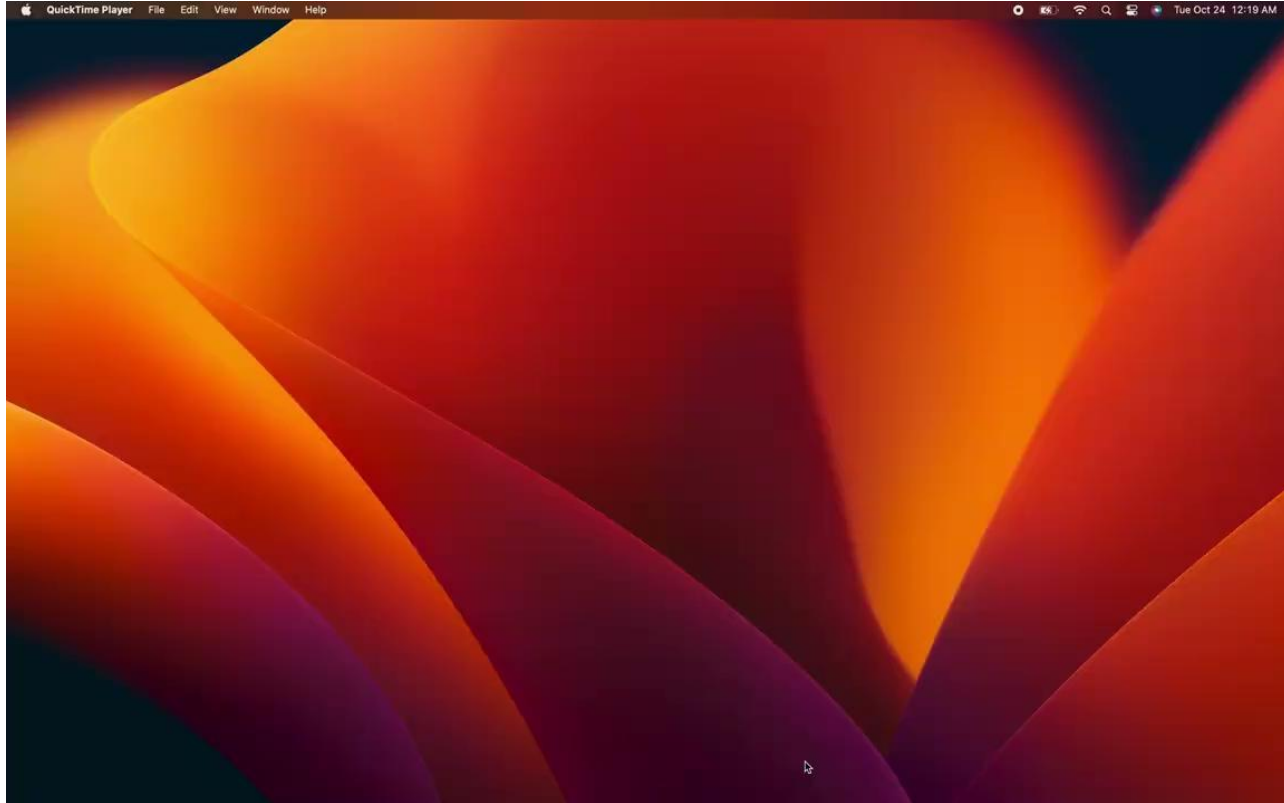
Click to Pixel Latency is one of the major performance indices in the Cloud gaming and it is recommended to be under 150 ms.



What is Cloud Gaming? - 120fps processing timeline

- 2023-09-29T00:02:37.514869Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(557)] Packet Info:
 - **2023-09-29T00:02:37.514933Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(558)]** SeqNum: 12926
 - 2023-09-29T00:02:37.514981Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(561)] TimeStamp: 2985840
 - 2023-09-29T00:02:37.514998Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(562)] Receive Time: 92605925 us
 - 2023-09-29T00:02:37.525421Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(557)] Packet Info:
 - **2023-09-29T00:02:37.525477Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(558)]** SeqNum: 12928
 - 2023-09-29T00:02:37.525529Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(561)] TimeStamp: 2986560
 - **2023-09-29T00:02:37.525567Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(562)]** Receive Time: 92616493 us
 - 2023-09-29T00:02:37.525788Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(557)] Packet Info:
 - 2023-09-29T00:02:37.525811Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(558)] SeqNum: 12929
 - **2023-09-29T00:02:37.525854Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(561)]** TimeStamp: 2986560
 - **2023-09-29T00:02:37.525870Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(562)]** Receive Time: 92616798 us
 - 2023-09-29T00:02:37.530937Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(557)] Packet Info:
 - 2023-09-29T00:02:37.530997Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(558)] SeqNum: 12930
 - **2023-09-29T00:02:37.531040Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(561)]** TimeStamp: 2987280
 - **2023-09-29T00:02:37.531054Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(562)]** Receive Time: 92621981 us
 - 2023-09-29T00:02:37.531180Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(557)] Packet Info:
 - 2023-09-29T00:02:37.531200Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(558)] SeqNum: 12931
 - 2023-09-29T00:02:37.531238Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(561)] TimeStamp: 2987280
 - 2023-09-29T00:02:37.531251Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(562)] Receive Time: 92622180 us
 - 2023-09-29T00:02:37.536199Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(557)] Packet Info:
 - **2023-09-29T00:02:37.536251Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(558)]** SeqNum: 12927
 - 2023-09-29T00:02:37.536293Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(561)] TimeStamp: 2985840
 - **2023-09-29T00:02:37.536307Z WARNING chrome[6644:38]: [rtp_video_stream_receiver2.cc(562)]** Receive Time: 92627234 us
- Frame to Frame: 5.1ms
- Packet Retransmission: 10.7ms

What is Cloud Gaming? - Demo



What are the differences from the normal video streaming

- Ultra Low latency
 - Desirable C2P latency is $< 120\text{ms}$
 - $> 170\text{ ms}$ makes first person shooter games unplayable
- Consistent latency
 - Critical for player adaptability
- Video Content
 - High motion complexity during active gameplay
 - Text, HUD overlays
 - Devil is in the details - Crisp horizons, maps
- QoS
 - Video loss is highly undesirable
 - Garbled video with fast recovery better than video freeze
- And more
 - Display Vsync control
 - Unaccelerated, high event rate mouse events
 - ...

Current Standardization Activities - W3C WebRTC WG

- [W3C PR#118](#) Quality Improvements on lossy network condition
 - Faster Video Recovery
 - [b/15192](#) Non keyframe based recovery through Dependency Descriptor
 - Implementing Sender Receiver Synchronization Loss notification - RPSI/LNTF ([RPSI Discussion](#))
 - Consistent Latency
 - Configurable Transport Wide Collision Control Feedback interval
 - [b/15535](#) Increases accuracy of jitter buffer adaptation
 - Set the actual data instead of assumptions: 60fps or 10ms render delay

macOS/iOS Topics

- WebRTC Release Cycle
 - AS-IS: Bi-Annual, need to do individual update([b/262881](#))
- Higher Resolution(4K) Support
 - AS-IS: HEVC is behind a flag ([b/242921](#))
- User Inputs(GamePad, Keyboard and Mouse)
 - Pointer Lock support on iOS([b/216621](#))
 - Keyboard Lock support ([i/182](#))
 - Haptic support on iOS ([b/263022](#))