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WebRTC Media in the Cloud

Chad Hart

IIT RTC Conference 2014

Why do you need a media server?

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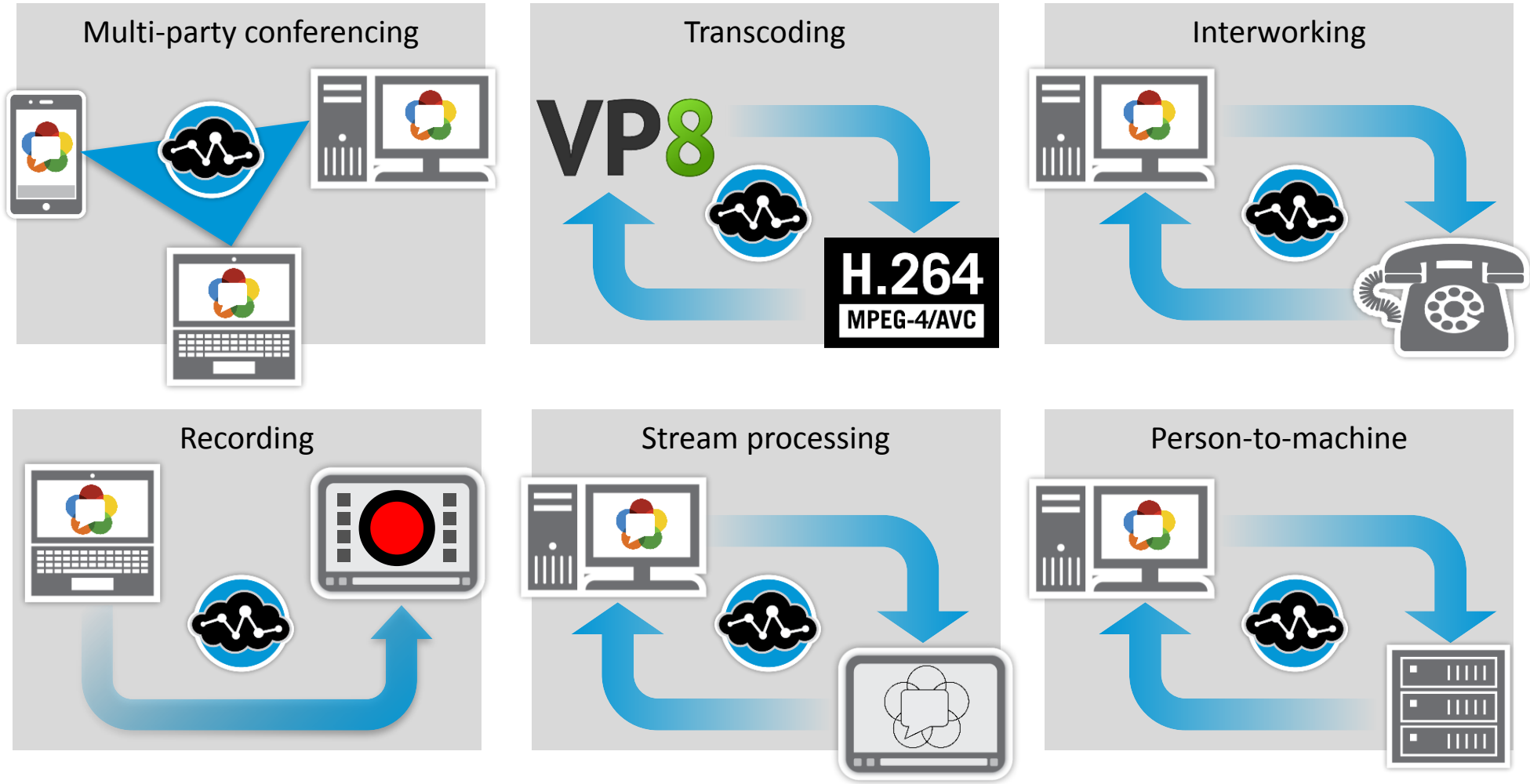

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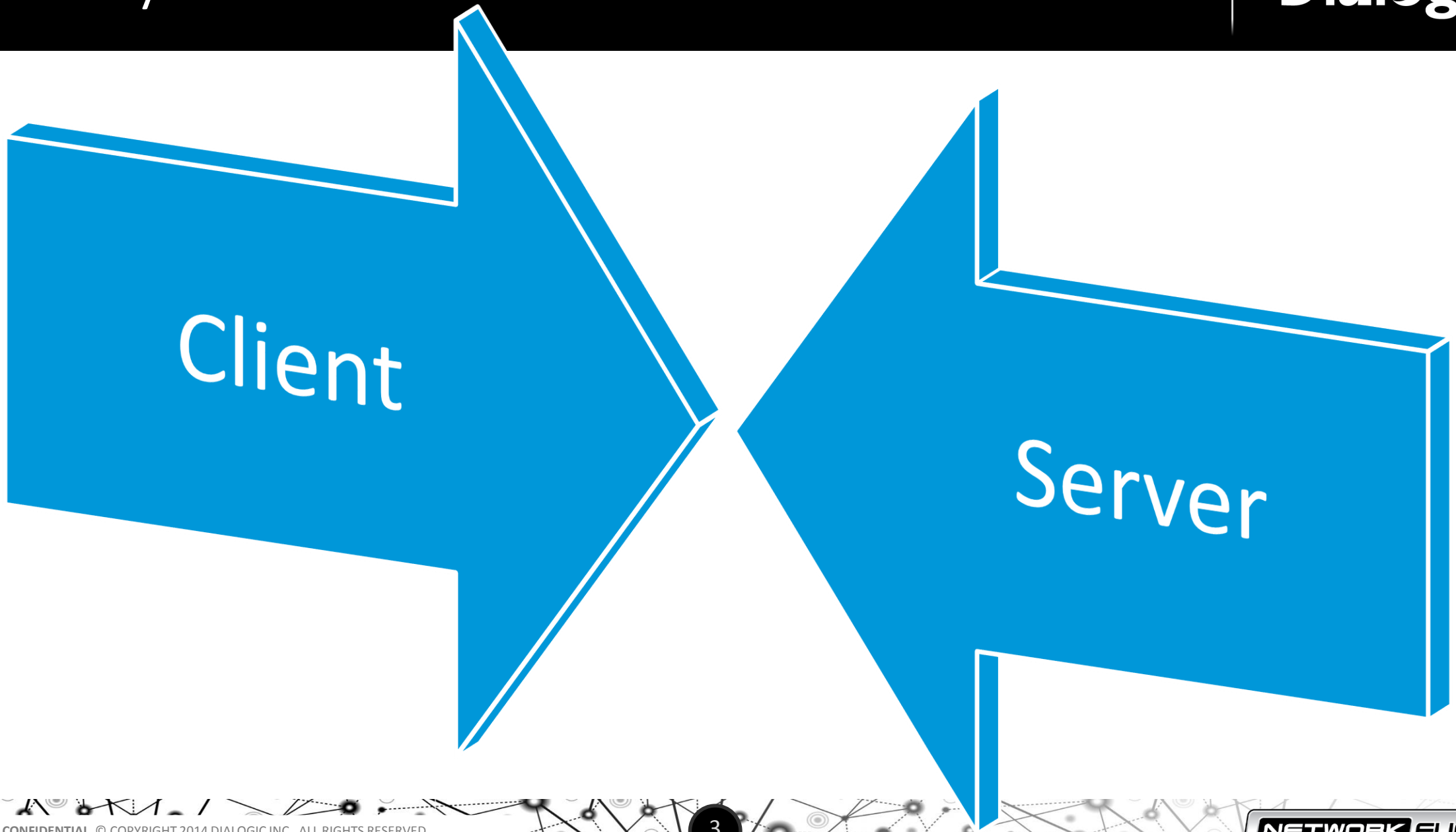
What do you care more about?



Bandwidth is not always ubiquitous or free

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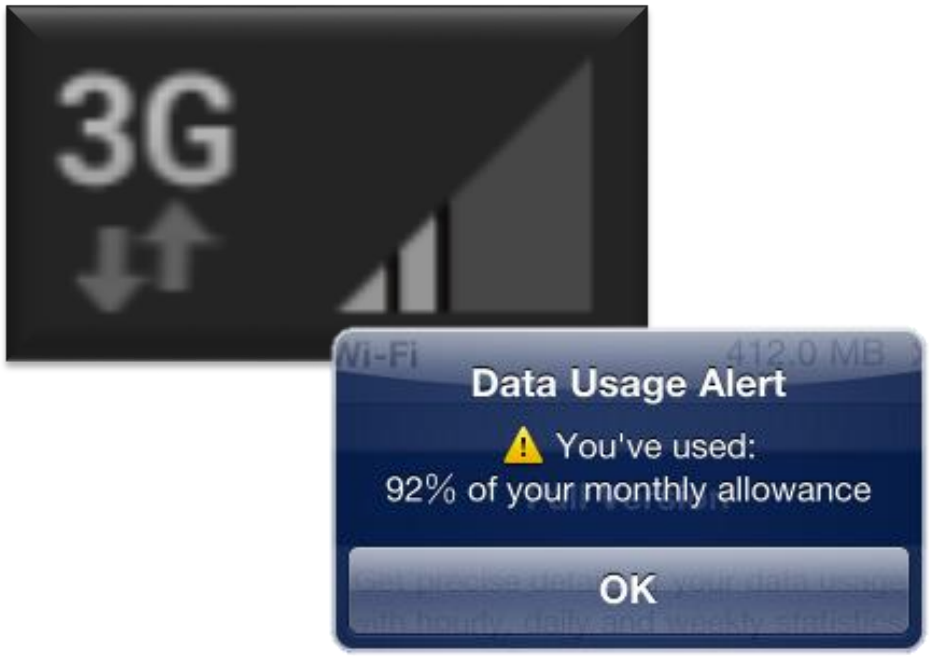
Client-side



Server-side

Network

- 5TB/month Outbound Public Bandwidth (with monthly billing)
- Unlimited Inbound Public Bandwidth
- Unlimited Private Network (Server-to-Server) Bandwidth
- 100Mbps Public and Private Network Ports (upgradable to 1Gb
- Private VLAN via Public & Private Network
- Geographically Redundant DNS
- Dual-Stack IPv4 and IPv6 Capable

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CPU & processing power is expensive

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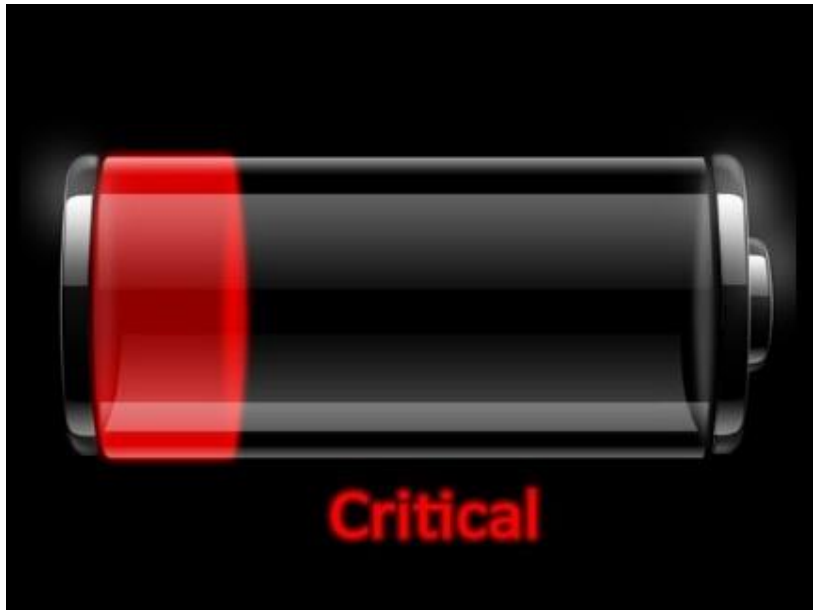
Client view



Provider View

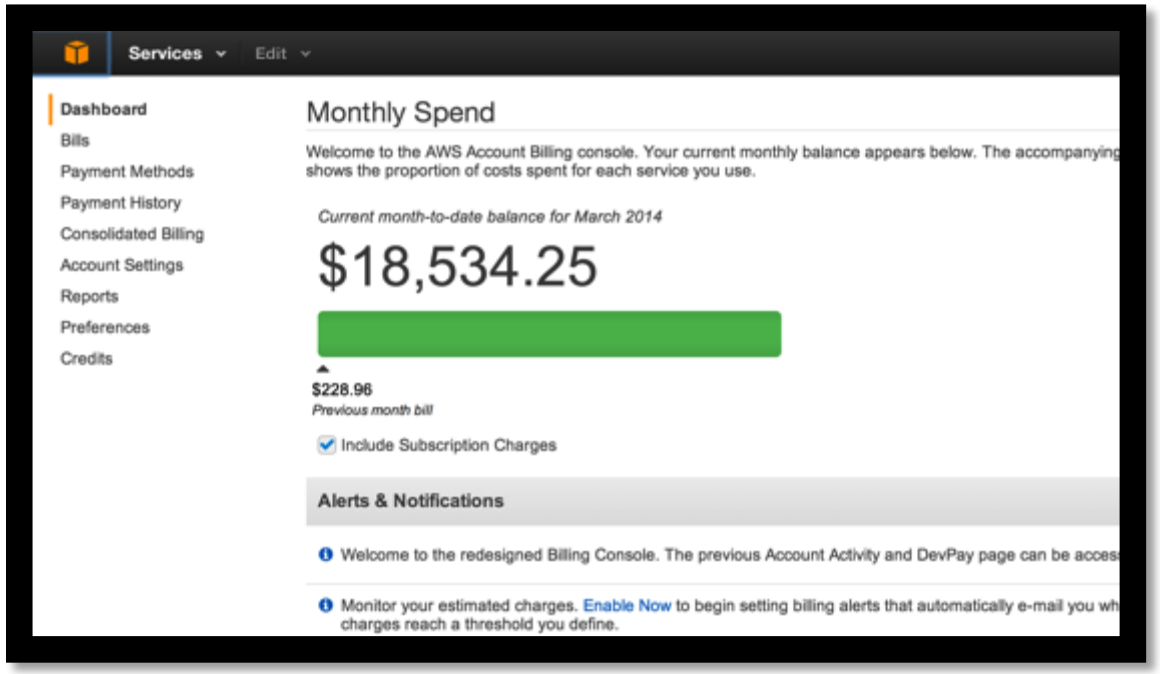


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Image source: http://thewrestlinglifeupdate.tumblr.com/

Multi-PARTY! Video Conferencing

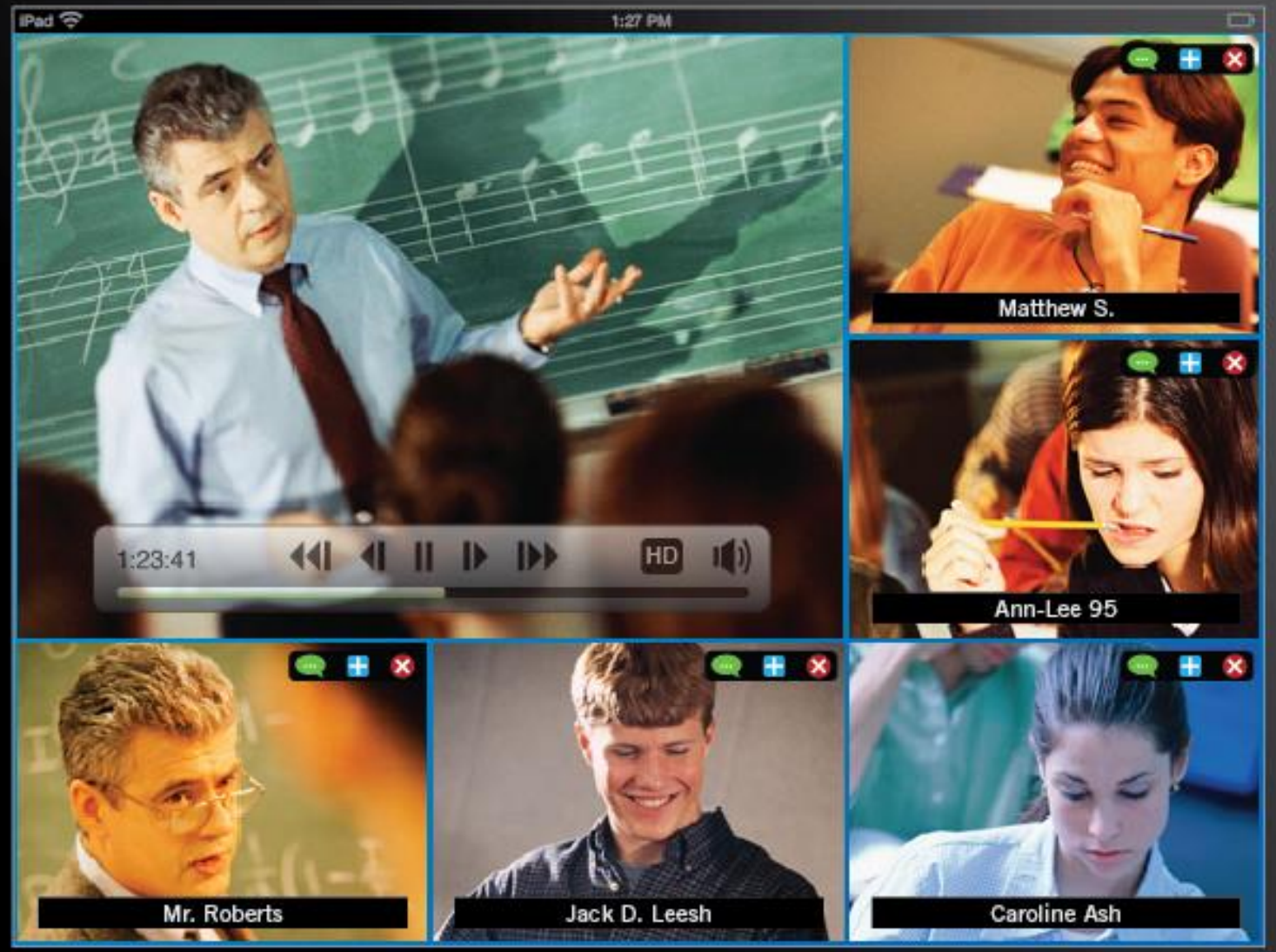

Image source: http://thewrestlinglifeupdate.tumblr.com/

Easy & cheap approach to multi-party: Mesh

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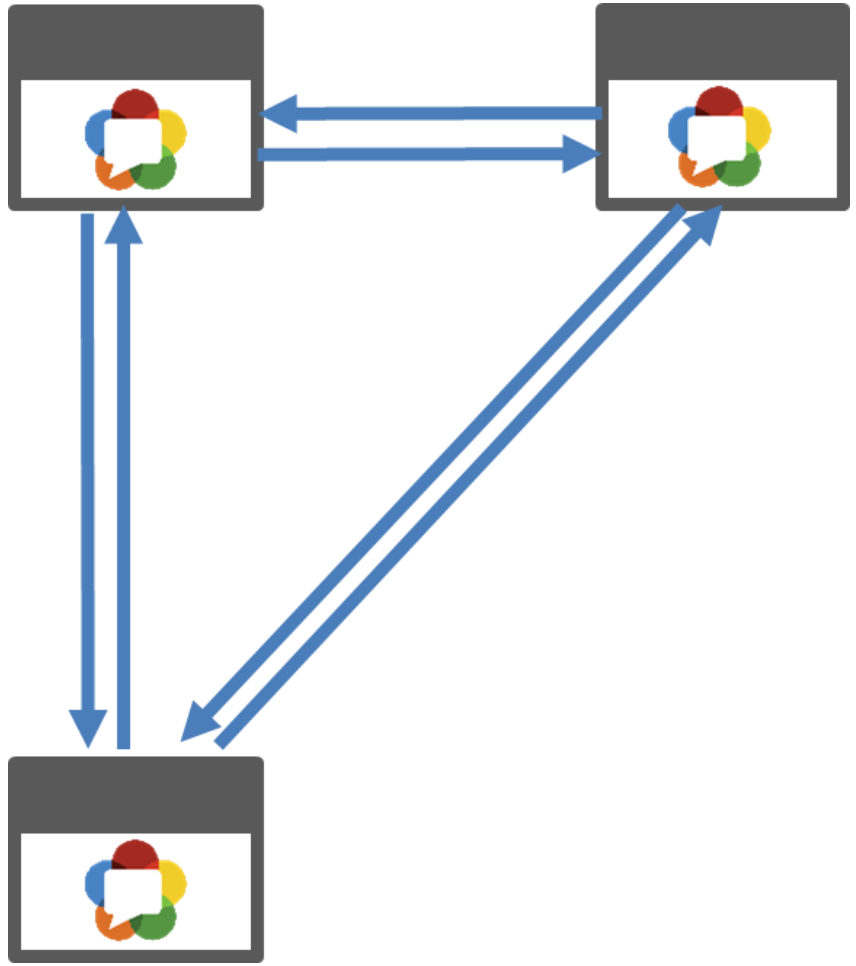
Full Mesh

- Works for a few parties
- No server cost
- Lowest latency



8

Mesh does not scale for many video conferees

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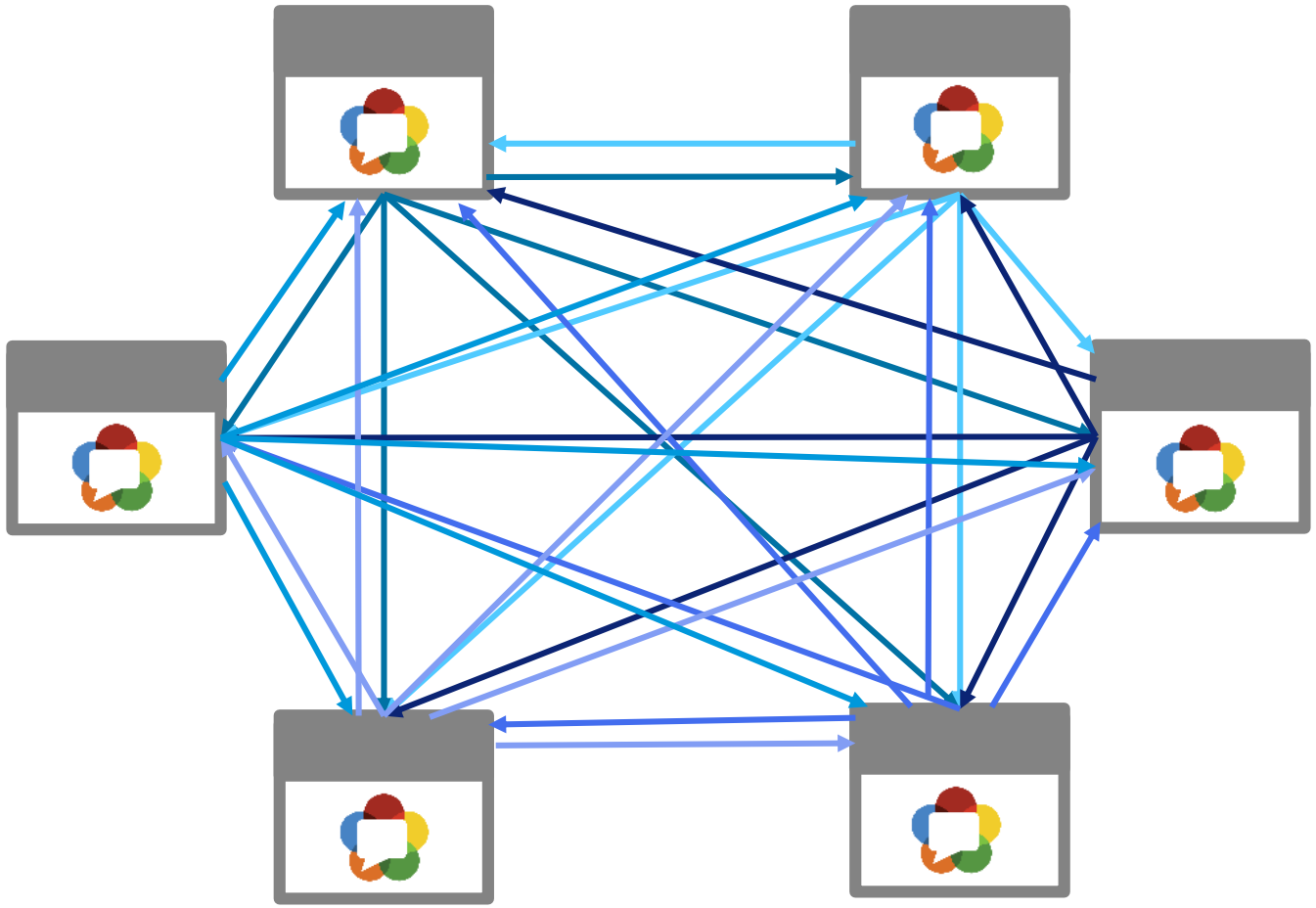
Full Mesh

- Clients get overloaded
  - Encode costs more than decode
  - Limited uplink bandwidth
- Inconsistent performance across participants



9

Traditional Telephony Approach: MCU

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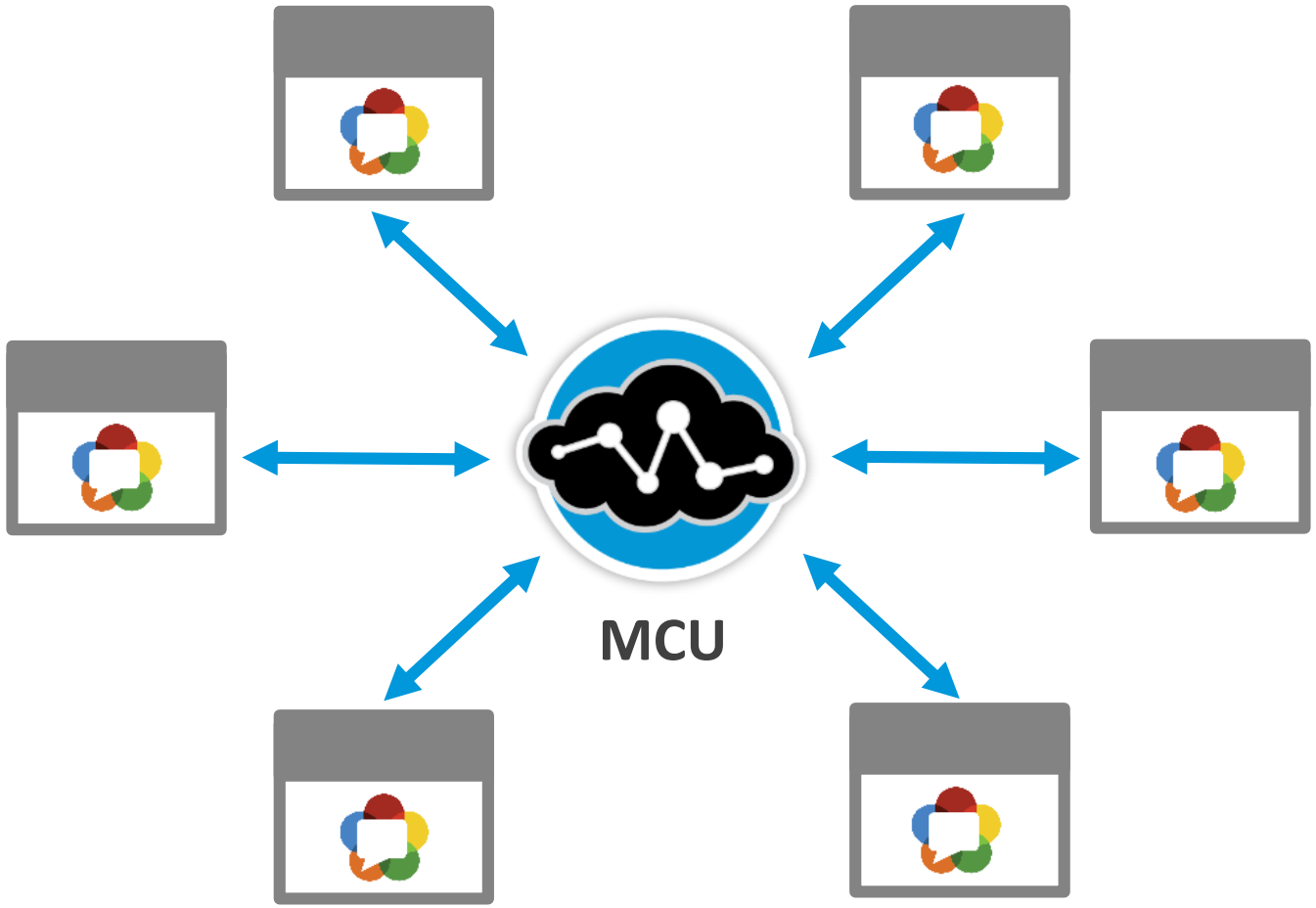
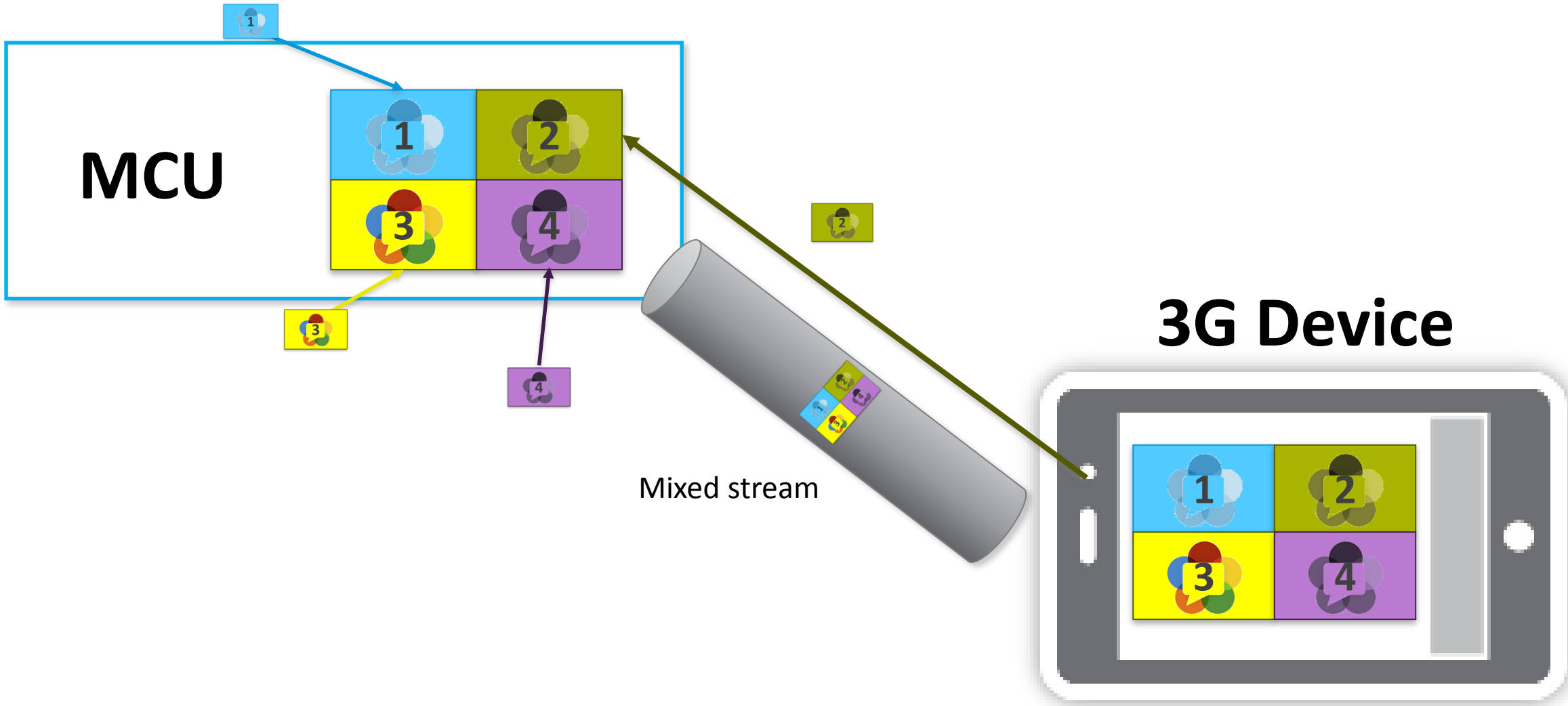
Multipoint Control Unit (MCU)

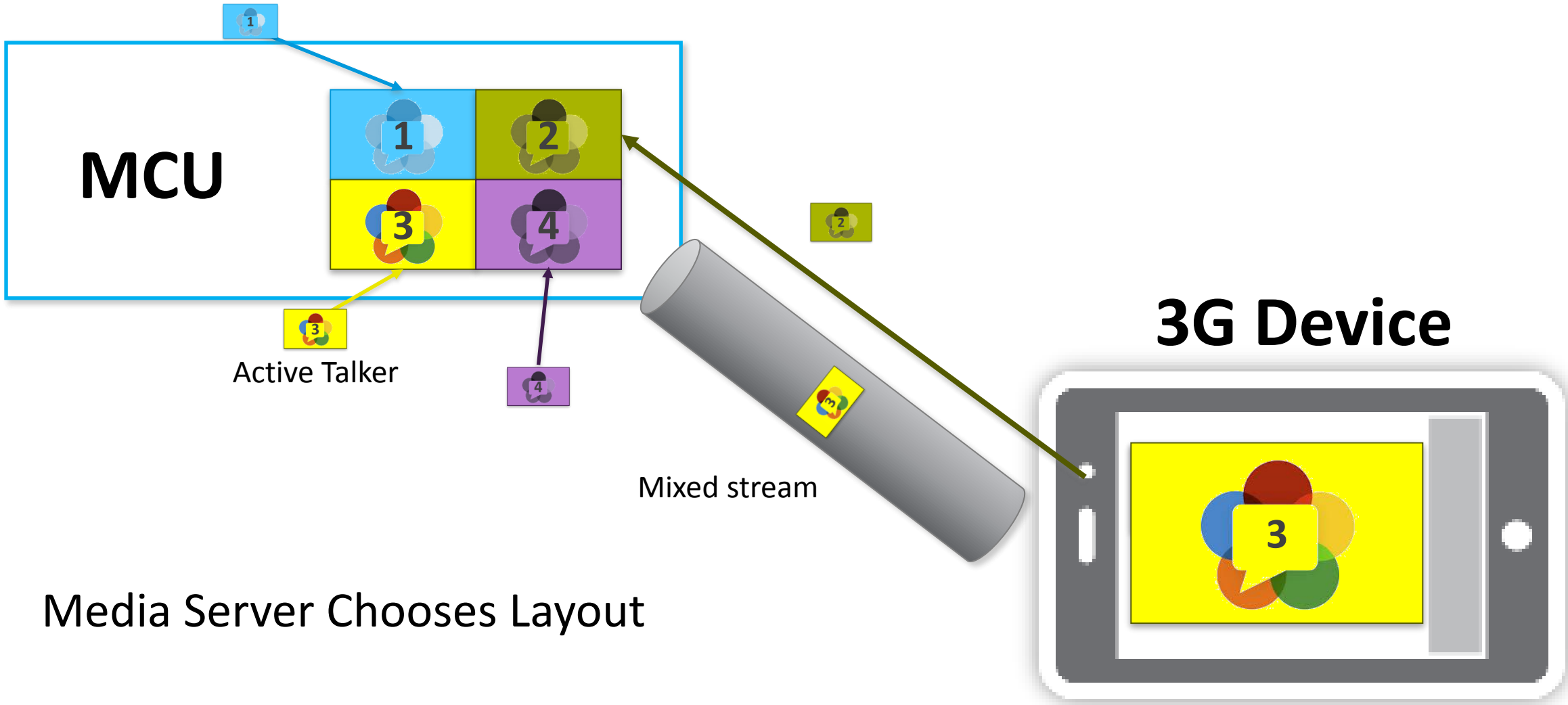
- Good at manipulating all media
  - Transcoding
  - Transizing
  - Transrating
  - Interworking
- Server-side CPU intensive
- Client can request different conference mixes
- Usually client friendly
  - Downsizing & mixing can reduce bandwidth
  - Fewer client streams to process



Video UX: Traditional method – mixed screen



Video UX: Traditional method – active talker



Media Server Chooses Layout

Modern UX with MCU mixing, HTML5 & JavaScript

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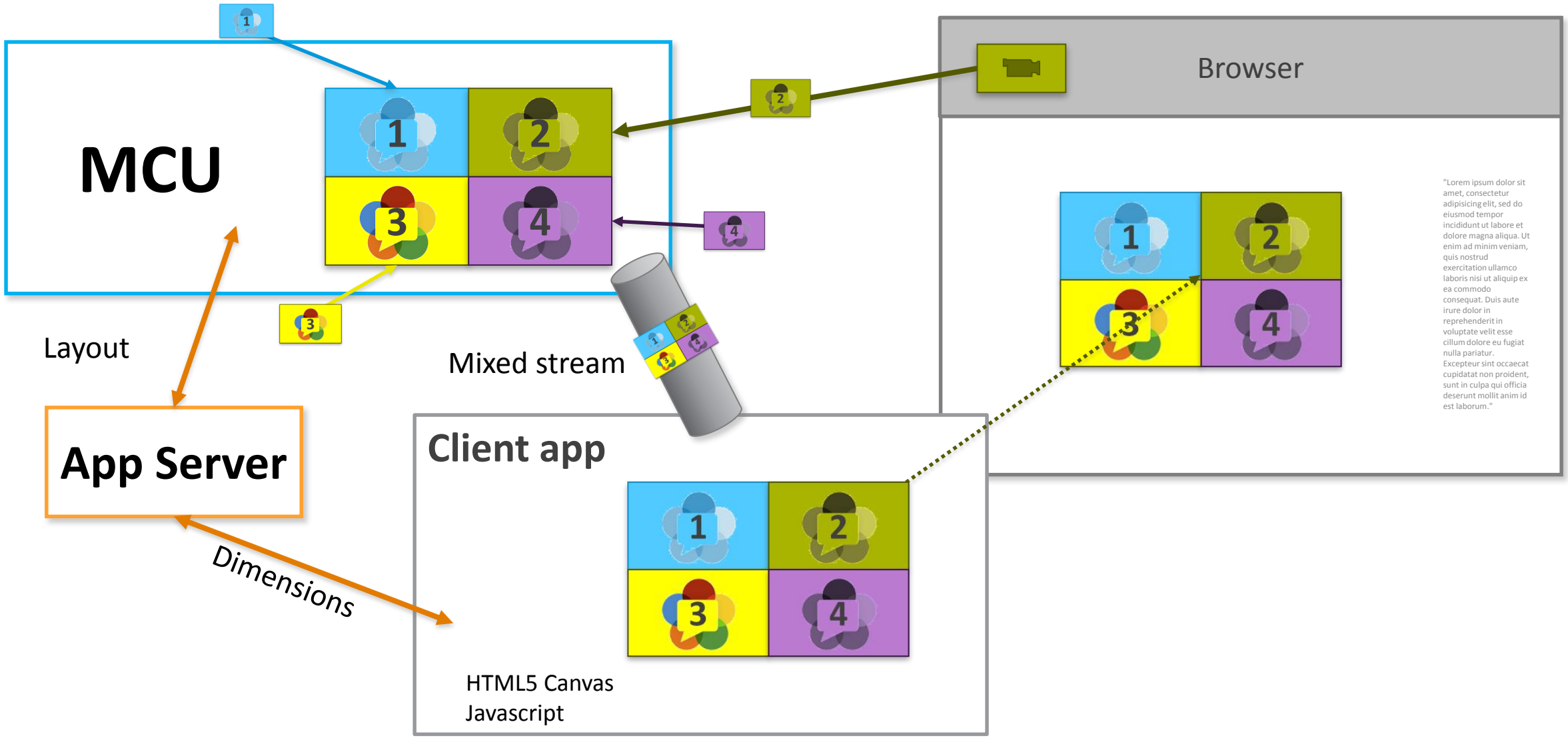

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Modern UX with MCU mixing, HTML5 & JavaScript

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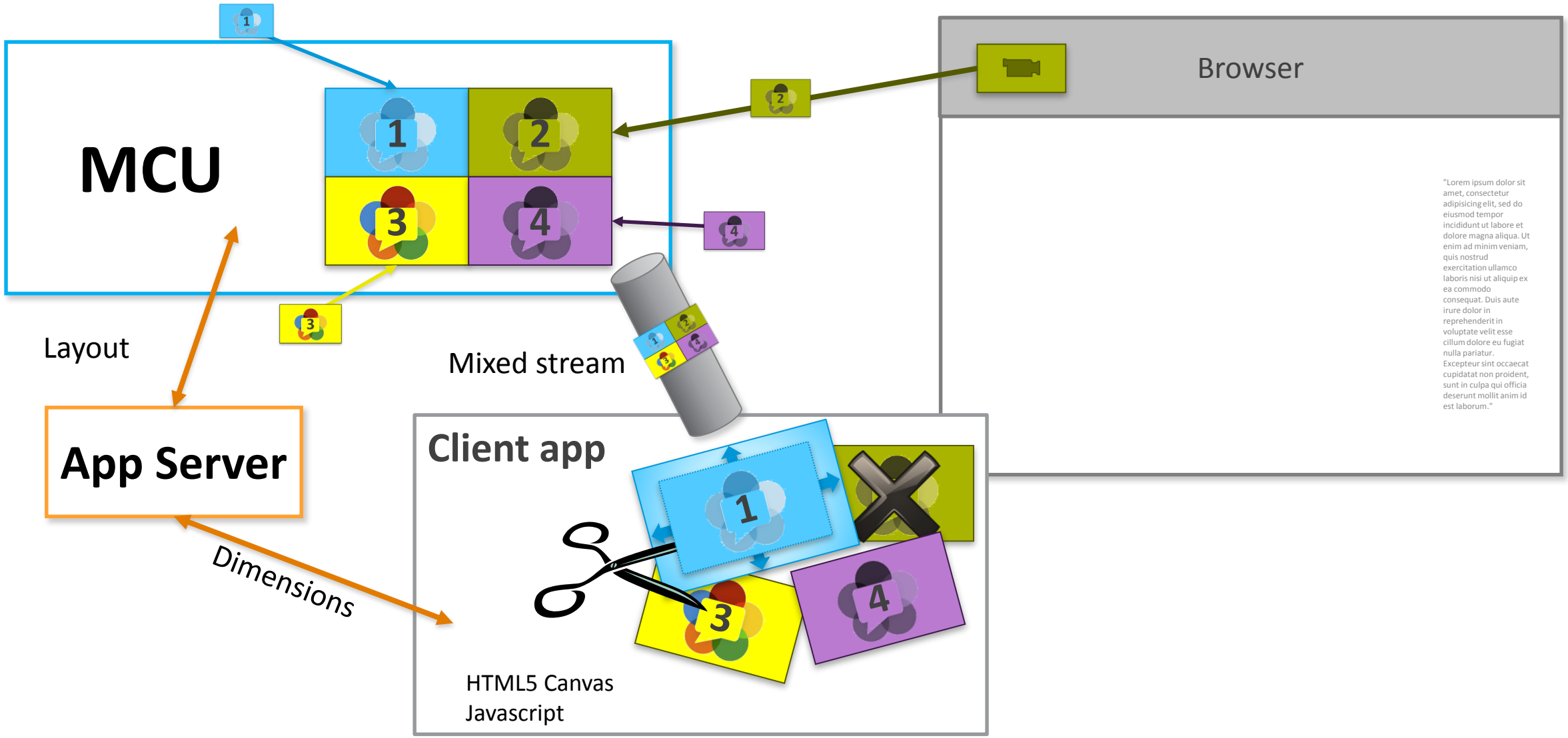

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Modern UX with MCU mixing, HTML5 & JavaScript

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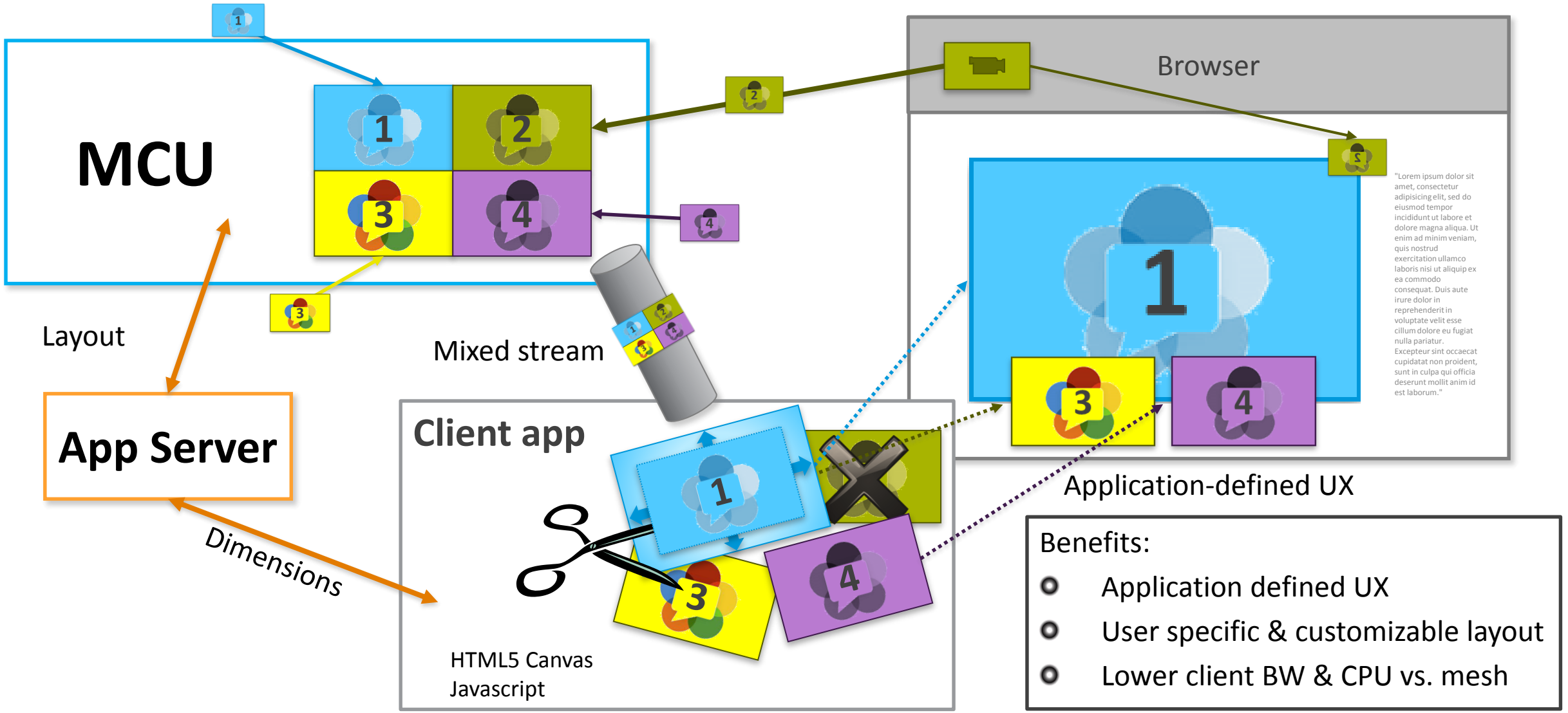

Benefits:

- Application defined UX
- User specific & customizable layout
- Lower client BW & CPU vs. mesh

Newer approach: SFU

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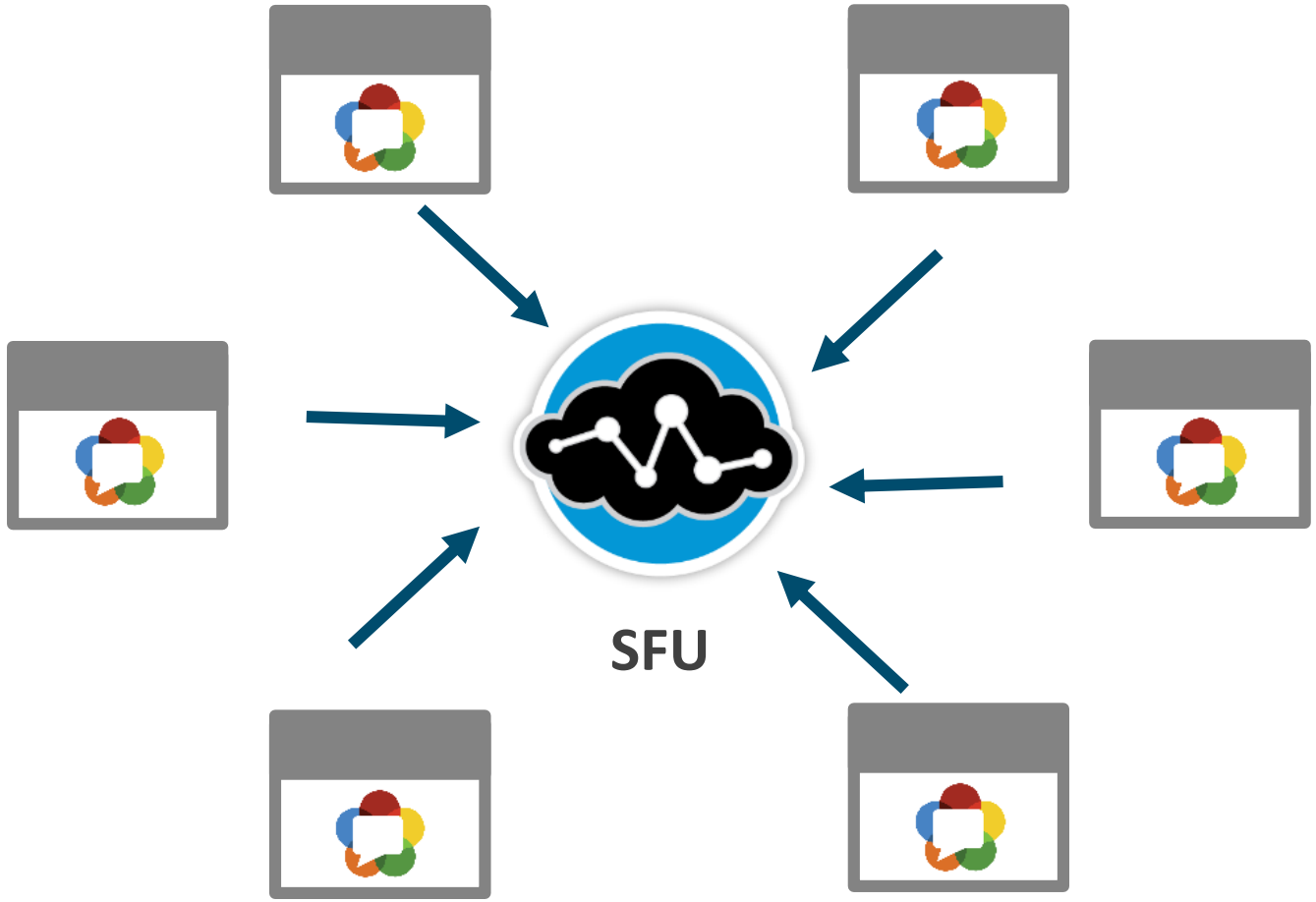
Selective Forwarding Unit (SFU) routing

- Clients send one & receive many
- Client can instruct SFU which streams to send
- High throughput
- Can be lots of downlink bandwidth
- Low latency



16

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Newer approach: SFU

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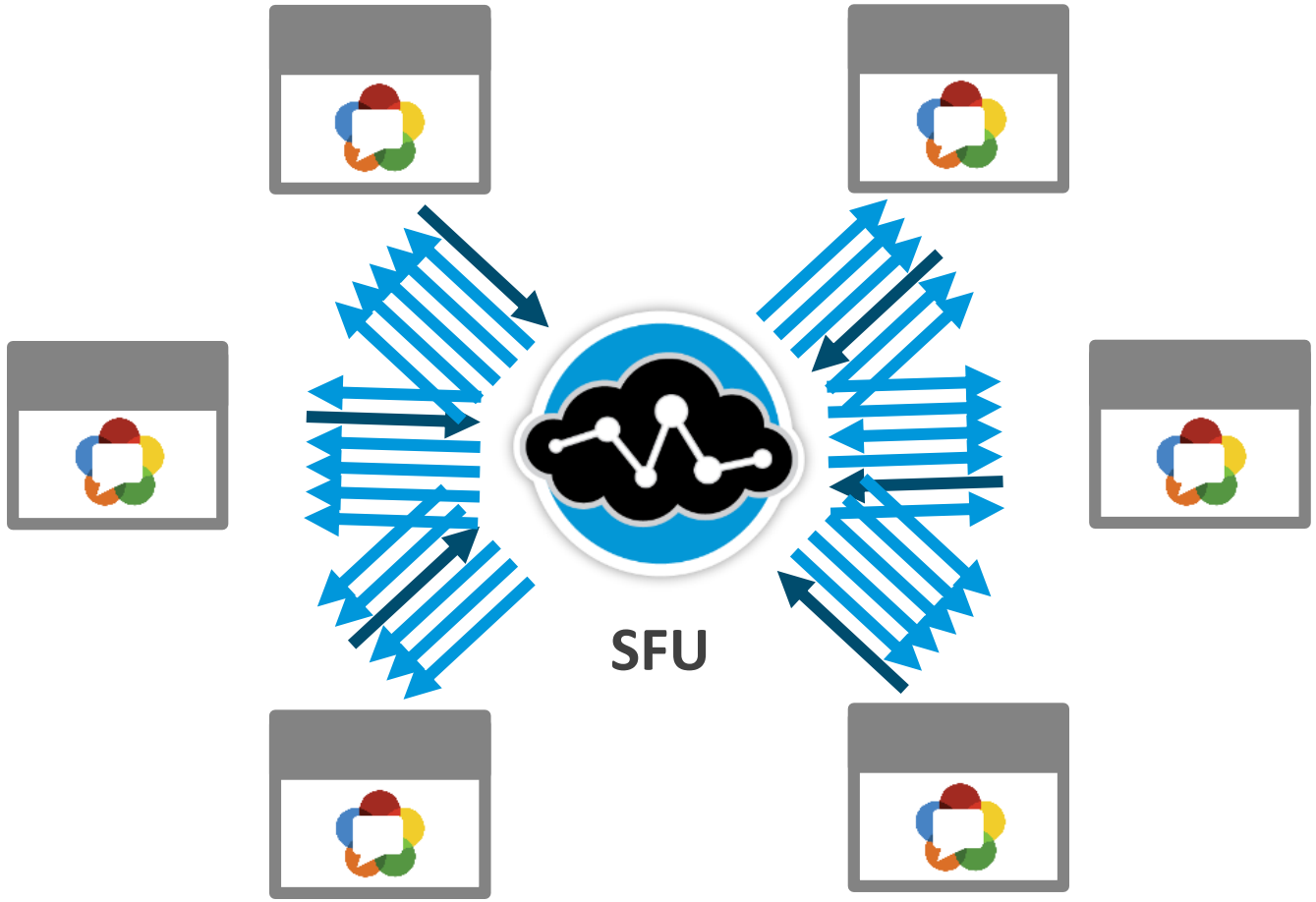

17

New WebRTC approach: Simulcast

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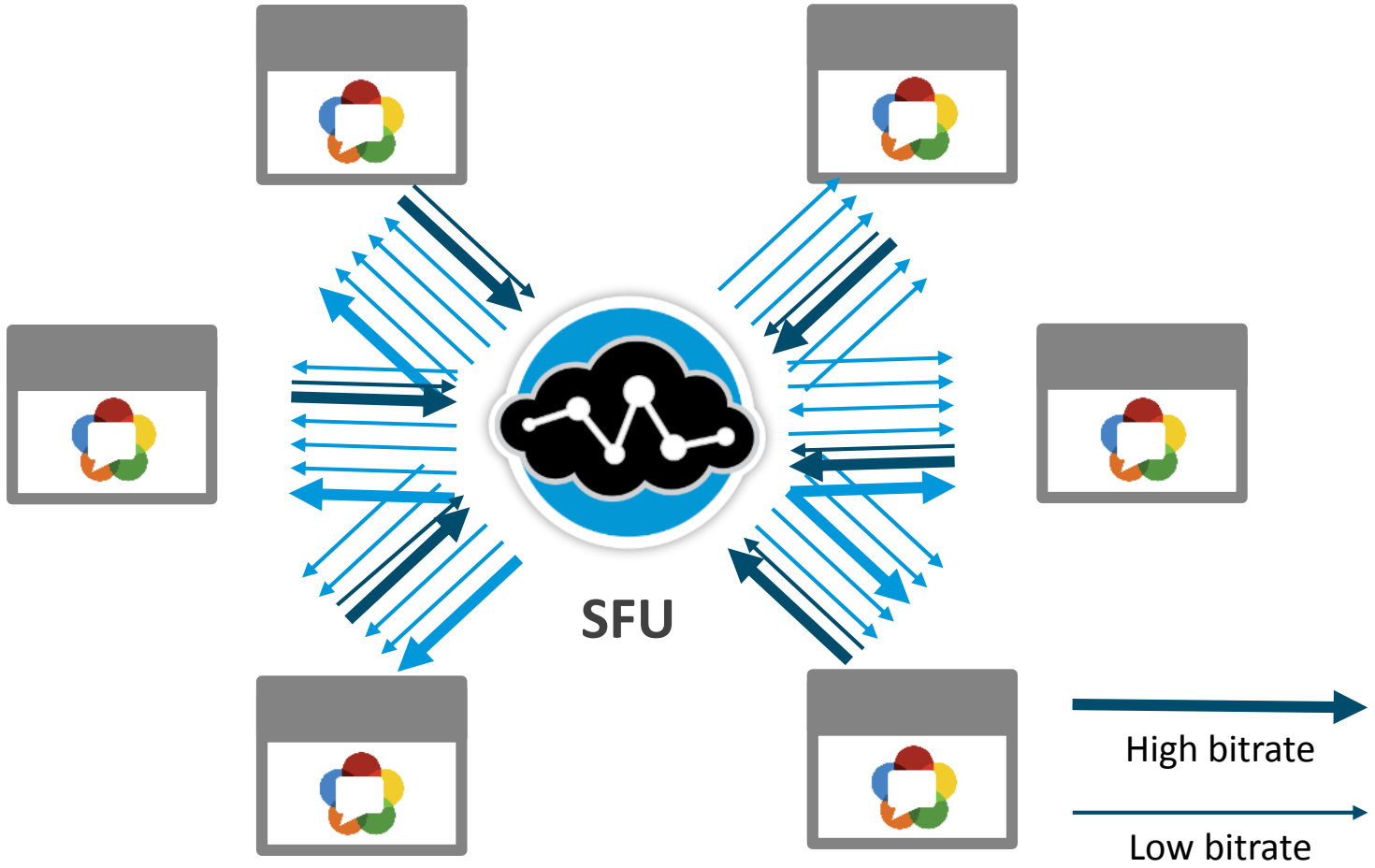
Selective Forwarding Unit (SFU) with Simulcast

- Clients send multiple streams to SFU
  - one high-bit rate
  - one or more lower-bit
- Client directs SFU which streams to receive
- Reduces bandwidth vs. SFU
- Simulcast in WebRTC coming



18

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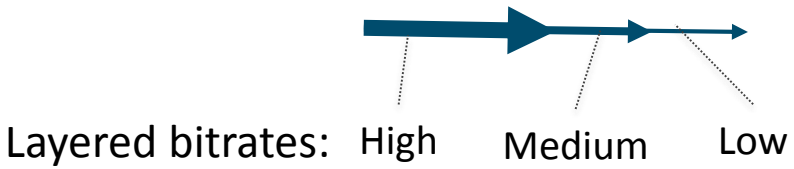
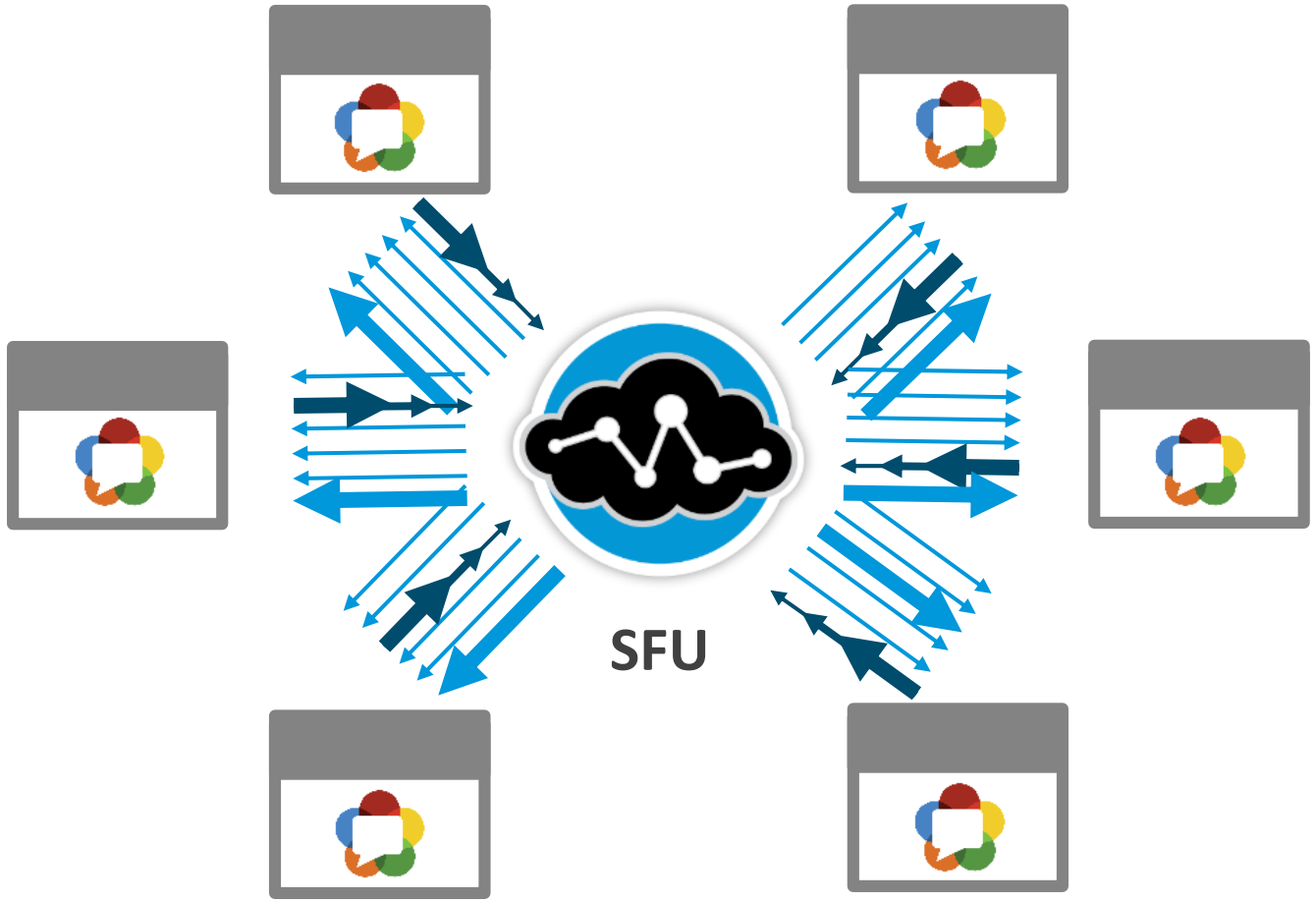
Selective Forwarding Unit (SFU) with SVC

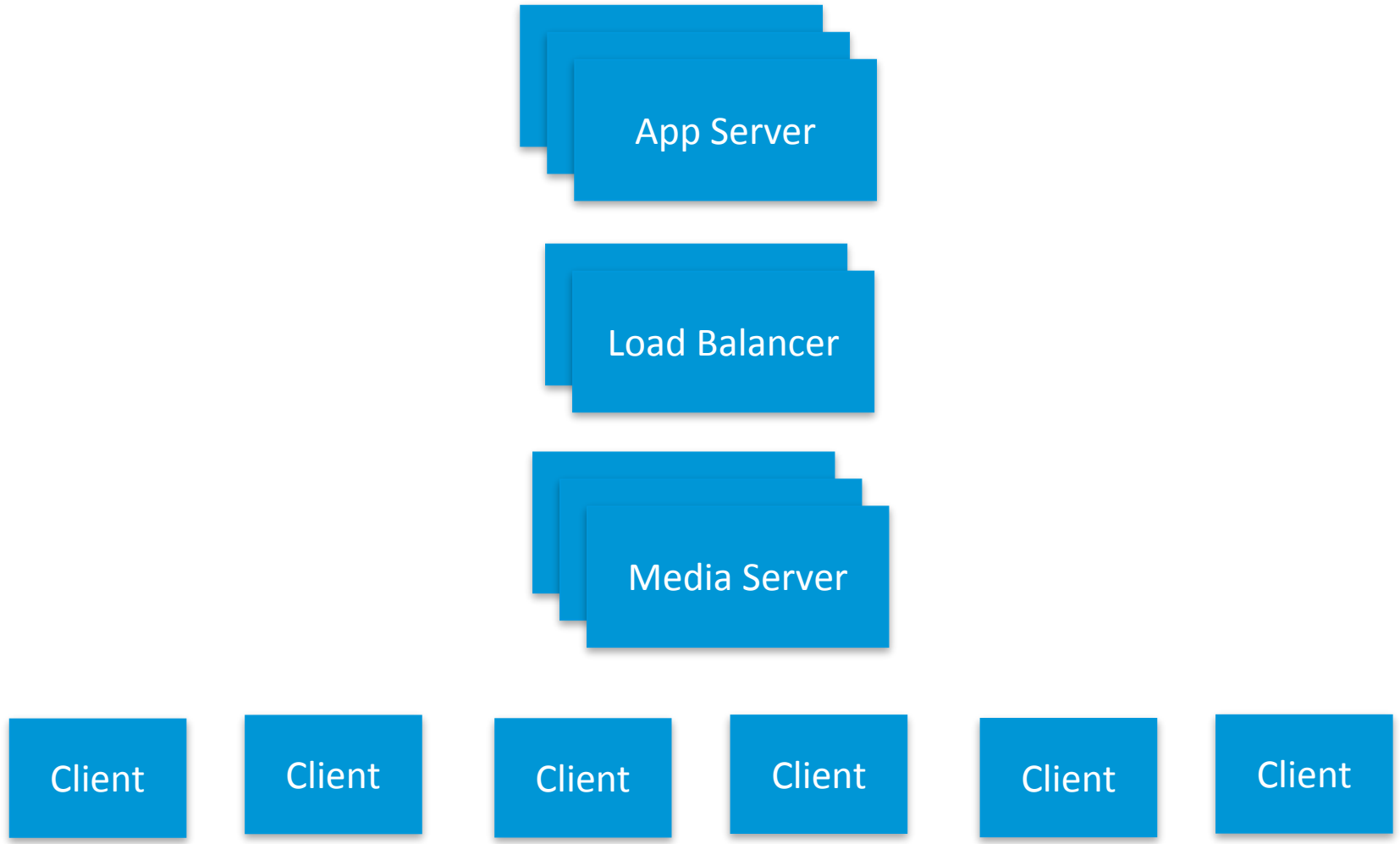
- Clients send layered stream to SFU
  - Varying bitrates – time, size, quality
- SFU directs who gets what
- Coming to WebRTC eventually



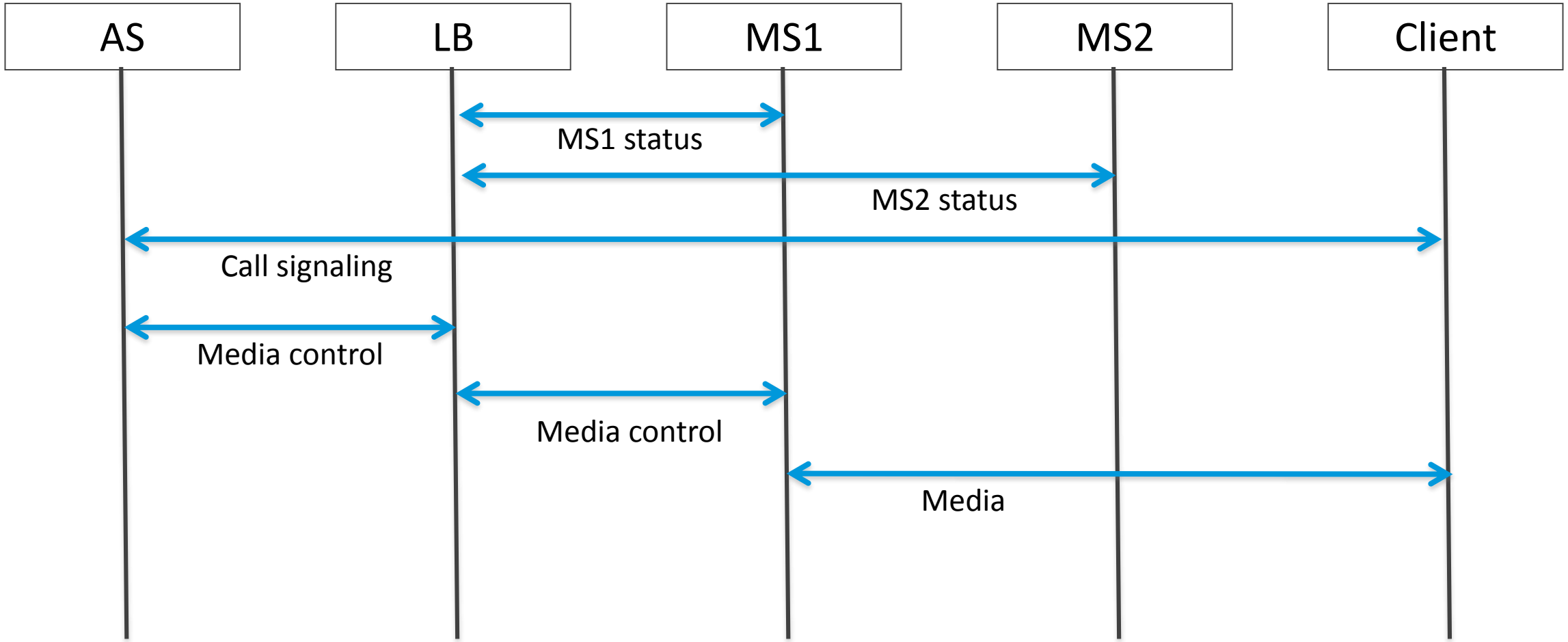


19

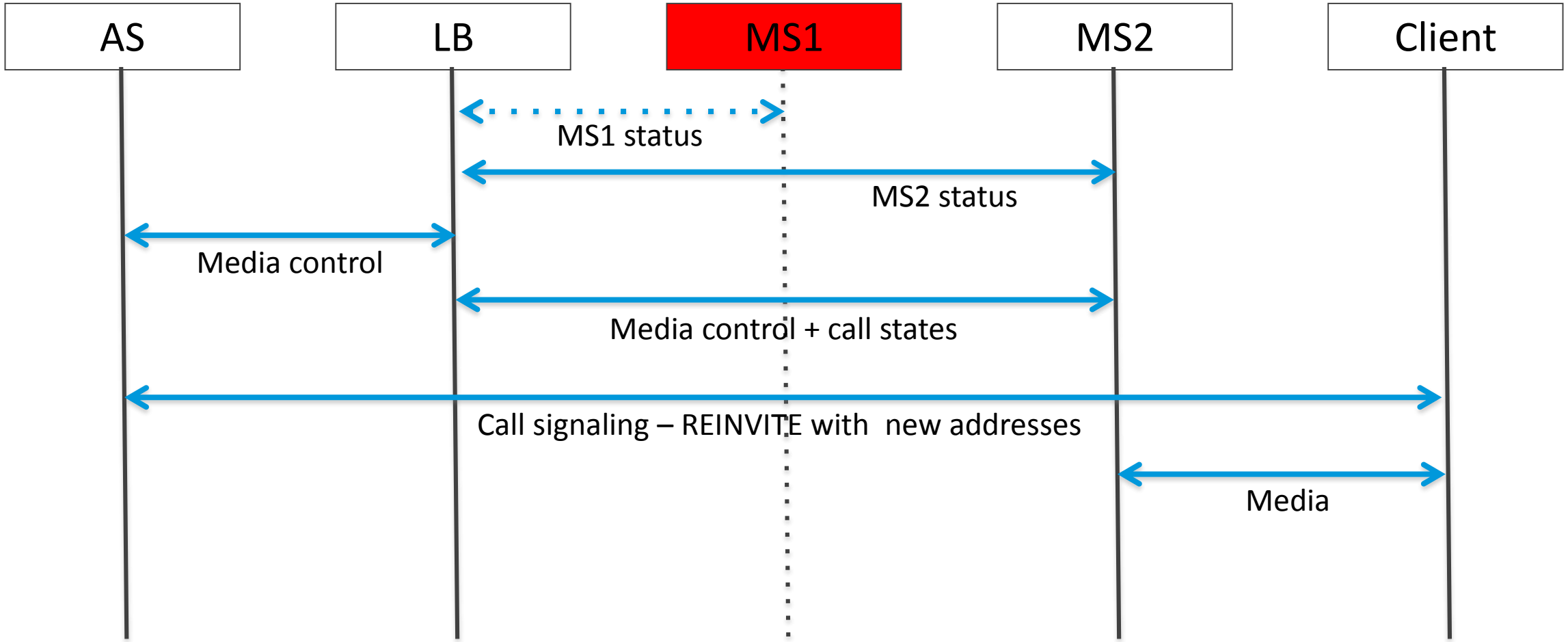
Typical media server network model



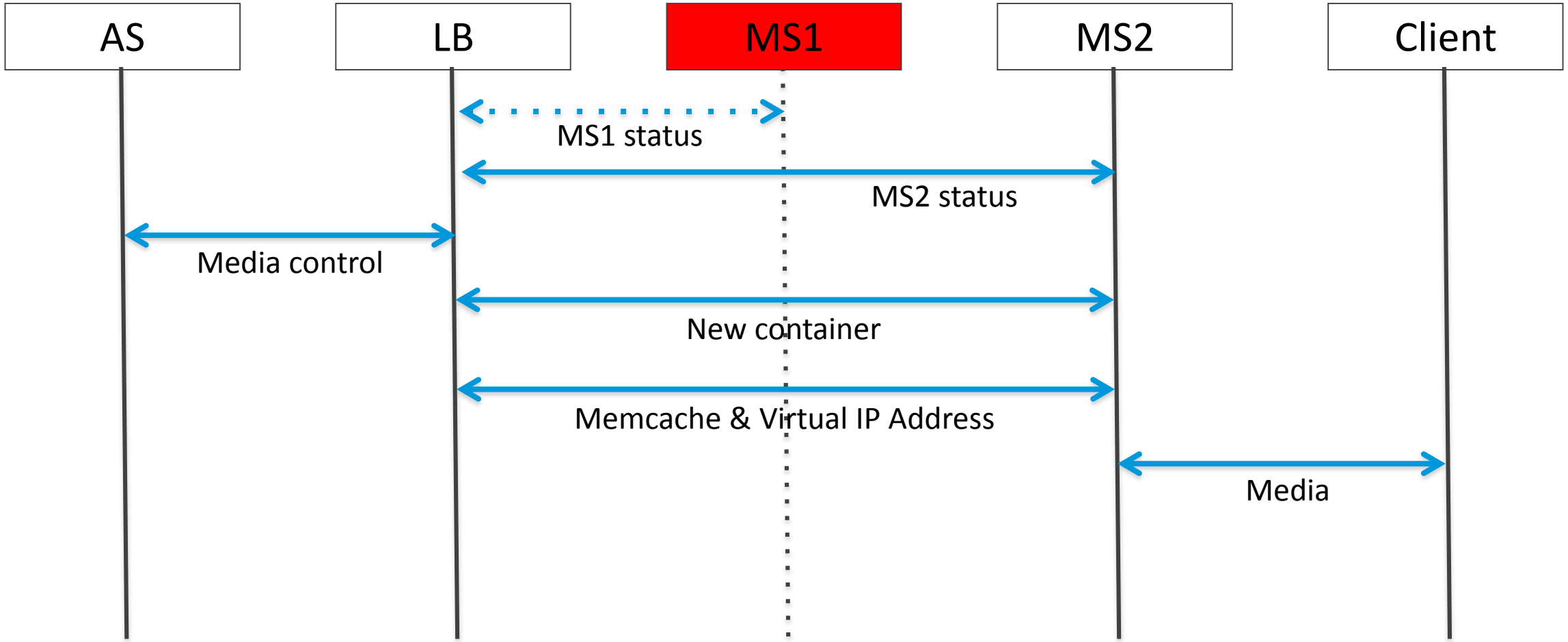
Pseudo Call-flow with a media server



Pseudo Call-flow – traditional fail-over with RE-INVITE



Pseudo Call-flow – fail-over the cloud way



When you are serious about scale

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- Declarative
- Concurrency
- Soft real-time
- Robustness
- Distribution
- Hot code loading
- External interfaces
- Portability

ICE, STUN, and TURN save the day

Image source: webrtcHacks- http://webrtchacks.com/an-intro-to-webrtcs-natfirewall-problem/

- Use of Public IP's mitigates need for TURN servers
- Open source TURN servers do reasonably well
- Running the TURN server co-resident with the media server works well when you need it