

Measuring the Performance and Network Utilization of Popular Video-Conferencing Applications

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Question From Policymakers



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What is the baseline level of internet performance needed to support common video-conferencing applications (VCAs) for remote learning?

VCAAs Studied



What are the requirements for VCAs?

Consumption	

VCAAs have low utilization (< 2 Mbps)

VCA	Utilization (Mbps)	
	Upstream	Downstream
Meet	0.95	0.84
Teams	1.40	1.86
Zoom	0.78	0.95

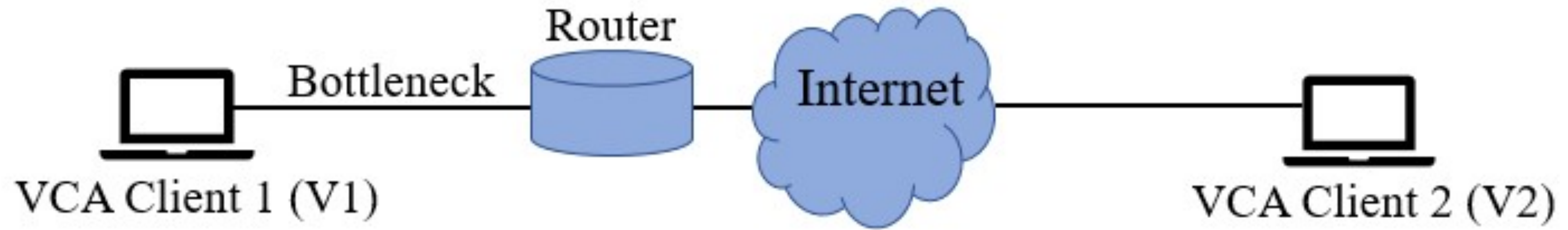
How do VCAs respond to interruptions?

Consumption

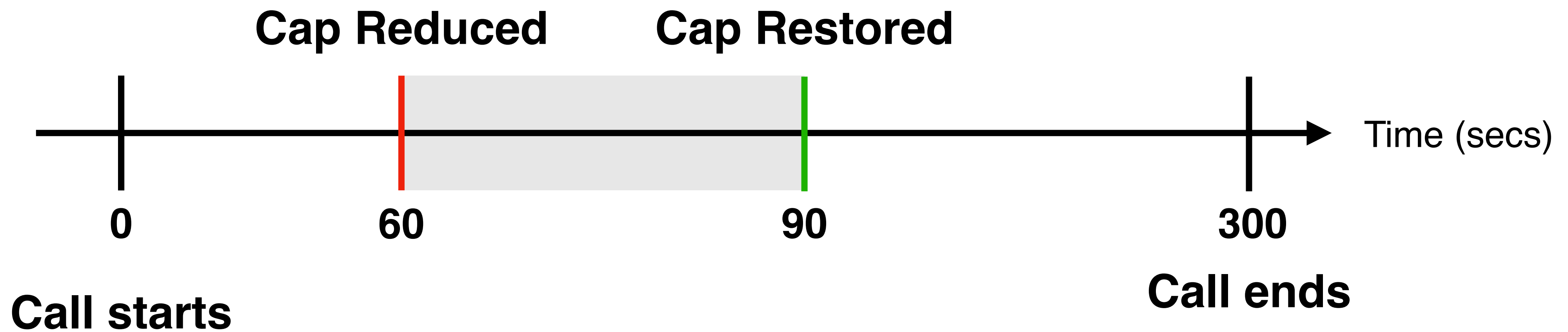
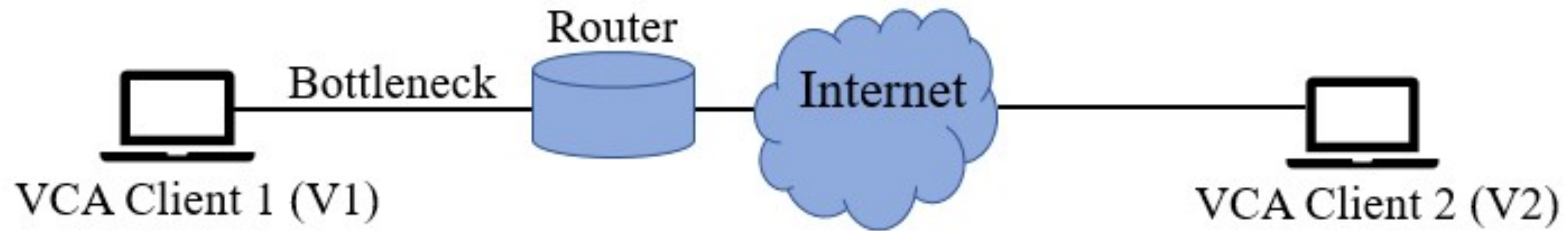
Takeaway: VCAs have low utilization

Interruption

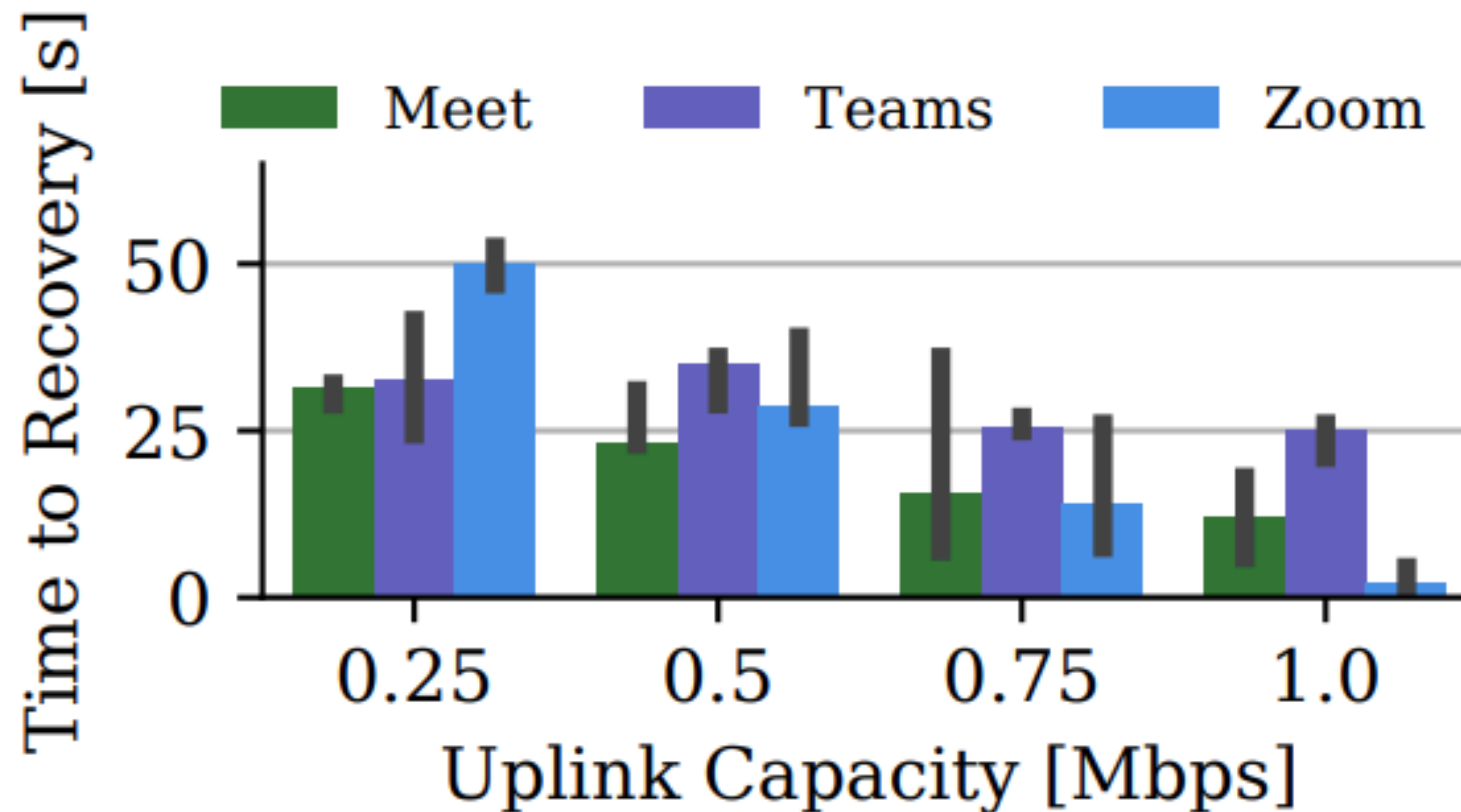
Experiment Setup



Experiment Setup



VCAs can take a long time to recover



Time to recover from uplink disruptions

How do VCAs respond to competition?

Consumption

VCAs have low utilization

Interruption

Takeaway: VCAs can take a long time to recover

Competition

More than one user on the network

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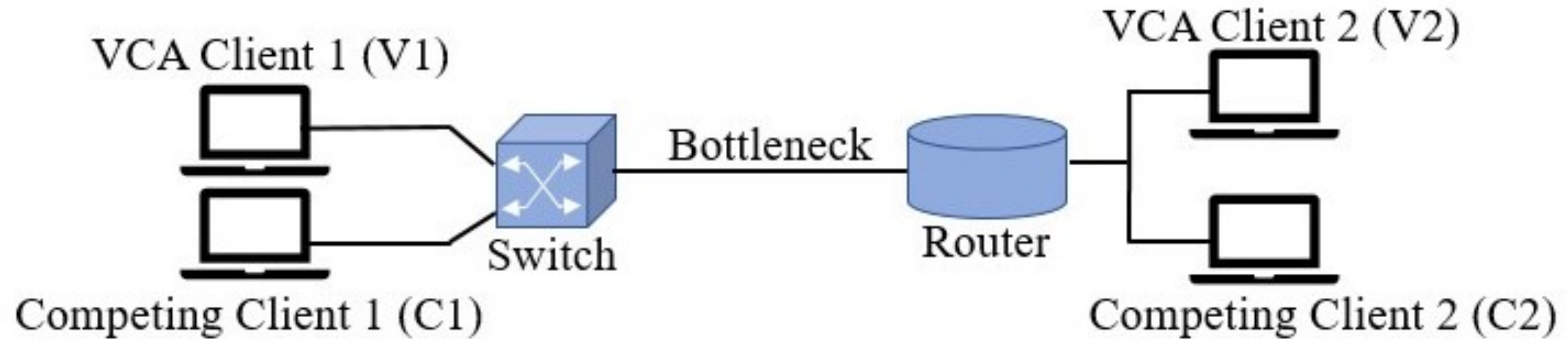
- **Multiple people on separate video calls**

More than one user on the network

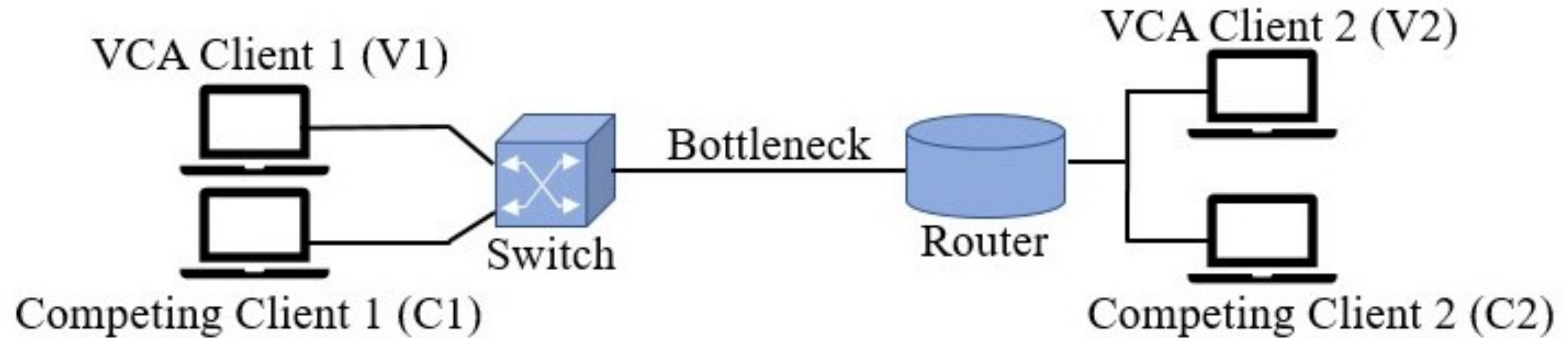
- **Multiple people on separate video calls**
- **Other people streaming video**

More than one user on the network

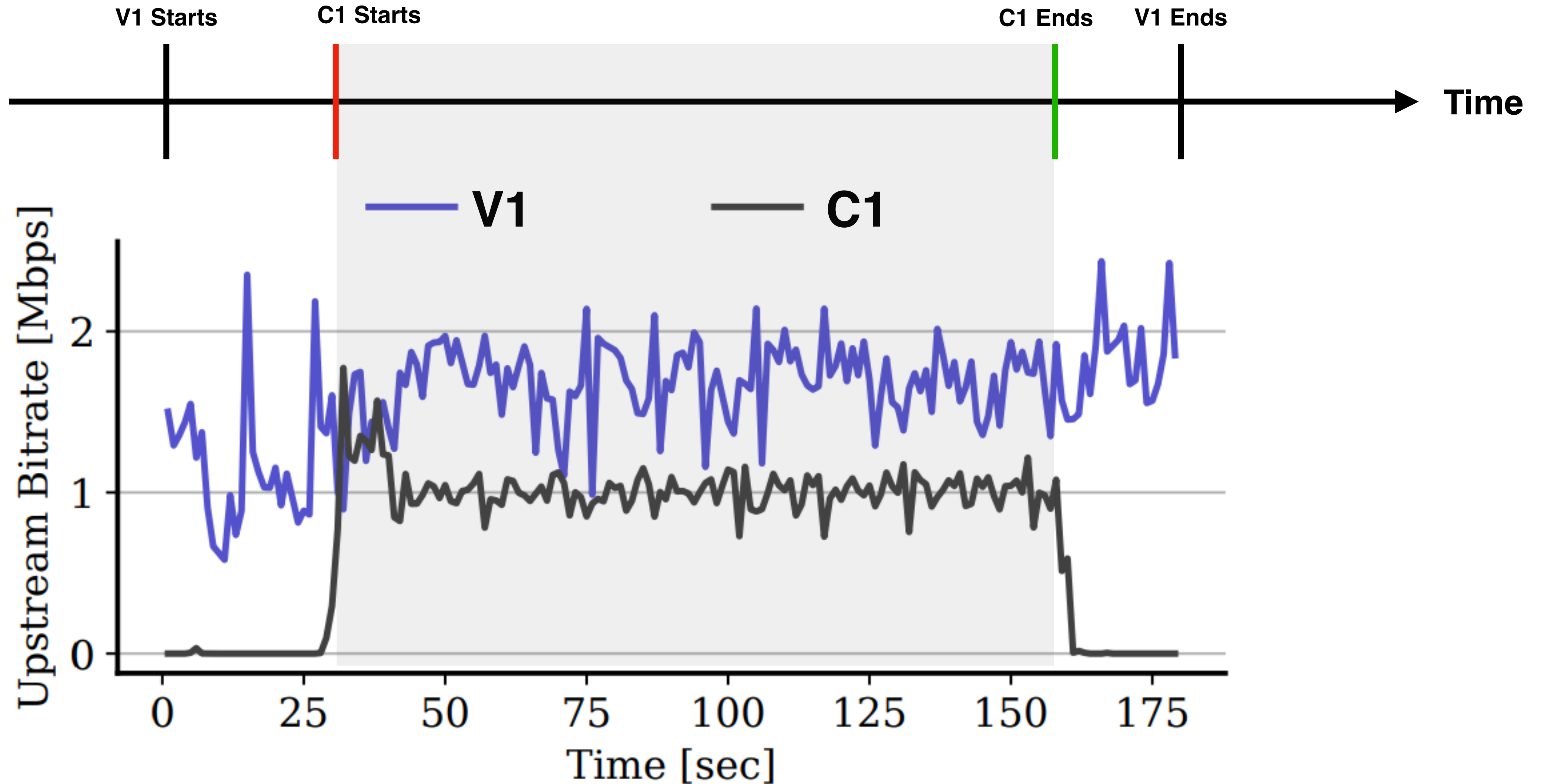
- Multiple people on separate video calls
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Competition Timeline

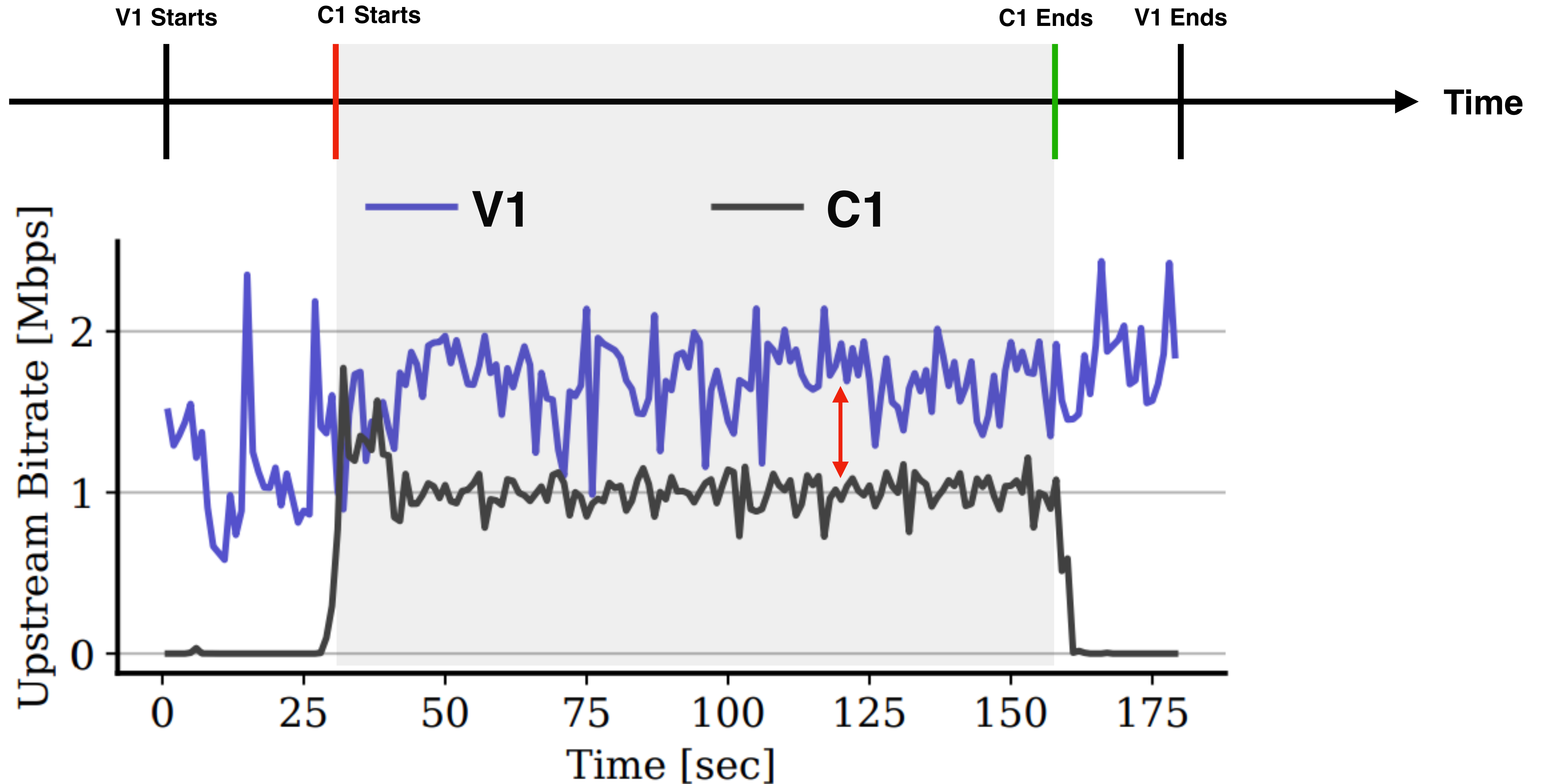


VCAs are not always fair with themselves



Teams vs. Teams utilization on a 3 Mbps uplink

VCAs are not always fair with themselves



Teams vs. Teams utilization on a 3 Mbps uplink

Different ways to use VCAs

Consumption

VCAs have low utilization

Interruption

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Competition

Takeaway: VCAs are not always fair
with themselves

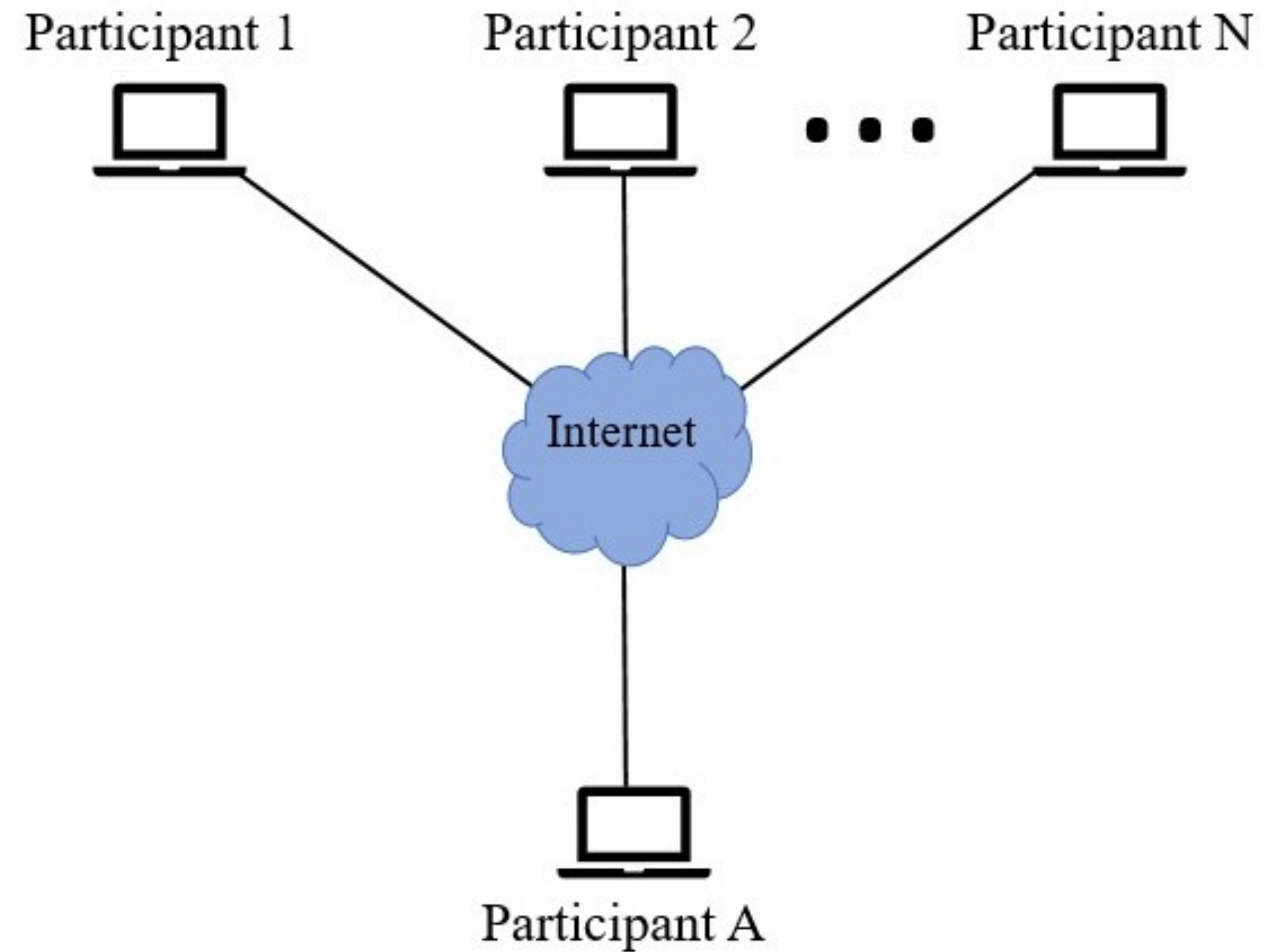
Modality

Setup

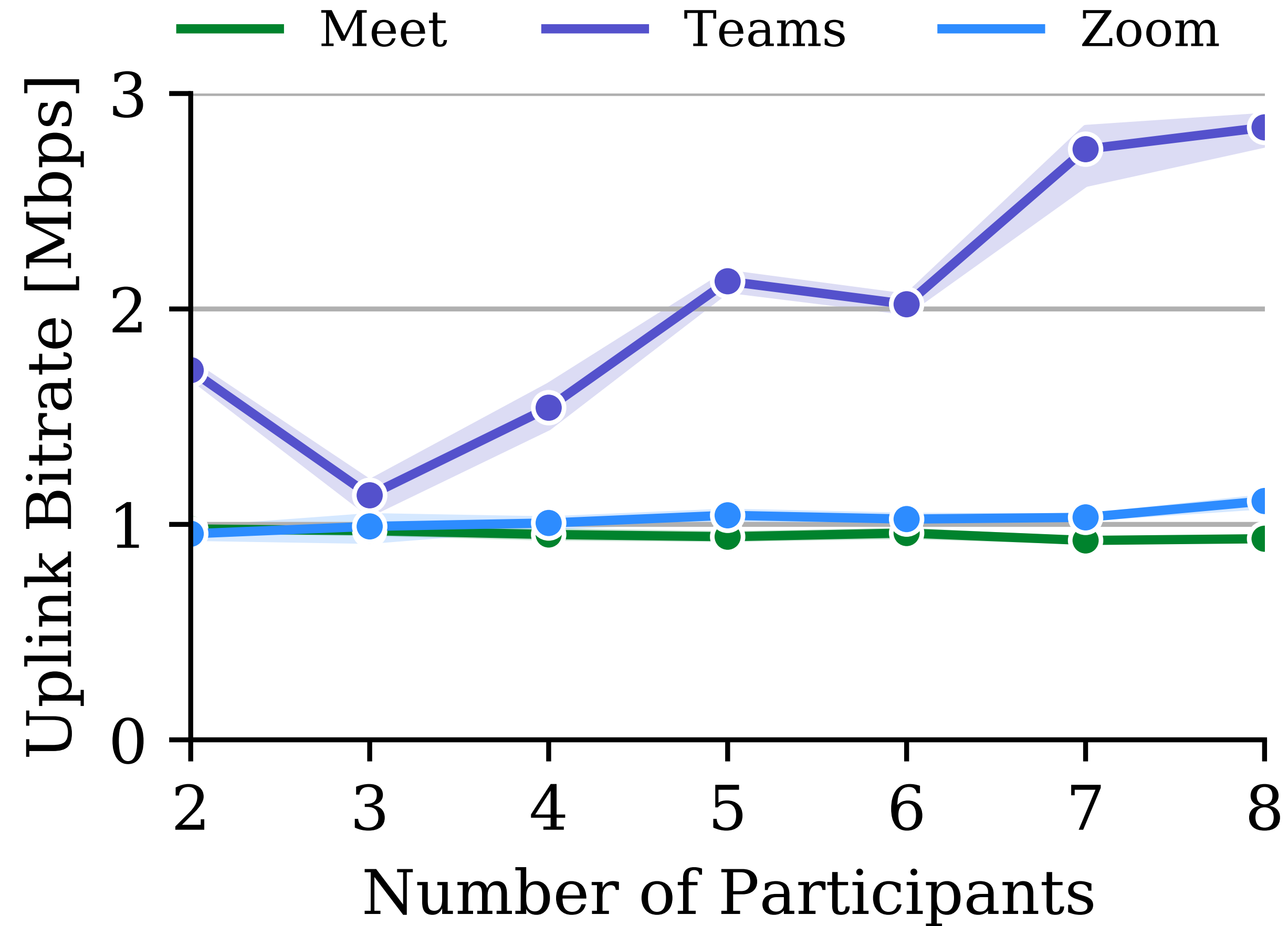
- **Modalities: (1) Number of participants and (2) Viewing mode (speaker vs. gallery)**

Setup

- **Modalities:** (1) Number of participants and (2) Viewing mode (speaker vs. gallery)



Other participants affect your utilization



User A's utilization when all other participants enlarge User A's video

Consumption

VCAs have low utilization

Conclusion

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Modality

Other people's viewing mode can affect utilization