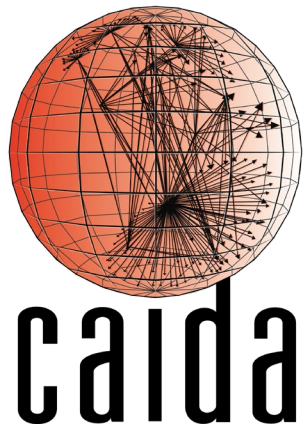# Measuring the impact of COVID-19 on cloud network performance

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Project Goal

- Observe network performance changes of the cloud as the development of COVID-19 pandemic

- One of several NSF-funded projects to study impacts of COVID
  - Title: Measuring Critical Infrastructure for Coronavirus-related Congestion

- CLoud-based Application Speed measurement Platform (CLASP)
  - Measure throughput between cloud VMs and speed test servers
    - Ookla/Comcast/M-Lab speedtest servers in access and other networks
    - Measure in both directions
    - Download/Upload throughput, Latency
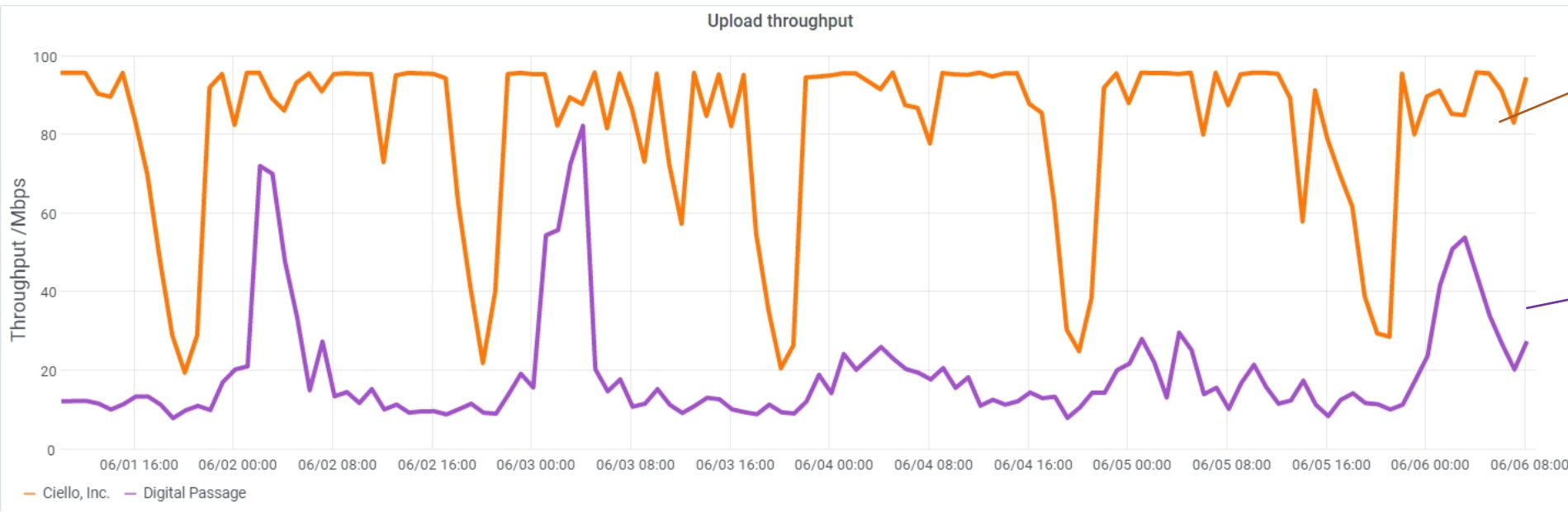
Evidence of ISP → cloud congestion

- Example of diurnal "downstream" ISP → cloud congestion
  - Likely Impact on video conferencing (correlation with QoE is separate project)
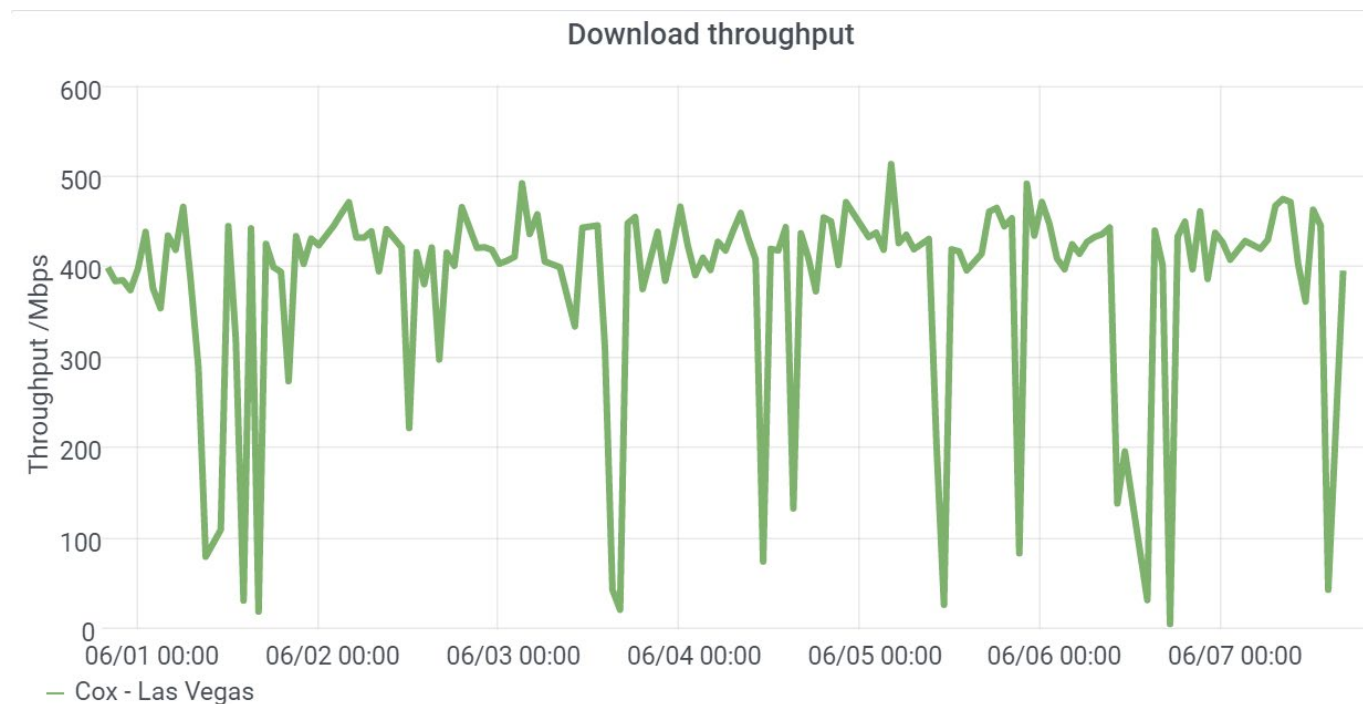
Cox (Las Vegas)→ GCP west 1 region

Cloud → ISP congestion

- Example of diurnal "upload" (cloud → ISP) congestion
  - Impact on video streaming
 - VM was rate-limited to 100Mbps

Upload throughput to Ceillo degraded between 6-9pm (PST)/ 7-10(MDT)

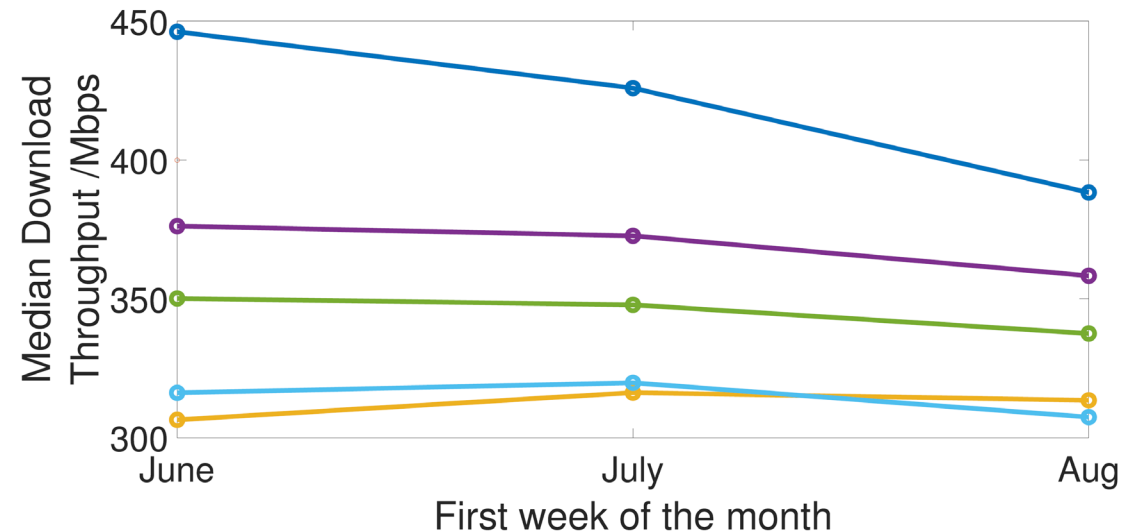Upload throughput to Digital Passage was persistently low

AWS N. Cal region → Ciello (Regional ISP in Colorado)
Digital Passage (Regional ISP in Texas)

Observed Performance Drops (access ISPs)

- Decreasing throughput (ISPs→Cloud) trends in some cloud regions
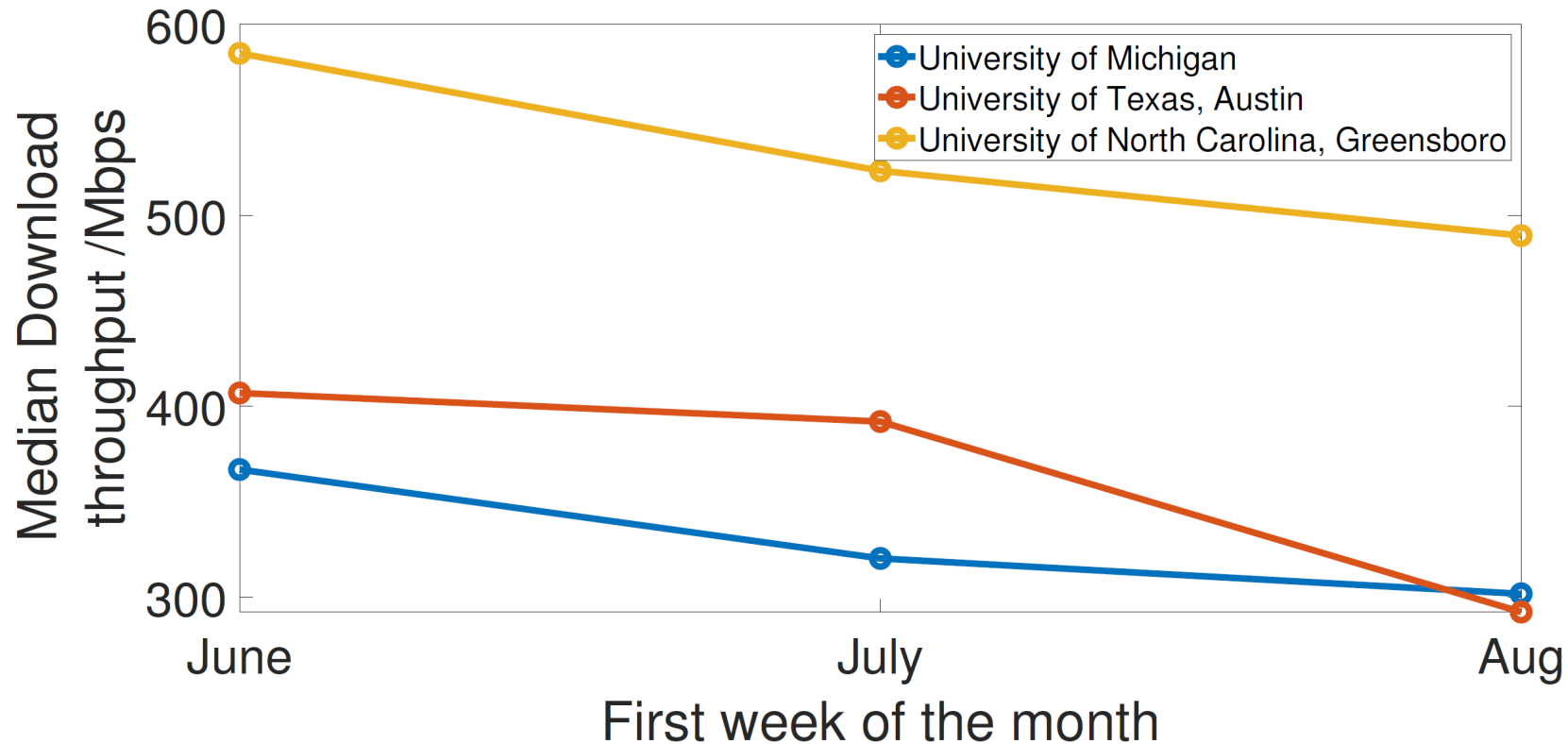- Note: have not looked at full year of data, possible seasonal variation!
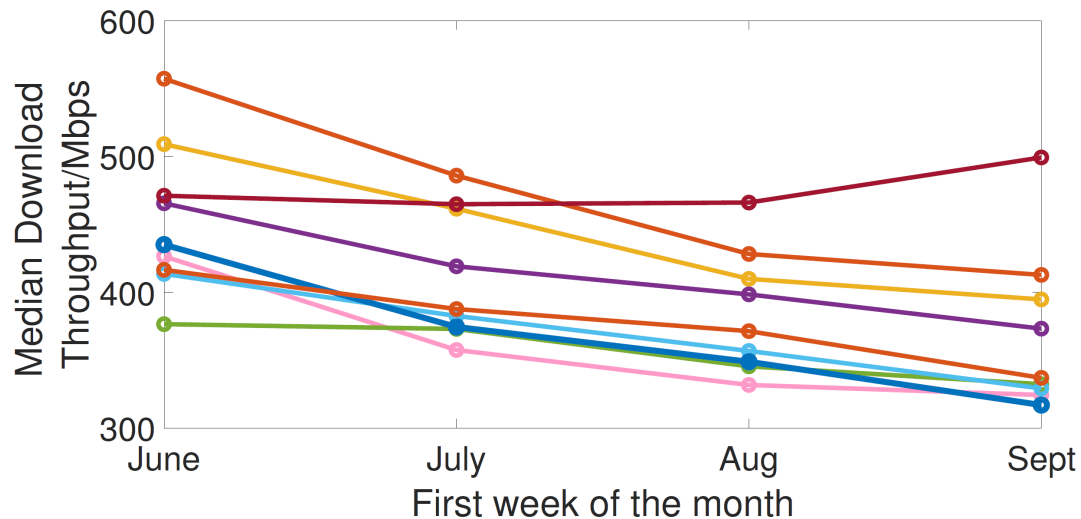
Spectrum → Azure Central 1 region

Comcast → AWS Ohio region

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Observed Performance Drops (edu)

- Decreasing throughput (edu's→Cloud) trends in some regions
  - Higher cloud usage for distance learning?

First week of the month

Educational networks → GCP East 1

Summary

- CLASP measurements revealed
  - Evidence of end-to-end throughput degradation across some paths
  - Downtrends in throughput during post-lockdown period
- Currently analyzing 6 months (May to mid-Oct)of data
  - Will make data publicly available. https://webspeedtest.caida.org
- Next steps
  - Coupling topology measurements and interconnection inferences
  - More sophisticated and efficient measurements of throughput