Internet Path Transparency Measurements using RIPE Atlas

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mami

measurement and architecture for a middleboxed internet

measurement | architecture | experimentation

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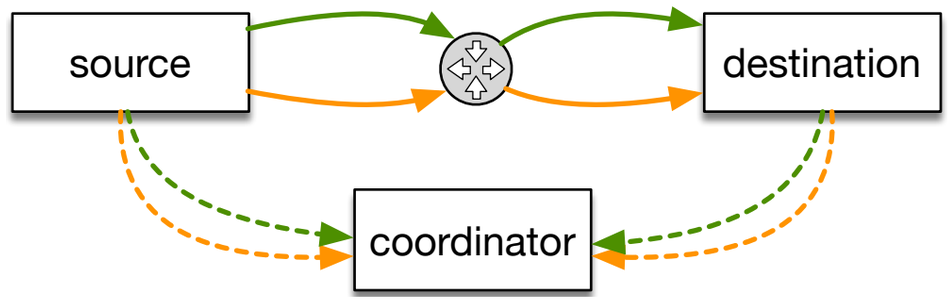
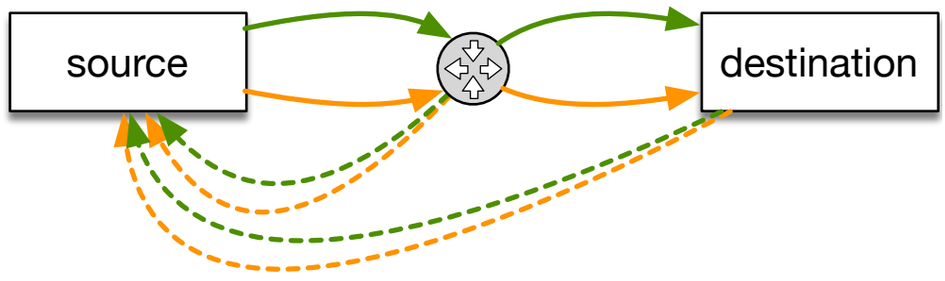
“Can we run the Internet over UDP?”

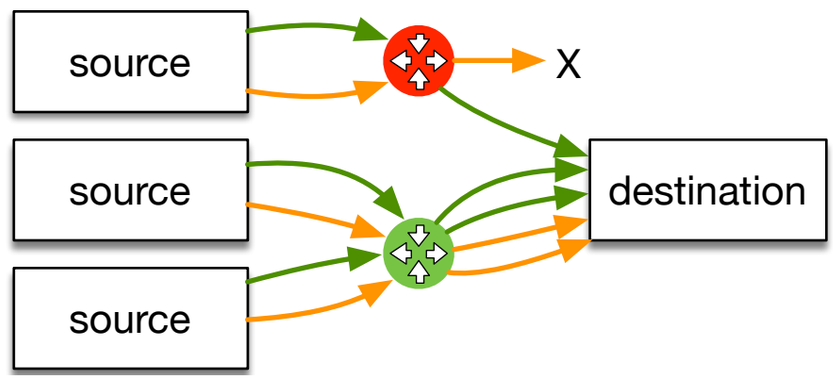
- UDP encapsulation attractive for new transport protocols
  - (mostly) NAT- and middlebox-compatible header
  - wide availability of APIs in userland
- Lots of work already going on in the area:
  - WebRTC data channel: SCTP/DTLS/UDP
  - QUIC: Google’s new HTTP/2 new transport over UDP
  - SPUD: universal shim layer for explicit path signaling
- ***Is this safe?***
  - Widespread operational practice may hinder UDP

Background: Active Measurement of Path Transparency

- Basic methodology: throw a bunch of packets with certain properties at the Internet, and see what happens.
- Ideal: two-ended A/B testing
- Scalable: one-ended A/B testing
- Comparison with topology to isolate on-path vs near-endpoint impairments

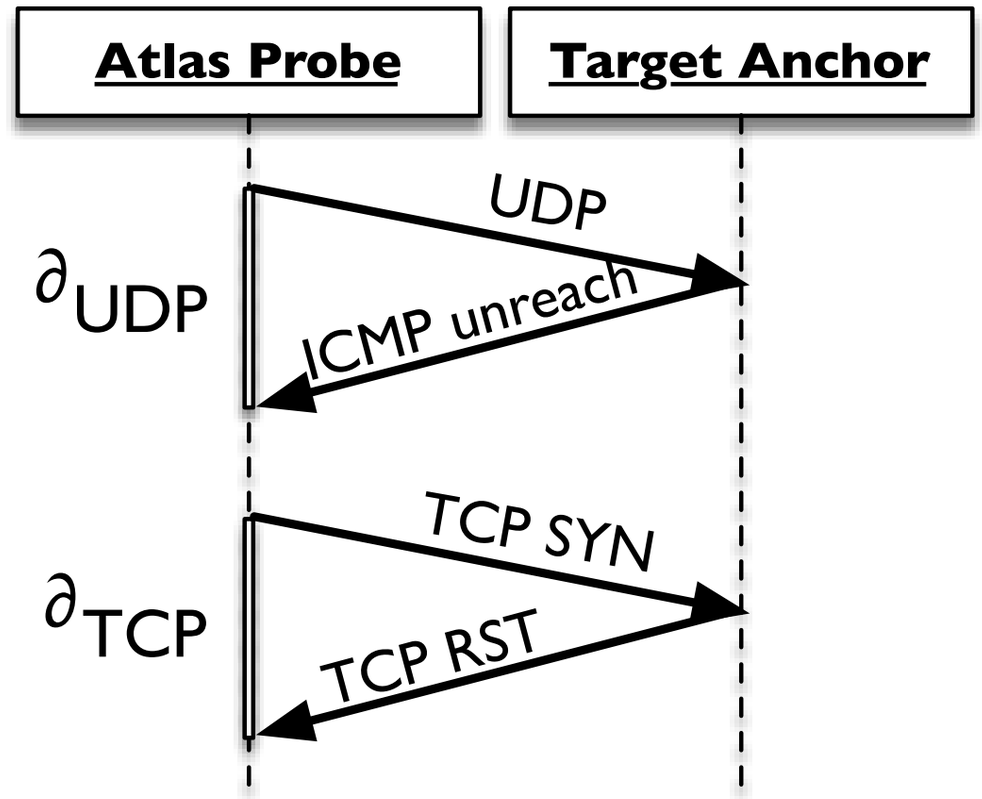




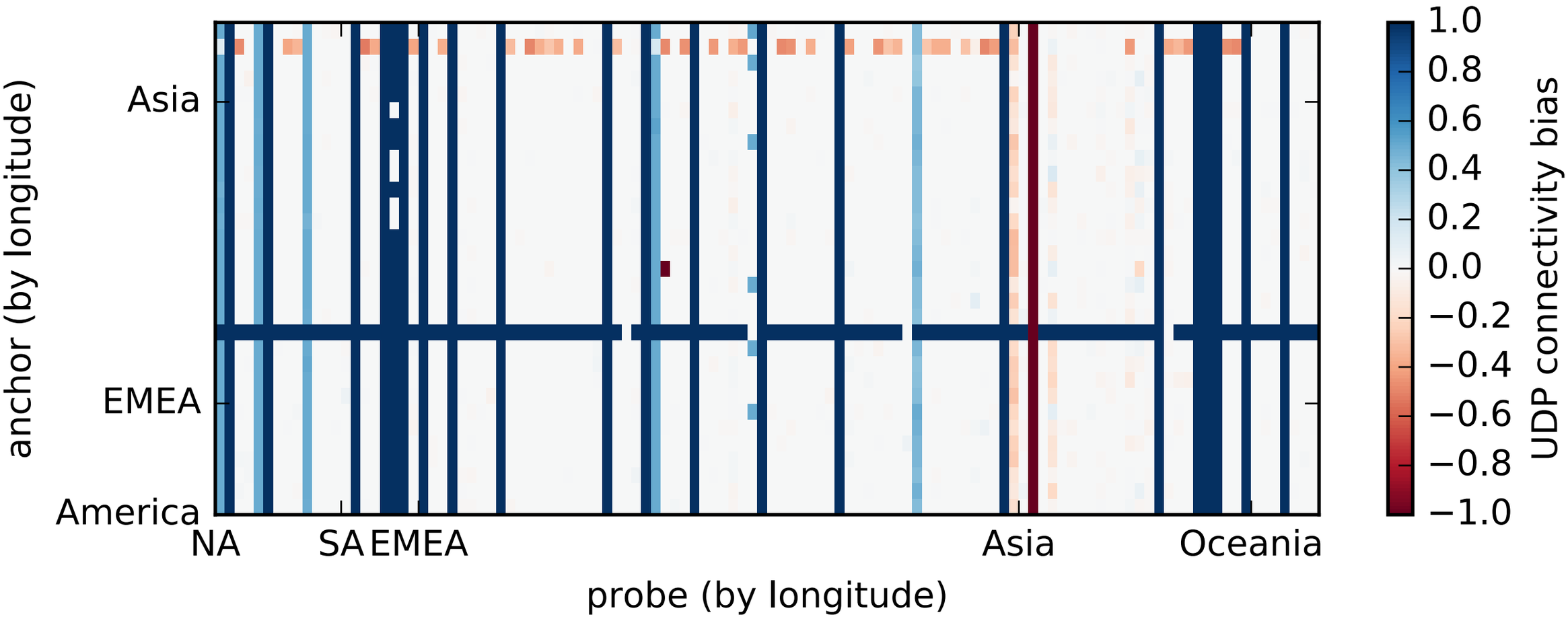


RIPE Atlas to the rescue

- Atlas does not allow arbitrary TCP/UDP packet injection…
- …but traceroute uses ICMP, TCP, or UDP forward packets
  - can measure basic connectivity and first-packet latency
- Many-to-many measurements: isolate path- from access-impairment
- Many-to-one measurements: find probes on UDP-blocking networks
- Not perfect, but better than nothing

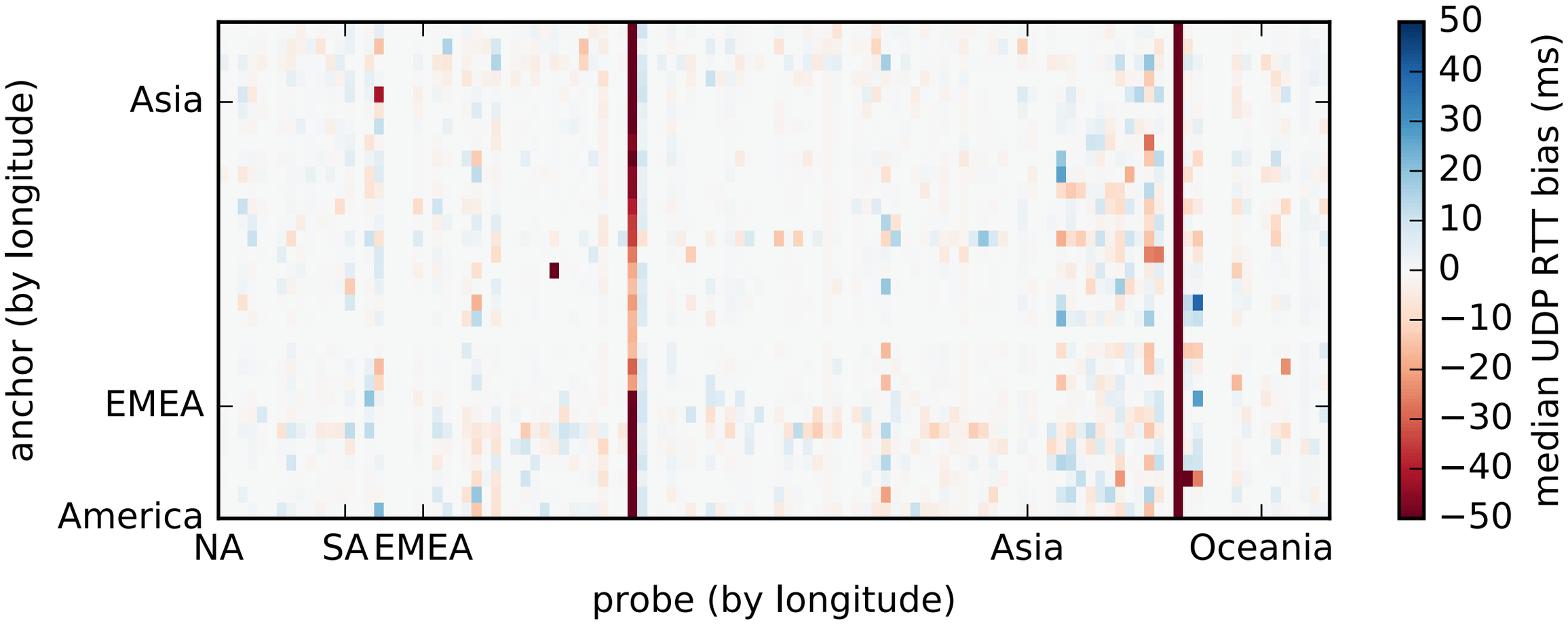


TCP appears more impaired than UDP



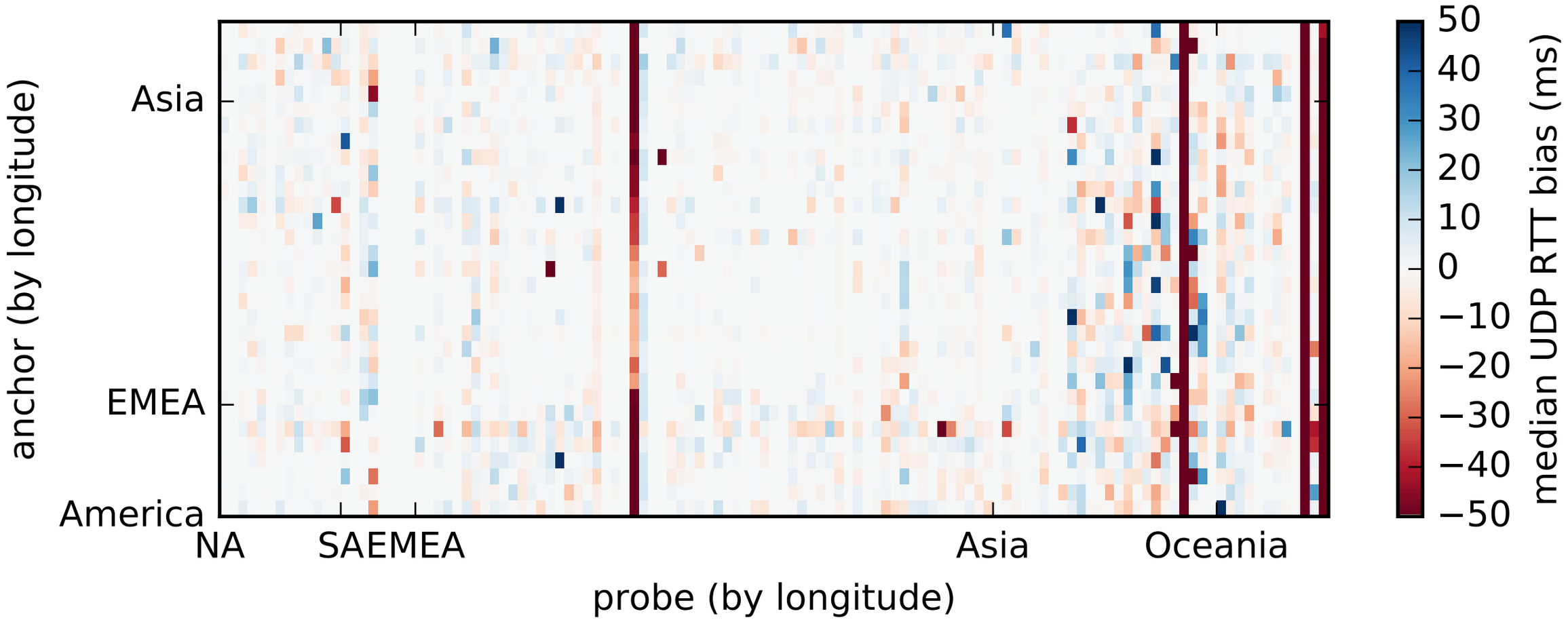
Connectivity, UDP/33435 vs TCP/33435, <= 19 trials, 128 probes to 32 anchors
September 2015

RTT bias mostly probe-dependent



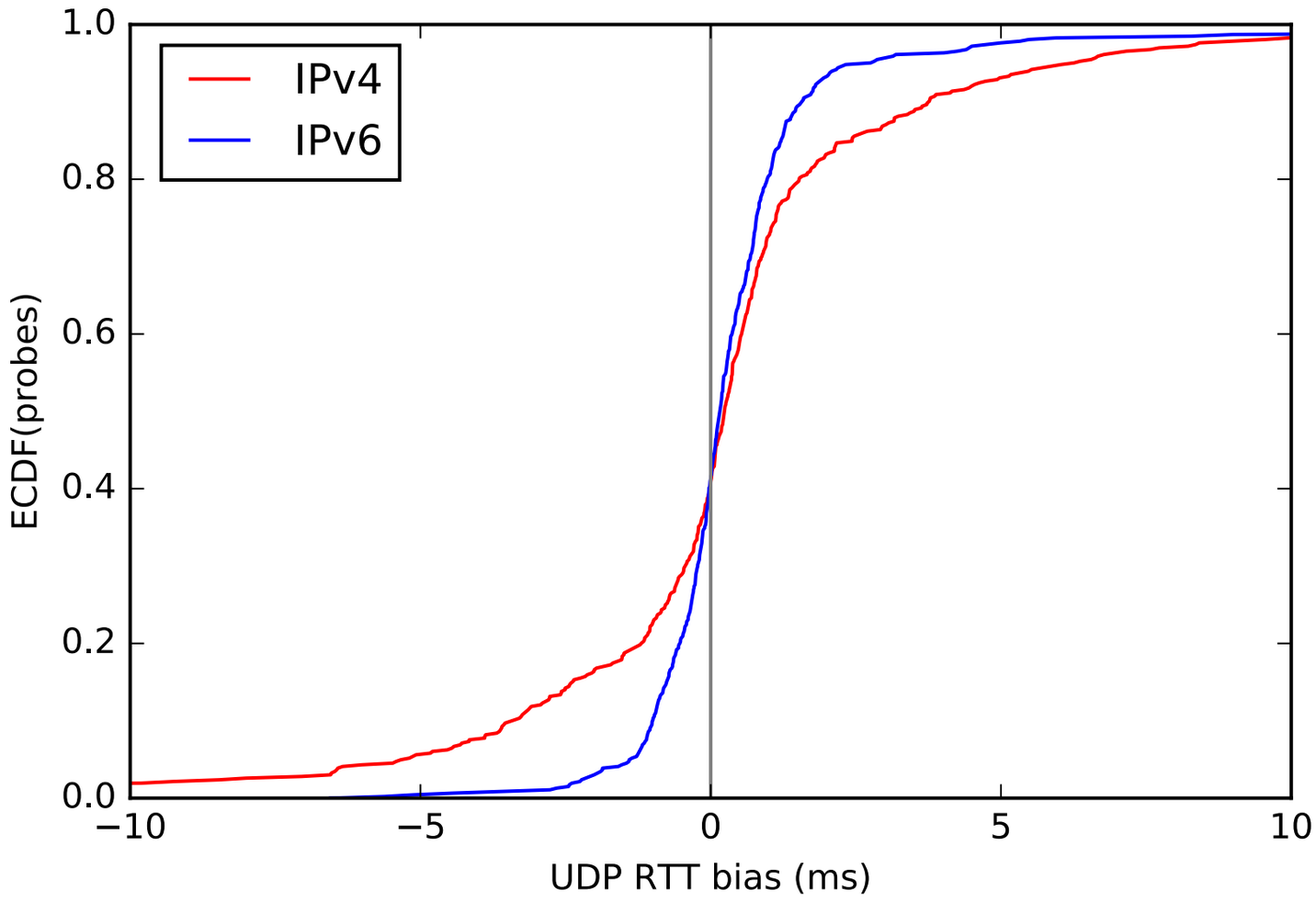
Median RTT bias, UDP/33435 vs TCP/33435, <= 19 trials, 128 probes to 32 anchors
September 2015

Much more interference with TCP/80



Median RTT bias, UDP/33435 vs TCP/80, <= 19 trials, 128 probes to 32 anchors
September 2015

RTT bias spread tighter on IPv6 than IPv4



Median RTT bias, UDP/33435 vs TCP/33435, 464 probes to APNIC anchor
Feburary 2016

…not so fast: UDP blocked on one in thirty Atlas probe networks

- Methodology: find all probes
  - that tried to do at least 9 UDP traceroutes in 2015
  - to targets that were up at the time
  - and that showed connectivity via TCP or ICMP
- **2240** probes meet this criterion
  - How many of these never succeeded via UDP?
- **82** probes, largely on networks with marginal connectivity

- Running the Internet over UDP needs a backup for this 3.6%
  - (In line with a 6-7% “QUIC doesn’t work” reported in HOPSRG)