

# Can we run the Internet over UDP?

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Measurement and Analysis for Protocols (MAP) proposed RG

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measurement and architecture for a middleboxed internet

**measurement**

**architecture**

**experimentation**



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**Yes.**

**Yes.**  
(Mostly. Probably. Carefully.)



# Why would we want to?

- UDP encapsulation attractive for new transport protocols
  - (mostly) NAT- and middlebox-compatible header
  - wide availability of APIs in userland
  - few other real options for evolving the stack
- Lots of current work in the IETF
  - WebRTC (draft-ietf-rtcweb-data-channel)
  - QUIC (draft-tsvwg-quic-protocol)
  - SPUD (draft-trammell-spud-req)
- Many other examples
  - RTP, uTP, basically every gaming application-layer protocol



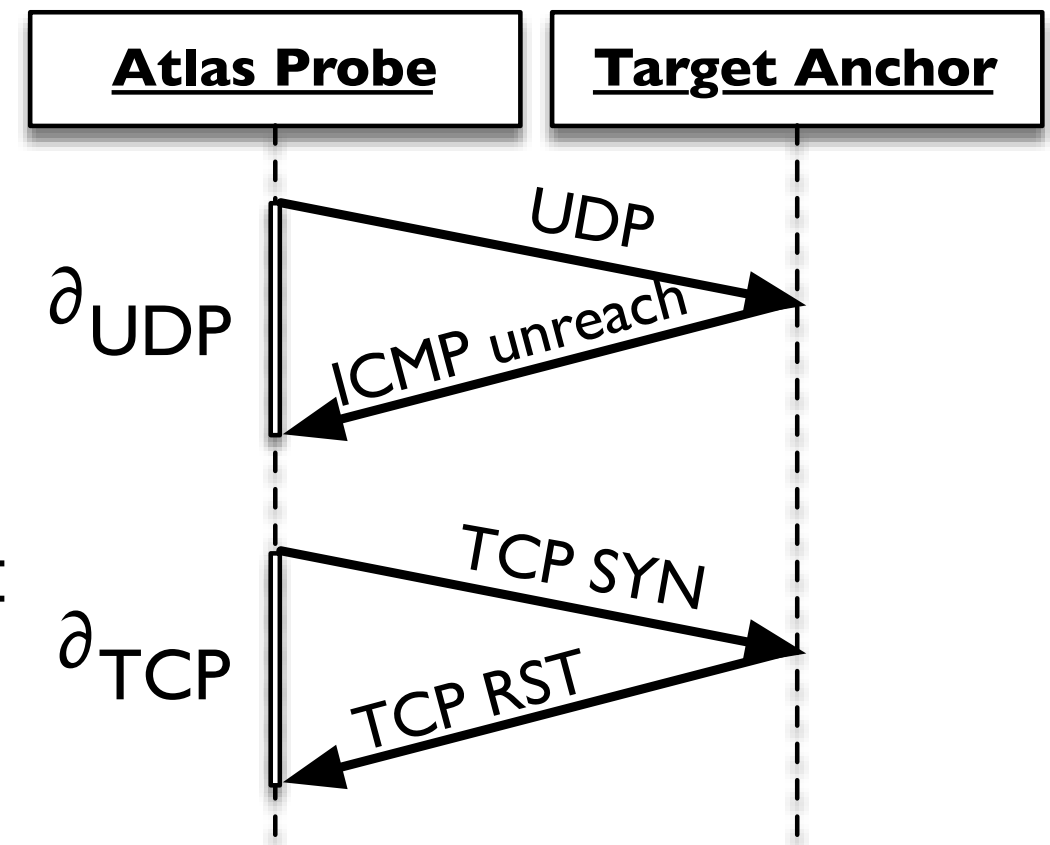
# Reframing the question

- What kinds of different treatment can we expect based *just* on the presence of a UDP header?
  - Connectivity risk (firewall rules, etc.)
  - Differential latency and traffic shaping
  - Reordering, MTU, etc.
- Today's answers: RIPE Atlas measurements
  - Snapshot of work in progress
  - A few more data points to add to others:  
"works fine in (much) more than 90% of cases"



# Using Atlas for TCP/UDP connectivity testing

- No arbitrary TCP/UDP packets...
- ...but traceroute uses ICMP, TCP, or UDP on the forward path
  - 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





# How many networks block UDP?

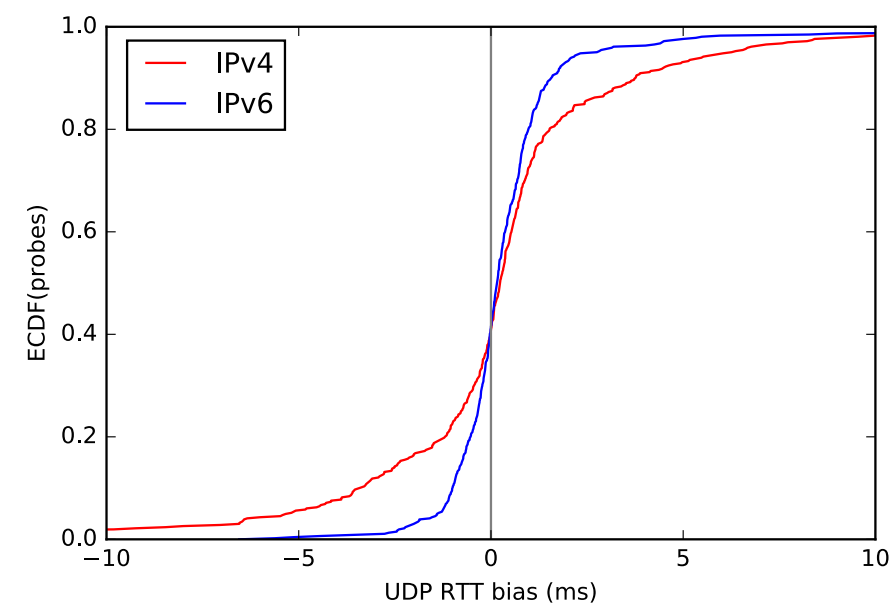
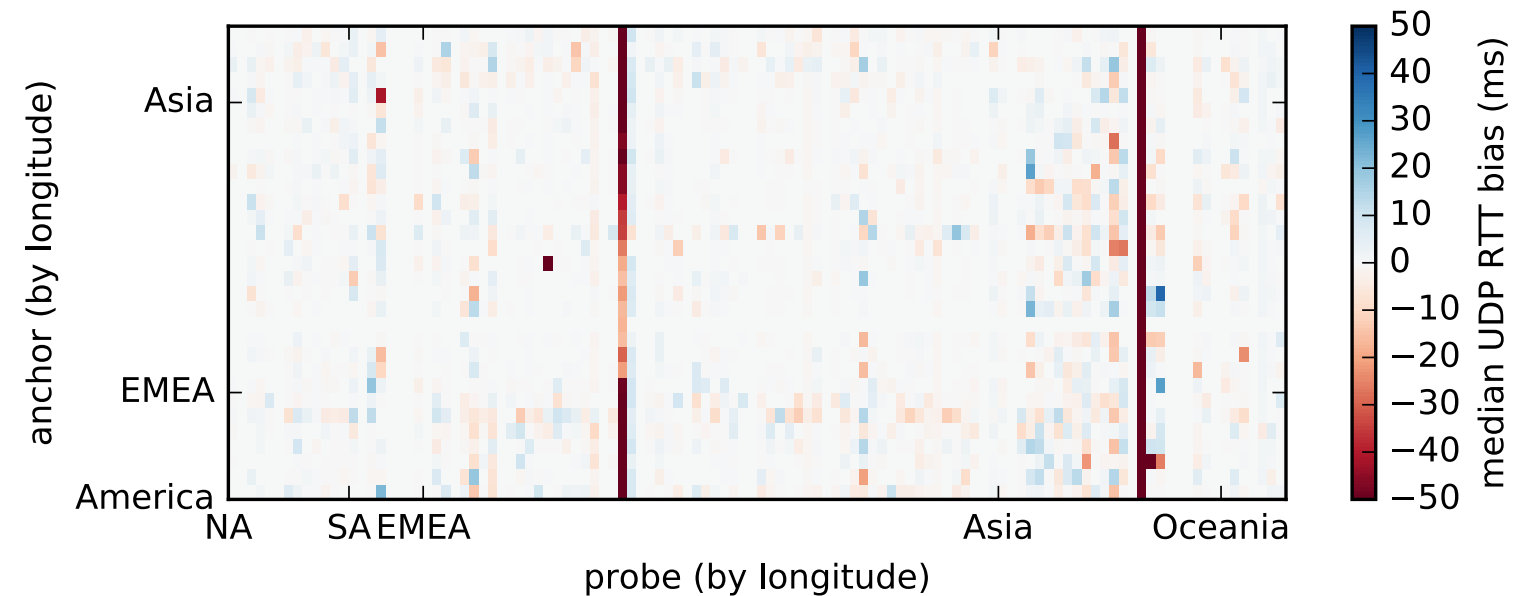
- **2240** probes did UDP traceroutes\* in 2015
- **82** (3.6%) never succeeded using UDP: probable blocking
  - Many of these on networks with marginal connectivity
- Selection bias: Atlas probe hosts tend to be network geeks or network geek adjacent.
  - Enterprise networks under-represented
  - Few mobile/wireless-connected probes

\* more than 9 samples to targets that were up, excluding non-ICMP/non-TCP connected probes.



# How much slower is UDP?

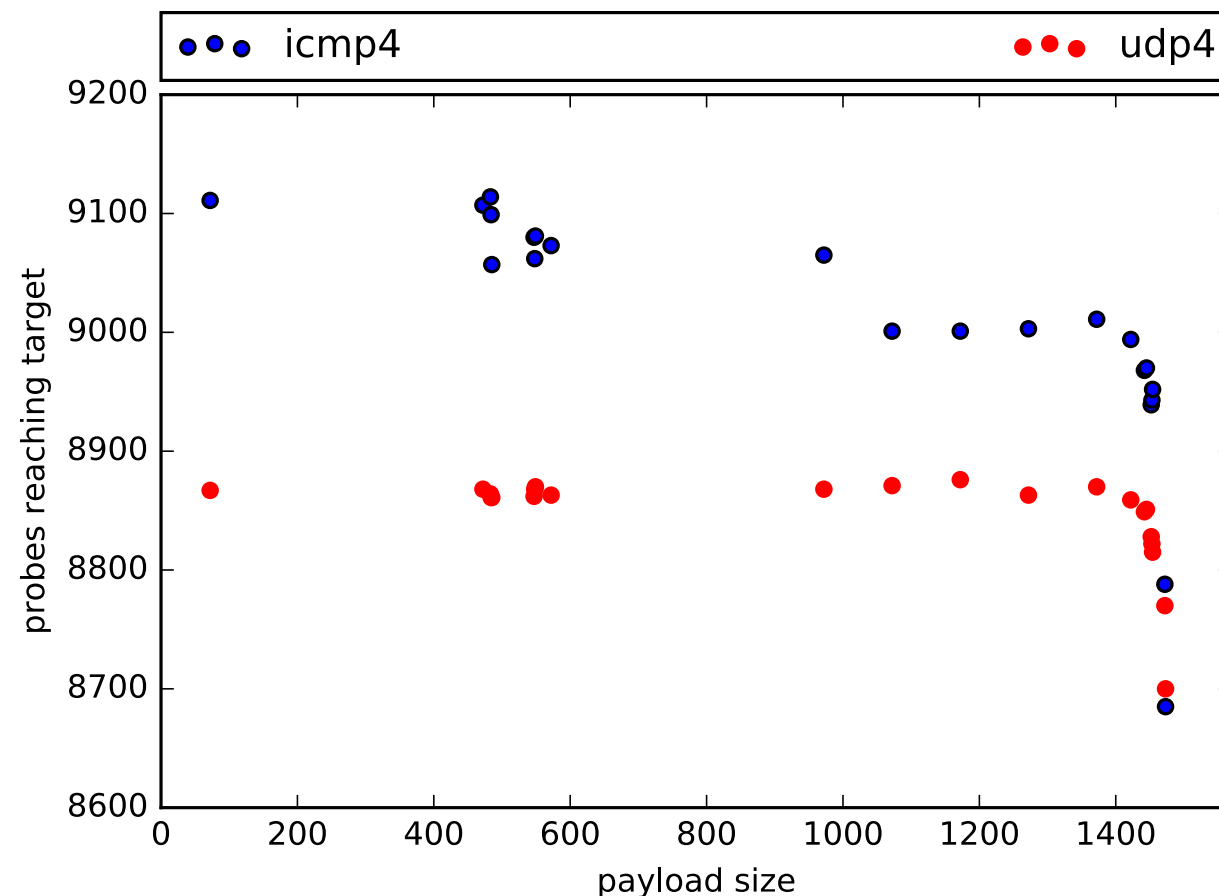
- No systematic first-packet penalty
- Some probes slower
  - 128 probes to 32 anchors, Sep '15
- IPv6 less variable
  - 461 probes to APNIC, Feb '16
- Widespread meddling with TCP (esp. 80)







# Are larger UDP packets blocked?



- Apparently not
  - one-off measurement, Mar '16, 9396 probes to one anchor
- No additional blocking after 512, 1024 for IPv4
- (In this short campaign, **296 of 9262** probes (3.2%) may block UDP)



# Can we run the internet over UDP?

- Two more datapoints: 82/2240 (3.6%) and 296/9262 (3.2%) of Atlas probes may to be on UDP-blocked networks.
- No latency difference or protocol-dependent MTU
- Works on twenty-nine access networks in thirty
  - It's easy to tell when you're on the other one:  
*trivial fallback mechanisms are useful for UDP encapsulations*
- Work in progress: full-mesh measurements for loss rates and achievable bandwidth comparison.
- Watch <https://mami-project.eu> for more