The Current State of QUIC Deployments and Used Libraries

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GMI-AIMS-5

Motivation

This is an update to results published in
"QUIC Hunter: Finding QUIC Deployments and Identifying Server Libraries Across the Internet"

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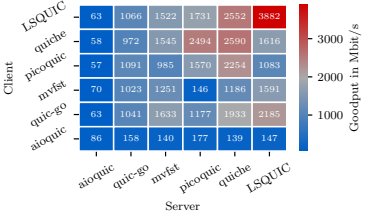
- More than 20 implementations exist
- They follow the same standard

But differences are visible impacting the effectiveness of scans and research

- *e.g.*, Is the observed performance due to the network or the used implementation?

Performance Differences[1]:



Different Features[2]:

	aioquic	Google Q.	LSQUIC	mvfst
Flow Control category	2	1	1	1
Retransmission approach	2	1	2	3
DATA frame size	large	medium	small	large

[1] B. Jaeger, et al., "QUIC on the Highway: Evaluating Performance on High-Rate Links," IFIP Networking 2023

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Which libraries are actually used?

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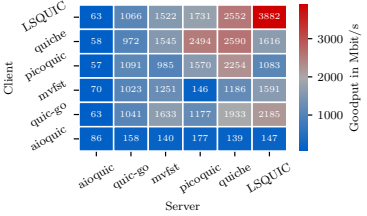

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- QUIC defines a new TLS extension
  - Implemented within the QUIC library
  - Sent in a library specific order
- Conduct a complete QUIC handshake

→ Evaluate the order of parameters

↯ Requires a successful handshake

Impl.	Ext. Order	TP Order
LSQUIC	51-43	4-6-7-8-0-f-2
HAProxy	43-51	0-2-f-3-4-6-7-8
mvfst	43-51	0-6-7-4-8-a-3-2-f

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(ii) Error messages

- QUIC specifies error codes
  - Can be extended with error messages
  - Messages contain a unique text
- Trigger an error with an *invalid* ALPN value

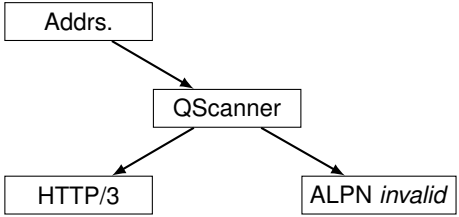
→ Map error messages to individual libraries

↯ Only some libraries send an error message

Impl.	Error Message
Quinn	peer doesn't support any known
aioquic	No common ALPN protocols
NGINX	handshake failed

What is the Current State of QUIC Deployments?

	Targets	
	2023	2024



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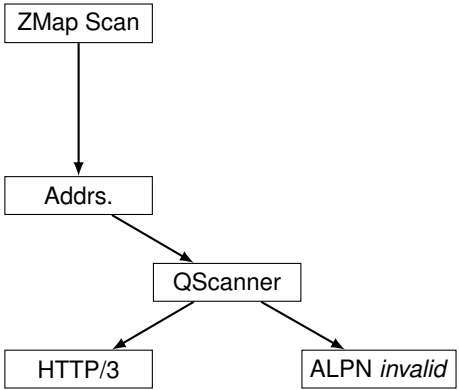

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SNI	601.9 k	834.7 k

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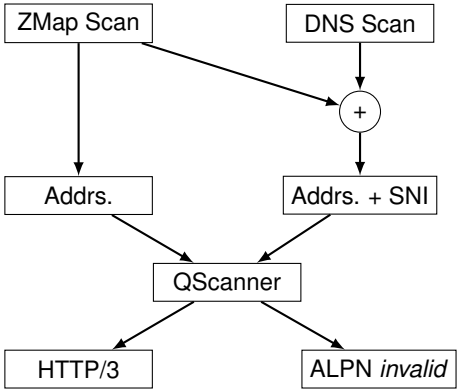
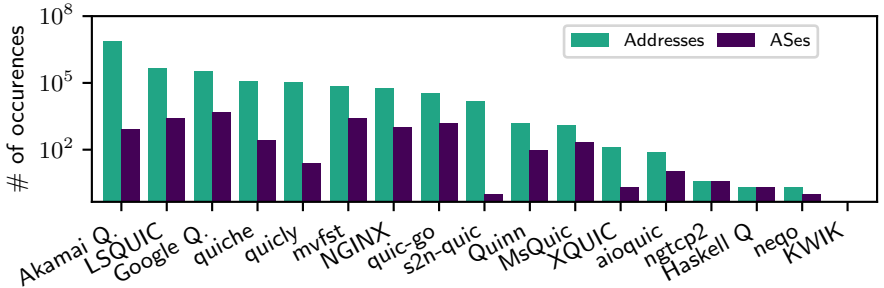
- DNS scans
  - ~700 M domains
  - Single vantage point
  - A/AAAA and HTTPS resource records



Which Libraries Are Used? - 2023



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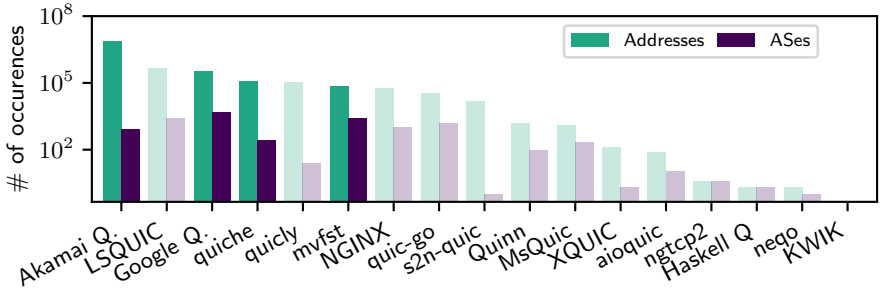

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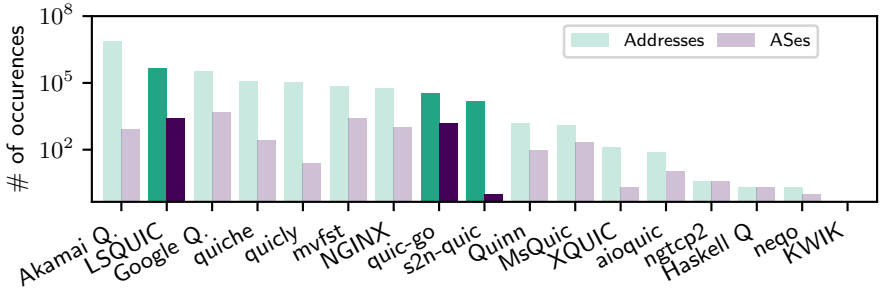

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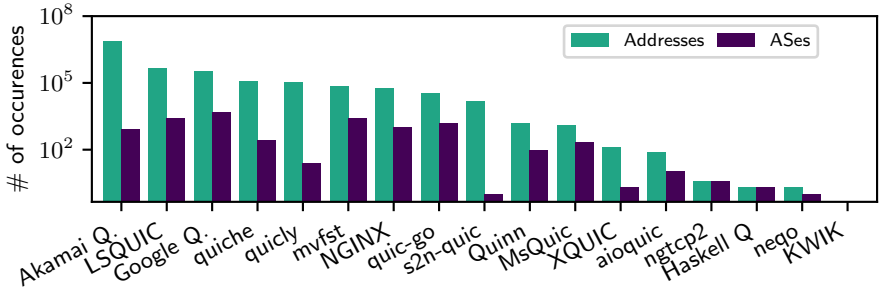

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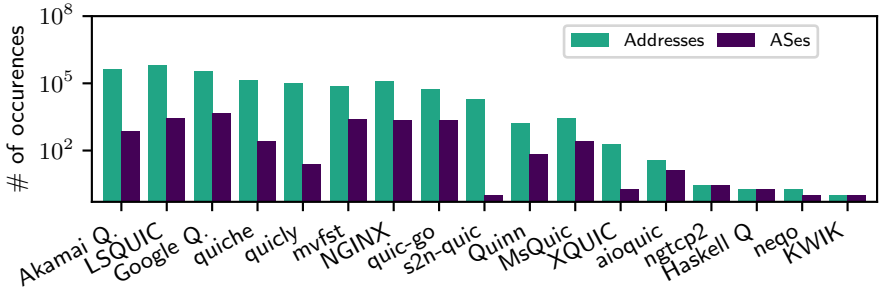

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Google Q.	327.2 k	4736	352.4 k	4683
quiche	122.2 k	281	134.8 k	269
mvfst	72.9 k	2584	77.3 k	2622

- The hyper giants:
  - Mostly use the libraries themselves
  - Most deployments are off-nets/load balancers
  - Slight increase in deployments
  - Similar configurations, *e.g.*, transport parameters

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LSQUIC	486.2 k	2671	646.7 k	2944
NGINX	55.9 k	1070	123.8 k	2264
quic-go	35.3 k	1644	58.2 k	2377

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  - Most deployments are off-nets/load balancers
  - Slight increase in deployments
  - Similar configurations, *e.g.*, transport parameters
- Web servers
  - Set up by a variety of users
  - A larger increase visible
  - Higher configuration diversity

Why Did You Listen to This?

We want to scale this and allow distributed measurements.

- We will start a project:
  - to add QUIC and H3 to scamper
  - to allow distributed measurements from ARK
- Can we identify more?
- Can we see regional differences?

It's your chance to dump ideas what you want!