Internet speed test

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RIPE 74

Budapest, Hungary

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NETFLIX

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Who am I?

Sergey Fedorov

Senior Software Engineer

4 years at Netflix

Open Connect monitoring system

QoE/traffic analysis tools

FAST.com

API acceleration using Open Connect

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Who am I?

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VS

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920 Mbps

Compare on SPEEDTEST.NET

POWERED BY NETFLIX

Measurement & Ranking of NETFLIX's streaming application performance across ISPs*

Measurement of the effective speed of ANY user

** The Netflix ISP Speed Index lists the average prime time bitrate for Netflix content streamed to Netflix members during a particular month*

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Goals

Simple UX

Lightweight

Fast and reliable

Device support

Represent real usage scenarios

Why Netflix?

Experience in the field

Up to 35% of Internet traffic

Global infrastructure

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Open Connect Network

OCAs aka **O**pen **C**onnect **A**ppliances

Space/Power optimized

10/40/100 Gb/s interface

FreeBSD

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Gizmodo, "This box can hold an entire Netflix"

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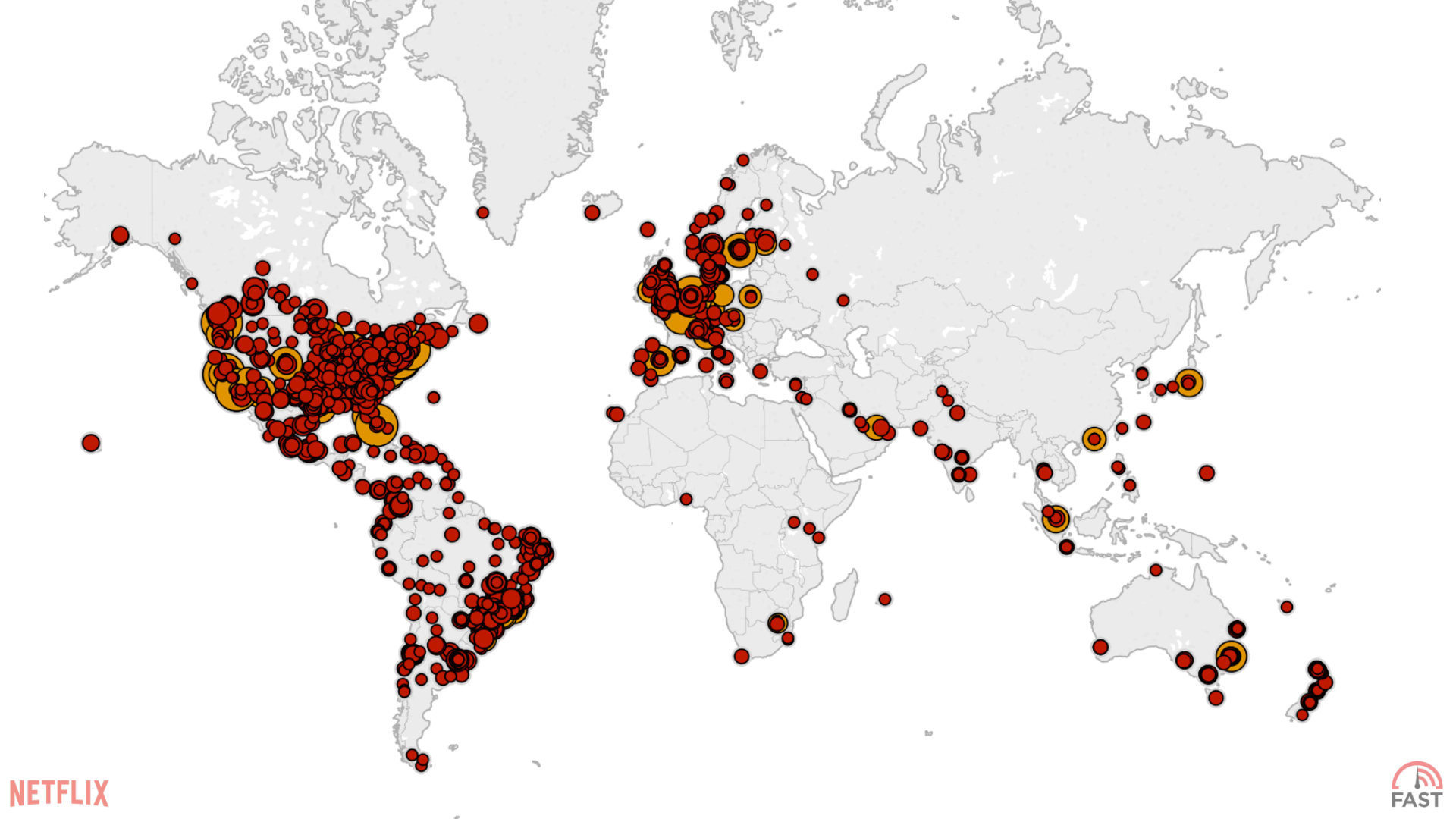
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Network

Internet Exchange

PNI / Transit

ISP embedded

Control Plane

End-user content request router

Steer to an OCA based on:

- client location
- network conditions
- server utilization
- content distribution

The Open Connect Team

Open Connect @RIPE 74

Aaron Klink

Nina Bargisen

Samer Abdel-Hafez

Mike Peterson

Javed Vohra

Nat Morris

Sergey Fedorov

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FAST.com

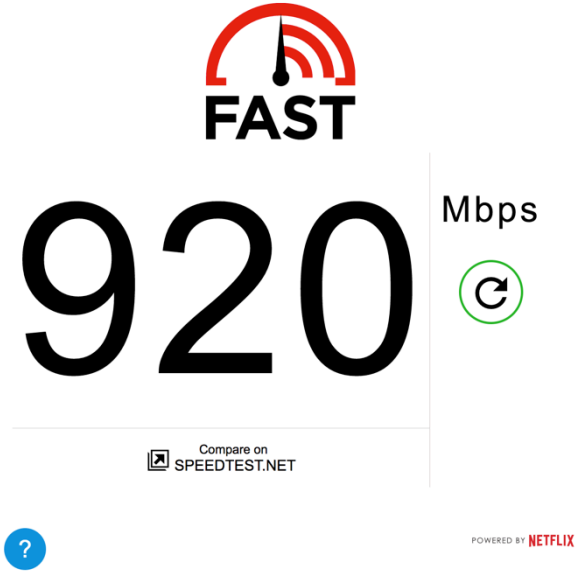
Minimalistic UX

Download speed as most important measure

Auto-start

Wide browsers/device support (tested)

- IE8+, Safari 4+, Firefox 4+, Opera 12+
- iOS 4+, Android 4+
- (Anecdotal) successful measurements from:
  - Cameras
  - eReaders
  - watches



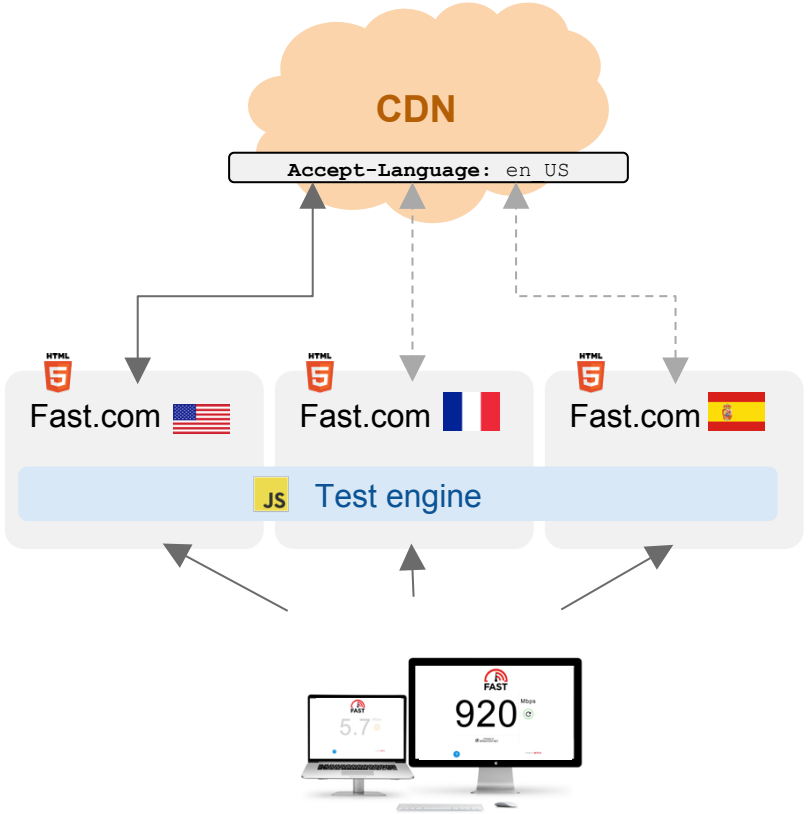
How does **FAST**.com work?

Step 1: Load HTML/JS client

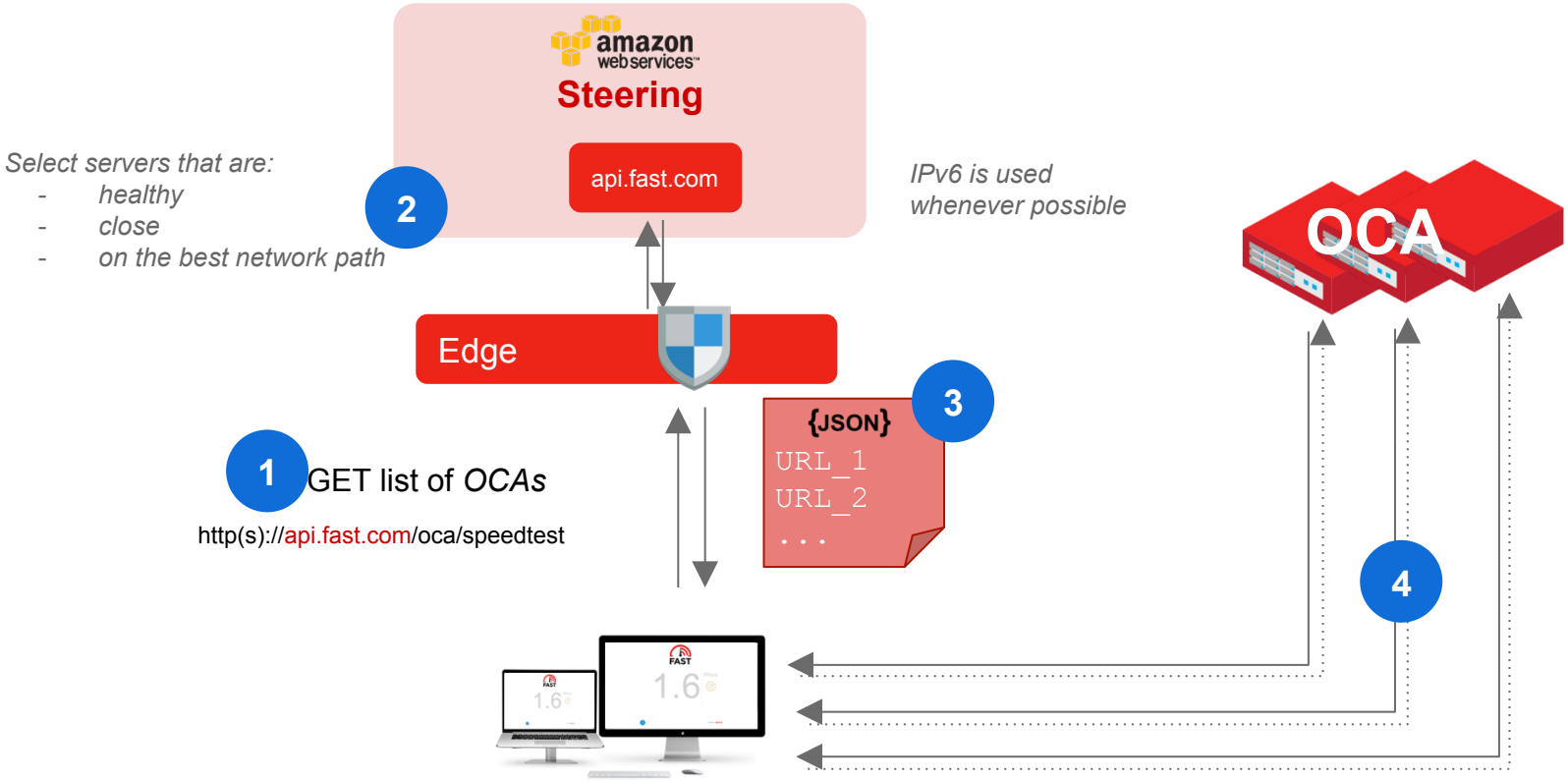
25KB page size

Scalable UI

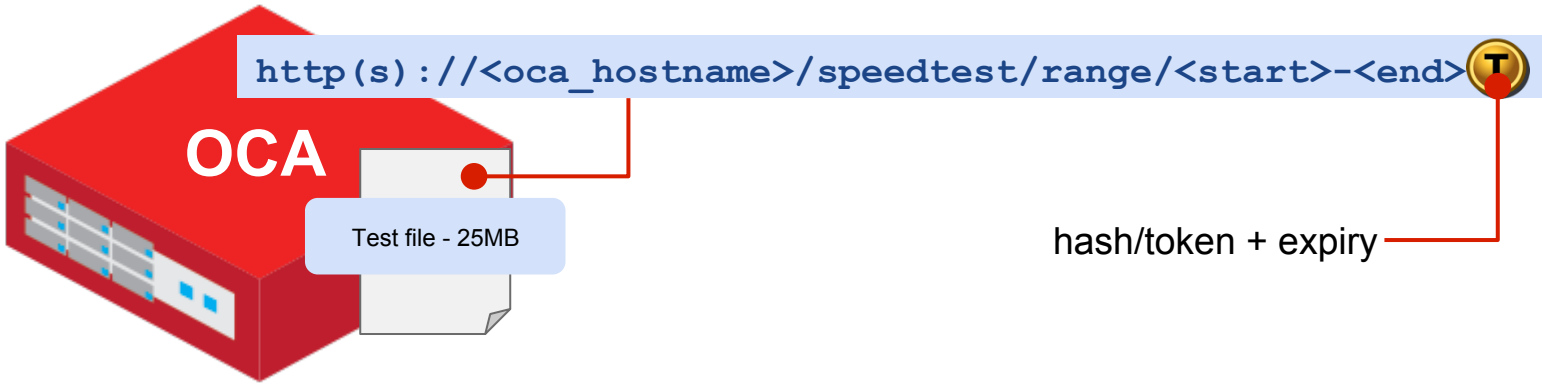
JS/HTML5



Step 2: Get a list of nearby OCAs



Step 3: Construct the OCA url



HTTPS only!

Test client

Clients

Events:
Progress
Result
Connection stats

Commands:
Start
Stop

Engine

Orchestrator
Initializes connectors, schedules downloads

Stopper
Time to stop the test?

Aggregator
Measurements -> speed

Download stats:
bytes
[start, end]

Download request:
url

Connectors

xhr | websockets | OS native | npm

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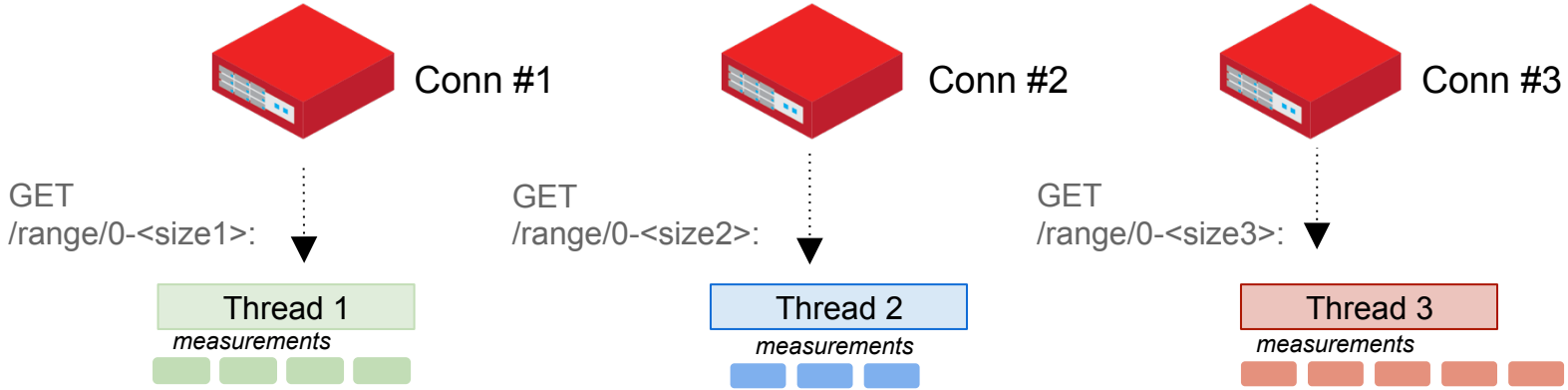
Step 4: Concurrent downloads



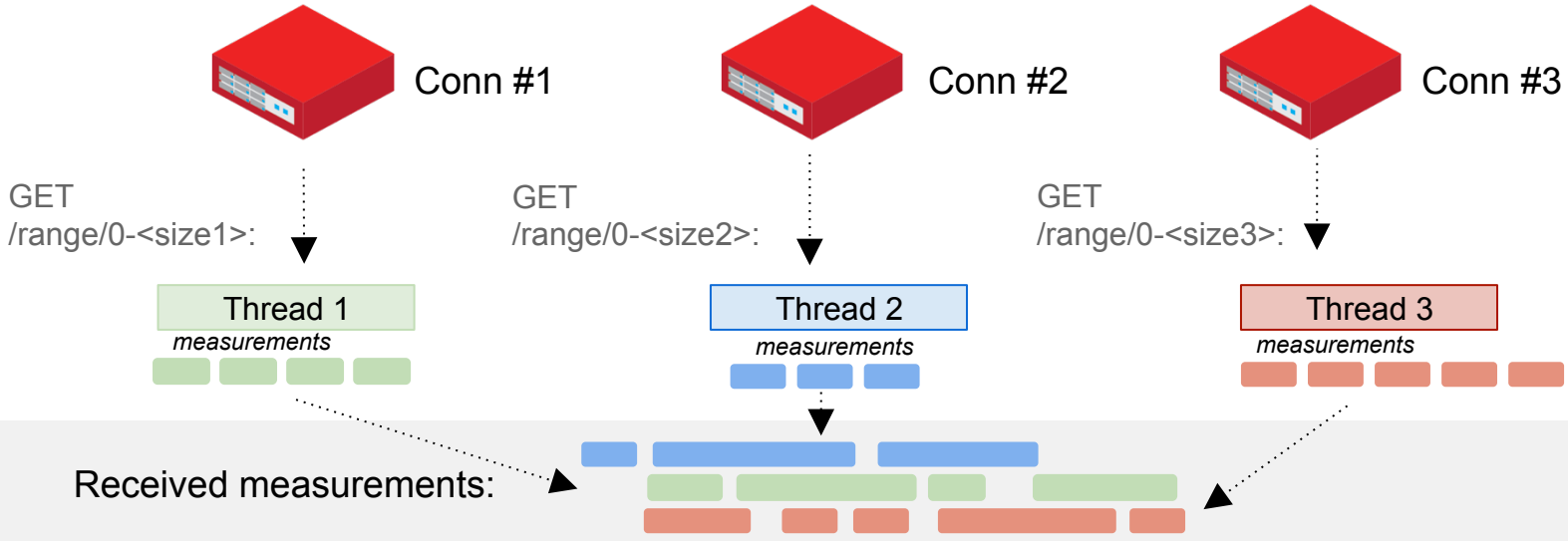
When throughput is low, don't want connections to compete for limited bandwidth

>500Kbps

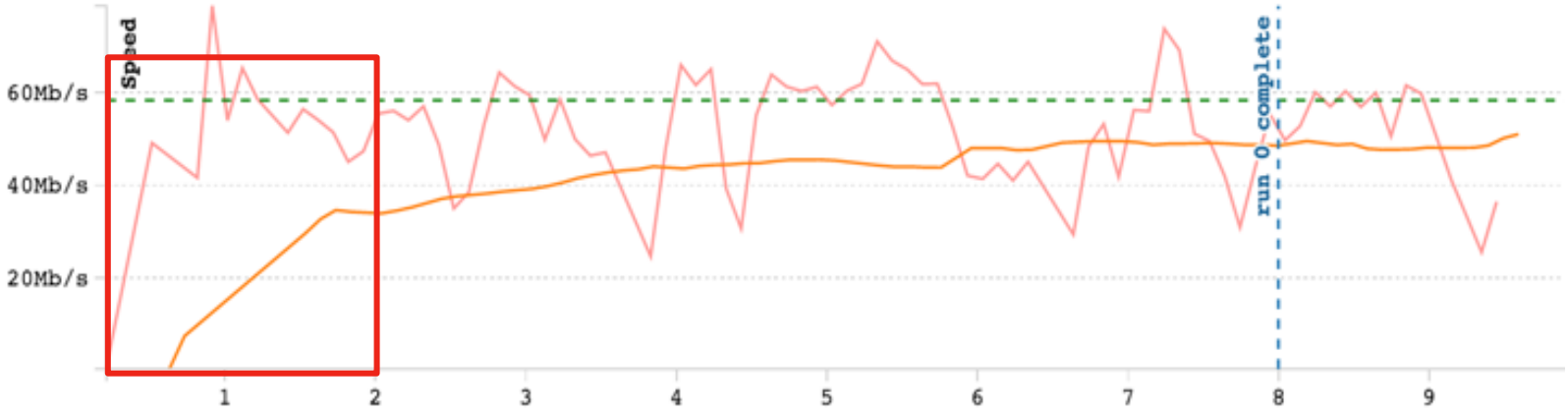
>1Mbps

** Actively experimenting with thresholds and number of connections*

Step 4: Concurrent downloads



How to aggregate results?



Exclude TCP ramp-up

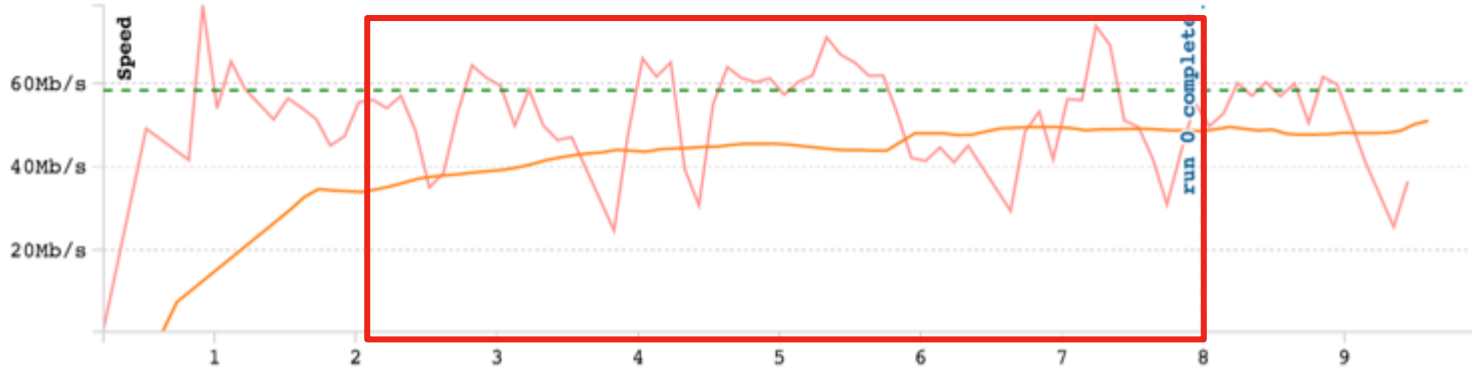
Dynamically define ramp-up period

Show goodput

Reflects real customers experience

Protocol overhead is hard to get right from the browser - more work needed here

How long to run the test?



Past ramp-up:

- compute average speed
- don't exclude any data points

Track how the speed changes

- Compute a delta within sliding window of last measurements
- Stop the test once the delta is within a few %

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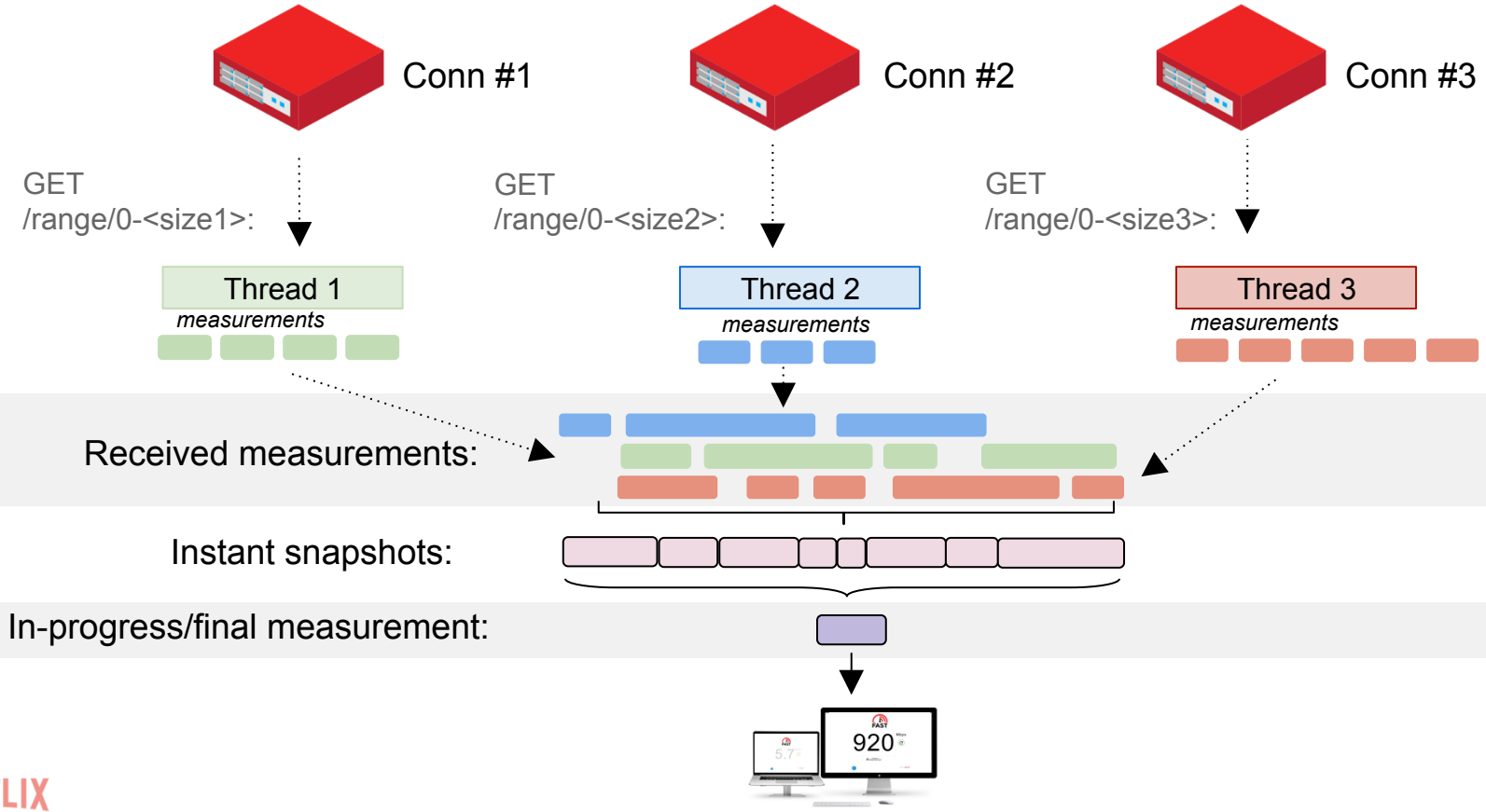
Step 5: Compute speed



Usage

Fastest measured speed?

3.2 Gbs

ASN 134171, Singapore

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ASNs coverage

IPv4

40k ASNs 5k with 1k+ tests 1k with 10k+ tests

IPv6

3k ASNs 1.2K with 1k+ tests 0.5K with 10k+ tests

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10K+ tests per country

71%

139 countries

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100K+ tests per country

41%

79 countries

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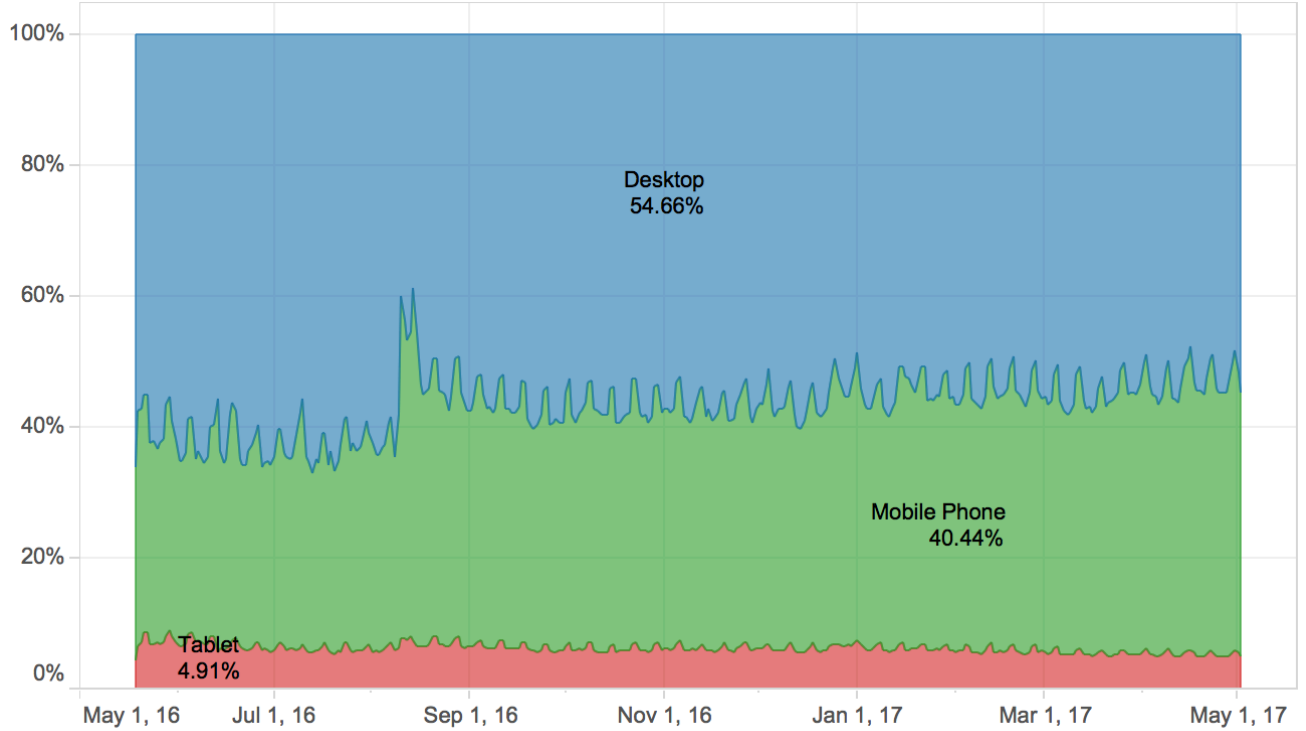
Mobile vs Desktop



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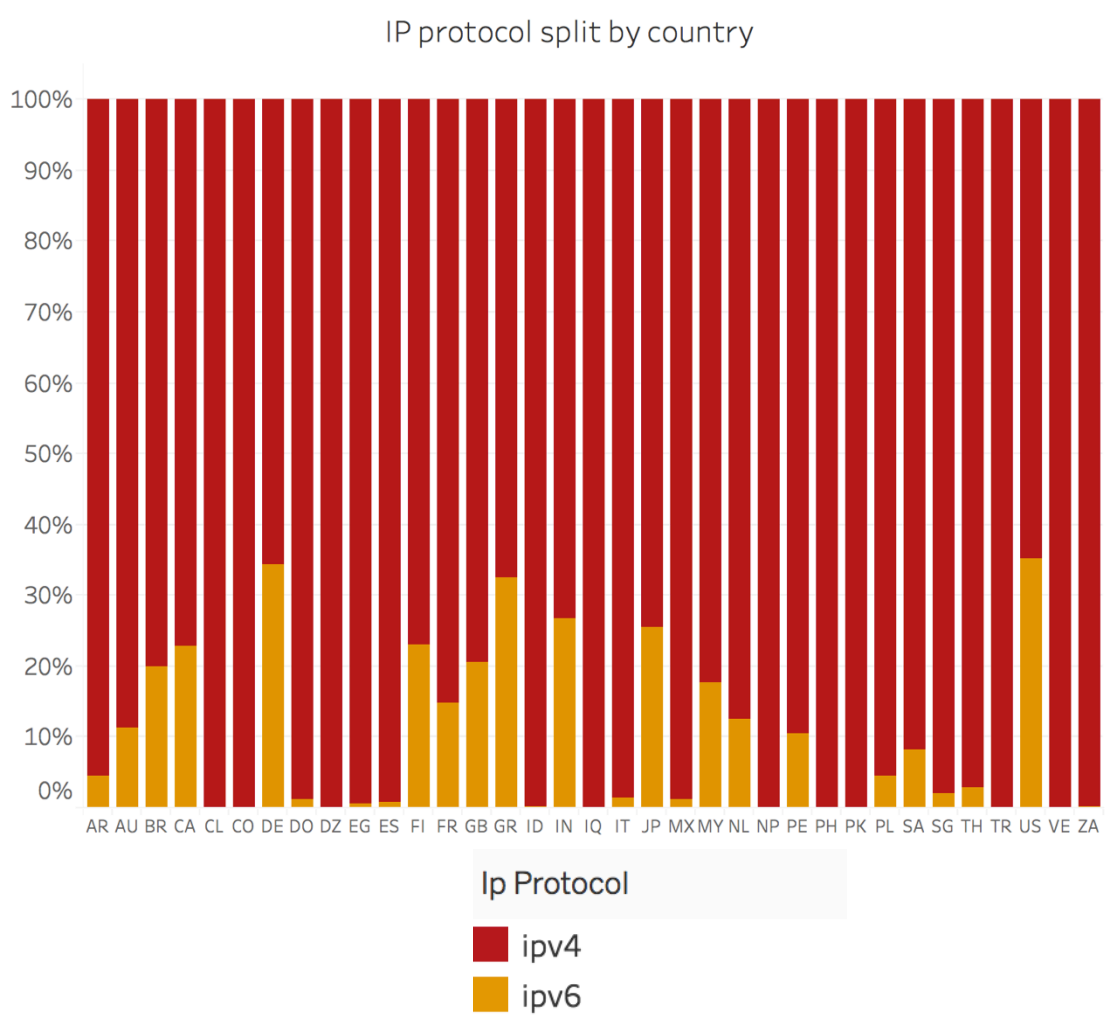
IPv4 vs IPv6 coverage



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Summary & Next steps

Simple approach worked well

More tweaks in the measurement methodology

- Number of connections
- Stop condition
- Collect low-level metrics from servers

Correlating FAST.com results with other data sources

- Can we correlate with probe measurements?
- How much variation does browser add?

FAQ

Will you ever add latency/upload measurements?

Yes

Can I embed FAST.com test on my website?

Not at the moment, but talk to me regarding your use cases

Are you going to publish test results

No plans for now

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Questions?

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Thank you!

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