

Opportunities and Challenges of Ad-based Measurements from the Edge of the Network

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Motivation

- Quality of Experience perceived by end-users
 - ISP's network design
 - Regulatory policies
- Discovered network neutrality infringements
 - DNS manipulation
 - HTTP header injection

measurements from the
edge of the network

Edge-driven measurement techniques

- Balance between ISP-coverage, user scale and accuracy

	RIPE Atlas	Archipelago	Netalyzr	Luminati
Number of sessions*	 9.3K	 181	 2.2M*	 1.3M*
Targeting				
Time	 6 yrs	 10 yrs	 6 yrs	 5 days
ISP-coverage	 3.3K	 146	 14.5K	 14.7K
Measurement capabilities				

AdTag

- Ad-based measurements

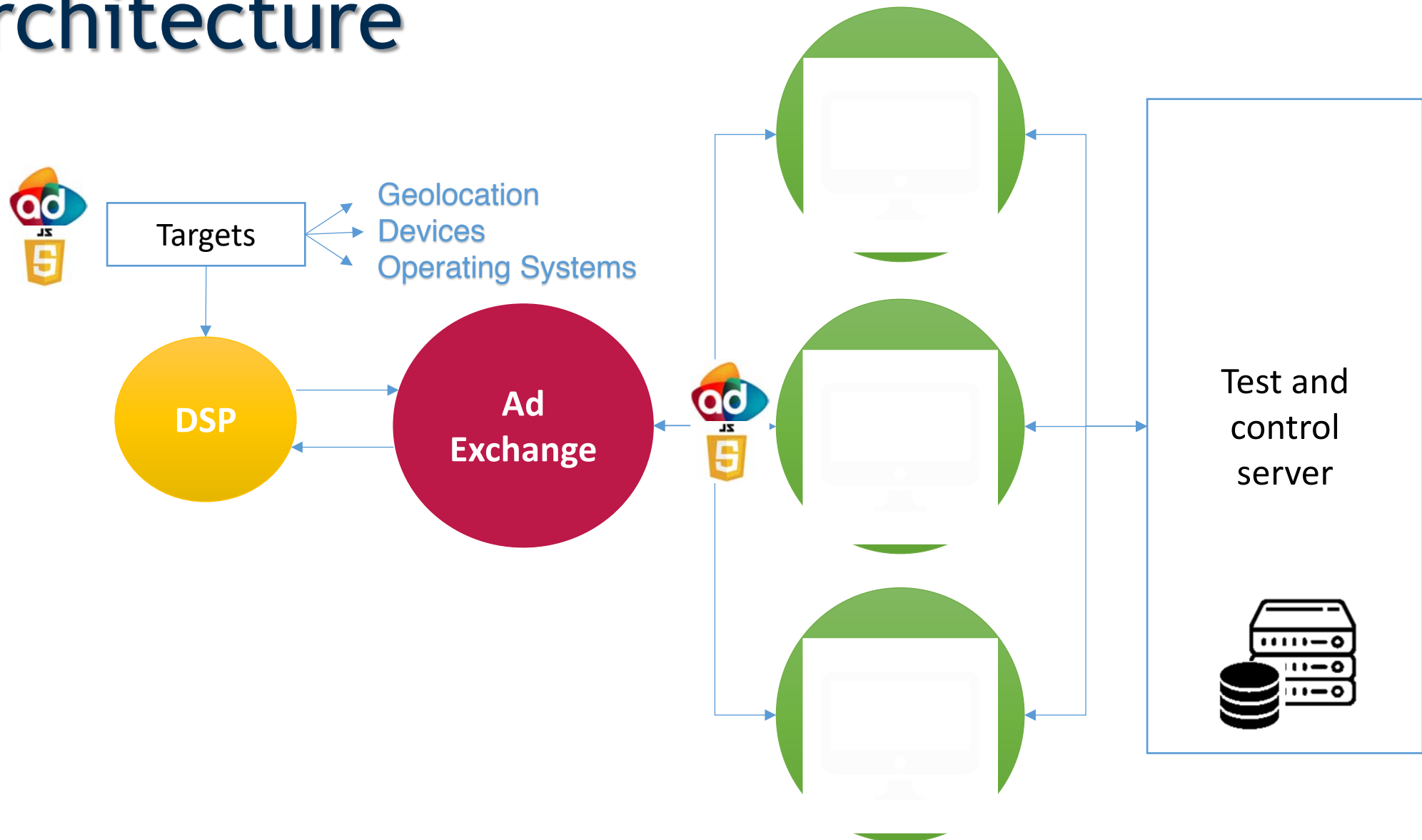
- Why?

- Leverage the nature of ad networks
- Large ISP-coverage – short period of time
- **Targeting capabilities of ad networks**

- What?

- Architecture
- Technical aspects
- Deployability – browser support
- Cost
- Ethical aspects
- Targeting capabilities

Architecture



Technical aspects

- AdTag leverages HTML5-based ads
- Execute JavaScript-based active network measurements
- Limited by browsers libraries:
 - **XMLHttpRequest** – TCP / HTTP requests
 - **WebSocket** – TCP channel
 - **WebRTC** – UDP channel

Deployability

- In Ad Networks, DSPs, Ad Exchanges ...
- Specifically, we run real campaigns in a DSP
 - Access to multiple vendors
 - Settings - targeting:
 - Geographical location
 - Browser brand
 - Device type
 - Operating System

Cost

- Maximize number of impressions
- Minimum CPM (Cost Per Mille) \$ 0.10

1M measurements → \$ 100 budget

LOW COST!

Ethical aspects

- Not user consent possible
- Do Not Track header

GUIDELINES

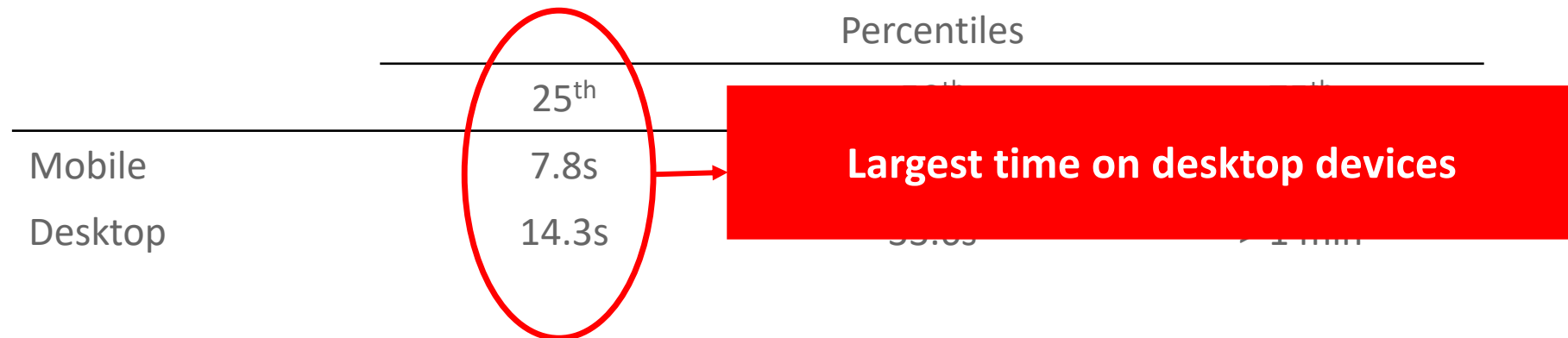
- ☐ Do not use excessive amount of data.
- ☐ Do not collect any PII.
- ☐ Do not execute test which may compromise security.
- ☐ Do not perform experiments with user's personal integrity at risk.

AdTag evaluation

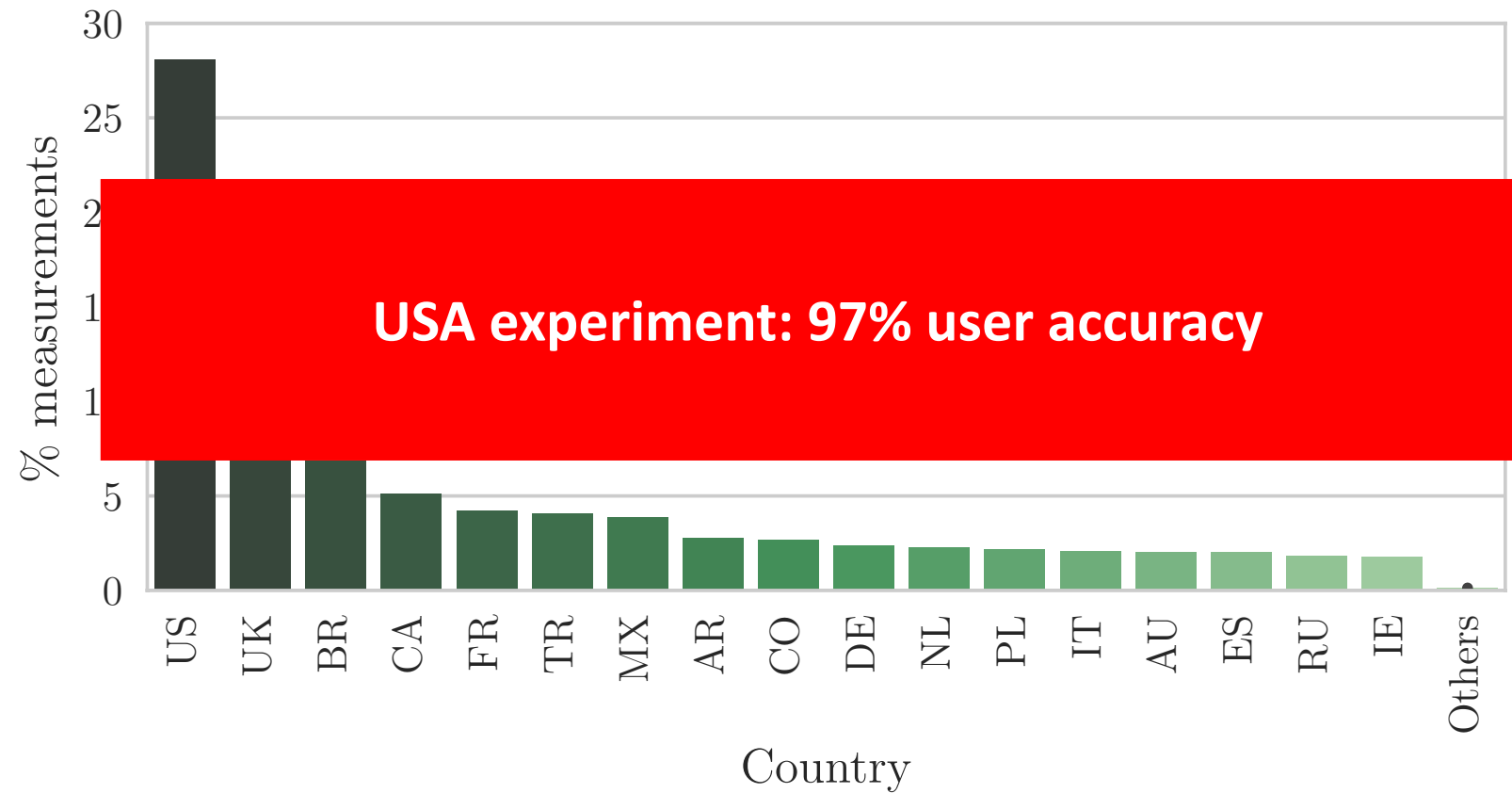
- Execution window
- Targeting accuracy
- Browser support

Execution window

- Time active in the browser
- Limited time



Targeting ISPs and Locations



Browser support

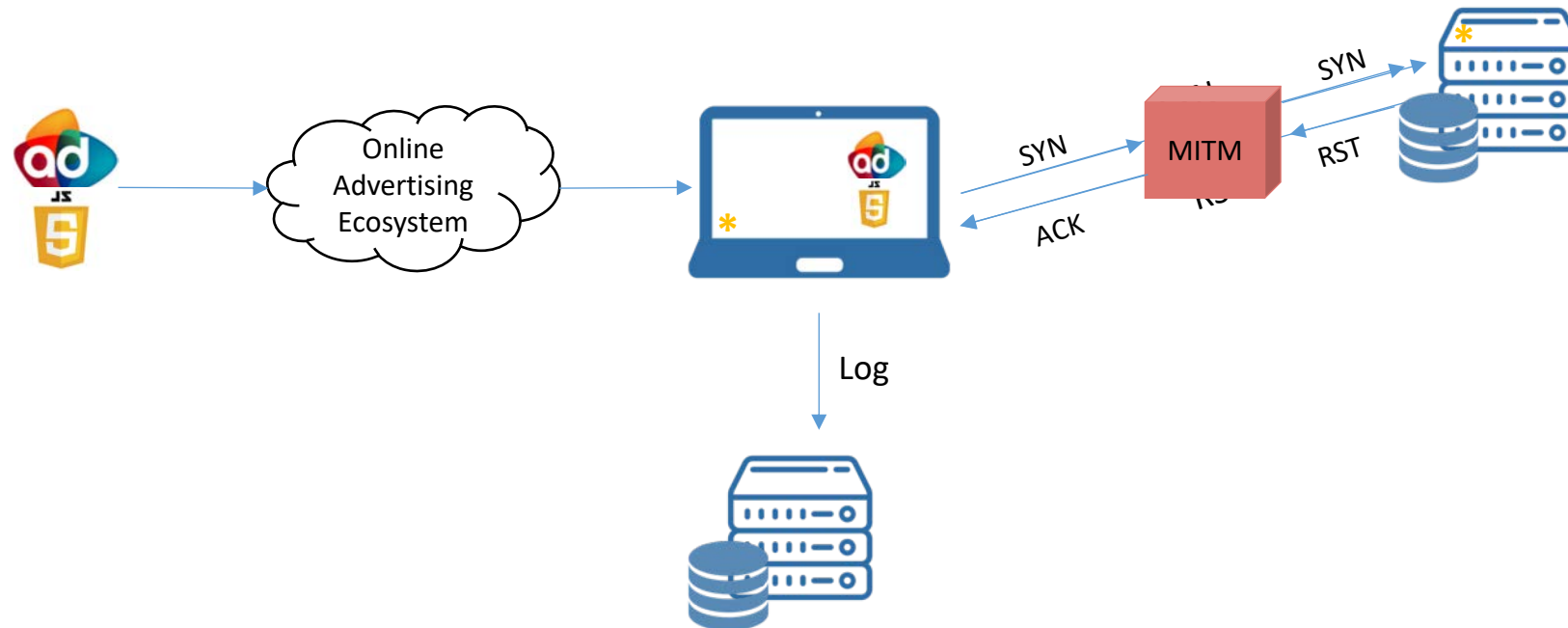
	total	WebRTC	WebSocket
Chrome	34.5 %	97 %	97 %
Mobile Safari	21.7 %	n/a	14.3 %
Chrome Mobile	19.8 %	56 %	56 %
Firefox	5.4 %	88 %	88 %
Safari	4.6		

Less support in mobile browsers

Use cases

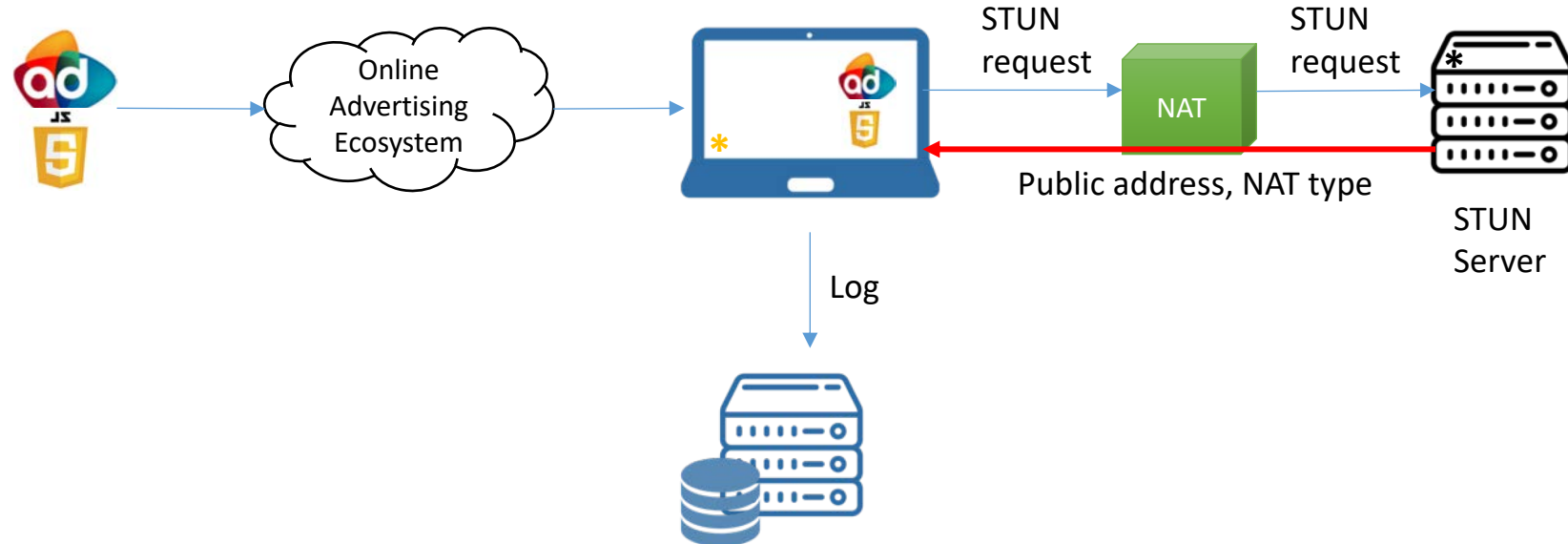
Use cases: Middleboxes

- Detecting middleboxes and traffic manipulation (XHR and WebSocket)



Use cases: NAT

- NAT detection and characterization (WebRTC and WebSocket)



Use cases

- Detecting middleboxes and traffic manipulation (XHR and WebSocket)
- NAT detection and characterization (WebRTC and WebSocket)
- **CDN performance (XHR and WebSocket)**
- **IP classification (WebRTC and WebSocket)**

Summarizing ...

	RIPE Atlas	Archipelago	Netalyzr	Luminati	AdTag
Number of sessions	✓	✗	✓	✓	✓
Targeting	✗	✗	✗	✗	✓
Time	✗	✗	✗	✓	✓
ISP-coverage	✓	✗	✓	✓	✓
Measurement capabilities	✓	✓	✓	✗	✗

Thank you



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