IPv6 at web clients and caching resolvers

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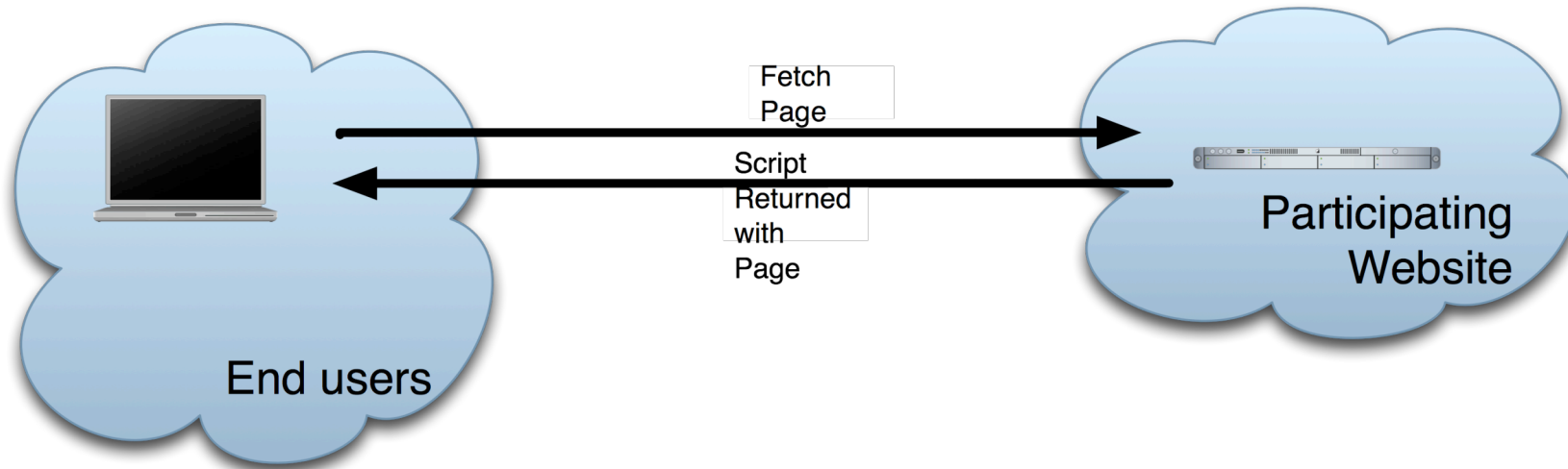
Introduction

- ## We want more insight into IPv6 deployment

- ## IPv6 deployment numbers:

  - Routing table: 6% of ASes

  - Web traffic: 0.25% - 2 % of web clients

- ## Where is the difference?

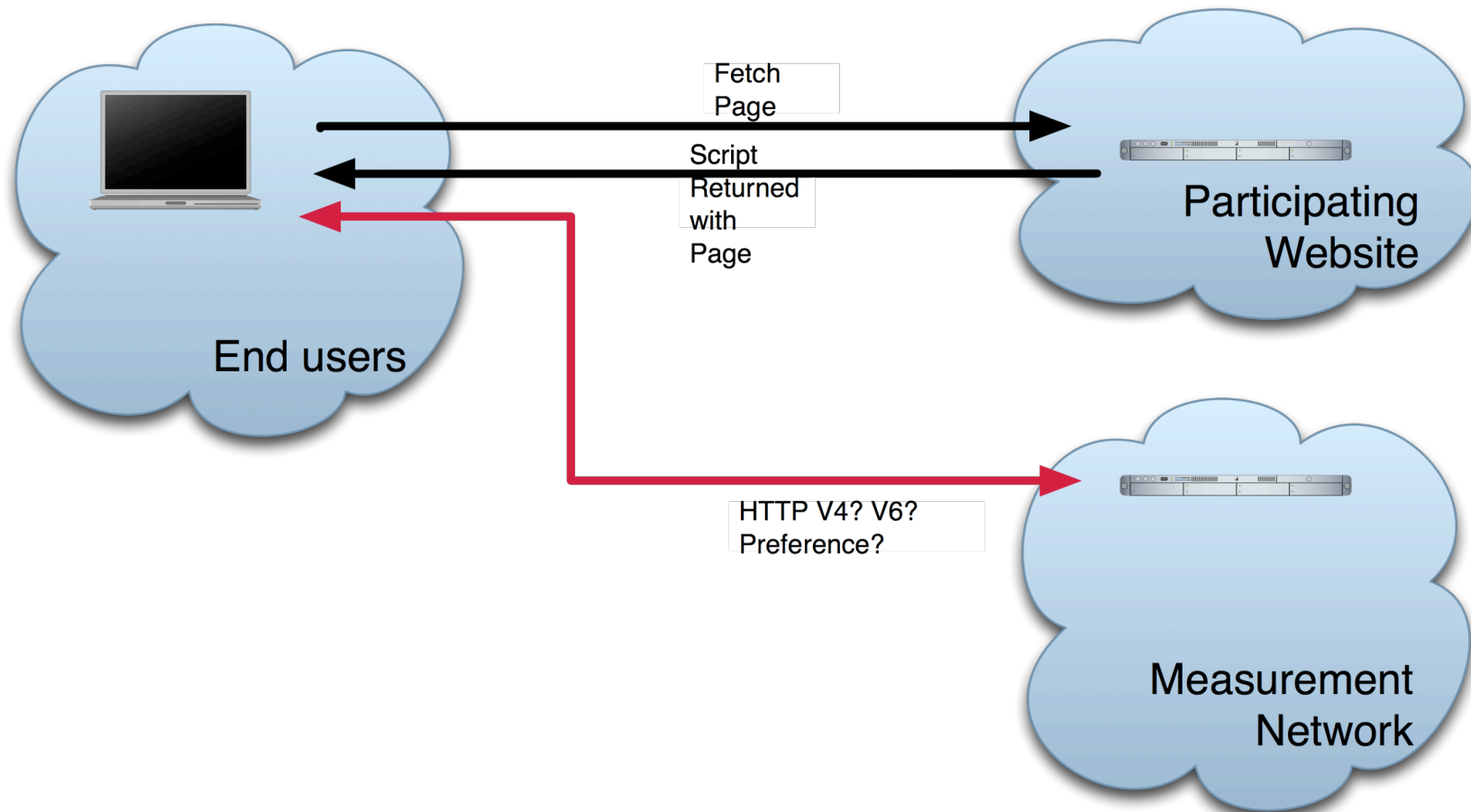- ## Measure IPv6 connectivity of end-user combined with ISP infrastructure
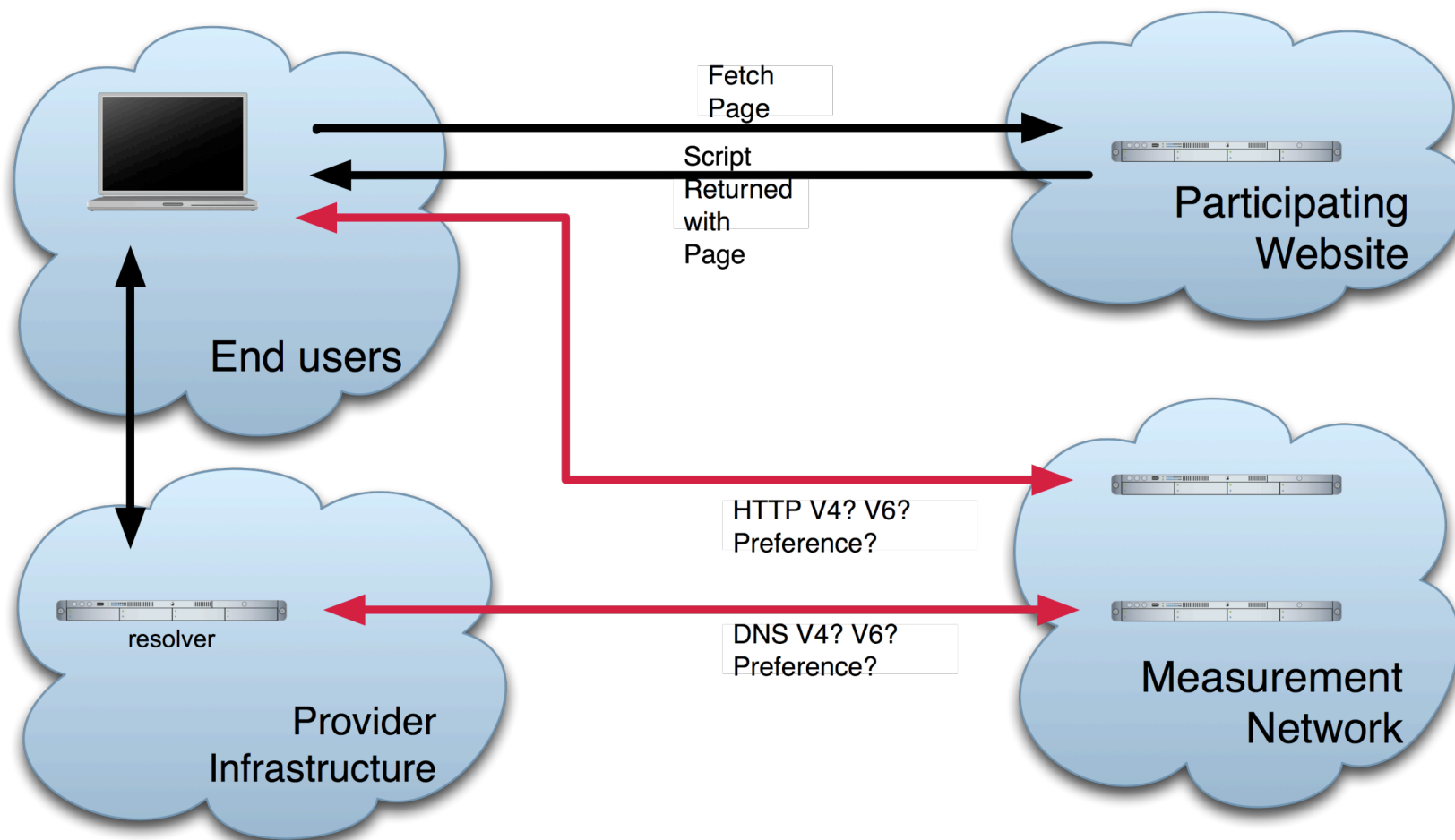
Measurement start

Fetch
Page

Script
Returned
with
Page

End users

Participating
Website

HTTP measurements

Fetch
Page

Script
Returned
with
Page

Participating
Website

End users

HTTP V4? V6?
Preference?

Measurement
Network

HTTP+DNS measurements

Fetch Page

Script Returned with Page

Participating Website

End users

HTTP V4? V6? Preference?

resolver

DNS V4? V6? Preference?

Provider Infrastructure

Measurement Network

Caveats

- Measured to www.ripe.net :
    - Operator skew
    - RIPE-region skew

- Not all clients use resolver that upstream provides (open resolvers, 8.8.8.8)

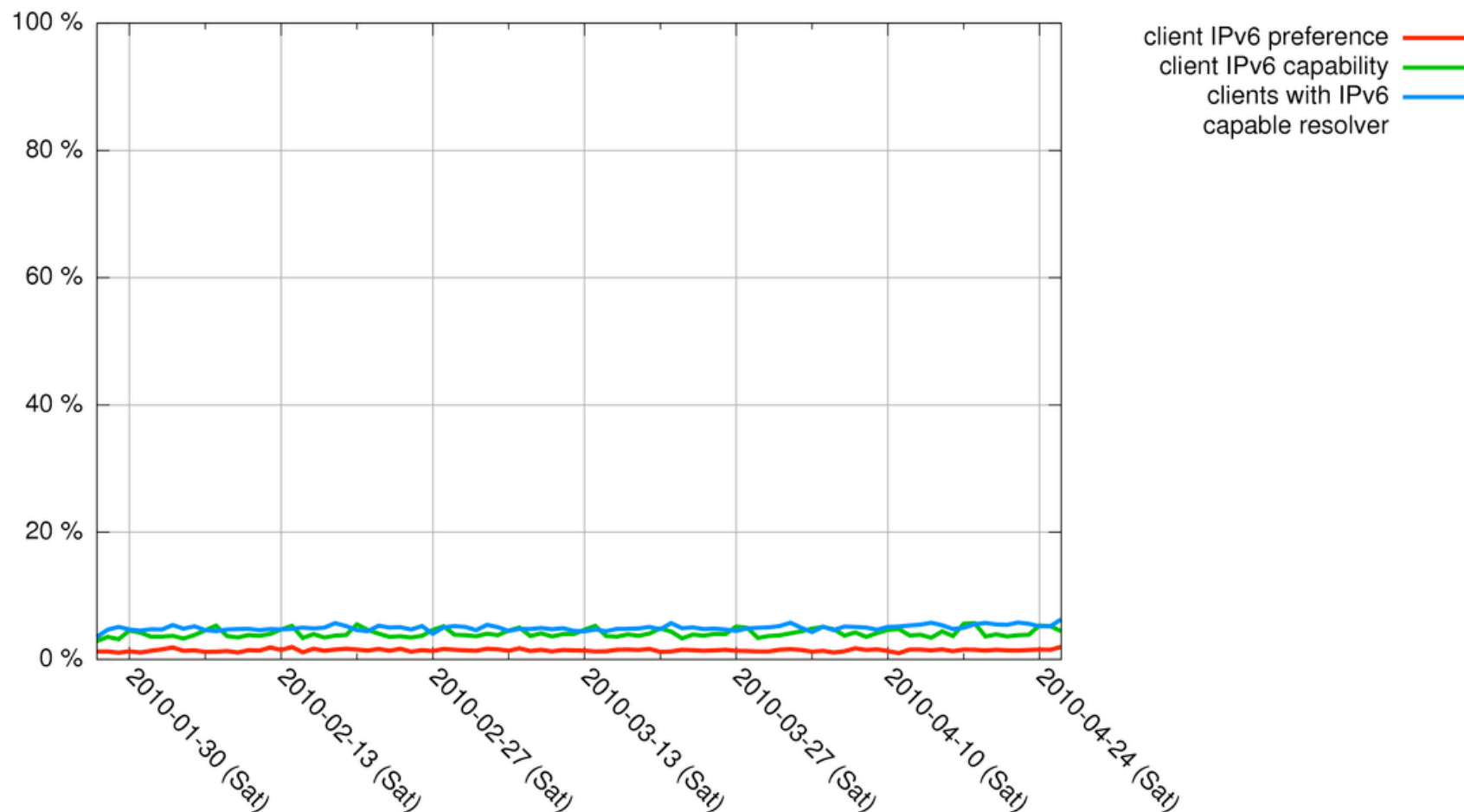- Only webclients that do run javascript

Measurement results
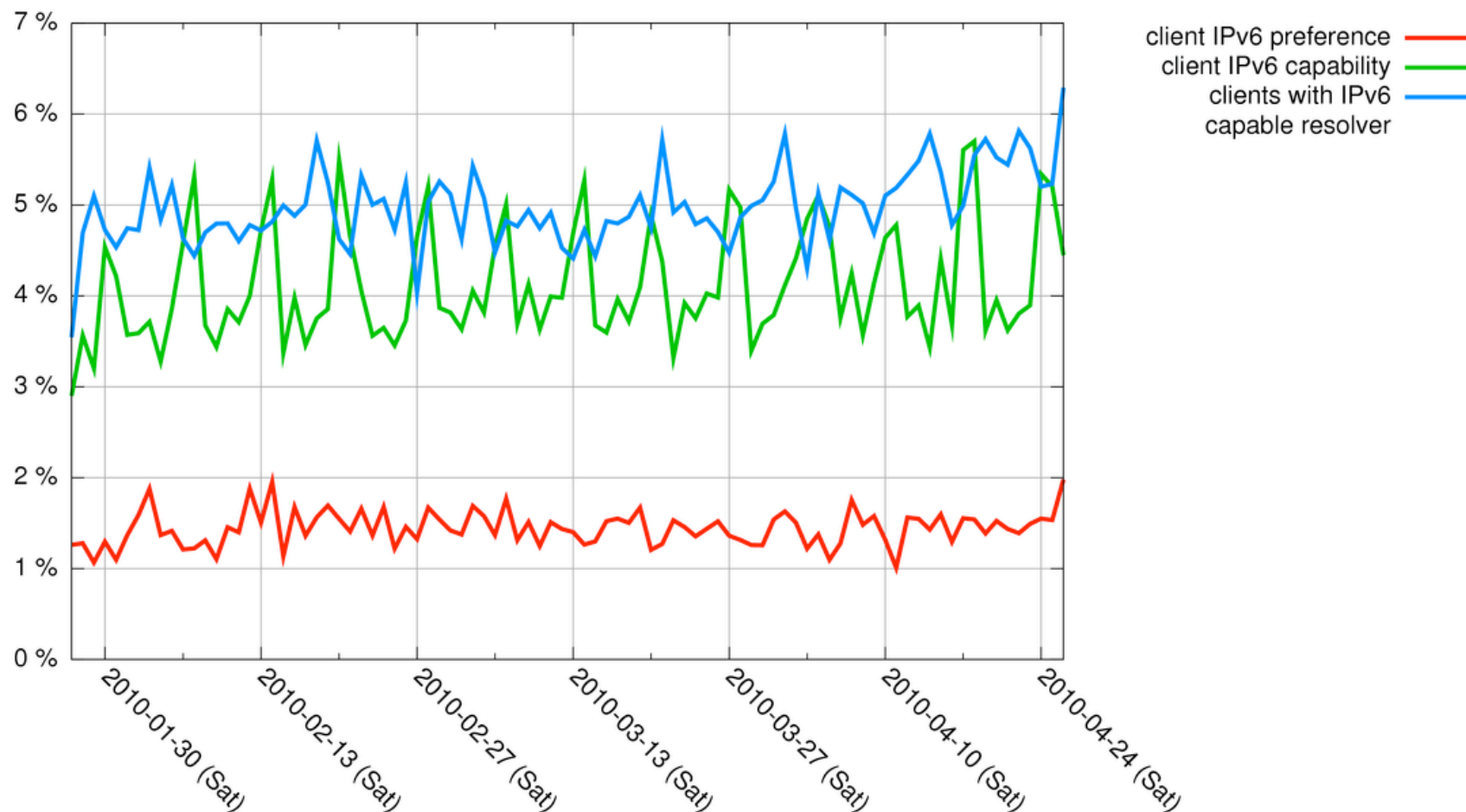
IPv6 for clients/resolvers for www.ripe.net
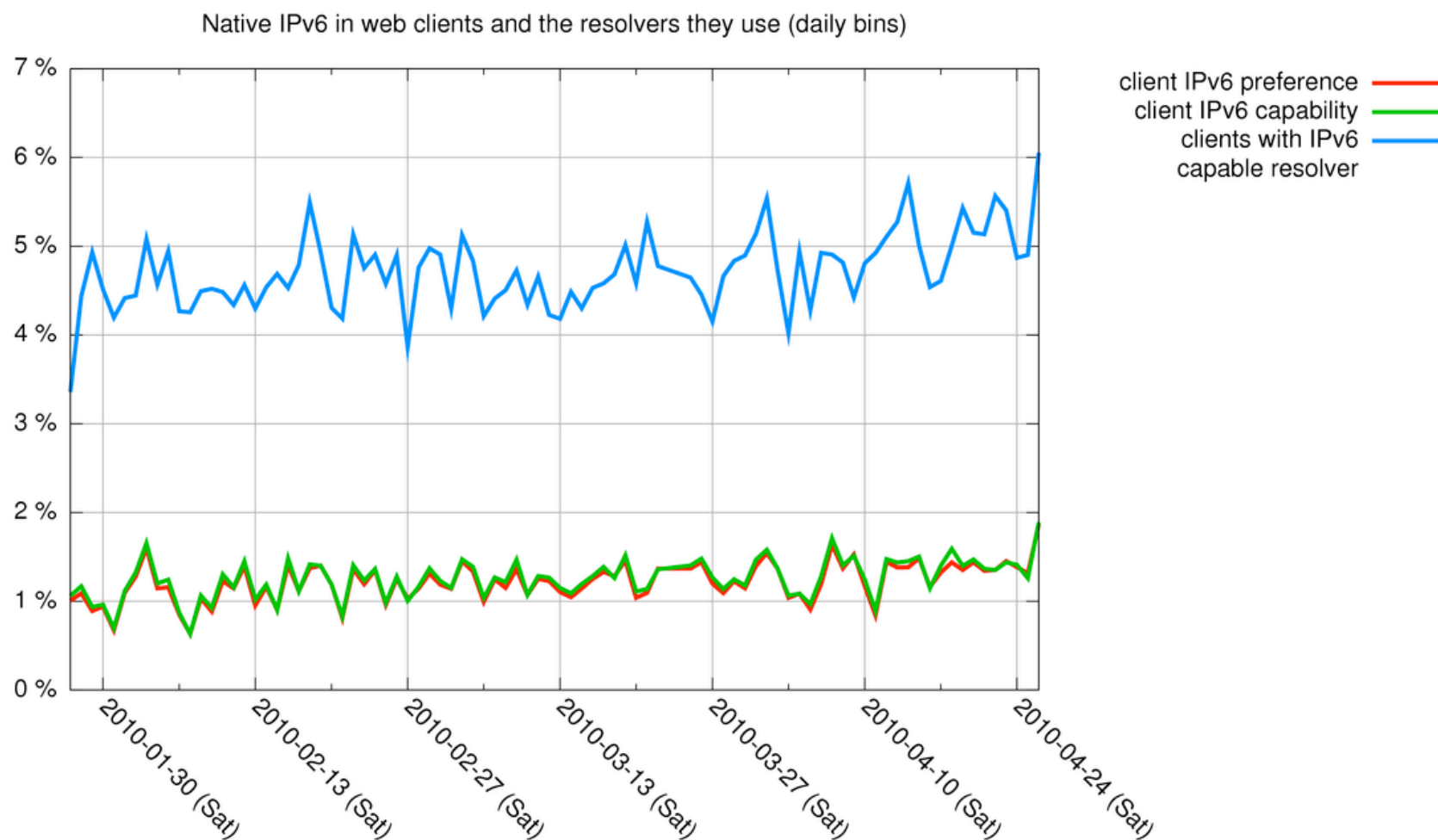

IPv6 in web clients and the resolvers they use (daily bins)

client IPv6 preference ———
client IPv6 capability ———
clients with IPv6 ———
capable resolver

IPv6 for clients/resolvers for www.ripe.net

IPv6 in web clients and the resolvers they use (daily bins)

client IPv6 preference
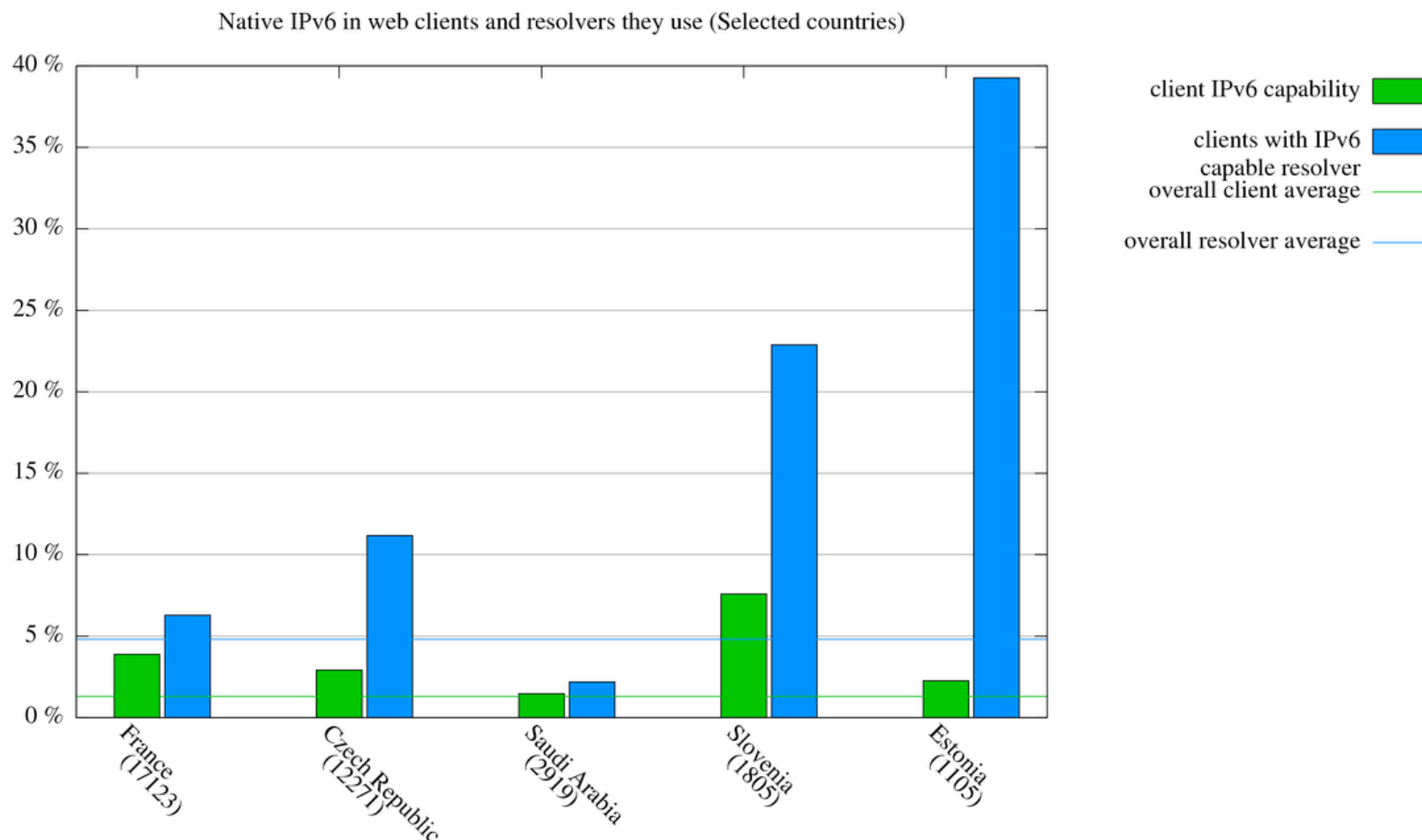client IPv6 capability
clients with IPv6 capable resolver

"Native" IPv6

Native: not-autotunneled (ie. No Teredo, 6to4)

Pockets of native IPv6 (countries)

Native IPv6 in web clients and resolvers they use (Selected countries)

Geoloc based on client IPv4

Pockets of native IPv6 (cities)

City	n	% Native Client IPv6	# IPv6 ASes/ # IPv4 ASes
Ljubljana,SI	828	11.1%	6/42
Espoo,FI	819	9.8%	4/36
Paris,FR	3334	8,8%	14/129
Almere,NL	405	8.6%	4/26
Bern,CH	472	7.0%	3/28
Uppsala,SE	498	6.6%	5/15
Utrecht,NL	631	6.2%	5/35
Lisbon,PT	775	5.6%	3/20
Brno,CZ	975	5.2%	7/27
Bonn,DE	404	5.2%	3/21
Ostrava,CZ	374	4.8%	2/16
Chisinau,MD	1219	4.5%	2/28
Munich,DE	2173	4.5%	12/70
Prague,CZ	5217	4.2%	20/66

And at the AS level

	Total	IPv6	%IPv6
ASes with resolvers	12021	591	4.9%
ASes with web clients	13690	530	3.8%
Compare to:			
ASes seen in RIS	34563	2125	6.1%

Indication of populations at various stages of deployment

What next?

- Keep this running

    - Next year should be interesting

- For less skew we'd need to measure Joe Average Internet user

    - You can participate! Ask me

- Feedback?
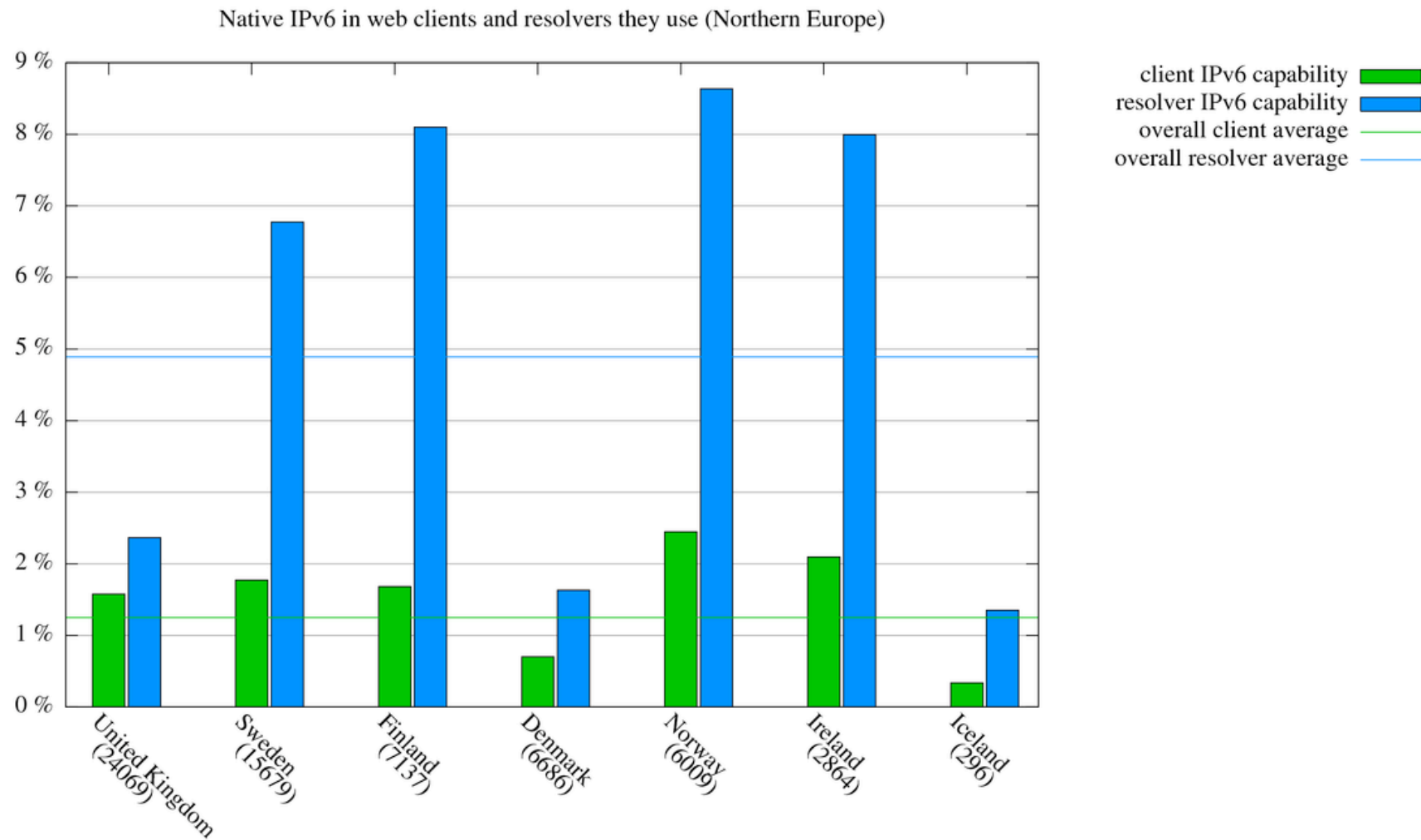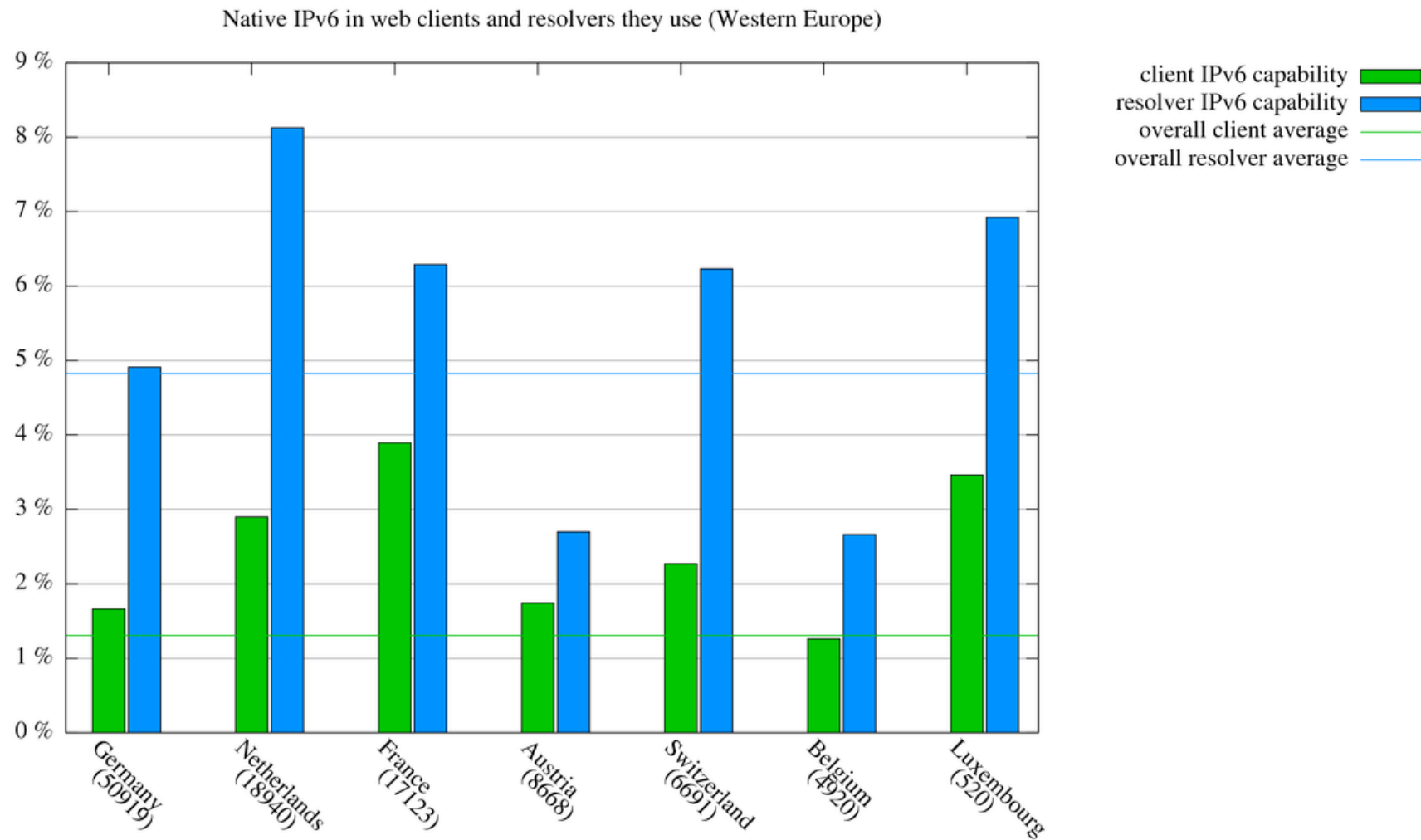
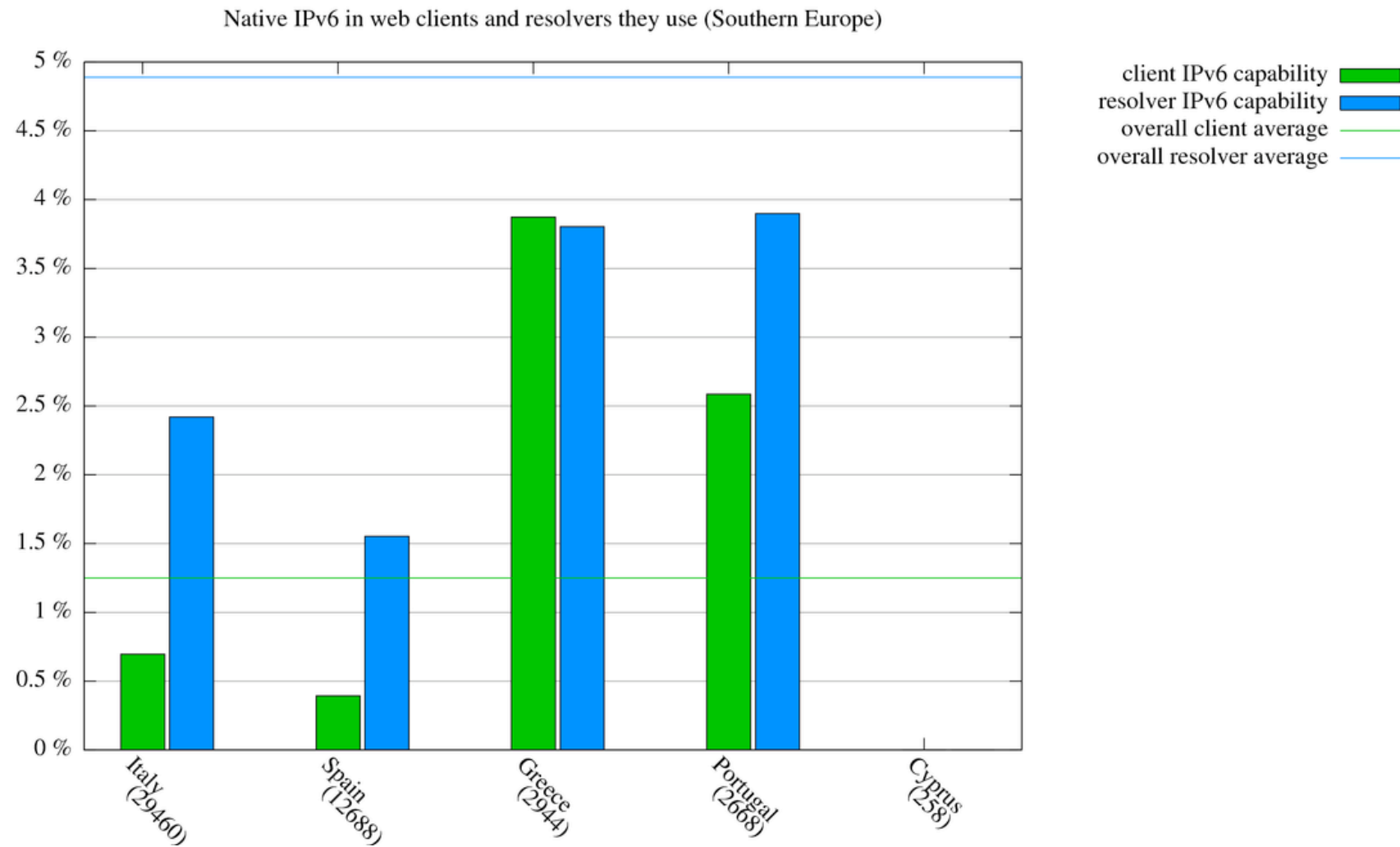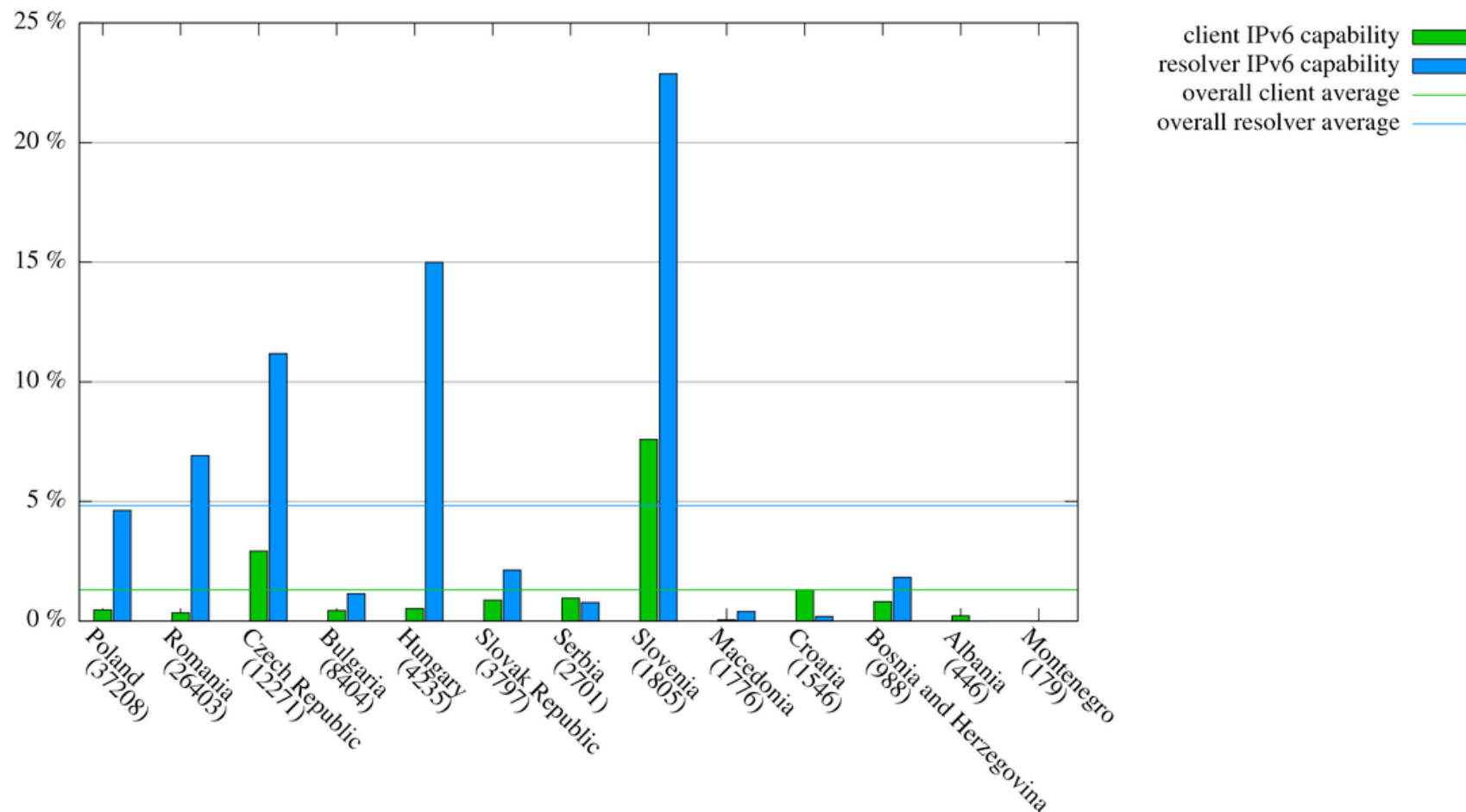- For tech details : see TT-WG presentation

Questions?

More countries

More countries

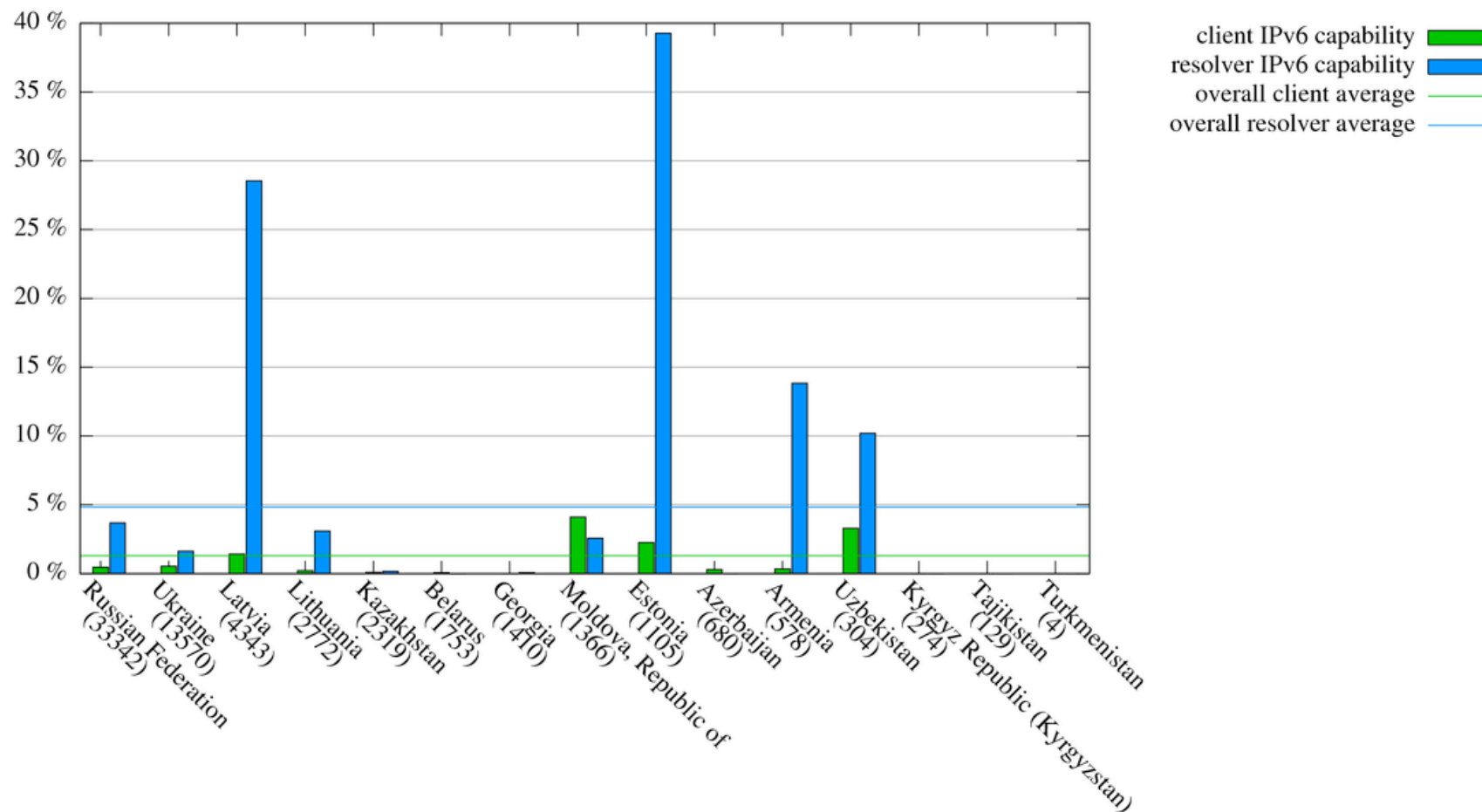
Native IPv6 in web clients and resolvers they use (Western Europe)

More countries

Native IPv6 in web clients and resolvers they use (Southern Europe)

Legend:
- client IPv6 capability (green)
- resolver IPv6 capability (blue)
- overall client average
- overall resolver average

Countries: Italy (29460), Spain (12688), Greece (2944), Portugal (2668), Cyprus (258)
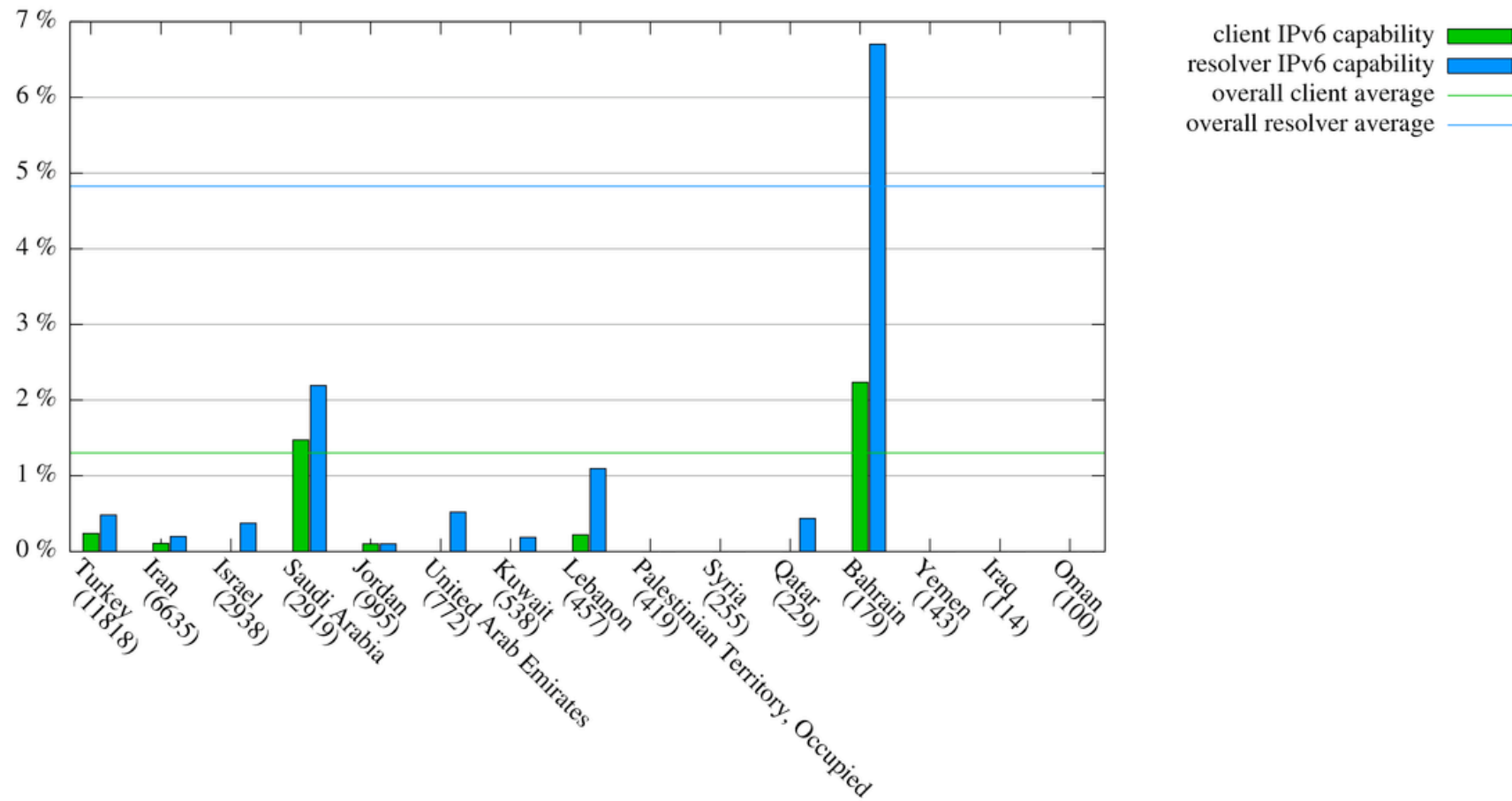
More countries

More countries

Native IPv6 in web clients and resolvers they use (Former Soviet countries)

More countries

Native IPv6 in web clients and resolvers they use (Middle East)

More countries

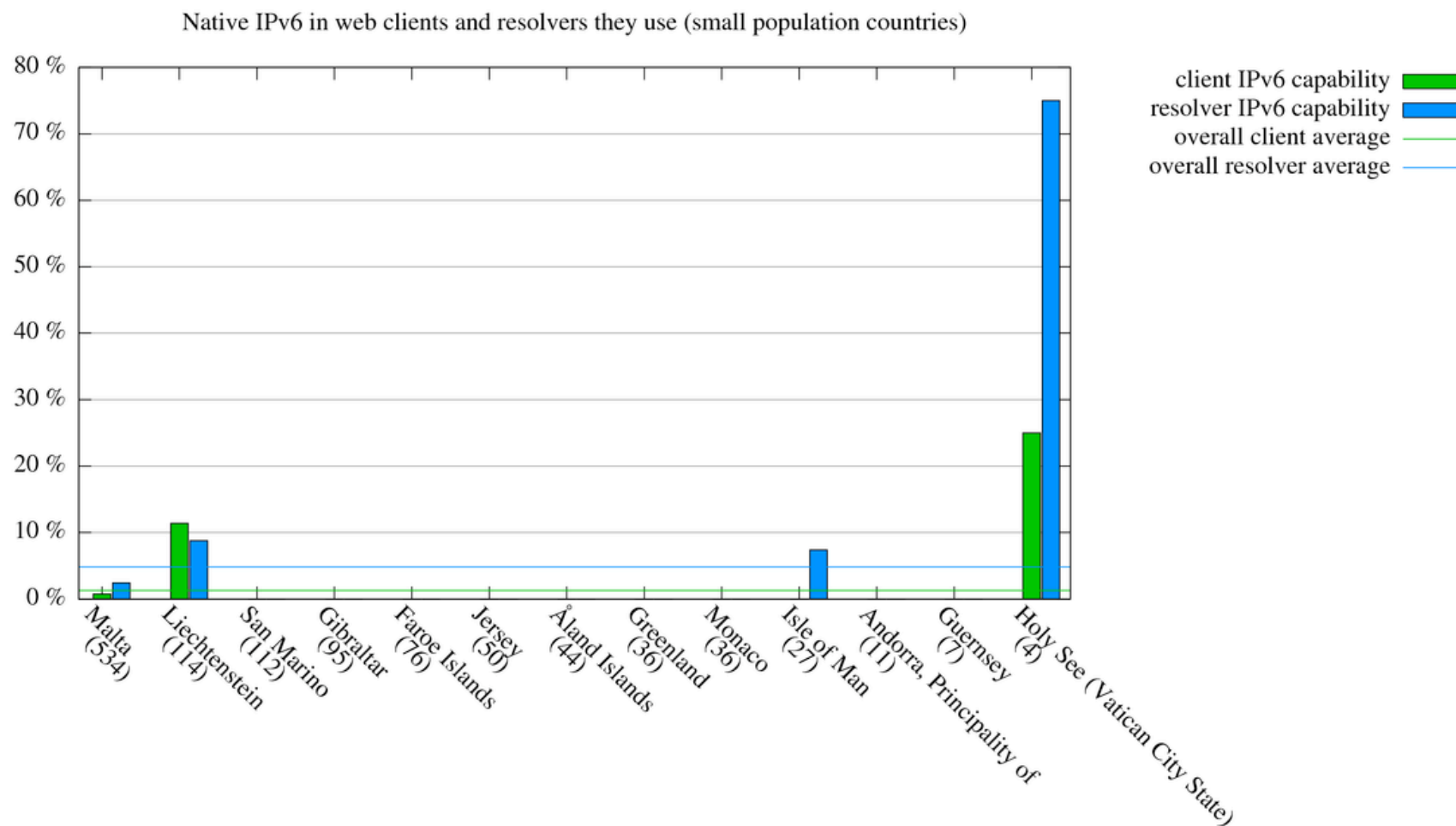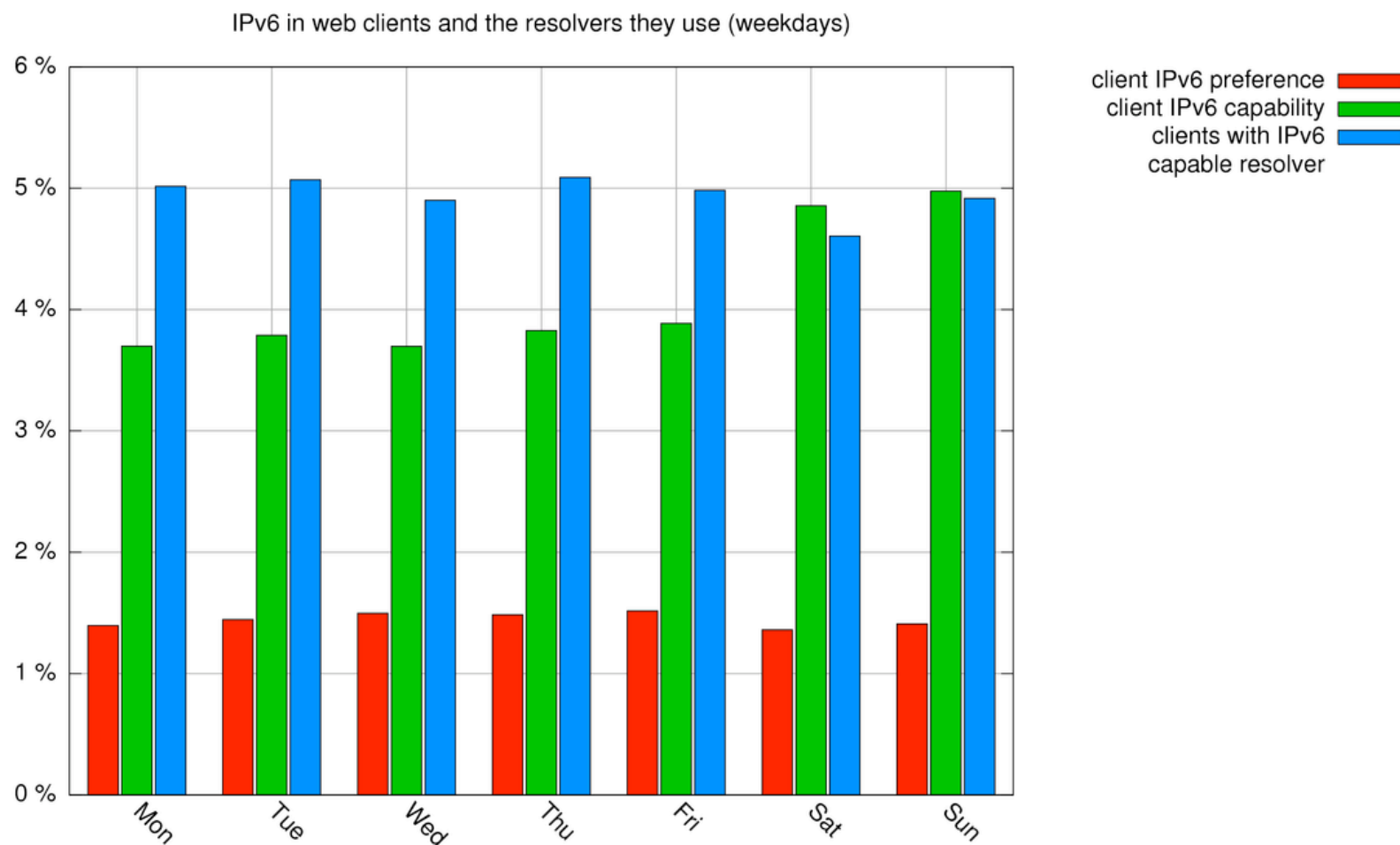Native IPv6 in web clients and resolvers they use (small population countries)

The weekend effect

IPv6 in web clients and the resolvers they use (weekdays)

client IPv6 preference
client IPv6 capability
clients with IPv6 capable resolver

More transition technologies at home in the weekend?

AS IPv6 readiness

CDF of v6/v4 ratio for measurements in ASes where we detect both v4 and native v6 capabilities
(ASes with 50+ hits on v4 or v6)