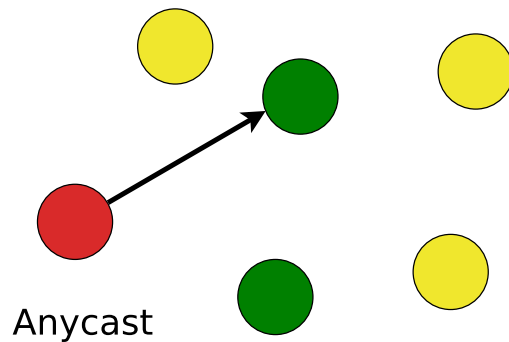
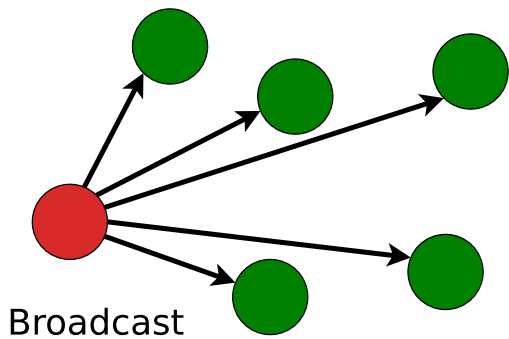
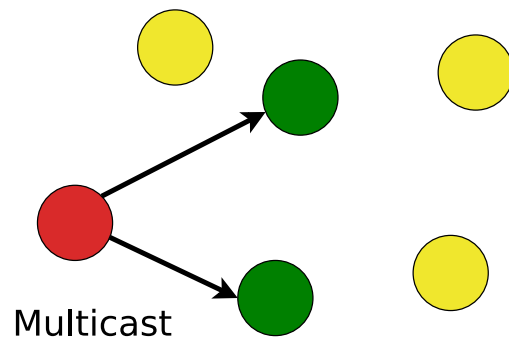
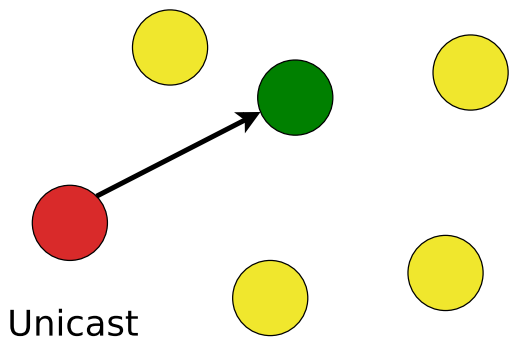


Optimalizace anycastu

Lukáš Vacek • 07. 10. 2023

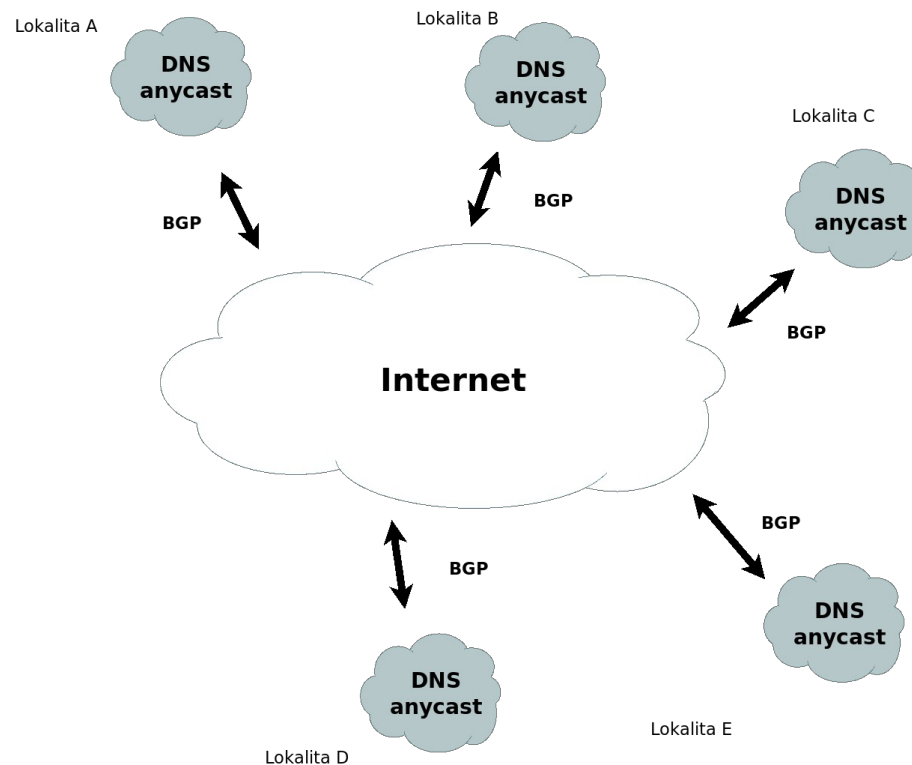
Anycast



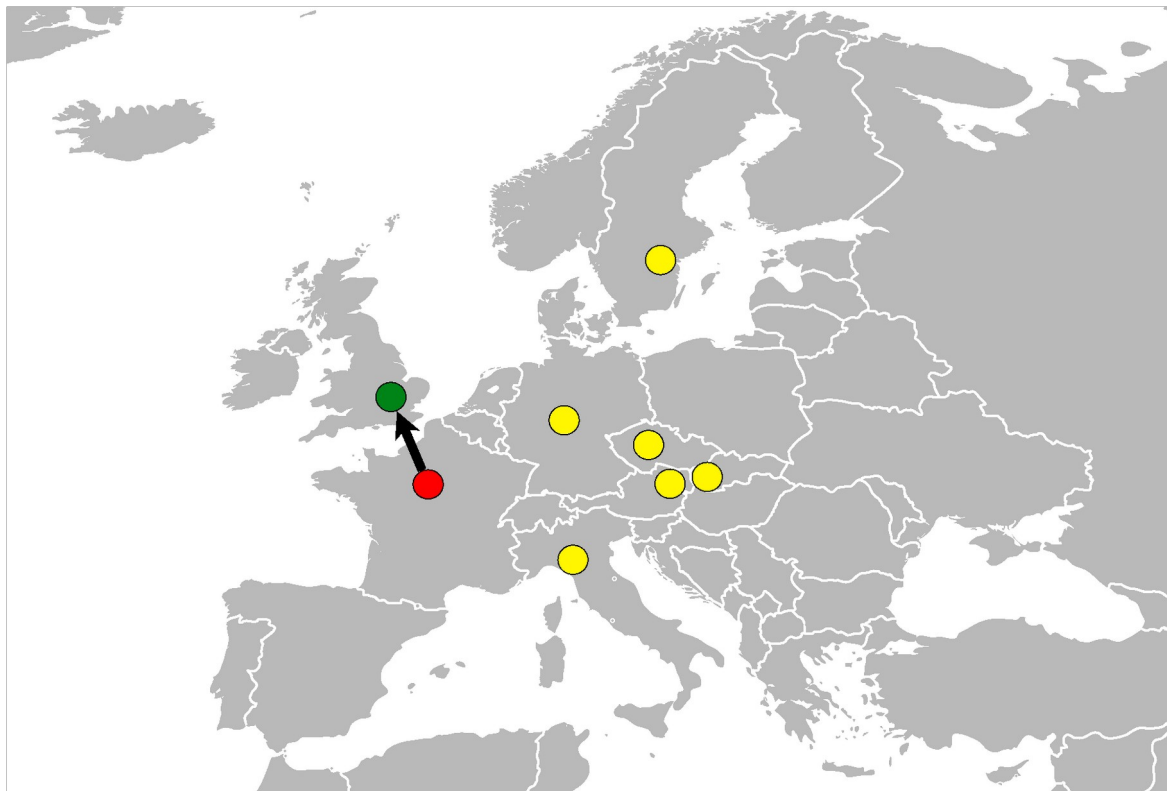
BGP a DNS

Autonomní systém

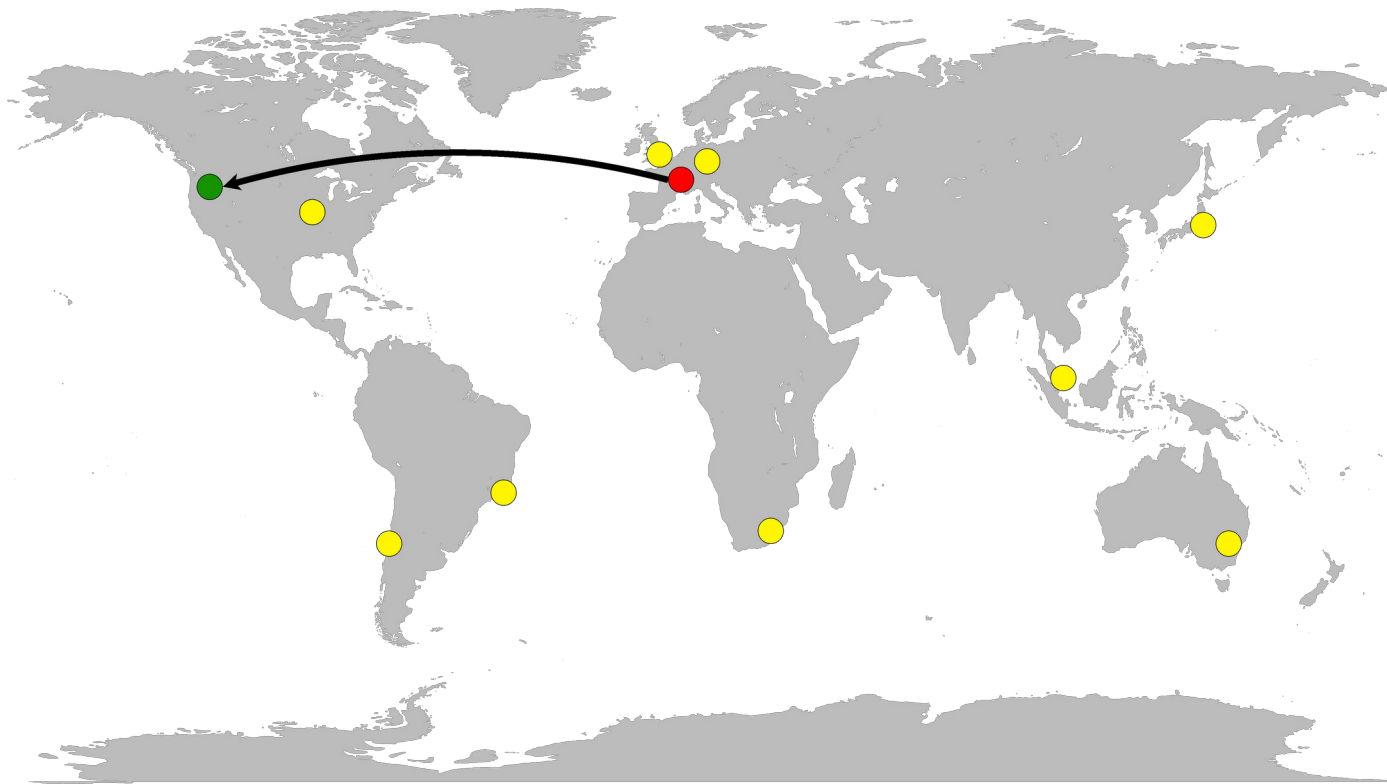
12 atributů pro výběr nejlepší cesty



Ideální scénář



V některý případech...



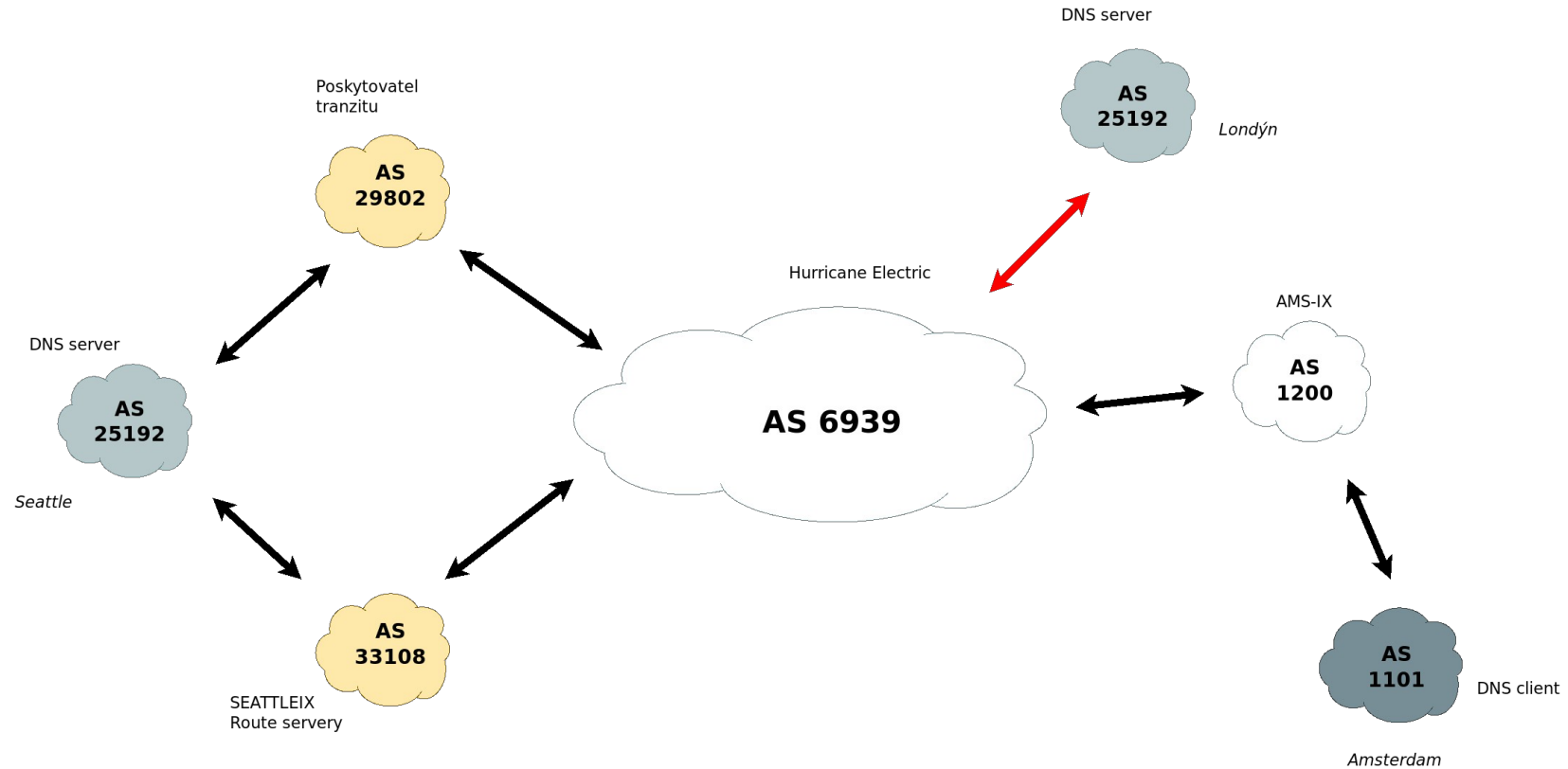
Možné příčiny

Filtry u tranzitního poskytovatele

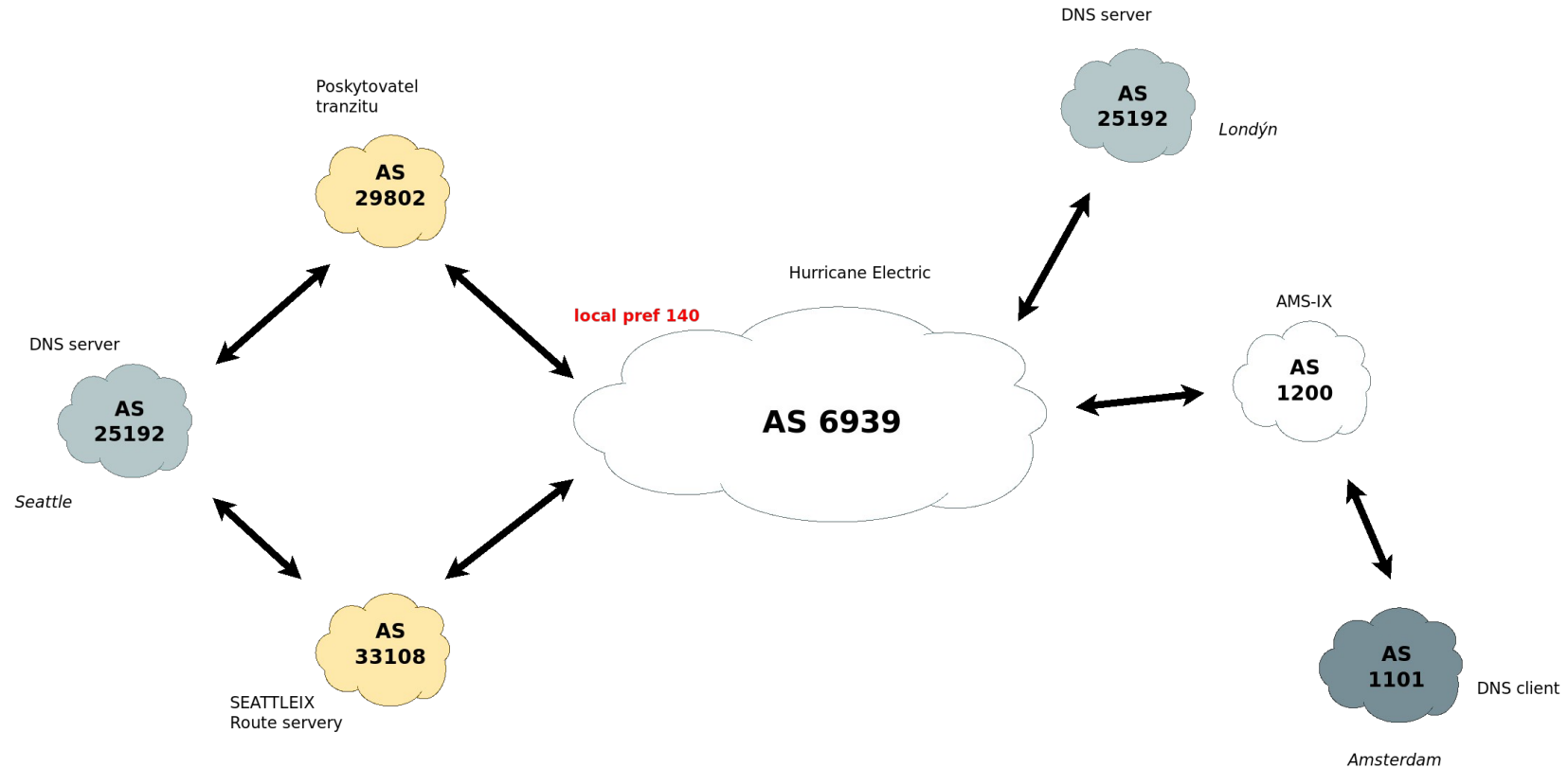
Neviditelnost prefixů

Tranzit provider preferuje vlastní klienty

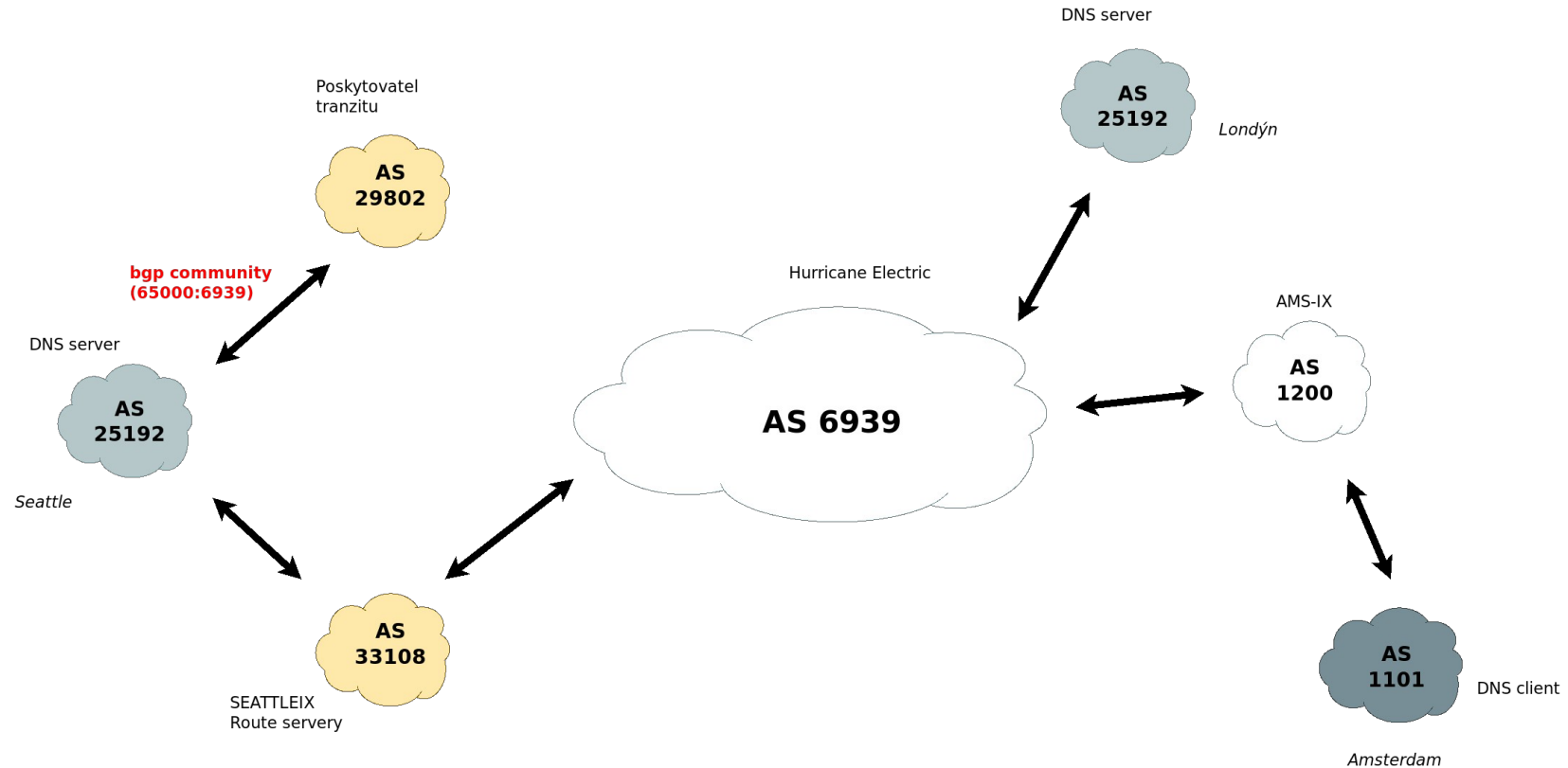
Neviditelnost prefixů



Preference vlastních klientů



Preference vlastních klientů



Jak to zkoumat?

Looking glass

RIPE Atlas

Jiné nástroje pro monitoring route

Looking glass

core2.yyc1.he.net> show ip bgp routes detail 194.0.12.0/24										
Matching Routes		1								
Status Codes		A - Aggregate B - Best b - Not Install Best C - Confederation eBGP D - Damped E - eBGP H - History I - iBGP L - Local M - Multipath m - Not Installed Multipath S - Suppressed F - Filtered s - Stale x - Best-External								
Status		Network	Next Hop	Learned	Metric	LocPrf	Weight	Path	Origin	ROA
BI		194.0.12.0/24	206.81.80.138	216.218.253.17 (6939)	200	100	0	25192	IGP	✓
Last Update		0h3m41s ago								
Entry cached for another 60 seconds.		2023-10-06 07:35:48 UTC								

core1.ams2.he.net> show ip bgp routes detail 194.0.12.0/24										
Matching Routes	5									
Amsterdam										
Status Codes	A - Aggregate B - Best b - Not Install Best C - Confederation eBGP D - Damped E - eBGP H - History I - iBGP L - Local M - Multipath m - Not Installed Multipath S - Suppressed F - Filtered s - Stale x - Best-External									
Status	Network	Next Hop	Learned	Metric	LocPrf	Weight	Path	Origin	ROA	
BI	194.0.12.0/24	80.81.193.112	216.218.253.18 (6939)	85	100	0	25192	IGP		✓
I	194.0.12.0/24	91.210.16.13	216.218.253.45 (6939)	195	100	0	25192	IGP		✓
I	194.0.12.0/24	194.30.187.3	216.218.253.15 (6939)	229	100	0	25192	IGP		✓
I	194.0.12.0/24	194.30.187.3	216.218.253.226 (6939)	229	100	0	25192	IGP		✓
Ex	194.0.12.0/24	216.66.85.142	216.66.85.142 (12956)	0	100	0	12956, 14259, 27678, 25192	IGP		✓
Last Update 0h3m44s ago										
Entry cached for another 60 seconds.										
2023-10-06 07:35:48 UTC										

core2.yyc1.he.net> show ip bgp routes detail 194.0.12.0/24										
Matching Routes	5									
Status Codes	A - Aggregate B - Best b - Not Install Best C - Confederation eBGP D - Damped E - eBGP H - History I - iBGP L - Local M - Multipath m - Not Installed Multipath S - Suppressed F - Filtered s - Stale x - Best-External									
Status	Network	Next Hop	Learned	Metric	LocPrf	Weight	Path	Origin	ROA	
BI	194.0.12.0/24	64.71.134.142	216.218.252.106 (6939)	459	140	0	29802, 25192	IGP		✓
I	194.0.12.0/24	216.66.1.134	216.218.253.30 (6939)	470	140	0	29802, 25192	IGP		✓
I	194.0.12.0/24	216.66.1.134	216.218.253.55 (6939)	470	140	0	29802, 25192	IGP		✓
I	194.0.12.0/24	216.66.36.10	216.218.252.254 (6939)	545	140	0	29802, 25192	IGP		✓
I	194.0.12.0/24	216.66.36.10	216.218.253.12 (6939)	545	140	0	29802, 25192	IGP		✓
Last Update 0h5m10s ago										
Entry cached for another 47 seconds.										
2023-10-06 07:30:12 UTC										

core1.ams2.he.net> show ip bgp routes detail 194.0.12.0/24										
Matching Routes	3 Amsterdam									
Status Codes	A - Aggregate B - Best b - Not Install Best C - Confederation eBGP D - Damped E - eBGP H - History I - iBGP L - Local M - Multipath m - Not Installed Multipath S - Suppressed F - Filtered s - Stale x - Best-External									
Status	Network	Next Hop	Learned	Metric	LocPrf	Weight	Path	Origin	ROA	
BMI	194.0.12.0/24	216.66.1.134	216.218.252.66 (6939)	812	140	0	29802, 25192	IGP		✓
MI	194.0.12.0/24	216.66.1.134	216.218.253.11 (6939)	812	140	0	29802, 25192	IGP		✓
Ex	194.0.12.0/24	216.66.85.142	216.66.85.142 (12956)	0	100	0	12956, 14259, 27678, 25192	IGP		✓
Last Update	0h3m47s ago									
Entry cached for another 25 seconds.										
2023-10-06 07:30:12 UTC										

RIPE Atlas

Create a New Measurement

Step 1 Definitions

▼ Testovací měření - Linux Days

Target*:
194.0.12.1
An IP address or hostname

Description:
Testovací měření - Linux Days

Address Family*:
IPv4

Protocol*:
ICMP

Response Timeout (ms):
4000

Tags
A list of comma separated tags

Resolve on Probe:
Force the probe to do DNS resolution

► Advanced Options

+ Ping + Traceroute + DNS + SSL + HTTP + NTP

Step 2 Probe Selection

Worldwide 10

+ New Set - wizard + New Set - manual + IDs List + Reuse a set from a measurement

Step 3 Timing

This is a One-off: ☒

Start time (UTC):

Now

► Measurement API Compatible Specification

Create My Measurement(s)

Settings & Status		Latest Results		Map	Tracemon	IPMap	Downloads			
Probe	ASN (IPv4)	ASN (IPv6)			Time (UTC)	RTT		Hops	Success	
6031	1101	1101			2023-04-27 07:38	181.788		19		
6039	12303	12303			2023-04-27 07:38	199.471		18		
6054	28000	28000			2023-04-27 07:38	171.683		10		
6249	2602	2602			2023-04-27 07:38	179.110		16		
6392	42473	42473			2023-04-27 07:38	268.950		19		
6426	59795	59795			2023-04-27 07:38	183.907		19		
6427	9268	9268			2023-04-27 07:38	194.656				
6566	31272	31272			2023-04-27 07:38	330.253				
6567	1140	1140			2023-04-27 07:38	184.301				
6749	8728	8728			2023-04-27 07:38	235.919				
6825	5408	5408			2023-04-27 07:38	218.663				

Latest Traceroute Result for Measurement #52708902

2023-04-27 07:38 UTC

Traceroute to 194.0.12.1 (194.0.12.1), 48 byte packets

1

145.220.0.1

onwee.as1101.net

AS1101

0.687ms

0.417ms

0.279ms

2

192.12.54.241

AS1101

0.507ms

0.438ms

0.639ms

Latest Traceroute Result for Measurement #52708902

2023-04-27 07:38 UTC

Traceroute to 194.0.12.1 (194.0.12.1), 48 byte packets

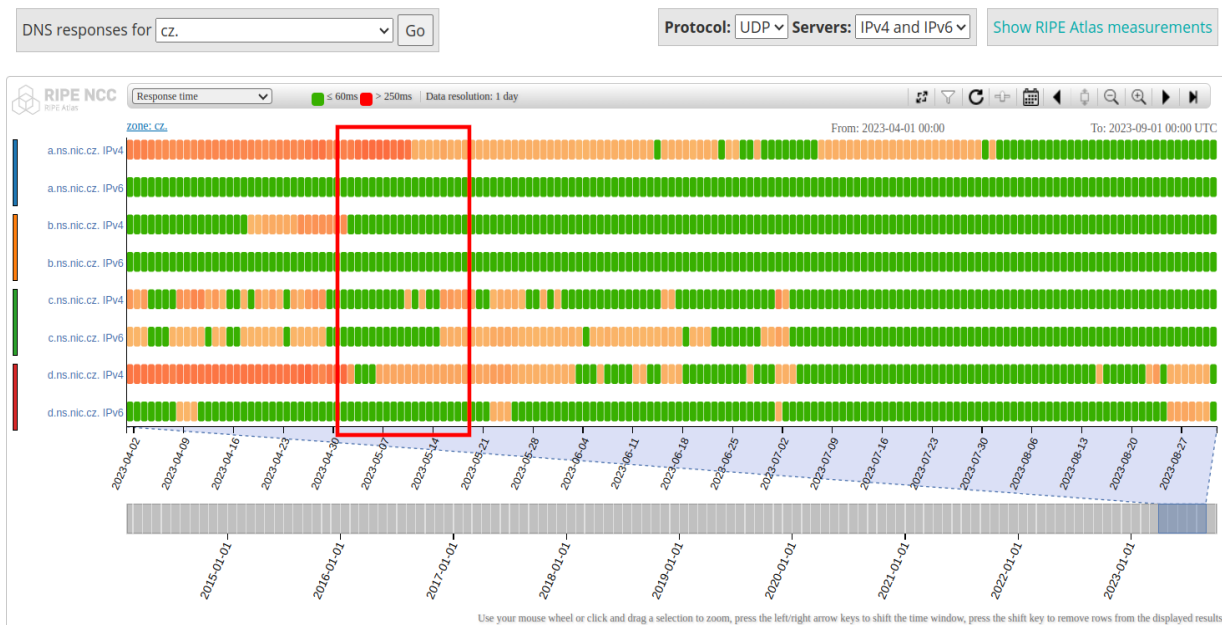
1	145.220.0.1	onweaver.as1101.net	AS1101	0.687ms	0.417ms	0.279ms
2	192.12.54.241	AS1101		0.507ms	0.438ms	0.639ms
3	185.1.203.154	as6939.tryc-sa.net		17.177ms	0.798ms	*
4	* *	72.52.92.213	port-channel13.core3.lon2.he.net	AS6939	5.64ms	
5	* * *					
6	184.105.222.190	port-channel11.core2.ash1.he.net	AS6939	81.138ms	*	*
7	184.105.80.162	port-channel13.core2.atl1.he.net	AS6939	93.684ms	*	*
8	184.105.223.234	100ge0-35.core2.tpa1.he.net	AS6939	101.746ms	102.182ms	101.64ms
9	216.66.36.10	hivelocity-ventures-corp.port-channel6.core2.tpa1.he.net	AS6939	102.504ms		
	102.607ms	102.525ms				
10	10.254.0.7	104.92ms	101.932ms	101.308ms		
11	10.254.0.126	103.357ms	103.921ms	104.009ms		
12	* * *					
13	10.254.0.128	123.619ms	123.534ms	123.513ms		
14	10.254.0.55	151.789ms	151.683ms	151.477ms		
15	10.254.0.219	180.755ms	180.894ms	219.486ms		
16	10.253.32.14	192.4ms	283.641ms	197.259ms		
17	10.253.32.50	194.706ms	253.048ms	204.501ms		
18	10.200.200.250	180.573ms	180.521ms	180.517ms		
19	194.0.12.1	6.ms.nic.cz	AS25192	181.828ms	181.712ms	181.788ms

DNSMON

A anycast

140ms → 67ms → 38ms

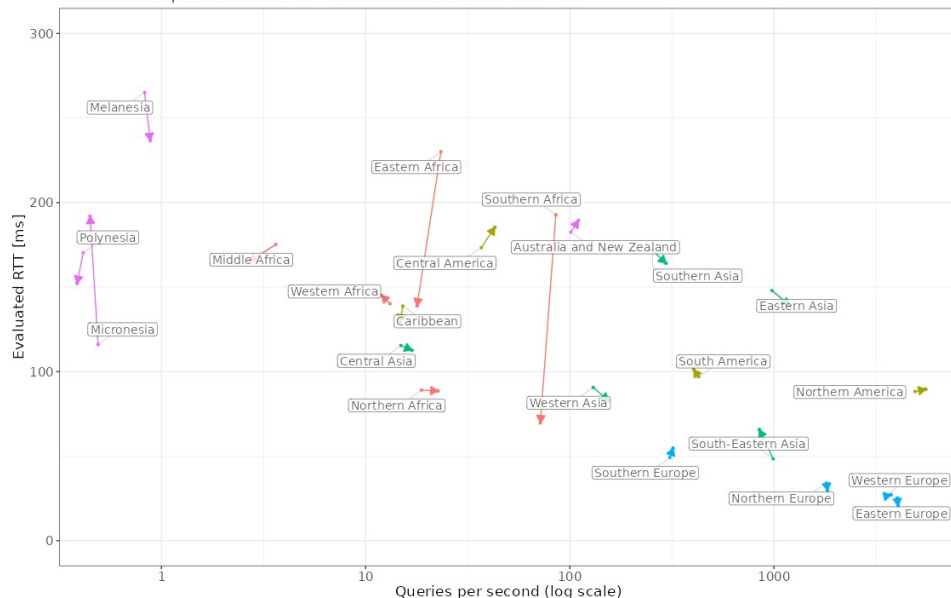
DNSMON



Data z projektu ADAM

Plot

Change in QPS vs evaluated RTT by region
For DNS traffic captured on 2023-02-05 - 2023-02-18 and 2023-05-14 - 2023-05-27



Region	QPS (1)	RTT (1)	QPS (2)	RTT (2)	Continent	QPS change	RTT change
Northern Africa	18.8	89.1	22.6	88.6	Africa	+20.5%	-0.5%
Polynesia	0.4	170.4	0.4	152.2	Oceania	-6.6%	-10.6%
Melanesia	0.8	265.2	0.9	236.7	Oceania	+ 6.6%	-10.7%
Northern Europe	1808.2	34.1	1828.3	29.7	Europe	+ 1.1%	-12.9%
Eastern Europe	4013.0	25.3	4050.9	20.6	Europe	+ 0.9%	-18.7%
Central Asia	14.9	115.4	16.8	112.7	Asia	+13.1%	-2.4%
Eastern Africa	23.4	230.0	17.9	138.9	Africa	-23.6%	-39.6%
Southern Asia	253.6	171.7	295.8	164.1	Asia	+16.6%	-4.4%
Middle Africa	3.6	175.2	2.7	165.4	Africa	-26.1%	-5.6%
Eastern Asia	977.6	147.9	1190.3	139.1	Asia	+21.8%	-6.0%
Caribbean	15.2	138.8	14.7	129.4	Americas	-3.1%	-6.8%
Southern Africa	85.4	192.7	71.7	69.8	Africa	-16.0%	-63.8%
Western Asia	130.2	90.6	154.8	82.9	Asia	+18.9%	-8.5%
Western Europe	3624.3	26.8	3741.1	27.1	Europe	+ 3.2%	+ 1.4%
Northern America	4903.5	88.2	5537.0	89.6	Americas	+12.9%	+ 1.6%
Western Africa	13.2	140.2	11.9	145.1	Africa	-9.2%	+ 3.5%
Australia and New Zealand	101.2	182.6	110.2	189.4	Oceania	+ 8.9%	+ 3.8%
South America	427.6	97.0	404.2	101.3	Americas	-5.5%	+ 4.4%
Central America	36.8	173.3	42.9	185.4	Americas	+16.5%	+ 7.0%
Southern Europe	309.1	49.2	320.2	54.7	Europe	+ 3.6%	+11.1%
South-Eastern Asia	991.1	48.4	848.2	65.7	Asia	-14.4%	+35.7%
Micronesia	0.5	116.0	0.4	191.9	Oceania	-8.6%	+65.4%

Závěrem

Zlepšení RTT

Lepší povědomý o provozu

Pravidelný monitoring

Děkuji vám za pozornost!

Lukáš Vacek

Zdroje

RIPE DNSMON: <https://atlas.ripe.net/dnsmon/>

LG HE: <https://lg.he.net/>

Mapa Evropy: https://cs.m.wikipedia.org/wiki/Soubor:Blank_map_of_Europe.svg

Mapa světa: https://commons.wikimedia.org/wiki/File:World_map_blank_without_borders.svg

Naše projekty

