



RIPE NCC
RIPE NETWORK COORDINATION CENTER

Internet Landscape and Network Resiliency

in South East Europe

Jelena Ćosić | ANIX meeting | December 2024



Internet resilience

[ˈɪntənət rɪˈzɪləns] noun

The capacity of a country or region's Internet infrastructure to maintain stable and reliable service despite disruptions.



Internet Resilience Index



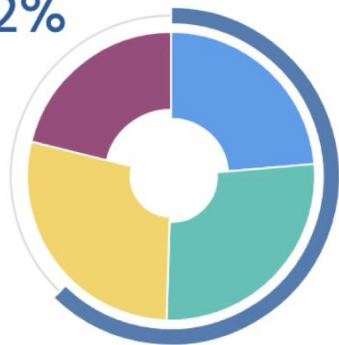
Overall Resilience

Europe ×

● Infrastructure ● Performance ● Security ● Market Readiness

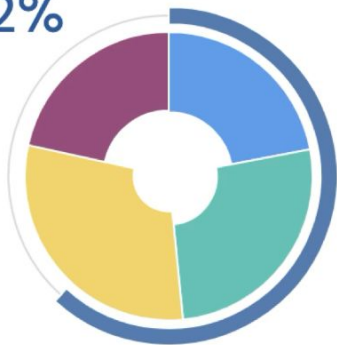
Northern Europe

62%



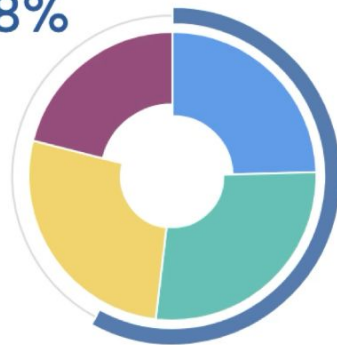
Western Europe

62%



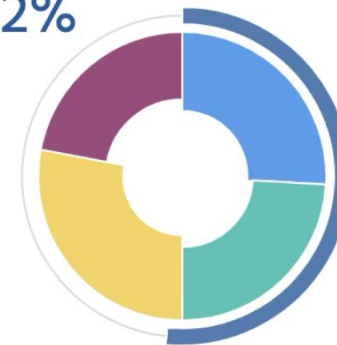
Eastern Europe

58%



Southern Europe

52%



Internet Society Pulse:

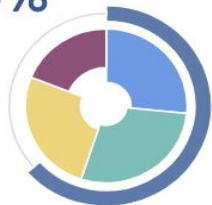
pulse.internetsociety.org/resilience

Internet Resilience Index

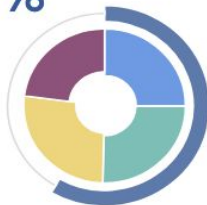


● Overall Resilience ● Infrastructure ● Performance ● Security ● Market Readiness

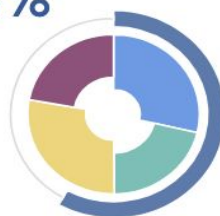
Bulgaria
64%



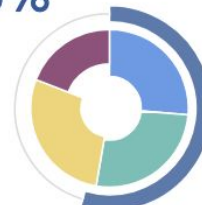
Romania
58%



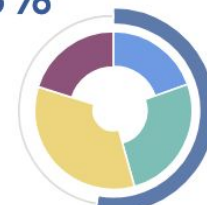
Greece
58%



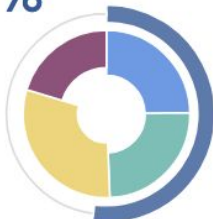
Croatia
55%



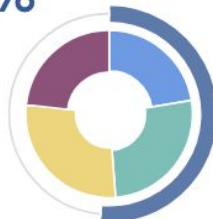
Slovenia
53%



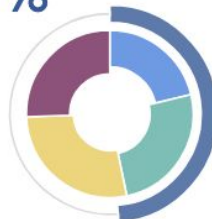
Serbia
52%



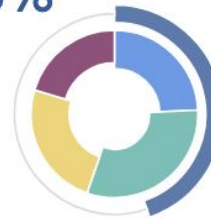
Montenegro
51%



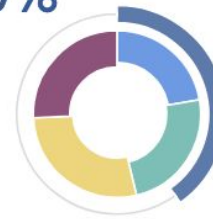
Albania
49%



North Macedonia
45%



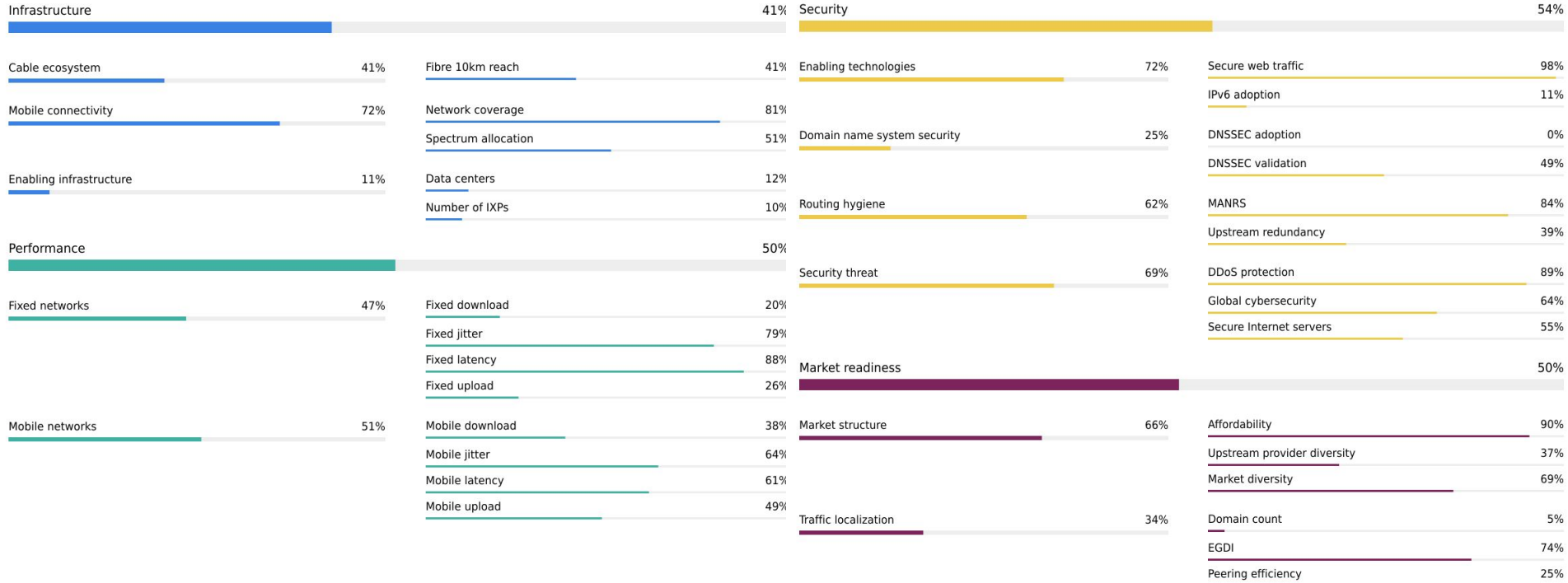
Bosnia and Herzegovina
40%



Internet Resilience Index



Albania





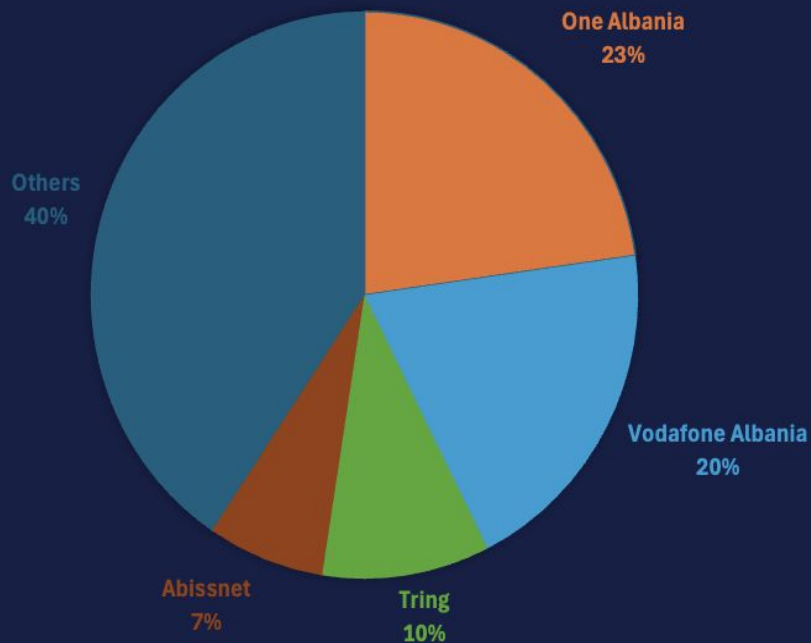
Market readiness

Market structure

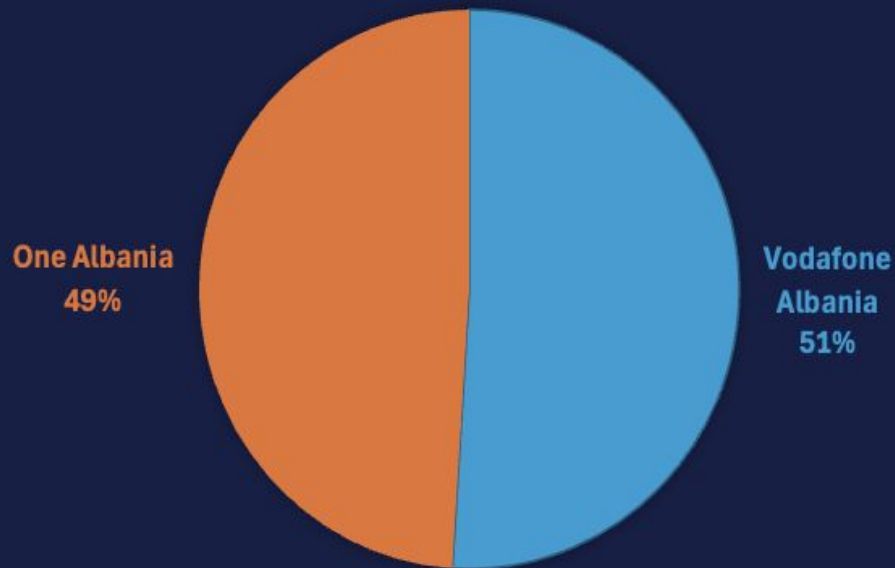
Market structure - Albania



Broadband market shares from fixed networks



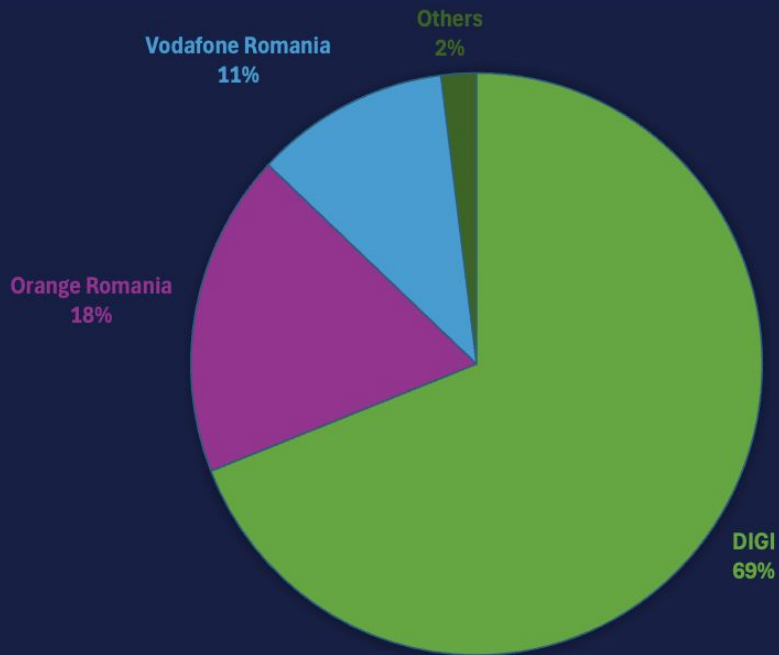
Number of active mobile phone users



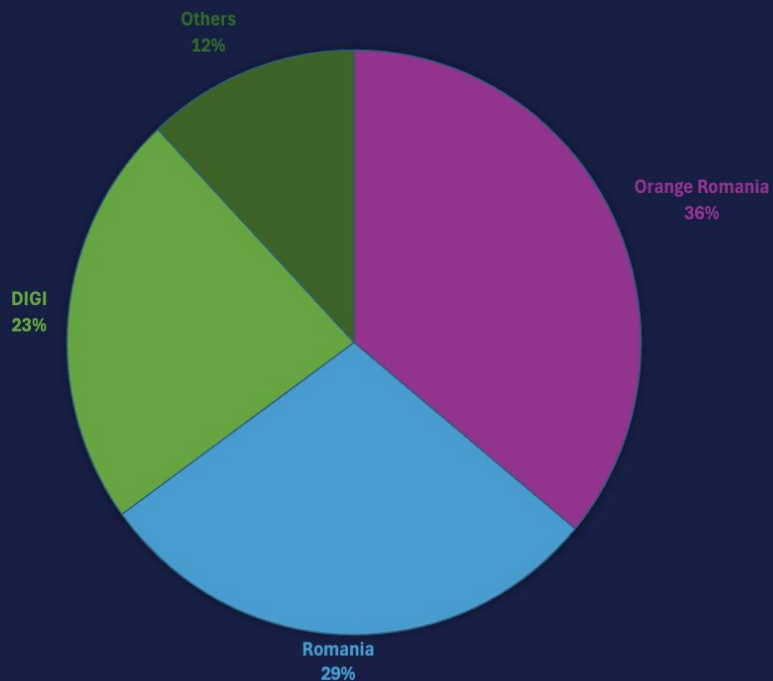
Market structure - Romania



Broadband market shares from fixed networks



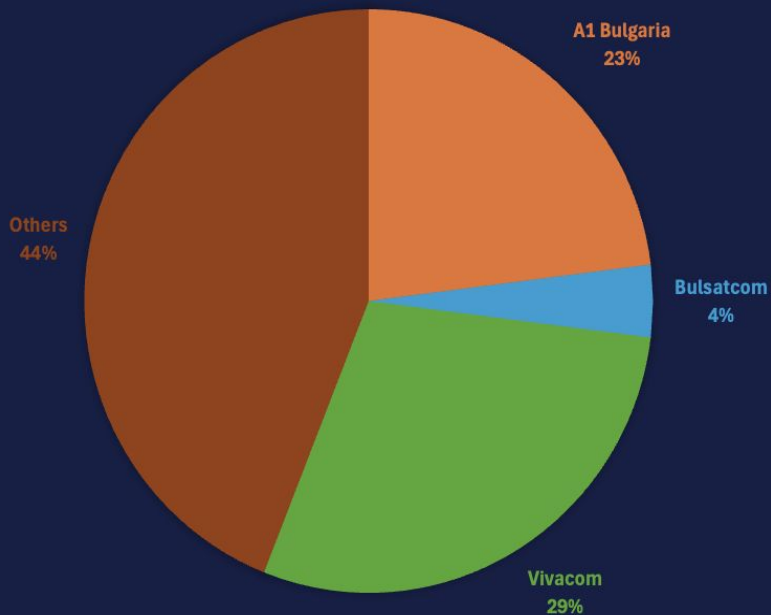
Number of active mobile phone users



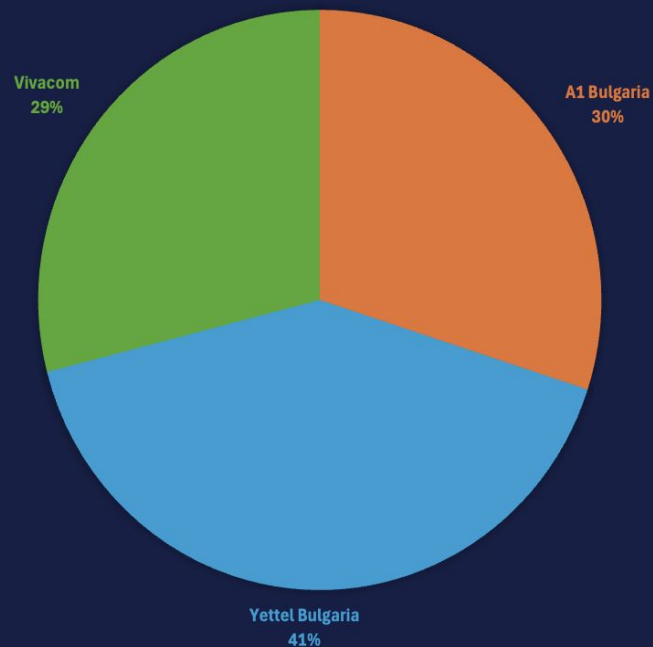
Market structure - Bulgaria



Broadband market shares from fixed networks



Number of active mobile phone users



Market structure



Country	HHI score
RO	0.418
GR	0.368
MK	0.368
SI	0.349
HR	0.346
ME	0.335
RS	0.283
BA	0.250
BG	0.178
AL	0.167 - 0.317

The Herfindahl-Hirschman Index (HHI) is an economic measure of market concentration.

We calculate the HHI using APNIC data on networks serving users in a specific country. Only networks with over 1% of users in that country are included.

By converting percentages to fractions, we obtain an HHI ranging from 0 (no concentration) to 1 (monopoly).

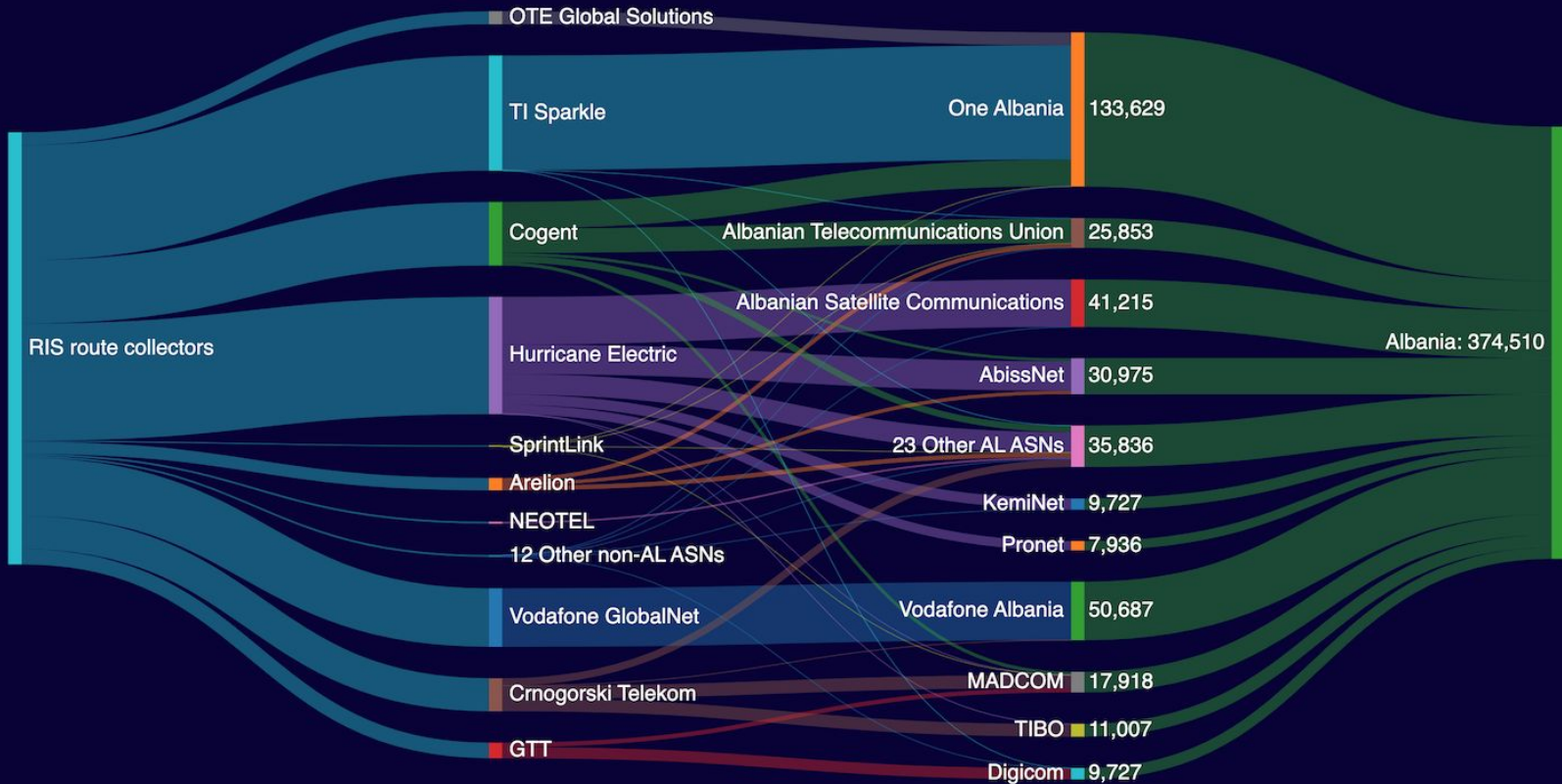
- $HHI < 0.1$: Unconcentrated (competitive market).
- $0.1 \leq HHI < 0.18$: Moderately concentrated.
- $HHI \geq 0.18$: Highly concentrated (indicative of significant market power).



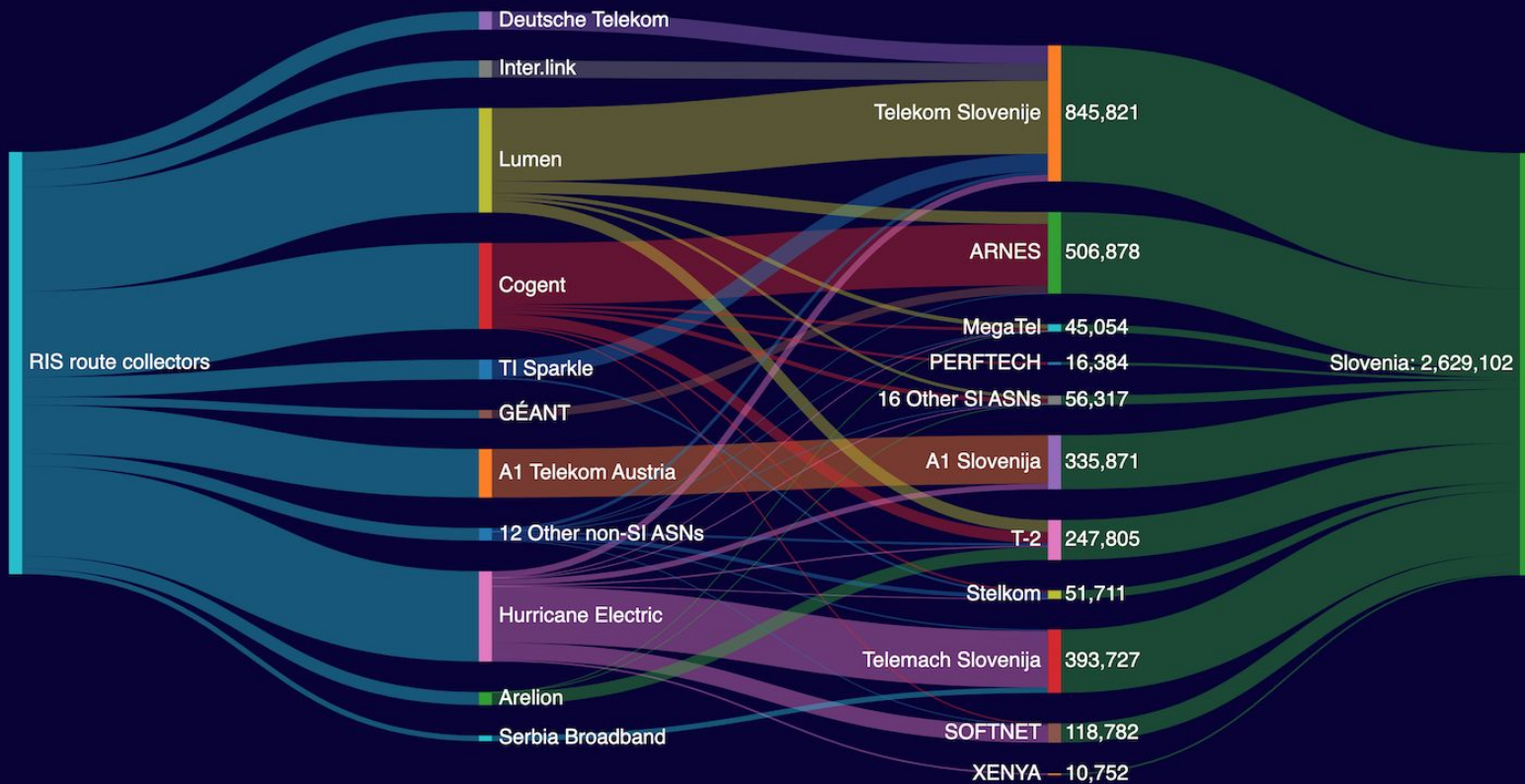
Market readiness

Upstream provider diversity

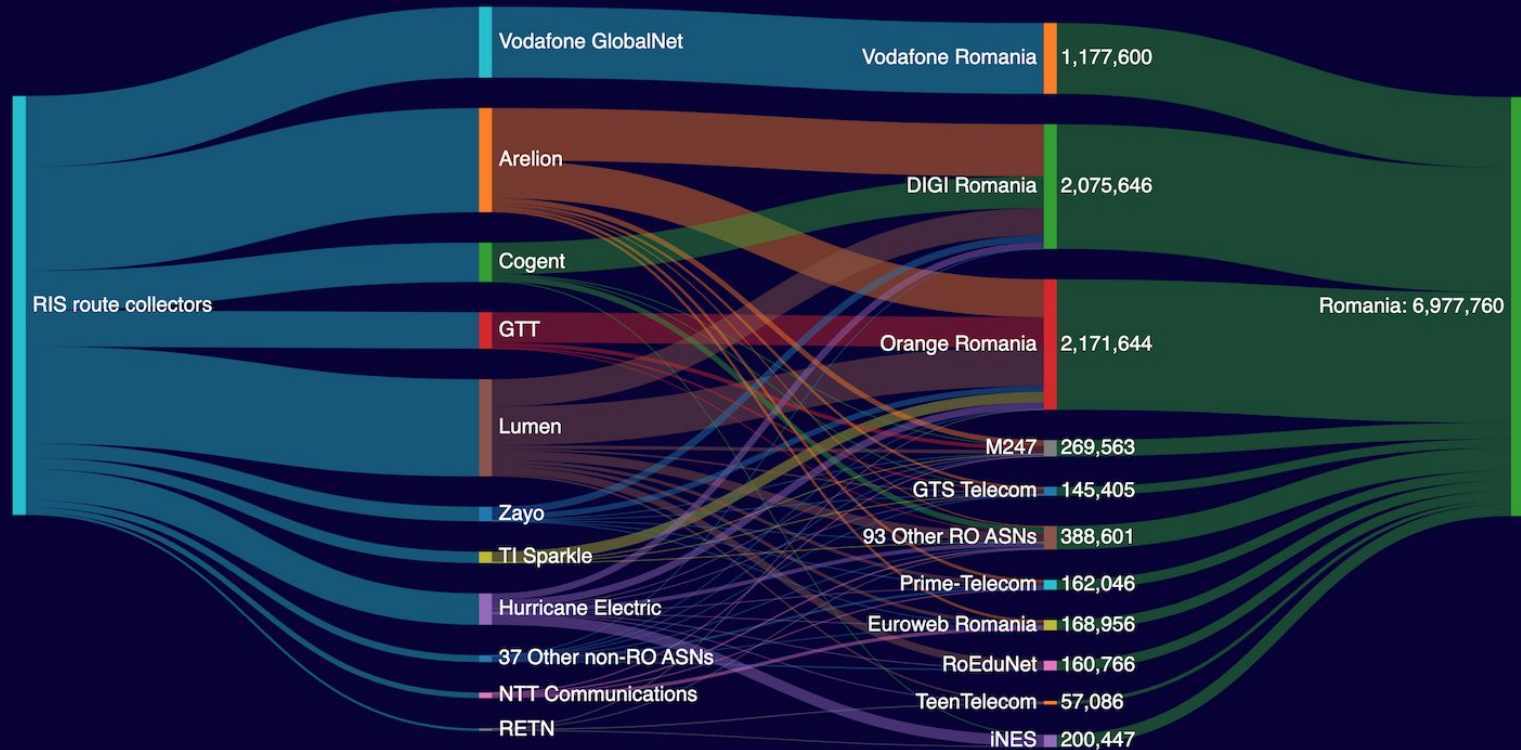
Upstream operators providing connectivity into Albania



Upstream operators providing connectivity into Slovenia



Upstream operators providing connectivity into Romania



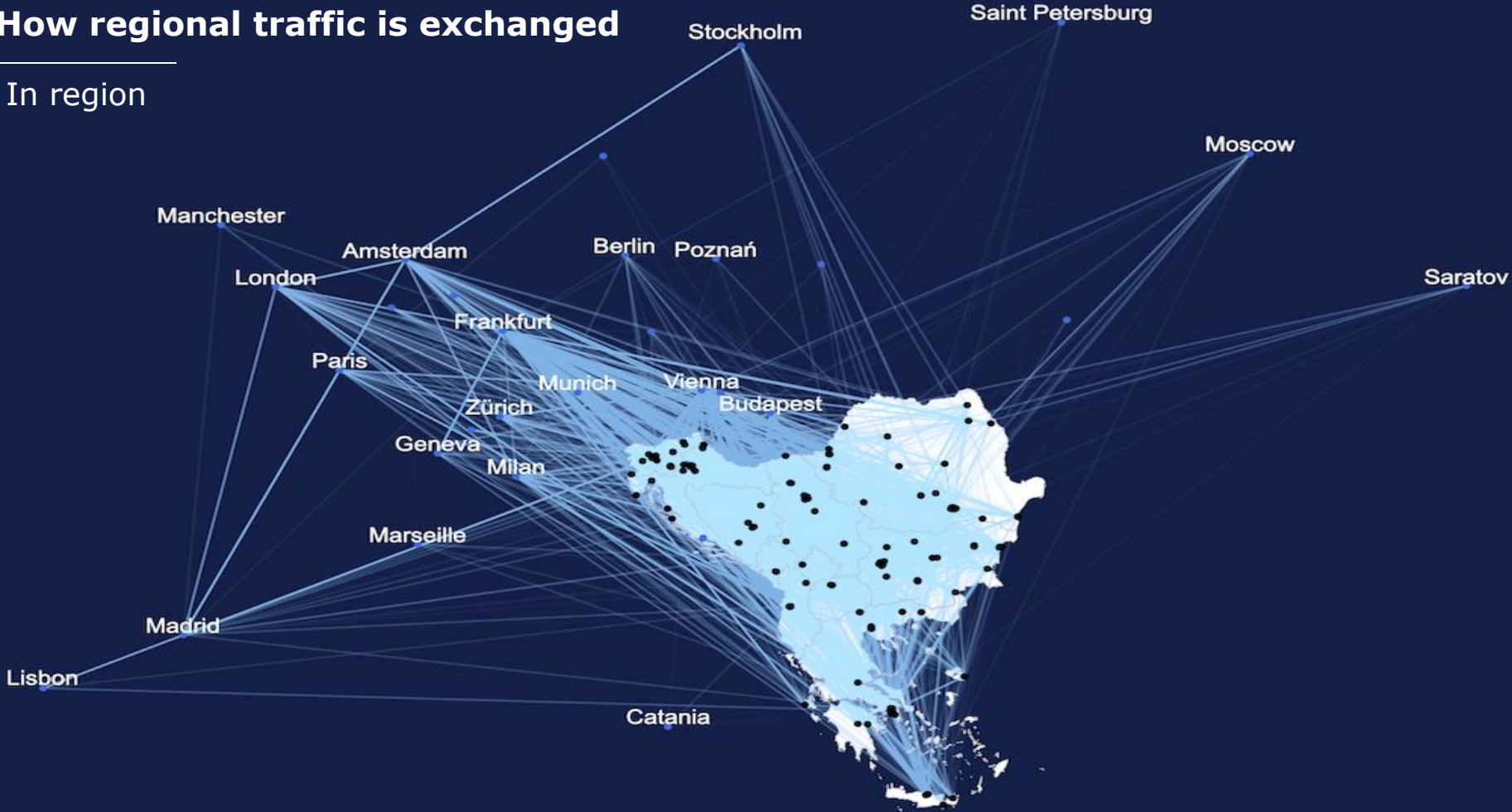


Market readiness

Traffic localisation

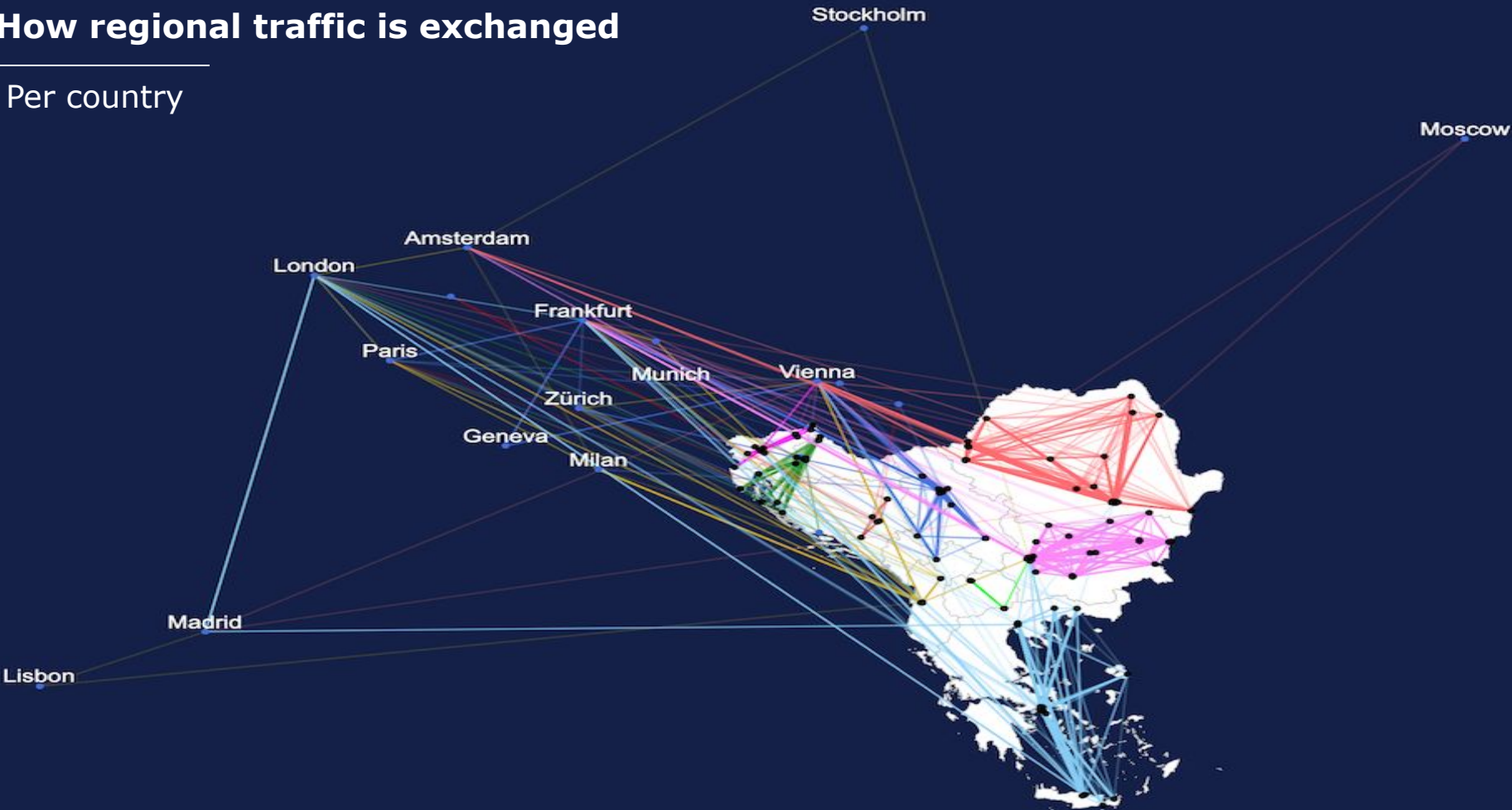
How regional traffic is exchanged

In region



How regional traffic is exchanged

Per country



Paths between origin and destination in AL





Infrastructure

Enabling infrastructure

Number of IXPs



Cloud, CDN and OTT leaders in IXP participation

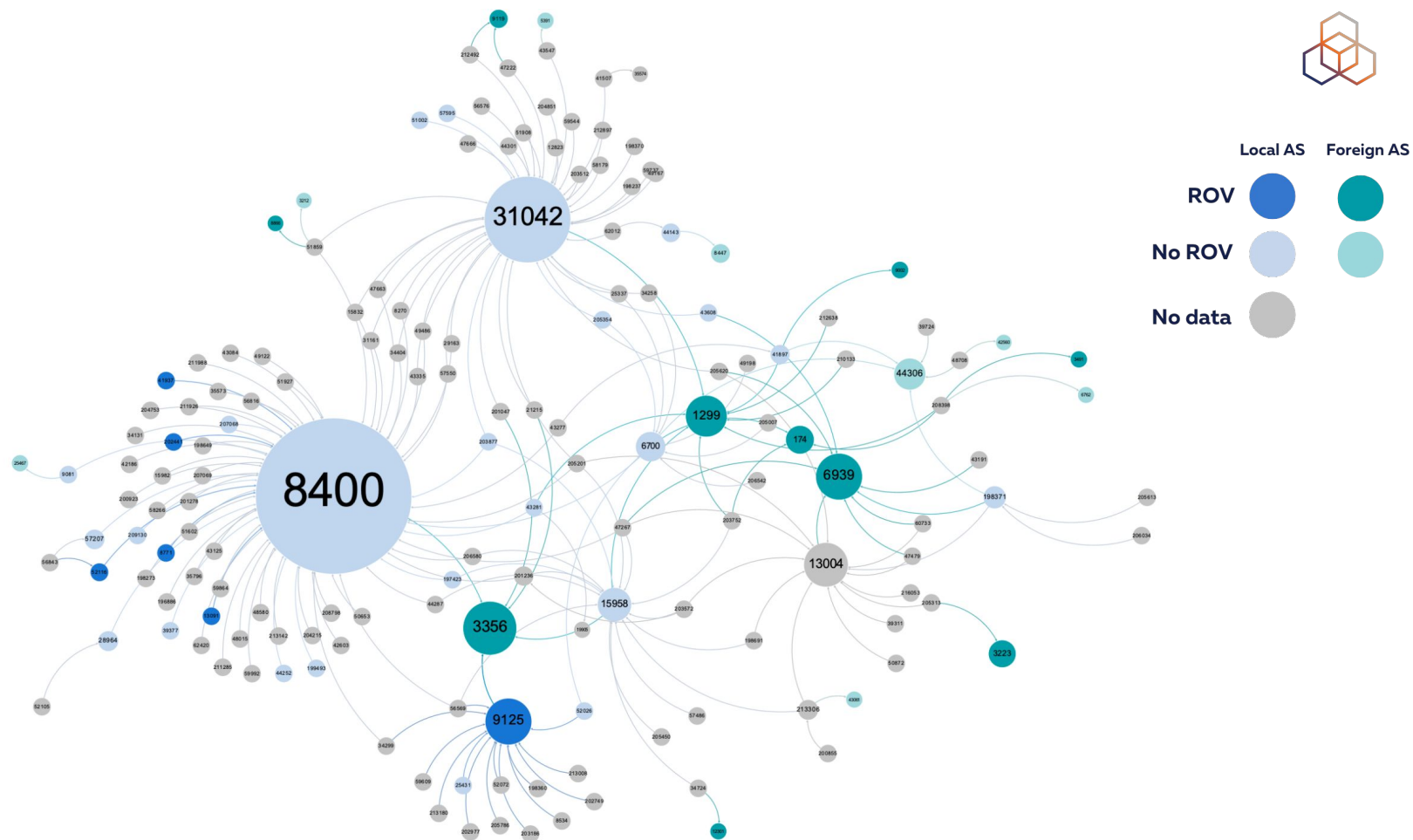


Provider	ANIX	SOX	InterLAN	RoNIX	CIX	BIX.BG	NetIX	GR-IX	IXP.mk
Google		100G	100G	40G		400G	400G		
Microsoft Azure		20G	20G		40G	200G	100G	200G	
Akamai			200G			40G	100G		
AWS		40G				200G		200G	
Meta	30G	200G	200G	200G		200G	220G		
Cloudflare		40G	100G	10G	40G	20G	200G	200G	20G
Fastly						200G			
Netflix	20G	40G	100G	100G					
ByteDance			100G				100G		

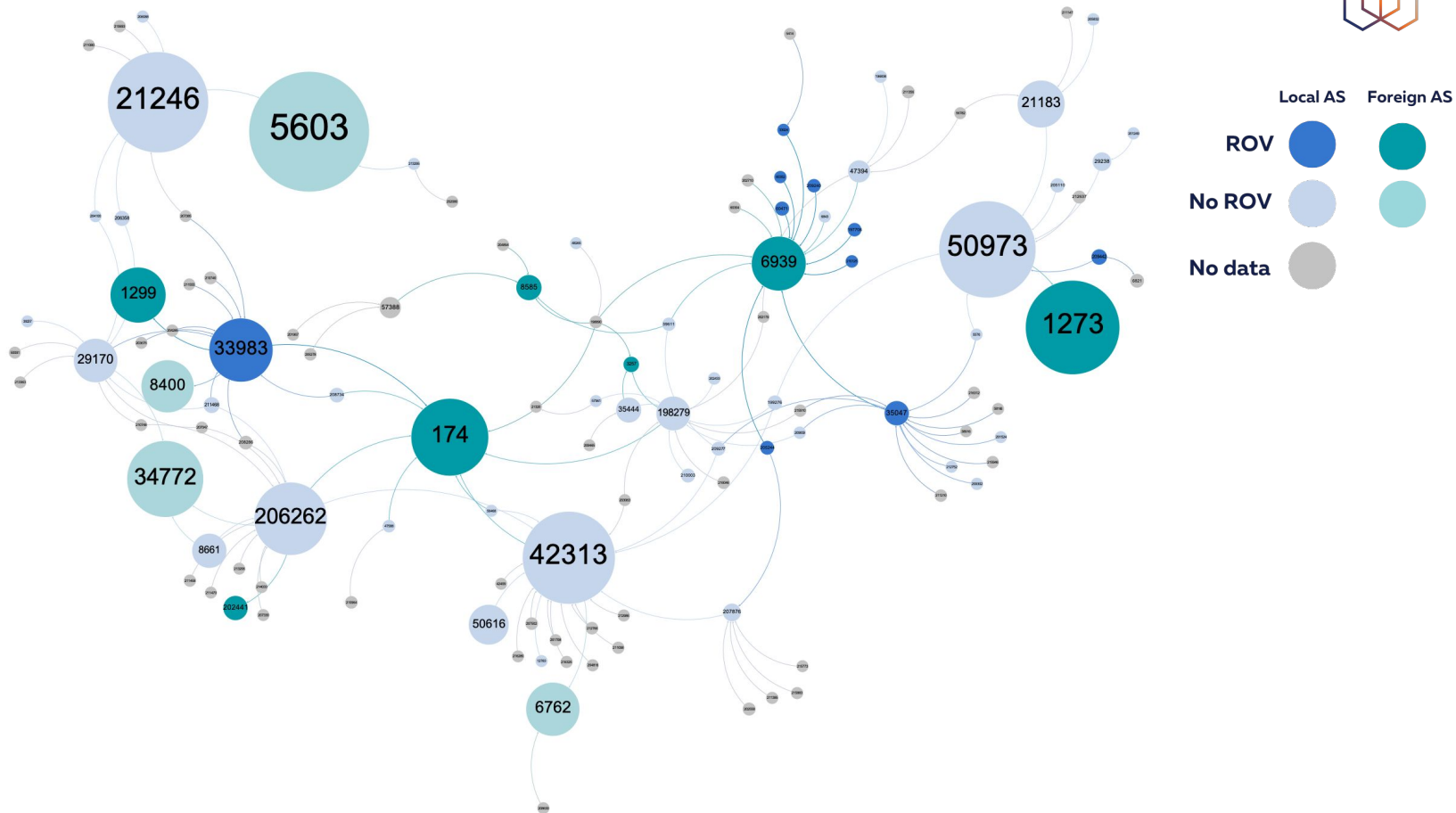


Security

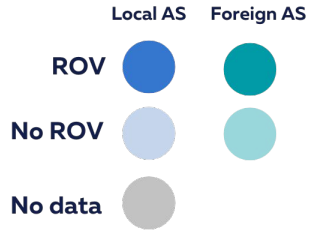
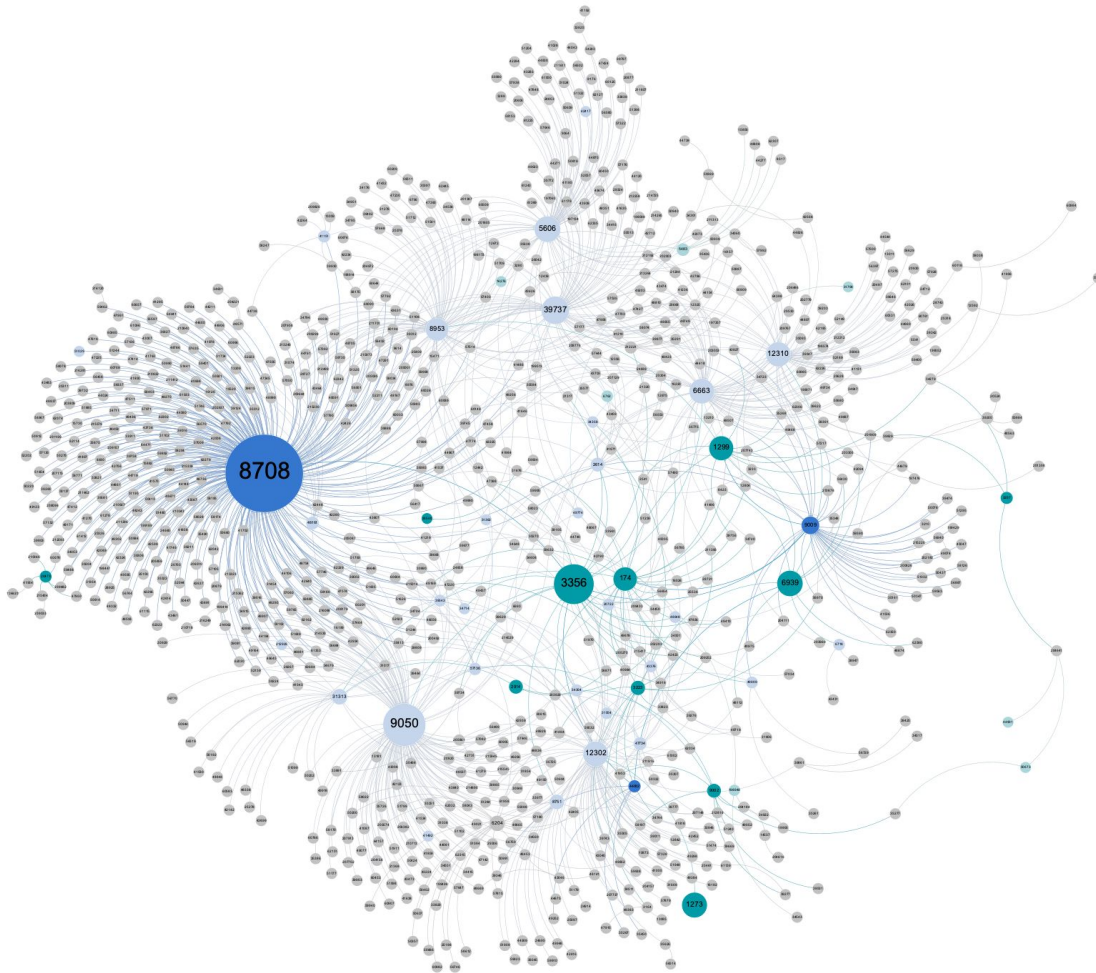
Routing Hygiene



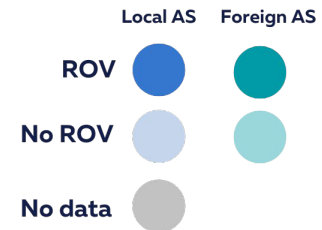
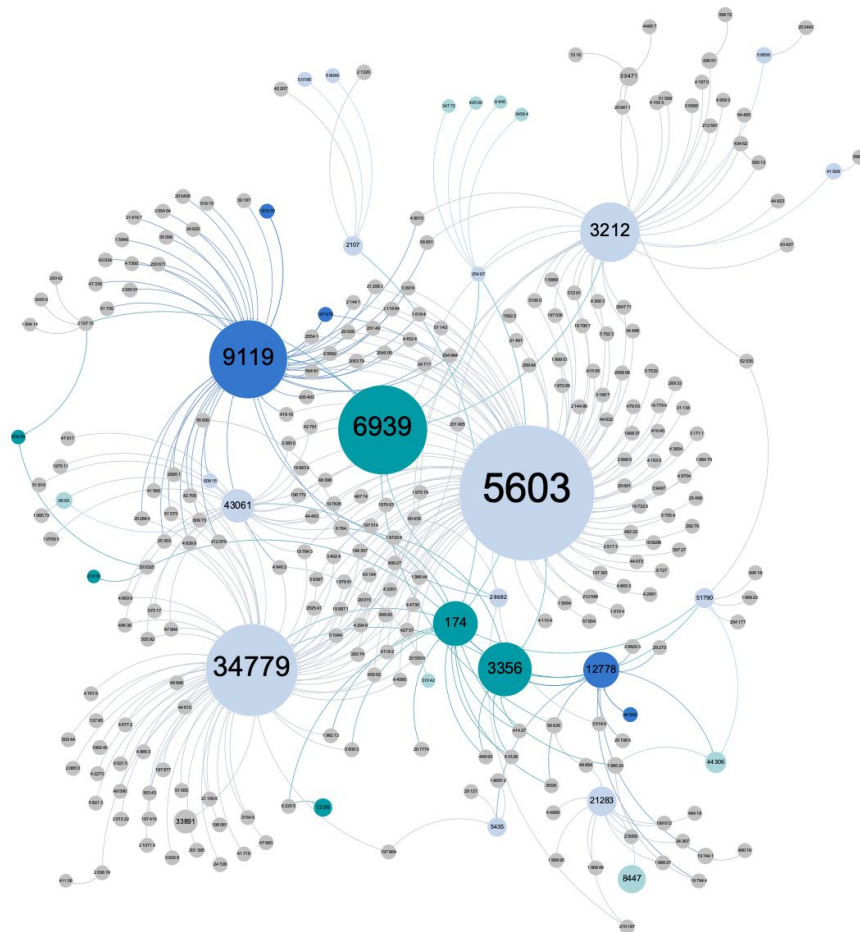
Albania



Romania



Slovenia



“It's the people, stupid.”



The strength of a network lies not just in its infrastructure, but in the community that builds, sustains, and defends it.

Highlights



- The (former) state telecommunications operators still exert a lot of influence. There are smaller numbers of independent providers than we see in some other parts of Europe.
- Routing within the region is generally efficient, although we observed a few anomalies that likely reflect the various peering arrangements that different networks have in place.
- There is a modest amount of diversity in terms of the routes available to traffic flowing into the region, the dominant role played by incumbents.
- Routing security could be further improved if more “central” ASNs deploy ROV, contributing to greater “collateral benefits”.

Help us increase RIPE Atlas coverage in Albania



ASN	Network name
50973	Vodafone Albania
21183	Vodafone Albania
50616	One Albania
35444	Digicom
35047	Abissnet
47394	ASC/Tring
57388	IBC



Questions & Comments



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THANK YOU!