The Internet Landscape in Romania

As seen by the RIPE NCC

Gergana Petrova | 29 September 2022 | RONOG

RIPE NCC

- One of five Regional Internet Registries in the world
- Also provide a number of technical services and tools
  - K-root
  - RIPE Atlas
  - RIPEstat
  - RIS
- Involved in public policy discussions and Internet governance

RIPE NCC Internet Country Reports

- Showcase RIPE NCC data and measurement platforms

- Bring value to local technical communities

- Support Internet development throughout service region

- Inform public policymaking

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RIPE NCC Internet Country Reports

- Nine reports so far

- Latest report published May 2022

  - https://labs.ripe.net/country-reports/

- Covers Romania, Moldova and Bulgaria

- Translation in Romanian
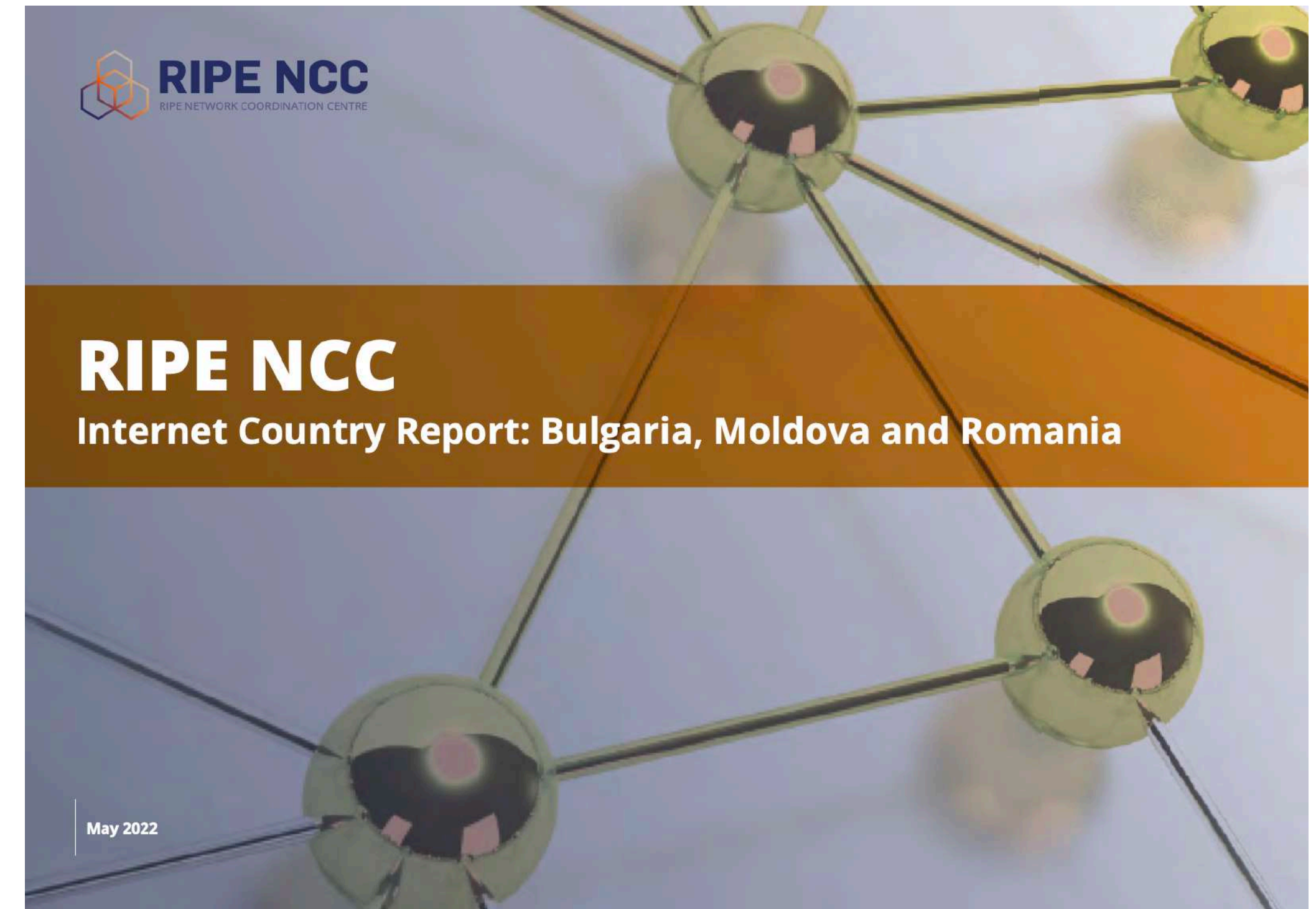
Market Development Challenges

- Losing skilled ICT workers to emigration

- Relatively low levels of Internet use compared to the rest of Europe

- Large urban-rural digital divide

- Relative lack of digital services such as e-government

Market Development

- Healthy levels of market competition

  - The incumbent market share in Romania is one of the lowest in the EU, at 17%

- Low Internet access prices

- Fast Internet speeds

  - 10th globally for fixed broadband speeds

- New investments made in both infrastructure and updated digital regulation

Figure 1:
Number of Local Internet Registries over time
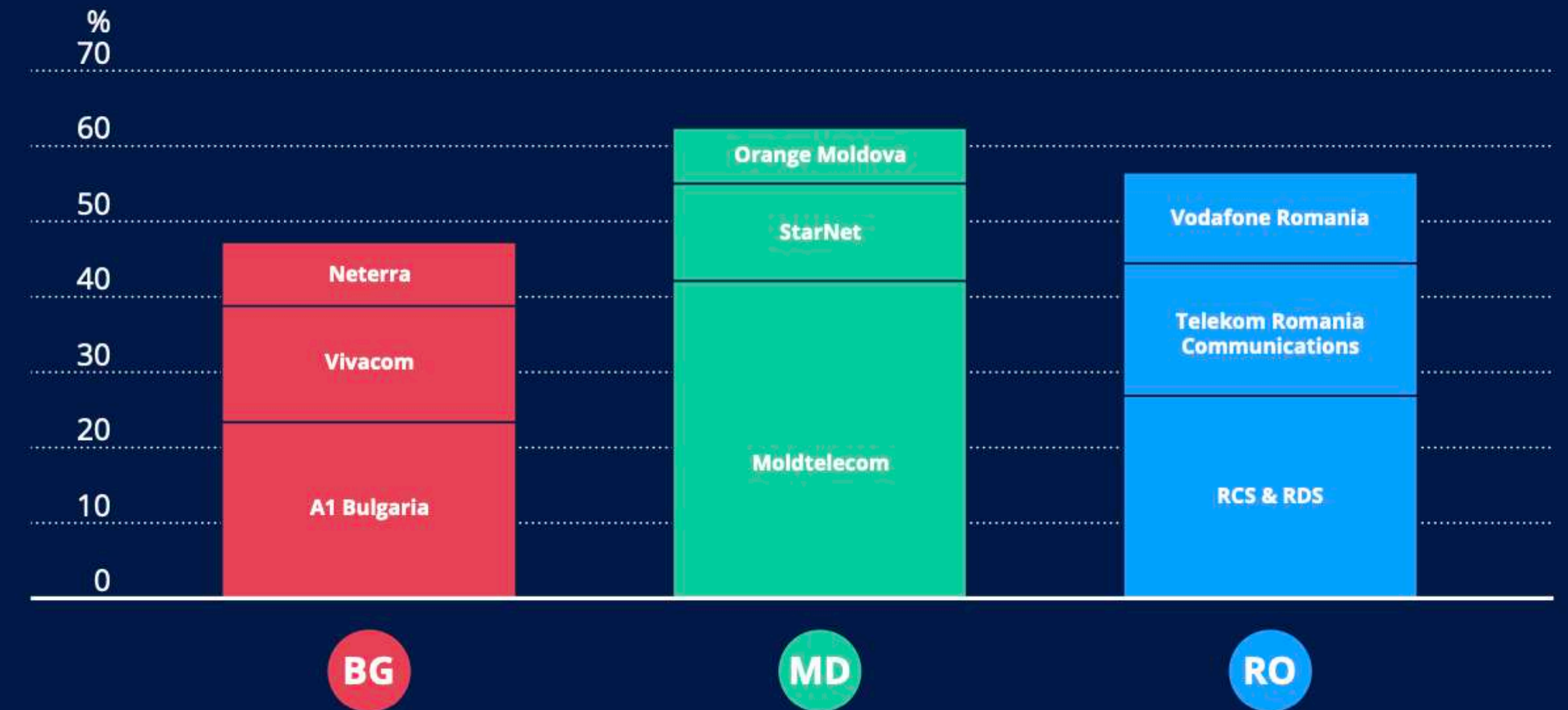
BG Bulgaria   MD Moldova   RO Romania
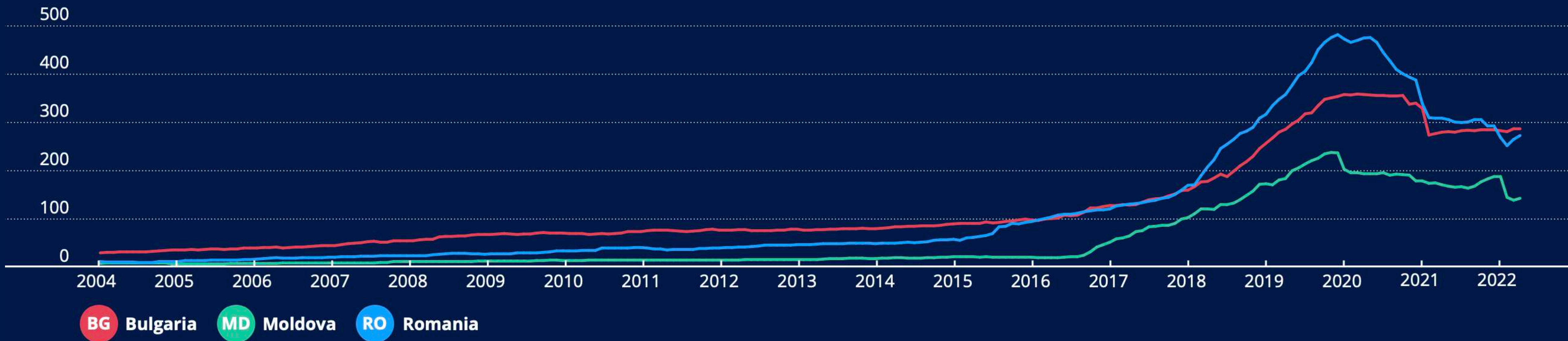
- More LIRs - more diversified market

- Not always:

  - More non-ISP LIRs

  - Members with multiple LIR accounts

Figure 3:
IPv4 holdings over time

Figure 4:
Top 3 IPv4 holders

- Correspond to population
- Fair bit of consolidation

Figure 5:
IPv4 transfers within, into and out of Bulgaria, Moldova and Romania between October 2012 and March 2022

Outgoing transfers

NL	136,704
CA	33,024
EE	7,168
GE	4,096
HN	2,048
PL	35,840
US	283,648
RO	8,797,696
GB	30,976
Other	4,864
HK	3,072
RU	25,344
TR	9,216
AT	4,352
UA	23,296
ES	5,120
SC	3,072
DE	3,584
MD	295,424
BG	1,267,456
GR	37,888
BY	4,096
LT	2,048

Incoming transfers

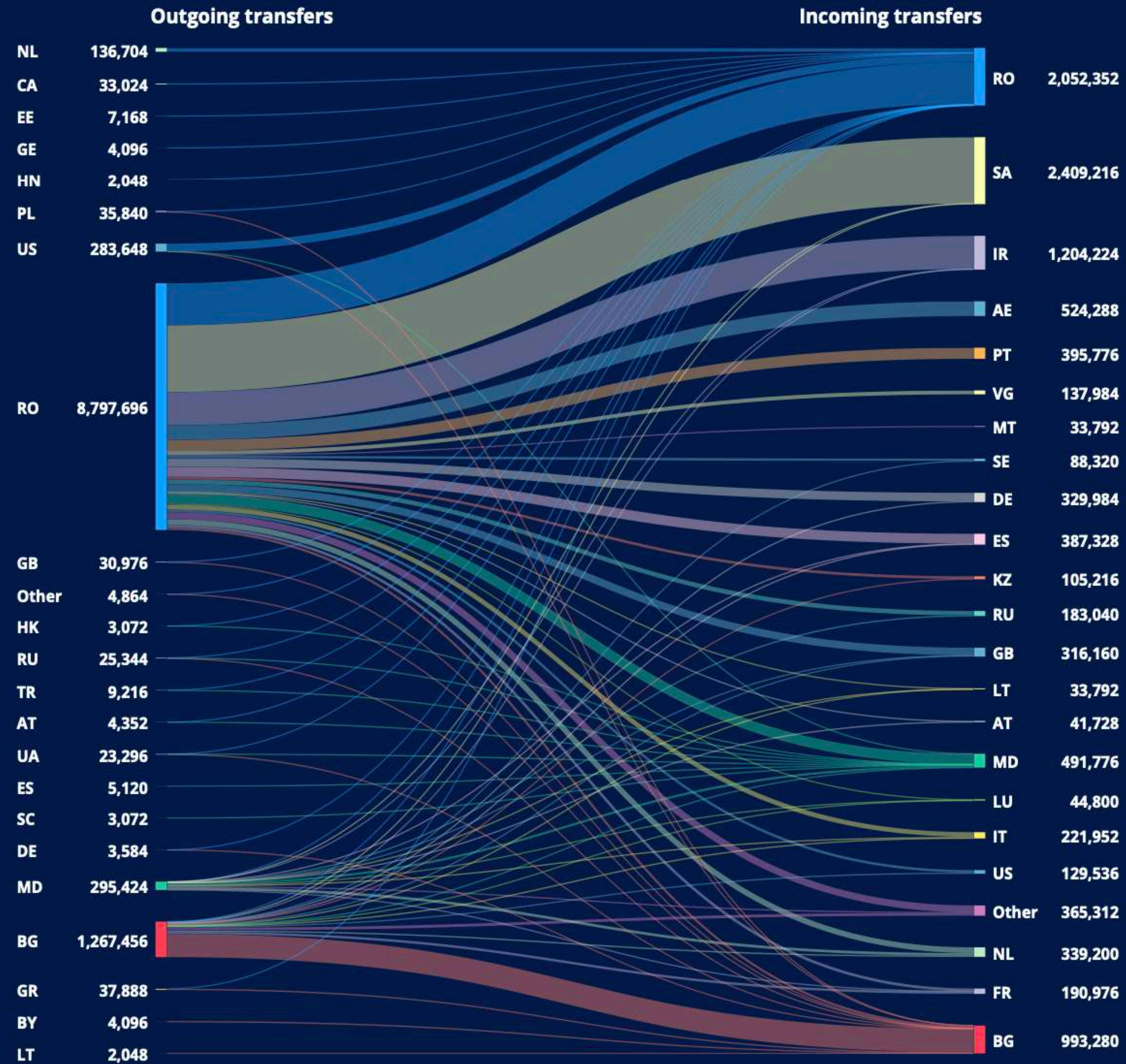|	
RO	2,052,352
SA	2,409,216
IR	1,204,224
AE	524,288
PT	395,776
VG	137,984
MT	33,792
SE	88,320
DE	329,984
ES	387,328
KZ	105,216
RU	183,040
GB	316,160
LT	33,792
AT	41,728
MD	491,776
LU	44,800
IT	221,952
US	129,536
Other	365,312
NL	339,200
FR	190,976
BG	993,280

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Figure 9:
IPv6 capability over time

Source: Compiled from raw APNIC data

- Just because organisations have it, doesn't mean they use it
- RO & BG route 44% of their IPv6 blocks
- Very little market consolidation in IPv6
- RO was previously world leader, now lags behind world average

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Figure 12:
Connectivity between networks in Romania
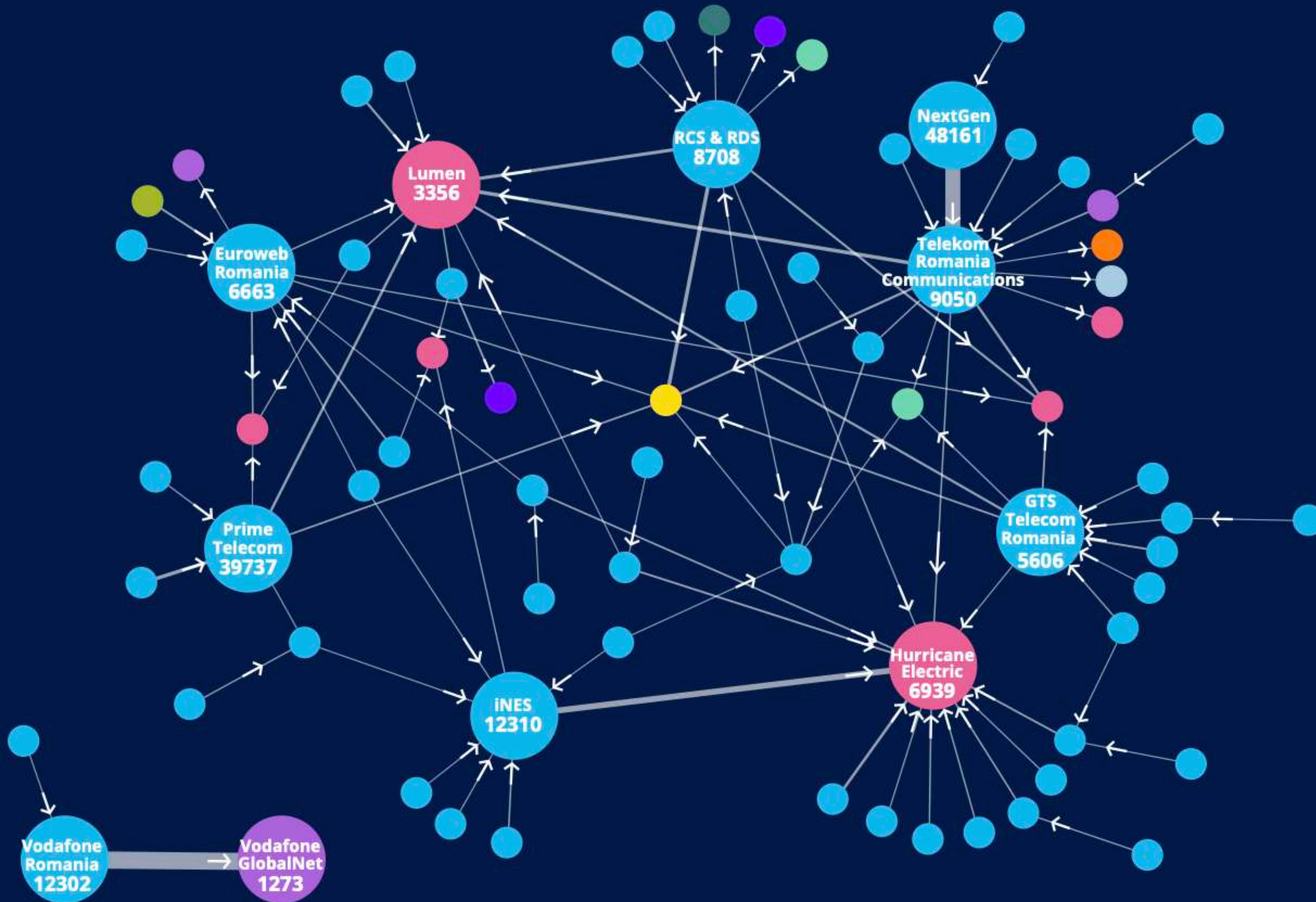
- Used Routing Information Service (RIS)

- In RO less prominent clustering of local networks around the larger providers compared to BG & MD

- More networks with a direct connection to a major international provider

Figure 15:
Romania's international connectivity
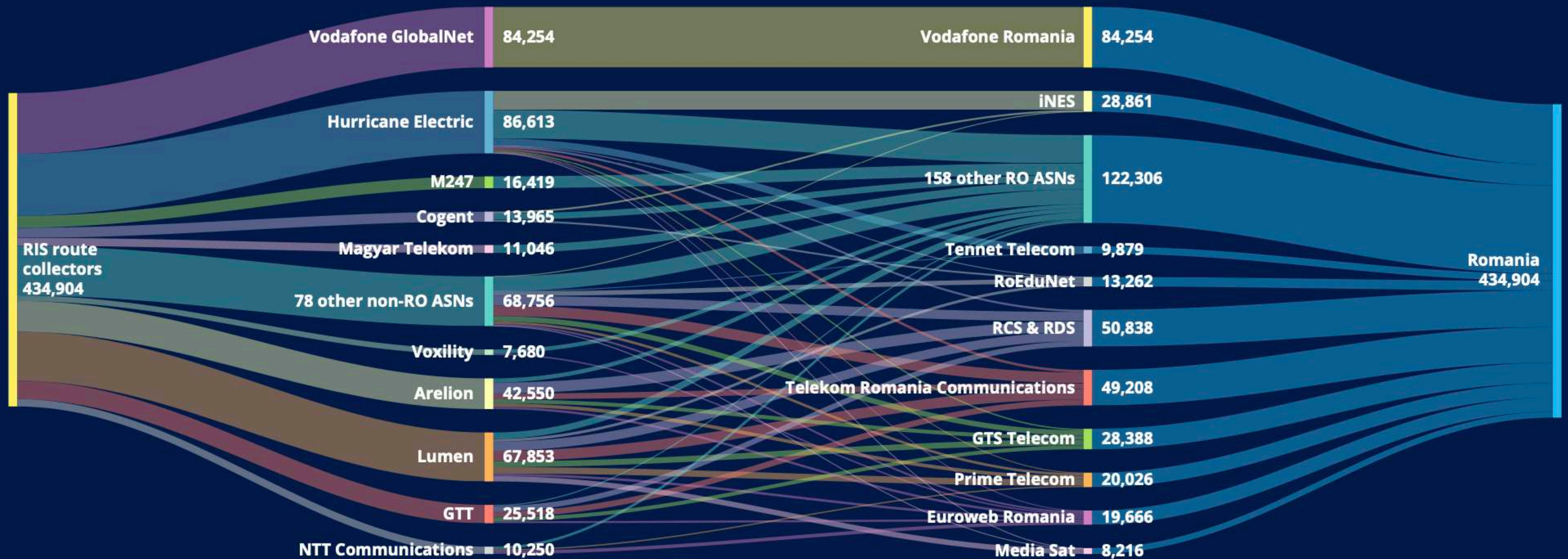
- Variety of upstream providers for the local ISPs
- Vodafone Romania relies exclusively on its parent company
- High number of different available paths

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Figure 16:
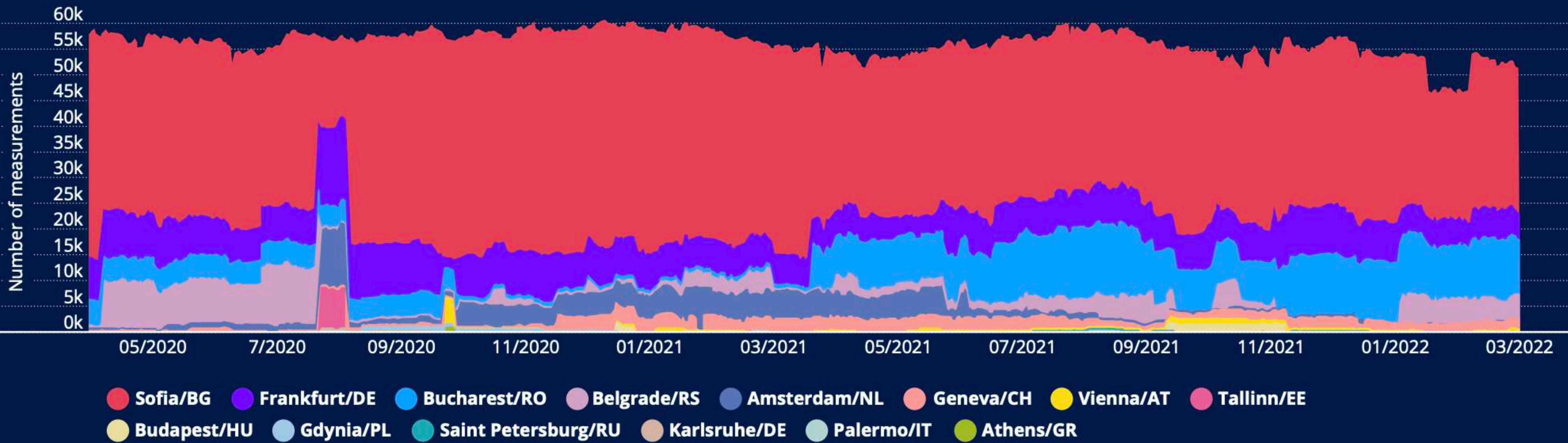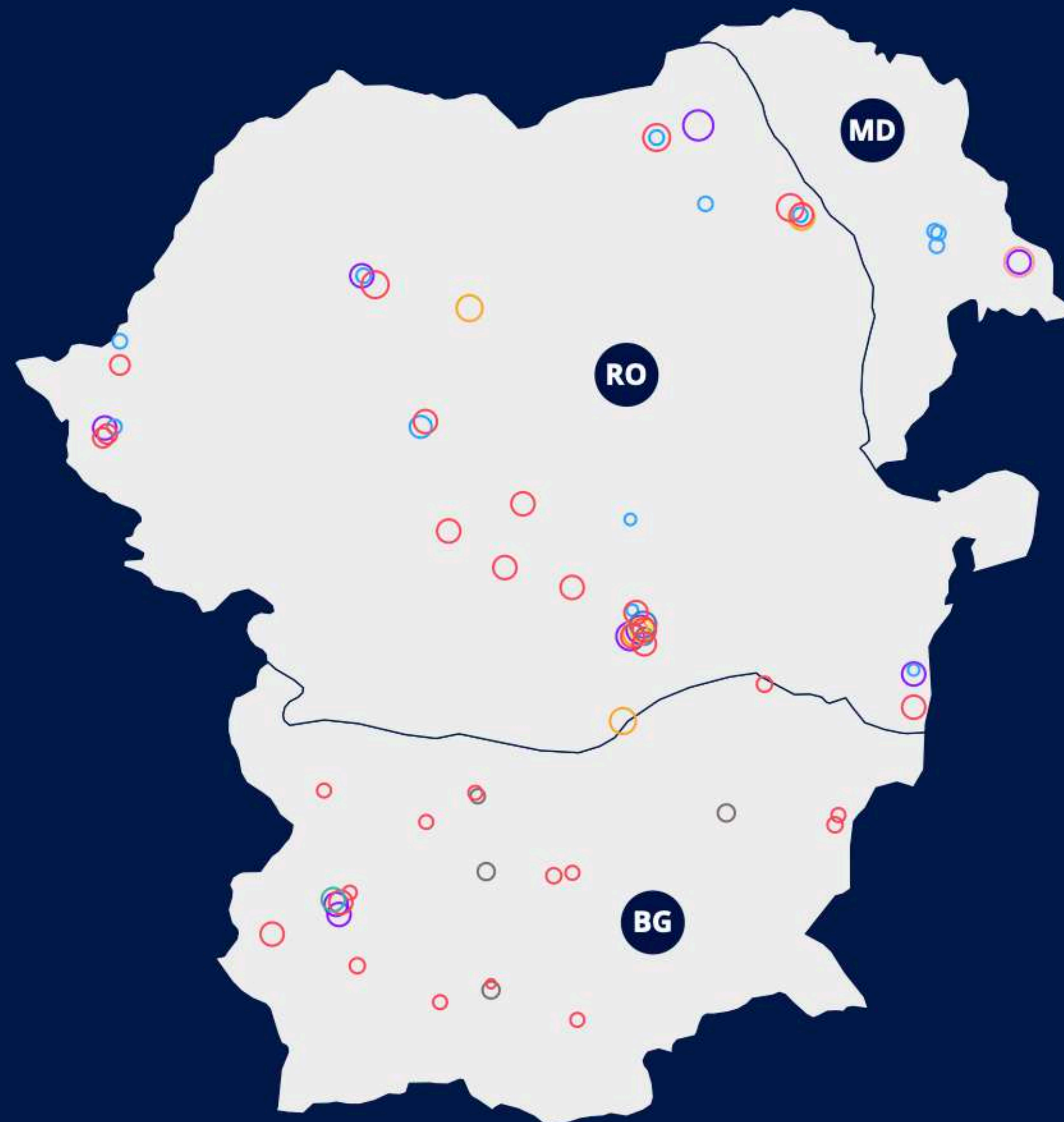**K-root locations reached from requests originating in Bulgaria, Moldova and Romania over time (IPv4)**

Legend:
- Sofia/BG
- Frankfurt/DE
- Bucharest/RO
- Belgrade/RS
- Amsterdam/NL
- Geneva/CH
- Vienna/AT
- Tallinn/EE
- Budapest/HU
- Gdynia/PL
- Saint Petersburg/RU
- Karlsruhe/DE
- Palermo/IT
- Athens/GR

Figure 17:
K-root locations reached from vantage points in Bulgaria, Moldova and Romania

- Some probes in RO reach the K-root instance in Sofia
- Probably not following the shortest path, but are instead being routed via an exchange point abroad before reaching Sofia

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Figure 19:
Paths between origin and destination in the same country for Bulgaria, Moldova and Romania (IPv4)

London

Frankfurt

Munich

Vienna

Chișinău

Bucharest

Sofia

BG
MD
RO
● Probe location
● Intermediate point in path
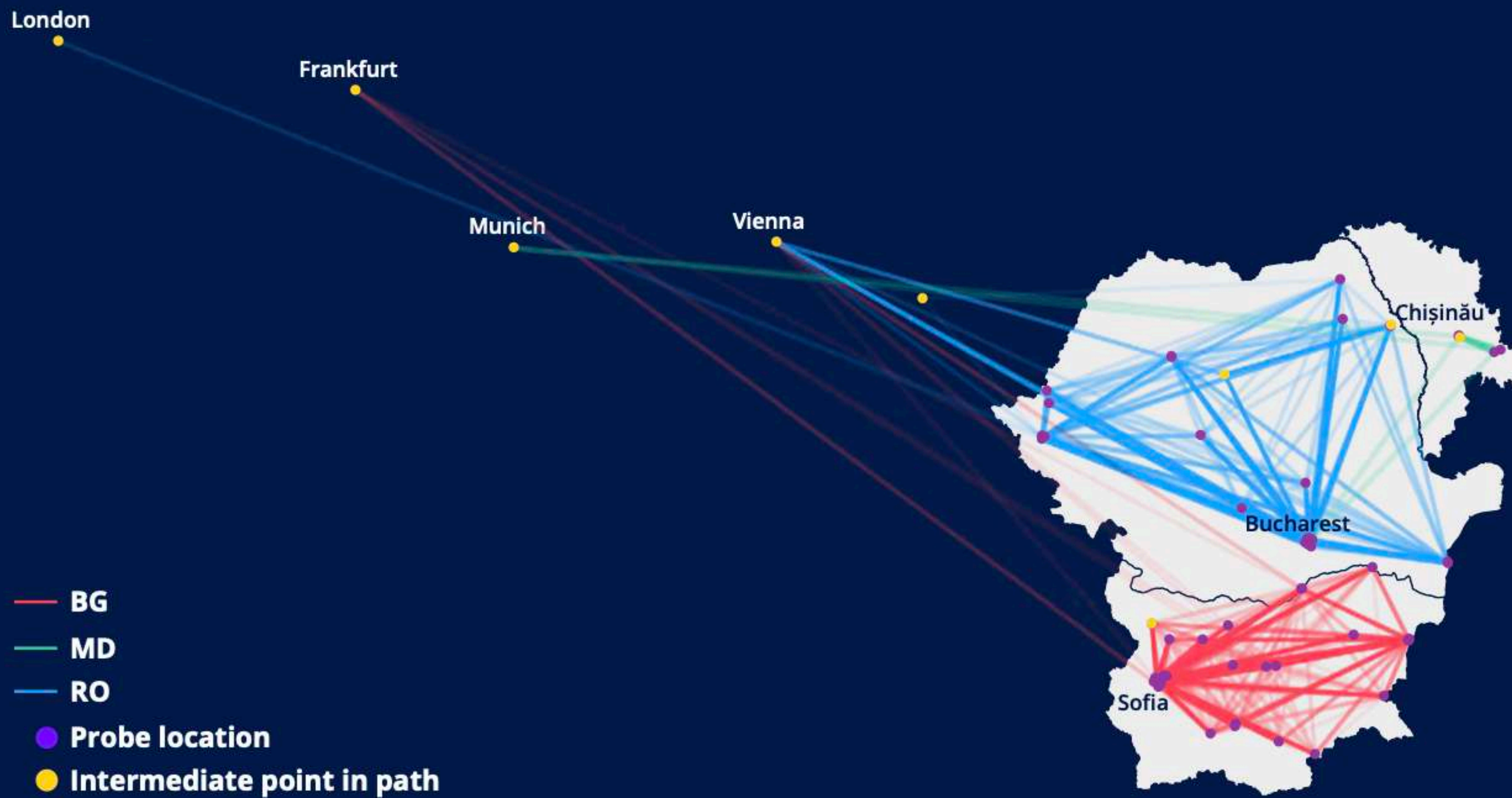
- Most domestic traffic stays inside each country

Figure 21:
IPv4 address space covered by RPKI over time

BG MD RO

Figure 22:
IPv6 address space covered by RPKI over time

BG MD RO

- RPKI uses digital certificates called ROAs (Route Origin Authorisations) to prove a resource holder's right to announce IP prefixes

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Conclusion

- Healthy market competition

  - Some of the lowest access prices and fastest speeds in Europe

- Biggest exporter of IPv4 addresses in the RIPE NCC service region

- Further IPv6 deployment to accommodate future growth

- Routing is generally optimised

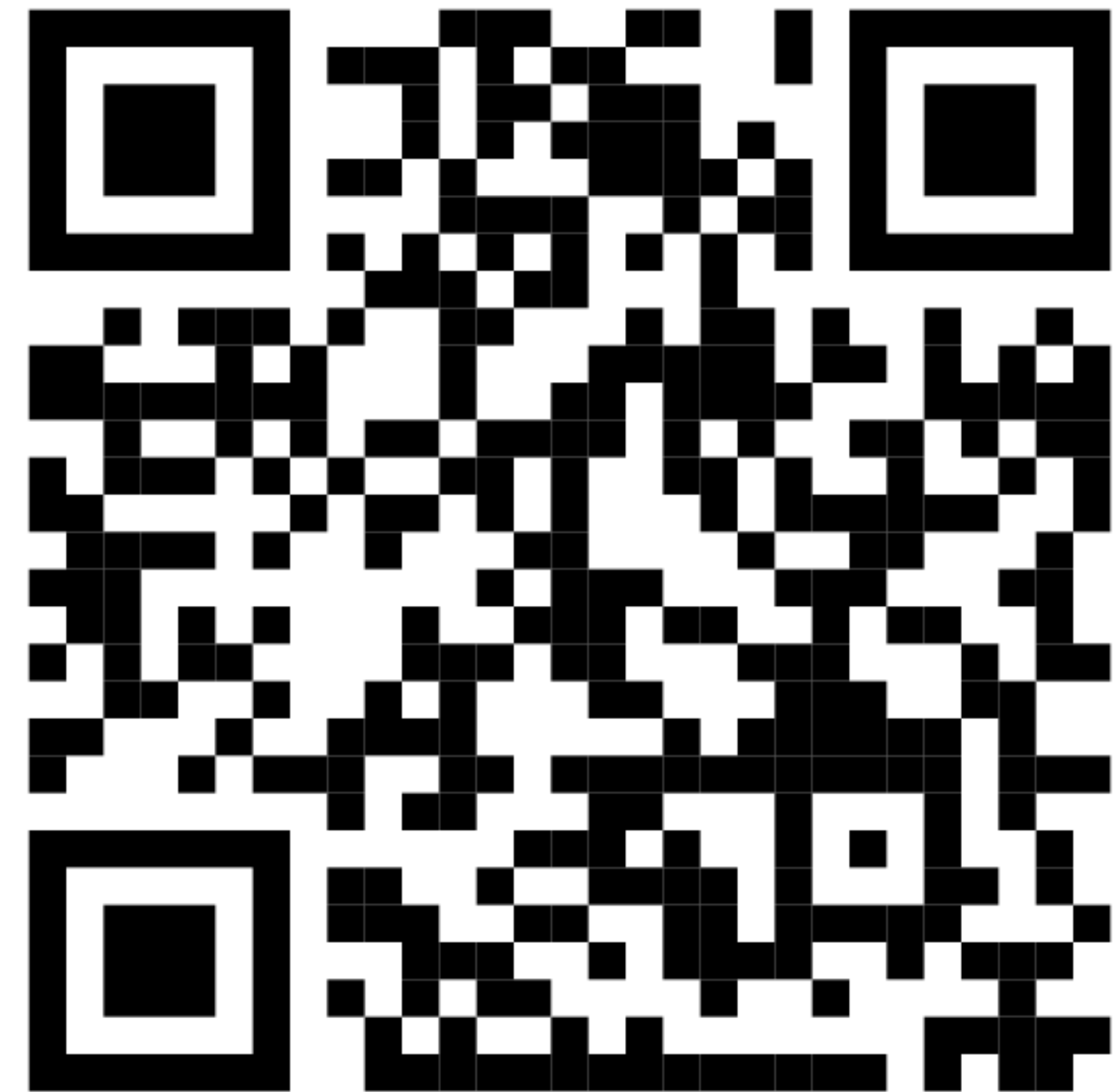- Diversity in international connectivity

See you at RIPE 85!

- RIPE 85 will be a hybrid meeting in Belgrade from 24-28 October

  https://ripe85.ripe.net/

- Remote attendance is free and you don't have to attend the entire week

RIPE 85

Belgrade, Serbia
24 – 28 October 2022

NOGs Participants Survey

- Takes 5-7 mins!

- Your views on:

  - Channels to stay connected

  - Important topics for NOGs to discuss

  - Challenges that prevent you from attending NOGs

https://ripe-ncc.typeform.com/to/SjgKEKSx

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Questions

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