



the Romanian Internet eXchange

by **ANISP**



Interconnection in Romania:

Insights from Internet Measurement Data

Peering/ transit in various countries:

LEGEND [collapse](#)



A network that serves end-users



A network that serves end-users and provides transit to other end-user networks within the country



A transit network or an IXP external to this country



An IXP that is identified with this country

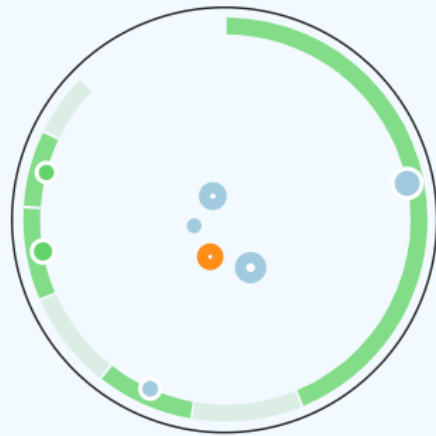


A sizable end-user network for which we have data



A sizable end-user network for which we have no data

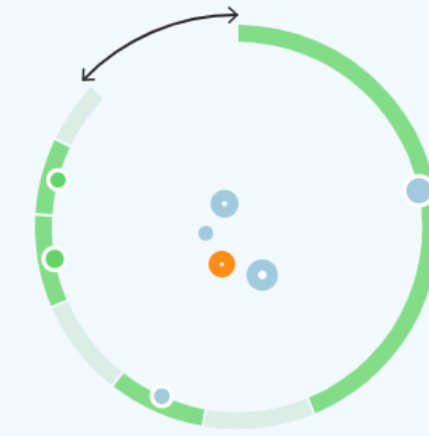
<https://jedi.ripe.net/peer-to-peer/ro/2024/07/01>



The full circle represents 100% of the end-users in a country.



Each network that provides connectivity to more than 1% of the end-users is represented by a colored circle segment. The length of the arc of the segment represents the percentage of the end-users in a country.

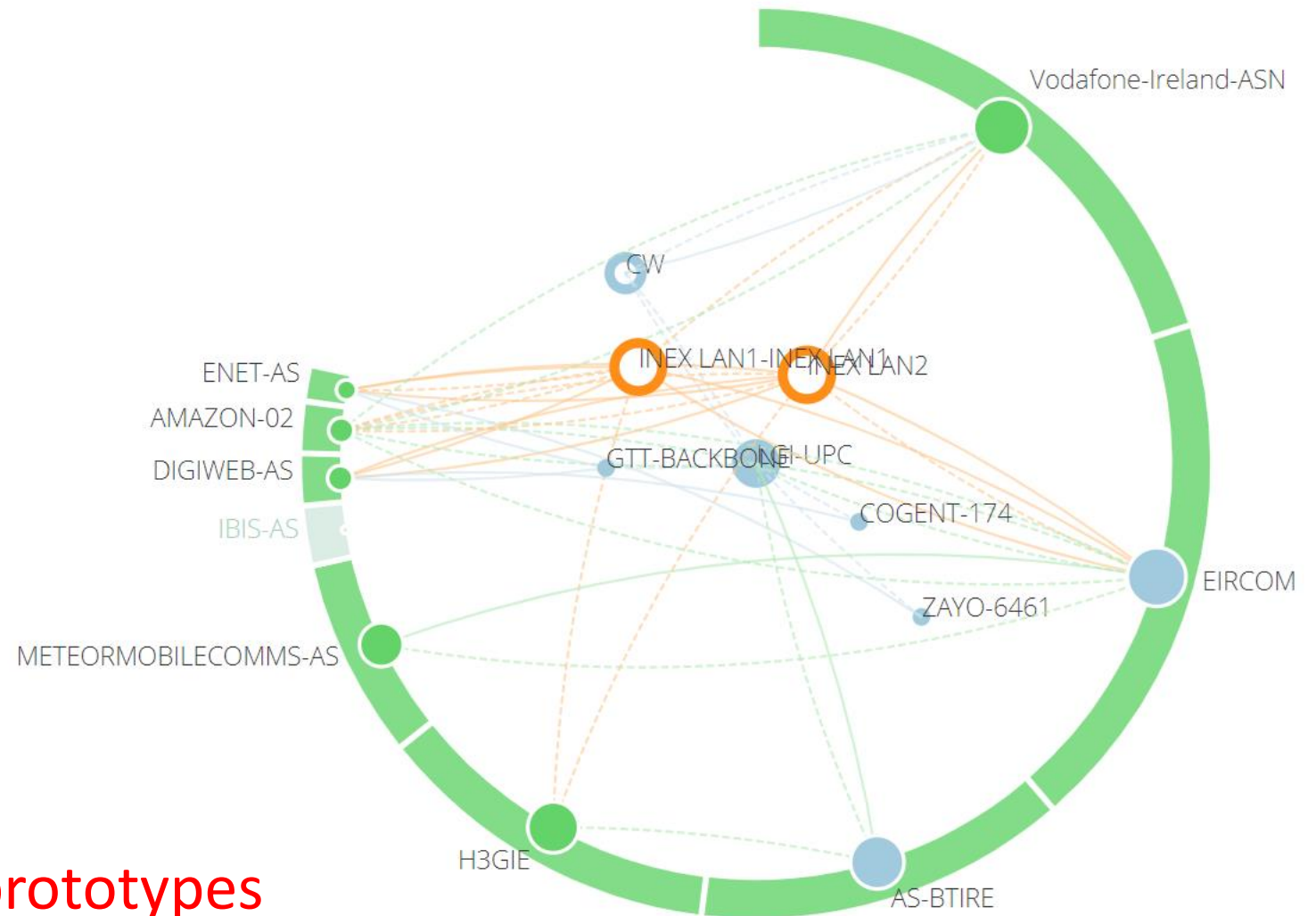


The open part of the circle represents the sum of all ASes that provide connectivity to less than 1% of the end-users in a country

Peering / interconnections / transit in various countries:

Ireland: 2 IXPs, several internal transit providers, several external transit providers, several p2p.

Main operators: excellent interconnectivity.

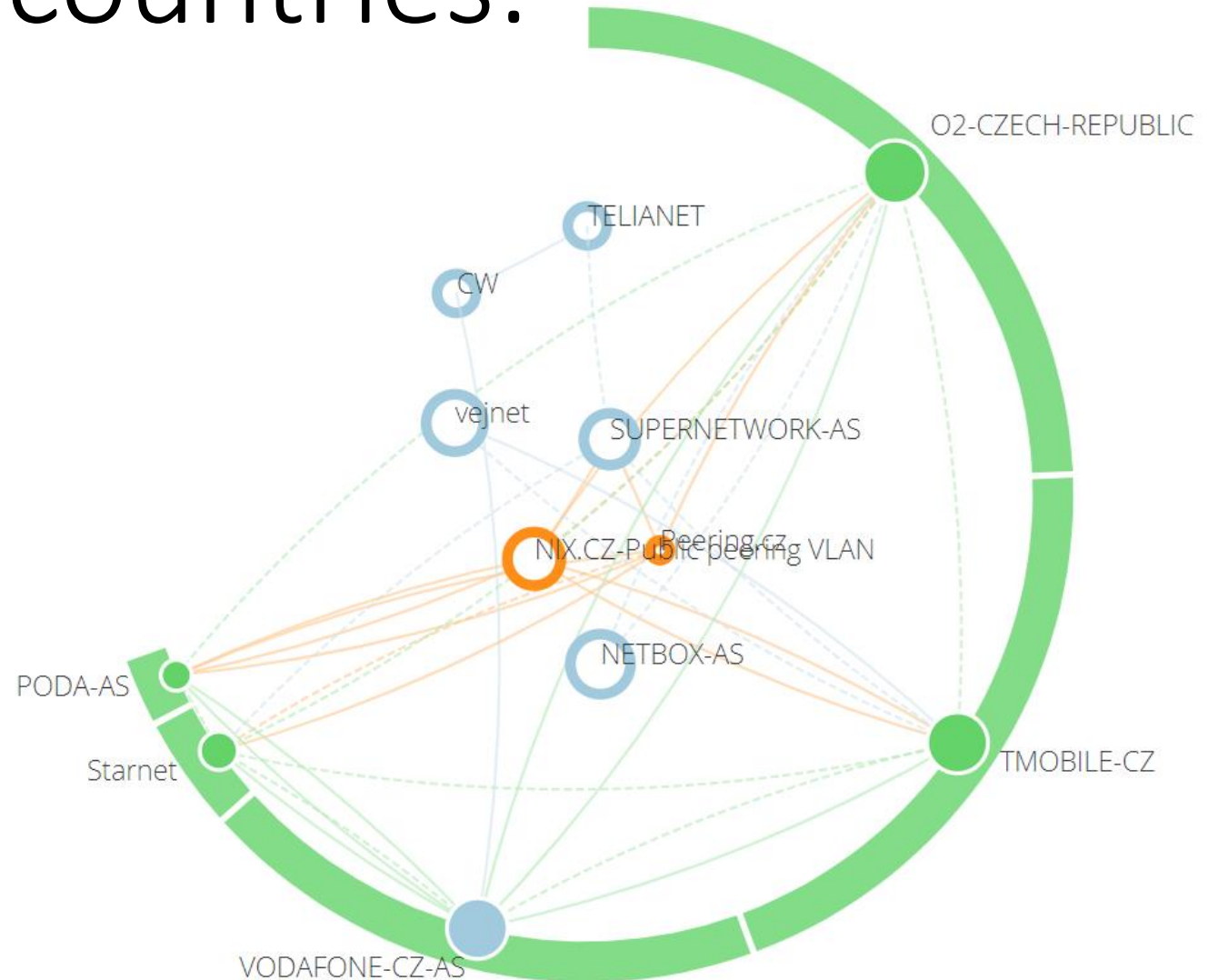


Disclaimer: all RIPE tools are prototypes

Peering / interconnections / transit in various countries:

Czech Republic: 2 IXPs, several external transit providers, several p2p.

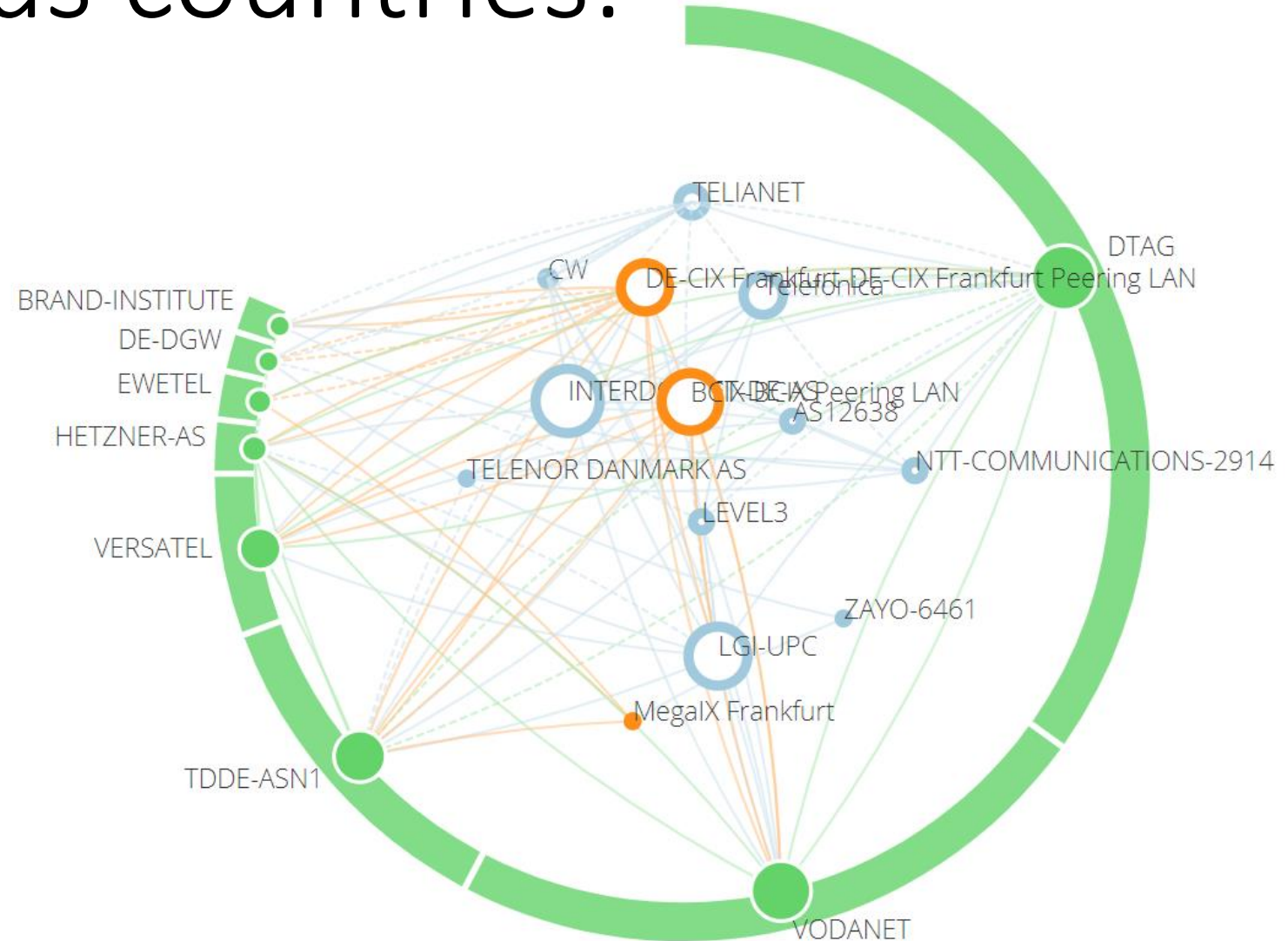
Main operators: excellent interconnectivity.



Peering / interconnections / transit in various countries:

Germany: 2 IXPs, several internal transit providers, several external transit providers, several p2p.

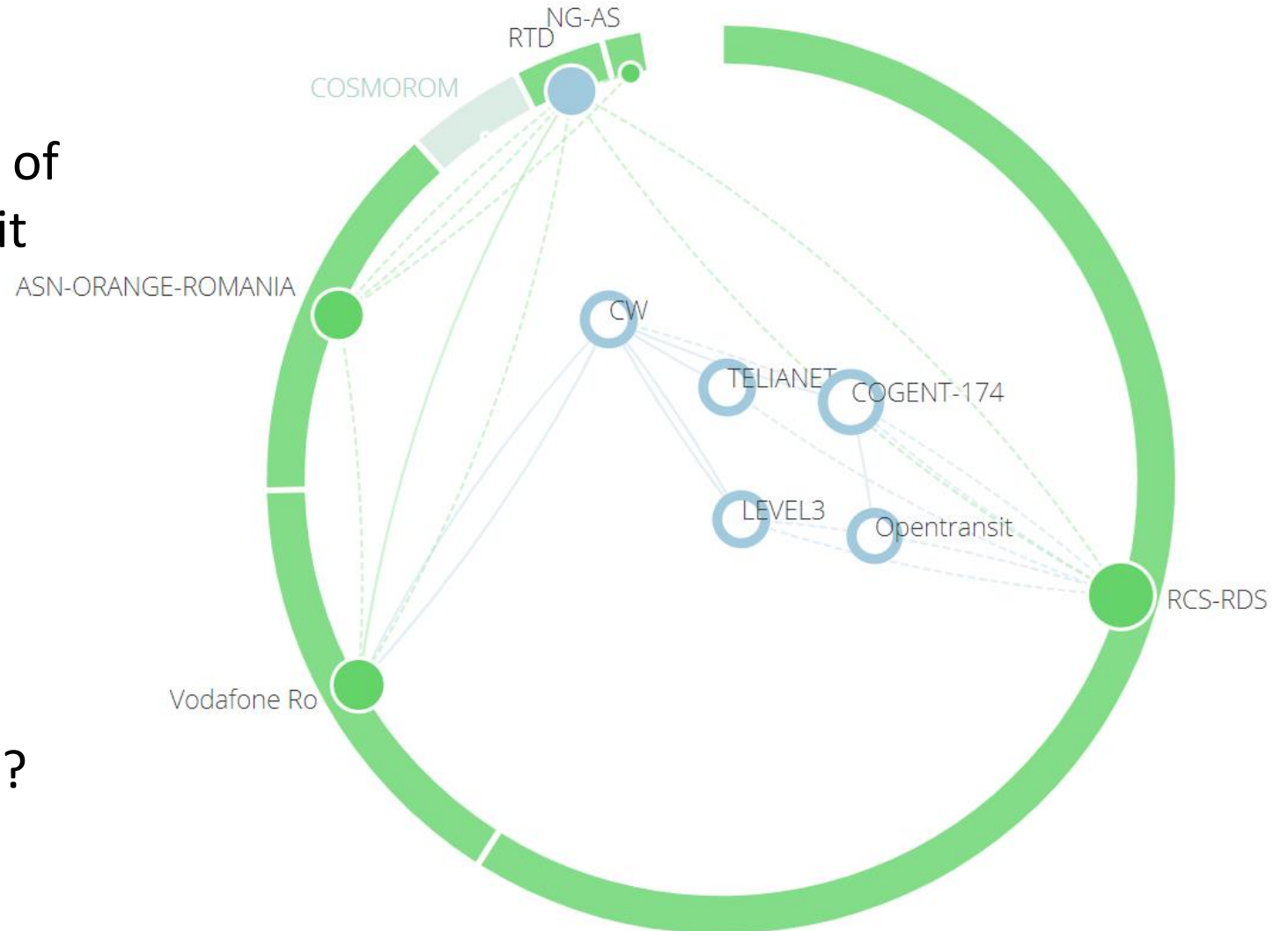
Main operators: excellent interconnectivity.



Peering / interconnections / transit in various countries:

Romania: no significant IXPs (in terms of internal traffic), several external transit providers, some p2p.

Looks like there is **one dominant** operator with **poor interconnectivity!**?



GeoPath tool:

<https://jedi.ripe.net/history/2024-07-01/RO/geopath/index.html> - These maps show the IPv4 paths [...] seen in traceroutes. Indirect links in traceroutes (i.e. with hops in-between without answer, or no geoloc) are shown with dotted lines, direct links with lines with long-short alternating pattern.



Ideally, most of the local traffic should stay local.

Is this the case?

Traceroute from RoNIX to hosts in the big unconnected network:

```
# tcptraceroute mail.icemenerg.ro 25
```

```
Selected device ens160, address 185.196.13.17, port 57583 for outgoing packets
```

```
Tracing the path to mail.icemenerg.ro (193.226.127.3) on TCP port 25 (smtp), 30 hops max
```

```
1 10ines.ronix.ro (185.196.13.1) 0.737 ms 0.770 ms 0.785 ms
2 ip4-89-238-246-53.euroweb.ro (89.238.246.53) 0.683 ms 0.912 ms 0.876 ms
3 * * *
4 31.210.8.142 23.333 ms 18.043 ms 18.137 ms
5 win-b2-link.ip.twelve99.net (213.248.86.98) 18.190 ms 18.277 ms 18.389 ms
6 win-bb2-link.ip.twelve99.net (62.115.114.182) 18.260 ms 18.139 ms 18.010 ms
7 bpt-b3-link.ip.twelve99.net (62.115.124.111) 24.435 ms 24.141 ms 24.166 ms
8 62.115.176.59 31.300 ms 31.240 ms 31.379 ms
9 * * *
10 * * *
11 * * *
12 static-82-78-127-1.rdsnet.ro (82.78.127.1) 38.398 ms 38.389 ms 38.291 ms
13 static-82-78-127-53.rdsnet.ro (82.78.127.53) 50.184 ms 48.609 ms 48.602 ms
14 mail.icemenerg.ro (193.226.127.3) [open] 48.303 ms 48.540 ms 48.472 ms
```

... while for well connected networks, the RTT is usually a couple milliseconds and the route is only 4-5 hosts long.

Who needs increased latency, more security risks / potential points of failure and extra costs? Looks like barriers?



RIPE traffic tools indications:

Network (ASN)	Network Name	Estimated User Population %
8708	RCS-RDS (Digi)	58.34
12302	Vodafone_Ro	15.6
8953	ASN-ORANGE-ROMANIA	14.4
35725	TELEKOMRO	4.06
9050	RTD	3.03

https://sg-pub.ripe.net/petros/population_coverage/country.html?name=RO

*CAIDA ARK probes (Center for Applied Internet Data Analysis, UC San Diego, CA, USA) recently installed in Romania, too.



All communication services lately migrated over IP:

- ✓ Voice (VoIP, VoLTE);
- ✓ Teleconference
- ✓ Telepresence
- ✓ Telemedicine
- ✓ IoT – sensor-based automatic processes
- ✓ Etc.

IP transit can no longer substitute local interconnections.

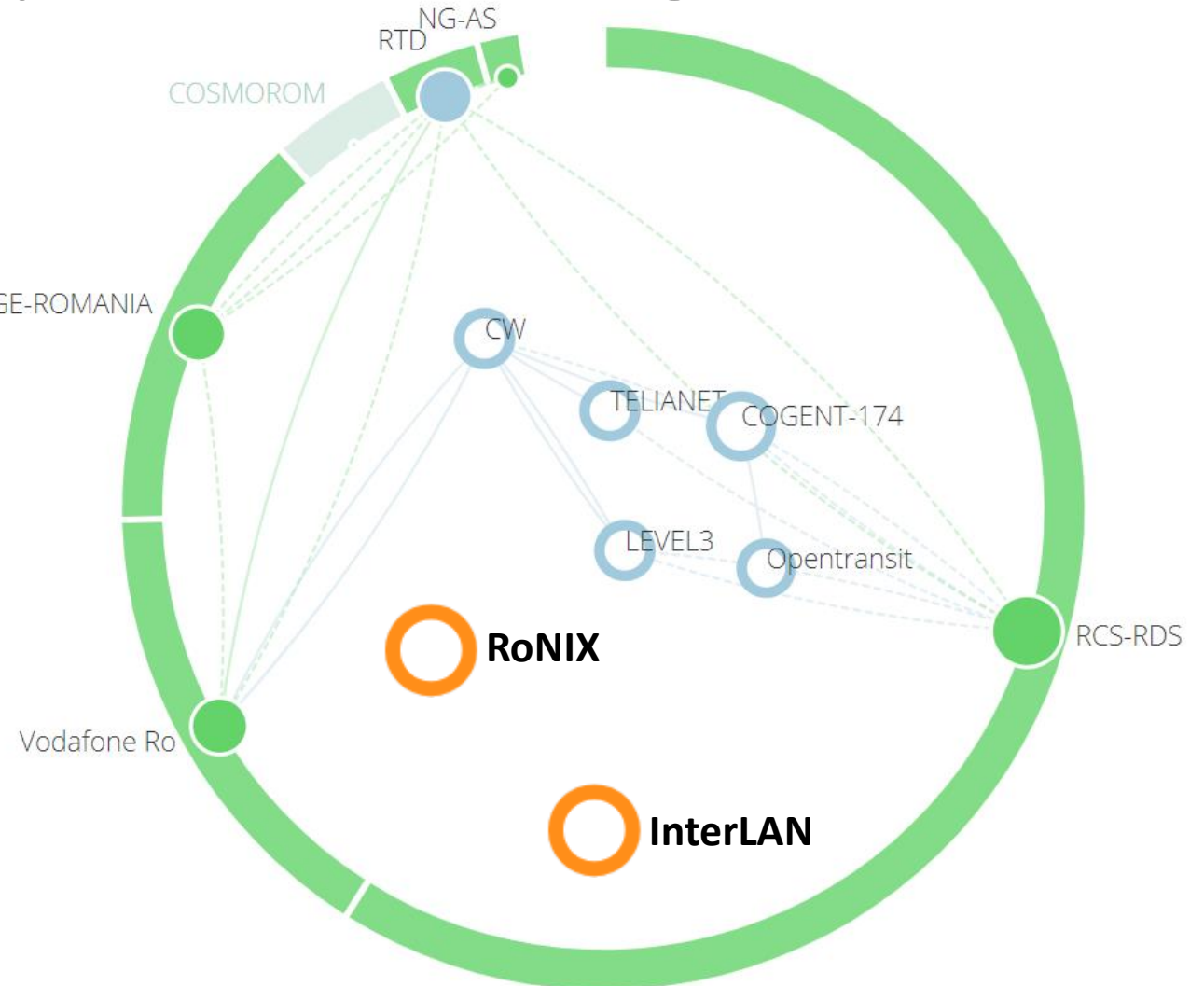
Long live the free market! However, in case of monopolistic behaviors (i.e. poor interconnection), NRAs should step in!

But these are opportunities for the those placed in the right spot at the right time:

Romania: Tens of smaller ISPs!

IXPs belonging to such ISP communities do exist.

On RIPE Atlas charts one should see...:



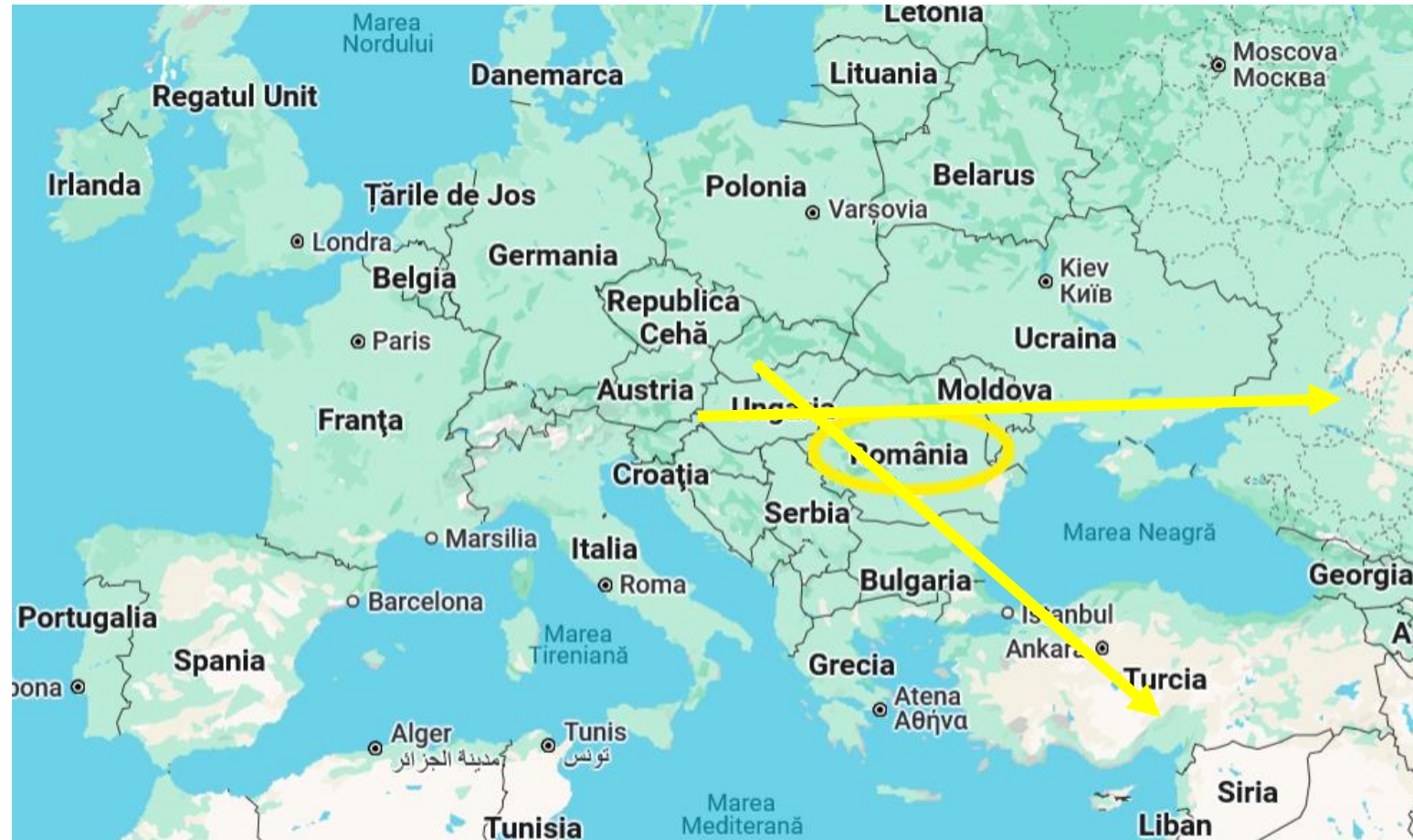
Why peer in Romania?

- Biggest market in SE Europe (19 mm pop);
- EU & NATO member. Not depending on submarine cables. Energy-wise quasi-independent.
- Sustained economic growth in the past 25 years (well, except 2008 and CoVID);
- Significant increase in average revenues.
- Widely spread, affordable and of high “speed” Internet & OTT applications (87% hh urban, 74% rural. 95% > 100M; 33% > 1G);



Why peer in Romania? (2)

- Well connected, placed on the route from West to East;
- Many networks, CDNs, clouds – already there and for good reason;
- Good telco infrastructure;
- Powerful IT&C industry;





tiberiu.gindu@ronix.ro

Thank you!