

LINX125, London
19-20 November 2025



Geopolitics and the Internet topology

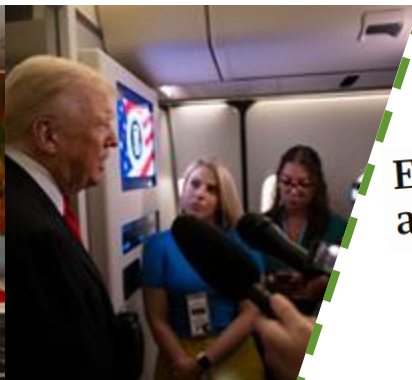
Joshua Levett, Dr Vassilios Vassilakis, Dr Poonam Yadav



Engineering and
Physical Sciences
Research Council



The world we live in...



PM plans to 'unleash AI' across UK to boost growth

BBC, 12 January 2025

EU asks X for internal documents about algorithms as it steps up investigation

The Guardian, 17 January 2025

A tale of two Christmas adverts: Coca-Cola vs John Lewis

Financial Times, 11 November 2025

Wikipedia loses challenge against Online Safety Act verification rules

BBC, 11 August 2025

'Sophisticated' fraudulent accounts now outnumber real business accounts on social media

The Telegraph, 15 June 2018



How does the **non-technical**...
...impact the **technical**?

Problems with Internet maps

Narrow collector placement
Limited metadata sources

Poor data quality

Wrong IP-to-AS mapping
No BGP data filtering

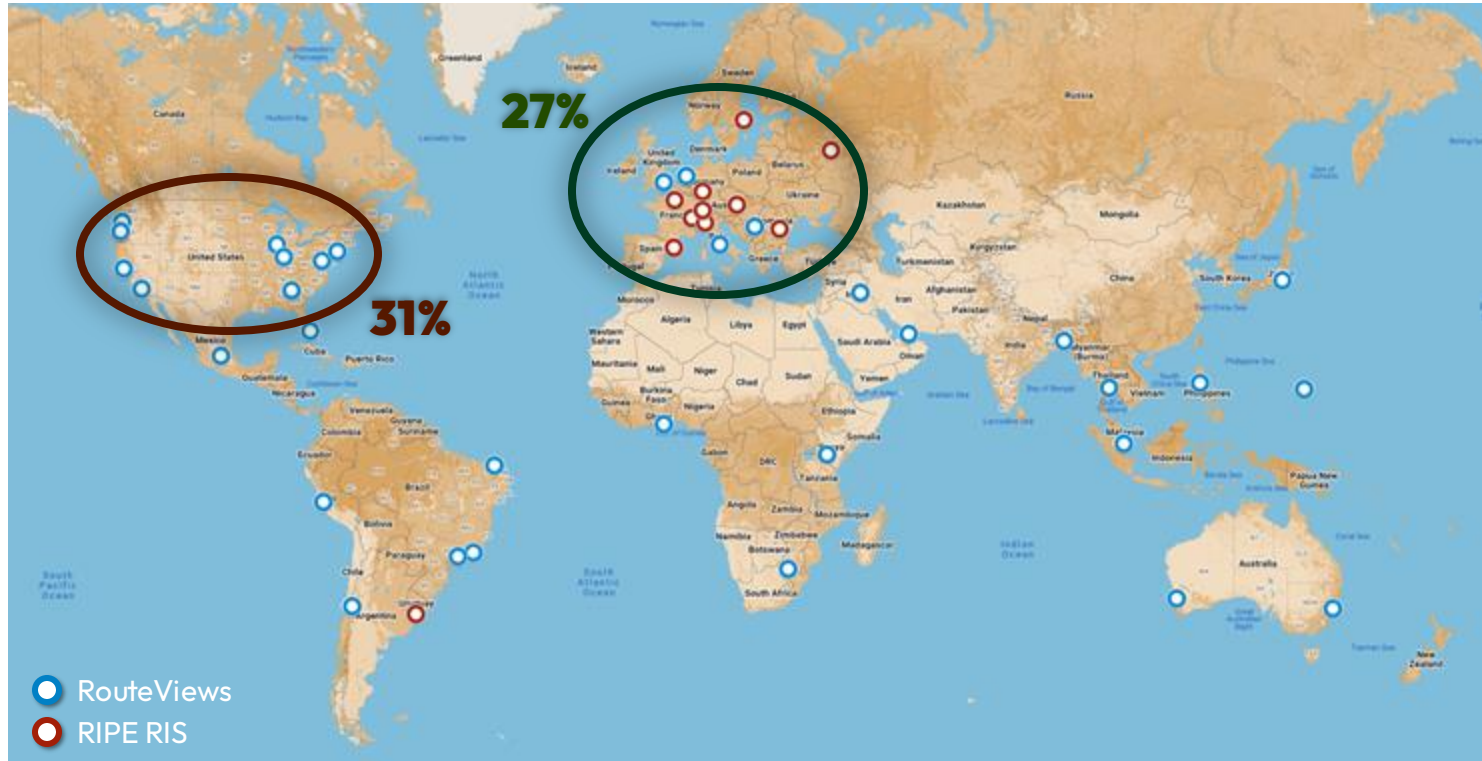


Disproportionate rankings
False peering inferences

Misleading results

Incomplete graph metrics
“Valley-free” routing

There's just a little **too much**...



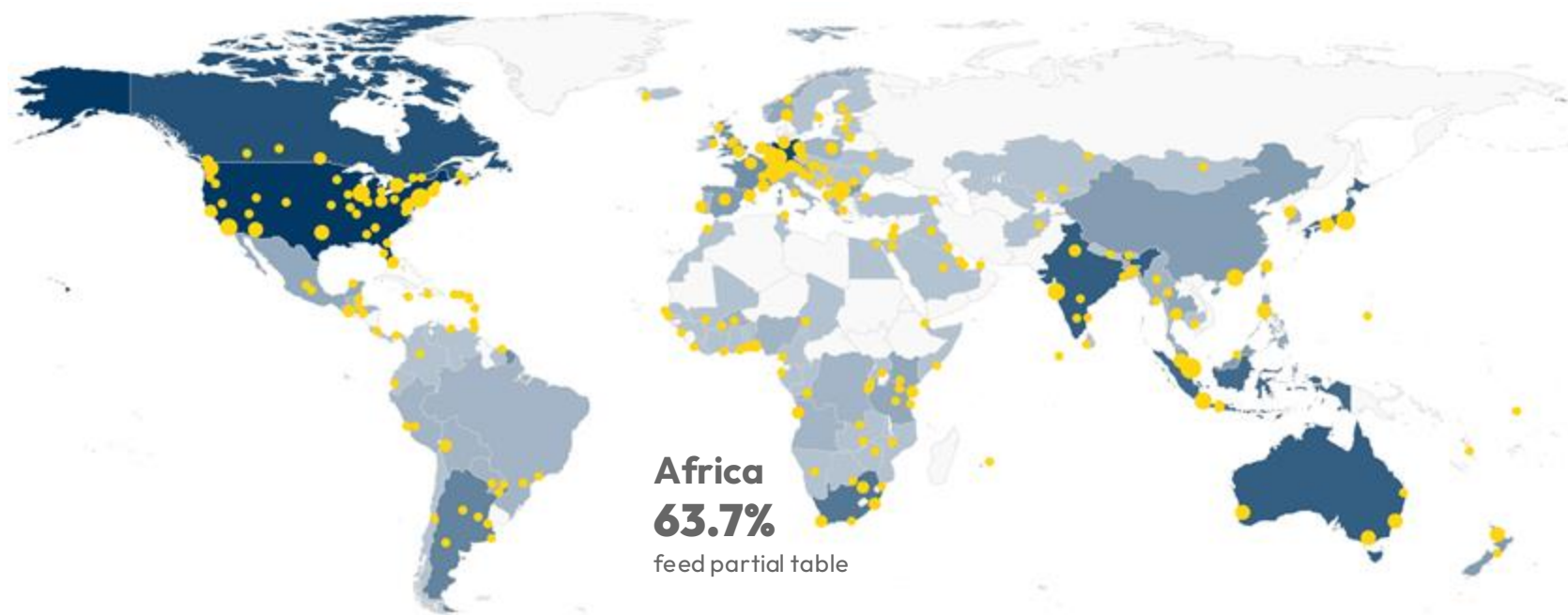
Africa
19.5%
1.550 billion people

Asia
62.2%
4.978 billion people

Europe
9.3%
744.1 million people

United States
4.34%
347.3 million people

Eating more BGP



Inferring relationships

```
34288 41913 6939 2914 20473
 34288 1299 174 16509
 1299 6762 262589 54994
 19754 1299 174 16509
45437 4826 5511 12956 54994
 14041 11164 3491 7602
 61138 137409 139901 135130
 14041 11164 3491 7602
```

AS Paths

Probably peered if
adjacent in path

```
[ '1120:2', '1121:65000',
  '65500:50000', '65500:59000',
    '65500:59151' ]
[ '174:21001', '174:22013',
  '36236:50', '36236:1001' ]
[ '13990:13990', '24115:65023',
  '45437:102', '45437:1040',
  '45437:10801', '64599:5010' ]
```

Communities

Possibly connected
(RFC 1997, RFC 4360)

```
6 ms 6 ms 5 ms [146.97.36.221]
6 ms 5 ms 7 ms [146.97.35.190]
6 ms 5 ms 6 ms [195.66.244.88]
11 ms 10 ms 10 ms [195.191.219.48]
10 ms 9 ms 11 ms [195.191.219.37]
9 ms 10 ms 10 ms [185.230.223.168]
```

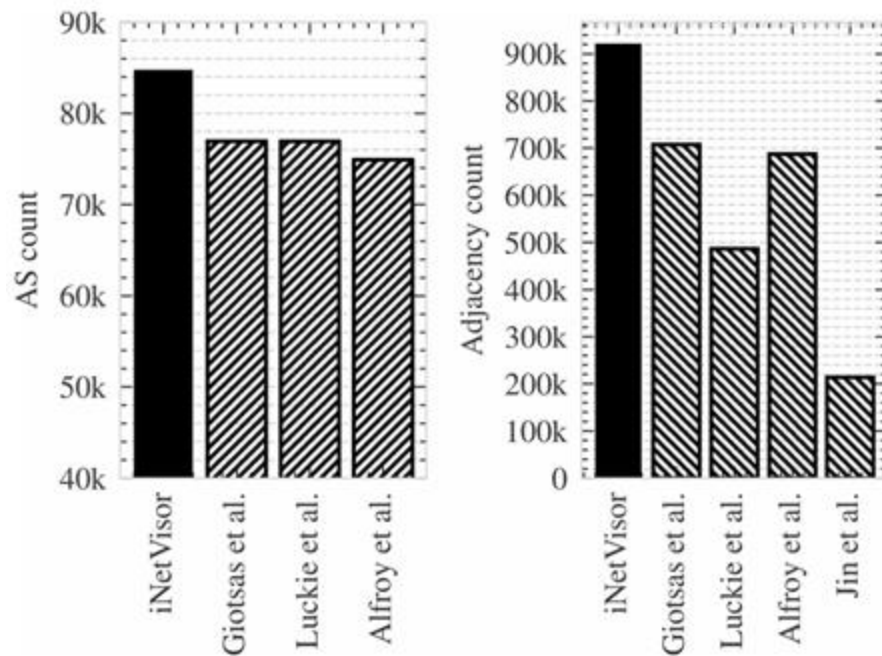
Traceroutes

Probably peered if
adjacent in path*

*lots of caveats (and filters)

Overall, we see more (at least than academic work)

- **84,779 ASes**
72% of NRO assignments
- **921,102 adjacencies**
+30% relative to other works



Global ASN distribution

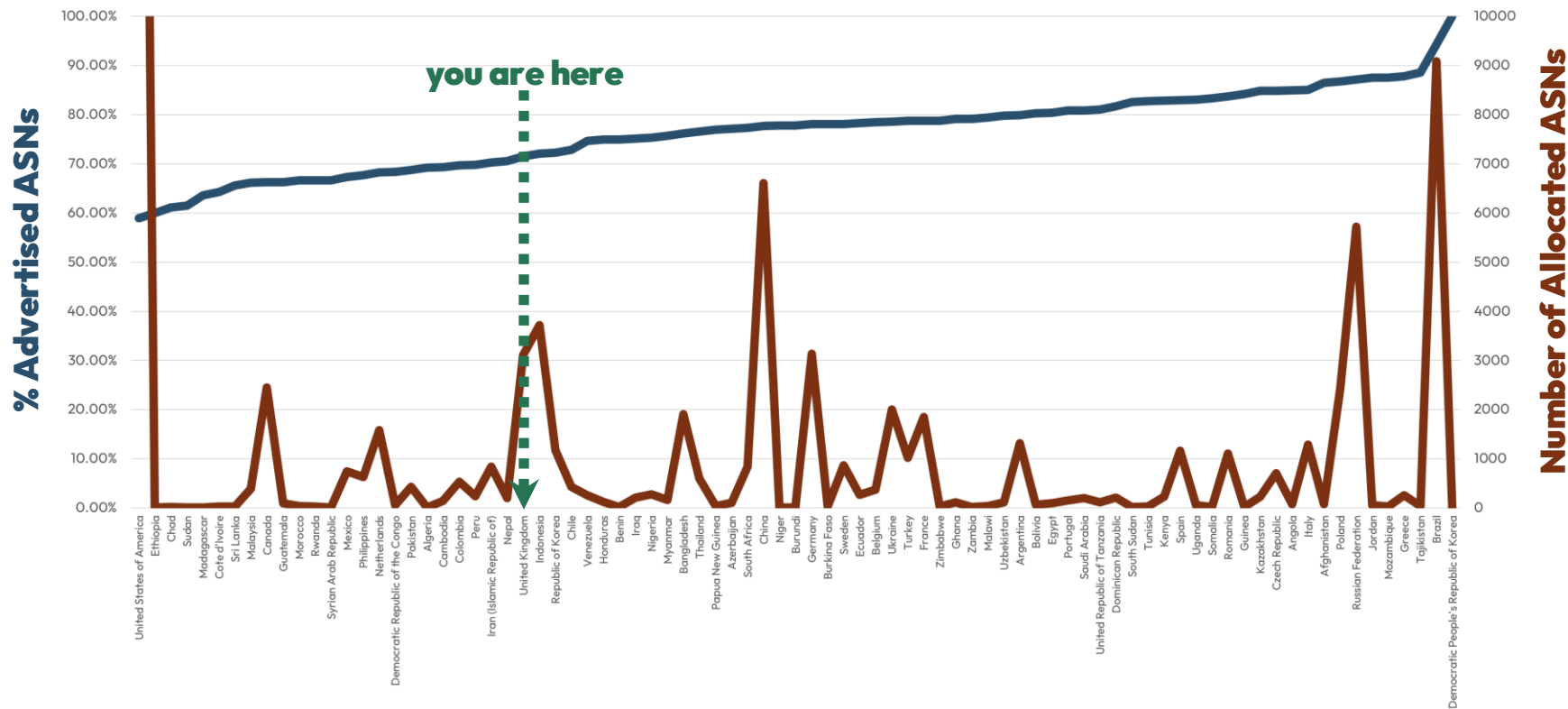
Allocated

1. **United States** (31,657)
2. **Brazil** (9,089)
3. **China** (6,611)
4. **India** (6,074)
5. **Russia** (5,722)
6. **Indonesia** (3,722)

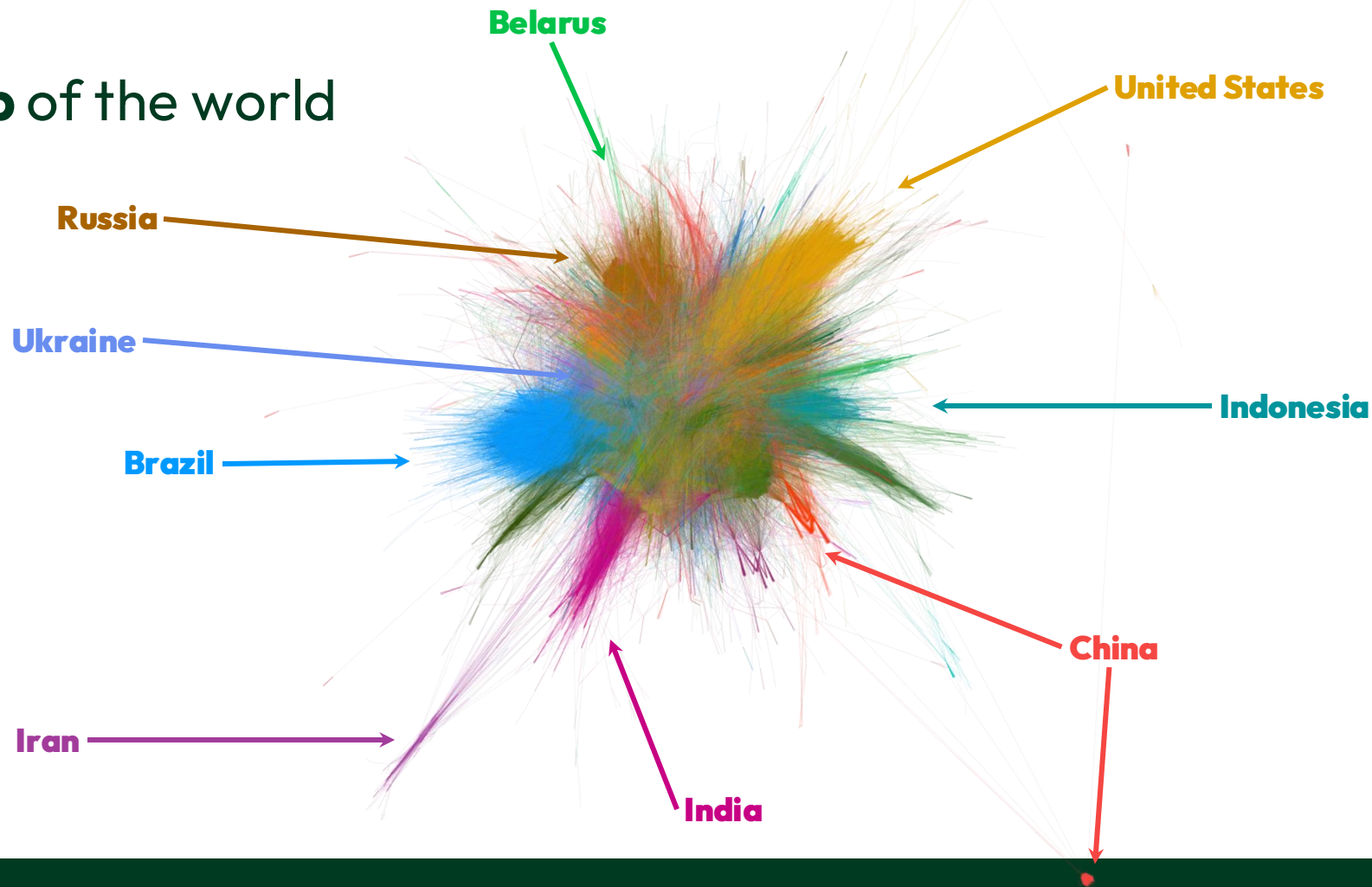
Advertised

1. **United States** (58.9%)
2. **Brazil** (94.3%)
3. **China** (77.7%)
4. **Russia** (87.2%)
5. **India** (47.2%)
6. **Indonesia** (72.1%)

ASN distribution in context



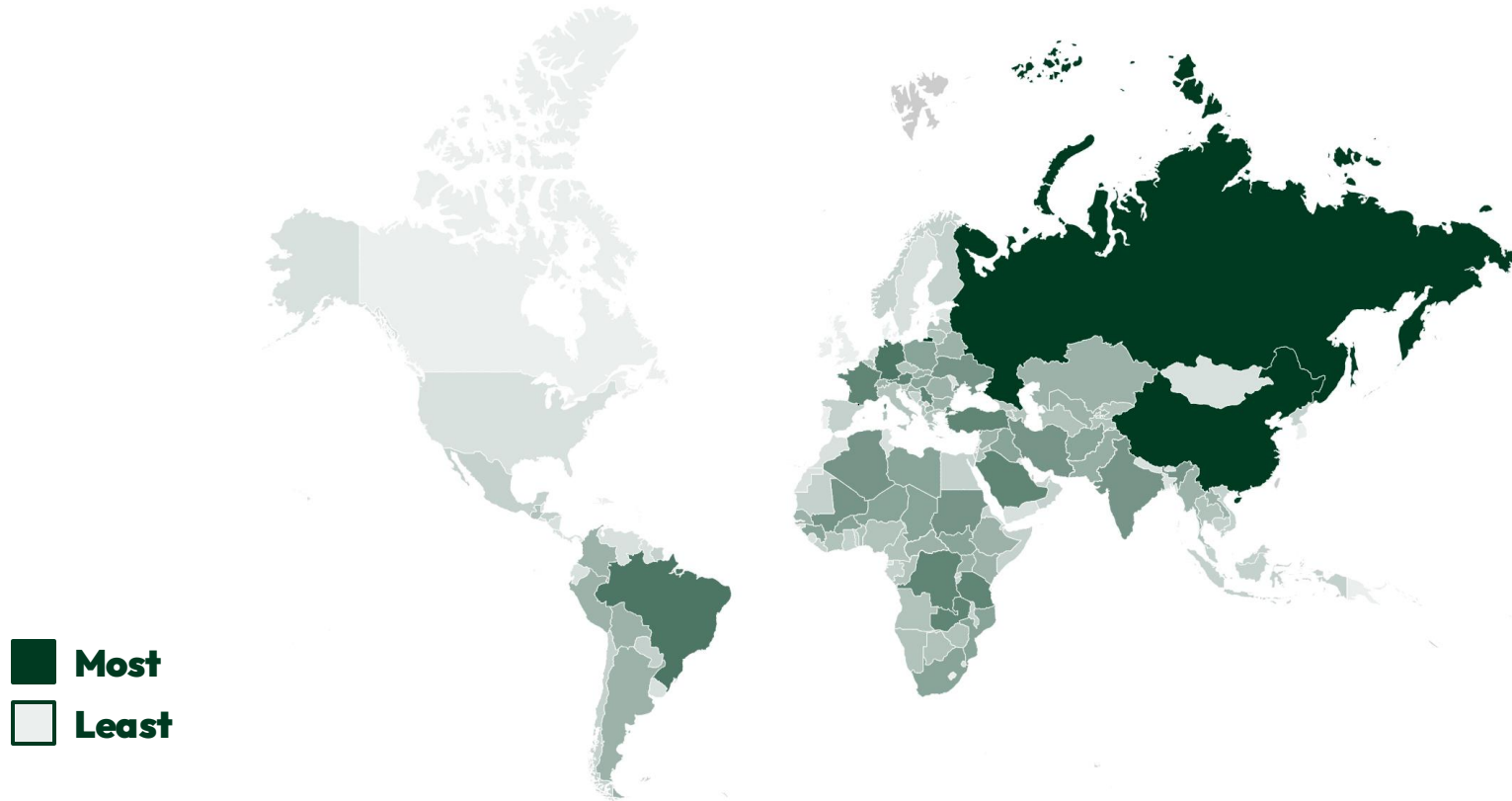
Map of the world



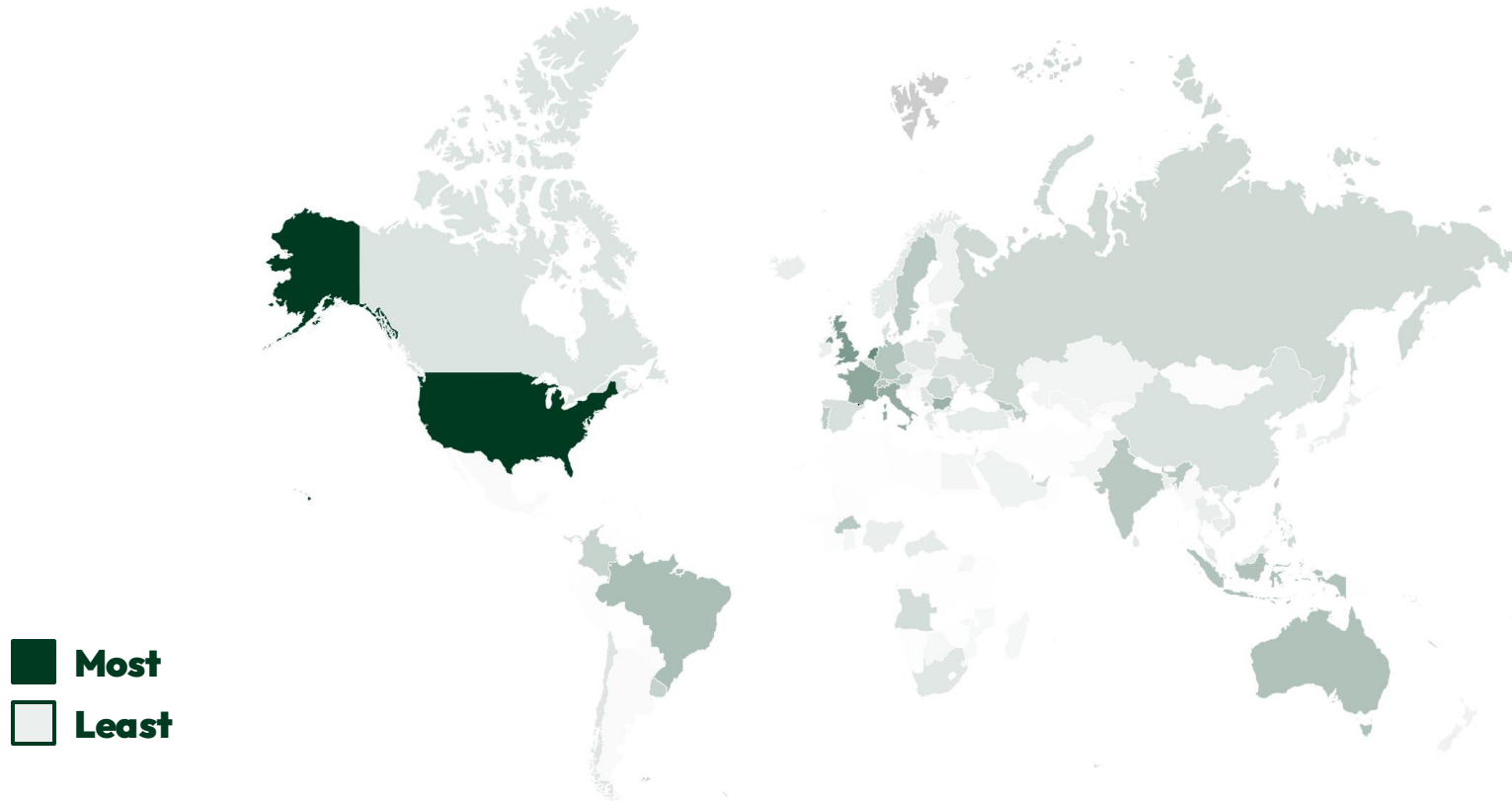


The **geography**...
...impact the **technical**?

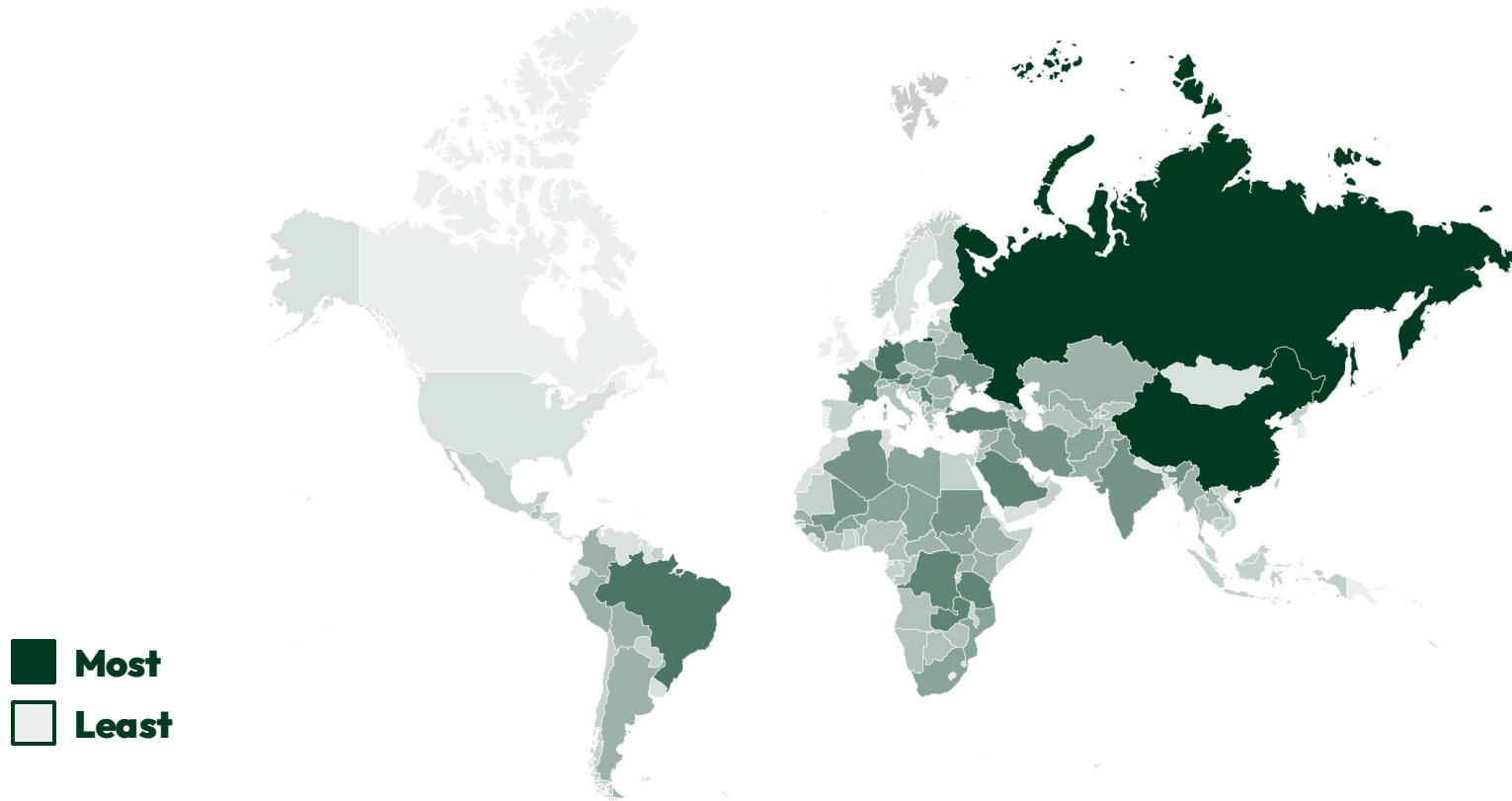
World map by **country neighbours**



World map by **peering neighbours**



World map by **country neighbours**



World map by **peering neighbours**

(excl United States)

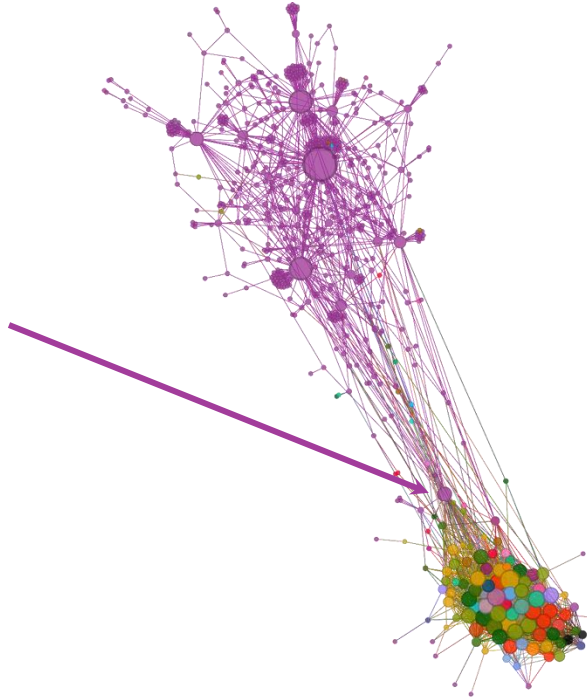




The **politics**...
...impact the **technical**?

Iran

**Telecommunication
Infrastructure Company**
AS49666



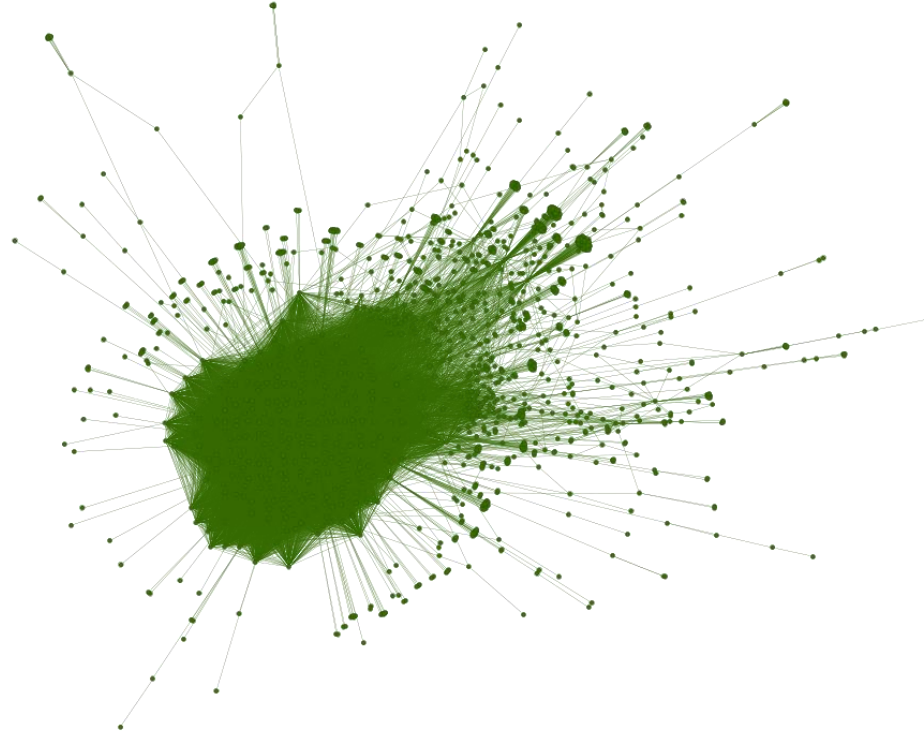
-  **Iran**
-  **United States**
-  **Russia**
-  **China**

Politics and the UK Internet

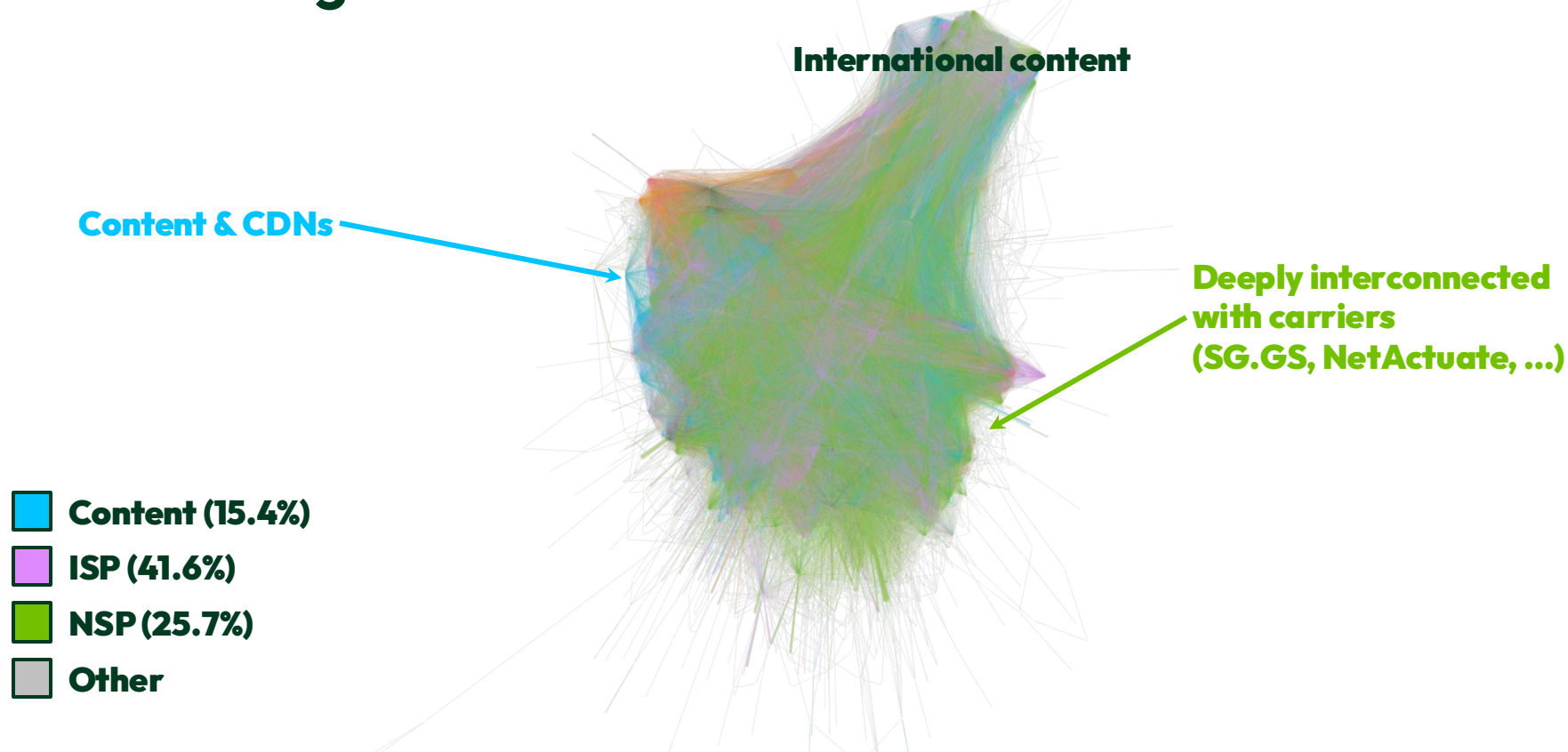


Changes in peering?

United Kingdom



United Kingdom 2022

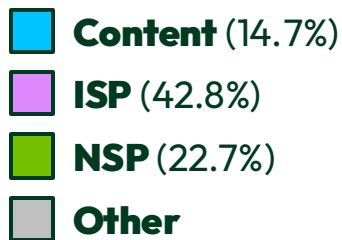


United Kingdom 2025

International content

Colt
AS8220

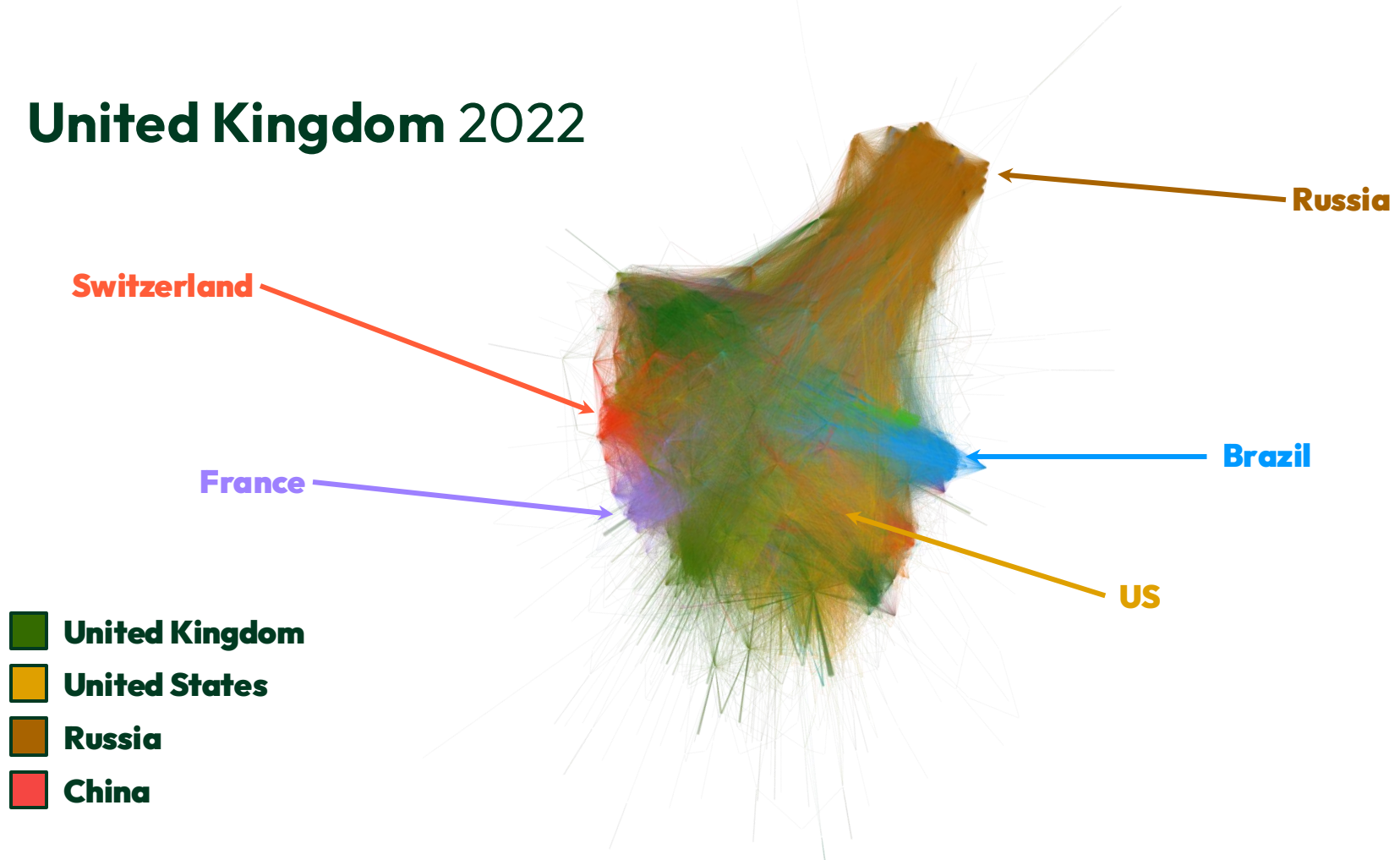
**Deeply interconnected
with carriers**



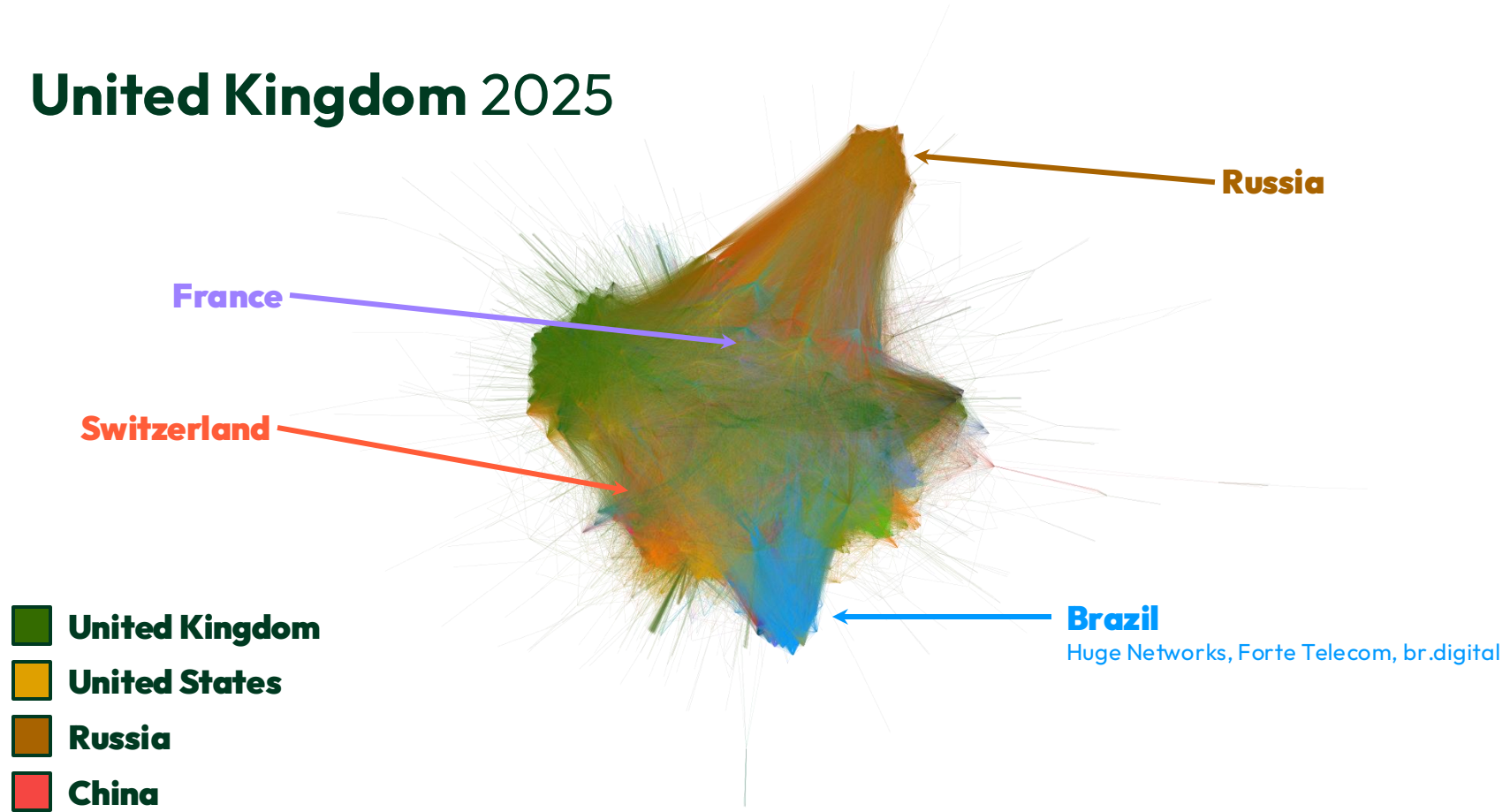
- **Content delivery is more local**

UK networks are closer to CDNs and hyperscalers

United Kingdom 2022



United Kingdom 2025



Peering between **UK** and **Russia**

Where? (UK ASes with an RU peer)

1. **LINX LON1** (406)
2. **AMS-IX** (40)
3. **DE-CIX** (36)
4. **GNM-IX** (22)
5. **NL-ix** (21)
6. **France-IX Paris** (17)
7. **NYIIX New York** (14)
- ...

Who?

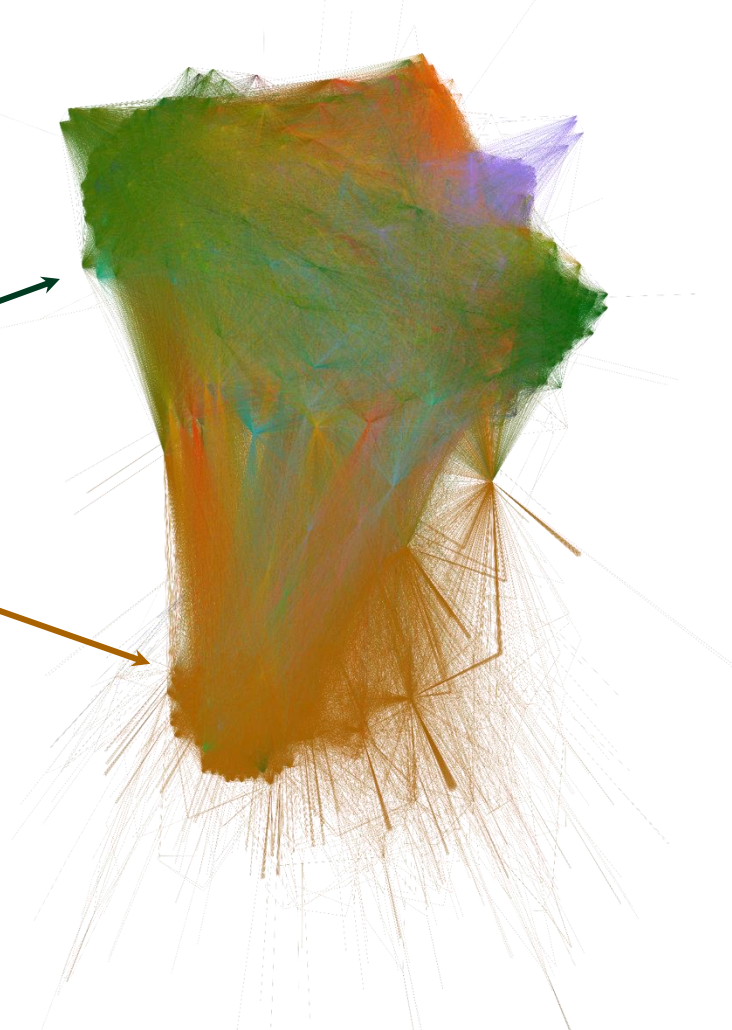
1. **INETCOM** (AS35598)
2. **VimpelCom** (AS3216)
3. **Mobile TeleSystems** (AS8359)
4. **Selectel** (AS59505)
5. **RASCOM** (AS20764)
6. **KIAE** (AS59624)
7. **Avelacom** (AS31059)

Russia 2025

Content providers

Domestic connectivity

-  **Russia**
-  **Germany**
-  **United Kingdom**
-  **Netherlands**



Russia's peering

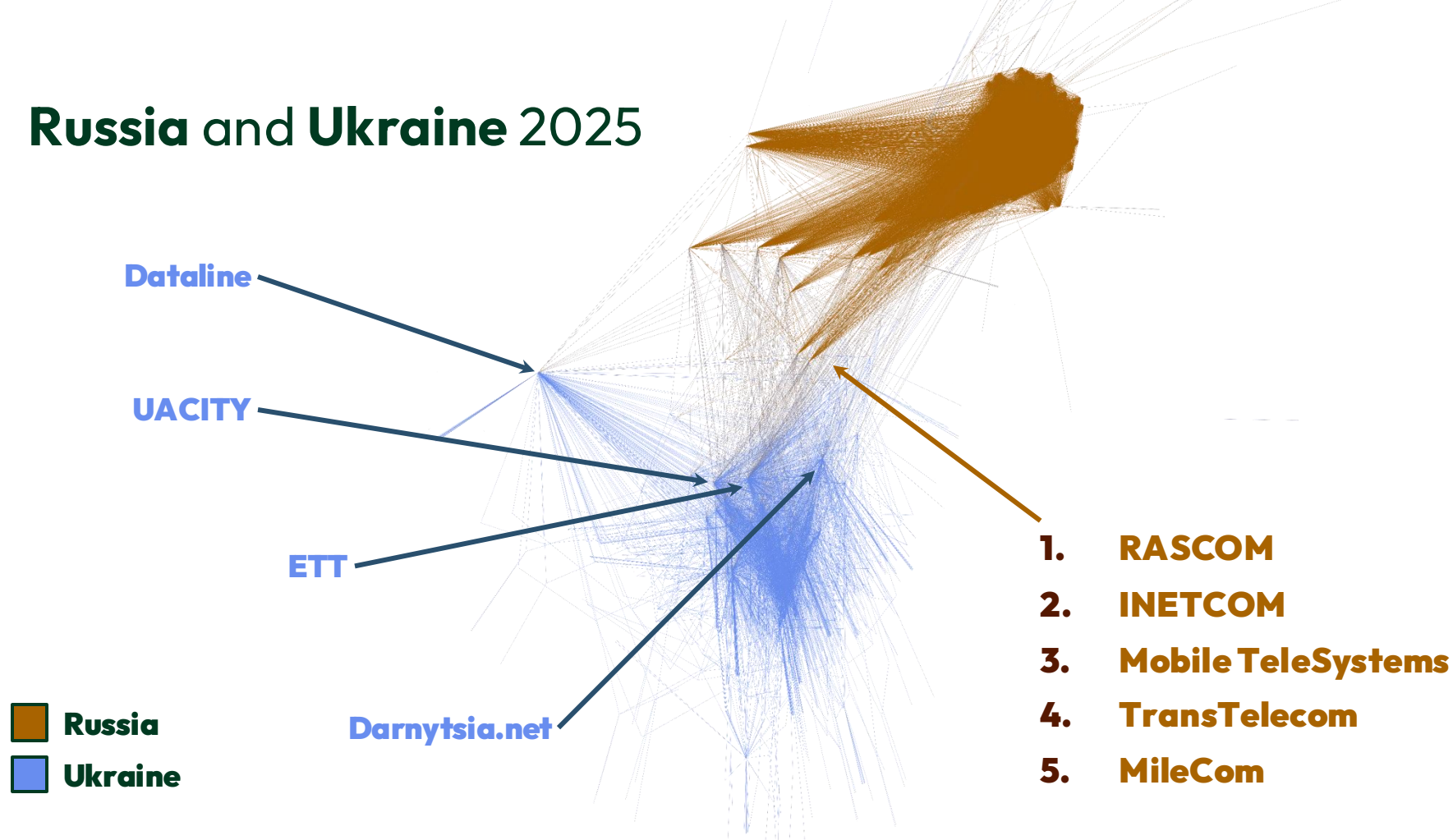
Who?

1. **Germany**
2. **United Kingdom**
3. **Netherlands**
4. **United States**
5. **France**
6. **Japan**
- ...

Where? (Outside RU)

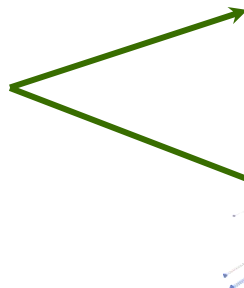
1. **Global-IX** (NL)
2. **DE-CIX** (DE)
3. **AMS-IX** (NL)
4. **Netnod Stockholm (B&G)** (SE)
5. **LINX LON1** (GB)
6. **NL-ix** (NL)
- ...

Russia and Ukraine 2025

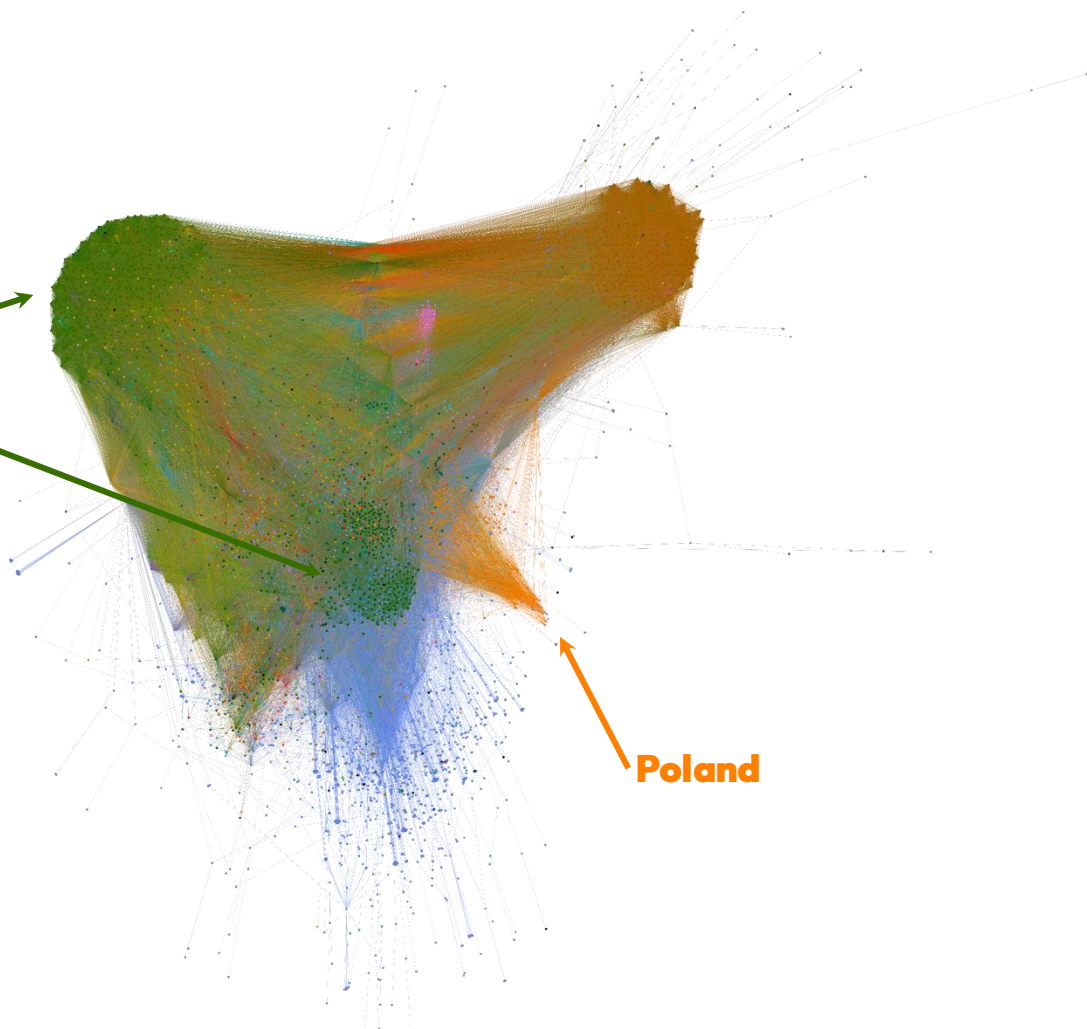


Russia 2025

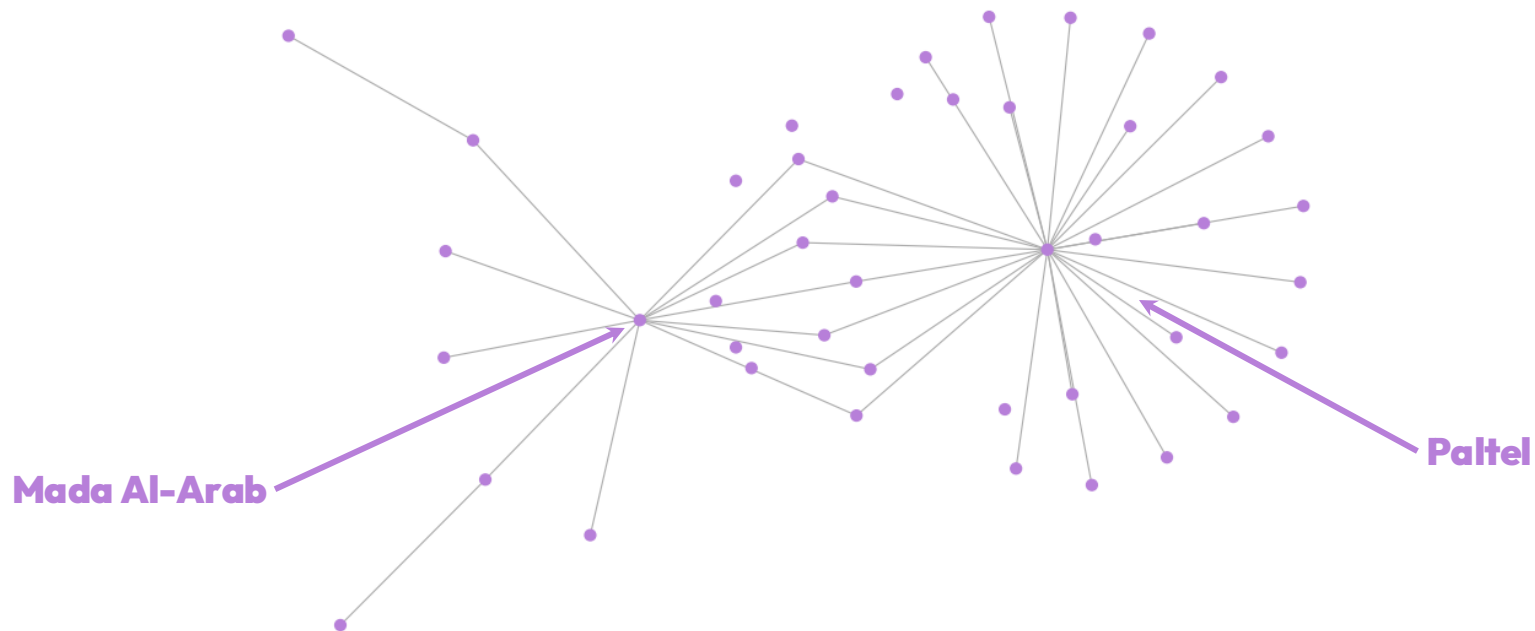
United Kingdom



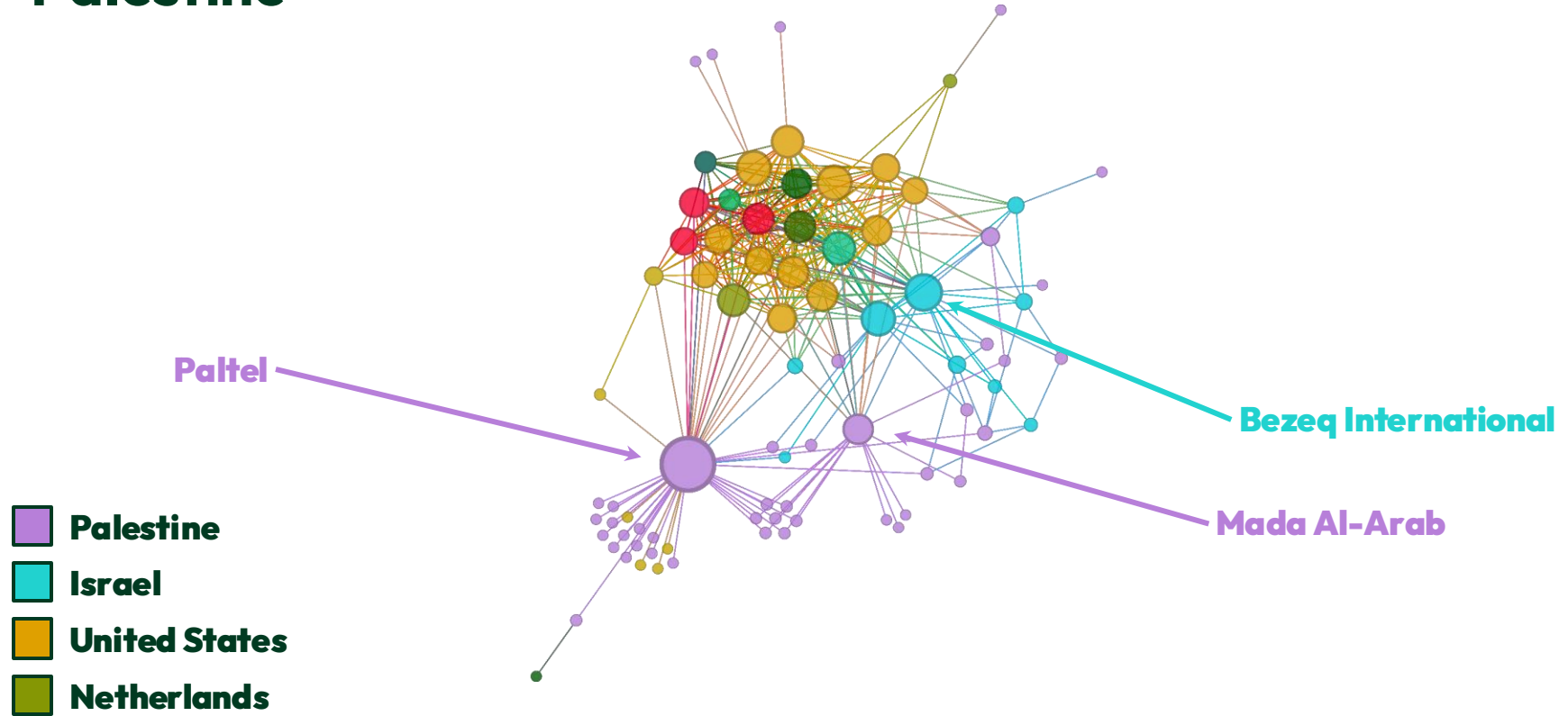
Poland



Palestine



Palestine

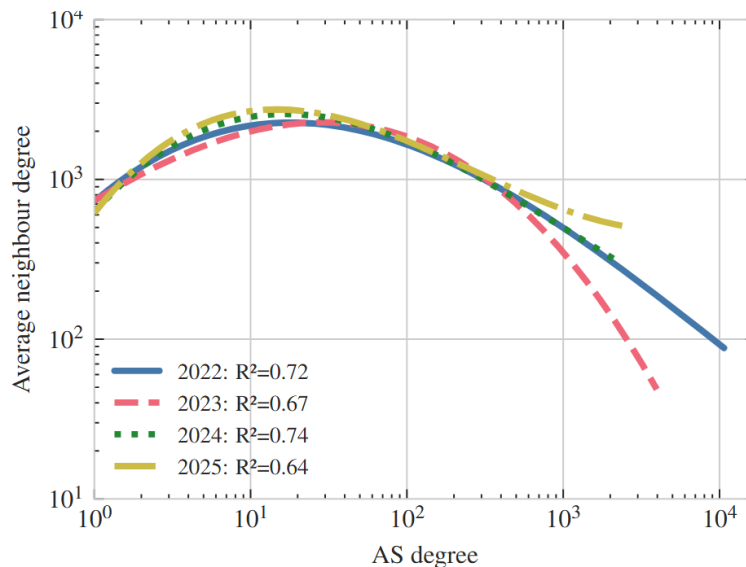




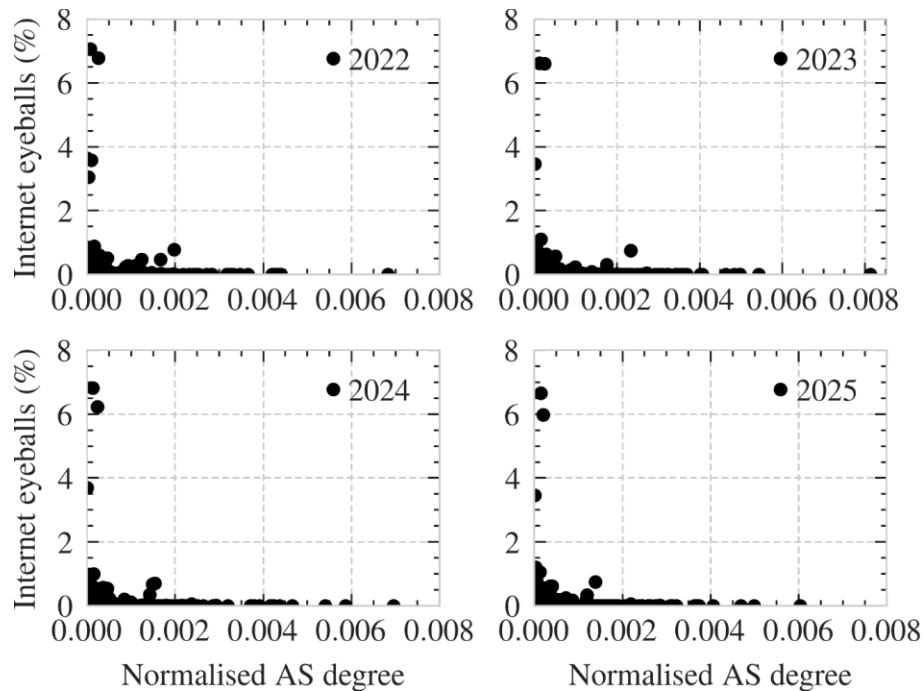
The **commercial**...
...impact the **technical**?

Largest networks by peers

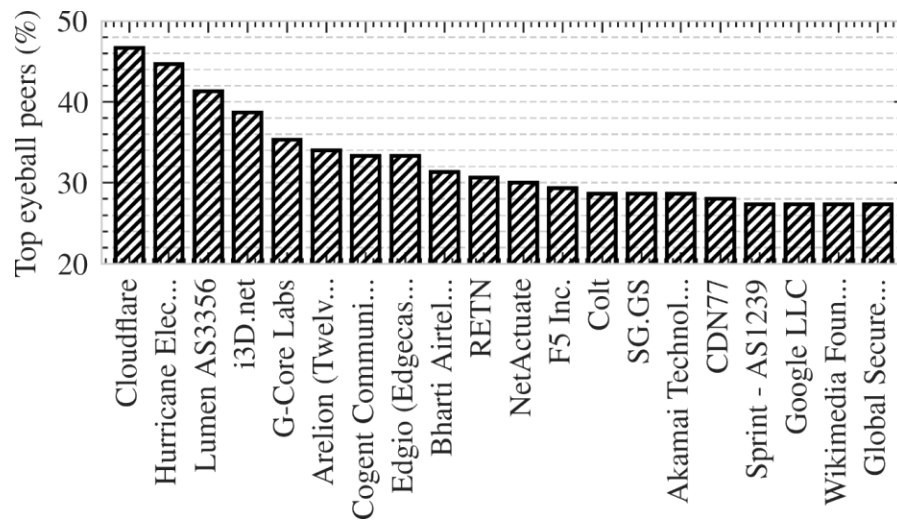
- **>28% ASes**
peer with a 'Tier 1'
- **Growing peering**
between the smallest
and largest networks



Eyeball networks vs peering networks



Who connects with eyeballs?



Summary

- **Geography** and **politics** have a measurable impact on inter-AS connectivity
- Even **small policy changes** materially change the topology
- Traditional 'Tier 2' networks are losing out to CDNs & 'Tier 1s'
- Critically: data gaps in North Africa and Central Asia

Questions & Contact

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