State of the Internet: Ukraine and Neighbouring Countries

Ukraine

- **Area: 603,628 km²**

  - The largest entirely European territory

  - Fourth (after Russia, Kazakhstan, France) if take into account non-European territories

- **Population: 41.99 million (1 Aug 2019)**

- **Economics (2018)**

  - GDP: 130.83 USD (59th place in the world)

  - GDP per capita: 3,104 USD (122nd place in the world)
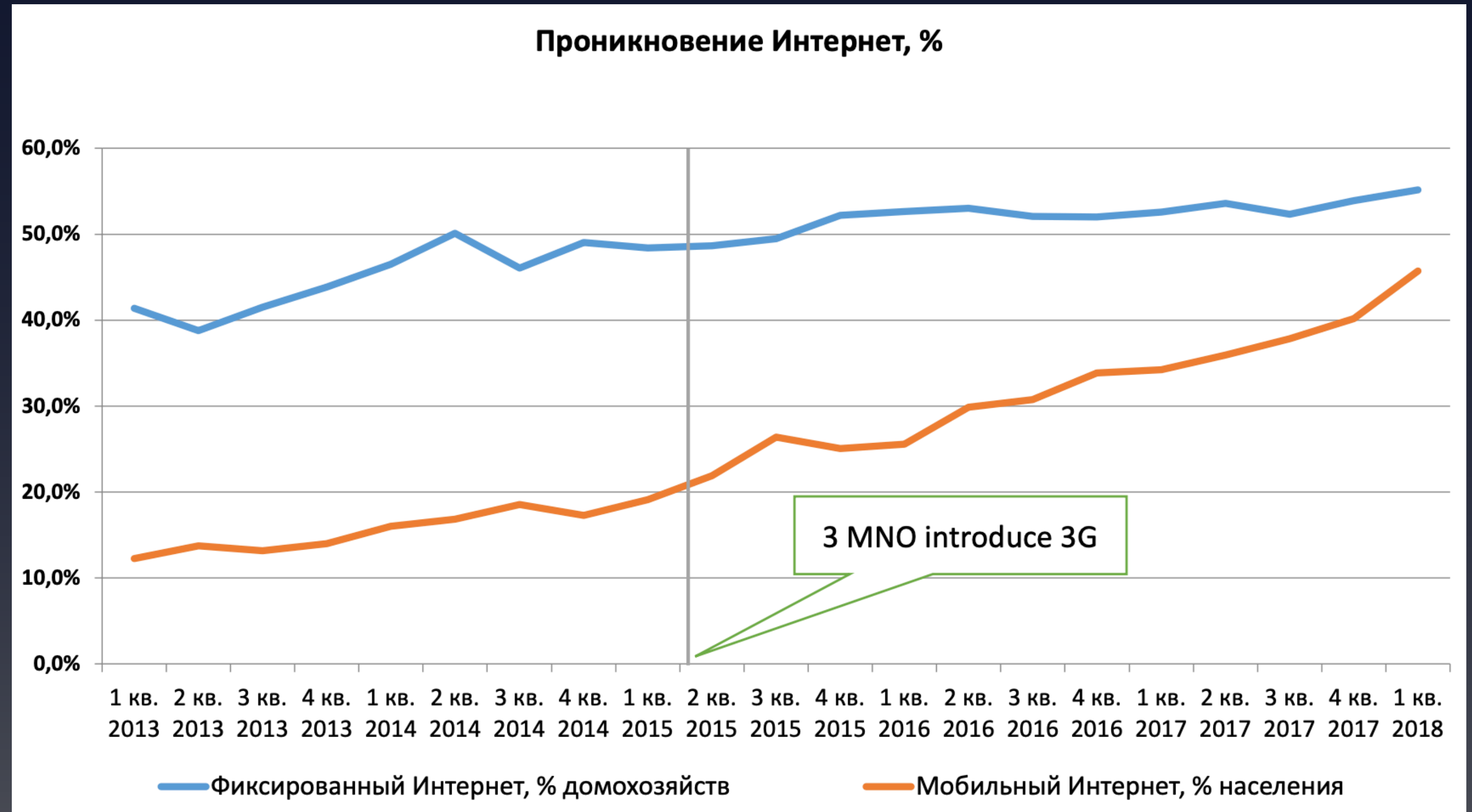
Basic Telecom Statistics

- **In the state register by NCCIR: 5888 operators**
  - Not all of them are alive
  - Not all of them really provide Internet access services
  - Still huge number!

- **FBB ARPU in 2017: 3.5 USD - one of the lowest in the world :(**
  - Russia 2017: 6.52 USD (S&P Global)
  - Moldova 2016: 9.6 USD (https://en.anrceti.md)
  - Brasil 2016: 16.93 USD (S&P Global)

- **Internet penetration (2017):**
  - InAU: 64% (users)
  - State Statistics Service: 48.7% (FBB, households)

- **Ukraine ranks 4th in the world in terms of stability of Internet infrastructure (Qrator Labs)**

Internet Penetration

- **ITU Data:**

  - Based on the data of State Statistics Service of Ukraine

  - Mobile Internet is growing faster
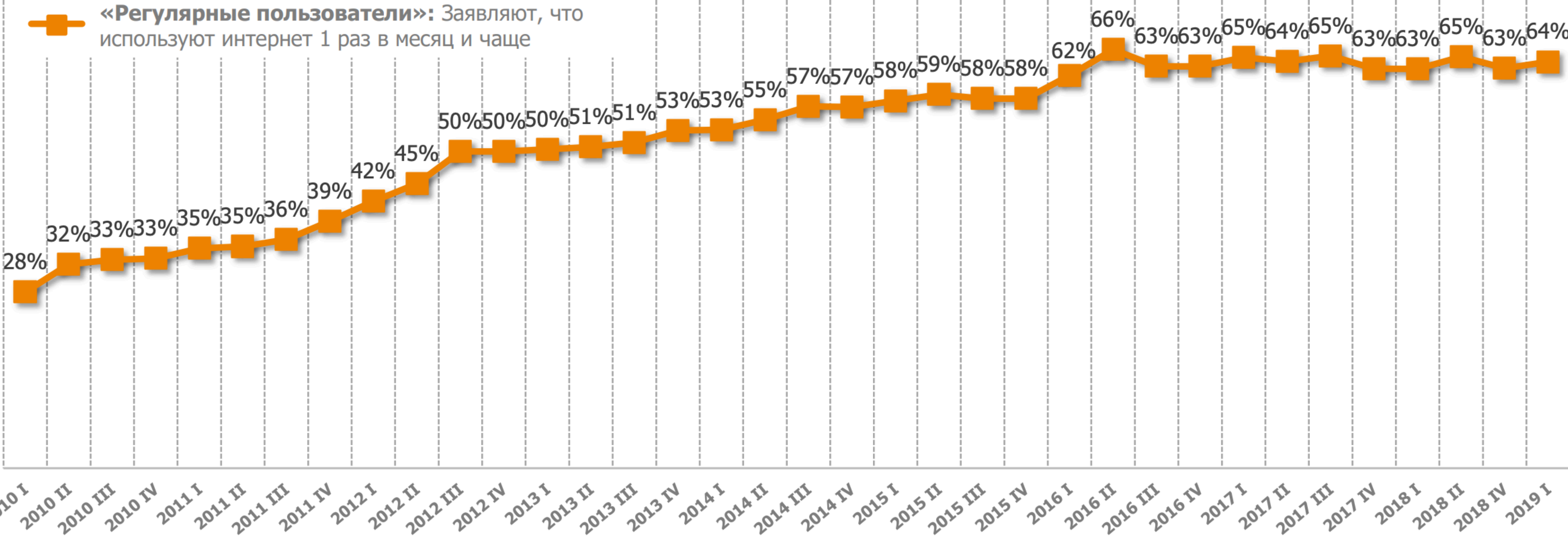
  - But there is the grows of the fixed broadband as well

Проникновение Интернет, %

3 MNO introduce 3G

— Фиксированный Интернет, % домохозяйств   — Мобильный Интернет, % населения

https://www.itu.int/en/ITU-D/Regional-Presence/CIS/Documents/Events/2018/05_Kiev/ITU%20Seminar%2016.05.18%20-%20Denis%20Zakharenko.pdf

Internet Penetration

Data provided by InAU

ЕЖЕКВАРТАЛЬНОЕ ИЗМЕРЕНИЕ

«Регулярные пользователи»: Заявляют, что используют интернет 1 раз в месяц и чаще

28% 32% 33% 33% 35% 35% 36% 39% 42% 45% 50% 50% 50% 51% 51% 53% 53% 55% 57% 57% 58% 59% 58% 58% 62% 66% 63% 63% 65% 64% 65% 63% 63% 65% 63% 64%

2010 I, 2010 II, 2010 III, 2010 IV, 2011 I, 2011 II, 2011 III, 2011 IV, 2012 I, 2012 II, 2012 III, 2012 IV, 2013 I, 2013 II, 2013 III, 2013 IV, 2014 I, 2014 II, 2014 III, 2014 IV, 2015 I, 2015 II, 2015 III, 2015 IV, 2016 I, 2016 II, 2016 III, 2016 IV, 2017 I, 2017 II, 2017 III, 2017 IV, 2018 I, 2018 II, 2018 IV, 2019 I

Internet penetration

- **Data by World Bank:**

  - Former Soviet Union + neighbours + Albania + France + overages for the world and Europe

  - 2016 is blue, 2017 is violet

  - Ukraine is doing better than the world in average

  - But still ranked 5th from the end in this list :-(
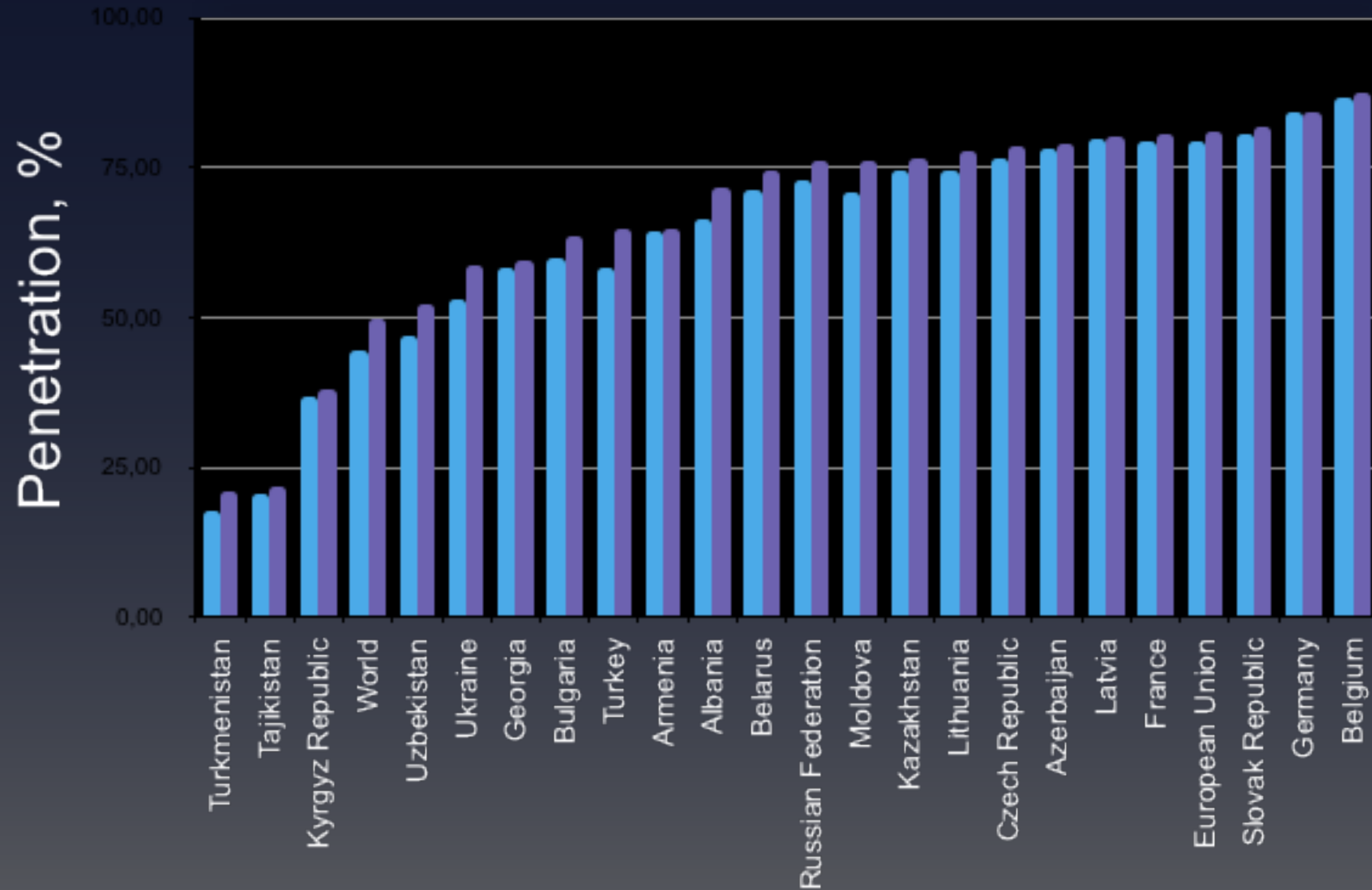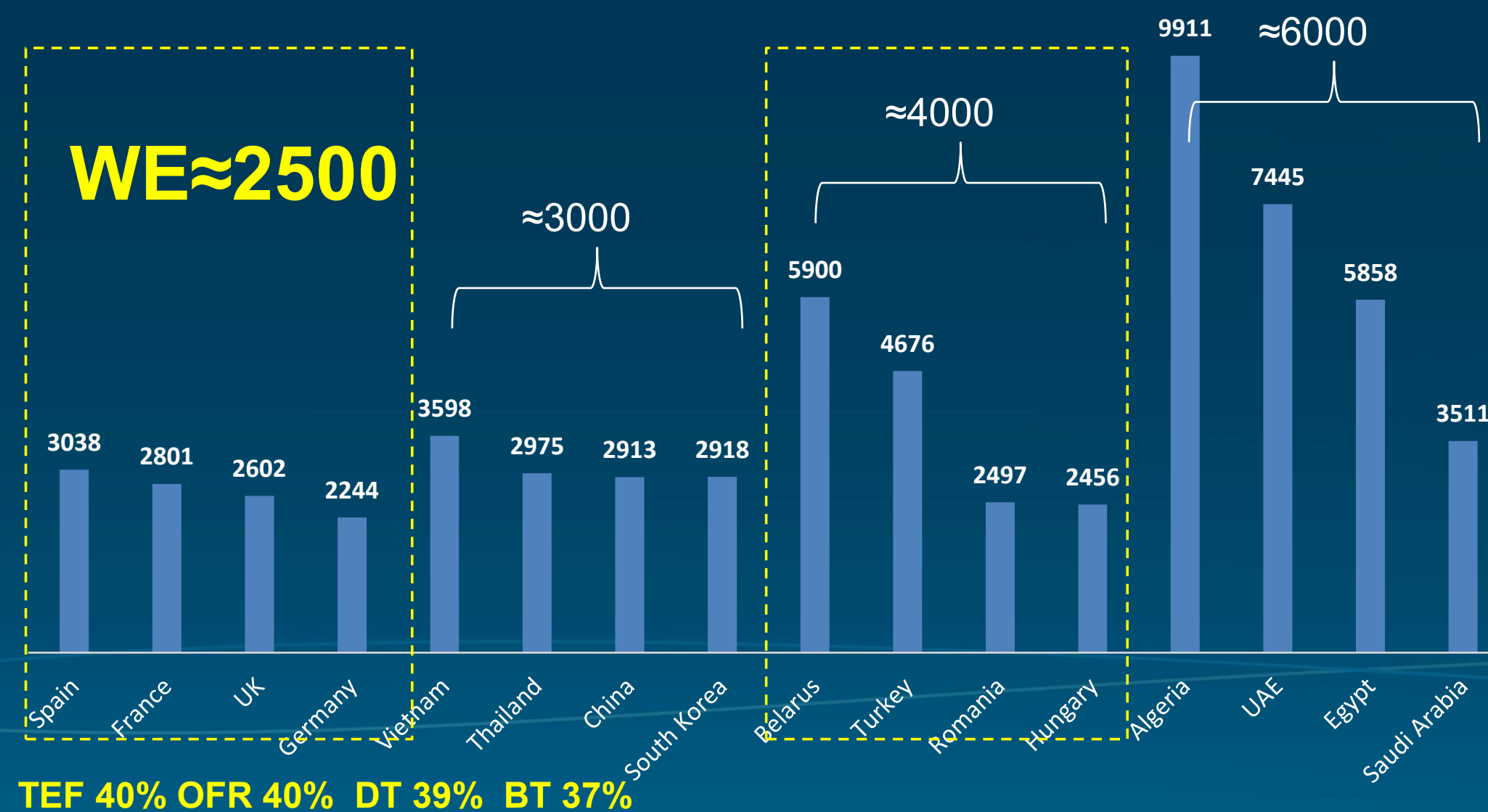
Telecom Industry Concentration

Industry Concentration : HHI (Herfindahl–Hirschman Index)

The Herfindahl-Hirschman Index (HHI) is a common measure of market concentration that is used to determine market competitiveness.

$$HHI=((S1)^2+(S2)^2+…+(Sn)^2)*10000$$

*where S is the market share of the each Firm.

Ukraine: $HHI=((15\%)^2+(9\%)^2+(8\%)^2+(3\%)^2+(1.5\%)^2+…+(0.01\%)^2)*10000≈**500**$

WE≈2500

≈3000

≈4000

9911 ≈6000

3038	2801	2602	2244	3598	2975	2913	2918	5900	4676	2497	2456	9911	7445	5858	3511

Spain, France, UK, Germany, Vietnam, Thailand, China, South Korea, Belarus, Turkey, Romania, Hungary, Algeria, UAE, Egypt, Saudi Arabia

TEF 40% OFR 40% DT 39% BT 37%

Ukraine **3.5 USD** ARPU
Global **22 USD** ARPU

Source: ITU, Telegeography_Country Telecom Industry report Ukraine 2017Q2

FCC of USA:
"The question that has to be asked about market concentration is how to **benchmark** the HHI number (**which the FCC puts at 2,848 out of 10,000**.)"
Department of Justice, USA:
"The agencies generally consider markets in which the HHI is in excess of 2500 points to be highly concentrated."

Data from "Huawei CS Cloud"

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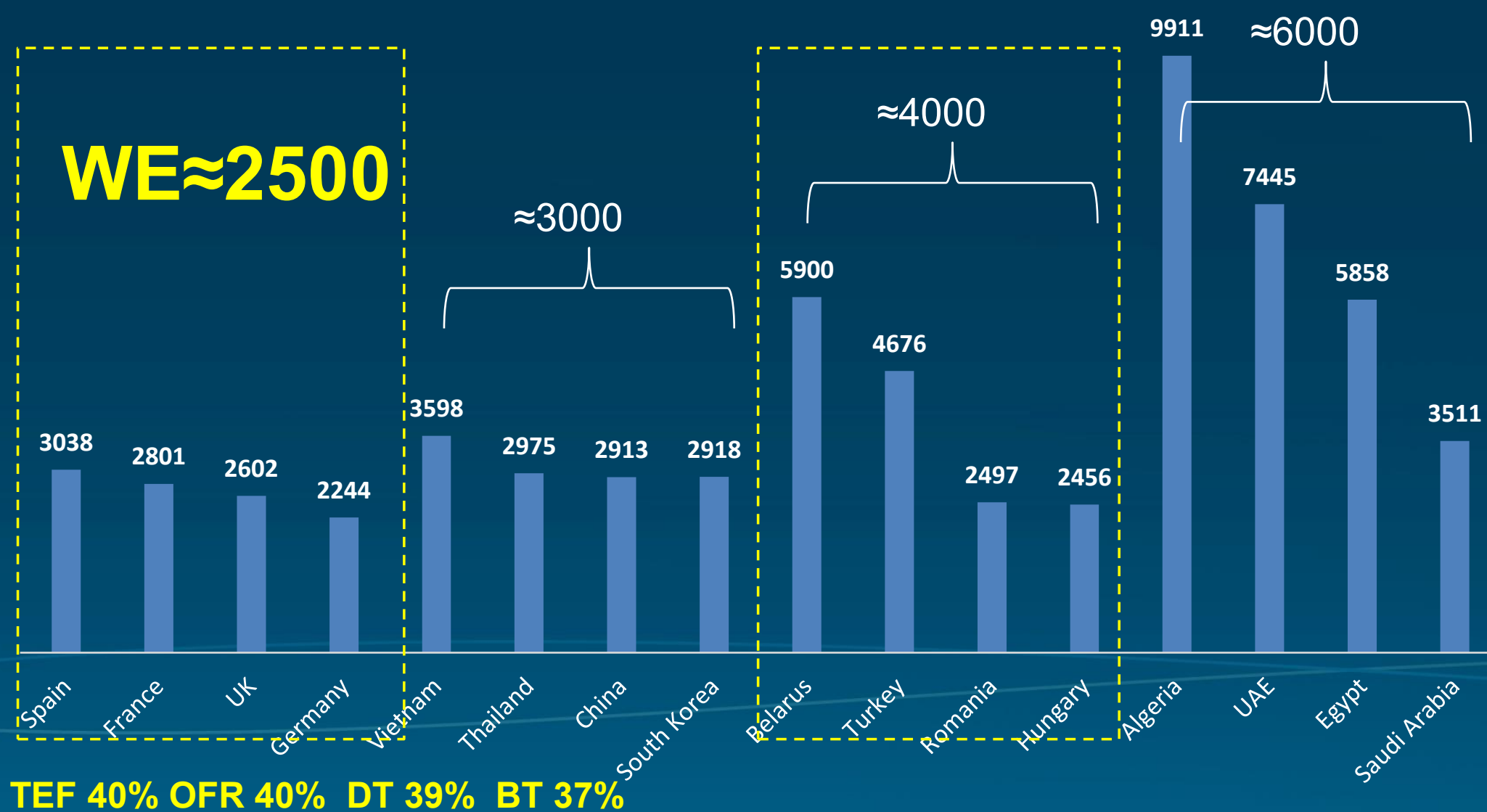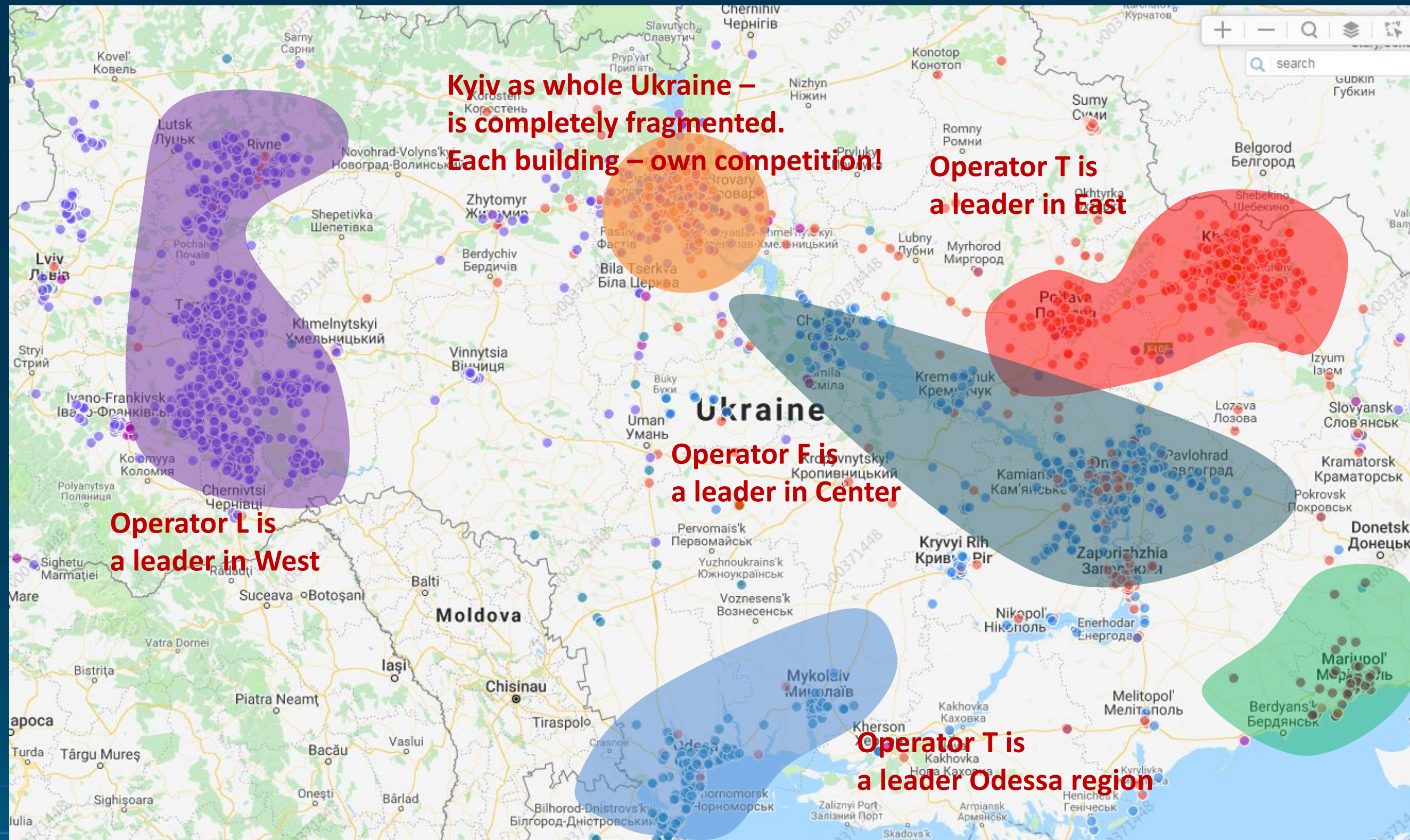
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Highly unconcentrated market

WE≈2500

≈3000

≈4000

≈6000

9911

Ukraine 3.5 USD ARPU
Global 22 USD ARPU

Source: ITU, Telegeography_Country Telecom Industry report Ukraine 2017Q2

Extremely low ARPU

Spain	France	UK	Germany	Vietnam	Thailand	China	South Korea	Belarus	Turkey	Romania	Hungary	Algeria	UAE	Egypt	Saudi Arabia
3038	2801	2602	2244	3598	2975	2913	2918	5900	4676	2497	2456	9911	7445	5858	3511

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Data from "Huawei CS Cloud"

Telecom Industry Concentration

FBB market is fragmented seriously with many players at different areas

Kyiv as whole Ukraine – is completely fragmented. Each building – own competition!

Operator T is a leader in East

Operator F is a leader in Center

Operator L is a leader in West

Operator T is a leader Odessa region

TOP 2 B2C players are national wide.
17 ISP's B2C players are strong in particular region/s 900+ – local players.

No Tier 1 Operators, a few Tier 2 Operators.

Around 20 B2O players provide global access to the Internet.

Only three national wide backbone OSP providers in Ukraine.

Source: Ookla/Huawei CS Cloud

Data from "Huawei CS Cloud"

- **Market is not just unconcentrated, it is scattered**

- **Despite of the low HHI, competition is not necessarily strong**

Connection Speed (by measurementlab.net)
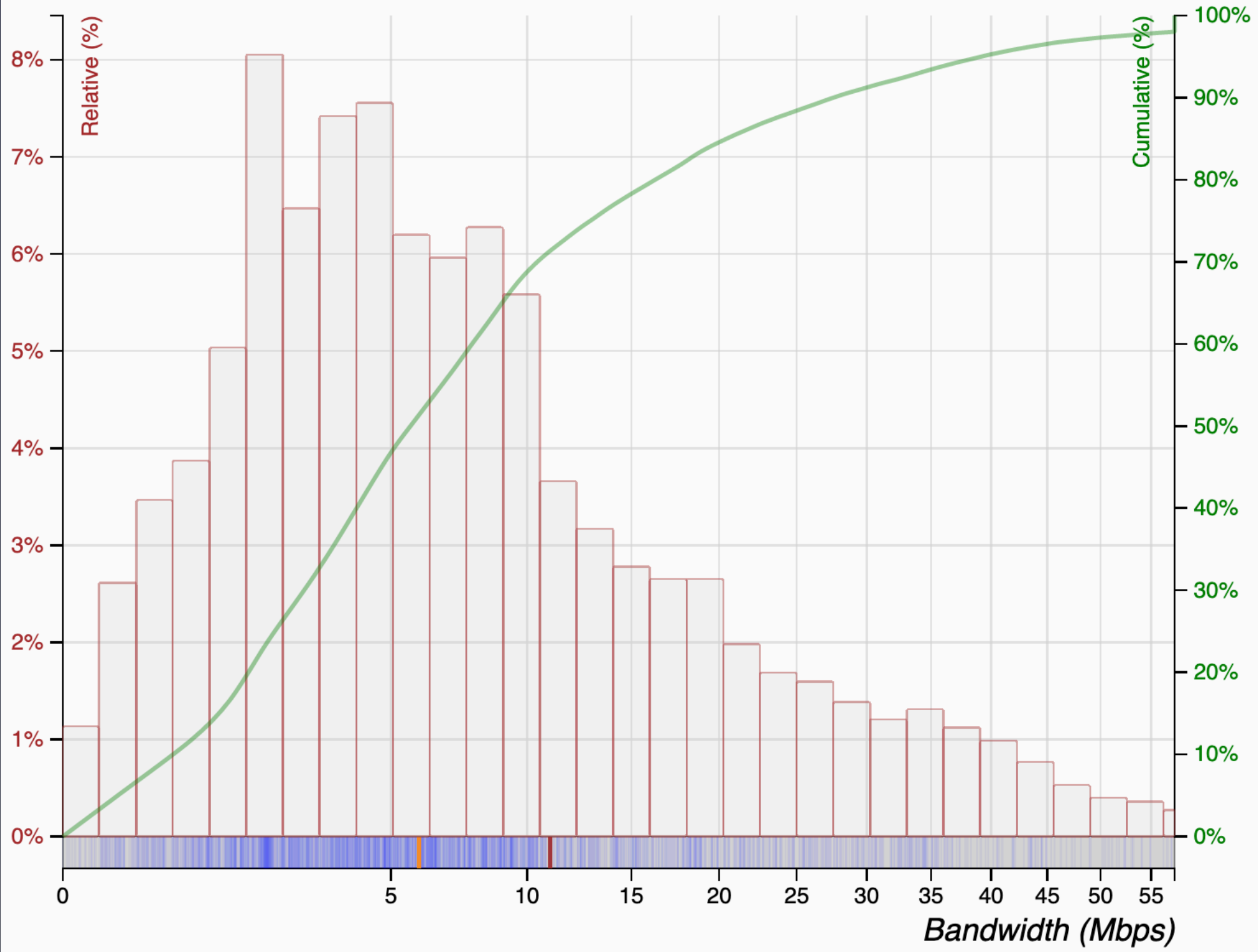
Average for last year
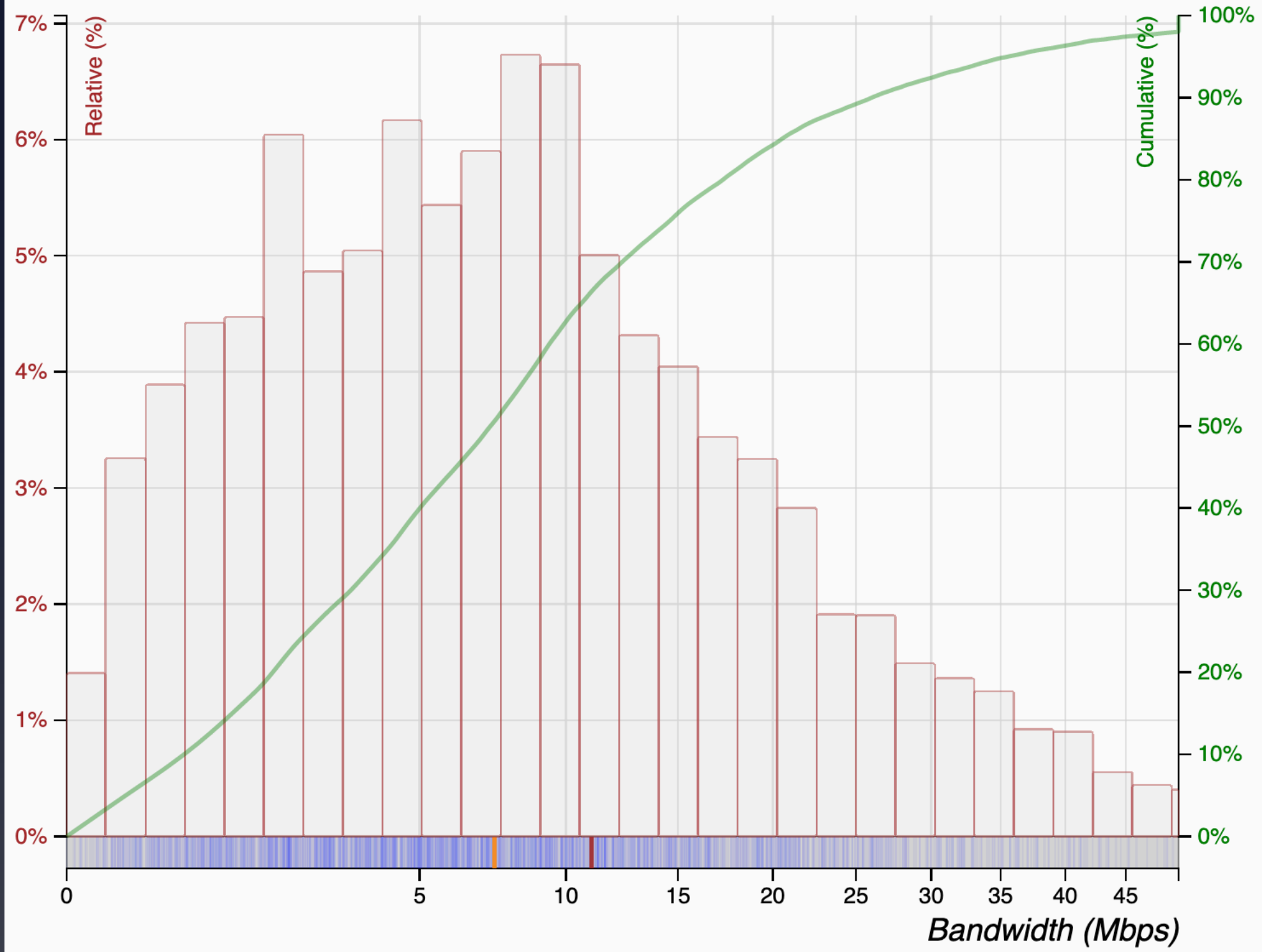
Average for last month
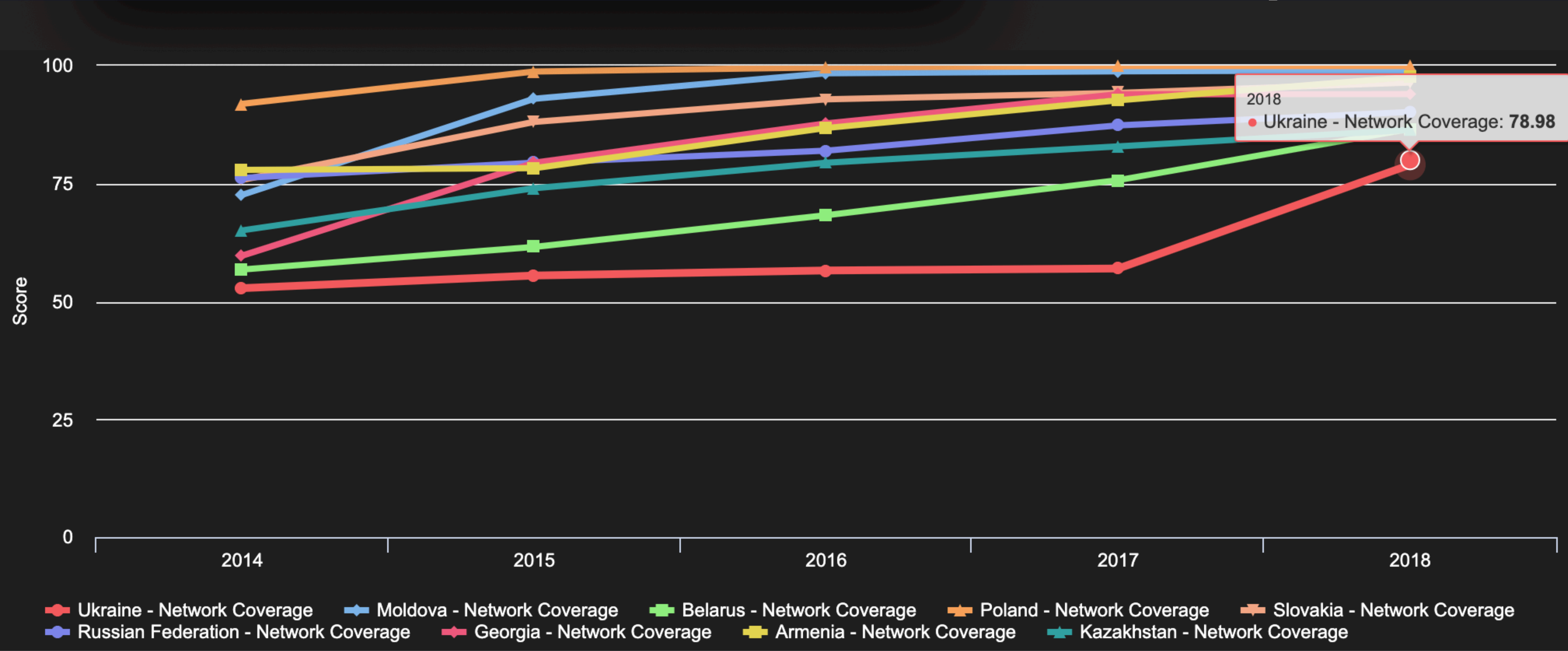
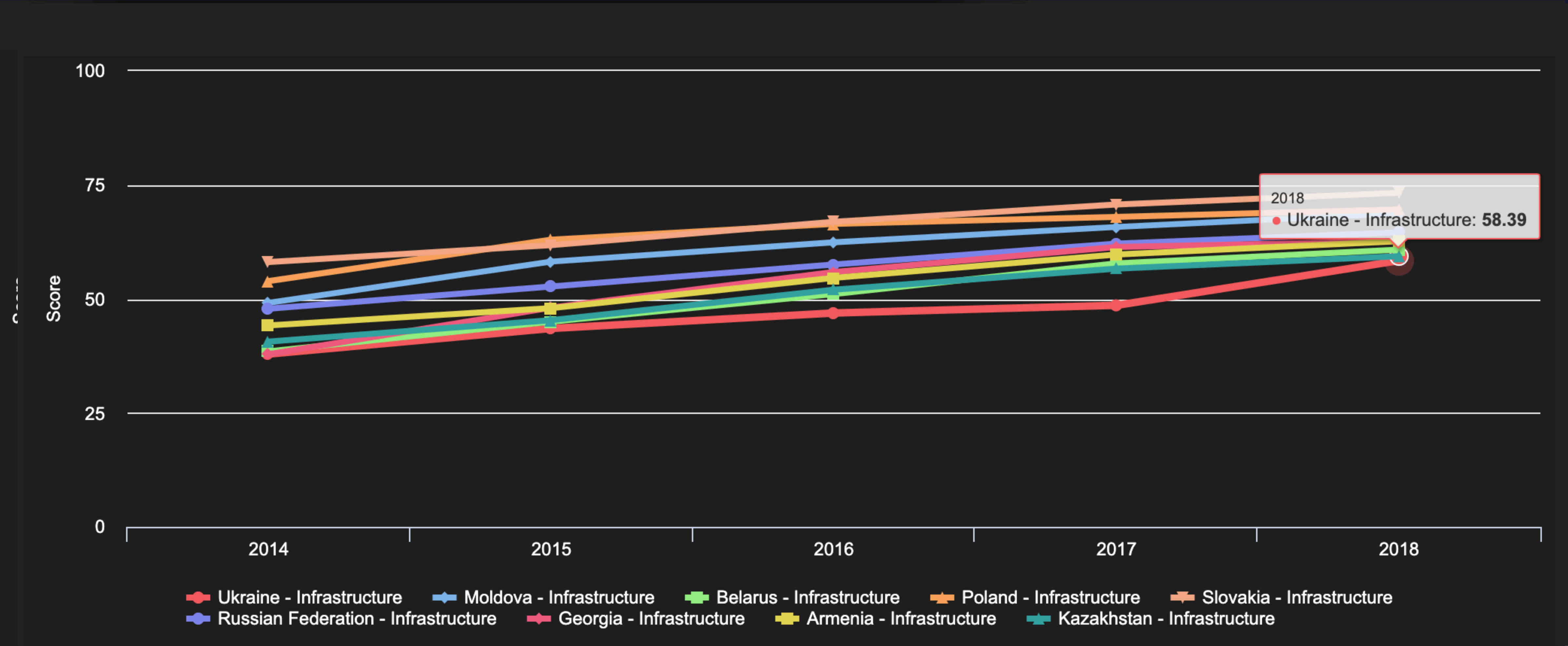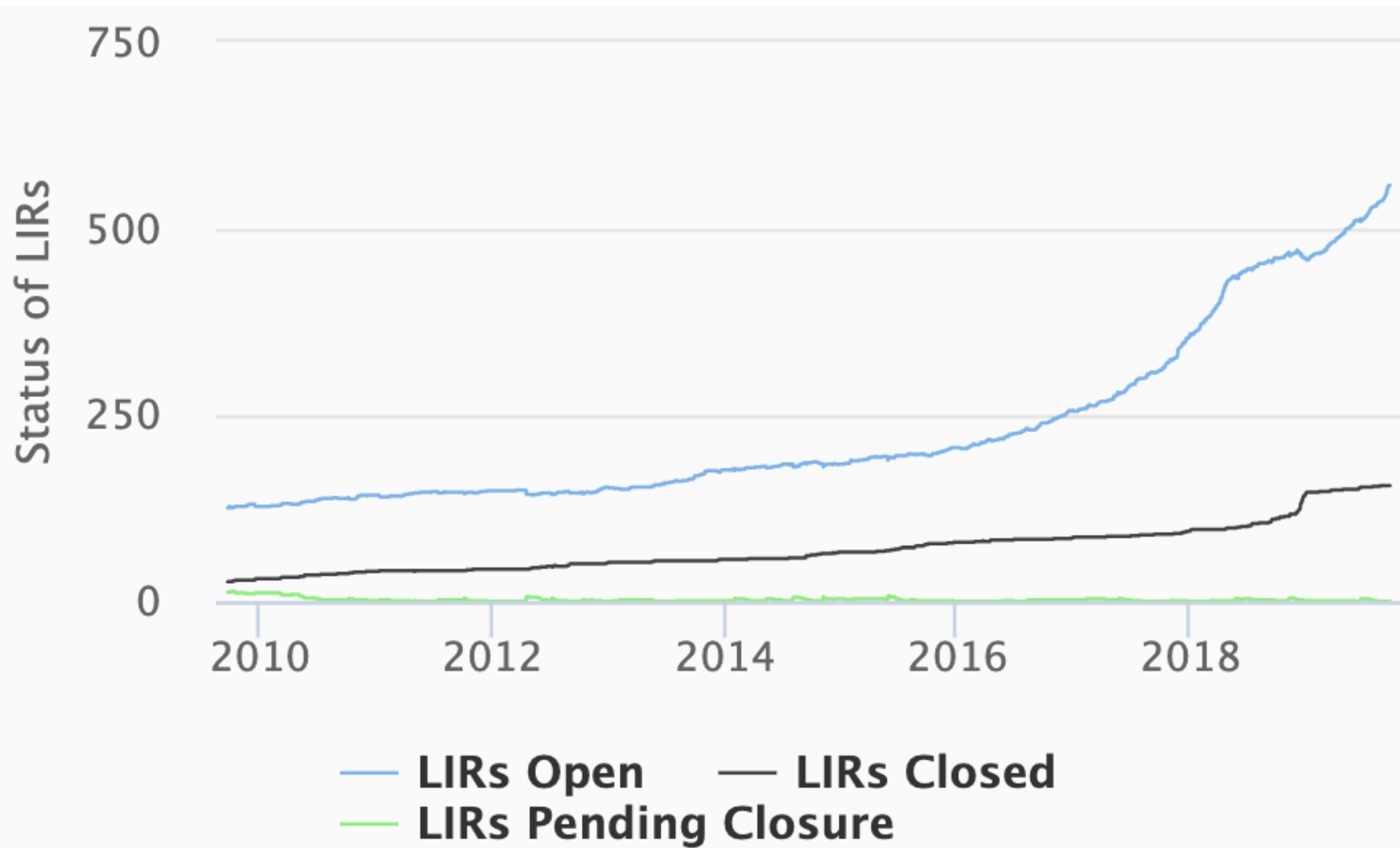**Speed of Internet access is growing fast**

Network Coverage

2018
● Ukraine - Network Coverage: **78.98**

Legend:
- ● Ukraine - Network Coverage
- ● Moldova - Network Coverage
- ● Belarus - Network Coverage
- ● Poland - Network Coverage
- ● Slovakia - Network Coverage
- ● Russian Federation - Network Coverage
- ● Georgia - Network Coverage
- ● Armenia - Network Coverage
- ● Kazakhstan - Network Coverage

Index of Infrastructure

Data by GSMA

LIRs in Ukraine

- **Growth partially caused by IPv4 run out**
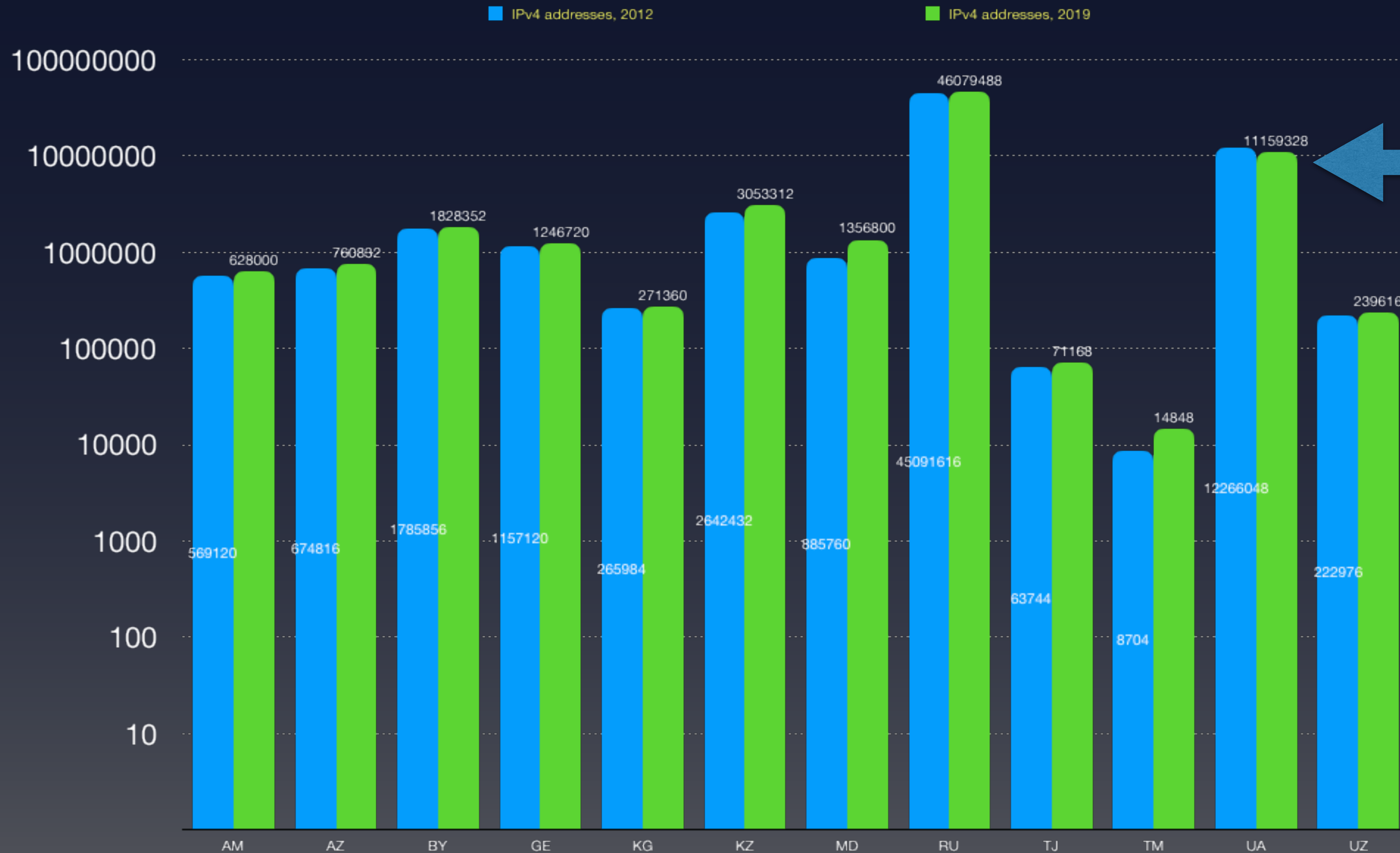
- **However, there is alignment with GSMA stats**

Growth of IPv4 Infrastructure

- **Steady growth**

- **Linear trend**

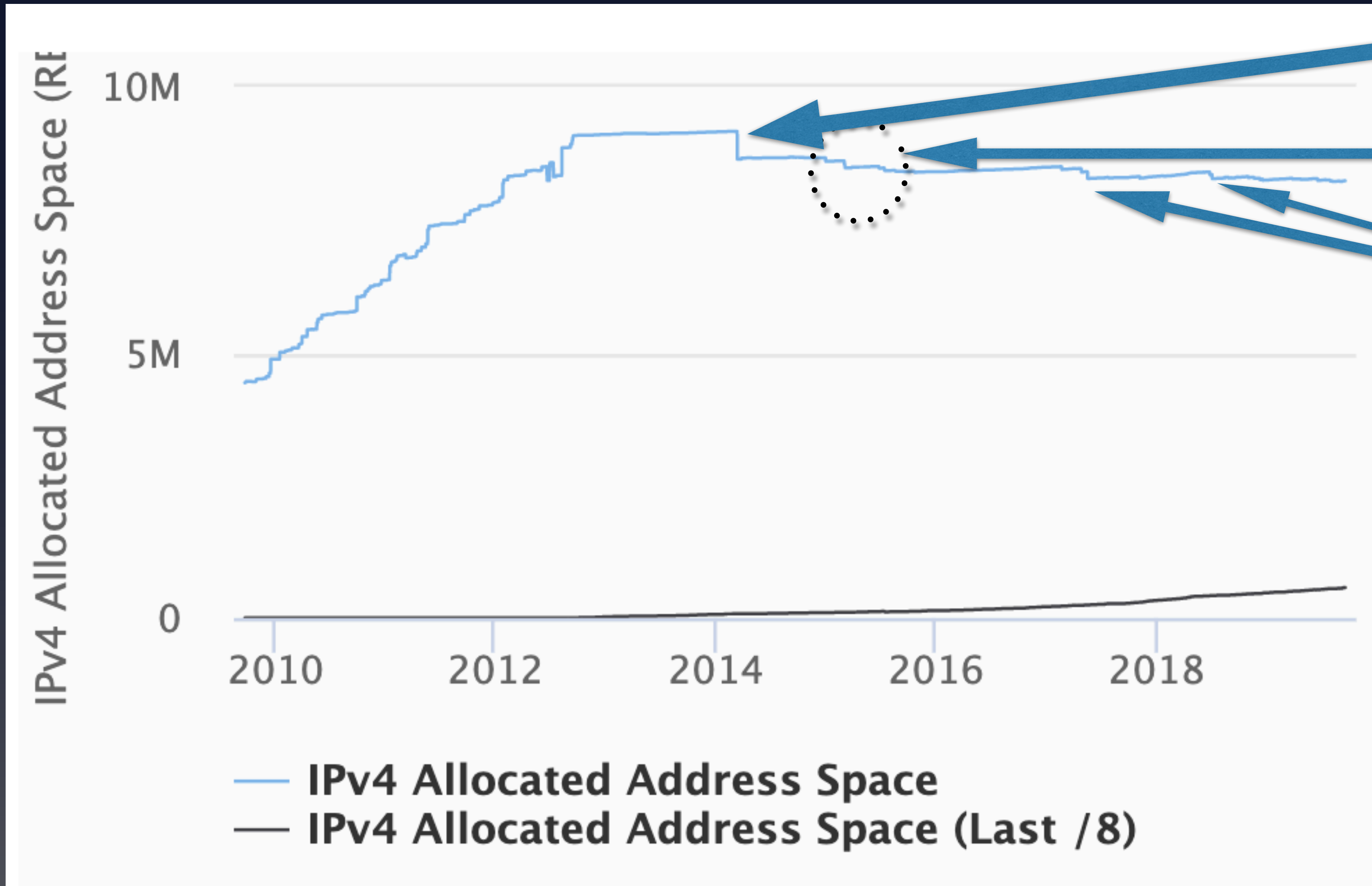IPv4 Assignments Infra (REG)
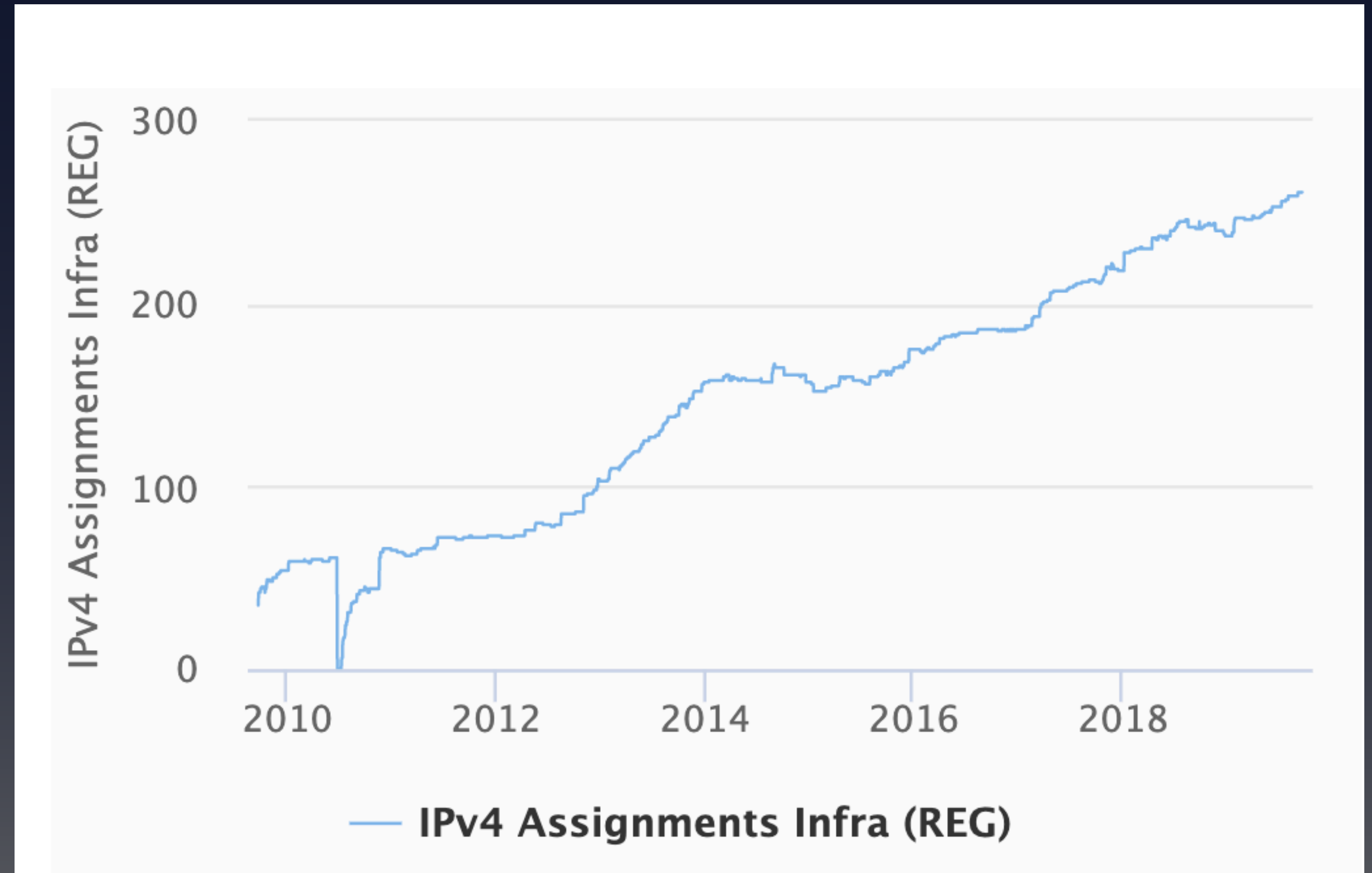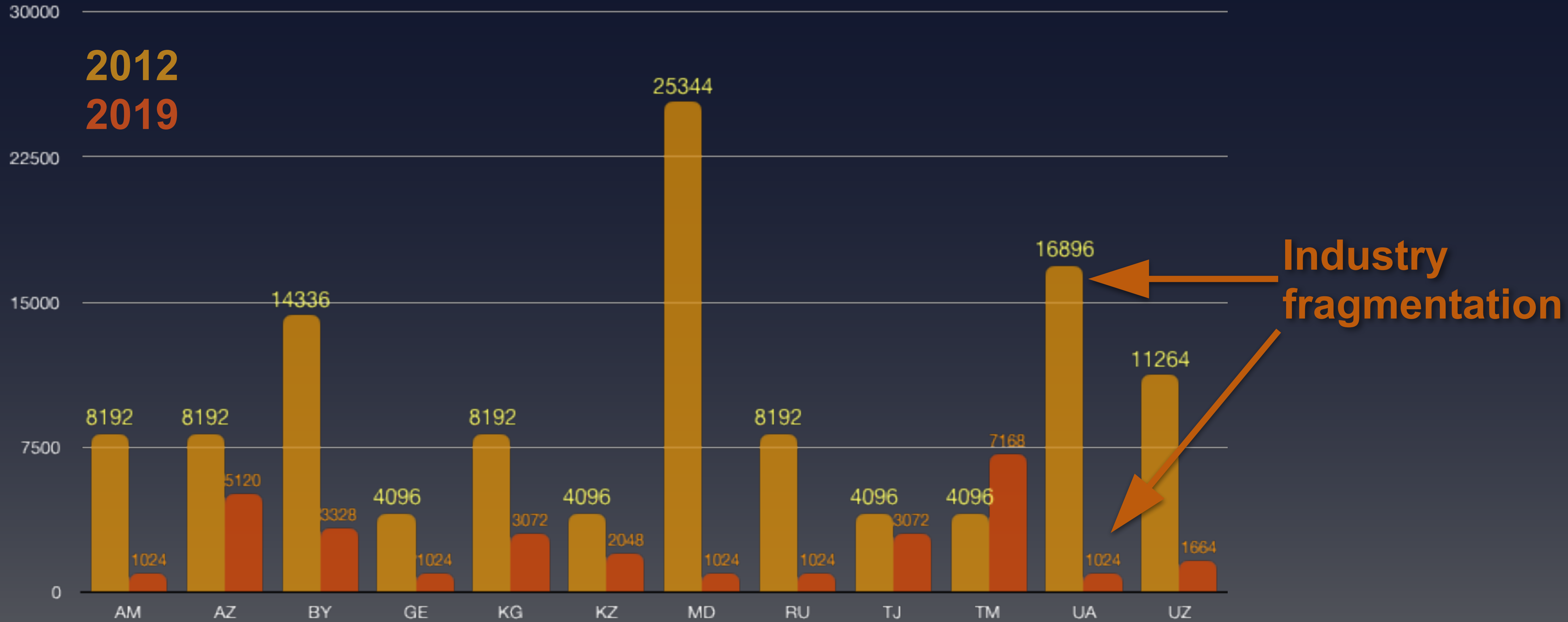
Number of IPv4: Total per Country

- **Ukraine is #2 in the region**
  - Both in 2012 and 2019

- **The total IPv4 space slightly decreased from 2012 to 2019**
  - Ukraine is the only country which decreased its address space
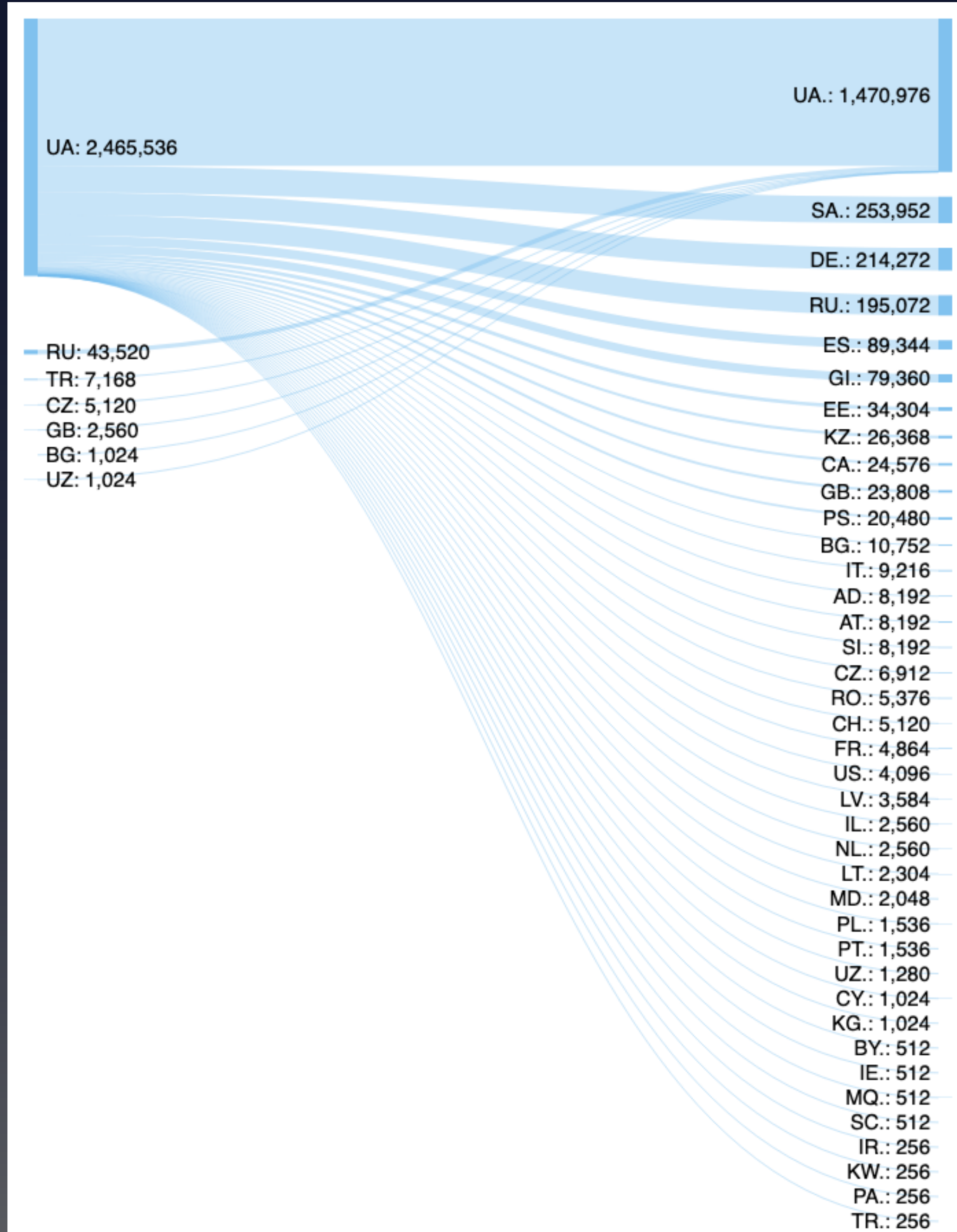
Ukraine's IPv4 Space Over Time

- **Crimea**
- **"DNR" and "LNR"**
- **?**

IPv4: Median Average per LIR

2012
2019

Chart showing IPv4 median average per LIR for 2012 (orange) and 2019 (red) by country:

- AM: 8192 / 1024
- AZ: 8192 / 5120
- BY: 14336 / 3328
- GE: 4096 / 1024
- KG: 8192 / 3072
- KZ: 4096 / 2048
- MD: 25344 / 1024
- RU: 8192 / 1024
- TJ: 4096 / 3072
- TM: 4096 / 7168
- UA: 16896 / 1024
- UZ: 11264 / 1664

Industry fragmentation

IPv4 Transfers

- **Most of transfers (58.2%) are inside Ukraine**

- **Also no transfers from abroad to Ukraine**
  - Russia is #1 (by 1.7%)

- **Top five destinations of transfers from Ukraine to abroad:**
  - South Africa (10.0%)
  - Germany (8.5%)
  - Russia (7.7%)
  - Spain (3.4%)
  - Gibraltar (3.0%)

- **At the same time, Ukraine is the main donor of IPv4 addresses for Russia**

  - 2.9% of the incoming addresses
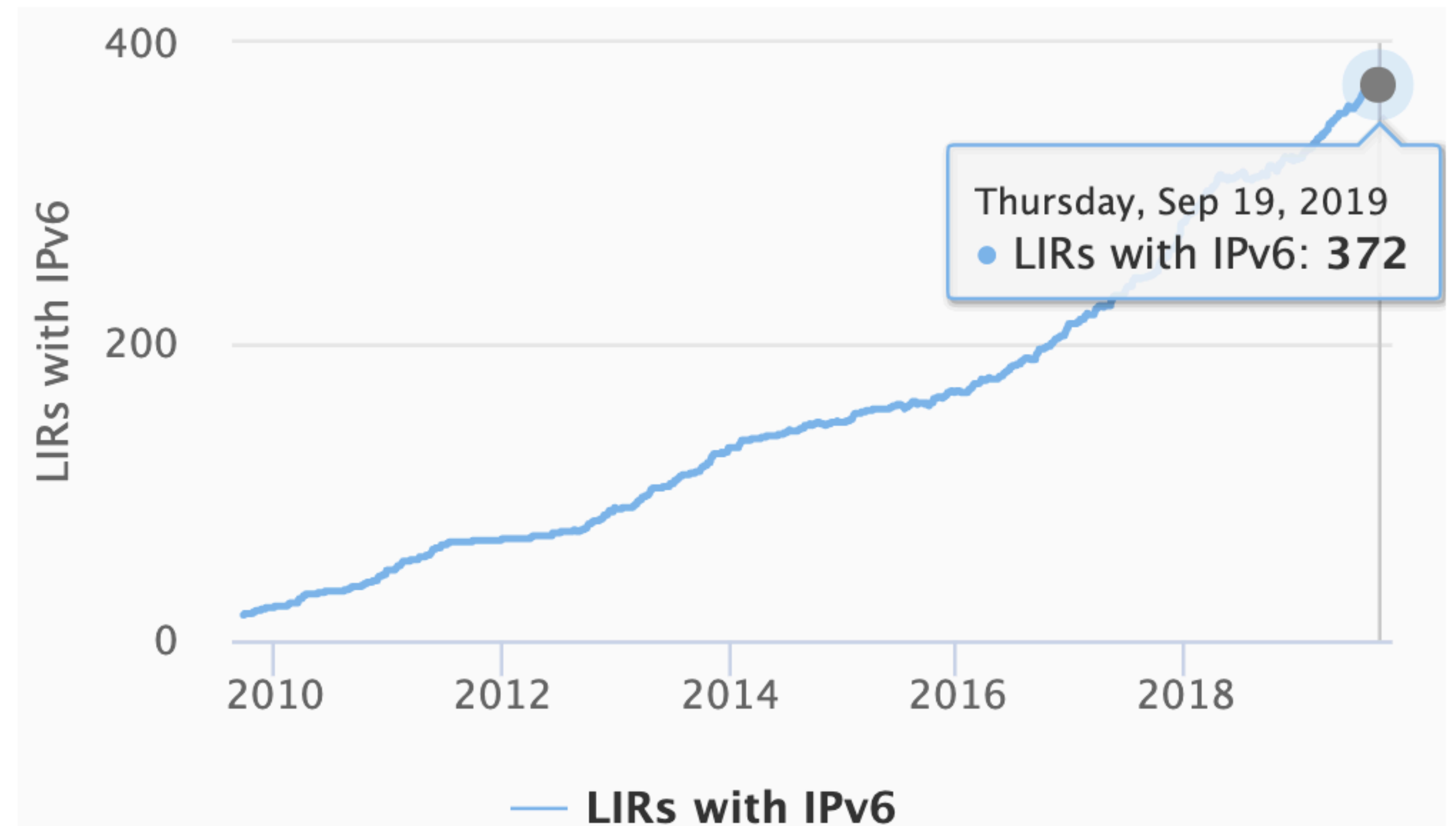 - Russia is more impermeable, 68% of transfers are internal.

UA	164,352
RO	163,840
US	32,768
DE	19,968
MD	18,432
CZ	8,704
FI	8,192
CY	7,424
KG	6,656
UZ	4,864
NL	4,096
KZ	2,048
LU	2,048
RS	2,048
GB	1,280
CH	1,024
LT	512
AM	256
AZ	256
BE	256
RU	5,055,104

RU	3,763,328
IR	349,440
ES	232,960
NL	199,680
CN	131,072
DE	128,000
EU	121,088
SY	84,992
KZ	57,856
AT	52,224
UA	43,520
SA	35,840
GB	30,720
LU	24,064
SE	22,784
EE	18,944
CA	18,432
PL	17,664
YE	16,384
LT	15,616
IT	13,312
CH	12,544
CZ	11,776
AZ	10,240
PS	9,216
IQ	8,448
TM	8,192
MD	7,936
RO	7,936
US	7,936
FR	6,400
AD	4,096
HU	4,096
KG	4,096
SG	4,096
UZ	3,328
BG	2,048
IL	2,048
MT	2,048
LV	1,536
MY	1,536
SC	1,280
BR	1,024
IE	1,024
IN	1,024
JE	1,024
TR	512
VG	512
BY	256

IPv6 LIRs

- **LIRs keep receiving IPv6 resources**

  - Rate is steady

  - 2/3 LIRs have an IPv6 allocation

- **But do LIRs use them?**

LIRs With IPv6

Thursday, Sep 19, 2019
- LIRs with IPv6: **372**

IPv6 Penetration (by E.Vyncke)

https://www.vyncke.org/ipv6status

- **The growth just started**

  - Current level is sufficiently lower than the world average: 27% (according to Google)

- **IPv6 operators:**

  - Netassist
  - ITL.ua
  - Triolan
  - ?

IPv6 penetration (by E.Vyncke)

Hungary 24%

Moldova 4.1%

Poland 11.2%

Russia 4.4%

Slovakia 4.5%
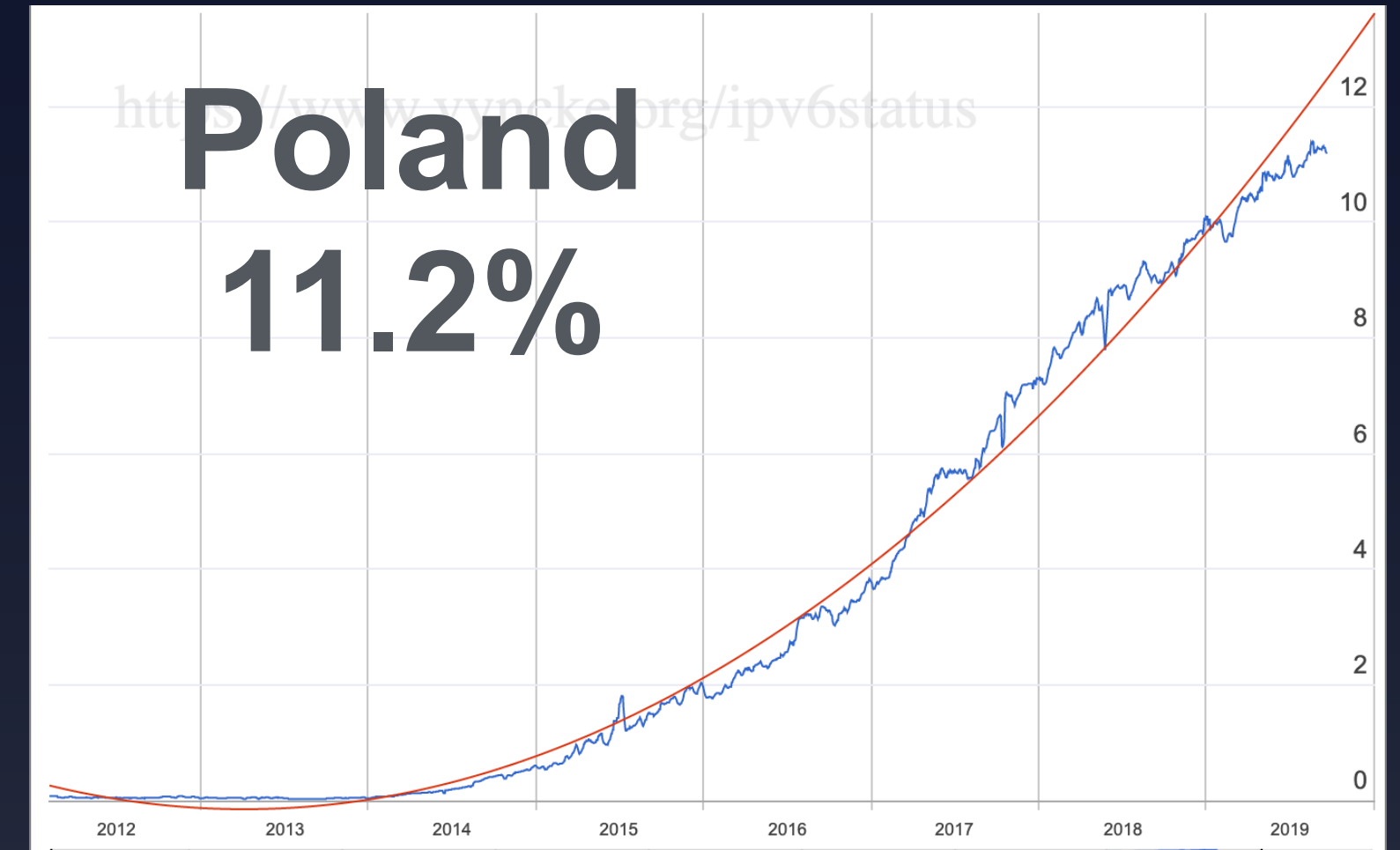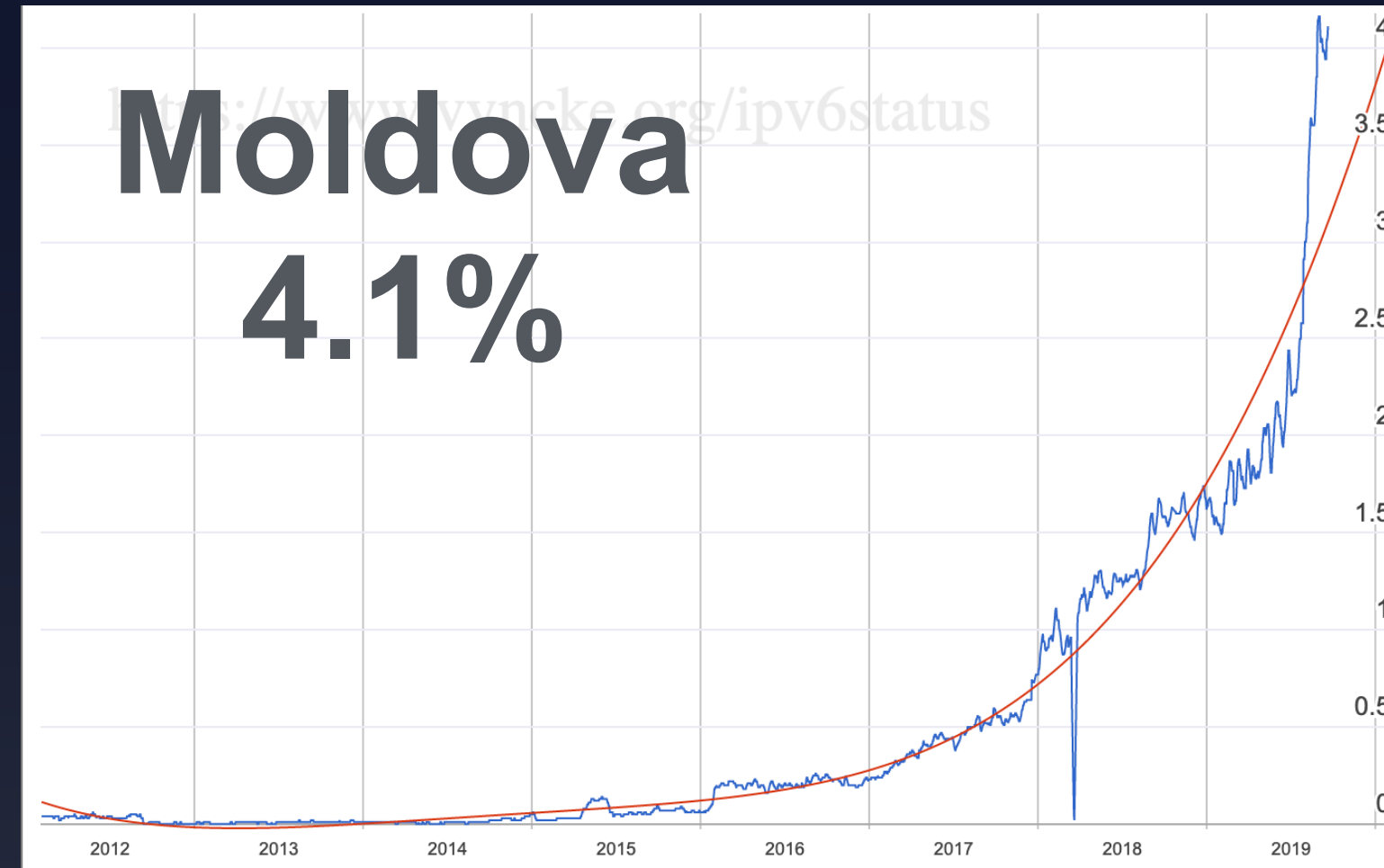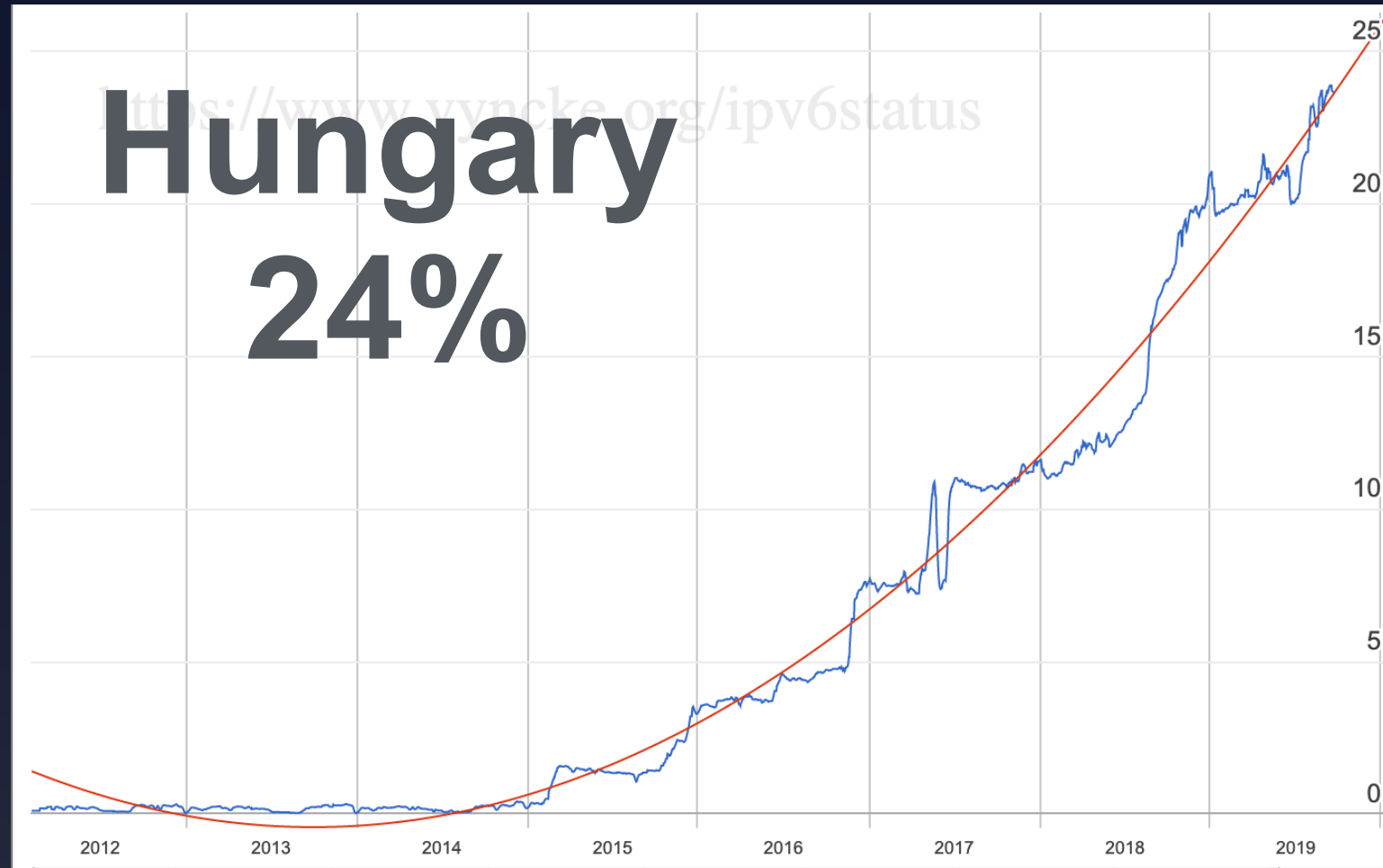
Almost all neighbours (except Belarus) have higher IPv6 penetration rate than Ukraine.

IPv6 Resources, Popular in Ukraine

- **It makes perfect sense for operators to implement IPv6**
  - The most popular resources are IPv6-enabled (Google, YouTube, Facebook)

- **Cloudflare helps**

- **Most of local resources do not see the reason to turn IPv6 on**

Source of data	BigMir	Liveinternet		InAU	Similar Web	TNS
Number of resources	300	300	3000	25	50	25
IPv6-enabled, %	30,0%	30,7%	25,9%	36,0%	32,0%	24,0%
Protected by Cloudflare, %	27,3%	24,7%	11,9%	4,0%	10,0%	0,0%
Native IPv6 support, %	2,7%	6,0%	14,0%	32,0%	22,0%	24,0%

Count only local resources

Include global resources (Google, Facebook etc)

23

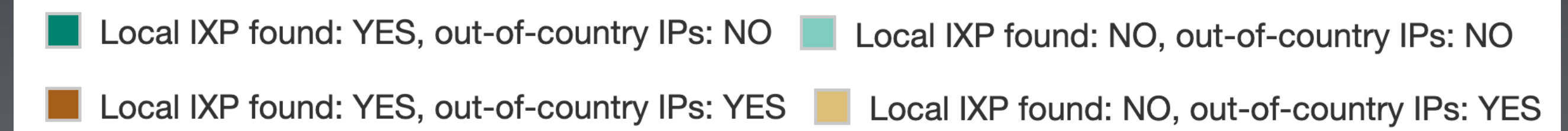# Internet Routing
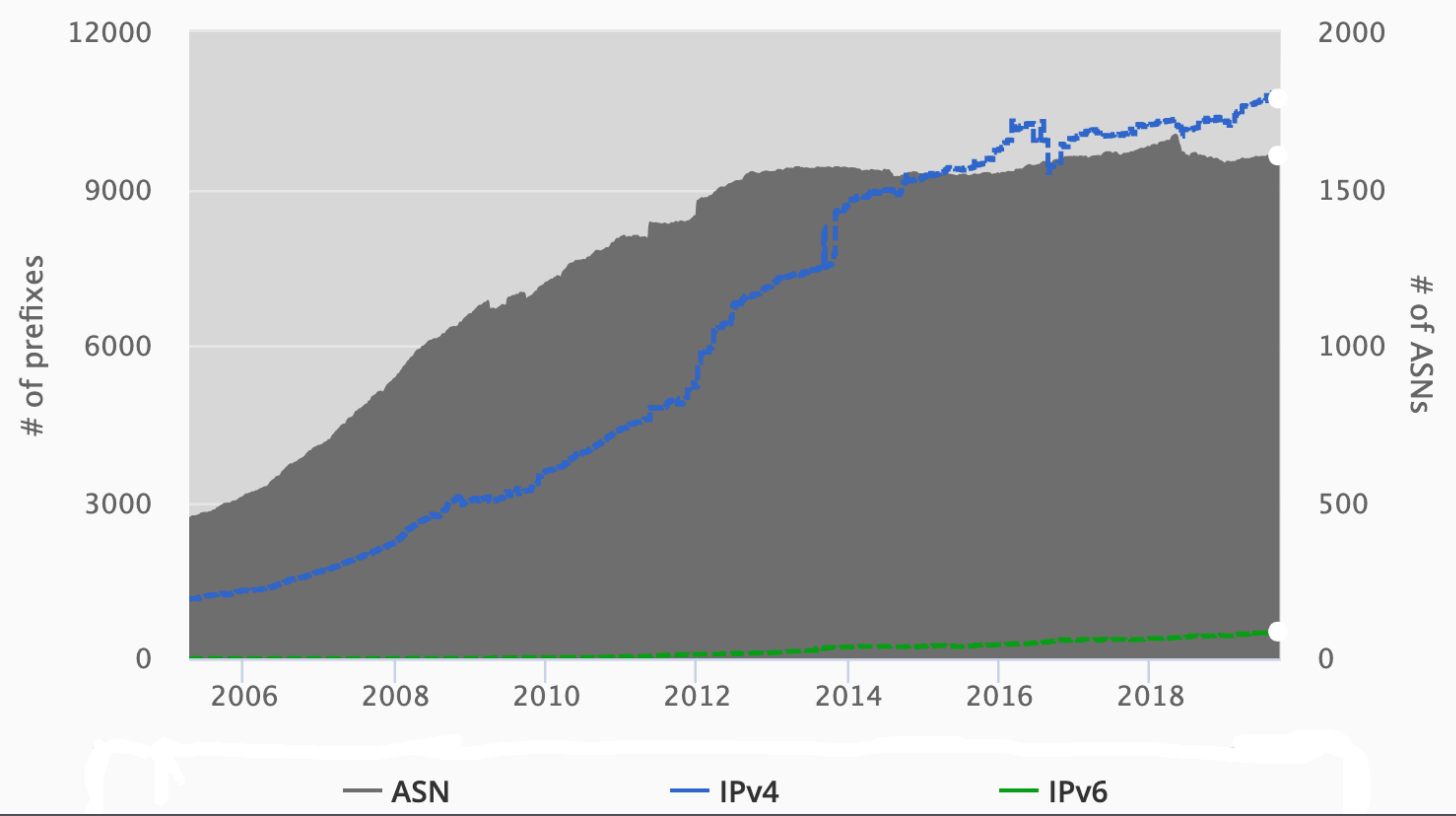
Traffic Locality in Ukraine

- **"IXP Country Jedi" by Emile Aben**
  - http://sg-pub.ripe.net/emile/ixp-country-jedi/history/2019-07-01/UA/ixpcountry/index.html
  - IPv4
  - July 2019
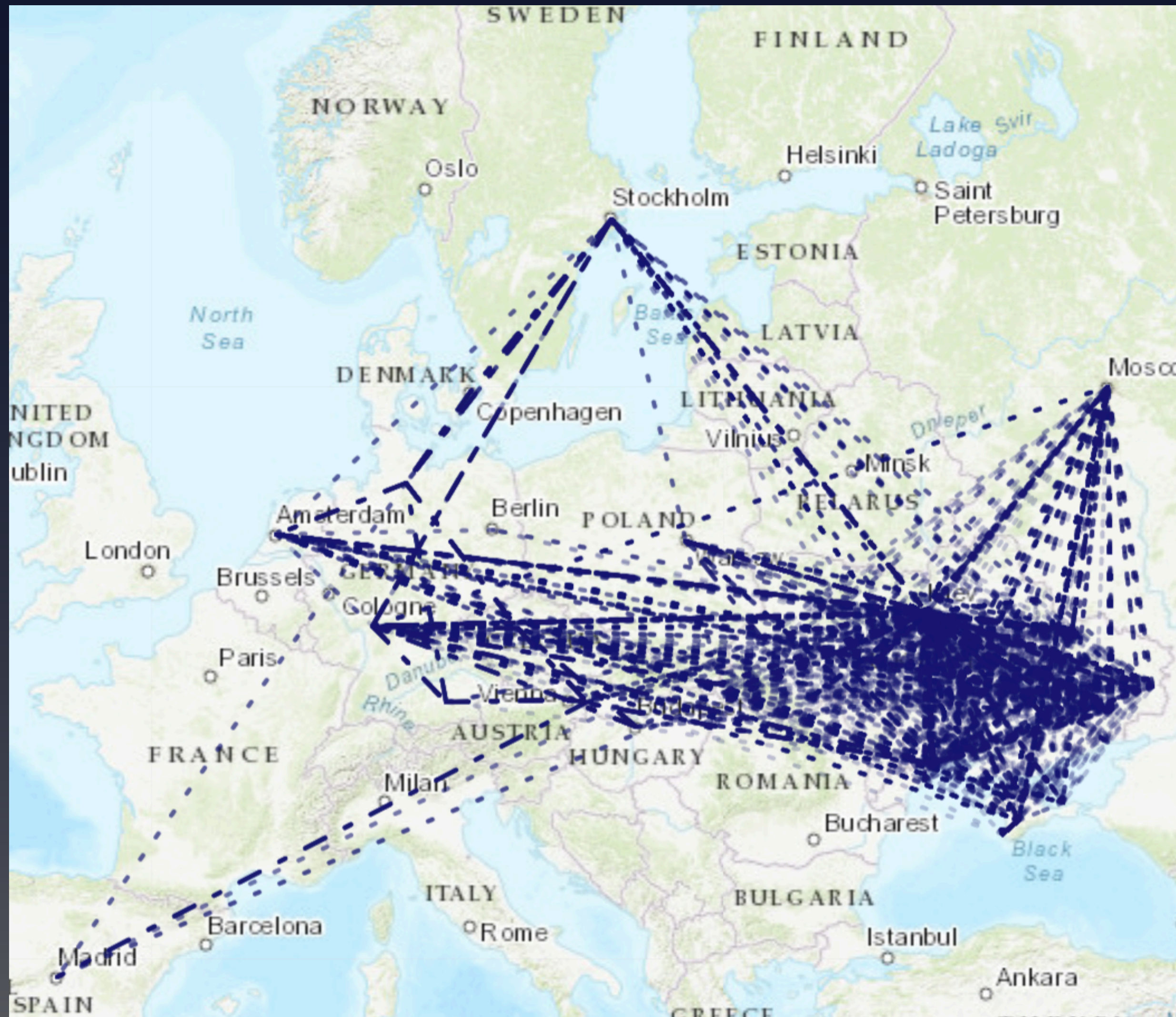
- **Traffic between Ukranian Autonomous System is mostly local**
  - Problematic ASes:
    - AS1820, AS3326, AS21390 - WNet
    - AS3326 - Datagroup
   - ASes from Crimea, Donetsk and Luhansk

- **The proportion of IXPs is large**

Legend:
- Local IXP found: YES, out-of-country IPs: NO
- Local IXP found: YES, out-of-country IPs: YES
- Local IXP found: NO, out-of-country IPs: NO
- Local IXP found: NO, out-of-country IPs: YES

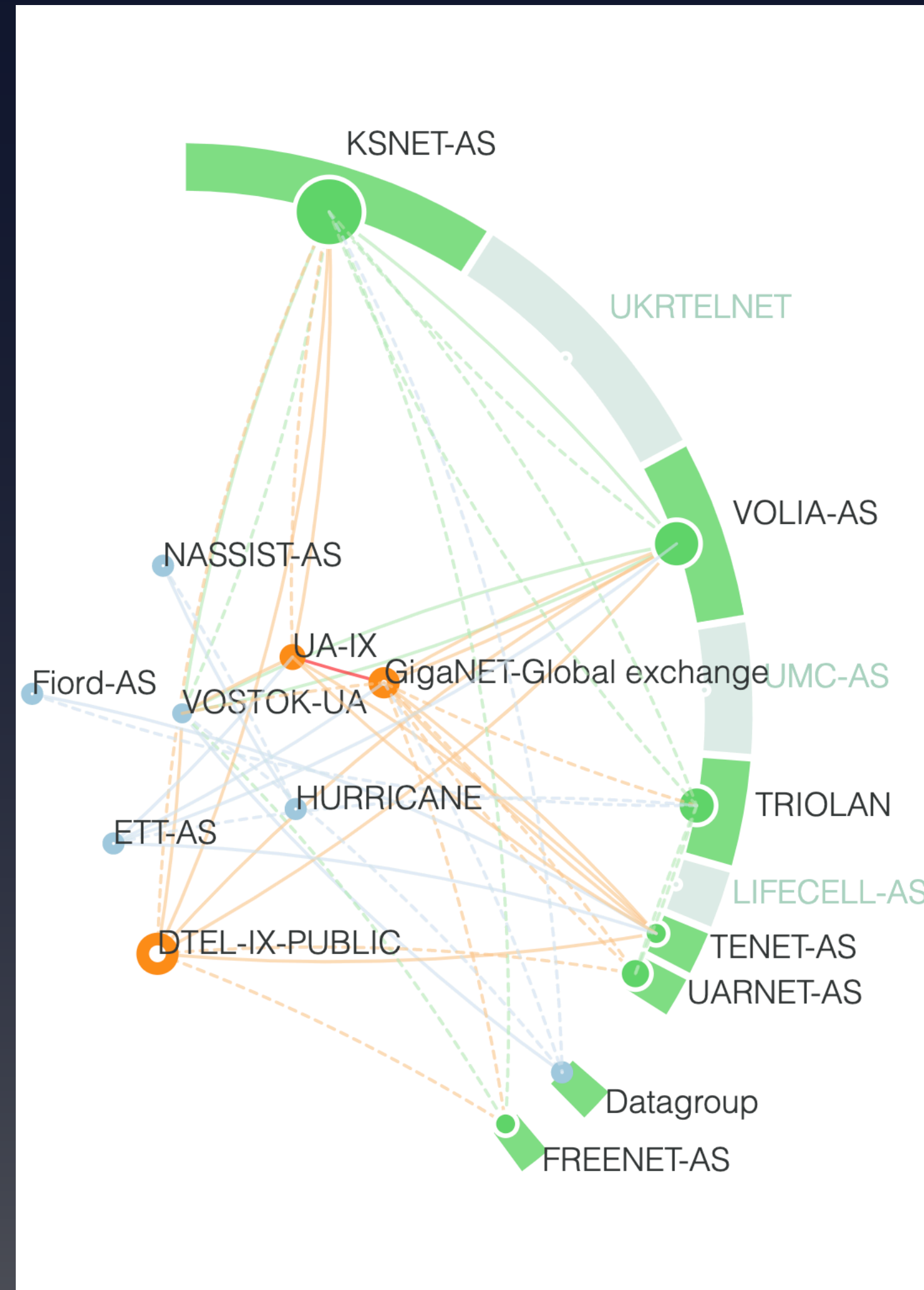# Traffic Locality in Ukraine

- **Most of routes are local**

- **Geography of non-local routes looks illogical, if not chaotic**
  - However, it is not a big surprise considering that ASes based in Crimea, Donetsk and Luhansk are participating
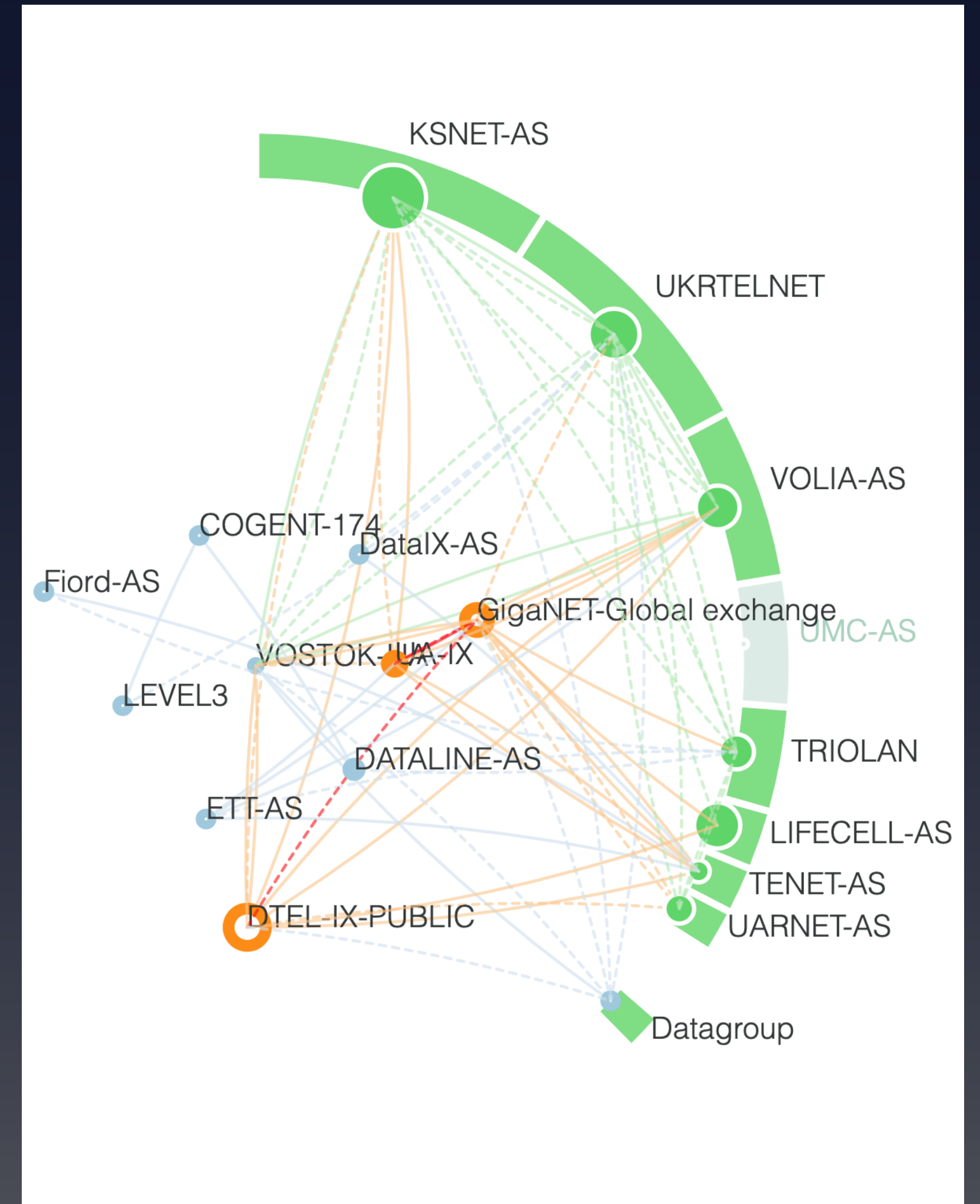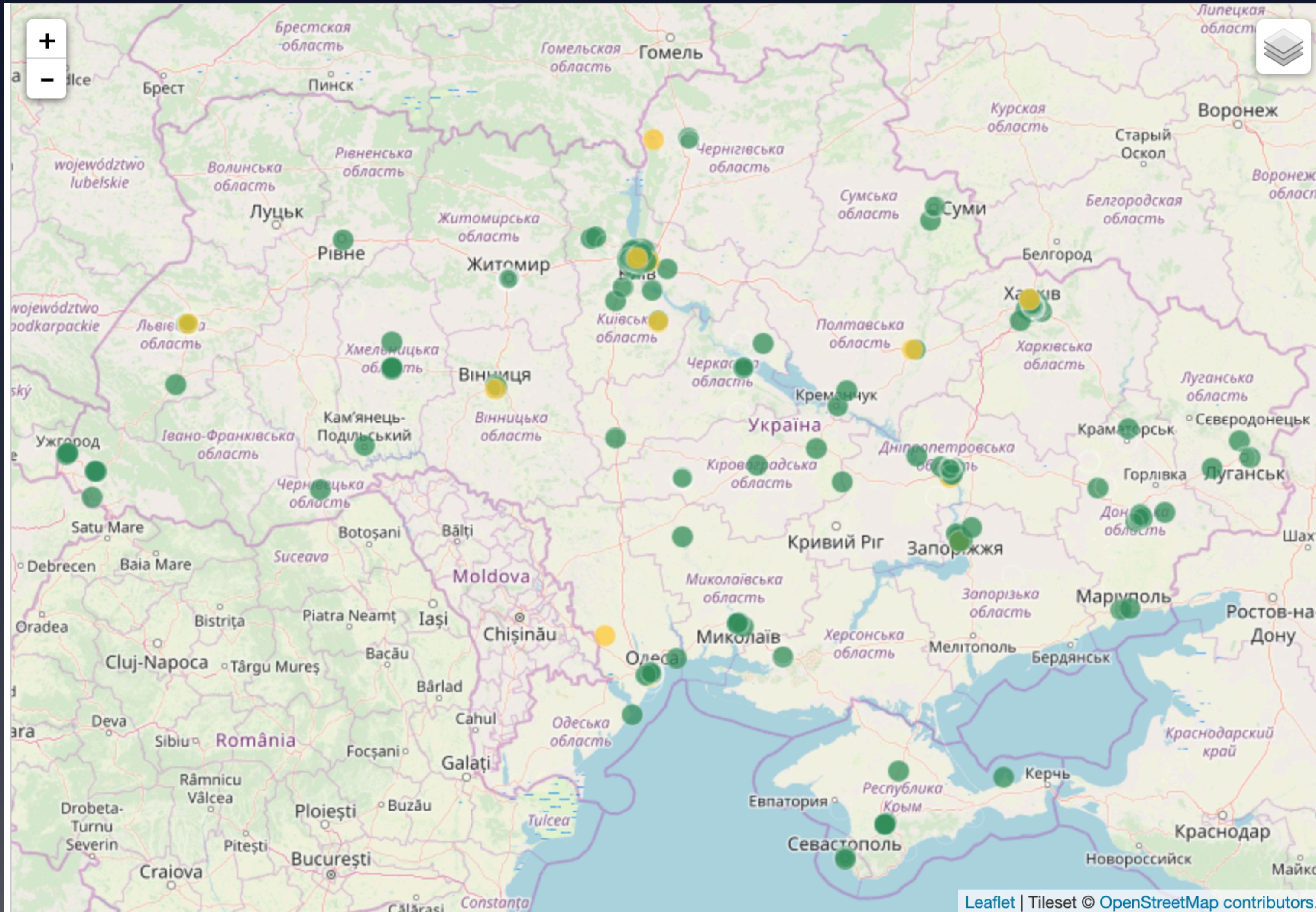
Ukrainian Interconnectivity
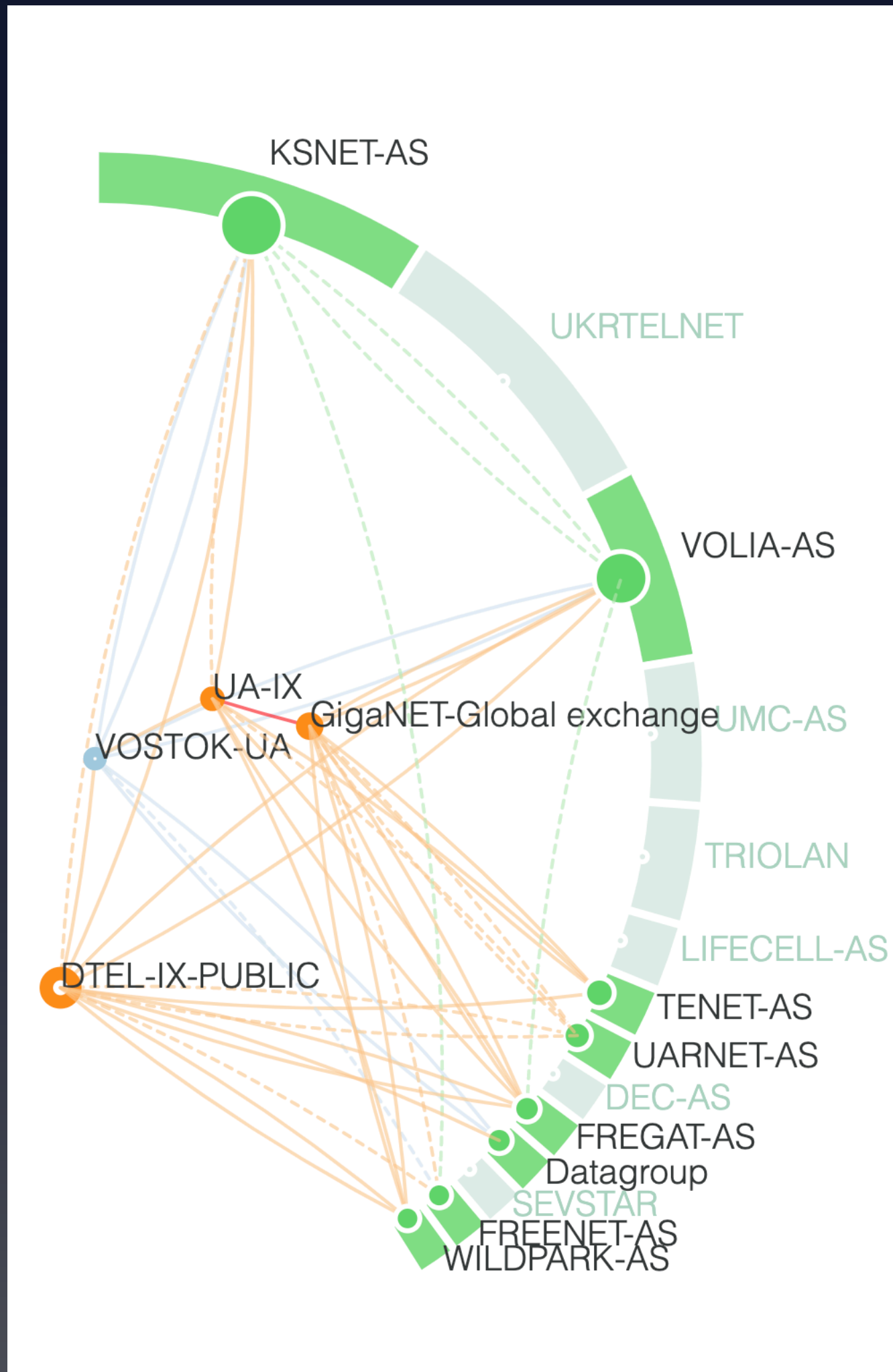
2019-06

2019-07

2019-09

Changes are fast!

RIPE Atlas Probe Distribution
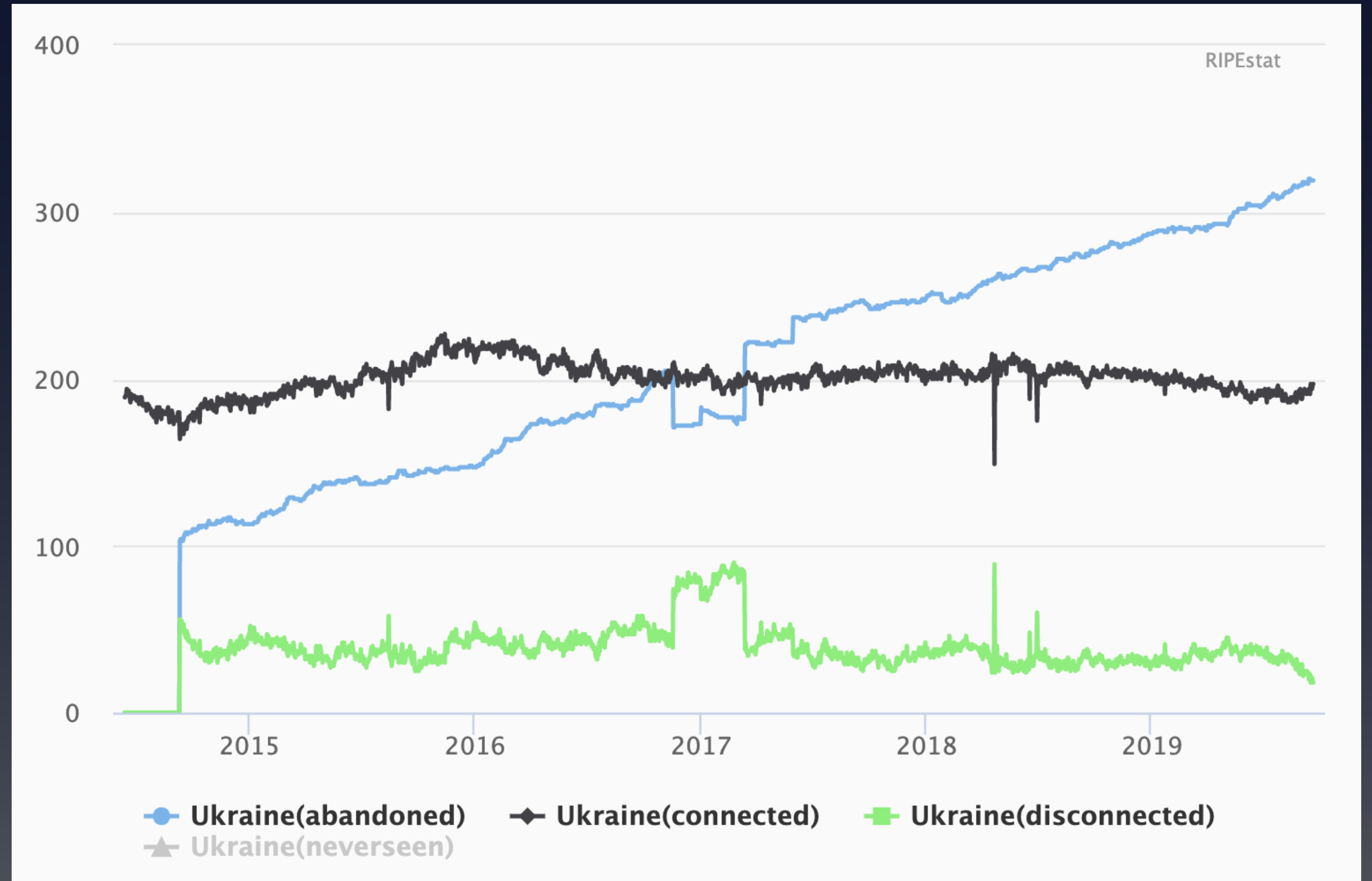

- **All over the country**

- **Relatively uniform distribution**

- **Total number: 195**
  - Czech Republic: 247
  - Switzerland: 287

- **Need more for research**

RIPE Atlas Dynamics

- **Obviously, the system in Ukraine is underutilised**

Some Conclusions

- **The industry is not stagnating; the processes are healthy but there is a noticeable delay compared to other countries**
- **Huge reserves for industry growth**
  - Both for ARPU
  - …and for number of users (penetration)
- **Implementation of the available opportunities is complicated by low ARPU (catch 22) and high fragmentation of the market**
  - This applies to both technical and commercial development
  - Perhaps the consolidation of the market will change everything
    - ▸ This may happen with the arrival of global players

Questions

asemenyaka@ripe.net