



**RIPE NCC**  
RIPE NETWORK COORDINATION CENTER

# The IXP landscape in the SEE region

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Initial Findings

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- **Purpose:**

- Assess the evolution and state of the IXP ecosystem in the SEE region to identify trends, challenges, and opportunities

- **Goals:**

- Identify areas of growth or stagnation
- Highlight internal and external challenges
- Propose actionable recommendations to address identified challenges and leverage opportunities

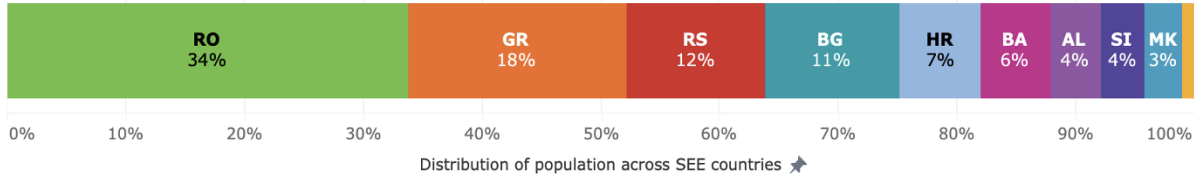


# Introducing the Region

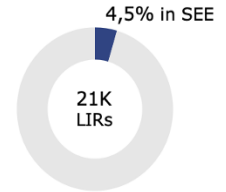
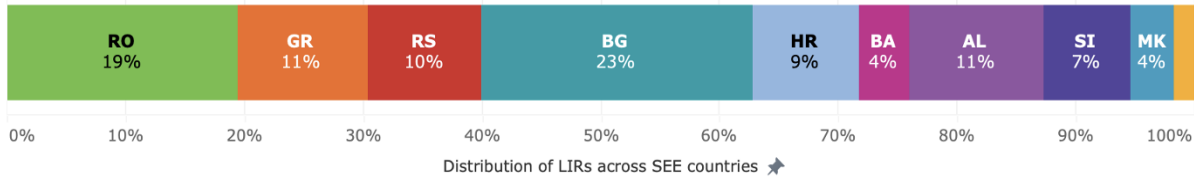


RO GR RS\* BG HR BA AL\* SI MK ME

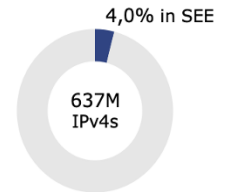
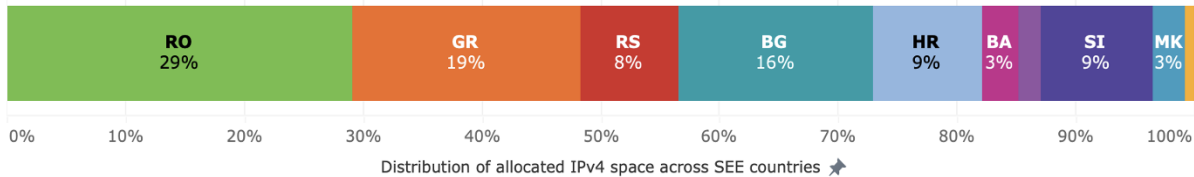
## Population



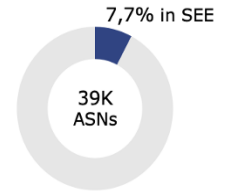
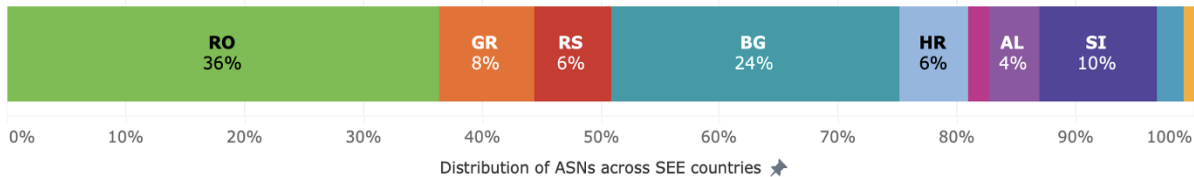
## LIRs



## Allocated IPv4 space



## ASNs



# Region is Not Homogeneous



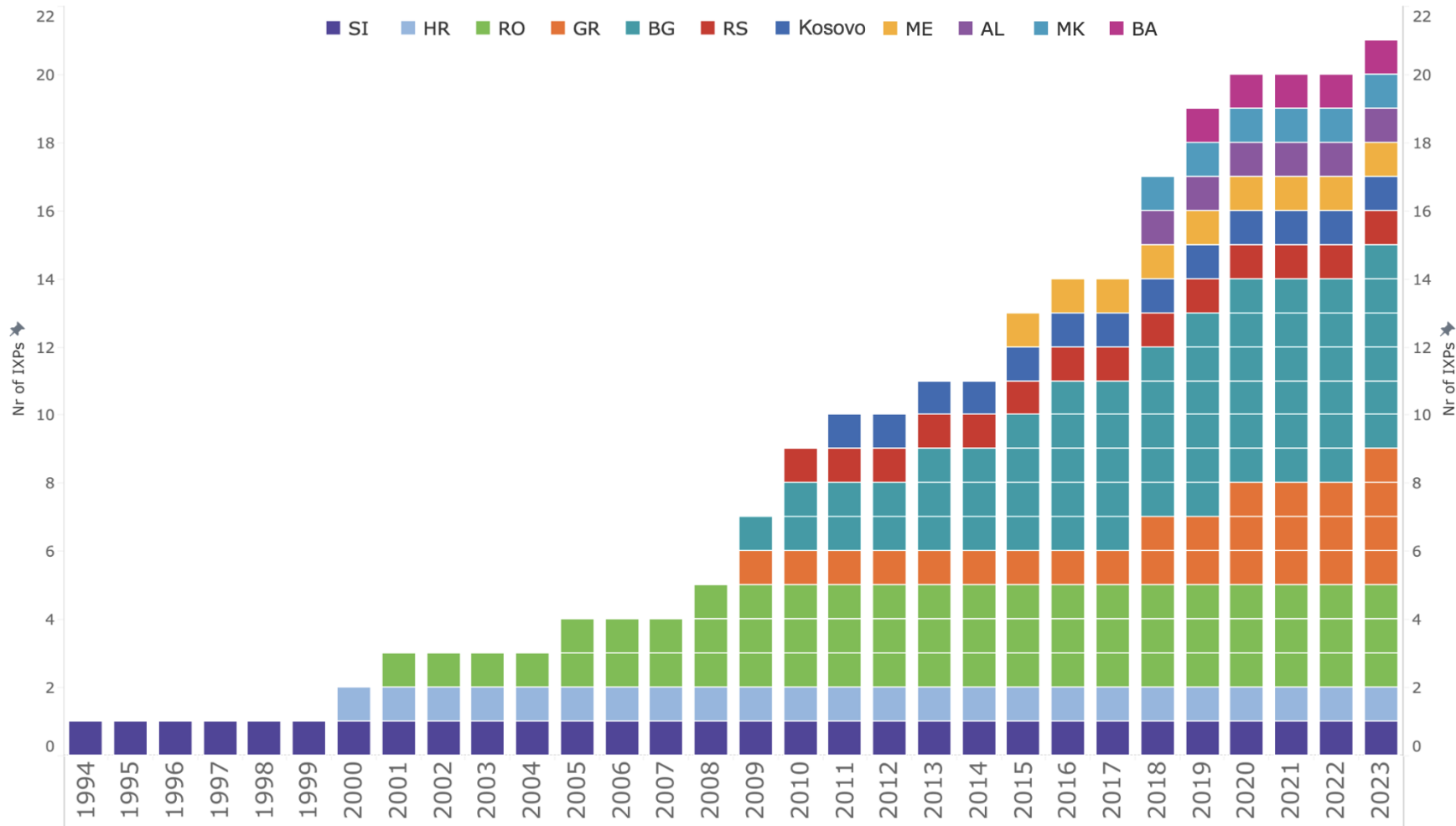
- Regulatory disparities (EU and non-EU)
- Market size (larger and smaller)
- Geographic location (landlocked and coastal)
- Intra-region connectivity (Ex-YU and rest)



# Initial Findings

# IXP Landscape





Data source: PCH IXP directory





- **Diverse Governance Models:**

- NREN-operated, ISP association, commercial, led by the regulator
- Large number of IXPs run by NRENS
- Different levels of membership involvement

- **Impact on Growth:**

- Governance and business models influence access to funding for critical equipment upgrades
- Affects the ability to attract new members and shape growth strategy
- Lack of focused personnel inhibiting growth potential



- **Incumbents' role:**

- Incumbent ISPs often hold significant influence over local IXPs
- Not all ISPs engage in open peering at the local IXP, limiting traffic exchange opportunities

- **Market Concentration:**

- IXPs is typically more useful for small and medium sized ISPs
- Larger ISPs may prefer private peering or rely on international hubs

- **Regional Investment Challenges:**

- The lack of a sustainable cross-border market makes it harder to draw in major players or secure large-scale infrastructure investment (E-commerce, Media, Finance, Content)

# Proximity to Major Data Hubs



- **Pros:**
  - Good access to a larger digital ecosystem
  - Low(-ish) latency
  - Low cost transit (for some countries)
- **Cons:**
  - Dependency on foreign hubs
  - Underdevelopment of local IXPs and peering
  - Export of capital from domestic economy
  - Lack of localisation



# Criteria for Success

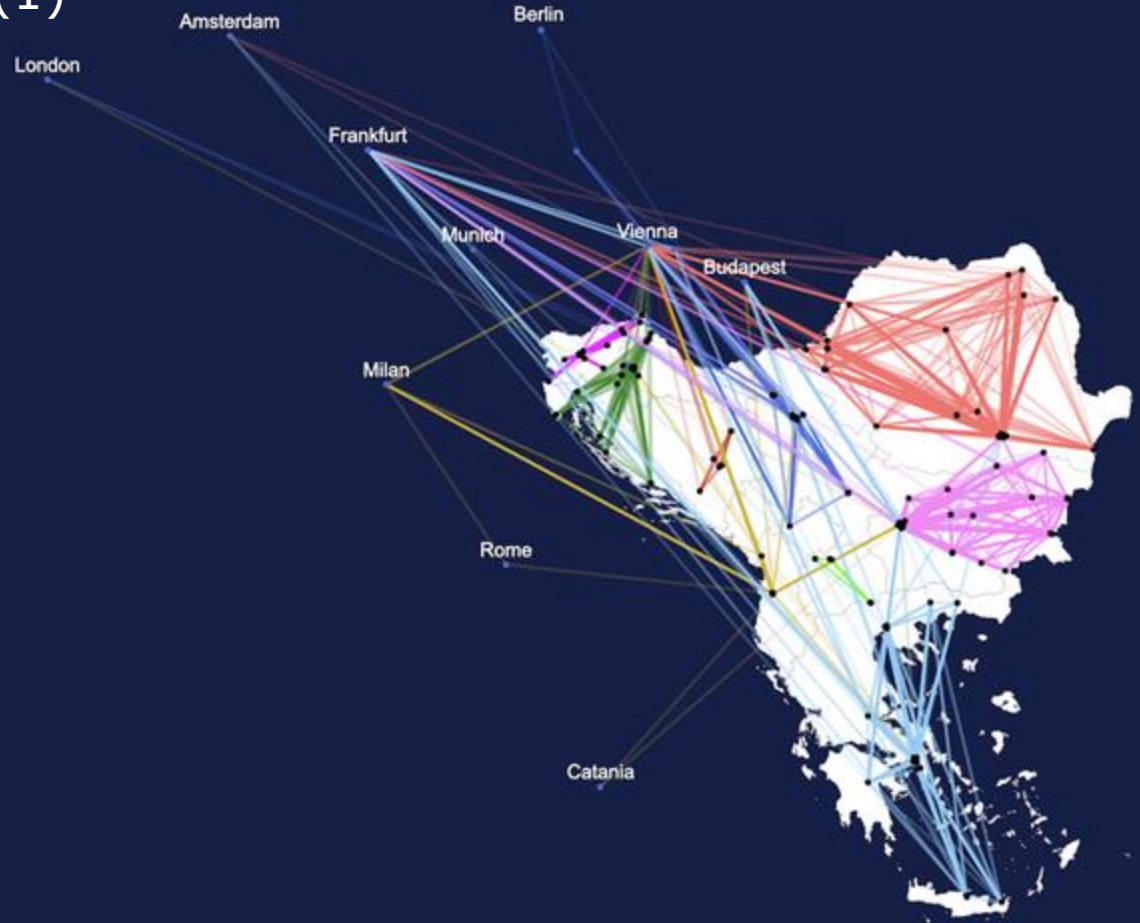
# The Four Criteria for Success



1. Keeping local traffic local
2. Facilitating inter-region traffic
3. Attracting global hyperscalers and content providers
4. Supporting economy digitisation

# In-Country Connections (1)

| Country | Total number of paths | Out-of-country number of paths | Out-of-country paths % |
|---------|-----------------------|--------------------------------|------------------------|
| AL      | 72                    | 19                             | 26.39%                 |
| BA      | 28                    | 3                              | 10.71%                 |
| RS      | 455                   | 31                             | 6.81%                  |
| GR      | 754                   | 27                             | 3.58%                  |
| RO      | 1544                  | 29                             | 1.88%                  |
| SI      | 418                   | 6                              | 1.44%                  |
| HR      | 592                   | 6                              | 1.01%                  |
| BG      | 2031                  | 15                             | 0.74%                  |
| MK      | 25                    | 0                              | 0.00%                  |



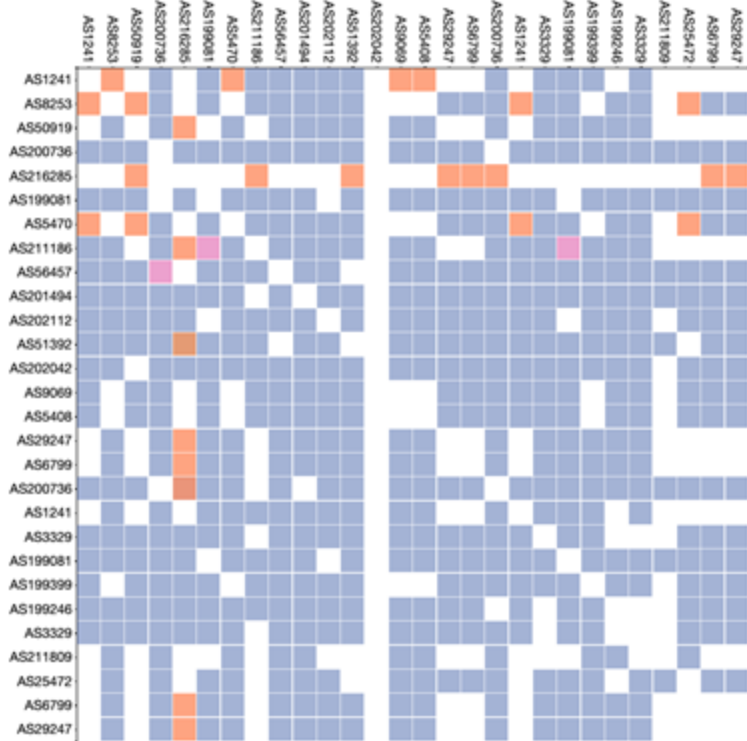
# In-Country Connections 1



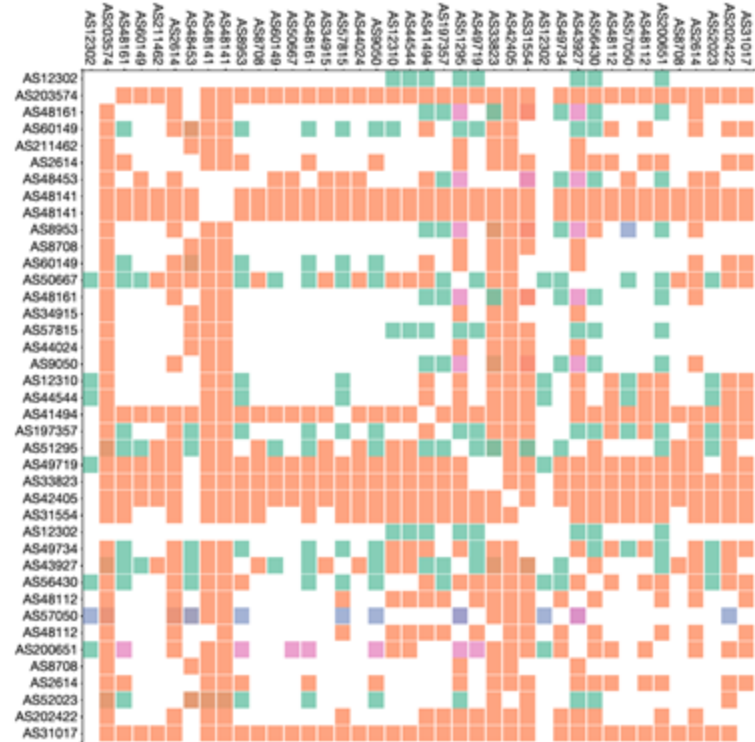
# In-Country Connections 2



- NetIX Greece
- GR-IX::Thessaloniki-Peering LAN
- GR-IX::Athens-Peering Lan
- Free-IX Greece



- RoNIX
- InterLAN-IX-InterLAN Peering Network
- DSIX
- Balkan-IX





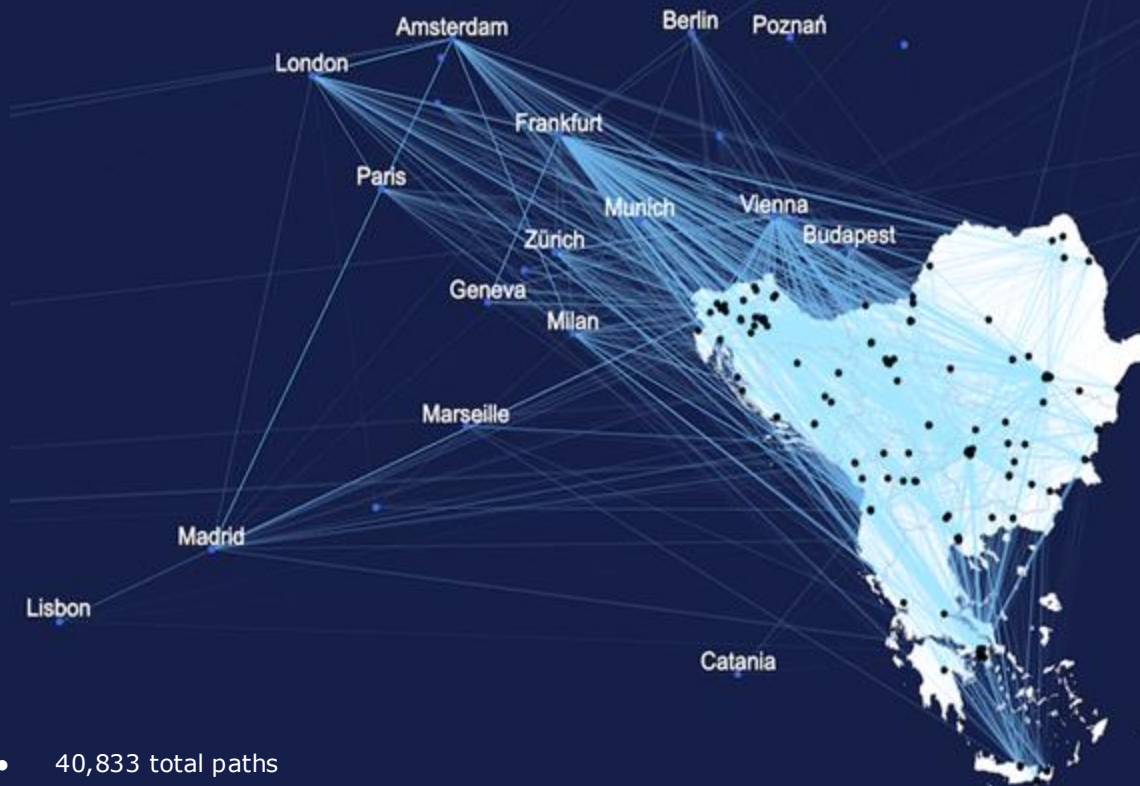
## Inter-region connections (2)

- Total IPv4 paths: 40,833
- Out-of-region paths: 8,507 (20.83%)
- In-region paths: 32,326 (79.17%)



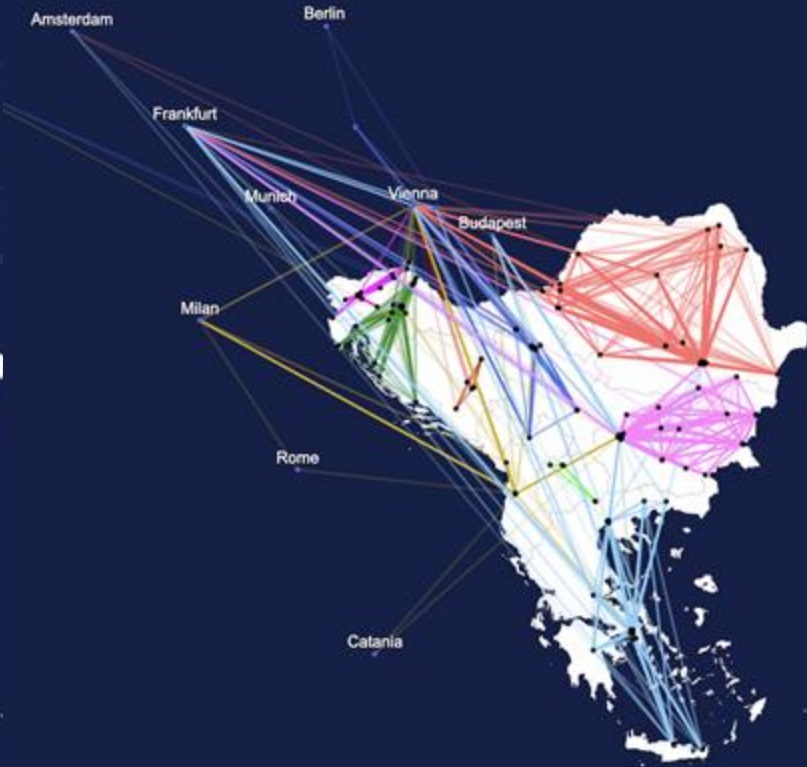
## Inter-region connections (2)

| Number of in-region IPv4 paths | Regional IXP in the path |
|--------------------------------|--------------------------|
| 8645                           | NetIX Sofia              |
| 8640                           | InterLAN                 |
| 8438                           | SOX                      |
| 7944                           | BIX.BG                   |
| 4526                           | CIX                      |
| 4424                           | SIX                      |
| 3567                           | GR-IX::Athens            |
| 2394                           | B-IX BG                  |
| 2359                           | Balkan-IX                |
| 878                            | NetIX GR                 |
| 702                            | GR-IX::Thessaloniki      |
| 543                            | RoNIX                    |
| 455                            | MegaIX Sofia             |
| 318                            | IXP.mk                   |
| 305                            | VarnaIX                  |
| 258                            | T-CIX                    |
| 36                             | BHNIX                    |
| 21                             | ANIX                     |
| 6                              | MIXP                     |



- 40,833 total paths
- 15,439 (38%) via one or more IXPs
- 1,392 (3%) via IXP and out of region

# Differences? (1) / (2)



# Presence of ISPs at regional IXPs



|          | SIX      | CIX     | BHNTIX                 | SOX    | MTXP       | InterLAN | RONIX | BALCAN-IX | BIX.BG   | NetIX | B-IX<br>(Balkan-IX) | MegaIX<br>Sofia | Varna IX | T-CIX   | ANIX         | IXP.mk | GR-IX:<br>Athens | GR-IX:<br>Thessaloniki | SEECIX | THESS-IX | NetIX Greece | KOSIX |
|----------|----------|---------|------------------------|--------|------------|----------|-------|-----------|----------|-------|---------------------|-----------------|----------|---------|--------------|--------|------------------|------------------------|--------|----------|--------------|-------|
|          | Slovenia | Croatia | Bosnia&<br>Herzegovina | Serbia | Montenegro | Romania  |       |           | Bulgaria |       |                     |                 |          | Albania | N. Macedonia | Greece |                  |                        | Kosovo |          |              |       |
| AS5603   | 200G     |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS3212   | 200G     |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS34779  | 200G     | 10G     |                        |        |            |          |       |           | 10G      |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS21283  | 40G      |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS9119   | 10G      | 10G     |                        | 10G    |            |          |       |           | 10G      |       |                     |                 |          |         |              | 10G    |                  |                        |        |          |              |       |
| AS5391   |          | 30G     |                        |        |            |          |       |           |          |       |                     |                 |          |         |              | 10G    |                  |                        |        |          |              |       |
| AS15994  |          | 80G     |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS205714 |          | 200G    |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS44306  |          | 80G     |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS25144  |          |         | 20G                    |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS9146   |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS42560  |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS20875  |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS8400   |          |         |                        | 400G   |            |          |       |           |          | 20G   |                     |                 |          | 1G      |              |        |                  |                        |        |          |              |       |
| AS31042  |          | 20G     |                        | 400G   |            | 10G      |       | 10G       | 20G      | 20G   |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS15958  |          |         |                        | 200G   |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS9125   |          |         |                        | 40G    |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS44143  |          |         |                        | X      |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS43940  |          |         |                        |        | X          |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS15397  |          |         |                        |        | X          |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS8585   |          |         |                        |        | X          |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS8708   |          |         |                        |        |            | 100G     |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS9050   |          |         |                        |        |            | 10G      |       | 40G       |          | 10G   |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS12302  |          |         |                        |        |            |          | 10G   |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS8953   |          |         |                        |        |            | 100G     | 100G  |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS8866   |          |         |                        |        |            |          |       |           | 20G      | 100G  | 10G                 |                 | 10G      |         |              |        |                  |                        |        |          |              |       |
| AS8717   |          |         |                        |        |            |          |       |           | 200G     | 20G   | 20G                 |                 | 10G      |         |              |        |                  |                        |        |          |              |       |
| AS29244  |          |         |                        |        |            |          |       |           | 100G     |       |                     |                 | 1G       |         |              |        |                  |                        |        |          |              |       |
| AS42313  |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              |       |
| AS50973  |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         | 1G           |        |                  |                        |        |          |              |       |
| AS206262 |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              | 10G   |
| AS21246  |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              | 10G   |
| AS33983  |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              | 10G   |
| AS29170  |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        |                  |                        |        |          |              | 10G   |
| AS6821   |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              | 10G    |                  |                        |        |          |              |       |
| AS43612  |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              | 10G    |                  |                        |        |          |              |       |
| AS34772  |          |         |                        |        |            |          |       |           |          | 100G  |                     |                 |          |         |              | 1G     |                  |                        |        |          |              |       |
| AS41557  |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              | 10G    |                  |                        |        |          |              |       |
| AS34547  |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              | 10G    |                  |                        |        |          |              |       |
| AS6799   |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        | 800G             | 20G                    |        |          |              |       |
| AS3329   |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        | 600G             | 200G                   |        |          |              |       |
| AS25472  |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        | 200G             | 10G                    | 10G    |          |              |       |
| AS1241   |          |         |                        |        |            |          |       |           |          |       |                     |                 |          |         |              |        | 200G             | 10G                    |        |          |              |       |

Data source: IHR, PeeringDB, RIPEStat

# Cloud, CDN and OTT leaders in IXP participation

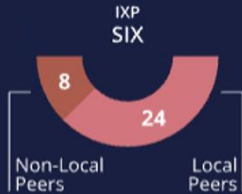


|                        | SI   | HR  | RS   | RO       |       |           | BG     |       |                     |                 |       | AL   | MK     | GR               |                        |        |                 |
|------------------------|------|-----|------|----------|-------|-----------|--------|-------|---------------------|-----------------|-------|------|--------|------------------|------------------------|--------|-----------------|
|                        | SIX  | CIX | SOX  | InterLAN | RonIX | BALCAN-IX | BIX.BG | NetIX | B-IX<br>(Balkan-IX) | MegaIX<br>Sofia | T-CIX | ANIX | IXP.mk | GR-IX:<br>Athens | GR-IX:<br>Thessaloniki | SEECIX | NetIX<br>Greece |
| Akamai                 |      |     |      | 200G     |       |           | 40G    | 100G  |                     |                 |       |      |        |                  |                        |        |                 |
| Amazon                 |      |     |      |          |       |           | 200G   |       |                     |                 |       |      |        | 200G             |                        |        |                 |
| Anexia                 |      |     |      | 10G      |       |           |        | 10G   |                     |                 |       |      |        | 10G              |                        |        |                 |
| BelCloud               |      |     |      | 20G      |       |           | 40G    |       |                     |                 |       |      |        | 10G              | 1G                     |        |                 |
| Blizzard Entertainment |      |     |      | 10G      |       |           |        | 10G   |                     |                 |       |      |        |                  |                        |        |                 |
| ByteDance              |      |     | 200G | 100G     |       |           |        | 100G  |                     |                 |       |      |        |                  |                        |        |                 |
| CacheFly               |      |     |      | 10G      | 10G   |           |        |       |                     |                 |       |      |        |                  |                        |        |                 |
| Cloudflare             |      | 40G | 40G  | 100G     | 10G   | 10G       | 20G    | 200G  | 100G                | 10G             | 10G   |      | 20G    | 400G             | 10G                    | 10G    | 100G            |
| Delta Cloud            |      |     |      |          |       |           | 300G   | 100G  |                     |                 |       |      |        |                  |                        |        |                 |
| Digital Realty         |      |     |      |          |       |           |        |       |                     |                 |       |      |        | 30G              |                        | 20G    |                 |
| Edgoo                  | 10G  |     |      |          |       |           |        |       |                     |                 |       |      |        |                  |                        |        |                 |
| Fastly                 |      |     |      |          |       |           | 200G   |       |                     |                 |       |      |        |                  |                        |        |                 |
| Google                 |      |     | 80G  | 200G     | 40G   |           | 600G   | 400G  | 20G                 | 20G             | 20G   |      |        |                  |                        |        |                 |
| Hetzner Online         |      |     | 100G |          |       |           |        | 200G  |                     |                 |       |      |        |                  |                        |        |                 |
| Huawei                 |      |     |      |          | 20G   |           |        |       |                     |                 |       |      |        |                  |                        |        |                 |
| Hurricane Electric     | 100G | 30G | 100G | 100G     | 100G  | 10G       | 100G   | 100G  | 100G                | 100G            | 10G   | 10G  | 10G    | 100G             | 10G                    | 20G    | 100G            |
| 3D.net                 |      |     |      | 100G     |       | 10G       |        |       |                     |                 |       |      |        |                  |                        |        |                 |
| M247                   |      |     | 10G  | 20G      | 10G   | 60G       |        | 10G   |                     |                 |       |      |        |                  |                        |        |                 |
| Mainstream             |      |     | 40G  |          |       |           |        |       |                     |                 |       |      |        |                  |                        |        |                 |
| Meta                   |      |     | 400G | 200G     | 200G  | 200G      | 200G   | 420G  | 400G                | 20G             | 20G   | 30G  |        |                  |                        |        |                 |
| Microsoft              |      | 40G |      | 20G      |       | 200G      | 200G   | 100G  |                     | 10G             |       |      |        | 200G             |                        | 20G    |                 |
| Netflix                |      |     |      | 100G     | 100G  |           |        |       |                     |                 |       | 10G* |        |                  |                        |        |                 |
| OVHcloud               |      |     |      |          |       |           |        | 100G  |                     |                 |       |      |        |                  |                        |        |                 |
| Riot Games             |      |     |      |          |       |           | 10G    | 10G   | 10G                 | 10G             |       |      |        | 10G              |                        |        |                 |
| Softnet                | 10G  | 10G | 10G  |          |       |           | 10G    |       |                     |                 |       |      | 10G    |                  |                        |        |                 |
| Sony                   |      |     |      |          |       |           |        |       |                     |                 |       |      |        | 10G              |                        |        |                 |
| Valve                  |      |     | 200G | 100G     |       |           |        | 100G  |                     |                 |       |      |        |                  |                        |        |                 |
| Voxility               |      |     |      | 20G      | 10G   | 20G       |        | 10G   |                     |                 |       |      |        |                  |                        |        |                 |
| Yahoo!                 |      |     |      |          |       | 10G       | 20G    | 10G   |                     |                 |       |      |        |                  |                        |        |                 |

# Digitalisation of the Local Economy



**Slovenia**  
Local ASNs: 301



**Croatia**  
Local ASNs: 173



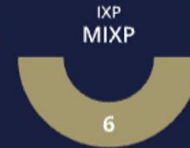
**Bosnia and Herzegovina**  
Local ASNs: 55



**Serbia**  
Local ASNs: 193



**Montenegro**  
Local ASNs: 30



**Romania**  
Local ASNs: 1100



**Bulgaria**  
Local ASNs: 732



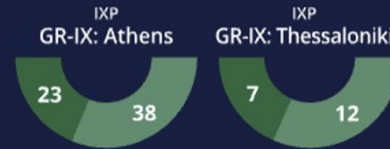
**Albania**  
Local ASNs: 94



**Republic of North Macedonia**  
Local ASNs: 66



**Greece**  
Local ASNs: 240



**Kosovo**  
Local ASNs: 38





# Takeaways



- **Evaluate Governance Structures:**

- Ensure IX operations are optimized from both policy and operational perspectives

- **Build Strong Communities:**

- Successful IXPs often foster active communities (e.g., hosting NOG meetings)
- Communities help attract new members and enhance collaboration
- Especially critical for small IXPs: community advocacy can drive growth and relevance



# Call for Action 2 - Better Regional Peering



- **More Attractive to Global Players**
  - Companies can/may serve multiple countries from a single hub
- **Stronger Security**
  - Less distance = fewer risks for data in transit
- **Lower Latency**
  - Crucial for gaming, fintech, and real-time apps
- **Greater Resiliency**
  - Less dependence on hubs like Frankfurt or Vienna
- **Cost Savings**
  - Reduced transit needs can lower overall costs

# Call for Action 3 - We Need Data!



- **Help us Produce Accurate Reports:**

- Keep your **PeeringDB** records up-to-date
- Provide access to public **membership data, traffic stats, looking glass and governance policies**
- Deploy more **RIPE Atlas Probes** and **Anchors** in the region to cover more diverse ASNs



# Questions & Comments



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**THANK YOU!**