



**RIPE NCC**  
RIPE NETWORK COORDINATION CENTER

# The IXP landscape in the SEE region

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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, address identified challenges and leverage opportunities



**First, some context!**

# Region is not Homogeneous



- Regulatory disparities (EU and non-EU)
- Regional hub influence (north and south)
- Geographic location (landlocked and coastal)
- Intra-region connectivity (Ex-YU and rest)



**Let us tell you what we found out**

# IXP Landscape





- **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 are 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 to secure large-scale infrastructure investment (E-commerce, Media, Finance, Content)



- **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



**OK, but how do we define success  
for an IXP?**

# The Four Criteria for Success



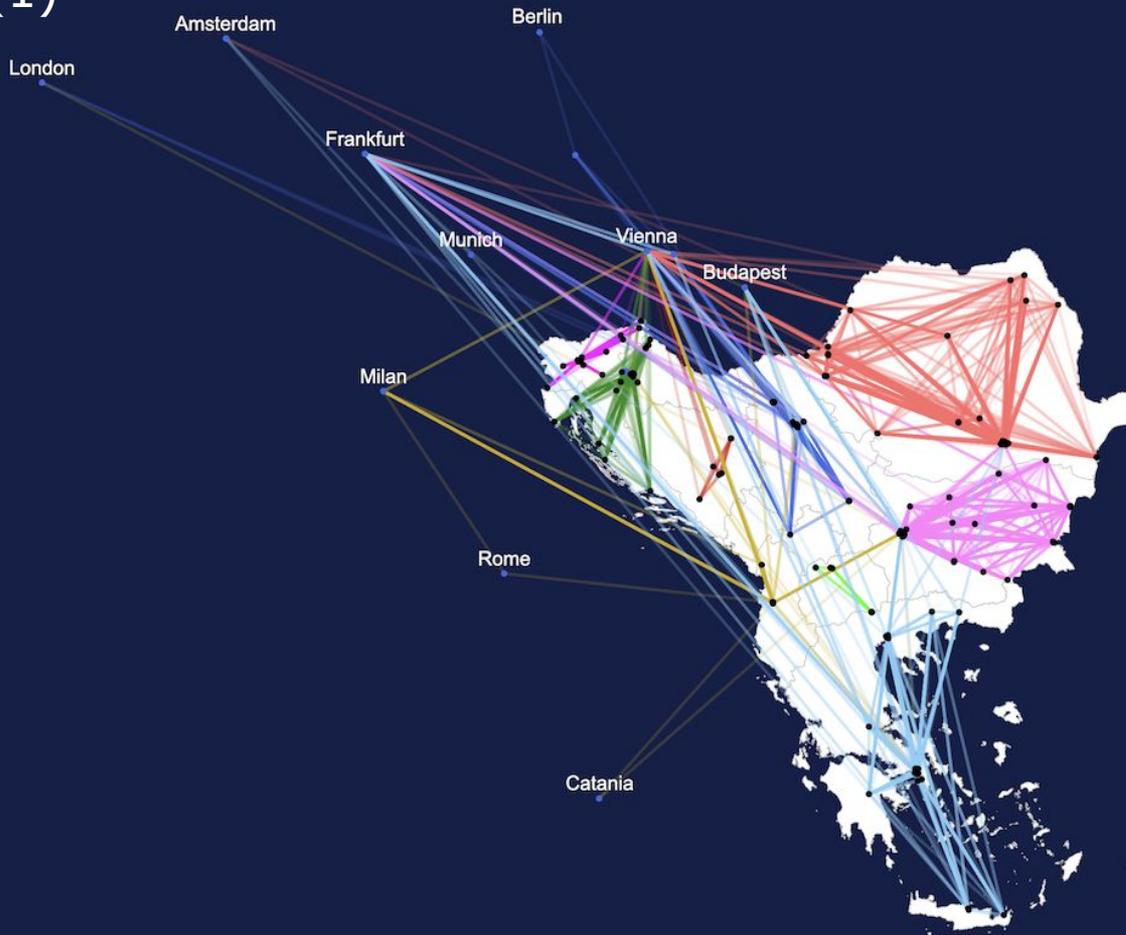
1. Keeping local traffic local
2. Facilitating inter-region traffic
3. Attracting global hyperscalers and content providers
4. Supporting economy digitisation



# **C1: Is the country traffic behaving?**

# In-Country Connections (1)

Country	Total paths	Out-of-country 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%

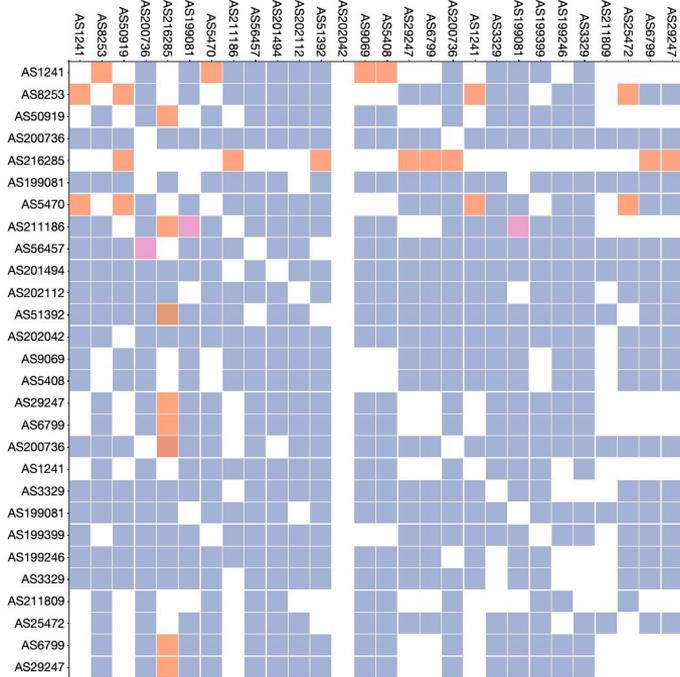




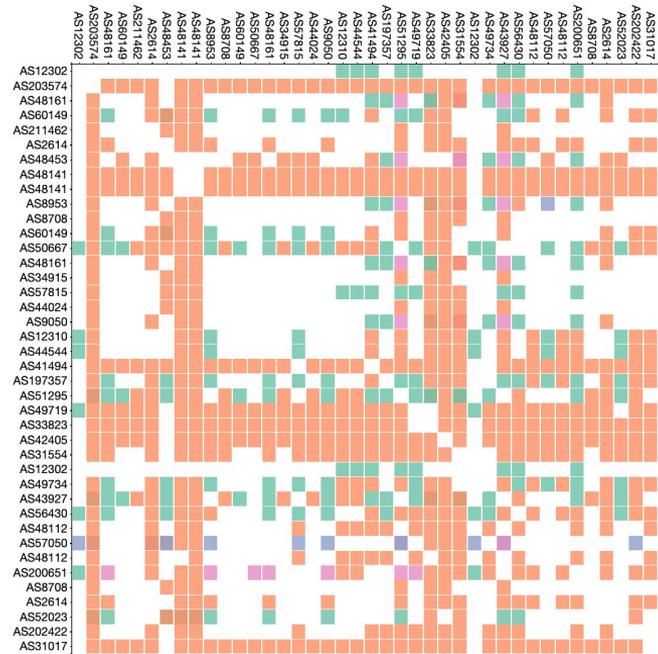
# In-Country Connections 2



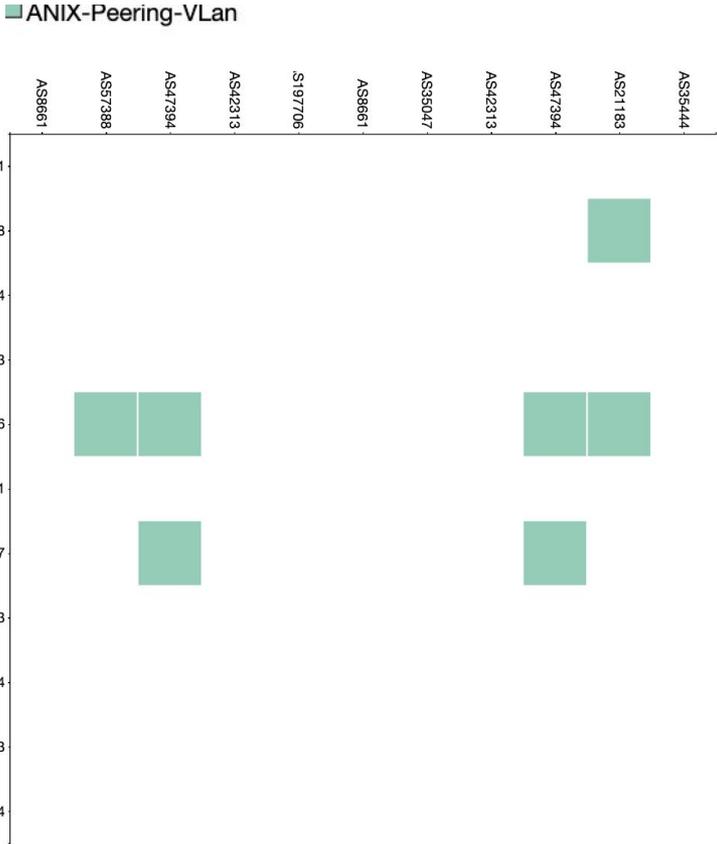
- NetIX Greece
- GR-IX::Thessaloniki-Peering LAN
- GR-IX::Athens-Peering Lan
- Free-IX Greece



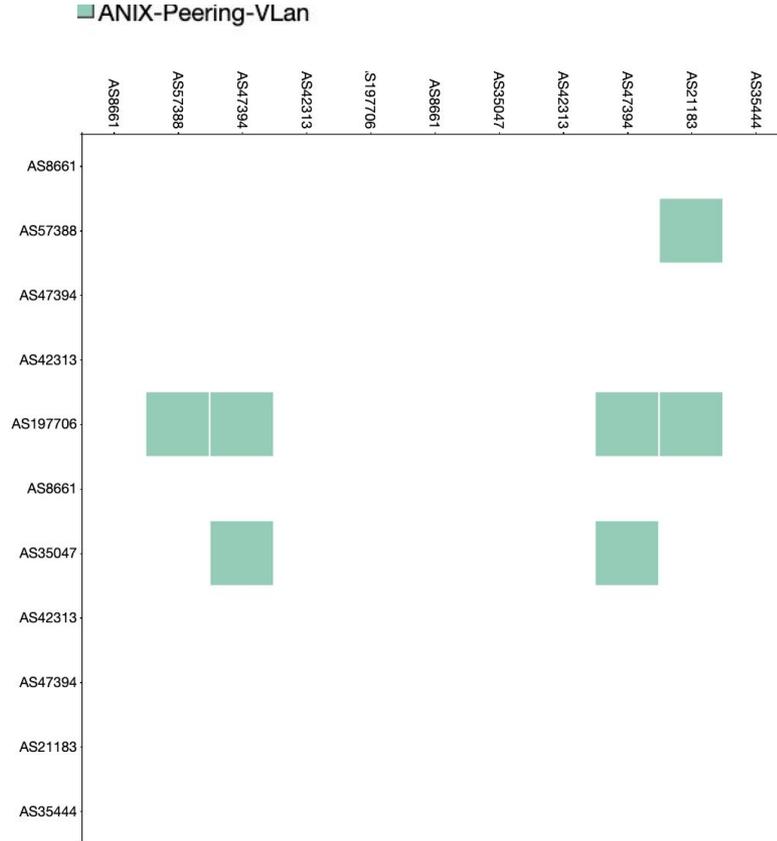
- RoNIX
- InterLAN-IX-InterLAN Peerina Network
- DSIX
- Balcan-IX



# In-Country Connections Albania



# In-Country Connections Albania



Keep in mind:

- data is from Feb 2025
- includes ASNs registered in Kosovo

Probe ID: 21750

Source IP: 192.168.1.37

AS42313

Min RTT: 91.73ms

Responded: yes

Complete Traceroute:

Hop	IP Address	Hostname	ASN	RTT (ms)
1	192.168.1.1		10	0.66/0.66/0.55
2	10.27.0.1			94.67/31.04/28.91
3	10.4.1.213		4	41.02/28.09/34.65
4	10.4.1.201			30.01/29.42/29.14
5	62.75.8.97		10 12713	37.48/37.78/36.89
6	62.75.14.134			66.92/65.11/66.62
7	80.81.192.172	ipv4.decix-frankfurt.core1.fra1.he.net		65.56
8	184.104.192.209	port-channel6.core2.zrh2.he.net	6939	71.66/70.79/71.85
9	184.104.199.124	port-channel12.core2.mil2.he.net	10 6939	74.66/75.35
10	184.104.188.187	100ge0-35.core1.bri1.he.net	6939	86.66/87.01/87.66
11	184.104.196.251	100ge0-34.core1.tia1.he.net	10 6939	92.8/91.96/92.37
12	184.104.206.194	anix.e0-2.core1.tia1.he.net	6939	91.62/92.24/92.4
13	185.33.109.6		10 24796	93/91.73/92.74

Traceroute example  
of when you don't  
utilize your local IXP

AL to AL ASN → 90+ms

Scenic traffic path over  
FRA, ZRH, MIL, BRI



## **C2: Is the regional traffic behaving?**

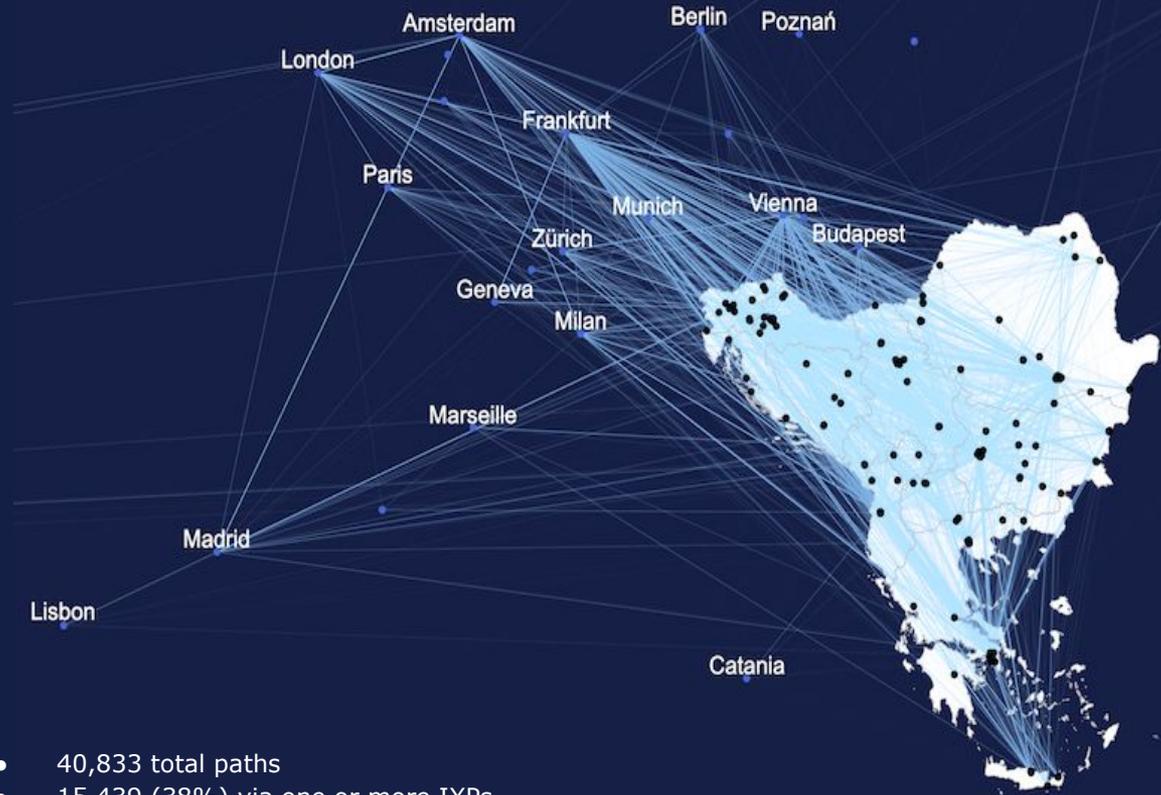
## Inter-region connections (2)

- 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	Balcan-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

# Presence of ISPs at regional IXPs



Country	Total Foreign Regional Operators at IXP(s)	Total Capacity (in G)	# Countries of Foreign Regional Operators
Albania	0	0	0
Bosnia and Herzegovina	0	0	0
Bulgaria	6	191	4
Croatia	3	40	2
Greece	1	1	1
Kosovo*	0	0	0
Montenegro	0	0	0
N. Macedonia	2	20	2
Romania	1	20	1
Serbia	1	10	1
Slovenia	0	0	0



# **C3: Is the region attractive for content and co.?**

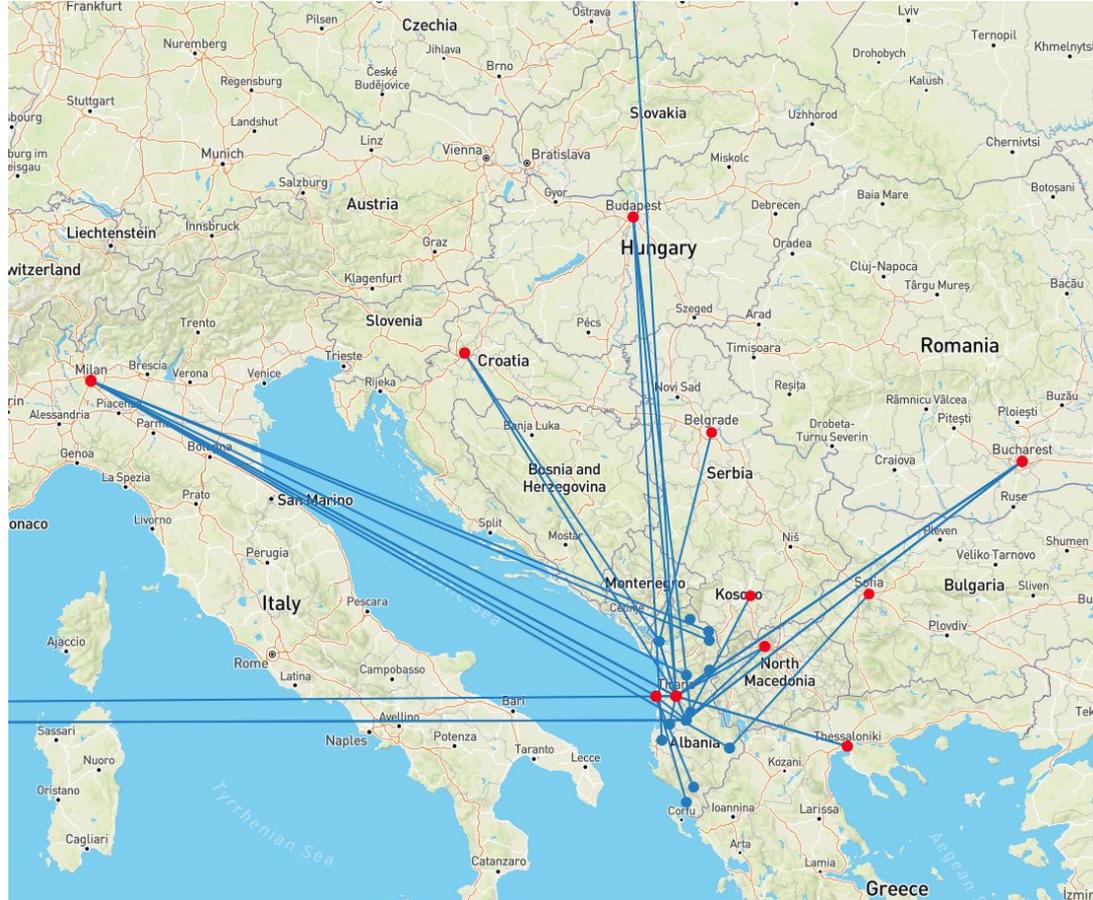
# Cloud, CDN and OTT leaders in IXP Participation



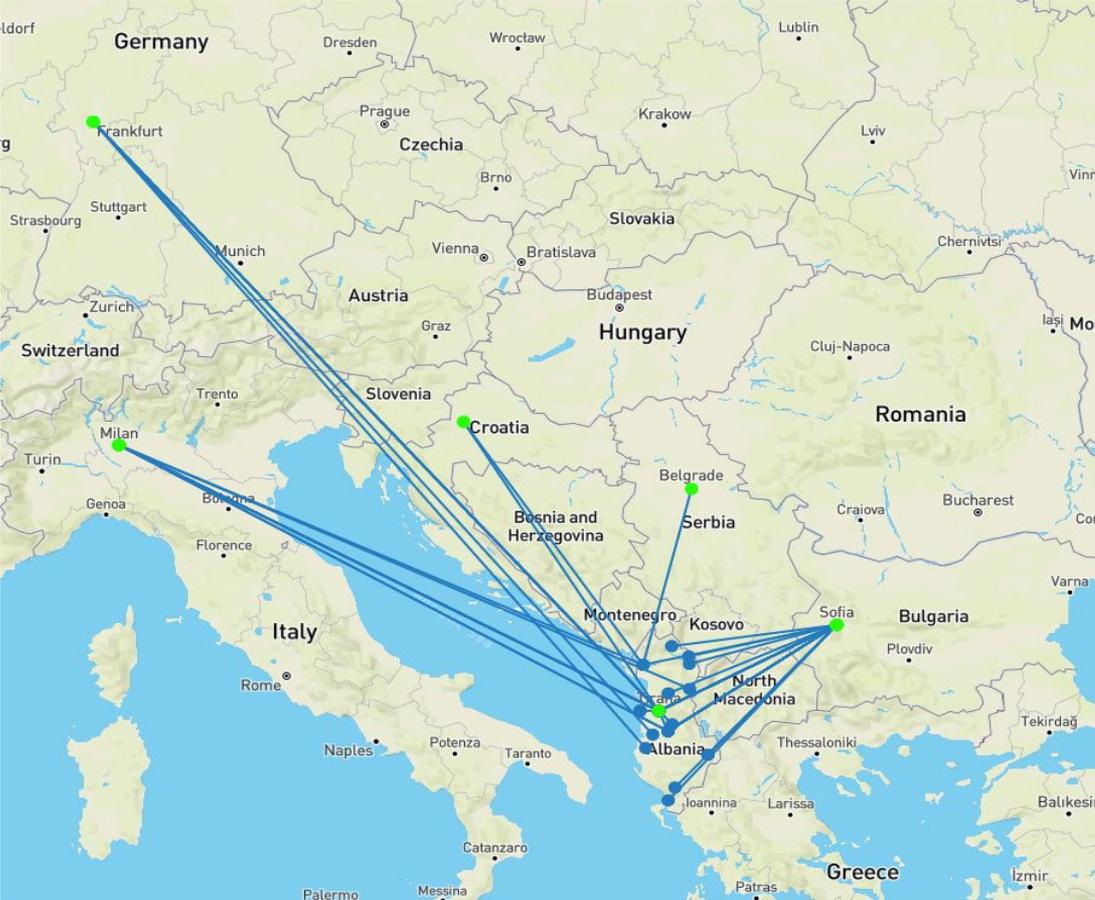
Company	Total Capacity (in G)	# IXPs	# Countries
Akamai	340	3	2
Amazon	400	2	2
Anexia	30	3	3
BelCloud	72	5	3
ByteDance	400	3	3
Cloudflare	1080	15	6
Google	1380	8	3
M247	110	5	3
Meta	2090	10	4
Microsoft	790	8	4
Riot Games	50	5	2
Valve	400	3	3
Voxility	60	4	2
Yahoo!	40	3	2

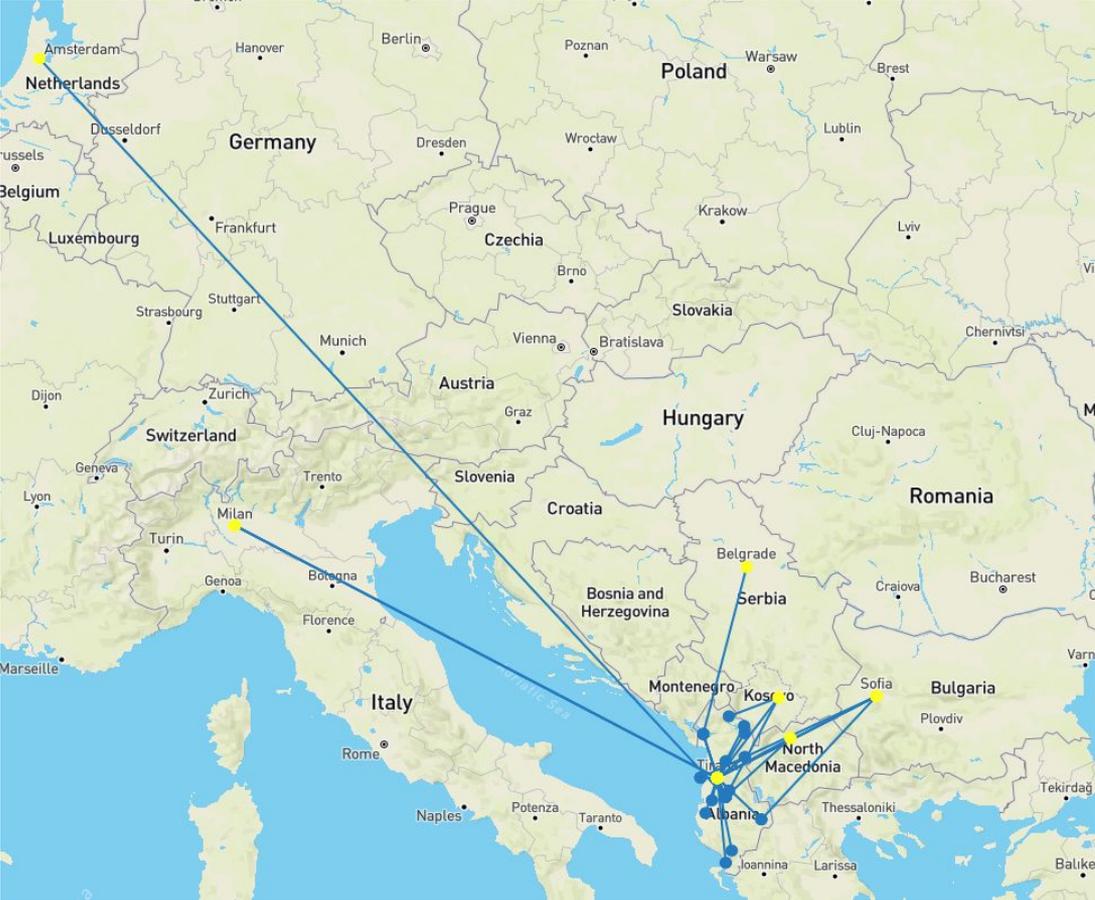


**So, where are Albanian networks getting their content from?**

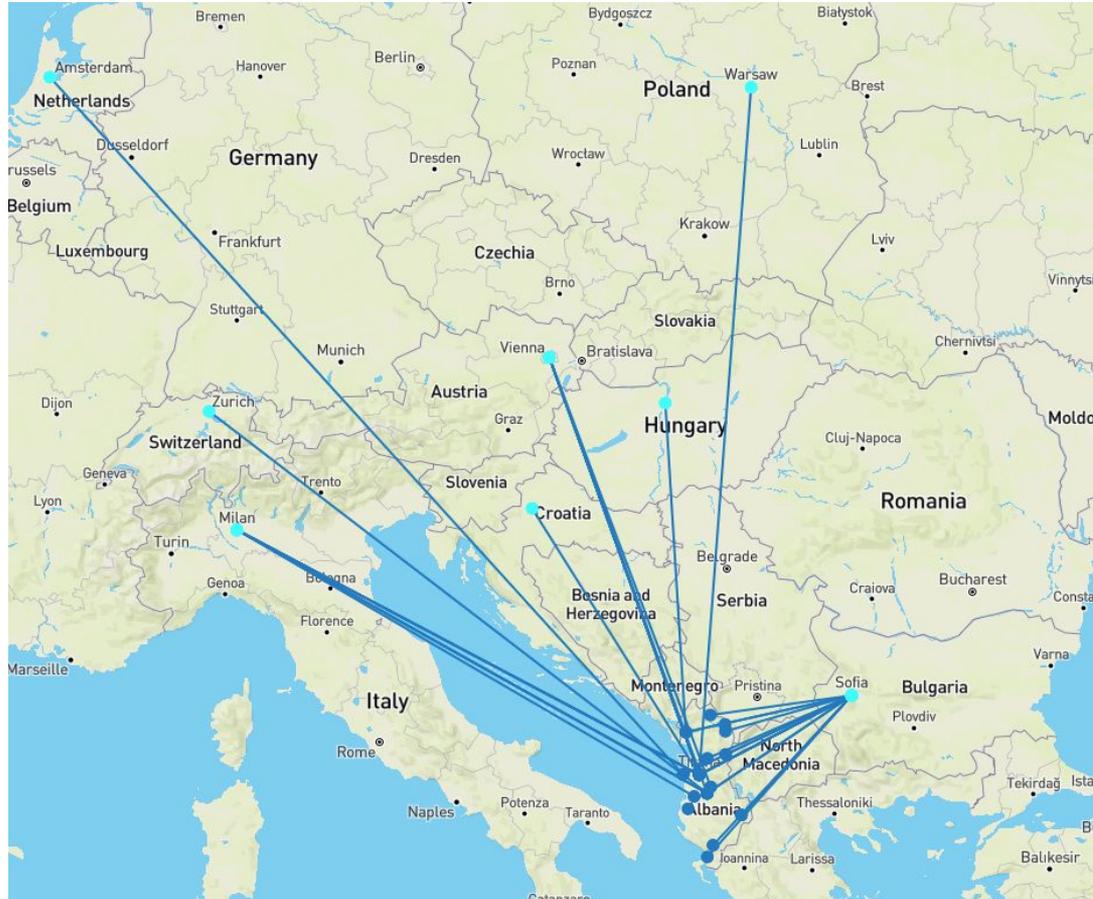


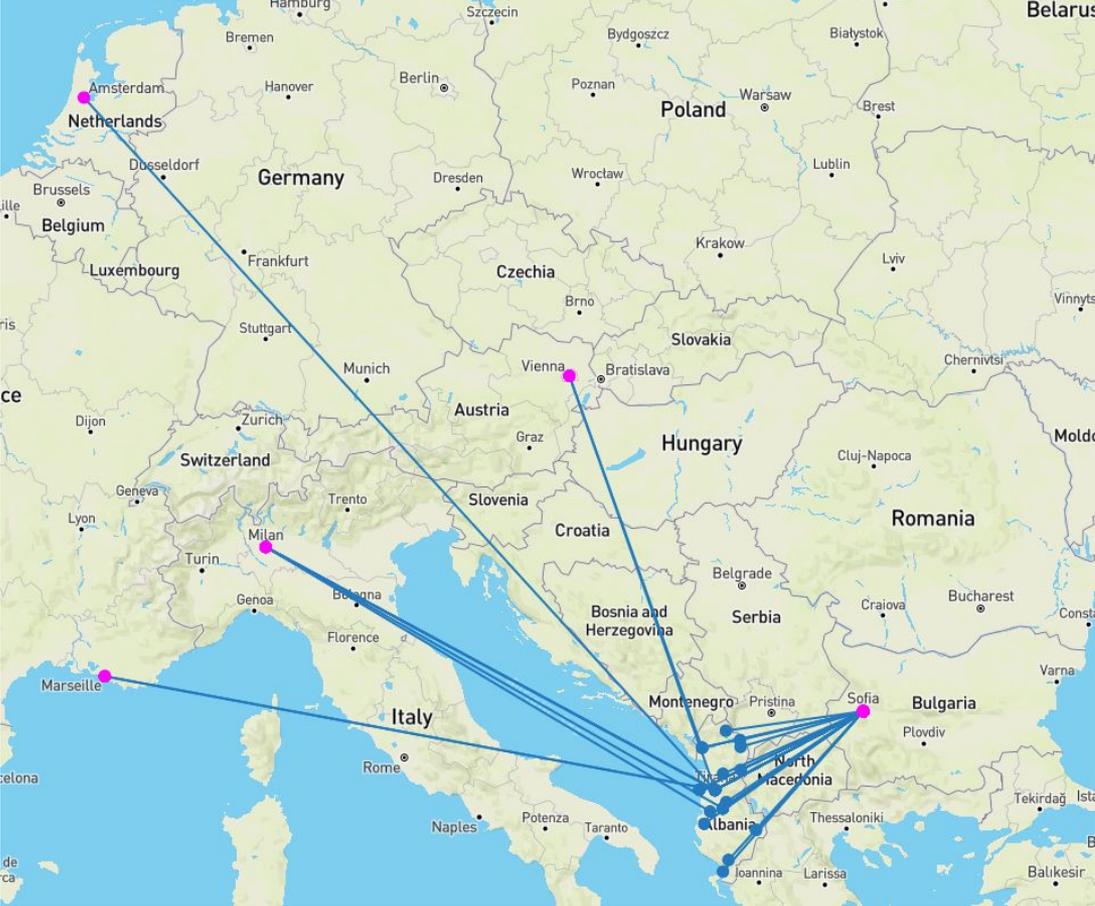
# Cloudflare





# Amazon

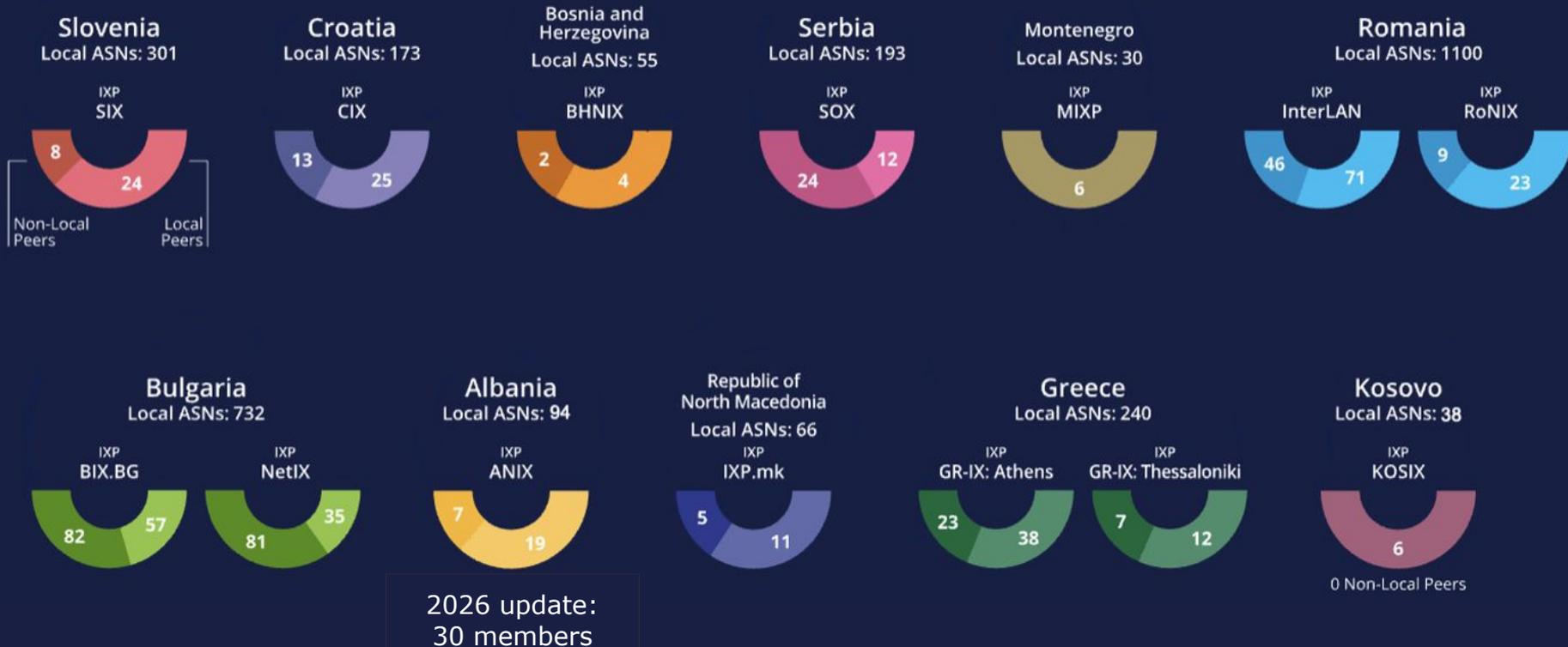






## **C4: Are the IXPs bringing everyone on board?**

# Digitalisation of the Local Economy





**OK!**

**Now we know the recipe  
for potential success**



**What should we do next with all of this?**



- **Evaluate Governance Structures:**

- Ensure IX operations are optimised 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

Full report is available for  
download on RIPE Labs





**We are here to help! Ping us!**



# Questions & Comments



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# Presence of ISPs at regional IXPs



		SIX	CIJ	BHNIX	SOX	MIXP	InterLAN	RONIX	BALCAN-IX	BIX.BG	NetIX	B-IX (Balkan-IX)	MegaIX Sofia	Varna IX	T-CIJ	ANIX	IXP.mk	GR-IX: Athens	GR-IX: Thessaloniki	SEECIX	THESS-IX	NetIX Greece	KOSIX	
		Slovenia	Croatia	Bosnia & Herzegovina	Serbia	Montenegro		Romania					Bulgaria			Albania	N. Macedonia			Greece			Kosovo	
AS5603	SI	200G																						
AS3212		200G																						
AS34779		200G	10G							10G														
AS21283		40G																						
AS9119		10G	10G		10G					10G								10G						
AS5391	HR	30G															10G							
AS15994		80G																						
AS205714		200G																						
AS44306		80G																						
AS25144	BA			20G																				
AS9146																								
AS42560																								
AS20875																								
AS8400	RS		20G		400G		10G		10G	20G	20G				1G									
AS31042					400G																			
AS15958					200G																			
AS9125					40G																			
AS44143					X																			
AS43940	ME					X																		
AS15397						X																		
AS8585						X																		
AS8708	RO						100G																	
AS9050							10G		40G		10G													
AS12302								10G																
AS8953								100G	100G															
AS8866	BG								20G	100G	10G		10G								1G			
AS8717									200G	20G	20G		10G											
AS29244									100G				1G											
AS42313	AL																							
AS50973																1G								
AS206262																							10G	
AS21246	AL*																						10G	
AS33983																							10G	
AS29170																							10G	
AS6821																		10G						
AS43612	MK																10G							
AS34772																	10G							
AS41557											100G						10G							
AS34547																	10G							
AS6799	GR																	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 (Balkan-IX)	MegaIX Sofia	T-CIX	ANIX	IXP.mk	GR-IX: Athens	GR-IX: Thessaloniki	SEECIX	NetIX Greece
Akamai				200G			40G	100G									
Amazon							200G							200G			
Anexia				10G				10G						10G			
BelCloud							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
<a href="#">i3D.net</a>				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									