

euro-IX



Don't forget the peers!

AfPIF2023

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***Interactive Session -
slido.com***

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Introduction

- Don't forget the peers is an interactive talk about the evolution of IXPs and peering
- Where was peering 20+ years ago, now and in the future
- Let's take a look...



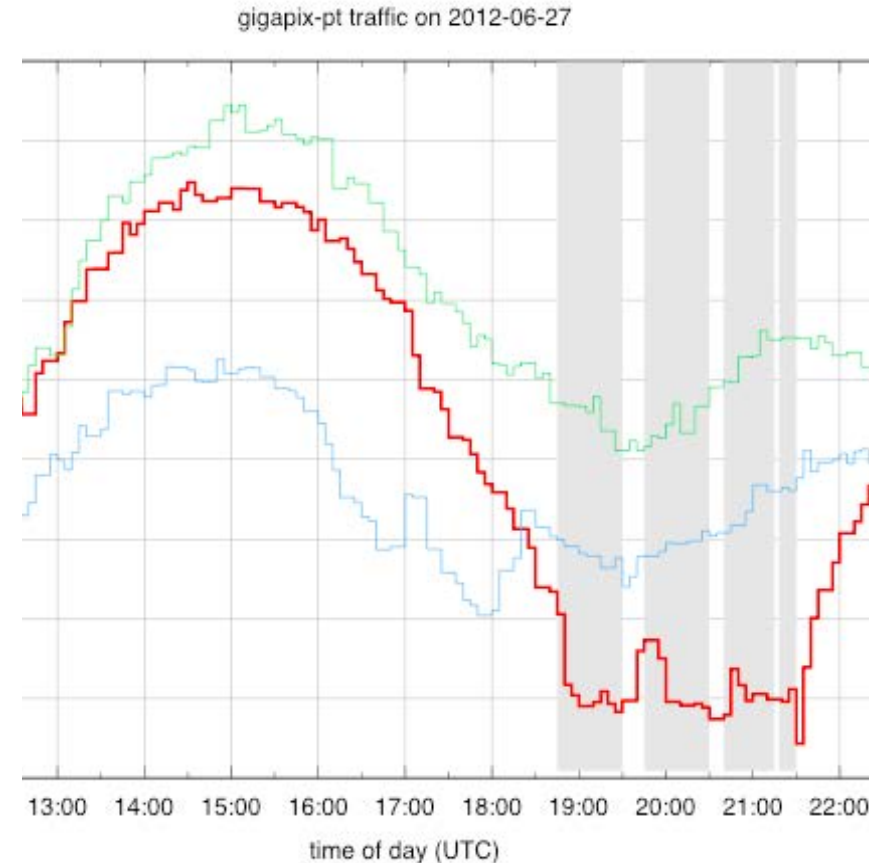
Evolution of Peering

- The concept of peering started back in the 1990's, when transit costs were high and networks needed to find alternative ways to interconnect
- Peering proved to be an efficient and cost effective way to exchange data
- Focus was on ISPs and network operators for traffic exchange
- It was simple, limited peering arrangements.



IXP Traffic Growth

- Traffic at IXP started to grow exponentially – things were great!
- One of the big drivers of this traffic was data and specifically video content
- In this graph we see the traffic at GIGAPIX (Portugal) during the football world cup, match Spain v Portugal – the red line shows the traffic on the day of the game. There's a clear drop in traffic while people watch the game on TV.
- At this time, there was none or very little online **live** content that we see today.



IXP Growth

- In the 2010's, we saw an increase in the number of operational IXPs in Europe
- Over a 12 year period we saw the number of IXPs in Europe double
- IXP growth was driven by caches, private peering (PNIs) and the need to keep local traffic local

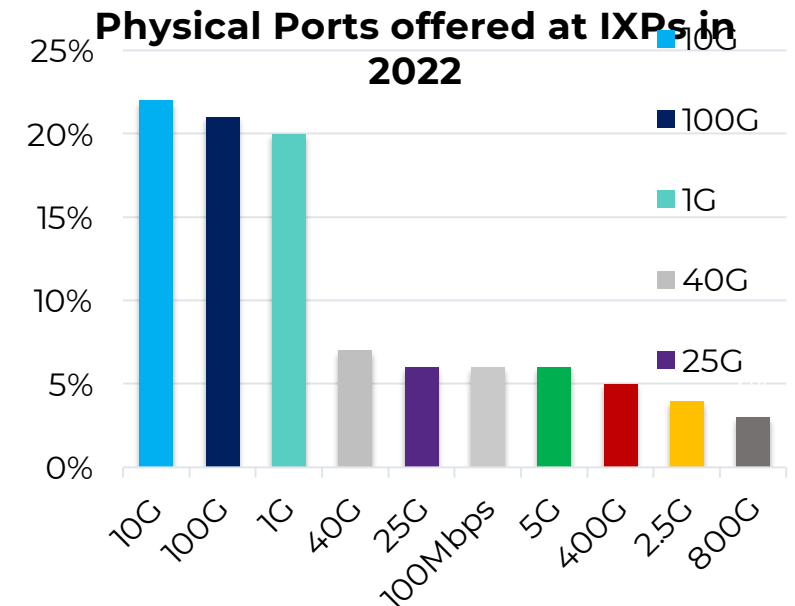
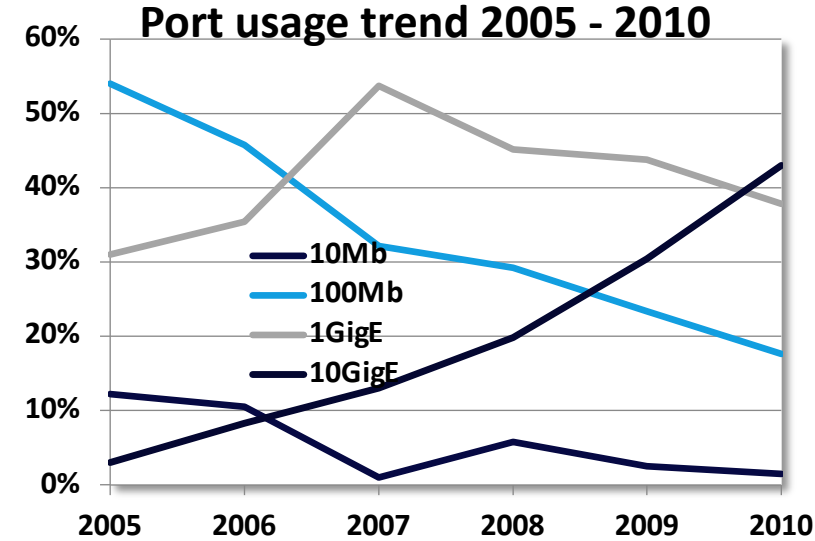
Year	IXPs Started	IXPs Closed	Growth	Operational
2010	18	4	14	136
2011	8	0	8	144
2012	2	0	2	146
2013	22	2	20	166
2014	37	16	21	187
2015	17	11	6	193
2016	14	12	2	195
2017	5	2	3	198
2018	7	2	5	203
2020	59	7	52	255
2021	18	2	16	273
2022	33	7	26	299

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IXP Technology

- Port choices have increased over time to meet member/customer demands
- In the first graph you can see the number of 10Mb ports reduce and an increase of 10G
- Technological advancements allowed adoption of faster Ethernet speeds (e.g., 10Gbps, 100Gbps, and beyond)



Growth in IXP Participants

This table shows 10 most common IXP participants in 2011 and 2023 a 12 year period.

2011			2023		
Participant	ASN	# of IXPs	Participant	ASN	# of IXPs
Google	15169	55	Hurricane Electric	6939	163
Akamai	20940	52	Cloudflare	13335	142
Limelight	22822	42	PCH	42	139
Hurricane Electric	6939	41	Akamai	20940	135
Microsoft	8075	30	Microsoft	8075	130
Yahoo	10310	30	Facebook	32934	115
E4A	34695	29	Google	15169	95
Mzima	25973	25	Amazon	16509	85
BroadbandONE	19151	24	Yahoo	10310	84
RETN	9002	24	Limelight	22822	68

Data from IXP{DB} where IXP contribute the data

Evolution of Peering

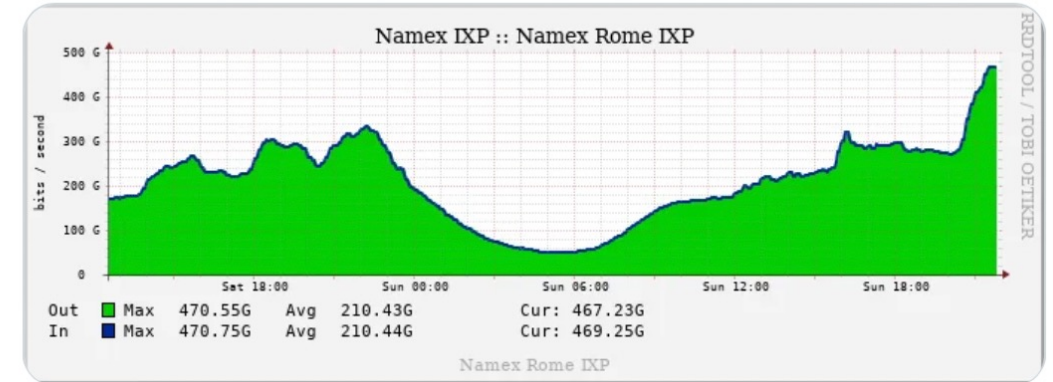
- Traffic Explosion
 - data-hungry applications
 - streaming services
 - cloud computing
- CDNs
 - Changed the dynamics of peering
- Cloud providers
 - Amazon Web Services (AWS), Microsoft Azure, Google Cloud
 - All posed challenges in terms of direct peering arrangements and routing optimisation to ensure reliable and low-latency connections to cloud services.

↻ NameX_IXP Retweeted

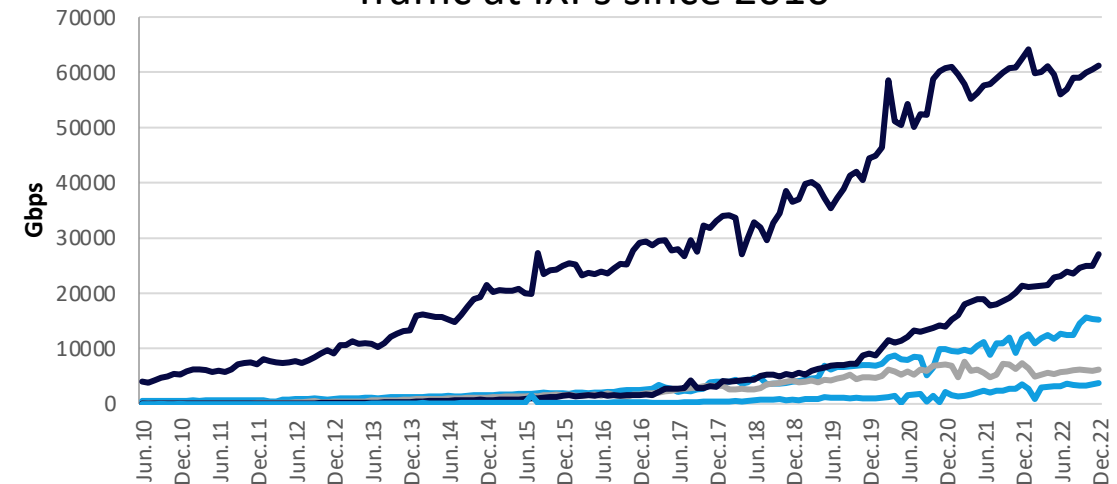


Flavio Luciani @flavioluciani81 · Feb 5

And again [#football](#) and again a [#Internet](#) traffic record. Tonight it is the turn of Inter - Milan for the Italian football major league. The highest [#traffic](#) peak ever here at [#NameX](#) ([@namex_ixp](#)), the Rome [#IXP](#). Almost half a tera! 470Gbps of public [#peering](#)!



Traffic at IXPs since 2010



Evolution of Peering

- **Interconnection Economics**

- As traffic volumes grew, the economics of peering became more complex.
- Smaller networks faced difficulties negotiating equitable peering agreements with larger networks and content providers

- **IP Address Exhaustion**

- **Internet Security Threats**

- Distributed Denial of Service (DDoS) attacks and other cybersecurity threats targeted peering infrastructure, disrupting network operations.



Evolution of Peering

- Automation, SDN
 - As Software-Defined Networking (SDN) and automation gained traction, networks face the challenge of adapting their infrastructure to support these technologies, improving operational efficiency while ensuring compatibility with existing systems.
- Sustainability and Green Initiatives
 - With growing awareness of environmental concerns, IXPs have faced pressure to reduce their carbon footprint. Achieving energy efficiency and sustainable operations while managing increasing traffic can be challenging.
- 4G and 5G and (AI) Artificial Intelligence

Evolution of Peering

- Regulatory Compliance

- Evolving regulations around interconnection (fair share), data privacy, net neutrality, and content distribution impacted peering arrangements.
- Networks needed to navigate regulatory challenges while maintaining efficient and compliant peering.

What does the future look like?

What is the future for our industry?

- 4G and 5G
- (AI) Artificial Intelligence
- Intelligent routing
- Something else...

Interactive Session

- Euro-IX is an association for IXPs
- Without the Peers there would be no IXP
- Now we want to hear your views about peering and IXPs
- What's useful and what more as a community of IXPs can we do....



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Thank You!
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