A Perspective of QoS - The role of peering in network performance

Villa Griffone, 25.11.2015

Elements (wikipedia)

- Transit (or *pay*) – The network operator pays money (or *settlement*) to another network for Internet access (or *transit*)
- Peer (or *swap*) – Two networks exchange traffic between their users freely, and for mutual benefit
- Customer (or *sell*) – A network pays another network money to be provided with Internet access

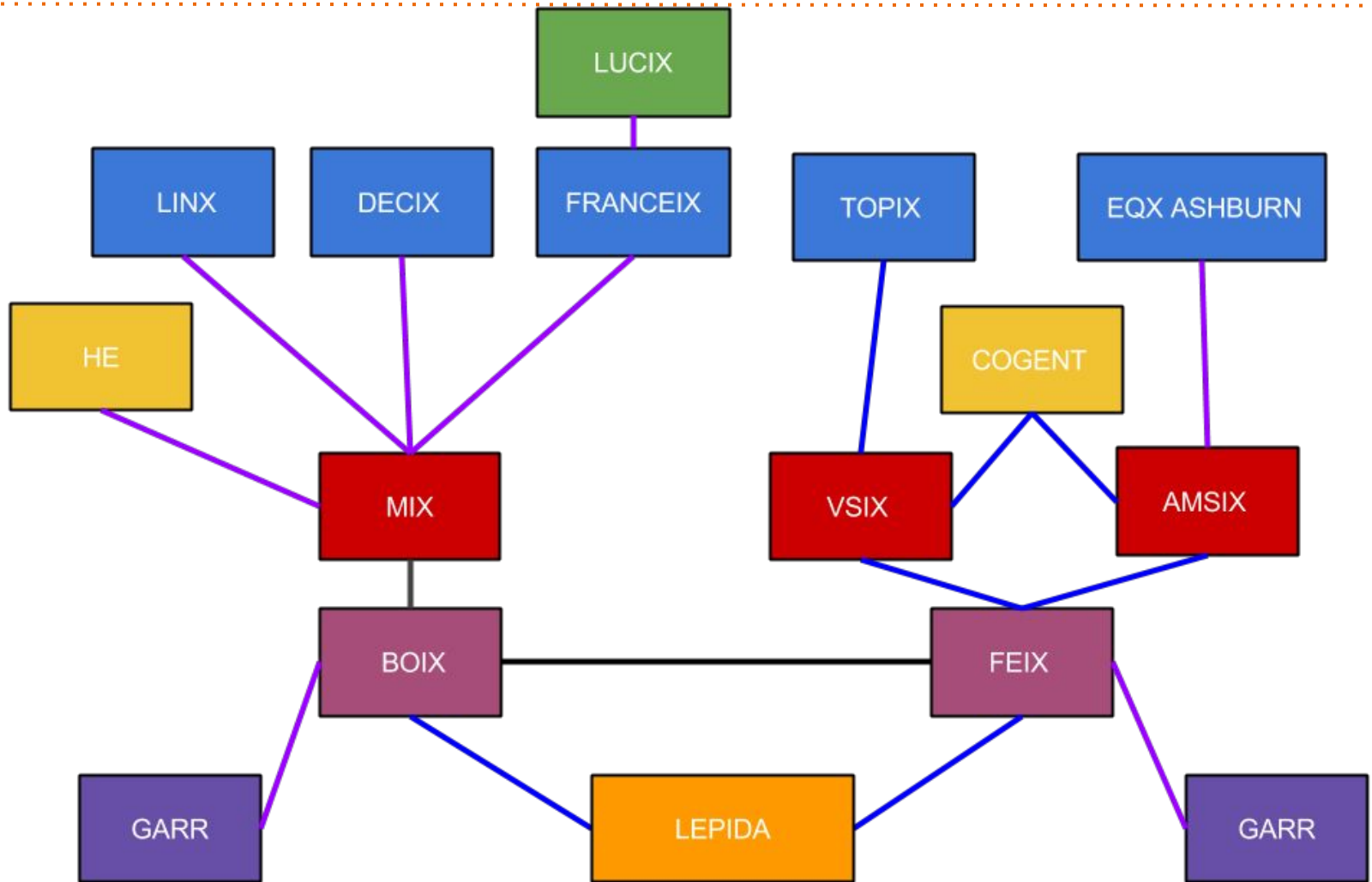lepidaspa

Motivations (wikipedia)

- Increased redundancy (by reducing dependence on one or more transit providers)
- Increased capacity for extremely large amounts of traffic (distributing traffic across many networks)
- Increased routing control over your traffic
- Improved performance (attempting to bypass potential bottlenecks with a "direct" path)
- Improved perception of your network (being able to claim a "higher tier")
- Ease of requesting for emergency aid (from friendly peers)

LepidaSpA & local operators versus Digital Divide
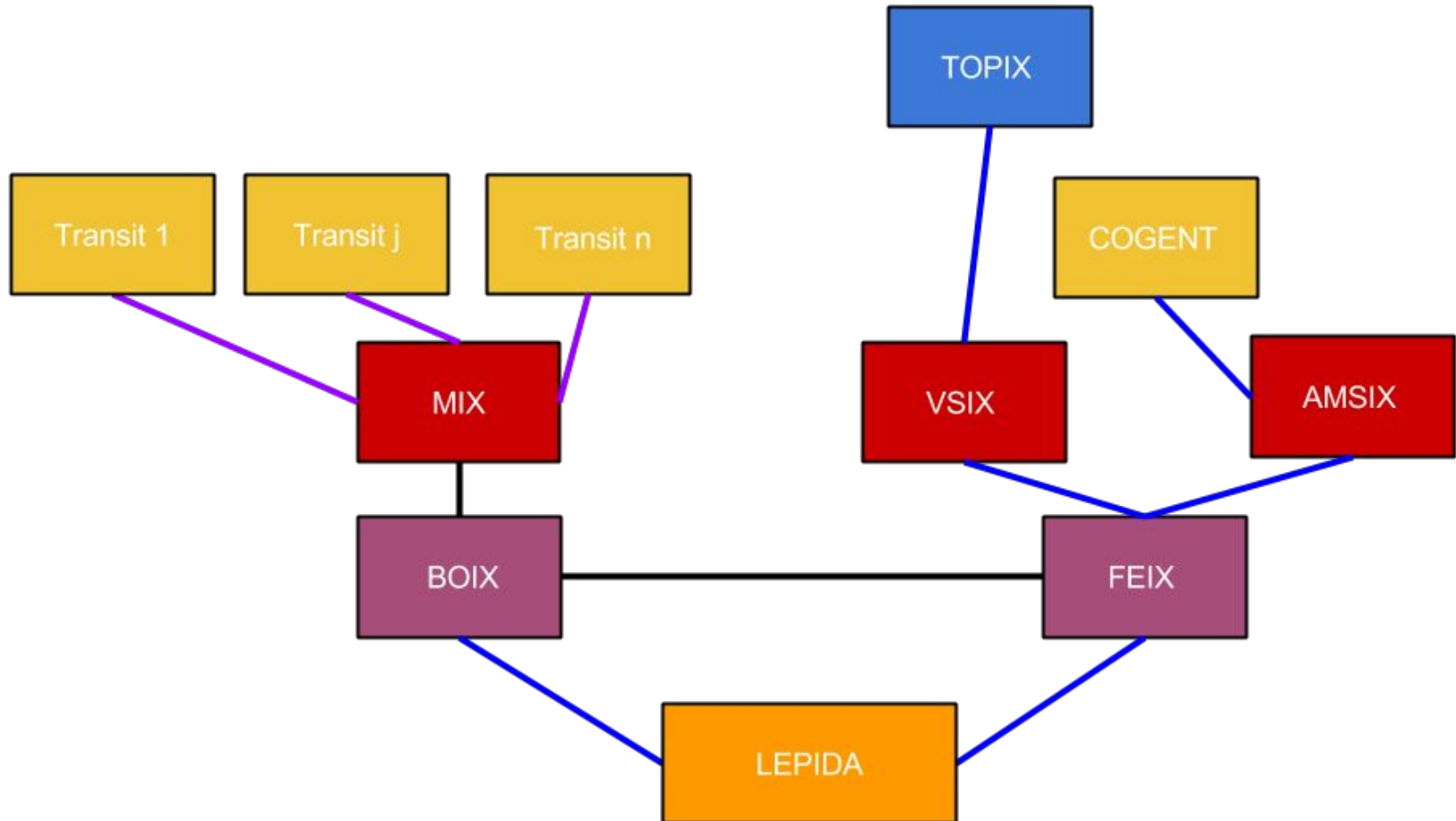
LepidaSpA peering on AS31638

peeringdb.com

Peering DB

Search here for a participant, IX, or facility.

Advanced Search

Register or Login

Lepida SpA

Also Known As	Lepida
Company Website	http://www.lepida.it
Primary ASN	31638
IRR Record	AS-LEPIDA
Route Server URL	
Looking Glass URL	
Network Type	NSP
IPv4 Prefixes	100
IPv6 Prefixes	100
Traffic Levels	5-10Gbps
Traffic Ratios	Mostly Inbound
Geographic Scope	Regional
Protocols Supported	⊘ Unicast IPv4 ◯ Multicast ⊘ IPv6
Last Updated	2015-11-23T19:09:53Z
Notes	

Peering Policy Information

Peering Policy	
General Policy	Open
Multiple Locations	Not Required
Ratio Requirement	False

Public Peering Exchange Points

Filter

Exchange ▼ ASN	IPv4 IPv6	Speed
AMS-IX 31638	80.249.211.74 2001:7f8:1::a503:1638:1	10G
DE-CIX Frankfurt 31638	80.81.193.203 2001:7f8::7b96:0:1	1G
Equinix Ashburn 31638	206.126.237.110 2001:504:0:2:0:3:1638:1	1G
France-IX 31638	37.49.237.52 2001:7f8:54::1:52	1G
LINX Juniper LAN 31638	195.66.226.103 2001:7f8:4::7b96:1	1G
LU-CIX 31638	188.93.170.66 2001:7f8:4c::7b96:1	100M
MIX-IT 31638	217.29.66.129 2001:7f8:b:100:1d1:a5d3:1638:129	10G
TOP-IX 31638	194.116.96.164 2001:7f8:23:ffff::152	10G
VSIX 31638	95.140.128.41 2001:7f8:5f:ffff::41	10G

Private Peering Facilities

Filter

Facility ▼ ASN	Country City	SONET	ETHER	ATM
BOIX 31638	Italy Bologna	◯	⊘	◯
EvoSwitch AMS1 31638	Netherlands Amsterdam	◯	⊘	◯
FEIX 31638	Italy Ferrara	◯	⊘	◯
MIX 31638	Italy Milano	◯	⊘	◯
VSIX 31638	Italy Padova	◯	⊘	◯

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rank by customers data from peeringdb.com

rank	id	name	customers	v4capacity	v6capacity	city	country
1	26	AMS-IX	687	15,243,951	13,731,611	Amsterdam	NL
2	31	DE-CIX Frankfurt	586	17,144,950	16,041,030	Frankfurt	DE
3	18	LINX Juniper LAN	581	10,211,100	9,247,450	London	UK
4	171	PTT-SP	500	3,828,673	2,667,819	Sao Paulo/SP	BR
5	321	LINX Extreme LAN	265	2,721,450	2,492,800	London	UK
6	359	France-IX	251	1,230,000	1,041,300	Paris	FR
7	64	NL-IX	245	3,348,514	3,013,814	Amsterdam	NL
8	1	Equinix Ashburn	243	4,912,200	4,345,200	Ashburn	US
9	13	SIX	229	2,754,235	2,396,100	Seattle	US
10	255	Equinix Paris	223	924,424	811,700	Paris	FR
11	142	CoreSite - Any2 California	219	2,299,210	1,841,010	Los Angeles and Silicon Valley	US
12	158	Equinix Singapore	175	1,794,300	1,442,500	Singapore	SG
13	2	Equinix Chicago	173	4,077,840	3,729,340	Chicago	US
14	42	HKIX	162	1,636,710	1,030,810	Hong Kong	HK
15	53	LONAP	156	1,222,600	1,012,300	London	UK
16	5	Equinix San Jose	151	1,903,600	1,464,200	San Jose	US
17	14	NYIIX	148	1,543,833	1,414,400	New York	US
18	24	TorIX	144	878,659	735,500	Toronto	CA
19	60	SwissIX	140	453,100	397,900	Zurich	CH
20	100	MSK-IX	130	3,184,700	2,373,200	Moscow	RU
21	35	MIX-IT	129	1,099,310	936,050	Milan	IT
22	94	Equinix Sydney	128	663,000	529,600	Sydney	AU
23	70	Netnod Stockholm	122	6,951,070	5,770,660	Stockholm	SE
24	30	JPIX	120	1,450,800	1,278,700	Tokyo	JP
25	7	Equinix Palo Alto	113	1,395,720	1,005,500	Palo Alto	US

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rank by IPv4 data from peeringdb.com

rank	id	name	customers	v4capacity	v6capacity	city	country
1	716	IX Australia NSW	102	110,591,850	20,486,700	Sydney/NSW	AU
2	21	IX Australia WA	52	100,106,200	57,500	Perth/WA	AU
3	31	DE-CIX Frankfurt	586	17,144,950	16,041,030	Frankfurt	DE
4	26	AMS-IX	687	15,243,951	13,731,611	Amsterdam	NL
5	18	LINX Juniper LAN	581	10,211,100	9,247,450	London	UK
6	70	Netnod Stockholm	122	6,951,070	5,770,660	Stockholm	SE
7	1	Equinix Ashburn	243	4,912,200	4,345,200	Ashburn	US
8	2	Equinix Chicago	173	4,077,840	3,729,340	Chicago	US
9	171	PTT-SP	500	3,828,673	2,667,819	Sao Paulo/SP	BR
10	64	NL-IX	245	3,348,514	3,013,814	Amsterdam	NL
11	100	MSK-IX	130	3,184,700	2,373,200	Moscow	RU
12	13	SIX	229	2,754,235	2,396,100	Seattle	US
13	321	LINX Extreme LAN	265	2,721,450	2,492,800	London	UK
14	142	CoreSite - Any2 California	219	2,299,210	1,841,010	Los Angeles and Silicon Valley	US
15	5	Equinix San Jose	151	1,903,600	1,464,200	San Jose	US
16	12	Equinix New York	111	1,881,300	1,575,000	New York	US
17	158	Equinix Singapore	175	1,794,300	1,442,500	Singapore	SG
18	42	HKIX	162	1,636,710	1,030,810	Hong Kong	HK
19	3	Equinix Dallas	98	1,587,020	1,391,480	Dallas	US
20	14	NYIIX	148	1,543,833	1,414,400	New York	US
21	95	JPNAP Tokyo	97	1,489,400	1,330,300	Tokyo	JP
22	30	JPIX	120	1,450,800	1,278,700	Tokyo	JP
23	7	Equinix Palo Alto	113	1,395,720	1,005,500	Palo Alto	US
24	22	Telx Atlanta	107	1,294,980	1,053,540	Atlanta	US
25	50	VIX	95	1,257,900	1,227,400	Vienna	AT

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rank in IT data from peeringdb.com

rank	id	name	customers	v4capacity	v6capacity	city	country
1	35	MIX-IT	129	1,099,310	936,050	Milan	IT
2	115	TOP-IX	67	182,600	99,400	Turin	IT
3	121	NaMeX	31	128,302	98,840	Rome	IT
4	311	VSIX	23	31,800	19,200	Padova	IT
5	273	TIX	16	7,834	1,100	Sesto Fiorentino - Florence	IT
6	240	MINAP Milan	12	6,501	5,400	Milan	IT
7	1131	DE-CIX Palermo	2	20,000	20,000	Palermo	IT

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MIX public

- 165 AS - 1.3Tbps - 0.120€/Mbps/m


```
■ Total peak traffic
■ Total traffic
Maximal total traffic :    305.294 Gb/s
Average total traffic :    157.684 Gb/s
Current total traffic :    175.567 Gb/s
-----------------
Maximal public peering :   304.154 Gb/s    Maximal private peering :     6.566 Gb/s
Average public peering :   156.411 Gb/s    Average private peering :     1.274 Gb/s
Current public peering :   175.240 Gb/s    Current private peering :   326.923 Mb/s
```
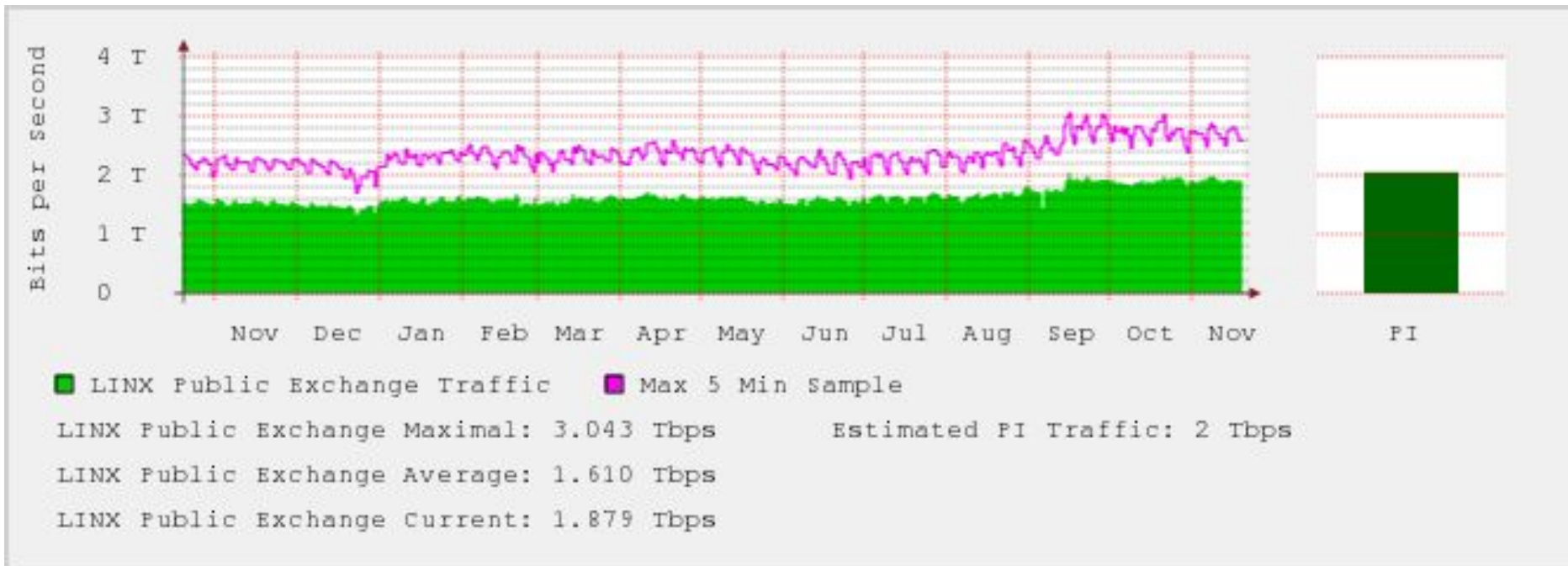
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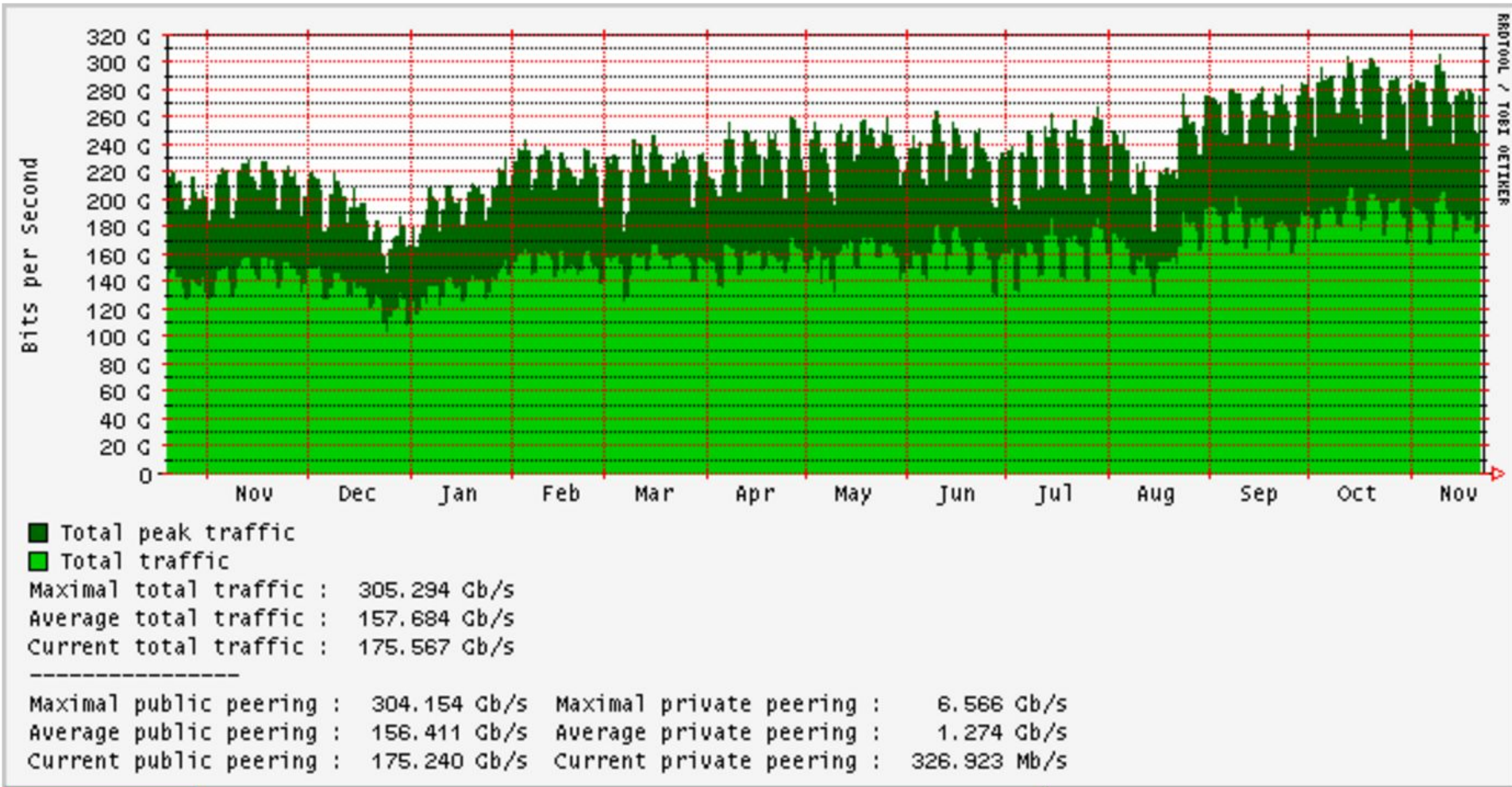
VSIX public

- 29 AS - 0.125€/Mbps/m
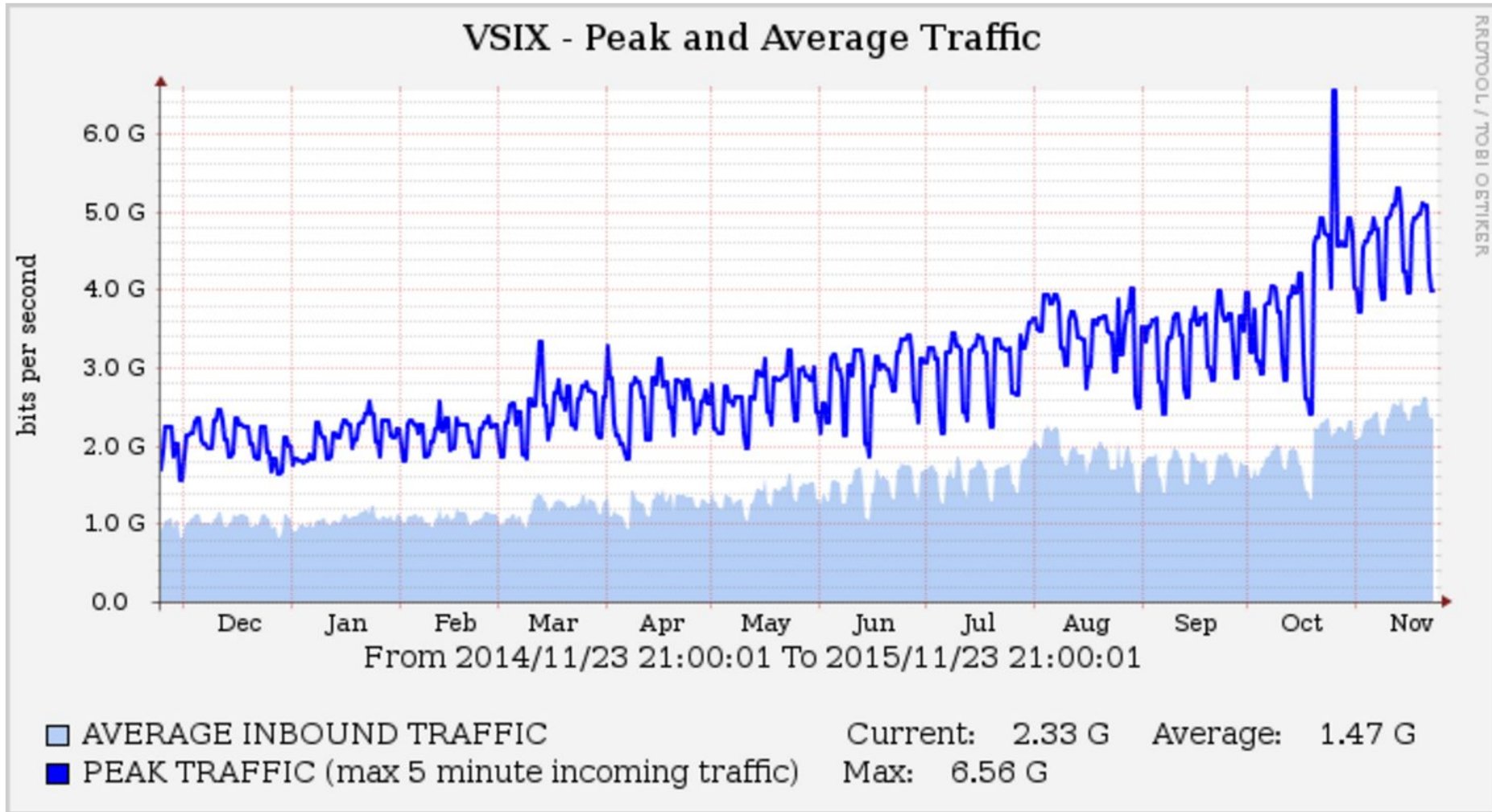
TOPIX public

- 86 AS - 0.100€/Mbps/m
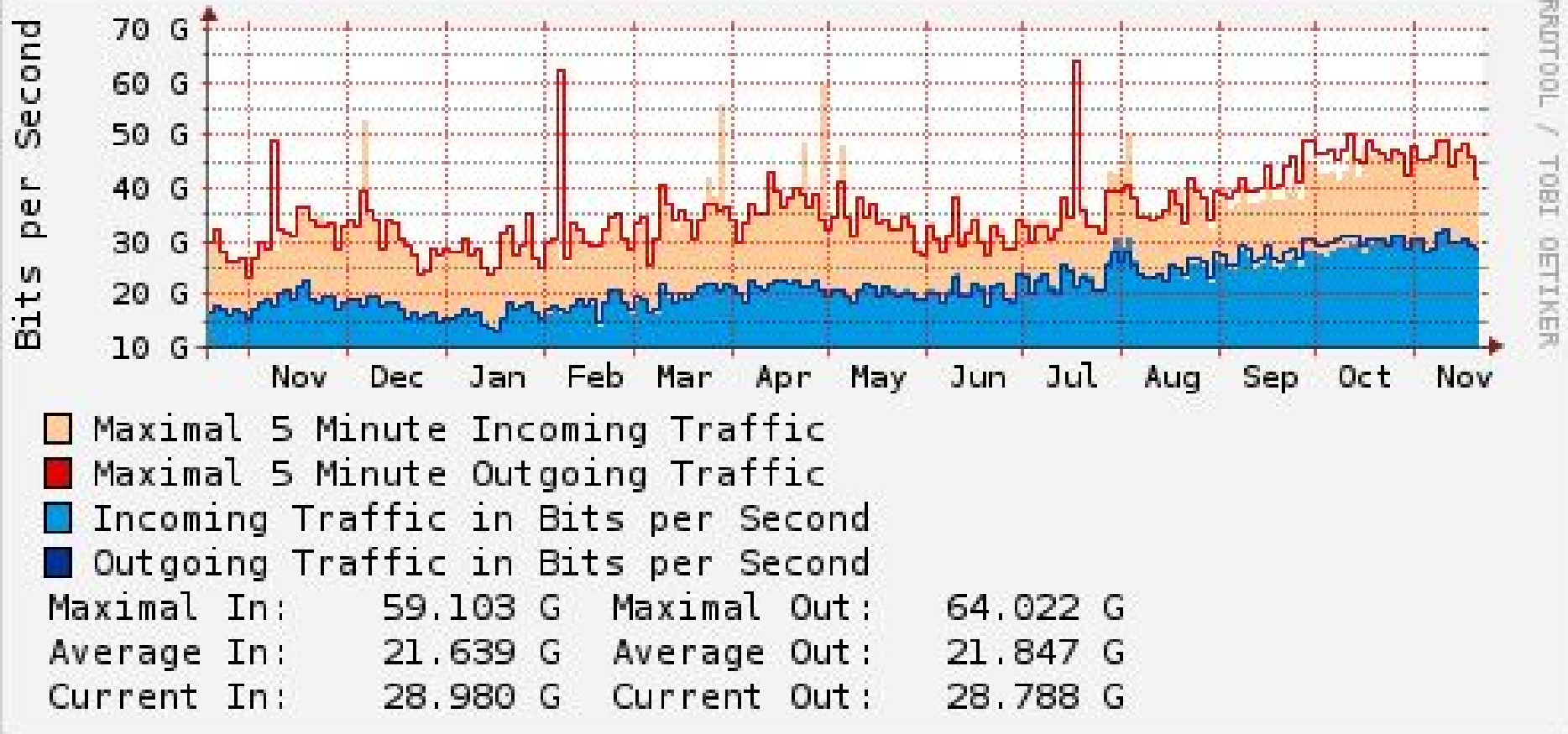
LINX public

- 679 AS - 14.6Tbps - 0.146€/Mbps/m

DECIX public
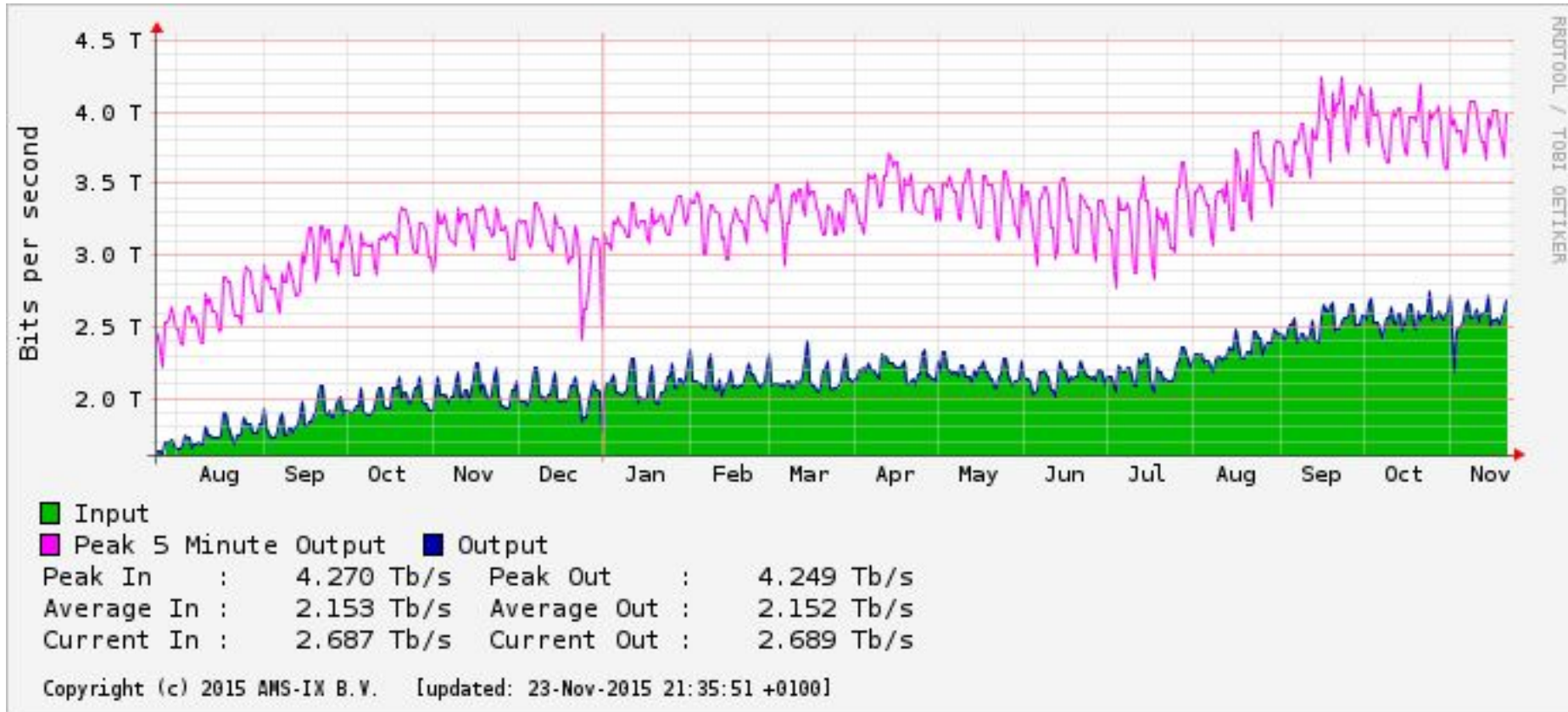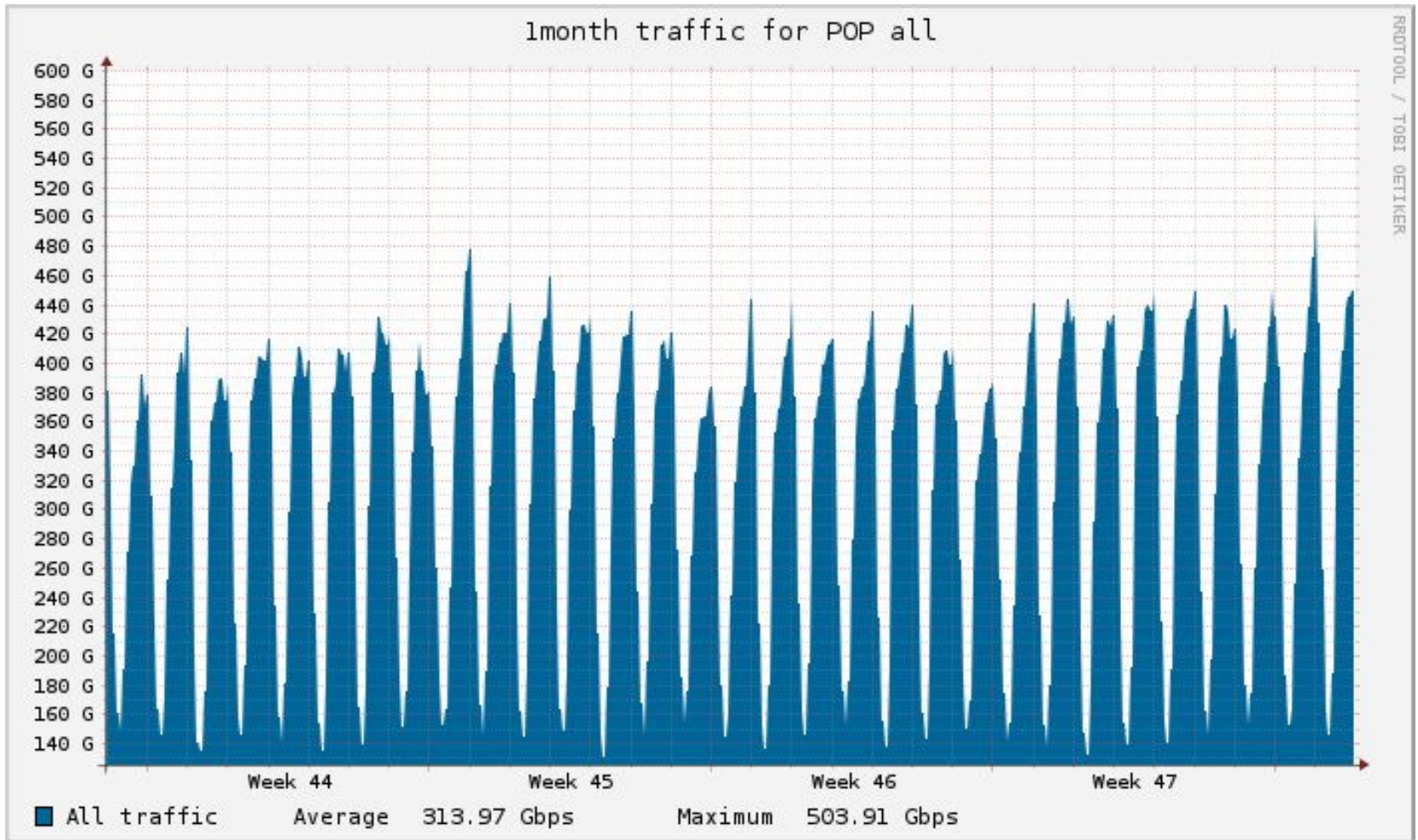
- 650 AS - 18Tbps - 0.155€/Mbps/m

average traffic in bits per second
peak traffic in bits per second
Current 3176.8 G
Averaged 2395.7 G
Graph Peak 4952.1 G
DE-CIX All-Time Peak 4952.15 G - reached at 2015-10-04T20:40+02:00
Created at 2015-11-23 20:30 UTC
Copyright 2015 DE-CIX Management GmbH

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AMSIX public

- 752 AS - 17Tbps - 0.100€/Mbps/m

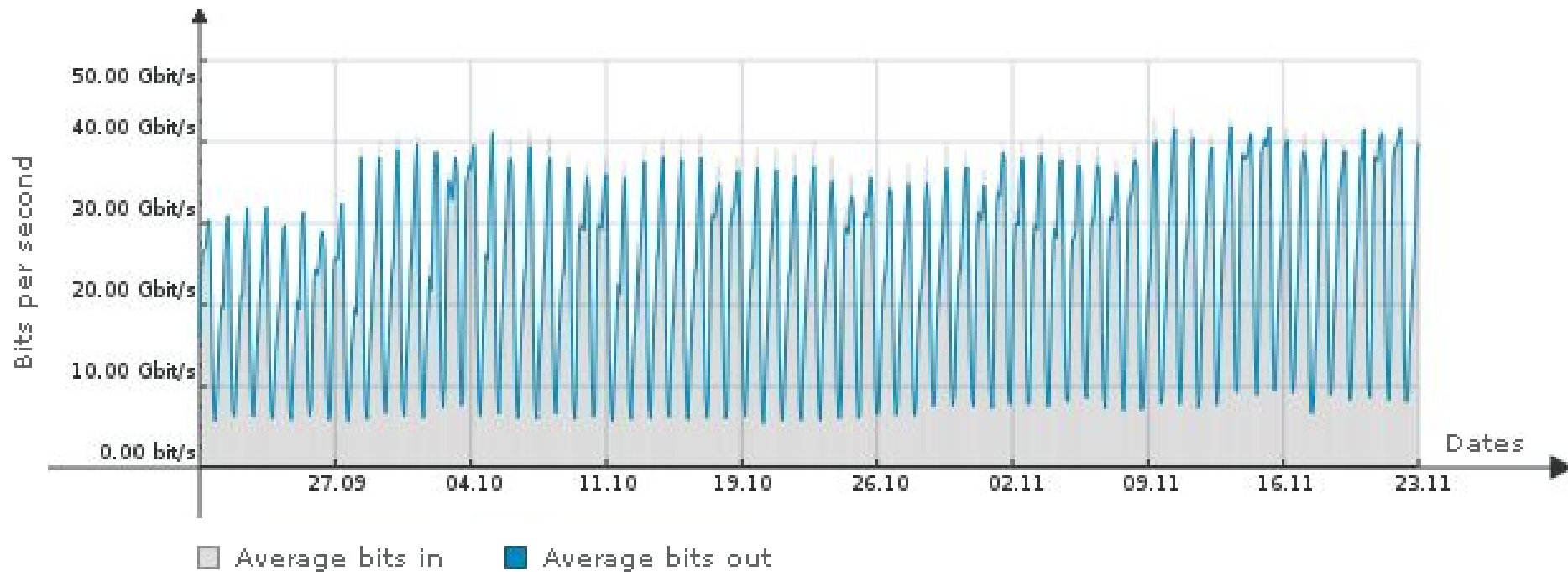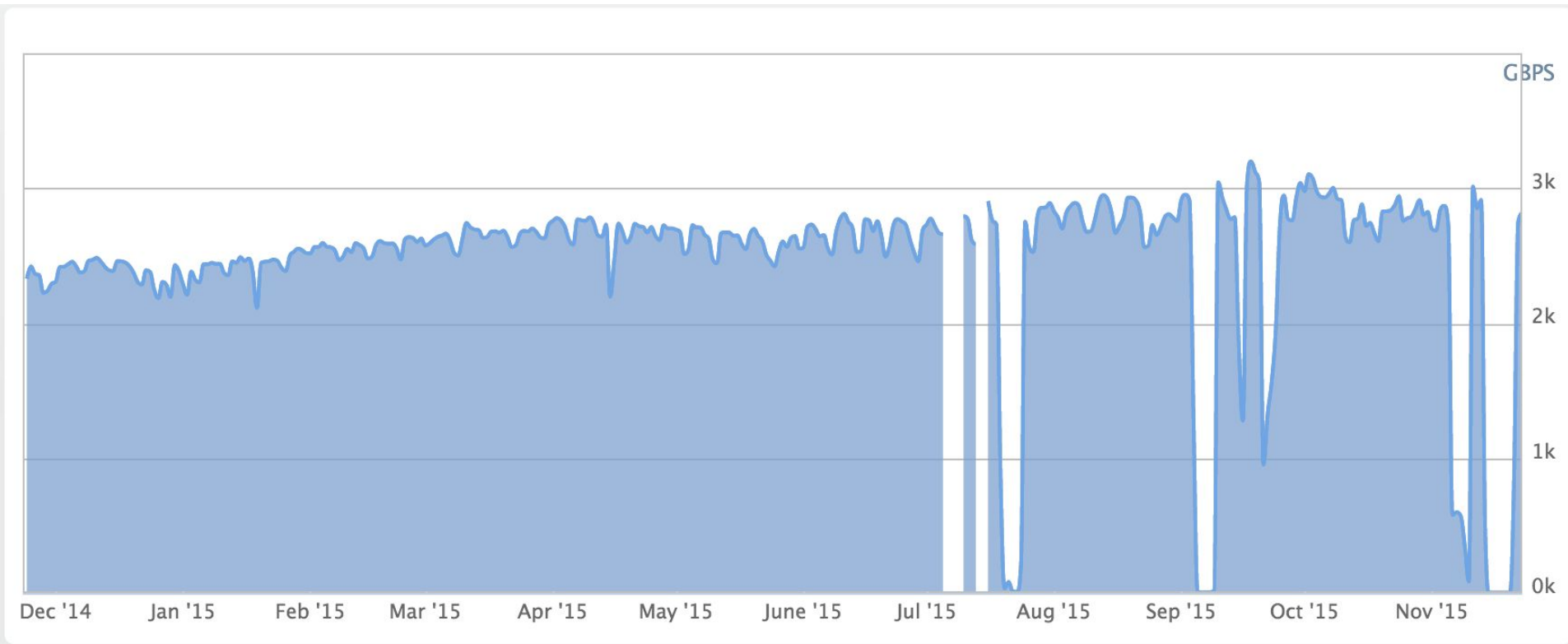# FRANCEIX public

- 292 AS - 0.150€/Mbps/m

LUCIX public

- 71 AS - 0.090€/Mbps/m
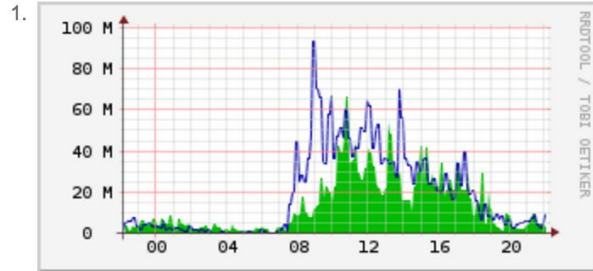
# ASHBURN public

- 261 AS

SFlow

- Provides a network-wide view
- Scalable
- Low cost solution
- Industry standard
- Accurate
- Detailed
- Timely
- Troubleshooting Network Problems
- Controlling Congestion
- Security and Audit Trail Analysis
- Route Profiling
- Accounting and Billing for Usage
- Software Defined Networks

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SFlow AS31638 in AMSIX
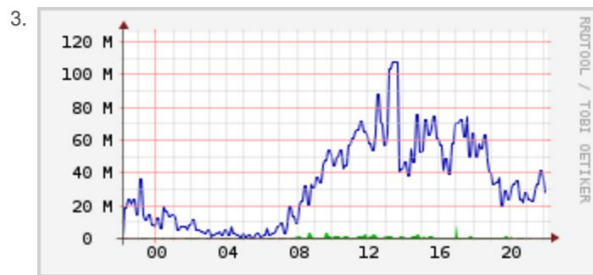

1. **A100 ROW, Inc**
   AS: 16509

   IP details:
   80.249.211.74 to 80.249.210.217
   80.249.211.74 to 80.249.210.100
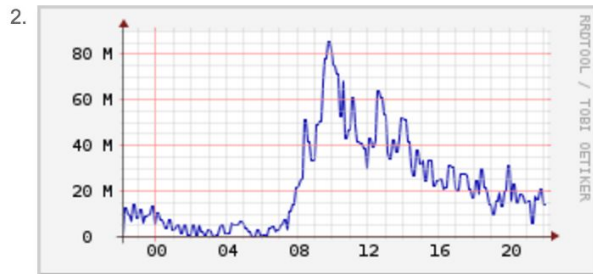
2. **OVH**
   AS: 16276

   IP details:
   80.249.211.74 to 80.249.209.231
   80.249.211.74 to 80.249.209.245

3. **Google Ireland Limited**
   AS: 15169

   IP details:
   80.249.211.74 to 80.249.208.247
   80.249.211.74 to 80.249.209.100
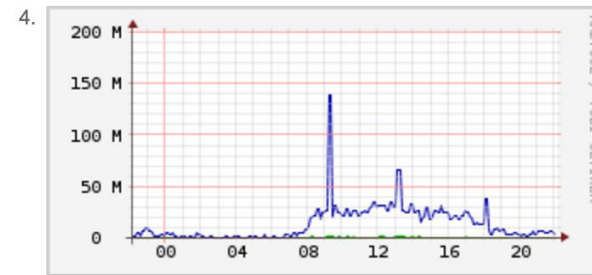
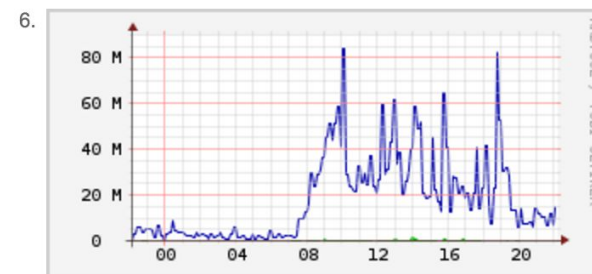4. **EdgeCast Networks, Inc**
   AS: 15133

   IP details:
   80.249.211.74 to 80.249.209.162
   80.249.211.74 to 80.249.208.151

5. **IP Transit, Inc.**
   AS: 46786

   IP details:
   80.249.211.74 to 80.249.211.47

6. **Microsoft**
   AS: 8075

   IP details:
   80.249.211.74 to 80.249.209.20
   80.249.211.74 to 80.249.209.21

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SFlow AS31638 with Hurricane Electric

No.	Outgoing					Ingoing				
	AS Num	AS Name	Traffic (GB)	Traffic %	Peer Traffic	AS Num	AS Name	Traffic (GB)	Traffic %	Peer Traffic
1	3269	ASN-IBSNAZ Telecom Italia S.p.a.	689.40	46.31 %	2.49	714	APPLE-ENGINEERING - Apple Inc.	90.66	12.53 %	0.00
2	198471	LINKEM-AS Linkem spa	51.16	3.44 %	0.00	22822	LLNW - Limelight Networks	83.87	11.59 %	0.01
3	16232	ASN-TIM TIM (Telecom Italia Mobile) Autonomous System	43.47	2.92 %	0.11	35994	AKAMAI-AS - Akamai Technologies	70.18	9.70 %	0.01
4	20746	ASN-IDC Telecomitalia s.p.a.	41.57	2.79 %	0.03	1299	TELIANET TeliaSonera International Carrier	66.77	9.23 %	0.00
5	7922	COMCAST-7922 - Comcast Cable Communications	30.92	2.08 %	0.20	3269	ASN-IBSNAZ Telecom Italia S.p.a.	36.28	5.01 %	2.49
6	16509	AMAZON-02 - Amazon.com	29.39	1.97 %	0.06	199156	EWEKA Eweka Internet Services B.V.	16.42	2.27 %	0.00
7	1299	TELIANET TeliaSonera International Carrier	23.39	1.57 %	0.00	16509	AMAZON-02 - Amazon.com	13.93	1.93 %	0.06
8	4134	CHINANET-BACKBONE No.31	18.72	1.26 %	0.22	32590	VALVE-CORPORATION - Valve Corporation	13.92	1.92 %	0.00
9	5607	BSKYB-BROADBAND-AS British Sky Broadcasting Limited	18.45	1.24 %	0.06	34164	AKAMAI-LON Akamai International B.V.	13.66	1.89 %	0.00
10	6830	LGI-UPC Liberty Global Operations B.V.	17.06	1.15 %	0.02	20940	AKAMAI-ASN1 Akamai International B.V.	13.10	1.81 %	0.00
11	5089	NTL Virgin Media Limited	14.56	0.98 %	0.12	9009	M247 M247 Ltd	12.45	1.72 %	0.00
12	701	UUNET - MCI Communications Services	13.18	0.89 %	0.08	6830	LGI-UPC Liberty Global Operations B.V.	11.56	1.60 %	0.02
13	3352	TELEFONICA_DE_ESPANA TELEFONICA DE ESPANA	13.09	0.88 %	0.00	35415	WEBAZILLA Webazilla B.V.	8.76	1.21 %	0.00
14	14618	AMAZON-AES - Amazon.com	12.40	0.83 %	0.01	43647	FIBERCUT-ASN Fibercut SRL	7.69	1.06 %	0.00
15	15557	LDCOMNET Societe Francaise du Radiotelephone S.A	11.69	0.79 %	0.00	41095	IPTP IPTriplePlay Ltd	7.38	1.02 %	0.00
16	55967	CNNIC-BAIDU-AP Beijing Baidu Netcom Science and Technology Co.	11.57	0.78 %	0.00	16265	LEASEWEB-NETWORK LeaseWeb B.V.	7.35	1.02 %	0.00
17	9143	ZIGGO Ziggo B.V.	11.34	0.76 %	0.00	2856	BT-UK-AS BT Public Internet Service	7.30	1.01 %	0.00
18	7018	ATT-INTERNET4 - AT&T Services	11.06	0.74 %	0.14	60781	LEASEWEB-NL LeaseWeb B.V.	6.19	0.86 %	0.00
19	35994	AKAMAI-AS - Akamai Technologies	10.24	0.69 %	0.01	61107	UCDN UNIVERSAL CDN (CYPRUS) LTD	5.76	0.80 %	0.00
20	10796	SCRR-10796 - Time Warner Cable Internet LLC	9.30	0.62 %	0.05	20454	SSASN2 - SECURED SERVERS LLC	5.54	0.77 %	0.09
		Others	406.67	27.32 %			Others	224.69	31.06 %	
		Total	1488.63	100.00%			Total	723.46	100.00%	
		Peering Traffic			4.10		*Peering Traffic*			4.10

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SFlow AS31638 with Cogent

No.	Outgoing					Ingoing			
	AS Num	AS Name	Traffic (GB)	Traffic %	Peer Traffic	AS Num	AS Name	Traffic (GB)	Traffic %	Peer Traffic
1	198292	WAVE-MAX Wave-Max S.r.L.	41.08	16.06 %	0.00	3269	ASN-IBSNAZ Telecom Italia S.p.a.	340.72	28.25 %	1.58
2	3215	AS3215 Orange S.A.	32.63	12.75 %	0.00	3356	LEVEL3 - Level 3 Communications	129.83	10.76 %	0.01
3	12322	PROXAD Free SAS	28.81	11.26 %	0.01	174	COGENT-174 - Cogent Communications	90.09	7.47 %	0.03
4	3320	DTAG Deutsche Telekom AG	18.18	7.11 %	0.47	34164	AKAMAI-LON Akamai International B.V.	86.96	7.21 %	0.00
5	174	COGENT-174 - Cogent Communications	10.37	4.05 %	0.03	54641	INMOTI-1 - InMotion Hosting	58.26	4.83 %	0.00
6	26484	HOSTSPACE - HOSTSPACE NETWORKS LLC	8.85	3.46 %	0.04	54113	FASTLY - Fastly	44.84	3.72 %	0.01
7	6739	ONO-AS Cableuropa - ONO	6.44	2.52 %	0.00	20746	ASN-IDC Telecomitalia s.p.a.	43.62	3.62 %	0.00
8	198291	GOOMOBILE Goomobile S.r.l	6.24	2.44 %	0.00	60144	THREE-W-INFRA-AS 3W Infra B.V.	43.39	3.60 %	0.00
9	12715	JAZZNET Jazz Telecom S.A.	4.72	1.85 %	0.05	201133	VERDINA Verdina Ltd.	20.53	1.70 %	0.00
10	18881	Global Village Telecom	3.58	1.40 %	0.01	198291	GOOMOBILE Goomobile S.r.l	15.49	1.28 %	0.00
11	262287	Maxihost Hospedagem de Sites Ltda	3.41	1.33 %	0.00	16232	ASN-TIM TIM (Telecom Italia Mobile) Autonomous System	13.92	1.15 %	0.00
12	3356	LEVEL3 - Level 3 Communications	3.12	1.22 %	0.01	10782	HP-DIGITAL-10782 - Hewlett-Packard Company	11.72	0.97 %	0.00
13	3269	ASN-IBSNAZ Telecom Italia S.p.a.	2.59	1.01 %	1.58	20580	Telecom Italia S.p.A.	11.01	0.91 %	0.00
14	8972	PLUSSERVER-AS PlusServer AG	2.32	0.91 %	0.01	12322	PROXAD Free SAS	10.57	0.88 %	0.01
15	33091	U-CALGARY - University of Calgary	2.21	0.86 %	0.00	29419	ALMAVIVA Almaviva S.p.A.	10.48	0.87 %	0.00
16	54113	FASTLY - Fastly	2.18	0.85 %	0.01	16509	AMAZON-02 - Amazon.com	10.27	0.85 %	0.00
17	28666	HOSTLOCATION LTDA	2.15	0.84 %	0.00	3215	AS3215 Orange S.A.	10.08	0.84 %	0.00
18	12946	TELECABLE Telecable de Asturias	2.14	0.84 %	0.01	17025	ABOVENET-CUSTOMER - Abovenet Communications	8.45	0.70 %	0.00
19	16880	AS2-TRENDMICRO-COM - TREND MICRO INCORPORATED	1.98	0.77 %	0.00	46179	MEDIAFIRE - MediaFire	7.96	0.66 %	0.00
20	4713	OCN NTT Communications Corporation	1.77	0.69 %	0.00	20940	AKAMAI-ASN1 Akamai International B.V.	7.49	0.62 %	0.00
		Others	71.05	27.77 %			Others	230.54	19.11 %	
		Total	255.82	100.00%			Total	1206.22	100.00%	
		Peering Traffic			1.95		*Peering Traffic*			1.95

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AS31638 Traffic