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Internet Exchange Points

2013 Report

Contents

1. Introduction

1.1 Foreword

This report has been compiled by the European Internet Exchange Association (Euro-IX) to give an overview of the European Internet Exchange Point situation at the end of 2013, including:

- The number of Internet Exchange Points (IXPs) currently operating in Europe
- Related statistics and trends that are now appearing in the European IXP market
- The evolution over the last couple of years

Since 2012, Euro-IX has started to automate some of the data collection in order to ease up the updating process. Improving and regulating the data collection is vital and we continue to work with the IXPs to automate as much data collection as possible, this reports combines data that has been collected automatically and data that has been collected manually.

1.2 Notes on this report

i.   Not all European IXPs make their traffic statistics publicly available and no attempts at estimates were made where true figures were not presented.

ii. All information has been gathered on a best effort basis and relies on the information that is published by individual IXPs. Therefore all information contained in this report is only as accurate as the information that has been published by these IXPs. If you are planning to base your decision on the information contained in this report we strongly advise to check the information against up-to-date data.

iii. It should be noted that not all European IXPs measure their peak traffic using the same periodic average. While the majority of IXPs choose to take samples every five minutes, some have chosen to take these samples more or less frequently.

iv. A best effort was made to list all known IXPs in Europe. Euro-IX may be unaware of the existence of one or more IXP and thus they do not appear in the list. Euro-IX welcomes any information about IXPs not shown in this report.

v.   Some IXPs that were listed in the 2012 report have not been included in the 2013 one due to the fact that either no contact can be made with them to verify if they are still operational, they have no working website or we have received information that they are no longer operational.

vi. In 2013 we have made further efforts, to get in contact with a larger percentage of the European IXP community, so that we were able to provide even more accurate information in this report. Euro-IX was in contact with over 50% of the IXPs listed in the appendix. This increase in contact has allowed us to provide more accurate trends on traffic statistics as well as better details of IXP establishment dates, participants and the switches that are being used at IXPs across Europe.

1.3 Internet Exchange Point (IXP)

Euro-IX has accepted the industry definition of an IXP as being:

"A physical network infrastructure operated by a single entity with the purpose to facilitate the exchange of Internet traffic between Autonomous Systems. The number of Autonomous Systems connected should at least be three and there must be a clear and open policy for others to join."

1.4 About Euro-IX

The European Internet Exchange Association (Euro-IX) was formed in May 2001 with the intention to further develop, strengthen and improve the Internet Exchange Point (IXP) community.

A number of Internet Exchange Points recognised a need to combine their resources so as to coordinate technical standards across the continent, develop common procedures, as well as share and publish statistics and other information. This publishing of information would in turn give all interested parties a better insight into the world of IXPs.

Euro-IX was originally set-up as a discussion forum for European based IXPs. However as interest started to grow from other regions it seemed a natural progression for Euro-IX to expand beyond its original boundaries. Thus in January 2005 Euro-IX decided to open its doors to IXPs from outside Europe, allowing them to join the association as "Associate Members".

In 2009, the association introduced the "Remote Member" category, intended for IXPs from outside Europe that would like to affiliate themselves with Euro-IX, but do not envisage attending Euro-IX forums on a regular basis. As of 2011, the "Remote Member" category is also open to European IXPs.

By the end of 2013, Euro-IX counted 74 Members and 11 Patrons from the IXP-related equipment-vendor and colocation sectors of the community. The 74 member IXPs are from 47 countries and the affiliations are as follows:

- **Members**: 41 IXPs from 27 countries

- **Associate Members**: 10 IXPs (from Brazil, Curacao, Egypt, India, Japan and USA).

- **Remote Members**: 22 IXPs (from 18 countries), including 8 IXPs from European countries - Finland, Germany, Iceland, Italy, Luxembourg and Ukraine – and 10 from outside of Europe – Australia, Canada, Congo, Kenya, Mozambique, Nepal, Nigeria, South Africa, Tunisia, United Republic of Tanzania, United States of America and Zambia.

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1.5 List of Euro-IX affiliates

1.5.1   Euro-IX Member IXPs (Euro-IX region)

MEMBER	CITY	COUNTRY
ALB-IX	Tirana	Albania
AMS-IX	Amsterdam	Netherlands
BCIX	Berlin	Germany
BIX	Budapest	Hungary
BIX.BG	Sofia	Bulgaria
BNIX	Brussels	Belgium
CATNIX	Barcelona	Spain
CIX	Zagreb	Croatia
CIXP	Geneva	Switzerland
DE-CIX	Frankfurt	Germany
DIX	Lyngby	Denmark
ECIX	Berlin	Germany
Equinix	Zurich	Switzerland
FICIX	Helsinki	Finland
France-IX	Paris	France
GigaPix	Lisbon	Portugal
GN-IX	Groningen	Netherlands
GR-IX	Athens	Greece
INEX	Dublin	Ireland
InterLAN	Bucharest	Romania
IXLeeds	Leeds	United Kingdom
KOSIX	Prishtinë	Kosovo
LINX	London	United Kingdom
LONAP	London	United Kingdom
LyonIX	Lyon	France
MIX-IT	Milan	Italy
MSK-IX	Moscow	Russian Federation
NaMeX	Rome	Italy
Netnod	Stockholm	Sweden
NIX	Oslo	Norway
NIX.CZ	Prague	Czech Republic
NL-ix	The Hague	Netherlands
PLIX	Warsaw	Poland
SFINX	Paris	France
SIX	Ljubljana	Slovenia
SwissIX	Zurich	Switzerland
TOP-IX	Torino	Italy
TPIX	Warsaw	Poland
UAE-IX	Dubai	United Arab Emirates
VIX	Vienna	Austria
VSIX	Padova	Italy

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1.5.2   Euro-IX Associate Member IXPs

ASSOCIATE MEMBER	CITY	COUNTRY
AMS-IX Caribbean	Willemstad	Curacao, Netherlands Antilles
BBIX	Tokyo	Japan
CyrusOne	Dallas	United States of America
GPX MEIX	Cairo	Egypt
JPIX	Tokyo	Japan
JPNAP	Tokyo	Japan
NIXI	Delhi	India
PTT.br	Sao Paulo	Brazil
Telx	Atlanta	United States of America
Terremark	Miami	United States of America

1.5.3   Euro-IX Remote Member IXPs (Europe)

REMOTE MEMBER	CITY	COUNTRY
DE-CIX Hamburg	Hamburg	Germany
DE-CIX Munich	Munich	Germany
FVG-IX	Udine	Italy
LU-CIX	Luxembourg	Luxembourg
RIX	Reykjavik	Iceland
TIX Tuscany	Florence	Italy
TREX	Tampere	Finland
UA-IX	Kiev	Ukraine

1.5.4   Euro-IX Remote Member IXPs (outside Europe)

REMOTE MEMBER	CITY	COUNTRY
Coresite	Los Angeles	United States of America
IX Australia	Perth	Australia
IXPN	Lagos	Nigeria
JINX	Johannesburg	South Africa
KINIX	Kinshasa	Congo
KIXP	Nairobi	Kenya
MOZ-IX	Maputo	Mozambique
NAP Africa	Johannesburg	South Africa
NPIX	Kathmandu	Nepal
OTTIX	Ottawa	Canada
TIX - Tanzania	Dar es Salaam	United Republic of Tanzania
TorIX	Toronto	Canada
TunIXP	Tunis	Tunisia
ZIXP	Lusaka	Zambia

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PATRON	CITY	COUNTRY
ADVA	Amsterdam	The Netherlands
Alcatel-Lucent	Paris	France
Brocade	Amsterdam	The Netherlands
Cisco Systems	San Jose	United States
Extreme Networks	Amsterdam	The Netherlands
Huawei	Amsterdam	The Netherlands
Interxion	Amsterdam	The Netherlands
Juniper Networks	San Jose	United States
MRV	Amsterdam	The Netherlands
TelecityGroup	London	United Kingdom
Telehouse	London	United Kingdom

1.6 Participants distribution at Euro-IX member IXPs

The chart below shows the distribution of participants (customers or members) at Euro-IX member IXPs. The number of participants at IXPs varies between 5 and 630. The largest share of IXPs, namely 30%, have between 3 and 25 members. The terms participants, customers and members are in use at IXPs, but they all mean Autonomous System Numbers (ASNs).

Percentage of Euro-IX IXPs with a given range of members (ASNs)
i.e. 30% of our member IXPs have 3 - 25 members/customers
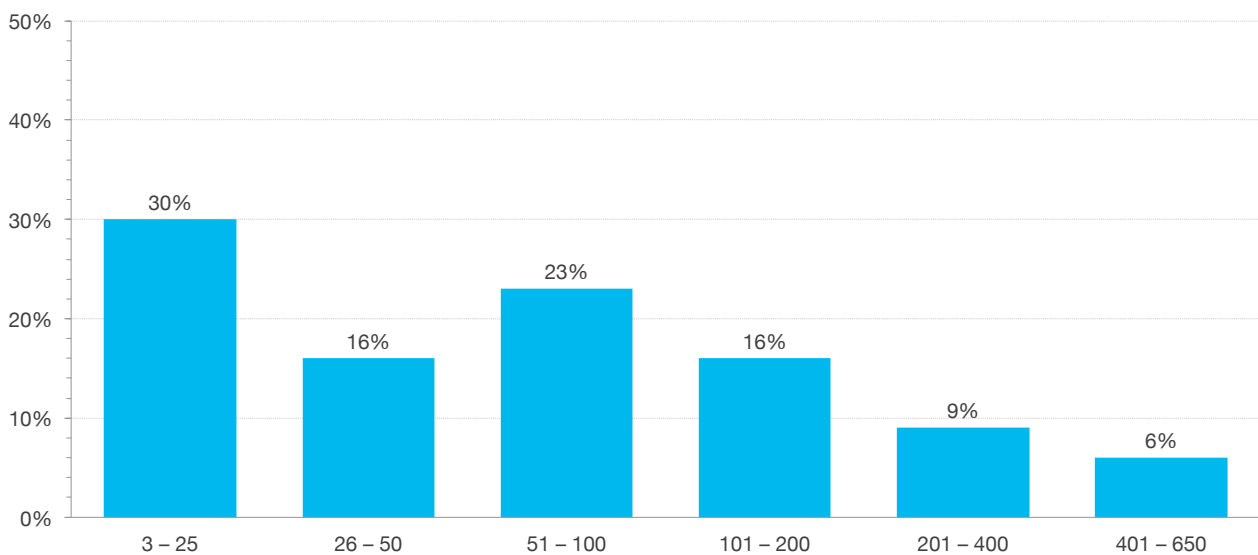
Number of ASNs per IXP
(Average: 103 ASNs)
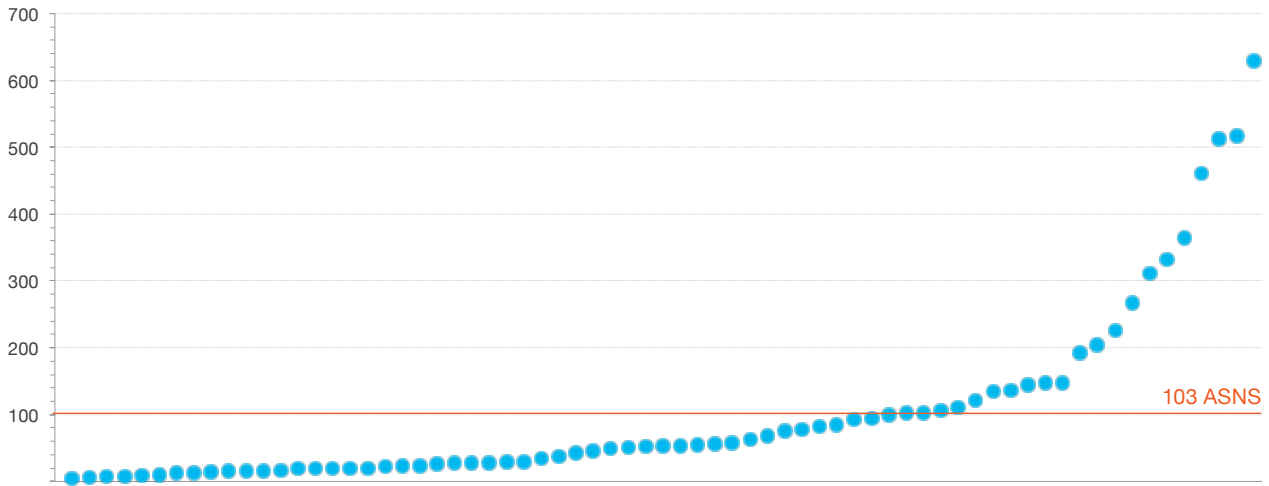
1.7 Evolution since 2007

The table below shows the evolution of the number of countries in Europe with IXPs, the known number of IXPs present in these countries, and aggregated peak traffic figures.

The aggregated peak traffic volume is determined by collecting publicly available traffic statistics from Euro-IX Member IXPs. Data was captured during a 12-month period (from January to December).

EVOLUTION SINCE 2007	DATA SOURCE	2007	2008	2009	2010	2011	2012	2013
Number of countries in the Euro-IX region with IXPs	Euro-IX, IXP website and PeeringDB	31	31	33	35	35	38	43
Known operating IXPs in these Cities in the Euro-IX region	Euro-IX, IXP website and PeeringDB	113	115	122	136	144	146	166
Aggregated peak IXP traffic within the Euro-IX membership [in Gbps]	Gathered monthly from known IXPs published traffic statistics	971	1,521	2,454	4,100	5,965	8,652	11,896

2. European IXP growth since 1993

2.1 IXP Trends in Europe since 1993

The table below shows the establishment of known IXPs in Europe since 1993. In some cases an IXP may have been 'unofficially' established (i.e. actually operating before becoming a legal entity) earlier than shown in this section.

The growth of 20 IXPs in 2013 includes both new born IXPs but also IXPs that were only identified by Euro-IX in 2013 *(Source: Euro-IX, IXP websites and PeeringDB)*.

YEAR	IXPS STARTED	IXPS CLOSED	GROWTH	OPERATIONAL
1993	3	0	3	3
1994	4	0	4	7
1995	7	0	7	14
1996	8	0	8	22
1997	8	0	8	30
1998	3	0	3	33
1999	6	0	6	39
2000	5	0	5	44
2001	20	0	20	64
2002	13	0	13	77
2003	12	0	12	89
2004	2	0	2	91
2005	11	0	11	102
2006	14	0	14	116
2007	3	6	-3	113
2008	14	12	2	115
2009	12	5	7	122
2010	18	4	14	136
2011	8	0	8	144
2012	2	0	2	146
2013	22	2	20	166

2.2 Changes and total IXP growth per year

This graph illustrates the growth of the known operational IXPs and the changes that occurred in a particular year.
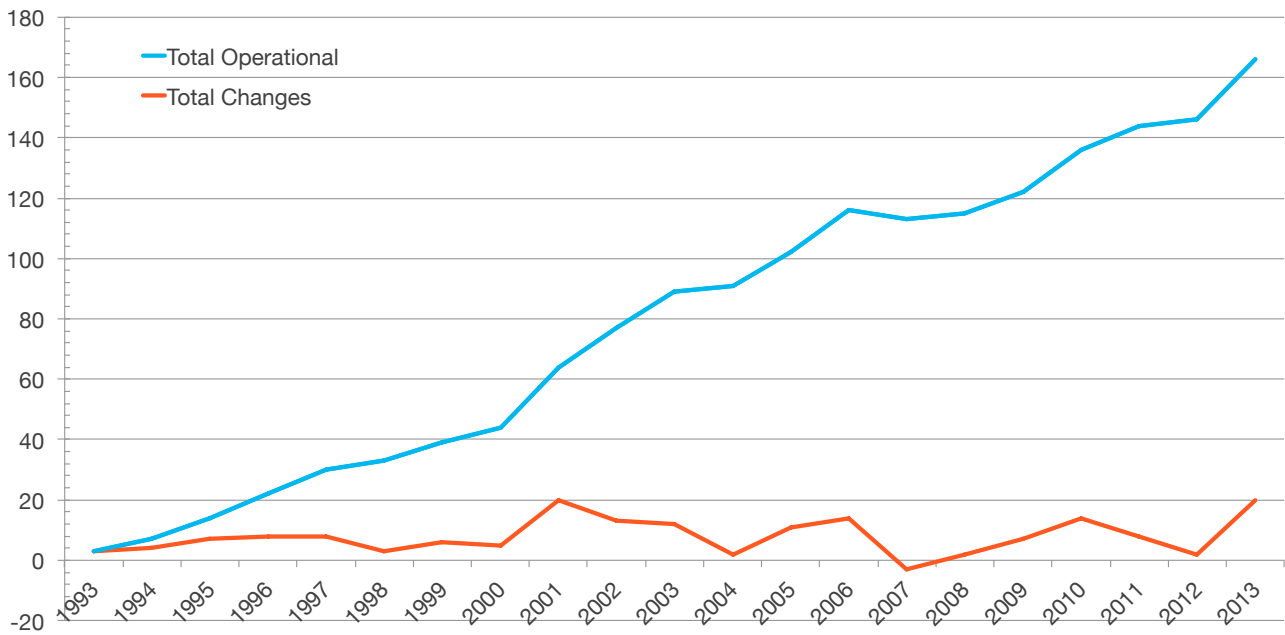
3. IXP Switching Platform Technology

3.1 Switches in use at European member IXPs

This graph displays the number of switches and/or routers being used by Euro-IX member IXPs across Europe. The IXPs enter the data for their exchange point(s), Euro-IX collects the data supplied and the totals are shown below.

There is no direct relationship between the number of devices/vendors in use at IXPs and such factors, as the traffic at IXPs, port density, deployment type of switches and routers (e.g., core, distribution/ aggregation, edge), and number of participants (ASNs).

Number of switch / routers in use at European IXPs:
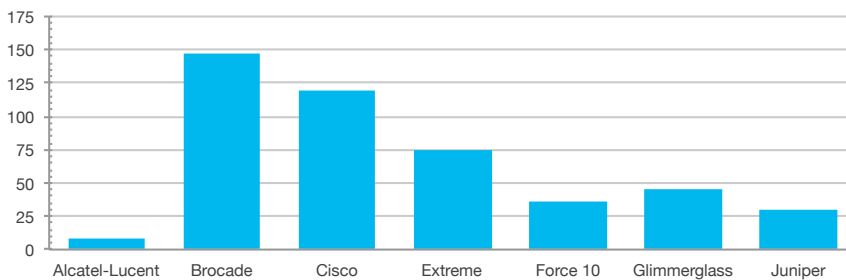
3.2 Market Share of switch/router vendors among European IXPs

This chart shows the percentage of switch/router vendors deployed at European IXPs:
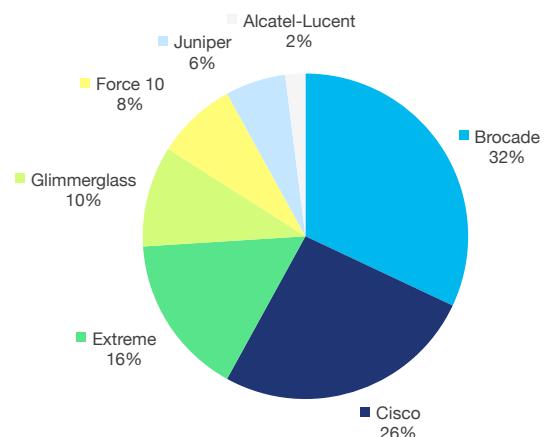
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3.3 Route Server daemons in use at Euro-IX member IXPs

Since 2009 Euro-IX has implemented a route server database for its membership. This database allows the participating IXP to provide information about the route servers that they have in use at their IXPs, in particular about the:

- Hardware
- Daemons
- Operating systems
- Filters

40 Euro-IX members have entered information in this database. There are 77 route servers in use at these IXPs. Data entered into the database may be only partially complete.

The table and the chart below show the use of route-server daemons:

ROUTE SERVER	NUMBER	PERCENTAGE
Bird	39	51%
Cisco	12	16%
OpenBGPd	10	13%
Quagga	16	21%
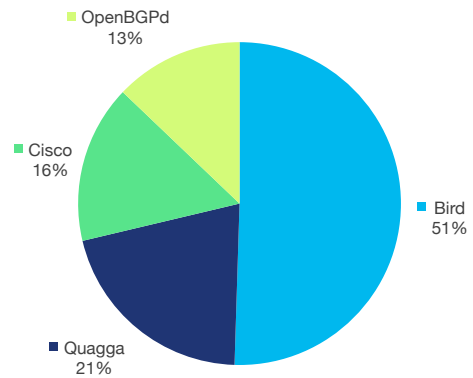
3.4 Route Server operating systems in use at Euro-IX member IXPs

The table and the chart below show the use of route-server operating systems:

OS	NUMBER	PERCENTAGE
CentOS	3	4%
Cisco	12	17%
Debian LINUX	19	27%
FreeBSD	14	20%
Gentoo	5	7%
OpenBSD	10	14%
Ubuntu	7	10%
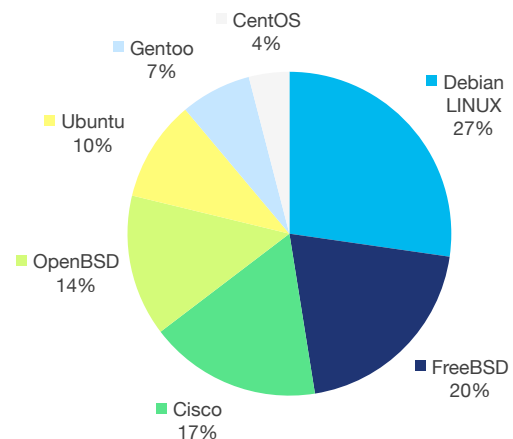
4. Further information

4.1 Resources

In an effort to seek further information regarding IXPs that we were not able to get in direct contact with we made use of the Peering DB https://www.peeringdb.com/ and we would like to express our appreciation to those responsible for managing this database.

Of course we would like to additionally thank all of the European IXPs, especially those that provide publicly available information of traffic statistics.

The biggest thank you goes to the 74 affiliated Euro-IX Member IXPs that commit themselves to openly exchanging information with the rest of the IXP community via the Euro-IX website and the biannual Euro-IX Forums. Thank you to all Euro-IX Members!

4.2 Contact

We very much welcome all forms of feedback and suggestions concerning this report and will do our best to answer any further requests for information.

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List of known IXPs in the Euro-IX Region
Note: * indicates Euro-IX Member

COUNTRY	CODE	# OF IXPS IN COUNTRY	CITY	FULL NAME OF IXP	ACRONYM
Albania	AL	1			
			Tirana	Albania Internet Exchange	ALB-IX*
Armenia	AM	1			
			Armenia	Armenia Internet Exchange	ARMIX
Austria	AT	3			
			Klagenfurt	Alpes Adria Internet Exchange	AAIX
			Graz	Grazer Internet Exchange	GraX
			Vienna	Vienna Internet eXchange	VIX*
Belarus	BY	1			
			Minsk	Belarus National Internet Exchange Point	BYIX
Belgium	BE	2			
			Brussels	Belgian National Internet Exchange	BNIX*
				FreeBIX	FreeBIX
Bosnia Herzegovia	BA	1			
			Sarajevo	Bosnia Internet Exchange	BHIX
Bulgaria	BG	3			
			Sofia	Bulgarian Internet Exchange	BIX.BG*
				Balkan Internet Exchange	Balkan-IX
				NetIX	NetIX
Croatia	HR	1			
			Zagreb	Croatian Internet eXchange	CIX*
Cyprus	CY	1			
			Nicosia	Cyprus Internet Exchange	CyIX
Czech Republic	CZ	3			
			Brno	Commercial Brno Internet Exchange	CBIX
			Prague	Neutral Internet eXchange of Czech Republic	NIX.CZ*
				Commercial Peering Centre in Prague	Peering.cz
Denmark	DK	2			
			Lyngby	Danish Internet eXchange point	DIX*
			Copenhagen	Copenhagen Internet eXchange	COPHIX
Estonia	EE	3			
			Tallin	Tallinn Internet eXchange	TIX
				Tallinn Internet Exchange	TLLIX
				Tallinn Governmental Internet Exchange	RTIX
Finland	FI	4			
			Espoo	Finnish Communication and Internet Exchange	FICIX 1*
			Helsinki	Finnish Communication and Internet Exchange	FICIX 2*
			Oulu	Finnish Communication and Internet Exchange	FICIX 3*
			Tampere	Tampere Region Exchange	TREX*

France	FR	9			
			Lyon	Lyonix	Lyonix*
			Paris	Equinix-France	Equinix*
				France-IX	France-IX*
				Paris Internet Exchange	PARIX
				POUIX	POUIX
				Service for French Internet Exchange	SFINX*
			Marseille	France-IX	France-IX*
			Saint-Etienne	SainteTiX	SainteTiX
			Toulouse	Le GIX de la grande region Toulousaine	TOUIX
Germany	DE	15			
			Berlin	Berlin Commercial Internet Exchange	BCIX*
				Europen Commercial Internet Exchange	ECIX*
				Deutscher Commercial Internet Exchange	DE-CIX*
			Bremen	Bremen Internet Exchange	BREM-IX
			Düsseldorf	Europen Commercial Internet Exchange	ECIX*
				Nederlands-Duitse Internet Exchange	NDIX
				OpenCarrier e.G. Member IX Dusseldorf	OCIX
			Frankfurt	Deutscher Commercial Internet Exchange	DE-CIX*
				Kleyer Rebstocker EXchange	KleyRex
			Hamburg	Deutscher Commercial Internet Exchange	DE-CIX*
				European Commercial Internet Exchange	ECIX*
			Munich	Deutscher Commercial Internet Exchange	DE-CIX*
				Internet Exchange Point in Munich	INXS
			Munster	Nederlands-Duitse Internet Exchange	NDIX
			Stuttgart	Stuttgarter internet eXchange	S-IX
Greece	GR	2			
			Athens	Athens Internet Exchange	AIX
				Greek Internet Exchange	GR-IX*
Hungary	HU	1			
			Budapest	Budapest Internet eXchange	BIX*
Iceland	IS	1			
			Reykjavik	Reykjavik Internet Exchange	RIX*
Ireland	IE	3			
			Cork	Cork Neutral Internet Exchange	CNIX
			Galway	eXchange West	ExWest
			Dublin	Internet Neutral EXchange	INEX*
Italy	IT	7			
			Udine	Friuli Venezia Giulia Internet eXchange	FVG-IX*
			Milan	Milan Neutral Access Point	MINAP
				Milan Internet eXchange	MIX*
			Rome	Nautilus Mediterranean Exchange Point	NaMeX*
			Florence	Tuscany Internet eXchange	TIX Tuscany*
			Torino	Torino Piemonte Exchange Point	TOP-IX*
			Padova	VSIX Nap del Nord Est	VSIX*
Kazakhstan	KZ	1			
			Almaty	Kazakhstan Traffic Exchange	KAZ-IX

Kosovo	XK	1		
		Prishtina	Kosovo Internet Exchange Point	KOSIX
Latvia	LV	2		
		Riga	Latvian Internet eXchange	LIX
			Santa Monica Internet Local Exchange	SMILE
Liechtenstein	LI	1		
		Eschen	Rheintal IX Internet Exchange	Rheintal IX
Lithuania	LT	1		
		Vilnius	Lithuania Internet Exchange	Litix
Luxembourg	LU	2		
		Luxembourg	Luxembourg Internet eXchange	LIX
		Bettembourg	Luxembourg Commercial Internet Exchange	LU-CIX*
Macedonia		1		
		Skopje	Macedonian Internet Exchange	MatrIX
Malta	MT	1		
		Msida	Malta Internet Exchange	MIX
Moldova	MD	1		
		Chisinau	Internet eXchange Moldova	MD-IX
Netherlands	NL	7		
		Amsterdam	Amsterdam Internet Exchange	AMS-IX*
		The Hague	Netherlands Internet Exchange	NL-ix*
		Leeuwarden	Friese Internet Exchange	FR-IX
		Groningen	Groningen Internet Exchange	GN-IX*
		Enschede	Nederlands-Duitse Internet Exchange	NDIX
		Rotterdam	Rotterdam Internet Exchange	R-iX
		Emmen	Zuid Oost Drentse Internet eXchange	ZOD-IX
Norway	NO	7		
		Bergen	Bergen Internet Exchange	BIX
		Oslo	Free Internet eXchange Oslo	FIXO
			Norwegian Internet eXchange	NIX1*
			Norwegian Internet eXchange	NIX2*
		Stavanger	Stavanger Internet Exchange	SIX
		Tromsø	Tromsø Internet Exchange	TIX
		Trondheim	Trondheim Internet Exchange	TRDIX
Poland	PL	9		
		Lodz	Lodz Internet Exchange	LIX
			K-IX.PL Project	K-IX
		Poznan	Poznan Internet Exchange	PIX
		Warsaw	Polish Internet Exchange	PLIX*
			Telekomunikacja Polska Internet Exchange	TPIX*
			Warsaw Internet eXchange	WIX
			K-IX.PL Project	K-IX
		Katowice	K-IX.PL Project	K-IX
		Gdansk	K-IX.PL Project	K-IX
Portugal	PT	2		
		Lisbon	GIGAbit Portuguese Internet eXchange	GIGAPIX*
		Oporto	GIGAbit Portuguese Internet eXchange OPorto	GigaPix Oporto

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Romania	RO	6			
			Bucharest	InterLAN IX	InterLAN*
				Romanian Network for Internet eXchange	RoNIX
			Galati	Balcans Internet Exchange	Balcan-IX
			Bacau	Balcans Internet Exchange	Balcan-IX
			Iasi	Balcans Internet Exchange	Balcan-IX
			Timisoara	Balcans Internet Exchange	Balcan-IX
Russia	RU	16			
			Chelyabinsk	Chelyabinsk Peering Point	CHEL-PP
			Ekaterinburg	Ekaterinburg Internet Exchange	EKT-IX
			Nizhny Novgorod	IX of Nizhny Novgorod	IX-NN
			Krasnoyarsk	Krasnoyarsk Internet Exchange	KRS-IX
			Kazan	Kazan Internet Exchange	KZN-IX
			Moscow	Moscow Internet Exchange	MSK-IX*
			Novosibirsk	Novosibirsk Internet eXchange	NSK-IX
			Perm	Perm Internet Exchange	PERM-IX
			Rostov on Don	Rostov on Don Internet Exchange	RND-IX
			Samara	SAMARA-IX	SMR-IX
			St. Petersburg	St. Petersburg Internet eXchange	SPB-IX
				DataIX	DataIX
			Stavropol	Stavropol Internet eXchange	STW-IX
			Ulyanovsk	Ulyanovsk Internet Exchange	ULN-IX
			Ekaterinburg	Ural-IX	Ural-IX
			Vladivostok	Vladivostok Internet Exchange	VLV-IX
Serbia	RS	1			
			Belgrade	Serbian Open eXchange	SOX
Slovakia	SK	3			
			Bratislava	Slovak Internet eXchange- Bratislava	SIX
				Sitel Internet eXchange	Sitelix
			Kosice	Slovak Internet eXchange- Kosice	SIX
Slovenia	SI	1			
			Ljubljana	Slovenian Internet Exchange	SIX*
Spain	ES	5			
			Barcelona	Catalunya Neutral Internet Exchange	CATNIX*
			Madrid	Espana Internet Exchange	ESPANIX
				Madrid Internet Exchange	MAD-IX
				Terremark NAP de las Madrid	Terremark NAP
			Bilboa	Punto neutro Vasco de Internet	EuskoNIX

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Sweden	SE	12			
			Gothenburg	Gothenburg Internet Exchange	GIX
				Internet Exchange i Sverige	Netnod*
			Malmoe	Internet eXchange point of the Oresund Region	IXOR
				Malmoe Internet Exchange	MALMIX
				Internet Exchange i Sverige	Netnod*
			Lulea	Internet Exchange i Sverige	Netnod*
			Umea	NorrNod	NorrNod
			Gavle	Regional Internet Exchange Gästrikland-Hälsingland	RIX-GH
			Stockholm	Stockholm Internet Exchange	STHIX
				SOLIX	SOLIX
				Internet Exchange i Sverige	Netnod*
			Sundsvall	Internet Exchange i Sverige	Netnod*
Switzerland	CH	7			
			Geneva	CERN Internet eXchange Point	CIXP*
			Zurich	Equinix-Switzerland	Equinix*
				Swiss Internet Exchange	SwissIX*
			Bern	Swiss Internet Exchange	SwissIX*
			Pratteln	Swiss Internet Exchange	SwissIX*
			Glattbrugg	Swiss Internet Exchange	SwissIX*
			Basel	Swiss Internet Exchange	SwissIX*
Turkey	TR	1			
			Istanbul	Terremark Istanbul	ISTIX
Ukraine	UA	7			
			Simferopol	Crimea-IX	Crimea-IX
			Donetsk	Donetsk Internet Exchange	DN-IX
			Kharkov	Kharkov Internet Exchange	KH-IX
			Khmelnytskiy	Khmelnytsky traffic exchange network	KM-IX
			Kiev	Ukrainian Internet Exchange	UA-IX*
				Giganet (formelry Od-IX Odessa)	Giganet
				Digital Telecom Internet Exchange	DTEL-IX
United Kingdom	GB	7			
			Leeds	IX Leeds	IXLeeds*
			London	London Internet Exchange	LINX*
				London Network Access Point	LONAP*
				Packet Exchange	Packet Exchange
			Manchester	NWIX Edge	Edge-IX
				IX Manchester	IXManchester
			Edinburgh	IXScotland	IXScotland

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