European Internet Exchange Association

2012 Report on European IXPs

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http://www.euro-ix.net

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Section 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 2012:

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

The Euro-IX Board has decided to carry out a thorough review of the report, in view of its content and to adapt it optimally to its readership. In particular, a task force has been set up to collect data as automatically as possible. The work of the task force is continuing and consequently, the report for 2012 is different from previous years.

1.2 Notes on this report

i.   *Not all European IXPs make 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 2011 report have not been included in the 2012 report 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 2012 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 100 of the 146 listed IXPs. *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 network infrastructure with the purpose to facilitate the exchange of Internet traffic between Autonomous Systems and operating below layer 3. *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 co-ordinate 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 of 2005 the association decided to open its doors to IXPs from outside of Europe and this saw the introduction of allowing non-European based IXPs to join Euro-IX 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.

Only IXPs in the Euro-IX region (see map, light blue area) can become Standard Members (Members with voting rights), the other member types apply to any region in the world.

By the end of 2012, Euro-IX counted 66 members from the IXP community and 11 Patrons from the IXP-related equipment-vendor and colocation sectors of the community.

The 66 member IXPs are from 40 countries and the affiliations are as follows:

Standard Members: 41 (from 25 European countries)
Associate Members: 9 (from 6 non-European countries: Brazil, Curacao, Egypt, Japan, India and the United States)
Remote Members: 16 (8 from 5 European countries: Germany, Finland, Italy, Luxembourg and Ukraine and 8 from 8 non-European countries: United States of America, Iceland, Kenya, Nepal, Nigeria, Tanzania, Mozambique and South Africa)

1.5 List of Euro-IX affiliates

1.5.1 Euro-IX Standard Member IXPs

Member	City	Country
ALB-IX	Tirana	Albania
AMS-IX	Amsterdam	The 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	4 Cities	Germany
DIX	Lyngby	Denmark
ECIX	3 Cities	Germany
Equinix	Zurich	Switzerland
FICIX	3 Cities	Finland
France-IX	Paris	France
GigaPIX	Lisbon	Portugal
GN-IX	Groningen	The Netherlands
GR-IX	Athens	Greece
INEX	Dublin	Ireland
InterLAN	Bucharest	Romania
IXLeeds	Leeds	United Kingdom
LINX	London	United Kingdom
LONAP	London	United Kingdom
Lyonix	Lyon	France
MIX	Milan	Italy
MSK-IX	Moscow	Russia
NaMeX	Rome	Italy
Netnod	5 cities	Sweden
NIX	5 Cities	Norway
NIX.CZ	Prague	Czech Republic
NL-ix	19 Cities	The Netherlands
PacketExchange	26 Cities	Europe and United States
PLIX	Warsaw	Poland
RoNIX	Bucharest	Romania
SFINX	Paris	France
SIX	Ljubljana	Slovenia
SwissIX	5 cities	Switzerland
TIX-Tuscany	Florence	Italy
TOP-IX	Torino	Italy
VIX	Vienna	Austria
VSIX	Padova	Italy

1.5.2 Euro-IX Associate Member IXPs

Associate Member	City	Country
BBIX	6 Cities	Japan
CAR-IX	Willemstad	Curaçao
JPIX	4 Cities	Japan
JPNAP	3 Cities	Japan
MEIX	Cairo	Egypt
NIXI	10 Cities	India
NOTA/Terremark	Miami	United States
PTT.br	16 Cities	Brazil
Telx	4 Cities	United States

1.5.3 Euro-IX Remote Member IXPs, Europe

Remote Member	City	Country
DE-CIX Dusseldorf	Dusseldorf	Germany
DE-CIX Hamburg	Hamburg	Germany
DE-CIX Munich	Munich	Germany
FVG-IX	Udine	Italy
LU-CIX	Bettembourg	Luxembourg
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	11 Cities	United States
IXPN	Lagos	Nigeria
JINX	Johannesburg	South Africa
KIXP	Nairobi	Kenya
MOSIX	Maputo	Mozambique
NPIX-Kathmandu	Kathmandu	Nepal
RIX	Reykjavik	Iceland
TIX-Tanzania	Dar es Salaam	Tanzania

1.5.5 Euro-IX Patrons

Patron	City	Country
ADVA	Amsterdam	The Netherlands
Brocade	Amsterdam	The Netherlands
Cisco Systems	San Jose	United States
Extreme Networks	Amsterdam	The Netherlands
DELL	London	United Kingdom
Interxion	Amsterdam	The Netherlands
Juniper Networks	San Jose	United States
MRV	Amsterdam	The Netherlands
TelecityGroup	London	United Kingdom
Telehouse	London	United Kingdom
Transmode	Stockholm	Sweden

1.6 Participants distribution at Euro-IX member IXPs

The chart below shows the distribution of participants (customers, members) at Euro-IX IXPs. The number of participants at IXPs varies between 7 and nearly 600. The largest share of IXPs, namely 43%, have between 3 and 40 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)
e.g., 43% of IXPs have 3 - 40 members
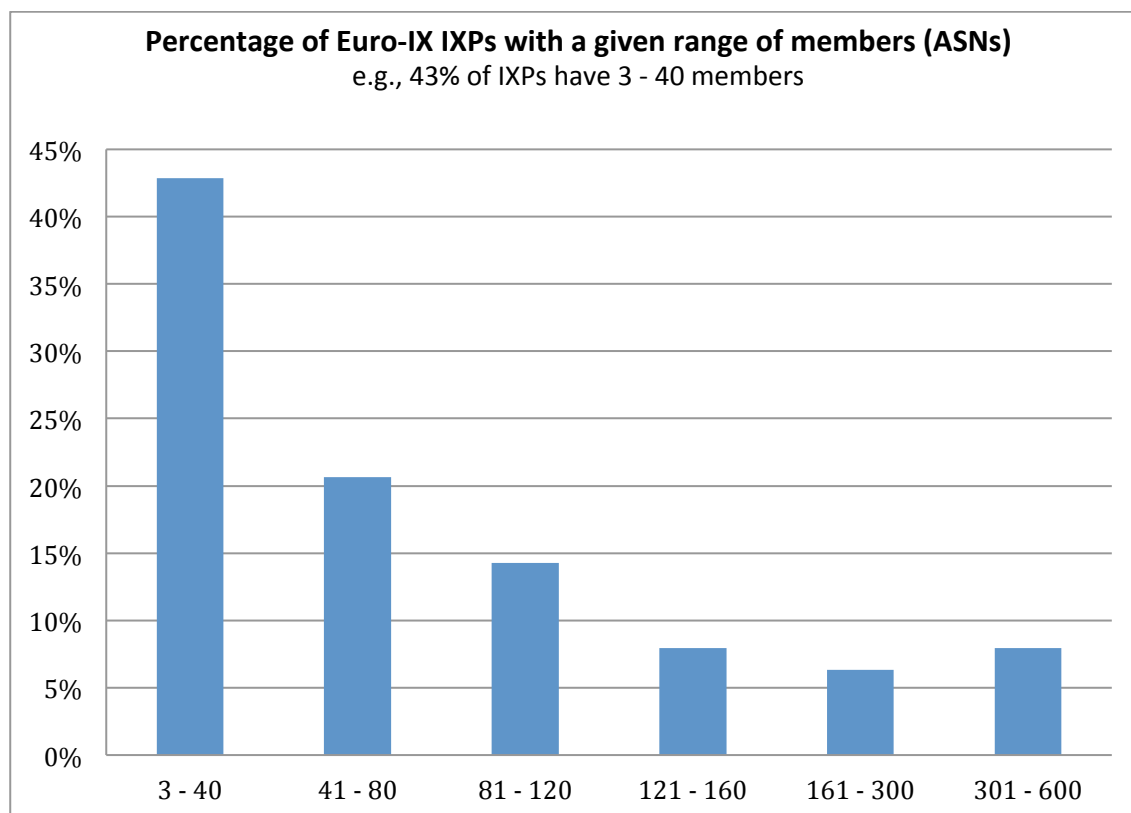
1.7 Evolution since 2007

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 this data was captured during a 12-month period (January through to December). The aggregated peak traffic therefore is the peak traffic that was recorded during the 12-month period.

Evolution since 2007	Data Source	2007	2008	2009	2010	2011	2012
Number of countries in Europe with IXPs	*Euro-IX and Wikipedia*	31	31	33	35	35	39
Known operating IXPs in these Cities in Europe	*Euro-IX and Wikipedia*	116	116	121	127	144	146
Aggregated peak IXP traffic within the Euro-IX membership [Gbps]	*Gathered monthly from known IXPs published traffic statistics*	971	1,521	2,454	4,100	5,965	8,652

Section 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 three-year period between 2001 and 2003 saw the growth of some 45 IXPs in Europe. The table shows that the sector continues to grow, but at a lower rate.

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

Source: Euro-IX, peeringdb and Wikipedia

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
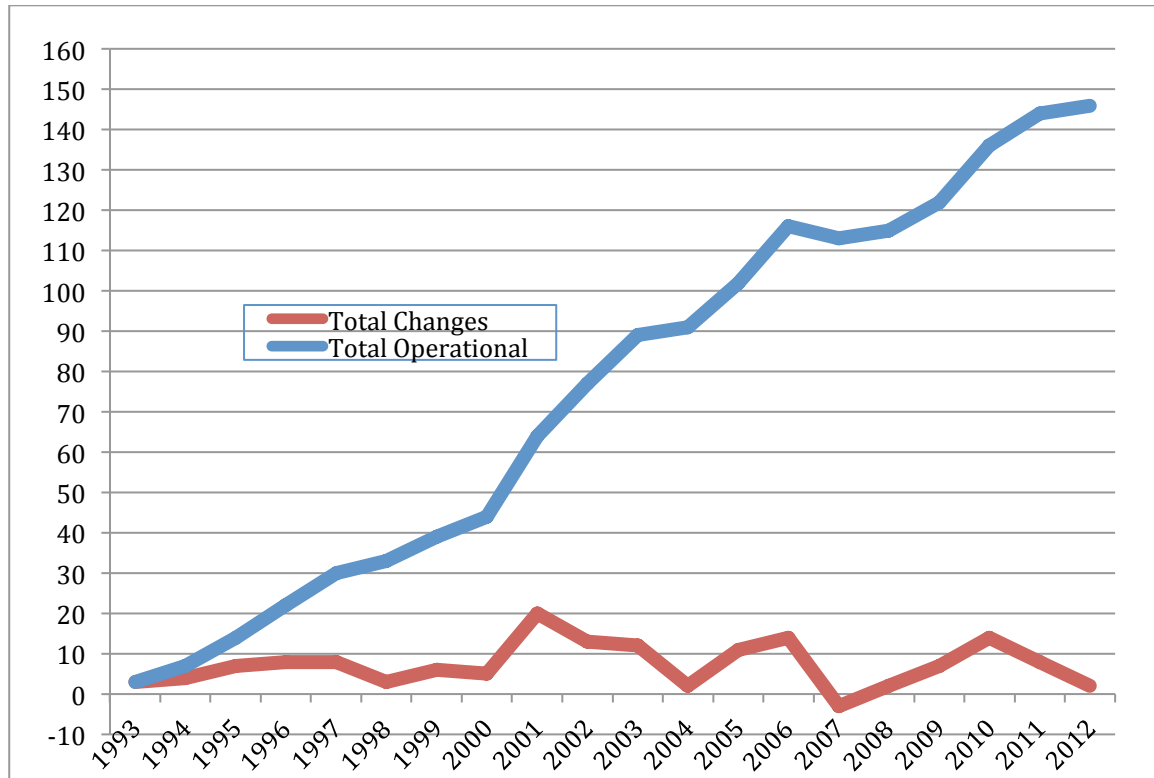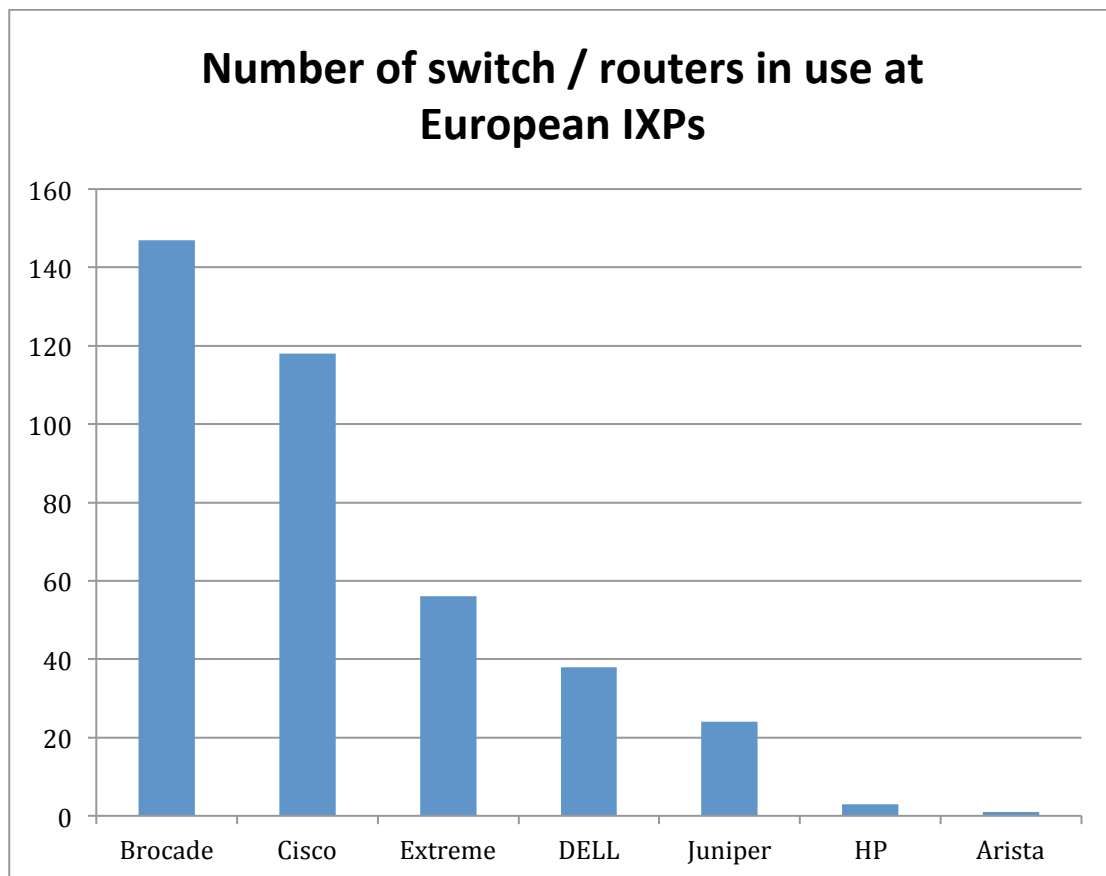
Section 3. IXP Switching Platform Technology

3.1 Switches in use at Euro-IX Member IXPs

This graph displays the number of switches and/or routers being used by 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

Vendor	Count
Brocade	147
Cisco	118
Extreme	56
DELL	38
Juniper	24
HP	3
Arista	1

3.2 Market Share of switch/router vendors among Euro-IX Member IXPs

This chart shows the percentage of switch/router vendors deployed at European IXP

Market share of switch/router vendors among European IXPs [%]
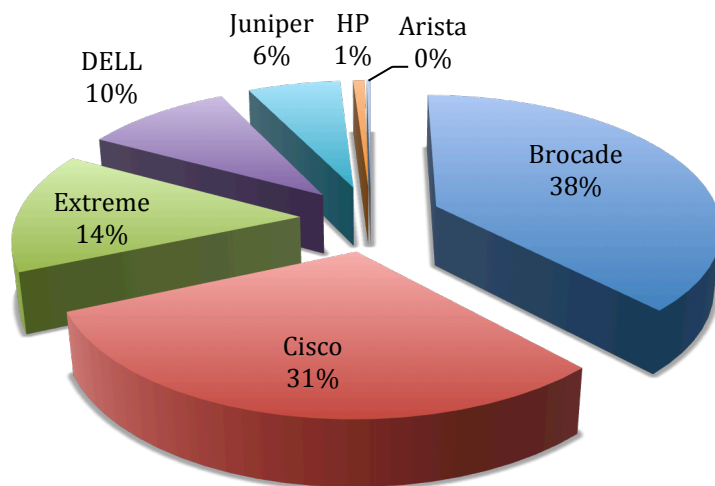
3.3 Route Server daemons in use at Euro-IX member IXPs

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.

Forty European Euro-IX IXPs have entered information in this database. There are 70 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.

Daemon	Number	Percentage
BIRD	32	46%
Cisco	8	11%
OpenBGPD	12	17%
Other	1	1%
Quagga	17	24%

Route server daemons in use [%]

Quagga 24%

Other 2%

OpenBGPD 17%

Cisco 11%

BIRD 46%
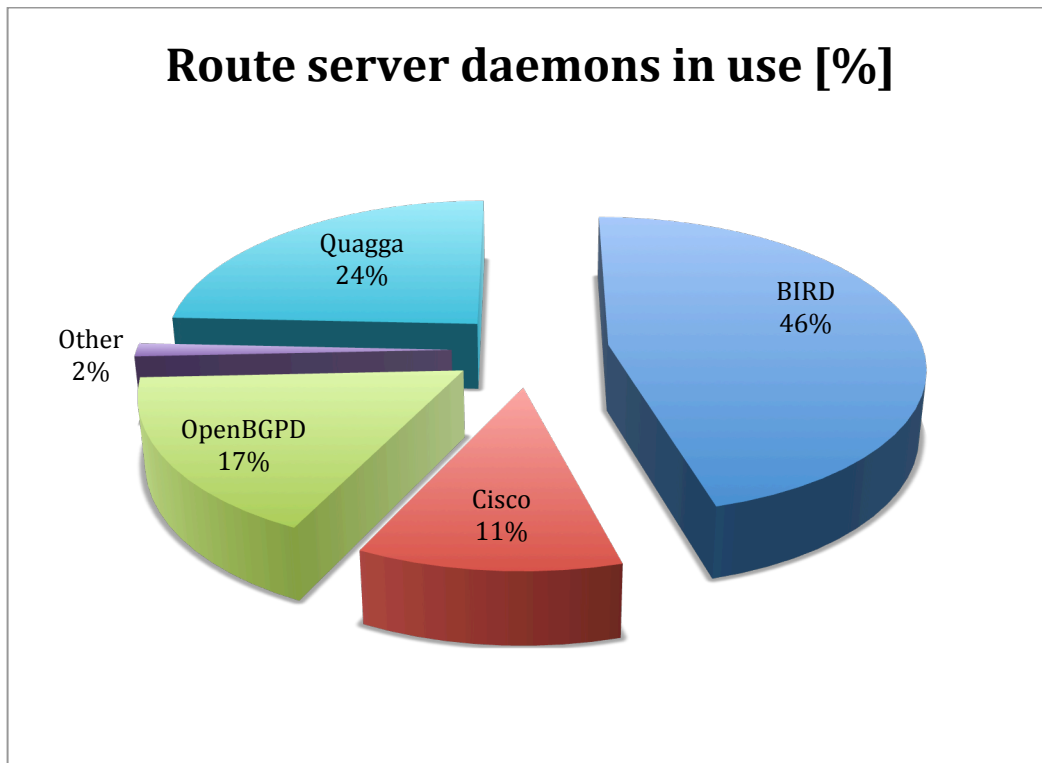
3.4 Route Server operating systems in use at Euro-IX member IXPs

The table and the chart on this page show the use of route-server operating systems

OS	Number	Percentage
Cisco IOS	8	11%
Debian/Linux	22	31%
Fedora	1	1%
FreeBSD	14	20%
Gentoo	6	9%
OpenBSD	12	17%
Ubuntu	7	10%

Route server operating systems in use [%]
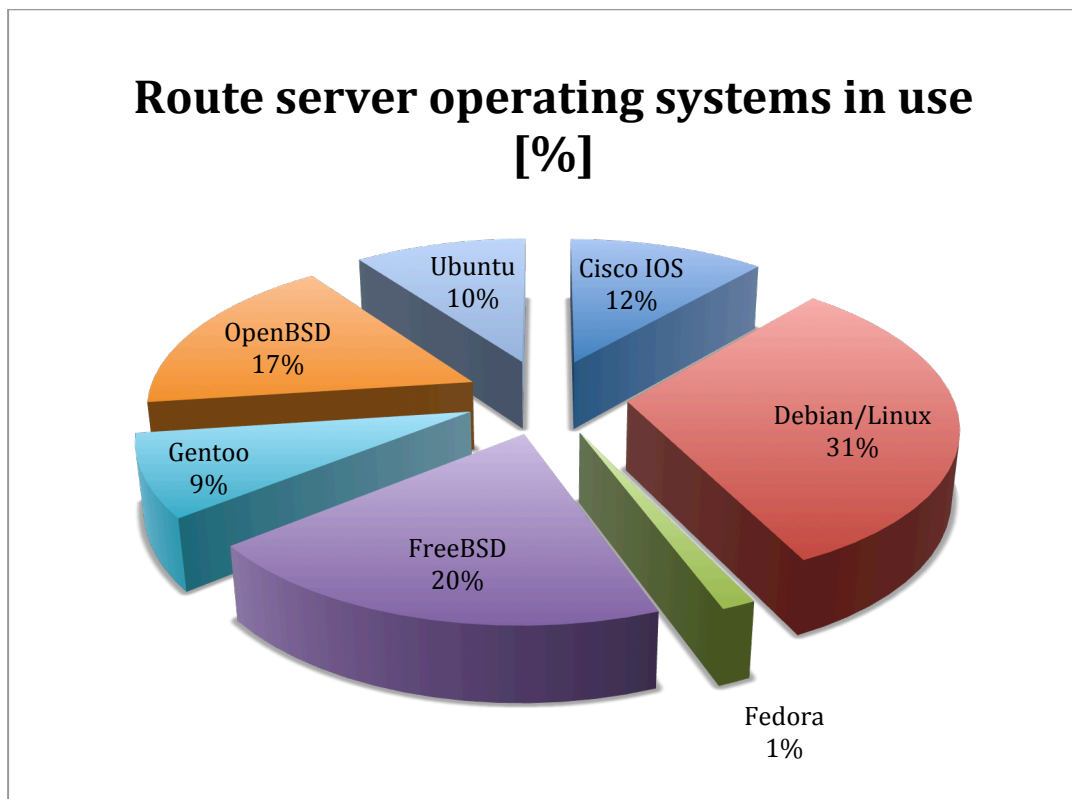
Section 4. Further information

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 66 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 About the author

Bijal Sanghani is Head of the Euro-IX Secretariat; she started in October 2011 and has since been closely involved in working with European Internet Exchange Points. She is in personal and regular contact with more than 100 IXPs and does her best to keep an eye on the rest of the community in Europe and other regions around the world.

4.3 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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APPENDIX – List of known IXPs in the Euro-IX Region

Country	Number of IXPs in country	IXP based in city	Name of IXP	IXP acronym
Albania	**1**			
		Tirana	The Albanian Internet eXchange	**ALB-IX**
Austria	**2**			
		Klagenfurt	Alpes Adria Internet Exchange	**AAIX**
		Vienna	Vienna Internet eXchange	**VIX***
Belarus	**1**			
		Minsk	Belarus National Internet Exchange Point	**BYIX**
Belgium	**2**			
		Brussels	Belgian National Internet Exchange	**BNIX***
			FreeBIX	**FreeBIX**
Bosnia and Herzegovina	**1**			
			Bosnia and Herzegovina Internet Exchange	**BHIX**
Bulgaria	**2**			
		Sofia	Bulgarian Internet Exchange	**BIX.BG***
			Balkan Internet Exchange	**B-IX**
Croatia	**1**			
		Zagreb	Croatian Internet eXchange	**CIX**
Cyprus	**1**			
		Nicosia	Cyprus Internet Exchange	**CyIX**
Czech Republic	**2**			
		Brno	Commercial Brno Internet Exchange	**CBIX**
		Prague	Neutral Internet eXchange of the Czech Republic	**NIX.CZ***
Denmark	**1**			
		Lyngby	Danish Internet eXchange point	**DIX***
Estonia	**2**			
		Tallin	Tallinn Internet eXchange	**TIX**
			Tallinn Internet Exchange	**TLLIX**
Finland	**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	**10**			
		Lyon	Lyonix	**Lyonix***
		Paris	Equinix-France	**Equinix***
			French National Internet Exchange IPv6	**FNIX6**
			France-IX	**France-IX***
			Paris Network Access Point	**PaNAP**
			Paris Internet Exchange	**PARIX**
			POUIX	**POUIX**
			Service for French Internet Exchange	**SFINX***
		Saint-Etienne	SainteTiX	**SainteTiX**
		Toulouse	Le GIX de la grande region Toulousaine	**TOUIX**
Germany	**14**			
		Berlin	Berlin Commercial Internet Exchange	**BCIX**
			Europen Commercial Internet Exchange	**ECIX***
		Düsseldorf	Deutscher Commercial Internet Exchange	**DE-CIX***
			Europen Commercial Internet Exchange	**ECIX***
			Nederlands-Duitse Internet Exchange	**NDIX**
			OpenCarrier e.G. Member IX Duesseldorf	**OCIX**
		Frankfurt	Deutscher Commercial Internet Exchange	**DE-CIX***
			Kleyer Rebstocker EXchange	**KleyRex**
		Hamberg	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**

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Country	Number of IXPs in country	IXP based in city	Name of IXP	IXP acronym
Greece	**2**			
		Athens	Athens Internet Exchange	**AIX**
			Greek Internet Exchange	**GR-IX***
Hungary	**1**			
		Budapest	Budapest Internet eXchange	**BIX***
Iceland	**1**			
		Reykjavik	Reykjavik Internet Exchange	**RIX***
Ireland	**3**			
		Cork	Cork Neutral Internet Exchange	**CNIX**
		Galway	eXchange West	**ExWest**
		Dublin	Internet Neutral EXchange	**INEX***
Italy	**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	**1**			
		Almaty	Kazakhstan Traffic Exchange	**KAZ-IX**
Kosovo	**1**			
		Prishtinë	Kosovo Internet Exchange	**KOSIX**
Latvia	**2**			
		Riga	Latvian Internet eXchange	**LIX**
			Santa Monica Internet Local Exchange	**SMILE**
Liechtenstein	**1**			
		Eschen	Rheintal IX Internet Exchange	**Rheintal IX**
Luxembourg	**2**			
		Luxembourg	Luxembourg Internet eXchange	**LIX**
		Bettembourg	Luxembourg Commercial Internet Exchange	**LU-CIX***
Macedonia	**1**			
		Msida	Macedonia Internet Exchange	**MatrIX**
Malta	**1**			
		Msida	Malta Internet Exchange	**MD-IX**
Netherlands	**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	**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	**8**			
		Lodz	Lodz Internet Exchange	**LIX**
		Poznan	Poznan Internet Exchange	**PIX**
		Warsaw	Polish Internet Exchange	**PLIX***
			Warsaw Internet eXchange	**WIX**
			K-IX.PL Project	**K-IX**
		Lodz	K-IX.PL Project	**K-IX**
		Katowice	K-IX.PL Project	**K-IX**
		Gdansk	K-IX.PL Project	**K-IX**
Portugal	**1**			
		Lisbon	GIGAbit Portuguese Internet eXchange	**GIGAPIX***

Country	Number of IXPs in country	IXP based in city	Name of IXP	IXP acronym
Romania	6			
		Bucharest	InterLAN IX	**InterLAN***
			Romanian Network for Internet eXchange	**RoNIX***
		Galati	Balcans Internet Exchnage	**Balcon-IX**
		Bacau	Balcans Internet Exchange	**Balcon-IX**
		Iasi	Balcans Internet Exchange	**Balcon-IX**
		Timisoara	Balcans Internet Exchange	**Balcon-IX**
Russia	14			
		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**
		Ulyanovsk	Ulyanovsk Internet Exchange	**ULN-IX**
		Ekaterinburg	Ural-IX	**Ural-IX**
		Vladivostok	Vladivostok Internet Exchange	**VLV-IX**
Slovakia	3			
		Bratislava	Slovak Internet eXchange- Bratislava	**SIX**
			Sitel Internet eXchange	**Sitelix**
		Kosice	Slovak Internet eXchange- Kosice	**SIX**
Slovenia	1			
		Ljubljana	Slovenian Internet Exchange	**SIX***
Spain	3			
		Barcelona	Catalunya Neutral Internet Exchange	**CATNIX***
		Madrid	Espana Internet Exchange	**ESPANIX**
		Bilboa	Punto neutro Vasco de Internet	**EuskoNIX**
Sweden	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	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***
Ukraine	5			
		Simferopol	Crimea-IX	**Crimea-IX**
		Kiev	Digital Telecom Internet Exchange	**DTEL-IX**
		Odessa	Odessa Internet Exchange	**Od-IX**
		Kharkov	Kharkov Internet Exchange	**KH-IX**
		Kiev	Ukrainian Internet Exchange	**UA-IX***

Country	Number of IXPs in country	IXP based in city	Name of IXP	IXP acronym
United Kingdom	5			
		Leeds	IX Leeds	**IXLeeds***
		London	London Internet Exchange	**LINX***
			London Network Access Point	**LONAP***
		Manchester	IXManchester	**IXManchester**
			NWIX Edge	**Edge-IX**

Note: * indicates Euro-IX Member