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IMWG

On the connectivity properties of Latin American IXPs

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October 6th 2023



Traffic delivery is a **fundamental** aspect of Internet operations

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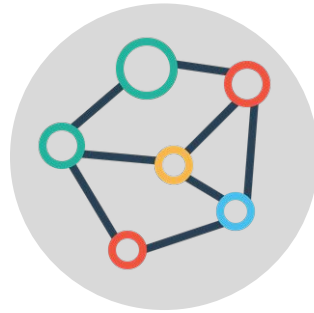


Increasing
traffic volumes

Traffic delivery is a **fundamental** aspect of Internet operations



Increasing
traffic volumes

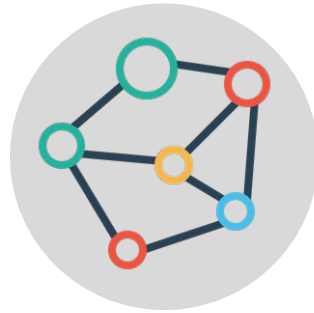


Application
requirements

Traffic delivery is a **fundamental** aspect of Internet operations



Increasing
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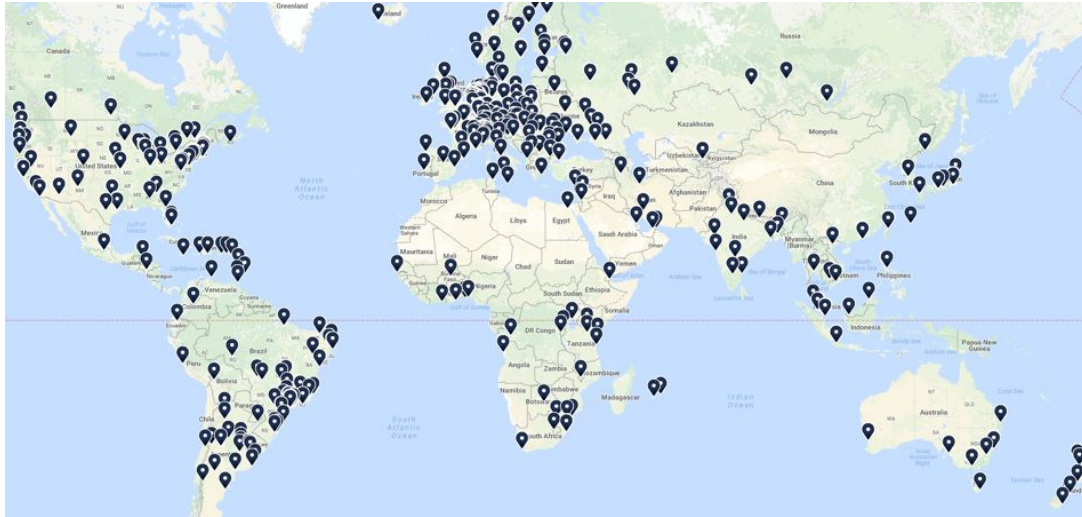
Application
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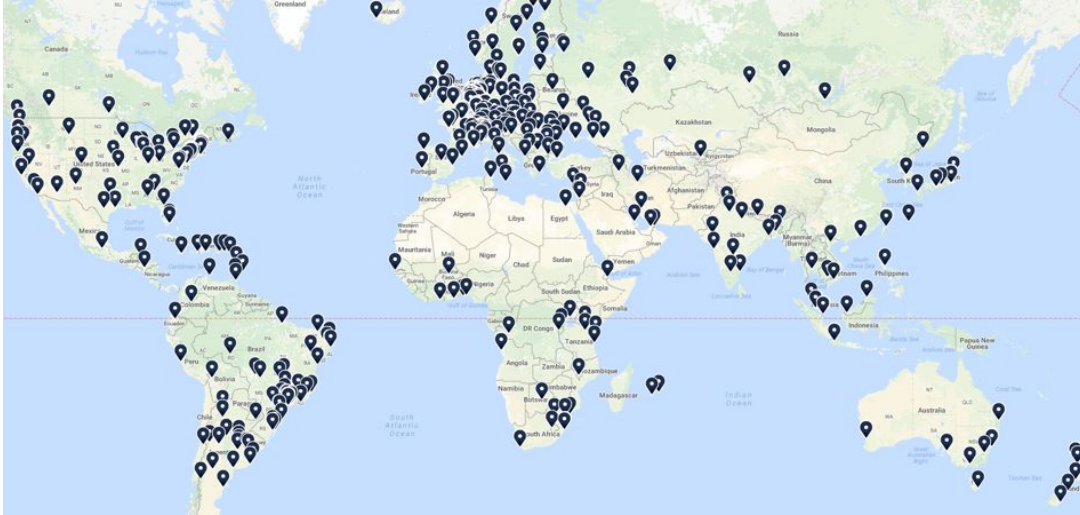
Routing and
interconnection

IXPs are essential elements in this process...

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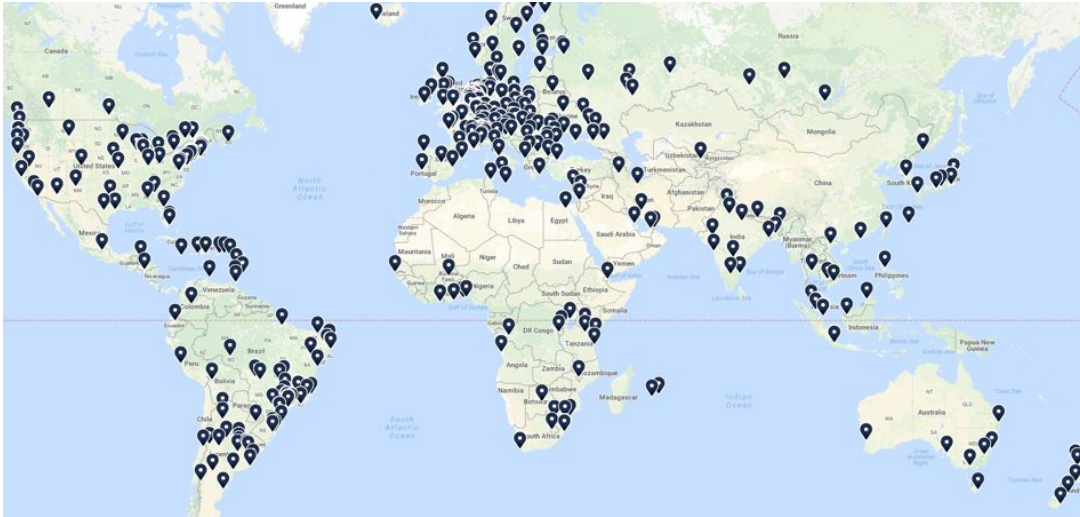


IXPs are essential elements in this process...



+100 IXPs

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+100 IXPs

... and each one offers different opportunities to improve routing and traffic delivery

Our goal is to contribute to the understanding of the connectivity properties in Latin America

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ASes

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ASes



Prefixes

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ASes



Prefixes



Geographical
coverage

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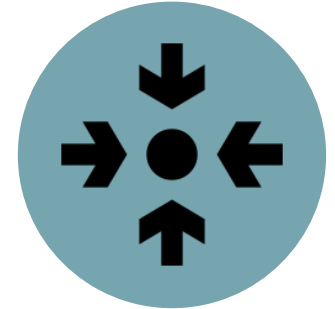
ASes



Prefixes



Geographical
coverage



Traffic
engineering

Before going deep, some details



Before going deep, some details



São Paulo
Fortaleza

Before going deep, some details



Before going deep, some details

ix.br São Paulo
Fortaleza

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Internet

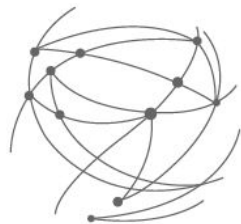


PITCHILE
HUB DE LATINOAMERICA

Before going deep, some details

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Data collected on
September 16th 2023

Before going deep, some details



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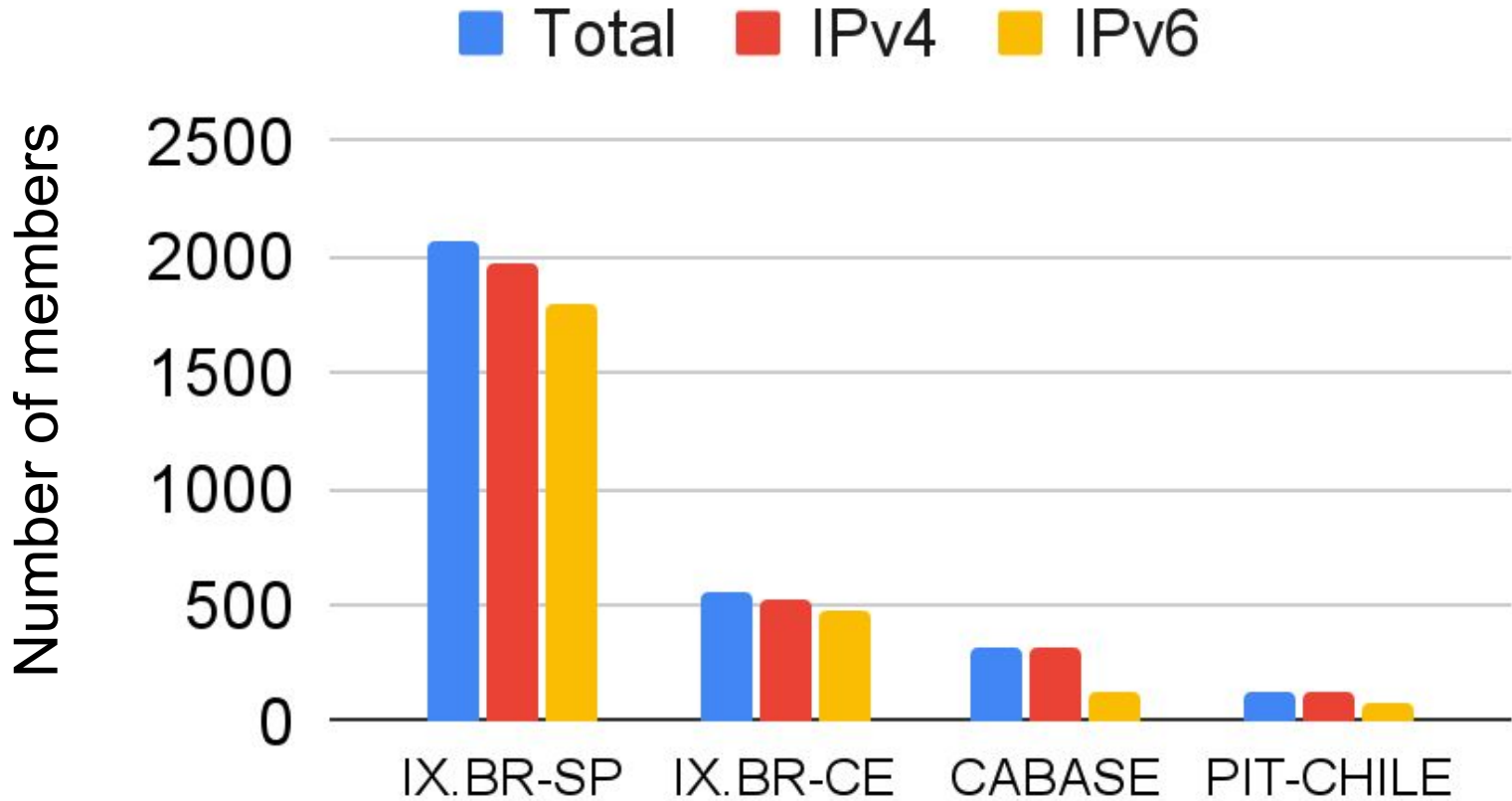


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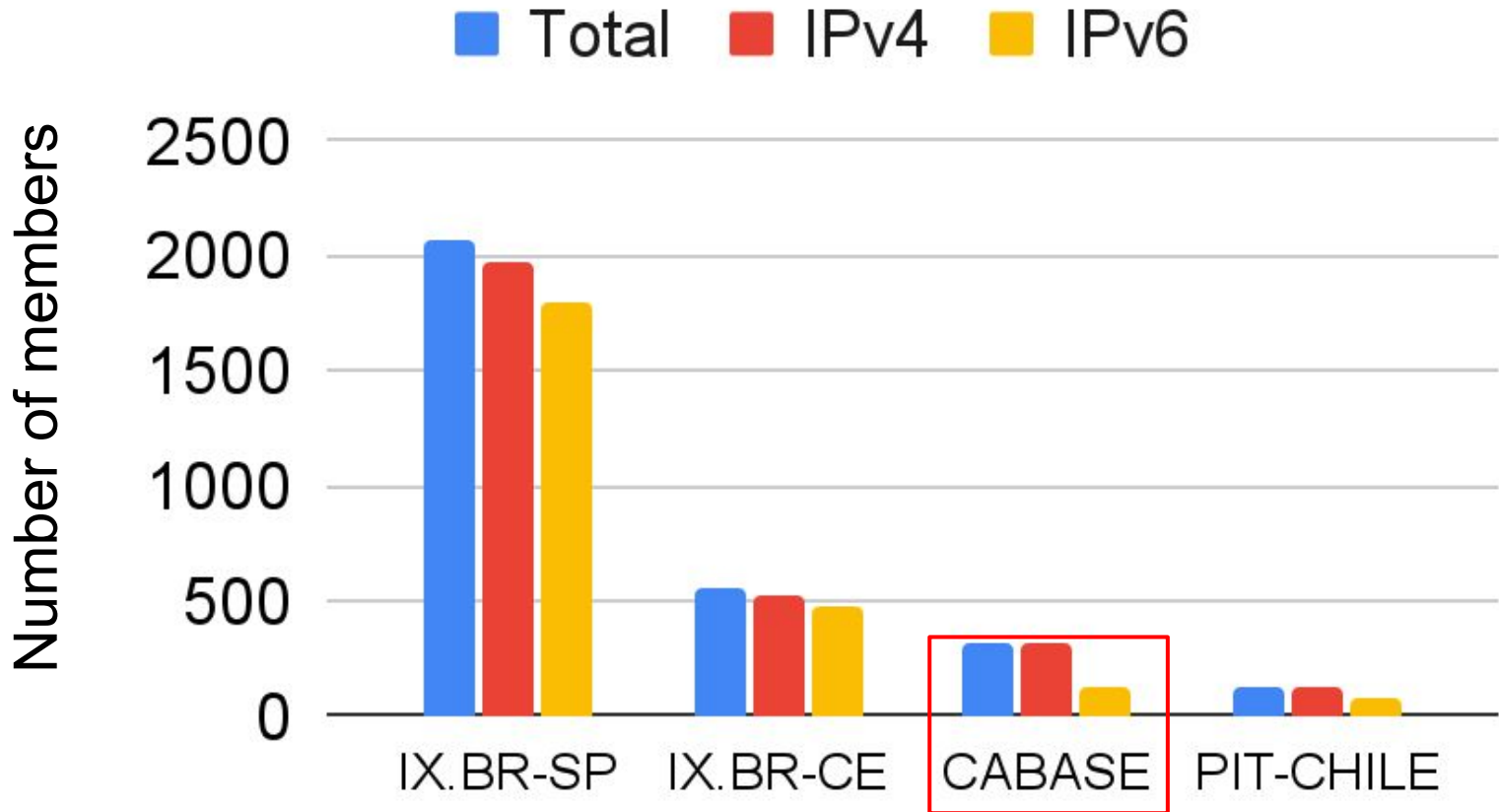
About members and their locations



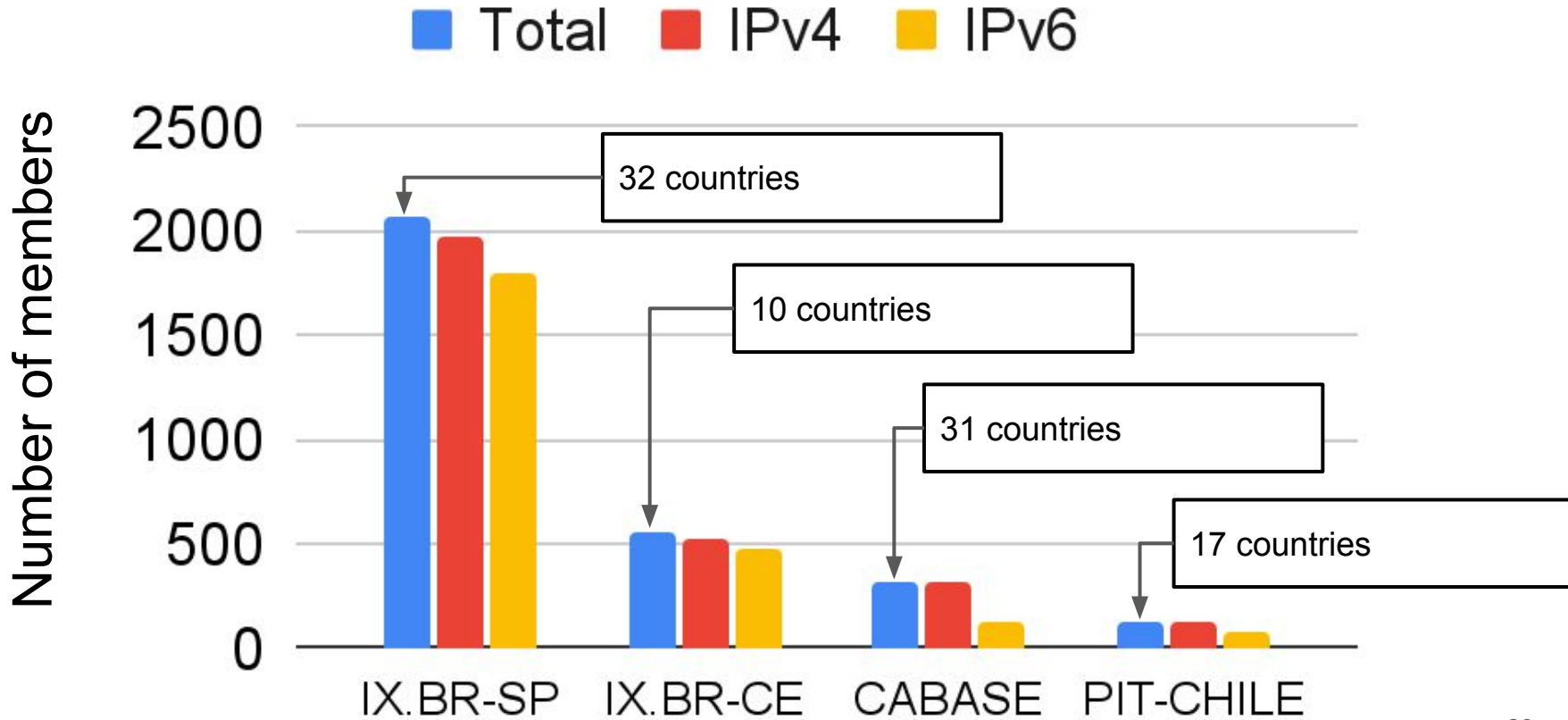
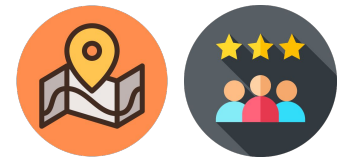
Members and their countries



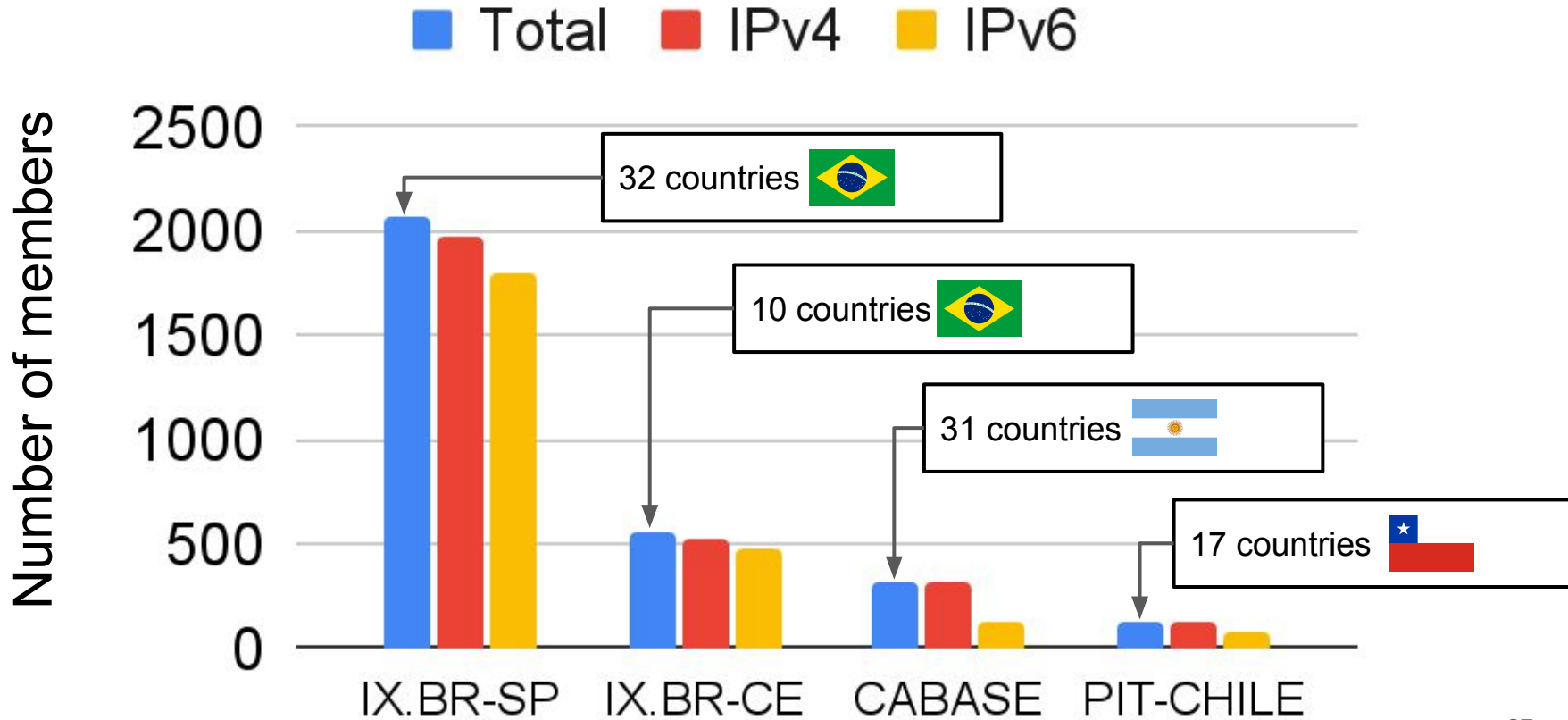
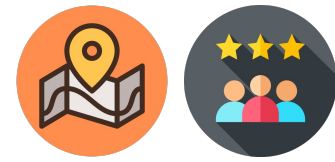
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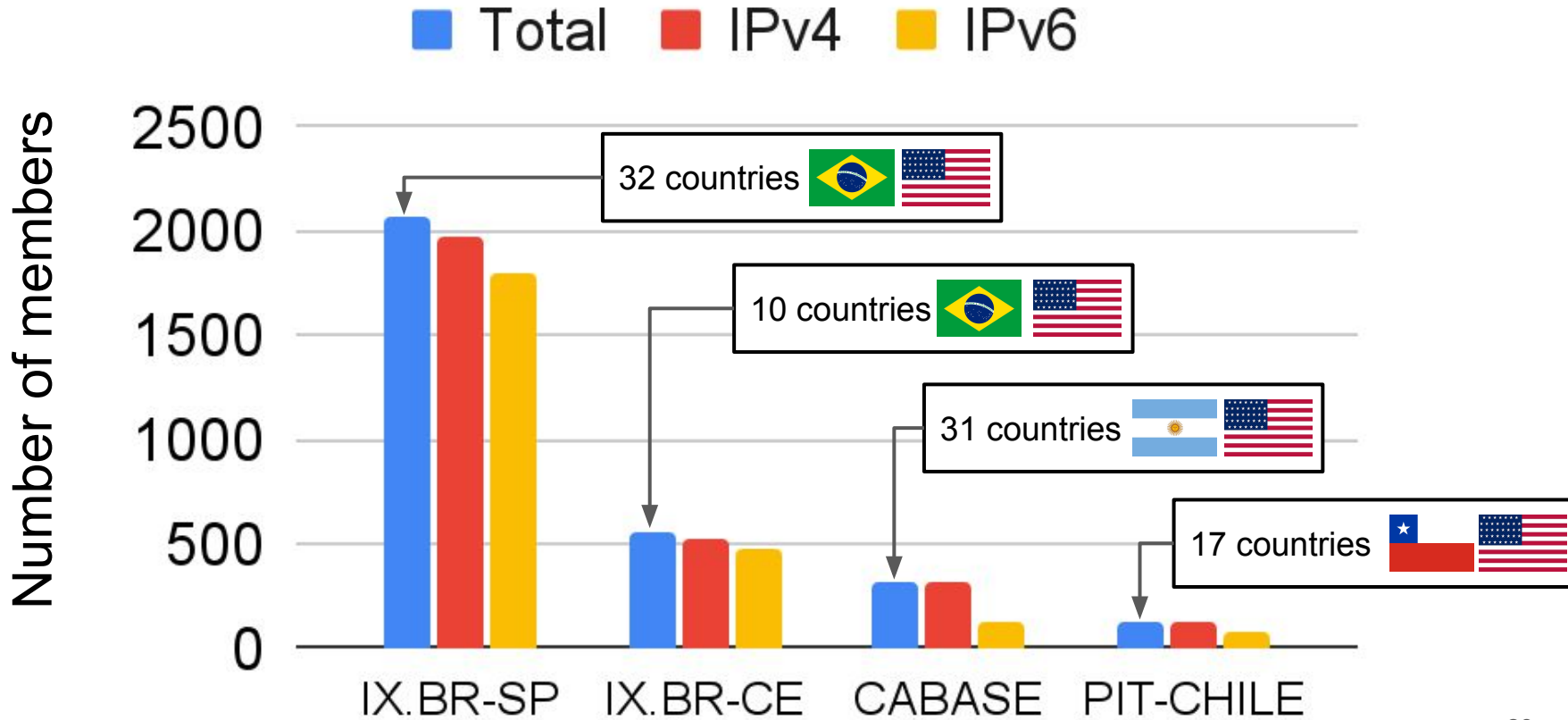
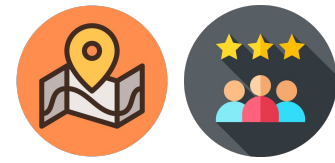
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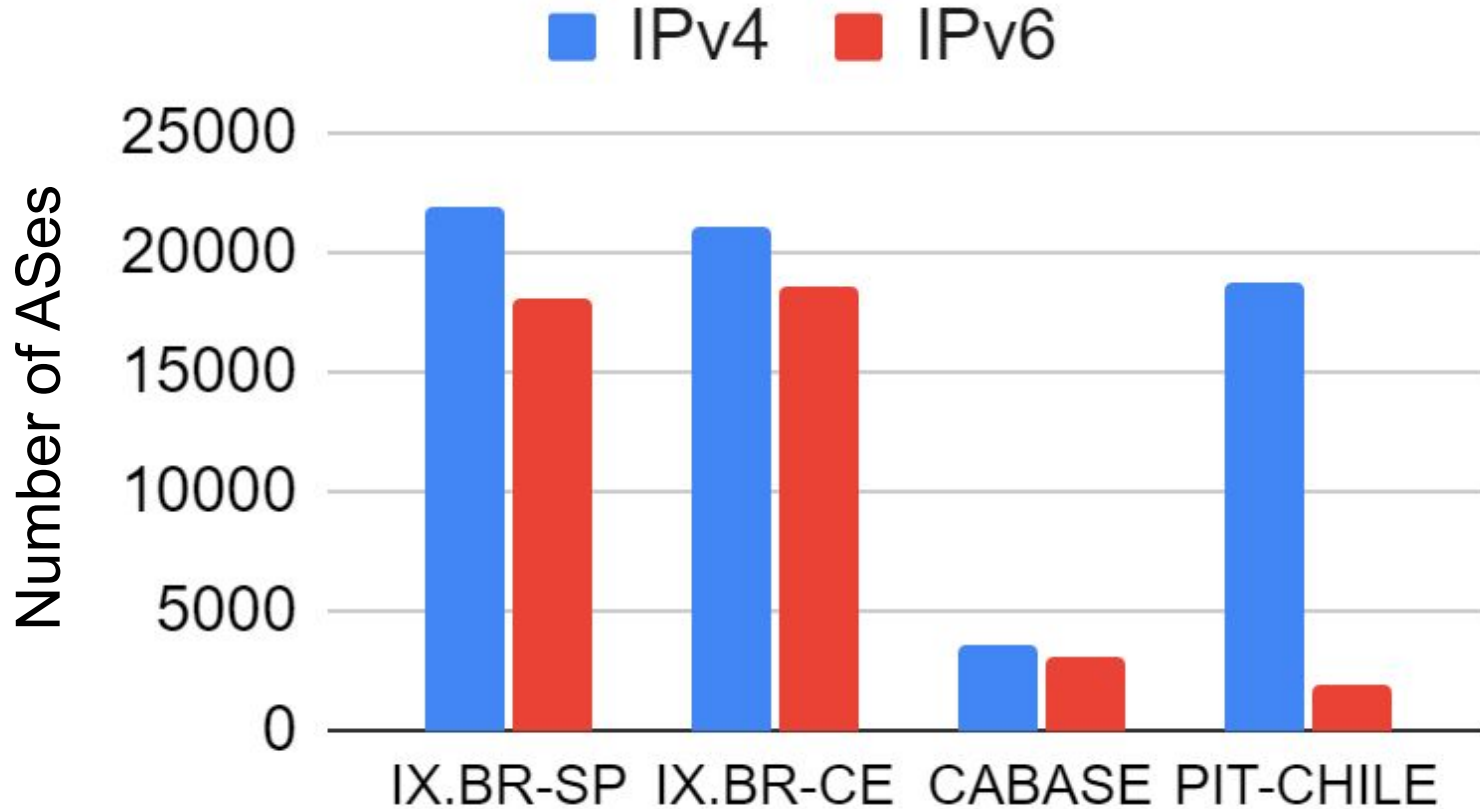


Reachable ASes through the IXPs



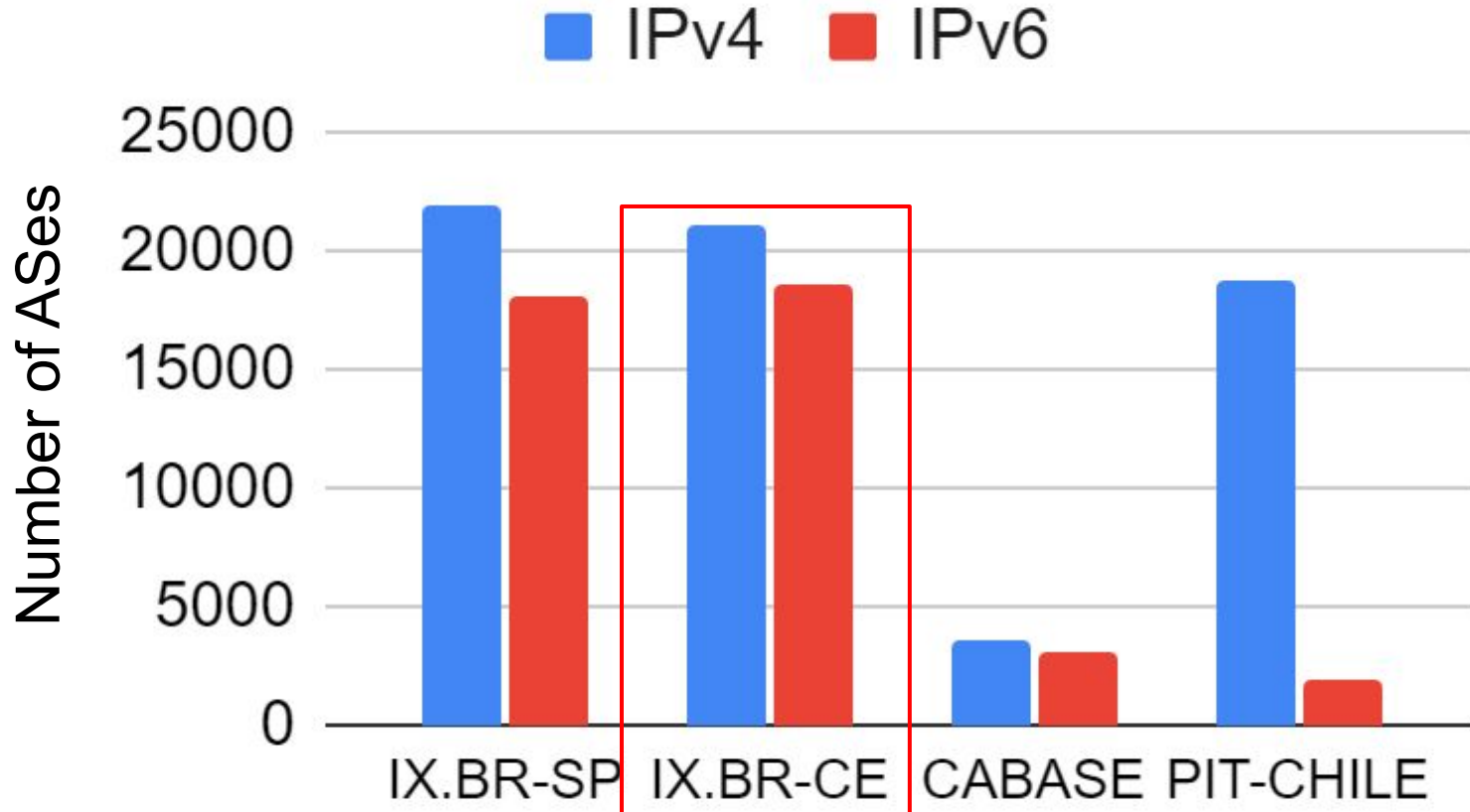


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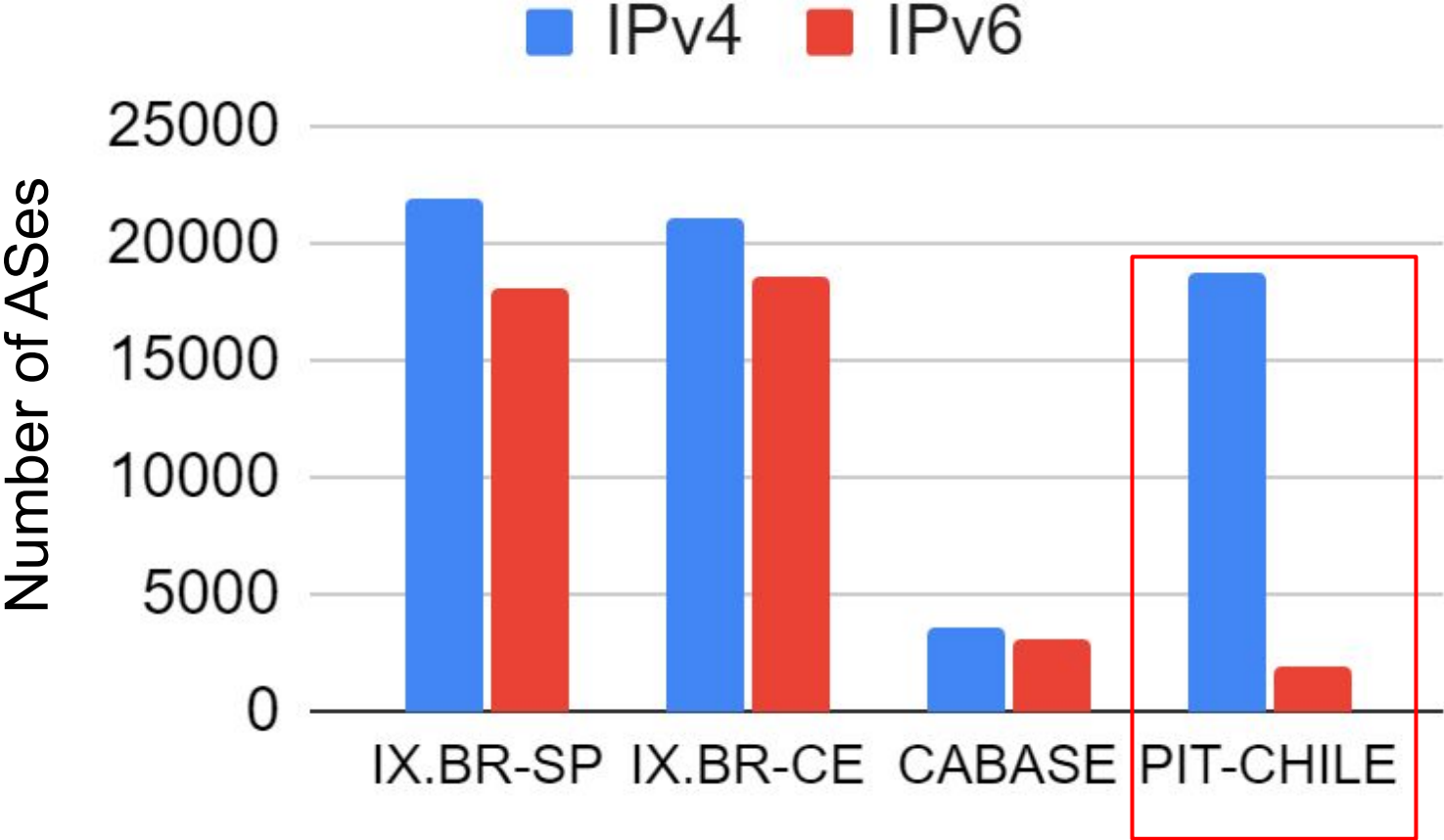


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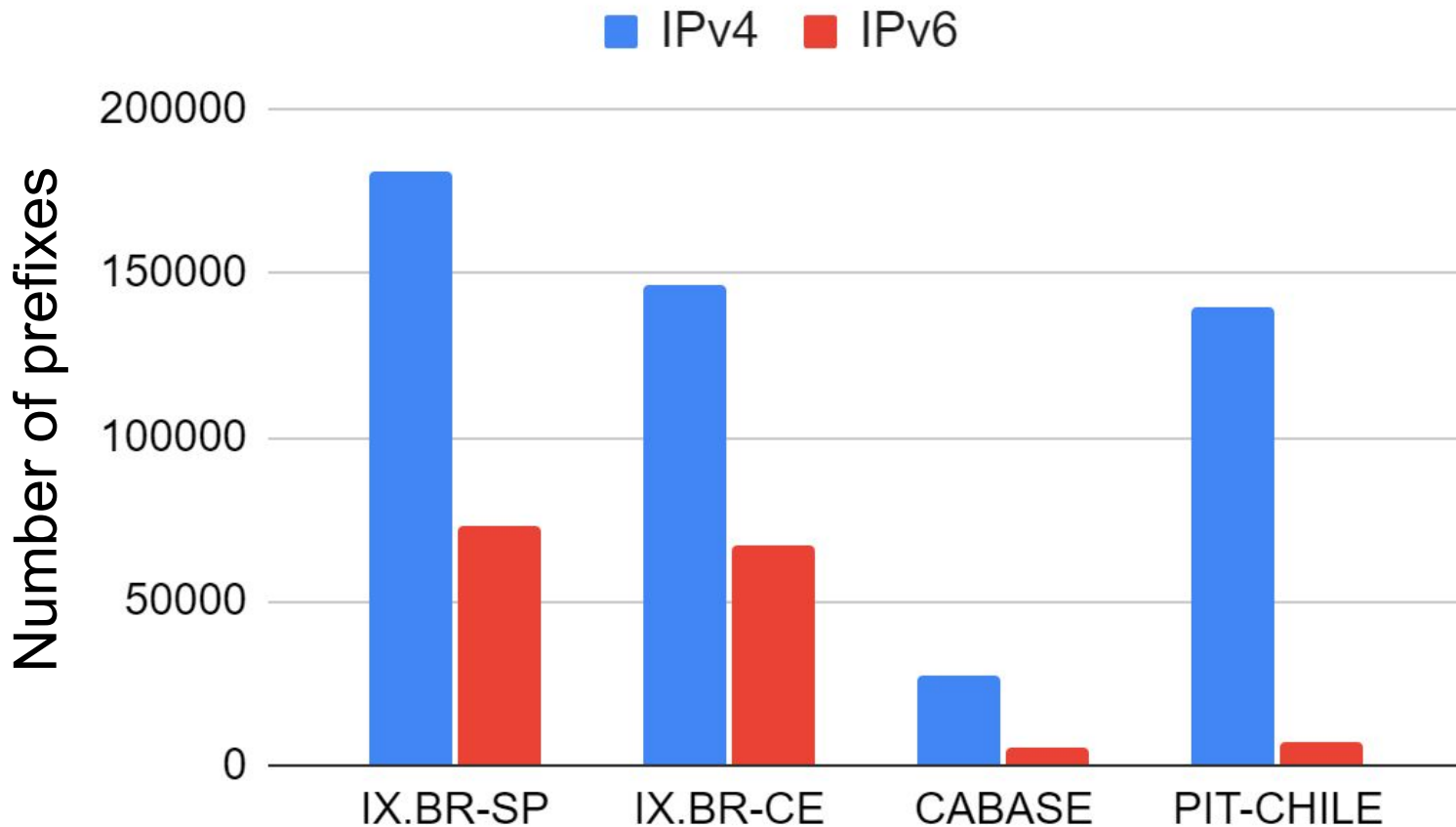
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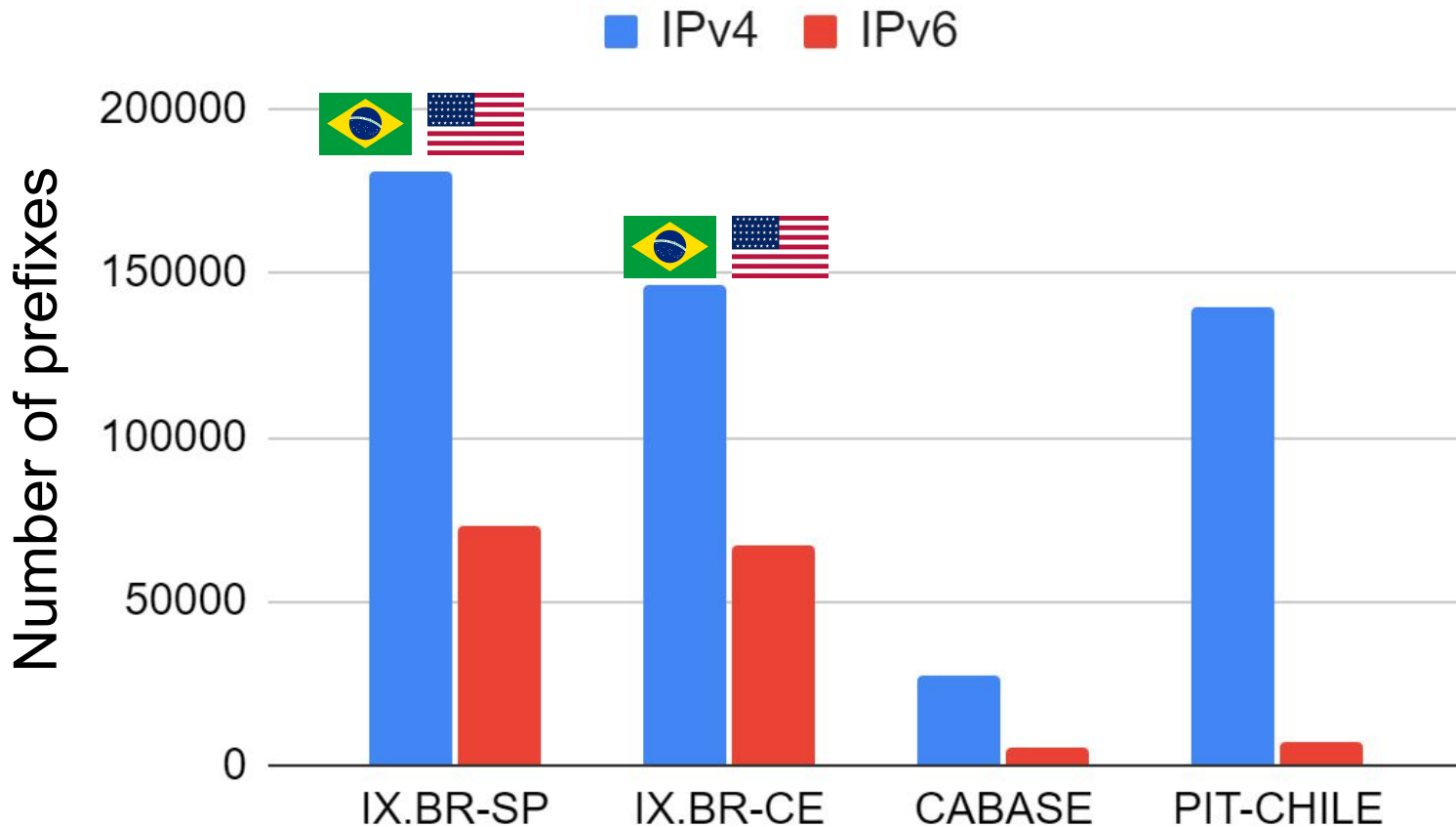
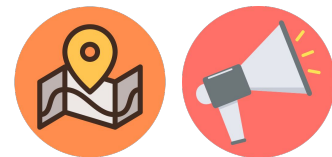
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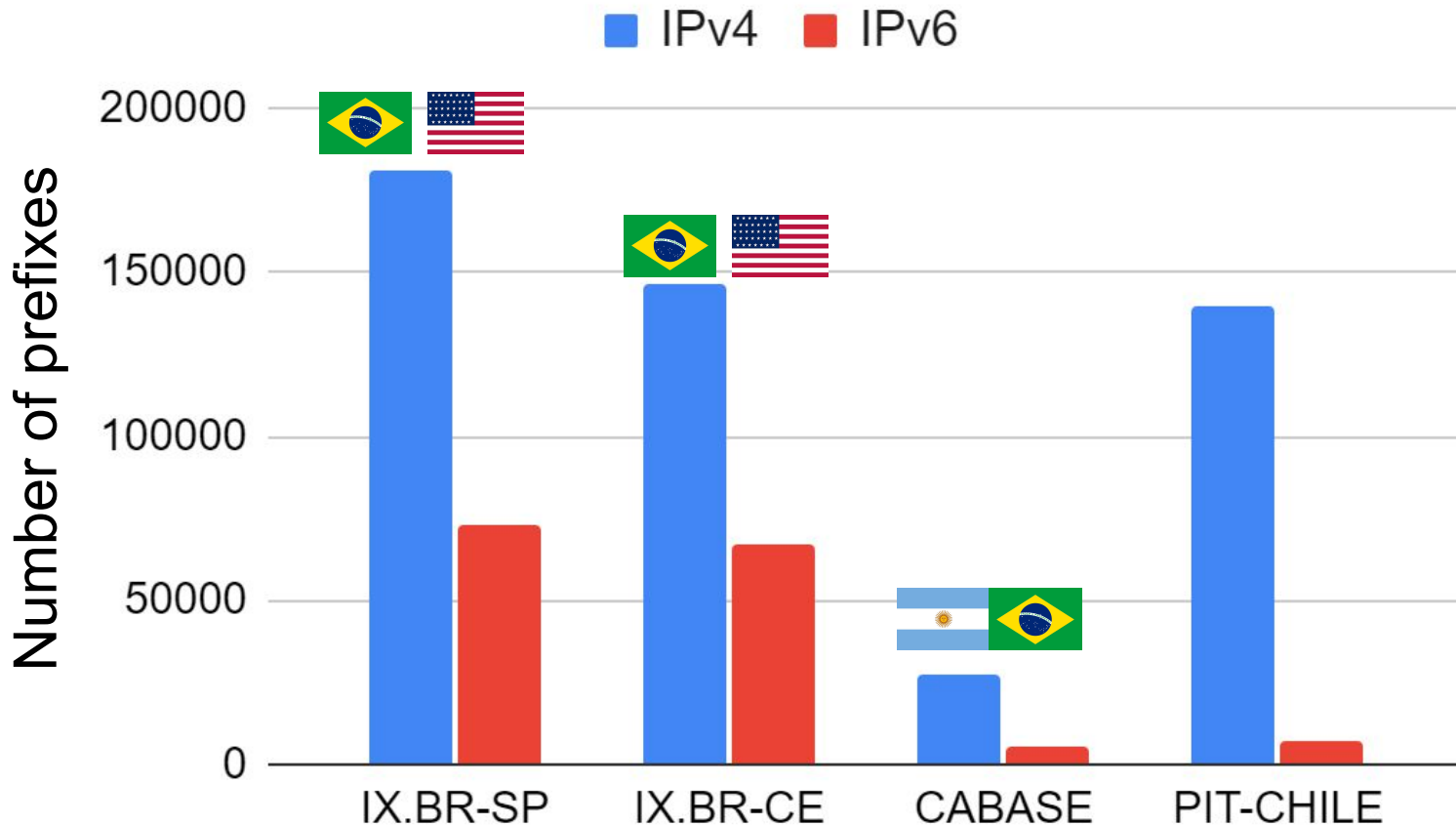
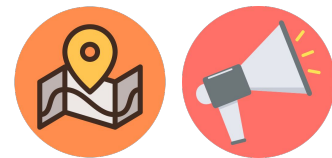
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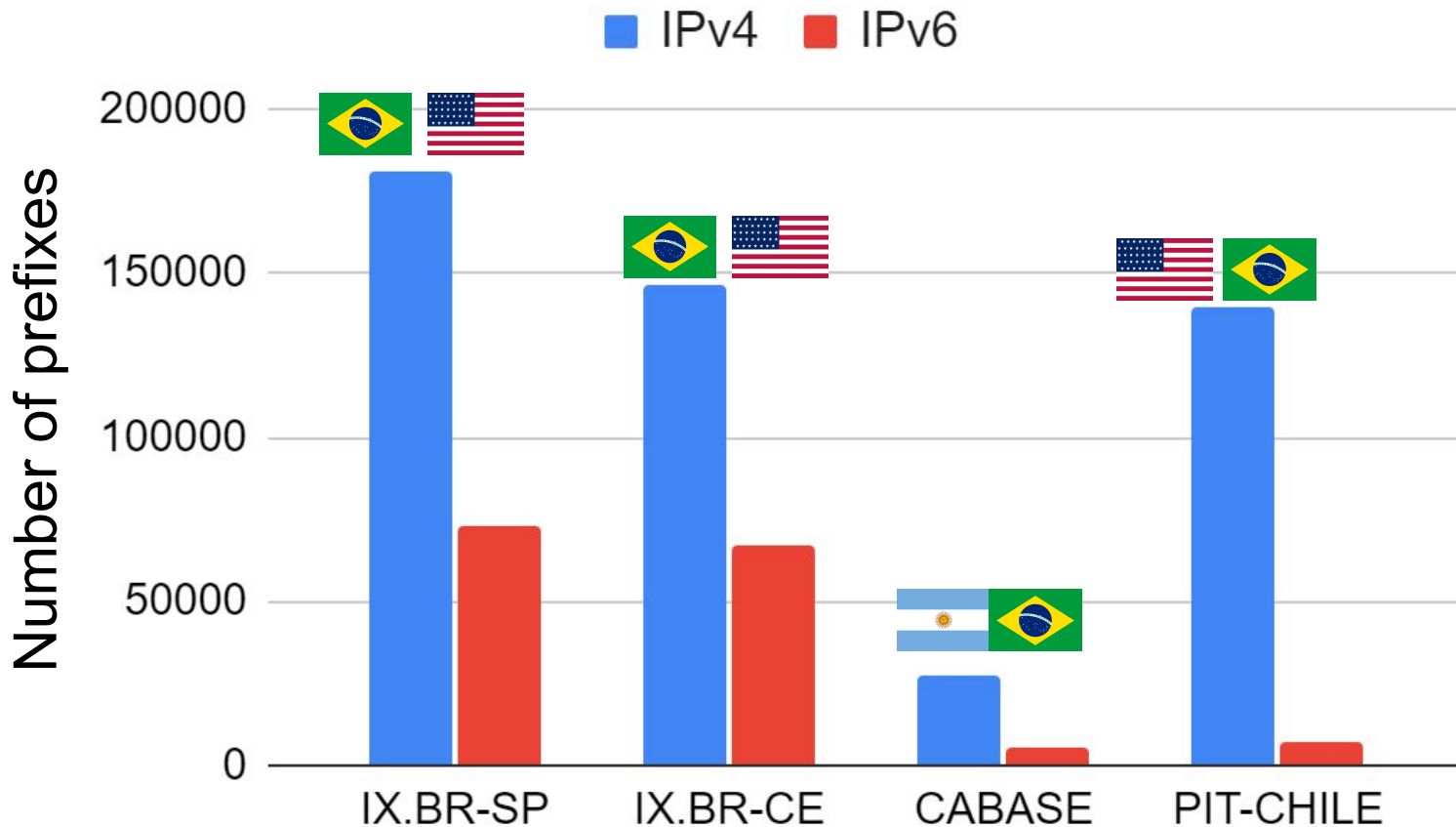
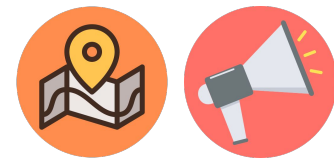
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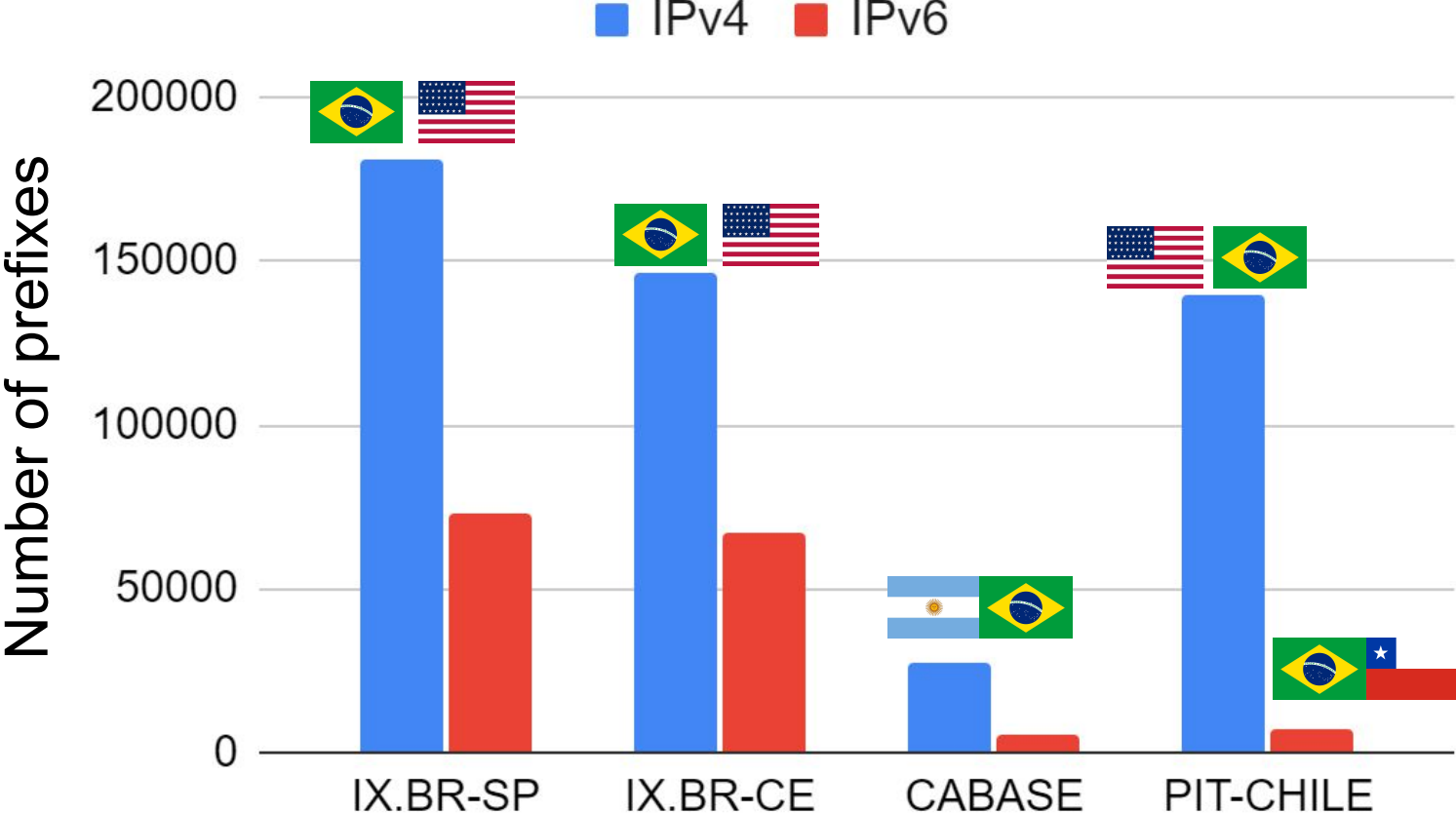
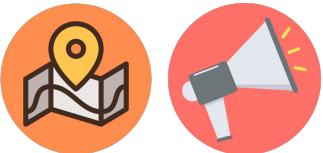
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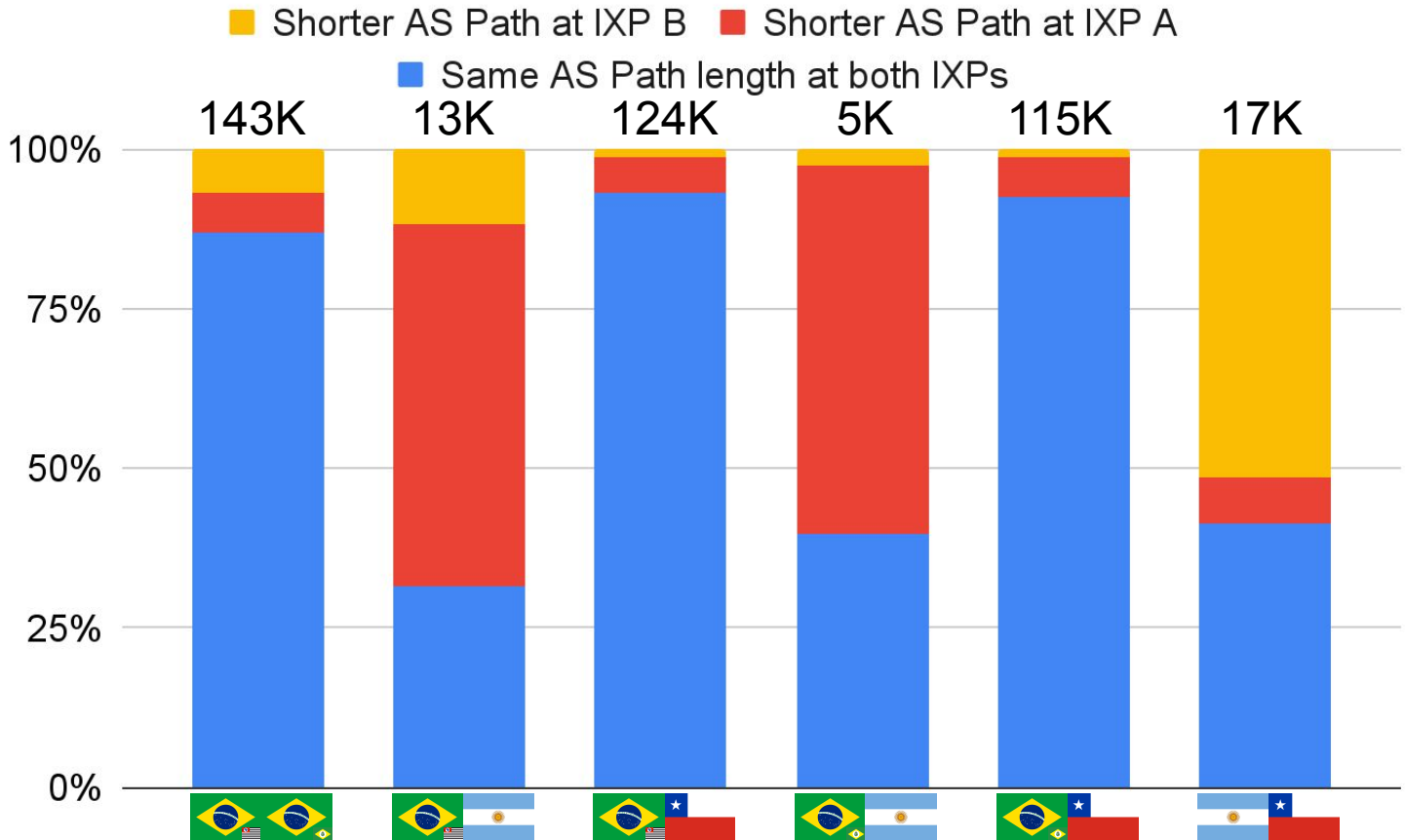
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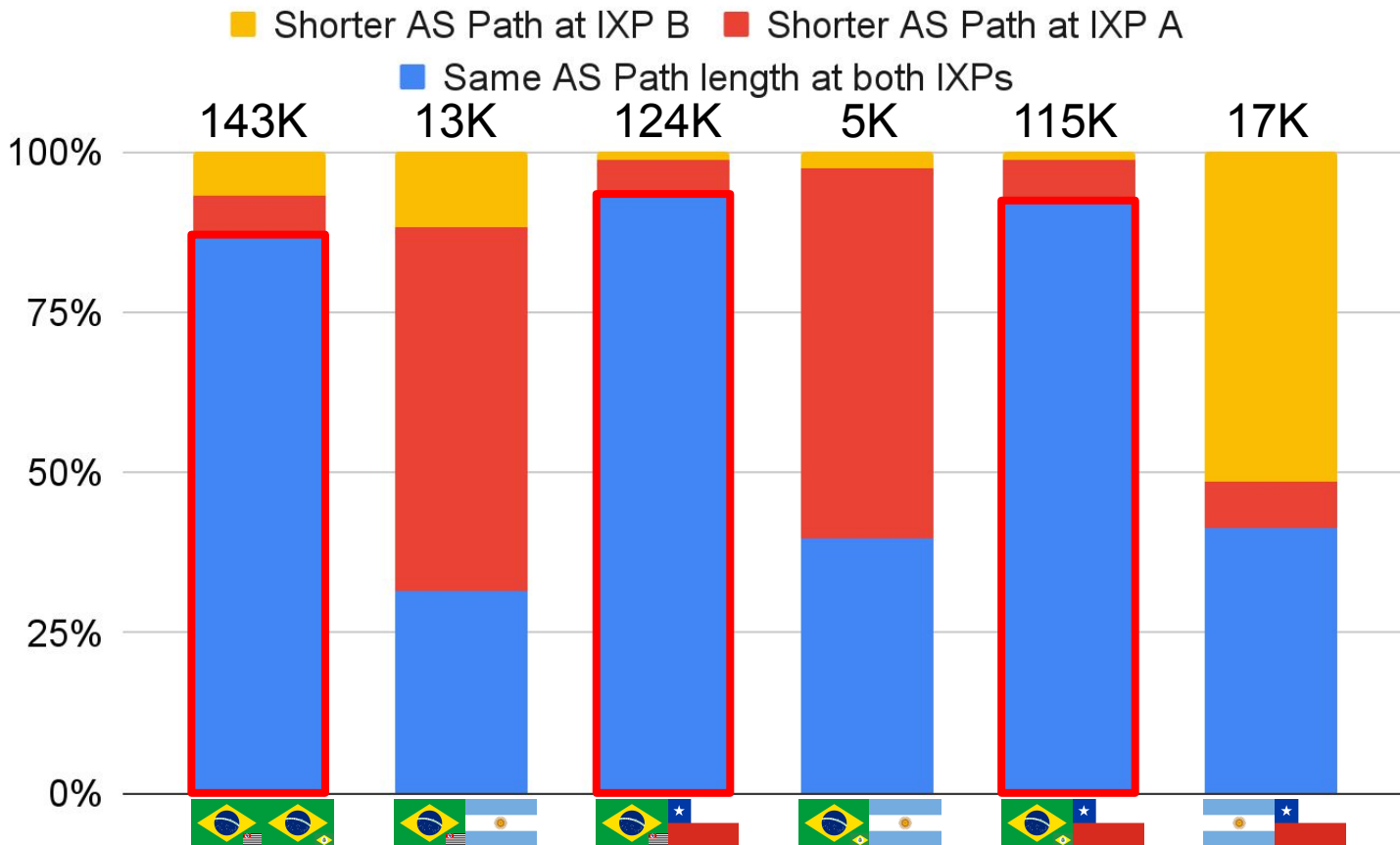
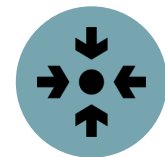
Where are the shorter paths? - IPv4



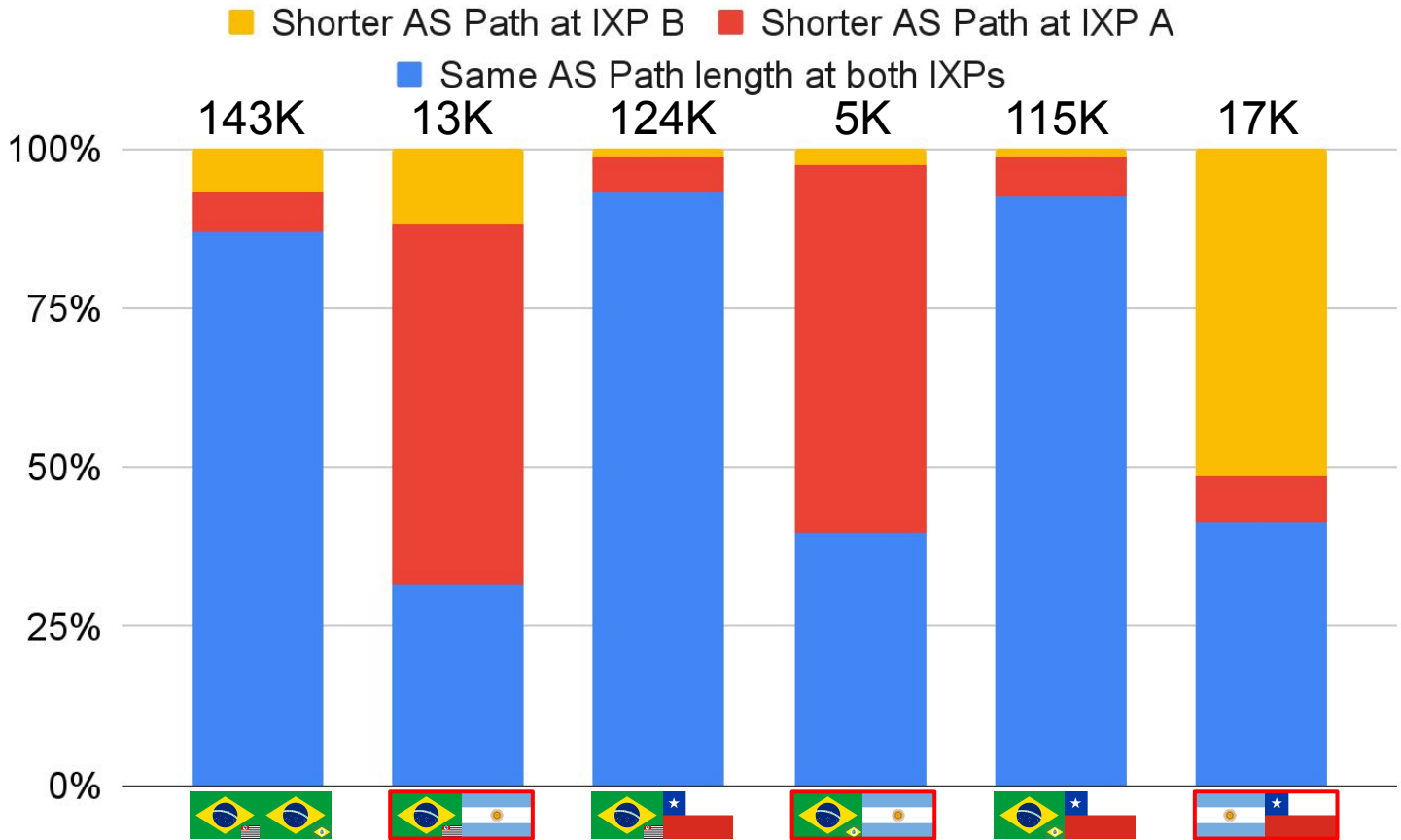
Where are the shorter paths? - IPv4



Where are the shorter paths? - IPv4



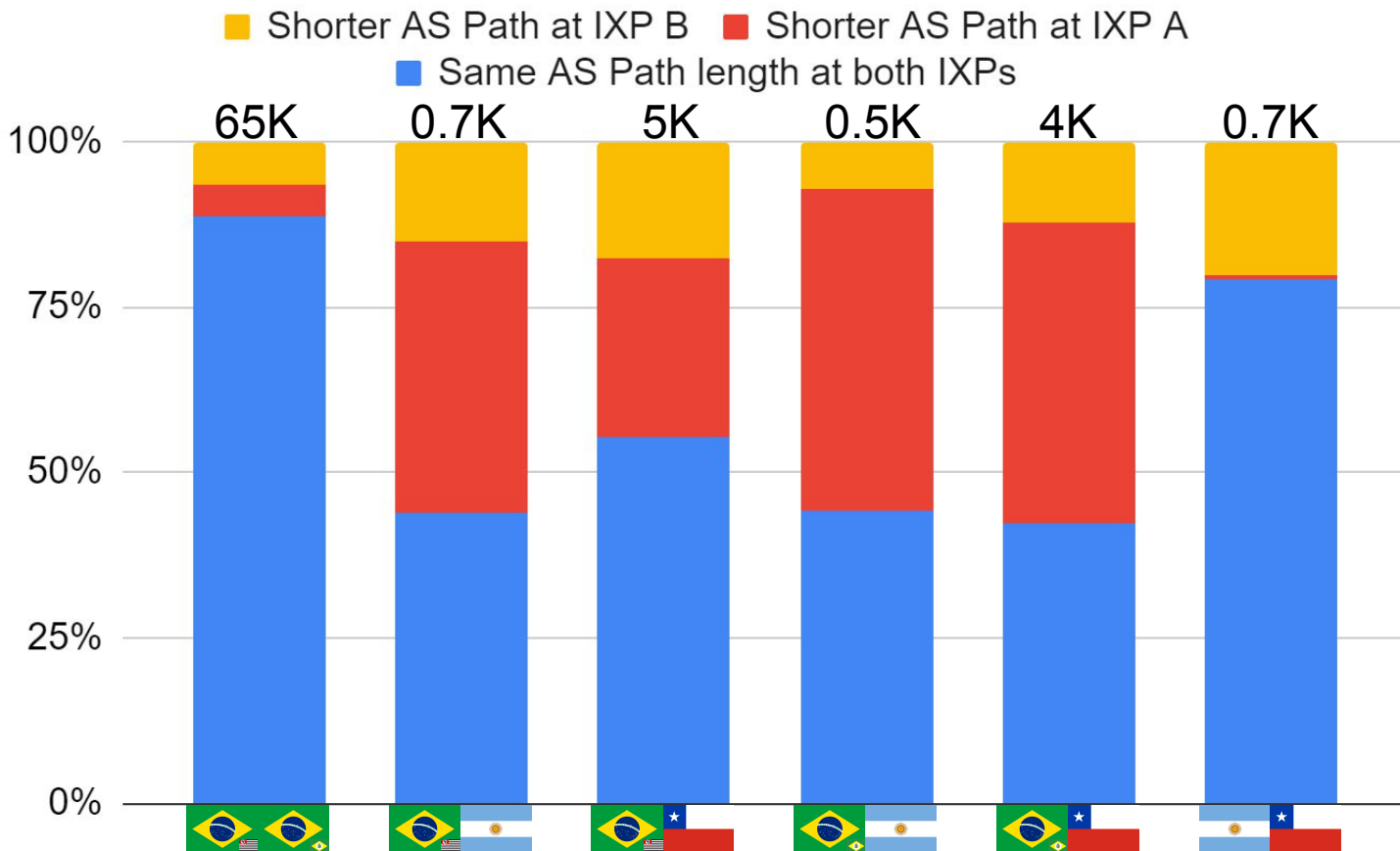
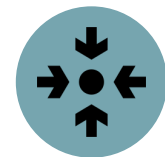
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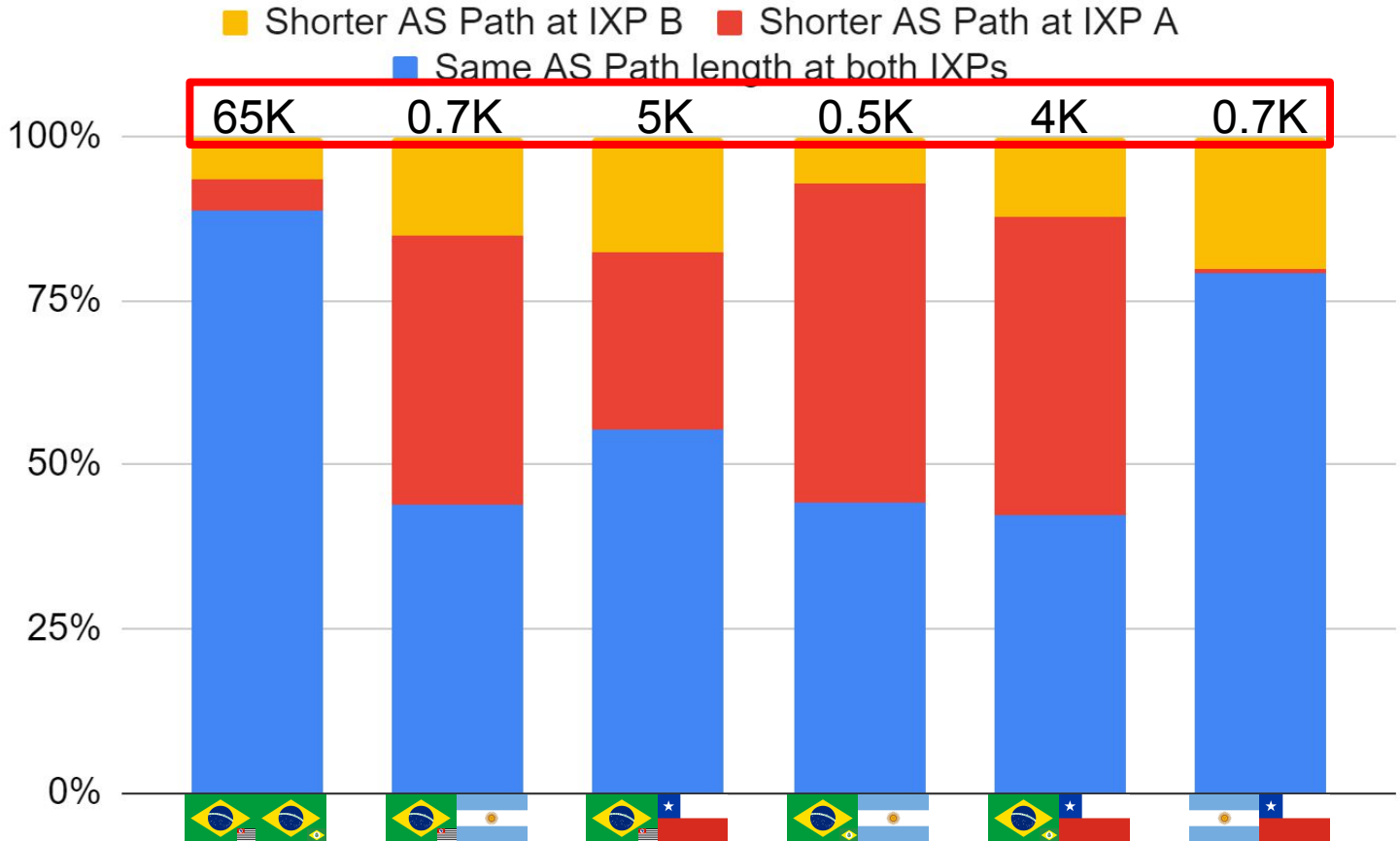
Where are the shorter paths? - IPv6



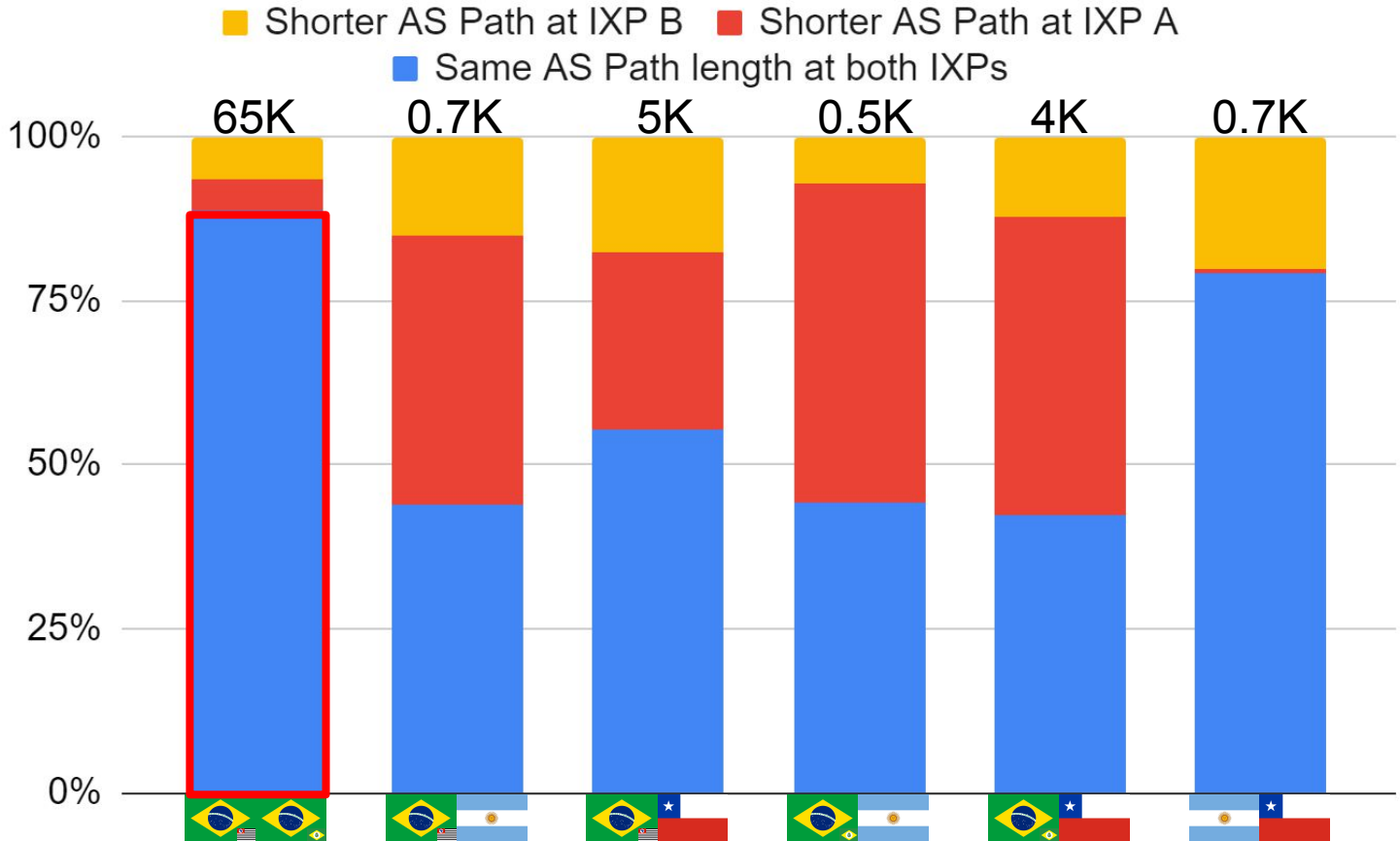
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Where are the shorter paths? - IPv6



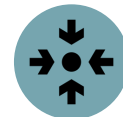
Where are the shorter paths? - IPv6















Traffic engineering practices - IPv4















Traffic engineering practices - IPv4



A	B	ASes in both IXP	No visible preference	AS always prefers A	AS always prefers B	Prefers both
		325				
		19				
		38				
		8				
		12				
		18				












Traffic engineering practices - IPv4



A	B	ASes in both IXP	No visible preference	AS always prefers A	AS always prefers B	Prefers both
		325	162	66	39	58
		19	1	4	1	13
		38	6	5	1	26
		8	1	-	-	7
		12	1	2	-	9
		18	3	1	2	12













Traffic engineering practices - IPv4



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Traffic engineering practices - IPv6















Traffic engineering practices - IPv6



A	B	ASes in both IXP	No visible preference	AS always prefers A	AS always prefers B	Prefers both
		277	194	30	21	32
		13	-	-	-	13
		30	5	2	2	21
		6	-	-	-	6
		10	1	-	1	8
		14	-	-	1	13













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Traffic engineering practices - IPv6

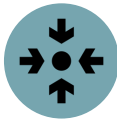




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Popular traffic engineering techniques - IPv4

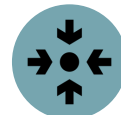














Popular traffic engineering techniques - IPv4



A	B	Only ASPP	Only more specifics	Only selective	ASPP + more specifics	ASPP + selective	More specifics + selective	All
 	 							
 								
 								
 								
 								
 								













Popular traffic engineering techniques - IPv4



A	B	Only ASPP	Only more specifics	Only selective	ASPP + more specifics	ASPP + selective	More specifics + selective	All
		31	42	40	9	2	34	5
		-	-	14	-	-	4	-
		1	-	24	-	2	4	1
		-	-	5	-	-	2	-
		-	-	9	-	-	1	1
		-	-	10	-	-	4	1













Popular traffic engineering techniques - IPv4



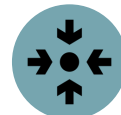
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		-	-	5	-	-	2	-
		-	-	9	-	-	1	1
		-	-	10	-	-	4	1













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Popular traffic engineering techniques - IPv4

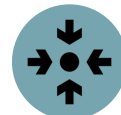














A	B	Only ASPP	Only more specific	Only selective	ASPP + more specific	ASPP + selective	More specific + selective	All
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Popular traffic engineering techniques - IPv6

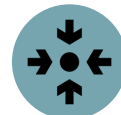














Popular traffic engineering techniques - IPv6



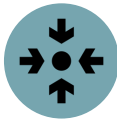
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		-	3	7	-	-	3	-
		1	1	20	-	1	2	-
		-	1	3	-	-	2	-
		-	-	7	-	1	1	-
		-	3	6	-	-	5	-













Popular traffic engineering techniques - IPv6



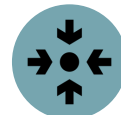
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Popular traffic engineering techniques - IPv6



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		-	-	7	-	1	1	-
		-	3	6	-	-	5	-

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In summary...

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Members are **mostly from the IXP country**, followed by international ASes based on the **United States**

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Majority of ASes use either **selective announcements** or **more specifics** to indicate preference for traffic exchange

In summary...



Questions?

Pedro Marcos - pbmarcos@furg.br
<https://pedrobmarcos.github.io>



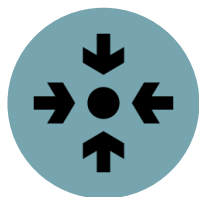
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BACKUP

About members and their locations







Members (Total)	Members (IPv4)	Members (IPv6)	Countries (IPv4)	Countries (IPv6)
2067	1973	1798	32	27
554	527	478	10	9
314	313	117	31	18
125	121	81	17	14













Reachable ASes through the IXPs

	Cone (IPv4)	Cone (IPv6)	Countries (IPv4)	Countries (IPv6)
	21925	18062	190	183
	21142	18643	186	182
	3616	3108	105	96
	18819	1938	189	29













About prefixes and their locations

	Prefixes (IPv4)	Prefixes (IPv6)	Countries (IPv4)	Countries (IPv6)
	180843	73080	222	249
	146503	66767	215	249
	27327	5704	117	59
	139333	7322	226	54

Where can I find shorter paths? - IPv4

A	B	Prefixes at both IXPs	Same AS Path length at both IXPs	Shorter AS Path at IXP A	Shorter AS Path at IXP B
		143163	124403	9203	9557
		13545	4278	7695	1572
		124276	115748	6965	1563
		5568	2206	3223	139
		115605	107059	7116	1430
		16989	7049	1224	8716

Where can I find shorter paths? - IPv6

A	B	Prefixes at both IXPs	Same AS Path length at both IXPs	Shorter AS Path at IXP A	Shorter AS Path at IXP B
		65878	58481	3118	4279
		666	292	273	101
		5508	3057	1478	973
		562	249	273	40
		4240	1789	1932	519
		687	545	4	138