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San José, Costa Rica

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IX.br(PTT.br) – Report of the 2016 Olympic Games

**LACNOG
2016**

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Goals

This presentation intend to show highlights from the IX.br report about the 2016 Olympic Games event. The target is to focus on infrastructure, traffic analyses, freezing period, impacts and benefits. Other relevant topics like planning and preparations will also be covered in summary.



IX.br – How to watch the Olympic Games?

- **42 Olympic Sports**
- **23 Paralympic Sports**

There were many ways to watch the games:

- 3 open TV channels;
- 16 pay TV channels; and
- Many channels on the Internet

Obs: many simultaneous transmissions



IX.br - Live streaming of Olympic Games

TV Globo is the largest open channel TV in Brazil and the second largest in the world

Globo.com is the largest media group Web Portal in Brazil

Globo.com is the 5th most visited website in Brazil

The internet transmissions occurred through AS28604 Globo.com

The Globo.com is connected to IX.br São Paulo and IX.br Rio de Janeiro

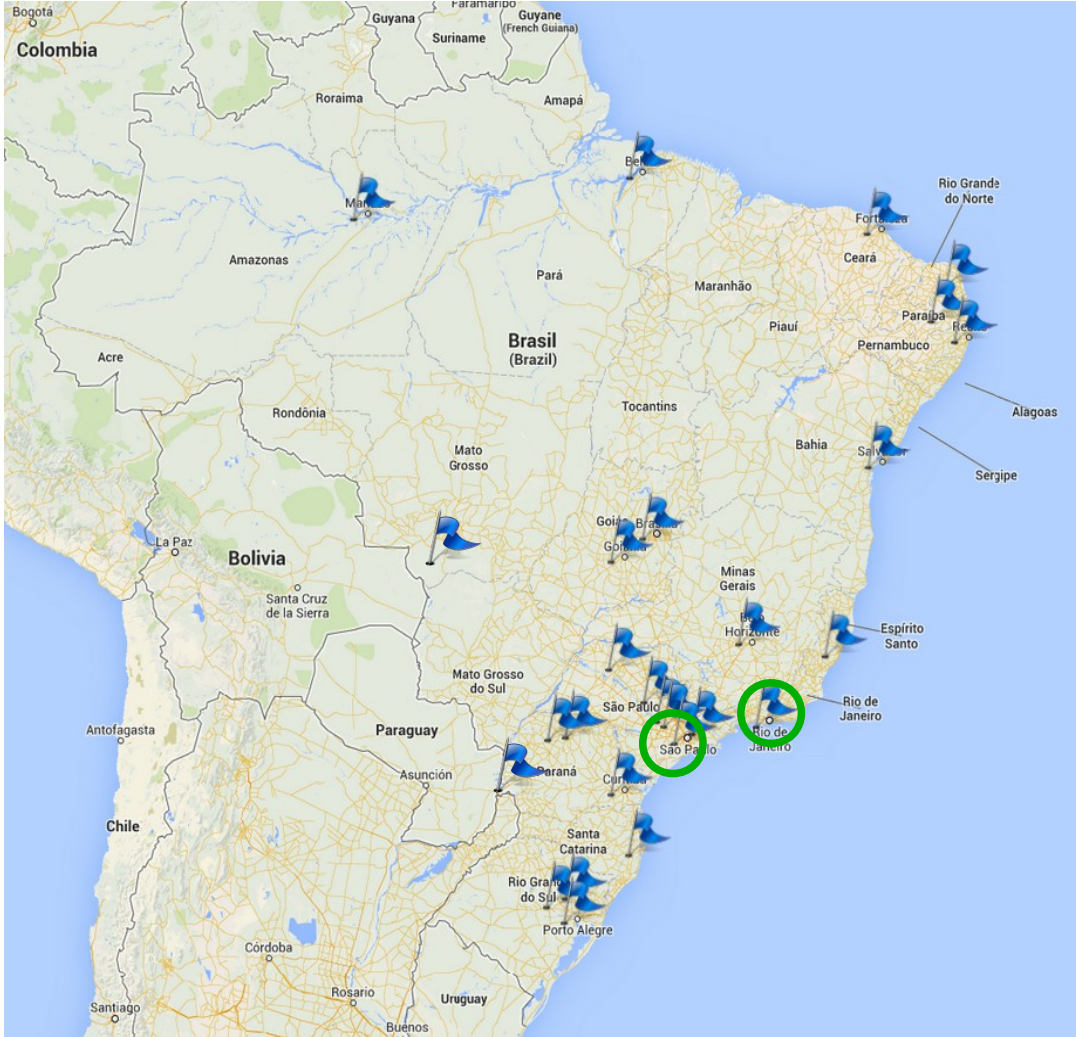
The expected traffic was high, as we had already seen a preview in 2014 FIFA World Cup Brazil



FIFA WORLD CUP
Brasil

IX.br – Locations - Cities with higher traffic

The installation of new IXPs was not necessary



#	IX.br Location
1	Belém
2	Belo Horizonte
3	Brasília
4	Campina Grande
5	Campinas
6	Caxias
7	Cuiabá
8	Curitiba
9	Florianópolis
10	Fortaleza
11	Foz do Iguaçu
12	Goiânia
13	Lajeado
14	Londrina
15	Manaus
16	Maringá
17	Natal
18	Porto Alegre
19	Recife
20	Rio de Janeiro
21	Salvador
22	São Carlos
23	São José do Rio Preto
24	São José dos Campos
25	São Paulo
26	Vitória



IX.br - Priorities before the 2016 Olympic Games

Until 6 months before the event the priority was capacity upgrade to support the amount of traffic that would be generated during the 2016 Olympic Games

The largest capacity upgrades occurred in IX.br São Paulo and IX.br Rio de Janeiro due to the traffic already exchanged, opening ceremony, closing ceremony, the Press Center and streaming of existing video content



IX.br - Priorities before the 2016 Olympic Games

It was expected that the amount of traffic would be higher in IX.br São Paulo and IX.br Rio de Janeiro because it was where the AS28604 is connected.

* Upgrade connections inter PIXes (24 Maintenance Windows only at IX.br São Paulo between February 1th, 2016 to May 11th, 2016)

Preparation of operating procedures to be executed during the 2016 Olympic Games if necessary

*(<ftp://ftp.registro.br/pub/gter/gter41/02-IX.br-update.pdf>)



IX.br - Priorities before the 2016 Olympic Games

Infrastructure activities executed before Operational Freezing Period at IX.br São Paulo:

- Core Network upgrade
- 2 new 100Gb participant's interfaces
- PIXes capacity upgraded
 - 16 PIXes changed
 - 135 new 10Gb interfaces



IX.br - Priorities before the 2016 Olympic Games

Infrastructure activities executed before Operational Freezing Period at IX.br Rio de Janeiro:

- 6 PIXes capacity upgrade
- Installation of 3 DWDM point to point systems
- 2 new 100Gb participant's interfaces
- Migration / Activation of new network equipments
- Activation of New PIX (Globo.com)

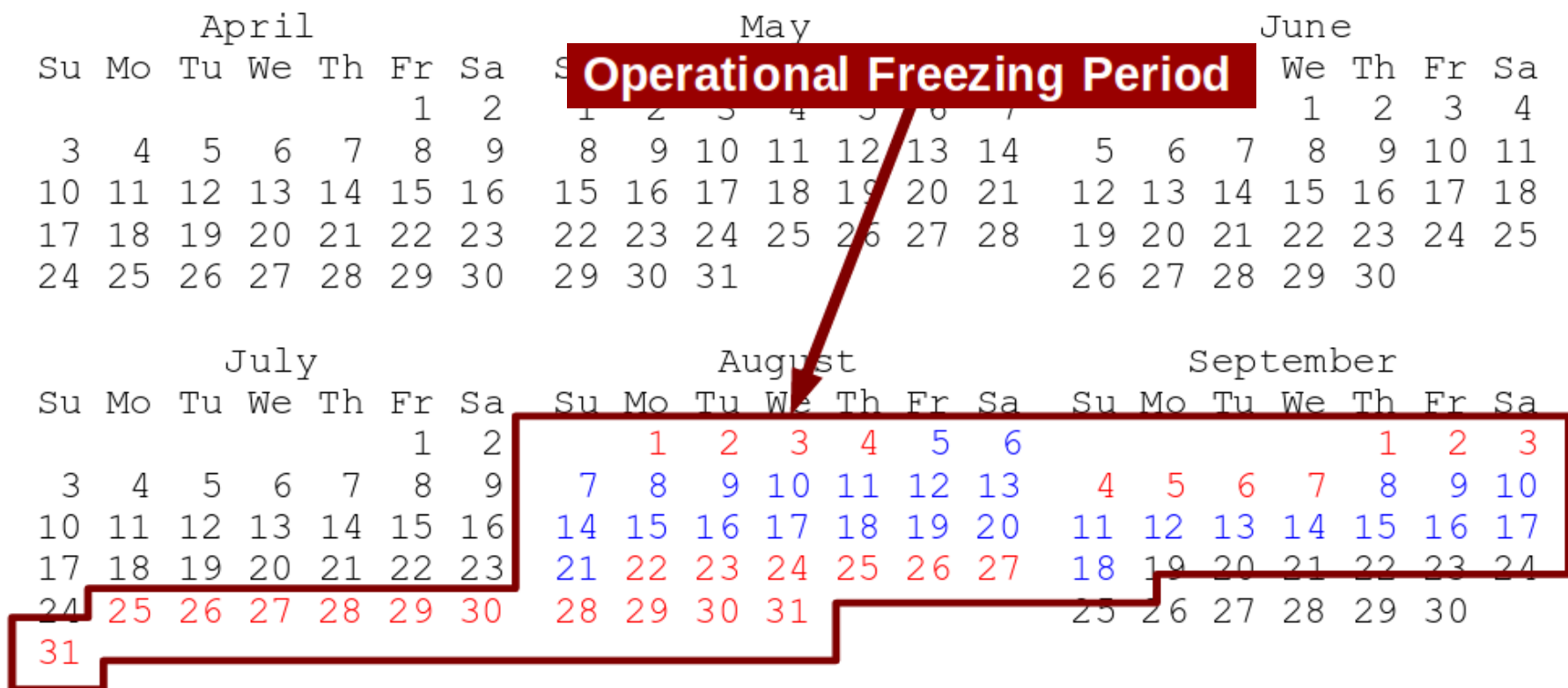


IX.br - Calendar Operational Freezing Period

Period Operational Freezing: July 25th to September 18th (56 days)

The IX.br team activities were restricted to the support and operation of already active services (São Paulo and Rio de Janeiro)

Other locations had normal activities



IX.br – Importance of Operational Freezing

Most network problems occur during physical changes

It is required a good planning to avoid this problem

Network interventions during a big event like the Olympic Games must be executed with the highest level of attention

The Operational Freezing is a good practice already in use in big companies and Internet Exchanges Points around the world



IX.br – Importance of Operational Freezing

The freezing period propose was to avoid new connections and changes in the active structure to ensure network stability and minimize external interference

A similar model was adopted in FIFA World Cup Brazil in 2014, but now only in IX.br São Paulo and IX.br Rio de Janeiro

During this period the IX.br team was dedicated to support

Freezing was a success, because during this period we did not have problems in IX.br network



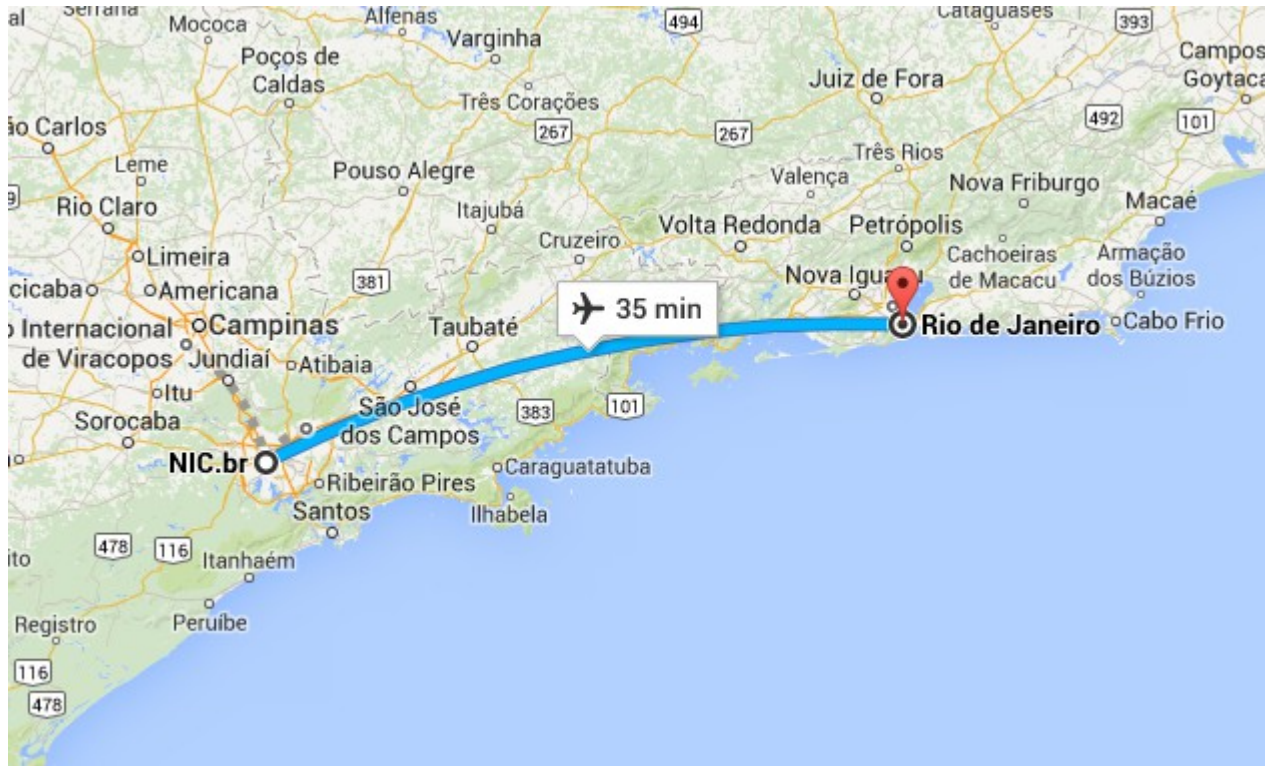
IX.br - Monitoring during the 2016 Olympic Games

The IX.br NOC is located in the NIC.br office at São Paulo city



IX.br - Monitoring during the 2016 Olympic Games

**Distance between São Paulo and Rio de Janeiro
400 Km**



Visits were scheduled before the event

IX.br - Monitoring during the 2016 Olympic Games

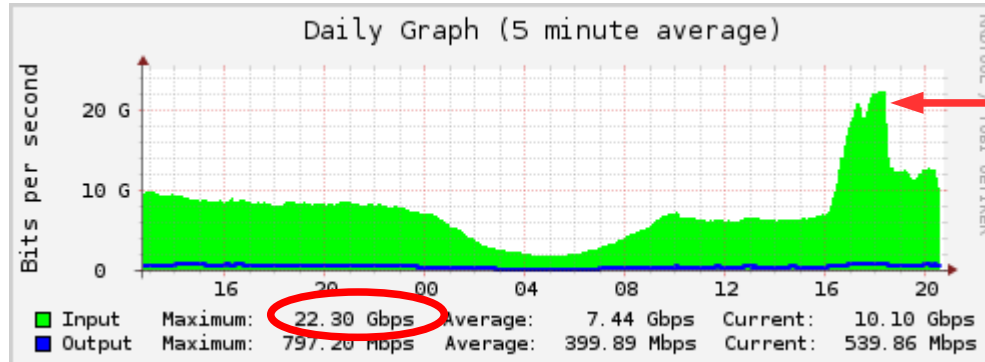
What was monitored?

- Possible Attacks
- Links saturation
- Main participants packet loss
- Performance loss during the internet transmission
- Operational support to participants

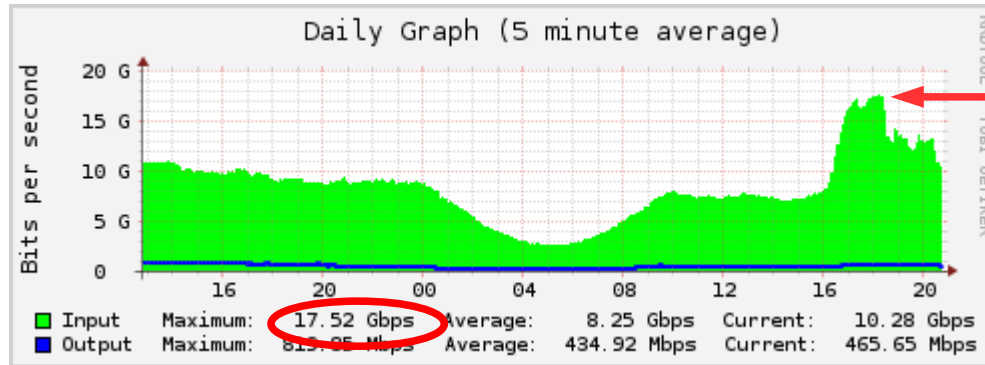


IX.br – Preview traffic - 2016 Olympic Games

Traffic of AS28604 in IX.br São Paulo and IX.br Rio de Janeiro - July 30th, 2016



22,30Gbps



17,52Gbps

AMISTOSOS AMISTOSO

BRASIL
Marquinhos, Gabriel

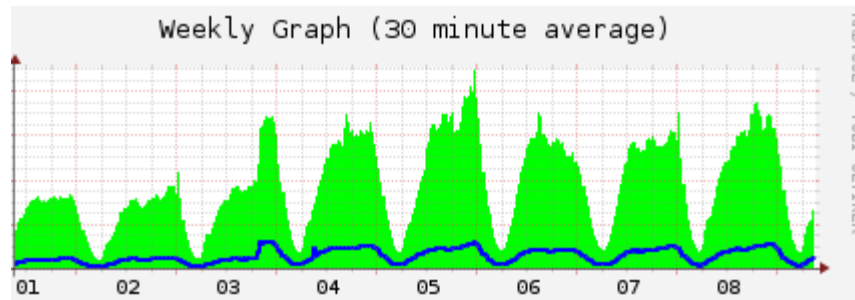


2 × 0

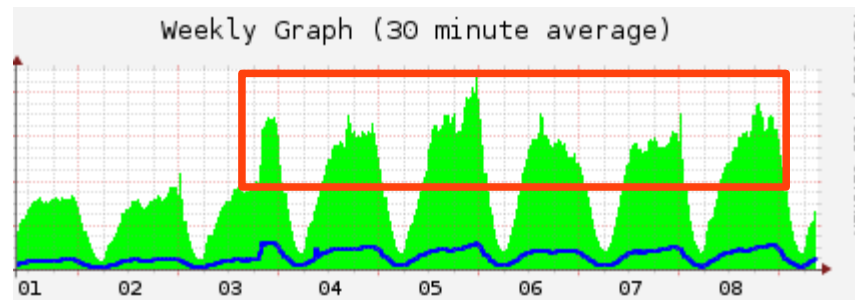


JAPÃO

Traffic of a big Social Network in IX.br São Paulo



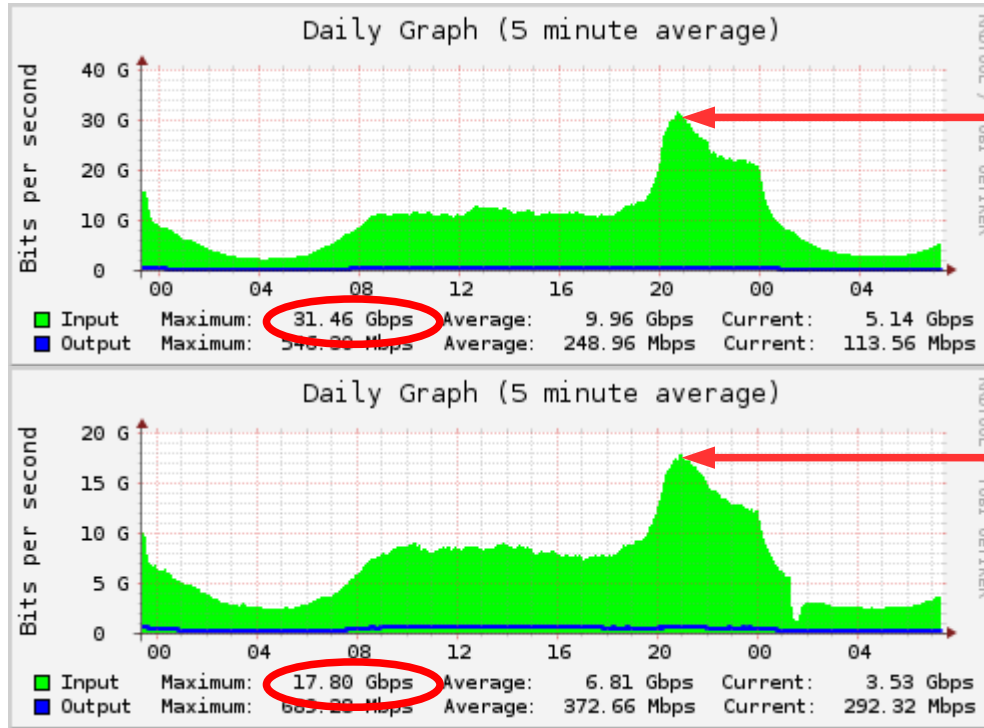
Traffic of a big Social Network in IX.br São Paulo



From the August 3th, 2016 there was a traffic increase. Almost 100%

IX.br - Monitoring during the 2016 Olympic Games – Opening

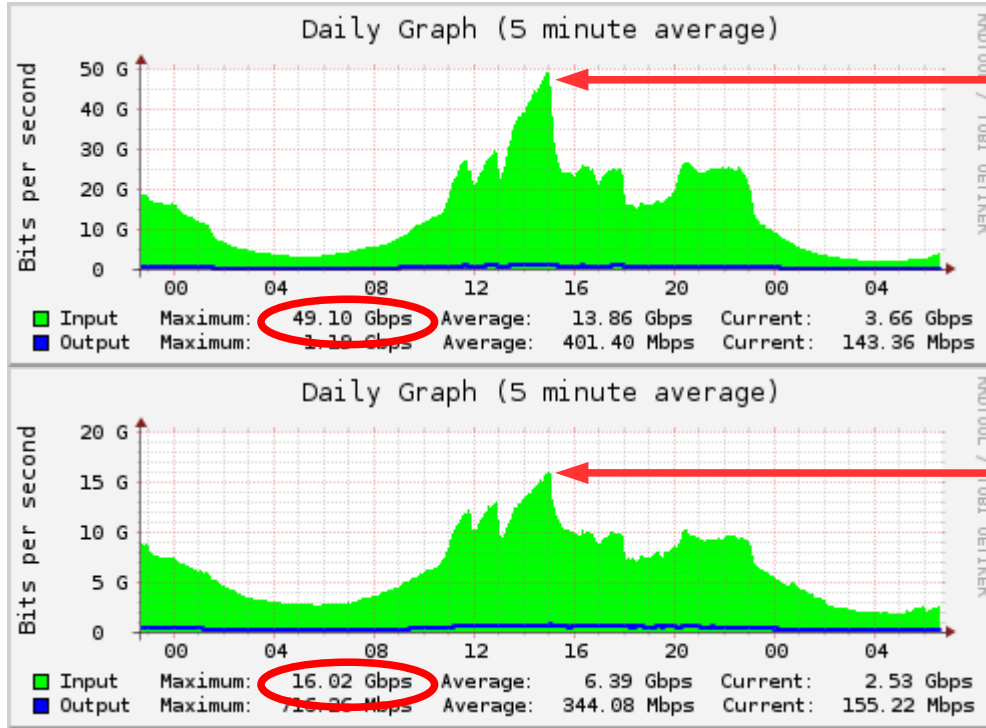
Traffic of AS28604 in IX.br São Paulo and IX.br Rio de Janeiro



**Traffic peak
during opening of Olympic Games
It was a Friday August 05th, 2016**

IX.br - Monitoring during the 2016 Olympic Games – Closing

Traffic of AS28604 in IX.br São Paulo and IX.br Rio de Janeiro

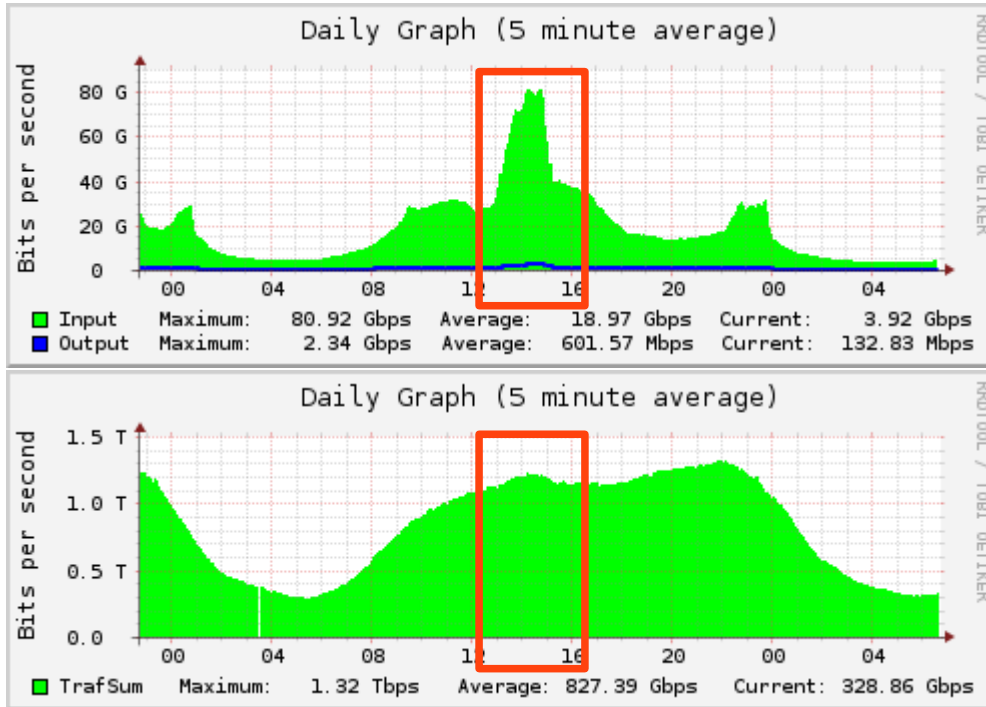


49,10Gbps

16,02Gbps

**Traffic peak
during the gold medal dispute at volleyball male
It was a Sunday August 21th, 2016**

IX.br - São Paulo Exchanged Traffic Comparison – Single day

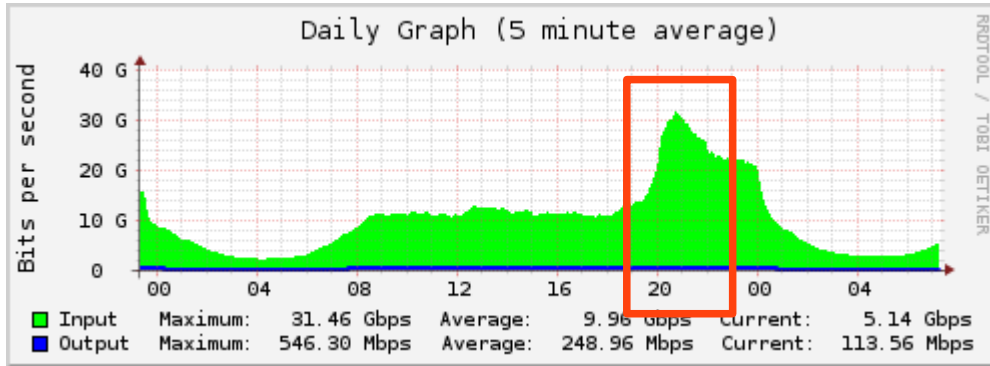


← AS28604

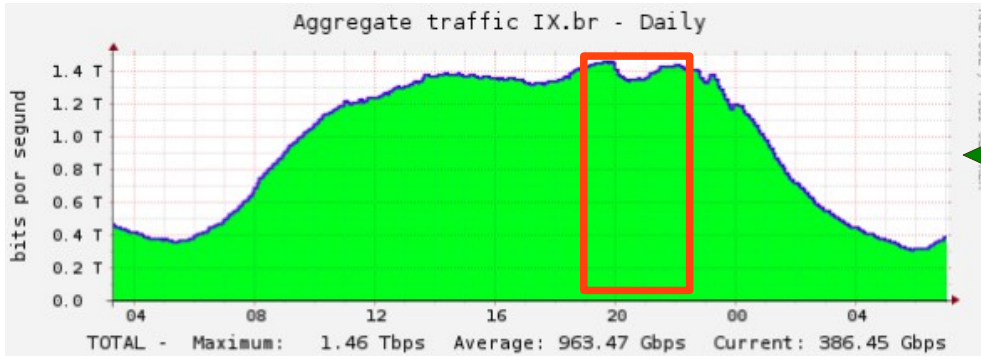
← IX.br São Paulo Aggregated

There was a little overlap traffic

IX.br - São Paulo Exchanged Traffic Comparison - Opening



AS28604



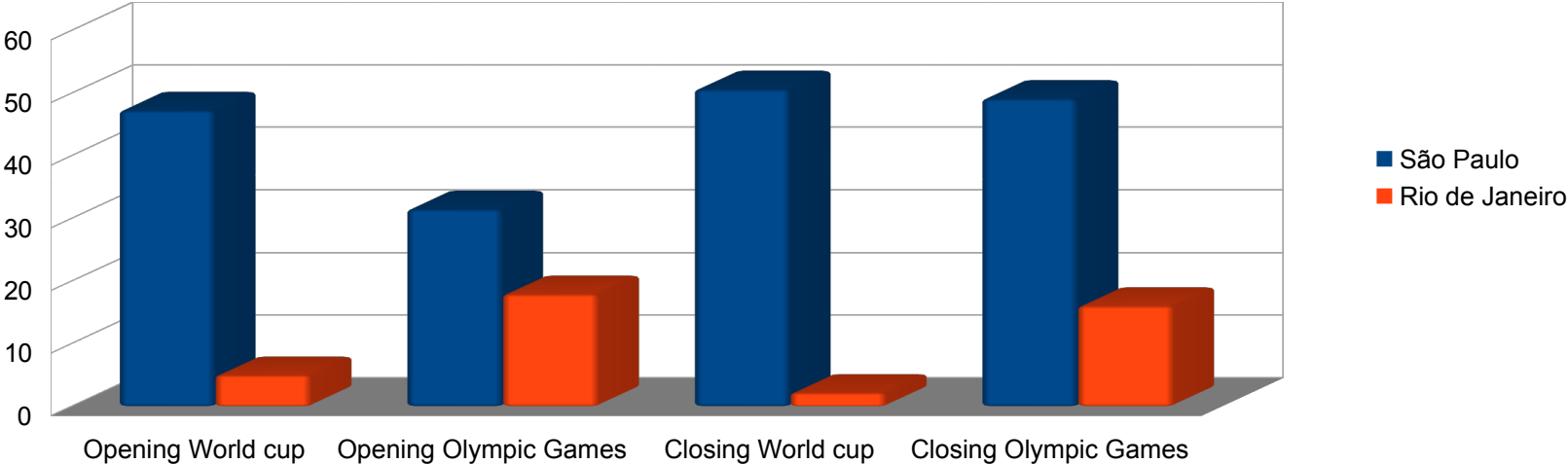
IX.br All Locations Aggregated Traffic

Decrease in traffic exchange

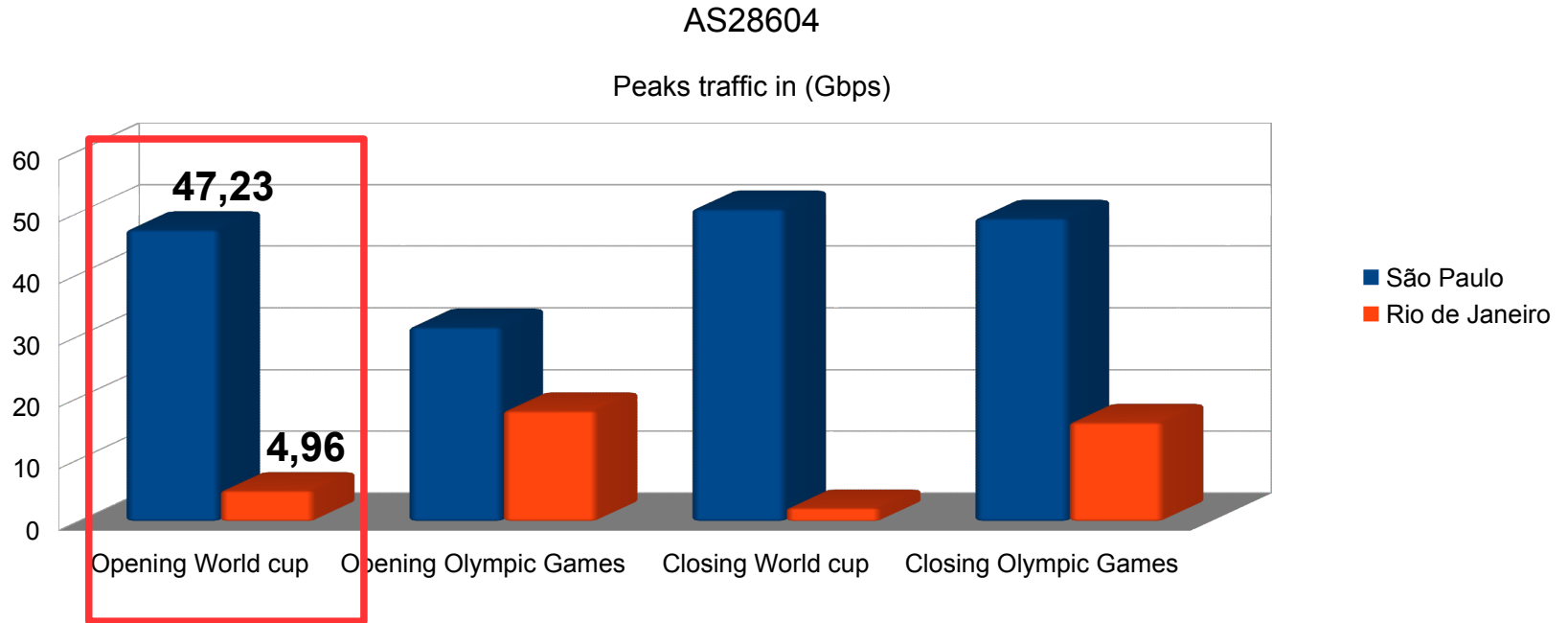
IX.br – Comparative between World Cup x Olympic Games traffic

AS28604

Peaks traffic in (Gbps)

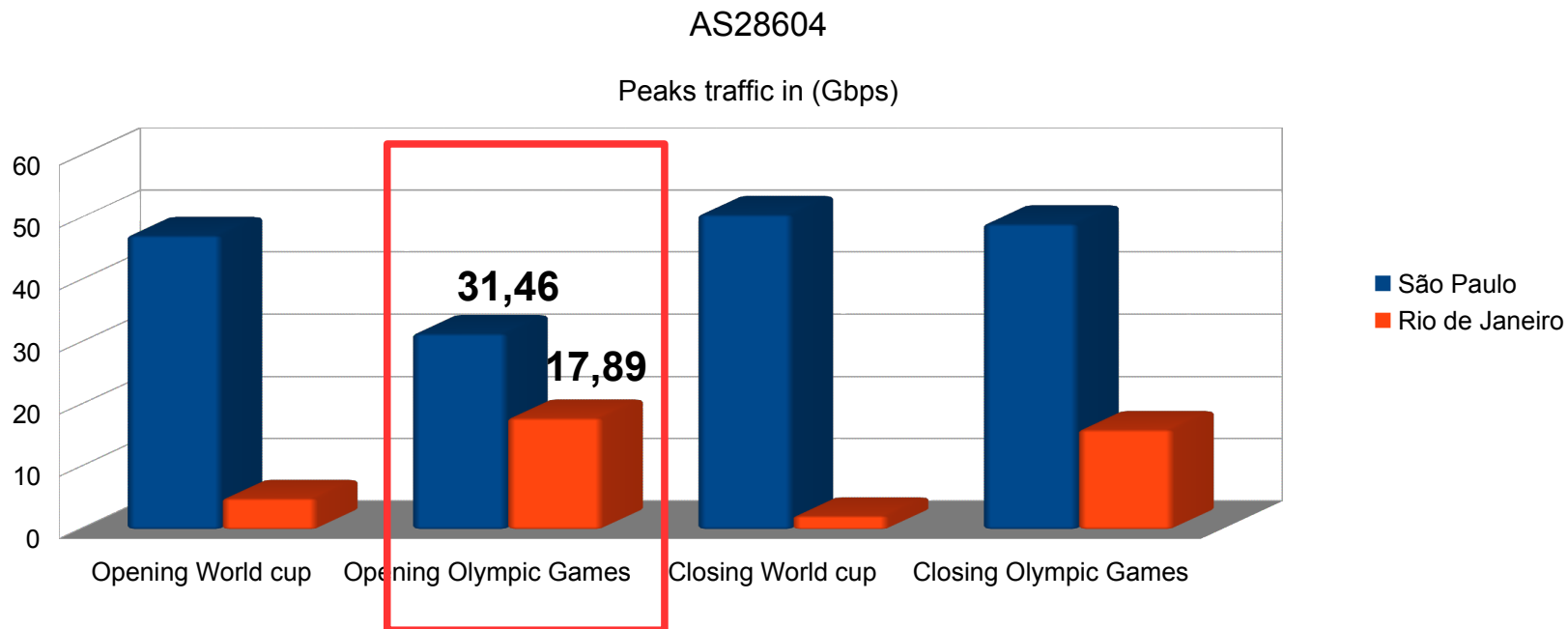


IX.br – Comparative between World Cup x Olympic Games traffic



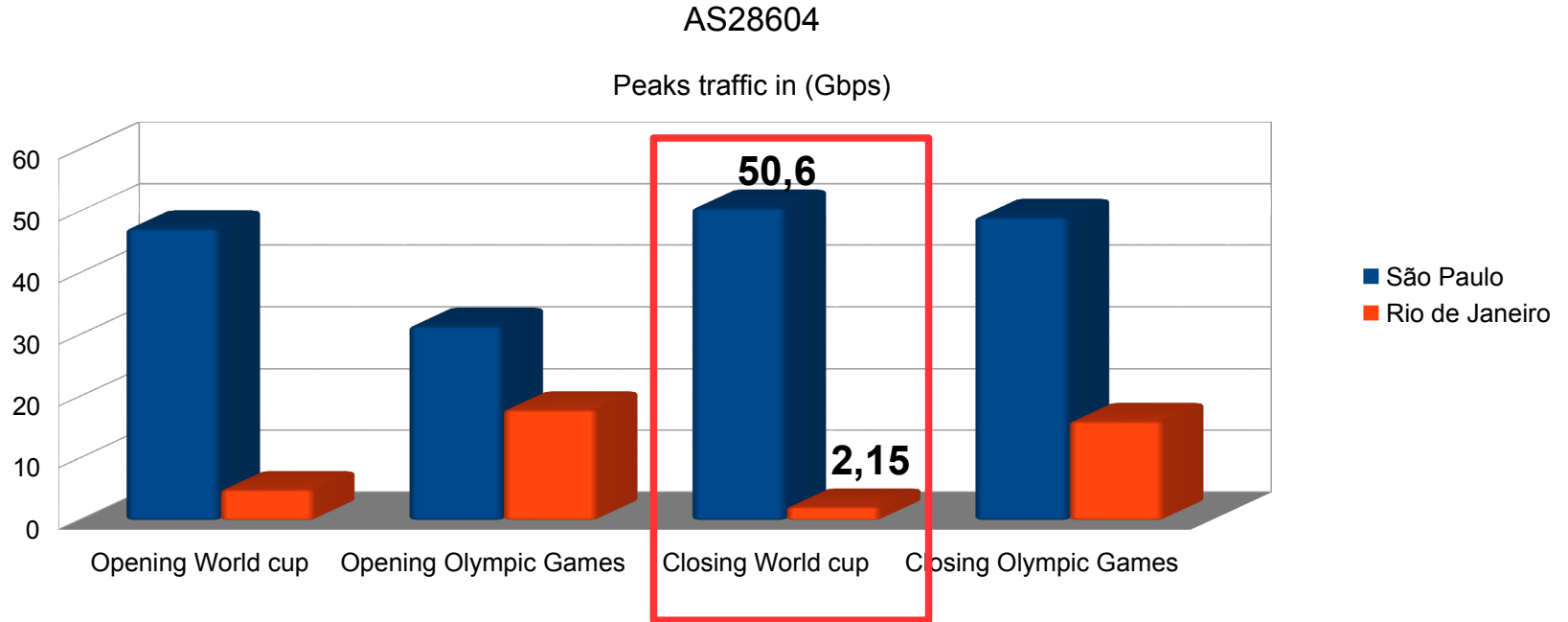
São Paulo had a traffic peak almost 10x higher than Rio de Janeiro

IX.br – Comparative between World Cup x Olympic Games traffic



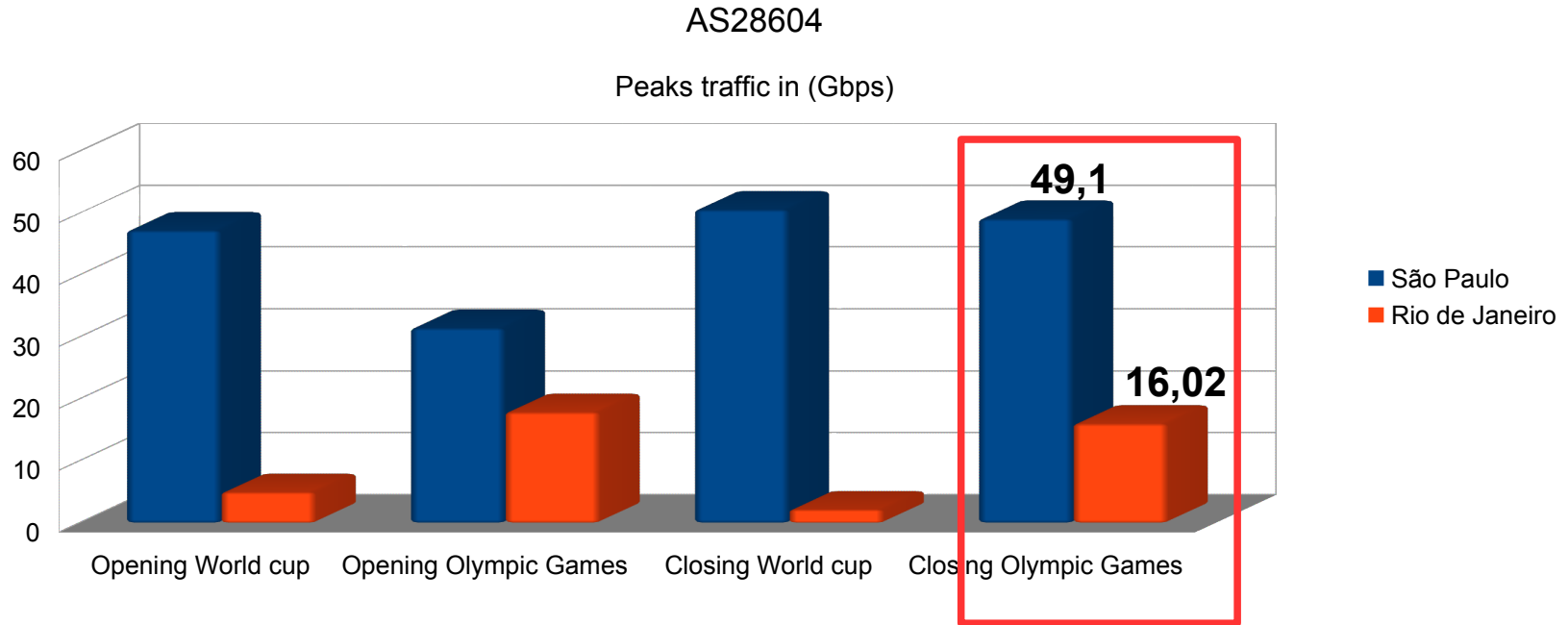
São Paulo had a traffic peak almost 2x higher than Rio de Janeiro

IX.br – Comparative between World Cup x Olympic Games traffic



São Paulo had a traffic peak almost 24x higher than Rio de Janeiro

IX.br – Comparative between World Cup x Olympic Games traffic



São Paulo had a traffic peak approximately 3x higher than Rio de Janeiro.

There was an increased traffic in Rio de Janeiro

IX.br – São Paulo x Rio de Janeiro - Growth

	#Participants	Traffic peak	#Participants	Traffic peak
São Paulo	503	408Gbps	984	1,39Tbps
Rio de Janeiro	34	12,09Gbps	134	233,12Gbps
	April 01th, 2014		August 25th, 2016	

IX.br – São Paulo x Rio de Janeiro - Growth

	#Participants	Traffic peak	#Participants	Traffic peak
São Paulo	503	408Gbps	984	1,39Tbps
Rio de Janeiro	34	12,09Gbps	134	233,12Gbps
	April 01th, 2014		August 25th, 2016	

Participants Growth almost 100%

Traffic Growth greater than 200%

IX.br – São Paulo x Rio de Janeiro - Growth

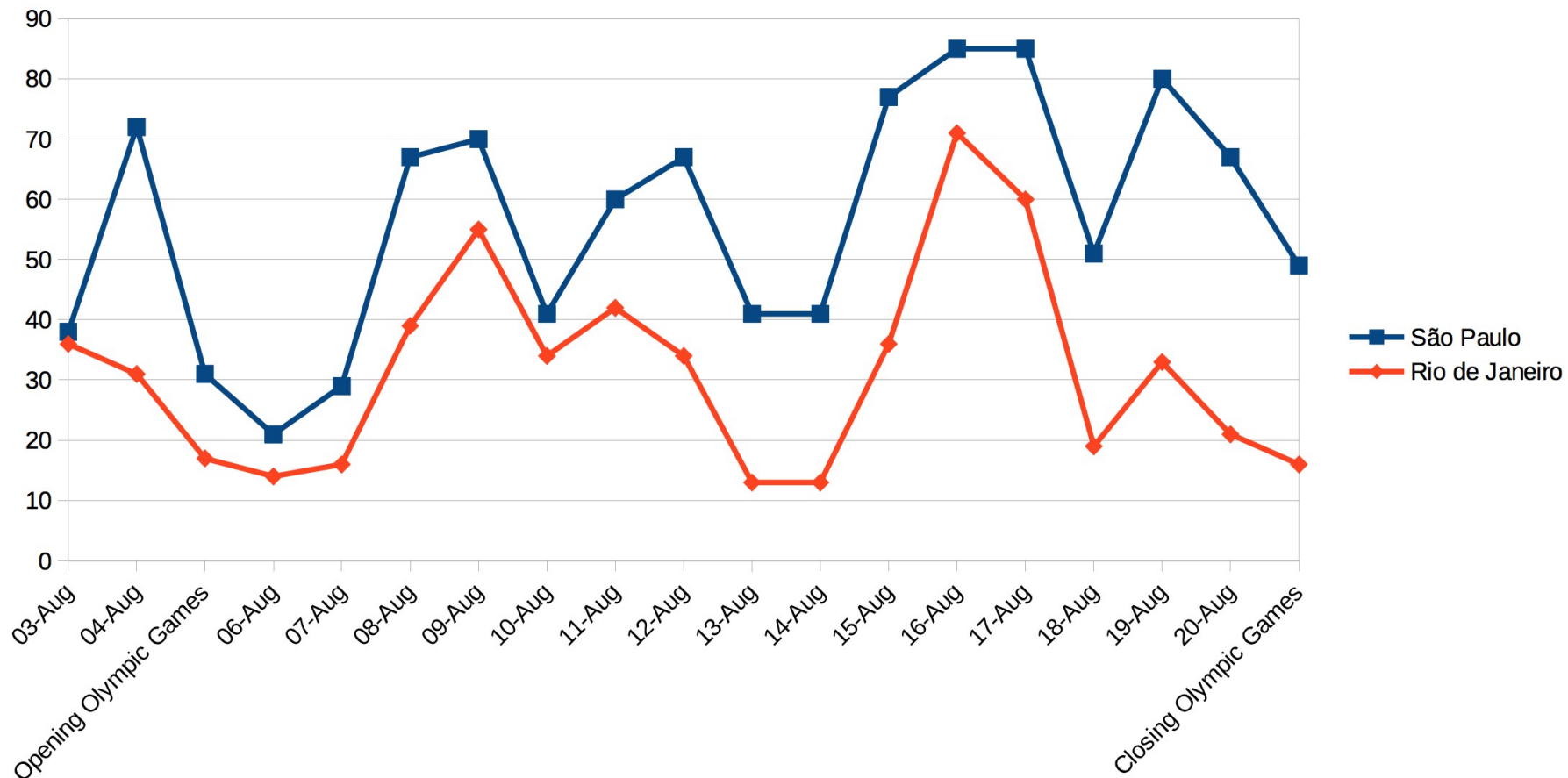
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São Paulo	503	408Gbps	984	1,39Tbps
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	April 01th, 2014		August 25th, 2016	

Participants Growth almost 300%

Traffic Growth 19x approximately

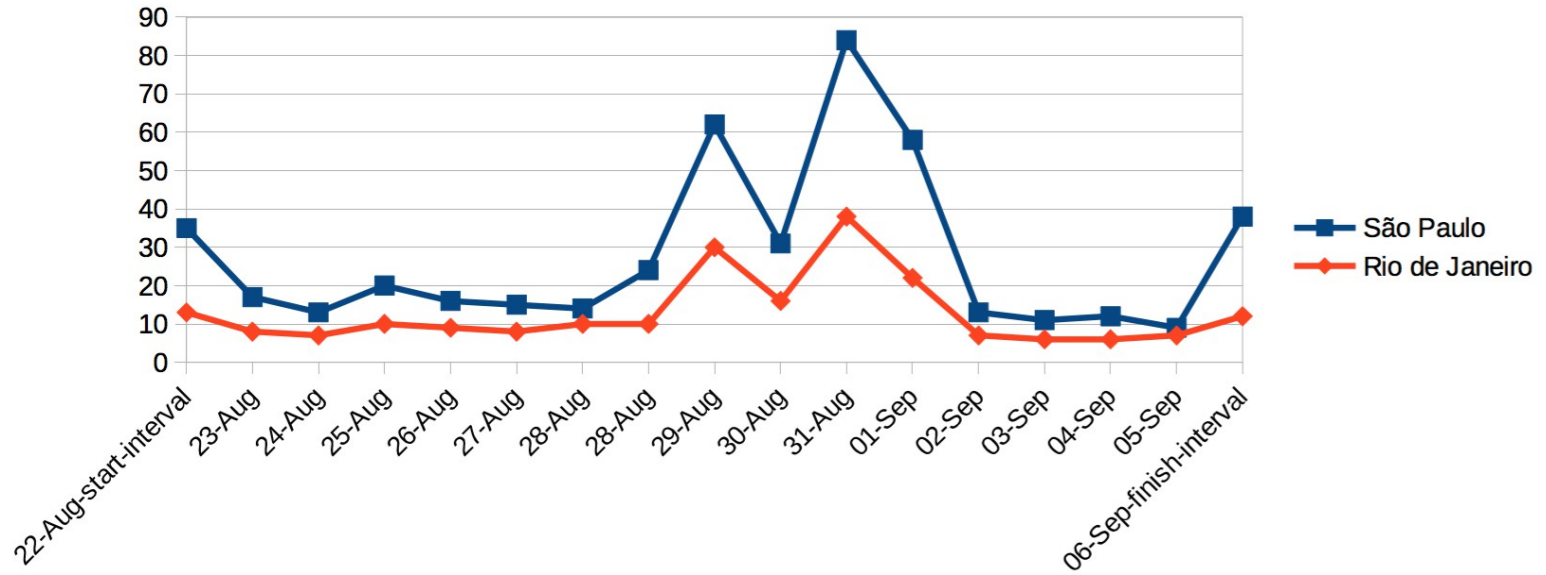
IX.br – São Paulo x Rio de Janeiro - AS28604

Traffic Peaks - Olympic Games

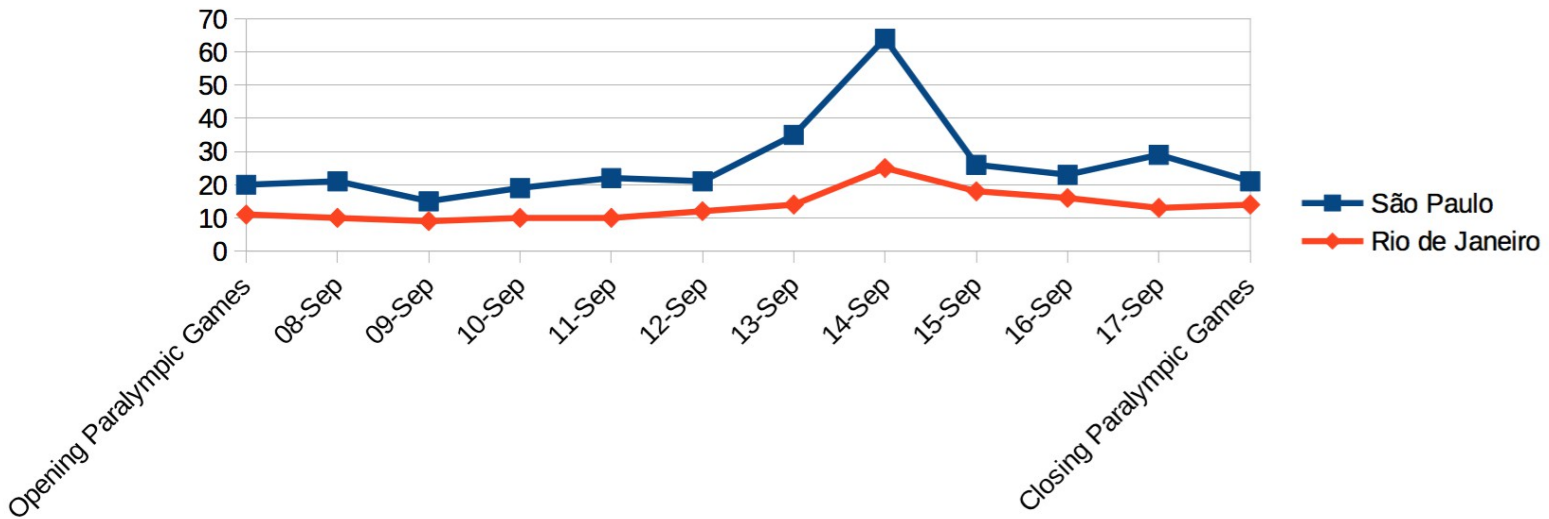


IX.br – São Paulo x Rio de Janeiro - AS28604

Traffic Peaks - Interval

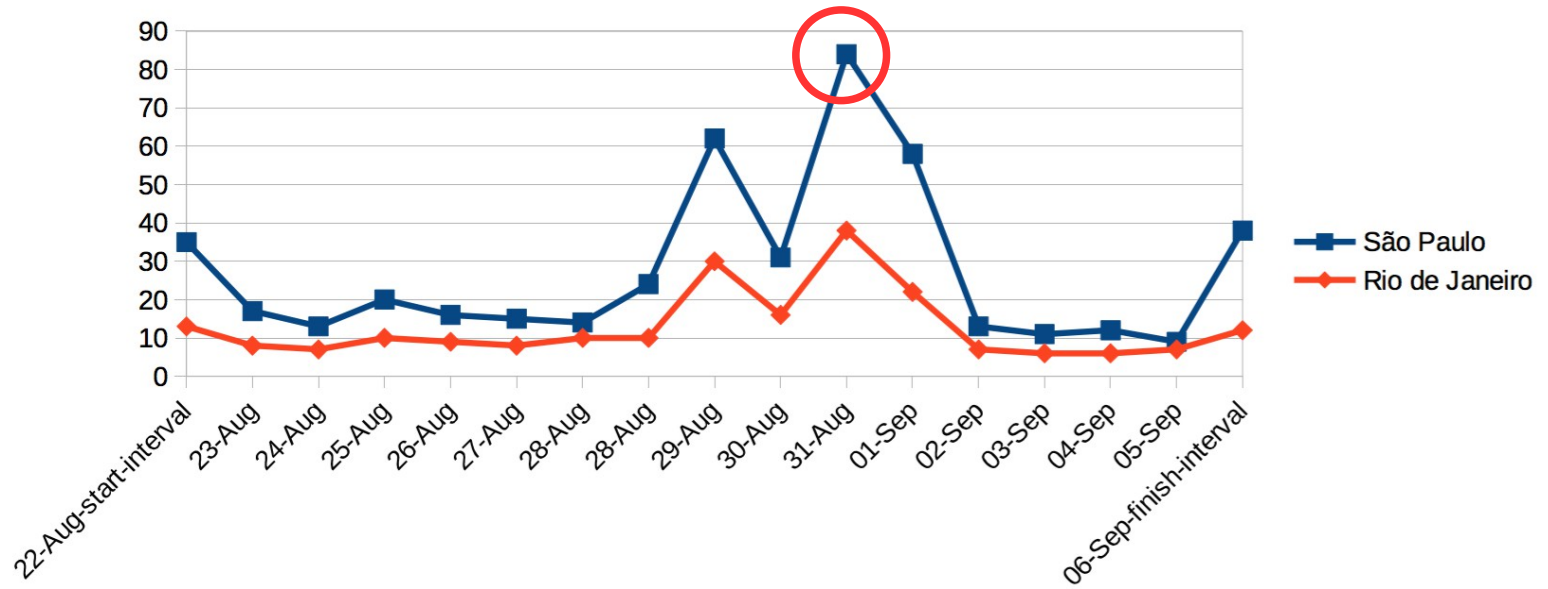


Traffic Peaks - Paralympic Games

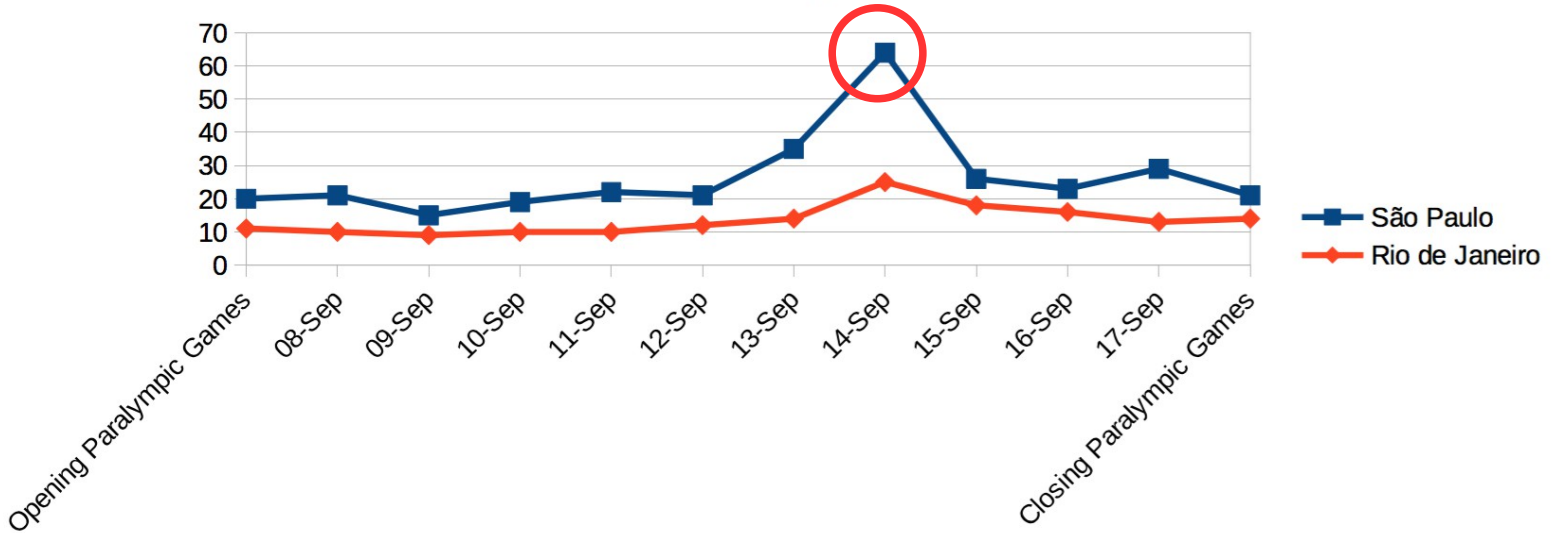


IX.br – São Paulo x Rio de Janeiro - AS28604

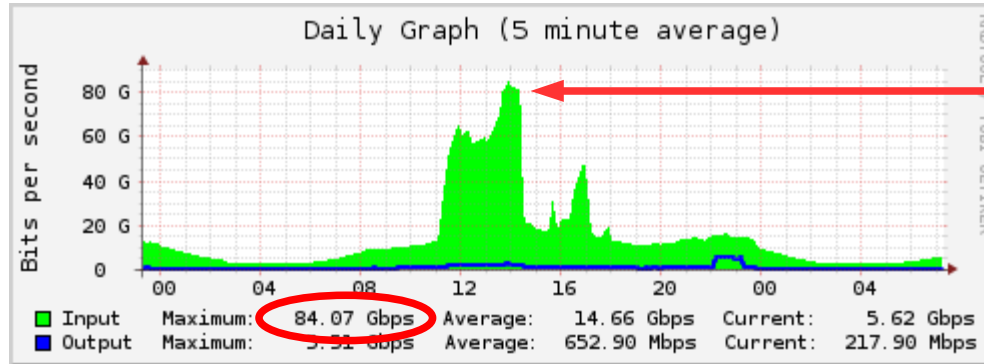
Traffic Peaks - Interval



Traffic Peaks - Paralympic Games



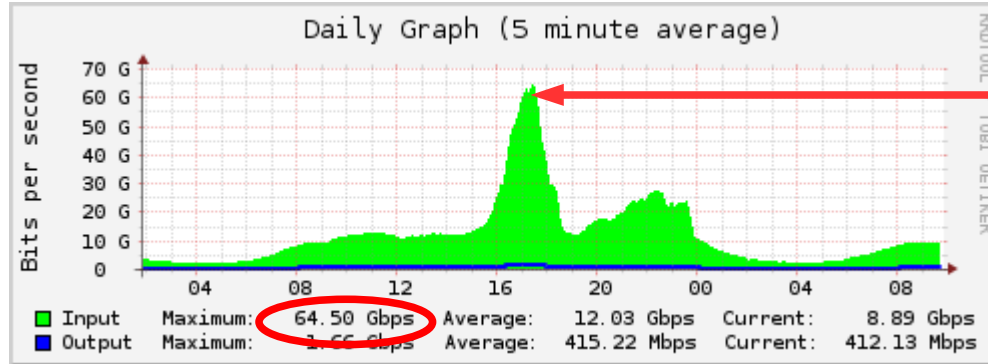
Traffic of AS28604 in IX.br São Paulo



84,07Gbps

***Almost the same traffic peak the Olympic Games
Transmission during a day between the Olympic and Paralympic Games
It was a Wednesday August 31th, 2016***

Traffic of AS28604 in IX.br São Paulo



64,50Gbps

***The highest traffic peak in the Paralympic Games was a transmission that wasn't paralympic dispute.
It was a Wednesday September 14th, 2016***

IX.br – Users during the transmission of the Olympic Games

Brazilians watched the games on the Internet during business hours, when they were at work.

What we noticed was that the traffic peaks in AS28604 occurred during business hours with a fall after went people went home when to watch the games on TV.

A Pay TV channel had 300% increase in audience in the first weekend of the Olympics may have influenced the use of internet to watch games.



IX.br - What were the results of the preparations?

All work done resulted in an event no problem infrastructure supporting traffic generated during the period

IX.br participants supported the amount of traffic generated and there was not saturation in their connections

Some upgrades there was already been made by some participants in the 2014 FIFA World Cup Brazil

Improved structure of IX.br São Paulo and IX.br Rio de Janeiro



Conclusions

Internet transmission of the 2016 Olympic Games over IX.br was successfully done

IX.br São Paulo and IX.br Rio de Janeiro network infrastructure already established to support demand of big video streaming content providers brought enough robustness to support the Olympic Games event

Traffic demanded by the 2016 Olympic Games demonstrated to be lower than traffic demanded by streaming content providers

Brazilians users are more interested in the transmission when there was a Brazilian athlete competing medal or in soccer games

Others transmissions had as much traffic as Olympic Games.

The AS28604 exchanged 20% of the total traffic Olympic over IX.br.

Thanks

Thanks to Globo.com that authorized the use information of traffic exchange on AS28604 in IX.br São Paulo and IX.br Rio de Janeiro during the 2016 Olympic Games



<http://ix.br/ixforum/10>

The PTT Fórum 10 event will take place in São Paulo, Brazil on the 05th and 06th of December 2016.

IX (PTT) Fórum normal audience is composed by Brazilian Autonomous Systems (AS) and IX.br participants (some of them are international companies).

The event will be translated between Portuguese and English.

The event will be part of the **Brazilian Internet Infrastructure week** together with GTER/GTS (Network Engineering, Operation and Security Working Groups).

Thank you

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September 29th, 2016

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