



REPUBLIKA E KOSOVËS/REPUBLIKA KOSOVA/ REPUBLIC OF KOSOVO  
Autoriteti Rregullator i Telekomunikacionit  
Telecommunications Regulatory Authority  
Regulativni Autoritet Telekomunikacije



# IXP Update

## Kosovo Internet Exchange Point KOSIX

RIPE NCC Regional Meeting  
Dubrovnik, 2011

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Telecommunications Regulatory Authority of Kosovo

# Kosovo at a glance

Capital: Prishtina

Official Currency :

Euro (€)

Population (2011 census) app.:  
1.7 mil.

Gross domestic product (GDP)  
constant prices (2009):

Households app.:  
300,000

Total app.: € 4 billion

Per capita app.: € 1800

## **How the idea of establishing an IXP in Kosovo came to light**

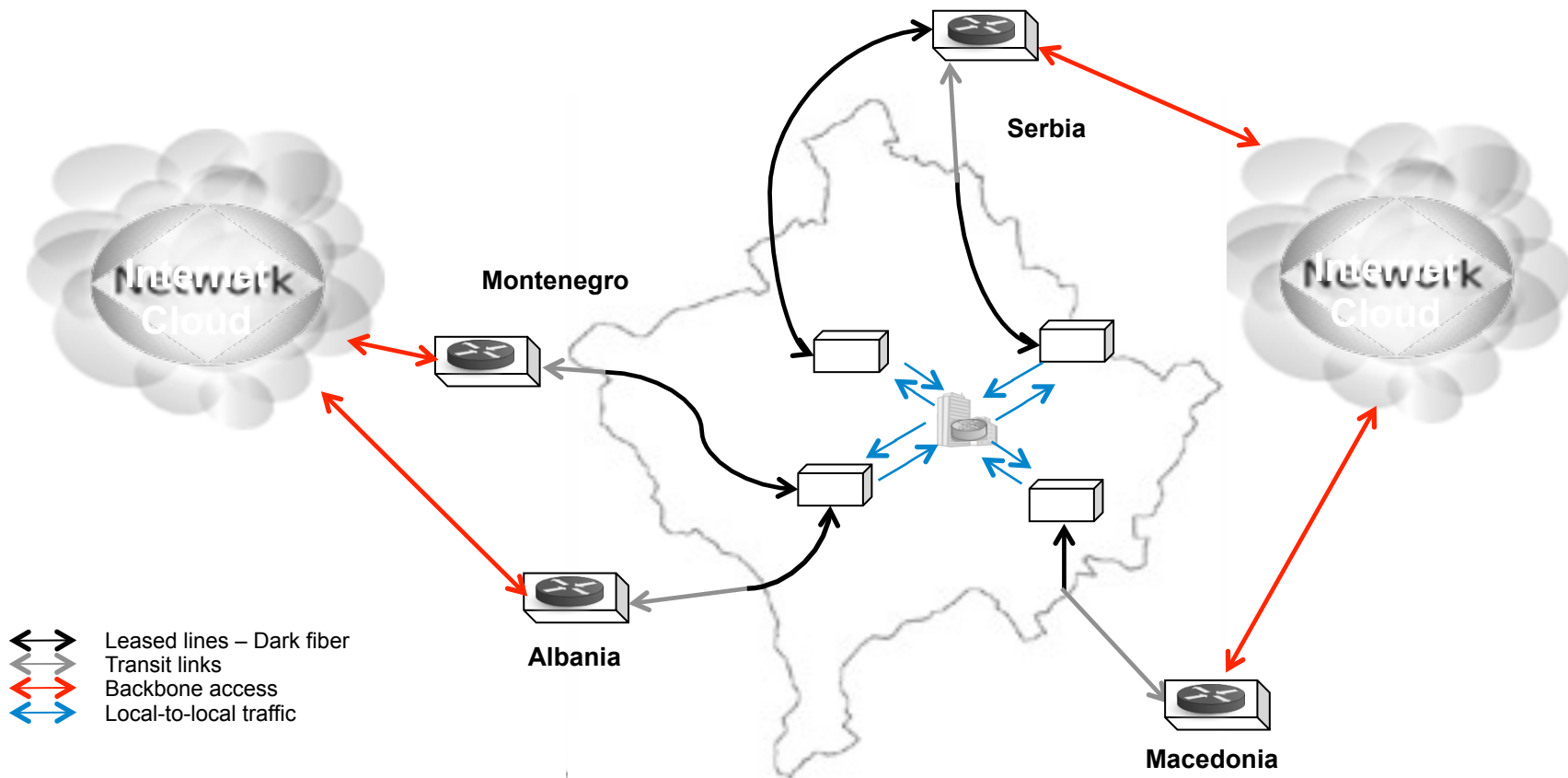
- ▶ The Government of Kosovo was committed to establish an Internet Exchange Point and this was approved in 2007
- ▶ The Government has also represented the idea to the European Commission, that an Internet Exchange Point would be established in Kosovo by 2009
- ▶ Completion of an Internet Exchange Point by the end of calendar 2010 was part of the TRA's (Kosovo's Assembly-approved) 2010 Annual Work Plan

**... we were a little bit behind and managed to complete it by June 2011**

# Who brought KOSIX to life?

- KOSIX is established by Kosovo's Telecommunication Regulatory Authority.
- Financial support received by Norwegian government and CISCO.
- Expert support provided by / through USAID and PCH.
- Premises made available by the University of Prishtina, Kosovo.

**Before KOSIX, all Kosovo's traffic had to enter the Internet cloud using international links, there was no peering ...**



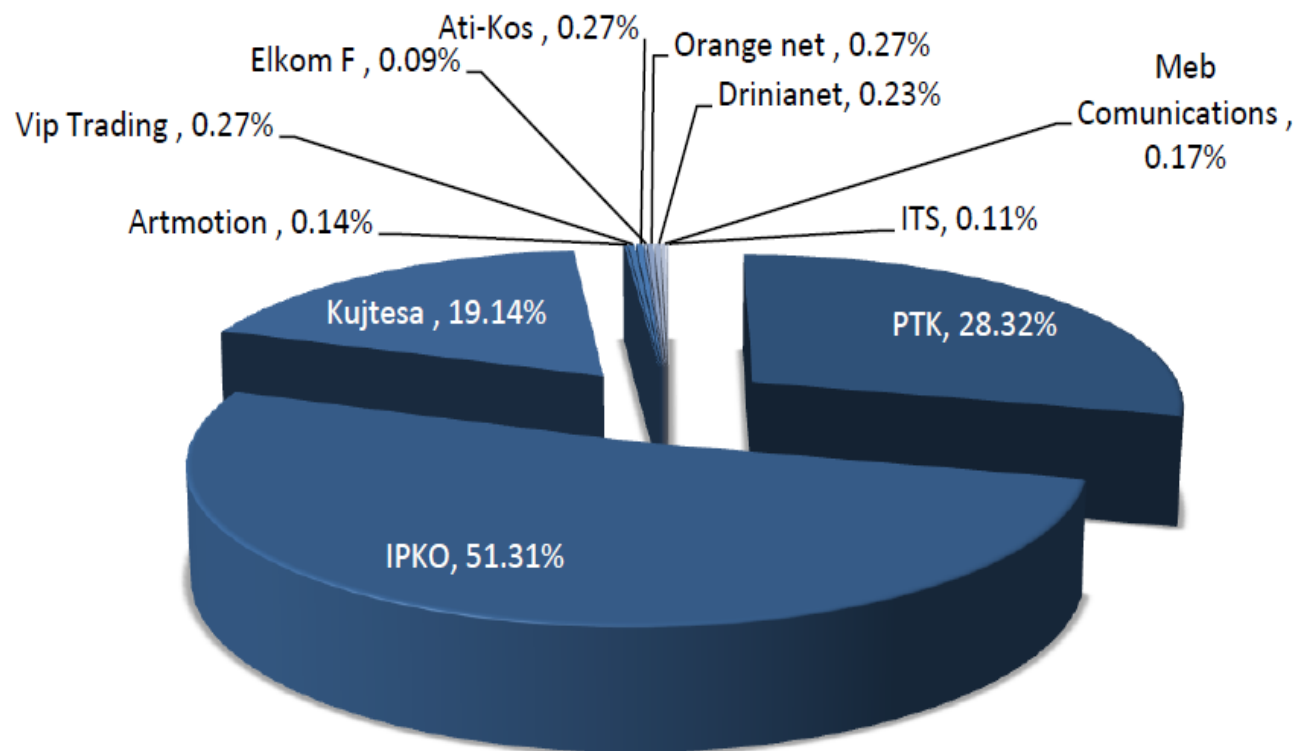
**But with KOSIX, transit links are not needed to deliver local traffic.**

# KOSIX – quick facts

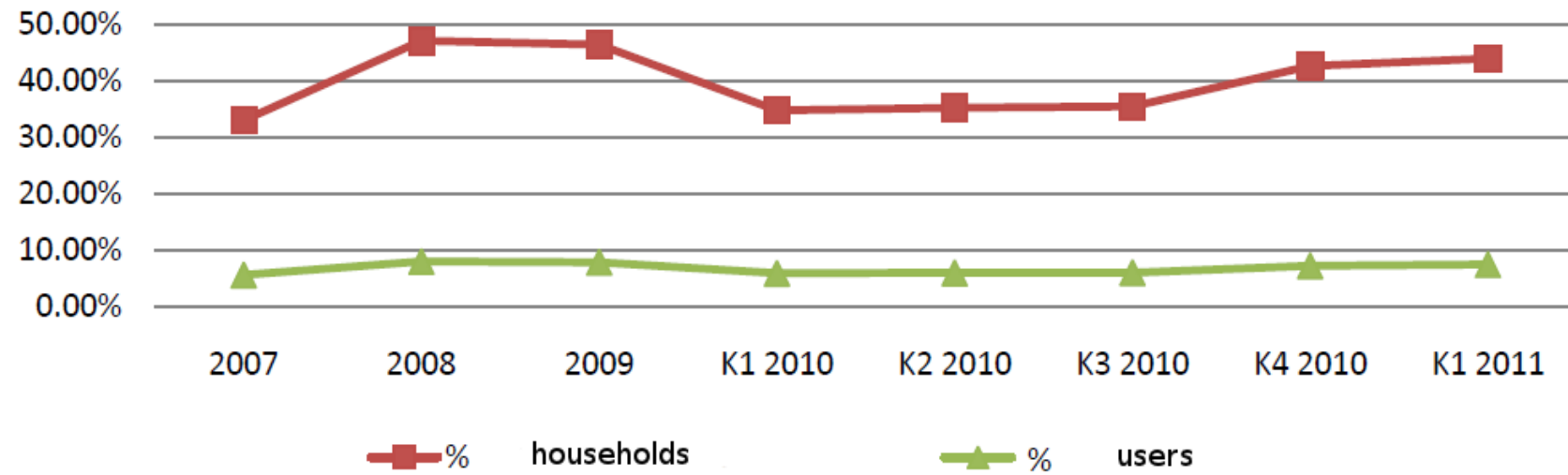
- First time at an IXP Update
- Almost 4 months old
- Uses CISCO switching fabrics
- 4 local ISP members
  1. Artmotion ([www.artmotion.net](http://www.artmotion.net))
  2. IPKO ([www.ipko.com](http://www.ipko.com))
  3. Kujtesa ([www.kujtesa.com](http://www.kujtesa.com))
  4. PTK ([www.ptkonline.com](http://www.ptkonline.com))

(All no-fee peering with each other)
- Peak traffic 140 Mbps
- [www.kosix.net](http://www.kosix.net) (in progress)

## ISP market shares

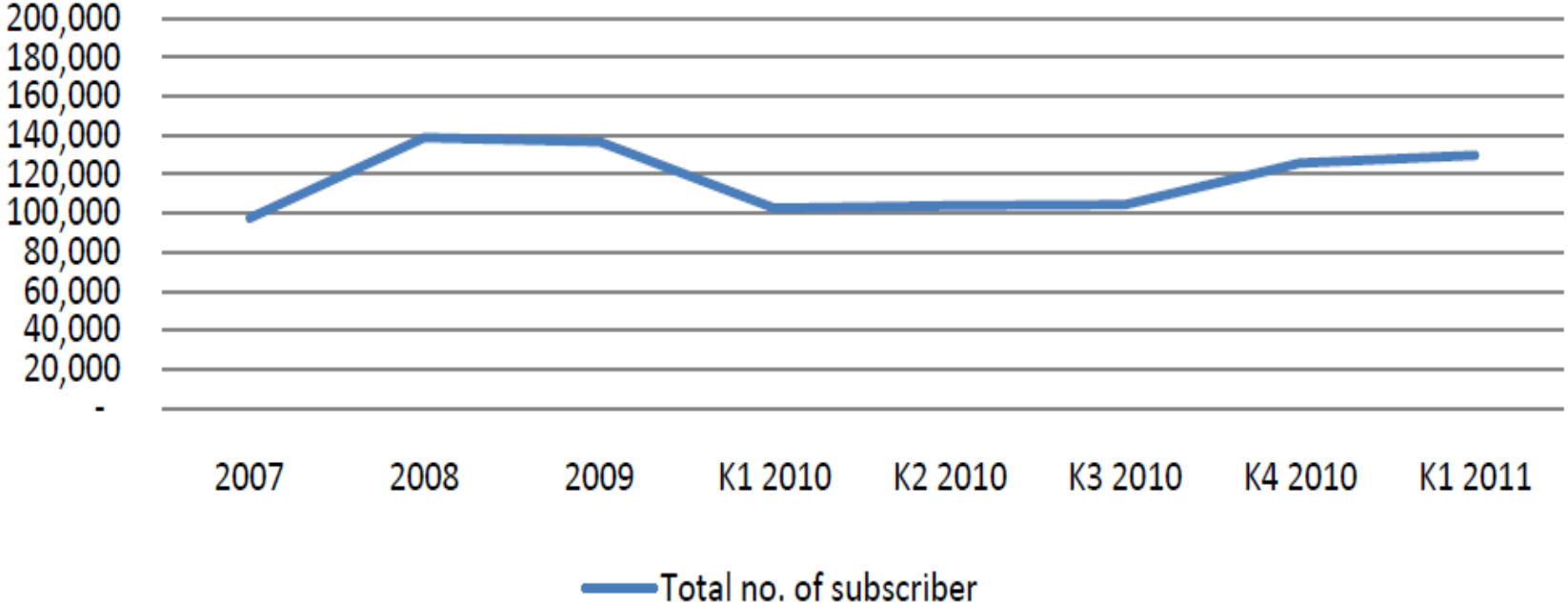


## Internet penetration

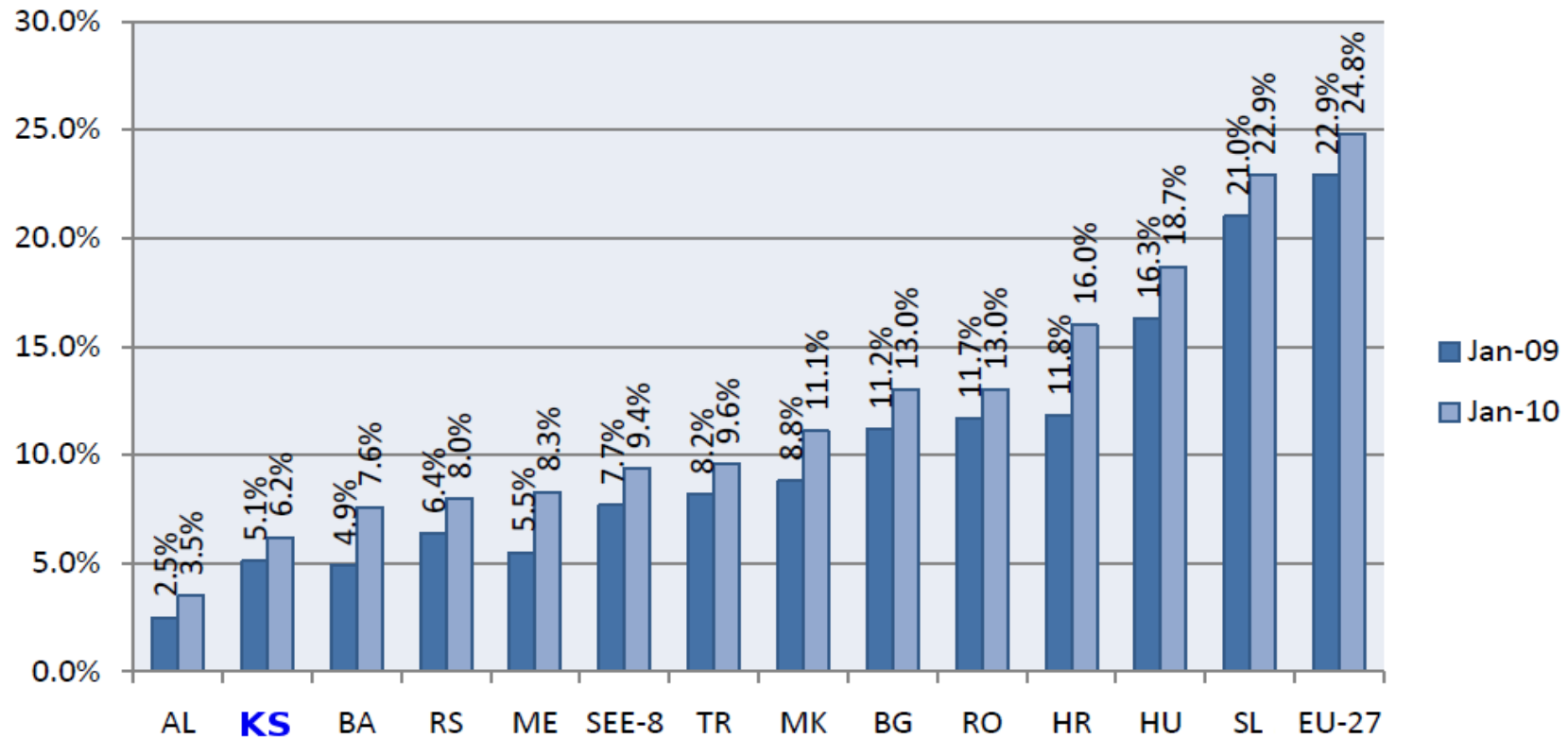




# Total number of subscribers



## Internet penetration compared to other countries



Traceroute  
Kujtesa -> Artmotion

Before

Tracing route to 84.22.48.99 over a maximum of 30 hops

1	1 ms	1 ms	1 ms	192.168.1.1
2	132 ms	102 ms	23 ms	10.255.31.254
3	146 ms	100 ms	102 ms	10.20.30.254
4	24 ms	22 ms	21 ms	82.114.64.185
5	25 ms	62 ms	19 ms	79.101.105.229 [Telekom Srbija]
6	23 ms	19 ms	18 ms	212.200.227.225
7	24 ms	19 ms	109 ms	212.200.232.90
8	218 ms	22 ms	24 ms	212.200.17.45
9	103 ms	104 ms	102 ms	79.101.96.130
10	122 ms	102 ms	103 ms	84.22.63.109
11	126 ms	102 ms	106 ms	84.22.63.25
12	114 ms	100 ms	103 ms	84.22.32.198
13	118 ms	102 ms	102 ms	84.22.48.99

Trace complete.

After

Tracing route to 84.22.48.99 over a maximum of 30 hops

1	1 ms	1 ms	1 ms	192.168.1.1
2	40 ms	84 ms	22 ms	10.255.31.254
3	44 ms	17 ms	10 ms	10.20.30.254
4	12 ms	23 ms	24 ms	82.114.64.185 [Kujtesa]
5	22 ms	16 ms	12 ms	192.168.100.12 [KOSIX]
6	31 ms	24 ms	12 ms	84.22.32.198 [Artmotion]
7	27 ms	11 ms	21 ms	84.22.48.99

Trace complete.

**Improvement:**

- Drop from 13 to 7 hops
- Average 3-packet delay drop from 75ms to 22ms

Ping  
Kujtesa -> Artmotion

Before

Pinging 84.22.48.99 with 32 bytes of data:  
Reply from 84.22.48.99: bytes=32 time=131ms TTL=245  
Reply from 84.22.48.99: bytes=32 time=143ms TTL=245  
Reply from 84.22.48.99: bytes=32 time=181ms TTL=245  
Reply from 84.22.48.99: bytes=32 time=199ms TTL=245

Ping statistics for 84.22.48.99:  
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
Minimum = 131ms, Maximum = 199ms, **Average = 163ms**

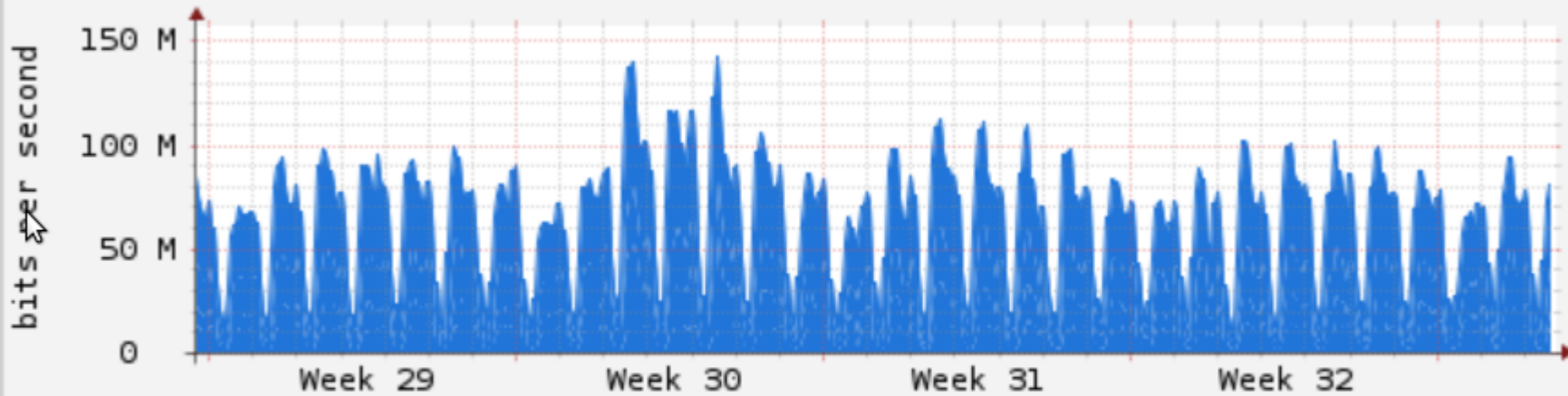
After

Pinging 84.22.48.99 with 32 bytes of data:  
Reply from 84.22.48.99: bytes=32 time=16ms TTL=249  
Reply from 84.22.48.99: bytes=32 time=14ms TTL=249  
Reply from 84.22.48.99: bytes=32 time=14ms TTL=249  
Reply from 84.22.48.99: bytes=32 time=13ms TTL=249

Ping statistics for 84.22.48.99:  
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
Minimum = 13ms, Maximum = 16ms, **Average = 14ms**

**Improvement :**  
Average RTT drop from 163 ms to 14 ms

# Total KOSIX traffic



From 2011/07/16 15:32:46 To 2011/08/16 15:32:46

■ Total Current: 80.53 M Average: 63.90 M Maximum: 142.70 M

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## TRA/KOSIX Objectives

- Become RIPE NCC member.
- Become Euro-IX member.
- Finalize KOSIX regulations.
- Complete KOSIX website ([www.kosix.net](http://www.kosix.net)).
- Establish a working group (in cooperation with ISPs).
- Discuss and decide on collocation services.
- Prepare a strategy for attracting new ISP members from the region.



# Thank you!

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Dubrovnik, 2011

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