



IPv6: Per aspera ad astra

(Through hardships to the stars / Через тернии к звездам)



**ENOG4/RIPE NCC Regional Meeting
Moscow October 23-24, 2012
Speaker: Dmitry Kozorez**

IP Transit

The scalable solution that offers the necessary bandwidth for content-intensive users. Speeds up to 100 Gbps. Static routing and BGP connections available worldwide. We can provide AS numbers and independent IP ranges.

DWDM

Expand your backbone and maximize its performance with edpnet Wavelengths. Dedicated worldwide point-to-point connections up to 100 Gbps based on the newest DWDM technology. Synchronous channels from STM-1 to STM-256.

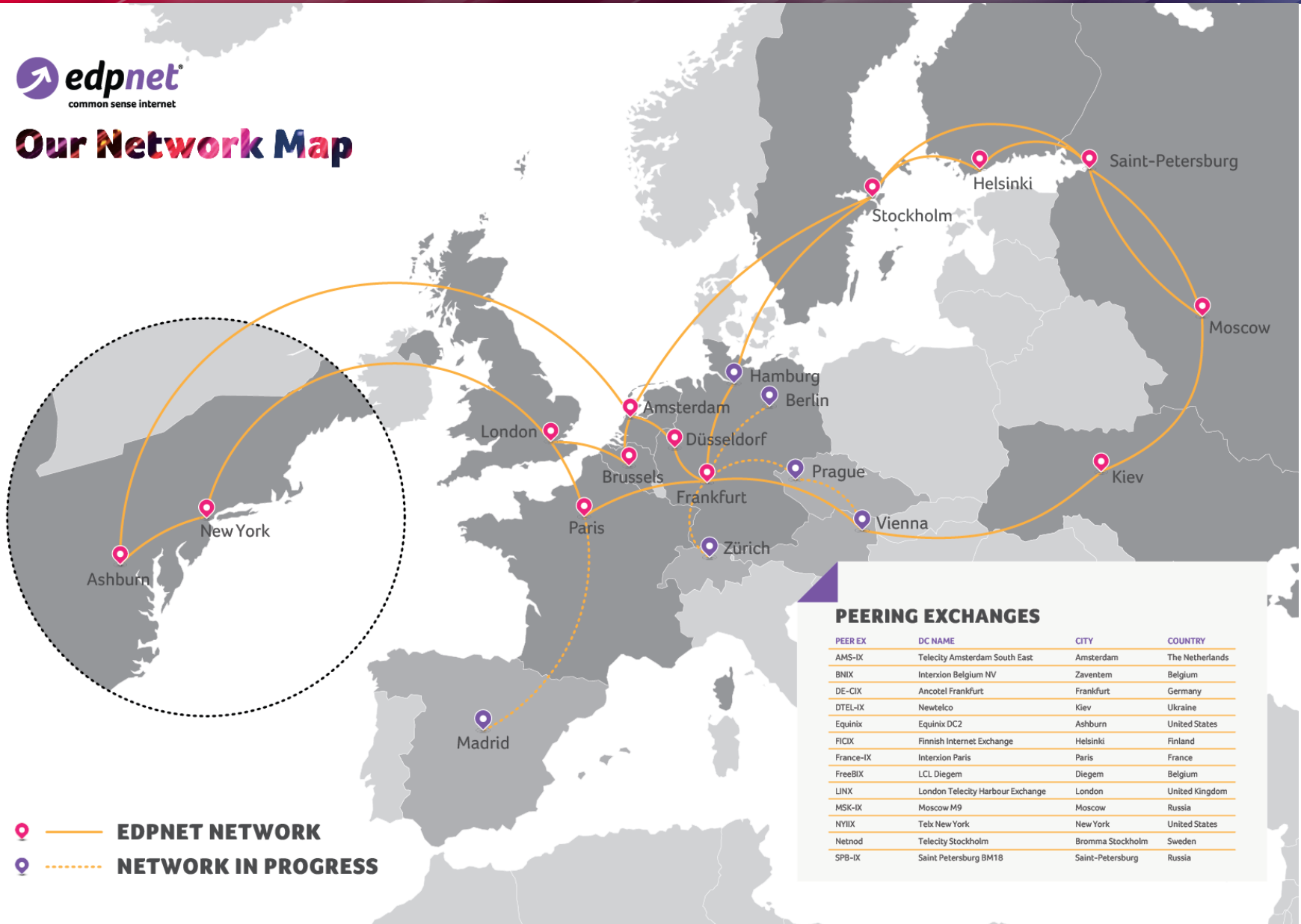
MPLS

EDPnet offers Layer2 ethernet connectivity from 10 Mbps to 10 Gbps. We can provide last mile MPLS solutions. Point-to-point & point-to-multipoint connections available worldwide.

SDH/SONET

We offer synchronous channels from STM-1 to STM-256 (with speeds up to 100 Gbps - 100 GigE WAN PHY, 100 GigE LAN PHY) in a variety of POP's in Europe, USA, and Russia. E1 and T1 connections are possible as well.

Our Network Map

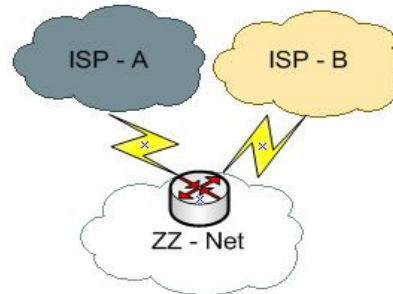


PEERING EXCHANGES

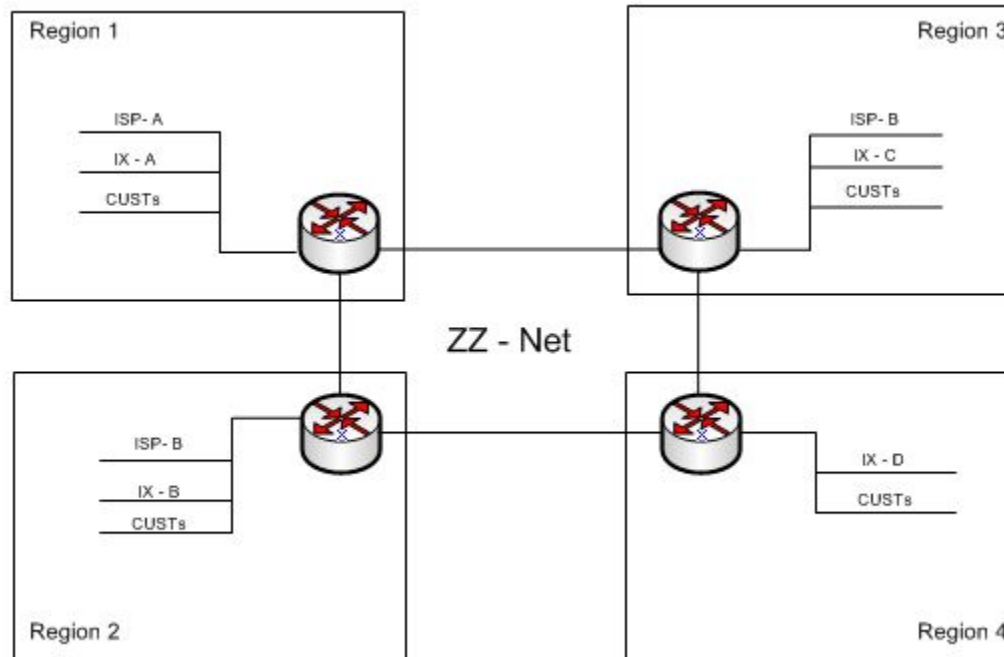
PEER EX	DC NAME	CITY	COUNTRY
AMS-IX	Telecity Amsterdam South East	Amsterdam	The Netherlands
BNIX	Intexion Belgium NV	Zaventem	Belgium
DE-CIX	Ancotel Frankfurt	Frankfurt	Germany
DTEL-IX	Newtelco	Kiev	Ukraine
Equinix	Equinix DC2	Ashburn	United States
FICIX	Finnish Internet Exchange	Helsinki	Finland
France-IX	Intexion Paris	Paris	France
FreeBIX	LCL Diegem	Diegem	Belgium
LINX	London Telecity Harbour Exchange	London	United Kingdom
MSK-IX	Moscow M9	Moscow	Russia
NYIIX	Telx New York	New York	United States
Netnod	Telecity Stockholm	Bromma Stockholm	Sweden
SPB-IX	Saint Petersburg BM18	Saint-Petersburg	Russia

-  — **EDPNET NETWORK**
-  — **NETWORK IN PROGRESS**

Scenario 1: XXXX:XXXX::/32 to each BGP peer.



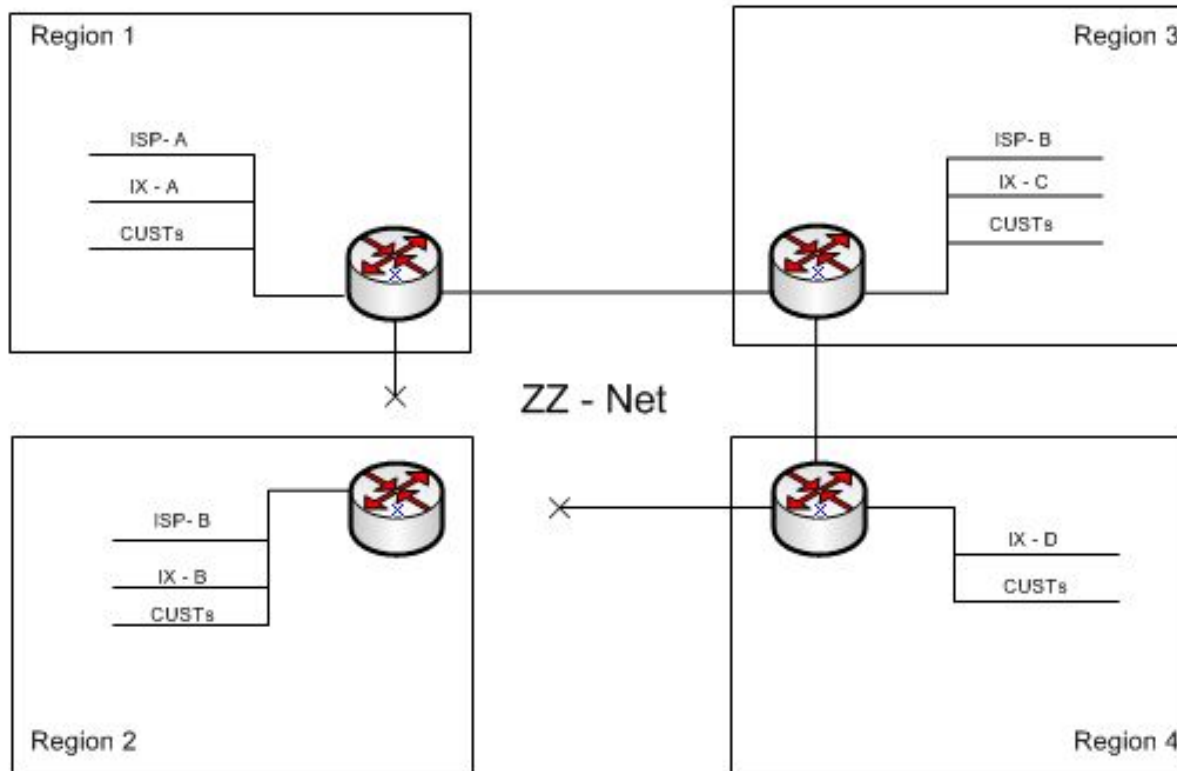
Scenario 2: One IPv6 - range per one node (blackhole-avoidance)



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Amount of Nodes?

XXXX:XXXX::/32



/34-/32=2 (2²=4 nodes)

XXXX:XXXX:0000::/34
 XXXX:XXXX:4000::/34
 XXXX:XXXX:8000::/34
 XXXX:XXXX:C000::/34

/36-/32=4 (2⁴=16 nodes)

XXXX:XXXX:0000::/36
 XXXX:XXXX:1000::/36
 XXXX:XXXX:2000::/36
 XXXX:XXXX:3000::/36
 XXXX:XXXX:4000::/36
 XXXX:XXXX:5000::/36
 XXXX:XXXX:6000::/36
 XXXX:XXXX:7000::/36
 XXXX:XXXX:8000::/36
 XXXX:XXXX:9000::/36
 XXXX:XXXX:A000::/36
 XXXX:XXXX:B000::/36
 XXXX:XXXX:C000::/36
 XXXX:XXXX:D000::/36
 XXXX:XXXX:E000::/36
 XXXX:XXXX:F000::/36

EDPnet IPv6 scheme: 2A02:578::/38

(maximum-prefix = 64)

2a02:578:0000::/38		2a02:578:8000::/38	
2a02:578:0400::/38	2a02:578:0000::/36	2a02:578:8400::/38	2a02:578:8000::/38
2a02:578:0800::/38		2a02:578:8800::/38	
2a02:578:0c00::/38		2a02:578:8c00::/38	
2a02:578:1000::/38		2a02:578:9000::/38	
2a02:578:1400::/38	2a02:578:1000::/36	2a02:578:9400::/38	2a02:578:9000::/36
2a02:578:1800::/38		2a02:578:9800::/38	
2a02:578:1c00::/38		2a02:578:9c00::/38	
2a02:578:2000::/38		2a02:578:a000::/38	
2a02:578:2400::/38	2a02:578:2000::/36	2a02:578:a400::/38	2a02:578:a000::/36
2a02:578:2800::/38		2a02:578:a800::/38	
2a02:578:2c00::/38		2a02:578:ac00::/38	
2a02:578:3000::/38		2a02:578:b000::/38	
2a02:578:3400::/38	2a02:578:3000::/36	2a02:578:b400::/38	2a02:578:b000::/36
2a02:578:3800::/38		2a02:578:b800::/38	
2a02:578:3c00::/38		2a02:578:bc00::/38	
2a02:578:4000::/38		2a02:578:c000::/38	
2a02:578:4400::/38	2a02:578:4000::/36	2a02:578:c400::/38	2a02:578:c000::/36
2a02:578:4800::/38		2a02:578:c800::/38	
2a02:578:4c00::/38		2a02:578:cc00::/38	
2a02:578:5000::/38		2a02:578:d000::/38	
2a02:578:5400::/38	2a02:578:5000::/36	2a02:578:d400::/38	2a02:578:d000::/36
2a02:578:5800::/38		2a02:578:d800::/38	
2a02:578:5c00::/38		2a02:578:dc00::/38	
2a02:578:6000::/38		2a02:578:e000::/38	
2a02:578:6400::/38	2a02:578:6000::/36	2a02:578:e400::/38	2a02:578:e000::/36
2a02:578:6800::/38		2a02:578:e800::/38	
2a02:578:6c00::/38		2a02:578:ec00::/38	
2a02:578:7000::/38		2a02:578:f000::/38	
2a02:578:7400::/38	2a02:578:7000::/36	2a02:578:f400::/38	2a02:578:f000::/36
2a02:578:7800::/38		2a02:578:f800::/38	
2a02:578:7c00::/38		2a02:578:fc00::/38	

Our way to IPv6.

**1 Step: Everything for our Office LAN:
Win7, DHCP, WiFi-AccessPoint, ASA.**

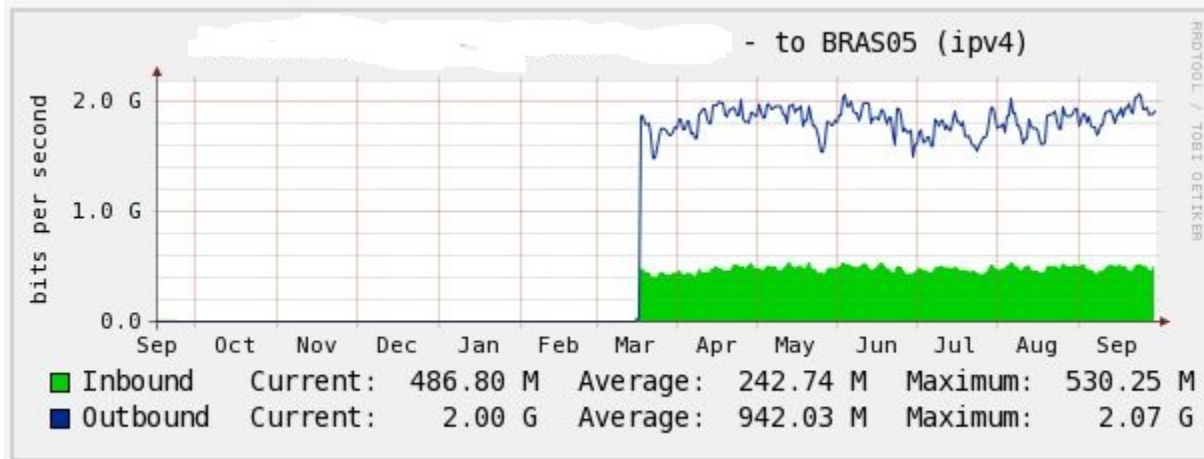
**2 Step: Our network Core:
Dual-stack; IPv6 from all IXs, Upstream; announce our range;
act as a transit IPv6 transit AS for our customers.**

3 Step: Our customers:

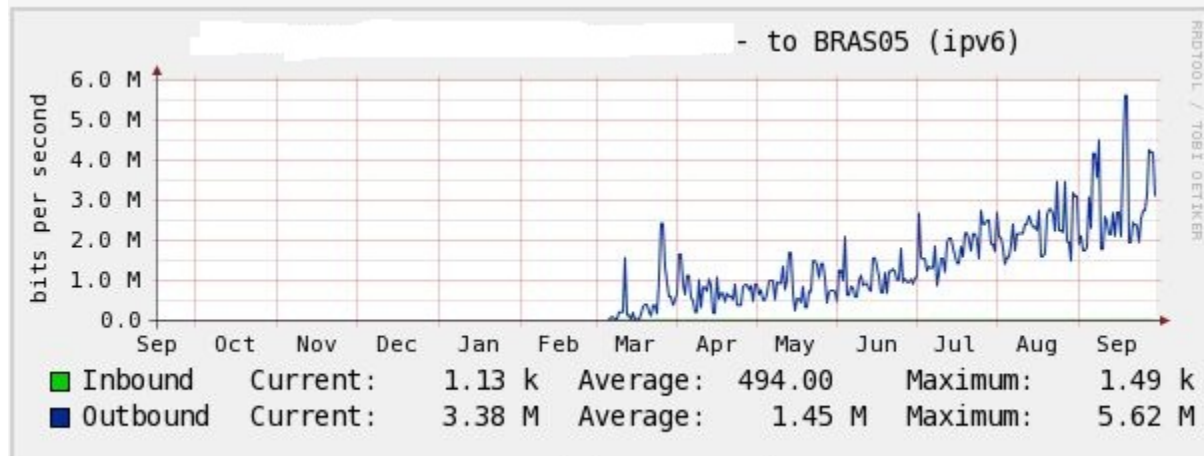
- **Enabling IPv6 on our services, such as WEB-servers, DNS-servers, etc.**
- **Migration from C7200 to ASR1K for BRAS so we could allow native IPv6 for end users.**
- **We created a small test user-db of EDPnet customers who wanted to test and experiment with us, in order to find bugs/problems/issues.**
- **Once this pilot project was done, we gave the opportunity to all customers to enable IPv6 on their internet connect**

IPv6 traffic is very low, but WE ARE READY!!!

These are graphs from one our BRAS:



Yearly (1 Day Average)



Yearly (1 Day Average)

To see IPv6 traffic in MRTG, we've forwarded traffic separately via two interfaces.
On both interfaces we have Dual-Stack but with different OSPF cost for IPv4&IPv6.

Dimidium facti qui coepit habet.

He who has begun has the work half done.

Тот сделал полдела, кто уже начал.

Problem:

CPE does not support IPv6.

Solution:

AVM fritz!box 7360

**Cisco 87x series and Cisco 88x series
(IPv6 works correctly only with advance enterprise IOS,
which requires license to buy)**

Cisco 89x (IPv6 works by default)

What benefits do I get? Is it urgent?

Dimidium facti qui coepit habet.

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Тот сделал полдела, кто уже начал.

The main Problem:

**We need an instrument for creation our own IPv6 plan.
We need another tool for IPv6 assignments.**

Solution:

OpenSource: IPplan <http://iptrack.sourceforge.net>

HaCi <http://haci.larsux.de>

Excel/MySQL -----> your own web-based application.

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Who is interested in it?

Dear RIPE NCC,

**could we ask you to support IPv6 by creation
a new project “IPv6-Plan” ?**

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