



Mobile broadband and IPv6 in Slovenia



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Agenda



- Few words about go6 institute
- IPv6 in Tušmobil cellular network
- IPv6 in Mobitel cellular network
- Q&A



Go6 institute



- IPv6 initiative in Slovenia
- Not-for-profit organisation
- Strategic partnership with Arnes and LTFE
- Open platform, based on membership (major ISP, mobile operators, content providers, integrators,...)
- Financially supported by members of go6 platform
- Steered by go6 expert council, formed from representatives of government, telco&post regulator, academic research network, faculty, Slo IPv6 WG chair and industry

Go6 expert council official meetings



Go6 expert council



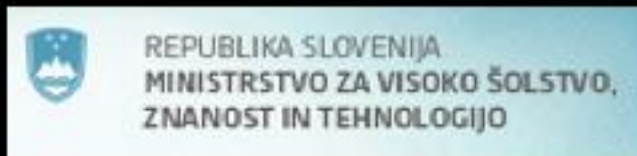
Go6 platform – strategic partners

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V sodelovanju z:



Go6 platform – Gold and silver members

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Zlati člani:

Telekom
Slovenije



go6

Srebrni člani:

ISKRATEL



POLICIJA



Go6 platform – members

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avtenta.si



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IPv6 Ready Logo Program



- Go6 now member of IPv6 Ready Logo Committee



IPv6 Ready
Logo Program



Surprise: Global ISOC became Go6 member

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***Internet
Society***



Go6 activities



- IPv6 working group – IP experts from industry
- Slovenian IPv6 summits (5th done in July 2011)
- IPv6 consulting to members of platform and outside
- 6DEPLOY workshops – organizing events
- Operating and hosting 6DEPLOY lab
- A+P RFC (RFC 6346)
- Go6lab – testing, testing, testing...
- World wide IPv6 speeches on various conferences

- Preparing the document, describing the requirements and compliancy of ITC equipment with IPv6 standards and also experience/knowledge needed for integrators
- Helping government with preparation of IPv6 action plan, hopefully becoming national strategy later.
- Mixed form of task force, RIPE WG and IETF WG

Slo IPv6 summits



- World known keynoters – Woiciech Dec (Cisco), Martin J. Levy (HE), Daniel Karrenberg (Chief scientist RIPE-NCC), Patrik Faltstrom (Cisco), Ron Broersma (US Navy/SPAWAR), ...
- Presenters from around the world
- Presenters from Slovenia (important)
- Updates minutes – big push, deployment engine
- Round tables, initiated by Ministry for science and technology

Slo IPv6 summits (high-level openings) CTO of Arnes and secretary of Ministry of S&T

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Jan Žorž <jan@go6.si>

Krakow, Poland 2011

Slo IPv6 summits (round tables – high-level)

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4. Slo IPv6 summit technical panel, lead by Daniel Karrenberg and Jan Žorž



Jan Žorž <jan@go6.si>

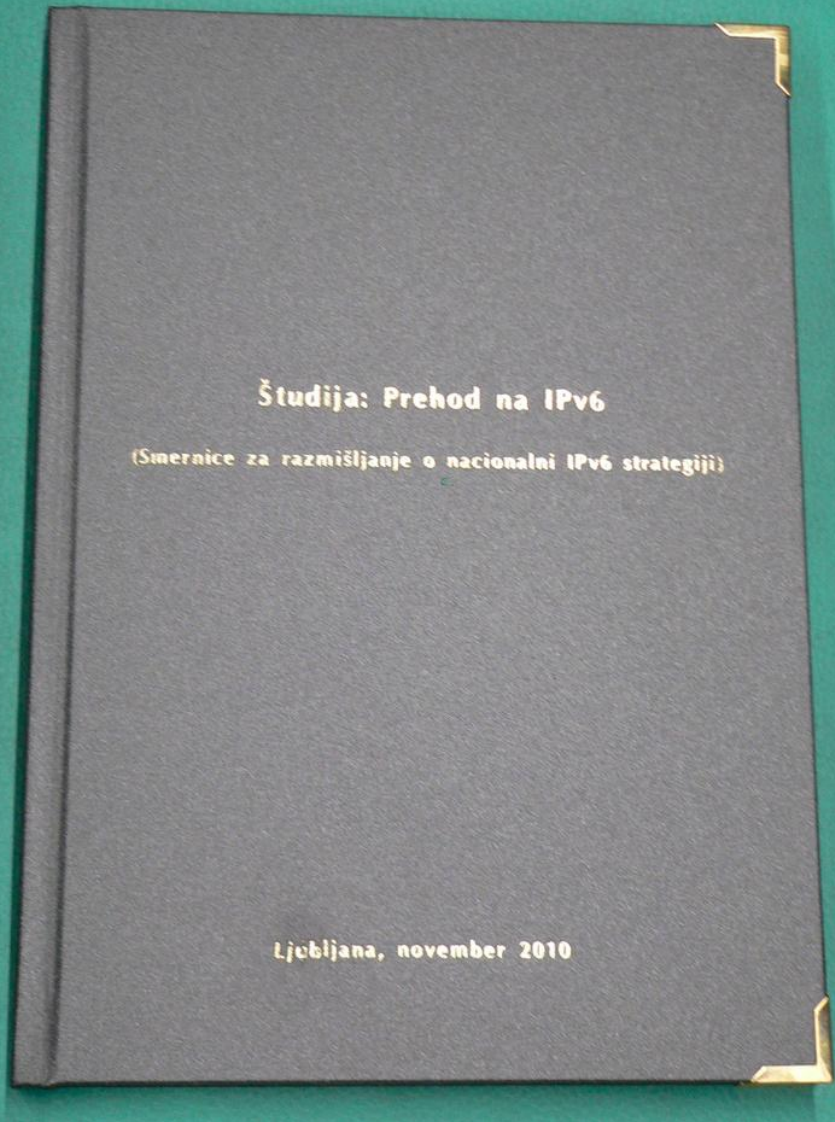
Krakow, Poland 2011

Regulators role in IPv6 deployment



- Apek published 79 pages long paper “IPv6 deployment recommendations”
- IPv6 survey to all operators, rendering IPv6 question very important in some CxO minds...
- Big involvement in Go6 platform
- Not regulating any IP related transports or networks.

IPv6 study for Slo government



170 pages

7 authors

International team

11 key questions

Many answers...

IPv6 study for Slo government - handover



Jan Žorž <jan@go6.si>

Krakow, Poland 2011

IPv6 study- Patrik signing the book 😊

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Krakow, Poland 2011

RIPE-501 – published!



← → ↻ ripe.net/docs/ripe-501.html

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Requirements For IPv6 in ICT Equipment





























Jan Žorž
Sander Steffann

Document ID: ripe-501
Date: November 2010



Contents





















- [Introduction](#)
- [Option 1](#)
 - [Requirements for support of standards](#)
 - [Hardware](#)
 - [Requirements for "host" equipment](#)
 - [Requirements for consumer grade "layer 2 switch" equipment](#)
 - [Requirements for enterprise/ISP grade "layer 2 switch" equipment](#)
 - [Requirements for "router or layer 3 switch" equipment](#)
 - [Requirements for "network security" equipment](#)
 - [Requirements for IPv6 support in software](#)
 - [Skill requirements of the systems integrator](#)
 - [DECLARATION](#)
- [Option 2](#)
 - [Proposed text for the tender initiator](#)
- [Option 3](#)
 - [Proposed text for the tender initiator](#)

Result...

LG	Prefix	tid	NetName	Owner	AS	S	Allocated	First seen
LG	2001:67c:58::/48		SI-NIL-NET6	NIL Podatkovne komunikaci...	24629	A	2009-09-07	2009-09-09 11:32:31
LG	2001:67c:124::/48		SI-LinIT	LinIT , Informacijske Teh...	50391	A	2010-01-25	2010-01-27 08:47:35
LG	2001:67c:1a0::/48		PROPLUS-SI	PRO PLUS, d.o.o.	5603	A	2010-03-11	2011-05-12 16:48:00
LG	2001:67c:1fc::/48		SI-SMART-COM	Smart Com d.o.o.	43462	A	2010-05-14	2011-03-14 15:17:58
LG	2001:67c:2f0::/48		HERMES-SOFTLAB	Hermes Softlab Programska...		A	2010-09-22	2011-02-28 12:32:57
LG	2001:67c:300::/48		DELO-SI6	DELO, d. d.	39387	A	2010-09-30	
LG	2001:67c:2004::/48		ISKRA-SISTEMI6	ISKRA SISTEMI Avtomatizac...	25173	A	2011-01-12	2011-02-23 14:17:57
LG	2001:67c:2014::/48		SI-ASTEC-NET	Astec d.o.o.	51816	A	2011-01-18	2011-01-24 09:17:50
LG	2001:67c:20b8::/47		SI-KDD	KDD Centralna klirinsko d...		A	2011-02-16	
LG	2001:67c:20d8::/48		AVTENTA-LJ6	Avtenta.si, d.o.o.		A	2011-02-18	
LG	2001:67c:21f4::/48		SI-BASS	BASS Racunalniski Inzenir...	197579	A	2011-04-26	2011-05-10 09:47:59
LG	2001:67c:2254::/48		SPORTNA-LOTERJA	Sportna loterija d.d.	42948	A	2011-05-10	
LG	2001:67c:2288::/48		ZD-LJ	Zdravstveni dom Ljubljana		A	2011-05-18	
LG	2001:7f8:46::/48		ARNES-SIX-IPv6-NET-2...	Slovenian Internet Exchan...	2107	A	2008-10-03	2008-10-23 08:47:34
LG	2001:1470::/32		SI-ARNES-20030618	ARNES (Academic and Resea...	2107	A	2003-06-18	2003-07-22 08:21:58
LG	2001:1590::/32		SI-MONOTEK-20101126	Monotek d.o.o.	197806	A	2010-11-26	2011-05-18 09:48:02
LG	2001:15c0::/32		SI-MEDINET-20031002	Amis d.o.o.	8591	A	2003-10-02	2003-10-05 16:41:08
LG	2001:1688::/32		SI-BONE-20031216	Triera Internet	3212	A	2003-12-16	2004-06-27 19:20:37
LG	2a00:ee0::/32		SI_TELEKOM-20081120	Telekom Slovenije d.d.	5603	A	2008-11-20	2010-02-09 14:02:36
LG	2a00:fc0::/32		SI-VOLJA-20081210	voljatelj	16016	A	2008-12-10	2009-02-10 13:32:38
LG	2a00:1368::/32		SI-LT-FE-20090915	University of Ljubljana,...	28933	A	2009-09-15	2010-05-06 14:32:41
LG	2a00:13d8::/32		SI-MMTC-20090922	Telemach d.o.o.		A	2009-09-22	
LG	2a00:1420::/32		SI-MOBIK-20090924	Mobik IPv6 network	44993	A	2009-09-24	2009-10-06 09:32:33
LG	2a00:1438::/32		SI-TSMART-20091002	TELESMART podatkovne komu...	49630	A	2009-10-02	2009-11-23 23:32:35
LG	2a00:1448::/32		SI-ELEKTROTURNEK-20...	Elektro Turnsek d.o.o.	42613	A	2009-10-05	2009-11-23 23:32:35
LG	2a00:1600::/32		SI-UNI-MB-20091106	Univerza v Mariboru	50195	A	2009-11-06	2009-12-31 00:02:36
LG	2a00:1a20::/32		SI-MOBIL-20100125	SI.MOBIL d.d.		A	2010-01-25	
LG	2a00:1c80::/32		SI-ARJO-20100304	ARJO, d.o.o.		A	2010-03-04	

Result...



LG	2a00:1da8::/32		SI-NAKOM-20100317	Nakom d.o.o.	49725	A	2010-03-17	2010-03-18 09:02:39
LG	2a00:f000::/32		SI-AKSON-20101203	AKSON, poslovno in inform...		A	2010-12-03	
LG	2a01:260::/32		SI-T-2-20061201	T-2 d.o.o.	34779	A	2006-12-01	2010-06-23 07:47:44
LG	2a02:e8::/32		SI-DOMENCA-20080229	Domenca d.o.o.	43128	A	2008-02-29	2008-11-12 08:47:36
LG	2a02:7a8::/32		SI-RTVSLO-20080911	RTV Slovenija	47917	A	2008-09-11	2009-02-12 09:32:28
LG	2a02:800::/32		SI-SOFTNET-20081217	Softnet d.o.o.	9119	A	2008-12-17	2009-11-24 14:32:35
LG	2a02:840::/32		SI-TUSMOBIL-20090105	TUSMOBIL D.O.O.	41828	A	2009-01-05	2009-09-25 11:32:33
LG	2a02:d68::/32		SI-SGN-20090420	SGN d.o.o.	35471	A	2009-04-20	2009-04-25 22:02:29
LG	2a02:d80::/32		SI-NETSI-20090421	Metaling d.o.o.	12778	A	2009-04-21	2009-04-25 22:02:29
LG	2a02:d90::/32		SI-STELKOM-20090422	Stelkom d.o.o.	43061	A	2009-04-22	2011-03-14 09:03:05
LG	2a02:e20::/32		SI-MOBITEL-20090507	Mobitel d.d.	29276	A	2009-05-07	2009-12-04 14:32:35
LG	2a02:2230::/32		SI-AKTON-20100804	Akton d.o.o. Network		A	2010-08-04	
LG	2a02:23d0::/32		SI-K2-20100909	VELCOM d.o.o.	5435	A	2010-09-09	2010-09-10 09:02:45
LG	2a02:2590::/32		SI-KATENG-20101007	Zavod Kabelska televizija...	51615	A	2010-10-07	2010-10-18 09:02:46
LG	2a02:28b0::/32		SI-SIEL-20101108	SIEL, INFORMACIJSKE RESIT...		A	2010-11-08	
LG	2a02:2b40::/32		si-masicom-20101125	Ljubljanski kabel d.d.		A	2010-11-25	
LG	2a02:7000::/32		SI-ABAK-20101206	Abak trgovina in storitve...	197441	A	2010-12-06	2010-12-11 21:47:53
LG	2a03:a100::/32		SI-XENYA-20110412	XENYA inzeniring, proizvo...		A	2011-04-12	
LG	2a03:c800::/32		SI-KZPS-20101220	KONTROLA ZRACNEGA PROMETA...		A	2010-12-20	
LG	2a03:f800::/32		SI-TSAT-20101220	TELESAT, d.o.o., Jesenice	52035	A	2010-12-20	2010-12-21 09:02:50

The database currently holds 48 IPv6 DFP's.

Of which 0 (0.00%) are reclaimed, 0 (0.00%) are returned to the pool and 14 (29.17%) IPv6 DFP's didn't have a routing entry.

Thus 34 (70.83%) networks are currently correctly announced.

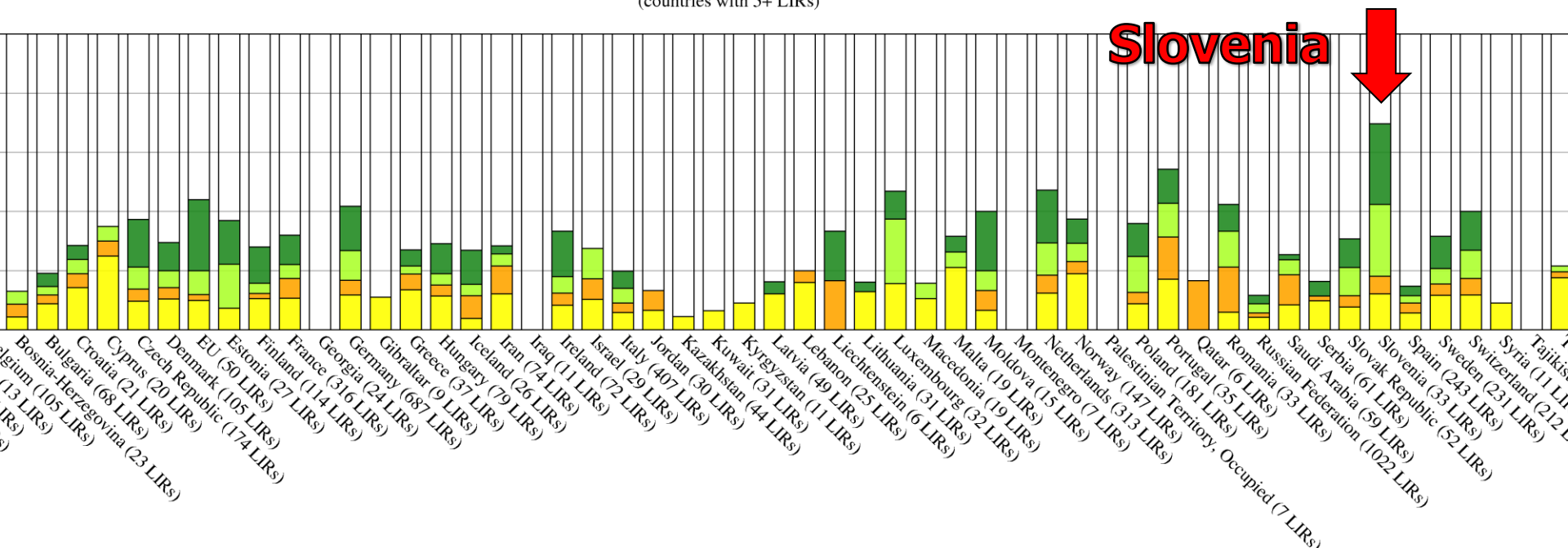
0 (0.00%) only announced a /35 while they have been allocated a /32.

0 (0.00%) announce both their /32 and their /35.

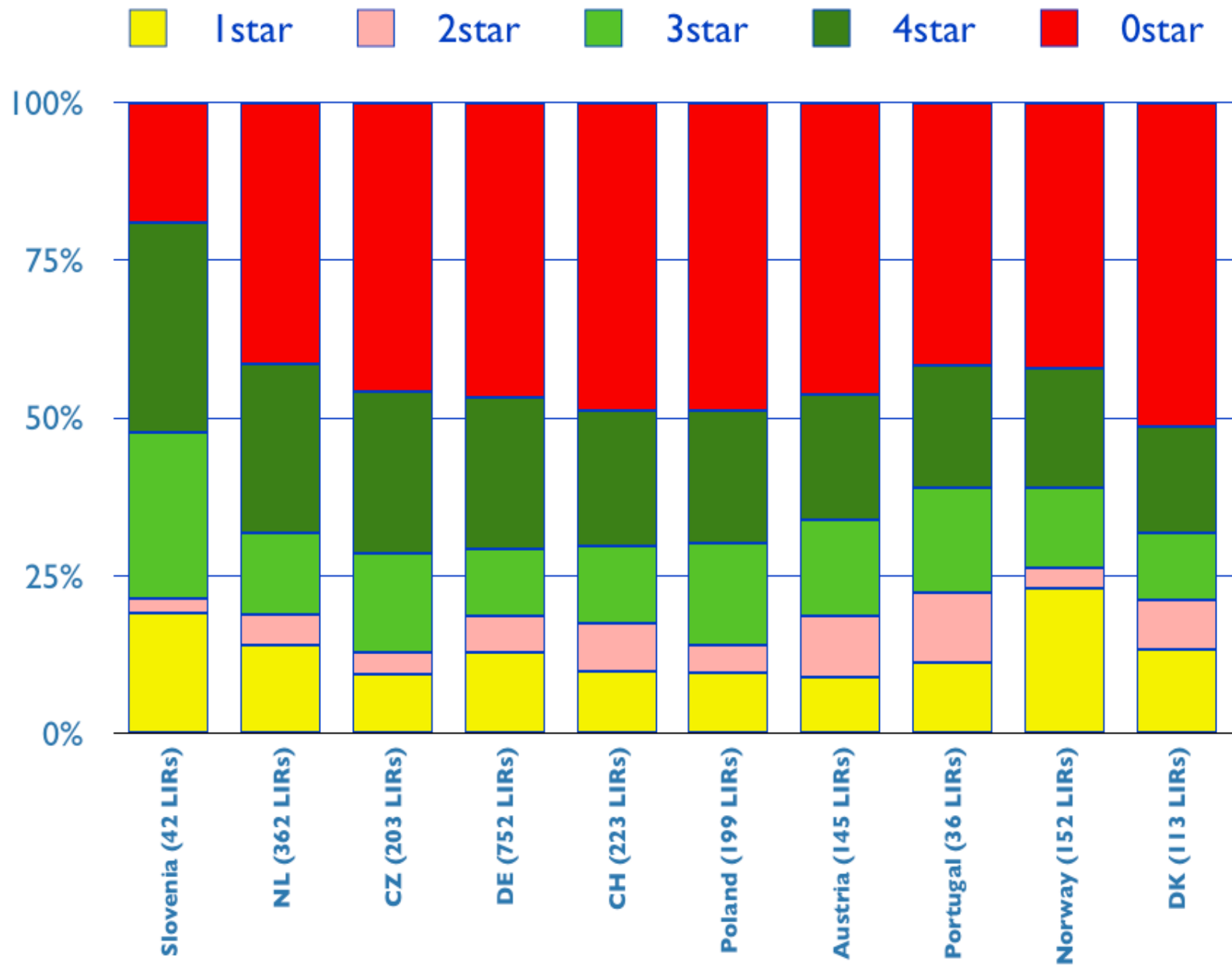
IPv6 in Slovenia



IPv6 'ripeness'-rating of LIRs per country
(countries with 5+ LIRs)



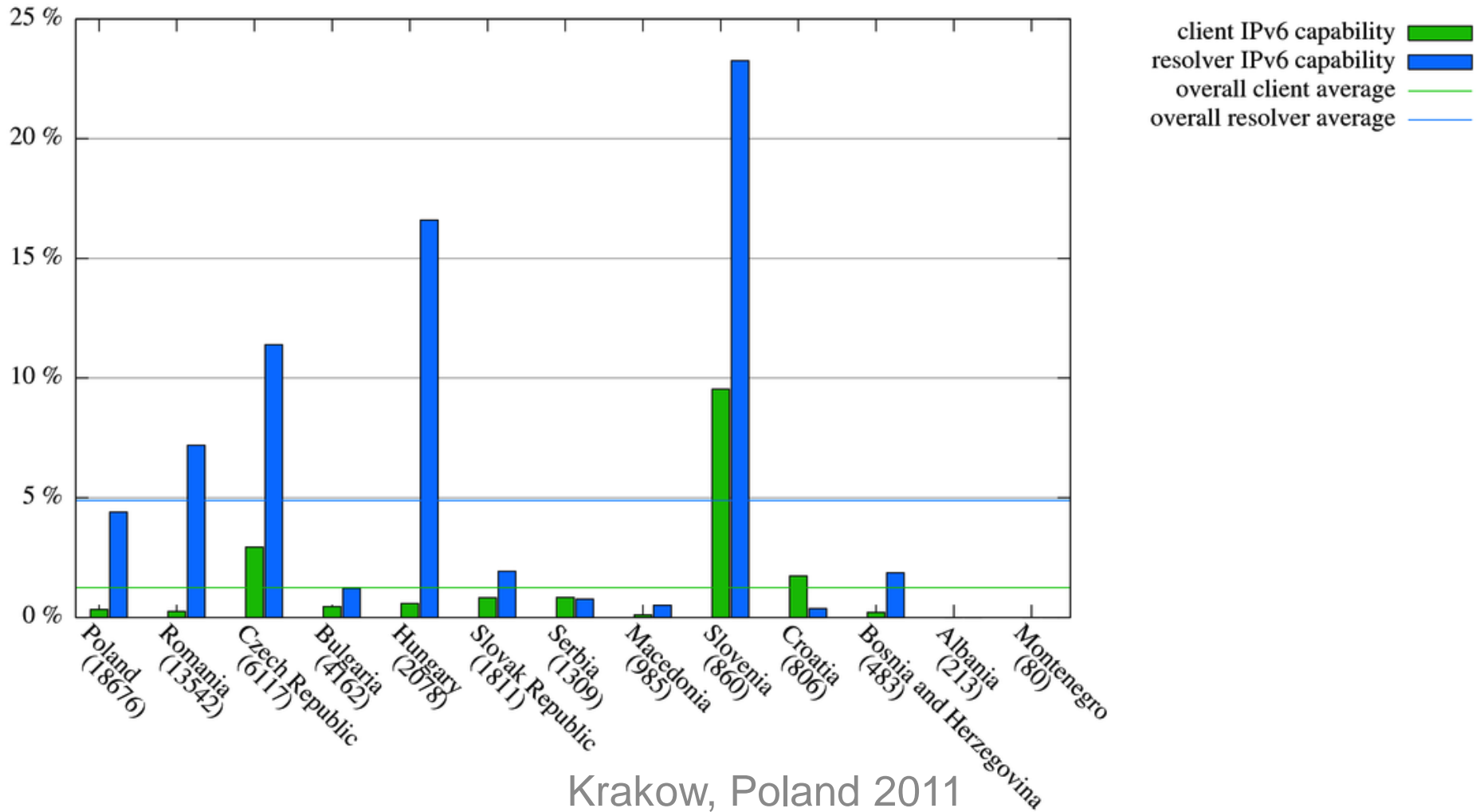
IPv6 RIPEness: relative (28 April 2011)



IPv6 in Slovenia



Native IPv6 in web clients and resolvers they use (Eastern Europe)



Sharing IPv6 knowledge around the world



It's very important sharing our knowledge, expertise and experience in IPv6 implementation with other IPv6 Task Forces, IPv6 initiatives and audiences around the world!!!

Thank you for finding our ideas interesting.

Around the world (Infosek 2008/2009)



Jan Žorž <jan@go6.si>

Krakow, Poland 2011

Around the world (RIPE60 Prague)

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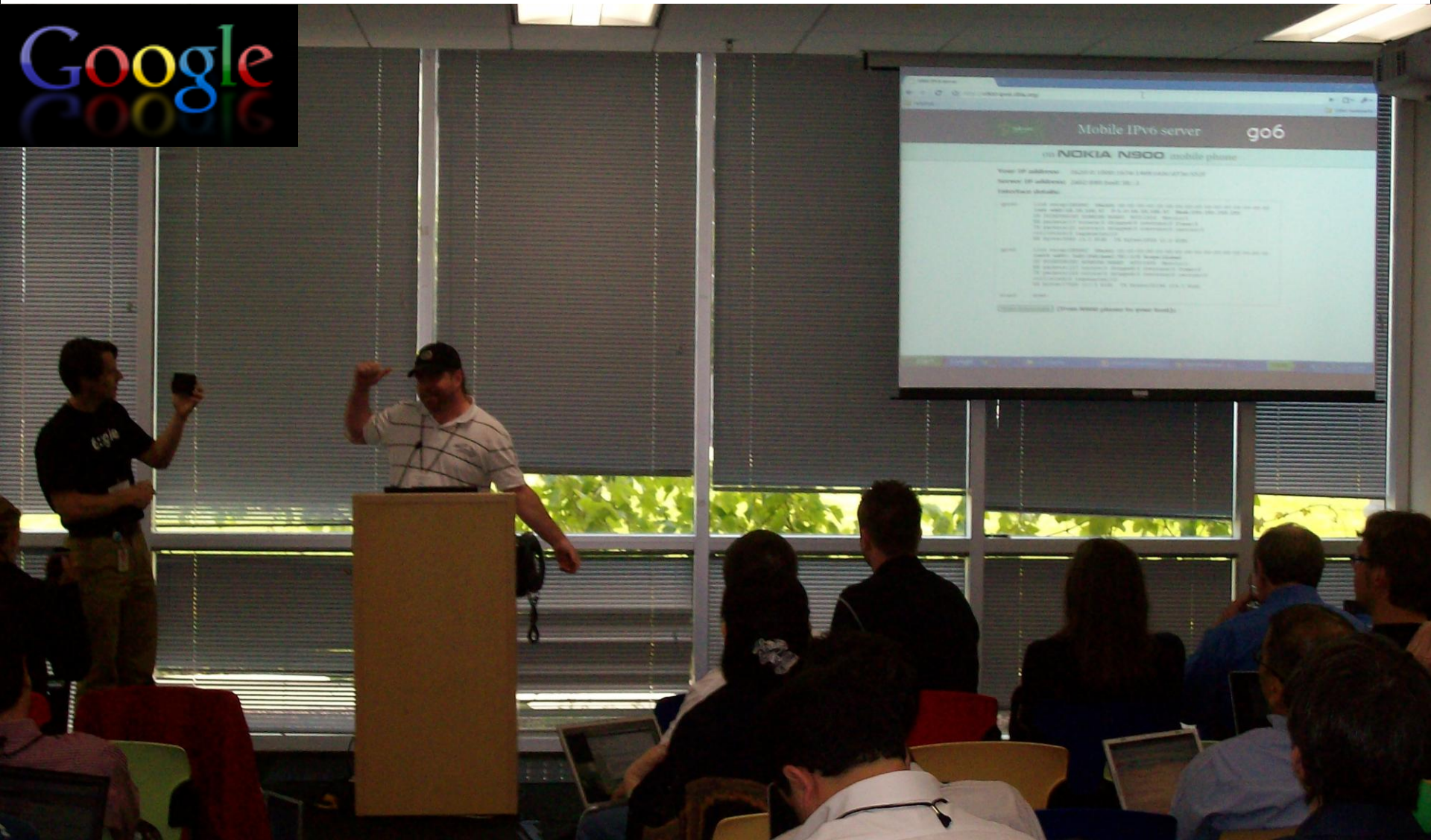


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Krakow, Poland 2011

29

Around the world (Google IPv6 conference)



Around the world (Greek IPv6 summit)



Around the world (3rd German IPv6 summit)



Around the world (Internet Governance Forum 2010 – Vilnius, Lithuania – RIPE workshop)



Around the world (Internet Governance Forum 2010 – Vilnius, Lithuania – plenary session)

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Around the world (RIPE61, Rome – Italy)

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Krakow, Poland 2011

Around the world (World v6 summit Paris)



Around the world (Norway v6 summit)

- We make people talk to each other about IPv6
- We push IPv6 deployment in Slovenia
- We aggregate knowledge and make it available between members of go6 platform
- We connect government, regulator, ISP's and industry between each other

Jan Žorž <jan@go6.si>

Oslo, Norway 2011



Around the world (Macedonia, Junij 2011)



Agenda

go6 go6

- Few words about go6 institute 
- IPv6 in Tušmobil cellular network 
- IPv6 in Mobitel cellular network 
- Q&A

Jan Žorž <jan@go6.si> Skopje, Macedonia 2011

Around the world (Dubrovnik RIPE-NCC regional meeting)



IPv6 world tour continued...



- 30.9 – EuroNOG – Krakow (Poland) – Go6 presentation (<- you are here)
- 4.10 – Menog – Muscat (Oman) - Go6 presentation
- 12.10 – Kiev (Ukraine) - Go6 presentation
- 20.10 – NLUUG – Ede (Netherlands) - Go6 presentation
- 26.10 – OECD meeting – Paris (France) - Go6 presentation
- 29.10-4.11 – RIPE63 – Vienna (Aus) – various presentations
- 8,9.11 – 6. Slo IPv6 meeting
- 21,22.11 – IPv6 meeting – Stavanger (Norway) - Go6 presentation
- 28.11 – 1.12 – Brazilian IPv6 summit – Sao Paulo (Brazil) - Go6 presentation
- December – time off (nice try...)

Mission, goal, quest...

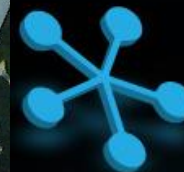


- We make people talk to each other about IPv6
- We push IPv6 deployment in Slovenia
- We aggregate knowledge and make it available between members of go6 platform
- We connect government, regulator, ISP's and industry between each other
- We make competition companies talk to each other to make IPv6 deployment easier
- We became IPv6 pivot point in Slovenia
- ...and it works 😊

And now for something completely different...



Intermission page...



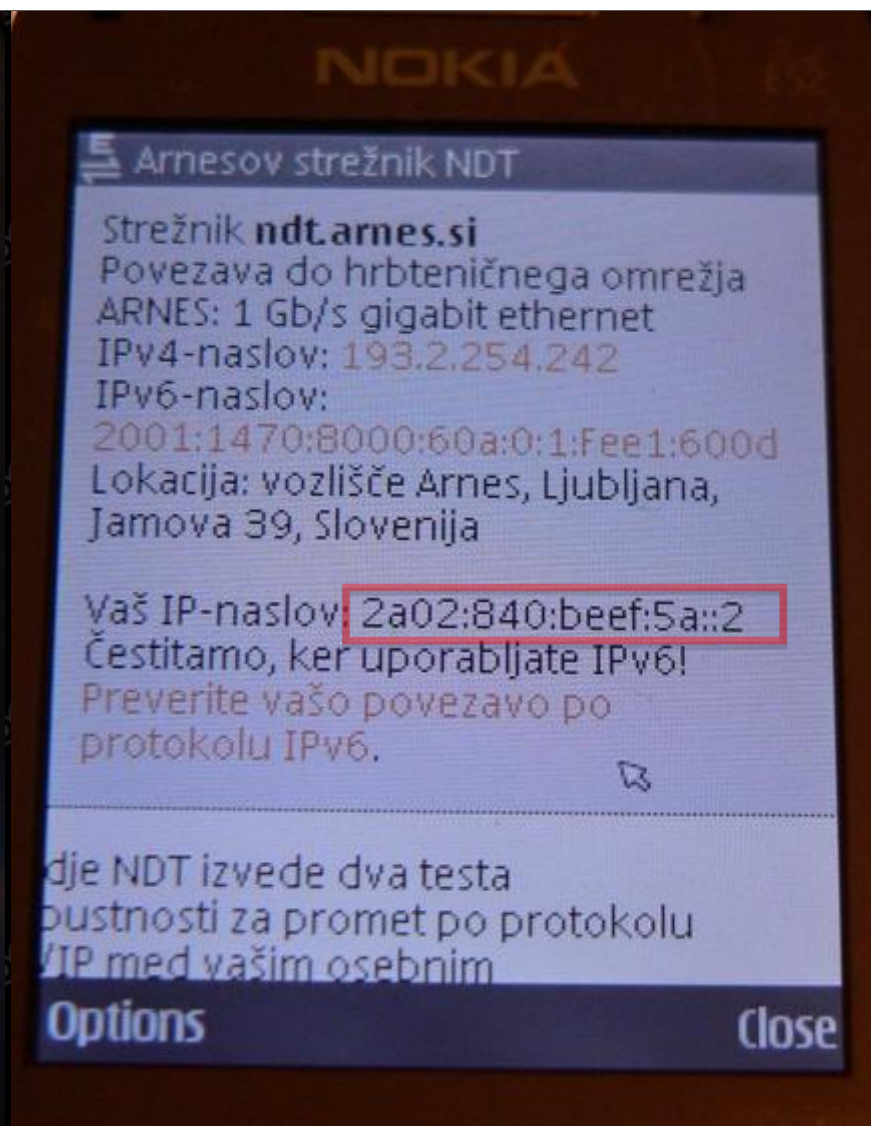
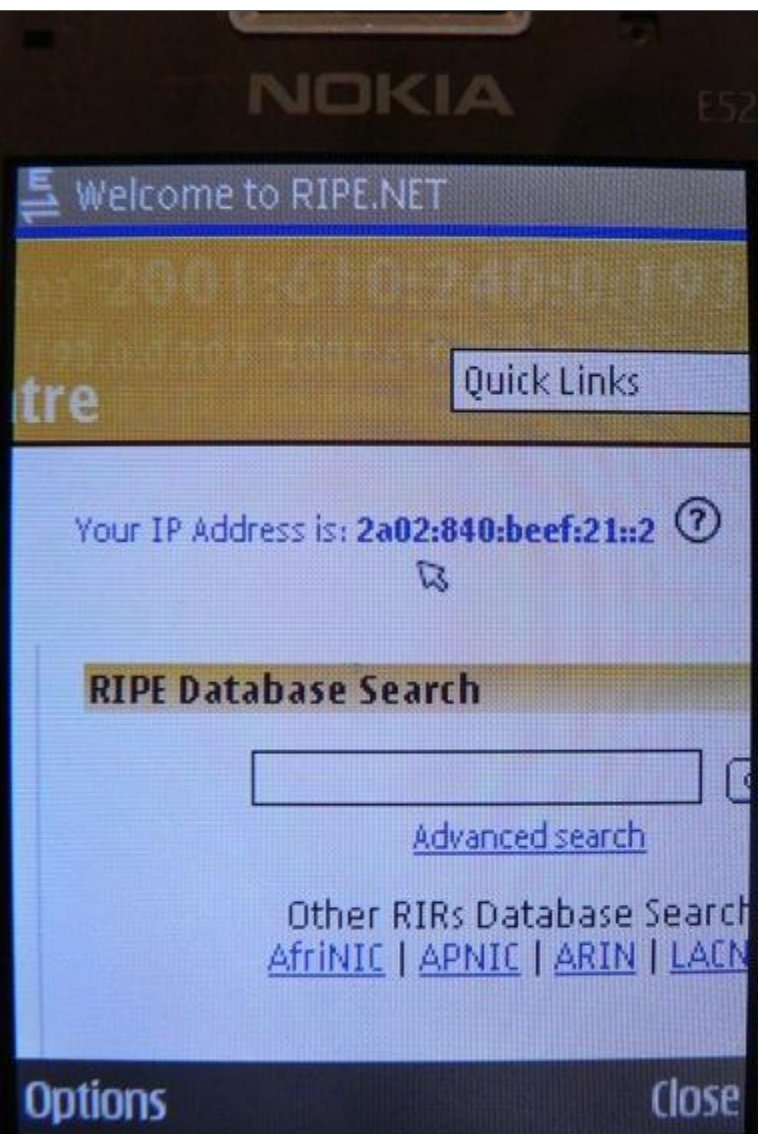
euronog
european network operators' group

Disclaimer:

IPv6 in Slovenia is being promoted by the Go6 institute, this is an industry body (important message here: self regulation can work!!!) and here is one of our success stories.

Go6 as an IPv6 catalyst got 2 mobile operators **together** deploying IPv6 on 3GPP **at the same time** and here is how they did it.

Tušmobil - 2a02:840::/32AS41828





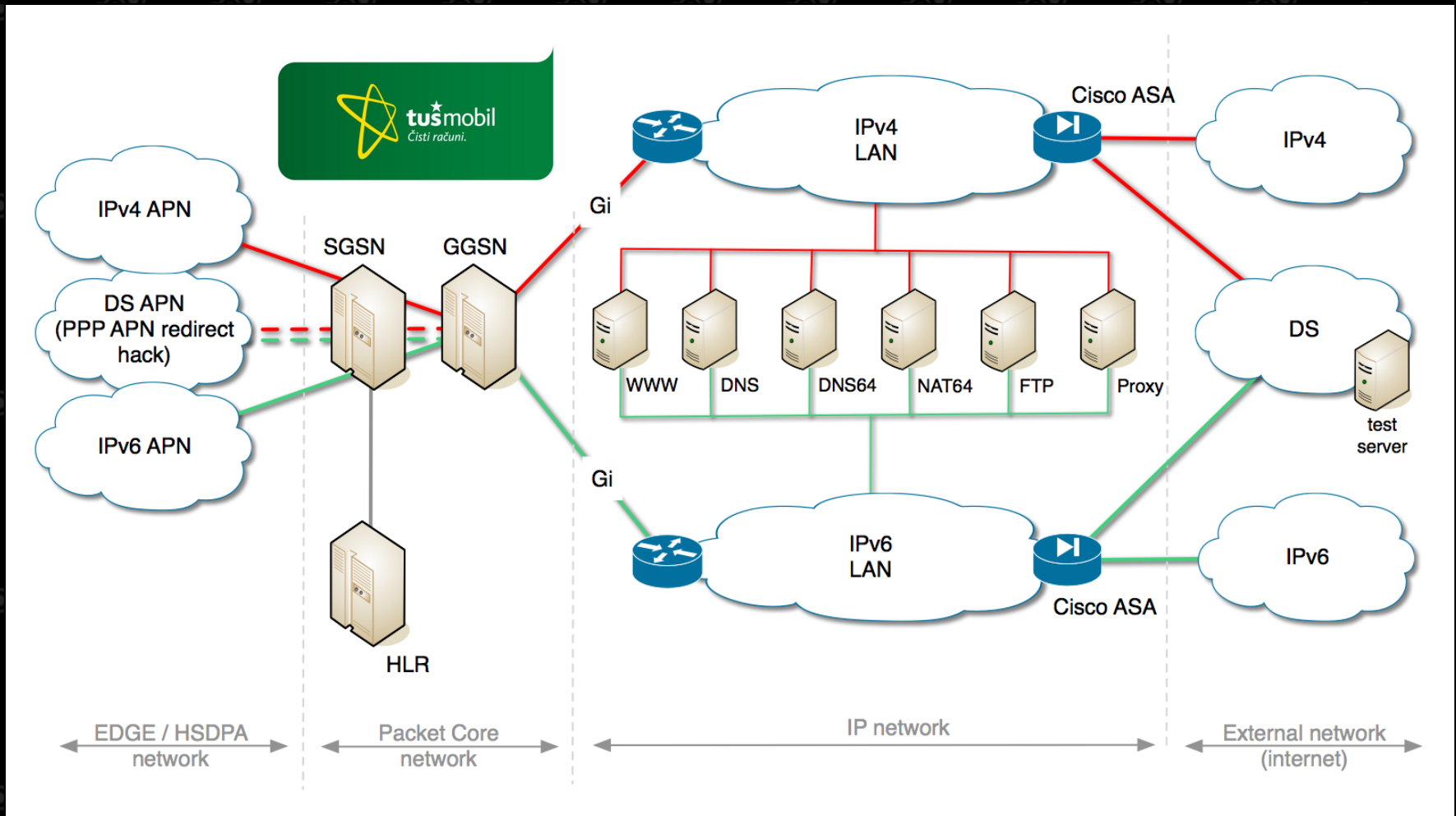
IMAP login log record:

```
Mar 5 12:07:47 go6lab dovecot: imap-  
login: Login: user=, method=PLAIN,  
rip=2a02:840:beef:4c::2,  
lip=2a02:e8:0:1::babe:face, TLS
```

SMTP log record (sending mail):

```
Mar 5 12:18:32 go6lab  
postfix/smtpd[24374]: 4AB9F2378666:  
client=unknown[2a02:840:beef:47::2],  
sasl_method=LOGIN, sasl_username=jan
```

Tušmobil - 2a02:840::/32 AS41828



Versions of software used:

- SGSN NSN, SG6
- GGSN NSN, FlexiISN v 3.2 CD7
- Firewall Cisco ASA v7.2
- DNS64 totd 1.5.1
- NAT64 ecdysis-nf-nat64-20100226 @gentoo 2.6.3
- Mobile Nokia e52

Mobitel - 2a02:e20::/32AS29276

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Your IP Address is:

2a02:e20:c000:102:fdaa:eccc:e0a0:c70e

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Možnosti

Zapri

Arnesov strežnik NDT

Strežnik **ndt.arnes.si**

Povezava do hrbteničnega omrežja
ARNES: 1 Gb/s gigabit ethernet

IPv4-naslov: 193.2.254.242

IPv6-naslov:

2001:1470:8000:60a:0:1:fee1:600d

Lokacija: vozlišče Arnes, Ljubljana,
Jamova 39, Slovenija

Vaš IP-naslov:

2a02:e20:c000:101:2524:e756:99cf:d20

Čestitamo, ker uporabljate IPv6!

Preverite vašo povezavo po
protokolu IPv6.

ie NDT izvede dva testa

Možnosti

Zapri



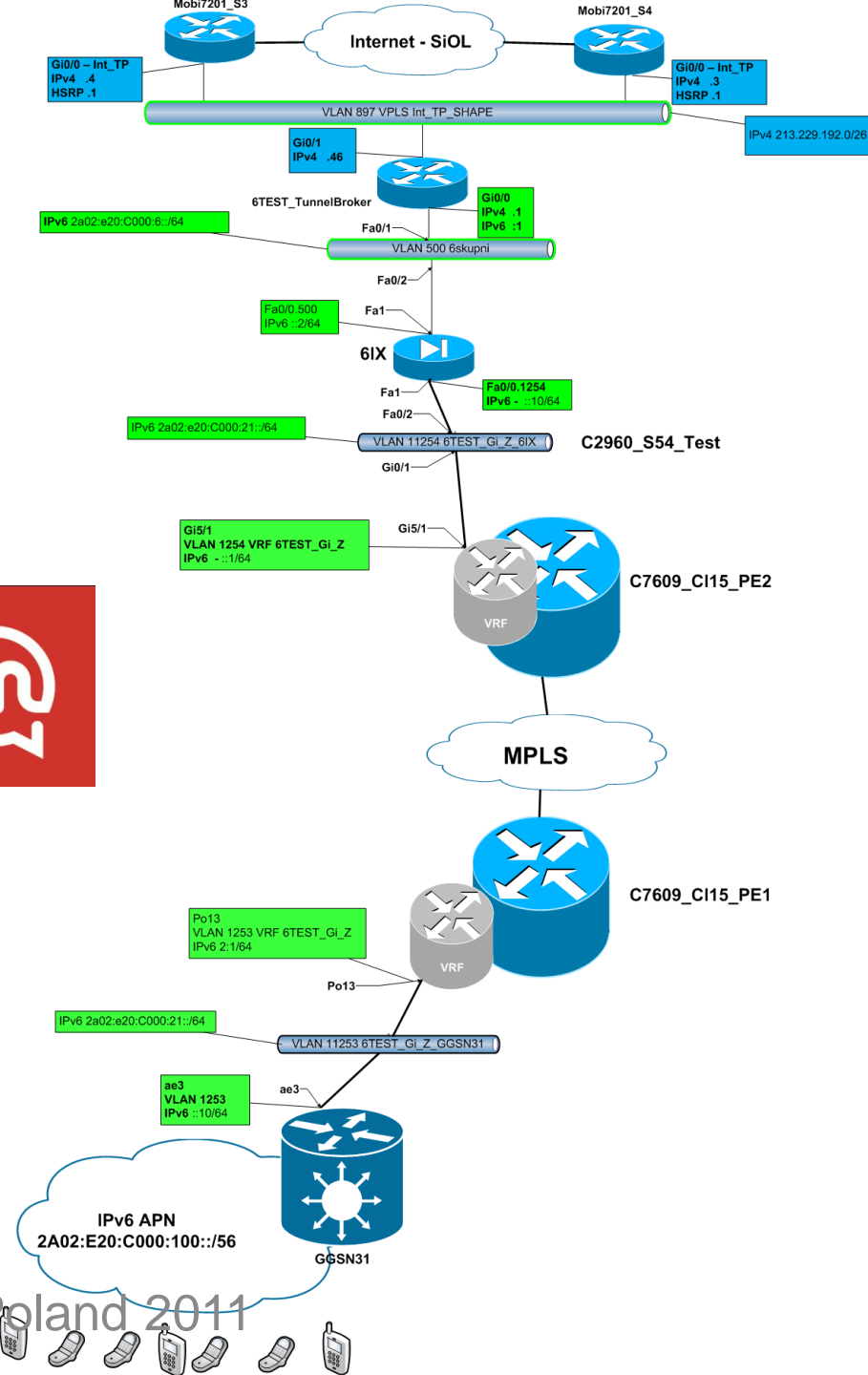
Mobitel and IPv6



- Packet core is IPv6 ready
- IPv6 only PDP context
 - IPv4 and IPv6 in same PDP context not supported jet
- 6VPE over MBICORE
 - Static routing

Terminals

- Each terminal gets /64
- Problems with IPv6 PPP and DNS
 - Manual config
- Limited terminal support
 - Nokia E and N series → OK
 - Window mobile 6.1 → No support
 - Data cards → Natively no support



Versions of software used:

- SGSN Ericsson Mk IV 2008B Dual Access
- GGSN Ericsson/Juniper J120 2009A
- MPLS Cisco 7609 Version 12.2(33)SRC2



Show stoppers...

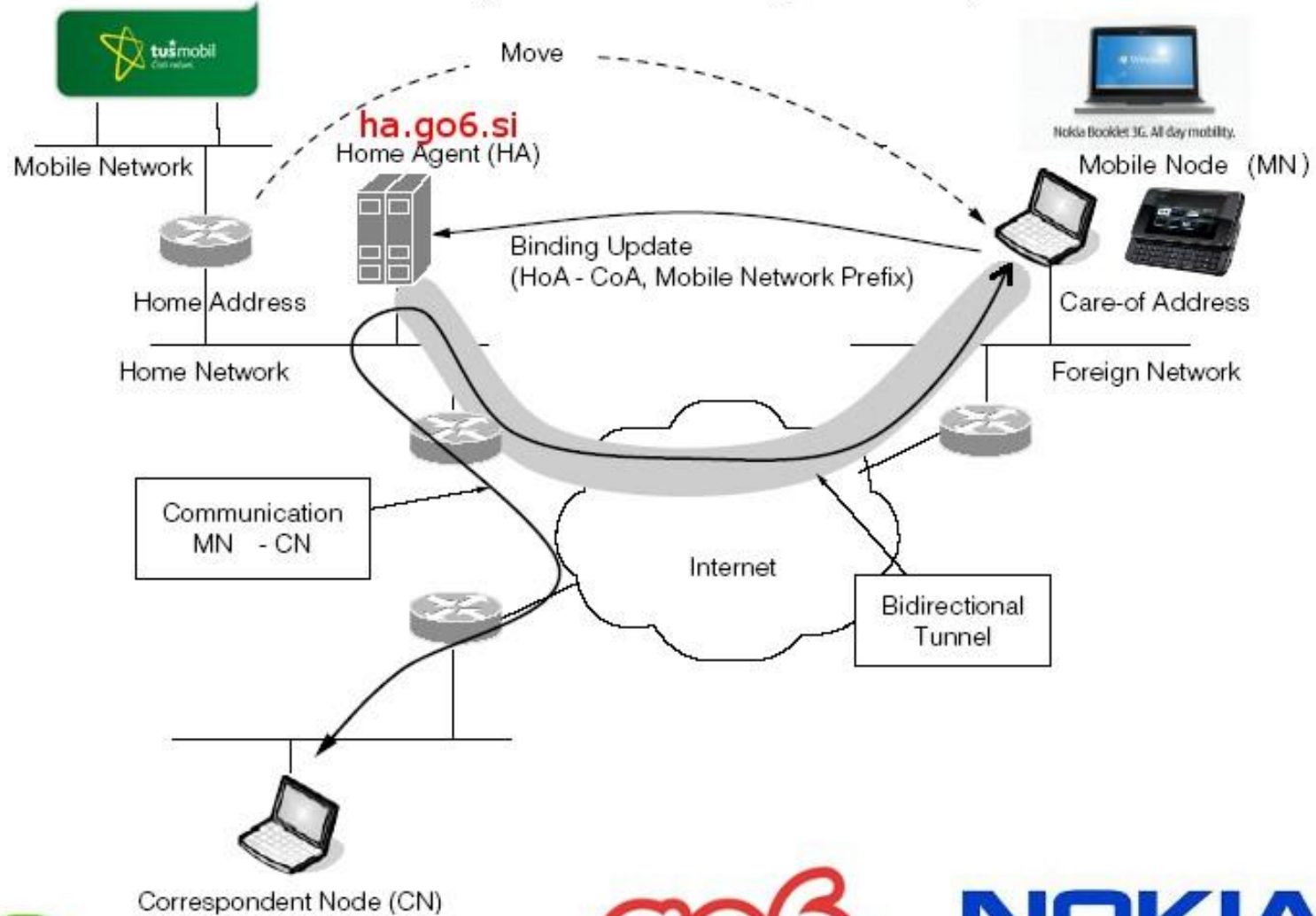


What is still missing?

- No wide support in mobile terminals (currently symbian only)
- Content based charging – not existent
- Limited or no support for dual-stack in terminals

Dual Stack Mobile IPv6

DSMIPv6-TLS Home Agent server setup, hosted by Tušmobil



Nokia Research Center



NOKIA
CONNECTING PEOPLE

Contacts...



- Questions regarding go6 institute, platform and Slo IPv6 initiative: jan@go6.si
- Questions regarding IPv6 in Tušmobil: miha.petkovsek@tusmobil.si
- Questions regarding IPv6 in Mobitel: primoz.jenko@mobitel.si
- Everything else: jan@go6.si

Questions?



- Thank you.

<http://go6.si/>

