



Implementing IPv6 in RCS & RDS Network



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RCS & RDS: Who Are We ?



• 2play 🛄 💆

- One of the most important telecom operators in the region
- Market leader for TV and Broadband Access in Romania
- Romania's only quad-play provider



IPv6: Why?



- Digi Net Fiberlink:
 - > 1,5 Million customers
 - ➢ 750.000 simultaneously used IP addresses
 - ➢ 920.000 allocated IPv4 addresses
 - ➢ 82% usage rate
- Most recent allocation from RIPE (27th of April): 5.12.0.0/14 (262.144 IPv4 addresses)



IPv6: Hopes & Expectations





Source of inspiration for graph: Geoff Huston's article "The End of IPv4, Part 2"

IPv6: History



- July 2003: our first IPv6 allocation from RIPE (::/32)
- 2006: first IPv6 peers in AMS-IX
- October 2008: DS turned on for backbone team in Bucharest
- March 2009: first IPv6 peering setup with Google
- June 2009: IPv6 enabled in DECIX, LINX & VIX (~500 current peering sessions in all IXs)
- July 2009: full IPv6 BGP routing table



IPv6: History



- 2010: Tested/ Qualified/ Shortlisted IP Routers with DS support: Cisco 6500, Cisco 7600, Cisco ASR9K, Cisco CRS & Juniper MX
- 2010: Built IPv6 addressing plan and exchanged the ::/32 prefix for a ::/28 prefix
- September 2010: Dual-stack enabled in Core & Distribution; still testing 6PE and 6VPE
- October 2011: Pilot project start-up
- April May 2012: IPv6 mass deployment



IPv6: Deployment details



- Our goal: "IPv6 for every residential customer"
- Virtual IPv6 Team
- IGP: OSPFv2 & OSPFv3
- PPPoE Authentication
- Distributed, redundant, flexible and scalable BNG System
- DIY Business model
- DHCPv6 Prefix Delegation (RFC 3769)
- ::/64 Dynamic Prefix
- Biggest issue: Lack of IPv6 support on CPEs





RCS & RDS: Start-up



- October 10th, 2011 (press release)
- "IPv6 test" Start-up program
- Program available in 20 large cities in Romania
- Signup from customer portal
- 12.000 customers registered for IPv6 test in less then 6 months
- IPv6 dedicated section on <u>www.rcs-rds.ro</u>



RCS & RDS: Follow-up



- IPv6 test pilot ends successfully in April 2012
- Starting May 2012 RCS & RDS offers IPv4 & IPv6 native dual stack unofficially
- June 6th, 2012: World IPv6 Launch
- IPv6 adoption rate percent evolution:
 - March 2012: 0,2%
 - April 2012: 0,98%
 - May 2012: 9,55%
 - June 2012: 18,6%
 - Sept 2012: 24.92%



World IPv6 Launch: CDN



• IPv6 CDN traffic: Google (95%) & Akamai (5%)



World IPv6 Launch: CDN



Google detected v6 brokenness and blacklisted our DNSes
Connection flapping on customer side (Link Local problem)
BGPv6 sessions down between IOS and Quagga



World IPv6 Launch: Traffic flow



 Akamai's v6 traffic not entirely served from our own data center and we have to pay for it !

	Remote	
6 (9)	www.facebook.com 🔎 2a03:2880:2110:3f01:face:b00c::	[Hide]
	2a03:2880:2110:3f02:face:b00c::	
	69.171.247.53	
6 (52) static.ak.fbcdn.net 🛛 🔍 2a02:2f01:30:3::51c4:1ab0	[+3]
6 (10) external.ak.fbcdn.net 🗢 2a02:2f01:30:3::51c4:1a93	[+3]
6 (5)	creative.ak.fbcdn.net 🗢 2a02:2f01:30:3::51c4:1aa2	[+3]
6 (5)	pixel.facebook.com 🛛 🛑 2a03:2880:2110:3f02:face:b00c:0:2	[+1]
62 (62) profile.ak.fbcdn.net 🛛 🔵 2a02:2f01:30:3::51c4:1a98	[+3]
6 (2)	photos-g.ak.fbcdn.net 🔎 2001:2030:0:6::50ef:c81a	[+4]
<u>б</u> (З)	a4.sphotos.ak.fbcdn.net 2a02:26f0:11::5c7b:44a1	[+5]
6 (5)	a3.sphotos.ak.fbcdn.net 2a02:26f0:11::5c7b:446b	[+4]
6 (2)	a2.sphotos.ak.fbcdn.net 2a02:26f0:11::5c7b:44ab	[+9]
6 (2)	a6.sphotos.ak.fbcdn.net 2a02:2f01:30:3::51c4:1ab9	[+3]
6 (5)	a7.sphotos.ak.fbcdn.net <a>2 a02:26f0:7::5c7b:4192	[+7]
6 (2)	a8.sphotos.ak.fbcdn.net <a>2 a02:26f0:7::5c7b:418a	[+10]
<u>б</u> (З)	a5.sphotos.ak.fbcdn.net 2a02:2f01:30:3::51c4:1a9b	[+3]
6 (2)	a1.sphotos.ak.fbcdn.net 2a02:26f0:11::5c7b:44a9	[+5]
6 (1)	photos-f.ak.fbcdn.net 🛛 🗢 2001:2030:0:6::50ef:c80b	[+4]
6 (1)	photos-c.ak.fbcdn.net 🔎 2001:2030:0:6::50ef:c823	[+3]

World IPv6 Launch: Peerings



- Traffic increased on peering connections
- Latency also increased



World IPv6 Launch: Latency





IPv6 Adoption Rate: per ISP



- Measurements: June.2012 -> Sept.2012
 - RCS & RDS: 18.6% -> 24.92%
 - ➢ KDDI Corp (JP): 17.5 % -> 20,64%
 - PROXAD Free (FR): 15.27 -> 16,00%
 - AT&T (US): 5,95% -> 10.77%

Economy	ASN	Details	Current Monthly v6pref	Average samples/mo
<u>R0</u>	AS8708	RDSNET RCS & RDS S.A.	<u>24.9231</u>	27257
<u>JP</u>	AS2516	KDDI KDDI CORPORATION	≫ 20.6460	9332
<u>FR</u>	AS12322	PROXAD Free SAS	≫ <u>16.0024</u>	17655
<u>JP</u>	AS18126	CTCX Chubu Telecommunications Company, Inc.	≫ <u>11.7506</u>	1476
<u>US</u>	AS7018	ATT-INTERNET4 - AT&T Services, Inc.	≫ <u>10.7741</u>	5922
<u>CN</u>	AS4808	CHINA169-BJ CNCGROUP IP network China169 Beijing Province Network	2.5763 🎊	10255
<u>US</u>	AS7132	SBIS-AS - AT&T Internet Services	2.225 <u>5</u> 2	7718
<u>US</u>	AS7922	COMCAST-7922 - Comcast Cable Communications, Inc.	2.8202 2	17684
DE	AS13184	HANSENET HanseNet Telekommunikation GmbH	2.6713 🕅	3945
<u>CN</u>	AS17816	CHINA169-GZ China Unicom IP network China169 Guangdong province	2011 <u>1.2618</u>	3251



IPv6 Adoption Rate: per ISP



We almost reached 20G of IPv6 traffic:

- CDN, especially Google (~ 10Gbps)
- IPv6 peerings (~6Gbps)
- RDS network / client2client (~3Gbps)



IPv6 Adoption Rate: per country



nei

- Reference period: Feb Sept 2012
- Source: Google

DIGI net

IPv6 Adoption Rate: per country

Economy	v6pref -	3month avg hits/month
RO	7,40%	98229
<u>FR</u>	4,03%	111408
LU	2,59%	1502
EU	2,14%	12283
JP	1,75%	119748
<u>SI</u>	1,07%	3730
CN	1,01%	633488
US	1,01%	135567

<- June 2012

September 2012 ->

Economy	v6pref 🔻	3month avg hits/month
RO	10.94%	71846
<u>EU</u>	7.27%	440
<u>FR</u>	4.30%	100707
LU	3.50%	1365
<u>JP</u>	2.39%	221336
<u>US</u>	1.71%	186401
<u>SI</u>	1.16%	9760
<u>CH</u>	1.09%	10212

- Reference period: June September 2012
- Source: (::) APNIC

IPv6 Adoption Rate: Romania



RCS & RDS: 24.92%

Romania: 10.86 %



- Reference period: September 2012
- Source: (::) APNIC

Conclusions:



IPv6 transition in RCS & RDS was smooth. Some customers didn't realize they are actually using IPv6

Short term plans (end of this year):

- replace ::/64 with ::/56 for residential customers
- provide IPv6 to all customers (B2B)

Long term plans:

Delay as much as possible any sort of CGN

Are you using IPv6 ?

Yes, native IPv6 from RDS (53%, 303 Votes) I'm not using IPv6 (28%, 160 Votes) What is IPv6 ?! (12%, 66 Votes) Yes, IPv6 tunnel (5%, 27 Votes)

Yes, native IPv6 from another ISP (2%, 12 Votes)



Questions?