IPv4 depletion at CERN: status and plan

CERN, 16th of October 2015
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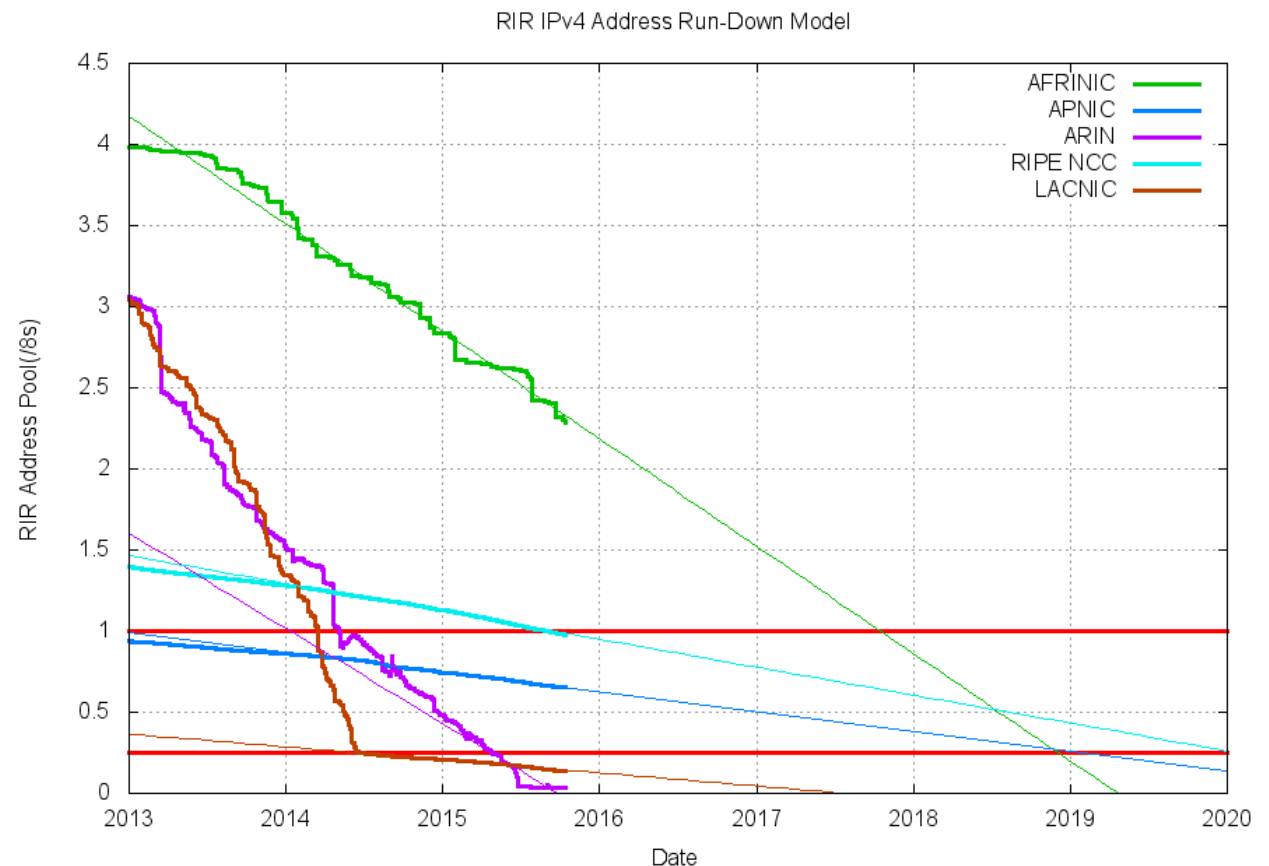
IPv4 depletion status

World IPv4 pools' status

Region	Exhaustion date	Remaining /8 (16M addrs)
Asia-Pacific	19-Apr 2011 (last /8)	0.6510
Europe	14-Sep-2012 (last /8)	0.9755
North America	24-Sep-2015	0
South America	10-Jun-2014 (last /8)	0.1364
Africa	13-Apr-2019	2.2875

[15th October 2015]

RIR IPv4 Address Run-Down Model

CERN IPv4 pools' status

Campus dynamics	75% used
Campus statics	85% used
GPN Data Centre	43% used
LCG servers	39% used
LCG VMs	26% used
Wigner data centre	49% used

[15th of October 2015]

128.141.0.0/16
128.142.0.0/16
137.138.0.0/16
188.184.0.0/17
188.184.128.0/17
188.185.0.0/16
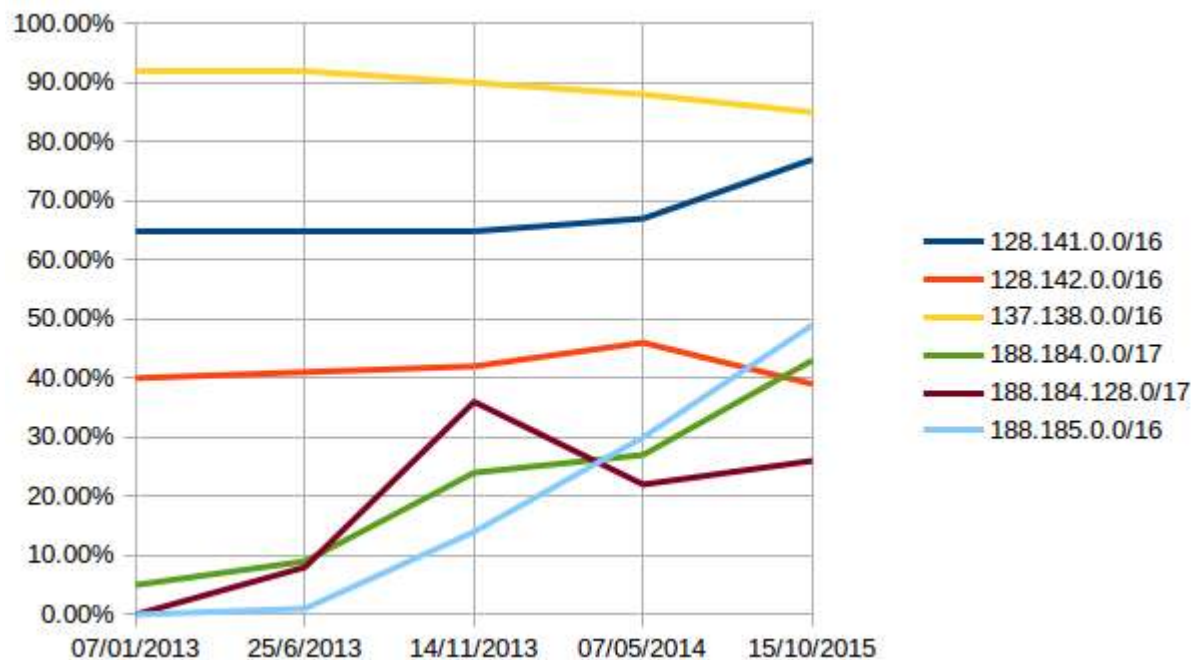
Other IPv4 addresses

194.12.128.0/18 (16384) for WIFI controller
192.16.156.0/22 (1024)
192.16.160.0/22 (1024)
192.65.188.0/22 (1024)
192.65.192.0/22 (1024)   used for external WIFI
192.91.236.0/22 (1024)
192.91.240.0/23 (512)
192.91.242.0/24 (256)   being freed
192.91.243.0/24 (256)
Last /22 (1024) from RIPE (not requested yet)

6144 addresses available (+1024 if requested)

IPv4 utilization projections

Campus

Today: **IP+PB = 98960**
Can be replaced by:
- **60864** PU addresses
- **9456** current IP for special users will stay
= 28640 saved addresses (30%)

Further reduction when WIFI users will move to
194.12.128.0/18

~7000 addresses assigned in the last 18 months

Enough addresses for the next 4-6 years

DC Wigner

~16000 addresses allocated in the last 18 months

25% (16384) of Wigner IP addresses moved to Geneva for new DC infrastructure

~17000 addresses left. They may last 12-24 months, probably enough for all the servers that can be hosted there

DC Geneva

~5000 addresses allocated in the last 18 months

16384 Wigner IP addresses moved to Geneva for new DC infrastructure

~72000 addresses left. Can last several years, unless a new datacentre is built somewhere

Unknown factors

- New remote datacentres

- IoT (Internet of Things) uptake: it can require lot of addresses, but maybe only IPv6

- Virtualization on users' desktops

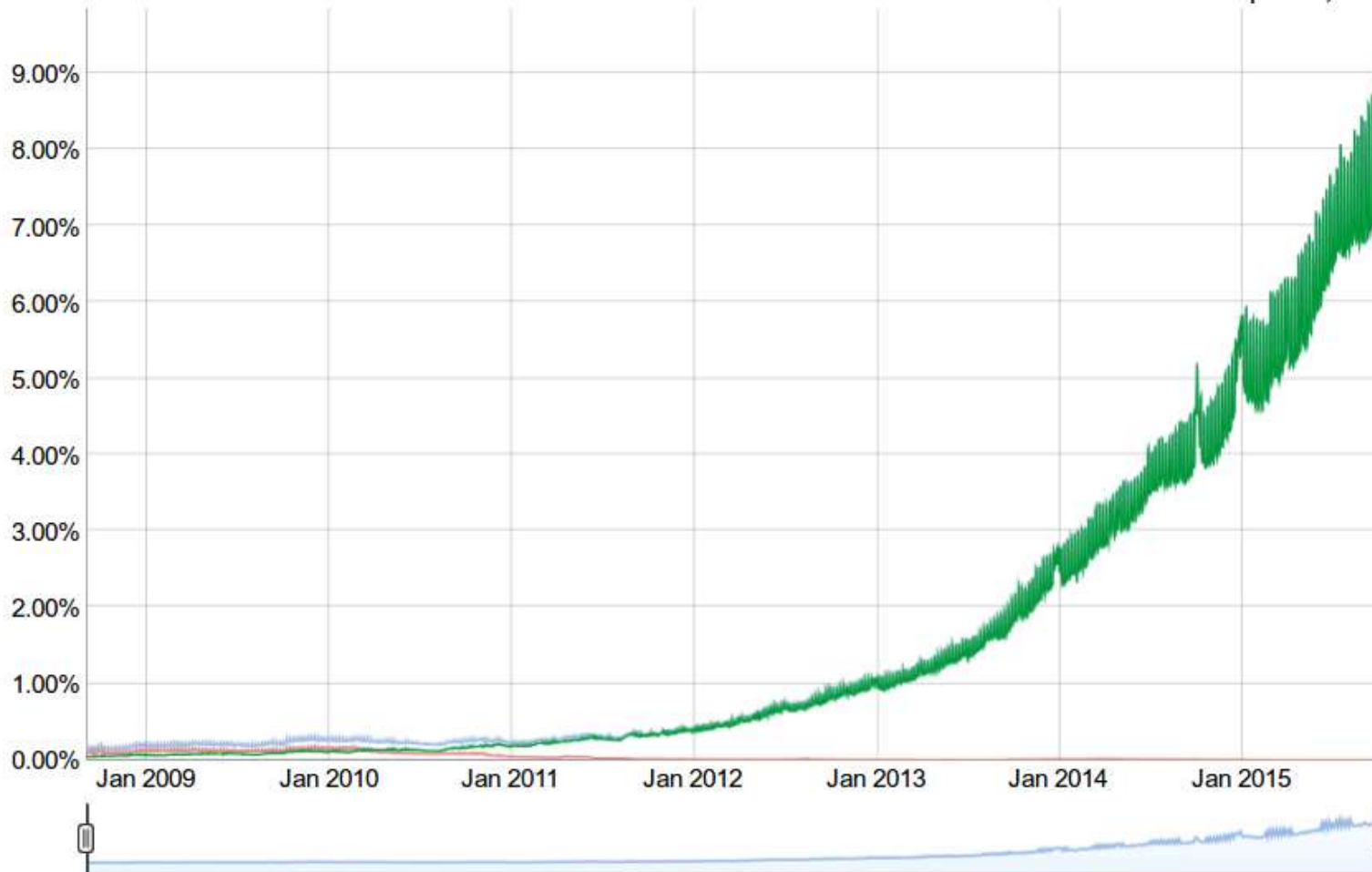Or, IPv4 may suddenly become obsolete

IPv6 adoption seen by Google

What's after exhaustion

NAT

NAT has been avoided because it's a bottleneck, may cause problems to special applications, may be difficult to track

Anyway:

- WIFI users can be NATed, allowing large grow

- Campus desktops could be NATed too

(if Security Team agrees)

IPv6-only

- NAT64 allows IPv6-only clients to reach IPv4 only servers. It doesn't work with special applications, though

- Very few WLCG sites have started deploying IPv6 at production level: they will have problems to reach IPv6-only CERN nodes

Worst case scenario

IPv4 public addresses assigned only to servers that must be visible outside CERN. All the rest can be NATed

Conclusions

Conclusions

- IPv4 addresses saving measures have delayed depletion

- IPv4 addresses enough for 3-5 years more

- NAT in the Campus can be used to recover addresses for Datacentres

- Unlikely feasible to move to IPv6-only in the next 5 years

Actions

- monitor IPv4 addresses consumption every year

- encourage use of IPv4 private addresses

- encourage deployment of IPv6 services

- optimize allocation of IPv4 addresses in existing blocks to allow disaggregation of large chunks

That's it