



IPv6

IPv6 deployment monitoring



Ghent, 14 December 2010



Measurement campaign



Outline

Part I

- Motivation of the measurements
- Measurement methodology
- Deployment results
- Conclusions

Part II

- Reflection
- Improving IPv6 deployment measurements
- Discussion

Part I

- Motivation of the measurements
- Measurement methodology
- Measured IPv6 deployment results
- Conclusions

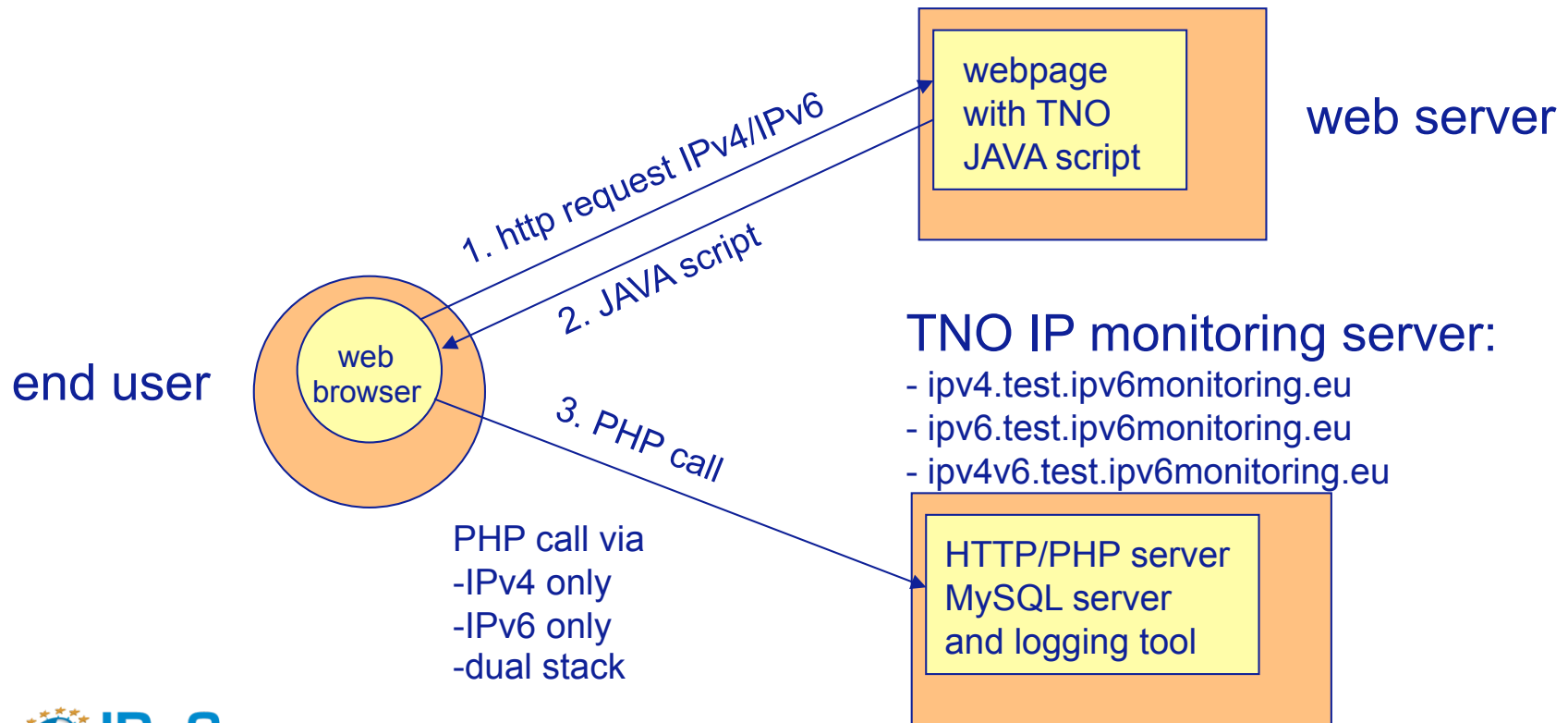
IPv6 measurements

- Provide information on the progress of IPv6 deployment in Europe
- First measurement campaign in October/November 2009
- Second measurement campaign in October/November 2010
- This presentation presents results of the second measurement campaign and compares these with the first measurement results
- Make a statement to which extend the target set by the European Commission to have 25 percent of the European citizens capable of accessing the IPv6 internet is met.

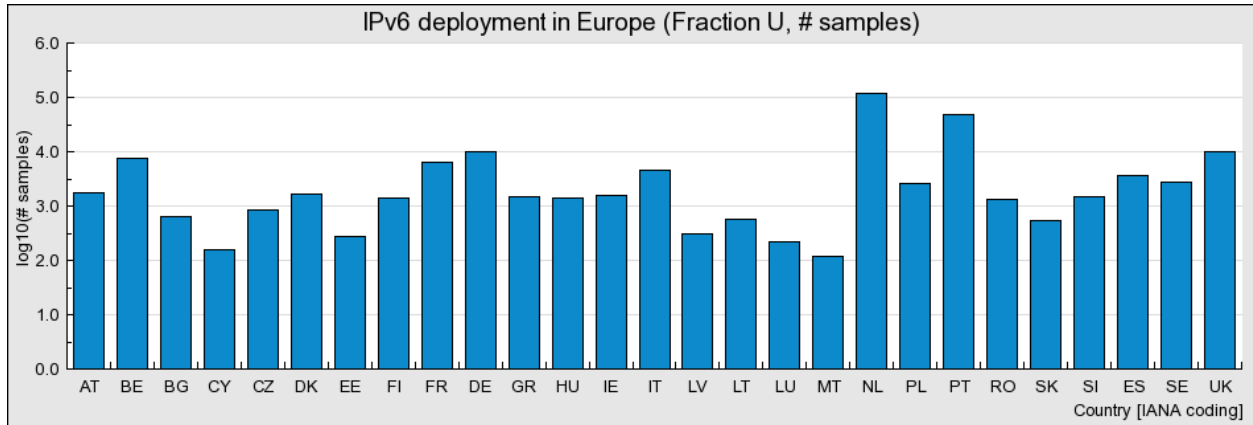
Note: measurement platform measures continuously in time.

Measurement Methodology

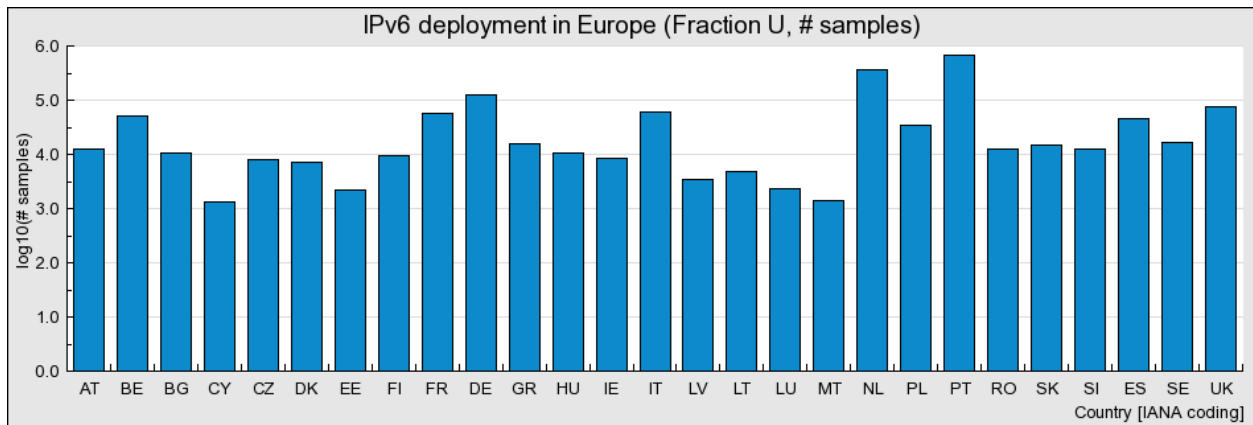
- Have webmasters place a script on their website that causes end users to connect to measurement server.
- Measurement server measures user's IPv4 and IPv6 connectivity



Sample size



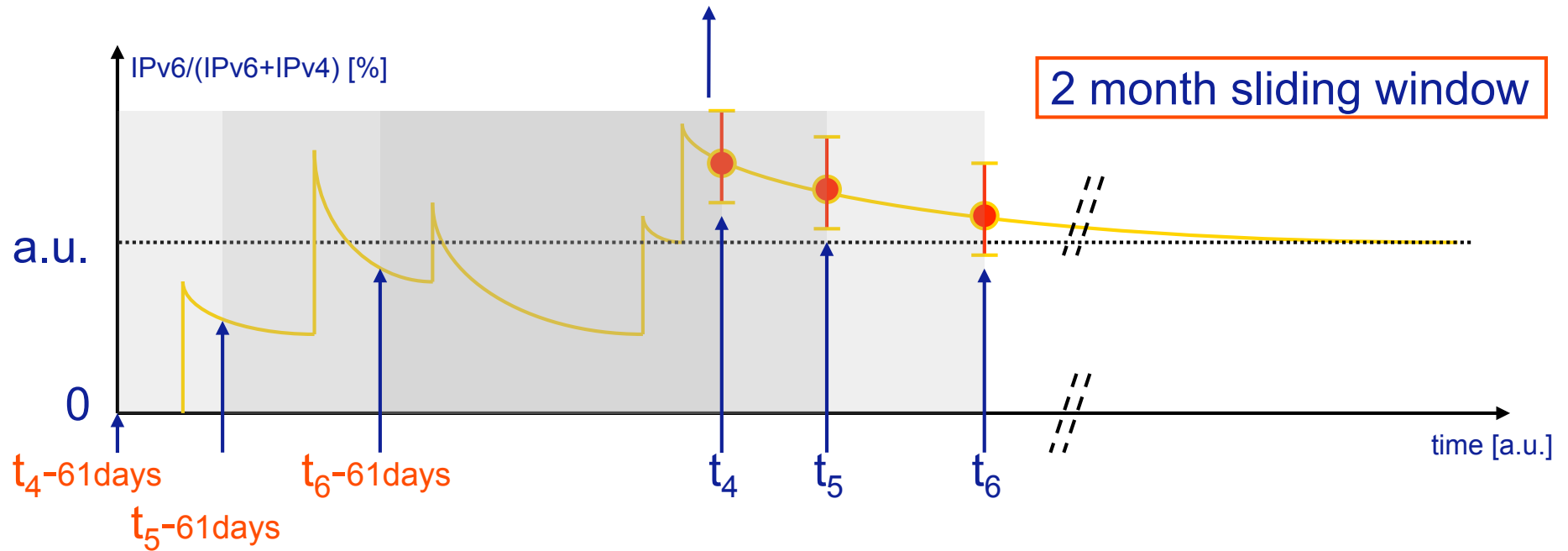
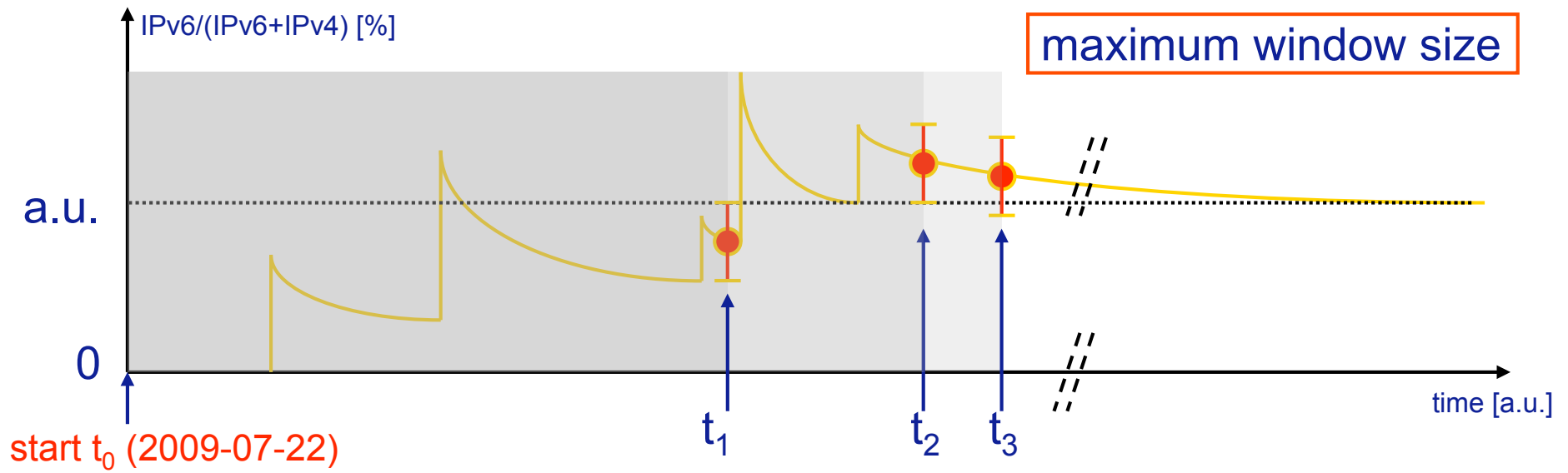
5-11-2009



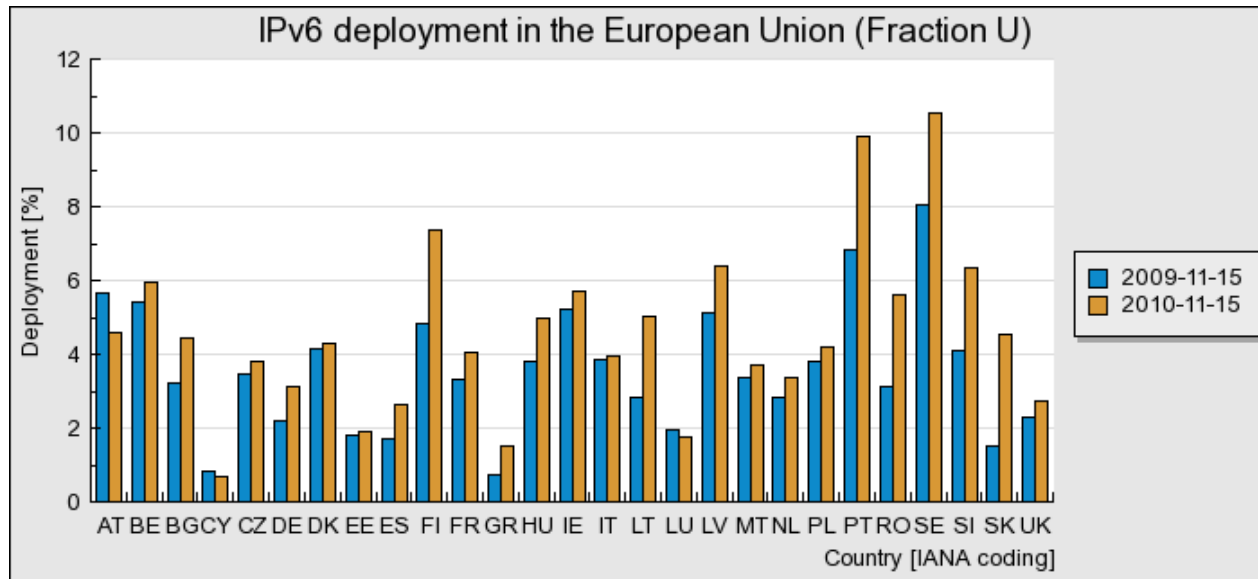
15-11-2010

- Size of sample set has increased significantly, also for smaller states
- Participating websites has doubled from <15 to >30

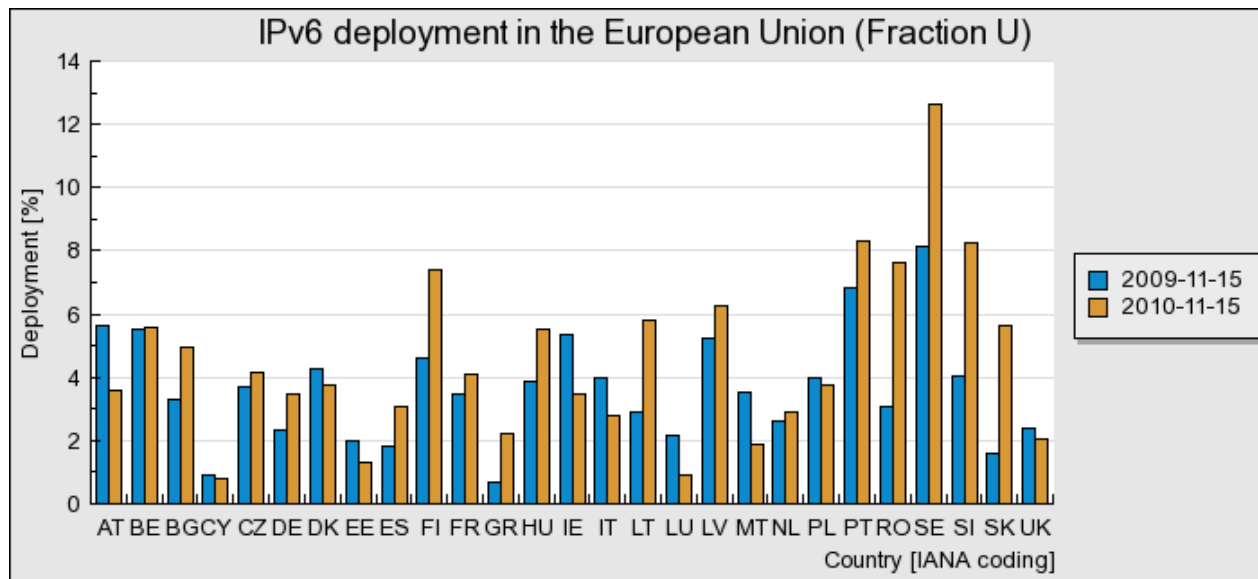




IPv6 deployment per EU member state

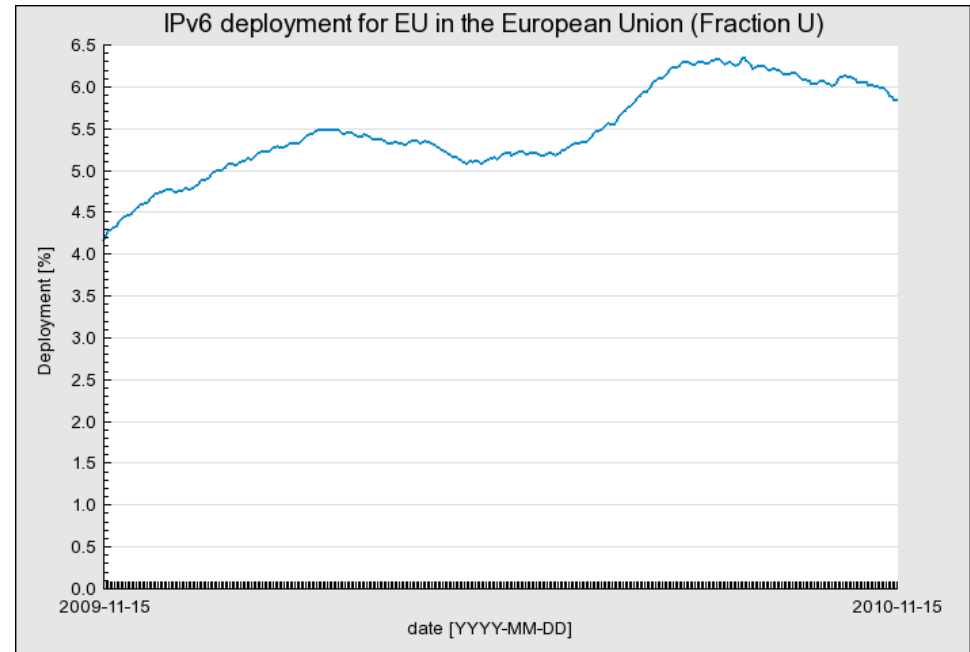
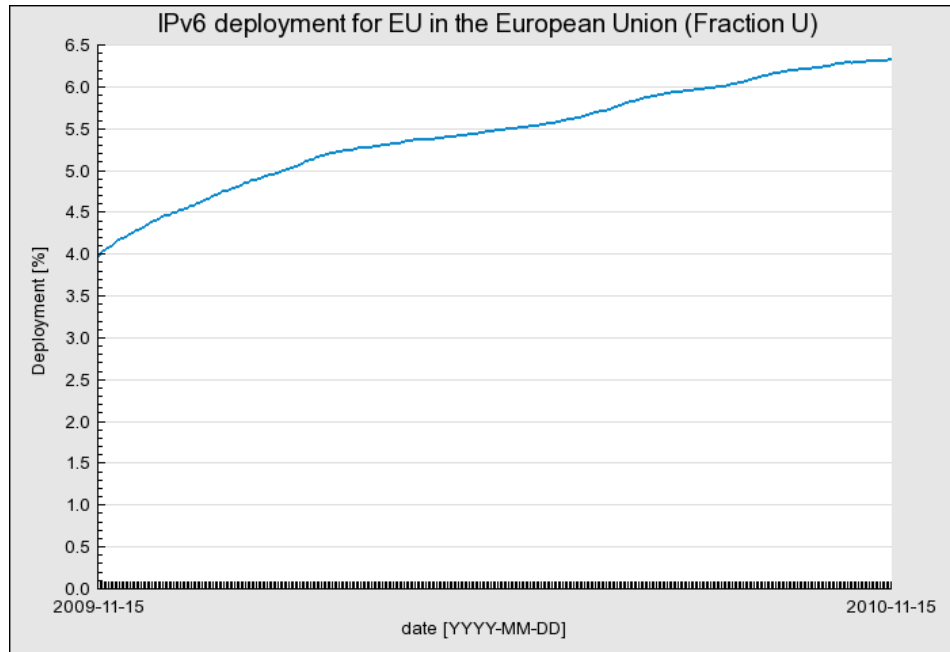


maximum window size



2 month sliding window

IPv6 deployment for the EU



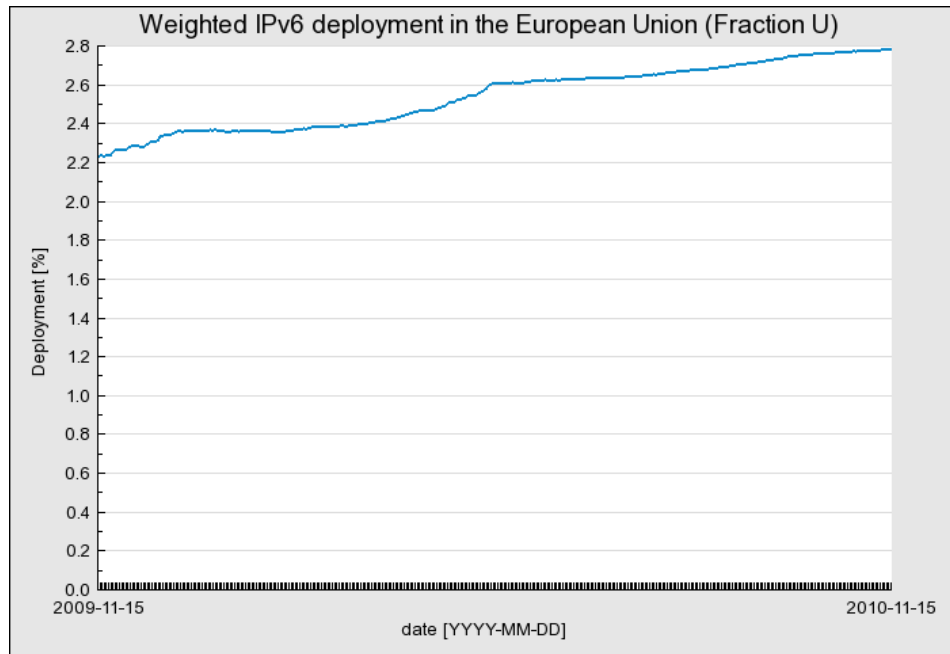
maximum window size

2 month sliding window

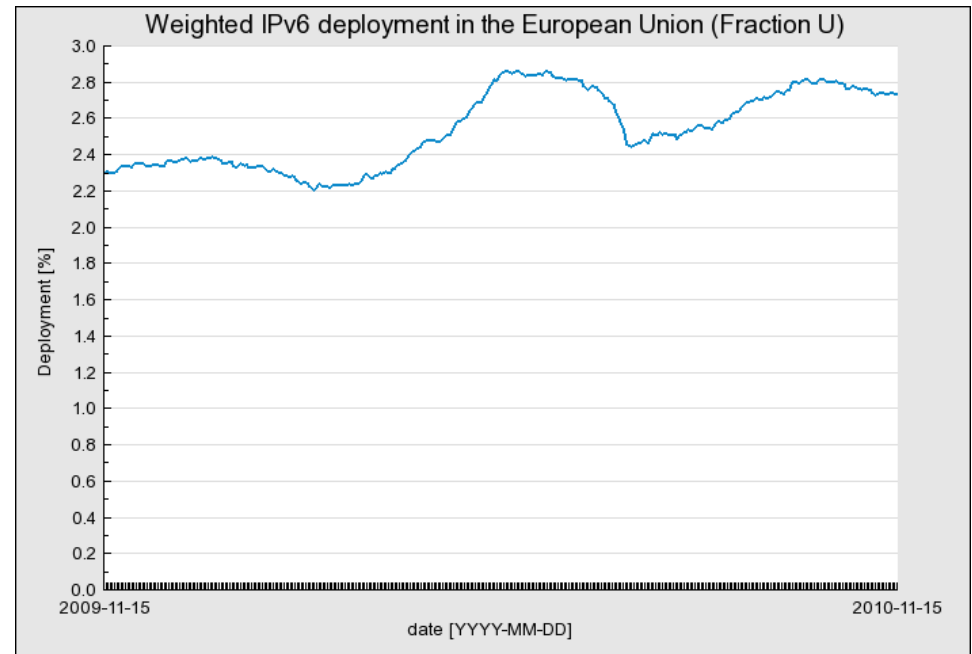
- Bias exists towards academic and industry
- Discrepancy between #samples and #internet users between countries
- 2% increase in IPv6 deployment



IPv6 deployment for the EU (weighted)



maximum window size

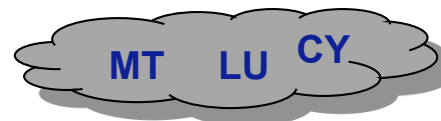
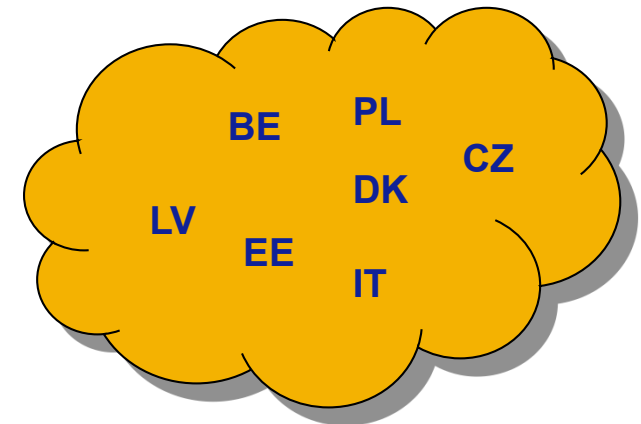
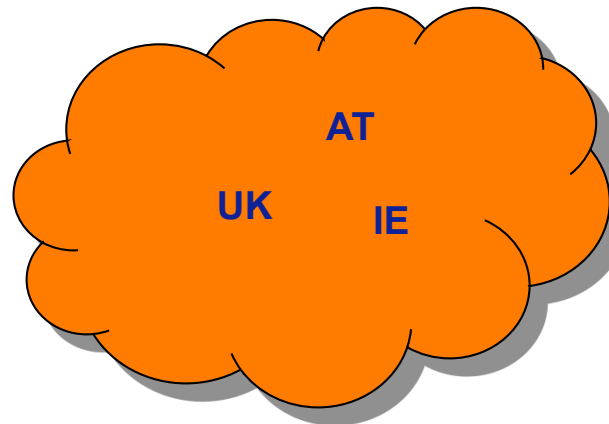
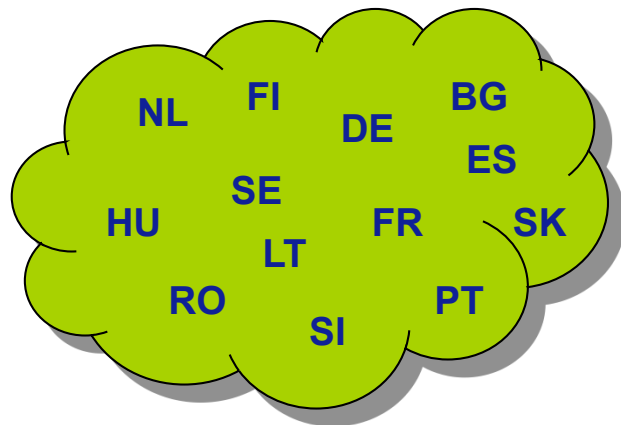
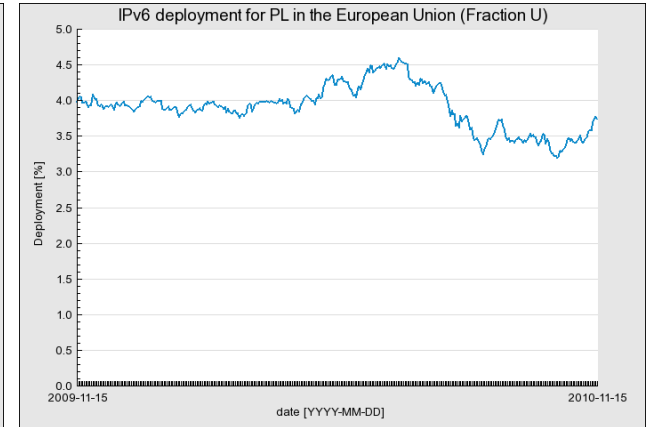
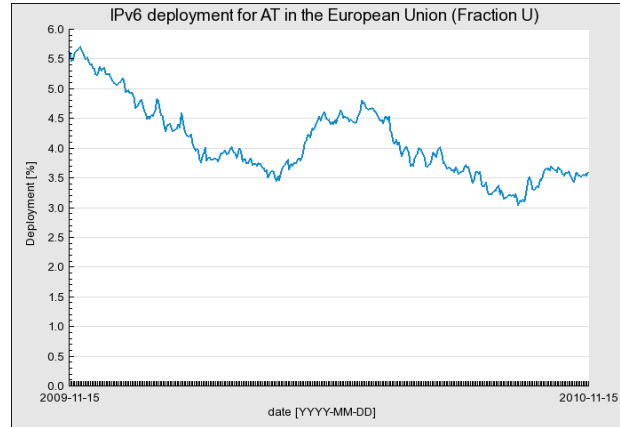
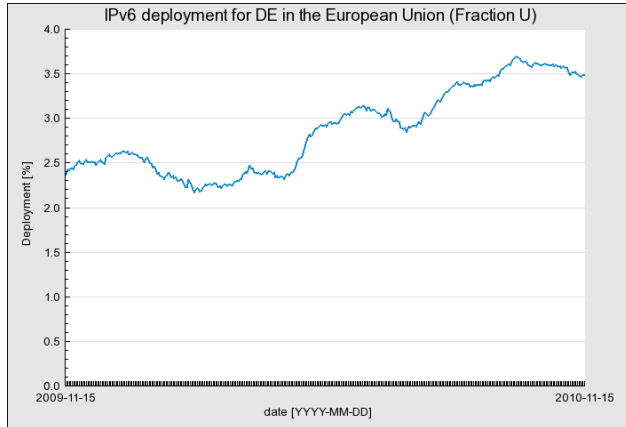


2 month sliding window

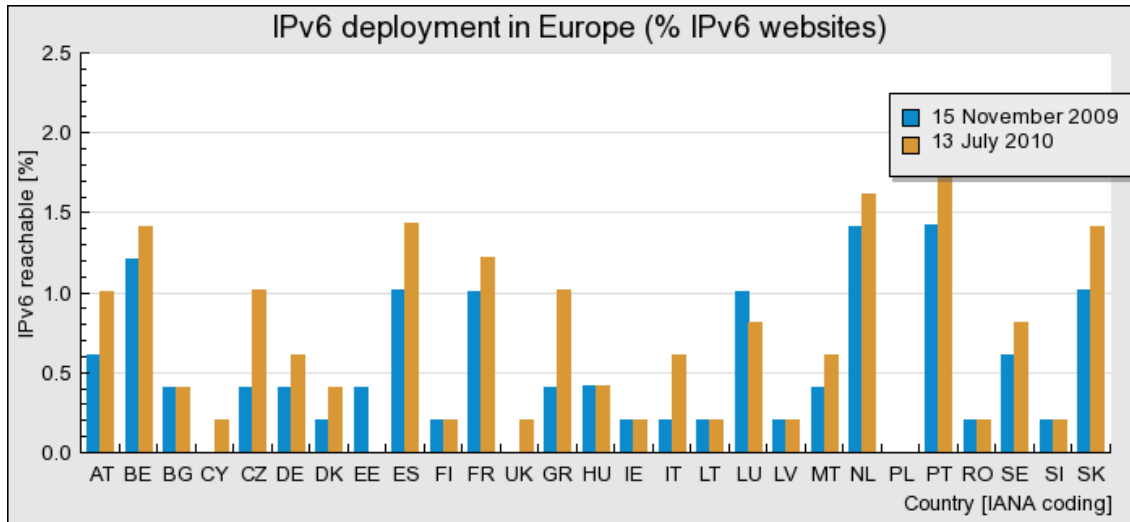
- Weighted results using internet penetration per country
- 0.6% increase in IPv6 deployment



IPv6 deployment trends per EU member state

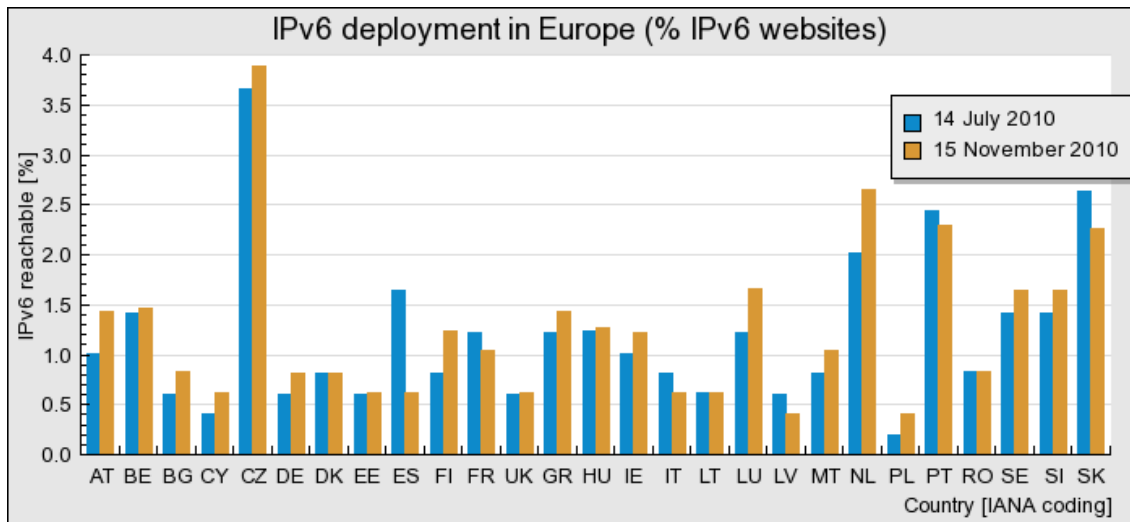


Number of websites of ALEXA top 500 per country reachable on IPv6 (total of 13500 websites analyzed)



without sub-domains:

- WWW
- IPv6

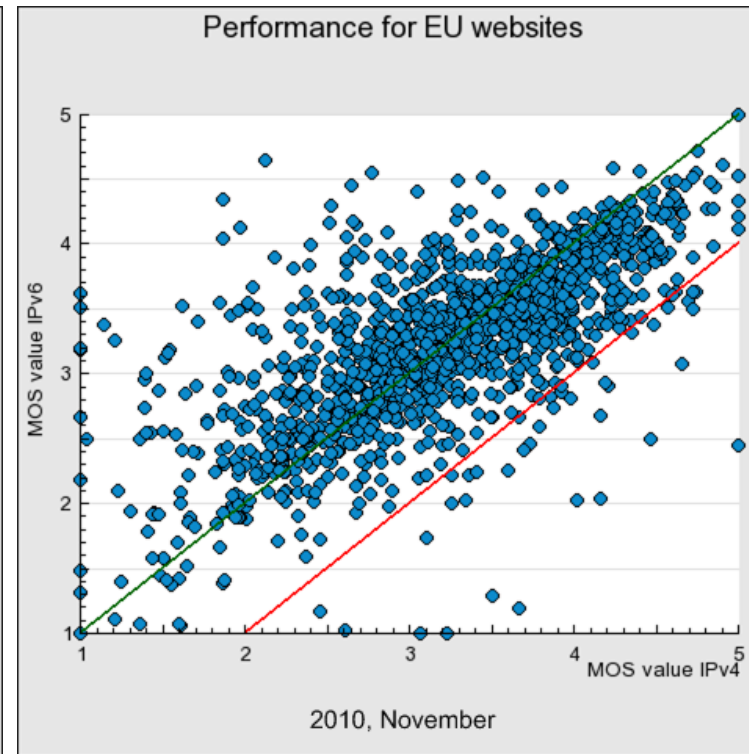
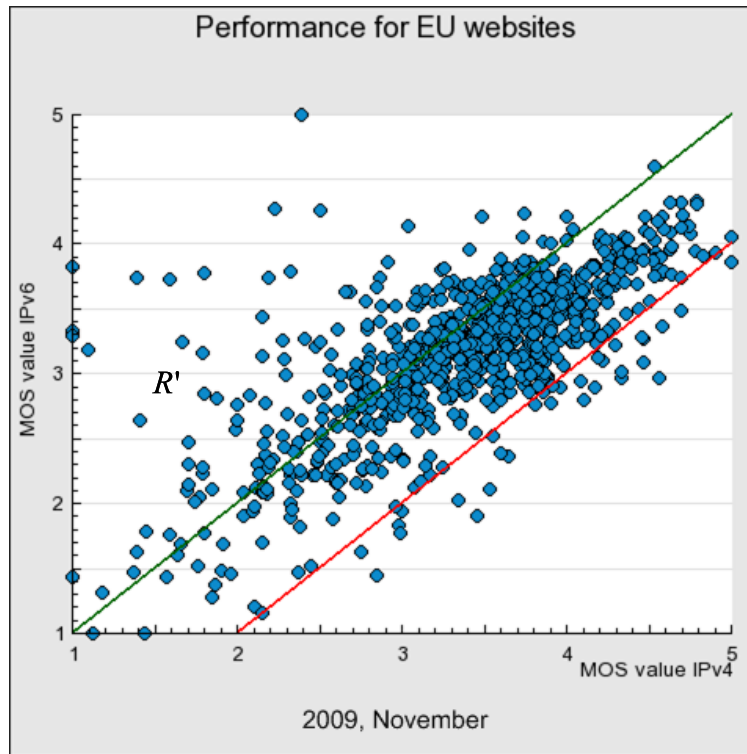


with sub-domains:

- WWW
- IPv6

Growth in IPv6 reachable websites negligible!

Performance websites in the EU



	2009 November	2010 November
IPv6 < (IPv4 - 1) (below red line)	3.5%	2.6%
IPv6 > IPv4 (above green line)	27%	49%

Via IPv6 websites *can* be experienced with the same quality as via IPv4

Conclusions

- IPv6 deployment has not significantly improved over the last year.
 - IPv6 accessible content has not become available in a significant amount
 - The fraction of unique users capable of accessing the Internet over IPv6 has grown less than a percent.
- The target set by the European Commission to have 25 percent of the European citizens capable of accessing the IPv6 internet is not met.
- Results are in line with outcomes from the interviews and questionnaires and bottleneck studies.

Part II

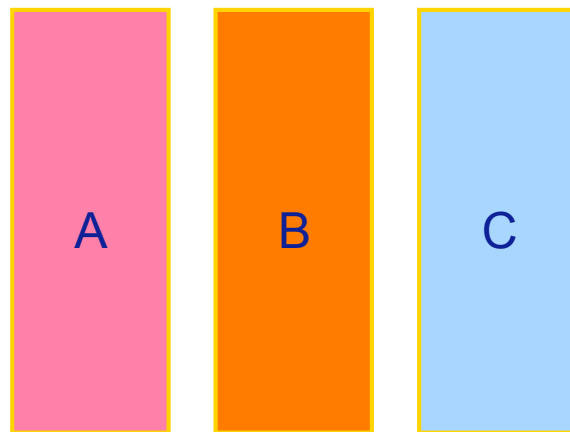
- Reflecting on IPv6 measurements
- Improving IPv6 deployment measurements
- Discussion (separate agenda item)

Reflecting on IPv6 deployment measurements

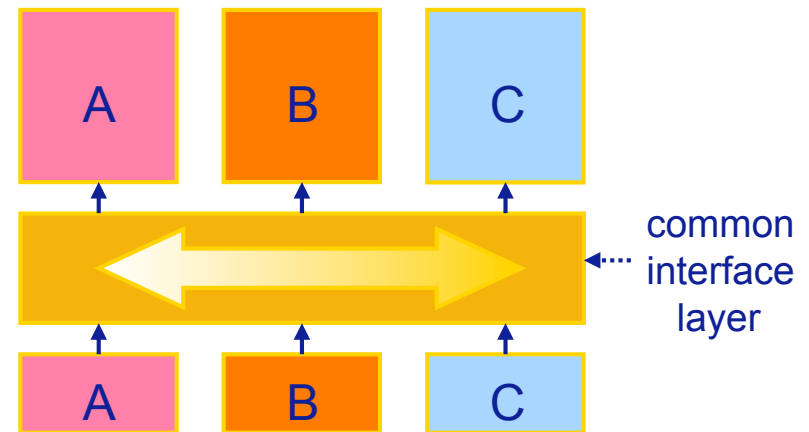
- Large number of measurement initiatives and consortia exist
 - Active measurements
 - Passive measurements
 - Technical vs. non-technical
- Common implementation problems
 - Uniformity of data set
 - Representativeness of data set
 - Poor business case
 - Privacy
- Different measures for IPv6 deployment
 - User oriented
 - Network oriented
 - Service, content, data oriented

Measure once, analyze as often as you like

- Holistic approach improves efficiency and effectiveness of measurements by exchanging results between measurement groups and reuse of data and results
- Separation of data acquisition layer and shared interfaces for analysis module plug-ins.



Isolated



Framework based

Discussion

- Dealing with privacy
- Ownership, maintenance of, and contribution to data acquisition platform, (processed) data, (analyzed) results
- Feasibility