

Addressing the Barriers to IPv6 Adoption – Current State of IPv6 Deployment

Mark McFadden

IPv6 Framework for European Governments – SMART 2016/0099

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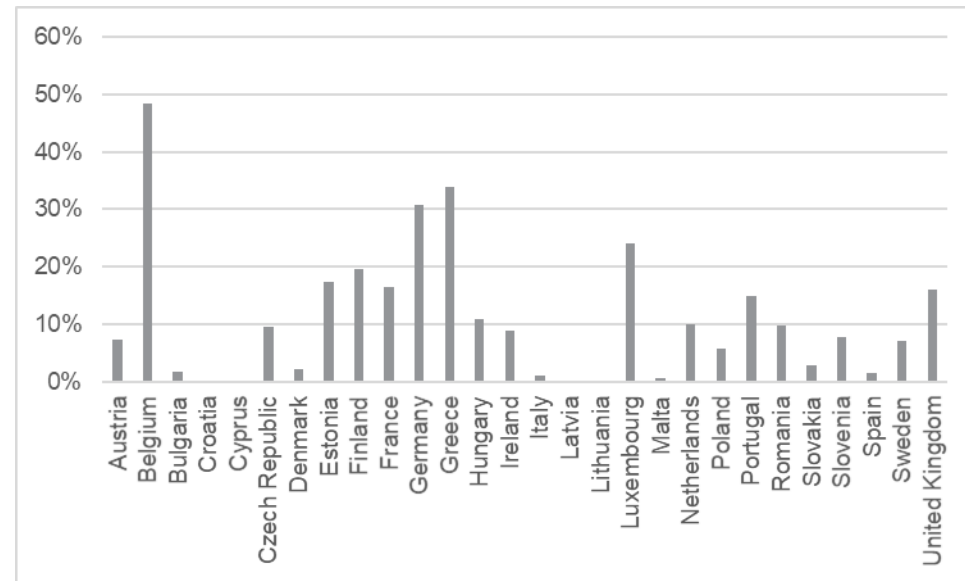
11th October 2018

Research Phase of the Project

- The current project is made up of a combination of research work and technology transfer
 - Today's workshop is the final deliverable for the project – a review of the results and outcomes of the project
- In 2017 and 2018, significant research activity was conducted
- This was to meet the following goal of the project:
 - Produce information on current, ongoing and planned deployments of IPv6 in public administrations across Europe
- While a much larger document provides the entire detail for all the research conducted in European Member States, this presentation is a summary of some of the most important results

Context

- The adoption of IPv6 in general is very different across MS in Europe
 - Belgium, Germany and Greece (plus to a lesser extent Luxemburg) at the forefront
 - Many MS are still below 2% of total penetration. More than half of MS are below 10% (and at least 10MS below 5%).
- It is no surprise to see very low adoption in the public sector



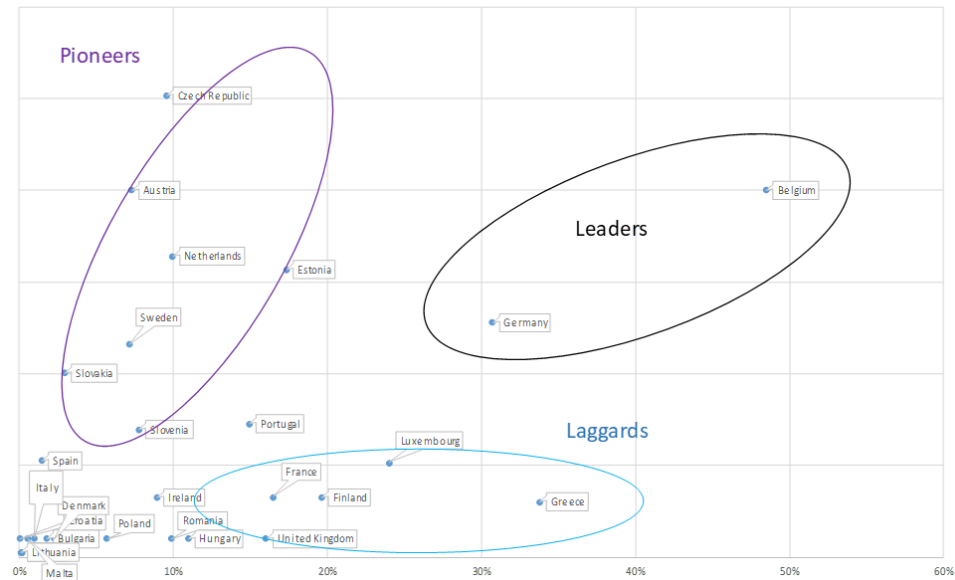
Source: IDATE, based on Google and Akamai

Further Context

- For Google's stats – about 25% of all Google users access the search engine and its tools using IPv6 – that's a global average – we will see, in a moment, why statistics matter
- Some countries in Europe are a significant part of this change:
 - Belgium 53%
 - Germany 39%
 - Greece 37%
 - Switzerland 28%
 - Several other countries are right around the global average
- Some countries in Europe are not part of the IPv6 ecosystem yet:
 - Italy 2%
 - Spain 3%
 - Slovakia 4%
 - Economic power or GDP is not a good predictor of IPv6 deployment
- Statistics from October 2018 – from Google, what about Akamai?? Facebook??

Main results : Global Mapping of MS

- Strong correlation for most MS between the level of adoption of IPv6 in the public sector and globally
 - Progressive roll out as IPv6 is being offered by ISPs
- “Public pioneers” = group of advanced users in the public sector, despite low adoption overall in the country.
- “Public laggards” = group of laggards for adoption in the public sector, despite good adoption in the country.
- Some MS on their own (Belgium and Germany) appear as the leaders.



Source: IDATE

X-axis = penetration of IPv6 (global)

Y-axis = penetration of IPv6 (public sector)

Main results : Key stakeholders (1/2)

- Government
 - Direct involvement of the government (Ministry level or equivalent) in successful MS. (all MS with adoption of more than 20% of the public sector)
- Task Forces
 - Action is/was generally both public and private sector
 - Mostly inactive today (except Belgium, Sweden, Netherlands and Estonia)
- R&D research center
 - Often involved on its own, but not impacting any global plans (just a testbed)
 - Often not successful and not done by leading MS.

Main results : Key stakeholders (2/2)

- National Regulation Authority
 - Mostly done by MS and not successful (Finland, Croatia, Denmark, Malta, etc...).
 - Sweden as an exception (until 2013-2014)
- Third party organization
 - Quite efficient in some MS like Czech Republic and Slovenia
 - Also in Ireland, without the same success.
- Central organization
 - Really the case of only a few MS, either managed by a Ministry (Germany, Spain, Belgium, Netherlands) or by a third party (Czech Republic)
 - Rare cases of central LIR (Germany, Czech Republic) or central network (Spain).
 - Mixed results

Main results : Plans

- Specific plans for the public sector
 - Specific public plans are quite rare (Netherlands, Belgium, Germany, Czech Republic, plus partly Austria and Spain). Clearly proving to have good results
 - A lot of plans not specific to public sector (Sweden, France, Spain, plus to a lesser extent Luxemburg)
 - A lot of MS without any plans...
- Targets
 - Most plans are mainly recommendations with no clear targets or deadlines
 - Clear targets mainly within plans of Belgium, Luxemburg, Denmark and Sweden, with quite various types of results.
 - Initial plans not met, leading to an updated but less ambitious plan.

Main results : Key initiatives

- Procurement
 - Most efficient measure in terms of results
 - Often mandatory for equipment and/or websites.
 - Positive measure, but so far limited impacts as scope limited to new equipment.
- Training
 - More developed than procurement, but so far less efficient (no real reduction of the gap).
- General information
 - Mostly by motivated MS + Some rare observatories
- Definition of IPv6 profiles
 - Rare (Slovenia, reused by Germany)

Main results : Key barriers

- The lack of interest and involvement of most MS
 - Benefits considered unclear. Mostly the case of MS not well advanced
- The cost and budget necessary to operate the transition to IPv6.
 - MS see IPv6 as essentially costs, especially as IPv4 still be supported
 - Mentioned even by leading MS, that have then reduced their ambitions
- Technical issues.
 - IPv6 maturity (around hardware) considered as being low, especially in terms of performance and security, even for leading MS.
 - Many MS mention they would need some technical support.
- Not enough involvement of ISPs in some MS
- Lack of coordination

Clusters : Public laggards

- Main MS from the group : France, UK, Luxemburg, Greece and Finland
 - High level IPv6 adoption in global and a very low implementation of IPv6 in public administrations.
- Main common points in terms of organization
 - The lack of focus on public sector from the government
 - The current inactivity, dismantlement or inexistence of IPv6 Task Force
 - The quite good involvement of ISPs as stakeholders (members of the IPv6 dedicated group) leading to less focus on the public sector
- Main barriers identified for the IPv6 implementation in the public sector
 - Lack of coordination (coherent move)
 - Lack of reasons to move

Clusters : Public pioneers (1/3)

- Main MS from the group : Austria, the Czech Republic, Estonia Netherlands, Portugal, Slovakia and Sweden (plus to a lesser extent Slovenia and Spain)
 - Good for public sector, lagging behind otherwise
- Key stakeholders
 - Mainly government as the main stakeholder (five of the seven MS)
 - Exceptions : Czech Republic, with CZ.NIC Association (which runs and maintains the Czech national domain and is the main body for IPv6 related issues), and Sweden with PTS (NRA) and IIS (Internet Foundation in Sweden).
 - Some active Task Forces for half of MS.

Clusters : Public pioneers (2/3)

- Plans and strategies : Some forms of plans in all MS
 - Of particular interest in the Czech Republic and Sweden with an IPv6 policy plan mapped out by the government in 2013.
 - Only exception is somehow Austria, no clear plan but started early.
 - Recent plans in the Netherlands and Estonia, still active until 2019 and 2020 respectively.
- Deployments
 - Adoption at national and regional levels, as well as in research networks.
 - These research networks were often used as “test beds” and were generally the first compatible networks in the country.
 - Some initiatives going beyond IPv6 by offering “rewards” for higher-ranking websites (the Netherlands and in the Czech Republic)

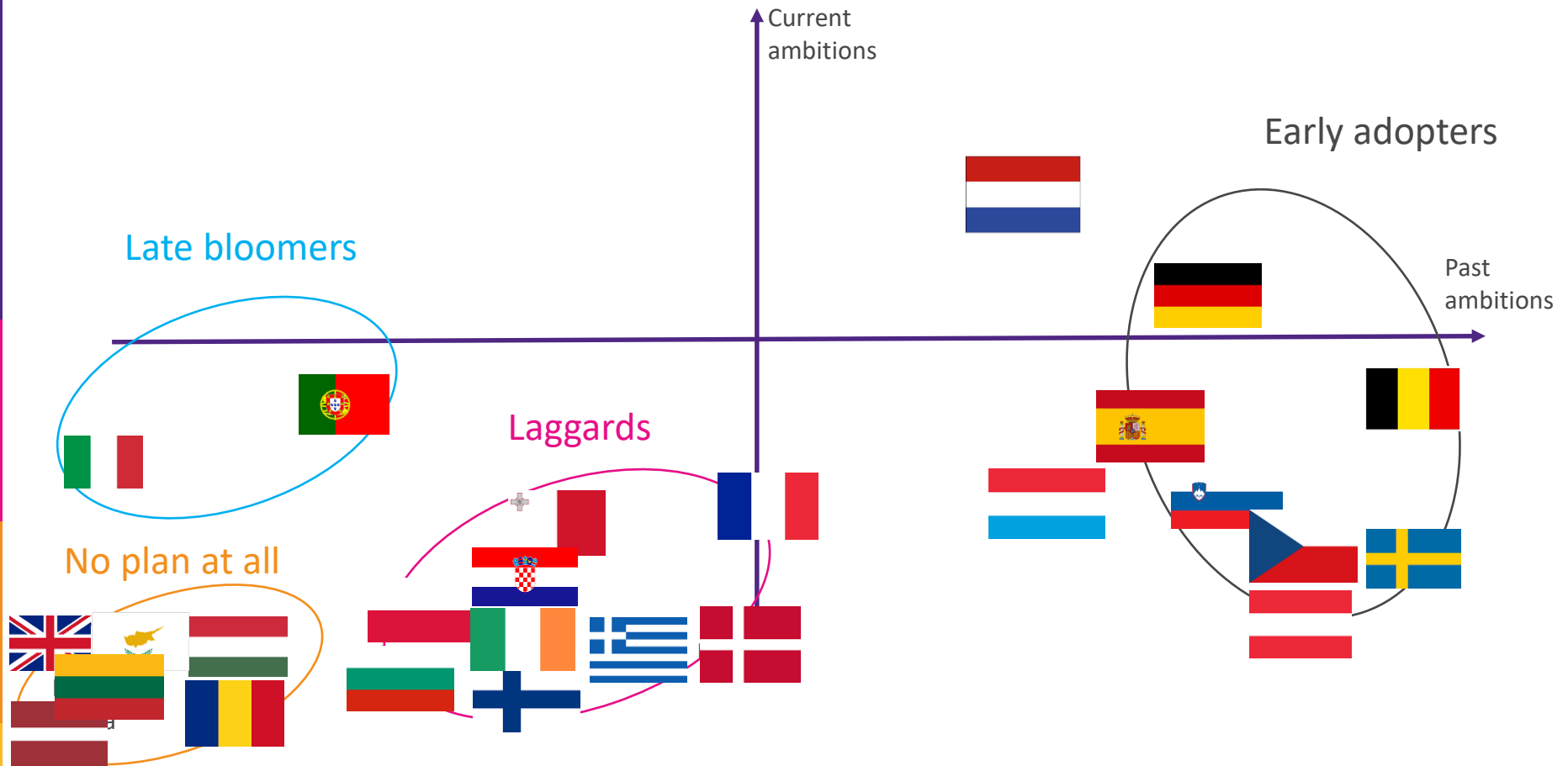
Clusters : Public pioneers (3/3)

- Operations & Organisation
 - Procurement requirements generally apply for new equipment
 - In some countries, public administrations must explicitly explain their decision if they choose to buy a non-compatible equipment (comply or explain)
 - Training sessions to help overcome technical difficulties,
 - Generally led by public entities responsible for the management of government networks.
- Barriers and Future developments
 - Nothing specific
 - Future plans include formulating procurement requirements (if none yet), setting clear deadlines for migration and working more closely with ISPs.

Clusters : Views on past and future (1/2)

- Ambitions towards the adoption of IPv6 have significantly decreased in recent years.
 - For the most forward-looking countries, start in the early 2000s
 - For most MS, peak of interest in Europe around the 2010-2013
 - Now with a diminishing of number of national plans (regardless of current adoption metrics) as well as the diminishing number of studies and report related to IPv6.
 - Often combined with a shift in priority, a lack of budget, or a general discouragement toward the status quo

Clusters : Views on past and future (2/2)



Country Focus : Belgium

General IPv6 development :
50.6% (Google) - 46.4% (Akamai)



■ Key Stakeholders

Central organization :

- SPF Economie (federal economy ministry)
 - Policies regarding the adoption of IPv6

Other organizations :

- SPF BOSA (policy and support ministry)
 - Public procurement services and organization of federal administrations
- IPv6 Council, still very active
 - Several events organized each month
- Local ICT agencies (given the federal nature of Belgium)

■ Plan for IPv6

Plan for IPv6 adoption in public administration (2012)

- Goal was to ensure adoption by public services before 2015
- Scope : public only
- Main components :
 - Preparatory phase (2012)
 - Implementation phase (2014)
- Targets : public services
- Ambitions for the future : No new plan for the adoption of IPv6 adopted since

■ Key initiatives

Procurement : Public procurement rule (2014) by the SPF BOSA

Training : Help and guidance to system administrators of public services in their transition, with an interoperability expert (SPF Bosa)

Other:

- Some studies from SPF Economie targeting specifically the adoption of IPv6 in public administration
 - A 2015 report noted a significant delay from the plans of 2014 (original plan was too ambitious)
- Meetings and workshops organized by the IPv6 council

Country Focus : Germany

General IPv6 development :
33.8% (Google) - 27.6% (Akamai)
Public IPv6 development : 25.6%



■ Key Stakeholders

Central organization :

- Federal Ministry of the Interior (BMI) and the Federal Office of Administration (BVA).
 - coordinate the IPv6 working group (federation, states and municipalities, public IT service providers and the Federal Office for Information security)
 - Manages the de.government LIR which is responsible for the entire IPv6 address space of the public administration sector.

Other organizations :

- n.a.

■ Plan for IPv6

Decision to adopt IPv6 in the public sector taken in 2007 by the responsible under-secretaries of state

- Scope : public only.
- Main components : The BMI is not forcing other public administrations to adopt IPv6 immediately, but seeks to create traction through evangelization and by facilitating the move
- Targets : n.a.
- Ambitions for the future : No information on future developments

■ Key initiatives

Procurement:

- IPv6 profiles developed by the BMI/BVA for the purpose of facilitating procurement (in cooperation with external experts from Fraunhofer Institute)

Training : n.a.

Other :

- Development of reference documents by the BMI/BVA such as an IPv6 reference manual and best practices, which are available online

Country Focus : Netherlands

General IPv6 development :
12.8% (Google) - 7.1% (Akamai)
Public IPv6 development : 32.8%

■ Key Stakeholders

Central organization :

- Dutch Ministry of the Interior and Kingdom Relations (BZK)
 - initiatives related to IPv6, based on recommendations by TNO (Organisation for applied scientific research).

Other organizations :

- Logius (digital government service of the BZK)
- Dutch Standardisation Forum
- VNG Realisatie (part of the Association of Netherlands Municipalities)
- IPv6 task force (launched in 2005, still active)
 - established by order of the Ministry of Economic Affairs
- Stipv6 (still active)

■ Plans for IPv6

BZK launched a government-wide IPv6 numbering plan

VNG started a campaign to push municipalities toward IPv6 migration

- Scope : public only
- Main components : documents and publications to raise awareness, development and elaboration of a step-by-step plan and its execution
- Targets : No set deadline for government (except for municipalities)
- Ambitions for the future : VNG aims for municipalities to complete transition before end-2019

■ Key initiatives

Procurement : IPv6 signed up for inclusion in the 'Comply or Explain' list of Open Standards for Government

Training : The IPv6 task force organized a seminar dedicated to IPv6 in public administration in 2013.

Other :

- The Standardisation Forum publishes frequent “monitors” regarding the situation of compulsory open standards, including IPv6
- Studies published by Stipv6, aiming at promoting IPv6 development and awareness
- The “Dutch Internet Standards Platform” launched Internet.nl, a website which check whether a website, email and Internet connection use modern and reliable Internet Standards (including IPv6)

Country Focus : Slovenia

General IPv6 development :
9.6% (Google) - 5.9% (Akamai)
Public IPv6 development : 13.9%



■ Key Stakeholders

Central organization :

- Go6 Institute : main platform for IPv6 awareness/assistance
 - Non-profit

Other organizations :

- Government authorities cooperates with Go6 :
 - Ministry for Higher Education (MVZT),
 - National regulating authority (APEK)
 - Academic and research network (ARNES)
 - University of Ljubljana's laboratory for telecommunications (LTFE)

■ Plan for IPv6

2010 study (updated in 2012) commissioned by the MVZT

- Goal : help the government and the public sector define an IPv6 strategy
- Scope : public
- Main components : n.a.
- Targets : : n.a.
- Ambitions for the future :
 - No information on future developments

■ Key initiatives

Procurement : Requirements for IPv6 in a number of ICT equipment (Slovenia at the origin of RIPE 554)

Training :

- Training sessions financed by the government, across the country (currently inactive)

Other :

- Development of IPv6 profiles (partnership between Go6 and the Slovenian government)
- Pilots supported by the Slovenian government (e.g. cross-border pilot with Spain and Luxembourg)

Country Focus : Czech Republic

General IPv6 development :
11.0% (Google) – 8.1% (Akamai)
Public IPv6 development : 50%



■ Key Stakeholders

Central organizations :

- CZ.NIC Association
 - main body for IPv6 related issues
 - runs and maintains the Czech national domain
 - provides technical advice and training on IPv6
 - provides monthly statistics of IPv6 deployment by governments (11 countries)

Other organizations :

- N/A – CZ.NIC is central to all IPv6 related issues

■ Plan for IPv6

Government Policies on IPv6 (2009 - 2015)

- Scope : Government websites and public tenders
- Main components :
 - Ensure government websites availability via IPv4 and IPv6
 - DNSSEC and IPv6 in all relevant public tenders
 - Availability of mail servers via IPv6
 - IPv6 as part of net neutrality
- Targets : 100% government websites and relevant public tenders
- Ambitions for the future : No new plan

■ Key initiatives

Procurement :

- IPv6 incorporated as a requirement in all relevant public tenders

Training :

- CZ.NIC Association provides IPv6 related training and also other advice on technical issues

Other:

- “Golden Crest” competition, awarded to the best municipality website; essentially impossible to win unless IPv6 is supported

Country Focus : Sweden

General IPv6 development :
6,1% (Google) – 8,1% (Akamai)
Public IPv6 development : 32%



■ Key Stakeholders

Central organization :

- PTS (Swedish Post and Telecom Agency)
 - The Swedish NRA
- Torbjörn Eklöv, a consultant driving IPv6 in Sweden
 - Co-founder of Interlan, following trends and creating a website related to IPv6 adoption in Scandinavia

Other organizations :

- IIS (Internet Foundation in Sweden)
 - responsible for the Swedish top-level domain, .se
 - Partially funds Torbjörn Eklöv's IPv6 promotion activities

■ Plan for IPv6

Government Mandate on Deploying IPv6 - Practical guidance (2011)

- Scope : Public authorities
- Main components :
 - Public authorities should deploy IPv6 no later than 2013.
 - PTS should be assigned to promote and follow up the deployment of IPv6 at government authorities
- Targets : All public authorities (recommendation)
- Ambitions for the future : No new plan

■ Key initiatives

Procurement :

- There is no requirement for IPv6 in the procurement stage that may help drive IPv6

Training :

- There seems to be lack of understanding of the need to move to IPv6; training on the topic would be important for future development.

Other:

- Government mandate. Its importance can be seen in that after 2013 (the mandate's deadline), IPv6 priority has deteriorated

Country Focus : Spain

General IPv6 development :
2.2% (Google) - 21.7% (Akamai)
Public IPv6 development : 10.52%



■ Key Stakeholders

Central organizations :

- Ministry of Energy, Tourism and the Digital Agenda
 - Plan developed to foster the deployment of IPv6
 - Responsible of RedIRIS
- Ministry of Finance and Public Function
 - Integration of IPv6 in public administration
 - Responsible of the new administrative addressing plan

Other organizations :

- Task Force Español, likely inactive

■ Plan for IPv6

National plan for IPv6 transition (2011)

- Scope : Global (individual users, companies, ISPs, Public)
- Main components :
 - 10 measures for the promotion of IPv6 through the creation of dictatorial portal, prototypes, working groups, training sessions, studies
- Targets : no specific target, no timeline defined
- Ambitions for the future : No new plan

■ Key initiatives

Procurement : IPv6 incorporated as a requirement/clause in public procurements of ICT products and services

Training :

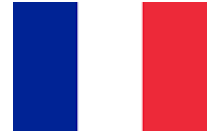
- Free 20 theoretical and hands-on IPv6 training sessions co-organized by 6DEPLOY and the Spanish Government
- Training for the people responsible for the Internet services of the administration (prerequisite for an ICT civil servant)

Other:

- Gen6 pilot for the IPv6 transition through the creation of a platform and studies for transition of administrative network with Red SARA

Country Focus : France

General IPv6 development :
20.39% (Google) – 12.5% (Akamai)



■ Key Stakeholders

Central organization :

- Inter-ministerial direction of the digital and information system and communication (DINSIC within the minister in charge of the digital)
 - Coordination of IPv6 deployment between the different ministries but without power of decision

Other organizations :

- RENATER, providing IPv6 training and support
- AFNIC, no direct responsibility but for IPv6 promotion
- Task Force France, inactive

■ Plan for IPv6

IPv6 introduction as part of the national digital plan (2008)

- Goal was to ensure IPv6 utilisation by the whole public services by 2015 and by companies by 2020
- Scope : Public and private
- Main components :
 - Only one measure out of 150 on IPv6 regarding public procurement rules
- Targets : 100% public services using IPv6 by 2015
- Ambitions for the future : No new plan

■ Key initiatives

Procurement : encouragement of the inclusion of IPv6 compatibility in the technical specifications of public procurement for goods or services using the IP protocol (mixed version about IPv6 procurement rules in public calls)

Training : n.a

Other:

- Statement in the transition to IPv6 done by ARCEP, the French regulator in 2016 including six recommendations
- Creation of an observatory of the transition of IPv6

Country Focus : Slovakia

General IPv6 development :
3.8% (Google) - 2% (Akamai)
Public IPv6 development : 20.1%



■ Key Stakeholders

Central organization :

- Awareness and migration promoted by the ministry of Finance

Other organizations :

- No IPv6 Council or Task Force
- UPC (major operator) turned on IPv6 support in early 2017

■ Plan for IPv6

IPv6 is mandatory in public services since 2008

(According to CESifo Group)

- Scope : n.a.
- Main components : n.a.
- Targets : n.a.
- Ambitions for the future : No information on future developments

■ Key initiatives

Procurement : n.a.

Training :

- Dedicated training and research opening in 2011
 - Partnership between Cisco and the Technical University of Kosice (Tuke)

Other:

- Technical report on the transition released by the Ministry of Finance (intended primarily for architects and network administrators)
- Survey about IPv6 awareness and migration activity released in 2011 by the Ministry of Finance

Questions?

Back-up

Country Focus : Austria

General IPv6 development :
5.9% (Google) - 8.7% (Akamai)
Public IPv6 development : n/a



■ Key Stakeholders

Central organization :

- IPv6 Task Force
 - Promotion of national IPv6 activities

Other organizations :

- The Federal Chancellery
 - Oversees the IPv6 transition; support of the IPv6 Task Force, assessment of IPv6 deployment (surveys)
- NRA
 - Support of the IPv6 Task Force

■ Plan for IPv6

Initiatives promoted by IPv6 Task Force (2004)

- Scope : global
- Main components :
 - introduction of IPv6 in the networks both on the consumer side and as peering between individual Internet Service Providers
- Targets : Not specified
 - N.B. the transition to IPv6 for the federal ministries is considered complete by the Chancellery.
- Ambitions for the future : No new plan

■ Key initiatives

Procurement :

- The need to formulate procurement requirements was mentioned in a 2011 survey of federal ministries

Training :

- Necessity to offer training was mentioned in a 2011 survey of federal ministries

Other:

- N/A

Country Focus : Luxembourg

General IPv6 development :
26.32% (Google) - 21.7% (Akamai)
Public IPv6 development : 10.26%

■ Key Stakeholders

Central organization :

- Luxembourg IPv6 Council created in 2007
 - Action plan and roadmap defined

Other organizations :

- State Technology Center
 - Establishment and development of eGov and support of the digital transition of the Luxembourg administrations
- No specific ministry involved
- Internet Society (ISOC)/ Task Force IPv6: inactive

■ Plan for IPv6

Action plan for IPv6 deployment in Luxembourg (2009)

- Scope : global
- Main components : 4 actions
 - Enabling IPv6 on public sector websites
 - Public procurement
 - Ensuring IPv6 knowledge through training and courses
 - Preventing from security and privacy issues
- Targets : 25% penetration by 2010
- Ambitions for the future : No new plan

■ Key initiatives

Procurement : recommendation from IPv6 council to specify IPv6 capabilities as core requirement for the renewal cycle of network equipment and services of Luxembourg government

Training : inclusion of IPv6 technology knowledge in relevant training and courses in computer and network engineering of universities

Other:

- Gen6 pilot on the transition of IPv6 of a private cloud

Country Focus : Estonia

General IPv6 development
19.3% (Google) - 15.3% (Akamai)
Public IPv6 development : 31.4%



■ Key Stakeholders

Central organization :

- Information System Authority (RIA)
 - Coordinates the development and administration of the national information system
 - It can also provide data communication and internet services to state agencies and local governments.

Other organizations :

- IPv6 Council (2014 launch) : inactive

■ Plan for IPv6

Digital Agenda 2020 for Estonia (2013)

- IPv6 is only mentioned
- Scope : public and private
 - «Transition to IPv6 will be promoted. »
- Main components : None
- Targets : No explicit target
- Ambitions for the future : No information on future developments

■ Key initiatives

Procurement : n.a.

Training : Training sessions held in 2014 by the RIA (held at the University of Tartu)

Other :

- State agencies and local governments using the RIA's internet services can use both IPv4 and IPv6 address space.

Country Focus : XXX

General Data
IPv6 : AKMGGL
Public IPv6 :

Flag

▪ Key Stakeholders

- Central organization
- Government involvement : type of Ministry
- Other relevant stakeholders involved (and role)

▪ Plan for IPv6

- Scope : Public only or Global
- Main components
- Targets
- Ambitions for the future

▪ Key initiatives

- Procurement, Training, Other (Profiles, Information, Review/studies/observatories, etc...)

Questions?