IPv6 in the public sector – Country Profiles

A report for the European Commission

iDATE

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1 Executive summary

1.1 Introduction on global adoption of IPv6

The adoption of IPv6 in general is very different across MS in Europe, with Belgium, Germany and Greece (plus to a lesser extent Luxemburg) at the forefront, while many MS are still below 2% of total penetration. More than half of MS are below 10% of penetration overall (and at least 10MS below 5%).

Figure 1: Overall development of IPv6
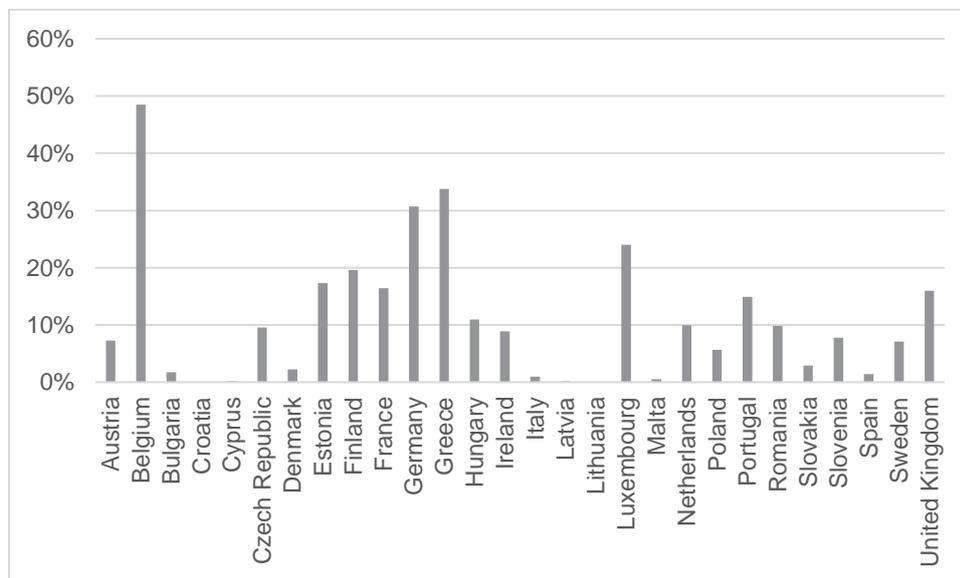
Source: IDATE, combining Google and Akamai data

With this in mind, it is no surprise to see very low adoption in the public sector, as seen in the next section.

1.2 Overall adoption in the public sector

There are no numbers to really compare IPv6 adoption in the public sector for all MS, so we have used various metrics (including CZ.NIC tool but mostly for Gen6 countries) that are not fully equivalent country by country. The graph below should therefore be taken as a good proxy, rather than the exact reality.

A few countries stand out, including countries that have not developed really well yet on IPv6 like Netherlands, Czech Republic, Austria, Sweden or Estonia. On the contrary, MS like Luxemburg or Greece (plus to a lesser extent France or UK) benefit from a good penetration of IPv6 but have not really made any significant developments for the public sector.

With no surprise, all MS with very low global IPv6 penetration are obviously also lagging behind for the public sector.

X-axis = penetration of IPv6 (global)

Y-axis = penetration of IPv6 (public sector)

There are no major clusters of MS that appear from the analysis. Indeed, for most MS, there is a strong correlation between the level of adoption of IPv6 in the public sector and the adoption of IPv6 in the country as a whole, with many MS not developed on both (more than 10MS really close to no development at all). Only around 10 MS have a very different adoption rate for the public sector than for the whole country. This implies a progressive roll out by some organisations as IPv6 is being offered by ISPs and equipment being renewed.

Indeed, as already mentioned, two groups stand out in the analysis, with some common patterns :

- A first group of advanced users in the public sector, despite low adoption overall in the country. These MS can be referred as "Public pioneers".

- A second group of laggards for adoption in the public sector, despite quite good adoption in the country. These MS can be referred as "Public laggards".

- Two MS also stand out (Belgium and Germany) and appear as the leaders. But they are very specific and can not been analysed as a coherent group, but more as specific cases.

- Finally, Gen6 MS are more advanced than other MS on average, but the results are still very different between from one MS to another even among Gen6 main players. Gen6 MS have been analysed in more details in a separate deliverable.

1.3 Overall analysis regarding IPv6 in the public sector

1.3.1 Key stakeholders

Government

Most advanced MS for adoption of IPv6 in the public sector are without surprise the MS that have some direct involvement of the government (Ministry level or equivalent). This is the case of all MS with adoption of more than 20% of the public sector and also a of few laggards MS.

List of MS with direct government involvement
Austria, Belgium, Estonia, Germany, Ireland, Italy (recent), Netherlands, Portugal, Spain (plus to a lesser extent Luxemburg, Malta

Task Forces

The involvement of other stakeholders is not a guaranteed sign of success. Some MS have been successful without leveraging a task force or the national R&D centre. Most task forces (whose action was generally both public and private sector) are anyway today inactive (only Belgium, Sweden, Netherlands and Estonia seem really still partly active as of early 2018, compared to more than 10 back in 2011-2012).

List of MS with IPv6 Task Force or equivalent
Still active : Belgium, Sweden, Netherlands and Estonia
Now inactive : Croatia, Finland, France, Greece, Ireland, Italy, Poland, Portugal, Spain, the UK, Luxemburg, Romania

R&D research centre

In most of the cases, the R&D research centre has been involved on its own, not impacting any global plans (and often being as a very specific testbed). In addition, there are many examples of MS without any success that have involved this type of stakeholder (Romania, Poland, Hungary, Greece, etc…). Leading MS for IPv6 adoption in the public sector are rarely using this type of stakeholder (somehow Netherlands are the exception, but not their main focus).

List of MS with R&D research center
Romania, Poland, Hungary, Greece, Bulgaria, France, Ireland, Luxemburg, Spain, Lithuania, Slovenia, Portugal + to a lesser extent Netherlands and the UK

National Regulation Authority

Finally, the MS in which activities are mostly driven by telecom regulators have also not shown any signs of being a good practice for further developments (Finland, Croatia, Denmark, Malta, etc...). While Sweden has had good results (until 2013-2014), it looks as an exception as other MS relying on the NRA are trailing behind in adoption.

List of MS with NRA
Finland, Croatia, Denmark, Malta, Sweden, Cyprus, Poland + to a lesser extent France

Third party organization

It should also be noted that some third parties have been used quite efficiently in leading MS like Czech Republic, Slovenia and Ireland, but have led to various results in general, with Czech Republic at the forefront, but Ireland still lagging behind.

Central organization

Only a few MS are relying on a central organization/approach managed by a Ministry (Germany, Spain, Belgium, Netherlands) or by a third party (Czech Republic), with even a central LIR (Germany, Czech Republic) or a central network (Spain). One MS (Belgium) even considered to develop an IPv6 public service datacentre but gave up as it considered this too ambitious. The results of such an approach are generally good, but the adoption may remain still low (Spain).

1.3.2   Plans

As mentioned in details below (see section 6), many MS do not have a plan for IPv6 (public sector or more globally). It is obviously the case of MS with no government involvement.

Specific plans for the public sector

For those with real plans (beyond just an analysis of the situation), specific plans addressing the public sector are quite rare (Netherlands, Belgium, Germany, Czech Republic, plus to a lesser extent Austria and Spain) and can be found logically in the most successful MS for IPv6 adoption in the public sector. The commitment of the government is showing improved performances than for other MS. Most other MS have tried to adopt a more global IPv6 plan addressing both public and private sector (Sweden, France, Spain, plus to a lesser extent Luxemburg or Slovakia), with results that are generally not as good.

Targets

It should be noted that most plans, when they do exist, are still mainly recommendations with no clear targets, deadlines and/or enforcement. Clear targets are mainly within plans of Belgium, Luxemburg,

Denmark and Sweden, with quite various types of results. All these MS did not reach their targets and have gone for an updated but less ambitious plan.

1.3.3   Key initiatives to develop IPv6

Apart from very specific initiatives mentioned earlier, main actions taken by MS can be classified into 4 categories:

- The most important one is without a doubt **procurement** that is often mandatory for new equipments and/or new websites. This is especially the case of Belgium, Czech Republic, Spain Italy, Latvia and Portugal, plus with less enforcement for Denmark, Austria and Slovakia (but also MS like Croatia, France, Germany). This measure is quite positive, but has had so far limited impacts, as it only concerns new equipments. Many MS have now such rules (or equivalent) and are still trailing behind for adoption, as the measure takes time to have some effect.

- The other major action is **training**, even though it is a little bit more developed than procurement. Key MS that developed such an approach are Belgium, Estonia, Slovenia, Luxemburg, France, Spain. Like for procurement, this measure is positive, but not fully efficient (this is also done by laggards MS without real reduction of the gap).

- **General information** on IPv6 is provided by many MS, but generally by MS are the most motivated ones by IPv6 in the public sector.

- **Definition of IPv6 profiles** is rare (Slovenia, reused by Germany) and used by tech-savvy MS.

1.3.4   Barriers

There are three main barriers identified, almost independently of the situation regarding the current (or even future) adoption of IPv6 in the public sector:

- **The lack of interest and involvement of most MS**, not identifying benefits of moving to IPv6 and often ready to leave it to ISPs. There are some MS not feeling any urgency. This is mostly the case of MS not well advanced yet on IPv6 in the public sector.

- **The cost and budget necessary to operate the transition to IPv6**. This has been identified by both leading MS during the deployment of their plans (there is no scale effect yet and also no clear budget allocated to this) like Belgium, Austria or Germany and by MS that have reduced their ambitions, often due to budget cuts like Sweden or Slovenia. MS see IPv6 as essentially costs, especially as support is required for both IPv4 and IPv6.

- Finally, **there are also technical issues**. IPv6 maturity (around hardware) is still considered as being low, especially in terms of performance and security, even by MS that have advanced adoption of IPv6 (Germany). Many MS mention they would need some technical support.

A few MS have also mentioned that ISPs are often not enough involved to develop IPv6, which is an additional roadblock (Italy, Latvia, but also Netherlands).

Organizational issues are sometimes mentioned (especially in terms of coordination), but are not as important as expected. It seems to be more an issue of commitment (political and budget), then organization will often follow.

1.4   Cluster of public pioneers

This cluster (Austria, the Czech Republic, Estonia Netherlands, Portugal, Slovakia and Sweden) represents the countries where global IPv6 deployment is not particularly high when compared to overall Member States, yet does score high when focusing on IPv6 deployment in the public sector. In other words, this is the cluster where one could reasonably argue: "these Member States have promoted IPv6 deployment in the public sector". This does not include leading MS like Belgium and Germany, performing well on both public and private sector, with their own specific approach.

1.4.1   Key stakeholders

There are two main axes one can look for regarding the key stakeholders; the existence of an IPv6 Task Force, and whether the key stakeholder is a part of the government (typically a Ministry).

Concerning the existence of an IPv6 Task Force, there is no real pattern since its existence is roughly half-and-half. The Netherlands, Portugal, Austria and Estonia all had an IPv6 Task Force in place, although with the exception of Estonia, it must be noted that these Task Forces have been defunct since around 2003/2004 with the exception of the Netherlands where Dutch IPv6 task force was subsumed under the Platform Internetstandaarden (see https://ecp.nl/activiteiten/platform-internetstandaarden/).

Estonia's IPv6 Council was set up in 2014, which is comparatively very recent; however, this council apart from the launch of the Council itself has mentioned no activities. Slovakia, the Czech Republic and Sweden have no such Task Forces (Sweden can appear to have had one, but in reality it was and still is the PTS, see below).

Figure 3 : Cluster analysis: Task forces in select countries

	IPv6 Task Force	Currently active
Austria	Yes	No
Czech Republic	No	No
Estonia	Yes	Yes
Netherlands	Yes	Yes (but no publications)
Portugal	Yes	No
Slovakia	No	No
Sweden	Yes (PTS acts a Task Force)	Yes

Source: IDATE Digiworld, based on desk research and interviews

Concerning the involvement of the government, it is noteworthy that for five of the seven Member States the key stakeholder is indeed the government. The exceptions are the Czech Republic, where the key stakeholder is the CZ.NIC Association (which runs and maintains the Czech national domain and is the main body for IPv6 related issues), and in Sweden where the key stakeholder is the PTS (Swedish Post and Telecom Agency) together with the IIS (Internet Foundation in Sweden).

1.4.2   Government Plans and Strategies

It can be noted that all of the governments of the Member States included in this cluster have some sort of national plan in place. Of particular interest in the Czech Republic and Sweden, as both had an IPv6 policy plan mapped out by the government, running up to 2013 (and not much more being done since). Austria could also potentially be grouped here, since although there was no given governmental policy per se, the government did carry out a survey in 2011 in which the majority of ministries replied that they intend to complete IPv6 deployment by 2013. One could assume this survey (recorded as a white paper) put pressure on the ministries to proceed with the IPv6 deployment.

The Netherlands and Estonia, on the other hand, have recent governmental plans in place, which run until 2019 and 2020 respectively. In the case of Estonia, the policy was put in place in 2003, while for the Netherlands it has been running since 2016.

1.4.3   Deployments

Regarding this cluster of countries, IPv6 is more broadly adopted in the public sector, at national and regional levels, as well as in research networks. These research networks were often used as "test beds" for IPv6 deployment and were generally the first compatible networks in the country.

Some initiatives related to the improvement of the overall quality of websites/services, while not directly related to IPv6, take nonetheless this parameter into account. These initiatives directly promote IPv6 adoption (among other internet standards) by offering "rewards" for higher-ranking websites. This is notably the case in the Netherlands and in the Czech Republic.

1.4.4   Operations & Organisation

Procurement requirements generally apply, which compel public administrations to choose IPv6-compatible equipment when facing a purchase equipment. In some countries, public administrations must explicitly explain their decision is they choose to buy a non-compatible equipment (comply or explain)

In order to help overcome technical difficulties, training sessions were offered in many of these countries, generally led by public entities responsible for the management of government networks.

1.4.5   Barriers and Future developments

Barriers are roughly the same as in other countries, but several governments from this group aim to implement plans to overcome them, notably by formulating procurement requirements (if none yet), setting clear deadlines for migration and working more closely with ISPs.

1.5   Cluster of laggards

There is no obvious common elements between those countries (France, UK, Luxemburg, Greece and Finland) displaying a relatively high level IPv6 adoption in global and a very low implementation of IPv6 in public administrations.

Though few elements can be highlighted like:

- The current inactivity, dismantlement or inexistence of national IPv6 Task Force, often used to get more information

- The involvement of ISPs as stakeholders (members of the IPv6 dedicated group) and also being pushed forward as key references of IPv6 implementation, leading to less focus on the public sector

- The lack of focus on public sector from the responsible organization (except for France)

- Somewhat a relative involvement of the government by being a stakeholder or by being interested in having a national review of IPv6 (except for Greece and Finland)

Also, the main barriers identified for the IPv6 implementation in the public sector are mainly related to the lack of coordination (coherent move) and also the lack of reasons to move.

Therefore, the development in these MS is indeed driven by ISPs and not the public sector, that has no or minimal plans. IPv6 adoption is therefore slow and with no direct impacts for the public sector.

	France	UK	Luxembourg	Greece	Finland
Dedicated Task Force created initially	Inactive since 2007	Inactive since 2002 (except in Scotland)	No	Dismantled in 2015	Inactive since 2008
Responsible organization	Government	IPv6 council	IPv6 council	GRNOG	Regulatory body (FICORA)
Focused on public sector	*Yes*	*No*	*No*	*No*	*No*
Government involvement	IPv6 responsible organization	Member of UK TF but not in IPV6 council	Member of IPv6 council	No	Initially member of Finnish TF
Existing government plan	*Yes (without target)*	*No (IPv6 not mention in eGov plan)*	*Yes with target*	*No*	*No*
Procurement rules	*Yes (but not enforced)*	*Recommended*	*In the roadmap*	*n/a*	*n/a*
Review asked	*Regulator body (ARCEP) assigned by the government for a review in 2016*	*Secretary of State for Culture and Digital Economy commissioned for a review of IPv6 in 2015*	*Review asked by the Ministry of Communications in 2011*	*No*	*No*
ISPs involvement	None	Members of UK IPv6 council	None	Key members of GRNOG	Initially members of Finnish TF
ISPs as references being IPv6-enabled	*ISPs IPv6 implementation provided in the ARCEP observatory*	*ISPs IPv6 implementation provided in the OFCOM annual "Connected Nations"*	*Post Luxembourg case cited as pioneer in IPv6 since 2009*	*No*	*Participants to the national IPv6 day*

|	France	UK	Luxembourg	Greece	Finland
Barriers identified	• Lack of interest from public institutions • No coordination deployments within the public sector • No coherent moves/initiatives	• Lack of commercial opportunity in short term • Lack of coordination "wait and see" • Lack of maturity (control) • Lack of centralized information system within government entities	• Lack of technical knowledge in admin and need for training • No motivation to move into innovation and digitalization	N/A	• Lack of motivations • Lack of organization • Lack of education to move

1.6   Classification of MS around past and current ambitions

Finally, we conclude with a dynamic vision of the IPv6 in the public sector. The different European countries have shown different attitudes and level of ambitions toward the adoption of IPv6 in their public administrations.

Overall, the main outcome of this analysis is that, globally and with only a few exception, the ambitions towards the adoption of IPv6 have significantly decreased in recent years. For the most forward-looking countries, the ambitions of IPv6 transition started to develop in the early 2000s, they probably peaked overall in Europe around the 2010-2013 time frame and are clearly decreasing since. This decrease in ambition is noticeable by the diminution of the number of national plans (regardless of current adoption metrics) as well as the diminution of the number of studies and report related to IPv6. The trend is often confirmed in interviews with responses pointing toward a shift in priority, a lack of budget, or a general discouragement toward the status quo.

We can group several countries showing similarities in their attitude, the measure they concretely took and the timing at which they decided to act. Estonia is not covered into a group due to limited information.

Groups of players according the ambitions of the plans
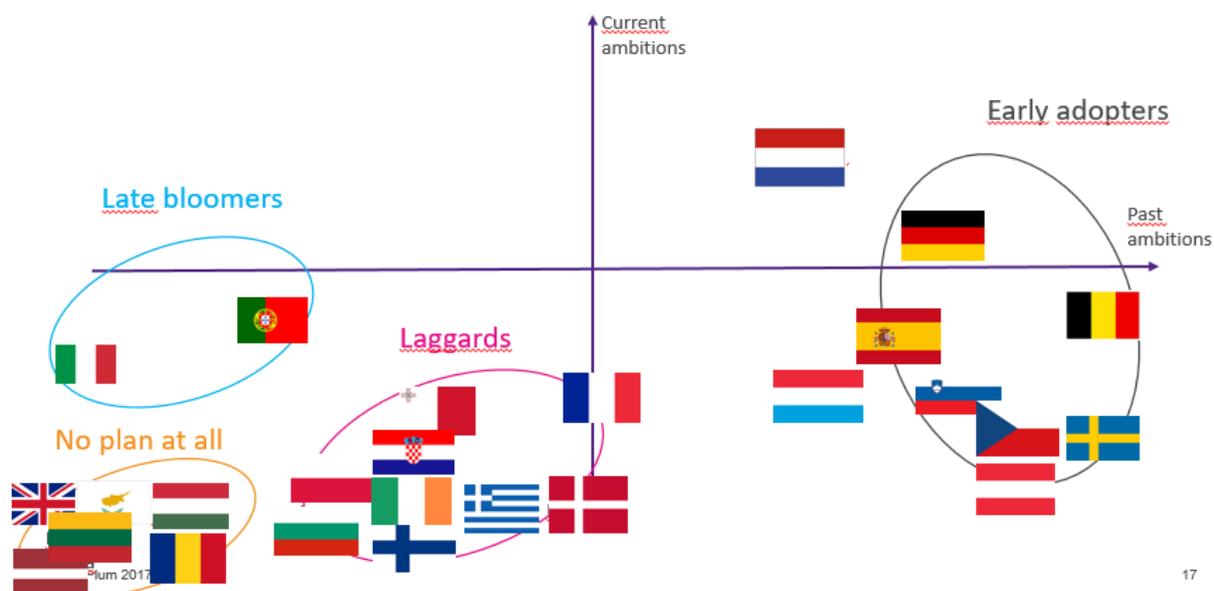
Group 1: early adopters with reduced ambitions over time

- This first group gathers countries that identified early on within their national government the necessity and implications of switching toward IPv6. This group includes Belgium, Germany, the Czech Republic, Spain, Slovenia, the Netherlands, Sweden and Austria.

- They often had an active IPv6 taskforce, well identified structures in the government responsible for the digital transformation of public administrations, defined public procurement rules, set up training programs and often had a clearly identified national plan. Some, such as Sweden or

Belgium even defined clear deadlines for adoption. For this group, most of these activities were done before 2014.

Country	Past Ambitions	Current Ambitions
Belgium	Plan for full adoption in public services by 2014 Very active taskforce Plans at regional levels as well	Resource limitation has delayed plan Plan downscaled to mandatory adoption on new public procurement or significant website update
Germany	Identified responsibility in gov Plan for public procurement Support to local / regional gov for adoption No deadline set	Still supporting adoption
Czech Republic	National association providing training Plan for adoption in public administration Public procurement rules	Mostly inactive since 2013 not mentioned anymore in eGov plans
Spain	IPv6 Task Force National Plan for IPv6 (non gov) Identified responsibilities in gov Public Procurement rules	Task Force now inactive Plan still there but low efforts
Slovenia	Responsibilities well identified National association with gov support Plan and action toward public procurement	Economic downturn reduced budget for training Seem to have reduced efforts
Sweden	Plan to deploy by 2013 Main stakeholder: regulator	Minimal support to some IPv6 activities
Netherlands	Existing Task force and supporting organizations Plan for adoption in public administrations	Still active Plan in 2016 to help municipalities migrate to IPv6 (target 2019)
Austria	Task force set up Gov agency responsible Training provided Public procurement rules	Transition considered as complete (no plans for regional / local government)
Luxembourg	Government plan for adoption Plan for public procurement rules Plans for promotion	Plan still in place without update

After these initial ambitions, most of them seem to have now significantly reduced their ambitions, mostly by lack of budget, political support or because (such as Austria) they consider the task as complete (although the adoption is clearly not reaching 100% yet). The level of adoption of IPv6 in public administrations in these countries can be expected to still rise but quite slowly mainly due to the public procurement rules in place, except maybe for Netherlands and Germany still quite active.

All these MS are classified as IPv6 pioneers or leaders for the public sector. Without a surprise, early adopters can be found only within MS that have a public plan.

Group 2: limited interest and potentially dropping out

This second group gather countries that started to move toward IPv6 usually around the same time as the first group (2002-2010) but with much more limited ambitions. These initial ambitions have now decreased and in many cases they have entirely dropped their meagre ambitions. This group includes: France, Luxembourg, Slovakia, Malta, Croatia, Denmark, Finland, Poland, Bulgaria, Ireland and Greece.

The countries in that group have at some point set up some policies for IPv6 adoption such as dedicated research groups and pilots, taskforces, national plans, training or public procurement rules. Some of these activities are still active or policies still in place but a large part of the initial ambitions have been given up.

Country	Past Ambitions	Current Ambitions
France	IPv6 Task Force IPv6 national transition plan not dedicated to public administration Mixed and changing responsibilities in gov Public procurement rules	Task Force now inactive Gov plan objectives not met Reduced interest Procurement rules not really enforced.
Slovakia	No Taskforce or well identified government agency IPv6 mandatory in public services (public procurement?)	No recent activity or visible plan
Malta	IPv6 included in the national digital agenda Lack of concrete plan or organization driving things forward	Recent events and annual plan suggest IPv6 still on the agenda but low priority
Croatia	Limited awareness, mostly in R&D and Education	Limited awareness, mostly in R&D and Education
Denmark	Past plans for IPv6 adoption at national level Past plans for public procurement	No plan or support from gov
Finland	Main stakeholder: regulator No plans or strategy specific to gov Past task force	No plan or support from gov
Poland	Past task force and limited plans	No plan or support from gov
Bulgaria	No Taskforce or gov initiative R&D Lab set up	No plan or support from gov
Ireland	IPv6 TaskForce with participation of gov No visible government plan	No plan or support from gov
Greece	Taskforce from 2010 to 2015 (disbanded) Ambition to have a national plan	No plan or support from gov

The overall ambition in this group started lower than in group 1, it diminished over time, but is still somewhat active. The level of adoption of IPv6 in public administrations in these countries can be expected to stagnate or rise very slowly mainly when public procurement rules are in place.

Group 3: potential late bloomers?

This third group gather the countries in which the necessary transition of public services to IPv6 was only considered relatively recently and that show some limited ambitions of adoption. This group gathers Portugal and Italy.

The effort of adoption seem to be relatively recent in these countries, and they have set up a plan to switching to IPv6 (considered for 2019 in Portugal) and public procurement rules (since 2016 in Italy).

Country	Past Ambitions	Current Ambitions
Portugal	Limited plans and public procurement in research and education	Entity responsible for management of government network has plans for switching in 2019
Italy	No plan or support from gov	Recently included requirement in public procurements

The countries in this group appear to have rising ambitions of IPv6 transition, but this should be taken with caution as the plans announced are not very ambitious (compared to Belgium, Netherlands or Germany). In addition, the overall limited adoption of IPv6 in these countries does not prefigure a rapid switch of their public services to IPv6. It is thus mostly by a figure of contrast with the other group that these countries appear to have ambitions.

Group 4: No interest past or present

This group gather countries, which seem to have never had any ambitions of transitioning their public services toward IPv6. This group includes the United Kingdom, Lithuania, Cyprus, Hungary, Latvia, and Romania.

At most, they had at one point a taskforce in place, but the public administration never showed much interest or support for a transition to IPv6.

Country	Past Ambitions	Current Ambitions
United Kingdom	No plan or support from gov Some form of task force in the past (defunct now)	No plan or support from gov
Lithuania	No plan or support from gov	No plan or support from gov
Cyprus	No plan or support from gov	No plan or support from gov
Hungary	Identified responsibility in gov but no plans or specific support to IPv6 in gov	No plan or support from gov
Latvia	No plan or support from gov	No plan or support from gov
Romania	Taskforce established, no activity since 2014 No government plan	No plan or support from gov

The adoption of IPv6 by public administration in this group can be expected to stagnate with very limited activities for the future.