

LUXEMBOURG IPv6 DEPLOYMENT ROADMAP



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- ISPs, which need over time to offer IPv6 connectivity and IPv6 based services to customers.

There is evidence that less than half of the ISPs offer some kind of IPv6 interconnectivity. Only a few ISPs have a standard offer for IPv6 customer access service (mainly for business users) and provide IPv6 addresses. The percentage of "Autonomous Systems" (typically ISPs and large end-users) that operate IPv6 is estimated at 2.5%.

Accordingly, IPv6 traffic seems to be relatively low. Typically the IPv6/v4 ratio is less than 0.1% at Internet Exchange Points (of which about one in five supports IPv6). However, this omits direct ISP to ISP traffic and IPv6 which is "tunnelled" and so appears at first glance to be still IPv4. Recent measurements suggest that this kind of traffic IPv6 which is "tunnelled" is growing.

- Infrastructure vendors (such as network equipment, operating systems, network application software), which need to integrate IPv6 capability into their products.

Many equipment and software vendors have upgraded their products to include IPv6. However there are still issues with certain functions and performance, and vendor support equivalent to IPv4. The installed equipment base of consumers, such as small routers and home modems to access the Internet, still by and large do not yet support IPv6.

- Content and service providers (such as websites, instant messaging, e-mail, file sharing, voice over IP), which need to be reachable by IPv6 on their servers.

Worldwide there are only very few IPv6 websites. Almost none of the global top sites offer an IPv6 version. The de-facto non-existence of IPv6 reachable content and services on the Internet is a major obstacle in the take-up of the new protocol.

- Business and consumer application vendors (such as business software, smart cards, peer-to-peer software, transport systems, sensor networks), which need to ensure that their solutions are IPv6 compatible and increasingly need to develop products and offer services that take advantage of IPv6 features.

Today there are few if any current applications that are exclusively built on IPv6.

One expectation has been that proliferation of IP as the dominant network protocol would drive IPv6 into new areas such as logistics and traffic management, mobile communication, and environment monitoring which has not taken place to any significant degree yet.

Many home end-users, without being aware of it, operate IPv6 capable equipment and yet as a result of missing applications without necessarily making use of it. Companies and public administrations are cautious to make changes to a functioning network without a clear need. Therefore there is not much user deployment in private networks visible. Among the early adopters have been universities and research institutions.

All EU national research and education networks also operate on IPv6. The European Géant network and the Luxembourg RESTENA are IPv6 enabled, whereby approximately 1% of its traffic is native IPv6.

How much and which efforts are required to adopt IPv6 differ amongst actors and depend on each individual case. Therefore it is practically impossible to reliably estimate the aggregated costs to introduce IPv6 globally. Experience and learning from projects have shown that costs can be kept under control when deployment is gradual and planned ahead. It is recommended introducing IPv6 step-by-step, possibly in connection with hardware and software upgrades, organisational changes, and training measures (at first glance unrelated to IPv6). This requires a general awareness within the organisation in order not to miss those synergies. The costs will be significantly higher when IPv6 is introduced as a separate project and under time constraints.

Introduction of IPv6 will take place alongside the existing IPv4 networks. Standards and technology allow for a steady incremental adoption of IPv6 by the various stakeholders which will help to keep costs under control. Users can use IPv6 applications and generate IPv6 traffic without waiting for their ISP to offer IPv6 connectivity. ISPs can increase their IPv6 capability and offer this in line with perceived demand.

3.5 The need for policy driving at Luxembourg level

Today, for a number of stakeholders the advantages of adopting IPv6 are not immediately visible. The benefits are long-term and also depend on other stakeholder's decisions on when and how to implement IPv6.

The more users work with IPv6 the more attractive it becomes for others to do the same. As the number of users increases more products and services will be offered at lower prices and better quality. The collective knowledge about IPv6 operation and management will also increase. The result will be an eco-system of suppliers and service providers re-enforcing each other, boosting confidence, and accelerating deployment. However similar market forces apply to IPv4 where this eco-system has been in place for many years resulting in a large legacy of appliances and applications.

A collective movement to implement IPv6 is difficult to trigger as stakeholders cannot easily take into account others' decisions. There is no single authority to steer IPv6 introduction or to establish a co-ordinated master plan. Thus roll-out of IPv6 is largely a decentralised and market driven process on a global scale. In this situation many stakeholders have taken a "wait and see" position on IPv6 or opted for a "safe and known" IPv4 solution. The cumulative result has been the described delay in the widespread adoption of IPv6. This is a situation where appropriate policy measures could give a market stimulus by encouraging people and organisations to consider moving ahead positively. Those measures will be more effective when taken collectively at Luxembourg level.

4 ACTIONS: IPV6 TO BECOME WIDELY IMPLEMENTED IN LUXEMBOURG BY 2010

Luxembourg should set itself the objective that at least 25% of users should be able to connect to the IPv6 Internet and to access their most important content and service providers without noticing a major difference compared to IPv4.

4.1 Actions to stimulate IPv6 accessibility to content, services, and applications

- The Luxembourg IPv6 Council calls upon content and service providers to make their offer IPv6 accessible by 2010, amongst them the top 100 Luxembourg web sites. It intends to facilitate this co-operation through "Thematic Networks" involving vendors, ISPs, and content and service providers, as part of the Competitiveness and Innovation Programme (CIP).
- The Luxembourg IPv6 Council calls upon industrial stakeholders that are now embracing IP technology in their core business,
- to consider IPv6 as their primary platform for developing applications or appliances (such as sensors, cameras etc).
- The Luxembourg IPv6 Council calls upon the Luxembourg Government to enable IPv6 on public sector websites.
- The Luxembourg IPv6 Council calls for further standardization efforts.
- The Luxembourg IPv6 Council will encourage research projects funded by Framework Programme 7 and facing a choice of computer network protocol, to utilise IPv6 whenever possible.

4.2 Actions to generate demand for IPv6 connectivity and products through public Procurement

In a public consultation the use of public procurement was identified as an efficient way to speed up the transition to IPv6. For example in 2005, the US Government directed all federal government agencies to migrate their core backbone networks to IPv6 by mid 2008.

- The Luxembourg Government should specify IPv6 capabilities as a core requirement for the continuous renewal cycle of its own network equipment and services. It will carry out timely and appropriate internal trials and projects to prepare for IPv6.
- The Luxembourg Government should apply for its own IPv6 prefix.

4.3 Actions to ensure timely preparation for IPv6 deployment

The transition to IPv6 will take some time and will require operating a dual IPv4/IPv6 network, bringing up specific issues to be resolved. All actors will need to prepare themselves for developing and deploying IPv6 compliant solutions; the sooner the better. Organisations should not wait for their ISPs to provide native IPv6 connectivity but should begin to enable the protocol on their own network.

- The Luxembourg IPv6 Council will undertake targeted awareness campaigns to various user groups.
- The Luxembourg IPv6 Council encourages ISPs to provide full IPv6 connectivity to their customers by 2010 and where applicable to upgrade the equipment they supply to consumers.
- The Luxembourg IPv6 Council supports the inclusion of IPv6 technology knowledge in relevant retraining curricula and in computer and network engineering courses of universities etc.

4.4 Actions to tackle security and privacy issues

Security issues in IPv6 are not better or worse than in IPv4, they are just different. In a dual IPv4/v6 environment security issues could become complex to deal with in terms of implementation and configuration.

The Court of Justice has recognised that an IP address may be considered as personal data falling within the scope of the Data Protection directives. Some concerns have been expressed about IPv6 and privacy, in particular by the Article 29 Data Protection Working Party.

- The Luxembourg IPv6 Council will disseminate best practices and will work with vendors to provide full IPv6 functionality.
- The Luxembourg IPv6 Council will monitor the privacy and security implications of widespread IPv6 deployment, in particular through consultation with stakeholders such as data protection authorities or law enforcement.

5 EXECUTION OF THE ACTION PLAN

This Action Plan is scheduled to be executed over the next 3 years. The Luxembourg IPv6 Council will monitor the adoption of Pv6; in particular it will carry out an implementation test to measure the degree of IPv6 availability and functionality for users in Luxembourg.

- The Luxembourg IPv6 Council will continue to follow the activities of the Internet organisations, such as the ongoing debate about IPv4 distribution policies with in the registries communities, and where necessary make contributions.
- The Luxembourg IPv6 Council will regularly make available progress reports on its website and by other appropriate means.

IPv6 Council Luxembourg

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