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Responsible and Editor/Authors: Jiří Průša, Zuzana Duračinská	Organization: CZ.NIC	Contributing WP: WP1
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Authors (organisations):
 Carsten Schmoll (Fraunhofer); Jens Tiemann (Fraunhofer); Petra Holubičková (MoIT); Dana Černohousová (MVCR); Antonio Skarmeta (UMU);

Abstract:
 This document involves a leaflet focused on Government Motivation. The aim of this leaflet is to encourage public administration to implement IPv6 support within eGovernment services. The leaflet involves chapters such as: When the process of adoption has started? Why should we introduce IPv6? Is IPv6 deployment just a public matter? Policy background or Best practice. This document represents the text only, without any layout.

Keywords:
 IPv6, Governments, public administration, dissemination, awareness raising.

Revision History

The following table describes the main changes done in this document since its creation.

Revision	Date	Description	Author (Organization)
v1.0	01/02/2013	Document creation	Jiří Průša (CZ.NIC), Zuzana Duračinská (CZ.NIC),
V1.1	04/02/2013	Comments and modifications	Antonio Skarmeta (UMU)

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Milestone Description

Europe, as a competitive region based on knowledge and innovation should provide e-Government services to all citizens without any difference. Among representatives of government, including self-government, there is often lack of information about IPv6 and its importance. GEN6 project has prepared an awareness raising leaflet about the reason why IPv6 has to be introduced and the way it will affect European citizens. The leaflet will answer many questions to representatives of all level of government. The aim of the leaflet is to help governments' representatives to understand the importance of IPv6 transition and how eGovernment services and their users can benefit from IPv6.

Based on this deliverable, the graphic version of this leaflet will be prepared. Later on it will be distributed in an on-line and printed version. Printed version is expected to be distributed especially on e-Government conferences in order to bring discussion and implementation of new Internet protocol among government representatives. Member states of European Union will have the opportunity to translate this leaflet in their national languages since every single European state will have to bring that issue on the table at a certain point in the future.

Be ready for IPv6

There is nothing more important in the contemporary world than to be a step ahead. Leaders in the Internet world like Facebook and Google are already running on the new version of the Internet protocol (IPv6). Some governments have already followed their model. Now it is your turn to join them! In 2012 the Internet address registries have almost run out of IP addresses from the current version 4 (IPv4). Nobody predicted such a growth of the Internet when the initial Internet protocol was introduced. The IPv4 address depletion is the most important reason to introduce IPv6. Internet Service Providers (ISP) as well as governments have to deal with an increasing number of Internet users and devices connected to the network. Only when governments introduce IPv6 in their policies, nobody will be excluded in future from the benefits of the Information society. All citizens can enjoy its convenience and an improved networking and addressing infrastructure. At the same time governments and public institutions should enable the access to their electronic services using IPv6 so that further developments for eGovernment services will be triggered.

What is an IP address and why is it important?

The Internet Protocol (IP) is the basis of communication across the Internet. Every connected device (computer, mobile device, sensor, etc.) needs an Internet endpoint identifier linking it to the global network. These unique identifiers are called IP addresses. Those identifiers are designed to communicate with other computers, and without them, the Internet would not work at all. The majority of Internet users do not have to be concerned directly with these numeric identifiers, since they are working only with end system (host) names that are easier to remember, e.g. www.gen6.eu.

When did the process of adoption on IPv6 start?

Transition to IPv6 has started years ago. First components were ready, but IPv6 deployment competed with the tremendous growth of the Internet and its services. IPv4 still worked well and most administrators had no time to care about IPv6 yet. Now the situation has changed: We are running out of IPv4 addresses. Starting in Asia, administrators are forced to find new ways to connect to the Internet. The topic of IPv6 gained momentum and has reached a wider audience with the two “IPv6 days” in June 2011 and 2012. Countries with traditionally good Internet infrastructure need more time for this transition, but new Internet Service Providers with a homogenous infrastructure can enable IPv6 quite fast – we have seen this in France and Romania. The time for complete migration to IPv6 cannot be estimated today, but the process has started and cannot be reversed. After some turning point, the rate of adoption will suddenly increase, because after one point in time, IPv6 will be the default protocol for daily business and IPv4 will be an exotic exception.

What will happen with IPv4?

Your IPv4 address will be still assigned to your services as long as people will be using IPv4 widespread. That is the reason why the transition to IPv6-only will only happen way in the future. In addition to that, IPv4 and IPv6 enabled hosts cannot communicate with each other directly. However a host can run IPv4 and IPv6 simultaneously (so called ‘dual stack’ mode). Your Internet Service Provider will have to run both protocols simultaneously until the transition phase is fully completed (which might take many years). Both protocols will be used in order to keep all public parts of the Internet reachable for everyone. The **Digital Agenda for Europe**, a key European strategy, suggests making eGovernment solutions fully interoperable. It is important to overcome organisational and technical barriers and integrate IPv6 into eGovernment services. By upgrading infrastructures and introducing the new IPv6 protocol, public services will be a challenging example for the private sector.

Why should we introduce IPv6?

Public services are used by citizens in order to fulfil their obligations related to public administration, for example registering a car or uploading tax-related documents. These services have to be provided in a non-discriminating fashion to all citizens. This does not only include access for e.g. visually impaired citizens, but also across citizens with different technical access technologies (e.g. low-bandwidth or IPv6-only Internet access).

Thus, improving eGovernment services needs to satisfy future needs of mentioned services. Not introducing IPv6 is not an option: If just these addresses are allocated from now on, citizens and parts of the private sector running on them would not be able to access services running on IPv4 alone. Since future Internet growth should rely on IPv6, it is necessary to avoid this potential “digital darkness”. By deploying IPv6, the public administration can build future-proof environments and support innovation.

What's great about the transition to IPv6?

You will be able to consolidate your infrastructure during the transition to IPv6. That means you need to clean up your network and upgrade the devices. By cleaning up and upgrading, you will make sure that you're ready to introduce a new protocol. By restructuring your network you can possibly simplified your network that has grown over the years. You can eliminate potential bugs and make your network more secure and ready for new technologies. Although it does not seem evident, you will realize in couple of years how much you actually have reinforced democracy by enabling services for everybody.

How long will it take to adopt IPv6?

Talking about maintaining security of our fellow citizens' upgrade of the system should be very thoughtful. Make sure your IPv6 will be running with existing IPv4. Then there will not be any problem to access your services from IPv4 as well as from IPv6. Learn as much related information as possible and make sure that you and your staff are aware of IPv6. By building up a professional trained team of workers that will upgrade your hardware and maintain software, time and expenses for transition will be reduced.

How much will it cost and what are the perspectives of further protocols?

Internet service provisioning is often outsourced. This means that public services' availability with IPv6 depends not only on their own upgrades towards using IPv6. Your provider should provide you with IPv4 and IPv6 at the Internet access. Benefits that come along the transition are long-term. All investments are prospective proof and you should incur them as soon as possible. Thanks to the **GEN6 project (Government ENabled with IPv6)** costs will be reduced through knowledge exchange and sharing of best practices across Europe. By sharing expertise from other countries that are implementing the new protocol we can avoid common mistakes. A special plan to use of auto configuration features of IPv6 is suggested, at least for workstation systems. This makes management of IPv6 networks and services more available. Moreover, there is no need to worry about the demand for yet another Internet protocol anymore due to IP address shortage, since there are $\sim 4.8 \times 10^{28}$ addresses per person available in the global IPv6 address range.

How to get informed?

Thanks to the efforts of the European Union there are many free IPv6 training courses, both on-site and on-line as well. The GEN6 project (Governments ENabled with IPv6) offer some workshops and material that can help to fill the information gap. As part of the European Competitiveness and Innovation Framework Programme¹ we should try to do our best to build European knowledge society. Transition to IPv6 requires learning and being familiar with best practices. Don't be inactive! Learn and make sure you're keeping the track. Information and discussion will prevent underestimation of this important issue and will prevent possible mistakes in the future.

A couple of years ago, Spanish Ministry launched a strategic plan for IPv6 deployment. A web site www.ipv6.es and www.ipv6.gob.es offer several support and best practice within the Spanish government, as also short tutorials.

Private and non-profit sector may be involved too. For example, CZ.NIC association (Czech domain registry) runs an initiative of IPv6 deployment covered by GEN6. Free lectures and courses about to the new protocol are provided within this project. Moreover CZ.NIC is running campaigns in order to inform public administration and society about IPv6, its deployment, and necessity.

What is the security issue in IPv4 and IPv6?

A technology called NAT (Network Address Translation) has been introduced to extend the usage of IPv4, because it was clear that the number of available IPv4-addresses is finite and more are needed. NAT allows sharing one public IP address (at the outside) among several computers and devices. The problem is that each device on the network should have its own individual address so that computers can communicate with one another. Security issue lies in inability to identify processes on the network because to the wider Internet all these processes seem to come from one address or device.

¹ <http://ec.europa.eu/cip/>

IPv6 makes it possible to use one or more unique addresses for every device. Even more so, IPv6 is designed to take care of assigning the addresses automatically. This is called auto configuration and reduces the possibilities of human mistakes. A well-designed network with automatic configuration can increase the security.

Since the implementation of the new protocol is a process that many IT engineers have not gone through yet, mistakes may appear. That is the reason for running pilot projects on IPv6. We need to inform experts and enlarge public understanding of this issue. Through experiences and training best practices are developed. Although discussion about the need of IPv6 has been around for a while, it came out that real transition takes a lot of analysing, testing and verifying. So start now with a test network or with the migration of a smaller part of your network to collect first experiences and get used to the new protocols and its management tools.

What is the best time to deploy?

There is no need to wait. The sooner you will start deploying new protocol better for you and your clients: citizens and businesses. It will not take long and all public web servers will be IPv6-ready. Make sure you actively communicate with your provider about the process of implementation. You should check whether your ISP (Internet Service Provider) provides IPv6 connectivity. The need for a new protocol applies to older services as well as to the new ones that will be implemented in the future. Develop a migration strategy: How to start? What are next steps? Demand IPv6 especially when you're introducing new systems. Since you're paying your provider for certain services make sure you'll get the best of it. Do not forget that IT audit itself should precede deployment. By making the audit you can upgrade or even, replace a certain kind of equipment (routers, servers and other hardware) and software in order to ensure compatibility with the next generation of IP addressing. You will find out which equipment does not meet safety standards anymore.

Is IPv6 deployment just a public matter?

In addition, the private sector is involved in the transition to IPv6. The concept of IPv6 deployment is a global question – Internet means connectivity IPv6 is being massively deployed around the world within few last years, esp. in Asia. The time schedule in Europe is arranged in order to provide services continually and to be innovative at the same time. The “Internet” does not recognize whether you are public or private institution – the end user is basically the same. However, public administrations are encouraged to drive and support the IPv6 deployment strategy and also offer advanced services that could be based on IPv6 to the citizens. Providers of all kinds of services will have to go through updating hardware, operating system and applications. The point is to be a step ahead and do not leave the deployment aside!

Policy background

Some governments implemented the support of the new Internet Protocol into their national policies. However, in the global era of Internet, it isn't just the national issue, but it is a **European** as well. The first policy support of IPv6 was mentioned already in 2002 within the Communication called “**Next Generation Internet – priorities for action in migrating to the new Internet protocol IPv6**” (COM(2002) 96). Nevertheless the **Digital Agenda for Europe** (COM(2010) 245) is much more important for current decision makers and policy creators. These key European strategies called the Member States to make eGovernment services fully interoperable while overcoming organisational, technical or semantic barriers and supporting IPv6. The need to provide electronic services via IPv4 and IPv6 as well is highlighted also within the **European eGovernment Action Plan 2011-2015** (COM(2010) 743).

Best practice

A good example of an initiative in practice can be highlighted in the Czech Republic, where legislation made the implementation of IPv6 obligatory for selected government institutions. This government resolution, prepared by the Ministry of Industry and Trade in 2009, had a positive impact on IPv6 that resulted in considerable higher rank of IPv6 deployment. Remarkable differences can be observed between government institution with mandatory deployment and other institutions for which IPv6 is just a recommendation. An average implementation of the new protocol in regional offices is 7% and the average in central authorities is 50%. Meanwhile national average in the Czech Republic is 15% (October 2012). The example shows that mandatory deployment of IPv6 can be an efficient tool to increase the readiness for IPv6.

In general, the national domains registry plays a very positive role in the current deployment of IPv6. Just like CZ.NIC in the Czech Republic, by promoting and informing about necessity of new protocol, the national domain registrars can help state legislators as well as IT experts to create a strategy for IPv6 deployment. Other countries have set-up special initiatives or programs to promote IPv6 for the public sector too.

Recommendation for policy-makers

Based on analysis and long-term experiences from GEN6 project, following recommendations can be made in order to improve provision of electronic services as well as implementation of IPv6:

- *involve* support for improvement of electronic services and IPv6 in strategic documents and policies
- *require* IPv6 support when renewing infrastructure and electronic services, preferably in the RFP (Request for Proposal) documentation
- *communicate* on regular base with national domain registries since they are usually the ones who informs about various ways of IPv6 implementation

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- follow awareness-raising and information events in order not to forget about software and hardware that need to be transformed to IPv6
- maintain permanent discussion among IT experts, politicians and civil servants to exert pressure on implementation of new technologies
- provide practical workshops for IT experts in order to learn and work with IPv6 and spread technical best practices