National plan for IPv6 transition in Montenegro

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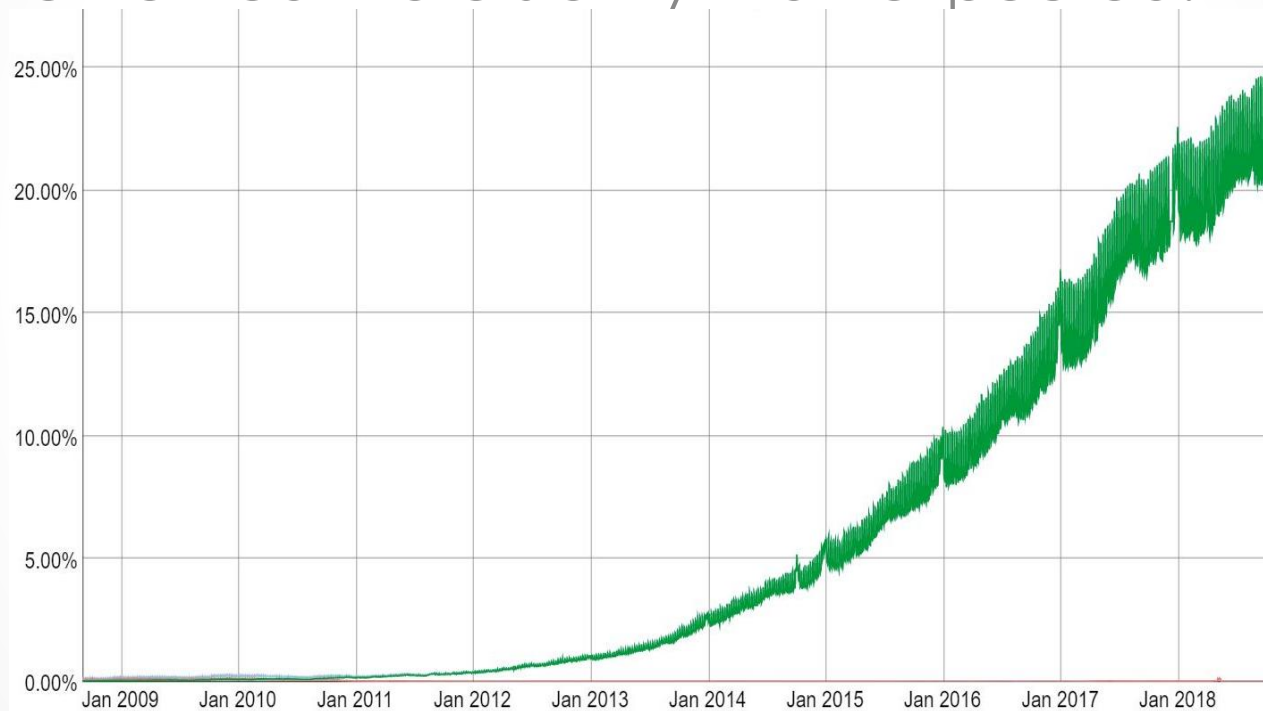*University of Montenegro*
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Content

- Status of the use of IPv6 in Montenegro
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Status of the use of IPv6 addresses

- IPv6 has been used since 1996, but it has been implemented more slowly than expected.
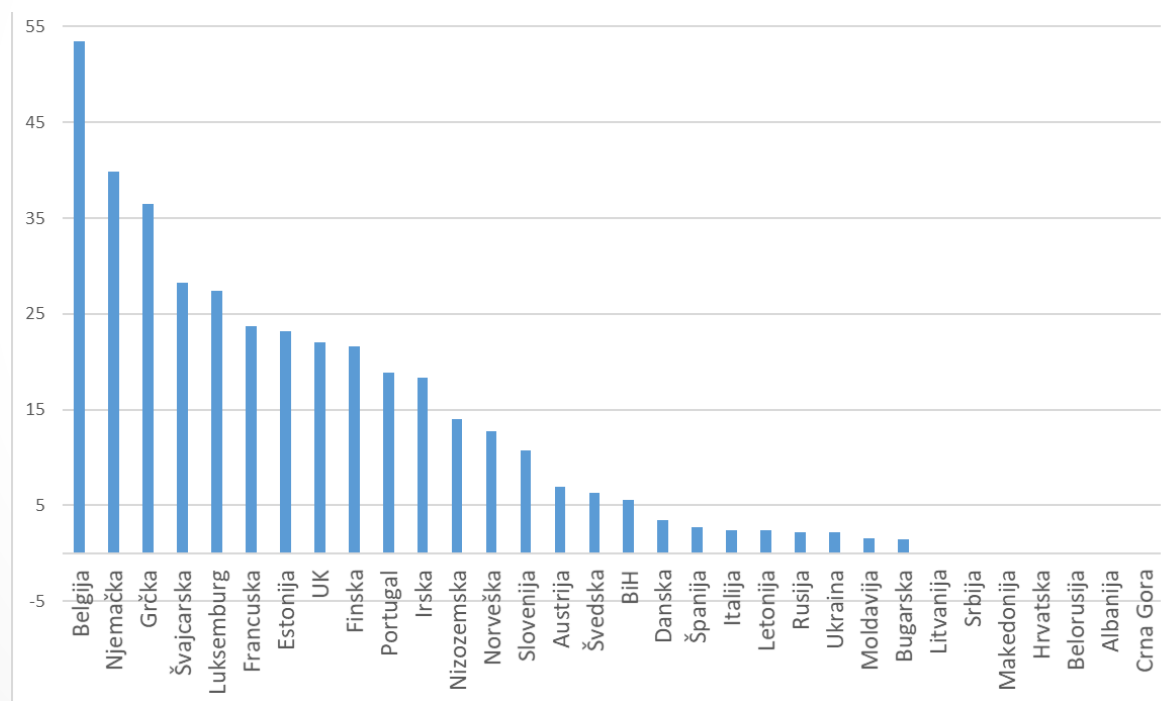

Percentage of the users who accessed Google-services via IPv6 protocol

- https://www.google.com/intl/en/ipv6/statistics.html#tab=ipv6-adoption

Status of the use of IPv6 addresses in Europe

The only countries in Europe in which Internet connection is not possible via IPv6 protocol, are Montenegro and Albania (November 2018).

Connection accessibility via IPv6 protocol in the European countries.

https://www.google.com/intl/en/ipv6/statistics.html#tab=ipv6-adoption

AS in Montenegro

ASN	NAZIV	IPv6
AS60861	ASREDCAT - D.O.O. Redcat	without
AS201649	CBCGME-AS - Centralna Banka Crne Gore	2a03:2920::/32
AS47451	DOMEN - D.O.O."Domen" Drustvo za Proizvodnju, Promet i Usluge – Podgorica	2001:678:408::/48
AS203824	INFOSME-AS - Info Sistemi d.o.o.	2a0c:60c0::/29
AS8585	INTERNET-CG - Crnogorski Telekom a.d.Podgorica	2a00:fe80::/29
AS62301	IPMONT-AS - Drustvo za telekomunikacije, promet roba i usluga, export-import IPMONT d.o.o. Podgorica	2a01:5160::/32
AS202644	MEWIRELESS - Wireless Montenegro D.O.O.	without
AS200608	MIXP - University of Montenegro	2001:7f8:22::/48
AS51629	MKABL-AS - Telemach d.o.o.	without
AS47881	MNNEWS-AS - Telenor d.o.o. Podgorica	without
AS203506	MOD-ME - MINISTRY OF DEFENCE OF MONTENEGRO (MINISTARSTVO ODBRANE CRNE GORE)	2a06:e340::/29
AS205546	MONTE-HOSTING - MonteHosting LTD	2a0b:9e40::/29
AS43940	MTEL-AS - Drustvo za telekomunikacije "MTEL" DOO	2a03:7a0::/29
AS201777	MTEL-AS-1 - Drustvo za telekomunikacije "MTEL" DOO	without
AS198961	ORION-TELEKOM-MONTENEGRO - Orion Telekom Tim d.o.o.Beograd	without
AS51924	PORTOMONTENEGRO-AS - Adriatic Marinas d.o.o.	without
AS29453	TELEKOM-MPLS - Crnogorski Telekom a.d.Podgorica	without
AS43846	TELEMACH-AS - Telemach d.o.o.	2a00:8700::/29 2a05:7b40::/29
AS15397	TELENORMONTENEGRO - Telenor d.o.o. Podgorica	2a01:5da0::/32 2a03:16a0::/32
AS40981	UNIVCG - University of Montenegro	2a02:4280::/32
AS203879	ZAPADBANKA - Zapad banka akcionarsko drustvo – Podgorica	without
AS13213	Drustvo Za Konsalting I Usluge, Export-Import "New Wind D.O.O." Budva	2a04:7400::/29

Status of the use of IPv6 addresses in Montenegro

- There have been registered **22** ASs at RIPE, in Montenegro, with a special ASN owned by **17** entities;

- **13** ASs (**59.1%**), which is 12 entities, have IPv6 addresses;

- **3** ASs (**13.6%**) have globally visible IPv6 addresses;

- There is no website, neither any service available on IPv6 addresses in Montenegro;

- There is no registered IP traffic by IPv6 protocol to Google service.

Strategic Commitments of Montenegro

- In the Strategy for the Information Society Development of Montenegro 2020, adopted by the Government of Montenegro in **2016**, it is pointed out that further digital transformation of the society depends on two key conditions which need to be fulfilled, and these are:
  - Achieving intensive development of Broadband Internet Access, and
  - Improving the appropriate infrastructure.

- The Strategy has recognized introduction of **IPv6** protocol as an infrastructural requirement for developing future Internet services.

Strategic Commitments of Montenegro

- In order to implement strategic plans and activities defined by the Strategy, the **Agency for Electronic Communications and Postal Services (EKIP)** initiated procedure for developing Plan of transition to IPv6 protocol in Montenegro;

- The tender was announced on **15 June 2018**;

- On **27 September 2018** was signed the Agreement with the **Institute for Technical Researches in Podgorica**, and for writing this Plan, the Institute engaged a team of experts from the University of Montenegro and local ICT companies;

- The Plan was completed on **24 January 2019**;

- **http://www.ekip2.me/download/izvjestaji/Plan%20migracije%20na%20protokol%20IPv6%20u%20CG.PDF**

1. **Implementing IPv6 – advantages and challenges**

   IP Network architecture; IPv4 protocol; IPv6 protocol;

   Advantages of IPv6 over IPv4.

2. **The analysis of the current status of IPv6 protocol implementation in Montenegro and existing challanges**

   - Implementation of IPv6 in the public electronic communications networks, state institutions and companies;

   - Status of the assignment of IPv6 addresses and accessibility of websites by means of IPv6 protocol in Montenegro;

   - Challenges during implementation of IPv6 in Montenegro.

3. **The analisis of potential methods of implementation of IPv6 – advantages and disadvantages**

- Network architecture;
- Transition mechanisms;
  - Dual-stack;
  - Tunneling;
  - Protocol Translation;
- Compative analizis of the transition mechanisms;
- Recommendations for implementation.

Contents of the Study 3/7

4. **Security and privacy challenges of IPv6 implementation**

- Influence of IPv6 on the security;
- Influence of IPv6 on the privacy;
- Transition mechanisms: security aspects;
- Influence of IPv6 on legal obligations of the operators;
- IPv6 influence on blocking websites, protection of intellectual property and children's protection.

5. **Experiences of IPv6 implementation**
   - Implementation of IPv6 protocol in EU countries
     - Implementation of IPv6 protocol in France
     - Implementation of IPv6 protocol in Germany
   - Implementation of IPv6 protocol in the United States of America
   - Implementation of IPv6 protocol in some countries in Asia
     - Implementation of IPv6 protocol in Japan
     - Implementation of IPv6 protocol in China

6. Analisis of the scenario for implementing IPv6 in Montenegro from technical and economic aspects (especially for private and public sector)

- IPv6 implementation requirements
- Phases of IPv6 implementation
- Scenarios of transition to IPv6
- Analisis of advantages and disadvantages of transition to IPv6, from the economic point of view, and scenario proposal
- Operators of public electronic communications networks and services (ISP)
- Providers of the contents and applications
- Business users
- Residential users
- Hardware and software providers
- System integrators
- Public institutions

7. **Recommendations for IPv6 implementation in the public institutions of Montenegro**

- IPv6 implementation method
- Network structure and device addressing
- Components which refer to the security
- Network management and control
- Infrastructure services
- Detailed recommendations in the form of the control list, during implementation
- Raising awareness concerning migration from IPv4 to IPv6

7. **IPv6 implementation plan for the Montinegrin academic network (AMUCG)**

- Analysis of the current state of the AMUCG
- Plan of IPv6 address space of the AMUCG
- IPv6 transition of Basic Infrastructure Components in I Phase
- Migration of serverces
- Possibilities of integrating existing IPv4 components
- Recommendation for replacing the AMUCG network infrastructure needed for the transition to IPv6 with a pro forma invoice

Recommended Plan for IPv6 Transition 1/2

- Establishing a national body („IPv6 task force")
  - Action Plan for IPv6 Transition;
  - Coordination of the activities, promotions, etc;
- Promotions of the advantages of IPv6 protocol and education on transition techniques for the entities at all levels of the public administration and residential users.
- Realization of survey with the operators regarding their IPv6 transition plans.
- Develop guidelines for IPv6 transition implementation and their formalization in order to be used in public institutions;

Recommended Plan for IPv6 Transition 2/2

- Establishing a laboratory within AMUCG data centre, necessary for IPv6 transition testing;
- Drive the agile IPv6 transition in the AMUCG network (dual-stack mechanism) as pilot project for making the documented experiences and knowledge which are further applicable in other public institutions;
- Preparing the particular transition project for public institutions based on the Pilot project and activities of the AMUCG;
- Implementation of IPv6 transition in public institutions.

CONCLUSION

- New IP protocol - IPv6 will be implemented sooner or later, regardless of the activities of public institutions, companies, individuals or the society as a whole;

- Monenegro has decided to have a proactive approach in this field, and in the Strategy for the Information Society Development of of Montenegro 2020, it has identified IPv6 transition as one of its strategic priorities;

- This Study is the first tangible step in reaching strategic ICT infrastructural objectives, by defining plans and activities of the relevant entities.

CONCLUSION

- From technical aspect, the IPv4/IPv6 **dual-stack** technique is the main solution for ICT infrastructure transition, with partial implementation of other available techniques (tunneling, translation), when necessary.

- In the Study are given suggestions for chosing scenarios for relevant entity groups in Montenegro, along with a number of generalized technical recommendations necessary to be implemented with detailed planning of each particular solution.

CONCLUSION

- Considering that public institutions are among the largest users of ICT services and resources in Montenegro, transition plan has mostly related on this target group.

- Applying the reccomendations from the Study, as well as using the literature, technical standards and experiences with an agile approach to transition process, are the guarantees of a successful implementation of new Internet protocol and they create new technical and business opportunities for all entities in Montenegro.

Thank you !