

GOVERNMENTS ENABLED WITH IPv6

# IPv6 Academic Pilot

*Brussels, Belgium  
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## Main goals

- Identify and recommend tools for monitoring and characterizing IPv6 traffic academic institutions
  - Explore information from other CLUSTER universities
- Monitor the take-up of IPv6 by Academia across Europe, and provide updated figures for the IPv6 indicator in the Digital Agenda Scoreboard.
- Provide and propagate these good practices by means of booklets and dissemination near other CLUSTER universities

## Sub-activity 4.6 Overview

Roadmap for IPv6 deployment in Academia

- Collect & review existing information on IPv6 deployment taking into account past experience on academic applications:
  - IPv6 deployment procedures (paths) for common use case scenarios in Academia;
    - Definition of allocation plans
    - Selection of preferred applications
    - Testbed setup for collecting first experience
  - Best practices and recommendations to be followed when deploying IPv6 in academia;
  - Open source tools for debugging, characterization and monitoring of IPv6 traffic;
  - Hints and tricks for debugging on major platforms;

## A 4.6 – Roadmap for IPv6 deployment in academia



### Deliverables

- D 4.6.1 Interim roadmap for IPv6 deployment in Academia
  - Delivery date: 31/12/2015
- D 4.6.2 Roadmap for IPv6 deployment in Academia
  - Delivery date: 08/04/2015 (language check 04/05/2015)



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- References and annexes

## D 4.6.2 Roadmap for IPv6 deployment in Academia



- Differences between academia and government networks
  - Variety of systems
    - workstations, servers
  - Heterogeneity of applications
    - Office applications / browsers / mail clients / databases /
  - Homebrew applications for internships / seminars
    - Partly on old platforms / OS
  - Mobility / BYOD
    - Usual in academia / unbelievable in government (police station!)
  - IT & network administration
    - Centralized / hierarchical / uncoordinated
  - Protection mechanisms
    - IT safety
    - network reliability



## Why IPv6 now (especially in Academia)?

- We are running out of IPv4 addresses
- Prevent increased costs with „work-arounds“
- Prevent disruption of internet services
- Growth of number of „connected“ devices
- Avoid reduced experience for the users

**-> IPv6 is ready to deploy today!**



## Planning an IPv6 network (1/4)

- No need to restructure the complete network
- Keep structure if
  - Security areas are well designed and under production
  - Available IPv6 address space (# of /64) sufficient
    - General use of /64 is highly recommended
- otherwise there is an excellent chance for restructuring before starting with IPv6
- Define a future proof subnet allocation plan





## Planning an IPv6 network (2/4)

- Things to consider in the current IPv4-network
  - Actual network structure (subnetting, vlans, broadcast domains, routing...)
  - Networking hardware
    - » Routers, Switches, Firewalls, VPN concentrators, WLAN access points & controllers, ...
  - IP based security / firewalling
  - Network services and network strength
  - Servers & Clients
  - Applications
  - Management
  - ...



## Planning an IPv6 network (3/4)

- IPv6 strategy
  - Defining IPv6 subnets needed
  - Create an address allocation plan
  - Think over address management:
    - DHCP? SLAAC?
  - Set up clean routing:
    - Dynamic routing protocols? Static routing?
  - Choosing a network transition mechanism
    - Dual-stack/tunneling/translation



## Planning an IPv6 network (4/4)

- Security considerations
  - IPsec
  - Firewalls
  - ICMPv6-filtering
  - First-hop security
  - DoS protection
  - Anti-spoofing



## Detailed considerations (1/3)

- Check whether your products used are IPv6 compliant
  - Don't trust in any datasheets!
    - „IPv6 ready“ is a phrase – nothing else
  - L2 switches are rather uncritical
    - How are mcasts handled
    - Management VLAN?
  - L3+ switches need a deeper look into details
    - Hardware based switching for IPv6?
      - All protocols?
        - » TCP, UDP, ICMP, ...
        - » L4 Interface Access Lists
        - » PBR
      - Routing protocols
        - » OSPFv3, BGPv4 (EBGP/IBGP), IS-IS, ...



## Detailed considerations (2/3)

- Network services:
  - DNS
  - DHCP
  - NTP
  - VPN
- Multicast
- Neighbor Discovery (ND)/Router Advertisements (RA)
- Routing protocols
  - RIP
  - EIGRP
  - OSPF
  - IS-IS
  - BGP



## Detailed considerations (3/3)

- WLAN:
  - APs
  - WLAN controllers
  - Eduroam
- Network management
  - SNMP
  - Netflow
  - OpenFlow
- Security
- Applications
- Load-balancers
- Testing



## Implementing IPv6

- Getting an IPv6 prefix
- Equipment configuration
  - *see example in annexes*
- Enabling IPv6 for central services
  - DNS
  - VPN
  - Web servers, mail servers, file servers
  - Directories and authentication services
- Load-balancers
- Grids, HPC
  - E.g. Globus toolkit



## Troubleshooting and monitoring IPv6

- Tools for Linux clients:
  - E.g. Ping6, traceroute6, ip -6, ...
- Tools for Windows clients
  - E.g. netsh, ipconfig, ...
- Monitoring:
  - Netflow, ntop, ...
- IPv6 Launch Day
  - <http://www.worldipv6launch.org/>





## User information

- For network operators: education program, training and testing time
- For end users:
  - Seminars, informational events
  - Advertising IPv6 in local magazines, papers, ...
  - Online practical manuals, FAQs, ...



## Where to find help for IPv6 deployment?

- IPv6 forum
  - <http://www.ipv6forum.com/>
- 6NET
  - <http://www.6net.org/>
- GEN6
  - <http://www.gen6.eu/>

## D 4.6.2 Roadmap for IPv6 deployment in Academia



Finally?

- There are no reasons for excuses
- Products are ready for IPv6 deployment
- There are enough „How Tos“

***Enter the ipv6 road and start speeding up!***



# Discussion

## Q & A