Introducing IPv6
in the Portuguese public administration

A concept for the national IPv6-addressing for governments

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European Commission

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Agenda

- Connectivity in huge environments – the German government's IPv6 addressing approach
- Setup of IPv6 addressing scheme for national government
- Special support for IPv6 transition in governments

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Connectivity in huge environments – the German government's IPv6 addressing approach

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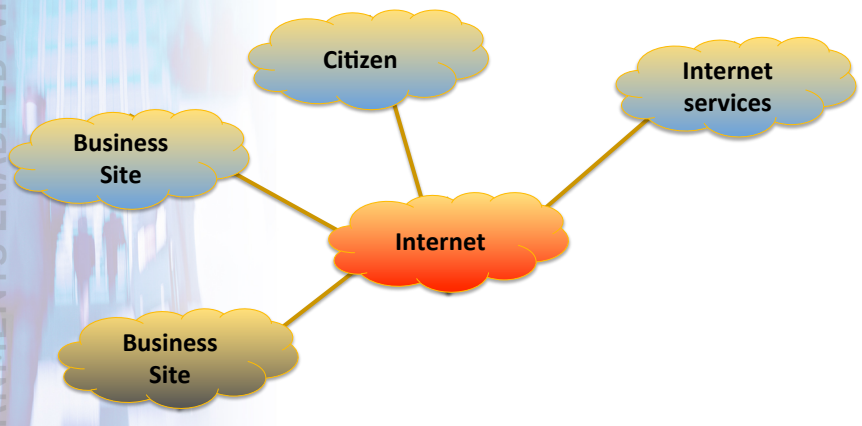
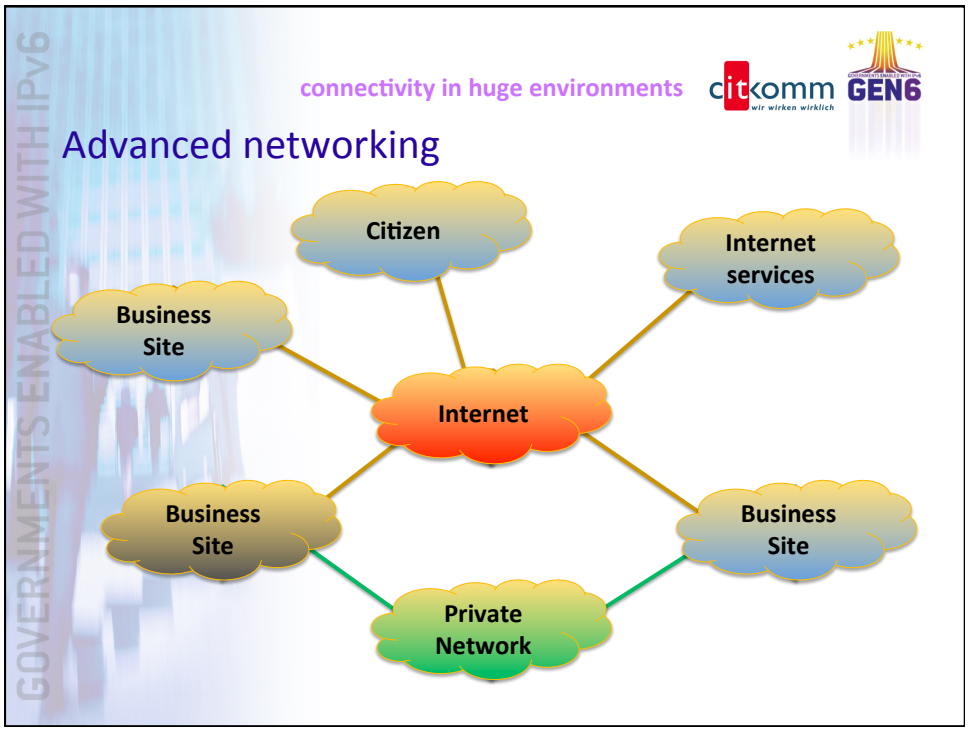
Simple networking




connectivity in huge environments
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Advanced networking
Citizen
Internet services
Business Site
Internet
Business Site
Business Site
Private Network
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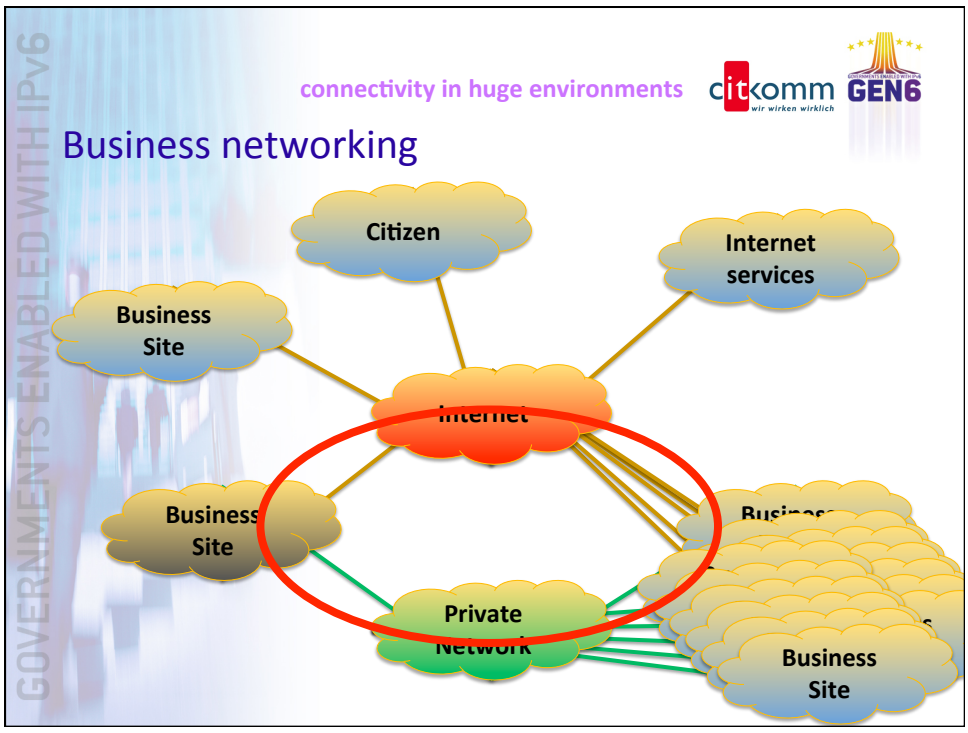
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Business networking
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Business Site
Private
Business Site
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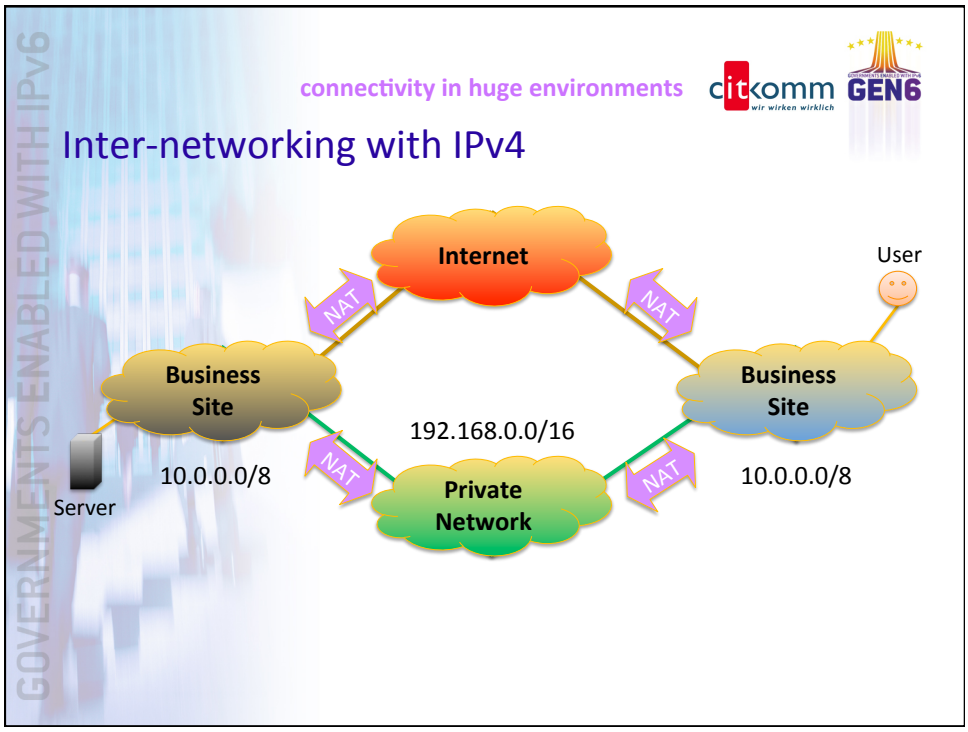
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Inter-networking with IPv4
Internet
User
NAT
NAT
Business Site
Business Site
192.168.0.0/16
NAT
NAT
Private Network
10.0.0.0/8
10.0.0.0/8
Server
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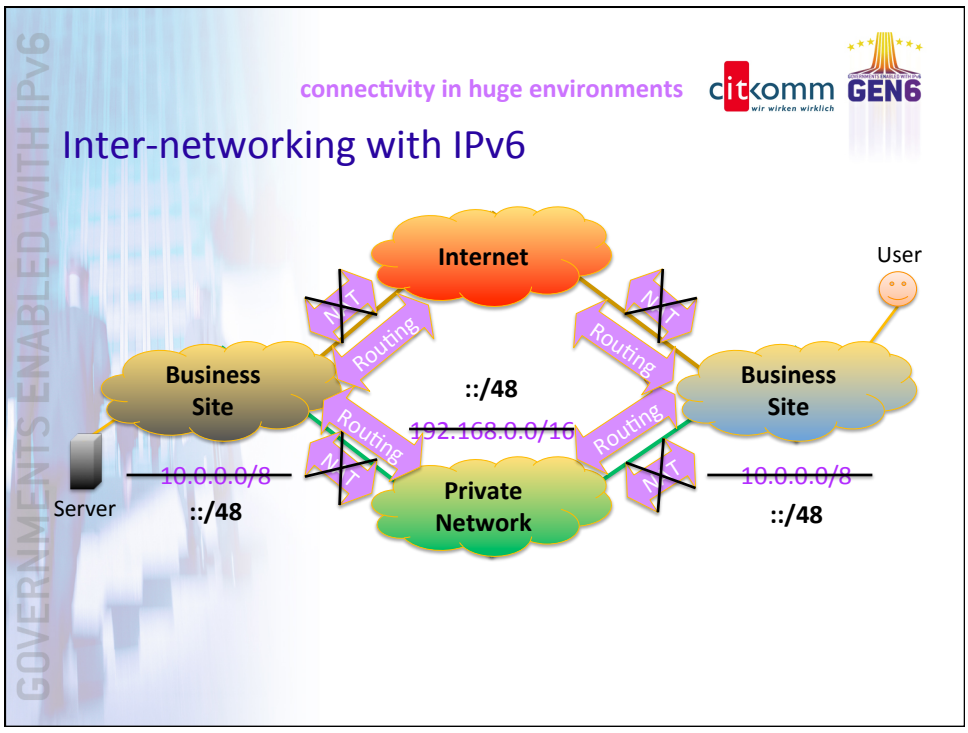
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Inter-networking with IPv6
Internet
User
NAT
NAT
Routing
Routing
Business Site
Business Site
::/48
Routing
Routing
192.168.0.0/16
NAT
NAT
Private Network
10.0.0.0/8
10.0.0.0/8
Server
::/48
::/48
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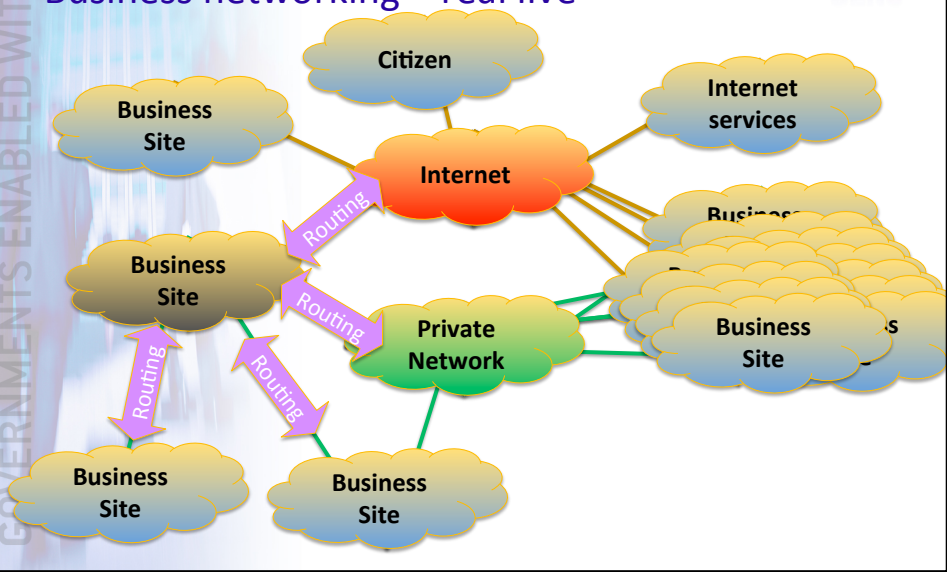
Business networking – real live



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Situation for national governments

- Specific situation for national governments, esp. with federal constitution
  - Several locations
  - Independent in ICT (strategy, organization, architecture, infrastructure)
  - No unit being able to set and enforce central decisions in ICT
  - Using secured networks for communication between each other is common sense
- Similar for huge companies / corporate groups with only small integration in ICT

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Resulting Challenges

- Quadratic growth of routing entries to the closed network according to linear growth of number of connecting networks
- Attendees of the closed network vary heavy in dimension – single user locations up to central governments
  - Broad difference of used routers and router capabilities
- Full set of routing entries must be handled by each router in the network – even the poorest – to enable any to any communication
- Exchange and announcement of network addresses is necessary between all participants of the private network
- Dynamic Routing is limited due to router dimension or security governance

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What we want ...

- Easy routing decision between Internet and private networks
  - Security by transparency
  - Scalability by components
  - Scalability by network dimension
- Never need to renumber any more (after once numbering with IPv6)
- Infrastructure ready for future communication requirements (e.g. end to end to other governments, to Internet services)

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Solution idea

- Allocation of *one* Global Unique Address per endpoint
  - Use for communication over private links
  - Use for communication with Internet peer
- Setup of a (central) governmental LIR (local internet registry)
- Design of a central (aggregatable) address space for all national governments

connectivity in huge environments

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Additional advantages

- Address space for governmental end site can be used (network) provider independent
- Advanced security architecture possible
  - Management of unused address space / prevention of IP-hijacking
  - Setup of security features like Routing PKI independent from single operators possible

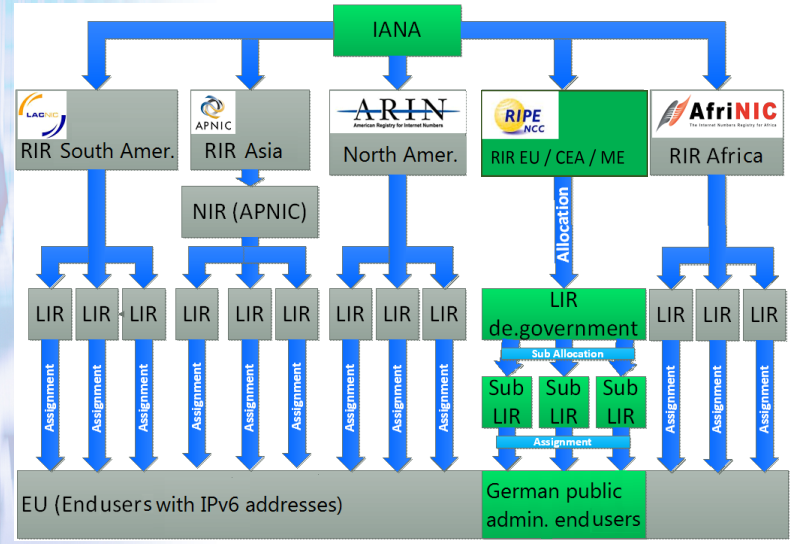
Setup of IPv6 addressing scheme for national government

Setup LIR de.government

- Address block /26 was assigned in 2009
- Organisational structures had to be developed
  - National LIR localized at Federal Office of Administration
  - Setup of federal working group (the “IPv6 working group”)
  - Suggested structure was accepted by the national ICT planning council (1/2011)

Setup of a central IPv6 addressing

Request of IPv6 address ressources



Source: DOI IPv6 Reference Manual

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Block	No.	Dual	Prefix	Block	No.	Dual	Prefix
00: Hamburg	0	000000	2a02:1000 /32	08: Lower Saxony	8	001000	2a02:1008 /32
01: Reserve	1	000001	2a02:1001 /32	09: Reserve	9	001001	2a02:1009 /32
02: Schleswig Holstein	2	000010	2a02:1002 /32	10: Reserve	10	001010	2a02:100a /32
03: Reserve	3	000011	2a02:1003 /32	11: Reserve	11	001011	2a02:100b /32
04: Bremen	4	000100	2a02:1004 /32	12: NRW	12	001100	2a02:100c /32
05: Reserve	5	000101	2a02:1005 /32	13: Reserve	13	001101	2a02:100d /32
06: Mecklenburg-Western Pomerania	6	000110	2a02:1006 /32	14: Reserve	14	001110	2a02:100e /32
07: Reserve	7	000111	2a02:1007 /32	15: Reserve	15	001111	2a02:100f /32
Block	**No.**	**Dual**	**Prefix**	**Block**	**No.**	**Dual**	**Prefix**
16: Hesse	16	010000	2a02:1010 /32	24: Saarland	24	011000	2a02:1018 /32
17: Reserve	17	010001	2a02:1011 /32	25: Reserve	25	011001	2a02:1019 /32
18: Reserve	18	010010	2a02:1012 /32	26: DOI+ Public SP	26	011010	2a02:101a /32
19: Reserve	19	010011	2a02:1013 /32	27: Reserve	27	011011	2a02:101b /32
20: Rhineland-Palatin.	20	010100	2a02:1014 /32	28: Saxony	28	011100	2a02:101c /32
21: Reserve	21	010101	2a02:1015 /32	29: Reserve	29	011101	2a02:101d /32
22: Reserve	22	010110	2a02:1016 /32	30: Reserve	30	011110	2a02:101e /32
23: Reserve	23	010111	2a02:1017 /32	31: Reserve	31	011111	2a02:101f /32
Block	**No.**	**Dual**	**Prefix**	**Block**	**No.**	**Dual**	**Prefix**
32: Brandenburg	32	100000	2a02:1020 /32	40: Baden-Württemberg	40	101000	2a02:1028 /32
33: Reserve	33	100001	2a02:1021 /32	41: Reserve	41	101001	2a02:1029 /32
34: Berlin	34	100010	2a02:1022 /32	42: Reserve	42	101010	2a02:102a /32
35: Reserve	35	100011	2a02:1023 /32	43: Reserve	43	101011	2a02:102b /32
36: Saxony-Anhalt	36	100100	2a02:1024 /32	44: Bavaria	44	101100	2a02:102c /32
37: Reserve	37	100101	2a02:1025 /32	45: Reserve	45	101101	2a02:102d /32
38: Thuringia	38	100110	2a02:1026 /32	46: Reserve	46	101110	2a02:102e /32
39: Reserve	39	100111	2a02:1027 /32	47: Reserve	47	101111	2a02:102f /32
Block	**No.**	**Dual**	**Prefix**	**Block**	**No.**	**Dual**	**Prefix**
48: Netze des Bundes	48	110000	2a02:1030 /32	56: BMVg res.	56	111000	2a02:1038 /32
49: Reserve	49	110001	2a02:1031 /32	57: BMVg res.	57	111001	2a02:1039 /32
50: Reserve	50	110010	2a02:1032 /32	58: BMVg res.	58	111010	2a02:103a /32
51: Reserve	51	110011	2a02:1033 /32	59: BMVg res.	59	111011	2a02:103b /32
52: Reserve	52	110100	2a02:1034 /32	60: BMVg	60	111100	2a02:103c /32
53: Reserve	53	110101	2a02:1035 /32	61: BMVg	61	111101	2a02:103d /32
54: Reserve	54	110110	2a02:1036 /32	62: BMVg	62	111110	2a02:103e /32
55: Reserve	55	110111	2a02:1037 /32	63: BMVg	63	111111	2a02:103f /32

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Address concept de.government SubLIR level

Setup of a central IPv6 addressing

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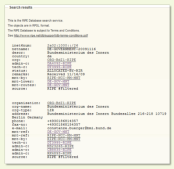
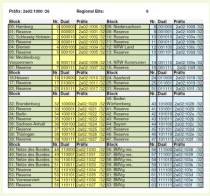
Initialised Sub-LIRs

RIPE NCC ⇔ [de:government] addressing tomorrow





by June 2014

In operation
Sub-LIR DOI
Sub-LIR NdB
Sub-LIR NRW Communes
Sub-LIR Berlin
Sub-LIR Lower Saxony
Sub-LIR Meck.-Western Pommerania
Sub-LIR Bavaria
Sub-LIR Schleswig-Holstein
Sub-LIR Hamburg
Sub-LIR Hessen
Sub-LIR Saxony

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Special support for IPv6 transition in governments

Special support for IPv6 transition in governments

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Motivation to start IPv6 transition now

- Network provider enable IPv6 as default
- Carrier grade NAT causes potential problems
- Microsoft declared IPv6 as “mandatory part of the Windows operating system” in 2008*
  - Microsoft does no tests for evaluation on system behaviour with deactivated IPv6
  - New system services of Microsoft partly base on IPv6 only (e.g. HomeGroup, DirectAccess)

* http://technet.microsoft.com/en-us/magazine/2009.07.cableguy.aspx
http://www.msxfaq.de/konzepte/ipv6.htm

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Special support for IPv6 transition in governments

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Governmental specific basics - IPv6 transition guide

- Content
  - Basics on IPv6
  - Workshop modules for training and approach planning
  - Best practices for approach
  - Suggestions for solutions
  - Checklists
- Documents public available in English
  - http://www.lir.bund.de – best practice

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Special support for IPv6 transition in governments

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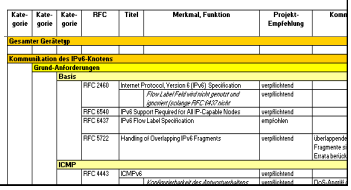
Governmental specific basics - IPv6 profiles

- IPv6 profiles
  - Evaluation of existing equipment
  - Support for procurement
  - Bases on existing profiles (ripe-554, NIST USGv6, …)
- End to end view on eGov-applications
  - Investigation of Hardware and Software
- No recommendations for configuration
- Documents public available in English
  - http://www.lir.bund.de – best practice



Kate-gorie	Kate-gorie	Kate-gorie	RFC	Titel	Merkmal, Funktion	Projekt-Empfehlung	Kome
Gesamter Gerätetyp							
Kommunikation des IPv6-Knotens							
	Grund-Anforderungen						
		Basis					
			RFC 2460	Internet Protocol, Version 6 (IPv6) Specification		verpflichtend	
					Flow Label Feld wird nicht genutzt und gesetzt (codage RFC 6437 obligatoire)	verpflichtend	
			RFC 6540	IPv6 Support Required for All IP-Capable Nodes		verpflichtend	
			RFC 6437	IPv6 Flow Label Specification		empfohlen	
			RFC 5722	Handling of Overlapping IPv6 Fragments		verpflichtend	Überlappende Fragmente s… Errata beachten
		ICMP					
			RFC 4443	ICMPv6		verpflichtend	
					Loopbackmöglichkeit der Antwortmeldungen	verpflichtend	DoS-Angriff…

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Questions ?

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