

GOVERNMENTS ENABLED WITH IPv6

German Roadshow

IPv6 in Germany's Public Administration

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IPv6 in Germany's Public Administration



- IPv6 enabling of Government Infrastructures
- Management of the IPv6 address space
- Routing

Networks of the Central Government

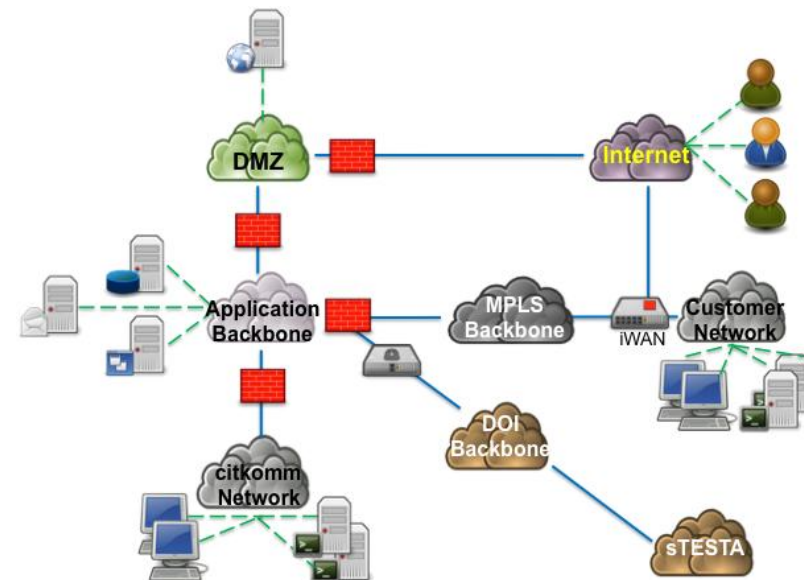
- **Netze des Bundes (NdB, Networks of the Central Government)** was
 - designed based on a IPv6-Infrastructure
 - prepared for the new generation of IP-Addresses und -Technologies
- **Informationsverbund Bonn-Berlin (IVBB, Information Network Bonn-Berlin):**
 - 2009: Request to the service provider of **IVBB**, to implement only IPv6 enabled components in the future
 - Krypto-Infrastructure is not IPv6-enabled. Replacement planned within the IVBB-CR „SiReKo“ (Sichere Regierungs-Kommunikation, Secure Government Communication).
- **Informationsverbund der Bundesverwaltung / Bundesverwaltungsnetz (IVBV/BVN, Network of the central administration):** the central network components were proved to be IPv6 enabled, Migration to IPv6 was planned during this year.

IPv6 in Government Networks (2)



Networks of Municipalities

- **Citkomm:** Enabling a municipal datacenter's network and infrastructure for IPv6 within GEN6 project
 - IPv6 was successful added and proved to the network concept for autonomous system (AS) integration
 - Successful external validation of AS-concept
 - Transition of DOI network access point to IPv6
 - Detailed concept and implementation of test network for application evaluation
 - Enabling WAN-link to Fraunhofer FOKUS test bed based on WAN gateway implementation
 - Enabling further services in WAN gateway
 - Gateway connection for national TESTAng gateway opened for tunnel communication (IPv6 over IPv4) at national gateway



IPv6 in Government Networks (3)



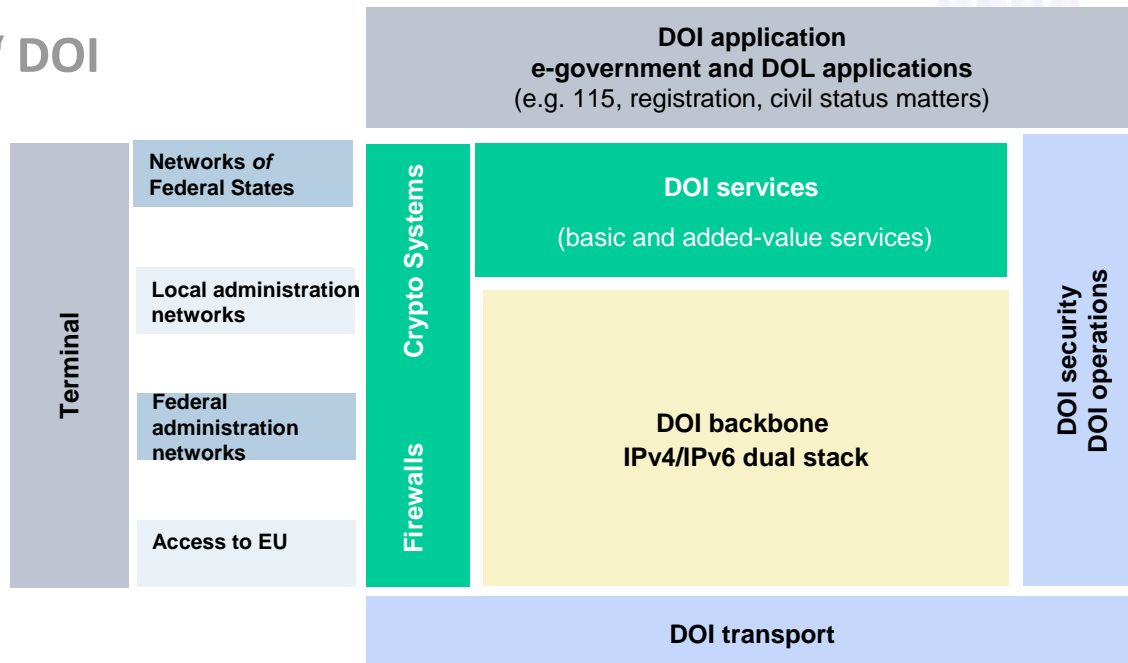
„Interconnection Network“ DOI

DOI services

- DNS ✓
- Secure eMail ✓
- PKI
- Video conferencing (✓)

IPv6-enabled infrastructure

- IPv4/IPv6 Dual Stack Backbone ✓
- Central services ✓
- Security Gateway ✓
- Crypto System (intermediate version ✓, final version with dual stack end of 2014)



Management of the IPv6 address space

Implementation of SubLIRs

- 11 SubLIRs are in operation
- 8 federal states have no operative SubLIR



[de:government]
addressing tomorrow

Search results

This is the RIPE Database search service.
The objects are in RPSL format.
The RIPE Database is subject to Terms and Conditions.
See <http://www.ripe.net/ripe/whois/whois-conditions.pdf>

```
inetnum: 2a02:1000:1:24
netname: DE-SOVVERSOFT-20091116
descr: Bundesministerium des Innern
country: de
org: RIPE-DE-RIPE
admin-c: 20101011-2116
tech-c: 20101011-2116
status: ALLOCATED NON-PORTABLE
remarks: Received 11/16/09
mnt-by: RIPE-NCC-HMNT
mnt-lower: RIPE-NCC-HMNT
mnt-routes: RIPE-NCC-HMNT
source: RIPE #Filtered
```

```
organisation: RIPE-DE-RIPE
org-name: Bundesministerium des Innern
cfr: 100
address: Bundesministerium des Innern Bundesallee 216-218 10719
Berlin Germany
phone: +4930166814357
fax-cnr: +4930166814350
e-mail: konstanz.buergel@bmi.bund.de
org-website: http://www.bmi.bund.de
mnt-ref: RIPE-NCC-HMNT
mnt-by: RIPE-NCC-HMNT
status: ALLOCATED NON-PORTABLE
admin-c: 20101011-2116
tech-c: 20101011-2116
admin-c: 20101011-2116
admin-c: 20101011-2116
source: RIPE #Filtered
```

Präfix: 2a02:1000:26 Regional Bits: 6

Block	Nr.	Dual	Präfix	Block	Nr.	Dual	Präfix
00 Hamburg	4	000001	2a02:1000:26:00::/32	00 Niedersachsen	4	001000	2a02:1000:26:00::/32
01 Reserve	1	000001	2a02:1001:70:00::/32	01 Reserve	9	001001	2a02:1000:26:00::/32
02 Schleswig Holstein	2	000010	2a02:1002:20:10::/32	02 Reserve	10	001010	2a02:1000:26:00::/32
03 Reserve	3	000011	2a02:1003:20:11::/32	03 Reserve	11	001011	2a02:1000:26:00::/32
04 Bremen	4	000100	2a02:1004:20:12::/32	04 NRW Land	12	001100	2a02:1000:26:00::/32
05 Reserve	5	000101	2a02:1005:20:13::/32	05 Reserve	13	001101	2a02:1000:26:00::/32
06 Mecklenburg-Vorpommern	6	000110	2a02:1006:20:14::/32	06 NRW Kommunen	14	001110	2a02:1000:26:00::/32
07 Reserve	7	000111	2a02:1007:20:15::/32	07 Reserve	15	001111	2a02:1000:26:00::/32
16 Hessen	16	010000	2a02:1010:30:24::/32	16 Saarland	24	011000	2a02:1010:30:24::/32
17 Reserve	17	010001	2a02:1011:30:25::/32	17 Reserve	25	011001	2a02:1010:30:24::/32
23 Reserve	23	010111	2a02:1017:30:31::/32	23 Reserve	31	011111	2a02:1017:30:31::/32
Block	Nr.	Dual	Präfix	Block	Nr.	Dual	Präfix
00 Baden	32	100000	2a02:1020:70:00::/32	00 Baden	40	101000	2a02:1020:70:00::/32
33 Reserve	33	100001	2a02:1021:70:01::/32	33 Reserve	41	101001	2a02:1020:70:00::/32
34 Berlin	34	100010	2a02:1022:70:02::/32	34 Reserve	42	101010	2a02:1020:70:00::/32
35 Reserve	35	100011	2a02:1023:70:03::/32	35 Reserve	43	101011	2a02:1020:70:00::/32
36 Sachsen-Anhalt	36	100100	2a02:1024:70:04::/32	36 Bayern	44	101100	2a02:1020:70:00::/32
37 Reserve	37	100101	2a02:1025:70:05::/32	37 Reserve	45	101101	2a02:1020:70:00::/32
38 Thüringen	38	100110	2a02:1026:70:06::/32	38 Reserve	46	101110	2a02:1020:70:00::/32
39 Reserve	39	100111	2a02:1027:70:07::/32	39 Reserve	47	101111	2a02:1020:70:00::/32
Block	Nr.	Dual	Präfix	Block	Nr.	Dual	Präfix
40 Netze des Bundes	48	110000	2a02:1030:20:00::/32	40 BMW res.	56	111000	2a02:1030:20:00::/32
41 Netze des Bundes	49	110001	2a02:1031:20:01::/32	41 BMW res.	57	111001	2a02:1030:20:00::/32
50 Netze des Bundes	50	110010	2a02:1032:20:02::/32	50 BMW res.	58	111010	2a02:1030:20:00::/32
51 Netze des Bundes	51	110011	2a02:1033:20:03::/32	51 BMW res.	59	111011	2a02:1030:20:00::/32
52 Reserve	52	110100	2a02:1034:20:04::/32	52 BMW res.	60	111100	2a02:1030:20:00::/32
53 Reserve	53	110101	2a02:1035:20:05::/32	53 BMW res.	61	111101	2a02:1030:20:00::/32
54 Vorpommern	54	110110	2a02:1036:20:06::/32	54 BMW res.	62	111110	2a02:1030:20:00::/32
55 Reserve	55	110111	2a02:1037:20:07::/32	55 BMW res.	63	111111	2a02:1030:20:00::/32

In Operation

Sub-LIR DOI

Sub-LIR NdB

Sub-LIR NRW Kommunen

Sub-LIR Berlin

Sub-LIR Niedersachsen

Sub-LIR Meck.-Vorpommern

Sub-LIR Bayern

Sub-LIR Schleswig-Holstein

Sub-LIR Hamburg

Sub-LIR Hessen

Sub-LIR Sachsen

Management of the IPv6 address space

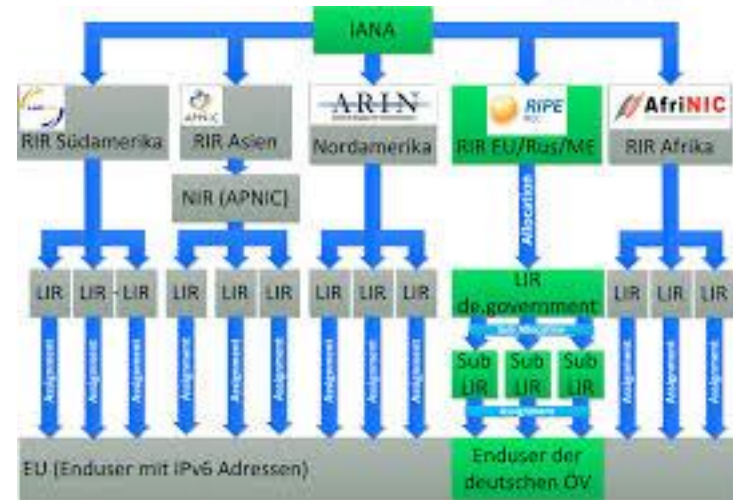


Challenges:

- A significant part of addresses are not (yet) announced to the internet.
- Some addresses and responsibilities cannot be published (e.g. in the RIPE-DB)
- The address space based on long-term considerations . Therefore the address plan contains reserves, i.e. at the beginning the „HD Ratio“ is small compared with the RIPE requirements.
- On the other hand, implementation of the address plan shows that the present /26 will be too small.

Solution approach

- Adjustment of the corresponding RIPE Policies 589, 513 to the requirements of the public administration.
- Proposal was prepared and discussed with RIPE, common approach with EU and member states planned



RIPEstat Object Browser (organisation:ORG-tcg2-RIPE)

Showing state at 2012-04-09 00:00:00

Valid from 2011-09-15T12:25:39 to 2012-04-09T00:00:00.
24 changes since 2004-04-17T11:11:57.

organisation: ORG-tcg2-RIPE [Show all fields](#)

mnt-by RIPE-NCC-HM-MNT

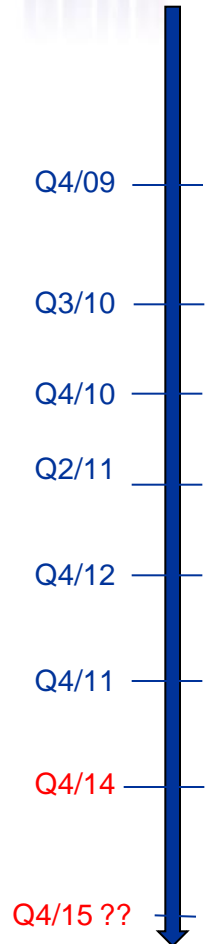
aut-num: AS34086 [org] Show all	person: Alan Young [admin-c] Show all
inet6num: 2a00:da8::/32 [org] Show all	person: Andreas Schneider [admin-c] Show all
inetnum: 217.150.144.0/20 [org] Show all	person: Thomas Wende [admin-c] Show all
inetnum: 46.29.96.0/21 [org] Show all	mntner: RIPE-NCC-HM-MNT [mnt-ref, mnt-by] Show all
inetnum: 93.188.240.0/21 [org] Show all	mntner: SCZN-MNT [mnt-ref] Show all
inetnum: 94.100.240.0/20 [org] Show all	

[source data](#) [grab](#) [permalink](#) [info](#)

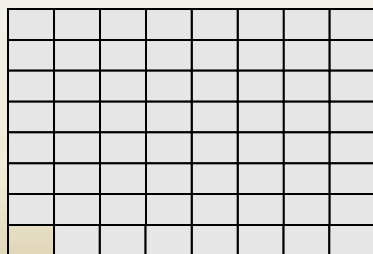
Status and Plan



- Assignment of a /26 (plan /19) address space „de.government“
- First local IPv6 Pilots of the de.government address space
- Start Piloting IPv6 in DOI
- Start Implementation of SubLIRs
- Going into operations of IPv6 in DOI
- Completion of the implementation of the LIR de.government
- Implementation of Dual Stack
- Complete Implementation of SubLIRs



Allokation de.government: /26



- Splits the /26 in 64 /32 blocks
- Target: well structured networks
- Transparent networks, hierarchical routing (with some well defined exceptions)
- Each /32 will be implemented locally (i.e. per federal state) by the corresponding “Sub-LIR”

Routing



Block	Nr.	Dual	Präfix	Block	Nr.	Dual	Präfix
00: Hamburg	0	000000	2a02:1000 /32	08: Niedersachsen	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-Vorpommern	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	Nr.	Dual	Präfix	Block	Nr.	Dual	Präfix
16: Hessen	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: DOL+Öffentliche DL	26	011010	2a02:101a /32
19: Reserve	19	010011	2a02:1013 /32	27: Reserve	27	011011	2a02:101b /32
20: Rheinland-Pfalz	20	010100	2a02:1014 /32	28: Sachsen	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	Nr.	Dual	Präfix	Block	Nr.	Dual	Präfix
32: Brandenburg	32	100000	2a02:1020 /32	40: Baden			
33: Reserve	33	100001	2a02:1021 /32	Württemberg	40	101000	2a02:1028 /32
34: Berlin	34	100010	2a02:1022 /32	41: Reserve	41	101001	2a02:1029 /32
35: Reserve	35	100011	2a02:1023 /32	42: Reserve	42	101010	2a02:102a /32
36: Sachsen-Anhalt	36	100100	2a02:1024 /32	43: Reserve	43	101011	2a02:102b /32
37: Reserve	37	100101	2a02:1025 /32	44: Bayern	44	101100	2a02:102c /32
38: Thüringen	38	100110	2a02:1026 /32	45: Reserve	45	101101	2a02:102d /32
39: Reserve	39	100111	2a02:1027 /32	46: Reserve	46	101110	2a02:102e /32
40: Baden				47: Reserve	47	101111	2a02:102f /32
Block	Nr.	Dual	Präfix	Block	Nr.	Dual	Präfix
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

Internal Routing

- § 3 IT-NetzG: For data communication between the central government and the federal states the “interconnection network” (=DOI) has to be used.

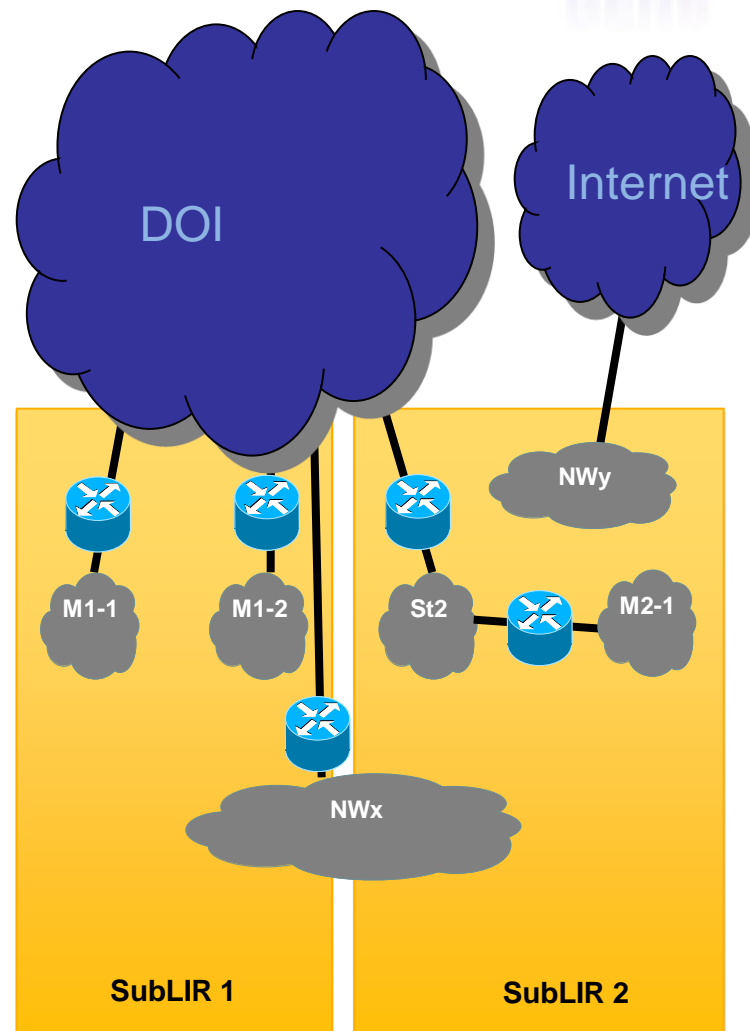
Can IPv6 routing support the implementation of this law?
(de.gov addresses will be routed over government networks)

- Municipalities are not necessarily connected to a “state network”
- Certain institutions of (different) federal states (part of the corresponding SubLIR) may be connected by a separate network
- Many services are only reached over the internet

What is the normal case and what is the exception?

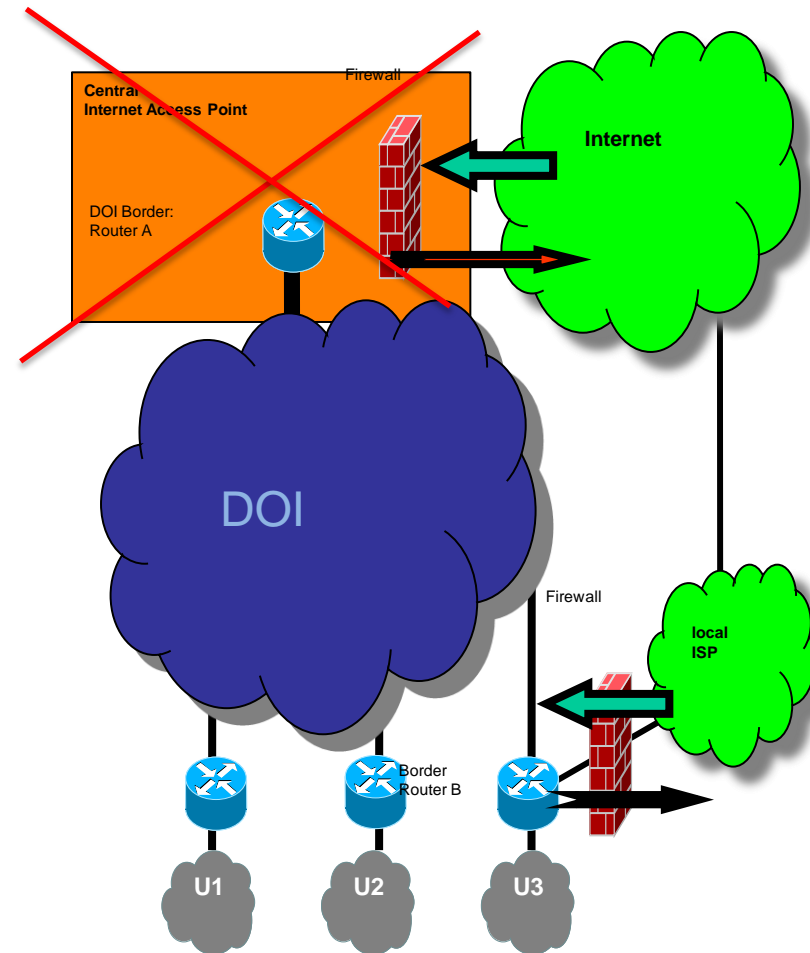
Solution approach

- Routing concept in preparation



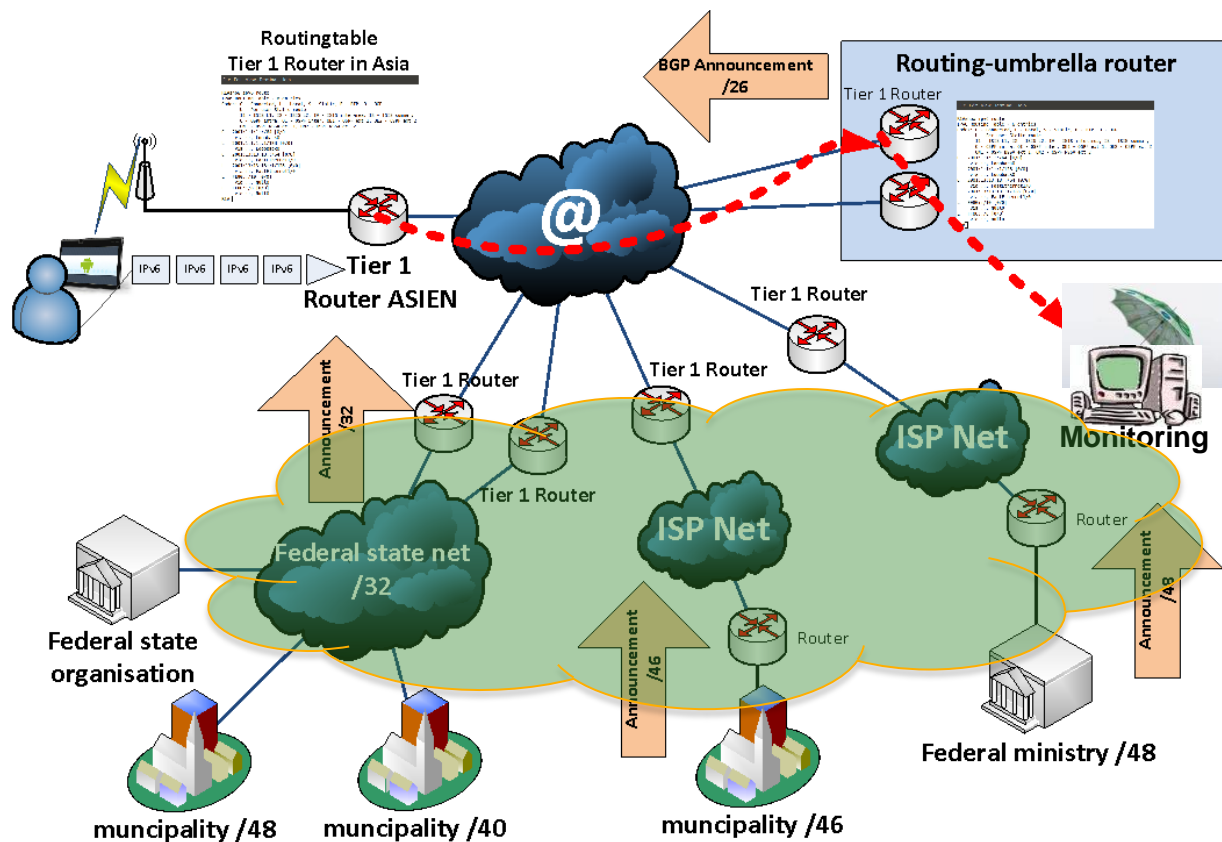
External Routing (1)

- Different local networks (e.g. networks of federal states) have their own Internet access.
- Local announcement of the /32s (and possibly of smaller address spaces)
- Routing of small address spaces is not ensured
- **Solution approach**
 - Routing agreements with ISPs (“green cloud”)
 - Central routing instance (Routingfallschirm)
 - Possibly central announcement of the /26
 - Enlargement of the address space (see above)
 - Concept in preparation



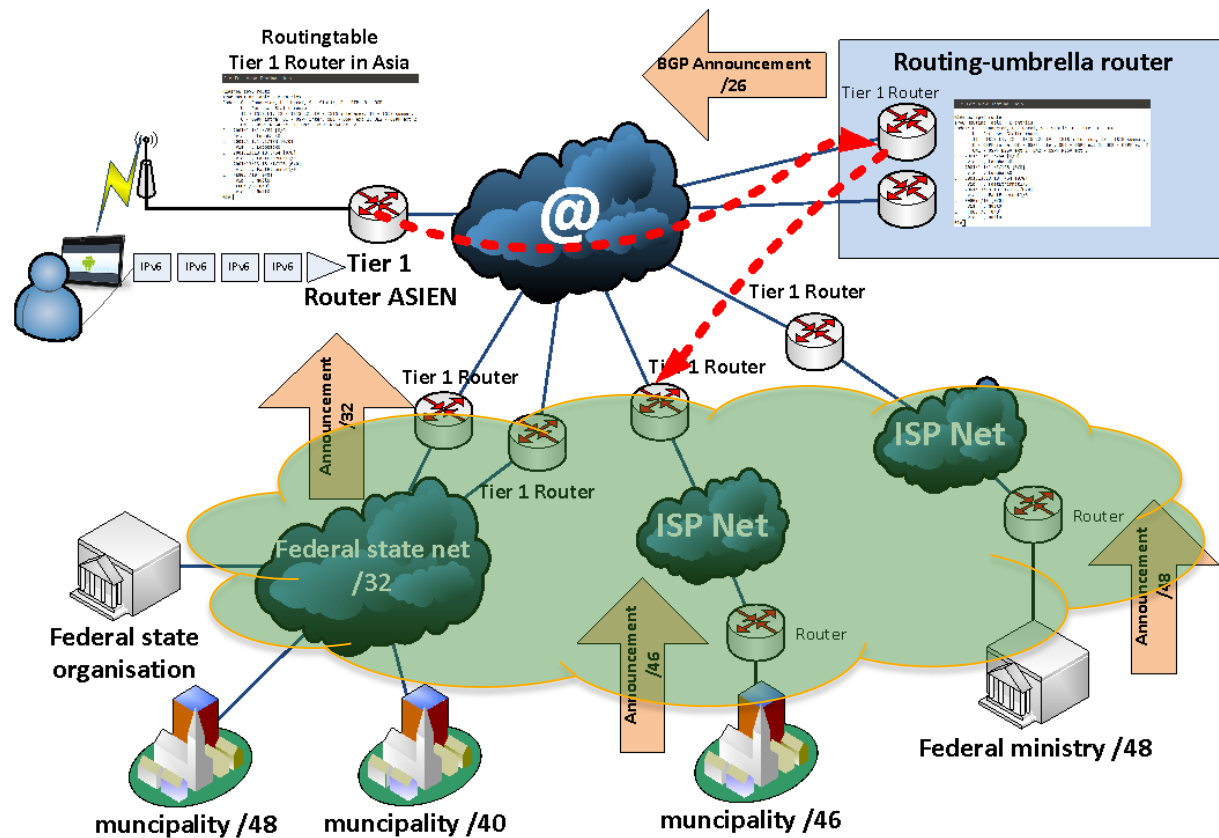
External Routing (2)

- Routing umbrella, first step: Monitoring of misrouted packets



External Routing (3)

- Routing umbrella, second step: Rerouting of misrouted packets



Discussion & Questions

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