



IPv6 Deployment in Germany and Croatia

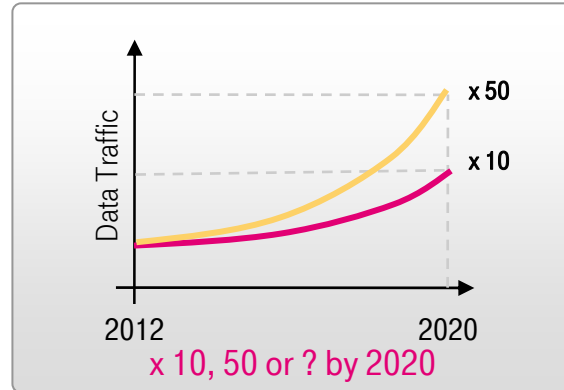
Axel Clauberg, Vice President CTO-ATI, IP Architecture, Transport & Aggregation, Deutsche Telekom AG

Carrier Challenges.

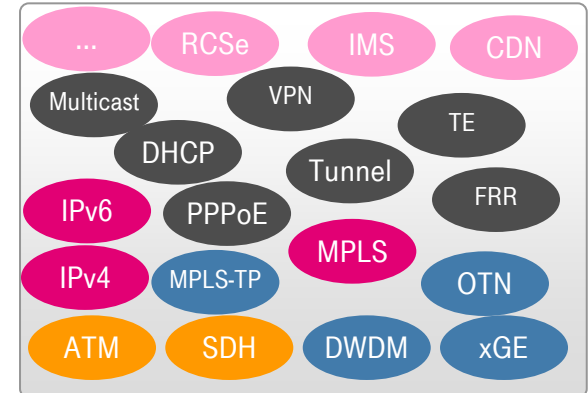
Competitive Pressure



Traffic Growth



Cost & Complexity

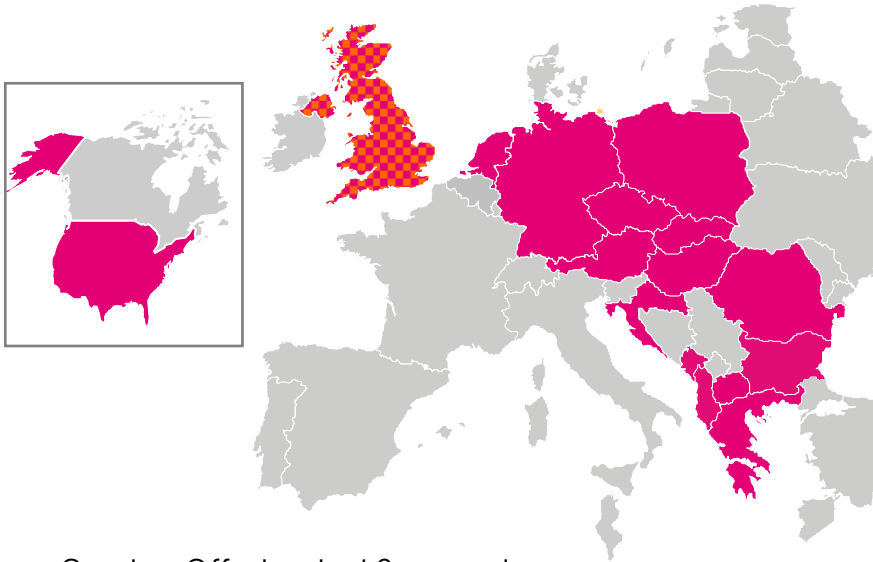


Innovation



The DT Group & IPv6.

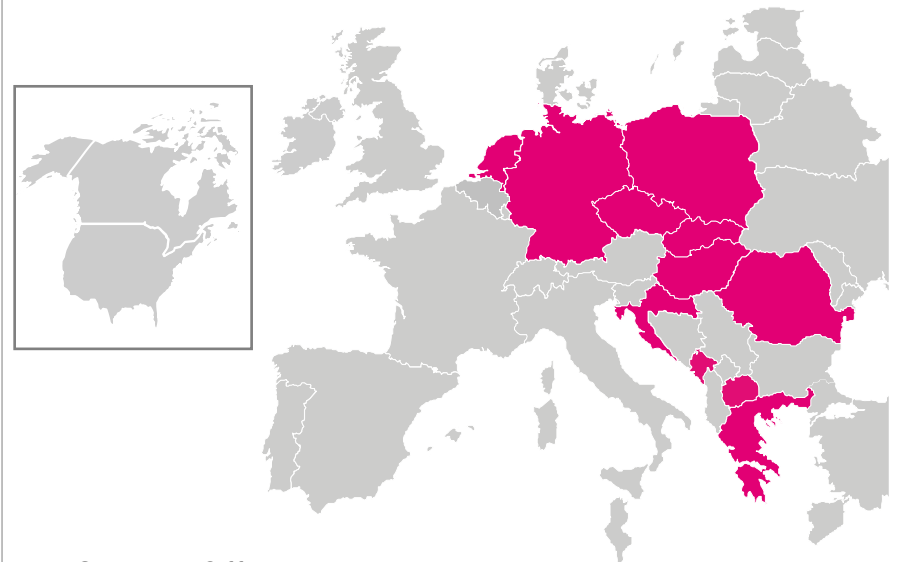
Mobile Networks



- Service Offering in 16 countries
- Private and/or Public IPv4 addresses used for Customer Facing Services. RFC1918 Address space shared across DT Affiliates.

→ IPv6 introduction driven by Private IPv4 exhaustion

Fixed Networks



- Service Offering in 11 countries
- Mainly Public IPv4 addresses used for Customer Facing Services. No NAT functionality deployed within the network.

→ IPv6 introduction driven by Public IPv4 exhaustion



Fixed Networks.

- All new DT IP-based DSL connections in Germany are offering Dual-Stack IPv4/IPv6 since Sep 2012

The screenshot shows the FRITZ!Box 7390 web interface. The top header includes the FRITZ! logo, the model name 'FRITZ!Box 7390', and the status 'dt-gw'. Below the header, there are navigation links: 'Angemeldet', 'FRITZ!Box', 'FRITZ!NAS', 'MyFRITZ!', and a help icon. The left sidebar contains a menu with 'Übersicht', 'Internet', 'Telefonie', 'Heimnetz', 'WLAN', and 'DECT'. Under 'Internet', 'Online-Monitor' is selected. The main content area is titled 'Online-Monitor' and contains three tabs: 'Online-Monitor', 'Online-Zähler', and 'Tarifübersicht'. The 'Online-Monitor' tab is active, displaying a message: 'Der Online-Monitor stellt Informationen zu Ihrer Internetverbindung und zu aktivierten Zusatzfunktionen zur Verfügung.' Below this, there is a table showing connection details:

DSL	● bereit, 2,3 Mbit/s ▾ 1,6 Mbit/s ▲
Internet, IPv4	● verbunden seit 20.01.2013, 16:20 Uhr, T-Online, IP-Adresse: 84.187. [redacted] 119
Internet, IPv6	● verbunden seit 20.01.2013, 16:20 Uhr, T-Online, IPv6-Adresse: 2003:6f:8f:f [redacted] :ee0d, Gültigkeit: 13956/1356s, IPv6-Präfix: 2003:6f:f [redacted] :500::/56, Gültigkeit: 14078/1478s
Genutzte DNS-Server	217.0.43.49(aktuell genutzt für Standardanfragen)
	217.0.43.33
	2003:180:2:1000::1:0:53
	2003:180:2:5000::1:0:53

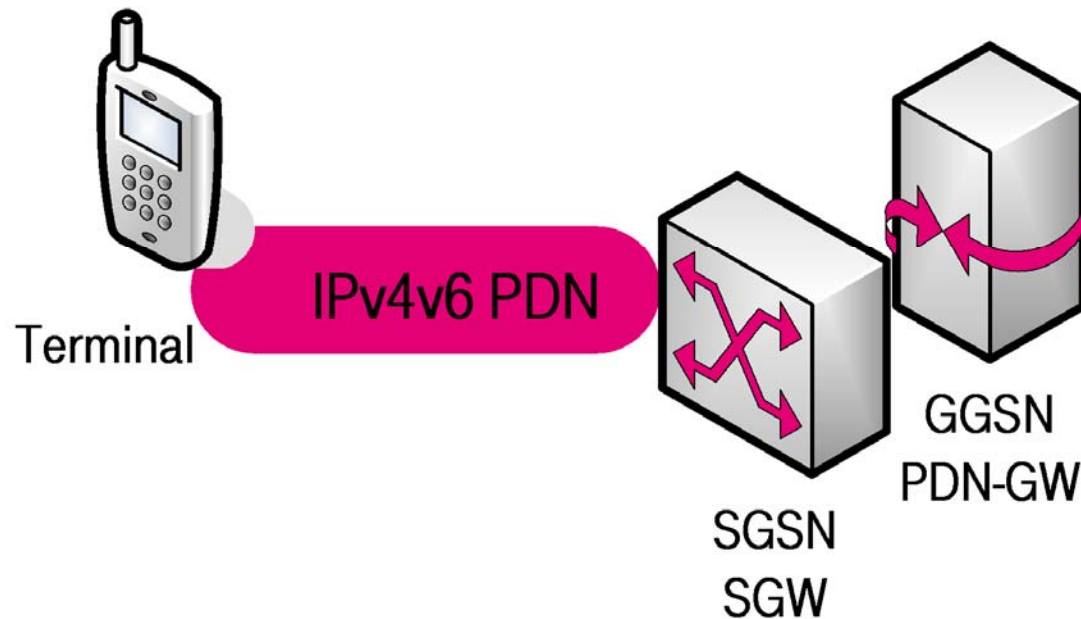


How Does IPv6 Impact Mobile Networks?

- Two kinds of impact
 - Platforms forwarding IPv6 traffic
 - Platforms processing IP addressing on the application level
- Dual-Stack support
 - Two primary PDP bearers IPv4 & IPv6 since 3GPP Rel-99
 - New IPv4v6 PDN type as of Rel-8 LTE networks, Rel-9 2G/3G networks
- IPv6 support required ... nearly everywhere
 - Terminals, Packet Core, Transport Network
 - OSS/BSS systems, ...



3. Dual-Stack using single PDN / RAB



Moving Forward: Architectural Cornerstones.

Simplicity

Ethernet Transport

100 GE in Core & Aggregation, 400GE and 1TE ahead
IP & Optical: “black link”, coherent optics where needed

IP

IPv6-only network

IPv4 and (if needed) MPLS as a service

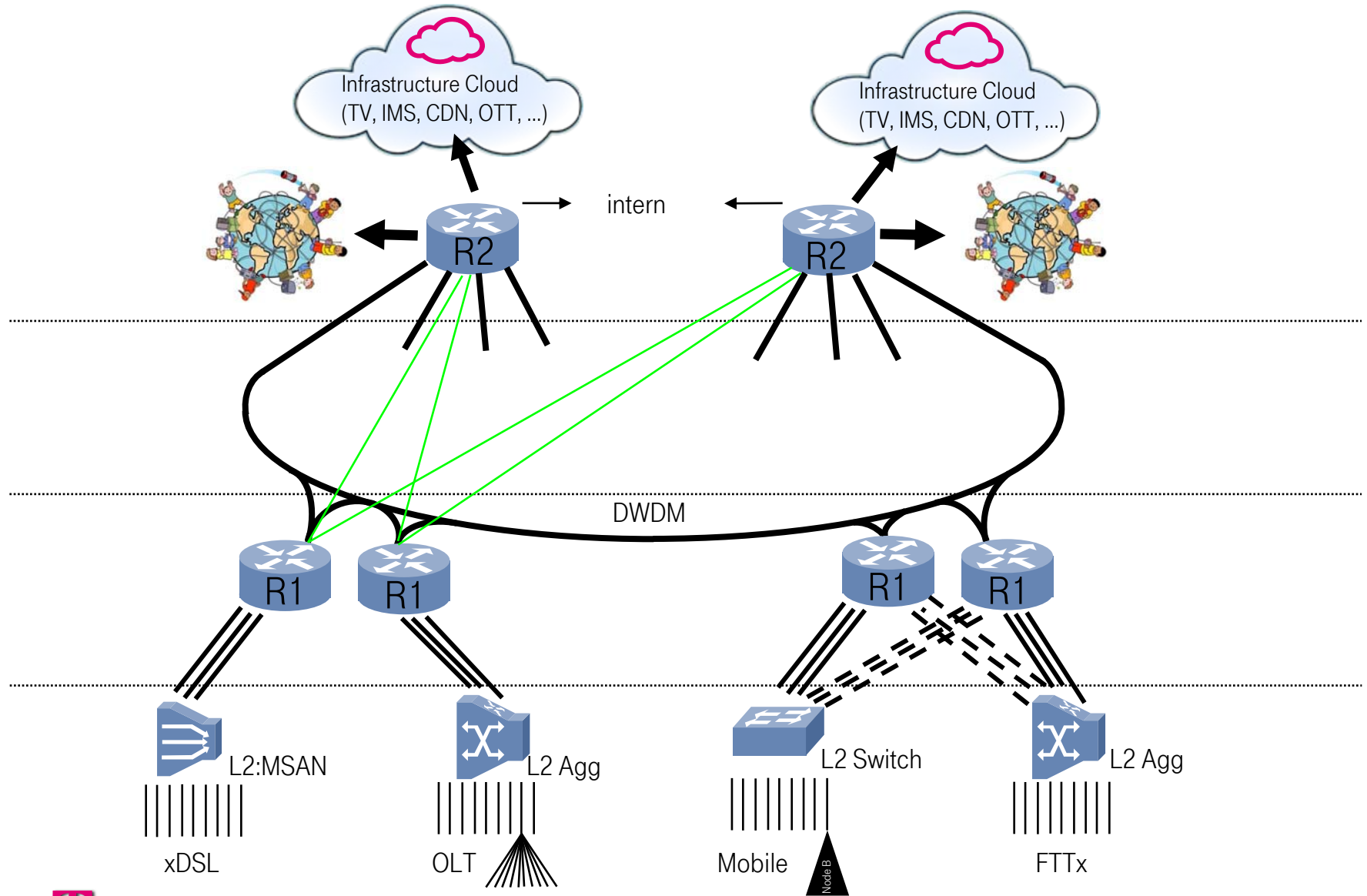
IT Speed for NT: Infrastructure Cloud Model

Software Defined Networks

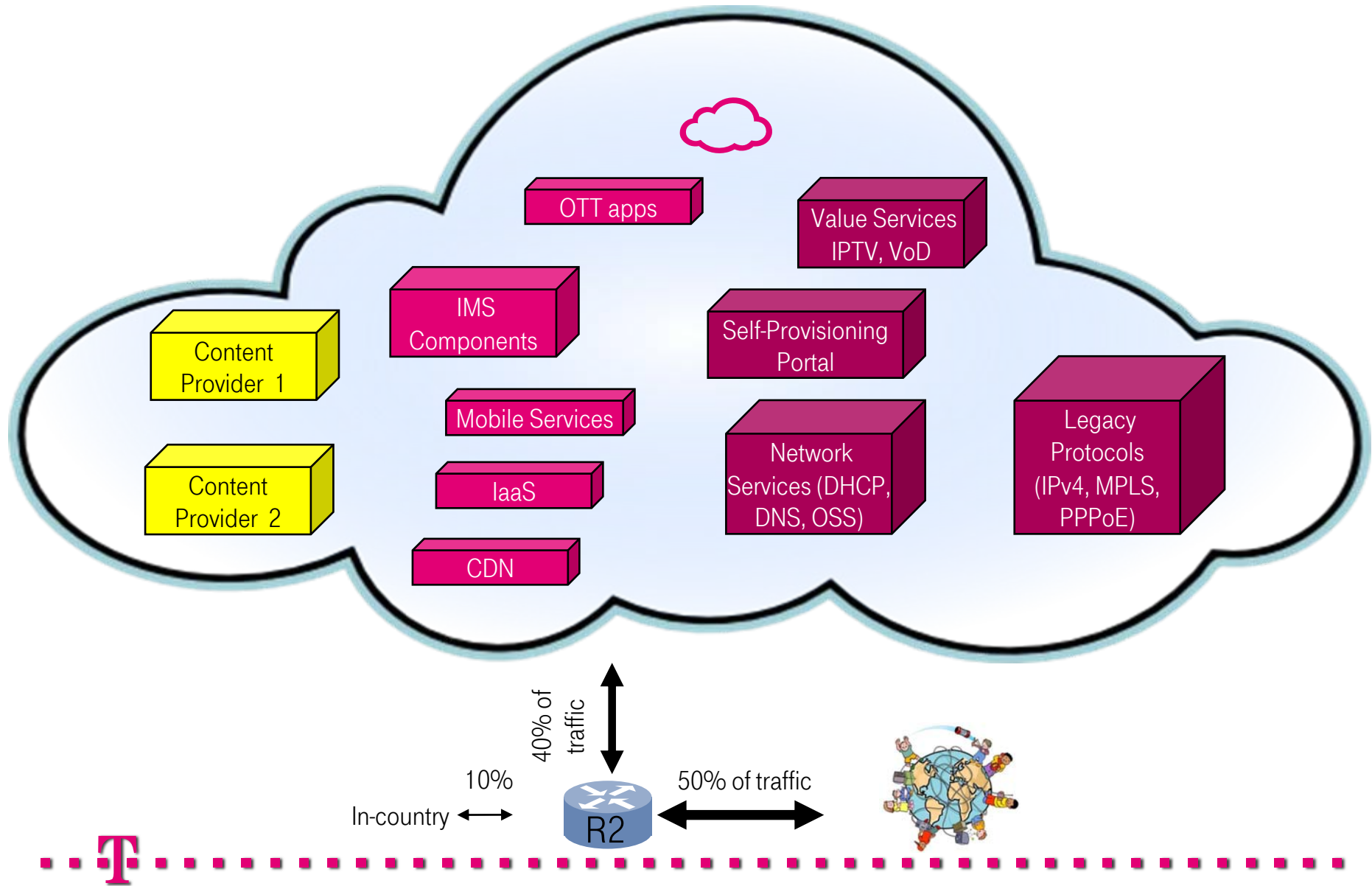
Realtime OSS
Service Modeling



The TeraStream Architecture.



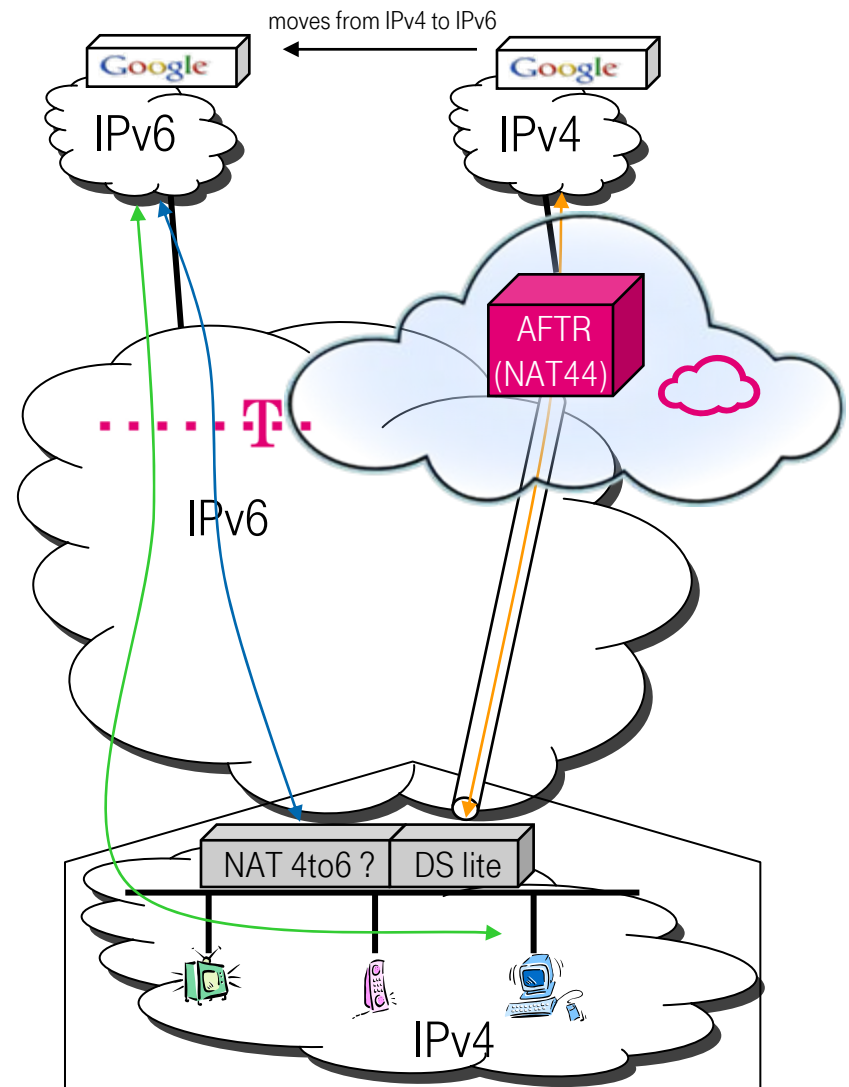
What's in the Infrastructure Cloud ?



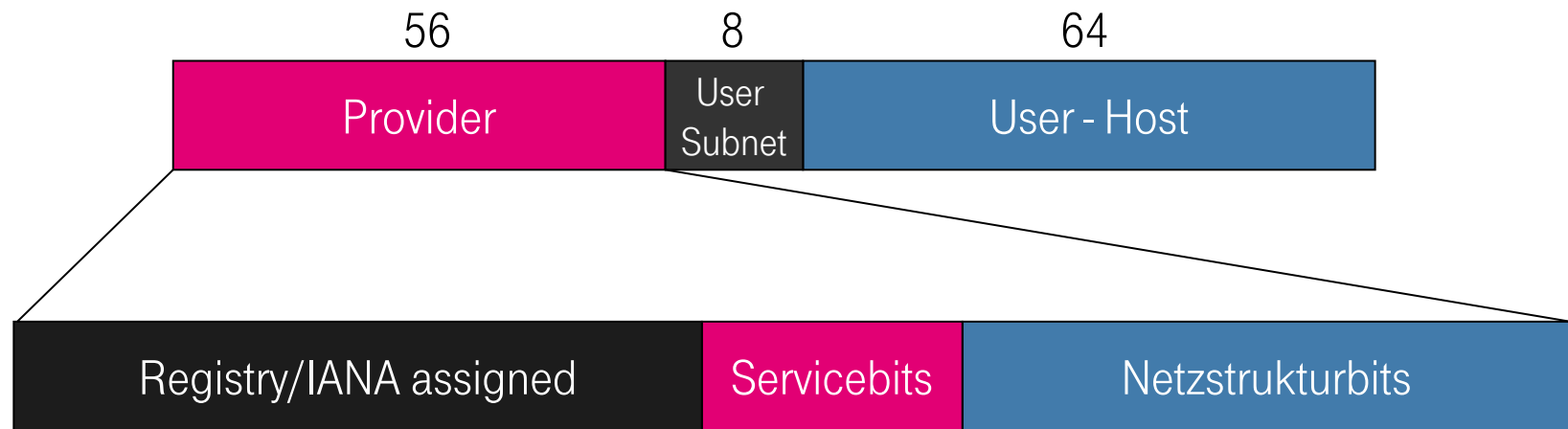
IPv4 Service

Legacy Services like IPv4, MPLS will be tunneled and produced in the datacenter

IETF Softwire Working Group:
Dual-Stack Lite RFC 6333



Service Differentiation through Addresses.



P Public	0=SP-intern, 1=extern
I Infrastructure	0=end user, 1=infrastructure packet
E Endpoint/Service	0=endpoint, 1=service
SSS Service Type	0=res, 1=internet, 4=video, 5=L2, 6=voice, 7=mgmt
M	0=fixed, 1=mobile endpoint

Examples:

	Source PIESSS	Destination PIESSS

User -> IMS	000110	011110
IMS -> User	011110	000110
User -> User (best effort)	X00001	X00001
User -> Internet (best effort)	100001	XXXXXX
Internet -> User (best effort)	XXXXXX	100001
Lan-Lan service	010101	010101

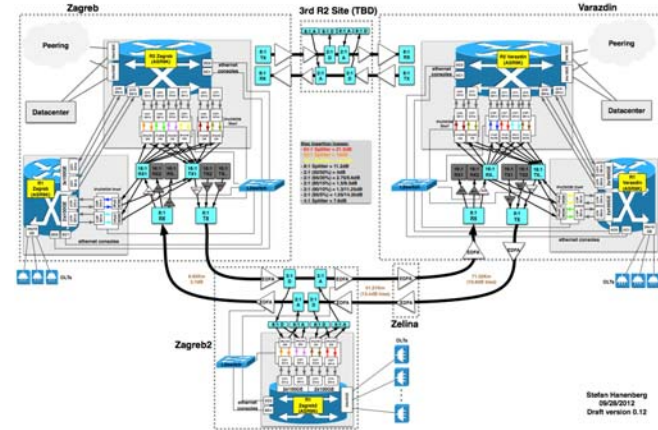
TeraStream Launch @ Hrvatski Telekom, 10-Dec-2012.

Croatia (4.3m people 76 per sq km, 1m house holds, 56,600 sq km, \$80bn GDP)

Current field trial



- Native IPv6 Network
- Access Speeds up to 1 Gb/s
- 500 Pilot Customers



**TeraStream in
Croatia**



Summary.

- IPv6 Introduction in existing networks made only slow progress in the market.
- Dual-Stack available for DT's German IP-based fixed customers since Sep 2012.
- Dual-Stack in Mobile networks coming to the market in 2014.
- New Network Architectures like DT's TeraStream show that native IPv6 can deliver a significant experience boost for the customers and significant cost benefits for the carrier
- Legacy IPv4 or MPLS delivered as a service.
- DT's TeraStream pilot launched at Hrvatski Telekom on Dec 10, 2012



..... It's our passion and our enabler for growth

Life is for sharing.

