

IPv6

Discovering IPv6 with Wireshark

presented by
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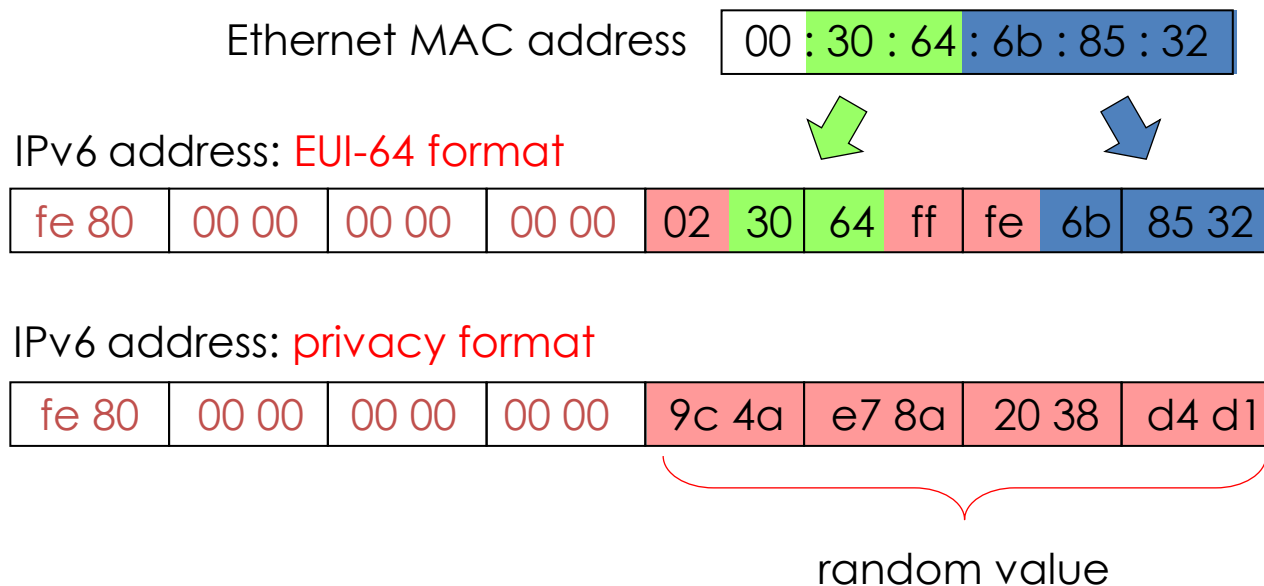
Agenda

- Address Autoconfiguration
- Neighbor discovery, Router discovery
- Host configuration with DHCPv6
- New DNS AAAA record
- Transition technologies, 6rd Tunnel

Address Autoconfiguration

IPv6 Stateless Address Autoconfiguration (SLAAC)

- An IPv6 host will **auto configure** a link-local address for each interface
- Prefix for link-local address is **fe80::/64**
- Interface ID is either derived from **MAC address** or a **random value**

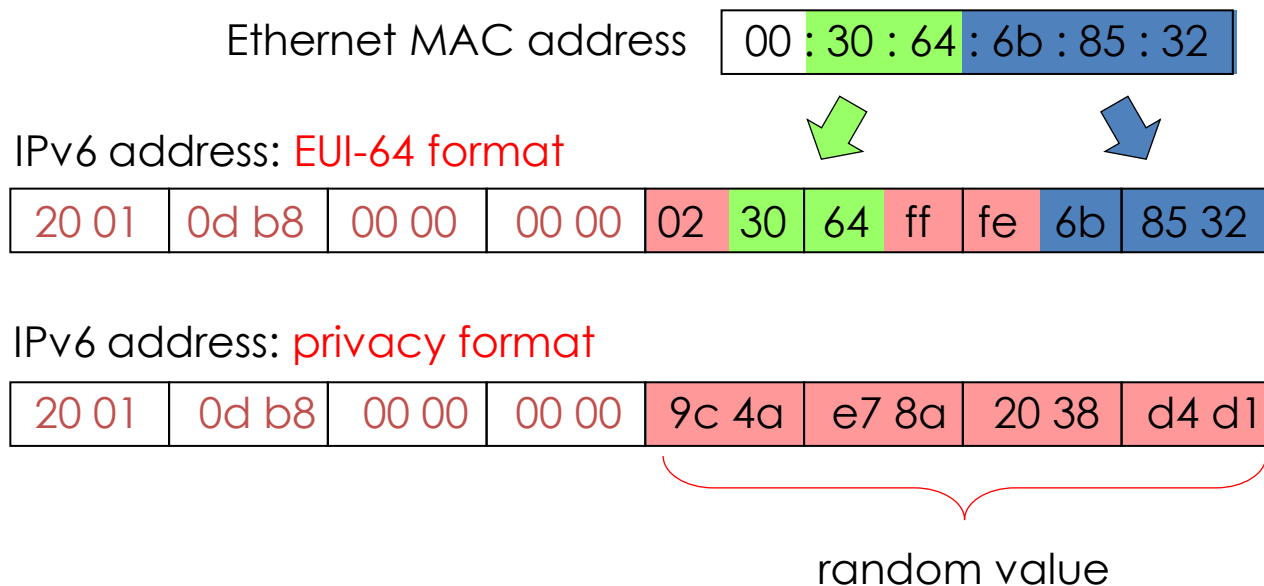


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Address Autoconfiguration

IPv6 Stateless Address Autoconfiguration (SLAAC)

- If a router is present, host will also **autoconfigure global address**
- Prefix will be obtained from router, example **2001:db8::/64**
- Interface ID is either derived from **MAC address** or a **random value**
- Router indicates in advertisement if **stateful configuration** may be used



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Address Autoconfiguration

Solicited Node Multicast Address (SNMA)

- Probably the **most strange** part of IPv6 addressing
- An IPv6 host forms a SNMA for **each own unicast address** in use
- The SNMA address is used for **Neighbor Discovery** (replacement of ARP)
- The SNMA address is **derived from** each **unicast address** in use

Hosts unicast address



Hosts SNMA address



SNMA prefix `ff02:0:0:0:0:1:ff00/104`

24 bits

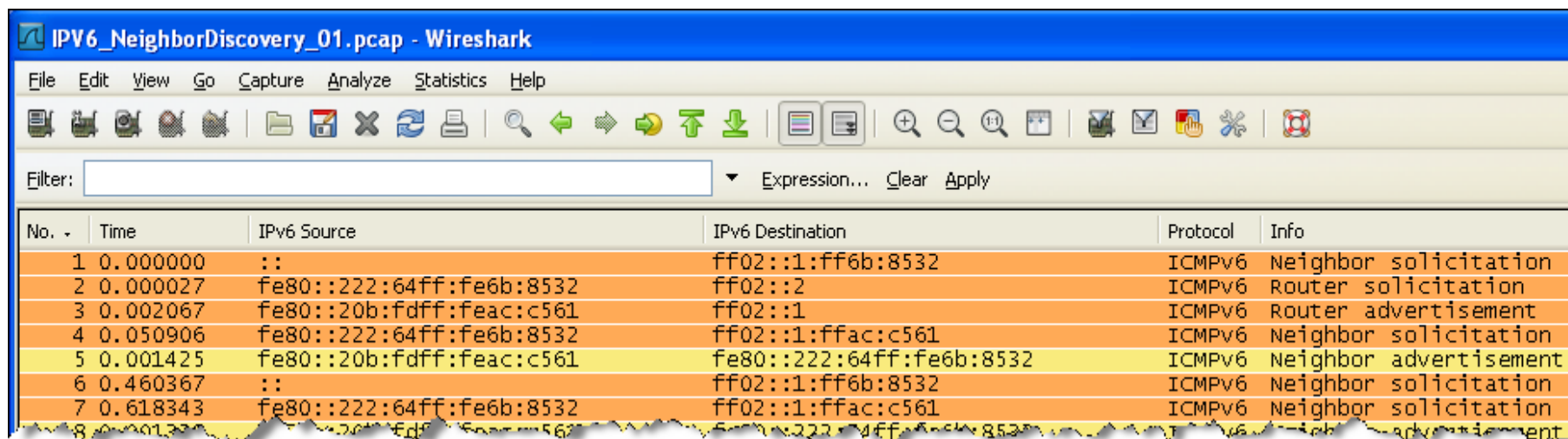
SNMA derived from unicast address: `ff02::1:ff6b:8532`

Duplicate Address Detection (DAD)

The initial client startup process includes the following steps:

Frame #

- 1 Duplicate Address Detection after Link-Local autoconfiguration
- 2 Router Discovery
- 3 Router Advertisement and global address autoconfiguration
- 4 Neighbor Discovery (searching for Router MAC)
- 5 Neighbor Advertisement (reply from Router with MAC)
- 6 Duplicate Address Detection with acquired global address



The image shows a Wireshark capture of IPv6 Neighbor Discovery protocol frames. The capture is titled "IPv6_NeighborDiscovery_01.pcap - Wireshark". The interface includes a menu bar (File, Edit, View, Go, Capture, Analyze, Statistics, Help), a toolbar with various icons, and a filter field. The main display area shows a list of frames with columns for No., Time, IPv6 Source, IPv6 Destination, Protocol, and Info. The frames are as follows:

No.	Time	IPv6 Source	IPv6 Destination	Protocol	Info
1	0.000000	::	ff02::1:ff6b:8532	ICMPv6	Neighbor solicitation
2	0.000027	fe80::222:64ff:fe6b:8532	ff02::2	ICMPv6	Router solicitation
3	0.002067	fe80::20b:fdff:feac:c561	ff02::1	ICMPv6	Router advertisement
4	0.050906	fe80::222:64ff:fe6b:8532	ff02::1:ffac:c561	ICMPv6	Neighbor solicitation
5	0.001425	fe80::20b:fdff:feac:c561	fe80::222:64ff:fe6b:8532	ICMPv6	Neighbor advertisement
6	0.460367	::	ff02::1:ff6b:8532	ICMPv6	Neighbor solicitation
7	0.618343	fe80::222:64ff:fe6b:8532	ff02::1:ffac:c561	ICMPv6	Neighbor solicitation
8	0.001327	fe80::20b:fdff:feac:c561	fe80::222:64ff:fe6b:8532	ICMPv6	Neighbor advertisement

IPv6 Interfaces

- In Windows Vista/7, each IPv6 interface is numbered with unique 'Zone ID'

```
Administrator: Command Prompt
C:\windows\system32>route print -6
=====
Schnittstellenliste
13 ...00 22 64 6b 85 32 ..... Marvell Yukon 88E8072 PCI-E Gigabit Ethernet Controller
12 ...00 21 6b 17 a5 bc ..... Intel(R) WiFi Link 5100 AGN
11 ...00 21 86 d1 3f 9b ..... Bluetooth-Gerät (PAN)
 1 ..... Software Loopback Interface 1
16 ...00 00 00 00 00 00 e0 isatap.{0BF5943C-D67C-4195-9860-781CC293A689}
17 ...00 00 00 00 00 00 e0 isatap.{BC043990-D4EC-4B5C-BDD2-8E9DD8697BF3}
15 ...00 00 00 00 00 00 e0 6T04 Adapter
14 ...02 00 54 55 4e 01 ..... Teredo Tunneling Pseudo-Interface
=====
```

- A link-local address is automatically configured with the address prefix **fe80::/64** for each physical or logical IPv6 interface
- If a **router** is available, a **global address** is configured on interface

IPv6 Interfaces

```
Administrator: Command Prompt
IPv6-Routentabelle
=====
Aktive Routen:
If Metrik Netzwerkziel Gateway
13 286 ::/0 fe80::20b:fdff:feac:c560
16 281 ::/0 fe80::5efe:192.168.20.1
1 306 ::1/128 Auf Verbindung
14 18 2001::/32 Auf Verbindung
14 266 2001:0:d5c7:a2d6:281b:276f:3f57:ff32/128 Auf Verbindung
13 38 2001:cafe:0:20::/64 Auf Verbindung
13 286 2001:cafe:0:20::113/128 Auf Verbindung
13 286 2001:cafe:0:20:222:64ff:fe6b:8532/128 Auf Verbindung
13 286 2001:cafe:0:20:8d2d:33b4:5455:ad15/128 Auf Verbindung
16 33 2001:cafe:0:40::/64 Auf Verbindung
16 281 2001:cafe:0:40:0:5efe:192.168.0.205/128 Auf Verbindung
13 286 fe80::/64 Auf Verbindung
14 266 fe80::/64 Auf Verbindung
16 281 fe80::5efe:192.168.0.205/128 Auf Verbindung
17 296 fe80::5efe:192.168.10.100/128 Auf Verbindung
13 286 fe80::222:64ff:fe6b:8532/128 Auf Verbindung
14 266 fe80::281b:276f:3f57:ff32/128 Auf Verbindung
1 306 ff00::/8 Auf Verbindung
14 266 ff00::/8 Auf Verbindung
13 286 ff00::/8 Auf Verbindung
=====
```

Global Addresses

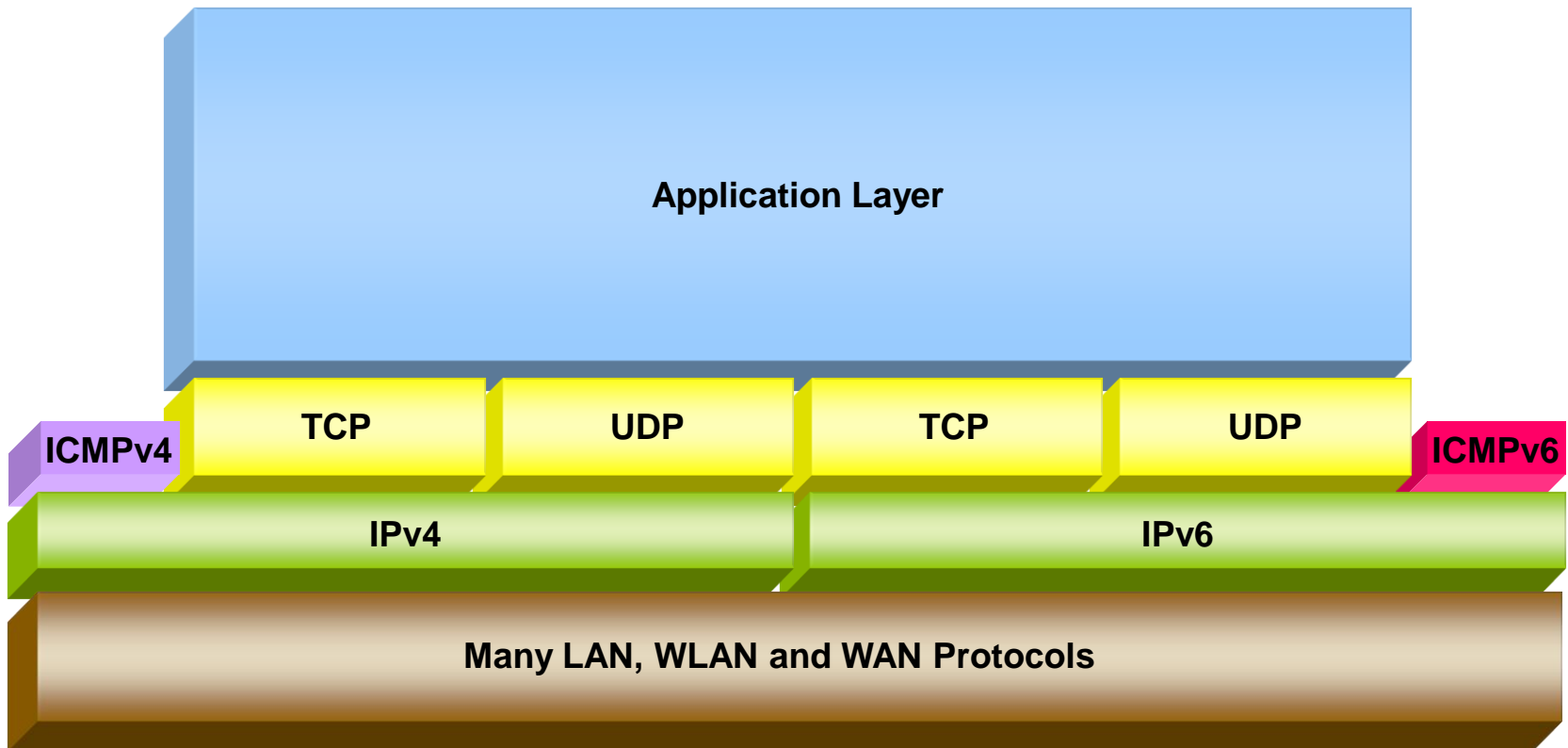
Link Local Addresses

Agenda

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- New DNS AAAA record
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TCP/IP Protocol Family

Dual stack implementation



- **Internet Control Message Protocol v6** (ICMPv6) plays an important role
- Many new ICMPv6 messages have been defined

ICMPv6 Messages

Error
and Control
Messages

Multicast Listener
Discovery (MLD)
Messages

Neighbor
Discovery (ND)
Messages

Echo Request/Reply
Destination unreachable
Time exceeded
Redirect
Parameter Problem
Packet too big

Multicast Listener Query
Multicast Listener Report
Multicast Listener Done

Neighbor Solicitation
Neighbor Advertisement
Router Solicitation
Router Advertisement

ICMPv6

IPv6

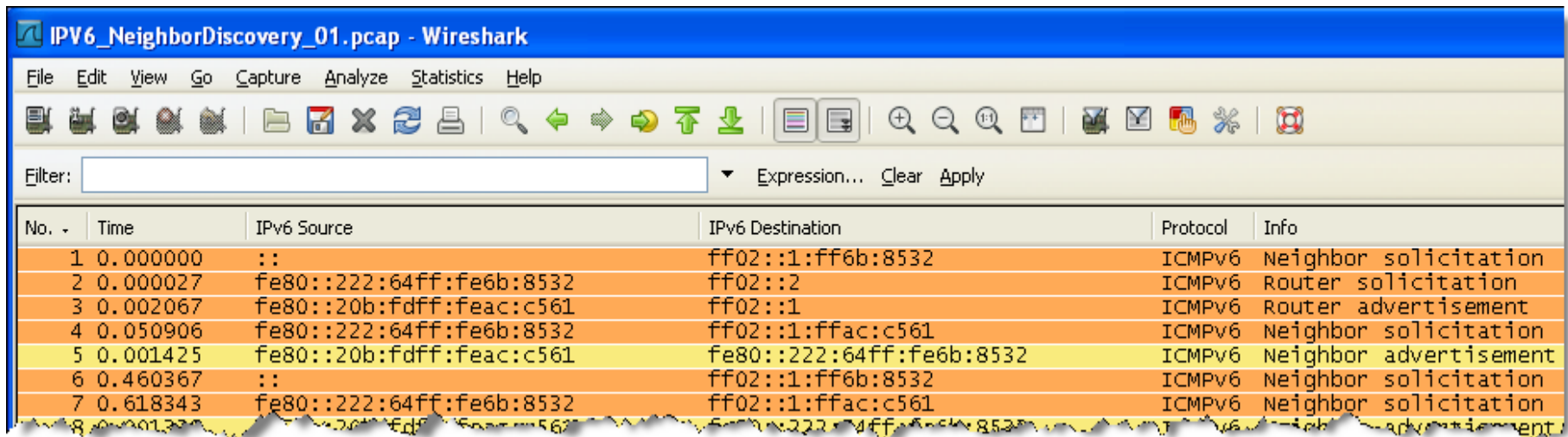
LAN, WLAN and WAN Protocols

Neighbor Discovery (ND)

The initial client startup process includes the following steps:

Frame

- 1 Duplicate Address Detection after Link-Local autoconfiguration
- 2 Router Discovery
- 3 Router Advertisement and global address autoconfiguration
- 4 Neighbor Discovery (searching for Router MAC)
- 5 Neighbor Advertisement (reply from Router with MAC)
- 6 Duplicate Address Detection with acquired global address



The image shows a Wireshark capture of IPv6 Neighbor Discovery (ND) protocol frames. The capture is titled "IPv6_NeighborDiscovery_01.pcap - Wireshark". The interface includes a menu bar (File, Edit, View, Go, Capture, Analyze, Statistics, Help), a toolbar with various icons, and a filter field. The main display area shows a list of frames with columns for No., Time, IPv6 Source, IPv6 Destination, Protocol, and Info. The frames are as follows:

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4	0.050906	fe80::222:64ff:fe6b:8532	ff02::1:ffac:c561	ICMPv6	Neighbor solicitation
5	0.001425	fe80::20b:fdff:feac:c561	fe80::222:64ff:fe6b:8532	ICMPv6	Neighbor advertisement
6	0.460367	::	ff02::1:ff6b:8532	ICMPv6	Neighbor solicitation
7	0.618343	fe80::222:64ff:fe6b:8532	ff02::1:ffac:c561	ICMPv6	Neighbor solicitation
8	0.001327	fe80::20b:fdff:feac:c561	fe80::222:64ff:fe6b:8532	ICMPv6	Neighbor advertisement

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Host configuration with DHCPv6

Despite Address Autoconfiguration, DHCP plays an important role in IPv6 environment. It is required to provide clients with additional parameters like DNS server address and many other options.

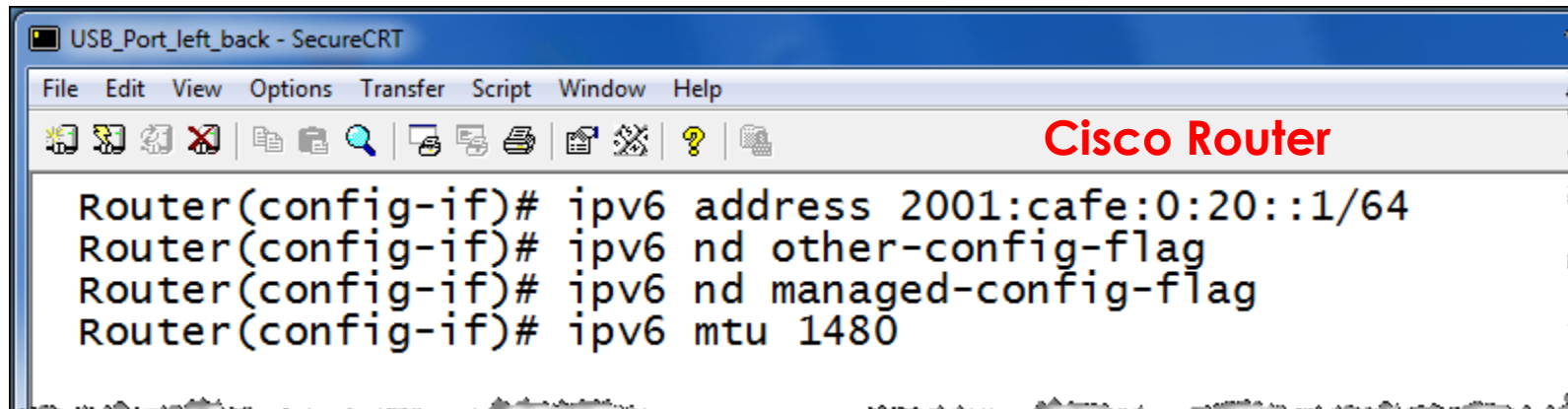
DHCPv6 offers different level of control over the workstations:

Client parameters	Stateless Auto Address Config. RFC2462	Stateless DHCP Service for IPv6 RFC3736	Stateful DHCPv6 RFC3315
Subnet Prefix & Mask	From Router Advertisements (O-Flag=0 M-Flag=0)	From Router Advertisements (O-Flag=1 / M-Flag=0)	From Router Advertisements (O-Flag=1 / M-Flag=1)
Interface Identifier	Auto Configuration	Auto Configuration	From DHCPv6 Server
DNS, NTP address etc.	Manual Configuration	From DHCPv6 Server	From DHCPv6 Server

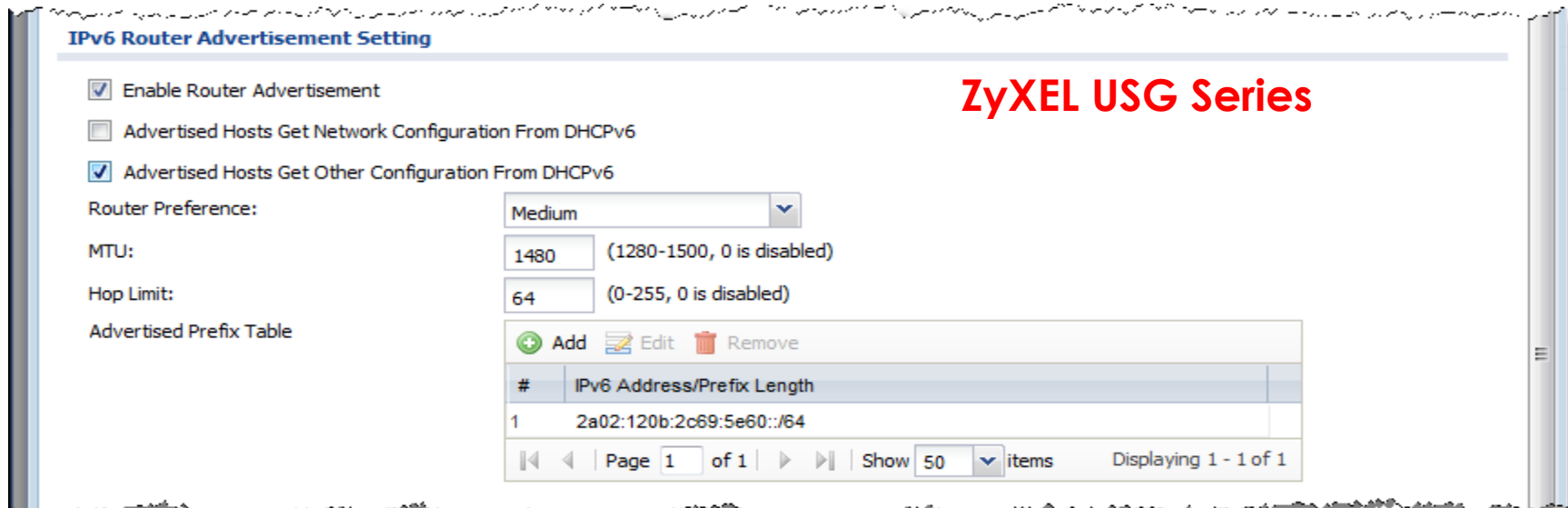
O = Other Flag / M = Managed Flag

Host configuration with DHCPv6

Router Configuration Examples:



```
Router(config-if)# ipv6 address 2001:cafe:0:20::1/64
Router(config-if)# ipv6 nd other-config-flag
Router(config-if)# ipv6 nd managed-config-flag
Router(config-if)# ipv6 mtu 1480
```



IPv6 Router Advertisement Setting

Enable Router Advertisement
 Advertised Hosts Get Network Configuration From DHCPv6
 Advertised Hosts Get Other Configuration From DHCPv6

Router Preference:

MTU: (1280-1500, 0 is disabled)

Hop Limit: (0-255, 0 is disabled)

Advertised Prefix Table

#	IPv6 Address/Prefix Length
1	2a02:120b:2c69:5e60::/64

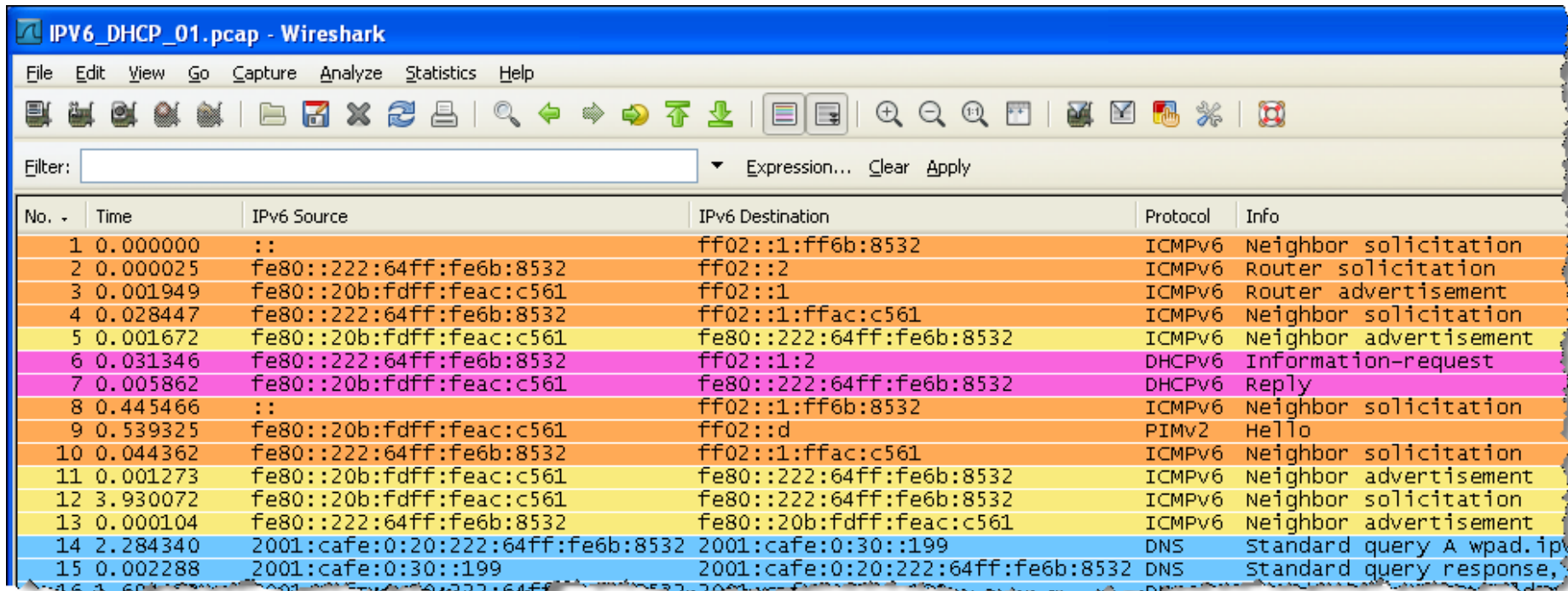
Page 1 of 1 | Show 50 items | Displaying 1 - 1 of 1

Host configuration with DHCPv6

During this phase, the client is supplied with additional parameters:

Frame #

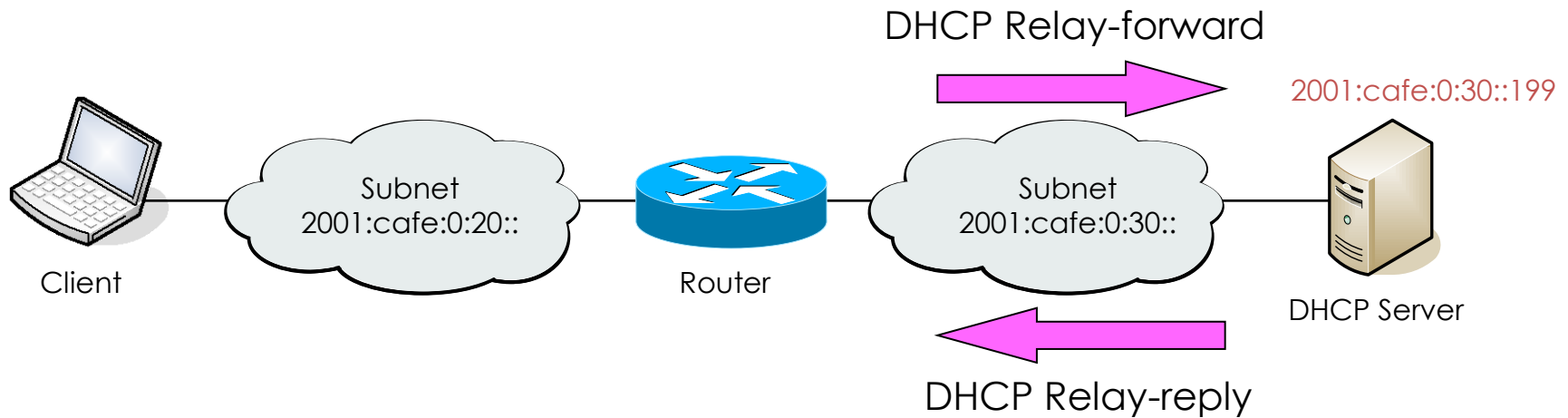
- 2 Router Discovery
- 3 Router Advertisement with 'Other Flag' set
- 6 Client contacts DHCP server
- 7 DHCP server delivers additional parameter like DNS, suffixes etc.



The image shows a Wireshark capture of IPv6 DHCPv6 traffic. The interface includes a menu bar (File, Edit, View, Go, Capture, Analyze, Statistics, Help), a toolbar with various icons, and a filter field. The main display area shows a list of network packets with columns for No., Time, IPv6 Source, IPv6 Destination, Protocol, and Info. The packets are color-coded: orange for ICMPv6, yellow for ICMPv6, pink for DHCPv6, and blue for DNS.

No.	Time	IPv6 Source	IPv6 Destination	Protocol	Info
1	0.000000	::	ff02::1:ff6b:8532	ICMPv6	Neighbor solicitation
2	0.000025	fe80::222:64ff:fe6b:8532	ff02::2	ICMPv6	Router solicitation
3	0.001949	fe80::20b:fdff:feac:c561	ff02::1	ICMPv6	Router advertisement
4	0.028447	fe80::222:64ff:fe6b:8532	ff02::1:ffac:c561	ICMPv6	Neighbor solicitation
5	0.001672	fe80::20b:fdff:feac:c561	fe80::222:64ff:fe6b:8532	ICMPv6	Neighbor advertisement
6	0.031346	fe80::222:64ff:fe6b:8532	ff02::1:2	DHCPv6	Information-request
7	0.005862	fe80::20b:fdff:feac:c561	fe80::222:64ff:fe6b:8532	DHCPv6	Reply
8	0.445466	::	ff02::1:ff6b:8532	ICMPv6	Neighbor solicitation
9	0.539325	fe80::20b:fdff:feac:c561	ff02::d	PIMv2	Hello
10	0.044362	fe80::222:64ff:fe6b:8532	ff02::1:ffac:c561	ICMPv6	Neighbor solicitation
11	0.001273	fe80::20b:fdff:feac:c561	fe80::222:64ff:fe6b:8532	ICMPv6	Neighbor advertisement
12	3.930072	fe80::20b:fdff:feac:c561	fe80::222:64ff:fe6b:8532	ICMPv6	Neighbor solicitation
13	0.000104	fe80::222:64ff:fe6b:8532	fe80::20b:fdff:feac:c561	ICMPv6	Neighbor advertisement
14	2.284340	2001:cafe:0:20:222:64ff:fe6b:8532	2001:cafe:0:30:199	DNS	Standard query A wpad.ip
15	0.002288	2001:cafe:0:30:199	2001:cafe:0:20:222:64ff:fe6b:8532	DNS	Standard query response,

Host configuration with DHCPv6



IPV6_DHCP_Relay_01.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Help

Filter: Expression... Clear Apply

No.	Time	IPv6 Source	IPv6 Destination	Protocol	Info
1	0.000000	2001:cafe:0:30::3	2001:cafe:0:30::199	DHCPv6	Relay-forw
2	0.000676	2001:cafe:0:30::199	ff02::1:ff00:3	ICMPv6	Neighbor solicitation
3	0.001176	2001:cafe:0:30::3	2001:cafe:0:30::199	ICMPv6	Neighbor advertisement
4	0.000041	2001:cafe:0:30::199	2001:cafe:0:30::3	DHCPv6	Relay-reply
5	4.998115	fe80::20b:fdff:feac:c560	2001:cafe:0:30::199	ICMPv6	Neighbor solicitation
6	0.000245	fe80::20ea:d4cf:1963:571f	ff02::1:ffac:c560	ICMPv6	Neighbor solicitation
7	0.001134	fe80::20b:fdff:feac:c560	fe80::20ea:d4cf:1963:571f	ICMPv6	Neighbor advertisement
8	0.000051	2001:cafe:0:30::199	fe80::20b:fdff:feac:c560	ICMPv6	Neighbor advertisement
9	2.248004	2001:cafe:0:20:222:64ff:fe6b:8532	2001:cafe:0:30::199	DNS	Standard query A wpad.ip
10	0.000274	2001:cafe:0:30::199	2001:cafe:0:20:222:64ff:fe6b:8532	DNS	Standard query response
11	1.696142	2001:cafe:0:20:222:64ff:fe6b:8532	2001:cafe:0:30::199	DNS	Standard query SRV _ldap

Host configuration with DHCPv6

At this state, the client is configured with all required parameters:



```
C:\windows\system32>ipconfig /all
```

```
Ethernet-Adapter LAN-Verbindung:
```

```
Verbindungsspezifisches DNS-Suffix: ipv6.ch
```

```
Beschreibung. . . . . : Marvell Yukon 88E8072 PCI-E Gigabit Ethernet
```

```
Physikalische Adresse . . . . . : 00-22-64-6B-85-32
```

```
DHCP aktiviert. . . . . : Ja
```

```
Autokonfiguration aktiviert . . . . : Ja
```

```
IPv6-Adresse. . . . . : 2001:cafe:0:20:222:64ff:fe6b:8532 (Bevorzugt)
```

```
Verbindungslokale IPv6-Adresse . . : fe80::222:64ff:fe6b:8532%13 (Bevorzugt)
```

```
Lease erhalten. . . . . : Samstag, 21. Februar 2009 11:46:04
```

```
Lease läuft ab. . . . . : Sonntag, 1. März 2009 11:46:03
```

```
Standardgateway . . . . . : fe80::20b:fdff:feac:c561%13
```

```
DHCPv6-IAID . . . . . : 251667044
```

```
DHCPv6-Client-DUID. . . . . : 00-01-00-01-10-D2-B9-65-00-22-64-6B-85-32
```

```
DNS-Server . . . . . : 2001:cafe:0:30::199
```

```
Suchliste für verbindungsspezifische DNS-Suffixe:  
yourdomain.ch  
ipv6.ch  
dummy.ch
```

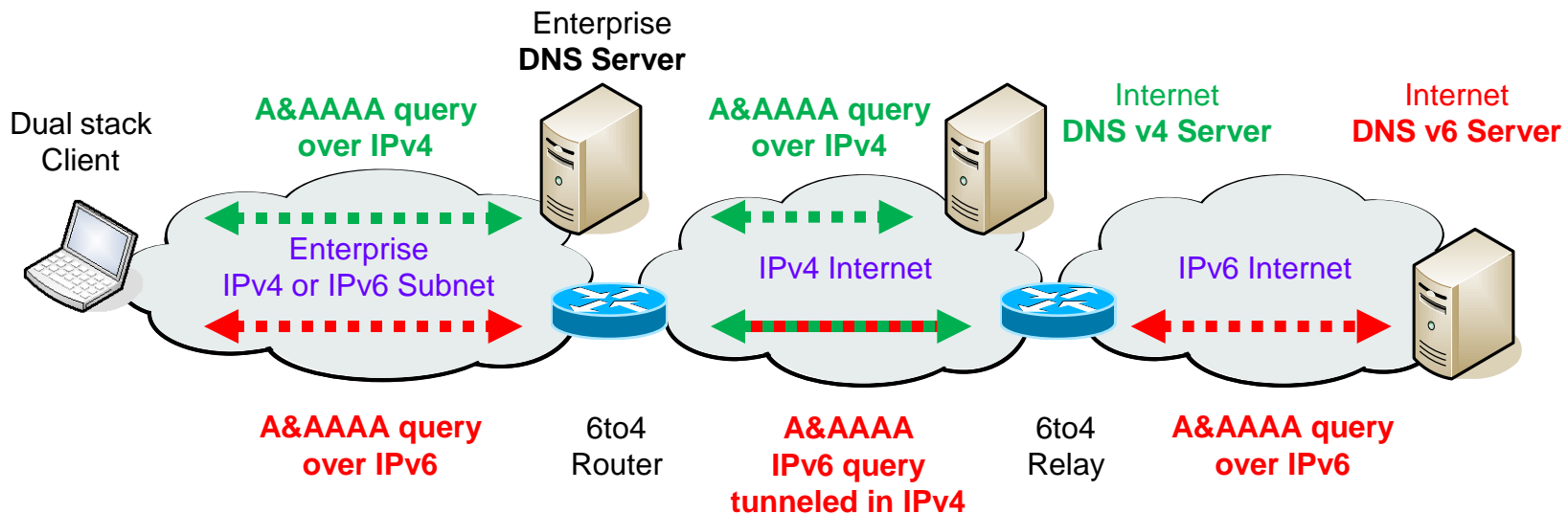
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- **New DNS AAAA record**
- Transition technologies, 6rd Tunnel

IPv6 Domain Name System (DNS)

New AAAA resource record

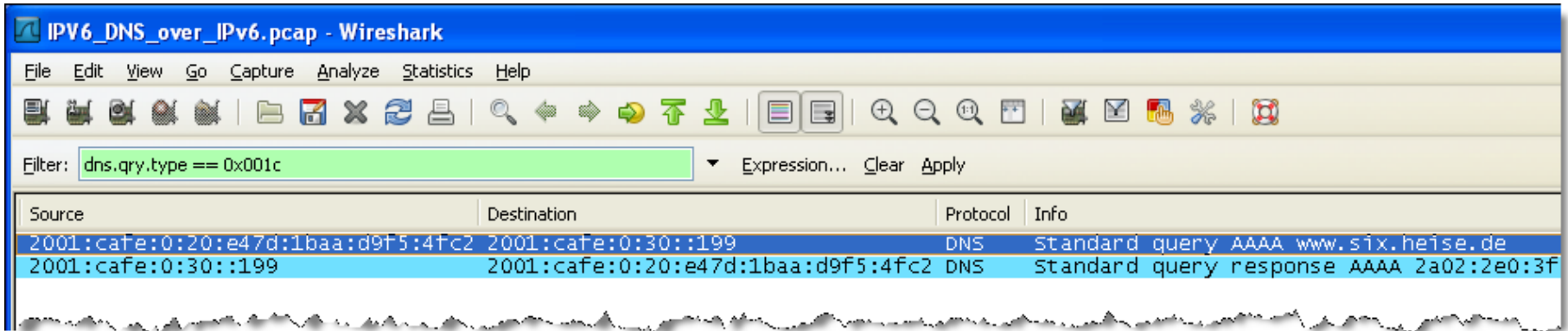
- Due to the unhandy IPv6 address, DNS plays an **important role in IPv6**
- A new resource record type AAAA (**called quad-A**) has been defined
- During migration, DNS servers will support **dual stack IPv4/IPv6**
- IPv6 record queries and responses may be transmitted over **IPv4** or **IPv6**



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IPv6 Domain Name System (DNS)

- A & AAAA record query & response over IPv6 transport

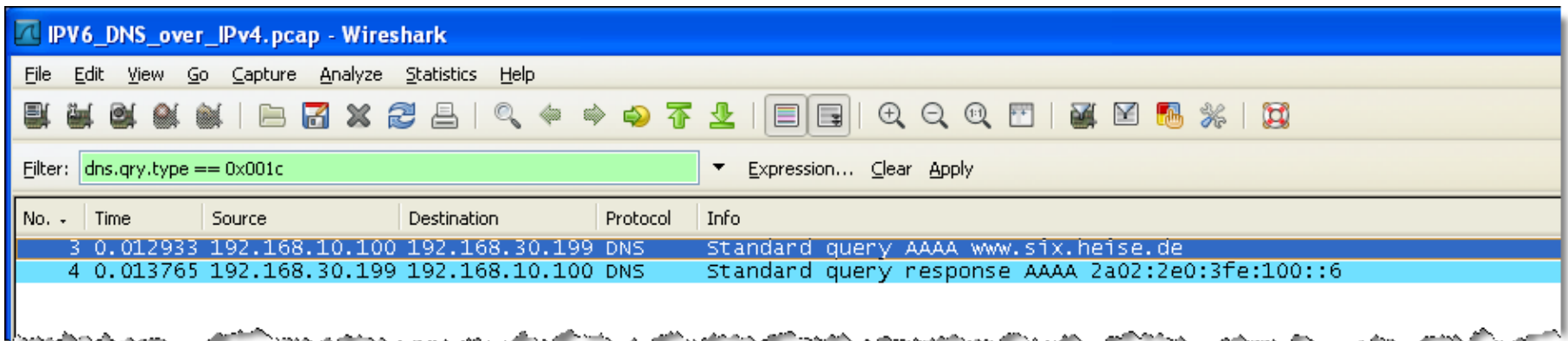


IPV6_DNS_over_IPv6.pcap - Wireshark

Filter: dns.qry.type == 0x001c

Source	Destination	Protocol	Info
2001:cafe:0:20:e47d:1baa:d9f5:4fc2	2001:cafe:0:30::199	DNS	Standard query AAAA www.six.heise.de
2001:cafe:0:30::199	2001:cafe:0:20:e47d:1baa:d9f5:4fc2	DNS	Standard query response AAAA 2a02:2e0:3f

- A & AAAA record query & response over IPv4 transport



IPV6_DNS_over_IPv4.pcap - Wireshark

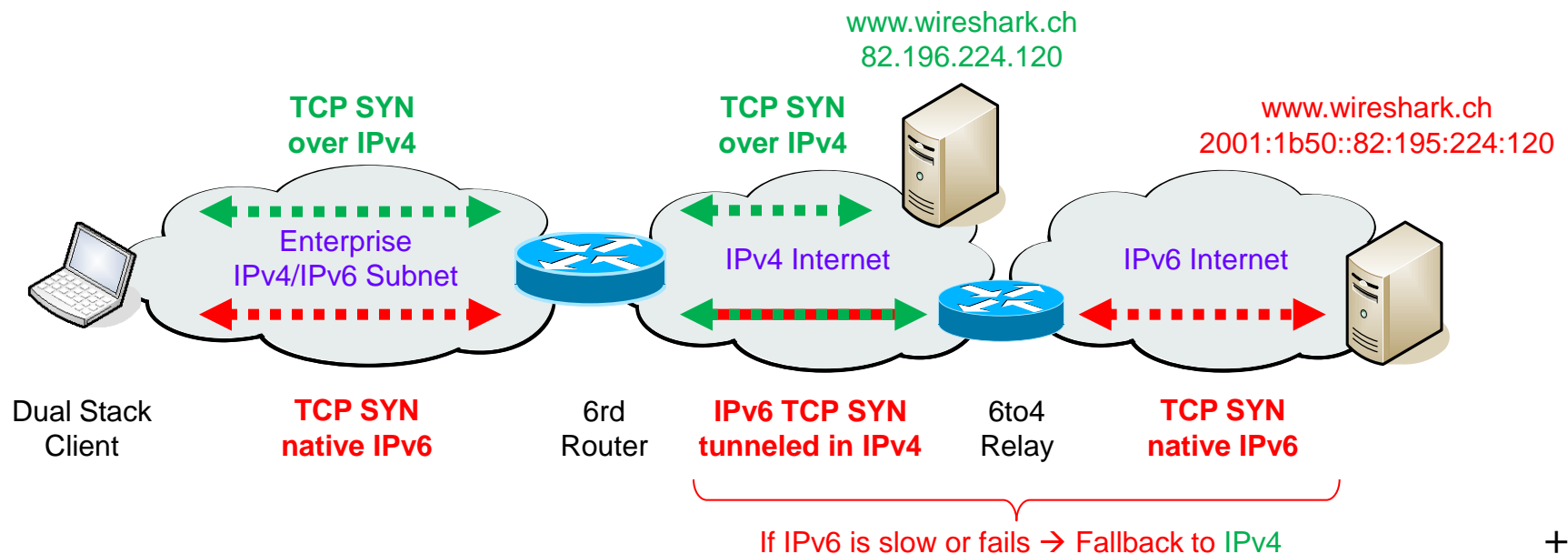
Filter: dns.qry.type == 0x001c

No. -	Time	Source	Destination	Protocol	Info
3	0.012933	192.168.10.100	192.168.30.199	DNS	Standard query AAAA www.six.heise.de
4	0.013765	192.168.30.199	192.168.10.100	DNS	Standard query response AAAA 2a02:2e0:3fe:100::6

IPv6 Domain Name System (DNS)

How to force the Client to use IPv6 protocol

- If a global IPv6 address is provided, most newer OSs **prefer** IPv6 over IPv4
- Some content providers use a separate namespace (www.six.heise.de)
- Newer Browsers will try to resolve **A and AAAA** record of an URI
- If an A and an AAAA record is available, **IPv6 will be preferred**
- **Happy Eyeball** (RFC6555) solves problem with slow fallback if IPv6 fails



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IPv6 Domain Name System (DNS)

IPv6 preferred before IPv4 (WIN7 Client with Firefox 12.0)

The image shows a Wireshark network traffic capture window titled "IPv6 Preferred_native.pcap [Wireshark 1.6.6 (SVN Rev 41803 from /trunk-1.6)]". The interface includes a menu bar (File, Edit, View, Go, Capture, Analyze, Statistics, Telephony, Tools, Internals, Help), a toolbar with various icons, and a filter field. The main display area shows a list of network packets with columns for No., Time, Source, Destination, Length, Protocol, and Info. Packet 5 is highlighted in red, showing a TCP SYN packet from IPv6-Client to www.wireshark.ch. Packet 6 is highlighted in grey, showing a TCP SYN-ACK packet from www.wireshark.ch to IPv6-Client. Packet 7 is highlighted in green, showing a TCP ACK packet from IPv6-Client to www.wireshark.ch. Packet 8 is highlighted in green, showing an HTTP GET request from IPv6-Client to www.wireshark.ch. Packets 9-13 are highlighted in green and represent TCP segments of a reassembled PDU. Packet 14 is highlighted in green, showing a TCP ACK packet from IPv6-Client to www.wireshark.ch. The bottom pane shows the details of the selected packet (Frame 5), including Ethernet II, Internet Protocol Version 6, and Transmission Control Protocol fields.

No.	Time	Source	Destination	Length	Protocol	Info
1	0.000000	IPv6-Client	ordns.he.net	96	DNS	Standard query A www.wireshark.ch
2	0.028899	ordns.he.net	IPv6-Client	112	DNS	Standard query response A 82.195.224.120
3	0.000195	IPv6-Client	ordns.he.net	96	DNS	Standard query AAAA www.wireshark.ch
4	0.032254	ordns.he.net	IPv6-Client	124	DNS	Standard query response AAAA 2001:1b50::82:195:224:120
5	0.024493	IPv6-Client	www.wireshark.ch	86	TCP	49650 > http [SYN] Seq=0 Win=8192 Len=0 MSS=1420 WS=4 SACK_PERM=
6	0.036447	www.wireshark.ch	IPv6-Client	86	TCP	http > 49650 [SYN, ACK] Seq=0 Ack=1 win=65535 Len=0 MSS=1440 WS=
7	0.000067	IPv6-Client	www.wireshark.ch	74	TCP	49650 > http [ACK] Seq=1 Ack=1 win=17040 Len=0
8	0.000068	IPv6-Client	www.wireshark.ch	388	HTTP	GET /de/ HTTP/1.1
9	0.042209	www.wireshark.ch	IPv6-Client	1494	TCP	[TCP segment of a reassembled PDU]
10	0.001927	www.wireshark.ch	IPv6-Client	1494	TCP	[TCP segment of a reassembled PDU]
11	0.000026	IPv6-Client	www.wireshark.ch	74	TCP	49650 > http [ACK] Seq=315 Ack=2841 win=17040 Len=0
12	0.001196	www.wireshark.ch	IPv6-Client	1494	TCP	[TCP segment of a reassembled PDU]
13	0.001647	www.wireshark.ch	IPv6-Client	1494	TCP	[TCP segment of a reassembled PDU]
14	0.000023	IPv6-Client	www.wireshark.ch	74	TCP	49650 > http [ACK] Seq=315 Ack=5681 win=17040 Len=0

Frame 5: 86 bytes on wire (688 bits), 86 bytes captured (688 bits)
Ethernet II, Src: Flextron_44:87:dc (00:21:cc:44:87:dc), Dst: ZyxelCom_3b:41:40 (c8:6c:87:3b:41:40)
Internet Protocol Version 6, Src: IPv6-Client (2a02:120b:2c69:5e60:221:ccff:fe44:87dc), Dst: www.wireshark.ch (2001:1b50::)
Transmission Control Protocol, Src Port: 49650 (49650), Dst Port: http (80), Seq: 0, Len: 0

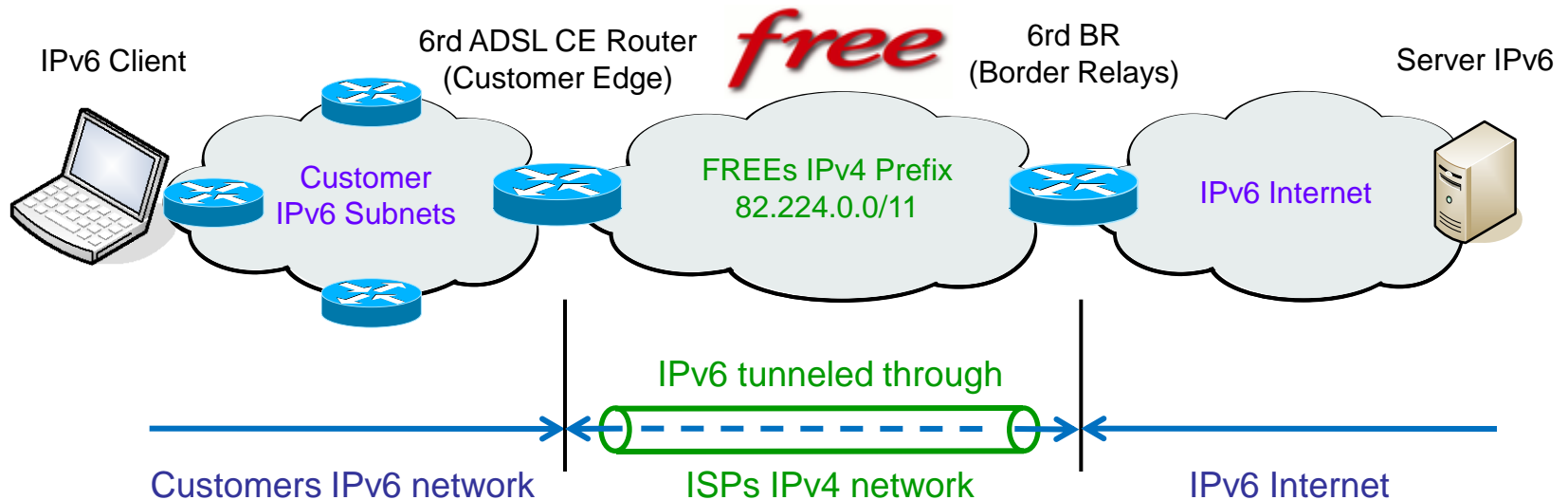
Agenda

- Address Autoconfiguration
- Neighbor discovery, Router discovery
- Host configuration with DHCPv6
- New DNS AAAA record
- Transition technologies, 6rd Tunnel

Transition Technologies, 6rd

6rd Rapid Deployment Tunnel

- Named after inventor [Remi Despres](#) / France
- First deployed by large French ISP **FREE** within 5 weeks in 2007
- 6rd does **NOT** use the 6to4 global address prefix `2002:WWXX:YYZZ::/48`
- Uses IPv6 prefix provided by ISP instead (i.e. [Swisscom](#) `2a02:1200::/28`)
- Minimal changes on ISPs IPv4 infrastructure

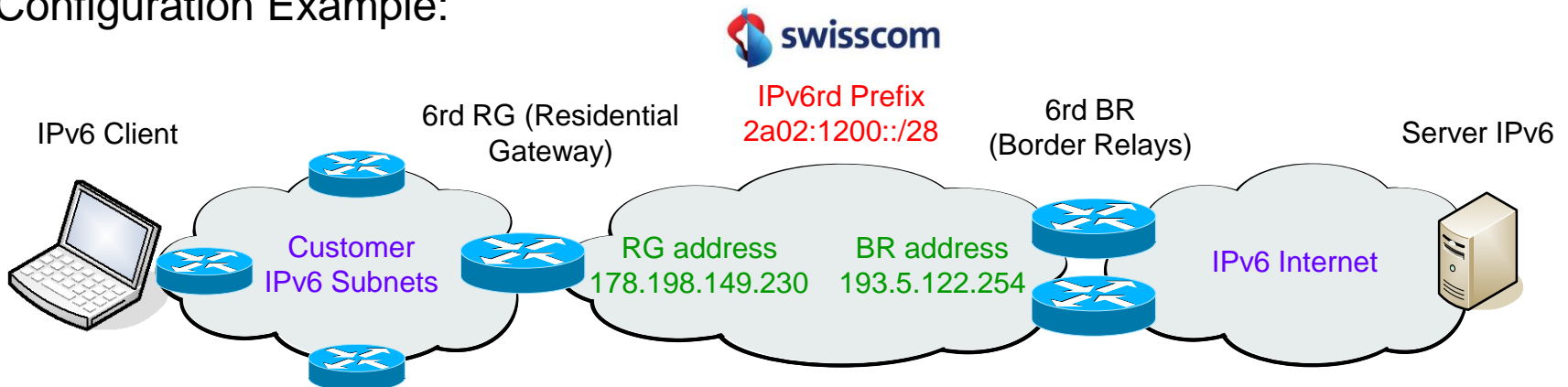


Transition Technologies, 6rd

6rd Rapid Deployment Tunnel

- **Swisscom** is providing public IPv4 address to **Residential Gateway (RG)**
- **Swisscom** is using **IPv4 anycast address 193.5.122.254** for 6rd Border Relays
- Border Relays are **stateless**, traffic flow through any BR in both directions
- Works with global **IPv4 and NAT44** addresses in customers network

Configuration Example:

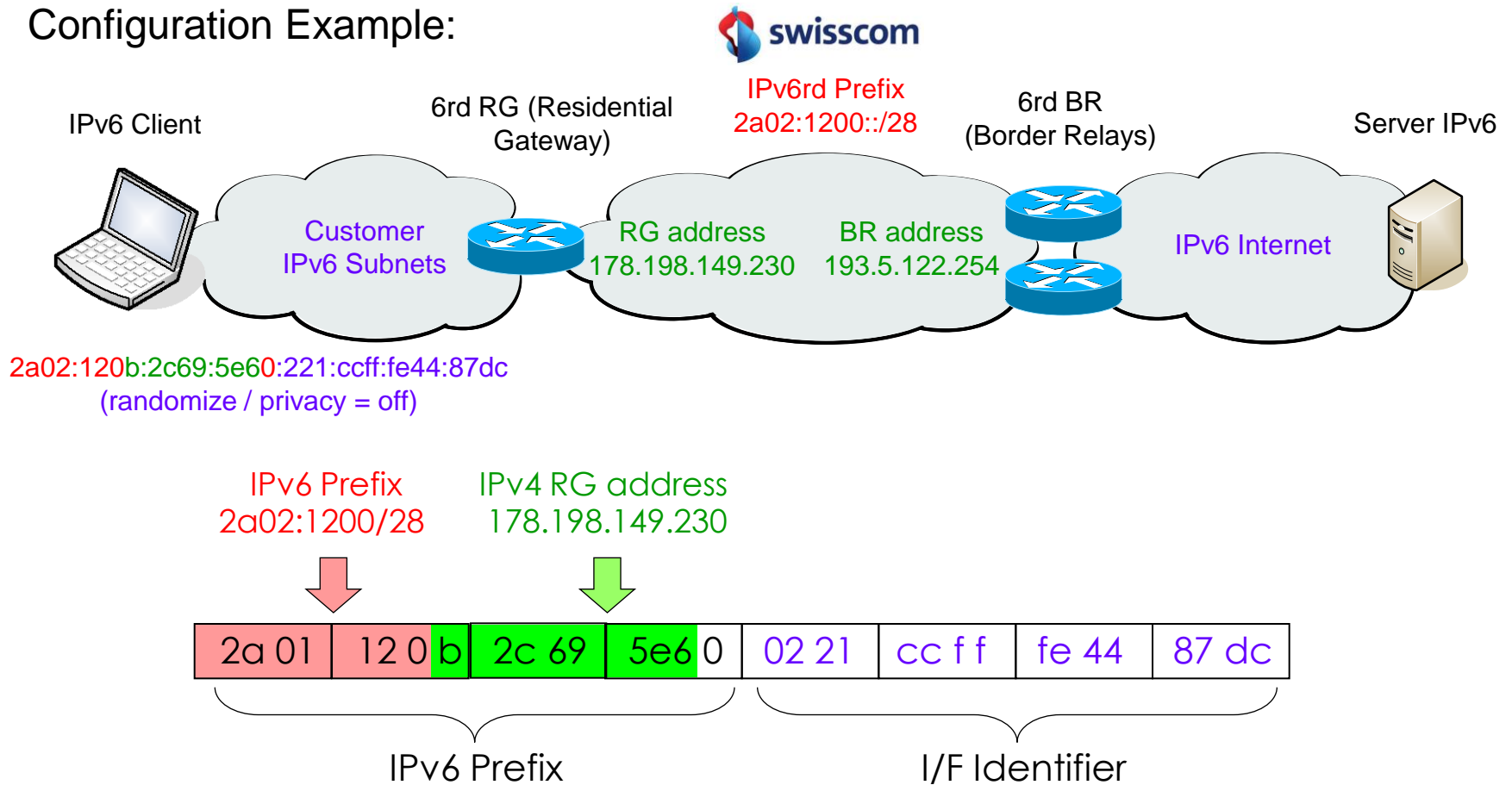


Transition Technologies, 6rd

6rd Rapid Deployment Tunnel

- IPv6 Client derives prefix from Swisscoms IPv6 and IPv4 prefixes

Configuration Example:

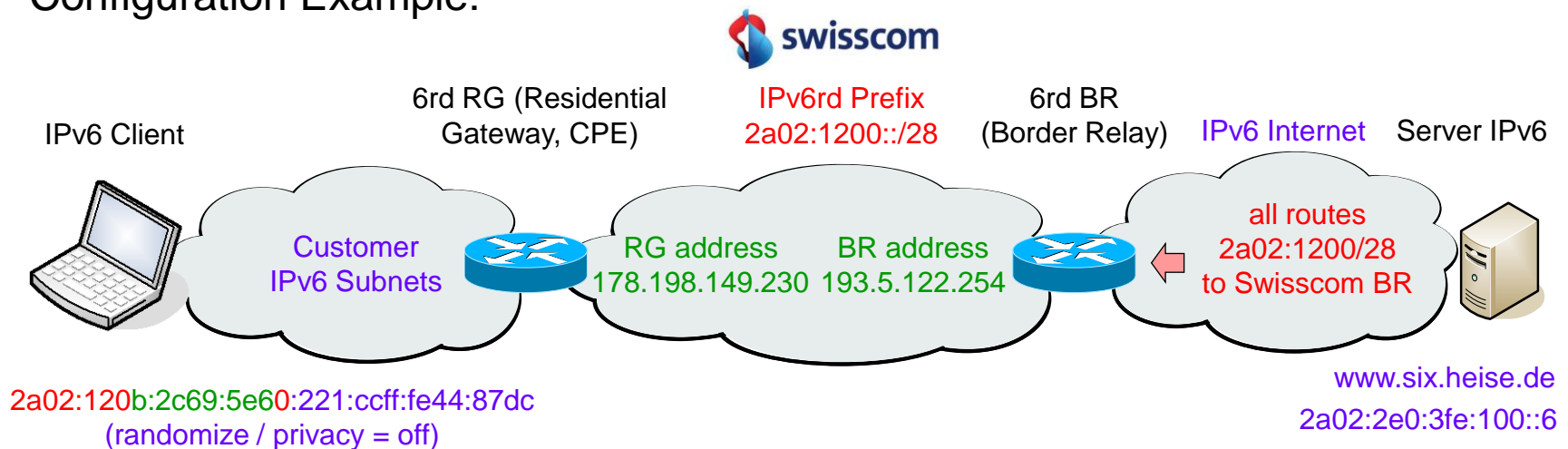


Transition Technologies, 6rd

6rd Rapid Deployment Tunnel

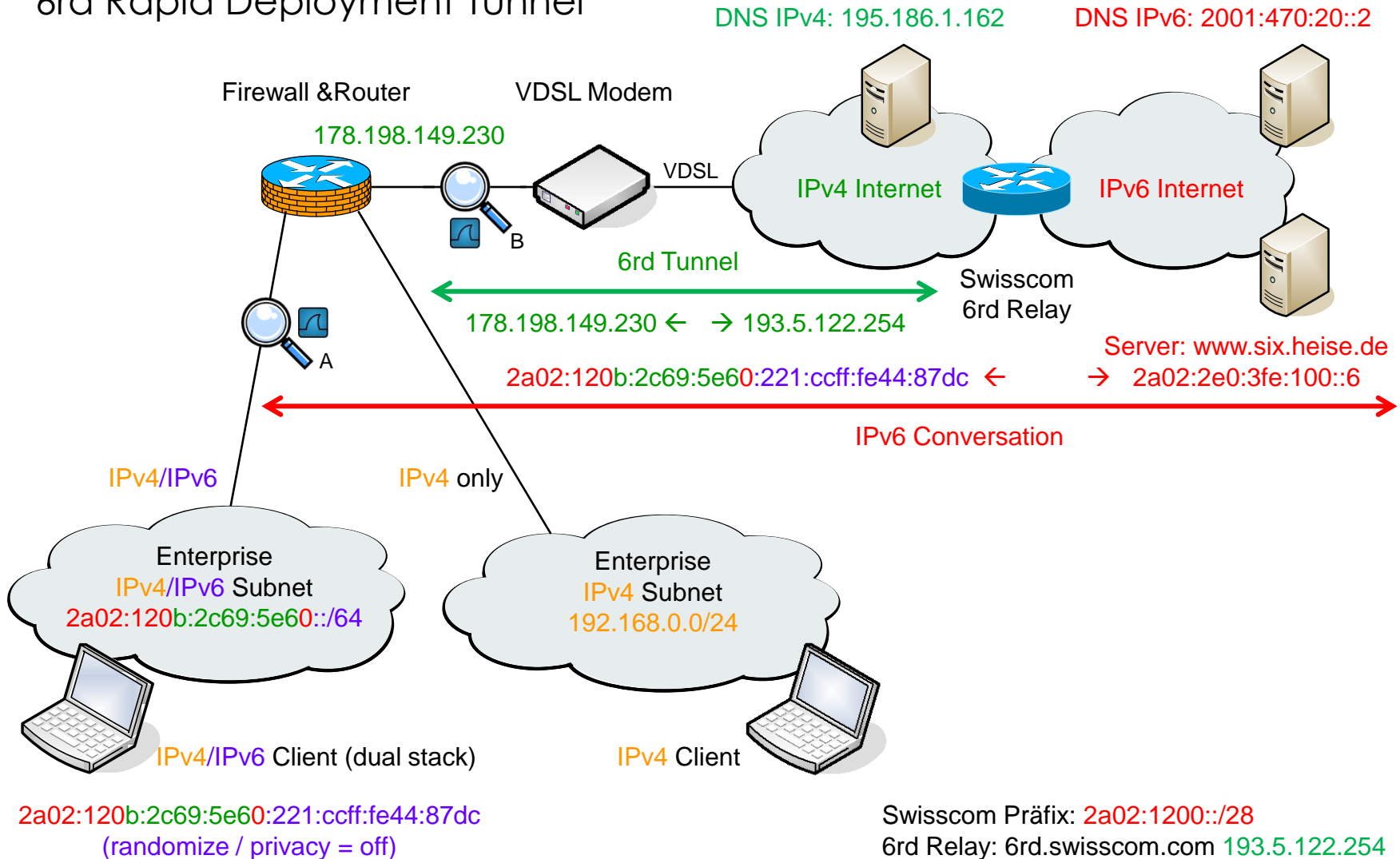
- Easy and fast deployments for **ISPs**
- **Simple, stateless, automatic** IPv6-in-IPv4 encap and decap functions
- IPv6 traffic automatically **follows IPv4 Routing** between CPE and BR
- From **Swisscom** offered as IPv6 Service (Pilot, today ~22'000 customers)
- Provides **native IPv6** access to home user

Configuration Example:



Transition Technologies, 6rd

6rd Rapid Deployment Tunnel



Transition Technologies, 6rd

6rd Rapid Deployment Tunnel

The image shows a Wireshark capture of network traffic. The main pane displays a list of packets with columns for No., Time, Source, Destination, Length, Protocol, and Info. Packet 5 is highlighted in red, showing a TCP SYN packet from an IPv6 client to www.wireshark.ch. Packet 6 is highlighted in grey, showing a TCP SYN-ACK packet from www.wireshark.ch to the IPv6 client. Packet 7 is highlighted in green, showing a TCP ACK packet from the IPv6 client to www.wireshark.ch. Packet 8 is highlighted in green, showing an HTTP GET request from the IPv6 client to www.wireshark.ch. Packets 9-12 are highlighted in green and represent TCP segments of a reassembled PDU. Packets 13 and 14 are highlighted in green and represent TCP ACK packets from the IPv6 client to www.wireshark.ch.

No.	Time	Source	Destination	Length	Protocol	Info
1	0.000000	IPv6-Client	ordns.he.net	116	DNS	Standard query A www.wireshark.ch
2	0.027174	ordns.he.net	IPv6-Client	132	DNS	Standard query response A 82.195.224.120
3	0.001792	IPv6-Client	ordns.he.net	116	DNS	Standard query AAAA www.wireshark.ch
4	0.030699	ordns.he.net	IPv6-Client	144	DNS	Standard query response AAAA 2001:1b50::82:195:224:120
5	0.026237	IPv6-Client	www.wireshark.ch	106	TCP	49650 > http [SYN] Seq=0 win=8192 Len=0 MSS=1420 WS=4 SACK_PERM=
6	0.034712	www.wireshark.ch	IPv6-Client	106	TCP	http > 49650 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=1440 WS=
7	0.001513	IPv6-Client	www.wireshark.ch	94	TCP	49650 > http [ACK] Seq=1 Ack=1 Win=17040 Len=0
8	0.000179	IPv6-Client	www.wireshark.ch	408	HTTP	GET /de/ HTTP/1.1
9	0.039427	www.wireshark.ch	IPv6-Client	1514	TCP	[TCP segment of a reassembled PDU]
10	0.001987	www.wireshark.ch	IPv6-Client	1514	TCP	[TCP segment of a reassembled PDU]
11	0.000500	www.wireshark.ch	IPv6-Client	1514	TCP	[TCP segment of a reassembled PDU]
12	0.002254	www.wireshark.ch	IPv6-Client	1514	TCP	[TCP segment of a reassembled PDU]
13	0.000640	IPv6-Client	www.wireshark.ch	94	TCP	49650 > http [ACK] Seq=315 Ack=2841 win=17040 Len=0
14	0.002092	IPv6-Client	www.wireshark.ch	94	TCP	49650 > http [ACK] Seq=315 Ack=5681 win=17040 Len=0

Frame 5: 106 bytes on wire (848 bits), 106 bytes captured (848 bits)
Ethernet II, Src: ZyxelCom_3b:41:3f (c8:6c:87:3b:41:3f), Dst: ThomsonT_63:ff:04 (00:90:d0:63:ff:04)
Internet Protocol Version 4, Src: 230-149.198-178.cust.bluewin.ch (178.198.149.230), Dst: 6rd.ip-plus.net (193.5.122.254)
Internet Protocol Version 6, Src: IPv6-Client (2a02:120b:2c69:5e60:221:ccff:fe44:87dc), Dst: www.wireshark.ch (2001:1b50::)
Transmission Control Protocol, Src Port: 49650 (49650), Dst Port: http (80), Seq: 0, Len: 0

IPv6 Session Summary

- Verify IPv6 readiness of your suppliers
- Verify IPv6 readiness of your applications
- IPv6 can perfectly coexist with IPv4
- Start experimenting using 6rd Tunnel
- Network migration can be done smoothly
- Train yourself and your people
- Wireshark is the perfect tool to learn and train
- Interesting IPv6 references:

How to get



www.worldipv6launch.org Organized by the Internet Society, World IPv6 Launch on 6 June 2012 is intended to motivate organizations across the industry to prepare for and permanently enable Internet Protocol version 6.

www.sixxs.net IPv6 Deployment and IPv6 Tunnel Broker, helping to deploy IPv6 around the world, IPv6 monitoring, IPv6 routing monitoring, IPv6 coordination.

www.ipv6forum.com World-wide consortium of Internet vendors aiming to promote IPv6. Includes mailing lists, event listings, technical information, and links

Our Trainings

NET-Analysis with Wireshark

2 days introduction to Network Analysis using Wireshark. A perfect quick start and overview of Wireshark's almost unlimited possibilities for troubleshooting and analysing problems in TCP/IP, WLAN, VoIP network.

WLAN Wireshark Network Analyser Training

3 days training providing in-depth knowledge and skills in WLAN 802.11a/b/g/n technology, analysing and troubleshooting problems using the Wireshark® network analyser and AirPcap USB WLAN Adapters.

TCP/IP Wireshark Network Analyser Training

3 days training providing in-depth knowledge and skills in TCP/IP network technology, analysing and troubleshooting problems using the Wireshark® network analyser. Covering also all important new features of TCP like Window Scaling, Selective Acknowledges, Time Stamp, Checksum & Chimney offloading, Win7 Auto tuning, Wireshark TCP Expert System & TCP Graph and many more.

VoIP Wireshark Network Analyser Training

2 days hands-on training analysing most popular VoIP protocols like Session Initiation Protocol (SIP), H.323 Protocol, Session Description Protocol (SDP), Skinny Client Control Protocol (SCCP), Real-time Transport Protocol (RTP), RTP Control Protocol (RTCP), Megaco/H.248 Gateway Control Protocol, Media Gateway Control Protocol (MGCP) using the Wireshark® network analyser.

IPv6 Wireshark Network Analyser Training

2 days training providing in-depth knowledge and skills in IPv6 network technology, analyzing and troubleshooting protocols & processes like "Automatic Address Configuration", "Neighbor & Router Discovery", "Multicast Listener Discovery", Tunnelling Methods ISATAP, Teredo, 6to4, 6rd etc.

In-house Wireshark Training

If you need to train more than 4 students, please ask for customized in-house and onsite courses. All training are provided by highly experienced and certified network professionals from Leutert NetServices in English and German. Please ask for an offer through info@wireshark.ch

Our complete list of trainings & locations on <http://www.wireshark.ch/de/wireshark-kurse/oeffentliche-kurse>

Thanks for visiting



Rolf Leutert, Leutert NetServices, www.wireshark.ch