Discovering Provisioning Domain Names and Data

draft-ietf-intarea-provisioning-domains-02

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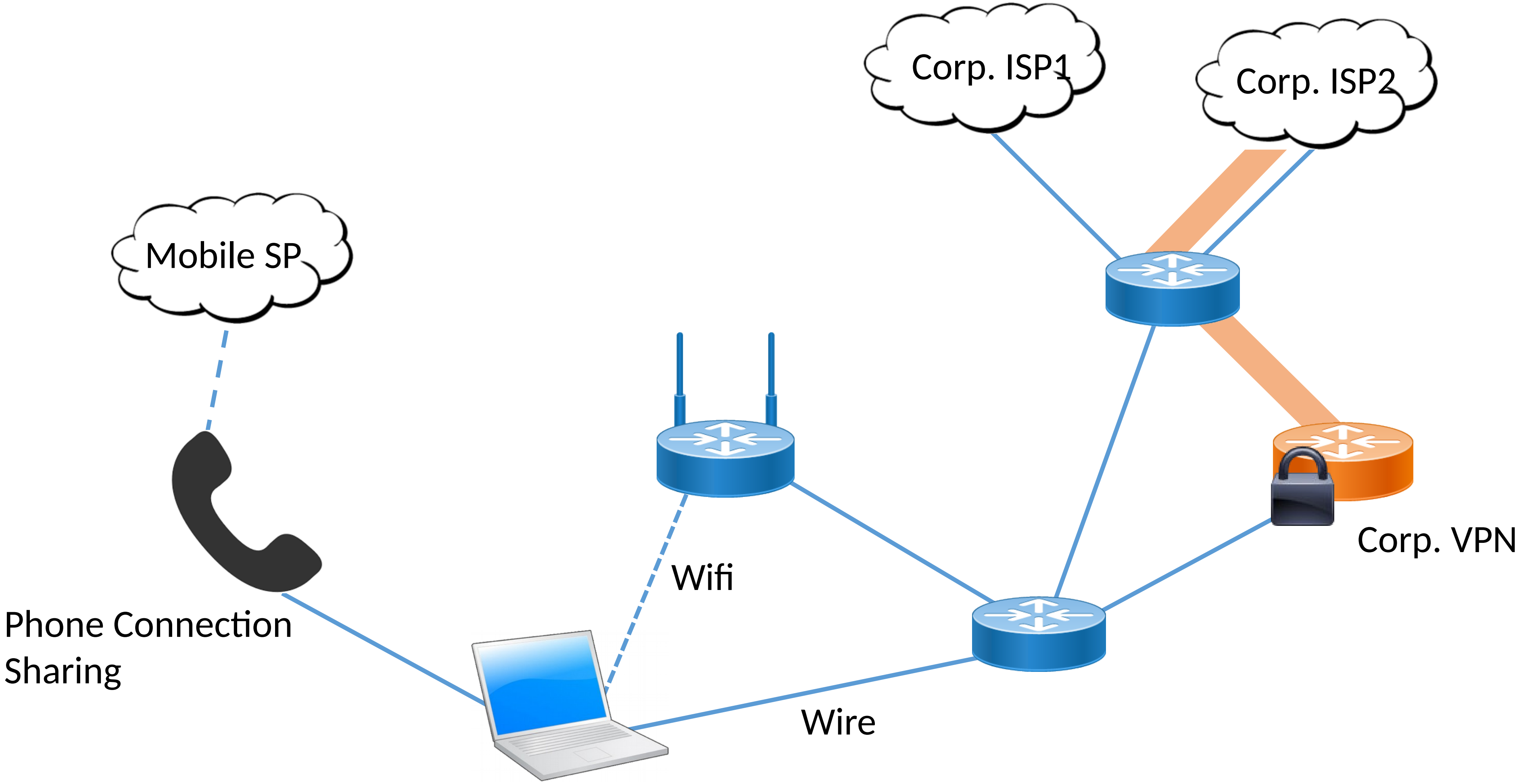
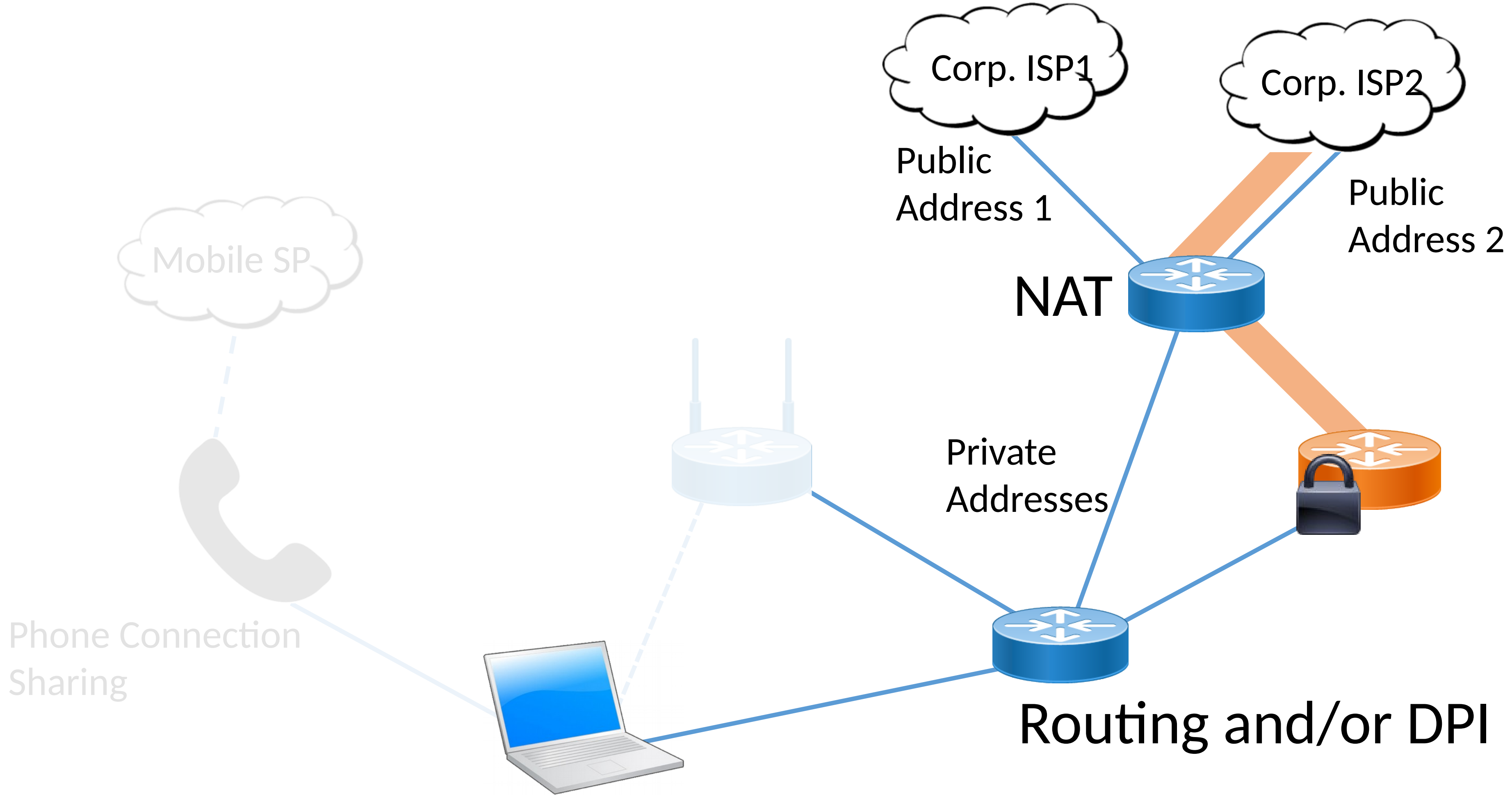
IETF-102, Montréal, July 2018

Hosts and networks are multi-homed

Just a few examples…



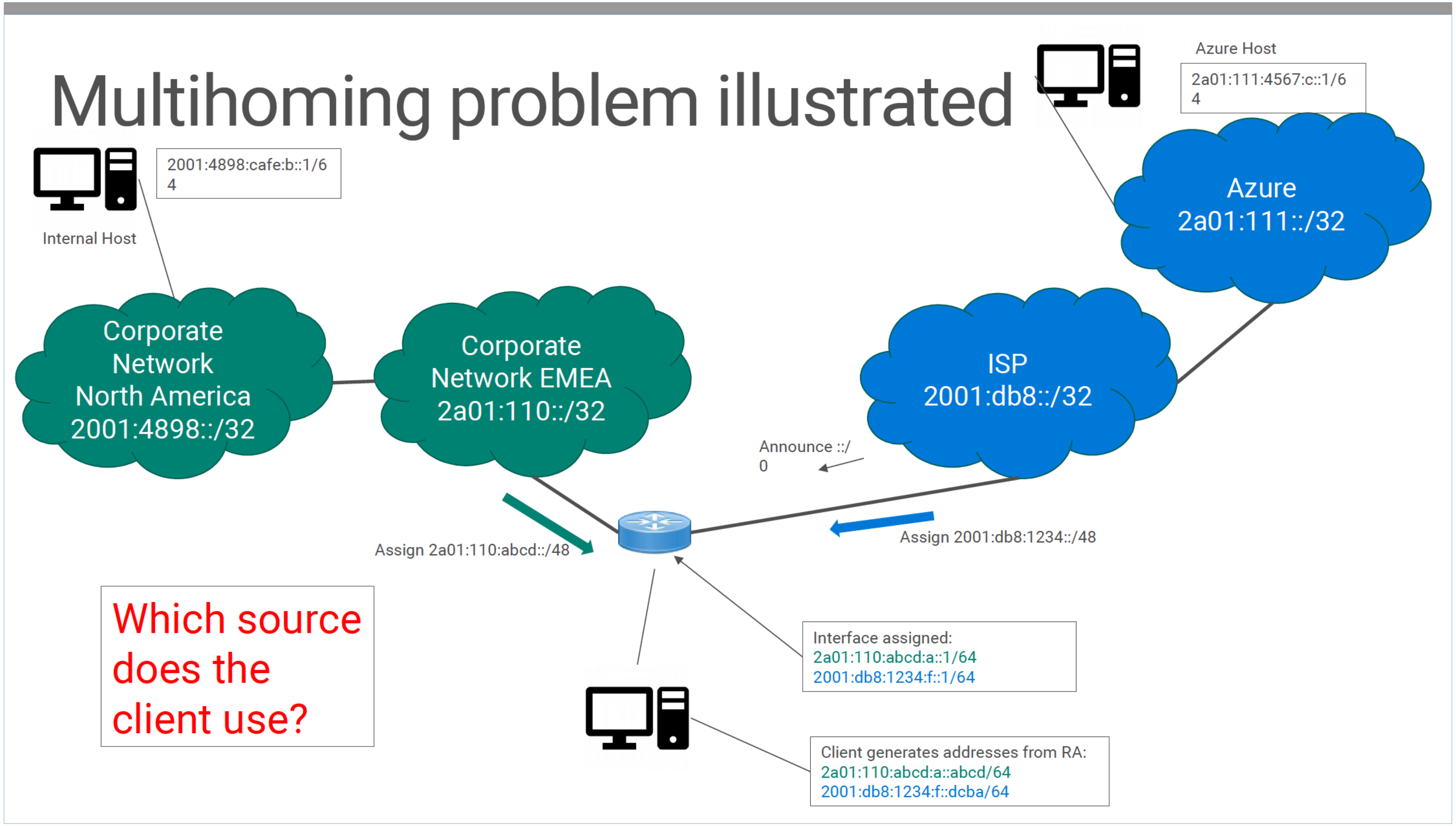
Multi-Homing, the legacy way…



Multi-Homed networks in IPv6

- Assign provider assigned (PA) addresses to hosts.
  - Native to IPv6 hosts (RFC4861, …)
  - HNCP for home networks (RFC7788)
  - draft-ietf-rtgwg-enterprise-pa-multihoming-07 for corp. networks.

- Teach the hosts to pick and use multiple addresses.
  - IPv6 source address selection (RFC6724)
  - draft-linkova-6man-default-addr-selection-update
  - draft-ietf-v6ops-conditional-ras-05
  - Multi-Path TCP (RFC6824)



Multihoming problem illustrated

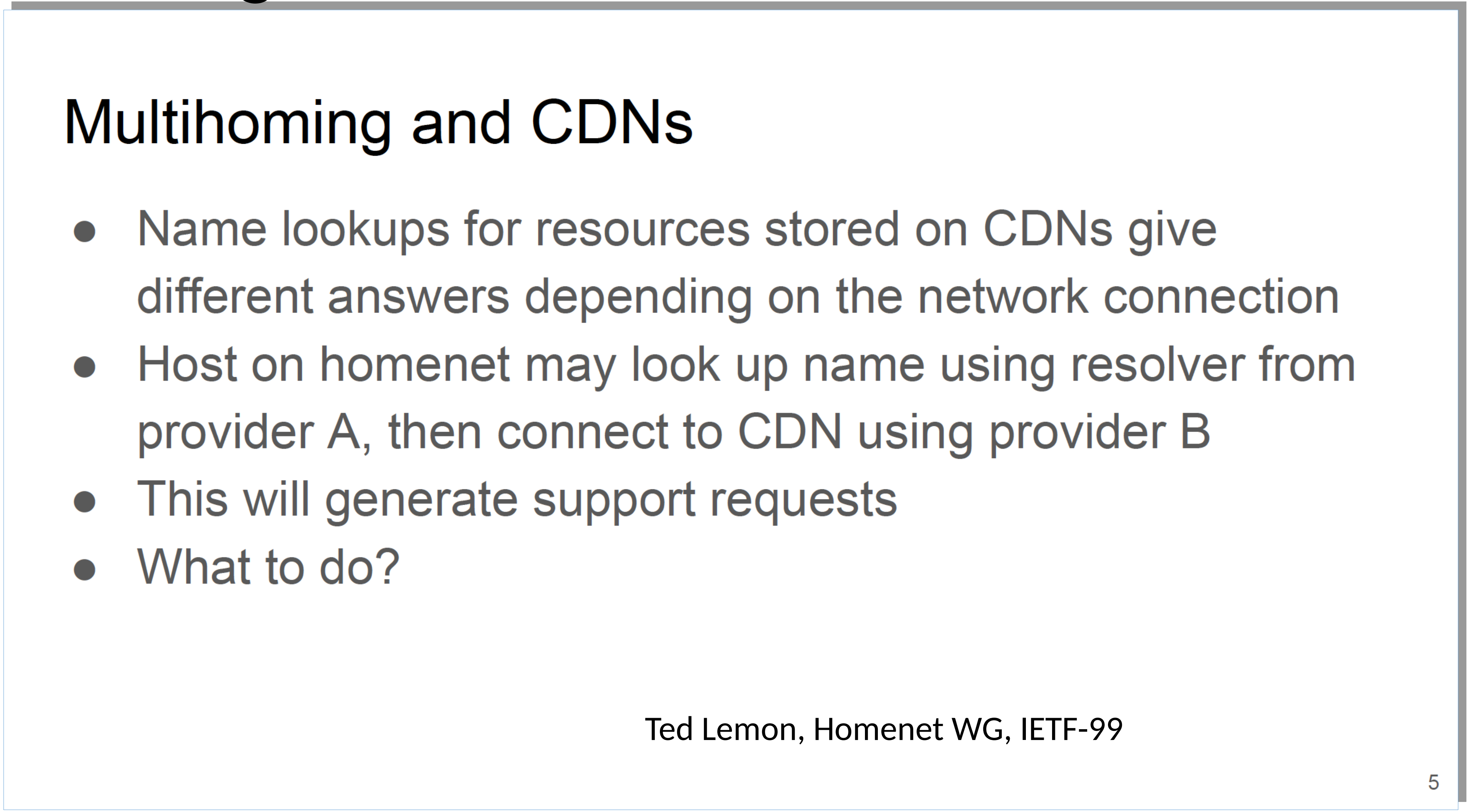
Interface assigned:
2a01:110:abcd:a::1/64
2001:db8:1234:f::1/64

Client generates addresses from RA:
2a01:110:abcd:a::abcd/64
2001:db8:1234:f::dcba/64

Which source does the client use?

From Marcus Kean, Microsoft IT, at V6OPS IETF-99

Bundling IP address & DNS resolver



Multihoming and CDNs

- Name lookups for resources stored on CDNs give different answers depending on the network connection
- Host on homenet may look up name using resolver from provider A, then connect to CDN using provider B
- This will generate support requests
- What to do?

Ted Lemon, Homenet WG, IETF-99

The purpose of this draft is to:

1. Identify Provisioning Domains (PvDs).

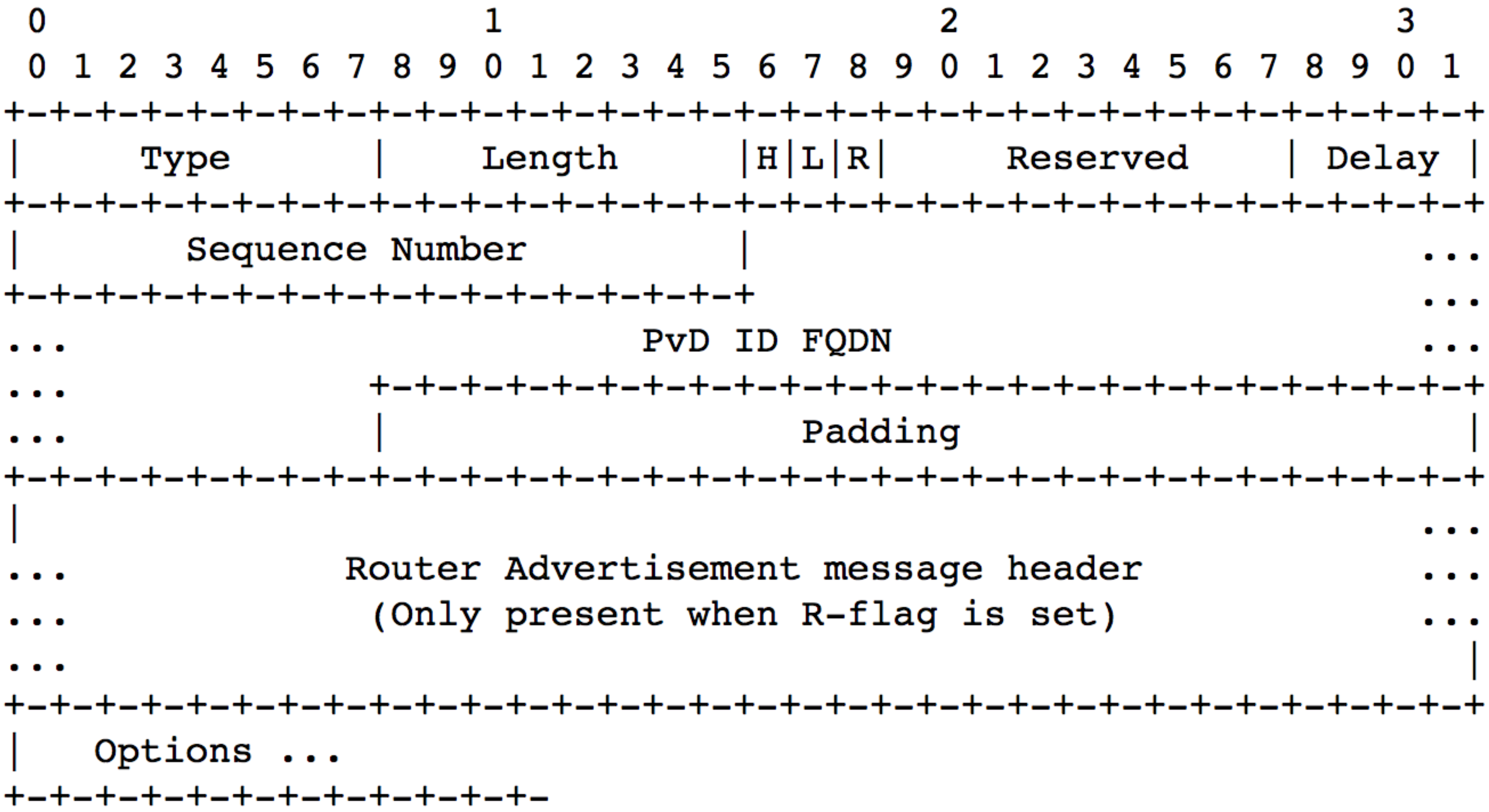
[RFC7556] *Provisioning Domains (PvDs) are consistent sets of network properties that can be implicit, or advertised explicitly.*

Differentiate provisioning domains by using FQDN identifiers.

2. Give PvD Additional Information.

Name, characteristics, captive portal, etc…

Step 1: PvD ID

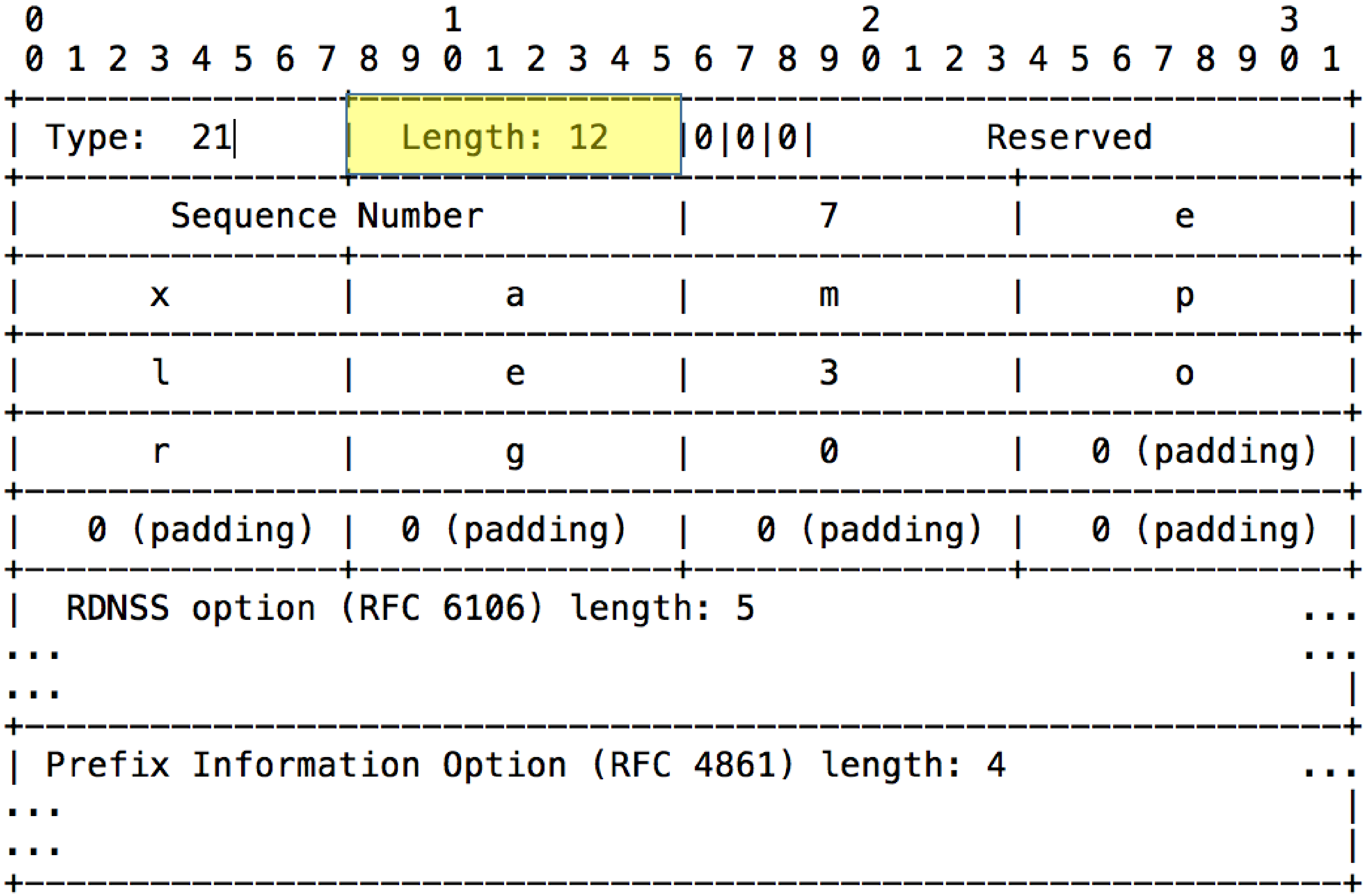


```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Type      |    Length     |H|L|R|     Reserved    | Delay |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Sequence Number         |                             ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+                             ...
...                         PvD ID FQDN                       ...
...             +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
...             |                  Padding                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                             ...
...            Router Advertisement message header            ...
...             (Only present when R-flag is set)             ...
...                                                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Options ...
+-+-+-+-+-+-+-+-+-+-+-+-
```

Step 1: Identify PvDs

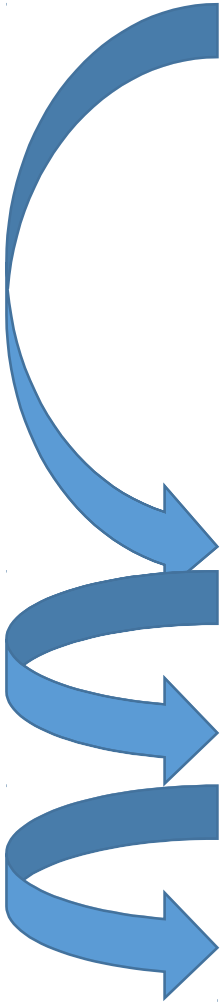
- At most **one occurrence in each RA**.
- **PvD ID is an FQDN** associated with options in the RA**.**
- **Implicit PvDs** (without option) identified by **RA source address and interface**.
- **L bit** to indicate the **PvD has DHCPv4 on the link**.
- **H bit** to indicate **Additional Information is available with HTTPS**.
- **R bit** to indicate that another RA header is included
- Seq. number used for **push-based refresh**.
- **Delay** is for exponential backoff when refreshing

PvD ID Example

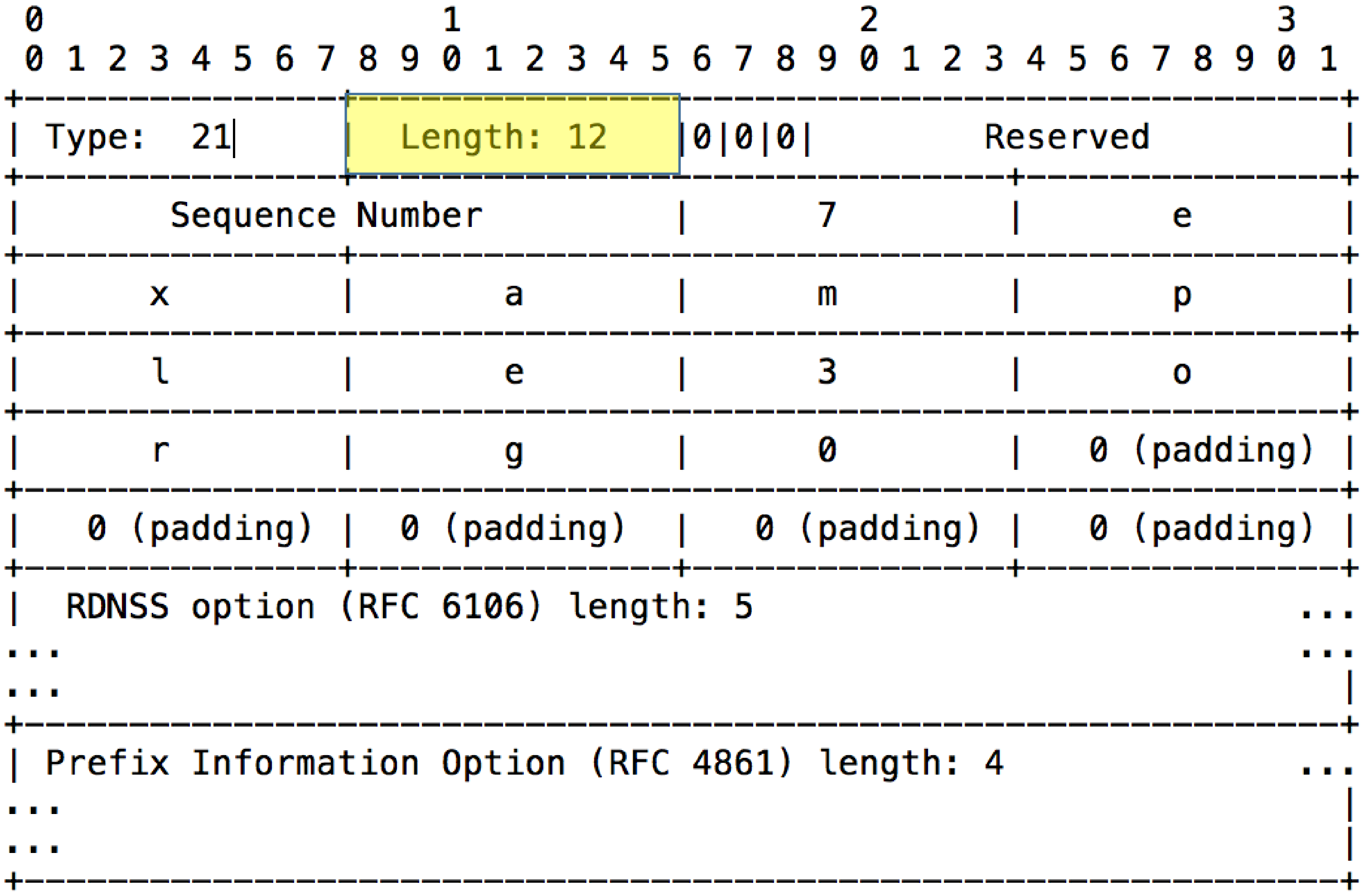


```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---------------------------------------------------------------+
| Type:  21     |  Length: 12   |0|0|0|        Reserved         |
+---------------+-------------------------------+---------------+
|       Sequence Number         |      7        |       e       |
+---------------+-----------------------------------------------+
|      x        |       a       |      m        |       p       |
+---------------------------------------------------------------+
|      l        |       e       |      3        |       o       |
+---------------------------------------------------------------+
|      r        |       g       |      0        |   0 (padding) |
+---------------------------------------------------------------+
|   0 (padding) |  0 (padding)  |   0 (padding) |   0 (padding) |
+---------------+---------------+---------------+---------------+
|  RDNSS option (RFC 6106) length: 5                         ...
...                                                          ...
...                                                             |
+---------------------------------------------------------------+
| Prefix Information Option (RFC 4861) length: 4              ...
...                                                             |
...                                                             |
+---------------------------------------------------------------+
```

PvD ID Example

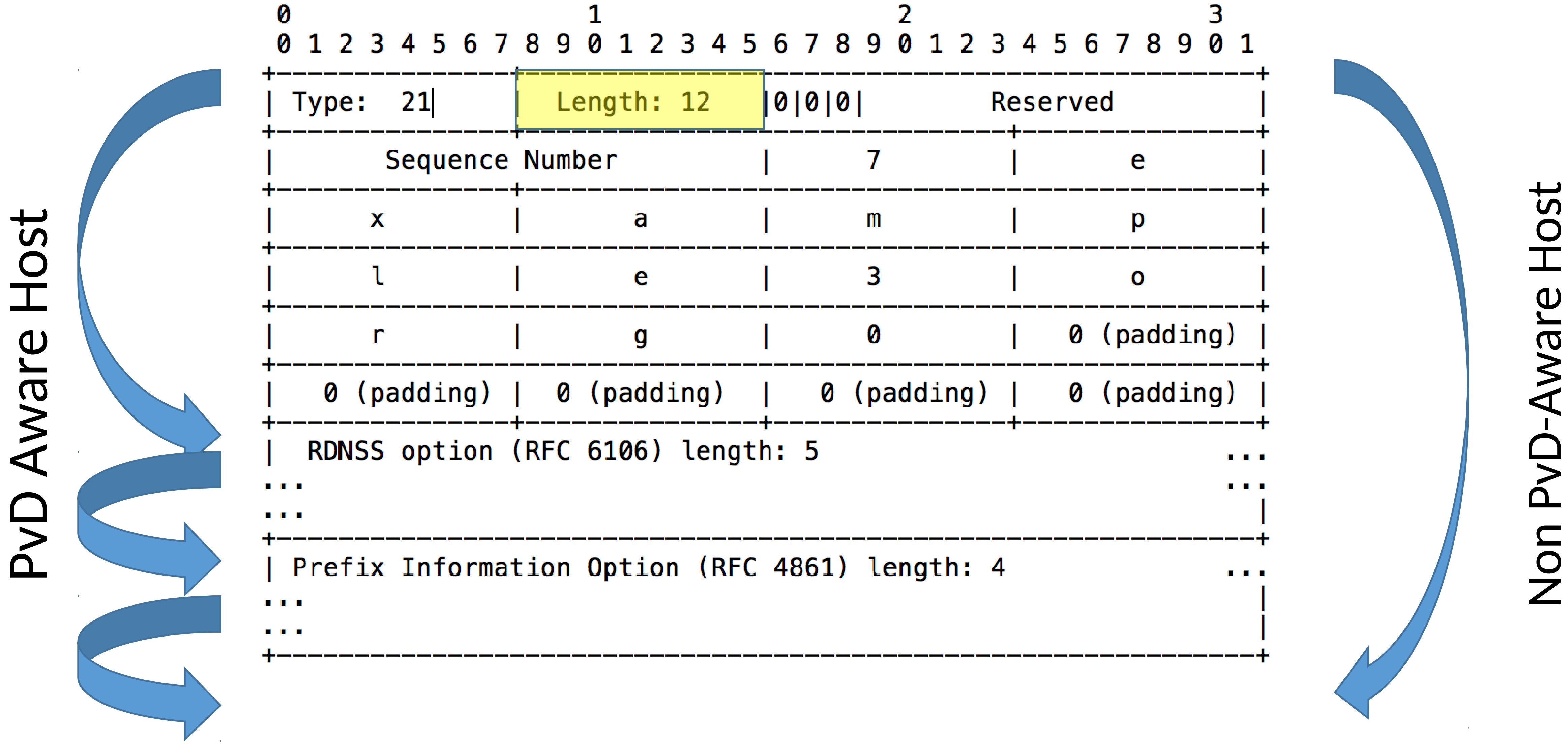


PvD Aware Host



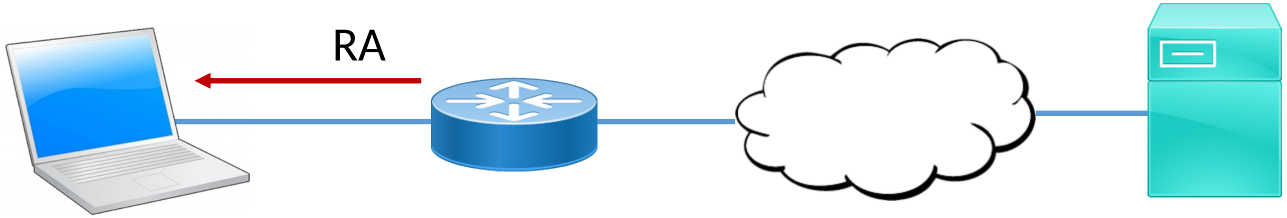
```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---------------+---------------+---------------+---------------+
| Type:   21    |   Length: 12  |0|0|0|          Reserved       |
+---------------+---------------+---------------+---------------+
|        Sequence Number        |       7       |       e       |
+---------------+---------------+---------------+---------------+
|       x       |       a       |       m       |       p       |
+---------------+---------------+---------------+---------------+
|       l       |       e       |       3       |       o       |
+---------------+---------------+---------------+---------------+
|       r       |       g       |       0       | 0 (padding)   |
+---------------+---------------+---------------+---------------+
|  0 (padding)  |  0 (padding)  |  0 (padding)  | 0 (padding)   |
+---------------+---------------+---------------+---------------+
|  RDNSS option (RFC 6106) length: 5                          ...
...                                                           ...
...                                                             |
+---------------------------------------------------------------+
| Prefix Information Option (RFC 4861) length: 4              ...
...                                                             |
...                                                             |
+---------------------------------------------------------------+
```

PvD ID Example



```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---------------------------------------------------------------+
| Type:   21    |   Length: 12  |0|0|0|        Reserved         |
+-----------------------------------------------+---------------+
|        Sequence Number        |       7       |       e       |
+---------------+-----------------------------------------------+
|       x       |       a       |       m       |       p       |
+---------------------------------------------------------------+
|       l       |       e       |       3       |       o       |
+---------------------------------------------------------------+
|       r       |       g       |       0       |  0 (padding)  |
+---------------------------------------------------------------+
|  0 (padding)  |  0 (padding)  |  0 (padding)  |  0 (padding)  |
+---------------+---------------+---------------+---------------+
|  RDNSS option (RFC 6106) length: 5                          ...
...                                                           ...
...                                                             |
+---------------------------------------------------------------+
| Prefix Information Option (RFC 4861) length: 4              ...
...                                                             |
...                                                             |
+---------------------------------------------------------------+
```

Step 2: Get the PvD Additional Data

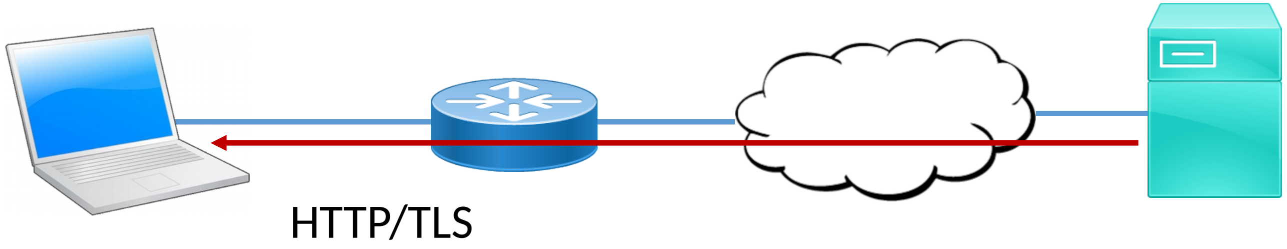


When the H bit is set:

GET https://<pvd-id>/.well-known/pvd

Using network configuration (source address, default route, DNS, etc...) **associated with the received PvD**.

Step 2: Get the PvD Additional Data



When the H bit is set:

GET https://<pvd-id>/.well-known/pvd

Using network configuration (source address, default route, DNS, etc…) **associated with the received PvD**.

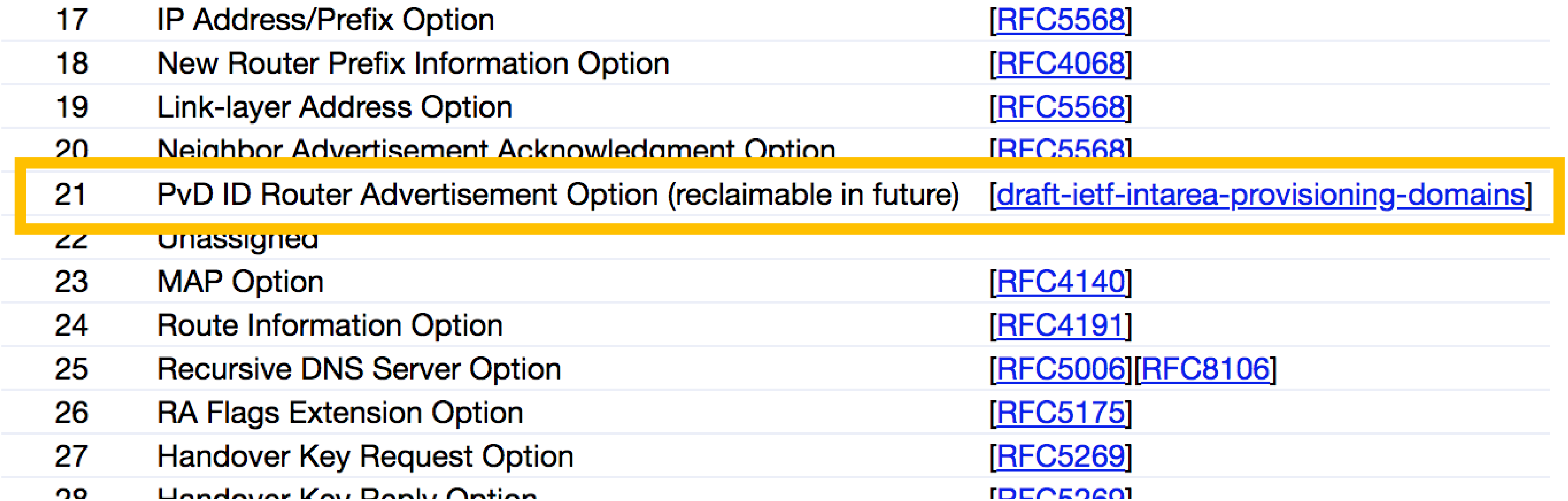
Step 2: Get the PvD Additional Data

```
{
  "name": "Foo Wireless",
  "expires": "2017-07-23T06:00:00Z",
  "prefixes" : ["2001:db8:1::/48", "2001:db8:4::/48"]
}
```

Some other examples (see also https://smart.mpvd.io/.well-known/pvd)
as well as draft-pfister-capport-pvd-00

```
captive-api : "https://captive.org/api”
```

Big News from IANA



17	IP Address/Prefix Option	[RFC5568]
18	New Router Prefix Information Option	[RFC4068]
19	Link-layer Address Option	[RFC5568]
20	Neighbor Advertisement Acknowledgment Option	[RFC5568]
21	PvD ID Router Advertisement Option (reclaimable in future)	[draft-ietf-intarea-provisioning-domains]
22	Unassigned	
23	MAP Option	[RFC4140]
24	Route Information Option	[RFC4191]
25	Recursive DNS Server Option	[RFC5006][RFC8106]
26	RA Flags Extension Option	[RFC5175]
27	Handover Key Request Option	[RFC5269]
28	Handover Key Reply Option	[RFC5269]

Implementation status

Linux - https://github.com/IPv6-mPvD

- pvdd: A Daemon to manage PvD IDs and Additional Data
- Linux Kernel patch for RA processing
- iproute tool patch to display PvD IDs
- Wireshark dissector
- RADVD and ODHCPD sending PvD ID

IPv6 mPvD + NEAT + SADR + Capport

=

IETF 101 Hackathon

AWESOME

Hack & Interrop

Tom Jones

UNIVERSITY OF ABERDEEN

Wenqin Shao

TELECOM ParisTech

Kyle Larose

SANDVINE

Pierre Pfister

Eric Vyncke

CISCO

Michael Di Bartolomeo

LIÈGE université