Using Subnet-Specific Link-Local Addresses to Improve SLAAC Robustness

draft-link-v6ops-gulla-01

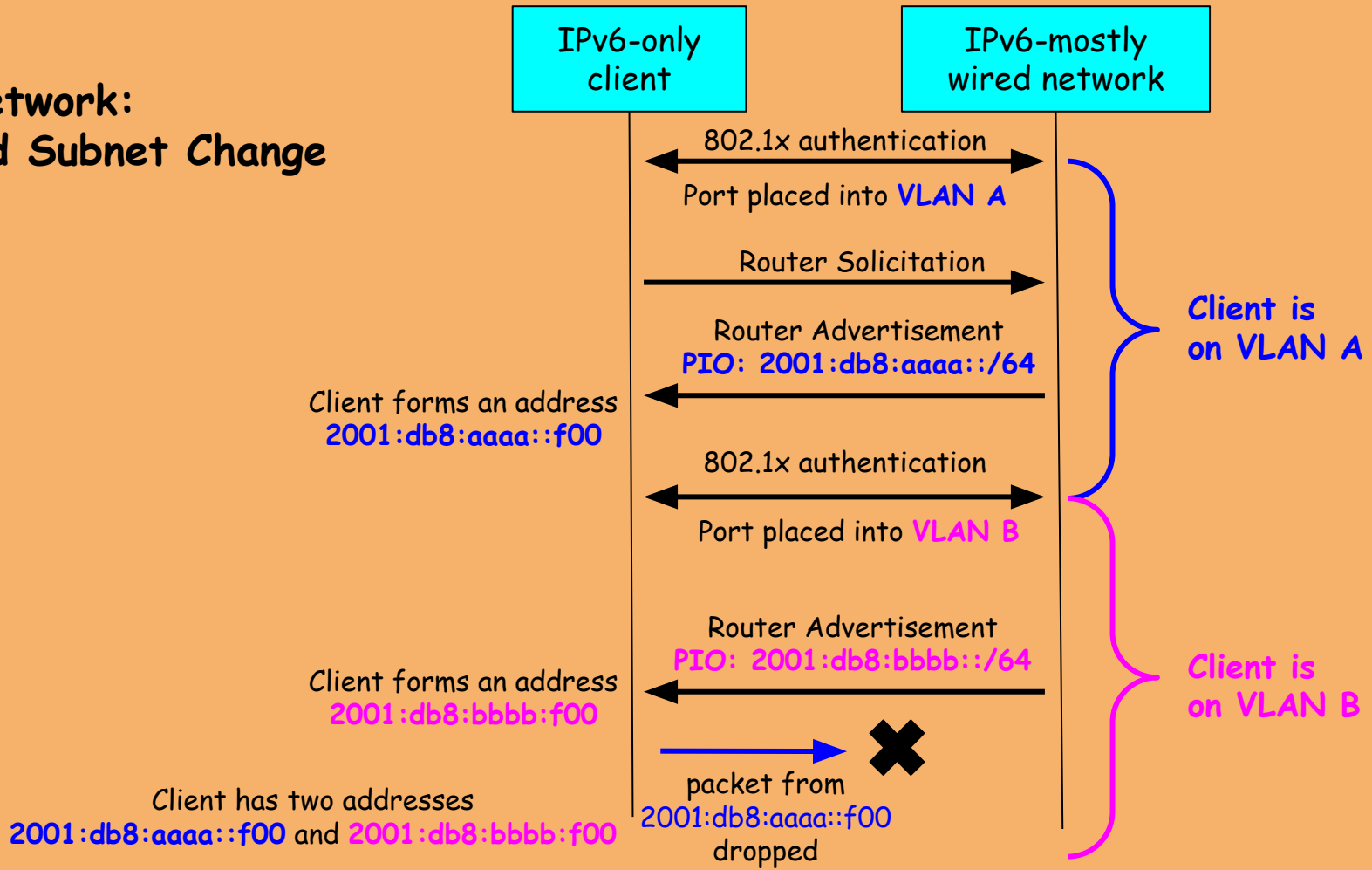
Jen Linkova, IETF119, March 2024, AU

Renumbering Scenarios: Examples

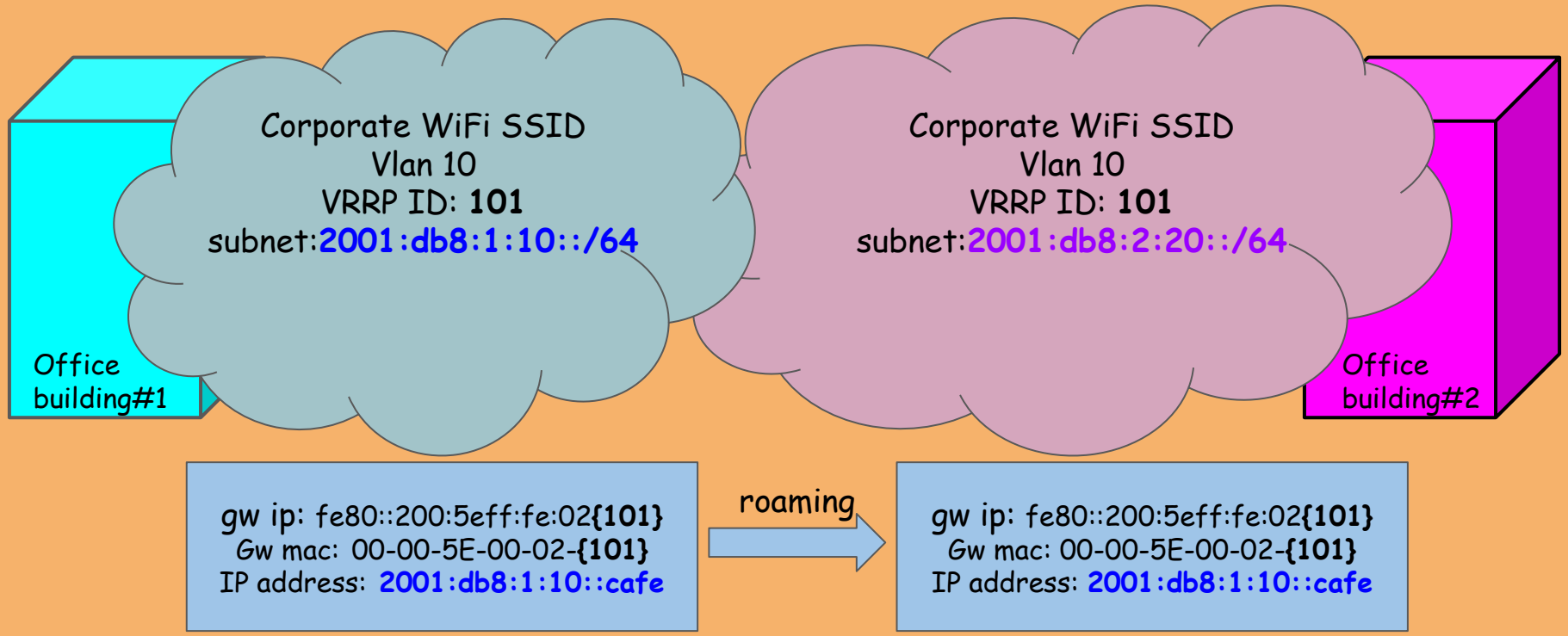
- DHCPv6 PD prefix change
  - CPE might not deprecate the old prefix
- SLAAC prefix change as a result of network maintenance/changes
- Hosts moving between links
- VLAN change as a result of 802.1x authentication or switchport config change

Also: Multihoming

Wired Network:
VLAN and Subnet Change

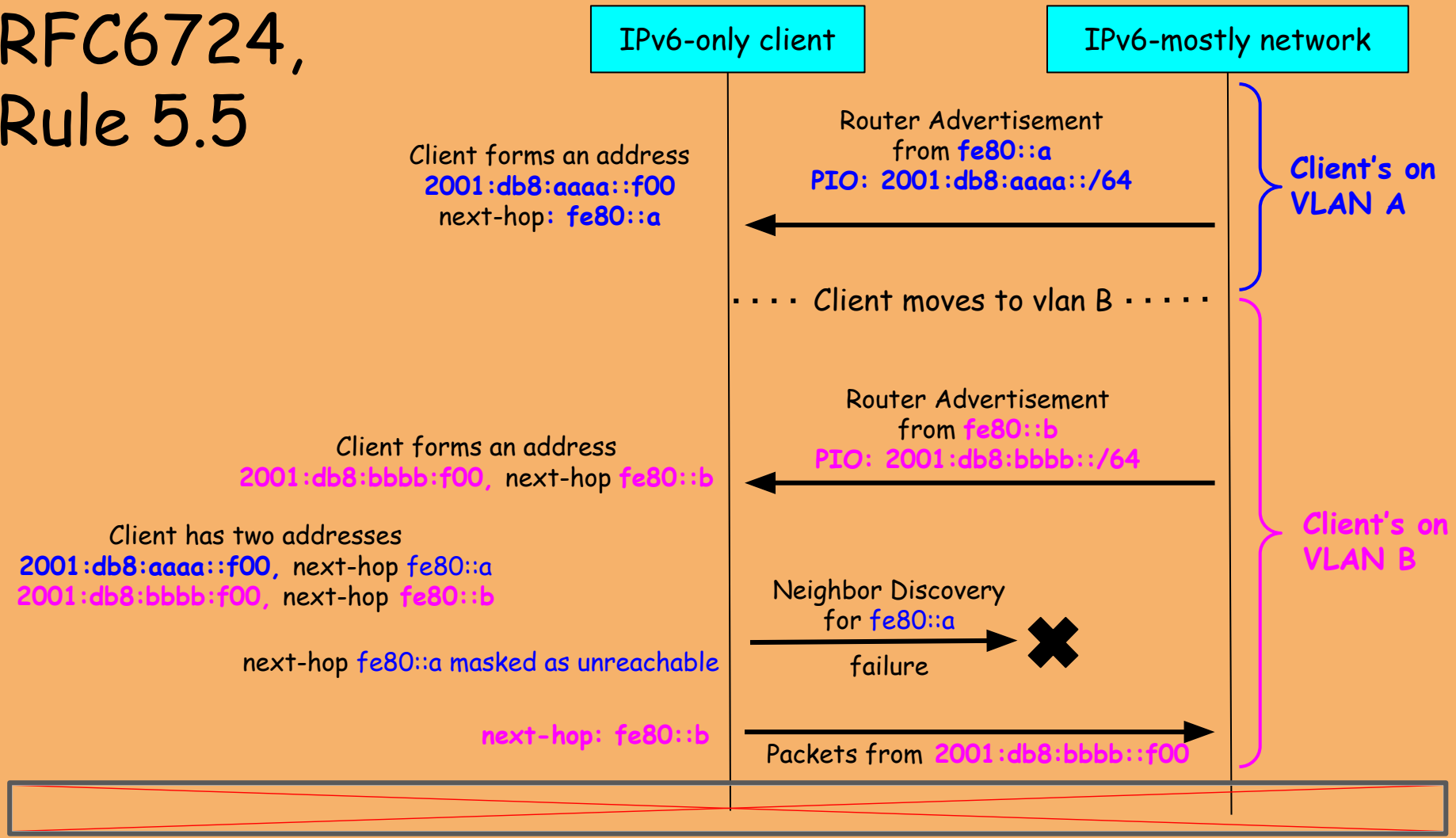


Roaming Case



Default gateway IP and MAC didn't change, so the host is keeping old addresses

RFC6724, Rule 5.5



Router Link-Local Addresses

- If VRRP is used, link-local address might be the same for the same ID
- Administrators often configure fe80::1
- Routers use RFC7217 or EUI-64 for generating link-local
  - Such addresses do not change in case of:
    - DHCPv6-PD prefix change
    - Any other forms of renumbering

Solution:

- Ensure that when a link (or subnet) changes, the router link-local address changes as well.
- Interface ID as a function of prefixes on the link (PIOs in RA)
- If the subnet changes, the host would receive an RA from a different link-local address

Generating Interface ID: Managed Case

Administrator can configure unique link-local addresses within the given domain (router/building/office/city/globally).

- Example 1:
  - The interface has 2001:db8:1:2::/64 configured,
  - link-local address: fe80::2001:db8:1:2
- Example 2:
  - VRRPv3 VIP: 2001:db8:1:2::1
  - Virtual link-local address: fe80::2001:db8:1:2

Generating Interface ID: Unmanaged (Default) Case

CPEs (and any other routers) MAY use RFC7217 (stable ID)

- Using list of PIOs as “prefix”

RAs containing those PIOs shall be sent from that link-local address

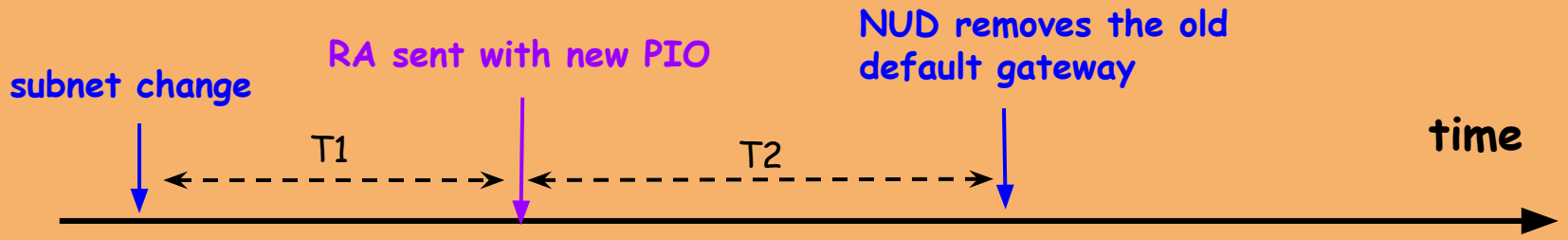
Stable Interface ID

It might be desirable to have a stable link-local address:

The router might run some services, such as DNS, on that address

Router MAY generate subnet-specific link-local addresses in addition to a stable link-local address.

Recovery Time



T1:

- CPE routers MUST advertise new prefix immediately (RFC7084, RFC9096)
- All other routers: "MAY" (with ~16 secs delay) (RFC4861)
- Proposed fix: draft-ietf-6man-slaac-renum (expired), draft-link-6man-truce

T2 is below 40secs

ReachableTime milliseconds (REACHABLE -> STALE) + DELAY_FIRST_PROBE_TIME + MAX_UNICAST_SOLICIT*RetransTimer = 30 seconds + 5 second + 3*1 = 38 seconds.

Multiple Prefixes on the Same Link

- GUA prefix + ULA prefix or Multihoming
- Changing one prefix shouldn't disturb communication for flows using other prefixes
- Solution (see Section 6.2.2 of RFC8678):
  - Send one RA per PIO
  - Use subnet-specific link-local address for each RA

This requires updating RFC4861
contradicting (expired) draft-ietf-6man-slaac-renum

Comments? Questions? Adoption call?