IPv6 Backbone Router draft-thubert-6lo-backbone-router-02

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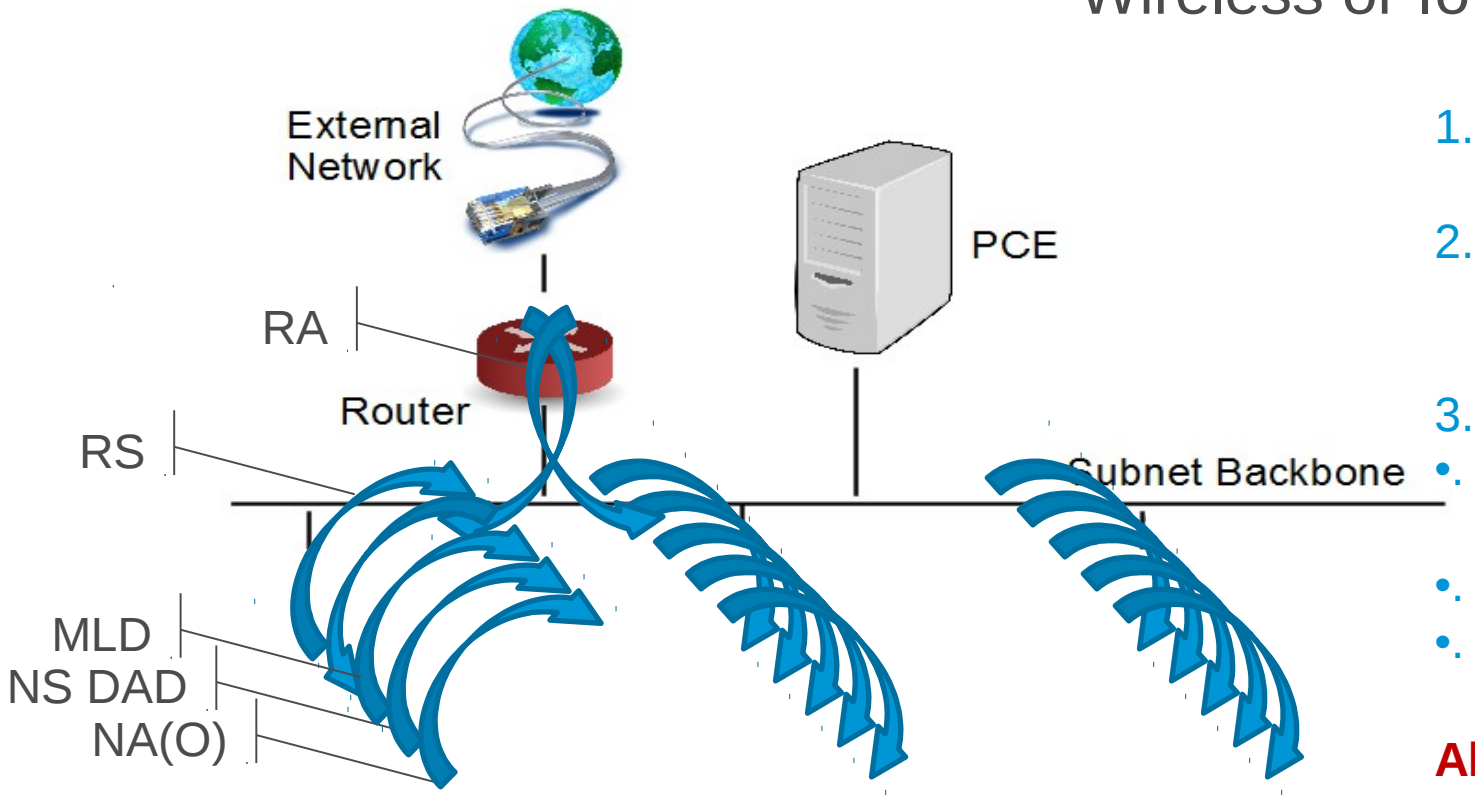
General Problem: flooding hinders wireless operations



IPv6 (virtual) device moves

Wireless or IoT device moves:

1. MAC address flooded over spanning tree for L2 switching
2. Device sends RS to all_routers to find a router and check if same link
3. For each address:
- Device subscribes to Solicited-node Multicast Address
- Device sends NS(DAD) to all
- Device sends NA (override) to all

All of IPv6 is multicast but handled as broadcast by the switch fabric Sent @ low speed from all APs

Protections: MLD snooping for SNMA (limited) and RS. Cisco: IPv6 FHS ND Suppress

What is 6BBR?

Initially

- A Layer 3 “association” for IPv6
- Based on MIPv6 binding update but with no tunnel
- Goal to register IPv6 addresses and do ND proxy
- https://www.ietf.org/proceedings/72/slides/6lowpan-0.pdf

Since Then

- Adopted @ 6LowPAN, adapted to ND messaging (NS ARO)
- ND proxy split from WG doc that became RFC 6775
- Finally ready for prime time

What is 6BBR?

Support for multilink subnet

- Which is typical of many LLN solutions

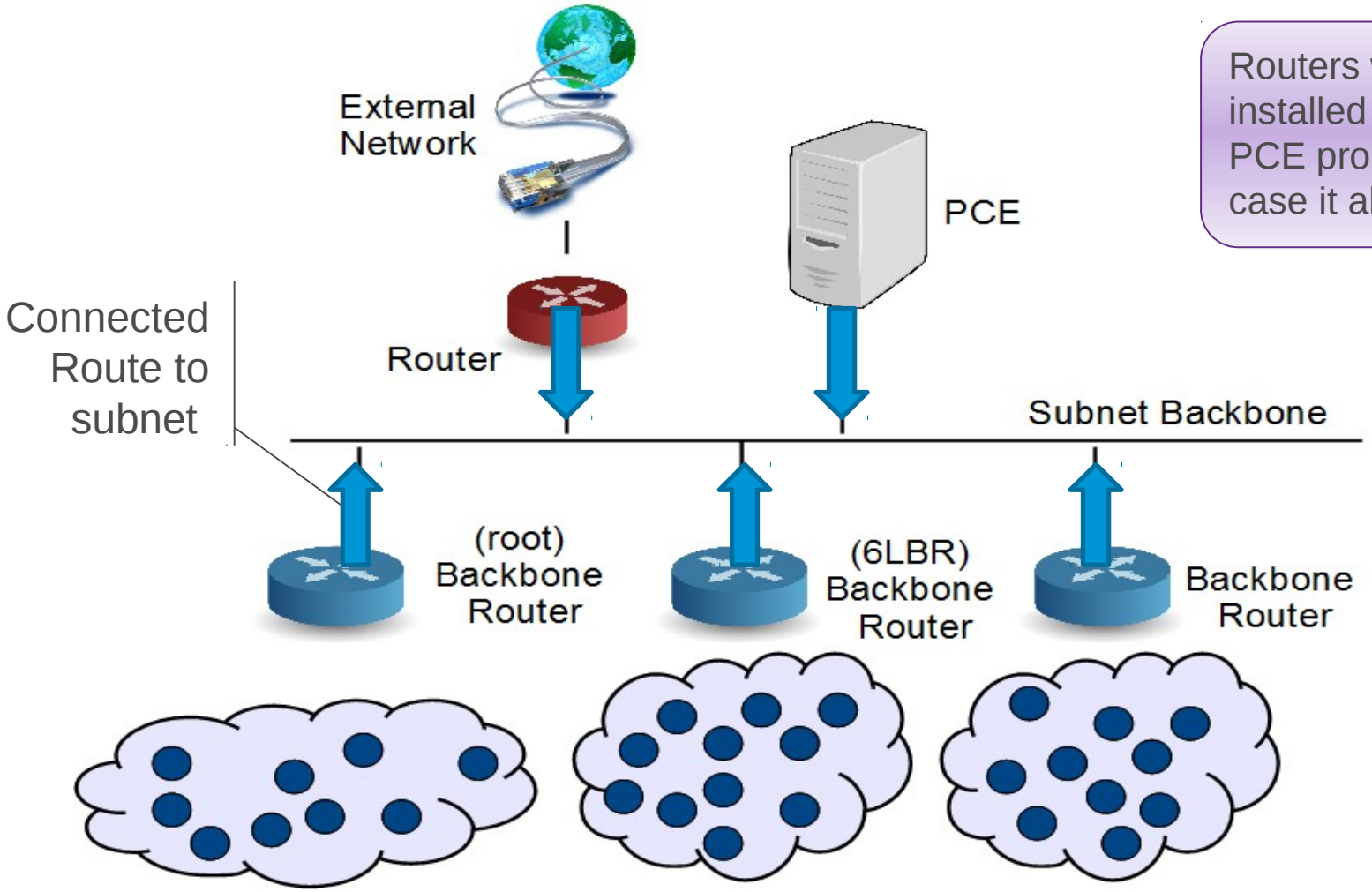
Support for multiple 6LBR == RPL root

- Support for device mobility between 6LBRs

Support for multiple 6LLN types

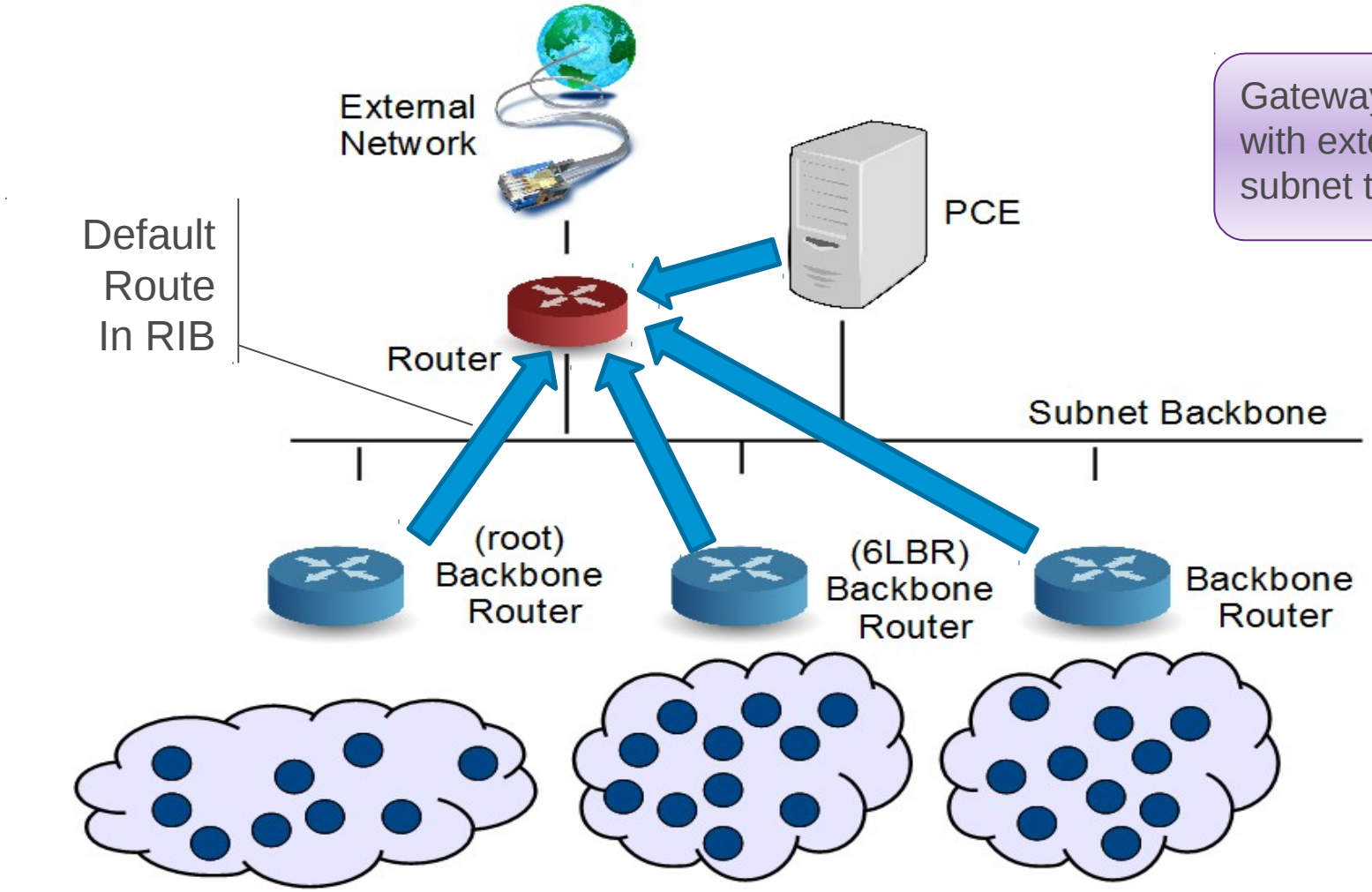
- BTLE, LP Wi-Fi …

Initial time



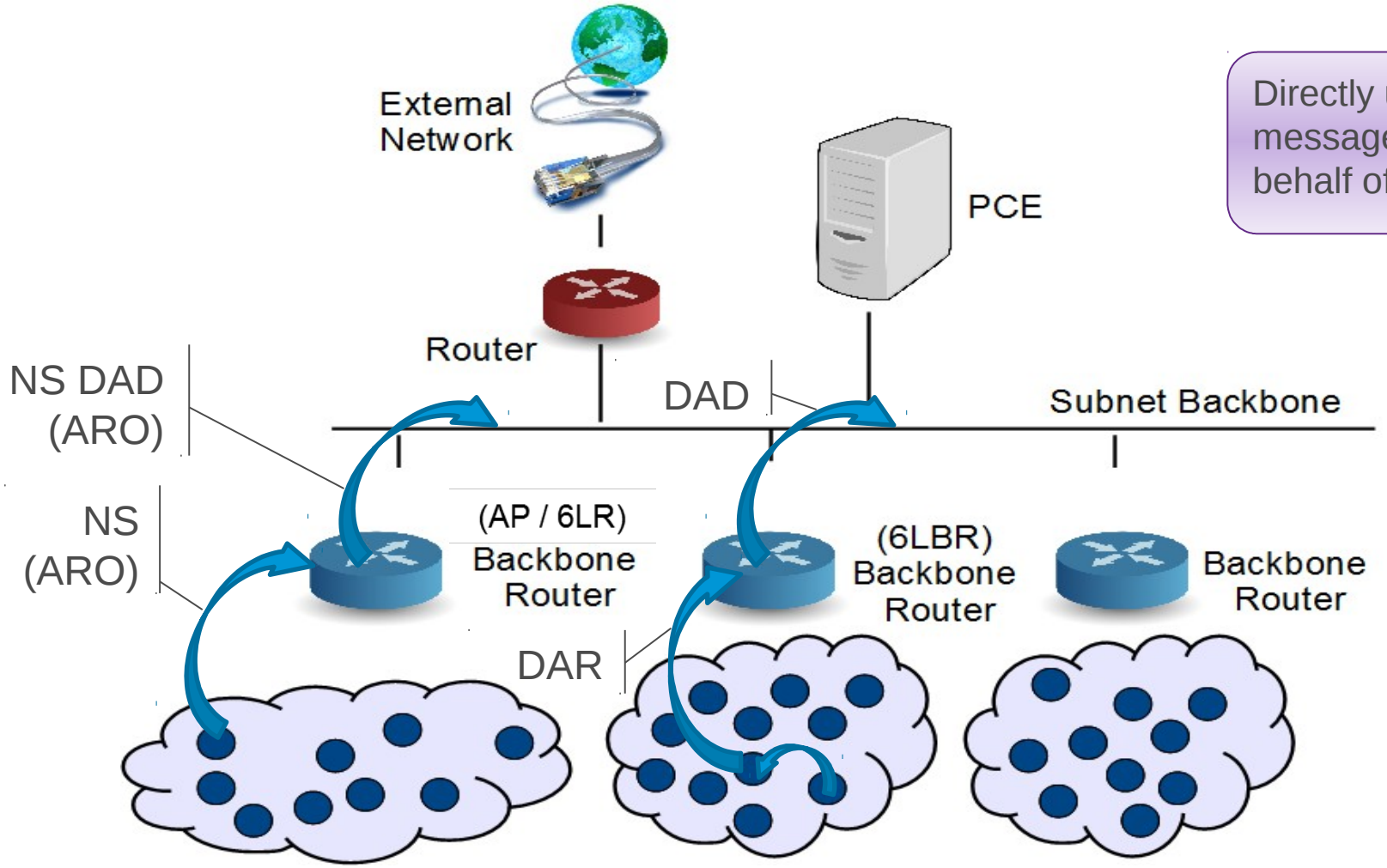
Routers within subnet have a connected route installed over the subnet backbone.
PCE probably has a static address in which case it also has a connected route

First advertisements from GW (RA, IGP, RPL)



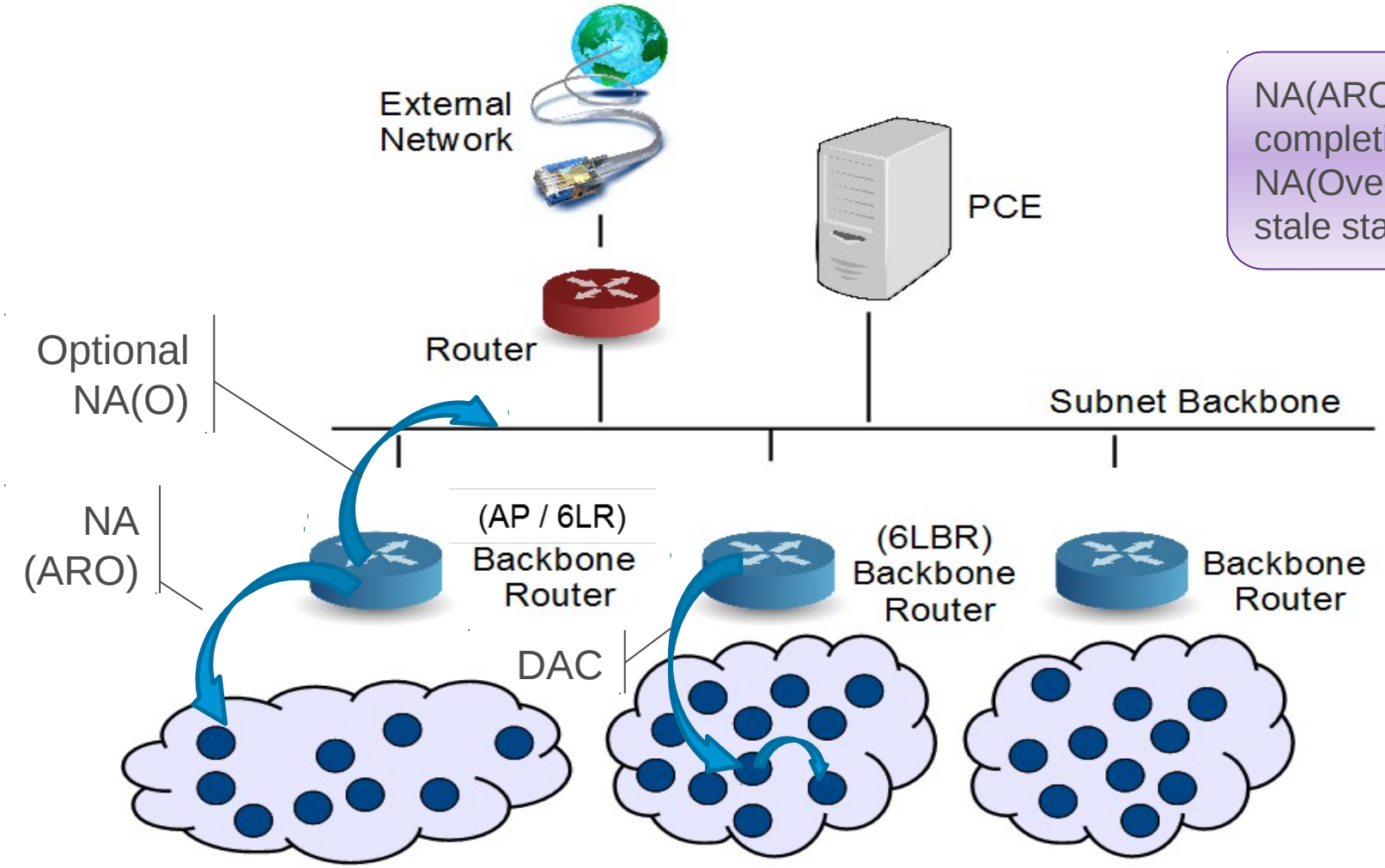
Gateway to the outside participate to some IGP with external network and attracts all extra-subnet traffic via protocols over the backbone

Registration to 6LR and 6LBR: “L3 association”



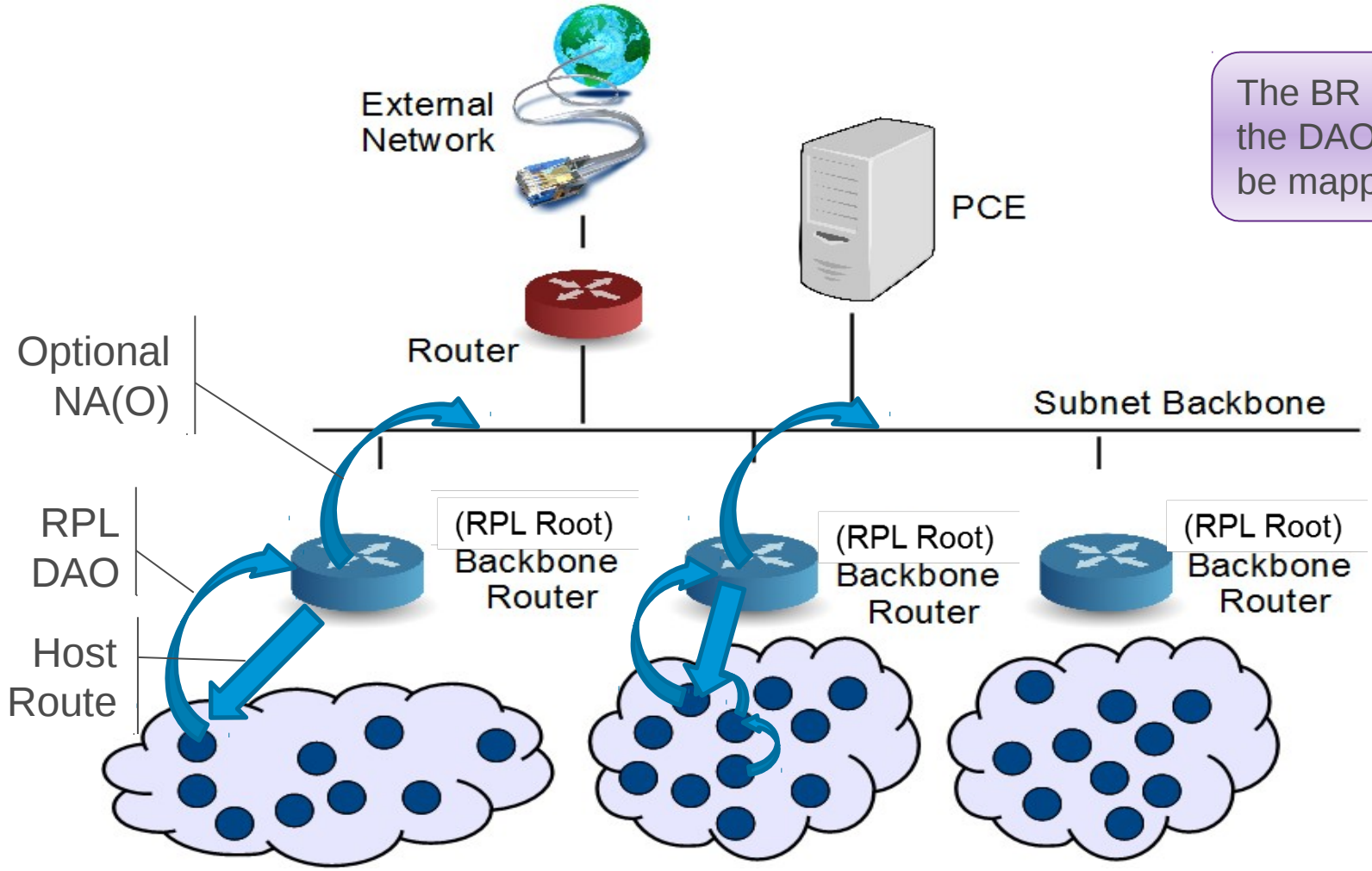
Directly upon NS(ARO) or indirectly upon DAR message, the backbone router performs DAD on behalf of the wireless device.

IPv6 ND Registration and Proxy for NS ARO



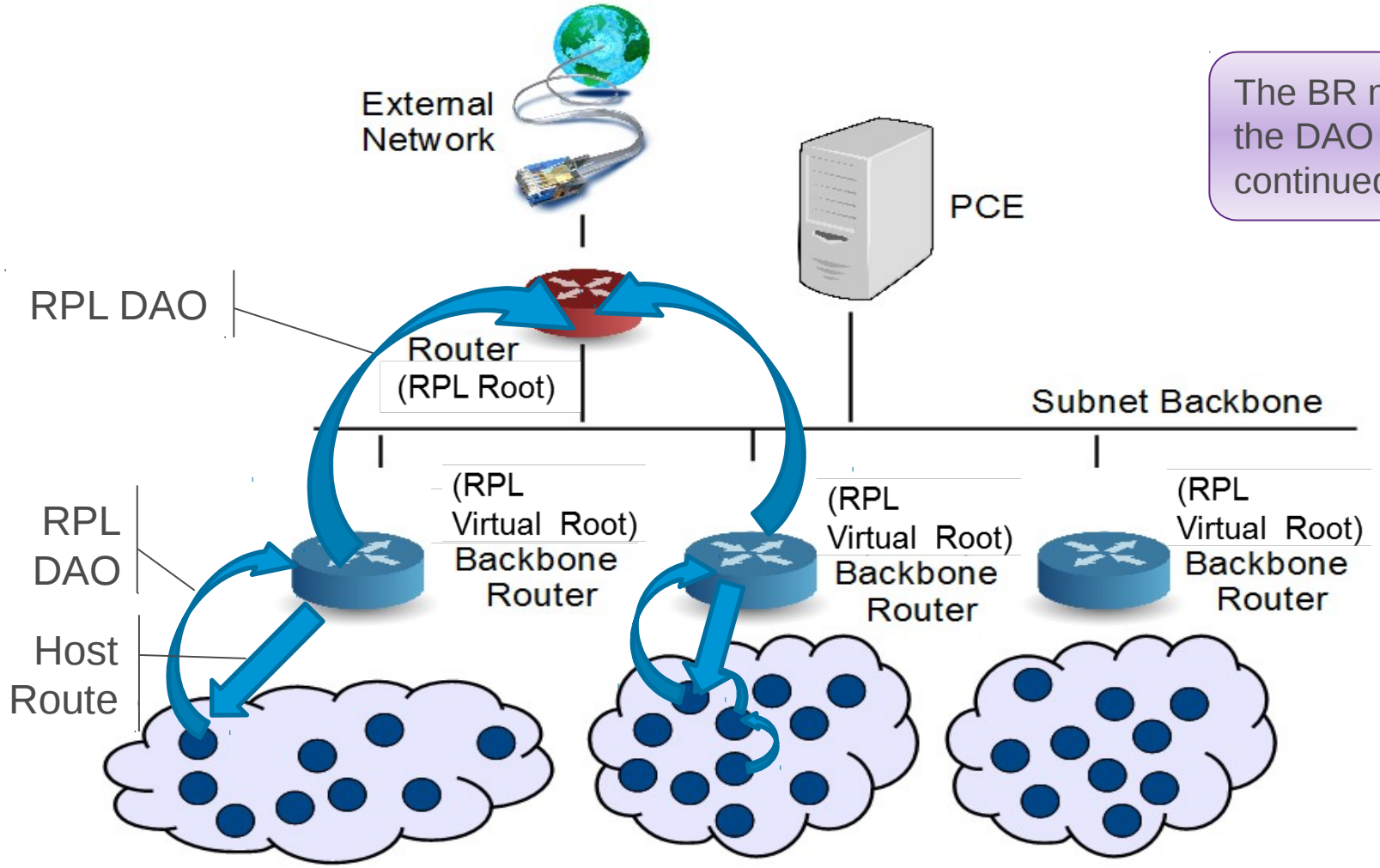
NA(ARO) or DAC message carry succeful completion if DAD times out.
NA(Override) is optional to clean up ND cache stale states, e.g. if node moved.

IPv6 ND Proxy for RPL



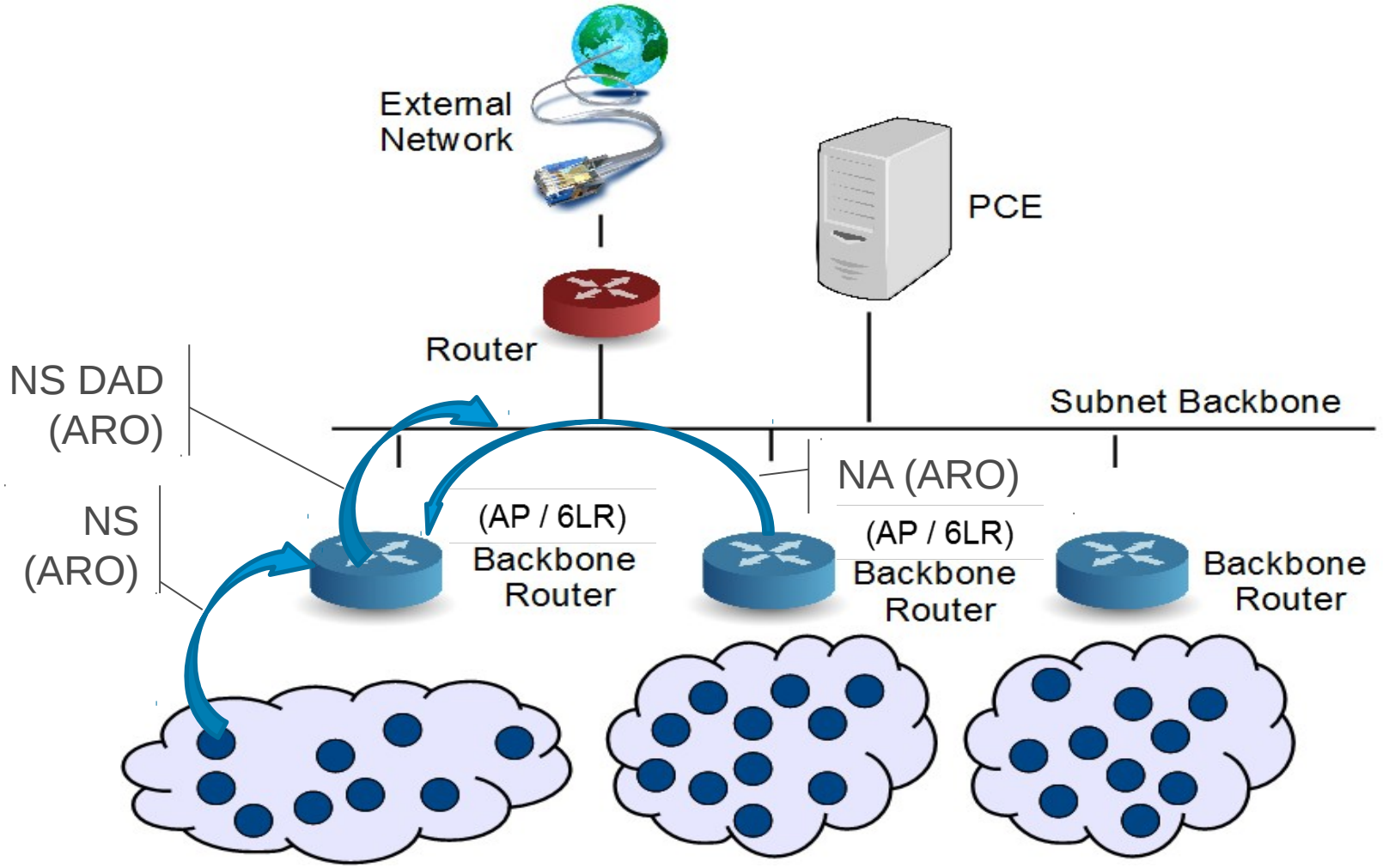
The BR maintains a route to the WSN node for the DAO Lifetime over instance VRF. VFR may be mapped onto a VLAN on the backbone.

RPL over the backbone



The BR maintains a route to the WSN node for the DAO Lifetime over instance VRF that is continued with RPL over backbone.

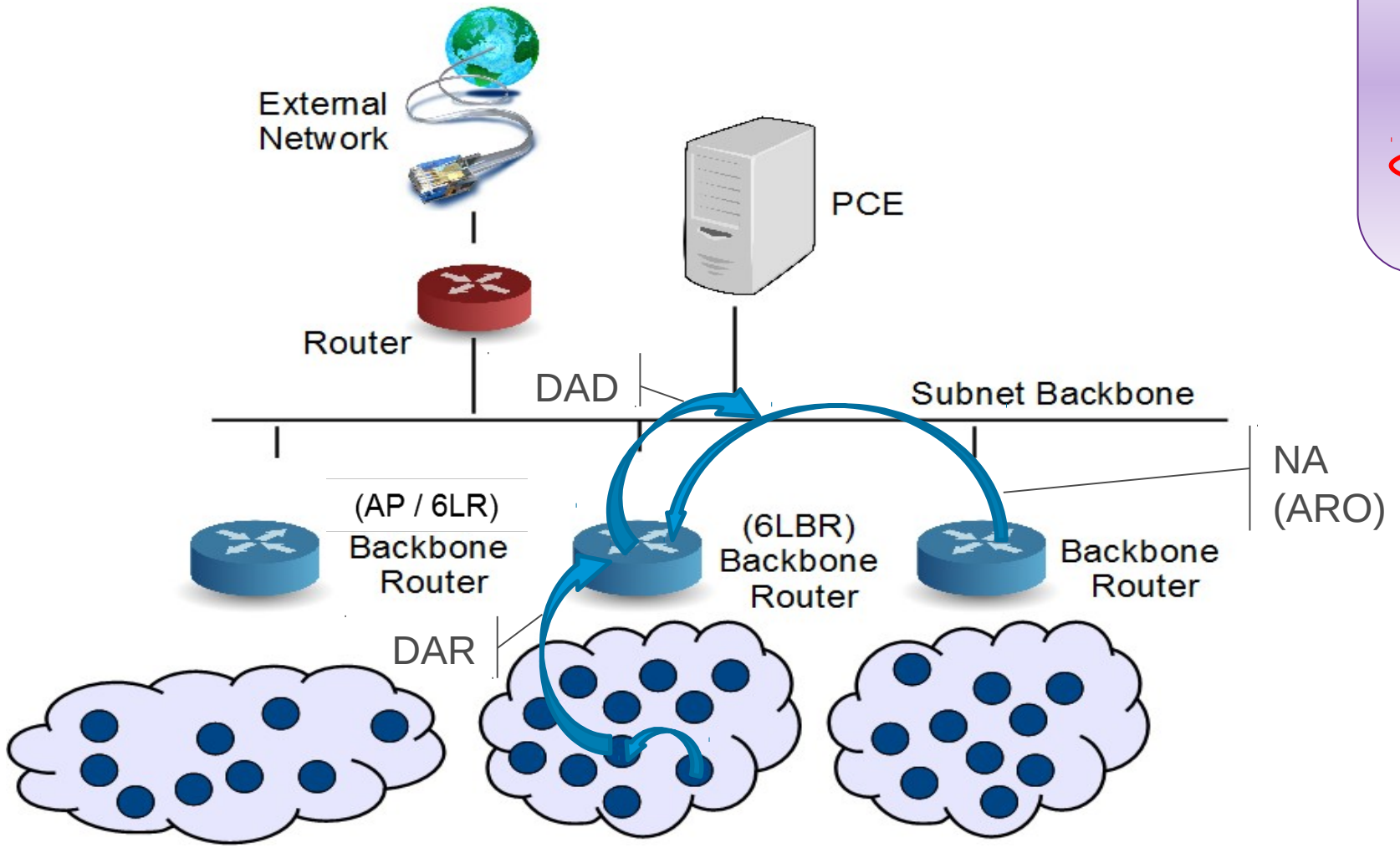
Duplication



DAD option has:
Unique ID
TID (SeqNum)

Defend with NA if:
Different OUID
Newer TID

Duplication (2)



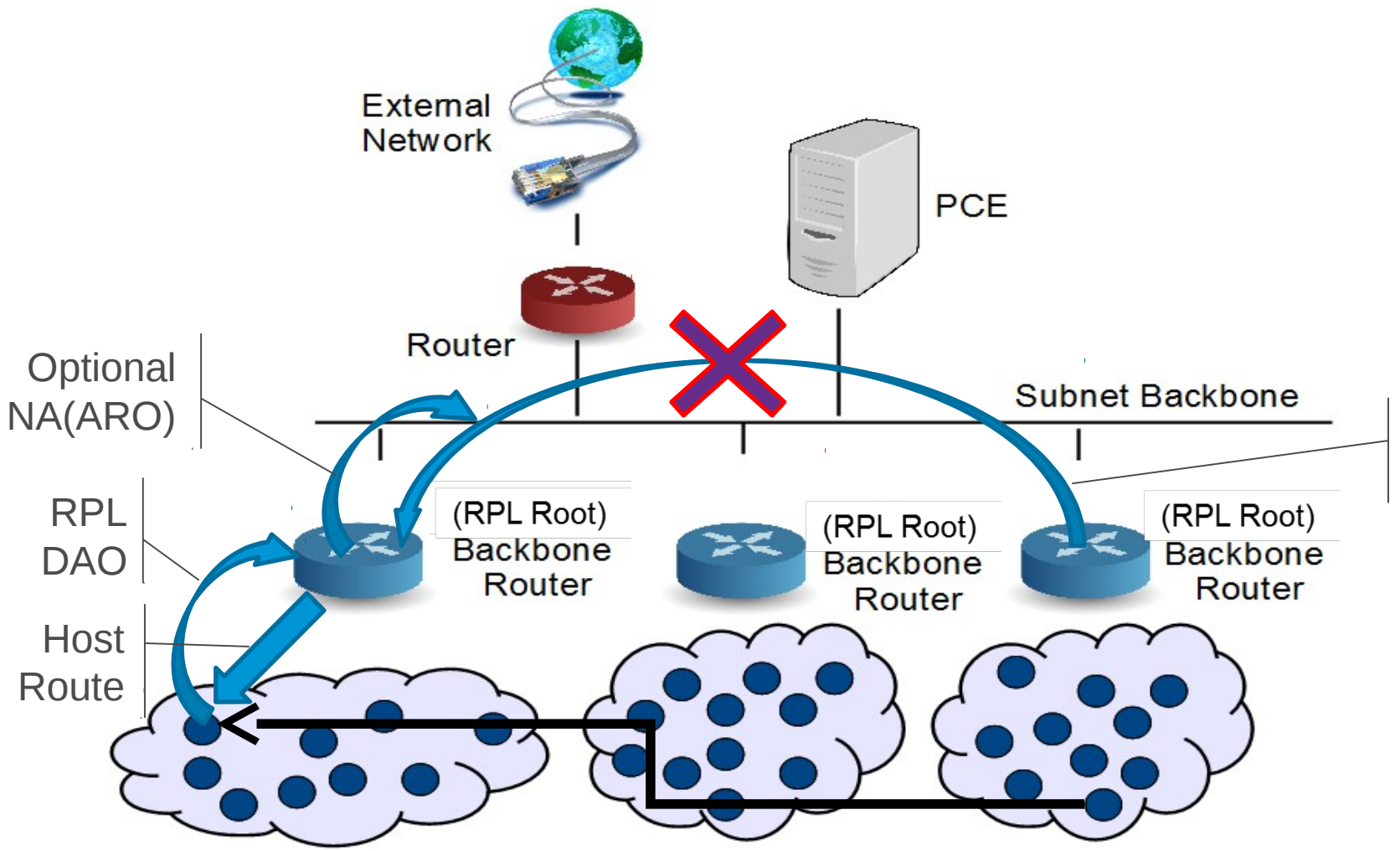
DAD option has:
Unique ID
TID (SeqNum)

Defend with NA if:
Different OUID
Newer TID

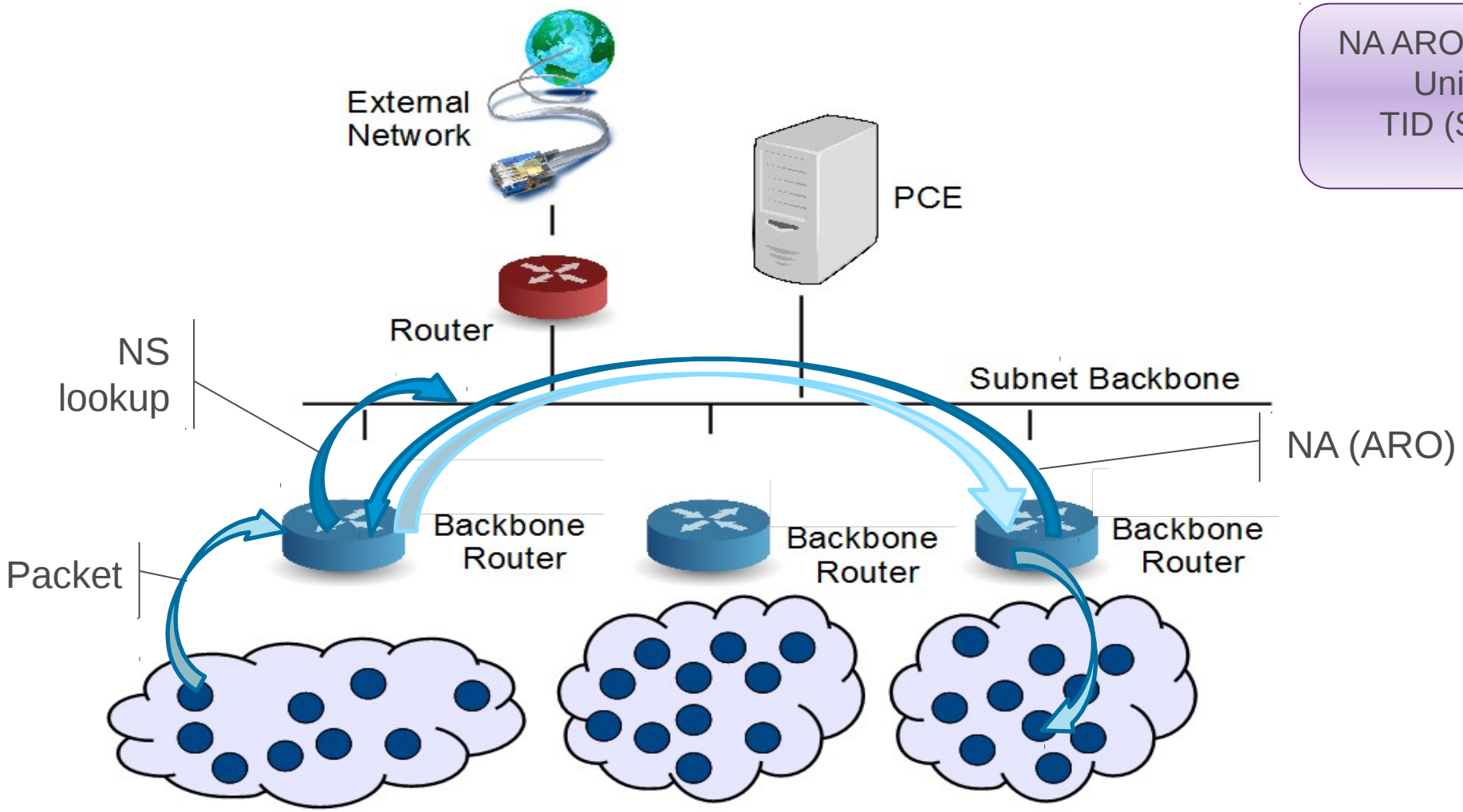
Mobility

DAD option has:
Unique ID
TID (SeqNum)

Defend with NA if:
Different OUID
Newer TID

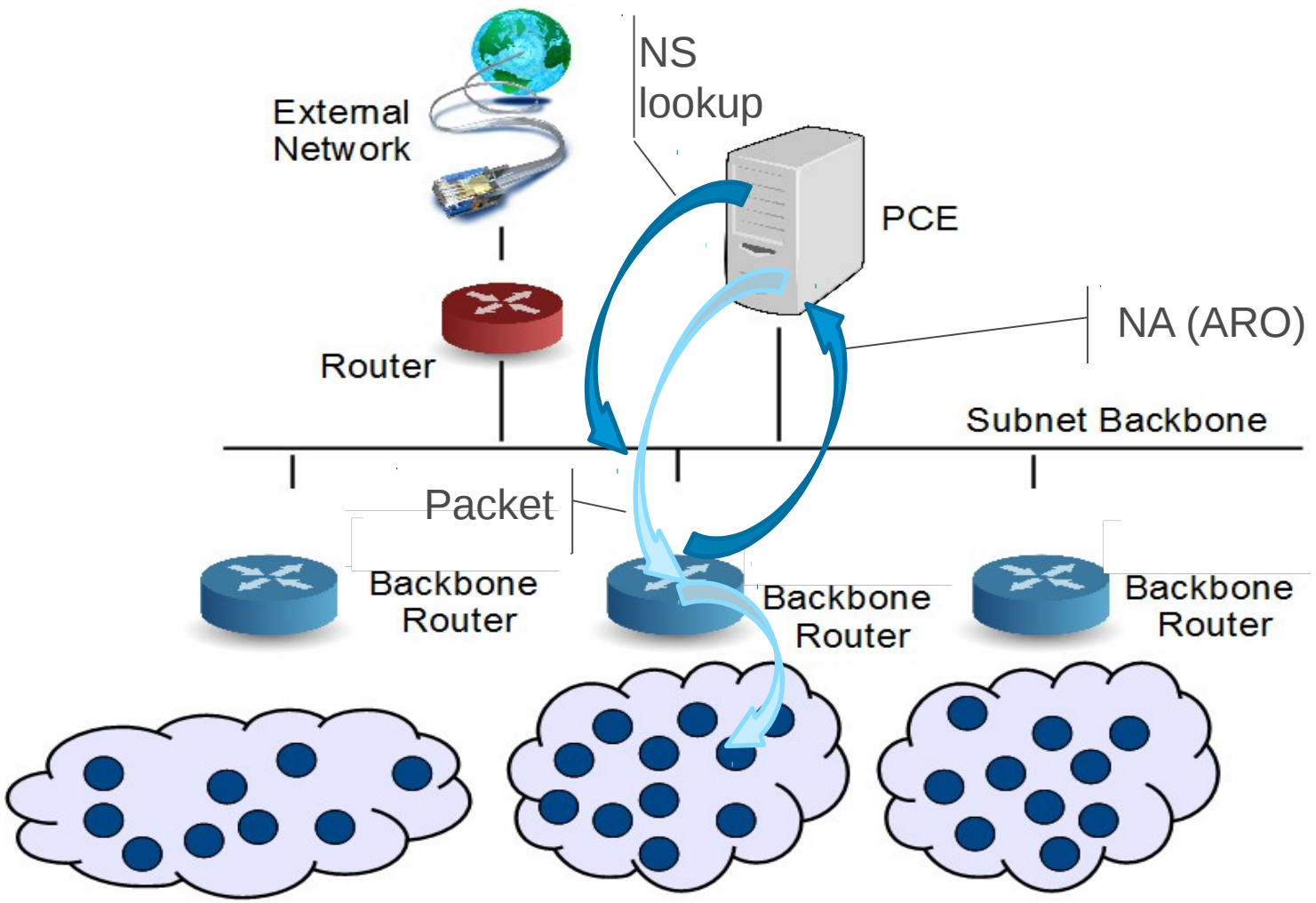


Resolution



NA ARO option has:
Unique ID
TID (SeqNum)

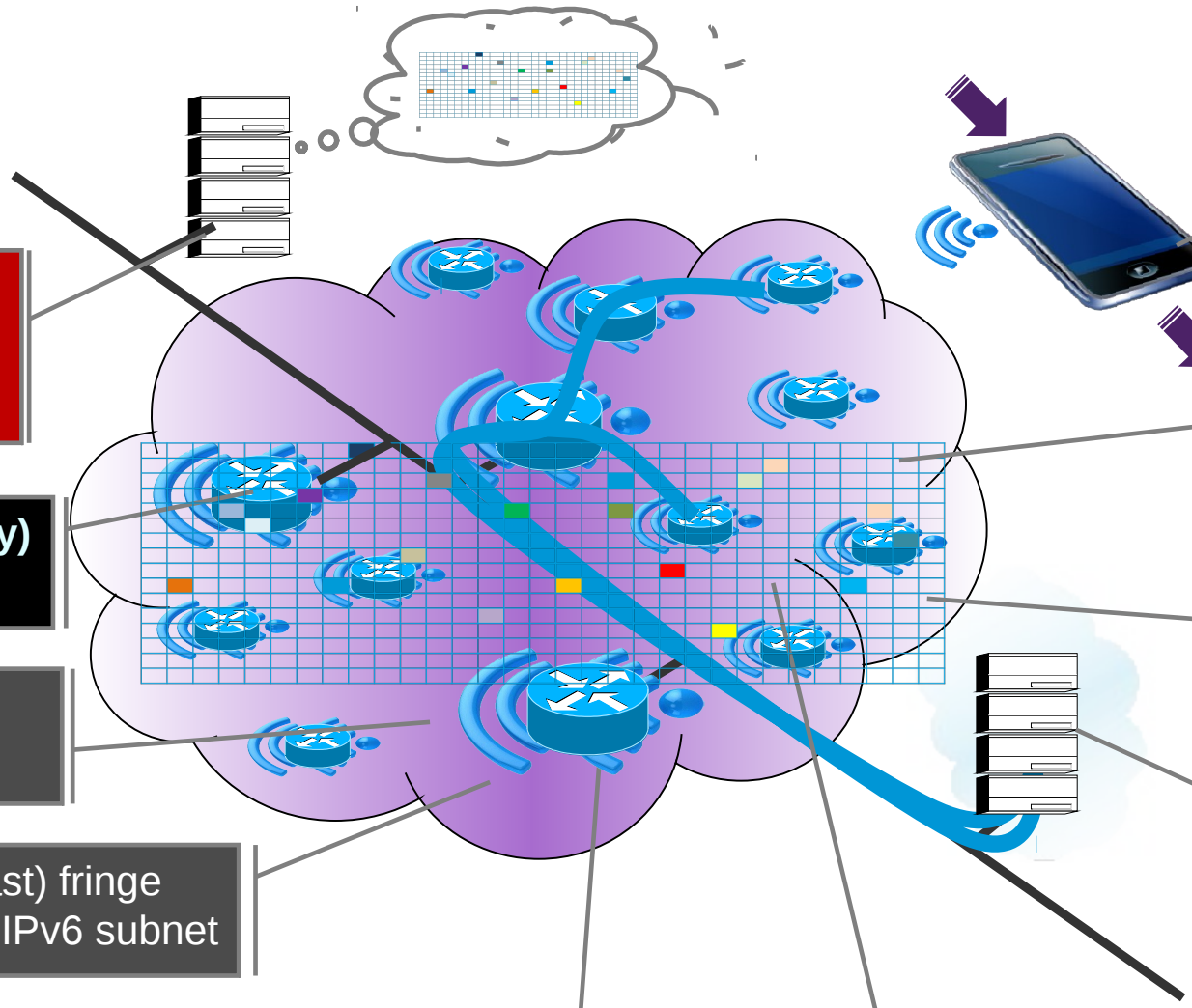
Resolution (2)



Mixed mode ND
BBR proxying over the backbone

Enabling Next-Gen backbone

Grey: Existing work Black: This draft Red: Starting now



Centralized control for deterministic routing and scheduling (PCE)

Backbone router (ND proxy) enables Multi-Link subnet

RPL distributed routing & scheduling for best effort

Layer-3 routed (non broadcast) fringe aggregated in a single large IPv6 subnet

IPv6 registration mechanism
Authoritative Registrar / 6LBR gives full visibility on IP activity, address allocation and source address ownership

For Wi-Fi: L3 “association” using extension of 6LoWPAN ND

Distributed routing and scheduling of 6TiSCH resources (OTF)

Fully scheduled wireless

Industrial control logic running deterministically in carpeted floor (Fog)

Deterministic control loops including deterministic wired, wireless, and execution of control logic

6BBR vs. RFC 6775

Solves most of draft-thubert-6lo-rfc6775-update-reqs

Extended ARO option

- Add TID field to support registration mobility
- Same as efficient ND

Proxy registration

- 6LBR may register on behalf of 6LN
- Registering the target as opposed to source address

What's new Since IETF 72?

Finally ready for prime time

Implementations and demos

- Cisco, DUST Networks

Detailed operation based on **Running Code**

Call for decisions

WG adoption

6TiSCH plugtest content for Berlin being defined now