Address Protected Neighbor Discovery for Low-power and Lossy Networks

draft-sarikaya-6lo-ap-nd-02

Behcet Sarikaya, Pascal Thubert

IETF 95

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SeND for 6LoWPAN?

Address Spoofing

Need for defense against spoofing like classical ND?

IEEE appears to think so (Dorothy’s presentation Sunday)

Attack is not on NS lookup since we use not onlink model

Spoofing happens at registration time

From devices with a join key (misplaced trust, compromised)

Thus the need to ensure first come first serve registration

Proposal

Cryptographic token proving identify

Used as a replacement for the MAC address in ARO

State in 6LR/6LBR associates first come with token

Could be a RSA public key but that’s at least 384 bits

That’s potentially a lot of state at the 6LR

CGA has IPR

Suggestion: use private key on MAC address (SLLAO) and ECC

What changed since 01

- Added <Updates: 6775 (if approved)>
- New/updated section 4.2. Updating RFC 6775
- Added comparision with SeND

  => this specification saves ~1Kbytes in every NS/NA
- Added crypto ID computation and a bit in the ARO indicating crypto ID

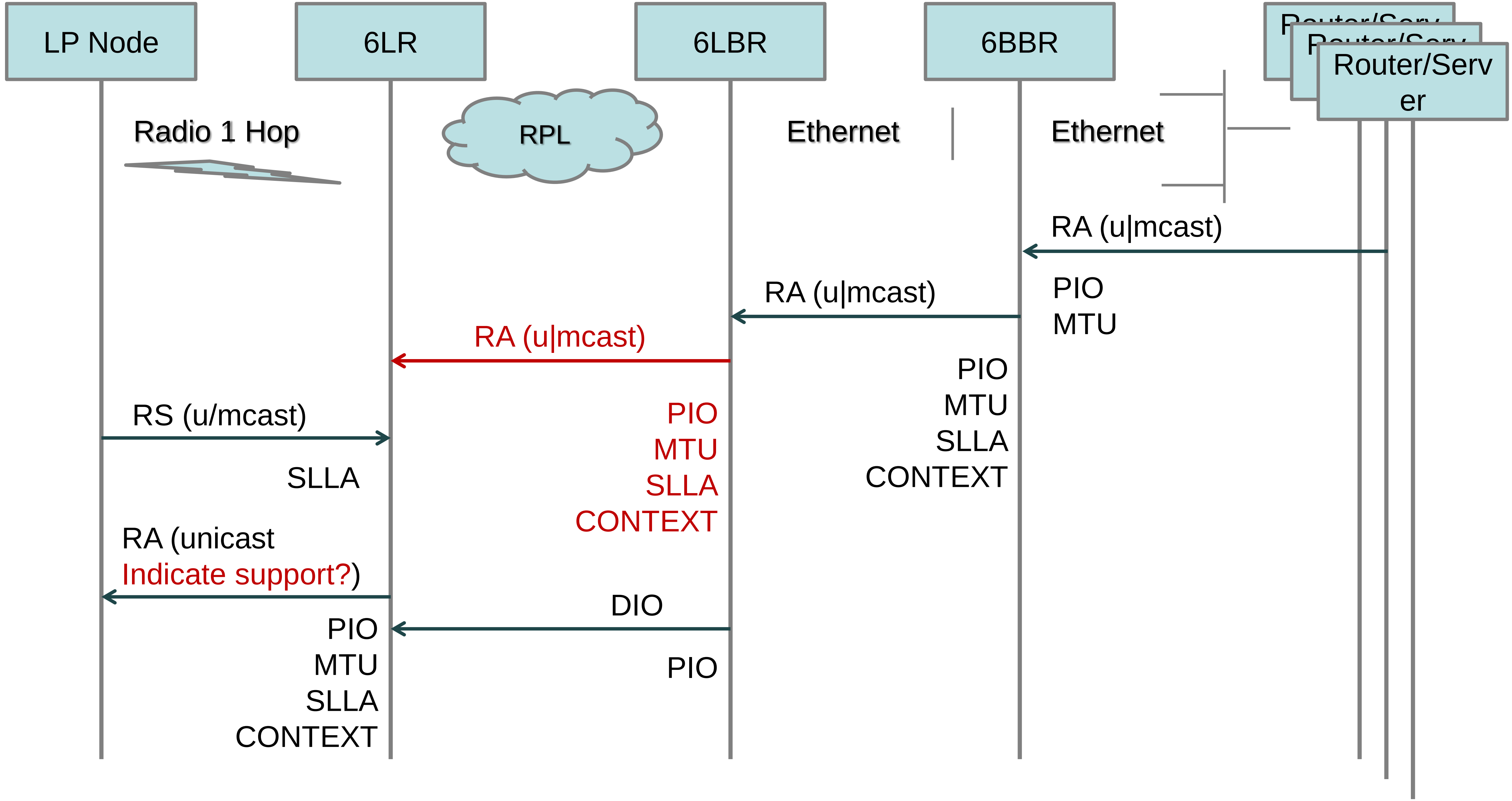
Questions

Do people see that address spoofing may occur in IOT?

Is this a valid approach?

Where do we go from here?

FIRST REGISTRATION



LP Node

6LR

6LBR

6BBR

Router/Serv
er

Radio 1 Hop

RPL

Ethernet

Ethernet

RA (u|mcast)

PIO
MTU

RA (u|mcast)

PIO
MTU
SLLA
CONTEXT

RA (u|mcast)

PIO
MTU
SLLA
CONTEXT

RS (u/mcast)

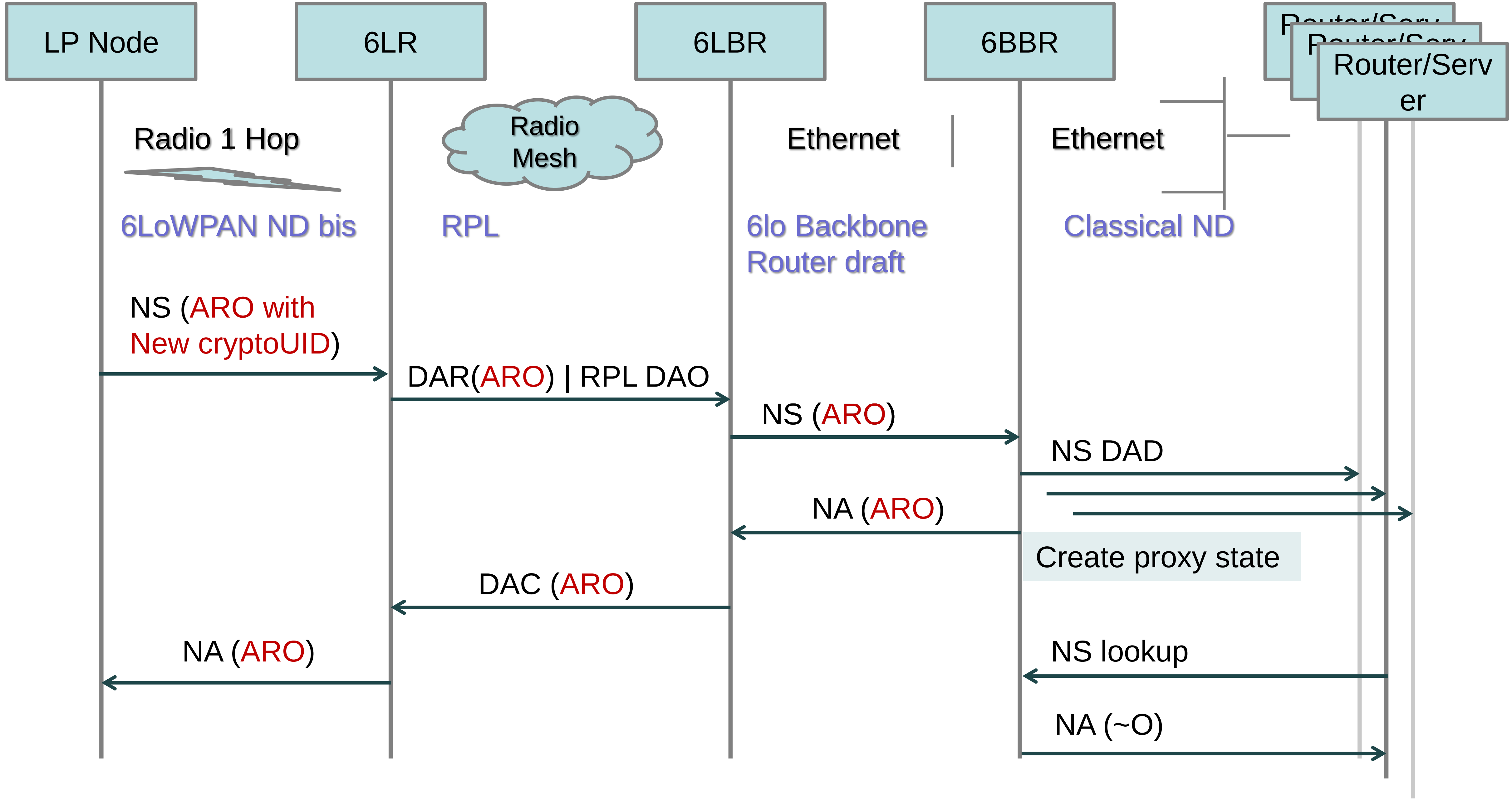
SLLA

RA (unicast
Indicate support?)

PIO
MTU
SLLA
CONTEXT

DIO

PIO



LP Node

6LR

6LBR

6BBR

Router/Serv
er

Radio 1 Hop

Radio
Mesh

Ethernet

Ethernet

6LoWPAN ND bis

RPL

6lo Backbone
Router draft

Classical ND

NS (ARO with
New cryptoUID)

DAR(ARO) | RPL DAO

NS (ARO)

NS DAD

NA (ARO)

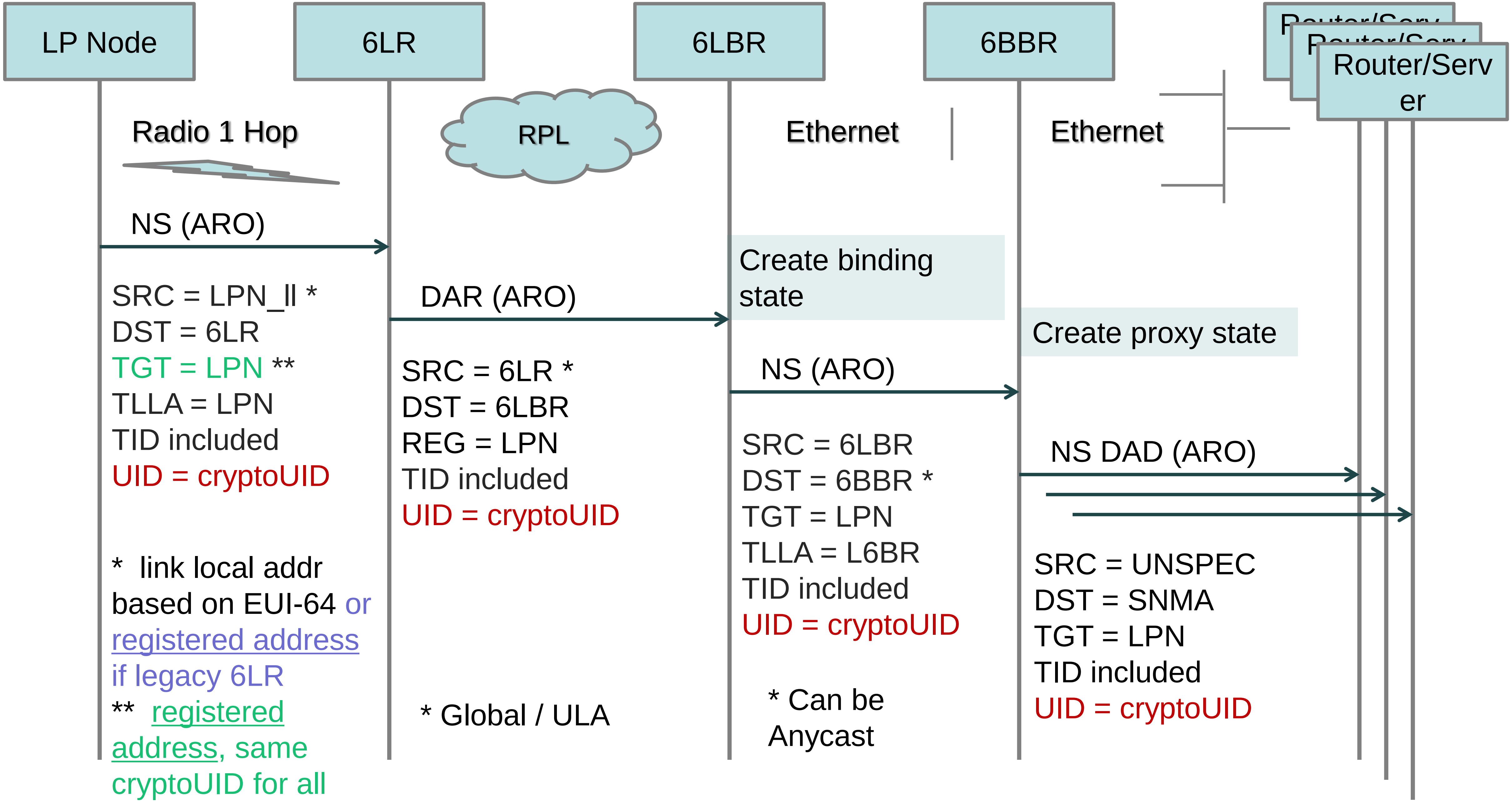
Create proxy state

DAC (ARO)

NA (ARO)

NS lookup

NA (~O)



LP Node

6LR

6LBR

6BBR

Router/Server

Radio 1 Hop

RPL

Ethernet

Ethernet

NS (ARO)

SRC = LPN_ll *
DST = 6LR
TGT = LPN **
TLLA = LPN
TID included
UID = cryptoUID

* link local addr based on EUI-64 or registered address if legacy 6LR

** registered address, same cryptoUID for all

DAR (ARO)

SRC = 6LR *
DST = 6LBR
REG = LPN
TID included
UID = cryptoUID

* Global / ULA

Create binding state

NS (ARO)

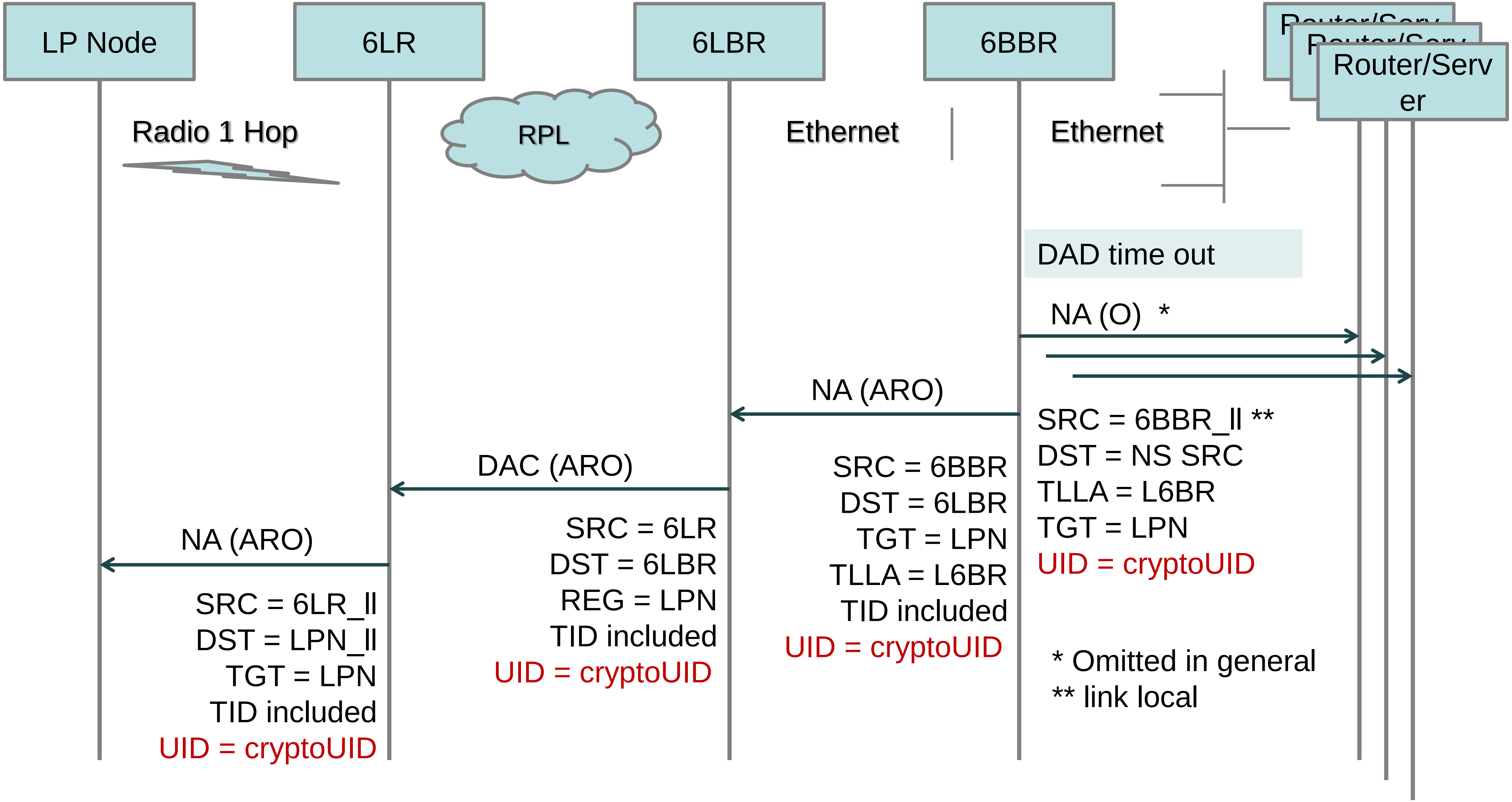
SRC = 6LBR
DST = 6BBR *
TGT = LPN
TLLA = L6BR
TID included
UID = cryptoUID

* Can be Anycast

Create proxy state

NS DAD (ARO)

SRC = UNSPEC
DST = SNMA
TGT = LPN
TID included
UID = cryptoUID



LP Node

6LR

6LBR

6BBR

Router/Serv er

Radio 1 Hop

RPL

Ethernet

Ethernet

DAD time out

NA (O) *

SRC = 6BBR_ll **
DST = NS SRC
TLLA = L6BR
TGT = LPN
UID = cryptoUID

NA (ARO)

SRC = 6BBR
DST = 6LBR
TGT = LPN
TLLA = L6BR
TID included
UID = cryptoUID

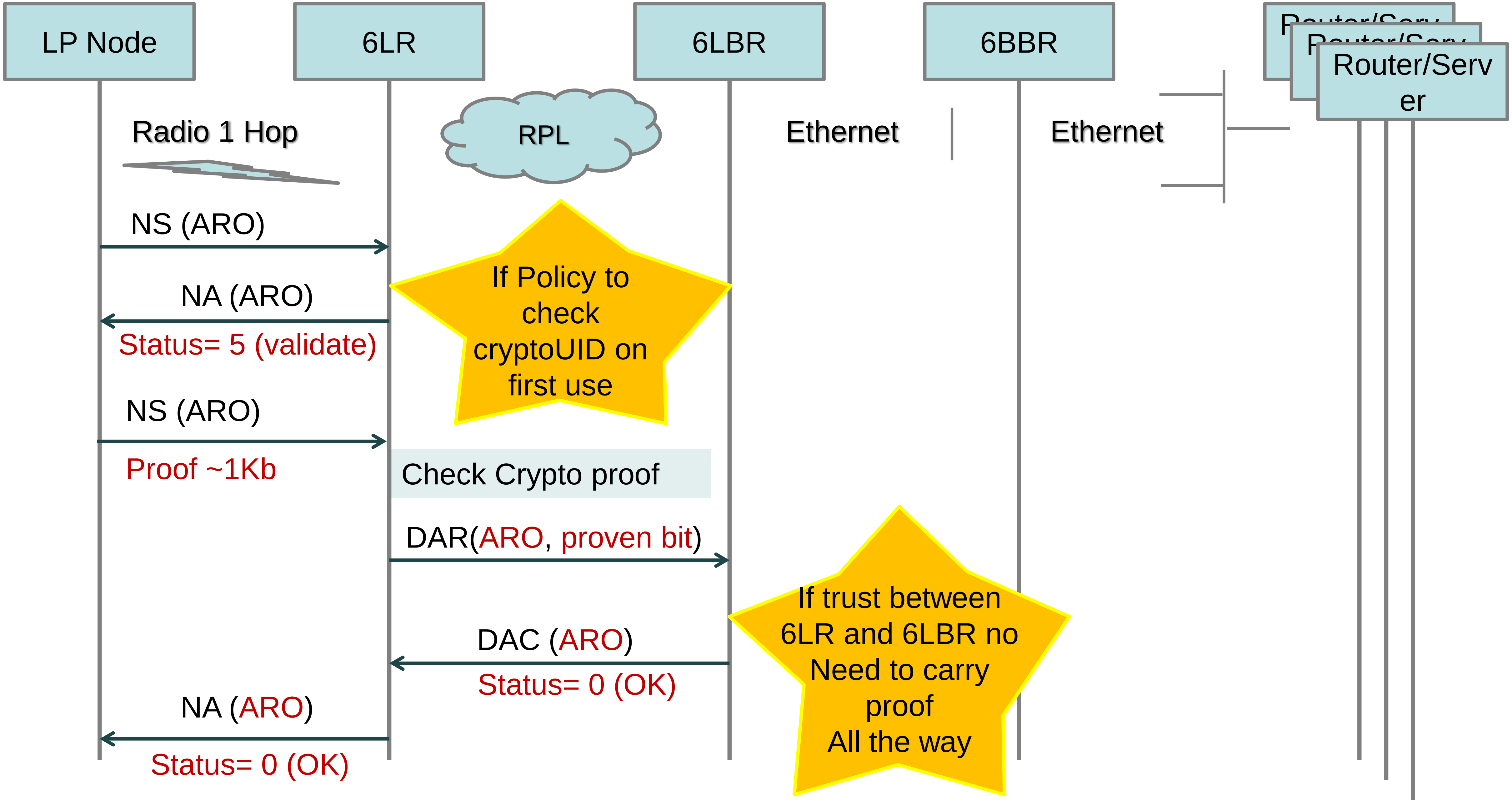
DAC (ARO)

SRC = 6LR
DST = 6LBR
REG = LPN
TID included
UID = cryptoUID

NA (ARO)

SRC = 6LR_ll
DST = LPN_ll
TGT = LPN
TID included
UID = cryptoUID

* Omitted in general
** link local



LP Node

6LR

6LBR

6BBR

Router/Serv
er

Radio 1 Hop

RPL

Ethernet

Ethernet

NS (ARO)

NA (ARO)

Status= 5 (validate)

If Policy to
check
cryptoUID on
first use

NS (ARO)

Proof ~1Kb

Check Crypto proof

DAR(ARO, proven bit)

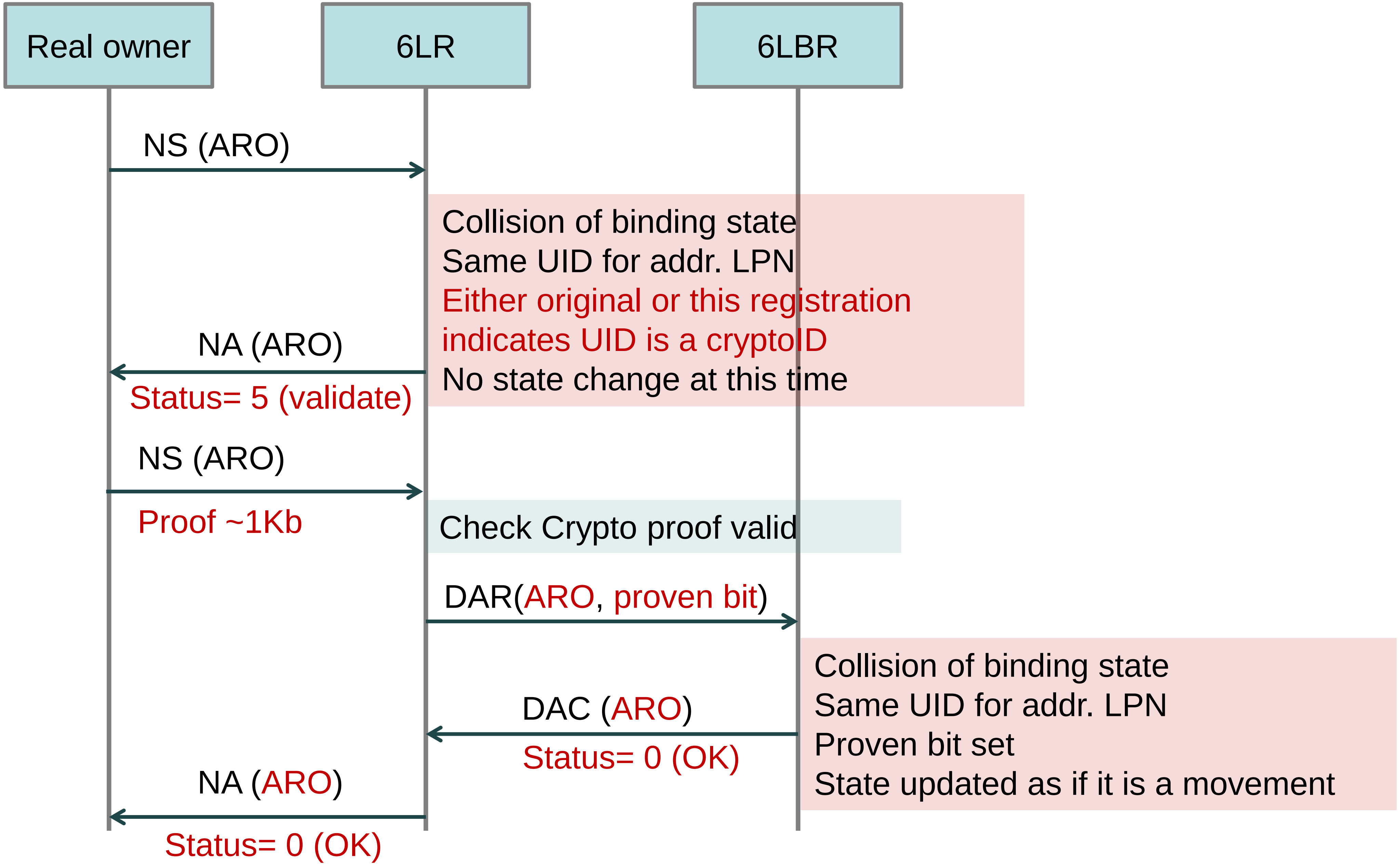
DAC (ARO)

Status= 0 (OK)

If trust between
6LR and 6LBR no
Need to carry
proof
All the way

NA (ARO)

Status= 0 (OK)



Real owner

6LR

6LBR

NS (ARO)

Collision of binding state
Same UID for addr. LPN
Either original or this registration
indicates UID is a cryptoID
No state change at this time

NA (ARO)
Status= 5 (validate)

NS (ARO)
Proof ~1Kb

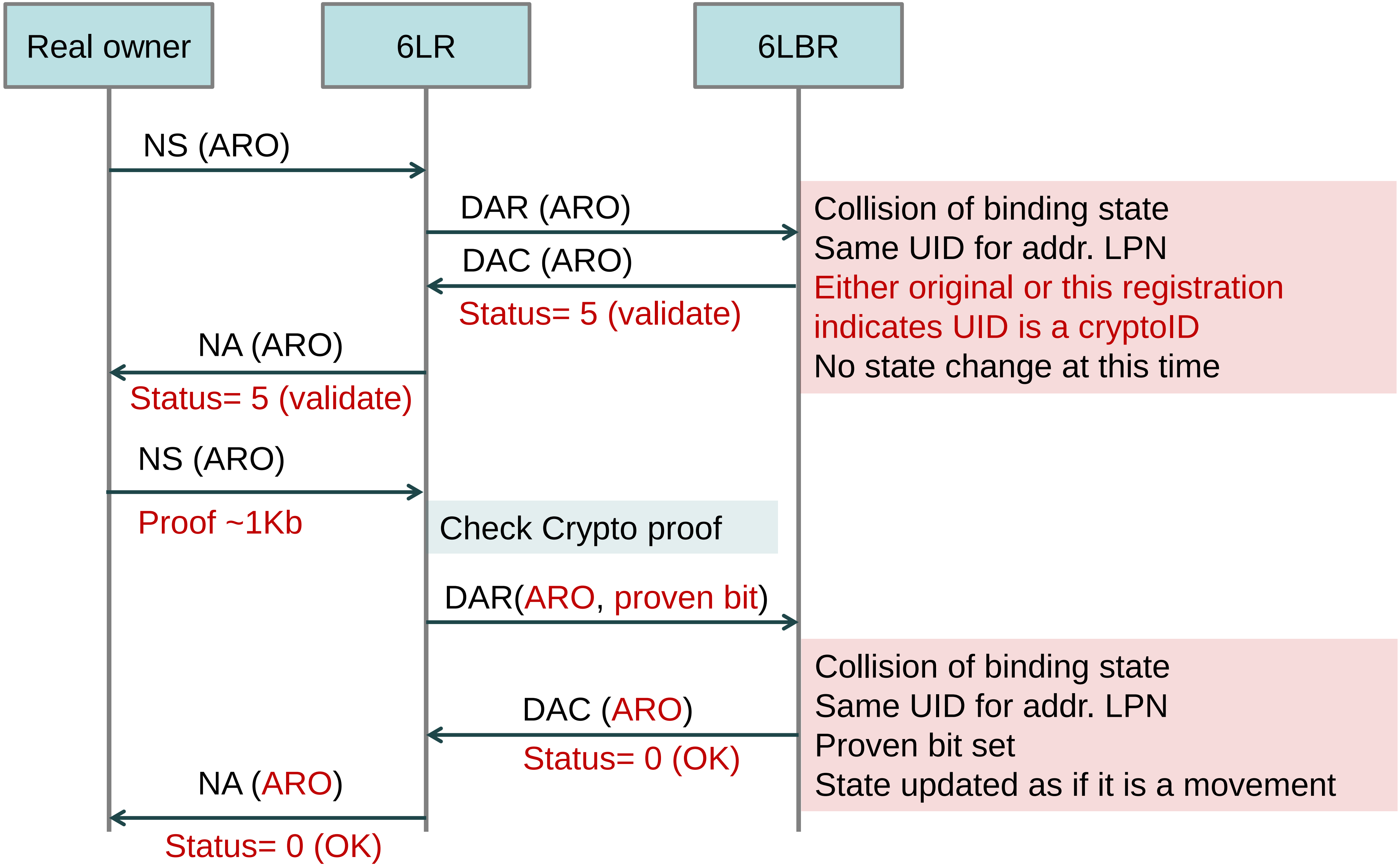
Check Crypto proof valid

DAR(ARO, proven bit)

Collision of binding state
Same UID for addr. LPN
Proven bit set
State updated as if it is a movement

DAC (ARO)
Status= 0 (OK)

NA (ARO)
Status= 0 (OK)



Real owner

6LR

6LBR

NS (ARO)

DAR (ARO)

DAC (ARO)

Status= 5 (validate)

Collision of binding state
Same UID for addr. LPN
Either original or this registration
indicates UID is a cryptoID
No state change at this time

NA (ARO)

Status= 5 (validate)

NS (ARO)

Proof ~1Kb

Check Crypto proof

DAR(ARO, proven bit)

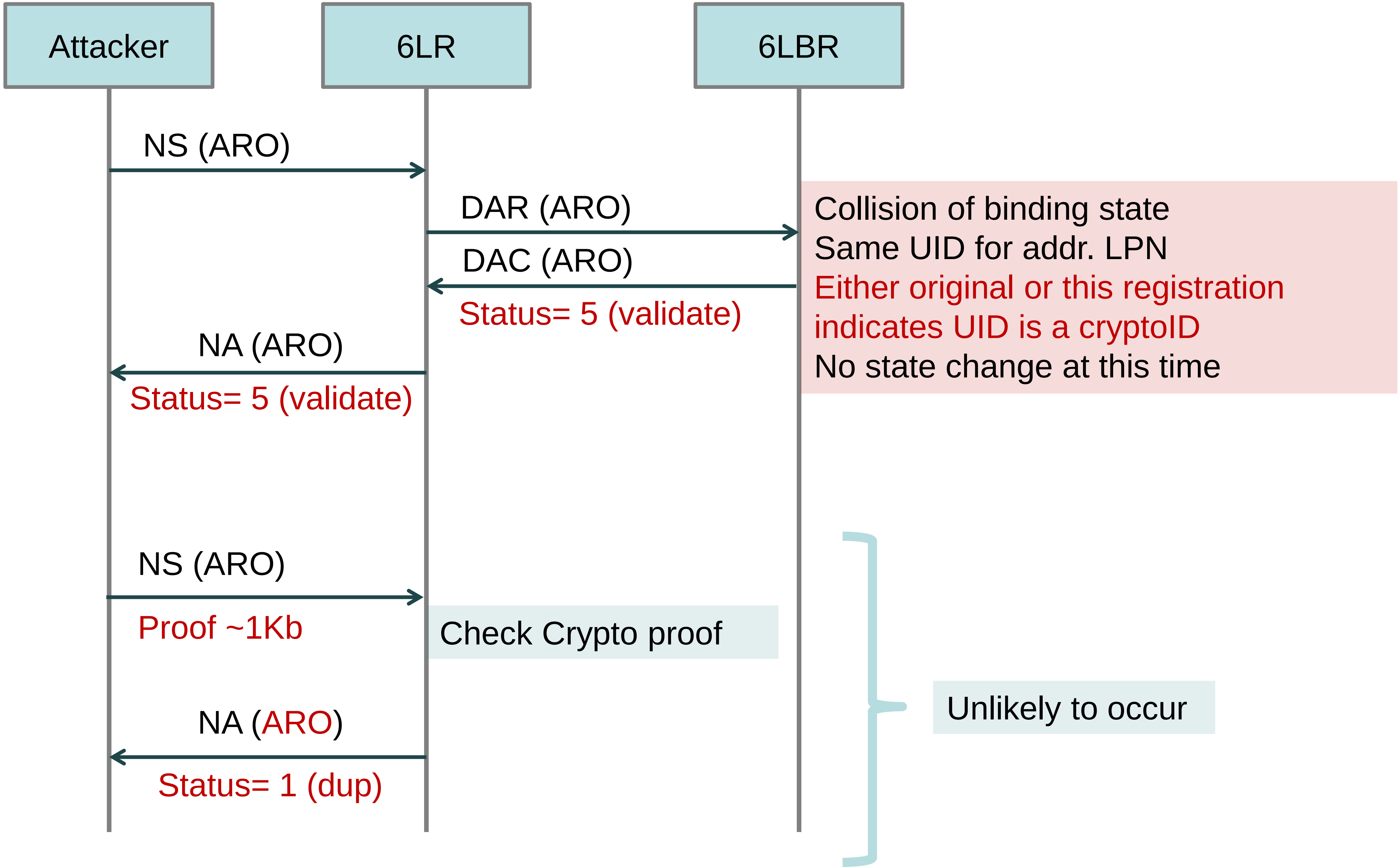
Collision of binding state
Same UID for addr. LPN
Proven bit set
State updated as if it is a movement

DAC (ARO)

Status= 0 (OK)

NA (ARO)

Status= 0 (OK)



Attacker

6LR

6LBR

NS (ARO)

DAR (ARO)

DAC (ARO)

Status= 5 (validate)

Collision of binding state
Same UID for addr. LPN
Either original or this registration
indicates UID is a cryptoID
No state change at this time

NA (ARO)

Status= 5 (validate)

NS (ARO)

Proof ~1Kb

Check Crypto proof

NA (ARO)

Status= 1 (dup)

Unlikely to occur