IPv6 Prefix Delegation routing state maintenance approaches

`draft-stenberg-v6ops-pd-route-maintenance-00`

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Problem Statement

- DHCPv6 Prefix Delegation (DHCPv6-PD) used to assign prefix(es) to routers

    - DR: delegating router (DHCPv6 server)

    - RR: requesting router (DHCPv6 client)

- RR assigns delegated prefixes to other links

- How are routes to these delegated prefixes inserted into the routing infrastructure?

    - Initial solutions proposed in dhc WG

    - However, there are also non-DHCPv6 solutions

    - Request to v6ops: input on which solution to settle on and develop

Network Model

Aggregating
router (AR)

Provisioning
system

Requesting
router (RR)
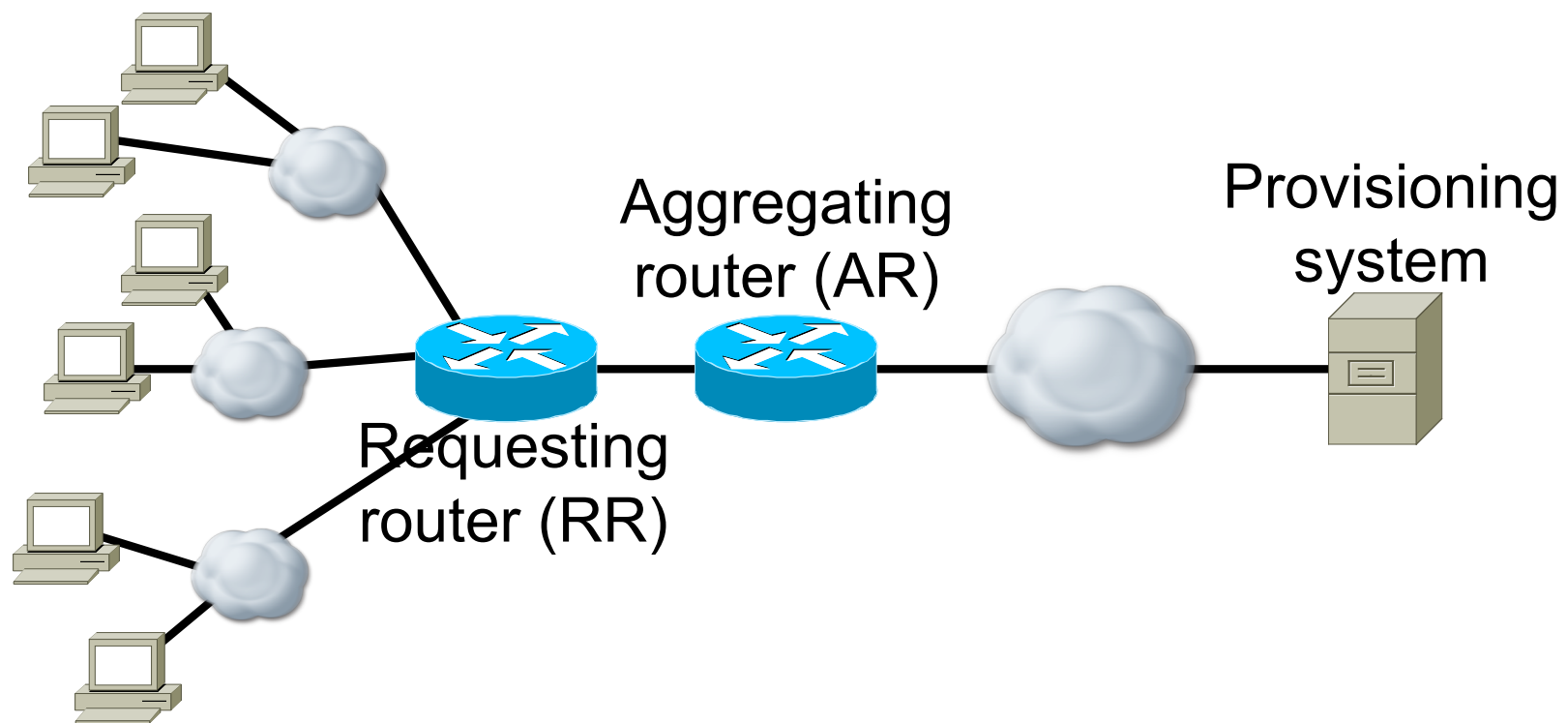
Problem details

- RFC 3633 describes DR as located in AR

- However, deployments will want centralized DR in provisioning system

  - DHCPv6-PD operates through relay agent in AR

  - RFC 3633 doesn't preclude operation with relay agent

- Two types of routing information

  - Global: routing through network to AR

  - Local: routing in AR to RR

- Routing information requires state in AR; requires:

  - Installation with prefix delegation

  - Deletion when prefix assignment ends (lease expiration)

  - Maintenance if AR loses state

Alternatives

- ## DR in AR
  - Local: DHCPv6 server manages internal routes
  - Global: AR injects routes for assigned prefixes or static aggregation

- ## Centralized DR: Either DHCPv6-PD server or AR can manage routes
  - DHCPv6-PD server has authoritative information
  - AR can obtain information from various sources
  - RR has authoritative information

Insertion by DHCPv6-PD server

- Global: DHCPv6-PD server interacts with routing infrastructure (routing protocols)
  - DHCPv6-PD server has authoritative information
  - No standard mechanism for interaction between server and routing protocol
- Local: DHCPv6-PD server uses control protocol to manage AR forwarding tables
  - What protocol?
 - How does server become aware that AR has lost state?

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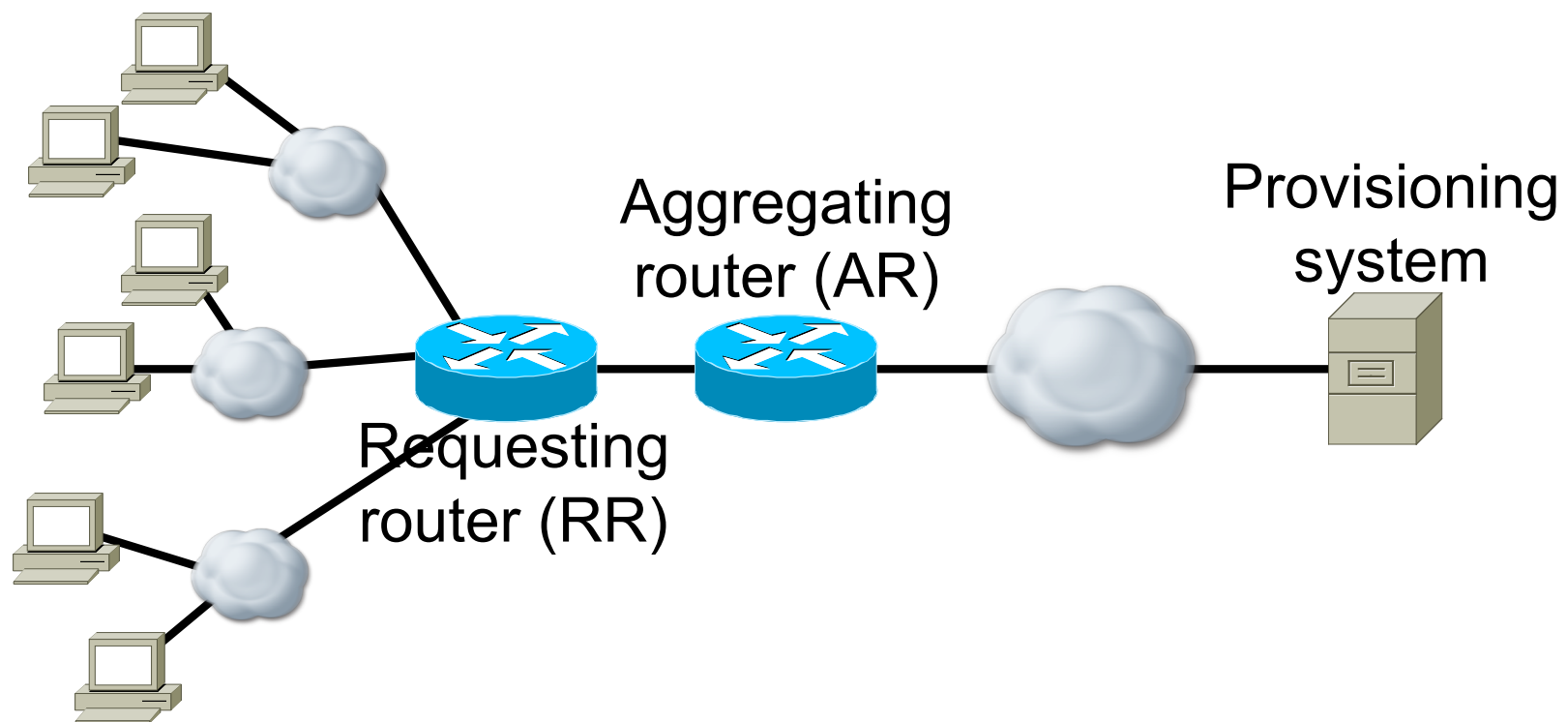
Insertion by AR

- AR can learn routing information
  - Local: manage local forwarding tables
  - Global: participate in routing protocol
- AR learns prefix assignment and expiration from DHCPv6 message transactions
  - Explicit relay agent message to set routes in AR (control protocol from DHCPv6-PD server to AR)
  - Implicit "gleaning" from messages to server
  - What happens when AR loses state?

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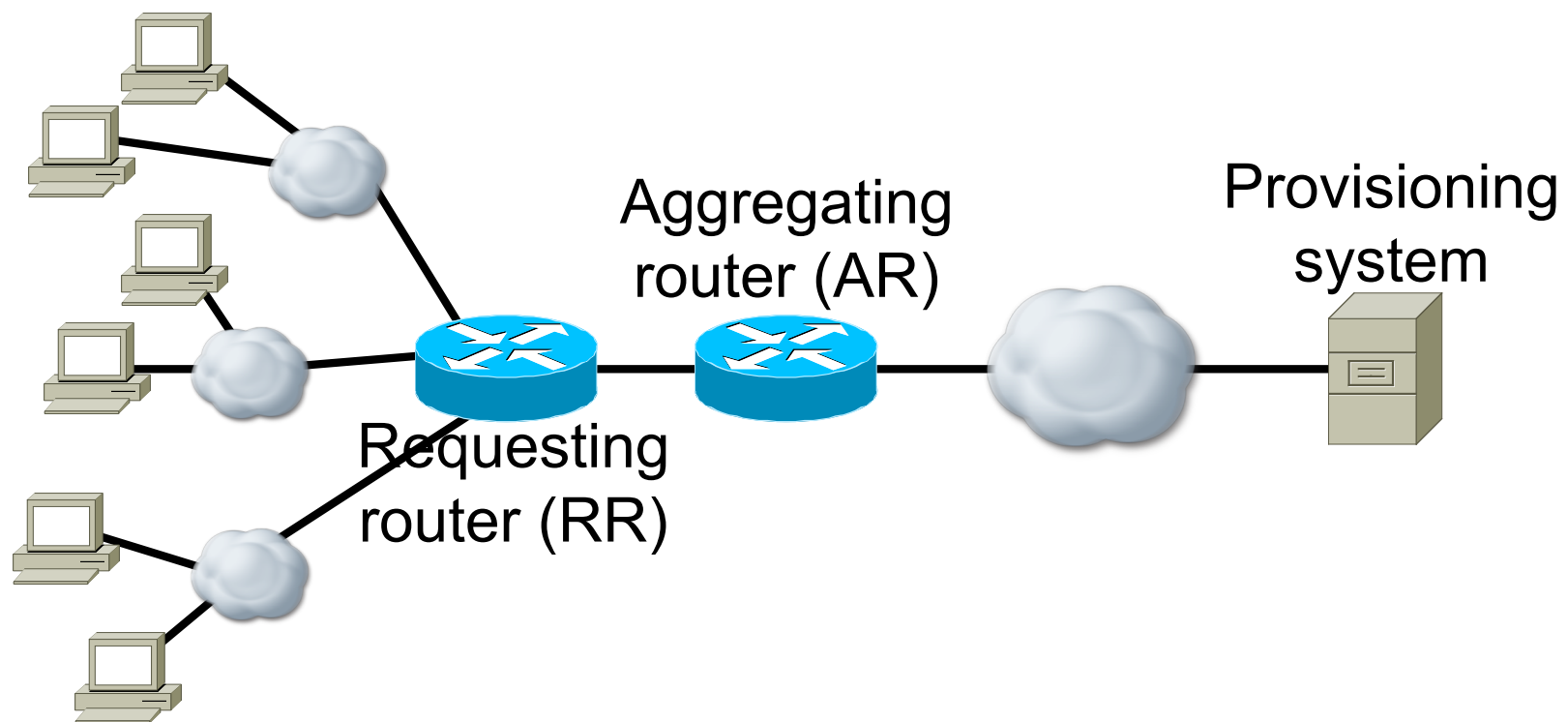
Restoring State in AR

- DHCPv6 has *leasequery* function, through which relay agent can request information about prefix assignments

- Can be used to restore state; when does AR issue requests?

  - On demand: when AR receives traffic from/to unknown prefix

  - In bulk: when AR restarts and needs to restore state

Injection by RR

- RR knows current prefix state and can participate in routing protocol exchange with AR

  - AR inserts local forwarding information
  - AR injects routing information into routing infrastructure

- But, can this work for service providers?

  - Trust: how does AR trust routing updates from customer-managed RR device?
  - Scale: how does AR scale to 100,000 RRs?

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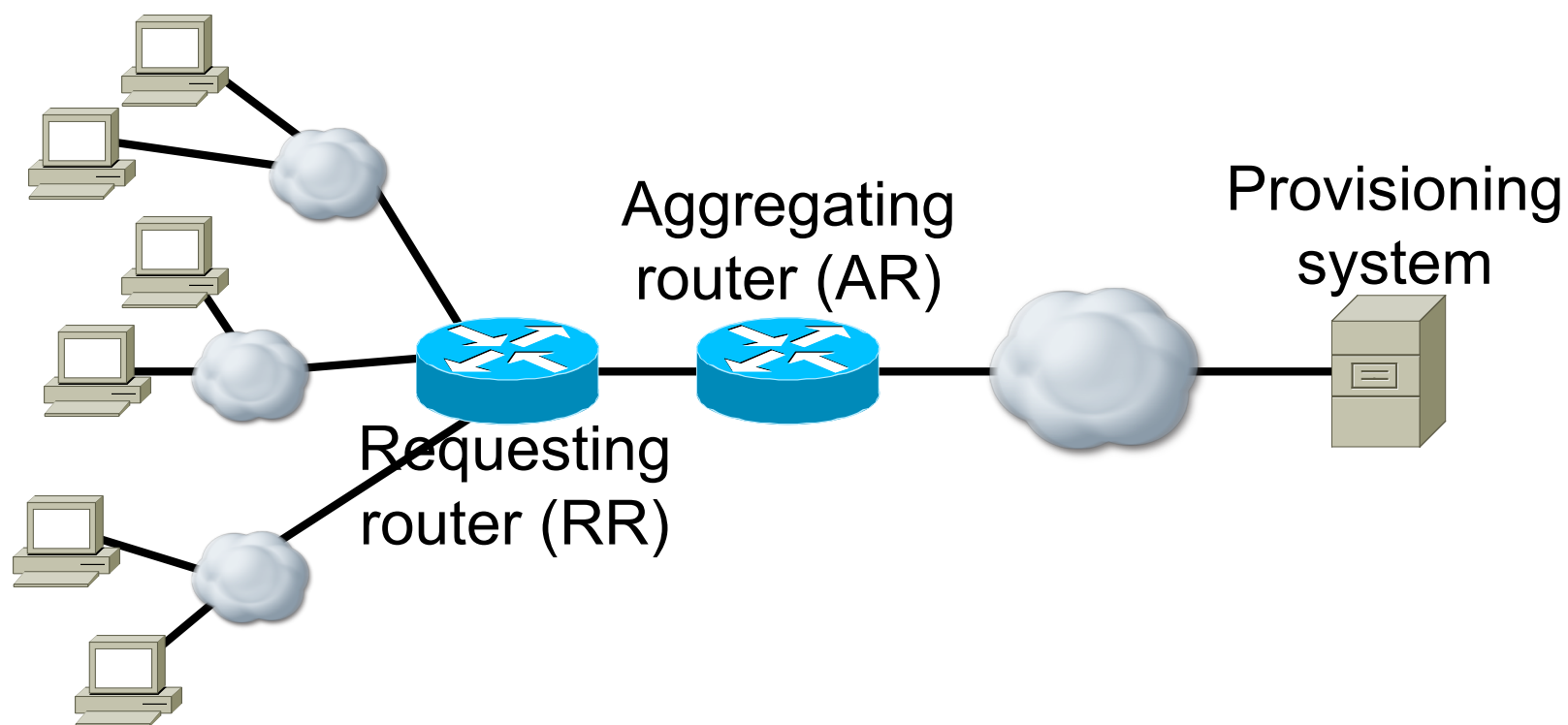
Wrap up

- Issue is related to "CPE Default Route Detection" (Van de Velde, Brzozowski and Miyakawa)

- Problem posed to v6ops for discussion and guidance

- Questions?