DHCPv6

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DHCPv6 (1)

- DHCPv6 is a client-server-based UDP protocol designed to reduce the IPv6 nodes management cost in those environments whereby control of IPv6 address allocation is required and/or more control than the one provided by the stateless mechanism about the provision of network parameters is needed
- DHCP reduces the cost of ownership by centralizing the management of network resources such as IP addresses, routing information, OS installation information, directory service information, and other such information on a few DHCP servers, rather than distributing such information in local configuration files among each network node
- DHCPv6 provides a superset of features, and benefits from the additional features of IPv6 and freedom from BOOTP - backward compatibility constraints

DHCPv6 (2)

- DHCPv6 is RFC3315
- Doesn’t provide the Default Gateway
- Use well-known multicast addresses:

  All_DHCP_Relay_Agents_and_Servers (FF02::1:2)

  All_DHCP_Servers (FF05::1:3)
- DHCPv6 stateless [RFC3736]

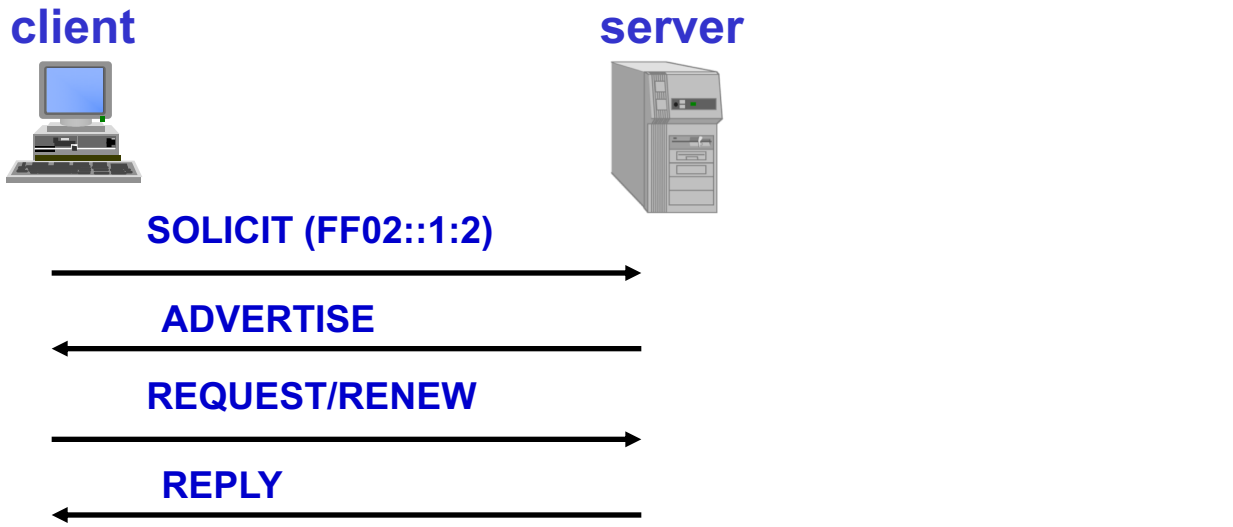
Goals of DHCPv6

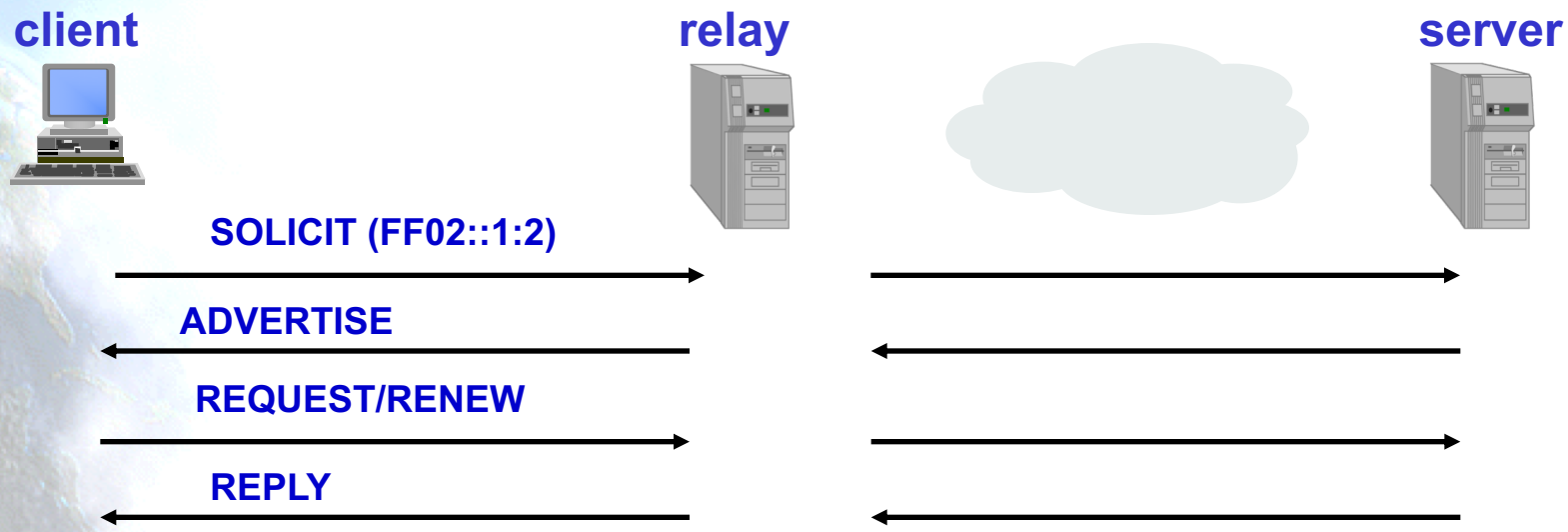
- DHCP is a mechanism rather than a policy. Network administrators set their administrative policies through the configuration parameters they place upon the DHCP servers in the DHCP domain they're managing. DHCP is simply used to deliver parameters according to that policy to each of the DHCP clients within the domain
- DHCP is compatible with SLAAC
- DHCP does not require manual configuration of network parameters on DHCP clients, except in cases where such configuration is needed for security reasons. A node configuring itself using DHCP should require no user intervention
- DHCP does not require a server on each link. To allow for scale and economy, DHCP must work across DHCP relays
- DHCP coexists with statically configured, non-participating nodes and with existing network protocol implementations
- DHCP clients can operate on a link without IPv6 routers present
- DHCP will provide the ability to renumber network(s) when required by network administrators
- A DHCP client can make multiple, different requests for configuration parameters when necessary from one or more DHCP servers at any time
- DHCP will contain the appropriate time out and retransmission mechanisms to efficiently operate in environments with high latency and low bandwidth characteristics

DHCPv6 Details

- UDP ports are
  - Clients listens to 546
  - Server and relays listen to 547
- Address for DHCPv6 relay agent and servers
  - FF02::1:2 (link local scope)
  - FF05::1:3 (site scope only for servers)
- DHCP messages
  - SOLICIT
  - ADVERTISE
  - REQUES
  - CONFIRM
  - RENEW
  - REBIND
  - REPLY
  - RELEASE
  - DECLINE
  - RECONFIGURE
  - INFORMATION-REQUEST
  - RELAY-FORW
  - RELAY-REPL
- Each message can carry one or more DHCP options
  - Domain-list
  - DNS-server
  - IA-NA, etc.
- DHCP Unique Identifier (DUID)
  - servers use DUIDs to identify clients for the selection of configuration parameters and in the association of IAs with clients
  - clients use DUIDs to identify a server in messages where a server needs to be identified

Basic DHCPv6 Example





DHCPv6 Host Configuration

- Windows
  - GUI
  - netsh interface ipv6
- Linux
  - GUI
  - /etc/network/interfaces

    iface eth0 inet6 dhcp

DHCPv6 Router Configuration

```
ipv6 dhcp pool ipv6-lab
        dns-server Y:Y:Y:Y::Y
        domain-name ipv6-lab
interface VLAN1
        ipv6 address X:X:X:X::X/64
        ipv6 nd managed-config-flag
        ipv6 nd other-config-flag
        ipv6 dhcp server ipv6-lab
```

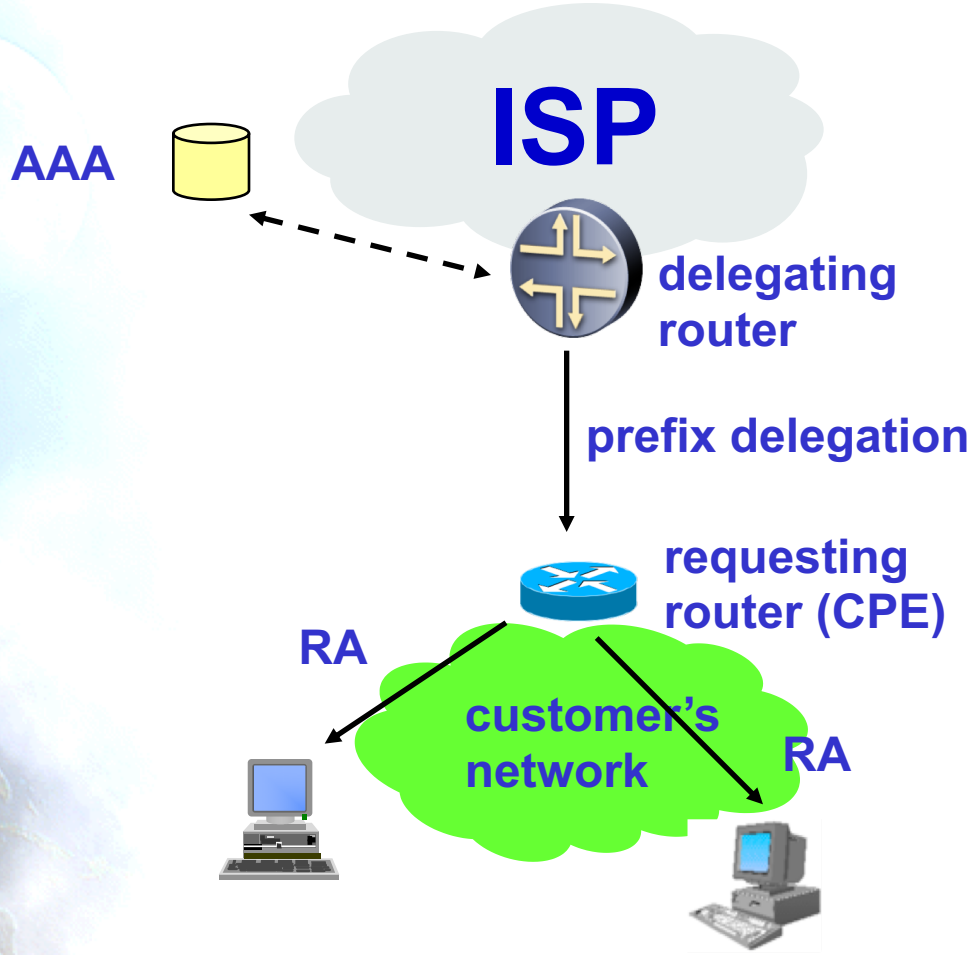
DHCPv6-PD (RFC3633)

- It provides an automated mechanism for the delegation of IPv6 prefixes to authorized requesting routers
- Delegating router does not require knowledge about the topology of the networks to which the requesting router is attached
- Delegating router does not require other information aside from the identity of the requesting router to choose a prefix for delegation
  - for example a ISP to assign a prefix to a CPE device acting as a router

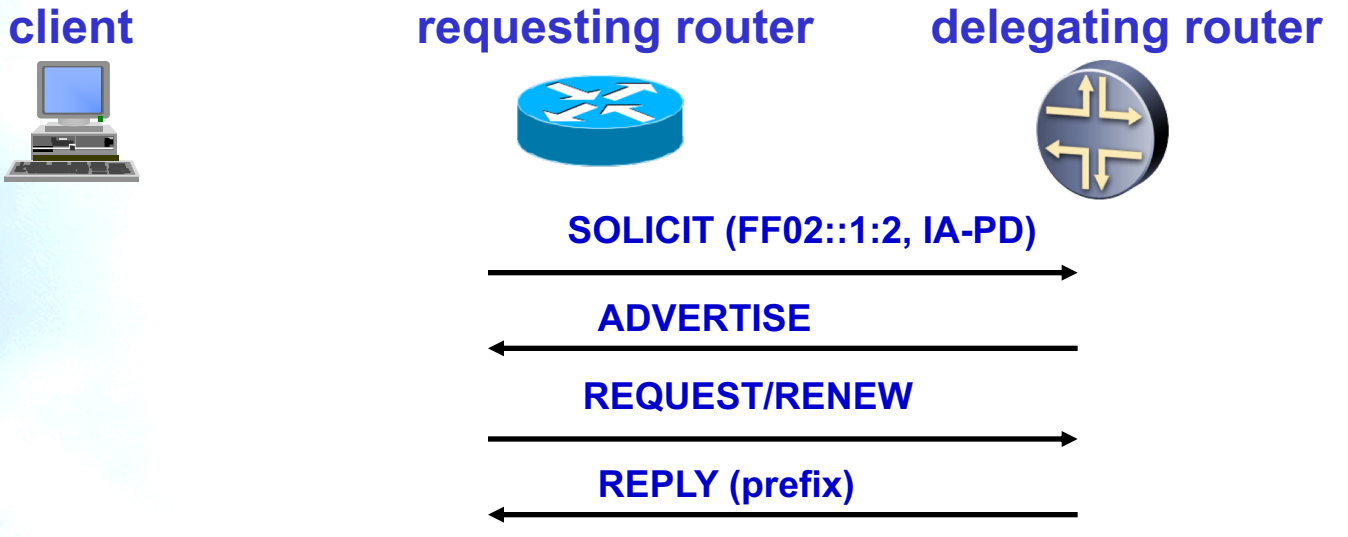
DHCPv6 Details

- Requesting router (RR) authentication is needed
- Profile for a RR could be stored in AAA server
- Delegated prefix could be gotten from either:
  - the customer's profile stored in the AAA server
  - prefix pool
- The delegated prefixes have lifetime as IPv6 address in DHCPv6
- DHCPv6-PD doesn't provide a way to propagate the delegated prefix through the customer's network
  - ::/64 prefixes form the delegated prefix are assigned in the RR according to the configured policy
- DHCPv6 relay agents could also be used as in DHCPv6

DHCPv6-PD Network architecture



Basic DHCPv6-PD Example



New User Features with DHCPv6

- Configuration of Dynamic Updates to DNS.
- Address deprecation, for dynamic renumbering.
- Relays can be preconfigured with server addresses, or use of multicast.
- Authentication.
- Clients can ask for multiple IP addresses.
- Addresses can be reclaimed using the Reconfigure-init message.
- Integration between stateless and stateful address autoconfiguration.
- Enabling relays to locate off-link servers.

DHCPv6 Servers

- Many choices
  - Routers and appliances
  - Windows
  - Linux
    - ISC-DHCP, ISC-KEA, Dibbler, ...
- Some support PD
- Some support “persistency”
  - DHCP option 37 (Remote-ID), RFC4649
  - Manual Reservations
  - Provisioning with AAA
  - Longer lifetimes

DHCPv6-PD Host Configuration

- Windows
  - GUI
  - netsh interface ipv6
- Linux
  - GUI
  - /etc/network/interfaces

```
iface eth0 inet6 auto
dhcp 1
request_prefix 1
```

- or

```
iface eth0 inet6 dhcp
request_prefix 1
```

DHCPv6-PD Router Configuration

- Server

```
ipv6 dhcp pool ipv6-bras
        prefix-delegation pool bras1 lifetime 1800 600
ipv6 local pool bras1 Y:Y:Y:Y::Y/36 48
interface FastEthernet0/0
        ipv6 enable
        ipv6 dhcp server ipv6-bras
```

- Client

```
interface FastEthernet0/0
        ipv6 address autoconfig default
        ipv6 dhcp client pd ftth
Interface FastEthernet0/1
        ipv6 address ftth ::X:Y:Z:W/64
```

DHCPv6 Linux Configuration

- Config file at /etc/dhcp6.conf

```
default-lease-time 2592000;
preferred-lifetime 604800;
option dhcp-renewal-time 3600;
option dhcp-rebinding-time 7200;
allow leasequery;
option dhcp6.info-refresh-time 21600;
# The subnet where the server is attached
#  (i.e., the server has an address in this subnet)
subnet6 2001:470:68ee::/48 {
pool6 {
        range6 2001:470:68ee::100 2001:470:68ee::300;
#           # Some /64 prefixes available for Prefix Delegation (RFC 3633)
            prefix6 2001:470:68ee:3000:: 2001:470:68ee:3e80:: /60;
}
            option dhcp6.name-servers 2001:4860:4860::8888;
            option domain-name "other-ipv6-lab.org";
}

service isc-dhcp-server6 start | restart | stop | status
```

DHCPv6 Leases

- At the server:

  /var/lib/dhcp/dhcpd6.leases

- At the client:

  /var/lib/dhcp/dhclient6.eth0.leases

- Both of them:

  tail -f /var/log/syslog

KEA ISC

- https://ftp.isc.org/isc/kea/1.4.0-P1/kea-guide.pdf

- Better performance
- Ability to store lease info in databases
- High Availability, even in the same address
- Extensible via Hooks
- Config in JSON format

Thanks !!

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