DHCP Protocol Principles

Foreword

An enterprise network may often consist of a substantial number of host devices, each requiring network parameters in the form of IP addressing and additional network configuration information. Manual allocation is often a tedious and inaccurate business which can lead to many end stations facing address duplication or failure to reach services necessary for smooth network operation. DHCP is an application layer protocol that is designed to automate the process of providing such configuration information to clients within a TCP/IP network. DHCP therefore aids in ensuring correct addressing is allocated, and reduces the burden on administration for all enterprise networks. This section introduces the application of DHCP within the enterprise network.

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Objectives

Upon completion of this section, trainees will be able to:

- Describe the function of DHCP in the enterprise network.
- Explain the leasing process of DHCP.
- Configure DHCP pools for address leasing.

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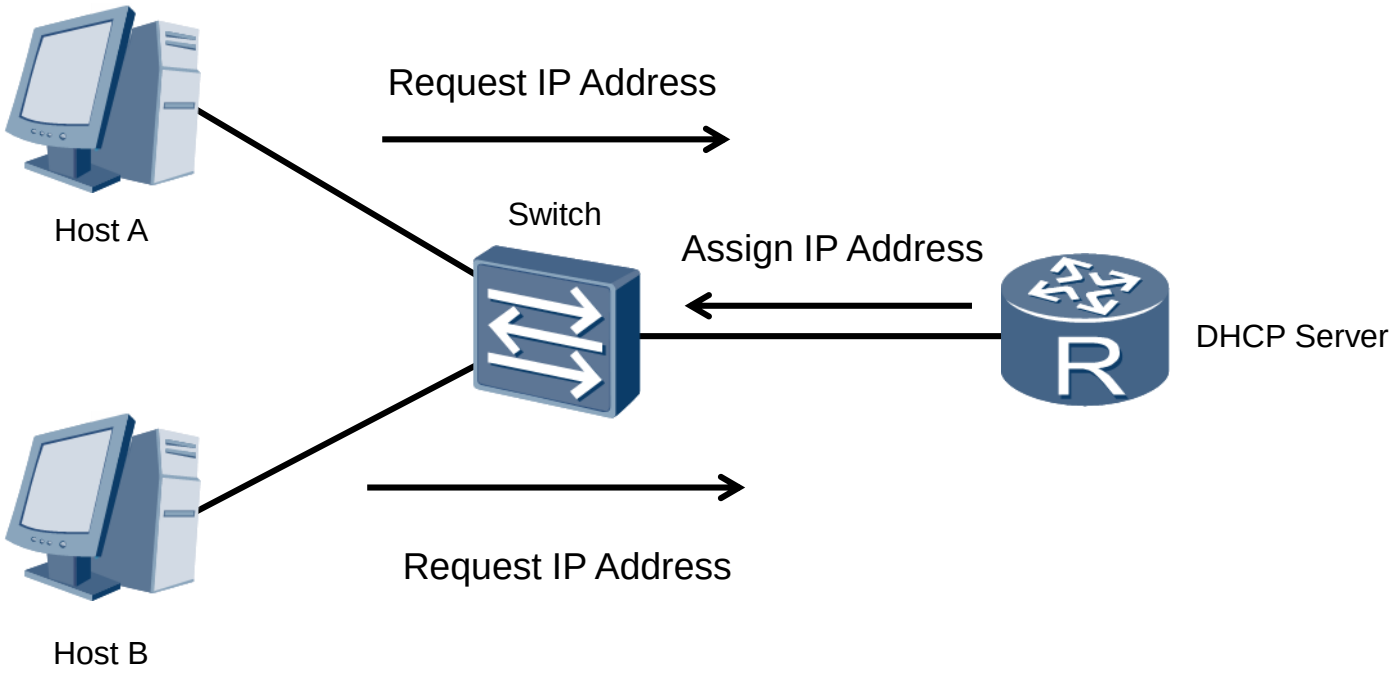
DHCP Application In The Enterprise Network



- Networks comprising of a large number of users requires a central management system for IP address allocation.

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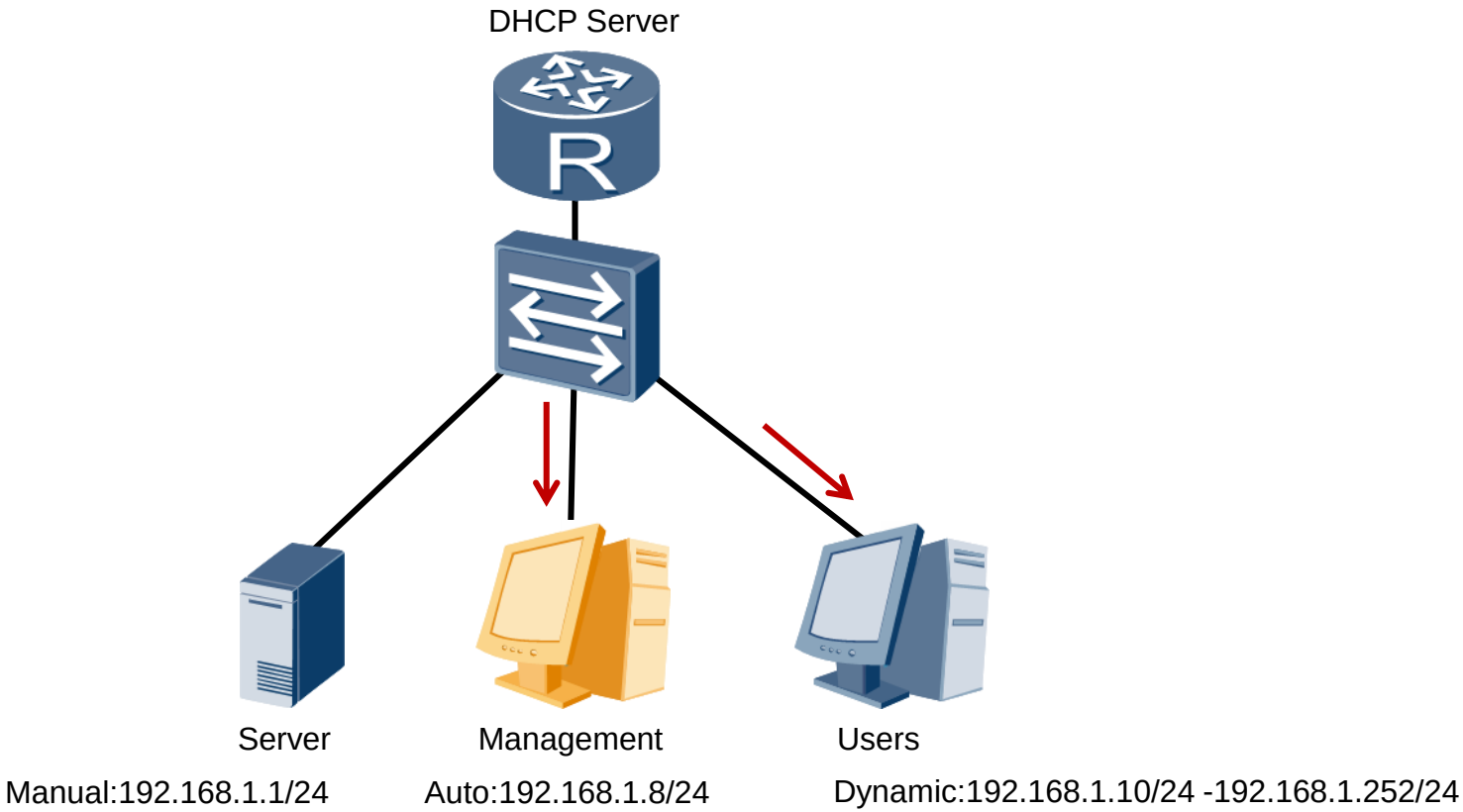
Address Allocation Mechanisms



- DHCP supports three mechanisms for IP address allocation.

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DHCP Messages

Message Types	Function
DHCP DISCOVER	Client broadcast used to locate available DHCP servers.
DHCP OFFER	Server responds to DHCPDISCOVER with an offer of configuration parameters.
DHCP REQUEST	Client message to servers, either (a) requesting offered parameters from one server and implicitly declining offers from all others, (b) confirming the correctness of previously allocated address after, e.g., system reboot, or (c) extending the lease on a particular network address.
DHCP ACK	Server confirmation sent to the client with configuration parameters, including committed network address.
DHCP NAK	Server indicates to the client that client's requested network address cannot be assigned.
DHCP RELEASE	Client relinquishes the network address to the server and cancels the remaining lease.
DHCP DECLINE	Client refuses IP address due to IP conflict.

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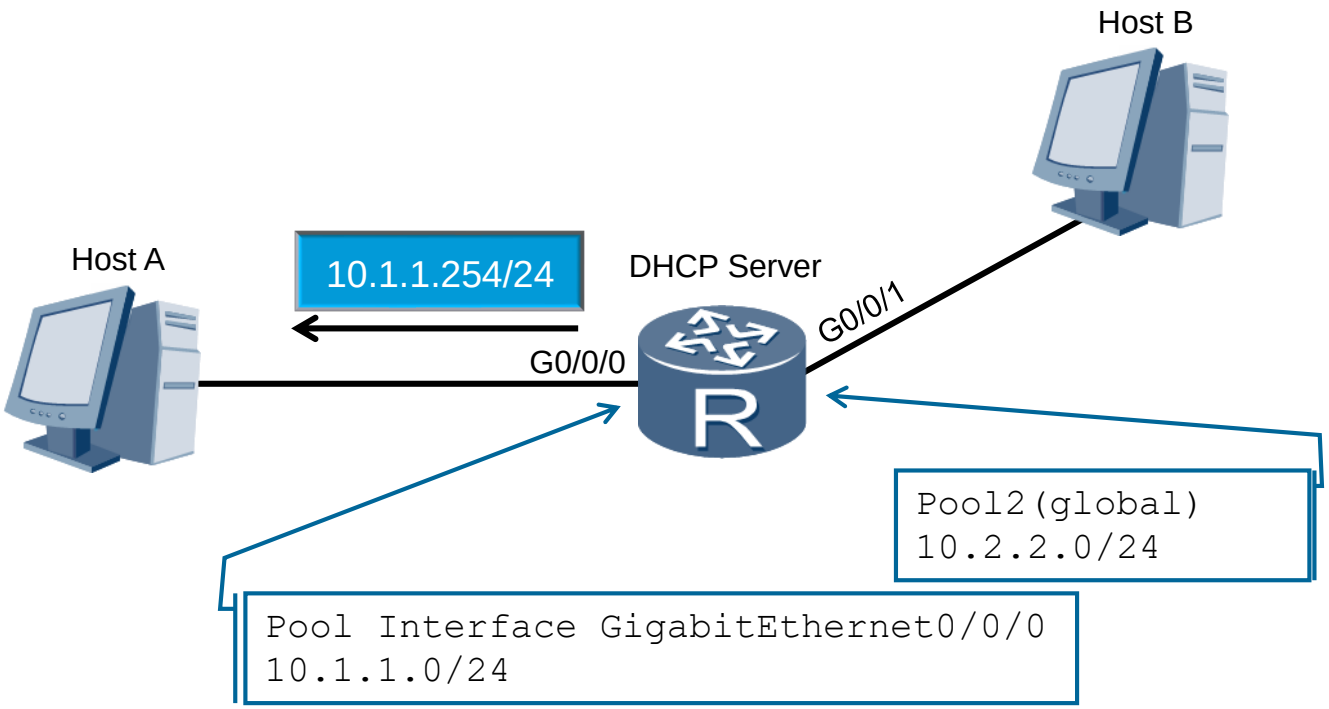
Address Pools



- Address pools can be either global or interface based.

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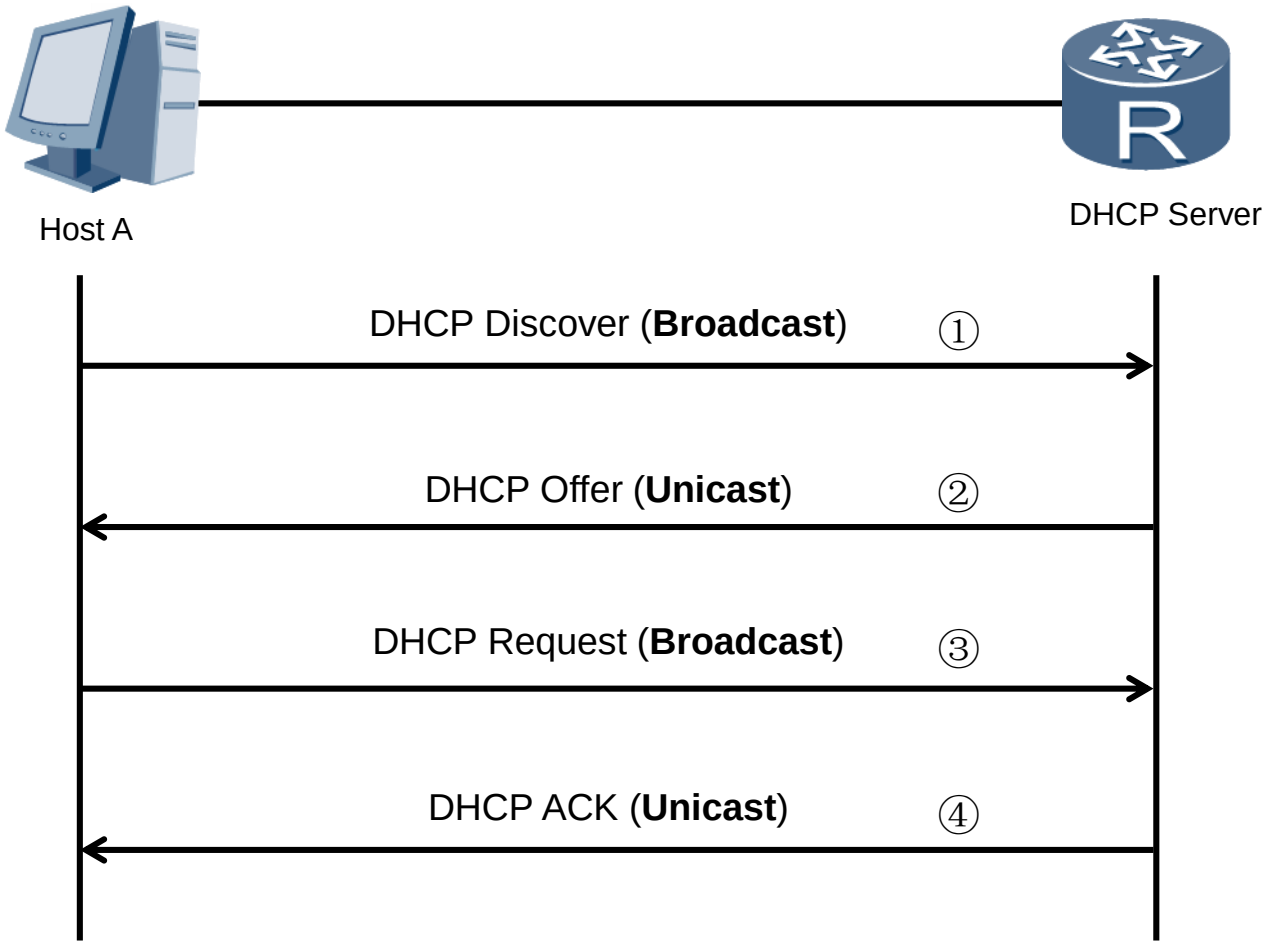
DHCP Address Acquisition



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DHCP Address Acquisition

1	0.000000	0.0.0.0	255.255.255.255	DHCP	410 DHCP Discover - Transaction ID 0x75d7
2	0.047000	192.168.1.1	192.168.1.254	DHCP	342 DHCP Offer - Transaction ID 0x75d7
3	2.016000	0.0.0.0	255.255.255.255	DHCP	410 DHCP Request - Transaction ID 0x75d7
4	2.032000	192.168.1.1	192.168.1.254	DHCP	342 DHCP ACK - Transaction ID 0x75d7
5	3.016000	HuaweiTe_fb:02:b0	Broadcast	ARP	60 Gratuitous ARP for 192.168.1.254 (Request)
6	4.000000	HuaweiTe_fb:02:b0	Broadcast	ARP	60 Gratuitous ARP for 192.168.1.254 (Request)
7	5.000000	HuaweiTe_fb:02:b0	Broadcast	ARP	60 Gratuitous ARP for 192.168.1.254 (Request)

dhcp_acquisition.pcapng

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DHCP Address Acquisition – Indirizzo del client

Il client riceve un pacchetto IP dal server con indirizzo unicast 192.168.1.1, perchè dovrebbe processarlo se il suo indirizzo è 0.0.0.0?

RFC1122 definisce l'indirizzo 0.0.0.0 come:

```
This host on this network.  MUST NOT be sent, except as
a source address as part of an initialization procedure
by which the host learns its own IP address.
```

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DHCP Address Acquisition – Indirizzo del client

Per quanto riguarda il processamento del pacchetto inviato dal server:

In the case of a client using DHCP for initial configuration (before the client's TCP/IP software has been completely configured), DHCP requires creative use of the client's TCP/IP software and liberal interpretation of RFC 1122. **The TCP/IP software SHOULD accept and forward to the IP layer any IP packets delivered to the client's hardware address before the IP address is configured;** DHCP servers and BOOTP relay agents may not be able to deliver DHCP messages to clients that cannot accept hardware unicast datagrams before the TCP/IP software is configured.

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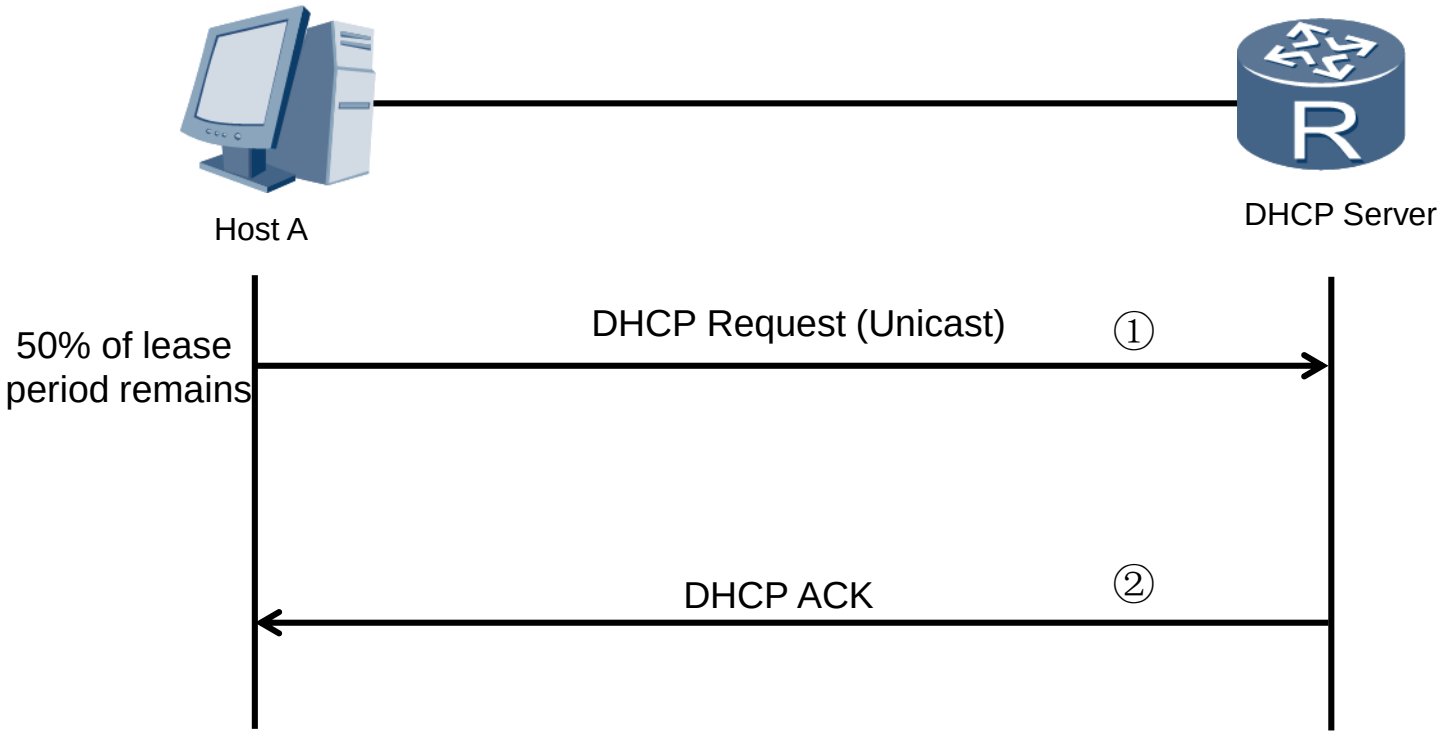
DHCP Lease Renewal



- DHCP initiates an IP lease renewal process when a lease period of 50% remains.

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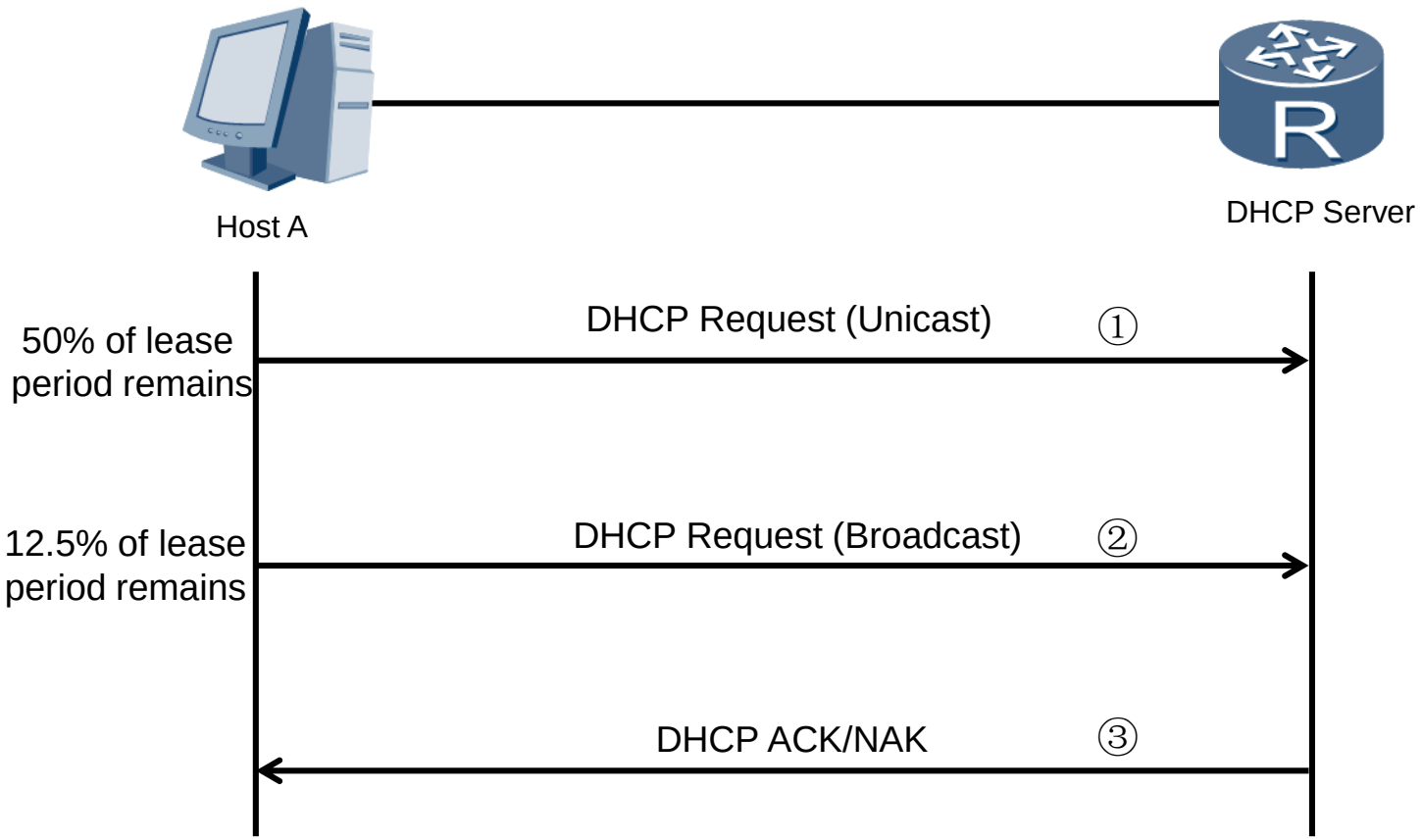
DHCP Rebinding Expiry



- Rebinding will occur if the lease is not renewed in time.

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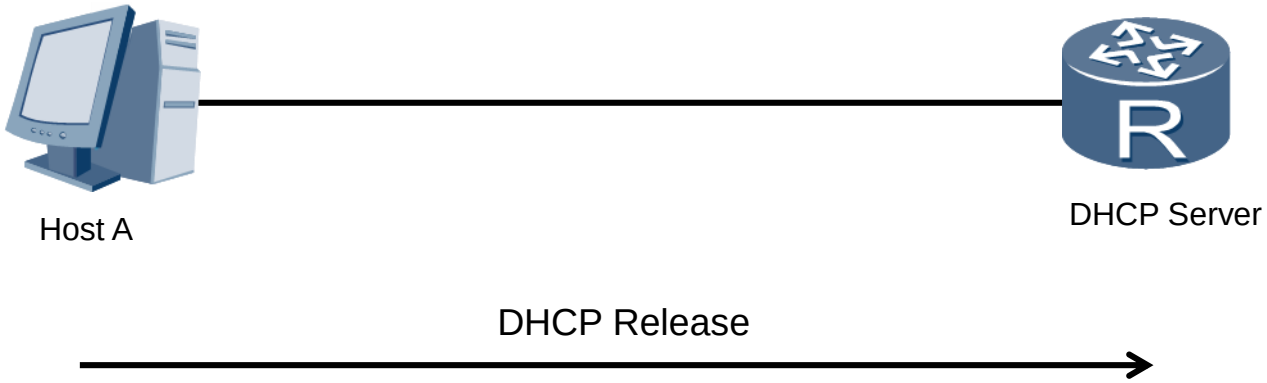
IP Address Release



- DHCP will result in the release of an IP address if the client fails to renew the IP address before the lease expiry.

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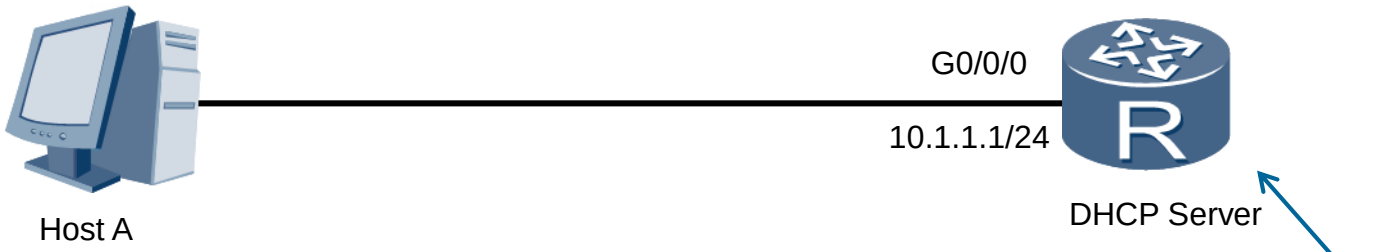
DHCP Interface Pool Configuration




```
[Huawei]dhcp enable
[Huawei]interface GigabitEthernet0/0/0
[Huawei-GigabitEthernet0/0/0]dhcp select interface
[Huawei-GigabitEthernet0/0/0]dhcp server dns-list 10.1.1.2
[Huawei-GigabitEthernet0/0/0]dhcp server excluded-ip-address
10.1.1.2
[Huawei-GigabitEthernet0/0/0]dhcp server lease day 3
```

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DHCP Configuration Validation

```
[Huawei]display ip pool interface GigabitEthernet0/0/0
  Pool-name      : GigabitEthernet0/0/0
  Pool-No        : 0
  Lease          : 3 Days 0 Hours 0 Minutes
  Domain-name    : huawei.com
  DNS-Server0    : 10.1.1.2
  NBNS-Server0   : -
  Netbios-type   : -
  Position       : Interface       Status       : Unlocked
  Gateway-0      : 10.1.1.1
  Mask           : 255.255.255.0
  VPN instance   : --
 ------------------------------------------------------------------
  Start        End      Total Used  Idle(Expired) Conflict Disable
 ------------------------------------------------------------------
 10.1.1.1  10.1.1.254  253   1        251(0)          0       1
```

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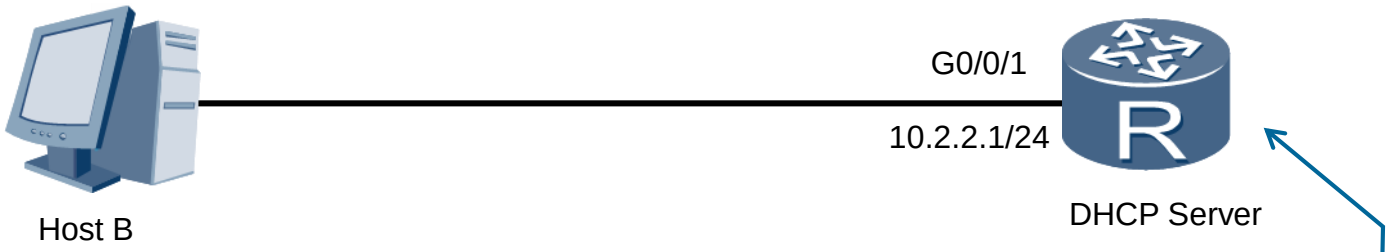
DHCP Global Pool Configuration




```
[Huawei]dhcp enable
[Huawei]ip pool pool2
Info: It's successful to create an IP address pool.
[Huawei-ip-pool-pool2]network 10.2.2.0 mask 24
[Huawei-ip-pool-pool2]gateway-list 10.2.2.1
[Huawei-ip-pool-pool2]lease day 1
[Huawei-ip-pool-pool2]quit
[Huawei]interface GigabitEthernet0/0/1
[Huawei-GigabitEthernet0/0/1]dhcp select global
```

- Establishment of an address pool and associated parameters is implemented on the DHCP server.

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DHCP Configuration Validation

```
[Huawei]display ip pool
 ---------------------------------------------------------------
  Pool-name      : pool2
  Pool-No        : 0
  Position       : Local            Status            : Unlocked
  Gateway-0      : 10.2.2.1
  Mask           : 255.255.255.0
  VPN instance   : --
  IP address Statistic
    Total        :253
    Used         :1          Idle         :252
    Expired      :0          Conflict     :0          Disable    :0
```

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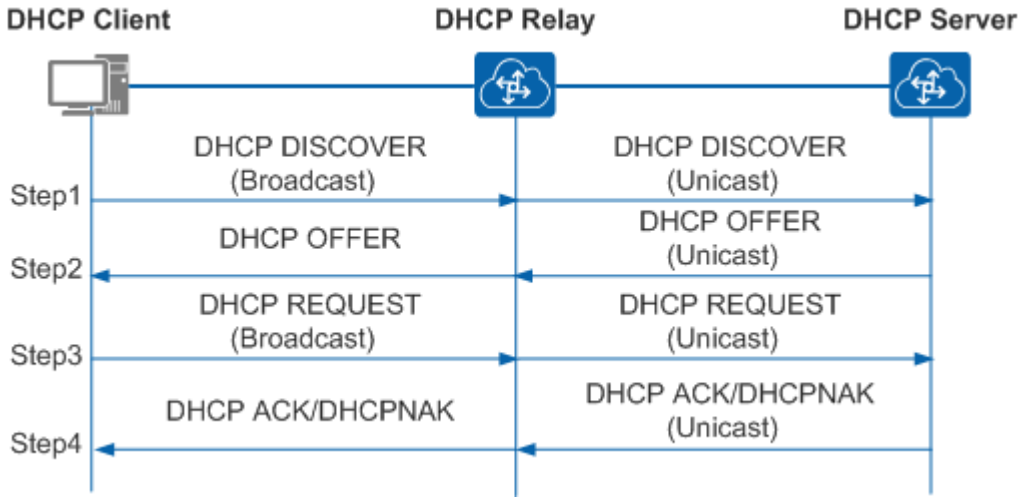
DHCP Relay

- Tecnica che consente di utilizzare un server DHCP posto in una rete diversa da quella dei client;
  - Centralizzazione delle funzioni;
  - Protezione del server;
- La richiesta DHCP viene “intercettata” da un dispositivo che la inoltra al server DHCP;



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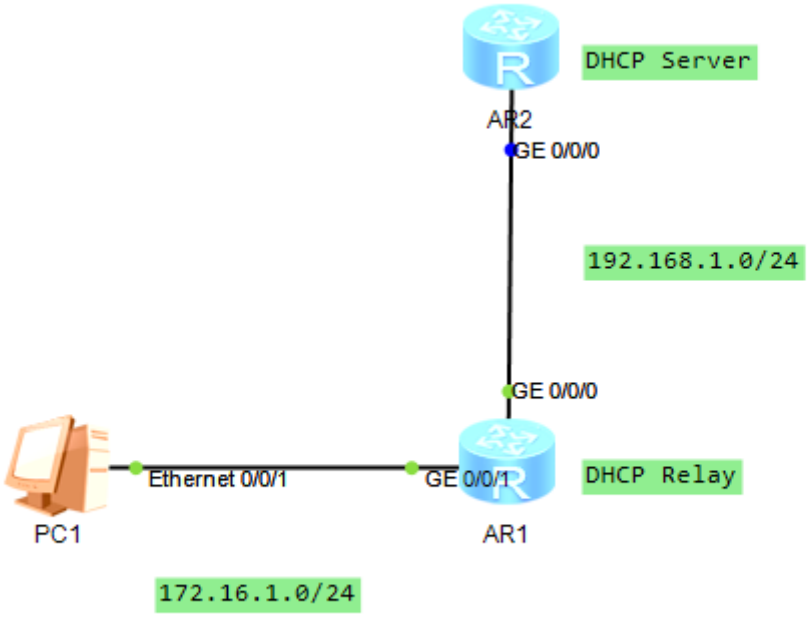
DHCP Relay



Note per la configurazione:

- AR1

  Abilitare DHCP server;

- AR1 – gig 0/0/1

  Impostare il dhcp relay;

  Indicare l'ip del server remote;

- AR2

  Abilitare DHCP server;

  Creare il pool degli indirizzi IP;

  Impostare una rotta statica verso la 172.16.0.0/24

  dchp select global sulla gig 0/0/0.

Mini-Lab_basic:12-dhcp_relay_01

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DHCP Relay

```
AR1
#
dhcp enable
#
interface GigabitEthernet0/0/1
 ip address 172.16.1.1 255.255.255.0
 dhcp select relay
 dhcp relay server-ip 192.168.1.2
#
```

```
AR2
#
dhcp enable
#
ip pool remote_172_16
 gateway-list 172.16.1.1
 network 172.16.1.0 mask
255.255.255.0
#
#
interface GigabitEthernet0/0/0
 ip address 192.168.1.2 255.255.255.0
 dhcp select global
#
```

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Summary

- Which IP addresses should generally be excluded from the address pool?
- What is the default IP address lease period?

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