Reti di Calcolatori I

Prof. Roberto Canonico
Dipartimento di Ingegneria Elettrica e delle Tecnologie dell'Informazione

Corso di Laurea in Ingegneria Informatica

Protocollo DHCP

**I lucidi presentati al corso sono uno strumento didattico
che NON sostituisce i testi indicati nel programma del corso**
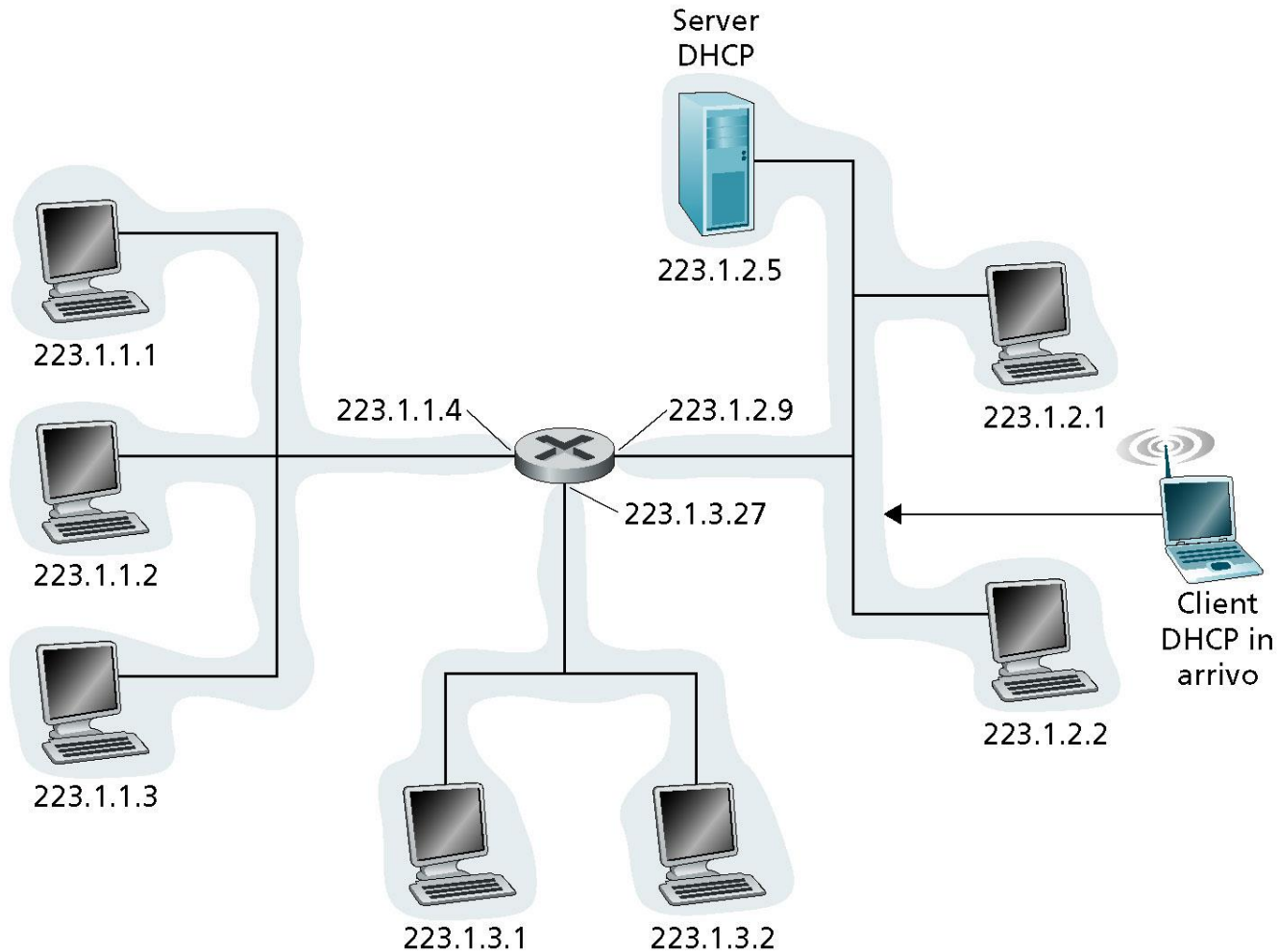
Nota di copyright per le slide COMICS

UNIVERSITÀ DEGLI STUDI DI NAPOLI
FEDERICO II

DHCP: scenario tipico

Interazione client-server via DHCP
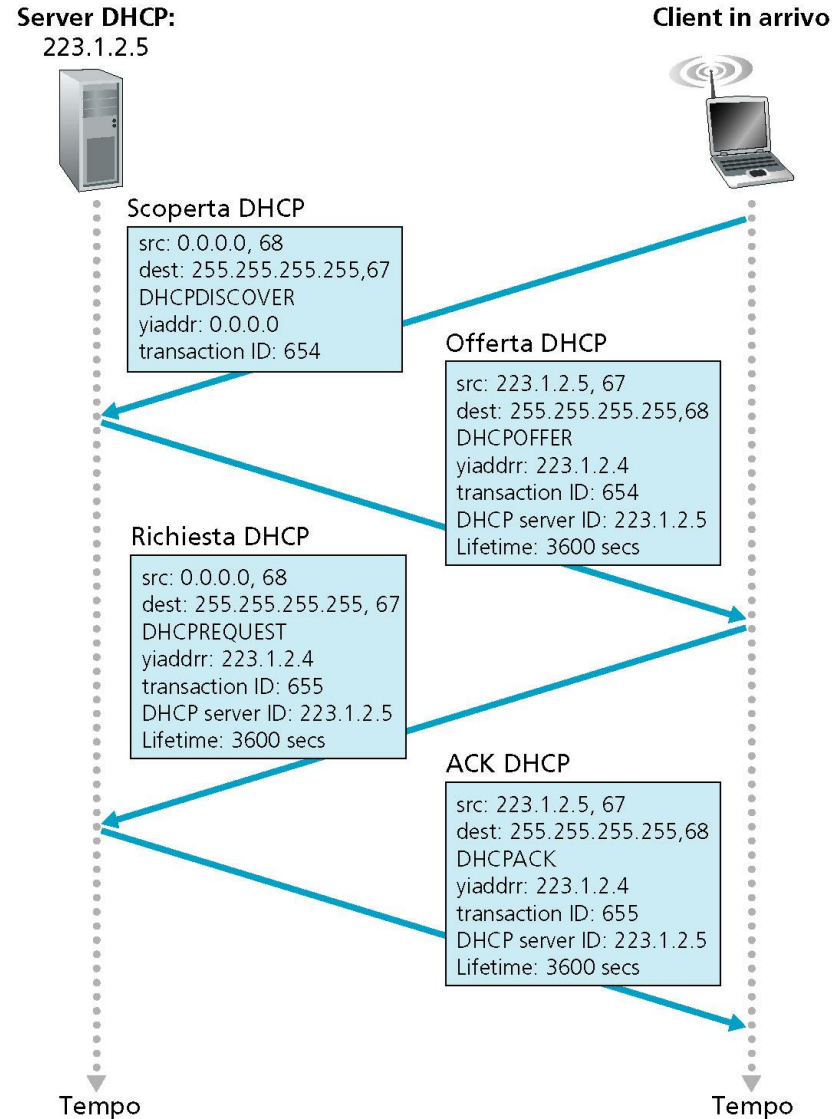
DHCP discover

No.	Time	Source	Destination	Protocol	Info
1	0.000000	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0xb2c065b
2	0.004628	192.168.2.1	192.168.2.13	DHCP	DHCP Offer - Transaction ID 0xb2c065b
3	0.005392	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0xb2c065b
4	0.009656	192.168.2.1	192.168.2.13	DHCP	DHCP ACK - Transaction ID 0xb2c065b

```
⊞ Frame 1 (342 on wire, 342 captured)
⊟ Ethernet II
    Destination: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
    Source: 00:02:2d:09:17:be (Agere_09:17:be)
    Type: IP (0x0800)
⊞ Internet Protocol, Src Addr: 0.0.0.0 (0.0.0.0), Dst Addr: 255.255.255.255 (255.255.255.255)
⊟ User Datagram Protocol, Src Port: bootpc (68), Dst Port: bootps (67)
    Source port: bootpc (68)
    Destination port: bootps (67)
    Length: 308
    Checksum: 0xae22 (correct)
⊟ Bootstrap Protocol
    Message type: Boot Request (1)
    Hardware type: Ethernet
    Hardware address length: 6
    Hops: 0
    Transaction ID: 0x0b2c065b
    Seconds elapsed: 0
    Broadcast flag: 0x0000
    Client IP address: 0.0.0.0 (0.0.0.0)
    Your (client) IP address: 0.0.0.0 (0.0.0.0)
    Next server IP address: 0.0.0.0 (0.0.0.0)
    Relay agent IP address: 0.0.0.0 (0.0.0.0)
    Client hardware address: 00:02:2d:09:17:be
    Server host name not given
    Boot file name not given
    Magic cookie: (OK)
    Option 53: DHCP Message Type = DHCP Discover
    Option 116: DHCP Auto-Configuration (1 bytes)
  ⊞ Option 61: Client identifier
    Option 50: Requested IP Address = 192.168.2.13
    Option 12: Host Name = "java"
    Option 60: Vendor class identifier = "MSFT 5.0"
  ⊞ Option 55: Parameter Request List
    End Option
    Padding
```

DHCP offer

No. .	Time	Source	Destination	Protocol	Info
1	0.000000	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0xb2c065b
2	0.004628	192.168.2.1	192.168.2.13	DHCP	DHCP Offer - Transaction ID 0xb2c065b
3	0.005392	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0xb2c065b
4	0.009656	192.168.2.1	192.168.2.13	DHCP	DHCP ACK - Transaction ID 0xb2c065b

```
⊞Frame 2 (590 on wire, 590 captured)
⊟Ethernet II
    Destination: 00:02:2d:09:17:be (Agere_09:17:be)
    Source: 00:30:bd:96:28:fa (BELKIN_96:28:fa)
    Type: IP (0x0800)
⊞Internet Protocol, Src Addr: 192.168.2.1 (192.168.2.1), Dst Addr: 192.168.2.13 (192.168.2.13)
⊟User Datagram Protocol, Src Port: bootps (67), Dst Port: bootpc (68)
    Source port: bootps (67)
    Destination port: bootpc (68)
    Length: 556
    Checksum: 0xc29a (correct)
⊟Bootstrap Protocol
    Message type: Boot Reply (2)
    Hardware type: Ethernet
    Hardware address length: 6
    Hops: 0
    Transaction ID: 0x0b2c065b
    Seconds elapsed: 0
    Broadcast flag: 0x0000
    Client IP address: 0.0.0.0 (0.0.0.0)
    Your (client) IP address: 192.168.2.13 (192.168.2.13)
    Next server IP address: 0.0.0.0 (0.0.0.0)
    Relay agent IP address: 0.0.0.0 (0.0.0.0)
    Client hardware address: 00:02:2d:09:17:be
    Server host name not given
    Boot file name not given
    Magic cookie: (OK)
    Option 53: DHCP Message Type = DHCP Offer
    Option 54: Server Identifier = 192.168.2.1
    Option 51: IP Address Lease Time = 12427 days, 7 hours, 45 minutes, 41 seconds
    Option 1: Subnet Mask = 255.255.255.0
    Option 3: Router = 192.168.2.1
  ⊟Option 6: Domain Name Server
      IP Address: 217.9.64.200
      IP Address: 217.9.64.220
      IP Address: 217.9.64.3
    Option 15: Domain Name = "napoli.consorzio-cini.it"
    Option 44: NetBIOS over TCP/IP Name Server = 217.9.64.200
    End Option
    Padding
```

DHCP request

File Edit Capture Display Tools

No. .	Time	Source	Destination	Protocol	Info
1	0.000000	0.0.0.0	255.255.255.255	DHCP	DHCP Discover - Transaction ID 0xb2c065b
2	0.004628	192.168.2.1	192.168.2.13	DHCP	DHCP Offer - Transaction ID 0xb2c065b
3	0.005392	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0xb2c065b
4	0.009656	192.168.2.1	192.168.2.13	DHCP	DHCP ACK - Transaction ID 0xb2c065b

```
⊞ Frame 3 (361 on wire, 361 captured)
⊟ Ethernet II
    Destination: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
    Source: 00:02:2d:09:17:be (Agere_09:17:be)
    Type: IP (0x0800)
⊞ Internet Protocol, Src Addr: 0.0.0.0 (0.0.0.0), Dst Addr: 255.255.255.255 (255.255.255.255)
⊞ User Datagram Protocol, Src Port: bootpc (68), Dst Port: bootps (67)
⊟ Bootstrap Protocol
    Message type: Boot Request (1)
    Hardware type: Ethernet
    Hardware address length: 6
    Hops: 0
    Transaction ID: 0x0b2c065b
    Seconds elapsed: 0
    Broadcast flag: 0x0000
    Client IP address: 0.0.0.0 (0.0.0.0)
    Your (client) IP address: 0.0.0.0 (0.0.0.0)
    Next server IP address: 0.0.0.0 (0.0.0.0)
    Relay agent IP address: 0.0.0.0 (0.0.0.0)
    Client hardware address: 00:02:2d:09:17:be
    Server host name not given
    Boot file name not given
    Magic cookie: (OK)
    Option 53: DHCP Message Type = DHCP Request
  ⊟ Option 61: Client identifier
      Hardware type: Ethernet
      Client hardware address: 00:02:2d:09:17:be
    Option 50: Requested IP Address = 192.168.2.13
    Option 54: Server Identifier = 192.168.2.1
    Option 12: Host Name = "java"
    Option 81: Client Fully Qualified Domain Name (23 bytes)
    Option 60: Vendor class identifier = "MSFT 5.0"
  ⊟ Option 55: Parameter Request List
      1 = Subnet Mask
      15 = Domain Name
      3 = Router
      6 = Domain Name Server
      44 = NetBIOS over TCP/IP Name Server
      46 = NetBIOS over TCP/IP Node Type
      47 = NetBIOS over TCP/IP Scope
      31 = Perform Router Discover
      33 = Static Route
      Unknown Option Code: 249
      43 = Vendor-Specific Information
    End Option
```

7

DHCP ACK


```
File  Edit  Capture  Display  Tools

No. .  Time       Source              Destination         Protocol  Info
     1 0.000000  0.0.0.0             255.255.255.255     DHCP      DHCP Discover - Transaction ID 0xb2c065b
     2 0.004628  192.168.2.1         192.168.2.13        DHCP      DHCP Offer    - Transaction ID 0xb2c065b
     3 0.005392  0.0.0.0             255.255.255.255     DHCP      DHCP Request  - Transaction ID 0xb2c065b
     4 0.009656  192.168.2.1         192.168.2.13        DHCP      DHCP ACK      - Transaction ID 0xb2c065b

⊞ Frame 4 (590 on wire, 590 captured)
⊟ Ethernet II
     Destination: 00:02:2d:09:17:be (Agere_09:17:be)
     Source: 00:30:bd:96:28:fa (BELKIN_96:28:fa)
     Type: IP (0x0800)
⊞ Internet Protocol, Src Addr: 192.168.2.1 (192.168.2.1), Dst Addr: 192.168.2.13 (192.168.2.13)
⊞ User Datagram Protocol, Src Port: bootps (67), Dst Port: bootpc (68)
⊟ Bootstrap Protocol
     Message type: Boot Reply (2)
     Hardware type: Ethernet
     Hardware address length: 6
     Hops: 0
     Transaction ID: 0x0b2c065b
     Seconds elapsed: 0
     Broadcast flag: 0x0000
     Client IP address: 0.0.0.0 (0.0.0.0)
     Your (client) IP address: 192.168.2.13 (192.168.2.13)
     Next server IP address: 0.0.0.0 (0.0.0.0)
     Relay agent IP address: 0.0.0.0 (0.0.0.0)
     Client hardware address: 00:02:2d:09:17:be
     Server host name not given
     Boot file name not given
     Magic cookie: (OK)
     Option 53: DHCP Message Type = DHCP ACK
     Option 54: Server Identifier = 192.168.2.1
     Option 51: IP Address Lease Time = 12427 days, 13 hours, 37 minutes, 3 seconds
     Option 1: Subnet Mask = 255.255.255.0
     Option 3: Router = 192.168.2.1
   ⊟ Option 6: Domain Name Server
       IP Address: 217.9.64.200
       IP Address: 217.9.64.220
       IP Address: 217.9.64.3
     Option 15: Domain Name = "napoli.consorzio-cini.it"
     Option 44: NetBIOS over TCP/IP Name Server = 217.9.64.200
     End Option
     Padding
```

8

DHCP relay agent

- Un DHCP relay agent è un'entità che consente ad un client DHCP di comunicare con un server DHCP collocato in una diversa rete
- Dal momento che client e server sono in reti diverse, tra essi non è possibile lo scambio di messaggi broadcast DHCP
- Pertanto, il compito di un agent DHCP relay è quello di convertire pacchetti broadcast in pacchetti unicast
  - Le comunicazioni client-agent sono broadcast
  - Le comunicazioni agent-server sono unicast
- Dal punto di vista del client, il relay agent si comporta come un server

DHCP client — BROADCAST — DHCP relay agent — UNICAST — DHCP server