

Corso di Laurea in Ingegneria Informatica



Corso di Reti di Calcolatori I

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ICMP: ping e traceroute

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ICMP (Internet Control Message Protocol)



- Funzionalità:
 - Verificare lo stato della rete
 - echo request, echo reply
 - Riportare anomalie
 - destination unreachable
 - time exceeded
 - parameter problem
 - Scoprire la netmask
 - mask request
 - address mask reply
 - Migliorare il routing
 - Redirect
- **Messaggi ICMP trasportati in datagrammi IP con Protocol Type = 0x01**

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ICMP



| | <u>Type</u> | <u>Code</u> | <u>description</u> |
|---|-------------|-------------|---|
| | 0 | 0 | echo reply (ping) |
| • I messaggi sono individuati da un tipo e da un codice | 3 | 0 | dest. network unreachable |
| | 3 | 1 | dest host unreachable |
| | 3 | 2 | dest protocol unreachable |
| | 3 | 3 | dest port unreachable |
| | 3 | 6 | dest network unknown |
| | 3 | 7 | dest host unknown |
| | 4 | 0 | source quench (congestion control - not used) |
| | 8 | 0 | echo request (ping) |
| | 9 | 0 | route advertisement |
| | 10 | 0 | router discovery |
| | 11 | 0 | TTL expired |
| | 12 | 0 | bad IP header |

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ICMP



- Applicazioni:
 - Ping
 - Utilizzato per verificare la connettività a livello rete tra due host, A e B
 - l'host A invia un pacchetto "echo request"
 - alla ricezione di tale messaggio, l'host B risponde con un pacchetto "echo reply"
 - Traceroute
 - Utilizzato per scoprire il percorso seguito per raggiungere una certa destinazione
 - Viene inviata una serie di pacchetti con TTL via via crescente, a partire da 1:
 - il router che, decrementando il TTL, lo azzererà invierà indietro un messaggio "time exceeded"
 - » in questo modo si riesce a determinare il percorso fino alla destinazione

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Esempio di traceroute (1/9)



```
C:\Documents and Settings\sromano>tracert 143.225.229.3

Rilevazione instradamento verso grid.grid.unina.it [143.225.229.3]
su un massimo di 30 punti di passaggio:

 1    2 ms    2 ms    2 ms    192.168.2.1
 2    4 ms    8 ms    9 ms    217.9.64.193
 3   11 ms   19 ms   19 ms   192.55.101.129
 4    3 ms    3 ms    3 ms    grid.grid.unina.it [143.225.229.3]

Rilevazione completata.
```

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Esempio di traceroute (2/9)



<capture> - Ethereal

| No. | Time | Source | Destination | Protocol | Info |
|-----|----------|----------------------|--------------------|----------|---------------------|
| 1 | 0.000000 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |

Frame 1 (106 on wire, 106 captured)

- Ethernet II
 - Destination: 00:30:bd:96:28:fa (BELKIN_96:28:fa)
 - Source: 00:02:2d:09:17:be (java.comics.unina.it)
 - Type: IP (0x0800)
- Internet Protocol, Src Addr: java.comics.unina.it (192.168.2.6), Dst Addr: grid.grid.unina.it (143.225.229.3)
 - Version: 4
 - Header length: 20 bytes
 - Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
 - Total Length: 92
 - Identification: 0x2042
 - Flags: 0x00
 - Fragment offset: 0
- Time to live: 1
- Protocol: ICMP (0x01)
 - Header checksum: 0x61cc (correct)
 - Source: java.comics.unina.it (192.168.2.6)
 - Destination: grid.grid.unina.it (143.225.229.3)
- Internet Control Message Protocol
 - Type: 8 (Echo (ping) request)
 - Code: 0
 - Checksum: 0xaeff (correct)
 - Identifier: 0x0300
 - Sequence number: 46:00
 - Data (64 bytes)

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Esempio di traceroute (3/9)



<capture> - Ethereal

| No. | Time | Source | Destination | Protocol | Info |
|-----|----------|----------------------|----------------------|----------|-----------------------|
| 1 | 0.000000 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |
| 2 | 0.002111 | 192.168.2.1 | java.comics.unina.it | ICMP | Time-to-live exceeded |

Frame 2 (134 on wire, 134 captured)

- Ethernet II
 - Destination: 00:0c:29:14:00:00 (eth0)
 - Source: 00:0c:29:14:00:00 (eth0)
 - Type: IP (0x0800)
- Internet Protocol, Src Addr: 192.168.2.1 (192.168.2.1), Dst Addr: java.comics.unina.it (192.168.2.6)
 - Version: 4
 - Header length: 20 bytes
 - Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
 - Total Length: 92
 - Identification: 0x2042
 - Flags: 0x00
 - Fragment offset: 0
- Time to live: 1
- Protocol: ICMP (0x01)
 - Header checksum: 0x61cc (correct)
 - Source: java.comics.unina.it (192.168.2.6)
 - Destination: grid.grid.unina.it (143.225.229.3)
- Internet Control Message Protocol
 - Type: 8 (Echo (ping) request)
 - Code: 0
 - Checksum: 0xaeff (correct)
 - Identifier: 0x0300
 - Sequence number: 46:00
 - Data (64 bytes)

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Esempio di traceroute (4/9)



<capture> - Ethereal

| No. | Time | Source | Destination | Protocol | Info |
|-----|----------|----------------------|----------------------|----------|-----------------------|
| 5 | 0.004468 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |
| 6 | 0.006490 | 192.168.2.1 | java.comics.unina.it | ICMP | Time-to-live exceeded |
| 7 | 1.006318 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |

Frame 7 (106 on wire, 106 captured)
Ethernet II
Internet Protocol, Src Addr: java.comics.unina.it (192.168.2.6), Dst Addr: grid.grid.unina.it (143.225.229.3)
Version: 4
Header length: 20 bytes
Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
Total Length: 92
Identification: 0x2045
Flags: 0x00
Fragment offset: 0
Time to live: 1
Protocol: ICMP (0x01)
Header checksum: 0x60c9 (correct)
Source: java.comics.unina.it (192.168.2.6)
Destination: grid.grid.unina.it (143.225.229.3)
Internet Control Message Protocol
Type: 8 (Echo (ping) request)
Code: 0
Checksum: 0xabff (correct)
Identifier: 0x0300
Sequence number: 49:00
Data (64 bytes)

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Esempio di traceroute (5/9)



<capture> - Ethereal

| No. | Time | Source | Destination | Protocol | Info |
|-----|----------|----------------------|----------------------|----------|-----------------------|
| 5 | 0.004468 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |
| 6 | 0.006490 | 192.168.2.1 | java.comics.unina.it | ICMP | Time-to-live exceeded |
| 7 | 1.006318 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |
| 8 | 1.011137 | 217.9.64.193 | java.comics.unina.it | ICMP | Time-to-live exceeded |

Frame 8 (70 on wire, 70 captured)
Ethernet II
Internet Protocol, Src Addr: 217.9.64.193 (217.9.64.193), Dst Addr: java.comics.unina.it (192.168.2.6)
Internet Control Message Protocol
Type: 11 (Time-to-live exceeded)
Code: 0 (TTL equals 0 during transit)
Checksum: 0xf4ff (correct)
Internet Protocol, Src Addr: java.comics.unina.it (192.168.2.6), Dst Addr: grid.grid.unina.it (143.225.229.3)
Version: 4
Header length: 20 bytes
Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
Total Length: 92
Identification: 0x2045
Flags: 0x00
Fragment offset: 0
Time to live: 1
Protocol: ICMP (0x01)
Header checksum: 0x61c9 (correct)
Source: java.comics.unina.it (192.168.2.6)
Destination: grid.grid.unina.it (143.225.229.3)
Internet Control Message Protocol
Type: 8 (Echo (ping) request)
Code: 0
Checksum: 0xabff (correct)
Identifier: 0x0300
Sequence number: 49:00

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Esempio di traceroute (6/9)



<capture> - Ethereal

File Edit Capture Display Tools Help

| No. | Time | Source | Destination | Protocol | Info |
|-----|----------|----------------------|--------------------|----------|---------------------|
| 13 | 2.023553 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |

Frame 13 (106 on wire, 106 captured)

- Ethernet II
- Internet Protocol, Src Addr: java.comics.unina.it (192.168.2.6), Dst Addr: grid.grid.unina.it (143.225.229.3)
 - Version: 4
 - Header length: 20 bytes
 - Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
 - Total Length: 92
 - Identification: 0x2049
 - Flags: 0x00
 - Fragment offset: 0
 - Time to live: 3
- Protocol: ICMP (0x01)
 - Header checksum: 0x5fc5 (correct)
 - Source: java.comics.unina.it (192.168.2.6)
 - Destination: grid.grid.unina.it (143.225.229.3)
- Internet Control Message Protocol
 - Type: 8 (Echo (ping) request)
 - Code: 0
 - Checksum: 0xa8ff (correct)
 - Identifier: 0x0300
 - Sequence number: 4c:00
 - Data (64 bytes)

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Esempio di traceroute (7/9)



<capture> - Ethereal

File Edit Capture Display Tools Help

| No. | Time | Source | Destination | Protocol | Info |
|-----|----------|----------------------|----------------------|----------|-----------------------|
| 13 | 2.023553 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |
| 14 | 2.034492 | 192.55.101.129 | java.comics.unina.it | ICMP | Time-to-live exceeded |

Frame 14 (70 on wire, 70 captured)

- Ethernet II
- Internet Protocol, Src Addr: 192.55.101.129 (192.55.101.129), Dst Addr: java.comics.unina.it (192.168.2.6)
- Internet Control Message Protocol
 - Type: 11 (Time-to-live exceeded)
 - Code: 0 (TTL equals 0 during transit)
 - Checksum: 0xf4ff (correct)
- Internet Protocol, Src Addr: java.comics.unina.it (192.168.2.6), Dst Addr: grid.grid.unina.it (143.225.229.3)
 - Version: 4
 - Header length: 20 bytes
 - Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
 - Total Length: 92
 - Identification: 0x2049
 - Flags: 0x00
 - Fragment offset: 0
 - Time to live: 1
- Protocol: ICMP (0x01)
 - Header checksum: 0x61c5 (correct)
 - Source: java.comics.unina.it (192.168.2.6)
 - Destination: grid.grid.unina.it (143.225.229.3)
- Internet Control Message Protocol
 - Type: 8 (Echo (ping) request)
 - Code: 0
 - Checksum: 0xa8ff (correct)
 - Identifier: 0x0300
 - Sequence number: 4c:00

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Esempio di traceroute (8/9)



<capture> - Ethereal

File Edit Capture Display Tools Help

| No. | Time | Source | Destination | Protocol | Info |
|-----|-----------|----------------------|----------------------|----------|-----------------------|
| 15 | 2.034848 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |
| 16 | 2.054220 | 192.55.101.129 | java.comics.unina.it | ICMP | Time-to-live exceeded |
| 17 | 2.054538 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |
| 18 | 2.074440 | 192.55.101.129 | java.comics.unina.it | ICMP | Time-to-live exceeded |
| 19 | 16.070350 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |

Frame 19 (106 on wire, 106 captured)

- Ethernet II
- Internet Protocol, Src Addr: java.comics.unina.it (192.168.2.6), Dst Addr: grid.grid.unina.it (143.225.229.3)
 - Version: 4
 - Header length: 20 bytes
 - Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
 - Total Length: 92
 - Identification: 0x2053
 - Flags: 0x00
 - Fragment offset: 0
 - Time to live: 4
 - Protocol: ICMP (0x01)
 - Header checksum: 0x5ebb (correct)
 - Source: java.comics.unina.it (192.168.2.6)
 - Destination: grid.grid.unina.it (143.225.229.3)
- Internet Control Message Protocol
 - Type: 8 (Echo (ping) request)
 - Code: 0
 - Checksum: 0xa5ff (correct)
 - Identifier: 0x0300
 - Sequence number: 4f:00
 - Data (64 bytes)

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Esempio di traceroute (9/9)



<capture> - Ethereal

File Edit Capture Display Tools Help

| No. | Time | Source | Destination | Protocol | Info |
|-----|-----------|----------------------|----------------------|----------|-----------------------|
| 16 | 2.054220 | 192.55.101.129 | java.comics.unina.it | ICMP | Time-to-live exceeded |
| 17 | 2.054538 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |
| 18 | 2.074440 | 192.55.101.129 | java.comics.unina.it | ICMP | Time-to-live exceeded |
| 19 | 16.070350 | java.comics.unina.it | grid.grid.unina.it | ICMP | Echo (ping) request |
| 20 | 16.074284 | grid.grid.unina.it | java.comics.unina.it | ICMP | Echo (ping) reply |

Frame 20 (106 on wire, 106 captured)

- Ethernet II
- Internet Protocol, Src Addr: grid.grid.unina.it (143.225.229.3), Dst Addr: java.comics.unina.it (192.168.2.6)
 - Version: 4
 - Header length: 20 bytes
 - Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
 - Total Length: 92
 - Identification: 0xa0b4
 - Flags: 0x00
 - Fragment offset: 0
 - Time to live: 252
 - Protocol: ICMP (0x01)
 - Header checksum: 0xe658 (correct)
 - Source: grid.grid.unina.it (143.225.229.3)
 - Destination: java.comics.unina.it (192.168.2.6)
- Internet Control Message Protocol
 - Type: 0 (Echo (ping) reply)
 - Code: 0
 - Checksum: 0xadff (correct)
 - Identifier: 0x0300
 - Sequence number: 4f:00
 - Data (64 bytes)

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