

**Corso di Laurea in Ingegneria Informatica**



**Corso di Reti di Calcolatori**

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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**



# ICMP

- I messaggi sono individuati da un tipo e da un codice

<u>Type</u>	<u>Code</u>	<u>description</u>
0	0	echo reply (ping)
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



- 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 azzerà invierà indietro un messaggio "time exceeded"
        - » in questo modo si riesce a determinare il percorso fino alla destinazione



# Esempio di traceroute (1/9)

```
C:\Documents and Settings\spromano>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.
```



# Esempio di traceroute (2/9)

<capture> - Ethereal					
File Edit Capture Display Tools Help					
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)					



# Esempio di traceroute (3/9)

<capture> - Ethereal					
File Edit Capture Display Tools Help					
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					
Internet Protocol, Src Addr: 192.168.2.1 (192.168.2.1), 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: 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)					





# Esempio di traceroute (4/9)

<capture> - Ethereal					
File Edit Capture Display Tools Help					
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: 2**
- 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)



# Esempio di traceroute (5/9)

<capture> - Ethereal

File Edit Capture Display Tools Help

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



# 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)					



# 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



# 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)



# 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)