

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: 8 (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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