

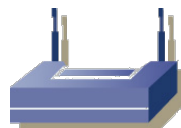
# Wi-Fi: Tráfico en un *ping* entre dos terminales inalámbricos

Area de Ingeniería Telemática  
<http://www.tlm.unavarra.es>

Grado en Ingeniería en Tecnologías de  
Telecomunicación, 3º

# Ping entre dos terminales WiFi

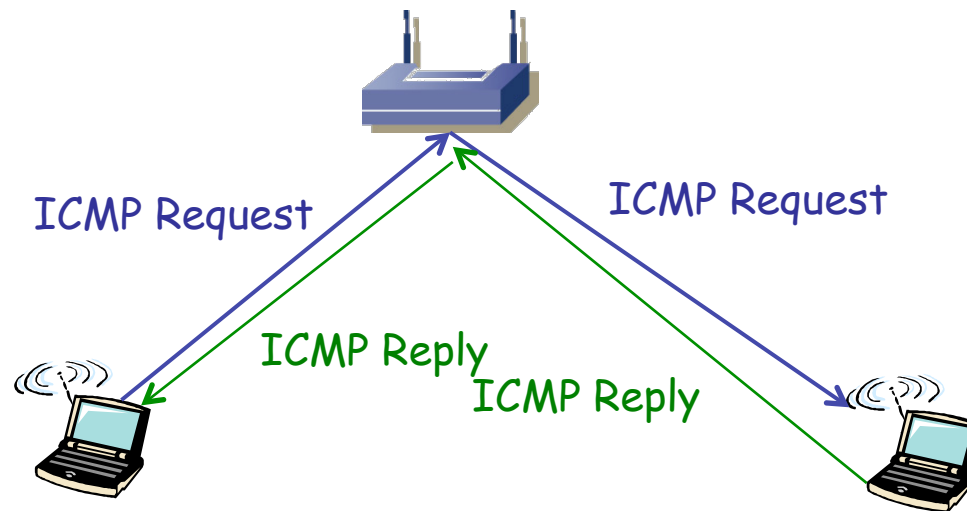
No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....



# Ping entre dos terminales WiFi

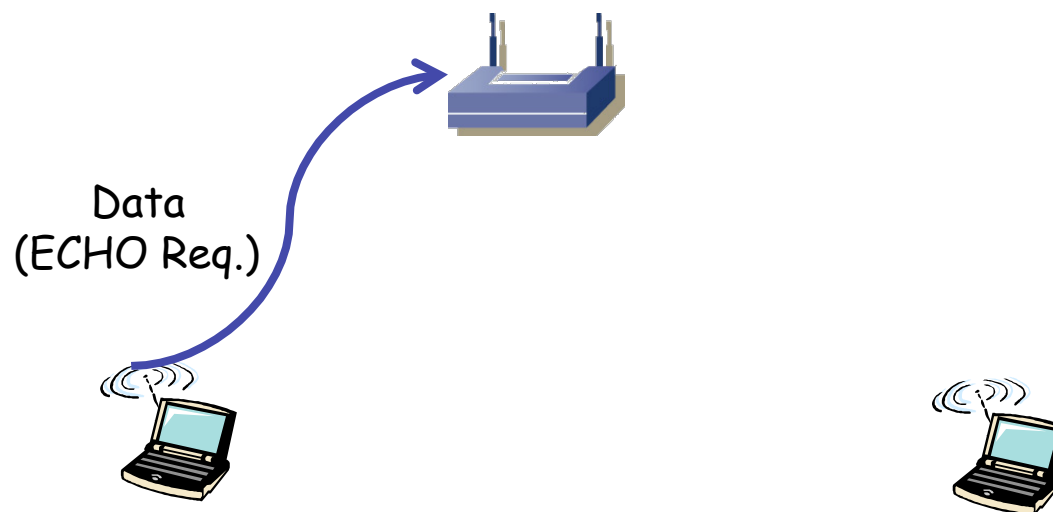
No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....

Si miramos solo las tramas de datos tenemos esto:



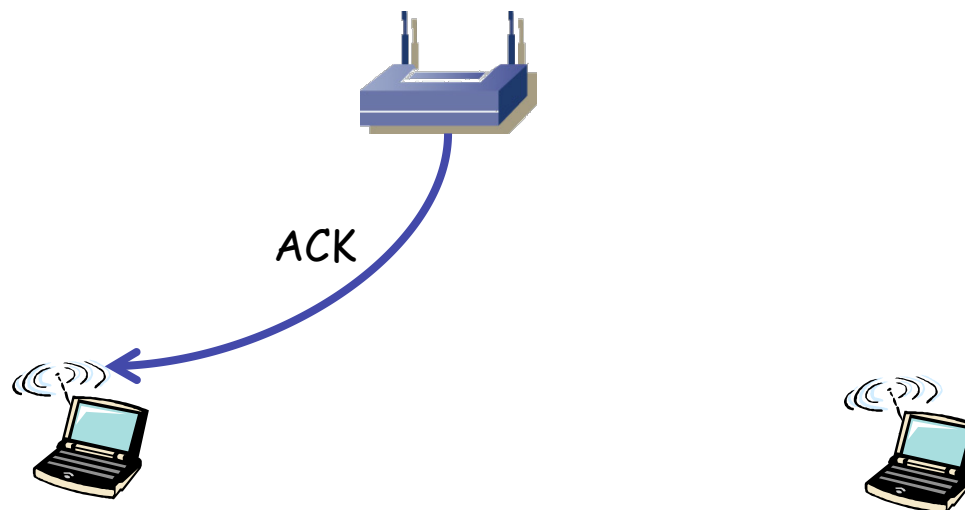
# Incluyendo tramas de control

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....



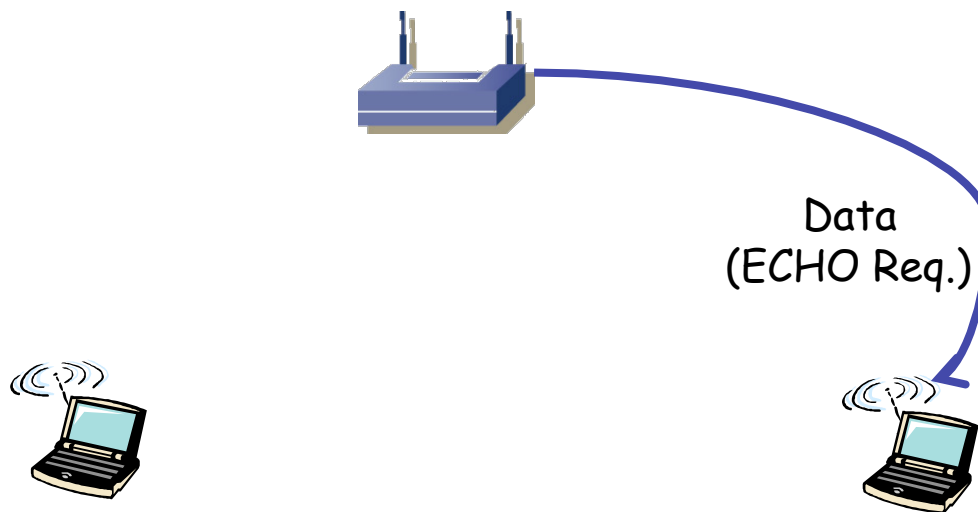
# Incluyendo tramas de control

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....



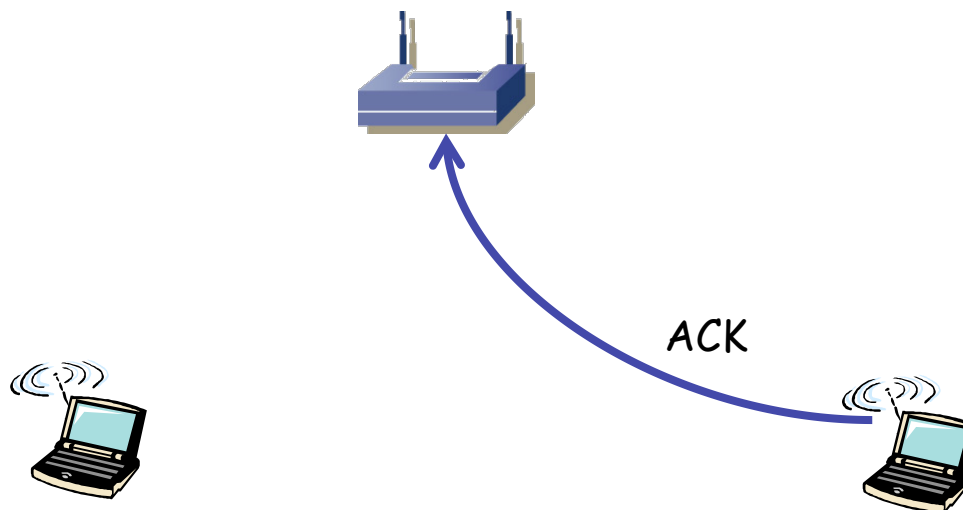
# Incluyendo tramas de control

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....



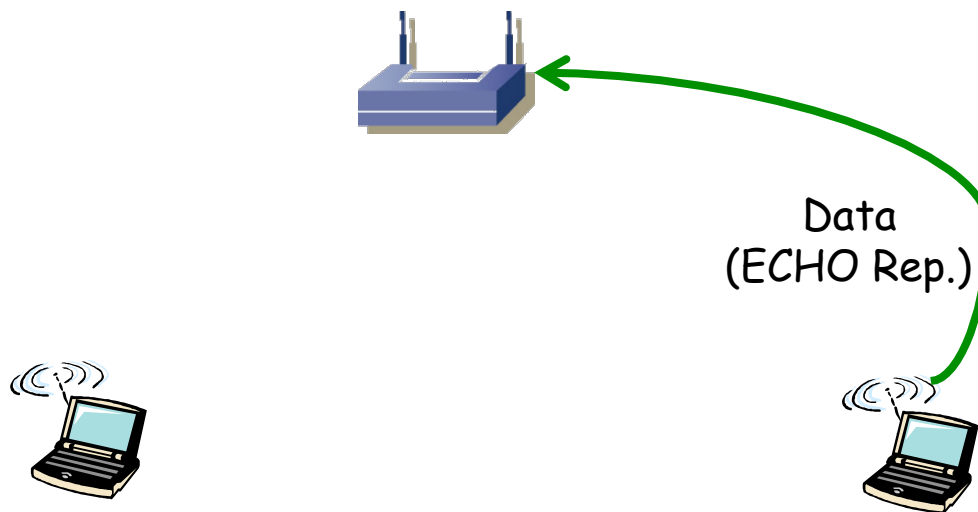
# Incluyendo tramas de control

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....



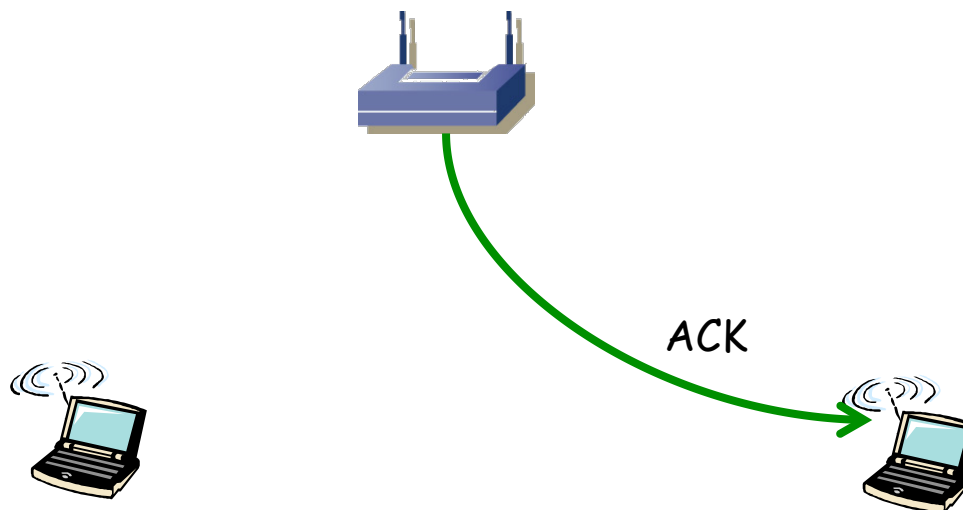
# Incluyendo tramas de control

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....



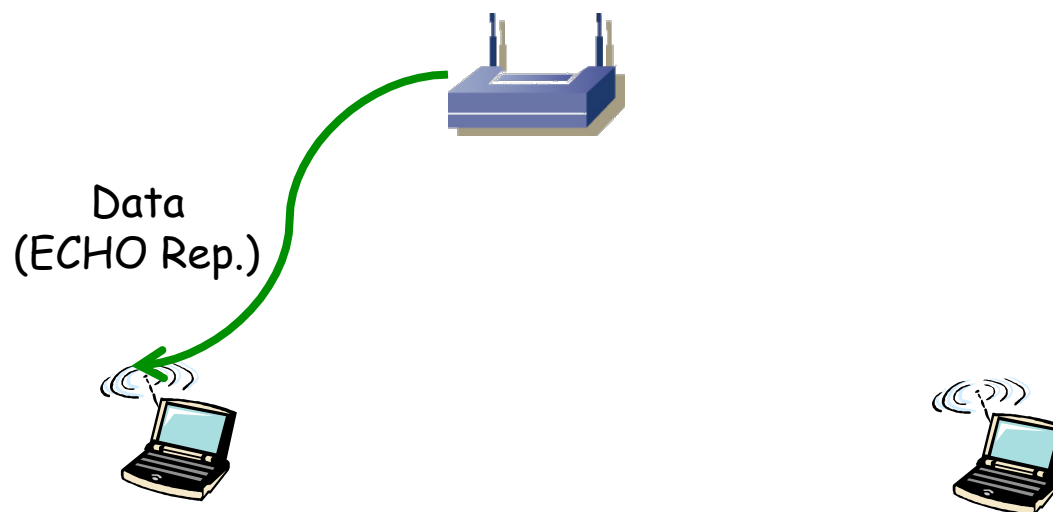
# Incluyendo tramas de control

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....



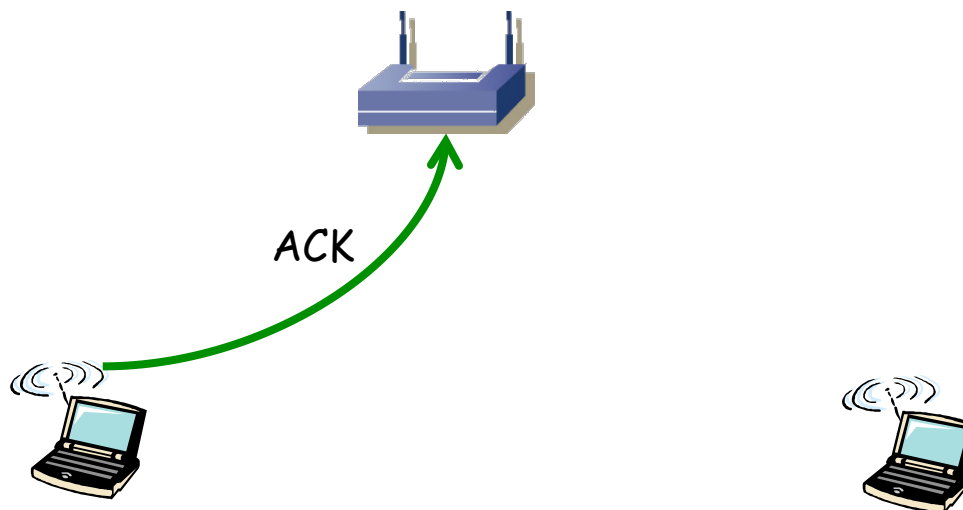
# Incluyendo tramas de control

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....



# Incluyendo tramas de control

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....



# Contenido de las tramas

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:33:53
2	0.000016446	0.000016446	192.168.1.101	SmcNetwo_54:32:01 ...	28	12	00:13:f7:54:33:53
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:28:24
4	0.000287857	0.000017793	192.168.1.101	Cisco-Li_92:a8:60 ...	28	24	00:13:f7:54:33:53
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53
6	0.000390506	0.000075915	192.168.1.100	SmcNetwo_54:33:53 ...	28	24	00:13:10:92:28:24
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:28:24
8	0.000745338	0.000016943	192.168.1.100	Cisco-Li_92:a8:60 ...	28	24	00:13:10:92:28:24

▶ Frame 1: 134 bytes on wire (1072 bits), 134 bytes captured (1072 bits) on interface 0

▶ Radiotap Header v0, Length 18

▶ 802.11 radio information

▶ IEEE 802.11 Data, Flags: .....T

▶ Logical-Link Control

▼ Internet Protocol Version 4, Src: 192.168.1.100, Dst: 192.168.1.101

0100 .... = Version: 4

.... 0101 = Header Length: 20 bytes (5)

▶ Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)

Total Length: 84

Identification: 0xc38b (50059)

Flags: 0x02 (Don't Fragment)

Fragment offset: 0

Time to live: 64

Protocol: ICMP (1)

Header checksum: 0xf303 [validation disabled]

[Header checksum status: Unverified]

Source: 192.168.1.100

Destination: 192.168.1.101

[Source GeoIP: Unknown]

[Destination GeoIP: Unknown]

▶ Internet Control Message Protocol

0000 00 00 12 00 2e 48 00 00 00 18 6c 09 c0 00 cc 01 .....H.. .l....

0010 00 00 08 01 34 00 00 13 10 92 a8 60 00 13 f7 54 .....4... ..T

0020 32 01 00 13 f7 54 33 53 40 9b aa aa 03 00 00 00 .....T3S @.....

0030 08 00 45 00 00 54 c3 8b 40 00 40 01 f3 03 c0 a8 ..E..T.. @.@.....

0040 01 64 c0 a8 01 65 08 00 99 b0 09 9a 02 1f 2f 61 ..d...e.. ..../a

0050 f0 59 00 00 00 00 6a 08 0a 00 00 00 00 10 11 .Y....j. ....

0060 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 !

0070 22 23 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 "#\$%&'()\*+,-./01

0080 32 33 34 35 36 37 234567

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:33:53
2	0.000016446	0.000016446	192.168.1.101	SmcNetwo_54:32:01 ...	28	12	00:13:f7:54:33:53
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:28:24
4	0.000287857	0.000017793	192.168.1.101	Cisco-Li_92:a8:60 ...	28	24	00:13:f7:54:33:53
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53
6	0.000390506	0.000075915	192.168.1.100	SmcNetwo_54:33:53 ...	28	24	00:13:10:92:28:24
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:28:24
8	0.000745338	0.000016943	192.168.1.100	Cisco-Li_92:a8:60 ...	28	24	00:13:10:92:28:24

▶ Frame 3: 134 bytes on wire (1072 bits), 134 bytes captured (1072 bits) on interface 0

▶ Radiotap Header v0, Length 18

▶ 802.11 radio information

▶ IEEE 802.11 Data, Flags: .....F

▼ Internet Protocol Version 4, Src: 192.168.1.101, Dst: 192.168.1.100

0100 .... = Version: 4

.... 0101 = Header Length: 20 bytes (5)

▶ Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)

Total Length: 84

Identification: 0xc38b (50059)

Flags: 0x02 (Don't Fragment)

Fragment offset: 0

Time to live: 64

Protocol: ICMP (1)

Header checksum: 0xf303 [validation disabled]

[Header checksum status: Unverified]

Source: 192.168.1.101

Destination: 192.168.1.100

[Source GeoIP: Unknown]

[Destination GeoIP: Unknown]

▶ Internet Control Message Protocol

0000 00 00 12 00 2e 48 00 00 00 60 6c 09 c0 00 df 01 .....H.. .l....

0010 00 00 08 02 2c 00 00 13 f7 54 33 53 00 13 10 92 .....T3S....

0020 a8 60 00 13 f7 54 32 01 a0 6d aa aa 03 00 00 00 .....T2.. .m....

0030 08 00 45 00 00 54 c3 8b 40 00 40 01 f3 03 c0 a8 ..E..T.. @.@.....

0040 01 64 c0 a8 01 65 08 00 99 b0 09 9a 02 1f 2f 61 ..d...e.. ..../a

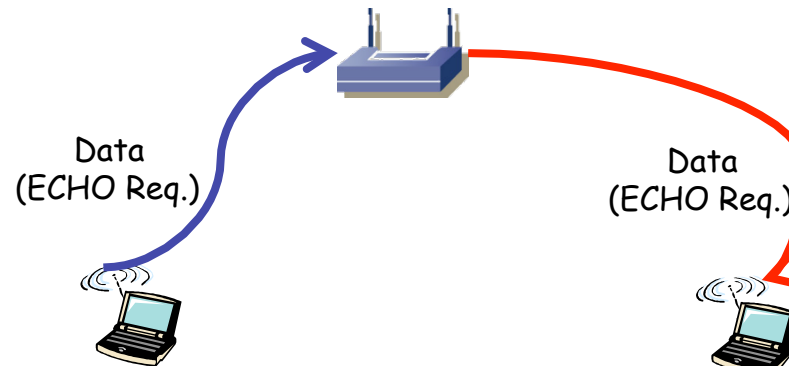
0050 f0 59 00 00 00 00 6a 08 0a 00 00 00 00 10 11 .Y....j. ....

0060 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 !

0070 22 23 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 "#\$%&'()\*+,-./01

0080 32 33 34 35 36 37 234567

Idéntico hacia y desde el AP  
(bridging)



# Contenido

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12	
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:28:24
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24	
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:32:01
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24	
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:28:24
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24	

▶ Frame 1: 134 bytes on wire (1072 bits), 134 bytes captured (1072 bits) on interface 0  
 ▶ Radiotap Header v0, Length 18  
 ▶ 802.11 radio information  
 ▶ IEEE 802.11 Data, Flags: .....T  
 ▶ Logical-Link Control

▼ Internet Protocol Version 4, Src: 192.168.1.100, Dst: 192.168.1.101

0100 .... = Version: 4  
 .... 0101 = Header Length: 20 bytes (5)  
 ▶ Differentiated Services Field  
 Total Length: 84  
 Identification: 0xc38b (500)  
 ▶ Flags: 0x02 (Don't Fragment)  
 Fragment offset: 0  
 Time to live: 64  
 Protocol: ICMP (1)  
 Header checksum: 0xf303 [valid]  
 [Header checksum status: Unchecked]  
 Source: 192.168.1.100  
 Destination: 192.168.1.101  
 [Source GeoIP: Unknown]  
 [Destination GeoIP: Unknown]

▶ Internet Control Message Protocol

```

0000 00 00 12 00 2e 48 00 00 00 18 6c 09 c0 00 cc 01 .....H.. .l....
0010 00 00 08 01 34 00 00 13 10 92 a8 60 00 13 f7 54 .....4... ..T
0020 32 01 00 13 f7 54 33 53 40 9b aa aa 03 00 00 00 .....T3S @.....
0030 08 00 45 00 00 54 c3 8b 40 00 40 01 f3 03 c0 a8 ..E..T.. @.@....
0040 01 64 c0 a8 01 65 08 00 99 b0 09 9a 02 1f 2f 61 ..d...e.. ..../a
0050 f0 59 00 00 00 00 6a 08 0a 00 00 00 00 10 11 ..Y....j. ....
0060 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 ..Y....j. ....
0070 22 23 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 "##$%&'()*+,-./01
0080 32 33 34 35 36 37 234567
  
```

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12	
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:28:24
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24	
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:32:01
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24	
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:28:24
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24	

▶ Frame 3: 134 bytes on wire (1072 bits), 134 bytes captured (1072 bits) on interface 0  
 ▶ Radiotap Header v0, Length 18  
 ▶ 802.11 radio information  
 ▶ IEEE 802.11 Data, Flags: .....F.  
 ▶ Logical-Link Control

▼ Internet Protocol Version 4, Src: 192.168.1.100, Dst: 192.168.1.101

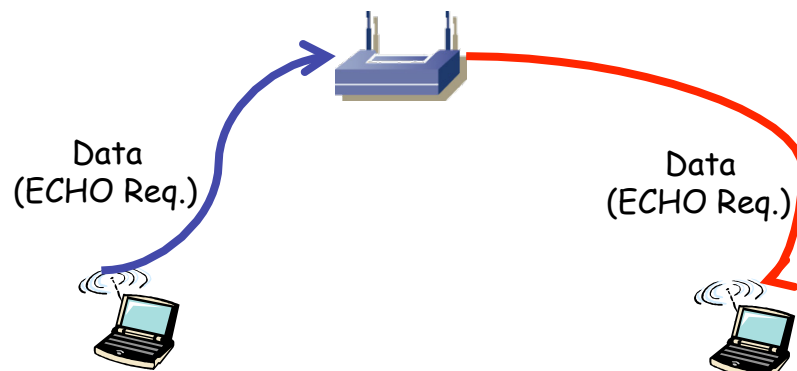
0100 .... = Version: 4  
 .... 0101 = Header Length: 20 bytes (5)

[Source GeoIP: Unknown]  
 [Destination GeoIP: Unknown]  
 ▶ Internet Control Message Protocol

```

0000 00 00 12 00 2e 48 00 00 00 60 6c 09 c0 00 df 01 .....H.. .l....
0010 00 00 08 02 2c 00 00 13 f7 54 33 53 00 13 10 92 .....T3S....
0020 a8 60 00 13 f7 54 32 01 a0 6d aa aa 03 00 00 00 .....T2..m....
0030 08 00 45 00 00 54 c3 8b 40 00 40 01 f3 03 c0 a8 ..E..T.. @.@....
0040 01 64 c0 a8 01 65 08 00 99 b0 09 9a 02 1f 2f 61 ..d...e.. ..../a
0050 f0 59 00 00 00 00 6a 08 0a 00 00 00 00 10 11 ..Y....j. ....
0060 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 ..Y....j. ....
0070 22 23 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 "##$%&'()*+,-./01
0080 32 33 34 35 36 37 234567
  
```

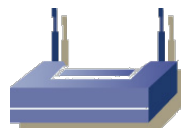
Solo ha cambiado la cabecera 802.11.  
 Cambian las direcciones MAC y que primero  
 va hacia el DS y luego viene del DS



# Direcciones MAC

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....

00:13:10:92:a8:60



00:13:f7:54:32:01



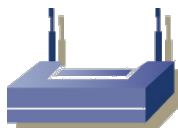
00:13:f7:54:33:53

# Direcciones MAC

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....

Interfaz WiFi que envía la trama

00:13:10:92:a8:60



00:13:f7:54:32:01



00:13:f7:54:33:53

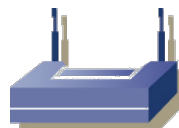
# Direcciones MAC

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....

Interfaz WiFi que envía la trama

Interfaz WiFi que debe leer la trama

00:13:10:92:a8:60



00:13:f7:54:32:01



00:13:f7:54:33:53

# Direcciones MAC

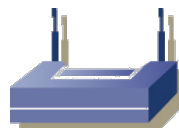
No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....

Interfaz WiFi que envía la trama

Interfaz origen de la trama de datos

Interfaz WiFi que debe leer la trama

00:13:10:92:a8:60



00:13:f7:54:32:01



00:13:f7:54:33:53

# Direcciones MAC

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....

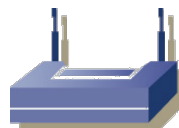
Interfaz WiFi que envía la trama

Interfaz origen de la trama de datos

Interfaz WiFi que debe leer la trama

Interfaz destino de la trama de datos

00:13:10:92:a8:60



00:13:f7:54:32:01



00:13:f7:54:33:53

# Direcciones MAC: Ejemplo

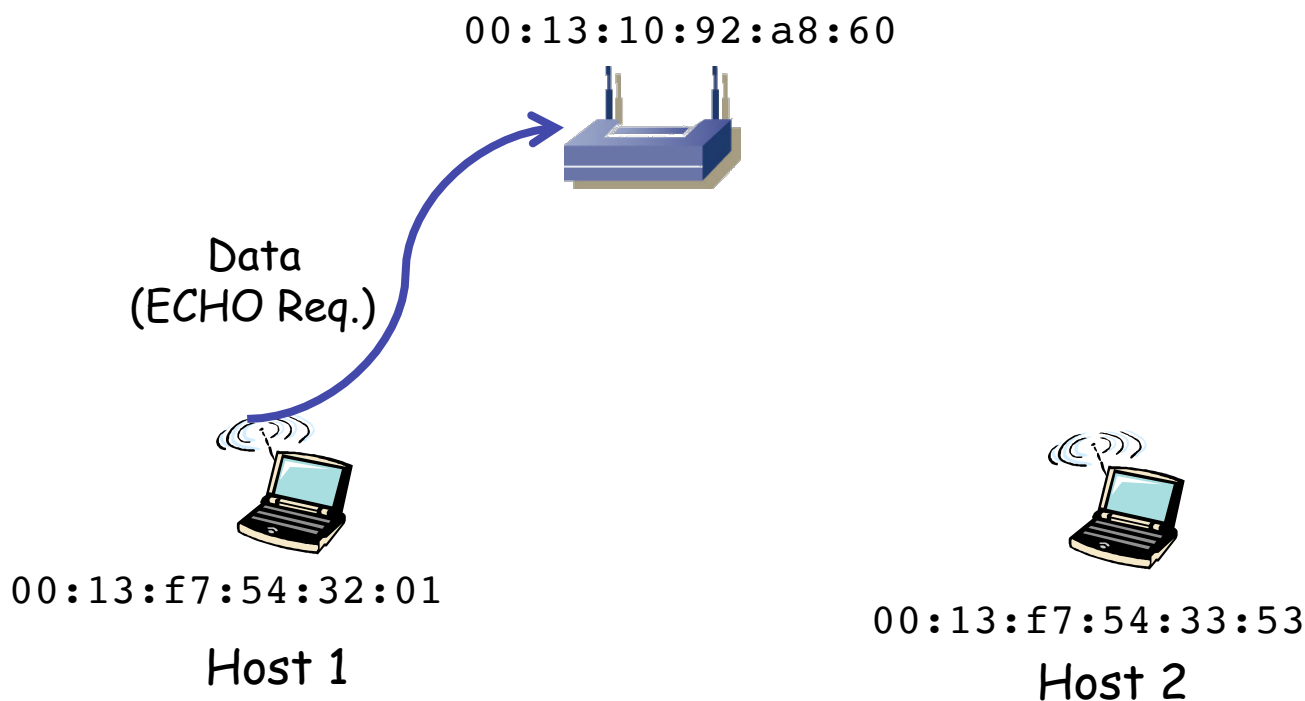
No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....

Transmite el interfaz del host 1

Recibe el Punto de acceso

El origen de la trama es el host 1

El destino es el host 2



# Direcciones MAC: Ejemplo

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....

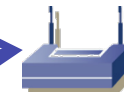
  

▶ Frame 1: 134 bytes on wire (1072 bits), 134 bytes captured (1072 bits) on interface 0  
 ▶ Radiotap Header v0, Length 18  
 ▶ 802.11 radio information  
 ▼ IEEE 802.11 Data, Flags: .....T  
 Type/Subtype: Data (0x0020)  
 ▼ Frame Control Field: 0x0001  
 .... ..00 = Version: 0  
 .... 10.. = Type: Data frame (2)  
 0000 .... = Subtype: 0  
 ▼ Flags: 0x01  
 .... ..01 = DS status: Frame from STA to DS via an AP (To DS: 1 From DS: 0) (0x1)  
 .... .0.. = More Fragments: This is the last fragment  
 .... 0... = Retry: Frame is not being retransmitted  
 ...0 .... = PWR MGT: STA will stay up  
 ..0. .... = More Data: No data buffered  
 .0.. .... = Protected flag: Data is not protected  
 0... .... = Order flag: Not strictly ordered  
 .000 0000 0011 0100 = Duration: 52 microseconds  
 Receiver address: Cisco-Li\_92:a8:60 (00:13:10:92:a8:60)  
 Destination address: SmcNetwo\_54:33:53 (00:13:f7:54:33:53)  
 Transmitter address: SmcNetwo\_54:32:01 (00:13:f7:54:32:01)  
 Source address: SmcNetwo\_54:32:01 (00:13:f7:54:32:01)  
 BSS Id: Cisco-Li\_92:a8:60 (00:13:10:92:a8:60)  
 STA address: SmcNetwo\_54:32:01 (00:13:f7:54:32:01)  
 .... .... 0000 = Fragment number: 0  
 1001 1011 0100 .... = Sequence number: 2484  
 ▶ Logical-Link Control  
 ▶ Internet Protocol Version 4, Src: 192.168.1.100, Dst: 192.168.1.101  
 ▶ Internet Control Message Protocol

0000	00 00 12 00 2e 48 00 00	00 18 6c 09 c0 00 cc 01	....H.. .l....
0010	00 00 08 01 34 00 00 13	10 92 a8 60 00 13 f7 54	...4... ..T
0020	32 01 00 13 f7 54 33 53	40 9b aa aa 03 00 00 00	2...T3S @.....
0030	08 00 45 00 00 54 c3 8b	40 00 40 01 f3 03 c0 a8	..E..T.. @. ....
0040	01 64 c0 a8 01 65 08 00	99 b0 09 9a 02 1f 2f 61	.d...e.. ..../a
0050	f0 59 00 00 00 00 6a 08	0a 00 00 00 00 00 10 11	.Y...j. ....
0060	12 13 14 15 16 17 18 19	1a 1b 1c 1d 1e 1f 20 21	..... !
0070	22 23 24 25 26 27 28 29	2a 2b 2c 2d 2e 2f 30 31	"#%&'()*+,-./01
0080	32 33 34 35 36 37		234567

Data  
(ECHO Req.)



# Direcciones MAC: Ejemplo

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....

► Frame 1: 134 bytes on wire (1072 bits), 134 bytes captured (1072 bits) on interface 0  
 ► Radiotap Header v0, Length 18  
 ► 802.11 radio information

## ▼ IEEE 802.11 Data, Flags: .....T

Type/Subtype: Data (0x0020)

▼ Frame Control Field: 0x0001

.... ..00 = Version: 0

.... 10.. = Type: Data frame (2)

0000 .... = Subtype: 0

▼ Flags: 0x01

.... ..01 = DS status: Frame from STA to DS via an AP (To DS: 1 From DS: 0) (0x1)

.... .0.. = More Fragments: This is the last fragment

.... 0... = Retry: Frame is not being retransmitted

...0 .... = PWR MGT: STA will stay up

..0. .... = More Data: No data buffered

.0.. .... = Protected flag: Data is not protected

0... .... = Order flag: Not strictly ordered

.000 0000 0011 0100 = Duration: 52 microseconds

Receiver address: Cisco-Li\_92:a8:60 (00:13:10:92:a8:60)

Destination address: SmcNetwo\_54:33:53 (00:13:f7:54:33:53)

Transmitter address: SmcNetwo\_54:32:01 (00:13:f7:54:32:01)

Source address: SmcNetwo\_54:32:01 (00:13:f7:54:32:01)

BSS Id: Cisco-Li\_92:a8:60 (00:13:10:92:a8:60)

STA address: SmcNetwo\_54:32:01 (00:13:f7:54:32:01)

.... .... 0000 = Fragment number: 0

1001 1011 0100 .... = Sequence number: 2484

► Logical-Link Control

► Internet Protocol Version 4, Src: 192.168.1.100, Dst: 192.168.1.101

► Internet Control Message Protocol

Trama de datos

Va de una estación (STA) al Distribution System (DS). La funcionalidad de bridge del AP es parte del DS.

Duración, para que el resto de STAs sepan el tiempo que va a estar ocupado el medio. Incluye al ACK.

```

0000 00 00 12 00 2e 48 00 00 00 18 6c 09 c0 00 cc 01 .....H...l....
0010 00 00 08 01 34 00 00 13 10 92 a8 60 00 13 f7 54 ....4...T....
0020 32 01 00 13 f7 54 33 53 40 9b aa aa 03 00 00 00 2..T3S @.....
0030 00 00 45 00 00 54 c3 8b 40 00 40 01 f3 03 c0 a8 ..E..T.. @. ....
0040 01 64 c0 a8 01 65 08 00 99 b0 09 9a 02 1f 2f 61 .d...e.../a....
0050 f0 59 00 00 00 00 6a 08 0a 00 00 00 00 10 11 .Y...j. .......
0060 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 .....!.....
0070 22 23 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 "###&'()*+,-./01
0080 32 33 34 35 36 37 234567
  
```

Data  
(ECHO Req.)



# Direcciones MAC: Ejemplo

```

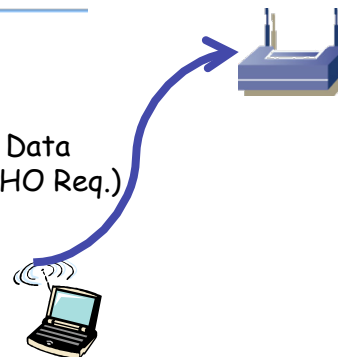
▶ Frame 1: 134 bytes on wire (1072 bits), 134 bytes captured (1072 bits) on interface 0
▶ Radiotap Header v0, Length 18
▶ 802.11 radio information
▼ IEEE 802.11 Data, Flags: .....T
  Type/Subtype: Data (0x0020)
  ▼ Frame Control Field: 0x0801
    .... ..00 = Version: 0
    .... 10.. = Type: Data frame (2)
    0000 .... = Subtype: 0
    ▼ Flags: 0x01
      .... ..01 = DS status: Frame from STA to DS via an AP (To DS: 1 From DS: 0) (0x1)
      .... .0.. = More Fragments: This is the last fragment
      .... 0... = Retry: Frame is not being retransmitted
      ...0 .... = PWR MGT: STA will stay up
      ..0. .... = More Data: No data buffered
      .0.. .... = Protected flag: Data is not protected
      0... .... = Order flag: Not strictly ordered
      .000 0000 0011 0100 = Duration: 52 microseconds
      Receiver address: Cisco-Li_92:a8:60 (00:13:10:92:a8:60)
      Destination address: SmcNetwo_54:33:53 (00:13:f7:54:33:53)
      Transmitter address: SmcNetwo_54:32:01 (00:13:f7:54:32:01)
      Source address: SmcNetwo_54:32:01 (00:13:f7:54:32:01)
      BSS Id: Cisco-Li_92:a8:60 (00:13:10:92:a8:60)
      STA address: SmcNetwo_54:32:01 (00:13:f7:54:32:01)
      .... ..0000 = Fragment number: 0
      1001 1011 0100 .... = Sequence number: 2484
▶ Logical-Link Control
▶ Internet Protocol Version 4, Src: 192.168.1.100, Dst: 192.168.1.101
▶ Internet Control Message Protocol
  
```

¡ No hay 5 direcciones en la trama !  
Hay solo 3

```

0000 00 00 12 00 2e 48 00 00 00 18 6c 09 c0 00 cc 01 .....H.. ..l.....
0010 00 00 08 01 34 00 00 13 10 92 a8 60 00 13 f7 54 ....4.. ...T
0020 32 01 00 13 f7 54 33 53 40 9b aa aa 03 00 00 00 2...T3S @.....
0030 08 00 45 00 00 54 c3 8b 40 00 40 01 f3 03 c0 a8 ..E..T.. @.@.....
0040 01 64 c0 a8 01 65 08 00 99 b0 09 9a 02 1f 2f 61 .d...e.. ....../a
0050 f0 59 00 00 00 00 6a 08 0a 00 00 00 00 00 10 11 .Y....j. ....
0060 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21
0070 22 23 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 "#$%&'()*+,-./01
0080 32 33 34 35 36 37 234567
  
```

Data  
(ECHO Req.)



# Direcciones MAC: Ejemplo

```

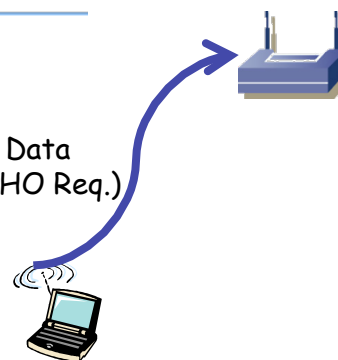
▶ Frame 1: 134 bytes on wire (1072 bits), 134 bytes captured (1072 bits) on interface 0
▶ Radiotap Header v0, Length 18
▶ 802.11 radio information
▼ IEEE 802.11 Data, Flags: .....T
  Type/Subtype: Data (0x0020)
  ▼ Frame Control Field: 0x0801
    .... ..00 = Version: 0
    .... 10.. = Type: Data frame (2)
    0000 .... = Subtype: 0
    ▼ Flags: 0x01
      .... ..01 = DS status: Frame from STA to DS via an AP (To DS: 1 From DS: 0) (0x1)
      .... .0.. = More Fragments: This is the last fragment
      .... 0... = Retry: Frame is not being retransmitted
      ...0 .... = PWR MGT: STA will stay up
      ..0. .... = More Data: No data buffered
      .0.. .... = Protected flag: Data is not protected
      0... .... = Order flag: Not strictly ordered
      .000 0000 0011 0100 = Duration: 52 microseconds
      Receiver address: Cisco-Li_92:a8:60 (00:13:10:92:a8:60)
      Destination address: SmcNetwo_54:33:53 (00:13:f7:54:33:53)
      Transmitter address: SmcNetwo_54:32:01 (00:13:f7:54:32:01)
      Source address: SmcNetwo_54:32:01 (00:13:f7:54:32:01)
      BSS Id: Cisco-Li_92:a8:60 (00:13:10:92:a8:60)
      STA address: SmcNetwo_54:32:01 (00:13:f7:54:32:01)
      .... .... 0000 = Fragment number: 0
      1001 1011 0100 .... = Sequence number: 2484
▶ Logical-Link Control
▶ Internet Protocol Version 4, Src: 192.168.1.100, Dst: 192.168.1.101
▶ Internet Control Message Protocol
  
```

En una trama que va de una STA al DS el transmisor y el origen son el mismo

```

0000 00 00 12 00 2e 48 00 00 00 18 6c 09 c0 00 cc 01 .....H.. ..l.....
0010 00 00 08 01 34 00 00 13 10 92 a8 60 00 13 f7 54 ....4... ..T
0020 32 01 00 13 f7 54 33 53 40 9b aa aa 03 00 00 00 2....T3S @.....
0030 08 00 45 00 00 54 c3 8b 40 00 40 01 f3 03 c0 a8 ..E..T.. @.@.....
0040 01 64 c0 a8 01 65 08 00 99 b0 09 9a 02 1f 2f 61 .d...e.. ..../a
0050 f0 59 00 00 00 00 6a 08 0a 00 00 00 00 10 11 .Y....j. ....
0060 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 .....!
0070 22 23 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 "#$%&'()*+,-./01
0080 32 33 34 35 36 37 234567
  
```

Data  
(ECHO Req.)



# Direcciones MAC: Ejemplo

```

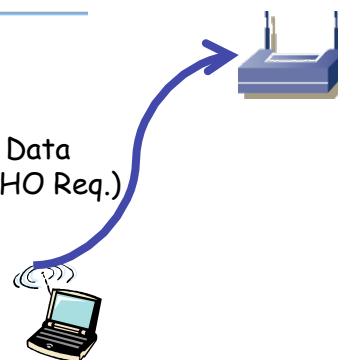
▶ Frame 1: 134 bytes on wire (1072 bits), 134 bytes captured (1072 bits) on interface 0
▶ Radiotap Header v0, Length 18
▶ 802.11 radio information
▼ IEEE 802.11 Data, Flags: .....T
  Type/Subtype: Data (0x0020)
  ▼ Frame Control Field: 0x0801
    .... ..00 = Version: 0
    .... 10.. = Type: Data frame (2)
    0000 .... = Subtype: 0
    ▼ Flags: 0x01
      .... ..01 = DS status: Frame from STA to DS via an AP (To DS: 1 From DS: 0) (0x1)
      .... .0.. = More Fragments: This is the last fragment
      .... 0... = Retry: Frame is not being retransmitted
      ...0 .... = PWR MGT: STA will stay up
      ..0. .... = More Data: No data buffered
      .0.. .... = Protected flag: Data is not protected
      0... .... = Order flag: Not strictly ordered
      000 0000 0011 0100 = Duration: 52 microseconds
      Receiver address: Cisco-Li_92:a8:60 (00:13:10:92:a8:60)
      Destination address: SMCNetwo_54:33:53 (00:13:17:54:33:53)
      Transmitter address: SMCNetwo_54:32:01 (00:13:f7:54:32:01)
      Source address: SMCNetwo_54:32:01 (00:13:f7:54:32:01)
      BSS Id: Cisco-Li_92:a8:60 (00:13:10:92:a8:60)
      STA address: SMCNetwo_54:32:01 (00:13:17:54:32:01)
      .... ..0000 = Fragment number: 0
      1001 1011 0100 .... = Sequence number: 2484
▶ Logical-Link Control
▶ Internet Protocol Version 4, Src: 192.168.1.100, Dst: 192.168.1.101
▶ Internet Control Message Protocol
  
```

En una trama que va de una STA al DS el SSID es la dirección MAC del receptor, ya que es el Access Point

```

0000 00 00 12 00 2e 48 00 00 00 18 6c 09 c0 00 cc 01 .....H.. ..l.....
0010 00 00 08 01 34 00 00 13 10 92 a8 60 00 13 f7 54 ....4... ..T
0020 32 01 00 13 f7 54 33 53 40 9b aa aa 03 00 00 00 2...T3S @.....
0030 08 00 45 00 00 54 c3 8b 40 00 40 01 f3 03 c0 a8 ..E..T.. @.@.....
0040 01 64 c0 a8 01 65 08 00 99 b0 09 9a 02 1f 2f 61 .d...e.. ..../a
0050 f0 59 00 00 00 00 6a 08 0a 00 00 00 00 10 11 .Y....j. ....
0060 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 .....!
0070 22 23 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 "#$%&'()*+,-./01
0080 32 33 34 35 36 37 234567
  
```

Data  
(ECHO Req.)



# Direcciones MAC: Ejemplo

```

▶ Frame 1: 134 bytes on wire (1072 bits), 134 bytes captured (1072 bits) on interface 0
▶ Radiotap Header v0, Length 18
▶ 802.11 radio information
▼ IEEE 802.11 Data, Flags: .....T
  Type/Subtype: Data (0x0020)
  ▼ Frame Control Field: 0x0801
    .... ..00 = Version: 0
    .... 10.. = Type: Data frame (2)
    0000 .... = Subtype: 0
    ▼ Flags: 0x01
      .... ..01 = DS status: Frame from STA to DS via an AP (To DS: 1 From DS: 0) (0x1)
      .... .0.. = More Fragments: This is the last fragment
      .... 0... = Retry: Frame is not being retransmitted
      ...0 .... = PWR MGT: STA will stay up
      ..0. .... = More Data: No data buffered
      .0.. .... = Protected flag: Data is not protected
      0... .... = Order flag: Not strictly ordered
    .000 0000 0011 0100 = Duration: 52 microseconds
    Receiver address: Cisco-Li_92:a8:60 (00:13:10:92:a8:60)
    Destination address: SmcNetwo_54:33:53 (00:13:f7:54:33:53)
    Transmitter address: SmcNetwo_54:32:01 (00:13:f7:54:32:01)
    Source address: SmcNetwo_54:32:01 (00:13:f7:54:32:01)
    BSS Id: Cisco-Li_92:a8:60 (00:13:10:92:a8:60)
    STA address: SmcNetwo_54:32:01 (00:13:f7:54:32:01)
    .... .... 0000 = Fragment number: 0
    1001 1011 0100 .... = Sequence number: 2484
  ▶ Logical-Link Control
  ▶ Internet Protocol Version 4, Src: 192.168.1.100, Dst: 192.168.1.101
  ▶ Internet Control Message Protocol

```

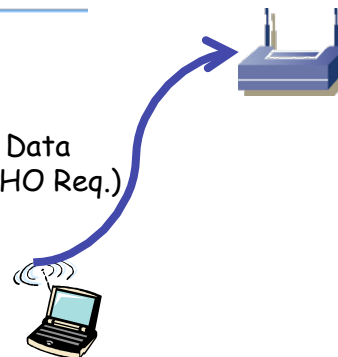
Y finalmente tenemos la dirección del host destino

```

0000 00 00 12 00 2e 48 00 00 00 18 6c 09 c0 00 cc 01 .....H.. ..l.....
0010 00 00 08 01 34 00 00 13 10 92 a8 60 00 13 f7 54 ....4... ..T
0020 32 01 00 13 f7 54 33 53 40 9b aa aa 03 00 00 00 2...T3S @.....
0030 08 00 45 00 00 54 c3 8b 40 00 40 01 f3 03 c0 a8 ..E..T.. @.@.....
0040 01 64 c0 a8 01 65 08 00 99 b0 09 9a 02 1f 2f 61 .d...e.. ..../a
0050 f0 59 00 00 00 00 6a 08 0a 00 00 00 00 10 11 .Y....j. ....
0060 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 .....!
0070 22 23 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 "#$%&'()*+,-./01
0080 32 33 34 35 36 37 234567

```

Data  
(ECHO Req.)

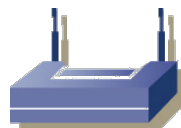


# Data rate

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....

La velocidad de transmisión no es la misma para todas las tramas

00:13:10:92:a8:60



00:13:f7:54:32:01

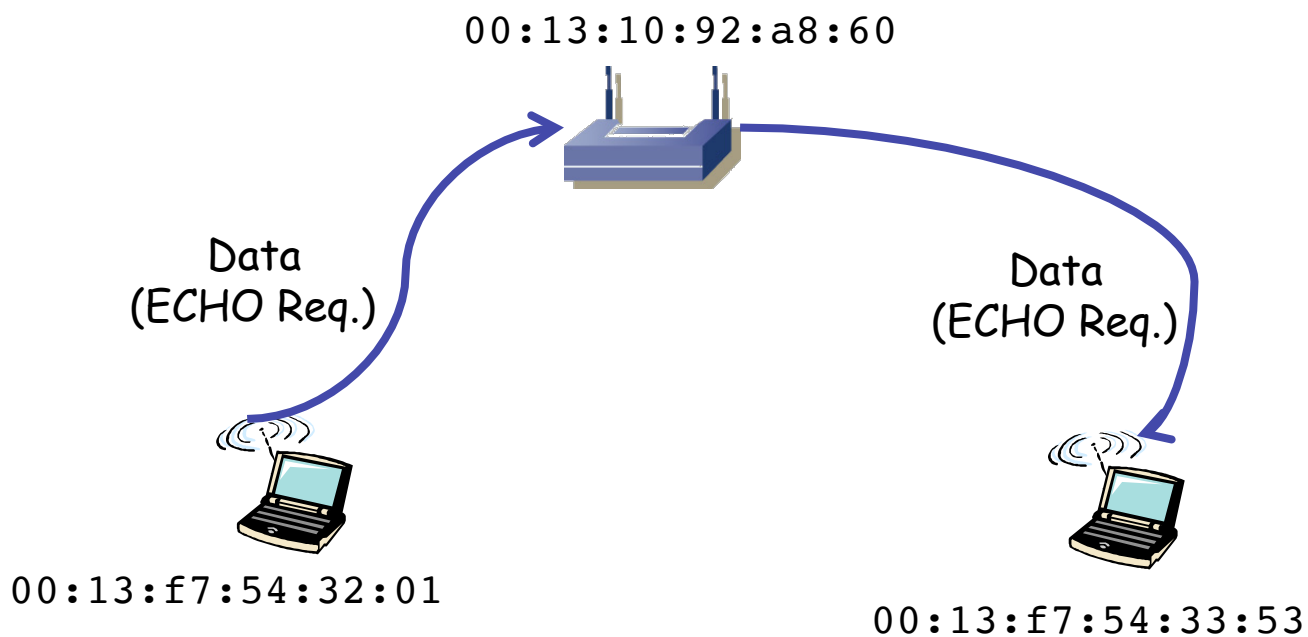


00:13:f7:54:33:53

# Data rate

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address	Source address	Receiver address	Info
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01			Acknowledgement, Flags=.....
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	00:13:f7:54:33:53	Echo (ping) request id=0x099a,...
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53			Acknowledgement, Flags=.....
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:32:01	00:13:f7:54:33:53	00:13:f7:54:32:01	Echo (ping) reply id=0x099a,...
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60			Acknowledgement, Flags=.....

Ni siquiera tiene que ser la misma entre que se entrega al AP y él la entrega al destino



# Acknowledgement

No.	Time	Arrival Time	Source	Destination	Length	Data rate	Transmitter address	Receiver address
1	0.000000000	0.000000000	192.168.1.100	192.168.1.101	134	12	00:13:f7:54:32:01	00:13:10:92:a8:60
2	0.000016446	0.000016446		SmcNetwo_54:32:01 ...	28	12		00:13:f7:54:32:01
3	0.000270064	0.000253618	192.168.1.100	192.168.1.101	134	48	00:13:10:92:a8:60	00:13:f7:54:32:01
4	0.000287857	0.000017793		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60
5	0.000314591	0.000026734	192.168.1.101	192.168.1.100	134	54	00:13:f7:54:33:53	00:13:10:92:a8:60
6	0.000390506	0.000075915		SmcNetwo_54:33:53 ...	28	24		00:13:f7:54:33:53
7	0.000728395	0.000337889	192.168.1.101	192.168.1.100	134	54	00:13:10:92:a8:60	00:13:f7:54:33:53
8	0.000745338	0.000016943		Cisco-Li_92:a8:60 ...	28	24		00:13:10:92:a8:60

- ▶ Frame 2: 28 bytes on wire (224 bits), 28 bytes captured (224 bits) on interface 0
- ▶ Radiotap Header v0, Length 18
- ▶ 802.11 radio information

## ▼ IEEE 802.11 Acknowledgement, Flags: .....

Type/Subtype: Acknowledgement (0x001d)

### ▼ Frame Control Field: 0xd400

- .... ..00 = Version: 0
- .... 01.. = Type: Control frame (1)
- 1101 .... = Subtype: 13

### ▼ Flags: 0x00

- .... ..00 = DS status: Not leaving DS or network is operating in AD-HOC mode (To DS: 0 From DS: 0) (0x0)
- .... .0.. = More Fragments: This is the last fragment
- .... 0... = Retry: Frame is not being retransmitted
- ...0 .... = PWR MGT: STA will stay up
- ..0. .... = More Data: No data buffered
- .0.. .... = Protected flag: Data is not protected
- 0... .... = Order flag: Not strictly ordered

.000 0000 0000 0000 = Duration: 0 microseconds

Receiver address: SmcNetwo\_54:32:01 (00:13:f7:54:32:01)

Trama de confirmación (subtipo de tramas de control)

No pasa por el DS

```
0000 00 00 12 00 2e 48 00 00 00 18 6c 09 c0 00 dd 01 .....H.. ..l.....
0010 00 00 d4 00 00 00 00 13 f7 54 32 01 .....T2.
```

Solo incluye la dirección MAC del receptor (el que envió la de datos)

