

1. What are the SSIDs of the two access points that are issuing most of the beacon frames in this trace?

Answer: The two most common SSIDs that can be identified in this trace are: 30 Munroe St (more) and linksys\_SES\_24086

The image shows a Wireshark packet capture of 802.11 beacon frames. The packet list pane displays several frames, with the following details:

No.	Time	Source	Destination	Protocol	Length	Info
1496	1183082749.453527	LinksysG_67:22:94	5f:a5:ff:ff:ff:ff	802.11	90	Beacon frame, SN=3485, FN=0, Flags=....., BI=16484, SSID=linksys12
1497	1183082749.549584	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=3503, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
1498	1183082749.556027	LinksysG_67:22:94	Broadcast	802.11	90	Beacon frame, SN=3486, FN=0, Flags=.....C, BI=100, SSID=linksys12
1499	1183082749.605053	Cisco-Li_f5:ba:bb	Broadcast	802.11	132	Beacon frame, SN=3640, FN=0, Flags=.....C, BI=100, SSID=linksys_SES_24086
1500	1183082749.652013	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=3504, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
1501	1183082749.754403	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=3505, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
1502	1183082749.856857	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=3506, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
1503	1183082749.857019	IntelCor_d1:b6:4f	Cisco-Li_f7:1d:51	802.11	54	QoS Null function (No data), SN=1566, FN=0, Flags=.....TC

The packet details pane for frame 1217 shows the following structure:

- > Frame 1217: 38 bytes on wire (304 bits), 38 bytes captured (304 bits)
- > Radiotap Header v0, Length 24
- > 802.11 radio information
- > IEEE 802.11 Acknowledgement, Flags: .....C

The packet bytes pane shows the raw data in hexadecimal and ASCII:

```
0000 00 00 18 00 ee 58 00 00 10 30 85 09 c0 00 ea 9c  ....X... .0.....
0010 40 00 00 4e 0a 5c 42 31 d4 00 00 00 00 16 b6 f7  @..N..B1 .....
0020 1d 51 0a 5c 42 31  ..Q..B1
```

2. What are the intervals of time between the transmissions of the beacon frames the linksys\_ses\_24086 access point? From the 30 Munroe St. access point?

Answer:

1. 30 Munroe St – 0.102400 seconds

The image shows a Wireshark packet capture of an IEEE 802.11 Beacon frame. The packet list shows a frame at time 1183082707.072457 from source Cisco-Li\_f7:1d:51 to destination Broadcast, protocol 802.11, length 183. The packet details pane shows the frame structure: Radiotap Header v0, Length 24; 802.11 radio information; IEEE 802.11 Beacon frame, Flags: .....C; IEEE 802.11 wireless LAN; Fixed parameters (12 bytes) including Timestamp: 0x000000289638e182, Beacon Interval: 0.102400 [Seconds], and Capabilities Information: 0x0601; Tagged parameters (119 bytes). The packet bytes pane shows the raw data in hexadecimal and ASCII.

No.	Time	Source	Destination	Protocol	Length	Info
1	1183082707.072457	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=2854, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
2	1183082707.134558	b6:78:8c:c1:ae:c0	65:a8:d5:b2:c1:99	802.11	1624	802.11 Block Ack Req, Flags=op.P...T
3	1183082707.157931	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=2855, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
4	1183082707.260376	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=2856, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
5	1183082707.260557	IntelCor_d1:b6:4f	Cisco-Li_f7:1d:51	802.11	54	QoS Null function (No data), SN=1482, FN=0, Flags=.....TC
6	1183082707.260658	IntelCor_d1:b6:4f	IntelCor_d1:b6:4f	802.11	38	Acknowledgement, Flags=.....C
7	1183082707.261392	IntelCor_d1:b6:4f	Cisco-Li_f7:1d:51	802.11	54	QoS Null function (No data), SN=1483, FN=0, Flags=...P...TC
8	1183082707.261491	IntelCor_d1:b6:4f	IntelCor_d1:b6:4f	802.11	38	Acknowledgement, Flags=.....C

Frame 1: 183 bytes on wire (1464 bits), 183 bytes captured (1464 bits)

> Radiotap Header v0, Length 24

> 802.11 radio information

> IEEE 802.11 Beacon frame, Flags: .....C

▼ IEEE 802.11 wireless LAN

- Fixed parameters (12 bytes)
  - Timestamp: 0x000000289638e182
  - Beacon Interval: 0.102400 [Seconds]
  - Capabilities Information: 0x0601
- Tagged parameters (119 bytes)

0010 52 00 00 47 08 26 7e 05 80 00 00 00 ff ff ff ff R G & ~ . . . . .

0020 ff ff 00 16 b6 f7 1d 51 00 16 b6 f7 1d 51 60 b2 . . . . . Q . . . . . Q .

0030 82 e1 38 96 28 00 00 00 64 00 01 06 00 0c 33 30 . 8 . . . . d . . . . 30

0040 20 4d 75 6e 72 6f 65 20 53 74 01 04 82 84 8b 96 Munroe St . . . . .

0050 03 01 06 05 04 00 01 00 00 07 06 55 53 49 01 0b . . . . . USI . . . . .

0060 1a 0c 12 0f 00 03 a4 00 00 27 a4 00 00 42 43 5e . . . . . BC ^ . . . . .

0070 00 62 32 2f 00 2a 01 00 32 08 8c 12 98 24 b0 48 . b2 / . \* . . . 2 . . . . \$ H

0080 60 6c dd 15 00 0a f5 0a 02 40 c0 00 03 01 03 05 . l . . . . @ . . . . P . . . .

0090 0e 04 ff 00 03 00 11 01 01 dd 18 00 50 f2 02 01 . . . . .

IEEE 802.11 wireless LAN (wlan), 24 bytes | Packets: 2364 · Displayed: 2364 (100.0%) | Profile: Default

2. For linksys\_ses\_24086: 0.102400 seconds

Wireshark\_802\_11.pcap

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No.	Time	Source	Destination	Protocol	Length	Info
1496	1183082749.453527	LinksysG_67:22:94	5f:a5:ff:ff:ff:ff	802.11	90	Beacon frame, SN=3485, FN=0, Flags=.....C, BI=16484, SSID=linksys12
1497	1183082749.549584	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=3503, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
1498	1183082749.556027	LinksysG_67:22:94	Broadcast	802.11	90	Beacon frame, SN=3486, FN=0, Flags=.....C, BI=100, SSID=linksys12
1499	1183082749.605053	Cisco-Li_f5:ba:bb	Broadcast	802.11	132	Beacon frame, SN=3640, FN=0, Flags=.....C, BI=100, SSID=linksys_SES_24086
1500	1183082749.652013	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=3504, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
1501	1183082749.754403	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=3505, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
1502	1183082749.856857	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=3506, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
1503	1183082749.857019	IntelCor_d1:b6:4f	Cisco-Li_f7:1d:51	802.11	54	QoS Null function (No data), SN=1566, FN=0, Flags=.....TC

> Frame 1499: 132 bytes on wire (1056 bits), 132 bytes captured (1056 bits)

> Radiotap Header v0, Length 24

> 802.11 radio information

> IEEE 802.11 Beacon frame, Flags: .....C

IEEE 802.11 wireless LAN

- Fixed parameters (12 bytes)
  - Timestamp: 0x000005c6ee8fb189
  - Beacon Interval: 0.102400 [Seconds]
    - Capabilities Information: 0x0011
  - Tagged parameters (68 bytes)

```

0000 00 00 18 00 ee 58 00 00 10 02 85 09 a0 00 a4 9c .....X.....
0010 0b 00 00 08 f2 30 09 7c 80 00 00 00 ff ff ff ff .....0.....
0020 ff ff 00 18 39 f5 ba bb 00 18 39 f5 ba bb 80 e3 .....9.....9.....
0030 89 b1 8f ee c6 05 00 00 64 00 11 00 00 11 6c 69 .....d.....li
0040 6e 6b 73 79 73 5f 53 45 53 5f 32 34 30 38 36 01 nksys_SE S_24086
0050 04 82 84 8b 96 03 01 06 05 04 00 01 00 00 dd 06 .....P.....P
0060 00 10 18 02 00 f4 dd 18 00 50 f2 01 01 00 00 50 .....P.....P
0070 f2 02 01 00 00 50 f2 02 01 00 00 50 f2 02 00 00 .....P.....P
0080 f2 30 09 7c .....0.....

```

IEEE 802.11 wireless LAN (wlan), 24 bytes

Packets: 2364 · Displayed: 2364 (100.0%) Profile: Default

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3. What (in hexadecimal notation) is the source MAC address on the beacon frame from 30 Munroe St? Recall from Figure 7.13 in the text that the source, destination, and BSS are three addresses used in an 802.11 frame. For a detailed discussion of the 802.11 frame structure, see section 7 in the IEEE 802.11 standards document (cited above)

Answer: Source Mac address for beacon frame from 30 Munroe St is **00:16:b6:f7:1d:51**

Wireshark\_802.11.pcap

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No.	Time	Source	Destination	Protocol	Length	Info
1	1183082707.072457	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=2854, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
2	1183082707.134558	b6:78:8c:c1:ae:c0 ...	65:a8:d5:b2:c1:99 ...	802.11	1624	802.11 Block Ack Req, Flags=op.P...T.
3	1183082707.157931	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=2855, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
4	1183082707.260376	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=2856, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
5	1183082707.260557	IntelCor_d1:b6:4f	Cisco-Li_f7:1d:51	802.11	54	QoS Null function (No data), SN=1482, FN=0, Flags=.....TC
6	1183082707.260658	IntelCor_d1:b6:4f ...	802.11	38	Acknowledgement, Flags=.....C	
7	1183082707.261392	IntelCor_d1:b6:4f	Cisco-Li_f7:1d:51	802.11	54	QoS Null function (No data), SN=1483, FN=0, Flags=...P...TC
8	1183082707.261491	IntelCor_d1:b6:4f ...	802.11	38	Acknowledgement, Flags=.....C	

> 802.11 radio information

IEEE 802.11 Beacon frame, Flags: .....C

Type/Subtype: Beacon frame (0x0008)

Frame Control Field: 0x8000

.000 0000 0000 0000 = Duration: 0 microseconds

Receiver address: Broadcast (ff:ff:ff:ff:ff:ff)

Destination address: Broadcast (ff:ff:ff:ff:ff:ff)

Transmitter address: Cisco-Li\_f7:1d:51 (00:16:b6:f7:1d:51)

Source address: Cisco-Li\_f7:1d:51 (00:16:b6:f7:1d:51)

BSS Id: Cisco-Li\_f7:1d:51 (00:16:b6:f7:1d:51)

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

0010 52 00 00 47 08 26 7e 05 80 00 00 ff ff ff ff R G & ~ .....  
 0020 ff ff 00 16 b6 f7 1d 51 00 16 b6 f7 1d 51 60 b2 .....Q .....Q`  
 0030 82 e1 38 96 28 00 00 00 64 00 01 06 00 0c 33 30 ..8 ( ... d .....30  
 0040 20 4d 75 6e 72 6f 65 20 53 74 01 04 82 84 8b 96 Munroe St .....  
 0050 03 01 06 05 04 00 01 00 00 07 06 55 53 49 01 0b ..... ..USI..  
 0060 1a 0c 12 0f 00 03 a4 00 00 27 a4 00 00 42 43 5e ..... ' ...BC^  
 0070 00 62 32 2f 00 2a 01 00 32 08 8c 12 98 24 b0 48 ..b2/. \*.. 2...\$ .H  
 0080 60 6c dd 15 00 0a f5 0a 02 40 c0 00 03 01 03 05 `1 ..... @ .....  
 0090 0e 04 ff 00 03 00 11 01 01 dd 18 00 50 f2 02 01 ..... ..P...

Type and subtype combined (first byte: type, second byte: subtype) (wlan.fc.type\_subtype), 1 byte

Packets: 2364 · Displayed: 2364 (100.0%) Profile: Default

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4. What (in hexadecimal notation) is the destination MAC address on the beacon frame from 30 Munroe St??

Answer: Destination address: Broadcast (ff:ff:ff:ff:ff:ff)

Wireshark\_802.11.pcap

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Apply a display filter ... <Ctrl-/> Expression...

No.	Time	Source	Destination	Protocol	Length	Info
1	1183082707.072457	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=2854, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
2	1183082707.134558	b6:78:8c:c1:ae:c0 ...	65:a8:d5:b2:c1:99 ...	802.11	1624	802.11 Block Ack Req, Flags=op.P...T.
3	1183082707.157931	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=2855, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
4	1183082707.260376	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=2856, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
5	1183082707.260557	IntelCor_d1:b6:4f	Cisco-Li_f7:1d:51	802.11	54	QoS Null function (No data), SN=1482, FN=0, Flags=.....TC
6	1183082707.260658		IntelCor_d1:b6:4f ...	802.11	38	Acknowledgement, Flags=.....C
7	1183082707.261392	IntelCor_d1:b6:4f	Cisco-Li_f7:1d:51	802.11	54	QoS Null function (No data), SN=1483, FN=0, Flags=...P...TC
8	1183082707.261491		IntelCor_d1:b6:4f ...	802.11	38	Acknowledgement, Flags=.....C

> 802.11 radio information

▼ IEEE 802.11 Beacon frame, Flags: .....C

Type/Subtype: Beacon frame (0x0008)

> Frame Control Field: 0x8000

.000 0000 0000 0000 = Duration: 0 microseconds

Receiver address: Broadcast (ff:ff:ff:ff:ff:ff)

Destination address: Broadcast (ff:ff:ff:ff:ff:ff)

Transmitter address: Cisco-Li\_f7:1d:51 (00:16:b6:f7:1d:51)

Source address: Cisco-Li\_f7:1d:51 (00:16:b6:f7:1d:51)

BSS Id: Cisco-Li\_f7:1d:51 (00:16:b6:f7:1d:51)

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

0010 52 00 00 47 08 26 7e 05 8c 00 00 00 ff ff ff ff R: G & ~ .....  
0020 ff ff 00 16 b6 f7 1d 51 00 16 b6 f7 1d 51 60 b2 .....Q .....Q  
0030 82 e1 38 96 28 00 00 00 64 00 01 06 00 0c 33 30 ..8 ( ... d .....30  
0040 20 4d 75 6e 72 6f 65 20 53 74 01 04 82 84 8b 96 Munroe St .....  
0050 03 01 06 05 04 00 01 00 00 07 06 55 53 49 01 0b .....USI..  
0060 1a 0c 12 0f 00 03 a4 00 00 27 a4 00 00 42 43 5e .....BC^  
0070 00 62 32 2f 00 2a 01 00 32 08 8c 12 98 24 b0 48 b2/.\* 2...\$.H  
0080 60 6c dd 15 00 0a f5 0a 02 40 c0 00 03 01 03 05 `1.....@.....  
0090 0e 04 ff 00 03 00 11 01 01 dd 18 00 50 f2 02 01 .....P...

Type and subtype combined (first byte: type, second byte: subtype) (wlan.fc.type\_subtype), 1 byte

Packets: 2364 · Displayed: 2364 (100.0%) Profile: Default

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5. What (in hexadecimal notation) is the MAC BSS id on the beacon frame from 30 Munroe St?

Answer: BSS Id: Cisco-Li\_f7:1d:51 (00:16:b6:f7:1d:51)

Wireshark\_802\_11.pcap

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No.	Time	Source	Destination	Protocol	Length	Info
1	1183082707.072457	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=2854, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
2	1183082707.134558	b6:78:8c:c1:ae:c0 ...	65:a8:d5:b2:c1:99 ...	802.11	1624	802.11 Block Ack Req, Flags=op.P...T.
3	1183082707.157931	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=2855, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
4	1183082707.260376	Cisco-Li_f7:1d:51	Broadcast	802.11	183	Beacon frame, SN=2856, FN=0, Flags=.....C, BI=100, SSID=30 Munroe St
5	1183082707.260557	IntelCor_d1:b6:4f	Cisco-Li_f7:1d:51	802.11	54	QoS Null function (No data), SN=1482, FN=0, Flags=.....TC
6	1183082707.260658		IntelCor_d1:b6:4f ...	802.11	38	Acknowledgement, Flags=.....C
7	1183082707.261392	IntelCor_d1:b6:4f	Cisco-Li_f7:1d:51	802.11	54	QoS Null function (No data), SN=1483, FN=0, Flags=...P...TC
8	1183082707.261491		IntelCor_d1:b6:4f ...	802.11	38	Acknowledgement, Flags=.....C

> 802.11 radio information

IEEE 802.11 Beacon frame, Flags: .....C

Type/Subtype: Beacon frame (0x0008)

> Frame Control Field: 0x8000

.000 0000 0000 0000 = Duration: 0 microseconds

Receiver address: Broadcast (ff:ff:ff:ff:ff:ff)

Destination address: Broadcast (ff:ff:ff:ff:ff:ff)

Transmitter address: Cisco-Li\_f7:1d:51 (00:16:b6:f7:1d:51)

Source address: Cisco-Li\_f7:1d:51 (00:16:b6:f7:1d:51)

BSS Id: Cisco-Li\_f7:1d:51 (00:16:b6:f7:1d:51)

.... 0000 = Fragment number: 0

0010 52 00 00 47 08 26 7e 05 80 00 00 00 ff ff ff ff R..G.&~.....

0020 ff ff 00 16 b6 f7 1d 51 00 16 b6 f7 1d 51 60 b2 .....Q.....Q'

0030 82 e1 38 96 28 00 00 00 64 00 01 06 00 0c 33 30 ..8.(...d....30

0040 20 4d 75 6e 72 6f 65 20 53 74 01 04 82 84 8b 96 Munroe St.....

0050 03 01 06 05 04 00 01 00 00 07 06 55 53 49 01 0b .....USI...

0060 1a 0c 12 0f 00 03 a4 00 00 27 a4 00 00 42 43 5e .....BC^

0070 00 62 32 2f 00 2a 01 00 32 08 8c 12 98 24 b0 48 .b2/.\*.2...\$^H

0080 60 6c dd 15 00 0a f5 0a 02 40 c0 00 03 01 03 05 `l.....@.....

0090 0e 04 ff 00 03 00 11 01 01 dd 18 00 50 f2 02 01 .....P...

Type and subtype combined (first byte: type, second byte: subtype) (wlan.fc.type\_subtype), 1 byte

Packets: 2364 · Displayed: 2364 (100.0%) Profile: Default

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