

Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης Πολυτεχνική Σχολή

Δίκτυα Υπολογιστών ΙΙ

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1 Image

Αξίζει να σημειωθεί, μιας και δεν φαίνεται στα wireshark captures, ότι είχαμε δημιουργήσει ένα custom filter: host 155.207.18.208 and udp το οποίο το επιλέγαμε προτού αρχίσουμε το capturing των πακέτων.

No.	Time	Source	Destination	Protocol Le	ngth	Info			
г	1 2020-11-25 22:44:36.755882097	192.168.1.50	155.207.18.208	UDP	47	48032 → 38032 Len=5			
	2 2020-11-25 22:44:39.479950928	155.207.18.208	192.168.1.50	UDP	74	58032 → 48032 Len=32			
	3 2020-11-25 22:44:39.490131454	192.168.1.50	155.207.18.208	UDP	47	48032 → 38032 Len=5			
	4 2020-11-25 22:44:41.863274842	155.207.18.208	192.168.1.50	UDP	74	58032 → 48032 Len=32			
	5 2020-11-25 22:44:41.864509919	192.168.1.50	155.207.18.208	UDP	47	48032 → 38032 Len=5			
1	6 2020-11-25 22:44:42.978898363	155.207.18.208	192.168.1.50	UDP	74	58032 → 48032 Len=32			
	7 2020-11-25 22:44:42.980298519	192.168.1.50	155.207.18.208	UDP	47	48032 → 38032 Len=5			
	8 2020-11-25 22:44:44.182104925	155.207.18.208	192.168.1.50	UDP	74	58032 → 48032 Len=32			
L	9 2020-11-25 22:44:44.209077362	192.168.1.50	155.207.18.208	UDP	55	48032 → 38032 Len=13			
	10 2020-11-25 22:44:44.446438913	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	11 2020-11-25 22:44:44.483780124	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	12 2020-11-25 22:44:44.522436932	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	13 2020-11-25 22:44:44.560434091	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	14 2020-11-25 22:44:44.599023525	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	15 2020-11-25 22:44:44.636988129	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	16 2020-11-25 22:44:44.675957130	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	17 2020-11-25 22:44:44.714471262	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	18 2020-11-25 22:44:44.753185142	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	19 2020-11-25 22:44:44.790992341	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	20 2020-11-25 22:44:44.829977493	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	21 2020-11-25 22:44:44.868213060	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	22 2020-11-25 22:44:44.906193832	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	23 2020-11-25 22:44:44.945183978	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
	24 2020-11-25 22:44:44.982968702	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024			
-	Frame 7: 47 bytes on wire (376 bit	s), 47 bytes captured	(376 bits) on interfac	e enp2s0, id	0				
- 1	Ethernet II, Src: HewlettP_96:9d:b	6 (40:b0:34:96:9d:b6)	, Dst: zte_1a:b4:0a (d4	:76:ea:1a:b4	:0a)				
- 1	Internet Protocol Version 4, Src:	192.168.1.50, Dst: 15	5.207.18.208						
- 1	User Datagram Protocol, Src Port:	48032, Dst Port: 3803	2						
*	Data (5 bytes)								
	Data: 4538313432								
	[Length: 5]								
0000 d4 76 ea 1a b4 0a 40 b0 34 96 9d b6 08 00 45 00 ·v····@· 4····E·									
001			!·M@·@· ·····2··						
002		45 38 31 34 32	E8142						

Figure 1: Echo request code

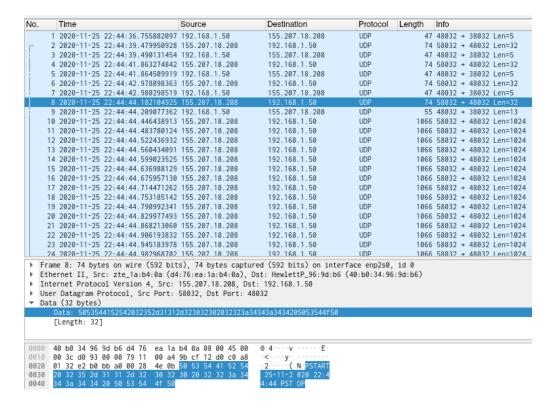


Figure 2: Echo response time

Destination

Protocol Length Info

Source

Time

No.	Time	Source	Destination	Protocol	Length	Info
г 1	1 2020-11-25 22:44:36.75588209	7 192.168.1.50	155.207.18.208	UDP	47	48032 → 38032 Len=5
1 2	2 2020-11-25 22:44:39.479950928	3 155.207.18.208	192.168.1.50	UDP	74	58032 → 48032 Len=32
3	3 2020-11-25 22:44:39.490131454	4 192.168.1.50	155.207.18.208	UDP	47	48032 → 38032 Len=5
. 4	4 2020-11-25 22:44:41.863274842	2 155.207.18.208	192.168.1.50	UDP	74	58032 → 48032 Len=32
5	5 2020-11-25 22:44:41.864509919	9 192.168.1.50	155.207.18.208	UDP	47	48032 → 38032 Len=5
. 6	6 2020-11-25 22:44:42.978898363	3 155.207.18.208	192.168.1.50	UDP	74	58032 → 48032 Len=32
1 7	7 2020-11-25 22:44:42.980298519	9 192.168.1.50	155.207.18.208	UDP	47	48032 → 38032 Len=5
. 8	8 2020-11-25 22:44:44.182104929	5 155.207.18.208	192.168.1.50	UDP	74	58032 → 48032 Len=32
L 9	9 2020-11-25 22:44:44.209077362	2 192.168.1.50	155.207.18.208	UDP	55	48032 → 38032 Len=13
16	0 2020-11-25 22:44:44.446438913	3 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
11	1 2020-11-25 22:44:44.483780124	4 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
12	2 2020-11-25 22:44:44.522436932	2 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
13	3 2020-11-25 22:44:44.560434091	1 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
14	4 2020-11-25 22:44:44.599023529	5 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
15	5 2020-11-25 22:44:44.636988129	9 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
16	6 2020-11-25 22:44:44.675957130	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
17	7 2020-11-25 22:44:44.714471262	2 155.207.18.208	192.168.1.50	UDP	1066	58032 > 48032 Len=1024
18	8 2020-11-25 22:44:44.753185142	2 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
19	9 2020-11-25 22:44:44.79099234	1 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
26	0 2020-11-25 22:44:44.829977493	3 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
21	1 2020-11-25 22:44:44.868213060	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
22	2 2020-11-25 22:44:44.906193832	2 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
23	3 2020-11-25 22:44:44.945183978	3 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
24	4 2020-11-25 22:44:44.982968703	155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
▶ Fra	me 9: 55 bytes on wire (440 bi	ts), 55 bytes captured	(440 bits) on interfac	e enp2s0,	id 0	
▶ Eth	ernet II, Src: HewlettP_96:9d:	b6 (40:b0:34:96:9d:b6)), Dst: zte_1a:b4:0a (d4	1:76:ea:1a	b4:0a)	
▶ Inteller	ernet Protocol Version 4, Src:	192.168.1.50, Dst: 15	5.207.18.208			
Use	r Datagram Protocol, Src Port:	48032, Dst Port: 3803	32			
▼ Data	a (13 bytes)	•				
	Data: 4d343839385544503d313032	34				
	[Length: 13]					
	d4 76 ea 1a b4 0a 40 b0 34 96		v····@· 4·····E·			
	00 29 f5 64 40 00 40 11 d4 e5		·)·d@·@· ····2·· ······ ·· <mark>M4898U</mark>			
	12 d0 bb a0 94 90 00 15 9b a2 44 50 3d 31 30 32 34		DP=1024			
0030	44 30 30 31 30 32 34		77-1024			

Figure 3: Image request code

No.	Time	Source	Destination	Protocol	Length	Info
	1 2020-11-25 22:44:	36.755882097 192.168.1.50	155.207.18.208	UDP	47	48032 → 38032 Len=5
г	2 2020-11-25 22:44:	39.479950928 155.207.18.208	192.168.1.50	UDP	74	58032 → 48032 Len=32
	3 2020-11-25 22:44:	39.490131454 192.168.1.50	155.207.18.208	UDP	47	48032 → 38032 Len=5
	4 2020-11-25 22:44:	41.863274842 155.207.18.208	192.168.1.50	UDP	74	58032 → 48032 Len=32
	5 2020-11-25 22:44:	41.864509919 192.168.1.50	155.207.18.208	UDP	47	48032 → 38032 Len=5
	6 2020-11-25 22:44:	42.978898363 155.207.18.208	192.168.1.50	UDP	74	58032 → 48032 Len=32
	7 2020-11-25 22:44:	42.980298519 192.168.1.50	155.207.18.208	UDP	47	48032 → 38032 Len=5
	8 2020-11-25 22:44:	44.182104925 155.207.18.208	192.168.1.50	UDP	74	58032 → 48032 Len=32
-	9 2020-11-25 22:44:	44.209077362 192.168.1.50	155.207.18.208	UDP	55	48032 → 38032 Len=13
	10 2020-11-25 22:44:	44.446438913 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
	11 2020-11-25 22:44:	44.483780124 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
	12 2020-11-25 22:44:	44.522436932 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
	13 2020-11-25 22:44:	44.560434091 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
	14 2020-11-25 22:44:	44.599023525 155.207.18.208	192.168.1.50	UDP		58032 → 48032 Len=1024
	15 2020-11-25 22:44:	44.636988129 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
	16 2020-11-25 22:44:	44.675957130 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
	17 2020-11-25 22:44:	44.714471262 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
	18 2020-11-25 22:44:	44.753185142 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
	19 2020-11-25 22:44:	44.790992341 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
	20 2020-11-25 22:44:	44.829977493 155.207.18.208	192.168.1.50	UDP		58032 → 48032 Len=1024
	21 2020-11-25 22:44:	44.868213060 155.207.18.208	192.168.1.50	UDP		58032 → 48032 Len=1024
	22 2020-11-25 22:44:	44.906193832 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
	23 2020-11-25 22:44:	44.945183978 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
	24 2020-11-25 22:44:	44.982968702 155.207.18.208	192.168.1.50	UDP	1066	58032 → 48032 Len=1024
-	Frame 10: 1066 bytes	on wire (8528 bits), 1066 bytes c	aptured (8528 bits)	on interface e	np2s0, io	0 1
	Ethernet II, Src: zte.	_1a:b4:0a (d4:76:ea:1a:b4:0a), Ds	t: HewlettP_96:9d:b6	(40:b0:34:96:	9d:b6)	
	Internet Protocol Vers	sion 4, Src: 155.207.18.208, Dst:	192.168.1.50			
	User Datagram Protoco:	1, Src Port: 58032, Dst Port: 480	32			
*	Data (1024 bytes)					
	Data: ffd8ffe00010	4a46494600010200000100010000ffdb0	04300080606070605080	7070709		
	[Length: 1024]					
0.00		04.00 0.51 55 10.55 0.00				
002			.2[
003		02 00 00 01 00 01 00 00 ff db 07 06 05 08 07 07 07 09 09 08	JFIF			
005						
006		24 2e 27 20 22 2c 23 1c 1c 28	····· \$, ' ".#··(
000		21 20 21 20 22 20 23 10 10 20	φ. ,π (

Figure 4: Image response data

2 Audio

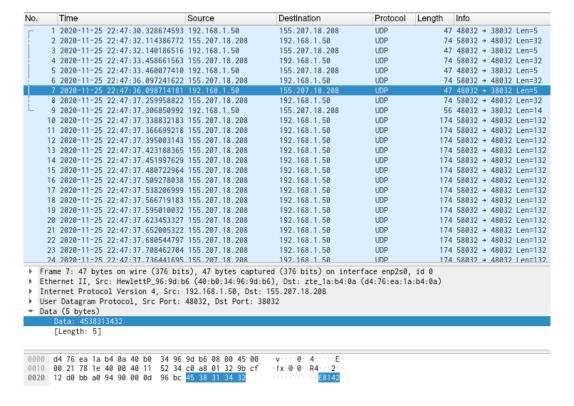


Figure 5: Echo request code

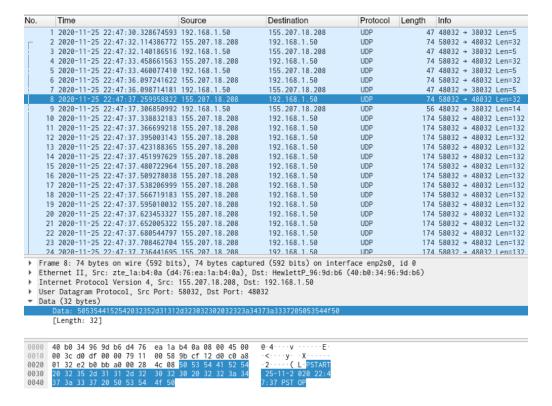


Figure 6: Echo response time

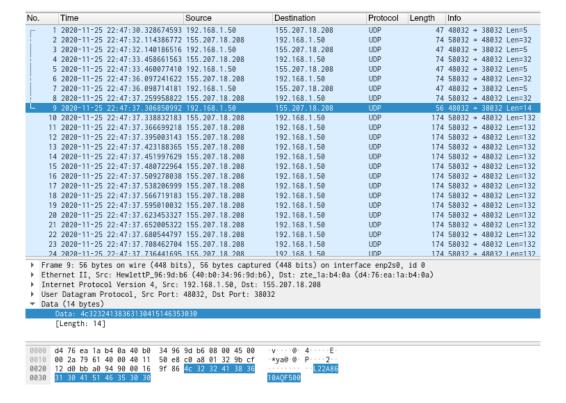


Figure 7: Audio request code

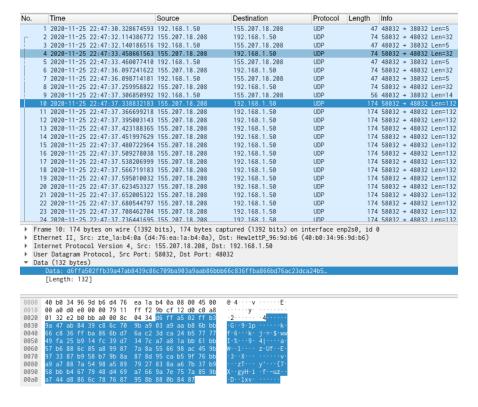


Figure 8: Audio response data

3 Ithakicopter TCP version

Αξίζει να σημειωθεί ότι στο input stream , τη στιγμή δημιουργίας TCP socket, δέχομαστε δεδομένα (οδηγίες χρήσης σχετικά με το format του μηνύματος αποστολής για να ληφθούν δεδομένα), προτού γράψουμε κάτι στο output stream. Ενδεικτικά δείχνουμε στο capture (Figure 12) την ωφέλιμη πληροφορία.

```
2020-11-25 22:53:53.737939459 155.207.18.208
245 2020-11-25 22:53:54.737944959 155.207.18.208
489 2020-11-25 22:53:55.738608591 155.207.18.208
                                                                     192.168.1.50
192.168.1.50
                                                                                                UDP
                                                                                                                  155 56232 →
                                                                                                                                 48078 Len=113
                                                                                                                  155 56232 →
                                                                                                UDP
                                                                                                                                 48078 Len=113
 723 2020-11-25 22:53:56.630779212 192.168.1.50
                                                                     155.207.18.208
                                                                                                UDP
                                                                                                                    47 48078
                                                                                                                                 38032 Len=5
                                                                                                                   47 48078 → 38032 Len=5
 724 2020-11-25 22:53:56.647217159 192.168.1.50
                                                                     155.207.18.208
                                                                                                LIDP
 725 2020-11-25 22:53:56.647402453 192.168.1.50
                                                                     155.207.18.208
                                                                                                UDP
                                                                                                                   47 48078 → 38032 Len=5
730 2020-11-25 22:53:56.739005990 155.207.18.208
917 2020-11-25 22:53:57.738790006 155.207.18.208
                                                                     192.168.1.50
                                                                                                UDP
                                                                                                                   155 56232 → 48078 Len=113
                                                                     192.168.1.50
                                                                                                UDP
                                                                                                                  155 56232 → 48078 Len=113
 10... 2020-11-25 22:53:58.644390499 155.207.18.208
                                                                     192.168.1.50
                                                                                                UDP
                                                                                                                    74 58032 →
                                                                                                                                 48032 Len=32
 11... 2020-11-25 22:53:58.740137012 155.207.18.208
                                                                     192.168.1.50
                                                                                                UDP
                                                                                                                  155 56232 →
                                                                                                                                 48078 Len=113
 13... 2020-11-25 22:53:59.738862041 155.207.18.208
                                                                     192.168.1.50
                                                                                                UDP
                                                                                                                  155 56232 →
                                                                                                                                 48078 Len=113
 15... 2020-11-25 22:54:00.667892266 155.207.18.208
                                                                     192.168.1.50
                                                                                                UDP
                                                                                                                    74 58032 →
                                                                                                                                 48032 Len=32
 15... 2020-11-25 22:54:00.747674530 155.207.18.208
                                                                     192.168.1.50
                                                                                                UDP
                                                                                                                  155 56232 →
                                                                                                                                 48078 Len=113
 17... 2020-11-25 22:54:01.740014491 155.207.18.208
                                                                     192.168.1.50
                                                                                                UDP
                                                                                                                  155 56232 →
                                                                                                                                 48078 Len=113
 19... 2020-11-25 22:54:02.272013586 155.207.18.208
                                                                     192.168.1.50
                                                                                                                                 48032 Len=32
                                                                                                UDP
                                                                                                                    74 58032 →
 21... 2020-11-25 22:54:02.740138065 155.207.18.208
                                                                     192.168.1.50
                                                                                                UDP
                                                                                                                  155 56232 →
                                                                                                                                 48078 Len=113
 23... 2020-11-25 22:54:03.324783060 155.207.18.208
                                                                    192.168.1.50
                                                                                               UDP
                                                                                                                   74 58032 →
                                                                                                                                 48032 Len=32
 24... 2020-11-25 22:54:03.740662854 155.207.18.208
                                                                     192.168.1.50
                                                                                                                   155 56232 →
                                                                                                                                 48078 Len=113
                                                                                                UDP
 24... 2020-11-25 22:54:04.741231601 155.207.18.208
                                                                     192.168.1.50
                                                                                                                   155 56232 →
                                                                                                                                 48078 Len=113
                                                                                                UDP
27... 2020-11-25 22:54:05.741014193 155.207.18.208
27... 2020-11-25 22:54:06.741427283 155.207.18.208
                                                                    192.168.1.50
                                                                                               UDP
                                                                                                                  155 56232 → 48078 Len=113
                                                                     192.168.1.50
                                                                                                UDP
                                                                                                                   155 56232 → 48078 Len=113
                                                                                                                  155 56232 → 48078 Len=113
 31... 2020-11-25 22:54:07.742364190 155.207.18.208
                                                                     192.168.1.50
                                                                                                UDP
 33... 2020-11-25 22:54:08.743188671 155.207.18.208
                                                                    192.168.1.50
                                                                                               UDP
                                                                                                                  155 56232 → 48078 Len=113
Frame 726: 47 bytes on wire (376 bits), 47 bytes captured (376 bits) on interface enp2s0, id 0 Ethernet II, Src: HewlettP_96:9d:b6 (40:b0:34:96:9d:b6), Dst: zte_1a:b4:0a (d4:76:ea:1a:b4:0a) Internet Protocol Version 4, Src: 192.168.1.50, Dst: 155.207.18.208
User Datagram Protocol, Src Port: 48078, Dst Port: 38032
Data (5 bytes)
    [Length: 5]
   d4 76 ea 1a b4 0a 40 b0
00 21 bf 02 40 00 40 11
12 d0 bb ce 94 90 00 0d
                                  34 96 9d b6 08 00 45 00
                                  0b 50 c0 a8 01 32 9b cf
                                                                   1 - - @ - @
                                  96 8e
```

Destination

192.168.1.50

Protocol Length Info

155 56232 → 48078 Len=113

Source

Time

No.

Figure 9: Echo request code

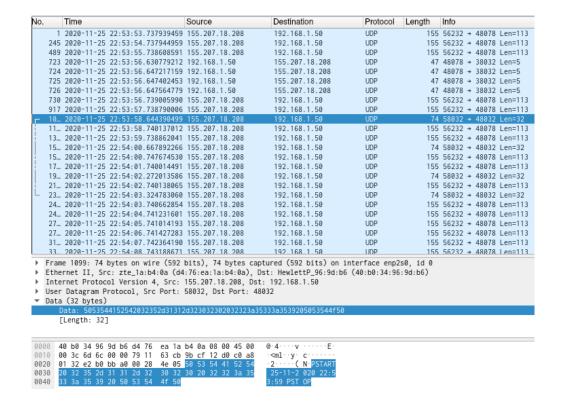


Figure 10: Echo response time

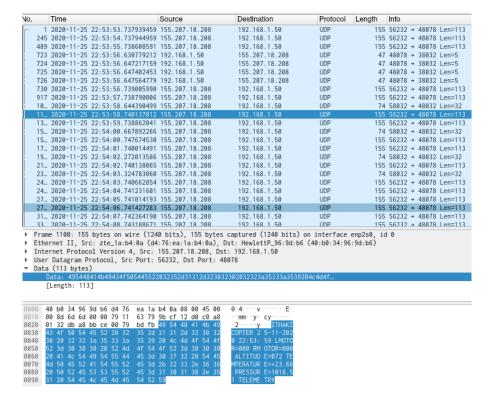


Figure 11: Copter output stream

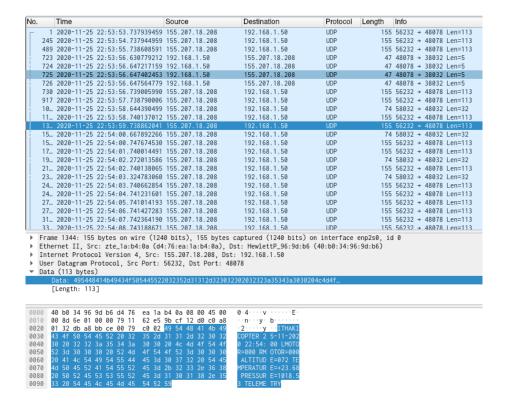


Figure 12: Copter input stream

4 Car fault diagnostics

```
Destination
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Protocol Length Info
                                                     2020-11-25 22:58:36.827351474 192.168.1.50
2020-11-25 22:58:38.724108987 155.207.18.208
2020-11-25 22:58:38.732434084 192.168.1.50
2020-11-25 22:58:39.551515824 155.207.18.208
2020-11-25 22:58:39.555261370 192.168.1.50
2020-11-25 22:58:39.555261370 192.168.1.50
2020-11-25 22:58:40.546148960 155.207.18.208
                                                                                                                                                                                                                                                                                                                                                                                                                                 Destination
155.207.18.208
192.168.1.50
155.207.18.208
192.168.1.50
155.207.18.208
192.168.1.50
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             47 48032 + 38032 Len=5

47 48032 + 48032 Len=32

47 48032 + 38032 Len=5

74 58032 + 48032 Len=32

47 48032 + 38032 Len=32

74 58032 + 48032 Len=32

74 58032 + 38032 Len=5
                                        7 2020-11-25 22:58:40.547722002 192.168.1.50
8 2020-11-25 22:58:42.145132983 155.207.18.208
                                                                                                                                                                                                                                                                                                                                                                                                                                   155.207.18.20
192.168.1.50
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               47 48032 → 38032 Len=5
74 58032 → 48032 Len=32
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            UDP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             74 43394 - 90072 ELEI-32
74 43394 - 92078 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 SACK_PERM=1 TSVal=2077519728 TSecr=0 WS=128
66 29078 - 43394 [SYN] Seq=0 Ack=1 Win=65535 Len=0 MSS=1436 WS=256 SACK_PERM=1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         66 29078 + 43394 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS-
54 43394 + 29078 [ACK] Seq=1 Ack=1 Win=64256 Len=0
66 43394 + 29078 [PSH, ACK] Seq=1 Ack=1 Win=64256 Len=6
66 29078 + 43394 [PSH, ACK] Seq=1 Ack=1 Win=64256 Len=12
54 43394 + 29078 [ACK] Seq=7 Ack=13 Win=64256 Len=6
60 43394 + 29078 [ACK] Seq=7 Ack=13 Win=64256 Len=6
61 29078 + 43394 [PSH, ACK] Seq=13 Ack=22 Win=64256 Len=6
61 29078 + 43394 [PSH, ACK] Seq=13 Ack=22 Win=64256 Len=6
60 43394 + 29078 [PSH, ACK] Seq=13 Ack=22 Win=64256 Len=6
60 29078 + 43394 [PSH, ACK] Seq=22 Ack=19 Win=262565 Len=6
61 29078 + 43394 [PSH, ACK] Seq=19 Ack=31 Win=64256 Len=6
61 43394 + 29078 [PSH, ACK] Seq=19 Ack=31 Win=64256 Len=6
60 43394 + 29078 [PSH, ACK] Seq=19 Ack=31 Win=64256 Len=6
60 43394 + 29078 [PSH, ACK] Seq=19 Ack=31 Win=64256 Len=6
60 43394 + 43394 [PSH, ACK] Seq=19 Ack=31 Win=64256 Len=6
60 61 29078 + 43394 [PSH, ACK] Seq=31 Ack=25 Win=262656 Len=6
60 61 29078 + 43394 [PSH, ACK] Seq=31 Ack=25 Win=262656 Len=12
                                11 2020-11-25 22:58:42.185594139 192.16.8.1.50
12 2020-11-25 22:58:42.243785727 192.16.8.1.50
13 2020-11-25 22:58:42.243785727 192.16.8.1.50
13 2020-11-25 22:58:42.283315234 155.207.18.208
14 2020-11-25 22:58:42.283422638 192.16.8.1.50
15 2020-11-25 22:58:42.318721389 192.16.8.1.50
                                                                                                                                                                                                                                                                                                                                                                                                                               155.207.18.208
155.207.18.208
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              TCP
TCP
                                                                                                                                                                                                                                                                                                                                                                                                                                 192.168.1.50
155.207.18.208
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                TCP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              TCP
                 15 2020-11-25 22:58:42 318701389 192.168.1.50 155.207.18.208 TCP 16 2020-11-25 22:58:42 338308433 155.207.18.208 192.168.1.50 152.207.18.208 TCP 17 2020-11-25 22:58:42 383158352 152.07.18.208 155.207.18.208 TCP 18 2020-11-25 22:58:42 38549580 192.168.1.50 155.207.18.208 TCP 19 2020-11-25 22:58:42 461345271 55.207.18.208 192.168.1.50 TCP 20 2020-11-25 22:58:42 461345271 55.207.18.208 192.168.1.50 TCP 21 2020-11-25 22:58:42 491126776 155.207.18.208 192.168.1.50 TCP 22 2020-11-25 22:58:42 49123659 192.168.1.50 155.207.18.208 TCP 22 2020-11-25 22:58:42 49123659 192.168.1.50 155.207.18.208 TCP 22 2020-11-25 22:58:42 49123659 192.168.1.50 155.207.18.208 TCP 23 2020-11-25 22:58:42.572124543 155.207.18.208 192.168.1.50 TCP 24 2020-11-25 22:58:42.572124543 155.207.18.208 192.168.1.50 TCP 24 2020-11-25 22:58:42.572124543 155.207.18.208 192.168.1.50 TCP 54 2020-11-25 22:58:42.57212453 155.207.18.208 192.168.1.50 TCP 54 2020-11-25 22:58:42.2000-11
                                                                                                                                                                                                                                                                                                                                                                                                                                 155.207.18.208
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                TCP
                       Data (5 bytes)
                                               [Length: 5]
0000 d4 76 ea 1a b4 0a 40 b0 34 96 9d b6 08 00 45 00 0010 00 21 22 9a 40 00 40 11 a7 b8 c0 a8 01 32 9b cf 0020 12 d0 bb a0 94 90 00 dd 96 bc 45 38 31 34 32
```

Figure 13: Echo request code

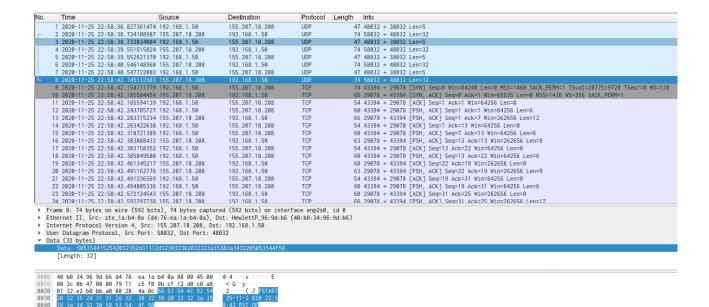


Figure 14: Echo response time

```
Destination
                                                                                                                                                                                                                                                                                                                                                                                                                                                Protocol Length
                          2020-11-25 22:58:36.827361474 192.168.1.50
2020-11-25 22:58:38.724108987 155.207.18.208
                                                                                                                                                                                                                                                                                                                       155.207.18.208
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           47 48032 → 38032 Len=5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        47 48032 + 38032 Len=5
47 48032 + 38032 Len=5
74 58032 + 48032 Len=5
47 48032 + 38032 Len=3
47 48032 + 38032 Len=3
47 48032 + 38032 Len=5
47 58032 + 48032 Len=5
74 58032 + 48032 Len=3
                                                                                                                                                                                                                                                                                                                     192.168.1.50
                                                                                                                                                                                                                                                                                                                                                                                                                                                UDF
                                                                                                                                                                                                                                                                                                                     155.207.18.208
192.168.1.50
                            2020-11-25 22:58:38.732034004 192.168.1.50
                          2020-11-25 22:58:39.551515824 155.207.18.208
                                                                                                                                                                                                                                                                                                                                                                                                                                                  UDF
                          2020-11-25 22:58:39.552621370 192.168.1.50
2020-11-25 22:58:40.546148960 155.207.18.208
                                                                                                                                                                                                                                                                                                                     155.207.18.208
                                                                                                                                                                                                                                                                                                                                                                                                                                                  UDF
                                                                                                                                                                                                                                                                                                                     192.168.1.50
                                                                                                                                                                                                                                                                                                                                                                                                                                                  UDP
                          2020-11-25 22:58:40.547722002 192.168.1.50
                                                                                                                                                                                                                                                                                                                     155.207.18.208
                                                                                                                                                                                                                                                                                                                                                                                                                                                UDP
                            2020-11-25 22:58:42.145132983 155.207.18.208
                                                                                                                                                                                                                                                                                                                       192.168.1.50
                                                                                                                                                                                                                                                                                                                     155.207.18.208
192.168.1.50
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         74 43394 → 29078 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 SACK_PERM=1 TSval=2077519728 TSecr=0 WS=128 66 29078 → 43394 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=1436 WS=256 SACK_PERM=1
        10 2020-11-25 22:58.42.185504454 155.207.18.208
11 2020-11-25 22:58.42.185504454 155.207.18.208
11 2020-11-25 22:58.42.185594139 192.168.1.50
13 2020-11-25 22:58.42.243795727 192.168.1.50
13 2020-11-25 22:58.42.283315234 155.207.18.208
14 2020-11-25 22:58.42.3831523198 192.168.1.50
15 2020-11-25 22:58.42.383208433 155.207.18.208
17 2020-11-25 22:58.42.383088433 155.207.18.208
17 2020-11-25 22:58.42.383158352 192.168.1.50
19 2020-11-25 22:58.42.49123527 155.207.18.208
20 2020-11-25 22:58.42.491235569 192.168.1.50
19 2020-11-25 22:58.42.491235569 192.168.1.50
21 2020-11-25 22:58.42.491235569 192.168.1.50
22 2020-11-25 22:58.42.491235569 192.168.1.50
23 2020-11-25 22:58.42.491235569 192.168.1.50
23 2020-11-25 22:58.42.491235569 192.168.1.50
24 2020-11-25 22:58.42.491235569 192.168.1.50
24 2020-11-25 22:58.42.491235569 192.168.1.50
24 2020-11-25 22:58.42.491235569 192.168.1.50
24 2020-11-25 22:58.42.491235569 192.168.1.50
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      66 29078 + 43394 | SIN | ACK | Seq=0 Ack=1 Win=65535 | Len=0 WS-54 43394 + 29078 | CAK | Seq=1 Ack=1 Win=64256 | Len=0 C 43394 + 29078 | CAK | Seq=1 Ack=1 Win=64256 | Len=0 C 43394 + 29078 | CAK | ACK | Seq=1 Ack=1 Win=64256 | Len=1 C 54 43394 + 29078 | CAK | Seq=7 Ack=1 3 Win=64256 | Len=6 C 43394 + 29078 | CAK | Seq=7 Ack=1 3 Win=64256 | Len=6 C 43394 + 29078 | CAK | Seq=7 Ack=1 3 Win=64256 | Len=6 C 43394 + 29078 | CAK | Seq=1 Ack=2 Win=64256 | Len=6 C 43394 + 29078 | CAK | Seq=1 Ack=2 Win=64256 | Len=6 C 43394 + 29078 | CAK | Seq=2 C Ack=1 9 Win=256556 | Len=6 C 43394 + 29078 | CAK | Seq=2 C Ack=1 9 Win=262556 | Len=6 C 43394 + 29078 | CAK | Seq=2 C Ack=1 Win=64256 | Len=6 C 43394 + 29078 | CAK | Seq=19 Ack=3 | Win=64256 | Len=6 C 43394 + 29078 | CAK | Seq=19 Ack=3 | Win=64256 | Len=6 C 43394 + 29078 | CAK | Seq=19 Ack=3 | Win=64256 | Len=6 C 43394 + 29078 | CAK | Seq=19 Ack=3 | Win=64256 | Len=6 C 43394 + 29078 | CAK | Seq=19 Ack=3 | Win=64256 | Len=6 C 43394 + 24394 | CAK | Seq=1 Ack=2 | Win=2625656 | Len=6 C 43394 + 24394 | CAK | Seq=3 | Ack=2 | Win=2625656 | Len=10 | Len=12 | 
                                                                                                                                                                                                                                                                                                                  192.168.1.50
155.207.18.208
195.168.1.50
195.207.18.208
192.168.1.50
155.207.18.208
195.207.18.208
195.207.18.208
195.207.18.208
195.207.18.208
195.207.18.208
195.207.18.208
195.207.18.208
195.207.18.208
195.207.18.208
Frame 12: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface enp2s0, id 0 Ethernet II, Src: HewlettP_96:9d:b6 (40:00:34:96:9d:b6), Dst: zte_la:b4:0a (44:76:ea:la:b4:0a) Internet Protocol Version 4, Src: 192.168.150, Dst: 155.207.18.208
Transmission Control Protocol, Src Port: 43394, Dst Port: 29078, Seq: 1, Ack: 1, Len: 6
   Data (6 bytes)
                d4 76 ea 1a b4 0a 40 b0 34 96 9d b6 08 00 45 00 00 2e c3 be 40 00 40 06 06 92 c0 a8 01 32 9b cf 12 d0 a9 82 71 96 a2 53 a3 d2 44 11 5 d0 50 18 01 f6 70 9a 00 00 38 31 20 31 46 05
```

Figure 15: Vehicle output stream

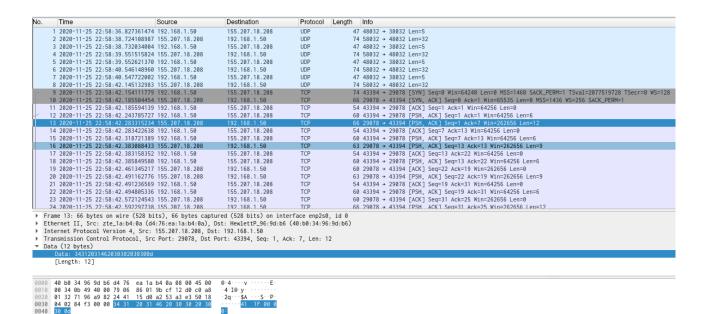


Figure 16: Vehicle input stream