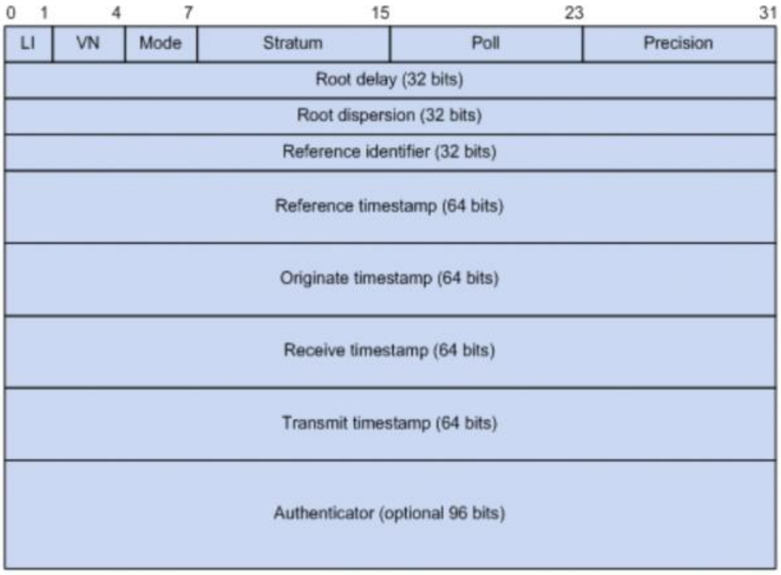
NTP message format

NTP uses two types of messages: clock synchronization and NTP control messages. All NTP messages mentioned in this document refer to NTP clock synchronization messages. NTP control messages are used in environments where network management is needed. Because NTP control messages are not essential for clock synchronization, they are not described in this document.

A clock synchronization message is encapsulated in a UDP message, in the format shown in Figure 18.

Figure 18: Clock synchronization message format

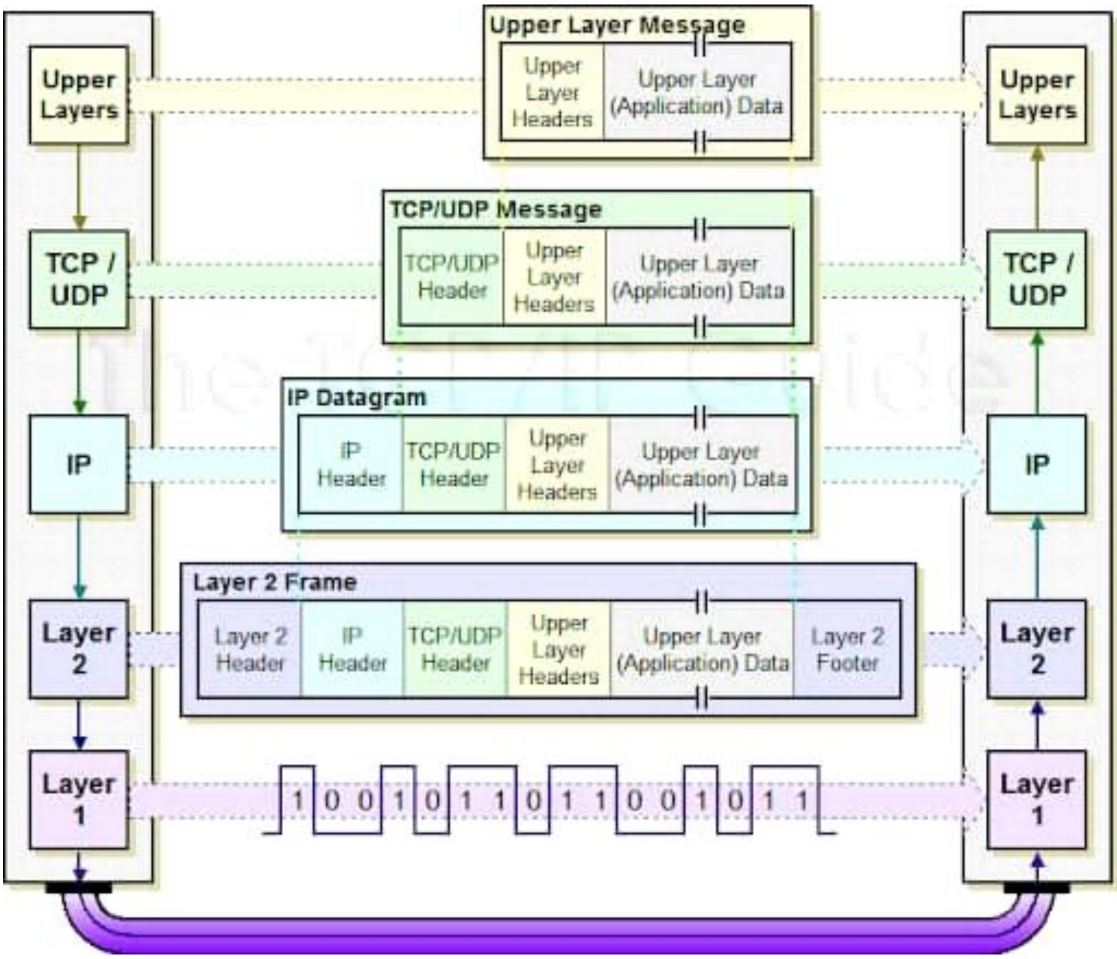


Main fields are described as follows:

- **LI (Leap Indicator)**—A 2-bit leap indicator. When set to 11, it warns of an alarm condition (clock unsynchronized); when set to any other value, it is not to be processed by NTP.
- **VN (Version Number)**—A 3-bit version number that indicates the version of NTP. The latest version is version 4.
- **Mode**—A 3-bit code that indicates the work mode of NTP. This field can be set to these values:
  - **0**—reserved
  - **1**—symmetric active
  - **2**—symmetric passive
  - **3**—client
  - **4**—server
  - **5**—broadcast or multicast
  - **6**—NTP control message
  - **7**—reserved for private use.
- **Stratum**—An 8-bit integer that indicates the stratum level of the local clock, with the value ranging from 1 to 16. Clock precision decreases from stratum 1 through stratum 16. A stratum 1 clock has the highest precision, and a stratum 16 clock is not synchronized and cannot be used as a reference clock.
- **Poll**—An 8-bit signed integer that indicates the maximum interval between successive messages, which is called the poll interval.
- **Precision**—An 8-bit signed integer that indicates the precision of the local clock.
- **Root Delay**—Roundtrip delay to the primary reference source.
- **Root Dispersion**—The maximum error of the local clock relative to the primary reference source.
- **Reference Identifier**—Identifier of the particular reference source.
- **Reference Timestamp**—The local time at which the local clock was last set or corrected.
- **Originate Timestamp**—The local time at which the request departed from the client for the service host.
- **Receive Timestamp**—The local time at which the request arrived at the service host.
- **Transmit Timestamp**—The local time at which the reply departed from the service host for the client.
- **Authenticator**—Authentication information.

OSI (Open Source Interconnection) 7 Layer Model

Layer	Application/Example		Central Device/ Protocols			DOD4 Model
Application (7) Serves as the window for users and application processes to access the network services.	**End User layer** Program that opens what was sent or creates what is to be sent Resource sharing • Remote file access • Remote printer access • Directory services • Network management		**User Applications** SMTP		GATEWAY Can be used on all layers	Process
Presentation (6) Formats the data to be presented to the Application layer. It can be viewed as the "Translator" for the network.	**Syntax layer** encrypt & decrypt (if needed) Character code translation • Data conversion • Data compression • Data encryption • **Character Set Translation**		JPEG/ASCII EBDIC/TIFF/GIF PICT			
Session (5) Allows session establishment between processes running on different stations.	**Synch & send to ports** (logical ports) Session establishment, maintenance and termination • Session support - perform security, name recognition, logging, etc.		**Logical Ports** RPC/SQL/NFS NetBIOS names			
Transport (4) Ensures that messages are delivered error-free, in sequence, and with no losses or duplications.	**TCP** Host to Host, Flow Control Message segmentation • Message acknowledgement • Message traffic control • Session multiplexing	PACKET FILTERING	TCP/SPX/UDP			Host to Host
Network (3) Controls the operations of the subnet, deciding which physical path the data takes.	**Packets** ("letter", contains IP address) Routing • Subnet traffic control • Frame fragmentation • Logical-physical address mapping • Subnet usage accounting		**Routers** IP/IPX/ICMP			Internet
Data Link (2) Provides error-free transfer of data frames from one node to another over the Physical layer.	**Frames** ("envelopes", contains MAC address) [NIC card —— Switch —— NIC card] (end to end) Establishes & terminates the logical link between nodes • Frame traffic control • Frame sequencing • Frame acknowledgment • Frame delimiting • Frame error checking • Media access control		**Switch** **Bridge** **WAP** PPP/SLIP	Land Based Layers		Network
Physical (1) Concerned with the transmission and reception of the unstructured raw bit stream over the physical medium.	**Physical structure** Cables, hubs, etc. Data Encoding • Physical medium attachment • Transmission technique - Baseband or Broadband • Physical medium transmission Bits & Volts		**Hub**			



TCP

- it is defined in a number of RFCc: 793, 1122, 2018, 5681, 7323
- many versions
- byte stream, not a message stream
- TCP segment strcuture: consists of a *segment header* and a *data section*

TCP segment header

Offsets	Octet	0	1	2	3
Octet	Bit	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0
0	0	Source port		Destination port	
4	32	Sequence number			
8	64	Acknowledgment number (if ACK set)			
12	96	Data offset / Reserved 0 0 0 / NS	CWR / ECE / URG / ACK / PSH / RST / SYN / FIN	Window Size	
16	128	Checksum		Urgent pointer (if URG set)	
20	160	Options (if *data offset* > 5. Padded at the end with "0" bits if necessary.)			
⋮	⋮				
60	480				

Antenna-Quick-Fix

Thursday, 2 January 2025 10.34

TABLE 4.3 Summary of Important Parameters and Associated Formulas and Equation Numbers for a Dipole in the Far Field

Parameter	Formula	Equation Number
	Infinitesimal Dipole ($l \leq \lambda/50$)	
Normalized power pattern	$U = (E_{\theta n})^2 = C_0 \sin^2\theta$	(4-29)
Radiation resistance R_r	$R_r = \eta\left(\frac{2\pi}{3}\right)\left(\frac{l}{\lambda}\right)^2 = 80\pi^2\left(\frac{l}{\lambda}\right)^2$	(4-19)
Input resistance R_{in}	$R_{in} = R_r = \eta\left(\frac{2\pi}{3}\right)\left(\frac{l}{\lambda}\right)^2 = 80\pi^2\left(\frac{l}{\lambda}\right)^2$	(4-19)
Wave impedance Z_w	$Z_w = \frac{E_\theta}{H_\phi} \simeq \eta = 377$ ohms	
Directivity D_0	$D_0 = \frac{3}{2} = 1.761$ dB	(4-31)
Maximum effective area A_{em}	$A_{em} = \frac{3\lambda^2}{8\pi}$	(4-32)
Vector effective length ℓ_e	$\boldsymbol{\ell}_e = -\hat{\mathbf{a}}_\theta l \sin\theta$ $\lvert\boldsymbol{\ell}_e\rvert_{max} = \lambda$	(2-92) Example 4.2
Half-power beamwidth	HPBW = 90°	(4-65)
Loss resistance R_L	$R_L = \frac{l}{P}\sqrt{\frac{\omega\mu_0}{2\sigma}} = \frac{l}{2\pi b}\sqrt{\frac{\omega\mu_0}{2\sigma}}$	(2-90b)
	Small Dipole ($\lambda/50 < l \leq \lambda/10$)	
Normalized power pattern	$U = (E_{\theta n})^2 = C_1 \sin^2\theta$	(4-36a)
Radiation resistance R_r	$R_r = 20\pi^2\left(\frac{l}{\lambda}\right)^2$	(4-37)
Input resistance R_{in}	$R_{in} = R_r = 20\pi^2\left(\frac{l}{\lambda}\right)^2$	(4-37)
Wave impedance Z_w	$Z_w = \frac{E_\theta}{H_\phi} \simeq \eta = 377$ ohms	(4-36a), (4-36c)
Directivity D_0	$D_0 = \frac{3}{2} = 1.761$ dB	
Maximum effective area A_{em}	$A_{em} = \frac{3\lambda^2}{8\pi}$	
Vector effective length ℓ_e	$\boldsymbol{\ell}_e = -\hat{\mathbf{a}}_\theta \frac{l}{2}\sin\theta$ $\lvert\boldsymbol{\ell}_e\rvert_{max} = \frac{l}{2}$	(2-92) (4-36a)
Half-power beamwidth	HPBW = 90°	(4-65)
	Half Wavelength Dipole ($l = \lambda/2$)	
Normalized power pattern	$U = (E_{\theta n})^2 = C_2\left[\frac{\cos\left(\frac{\pi}{2}\cos\theta\right)}{\sin\theta}\right]^2 \simeq C_2 \sin^3\theta$	(4-87)
Radiation resistance R_r	$R_r = \frac{\eta}{4\pi}C_{in}(2\pi) \simeq 73$ ohms	(4-93)

(*continued overleaf*)

TABLE 4.3 (*continued*)

Parameter	Formula	Equation Number
Input resistance R_{in}	$R_{in} = R_r = \frac{\eta}{4\pi} C_{in}(2\pi) \simeq 73$ ohms	(4-79), (4-93)
Input impedance Z_{in}	$Z_{in} = 73 + j42.5$	(4-93a)
Wave impedance Z_w	$Z_w = \frac{E_\theta}{H_\phi} \simeq \eta = 377$ ohms	
Directivity D_0	$D_0 = \frac{4}{C_{in}(2\pi)} \simeq 1.643 = 2.156$ dB	(4-91)
Vector effective length ℓ_e	$\boldsymbol{\ell}_e = -\hat{\mathbf{a}}_\theta \frac{\lambda}{\pi} \frac{\cos\left(\frac{\pi}{2}\cos\theta\right)}{\sin\theta}$	(2-91)
	$\lvert\boldsymbol{\ell}_e\rvert_{\max} = \frac{\lambda}{\pi} = 0.3183\lambda$	(4-84)
Half-power beamwidth	HPBW = 78°	(4-65)
Loss resistance R_L	$R_L = \frac{l}{2P}\sqrt{\frac{\omega\mu_0}{2\sigma}} = \frac{l}{4\pi b}\sqrt{\frac{\omega\mu_0}{2\sigma}}$	Example (2-13)
	Quarter-Wavelength Monopole ($l = \lambda/4$)	
Normalized power pattern	$U = (E_{\theta n})^2 = C_2 \left[\frac{\cos\left(\frac{\pi}{2}\cos\theta\right)}{\sin\theta}\right]^2 \simeq C_2 \sin^3\theta$	(4-87)
Radiation resistance R_r	$R_r = \frac{\eta}{8\pi} C_{in}(2\pi) \simeq 36.5$ ohms	(4-106)
Input resistance R_{in}	$R_{in} = R_r = \frac{\eta}{8\pi} C_{in}(2\pi) \simeq 36.5$ ohms	(4-106)
Input impedance Z_{in}	$Z_{in} = 36.5 + j21.25$	(4-106)
Wave impedance Z_w	$Z_w = \frac{E_\theta}{H_\phi} \simeq \eta = 377$ ohms	
Directivity D_0	$D_0 = 3.286 = 5.167$ dB	
Vector effective length ℓ_e	$\boldsymbol{\ell}_e = -\hat{\mathbf{a}}_\theta \frac{\lambda}{\pi} \cos\left(\frac{\pi}{2}\cos\theta\right)$	(2-91)
	$\lvert\boldsymbol{\ell}_e\rvert_{\max} = \frac{\lambda}{\pi} = 0.3183\lambda$	(4-84)

Power (dBm)	Power (W)
-30 dBm	0,000001 W
-20 dBm	0,00001 W
-10 dBm	0,0001 W
0 dBm	0,001 W
1 dBm	0,0012589 W
2 dBm	0,0015849 W
3 dBm	0,0019953 W
4 dBm	0,0025119 W
5 dBm	0,0031628 W
6 dBm	0,0039811 W
7 dBm	0,0050119 W
8 dBm	0,0063096 W
9 dBm	0,0079433 W
10 dBm	0,01 W
20 dBm	0,1 W
30 dBm	1 W
40 dBm	10 W
50 dBm	100 W

husk
this fucken!

Prefix		Base 10	Decimal	Adoption [nb 1]
Name	Symbol			
quetta	Q	10^{30}	1 000 000 000 000 000 000 000 000 000 000	2022[3]
ronna	R	10^{27}	1 000 000 000 000 000 000 000 000 000	
yotta	Y	10^{24}	1 000 000 000 000 000 000 000 000	1991
zetta	Z	10^{21}	1 000 000 000 000 000 000 000	
exa	E	10^{18}	1 000 000 000 000 000 000	1975[4]
peta	P	10^{15}	1 000 000 000 000 000	
tera	T	10^{12}	1 000 000 000 000	

Prefix		Base 10	Decimal	Adoption [nb 1]
Name	Symbol			
quetta	Q	10^{30}	1 000 000 000 000 000 000 000 000 000 000	2022[3]
ronna	R	10^{27}	1 000 000 000 000 000 000 000 000 000	
yotta	Y	10^{24}	1 000 000 000 000 000 000 000 000	1991
zetta	Z	10^{21}	1 000 000 000 000 000 000 000	
exa	E	10^{18}	1 000 000 000 000 000 000	1975[4]
peta	P	10^{15}	1 000 000 000 000 000	
tera	T	10^{12}	1 000 000 000 000	1960
giga	G	10^{9}	1 000 000 000	
mega	M	10^{6}	1 000 000	1873
kilo	k	10^{3}	1 000	1795
hecto	h	10^{2}	100	
deca	da	10^{1}	10	
—	—	10^{0}	1	—
deci	d	10^{-1}	0.1	1795
centi	c	10^{-2}	0.01	
milli	m	10^{-3}	0.001	
micro	μ	10^{-6}	0.000 001	1873
nano	n	10^{-9}	0.000 000 001	1960
pico	p	10^{-12}	0.000 000 000 001	
femto	f	10^{-15}	0.000 000 000 000 001	1964
atto	a	10^{-18}	0.000 000 000 000 000 001	
zepto	z	10^{-21}	0.000 000 000 000 000 000 001	1991
yocto	y	10^{-24}	0.000 000 000 000 000 000 000 001	
ronto	r	10^{-27}	0.000 000 000 000 000 000 000 000 001	2022[3]
quecto	q	10^{-30}	0.000 000 000 000 000 000 000 000 000 001	

S. No.	Dielectric Material	Relative Permittivity	Loss Tangent
1	Air	1.0006	0
2	FR4 epoxy	4.4	0.02
3	Bakelite	4.8	0.0002
4	Duroid	2.2	0.0009
5	Quartz glass	3.78	0
6	Foam	1.03	0
7	Polystyrene	2.55	0
8	Plexiglas	2.59	0.0068
9	Fused quartz	3.78	0
10	E glass	6.22	0.0023
11	RO4725JXR	2.55	0.0022
12	RO4730JXR	3	0.0023
13	Rogers RT/duroid 5870/5880	2.33/2.2	0.0012/0.0009
14	Teflon	2.1	0.001
15	Taconic CER-10	10	0.0035
16	Taconic RF-30	3	0.0014
17	Taconic RF-35	3.5	0.0018

TABLE 26.1 Dielectric Constants and Dielectric Strengths of Various Materials at Room Temperature

Material	Dielectric Constant κ	Dielectric Strength[a] (V/m)
Air (dry)	1.000 59	3×10^6
Bakelite	4.9	24×10^6
Fused quartz	3.78	8×10^6
Neoprene rubber	6.7	12×10^6
Nylon	3.4	14×10^6
Paper	3.7	16×10^6
Polystyrene	2.56	24×10^6
Polyvinyl chloride	3.4	40×10^6
Porcelain	6	12×10^6
Pyrex glass	5.6	14×10^6
Silicone oil	2.5	15×10^6
Strontium titanate	233	8×10^6
Teflon	2.1	60×10^6
Vacuum	1.000 00	—
Water	80	—

[a] The dielectric strength equals the maximum electric field that can exist in a dielectric without electrical breakdown. Note that these values depend strongly on the presence of impurities and flaws in the materials.

ASCII

Monday, 6 January 2025 13.42

```
cook@pop-os:~$ ascii -d
    0 NUL    16 DLE    32        48 0    64 @    80 P    96 `   112 p
    1 SOH    17 DC1    33 !      49 1    65 A    81 Q    97 a   113 q
    2 STX    18 DC2    34 "      50 2    66 B    82 R    98 b   114 r
    3 ETX    19 DC3    35 #      51 3    67 C    83 S    99 c   115 s
    4 EOT    20 DC4    36 $      52 4    68 D    84 T   100 d   116 t
    5 ENQ    21 NAK    37 %      53 5    69 E    85 U   101 e   117 u
    6 ACK    22 SYN    38 &      54 6    70 F    86 V   102 f   118 v
    7 BEL    23 ETB    39 '      55 7    71 G    87 W   103 g   119 w
    8 BS     24 CAN    40 (      56 8    72 H    88 X   104 h   120 x
    9 HT     25 EM     41 )      57 9    73 I    89 Y   105 i   121 y
   10 LF     26 SUB    42 *      58 :    74 J    90 Z   106 j   122 z
   11 VT     27 ESC    43 +      59 ;    75 K    91 [   107 k   123 {
   12 FF     28 FS     44 ,      60 <    76 L    92 \   108 l   124 |
   13 CR     29 GS     45 -      61 =    77 M    93 ]   109 m   125 }
   14 SO     30 RS     46 .      62 >    78 N    94 ^   110 n   126 ~
   15 SI     31 US     47 /      63 ?    79 O    95 _   111 o   127 DEL
```

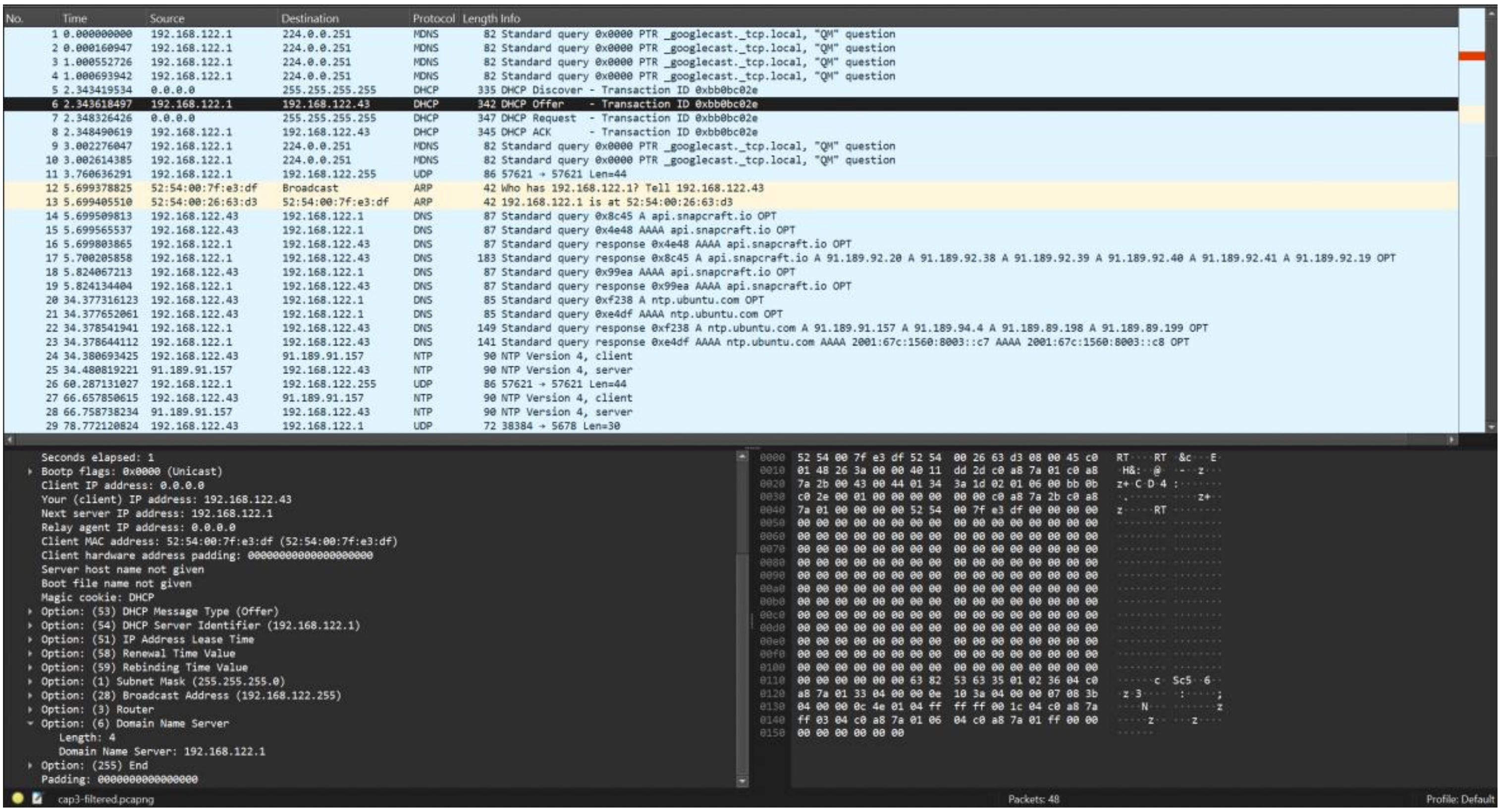
Wireshark

Monday, 6 January 2025 15.31

Husk der findes et søge felt.

Man kan udvide de forskellige dele og se mere information når man gå ind og kigger.

Find DNS information fra DHCP



DNS: DHCP

DHCP offer har al information

· Option 6 har 99.9% af tiden, DNS ardress