

ICMP & UDP

ICMP: Internet Control Message Protocol

- IP = unreliable, connectionless datagram delivery
- Routers forward datagrams one network (or hop) at a time
- When a datagram is dropped, an error message is sent.
- When a host wants to find some info., a control message is sent.
- ICMP:
 - Is used to format error or control messages.
 - Is a required part of an IP implementation.
 - Defined by RFC 792 (1981)

ICMP Message Format

- Type identifies Message, Code further identifies message type
- Checksum covers ICMP message
 - Query/Reply might have message specific header components plus data.
 - Error messages have ICMP header and in the data they include the IP header of the offending packet plus the next 8 bytes (i.e., TCP/UDP header)

Type	Code	Checksum
ICMP Specific Data		

ICMP

Type	Code	Description	Query/Reply	Error
0	0	echo reply	x	
3	0	network unreachable		x
	1	host unreachable		x
	2	protocol unreachable		x
	3	port unreachable		x
	4	fragmentation needed but DF set		x
	5	src route failed		x
	6	destination network unknown		x
	7	destination host unknown		x
			
4	0	source quench		x
5	x	redirect		x
8	0	echo request	x	
9	0	router advertisement	x	
10	0	router solicitation	x	
11	x	time exceeded		x
12	x	parameter problem		x
13	0	timestamp request	x	
14	0	timestamp reply	x	
15/16		information request/reply	x	
17/18		address mask req/reply	x	

ICMP: Ping application

Ping (packet Internet Groper ?):

- tests destination reachability and status.
- provides a way to assess performance over a path by monitoring loss and packet round trip times.
- Ping is an application that utilizes ICMP
 - some versions allow for IP options (record route, source routing).

ICMP Echo Request and Echo Reply

type=8	code=0	checksum=xxxx
Identifier (process ID=zzz)		Sequence number=1
Ping Echo data: 56 bytes by default		

What is the IP packet size of a Ping Echo Request ?

type=0	code=0	checksum=yyyy
Identifier (process ID=zzz)		Sequence number=1
Ping Reply data: 56 bytes by default		

ICMP

```
PING usatoday.com (209.67.29.11): 56 data bytes
64 bytes from usatoday.com (209.67.29.11): seq=0 ttl=246 time=24.6 ms.
64 bytes from usatoday.com (209.67.29.11): seq=1 ttl=246 time=23.9 ms.
64 bytes from usatoday.com (209.67.29.11): seq=2 ttl=246 time=23.8 ms.
64 bytes from usatoday.com (209.67.29.11): seq=3 ttl=246 time=22.5 ms.
64 bytes from usatoday.com (209.67.29.11): seq=4 ttl=246 time=21.7 ms.
64 bytes from usatoday.com (209.67.29.11): seq=5 ttl=246 time=40.2 ms.
64 bytes from usatoday.com (209.67.29.11): seq=6 ttl=246 time=23.8 ms.
64 bytes from usatoday.com (209.67.29.11): seq=7 ttl=246 time=27.3 ms.
```

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^C
```

```
---- usatoday.com (209.67.29.11) PING Statistics ----
```

```
8 packets transmitted, 8 packets received, 0% packet loss
round-trip (ms) min/avg/max = 21.7/26.0/40.2 (std = 5.57)
```

UDP: User Datagram Protocol

- Provides an unreliable connection between two hosts.
- Each output produces exactly one UDP datagram (as opposed to a stream oriented protocol).
- Ports: 16 bit number that identifies the sending and receiving process.

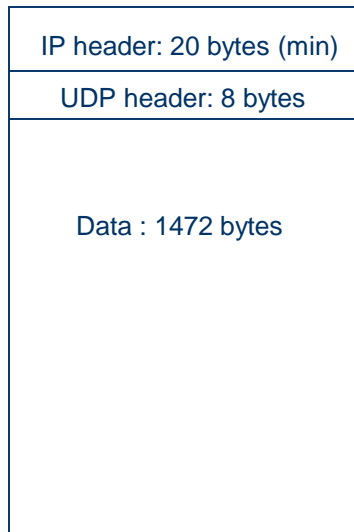
UDP Message Format

16 bit src port	16 bit dst port
16 bit UDP length	16 bit checksum
Data (if any)	

UDP Message Format

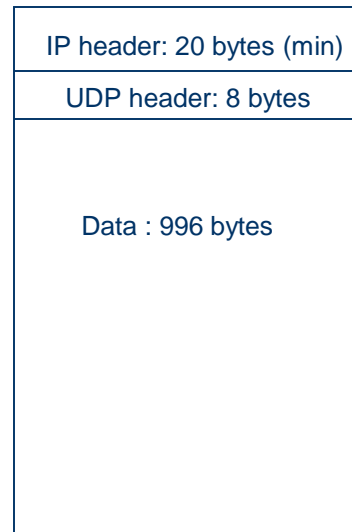
UDPEchoClient sampras.cs.clemson.edu 5000 1472

Case 1, MTU 1500 bytes



Generates 1 UDP datagram (size 1500)
And 1 IP packet (size 1500)

Case 2, MTU 1024 bytes



Generates 1 UDP datagram (size 1500)
But 2 IP packets (called fragments) of size 1024 and 496

