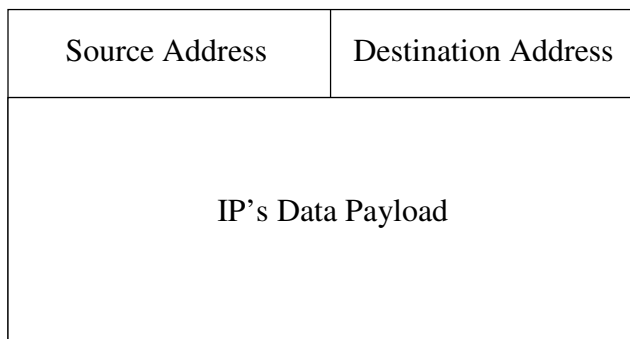


Linux Networking: ping

David Morgan

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IP packet structure



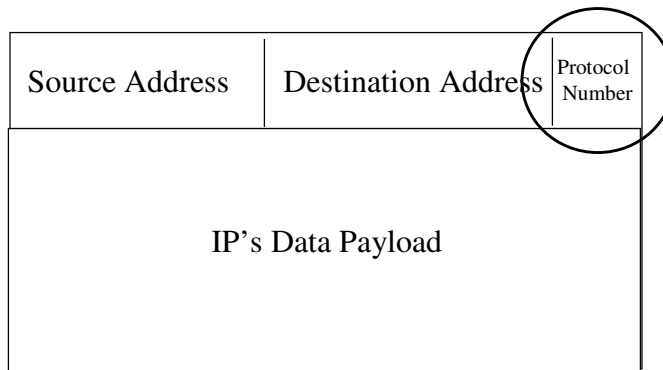
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IP's payload

- Theoretically
 - Payload can be anything
 - IP is payload-oblivious, payload-indifferent
- Actual practice
 - particular well-defined protocols use IP
 - IP recognizes them with a header field

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IP packet structure



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IP's Payload types – subprotocol examples and their numbers

Src	Dest	17
UDP (17) packet		

Src	Dest	1
ICMP (1) packet		

Src	Dest	6
TCP (6) packet		

... and many others

<http://www.iana.org/assignments/protocol-numbers>

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ping: a utility that uses icmp

- purpose: Tests connectivity
- method: Probes an address
- output: Reports whether there is a reply
- technique: Utilizes ICMP to do its work

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ping usage

```
[root@EMACH1 /root]# ping -c3 66.218.71.81
PING 66.218.71.81 (66.218.71.81) from 64.130.228.61 : 56(84) bytes of data.
64 bytes from 66.218.71.81: icmp_seq=0 ttl=55 time=34.5 ms
64 bytes from 66.218.71.81: icmp_seq=1 ttl=55 time=33.6 ms
64 bytes from 66.218.71.81: icmp_seq=2 ttl=55 time=34.1 ms
```

```
--- 66.218.71.81 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 33.6/34.0/34.5 ms
[root@EMACH1 /root]#
```

...so we know 66.218.71.81 is alive

```
[root@EMACH1 /root]# ping -c3 66.218.71.17
PING 66.218.71.17 (66.218.71.17) from 64.130.228.61 : 56(84) bytes of data.
```

```
--- 66.218.71.17 ping statistics ---
3 packets transmitted, 0 packets received, 100% packet loss
[root@EMACH1 /root]#
```

...so we don't know if 66.218.71.17 is alive

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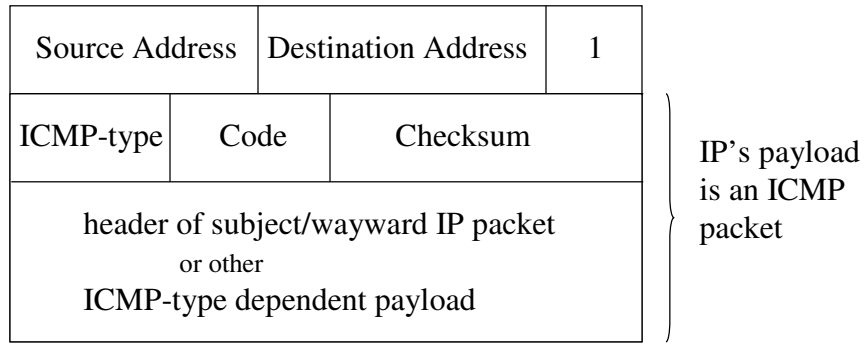
ICMP packet structure

ICMP-type	Code	Checksum
header of subject/wayward IP packet or other ICMP-type dependent payload		

(ICMP: Internet Control Message Protocol)

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ICMP/IP packet structure



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Some icmp message types

- 0 echo reply
- 3 destination unreachable
- 8 echo request
- 11 time-to-live exceeded

...and more (see RFC 792)

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ping operation

- ping causes an icmp “echo request”
- IP (tries to) deliver it
- ICMP requires an “echo reply” packet be issued in response to receipt of an “echo request”
- So ping'd computer (tries to) reply
- Pinging computer records incoming replies

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ICMP packet example

Used for echo (ping) requests...

```
[root@EMACH1 /root]# ping www.acme.com
```

8	Code	Checksum
echo request – “are you there?”		

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ICMP packet example

... and for echo (ping) replies.

0	Code	Checksum
echo reply – “yes I’m here”		

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ping options

- c specify a count
- i wait x seconds between requests
- s specify packet size

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ping options

ping w/o options will ping forever (ctrl-C kills)

ping -c5

ping 5 times and stop

ping w/o options pings at 1-second interval

ping -i5

ping every 5 seconds

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An application of ping: crude latency test

ping www.ucla.edu	L.A.	57ms
ping dandelion-patch.mit.edu	Boston	105
ping www.pku.edu.cn	Beijing	238
ping www.u-tokyo.ac.jp	Tokyo	181
ping www.usyd.edu.au	Sydney	213

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In linux it's a turn-off

```
echo 1 > /proc/sys/net/ipv4/icmp_echo_ignore_all
```

```
echo 1 > /proc/sys/net/ipv4/icmp_echo_ignore_broadcasts
```

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