Round trip time

The `ping` command can be used to find out the **Round Trip Time** (**RTT**) between two hosts on a network. RTT is the time required for the packet to reach the destination host and come back to the source host. RTT in milliseconds can be obtained from `ping`. An example is as follows:

```
--- google.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4000ms
rtt min/avg/max/mdev = 118.012/206.630/347.186/77.713 ms
```

Here, the minimum RTT is `118.012ms`, the average RTT is `206.630ms`, and the maximum RTT is `347.186ms`. The `mdev` (`77.713ms`) parameter in the ping output stands for mean deviation.

Limiting the number of packets to be sent

The `ping` command sends echo packets and waits for the reply of echo indefinitely until it is stopped by pressing *Ctrl + C*. However, we can limit the count of echo packets to be sent by using the `-c` flag. The usage is as follows:

```
-c COUNT
```

For example:

```
$ ping 192.168.0.1 -c 2
PING 192.168.0.1 (192.168.0.1) 56(84) bytes of data.
64 bytes from 192.168.0.1: icmp_seq=1 ttl=64 time=4.02 ms
64 bytes from 192.168.0.1: icmp_seq=2 ttl=64 time=1.03 ms

--- 192.168.0.1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 1.039/2.533/4.028/1.495 ms
```

In the previous example, the `ping` command sends two echo packets and stops. This is useful when we need to ping multiple machines from a list of IP addresses through a script and check its statuses.

Return status of the ping command

The `ping` command returns exit status `0` when it succeeds and returns non-zero when it fails. `Successful` means destination host is reachable, whereas `Failure` is when the destination host is unreachable.

The return status can be easily obtained as follows:

```
$ ping domain -c2
if [ $? -eq 0 ];
then
  echo Successful ;
else
  echo Failure
fi
```

Traceroute

When an application requests a service through the Internet, the server may be at a distant location and connected through many number of gateways or device nodes. The packets travel through several gateways and reach the destination. There is an interesting command `traceroute` that displays the address of all intermediate gateways through which a packet travelled to reach a particular destination. `traceroute` information helps us to understand how many hops each packet should take in order to reach the destination. The number of intermediate gateways or routers gives a metric to measure the distance between two nodes connected in a large network. An example of `traceroute` is as follows:

```
$ traceroute google.com
traceroute to google.com (74.125.77.104), 30 hops max, 60 byte packets
1  gw-c6509.lxb.as5577.net (195.26.4.1)  0.313 ms  0.371 ms  0.457 ms
2  40g.lxb-fra.as5577.net (83.243.12.2)  4.684 ms  4.754 ms  4.823 ms
3  de-cix10.net.google.com (80.81.192.108)  5.312 ms  5.348 ms  5.327 ms
4  209.85.255.170 (209.85.255.170)  5.816 ms  5.791 ms 209.85.255.172
(209.85.255.172)  5.678 ms
5  209.85.250.140 (209.85.250.140)  10.126 ms  9.867 ms  10.754 ms
6  64.233.175.246 (64.233.175.246)  12.940 ms 72.14.233.114
(72.14.233.114)  13.736 ms  13.803 ms
7  72.14.239.199 (72.14.239.199)  14.618 ms 209.85.255.166
(209.85.255.166)  12.755 ms 209.85.255.143 (209.85.255.143)  13.803 ms
8  209.85.255.98 (209.85.255.98)  22.625 ms 209.85.255.110
(209.85.255.110)  14.122 ms
*
9  ew-in-f104.1e100.net (74.125.77.104)  13.061 ms  13.256 ms  13.484 ms
```