

SPRAWOZDANIE

Lista 1 – Weronika Chmiela

PING:

Program służący do diagnozowania połączeń sieciowych, sprawdzenie dostępu do nich. Sprawdza stan połączenia od źródła do wybranego urządzenia przez sieć IP. Wysyła sygnał echo i czeka na odpowiedź.

Przykład użycia dla strony x-kom.pl (-c pozwala określić liczbę powtórzeń)

```
weronika@weronika-VirtualBox:~$ ping x-kom.pl -c 2
PING x-kom.pl (104.20.28.24) 56(84) bytes of data.
64 bytes from 104.20.28.24 (104.20.28.24): icmp_seq=1 ttl=57 time=12.1 ms
64 bytes from 104.20.28.24 (104.20.28.24): icmp_seq=2 ttl=57 time=10.7 ms

--- x-kom.pl ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1095ms
rtt min/avg/max/mdev = 10.703/11.423/12.143/0.720 ms
```

ILOŚĆ WĘZŁÓW

Żeby obliczyć ilość węzłów wracających należy odjąć podaną liczbę ttl od odpowiedniej stałej – dla systemu z którego korzystam (Ubuntu) jest to 64 – dla przykładu wyżej byłoby to: $64 - 57 = 7$ węzłów

```
weronika@weronika-VirtualBox:~$ ping -t 7 x-kom.pl -c 2
PING x-kom.pl (104.20.29.24) 56(84) bytes of data.
From akamai.gw.opentransit.net (193.251.154.18) icmp_seq=1 Time to live exceeded
From akamai.gw.opentransit.net (193.251.154.18) icmp_seq=2 Time to live exceeded

--- x-kom.pl ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1001ms

weronika@weronika-VirtualBox:~$ ping -t 8 x-kom.pl -c 2
PING x-kom.pl (104.20.29.24) 56(84) bytes of data.
64 bytes from 104.20.29.24 (104.20.29.24): icmp_seq=1 ttl=57 time=12.3 ms
64 bytes from 104.20.29.24 (104.20.29.24): icmp_seq=2 ttl=57 time=12.0 ms

--- x-kom.pl ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1112ms
rtt min/avg/max/mdev = 11.984/12.163/12.343/0.179 ms
```

Dla przychodzących należy podstawiać odpowiednio małe wartości ttl - tutaj 8

```

weronika@weronika-VirtualBox:~$ ping -c 2 www.spiegel.de
PING aacfb9d106f4.link11.de (128.65.210.184) 56(84) bytes of data.
64 bytes from 128.65.210.184 (128.65.210.184): icmp_seq=1 ttl=53 time=23.0 ms
64 bytes from 128.65.210.184 (128.65.210.184): icmp_seq=2 ttl=53 time=23.4 ms

--- aacfb9d106f4.link11.de ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
rtt min/avg/max/mdev = 23.038/23.220/23.403/0.182 ms
weronika@weronika-VirtualBox:~$ ping -c 2 -t 12 www.spiegel.de
PING aacfb9d106f4.link11.de (128.65.210.184) 56(84) bytes of data.
From 80.95.144.129 (80.95.144.129) icmp_seq=1 Time to live exceeded
From 80.95.144.129 (80.95.144.129) icmp_seq=2 Time to live exceeded

--- aacfb9d106f4.link11.de ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1008ms

weronika@weronika-VirtualBox:~$ ping -c 2 -t 13 www.spiegel.de
PING aacfb9d106f4.link11.de (128.65.210.184) 56(84) bytes of data.
64 bytes from 128.65.210.184 (128.65.210.184): icmp_seq=1 ttl=53 time=25.6 ms
64 bytes from 128.65.210.184 (128.65.210.184): icmp_seq=2 ttl=53 time=24.1 ms

--- aacfb9d106f4.link11.de ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1003ms
rtt min/avg/max/mdev = 24.107/24.835/25.564/0.728 ms

```

Do serwera – 13 – z serwera – 64-53 = 11

```

weronika@weronika-VirtualBox:~$ ping www.govt.nz -c 4
PING www.govt.nz (45.60.18.237) 56(84) bytes of data.
64 bytes from 45.60.18.237 (45.60.18.237): icmp_seq=1 ttl=52 time=190 ms
64 bytes from 45.60.18.237 (45.60.18.237): icmp_seq=2 ttl=52 time=139 ms
64 bytes from 45.60.18.237 (45.60.18.237): icmp_seq=3 ttl=52 time=139 ms
64 bytes from 45.60.18.237 (45.60.18.237): icmp_seq=4 ttl=52 time=139 ms

--- www.govt.nz ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3012ms
rtt min/avg/max/mdev = 138.766/151.747/189.810/21.976 ms

```

```

weronika@weronika-VirtualBox:~$ ping -t 12 www.govt.nz -c 2
PING www.govt.nz (45.60.18.237) 56(84) bytes of data.
From imperva-svc087390-lag004793.ip.twelve99-cust.net (62.115.54.67) icmp_seq=1 Time to live exceeded
From imperva-svc087390-lag004793.ip.twelve99-cust.net (62.115.54.67) icmp_seq=2 Time to live exceeded

--- www.govt.nz ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1003ms

weronika@weronika-VirtualBox:~$ ping -t 13 www.govt.nz -c 2
PING www.govt.nz (45.60.18.237) 56(84) bytes of data.
64 bytes from 45.60.18.237 (45.60.18.237): icmp_seq=1 ttl=52 time=528 ms
64 bytes from 45.60.18.237 (45.60.18.237): icmp_seq=2 ttl=52 time=464 ms

--- www.govt.nz ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1006ms
rtt min/avg/max/mdev = 464.095/496.120/528.145/32.025 ms

```

Witryna z Nowej Zelandii, wracając potrzebowano 64 - 52 = 12 węzłów; Do serwera: 13

```
weronika@weronika-VirtualBox:~$ ping site.china.cn -c 4
PING proxy.cn.qizhihaotian.com (180.163.233.31) 56(84) bytes of data.
64 bytes from 180.163.233.31 (180.163.233.31): icmp_seq=1 ttl=46 time=228 ms
64 bytes from 180.163.233.31 (180.163.233.31): icmp_seq=2 ttl=46 time=218 ms
64 bytes from 180.163.233.31 (180.163.233.31): icmp_seq=3 ttl=46 time=243 ms
64 bytes from 180.163.233.31 (180.163.233.31): icmp_seq=4 ttl=46 time=226 ms

--- proxy.cn.qizhihaotian.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3010ms
rtt min/avg/max/mdev = 217.648/228.851/243.180/9.186 ms

weronika@weronika-VirtualBox:~$ ping -t 16 site.china.cn -c 2
PING proxy.cn.qizhihaotian.com (180.163.233.32) 56(84) bytes of data.

--- proxy.cn.qizhihaotian.com ping statistics ---
2 packets transmitted, 0 received, 100% packet loss, time 1012ms

weronika@weronika-VirtualBox:~$ ping -t 17 site.china.cn -c 2
PING proxy.cn.qizhihaotian.com (180.163.233.32) 56(84) bytes of data.
64 bytes from 180.163.233.32 (180.163.233.32): icmp_seq=1 ttl=46 time=307 ms
64 bytes from 180.163.233.32 (180.163.233.32): icmp_seq=2 ttl=46 time=500 ms

--- proxy.cn.qizhihaotian.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
rtt min/avg/max/mdev = 306.644/403.089/499.535/96.445 ms
```

Witryna z Chin 64-46 = 18, do: 17

Widać, że ścieżki z miejsc odległych mają większe ścieżki niż te w pobliżu.

WIELKOŚĆ PAKIETU vs WĘZŁY:

```
weronika@weronika-VirtualBox:~$ ping -c 2 -t 12 www.spiegel.de -s 100
PING aacfb9d106f4.link11.de (128.65.210.180) 100(128) bytes of data.
From 80.95.144.129 (80.95.144.129) icmp_seq=1 Time to live exceeded
From 80.95.144.129 (80.95.144.129) icmp_seq=2 Time to live exceeded

--- aacfb9d106f4.link11.de ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1003ms

weronika@weronika-VirtualBox:~$ ping -c 2 -t 13 www.spiegel.de -s 100
PING aacfb9d106f4.link11.de (128.65.210.180) 100(128) bytes of data.
108 bytes from 128.65.210.180 (128.65.210.180): icmp_seq=1 ttl=53 time=24.8 ms
108 bytes from 128.65.210.180 (128.65.210.180): icmp_seq=2 ttl=53 time=25.0 ms

--- aacfb9d106f4.link11.de ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1003ms
rtt min/avg/max/mdev = 24.797/24.892/24.987/0.095 ms

weronika@weronika-VirtualBox:~$ ping -c 2 -t 13 www.spiegel.de -s 1000
PING aacfb9d106f4.link11.de (128.65.210.180) 1000(1028) bytes of data.
1008 bytes from 128.65.210.180 (128.65.210.180): icmp_seq=1 ttl=53 time=24.9 ms
1008 bytes from 128.65.210.180 (128.65.210.180): icmp_seq=2 ttl=53 time=26.2 ms

--- aacfb9d106f4.link11.de ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1067ms
rtt min/avg/max/mdev = 24.865/25.527/26.190/0.662 ms

weronika@weronika-VirtualBox:~$ ping -c 2 -t 12 www.spiegel.de -s 1000
PING aacfb9d106f4.link11.de (128.65.210.180) 1000(1028) bytes of data.
From 80.95.144.129 (80.95.144.129) icmp_seq=1 Time to live exceeded
From 80.95.144.129 (80.95.144.129) icmp_seq=2 Time to live exceeded

--- aacfb9d106f4.link11.de ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1095ms
```

Pakiet ma tą samą ilość TTL dla różnych wielkości (100, 1000 i 56-domyślne)

```

weronika@weronika-VirtualBox:~$ ping -c 2 -t 17 site.china.cn -s 1000
PING proxy.cn.qizhihaotian.com (180.163.233.32) 1000(1028) bytes of data.
1008 bytes from 180.163.233.32 (180.163.233.32): icmp_seq=1 ttl=46 time=299 ms
1008 bytes from 180.163.233.32 (180.163.233.32): icmp_seq=2 ttl=46 time=241 ms

--- proxy.cn.qizhihaotian.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 240.690/269.832/298.974/29.142 ms
weronika@weronika-VirtualBox:~$ ping -c 2 -t 16 site.china.cn -s 1000
PING proxy.cn.qizhihaotian.com (180.163.233.32) 1000(1028) bytes of data.

--- proxy.cn.qizhihaotian.com ping statistics ---
2 packets transmitted, 0 received, 100% packet loss, time 1034ms

weronika@weronika-VirtualBox:~$ ping -c 2 -t 16 site.china.cn -s 100
PING proxy.cn.qizhihaotian.com (180.163.233.32) 100(128) bytes of data.

--- proxy.cn.qizhihaotian.com ping statistics ---
2 packets transmitted, 0 received, 100% packet loss, time 1011ms

weronika@weronika-VirtualBox:~$ ping -c 2 -t 17 site.china.cn -s 100
PING proxy.cn.qizhihaotian.com (180.163.233.32) 100(128) bytes of data.
108 bytes from 180.163.233.32 (180.163.233.32): icmp_seq=1 ttl=46 time=241 ms
108 bytes from 180.163.233.32 (180.163.233.32): icmp_seq=2 ttl=46 time=241 ms

--- proxy.cn.qizhihaotian.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1003ms
rtt min/avg/max/mdev = 240.519/240.636/240.754/0.117 ms

```

Pakiet ma tą samą ilość węzłów do i z dla (56, 100, 1000)

```

weronika@weronika-VirtualBox:~$ ping -c 2 -t 7 www.harvard.edu -s 100
PING pantheon-systems.map.fastly.net (146.75.118.133) 100(128) bytes of data.
From fastly-7.gw.opentransit.net (193.251.254.166) icmp_seq=1 Time to live exceeded
From fastly-7.gw.opentransit.net (193.251.254.166) icmp_seq=2 Time to live exceeded

--- pantheon-systems.map.fastly.net ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1009ms

weronika@weronika-VirtualBox:~$ ping -c 2 -t 7 www.harvard.edu -s 1000
PING pantheon-systems.map.fastly.net (146.75.118.133) 1000(1028) bytes of data.
From fastly-7.gw.opentransit.net (193.251.254.166) icmp_seq=1 Time to live exceeded
From fastly-7.gw.opentransit.net (193.251.254.166) icmp_seq=2 Time to live exceeded

--- pantheon-systems.map.fastly.net ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1002ms

weronika@weronika-VirtualBox:~$ ping -c 2 -t 8 www.harvard.edu -s 100
PING pantheon-systems.map.fastly.net (146.75.118.133) 100(128) bytes of data.
108 bytes from 146.75.118.133 (146.75.118.133): icmp_seq=1 ttl=54 time=27.3 ms
108 bytes from 146.75.118.133 (146.75.118.133): icmp_seq=2 ttl=54 time=23.6 ms

--- pantheon-systems.map.fastly.net ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1033ms
rtt min/avg/max/mdev = 23.551/25.436/27.322/1.885 ms
weronika@weronika-VirtualBox:~$ ping -c 2 -t 8 www.harvard.edu -s 1000
PING pantheon-systems.map.fastly.net (146.75.118.133) 1000(1028) bytes of data.
1008 bytes from 146.75.118.133 (146.75.118.133): icmp_seq=1 ttl=54 time=33.9 ms
1008 bytes from 146.75.118.133 (146.75.118.133): icmp_seq=2 ttl=54 time=26.4 ms

--- pantheon-systems.map.fastly.net ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 26.441/30.190/33.940/3.749 ms

```

10 i 8 zarówno dla 100 jak i 1000

Na podstawie tych trzech przykładów możemy uznać, że wielkość plików nie ma wpływu na ilość węzłów na trasie

```
weronika@weronika-VirtualBox:~$ ping -c 2 -t 12 www.spiegel.de -s 100 -M want
PING aacfb9d106f4.link11.de (128.65.210.184) 100(128) bytes of data.
From 80.95.144.129 (80.95.144.129) icmp_seq=1 Time to live exceeded
From 80.95.144.129 (80.95.144.129) icmp_seq=2 Time to live exceeded

--- aacfb9d106f4.link11.de ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1001ms

weronika@weronika-VirtualBox:~$ ping -c 2 -t 13 www.spiegel.de -s 100 -M want
PING aacfb9d106f4.link11.de (128.65.210.184) 100(128) bytes of data.
108 bytes from 128.65.210.184 (128.65.210.184): icmp_seq=1 ttl=53 time=24.7 ms
108 bytes from 128.65.210.184 (128.65.210.184): icmp_seq=2 ttl=53 time=25.7 ms

--- aacfb9d106f4.link11.de ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
rtt min/avg/max/mdev = 24.671/25.204/25.738/0.533 ms
weronika@weronika-VirtualBox:~$ ping -c 2 -t 12 www.spiegel.de -s 1000 -M want
PING aacfb9d106f4.link11.de (128.65.210.184) 1000(1028) bytes of data.
From 80.95.144.129 (80.95.144.129) icmp_seq=1 Time to live exceeded
From 80.95.144.129 (80.95.144.129) icmp_seq=2 Time to live exceeded

--- aacfb9d106f4.link11.de ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1002ms

weronika@weronika-VirtualBox:~$ ping -c 2 -t 13 www.spiegel.de -s 1000 -M want
PING aacfb9d106f4.link11.de (128.65.210.184) 1000(1028) bytes of data.
1008 bytes from 128.65.210.184 (128.65.210.184): icmp_seq=1 ttl=53 time=25.7 ms
1008 bytes from 128.65.210.184 (128.65.210.184): icmp_seq=2 ttl=53 time=25.9 ms

--- aacfb9d106f4.link11.de ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 25.732/25.837/25.942/0.105 ms
```

Na ilość węzłów nie ma wpływu też fragmentacja. Pakiet ma tą samą ilość TTL jak te fragmentowane.

WIELKOŚĆ PAKIETU vs czas propagacji:

```
weronika@weronika-VirtualBox:~$ ping -c 10 -t 8 cloudflare.com -s 100
PING cloudflare.com (104.16.132.229) 100(128) bytes of data.
108 bytes from 104.16.132.229 (104.16.132.229): icmp_seq=1 ttl=57 time=12.7 ms
108 bytes from 104.16.132.229 (104.16.132.229): icmp_seq=2 ttl=57 time=13.9 ms
108 bytes from 104.16.132.229 (104.16.132.229): icmp_seq=3 ttl=57 time=11.4 ms
108 bytes from 104.16.132.229 (104.16.132.229): icmp_seq=4 ttl=57 time=16.7 ms
108 bytes from 104.16.132.229 (104.16.132.229): icmp_seq=5 ttl=57 time=11.7 ms
108 bytes from 104.16.132.229 (104.16.132.229): icmp_seq=6 ttl=57 time=12.1 ms
108 bytes from 104.16.132.229 (104.16.132.229): icmp_seq=7 ttl=57 time=12.6 ms
108 bytes from 104.16.132.229 (104.16.132.229): icmp_seq=8 ttl=57 time=11.6 ms
108 bytes from 104.16.132.229 (104.16.132.229): icmp_seq=9 ttl=57 time=11.8 ms
108 bytes from 104.16.132.229 (104.16.132.229): icmp_seq=10 ttl=57 time=11.1 ms

--- cloudflare.com ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9282ms
rtt min/avg/max/mdev = 11.128/12.555/16.732/1.584 ms
```

Średni czas dla wielkości 100 to 12.56ms. Dla wielkości 1000 to 16.72ms, dla 56 - 15.61ms, a dla 2000 – 18.67

Bez fragmentacji czas dla 100 - 17.70, dla 1000 – 15.12

Wielkość pakietu wydaje się nie mieć wpływu na czas propagacji, wszystkie liczby znajdują się w podobnym przedziale. Fragmentacja też nie wydaje się mieć wpływ. Można zaobserwować duże odchyły w pojedynczych przykładach, co tym bardziej potwierdzało, że rozmiar pakietu i propagacja są nie zależne.

```
64 bytes from 104.16.133.229 (104.16.133.229): icmp_seq=5 ttl=57 time=12.1 ms
64 bytes from 104.16.133.229 (104.16.133.229): icmp_seq=6 ttl=57 time=257 ms
64 bytes from 104.16.133.229 (104.16.133.229): icmp_seq=7 ttl=57 time=109 ms
64 bytes from 104.16.133.229 (104.16.133.229): icmp_seq=8 ttl=57 time=31.6 ms
```

NAJWIEKSZY NIEFRAGMENTOWANY PAKIET

```
--- pantheon-systems.map.fastly.net ping statistics ---
2 packets transmitted, 0 received, 100% packet loss, time 1011ms

weronika@weronika-VirtualBox:~$ ping -c 2 www.harvard.edu -M want -s 1500
PING pantheon-systems.map.fastly.net (146.75.118.133) 1500(1528) bytes of data.
1508 bytes from 146.75.118.133 (146.75.118.133): icmp_seq=1 ttl=54 time=26.0 ms
1508 bytes from 146.75.118.133 (146.75.118.133): icmp_seq=2 ttl=54 time=26.2 ms

--- pantheon-systems.map.fastly.net ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 26.026/26.137/26.249/0.111 ms
weronika@weronika-VirtualBox:~$ ping -c 2 www.harvard.edu -M want -s 1550
PING pantheon-systems.map.fastly.net (146.75.118.133) 1550(1578) bytes of data.

--- pantheon-systems.map.fastly.net ping statistics ---
2 packets transmitted, 0 received, 100% packet loss, time 1024ms

weronika@weronika-VirtualBox:~$ ping -c 2 www.harvard.edu -M want -s 1510
PING pantheon-systems.map.fastly.net (146.75.118.133) 1510(1538) bytes of data.
1518 bytes from 146.75.118.133 (146.75.118.133): icmp_seq=1 ttl=54 time=26.3 ms
1518 bytes from 146.75.118.133 (146.75.118.133): icmp_seq=2 ttl=54 time=38.7 ms

--- pantheon-systems.map.fastly.net ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1005ms
rtt min/avg/max/mdev = 26.277/32.505/38.733/6.228 ms
weronika@weronika-VirtualBox:~$ ping -c 2 www.harvard.edu -M want -s 1512
PING pantheon-systems.map.fastly.net (146.75.118.133) 1512(1540) bytes of data.
1520 bytes from 146.75.118.133 (146.75.118.133): icmp_seq=1 ttl=54 time=27.1 ms
1520 bytes from 146.75.118.133 (146.75.118.133): icmp_seq=2 ttl=54 time=108 ms

--- pantheon-systems.map.fastly.net ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
rtt min/avg/max/mdev = 27.092/67.591/108.091/40.499 ms
```

Największym pakietem, który udało mi się przesłać miał 1512, jednak nie dla każdego adresu to działa, konieczne było użycie mniejszych wartości.

```
weronika@weronika-VirtualBox:~$ ping -c 2 www.interia.pl -M want -s 1480
PING www.interia.pl (217.74.72.58) 1480(1508) bytes of data.
1488 bytes from www.interia.pl (217.74.72.58): icmp_seq=1 ttl=57 time=15.6 ms
1488 bytes from www.interia.pl (217.74.72.58): icmp_seq=2 ttl=57 time=47.2 ms

--- www.interia.pl ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1018ms
rtt min/avg/max/mdev = 15.601/31.399/47.197/15.798 ms
weronika@weronika-VirtualBox:~$ ping -c 2 www.interia.pl -M want -s 1481
PING www.interia.pl (217.74.75.90) 1481(1509) bytes of data.

--- www.interia.pl ping statistics ---
2 packets transmitted, 0 received, 100% packet loss, time 1017ms
```

ŚREDNICA INTERNETU

Średnicą Internetu powinna być najdłuższa możliwa do otrzymania ścieżka.

Udało mi się otrzymać ścieżkę o długość 21 łącząc się z Nową Zelandią

```
weronika@weronika-VirtualBox:~$ ping -c 2 -t 20 heartofthecity.co.nz
PING heartofthecity.co.nz (120.138.21.71) 56(84) bytes of data.
From rdns.120.138.31.131.sth.nz (120.138.31.131) icmp_seq=1 Time to live exceeded
From rdns.120.138.31.131.sth.nz (120.138.31.131) icmp_seq=2 Time to live exceeded
:
--- heartofthecity.co.nz ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 999ms

weronika@weronika-VirtualBox:~$ ping -c 2 -t 21 heartofthecity.co.nz
PING heartofthecity.co.nz (120.138.21.71) 56(84) bytes of data.
64 bytes from rdns.120.138.21.71.sth.nz (120.138.21.71): icmp_seq=1 ttl=46 time=334 ms
64 bytes from rdns.120.138.21.71.sth.nz (120.138.21.71): icmp_seq=2 ttl=46 time=348 ms
:
--- heartofthecity.co.nz ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1000ms
rtt min/avg/max/mdev = 333.848/340.707/347.567/6.859 ms
```

SIECI WIRTUALNE

Często próbują ukryć swoją strukturę, więc także wskaźnik TTL. To właśnie zmiany TTL lub IP powinny kierować nas do myśli, że mamy do czynienia z siecią wirtualną. Niestety utrudnia to ich śledzenie. Sieci wirtualne są często wykorzystywane przez serwery w Chinach.

TRACEROUTE:

Program pokazuje trasę wysłanych pakietów IP przebytą do wybranego serwera.

Wysyłając „próbki” TTL (czas życia pakietu) oczekuje na odpowiedź „TIME_EXCEEDED” przy każdym przejściu, by określić adres bramy i czas podróży każdej próbki.

Opcja -I pozwala wykorzystywać pakiety ICMP ECHO.

```
weronika@weronika-VirtualBox:~$ traceroute -I -m 15 wikipedia.com
traceroute to wikipedia.com (91.198.174.194), 15 hops max, 60 byte packets
 1 _gateway (10.0.2.2) 0.342 ms 0.321 ms 0.317 ms
 2 funbox.home (192.168.1.1) 1.641 ms 2.640 ms 2.949 ms
 3 wro-bng1.neo.tpnet.pl (83.1.4.234) 4.099 ms 4.127 ms 4.169 ms
 4 wro-r12.tpnet.pl (80.50.119.233) 10.171 ms 10.266 ms 10.262 ms
 5 195.116.35.206 (195.116.35.206) 10.303 ms 10.582 ms 10.577 ms
 6 hbg-b2-link.ip.twelve99.net (213.248.96.144) 17.188 ms 17.500 ms 17.517 ms
 7 hbg-bb3-link.ip.twelve99.net (62.115.120.70) 17.507 ms 16.281 ms 16.661 ms
 8 adm-bb1-link.ip.twelve99.net (80.91.252.42) 24.554 ms 25.886 ms 25.993 ms
 9 wikimedia-ic316335-adm-b3.ip.twelve99-cust.net (62.115.145.25) 25.795 ms 25.885 ms 25.918 ms
10 wikimedia-ic316335-adm-b3.ip.twelve99-cust.net (62.115.145.25) 25.983 ms 26.023 ms 25.788 ms
11 ncredir-lb.esams.wikimedia.org (91.198.174.194) 25.372 ms 25.367 ms 26.924 ms
```

Rys.: Wywołano komendę dla strony wikipedia.com – zmieniono maksymalną ilość hopsów na 15 (z 30 domyślnych) – lecz program potrzebował tylko 11.

Dla systemów Windows wykorzystuje się podobny program tracert.

```
C:\Users\darek>tracert interia.pl

Tracing route to interia.pl [217.74.75.90]
over a maximum of 30 hops:

  0  1 ms    <1 ms   1 ms   funbox.home [192.168.1.1]
  1  5 ms     3 ms    3 ms   wro-bng1.neo.tpnet.pl [83.1.4.234]
  2 12 ms     6 ms   31 ms   wro-r11.tpnet.pl [80.50.118.233]
  3 11 ms    11 ms  124 ms   kra-r2.tpnet.pl [213.25.12.246]
  4 12 ms    11 ms  11 ms    80.50.143.226
  5 12 ms    11 ms  11 ms   www.interia.pl [217.74.75.90]

Trace complete.
```

Rys: Trasa dla interia.pl z wykorzystaniem tracert - 6 hopsów

Jeśli nie ma odpowiedzi nie pojawi się określonym czasie oczekiwania - drukowana jest *

```
weronika@weronika-VirtualBox:~$ traceroute -I tools.wikimedia.pl
traceroute to tools.wikimedia.pl (94.23.242.48), 30 hops max, 60 byte packets
 1 _gateway (10.0.2.2) 0.372 ms 8.900 ms 8.899 ms
 2 funbox.home (192.168.1.1) 3.865 ms 5.071 ms 5.065 ms
 3 wro-bng1.neo.tpnet.pl (83.1.4.234) 7.777 ms 7.789 ms 8.041 ms
 4 wro-r11.tpnet.pl (80.50.118.233) 7.613 ms 7.630 ms 7.642 ms
 5 195.116.35.198 (195.116.35.198) 19.212 ms 19.190 ms 19.265 ms
 6 be105.waw-wa2-pb1-nc5.pl.eu (54.36.50.78) 18.449 ms 11.375 ms 22.174 ms
 7 * * *
 8 * * *
 9 * * *
10 fra-fr5-sbb1-nc5.de.eu (213.251.128.113) 39.806 ms 32.044 ms 28.472 ms
11 be102.rbx-g3-nc5.fr.eu (54.36.50.243) 38.889 ms 40.997 ms 41.118 ms
12 * * *
13 * * *
14 * * *
15 tools.wikimedia.pl (94.23.242.48) 44.800 ms 45.959 ms 46.041 ms
```

Rys. Dla strony tools.wikimedia.pl przekroczono timeout

Program ten może pozwolić odnaleźć opóźnienia, które należy zoptymalizować, czy określić w którym momencie dochodzi do awarii.

WIRESHARK:

Program z graficznym interfejsem użytkownika. To analizator protokołów sieciowych. Pozwala przechwytywać, nagrywać pakiety danych oraz je dekodować i interaktywnie przeglądać. Potrafi zdekodować wiele protokołów komunikacyjnych. Posiada bardzo wiele filtrów ułatwiających wydobycie potrzebnych informacji.

Wykorzystywany do śledzenia pakietów przez administratorów sieci oraz służby specjalne.

Poniższe ilustracje przedstawiają działanie programu na przykładzie szukania klucza publicznego: świeżo otwarty program, przechwycone strony bez włączonego filtra, włączony filtr i odnalezienie klucza

