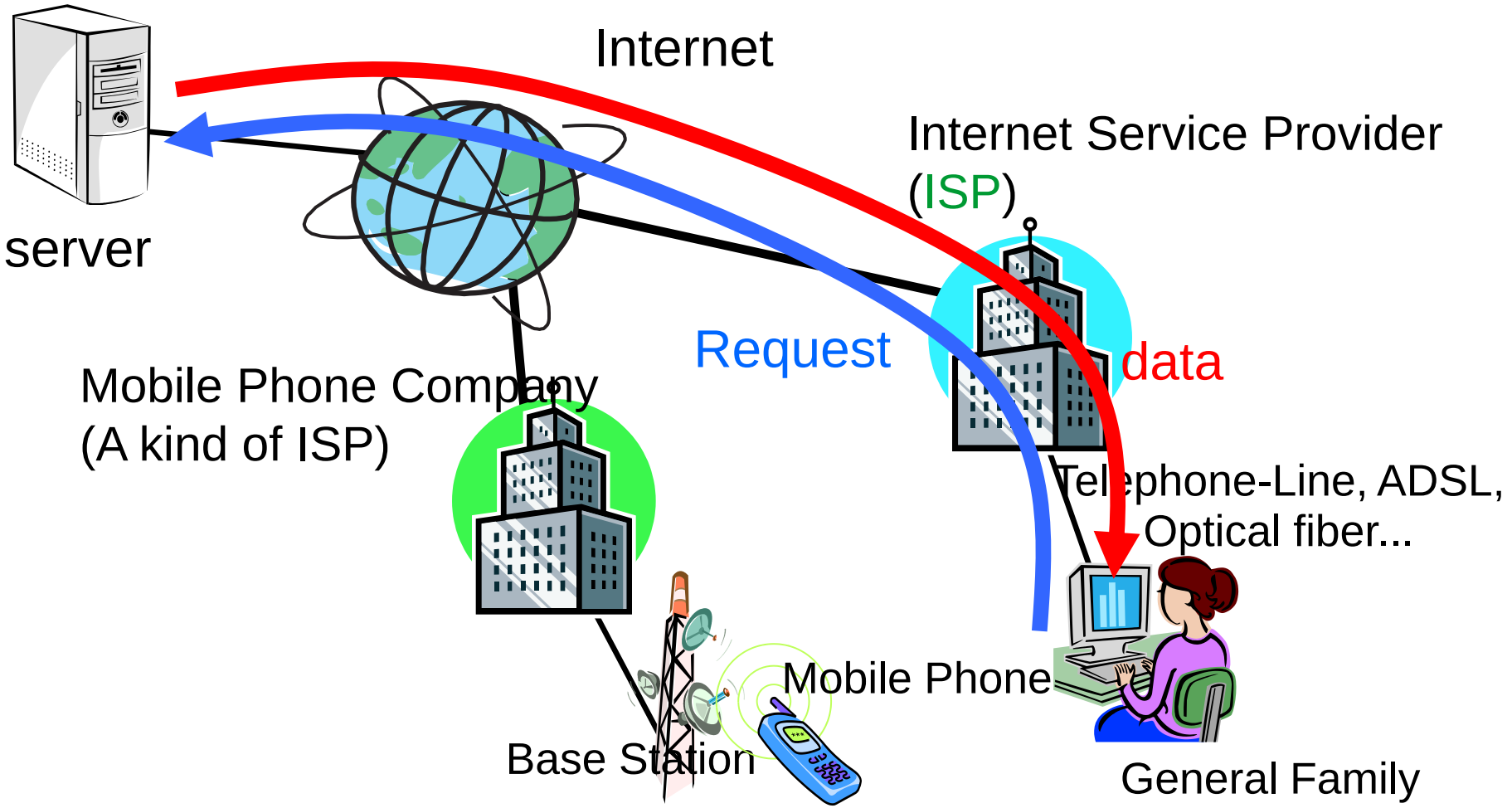
Fundamental of IP network
～ping, traceroute～

Practice 1

Information and Communications Technology
Internet Engineering

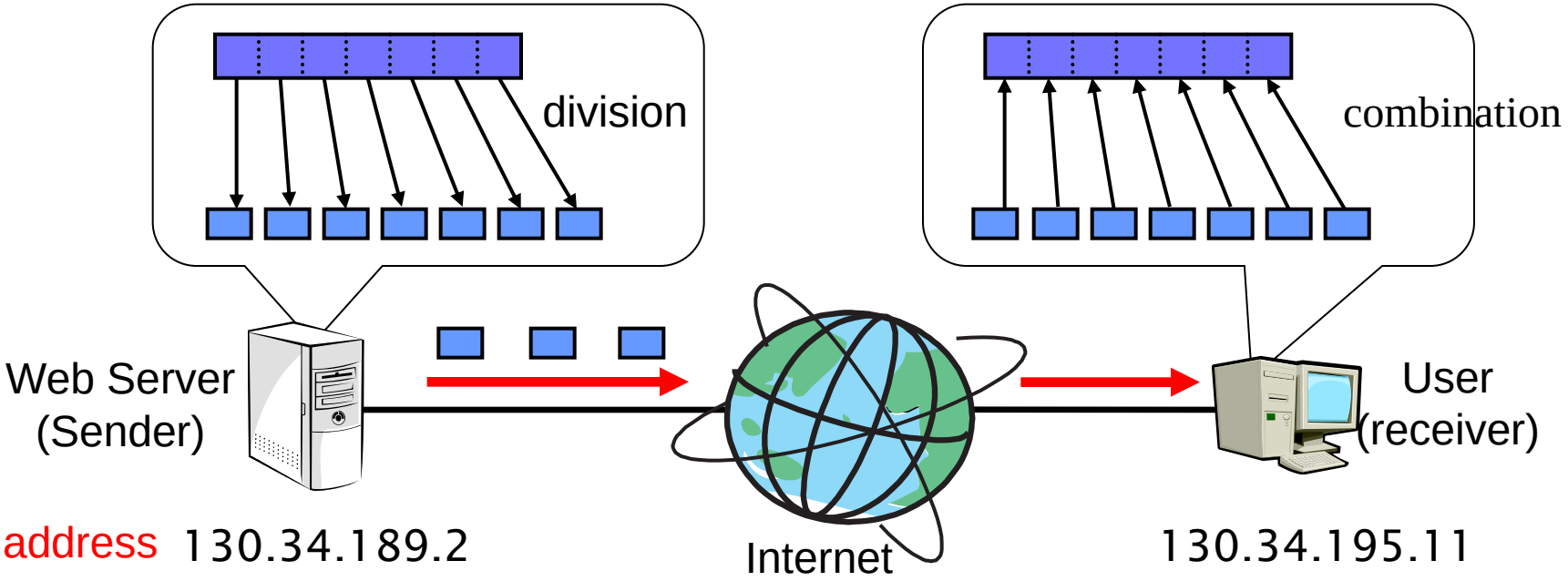
Internet Mechanism

- ex. Web browse



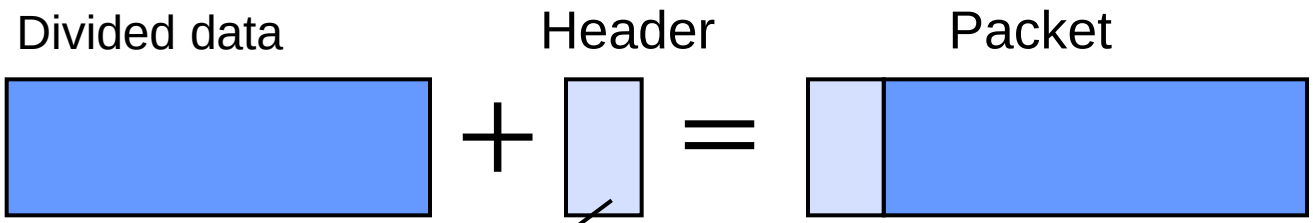
IP (Internet Protocol)

- Protocol: set of rules that end points in a telecommunication connection use when they communicate
- Internet use IP
  - Each machine has an unique IP address
  - Data is sent one way from machine A to machine B
  - Data is divided into many parts and send to the network



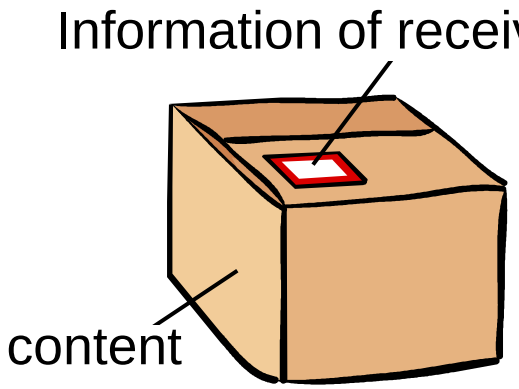
Data Transmit using Packet

- Divided data is send by packet



Header contains

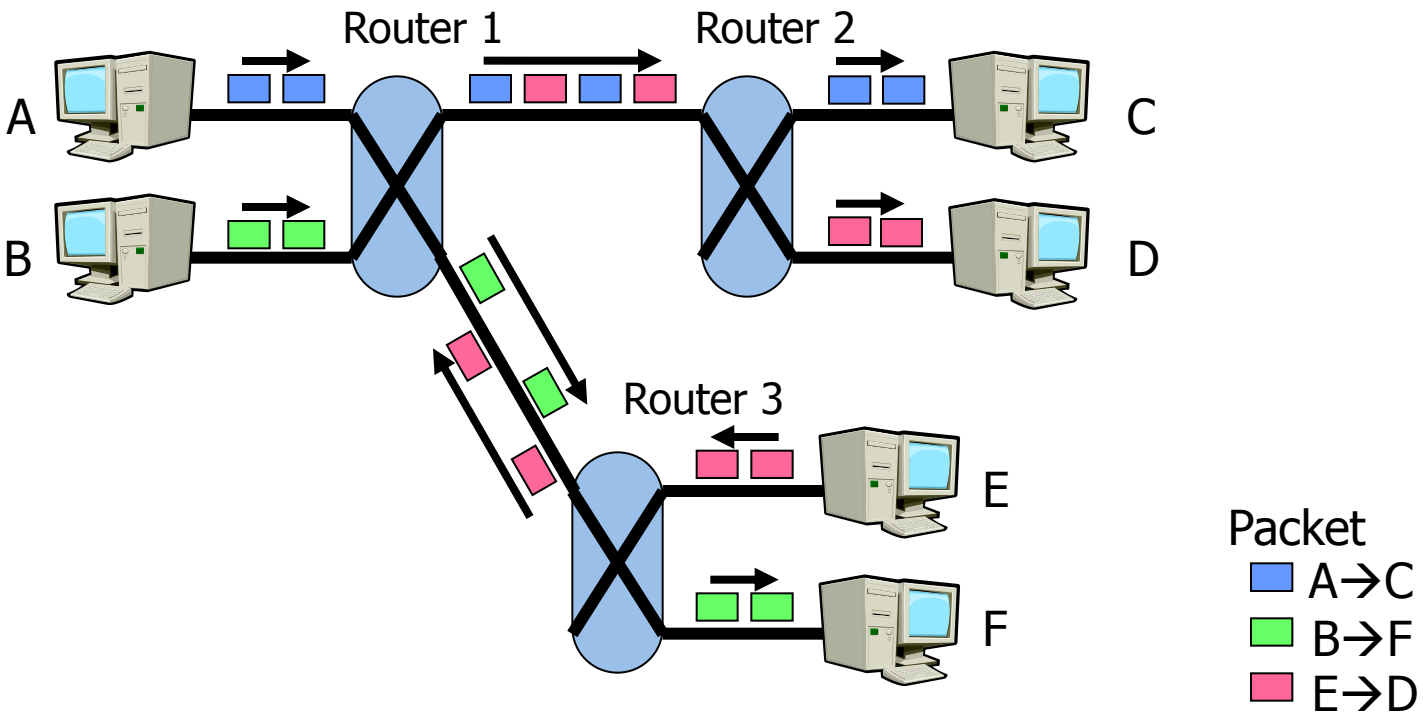
- IP address of sender
- IP address of receiver
- Other information



packet
package、parcel

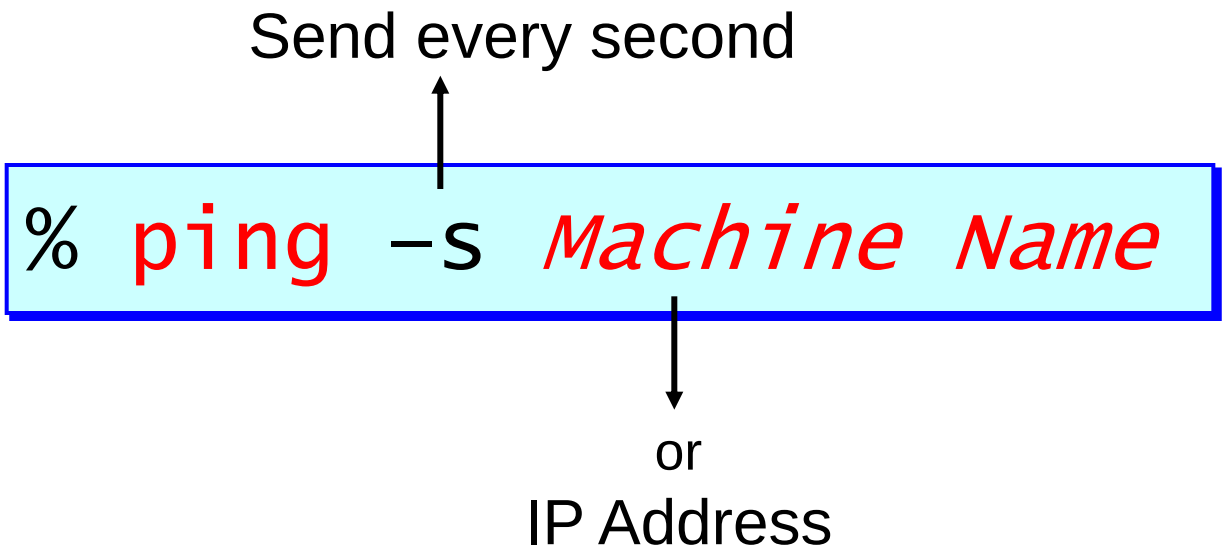
IP (Internet Protocol) Function

- Select a route in the network for sending packet
  - Router forward packet based on receiver IP address, which is contained in IP header



Checking packet reach destination

- ping
  - Command (in Solaris)



  - To stop sending message please press [Ctrl＋C]

Attention！

- Please don't execute Ping command to a specific machine to avoid warning about attacking 、
  For example
  - Send to a university or company's machine in your province
  - Send to a machine in your laboratory

- If you don't know the name of machine that you want to use ping command, using web search site（Google、Yahoo...!!）to search the name of university or company. Then using the URL for Ping command.
- Ex. If URL is「http://www.it.ecei.tohoku.ac.jp/lecture/」:
  Machine name will be [www.it.ecei.tohoku.ac.jp」
- For security reason, in some case even though we can view web page, but no reply for ping command.

Example of execute Ping

```
eiw01 % ping -s www.u-tokyo.ac.jp
PING www.u-tokyo.ac.jp: 56 data bytes
64 bytes from www.u-tokyo.ac.jp (133.11.128.254): icmp_seq=0. time=14. ms
64 bytes from www.u-tokyo.ac.jp (133.11.128.254): icmp_seq=1. time=14. ms
64 bytes from www.u-tokyo.ac.jp (133.11.128.254): icmp_seq=2. time=15. ms
64 bytes from www.u-tokyo.ac.jp (133.11.128.254): icmp_seq=3. time=14. ms
64 bytes from www.u-tokyo.ac.jp (133.11.128.254): icmp_seq=4. time=14. ms
64 bytes from www.u-tokyo.ac.jp (133.11.128.254): icmp_seq=5. time=14. ms
64 bytes from www.u-tokyo.ac.jp (133.11.128.254): icmp_seq=6. time=14. ms
64 bytes from www.u-tokyo.ac.jp (133.11.128.254): icmp_seq=7. time=14. ms
64 bytes from www.u-tokyo.ac.jp (133.11.128.254): icmp_seq=8. time=14. ms
64 bytes from www.u-tokyo.ac.jp (133.11.128.254): icmp_seq=9. time=14. ms
^C
----www.u-tokyo.ac.jp PING Statistics----
10 packets transmitted, 10 packets received, 0% packet loss
round-trip (ms)  min/avg/max = 14/14/15
```

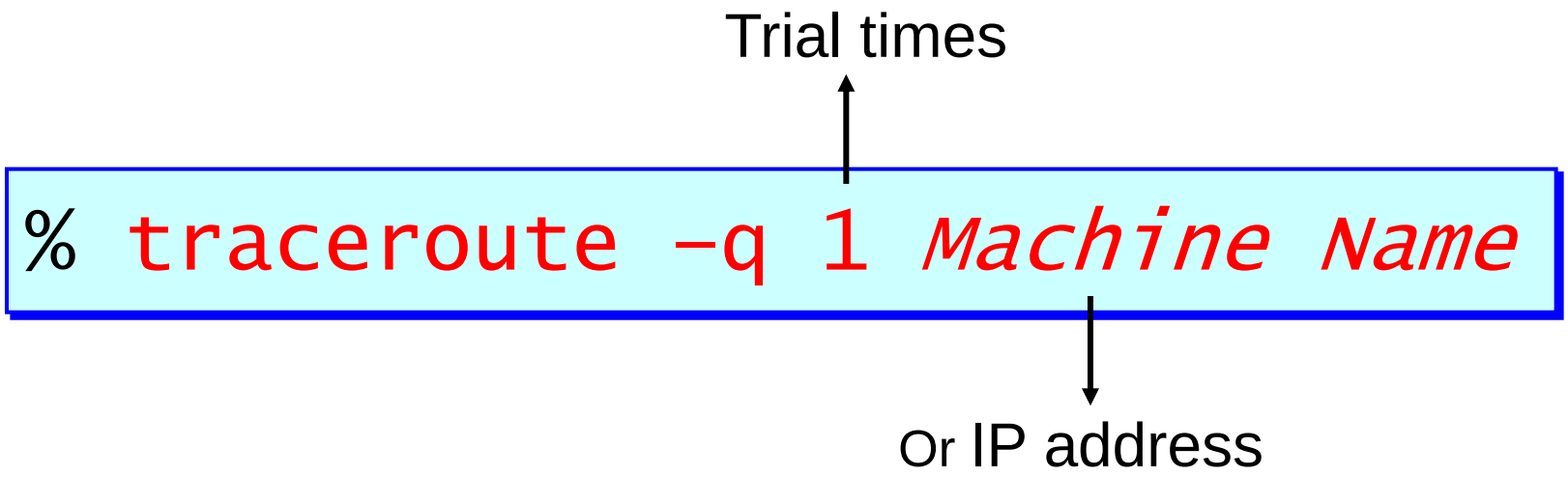
Round trip delay time※
maximum/average/minimum
RTT (round-trip time)
Unit: ms

Packet loss rate
(The rate of packets don't reach to destination)

※ Time from sending packet to receiving reply packet

Checking the route to destination

- traceroute
  - Command (Solaris)



  - *Please use traceroute for different machine as ping*

Example of execute traceroute (1)

```
eiw01 % traceroute -q 1 www.kyoto-u.ac.jp
traceroute: Warning: Multiple interfaces found; using 130.34.195.11 @ fjgi1
traceroute to www.kyoto-u.ac.jp (130.54.120.209), 30 hops max, 40 byte packets
 1  130.34.195.126 (130.34.195.126)  0.737 ms
 2  eigw.ec.ecei.tohoku.ac.jp (130.34.195.1)  0.673 ms
 3  192.168.226.41 (192.168.226.41)  0.545 ms
 4  192.168.230.42 (192.168.230.42)  0.526 ms
 5  br0900.net.tohoku.ac.jp (130.34.10.137)  0.582 ms
 6  202.211.0.194 (202.211.0.194)  0.779 ms
 7  sendai-dc-RM-GE-7-1-0-103.sinet.ad.jp (150.99.190.13)  0.992 ms
 8  tsukuba-dc-RM-AE-1-11.sinet.ad.jp (150.99.203.6)  9.105 ms
 9  tokyo1-dc-RM-AE-2-11.sinet.ad.jp (150.99.203.10)  28.306 ms
10  nagoya-dc-RM-AE-0-11.sinet.ad.jp (150.99.203.26)  19.029 ms
11  osaka-dc-RM-AE-0-11.sinet.ad.jp (150.99.203.30)  22.007 ms
12  kyoto-dc-RM-AE-0-11.sinet.ad.jp (150.99.203.34)  25.667 ms
13  kyoto-u.gw.sinet.ad.jp (150.99.190.38)  26.142 ms
14  *
15  *
16  RS4-8-V869.gw.kuins.kyoto-u.ac.jp (130.54.2.105)  26.790 ms
17  *
18  130.54.120.209 (130.54.120.209)  28.330 ms
```

Hop number（number of via router ）

Via router

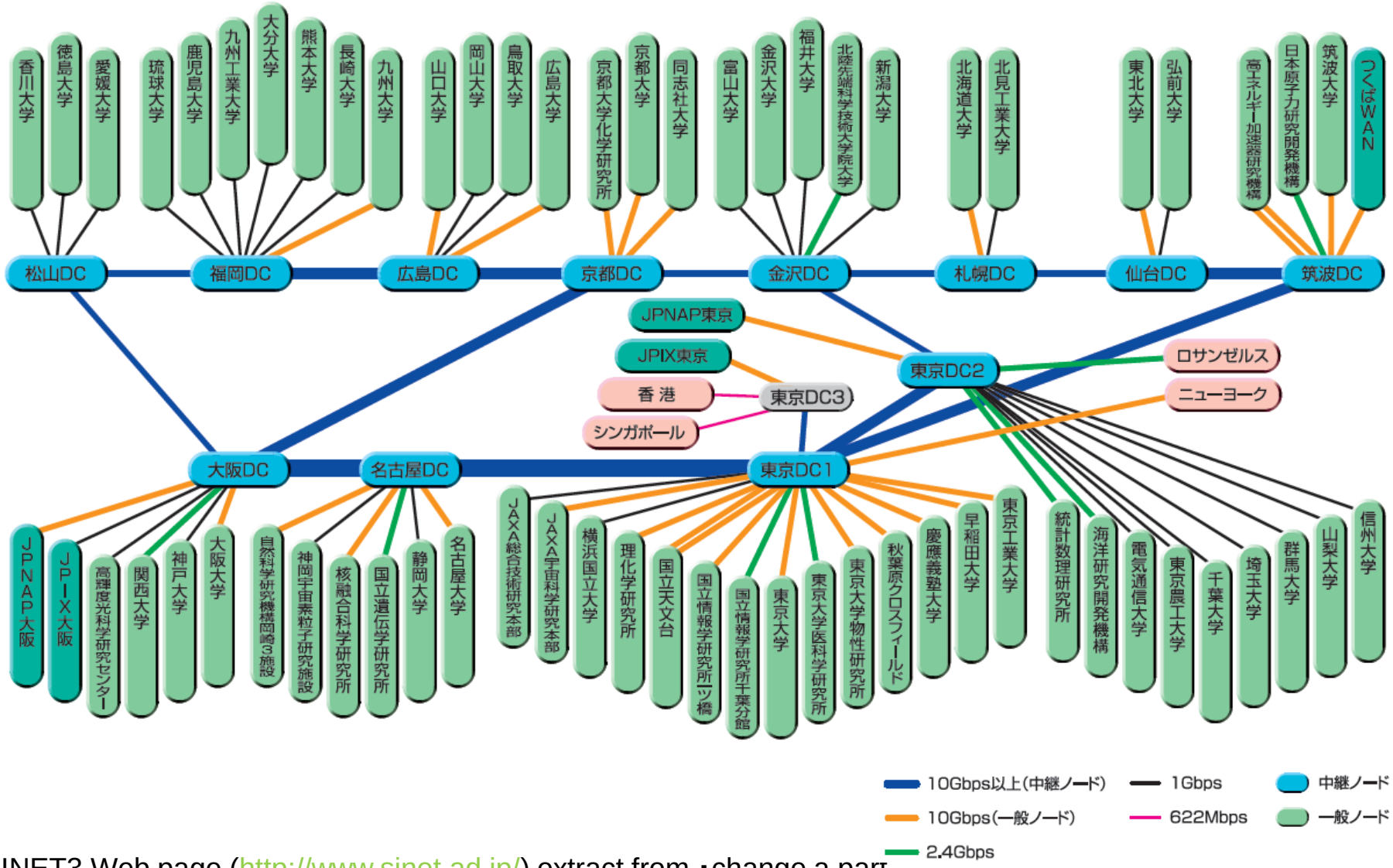
Round trip delay time (RTT)

*: no reply

Example of execute traceroute (2)

```
eiw01 % traceroute -q 1 www.bbc.co.uk
traceroute: Warning: Multiple interfaces found; using 130.34.195.11 @ fjgi1
traceroute to www.bbc.net.uk (212.58.224.86), 30 hops max, 40 byte packets
 1  130.34.195.126 (130.34.195.126)  0.738 ms
 2  eigw.ec.ecei.tohoku.ac.jp (130.34.195.1)  0.705 ms
 3  192.168.226.41 (192.168.226.41)  0.732 ms
 4  192.168.230.42 (192.168.230.42)  0.602 ms
 5  br0900.net.tohoku.ac.jp (130.34.10.137)  0.565 ms
 6  202.211.0.194 (202.211.0.194)  5.893 ms
 7  sendai-dc-RM-GE-7-1-0-104.sinet.ad.jp (150.99.190.17)  1.004 ms
 8  tsukuba-dc-RM-AE-1-11.sinet.ad.jp (150.99.203.6)  9.057 ms
 9  tokyo1-dc-RM-AE-2-11.sinet.ad.jp (150.99.203.10)  13.715 ms
10  TYO1-gate1-XGE-1-0.sinet.ad.jp (150.99.189.250)  13.936 ms
11  NYC-gate1-P3-0.sinet.ad.jp (150.99.198.246)  188.526 ms
12  65.59.192.29 (65.59.192.29)  188.517 ms
13  vlan89.csw3.NewYork1.Level3.net (4.68.16.190)  192.567 ms
14  ae-81-81.ebr1.NewYork1.Level3.net (4.69.134.73)  189.963 ms
15  ae-4.ebr2.London1.Level3.net (4.69.132.110)  268.990 ms
16  ae-21-52.car1.London1.Level3.net (4.68.116.47)  261.127 ms
17  212.58.238.153 (212.58.238.153)  259.548 ms
18  www41.thdo.bbc.co.uk (212.58.224.86)  260.000 ms
```

Science Information Network (SINET)



SINET3 Web page (http://www.sinet.ad.jp/) extract from・change a part