

Names and Numbers

Translating between names

www.google.com

To numbers

74.125.77.109

Problems with TCP/IP

Numbering system not intuitive

148.87.9.44

141.241.2.11

Can't work out location, service or even remember easily

Names much better

Can work out location, service and remember easily

What happens when you browse?



Web Browser software



Simplest way to implement the conversion

Use a text file with columns of names and IP numbers

```
localhost      127.0.0.1
www.oracle.com 148.87.9.44
```

A simple lookup process converts the name to number

Called the **hosts file**

This file still exists on machines today and is checked before the DNS/DHCP system is used

Demo

- Changing a hosts file to associate a name with an IP number
- Using ping command to see if it works

Demo

- Changing a hosts file to associate a name with an IP number



```
File Edit Format View Help
Copyright (c) 1983-2000 Microsoft Corp.
This is a sample hosts file used by Microsoft TCP/IP for Windows.
This file contains the mappings of IP addresses to host names. Each
entry should be typed on an individual line. The IP address should
be placed in the first column followed by the corresponding host name
The IP address and the host name should be separated by at least one
space.
Additionally, comments (such as these) may be inserted on individual
lines or following the machine name denoted by a '#' symbol.
For example:
#
200.04.04.01 www.oracle.com # oracle server
10.25.01.10 www.oracle.com # a client host
127.0.0.1 localhost
127.0.0.1 www.oracle.com
```

Works for very small number of machines

- Have one copy of the hosts file held centrally
- Regularly copied to other machines



Obvious problems

- Doesn't scale well
- Synchronisation problems
- How do names outside the domain get managed
- Name collisions / management problems

So: DNS and BIND

Domain Name System	Standard
Berkeley Internet Name Domain	Software

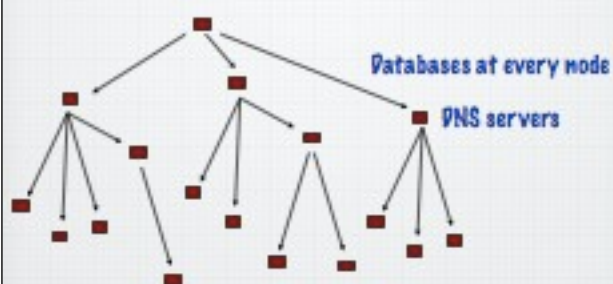
So: DNS and BIND

A distributed database system initially invented by Paul Mockapetris

RFCs 882, 883, 1034, 1035 + others

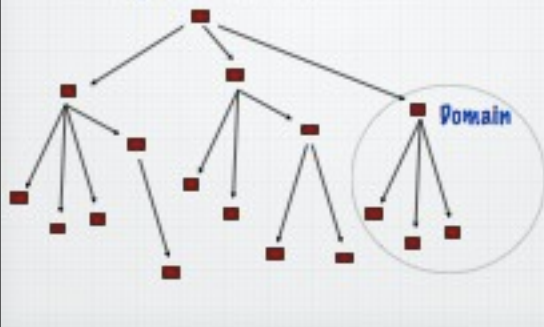
BIND is the most popular software for DNS

DNS can be visualised as an inverted tree

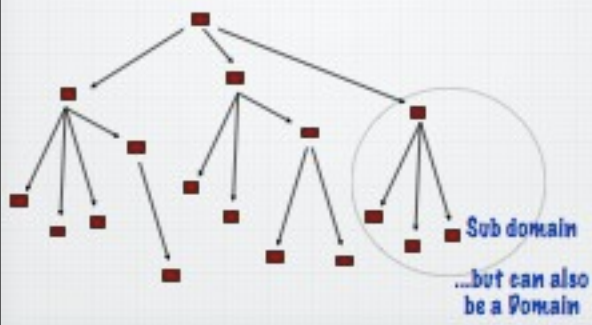


Other terms used

Top level DNS servers



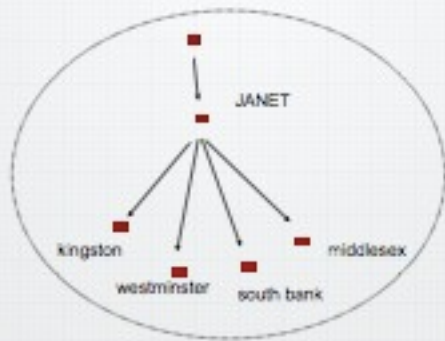
Other terms used



Domains and sub domains

academic domain .ac.uk

Run by JANET

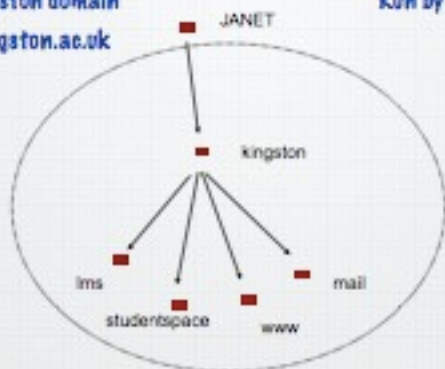


Domains and sub domains

kingston domain

kingston.ac.uk

Run by Kingston



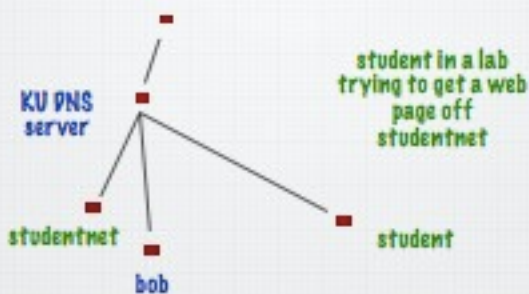
Note how names are formed

- names formed from right to left
- we control the names in our domains

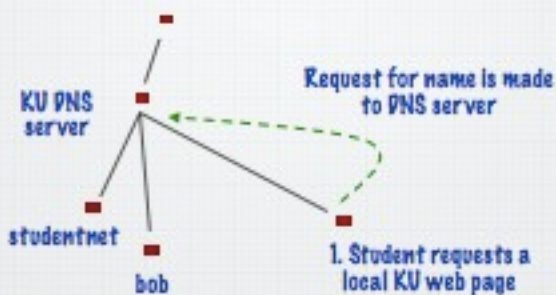
- if we have a computer called bob
- if westminster have a computer called bob

No name conflict bob.kingston.ac.uk
 bob.westminster.ac.uk

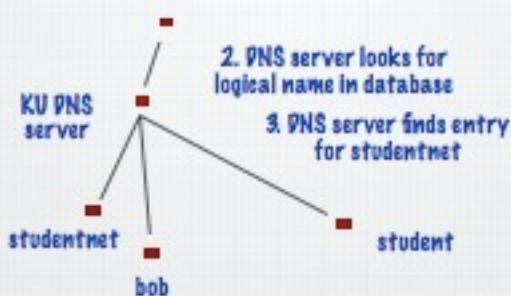
So how does name resolution work? Local example



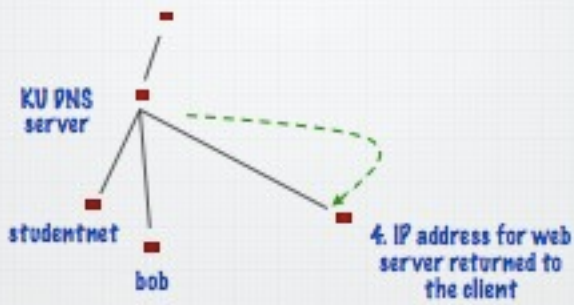
So how does name resolution work? Local example



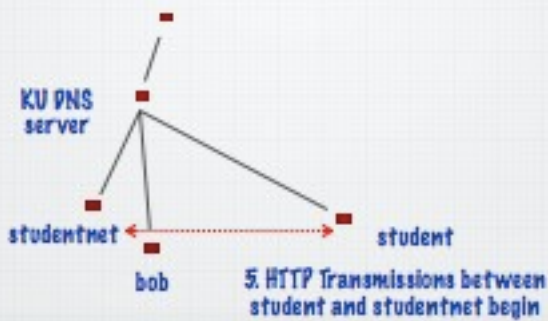
So how does name resolution work? Local example



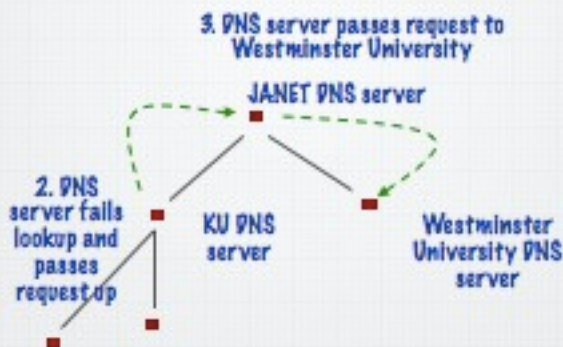
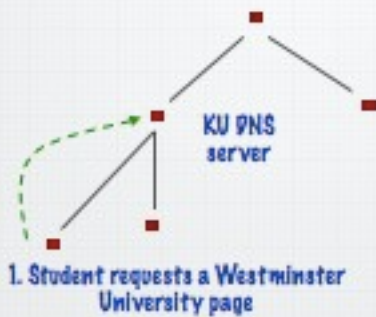
So how does name resolution work? Local example

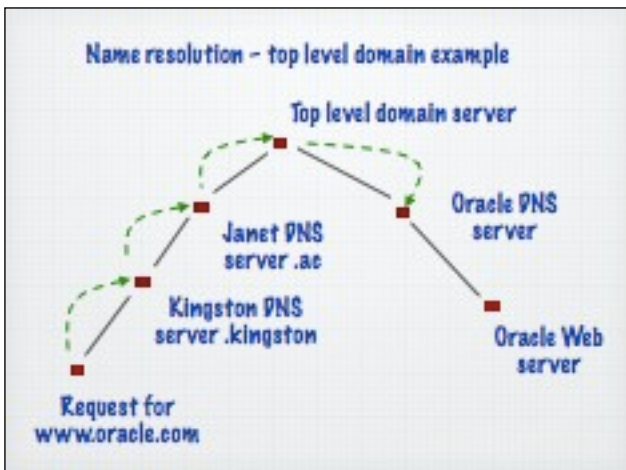
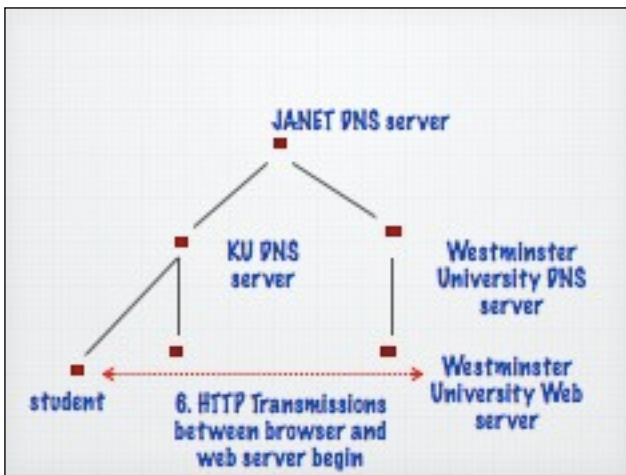
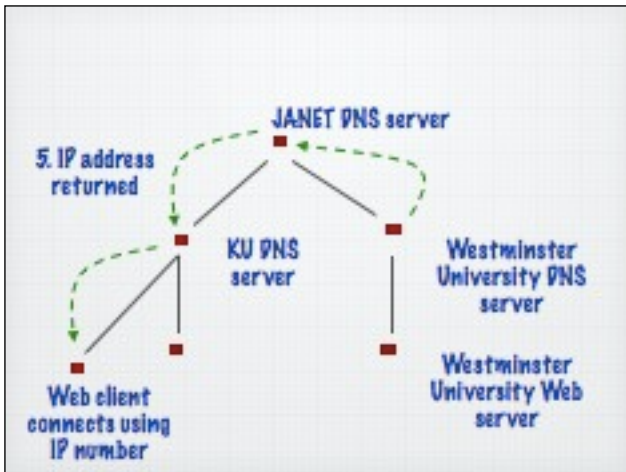
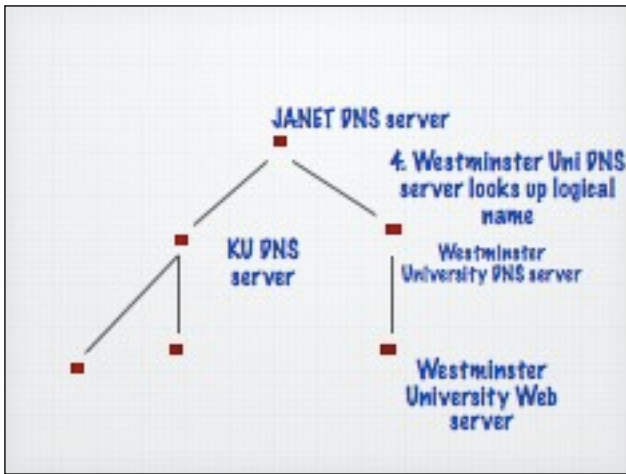


So how does name resolution work? Local example



Name resolution - JANET domain example





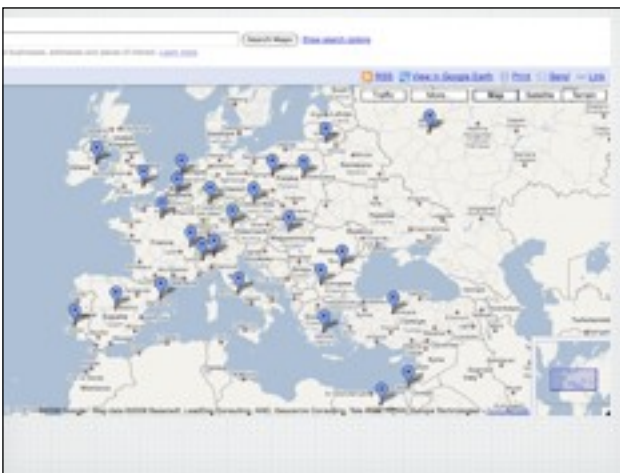
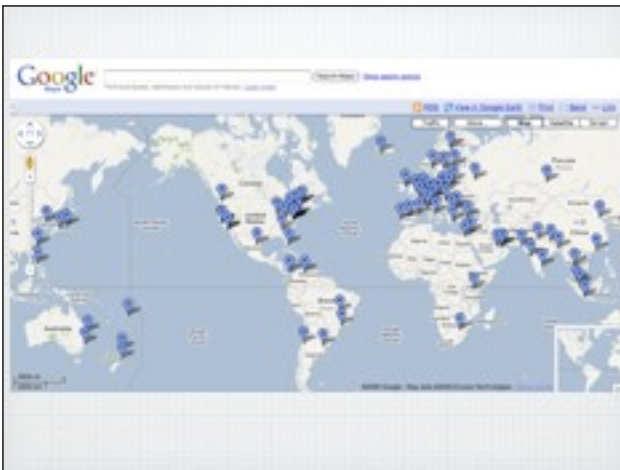
Points to note

Queries only travel up the tree as far as needed

Each DNS server has link to next level up

Cache at each level can reduce the amount of traffic

In fact many top level servers (replicated to overcome failures)



Things to try at home

`tracert` `name`

Shows the route and time taken for the hops


```
Traceroute to www.apple.com [66.235.252.131] over 3 hops, 40 bytes path:
 0: 10.0.2.1 (10.0.2.1) 1.730 ms 0.980 ms 0.740 ms
 1: 10.0.0.1 (10.0.0.1) 0.508 ms 0.500 ms 0.716 ms
 2: 10.0.0.1 (10.0.0.1) 1.552 ms 1.480 ms 1.478 ms
 3: 10.0.0.1 (10.0.0.1) 1.372 ms 1.300 ms 1.408 ms
 4: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
 5: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
 6: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
 7: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
 8: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
 9: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
10: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
11: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
12: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
13: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
14: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
15: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
16: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
17: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
18: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
19: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
20: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
21: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
22: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
23: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
24: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
25: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
26: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
27: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
28: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
29: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
30: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
31: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
32: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
33: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
34: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
35: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
36: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
37: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
38: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
39: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
40: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
41: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
42: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
43: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
44: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
45: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
46: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
47: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
48: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
49: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
50: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
51: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
52: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
53: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
54: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
55: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
56: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
57: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
58: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
59: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
60: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
61: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
62: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
63: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
64: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
65: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
66: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
67: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
68: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
69: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
70: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
71: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
72: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
73: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
74: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
75: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
76: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
77: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
78: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
79: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
80: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
81: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
82: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
83: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
84: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
85: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
86: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
87: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
88: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
89: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
90: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
91: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
92: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
93: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
94: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
95: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
96: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
97: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
98: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
99: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
100: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
101: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
102: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
103: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
104: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
105: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
106: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
107: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
108: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
109: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
110: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
111: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
112: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
113: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
114: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
115: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
116: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
117: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
118: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
119: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
120: 10.0.0.1 (10.0.0.1) 1.392 ms 1.300 ms 1.408 ms
```

Things to try at home

<http://visualroute.visualwars.com/>

Visually shows the route and time taken for the hops

