“The network is the computer.”

John Gage, Sun Microsystems
“The network is the network, the computer is the computer -sorry about the confusion.”

Joe on Computing
https://is.gd/mBkNPm
There is no cloud, only other people’s computers.
Visualization of the routing paths of the Internet.
Barrett Lyon / The Opte Project
https://www.opte.org/
Visualization of the routing paths of the Internet.
Barrett Lyon / The Opte Project
https://www.opte.org/
The Internet Assigned Numbers Authority (IANA) oversees global IP address/AS number allocation, root zone management etc.

https://www.iana.org/
NAME
whois -- Internet domain name and network number directory service

SYNOPSIS
whois [-aAbfgiiKlmPQrRS] [-c TLD | -h host] [-p port] [--] name ...

DESCRIPTION
The whois utility looks up records in the databases maintained by several
Network Information Centers (NICs).

By default whois starts by querying the Internet Assigned Numbers Authori-
ty (IANA) whois server, and follows referrals to whois servers that have
more specific details about the query name. The IANA whois server knows
about IP address and AS numbers as well as domain names.

There are a few special cases where referrals do not work, so whois goes
directly to the appropriate server. These include point-of-contact han-
dles for ARIN, nic.at, NORID, and RIPE, and domain names under ac.uk.

The options are as follows:
"cidr0_cidrs": [ {
  "v4prefix": "192.12.216.0",
  "length": 24
}
],
"arin_originas0_originautnums": [ ]
"port43": "whois.arin.net",
"objectClassName": "entity"

laptop$ curl -s https://rdap.arin.net/registry/entity/SIT | jq '.autnums[0].handle'
"AS16889"
laptop$ curl -s https://rdap.arin.net/registry/entity/SIT |
> jq -M '{ "AS": .autnums[0].handle, "Netblocks": [ .networks[] | "\(\.(startAddress) - \(\.(endAddress)\)\)" ]}'
{
  "AS": "AS16889",
  "Netblocks": [ 
    "155.246.0.0 - 155.246.255.255",
    "192.12.216.0 - 192.12.216.255"
  ]
}
traceroute to www.yahoo.com (74.6.143.25), 30 hops max, 60 byte packets
1 155.246.89.2 (155.246.89.2) [AS16889] 1.008 ms 1.270 ms 1.631 ms
2 10.255.8.171 (10.255.8.171) [*] 0.652 ms 0.650 ms 0.620 ms
3 155.246.151.33 (155.246.151.33) [AS16889] 3.981 ms 3.959 ms 3.941 ms
4 130.156.251.105 (130.156.251.105) [AS21976] 1.791 ms 1.851 ms 1.904 ms
5 130.156.251.25 (130.156.251.25) [AS21976] 1.648 ms 1.632 ms 1.613 ms
6 nyiix.bas1-m.nyc.yahoo.com (198.32.160.121) [AS4637] 1.573 ms 1.601 ms 1.605 ms
7 ae-1.pat1.bfw.yahoo.com (209.191.64.163) [AS10310] 10.364 ms 14.906 ms 10.394 ms
8 et-0-1-1.msr2.bf2.yahoo.com (74.6.227.61) [AS10310] 11.770 ms et-0-1-1.msr1.bf2.yahoo.com (74.6.227.67) [AS10310] 11.781 ms et-1-0-0.msr2.bf1.yahoo.com (74.6.227.45) [AS10310] 10.324 ms
9 et-1-1-0.clr1-a-gdc bf2 yahoo.com (74.6.122.53) [AS26101] 10.404 ms et-19-0-0.clr1-a-gdc bf2 yahoo.com (74.6.122.41) [AS26101] 11.803 ms et-0-1-0.clr2-a-gdc bf2 yahoo.com (74.6.122.25) [AS26101] 13.364 ms
10 lo0.fab7-1-gdc bf2 yahoo.com (74.6.123.238) [AS26101] 11.772 ms lo0.fab6-1-gdc bf2 yahoo.com (74.6.123.239) [AS26101] 10.274 ms lo0.fab2-1-gdc bf2 yahoo.com (74.6.123.243) [AS26101] 11.750 ms
11 usw1-lbb bf2 yahoo.com (74.6.98.138) [AS26101] 11.732 ms 13.141 ms usw2-1-lbb bf2 yahoo.com (74.6.98.139) [AS26101] 11.707 ms
12 media-router-fp73.prod.mediavip.bf1 yahoo.com (74.6.143.25) [AS26101] 13.025 ms 11.602 ms 11.624 ms

cshell$
traceroute to www.yahoo.com (74.6.143.25), 30 hops max, 60 byte packets
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9 et-1-1-0.clr1-a-gdc.bf2.yahoo.com (74.6.122.53) [AS26101] 10.404 ms et-19-0 .clf1-a-gdc.bf2.yahoo.com (74.6.122.41) [AS26101] 11.803 ms et-0-1-0.clr2-a-g dc.bf2.yahoo.com (74.6.122.25) [AS26101] 13.364 ms
10 lo0.fab7-1-gdc.bf2.yahoo.com (74.6.123.238) [AS26101] 11.772 ms lo0.fab6-1-gdc.bf2.yahoo.com (74.6.123.239) [AS26101] 10.274 ms lo0.fab2-1-gdc.bf2.yahoo.com (74.6.123.243) [AS26101] 11.750 ms
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12 media-router-fp73.prod.media.vip.bf1.yahoo.com (74.6.143.25) [AS26101] 13.0 25 ms 11.602 ms 11.624 ms
Daily stats

Daily traffic statistics, all colocations combined.

<table>
<thead>
<tr>
<th>Peak In</th>
<th>Peak Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.454 Tb/s</td>
<td>9.448 Tb/s</td>
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</table>

<table>
<thead>
<tr>
<th>Average In</th>
<th>Average Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.71 Tb/s</td>
<td>6.709 Tb/s</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Current In</th>
<th>Current Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.131 Tb/s</td>
<td>8.131 Tb/s</td>
</tr>
</tbody>
</table>
Summary and Questions

• Identify AS numbers of other organizations and companies and find out where they peer.

• Research and review some of publicly known cases of “depeering” between ISPs and how this could lead to degraded network performance for their respective customers.

• Review the list of largest internet exchange points and compare their throughput and facilities; try to find out more information about e.g., the “NAP of the Americas”.

• Consider joining the NANOG mailing list at: https://nanog.org

Coming up: tracing packets and applications
Links

- https://www.opte.org/
- https://en.wikipedia.org/wiki/Autonomous_system_(Internet)
- https://www.iana.org/assignments/as-numbers/as-numbers.xhtml
- whois(1)
- https://en.wikipedia.org/wiki/Peering
- https://en.wikipedia.org/wiki/List_of_Internet_exchange_points_by_size
- https://peeringdb.com/
- https://nanog.org