DNS Name Resolution

Query: www.example.com/A ?

Answer: 192.0.2.16

stub resolver

recursive resolver

com

to authoritative servers

to example.com

to .

Authoritative servers

Answer: 192.0.2.16
The Path Between Stub and Authoritative

- Unknowns
  - Recursive resolver(s)
  - Authoritative servers
  - Anycast instances
  - IPv4/IPv6 Network paths

- Perspective capabilities
  - TCP/UDP connectivity, latency
  - TLS/DTLS
  - EDNS: version, options, flags
  - DNSSEC records
  - Large packets
  - Record types

stub resolver

example.com

authoritative servers
Measuring from Other Vantage Points

- Platforms
  - CAIDA ARK
  - RIPE Atlas
  - NLNOG Ring

- Considerations
  - Access – full shell vs. API
  - Tests – canned vs. custom
  - Availability of probes
    - Number
    - Location
  - Synchronous vs. asynchronous execution
  - Sequential progressive diagnostics
DNS Looking Glass – Desired Capabilities

- Request components
  - Message (or optionally, parameters)
  - Destination IP
  - Destination port
  - Source IP (optional)
  - Source port (optional)
  - Transport protocol (TCP/UDP)
  - Timeout value

- Response components
  - Message (if no error)
  - Error (timeout or network error)
  - Error description (errno)
  - Source IP
  - Source port
  - Time elapsed
DNS Looking Glass – Desired Capabilities (2)

- Security
  - Loopback/local queries
  - Resource usage
  - Number of simultaneous queries
  - Authentication
  - Privileges/access control
  - Privacy/encryption

- Other
  - Ease of deployment
  - Accessibility (IPs, ports, protocol)
  - Synchronous execution, for diagnostics
  - Support for multiple queries per request
  - Parallel execution
DNSViz Looking Glass Implementation

• Encapsulation
  • JSON

• Transports
  • HTTP (to CGI script)
  • WebSocket (to Java Applet in Web browser)
Example: dnsviz probe

- Specify DNS looking glass URL on command line.
- Diagnostic queries are issued through looking glass (CGI script accessible over HTTP POST).

```
$ dnsprobe -u http://my-dns-lg-example.com/dnsviz-lg.cgi \
  example.com > example.com.json
```
Example: DNSViz Web Interface

- Indicate client-side analysis
DNS Looking Glass over HTTP - Benefits

- Relatively easy to deploy (CGI script).
- Uses sane security defaults.
- Flexible.
- Uses synchronous execution for sequential progressive diagnostics.
- Paradigm can be applied to other measurement models.
- Framework can be used for periodic automated measurement or on-demand measurement.
- Client-side diagnostics can be run in Web browser, without need for installation of custom software.
Summary

• DNS name resolution paths can be diverse.
• A multi-perspective analysis can help understand general resolver experience.
• A flexible DNS looking glass platform facilitates measurement from diverse vantage points.
• A DNS looking glass is implemented and available in the latest release of DNSViz.
  • https://github.com/dnsviz/dnsviz