# Running Software in Albuquerque to Measure Censorship Anywhere

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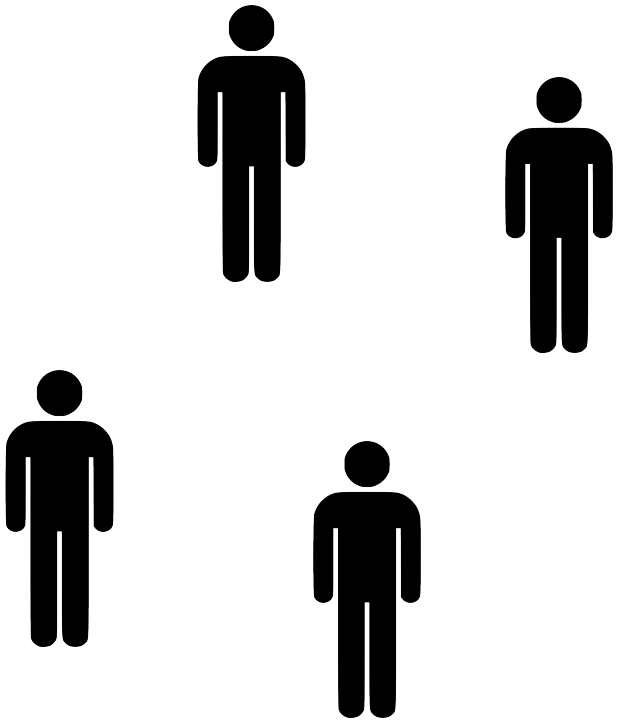
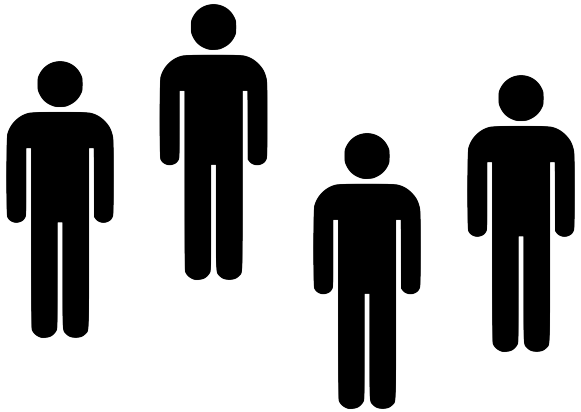
# When will Desert Storm invasion begin?

# No access to Pentagon

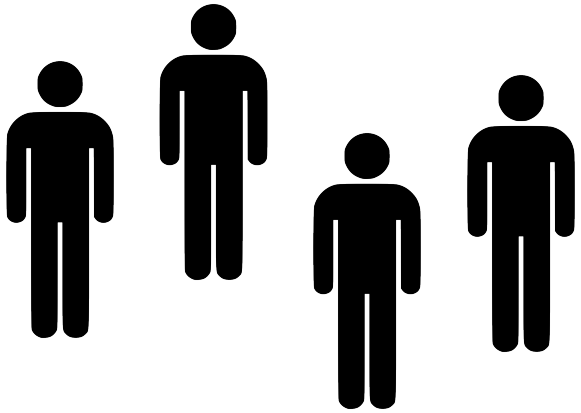


# Watch Dominos outside Pentagon

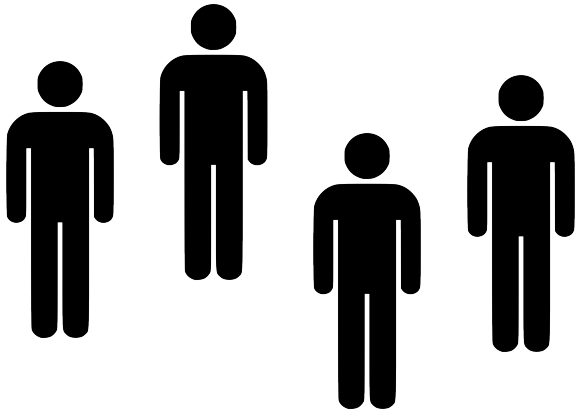



# Pentagon deliveries normally



# Night before an invasion

# Moral of the story

We can measure what is happening in a thing *without being in that thing*

# Question

Server

Clients

Can clients
connect
to the server?

Albuquerque

# TCP Connection

Server

SYN

SYNACK

ACK

Clients

Albuquerque

# Measurement

- Run measurement software over there
- Problem: cannot get software in there
- Or:
  - Not in the right city
  - Not right now
- We don't need measurement software on client, on server, or in between

# Client

- Find client with *globally incrementing IP ID*

IP Header

| Version / IHL / TOS | Length |
|---|---|
| ID | Flags / Fragment Offset |
| TTL / Protocol | Checksum |
| Source IP | |
| Destination IP | |

- Windows XP, FreeBSD, etc. globally increment this ID

# Measure # of packets sent

- Ping every second
- 1006, 1007, 1008, 1009…
  - 1, 1, 1… none sent
- 3003, 3007, 3012, 3016…
  - 4, 5, 4… some sent
- 4000, 5000, 6200, 7300…
  - 1000, 1200, 1100… lots sent

# Experiment

Server

Client

Forged
SYN

Albuquerque

# No censorship (+1)

Server

Client

SYNACK

RST

Forged SYN

Albuquerque

# Server → Client censored (+0)

Server

Client

~~SYNACK~~

~~SYNACK~~

...

Forged SYN

Albuquerque

# Client → Server censored (+>1)

Server

SYNACK

~~RST~~

SYNACK

~~RST~~

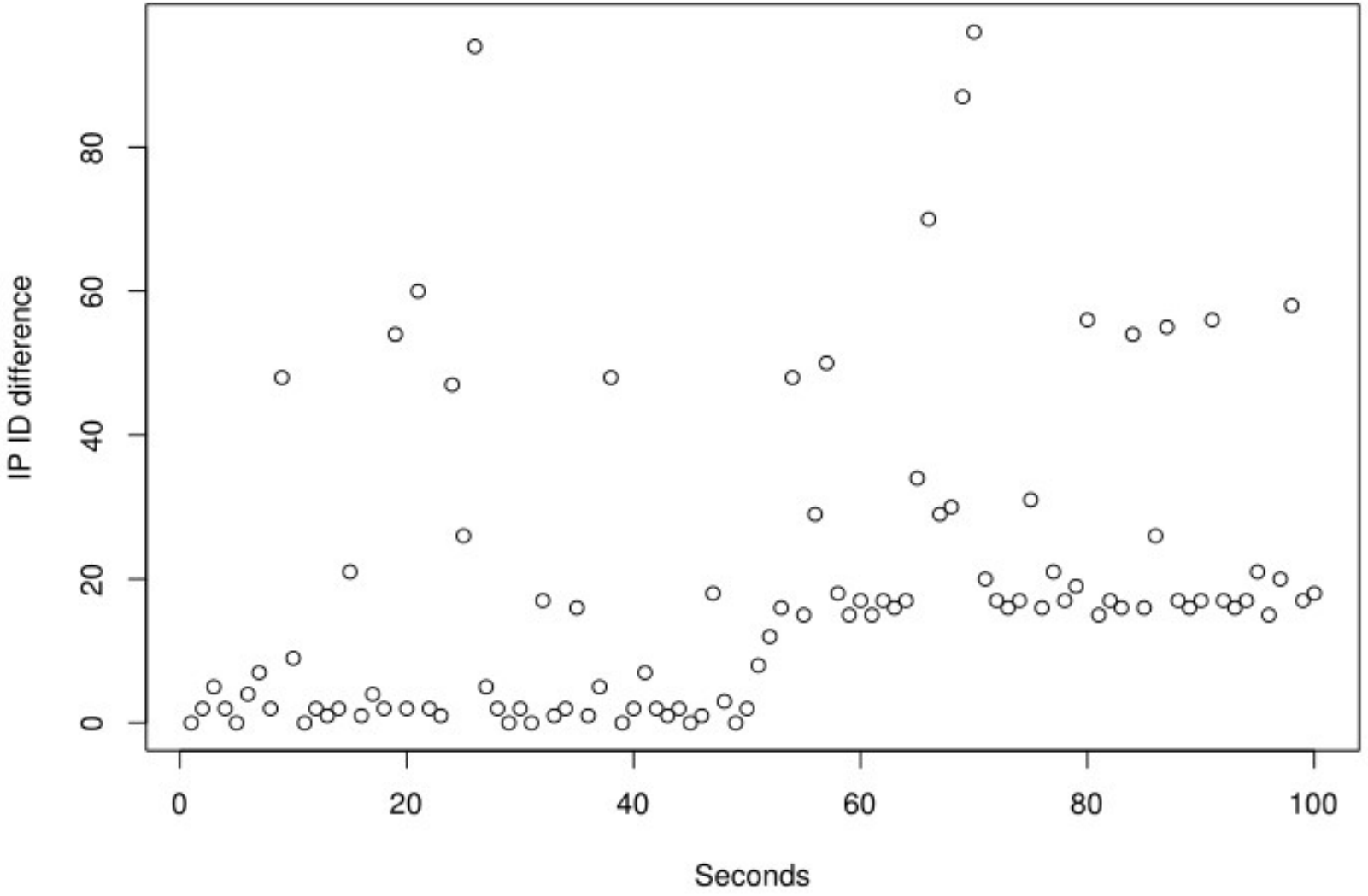
...

Client

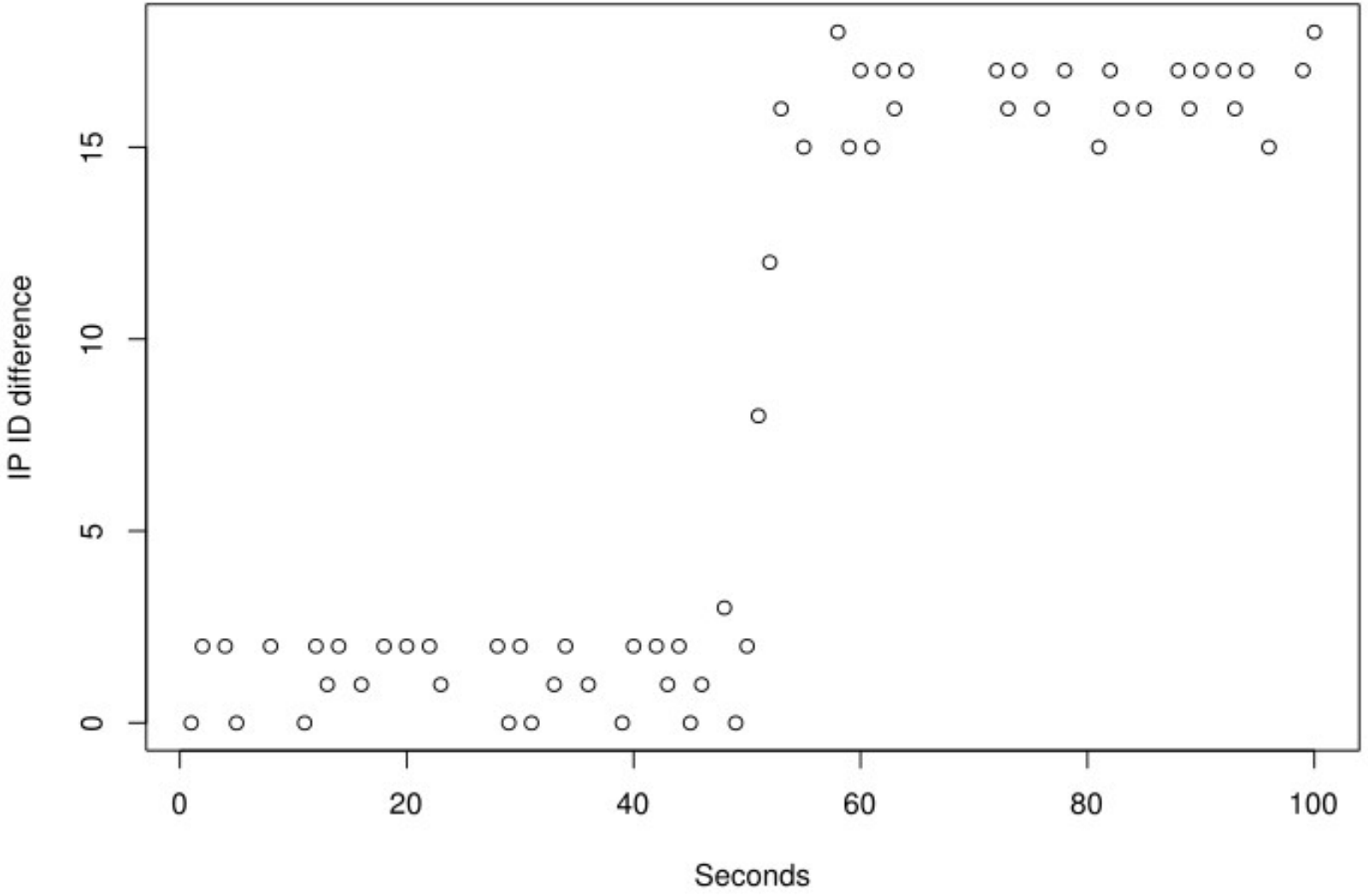
Forged SYN

Albuquerque

# ARIMA time series



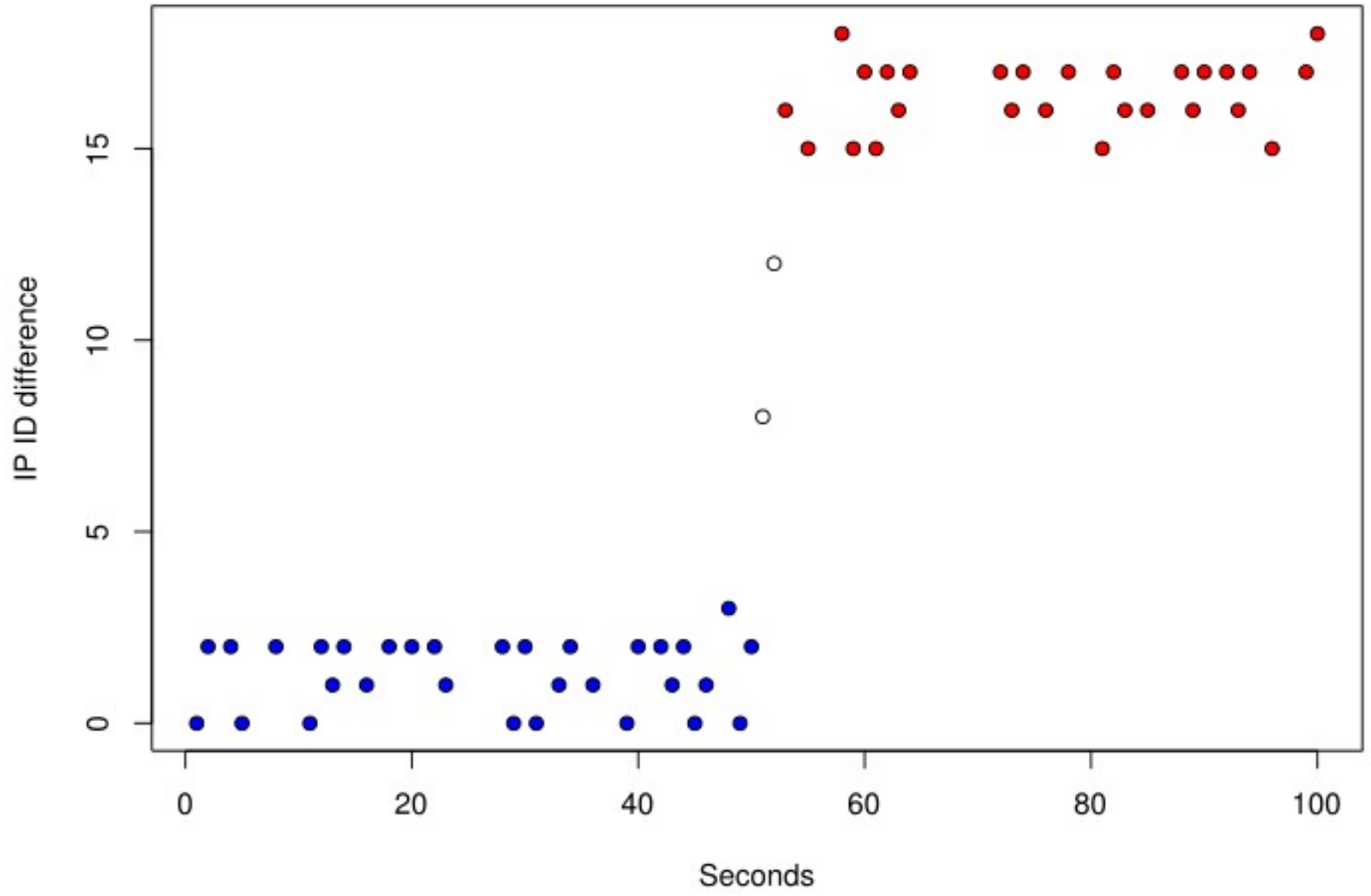
# Iterative outlier removal



# Intervention analysis

| | |
|---|---|
| Server → Client | 0 |
| No censorship | 5 |
| Client → Server | 15 |

Measured intervention: 15.1
Client → Server filtering!



# Ethical concerns

Can clients sending RST's get them hurt?

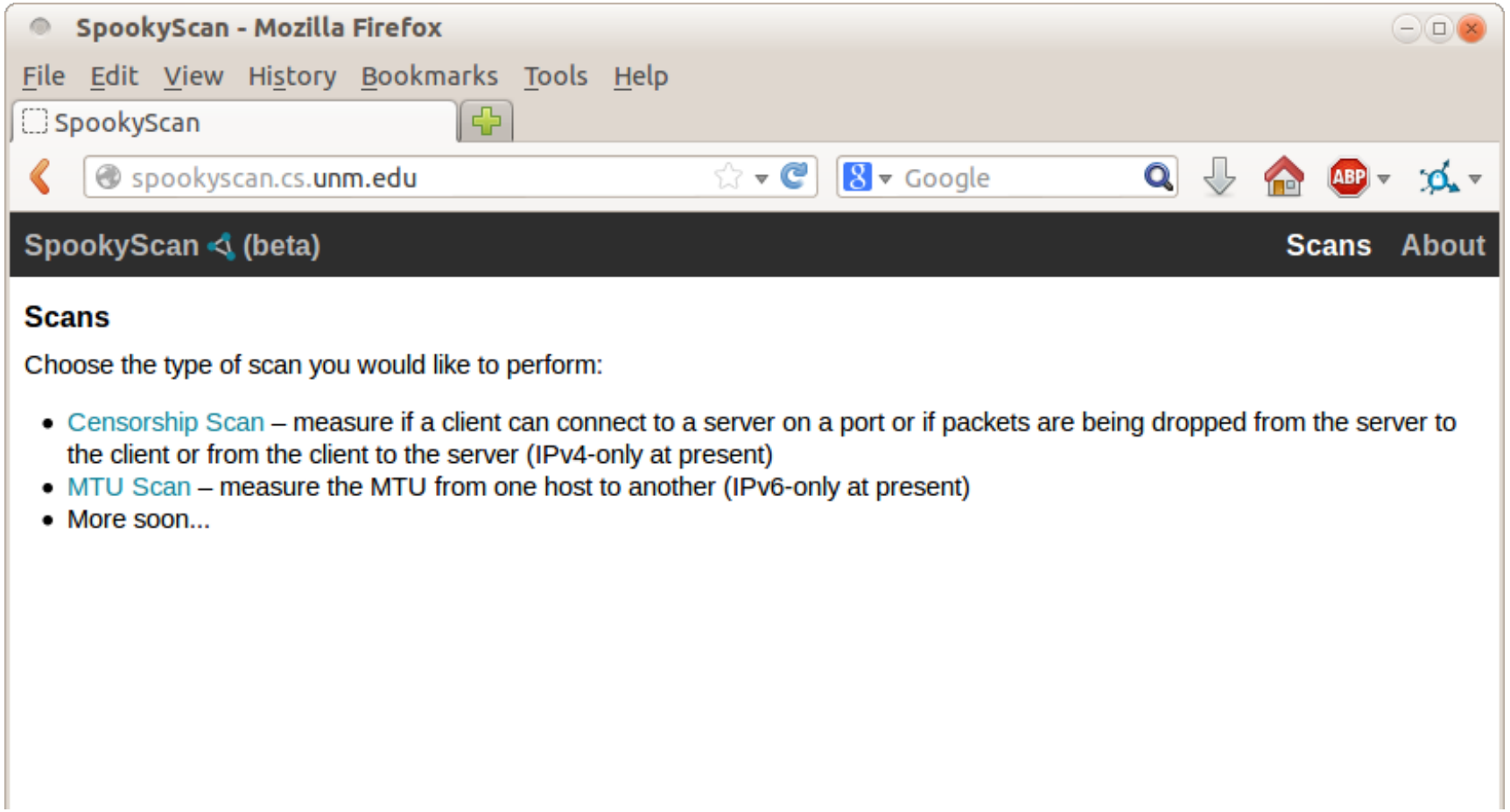
Ethical Knob


← Decrease clarity  Decrease karma →

# Future

- Gathering data
- Using other shared finite resources
  - Reassembly buffers
  - ...
- Other censorship
  - DNS
  - DPI
  - ...

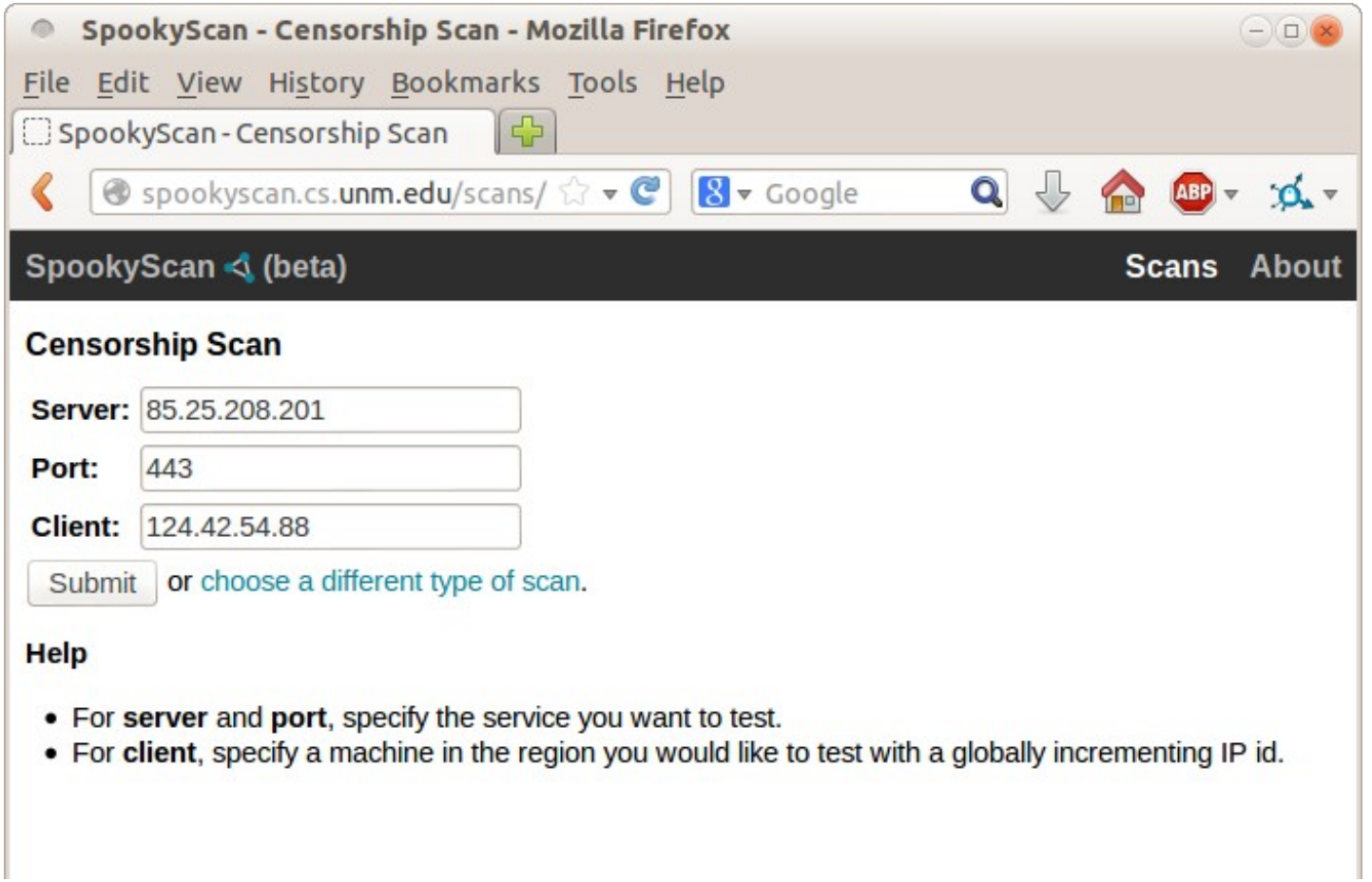
# SpookyScan



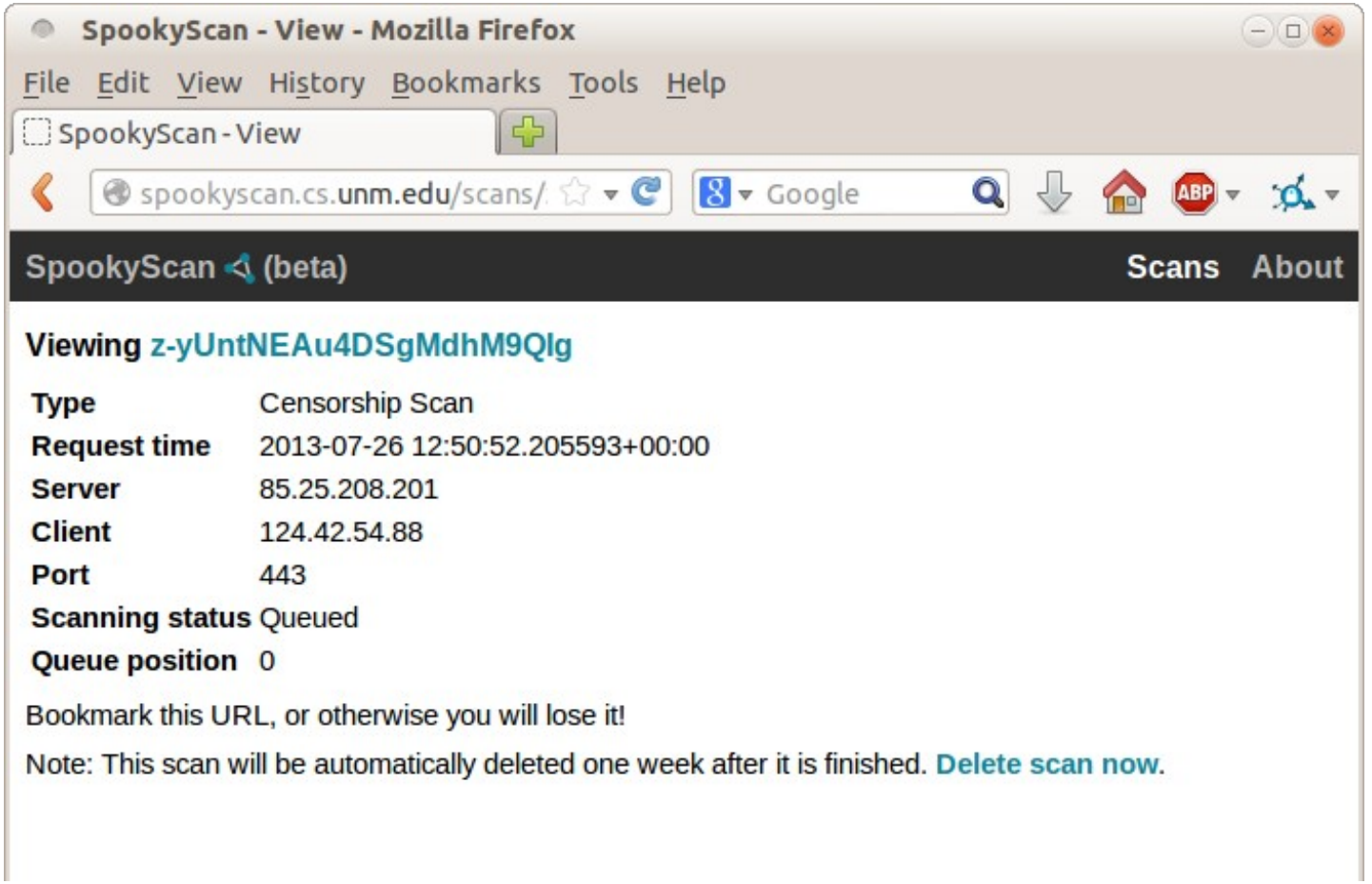

Spooky scanning at a distance

http://spookyscan.cs.unm.edu

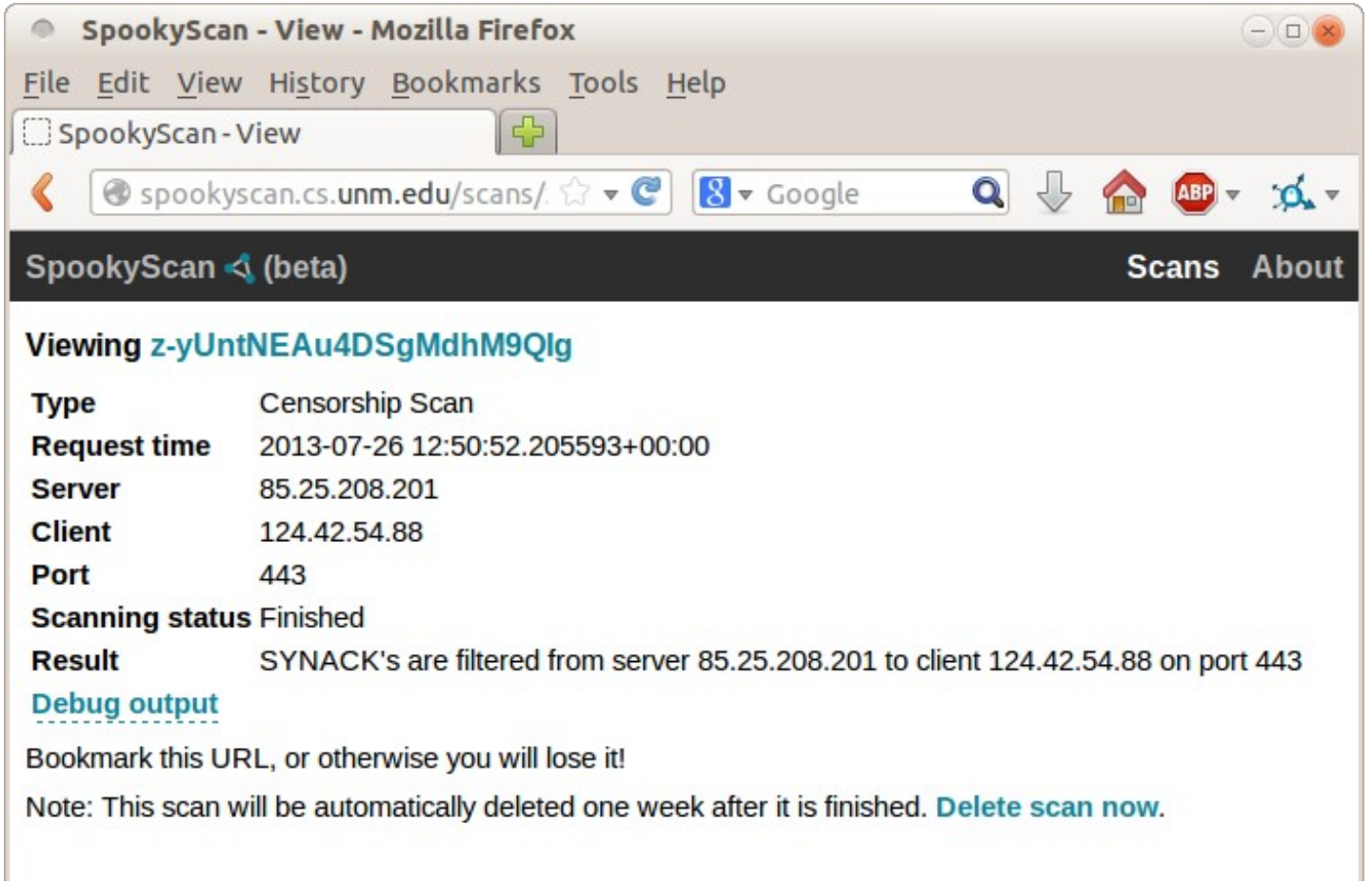
# SpookyScan


SpookyScan - Censorship Scan - Mozilla Firefox
File Edit View History Bookmarks Tools Help
SpookyScan - Censorship Scan
spookyscan.cs.unm.edu/scans/
Google
SpookyScan (beta)
Scans About
Censorship Scan
Server: 85.25.208.201
Port: 443
Client: 124.42.54.88
Submit
or choose a different type of scan.
Help
For server and port, specify the service you want to test.
For client, specify a machine in the region you would like to test with a globally incrementing IP id.

# SpookyScan


SpookyScan - View - Mozilla Firefox
File Edit View History Bookmarks Tools Help
SpookyScan - View
spookyscan.cs.unm.edu/scans/
Google
SpookyScan (beta)
Scans About
Viewing z-yUntNEAu4DSgMdhM9Qlg
Type Censorship Scan
Request time 2013-07-26 12:50:52.205593+00:00
Server 85.25.208.201
Client 124.42.54.88
Port 443
Scanning status Queued
Queue position 0
Bookmark this URL, or otherwise you will lose it!
Note: This scan will be automatically deleted one week after it is finished. Delete scan now.

# SpookyScan


SpookyScan - View - Mozilla Firefox
File Edit View History Bookmarks Tools Help
SpookyScan - View
spookyscan.cs.unm.edu/scans/
Google
SpookyScan (beta)
Scans About
Viewing z-yUntNEAu4DSgMdhM9Qlg
Type Censorship Scan
Request time 2013-07-26 12:50:52.205593+00:00
Server 85.25.208.201
Client 124.42.54.88
Port 443
Scanning status Finished
Result SYNACK's are filtered from server 85.25.208.201 to client 124.42.54.88 on port 443
Debug output
Bookmark this URL, or otherwise you will lose it!
Note: This scan will be automatically deleted one week after it is finished. Delete scan now.

# Acknowledgments

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