Botnet trap: Hunting DGA botnets

CSIRT.CZ

Martin Kunc • 06.10.2022

cz.nic | CZ DOMAIN REGISTRY

Who we are

- CSIRT.CZ
  - National CSIRT of the Czech Republic
- CZ.NIC
  - .CZ domain registry
  - Many projects (Bird, Knot, Fred, Turris)

Command & Control server evolution (CSIRT perspective)

- IP
  - easy to block
- Domain
  - less so
- DGA domains
  - can be difficult to predict
  - blocking one has almost no effect
- others IRC, Tor, peer-to-peer

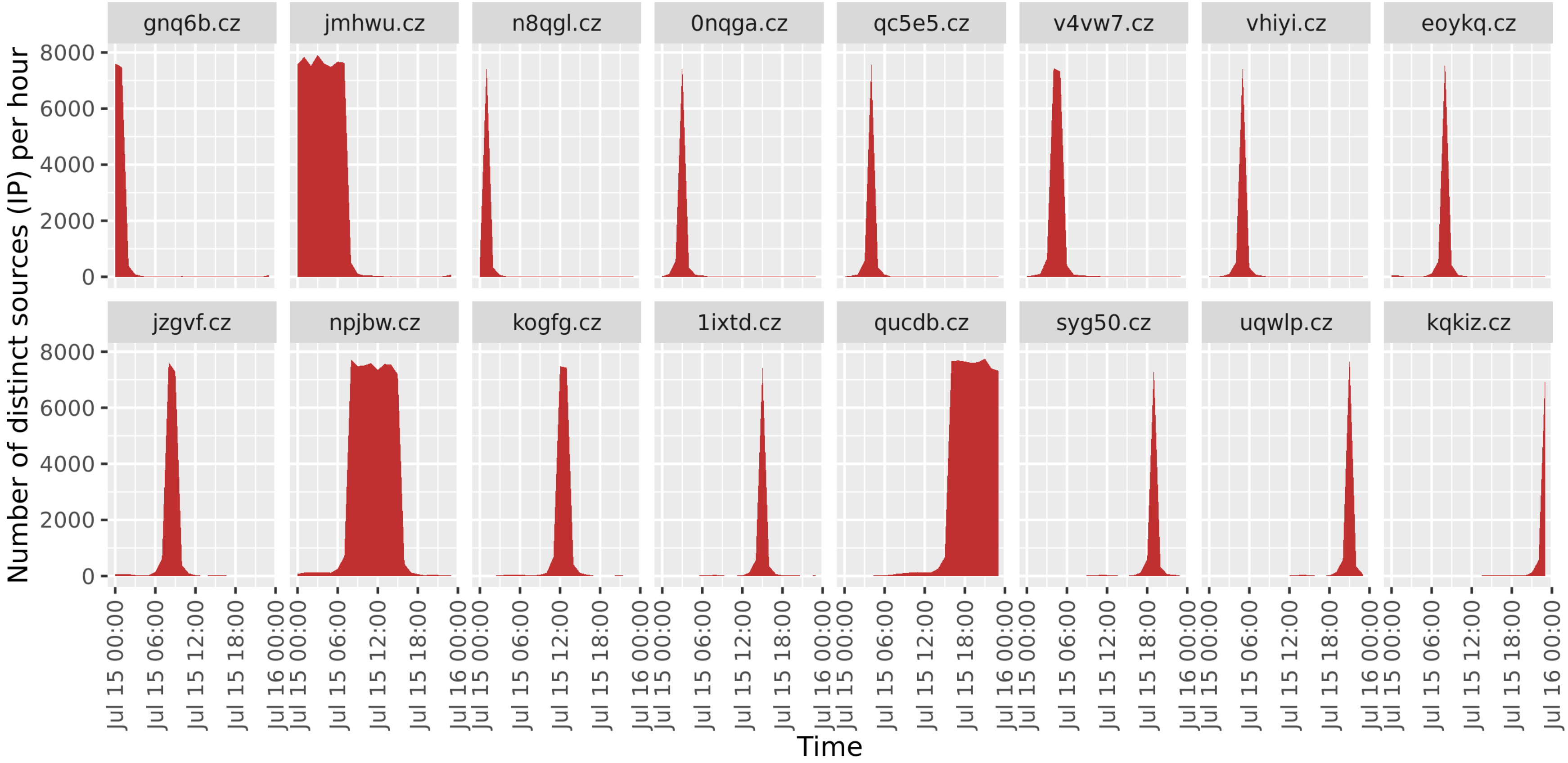
Domain Generation Algorithm - DGA

- Time based generation
- Often unique per botnet
- Need to reverse it
  - OR set clock into future
- DGA domains used by bots to communicate with C&C servers.

Are there any DGA domains in .CZ?

- Maciej Andziński
- None in popular DGA feeds
- ~54M distinct domains* daily (15 July 2020)
  - ~40x more than registered .CZ domains (1.3M)
- n-gram based DGA domain classifier

Detecting DGA domains in DNS traffic



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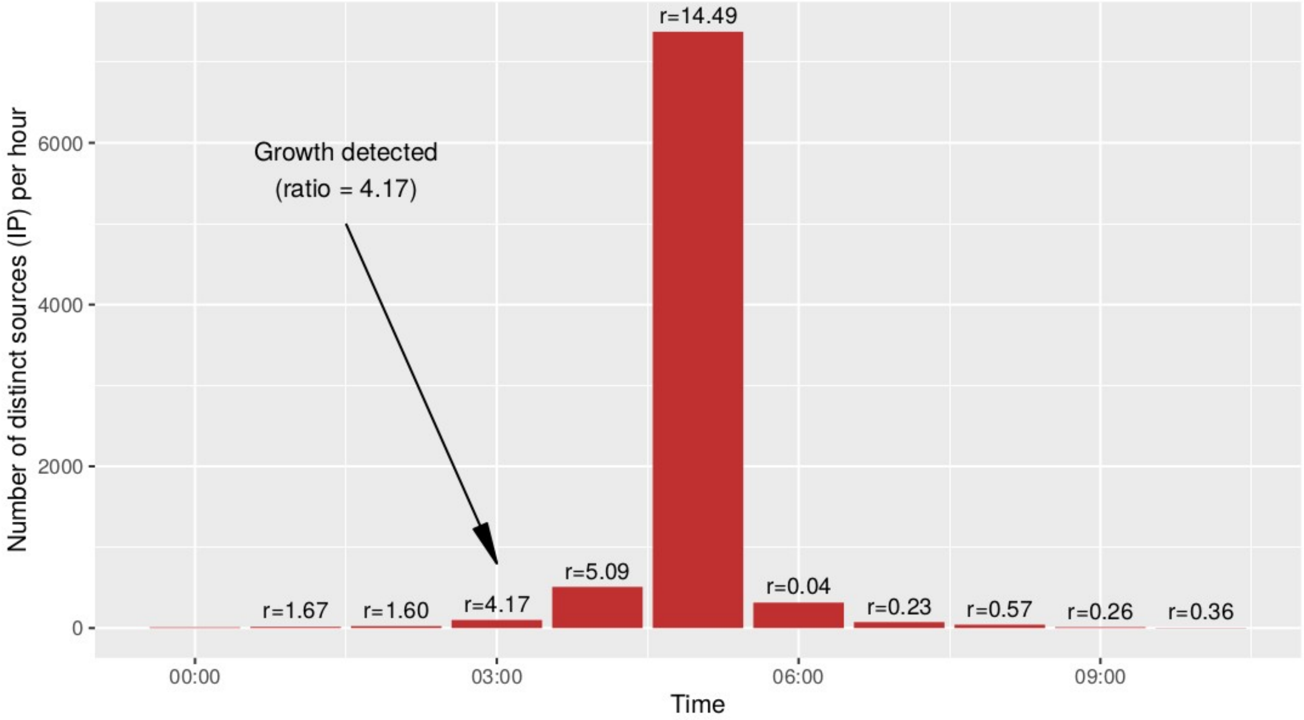


Number of unique sources for DNS queries for domain qnc1p.cz on 16 July 2020

Our plan

- register a DGA domain
- point towards our server
- profit?

InetSim a.k.a. our “Botnet trap“

- ...software suite for simulating common internet services in a lab environment, e.g. for analysing the network behaviour of unknown malware samples.
- unknown botnet → unknown network service
- easily enable many services
- packet capture as backup

Registering a DGA domain

- On 16.11.2021 we detected and registered a DGA domain: **naqsz.cz**
- InetSim ready..
- Packet capture running..
- Team waiting and expecting…

- HTTPS traffic starts coming!

HTTPS on TCP/443

```
87.154.x.x - - [16/Nov/2021:13:11:25 +0100] "GET /qnap_firmware.xml?t=1637064685 HTTP/1.1" 502 182 "-" "curl/7.43.0"
23.241.x.x - - [16/Nov/2021:13:11:26 +0100] "GET /qnap_firmware.xml?t=1637064420 HTTP/1.1" 502 182 "-" "curl/7.43.0"
153.186.x.x - - [16/Nov/2021:13:11:27 +0100] "GET /qnap_firmware.xml?t=1637064688 HTTP/1.1" 502 182 "-" "curl/7.43.0"
83.68.x.x - - [16/Nov/2021:13:11:30 +0100] "GET /qnap_firmware.xml?t=1637064690 HTTP/1.1" 502 182 "-" "curl/7.43.0"
124.120.x.x - - [16/Nov/2021:13:11:30 +0100] "GET /qnap_firmware.xml?t=1637067173 HTTP/1.1" 502 182 "-" "curl/7.43.0"
222.64.x.x - - [16/Nov/2021:13:11:30 +0100] "GET /qnap_firmware.xml?t=1637064699 HTTP/1.1" 502 182 "-" "curl/7.43.0"
84.106.x.x - - [16/Nov/2021:13:11:31 +0100] "GET /qnap_firmware.xml?t=1637064682 HTTP/1.1" 502 182 "-" "curl/7.43.0"
223.19.x.x - - [16/Nov/2021:13:11:33 +0100] "GET /qnap_firmware.xml?t=1637064692 HTTP/1.1" 502 182 "-" "curl/7.43.0"
73.233.x.x - - [16/Nov/2021:13:11:33 +0100] "GET /qnap_firmware.xml?t=1637064690 HTTP/1.1" 502 182 "-" "curl/7.43.0"
151.54.x.x - - [16/Nov/2021:13:11:33 +0100] "GET /qnap_firmware.xml?t=1637064692 HTTP/1.1" 502 182 "-" "curl/7.43.0"
79.184.x.x - - [16/Nov/2021:13:11:33 +0100] "GET /qnap_firmware.xml?t=1637065440 HTTP/1.1" 502 182 "-" "curl/7.43.0"
126.85.x.x - - [16/Nov/2021:13:11:36 +0100] "GET /qnap_firmware.xml?t=1637067096 HTTP/1.1" 502 182 "-" "curl/7.43.0"
89.143.x.x - - [16/Nov/2021:13:11:36 +0100] "GET /qnap_firmware.xml?t=1637064695 HTTP/1.1" 502 182 "-" "curl/7.43.0"
92.154.x.x - - [16/Nov/2021:13:11:36 +0100] "GET /qnap_firmware.xml?t=1637064695 HTTP/1.1" 502 182 "-" "curl/7.43.0"
212.106.x.x - - [16/Nov/2021:13:11:37 +0100] "GET /qnap_firmware.xml?t=1637064695 HTTP/1.1" 502 182 "-" "curl/7.43.0"
84.30.x.x - - [16/Nov/2021:13:11:38 +0100] "GET /qnap_firmware.xml?t=1637064033 HTTP/1.1" 502 182 "-" "curl/7.43.0"
95.154.x.x - - [16/Nov/2021:13:11:38 +0100] "GET /qnap_firmware.xml?t=1637064696 HTTP/1.1" 502 182 "-" "curl/7.43.0"
185.125.x.x - - [16/Nov/2021:13:11:39 +0100] "GET /qnap_firmware.xml?t=1637064698 HTTP/1.1" 502 182 "-" "curl/7.43.0"
112.193.x.x - - [16/Nov/2021:13:11:41 +0100] "GET /qnap_firmware.xml?t=1637064699 HTTP/1.1" 502 182 "-" "curl/7.43.0"
```

QSnatch malware

- **Potential Legacy Risk from Malware Targeting QNAP NAS Devices**

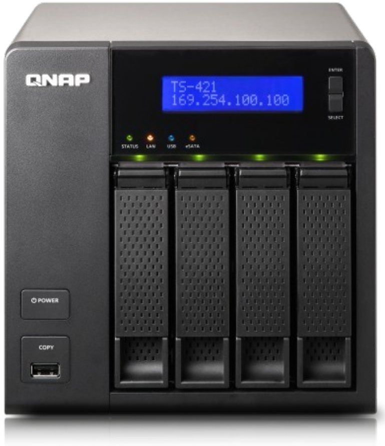
  ...The attacker then uses a domain generation algorithm (DGA) to establish a command and control (C2) channel that periodically generates multiple domain names for use in C2 communications - using the following HTTP GET request [1]:

  HTTP GET https://[generated-address]/qnap_firmware.xml?=t[timestamp]

[1] https://www.cisa.gov/uscert/ncas/alerts/aa20-209a

QNAP

- Network-attached storage (NAS) appliances



Results

- **4028** unique IP addresses
  - **726** networks (AS)
  - **90** countries

CSIRT mailing campaign

- We used abuse contact to reach IP address operator
- We sent e-mails with notification about infected QNAP device
  - **56** national/governmental CSIRTs (**3585** Ips)
  - **597** abroad e-mail addresses

Future steps

- Automatization
  - DGA domain candidates ✓
  - Domain registration (not tested)
  - InetSim can accept any domain ✓
- Analyse results
- Automate mailing results

Thank You

Martin Kunc

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REGISTRY