DNS Abuse:
how Kaspersky can help to counteract it

Alexey Shulmin
Malware Expert,
Threat Exploration

kaspersky

Agenda

What DNS Abuse consists of

Malwares abused DNS

Takedown service

DNS Tunneling

Botnets abused DNS

The Botfarm Project

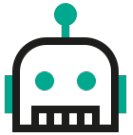
Three main groups of attacks on DNS

Q&A Session

DNS Abuse

According to DNS Abuse Framework [1], "DNS Abuse is composed of five broad categories of harmful activity insofar as they intersect with the DNS":

Malware



Botnets

Spam

Phishing

Pharming

[1] https://dnsabuseframework.org/media/files/2020-05-29_DNSAbuseFramework.pdf

Malware

is malicious software, installed on a device without the user's consent, which disrupts the device's operations, gathers sensitive information, and/or gains access to private computer systems [1].

URL Reputation, IDS, WEB-AV, Snort/Suricata

Malicious domains / malicious URLs (resources where the malicious software is hosted)

273,033,368 unique malicious URLs were blocked in Q2 2022

Drive-by attacks (web-exploits)

Almost disappeared now

DNS as a covert channel (DNS Tunneling)

DNS backdoors (dnscat2)

[1] https://www.internetjurisdiction.net/uploads/pdfs/Papers/Domains-Jurisdiction-Program-Operational-Approaches.pdf

Takedown Service

Takedown Service

Challenge

Cybercriminals create malicious and phishing domains which are used to attack companies and brands. The inability to quickly mitigate these threats, once identified, can lead to the loss of revenue, brand damage, loss of customer trust, data leaks, and more.

But managing takedowns of these domains is a complex process that requires expertise and time.

Solution

Our many years of experience in analyzing malicious and phishing domains mean we know how to collect all the necessary evidence to prove that they are malicious. We'll take care of a takedown management and enable swift action to minimize digital risks.

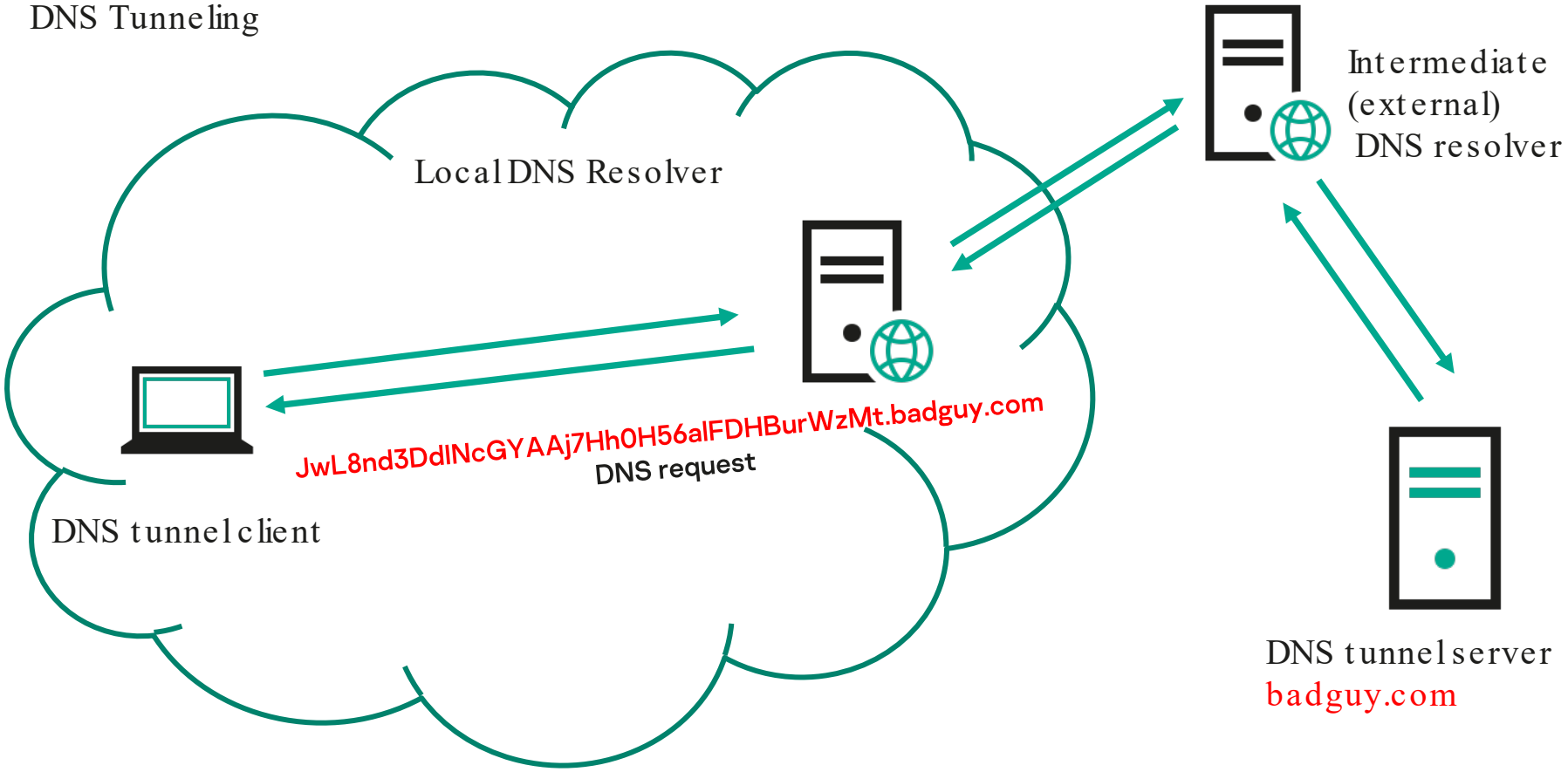
Takedown Service

How it works

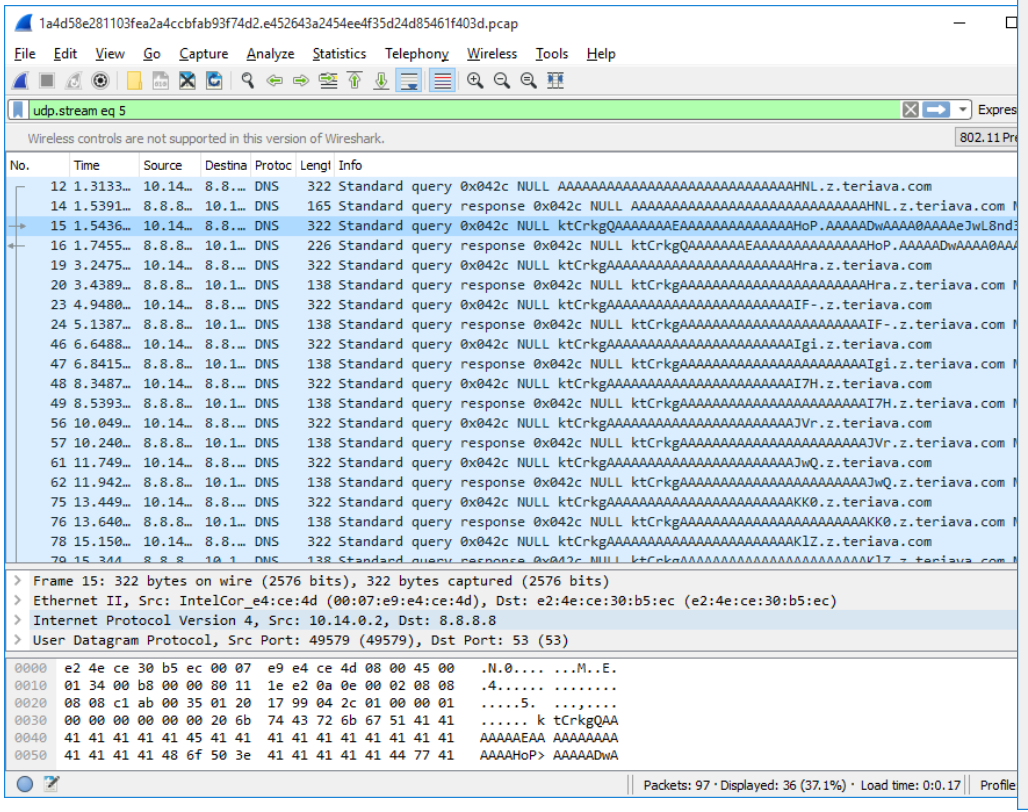
Our clients can submit their requests via our corporate customer support portal. We will prepare all the necessary documentation and will send the request for takedown to the relevant local/ regional authority (CERT, registrar, etc.) that has the necessary legal rights to shut down the domain. They will receive notifications at every step of the way until the requested resource is successfully taken down

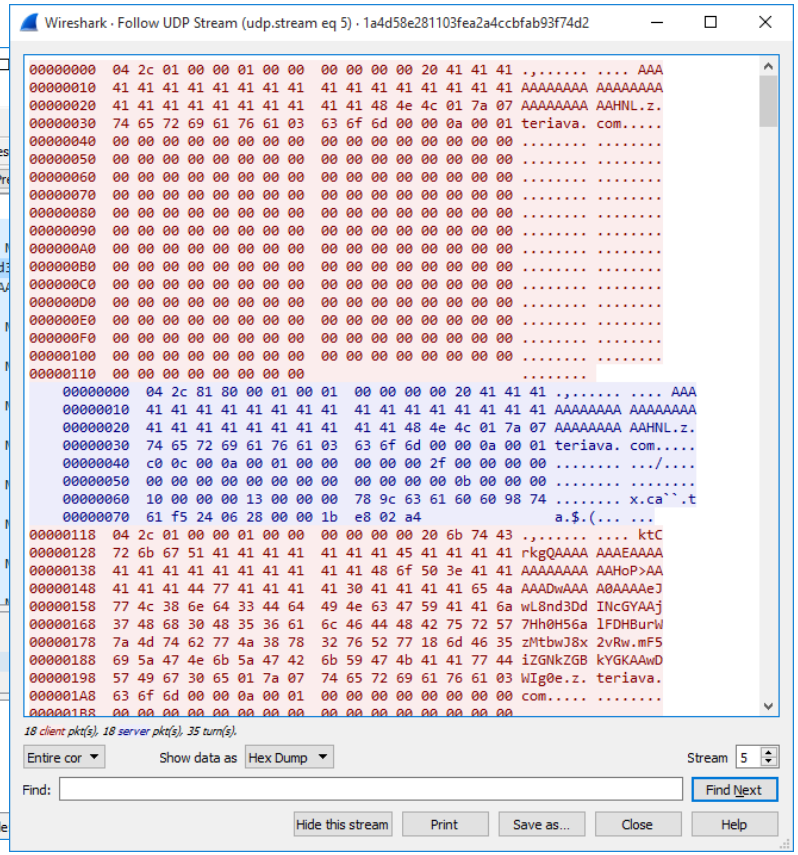
DNS Tunneling

DNS Tunneling

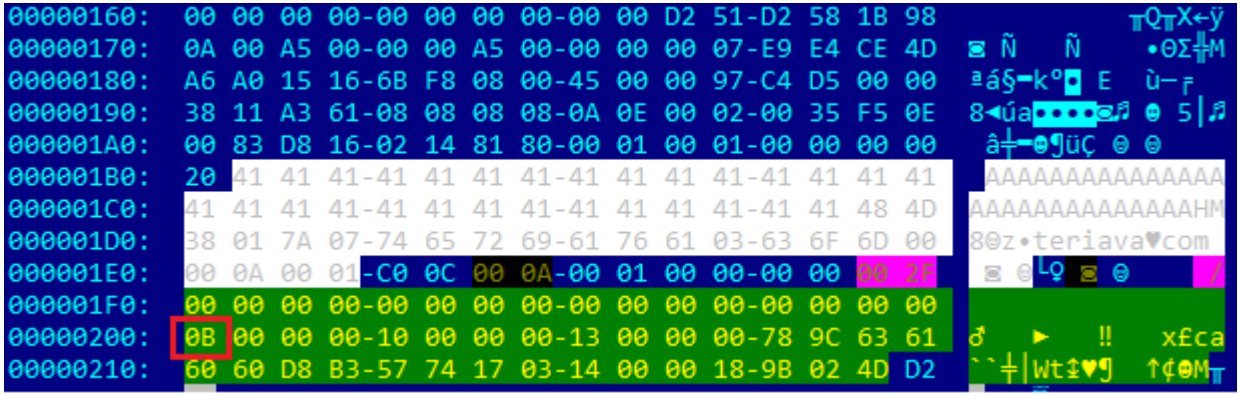


Backdoor.Win32.Denis





Response from C&C



```
00000160:  00 00 00 00-00 00 00 00-00 00 D2 51-D2 58 1B 98
00000170:  0A 00 A5 00-00 00 A5 00-00 00 00 07-E9 E4 CE 4D
00000180:  A6 A0 15 16-6B F8 08 00-45 00 00 97-C4 D5 00 00
00000190:  38 11 A3 61-08 08 08 08-0A 0E 00 02-00 35 F5 0E
000001A0:  00 83 D8 16-02 14 81 80-00 01 00 01-00 00 00 00
000001B0:  20 41 41 41-41 41 41 41-41 41 41 41-41 41 41 41
000001C0:  41 41 41 41-41 41 41 41-41 41 41 41-41 48 4D 38
000001D0:  38 01 7A 07-74 65 72 69-61 76 61 03-63 6F 6D 00
000001E0:  00 0A 00 01-C0 0C 00 0A-00 01 00 00-00 00 00 2F
000001F0:  00 00 00 00-00 00 00 00-00 00 00 00-00 00 00 00
00000200:  0B 00 00 00-10 00 00 00-13 00 00 00-78 9C 63 61
00000210:  60 60 D8 B3-57 74 17 03-14 00 00 18-9B 02 4D D2
```

```
case CMD_SET_CFG:
  v26 = (int *)Src;
  if ( (unsigned __int8)set_config(Src) )
    dword_B6BE7C = *v26;
  v13 = collectPCInfo(&lpAddress);
  *(_DWORD *)a2 = 4;
  goto clean;
case CMD_REG:
  v13 = collectPCInfo(&lpAddress);
  *(_DWORD *)a2 = 3;
  goto clean;
```

```
FFFFFFFF ; enum CMDS, mappedto_64
FFFFFFFF CMD_API_RUN       = 1
FFFFFFFF CMD_FREE_LIB      = 2
FFFFFFFF CMD_PROC_START    = 3
FFFFFFFF CMD_READ_FILE     = 4
FFFFFFFF CMD_SHELL_RES     = 5
FFFFFFFF CMD_NONE          = 6
FFFFFFFF CMD_WRITE         = 7
FFFFFFFF CMD_ENUM_WINDOWS  = 0Ah
FFFFFFFF CMD_GET_COM_INFO  = 0Bh
FFFFFFFF CMD_REG           = 0Ch
FFFFFFFF CMD_FIND          = 0Fh
FFFFFFFF CMDS_MOVE         = 10h
FFFFFFFF CMD_DELETE        = 11h
FFFFFFFF CMD_DRVS_INF      = 12h
FFFFFFFF CMD_CREATE_DIR    = 13h
FFFFFFFF CMD_REMOVE        = 14h
FFFFFFFF
```

Command accomplished


```
ktCrkgQAAAAAAAEAAAAAAAAAAAAAAHoP>AAAAADwAAAA0AAAAeJwL8nd3DdINcGYAAj7Hh0H56alFDHBurWzMtbwJ8x2vRw.mF5iZGNkZGBkYGKAAwDWIg0e==
```

BASE 64 decoding

```
00000000:  92 D0 AB 92-04 00 00 00-00 00 01 00-00 00 00 00  Т╦лТ♦       ☻
00000010:  00 00 00 00-00 00 7A 0F-00 00 00 00-3C 00 00 00        z☼    <
00000020:  34 00 00 00-78 9C 0B F2-77 77 0D D2-0D 70 66 00  4   xbð€ww♪╥♪pf
00000030:  02 3E C7 87-41 F9 E9 A9-45 0C 70 6E-AD 6C CC B5  ☻>╟зA·щйE♀pnнl╠╡
00000040:  BC 09 F3 1D-AF 47 09 85-E6 26 46 36-46 46 06 46  ╝○ѓ↔nGoЕц&F6FF♠F
00000050:  06 28 00 30-0D 62 20 D1-           -            ♠( 0♪b ╤
```

Zlib unpacking

```
ROGER-PC     ♫AcRoger PC     ♫Ac}↔\╔nРЯА╣Z↕UmaYБYYQYP
```

Response from c&C

- **DNS request's length**
  - `alert udp any any -> any 53 (msg:"Large DNS Query, possible cover channel"; content:"|01 00 00 01 00 00 00 00 00 00|"; depth:10; offset:2; dsize:>40; sid:192830182903; rev:1;)`
  - `alert udp $HOME_NET any -> any 53 (msg:"Long dns sub-level domains";content:"|01 00 00 01 00 00 00 00 00 00|"; depth:10; offset:2; pcre:"/[\x30-\xFF]{1}[\dA-Za-z\/+=]{48,}(?:[\x02-\xFF]\S{2,})+\x00/";sid:3843858;)`

- **Typical view of the DNS requests**
  - `alert udp $HOME_NET any -> any 53 (msg:"Not many numbers"; content:"|01 00 00 01 00 00 00 00 00 00|"; depth:10; offset:2; pcre:"/\x00[\x30-\xFF]{1}(?:\S+[^\-\d]\d){5,}(?:[\x02-\xFF]\S{2,})+\x00/"; sid:3858858;)`

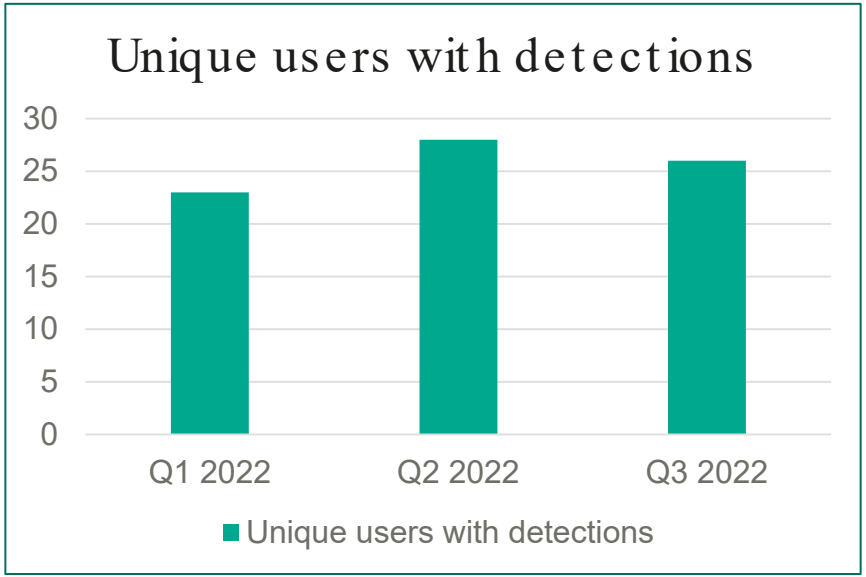
Dnscat2[1]

Introduction

Welcome to dnscat2, a DNS tunnel that WON'T make you sick and kill you!

This tool is designed to create an encrypted command-and-control (C&C) channel over the DNS protocol, which is an effective tunnel out of almost every network.

This README file should contain everything you need to get up and running! If you're interested in digging deeper into the protocol, how the code is structured, future plans, or other esoteric stuff, check out the doc/ folder.



[1] https://github.com/iagox86/dnscat2

Botnets

are collections of Internet-connected computers that have been infected with malware and commanded to perform activities under the control of a remote administrator [1].

Malicious domains / malicious URLs (**command and control servers** and other auxiliary resources)

118 active botnet families are monitored by our botfarm system (more than **229k** bots)

DDoS-attacks (at DNS servers)

Sometimes they happen even suddenly

Spoof.dns attacks
(Not a classic DNS spoofing attack, but sort of)

[1] https://niccs.cisa.gov/cybersecurity-career-resources/glossary#B

DNS DDoS Story (fun fact)

- several years ago a huge number of requests to non-existed domains 2-nd and 3-d levels were registered; it created enormous load at DNS-severs RU zone;
- there was a new version of well-known spam-bot Lethic behind that attack;
- we researched that version of trojan and discovered that the trojan, while was working in a multi-thread mode, created a lot of DNS-requests to non-existed subdomains;
- that trojan tried to hide the original CnC-communication that way;
- despite this story is interesting because it led to events that the developer, probably, had not expected, DDoS-attacks on DNS servers are not something new or highly-sophisticated, we are faced with such attacks on DNS-servers of our clients a lot of times.

- Bot tracking system
- Bot communication emulation
- Bot commands logging
- It can be used to:
  to extract malicious domains from samples;
  to predict newly registered malicious domains;

The Botfarm project

2022-09-28T18:40:10.346003+03:00 spoof.dns on o.com	
fake	209.85.229.104
2022-09-28T18:40:10.565766+03:00 spoof.dns on www.a s.ru	
fake	209.85.229.104
2022-09-28T18:40:10.777209+03:00 spoof.dns on forum .com	
fake	209.85.229.104
2022-09-28T18:40:10.988942+03:00 spoof.dns on www.ant t.com	
fake	209.85.229.104
2022-09-28T18:40:11.201511+03:00 spoof.dns on www. .com.au	
fake	209.85.229.104

2022.09.28 18:42:16	attack.start	spoof.dns on .de	config_decrypted(text) config_json(text) config_raw(text)
2022.09.28 18:42:16	attack.start	spoof.dns on ant .com	config_decrypted(text) config_json(text) config_raw(text)
2022.09.28 18:42:16	attack.start	spoof.dns on ru. com	config_decrypted(text) config_json(text) config_raw(text)
2022.09.28 18:42:16	attack.start	spoof.dns on www.persona .com	config_decrypted(text) config_json(text) config_raw(text)
2022.09.28 18:42:15	attack.start	spoof.dns on pct .com	config_decrypted(text) config_json(text) config_raw(text)
2022.09.28 18:42:15	attack.start	spoof.dns on guide.com	config_decrypted(text) config_json(text) config_raw(text)
2022.09.28 18:42:15	attack.start	spoof.dns on bs.com	config_decrypted(text) config_json(text) config_raw(text)

Summarize

- Attacks on DNS
- Attacks, performed by using DNS
- Attacks on DNS clients

Kaspersky DDoS Prevention

- **Attacks on DNS infrastructure (not DNS -specific):**
  - To scale DNS infrastructure
  - To use a special anti-DDoS solution or service, like Kaspersky DDoS Prevention
- **DNS request flood**
  - To scale DNS infrastructure
  - Fine tuning of service
  - To use a special anti-DDoS solution or service, like Kaspersky DDoS Prevention
- **NSXDOMAIN flood (a subset of DNS request flood attack)**
  - Mitigation measures are the same as for DNS request flood attack

- **DNS amplification DDoS:**
  - To tune your DNS-server correctly (if it is vulnerable to this attack, most likely it does not tune correctly)

Kaspersky Anti Targeted Attack Platform

- **DNS tunneling**
  - To use the complex of measures and settings and a special product or service, like, for example, Kaspersky Anti Targeted Attack Platform

- **DNS cache poisoning:**
  - To set TTL as lower as possible (our Kaspersky DDOS Prevention Service team recommends to our clients to set TLL=300).
  - To use DNSSEC protocol (it was especially developed to prevent this attack).

Thank you!

Q&A session

Alexey Shulmin Malware Expert Alexey.Shulmin@Kaspersky.com

kaspersky