

The Bitdefender logo is displayed in white text against a dark blue background. The background features a complex network diagram with numerous nodes and connecting lines, overlaid on a grid pattern. Some nodes are highlighted with colored circles and labels like '19.78-C', '21.87-A', '39.06-C', '42.49-A', '65.18-B', '73.27-B', '88.96-B', '94.28-C', and '99.83-C'. There are also some green checkmarks and red X marks scattered throughout the network.

Security

New TrickBot Module Bruteforces RDP Connections, Targets Select Telecommunication Services in US and Hong Kong



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Executive Summary

Bitdefender researchers have discovered a new TrickBot module (rdpScanDll) built for RDP bruteforcing operations on select targets. The new module was discovered on January 30 and, based on the IP addresses it targets, victims seem to be US- and Hong Kong-based, predominantly in the telecom industry.

Our researchers have kept a close eye on TrickBot. On January 30, 2020, our monitoring systems reported the delivery of a new module, performing brute force operations on a list of targets defined and sent by the attackers.

Key Findings

rdpScanDll:

- New module that bruteforces RDP for a specific list of victims
- Still in development, as the module features a broken attack mode
- Targets mostly in telecom, education, and financial services in the United States and Hong Kong

TrickBot:

- Lateral movement modules receive the most updates
- Dynamic C&C infrastructure, mostly based in Russia.
- Over 100 new C&C IPs added each month, with an average lifetime of about 16 days

Teaching and Old Dog New Tricks

While TrickBot is a Trojan that has been around since 2016, it turns out that you *can* teach an old dog new tricks. While it started out as a credential-harvesting threat mostly focusing on e-banking, its plugin-based design has made it much more than just a threat focused on financial data theft. Security companies and researchers have previously analyzed a wide range of modules, proving that the Trojan is still under active development and undergoing constant “feature upgrades”.

The flexibility allowed by this modular architecture has turned TrickBot into a very complex and sophisticated malware capable of a wide range of malicious activities, as long as there is a plugin for it.

From “add-ons” for stealing OpenSSH and OpenVPN sensitive data, to modules that perform SIM-swapping attacks to take control of a user’s telephone number, and even disabling Windows built-in security mechanisms before downloading its main modules, TrickBot is a jack-of-all-trades. Another interesting aspect is that, while there are a handful of core modules, each new module is accompanied by a

configuration file, potentially making each functionality fully independent.

TrickBot has been mostly distributed through spam campaigns but it was also seen in cahoots with other threats. Distributed by the Emotet spam-sending botnet to deliver Ryuk ransomware, TrickBot operators have extended its capabilities into one of the most advanced malware delivery vehicles out there.

This combo relied on Emotet for its huge spam campaign and effective social engineering, on TrickBot for its aggressive network spreading capabilities, and on the Ryuk ransomware for the final payload and direct monetization. The spam campaigns have focused on targeting organizations by going after enterprise assets.

New module: rdpScanDll

The new module was discovered on January 30, and its main functionality is to perform bruteforce operations on a list of targets.

The modus operandi is similar to that of other plugins. The TrickBot executable will download the plugin and its configuration file (from one of the available online C&Cs) containing a list of servers with whom the plugin will communicate to retrieve commands to be executed. TrickBot will load the plugin, executing the “start” and “control” exported functions, passing the configuration file as an argument for the last mention function.

This plugin shares the configuration file with another module, vncDll, but uses different URL endpoints to distinguish itself.

The communication with these new servers has a certain pattern. The structure of the URLs the plugin is using is as follows:

`https://<C&C>/<tag>/<computerID>/<controlEndpoint>`

Where:

- **C&C** – is one of the command and control servers from the configuration file
- **tag** – is the group tag used by the underlying TrickBot sample

- **computerID** – is the computer ID used by the underlying TrickBot sample
- **controlEndpoint** is one of the following:
 - **/rdp/mode** - used to determine what kind of attack the plugin should use
 - **/rdp/freq** - used to determine how frequently to report different statuses back to the server
 - **/rdp/domains** - a list of IP: Port pairs that will be attacked (the targets); note that when the port is missing, the plugin will use the canonical RDP port of 3389
 - **/rdp/over** - a list of IP: Port pairs that will be attacked after the previous list (returned by **/rdp/domains**) is exhausted
 - **/rdp/dict** - a list of passwords to try in the bruteforce process
 - **/rdp/names** - a list of usernames to try in the bruteforce process
 - **/81** - used to report different statuses back to the server (what IP: Port pairs are online or offline and what username - passwords have matched)

The plugin has three attack modes at its disposal: **check**, **trybrute** and **brute**.

Check Mode

The **check** mode should check for RDP connection on the list of targets (both **/rdp/domains** and **/rdp/over**). To do that, it first retrieves the frequency, then it retrieves and checks the list of targeted IPs from **/rdp/domains**, and finally it retrieves and checks the list of targeted IPs from **/rdp/over**. During testing, we found the plugin retrieves and checks the IP list from **/rdp/over** repeatedly. If the plugin is deployed on a larger number of victims, these collective repeated checks could flood the C&C server with requests.

TryBute Mode

The **trybrute** mode will perform a bruteforce operation on the list of targeted IPs returned by **/rdp/domains**, and later on the one returned by **/rdp/over**, using the usernames from **/rdp/names** and the passwords from **/rdp/dict**.

Brute Mode

The plugin looks like it's still in development, besides the inclusion in the executable of a set of functions that aren't called, the attack mode **brute** seems broken. The brute attack mode doesn't fetch the username list, causing the plugin to use null passwords and usernames to authenticate on the targets list.

If a host is found online, the plugin reports to the C&C through a POST multipart request to the /81 endpoint with the list of online IPs. The same happens if the plugin finds the credentials to a certain target. The plugin also reports to the /81 endpoint on a regular basis, with information about its state. At the same time, it will report to the main TrickBot executable statistics about the state of the execution and, when it finds working credentials, the username and password it found for a particular target.

During the analysis of pScanDll module, we were able to retrieve several updates for the lists of targeted IPs (both /rdp/domains and /rdp/over). At the time of writing, the lists contained 49 IP addresses (/rdp/domains) and 5,964 IP addresses (/rdp/over). Most of these targets are located in United States and Hong Kong. The geographical distribution of these lists is illustrated below.

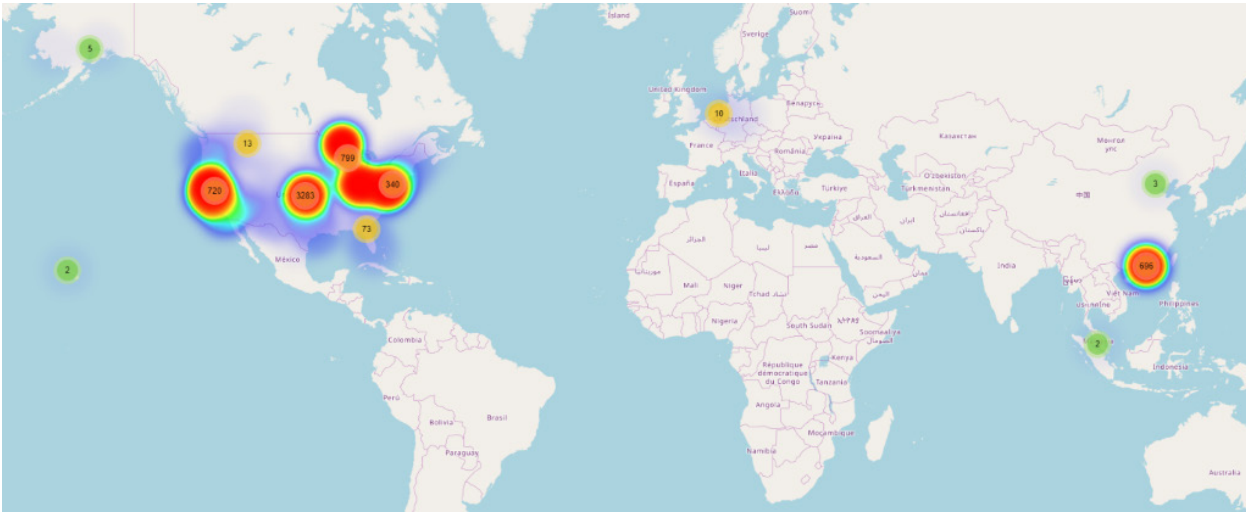


Fig. 1 - Geographical distribution of /rdp/over IP addresses

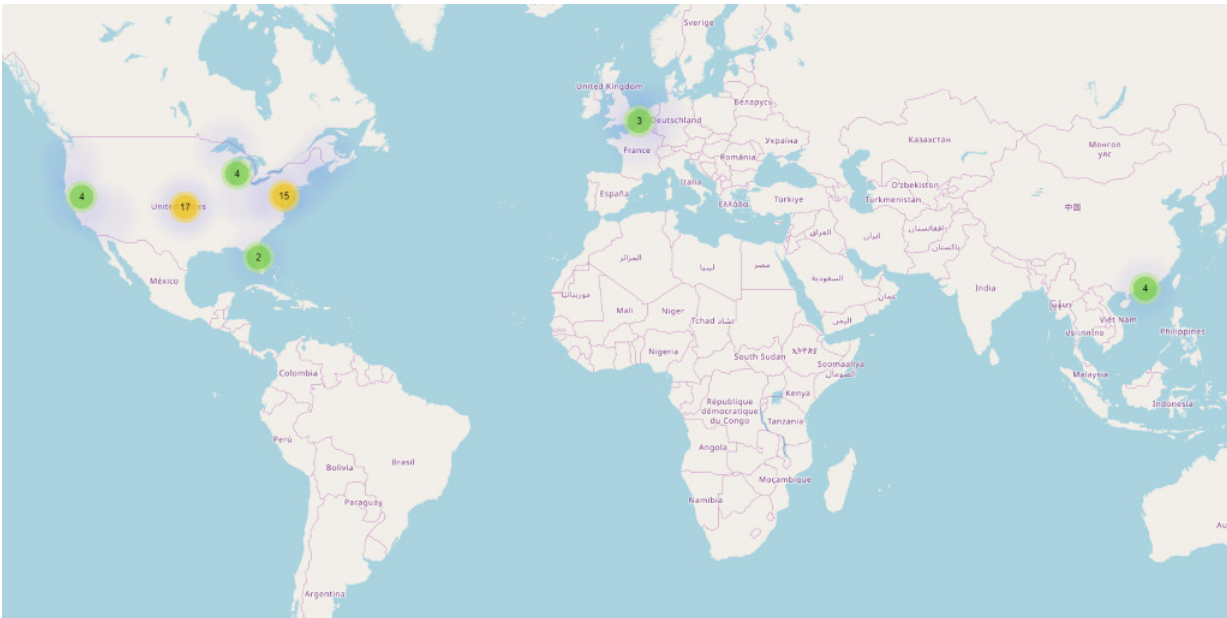


Fig. 2 - Geographical distribution of /rdp/domains IP addresses

When performing a screen on these targets, we found that they fall on different verticals, as observed in the chart below:

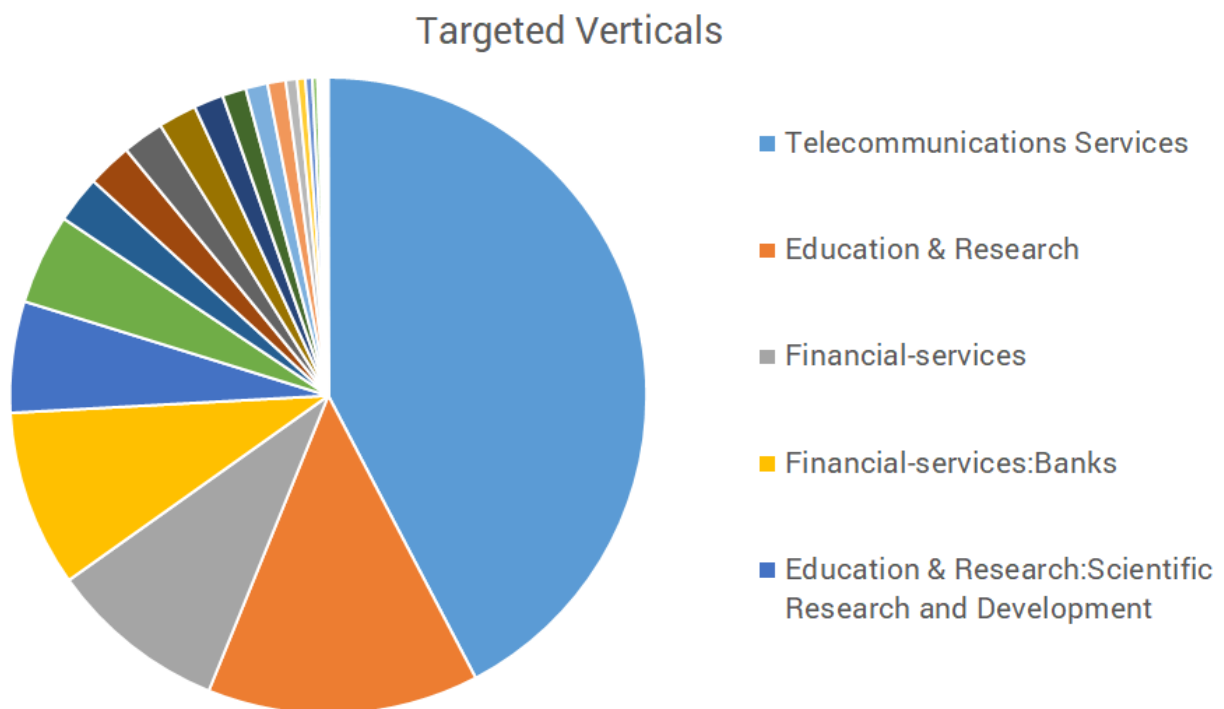


Fig. 3 - Most affected verticals

Modules overview

TrickBot has an embedded list of command and control servers and a list of “must-have” plugins. First, it contacts the servers to retrieve these plugins, as well as an updated list of command and control servers and an additional list of servers, used only for downloading purposes. After these initial actions, it awaits further instructions. One command is to start a certain plugin. If that plugin does not exist, it uses the list of download servers to retrieve it first, then it loads the plugin and executes the indicated exported function (from the command). As a persistence mechanism, some of the plugins are loaded automatically when TrickBot malware is started, without waiting for a command from the C&C servers.

During the last 6 months of close monitoring and gathering statistics about this threat, our systems were able to retrieve updates for several different active plugins, gathered around different functionalities, proving to have all the right tools to perform an end-to-end attack:

- **Lateral Movement**

- *WormDll/mWormDll/tWormDll* - a worm component responsible for spreading into the local network via SMB by exploiting through EternalBlue
- *TabDll* - uses EternalRomance to spread into the network via SMB
- *ShareDll/mShareDll/tShareDLL* - remote service manager using stolen credentials to install remote services on other computers from the network

- **Reconnaissance**

- *SystemInfo* - collects information about the affected system
- *NetworkDll* - performs network mapping

- *Psfin* - meant to identify POS-related terminals inside the compromised domain
- **Collection**
 - *ImportDll* - collects varying browser information such as cookies or browser configuration
 - *Pwgrab* - steals credentials from various applications
 - *aDll* - steals active directory credentials
- **Setting Foothold**
 - *NewBCtestnDll* - performs reverse proxy and executes commands
 - *VncDll* - used by the attacker as RAT, giving the option to remotely view and control the victim's computer
- **Exfiltration**
 - *Mailsearcher* - searches for files with certain extensions (usually document files)
- **Financial data theft**
 - *InjectDll* - used to steal financial information through webinjects by monitoring various banking websites
- **Credential Access**
 - *RdpScanDLL* - performs bruteforce attack on a certain list of targets (indicated by the attacker)

While monitoring the updates of malicious plugins, we observed that the most frequently updated ones were those performing lateral movement: 32.07% of them were wormDll, 31.44% were shareDll and 16.35% were tabDll. The rest of the plugins had fewer than 5% occurrences.

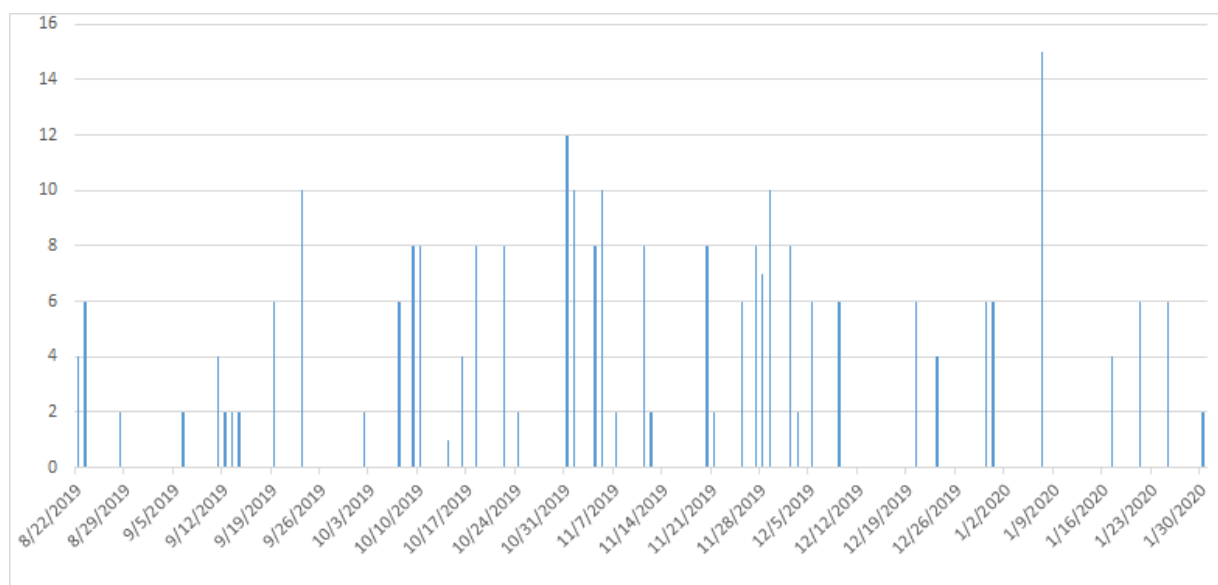


Fig. 4 - Timeline for plugin update

Some of these plugins can have configuration files, which serve varying purposes. If needed, they will be retrieved from the command and control servers. Some of those retrieved by our researchers are described below:

- *dinj* - configuration file for injectDLL plugin, containing information about targeted financial institutions; the attack uses server-side injections
- *sinj* - configuration file for injectDLL plugin, containing information about targeted financial institutions; the attack uses redirections (also known as web fake injections).
- *dpost* - also used by the injectDLL module, containing a list of servers; the stolen financial information is sent to one of the servers from this list

- *mailconf* - used by mailsearcher for exfiltration
- *srv* - used by rdpScanDLL as a list of C&C servers
- *vnccconf* - used by vncDLL and rdpScanDll for as a list of C&C servers

C&C servers

Our monitoring systems focused on collecting new command and control servers, both from embedded lists inside the samples and by constantly checking for C&C updates. We were able to retrieve 3,460 IP addresses, divided into 2,926 command and control servers and 556 servers dedicated to downloading new plugins, and 22 IPs serving both roles. The dynamics of the infrastructure can be defined by a rough statistic of around 100 new IPs added each month with each IP having an average lifetime of about 16 days.

Illustrated below is the geographical distribution of these servers. As can be observed, the threat actor prefers infrastructure from Russia.

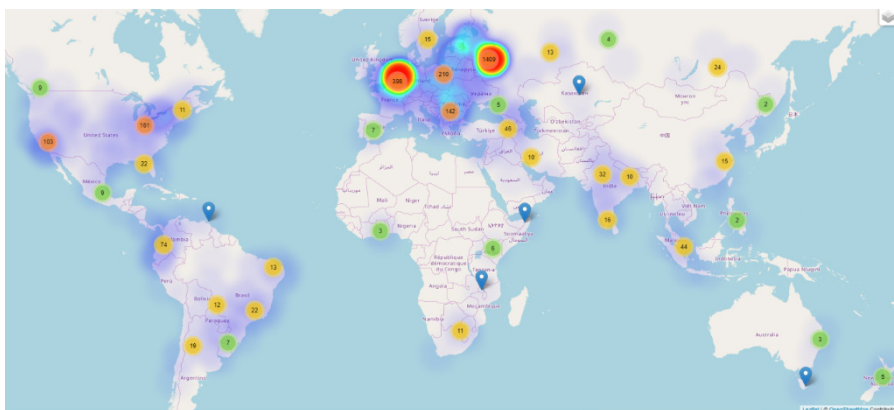


Fig. 5 - Geographical distribution of Command and Control servers

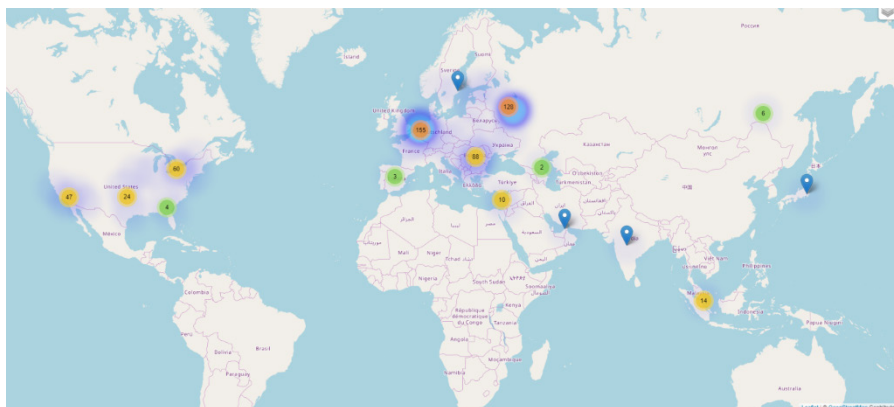


Fig. 6 - Geographical distribution of Servers used for download purposes

Victims

Since TrickBot is a mass attack threat, spreading mostly through spam e-mails, victims fall into multiple verticals and are spread all over the globe. Telemetry from our Network Attack Defense technology for the last month shows that most victims attempting to connect to a command and control server are based in the US, followed by Spain. This kind of distribution usually can be observed when massive spam campaigns are focused on particular geographical areas.

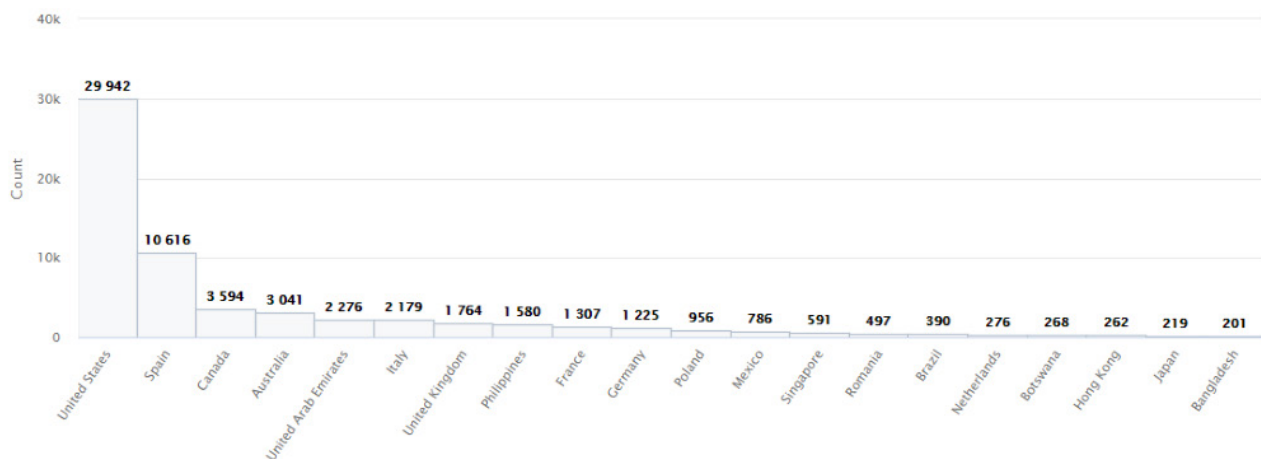


Fig 7 - Geographical distribution of victims contacting command and control server over the last month

Conclusions

The new rdpScanDll module may be the latest in a long line of modules that have been used by the TrickBot Trojan, but it's one that stands out because of its use of a highly specific list of IP addresses. While the module seems to be under development, as one attack mode seems broken, newer versions of rdpScanDll will likely fix this and potentially add new ones.

The new module also offers a glimpse into how TrickBot operators act. Using an existing infrastructure of TrickBot victims, the new module suggests attackers may also be focusing on verticals other than financial, such as telecommunications services and education & research.

Indicators of Compromise

An up-to-date list of indicators of compromise is available to Bitdefender Advanced Threat Intelligence users. More information about the program is available at <https://www.bitdefender.com/oem/advanced-threat-intelligence.html>.

Plugin samples

NewBCtestnD1132

```
6e61106594e106fc2192fdf341b63732d7cc2d13ee50dbb07234de416b851905
042774b7335f33a0813862b366c5fc2e70768f63b4cb0b98d53523a9636482b4
99f2d1f09246f6903a72d1056b96782a0242f1862d38d51e083e453acf1cde67
0cbca659207cc738798475355307ac580a75e5d3ac366ae377e622bb718ac723
```

NewBCtestnD1164

```
de7273f2d4a9f34523e4bb51cb867f91aafeccldfbce8df93299bd4038b1af69
cc9afe85292904747cac2ab4f13d9e02414ec561315f186b844b135a9cfa45aa
3c665472455558ea2ce7a7de637d53dd1868baaa6eff77538d31303424a86fdd
8f2ff42df687d6e2ed6df2c3c45092be7a07347b9819c5cd7589c64c3b4dee60
```

importD1132

```
cd79145f9eff2131d015fb729b32d79270a1690d2955b0945d6b8451bafebb99
5a5ed23fafe8038a44213cefab6fbd392ff672e27025e4185f94c68fe6590e91
4eb803eb95eb8b9533e957706e1861932036beb5eef019bf77aaeba7202fa303
```

importD1164

```
03e19745382c0f0a94a098a6d58630ba2af2b6bf65e21a230084e8cadcbef368
709a62ed92806ee68cd062966102354cae371d0f9f7a9cd17edf31e4c8dc663
e557d2018fae0621065c0d93836d09848d84f92e8188f947b8c8a1fa436f5632
```

injectD1132

```
a58f21fd1cf462ce8b3259aff19e03709a416b872ada566e8f11afcba2f20aeb
5bc9740e7f5b26d0d5522e2f6eb612908ea298c8f83476b3c455106342579a5c
```

injectD1164

```
fd8fb7d97a9f5f00c0a7306baafb54667ba0d34bd2bbd253554c3a036a8c7b24
26d1ecab7e74a7bd1ecc84ef047a4908cb22d2ef47da191c7163bc7749e035ff
```

mailsearcher32

```
a4f94ae7bd9ead9d4cb9f7510bd7af861767f1a1aa57e1c40c334e559b882cc7
79ff0c8a3338b7e97b3bd454373e163e8156ab8097229083eb1285940974f9d8
```

mailsearcher64

```
8e9623a5210e0e99e519f48abd5ff90601d8858d53613e0045c88b94113c560f
c668899703e90877ea5498391b377ae58504768b050595266ea82434a82e68e5
```

**mshareD1132**

adb0a247879d65f56eb4d2409dcad6bf4feeb3cb9ee81278afba568c9bfcff7
ac1199d506c66802d5bb10eb77de437fc29dd7b5d2798ab2aa7c1031725a0f67
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mshareD1164

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255cfbd4ba7a83cf0b992b086aec8ded98351ce7483f3a156fbccdd0eb0405603
3416b411b362bd1114975f0197f8d27a77f72d47fccc47acceeae71a8b4bd333

mwormD1132

7af8aa870398f4687cd4cadef4bc5aead9c36c54878e027d5d227e61bac7d06d
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b43881e63ef433624f3d29b09f48f4057ef22e2ca6624baa1fdc41e55083a496

mwormD1164

2b0c29f925d3d806623bd880fc1b3e6bc54d01014a8187fec010cb441d627c41
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networkD1132

c8c789296cc8219d27b32c78e595d3ad6ee1467d2f451f627ce96782a9ff0c5f
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ec26875adfa3922e048f1b1406f9b2ded1c4dd77fbad342ef78d9a9f0c09e2cb

networkD1164

99b51e28c9e57f3aff2e5753298e676fc6bbec8bef2b23c299a75ccfdcbd9ab3
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psfin32

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psfin64

6c0b2d61b8b0f220b8ad59d98920af77d01b7eff84edcf582bcd3403817d9c1b

pwgrab32

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52f3d9a9e6a8e06e86acf5add134d3e77a80cf954584abd469e040879f80ec9a

pwgrab64

7c457d326b3fb97d3a48047d92e9a2a6968968cdbc4aa975539521a12f1952f9
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ca676483d55cbf63256fdf5828ada78d3fbb440aec391c03eef07744a31fbcfd

rdpscanD1132

f0638d630e847f421656de482b0503e468f34ea13e913ee89b30acafcc05940e

rdpscanD1164

b85284564923d39aaa0e64ccf1627e21a76188dbcefbal275bbe4bd3deeb9430

shareD1132

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shareD1164

786719da4638be77328ad3fd84763d6180da94801e5e968f0a98d85f9e4b43a6



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systeminfo32

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systeminfo64

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tabD1132

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tshareD1132

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tshareD1164

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twormD1132

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wormD1132

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wormD1164

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TrickBot Samples

b49f9422344bc2c6ce84bc35912f67df81895bcf0c361acdb0a740260a3a6775
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■ Command and Controls servers

45.148.120.13:443
5.2.78.77:443
107.172.165.149:443
45.148.120.14:443
23.95.231.164:447
51.89.73.154:447
45.148.120.31:447
178.156.202.143:447
198.23.252.136:447
64.44.133.39:447
146.185.253.170:447
185.252.144.64:447

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More MSP-integrated solutions than any other security vendor

3 Bitdefender Partner Programs - to enable all our partners – resellers, service providers and hybrid partners – to focus on selling Bitdefender solutions that match their own specializations

Trusted Security Authority

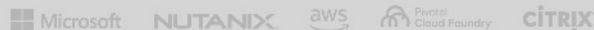
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RECOGNIZED BY LEADING ANALYSTS AND INDEPENDENT TESTING ORGANIZATIONS



TECHNOLOGY ALLIANCES



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Number of employees 1800+

Headquarters

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Technology HQ – Bucharest, Romania

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