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WAPPLES Web Application Firewall Multiple Vulnerabilities

TL:DR

Find out how multiple vulnerabilities in WAPPLES WAF allow an attacker to run arbitrary commands on the device with root privileges as well as access the device with privileges via a backdoor account.

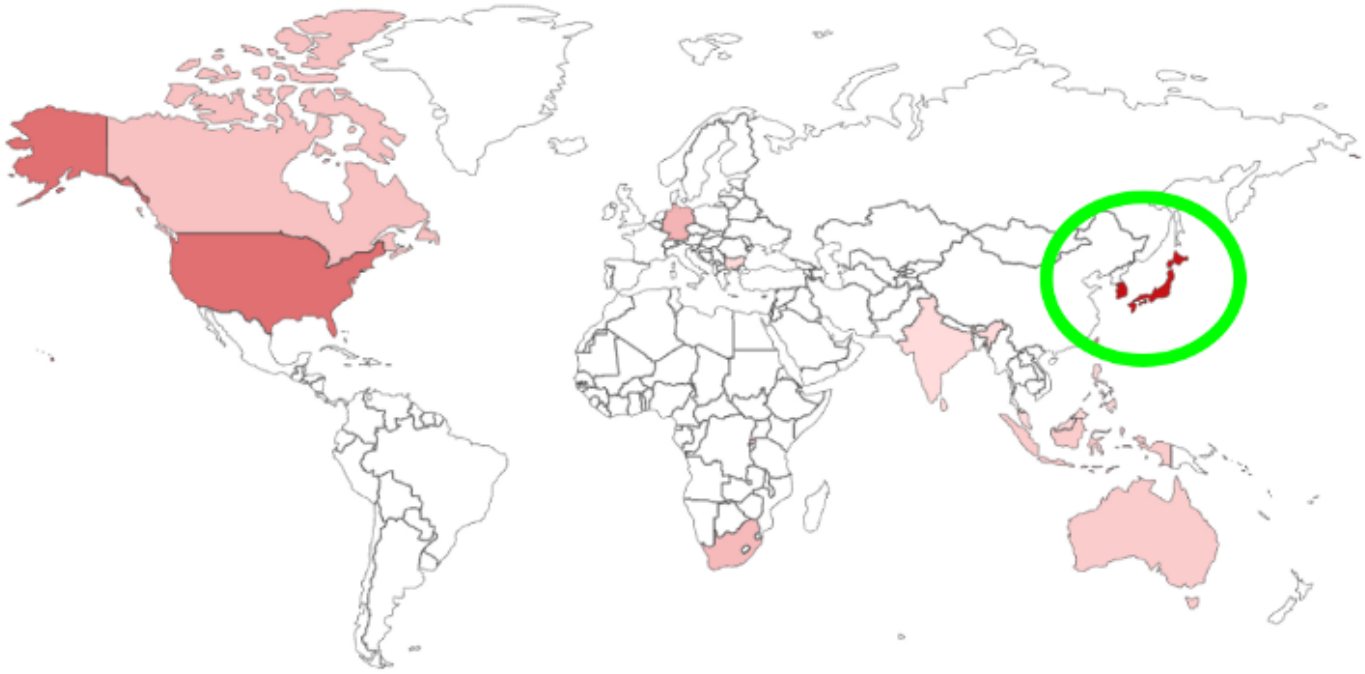
Vulnerability Summary

WAPPLES — “logical web application firewall” by Penta Security Systems Inc. founded in South Korea in 1997. Comes as a hardware appliance and a virtual machine. According to Shodan, it is most common in Korea and Japan.

In versions from 4.0 to 6.0, there are a number of vulnerabilities that allow a remote attacker to execute arbitrary code, obtain confidential information using predefined credentials that are not described in the user manual, as well as the use of vulnerable components. And also escalate user privileges to root in versions 5.0 and 6.0.

CVE list

CVE-2022-24706, CVE-2022-31322, CVE-2022-35413, CVE-2022-31324, CVE-2022-35582



Vulnerability Analysis

Foreword

The vendor assured me that patches or mitigations are ready for all the problems found. And customers are already receiving updates.

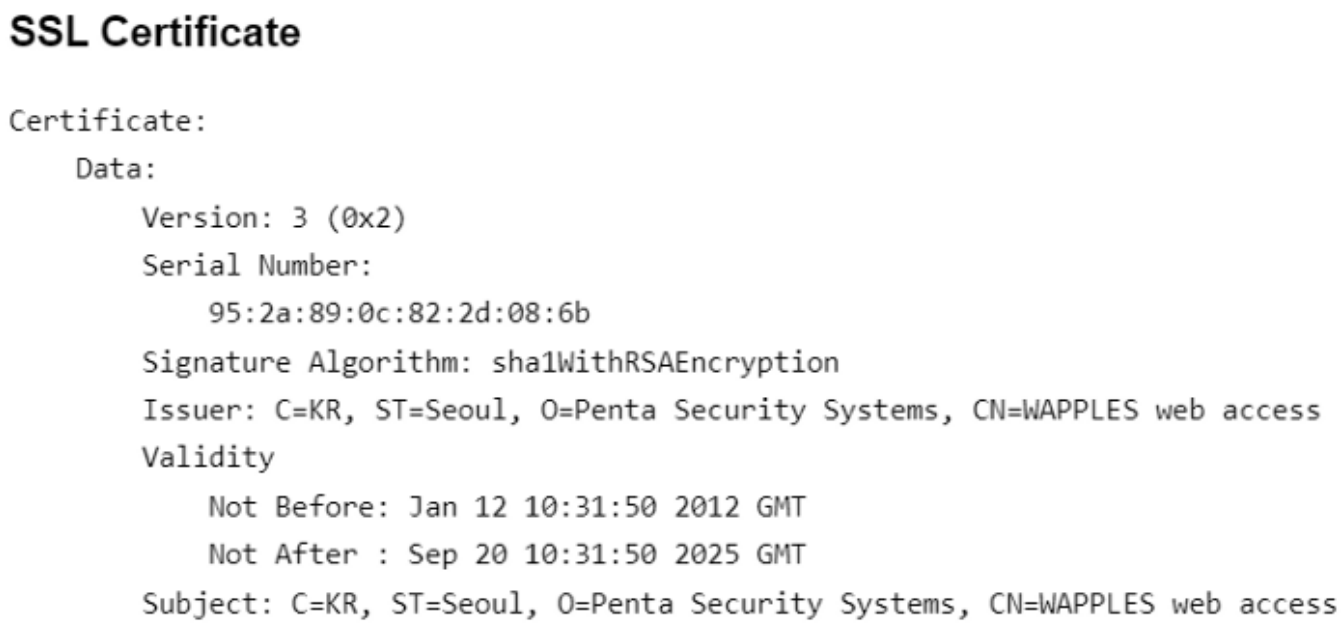
I also want to thank Hyeon Jae Jang of Cloudbric Corp. for his professional approach

Duplicate Web-UI certificate and SSH host keys

All WAPPLES instances found on shodan.io, as well as my local copies, had a pre-generated self-signed certificate for the web interface installed. Using a self-signed certificate is already a security risk, but the decision is up to the user.

```
ssl.cert.fingerprint:017b7408f0aa8da17c47c9fe326577df66ad7f78
```

Using the same certificate and private key on all installed copies carries additional risks for a Man-in-the-middle attack, since it costs nothing for an attacker to get a copy of the private key and the administrator will not notice the catch.

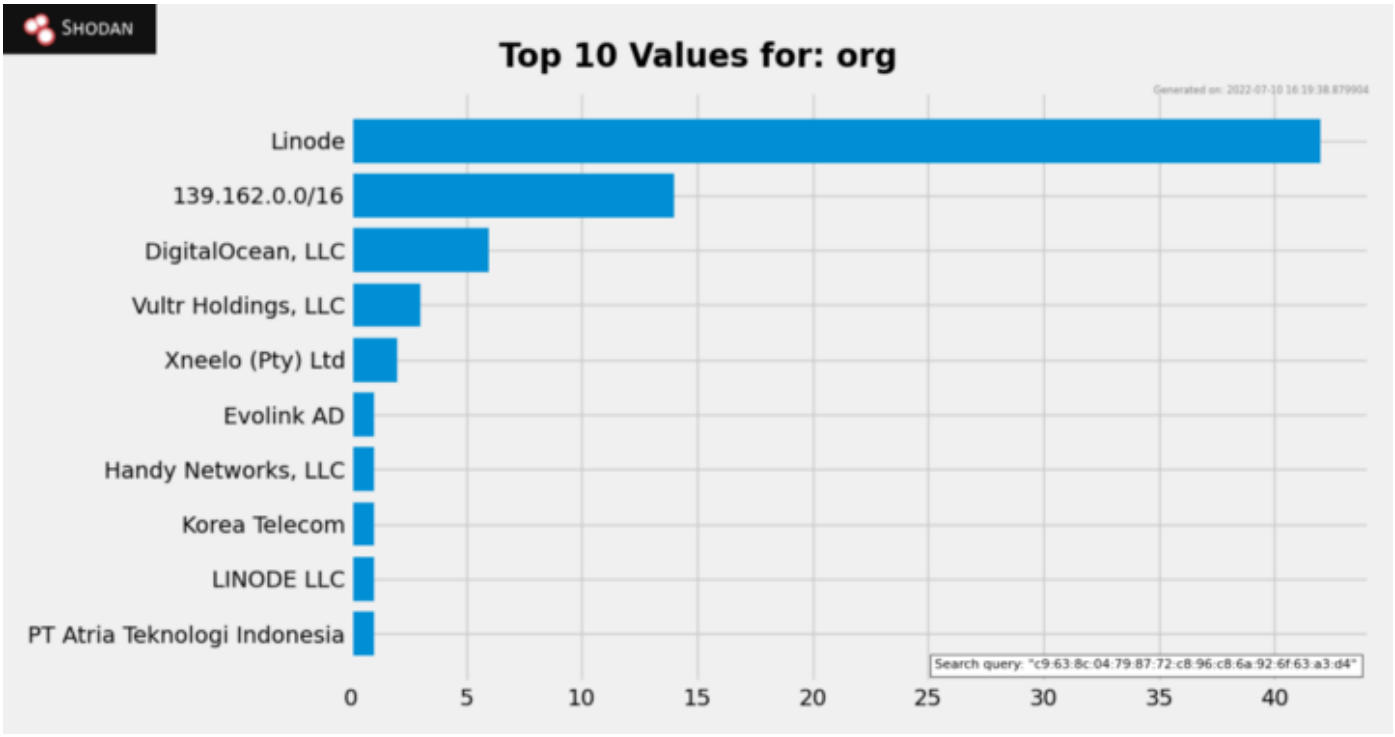


WAPPLES Web-UI certificate on Shodan

Duplicate ssh host keys are also a common problem among device and software manufacturers and WAPPLES is no exception. Digging in Shodan, I noticed the same SSH fingerprints in some instances belong to several cloud providers.

```
c9:63:8c:04:79:87:72:c8:96:c8:6a:92:6f:63:a3:d4
```

Most of the hosts are located in the Linode cloud.



How to fix?

For a Web-UI certificate, simply generate a new self-signed certificate, or better yet, either buy a trusted certificate and install it through the WAPPLES management console.

For SSH, remove keys and reconfigure ssh-server if you have access to the root shell. If not, you might use the vulnerabilities below 😉

```
# rm /etc/ssh/ssh_host_*
# dpkg-reconfigure openssh-server
# service sshd restart
```

Hidden Functionality (Backdoor)

The operating system that WAPPLES runs on has a built-in non-privileged user “penta” with a predefined password. The password for this user, as well as its existence, is not disclosed in the documentation. Knowing the credentials, attackers can use this feature to gain uncontrolled access to the device and therefore are considered an undocumented possibility for remote control.

The password is revealed in the system script and differs for different versions of the product. For security reasons, I will not publish the found passwords, but having a copy of the program, it will not be difficult to get them. Since the vendor no longer supports these versions, I highly recommend upgrading.

For version 5.0.12.* attacker can escalate privileges via vulnerability described below.

How to fix it?
Update to the latest supported version.

Vulnerable versions: 4.0., 5.0.0.*, 5.0.12.**
CVE-ID: CVE-2022–35582

Remote command execution

WAPPLES uses a vulnerable CouchDB version in default configuration that leads to remote OS command execution. To exploit this vulnerability the attacker must have access to the management interface. An attacker could gain unprivileged access to a system as a “couchdb” user, then escalate privileges using the other vulnerabilities described in this document.

You can read more about the exploitation and remediation of this vulnerability in my write-up about CouchDB vuln.

How to fix it?
Contact the vendor for a patch and block all unnecessary ports using built-in firewall or look at the link above.

Vulnerable versions: 6.0.4., 6.0.6.**
CVE-2022–24706

Local privilege escalation

Built-in utilities for moving files with SUID flag allow an unprivileged user to overwrite any file on behalf of the superuser.

Local unprivileged users are able to overwrite any file on behalf of the superuser. Which can lead to privilege escalation, such as adding permissions to use sudo without a password to the /etc/sudoers.d/ directory.

For version 6.0.* this is:

```
/opt/penta/wapples/bin/conf_mover
/opt/penta/data2/backup/wapples_integrity/bin/conf_mover
```

For version 5.0.12.* this is:

```
/opt/penta/wapples/bin/confMover
/opt/penta/backup/wapples_integrity/bin/confMover
```

Exploitation example

When launched, the `conf_mover` utility helpfully tells us how to use it:

First, let's try on an empty file. The example below shows that the unprivileged user *penta* copied the file as root:

It is also possible to copy files accessible only to the superuser:

How to fix it?
Contact the vendor for a patch or mitigation.

Vulnerable versions: 5.0.12., 6.0.**
CVE-2022–31322

Shell escape privilege escalation

I'm still not sure if the vendor provides access to the bash interpreter, so I can't say the issues below are a vulnerability. Nevertheless, I will describe them, because such use of the configurator shell was most likely not intended.

Wapples CLI provides access to a limited subset of standart linux system commands without the ability to launch a bash/sh shell, however the arguments to these commands are not filtered well enough for meta-character content like `&`, `` ` ``, `$` etc.

Obtaining an interactive shell with superuser rights from the "wapples" CLI section

Login with administrator creds and enter the *enable* command to access privileged CLI mode.

Enter to the *wapples* section and run one of the predefined commands with adding `& bash` to the end as command argument. You can see the list of commands by typing `?` instead of command, e.g `command ?`

And now you are **root**:

How to fix it?
Contact the vendor for a patch or mitigation.

*Vulnerable versions: 6.0.**
CVE-ID:none

Hardcoded credentials for Web-API

The predefined system account, which is not available for modification and viewing by standard ways, is present in the WAPPLES version 4, 5 and 6. Credentials are used in some system scripts.

The account can only be seen in the CouchDB database by connecting to it directly.

Credentials can be used only in API requests for the endpoint `https://<MGMT_IP>[:5001]/webapi/`. The list of API requests with examples can be viewed at `https://<MGMT_IP>[:5001]/docs/`.

There are many interesting things, such as user management, backup settings, SSL certificates and much more.

For example, with such a request, you can get the password from the SMTP account:

How to fix it?
Versions 4 and 5 need to be updated as they are no longer supported. For the version 6, you need to get a fix from the vendor.

Vulnerable versions: 4.0. (>=4.0.54.1), 5.0.*, 6.0.**
CVE-2022–35413

Web-API arbitrary file download (authenticated)

Another way to download an arbitrary file, this time through the API. In this case, you can use the hard coded *systemi* account described above, so in fact, this is an unauthenticated arbitrary fIle download.

```
$ curl -k -b 'WP_SESSID=<SESSIONID>' --url \
'https://<MGT_IP>/webapi/file/transfer?
name=/../../../../../../../../etc/passwd&type=db_backup'
```

How to fix it?

And again, versions 4 and 5 need to be updated as they are no longer supported. For the version 6, you need to get a fix from the vendor.

Vulnerable versions: 4.0. (>=4.0.54.1), 5.0.*, 6.0.**
CVE-ID: none

Web-UI arbitrary file download (authenticated)

An arbitrary file download vulnerability in the downloadAction() function allows attackers to download arbitrary files via a crafted POST request.

An authenticated user can download an arbitrary file by sending a POST request with the file name in the `file_name` parameter via the link `https://MGMT_IP/report/download`.

```
$ curl -k -X POST 'https://<MGMT_IP>:5001/report/download'  \
--header 'Cookie: PHPSESSID=<SESSION_ID>'  \
--data-urlencode 'file_name=../../../../../../etc/passwd'
```

How to fix it?
Versions 4 and 5 need to be updated as they are no longer supported. For the version 6, you need to get a fix from the vendor.

*Vulnerable versions: 4?, 5?, 6.0.**
CVE-2022–31324

Timeline and vendor reactions

Feb 22 — Initial contact with the vendor, via a web form… no response.
Feb 27 — The second attempt to contact the vendor via email… no response.
Mar 03 — Submitted a vulnerability report to kb.cert.org, still waiting…
May 17 — Sent the first report to cve.org.
Jun 17 — CVE assigned!
Jul 12 — Contacted the vendor's cloud partner about vulnerabilities.
Jul 14 — Began interaction with the vendor about the details.
31 Aug — The vendor let me know about fixing the problems and the upgrade plan for the customers.
12 Sep — Publishing.

References

- https://www.pentasecurity.com/product/wapples/
- https://www.shodan.io/search/facet?query=ssl.cert.fingerprint%3A017b7408f0aa8da17c47c9fe326577df66ad7f78&facet=country
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- https://blog.shodan.io/duplicate-ssh-keys-everywhere/
- https://www.exploit-db.com/exploits/50914
- https://medium.com/@_sadshade/couchdb-erlang-and-cookies-rce-on-default-settings-b1e9173a4bcd
- https://en.wikipedia.org/wiki/Setuid