SYNACKTIV

Depfuzzer

Fuzzing confused dependencies

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Who are we

SYNACKTIV

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Synacktiv

SYNACKTIV

- French offensive security company
- 170 security experts
- 4 departments :
  - Pentest / Redteam
  - RE / VR
  - Development
  - IR
- Hexacon (Paris - october 2024)

Overview

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- Software development registries landscape.
- Example of confused dependency and how to exploit it.
- A description of how Depfuzzer works.
- Demo.
- Conclusion.

Registries landscape

Registries landscape

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- Open-source libraries and packages :
  - NodeJS -> https://registry.npmjs.org/
  - Python -> https://pypi.org/
  - Rust -> https://crates.io/
  - Golang -> https://pkg.go.dev/
  - ...

Registries landscape

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- Package example in PyPI. :-)

```
$ pip3 install odd
Collecting odd
  Downloading odd-1.0.1-py3-none-any.whl (2.4 kB)
Installing collected packages: odd
Successfully installed odd-1.0.1

$ python3
Python 3.11.2 (main, Mar 13 2023, 12:18:29) [GCC 12.2.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> from odd import is_odd
>>> is_odd(9)
True
>>> is_odd(10)
False
```

Previous work

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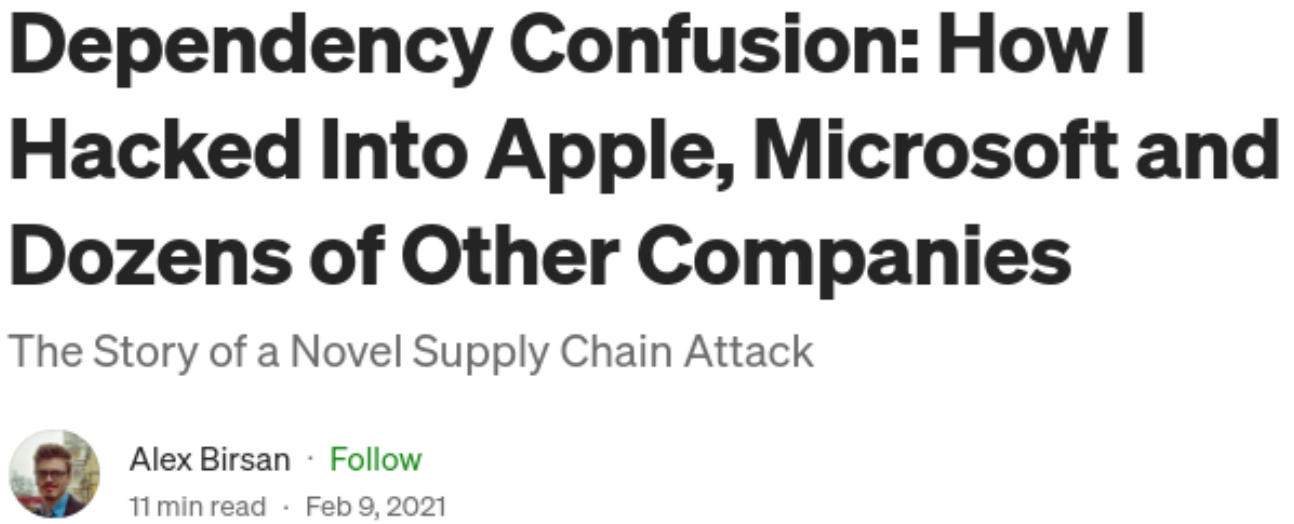
- https://medium.com/@alex.birsan/dependency-confusion-4a5d60fec610



Dependency Confusion: How I Hacked Into Apple, Microsoft and Dozens of Other Companies

The Story of a Novel Supply Chain Attack

Alex Birsan · Follow

11 min read · Feb 9, 2021

Confused dependencies

Confused dependencies

Example with NPM

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```
$ cat package.json
{
  "name": "dependency-confusion-demo",
  "version": "1.0.0",
  "description": "A demo to illustrate dependency confusion",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "dependencies": {
    "@pts2024-prez/private-package": "^1.0.0",
    "lodash": "^4.17.21"
  },
  "author": "Scouty",
  "license": "ISC"
}
```

Confused dependencies

Example with NPM

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- Private registry

```
$ cat .npmrc
@pts2024-prez:registry=http://localhost:4873
```

- *@pts2024-prez/private-package* installed from private registry
- *lodash* installed from default registry (*registry.npmjs.org*)

Confused dependencies

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Example with NPM

- Package installation

```
$ npm install

added 2 packages, and audited 2 packages in 2s

found 0 vulnerabilities
```

- Package content

```
$ cat dependency-confusion-demo/node_modules/@pts2024-prez/private-package/index.js
// index.js
module.exports = function() {
  console.log('This is a private package');
};
```

Confused dependencies

Example with NPM

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- *.npmrc* and *package-lock.json* alteration
  - Human error
  - Misconfiguration
  - Version control conflicts
  - Environment changes
  - Scripted automation

```
$ rm .npmrc && rm package-lock.json
```

Confused dependencies

Example with NPM

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```
$ npm install
npm error code E404
npm error 404 Not Found - GET https://registry.npmjs.org/@pts2024-prez%2fprivate-package - Not found
npm error 404
npm error 404  '@pts2024-prez/private-package@^1.0.0' is not in this registry.
npm error 404
npm error 404 Note that you can also install from a
npm error 404 tarball, folder, http url, or git url.
npm error A complete log of this run can be found in: /home/user/.npm/_logs/2024-07-04T11_59_45_530Z-debug-0.log
```

Confused dependencies

Example with NPM

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- Publish compromised package on *registry.npmjs.org*
- Same organization / Same name

```
$ npm publish --access public
npm notice
npm notice @pts2024-prez/private-package@1.0.0
[...]
npm notice integrity: sha512-lBrWveA9TtBjj[...]BttKY9k4LfuSw==
npm notice total files: 2
npm notice
npm notice Publishing to https://registry.npmjs.org/ with tag latest and public access
+ @pts2024-prez/private-package@1.0.0
```

Confused dependencies

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Example with NPM

- Package installation

```
$ npm install

added 2 packages, and audited 2 packages in 2s

found 0 vulnerabilities
```

- Package content

```
$ cat dependency-confusion-demo/node_modules/@pts2024-prez/private-package/index.js
// index.js
module.exports = function() {
  console.log('compromised');
};
```

Context

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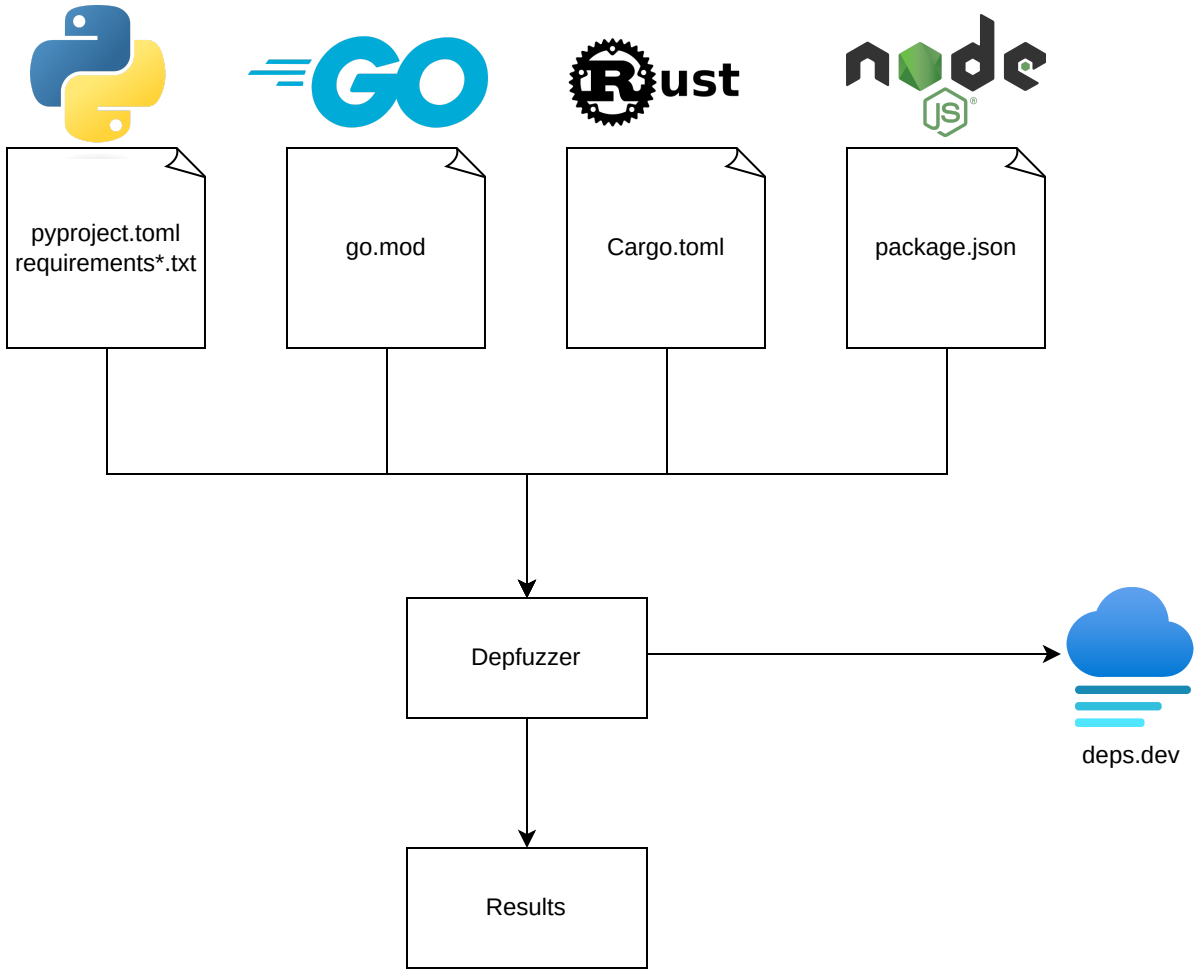
- Mission for one of our client
- Check if its possible to takeover dependencies
- 1400+ projects in the GitHub organisation
- Time for automation

Depfuzzer

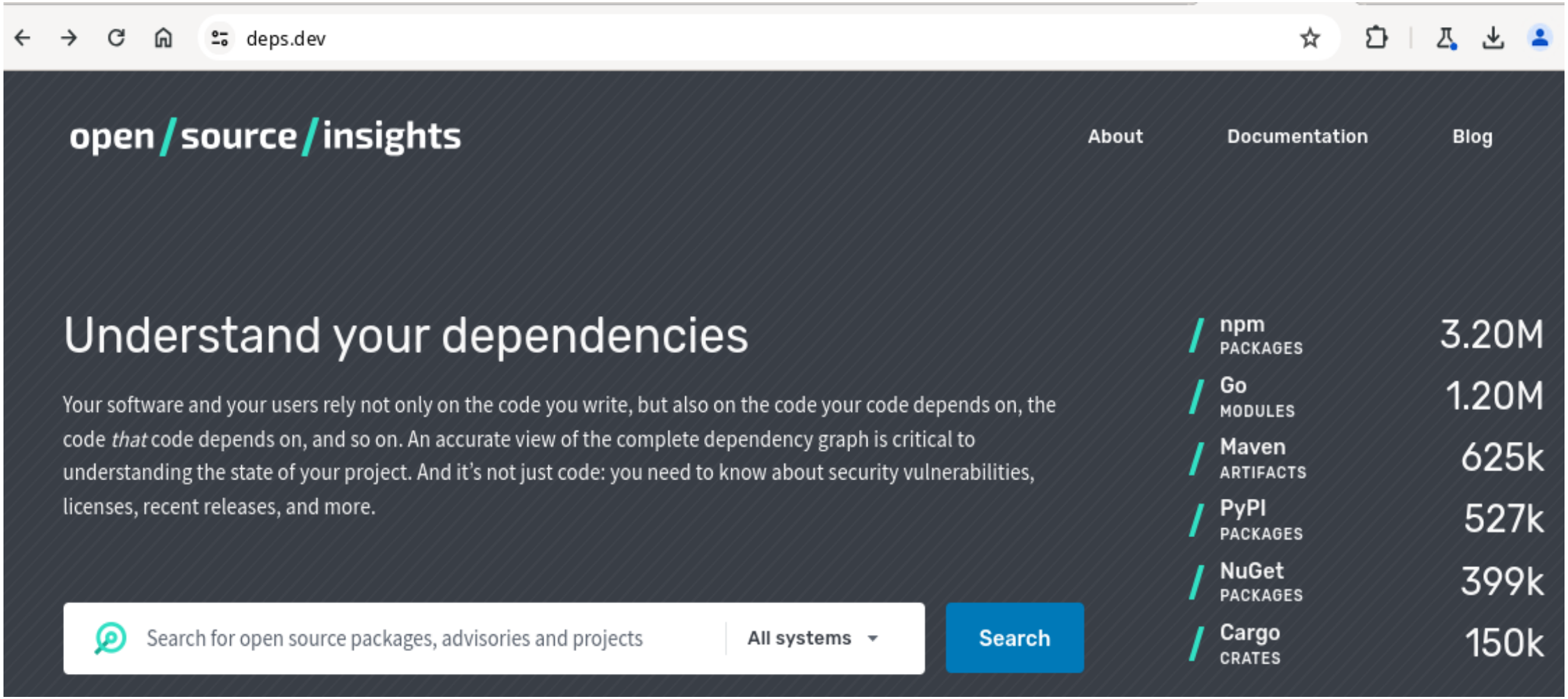
Depfuzzer

Overall diagram



Depfuzzer

https://deps.dev



Depfuzzer

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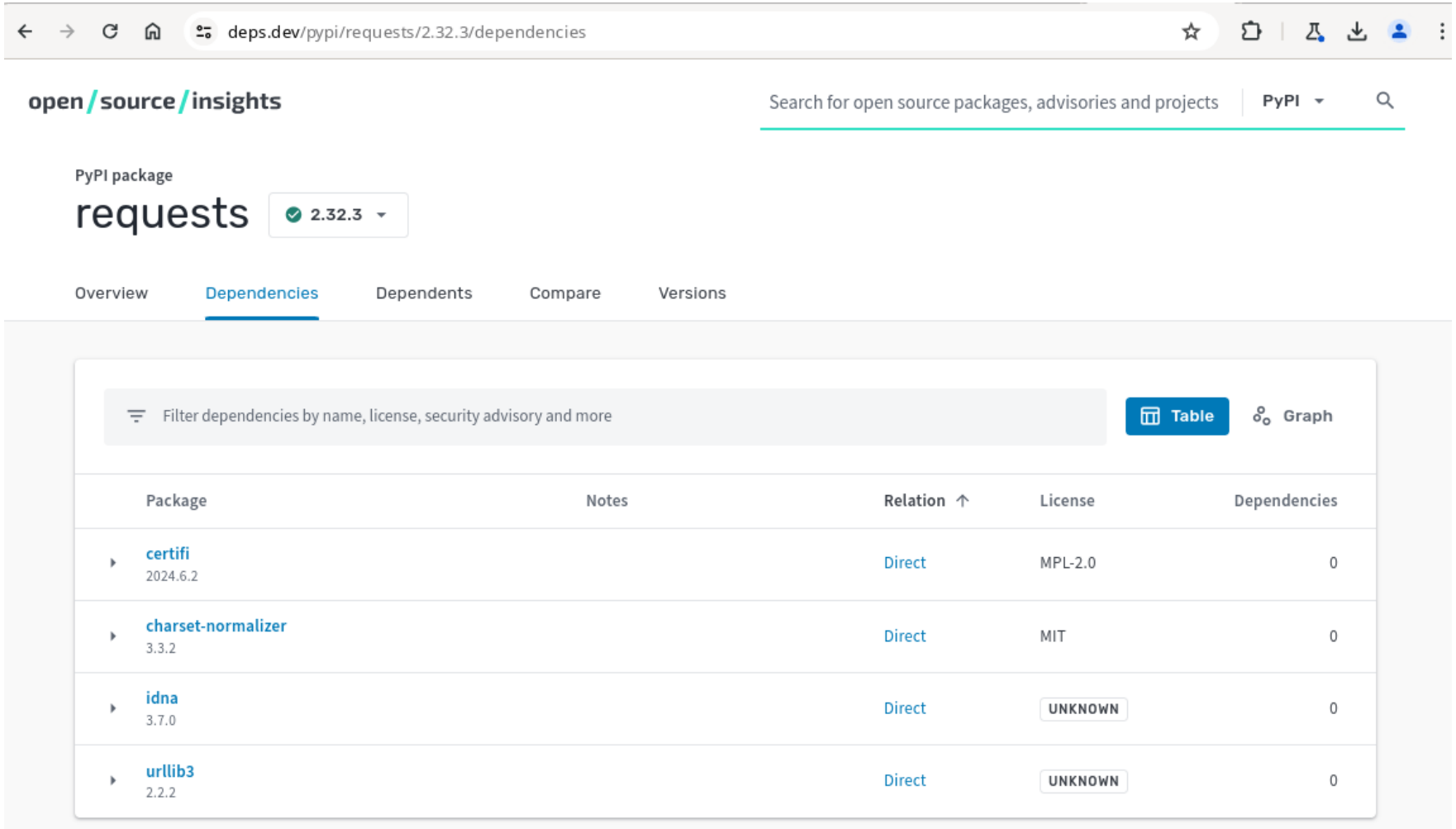

Demo

Results

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- We found some dependencies confusion
- We fuzz a lot of open-source projects and find few issues

Limitations

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- A lot of false positives (parsing requirements files is complex)
- This tool is not meant to be 100% accurate (act as a PoC)
- Exploiting this might break some CI/CD, so be careful

Further work

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- Scan for :
  - Nuget packages (.NET)
  - PHP Composer
- Amelioration for the requirements files parsing to reduce false positive

Conclusion

Conclusion

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- Attacker can hide malicious code into legitimate one
- Always use an internal package registry in your company !

Conclusion

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- Depfuzzer a tool to find confused dependencies
- PR are welcome
- https://github.com/Synacktiv/DepFuzzer

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https://www.linkedin.com/company/synacktiv

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https://synacktiv.com