SP2023 Week 02 • 2023-02-02

Web Hacking III

Daniel and Louis

Announcements

- Fall Semester Feedback Form!
  - Check Discord (free points!)
- CypherCon Interest Form
  - Check link in announcements
- DiceCTF
  - Playing tomorrow virtually, type `/ctf optin` in #bot-commands to be notified
- LA CTF
  - 2/10 to 2/12
  - Approachable event for all skill levels
  - Free pizza!

ctf.sigpwny.com

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Command Injection

Malicious user input modifies shell commands & arguments

Command Injection

- User input gets executed as a shell command!
- Example
  - Web application may need to call external scripts and pass in arguments
  - Similar to SQL injections, user input could escape quoting and inject arbitrary commands!

Example with Python Flask

```
def cowsay():
 input = request.json.get('input', 'Give me some input')

 command = f'/usr/games/cowsay "{input}"'
 print(command)
 output = os.popen(command).read()

 return jsonify({
   'output': output
 })
```

Template Injection

Malicious user injects server-side template syntax to execute code

Also known as Server-Side Template Injection (SSTI)

Templates?

- Web templates are similar to static files, but they can incorporate variables & expressions
- Templates are "rendered" before being sent to the user!

```
<!DOCTYPE html>
<html lang="en">
<head>
 <title>{{ title }}</title>
</head>
<body>
 <h1>It’s {{ title }}!</h1>
</body>
</html>
```

```
render_template("index.html", title="Title!")
```

Template Syntax

- Typical support for:
    - Statements (no output)
    - Expressions (prints output)

- Example: Python Flask + Jinja2
    - Statements with {% … %}
    - Expressions with {{ … }}

- {{ 4 / 2 }} → substituted with 2
- {{ request }} → substituted with the object!

Exploiting Template Syntax

- Example are for Jinja, but similar ideas apply to others
- Available variables include (source):
    - config (Flask configuration)
    - request (Flask request object)

- {{ config.items() }}
    - return all Flask config items (even keys!)
- {{ request.application.__globals__. }}
    - with some Python magic variables, we can access & run lots of Python functions

Example with Python Flask & Jinja

```python
from flask import Flask, request, render_template_string

app = Flask(__name__)

@app.route('/')
def index():
    user = request.args.get('user', 'guest')
    my_template = "Stick around, {}!".format(user)
    return render_template_string(my_template)
```

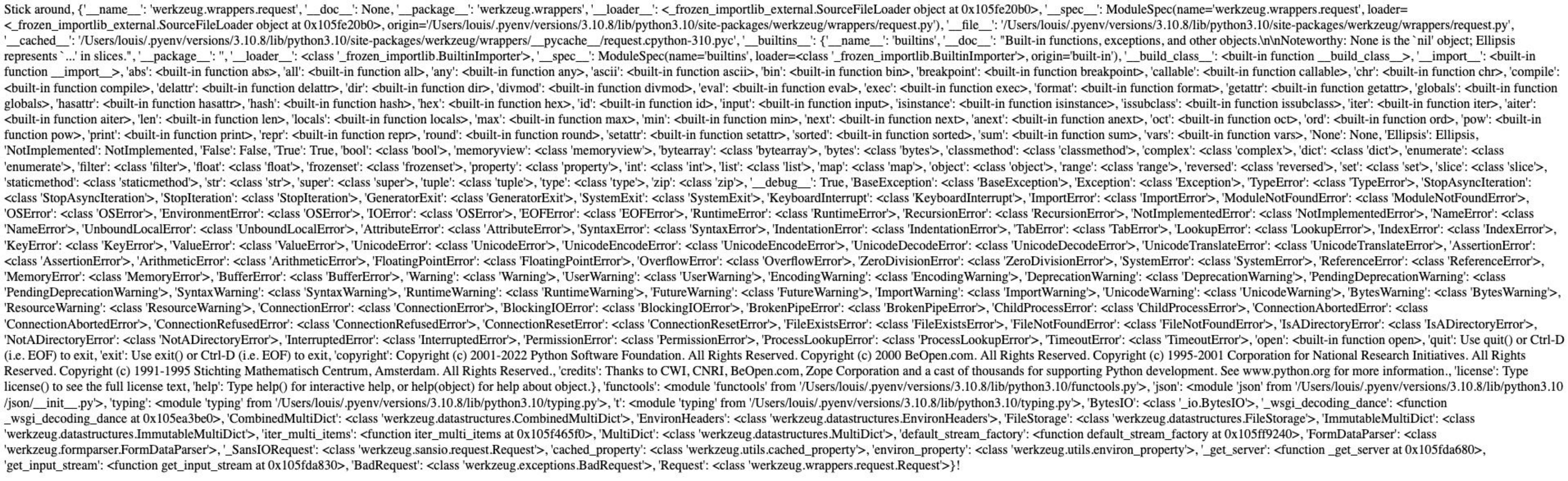
User input is injected into the template!

Exploiting Example

- Testing locally
- http://127.0.0.1:5000/?user={{ config.items() }}
  - Stick around, dict_items([('ENV', 'production'), ('DEBUG', False), ('TESTING', False), ('PROPAGATE_EXCEPTIONS', None), ('SECRET_KEY', 'NO_SO_SECRET_ANYMORE'), …])!
- Going further for arbitrary shell command execution…

Another Exploiting Example

- http://127.0.0.1:5000/?user={{ request.application.__globals__ }}
    - There are functions that can be used to run shell commands!



```
Stick around, {'__name__': 'werkzeug.wrappers.request', '__doc__': None, '__package__': 'werkzeug.wrappers', '__loader__': <_frozen_importlib_external.SourceFileLoader object at 0x105fe20b0>, '__spec__': ModuleSpec(name='werkzeug.wrappers.request', loader=
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'__cached__': '/Users/louis/.pyenv/versions/3.10.8/lib/python3.10/site-packages/werkzeug/wrappers/__pycache__/request.cpython-310.pyc', '__builtins__': {'__name__': 'builtins', '__doc__': "Built-in functions, exceptions, and other objects.\n\nNoteworthy: None is the `nil' object; Ellipsis
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(i.e. EOF) to exit, 'exit': Use exit() or Ctrl-D (i.e. EOF) to exit, 'copyright': Copyright (c) 2001-2022 Python Software Foundation. All Rights Reserved. Copyright (c) 2000 BeOpen.com. All Rights Reserved. Copyright (c) 1995-2001 Corporation for National Research Initiatives. All Rights
Reserved. Copyright (c) 1991-1995 Stichting Mathematisch Centrum, Amsterdam. All Rights Reserved., 'credits': Thanks to CWI, CNRI, BeOpen.com, Zope Corporation and a cast of thousands for supporting Python development. See www.python.org for more information., 'license': Type
license() to see the full license text, 'help': Type help() for interactive help, or help(object) for help about object.}, 'functools': <module 'functools' from '/Users/louis/.pyenv/versions/3.10.8/lib/python3.10/functools.py'>, 'json': <module 'json' from '/Users/louis/.pyenv/versions/3.10.8/lib/python3.10
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```

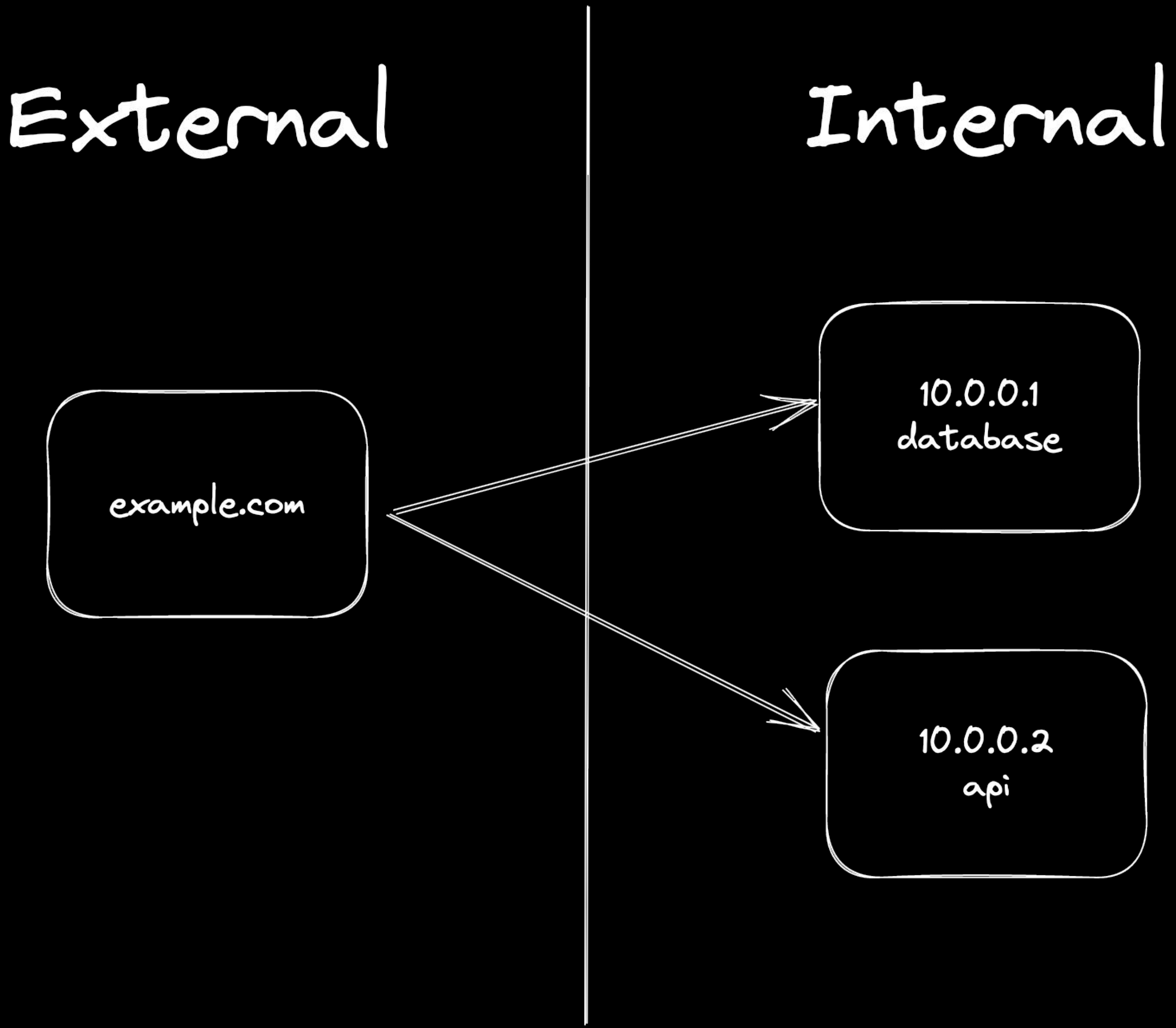
Server Side Request Forgery (SSRF)

Accessing private resources using the server

Basic SSRF

- Server returns the data from internal/external services

A Typical Network



Basic SSRF

- Server returns the data from internal/external services

- Places to look:
  - HTML to PDF/image renderers
  - Link preview generators
  - Webhooks
  - External resource imports
  - Referer headers

Exploitation

- Internal port scanning
- Network enumeration
- Cloud instance metadata services
    - Can allow you to pivot and gain more access
    - AWS: http://169.254.169.254/latest/meta-data
    - Google Cloud: http://metadata.google.internal/computeMetadata/v1

Python and Flask Example

```python
@app.route('/fetch')
def get_files():
    url = request.args.get('url')
    return requests.get(url).text
```

Python and Flask Example

```python
@app.route('/fetch')
def get_files():
    url = request.args.get('url')
    return requests.get(url).text
```

```
/fetch?url=http://10.0.0.2/flag
```

Blind SSRF

- SSRF without being able to read the response

- Do we have:
  - Response codes?
  - Response time?
  - Error messages?

Next Meetings

2023-02-03 - **DiceCTF 2023**

- Virtual CTF
- Type `/ctf optin` in #bot-commands

2023-02-05 - **This Sunday**

- macOS Privilege Escalation
- Rohit will be talking about his $XX,XXX bug he found

2023-02-09 - **Next Thursday**

- Pwn III
- ROP

2023-02-10 - **LA CTF**

Practice

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- Cowsay As A Service (CAAS)
- Meme Machine
- ssrf 1, 2, 3, 4

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