Server-Side Template Injection

Jakub Czyszczonik

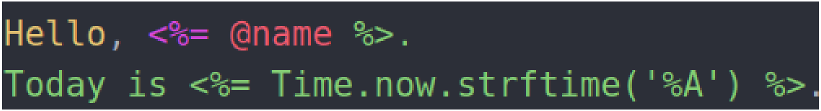
Template Engines

Why we use template engines:

- Generate static HTML page,
- Less (AJAX) calls for content,
- Simple and fast for development,
- Reusable.

Example Code

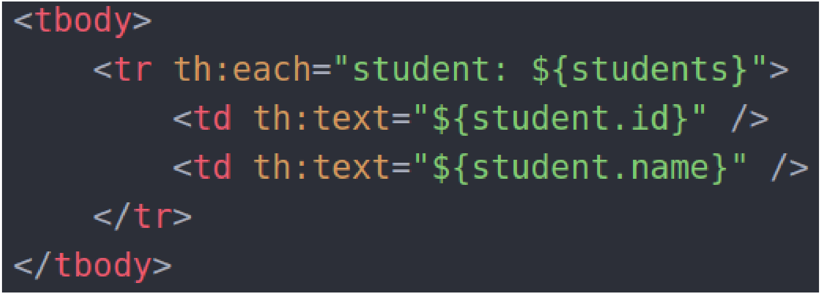
Ruby ERB:



```
Hello, <%= @name %>.
Today is <%= Time.now.strftime('%A') %>.
```

Example Code

Java Spring Thymeleaf:



```
<tbody>
    <tr th:each="student: ${students}">
        <td th:text="${student.id}" />
        <td th:text="${student.name}" />
    </tr>
</tbody>
```

Attack Stages

1. Detect

Attack Stages

1. Detect
2. Identify

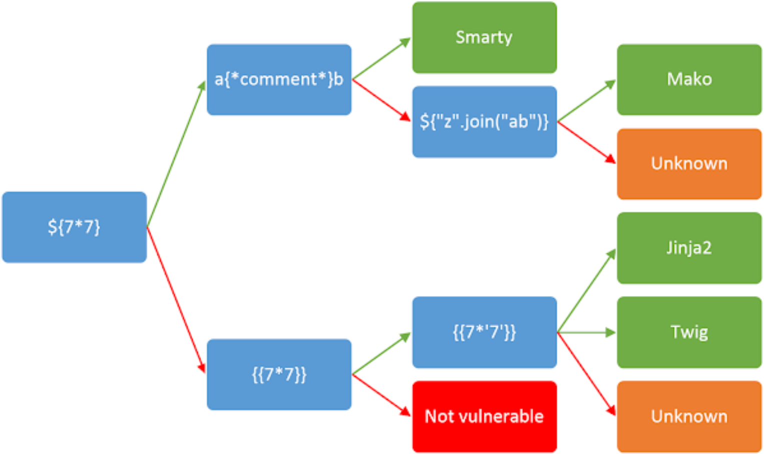
Attack Stages

1. Detect
2. Identify
3. Exploit

Identify

Engine	Injection code
jinja2	{{ %s }}
Mako	${ %s }
ERB	<%= %s %>
Dust	{# %s } or { %s } or {@ %s }
Velocity	#set($x=1+1)${x}

Identify Graph



https://portswigger.net/research/server-side-template-injection

Tplmap

Features:

- Detection and Identification vulnerability
- Run and execute shell command on the target
- Upload and Download files
- Can be used as a Burp Suite extension

Use cases

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4. Shout down servers

Prevention

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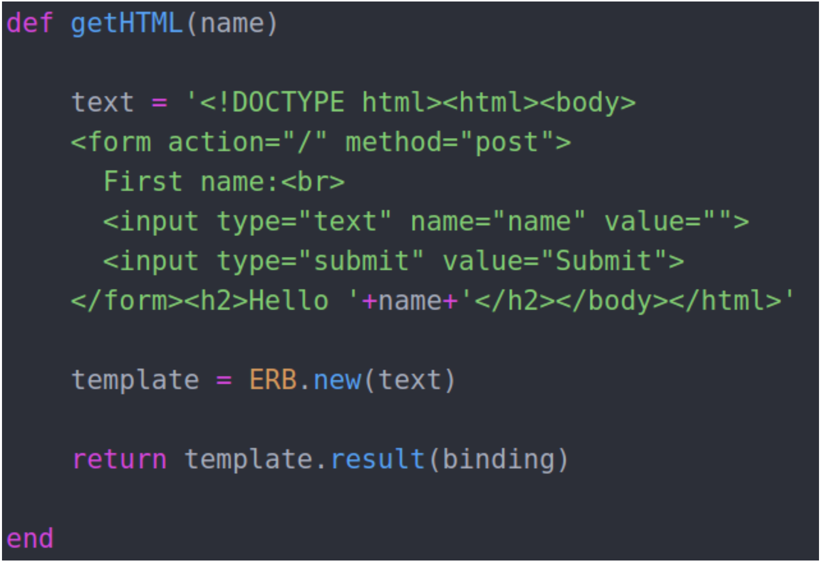
1. Resignation from templates
2. Using Save Engines (Logic-less templates, save mode)
3. Sand-boxing (black / white list, processing special characters)
4. Hardening (Virtual environment, file access rights, well configured SELinux or grsecurity policies)

Good Practices

Defence in depth

Example Attack



```ruby
def getHTML(name)

    text = '<!DOCTYPE html><html><body>
    <form action="/" method="post">
      First name:<br>
      <input type="text" name="name" value="">
      <input type="submit" value="Submit">
    </form><h2>Hello '+name+'</h2></body></html>'

    template = ERB.new(text)

    return template.result(binding)

end
```

Bibliography

- Book: Bezpieczeństwo aplikacji webowych, Securitum 2019, INSB: 978-83-954853-0-5
- https://portswigger.net/research/server-side-template-injection
- https://ajinabraham.com/blog/server-side-template-injection-in-tornado
- https://github.com/epinna/tplmap
- https://github.com/DiogoMRSilva/websitesVulnerableToSSTI