# Objective: Recover the Web Ring—Questions Only

This objective gives you a ringside seat (well, pcap-side anyway) to a successful attack on a web server, some practice bypassing security in a web browser, and a chance to make your own attack against a web server.

For the pcap attack, we will see how well Wireshark and tshark complement each other as we switch back and forth between the GUI and CLI versions of the famous protocol analyzer.

The web browser attack will use Chrome developer tools, and the web server attack will be with Burp Suite.

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## Naughty IP

The artifacts (a packet capture and a web log) will be used for the next four objectives. Alabaster also has hints for you when you talk to him. You could solve a lot of these with the web logs, but packet captures are more fun so we will work with them.

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Both the [link in the objective and in Alabaster’s](https://storage.googleapis.com/hhc22_player_assets/boriaArtifacts.zip) discussion are the same, and give you the artifacts. This is the link from [Top Talkers](https://protocoholic.com/2018/05/24/wireshark-how-to-identify-top-talkers-in-network/) hint.

### Question

Use the Top Talkers hint and Wireshark to find the IP address of the attacker and enter it into the objective. For bonus points, do the same task in tshark.

## Credential Mining

In the next phase, the attacker attempts to login to the site [with brute force](https://owasp.org/www-community/attacks/Brute_force_attack). Alabaster has advice for us, to look for requests to /login.html. We also know the attacker’s IP from the previous question.

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### Question

Use Wireshark to find a display filter that will focus on requests to /login.html. What is the first username tried?

## 404 FTW

In this attack, the attacker is using a tool like [Nikto](https://github.com/sullo/nikto) or [dirbuster](https://github.com/KajanM/DirBuster) to try paths from a wordlist in the URI. It appears that this attack worked and led to compromise of the server.

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<https://owasp.org/www-community/attacks/Forced_browsing>

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### Question

What is the URL path that the attacker found?

## IMDS, XXE, and Other Abbreviations

The attackers now use the reconnaissance from the previous attacks to compromise the AWS credentials for this server. Pay attention to the XXE Injection in this attack since you will see it again.

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Here is the [IMDS link](https://www.sans.org/blog/cloud-instance-metadata-services-imds-/) from Alabaster’s hint. It is also a good article about AWS attacks in general, well worth the read.

### Question 1

Use the IP address from the hint about IMDS and search for it in the body of the request. The ip.addr display filter will not be enough as it only searches the IP header. You can use Edit -> Find Packet but be careful to search the packet bytes. Another way is to put frame contains “searchTermHere” into the display filter.

### Question 2

Filter on the attacker IP and Content-Type: application/xml. Find the URL the attacker forced the server to fetch (and disclosed AWS credentials.)

## Boria Mine Door

This challenge is an exercise in using the web developer tools available in major browsers. I chose to use the tool in Chrome. You will learn about some basic methods to protect a site from attacker’s input and some methods to bypass protections.

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If you succeeded in helping Alabaster Snowball with his intrusion and artifacts, he has a lot of hints to offer for the Mine Door.

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<https://cheatsheetseries.owasp.org/cheatsheets/Content_Security_Policy_Cheat_Sheet.html>

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### Question Pin 1

The hints are explicit; we should check the HTML and JavaScript code and consider how to pick the locks. For Pin 1, look at pin1.html and pin1.js. Also, right click on the image for pin 1 and select Inspect; it will take you straight to the code for pin 1 in the DOM tree. (I am using Chrome dev tools.)

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Graphical user interface, application

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Sometimes the developer leaves helpful comments.

What do you need to enter to unlock the first pin?

### Question 2

Look at the code for Pin 2 and see if you can find useful information. When you are looking for things in a header, like Content Security Policy, look in the header just above the pin you are interested in and not in the headers at the top of the document. People found many ways to draw lines in the windows for the pins. I saw a hint from another player about using [SVG drawings](https://www.w3schools.com/graphics/svg_intro.asp) and I chose to use them for the rest of the challenge.

What kind of input is likely to slip through uninspected?

### Question Pin 3

What input sanitization may be missing from Pin 3? What is a simple SVG that will connect the two sides? Note that the pins are sensitive to color.

### Question Pin 4

Examine the code for Pin 4. The helpful comments are gone now, and some developer-supplied input filtering is in place. It uses the JavaScript method someString.replace(). There is an easy way around the filter they put in place. What is a line of input that will bypass filtering and work as expected?

### Pin 5 Question

This time you will find that the developer remembered the g flag, or global flag. All occurrences of the filtered characters will be removed. It is difficult to avoid. However, if you follow the source and find the event that triggers a call to the filtering, perhaps you can find a clever way to evade it.

### Pin 6 Question

Is there any client-side filtering in place for this pin? Can you draw the lines with SVG?

## Glamtariel’s Fountain

You have watched an XXE Injection attack through packet captures. Now it is time to execute one. You will use XXE Injection to retrieve the golden ring from Glamtariel’s Fountain.

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Hal Tandybuck gives you several hints after you unlock all six pins in the Boria Mine door.

Table

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<https://owasp.org/www-community/vulnerabilities/XML_External_Entity_(XXE)_Processing>

Words from Glamtariel in upper case may be helpful hints. I think they are too vague and will give you additional clues.

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You will need to intercept, change, and resend many packets to the fountain website to complete the XXE attack. Two of the tools available that do this are Burp Suite and the Edit/Resend feature in Firefox. Since we will need to make many changes to the traffic in this challenge, we will use Burp. We will use the Firefox function in the challenge, Exploit a Smart Contract.

Burp Suite is pre-installed on Kali Linux, but the Burp browser was not working properly on the version I had. It is good to install your own tools anyway. The Burp Suite Community Edition is [available here](https://portswigger.net/burp/communitydownload), for both Windows and Linux. I chose Linux, well, because.

To install the Linux version, execute burpsuite\_community\_linux\_v2022\_12\_4.sh and then follow the prompts in the GUI wizard.  
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The installer leaves a folder on your Desktop called BurpSuiteCommunity. Execute the file BurpSuiteCommunity to get going.Graphical user interface

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If you need help, it is [available here](https://portswigger.net/burp/documentation/desktop/getting-started).

Click through the Next and Start prompts to get to the Burp dashboard. Once you are there, click on the Target tab.  
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Burp now comes with its own Chromium browser. This is handy since you no longer need to configure a browser to proxy through Burp and to accept Burp’s Certificate Authority (CA) certificate. Click the Open Browser button. Now you should have windows for Burp and the browser, and if you open the Kringlecon site you will see it fill the Target tab in Burp.  
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Now we are ready to get started.

### Question 1: Catch a Drop

Find your way to the fountain in HHC and click on it. A new tab for Glamtariel’s Fountain will open. Talk to Glamtariel and the fountain by dragging the icons in the top right corner with your mouse and dropping them on Glamtariel or the fountain.

Diagram

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Find the traffic that your drag and drop causes in the Target tab of Burp.

What is the payload and Content-Type in the POST request that the drag and drop triggers?

### Question 2: Play the Game

You must drop each icon on each person (princess, fountain), receive a new set of icons, and repeat before the site will allow you to start the XXE attack. Pay attention to the name of the file that presents the frozen eye. Why do you think it may mean you are ready to start XXE?

### Question 3: Convert to XML

Before you try to send an XXE attack to the server, see if you can get the site to accept a normal transaction, but translated into XML. Translate this to XML:  
{  
 "imgDrop":"img1",  
 "who":"princess",  
 "reqType":"json"  
}

If you are not familiar with XML, you may find [this converter site](https://www.convertjson.com/json-to-xml.htm) helpful. Compare your XML to the XXE attack at the end of the objective, IMDS, XXE, and other Abbreviations. Where would you insert your XXE?

### Question 4: Insert XML

Burp has two functions that can replace the content the browser sends to the server with our own: proxy and repeater. We will use proxy first.  
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When we turn Intercept on, packets will be held in Burp and not sent on to the website until we click the Forward button. While the packets are held, we can change them however we want, and then forward them when we are done. Browsers like to send heartbeat traffic on their own so we may intercept extraneous traffic. Just click Forward on those packets until the packet of interest appears.

Send the translated XML without XXE to the website. Don’t forget to change Content-Type, and do not change Accept, since the princess always replies in JSON. Is your XML accepted?

### Question 5: Guess the PATH

Quite often, penetration testers do not have a view of the source code or file structure of the systems they attack. They are working in the dark and must do a lot of guessing. I think the writers of this challenge are simulating that for us. The words that Glamtariel and the fountain speak in bold letters are supposed to be enough for us to guess the path to our target.

*"I don't know why anyone would ever ask me to TAMPER with the cookie recipe. I know just how Kringle likes them.^Glamtariel likes to keep Kringle happy so that he and the elves will visit often."*

*"Kringle really likes the cookies here so I always make them the same way.^Kringle really dislikes it if anyone tries to TAMPER with the cookie recipe Glamtariel uses."*

*"I don't get away as much as I used to. I think I have one last trip in me which I've probably put off for far too long.^The elves do a great job making PATHs which are easy to follow once you see them."*

*"I helped the elves to create the PATH here to make sure that only those invited can find their way here.^I wish the elves visited more often."*

*"Did you know that I speak in many TYPEs of languages? For simplicity, I usually only communicate with this one though.^I pretty much stick to just one TYPE of language, it's a lot easier to share things that way."*

*"Wow!, what a beautiful silver ring! I don't have one of these. I keep a list of all my rings in my RINGLIST file. Wait a minute! Uh, promise me you won't tell anyone.^I never heard Glamtariel mention a RINGLIST file before. If only there were a way to get a peek at that."*

*"I like to keep track of all my rings using a SIMPLE FORMAT, although I usually don't like to discuss such things.^Glamtariel can be pretty tight lipped about some things."*

Many people I helped in the contest (including myself) found it difficult to guess the path based on these hints. Additionally, files that would have normally been accessible to test the XXE were not accessible. For example, static/js/ajax.js (visible in Target) was not accessible, even with the correct root. I wrote these additional clues that helped some players guess the correct path without further spoilers.

*Be careful you don't trip over a ROOT on the PATH or you will be disAPPointed.*

*I like to keep my things with my IMAGES.*

*RINGLIST and SIMPLE FORMAT go together.*

Be aware that web apps are often kept in containers or jails. The usual /var/www/html is not visible to them.

What is the path to the file we seek?

### Question 6: XXE with Repeater

Comparing our XML to the XXE attack in *IMDS, XXE, and Other Abbreviations* makes XXE seem a good possibility.

<?xml version="1.0" encoding="UTF-8" ?>

<!DOCTYPE foo [<!ENTITY xxe SYSTEM "file:///app/static/images/ringlist.txt" >]>

<root>

<imgDrop>&xxe;</imgDrop>

<who>princess</who>

<reqType>xml</reqType>

</root>

<?xml version="1.0" encoding="ISO-8859-1"?>

<!DOCTYPE foo [

<!ENTITY xxe SYSTEM "file:///etc/passwd" >]>

<foo>  
 &xxe;  
</foo>

The reference to the XXE, &xxe; could be inserted into any of the normal fields. In this case it is in imgDrop, in place of the normal content.

I found [this reference](https://portswigger.net/web-security/xxe) on XXE to be very helpful. The XML external entity (XXE) syntax allows the XML to reference content from other locations like websites and internal file systems. The location of the external content is specified in the header as a DOCTYPE. The XML inserts the content using a reference to the name before SYSTEM, xxe in this case. So, &xxe; is inserted into one of the normal XML fields.

Burp Proxy is nice, in that the replies return to the browser so we can view them there if we wish. Since we are in the middle of the transaction and not sending duplicate packets, cookie changes will not bother us, if they occur. Proxy requires a lot of clicking, however. Burp Repeater is nice, since we can select a packet, make changes, send, and see the code results immediately with just one click. If we make errors, just fix the errors, and click send again. Nice!

To use Repeater, select a drag/drop POST packet in the Target list, right-click, and choose Send to Repeater. Then make your changes and click Send.  
Graphical user interface, application

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Send a packet to the server with Content-Type: application/xml and the XXE in the payload.

### Question 7: More Hoops

Use XXE to retrieve the files in the folder, x\_phial\_pholder\_2022. Obvious filenames to try are bluering.txt and redring.txt. They probably live within //app/static/images.

### Question 8: Yet Another Hoop

Try to retrieve goldring\_to\_be\_deleted.txt.

### Question 9: The Last Hoop

Players had a lot of trouble with the bold REQuest, secret TYPE clue. I wrote this clue to help them.

*I like your eXXEllent language ability. Let's move to REQ TYPE for secrecy.*