Web Security

XSS – Cross-Site Scripting

- Idea: Place user provided data in the page
- Pros: makes pages more interactive and personal
- Cons: improperly used data could be interpreted as code
- Solutions: Make sure that user data is sanitized and validated

XSSI – Cross-Site Script Inclusion

- Idea: Browsers can prevent pages from one domain to read from pages in another domain
  - Do not prevent pages from referencing resources in other domains (specifically images and scripts)
- Allows an attacker to load their information (via images) or to run their scripts on your site even if you try to block them
- Solution: Make sure the code comes from a trusted site

XSRF – Cross-Site Request Forgery

- Sites will try to protect themselves by only accepting requests that include the proper cookie
- Problem: if the cookie is stolen then an attacker can fake any request and the site will run it
- Solutions: inspect the header, require user-provided secret, add nonce token, etc.

HTTP State

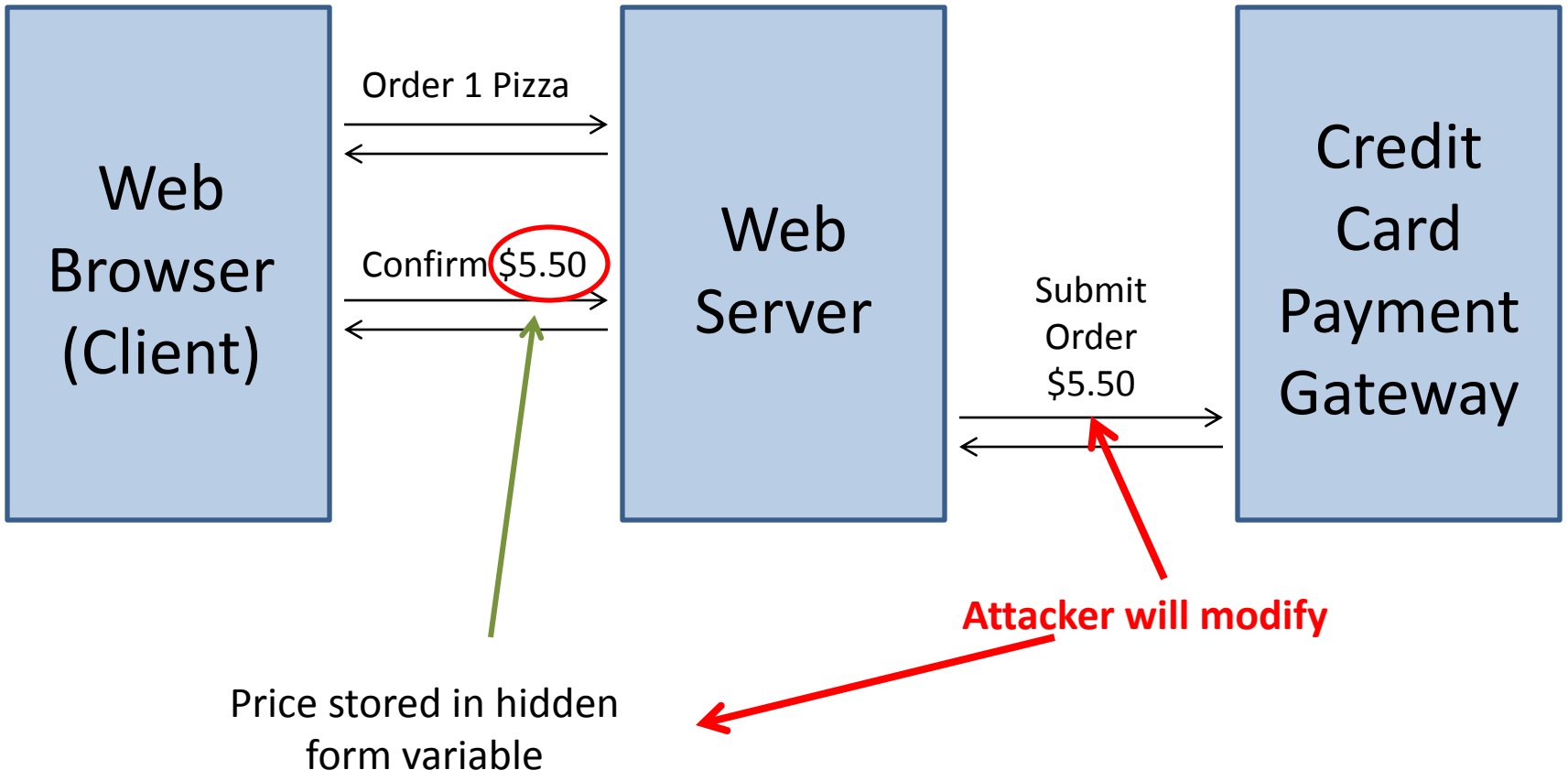
- HTTP is a stateless protocol
  - This means the state machine for the protocol is very simplistic (request and response)
- However, developers want state in order to build staged user experiences
  - Creates a much better user experience.
- Solution: provide state to user and have them echo it back in all future requests.

Option 1: Hidden Fields

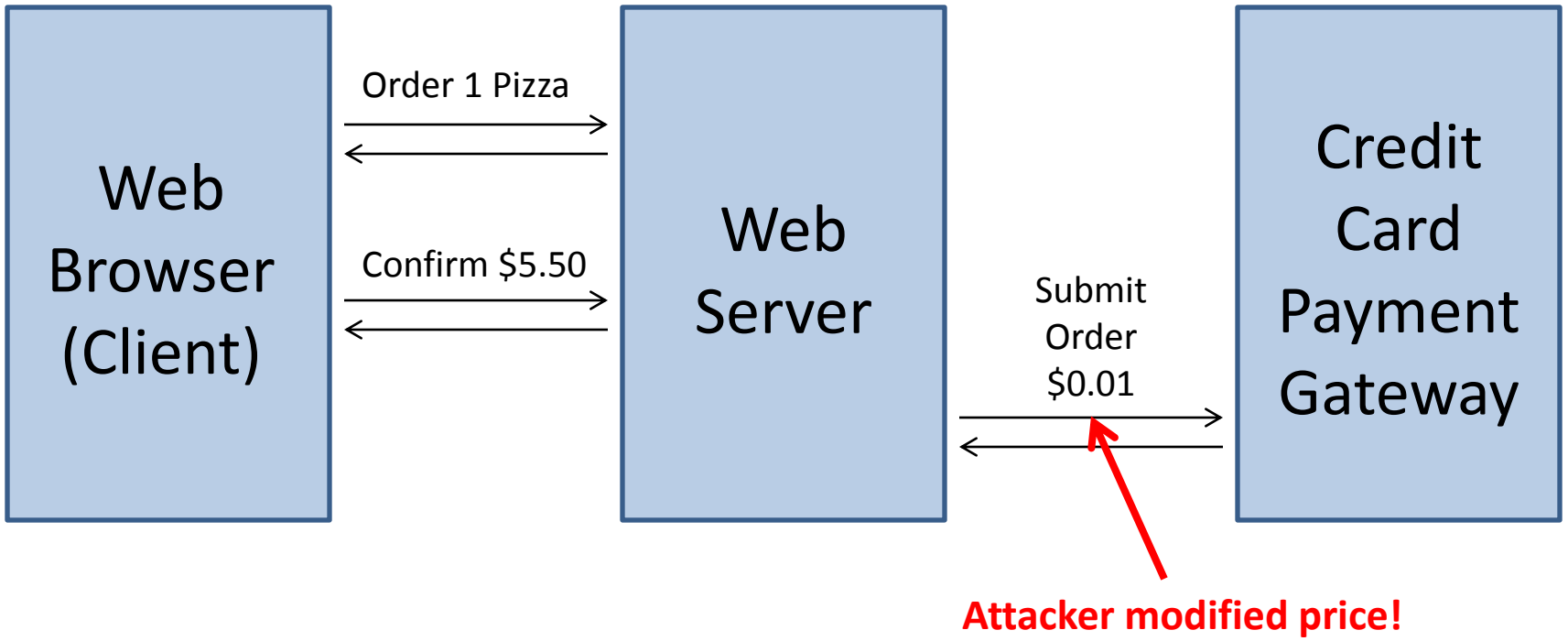
- Let's give the user hidden fields that will hold state variables for us to use on later requests

```
<html>
        <head>
                <title>Pay for Pizza</title>
        </head>
        <body>
                <form action="submit_order" method="GET">
                        <p> The total cost is 5.50. Are you sure you
                        would like to order? </p>
                        <input type="hidden" name="price" value="5.50">
                        <input type="submit" name="pay" value="yes">
                        <input type="submit" name="pay" value="no">
                </form>
        </body>
</html>
```

Option 1: Problems



Option 1: Problems



Option 2: Cookies

- Stores state on the client side in a special file
- File can only be accessed by code from the same domain

Option 2: Problems

- Cookies can be sniffed from HTTP requests
- Cookies can be stolen from injected scripts
  - LAB 2!
- Not a huge improvement over option 1, except that parameters are not directly visible in Get requests

Option 3: Sessions

- Let’s store state on the server side and only give the user an identifier for it
- Place identifier in a cookie, making it harder to gather
- Make the session id a hash of the user’s IP address and a nonce, making it harder to spoof

Option 3: Problems

- All user state is stored server side
  - This can add up to a lot of data for large sites
- Search for a user's session data can make the response time very large
- Sessions need to expire, otherwise they could be used by an attacker
- Putting the session id in a cookie does not eliminate XSRF attacks