CSE 484 / CSE M 584 (Autumn 2011)

Detour: Web Security

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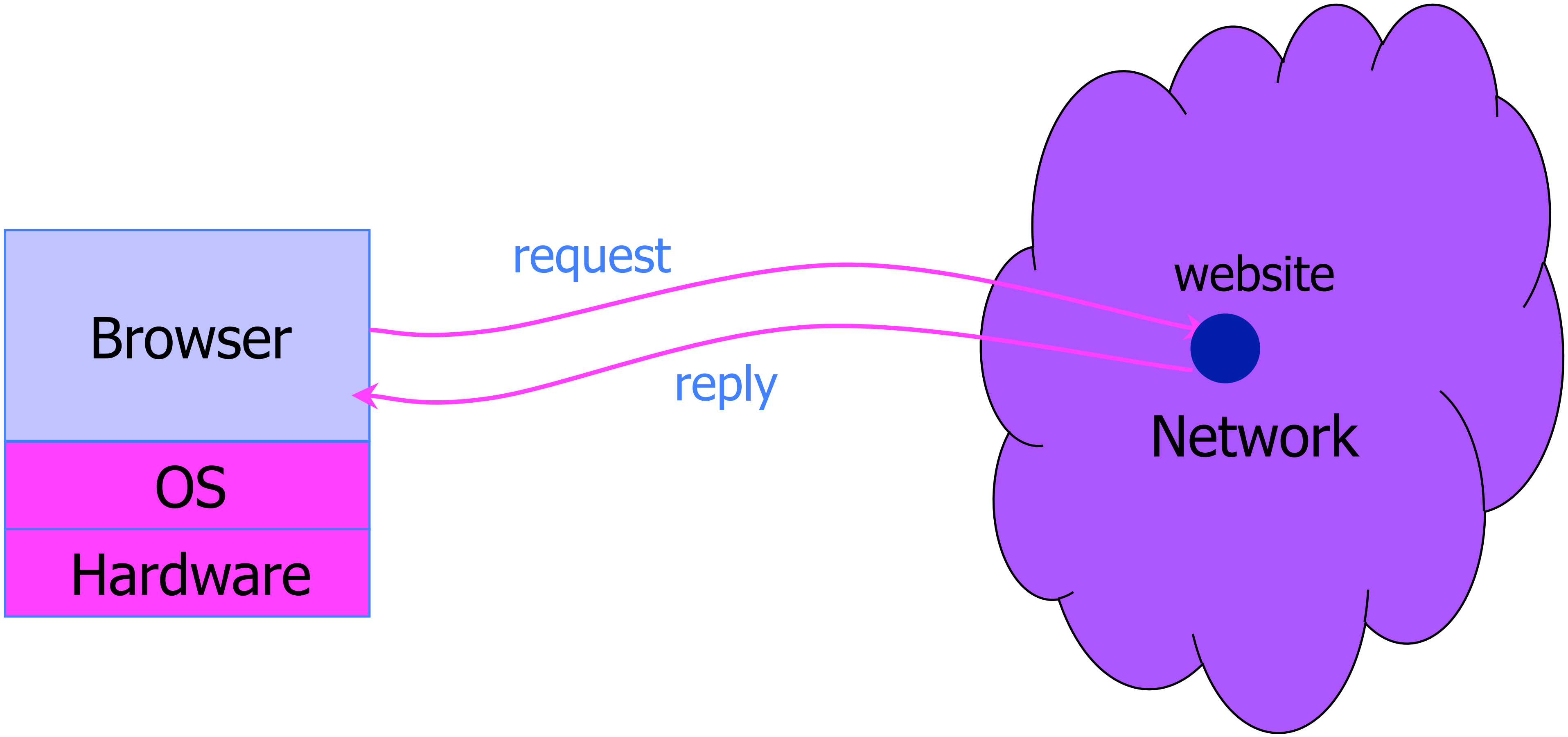
Thanks to Dan Boneh, Dieter Gollmann, John Manferdelli, John Mitchell, Vitaly Shmatikov, Bennet Yee, and many others for sample slides and materials ...

Today, 10/24

- Web Security (intro to Lab 2)
  - Back to Asymmetric Cryptography in a bit
- CELT
- Office hours after class in CSE 210
- Homework 2 (Crypto) coming soon

Browser and Network



Types of problems

- Web browser problems (client side)
  - Exploit vulnerabilities in browsers
  - Install botnets, keyloggers
  - Exfiltrate data

- Web application code (server side)
  - Exploit vulnerabilities in code running on servers (and coming from servers)
  - Examples: XSS, XSRF, SQL injection, insecure parameters, security misconfigurations
  - Steal user credentials, data from databases, ...

Example Questions

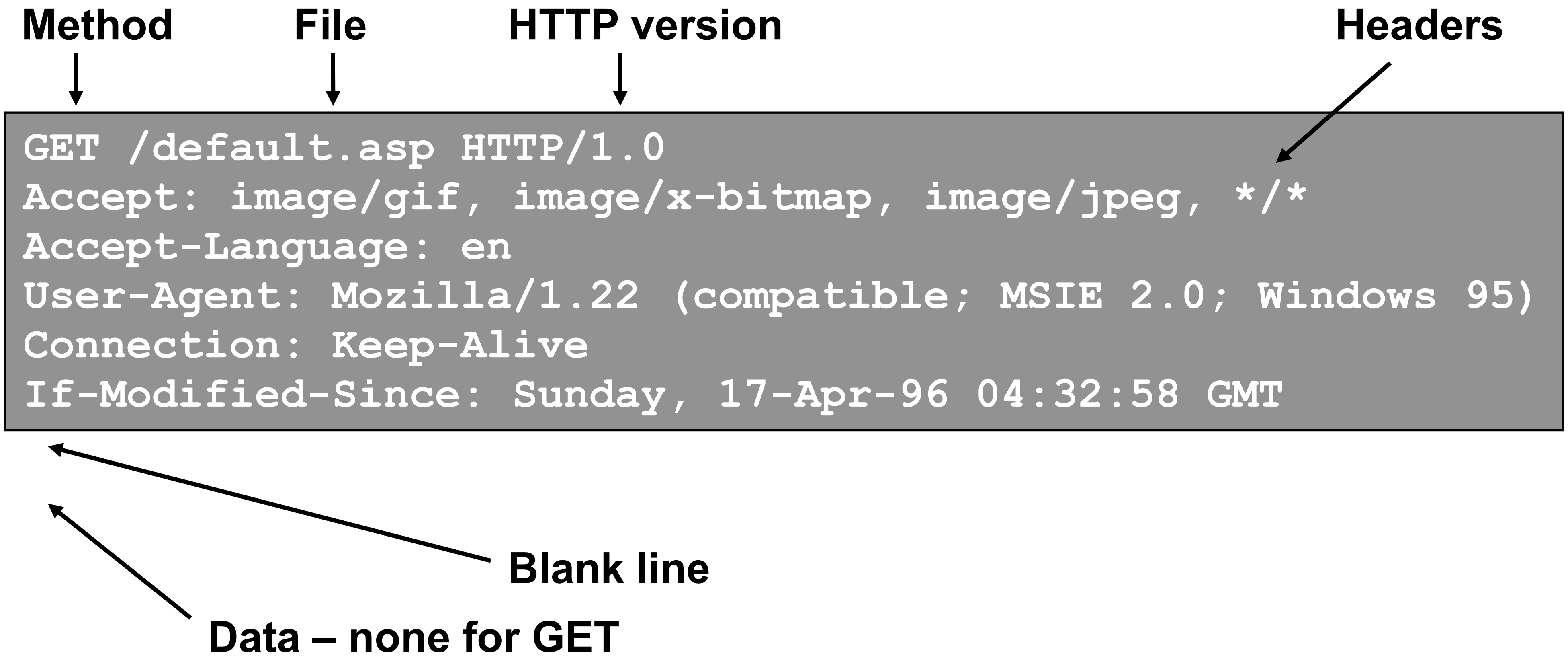
- How does website know who you are?
- How do you know who the website is?
- Can someone intercept traffic ?
- Related: How can you better control flow of information?

- Our focus: High-level principles (lab focuses on pragmatics)
- Focus on a bit of history: How we got here

HTTP: HyperText Transfer Protocol

- Used to request and return data
  - Methods: GET, POST, HEAD, …
- Stateless request/response protocol
  - Each request is independent of previous requests
  - Statelessness has a significant impact on design and implementation of applications
- Evolution
  - HTTP 1.0: simple
  - HTTP 1.1: more complex
  - ... Still evolving ...

HTTP Request



Method

File

HTTP version

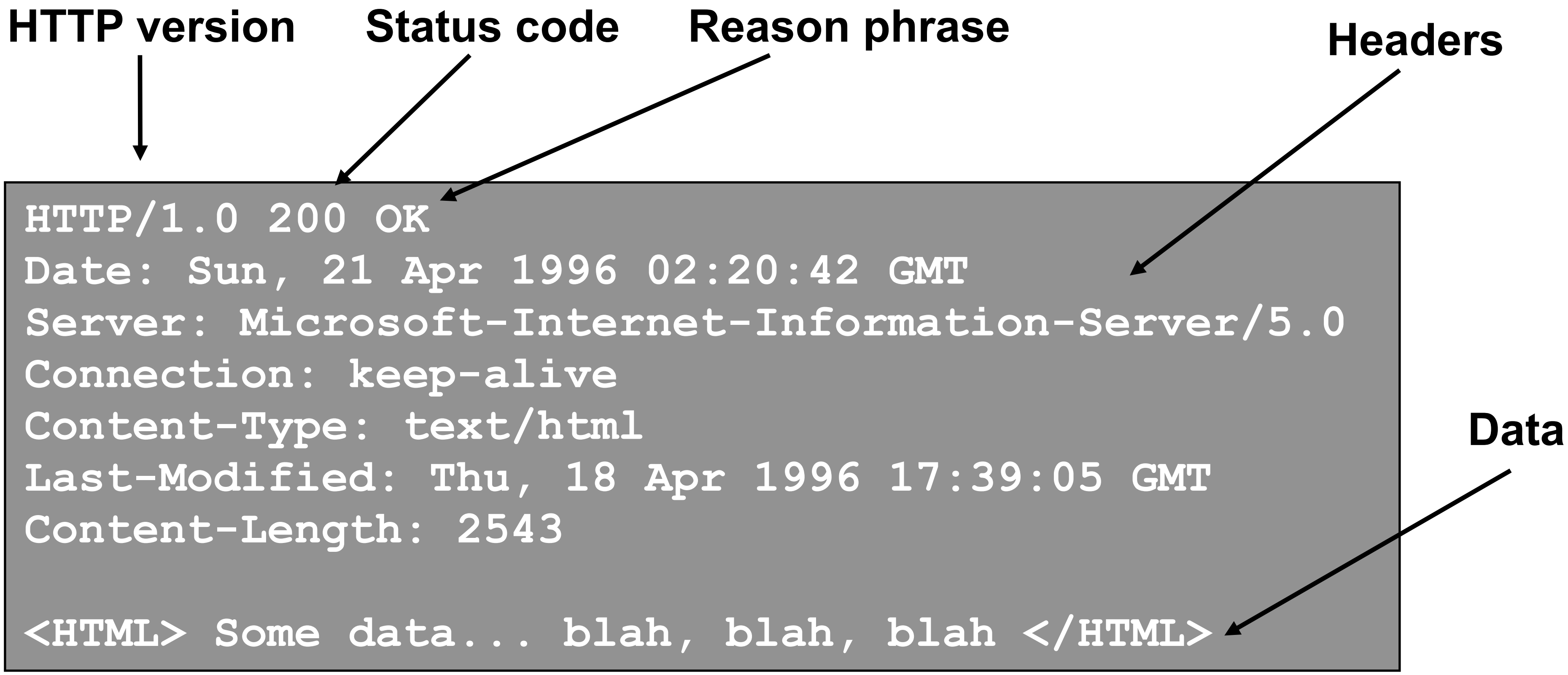
Headers

```
GET /default.asp HTTP/1.0
Accept: image/gif, image/x-bitmap, image/jpeg, */*
Accept-Language: en
User-Agent: Mozilla/1.22 (compatible; MSIE 2.0; Windows 95)
Connection: Keep-Alive
If-Modified-Since: Sunday, 17-Apr-96 04:32:58 GMT
```

Blank line

Data – none for GET

HTTP Response



HTTP version

Status code

Reason phrase

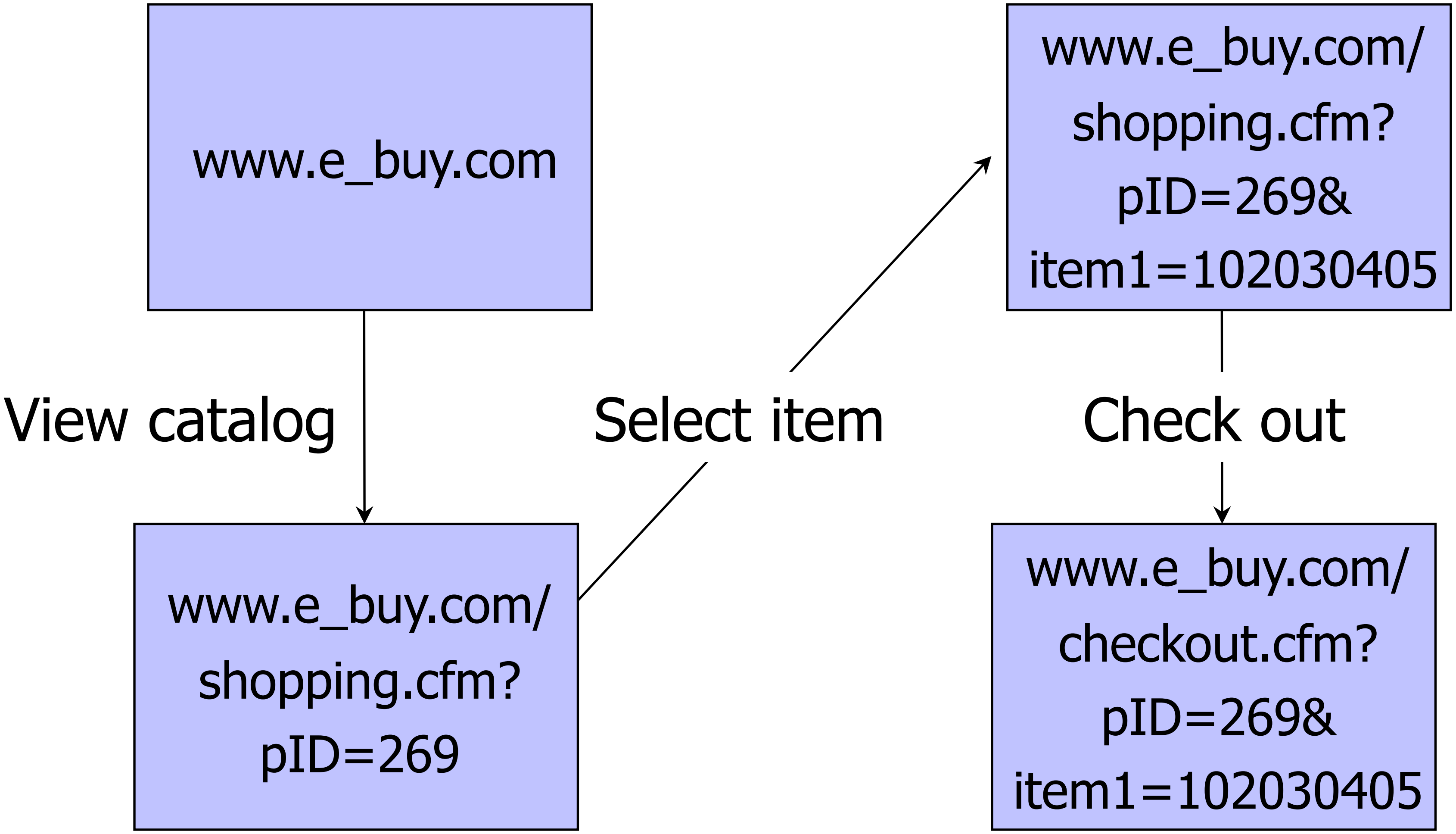
Headers

Data

```
HTTP/1.0 200 OK
Date: Sun, 21 Apr 1996 02:20:42 GMT
Server: Microsoft-Internet-Information-Server/5.0
Connection: keep-alive
Content-Type: text/html
Last-Modified: Thu, 18 Apr 1996 17:39:05 GMT
Content-Length: 2543

<HTML> Some data... blah, blah, blah </HTML>
```

Primitive Browser Session



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www.e_buy.com/ shopping.cfm? pID=269& item1=102030405
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Store session information in URL; easily read on network

FatBrain.com circa 1999 [due to Fu et al.]

- User logs into website with his password, authenticator is generated, user is given special URL containing the authenticator

  https://www.fatbrain.com/HelpAccount.asp?t=0&p1=me@me.com&p2=540555758

  - With special URL, user doesn't need to re-authenticate
    - Reasoning: user could not have not known the special URL without authenticating first. That's true, BUT…
- Authenticators are global sequence numbers
  - It's easy to guess sequence number for another user

    https://www.fatbrain.com/HelpAccount.asp?t=0&p1=SomeoneElse&p2=540555752
  - Partial fix: use random authenticators

Bad Idea: Encoding State in URL

- Unstable, frequently changing URLs
- Vulnerable to eavesdropping
- There is no guarantee that URL is private
  - Early versions of Opera used to send entire browsing history, including all visited URLs, to Google
  - Modern “browser bars” do similar things
    (possibly somewhat cleaned up, but this is not easy!)