TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Computer Science Institute of Systems Architecture, Operating Systems Group

PROBLEMS IN PRACTICE: THE WEB

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THE WEB AS A DISTRIBUTED SYSTEM

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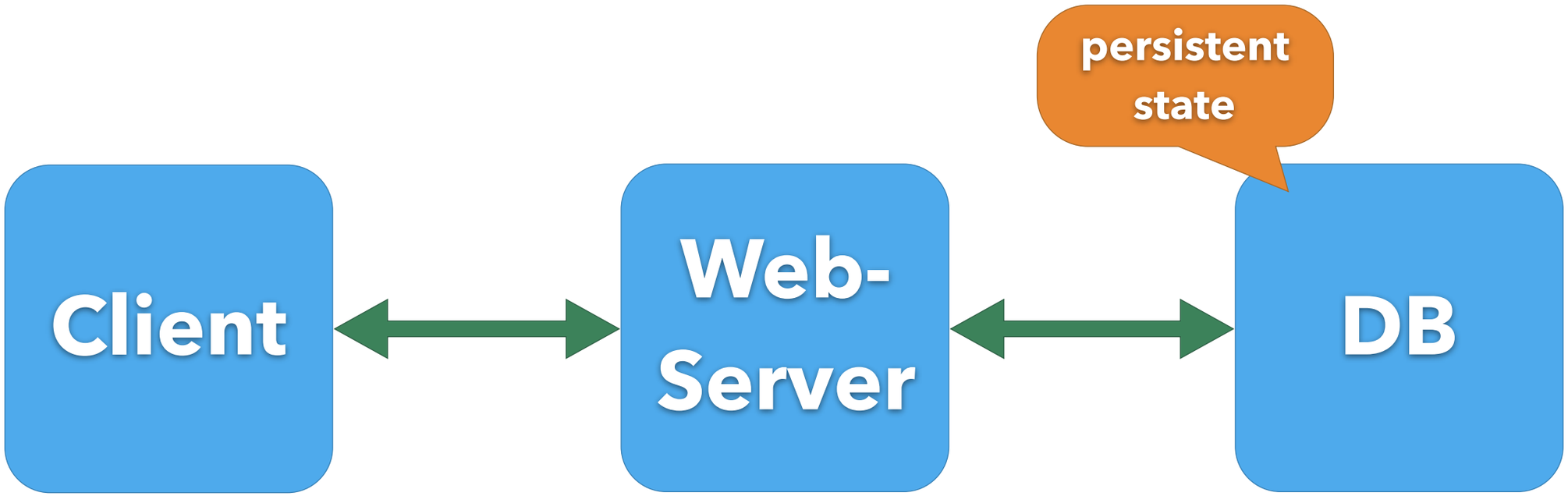
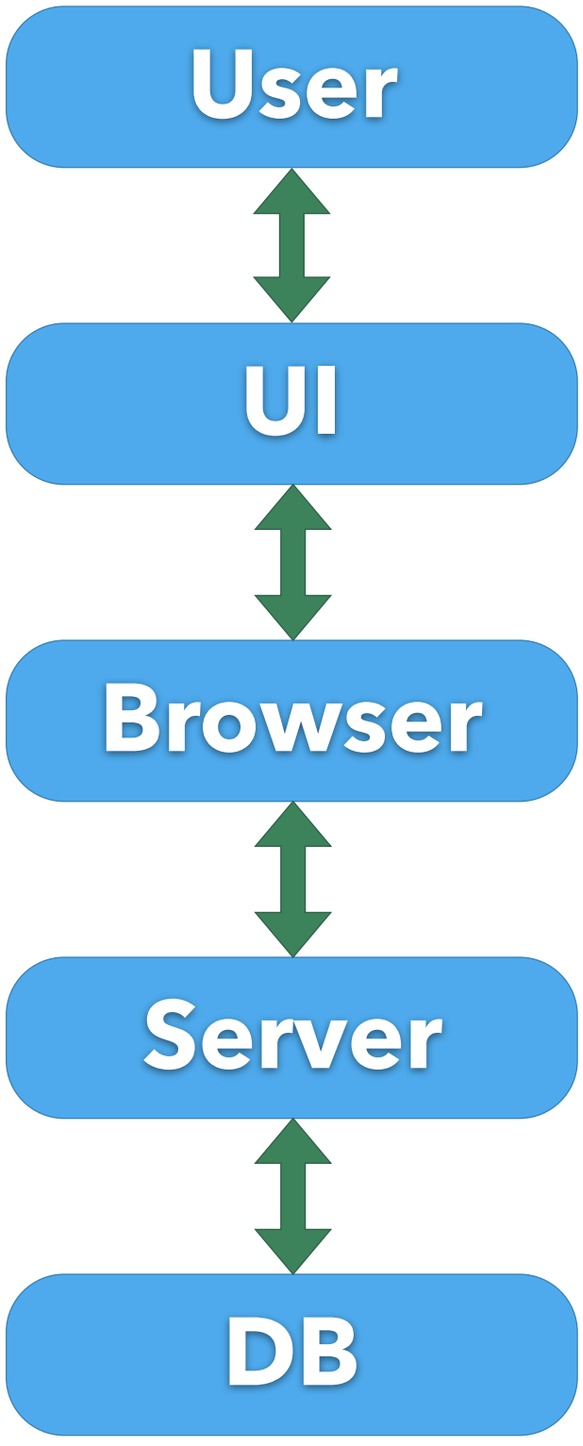
WEB HACKING SESSION

3-TIER



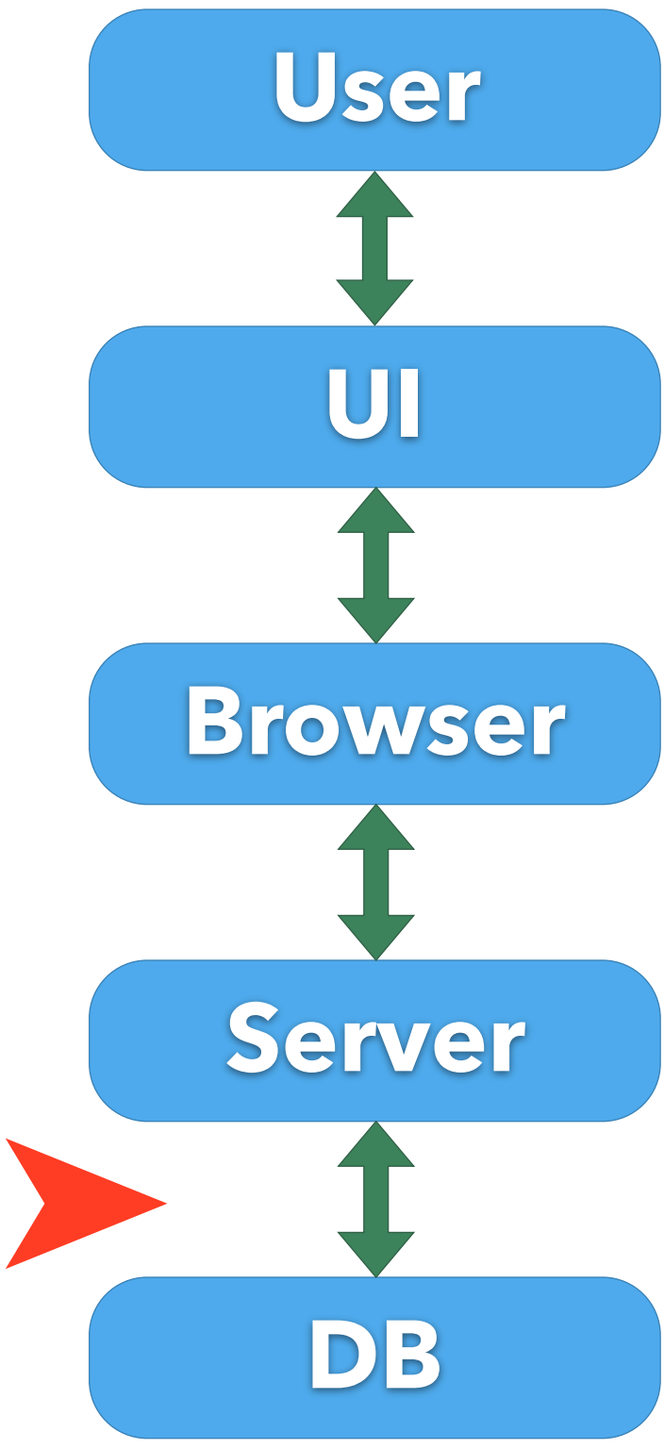
Presentation		Application Logic		Data
HTML	HTTP	PHP	(No)SQL	Relations
JavaScript		Rails		KVS
AJAX		Node.js		Documents

SCENARIO



- user visits a service
- attacker tries to disturb
- various complex layers
- independently developed technologies are being combined
- what you see may not be what you get…

BACKEND



- goal: manipulate state stored in the database
- not directly accessible (hopefully)
- improper input checking in frontend server required
- nice: inconsistency is persistent

EXAMPLE IN PHP

```
$password = $_POST['password'];
$id = $_POST['id'];
$sql = "UPDATE Accounts SET
   PASSWORD = '$password' WHERE
   account_id = $id";
```

Now imagine: password=';--

SQL injection

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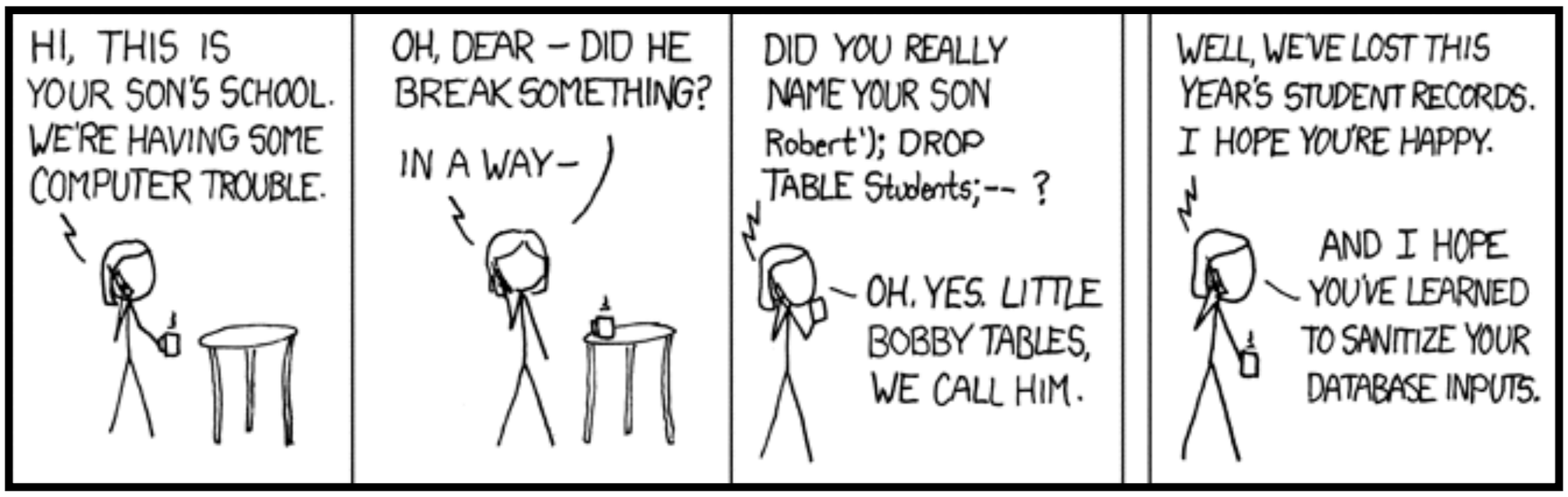
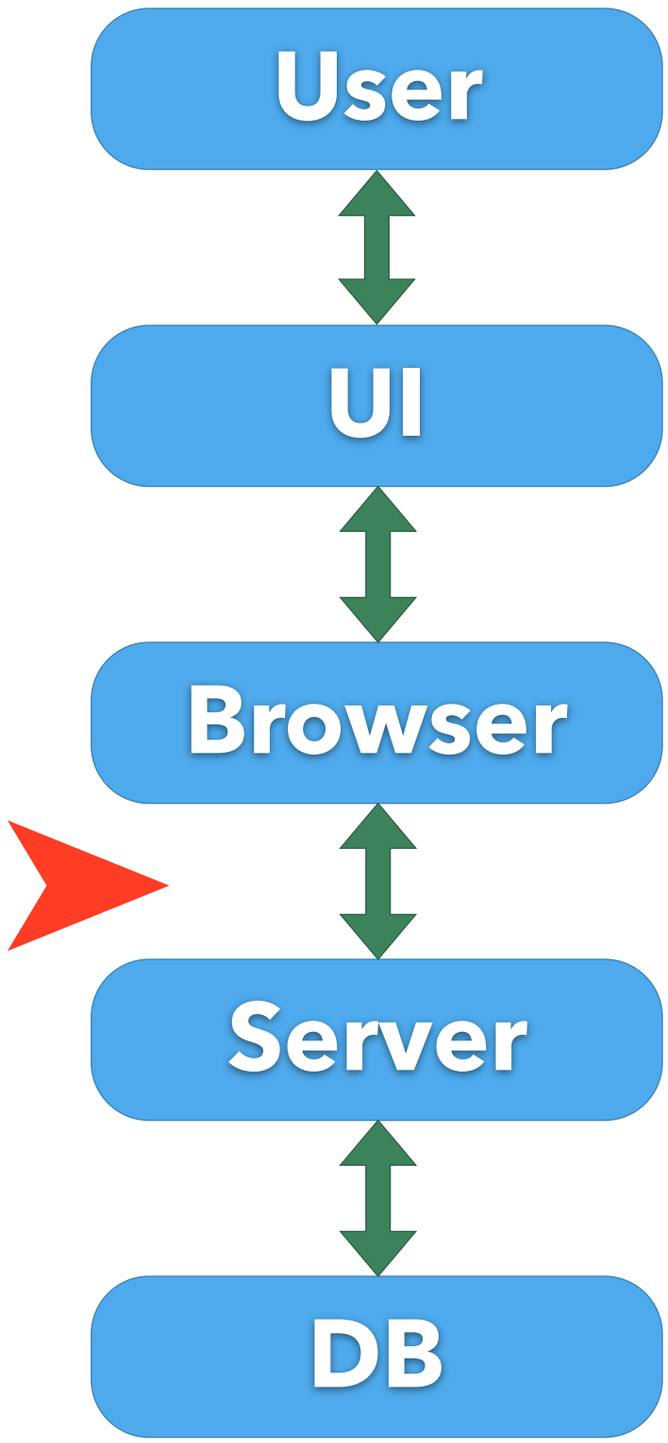
BOBBY TABLES



Comic by Randall Munroe, xkcd.com

LICENSE PLATE

FRONTEND



- goal: manipulate content delivered to the browser
- infrastructure attacks like DNS cache poisoning
- solution for this: make sure you use SSL
- improper input checking can still bite you

EXAMPLE

- http://example.com/?query=query string
- generates website containing:
  You are looking for: query string
- so how about that:
  http://example.com/?query=HTML code
- remember that?
  http://www.wolfgang-schaeuble.de/?search= …

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STEPPING DOWN

XSS

- can inject <script> code
- this code will run with the privileges of the embedding site (think IE zones)
- **cross-site scripting**

- Can you steal site credentials with this?
- imagine a bank website allowing injection
- How do you exfiltrate the password?

SAME ORIGIN

- JavaScript can access password fields
- you cannot use AJAX to send the password
- **same origin policy**
  - JavaScript may only connect back to the originating server (with some tolerance)
- can be defeated with <img> tags
  - encode password in URL to ping your server
- JavaScript can also read cookies…

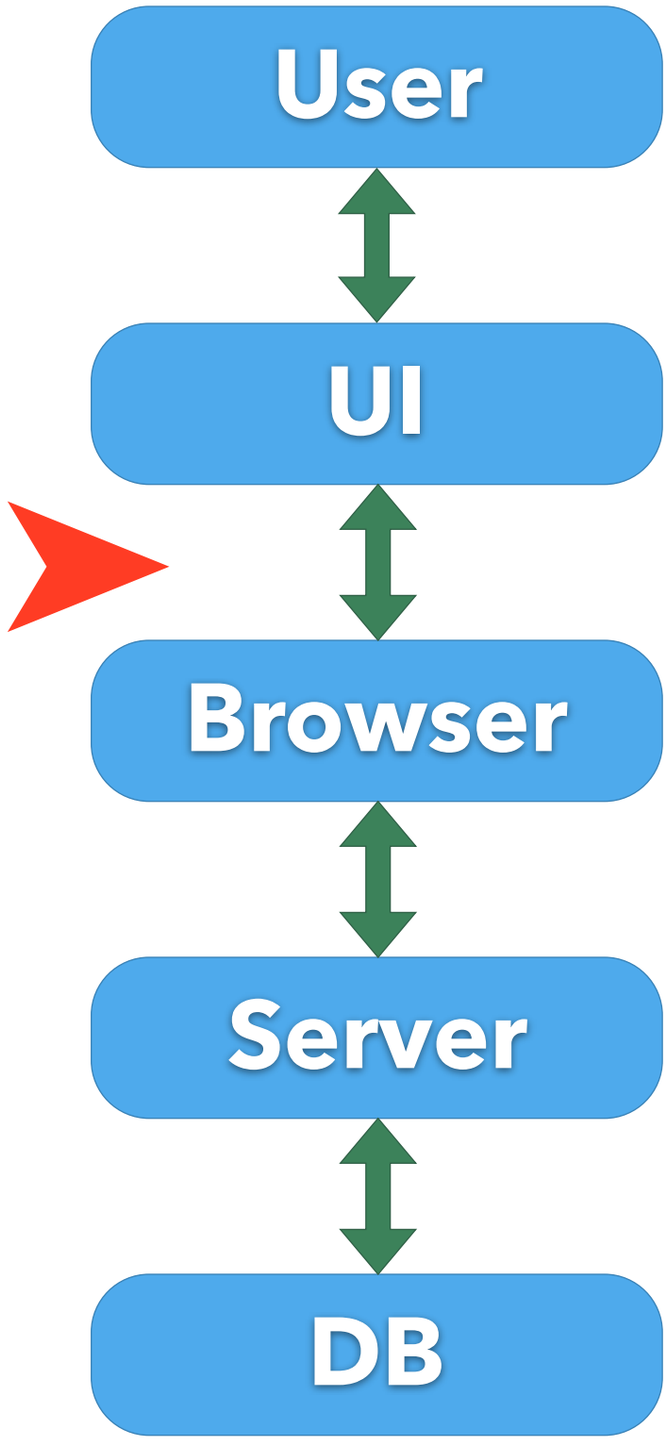
FIXES

- disallow cross-site image loading?
  - lots of sites use this
- no JavaScript access to password field?
  - AJAX logins need this
- fix web application
  - well…
- never click on suspicious links
- always use SSL

So you think SSL works?

- You explicitly type https://?
- Your site loads all JavaScript securely?
- Your platform checks for certificate revocation?
- … and for X.509 Basic Constraints?
- You trust all CAs on this planet to never issue broken certs?

REMOTE CONTROL



- goal: trick the browser to not show what's actually happening
- or: how to pull strings behind the user's back
- or: can one website control another one?
- no mischief with the server communication

SCENARIO

- user visits a regular website you control
- Can you use credentials of a different site?
- some preconditions
  - user is logged in to the target site in another browser tab
  - the target site identifies the user session with a cookie
- no cross-site cookie leakage in browser

CSRF

- same origin policy denies AJAX to target
- again, <img> is your friend
- one website can send arbitrary requests to another, unrelated site
- **cross site request forgery**
- a special case of the **confused deputy problem**
- requests are blindly operating the target

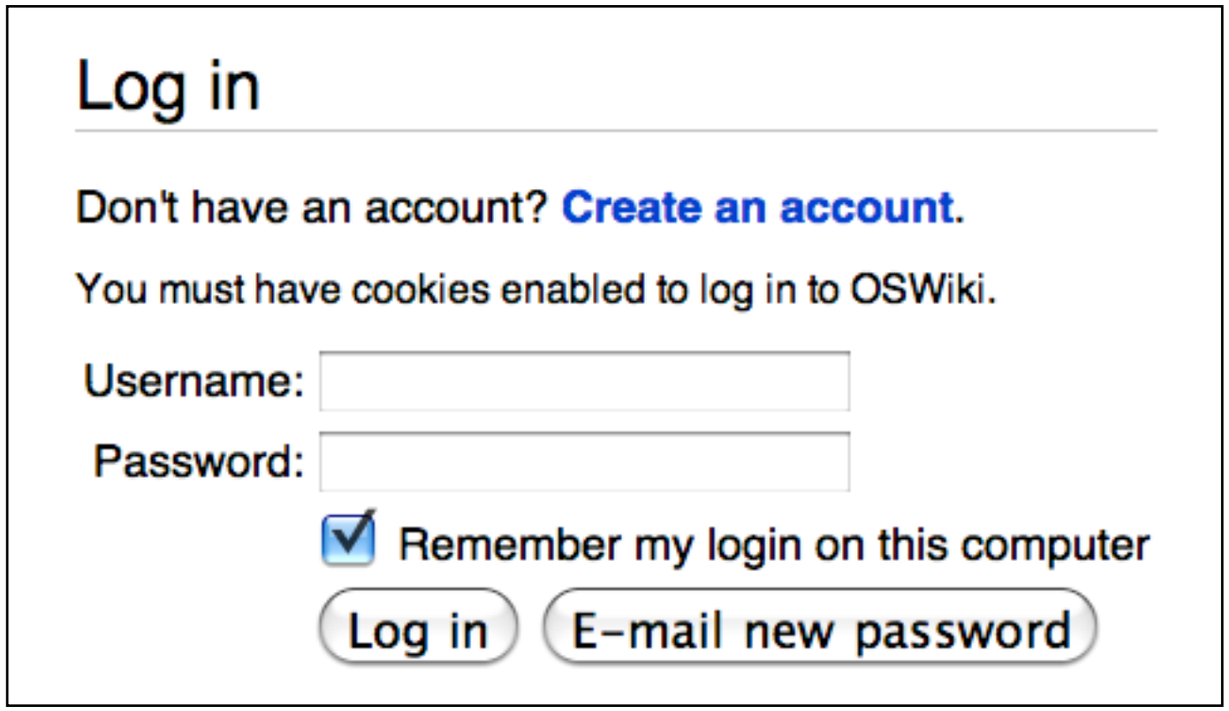
CAN DO

- send requests and GET parameters
  - click buttons in the UI of the target site
  - operate search fields and other text input
- basic or digest authentication? cookies?
  - browser automatically sends credential
  - session riding
- POST requests?
  - manufacture a <form> instead of <img>

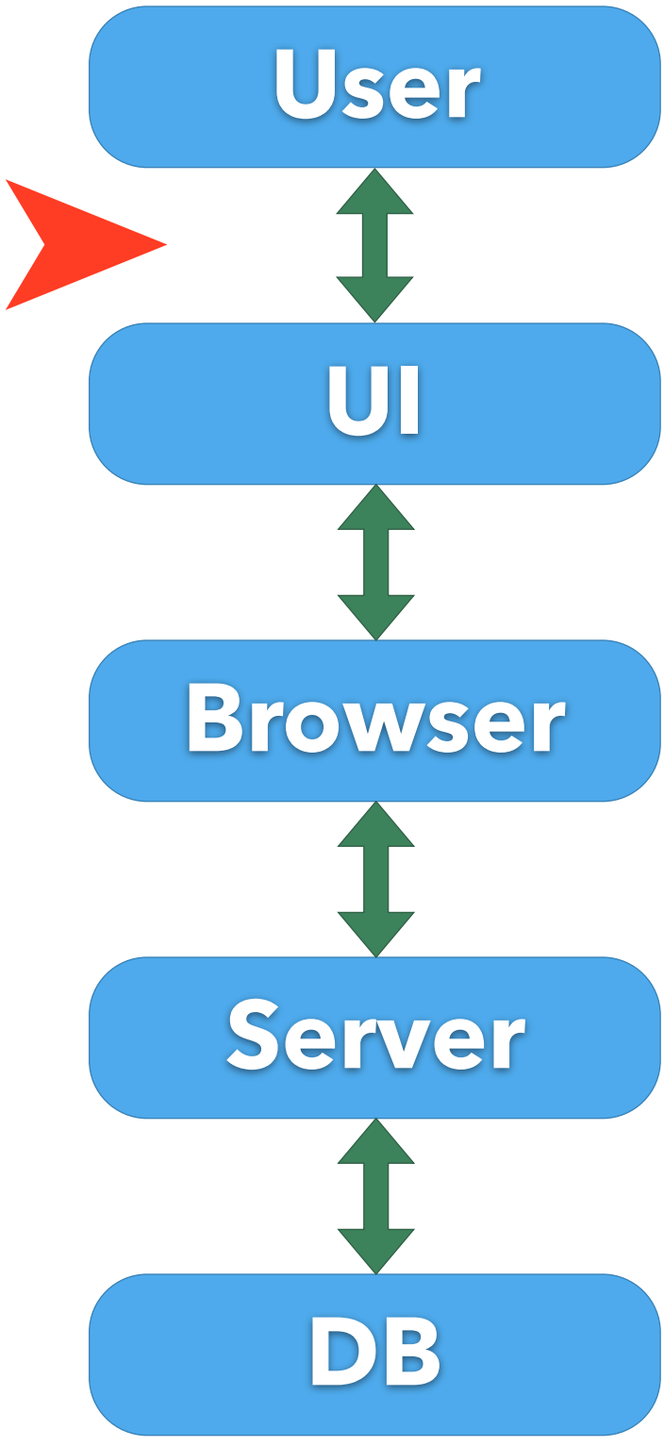
TARGETS

- study in late 2008: high-profile bank websites vulnerable
- browser-based port scanning
  - this is behind the corporate firewall
- WiFi routers with web interface
  - disable firewall
  - reset wifi protection
  - enable UPnP

- disable cross-site POST requests
  - GET requests should by definition never change persistent state
- never authenticate a change of persistent state by cookie only
- pass an additional credential
  - session ID in URL, edit tokens


Log in
Don't have an account? Create an account.
You must have cookies enabled to log in to OSWiki.
Username:
Password:
Remember my login on this computer
Log in
E-mail new password

BLINDNESS



- goal: mislead the user to not seeing what's actually happening
- nothing going on behind your back
- the internal state of the browser is properly displayed
- but you don't notice…

PICK ONE

www.paypal.com

CYRILLIC SMALL LETTER A (U+0430)

LATIN SMALL LETTER A (U+0061)

www.paypal.com

homograph attack

GENERALIZE

FRACTION SLASH (U+2044)

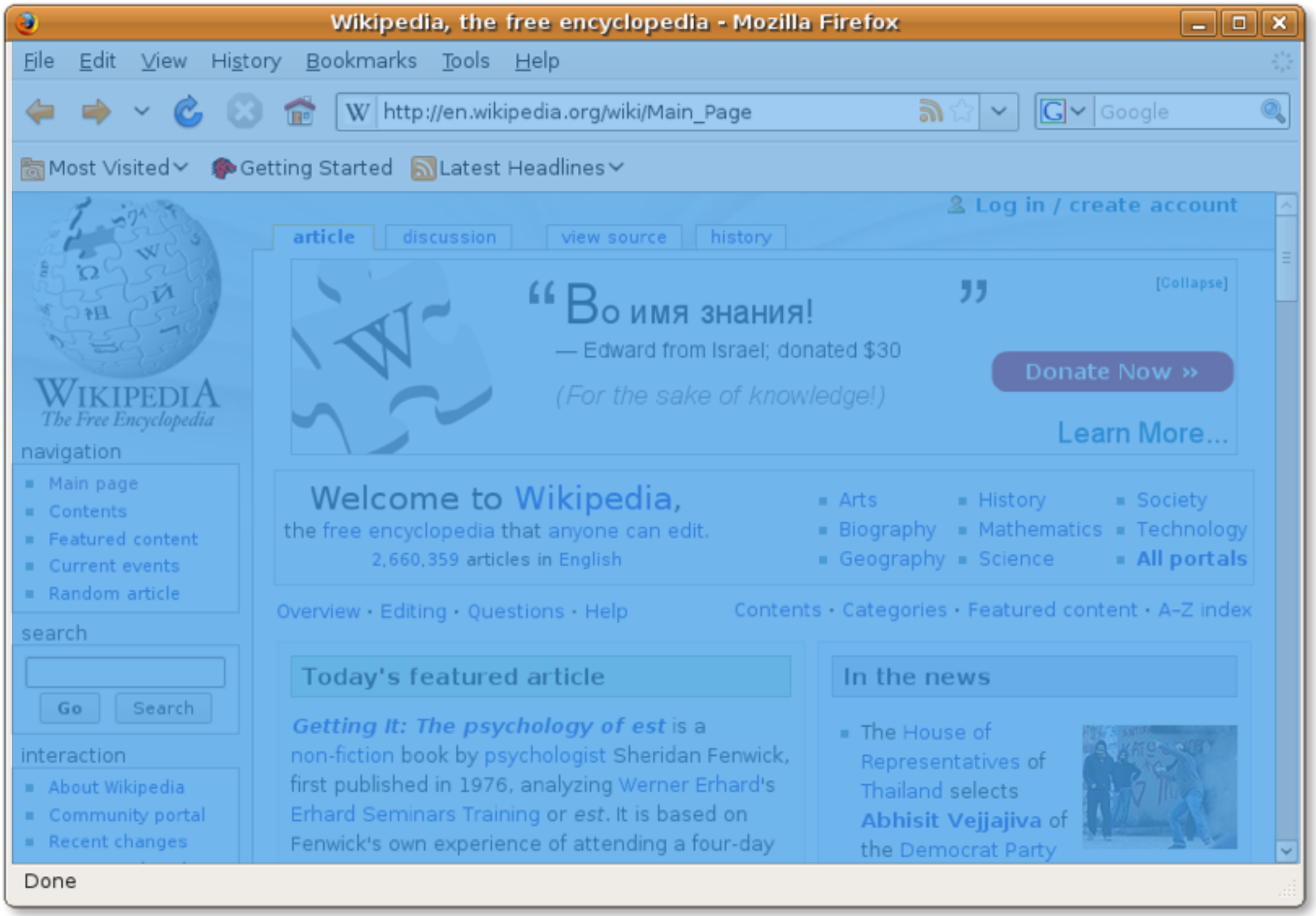
https://www.bank.com/account/login.ab.cd

www.bank.xn--comaccountlogin-uh0iha.ab.cd

https://www.bank.com/account/login.ab.cd

www.bank.com

CONTENT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WIKIPEDIA
The Free Encyclopedia
"Во имя знания!"
— Edward from Israel; donated $30
(For the sake of knowledge!)
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search
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Search
interaction
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Recent changes
Welcome to Wikipedia,
the free encyclopedia that anyone can edit.
2,660,359 articles in English
Arts
Biography
Geography
History
Mathematics
Science
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Today's featured article
Getting It: The psychology of est is a non-fiction book by psychologist Sheridan Fenwick, first published in 1976, analyzing Werner Erhard's Erhard Seminars Training or est. It is based on Fenwick's own experience of attending a four-day
In the news
The House of Representatives of Thailand selects Abhisit Vejjajiva of the Democrat Party
Done

PADLOCKS


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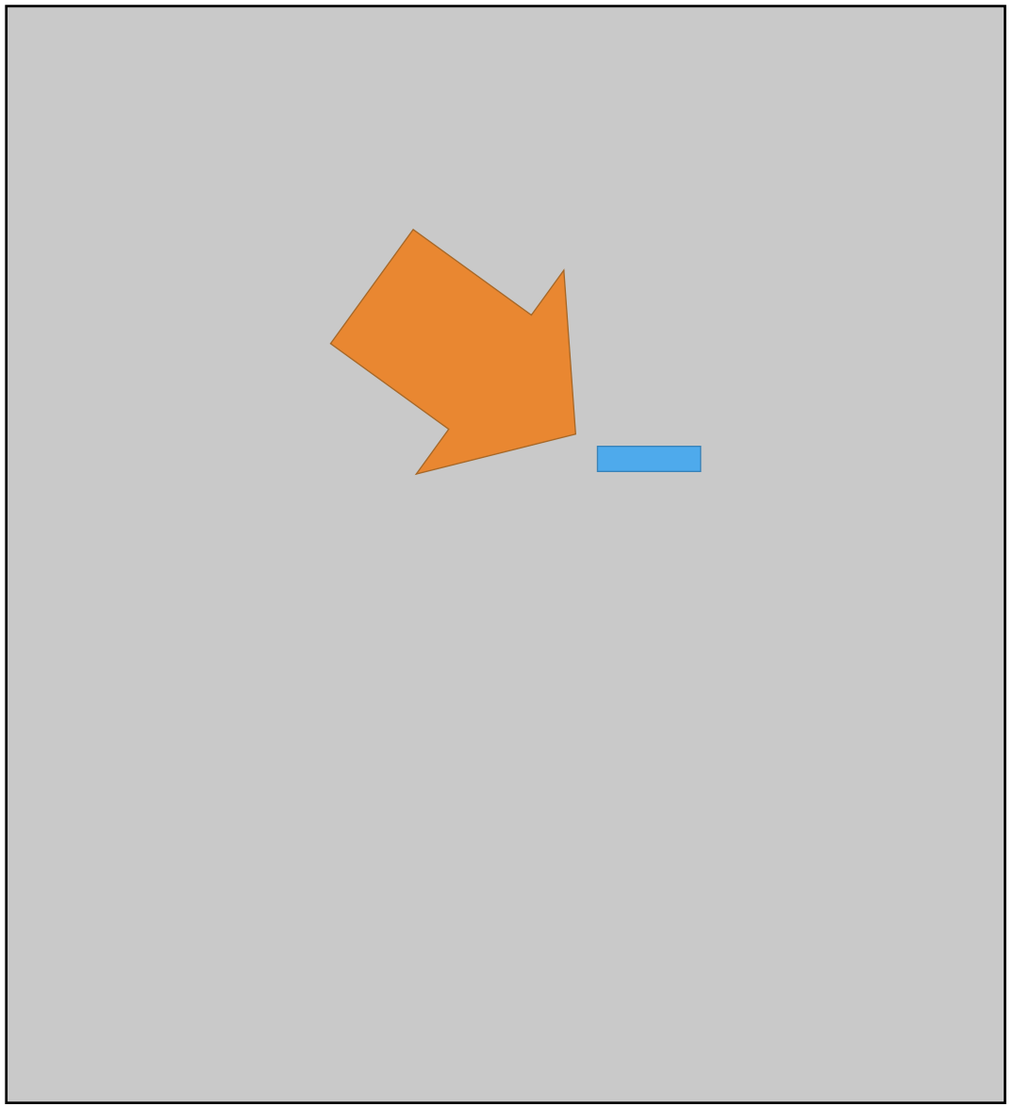
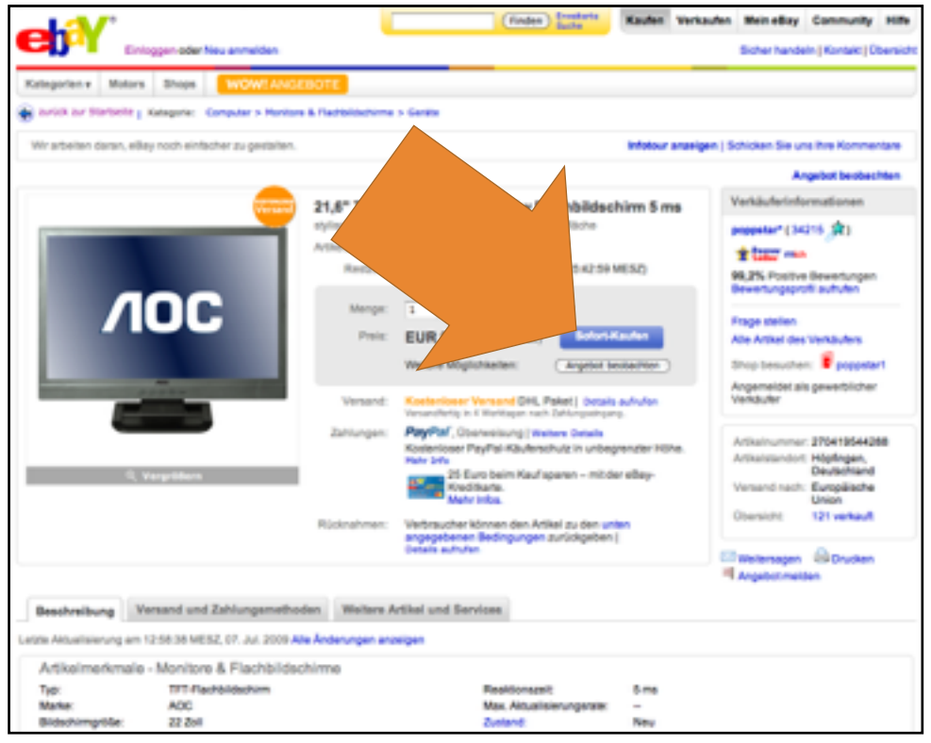
CLICKJACKING

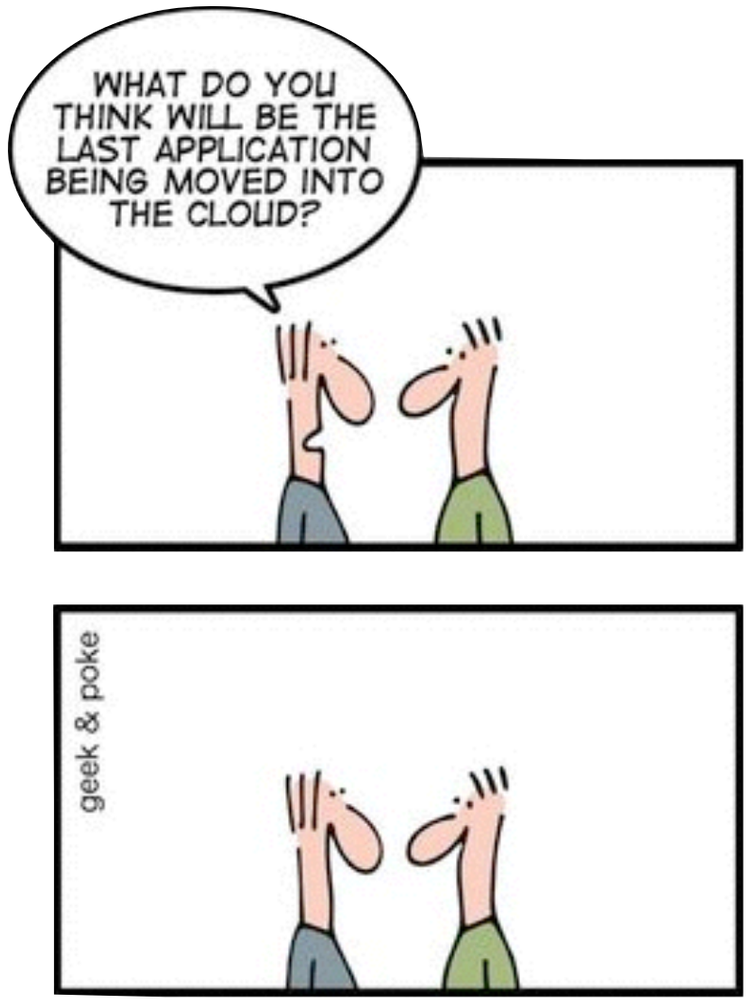


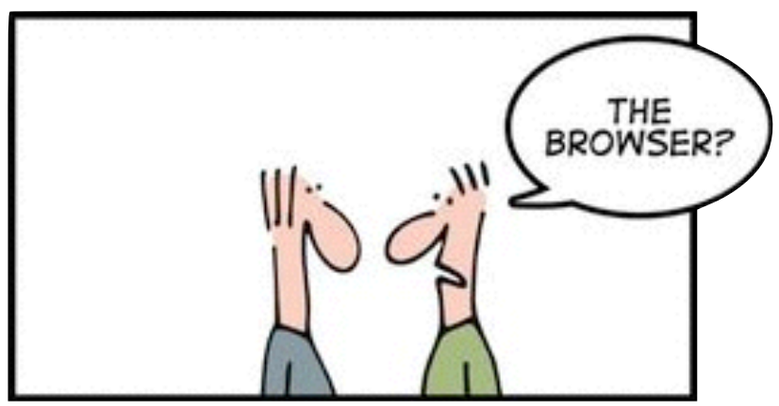


- this only works when logged in
  - always log out explicitly
  - do not use persistent logins
- you may want to check wether your password manager autofills inside frames

CONCLUSION

- web standards have gotten complex
- even bug-free behavior is vulnerable
- browsers are a bad application platform
- we did not even talk about WebSockets, WebGL, WebRTC, …





SUMMARY

Is everything lost?

Yes