TECHNISCHE UNIVERSITÄT DRESDEN

Department of Computer Science Institute of System Architecture, Operating Systems Group

PROBLEMS IN PRACTICE: THE WEB

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THE WEB AS A DISTRIBUTED SYSTEM

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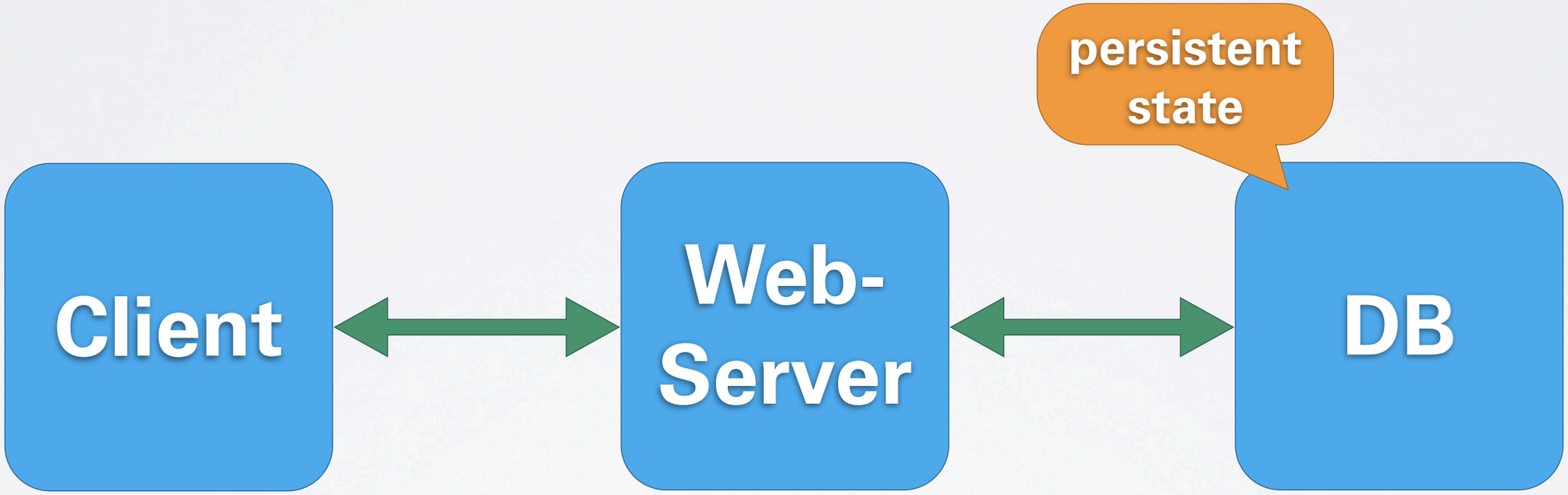
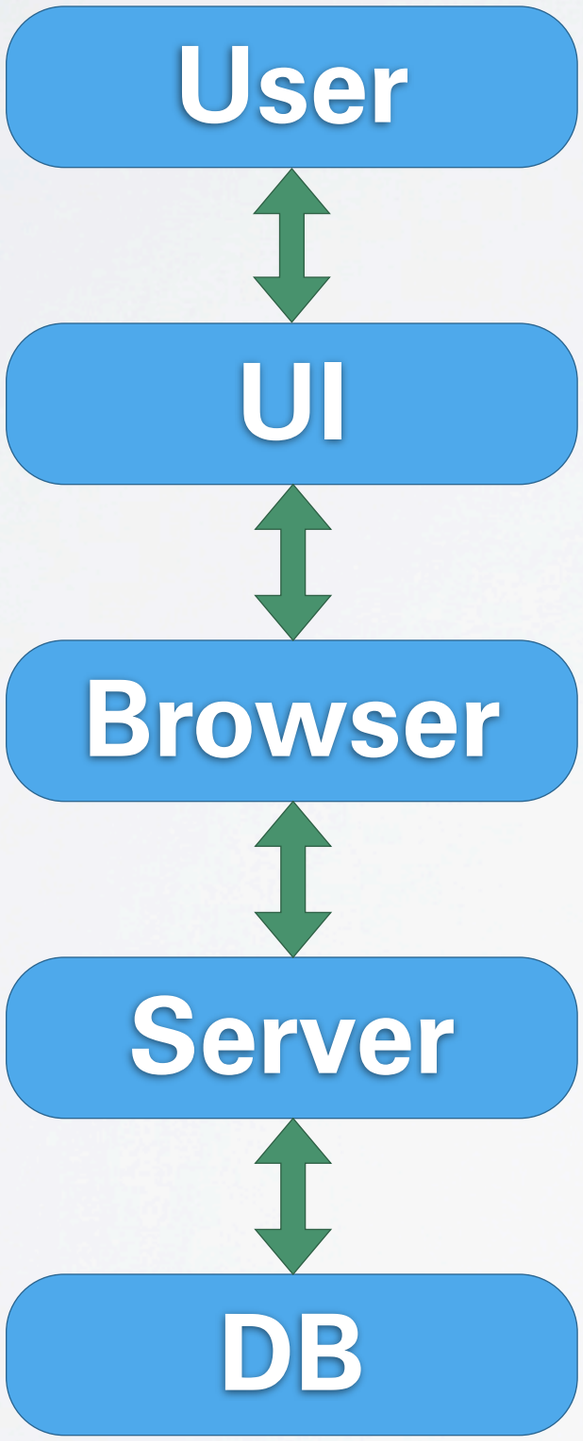
WEB HACKING SESSION

3-TIER



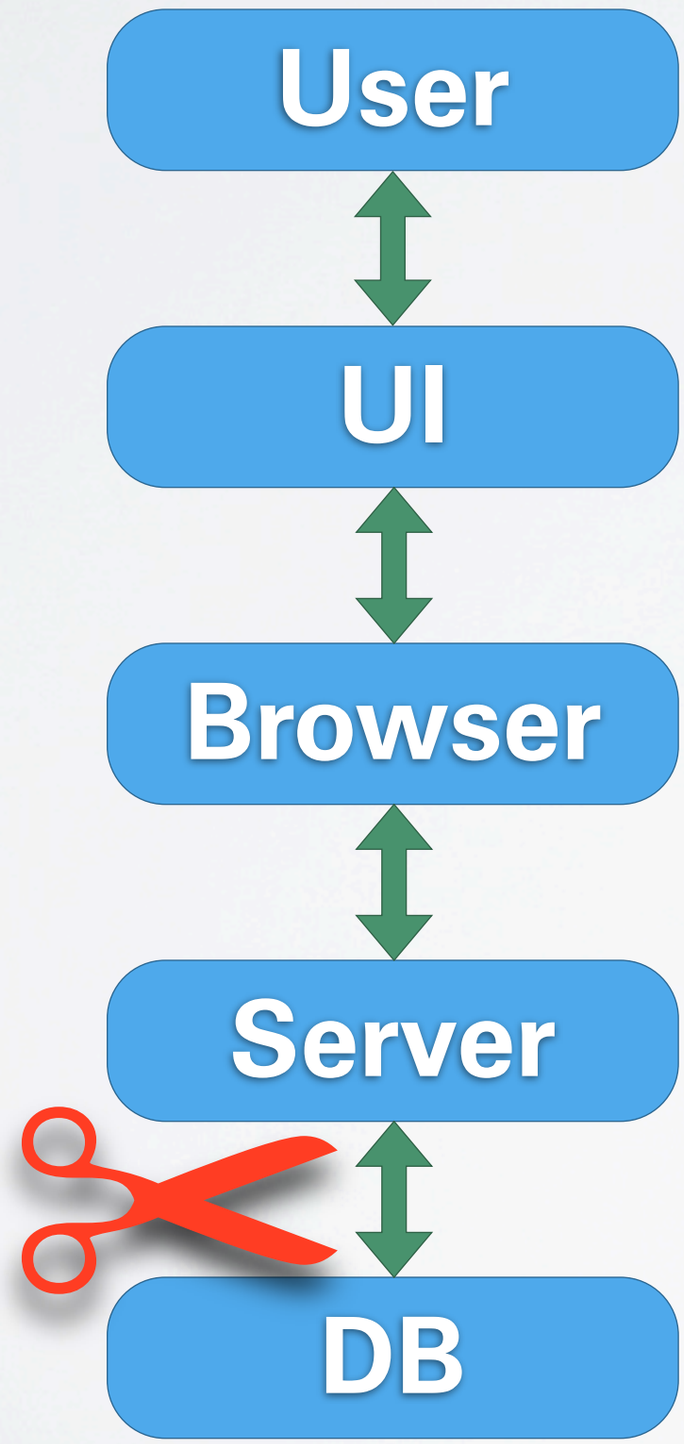
Presentation		Application Logic		Data
HTML JavaScript AJAX	HTTP	PHP EJB WebObjects	SQL	Relations

SCENARIO



- user accesses a sensitive 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 backend DB
- 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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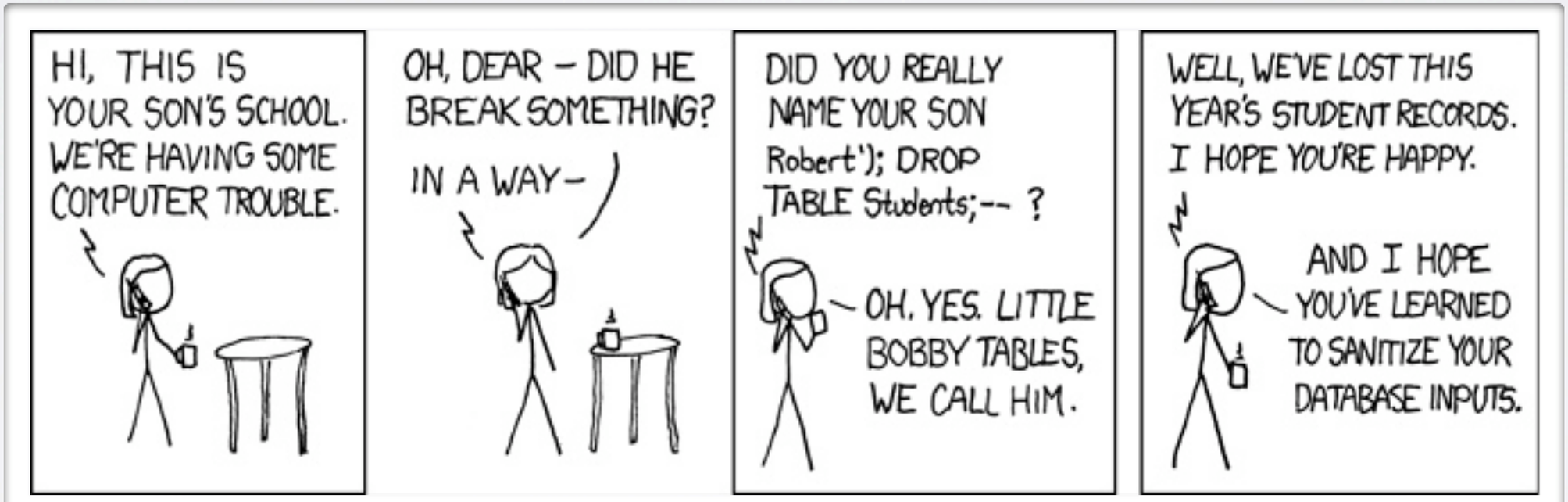
BOBBY TABLES



Comic by Randall Munroe, xkcd.com

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LICENSE PLATE

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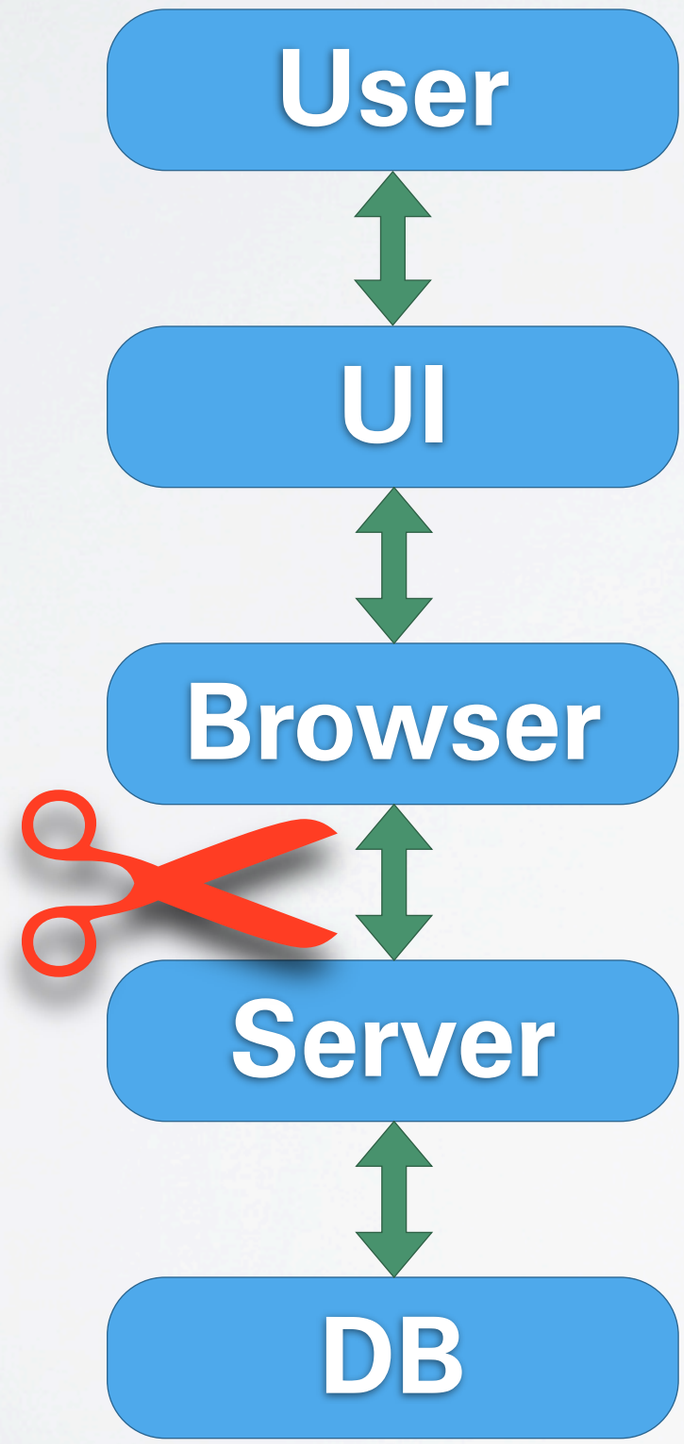
VARIATIONS

- exploit other flaws in the application logic
- insufficient boundaries between users
  - Hotmail hole exposes mails of other users
- security by obscurity
  - URL guessing can expose hidden resources
- logic bombs
  - Mikeyy worm on Twitter used code injection via custom CSS to replicate

always sanitize input

FRONTEND



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

EXAMPLE

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

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STEPPING DOWN

XSS

- sometimes this type of **HTML injection** is improperly called **cross-site scripting**
- injection (both HTML and SQL) can **become** cross-site scripting (XSS) attacks

- just embed `<script>` tags and send code
- this code will run with the privileges of the embedding site (think IE zones)
- the script can then operate the site for you

CREDENTIALS

- Can you steal site credentials with this?
- imagine a bank website allowing injection
- What do we have?
  - user needs to click attacker-provided link
  - you could display a fake login form
  - even with some JavaScript
  - the browser would indicate proper SSL
- How do you get the password?

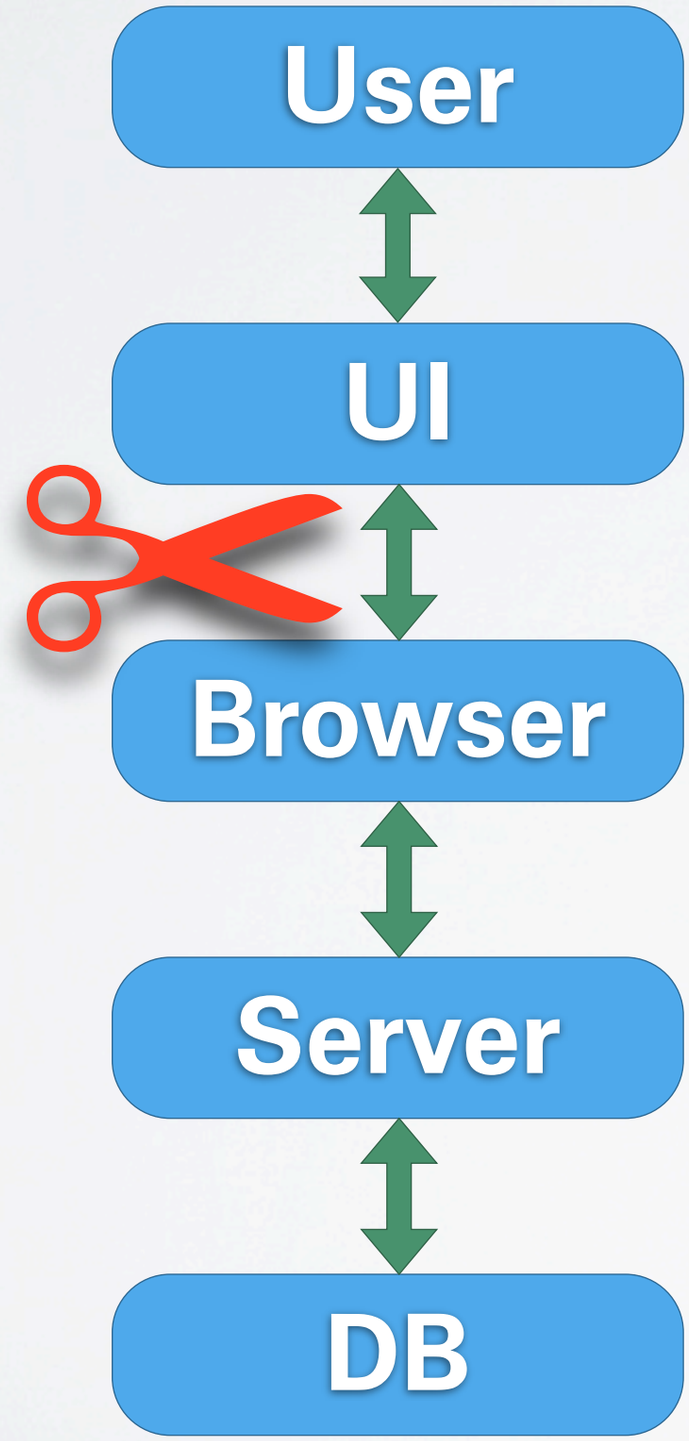
SAME ORIGIN

- JavaScript can access password fields
- you cannot use AJAX to get 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…

FIX

- fix web application
  - well…
- disallow cross-site image loading?
  - lots of sites use this
- no JavaScript access to password field?
  - AJAX logins need this

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 obtain 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 prevents 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**
- the requests are made blindly

CAN DO

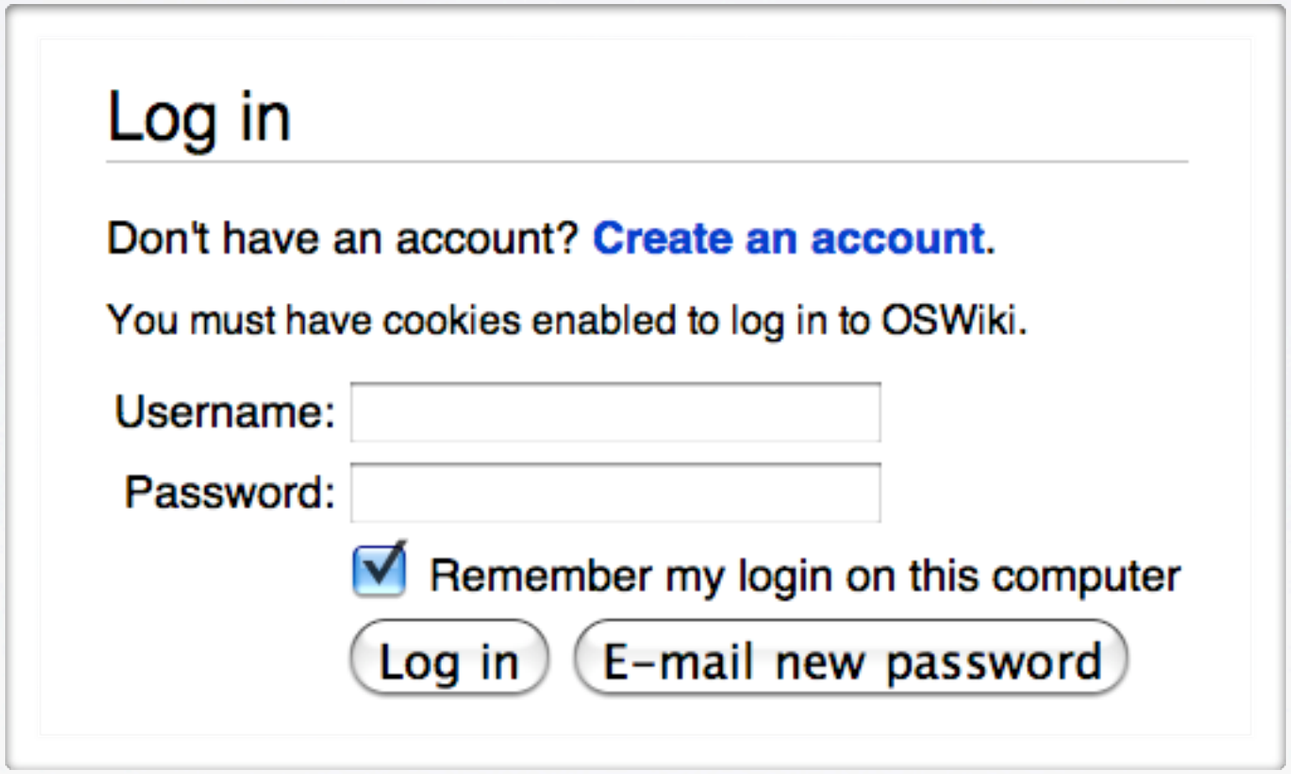
- send requests and GET parameters
  - click buttons in the UI of the target site
  - operate search fields and other text input
- basic or digest authentication? cookies?
  - browser automatically sends credential
  - **session riding**
- POST requests?
  - manufacture a `<form>` instead of `<img>`

TARGETS

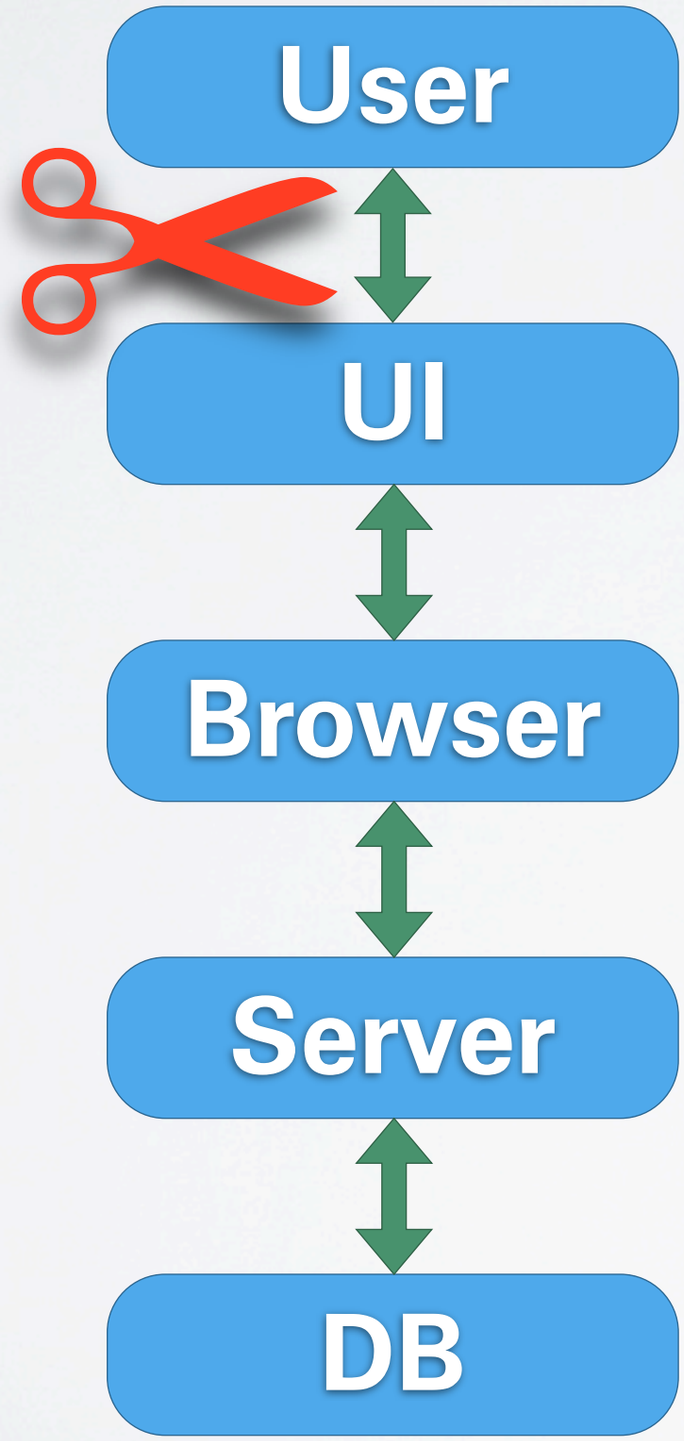
- study in late 2008: high-profile bank websites vulnerable
- DSL-Routers
  - disable firewall
  - reset wifi protection
  - enable UPnP
- browser-based port scanning
  - this is behind the corporate firewall

FIX

- disable cross-site POST requests
  - GET requests should by definition never change persistent state
  - there is a Firefox plugin for that
- 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

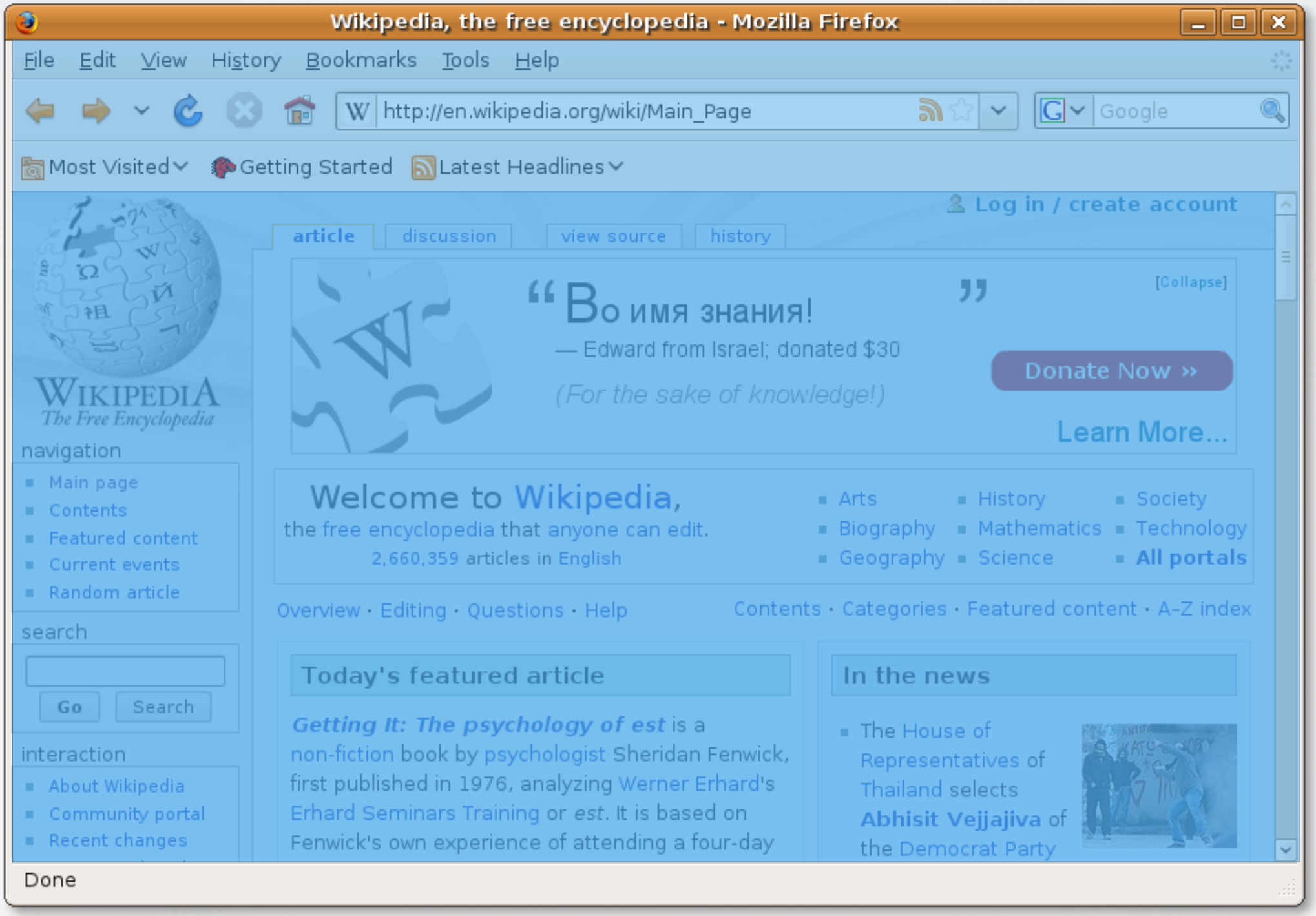
CYRILLIC SMALL LETTER A (U+0430)

LATIN SMALL LETTER A (U+0061)

www.paypal.com

homograph attack

CONTENT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the free encyclopedia that anyone can edit.
2,660,359 articles in English
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Today's featured article
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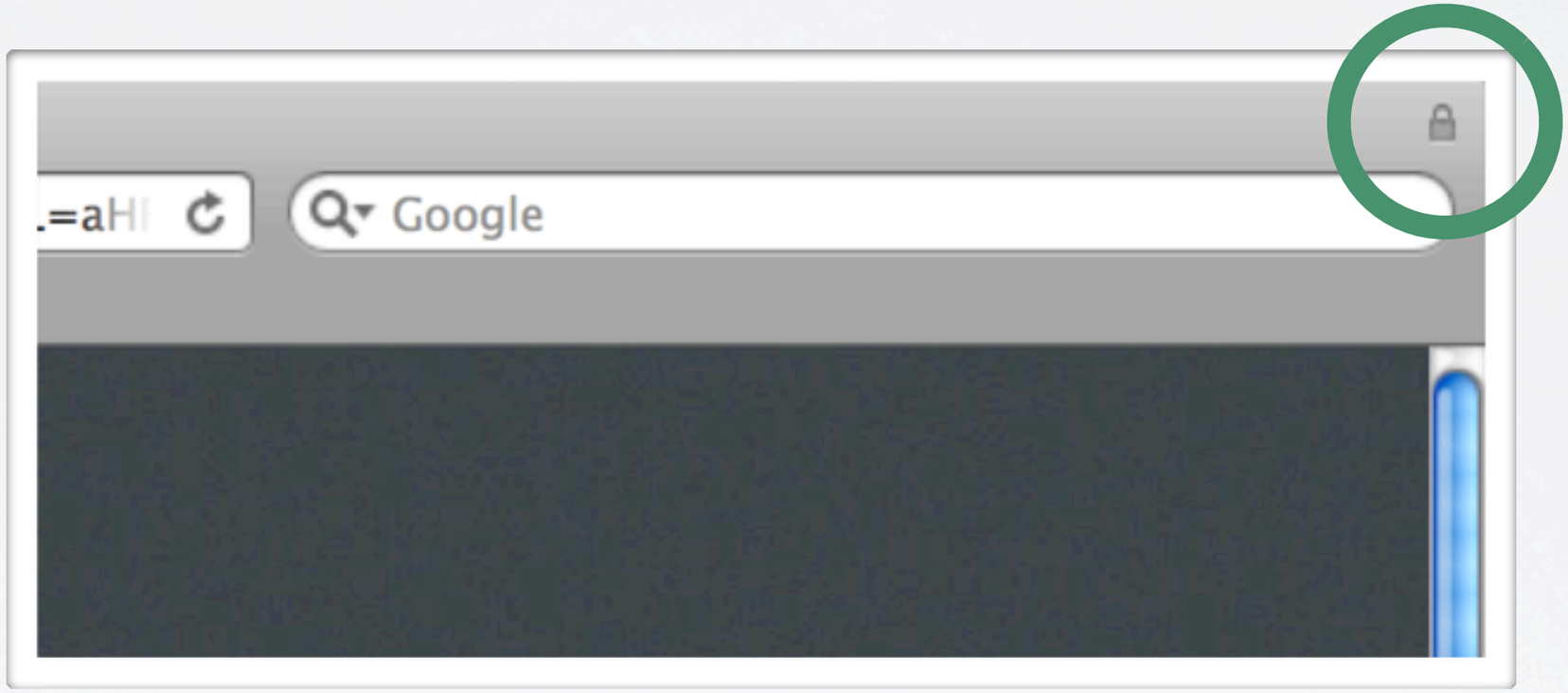
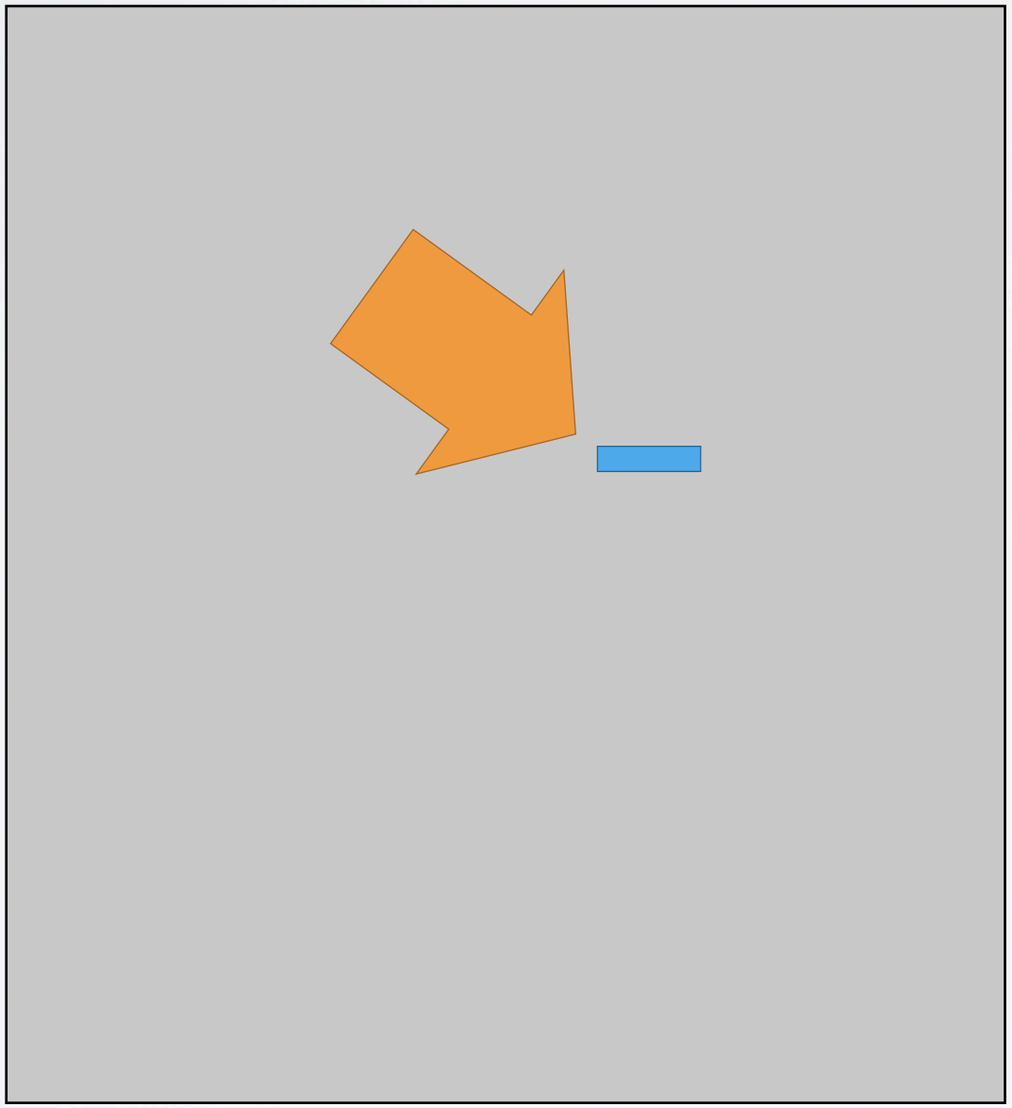
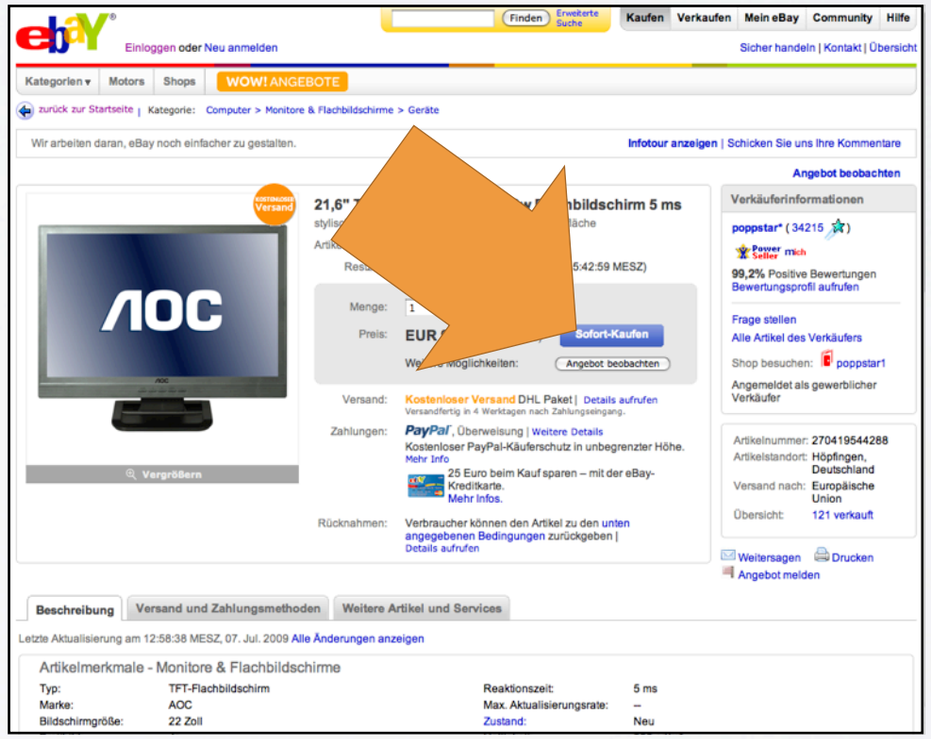
In the news
The House of Representatives of Thailand selects Abhisit Vejjajiva of the Democrat Party
Done

BETTER

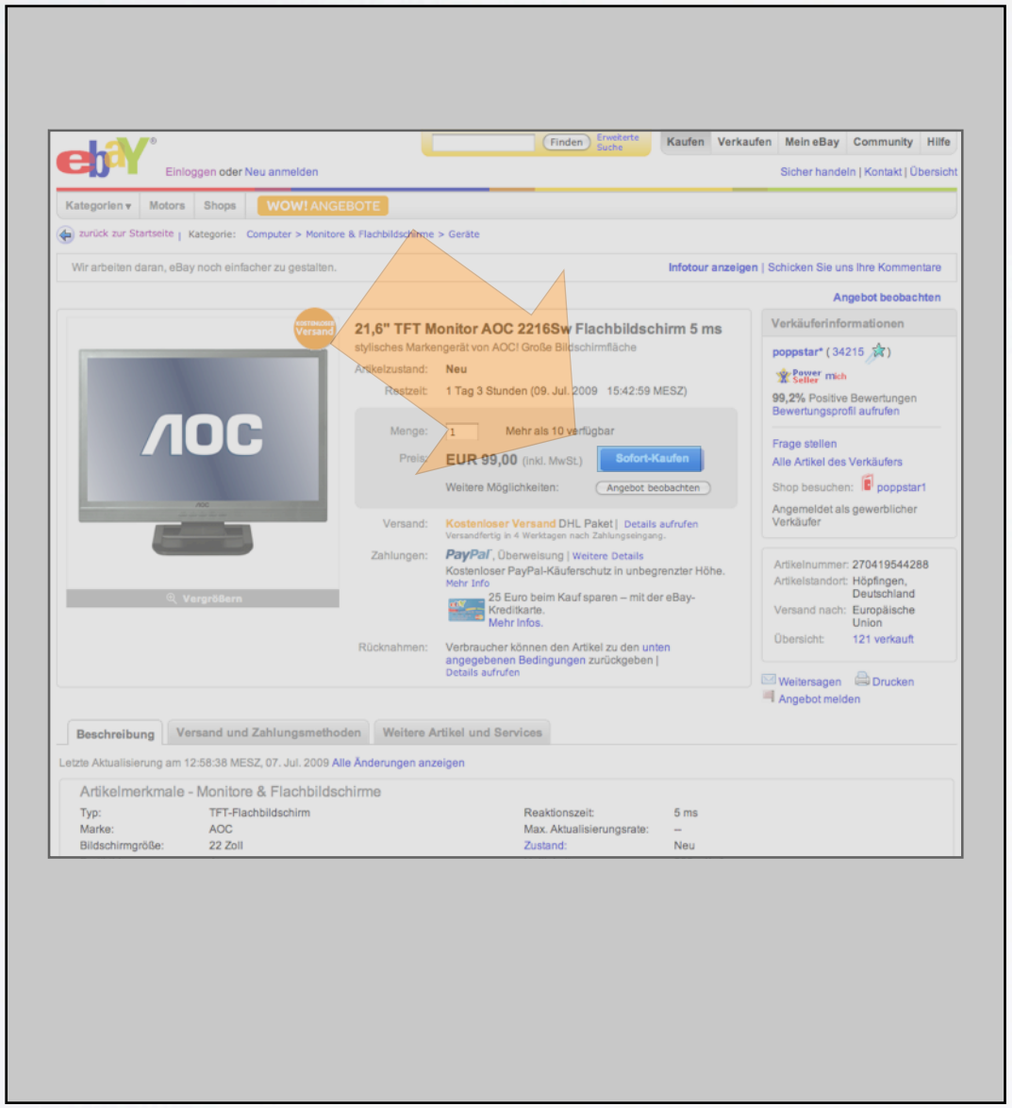


CLICKJACKING





CLICKJACKING



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

SUMMARY

Is everything lost?

Yes