TECHNISCHE
UNIVERSITÄT
DRESDEN

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

PROBLEMS IN PRACTICE: THE WEB

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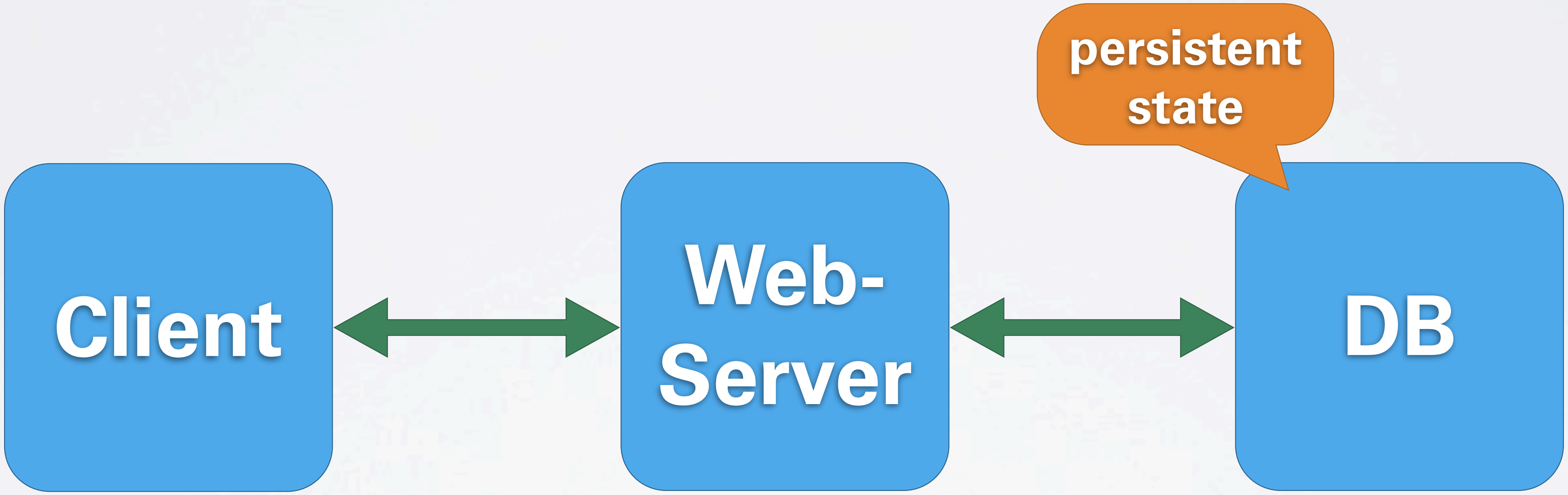
THE WEB AS A DISTRIBUTED SYSTEM

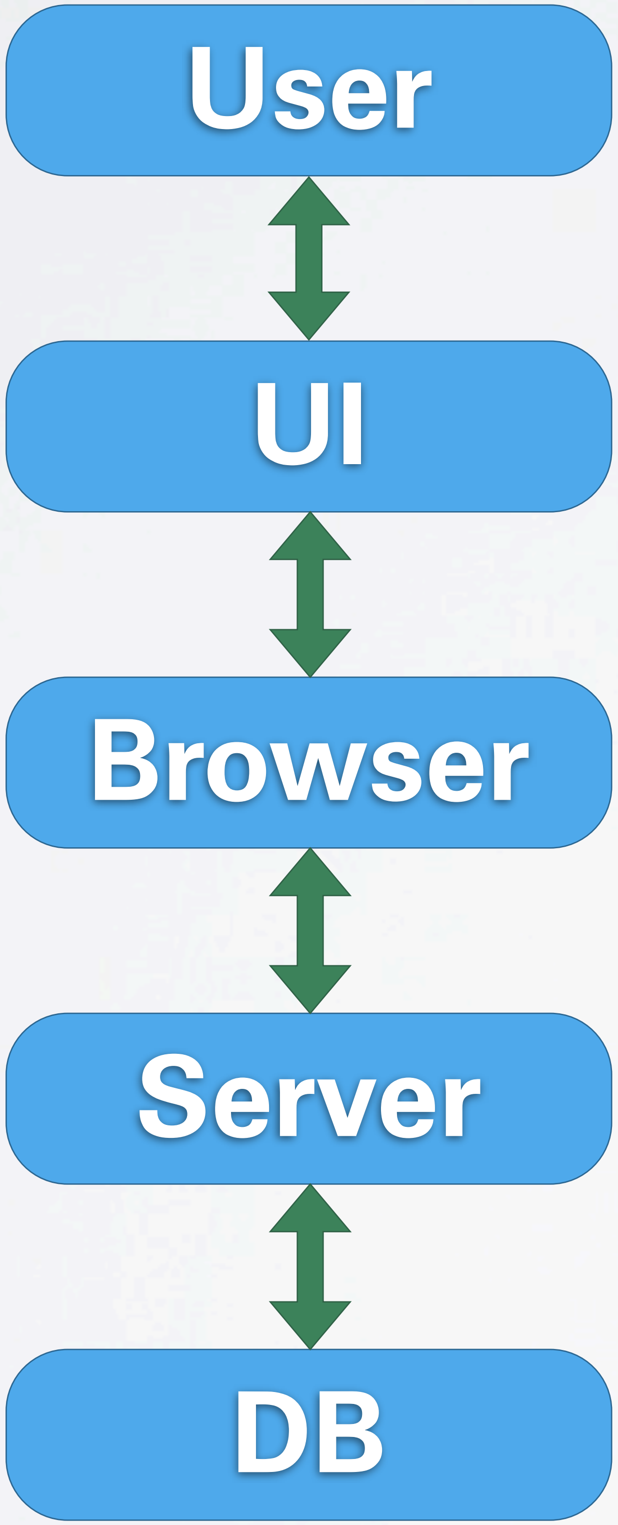
WEB HACKING SESSION

3-TIER



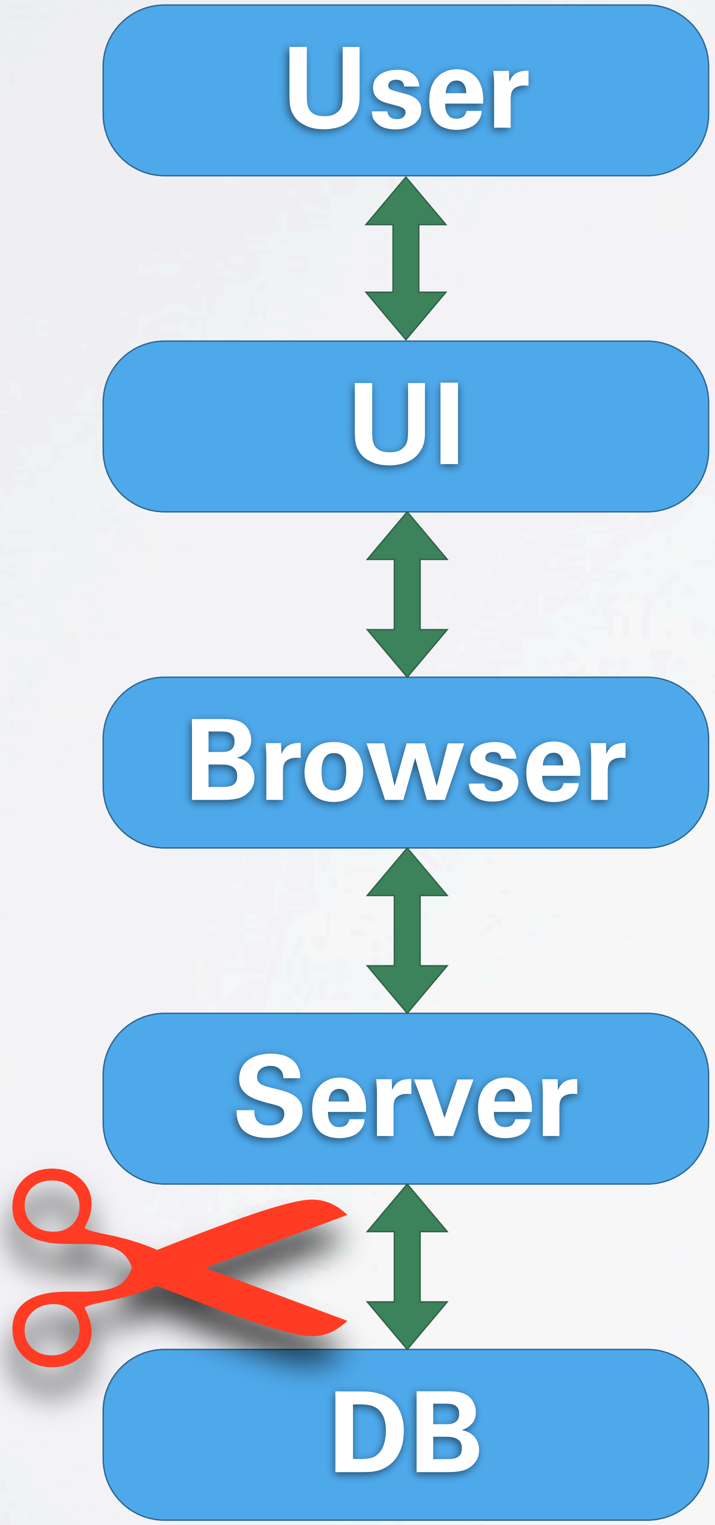
Presentation		Application Logic		Data
HTML JavaScript AJAX	HTTP	PHP EJB WebObjects	SQL	Relations

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

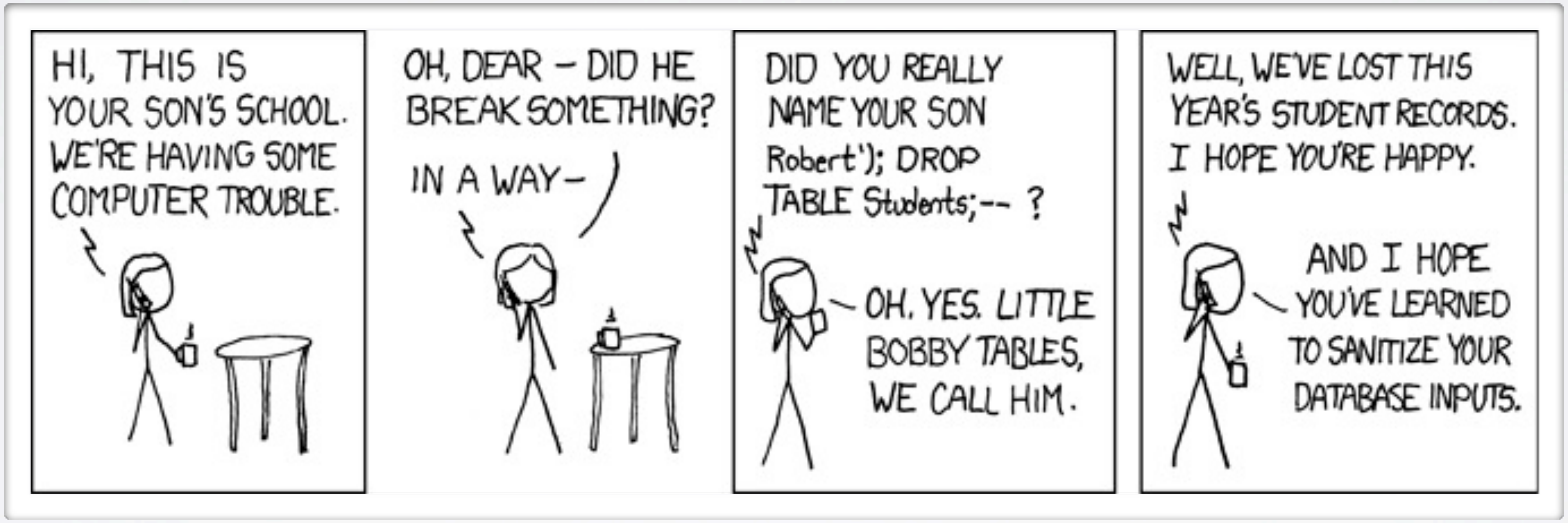
EXAMPLE IN PHP

```
$password = $_POST['password'];

$id = $_POST['id'];

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

Now imagine: `password=';--`

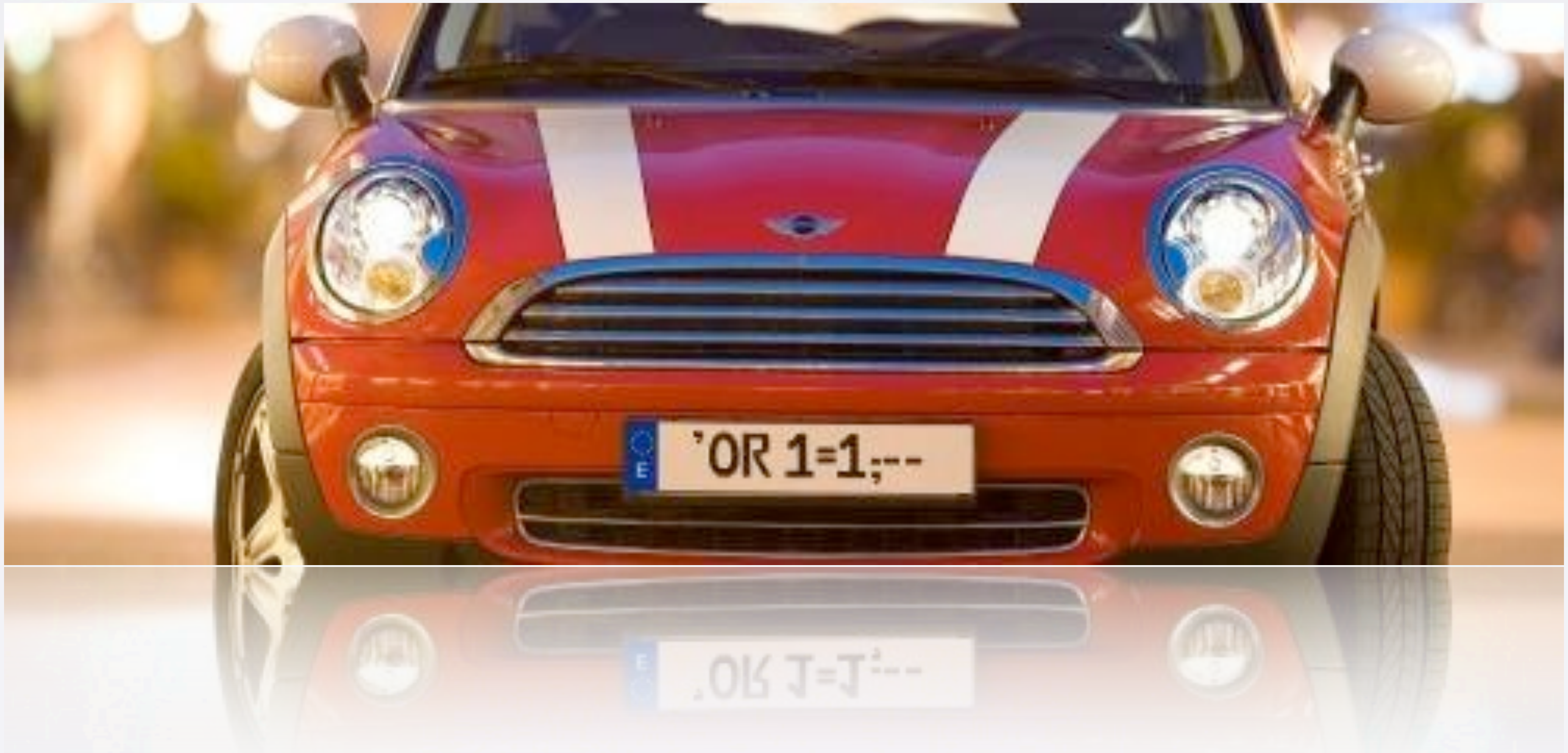
SQL injection

BOBBY TABLES


HI, THIS IS YOUR SON'S SCHOOL. WE'RE HAVING SOME COMPUTER TROUBLE.
OH, DEAR – DID HE BREAK SOMETHING?
IN A WAY–
DID YOU REALLY NAME YOUR SON Robert'); DROP TABLE Students;-- ?
OH. YES. LITTLE BOBBY TABLES, WE CALL HIM.
WELL, WE'VE LOST THIS YEAR'S STUDENT RECORDS. I HOPE YOU'RE HAPPY.
AND I HOPE YOU'VE LEARNED TO SANITIZE YOUR DATABASE INPUTS.

Comic by Randall Munroe, xkcd.com

LICENSE PLATE



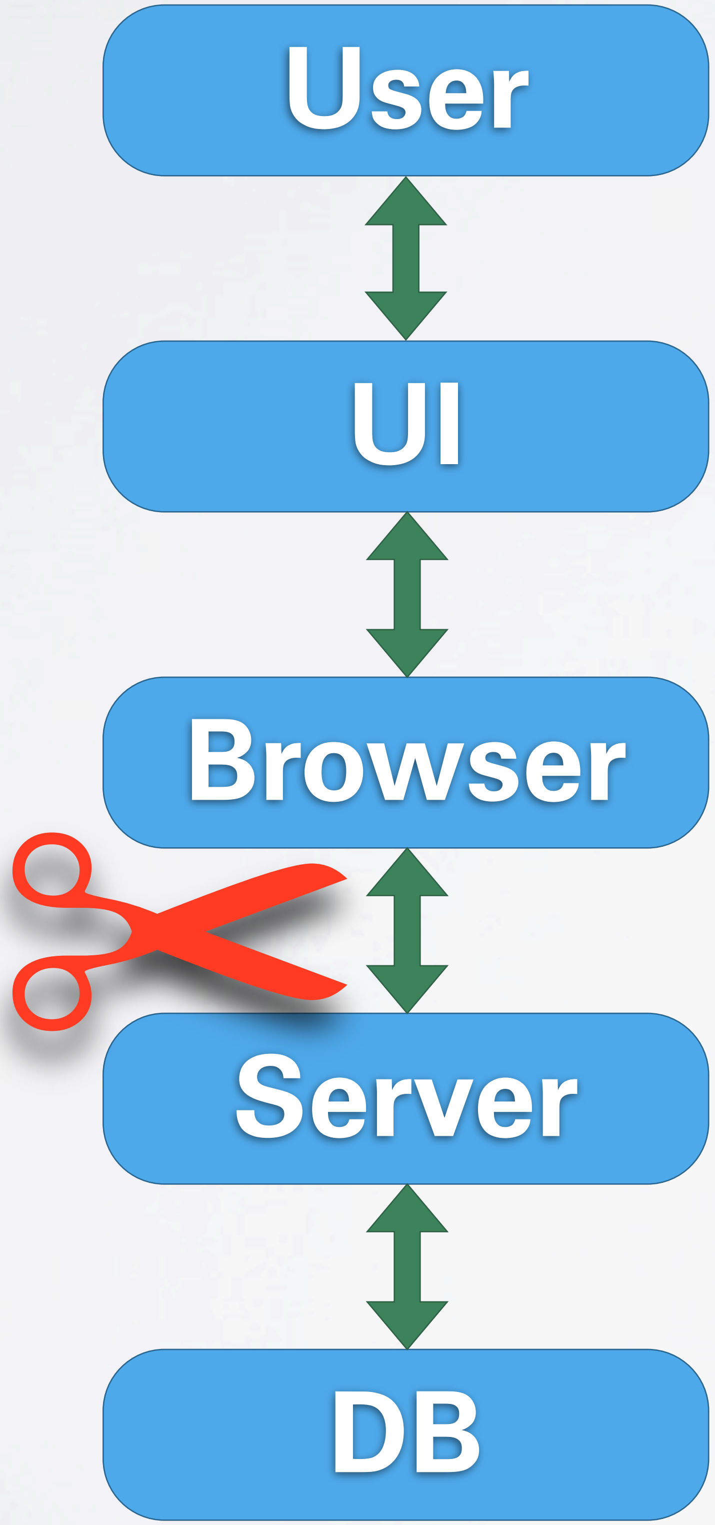
VARIATIONS

- 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

FIX

always sanitize input

FRONTEND

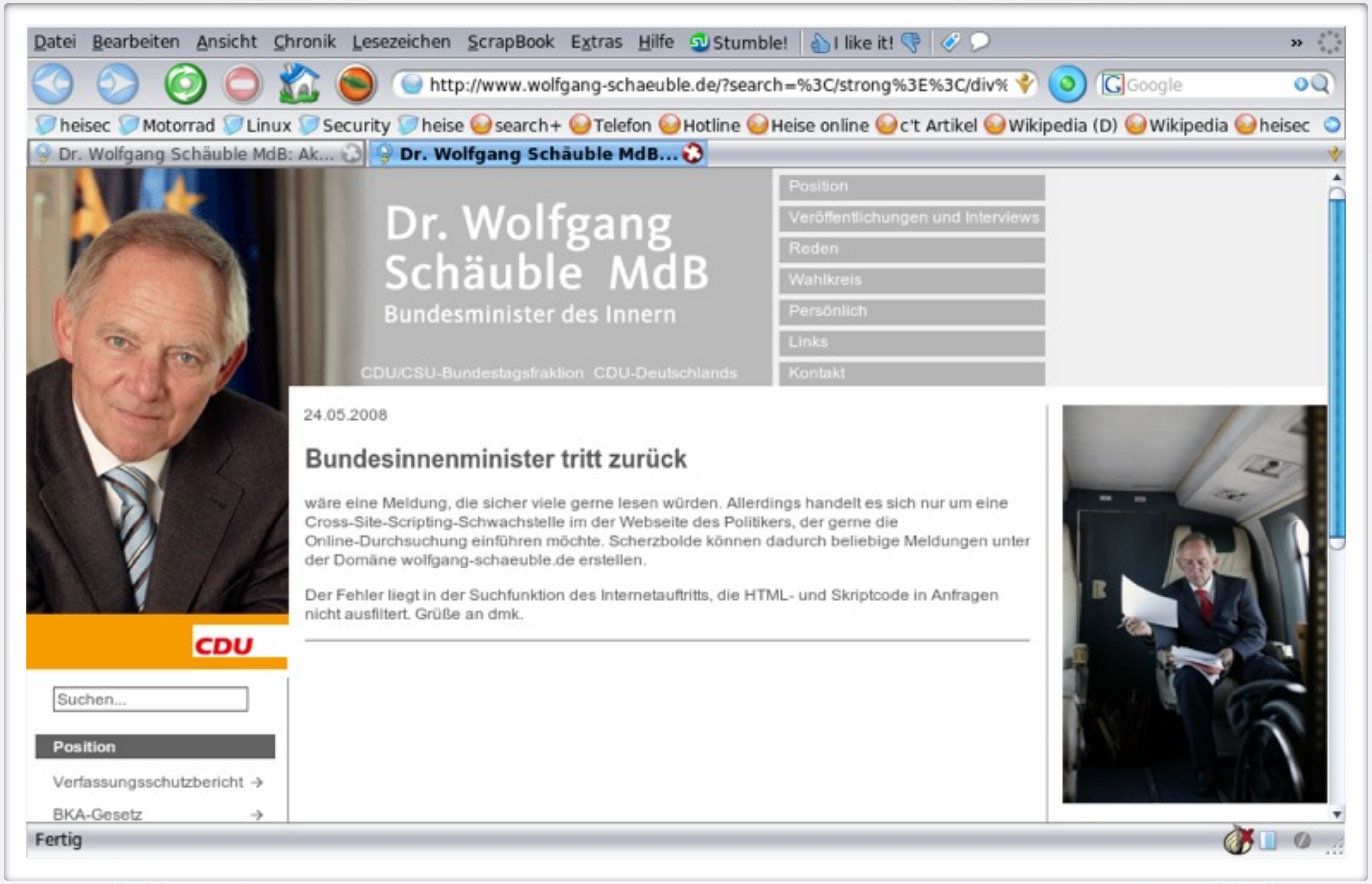


- **goal:** manipulate content delivered to the browser
- infrastructure attacks like DNS cache poisoning
- solution for this: make sure you use SSL
- … and check CRLs
- improper input checking can still bite you

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>…

STEPPING DOWN


Datei Bearbeiten Ansicht Chronik Lesezeichen ScrapBook Extras Hilfe Stumble! I like it!
http://www.wolfgang-schaeuble.de/?search=%3C/strong%3E%3C/div%
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heisec Motorrad Linux Security heise search+ Telefon Hotline Heise online c't Artikel Wikipedia (D) Wikipedia heisec
Dr. Wolfgang Schäuble MdB: Ak...
Dr. Wolfgang Schäuble MdB...
Dr. Wolfgang Schäuble MdB
Bundesminister des Innern
CDU/CSU-Bundestagsfraktion CDU-Deutschlands
Position
Veröffentlichungen und Interviews
Reden
Wahlkreis
Persönlich
Links
Kontakt
CDU
Suchen...
Position
Verfassungsschutzbericht →
BKA-Gesetz →
Fertig

24.05.2008

Bundesinnenminister tritt zurück

wäre eine Meldung, die sicher viele gerne lesen würden. Allerdings handelt es sich nur um eine Cross-Site-Scripting-Schwachstelle im der Webseite des Politikers, der gerne die Online-Durchsuchung einführen möchte. Scherzbolde können dadurch beliebige Meldungen unter der Domäne wolfgang-schaeuble.de erstellen.

Der Fehler liegt in der Suchfunktion des Internetauftritts, die HTML- und Skriptcode in Anfragen nicht ausfiltert. Grüße an dmk.

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?

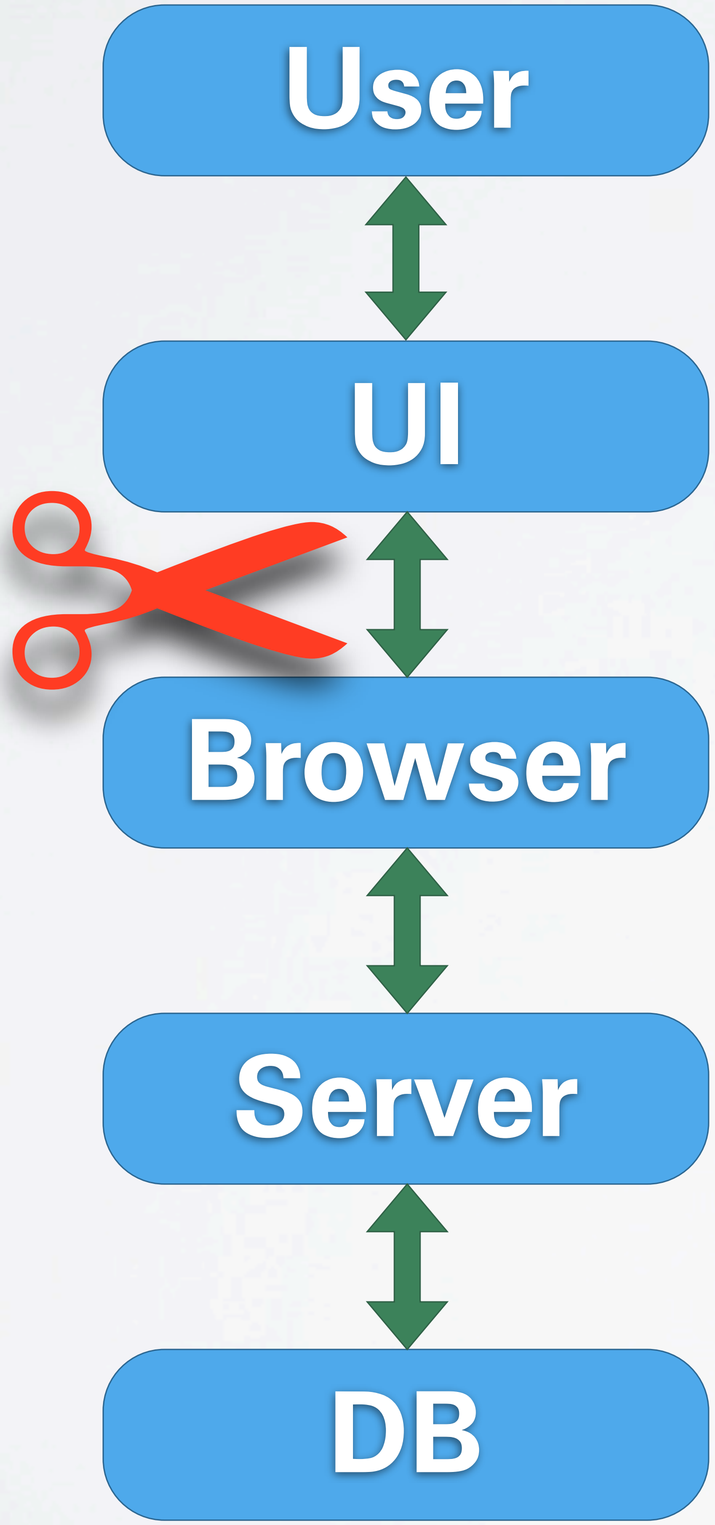
SAME ORIGIN

- 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**
- 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>`

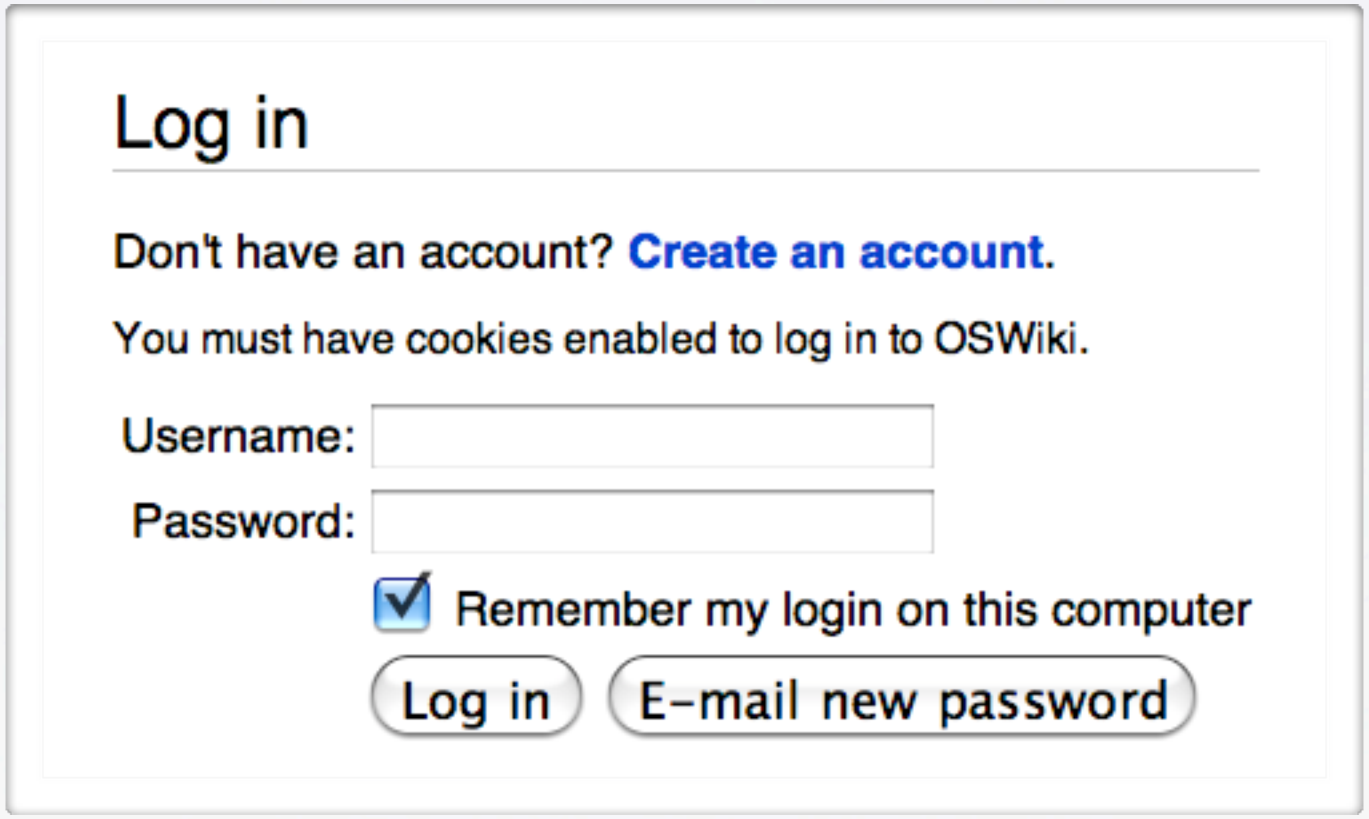
TARGETS

- study in late 2008: high-profile bank websites vulnerable
- 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

OTHERWISE



Log in

Don't have an account? Create an account.

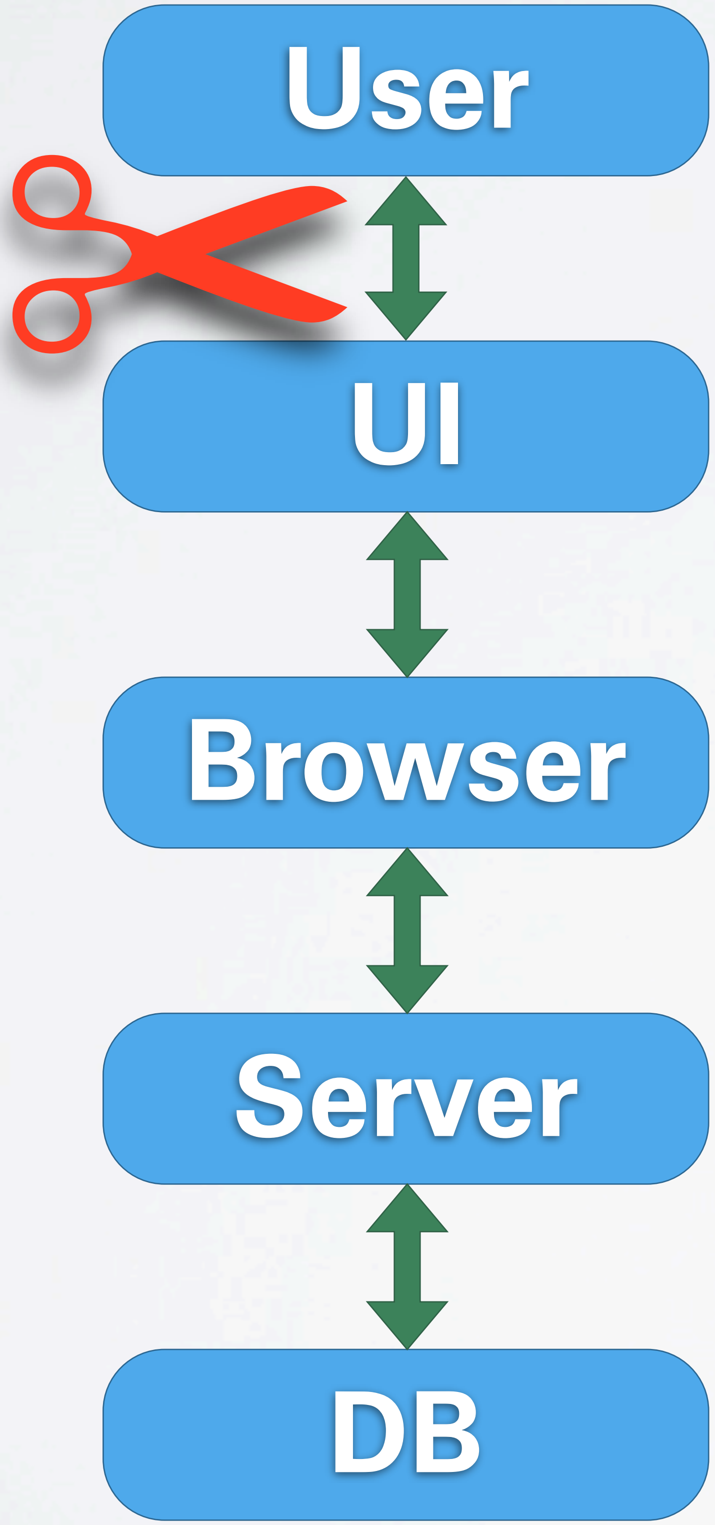
You must have cookies enabled to log in to OSWiki.

Username:

Password:

☑ Remember my login on this computer

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.pаypal.com

CYRILLIC SMALL LETTER A (U+0430)

LATIN SMALL LETTER A (U+0061)

www.paypal.com

homograph attack

GENERALIZE

FRACTION SLASH (U+2044)

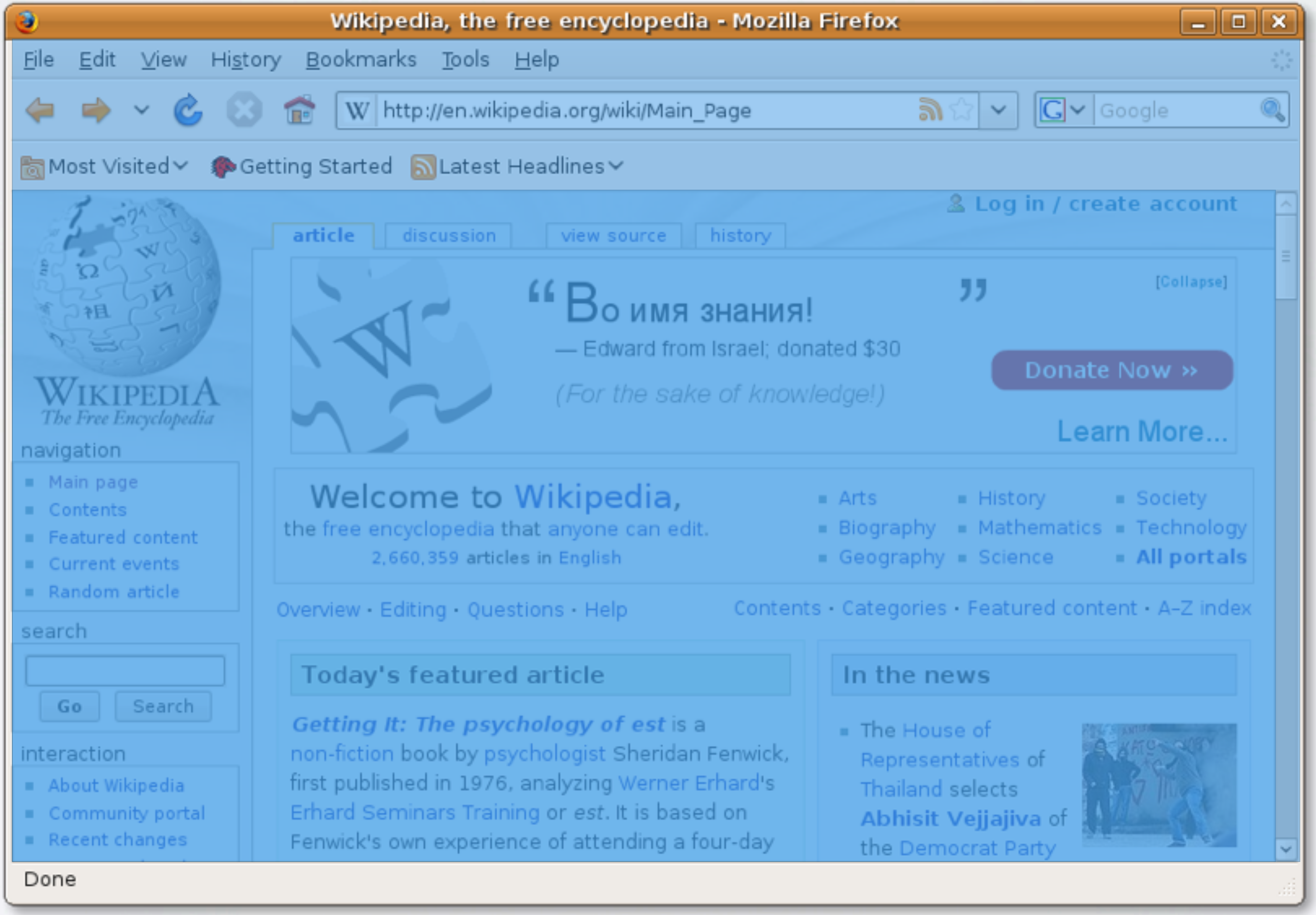
`https://www.bank.com⁄account⁄login.ab.cd`

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

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

www.bank.com

CONTENT



WIKIPEDIA
The Free Encyclopedia

“Во имя знания!”

— Edward from Israel; donated $30

(For the sake of knowledge!)

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the free encyclopedia that anyone can edit.

2,660,359 articles in English

Arts	History	Society
Biography	Mathematics	Technology
Geography	Science	All portals

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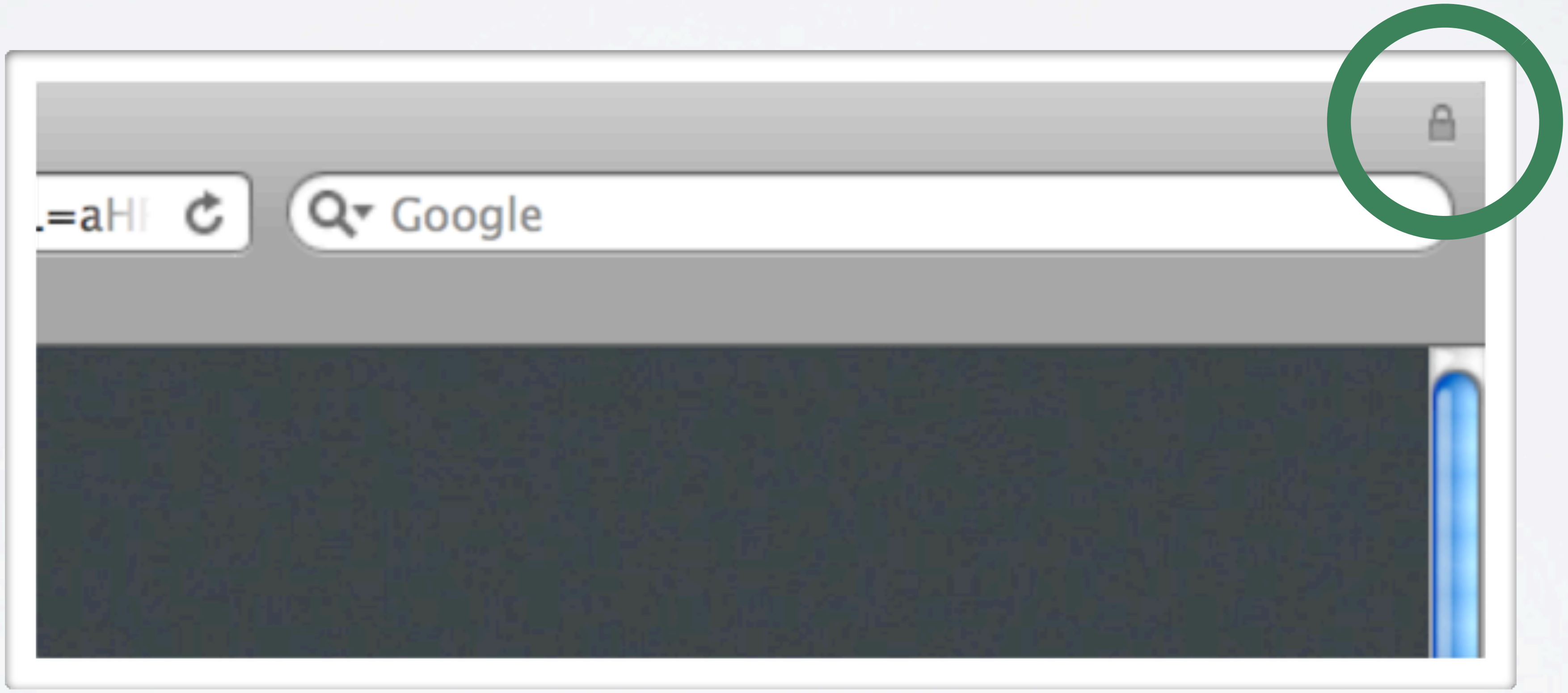
Today's featured article

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

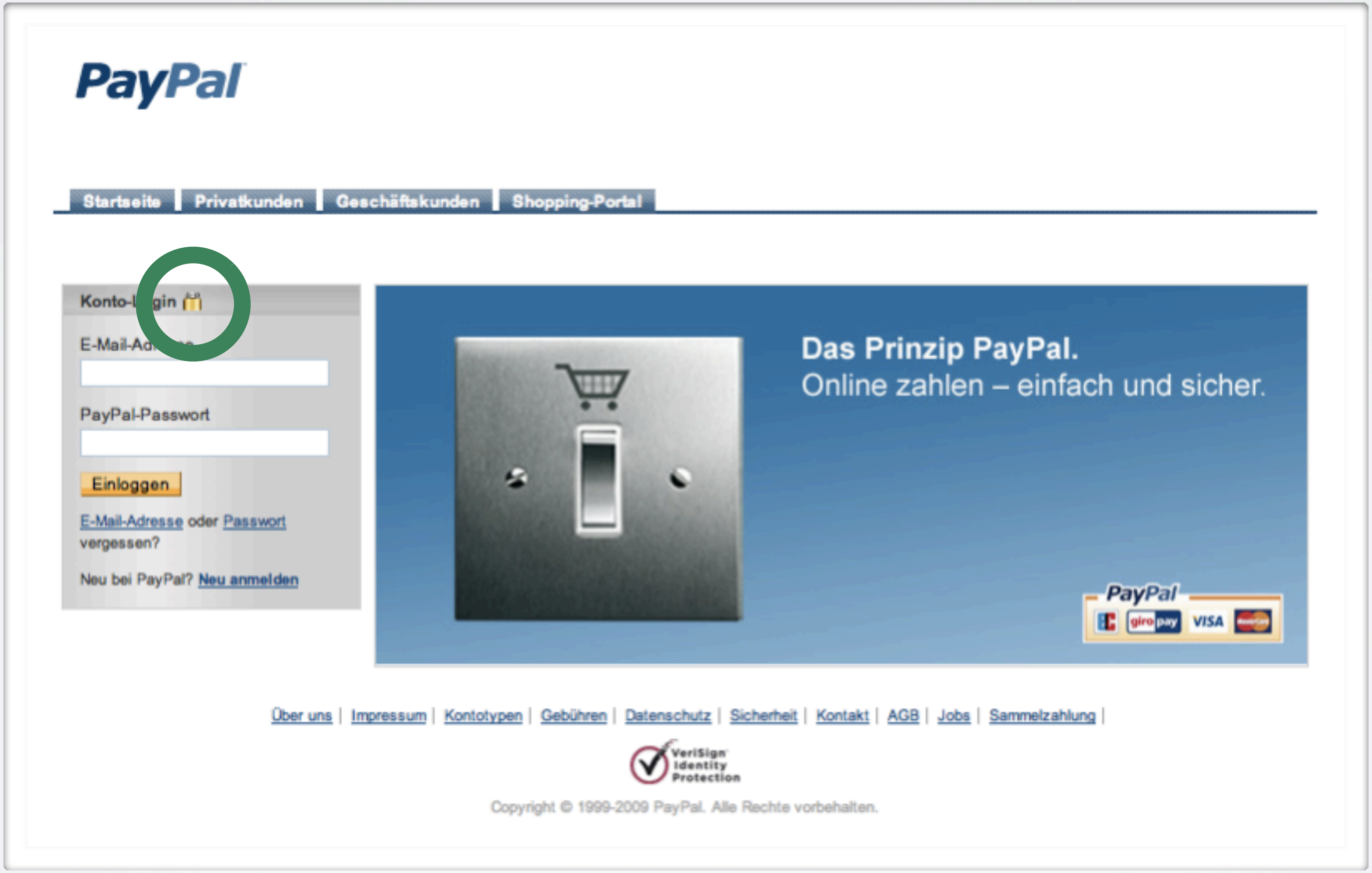
In the news

- The House of Representatives of Thailand selects **Abhisit Vejjajiva** of the Democrat Party

BETTER



PADLOCKS



PayPal

Startseite | Privatkunden | Geschäftskunden | Shopping-Portal

Konto-Login 🔒

E-Mail-Adresse

PayPal-Passwort

Einloggen

E-Mail-Adresse oder Passwort vergessen?

Neu bei PayPal? Neu anmelden

Das Prinzip PayPal.
Online zahlen – einfach und sicher.

Über uns | Impressum | Kontotypen | Gebühren | Datenschutz | Sicherheit | Kontakt | AGB | Jobs | Sammelzahlung |

VeriSign Identity Protection

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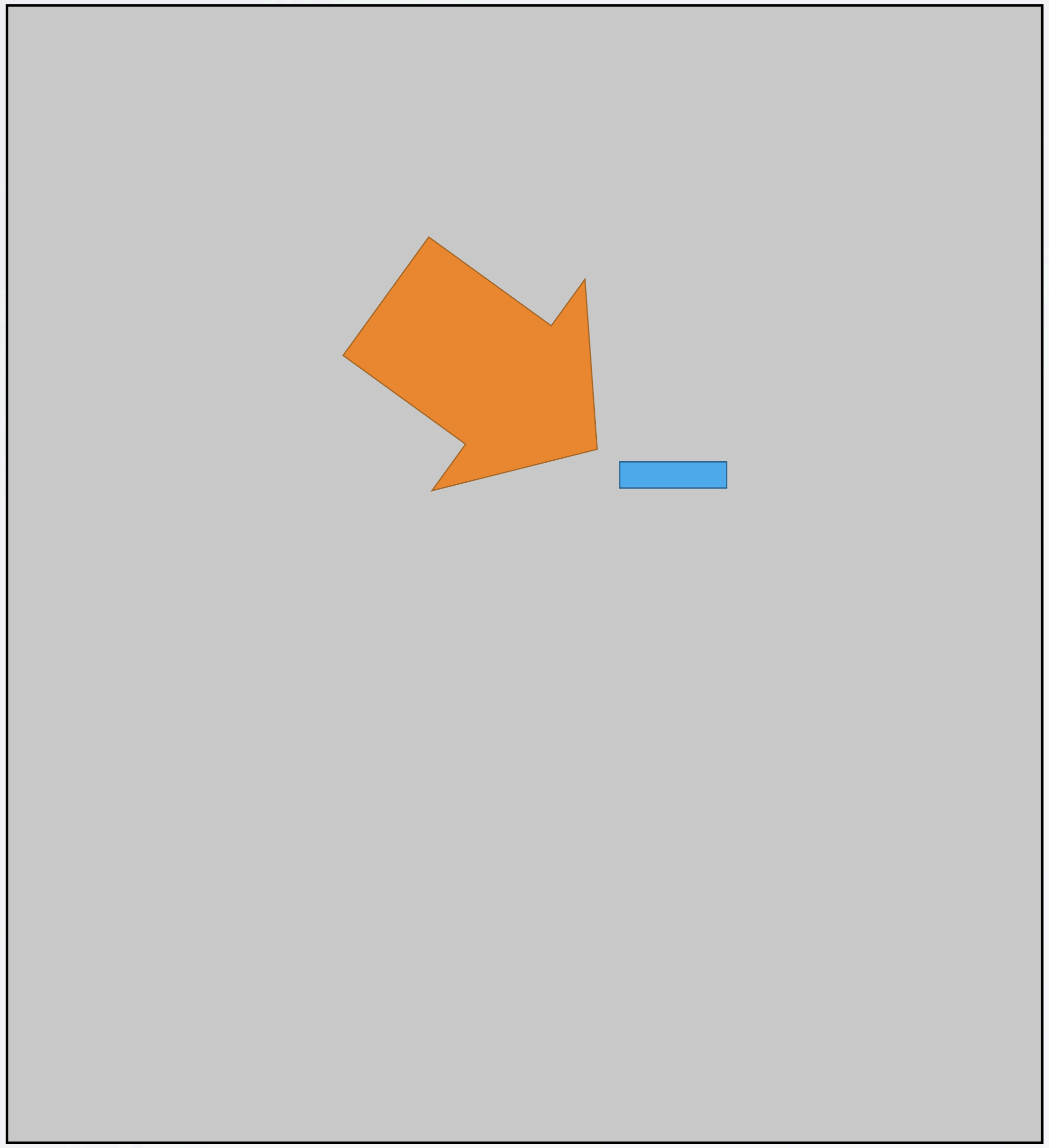
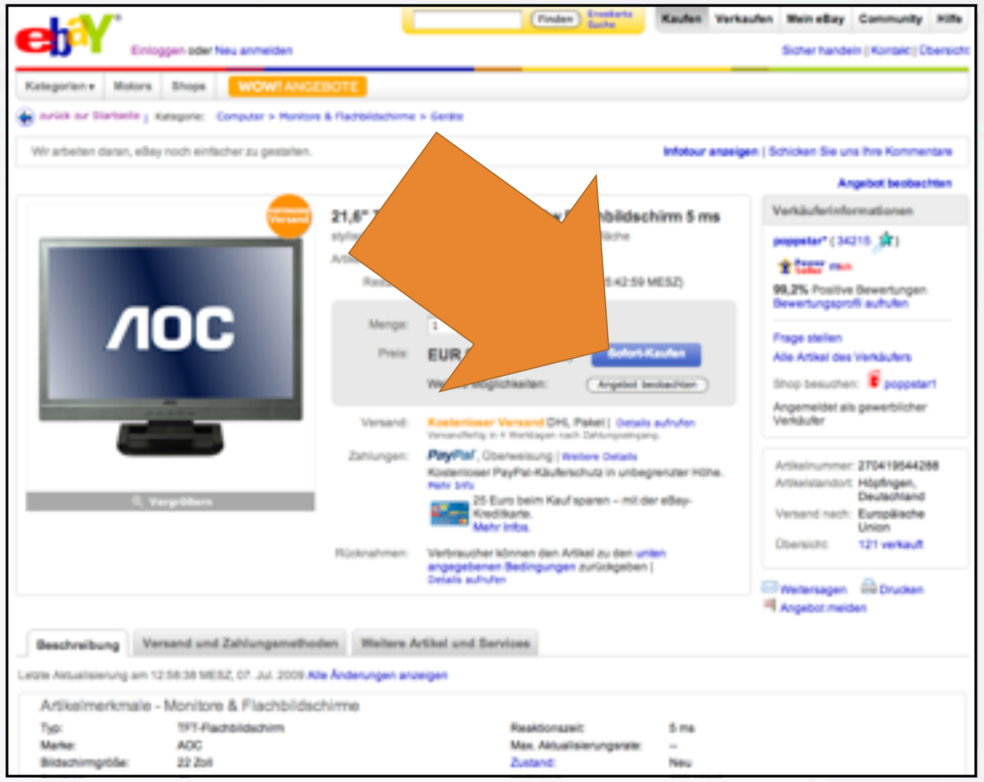
CLICKJACKING





21,6" … bildschirm 5 ms

Versand: Kostenloser Versand DHL Paket | Details aufrufen
Versandfertig in 4 Werktagen nach Zahlungseingang.

Zahlungen: PayPal, Überweisung | Weitere Details
Kostenloser PayPal-Käuferschutz in unbegrenzter Höhe. Mehr Info
25 Euro beim Kauf sparen – mit der eBay-Kreditkarte. Mehr Infos.

Rücknahmen: Verbraucher können den Artikel zu den unten angegebenen Bedingungen zurückgeben | Details aufrufen

Wir arbeiten daran, eBay noch einfacher zu gestalten.

99,2% Positive Bewertungen
Bewertungsprofil aufrufen

Angemeldet als gewerblicher Verkäufer

Artikelnummer: 270419544288
Artikelstandort: Höpfingen, Deutschland
Versand nach: Europäische Union
Übersicht: 121 verkauft

Letzte Aktualisierung am 12:58:38 MESZ, 07. Jul. 2009 Alle Änderungen anzeigen

Artikelmerkmale - Monitore & Flachbildschirme

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FIX

- 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