FIT 1047

Introduction to computer systems, networks and security

MONASH University

Overview for today

- Risk management
- Some weaknesses
- Privacy Enhancing Technologies
- The Dark Net

- Risk management basically means to have the right security controls in place
- But: There is a wide range of possible controls:

Risk Assessment; Certification, Accreditation and Security Assessments; System Services and Acquisition; Security Planning; Configuration Management; System and Communications Protection; Personnel Security; Awareness and Training; Physical and Environmental Protection; Media Protection; Contingency Planning; System and Information Integrity; Incident Response; Identification and Authentication; Access Control; and Accountability and Audit

More info at: **https://csrc.nist.gov/Projects/Risk-Management/Risk-Management-Framework-(RMF)-Overview/Security-Controls**

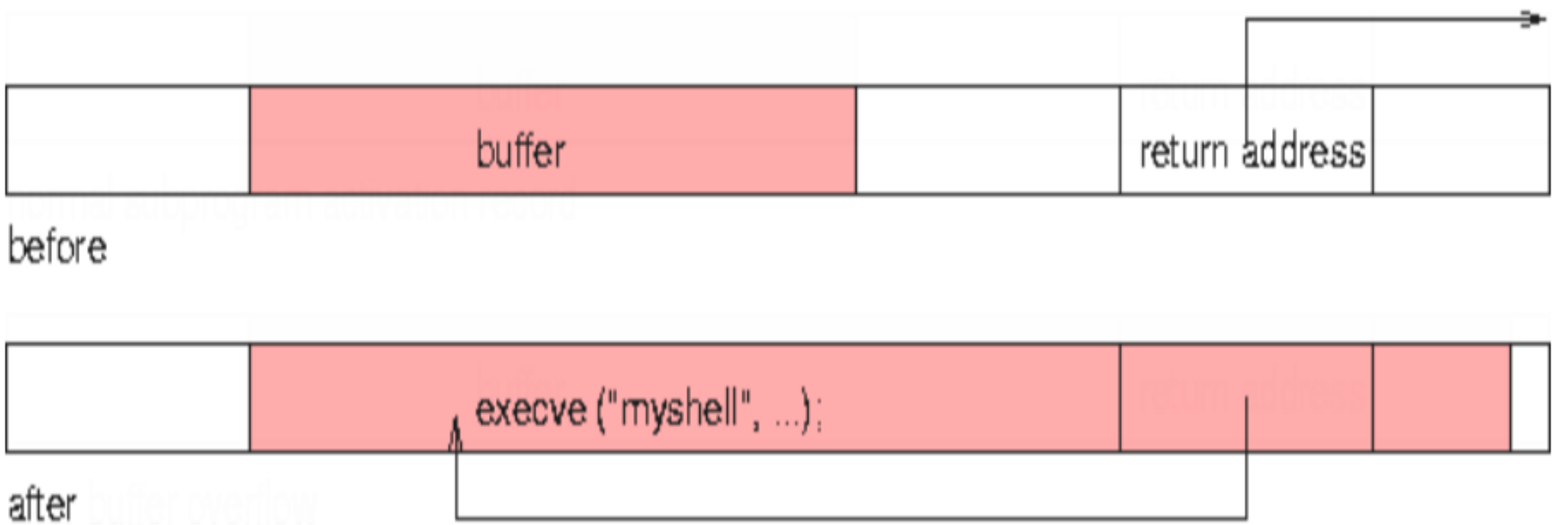
What kind of weaknesses can be exploited?

Some examples:

- Buffer overflow
- Command injection
- Cross-site scripting (XSS)
- SQL Injection

Buffer overflow

Example for an exploit



- Buffer overflow can be possible if input is not properly checked.
- Countermeasures do exist (canary, address randomization,...)

Command Injection

If an application passes on user input to a shell in a bad way, in can be used to execute arbitrary shell commands with the rights of the application process.

Examples at owasp.org (Open Web Applications Security Project):

https://www.owasp.org/index.php/Command_injection

What is Cross-site scripting?

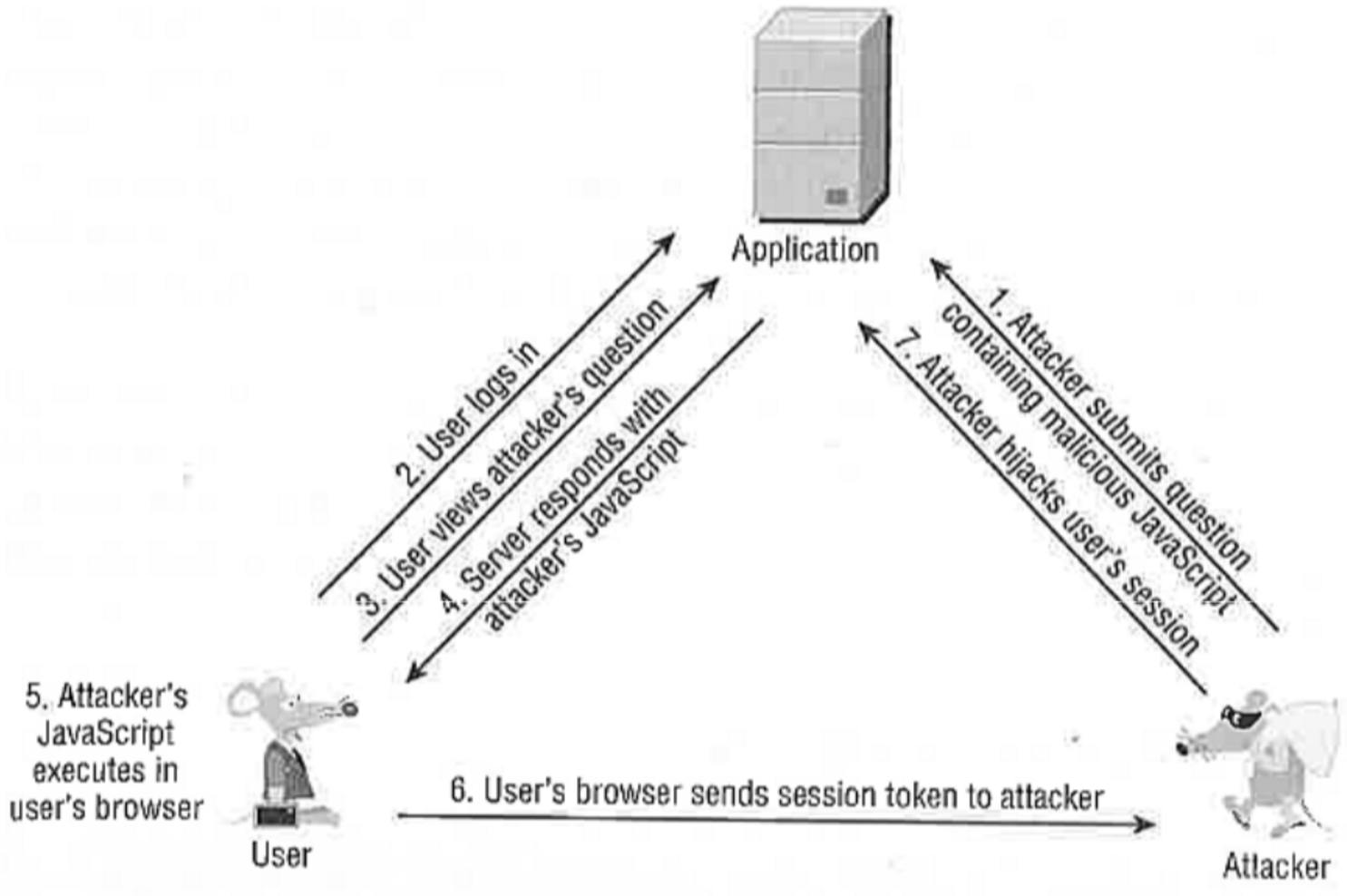
- Usually, browsers don't execute scripts not loaded (directly or indirectly) from the domain of the visited page.
- If an attacker can insert own code to be executed is this cross-site scripting.

How can attacker get script included in the page send from the server?

Let's look at one example:

- Stored XSS attack

Stored XSS attack



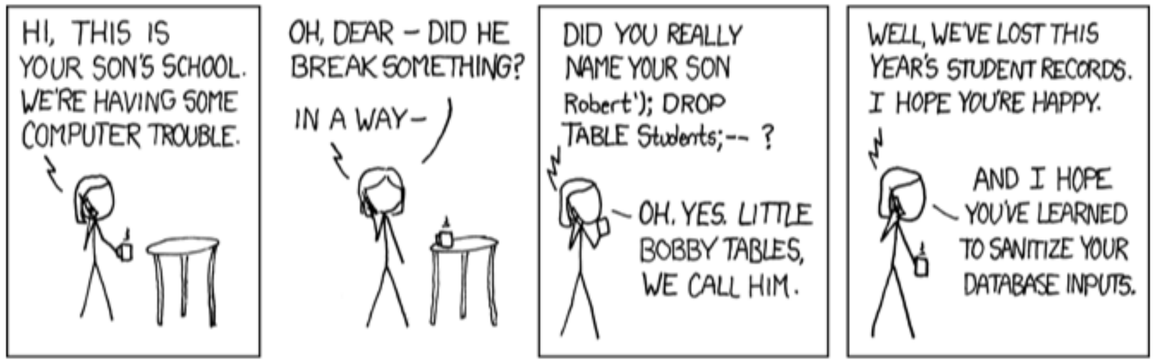
How to prevent XSS?

https://www.owasp.org/index.php/XSS_(Cross_Site_Scripting)_Prevention_Cheat_Sheet

SQL Injection

This is about attacking SQL databases.

Embed database commands in normal imput



(xkcd.org)

SQL Code that provides # of rows that contain a combination of UserName and password:

```
SELECT Count(*) FROM UsersTable
WHERE UserName= 'Joanne'
AND Password= 'JoannesPassword'
```

Now insert other SQL code and terminate with --

```
SELECT Count(*) FROM UsersTable
WHERE UserName= 'OR 1=1--'
AND Password= "
```

The OR 1=1 always returns TRUE. Thus the query will always return a count greater than zero, resulting in a successful login.

Other attacks

- Attacks via DMA

Direct memory access DMA can potentially be used to read arbitrary parts of memory

Prevention: Don't let anyone just attach devices to your computers.

- Physical (hard-disk access)

With physical (temporary) access, one can directly read from the hard-disk (or write to it) without being logged in.

Prevention: Disk encryption. Self-encrypted disks.

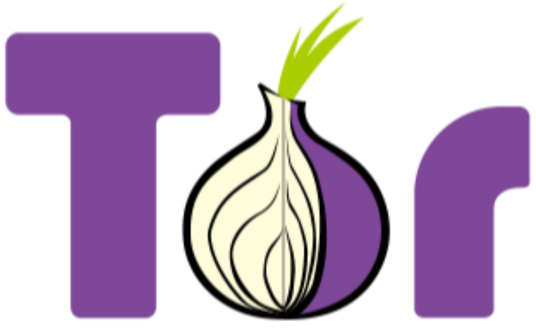
Privacy issues

- If a product is free you are the product.
- Companies build large collections of user profiles
- Linking this data provides even more information
- One photo might be enough to identify you and link to yohugeur profile

Privacy Enhancing Technologies

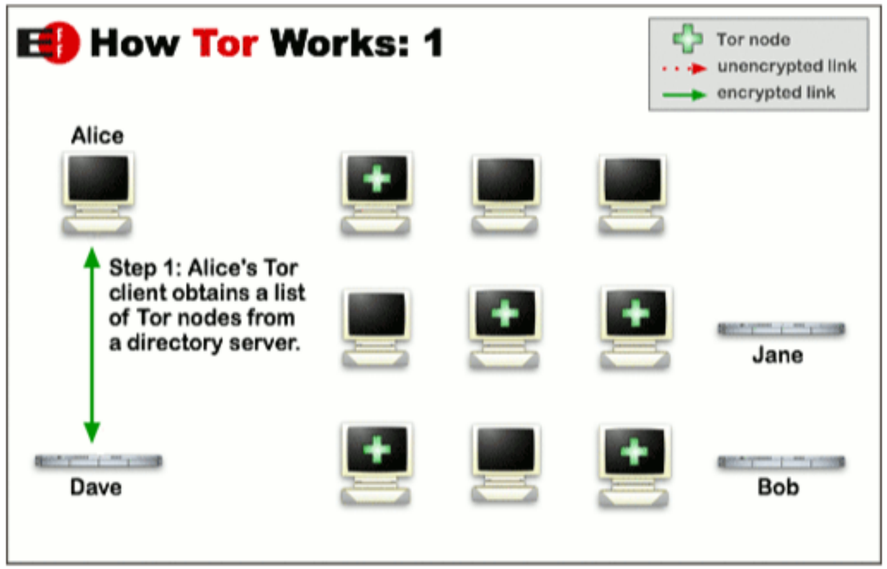
- Technologies are available
- They are not used by service providers, but by users
- One example is TOR, The Onion Routing

The Onion Router



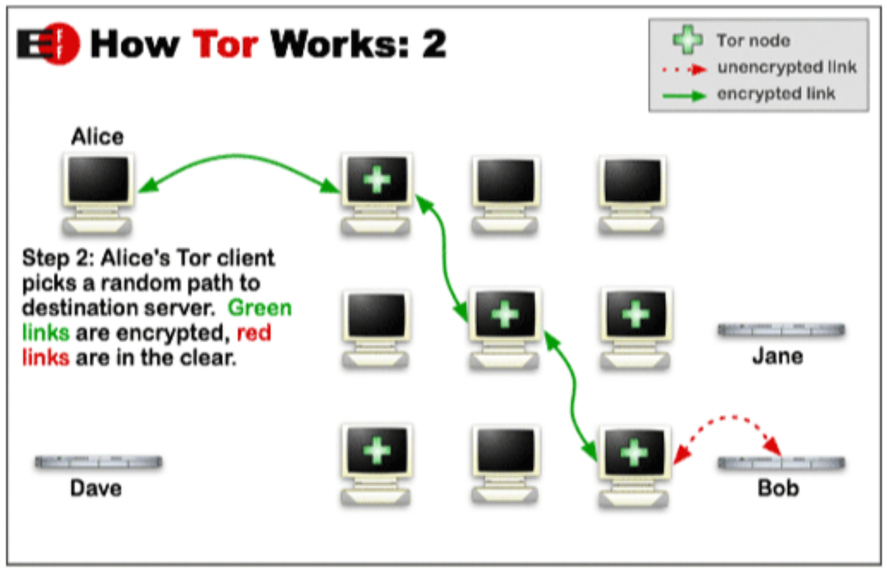
- Developed by US Navy, Protection for secret information
- Useful for:
- Human rights activists, whistleblowers
- For people that just want to have privacy
- Also for criminal activities

TOR Step 1:



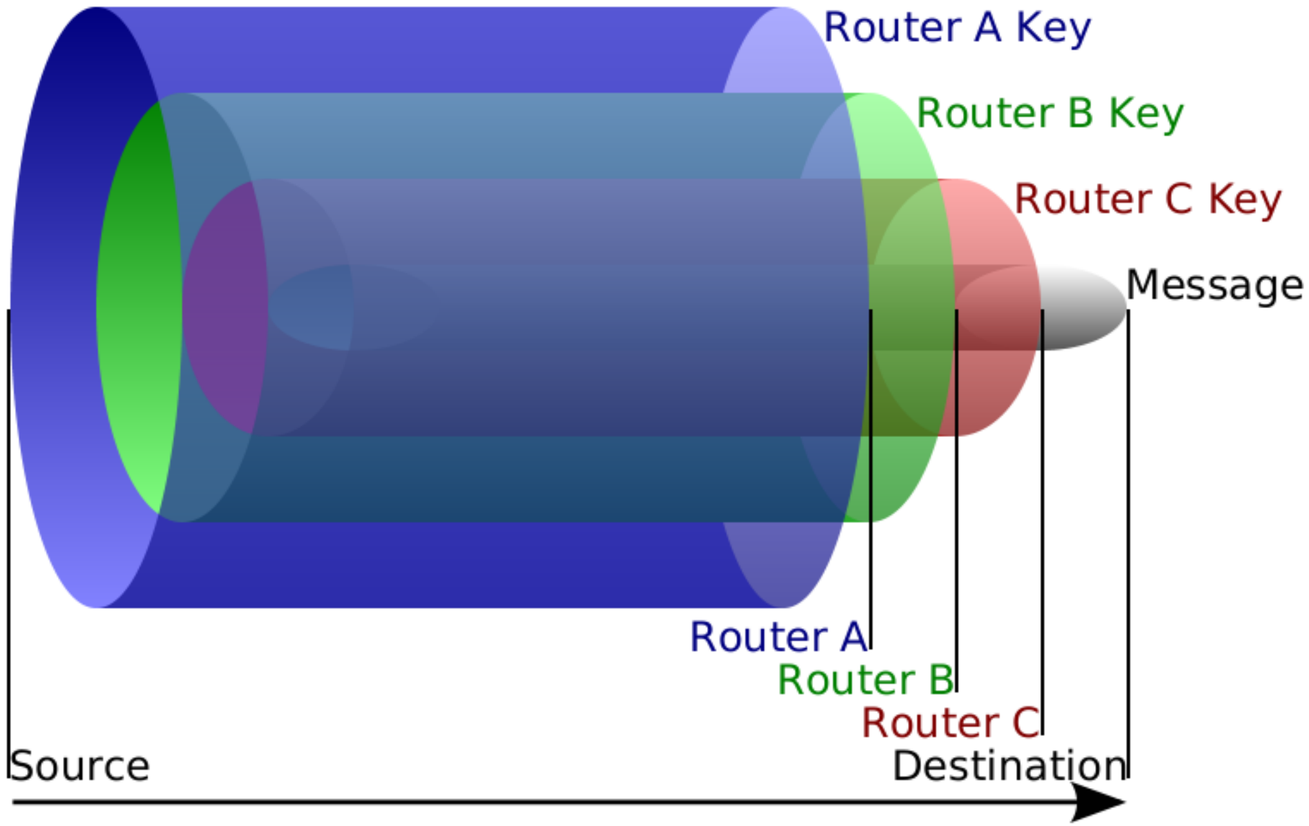
(Electronic Frontier Foundation)

TOR Step 2



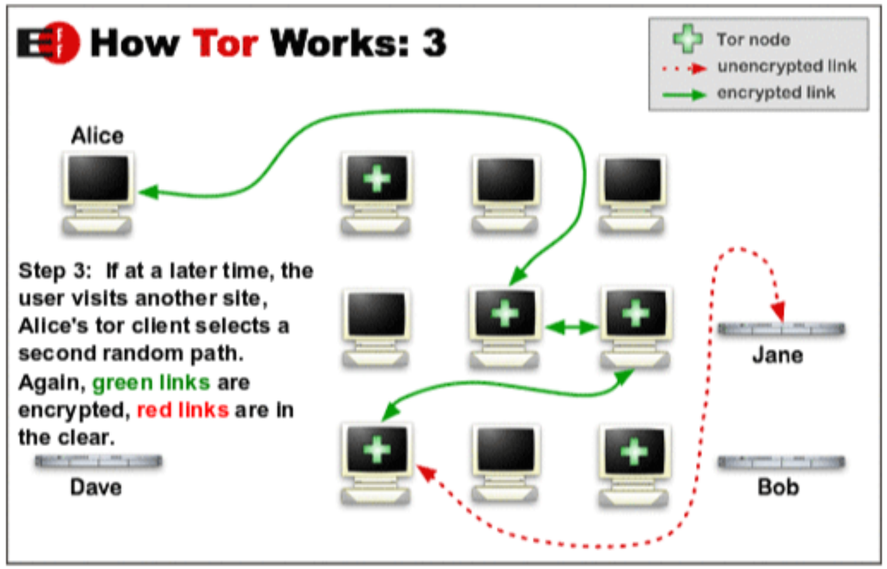
(Electronic Frontier Foundation)

TOR The Onion



(Wikimedia Commons)

TOR Step 3



(Electronic Frontier Foundation)

Deep Web vs Dark Web

Deep Web - All content that is only accessible with known address (might be 99% of all content)

- Cloud Storage
- Private videos
- Data bases
- Other data

Deep Web vs Dark Web

Dark Web - Client and server are hidden (e.g. both sides use TOR)

- Information on weaknesses, exploits, stolen data
- All types of criminal activities
- Lots of things you dont want to see or know about
- But also: Activities of human rights groups

A large part of the dark web is not the evil stuff that tabloid newspapers like to write about.

Good Luck with Your Exams

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