Web Security

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6.171
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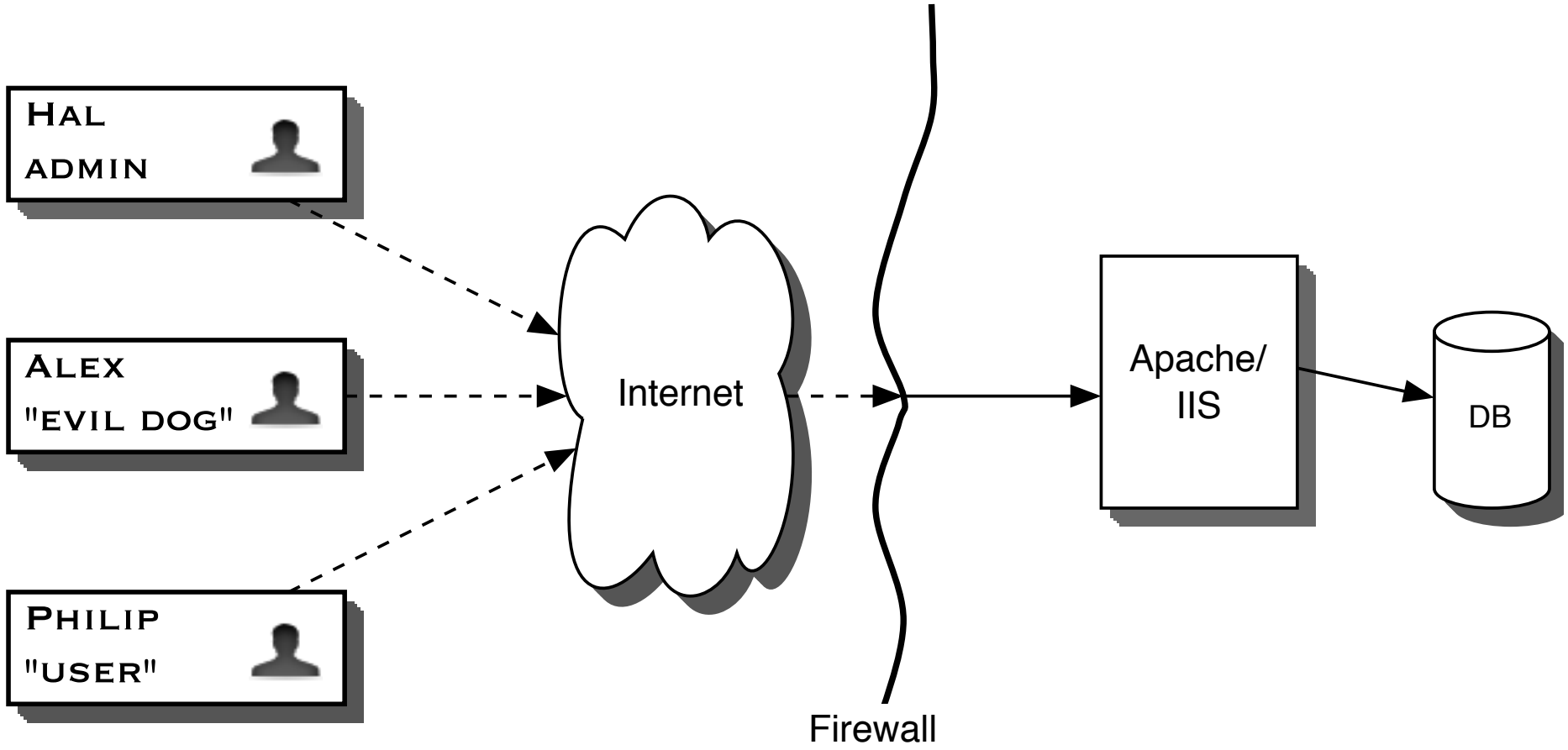
"Wisdom consists in being able to distinguish among dangers and make a choice of the least harmful"

Machiavelli

Threat Model

- Who is the attacker?
- Who is being attacked?
- What constitutes a breach?
- What is the cost of a breach?
- What is the response plan?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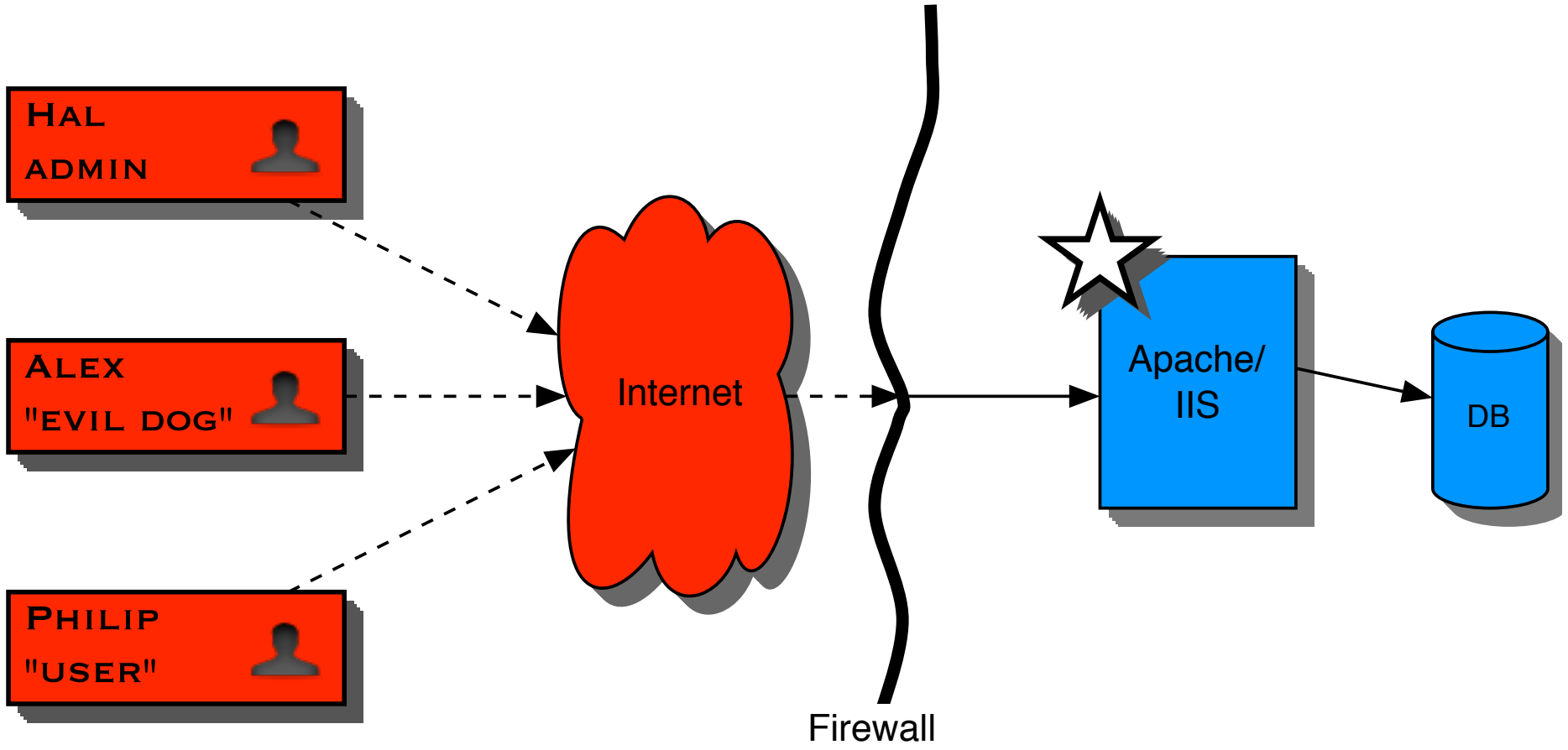
ADMIN
ALEX
"EVIL DOG"
PHILIP
"USER"
Internet
Firewall
Apache/
IIS
DB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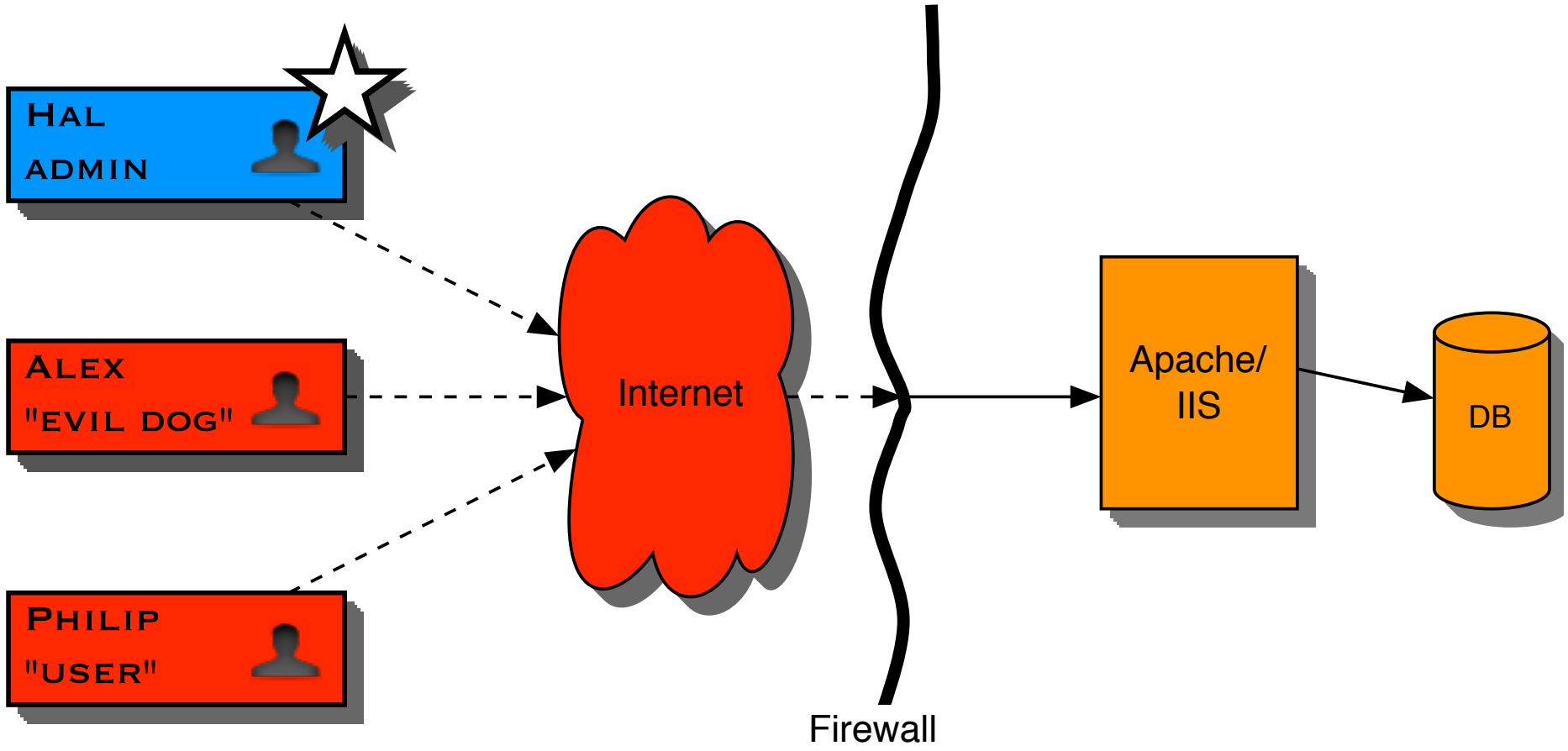
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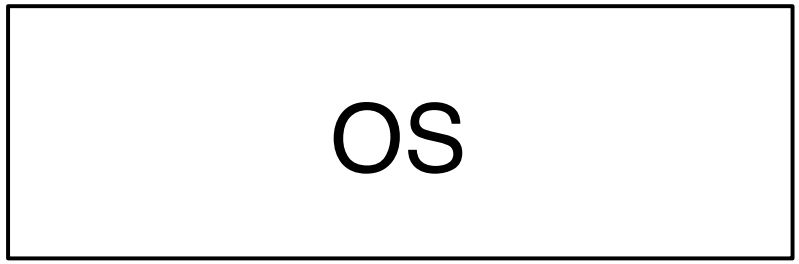
Remember

- Every Page is a Program
  Inputs provided by attacker
  Attacker is not constrained by browser
- You're Not Just Protecting Yourself
  You're protecting your user
- Browsers Assume you know what you're doing
  HTML + code delivered by you....

"Using **encryption** on the Internet is the equivalent of arranging an **armored car** to deliver credit card information from someone living in a **cardboard box** to someone living on a **park bench**."

Gene Spafford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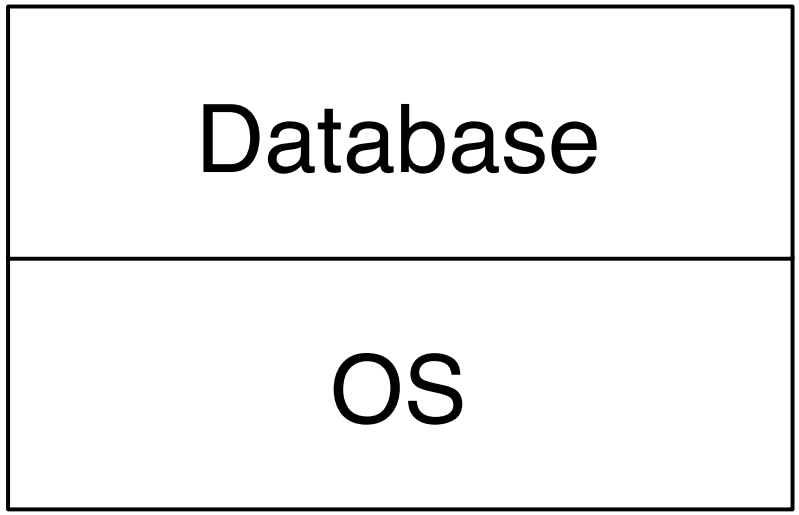
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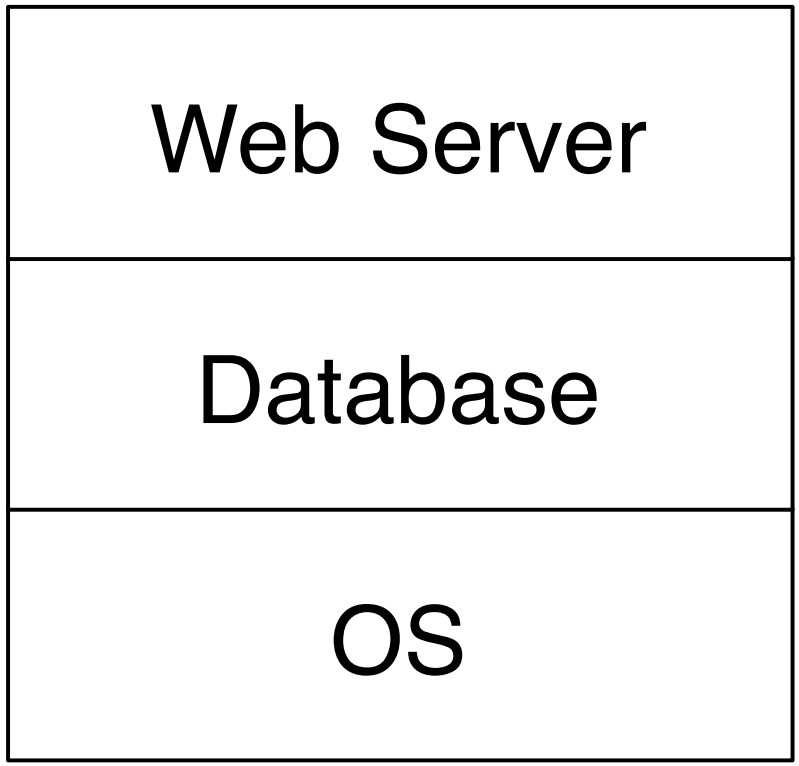
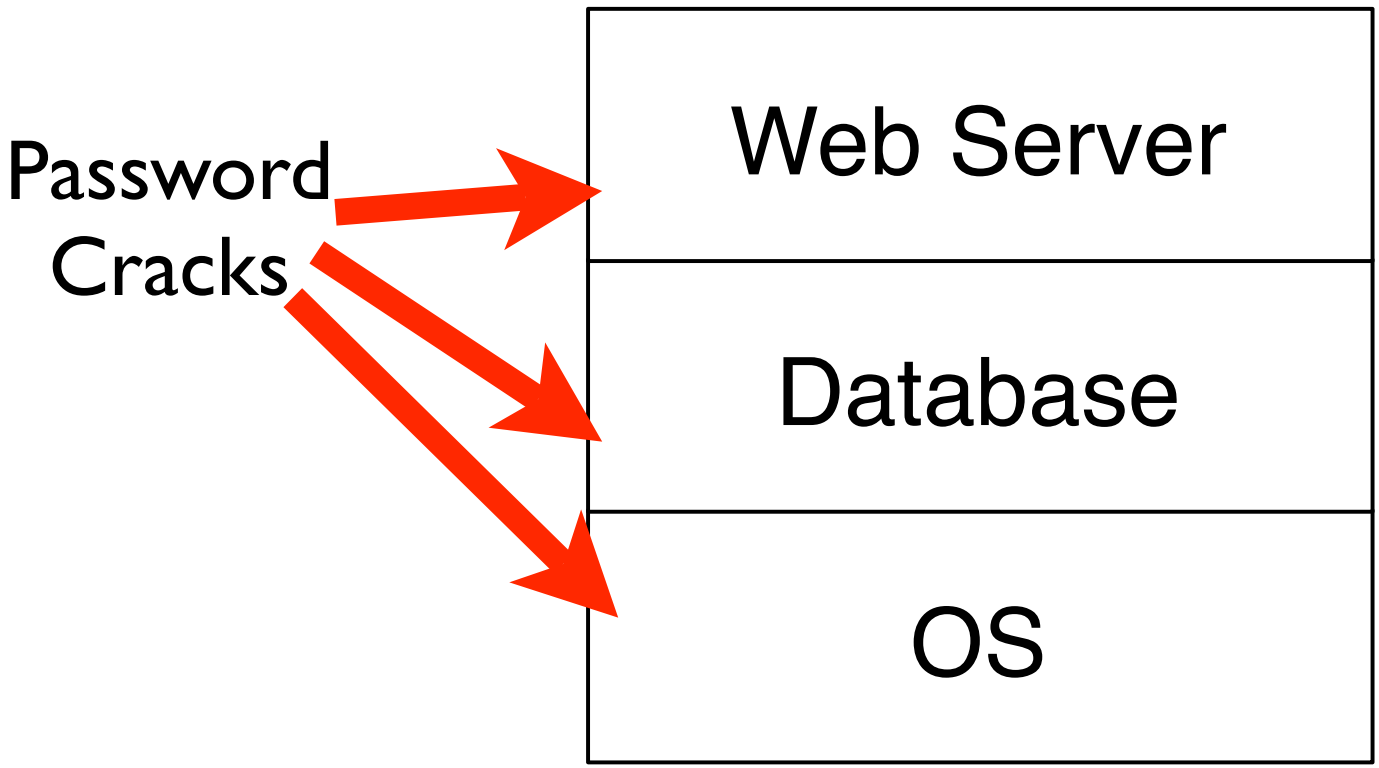
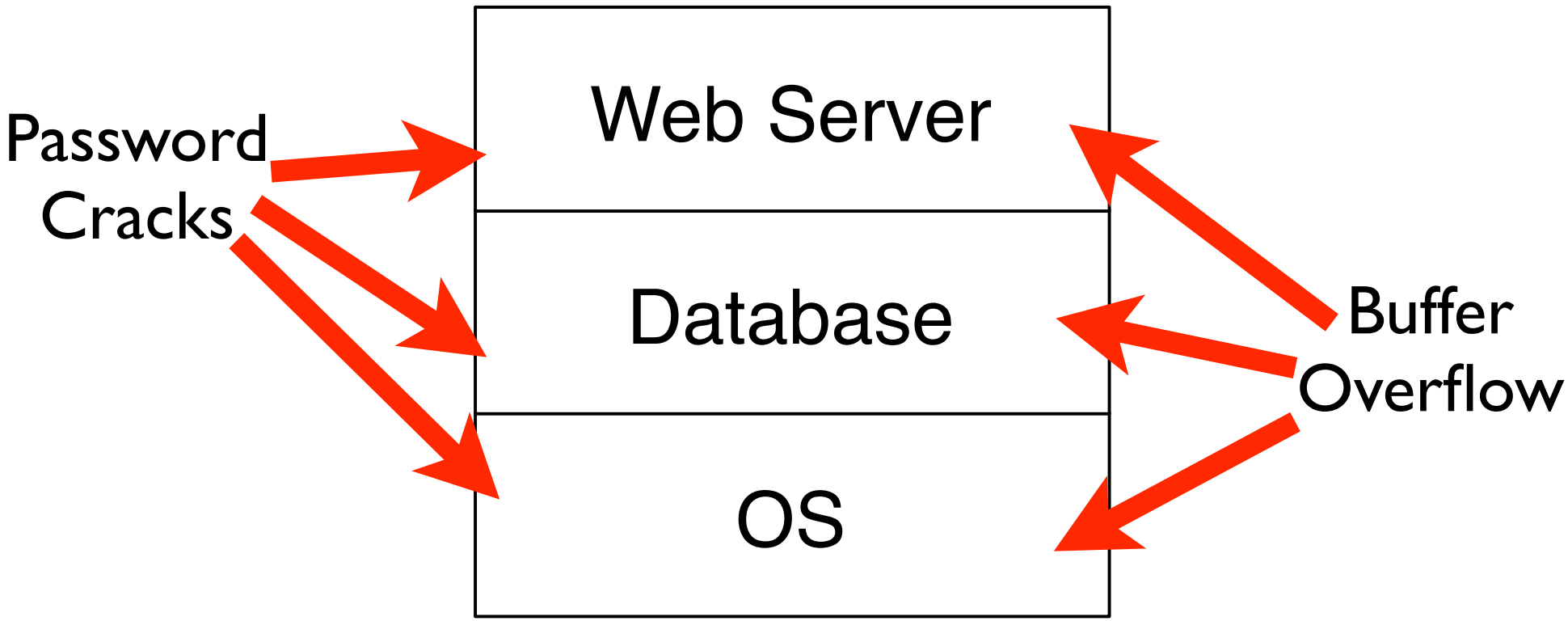
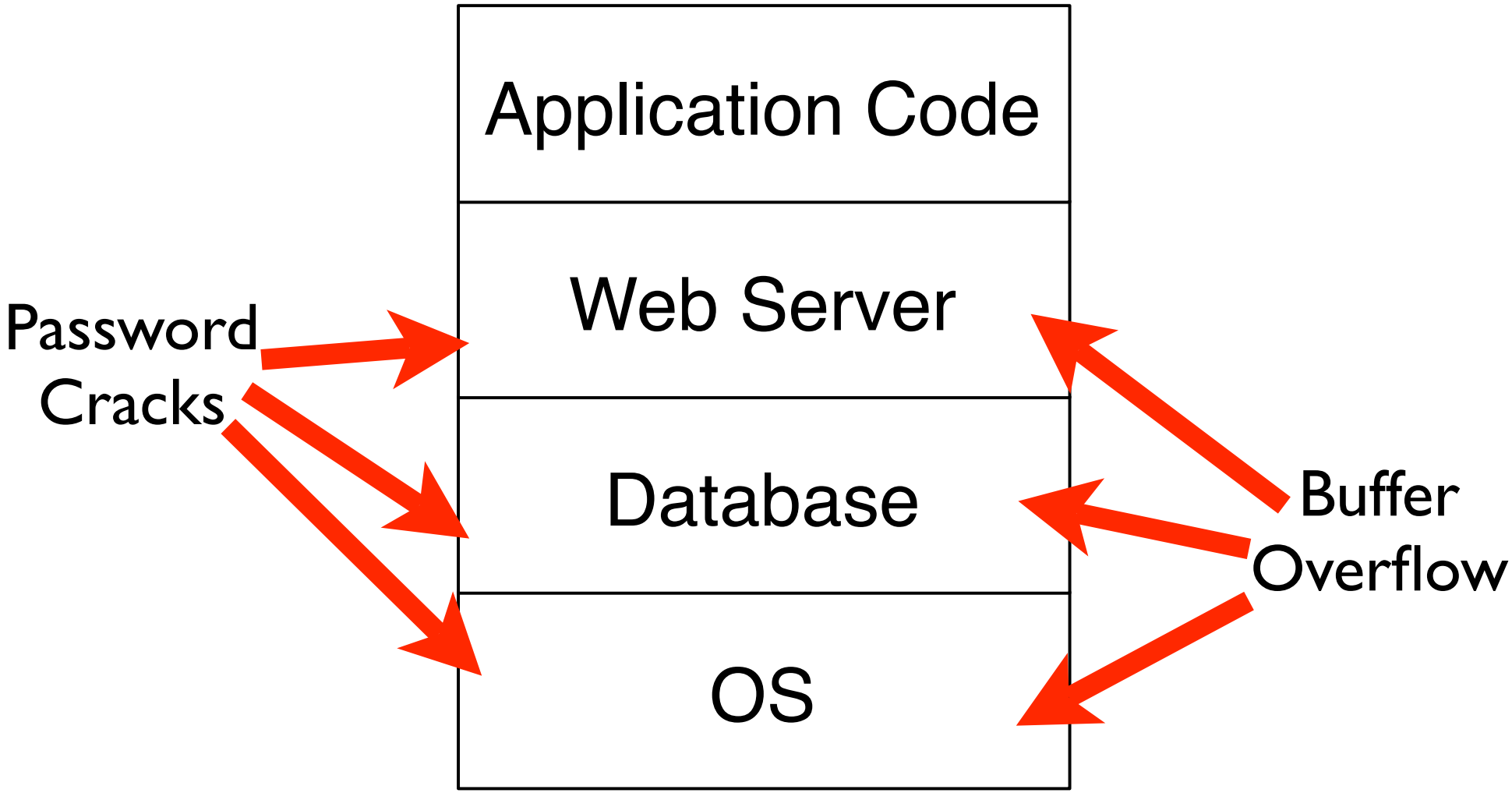
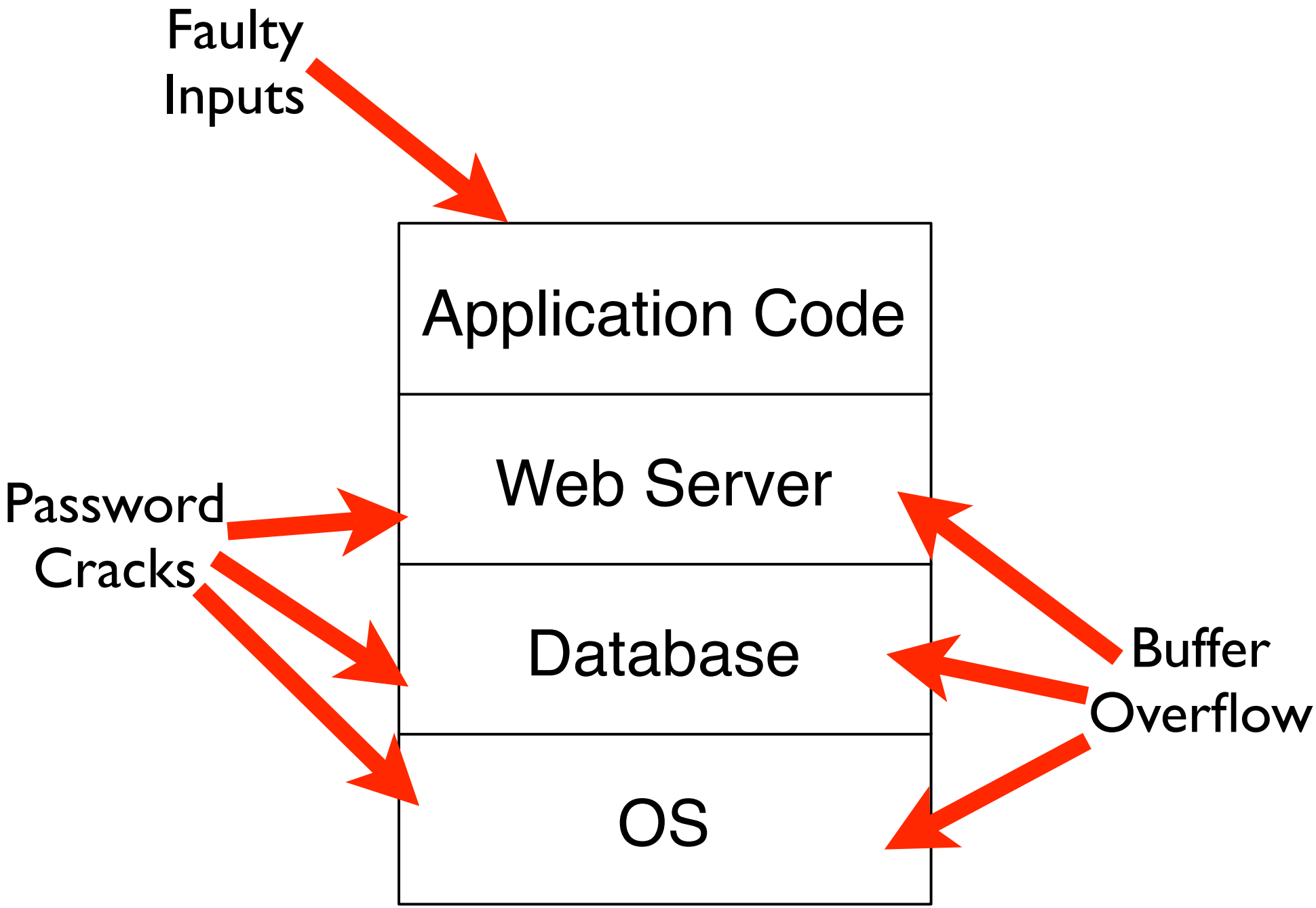
OS

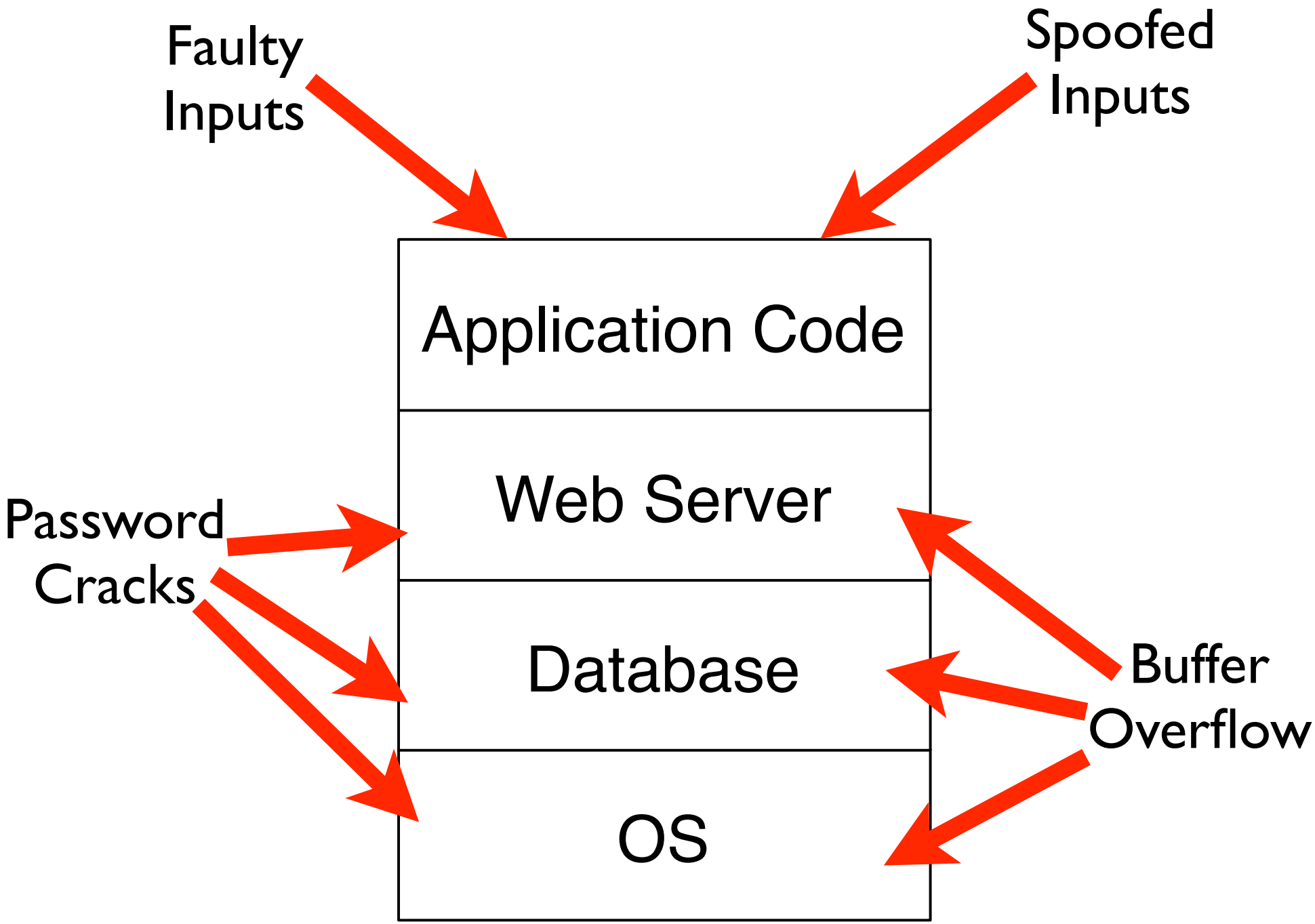

Web Server
Database
OS


Password
Cracks
Web Server
Database
OS


Password
Cracks
Web Server
Database
OS
Buffer
Overflow


Application Code
Web Server
Database
OS
Password
Cracks
Buffer
Overflow


Faulty
Inputs
Application Code
Web Server
Database
OS
Password
Cracks
Buffer
Overflow


Faulty
Inputs
Spoofed
Inputs
Application Code
Web Server
Database
OS
Password
Cracks
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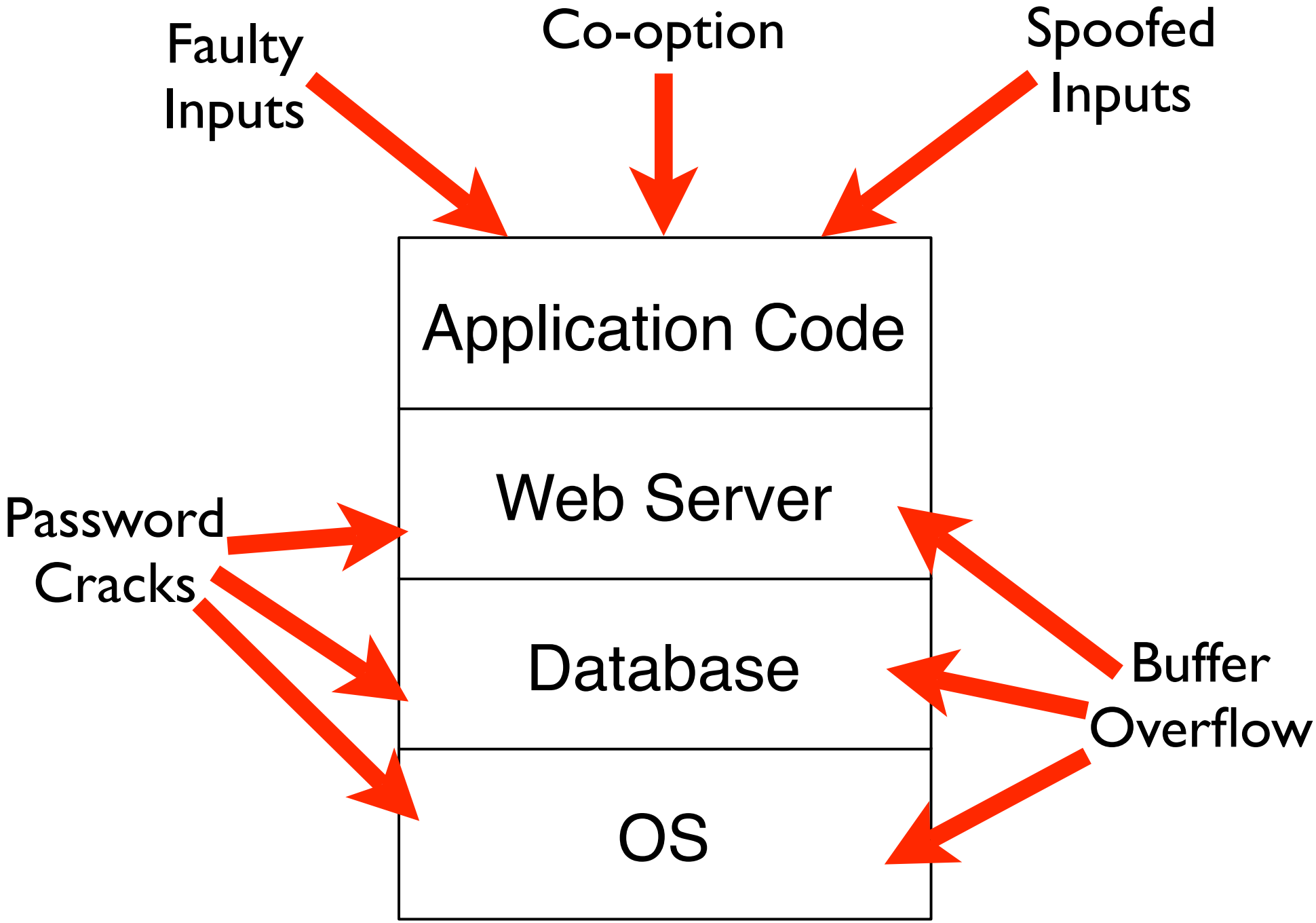
Overflow


Faulty Inputs
Co-option
Spoofed Inputs
Application Code
Web Server
Database
OS
Password Cracks
Buffer Overflow

Not Checking Permissions

Harvard rejects 119 accused of hacking

The Boston Globe

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By Robert Weisman, Globe Staff | March 8, 2005

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Business ethics 101: In the event of an blatant IT failure, blame the user.

Faulty Inputs

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`http://acme.com/view-user?id=4`

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```
http://acme.com/view-user?id=4
```

```
select name, email from users
where USERID = $id;
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view-user?USERID=NULL union select password as name, email from users where USERID=4

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select name, email from users
where USERID = $id;
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view-user?USERID=NULL union select password as name, email from users where USERID=4

```
select name, email from users
where USERID = NULL union select password
as name, email from users where USERID=4;
```

Spoofed Inputs

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```
<form action="buy-tickets">
<input
 type="hidden"
 name="adult_price"
 value="9.5" />
...
</form>
```

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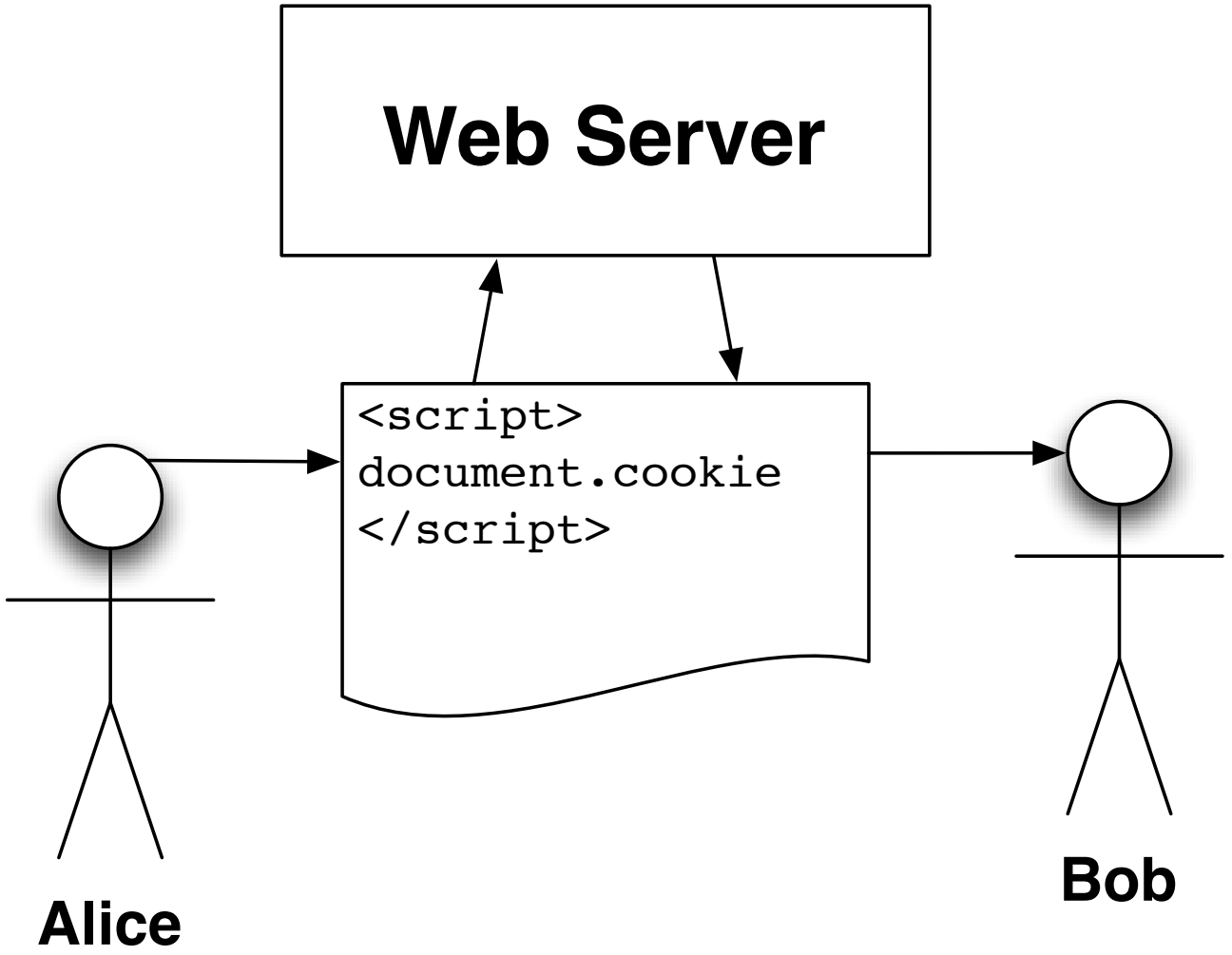
```
<form action="buy-tickets">
<input
 type="hidden"
 name="adult_price"
 value="9.5" />
...
</form>
```

```
Cookie: admin=1;
```

XSS - The Biggie



Prevention

- Standardize Input Processing
  e.g. *bind variables, HTML filtering*
- Don't Trust Client Data. Ever. Really.
  explore your own tools...
- Build in Role-Based Action Control Checks
  even if you don't implement them yet.
  e.g. `user_can_edit_msg($user_id,$msg_id)`

Mitigation

- Users' Passwords
  - store them hashed and salted
  - protect your users!
- Credit Card Numbers
  - do you really need to store them?
  - consider moving them off the main server

Let’s Crack

ECAC

- Nice Job on the login engine
  you reused code.
- Nice Job on the role-based permissions
  this is going to be very helpful to you.
- Ouch on the Cross-Site Scripting
  you're not even checking the <SCRIPT> tag.
  same for Texas4000.

A Word on .NET

- It checks for XSS attacks
  you are all safe....
  until you start adding features