6.033 Spring 2017

Lecture #20

- **Introduction to security**
  - **Threat models, policy**
  - **Guard model**

RISK ASSESSMENT —

Yahoo says half a billion accounts breached by nation-sponsored hackers

One of the biggest compromises ever exposes names, e-mail addresses, and much more.

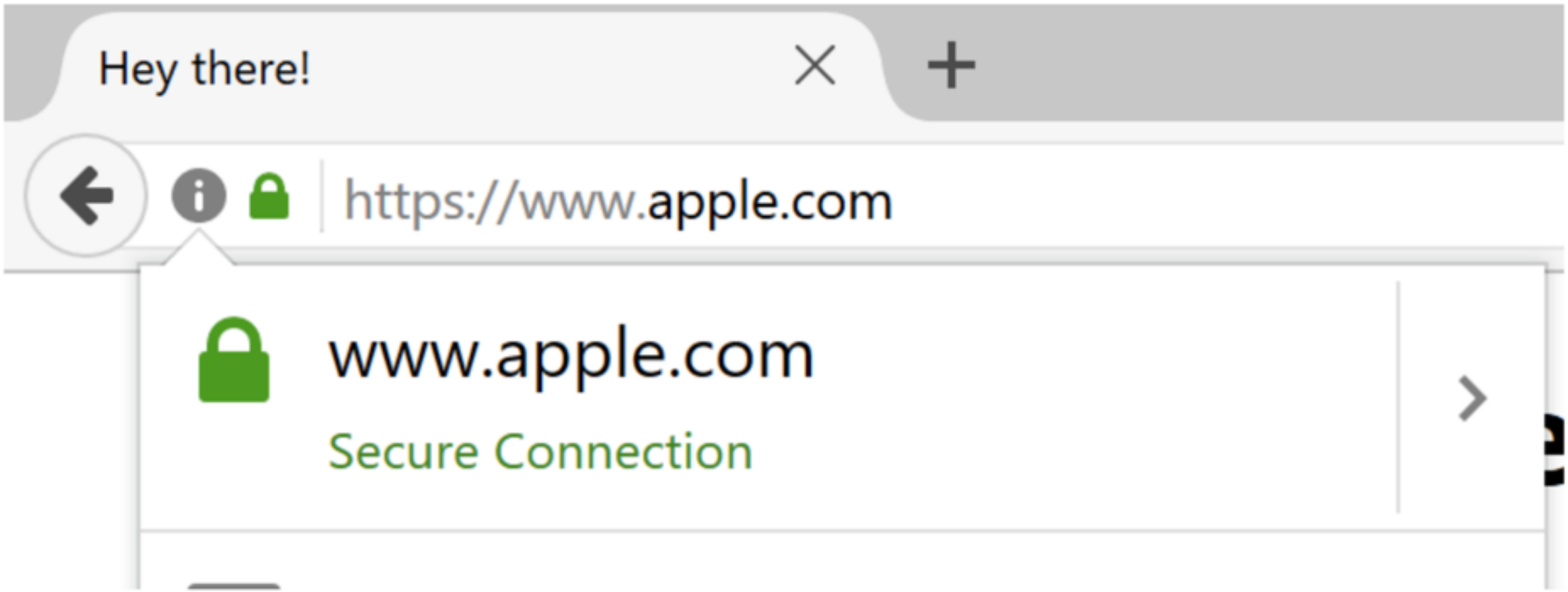
DAN GOODIN - 9/22/2016, 4:21 PM

LILY HAY NEWMAN SECURITY 04.18.17 7:00 AM

SNEAKY EXPLOIT ALLOWS PHISHING ATTACKS FROM SITES THAT LOOK SECURE

Phishing with Unicode Domains

Posted by Xudong Zheng on April 14, 2017



Before I explain the details of the vulnerability, you should take a look at the proof-of-concept.

Punycode makes it possible to register domains with foreign characters. It works by converting individual domain label to an alternative format using only ASCII characters. For example, the domain "xn--s7y.co" is equivalent to "短.co".

From a security perspective, Unicode domains can be problematic because many Unicode characters are difficult to distinguish from common ASCII characters. It is possible to register domains such as "xn--pple-

RISK ASSESSMENT —

BrickerBot, the permanent denial-of-service botnet, is back with a vengeance

New botnet squadrons wage fiercer, more intense attacks on unsecured IoT devices.

DAN GOODIN - 4/24/2017, 4:43 PM

MILITARY & DEFENSE

More: Stuxnet Iran Israel Cyberwarfare

The Stuxnet Attack On Iran's Nuclear Plant Was 'Far More Dangerous' Than Previously Thought

MICHAEL B KELLEY

NOV. 20, 2013, 12:58 PM 60,330 11

The Stuxnet virus that ravaged Iran's Natanz nuclear facility "was far more dangerous than the cyberweapon that is now

In-flight Wi-Fi is "direct link" to hackers

Report: Planes could be targeted by a malicious hacker on the ground.

by Michael Rundle Apr 15, 2015 11:03am EDT

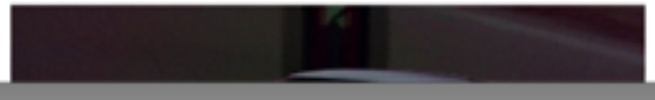
LATEST FEATURE STORY

FEATURE STORY (2 PAGES)

The promise—and massive challenge—of making games for the Apple Watch

How to make 15-second microgames with targets "the size of salad bar ham cubes"

WATCH ARS VIDEO



Meet the e-voting machine so easy to hack, it will take your breath away

Virginia decertifies device that used weak passwords and wasn't updated in 10 years.

by **Dan Goodin** - Apr 15, 2015 2:55pm EDT

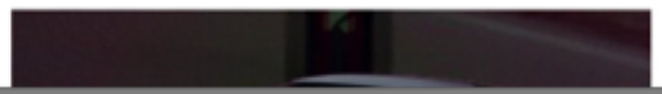
LATEST FEATURE STORY

FEATURE STORY (2 PAGES)

The promise—and massive challenge—of making games for the Apple Watch

How to make 15-second microgames with targets "the size of salad bar ham cubes"

WATCH ARS VIDEO



what makes computer security special?

why is security difficult?

steps towards building a more secure system:

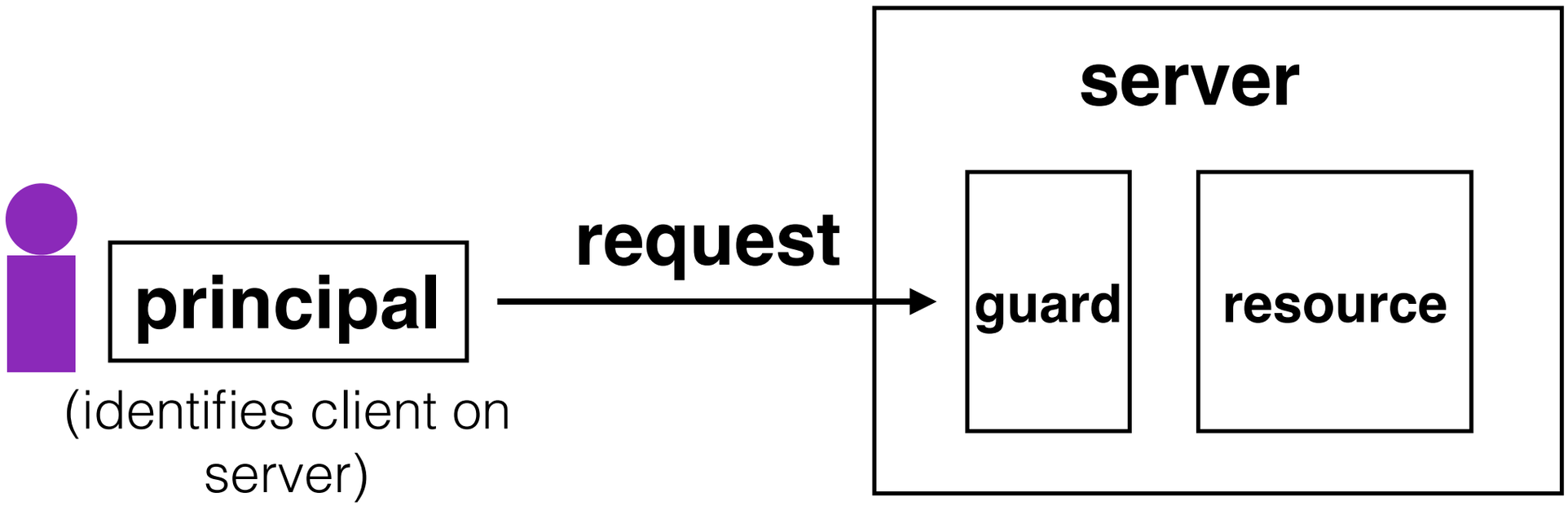
1. be clear about goals (policy)
2. be clear about assumptions (threat model)

guard model of security

provides **complete mediation**.

systems that use this model avoid common pitfalls

complete mediation: every request for resource goes through the guard



authentication: is the principal who they claim to be?

authorization: does principal have access to perform request on resource?

what can go wrong with the guard model?

sql injection demo

username	email	public?
melva	melva@mit.edu	yes
peter	psz@mit.edu	yes
katrina	lacurts@mit.edu	no

```
SELECT username, email FROM users WHERE
username='<username>' AND public='yes'
```

Let `<username>` = `katrina' OR username='`

sql injection demo

username	email	public?
melva	melva@mit.edu	yes
peter	psz@mit.edu	yes
katrina	lacurts@mit.edu	no

```
SELECT username, email FROM users WHERE
username='katrina' OR username='' AND
public='yes'
```

what can go wrong with the guard model?

- **Adversarial attacks** are different from “normal” failures. They’re targeted, rarely random, and rarely independent. Just one successful attack can bring down a system.

- Securing a system starts by specifying our goals (**policy**) and assumptions (**threat model**).

- The **guard model** provides **complete mediation**. Even though things can still go wrong, systems that use this model avoid common pitfalls.