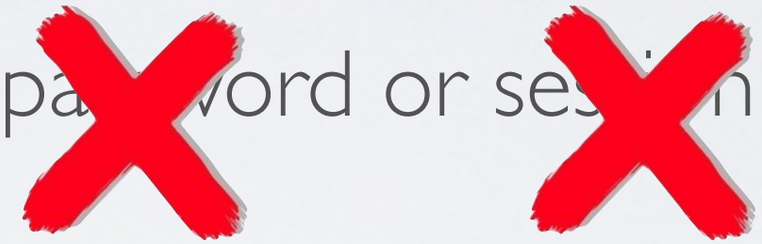
HTTPS

Thierry Sans

Understanding the threat

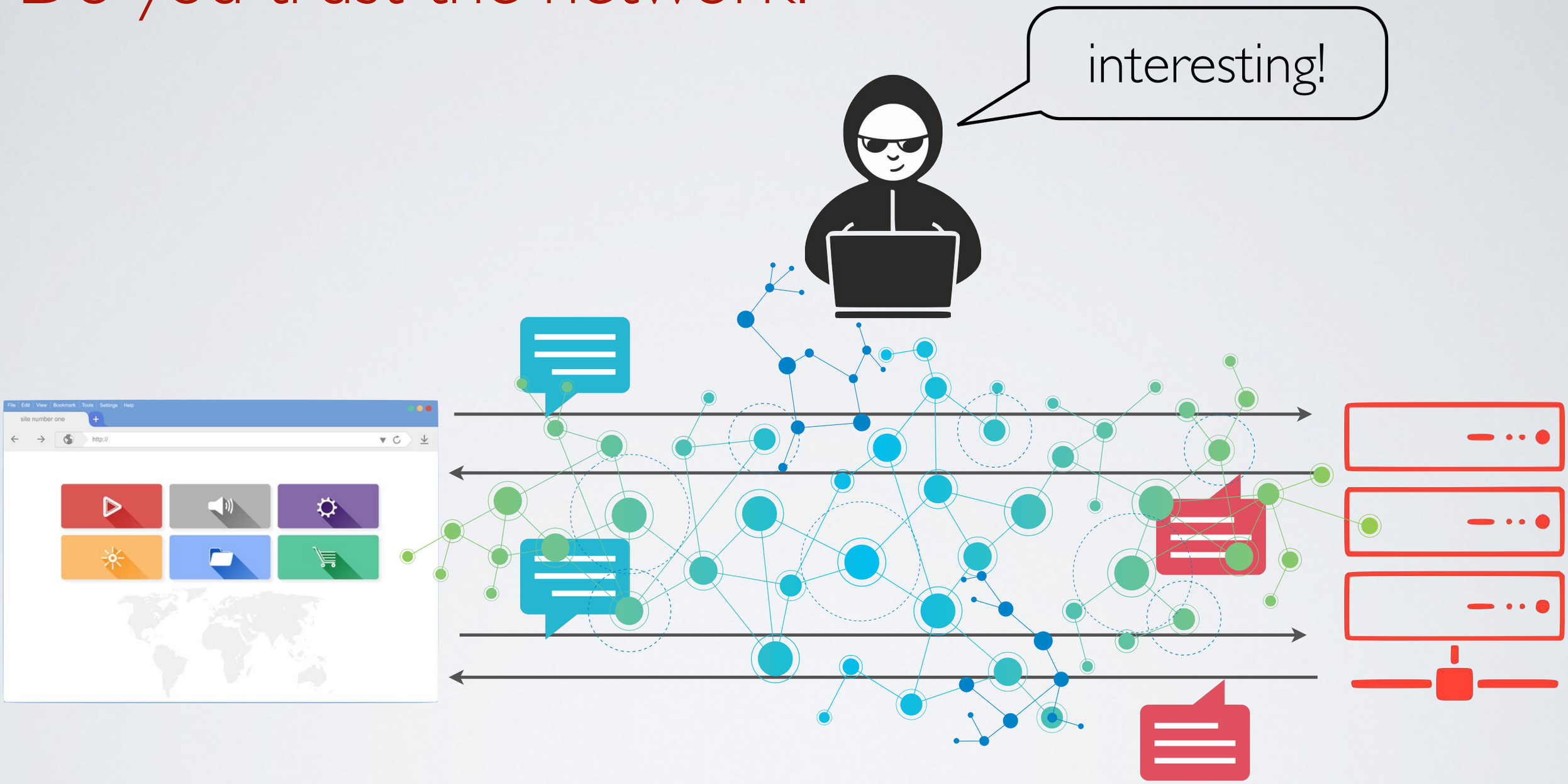
How to steal user's credentials

- Brute force the user's password or session ID



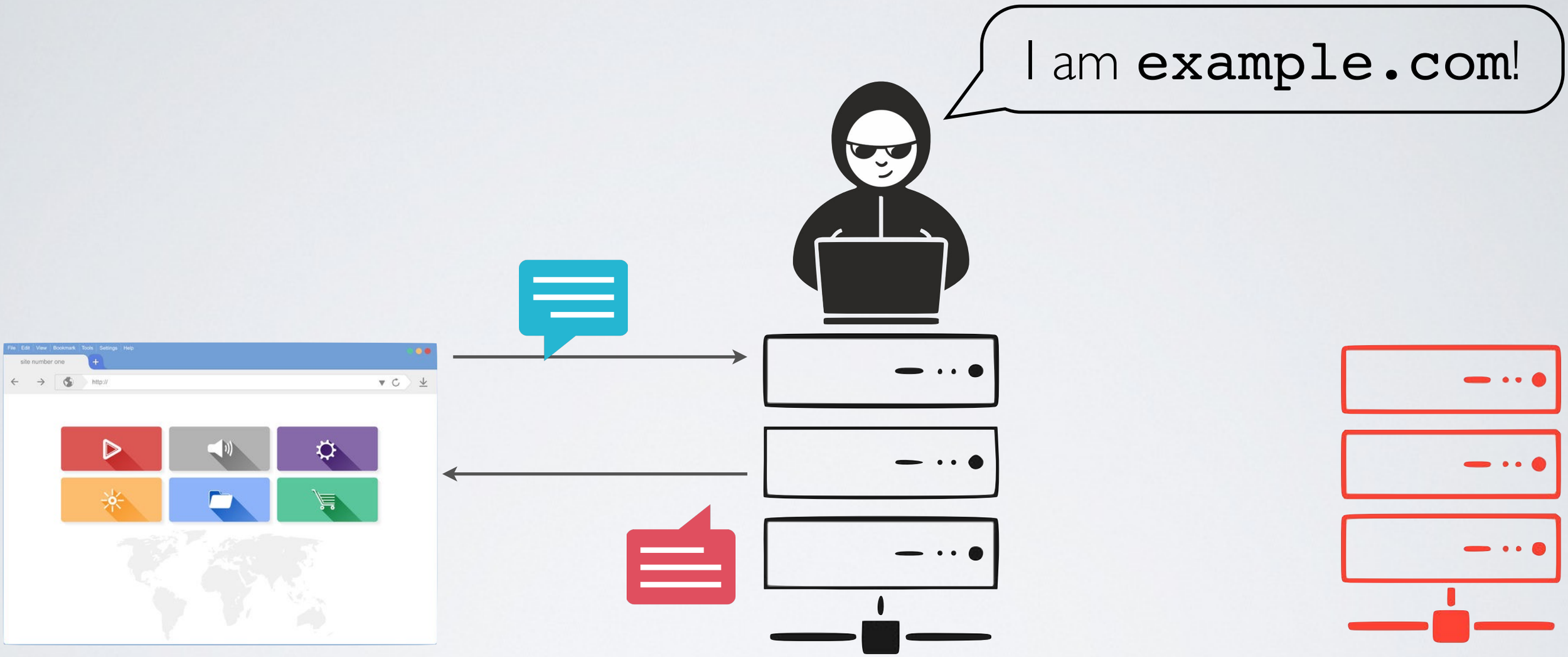
- Steal the user's password or session ID

Do you trust the network?



- Threat 1 : an attacker **can eavesdrop** messages sent back and forth

Do you *really* trust the network?



- Threat 2 : an attacker **can tamper with** messages sent back and forth

Confidentiality and Integrity

- Threat 1 : an attacker **can eavesdrop** messages sent back and forth

  Confidentiality: how do exchange information secretly?

- Threat 2 : an attacker **can tamper** messages sent back and forth

  Integrity: How do we exchange information reliably?

Securing HTTP with HTTPS

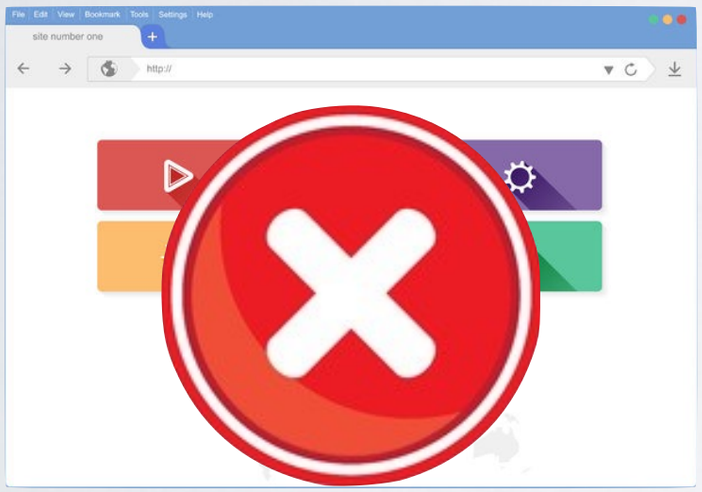
Generic solution - HTTPS

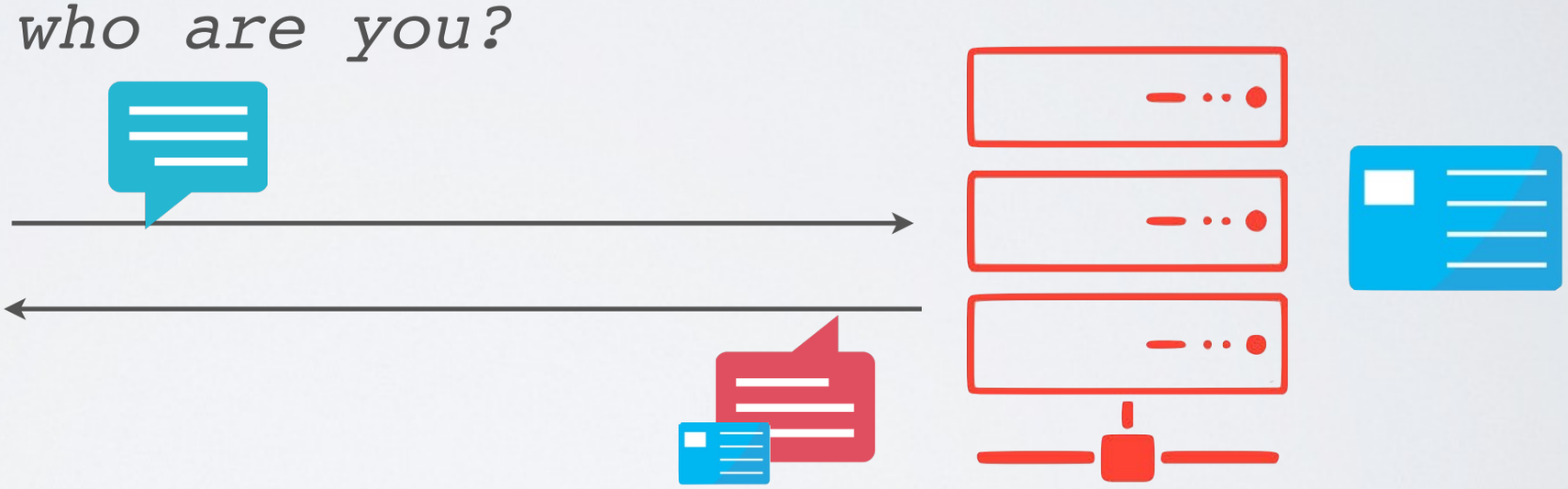
✓ HTTPS = HTTP + TLS

➡ Transport Layer Security (TLS previously known as SSL) provides

- **confidentiality:** end-to-end secure channel
- **integrity:** authentication handshake

Generating and using (self-signed) certificates





Self-signed certificates are not trusted by your browser

This Connection is Untrusted

You have asked Firefox to connect securely to **www.domainname.tld** but we can't confirm that your connection is secure.

Normally, when you try to connect securely, sites will present trusted identification to prove that you are going to the right place. However, this site's identity can't be verified.

What Should I Do?

If you usually connect to this site without problems, this error could mean that someone is trying to impersonate the site, and you shouldn't continue.

Get me out of here!

Technical Details

I Understand the Risks

If you understand what's going on, you can tell Firefox to start trusting this site's identification. **Even if you trust the site, this error could mean that someone is tampering with your connection.**

Don't add an exception unless you know there's a good reason why this site doesn't use trusted identification.

Add Exception...

Your connection is not private

Attackers might be trying to steal your information from **bitbucket.org** (for example, passwords, messages, or credit cards).

Hide advanced

Reload

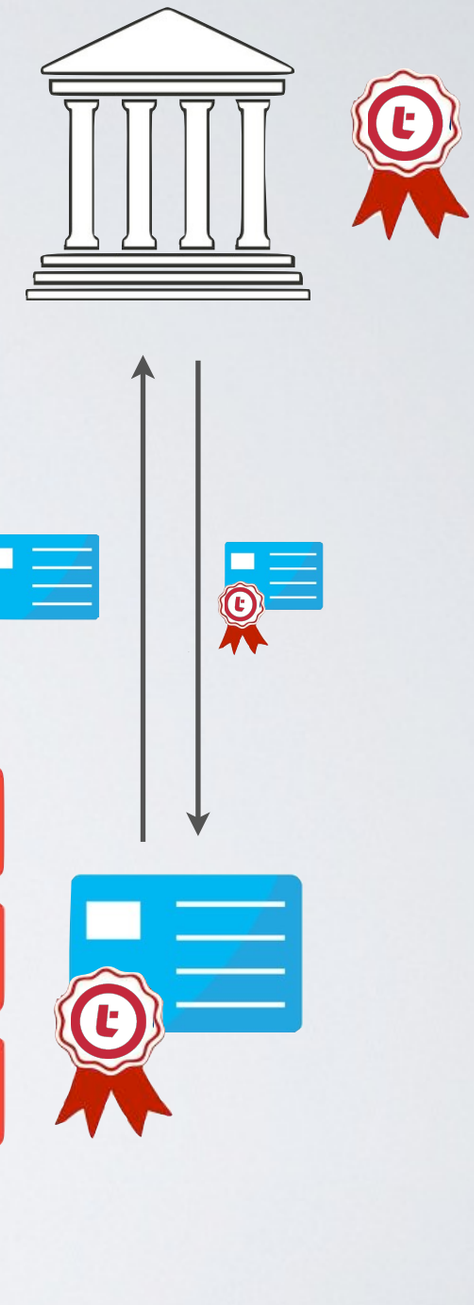
bitbucket.org normally uses encryption to protect your information. When Chrome tried to connect to bitbucket.org this time, the website sent back unusual and incorrect credentials. Either an attacker is trying to pretend to be bitbucket.org, or a Wi-Fi sign-in screen has interrupted the connection. Your information is still secure because Chrome stopped the connection before any data was exchanged.

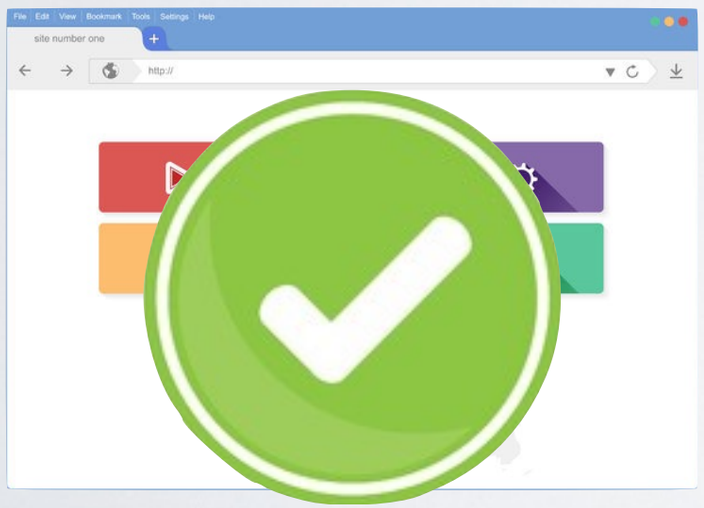
You cannot visit bitbucket.org right now because the website uses HSTS. Network errors and attacks are usually temporary, so this page will probably work later.

NET::ERR_CERT_DATE_INVALID

Signed Certificate

Certificate Authority (CA)

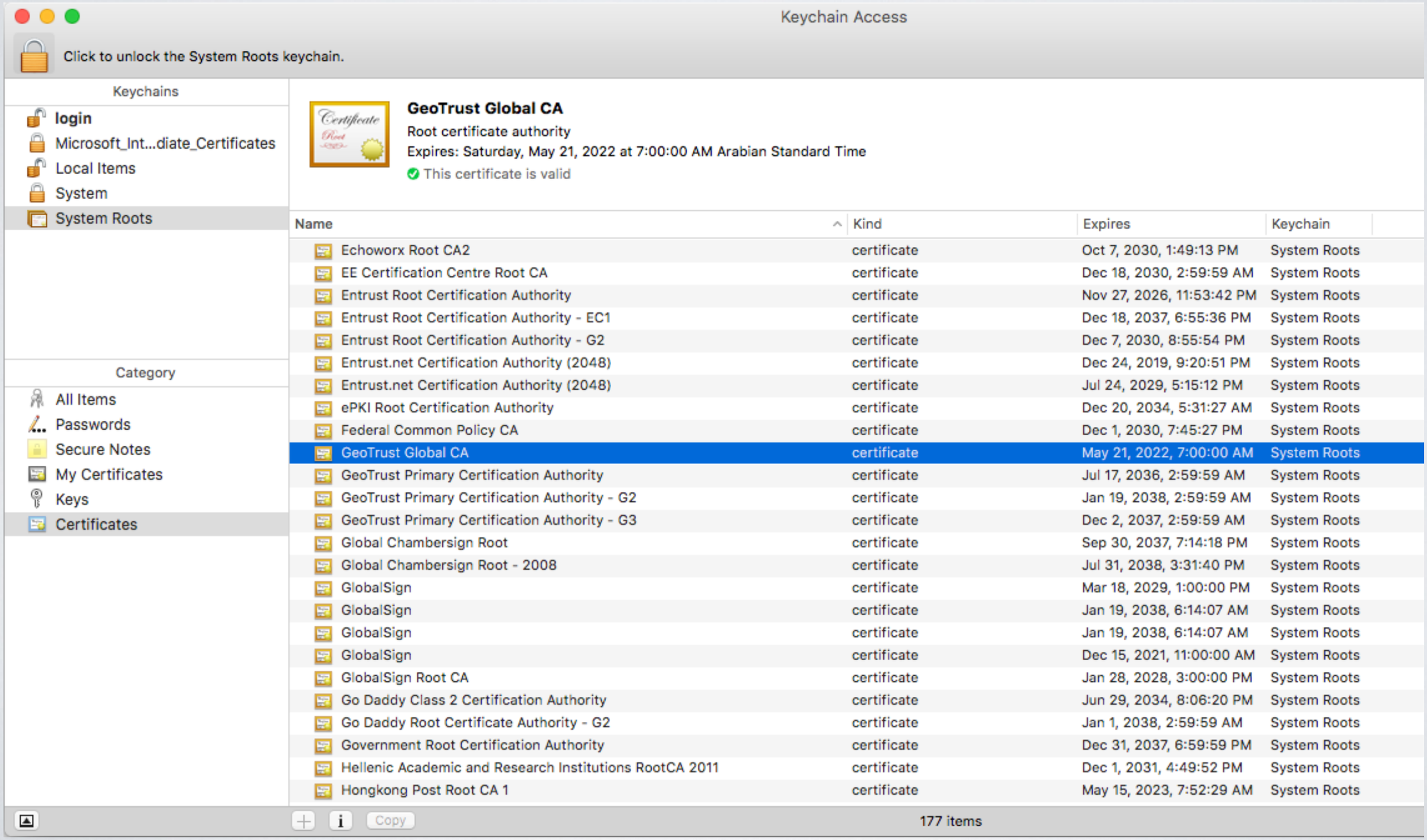




who are you?

I am example.com

Your browser trusts many CAs **by default**



Real attacks

Google Security Blog

The latest news and insights from Google on security and safety on the Internet

An update on attempted man-in-the-middle attacks

August 29, 2011

Posted by Heather Adkins, Information Security Manager

Today we received reports of attempted SSL man-in-the-middle (MITM) attacks against Google users, whereby someone tried to get between them and encrypted Google services. The people affected were primarily located in Iran. The attacker used a fraudulent SSL certificate issued by DigiNotar, a root certificate authority that should not issue certificates for Google (and has since revoked it).

Google Chrome users were protected from this attack because Chrome was able to detect the fraudulent certificate.

Google Security Blog

The latest news and insights from Google on security and safety on

Enhancing digital certificate security

January 3, 2013

Posted by Adam Langley, Software Engineer

Late on December 24, Chrome detected and blocked an unauthorized digital certificate for the "*.google.com" domain. We investigated immediately and found the certificate was issued by an intermediate certificate authority (CA) linking back to TURKTRUST, a Turkish certificate authority. Intermediate CA certificates carry the full authority of the CA, so anyone who has one can use it to create a certificate for any website they wish to impersonate.

Beyond HTTPS

Why and when using HTTPS?

HTTPS = HTTP + TLS

➡ TLS provides

- confidentiality: end-to-end secure channel
- integrity: authentication handshake

➡ HTTPS protects any data send back and forth including:

- login and password
- session ID

✓ **HTTPS everywhere**
HTTPS must be used during the entire session

Be careful of mixed content

Mixed-content happens when:

1. an HTTPS page served with HTTPS contains elements (ajax, js, image, video, css ...) served with HTTP

2. an HTTPS page transfers control to another HTTP page within the same domain

Do/Don't

- Always use HTTPS exclusively in production
- Always have a valid and signed certificate
- Always avoid absolute URL for everything

Limitation of HTTPS