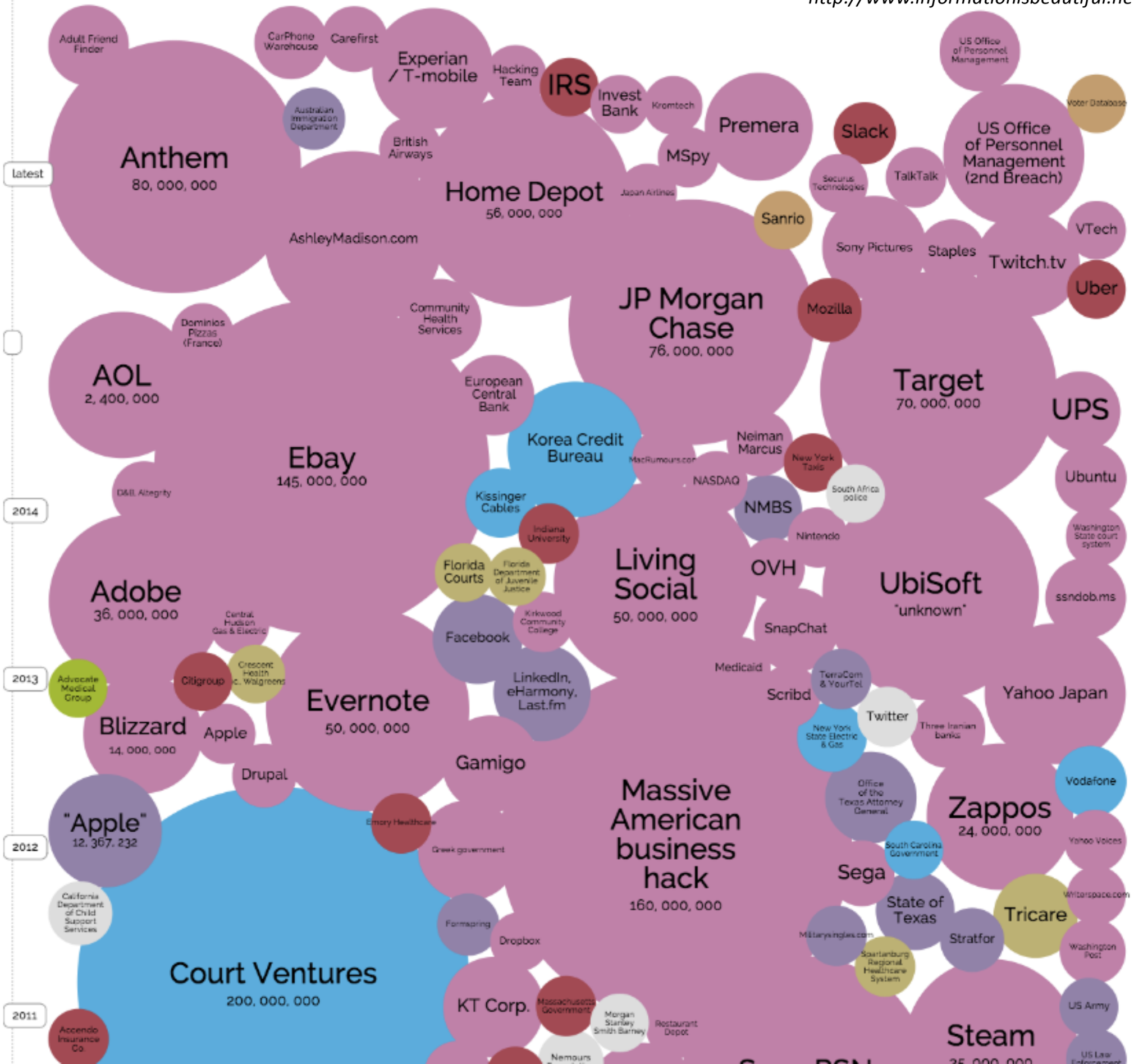
ETH zürich

What Did We Learn From Recent Data Breaches?

Srdjan Čapkun

Department of Computer Science
ETH Zurich

http://www.informationisbeautiful.net/



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Hacked

latest

2014

2013

2012

2011

Anthem
80, 000, 000

Adult Friend Finder

CarPhone Warehouse

Carefirst

Experian / T-mobile

Hacking Team

IRS

Invest Bank

Kromtech

Premera

Australian Immigration Department

British Airways

MSpy

Home Depot
56, 000, 000

Japan Airlines

AshleyMadison.com

US Office of Personnel Management

Voter Database

Slack

US Office of Personnel Management (2nd Breach)

Securus Technologies

TalkTalk

Sanrio

Sony Pictures

Staples

Twitch.tv

VTech

Uber

Community Health Services

Dominios Pizzas (France)

JP Morgan Chase
76, 000, 000

Mozilla

AOL
2, 400, 000

European Central Bank

Target
70, 000, 000

UPS

Ebay
145, 000, 000

Korea Credit Bureau

MacRumours.com

Neiman Marcus

New York Taxis

NASDAQ

South Africa police

D&B Allegrity

Kissinger Cables

NMBS

Ubuntu

Indiana University

Nintendo

Washington State court system

Florida Courts

Florida Department of Juvenile Justice

Living Social
50, 000, 000

OVH

UbiSoft
"unknown"

ssndob.ms

Kirkwood Community College

Facebook

SnapChat

Central Hudson Gas & Electric

Medicaid

Adobe
36, 000, 000

Advocate Medical Group

Citigroup

Crescent Health c. Walgreens

LinkedIn, eHarmony, Last.fm

TerraCom & YourTel

Scribd

Yahoo Japan

Twitter

New York State Electric & Gas

Three Iranian banks

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Apple

Evernote
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Drupal

Gamigo

Office of the Texas Attorney General

Vodafone

Zappos
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Yahoo Voices

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Greek government

Massive American business hack
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South Carolina Government

Sega

"Apple"
12, 367, 232

State of Texas

Tricare

Writerspace.com

California Department of Child Support Services

Formspring

Dropbox

Militaryingles.com

Stratfor

Spartanburg Regional Healthcare System

Washington Post

Court Ventures
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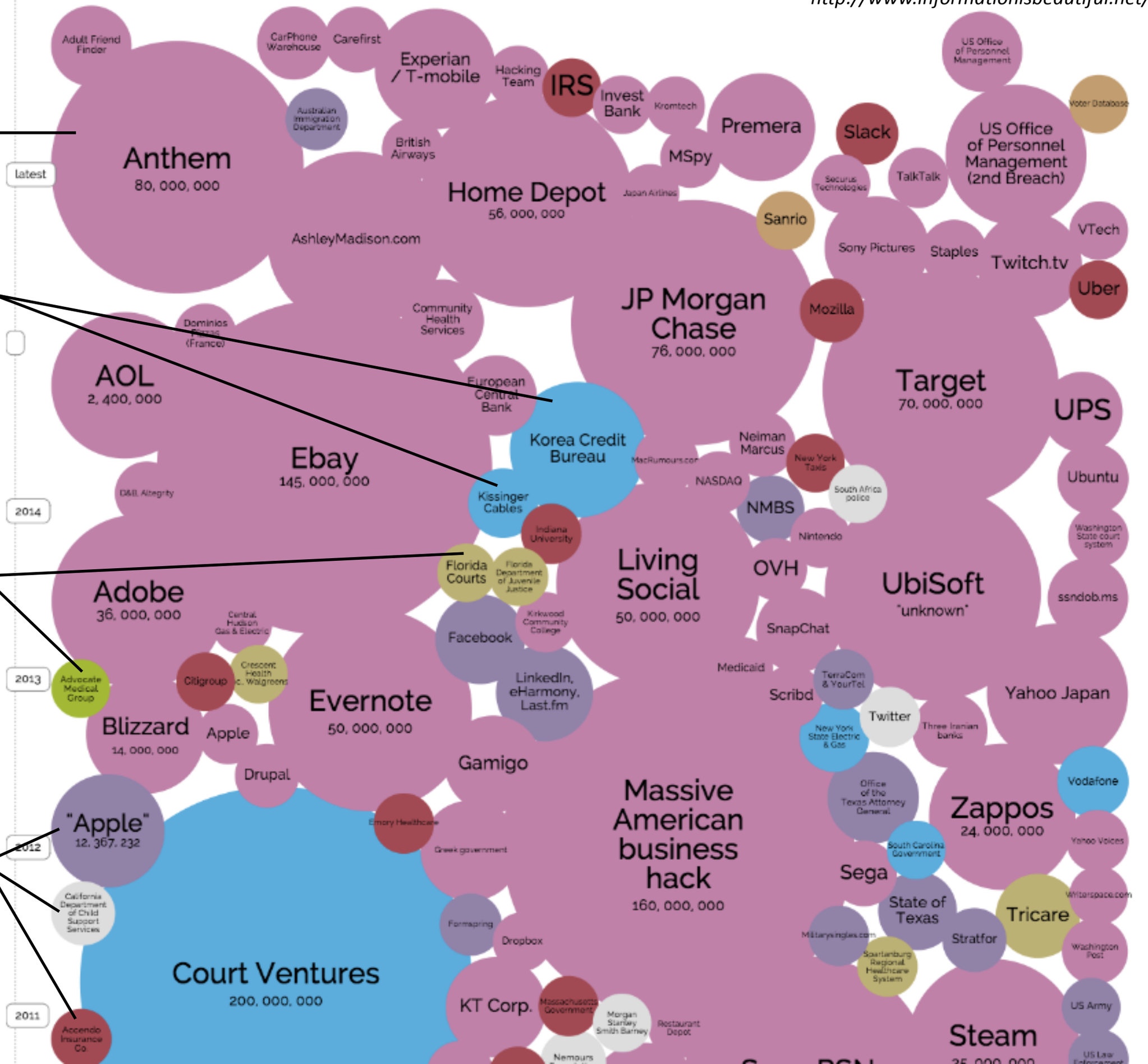
- Accidentally published
- Configuration errors
- Poor security



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- **SQL injection vulnerability** reveals 4.8 million customer email addresses, names and **weakly hashed passwords (MD5)**,
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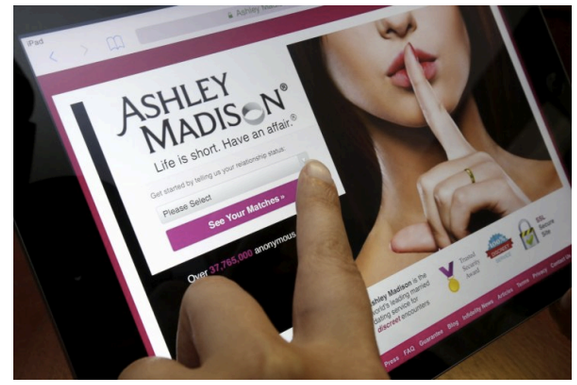

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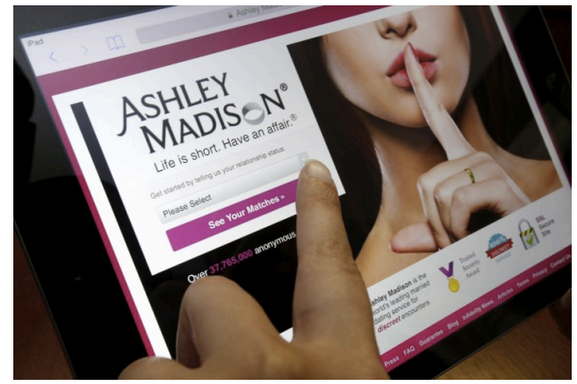

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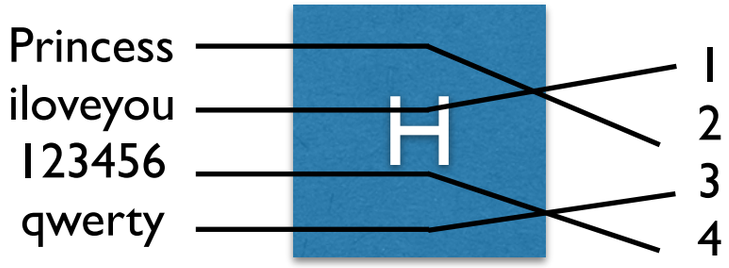

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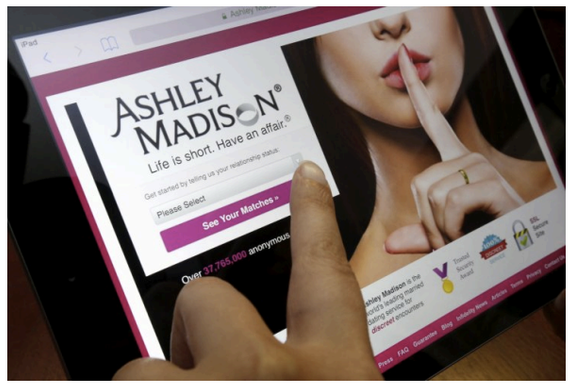

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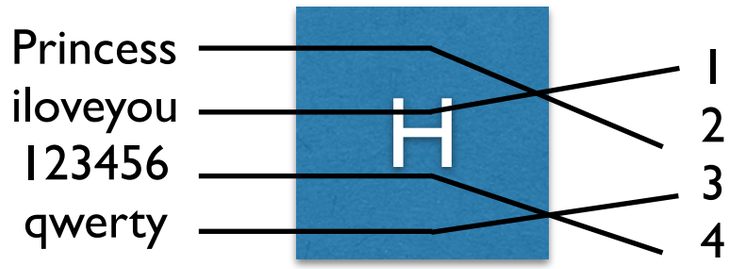

CynoSure analysis: 11 million hashes cracked
>630,000 people used usernames as passwords
MD5 hashed left around accidentally
http://cynosureprime.blogspot.ch/2015/09/csp-our-take-on-cracked-am-passwords.html

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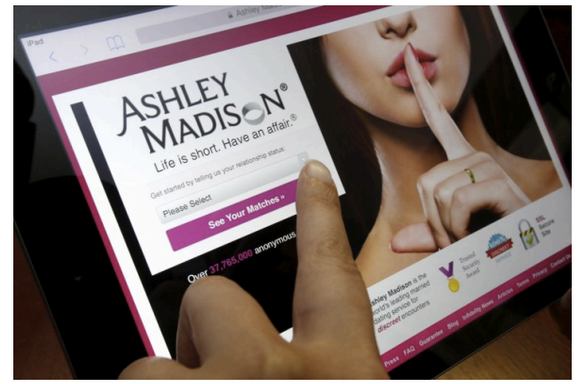

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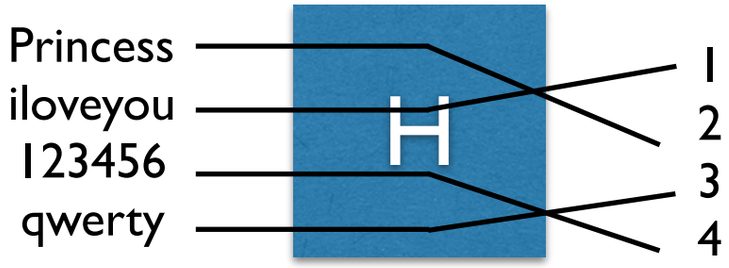

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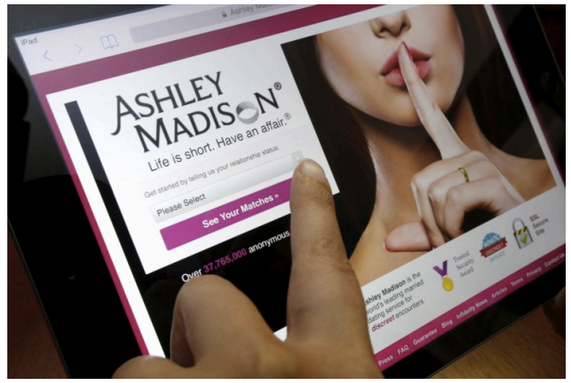

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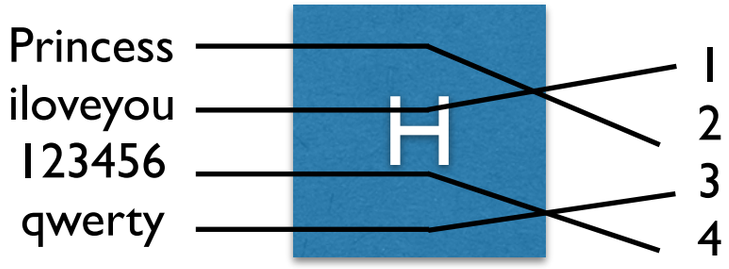

mypasswordispassword
superhardpassword
thebestpasswordever
thisisagoodpassword
likeimreallygoingtocheat
justcheckingitout
jusPryingthisout
goodguydoingthewrongthing
ishouldnotbedoingthis
ithinkilovemywife
thisiswrong
whaPhehellamidoing

US Office of Personnel Management (2015)

- Personnel records on 22 million current and former US federal employees (including some fingerprints)
- Attack: **Used contractor's stolen credentials to plant malware backdoor in the network.**
- Undetected for **343 days**
- Goal: intelligence, information gathering

- Discovery: Anomalous SSL traffic and a decryption tool found in the network, followed by a forensic investigation.

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- **Increasingly hostile environment**
  - Attacker is not only "on the channel"
  - Internal attackers (employees, subcontractors)
  - *"Post-Snowden attacker":*
    active subversion of systems, protocols and standards

Sensitive Data?

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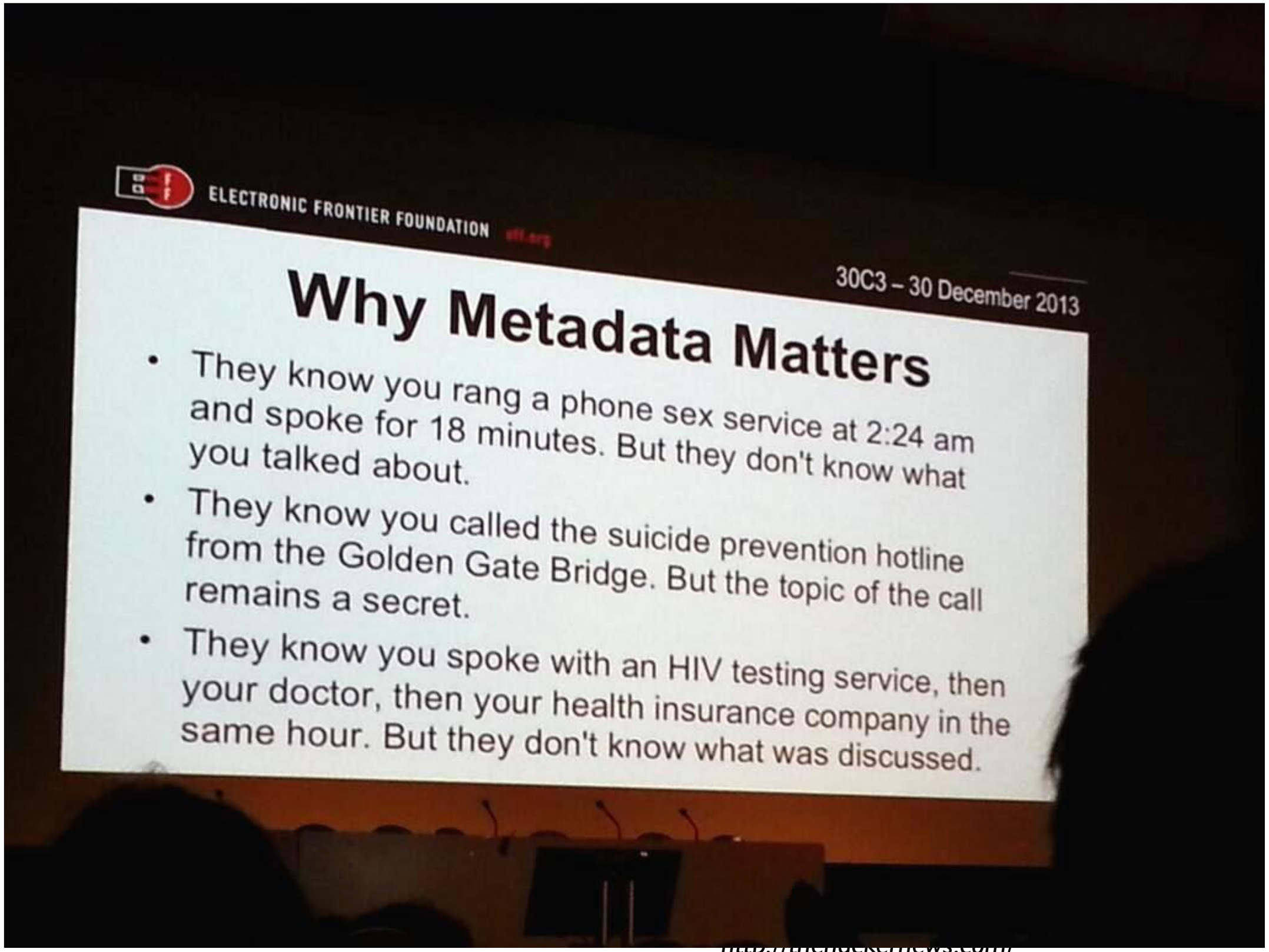
Ex-NSA Director Admits 'We Kill People Based On Metadata' with Drone Strike

Wednesday, May 14, 2014 Wang Wei

http://thehackernews.com/

Sensitive Data?



http://thenextweb.com/

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A Face Is Exposed for AOL Searcher No. 4417749

By MICHAEL BARBARO and TOM ZELLER Jr.
Published: August 9, 2006

SIGN IN TO E-MAIL THIS
PRINT
SINGLE PAGE
REPRINTS

Buried in a list of 20 million Web search queries collected by AOL and recently released on the Internet is user No. 4417749. The number was assigned by the company to protect the searcher's anonymity, but it was not much of a shield.

No. 4417749 conducted hundreds of searches over a three-month period on topics ranging from "numb fingers" to "60 single men" to "dog that urinates on everything."

And search by search, click by click, the identity of AOL

The New York Times

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TechCrunch

AOL: "This was a screw up"

Posted Aug 7, 2006 by **Michael Arrington** (@arrington)

0 SHARES

AOL is apologizing in the aftermath of yesterday's story about their voluntary release of search data on 650,000 users.

o. 4417749

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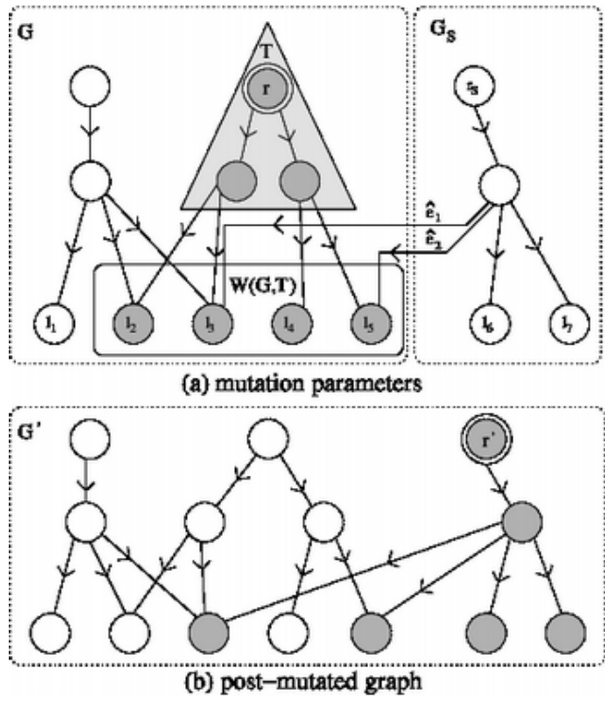

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Belgian press reveals British hacking of Belgacom

Share 37 Share 14 Tweet 33 Share 8

Published: 15/12/2014 - 07:08 | Updated: 15/12/2014 - 10:15 | 2

Maybe We Should Solve This Contractually?

What if the data leaks … hard to prove who leaked it. ***Attribution?***
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News / Asia

Will the US-China Cybersecurity Pact Work?

Print Comment Share:

President Barack Obama shakes hands with Chinese President Xi Jinping during their meeting in the Oval Office of the White House in Washington, Sept. 25, 2015.

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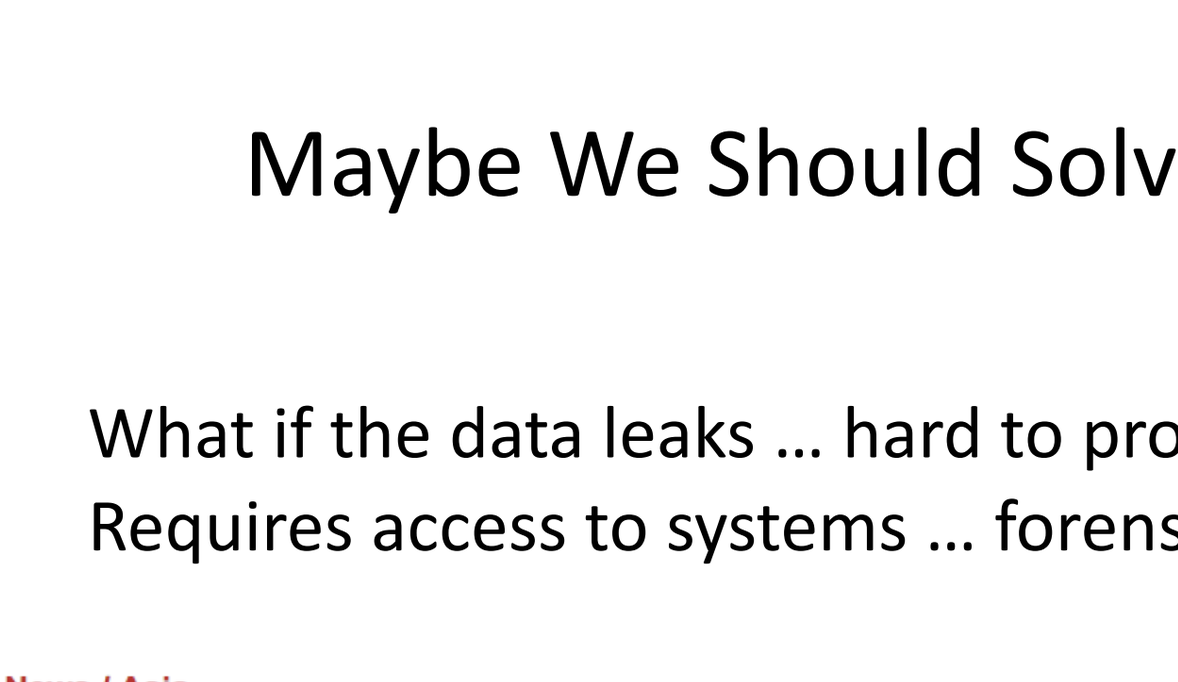


President Barack Obama shakes hands with Chinese President Xi Jinping during their meeting in the Oval Office of the White House in Washington, Sept. 25, 2015.

Report: China Already Violated Cybersecurity Agreement with US

SHARE TWEET EMAIL

Obama and Chinese President Xi Jinping / AP

BY: Morgan Chalfant

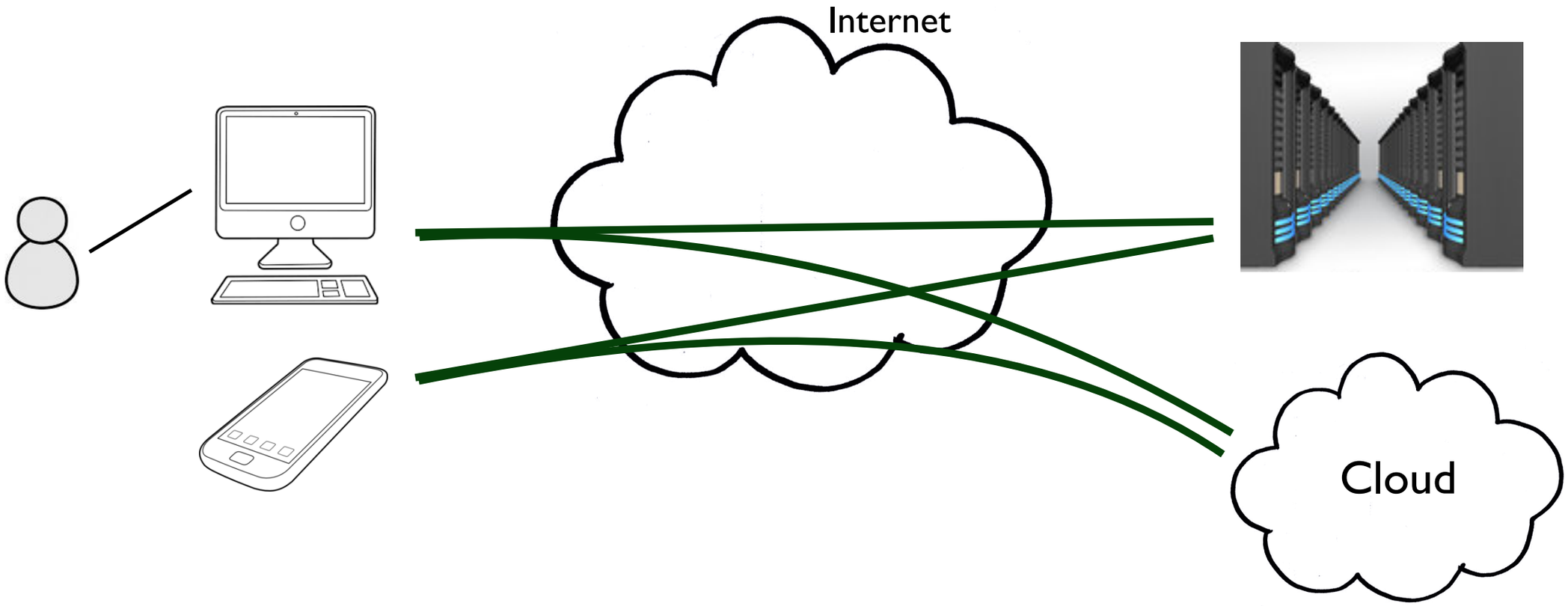
Follow @mchalfant16

October 19, 2015 11:33 am

A U.S. cybersecurity firm that works with the government has evidence that Chinese government-linked hackers violated the cyber agreement reached between Presiden Obama and Chinese President Xi Jinping less than a month ago.

The *Wall Street Journal* reported that CrowdStrike Inc. will announce Monday that some of its customers fell victim to

Increasingly Hostile Digital World



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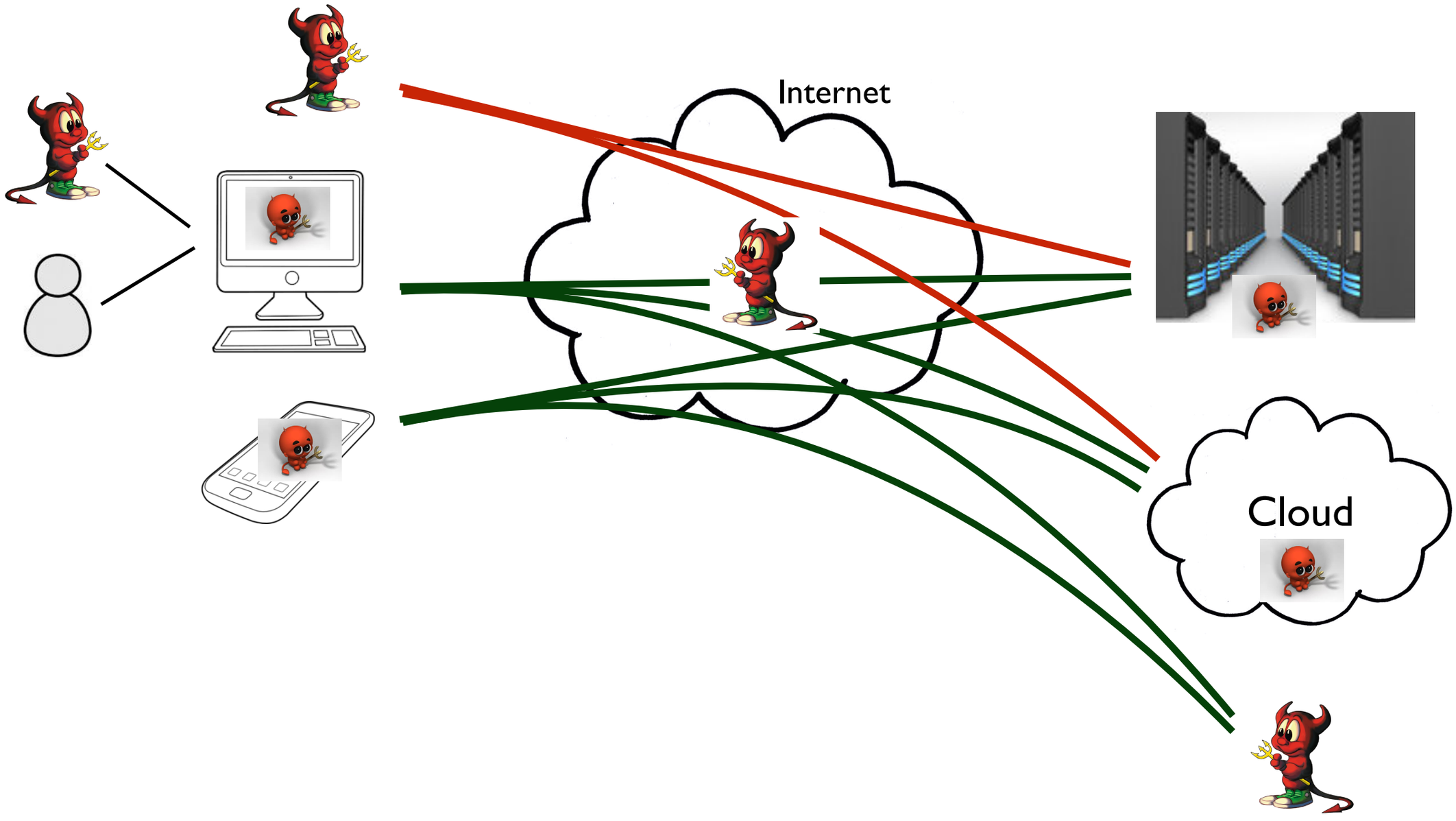

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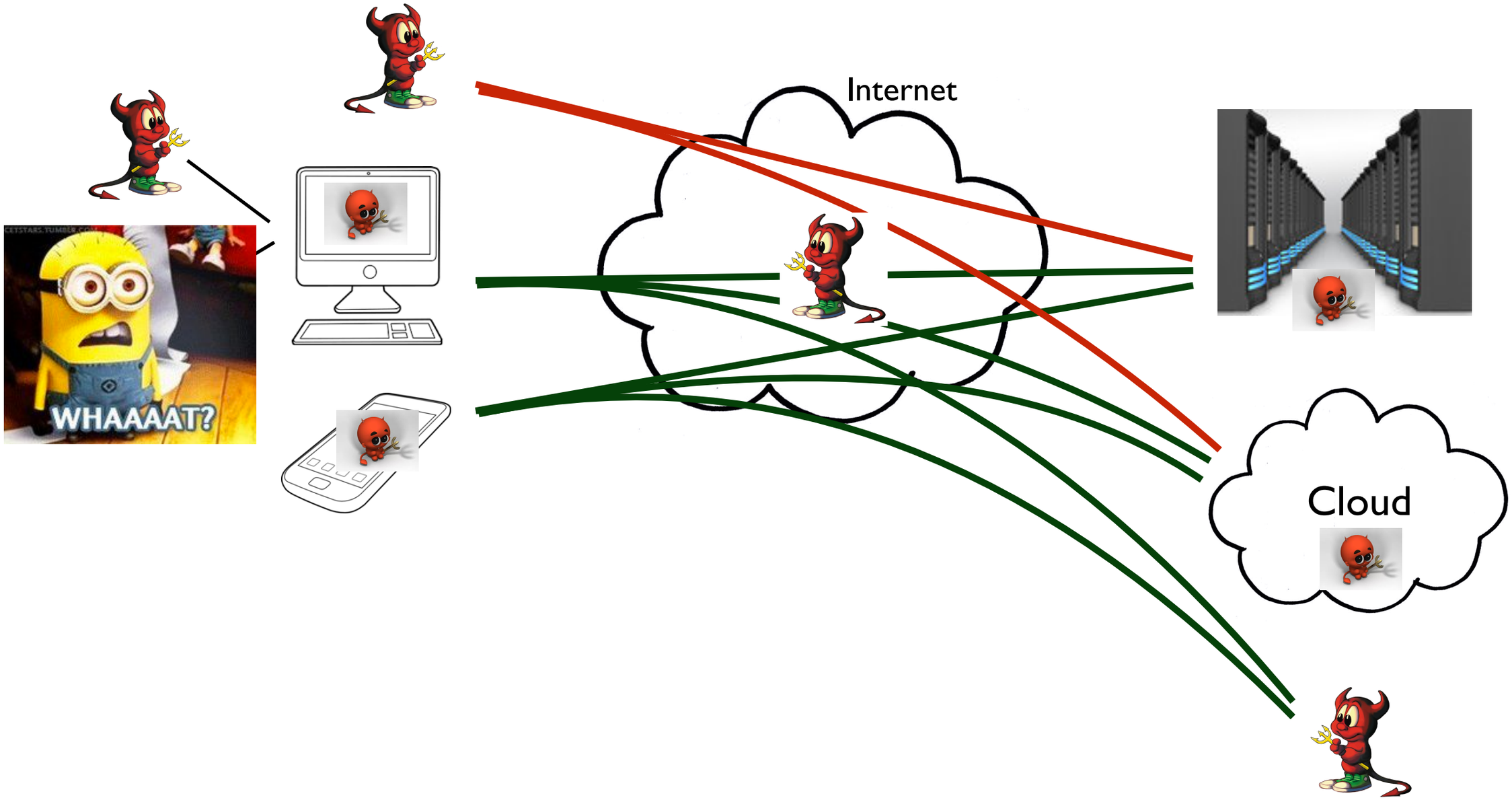

Problems on the Channel: *TLS ++*

Survey of the TLS vulnerabilities of the most popular websites

Attacks	Security				
	Insecure		Depends	Secure	Other
Renegotiation attack	2.2% (–0.1%) support insecure renegotiation		0.8% (±0.0%) support both	94.1% (+0.3%) support secure renegotiation	2.9% (–0.1%) no support
RC4 attacks	0.4% (–0.1%) support only RC4 suites	12.3% (–1.4%) support RC4 suites used with modern browsers	40.6% (–1.8%) support some RC4 suites	47.1% (+3.1%) no support	N/A
BEAST attack (mitigated at client side with modern browsers)	N/A		89.2% (+1.2%) vulnerable if connect with old browser	N/A	N/A
CRIME attack	4.0% (–0.2%) vulnerable		N/A	N/A	N/A
Heartbleed	0.2% (±0.0%) vulnerable		N/A	N/A	N/A
ChangeCipherSpec injection attack	1.4% (–0.2%) vulnerable and exploitable		8.5% (–0.4%) vulnerable, not exploitable	88.9% (+0.4%) not vulnerable	1.1% (+0.1%) unknown
POODLE attack against TLS (Original POODLE against SSL 3.0 is not included)	4.3% (–0.4%) vulnerable and exploitable		N/A	94.2% (+0.4%) not vulnerable	1.5% (±0.0%) unknown
Protocol downgrade	32.6% (–1.0%) TLS_FALLBACK_SCSV not supported		N/A	54.4% (+1.3%) TLS_FALLBACK_SCSV supported	13.0% (–0.3%) unknown

Wikipedia / https://www.trustworthyinternet.org/ssl-pulse/

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Cha… attack	vulnerable and exploitable	vulnerable, not exploitable	not vulnerable	1.1% (+0.1%) unknown
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Session 1: Transport Layer Security

N D S S '16 SYMPOSIUM

Transcript Collision Attacks: Breaking Authentication in TLS, IKE and SSH

In response to high-profile attacks that exploit hash function collisions, software vendors have started to phase out the use of MD5 and SHA-1 in third-party digital signature applications such as X.509 certificates. However, weak hash constructions continue to be used in various cryptographic constructions within mainstream protocols such as TLS, IKE, and SSH, because practitioners argue that their use in these protocols relies only on second preimage resistance, and hence is unaffected by collisions. This paper systematically investigates and debunks this argument.

Wikipedia / https://www.trustworthyinternet.org/ssl-pulse/

Problems in the End-Systems

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(Home Depot Hit By Same Malware as Target)

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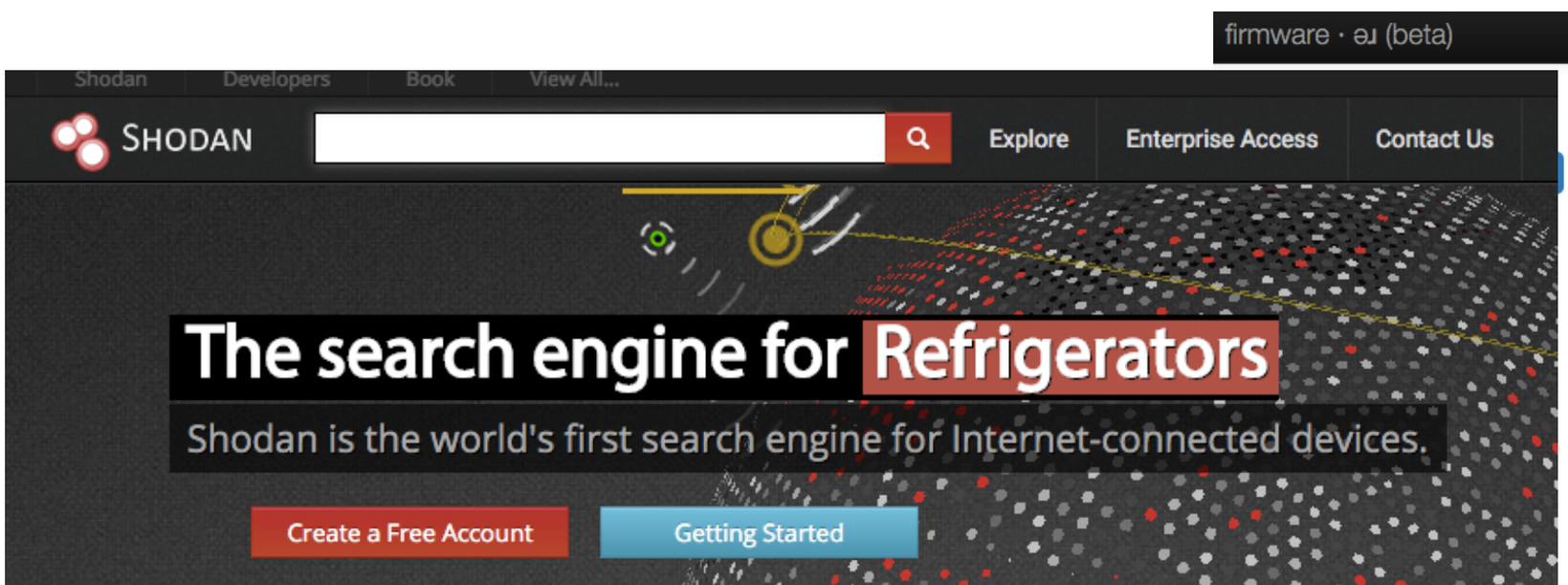
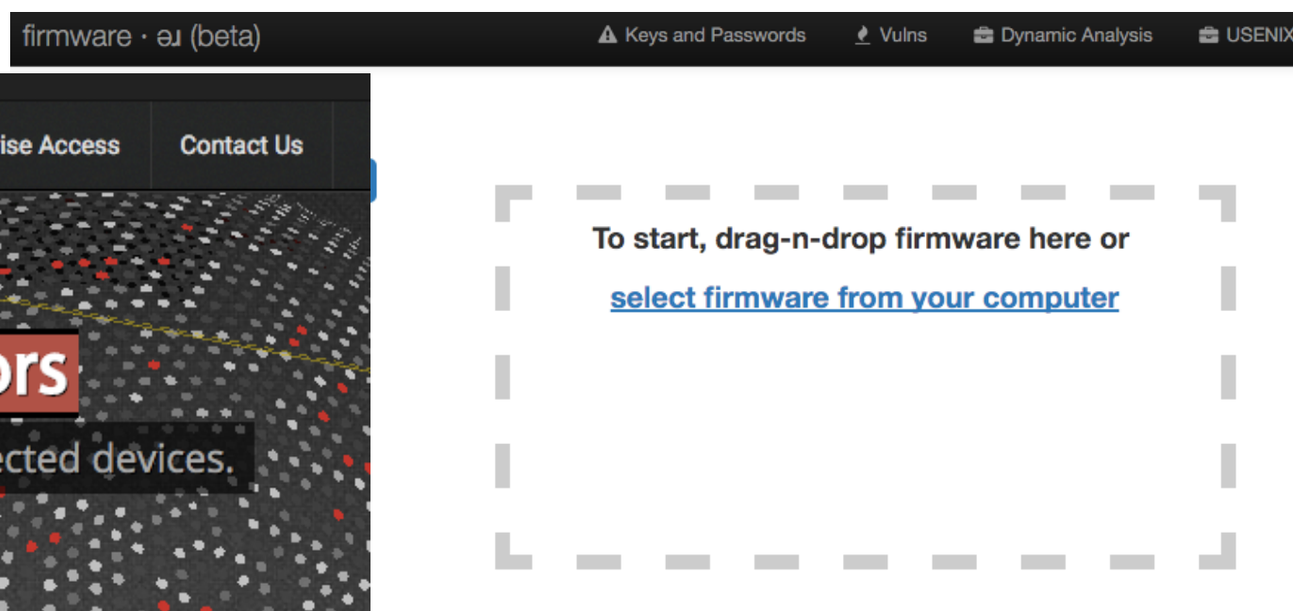
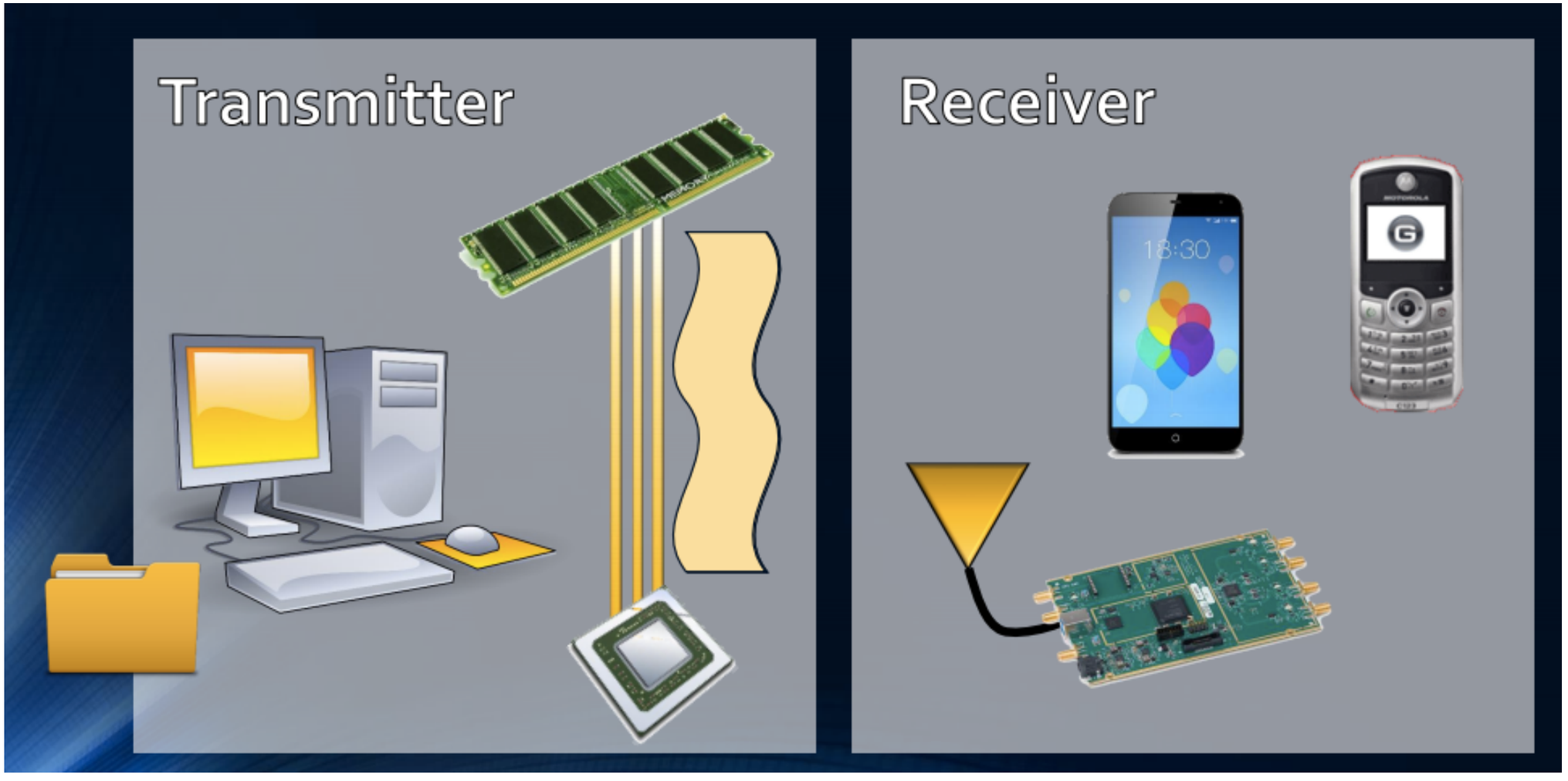




Air-Gapped you say?

Data Exfiltration from Air-Gapped Computers over GSM Frequencies



Usenix Security 2015

Problems with Standards and Recommendations (and therefore Compliance …)

Post-Snowden Cryptography … (2013)

- Bullrun/Sigint: a program by the NSA to *"Insert vulnerabilities into commercial encryption systems"*, to *"influence policies, standards and specification for commercial public key technologies"* and to *"shape the worldwide commercial cryptography marketplace to make it more tractable to advanced cryptanalytic capabilities being developed by NSA/CSS"*. Example: Dual EC RNG
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	Undetectability	Lack of Conspiracy	Deniability	Ease of Use	Monitorability	Severity	Durability	Scale	Precision	Control
Lotus Notes	L	L	L	H	L	H	M	H	M	H
Dual EC	M	L	L	M	L	M	H	L	L	H
Debian PRNG	H	H	H	M	M	H	L	H	M	L
Heartbleed	H	H	H	M	M	H	M	H	M	L
Double Goto	H	H	H	M	H	H	L	M	M	L

Low L Medium M High H

Surreptitiously Weakening Cryptographic Systems
https://eprint.iacr.org/2015/097.pdf

Problems with Outsourcing of Data

Do we trust the cloud provider / jurisdiction?

Do we/they trust their employees?

NSA's Grand Plan to Snowden-Proof Its Data Using the Cloud

Nextgov - 3 days ago

With NSA's widespread adoption of **cloud computing**, the spy agency may not have to.

Do we believe that they will secure our data / services better than we can?

We outsource more than data …

- Virtually everything is ‘Virtualized’ and ‘Outsourced’
  - We store our data in the cloud (Dropbox, Google, …)
  - We run servers in the cloud (systems, analytics) in the cloud
  - ***We run middleboxes (firewall, switches, VPN, …) in the cloud***
  - ***We run our network services in the cloud***
  - ***We run our security services in the cloud (PKI, AAA, …)***
  - ***We (will) run our (critical) infrastructure in clouds***

So how do we move forward and improve?

We should …

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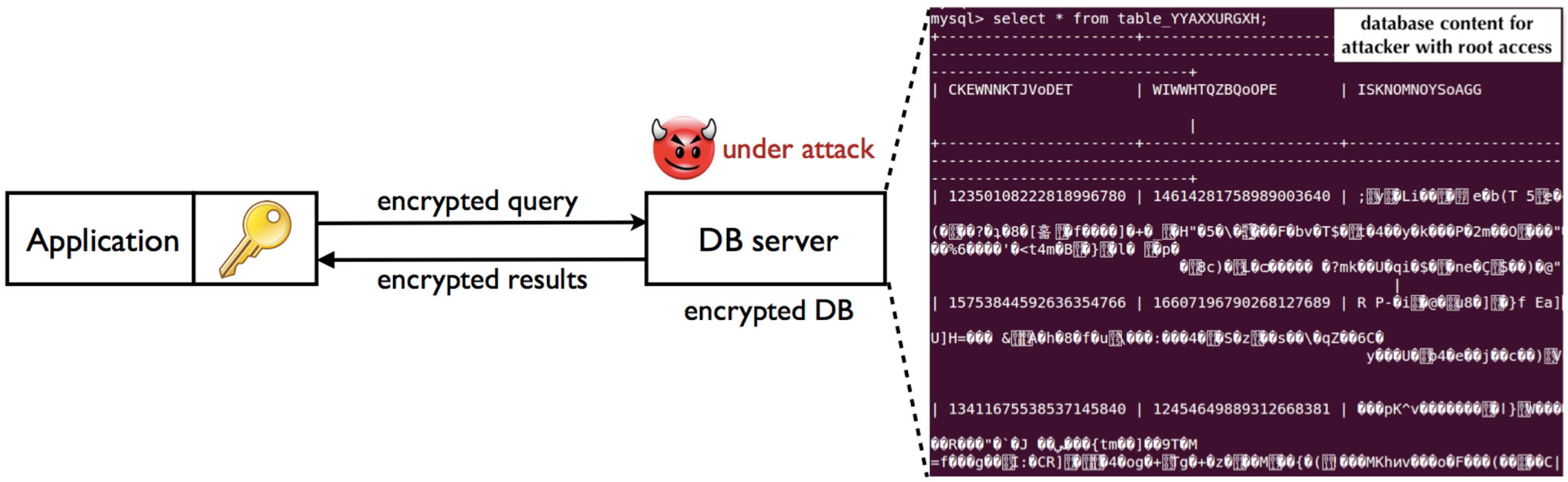
- But then be creative
  - There are some cool security technologies out there - we should deploy them.
  - Diversify and enable defense in depth.

We Can Do Processing over Encrypted Data

Data ***Confidentiality/Integrity.*** Storing only encrypted data in the cloud? But how do we process / query encrypted data (efficiently)?

- e.g., CryptDB



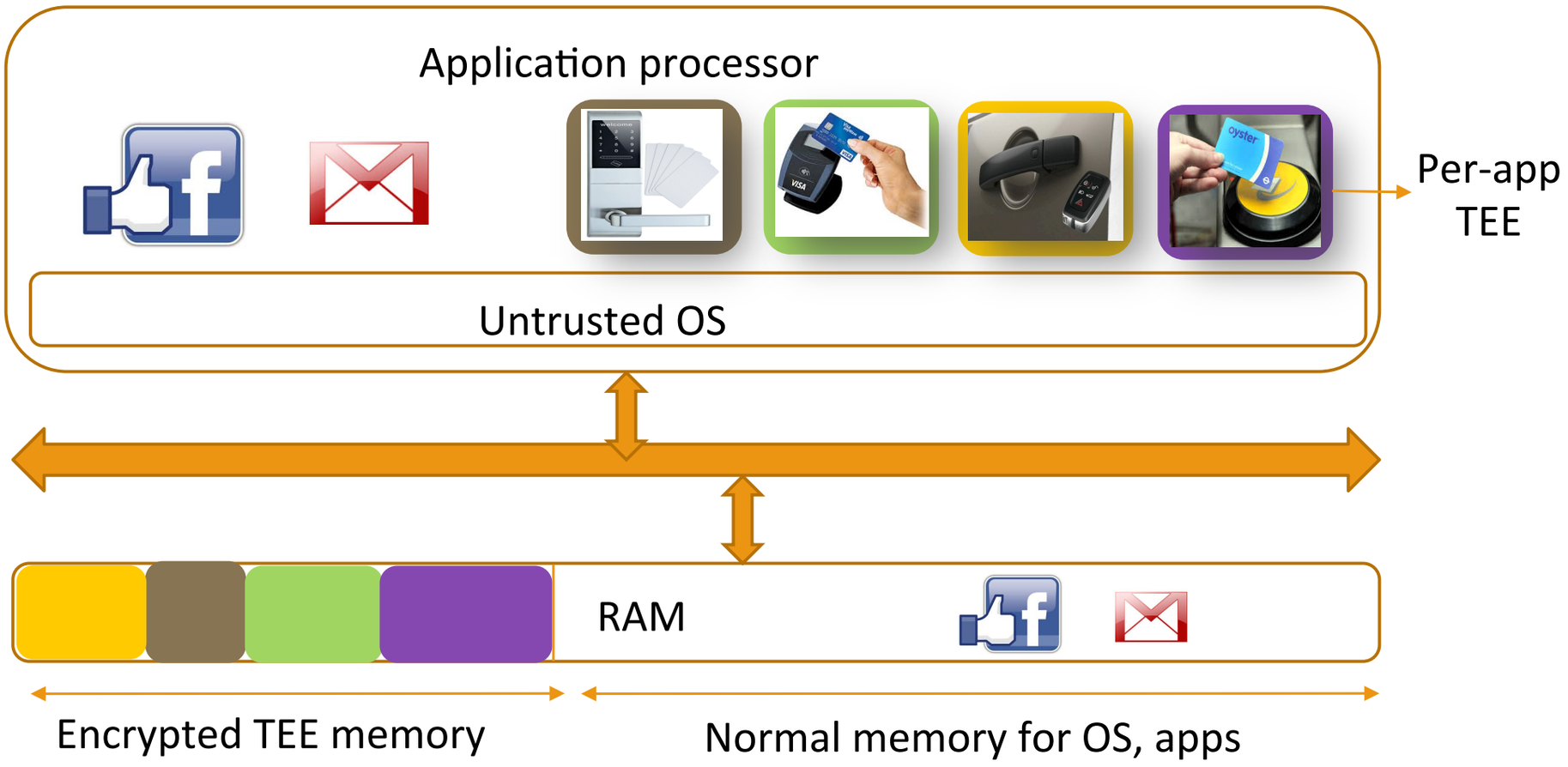
- Computing arbitrary functions over encrypted data *(Fully homomorphic encryption,* C. Gentry, 2009)

We Can Isolate Sensitive Operations

It is not only about storage, what about running code?

(Launch/Run time Integrity) - Trusted Computing is back!

- e.g., Intel SGX promisses isolated execution on an UNTRUSTED SYSTEM



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- @ETH e.g.,
  - New Internet Architectures providing isolation and security. (http://www.scion-architecture.net/)
  - Usable 2nd factor authentication systems http://www.sound-proof.ch/
  - Location-based Authentication and Access Control www.securepositioning.com

Security@ETH zürich

Institute of Information Security (INFSEC), ETH Zurich

> 60 PhD students and senior researchers in security

ZISC Zurich Information Security & Privacy Center

www.informationsecurity.ethz.ch

www.zisc.ethz.ch

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