

CSCD27

Computer and Network Security

Thierry Sans

Why security matters?

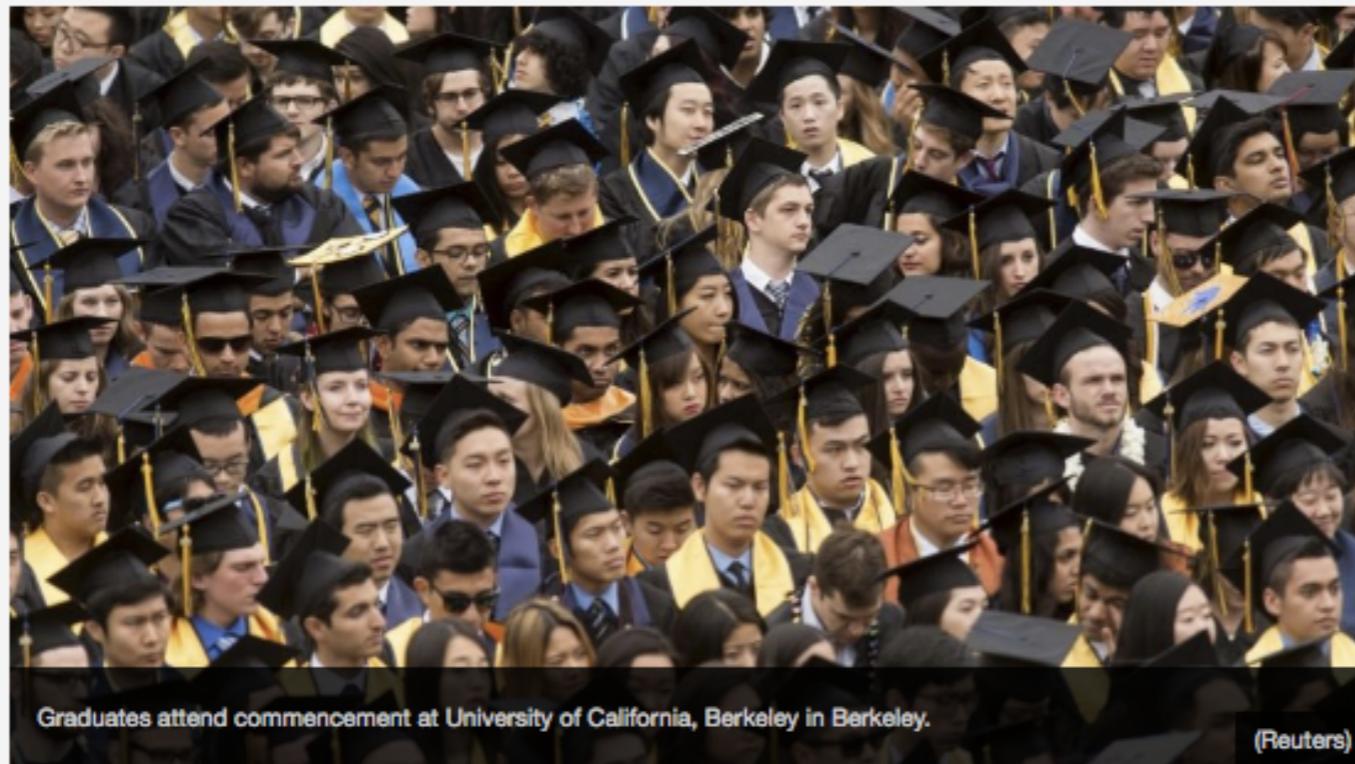
Dropbox hackers stole 68 million passwords - check if you're affected and how to protect yourself

The Telegraph

August 2016

Data breach affects 80,000 UC Berkeley faculty, students and alumni

Published February 28, 2016 • FoxNews.com



A hacker broke into the University of California, Berkeley computer system holding financial data of 80,000 students, alumni, current and former employees, school officials said Friday.

witnessed Manson
murder face transplant dies

Fox News

February 2016

CREDIT RSS | Tue Dec 29, 2015 2:20pm GMT

Database of 191 million U.S. voters exposed on Internet: researcher



Signs are pictured during a voter registration drive for National Voter Registration Day outside Convention Center in Los Angeles, California September 22, 2015. REUTERS/Mario Anzuoni



By Jim Finkle and Dustin Volz

An independent computer security researcher uncovered a database of information on 191 million voters that is exposed on the open Internet due to an incorrectly configured database, he said on Monday.

Reuters

September 2015

Identity Force

February 2016



IRS Data Breach Update: More Taxpayers Affected

Last year's IRS data breach is continuing to make headlines as the true scope of its damage becomes clearer. The breach, which the IRS believes took place in February 2015, was first announced in May 2015; at the time, it was thought that more than 100,000 American taxpayers had their personal information compromised. However, in August 2015, the agency revealed the discovery of an additional 220,000 victims. Now, about one year since the initial breach, the IRS is saying that the current total number of victims is topping 700,000 — about seven times more than initial estimates.

Hackers publish contact info of 20,000 FBI employees

By Mary Kay Mallonee, CNN

Updated 8:34 PM ET, Mon February 8, 2016



Hackers 'stole a master key' to U.S. government 02:17

Story highlights

Hackers published contact information for 20,000 FBI employees Monday afternoon

The Justice Department is actively investigating the incident

Washington (CNN) — Hackers, making good on their threat, published contact information for 20,000 FBI employees Monday afternoon, just one day after they released similar data on almost 10,000 Department of Homeland Security employees.

The hackers, tweeting from the account @DCLeaks, claim they obtained the details by hacking into the Justice Department's database.

CNN

February 2016

CNET

January 2018

Homeland Security breach exposes data on 240,000 employees

Personally identifiable information was discovered in the possession of a former department employee.

BY STEVEN MUSIL / JANUARY 3, 2018 6:20 PM PST



Equifax says number of Canadians affected by hack passes 19,000



Signage at the corporate headquarters of Equifax Inc. in Atlanta.

MIKE STEWART/AP

TORONTO
THE CANADIAN PRESS
PUBLISHED NOVEMBER 29, 2017

The Canadian Press

November 2017

2 Canadian banks hacked, 90,000 customers' data stolen

Two of Canada's largest banks, Bank of Montreal and the Canadian Imperial Bank of Commerce's Simplii Financial, confirmed hackers stole the personal and financial data of thousands of customers.



CSO Online

May 2018

Air Canada locks down 1.7 million mobile app accounts after breach affects 20,000 customers

Aeroplan numbers, passport numbers, birth dates, nationalities and countries of residence could have been accessed



Financial Post

August 2018

DDoS attack that disrupted internet was largest of its kind in history, experts say

Posted by [Eric Beaudoin](#)



Dyn estimated that the attack had involved '100,000 malicious endpoints', and the company said there had been reports of an extraordinary attack strength of 1.2 terabits (1,200 gigabytes) per second. Photograph: Alamy

AIRS

April 2017

8/29/2016
07:30 AM



Alex Campbell
Commentary

 0 COMMENTS
[COMMENT NOW](#)

Critical Infrastructure: The Next Cyber-Attack Target

Power and utilities companies need a risk-centric cybersecurity approach to face coming threats.

The way we think about cyber attacks changed in December 2015, when Ukraine experienced the first recorded power outage caused by a cyber attack. It didn't last long—between one and six hours, depending on the area—but it showed the government, industry, and the public how these attacks could affect the physical world. It's not just personal information and other sensitive data that's at stake. Critical infrastructure is now under threat.

Dark Reading

August 2016

Hackers gain access to hundreds of global electric systems

Researchers find that a cyberattack group has been quietly sneaking into the world's power grid control systems over the last six years.

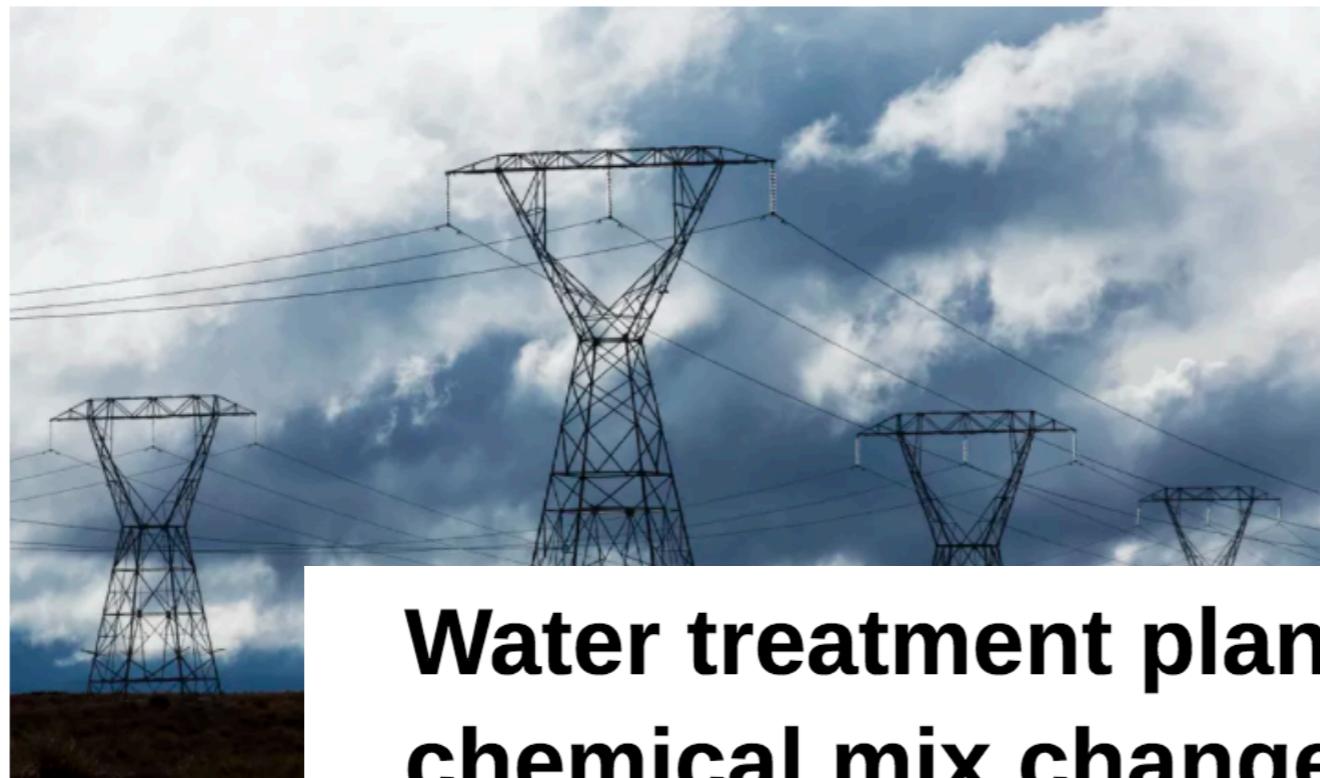
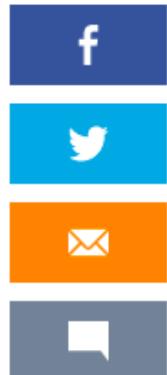
Security



by **Alfred Ng**

6 September 2017 5:56 pm BST

@alfredwng



Hundreds of po

CNET
September 2017

The Register

March 2016

Water treatment plant hacked, chemical mix changed for tap supplies

Well, that's just a little scary

By [John Leyden](#) 24 Mar 2016 at 12:19

82 SHARE ▼

Hackers infiltrated a water utility's control system and changed the levels of chemicals being used to treat tap water, we're told.

Cyber attack hits German train stations as hackers target Deutsche Bahn



“ 1 Comment

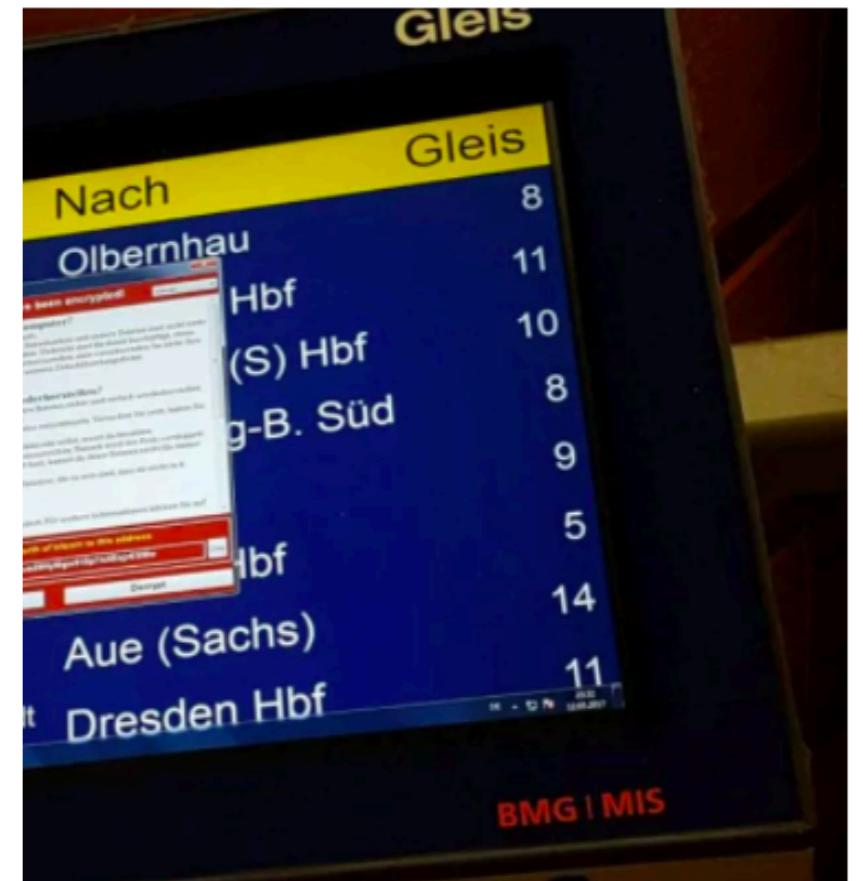
Government under pressure after NHS crippled in global cyber attack as weekend of chaos looms



“ 100 Comments



Screenshot of the suspected ransomware message on a GP's computer in the Greater Preston area
CREDIT: PA



A German train station displays the ransomware message CREDIT: PA

The biggest threat facing connected autonomous vehicles is cybersecurity

Posted Aug 25, 2016 by Rob Toews (@_RobToews)



Rob Toews
CRUNCH NETWORK
CONTRIBUTOR



Rob Toews is jointly pursuing degrees at Harvard Business School and Harvard Law School. He is the co-

Connected, autonomous vehicles are around the corner. Many of the most innovative and deep-pocketed companies in the world are racing to bring them to market — and for good reason: the economic and social gains they will generate will be tremendous.

Techcrunch

August 2016

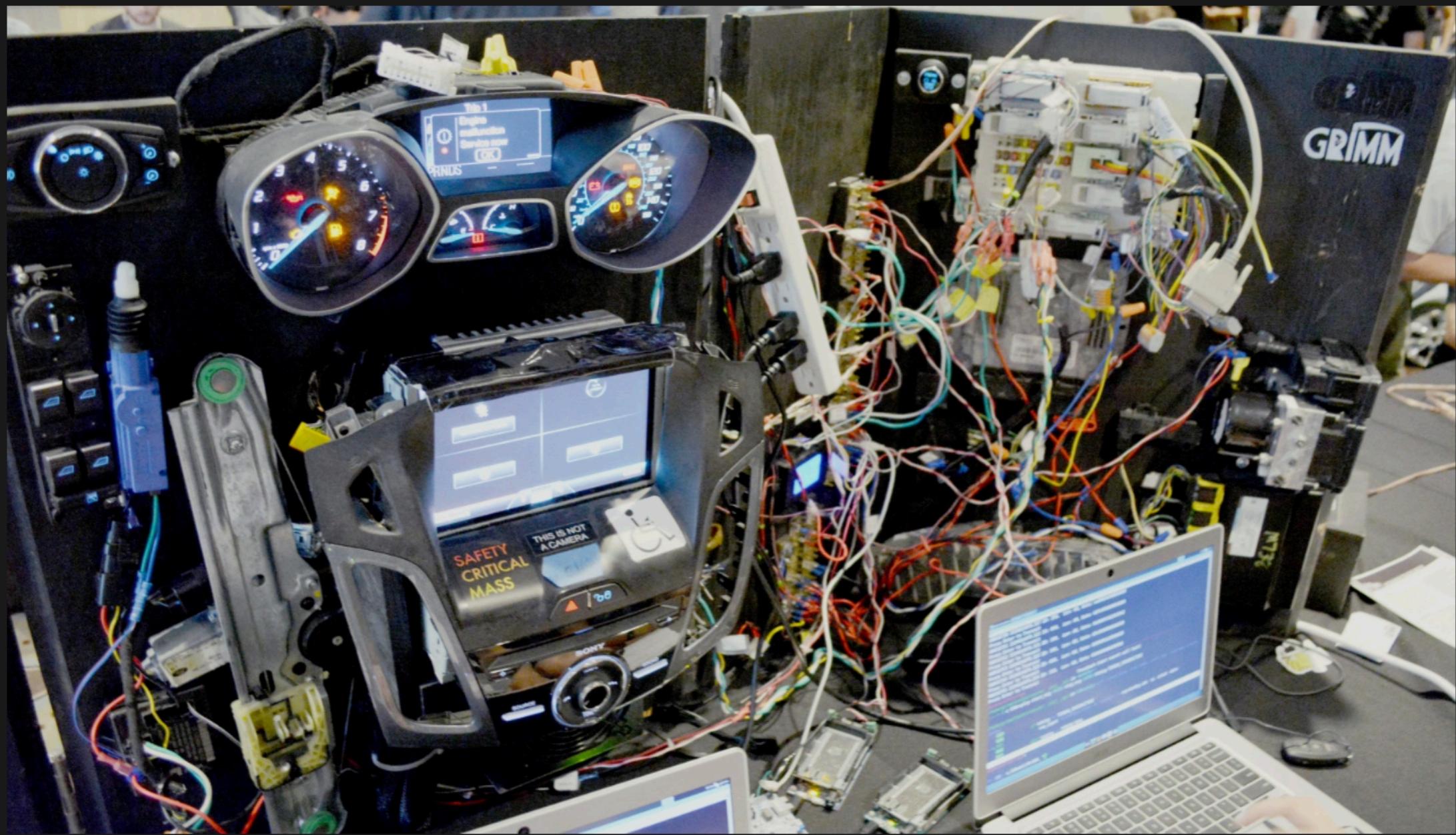
CAR HACKING AT DEF CON 26

by: **Mike Szczys**

9 Comments

f t g+

August 11, 2018



Hackaday

August 2018

Why do have security issues?

- **Bugs**
buffer overflows, cross-site scripting attacks ...
- **Insecure configuration**
improper authorization, incomplete mediation ...
- **No security by design**
most of network protocols running the internet

Why security should matter to you?

- Because **you** are going to build the next computer systems, networks and software

The Fast-Growing Job With A Huge Skills Gap: Cyber Security



Jeff Kauflin, FORBES STAFF I cover leadership, management and careers. [FULL BIO](#) ▾



Shutterstock

Some experts predict there will be a global shortage of two million cyber security professionals by 2019.

Forbes

Mars 2017

Dark Reading

June 2017

CAREERS & PEOPLE

6/7/2017
06:10 PM



Dawn Kawamoto
News

Cybersecurity Faces 1.8 Million Worker Shortfall By 2022

(ISC)2 report shows the skills shortage is getting worse.

Over the next five years, the number of unfilled cybersecurity jobs will rise to a whopping 1.8 million, a 20% increase from 2015 estimates, according to a new (ISC)2 survey released today.

Research suggests cybersecurity skills shortage is getting worse

New data from reveals growing skills gaps that represent an existential threat. What should organizations do?



Thinkstock

CSO Online

January 2018

Canada struggling to keep up with demand for cybersecurity talent: report



By Bradly Shankar JUL 4, 2018 | 6:29 PM EDT | 0 COMMENTS



MobyleSyrup

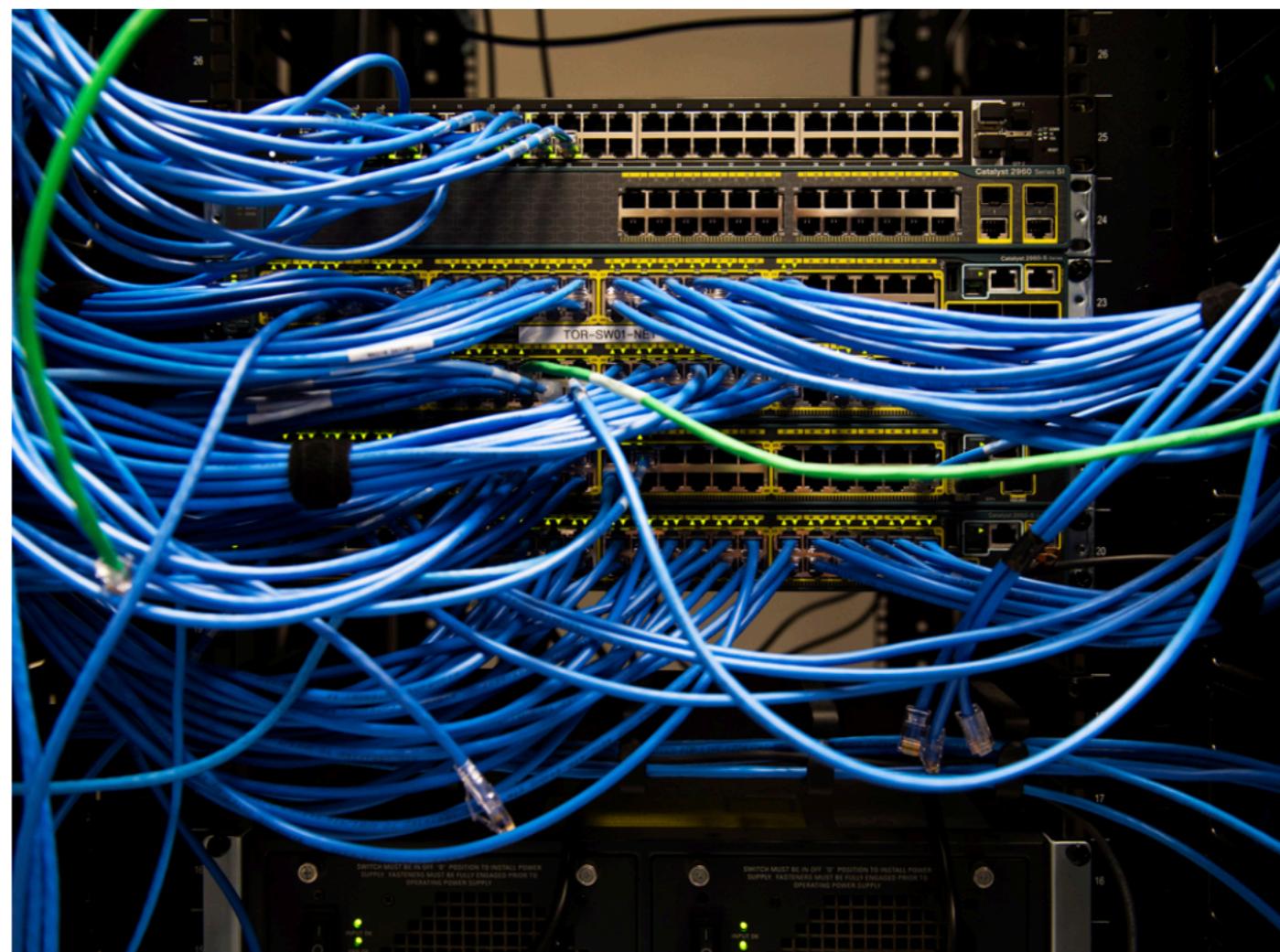
July 2018

Financial Post

July 2018

Canada facing a talent crunch when it comes to cybersecurity experts — and things look likely to get worse

The labour squeeze leaves companies at risk of serious cyberattacks that can go so far as to put them out of business



A new report from Deloitte says demand for cybersecurity professionals in Canada is growing by seven per cent annually, with 8,000 new workers needed by 2022. *Nathan Denette/The Canadian Press*

Welcome to CSCD27

Legacy

- CSCD27 Computer and Network Security
Alan Rosselet
University of Toronto Scarborough
- 15-349 Introduction to Computer and Network Security
Iliano Cervesato, Khaled Harras and Thierry Sans
Carnegie Mellon University Qatar

Course Objectives

CSCD27 is an undergraduate course that provides
a theoretical and technical overview of
the field of computer security

Learning goals

1. Acquire a **good understanding of basic concepts** such as
 - applied cryptography
 - networking security
 - software vulnerabilities analysis and defense
2. Acquire a **methodology to design and analyze the security of critical systems**
3. Acquire a **good practice to stay up-to-date** with the field

Course work, evaluation and grading

Tracks	Theory	Practice
Tutorials	Tutorials	Labs
Graded Work	Quizzes and Final	CTF challenges
Grade weight	50%	50%

Course Topics

1. Applied Cryptography

2. Network Security

3. Computer Security

I. Applied Cryptography

- Classical crypto systems
- Modern crypto systems : symmetric vs asymmetric
- Hash functions and digital signatures
- Cryptography protocols for authentication and encryption

2. Network Security

Vulnerabilities and defense for the network stack

	Protocol	Secure Layer
Application	DNS	DNSsec
Transport	TCP	TLS (a.k.a. SSL)
Internet	IP	IPSec
Link	802.11	WPA2

3. System Security

- Operating Systems
- Programs
- Malicious code
- Web

Ethical Hacking

- You will be exposed to attack methods
- You should uphold to a high standard of **professional and personal ethic**
- **Your knowledge of attack methods does not imply permission to exploit them**
 - ... even if it seems “harmful fun”
- **UofT policies** are strictly enforced
- **Canadian Criminal Code** is strictly enforced

Course website

<https://thierrysans.github.io/CSCD27/>

What I expect from you

- Good programming skills (especially Python and C)
- Good linux skills (shell scripting)
- Basic knowledge of computer systems (CSCB58)
- Learn new materials on your own

How to succeed in this course

- Come to lectures, tutorials ... blah blah blah
- Do the work ... blah blah blah
- Be curious, be stubborn and get your hands dirty