

CSCD27

Computer and Network Security

Thierry Sans

Why security matters?

SECURITY

Back-to-school malware is hiding in those digital textbooks

Kaspersky warns that it found more than 100,000 textbook files with malware lurking inside.

BY RAE HODGE | SEPTEMBER 3, 2019 1:41 PM PDT



Researchers warn that malicious actors are targeting students seeking to escape rising textbook costs via online alternatives.

Jeff Greenberg/Getty Images

CNET

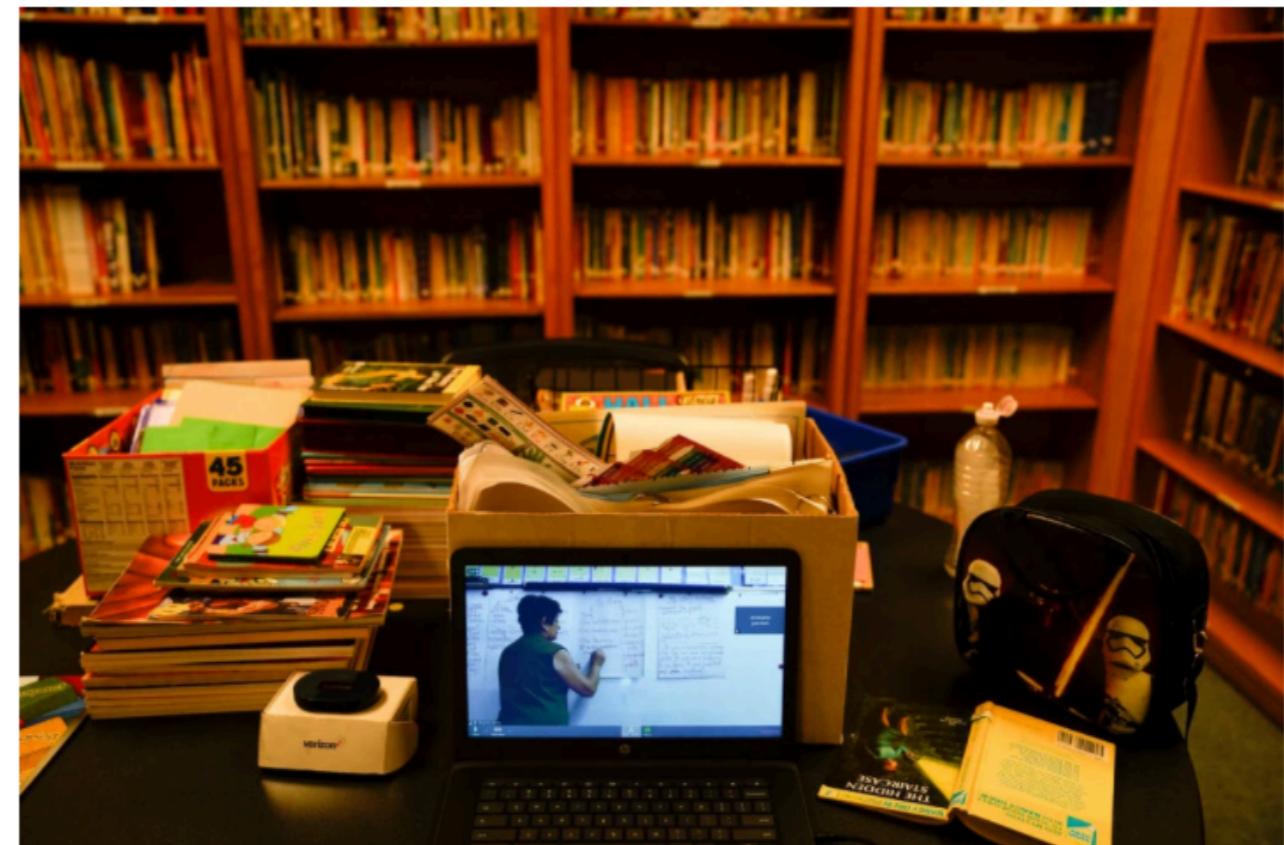
September 2019

New York Times

September 2020

Website Crashes and Cyberattacks Welcome Students Back to School

With many districts across the country opting for online learning, a range of technical issues marred the first day of classes.



Many of the nation's school districts faced technical challenges on Tuesday while starting the academic year remotely. Jae C. Hong/Associated Press

The University of Chicago Medicine Exposed ‘Perspective Givers’ Database With More Than A Million of Records



Security Discovery

June 2019

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.

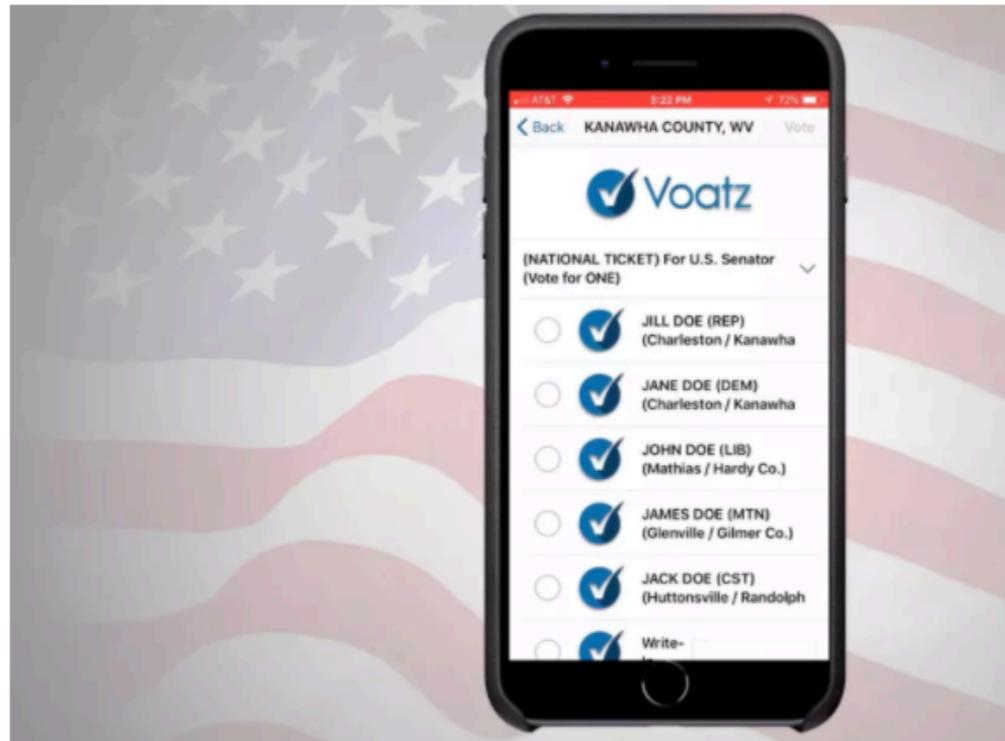
Online-voting company pushes to make it harder for researchers to find security flaws

Voatz, an e-voting company, tells the Supreme Court that security research should be done only with permission.

Alfred Ng  Sept. 3, 2020 4:23 p.m. PT



1



In a Supreme Court briefing, Voatz argues that security researchers should need a warrant to find vulnerabilities.

West Virginia Secretary of State; screenshot by Stephen Shankland/CNET

CNET

September 2020

New York Times

February 2020

THE SHIFT

The Only Safe Election Is a Low-Tech Election

The Iowa caucus debacle proved that a 21st-century election requires 19th-century technology.



At a Bernie Sanders watch party at the Holiday Inn Des Moines-Airport on Monday, people waited fruitlessly for results. Hilary Swift for The New York Times

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 @DC_Hackers, 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

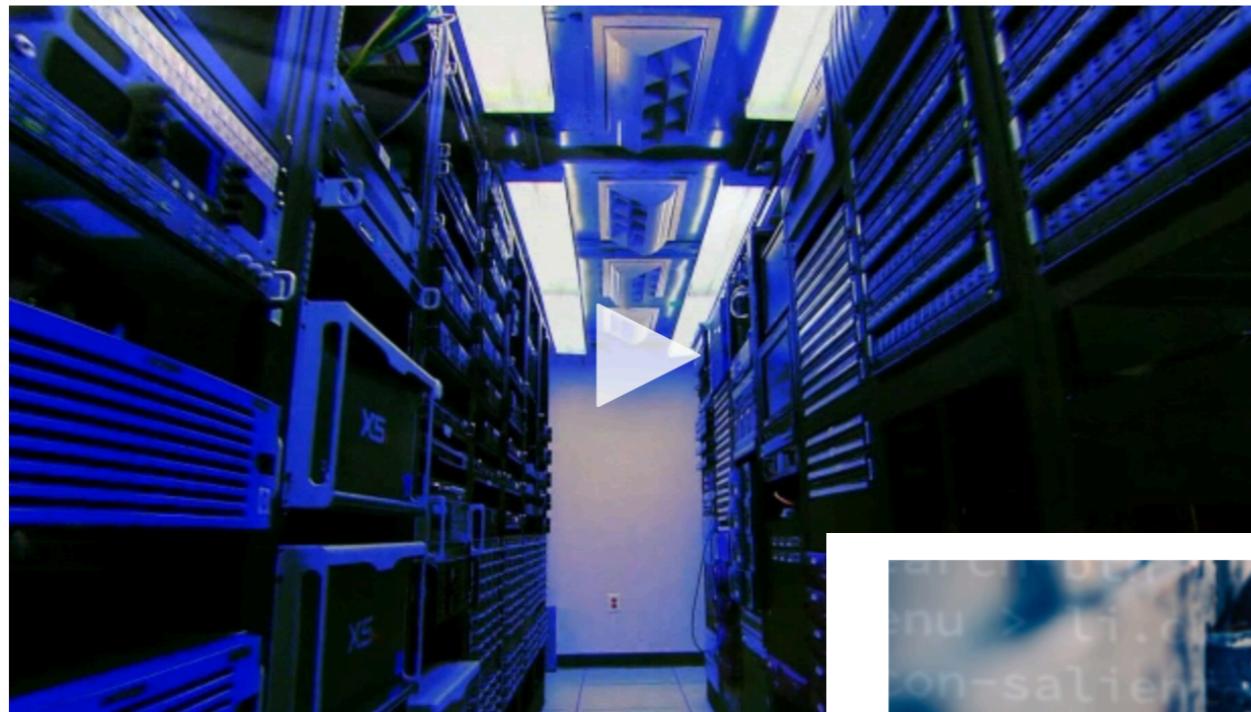
Aeroplan numbers, passport numbers, birth dates, nationalities and countries of residence could have been accessed



Financial Post

August 2018

19 million Canadians have had their data breached in eight months



CTV National News: Shocking data breach numbers



An exclusive investigation by the podcast 'Attention Control' hosted by Kevin Newman has uncovered disturbing data breach numbers.

913 913 913



Francesca Fionda, Investigative journalist, Attention Control
[@francescafionda](#)



PRIVACY & SECURITY

Canada is a prime target for cybersecurity attacks in 2019



Cindy Baker @itworldca

Published: January 16th, 2019

IT World Canada

January 2019

CTV News

September 2019

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.

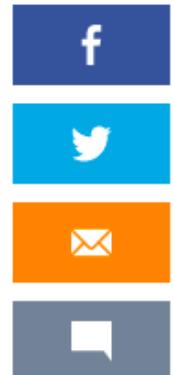
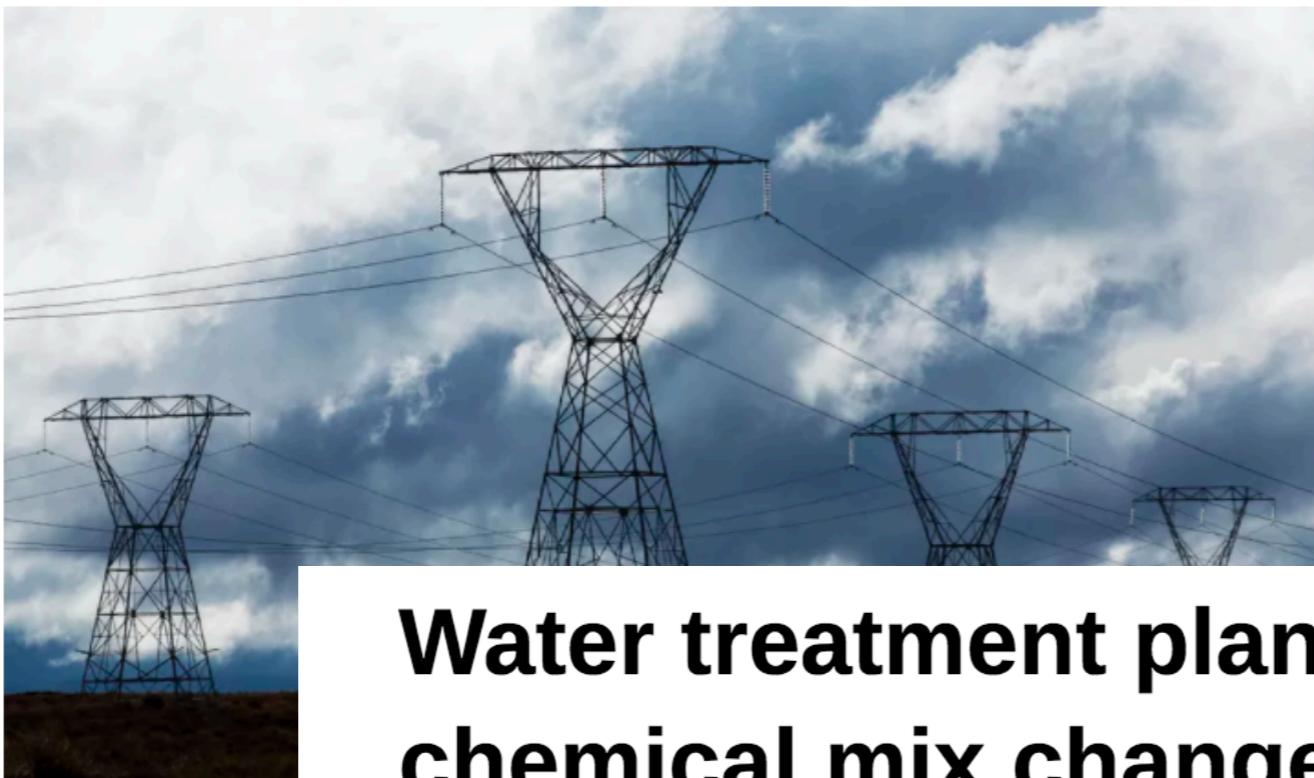
Security



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

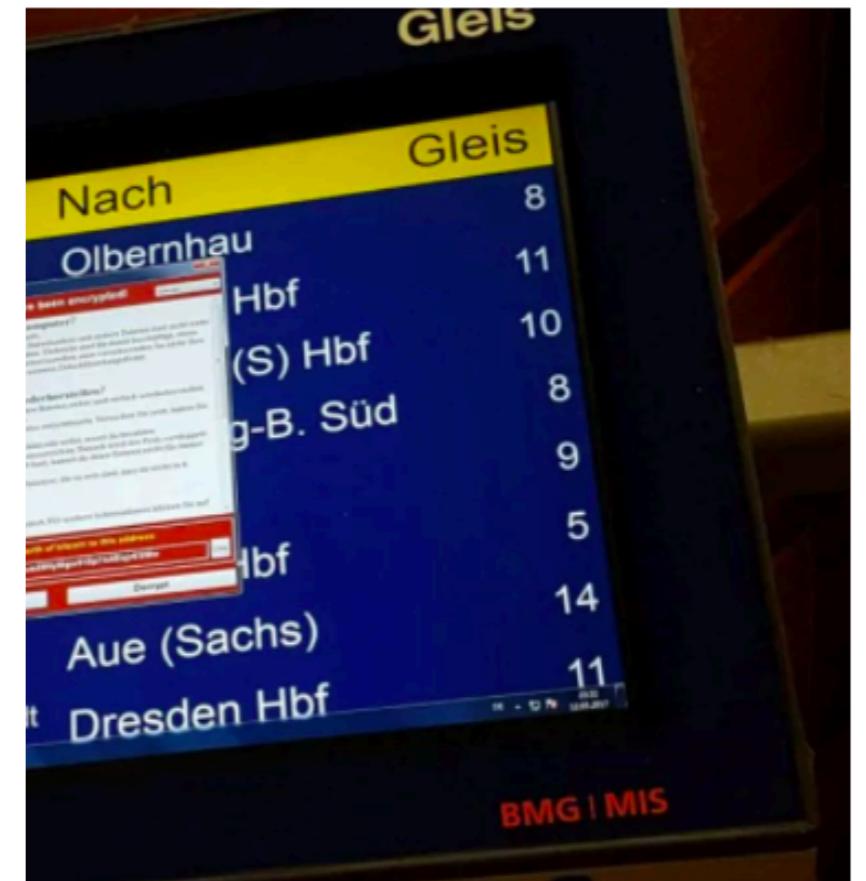
Government under pressure after NHS crippled in global cyber attack as weekend of chaos looms



“ 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:

Hit by Ransomware Attack, Florida City Agrees to Pay Hackers \$600,000



The city council in Riviera Beach, Fla., voted quietly to authorize a nearly \$600,000 ransom payment after hackers paralyzed the city's computer systems. Wilfredo Lee/Associated Press

The New York Times

June 2019

A cyber attack in Saudi Arabia failed to cause carnage, but the next attempt could be deadly

At a time when the world faces a dangerous escalation in cyber warfare, a series of assaults on petrochemical companies in Saudi Arabia – possibly backed by nation states – has caused alarm

Nicole Perlroth , Clifford Krauss | Wednesday 21 March 2018 06:00 |



Click to follow
The Independent



Computers crashed at sites including Sadara Chemical Company, a joint venture between the oil and chemical giants Saudi Aramco and Dow Chemical (*Sadara*)

Independent

March 2018

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

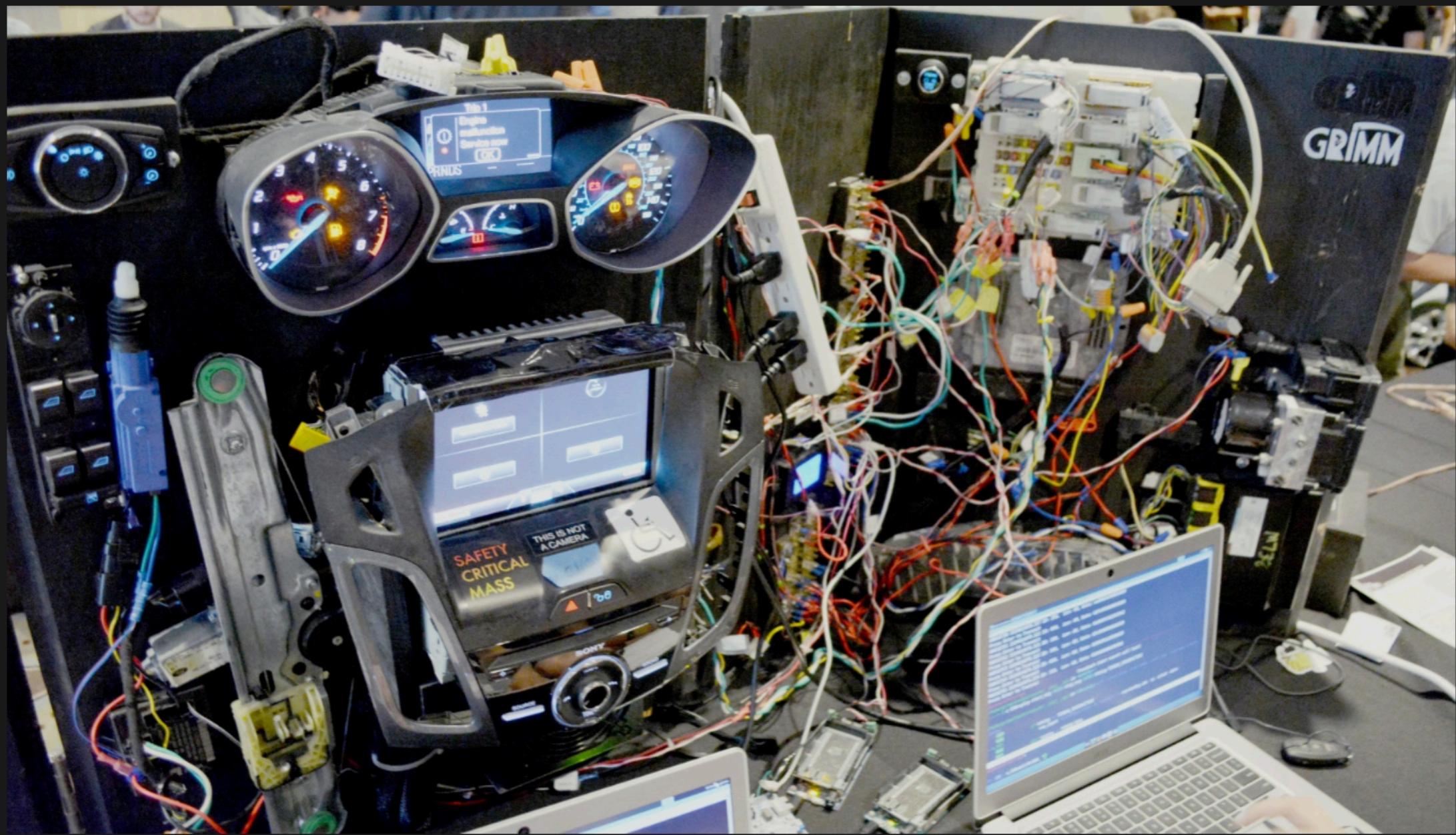
CAR HACKING AT DEF CON 26

by: **Mike Szczys**

9 Comments

f t g+

August 11, 2018



Hackaday

August 2018

Why do we 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.



Cybersecurity Skills Shortage Worsening for Third Year In A Row, Sounding the Alarm for Business Leaders

Third annual global study from ESG and ISSA finds cybersecurity skills shortage impacts 74 percent of organizations; explores causes and consequences of cybersecurity job stress

Global News Wire

May 2019

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



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



MobyleSyrup

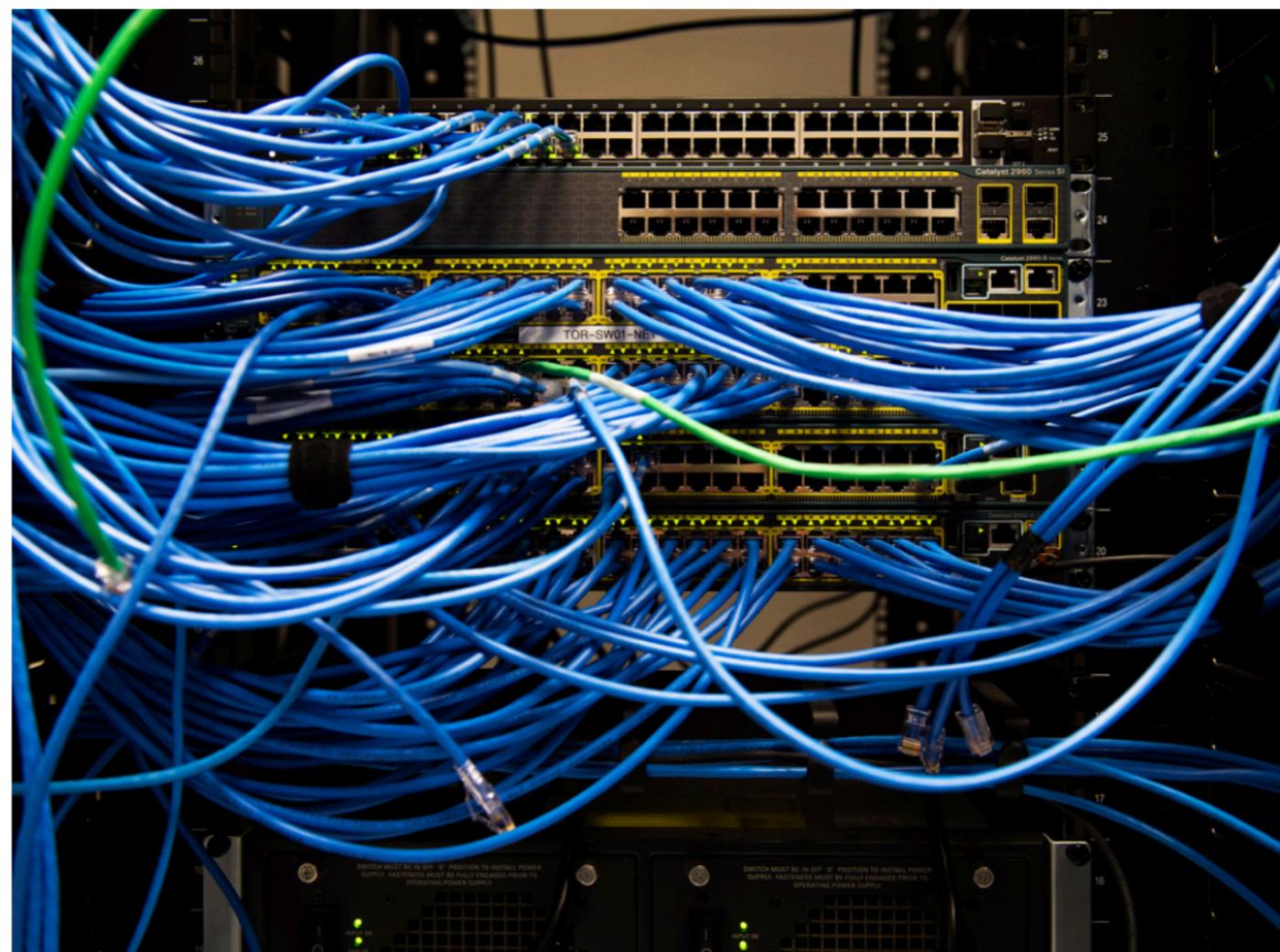
July 2018

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
- **I5-349 Introduction to Computer and Network Security**
Ilian 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 Topics

1. Applied Cryptography

2. Network Security

3. System 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

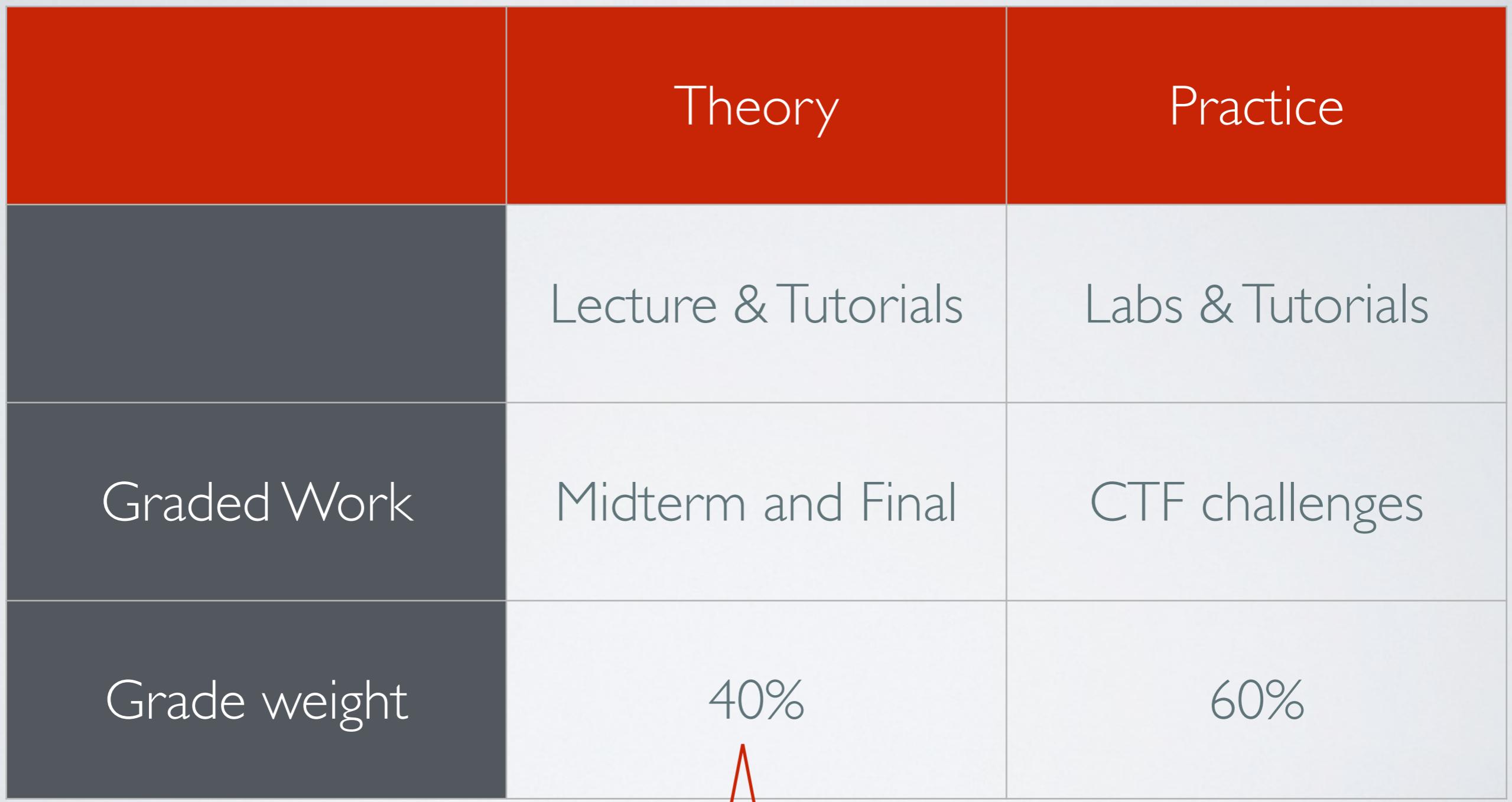
Vulnerabilities and defense for the network stack

	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 Security

Course work, evaluation and grading



A mark of at least **40% on the final exam is required** to pass the course

A fully online course

- **Lectures** will be live on BB-collaborate, recorded and posted on Youtube afterwards
- **Tutorials** will be group discussions online (no recording)
- **Labs** will be individual help sessions online
 - No access to Linux lab
 - ✓ Use your own computer - MAC or Linux recommended (Ubuntu or try Kali Linux, Parrot OS, BlackArch Linux)

Academic Integrity

- ✓ For CTF challenges you are allowed to discuss problems with your classmates **but not solutions**
- For midterm and exams, you are not allowed to discuss problems and solutions with anyone
- You are not allowed to search online for the solution to the problem
- ✓ But you are allowed to search online for snippets of code that will help you write your solution
- You are not allowed to share snippets of code with anyone
- You are not allowed to publish online any snippet of code related this course even after the end of the semester

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.me/CSCD27/>

How to succeed in this course

<https://thierrysans.me/CSCD27/doc/howtosucceed/>

You know the drill ...

- Come to lectures
- Tutorials are important ... blah blah blah
- Start to work early ... blah blah blah

.... but more specifically to this course

The important is **why** rather than *how*

The skills you must have

- Basic knowledge of computer systems (B09, B58 and C69)
 - Good programming skills (especially Python and C)
 - Good Linux skills (shell scripting)
- Be able to **seek for documentation** and **learn new materials** on your own

About the lectures

The slides are **not** lecture notes

About the tutorials

The important is **not the solution** to
the problems **but the discussion**

About the CTF challenges

For each challenge, there will be a **fair amount of materials to learn and to understand** before being able to start working on a solution

Each challenge is **highly experimental**

Warning - the course load is significant

About the midterm and final exam

You will be tested on your understanding of:

- the content covered in **lectures**
- the content covered during **tutorials**
- the content covered in the challenges including the
handout, the commands, and the starter code
- every **command and line of code** that you have used
for producing and running **your solution**

Beyond the course

- Be curious
- Experiment with things (in an ethical hacking way)
- Get yourself up-to-date with the latest security news

Wishing you a fun semester