Cybersecurity: Attacks

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CYBER CHALLENGE.IT

CYBERSECURITY NATIONAL LABORATORY

https://cybersecnatlab.it

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Acknowledgments

Thanks

- The presentation includes material from several contributors, whose valuable help is here acknowledged and highly appreciated.

Contributors

- CyberChallenge.IT
- Alessandro ARMANDO
- Roberto BALDONI
- Rocco DE NICOLA
- Arturo DI CORINTO
- Eugene KASPERSKY
- Rosario PUGLIESE
- Francesco VESTITO
- Stefano ZANERO

Prerequisites

- Lecture:
  - *CS_1.4 - Vulnerabilities*

Goal

- Presenting an overview of some significant attacks to cybersecurity and a possible clusterization.

Outline

- Attacks
- Cybercrime:
  - Motivations
  - Examples
  - Costs
- Cyber-espionage
- Cyber-terrorism
- Cyber-warfare
- Conclusions

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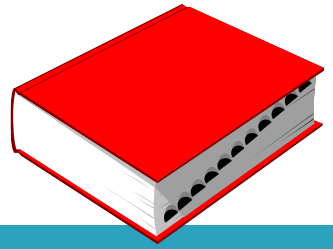
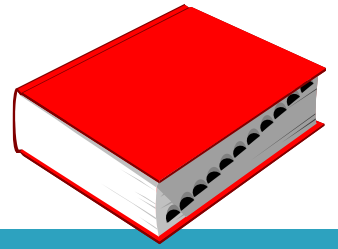
Vulnerability



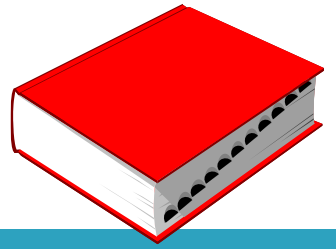
- *Particular* weakness present in a *specific* component of a system that can be *exploited* to carry out unauthorized actions to one's advantage against the Confidentiality, the Integrity or the Availability of the system assets.
- A vulnerability is such iff it is *exploitable*

Exploit



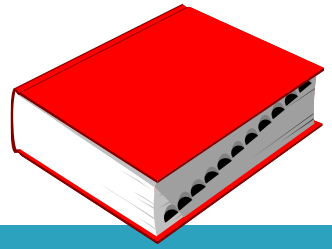
- The mean or method of taking advantage of a vulnerability for malicious purposes.

Attack



- The act of taking advantage of a vulnerability through an exploit.

Attack



- Any kind of malicious activity that attempts to collect, disrupt, deny, degrade, or destroy information system resources or the information itself.

[RFC 2828, Internet Security Glossary, May 2000]

Caveat

… and it will definitiely be …

“Anything” onnected to the Internet can be attacked …


..
de
Not IF,
But WHEN …
thing”
o the Internet
ttacked …

Everything is under attack

… always …

http://map.norsecorp.com/#/

Attack Goals

Attacks aim to:

Attack Goals

Attacks aim to:

- Steal:
  - Data:
    - Personal, Company, State
  - Money
  - Objects
  - Identity
  - Roles
- Damage
- Control in a malicious way:
  - Structures
  - Services
  - Whole nations

Attack Goals & Clustering

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  - *Cybercrime* (es: fraud, identity theft, etc.)
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  - *Cyber-terrorism* (with ideological connotation)
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Cybercrimine

Cybercrime has been defined as such for the first time by the Committee of Ministers of the Council of Europe at the *Budapest Convention on Cybercrime* in November 2001.

Budapest Convention on Cybercrime

- It states the cybercrime includes:
  - Unauthorized access
  - Unauthorized interceptions
  - Alteration of data and systems
  - Counterfeiting
  - Fraud
  - Child pornography
  - Copyright Infringement
  - …

Caveat

- Attacking a vulnerable system is considered a *criminal act*
  - *Would you enter a house just because its door is open*?

Cybercrime: where it stems from?

Cyberspace: nobody's land …

- In the cyberspace, social paradigms are completely different
- It is often considered *nobody's land* for the lack of clear
  - borders
  - laws

Consequences (1)

- Great asymmetry between attack and defense (*in favor of the attack*)

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- Attackers share information among them in the deep web
- Defenders tend to hide attacks and to not disclosure info's

Consequences (2)

- Continuous increase in the cost / benefit ratio for the attackers:
  - it is easier and easier for them to reach the desired target, regardless of its location

Consequences (3)

- Criminals and terrorists can do much more damage with:
  - Marginal efforts
  - relatively low risks
  - poor technological knowledges
- *Crime-as-a-Service*

Consequences (4)

- Many new ways to:
  - Perform crimes
  - Launch attacks
  - Damage
  - Fight wars
  - Perpetrate hostile acts
  - …

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ars TECHNICA

BIZ & IT TECH SCIENCE POLICY CARS GAMING & CULTURE

JUST THE FAX, MA'AM —

Equifax breach exposed millions of driver's licenses, phone numbers, emails

17.6 million driver's license numbers, thousands of ID images stolen in breach.

SEAN GALLAGHER - 5/8/2018, 5:13 PM

Hackerata la catena di hotel Marriott: a rischio i dati di 500 milioni di clienti

(reuters)

La compagnia ha annunciato di aver subito un attacco informatico ai suoi database. Potenzialmente coinvolti mezzo miliardo di utenti che hanno soggiornato negli albertghi del gruppo dal 2014 a oggi


CloudPets
THE INTERNET OF HACKABLE THINGS
Internet of Things Teddy Bear Leaked 2 Million Parent and Kids Message Recordings
LORENZO FRANCESCHI-BICCHIERAI
Feb 27 2017, 10:00pm
A company that sells "smart" teddy bears leaked 800,000 user account credentials—and then hackers locked it and held it for ransom.
UPDATE, Feb. 28, 12:25 p.m. ET: After this story was published, a security researcher revealed that the stuffed animals themselves could easily be hacked


ASHLEY MADISON®
Life is short. Have an affair.®
See Your Matches
READ MORE
Ashley Madison hack reveals its 37 million users sexual fantasies

Rubate le mail a 1,4 milioni di utenti Libero e Virgilio

Il cybercriminale, uno studente di 24anni, si è intrufolato nella rete Wi-Fi del gestore (Italiaonline) operando da un bar vicino alla sede dell'azienda (Assago, Milano). I carabinieri l'hanno fermato dopo che aveva già spedito il pacchetto di credenziali mail al committente

Cybercrime: Examples

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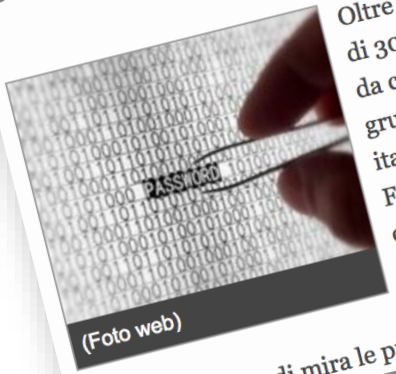
SICUREZZA INFORMATICA

Hacker rubano 36 milioni di euro sui conti di 30 banche europee via sms

Colpiti anche clienti italiani. L'attacco attraverso un trojan dormiente sui Pc che si è trasferito sugli smartphone



(Foto web)

Oltre 36 milioni di euro, sui conti di 30 banche europee. Una cifra da capogiro. Rubata da un gruppo di hacker anche di clienti italiani. A darne notizia è stato il Financial Times nell'edizione online, rilevando che si tratterebbe del primo caso di furto che ha preso specificatamente di mira le procedure di sicurezza sui servizi

NOTIZIE CORRELATE

- L'attacco di Apple: «Android è a rischio» (22/01/2014)

R.it Cronaca

Home | Politica | Economia | Sport | Spettacoli | Tecnologia | Motori

Mr. Confindustria a Bruxelles truffato da un hacker: persi 500mila euro. Licenziato

"Sposta subito mezzo milione su questo conto estero". Ma la mail era di un hacker. E i soldi sono spariti. Il finto ordine a firma della direttrice Panucci: "Esegui e non mi chiamare che sto fuori col presidente"

di ROBERTO MANIA

Lo leggo dopo | 30 settembre 2017

Gianfranco Dell'Alba

ROMA - Ci sono circa cinquecentomila euro che da un conto della Confindustria sono finiti in un conto estero di cui ancora non si conosce l'intestatario. Soldi evaporati, per ora. C'è una mail falsa da cui è cominciato tutto. C'è un dirigente dell'associazione degli industriali licenziato in tronco per un bonifico che non avrebbe dovuto fare. È successo in Confindustria ma sono centinaia le aziende colpite ogni giorno da frodi finanziarie e milioni le mail contraffatte (mail spoofing, le chiamano gli esperti del settore) da cui partono ordini per spostare denaro in ogni parte del mondo.

Hacker truffa con una mail falsa un dirigente di Confindustria: spariti 500mila euro

"Sposta subito mezzo milione su questo conto estero". Il finto ordine a firma della direttrice Marcella Panucci, ad eseguire il bonifico il dirigente livornese Gianfranco Dell'Alba

TRUFFE CONFINDUSTRIA HACKER

30 settembre 2017

CYBERSECURITY NATIONAL LABORATORY

ADVANCED CROSS-BORDER FINANCIAL CYBERCRIME

CARBANAK — THE $1 BILLION BANK HEIST

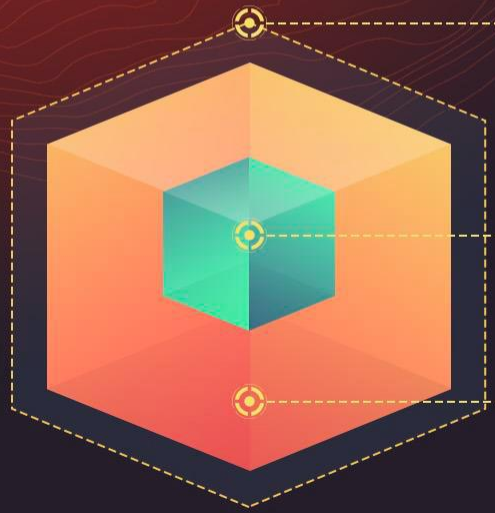
Infecting bank clerks' computers

Harvesting intelligence

Controlling admin computers

Stealing money

BANGLADESH CENTRAL BANK HEIST



35 transfer orders to the New York Federal Reserve

Four orders, $81M
Stolen, still missing

31 orders, $870M
Blocked because of word 'Fandation'

[E. Kaspersky, 2018]

Cybercrime: Examples

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Crime-as-a-Service

[E. Kaspersky, 2018]

Surveillance Camera Attack

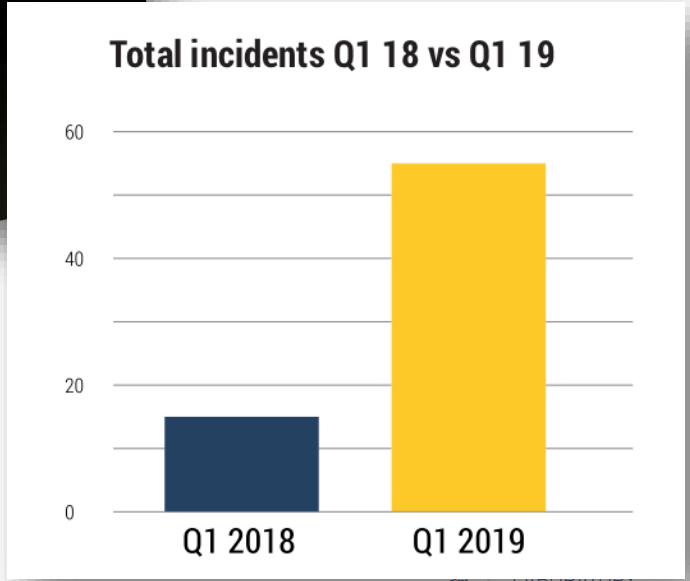
- A massive Distributed Denial of Service (DDoS) attack slowed down major websites
  - Twitter, Spotify, Amazon, Reddit, Yelp, Netflix, and The New York Times
- Target: Dyn (a major DNS host)
- Attack: a weakness in surveillance cameras, that allowed installing malicious software in more than 25,000 cameras!

Automotive attacks

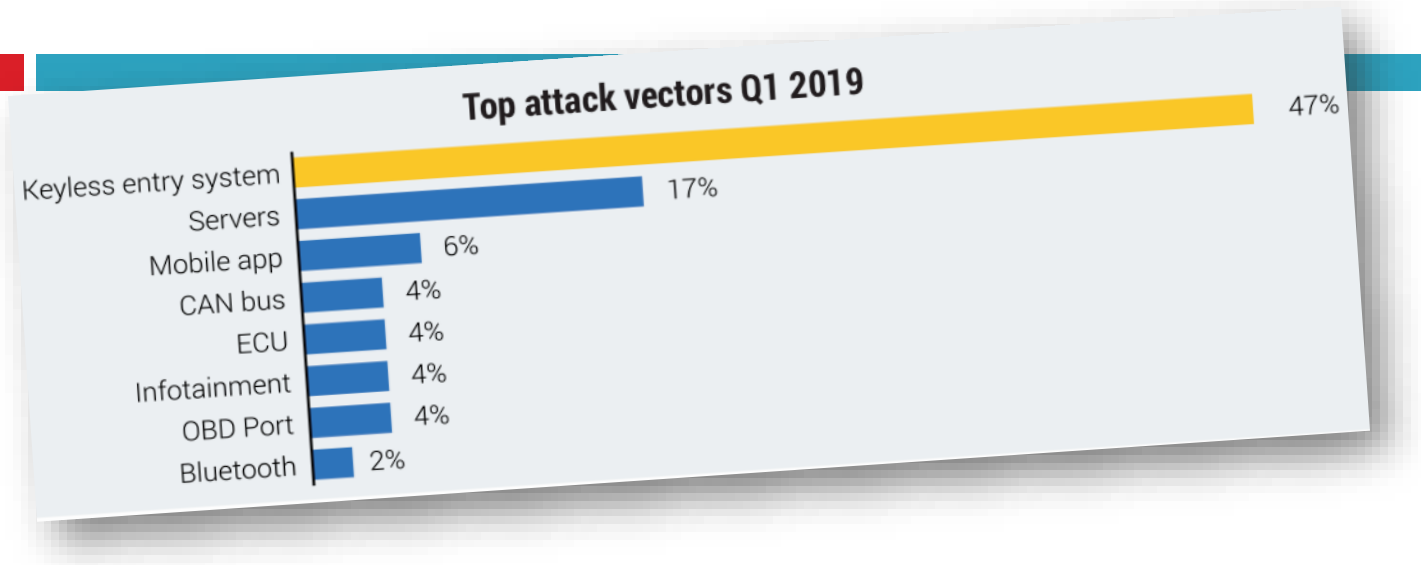
Automotive attacks

Upstream

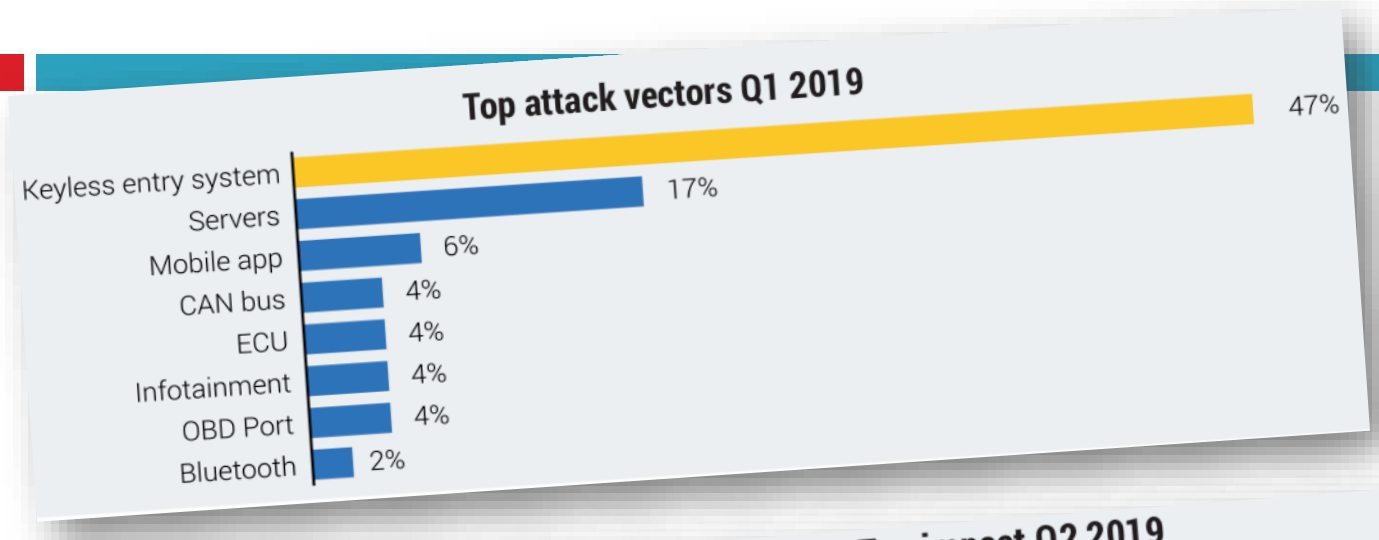
Q1 2019 SEES RAPID GROWTH OF AUTOMOTIVE CYBER INCIDENTS

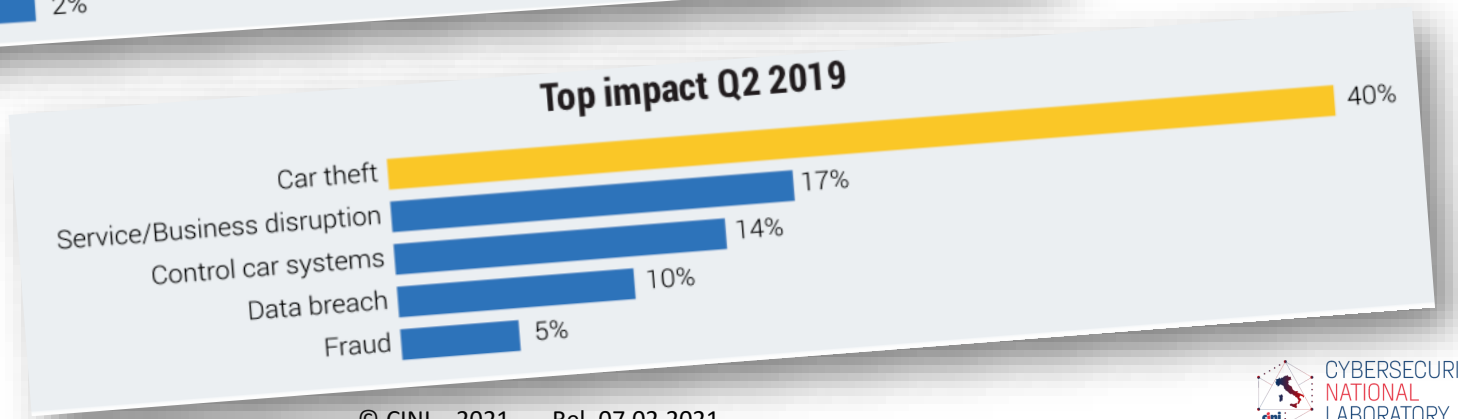


Automotive attacks



Automotive attacks





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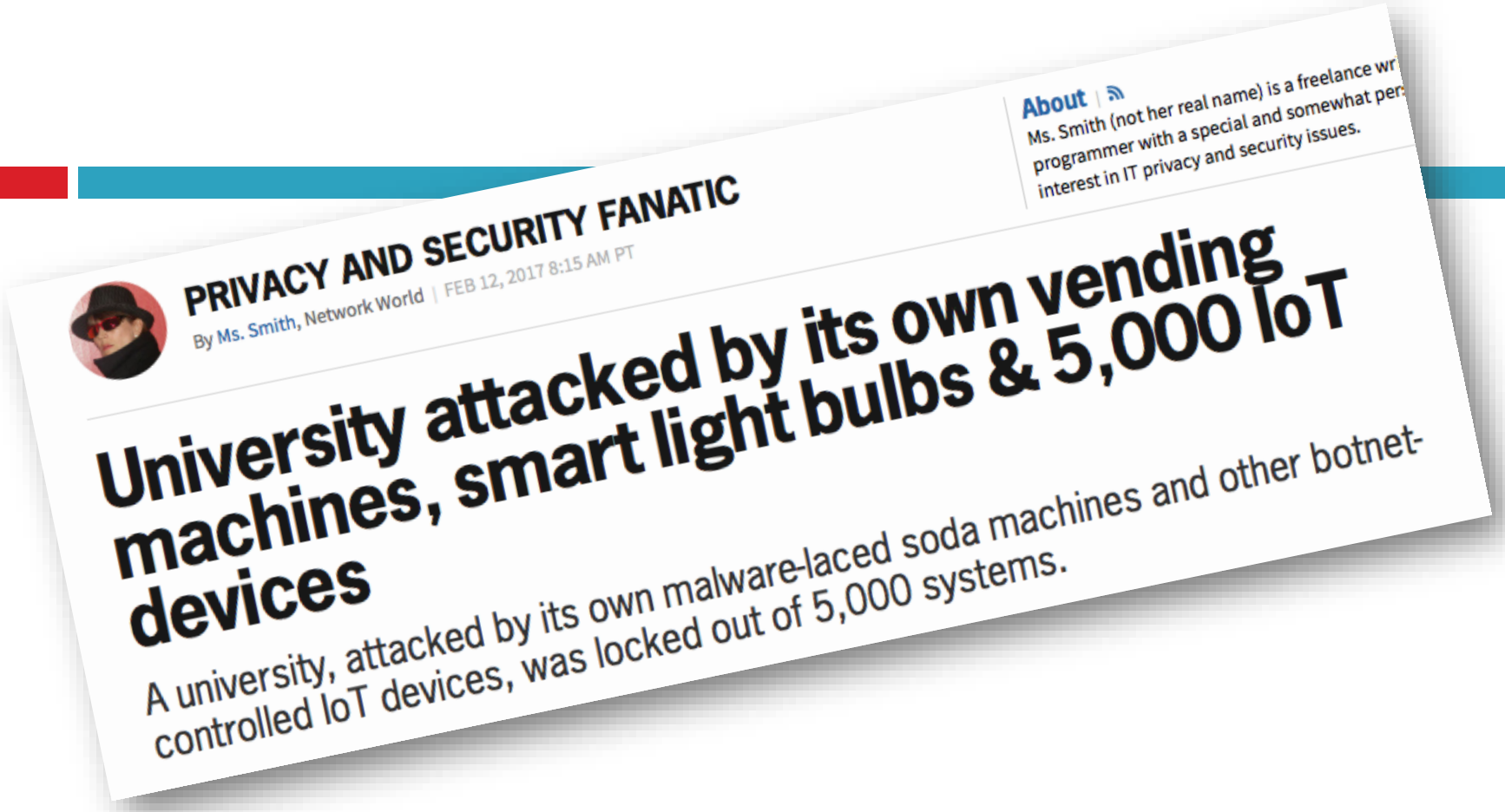
Attacco DDoS Contro Dyn DNS, giù twitter, spotify, github, heroku e altri.

I Cyber attacchi si fanno sempre più frequenti e rappresentano giorno per giorno una grave minaccia per le compagnie IT.



PRIVACY AND SECURITY FANATIC

By Ms. Smith, Network World | FEB 12, 2017 8:15 AM PT

About |

Ms. Smith (not her real name) is a freelance wr
programmer with a special and somewhat pers
interest in IT privacy and security issues.

University attacked by its own vending machines, smart light bulbs & 5,000 IoT devices

A university, attacked by its own malware-laced soda machines and other botnet-controlled IoT devices, was locked out of 5,000 systems.

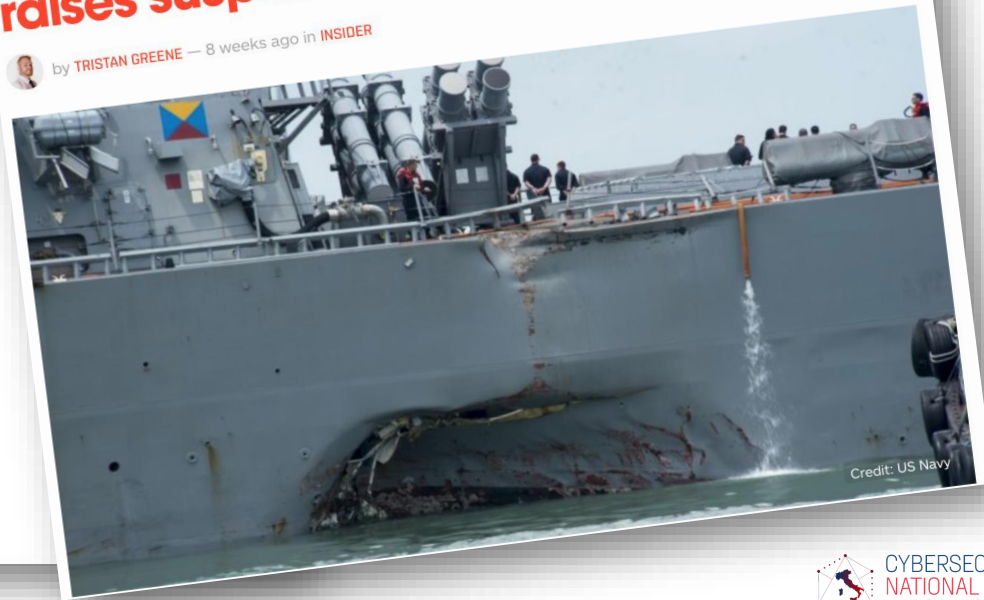
Hacking link to USS McCain warship collision? Expert says 'I don't believe in coincidence'

THE collision of a second US warship this year that has left 10 sailors missing points t
an expert has warned.

Charis Chang @CharisChang2

Fourth US Navy collision this year raises suspicion of cyber-attacks

by TRISTAN GREENE — 8 weeks ago in INSIDER



LA COMUNICAZIONE

Ascolta

IoT security, 350 mila pacemaker a rischio attacchi informatici negli USA

Intervento della Food and drug administration: batterie scarse e bassi livelli di cybersecurity. Solo l'anno passato sono state individuate oltre 8.000 vulnerabilità su sette diversi apparecchi.

di **Flavio Fabbri** | @FabbriFlav2 | 8 maggio 2018, ore 12:21

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Cybercrime costs

CYBERSECURITY

TECH | MOBILE | SOCIAL MEDIA | ENTERPRISE | CYBERSECURITY | TECH GU

Cybercrime costs the global economy $450 billion

Luke Graham | @LukeWGraham

Published 10:00 AM ET Tue, 7 Feb 2017

CNBC

Cybercrime costs

CYBERSECURITY

TECH | MOBILE | SOCIAL MEDIA | ENTERPRISE | CYBERSECURITY | TECH GU

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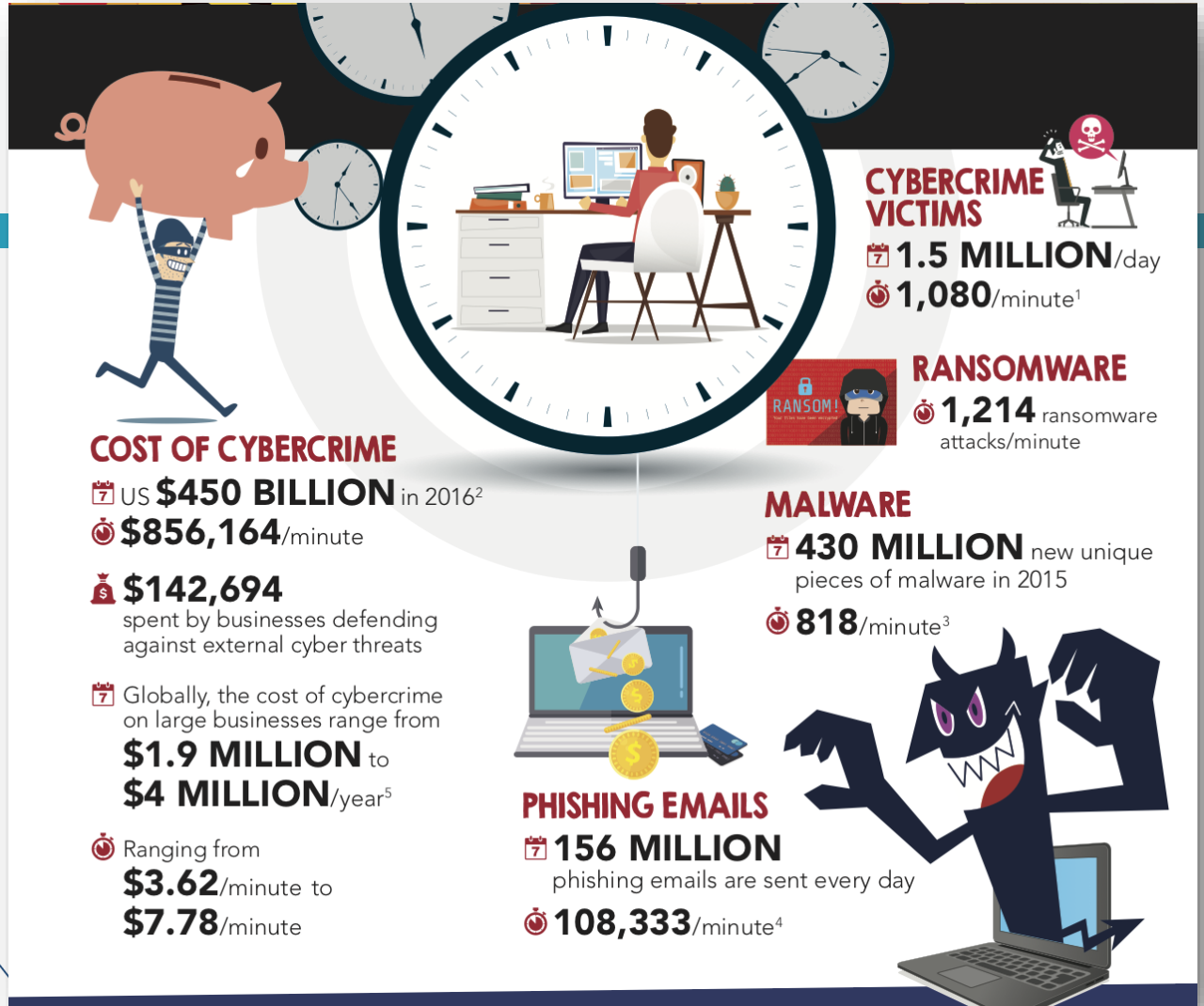
Published 10:00 AM ET Tue, 7 Feb 2017

CNBC

Austria GDP (Gross Domestic Product) in 2017: $434 billion


CYBERCRIME VICTIMS
1.5 MILLION/day
1,080/minute[1]
RANSOMWARE
1,214 ransomware attacks/minute
COST OF CYBERCRIME
US $450 BILLION in 2016[2]
$856,164/minute
$142,694
spent by businesses defending against external cyber threats
Globally, the cost of cybercrime on large businesses range from
$1.9 MILLION to
$4 MILLION/year[5]
Ranging from
$3.62/minute to
$7.78/minute
MALWARE
430 MILLION new unique pieces of malware in 2015
818/minute[3]
PHISHING EMAILS
156 MILLION
phishing emails are sent every day
108,333/minute[4]

NUMBER OF NEW BLACKLISTED MOBILE APPS
from Jan1 to June28

77,563 / 259,200
(number of minutes in 6 months)

.3 new blacklisted apps per minute

NUMBER OF NEW PHISHING PAGES
from Jan1 to June28

25,871,628 / 259,200
(number of minutes in 6 months)

100 new phishing pages per minute (99.81)

MALVERTISING:
Based on RiskIQ's 2016 malvertising report

7,623,099 total instances of malvertising in 2016. Divided by the number of minutes in a year, 525,600, we have around

14.5 incidents a minute

PIRATE CONTENT CREATED

4,300 people globally exposed to malware from content theft sites in one minute.

Based on 325 million Americans, 74.5% of whom are internet users and 3.8 billion internet users globally, this scales the number of people exposed to malware from content theft websites to

188 MILLION/month

4,300/minute[6]

Cybercrime vs. space

GLOBAL SPACE BUDGET:

$33 BILLION

[E. Kaspersky, 2018]

Cybercrime vs. space

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Cyber-espionage

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Cyber-espionage ??

Cyber-espionage ??

Liaoning CV 16

USS TRUMAN

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Cyber-terrorism

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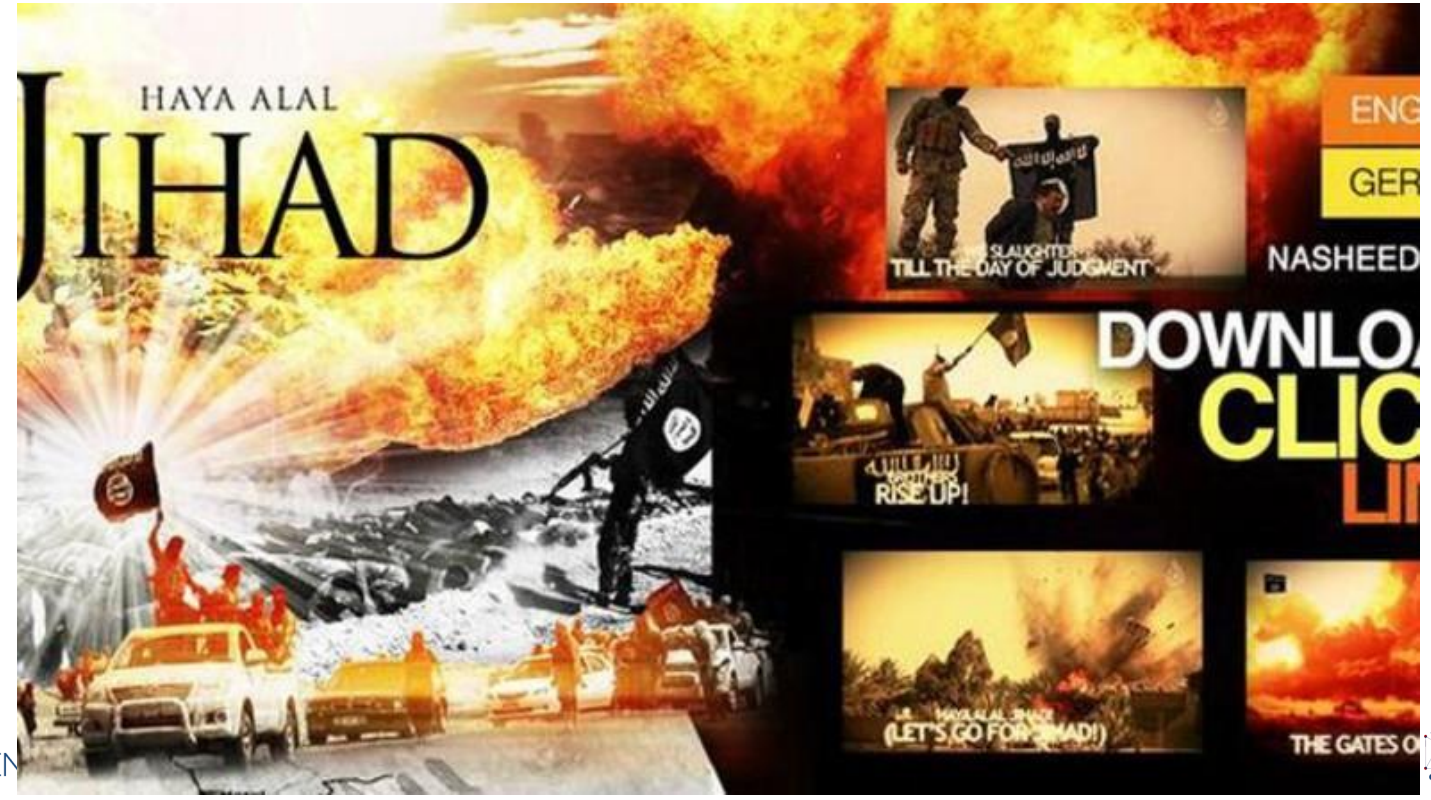
CYBER-JIHAD


HAYA ALAL
JIHAD
TILL THE DAY OF JUDGMENT
NASHEED
RISE UP!
(LET'S GO FOR JIHAD!)

Outline

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Cyber-warfare

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The 4th domain

- In 2016, during the Warsaw summit, NATO officially elevated cyberspace to the rank of "*operations domain*" together with *land*, *sea,* and *air*

CEMA (Cyber ElectroMagnetic Activities)

- Use the electromagnetic spectrum to have cyber effects
- Example:
  - how to inoculate malware in radars not through networks but waves (software-defined radio)
  - attackers can turn off or spy on radar not with viruses in systems, but through electromagnetism

- It is no longer the world where the vulnerability of networks is the result above all of the ingenuity of human beings.
- The so-called *air-gap* to get into the networks without entering the networks themselves is overcome.
- There will be military aircraft with ISR platforms capable of doing all this remotely, analyzing the information that passes via Wi-Fi

[**Francesco Vestito -** comandante del CIOC - Comando Interforze per le Operazioni Cibernetiche]

Cyber-warfare: Examples

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- Depending on authors and goals, threat is classified in:
  - *Cybercrime* (es: fraud, identity theft, etc.)
  - *Cyber-espionage* (unauthorized data acquisition)
  - *Cyber-terrorism* (with ideological connotation)
  - *Cyber-warfare* (operation planning and conducting)

6 SEPTEMBER 2007: ORCHARD OPERATION

(To Alessandro Rugolo) 09/09/18 - In the 2007 in Italy we just heard of *cyber*. Someone dared to write their thesis trying to illustrate the meaning of terms like *cyberspace*, *cyberdefence*, *cyberattack*, but without proving great public success. Yet the rest of the world went on.
Israel in the meantime hit a nuclear installation in Syria with the use of the Air Force ...
The night of the 6 September at least 4 F-16I *Sufa* and 4 F-15I *Ra'am* they crossed the border with Syria towards the nuclear installation near the city of Deir ez-Zor.

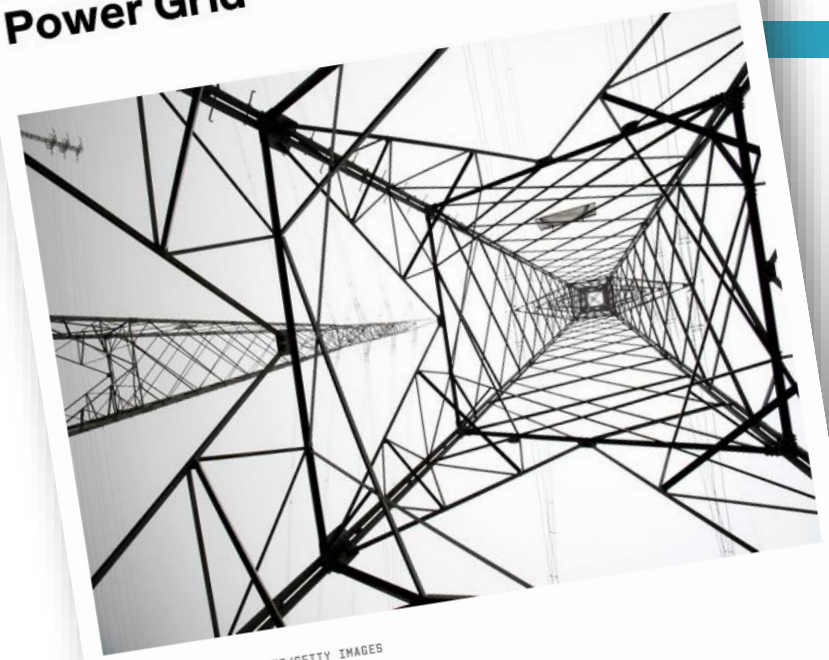
The aircraft carried out their mission and all returned to the base without the Syrian anti-aircraft defenses noticing: the radars were blind and the anti-aircraft defenses did not come into operation, although they were very advanced Russian systems (Pantsir S1).
The success of the mission has always been attributed to the great skill of the Israeli pilots and to the great work of the Israeli electronic war, and yet with time the truth has emerged: the mission has succeeded thanks to the use of a cyber weapon called *Suter*.
Suter it is a computer system that, through sensors, can identify the source of electromagnetic waves, for example a radar, understand what type of transmitter it has in front of it and send signals that can confuse the transmitter or even infect it with viruses.
*Suter*according to various sources, it is an American system developed by BAE Systems and integrated on some unmanned aircraft.
There are several versions of *Suter*, the most basic allows you to understand what they see the opposing radars, the second version allows you to take control of the enemy network and control the sensors, the third version allows you to take control of sensors and actuators connected, or weapon systems . All this is achieved "simply" by injecting the ad hoc built code.

These systems are used by the US at least from the 2006 and have been deployed in Iraq, Syria and Afghanistan.

What Israel has used *Suter* or something similar created by its laboratories does not matter, what is interesting to note is that very probably for at least ten years there are technologies capable of reducing the radar to impotence.

2015, Dec. 23rd

Inside the Cunning, Unprecedented Hack of Ukraine's Power Grid



JOSE A. BERNAT BACET/GETTY IMAGES

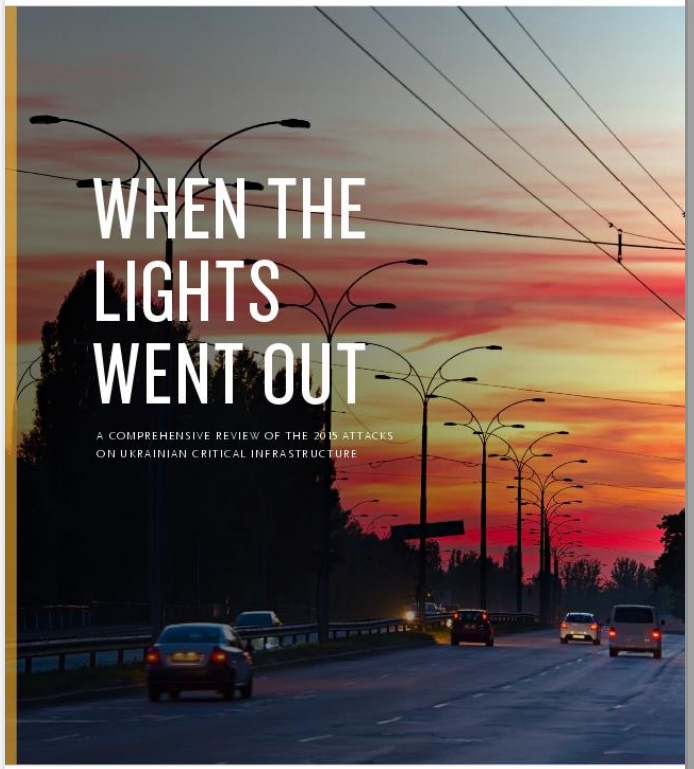
IT WAS 3:30 p.m. last December 23, and residents of the Ivano-Frankivsk region of Western Ukraine were preparing to end their

HACKING | Di Joseph Cox | gen 12 2016, 10:18am

La rete elettrica in Ucraina è stata attaccata da degli hacker

Gli hacker hanno attaccato anche i centri telefonici cercando di impedire ai clienti di notificare alle compagnie le interruzioni di corrente.

Booz | Allen | Hamilton



CONSULTING | ANALYTICS | SYSTEMS DELIVERY | ENGINEERING | CYBER

SANS ICS Industrial Control Systems

E-ISAC ELECTRICITY INFORMATION SHARING AND ANALYSIS CENTER

TLP: White

Analysis of the Cyber Attack on the Ukrainian Power Grid

Defense Use Case

March 18, 2016

1325 G Street NW
Suite 600
Washington, DC 20005
404-446-9780 #2 | www.eisac.com

e-gazette.it

Notiziario ambiente energia on-line dal 1999

CYBERATTACCO, UN VIRUS INFORMATICO PROVOCA BLACKOUT IN UCRAINA

KIEV (UCRAINA) LUN, 11/01/2016

1

Grazie a un documento Excel infetto, il 23 dicembre scorso 700mila persone sono rimaste al buio per diverse ore

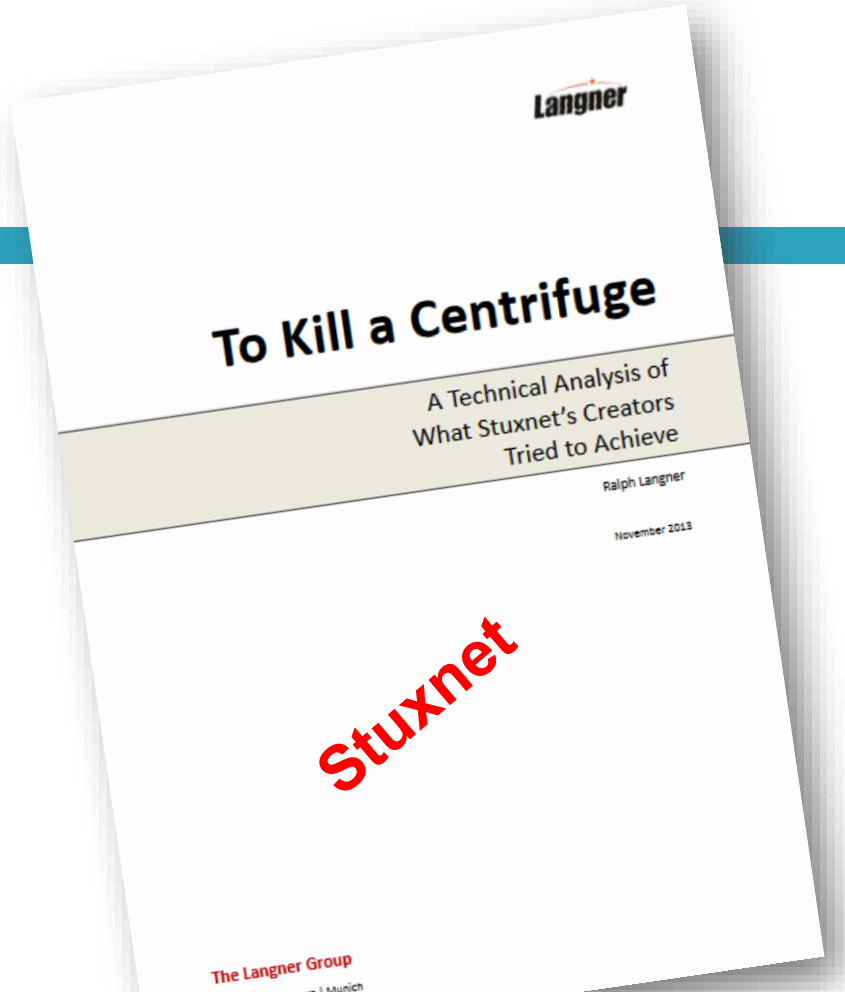
Il tanto temuto blackout provocato da attacco informatico alle centrali elettriche è arrivato. Il primo vero salto di qualità nelle minacce hacker ad impianti elettrici è avvenuto il 23 dicembre scorso, ai danni della rete elettrica ucraina nel Nord-Ovest del Paese: lo ha reso noto l'azienda di sicurezza informatica Eset, sottolineando come si tratti del primo caso del genere al mondo. Secondo Eset, il virus responsabile dell'attacco è stato infiltrato nel sistema grazie a un documento Excel infetto: si tratta di un programma denominato "BlackEnergy", contenente a sua volta un eseguibile, "KillDisk", in grado di sabotare le funzionalità dei sistemi industriali, spesso assai vulnerabili.

Nel capoluogo della regione Ivano/Frankivsk sono rimasti senza luce circa 700mila persone. L'interruzione della corrente - leggiamo su International Business Time - è durata circa sei ore. "Se questo è veramente il primo attacco riuscito contro impianti elettrici, credo che un sacco di persone lo interpreteranno come il passaggio del Rubicone" ha detto Jason Healy, esperto di conflitti informatici e ricercatore senior presso la Columbia University's School of International and Public Affairs di New York. "Non c'è dubbio che il rischio aumenta ogni anno e che tali attacchi saranno sempre più comuni."

I funzionari ucraini hanno aperto un'inchiesta su quell'evento ed alcuni studi recenti sottolineano che l'attacco avrebbe colpito almeno altre due utility in Ucraina occidentale. Secondo le spiegazioni fornite dai tecnici, BlackEnergy esiste da circa un decennio e in passato è stato utilizzato per attacchi hacker da parte del gruppo Sandworm, con sede a Mosca e vicino al governo russo.

Nonostante l'esistenza di responsabilità provate e circostanziate c'è una certa titubanza nell'attribuire la colpa a un partito politico. Un istruttore certificato di sicurezza informatica sostiene che occorrono più analisi per poter giungere ad una conclusione, soprattutto perché si tratta di infrastrutture civili fuori dalle zone del conflitto. Tuttavia, come alcuni stati utilizzano l'informatica per spiarsi l'un l'altro, gli stessi potrebbero arrivare a trovarsi in posizioni scomode nell'ammettere le azioni di spionaggio.

Stuxnet



Stuxnet

- In an article in The New York Times of June 1, 2012, White House policy expert David E. Sanger writes an article in which he anticipates the news that President Obama has ordered a cyber-attack on Iran.
- According to Sanger's reconstruction, some European states and some Israeli officers were also involved in the operation, the weapon used is Stuxnet

[http://www.nytimes.com/2012/06/01/world/middleeast/obama-ordered-wave-of-cyberattacks-against-iran.html]

From cyber to physical

- The attack was carried out with the Stuxnet worm which went from a Windows system to the SCADA controllers (Supervisory Control And Data Acquisition) used for the electronic monitoring of an Iranian nuclear power plant.
- The worm managed to change the speed of the rotors in a centrifuge of the Iranian plant used to enrich uranium.
- The compromise was possible thanks to social engineering activities and other techniques so as not to be discovered (when the rotor had warmed up the malware continued to send messages to the operations center confirming that everything was ok)

Trump secretly ordered cyber attacks against Iran missile systems

June 23, 2019 By Pierluigi Paganini

The United States launched a series of cyber attacks on Iran after the Iranian military has downed an American surveillance drone.

The military response to Iran, after the Iranian army has downed an American surveillance drone, started from the cyberspace.

US President Donald Trump first approved military strikes against Iran in retaliation for downing a surveillance drone, but pulled back from launching them on Thursday night after a day of escalating tensions.

Report: US Cyberattack Crippled Iran's Ability to Target Oil Tankers

The June 20 cyberattack, carried out in response to Iran's downing of a US drone, took out an Iranian database used by the IRGC to plan attacks against oil tankers in the Gulf, the New York Times reported

IsraelDefense | 29/08/2019

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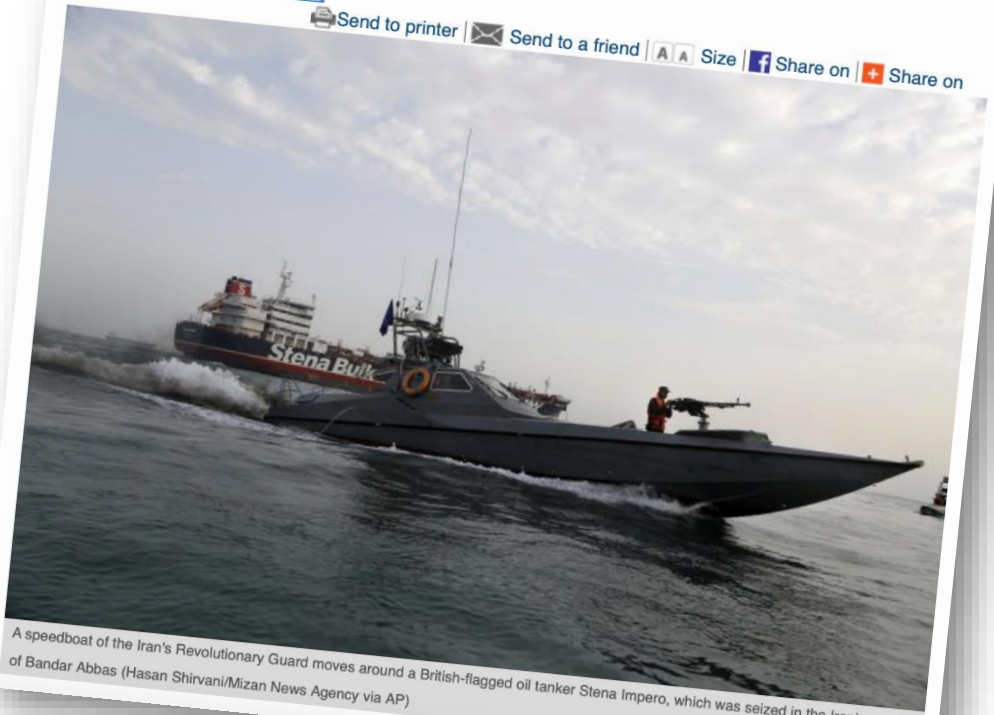


A speedboat of the Iran's Revolutionary Guard moves around a British-flagged oil tanker Stena Impero, which was seized in the Iranian port of Bandar Abbas (Hasan Shirvani/Mizan News Agency via AP)

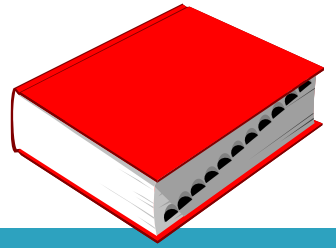
Israele vs Iran: il nuovo fronte di guerra è il cyberspazio

Un attacco hacker ha bloccato il porto di Shahid Rajaee sul Golfo Persico pochi giorno dopo l'incursione informatica nel sistema idrico israeliano. Gli esperti: è l'alba di un nuovo tipo di conflitto, senza regole

20 maggio 2020

State-sponsored cyberattacks

Hybrid warfare



- *Hybrid warfare* is a military strategy which employs political warfare and blends conventional warfare, irregular warfare and *cyberwarfare* with other influencing methods, such as fake news, diplomacy, lawfare and foreign electoral intervention.

Cyber attacks in *Hybrid warfare*

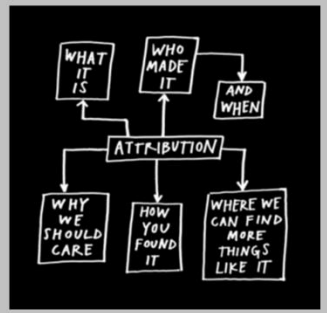
- Why Cyber attacks in *Hybrid warfares*:
  - favorable cost-effectiveness ratio;
  - "below the threshold" of military response;
  - absence of geographical boundaries and attribution difficulties.

The issue of attribution

- “Most sophisticated and exhaustive approaches to attribution are often outside the means of most companies, and from the perspective of the government or its intelligence organizations, is usually classified or sensitive.”

2017 PUBLIC-PRIVATE ANALYTIC EXCHANGE PROGRAM

PHASE II - CYBER ATTRIBUTION USING UNCLASSIFIED DATA



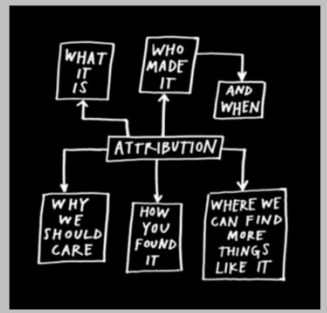
2017 Public-Private Analytic Exchange Program
1 September 2017

The issue of attribution

- This leaves private enterprise in a difficult position when it is targeted by state actors. They may fail to anticipate being targeted and lack the ability to respond when they are.

2017 PUBLIC-PRIVATE ANALYTIC EXCHANGE PROGRAM

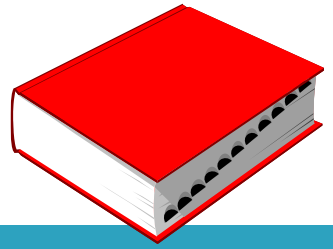
PHASE II - CYBER ATTRIBUTION USING UNCLASSIFIED DATA



2017 Public-Private Analytic Exchange Program

1 September 2017

Deterrence



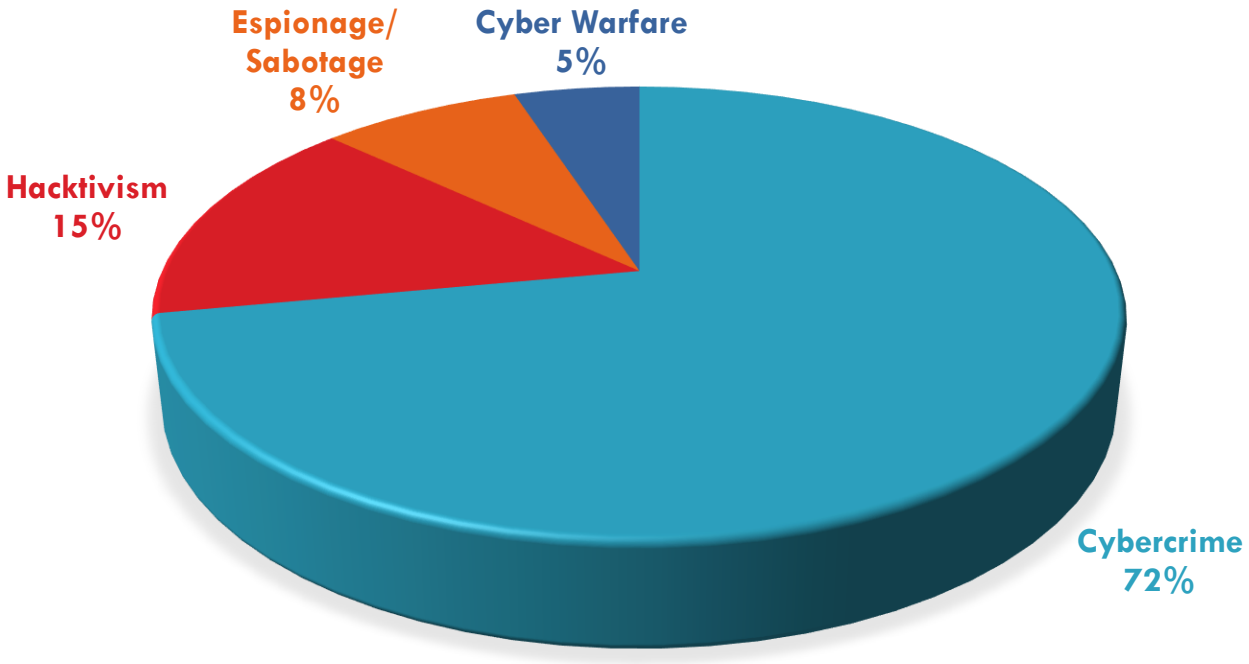
- Prevention of an action through a credible threat of retaliation with consequences of unacceptable size for the attacker and/or through operations that lead to the belief that the cost of the action exceeds the perceived benefits.

Outline

- Attacks
- Cybercrime:
  - Motivations
  - Examples
  - Costs
- Cyber-espionage
- Cyber-terrorism
- Cyber-warfare
- Conclusions

THREAT ANALYSIS

TYPES AND DISTRIBUTION OF ATTACKERS - 2016



[**Francesco Vestito -** comandante del CIOC - Comando Interforze per le Operazioni Cibernetiche]

Taxonomy of Attackers (from IBM)

- Class I – *Clever Outsiders*
- Class II – *Knowledgeable Insiders*
- Class III – *Funded Organizations*

Taxonomy of Attackers (from IBM)

- Class I – *Clever Outsiders*
- Class II – *Knowledgeable Insiders*
- Class III – *Funded Organizations*

- Insufficient knowledge of system
- Not highly sophisticated equipment
- Look for existing weaknesses

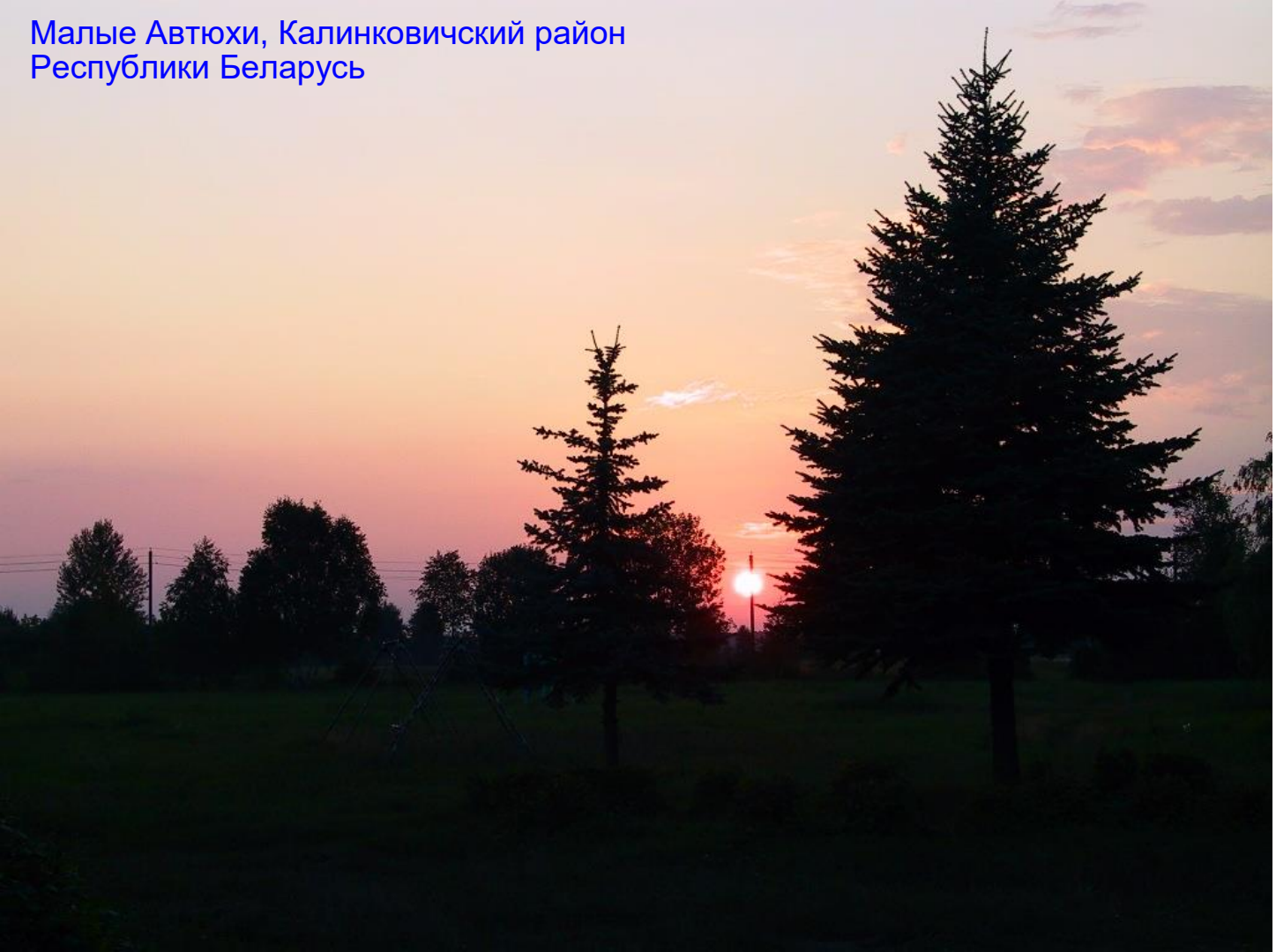
Taxonomy of Attackers (from IBM)

- Class I – *Clever Outsiders*
- Class II – *Knowledgeable Insiders*
- Class III – *Funded Organizations*

- Have potential access to
  - most parts of the system
  - highly sophisticated tools

Taxonomy of Attackers (from IBM)

- Class I – *Clever Outsiders*
- Class II – *Knowledgeable Insiders*
- Class III – *Funded Organizations*
  - Governments, terrorists, mafia
  - They resort to
    - teams of experts
    - big budgets
    - most advanced tools



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