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SBSeg 2016

Niterói, RJ

08 de novembro de 2016

Segurança em IoT: O futuro repetindo o passado

Miriam von Zuben
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Agenda

- **Ataques atuais envolvendo IoT**

- **Problemas antigos**

- **Desafios**

Breaking News
Ataques DDoS

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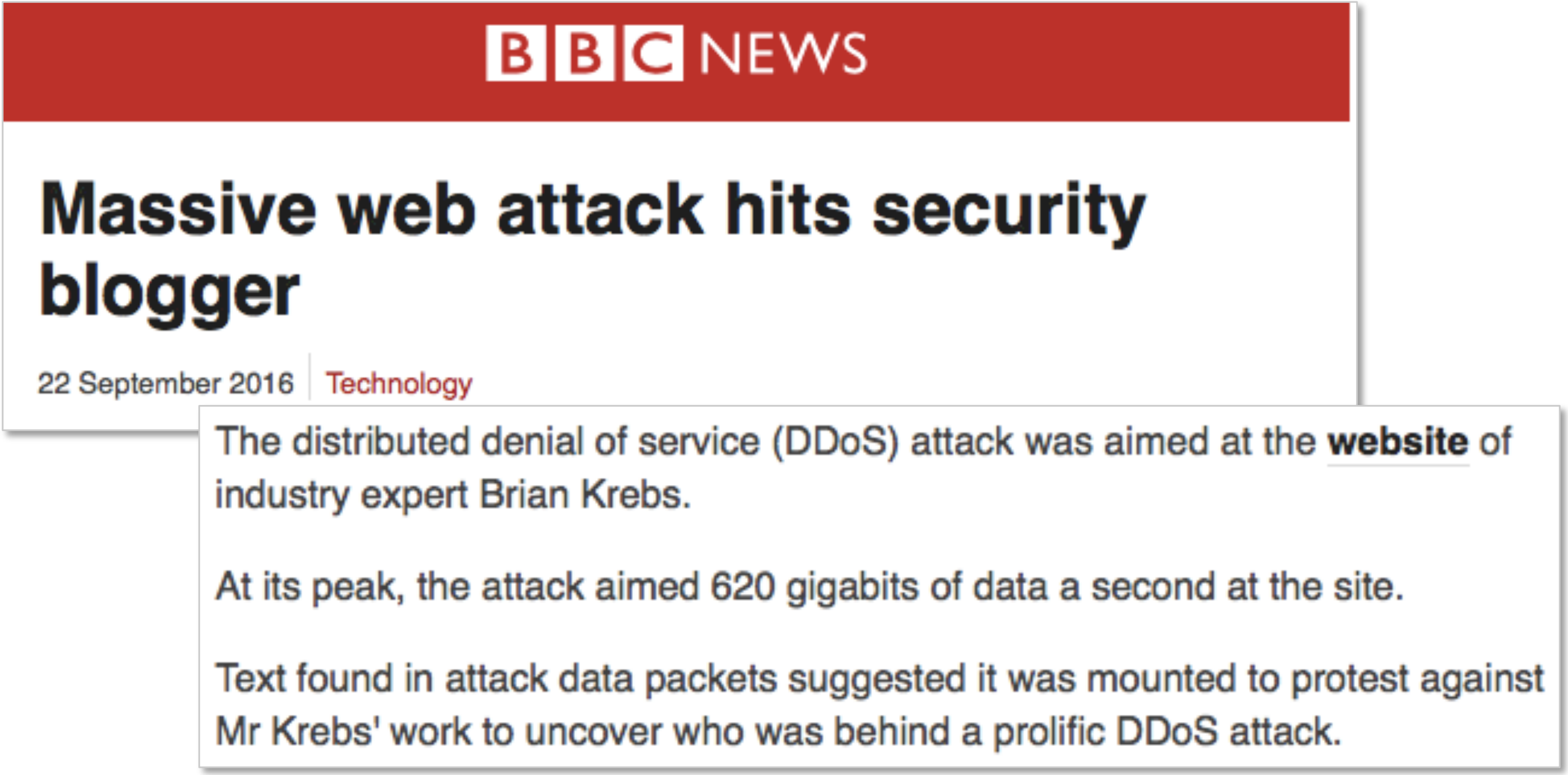
620Gbps contra o Blog do Brian Krebs



BBC NEWS

Massive web attack hits security blogger

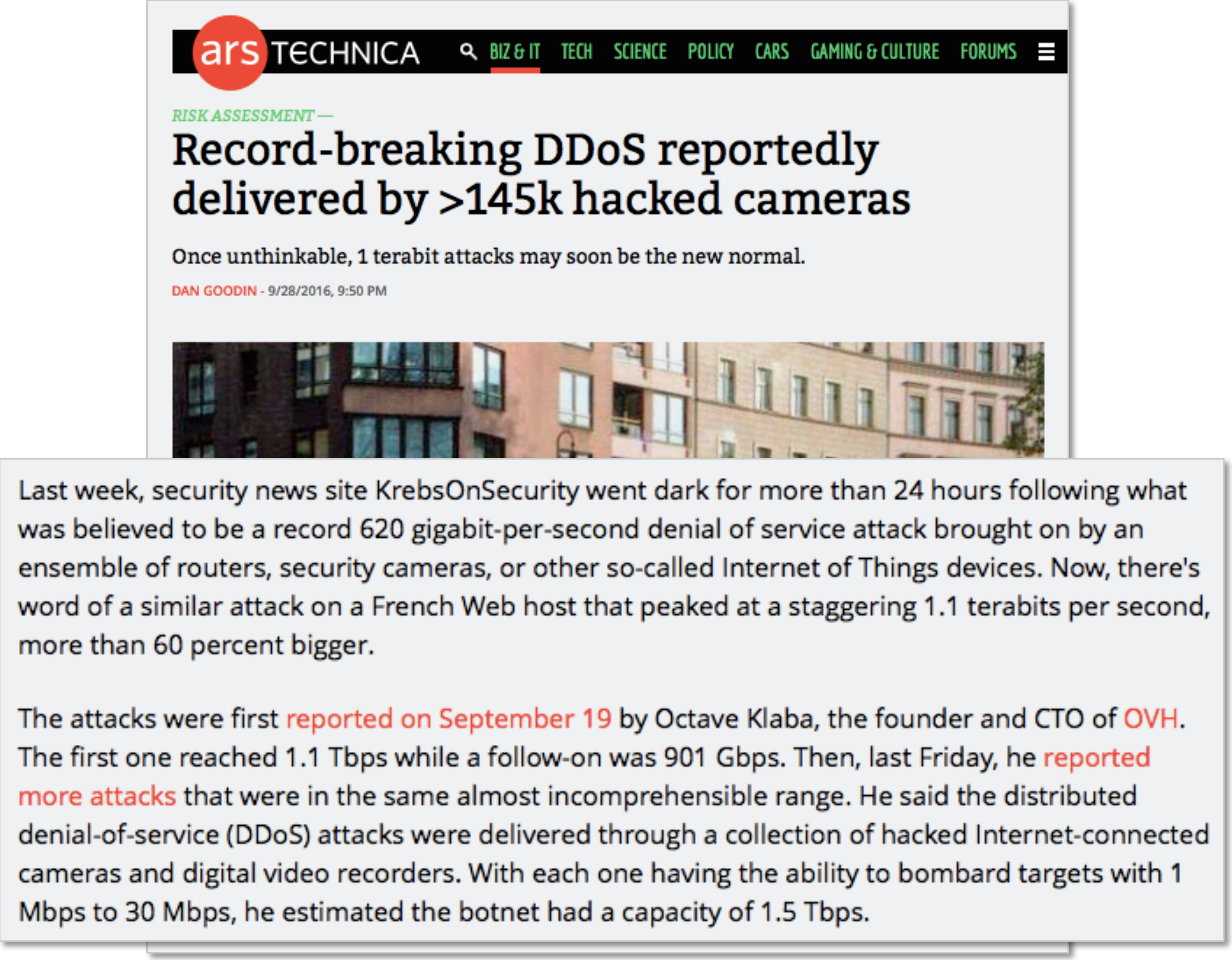
22 September 2016 | Technology

The distributed denial of service (DDoS) attack was aimed at the **website** of industry expert Brian Krebs.

At its peak, the attack aimed 620 gigabits of data a second at the site.

Text found in attack data packets suggested it was mounted to protest against Mr Krebs' work to uncover who was behind a prolific DDoS attack.

http://www.bbc.co.uk/news/amp/37439513



RISK ASSESSMENT —

Record-breaking DDoS reportedly delivered by >145k hacked cameras

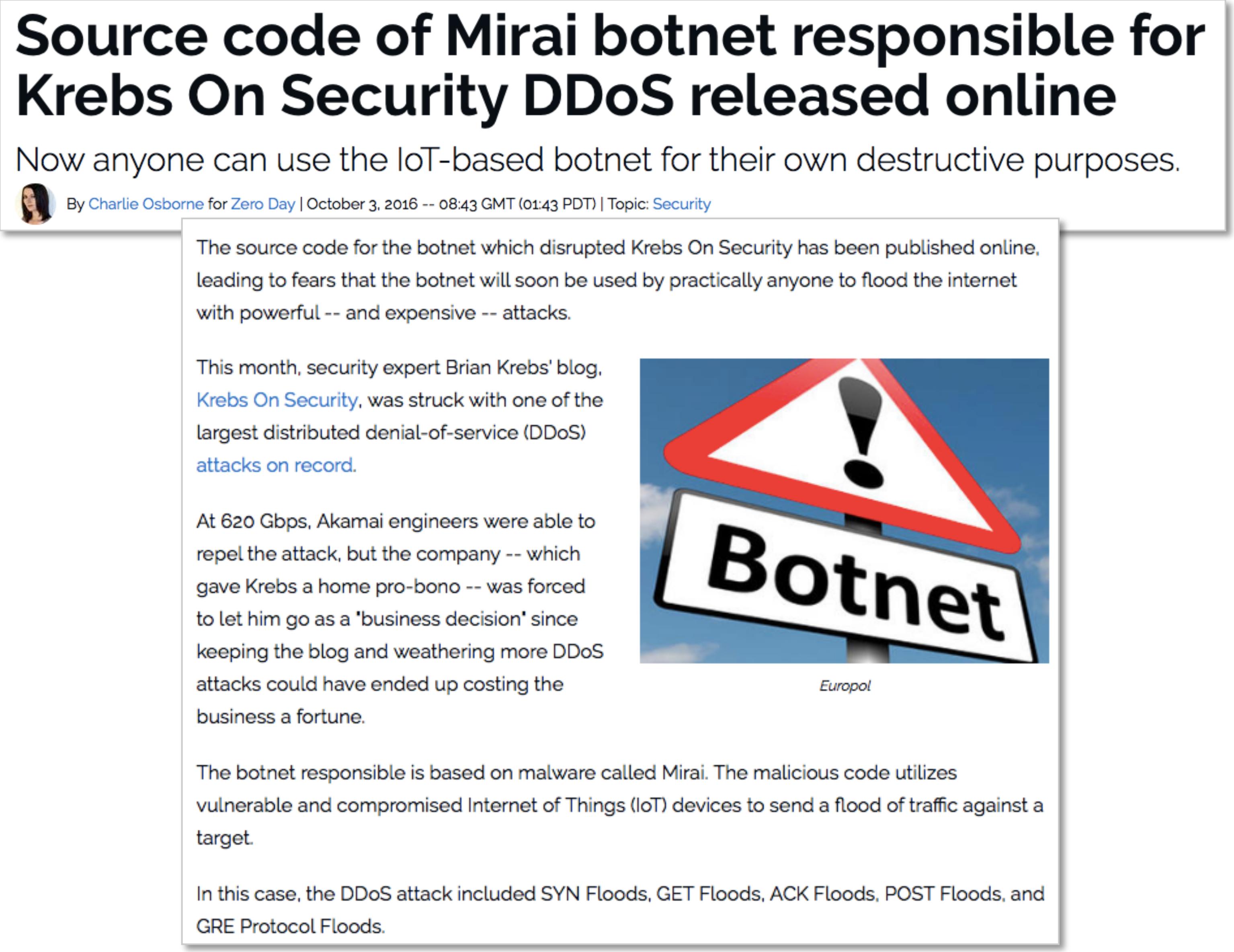
Once unthinkable, 1 terabit attacks may soon be the new normal.

DAN GOODIN - 9/28/2016, 9:50 PM

Last week, security news site KrebsOnSecurity went dark for more than 24 hours following what was believed to be a record 620 gigabit-per-second denial of service attack brought on by an ensemble of routers, security cameras, or other so-called Internet of Things devices. Now, there's word of a similar attack on a French Web host that peaked at a staggering 1.1 terabits per second, more than 60 percent bigger.

The attacks were first reported on September 19 by Octave Klaba, the founder and CTO of OVH. The first one reached 1.1 Tbps while a follow-on was 901 Gbps. Then, last Friday, he reported more attacks that were in the same almost incomprehensible range. He said the distributed denial-of-service (DDoS) attacks were delivered through a collection of hacked Internet-connected cameras and digital video recorders. With each one having the ability to bombard targets with 1 Mbps to 30 Mbps, he estimated the botnet had a capacity of 1.5 Tbps.

http://arstechnica.com/security/2016/09/botnet-of-145k-cameras-reportedly-deliver-internets-biggest-ddos-ever/



Source code of Mirai botnet responsible for Krebs On Security DDoS released online

Now anyone can use the IoT-based botnet for their own destructive purposes.

By Charlie Osborne for Zero Day | October 3, 2016 -- 08:43 GMT (01:43 PDT) | Topic: Security

The source code for the botnet which disrupted Krebs On Security has been published online, leading to fears that the botnet will soon be used by practically anyone to flood the internet with powerful -- and expensive -- attacks.

This month, security expert Brian Krebs' blog, Krebs On Security, was struck with one of the largest distributed denial-of-service (DDoS) attacks on record.

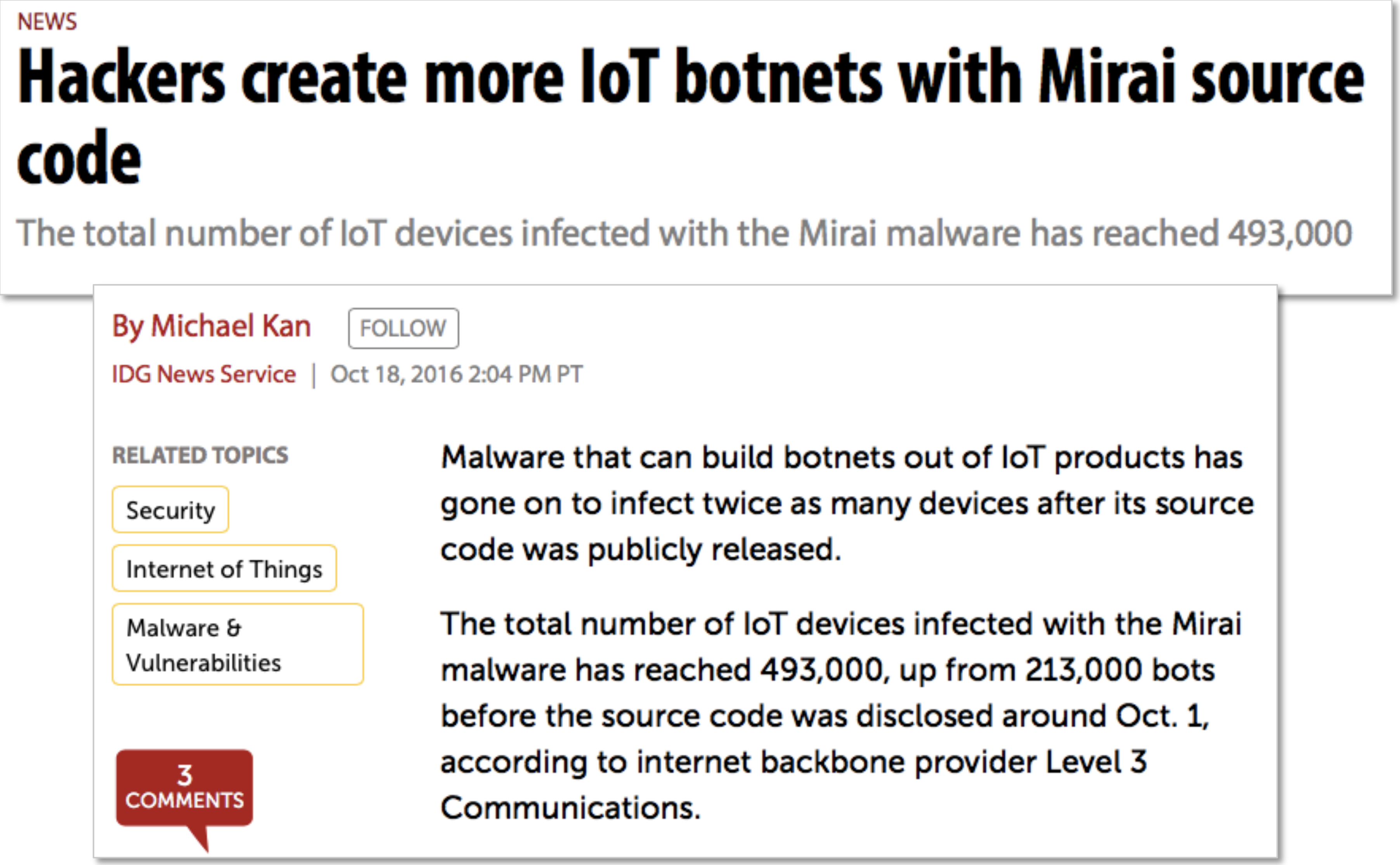
At 620 Gbps, Akamai engineers were able to repel the attack, but the company -- which gave Krebs a home pro-bono -- was forced to let him go as a 'business decision' since keeping the blog and weathering more DDoS attacks could have ended up costing the business a fortune.

Europol

The botnet responsible is based on malware called Mirai. The malicious code utilizes vulnerable and compromised Internet of Things (IoT) devices to send a flood of traffic against a target.

In this case, the DDoS attack included SYN Floods, GET Floods, ACK Floods, POST Floods, and GRE Protocol Floods.

http://www.zdnet.com/article/source-code-of-mirai-botnet-responsible-for-krebs-on-security-ddos-released-online/



NEWS

Hackers create more IoT botnets with Mirai source code

The total number of IoT devices infected with the Mirai malware has reached 493,000

By Michael Kan

IDG News Service | Oct 18, 2016 2:04 PM PT

Malware that can build botnets out of IoT products has gone on to infect twice as many devices after its source code was publicly released.

The total number of IoT devices infected with the Mirai malware has reached 493,000, up from 213,000 bots before the source code was disclosed around Oct. 1, according to internet backbone provider Level 3 Communications.

http://www.computerworld.com/article/3132359/security/hackers-create-more-iot-botnets-with-mirai-source-code.html

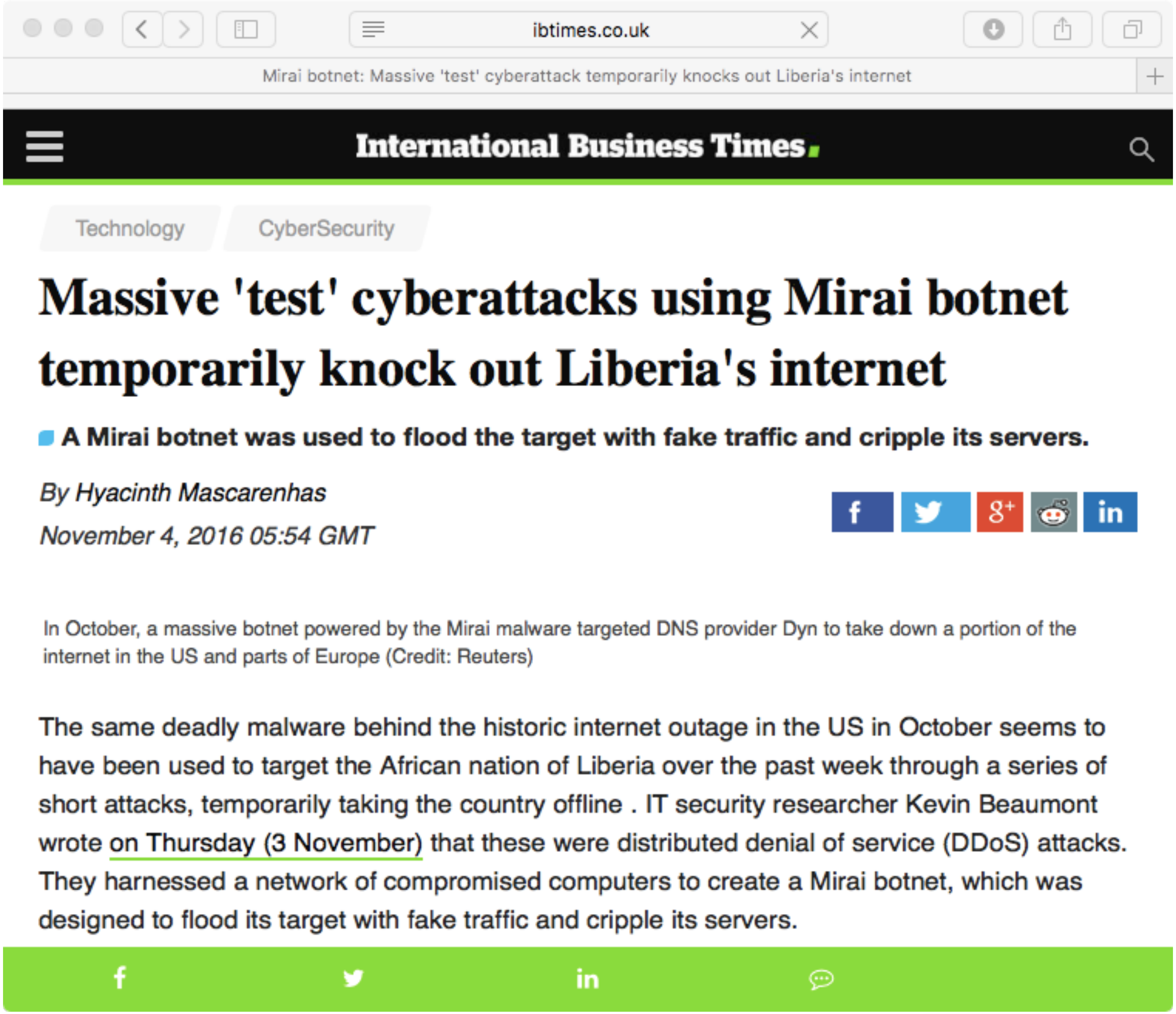
Major DDoS attack on Dyn DNS knocks Spotify, Twitter, Github, PayPal, and more offline

The sound of silence.

Brad Chacos | @BradChacos Oct 21, 2016 3:34 PM

Senior Editor, PCWorld

http://www.pcworld.com/article/3133847/internet/ddos-attack-on-dyn-knocks-spotify-twitter-github-etsy-and-more-offline.html


ibtimes.co.uk
Mirai botnet: Massive 'test' cyberattack temporarily knocks out Liberia's internet
International Business Times
Technology
CyberSecurity

Massive 'test' cyberattacks using Mirai botnet temporarily knock out Liberia's internet

A Mirai botnet was used to flood the target with fake traffic and cripple its servers.

By Hyacinth Mascarenhas

November 4, 2016 05:54 GMT

In October, a massive botnet powered by the Mirai malware targeted DNS provider Dyn to take down a portion of the internet in the US and parts of Europe (Credit: Reuters)

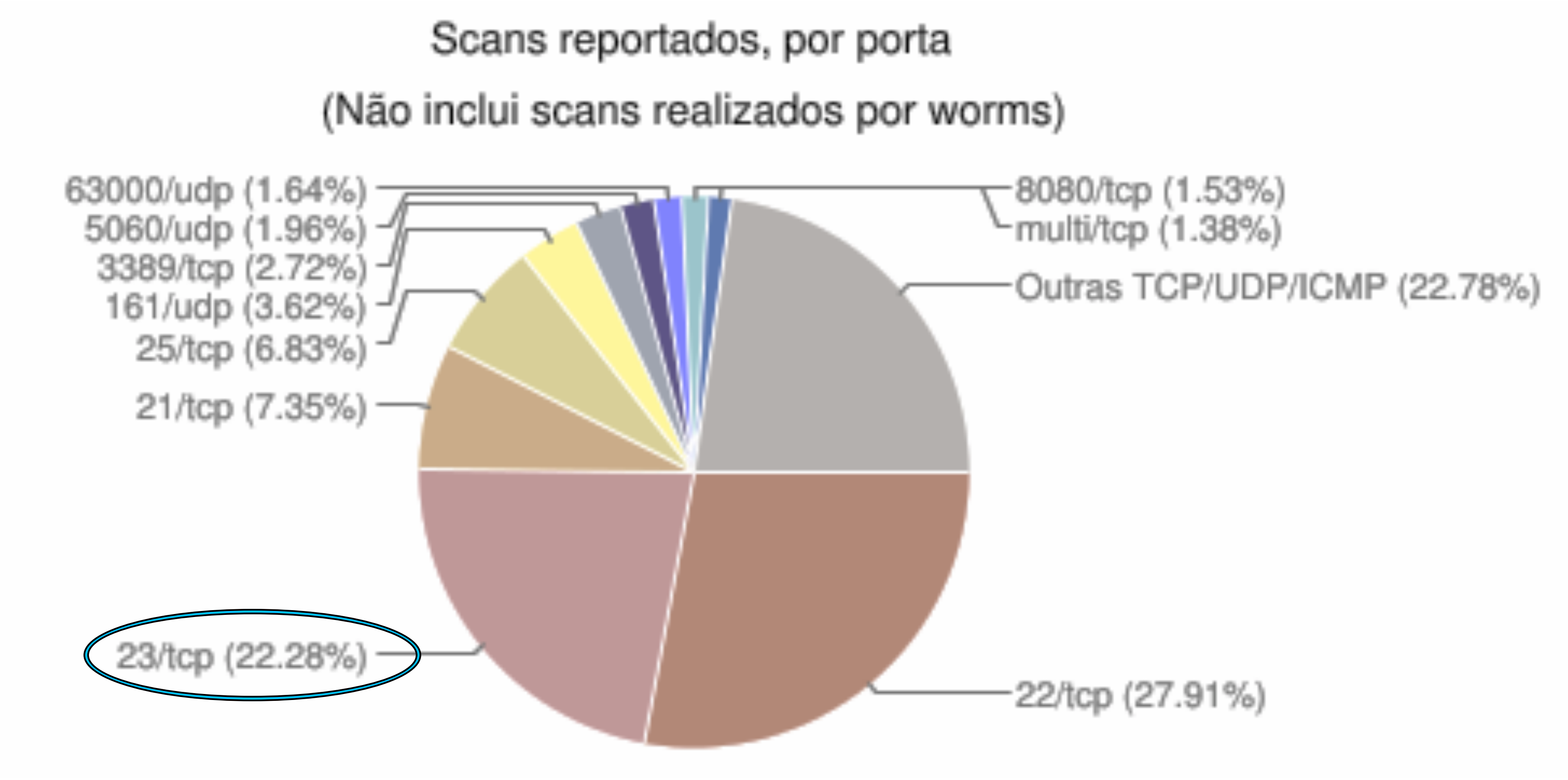
The same deadly malware behind the historic internet outage in the US in October seems to have been used to target the African nation of Liberia over the past week through a series of short attacks, temporarily taking the country offline . IT security researcher Kevin Beaumont wrote on Thursday (3 November) that these were distributed denial of service (DDoS) attacks. They harnessed a network of compromised computers to create a Mirai botnet, which was designed to flood its target with fake traffic and cripple its servers.

Problema:
telnet e senhas fracas

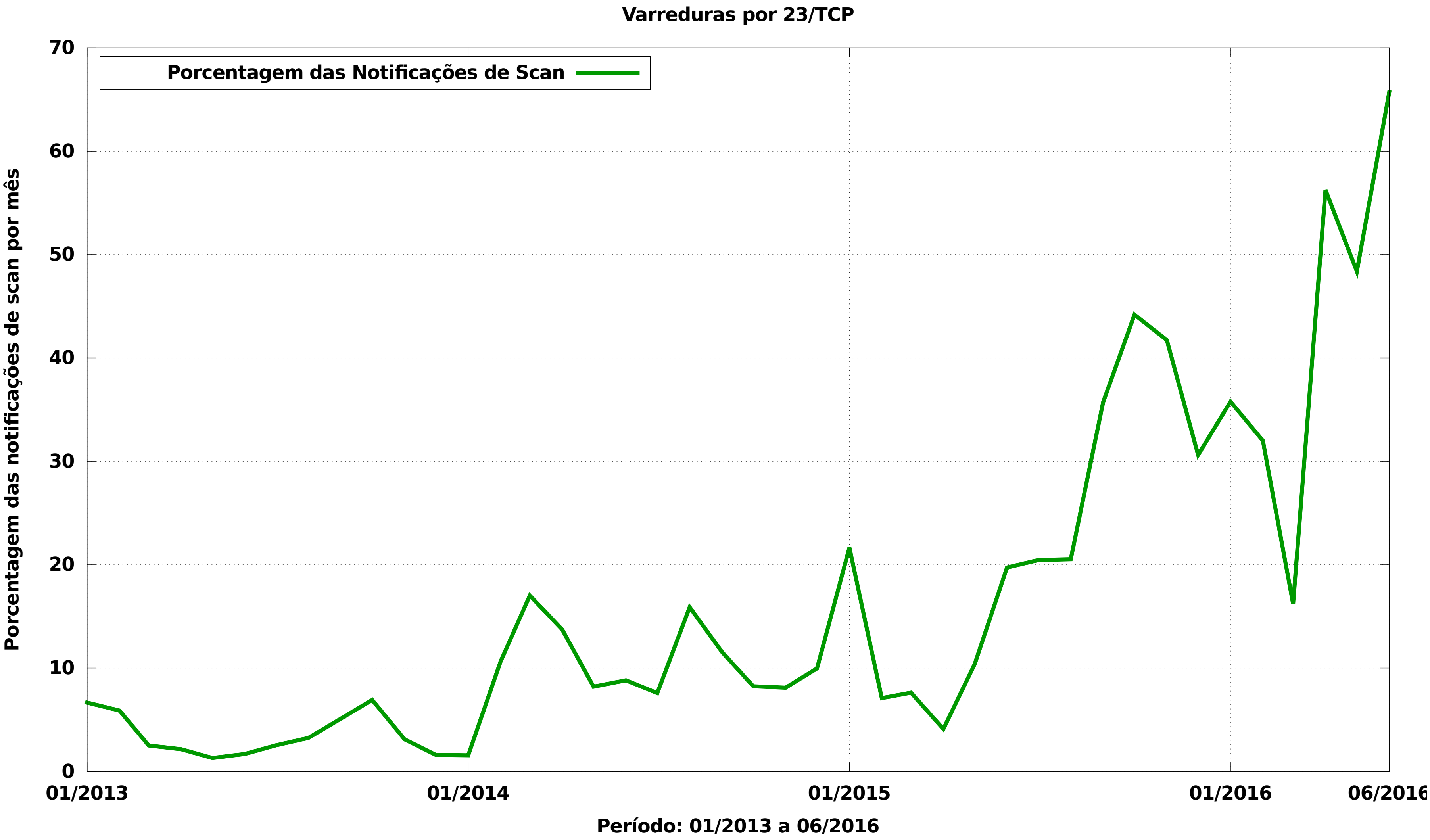
IoT *botnets*

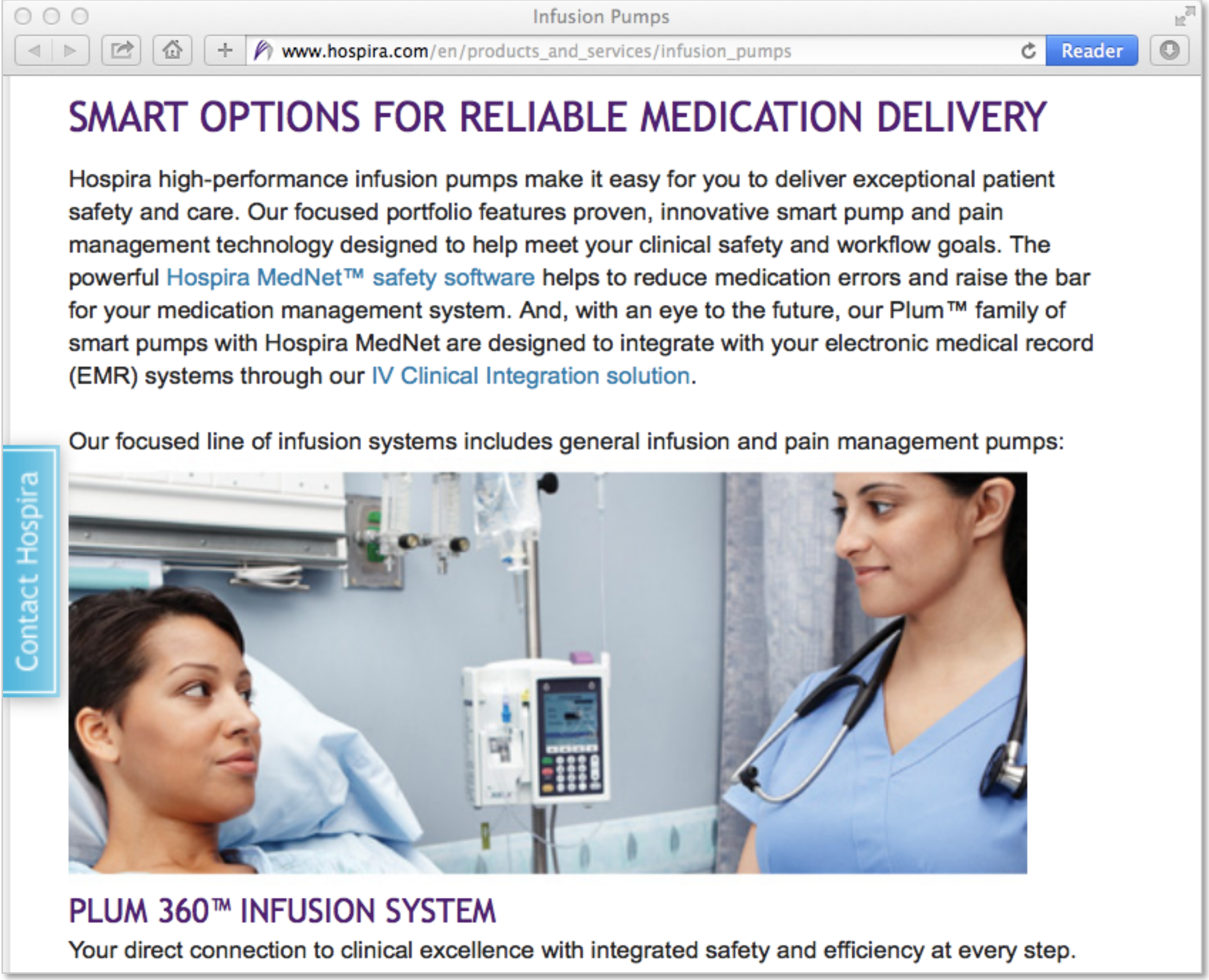
- **CPEs, DVRs, CCTVs, NAS, roteadores domésticos, etc**
- ***Malware* se propaga geralmente via telnet**
- **Explora senhas fracas ou padrão**
  - muitas vezes são “*backdoors*” dos fabricantes
- **Em nossos honeypots**
  - IPs de IoT infectados – 07/11/2016
    - Total: 581.917
    - BR: 76.187
  - Detecção:
    - número de sequência do pacote = endereço IP do destino

Notificações ao CERT.br: *Scans* por porta em 2015



Notificações ao CERT.br:
Scans por 23/TCP – 2013 a jun/2016





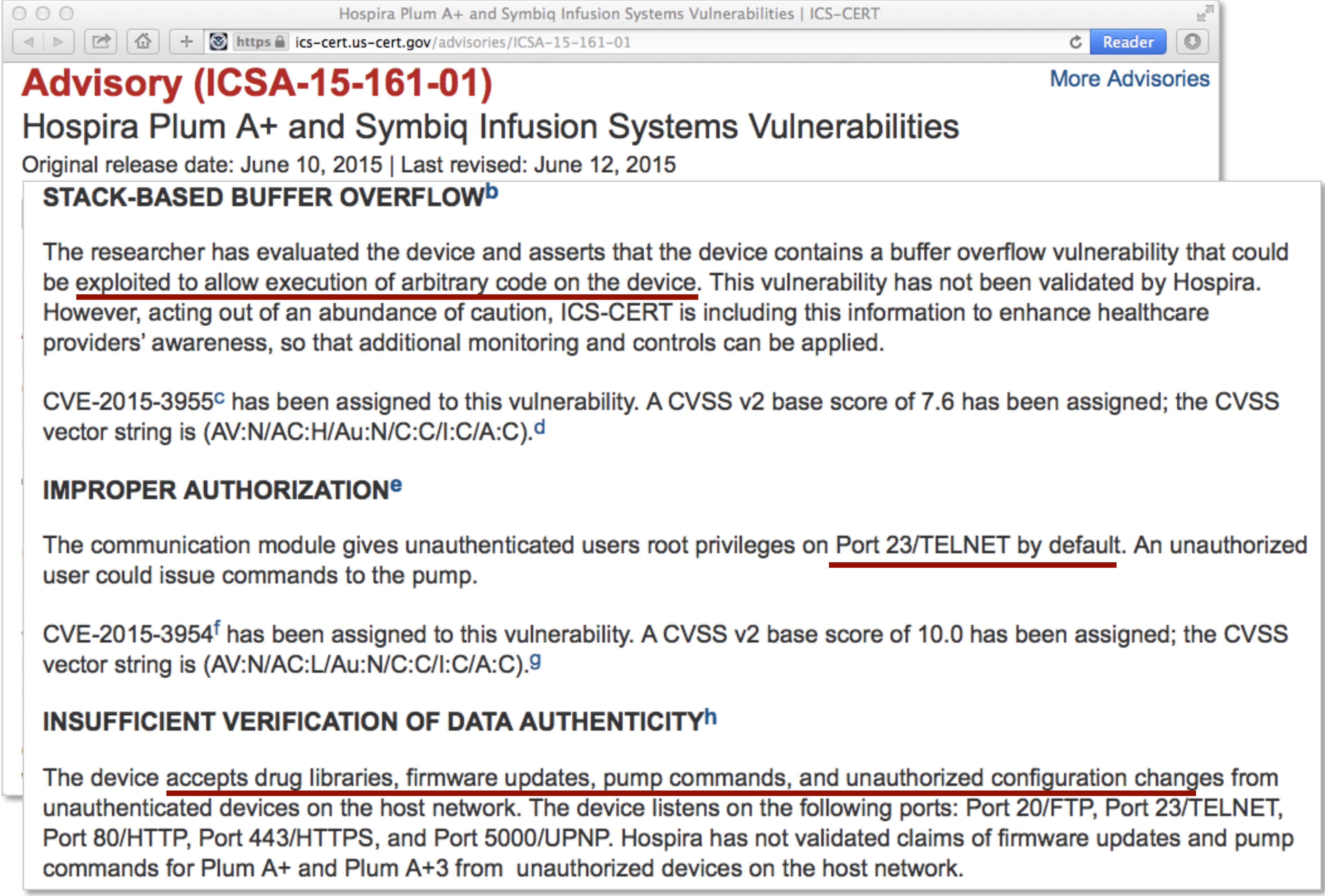
SMART OPTIONS FOR RELIABLE MEDICATION DELIVERY

Hospira high-performance infusion pumps make it easy for you to deliver exceptional patient safety and care. Our focused portfolio features proven, innovative smart pump and pain management technology designed to help meet your clinical safety and workflow goals. The powerful Hospira MedNet™ safety software helps to reduce medication errors and raise the bar for your medication management system. And, with an eye to the future, our Plum™ family of smart pumps with Hospira MedNet are designed to integrate with your electronic medical record (EMR) systems through our IV Clinical Integration solution.

Our focused line of infusion systems includes general infusion and pain management pumps:

PLUM 360™ INFUSION SYSTEM

Your direct connection to clinical excellence with integrated safety and efficiency at every step.


Hospira Plum A+ and Symbiq Infusion Systems Vulnerabilities | ICS-CERT
https ics-cert.us-cert.gov/advisories/ICSA-15-161-01
Reader
More Advisories

Advisory (ICSA-15-161-01)

Hospira Plum A+ and Symbiq Infusion Systems Vulnerabilities

Original release date: June 10, 2015 | Last revised: June 12, 2015

STACK-BASED BUFFER OVERFLOW[b]

The researcher has evaluated the device and asserts that the device contains a buffer overflow vulnerability that could be exploited to allow execution of arbitrary code on the device. This vulnerability has not been validated by Hospira. However, acting out of an abundance of caution, ICS-CERT is including this information to enhance healthcare providers' awareness, so that additional monitoring and controls can be applied.

CVE-2015-3955[c] has been assigned to this vulnerability. A CVSS v2 base score of 7.6 has been assigned; the CVSS vector string is (AV:N/AC:H/Au:N/C:C/I:C/A:C).[d]

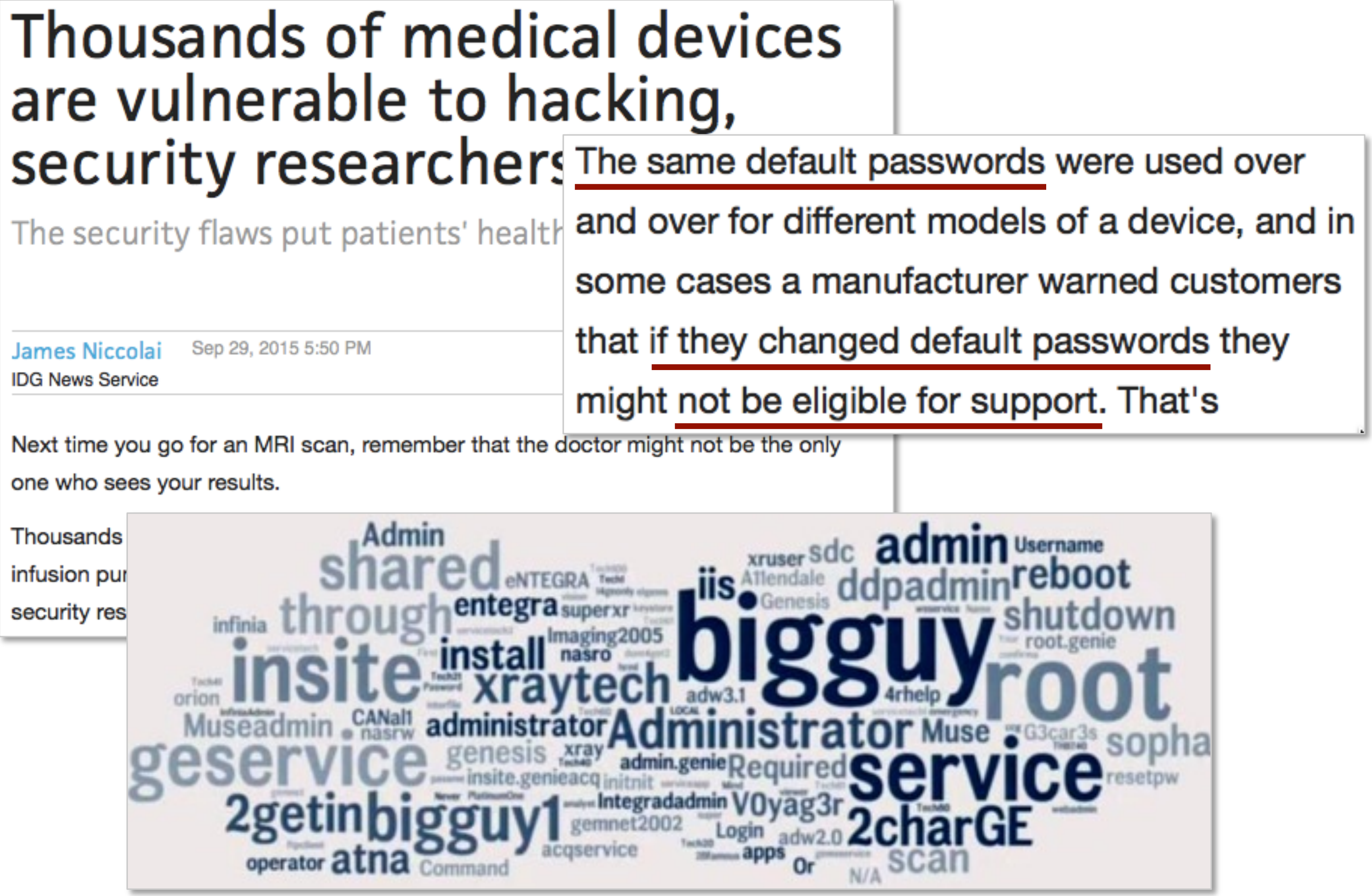
IMPROPER AUTHORIZATION[e]

The communication module gives unauthenticated users root privileges on Port 23/TELNET by default. An unauthorized user could issue commands to the pump.

CVE-2015-3954[f] has been assigned to this vulnerability. A CVSS v2 base score of 10.0 has been assigned; the CVSS vector string is (AV:N/AC:L/Au:N/C:C/I:C/A:C).[g]

INSUFFICIENT VERIFICATION OF DATA AUTHENTICITY[h]

The device accepts drug libraries, firmware updates, pump commands, and unauthorized configuration changes from unauthenticated devices on the host network. The device listens on the following ports: Port 20/FTP, Port 23/TELNET, Port 80/HTTP, Port 443/HTTPS, and Port 5000/UPNP. Hospira has not validated claims of firmware updates and pump commands for Plum A+ and Plum A+3 from unauthorized devices on the host network.



Thousands of medical devices are vulnerable to hacking, security researchers

The security flaws put patients' health

James Niccolai Sep 29, 2015 5:50 PM
IDG News Service

Next time you go for an MRI scan, remember that the doctor might not be the only one who sees your results.

Thousands
infusion pu
security res

The same default passwords were used over and over for different models of a device, and in some cases a manufacturer warned customers that if they changed default passwords they might not be eligible for support. That's

http://www.pcworld.com/article/2987813/thousands-of-medical-devices-are-vulnerable-to-hacking-security-researchers-say.html

Problema:
dados sensíveis armazenados em texto claro

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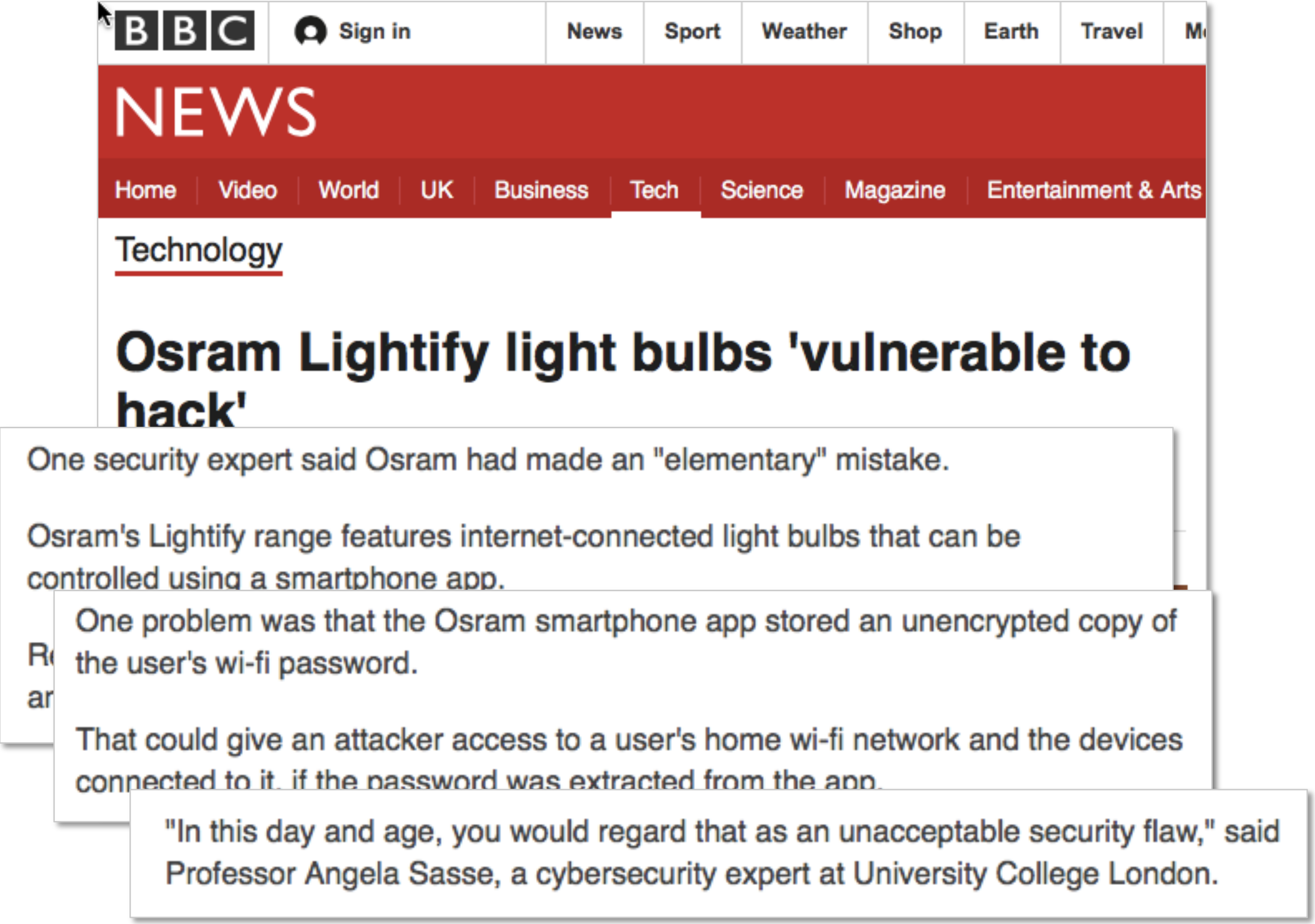


Osram Lightify light bulbs 'vulnerable to hack'

One security expert said Osram had made an "elementary" mistake.

Osram's Lightify range features internet-connected light bulbs that can be controlled using a smartphone app.

R

ar

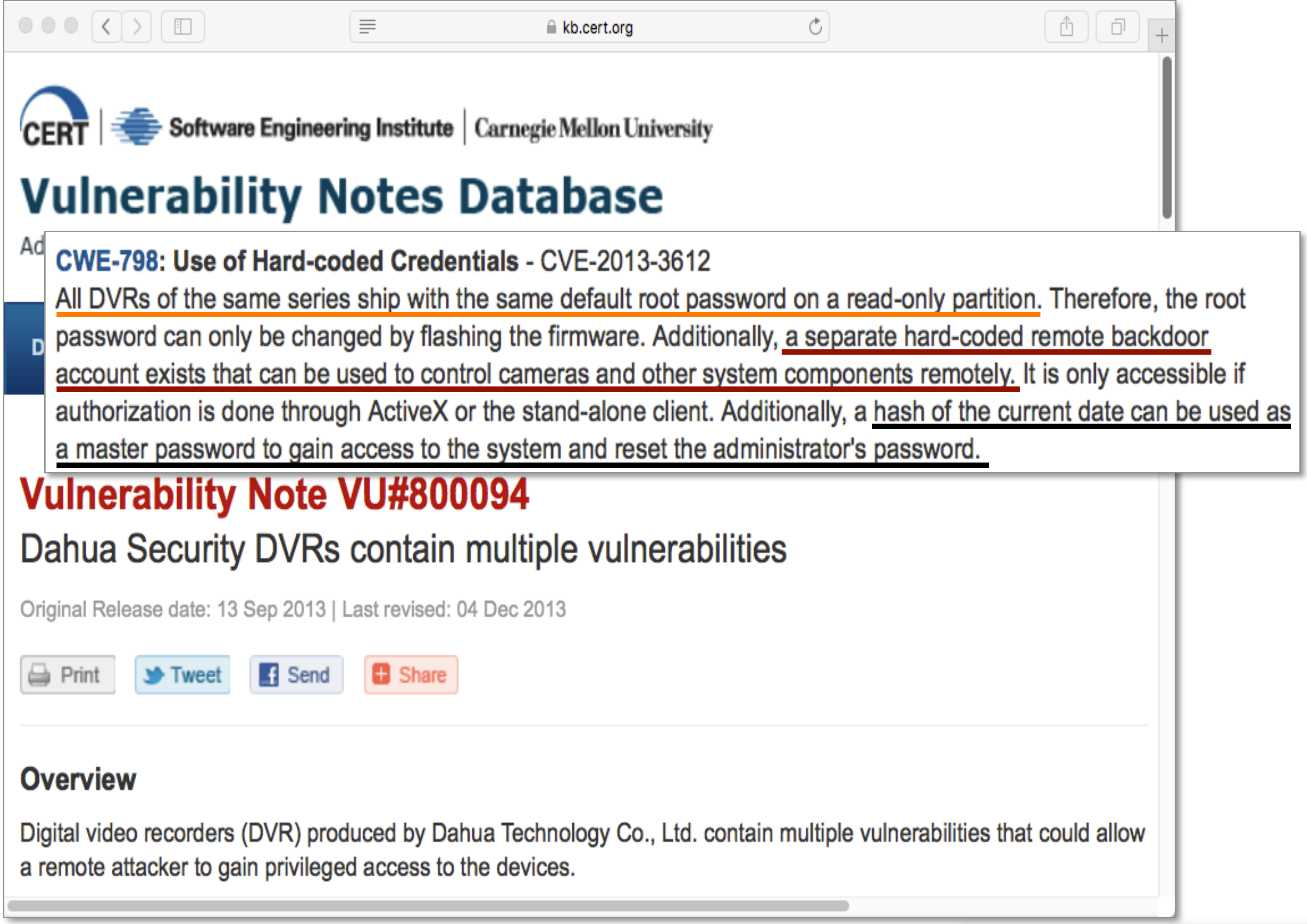
One problem was that the Osram smartphone app stored an unencrypted copy of the user's wi-fi password.

That could give an attacker access to a user's home wi-fi network and the devices connected to it, if the password was extracted from the app.

"In this day and age, you would regard that as an unacceptable security flaw," said Professor Angela Sasse, a cybersecurity expert at University College London.

http://www.bbc.com/news/technology-36903274

Problema: *backdoor* e senhas facilmente descobertas


kb.cert.org
CERT | Software Engineering Institute | Carnegie Mellon University
Print
Tweet
Send
Share

Vulnerability Notes Database

CWE-798: Use of Hard-coded Credentials - CVE-2013-3612

All DVRs of the same series ship with the same default root password on a read-only partition. Therefore, the root password can only be changed by flashing the firmware. Additionally, a separate hard-coded remote backdoor account exists that can be used to control cameras and other system components remotely. It is only accessible if authorization is done through ActiveX or the stand-alone client. Additionally, a hash of the current date can be used as a master password to gain access to the system and reset the administrator's password.

Vulnerability Note VU#800094

Dahua Security DVRs contain multiple vulnerabilities

Original Release date: 13 Sep 2013 | Last revised: 04 Dec 2013

Overview

Digital video recorders (DVR) produced by Dahua Technology Co., Ltd. contain multiple vulnerabilities that could allow a remote attacker to gain privileged access to the devices.

Problema:
DRDos e endereços spoofados

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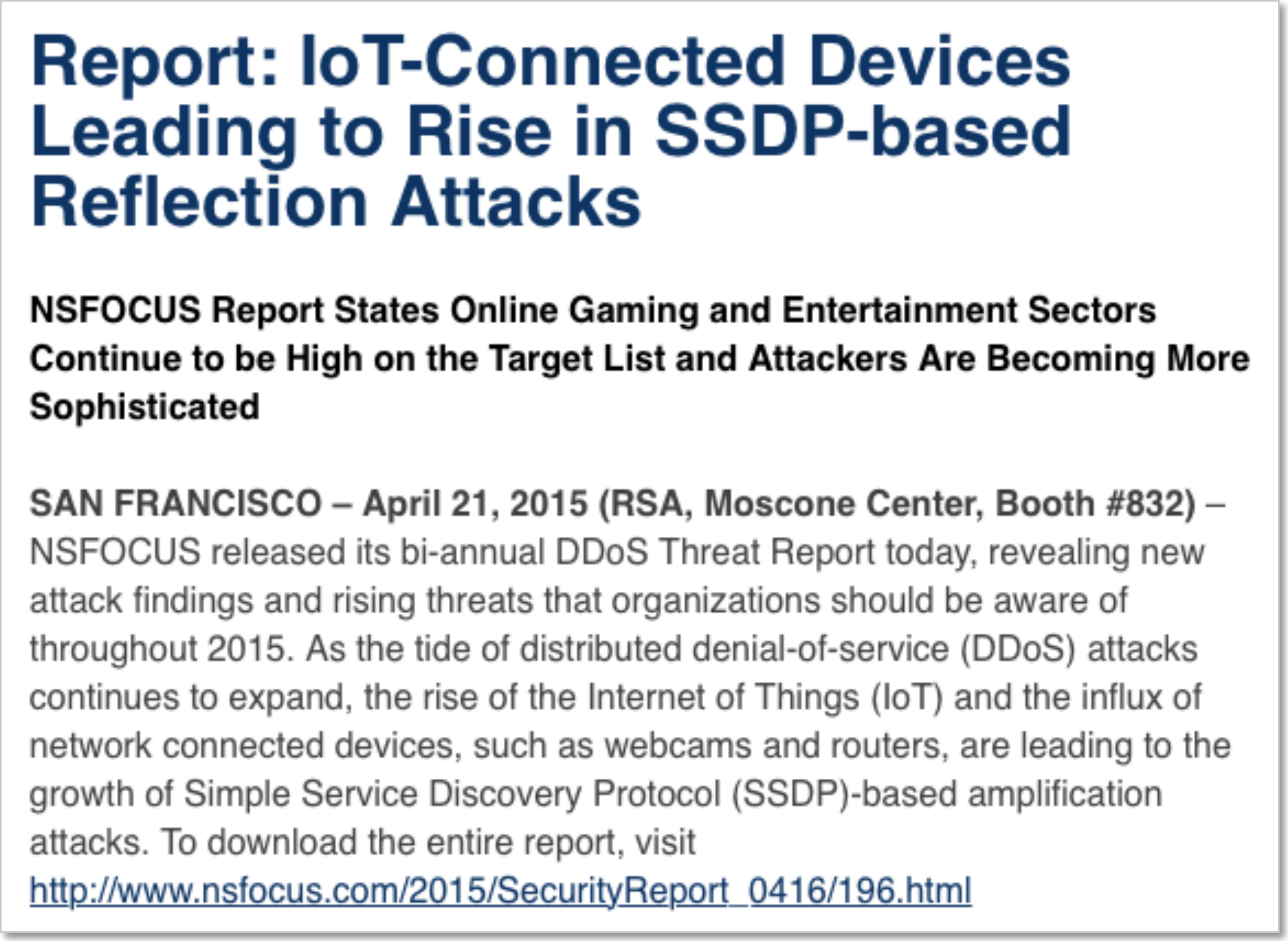


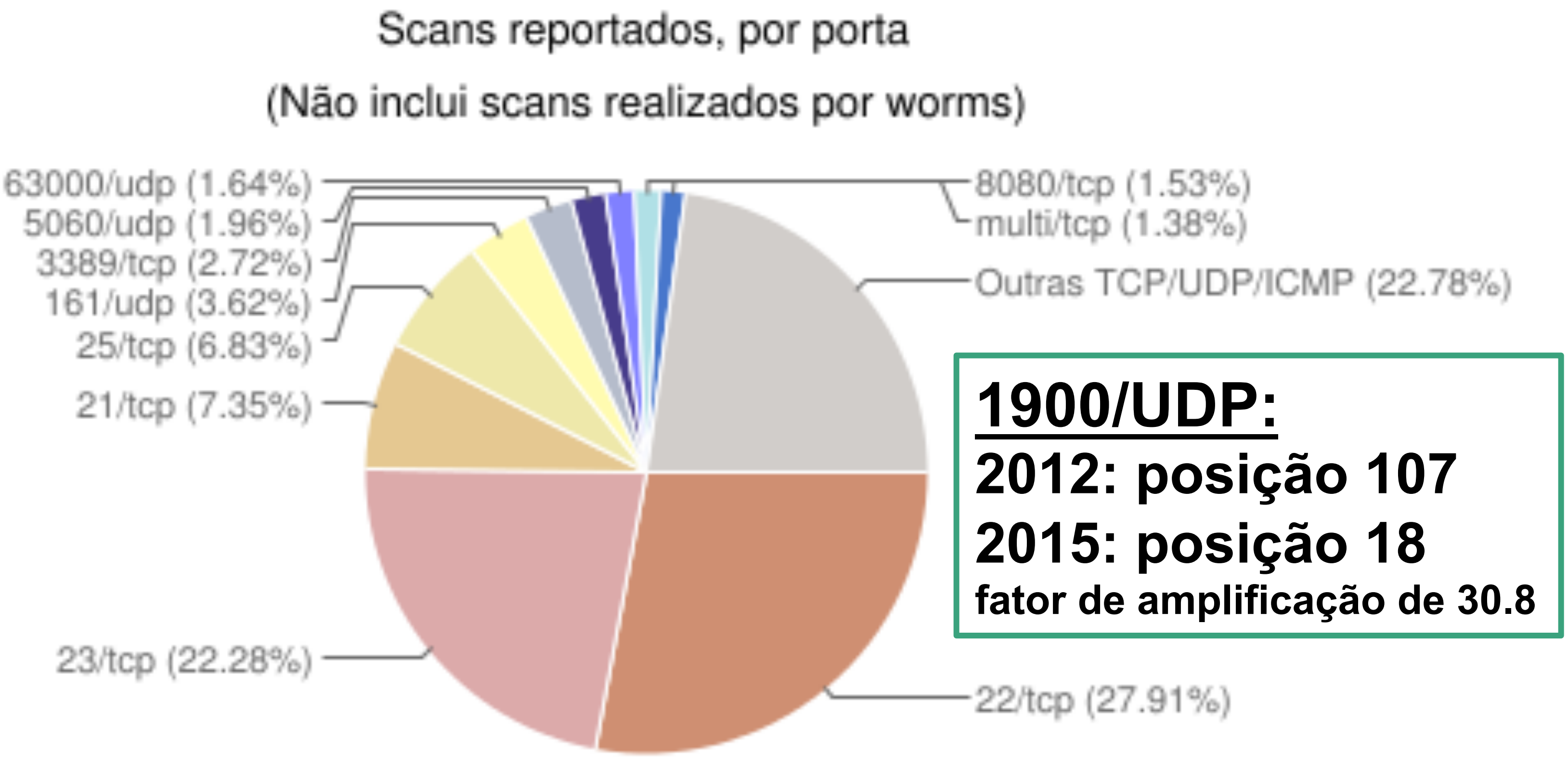
Report: IoT-Connected Devices Leading to Rise in SSDP-based Reflection Attacks

NSFOCUS Report States Online Gaming and Entertainment Sectors Continue to be High on the Target List and Attackers Are Becoming More Sophisticated

SAN FRANCISCO – April 21, 2015 (RSA, Moscone Center, Booth #832) – NSFOCUS released its bi-annual DDoS Threat Report today, revealing new attack findings and rising threats that organizations should be aware of throughout 2015. As the tide of distributed denial-of-service (DDoS) attacks continues to expand, the rise of the Internet of Things (IoT) and the influx of network connected devices, such as webcams and routers, are leading to the growth of Simple Service Discovery Protocol (SSDP)-based amplification attacks. To download the entire report, visit http://www.nsfocus.com/2015/SecurityReport_0416/196.html

http://www.darkreading.com/attacks-breaches/report-iot-connected-devices-leading-to-rise-in-ssdp-based-reflection-attacks-/d/d-id/1320149

Estatísticas CERT.br – 2015



1900/UDP:

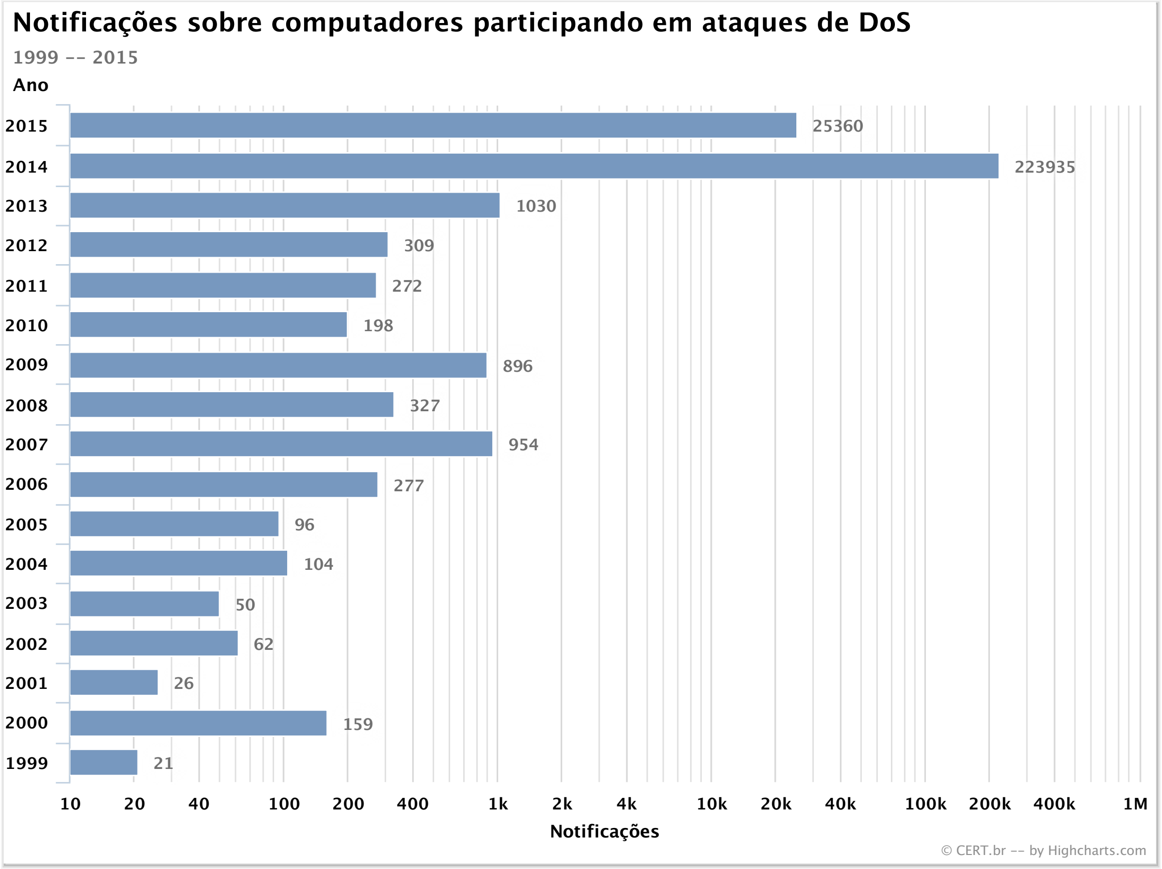
2012: posição 107

2015: posição 18

fator de amplificação de 30.8

Tipos de ataques DDoS Volumétrico – DRDoS

- **Serviços UDP permitindo abuso**
  - SNMP, SSDP, DNS recursivo aberto, entre outros



Notificações sobre computadores participando em ataques de DoS

1999 -- 2015

© CERT.br -- by Highcharts.com

Problema: *malware*

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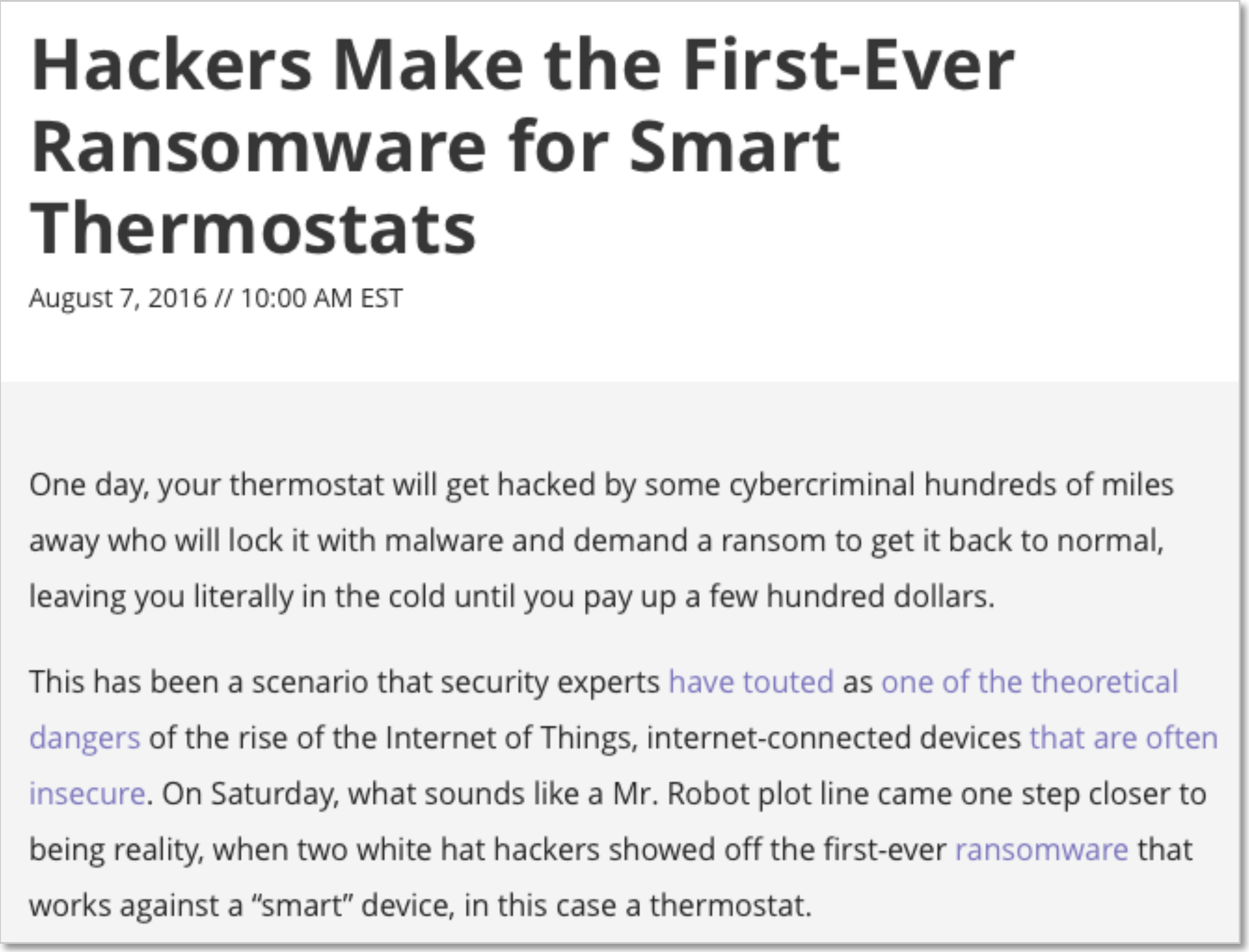


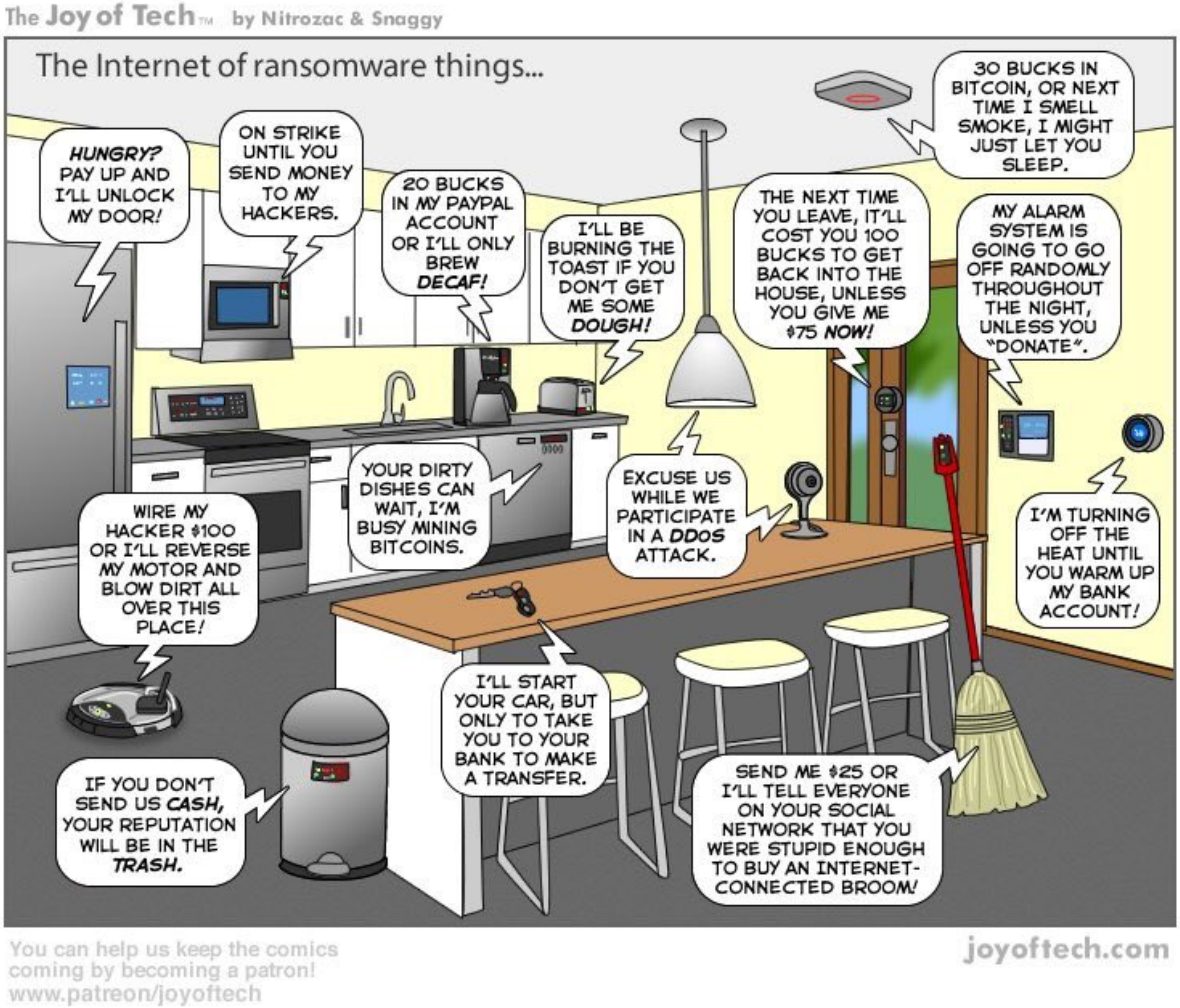
Hackers Make the First-Ever Ransomware for Smart Thermostats

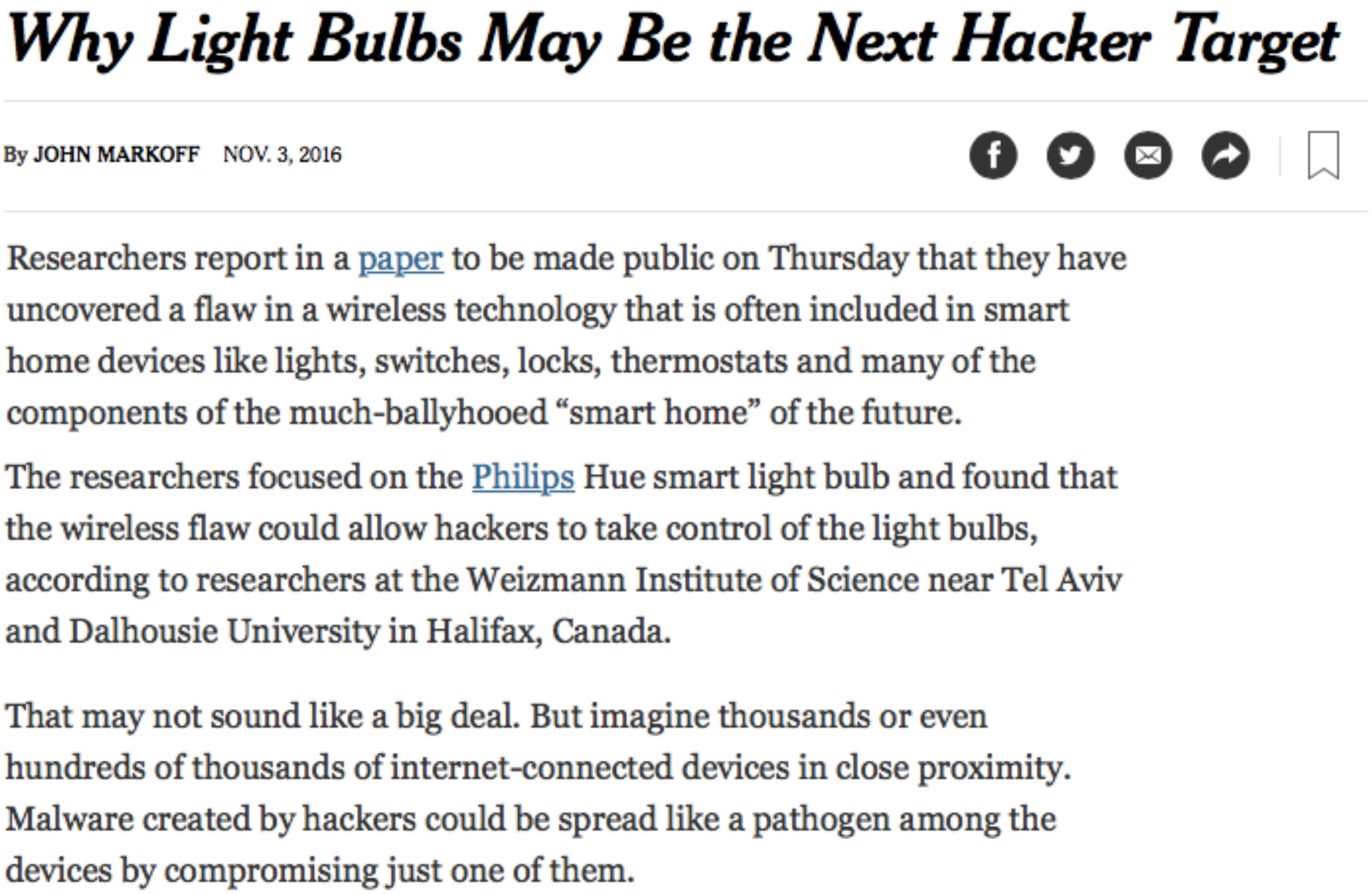
August 7, 2016 // 10:00 AM EST

One day, your thermostat will get hacked by some cybercriminal hundreds of miles away who will lock it with malware and demand a ransom to get it back to normal, leaving you literally in the cold until you pay up a few hundred dollars.

This has been a scenario that security experts have touted as one of the theoretical dangers of the rise of the Internet of Things, internet-connected devices that are often insecure. On Saturday, what sounds like a Mr. Robot plot line came one step closer to being reality, when two white hat hackers showed off the first-ever ransomware that works against a "smart" device, in this case a thermostat.

http://motherboard.vice.com/read/internet-of-things-ransomware-smart-thermostat


The Joy of Tech™ by Nitrozac & Snaggy
The Internet of ransomware things...
HUNGRY? PAY UP AND I'LL UNLOCK MY DOOR!
ON STRIKE UNTIL YOU SEND MONEY TO MY HACKERS.
20 BUCKS IN MY PAYPAL ACCOUNT OR I'LL ONLY BREW DECAF!
I'LL BE BURNING THE TOAST IF YOU DON'T GET ME SOME DOUGH!
THE NEXT TIME YOU LEAVE, IT'LL COST YOU 100 BUCKS TO GET BACK INTO THE HOUSE, UNLESS YOU GIVE ME $75 NOW!
30 BUCKS IN BITCOIN, OR NEXT TIME I SMELL SMOKE, I MIGHT JUST LET YOU SLEEP.
MY ALARM SYSTEM IS GOING TO GO OFF RANDOMLY THROUGHOUT THE NIGHT, UNLESS YOU "DONATE".
YOUR DIRTY DISHES CAN WAIT, I'M BUSY MINING BITCOINS.
EXCUSE US WHILE WE PARTICIPATE IN A DDOS ATTACK.
I'M TURNING OFF THE HEAT UNTIL YOU WARM UP MY BANK ACCOUNT!
WIRE MY HACKER $100 OR I'LL REVERSE MY MOTOR AND BLOW DIRT ALL OVER THIS PLACE!
I'LL START YOUR CAR, BUT ONLY TO TAKE YOU TO YOUR BANK TO MAKE A TRANSFER.
IF YOU DON'T SEND US CASH, YOUR REPUTATION WILL BE IN THE TRASH.
SEND ME $25 OR I'LL TELL EVERYONE ON YOUR SOCIAL NETWORK THAT YOU WERE STUPID ENOUGH TO BUY AN INTERNET-CONNECTED BROOM!
You can help us keep the comics coming by becoming a patron! www.patreon/joyoftech
joyoftech.com



Why Light Bulbs May Be the Next Hacker Target

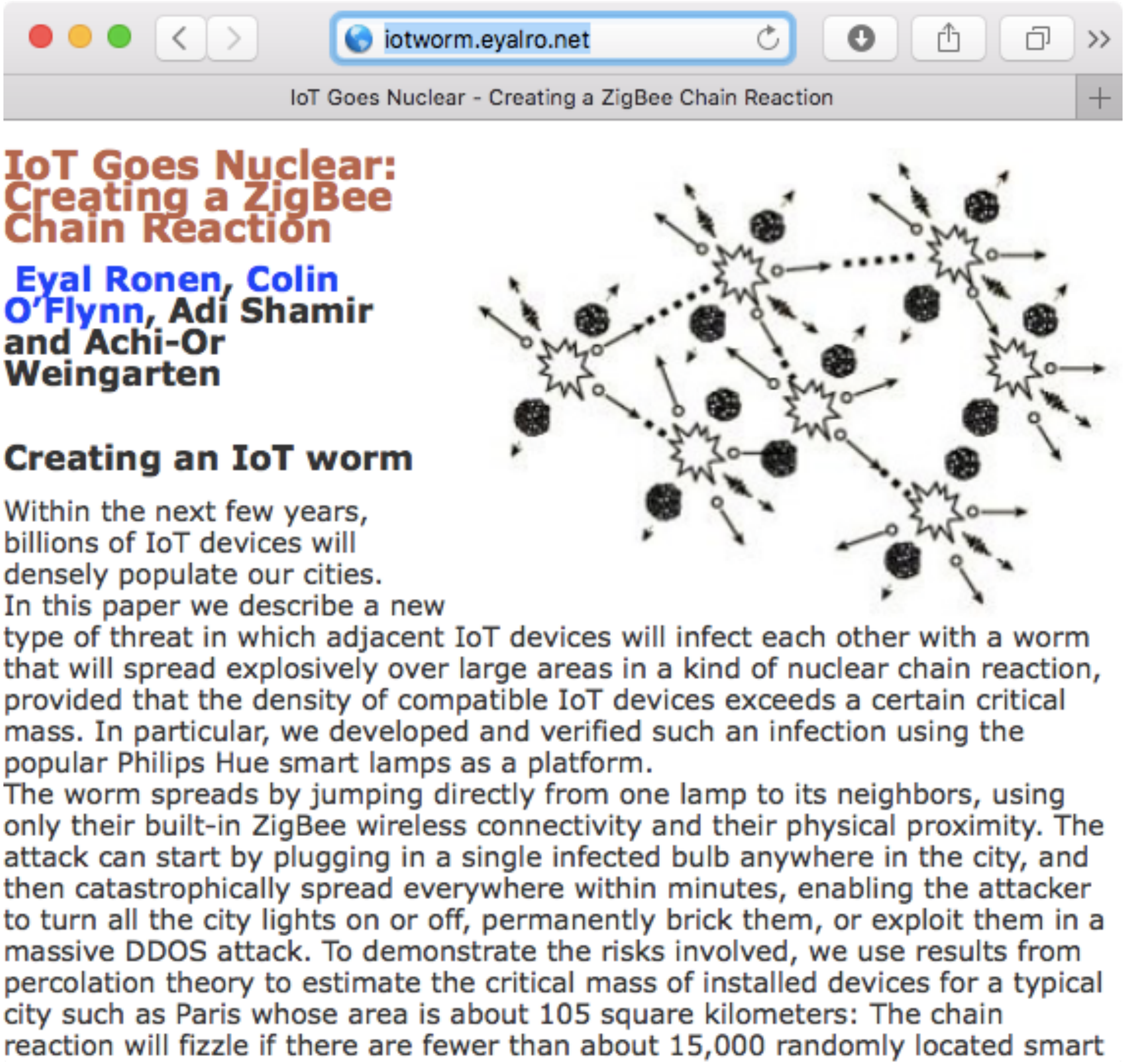
By JOHN MARKOFF NOV. 3, 2016

Researchers report in a paper to be made public on Thursday that they have uncovered a flaw in a wireless technology that is often included in smart home devices like lights, switches, locks, thermostats and many of the components of the much-ballyhooed "smart home" of the future.

The researchers focused on the Philips Hue smart light bulb and found that the wireless flaw could allow hackers to take control of the light bulbs, according to researchers at the Weizmann Institute of Science near Tel Aviv and Dalhousie University in Halifax, Canada.

That may not sound like a big deal. But imagine thousands or even hundreds of thousands of internet-connected devices in close proximity. Malware created by hackers could be spread like a pathogen among the devices by compromising just one of them.

http://www.nytimes.com/2016/11/03/technology/why-light-bulbs-may-be-the-next-hacker-target.html?_r=1



IoT Goes Nuclear: Creating a ZigBee Chain Reaction

Eyal Ronen, Colin O'Flynn, Adi Shamir and Achi-Or Weingarten

Creating an IoT worm

Within the next few years, billions of IoT devices will densely populate our cities.
In this paper we describe a new type of threat in which adjacent IoT devices will infect each other with a worm that will spread explosively over large areas in a kind of nuclear chain reaction, provided that the density of compatible IoT devices exceeds a certain critical mass. In particular, we developed and verified such an infection using the popular Philips Hue smart lamps as a platform.
The worm spreads by jumping directly from one lamp to its neighbors, using only their built-in ZigBee wireless connectivity and their physical proximity. The attack can start by plugging in a single infected bulb anywhere in the city, and then catastrophically spread everywhere within minutes, enabling the attacker to turn all the city lights on or off, permanently brick them, or exploit them in a massive DDOS attack. To demonstrate the risks involved, we use results from percolation theory to estimate the critical mass of installed devices for a typical city such as Paris whose area is about 105 square kilometers: The chain reaction will fizzle if there are fewer than about 15,000 randomly located smart

http://iotworm.eyalro.net

Desafios

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Como melhorar o cenário

- **Solução depende de diversas camadas**
  - usuários
  - desenvolvedores
  - administradores
  - fabricantes

Usuários

- **Antes de comprar**
  - ser criterioso ao escolher o fabricante
    - verificar se possui política de atualização de *firmware*
    - verificar histórico de tratamento de vulnerabilidades
- **Assumir que os dispositivos virão com sérios problemas**
  - mantê-los atualizados
  - desabilitar o acesso remoto se não for necessário
  - alterar as senhas padrão
  - desabilitar serviços desnecessários (*hardening*)

Desenvolvedores

- **Não usar protocolos obsoletos**
- **Usar criptografia e autenticação forte**
- **Não ter senha do dia, senha padrão não documentada, *reset* de configuração via rede, etc**
- ***Defaults* seguros**
- **Atualização**
  - precisa ser possível
  - necessário prever algum mecanismo de autenticação
- **Usar práticas de desenvolvimento seguro**

Desenvolvedores OWASP Top 10

Applications - 2013		*IOT - 2014*
1	*Injection*	*Insecure Web Interface*
2	*Broken Authentication and Session Management*	*Insufficient Authentication/Authorization*
3	*Cross-Site Scripting (XSS)*	*Insecure Network Services*
4	*Insecure Direct Object References*	*Lack of Transport Encryption/Integrity Verification*
5	*Security Misconfiguration*	*Privacy Concerns*
6	*Sensitive Data Exposure*	*Insecure Cloud Interface*
7	*Missing Function Level Access Control*	*Insecure Mobile Interface*
8	*Cross-Site Request Forgery (CSRF)*	*Insufficient Security Configurability*
9	*Using Components with Known Vulnerabilities*	*Insecure Software/Firmware*
10	*Unvalidated Redirects and Forwards*	*Poor Physical Security*

https://www.owasp.org/index.php/Category:OWASP_Top_Ten_Project
https://www.owasp.org/images/7/71/Internet_of_Things_Top_Ten_2014-OWASP.pdf

Administradores

- **Implementar boas práticas:**
  - BCP38/BCP84
  - filtrar pacotes com endereços “*spoofados*”
  - http://bcp.nic.br/entenda-o-antispoofing/
- **Manter os equipamentos atualizados**
  - sistema operacional e todos os serviços nele executados
  - serviço Web, SGBD, extensões, módulos e *plugins*
- **Desabilitar serviços desnecessários**
- **Ser cuidadoso ao usar e elaborar senhas**
  - se disponível, usar verificação em duas etapas

Fabricantes

- **Segurança deve ser nativa**
  - não deve ser opcional
  - requisitos de segurança devem ser considerados desde o projeto
- **Deve ser incluída na análise de risco das empresas**
  - danos à imagem
  - danos aos usuários
- **Como implementar segurança em larga escala**
- **Um equipamento ➔ diversos fabricantes**
  - recall????
  - Xiongmai Botnet
- **Ter grupo de resposta a incidentes preparado para lidar com os problemas**

Obrigada

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08 de novembro de 2016

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