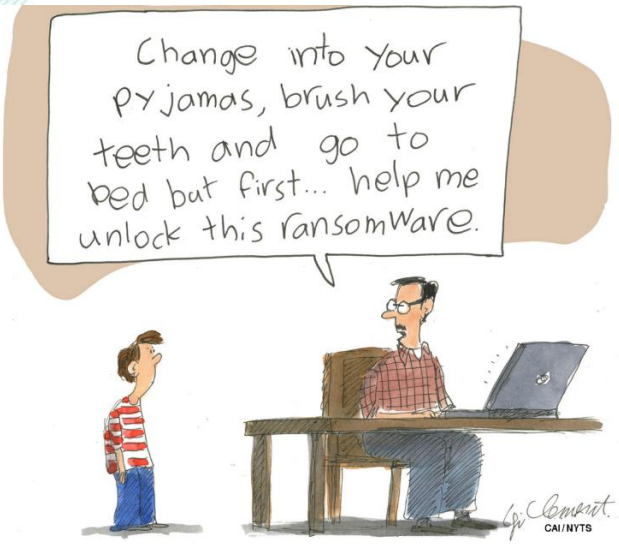
Ensure Your Home Network Device is not the Next Botnet

Bernard Kan
Senior Consultant
HKCERT

Agenda

- About HKCERT
- HKCERT Security Incident Report
- Potential Trend in 2018
- IoT Attacks
- Guideline for Selecting Smart Devices



Hong Kong Computer Emergency Response Team Coordination Centre

HKCERT

香港電腦保安事故協調中心

- Established in 2001
- Funded by the HKSAR Government
- Operated by **Hong Kong Productivity Council (香港生產力促進局)**

- Mission
  - –As the coordination of local cyber security incidents, serving Internet Users and SMEs in Hong Kong
  - –As the Point of Contact of cyber security incidents across the border

HKCERT Services

- Incident Report

24-hr Hotline: 8105-6060

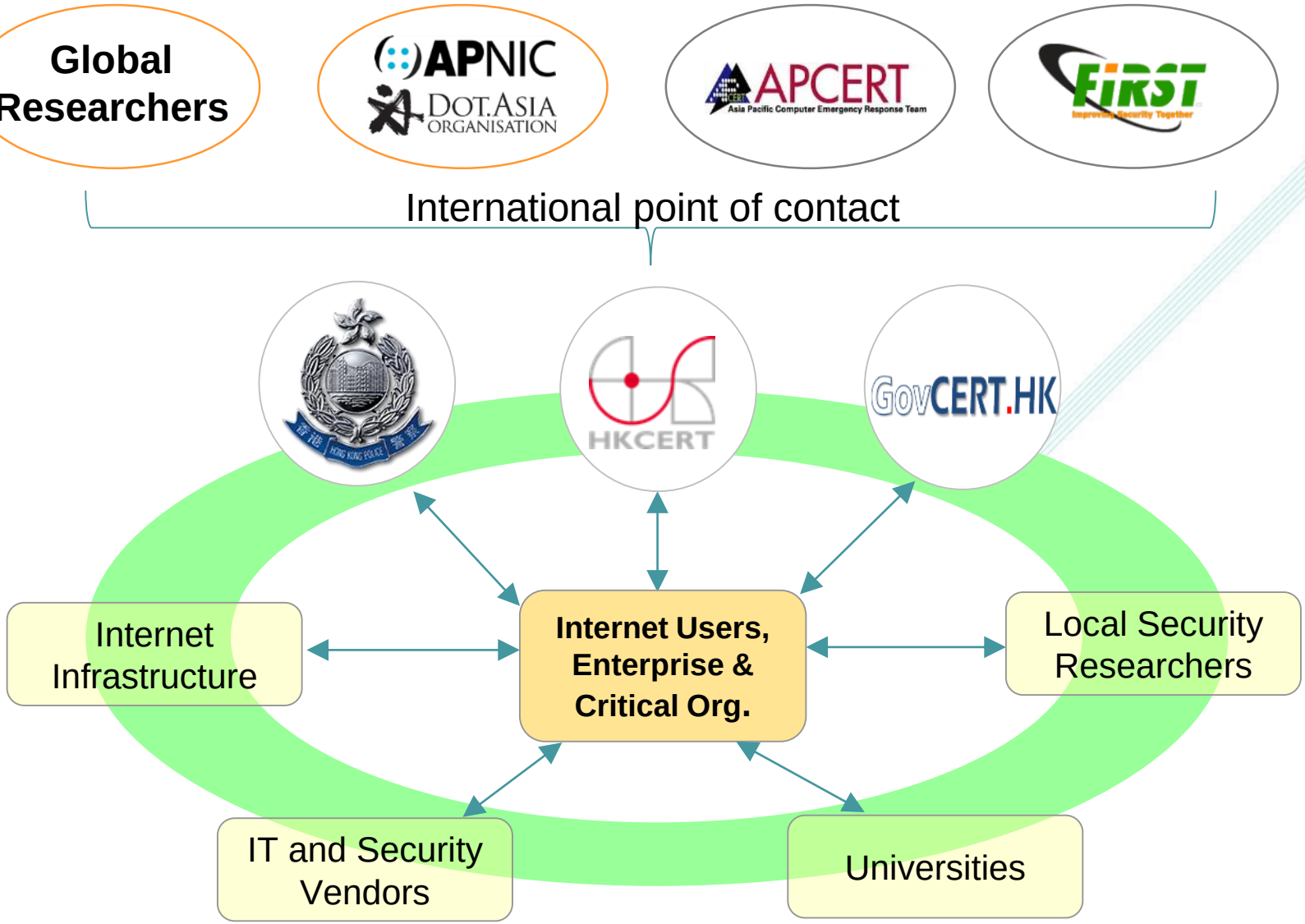
- Security Watch and Warning

Free subscription

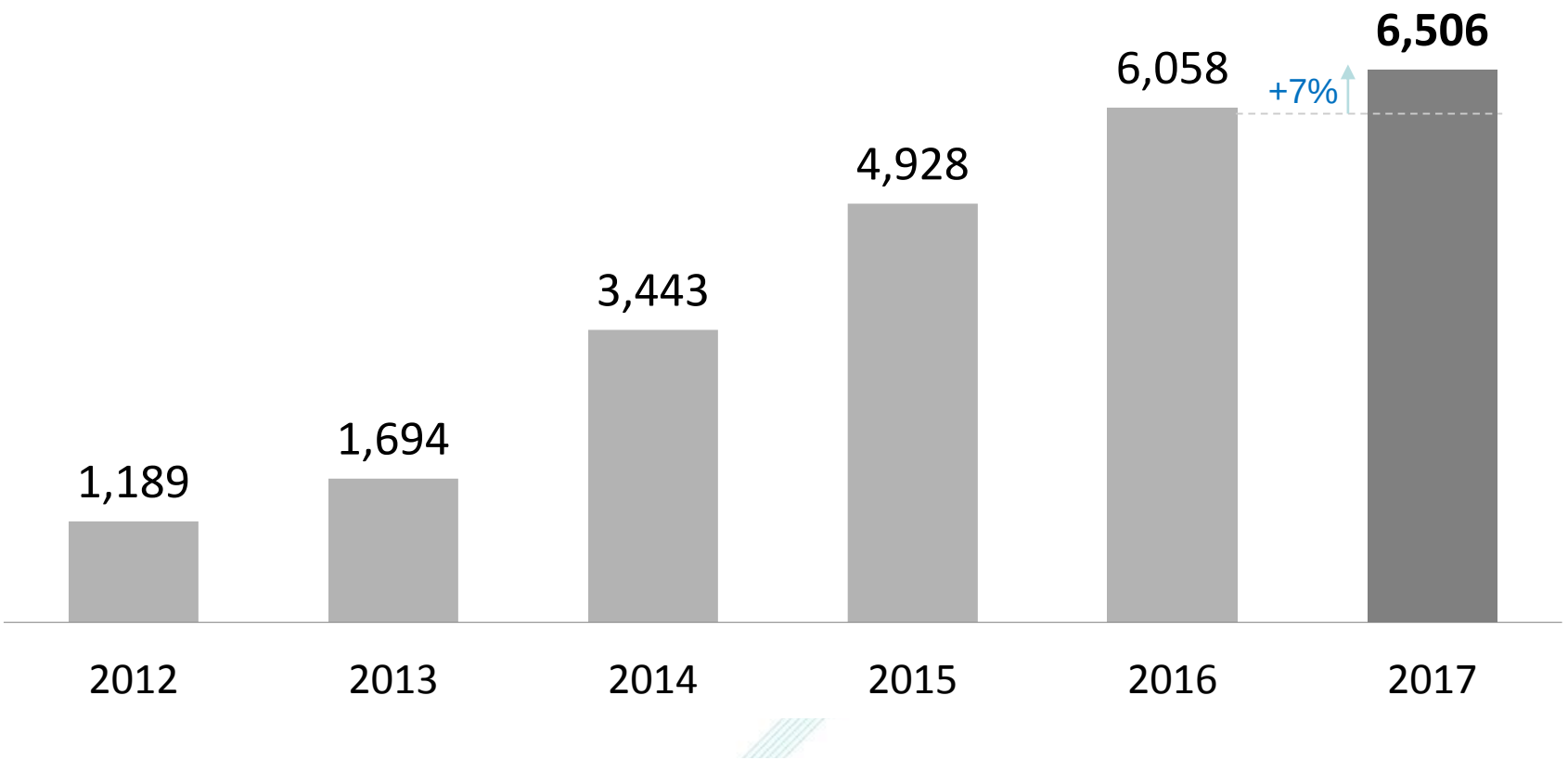
- Cross-border collaboration

- Awareness education and guideline

As the Coordination Centre



HKCERT Security Incident Reports
保安事故報告



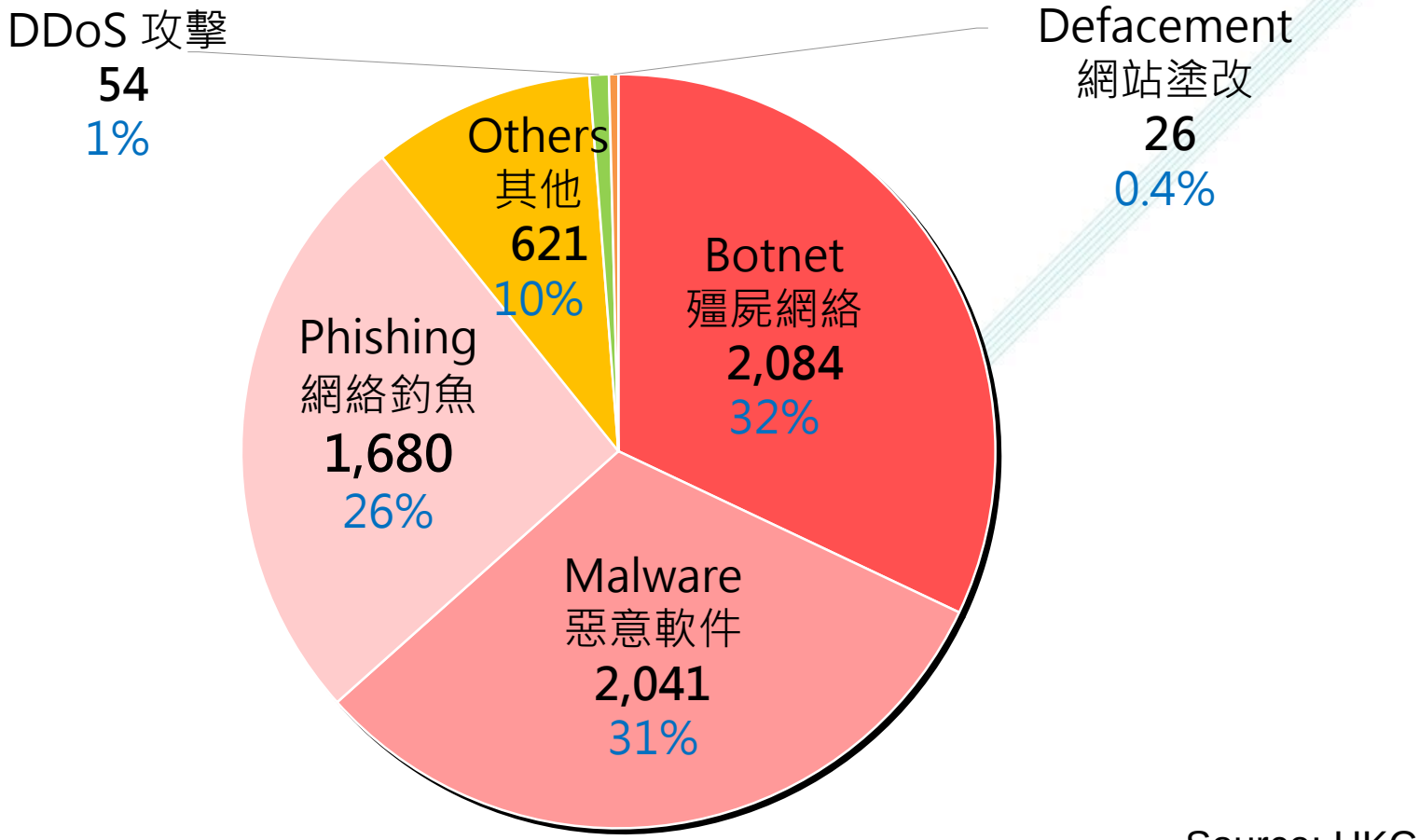
Referral cases with global collaboration accounted for **91%** of cases

與全球資訊保安機構合作, 2017年 **91%** 個案屬於轉介個案。

Source: HKCERT

HKCERT Incident Reports in 2017 by Type

Total : 6,506 (↑7%)



Source: HKCERT

Potential Trends in 2018

1. **Financially Motivated Cyber Crimes** continue to proliferate
   以榨取金錢為目標的網絡攻擊持續上升
2. **Internet of Things (IoT) attacks** on the Rise
   物聯網攻擊上升
3. **Mobile Payment Apps** as New Attack Targets
   流動付款程式或成為攻擊對象
4. **More Regulation** for Security and Privacy
   更多有關網絡安全和隱私的規管
5. **Supply Chain Attacks** bypass Enterprise Defense
   供應鏈攻擊繞過企業的防禦

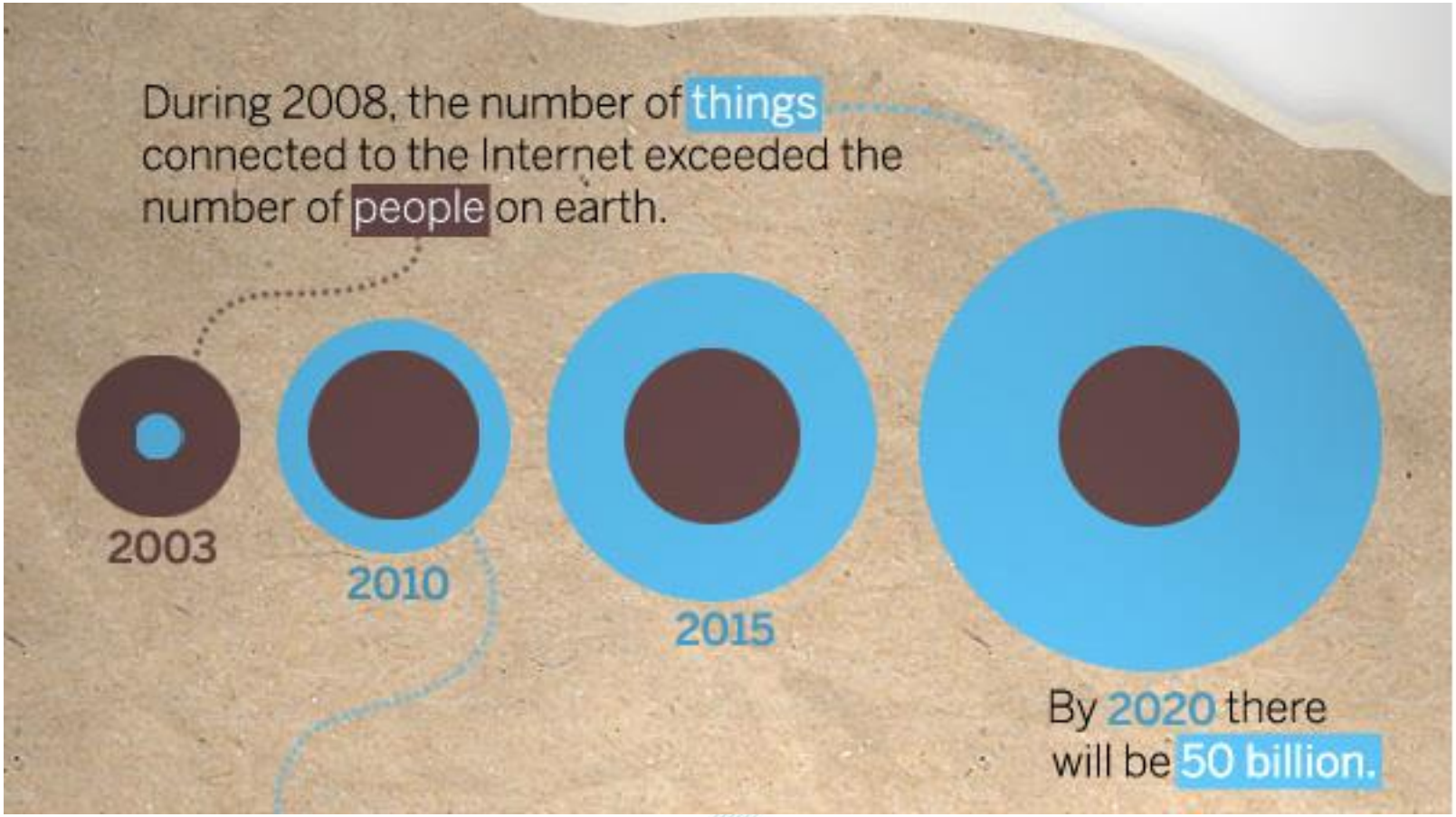
What is Internet of Things (IoT)?

- A network of physical objects that contain embedded tech to communicate, sense, and interact with internal states or external environment (Gartner)

- “Uniquely identifiable objects (things) and their virtual representations in an Internet-like structure.” (Wikipedia)

- More general, the Internet of Things as non-traditional personal computing devices connected to the Internet either directly or indirectly.

“Things” Connected to the Internet

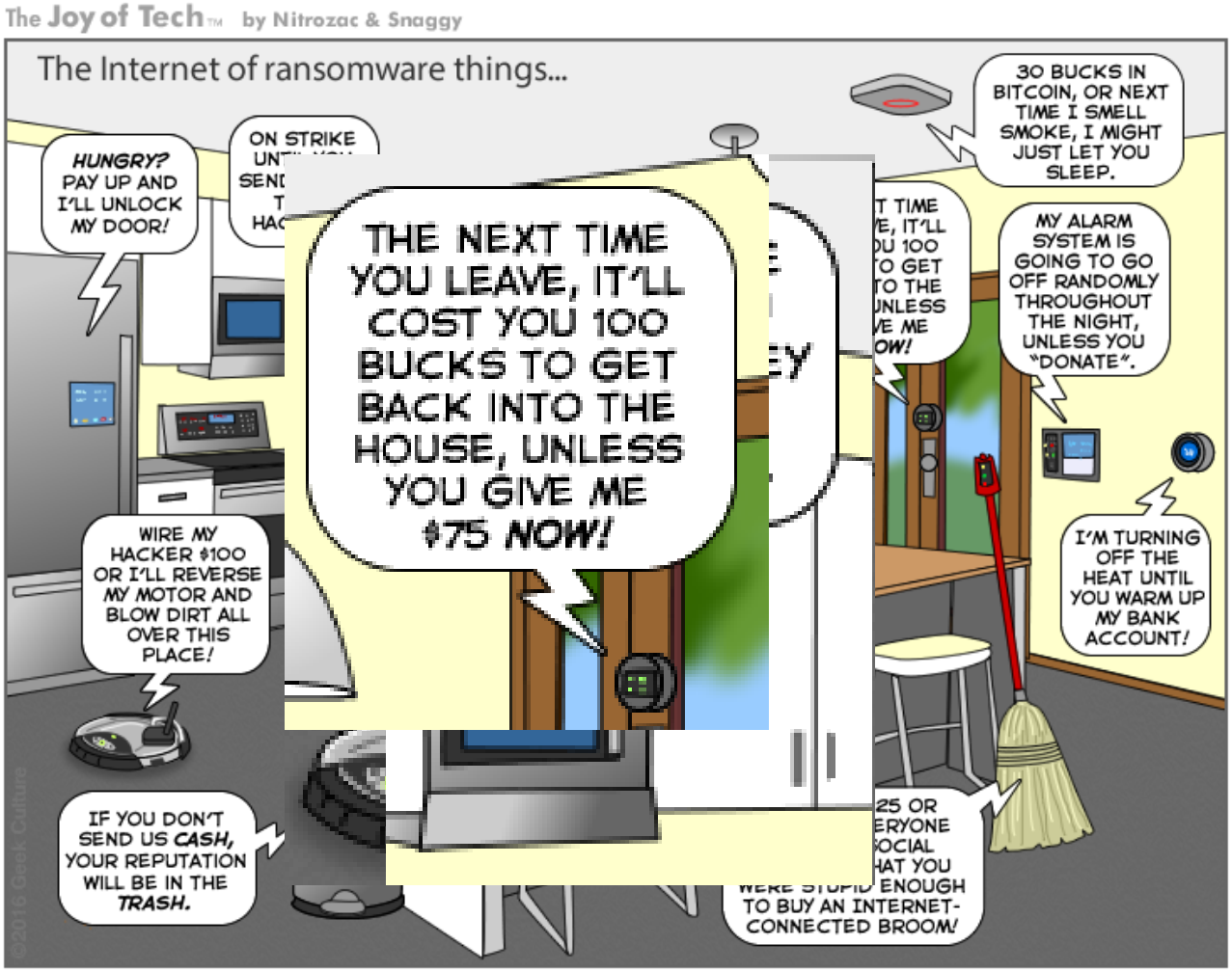


Source: CISCO

Do I have IoT devices at home?

What Can Go Wrong with IoT?

What happen if IoTs were infected by ransomwares?



What Can Go Wrong with IoT?

Prying webcams used by artist to capture unsuspecting Hongkongers in controversial UK exhibition

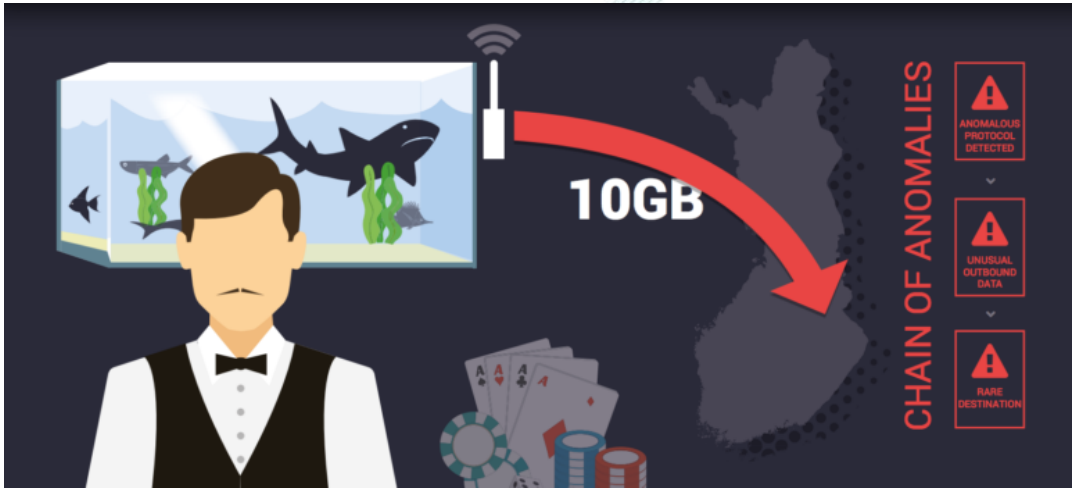
Privacy experts have criticised a London artist for unfairly accessing peoples' personal data after home devices were used without consent to collect images from inside homes

PUBLISHED : Tuesday, 16 August, 2016, 2:03am
UPDATED : Wednesday, 17 August, 2016, 7:48pm

COMMENTS: 3

What Can Go Wrong with IoT?

What Can Go Wrong with IoT?



Mirai Botnet

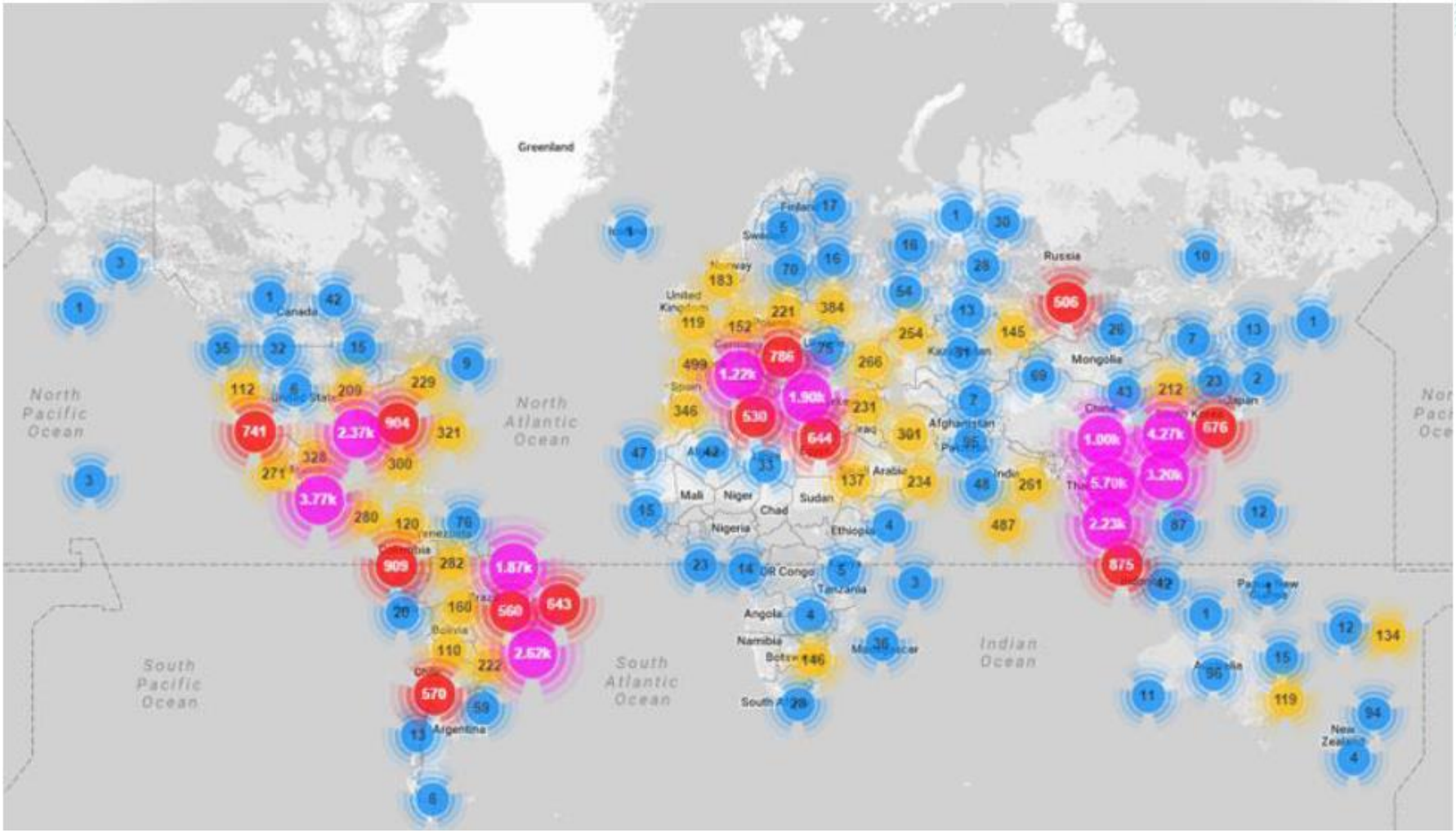
- Mirai is a piece of malware designed to launch multiple types of DDoS attacks
- The malware scans the internet for telnet servers then attempts to log in and infect them using a list of hard-coded passwords (most of which correspond to internet connected CCTV systems and routers)
- A botnets using the Mirai malware was responsible for the largest DDoS attack ever recorded, which peaked at 1.1 Tbps
- It exploits well-known hardcoded login credentials in IoT devices
- It uses segmented command-and-control which allows the botnet to launch simultaneous DDoS attacks against multiple, unrelated targets

Mirai Botnet

USER:	PASS:
root	xc3511
root	vizxv
root	admin
admin	admin
root	888888
root	xmhdipc
root	default
root	juantech
root	123456
root	54321
support	support
root	(none)
admin	password
root	root
root	12345
user	user
admin	(none)
root	pass
admin	admin1234
root	1111
admin	smcadmin
admin	1111
root	666666
root	password
root	1234
root	klv123
Administrator	admin
service	service
supervisor	supervisor
guest	guest
guest	12345
guest	12345

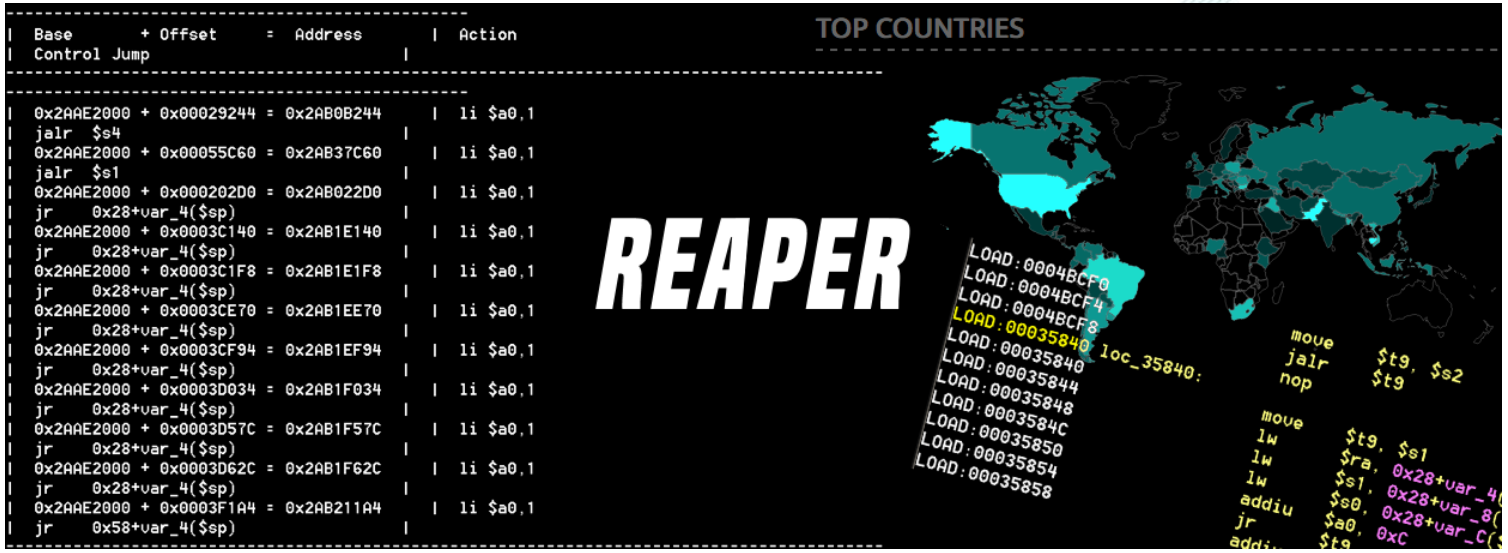
USER:	PASS:
admin1	password
administrator	1234
666666	666666
888888	888888
ubnt	ubnt
root	klv1234
root	Zte521
root	hi3518
root	jvbzd
root	anko
root	zlxx.
root	7ujMko0vizxv
root	7ujMko0admin
root	system
root	ikwb
root	dreambox
root	user
root	realtek
root	00000000
admin	1111111
admin	1234
admin	12345
admin	54321
admin	123456
admin	7ujMko0admin
admin	1234
admin	pass
admin	meinsm
tech	tech
mother	fucker

Geo-Locations of Mirai infected IoT Devices



The Reaper Botnet

- A new Botnet relying on more sophisticated takeover techniques
  - Spreads via nine different IoT vulnerabilities
- At least partially based on Mirai code
- Reports of up to 3.5 million infected devices
- Currently dormant: intention unknown
- Reaper includes an update mechanism



VPNFilter: New Router Malware with Destructive Capabilities

Image courtesy: Talos

Security research group Talos has released a report on a potentially destructive malware called "VPNFilter", which has infected at least 500,000 home routers and network-attached storage (NAS) devices in at least 54 countries [1].
According to the report, here are the known devices affected by the malware (updated on 2018-06-07):

- **ASUS:** RT-AC66U, RT-N10, RT-N10E, RT-N10U, RT-N56U, RT-N66U
- **D-LINK:** DES-1210-08P, DIR-300, DIR-300A, DSR-250N, DSR-500N, DSR-1000, DSR-1000N
- **HUAWEI**: HG8245
- **Linksys:** E1200, E2500, E3000, E3200, E4200, RV082, WRVS4400N [patch information]
- **MIKROTIK:** CCR1009, CCR1016, CCR1036, CCR1072, CRS109, CRS112, CRS125, RB411, RB450, RB750, RB911, RB921, RB941, RB951, RB952, RB960, RB962, RB1100, RB1200, RB2011, RB3011, RB Groove, RB Omnitik, STX5 [patch information]
- **Netgear:** DG834, DGN1000, DGN2200, DGN3500, FVS318N, MBRN3000, R6400, R7000, R8000, WNR1000, WNR2000, WNR2200, WNR4000, WNDR3700, WNDR4000, WNDR4300, WNDR4300-TN, UTM50 [patch information]
- **QNAP NAS:** TS251, TS439 Pro, Other QNAP NAS devices running QTS software [patch information]
- **TP-Link:** R600VPN, TL-WR741ND, TL-WR841N [patch information]
- **UBIQUITI:** NSM2, PBE M5
- **UPVEL:** Unknown Models
- **ZTE:** ZXHN H108N

Why IoT Devices are so vulnerable?

- There’s poor or non-existent security built into the device itself
- The device is directly exposed to the Internet because of poor network segmentation
- There’s un-needed functionality left in OS based on generic and often Linux-derivative hardware & software
- Default credentials are often hard coded
- Security patches deployment is difficult

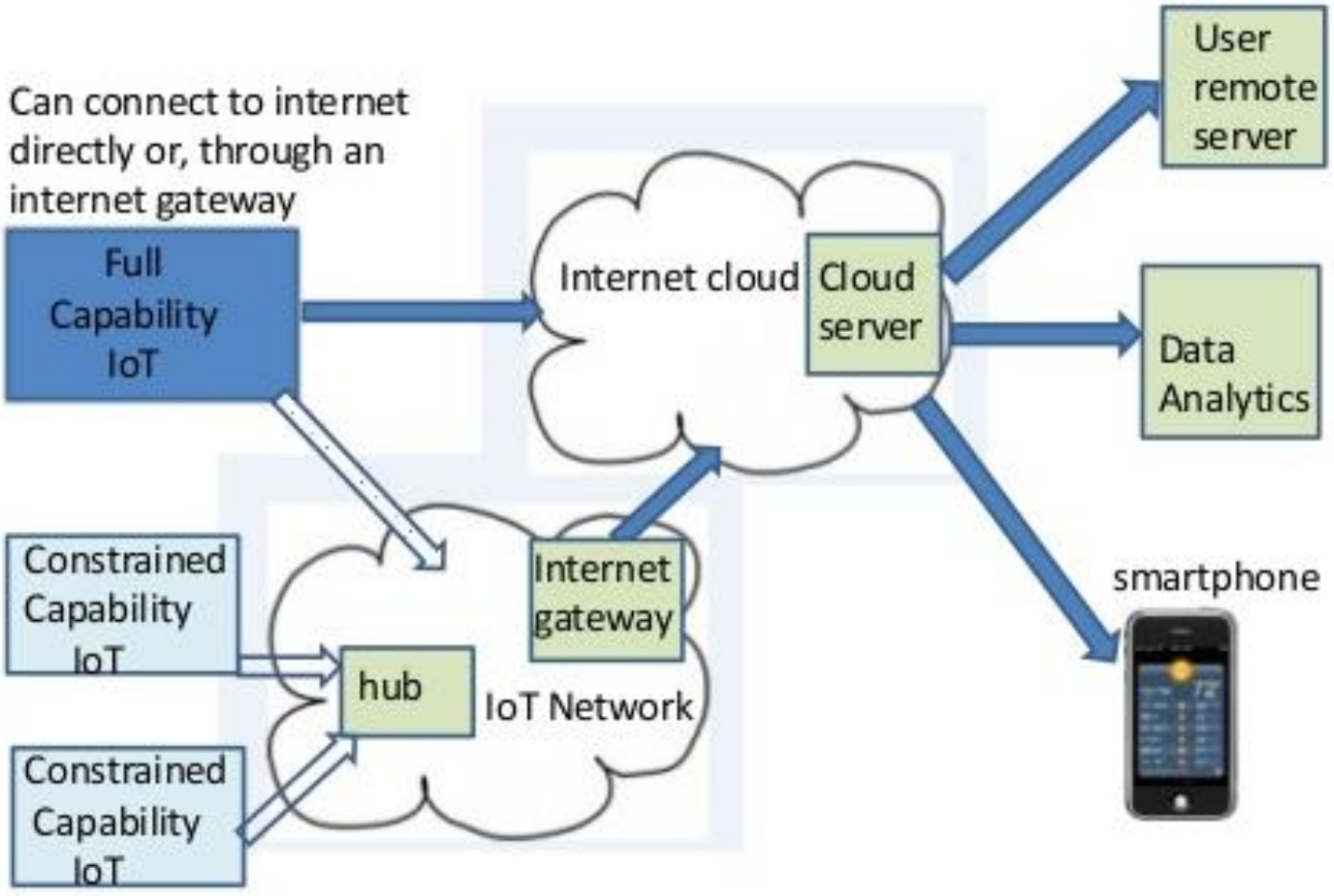
Consumers and Business - How to Protect IoTs

- Evaluate if the devices you are bringing into your network really need to be smart. It's better to treat IoT tech as hostile by default.
- Segment the network
- Change the default credentials
- Apply patches and update whenever possible

Developer Actions to Protect IoTs

- Have a red team audit the devices prior to commercial release.
- Force a credential change at the point of setup. (i.e., Devices will not work unless the default credentials are modified.)
- Require https if there's web access
- Remove unneeded functionality
- Provide mechanism for product update
- Security by design

A Simplified IoT Architecture



IoT Components Attack Surface

Components	Attack Surface
Devices (Sensors, Gateways)	Device memory, firmware, physical interfaces like USB ports, web interfaces, admin interfaces, Update Mechanism
Communication Channel	Device Network traffic using LAN, Wireless (Wi-Fi, ZigBee, Bluetooth)
Cloud Interface	Getting access to sensitive data/PII stored on cloud by Injection attacks, weak passwords or default credentials, Insecure Transport encryption.
Application Interface (Web and mobile)	Getting access to sensitive data or PII by exploiting vulnerabilities like OWASP web and mobile Top 10, in application interfaces.

Buying and installing tips for Smart Devices

To select the product, you need to:

- Understand the brand's credit
- Understand the product issues and handling methods of vendor in the past two years
- Understand the frequency of firmware update provided by the vendor
- Whether the product has an official verification
- Make sure the network connection is using encryption
- You can download the user manual to find out if enough security controls are provided
- Make sure the management interface is using encryption
- The device is easy to update the firmware
- The device is easy to install

HKCERT guideline URL: https://www.hkcert.org/my_url/en/blog/17091801

Buying and installing tips for Smart Devices (Cont')

Regarding device installation you should:

- Install in internal network, not connecting the internet directly
- Separate trusted and untrusted network. If possible establish an additional separate network for smart devices
- Disable the Universal Plug and Play (UPnP) function on the router
- Keep the firmware up-to-date, check at least twice a year whether the manufacturer's website has new firmware updates
- Use a strong password and change it regularly. If possible use one password for one device
- Management interface should not open directly on the Internet. Only open necessary service
- If the device is not necessarily connected to the cloud, please disable it. Enable cloud connection will increase security risk
- When internet service is not in use (such as SmartTV), unplug the network connection
- Use the search engine (such as Google) regularly. Try to enter the equipment brand name and model to search if there are any security issues.

HKCERT guideline URL: https://www.hkcert.org/my_url/en/blog/17091801

Summary

- Internet of Things (IoT) attacks are expected to rise as number of IoT devices continue to grow in coming years
- Securing IoT devices may be difficult due to constraints of hardware & software
- Consumers and business need to consider their real needs in selecting IoT devices and secure the devices as far as possible
- IoT developers and manufacturers need to adopt a security by design approach
- Consumers need to take extra care to ensure that the device is secure and will be not compromised by hackers

Q&A

HKCERT Hotline: 81056060

www.hkcert.org