ISP and Cyber Security

SC Leung
Senior Consultant
CISSP CISA CBCP

Who am I?

- Senior Consultant
  - @HKCERT since 2001
  - International and local liaison, strategic planning, supervision of CERT operation
- Previous industrial experiences
  - ISP, Telecommunication
  - Multinational Banking
  - Outsourcing Consultancy
  - Software distributor

SC Leung

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Agenda

- Major threats & problems we face today
- How these problems affect you?
- What HKCERT is doing to solve them?
- How you can get involved in solving the problems?

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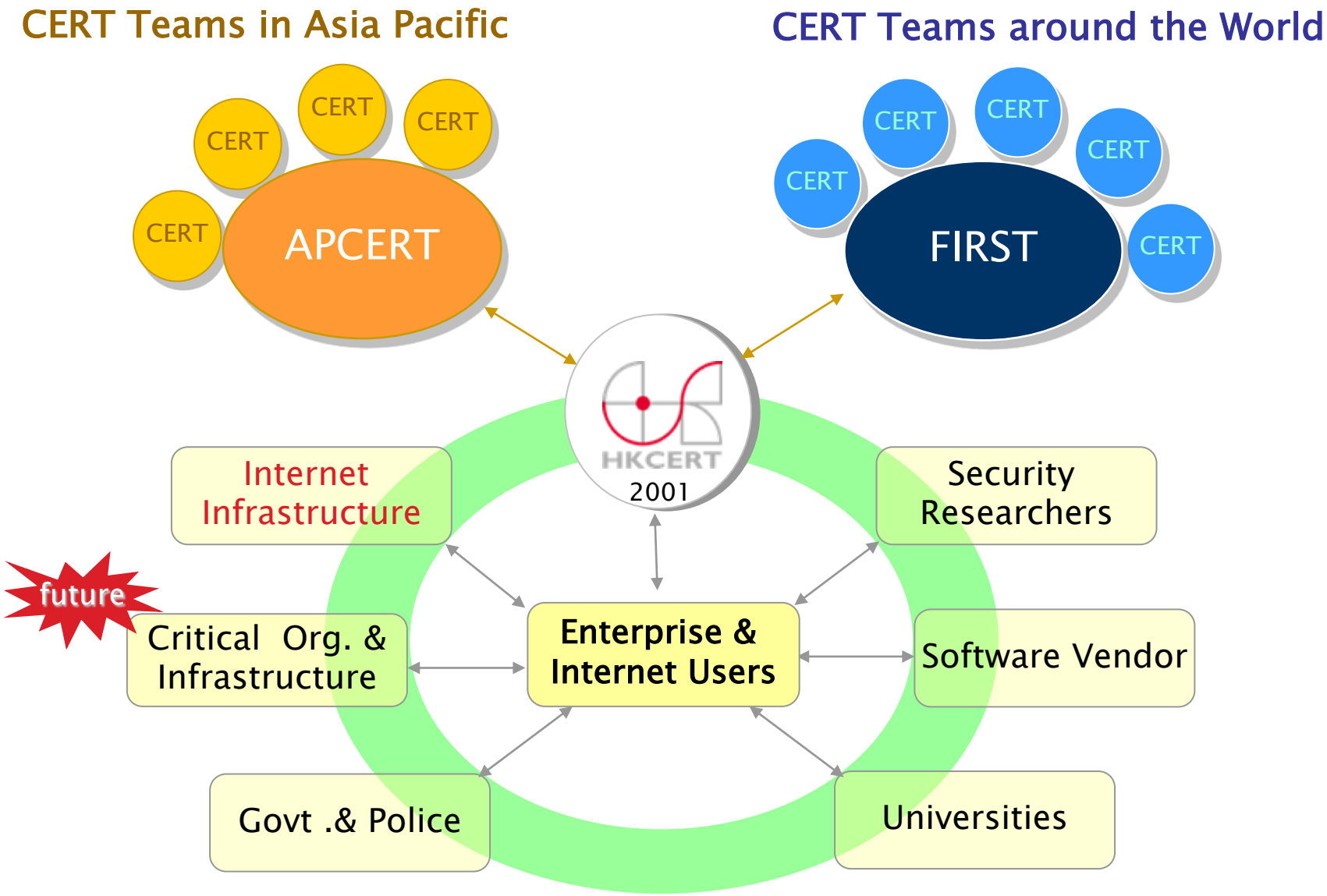
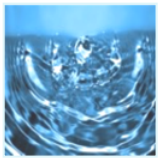
HKCERT as a Coordination Centre



Services



- Incident Response
  24-hour Hotline: 8105-6060

- Cross Border Coordination

- Early Warning and Advices

- Awareness Education

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Security Status of Hong Kong

HKCERT Statistics

Incentive for hackers to pick on Hong Kong

- Economy with Fastest Average Internet Speed

	Country/Region	Q2 '13 Peak Mbps	QoQ Change	YoY Change
1	Hong Kong	65.1	-0.9%	32%
2	South Korea	53.3	19%	14%
3	Japan	48.8	3.1%	21%
4	Romania	47.5	-0.6%	23%
5	Singapore	45.6	4.1%	61%
6	Latvia	44.6	5.4%	33%
7	Switzerland	41.4	3.9%	38%
8	Israel	40.1	6.4%	53%
9	Belgium	39.9	8.1%	35%
10	Taiwan	39.5	22%	61%

Source: Akamai Report (2013-Aug)

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Incentive for hackers to pick on Hong Kong

- Highest Attack Traffic
  - In 2013 Q1, Hong Kong was at 10th position (1.6%)

	Country	Q2 '13 % Traffic	Q1 '13 %
1	Indonesia	38%	21%
2	China	33%	34%
3	United States	6.9%	8.3%
4	Taiwan	2.5%	2.5%
5	Turkey	2.4%	4.5%
6	India	2.0%	2.6%
7	Russia	1.7%	2.7%
8	Brazil	1.4%	2.2%
9	Romania	1.0%	2.0%
10	South Korea	0.9%	1.4%
–	Other	11%	18%

Source: Akamai Report (2013-Aug)

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Security Incident Reports Handled

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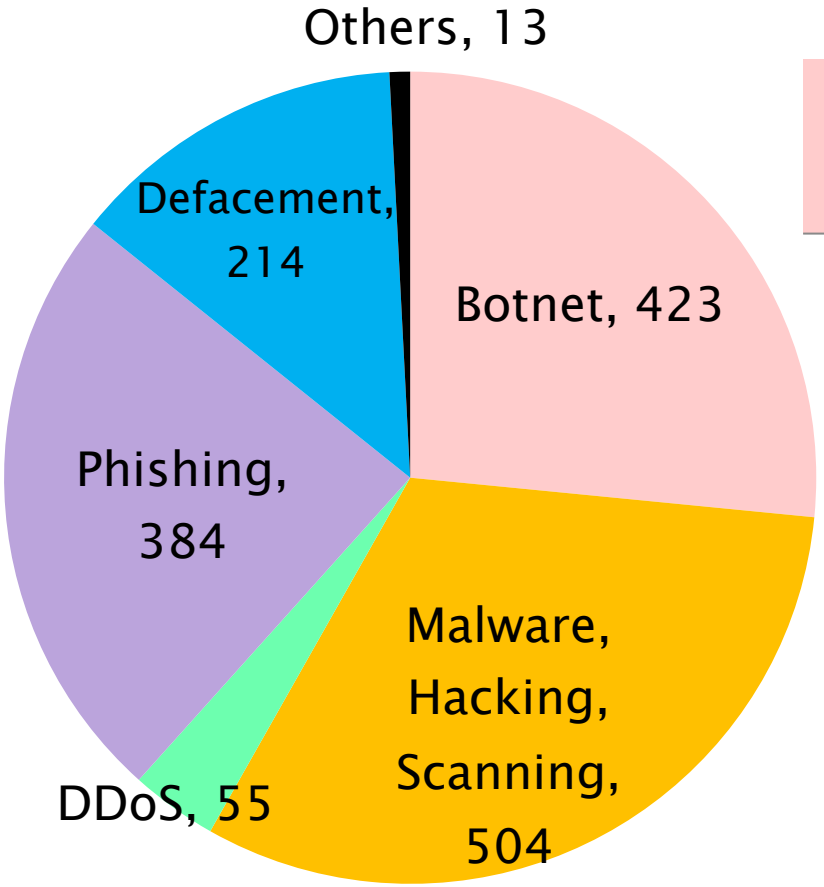
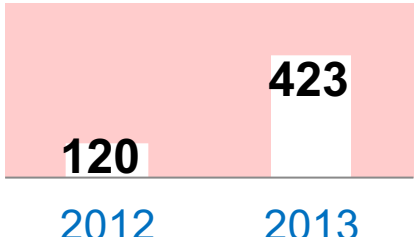
Distribution of Security Incident Reports Handled





Total: 1,593

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Invisible Bots 隱形殭屍 (Unreported compromised computers)

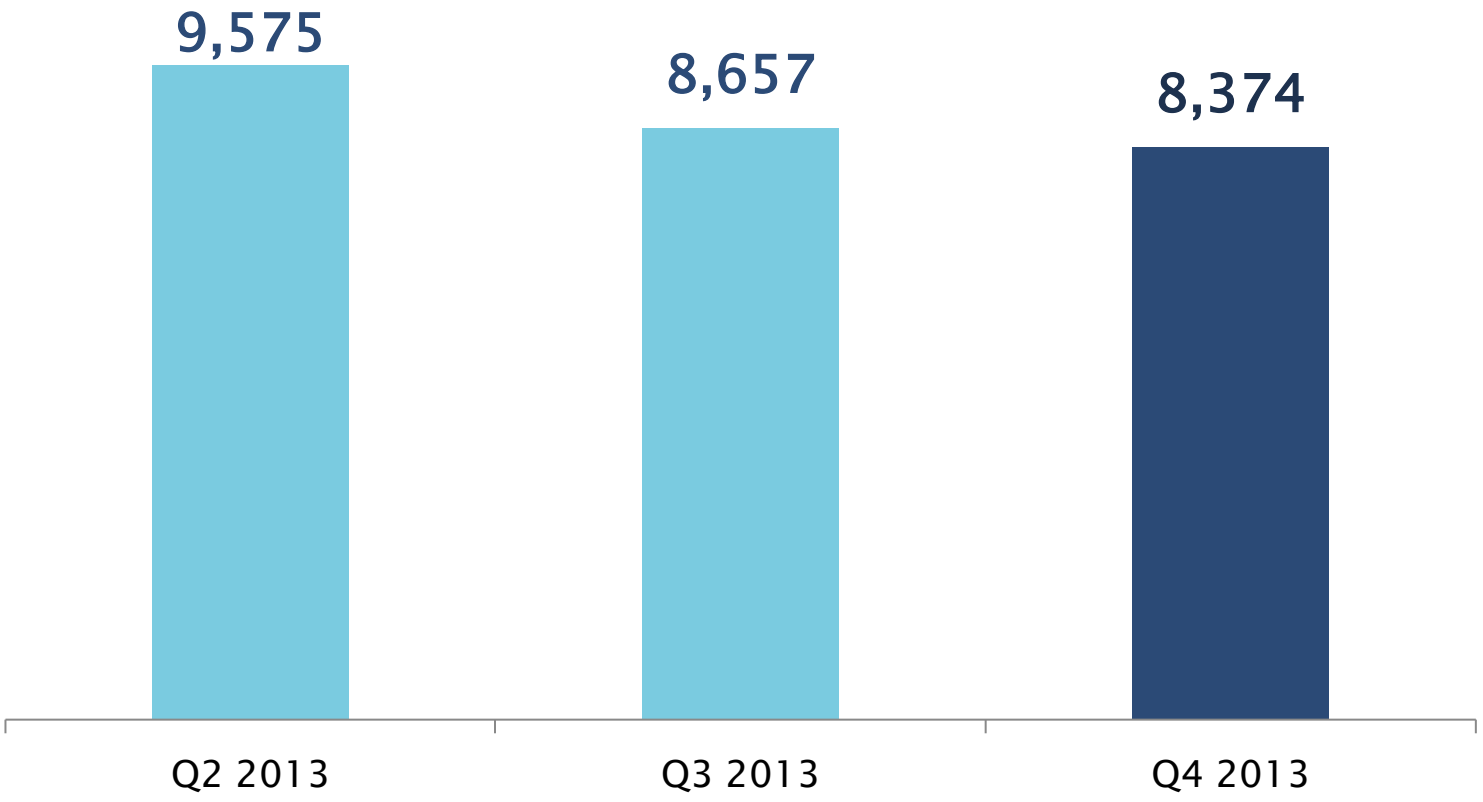
未被報告的被入侵電腦

(image created by Tom-b: http://commons.wikimedia.org/wiki/File:Botnet.svg)

Invisible Bots 隱形殭屍

Source: data collected from global security researchers

** Events not reported to HKCERT



Hacktivist and Nation State attacks

Modern Hackers

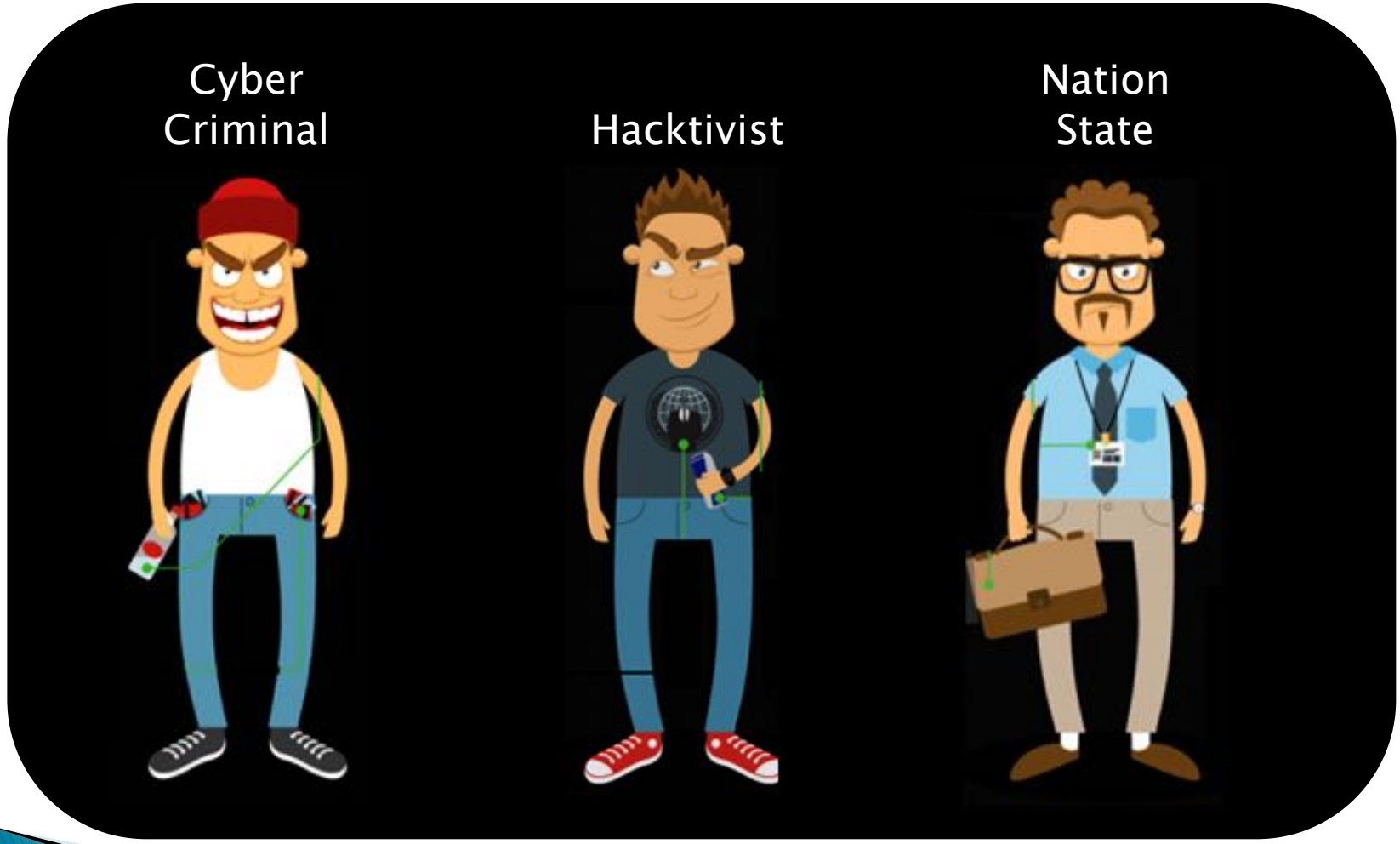


Image credits: Infographics of WatchGuard

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Modern Hackers

Cyber Criminal

- Motive: $$$
  - Underground economy
  - Crime-as-a-Service
- Botnet infrastructure
- Advanced (banking) Trojan
- Moving to mobile and cloud

Image credits: Infographics of WatchGuard

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Modern Hackers

Hacktivist

- Motive: Ideological
- High profile
- Crowdsourcing
- Data leakage → DDoS

Image credits: Infographics of WatchGuard

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Modern Hackers

- Motive: Political/Military
- Target critical infrastructure
- Advanced malware / attacks
- Low profile
- Espionage

Nation State

Image credits: Infographics of WatchGuard

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Largest DDoS attack on US Banks
since 2012-Sep

- **"Operation Ababil"** by Islam hacktivist group
- Attack sources: hundreds of hijacked web servers
  - Hacked web CMS servers with higher bandwidth (100Mbps)
- Attack traffic volume: 60-150 Gbps
  - As a reference: HKIX average throughput in 2012 = 150Gbps)

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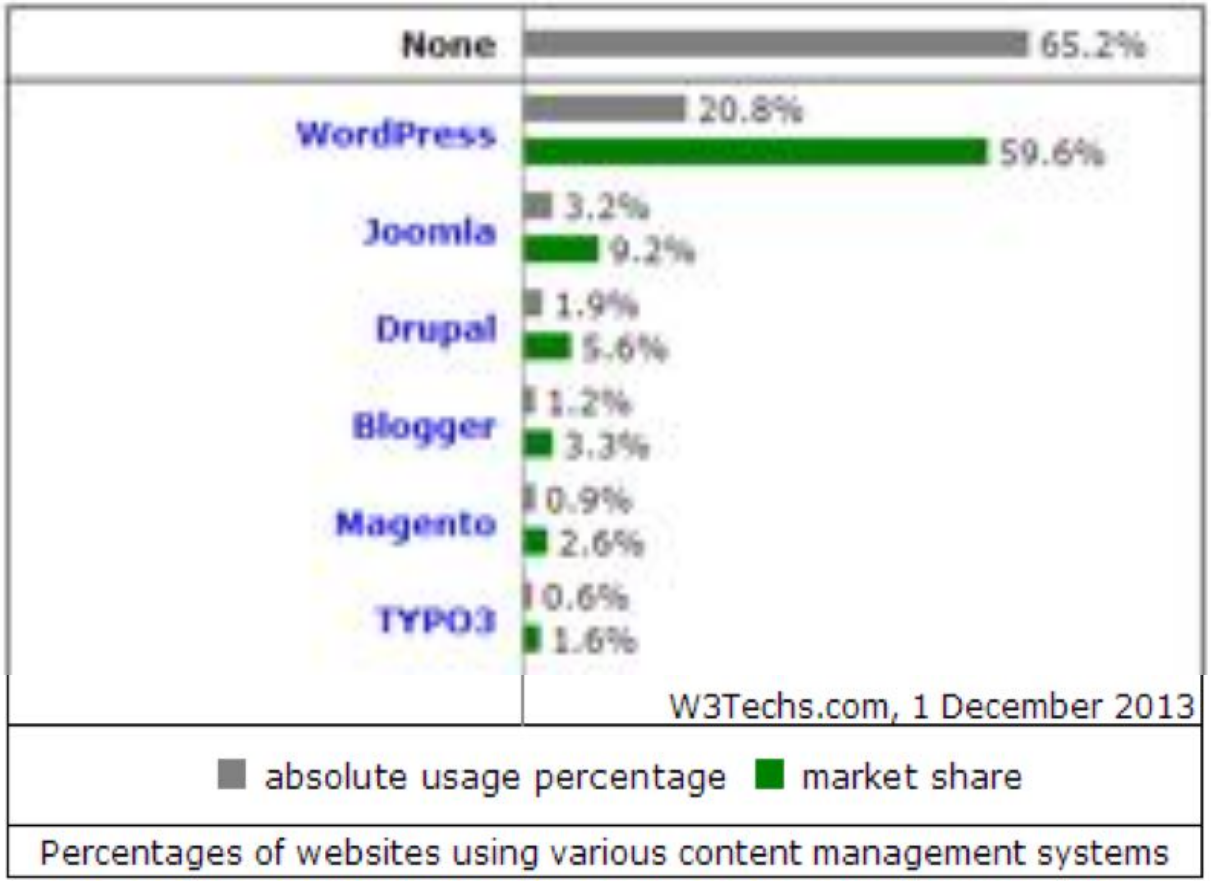
Market Share of CMS



source: W3Techs

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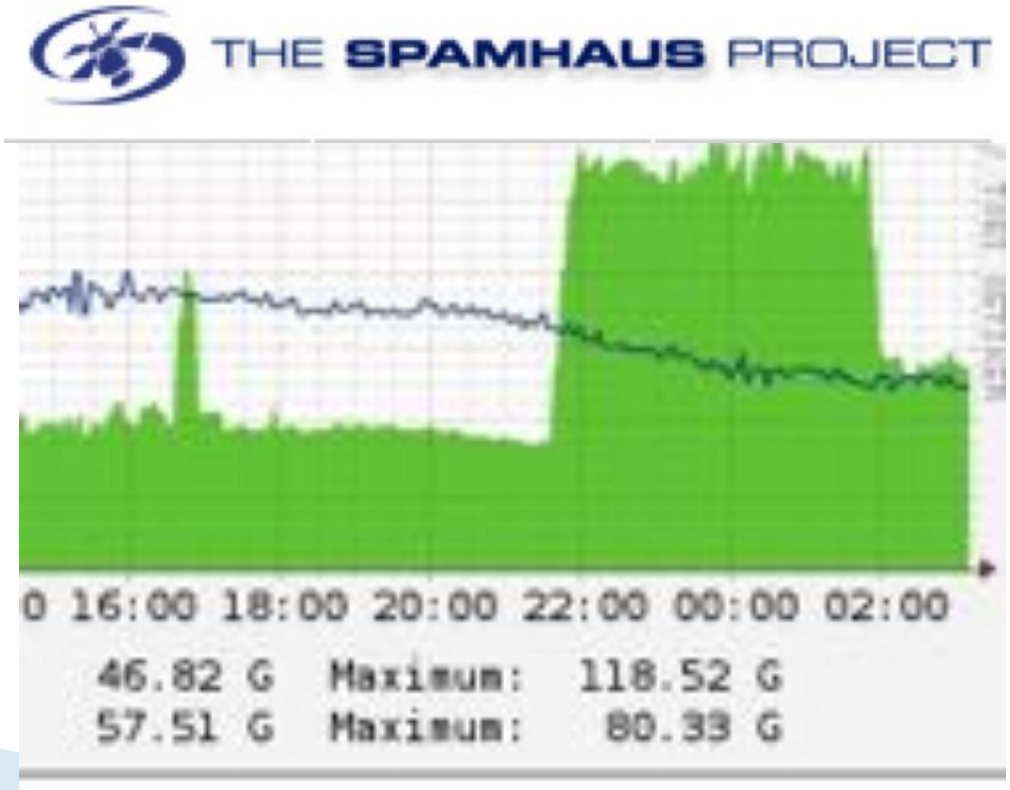
DDoS attack on Spamhaus

2013-Mar

- Attack against Spamhaus which fights spam
- Reflective amplification attack from open DNS recursive resolvers
- Traffic: 30-120Gbps



Attack arsenal – Open DNS resolvers

(2) A spoofs a DNS query by Server B
"domain.com TYPE = "ANY"
Packet size = 20 bytes

Misconfigured DNS open resolvers C

Attacker A

(1) A wants to attack B without being identified

Server B under attack

(3) Reply to query of unauthorized domain;
Amplified DNS Reply
Packet size = 1,200 bytes (60 times!)

Attack arsenal – Open DNS resolvers

Misconfigured
DNS open
resolvers

Bots

Server
under
attack

1000 bots
x 1000 servers
x 60 amplifications
= 60M amplifications
= 60M x 20 bytes
=1.2 Gbytes
= 9.6 Gbits

Nominum Study: Home routers open to exploitation

- > 24M routers have open DNS proxies exposed ISPs to DrDoS
- > 70% of total DNS traffic on a provider's network was associated with DNS amplification (2014-Jan)
- 5.3M routers used in DrDoS (2014-Feb) clogged ISP networks
- Reference:
  - http://nominum.com/news-post/24m-home-routers-expose-ddos/

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DDoS attack on CloudFlare

2014-Feb

- Traffic: > 350Gbps
- Attacker sources: Misconfigured NTP servers

- NTP (Network Time Protocol)
  - ntpd prior to version 4.2.7p26 that use the default unrestricted query configuration; other proprietary NTP implementations too

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Nature of DrDoS

- Distributed Reflective DoS attack
- Spoofed IP addresses

- Bandwidth Amplification Factor
  - DNS (UDP/57) : 20X – 100X
  - NTP (UDP/123) : 20X – 200X
  - SNMP (UDP/161,162) : 3X – 10X
  - Chargen (UDP/19) : 10X – 20X

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Routers, Set-top boxes, Webcams

- Internet exposed - weak password, default config. & vulnerability
- Lists of compromised CPE are traded in the underground
- Symantec: linux worm targeting hidden devices (2013-Nov)
  - Exploits a PHP vulnerability (CVE-2012-1823) to propagate itself
  - http://www.symantec.com/connect/blogs/linux-worm-targeting-hidden-devices

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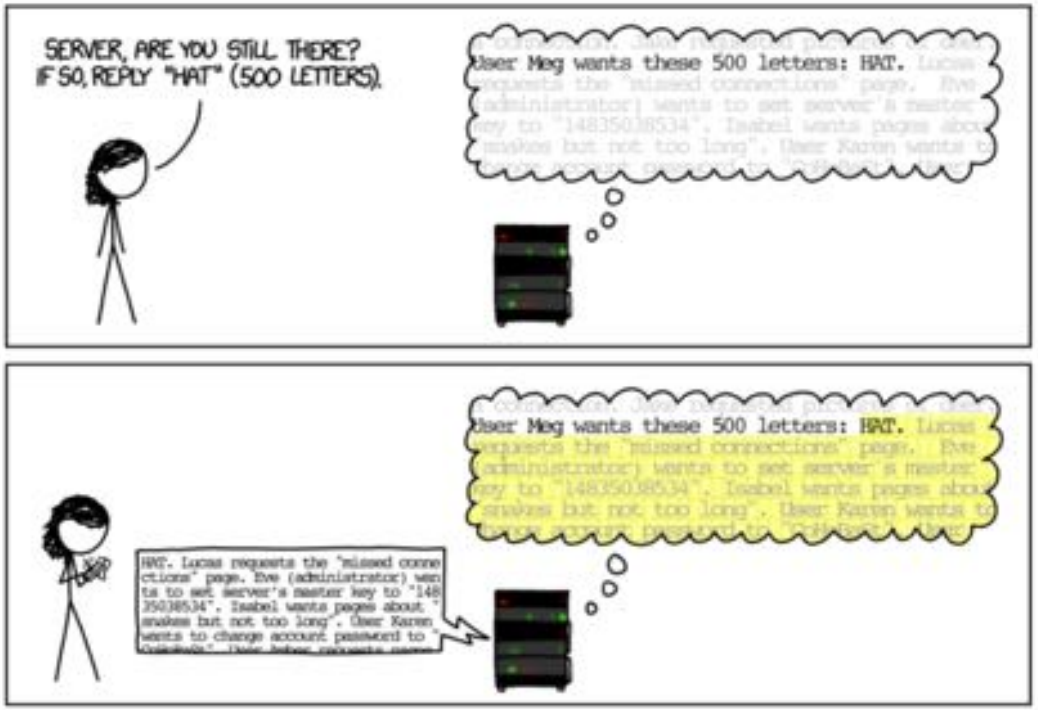
Vulnerable web servers

- OpenSSL Heartbleed vulnerability → leakage of private keys, credentials …



More info: https://www.hkcert.org/my_url/en/alert/14040802

Source: http://www.xkcd.com/1354/

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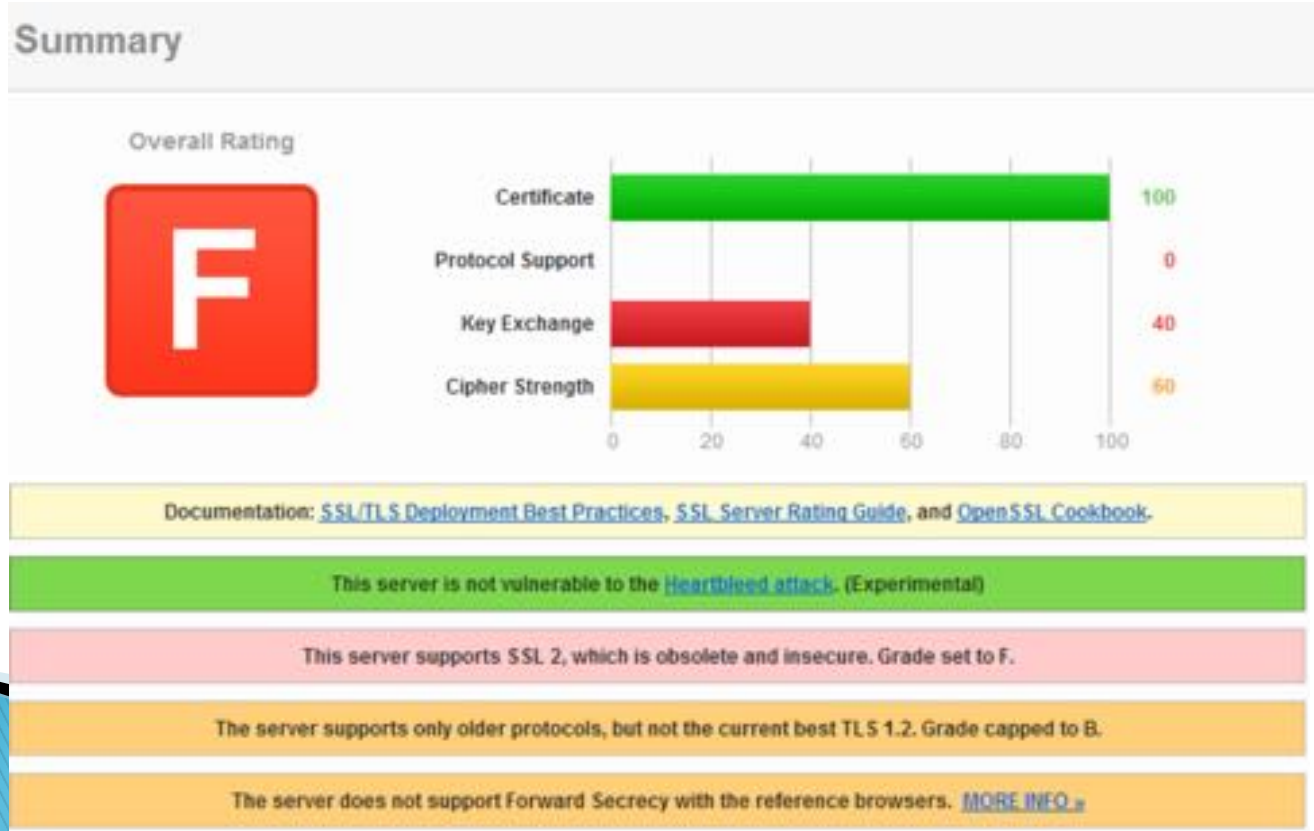
Good Guy using Bad Crypto

- SSL Server Test
  - https://www.ssllabs.com/ssltest/analyze.html
  - Many organizations uses old SSL protocol versions, weak cryptographic algorithms and 1024-bit SSL digital certificates



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Challenges

- Cross border / jurisdiction attacks by organized groups
- Critical infra, critical biz and mass media are targets
- DDoS: huge international traffic → $$$
- Undetected malware infiltrated to internal network
- Hacked computers (botnets) being used in attacks with their owners unaware → ISP blacklisted
- Vulnerable / misconfigured systems may become bots

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Mitigation Measures

Adopt ISP Best Security Practices

- RFC3013 Recommended ISP Security (Nov 2000)
  - Computer Security Incident Response Team (CSIRT)
  - Notification of vulnerabilities & Reported Incidents
  - User Policy
  - Ban IP spoofing traffic via Ingress filtering from customers; Egress filtering to customers (RFC1918, RFC2827)
  - Ban open mail relay (RFC2505)
  - …

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Harden your network

- Physical security (site and racks)

- Close all unnecessary services
- Secure network management (syslog, snmp, tftp)
- Secure remote access (ssh, vpn)
- Strong authentication

- Prevent route poisoning
  - Accepts only customer prefixes which have been assigned or allocated to their downstream customers

Coordinated Botnet Takedown

image credit: http://www.v3.co.uk

Collaborate to take down Botnets

Citadel take down (2013-Jun – now)	
C&C investigation and takedown	
Reverse engineer botnet communication	Security Researchers
Apply court order	FBI & Microsoft
Seize C&C data and evidence in USA	FBI
C&C takedown outside USA	Microsoft, CERT, ISPs
Bot Cleanup	
Sinkhole (fake C&C trap bot IP addresses)	Microsoft, DNR
Clean up local bots	Microsoft, CERT, ISPs
Provide tools to detect and clean up bot	Microsoft, security vendors

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Clean up Botnets in Hong Kong

- Works with HKCERT in joint operation with security researchers, law enforcement to take down botnet C&C and bots

- Botnet Detection and Cleanup Guideline | HKCERT
  - https://www.hkcert.org/botnet

Botnet	1st Operation	Max no. of IP addr detected (approx) by operation
ZeroAccess	2013-12	3,700
Pushdo	2013-08	490
Citadel	2013-06	720
brobot	2012-11	25
Flashback	2012-04	320
DNSChanger	2012-03	3,500
Conficker	2009-02	4,000

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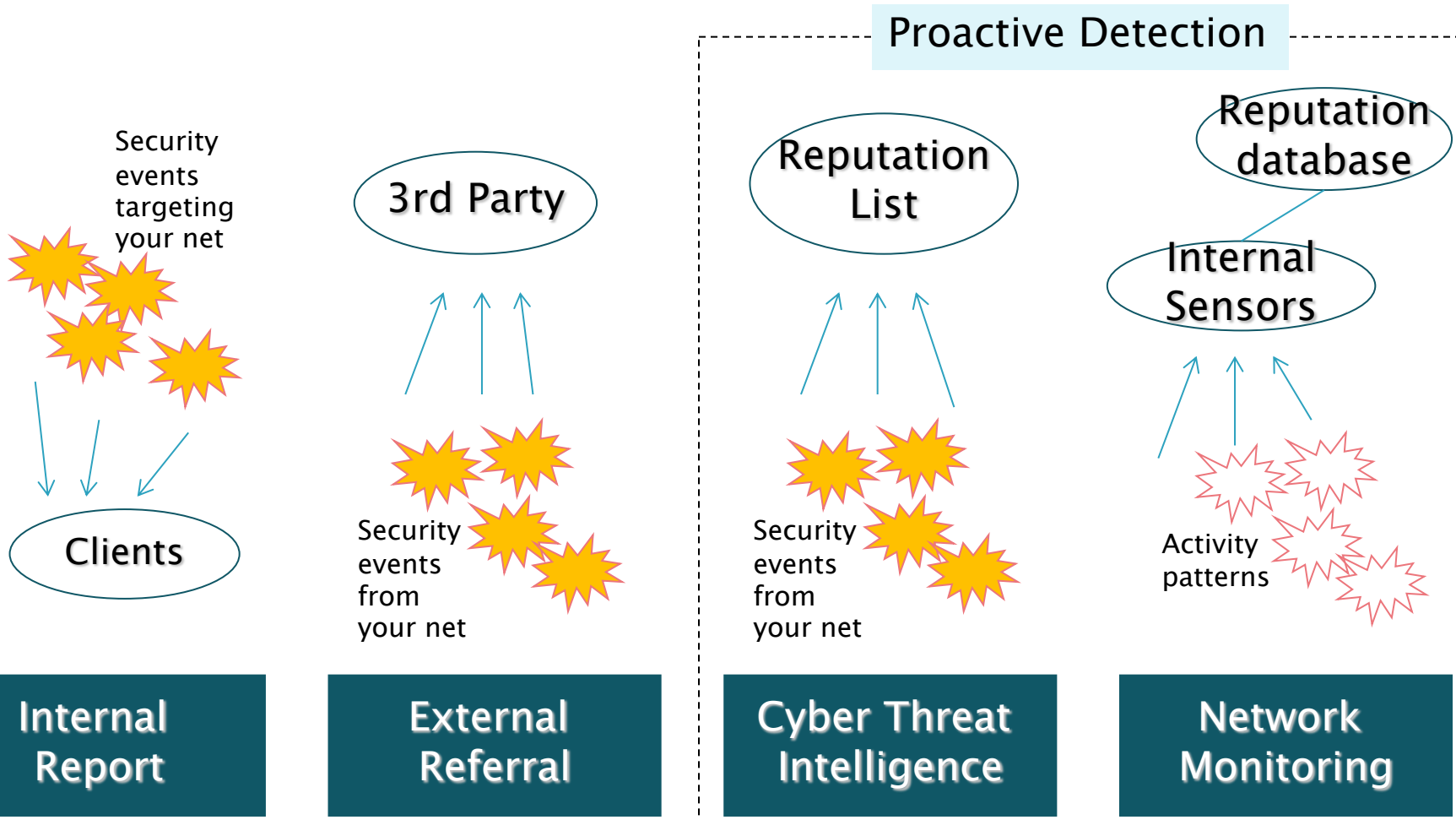
Incident Responses



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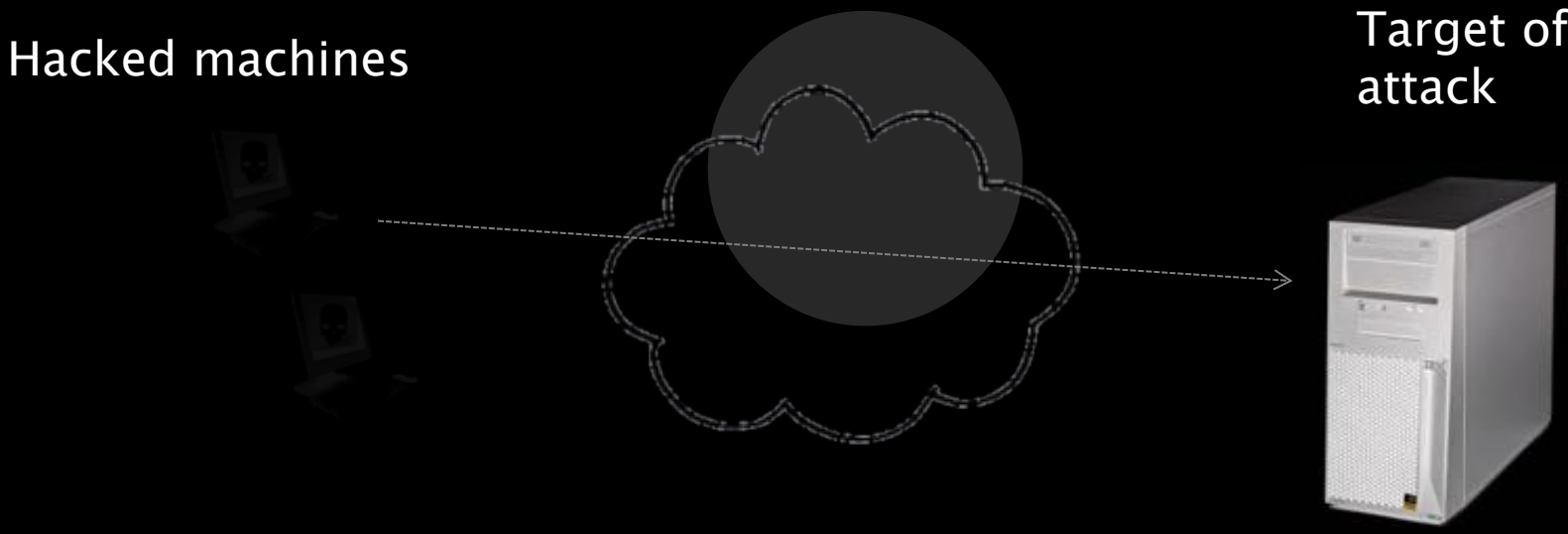
Proactive Detection of bots in your network

Leverage on Global Security Intelligence

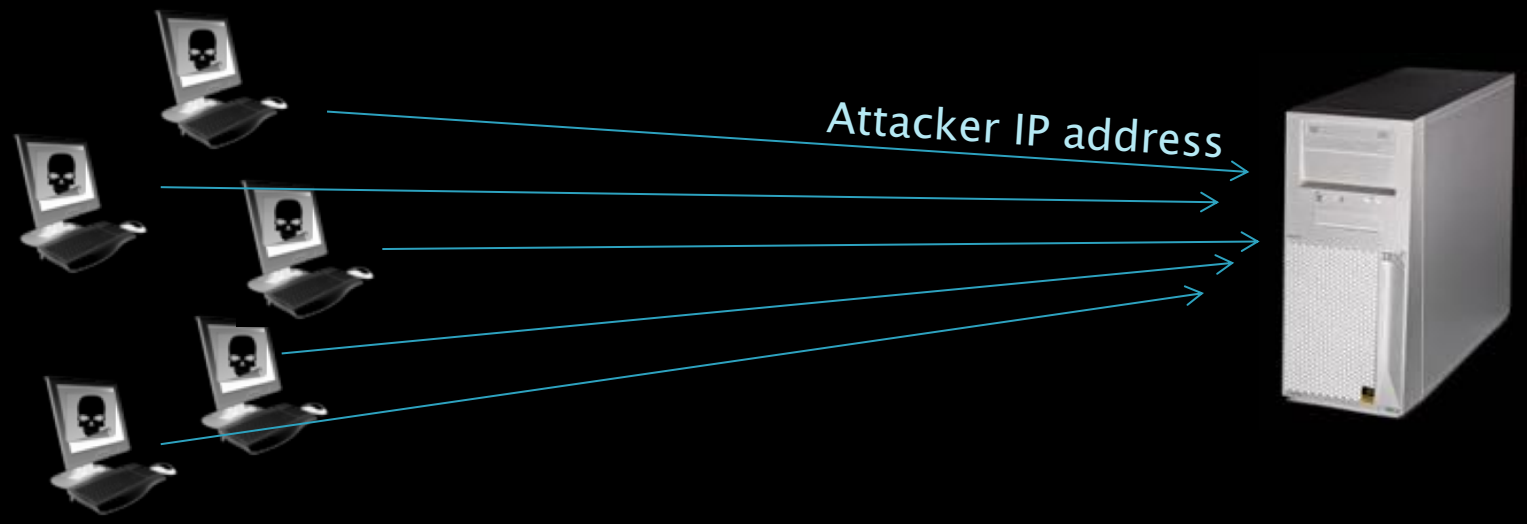
Global Intelligence, Local Footprints



- Attackers control hacked computers via stealthy malware.
- Owners of the hacked computers not aware of the compromise.
- But when a hacked computer launches an attack to a global target, it leaves footprints.

Global Intelligence, Local Footprints

Hacked machines



The footprints made by a local hacked machine

- IP addresses (logs of honeypot, firewall, ids/ips)
- Malware hosting URLs (reported)
- Phishing emails (reported)

Phishing intelligence

https://www.phishtank.com/

- by country
- by asn
- by target

Zeus, SpyEye botnet tracker

ZeuS Tracker :: Hong Kong (HK)

The list below shows all ZeuS C&Cs and FakeURLs which are hosted in **Hong Kong (HK)**.

Set a filter for the list below: online ZeuS hosts | offline ZeuS hosts | ZeuS hosts unknown status | ZeuS hosts with files online | all

Subscribe this list via RSS feed

Dateadded	CC	FU	Host	IP address	Level	Status	Files Online	SBL	Registrar	AS number
2013-06-13	CC		www.wxjwsteel.com	59.188.241.136	2	online	0	Not listed	BIZCN.COM, INC.	AS17444
2013-05-22	CC		103.31.186.240	103.31.186.240	4	unknown	0	Not listed	n/a	AS39743

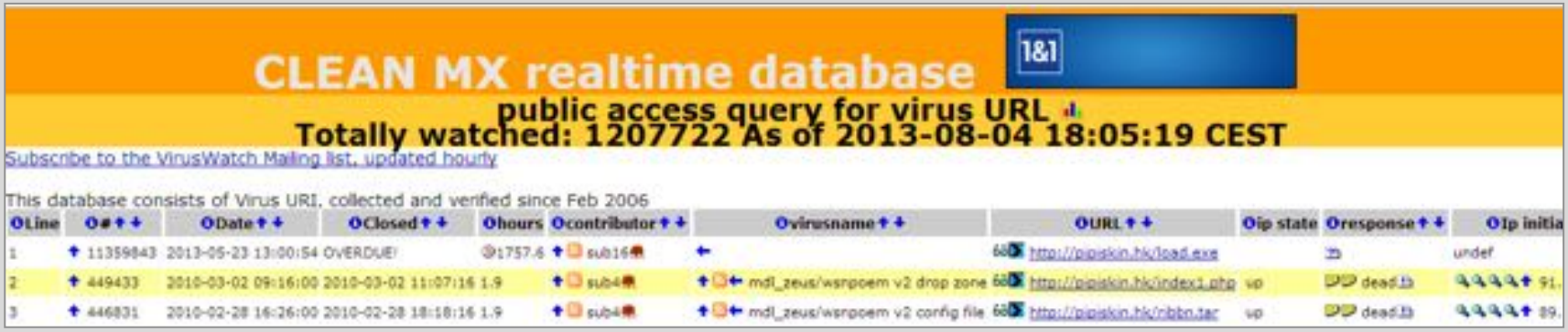
SET SpyEye TRACKER

Dateadded	SpyEye BinaryURL	Status	MD5 Hash	Filesize	Virustotal	Anubis	File download
2011-10-12	gogofuck.eu/bh/w.php?f=16&e=6	offline	665c5383160fd98f63fe7e4edbe67dcc	431'104	17/43 (39.50%)	report	download
2011-10-11	wavone.us/w.php?f=16&e=6	offline	1b18b0f15960b38023d8c8a7cfd72e5d	130'960	13/43 (30.20%)	report	download
2011-09-15	31.31.203.123/e-cards.exe	offline	22b6a5069366f9c0fddbe82aaf653b27	207'360	35/44 (79.50%)	report	download

http://zeustracker.abuse.ch
http://spyeyetracker,abuse.ch

- by country

Malware intelligence



CLEAN MX realtime database

public access query for virus URL

Totally watched: 1207722 As of 2013-08-04 18:05:19 CEST

Subscribe to the VirusWatch Mailing list, updated hourly

This database consists of Virus URI, collected and verified since Feb 2006

OLine	O#	ODate	OClosed	Ohours	Ocontributor	Ovirusname	OURL	Oip state	Oresponse	Oip initia
1	11359843	2013-05-23 13:00:54	OVERDUE!	1757.6	sub16		http://pipiskin.hk/load.exe			undef
2	449433	2010-03-02 09:16:00	2010-03-02 11:07:16	1.9	sub4	mdl_zeus/wsnpoem v2 drop zone	http://pipiskin.hk/index1.php	up	dead	91.
3	446831	2010-02-28 16:26:00	2010-02-28 18:18:16	1.9	sub4	mdl_zeus/wsnpoem v2 config file	http://pipiskin.hk/nbbn.tar	up	dead	89.

http://support.clean-mx.de/clean-mx/viruses

MALWARE DOMAIN LIST

Homepage | Forums | Recent Updates | RSS update feed | Contact us

Date (UTC)	Domain	IP	Reverse Lookup	Description	Registrant	ASN
2013/08/04_05:14	zxkewwcw.biz	199.79.63.83	md-47.webhostbox.net .	Trojan	contact@privacyprotect.org	40034
2013/08/04_05:01	safwdxc23e.biz	199.79.63.83	md-47.webhostbox.net .	Trojan	contact@privacyprotect.org	40034
2013/08/04_05:01	qwlpxcq2f.biz	199.79.63.83	md-47.webhostbox.net .	Trojan	contact@privacyprotect.org	40034

http://www.malwaredomainlist.com

Defacement intelligence

http://www.zone-h.org

- by country
- by domain

TorExit List

- Traffic originated from Tor Exit Node is suspicious

HKRealDemocracy	100	0 d	n11649205030.netvigator.com [116.49.205.30]
HKRelay	6	8 d	223.16.44.193 [223.16.44.193]
HKT01	9	75 d	117.18.118.136 [117.18.118.136]
HKT02	113	75 d	117.18.118.137 [117.18.118.137]
HongTor	6	0 d	119247089219.ctinets.com [119.247.89.219]

- http://torstatus.blutmagie.de
  - (note this site is blocked by some web security tools)

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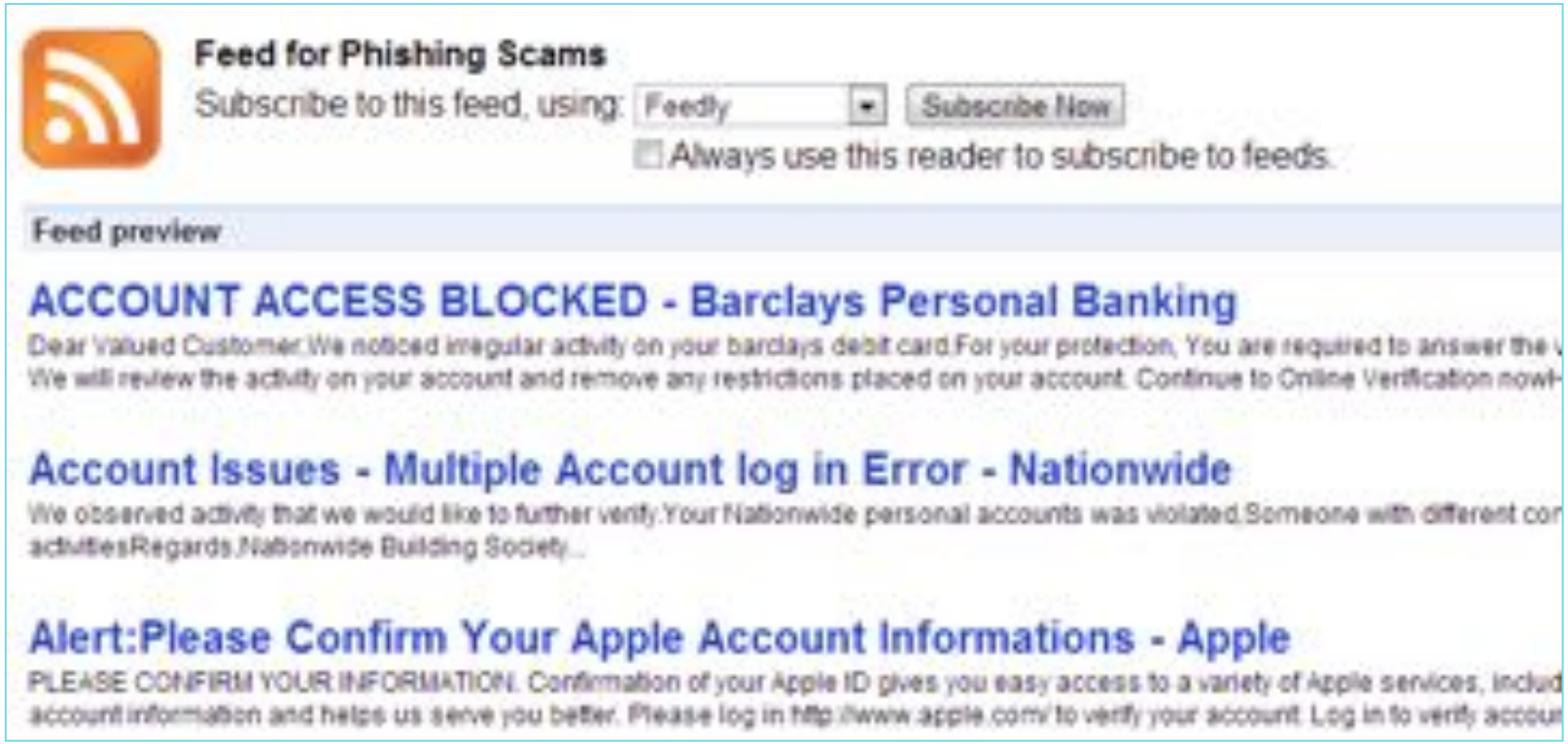
Automated collection of intelligence

- Some provide API or structured format, e.g. XML



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Google Safe Browsing Alerts
for network admin

- http://www.google.com/safebrowsing/alerts/

安全瀏覽
AS13354 (ASN-EBLGLOBAL) 的診斷網頁

公告發佈者：Google

Google 造訪此聯播網上的網站時有什麼發現？

我們在過去 90 天內測試了此聯播網上的 6593 個網站，當中有 sirkenayo.net/, ewallpops.com/, sanghparivar.org/ 等 70 個網站的內容會擅自將惡意軟體下載及安裝至使用者的電腦。

Google 上次針對此聯播網上的網站進行測試的日期是 2014-04-13，而上次發現可疑內容的日期則是 2014-04-13。

此聯播網中是否有任何網站成為進一步散佈惡意軟體的媒介？

在過去 90 天內，我們發現惡意軟體透過此聯播網上的 cornerstoneethics.org/, sirkenayo.net/, club-vw.cl/ 等 12 個網站，向其他 141 個網站進行散佈，受害網站包括：dhr.it/, google.com/, sexxxdoll.com/。

此聯播網中是否有任何網站曾散佈惡意軟體？

是，此聯播網中有 15 個網站曾在過去 90 天內散佈惡意軟體，這些網站包括：tbclassifieds.com/, topfreeproxy.com/, kicksdrinks.com/。受害網站有 199 個，其中包括：proxysite.org/, aplusproxy.com/, dom-arquitectura.com/。

後續步驟：

- 返回上一頁。

上次更新時間：7 小時前

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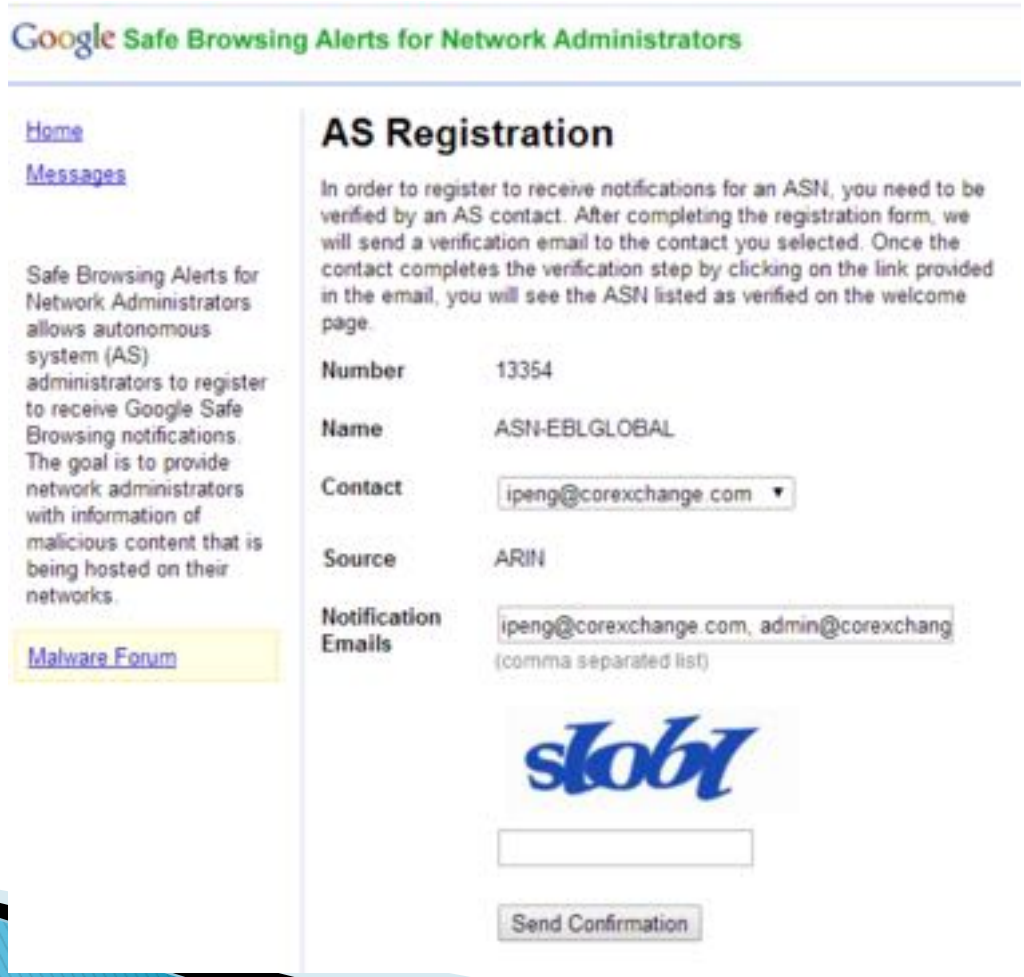
Google Safe Browsing Alerts
for network admin

- http://www.google.com/safebrowsing/alerts/



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HKCERT IFAS Project

– an automated global intelligence collection system

Visualize **Internet Security Status**

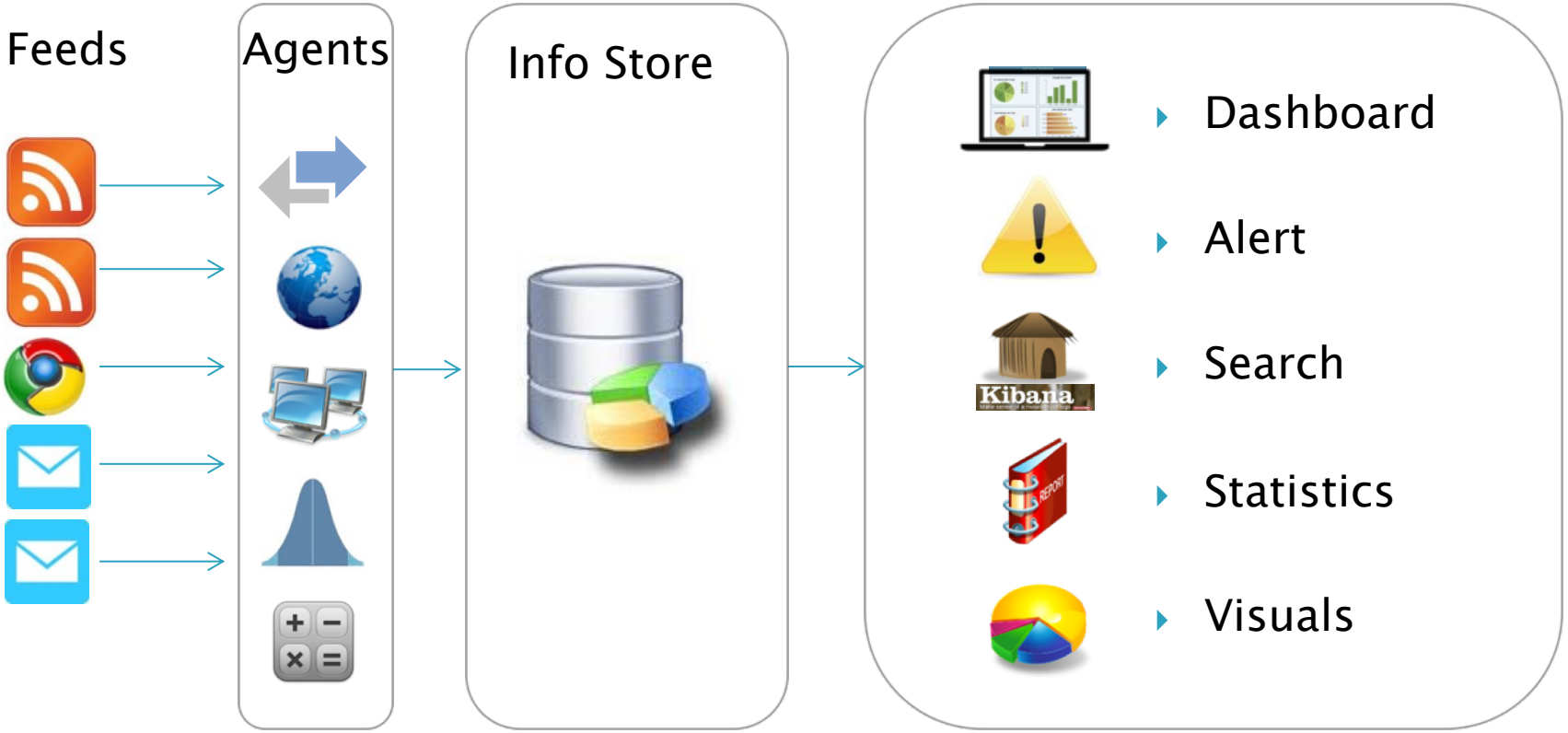
Situational Awareness

Track **Trends**

Generate **Alerts**

IFAS

– an automated global intelligence collection system



– feed collection, geolocation tag, ASN tag, normalization and calculation

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IFAS Information Sources

Current plug-ins for …

- Abuse.ch
- Arbor SRF
- CleanMX
- Malc0de
- MaliciousDomainList
- Millersmiles
- Phishtank
- Shadowserver
- Zone-H

Plug-ins to be developed

- Google Safe Browsing
- Microsoft
- Scumware

… more

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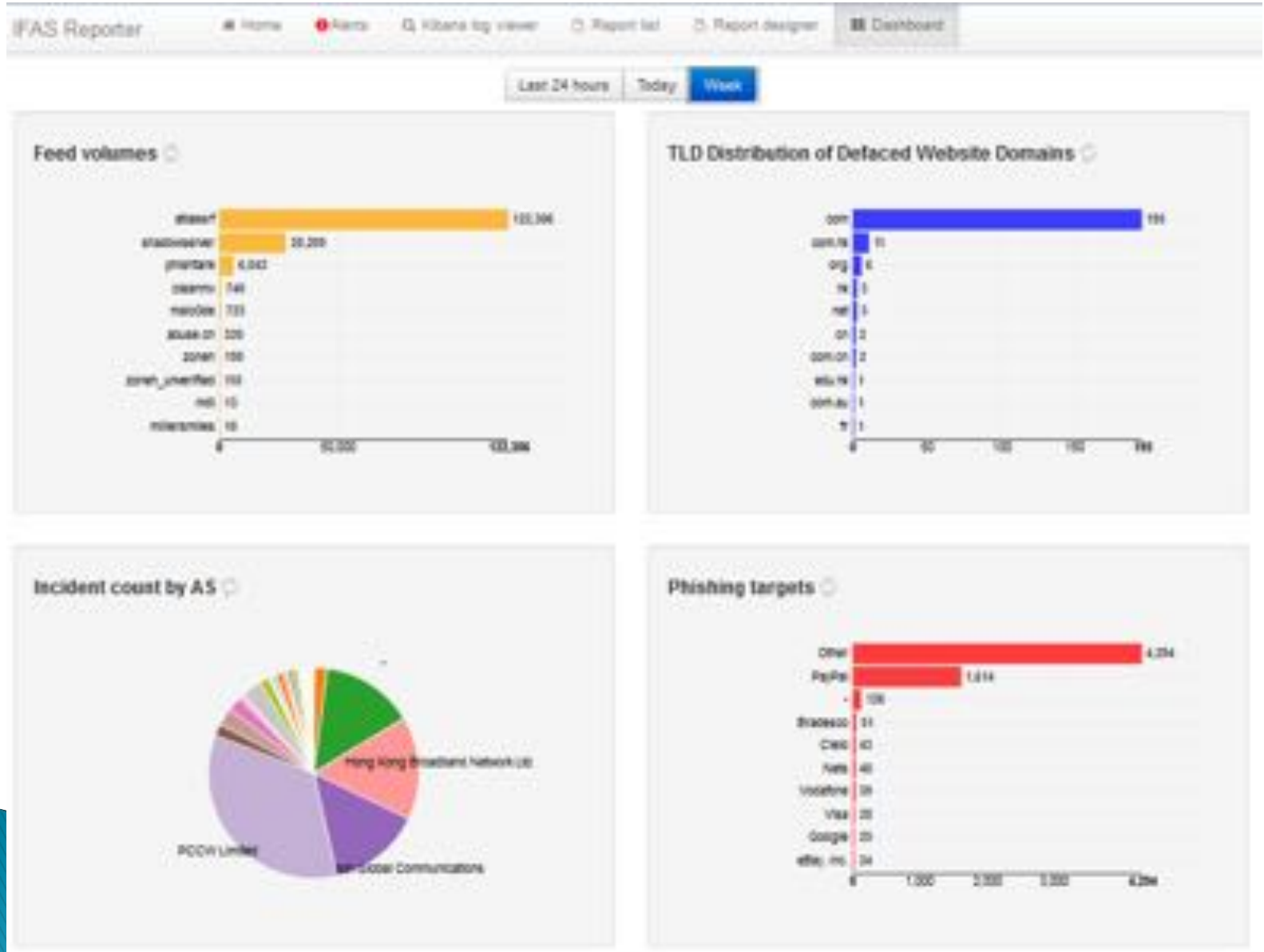
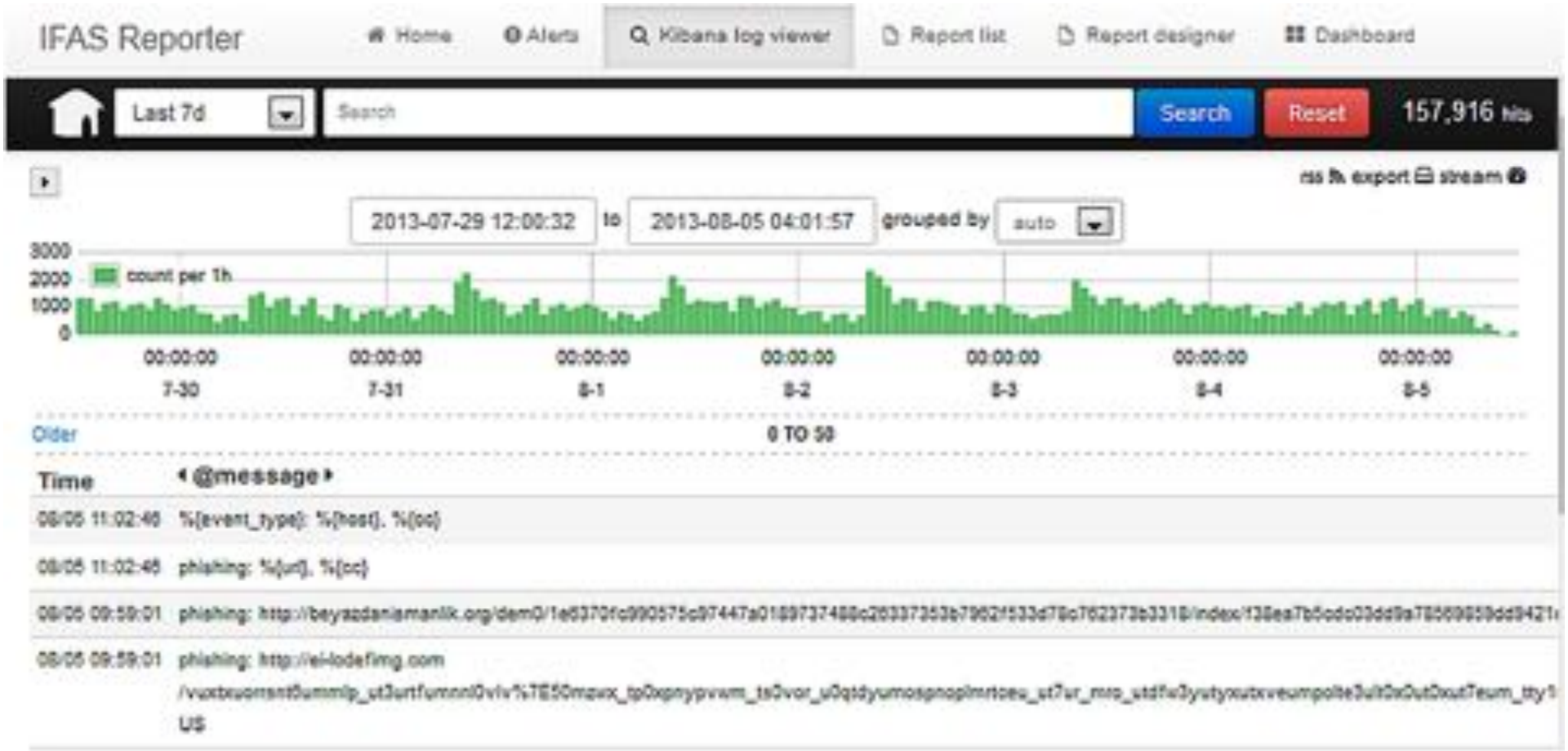
Dashboard

Real-time situational awareness for CERT management



Give a sense of Today's Events



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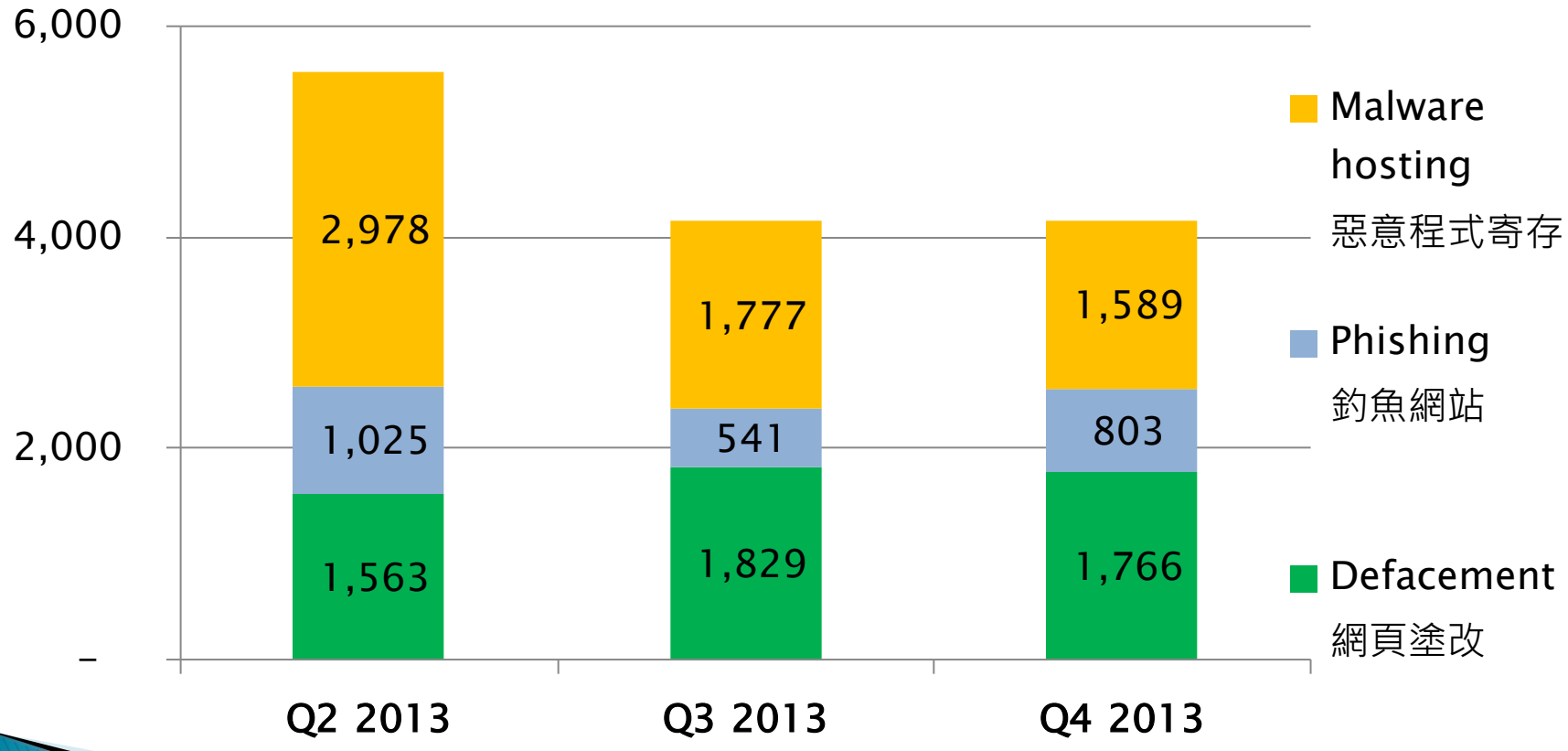
Compromised Servers in HK

> 4,000 compromised servers



Source: HK Security Watch Report 2013 Q4

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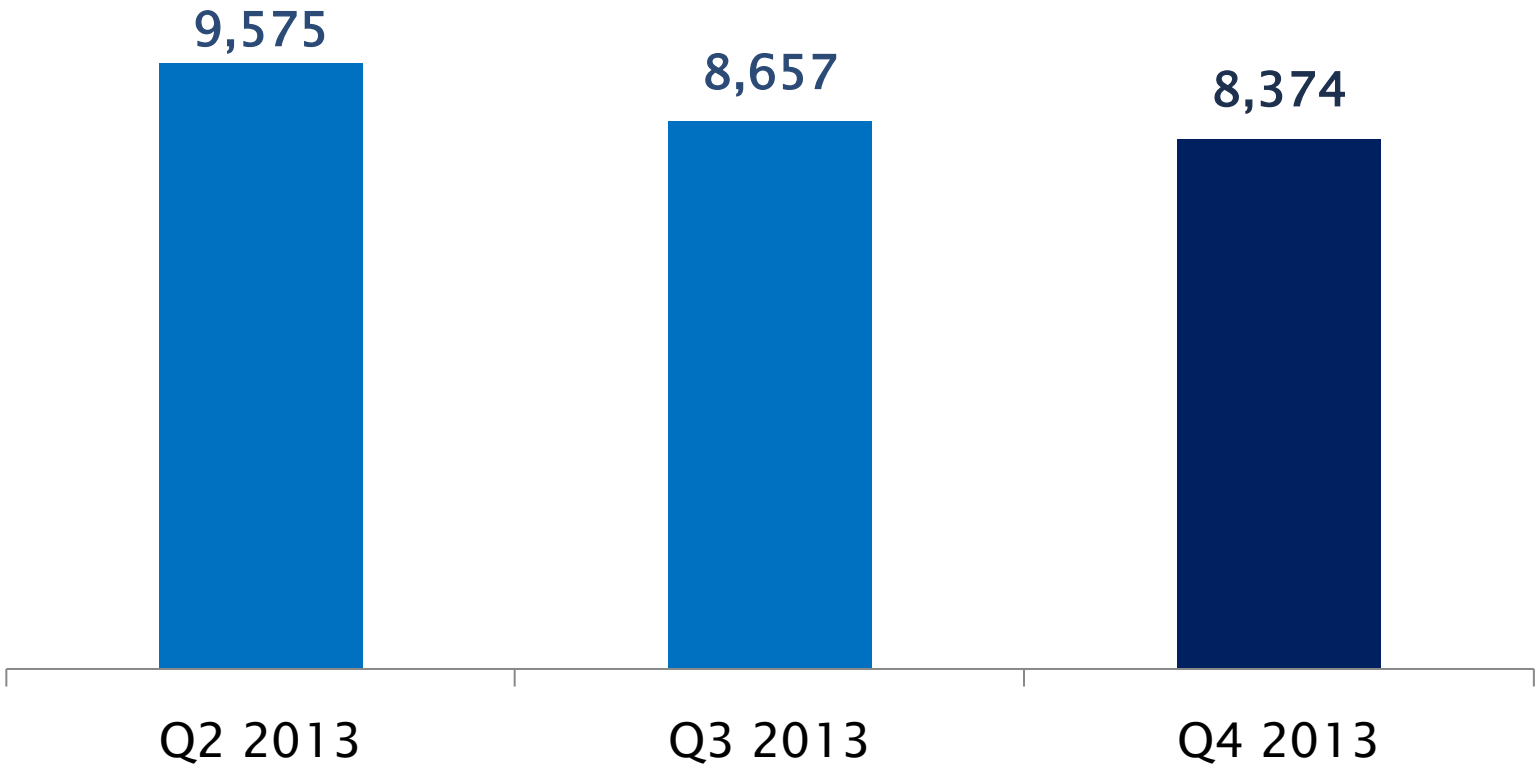
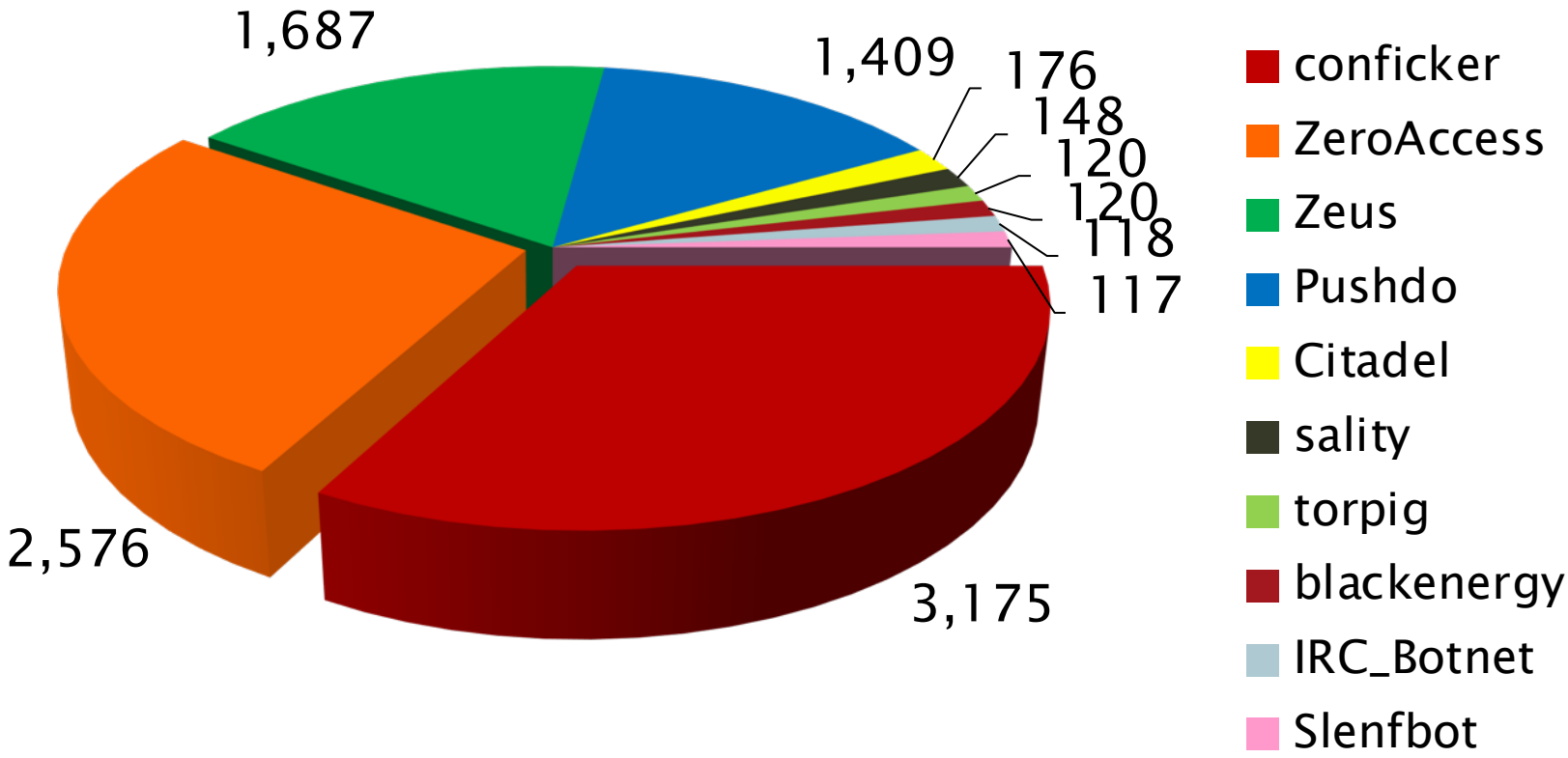
Invisible Bots 隱形殭屍

> 8,000 compromised PCs



Source: HK Security Watch Report 2013 Q4

Major Botnet Families in Hong Kong



Source: HK Security Watch Report 2013 Q4

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Analysis of Trend with Events

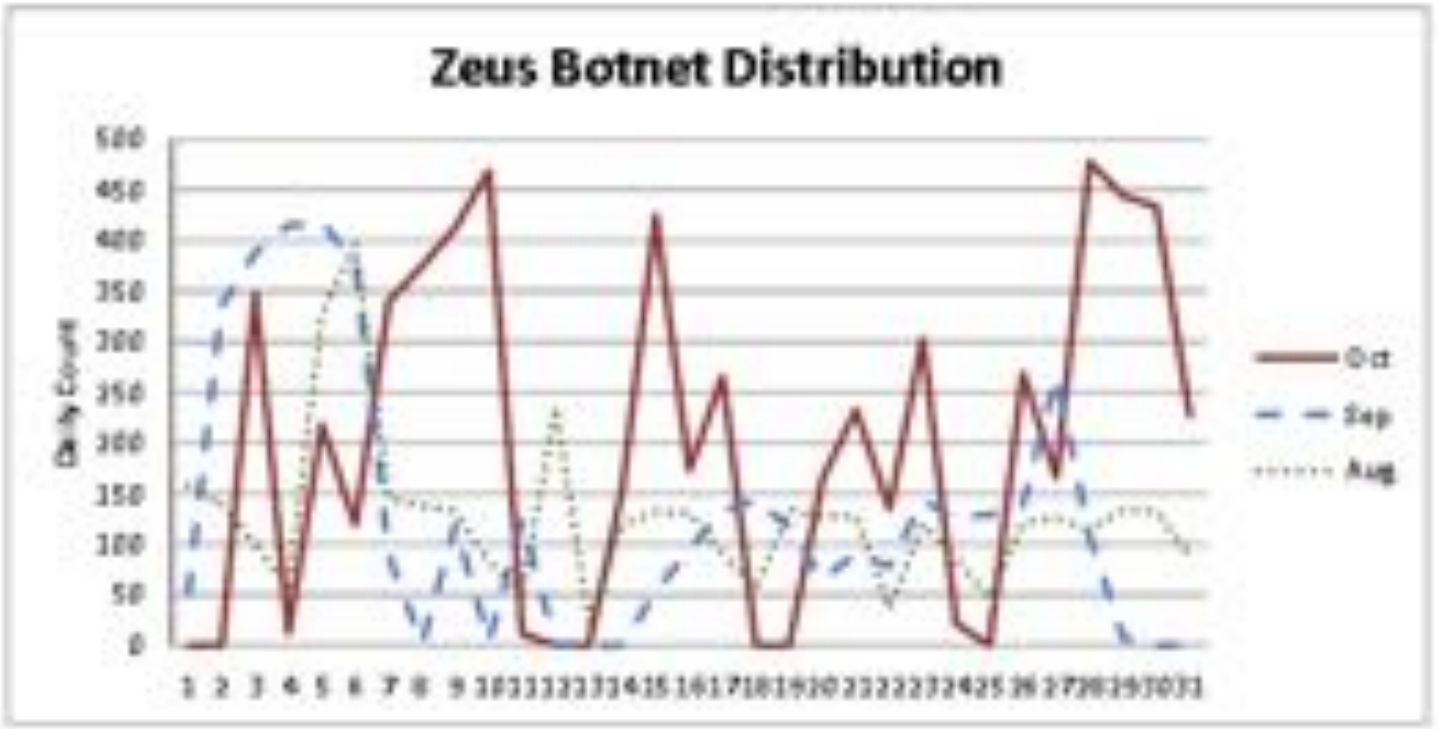

Figure 4: Zeus Botnet Distribution

- Correlate Cryptolocker 2013-Oct with Zeus

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Network Monitoring

- Closer watch on the critical network segments
- Detect anomaly outgoing traffic
  - Passive DNS
  - Netflow
- Deceptive detection
  - Honeypot – Dionaea
  - Honeydoc

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Proactive Network Hygiene

Network Hygiene

Detect / Clean up weak infrastructure

- CERTs work with ISPs and service providers to address the network hygiene issue.

Assess – you can do this for your network and your client

- Scan for vulnerable web servers
  - https://www.scantosecure.com/
- Scan for open DNS recursive resolvers
  - http://openresolverproject.org/
- Scan for open NTP servers
  - http://openntpproject.org/
- Scan for vulnerable mail servers
  - http://mxtoolbox.com/diagnostic.aspx

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Clean up vulnerable CPE

- Find out these devices with CERTs
- Give advice to users:
  - Firewall protect the devices unless necessary to open to Internet
  - Patch the devices. Change default settings

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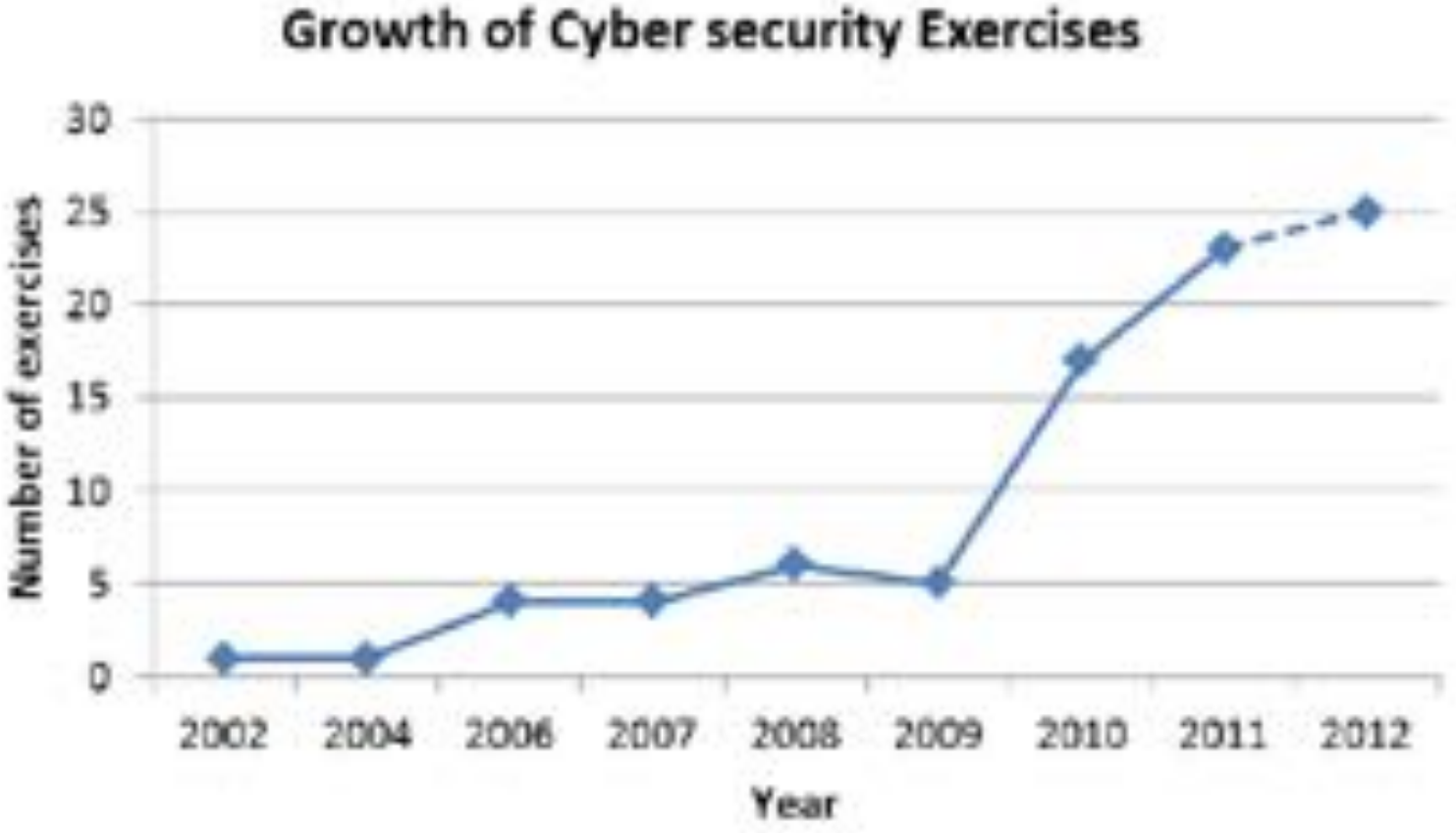
Preparation for Large Scale Attacks

ENISA – Survey of Cyber Drill Exercise 2012



ENISA – European Network and Information Security Agency

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Adoption of Cyber Security Drill

- Hong Kong
  - 2009 HKCERT
- Asia Pacific
  - 2005 APCERT
  - 2006 ASEAN
  - 2006 Japan
  - 2007 Taiwan
  - 2008 Malaysia

  …
- US
  - 2006 DHS (CyberStorm bi-annually)
  - 2010 FS-ISAC
- Europe
  - 2007 Netherlands
  - 2008 Finland
  - 2009 Norway, UK
  - 2010 Bulgaria, Estonia, France, Greece, Ireland, Spain, ENISA
  - 2011 Denmark, Germany, Italy, Latvia, Slovakia
  - 2012 Austria, Iceland, Poland , Switzerland

Source: ENISA Survey of Cyber Drill Exercise 2012

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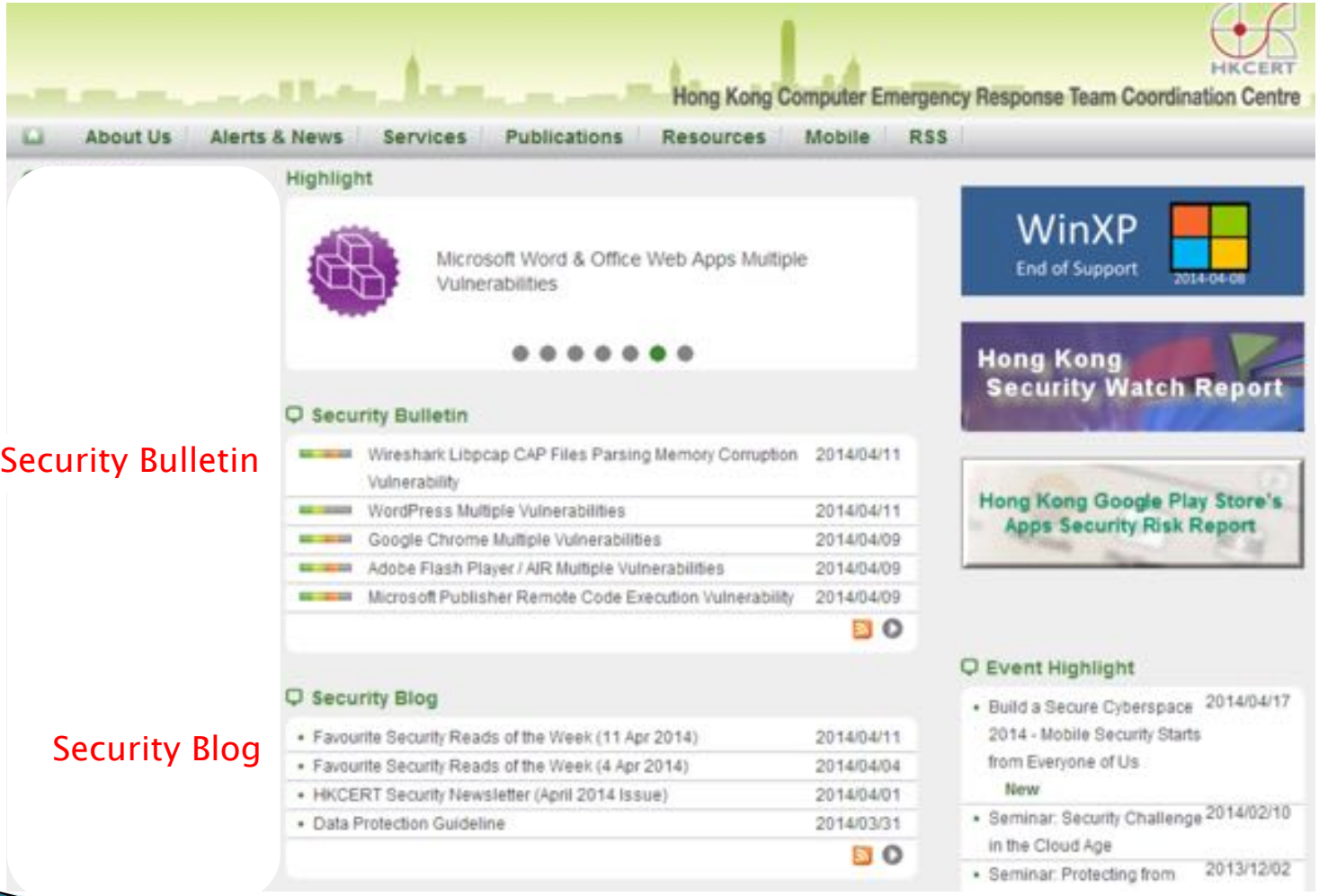
HKCERT services available to you

Information @ HKCERT website



Security Bulletin

Security Blog

!! Hot topics

Security Watch Report

Android App Risk Report

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HKCERT information

- RSS

HKCERT App

GovHK App

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RSS Feed on Mail Client

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Join HK Cyber Security Drills

2009 Hong Kong Incident Response Drill 2009

2010 Theme: Fighting financial crime on the Internet

2011 Theme: Handling Phishing Scams on Web Forum

2012 Theme: Defending Against Hacktivist Cyber Attack

2013 Theme: Responding to Targeted Attack

Proactive Measures

- Botnet Takedown
- Cyber Threat Intelligence
- Network Monitoring
- Network Hygiene – clean up vulnerable servers
- Cyber Security Drill

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Security is not an Island

- Information security attacks are globalized
- HKCERT is sharing information and exploring collaborate with ISPs to make the Internet a safe place for all.

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Thank You

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