



Hong Kong Security Watch Report

2019 Q4

Initial release date: 31 Jan 2020
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Correction Notice

In the earlier published report, there was an error in the Botnet (Bots) security events. The number of security events of Nymaim, Virut, ZeroAccess, Pushdo, Nivdort, Bedep and Corebot bots were missing. The affected contents are as below:

- The total number of Botnet (bots) security events should be 7,878 instead of 6,831 in Table 2 and Figure 4.
- The total number of Nynaim and Virut security events were 786 and 175 respectively, ranked 3rd and 6th in major botnet families in Hong Kong network in Figure 12 and Table 3.
- The quarterly figures of Nynaim bot should make it as one of Top 5 botnet families in Figure 13 and Table 4.

All related contents of this report have been corrected.

Foreword

Better Security Decision with Situational Awareness

Nowadays, many networked digital devices, such as computers, smartphones, tablets, are being compromised without the user's knowledge. The data on them may be mined and exposed every day, and even be used for various criminal activities.

The Hong Kong Security Watch Report aims to raise public awareness of the problem of compromised systems in Hong Kong, enabling them to make better decision in information security. The data in this quarterly report focuses on the activities of compromised systems in Hong Kong which suffer from, or have participated in various types of cyber attacks, including web defacement, phishing, malware hosting, botnet command and control centres (C&C) or bots. "Computers in Hong Kong" refer to those whose network geolocation is Hong Kong, or the top level domain of their host name is ".hk".

Capitalising on the Power of Global Intelligence

This report is the result of collaboration between the Hong Kong Computer Emergency Response Team Coordination Centre (HKCERT) and global security researchers. Many security researchers have the ability to detect attacks against their own or clients' networks. Some will provide the collected information of IP addresses of attack source or web links of malicious activities to other information security organisations with an aim to collectively improve the overall security of the cyberspace. They have good practice in sanitising personal identifiable data before sharing the information.

HKCERT collects and aggregates such data about Hong Kong from multiple information sources for analysis with the Information Feed Analysis System (IFAS), a system developed by HKCERT. The information sources (Appendix 1) are very diverse and reliable, providing a balanced reflection of the security status of Hong Kong.

HKCERT remove duplicated events reported by multiple sources and use the following metrics for measurement to assure the quality of statistics.

Table 1: Types of Attack

Type of Attack	Metric used
Defacement, Phishing, Malware Hosting	Security events on unique URLs within the reporting period
Botnet (C&Cs)	Security events on unique IP addresses within the reporting period
Botnet (Bots)	Maximum daily count of security events on unique IP addresses within the reporting period

Better information better service

HKCERT will continue to enhance this report with more valuable information sources and more in-depth analysis, and explore how to best use the data to enhance our services. *Please send your feedback via email (hkcert@hkcert.org).*

Limitations

Data collected for this report come from multiple sources with different collection periods, presentation formats and their own limitations. The numbers from the report should be used as a reference only, and should neither be compared directly nor be regarded as a full picture of the reality.

Disclaimer

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Contents

Report Highlights	6
Report Details	11
1 Defacement	11
1.1 Summary	11
2 Phishing	13
2.1 Summary	13
3 Malware Hosting	15
3.1 Summary	15
4 Botnet	17
4.1 Botnets Command & Control Centers (C&C)	17
4.2 Botnets (Bots)	18
4.2.1 Major Botnet Families	18
Appendix	19
A Sources of information in IFAS	20
B Geolocation identification methods in IFAS	20
C Major Botnet Families	21

Report Highlights

In 2019 Q4, there were 9,911 unique security events related to Hong Kong used for analysis in this report. Data were collected through IFAS¹ with 11 sources of information², and not collected from the incident reports received by HKCERT.

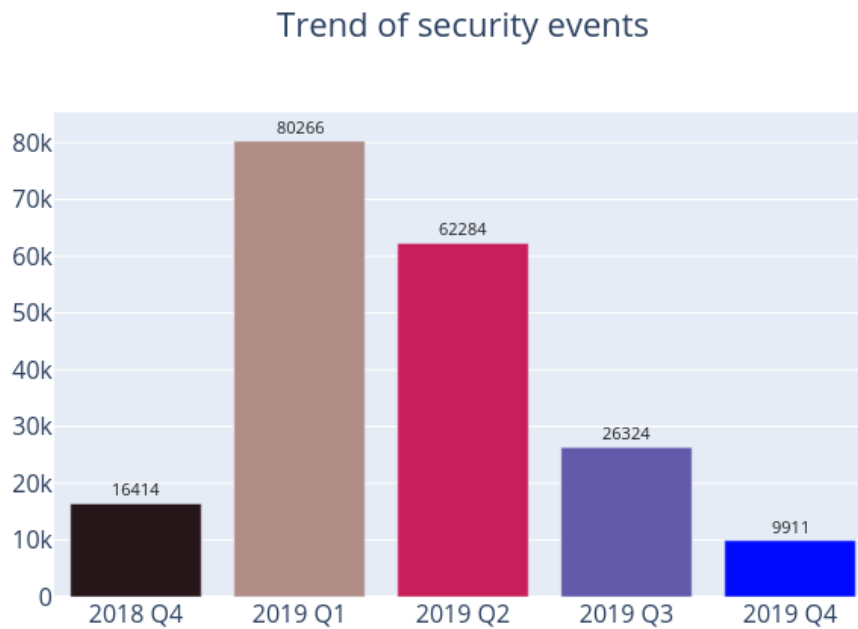


Figure 1: Trend of security events

Table 2: Trend of security events

Event Type	2018 Q4	2019 Q1	2019 Q2	2019 Q3	2019 Q4
Defacement	590	318	532	1,120	591
Phishing	365	289	1,306	849	257
Malware Hosting	8,152	72,201	48,892	17,273	1,185
Botnet (Bots)	7,307	7,458	11,554	7,078	7,878
Botnet (C2)	0	0	0	4	0

In the last quarter of 2019, all types of security events have fallen back to relatively low levels as the total number of security events amounted to 9,911, down almost two-thirds on the previous quarter's figure. The most notable decline was seen in malware hosting events, which fell by more than 93%, while a 70% decrease was reported in phishing events.

Server related security events

Server related security events include malware hosting, phishing and defacement. Their trends and distributions are summarized as below:

¹IFAS - Information Feed Analysis System is a HKCERT developed system that collects global security intelligence relating to Hong Kong to provide a picture of the security status.

²Refer to Appendix 1 for the sources of information

Trend and distribution of server related security events

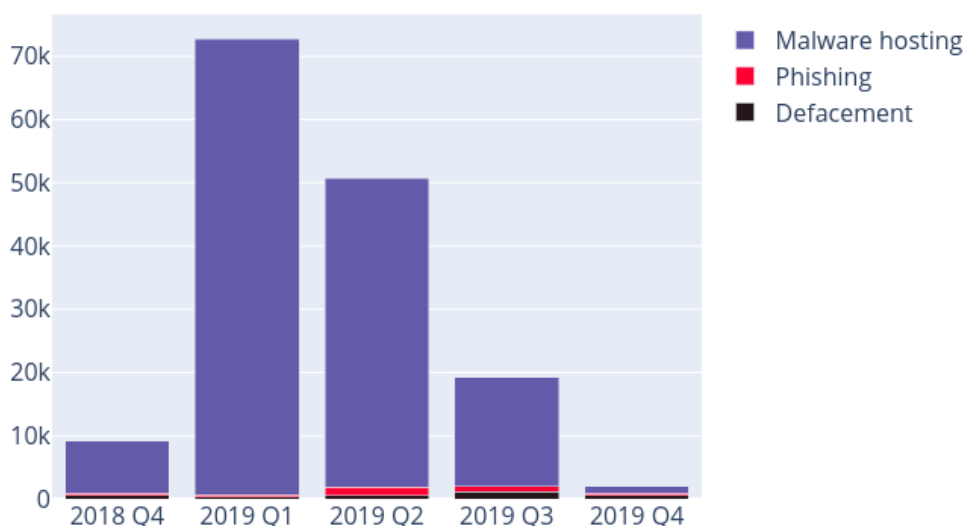


Figure 2: Trend and distribution of server related security events

As shown in Table 2, having reached a peak of 72,201 events in the first quarter of 2019, malware hosting fell continuously to the lowest point of the year with 1,185 events only. The number of malware hosting IP addresses involved has also dropped sharply to 63 (see Figure 9), the first time since the first quarter of 2018 that double digits are recorded for its occurrence.

Phishing events also declined by nearly 600, while the number of phishing IP addresses involved fell from 196 in the previous quarter to 55 (see Figure 7). After analysing the data, we observed that while Apple iCloud continued to be the main target of such attacks, eBay-related phishing events have also increased. The rise might be attributed to the end-of-year sales, with fraudsters usually taking this opportunity to conduct phishing attacks against the branded online shopping planforms.

Meanwhile, defacement events and the number of defacement IP addresses involved fell by nearly half and 36% in this quarter respectively. Further analysis of these IP addresses in Zone-H and Shodan³ revealed that around a quarter of servers on these IP addresses still carry security vulnerabilities, and some of them are even using End-of-Support (EOS) operating systems, which are deemed the possible main causes of defacement incidents.

HKCERT urges system and application administrators to strengthen the protection of servers



- Patch server up-to-date to avoid the known vulnerabilities being exploited
- Update web application and plugins to the latest version
- Follow best practice on user account and password management
- Implement validation check for user input and system output
- Provide strong authentication e.g. two factor authentication, administrative control interface
- Acquire information security knowledge to prevent social engineering attack

³Shodan is a search engine for Internet-connected devices: <https://www.shodan.io/>

Botnet related security events

Botnet related security events can be classified into two categories:

- Botnet Command and Control Centers (C&C) security events - involving a small number of powerful computers, mostly servers, which give commands to bots
- Botnet (Bots) security events - involving a large number of computers, mostly personal computers which receive commands from C&Cs.

Botnet Command and Control Servers (C&C)

The trend of Botnet (C&C) security events is summarised as below:

Trend of Botnet (C&C) security events

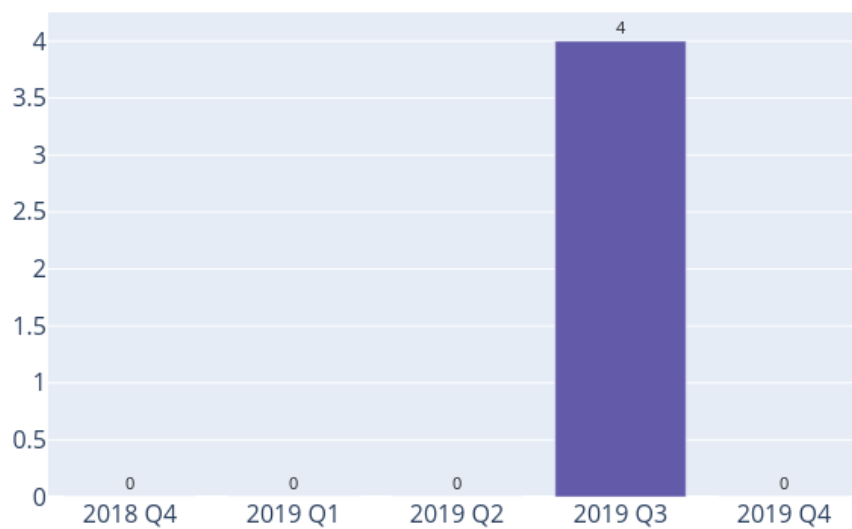


Figure 3: Trend of Botnet (C&Cs) security events

There was no Botnet (C&C) security events in this quarter.

Botnet (Bots)

The trend of Botnet (Bots) security events is summarised as below:

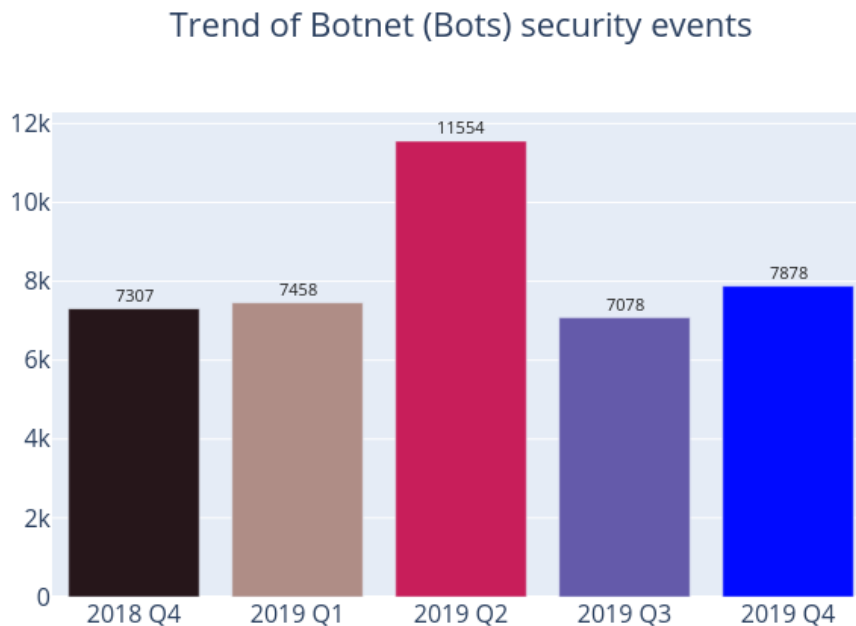


Figure 4: Trend of Botnet (Bots) security events

In 2019 Q4, the number of Botnets (bots) in Hong Kong network has increased by 11.3%, or 800. Most Botnet events show a downward trend, with WannaCry bots falling by nearly half to just 354. On the other hand, both Nymaim and Avalanche bots have hiked dramatically by more than 6 and 3 times respectively (see Table 3). Avalanche is a cyber crime hosting platform serving multiple malware families. Hackers can use it to deliver various malwares (such as Nymaim, Gamarue, Tinba, and Matsnu, etc.). After further analysis, it emerged that the number of unique IP addresses attempting to connect the Avalanche sinkhole from the end of November to December was persistently high, which was consistent with the rising trend shown by Nymaim sinkhole data. In addition, by comparing the Avalanche Botnets data of the previous three quarters, there have been notable increases in Nymaim and Matsnu malware events. These two malwares are trojan and both can be used as a springboard for further intrusions, such as ransomware attacks.

HKCERT urges users to take action so as not to become part of the botnets



- Patch the computer
 - Install security software and scan for malware
 - Set strong passwords to avoid credential based attack
 - Do not use Windows, media files and software that have no proper licenses
 - Do not use Windows and software that have no security updates
 - Do not open files from unreliable sources
-

HKCERT has been following up the security events received and proactively engaged local ISPs for the botnet cleanup since June 2013. Currently, botnet cleanup operations against major botnet family Avalanche, Pushdo, Citadel, Ramnit, ZeroAccess, GameOver Zeus, VPNFilter and Mirai are still ongoing.

HKCERT urges general users to join the cleanup acts, ensuring their computers are not being infected and controlled by malicious software, and protecting their personal data for a cleaner cyberspace.

Users can follow the HKCERT guideline to detect and clean up botnets



- Botnet Detection and Cleanup Guideline <https://www.hkcert.org/botnet>

Report Details

1 Defacement

1.1 Summary

Trend of Defacement security events

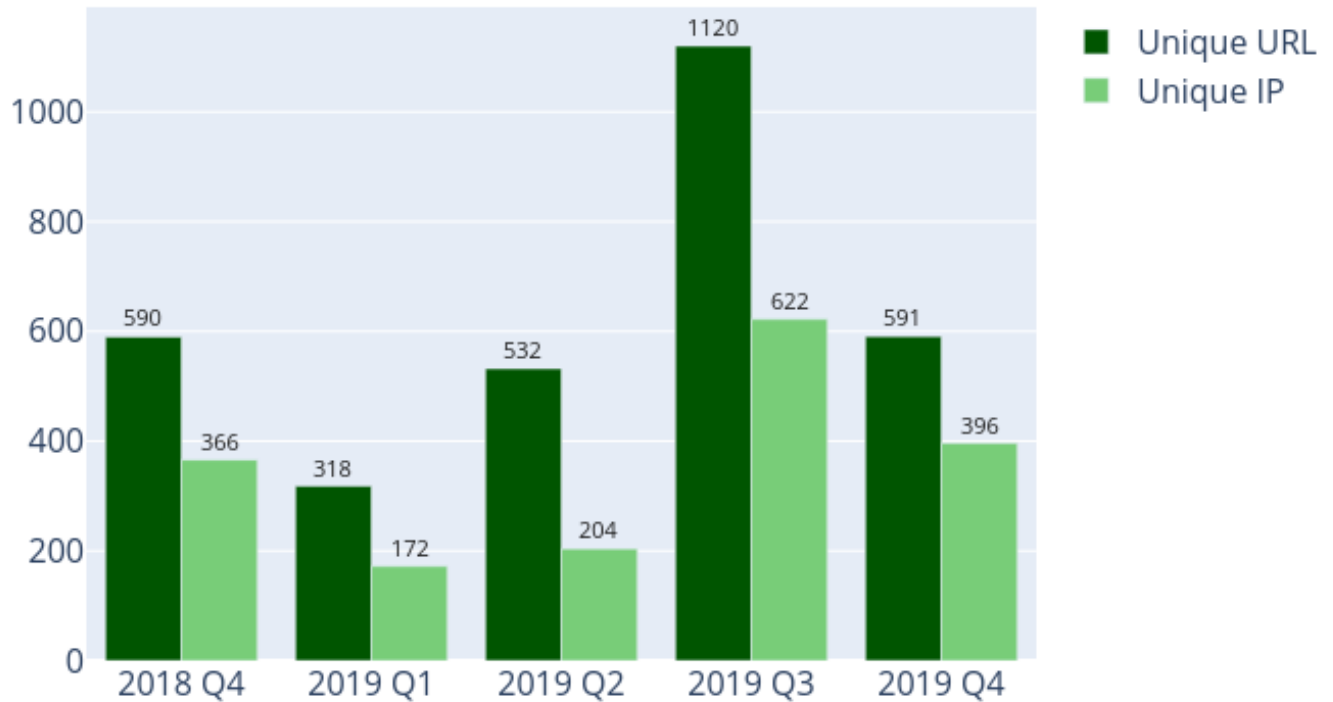


Figure 5: Trend of Defacement security events



What is defacement?

- Defacement is the unauthorised alteration of the content of a legitimate website using any hacking methods.

What are the potential impacts?

- The integrity of the website content is being damaged
 - Original content may be inaccessible
 - Reputation of the website owner may be damaged
 - Other information stored/processed on the server may be further compromised by hackers to perform other attacks
-

URL/IP ratio of Defacement security events

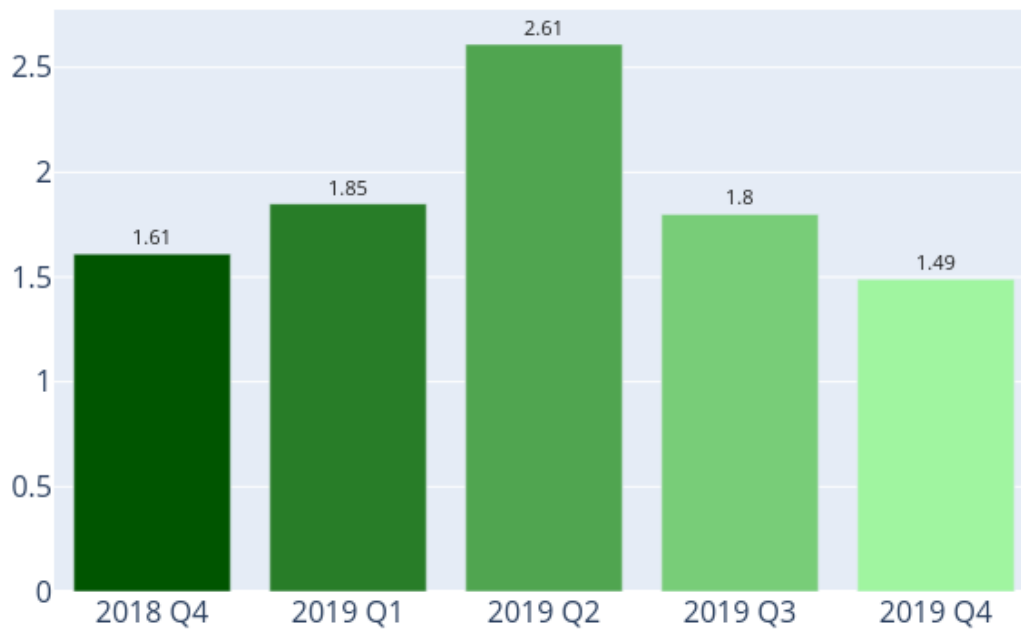


Figure 6: URL/IP ratio of Defacement security events



What is URL/IP ratio?

- It is the number of security events count in unique URL divided by the number of security events count in unique IP addresses

What can this ratio indicate?

- Number of events counted in unique URL cannot reflect the number of compromised servers, since one server may contain many URL
 - Number of events counted in unique IP address can be better related to the number of compromised servers
 - The higher the ratio is, the more mass compromise happened
-

Sources of Information:

- Zone-H

2 Phishing

2.1 Summary

Trend of Phishing security events

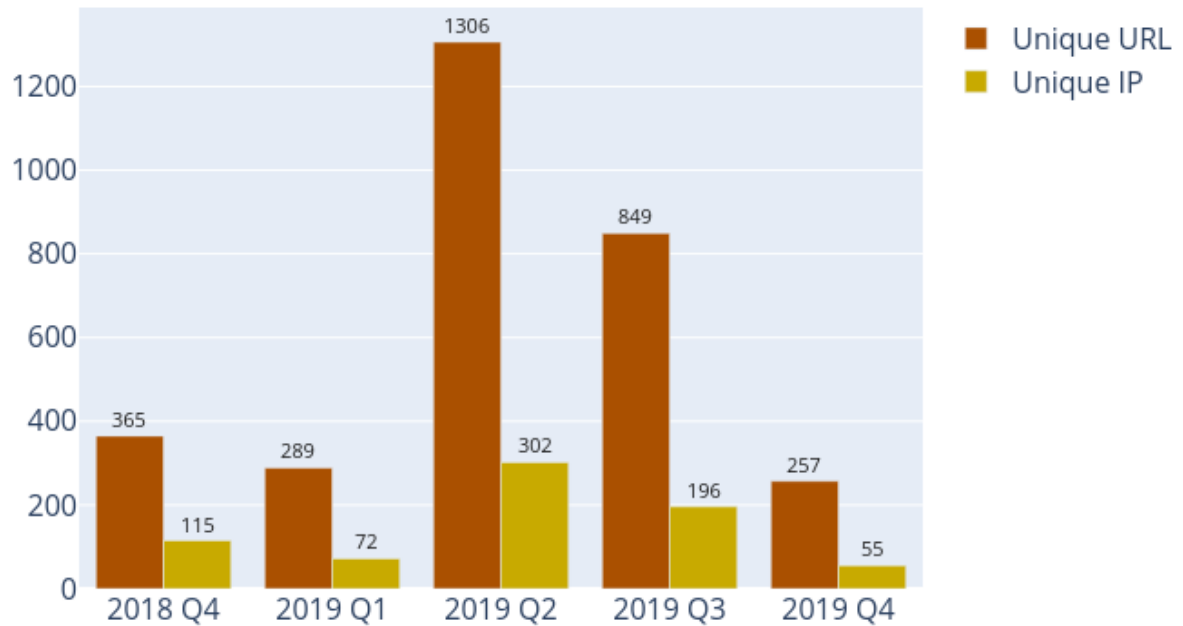


Figure 7: Trend of Phishing security events



What is phishing?

- Phishing is the spoofing of a legitimate website for fraudulent purposes

What are the potential impacts?

- Personal information or account credentials of visitors may be stolen, potentially leading to financial losses
 - Original content may be inaccessible
 - Reputation of the website owner may be damaged
 - Server may be further compromised to perform other attacks
-

URL/IP ratio of Phishing security events

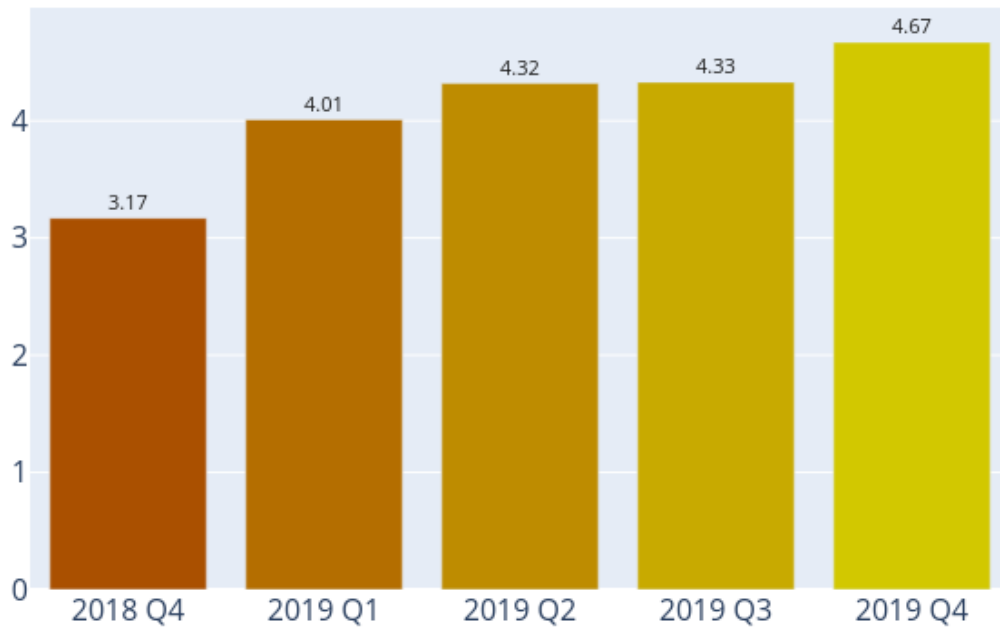


Figure 8: URL/IP ratio of Phishing security events



What is URL/IP ratio?

- It is the number of security events count in unique URL divided by the number of security events count in unique IP addresses

What can this ratio indicate?

- Number of events counted in unique URL cannot reflect the number of compromised servers, since one server may contain many URL
- Number of events counted in unique IP address can be better related to the number of compromised servers
- The higher the ratio is, the more mass compromise happened

Sources of Information:

- CleanMX - phishing
- Phishtank

3 Malware Hosting

3.1 Summary

Trend of Malware Hosting security events

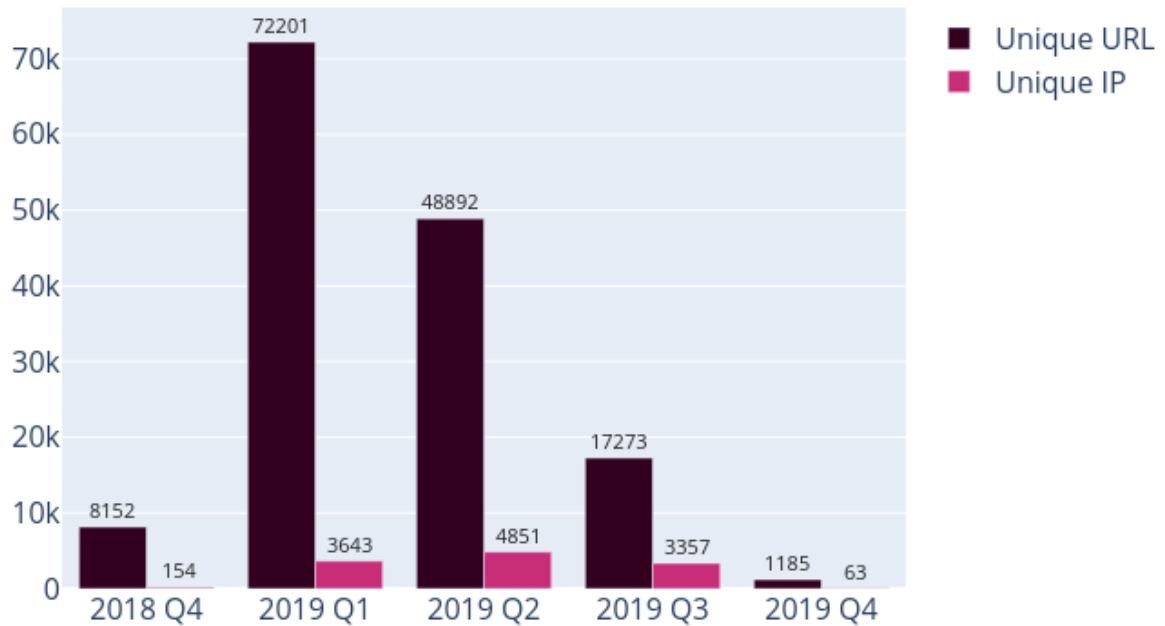


Figure 9: Trend of Malware Hosting security events



What is malware hosting?

- Malware hosting is the dispatching of malware on a website

What are the potential impacts?

- Visitors may download and install the malware, or execute the malicious script to have their devices hacked
 - Original content may be inaccessible
 - Reputation of the website owner may be damaged
 - Server may be further compromised to perform other hacking or even criminal activities
-

URL/IP ratio of Malware Hosting security events

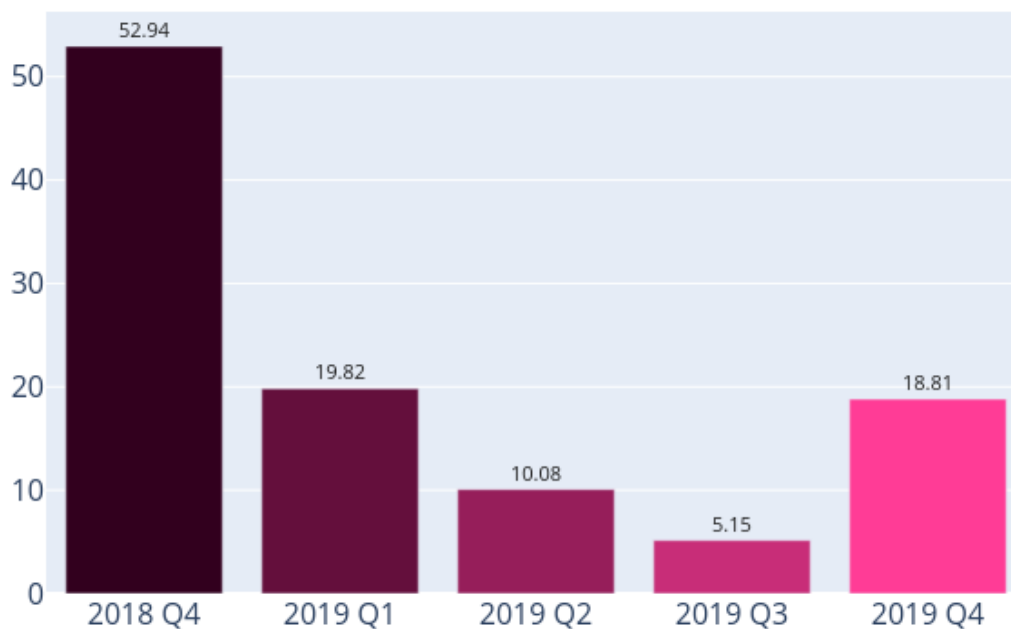


Figure 10: URL/IP ratio of Malware Hosting security events



What is URL/IP ratio?

- It is the number of security events count in unique URL divided by the number of security events count in unique IP addresses

What can this ratio indicate?

- Number of events counted in unique URL cannot reflect the number of compromised servers, since one server may contain many URL
- Number of events counted in unique IP address can be better related to the number of compromised servers
- The higher the ratio is, the more mass compromise happened

Sources of Information:

- Abuse.ch:Zeus Tracker - Binary URL
- CleanMX - Malware
- Malc0de
- MalwareDomainList

4 Botnet

4.1 Botnets Command & Control Centers (C&C)

Trend and distribution of Botnet (C&Cs) security events

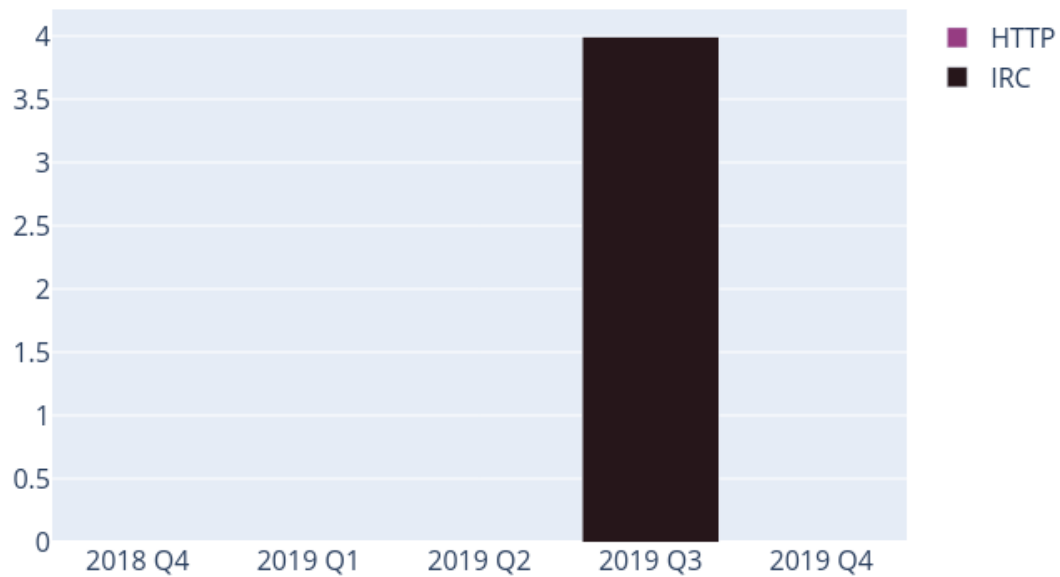


Figure 11: Trend and distribution of Botnet (C&Cs) security events



What is a Botnet Command & Control Center?

- Botnet Command & Control Center is a server used by cybercriminals to control the bots, which are compromised computers, by sending them commands to perform malicious activities, e.g. stealing personal financial information or launching DDoS attacks

What are the potential impacts?

- A server may be heavily loaded when many bots connect to it
 - A server may have a large amount of personal and financial data stolen
-

Sources of Information:

- Shadowserver - C&Cs

4.2 Botnets (Bots)

4.2.1 Major Botnet Families

Major Botnet families are selected botnet families with a considerable amount of security events reported from the information sources consistently across the reporting period.

Individual botnet's size is calculated from the maximum of the daily counts of unique IP address attempting to connect to the botnet in the reporting period. In other words, the real botnet size should be larger because not all bots are activated on the same day.

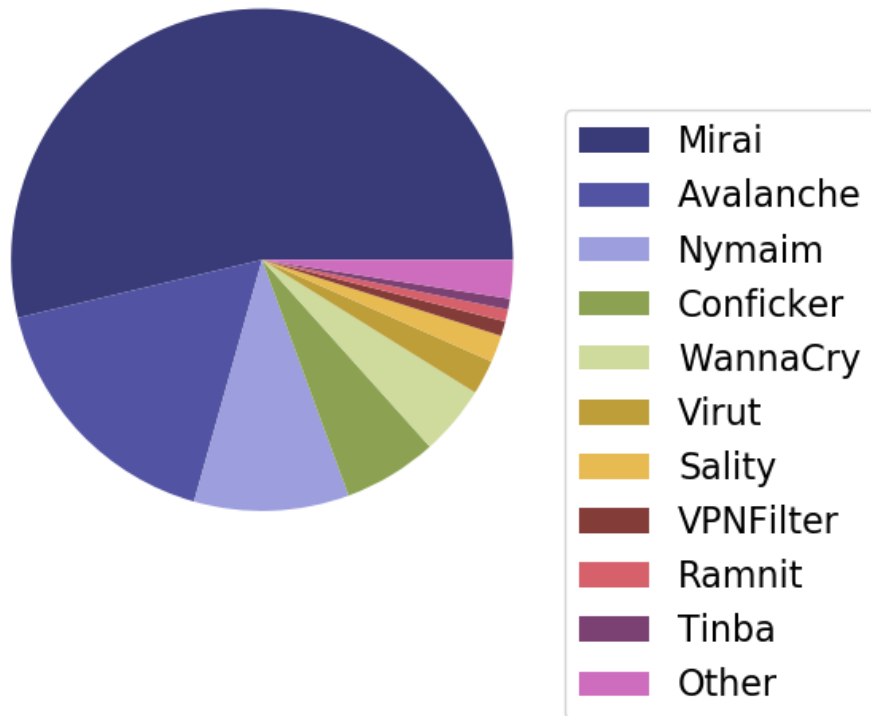


Figure 12: Major Botnet families in Hong Kong network

Table 3: Major Botnet families in Hong Kong network

Rank	↑↓	Concerned Bots	Number of Unique IP addresses	Changes with previous period
1	→	Mirai	4,231	-7.9%
2	↑	Avalanche	1,333	381.2%
3	↑	Nymaim	786	614.5%
4	↓	Conficker	476	-6.3%
5	↓	WannaCry	354	-49.2%
6	↓	Virut	175	-47.3%
7	↓	Sality	137	-7.4%
8	→	VPNFilter	75	-6.2%
9	↑	Ramnit	61	24.5%
10	↓	Tinba	55	-9.8%

Trend of 5 Botnet families in Hong Kong network

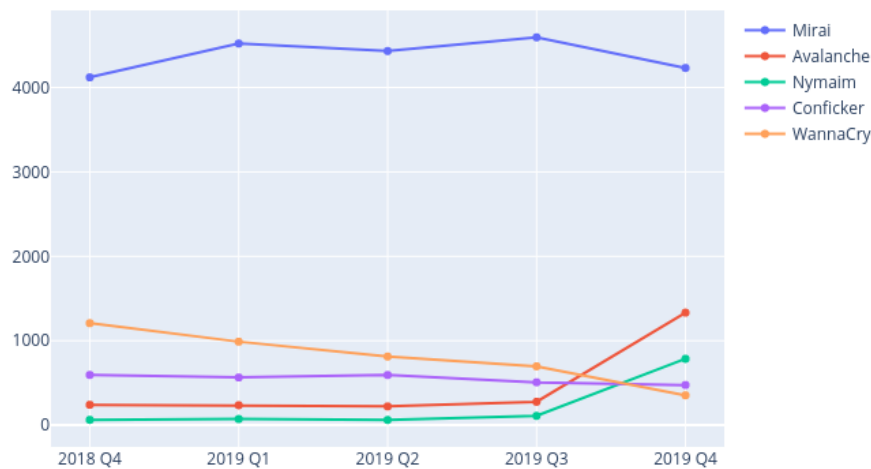


Figure 13: Trend of top 5 Botnet families in Hong Kong network

Table 4: Trend of top 5 Botnet families in Hong Kong network

Name	2018 Q4	2019 Q1	2019 Q2	2019 Q3	2019 Q4
Mirai	4,120	4,521	4,432	4,594	4,231
Avalanche	241	236	222	277	1,333
Nymaim	63	73	62	110	786
Conficker	595	565	594	508	476
WannaCry	1,208	989	813	697	354



What is a Botnet (Bots)?

- A Botnet (Bots) is usually a personal computer that is infected by malicious software to become part of a botnet. Once infected, the malicious software usually hides itself, and stealthily connects to the Command & Control Server to get instructions from the hackers.

What are the potential impacts?

- Computers may be commanded to perform other hacking or criminal activities
- Computer owner's personal and financial data may be stolen which may lead to financial loss
- Commands from hackers may lead to other malicious activities, e.g. spreading malicious software or launching DDoS attacks

Sources of Information:

- ShadowServer - botnet_drone
- ShadowServer - sinkhole_http_drone
- Shadowserver - Microsoft_sinkhole

Appendix

A Sources of information in IFAS

The following information feeds are information sources of IFAS:

Table 5: IFAS Sources of Information

Event Type	Source	First introduced
Defacement	Zone - H	2013-04
Phishing	CleanMX - Phishing	2013-04
Phishing	Phishtank	2013-04
Malware Hosting	Abuse.ch: Zeus Tracker - Binary URL	2013-04
Malware Hosting	CleanMX - Malware	2013-04
Malware Hosting	Malc0de	2013-04
Malware Hosting	MalwareDomainList	2013-04
Botnet (C&Cs)	Shadowserver - C&Cs	2013-09
Botnet (Bots)	Shadowserver - botnet_drone	2013-08
Botnet (Bots)	Shadowserver - sinkhole_http_drone	2013-08
Botnet (Bots)	Shadowserver - microsoft_sinkhole	2013-08

B Geolocation identification methods in IFAS

We use the following methods to identify if a network's geolocation is in Hong Kong:

Table 6: Methods of Geolocation Identification

Method	First introduced	Last update
Maxmind	2013-04	2020-04

C Major Botnet Families

Table 7: Botnet Families

Major Botnets	Alias	Nature	Infection Method	Attacks / Impacts
Avalanche	Nil	Crimeware-as-a-service	<ul style="list-style-type: none"> • Depends on underlying malwares 	<ul style="list-style-type: none"> • Send spams • Host phishing sites • Host malware • Steal sensitive information
Bamital	Nil	Trojan	<ul style="list-style-type: none"> • Drive-by download via exploit kit • Via P2P network 	<ul style="list-style-type: none"> • Click fraud • Search hijacking
BankPatch	<ul style="list-style-type: none"> • MultiBanker • Patcher • BankPatcher 	Banking Trojan	<ul style="list-style-type: none"> • Via adult web sites • Corrupt multimedia codecs • Spam e-mail • Chat and messaging systems 	<ul style="list-style-type: none"> • Monitor specific banking websites and harvest user's passwords, credit card information and other sensitive financial data
Bedep	Nil	Trojan	<ul style="list-style-type: none"> • Via adult web sites • Malvertising 	<ul style="list-style-type: none"> • Click fraud • Download other malwares
BlackEnergy	Nil	DDoS Trojan	<ul style="list-style-type: none"> • Rootkit techniques to maintain persistence • Uses process injection technique • Strong encryption and modular architecture 	<ul style="list-style-type: none"> • Launch DDoS attacks
Citadel	Nil	Banking Trojan	<ul style="list-style-type: none"> • Avoid and disable security tool detection 	<ul style="list-style-type: none"> • Steal banking credentials and sensitive information • Keystroke logging • Screenshot capture • Video capture • Man-in-the-browser attack • Ransomware
Conficker	<ul style="list-style-type: none"> • Downadup • Kido 	Worm	<ul style="list-style-type: none"> • Domain generation algorithm (DGA) capability • Communicate via P2P network • Disable security software 	<ul style="list-style-type: none"> • Exploit the Windows Server Service vulnerability (MS08-067) • Brute force attacks for admin credential to spread across network • Spread via removable drives using "autorun" feature

Table 8: Botnet Families (cont.)

Major Botnets	Alias	Nature	Infection Method	Attacks / Impacts
Corebot	Nil	Banking Trojan	<ul style="list-style-type: none"> • Via droppers 	<ul style="list-style-type: none"> • Steal sensitive information • Install other malware • Backdoor capabilities that allow unauthorised access
Dyre	Nil	Banking Trojan	<ul style="list-style-type: none"> • Spam e-mail 	<ul style="list-style-type: none"> • Steal banking credential by tricking the victim to call an illegitimate number • Send spams
Gamarue	<ul style="list-style-type: none"> • Andromeda 	Downloader/Worm	<ul style="list-style-type: none"> • Via exploit kit • Spam e-mail • MS Word macro • Removable-drives 	<ul style="list-style-type: none"> • Steal sensitive information • Allow unauthorised access • Install other malware
Ghost Push	Nil	Mobile malware	<ul style="list-style-type: none"> • Via app installation 	<ul style="list-style-type: none"> • Gain root access • Download other malware
Glupteba	Nil	Trojan	<ul style="list-style-type: none"> • Drive-by download via Blackhole Exploit Kit 	<ul style="list-style-type: none"> • Push contextual advertising and clickjacking to victims
IRC Botnet	Nil	Trojan	<ul style="list-style-type: none"> • Communicate via IRC network 	<ul style="list-style-type: none"> • Backdoor capabilities that allow unauthorised access • Launch DDoS attack • Send spams
Mirai	Nil	Worm	<ul style="list-style-type: none"> • Telnet with vendor default credentials 	<ul style="list-style-type: none"> • Launch DDoS attacks
Murofet	Nil	Trojan	<ul style="list-style-type: none"> • File infection • Via exploit kits 	<ul style="list-style-type: none"> • Download other malware
Nivdort	Nil	Trojan	<ul style="list-style-type: none"> • Spam e-mail 	<ul style="list-style-type: none"> • Steal login credentials and sensitive information
Nymaim	Nil	Trojan	<ul style="list-style-type: none"> • Spam e-mail • Malicious link 	<ul style="list-style-type: none"> • Lock infected systems • Stop victims from accessing files • Ask for ransom
Matsnu	Nil	Trojan	<ul style="list-style-type: none"> • Spam e-mail 	<ul style="list-style-type: none"> • Backdoor capabilities that allow unauthorised access • Lock infected systems • Encrypt user data • Ask for ransom
Palevo	<ul style="list-style-type: none"> • Rimecud • Butterfly bot • Pilleuz • Mariposa • Vaklik 	Worm	<ul style="list-style-type: none"> • Spread via instant messaging, P2P network and removable drives 	<ul style="list-style-type: none"> • Backdoor capabilities that allow unauthorised access • Steal login credentials and sensitive information • Steal money directly from banks using money mules

Table 9: Botnet Families (cont.)

Major Botnets	Alias	Nature	Infection Method	Attacks / Impacts
Pushdo	<ul style="list-style-type: none"> Cutwail Pandex 	Downloader	<ul style="list-style-type: none"> Hiding its malicious network traffic Domain generation algorithm (DGA) capability Distribute via drive by download Exploit browser and plugins' vulnerabilities 	<ul style="list-style-type: none"> Download other banking malware (e.g. Zeus and Spyeye) Launch DDoS attacks Send spams
Ramnit	Nil	Worm	<ul style="list-style-type: none"> File infection Via exploit kits Public FTP servers 	<ul style="list-style-type: none"> Backdoor capabilities that allow unauthorised access Steal login credentials and sensitive information
Sality	Nil	Trojan	<ul style="list-style-type: none"> Rootkit techniques to maintain persistence Communicate via P2P network Spread via removable drives and shares Disable security software Use polymorphic and entry point obscuring (EPO) techniques to infect files 	<ul style="list-style-type: none"> Send spams Proxying of communications Steal sensitive information Compromise web servers and/or coordinating distributed computing tasks for the purpose of processing intensive tasks (e.g. password cracking) Install other malware
Slenfbot	Nil	Worm	<ul style="list-style-type: none"> Spread via removable drives and shares 	<ul style="list-style-type: none"> Backdoor capabilities that allow unauthorised access Download financial malware Sending spam Launch DDoS attacks
Tinba	<ul style="list-style-type: none"> TinyBanker Zusy 	Banking Trojan	<ul style="list-style-type: none"> Via exploit kit Spam e-mail 	<ul style="list-style-type: none"> Steal banking credential and sensitive information
Torpig	<ul style="list-style-type: none"> Sinowal Anserin 	Trojan	<ul style="list-style-type: none"> Rootkit techniques to maintain persistence (Mebrook rootkit) Domain generation algorithm (DGA) capability Distribute via drive by download 	<ul style="list-style-type: none"> Steal sensitive information Man in the browser attack

Table 10: Botnet Families (cont.)

Major Botnets	Alias	Nature	Infection Method	Attacks / Impacts
Virut	Nil	Trojan	<ul style="list-style-type: none"> • Spread via removable drives and shares 	<ul style="list-style-type: none"> • Send spams • Launch DDoS attacks • Fraud • Data theft
VPNFilter	Nil	Worm	<ul style="list-style-type: none"> • Possibly exploit device vulnerabilities 	<ul style="list-style-type: none"> • Launch network attacks • Leak network traffic flowing through the infected devices • Disrupt Internet connection
WannaCry	<ul style="list-style-type: none"> • WannaCrypt 	Ransomware	<ul style="list-style-type: none"> • Spread across network • Exploit Windows SMB vulnerabilities 	<ul style="list-style-type: none"> • Encrypt user data • Demand ransom • Data unrecoverable
Wapomi	Nil	Worm	<ul style="list-style-type: none"> • Spread via removable drives and shares • Infects executable files 	<ul style="list-style-type: none"> • Backdoor capabilities • Download and drop additional destructive payloads • Alter important files causing unreliable system performance • Gather computer activity, transmit private data and cause sluggish computer
ZeroAccess	<ul style="list-style-type: none"> • Max++ • Sirefef 	Trojan	<ul style="list-style-type: none"> • Rootkit techniques to maintain persistence • Communicate via P2P network • Distribute via drive by download • Distribute via disguise as legitimate file (eg. media files, keygen) 	<ul style="list-style-type: none"> • Download other malware • Bitcoin mining and click fraud
Zeus	<ul style="list-style-type: none"> • Gameover 	Banking Trojan	<ul style="list-style-type: none"> • Stealthy techniques to maintain persistence • Distribute via drive by download • Communicate via P2P network 	<ul style="list-style-type: none"> • Steal banking credential and sensitive information • Man in the browser attack • Keystroke logging • Download other malware (eg. Cryptolocker) • Launch DDoS attacks