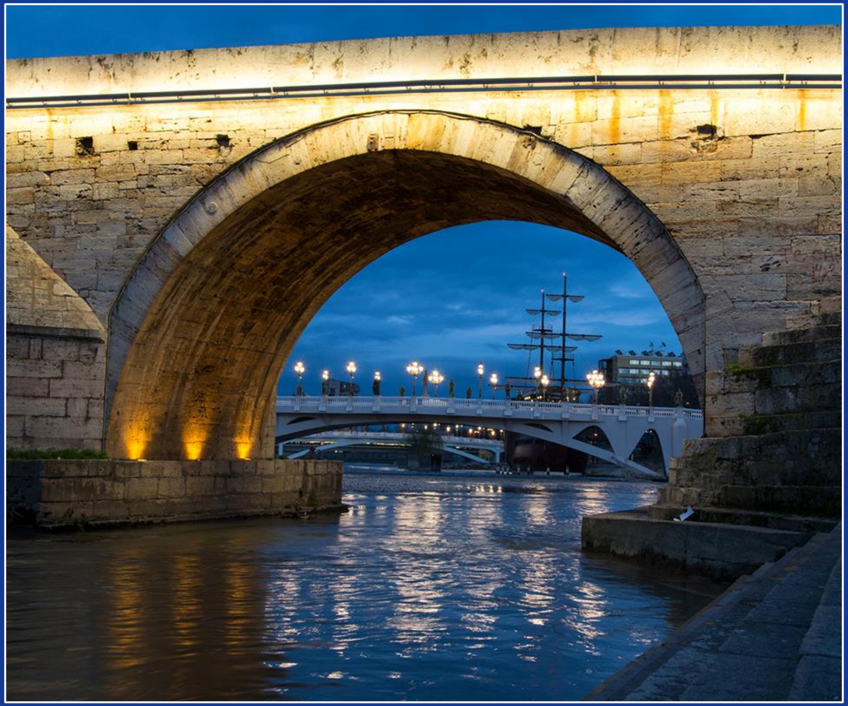
Advanced Malware Protection Against ransomware



György Ács

IT Security Consulting Systems Engineer

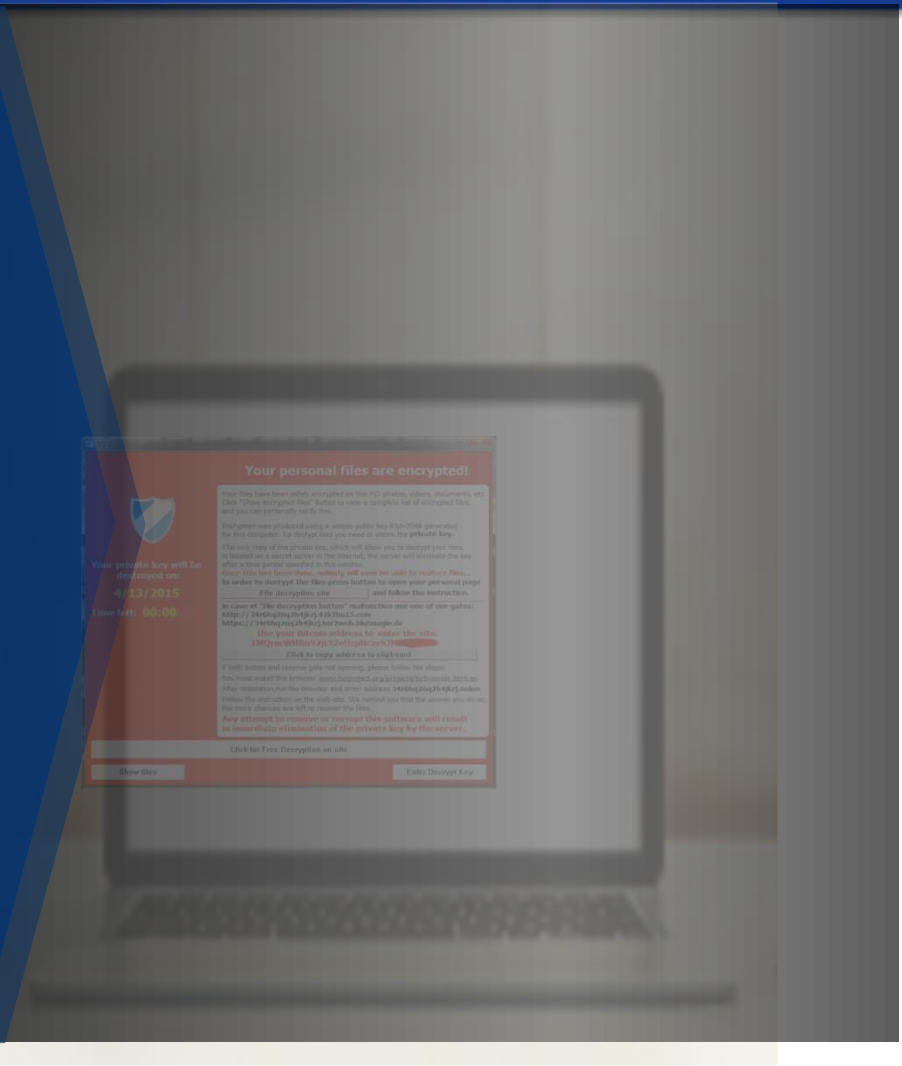
October 2016

Agenda

- Modern malware: ransomware
- What can be done?
- Ransomware analysis examples

Ransomware: Easy Profits

- Most profitable malware in history
- Lucrative: Direct payment to attackers!
- Cyber-criminals collected $209 million in the first three months of 2016 by extorting businesses and institutions to unlock computer servers.
- At that rate, ransomware is on pace to be a $1 billion a year crime this year.
- Let’s take an example:
  - Looking only at the Angler exploit kit delivering ransomware
  - $60 million dollars a year in profits



Your personal files are encrypted!

Your private key will be destroyed on:

4/13/2015

Time left: 00:00

Your files have been safely encrypted on this PC: photos, videos, documents, etc. Click "Show encrypted files" Button to view a complete list of encrypted files, and you can personally verify this.

Encryption was produced using a unique public key RSA-2048 generated for this computer. To decrypt files you need to obtain the **private key.**

The only copy of the private key, which will allow you to decrypt your files, is located on a secret server in the Internet; the server will eliminate the key after a time period specified in this window.

Once this has been done, nobody will ever be able to restore files...

In order to decrypt the files press button to open your personal page

File decryption site **and follow the instruction.**

In case of "File decryption button" malfunction use one of our gates:

http://34r6hq26q2h4jkzj.42k2bu15.com

https://34r6hq26q2h4jkzj.tor2web.blutmagie.de

Use your Bitcoin address to enter the site:

1MQrwWHRo52jL32eUzpHcaeSJH[redacted]

Click to copy address to clipboard

If both button and reserve gate not opening, please follow the steps:

You must install this browser www.torproject.org/projects/torbrowser.html.en

After installation,run the browser and enter address **34r6hq26q2h4jkzj.onion**

Follow the instruction on the web-site. We remind you that the sooner you do so, the more chances are left to recover the files.

Any attempt to remove or corrupt this software will result in immediate elimination of the private key by the server.

Click for Free Decryption on site

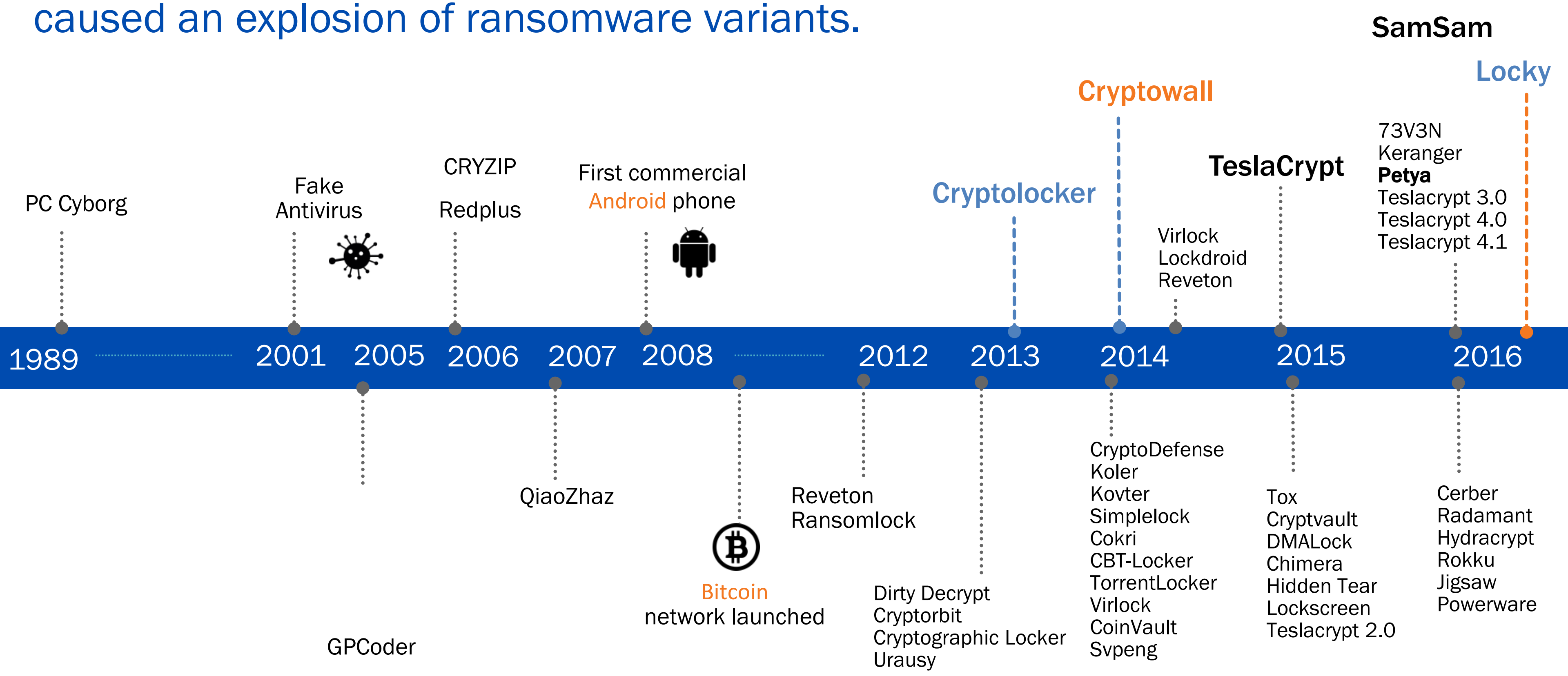
Show files

Enter Decrypt Key

- Ransomware as a Service, Tox

The Evolution of Ransomware Variants

The confluence of easy and effective encryption, the popularity of exploit kits and phishing, and a willingness for victims to pay have caused an explosion of ransomware variants.



PC Cyborg

Fake Antivirus

CRYZIP

Redplus

First commercial Android phone

Cryptolocker

Cryptowall

Virlock
Lockdroid
Reveton

TeslaCrypt

SamSam

Locky

73V3N
Keranger
Petya
Teslacrypt 3.0
Teslacrypt 4.0
Teslacrypt 4.1

1989 2001 2005 2006 2007 2008 2012 2013 2014 2015 2016

GPCoder

QiaoZhaz

Bitcoin network launched

Reveton
Ransomlock

Dirty Decrypt
Cryptorbit
Cryptographic Locker
Urausy

CryptoDefense
Koler
Kovter
Simplelock
Cokri
CBT-Locker
TorrentLocker
Virlock
CoinVault
Svpeng

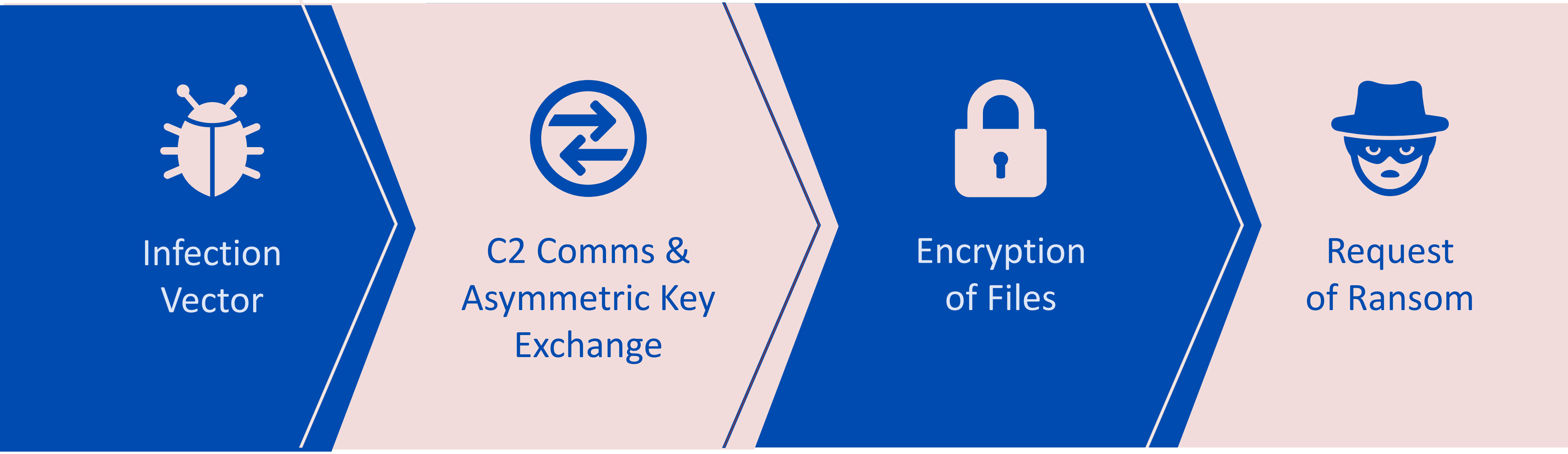
Tox
Cryptvault
DMALock
Chimera
Hidden Tear
Lockscreen
Teslacrypt 2.0

Cerber
Radamant
Hydracrypt
Rokku
Jigsaw
Powerware

How Does Ransomware Work?

Typical Ransomware Infection

- Problem: Customers can be taken hostage by malware that locks up critical resources – Ransomware



Infection Vector

C2 Comms & Asymmetric Key Exchange

Encryption of Files

Request of Ransom

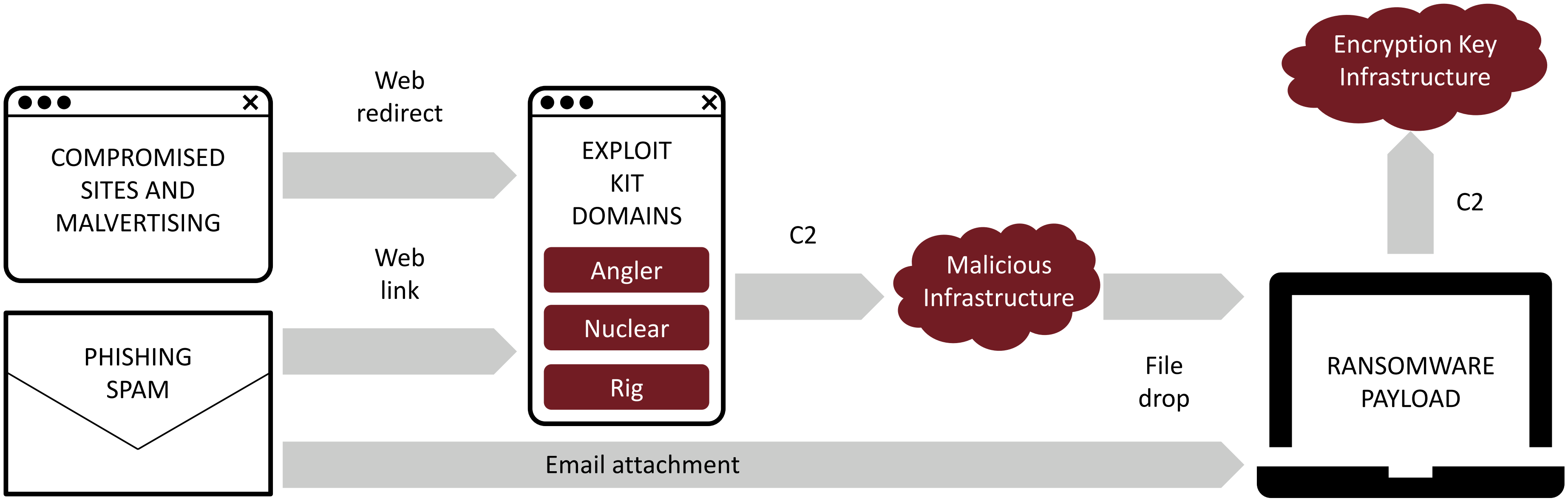
Ransomware frequently uses **web and email**

Ransomware takes **control** of targeted systems

Ransomware holds those systems **‘hostage**’

owner/company agrees to pay the ‘**ransom**’ (bitcoins) to free the system ($100-$1000, 0.5-1.5 bitcoin, deadline, demo files, “customer service”

Most Ransomware Relies on C2 Callbacks



Most Ransomware Relies on C2 Callbacks

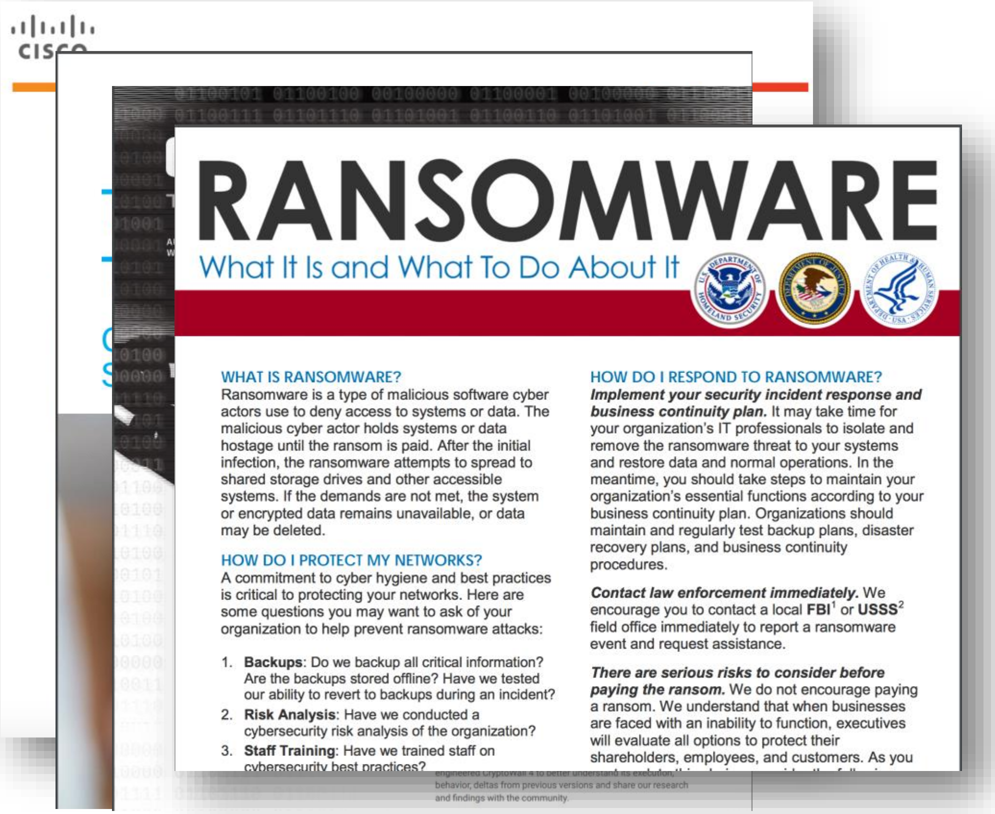
	Encryption Key				Payment MSG
NAME*	**DNS**	**IP**	**NO C2**	**TOR**	**PAYMENT**
Locky	●	●			DNS
SamSam			●		DNS (TOR)
TeslaCrypt	●				DNS
CryptoWall	●				DNS
TorrentLocker	● ●				DNS
PadCrypt	●			●	DNS (TOR)
CTB-Locker	●				DNS
FAKBEN	●				DNS (TOR)
PayCrypt	●			●	DNS
KeyRanger					DNS

*Top variants as of March 2016

What can be done?

Recommendations

1. Build User Awareness (check the sender checking, macro)
2. Assume That Breaches Have Taken Place (a security breach is no longer a question of “if” but “when.”)
3. Prioritize Cyber-hygiene (patch, backup!, min. privilege)



RANSOMWARE

What It Is and What To Do About It

WHAT IS RANSOMWARE?
Ransomware is a type of malicious software cyber actors use to deny access to systems or data. The malicious cyber actor holds systems or data hostage until the ransom is paid. After the initial infection, the ransomware attempts to spread to shared storage drives and other accessible systems. If the demands are not met, the system or encrypted data remains unavailable, or data may be deleted.

HOW DO I PROTECT MY NETWORKS?
A commitment to cyber hygiene and best practices is critical to protecting your networks. Here are some questions you may want to ask of your organization to help prevent ransomware attacks:

1. **Backups**: Do we backup all critical information? Are the backups stored offline? Have we tested our ability to revert to backups during an incident?
2. **Risk Analysis**: Have we conducted a cybersecurity risk analysis of the organization?
3. **Staff Training**: Have we trained staff on cybersecurity best practices?

HOW DO I RESPOND TO RANSOMWARE?
Implement your security incident response and business continuity plan. It may take time for your organization’s IT professionals to isolate and remove the ransomware threat to your systems and restore data and normal operations. In the meantime, you should take steps to maintain your organization’s essential functions according to your business continuity plan. Organizations should maintain and regularly test backup plans, disaster recovery plans, and business continuity procedures.

Contact law enforcement immediately. We encourage you to contact a local **FBI**[1] or **USSS**[2] field office immediately to report a ransomware event and request assistance.

There are serious risks to consider before paying the ransom. We do not encourage paying a ransom. We understand that when businesses are faced with an inability to function, executives will evaluate all options to protect their shareholders, employees, and customers. As you

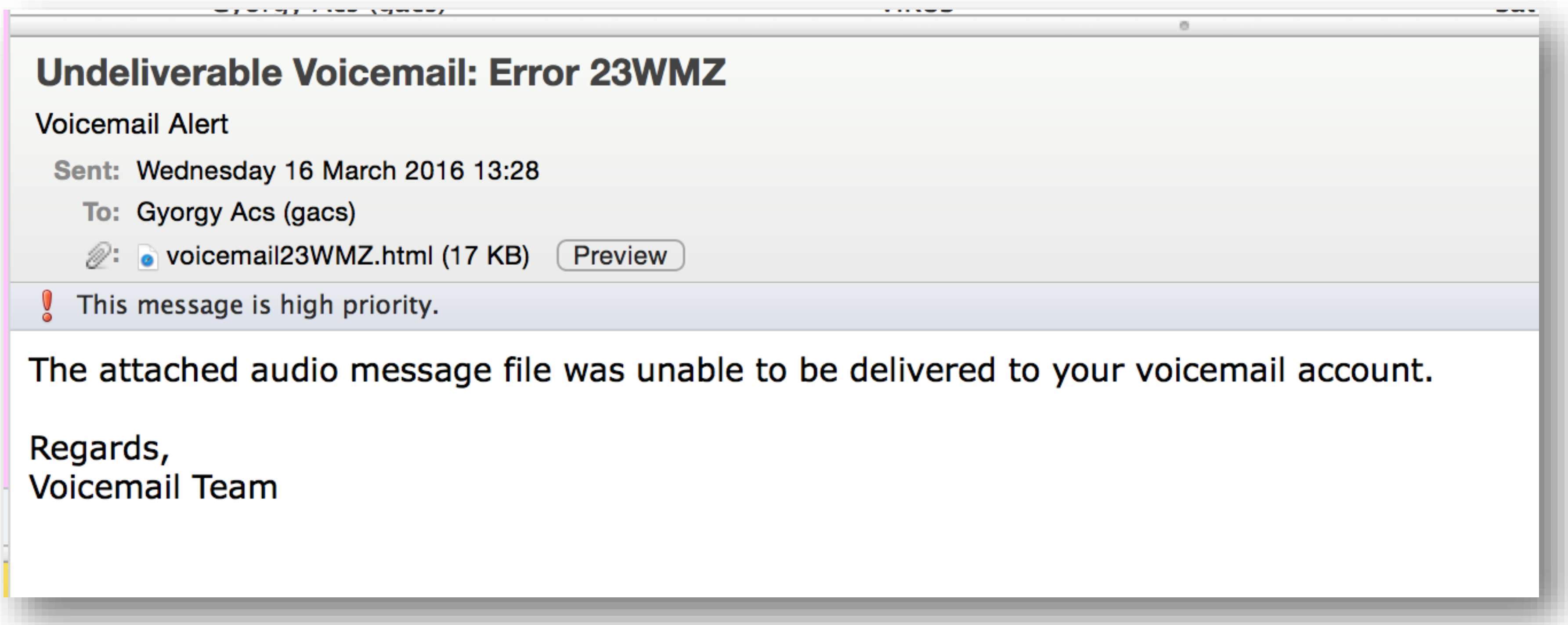
engineered Cryptowall 4 to better understand its execution, behavior, deltas from previous versions and share our research and findings with the community.

http://blogs.cisco.com/security/ransomware-the-race-you-dont-want-to-lose

Best-Practices Recommendations

- Solid patch management
- Non-native document rendering PDF + Office
- Users run as non-privileged users (no admin)
- Disable RDP
- Firewall enabled on endpoints
- Segmented and secured backups (tested)
- Encryption of backups and local documents

Build User Awareness



Undeliverable Voicemail: Error 23WMZ

Voicemail Alert

Sent: Wednesday 16 March 2016 13:28

To: Gyorgy Acs (gacs)

voicemail23WMZ.html (17 KB)

❗ This message is high priority.

The attached audio message file was unable to be delivered to your voicemail account.

Regards,
Voicemail Team

Cisco Ransomware Defense Solution

- Solution to Prevent, Detect and Contain ransomware attacks

Cisco Ransomware Defense Solution is not a silver bullet, and not a guarantee. It does help to:

- **Prevent** ransomware from getting into the network where possible
- **Stop it at the systems** before it gains command and control
- **Detect** when it is present in the network
- Work to **contain it** from expanding to additional systems and network areas
- Performs **incident response** to fix the vulnerabilities and areas that were attacked

✓ This solution helps to keep business operations running with less fear of being taken hostage and losing control of critical systems

Architectural Force Multiplier

Cisco Protects from the Network to the Endpoint to the Cloud

Email Security

On Promise or In the Cloud

Blocks 99% of Spam, 1 in 1 million false positive rate

Umbrella

Security from the cloud

Blocks 95% of threats before they cause damage

Next-Gen Firewall

Prioritizes threats

Automates response

Improved malware protection

Fully integrated management

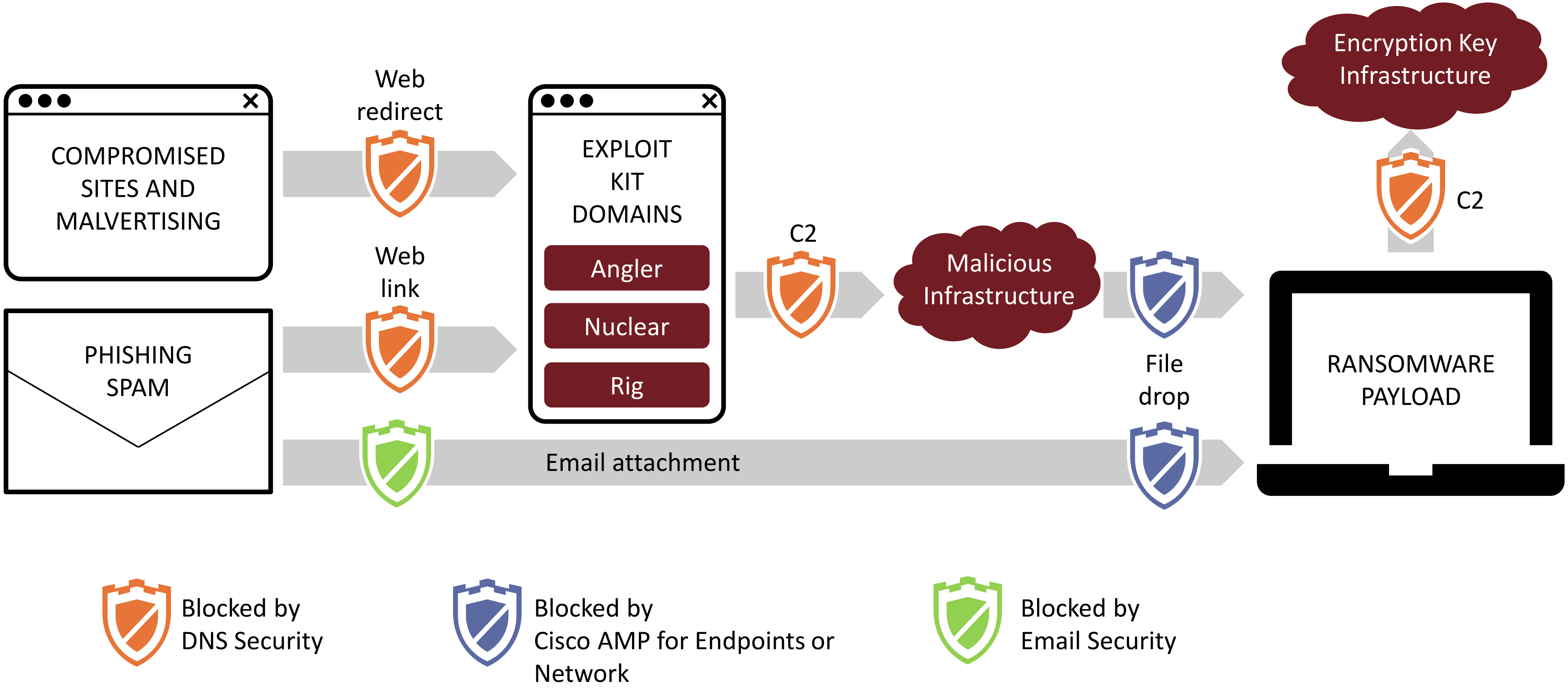
AMP

See a threat once, block it everywhere

Most effective solution for known and emerging advanced threats

Status: Connected
Scanned: Never
Policy: SCSORDAS POLICY

Protection against ransomware



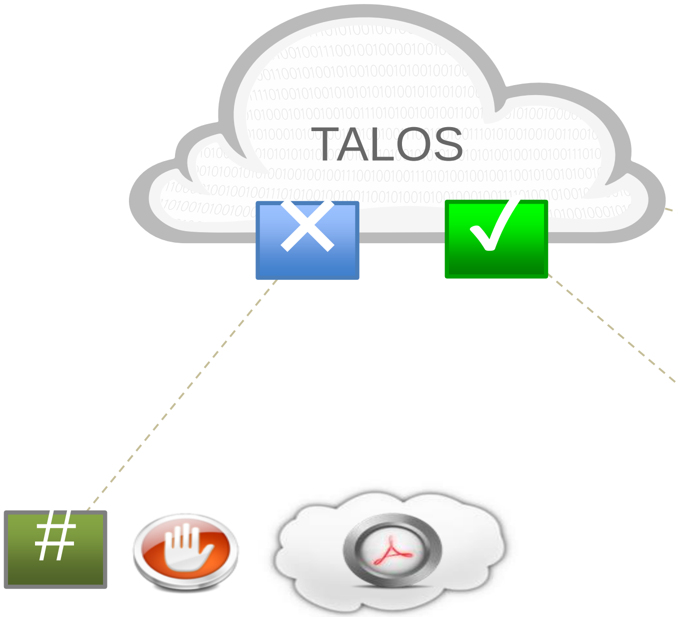
AMP: Advanced Malware Protection

Network-based AMP

Firepower Management Center

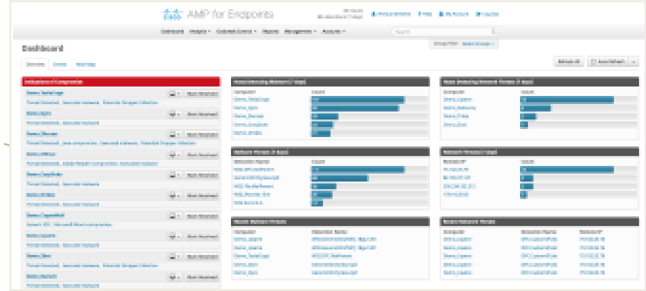
Firepower or
ASA FirePower Services

AMP
Malware
license



No agent
needed

AMP for hosts desktop (Win, MAC, Linux) and mobile devices (Android)



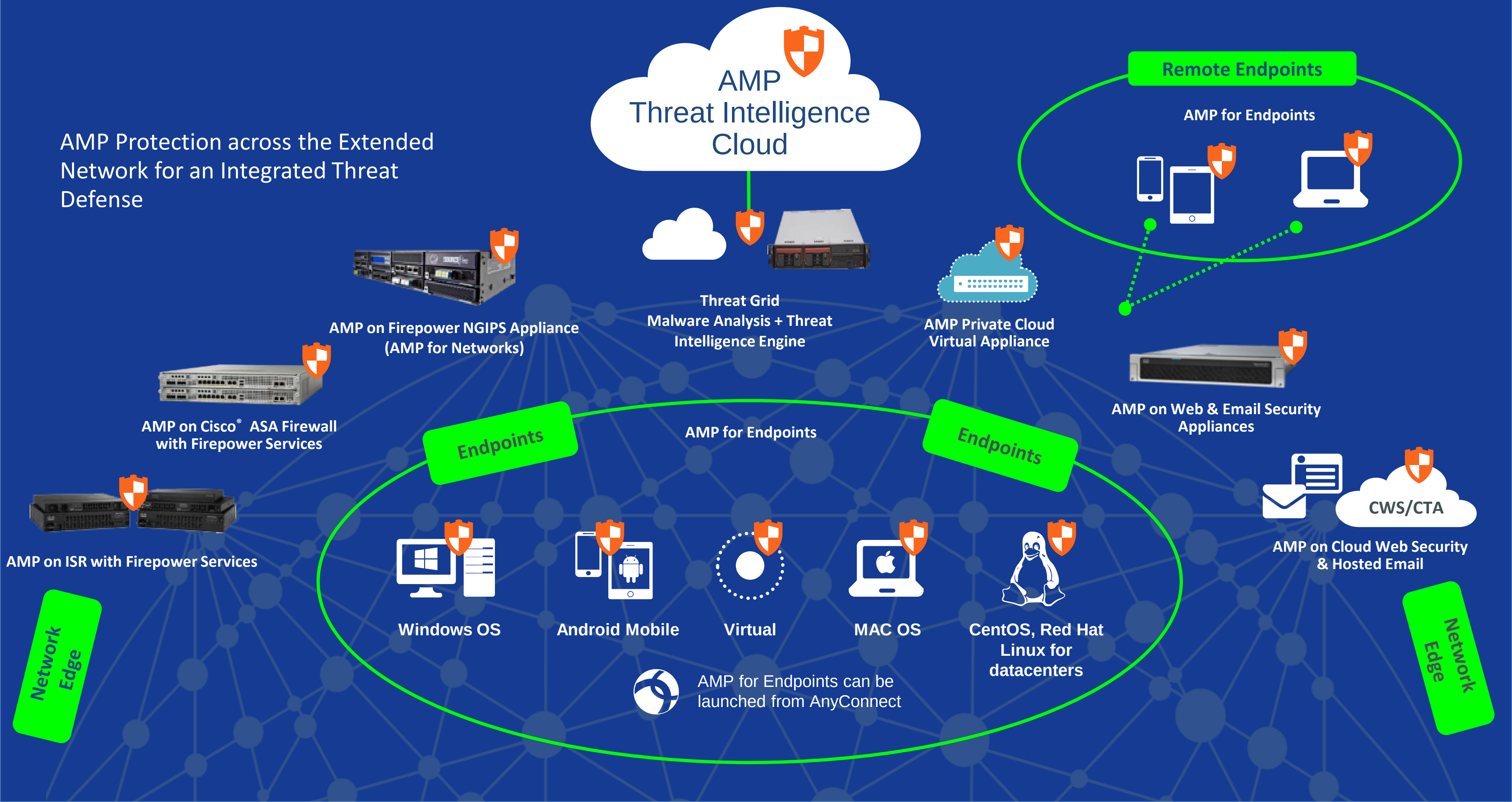
Private Cloud / SaaS Manager

Host-based AMP

- Small agent
- Monitors file access (move/copy/execute)
- Gathers features (fingerprint & attributes)
- Retrieves the file’s disposition (clean, malware, unknown)

The AMP Everywhere Architecture

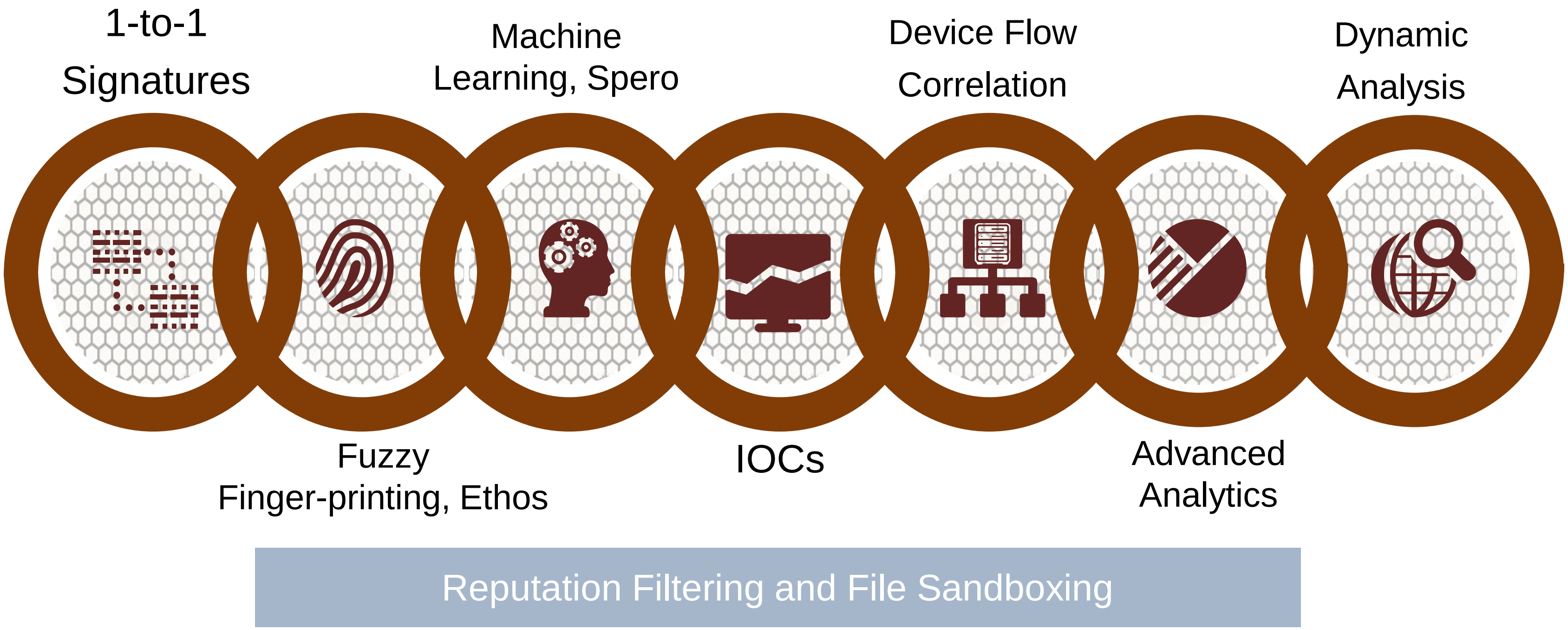
AMP Protection across the Extended Network for an Integrated Threat Defense



AMP for Endpoints can be launched from AnyConnect

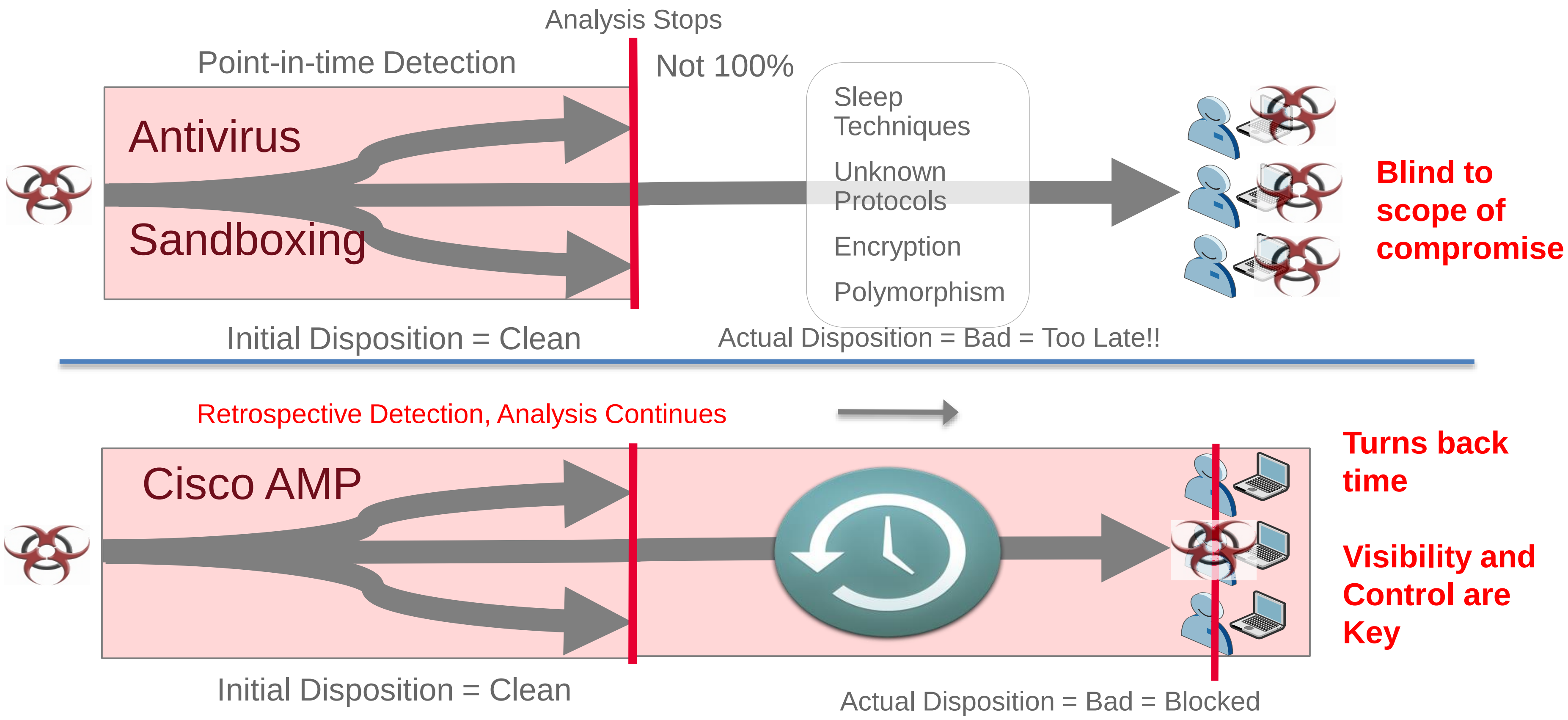
Plan A: The Protection Framework

All prevention solution < 100% protection



Plan B: Retrospective Security

- When you can’t detect 100%, visibility is critical



Analysis Stops

Point-in-time Detection

Not 100%

Antivirus

Sandboxing

Sleep Techniques

Unknown Protocols

Encryption

Polymorphism

Blind to scope of compromise

Initial Disposition = Clean

Actual Disposition = Bad = Too Late!!

Retrospective Detection, Analysis Continues

Cisco AMP

Turns back time

Visibility and Control are Key

Initial Disposition = Clean

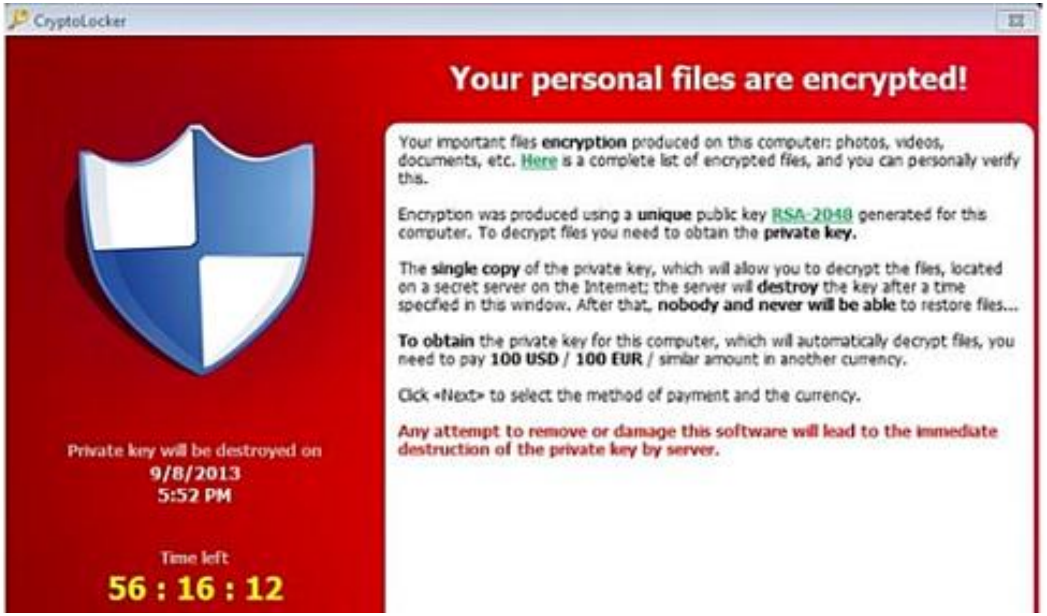
Actual Disposition = Bad = Blocked

Ransomware analysis examples

CryptoLocker

Cryptolocker

- CryptoLocker propagated via infected email attachments, and via an existing botnet
- malware encrypts certain types of files stored on local and mounted network drives using RSA
- private key stored only on the malware's control servers



Your personal files are encrypted!

Your important files **encryption** produced on this computer: photos, videos, documents, etc. Here is a complete list of encrypted files, and you can personally verify this.

Encryption was produced using a **unique** public key RSA-2048 generated for this computer. To decrypt files you need to obtain the **private key.**

The **single copy** of the private key, which will allow you to decrypt the files, located on a secret server on the Internet; the server will **destroy** the key after a time specified in this window. After that, **nobody and never will be able** to restore files...

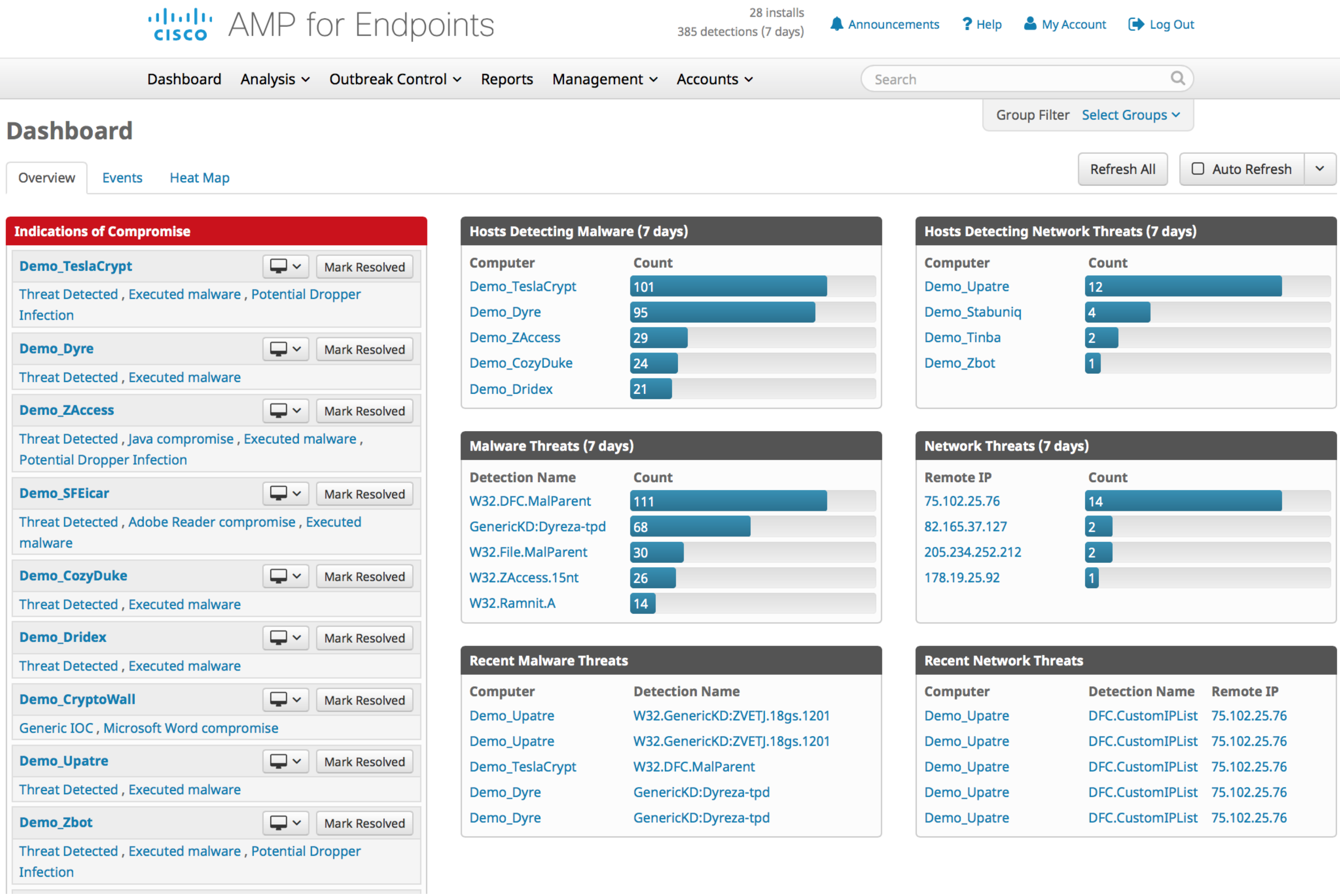
To obtain the private key for this computer, which will automatically decrypt files, you need to pay **100 USD** / **100 EUR** / similar amount in another currency.

Click «Next» to select the method of payment and the currency.

Any attempt to remove or damage this software will lead to the immediate destruction of the private key by server.

Private key will be destroyed on
9/8/2013
5:52 PM

Time left
56 : 16 : 12



Dashboard

Indications of Compromise

Demo_TeslaCrypt
Threat Detected , Executed malware , Potential Dropper Infection

Demo_Dyre
Threat Detected , Executed malware

Demo_ZAccess
Threat Detected , Java compromise , Executed malware , Potential Dropper Infection

Demo_SFEicar
Threat Detected , Adobe Reader compromise , Executed malware

Demo_CozyDuke
Threat Detected , Executed malware

Demo_Dridex
Threat Detected , Executed malware

Demo_CryptoWall
Generic IOC , Microsoft Word compromise

Demo_Upatre
Threat Detected , Executed malware

Demo_Zbot
Threat Detected , Executed malware , Potential Dropper Infection

Hosts Detecting Malware (7 days)

Computer	Count
Demo_TeslaCrypt	101
Demo_Dyre	95
Demo_ZAccess	29
Demo_CozyDuke	24
Demo_Dridex	21

Hosts Detecting Network Threats (7 days)

Computer	Count
Demo_Upatre	12
Demo_Stabuniq	4
Demo_Tinba	2
Demo_Zbot	1

Malware Threats (7 days)

Detection Name	Count
W32.DFC.MalParent	111
GenericKD:Dyreza-tpd	68
W32.File.MalParent	30
W32.ZAccess.15nt	26
W32.Ramnit.A	14

Network Threats (7 days)

Remote IP	Count
75.102.25.76	14
82.165.37.127	2
205.234.252.212	2
178.19.25.92	1

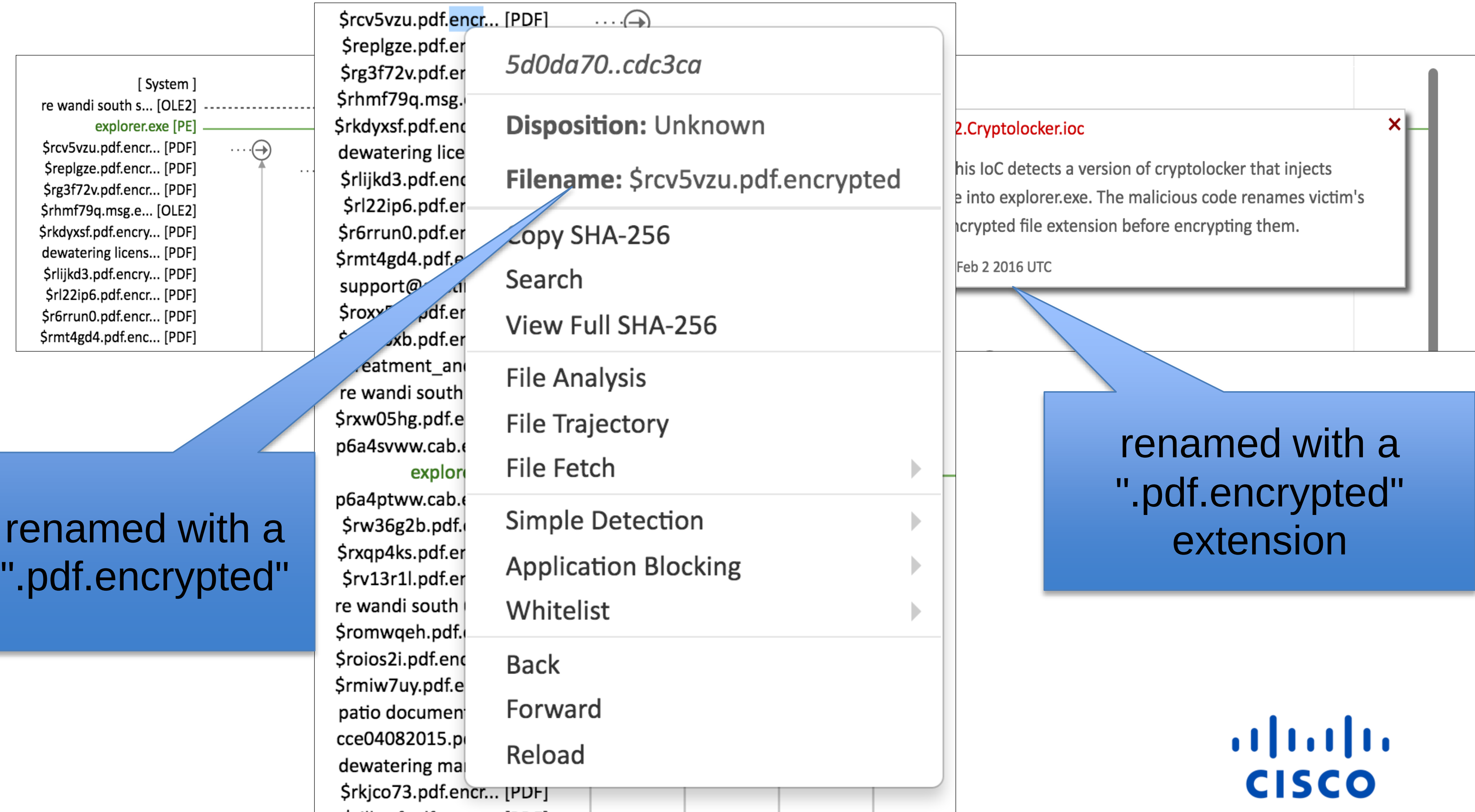
Recent Malware Threats

Computer	Detection Name
Demo_Upatre	W32.GenericKD:ZVETJ.18gs.1201
Demo_Upatre	W32.GenericKD:ZVETJ.18gs.1201
Demo_TeslaCrypt	W32.DFC.MalParent
Demo_Dyre	GenericKD:Dyreza-tpd
Demo_Dyre	GenericKD:Dyreza-tpd

Recent Network Threats

Computer	Detection Name	Remote IP
Demo_Upatre	DFC.CustomIPList	75.102.25.76
Demo_Upatre	DFC.CustomIPList	75.102.25.76
Demo_Upatre	DFC.CustomIPList	75.102.25.76
Demo_Upatre	DFC.CustomIPList	75.102.25.76
Demo_Upatre	DFC.CustomIPList	75.102.25.76

Cryptolocker in Feb 2016 – device trajectory



```
[ System ]
re wandi south s... [OLE2]
explorer.exe [PE]
$rcv5vzu.pdf.encr... [PDF]
$replgze.pdf.encr... [PDF]
$rg3f72v.pdf.encr... [PDF]
$rhmf79q.msg.e... [OLE2]
$rkdyxsf.pdf.encry... [PDF]
dewatering licens... [PDF]
$rlijkd3.pdf.encry... [PDF]
$rl22ip6.pdf.encr... [PDF]
$r6rrun0.pdf.encr... [PDF]
$rmt4gd4.pdf.enc... [PDF]
```

```
$rcv5vzu.pdf.encr... [PDF]
$replgze.pdf.er
$rg3f72v.pdf.er
$rhmf79q.msg.
$rkdyxsf.pdf.enc
dewatering lice
$rlijkd3.pdf.enc
$rl22ip6.pdf.er
$r6rrun0.pdf.er
$rmt4gd4.pdf.e
support@
$roxx pdf.er
xb.pdf.er
eatment_an
re wandi south
$rxw05hg.pdf.e
p6a4svww.cab.
explor
p6a4ptww.cab.
$rw36g2b.pdf.
$rxqp4ks.pdf.er
$rv13r1l.pdf.er
re wandi south
$romwqeh.pdf.
$roios2i.pdf.enc
$rmiw7uy.pdf.e
patio documen
cce04082015.p
dewatering ma
$rkjco73.pdf.encr... [PDF]
```

5d0da70..cdc3ca

Disposition: Unknown

Filename: $rcv5vzu.pdf.encrypted

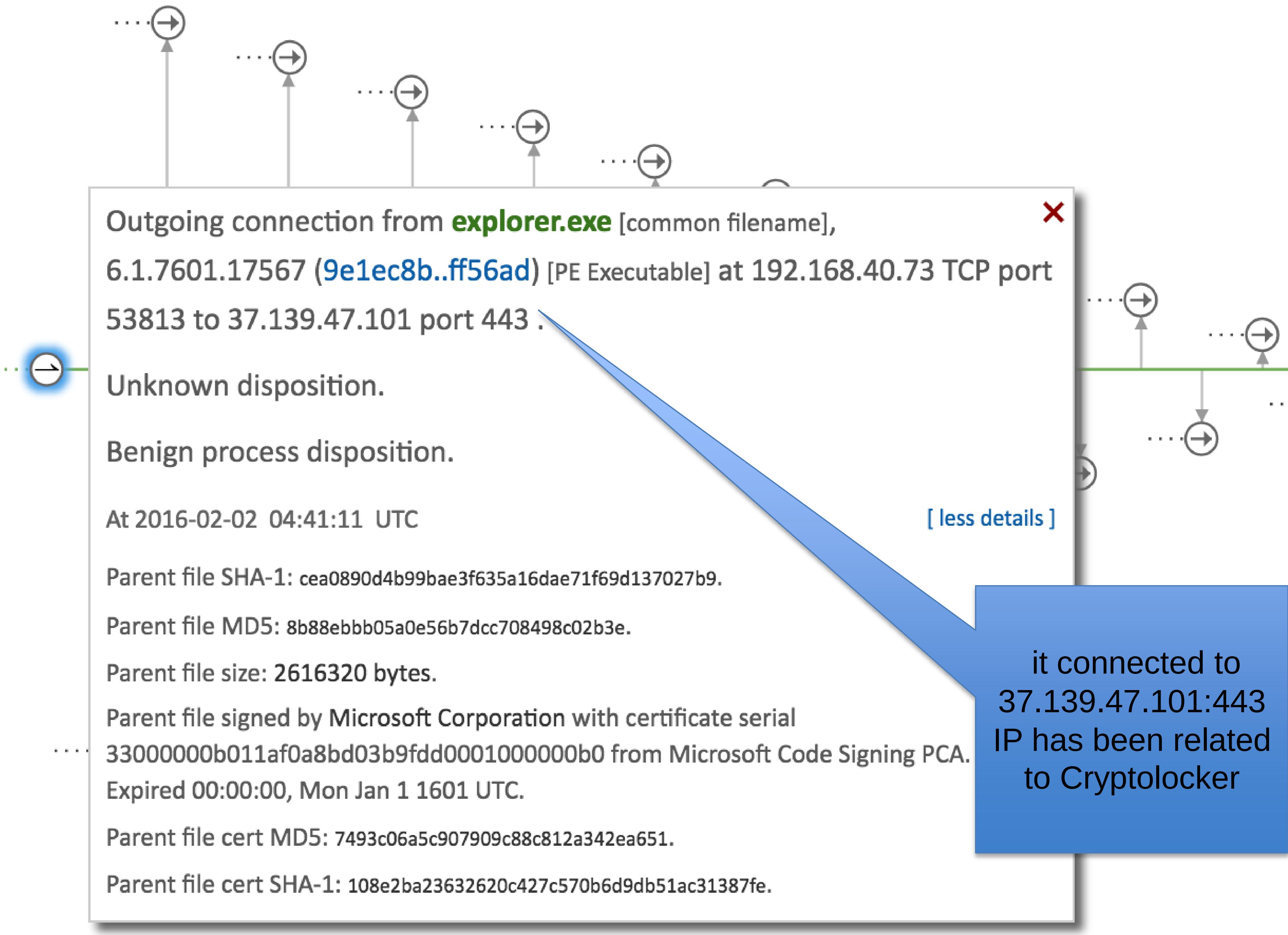
2.Cryptolocker.ioc

his IoC detects a version of cryptolocker that injects e into explorer.exe. The malicious code renames victim's ncrypted file extension before encrypting them.

Feb 2 2016 UTC

renamed with a ".pdf.encrypted"

renamed with a ".pdf.encrypted" extension



Outgoing connection from **explorer.exe** [common filename], 6.1.7601.17567 (9e1ec8b..ff56ad) [PE Executable] at 192.168.40.73 TCP port 53813 to 37.139.47.101 port 443 .

Unknown disposition.

Benign process disposition.

At 2016-02-02 04:41:11 UTC

Parent file SHA-1: cea0890d4b99bae3f635a16dae71f69d137027b9.

Parent file MD5: 8b88ebbb05a0e56b7dcc708498c02b3e.

Parent file size: 2616320 bytes.

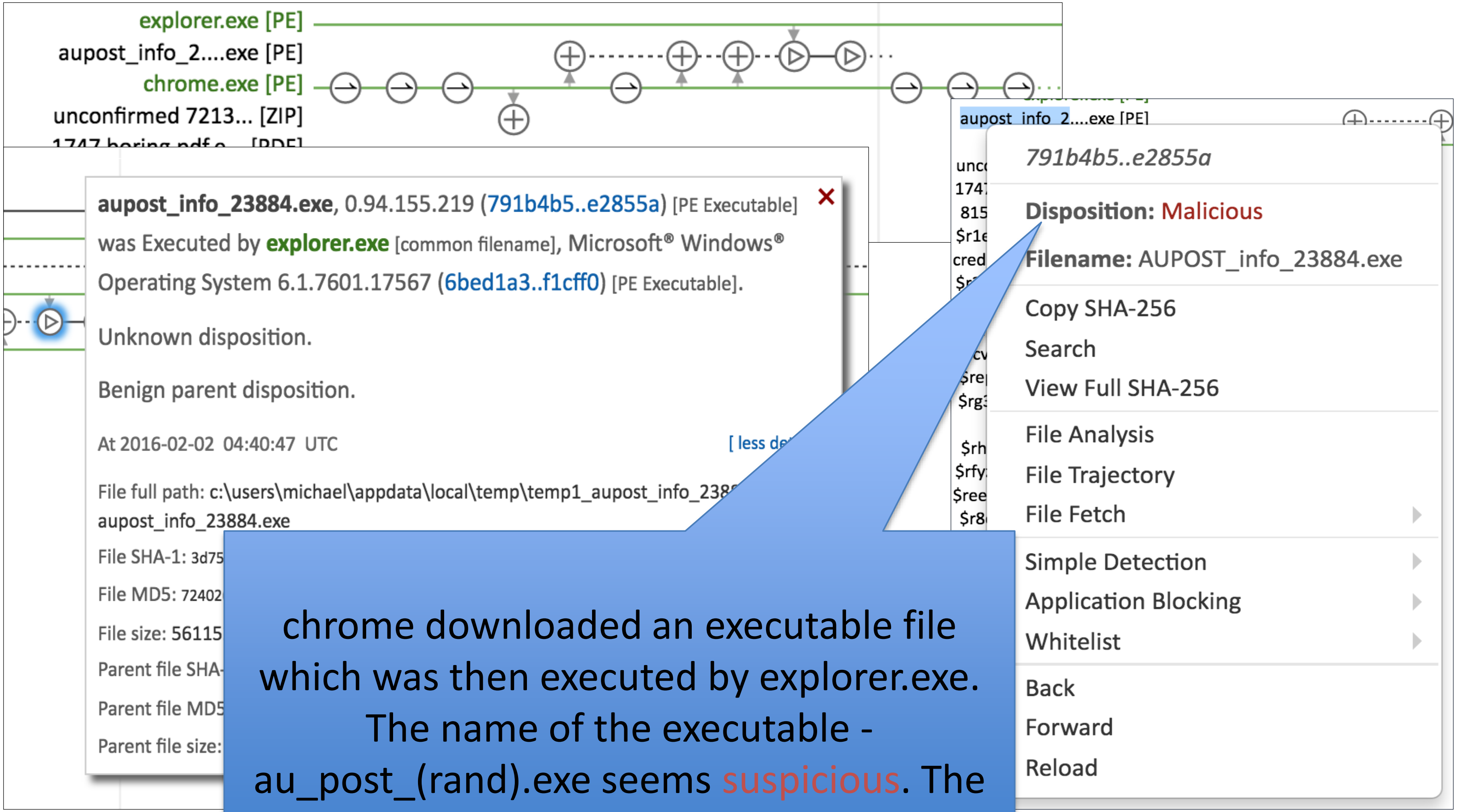
Parent file signed by Microsoft Corporation with certificate serial 3300000b011af0a8bd03b9fdd0001000000b0 from Microsoft Code Signing PCA. Expired 00:00:00, Mon Jan 1 1601 UTC.

Parent file cert MD5: 7493c06a5c907909c88c812a342ea651.

Parent file cert SHA-1: 108e2ba23632620c427c570b6d9db51ac31387fe.

it connected to
37.139.47.101:443
IP has been related
to Cryptolocker

Retrospective alert


explorer.exe [PE]
aupost_info_2....exe [PE]
chrome.exe [PE]
unconfirmed 7213... [ZIP]
1747 boring pdf e... [PDF]
aupost_info_2....exe [PE]
unc
174
815
$r1e
cred
cv
$re
$rg
$rh
$rfy
$ree
$r8

aupost_info_23884.exe, 0.94.155.219 (791b4b5..e2855a) [PE Executable] was Executed by **explorer.exe** [common filename], Microsoft® Windows® Operating System 6.1.7601.17567 (6bed1a3..f1cff0) [PE Executable].

Unknown disposition.

Benign parent disposition.

At 2016-02-02 04:40:47 UTC

[less de

File full path: c:\users\michael\appdata\local\temp\temp1_aupost_info_238
aupost_info_23884.exe

File SHA-1: 3d75

File MD5: 72402

File size: 56115

Parent file SHA-

Parent file MD5

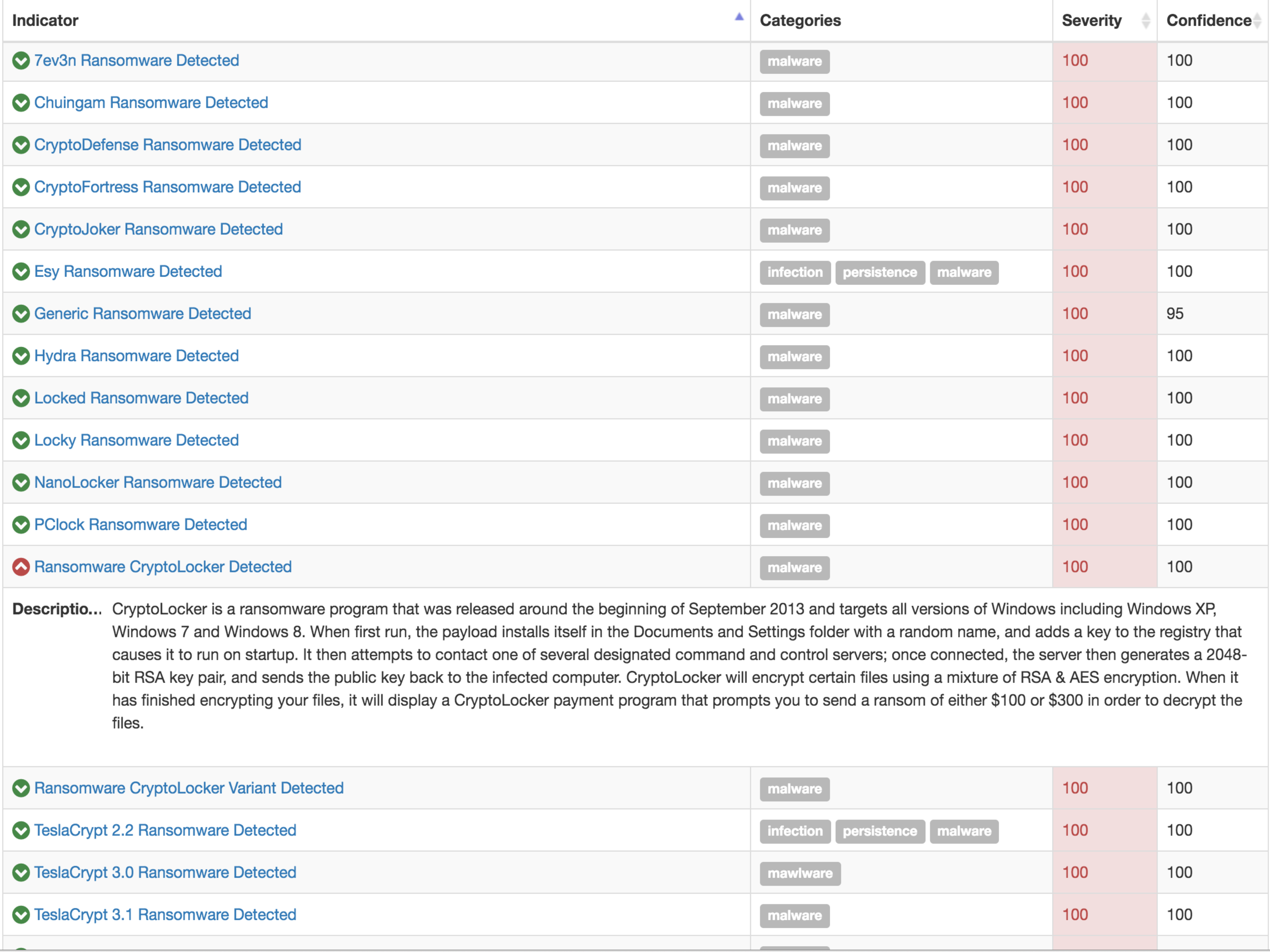
Parent file size:

791b4b5..e2855a

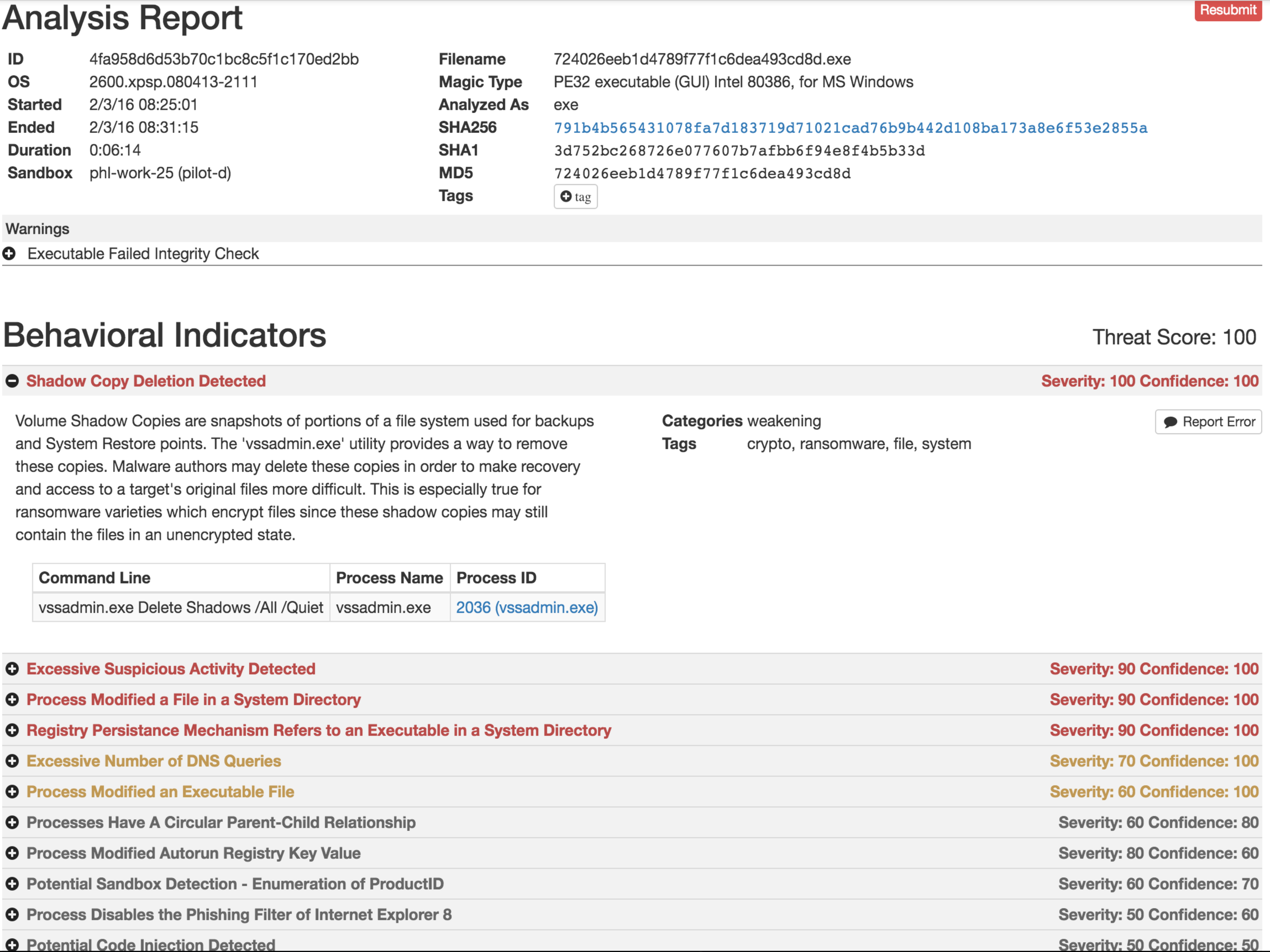
Disposition: Malicious

Filename: AUPOST_info_23884.exe

chrome downloaded an executable file which was then executed by explorer.exe. The name of the executable - au_post_(rand).exe seems suspicious. The disposition was unknown



Indicator	Categories	Severity	Confidence
7ev3n Ransomware Detected	malware	100	100
Chuingam Ransomware Detected	malware	100	100
CryptoDefense Ransomware Detected	malware	100	100
CryptoFortress Ransomware Detected	malware	100	100
CryptoJoker Ransomware Detected	malware	100	100
Esy Ransomware Detected	infection persistence malware	100	100
Generic Ransomware Detected	malware	100	95
Hydra Ransomware Detected	malware	100	100
Locked Ransomware Detected	malware	100	100
Locky Ransomware Detected	malware	100	100
NanoLocker Ransomware Detected	malware	100	100
PClock Ransomware Detected	malware	100	100
Ransomware CryptoLocker Detected	malware	100	100
Descriptio...	CryptoLocker is a ransomware program that was released around the beginning of September 2013 and targets all versions of Windows including Windows XP, Windows 7 and Windows 8. When first run, the payload installs itself in the Documents and Settings folder with a random name, and adds a key to the registry that causes it to run on startup. It then attempts to contact one of several designated command and control servers; once connected, the server then generates a 2048-bit RSA key pair, and sends the public key back to the infected computer. CryptoLocker will encrypt certain files using a mixture of RSA & AES encryption. When it has finished encrypting your files, it will display a CryptoLocker payment program that prompts you to send a ransom of either $100 or $300 in order to decrypt the files.		
Ransomware CryptoLocker Variant Detected	malware	100	100
TeslaCrypt 2.2 Ransomware Detected	infection persistence malware	100	100
TeslaCrypt 3.0 Ransomware Detected	mawlware	100	100
TeslaCrypt 3.1 Ransomware Detected	malware	100	100



Analysis Report

ID	4fa958d6d53b70c1bc8c5f1c170ed2bb	**Filename**	724026eeb1d4789f77f1c6dea493cd8d.exe
OS	2600.xpsp.080413-2111	**Magic Type**	PE32 executable (GUI) Intel 80386, for MS Windows
Started	2/3/16 08:25:01	**Analyzed As**	exe
Ended	2/3/16 08:31:15	**SHA256**	791b4b565431078fa7d183719d71021cad76b9b442d108ba173a8e6f53e2855a
Duration	0:06:14	**SHA1**	3d752bc268726e077607b7afbb6f94e8f4b5b33d
Sandbox	phl-work-25 (pilot-d)	**MD5**	724026eeb1d4789f77f1c6dea493cd8d
		Tags	⊕ tag

Warnings

⊕ Executable Failed Integrity Check

Behavioral Indicators

Threat Score: 100

⊖ **Shadow Copy Deletion Detected** — Severity: 100 Confidence: 100

Volume Shadow Copies are snapshots of portions of a file system used for backups and System Restore points. The 'vssadmin.exe' utility provides a way to remove these copies. Malware authors may delete these copies in order to make recovery and access to a target's original files more difficult. This is especially true for ransomware varieties which encrypt files since these shadow copies may still contain the files in an unencrypted state.

Categories weakening
Tags crypto, ransomware, file, system

Command Line	Process Name	Process ID
vssadmin.exe Delete Shadows /All /Quiet	vssadmin.exe	2036 (vssadmin.exe)

⊕ **Excessive Suspicious Activity Detected** — Severity: 90 Confidence: 100

⊕ **Process Modified a File in a System Directory** — Severity: 90 Confidence: 100

⊕ **Registry Persistance Mechanism Refers to an Executable in a System Directory** — Severity: 90 Confidence: 100

⊕ **Excessive Number of DNS Queries** — Severity: 70 Confidence: 100

⊕ **Process Modified an Executable File** — Severity: 60 Confidence: 100

⊕ **Processes Have A Circular Parent-Child Relationship** — Severity: 60 Confidence: 80

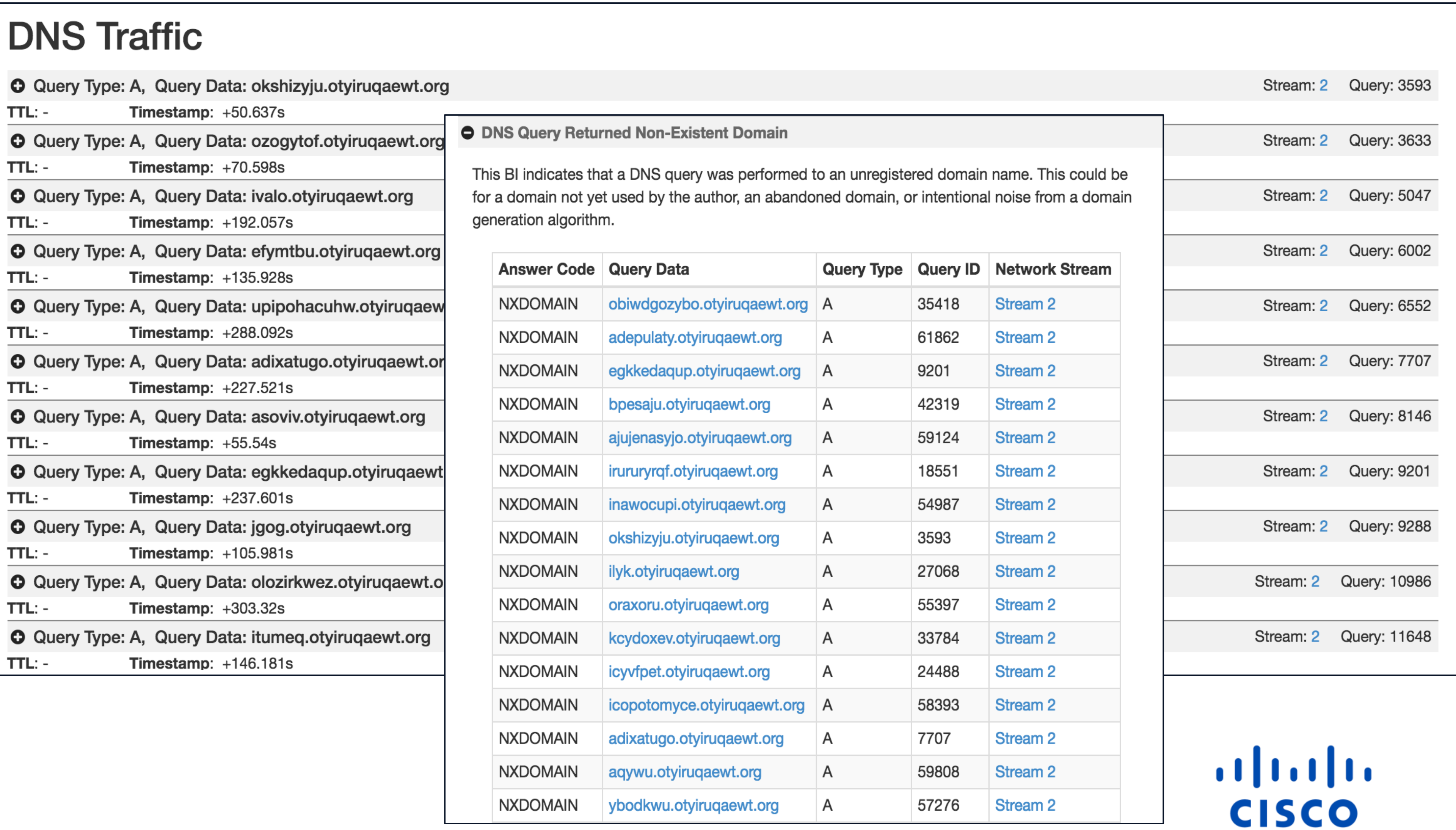
⊕ **Process Modified Autorun Registry Key Value** — Severity: 80 Confidence: 60

⊕ **Potential Sandbox Detection - Enumeration of ProductID** — Severity: 60 Confidence: 70

⊕ **Process Disables the Phishing Filter of Internet Explorer 8** — Severity: 50 Confidence: 60

⊕ **Potential Code Injection Detected** — Severity: 50 Confidence: 50

Artifacts – DNS traffic



DNS Traffic

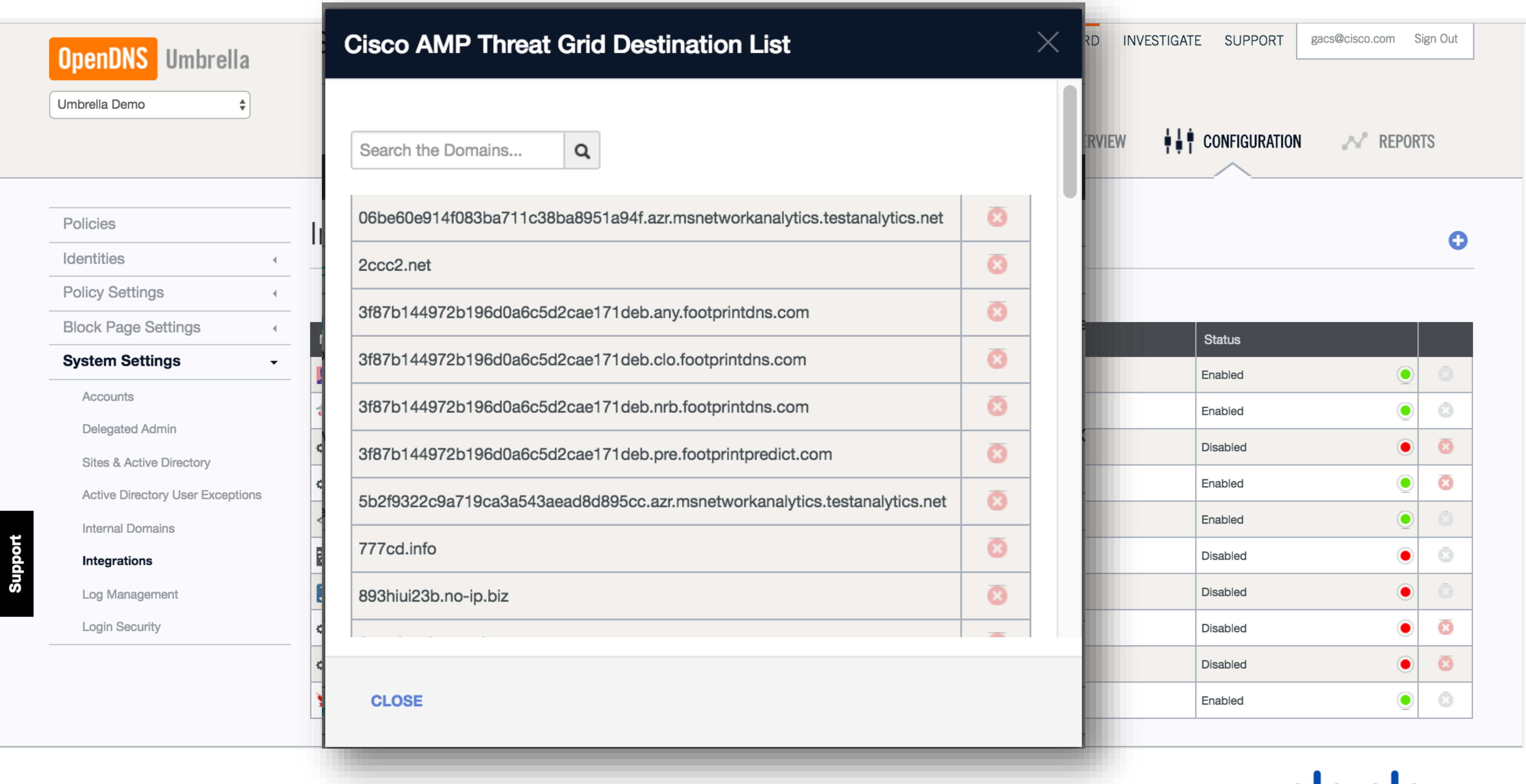
```
Query Type: A,  Query Data: okshizyju.otyiruqaewt.org          Stream: 2    Query: 3593
TTL: -          Timestamp:  +50.637s
Query Type: A,  Query Data: ozogytof.otyiruqaewt.org           Stream: 2    Query: 3633
TTL: -          Timestamp:  +70.598s
Query Type: A,  Query Data: ivalo.otyiruqaewt.org              Stream: 2    Query: 5047
TTL: -          Timestamp:  +192.057s
Query Type: A,  Query Data: efymtbu.otyiruqaewt.org            Stream: 2    Query: 6002
TTL: -          Timestamp:  +135.928s
Query Type: A,  Query Data: upipohacuhw.otyiruqaew             Stream: 2    Query: 6552
TTL: -          Timestamp:  +288.092s
Query Type: A,  Query Data: adixatugo.otyiruqaewt.or           Stream: 2    Query: 7707
TTL: -          Timestamp:  +227.521s
Query Type: A,  Query Data: asoviv.otyiruqaewt.org             Stream: 2    Query: 8146
TTL: -          Timestamp:  +55.54s
Query Type: A,  Query Data: egkkedaqup.otyiruqaewt             Stream: 2    Query: 9201
TTL: -          Timestamp:  +237.601s
Query Type: A,  Query Data: jgog.otyiruqaewt.org               Stream: 2    Query: 9288
TTL: -          Timestamp:  +105.981s
Query Type: A,  Query Data: olozirkwez.otyiruqaewt.o           Stream: 2    Query: 10986
TTL: -          Timestamp:  +303.32s
Query Type: A,  Query Data: itumeq.otyiruqaewt.org             Stream: 2    Query: 11648
TTL: -          Timestamp:  +146.181s
```

DNS Query Returned Non-Existent Domain

This BI indicates that a DNS query was performed to an unregistered domain name. This could be for a domain not yet used by the author, an abandoned domain, or intentional noise from a domain generation algorithm.

Answer Code	Query Data	Query Type	Query ID	Network Stream
NXDOMAIN	obiwdgozybo.otyiruqaewt.org	A	35418	Stream 2
NXDOMAIN	adepulaty.otyiruqaewt.org	A	61862	Stream 2
NXDOMAIN	egkkedaqup.otyiruqaewt.org	A	9201	Stream 2
NXDOMAIN	bpesaju.otyiruqaewt.org	A	42319	Stream 2
NXDOMAIN	ajujenasyjo.otyiruqaewt.org	A	59124	Stream 2
NXDOMAIN	irururyrqf.otyiruqaewt.org	A	18551	Stream 2
NXDOMAIN	inawocupi.otyiruqaewt.org	A	54987	Stream 2
NXDOMAIN	okshizyju.otyiruqaewt.org	A	3593	Stream 2
NXDOMAIN	ilyk.otyiruqaewt.org	A	27068	Stream 2
NXDOMAIN	oraxoru.otyiruqaewt.org	A	55397	Stream 2
NXDOMAIN	kcydoxev.otyiruqaewt.org	A	33784	Stream 2
NXDOMAIN	icyvfpet.otyiruqaewt.org	A	24488	Stream 2
NXDOMAIN	icopotomyce.otyiruqaewt.org	A	58393	Stream 2
NXDOMAIN	adixatugo.otyiruqaewt.org	A	7707	Stream 2
NXDOMAIN	aqywu.otyiruqaewt.org	A	59808	Stream 2
NXDOMAIN	ybodkwu.otyiruqaewt.org	A	57276	Stream 2

OpenDNS – AMP Threat Grid Collaboration



Cisco AMP Threat Grid Destination List

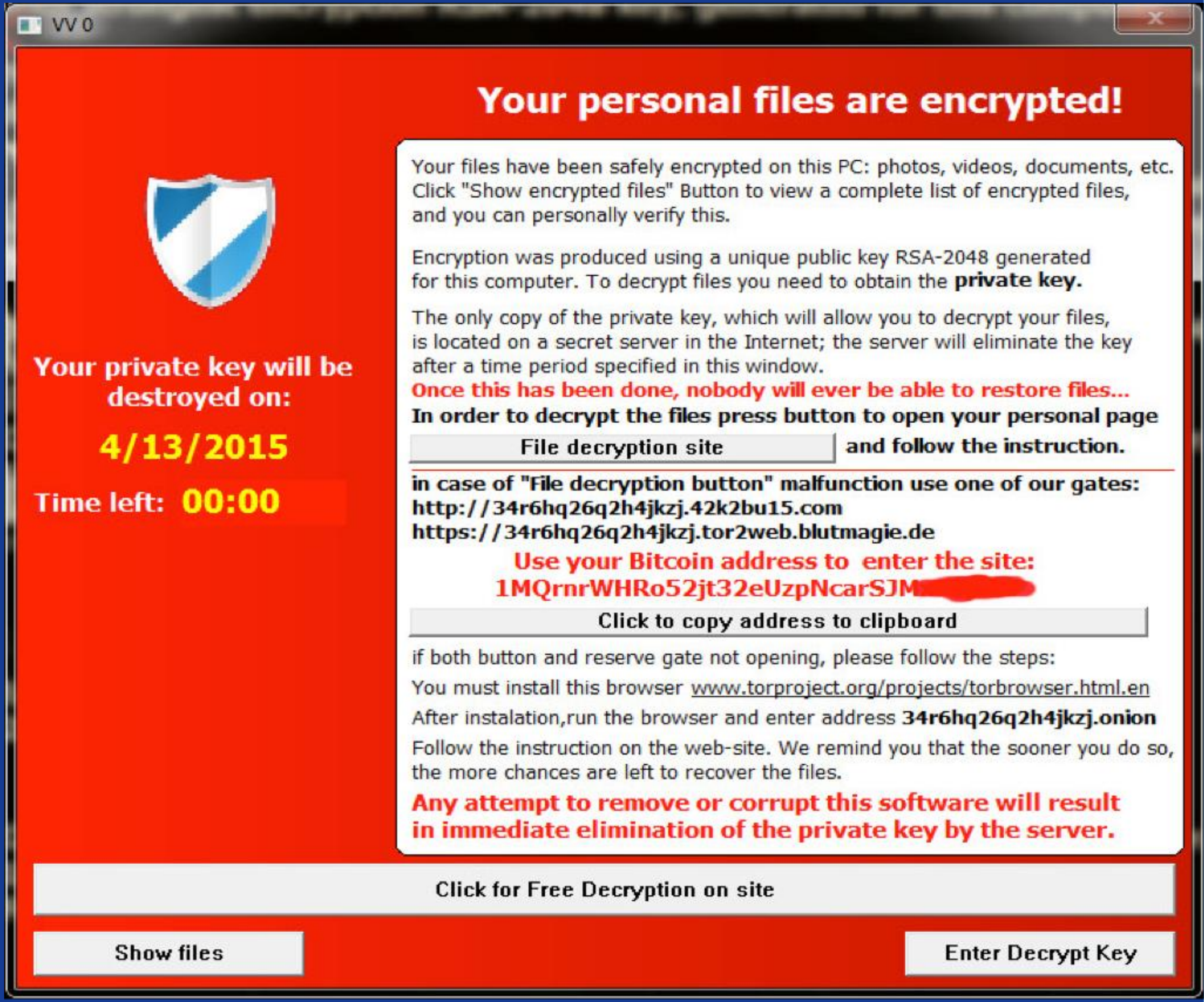
Search the Domains...

- 06be60e914f083ba711c38ba8951a94f.azr.msnetworkanalytics.testanalytics.net
- 2ccc2.net
- 3f87b144972b196d0a6c5d2cae171deb.any.footprintdns.com
- 3f87b144972b196d0a6c5d2cae171deb.clo.footprintdns.com
- 3f87b144972b196d0a6c5d2cae171deb.nrb.footprintdns.com
- 3f87b144972b196d0a6c5d2cae171deb.pre.footprintpredict.com
- 5b2f9322c9a719ca3a543aead8d895cc.azr.msnetworkanalytics.testanalytics.net
- 777cd.info
- 893hiui23b.no-ip.biz

CLOSE

Status
Enabled
Enabled
Disabled
Enabled
Enabled
Disabled
Disabled
Disabled
Disabled
Enabled

Angler exploit kit, Teslacrypt, Cryptowall


VV 0
File decryption site
Click to copy address to clipboard
Click for Free Decryption on site
Show files
Enter Decrypt Key

Your personal files are encrypted!

Your private key will be destroyed on:

4/13/2015

Time left: 00:00

Your files have been safely encrypted on this PC: photos, videos, documents, etc. Click "Show encrypted files" Button to view a complete list of encrypted files, and you can personally verify this.

Encryption was produced using a unique public key RSA-2048 generated for this computer. To decrypt files you need to obtain the **private key.**

The only copy of the private key, which will allow you to decrypt your files, is located on a secret server in the Internet; the server will eliminate the key after a time period specified in this window.
Once this has been done, nobody will ever be able to restore files...
In order to decrypt the files press button to open your personal page
File decryption site **and follow the instruction.**

in case of "File decryption button" malfunction use one of our gates:
http://34r6hq26q2h4jkzj.42k2bu15.com
https://34r6hq26q2h4jkzj.tor2web.blutmagie.de

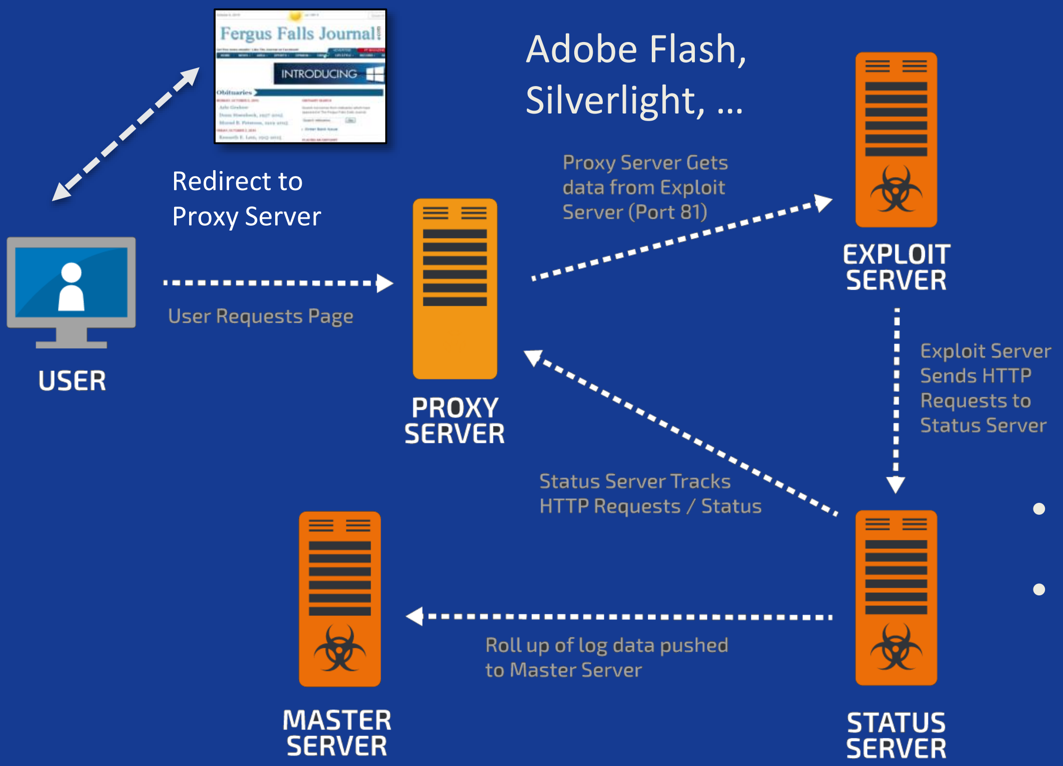
Use your Bitcoin address to enter the site:
1MQrnrWHRo52jt32eUzpNcarSJM[redacted]

if both button and reserve gate not opening, please follow the steps:
You must install this browser www.torproject.org/projects/torbrowser.html.en
After instalation,run the browser and enter address **34r6hq26q2h4jkzj.onion**
Follow the instruction on the web-site. We remind you that the sooner you do so, the more chances are left to recover the files.

Any attempt to remove or corrupt this software will result in immediate elimination of the private key by the server.

http://blog.talosintel.com/2015/12/cryptowall-4.html

Angler infrastructure

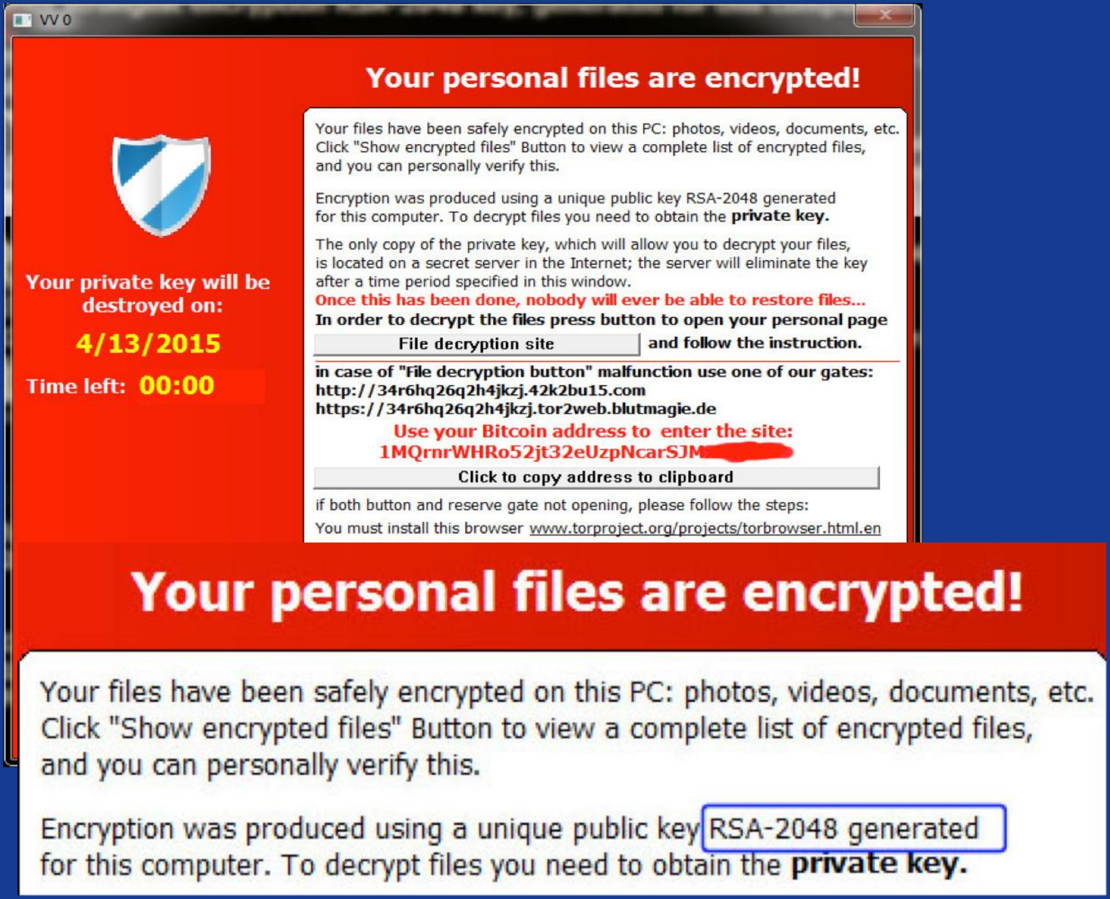


Adobe Flash, Silverlight, …

Fergus Falls Journal
INTRODUCING
Obituaries
USER
Redirect to Proxy Server
User Requests Page
PROXY SERVER
Proxy Server Gets data from Exploit Server (Port 81)
EXPLOIT SERVER
Exploit Server Sends HTTP Requests to Status Server
Status Server Tracks HTTP Requests / Status
STATUS SERVER
Roll up of log data pushed to Master Server
MASTER SERVER

- Angler
  - 90,000 victims daily
  - 40% “success” rate
  - 62%: ransomware : Cryptowall + Teslacrypt
  - A few Day0’s
  - Target: IE, No: Chrome
- RIG (webzilla)
- Nuclear:
  - domain shadowing
  - HTTP302: URL redirect
  - Referer checking

TeslaCrypt



Your personal files are encrypted!

Your private key will be destroyed on:

4/13/2015

Time left: 00:00

Your files have been safely encrypted on this PC: photos, videos, documents, etc. Click "Show encrypted files" Button to view a complete list of encrypted files, and you can personally verify this.

Encryption was produced using a unique public key RSA-2048 generated for this computer. To decrypt files you need to obtain the **private key.**

The only copy of the private key, which will allow you to decrypt your files, is located on a secret server in the Internet; the server will eliminate the key after a time period specified in this window.

Once this has been done, nobody will ever be able to restore files...

In order to decrypt the files press button to open your personal page

File decryption site **and follow the instruction.**

in case of "File decryption button" malfunction use one of our gates:
http://34r6hq26q2h4jkzj.42k2bu15.com
https://34r6hq26q2h4jkzj.tor2web.blutmagie.de

Use your Bitcoin address to enter the site:
1MQrnrWHRo52jt32eUzpNcarSJM[redacted]

Click to copy address to clipboard

if both button and reserve gate not opening, please follow the steps:
You must install this browser www.torproject.org/projects/torbrowser.html.en

Your personal files are encrypted!

Your files have been safely encrypted on this PC: photos, videos, documents, etc. Click "Show encrypted files" Button to view a complete list of encrypted files, and you can personally verify this.

Encryption was produced using a unique public key RSA-2048 generated for this computer. To decrypt files you need to obtain the **private key.**

TeslaCrypt

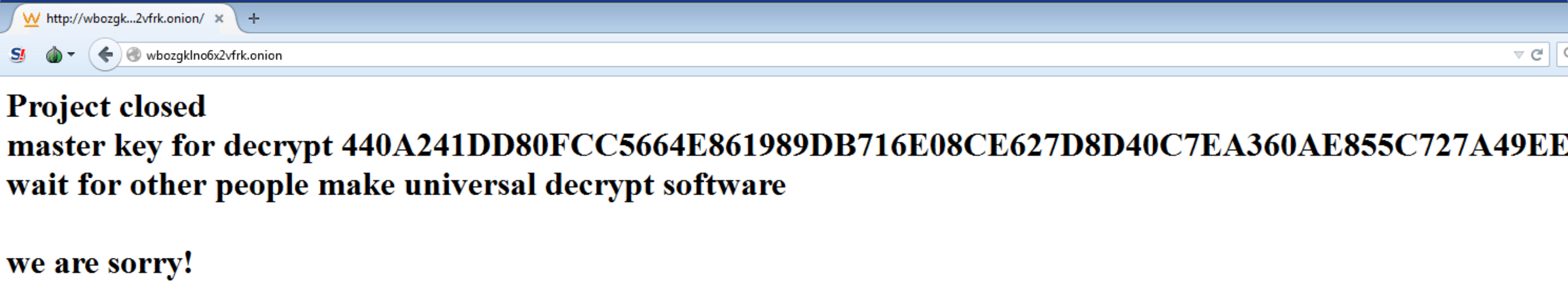
- Imitates CryptoLocker screen
- Pay in Bitcoin
- Not asymmetric (RSA2048) keys used
- Encryption: AES CBC 256-bit

TESLACRYPT
{ DECRYPTION TOOL }

TeslaCrypt: Victory

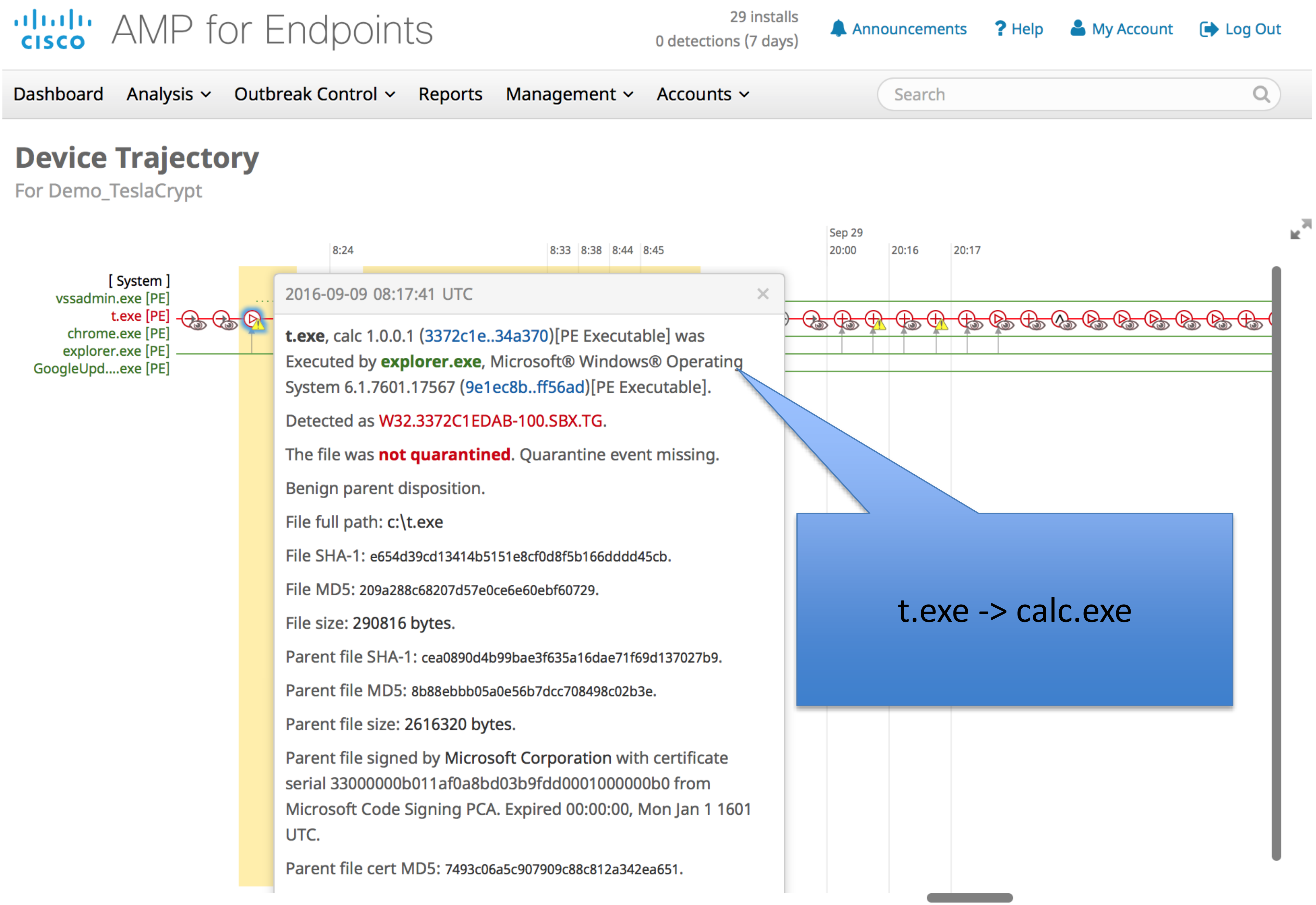
http://www.talosintelligence.com/teslacrypt_tool/

- TeslaCrypt 0.x - Encrypts files using an AES-256 CBC algorithm
- TeslaCrypt 2.x - Same as previous versions, but uses EC to create a weak Recovery key. The application is able to use factorization to recover the victim's global private key.
- TeslaCrypt 3 & 4 - The latest versions. Able to decrypt thanks to the C&C server EC private key which was recently released.



Project closed
master key for decrypt 440A241DD80FCC5664E861989DB716E08CE627D8D40C7EA360AE855C727A49EE
wait for other people make universal decrypt software

we are sorry!



AMP for Endpoints

Device Trajectory

For Demo_TeslaCrypt

2016-09-09 08:17:41 UTC

t.exe, calc 1.0.0.1 (3372c1e..34a370)[PE Executable] was Executed by **explorer.exe**, Microsoft® Windows® Operating System 6.1.7601.17567 (9e1ec8b..ff56ad)[PE Executable].

Detected as W32.3372C1EDAB-100.SBX.TG.

The file was **not quarantined**. Quarantine event missing.

Benign parent disposition.

File full path: c:\t.exe

File SHA-1: e654d39cd13414b5151e8cf0d8f5b166dddd45cb.

File MD5: 209a288c68207d57e0ce6e60ebf60729.

File size: 290816 bytes.

Parent file SHA-1: cea0890d4b99bae3f635a16dae71f69d137027b9.

Parent file MD5: 8b88ebbb05a0e56b7dcc708498c02b3e.

Parent file size: 2616320 bytes.

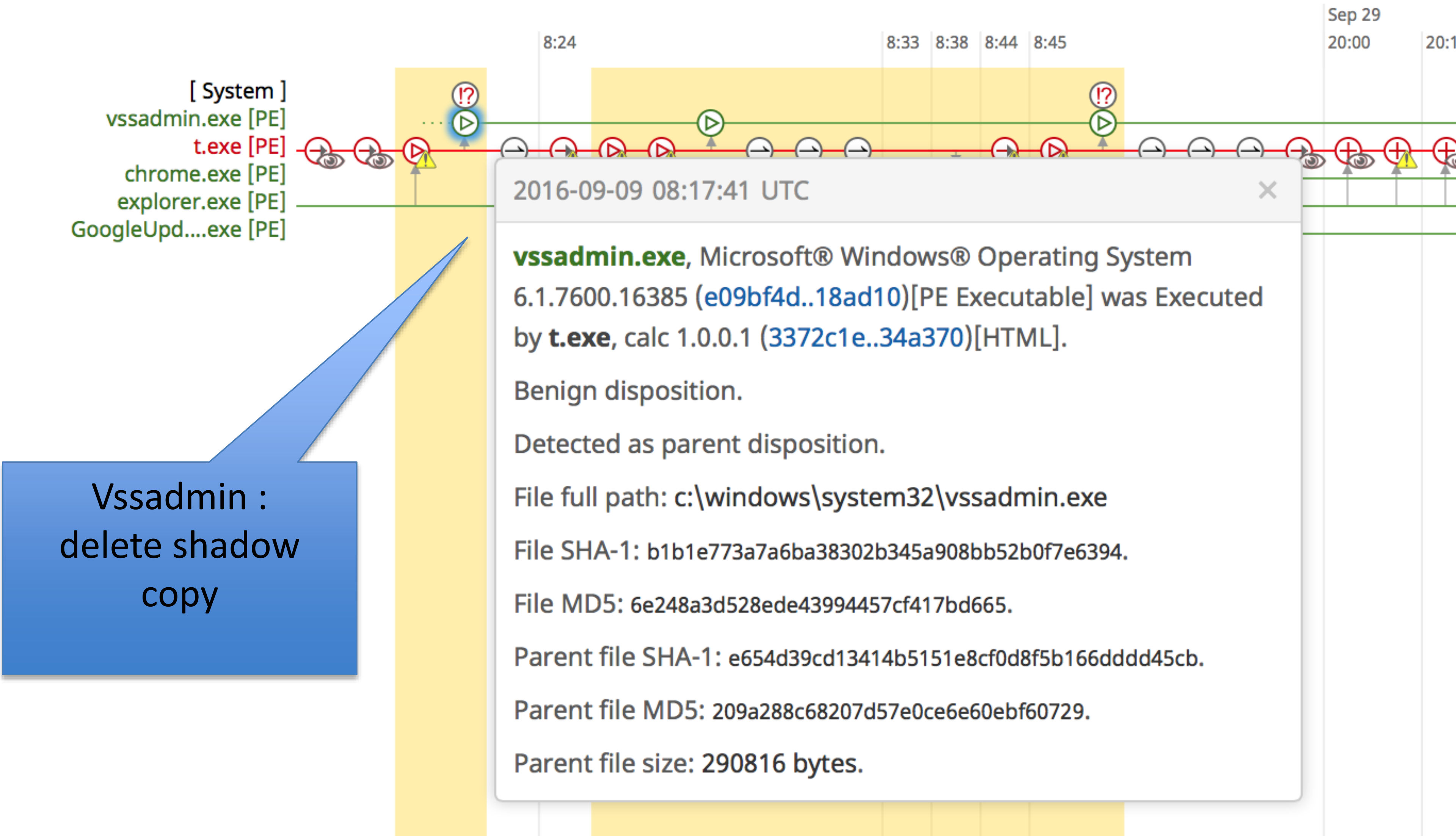
Parent file signed by Microsoft Corporation with certificate serial 33000000b011af0a8bd03b9fdd0001000000b0 from Microsoft Code Signing PCA. Expired 00:00:00, Mon Jan 1 1601 UTC.

Parent file cert MD5: 7493c06a5c907909c88c812a342ea651.

t.exe -> calc.exe

Device Trajectory

For Demo_TeslaCrypt



2016-09-09 08:17:41 UTC

vssadmin.exe, Microsoft® Windows® Operating System 6.1.7600.16385 (e09bf4d..18ad10)[PE Executable] was Executed by **t.exe**, calc 1.0.0.1 (3372c1e..34a370)[HTML].

Benign disposition.

Detected as parent disposition.

File full path: c:\windows\system32\vssadmin.exe

File SHA-1: b1b1e773a7a6ba38302b345a908bb52b0f7e6394.

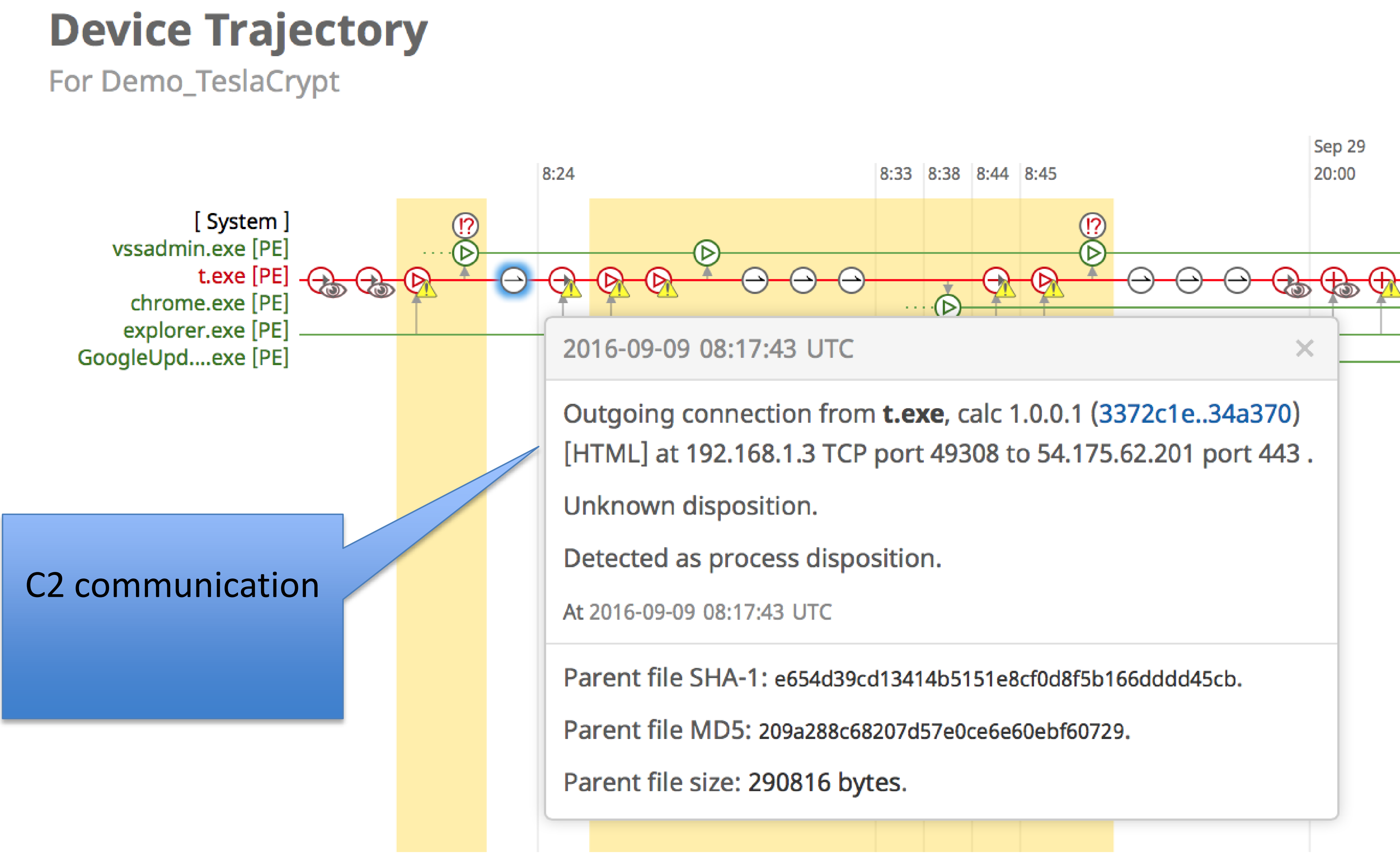
File MD5: 6e248a3d528ede43994457cf417bd665.

Parent file SHA-1: e654d39cd13414b5151e8cf0d8f5b166dddd45cb.

Parent file MD5: 209a288c68207d57e0ce6e60ebf60729.

Parent file size: 290816 bytes.

Vssadmin : delete shadow copy



Device Trajectory

For Demo_TeslaCrypt

2016-09-09 08:17:43 UTC

Outgoing connection from **t.exe**, calc 1.0.0.1 (3372c1e..34a370) [HTML] at 192.168.1.3 TCP port 49308 to 54.175.62.201 port 443 .

Unknown disposition.

Detected as process disposition.

At 2016-09-09 08:17:43 UTC

Parent file SHA-1: e654d39cd13414b5151e8cf0d8f5b166dddd45cb.

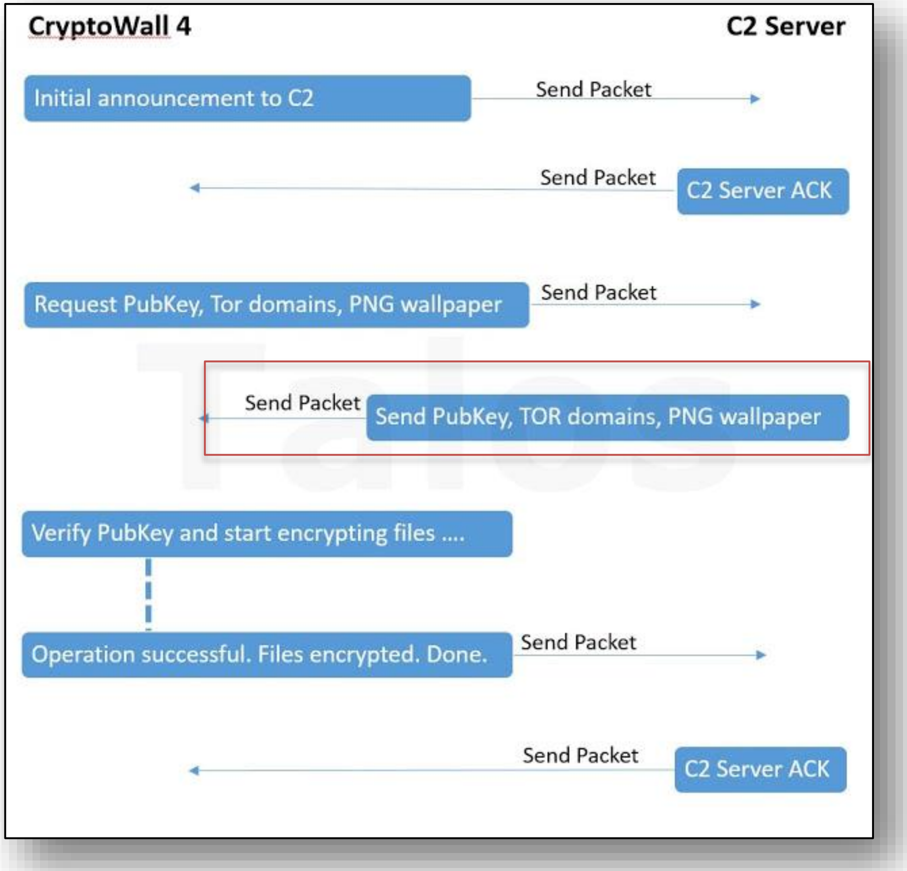
Parent file MD5: 209a288c68207d57e0ce6e60ebf60729.

Parent file size: 290816 bytes.

C2 communication

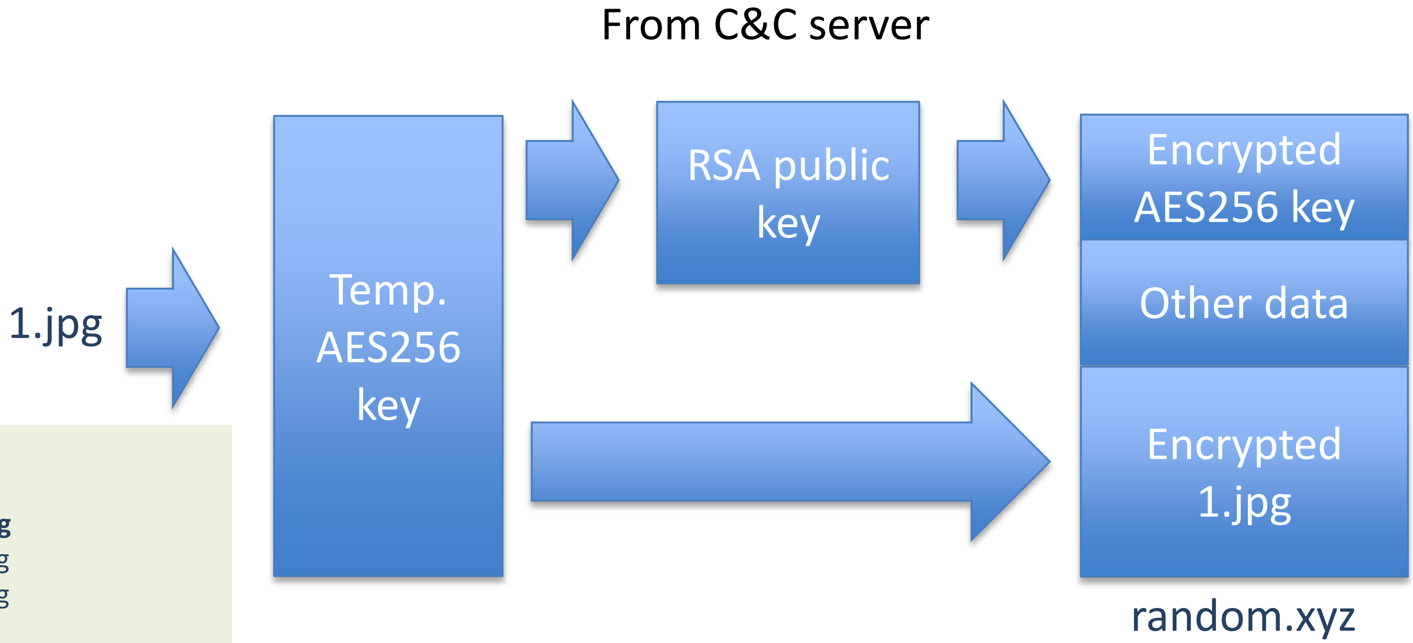
Cryptowall

- Version 4: Deletes all shadow copies, encrypts the filenames
- 2048 byte RSA public key encryption
- Decryption software`s initial price: $500
- if it cannot retrieve the public RSA encryption key from the C2 server it will not "harm" the victim's computer.
- excludes certain regions from infection (Russia +…)

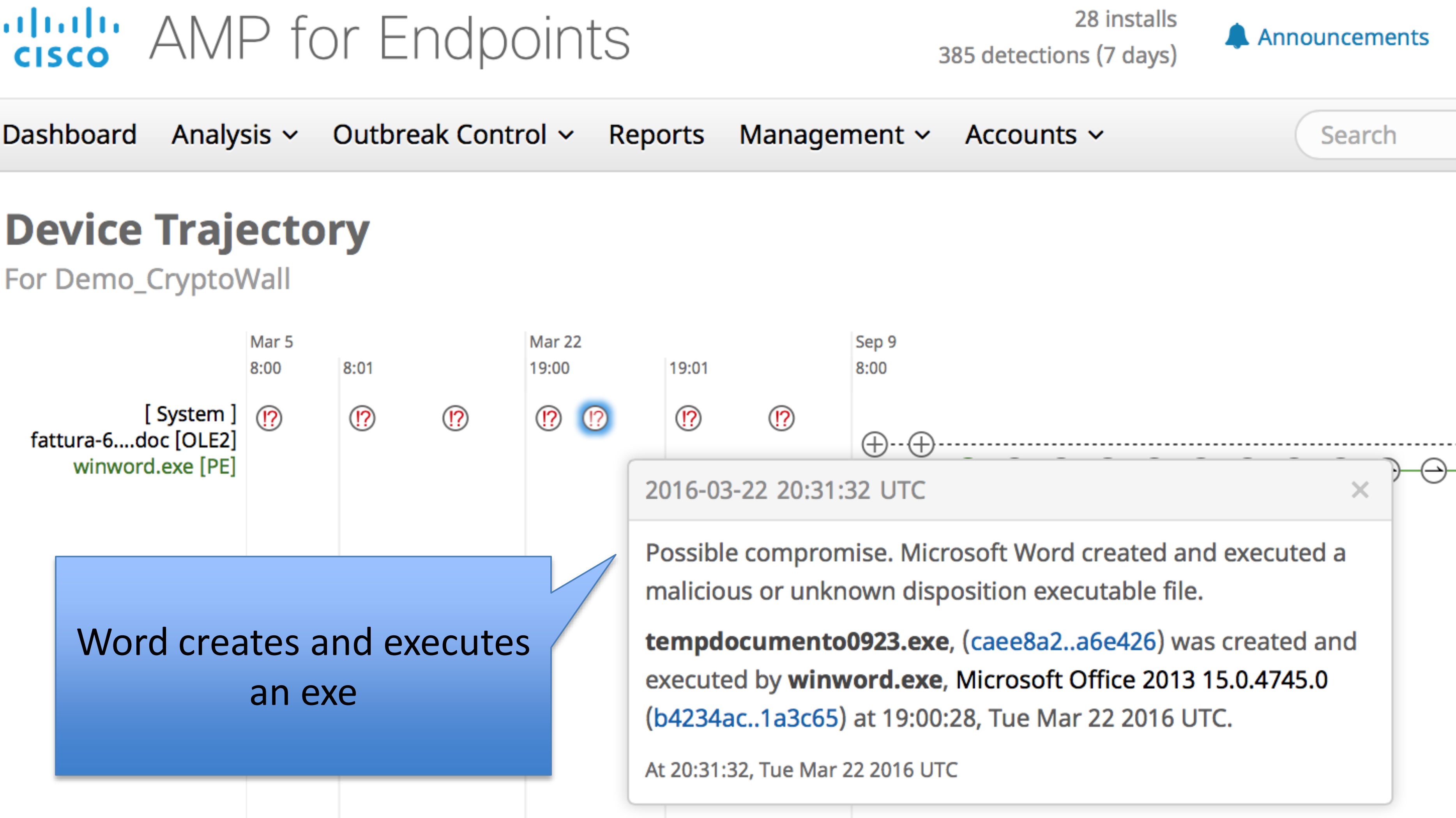

CryptoWall 4
C2 Server
Initial announcement to C2
Send Packet
Send Packet
C2 Server ACK
Request PubKey, Tor domains, PNG wallpaper
Send Packet
Send Packet
Send PubKey, TOR domains, PNG wallpaper
Talos
Verify PubKey and start encrypting files ....
Operation successful. Files encrypted. Done.
Send Packet
Send Packet
C2 Server ACK

Cryptowall : File encryption

```
15/10/07  12:39   <DIR>          .
15/10/07  12:39   <DIR>          ..
15/10/07  12:36         78,971   1.jpg
15/10/07  12:39        154,330   2.jpg
15/10/07  12:36        123,240   3.jpg
...
```



Temporary AES key can only be decrypted with the private RSA key



Device Trajectory

For Demo_CryptoWall

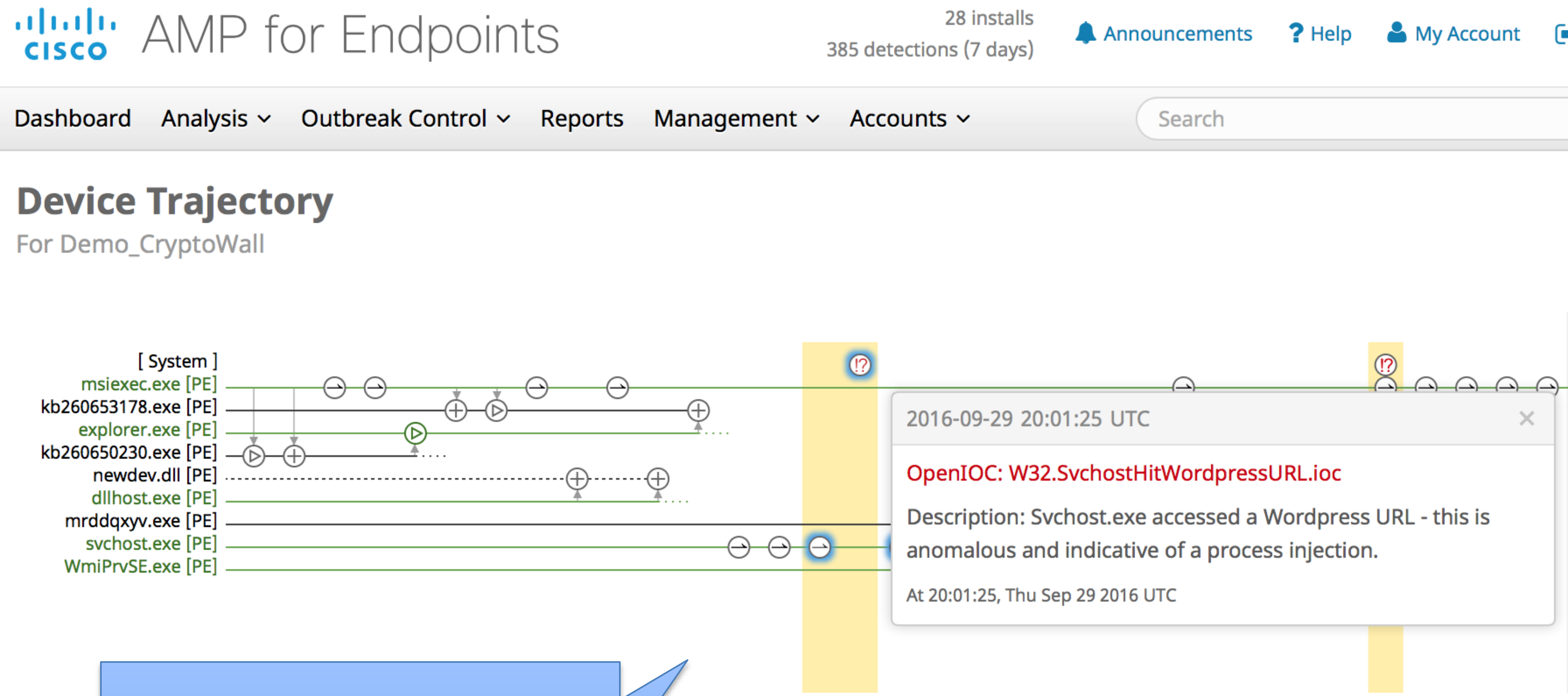
2016-03-22 20:31:32 UTC

Possible compromise. Microsoft Word created and executed a malicious or unknown disposition executable file.

tempdocumento0923.exe, (caee8a2..a6e426) was created and executed by **winword.exe**, Microsoft Office 2013 15.0.4745.0 (b4234ac..1a3c65) at 19:00:28, Tue Mar 22 2016 UTC.

At 20:31:32, Tue Mar 22 2016 UTC

Word creates and executes an exe



Device Trajectory

For Demo_CryptoWall

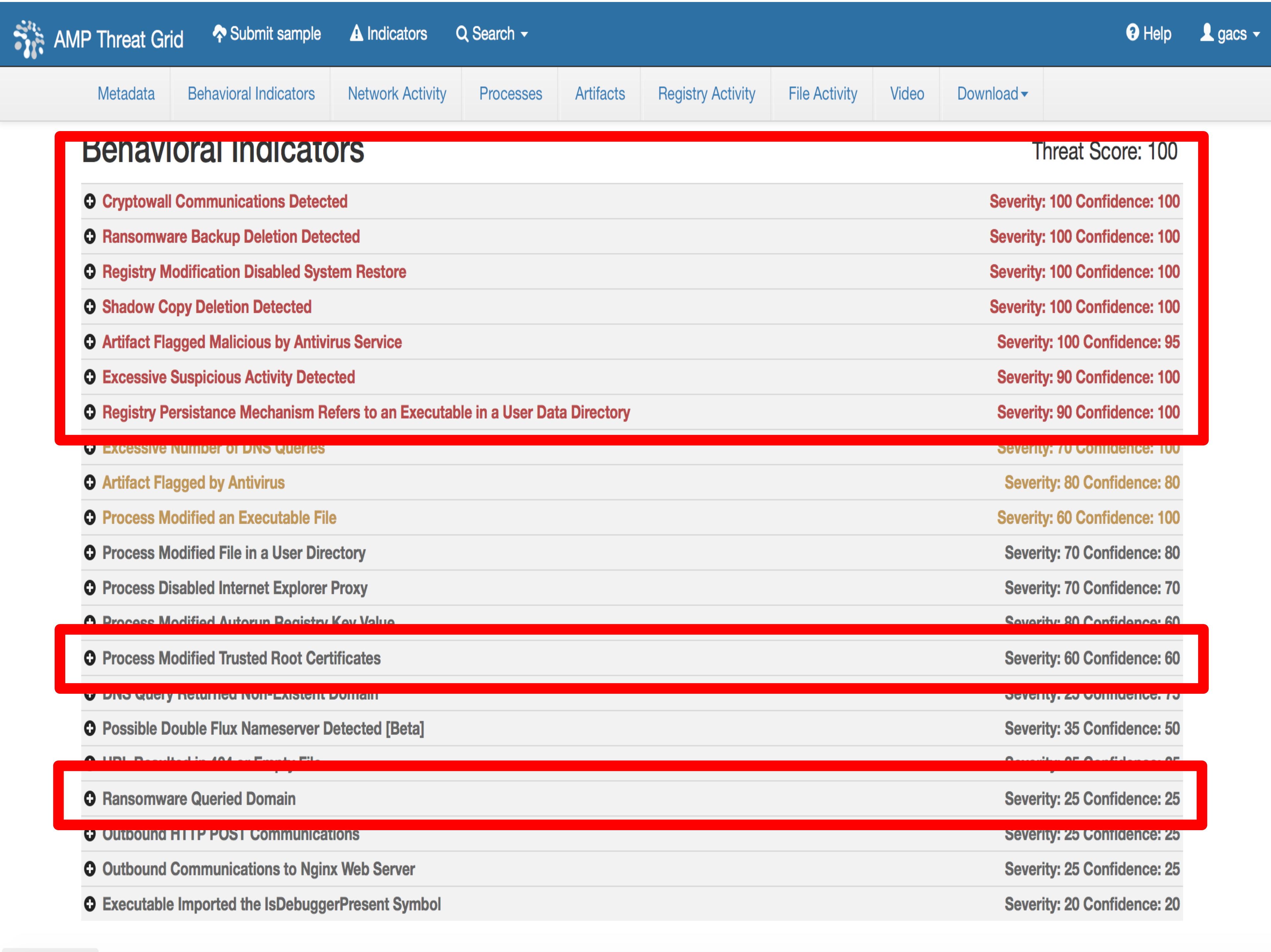
2016-09-29 20:01:25 UTC

OpenIOC: W32.SvchostHitWordpressURL.ioc

Description: Svchost.exe accessed a Wordpress URL - this is anomalous and indicative of a process injection.

At 20:01:25, Thu Sep 29 2016 UTC

Accesses Wordpress -> process injection

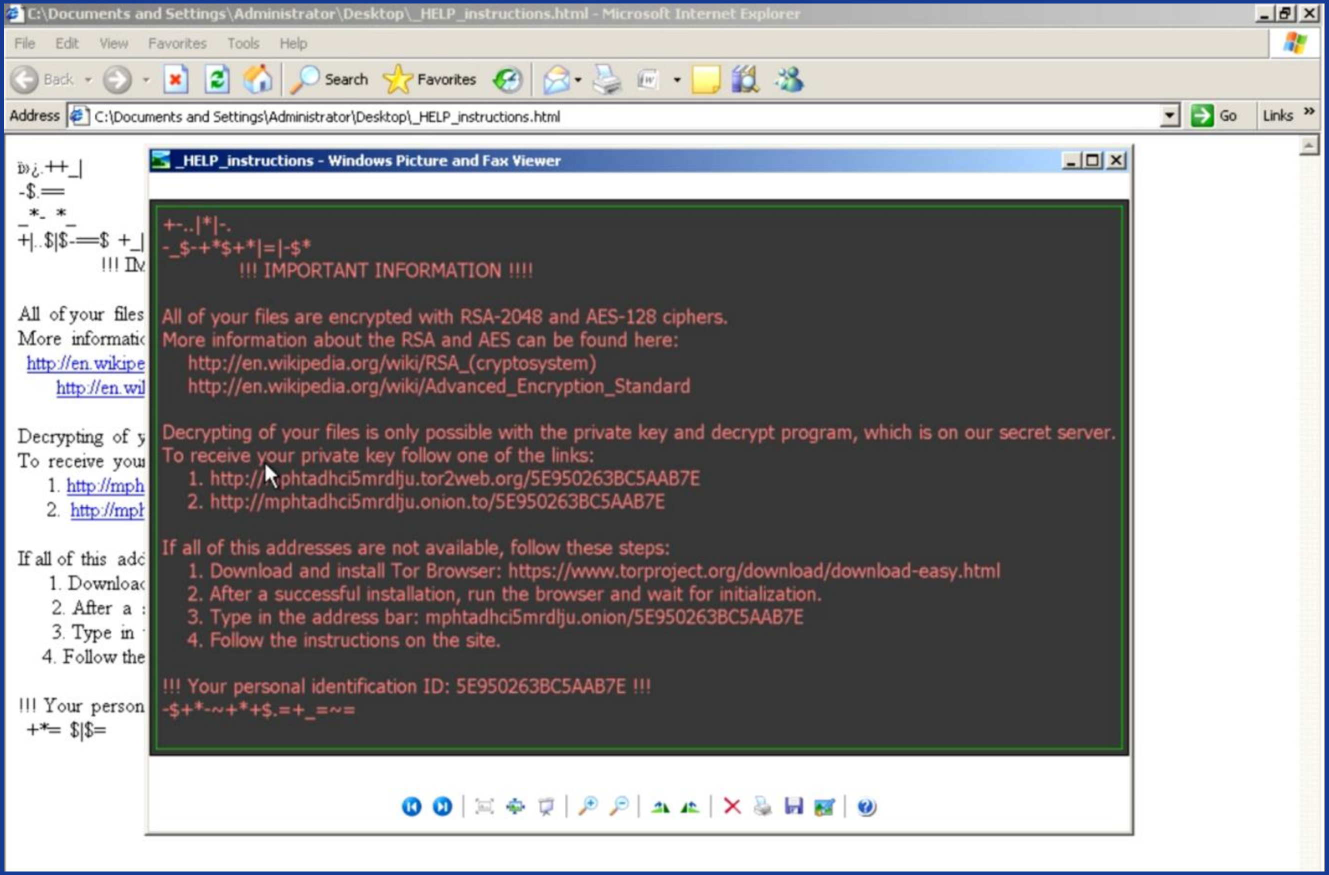


Behavioral Indicators

Threat Score: 100

Cryptowall Communications Detected	Severity: 100 Confidence: 100
Ransomware Backup Deletion Detected	Severity: 100 Confidence: 100
Registry Modification Disabled System Restore	Severity: 100 Confidence: 100
Shadow Copy Deletion Detected	Severity: 100 Confidence: 100
Artifact Flagged Malicious by Antivirus Service	Severity: 100 Confidence: 95
Excessive Suspicious Activity Detected	Severity: 90 Confidence: 100
Registry Persistance Mechanism Refers to an Executable in a User Data Directory	Severity: 90 Confidence: 100
Excessive Number of DNS Queries	Severity: 70 Confidence: 100
Artifact Flagged by Antivirus	Severity: 80 Confidence: 80
Process Modified an Executable File	Severity: 60 Confidence: 100
Process Modified File in a User Directory	Severity: 70 Confidence: 80
Process Disabled Internet Explorer Proxy	Severity: 70 Confidence: 70
Process Modified Autorun Registry Key Value	Severity: 80 Confidence: 60
Process Modified Trusted Root Certificates	Severity: 60 Confidence: 60
DNS Query Returned Non-Existent Domain	Severity: 25 Confidence: 75
Possible Double Flux Nameserver Detected [Beta]	Severity: 35 Confidence: 50
URL Resulted in 404 or Empty File	Severity: 25 Confidence: 25
Ransomware Queried Domain	Severity: 25 Confidence: 25
Outbound HTTP POST Communications	Severity: 25 Confidence: 25
Outbound Communications to Nginx Web Server	Severity: 25 Confidence: 25
Executable Imported the IsDebuggerPresent Symbol	Severity: 20 Confidence: 20

Locky/ Zepto

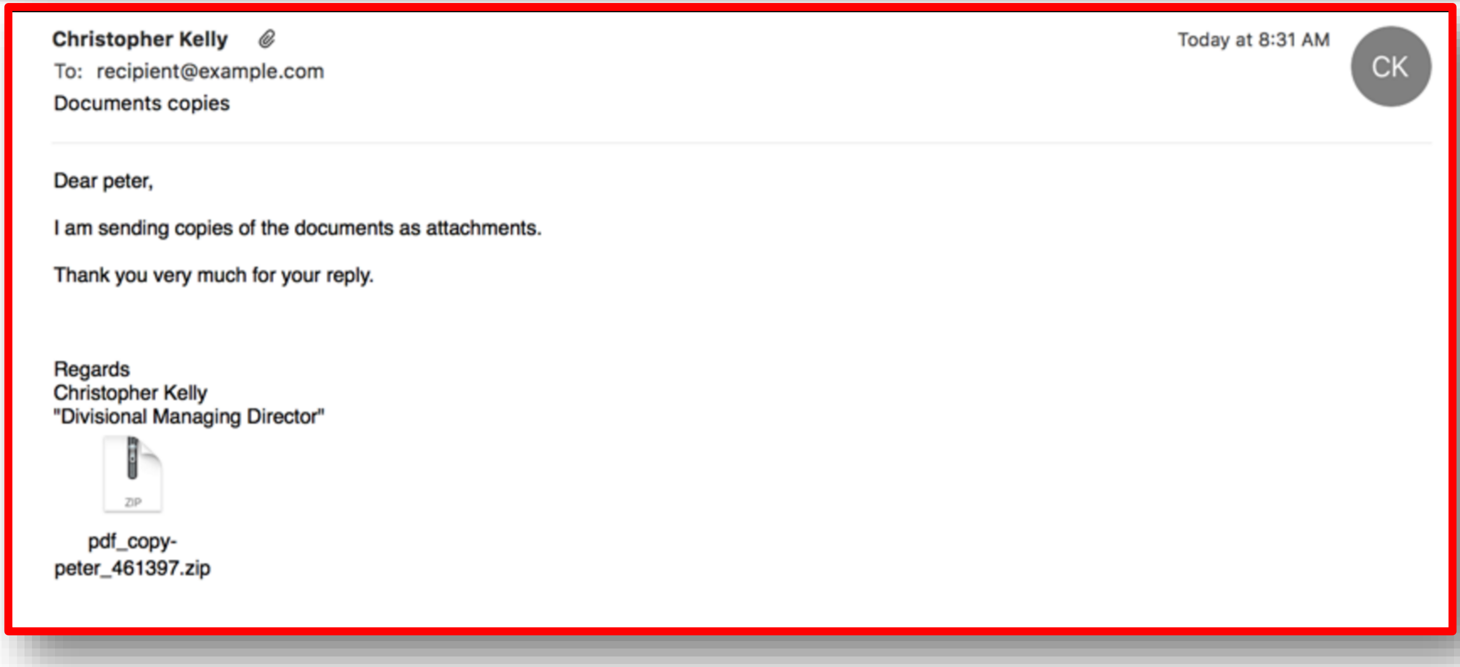

C:\Documents and Settings\Administrator\Desktop_HELP_instructions.html - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address C:\Documents and Settings\Administrator\Desktop_HELP_instructions.html
Go Links
_HELP_instructions - Windows Picture and Fax Viewer

```
+-..|*|-.
-_$-+*$+*|=|-$*
        !!! IMPORTANT INFORMATION !!!!

All of your files are encrypted with RSA-2048 and AES-128 ciphers.
More information about the RSA and AES can be found here:
    http://en.wikipedia.org/wiki/RSA_(cryptosystem)
    http://en.wikipedia.org/wiki/Advanced_Encryption_Standard

Decrypting of your files is only possible with the private key and decrypt program, which is on our secret server.
To receive your private key follow one of the links:
    1. http://mphtadhci5mrdlju.tor2web.org/5E950263BC5AAB7E
    2. http://mphtadhci5mrdlju.onion.to/5E950263BC5AAB7E

If all of this addresses are not available, follow these steps:
    1. Download and install Tor Browser: https://www.torproject.org/download/download-easy.html
    2. After a successful installation, run the browser and wait for initialization.
    3. Type in the address bar: mphtadhci5mrdlju.onion/5E950263BC5AAB7E
    4. Follow the instructions on the site.

!!! Your personal identification ID: 5E950263BC5AAB7E !!!
-$+*-~+*+$.=+_=~=
```

http://blog.talosintel.com/2016/06/gotta-be-swift-for-this-spam-campaign.html

Locky

- extension:
- .locky
- RSA and AES algorithms (Windows CryptoAPI)



Christopher Kelly

To: recipient@example.com

Documents copies

Today at 8:31 AM

CK

Dear peter,

I am sending copies of the documents as attachments.

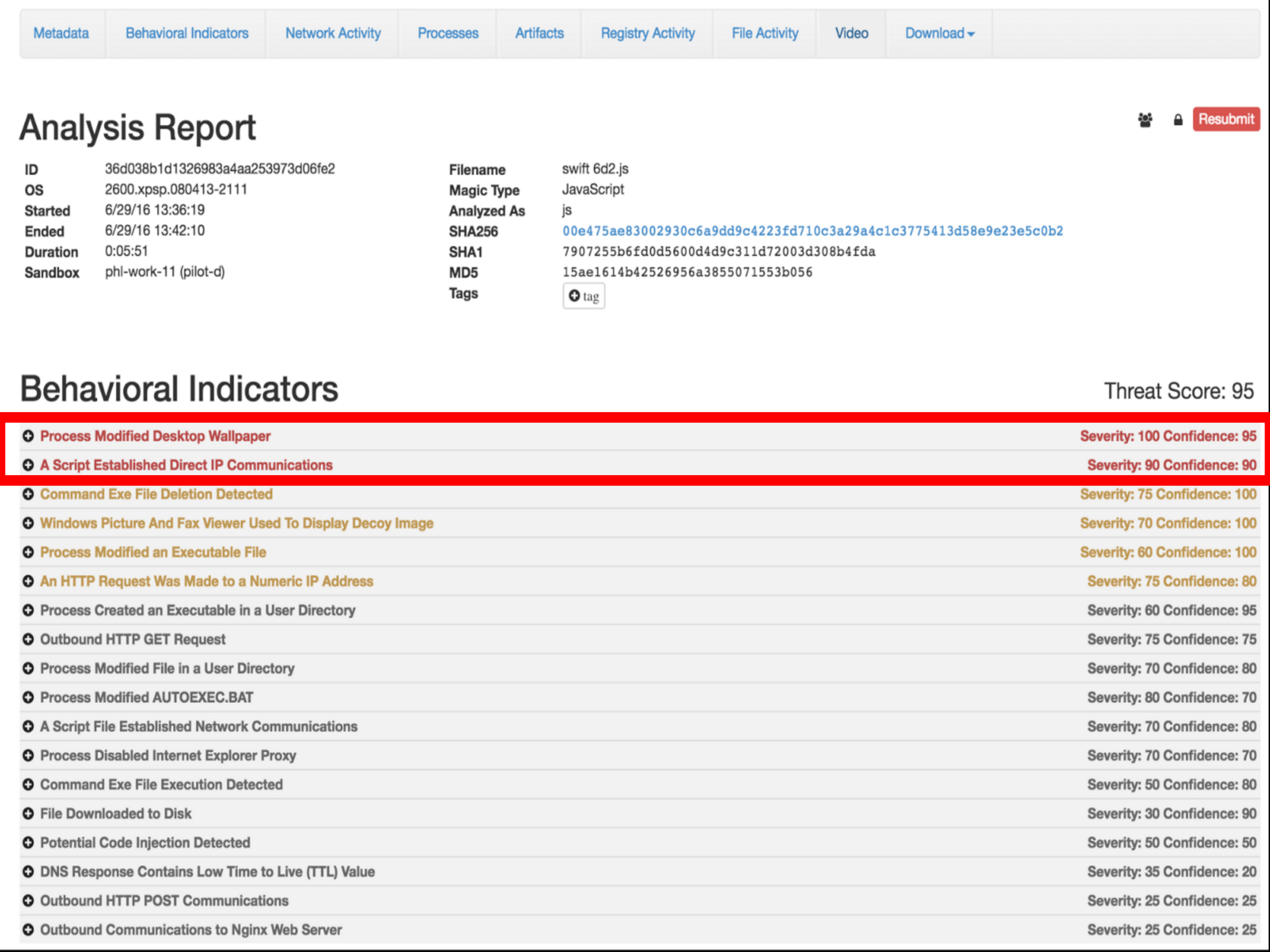
Thank you very much for your reply.

Regards
Christopher Kelly
"Divisional Managing Director"

ZIP

pdf_copy-peter_461397.zip

- Email/ phishing [137,731 emails per 4 days]
- Spam spike -> spam level like in 2010
- Doc or Javascript, attachment : swift [XXX|XXXX].js X: numbers
- Please allow macro : “if the data encoding is incorrect.”
- Deletes shadow copies, 'wscript.exe’ send HTTP GET requests to C2 domains



Analysis Report

ID	36d038b1d1326983a4aa253973d06fe2	Filename	swift 6d2.js
OS	2600.xpsp.080413-2111	Magic Type	JavaScript
Started	6/29/16 13:36:19	Analyzed As	js
Ended	6/29/16 13:42:10	SHA256	00e475ae83002930c6a9dd9c4223fd710c3a29a4c1c3775413d58e9e23e5c0b2
Duration	0:05:51	SHA1	7907255b6fd0d5600d4d9c311d72003d308b4fda
Sandbox	phl-work-11 (pilot-d)	MD5	15ae1614b42526956a3855071553b056
		Tags	tag

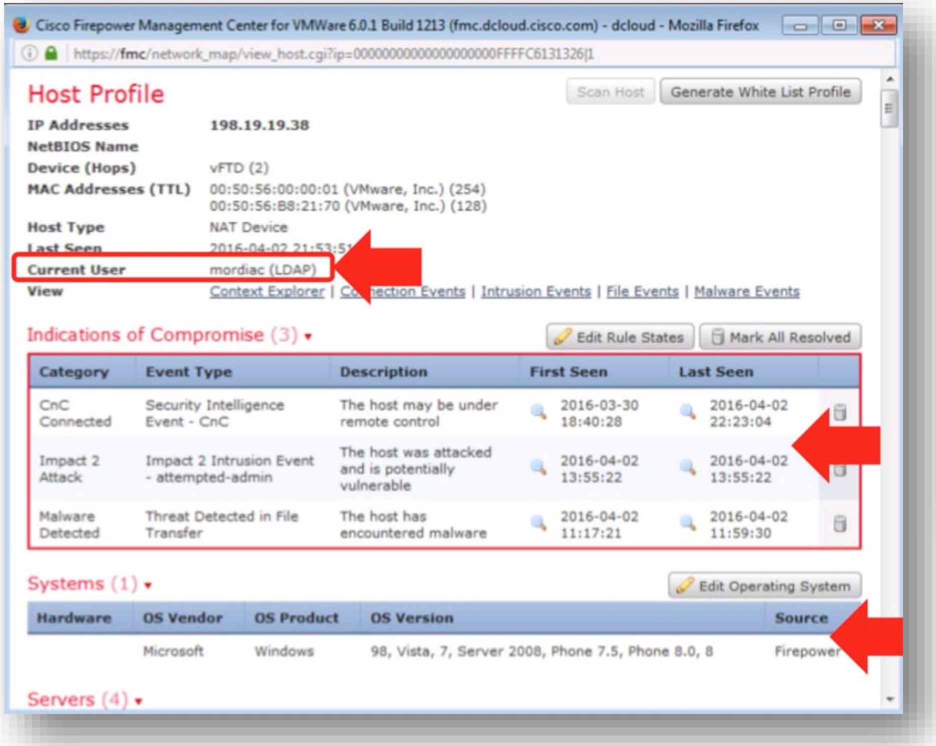
Behavioral Indicators

Threat Score: 95

Process Modified Desktop Wallpaper	Severity: 100 Confidence: 95
A Script Established Direct IP Communications	Severity: 90 Confidence: 90
Command Exe File Deletion Detected	Severity: 75 Confidence: 100
Windows Picture And Fax Viewer Used To Display Decoy Image	Severity: 70 Confidence: 100
Process Modified an Executable File	Severity: 60 Confidence: 100
An HTTP Request Was Made to a Numeric IP Address	Severity: 75 Confidence: 80
Process Created an Executable in a User Directory	Severity: 60 Confidence: 95
Outbound HTTP GET Request	Severity: 75 Confidence: 75
Process Modified File in a User Directory	Severity: 70 Confidence: 80
Process Modified AUTOEXEC.BAT	Severity: 80 Confidence: 70
A Script File Established Network Communications	Severity: 70 Confidence: 80
Process Disabled Internet Explorer Proxy	Severity: 70 Confidence: 70
Command Exe File Execution Detected	Severity: 50 Confidence: 80
File Downloaded to Disk	Severity: 30 Confidence: 90
Potential Code Injection Detected	Severity: 50 Confidence: 50
DNS Response Contains Low Time to Live (TTL) Value	Severity: 35 Confidence: 20
Outbound HTTP POST Communications	Severity: 25 Confidence: 25
Outbound Communications to Nginx Web Server	Severity: 25 Confidence: 25

One more thing ...

Host Analysis



Cisco Firepower Management Center for VMWare 6.0.1 Build 1213 (fmc.dcloud.cisco.com) - dcloud - Mozilla Firefox

https://fmc/network_map/view_host.cgi?ip=00000000000000000000FFFFC6131326|1

Host Profile

IP Addresses	198.19.19.38
NetBIOS Name	
Device (Hops)	vFTD (2)
MAC Addresses (TTL)	00:50:56:00:00:01 (VMware, Inc.) (254) 00:50:56:B8:21:70 (VMware, Inc.) (128)
Host Type	NAT Device
Last Seen	2016-04-02 21:53:51
Current User	mordiac (LDAP)
View	Context Explorer | Connection Events | Intrusion Events | File Events | Malware Events

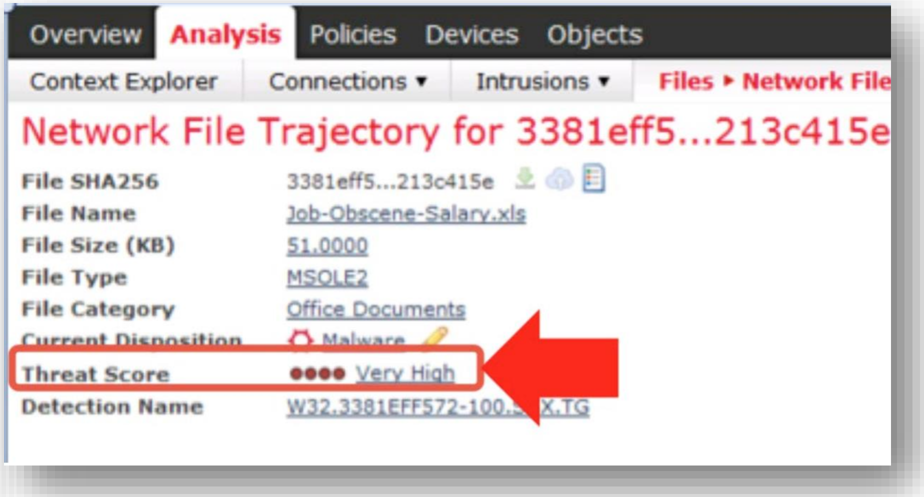
Indications of Compromise (3) ▾

Category	Event Type	Description	First Seen	Last Seen
CnC Connected	Security Intelligence Event - CnC	The host may be under remote control	2016-03-30 18:40:28	2016-04-02 22:23:04
Impact 2 Attack	Impact 2 Intrusion Event - attempted-admin	The host was attacked and is potentially vulnerable	2016-04-02 13:55:22	2016-04-02 13:55:22
Malware Detected	Threat Detected in File Transfer	The host has encountered malware	2016-04-02 11:17:21	2016-04-02 11:59:30

Systems (1) ▾

Hardware	OS Vendor	OS Product	OS Version	Source
	Microsoft	Windows	98, Vista, 7, Server 2008, Phone 7.5, Phone 8.0, 8	Firepower

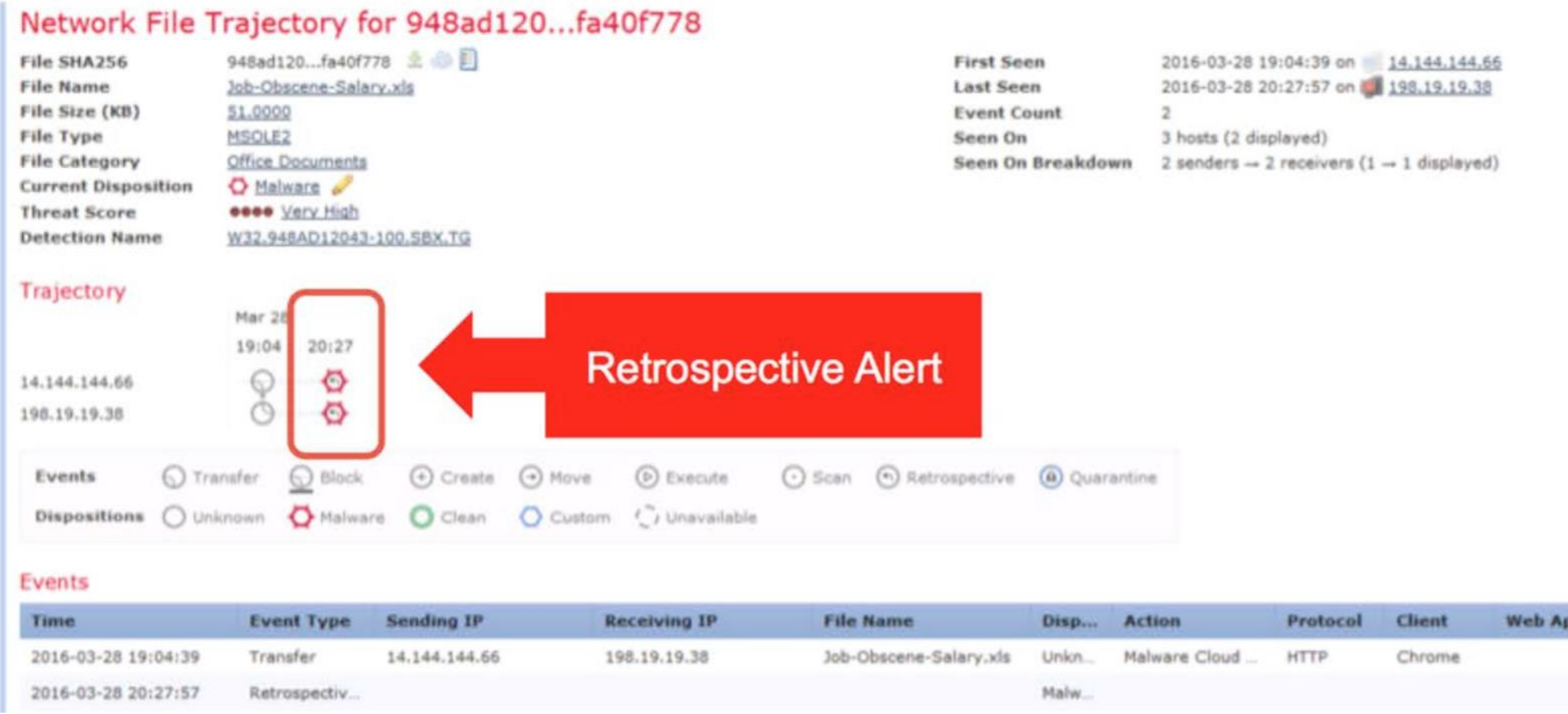
Servers (4) ▾



Network File Trajectory for 3381eff5...213c415e

File SHA256	3381eff5...213c415e
File Name	Job-Obscene-Salary.xls
File Size (KB)	51.0000
File Type	MSOLE2
File Category	Office Documents
Current Disposition	Malware
Threat Score	●●●● Very High
Detection Name	W32.3381EFF572-100.SBX.TG

Retrospective Alert



Network File Trajectory for 948ad120...fa40f778

File SHA256	948ad120...fa40f778
File Name	Job-Obscene-Salary.xls
File Size (KB)	51.0000
File Type	MSOLE2
File Category	Office Documents
Current Disposition	Malware
Threat Score	●●●● Very High
Detection Name	W32.948AD12043-100.SBX.TG

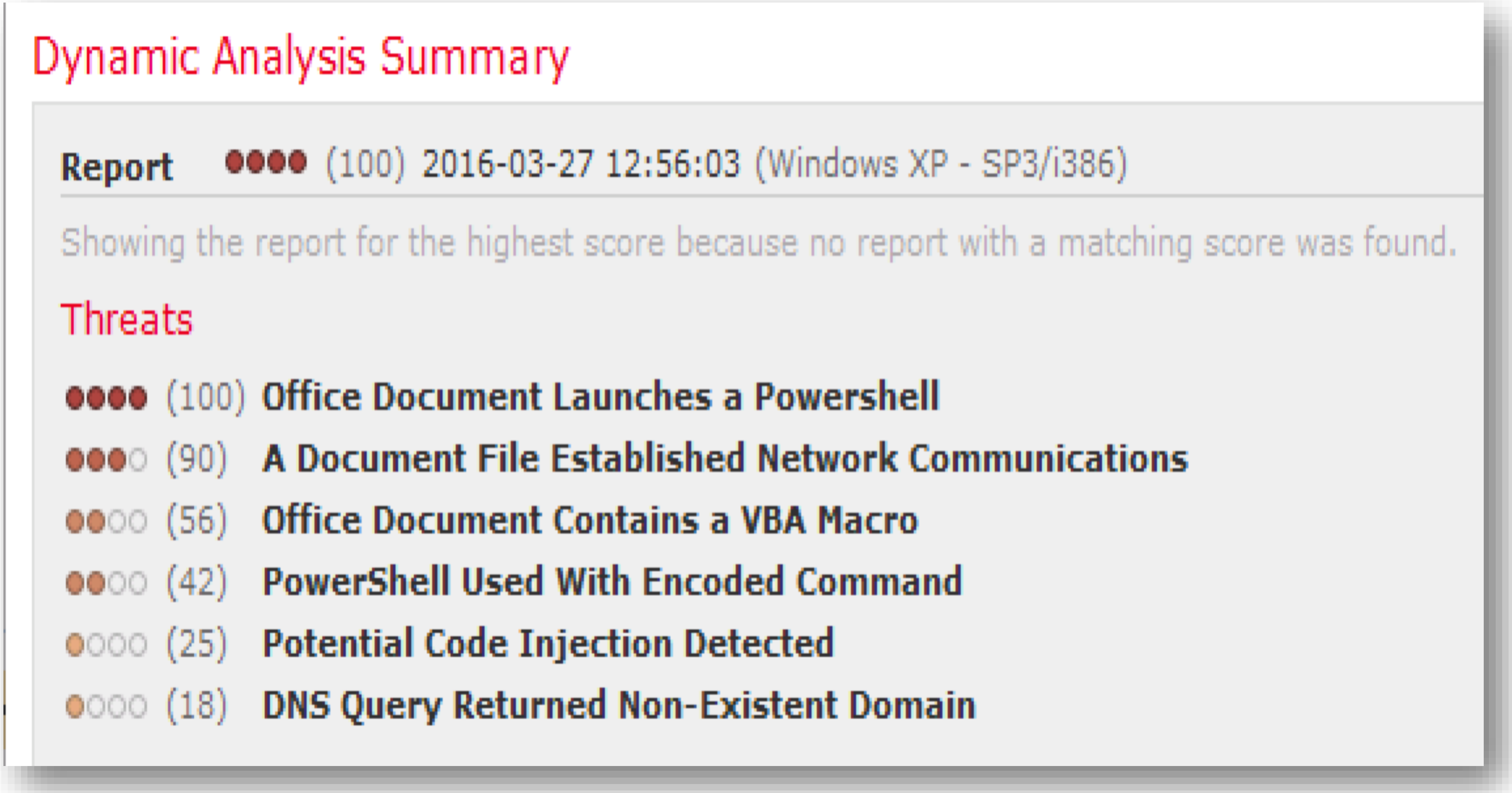
First Seen	2016-03-28 19:04:39 on 14.144.144.66
Last Seen	2016-03-28 20:27:57 on 198.19.19.38
Event Count	2
Seen On	3 hosts (2 displayed)
Seen On Breakdown	2 senders → 2 receivers (1 → 1 displayed)

Trajectory

Events

Time	Event Type	Sending IP	Receiving IP	File Name	Disp...	Action	Protocol	Client	Web Ap
2016-03-28 19:04:39	Transfer	14.144.144.66	198.19.19.38	Job-Obscene-Salary.xls	Unkn...	Malware Cloud ...	HTTP	Chrome	
2016-03-28 20:27:57	Retrospectiv...				Malw...				

Result of Dynamic Analysis



Dynamic Analysis Summary

Report ●●●● (100) 2016-03-27 12:56:03 (Windows XP - SP3/i386)

Showing the report for the highest score because no report with a matching score was found.

Threats

●●●●	(100)	**Office Document Launches a Powershell**
●●●○	(90)	**A Document File Established Network Communications**
●●○○	(56)	**Office Document Contains a VBA Macro**
●●○○	(42)	**PowerShell Used With Encoded Command**
●○○○	(25)	**Potential Code Injection Detected**
●○○○	(18)	**DNS Query Returned Non-Existent Domain**

Summary

AMP and Ransomware

- Most profitable malware, targeting corporates
- Main goal : focus on protection, but quick detections and countermeasures [retrospective analysis] can minimize the costs.
- AMP : Time-to-detect : [TTD] 13 hours vs 100-200 days,
- NSS Labs : 91.8 % [>3min]

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