Threat STOP

RANSOMWARE: The Ultimate Guide

The Evolution of Ransomware

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ThreatSTOP

What Is Ransomware?

Ransomware is a type of malware that prevents victims from accessing their data, and then threatens to publish or perpetually block access to it unless a ransom is paid. The first ransomware attack occurred in 1989, though the malware type became a threat to look out for only in the mid 2000's. Today, ransomware is one of the most prominent, dangerous cyber threats. What started out as a simple malware that locks up a few folders on the victim's computer has evolved into a cyber beast that is being used to handicap enterprises, shut down global production lines, halt IoT and medical devices, and extort enormous sums of money. In this whitepaper, we will review the evolution of this widely successful threat, and explain how to prevent ransomware infections.

Crypto vs. Locker

Crypto Ransomware

Cryptographic ransomware encrypts files on the victim's device, blocking them from accessing the files and demanding a ransom in order to decrypt them.

Locker Ransomware

Locker ransomware locks the victim out of their device, and then demands a ransom in order to restore access to the device and data.

INFECTION VECTORS

EMAIL

Ransomware is spread via email in two main ways: emails with malicious links that redirect the victim to a ransomware download, or emails containing malicious attachments, whether it be executables that download the malware, or Office files with macro exploits that ignite the ransomware download.

PROGRAMS

Some seemingly-legitimate programs are later revealed to be malicious applications, whose sole purpose is to download ransomware. In other cases, legitimate programs may be exploited and bundled together with ransomware.

COMPROMISED WEBSITES

Websites that have been hacked by cyber attackers can be laced with ransomware. The attackers implant ransomware on the compromised web page, causing visitors to unknowingly download the ransomware.

MALICIOUS ADVERTISEMENTS

Third party ads are a common sight on most websites, making it easy for attackers to insert malicious advertisements that redirect victims to ransomware downloads.

EXPLOIT KITS

Used in drive-by-downloads, EKs are a collection of known vulnerabilities packed together to exploit the victim's machine and serve malware. Today, EK's are used to serve many strains of ransomware.

RDP ACCESS

Hackers exploit the Remote Desktop Protocol (RDP) by brute-forcing credentials through relevant ports, purchasing credentials from breach sites or phishing for them through target victims. After hacking the target network, attackers will install ransomware.

EXTORTION & PAYMENT

Extortion Methods

After ransomware has compromised a victim's machine, and locked or encrypted their data, it's time for the attackers to ask for money. Over time, ransomware threat actors have used the following extortion tactics:

Ransom Note

Pay up or else!

Law Enforcement Notice

Pay up or face charges!

Decryption Tool

Buy our decryption tool!

Payment Options

The form through which attackers ask for payment has varied greatly over time and between different ransomware variants. In their ransom note, attackers would give victims one or more of the following options:

1

Calling or Texting

Attackers ask victims to call or text a "free" number regarding the problem that caused their data to be blocked, while the number is actually a premium rate number. This method is no longer in use today.

2

Wire Transfer

An old method that is no longer in use, attackers would ask for a wire transfer, or sometimes even a credit card payment.

3

Prepaid cards and vouchers

Another uncommon method today, ransom notes would demand victims to buy prepaid cards such as gift cards, and send the codes to the attackers.

4

Cryptocurrency

By far the most popular method today, ransomware demands its ransom payment in bitcoin and other cryptocurrencies.

EVOLUTION - B.C. (BEFORE CRYPTOLOCKER)

The first ransomware variant was spotted in 1989, and ever since, this notorious threat has become drastically more sophisticated and prevalent. Our Ransomware Evolution Timeline examines important ransomware variants of the last 30 years, from before the infamous CryptoLocker ransomware unleashed its wrath in 2013, to where it is today, and the evolution between.

1989

AIDS Trojan

The first ransomware was handed out on floppy disks at an AIDS conference. The ransomware hid directories and encrypted the names of all files on drive C, then asked for $189.

2006

MayArchive

Archived certain file types and deleted the original copy. As payment, MayArchive forced victims to buy products from “recommended” websites.

TROJ.RANSOM.A

This ransomware boasted a "gangster" ransom note, showing pornographic images and threatening to delete files every 30 minutes if the ransom is not paid.

Archiveus

Archiveus locked up everything in the My Documents folder with a 30-digit password. To obtain the password, victims needed to complete a purchase at an online pharmacy.

2010

WinLock

This ransomware spammed victims with pornography and asked them to send a $10 premium-rate SMS. The WinLock attackers made $16 million in one year, but then got caught and sent to jail.

2011

Unnamed Locker

This locker displayed a warning for a fraudulent Windows license, telling victims to call a "free" number which was actually premium.

Reveton

Reveton informed users that their machine had been used to download copyright material or child pornography and demanded a payment of a “fine”.

CRYPTOLOCKER: THE GAME CHANGER

In 2013, a ransomware variant named **CryptoLocker emerged** in the wild. This variant was so much stronger than its predecessors, that it completely changed the ransomware realm and the cybersecurity industry's conception of ransomware as a threat.

CryptoLocker was the first ransomware to make big news outside the cyber realm. It had stronger encryption, using a RSA 2048-bit key, and much better file encryption coverage - it encrypted locally connected, network-attached, or cloud-based storage, a wider variety of file extensions, as well as mapped drives, DropBox files and more. CryptoLocker also used Domain Generated Algorithms (DGAs) to dynamically and randomly assign domains to their Command and Control (C&C) servers. Since the control domains were constantly changing, it became difficult to take the operation down. To assure steady profits, the ransomware even had a customer support service, making sure that every victim received the help needed in carrying out the ransom payment.

After CryptoLocker, a wave of advanced, evasive and effective ransomware variants hit the cyber threat landscape. Evolving from simple Locker malware asking for a couple hundred dollars, ransomware has become one of the biggest (and most expensive) threats to watch out for.

CryptoLocker's Fate: Operation Tovar

In 2014, a joint operation by the FBI, Interpol, and various security companies succeeded in taking down the Gameover Zeus botnet and seizing CryptoLocker’s C&C servers. The FBI has been on the search for the man behind the ransomware, Evgeniy Bogachev, for years, and they are offering $3 million as a reward for information on his whereabouts. At it’s peak, the reward stood at a whopping $4.6 million.

EVOLUTION - A.C. (AFTER CRYPTOLOCKER)

2015

TeslaCrypt

A famous CryptoLocker copycat, the threat actors made a small fortune before surprisingly publicly releasing the ransomware's public key.

SamSam

This ransomware specializes in targeted attacks, hitting large entities from hospitals to city municipalities, and more.

2016

Locky

This sophisticated variant created a vast public fear of ransomware in 2016, infecting victims in both mass campaigns and successful targeted attacks.

Jigsaw

Jigsaw ransomware, which boasted one of the creepiest ransom notes, was the first variant to gradually delete the victim's files until they paid the ransom.

Petya

Instead of encrypting specific files, Petya would encrypt the victim's Master File Table, blocking them from their entire hard drive.

NotPetya

NotPetya may show some similarities to Petya, but this destructive variant created much more havoc, deploying a ransomware attack that cost billions of dollars in damages.

2017

WannaCry

This high-class ransomware cryptoworm used the famous EternalBlue exploit to propagate in victim networks. The WannaCry attacks in 2017 caused havoc around the world, spreading to over 150 countries and causing worldwide financial losses of over $4 billion.

2018

Ryuk

One of the most expensive ransomwares in history, Ryuk targets state, local, tribal, and territorial government entities, and then asks for huge sums of money to release victim data.

GandCrab

The GandCrab gang were extremely successful in 2018, providing it as a Ransomware as a Service (RaaS) and making it one of the most prevalent variants of the year.

2019

NetWalker

NetWalker is tailored for targeted attacks, and has compromised organizations in various industries, including government, healthcare and higher education.

Sodinokibi

This ransomware is famous for its advanced evasion capabilities, and an affiliate program that allows the ransomware to spread widely and efficiently.

RANSOMWARE: THEN AND NOW

Ransomware has changed drastically over time. Attackers have become quicker and more strategic, and ransomware has become more sophisticated and evasive. In other words - ransomware has become extremely powerful, enough to halt an organization's business, freeze production lines, and disrupt healthcare services. Ransomware's capabilities and targeted industries grow every day.

Over the last 30 years, the ransomware threat landscape has seen some drastic changes and trends:

Payment Options	Ransom payments went from a mere couple hundred dollars via simple, easier to track payment methods, to thousands and even millions via cryptocurrency.
Today, almost all ransomware payments are made through the TOR network, so that threat actors can stay anonymous while cashing in on their attacks.	**TOR Usage**
No More Police Ransomware	At its beginning, many ransomware variants used law enforcement warnings as ransom notes. Today, they explicitly state the attack and demand payment.
While many early ransomware variants were simple Locker ransomware, today almost all are classified as crypto ransomware, encrypting victim data.	**Mostly Crypto**
Extortion Tactics	Up until recent years, ransomware's digital damage mostly ended in encrypted files, but variants today will also threaten to publish or delete victim data.
With ransomware's growing popularity, attackers started supplying ransomware as a service to any hacker who wants to join in on the fun (and the profits).	**RaaS**
Targeted Attacks	Attackers used to deploy wide hit-or-miss ransomware campaigns, but in recent years, there has been a jump in campaigns targeting specific companies and sectors.

NOT JUST FOR PCs

While PC ransomware has been around for a few decades, Mac ransomware seems to be lagging far behind. The concept of OS X malware appeared around 2003, but only started blooming in the first half of the 21st century, when the first full-fledged ransomware for OS X was released in the wild in 2016. While Mac ransomware is evolving, it has yet to match leading PC ransomware on both quantity and sophistication.

Notable MacOS Ransomware Variants

KeRanger (2016)

The first functional Mac variant, KeRanger downloaded itself via infected Transmission BitTorrent client installers, but was taken down quite swiftly when Apple researchers revoked the security certificate that KeRanger was using.

FileCoder (2017)

This ransomware disguised itself as “patcher” apps downloaded from piracy sites. Like many ransomware strains at the time, FileCoder could not actually decrypt files, so even victims who paid the ransom did not get their files back.

ThiefQuest (2020)

This new-generation OS X ransomware not only encrypts the data on its victims’ devices, but also comes bundled with spyware capabilities, stealing credentials and cryptocurrency wallet data.

Mobile Ransomware

The year 2014 saw a wave of mobile ransomware as the new concept hit mobile devices around the globe. With variants for both IoS and Android, these ransomware strains mostly locked victims out of their devices and asked for a ransom. Since then, mobile ransomware has upped its sophistication, boasting better ransomware capabilities as well as additional malicious features.

Simplocker (2014): One of the first mobile ransomware strains, Simplocker infected victims via third-party downloads of a fake “Flash Player”. This crypto-ransomware encrypted the victim’s files and displayed a fake NSA or FBI alert, asking victims to pay a fine.

DogSpectus (2016): This Locker ransomware was distributed via malicious advertisements on websites. As opposed to previous mobile ransomware variants, DogSpectus did not need interaction with the victim. It used an EK and exploited several Android vulnerabilities to silently install itself on the victim’s device.

FileCoder (2019): Another variant dubbed FileCoder, this Android ransomware sent out malicious SMS’s to all of its victims’ contacts with a link to the ransomware download, before encrypting their files and requesting a ransom.

BEYOND IT DEVICES

Ransomware attacks on the networks and servers of large IT corporations is a frightful-enough thought for most, but the worry doubles when we imagine ransomware attacks on industrial systems, production lines, power plants, or even Internet-of-Things (IoT) devices such as smart cars and elevators. What happens when global manufacturing is halted because of ransomware? When a train schedule computer goes black until a ransom is paid? Or when a ventilator keeping a COVID-19 patient is held hostage in a ransomware attack?

In 2017, WannaCry ransomware wreaked havoc all around the globe. The ransomware infected over 200,000 computers in over 150 countries, creating global damage approximated at 4-8 Billion dollars. During the notorious 2017 attacks, WannaCry also attacked hospitals, holding medical devices hostage, such as an MRI imaging machine. Since then, it has become too clear that the IoT ransomware risk is no longer hypothetical. The IoT's connectivity is it's biggest strength but also what makes it so vulnerable to cyber attacks.

Ransomware attacks against ICS\SCADA environments are also an alarming concept that has recently been set in action. Although the internal, industrial parts of these networks use industrial protocols, the environment's IT touch points make it vulnerable to any malware that the cyber attackers of the internet have concocted. Just this year, a Snake Ransomware attack on Honda halted the manufacturing giant's global operations in Japan, North America, the U.K., Turkey and Italy.

Attacks like these shed light on the fact that the new trend of targeted ransomware attacks is taking another step up, setting the bullseye on industrial and medical environments, with advanced and sometimes tailored ransomware variants. Industries using IoT devices must constantly ensure that their internet connected devices are extremely secure - with extensive attack protection, and a service that blocks all outgoing attempts by ransomware existing in the network to its attackers and control and command servers.

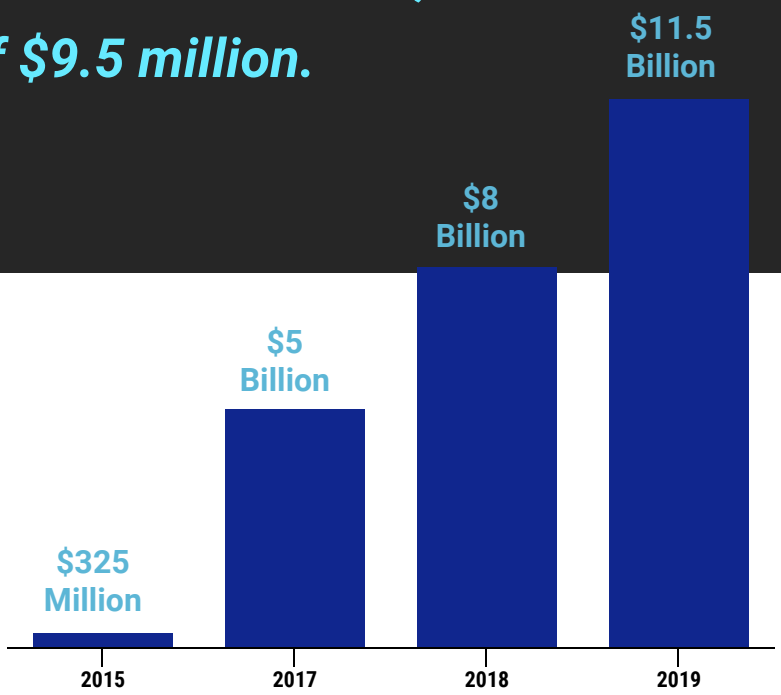
THE PRICE OF RANSOMWARE

So much has been discussed regarding "the cost of ransomware", but is the damage caused by this threat merely the cost of its ransom? The answer is a definite no, it's much much more. The price a business is set to pay from the second the ransomware infection begins is far higher than the price written on the ransom note. First of all, ransomware recovery takes time and effort, even if backups are present, and companies may have to pay hardware replacement and repair costs. Major prices and burdens caused by a ransomware attack also originate from lost business and revenue, damage to the victim's brand, or hourly fees. In at least four known cases, a ransomware attack led to the closure of a corporation.

The City of Atlanta had a ransom demand of $52,000 compared to a recovery cost of $9.5 million.

Ransomware Damages by Year

As depicted in Cybersecurity Ventures' estimation of annual ransomware damage costs throughout the years, we may soon be facing over $20 Billion in damages per year.



PREVENTION & PROTECTION

So how do you make sure that you're protected from ransomware? With next-generation capabilities and evasion techniques, effective infection methods, and targeted campaigns, ransomware is getting more advanced and harder to combat, so we've put together this list of recommendations, tips and processes for you to use.

Use Advanced Endpoint Protection

to detect and block malicious traffic

Only download software from product websites

avoid third-party download and torrent sites and "free" downloads of paid software

Be Cautious of Emails

suspect unexpected emails, unknown senders, and messages with typos

Update Often

to minimize vulnerability exploitation

Scan and Filter Content

on your mail servers to block malicious incoming emails

Display File Extensions

make sure the icon matches the extension displayed

Disable Macro Execution

to ensure malicious macros won't automatically run in the background

Implement Access and Permission Control

Limit write and execution permissions

Use a VPN

when connecting to public Wi-Fi networks

Segment Your Network

so infections can't spread in the network

Educate

your team on ransomware and its infection vectors

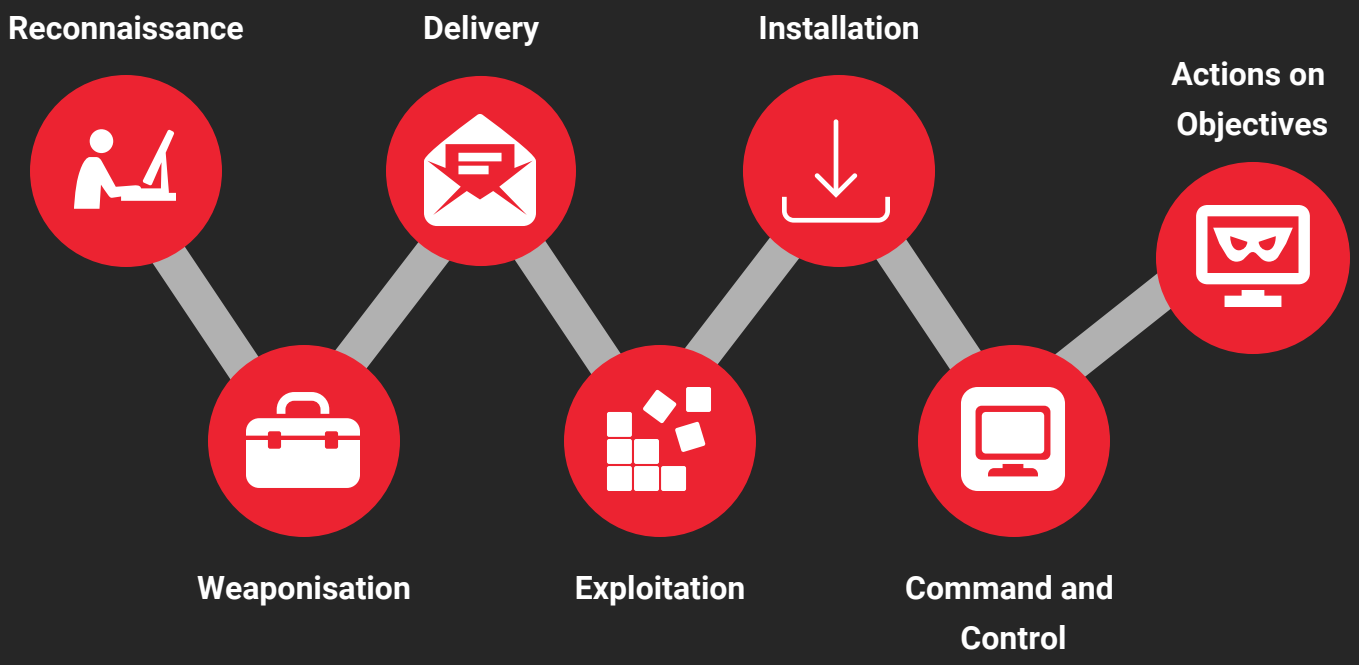
Backup

your data as much as possible

BLOCKING RANSOMWARE THROUGHOUT THE KILL CHAIN

Block inbound to terminate threats before they enter your network, block outbound to add a second line of defense.

A key to understanding inbound and outbound traffic filtering and blocking is understanding the cyber kill chain. The famous kill chain consists of seven steps, and while many security solutions focus on the middle steps by spending most or all of their effort on detecting malware behavior once it's on the machine, and trying to stop it at that level, a much simpler - and much more effective - approach combats malware and ransomware infections early on in the kill chain, so that infections are prevented in the first place.



Blocking suspicious **inbound** traffic creates protection all the way from step one. This allows devices to automatically block phishing and other reconnaissance attempts, barring attackers from gaining access to the machine or network. Inbound blocking will also prevent the ransomware delivery and installation, preventing the ransomware from downloading. If attackers have managed to pass filters and breach the system, blocking malicious **outbound** connections can also prevent the ransomware download in some cases, and will also block it from reaching its C&C servers, and thus from being unable to return data home.

ABOUT THREATSTOP

ThreatSTOP proactively blocks threats - automatically, efficiently, and reliably.

The ThreatSTOP service delivers up-to-the-minute protection against malware, ransomware, DDoS and other advanced attacks, and enhances your existing security posture by improving the effectiveness of firewalls, IDS/IPS, routers, switches, endpoint and other security tools.

The service protects your network and devices by automatically delivering best-in-class threat intelligence to your perimeter security devices, including firewalls, routers and switches. A cloud-based service, it is easy to deploy and manage, and does not require upgrades to your infrastructure or new hardware. Once deployed, the ThreatSTOP service provides immediate relief by deflecting attacks and unwanted or malicious traffic.

Connect with us today to learn more!

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