Defender Economics

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Who is this guy?

- Security Analyst at I Secure Sweden
- Used to work for a big automotive company
- Computer security philosopher
  - @addelindh -> Twitter
- Security Swiss Army knife
  - Not sharp, just versatile ☺

What’s it about?

- Understanding attackers, their capabilities and constraints
- How this information can be used to make better defensive decisions
- Bonus: provide input on how offense can get better at emulating real threats

Inspiration

- This talk shamelessly builds on the work of some very smart people, so thanks:
  - Dan Guido (@dguido)
  - Dino Dai Zovi (@dinodaizovi)
  - Jarno Niemelä (@jarnomn)
  - Vincenzo Iozzo (@_snagg)

- You should really go Twitter-stalk these guys if you aren't already

Disclaimer

O foolish anxiety of wretched man, how inconclusive are the arguments which make thee beat thy wings below!

(Dante Alighieri)

izquotes.com

The thing about security

Security truism #1

“An attacker only needs to find one weakness while the defender needs to find every one.”

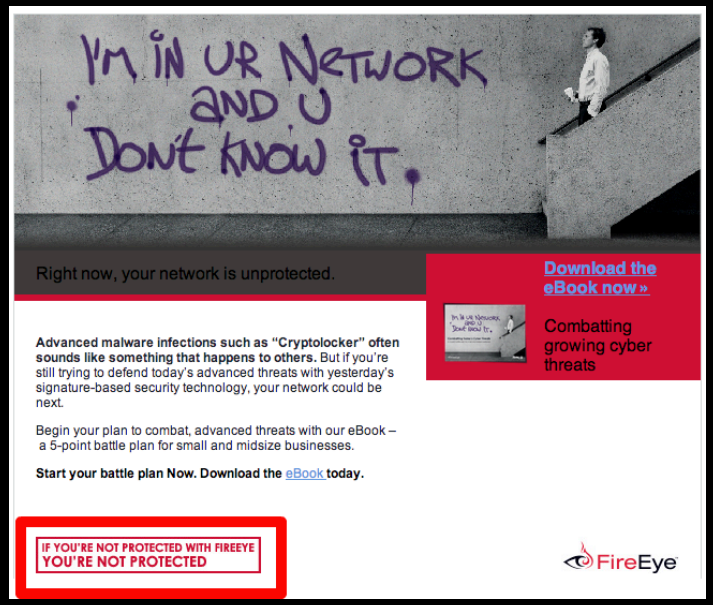
The defenders dilemma

Security truism #2

“A skilled and motivated attacker will always find a way.”

The sky is falling

How Malware Bypasses Our Most Advanced Security Measures

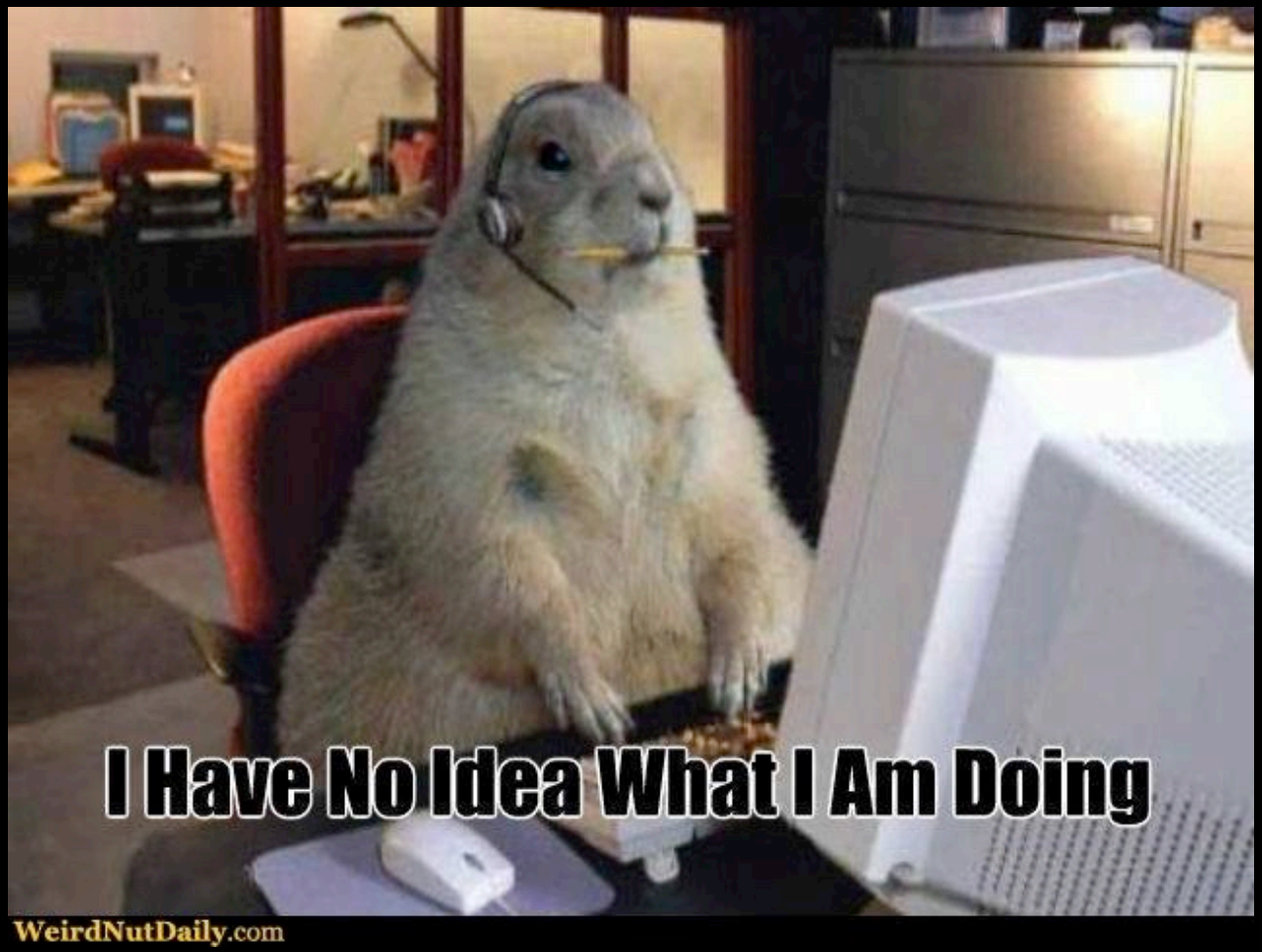


Nation-State Cyber Espionage, Targeted Attacks Becoming Global Norm

Attacker mythology

Photoshop magic by Mirko Zorz @ http://www.net-security.org

Meanwhile in the CISO’s office



The thing about the thing

- On the one hand
  - Yes, attackers are evolving
  - No, you can’t protect against everything
- On the other hand
  - No attacker has infinite resources
  - Do you really *need* to protect against everything?

From the 2015 Verizon DBIR*

NOT ALL CVES ARE CREATED EQUAL.

If we look at the frequency of exploitation in Figure 11, we see a much different picture than what's shown by the raw vulnerability count of Figure 12. Ten CVEs account for almost 97% of the exploits observed in 2014. While that's a pretty amazing statistic, don't be lulled into thinking you've found an easy way out of the vulnerability remediation rodeo. Prioritization will definitely help from a risk-cutting perspective, but beyond the top 10 are 7 million other exploited vulnerabilities that may need to be ridden down. And therein, of course, lies the challenge; once the "mega-vulns" are roped in (assuming you could identify them ahead of time), how do you approach addressing the rest of the horde in an orderly, comprehensive, and continuous manner over time?

**http://www.verizonenterprise.com/DBIR/*

Hackers vs Attackers

Attacker constraints

Attacker math

“If the cost of attack is less than the value of your information to the attacker, you will be attacked.”

Dino Dai Zovi, “Attacker Math”, 2011*

**https://www.trailofbits.com/resources/attacker_math_101_slides.pdf*

Attacker economics

- An attack has to make “economic” sense to be motivated
- An attack that is motivated has to be executed using available resources
- Bottom line: <u>keep it within budget</u>

Defender economics

- Figure out your attacker's limitations
- Raise the cost of attack where your attacker is weak and you are strong
- Bottom line: <u>break the attacker's budget</u>

Know your enemy

Attacker profiling

- Motivation
- Resources
- Procedures

Motivation

- Motivation behind the attack
- Level of motivation per target

OMG! ← Motivation-O-Meter → **Meh.**

Resources

- People and skills
- Tools and infrastructure
- Supply chain
- And so on...

- Willingness to spend resources depends on motivation

Procedures

- Attack vectors
- Post-exploitation activities
- Flexibility
- And so on...

- Procedures often designed for efficiency, reusability, and scalability

Two very different examples

Google Chrome
vs
Malware

Big company X
vs
APT groups

Google Chrome

- 61.6% market share (December 2014)
  - Source: w3schools
- 220 RCE vulnerabilities in 2012-2014
  - Source: OSVDB
- Should be an attractive infection vector for malware

Attacker profile: Malware

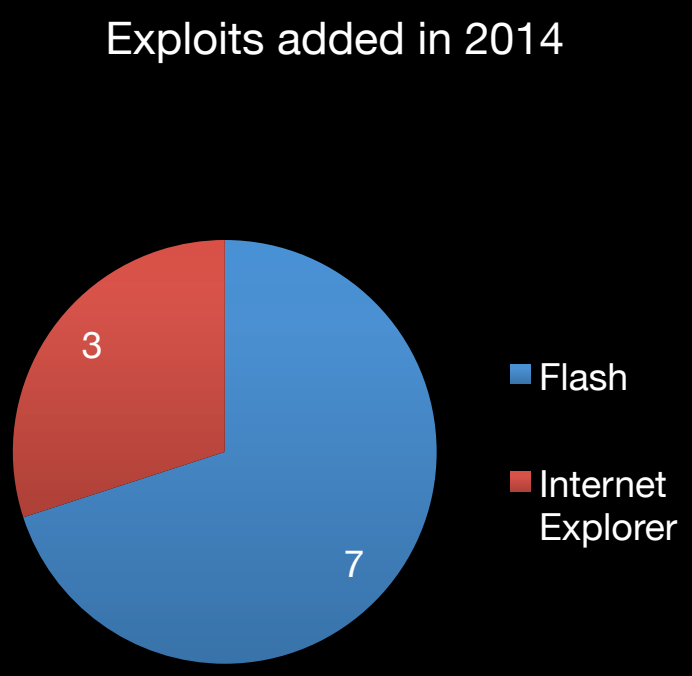
- Volume driven
- Drive-by downloads
- Requires file system access
- Supply chain dependency
  - ➢Exploit Kits

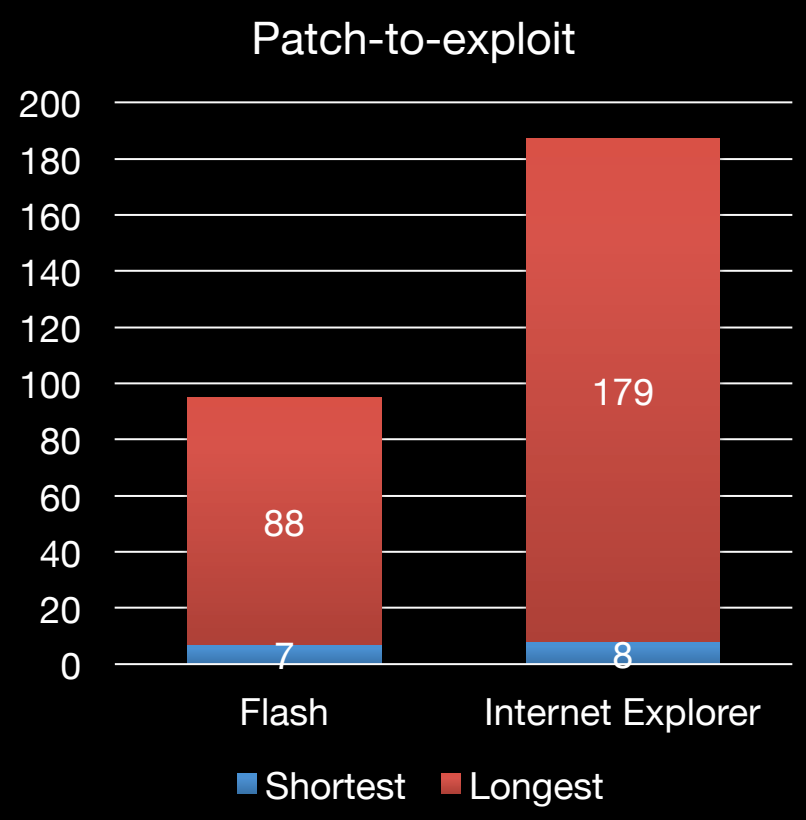
Exploit Kits

- Most exploits not developed in-house
  - Repurposed from other sources
  - See Dan Guido's Exploit Intelligence Project*
- Exploits developed for default setup
- Very few 0days
- Limited targets

*https://www.trailofbits.com/resources/exploit_intelligence_project_paper.pdf

21 Exploit Kits in 2014





Source: Contagio Exploit Kit table - http://contagiodata.blogspot.com/2014/12/exploit-kits-2014.html

Chrome security model

- Strong security architecture
  - Tabs, plugins run as “sandboxed”, unprivileged processes
- Rapid patch development
  - Capable of 24 hour turnaround
- Rapid patch delivery
  - Silent security updates
  - 90% of user-base patched in ~1 week

Hacking Chrome...

TRAIL OF BITS

Practical example

Last year, VUPEN released a video to demonstrate a successful sandbox escape against Chrome but Google challenged the validity of that hack, claiming it exploited third-party code, believed to be the Adobe Flash plugin.

A rational attacker

we'd like to offer an inside look into the exploit submitted by Pinkie Pie.

So, how does one get full remote code execution in Chrome? In the case of Pinkie Pie's exploit, it took a chain of six different bugs in order to successfully break out of the Chrome sandbox.

A black swan (AKA: are you nuts?)

Source: Vincenzo Iozzo – A Tale of Mobile Threats (https://www.trailofbits.com/resources/a_tale_of_mobile_threats_slides.pdf)

Chrome vs Malware

- Raised cost for exploit developers
  - Usually requires multiple chained vulnerabilities for file system access
- Raised cost for Exploit Kits
  - Few publicly available exploits
  - No market for exploits that are only effective for a couple of days

Big company X

- 50 000 employees
- Centrally managed IT
- No rapid patching
- Low security awareness among employees
- Has an APT* problem

**OMG CYBER!*

Attacker profile: APT groups

- Target driven
- Phishing
- 0ldays and 0days
- Off-the-shelf and custom tools/malware
- Post-intrusion activity
- Stealthy presence
- Professional

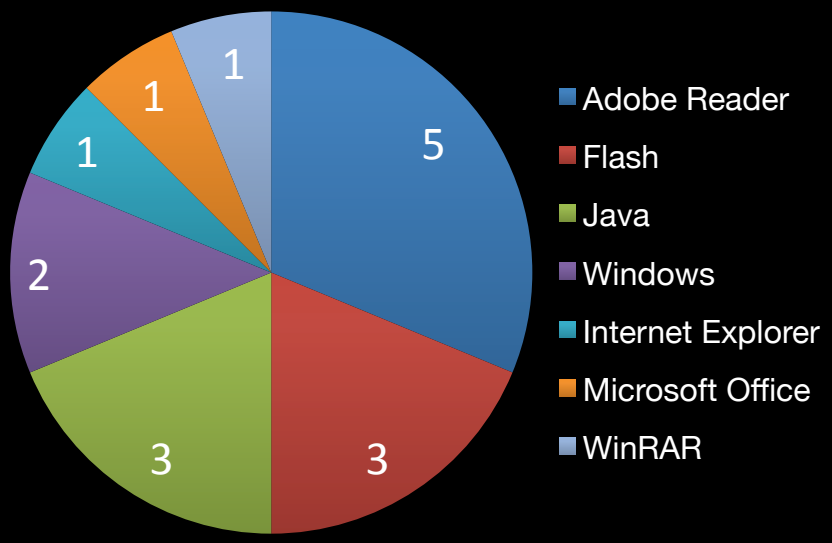
APT groups – previous research

- "Statistically effective protection against APT attacks"* by @jarnomn
- ~930 samples of exploits used in the wild by APT groups 2010-2013
- EMET was found to block 100% of exploits
  - Indicative but not conclusive

https://www.virusbtn.com/pdf/conference_slides/2013/Niemela-VB2013.pdf

APT groups active in 2014*

- 13 groups
- Active from 2003
- 100% spear phishing
- ~50% has used 0days (≥ 2)
- Only one exploit bypassed “non-default”



Source: https://apt.securelist.com

APT strengths | weaknesses

- Strengths
  - Post-intrusion activity
  - Stealthy presence
  - Professional

- Weaknesses
  - Predictable attack vector
  - Unsophisticated initial intrusion

Options for Company X

- Cheap but effective
  - Exploit mitigation
  - Secure software configurations
- More expensive and effective
  - 3rd party sandbox
- Very expensive and possibly(?) effective
  - Email security product

Conclusion


Vittel
PHOTOSLOP
ON FACEBOOK
tdwsport.com
photography
ID: 20112250-154069 Date: 06/07/2011 Author: Tim De Waele City: Cap Frehe Country: France Frankrijk
Cycling : 98th Tour De France 2011 / Stage 5 Arrival / Mark Cavendish (gbr) Celebration Joie Vreugde / Philippe Gilbert (bel)/ Jos Joaquin Rojas (esp) Green Jersey / Carhaix - Cap Frehel (164,5 Km)/ Ronde Van Frankrijk / Tdf / Etape Rit/(c) Tim De Waele

MASTER SPLINTER

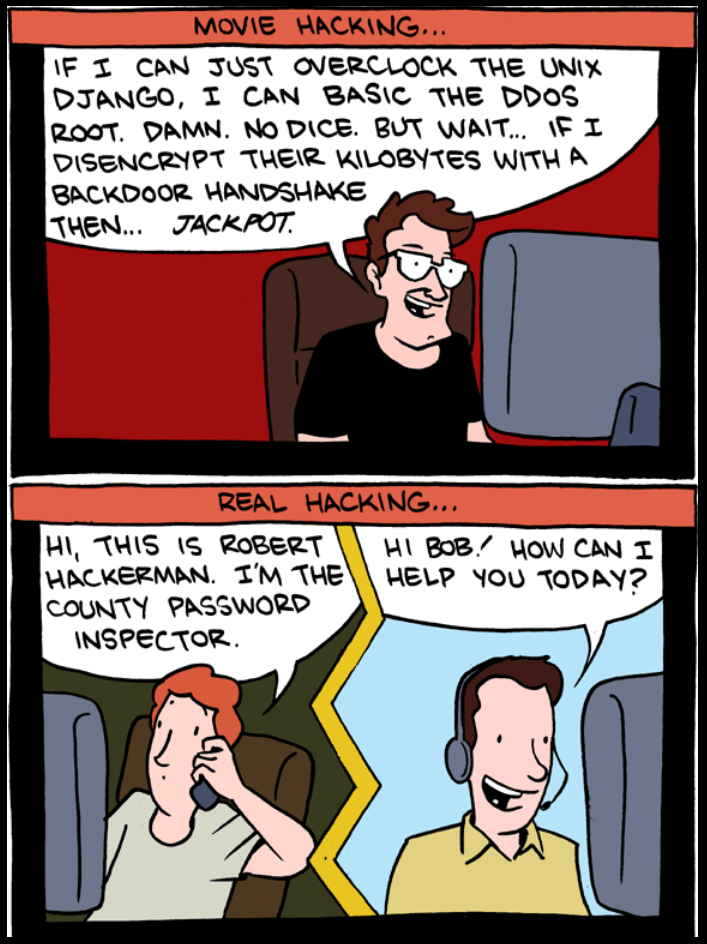
"You do not fight the armor. You fight the man inside."

Security is hard, but...

- Attackers are not made of magic
- Every attacker has constraints
- Understanding these constraints is the key to making informed defensive decisions
- Raising the cost (bar) of attack can be very effective
- This is NOT about being 100% secure

For the pentesters

- Thinking like a hacker is *not* the same as thinking like an attacker
- Understand that attackers have scopes and constraints too




SO YOU'RE AN ATTACKER?
THAT DON'T IMPRESS ME MUCH
memegenerator.net

Thank you for listening!

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Questions?