UNIVERSITÀ DEGLI STUDI
DI TRENTO

SECONOMICS

Crime Pays if You are Just an Average Hacker

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Outline

Motivation

- Market for security doesn't really work well [1]
- "There are also the markets we don't like that work entirely too well: for example, the market for stolen goods, that encourages burglary [..]" [1]
- Cost of cybercrime:
  - Herley: It's quite tricky to get black market numbers right [2]
  - Anderson: Our investments in security are 10x the gains for the attackers (i.e. we're using the wrong strategy) [3]
- However, we still do not have a model of the economically involved hacker
  - Black markets for attack tools
  - Black markets for compromised hosts
  - Black markets for credit cards

1. MicroMOTIVES and MACROBehavior – Thomas C. Schelling. *Ed. Norton*, pg 30.

Motivation

"Why does an hacker become an hacker?"

What's happening in the black markets

- Do bank robbers manufacture their own guns?

Exploitation success rate: 10-15%
Success rate highly depends on quality of traffic

***Средний пробив на связке:* 10-25%**
* Пробив указывается приблизительный, может отличаться и зависит напрямую от

Install rates, slightly higher than usual:

* Отстук стандартный, даже чуть выше стандартного:
> Зевс = 50-60% Zeus = 50-60%
> Лоадер = 80-90% Loader = 80-90%

Price for latest version 1.6.x:

Цена последней версии 1.6.x:
> Стоимость самой связки = 2000$ Package cost = 200$
> Чистки от АВ = от 50$ "Clean" from AV = from 50$
> Ребилд на другой домен/ИП = 50$ Rebuild on new domain/IP=50$
> Апдейты = от 100$ Update = from 100$
* Связка с привязкой к домену или IP . Package bounded to one domain or IP

23.03.2011, 19:44

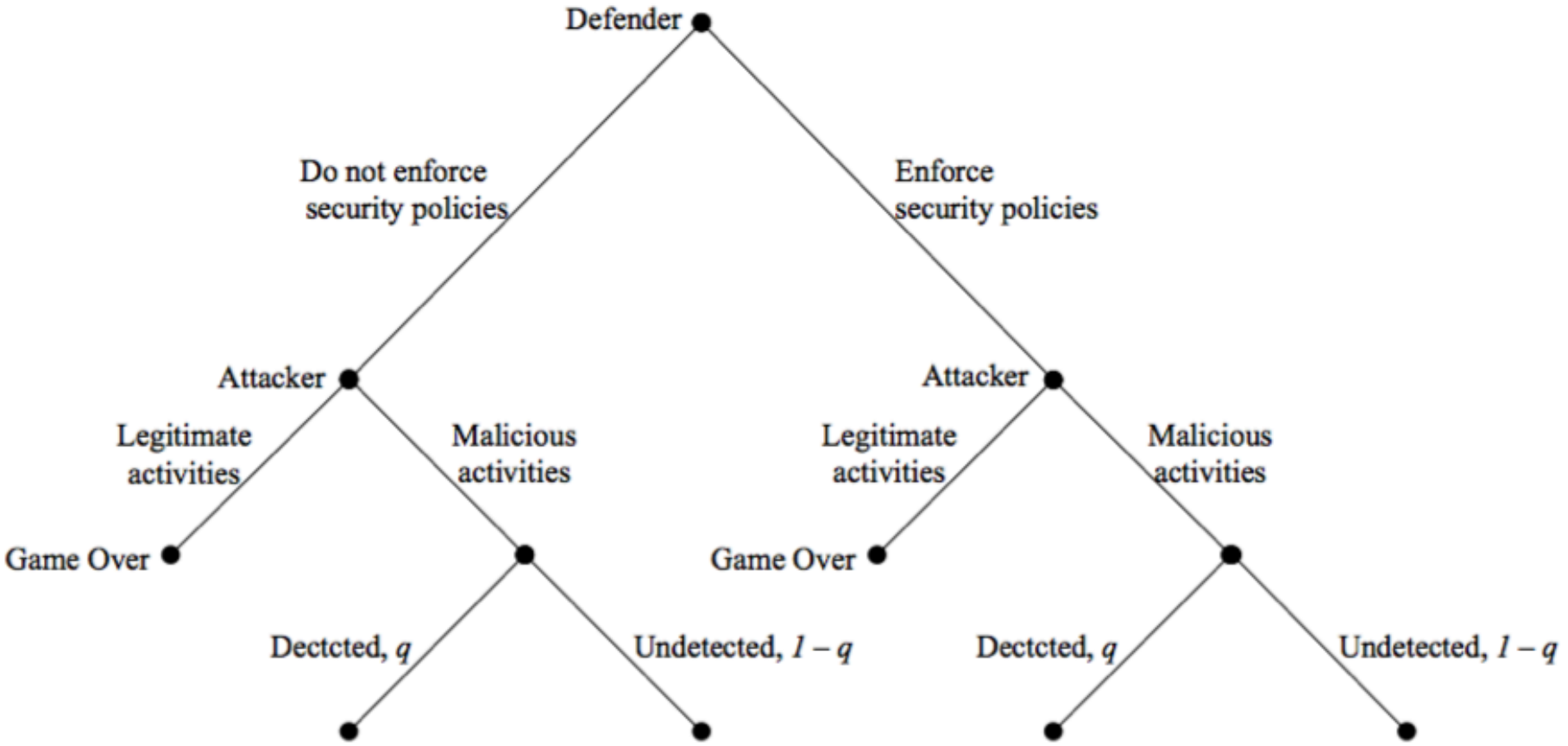
Update for version ..

Апдейт до версии "***Eleonore Exp v1.6.5***"

The package features these exploits:

В состав связки входят следующие эксплойты:
> CVE-2006-0003 (MDAC)
> CVE-2006-4704 (WMI Object Broke)
> CVE-2008-2463 (Snapshot)
> CVE-2010-0806 (IEpeers)
> CVE-2010-1885 (HCP)
> CVE-2010-0188 (PDF libtiff mod v1.0)
> CVE-2011-0558 (Flash <10.2)
> CVE-2011-0611 (Flash <10.2.159)
> CVE-2010-0886 (Java Invoke)
> CVE-2010-4452 (Java trust)
*Виста и 7ка бьется Work on Vista and Win7

The game


Defender
Do not enforce security policies
Enforce security policies
Attacker
Attacker
Legitimate activities
Malicious activities
Legitimate activities
Malicious activities
Game Over
Game Over
Dectcted, q
Undetected, 1 – q
Dectcted, q
Undetected, 1 – q

Preliminary Model (1/4)

- To build our model, we look at the attacker:
  - He has limited time
    - Might have a regular job
    - Other activities

T: total time

L: time dedicated to legal activities

I : time dedicated to illegal activities

$$L = (T - I)$$

Preliminary Model (1/4)

- To build our model, we look at the attacker:

- He needs to weight legal activities…

T: total time
B: maximum benefit from legal activities
L: time dedicated to legal activities
p: probability of earning B
I : time dedicated to illegal activities
S: minimum benefit from legal activities

$$L = (T - I)$$

$$EU_{Legal} = L(pB + (1-p)S)$$

Preliminary Model (2/4)

- To build our model, we look at the attacker:

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I : time dedicated to illegal activities
L = (T – I)

- He needs to weight legal activities…

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$$EU_{Legal}=L(pB+(1-p)S)$$

Preliminary Model (3/4)

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$L = (T - I)$

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- ..With the effects of security policies against criminal activities, enforced by the defender..

q: probability of detection of the criminal activity
t: time to detect and disable criminal activity

Preliminary Model (4/4)

- To build our model, we look at the attacker:

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t: time to detect and disable criminal activity

- ..and the potential return for the criminal activity

Z: maximum benefit from a criminal activity
C: cost for the hacker in perpetrating it

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Preliminary Model (putting it together)

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CRIMINAL

q: probability of detection of the criminal activity
t: time to detect and disable criminal activity

Z: maximum benefit from a criminal activity
C: cost for the hacker in perpetrating it

$$EU_M=q[(T-L)(Zt-C)+L(pB+(1-p)S)]+(1-q)[(T-L)Z+L(pB+(1-p)S)].$$

$$EU_{Criminal}=I(q(Zt-C)+(1-q)Z)$$

Our approach with the model [4]

- We use a simulation approach
- We fix a "standard value" for each parameter according to our direct observations

- … briefly describe Krebs et al. [4]
- p = 0.3
- S = 0.5
- … and briefly explain why 0.3. and 0.5

Parameters estimation (q)

- q=Probability of neutralization by defenders
- Verizon 2012 Incident report

> Unfortunately, as our research has shown for the last several years, third parties discover data breaches much more frequently than do the victim organizations themselves.

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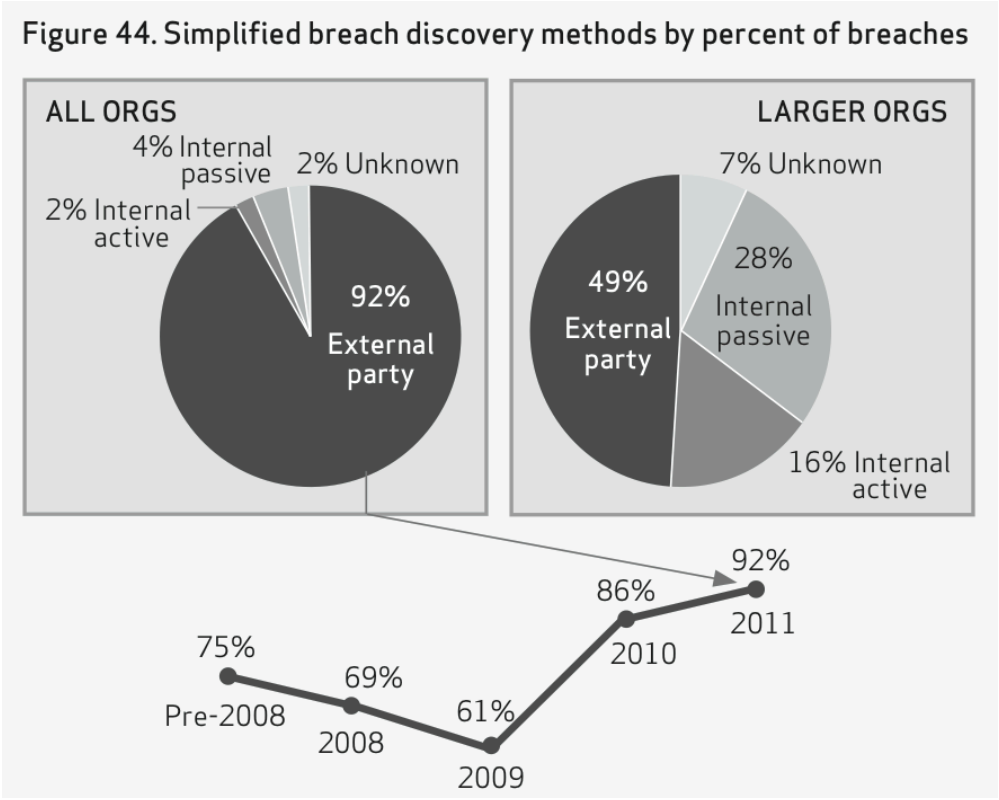

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- Grier et. all, CCS 2012 [5]
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- Difficult cooperation between law forces

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Meanwhile, Russia's anti-cybercrime unit has claimed that there's a very good reason that it hasn't investigated the Koobface gang - it hasn't been asked to.

Parameters estimation (q=0.1)

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Parameters estimation (C=0.2)

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- Exploit kits do not require particular technology (inexpensive)
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  - B>Z
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- We distinguish two cases:
  - Z=1>B=0.8
    - Hacker valuates thrill, fun from hacking, sense of superiority more than lawful returns
  - B=1>Z=0.8
    - Hacker values legality and moral self-esteem more than criminal returns

Parameters estimation (L)

- L=time dedicated to legal activities
- Hackers are usually young and well educated
  - Meaning they spend time studying and working

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gion, Russia. Education: Graduated in 2003 from the School of Computer Systems and Programming of Saint Petersburg State University of Aerospace Instrumentation. Citizenship: Russian

Parameters estimation (L)

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- Does not take a lot of time to run a cyber-criminal activity

"Botnet operation is a mini job, once a day you check for 30minutes, pay once a month server bills, sell for about an hour information on the market and enchance your code if you feel like it. I was thinking about working for Kaspersky, but these guys want all kinds of phony diplomas and can't even recognize native code (see the duqu 'incident'). The profit? Depends, sometimes 400$ a day, sometimes none, but a steady 40$ a day with bitcoins alone."

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Our approach with the model – cnd.

Activity type	Variable	Meaning
General	T	hacker's total time
	t	time for detection and neutralization of criminal activity
	p	probability of obtaining maximum benefit from legal activities
	1-p	probability of obtaining only minimum benefit from legal activities
	q	probability of detection of the criminal activity
	q-1	probability of non-detection of the criminal activity
Legal	L	fraction of time the hacker devotes to legal activities
	B	maximum benefit gained from a legal activity
	S	minimum benefit gained from a legal activity
Criminal	I	fraction of time the hacker devotes to criminal activities
	Z	maximum benefit gained from a criminal activity
	C	cost for the hacker in perpetrating criminal activities

Simulations

- We run simulations changing one parameter at a time,
  - From 0.05
  - To 1
  - With 0.05 steps

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- We run simulations changing one parameter at a time,
  - From 0.05
  - To 1
  - With 0.05 steps
- Each run simulates the policy maker enforcing a policy addressing one particular aspect of the hacker decisional model

Simulation results

Changes in key variable	Model 1 p changes	Model 2 q changes	Model 3 S changes	Model 4 C changes	Model 5 B changes	Model 6 Z changes	Model 7 t changes
0.05						Succeed	
0.1						Succeed	
0.15						Succeed	
0.2						Succeed	
0.25						Succeed	
0.3						Succeed	
0.35						Succeed	
0.4						Succeed	
0.45						Succeed	
0.5						Succeed	
0.55		Succeed	Succeed			Succeed	
0.6		Succeed	Succeed			Succeed	
0.65		Succeed	Succeed			Succeed	
0.7	Succeed	Succeed	Succeed				
0.75	Succeed	Succeed	Succeed				
0.8	Succeed	Succeed	Succeed				
0.85	Succeed	Succeed	Succeed				
0.9	Succeed	Succeed	Succeed				
0.95	Succeed	Succeed	Succeed				
1	Succeed	Succeed	Succeed				

Thanks

Questions?

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