What Is ROI for Attackers

- Researchers subverted a botnet's command and control infrastructure (proxy bots)
  - Modified its spam messages to point to the Web server under researcher control
- That server mimicked the original Web page from the spam emails
  - A pharmacy site
  - A greeting card download site

"Spamalytics: An Empirical Analysis of Spam Marketing Conversion" C. Kanich, C. Kreibich, K. Levchenko, B. Enright, G. Voelker, V. Paxson, and S. Savage, ACM CCS 200

What Is ROI for Attackers

- How many spam emails reach recipients: open a few email accounts themselves and append them to email delivery lists in spam messages
- How many emails result in Web page visits
  - Must filter out defense accesses
- How many users actually buy advertised products or download software
  - No "sale" is finalized
- Ethical issues abound

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Most-targeted E-mail Domains

Domain	Freq.
hotmail.com	8.47%
yahoo.com	5.05%
gmail.com	3.17%
aol.com	2.37%
yahoo.co.in	1.13%
sbcglobal.net	0.93%
mail.ru	0.86%
shaw.ca	0.61%
wanadoo.fr	0.61%
msn.com	0.58%
Total	23.79%

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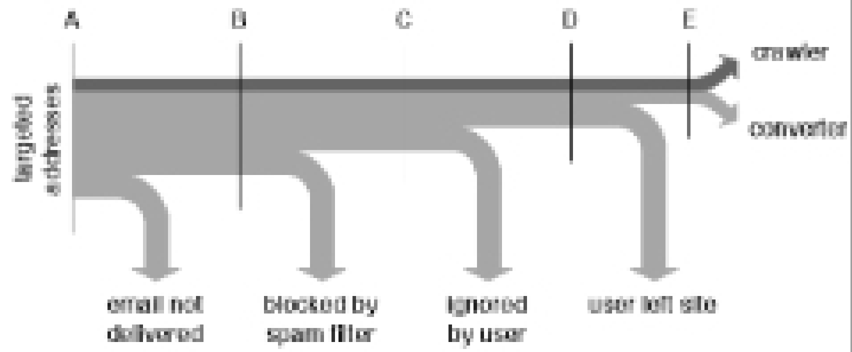
Spam Conversion Pipeline



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Spam Conversion Pipeline

Stage	Pharmacy		Postcard		April Fool	
A – Spam Targets	347,590,389	100%	83,655,479	100%	40,135,487	100%
B – MTA Delivery (est.)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C – Inbox Delivery	—	—	—	—	—	—
D – User Site Visits	10,522	0.00303%	3,827	0.00457%	2,721	0.00678%
E – User Conversions	28	0.0000081%	316	0.000378%	225	0.000561%

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Spam Filter Misses

Spam Filter	Pharmacy	Postcard	April Fool
Gmail	0.00683%	0.00176%	0.00226%
Yahoo	0.00173%	0.000542%	none
Hotmail	none	none	none
Barracuda	0.131%	N/A	0.00826%

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For More on Botnets

http://www.shadowserver.org
http://www.honeynet.org/papers/bots/
http://www.honeynet.org/papers/ff

Trusted Computing

What Problem Are We Solving?

- Can't protect applications from within themselves
  - Exploits can turn off defenses
- Can't protect the OS from within itself
  - Exploits can turn off defenses
  - Rootkits can hide any sabotage from users
- May not be able to trust users
  - They may be uninformed
  - They may be malicious – OK for their computer but risk for the others they communicate with
  - Digital right management issues

What is Trusted Computing

- Attestation
  - Means of ensuring someone (user, remote computer) of the system's trustworthy status
    - Usually means authentic/approved apps
  - Root of trust needed to store keys
  - Trusted path (allows user to have confidence in the system)
  - Chain of trust (like for certificate authorities)
- Separation
  - Secure storage (data/keys)
  - Protection of processes
- The rest is policy
  - That's the hard and controversial part

Trusted Path

- We need a "trusted path"
  - For user to communicate with a domain that is trustworthy.
    - Usually initiated by escape sequence that application can not intercept: e.g. CTL-ALT-DEL
  - Could be direct interface to trusted device:
    - Display and keypad on smartcard

Communicated Assurance

- We need a "trusted path" across the network.
- Provides authentication of the software components with which one communicates

What Can We Do with TC?

- Clearer delineation of security domains
  - We can run untrusted programs safely
    - Run in domain with no access to sensitive resources
    - Such as most of your filesystem
    - Requests to resources require mediation by TCB (trusted computing base), with possible queries to the user through trusted path.

Mediating Programs Today

- Why are we so vulnerable to malicious code today?
  - Running programs have full access to system files
  - Why? NTFS and XP provide separation
    - But many applications won't install, or even run, unless users have administrator access
  - So we run in "System High"

Corporate IT Departments' Solution

- Users don't have administrator access even on their own laptops
  - This keeps end users from installing their own software, and keeps IT staff in control
  - IT staff select only software for end users that will run without administrator privilages
  - But systems still vulnerable to exploits in programs that cause access to private data
  - Effects of "Plugins" can persist across sessions

The Next Step

- But, what if programs were accompanied by third party certificates that said what they should be able to access?
  - IT department can issue the certificates for new applications
  - Access beyond what is expected results in system dialogue with user over the trusted path

Red / Green Networks

- Butler Lampson of Microsoft and MIT suggests we need two computers (or two domains within our computers)
  - Red network provides for open interaction with anyone, and low confidence in who we talk with
  - We are prepared to reload from scratch and lose our state in the red system

Red / Green Networks

- The Green system is the one where we store our important information, and from which we communicate to our banks, and perform other sensitive functions
  - The Green network provides high accountability, no anonymity, and we are safe because of the accountability
  - But this green system requires professional administration
  - A breach anywhere destroys the accountability for all