Further Worm Developments

- Malicious payloads (disk-trashing)
- Global outbreaks within 24 hours of vulnerability disclosure
- “Server” exploited for infection is a NIDS
- Single outbreak of > 15 million infectees
- “Counterworm” released to clean up original worm …
  - … oh and install a root backdoor
- DoS’ing Windows Update as a worm spreads
- Worms that use Google to search for victims
Thinking About Worm Defenses

• We can methodically explore possible worm defenses by considering the equation:

\[
\frac{dI(t)}{dt} = \beta \cdot I(t) \cdot \frac{S(t)}{N}
\]

• Strategy #1: reduce contact rate \( \beta \) to slow a worm’s propagation …

• … how can we reduce it?
  – Decrease \( N \) so that random scanning less effective
    • Turn off unneeded services; aggressive patch management
  – Increase size of address space (IPv6)
    • Worm countermeasures?
      – Heuristics to guess likely address use patterns
      – Locate likely victims via DNS, Google
  – Suppress scans (limit connection “fanout”)
  – Isolate susceptibles (install firewall blocks upon outbreak)
Thinking About Defenses, con’t

\[ \frac{dI(t)}{dt} = \beta \cdot I(t) \cdot \frac{S(t)}{N} \]

• Reduce I(t)
  – Identify and isolate (“quarantine”) infected hosts

• Reduce S(t)
  – Dynamically push out patches

• What did Slammer teach us about employing dynamic defenses?
  – They have to be fully automated
    • No human in the loop
  – Thus: highly accurate
Worm Take-Aways

- Potentially enormous reach/damage
  ⇒ Weapon
- Hard to get right
- Emergent behavior / surprising dynamics
- Institutional antibodies
- Propagation faster than human response

- What about fighting a worm using a worm?
  - “White worm” spreads to disinfect/patch
  - Experience shows: likely not to behave predictably!
  - Additional issues: legality, collateral damage, target worm having already patched so white worm can’t access victim
Botnets

• Collection of compromised machines (bots) under (unified) control of an attacker (botmaster)
• Method of compromise decoupled from method of control
  – Launch a worm / virus / drive-by infection / etc.
• Upon infection, new bot “phones home” to rendezvous w/ botnet command-and-control (C&C)
• Lots of ways to architect C&C:
  – Star topology; hierarchical; peer-to-peer
  – Encrypted/stealthy communication
• Botmaster uses C&C to push out commands and updates
Botnets, con’t

• Constitute the *Great Modern Threat* of Internet security

• Why botnets rather than worms?
  – Greater control
  – Less emergent
  – Quieter
  – Optimal flexibility

• Why the shift towards valuing these instead of seismic worm infection events?
  $$ \text{Profit} $$

• How can attackers leverage *scale* to monetize botnets?
Monetizing Botnets

• General malware monetization
  – Keylogging: steal financial/email/social network accounts
  – Transaction generators

• Monetization that leverages scale
  – DDoS (extortion)
  – Spam (discussed next week)
  – Click fraud
  – Scam infrastructure
    • Hosting web pages (e.g., phishing)
    • Redirection to evade blacklisting/takedown (DNS)

• Which of these cause serious pain for infected user?
  – None. Users have little incentive to prevent (⇒ externality)
How FBI, police busted massive botnet
12m zombie machines run by 3 admins

By John Leyden
Posted in Malware, 3rd March 2010 15:56 GMT

Analysis More details have emerged about a cybercrime investigation that led to the takedown of a botnet containing 12m zombie PCs and the arrest of three alleged kingpins who built and ran it.

As previously reported, the Mariposa botnet was principally geared towards stealing online login credentials for banks, email services and the like from compromised Windows PCs. The malware infected an estimated 12.7 million computers in more than 190 countries.

The Mariposa Working Group infiltrated the command-and-control structure of Mariposa to monitor the communication channels that relayed information from compromised systems back to the hackers who run the botnet. Analysis of the command system laid the groundwork for the December 2009 shutdown of the botnet, as well as shedding light on how the malware operated and provided a snapshot of the current state of the underground economy.
The botmasters made money by selling parts of the botnet to other cybercrooks,

Netkairo finally regained control of Mariposa and launched a denial of service attack against Defence Intelligence using all the bots in his control. This attack seriously impacted an ISP, leaving numerous clients without an Internet connection for several hours, including several Canadian universities and government institutions.
Once again, the Mariposa Working Group managed to prevent the DDP Team from accessing Mariposa. We changed the DNS records, so the bots could not connect to the C&C servers and receive instructions, and at that moment we saw exactly how many bots were reporting. We were shocked to find that more than 12 million IP addresses were connecting and sending information to the C&C servers, making Mariposa one of the largest botnets in history.

alleged lieutenants “Ostiator” and “Johnyloleante” have been charged with cybercrime offences. More arrests are expected to follow.

Under Spanish law suspects are not named at this stage of proceedings. Pedro Bustamante, senior research advisor at Panda Security, said: “Our preliminary analysis indicates that the botmasters did not have advanced hacking skills.

"This is very alarming because it proves how sophisticated and effective malware distribution software has become, empowering relatively unskilled cyber criminals to inflict major damage and financial loss." ©
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seller/баер акк 10-25 фидов = 10$
seller/баер акк 25-50 фидов = 15$
seller/баер акк более 50 фидов = 25$
allBots Inc.

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Winsock (Multi-threaded) Bots

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Accounts Creator
(You Just Need To Type In The CAPTCHAs To Create Accounts)

<table>
<thead>
<tr>
<th>Social Networks</th>
<th>Price</th>
<th>Discount</th>
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<tr>
<td>TagWorld Accounts Creator</td>
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Friend Adders, Message Senders, Comment Posters & Others
(All Bots Work In A Conventional Manner, They Gather Friend IDs/Names And Send Friend Requests, Messages, Comments Automatically)

**Chaining Feature** Is Available On All Bots for All Networks Except Facebook
Marketplace Ads for Services

Percentage of Labeled Data

Ad Type (Services)

- Cashier Available
- Cashier Wanted
- Confirmer Available
- DoS Available
- Phisher Wanted
- Confirmer Wanted
- Carder Wanted
- Phisher Available
- Carder Available
- DoS Wanted
Marketplace Ads for Goods, con’t
The Underground Economy

Why is its emergence significant?

Markets enable efficiencies
- Specialization: individuals rewarded for doing a single thing particularly well

Lowers barrier-to-entry
- Only need a single skill
- Some underground market activities are legal

Competition spurs innovation
- Accelerates arms race
- Defenders must assume a more pessimistic threat model

Facilitates non-$ Internet attacks (political, nation-state)
- Provides actors with cheap attack components
- Provides stealthy actors with plausible cover
The Underground Economy, con’t

• What problems do underground markets face?

• Markets only provide major efficiencies if they facilitate deals between strangers
  – Susceptible to infiltration

• Depending on marketplace architecture, can present a target / single point of failure

• By definition, deals are between crooks
  – Major issue of betrayal by “rippers”