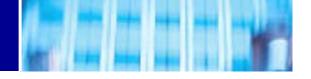


Botnets and spam: What we're doing to deal with the blended threat

Jim Lippard FRnOG 6, April 1, 2005



Botnets and spam



AGENDA

- 1. Overview of the blended threat.
- 2. Some trends.
- 3. Rogue's gallery.
- 4. Defense and attack strategies.
- 5. Our implementation and plans.
- 6. Help wanted.
- 7. Q&A.

Rise of the botnets

Early 1990s: IRC channel bots (e.g., eggdrop, mIRC scripts, ComBot, etc.).

Late 1990s: Denial of service tools (e.g., Trinoo, Tribal Flood Network, Stacheldraht, Shaft, etc.).

2000: Merger of DDoS tools, worms, and rootkits (e.g., Stacheldraht+t0rnkit+Ramen worm; Lion worm+TFN2K).

2002: IRC-controlled bots implementing DDoS attacks.

2003: IRC-controlled bots spread with worms and viruses, fully implementing DDoS, spyware, malware distribution activity.

(Dave Dittrich, "Invasion Force," Information Security, March 2005, p. 30)

2003-2005: Botnets used as a criminal tool for extortion, fraud, identity theft, computer crime, spam, and phishing.

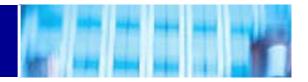


Botnets today

- •Botnets are usually compromised Windows machines, usually controlled from a compromised Unix machine running ircd, sometimes with passwords, sometimes with encryption. Controllers are most often found on low-cost, high-volume web hosting providers. Bots are most often found on home machines of cable modem and DSL customers.
- •Agobot/Phatbot is well-written, modular code supporting DoS attacks, spam proxying, ability to launch viruses, scan for vulnerabilities, steal Windows Product Keys, sniff passwords, support GRE tunnels, self-update, etc. Phatbot control channel is WASTE (encrypted P2P) instead of IRC.
- •Approximately 70% of spam is sent via botnets. (MessageLabs, October 2004 Monthly Report)
- •Bots refute the common argument that "there's nothing on my computer that anyone would want" (usually given as an excuse not to bother securing the system).



Malicious traffic comparison



Unique Infected IPs, week ending March 28, 2005:

Entire Internet (unique IPs within each category; a single IP may have multiple problems)

Spam	1819518	71%
Bots	356211	14%
Phatbot	229270	9%
Beagle3	95141	4%
Slammer	22976	1%
Proxy	11814	0%
Dameware	11428	0%
Nachi	5823	0%
Beagle	4339	0%
Scanners	2744	0%
Scan445	2090	0%
Dipnet	1435	0%
Blaster	910	0%
Mydoom	551	0%
Sinit	376	0%
Phishing	252	0%
Bruteforce	10	0%
Total	2564888	



Malicious traffic trends

Spam, viruses, phishing are growing. Possible drop in DoS attacks.

Percentage of email that is spam:

2002: 9%. 2003: 40%. 2004: 73%. (received by GLBC Apr 2004-Mar 2005: 73%)

Percentage of email containing viruses:

2002: 0.5%. 2003: 3%. 2004: 6.1%. (received by GLBC Apr 2004-Mar 2005: 5%)

Number of phishing emails:

Total through September 2003: 273

Total through September 2004: >2 million

Monthly since September 2004: 2-5 million

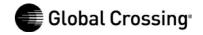
(Above from MessageLabs 2004 end-of-year report.)

Denial of Service Attacks (reported):

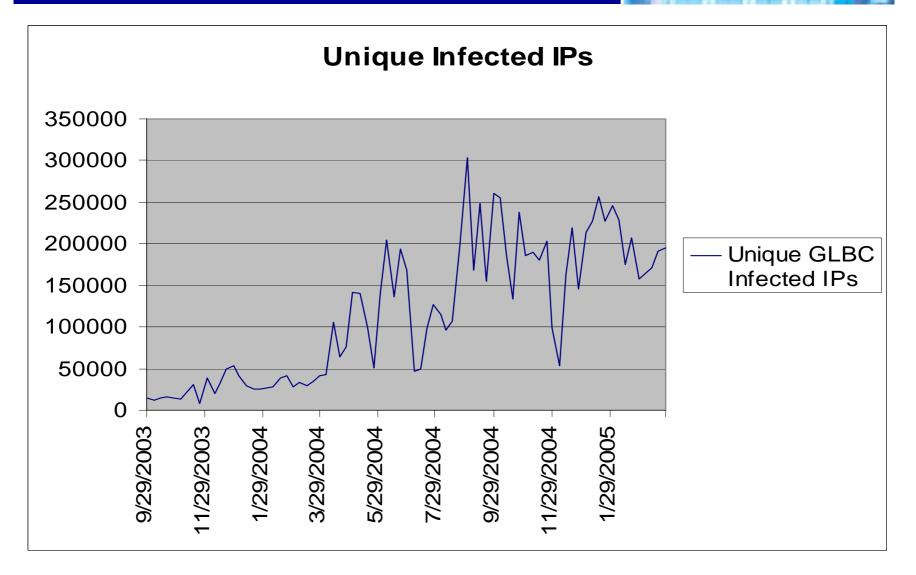
2002: 48 (16/mo). 2003: 409 (34/mo). 2004: 482 (40/mo). Jan. 1-Mar.

23, 2005: 74 (25/mo).

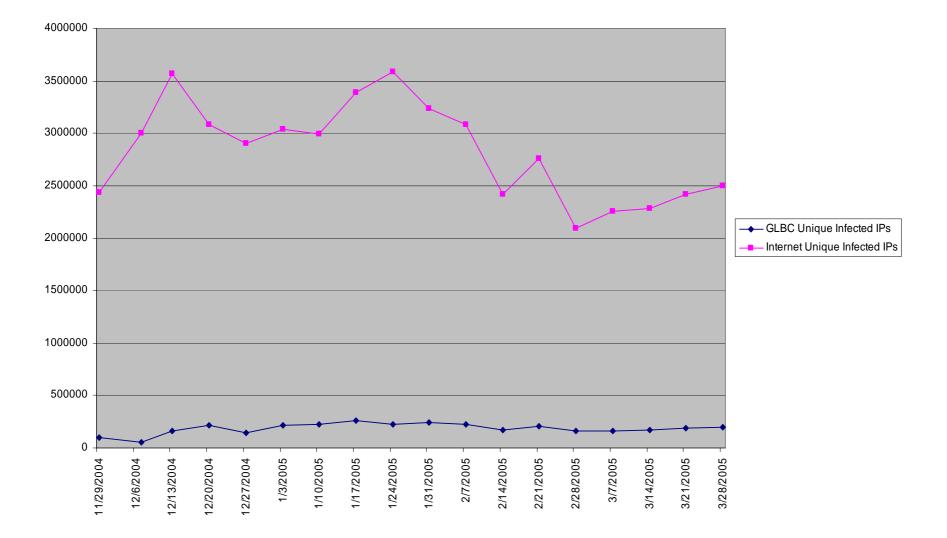
(Above from Global Crossing; 2002 is for Oct-Dec only.)



GLBC downstream malware-infected hosts

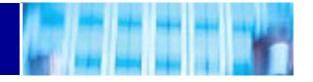


Infected hosts: Internet/GLBC downstreams





GLBC Infected Downstreams

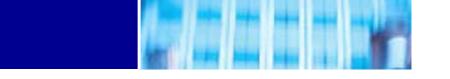


Distribution by region for week ending March 28, 2005; unique infected IPs on AS's with more than 300 infected IPs, which accounts for 91% of unique infected IPs for the week.

Total	203521	
IPs for AS w/>300	184586	
Europe	66832	36%
South America	65516	35%
Asia	46592	25%
U.S.	5646	3%



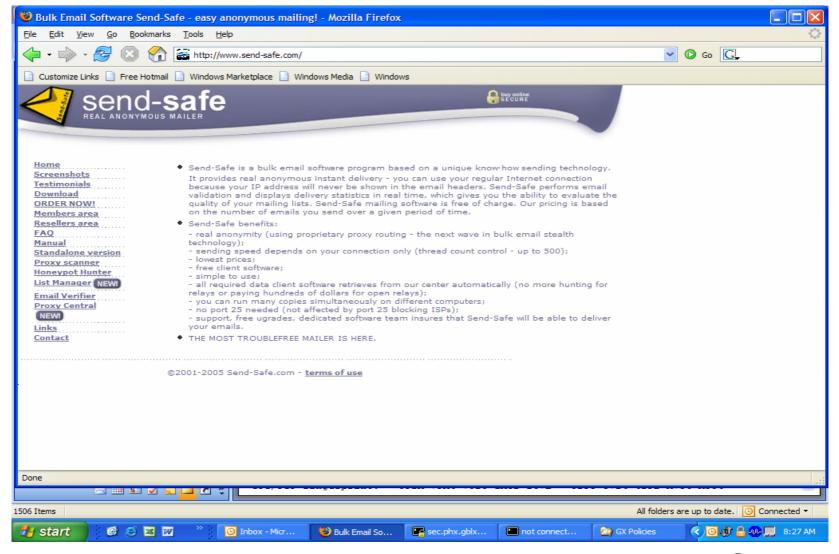
Money is the main driver



Most botnet-related abuse is driven by financial considerations:

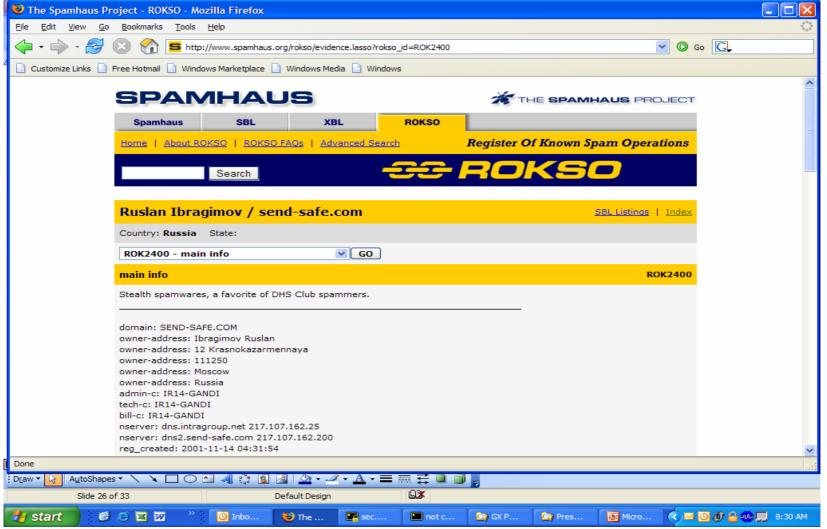
- •Viruses and worms are used to compromise systems to use as bots.
- •Bots are used to send spam to sell products and services (often fraudulent), engage in extortion (denial of service against online gambling, credit card processors, etc.), send phishing emails to steal bank account access.
- •Access to bots as proxies ("peas") is sold to spammers, often with a very commercial-looking front end web interface.

Ruslan Ibragimov/send-safe.com

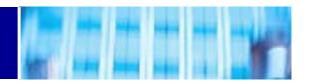


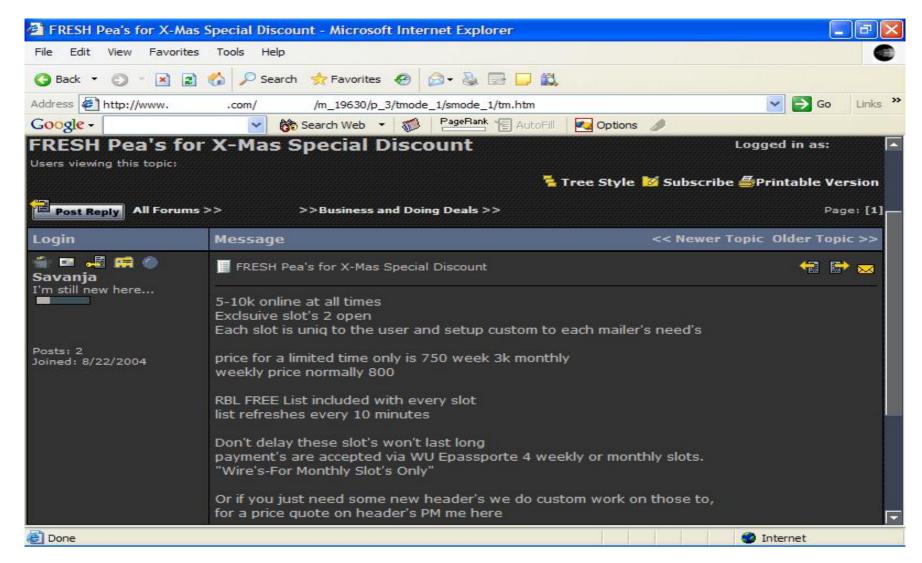




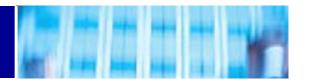


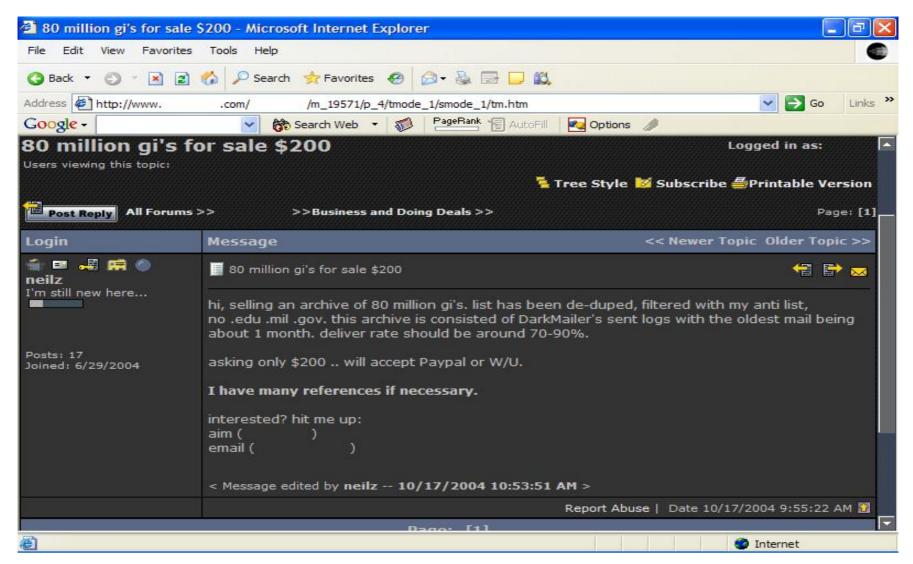
"FRESH Pea's for X-Mas Special Discount"



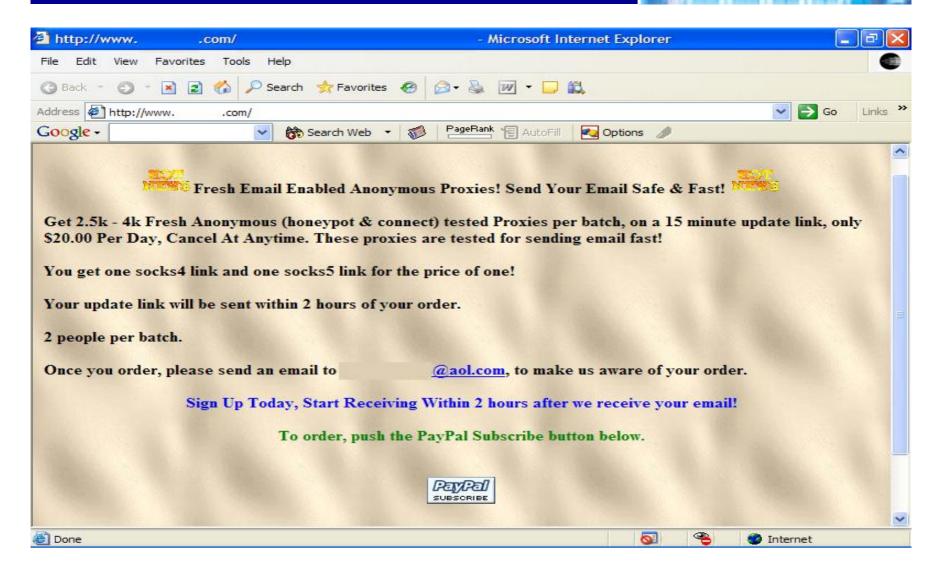


General Interest emails for sale



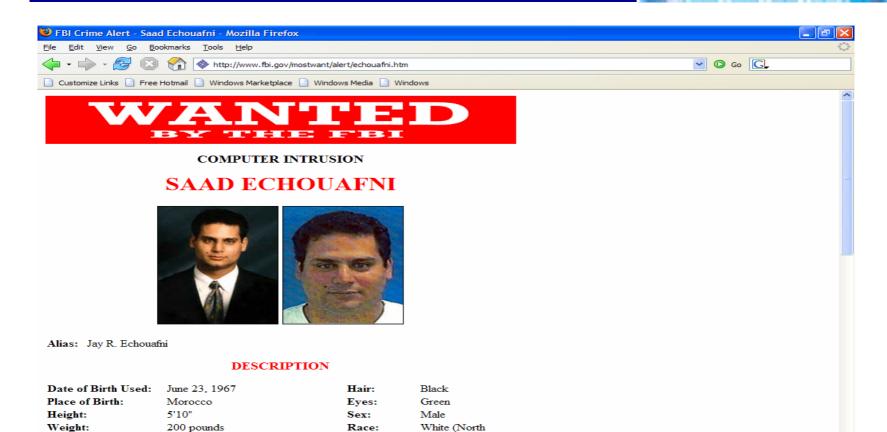


Proxies for Sale





Jay Echouafni / Foonet



African)



Done

Jeremy Jaynes – 9 year prison sentence





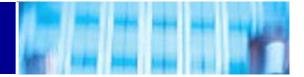
Other miscreants



- •Howard Carmack, the Buffalo spammer: \$16 million judgment for Earthlink, 3.5-7 years on criminal charges from NY AG.
- •Jennifer Murray, Ft. Worth spamming grandmother, arrested and extradited to VA.
- •Ryan Pitylak, UT Austin philosophy student, sued by Texas AG.
- •200+ spam lawsuits filed in 2004 by Microsoft (Glenn Hannifin, etc.)
- •Robert Kramer/CIS Internet lawsuit in Iowa: \$1 billion judgment.
- Long list of names at the Registry of Known Spam Operations (ROKSO): http://www.spamhaus.org



Weak points in need of defense



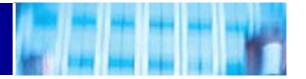
Weak points being exploited:

- •ISPs not vetting/screening customers—spammers set up shop in colo spaces at carriers worldwide.
- •Poorly secured end user machines with high-bandwidth connections.
- Organizations failing to secure their networks and servers.
- •NSPs/ISPs not monitoring for malicious traffic, not being aggressive to terminate abusers—spammers operating for months or years on major carriers sending proxy spam.
- •Law enforcement not having the right resources or information to catch/prosecute offenders.

Defense and attack strategies for NSPs/ISPs

- •Screen prospective customers against ROKSO and other publicly available information sources.
- •Strengthen AUPs and contracts to allow rapid removal of miscreants (and filtering or nullrouting of specific problems prior to termination).
- Secure company end-user machines with endpoint security.
- •Monitor for malicious traffic (or interact with security researchers or upstreams who monitor); notify downstreams and escalate if they fail to act.
- •Filter and terminate abusers.
- •Nullroute bot controllers and phishing websites.
- Collect actionable intelligence and notify law enforcement.

Global Crossing's implementation



External customer-facing components

AUP provisions

Global Crossing reserves the right to deny or terminate service to a Customer based upon the results of a security/abuse confirmation process used by Global Crossing. Such confirmation process uses publicly available information to primarily examine Customer's history in relation to its prior or current use of services similar to those being provided by Global Crossing and Customer's relationship with previous providers.

If a Customer has been listed on an industry-recognized spam abuse list, such Customer will be deemed to be in violation of Global Crossing's Acceptable Use Policy.

Customer screening

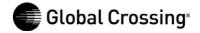
Policy Enforcement/Compliance department reviews new orders for known publicly reported abuse incidents, suspicious contact information (e.g., commercial mail drops, free email addresses, cell phone as only contact).

Network monitoring and customer notification

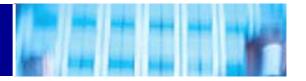
We use Arbor Peakflow to detect and mitigate DoS attacks and engage in regular information exchange with peers and security researchers. We have automated processes for sending daily reports to customers of detected issues.

Regular review of spam block lists and taking action

Reduced Spamhaus SBL listings from 43 in January 2004 to 6 at end of 2004. Currently (25 March 2005) at 11; several removal actions in process.



Global Crossing's implementation



Law enforcement interaction

Participation in the FBI's Operation Slam Spam, which has collected data since September 2003. We are hoping to see major prosecutions in 2005.

Internal components

Comprehensive Enterprise Security Program Plan (ESPP)

Physical and Information Security merged into single organization; reports directly to Security Committee of corporate board of directors under Network Security Agreement with U.S. government agencies (a public document obtainable at www.fcc.gov).

Endpoint security

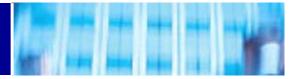
Sygate Enforcer at corporate VPN access points; Sygate Agent on all corporate laptops (and being deployed to all corporate workstations). Sygate Agent acts as PC firewall, IDS, file integrity checker, and enforces compliance on patch levels and anti-virus patterns; it reports back to a central management station. The IDS functionality makes every individual's machine into an IDS sensor.

Antispam/antivirus

Corporate mail servers use open source SpamAssassin plus Trend Micro VirusWall.



Future Plans



Partially automated escalation

Automated testing of botnet controllers and phishing websites; ticket generation, customer notification, nullrouting (with human intervention step).

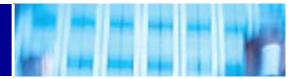
More creative monitoring and analysis of Netflow data

To automate detection of proxy spamming and botnet activity.

More creative monitoring and analysis of DNS queries

To spot cache poisoning and "pharming" attacks, detection of bots by DNS lookups of botnet controllers; possibly use passive DNS replication to view historical data or find FQDNs associated with botnet controllers where the IP has no rDNS.

Help wanted



Peers:

Similar implementations: screen customers, strengthen and enforce AUPs, nullroute botnet controllers and phishing websites. Share additional ideas; coordination of defenses.

OS/Application vendors:

More securely written software, with secure-by-default configurations. Automated, digitally-signed update capability, turned on by default for home users.

ISPs with end user customers:

Better filtering/quarantining of infected customer systems—automation and self-service point-and-click tools needed. Any solution that requires end users to become expert system administrators is doomed to failure.

Organizations on the Internet:

Use firewalls and endpoint security solutions, use spam and anti-virus filtering. Block email from known infected systems using the Composite Blocking List (CBL), cbl.abuseat.org.

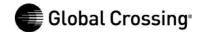
Law enforcement and prosecutors:

Undercover investigations to follow the money and capture the criminals profiting from spam, phishing, denial of service, and the use of botnets. Follow up civil litigation from large providers like AOL, Earthlink, and Microsoft with criminal charges.

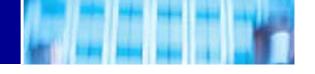


Conclusion

An effective response to botnets, spam, phishing, and denial of service requires a combination of policies and procedures, technology, and legal responses from network providers, ISPs, organizations on the Internet, and law enforcement and prosecutors. All of these components need to respond and change as the threats continue to evolve.



Botnets and spam



Further Information

Composite Blocking List: http://cbl.abuseat.org

Registry Of Known Spam Operations (ROKSO): http://www.spamhaus.org

Bot information: http://www.lurhq.com/research.html

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

Message Labs 2004 end-of-year report:

http://www.messagelabs.com/binaries/LAB480_endofyear_v2.pdf

CAIDA Network Telescope: http://www.caida.org/analysis/security/telescope/

Team Cymru DarkNet: http://www.cymru.com/Darknet/

Internet Motion Sensor: http://ims.eecs.umich.edu/

Passive DNS Replication: http://cert.uni-stuttgart.de/stats/dns-replication.php

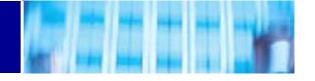
Brian McWilliams, Spam Kings, 2004, O'Reilly and Associates.

Spammer-X, Inside the Spam Cartel, 2004, Syngress. (Read but don't buy.)

Jim Lippard @globalcrossing.com



Appendix: Global Crossing notifications



The following is a list of IP addresses on your network which we have good reason to believe may be compromised systems engaging in malicious activity. Please investigate and take appropriate action to stop any malicious activity you verify.

The following is a list of types of activity that may appear in this report:

BEAGLE	BEAGLE3	BLASTER	BOTNETS	BOTS	BRUTEFORCE
DAMEWARE	DI PNET	DNSBOTS	MYDOOM	NACHI	PHATBOT
PHI SHI NG	SCAN445	SINIT	SLAMMER	SPAM	

Open proxies and open mail relays may also appear in this report. Open proxies are designated by a two-character identifier (s4, s5, wg, hc, ho, hu, or fu) followed by a colon and a TCP port number. Open mail relays are designated by the word "relay" followed by a colon and a TCP port number.

A detailed description of each of these may be found at https://security.gblx.net/reports.html

NOTE: IPs identified as hosting botnet controllers or phishing websites (marked with BOTNETS or PHISHING, respectively) may be null routed by Global Crossing following a separately emailed notice.

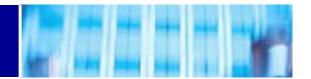
This report is sent on weekdays, Monday through Friday. If you would prefer a weekly report, sent on Mondays, please contact us by replying to this email to request it. We would prefer, however, that you receive and act upon these reports daily.

Unless otherwise indicated, timestamps are in UTC (GMT).

```
3549 | 208. 50. 20. 164/32 | 2005-01-10 23: 23: 36 BOTNETS | GBLX Global Crossing Ltd.
3549 | 209. 130. 174. 106/32 | 2005-02-03 15: 58: 06 tokeat. 4two0. com TCP 13222 BOTNETS | GBLX Global Crossing Ltd.
3549 | 146. 82. 109. 130 | 2005-03-24 10: 01: 30 BEAGLE3 | GBLX Global Crossing Ltd.
3549 | 195. 166. 97. 130 | 2005-03-24 08: 40: 03 SPAM | GBLX Global Crossing Ltd.
3549 | 206. 132. 221. 37 | 2005-03-24 01: 56: 13 PHATBOT | GBLX Global Crossing Ltd.
3549 | 206. 132. 93. 5 | 2005-03-23 22: 13: 40 NACHI | GBLX Global Crossing Ltd.
3549 | 206. 165. 142. 184 | 2005-03-23 09: 35: 53 SLAMMER | GBLX Global Crossing Ltd.
3549 | 206. 165. 192. 5 | 2005-03-24 12: 35: 53 SPAM | GBLX Global Crossing Ltd.
```



Appendix: Phatbot functionality



Phatbot command list (from LURHQ)

bot.command runs a command with system()

bot.unsecure enable shares / enable dcom

bot secure delete shares / disable dcom

bot.flushdns flushes the bots dns cache

bot.quit quits the bot

bot.longuptime If uptime > 7 days then bot will respond

bot.sysinfo displays the system info

bot.status gives status

ot.rndnick makes the bot generate a new random nick

bot removeallbut removes the bot if id does not match

bot remove removes the bot

bot.open opens a file (whatever)

bot.nick changes the nickname of the bot

bot.id displays the id of the current code

bot execute makes the bot execute a .exe

bot.dns resolves ip/hostname by dns

bot.die terminates the bot

bot.about displays the info the author wants you to see

shell disable Disable shell handler

shell enable Enable shell handler

shell.handler FallBack handler for shell

commands.list Lists all available commands

plugin unload unloads a plugin (not supported yet)

plugin.load loads a plugin

cvar.saveconfig saves config to a file

cvar.loadconfig loads config from a file

cvar.set sets the content of a cvar

cvar.get gets the content of a cvar

cvar.list prints a list of all cvars

inst.svcdel deletes a service from scm

inst sycadd adds a service to scm

inst.asdel deletes an autostart entry

inst.asadd adds an autostart entry

logic.ifuptime exec command if uptime is bigger than specified

mac.login logs the user in

mac.logout logs the user out

ftp.update executes a file from a ftp url

ftp.execute updates the bot from a ftp url

ftp.download downloads a file from ftp

http.visit visits an url with a specified referrer

http.update executes a file from a http url

http.execute updates the bot from a http url

http.download downloads a file from http

rsl.logoff logs the user off

rsl.shutdown shuts the computer down

rsl.reboot reboots the computer

pctrl.kill kills a process

pctrl.list lists all processes

scan.stop signal stop to child threads

scan.start signal start to child threads

scan.disable disables a scanner module

scan.enable enables a scanner module

scan.clearnetranges clears all netranges registered with the scanner

scan.resetnetranges resets netranges to the localhost

scan.listnetranges lists all netranges registered with the scanner

scan.delnetrange deletes a netrange from the scanner

scan.addnetrange adds a netrange to the scanner

ddos.phatwonk starts phatwonk flood

ddos.phaticmp starts phaticmp flood

ddos.phatsyn starts phatsyn flood

ddos.stop stops all floods

ddos.httpflood starts a HTTP flood

ddos.svnflood starts an SYN flood

ddos.udpflood starts a UDP flood

redirect.stop stops all redirects running

redirect.socks starts a socks4 proxy

redirect.https starts a https proxy

redirect.http starts a http proxy

redirect.gre starts a gre redirect

redirect.tcp starts a tcp port redirect

harvest.aol makes the bot get aol stuff

harvest.cdkeys makes the bot get a list of cdkeys

harvest.emailshttp makes the bot get a list of emails via http

harvest.emails makes the bot get a list of emails

waste.server changes the server the bot connects to

waste.reconnect reconnects to the server

waste.raw sends a raw message to the waste server

waste.quit

waste.privmsg sends a privmsg

waste.part makes the bot part a channel

waste.netinfo prints netinfo

waste, mode lets the bot perform a mode change

waste.join makes the bot join a channel

waste.gethost prints netinfo when host matches

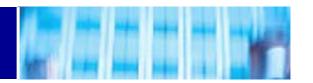
waste.getedu prints netinfo when the bot is .edu

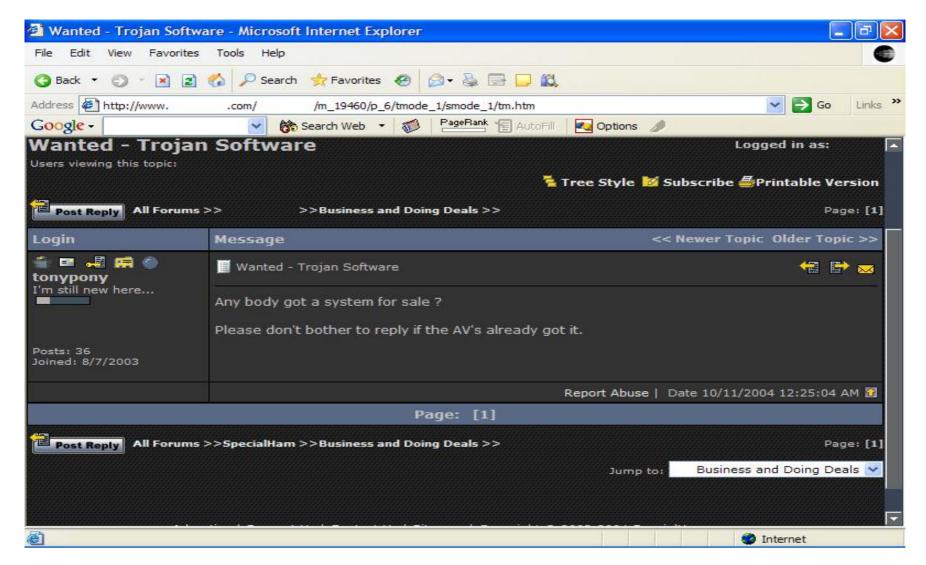
waste.action lets the bot perform an action

waste.disconnect disconnects the bot from waste

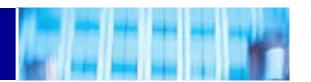


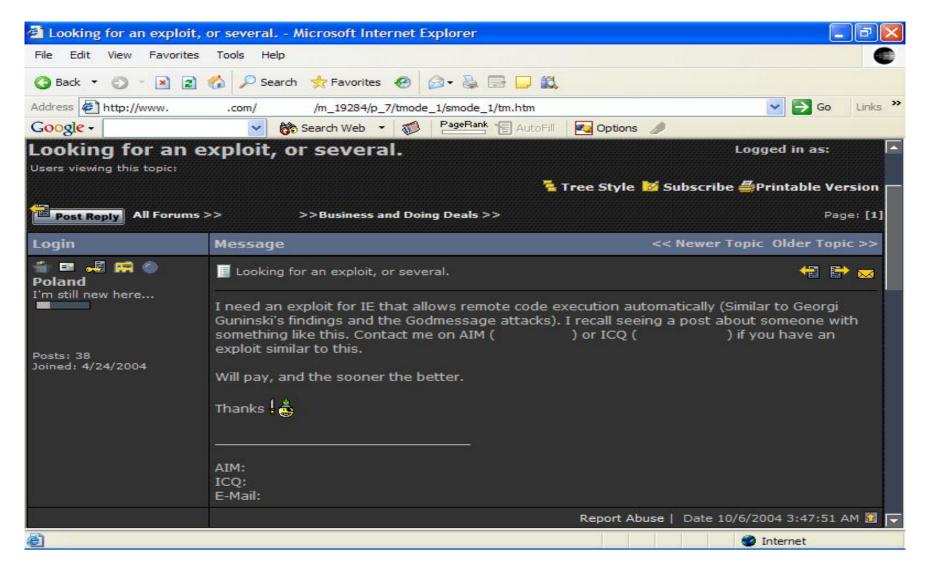
Appendix: Trojan software wanted





Appendix: Looking for an Exploit





Appendix: Spammer Bulletin Board

