Information Operations
Immunity Style

www.immunityinc.com
Agenda

• A Real Life Scenario
• Problems of scale when hacking
  – Client-sides
• Immunity's PINK Framework
• Trojaning hard targets
  – Immunity Debugger Parasitic Infection
Real Life Scenario

- Modeling attack on high value target
- Long time scale operation
- Wide internal scope
- A different kind of contract than pen-testing
- Immunity calls this “Information Operation (IO)”
IO simulation vs. Pen-test

- Modern pen-test is compressed timescale.
- IO is not. Time passes, collection occurs.
- Collection over time gives clear picture of the network, people and data.
- No need for blind network scans or random break-ins. First learn where to go.
- Exploit trust!
Your Network vs Your Attacker

This month your security budget dropped and I owned you here.

This part of the curve doesn't matter unless I get really careless and trigger incident response.
Model of attacker

- Guaranteed to exist
  - Web server
  - MTA server
  - DNS server
  - Border Routers, FW / VPN
  - Endpoints (unknown internal networks)
Not the web server

- Web server was on some random other ISP
  - Dry content without useful logic
  - Hard targets are just that – HARD
  - Even if we broke into the web server, no guarantee of anything useful there
- Apache + IIS only players
  - Hard to audit – large investment
Not the infrastructure

- Routers
  - Embedded device exploitation is fun but
    - Costly lab setup
    - Hard to get it right for all potential firmware
    - Might not detect exact hardware (mips vs. ppc)

- VPN

- Firewall
Not the endpoint

- Did not start with client-sides
  - client-sides are somewhat blind
  - detection is much easier for smart opponent
  - hard to clean up after them

Attacker not caught

Attacker caught but doesn't know he's caught

Attacker caught
The MTA

- Intense versioning on mail server
- One box only
- No class-C scan
- No port scan of that one box
- MTA Gateways
  - No big corporation can run without SPAM/Malware filter
  - Hard to fingerprint – Protocol response is the best way (now in CANVAS)
Soft direct approach - I

- Audit 3rd party AV-SPAM product on MTA Gateway. Easier task than to look into core OS components.

- Extensive file format parsing proven by many researchers to be badly implemented.

- AV on gateways has to be hi-avail, which means watchdogs and intensive exception-handling. Memory corruptions handled or process restarted.
  - Gives unlimited exploitation trial.
Soft direct approach - II

- Model your target in lab.
- VMware vs. Real Iron
- Language detection might be an issue
- Extensive modeling of your target in lab cuts down the exploit development time by half.
- AV products vague about restarts and crashes. Makes attempts less suspicious.
- Almost all AV breaks DEP and SafeSEH. Most compiled with Borland = insecure heap metadata. Do not use /GS.
Audit results

- Heap overflow in unpacking (quite common)
- Alex Wheeler independently discovered the issue as well. Vendor patches available

Exploitation vector:
- Email attachment
- Could be send to void user
- Scanned no matter what, than discarded
- Not much trace left even after failed exploitation
- DEP disabled by product, Watchdog restarts process
Custom Payload

- First a MOSDEF shell (CANVAS)
- Than custom backdoor DLL for email collection
- Inject custom DLL into memory (MS detours) and write into the PE header
- DLL hooks API within the AV process to get a copy of the scanned email
  - Stores email in archive file for later collection
  - Scans email content for keyword to callback MOSDEF shell to encoded IP
Further breach - I

• Email collection over long period
• Analyze email. Now you know which internal box is high value
• DMZ to internal LAN cross over is simple with acquired intelligence
  – Exploiting trust is trivial at this point
Further breach - II

- Exploited Email chatter between user and 3rd party
- Used mail attachment to infect internal Desktop (PINK)
- Broke into PDC with DNS msrpc exploit
- Obtained domain admin hash
- Installed executable remotely to high value target using the admin hash (CANVAS)
- Recently accessed files folder content not on the hard drive. USB drive!
Breaching the Air-Gap - 1

- USB drive goes between segmented development network and the Internet network
- Error logs from 3rd party product are emailed to the support group
- Logs carried from segmented network to the Internet network
- USBDumper comes to mind!
Breaching the Air-Gap – II

- Modified USBDumper for in-memory injection
- Same DLL injection trick
- Added file tracking and free disk space tracking
- Once again, time passes
- Eventually partial access to high value “segmented” data
- Breach vector: Simply a tainted USB drive
Scenario Conclusions

- AntiVirus gateways are a serious security risk
  - Complex parser on crucial hosts!
- USB drives can be high value targets
- Relationship mapping is required in professional attack toolkits
  - More than just X knows Y – needs technical information about email content as well. Does X talk to Y about Z? Do they send PDFs about Q?
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Scalability problems

• Management of one hundred ants is easy
  – Picture of thirty million ants
• A good client-side vulnerability can be used to own a quarter million boxes a day
• Future work involves self-directed worms
Current Botnet C&C technology

- IRC
  - Easy to tear down, take over
- HTTP to single server
  - Share IRC's cons
- Fast-Flux of DNS Servers
  - Easy to block the domain requests
- Storm P2P protocols
  - Reliable but not covert
  - Does not pass through strict proxies
New C & C

• Need a new Command & Control technology
  – Scalable
  – Covert
  – Portable
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PINK C&C Framework

- C&C
- Listening Posts
- Blog/Web/News Searchers
- Targets
- Dead Drops

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Blog Search

• Blog searching is currently the best parasitic host protocol for PINK
  - Almost instantaneous responses
  - Easy to find hosts for our blogs
  - Lots of signal to hide in
  - RSS feeds

• Other search operations can be implemented as well
PINK Dead Drops

<Cover Text>

<TRIGGER>

<base 64><RC4 Encrypted/RSA Signed Commands></base64>

<END TRIGGER>

<More Cover Text>
PINK Dead Drops

- Signed and Encrypted payloads prevent replay attacks with removal kits
- Triggers need to be signed with time-based key as well. PINK verifies signature before command execution
- Trigger strings of random words makes it hard for search engines to filter our requests
PINK Tech - I

- Installs itself as a Shell Extension
- Does not require Admin privs due to current user-only registry key injection
- Persistent across reboots
- In DLL format within Explorer.exe
- Takes itself out of PEB loaded modules list
- Invisible in user mode
PINK Tech - II

- No known AV product checks for malicious Shell Extensions.
- Initial loading of the shell extension requires a shell activity such as; copy, paste, delete, right-click, drag & drop etc. by end user.
- Personal firewalls might trigger on Explorer.exe outbound connection. Easy problem to solve, hard to port across the whole market.
PINK Tech - III

• 3 components
  – PINK backdoor dll (shell extension)
  – PINK installer (dll embedded within)
  – Blog content generator
    TriggerText((RSA_sign(RC4_enc(Commands))));

• PINK installer changes before download to reflect a certain drone subnet

• GeoIP <-> Blog search
PINK Subnets

Web App → GeoIP

pink_GeoA.exe
pink_GeoB.exe
pink_GeoC.exe
...

Download & Exec Shellcode

Targets

Blog Post A
Blog Post B
Blog Post C
Blog Post ...

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Targets & Triggers

- Goal is to divide our targets into manageable sets. Could be:
  - Per Country
  - Per Company
  - Per Domain
  - Per Time-of-exploit
  - etc

- Could than do things like:
  - “All hosts from immunityinc.com domain” please contact listeningpost.my.com using HTTP MOSDEF on port 443
PINK Tech - IV

- Internet searches on configurable timer. Every X hour
- When the timer expires, checks for user mouse, keyboard activity
- If none, sleeps on shorter intervals to check for user activity more often
- If user active, google search, find dead drop block, verify signature, decode
- Run commands, sleep on timer again
Current Pink Commands

- Callback over HTTP/HTTPS MOSDEF to CANVAS
- Callback over TCP MOSDEF to CANVAS
- Download from URL and Exec
- Download from URL and LoadLibrary
- Exec given string
- Upload file(s) to URL (ftp/http/https)
- Key log
- Update self

Coming: Vbscripting
PINK conclusions

• Currently in Beta-testing state – pushing out to CANVAS shortly

• Parasitic C&C is:
  – Hard to detect and monitor
  – Easily re-targetable to any search engine or search option on a web page
  – Does not require expensive infrastructure to maintain
PINK exploitation setup

- Client-Side exploit
  - Acrobat PDF reader through IE7
- Shellcode
  - UrlDownloadToFile & WinExec
  - Downloads pink installer into IE cache and runs it
- Pink installer extracts pink.dll into a user directory
- Adds pink.dll as a shell extension
- Clean up
PINK demo

• TBD
Overall Conclusions

• IO proven itself. MTA compromised, Endpoint compromised, Air gap breached

• PINK introduces stealth and persistence on endpoints

• Recent market shift to automated incident response as part of vulnerability analysis faces ongoing challenges as attackers build one-time custom-use trojans and one-time use exploits
Epilogue

- Invest in human capital
  - Build and train teams
- Be on the offense
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Servers and hard targets

- Servers may not be able to contact us via HTTP
- Need way to connect to stationary targets behind firewalls and application proxies covertly
- Each target is different!
- Example target: MS SQL Server 2005 in strict DMZ tier
Every web application is a unique snowflake
Custom automatic backdoors

- Use Immunity Debugger to analyze target .exe/.dll
- Send traffic to it and trace where our triggers are seen
- Create custom backdoor .dll and write this to disk and memory
- Box is now trojaned in a way that does not require direct connectivity!
Why Immunity Debugger?

- Includes built in analysis engine
- Full Python scripting API can do both dynamic and static analysis
- Send data to the server and then see what API it triggers
- Trojan in memory or on disk or both