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Honeypots and Cyber Security

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Ancient History

Sun Tzu, The Art of War, 500BC (v. Chr.)

All warfare is based on deception, Chapter 1

- ▶ when we are able to attack, we must seem unable
- ▶ when using our forces, we must appear inactive
- ▶ when we are near, we must make the enemy believe we are far away
- ▶ when far away, we must make them believe we are near



Modern Military/Gov Deception

Militaries try deceive the enemy

- ▶ fake capability
- ▶ hidden capability
- ▶ counter intelligence
- ▶ manipulate information
- ▶ government spy vs spy



From Snowden leaks:

<https://archive.org/details/gchq-online-deception/>

Modern Cyber Deception

Criminals do it all the time

- ▶ anonymized IPs
- ▶ spoofed packets
- ▶ spoofed emails
- ▶ phishing websites
- ▶ malware - files intended to look harmless
- ▶ obfuscation - malicious javascript, polymorphic code

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Security people do it a little bit...

- ▶ firewalls - to hide hosts and ports
- ▶ split DNS - to hide internal network
- ▶ security by obscurity ?!?! (moving ssh to port 2222, srsly?)

Honeypots are also a form of deception

Honeytrap Deception

Honeytraps are used in computer security for:

- ▶ detection
- ▶ intelligence
- ▶ investigation
- ▶ research

Deception by good guys (hopefully)

- ▶ fake computer systems
- ▶ fake networks
- ▶ fake services
- ▶ fake people
- ▶ operate at different OSI layers



High Interaction Honeypot

Intended to give attacker maximum functionality

- ▶ vulnerable OS or application
- ▶ unpatched, bad configuration
- ▶ no security software (firewall, AV)
- ▶ functional, real environment (but no real data)

Expected and allowed to be compromised

- ▶ can be a VM or physical machine
- ▶ directly exposed to the Internet
- ▶ monitored closely for attacks
- ▶ analyze the attack after its over

Attackers find it and break in

- ▶ find it by scanning or Shodan searches
- ▶ port scanning the whole Internet is trivial today

Low Interaction Honeypot

Intended to give attacker "perception" of functionality

- ▶ looks real, but is only a simulation
- ▶ OS network fingerprint is faked
- ▶ services are emulated, not real
- ▶ useful for automated scanning
- ▶ human attackers will quickly learn its fake

Safer more controlled honeypot environment

- ▶ installed as a honeypot application (honeyd, kippo)
- ▶ can impersonate large range of IPs from single machine
- ▶ link layer can answer arp requests for non-existent hosts

Sticky honeypots, or tarpits

- ▶ accept connections, but slow them way down, keep them alive
- ▶ lebrex - original tarpit daemon (named after a dinosaur park)
- ▶ endlessh - slow display of endless ssh banner

Spamtraps - Email Honeypots

For attracting spammers

- ▶ post/publish spamtrap email addresses in public forums/lists
- ▶ embed email addresses in html (machines see it, people don't)
- ▶ when spammers are harvesting addresses, they find your spamtrap address
- ▶ email to your spamtrap addresses can be analyzed, monitored
- ▶ good for anti-spam, and collecting new malware samples

Honeypot mail servers

- ▶ functional DNS, MX records, SMTP daemon
- ▶ look like normal servers that accept mail for delivery
- ▶ can act like open relays, but quarantine everything
- ▶ also good for infected client honeypots sending spam

Client Honeybots

Sometimes called honeybots or malware drones

- ▶ client machine is purposely infected with malware
- ▶ can be manual infection by malware analyst
- ▶ automated infection with client side honeypot farms
- ▶ can be virtual machines or physical machines

Used for malware analysis and malware research

- ▶ mitm for traffic analysis
- ▶ monitor botnet communication
- ▶ memory dumps of infected machine
- ▶ filesystem forensic analysis

Depending on the malware, may refuse to infect under some criteria (region, machine type, user environment, etc.)

Botnet Sinkholes

Honeypot for a whole botnet

- ▶ "fake" Command and Control (C&C or C2) server
- ▶ taking control of botnet's C2 server or DNS domain
- ▶ DGA (Domain Generation Algorithm) predicted, future DNS domain(s) registered in advance
- ▶ all infected bots connect to sinkhole server

Botnet herder (owner) loses control

- ▶ part of police assisted action (siezed domain or server)
- ▶ security researchers finding vulnerabilities in botnet
- ▶ can also be criminals steeling control from other criminals

abuse.ch and shadowserver.org are good resources

Internal Routing/DNS Sinkholes

Sinkhole servers, honeypots for internal infrastructure security

- ▶ organizations must use proxy access to Internet
- ▶ no NAT or routed traffic, everything configured via proxies
- ▶ no DNS resolution for external names, all via proxies
- ▶ internal default route sends outbound traffic to sinkhole
- ▶ internal DNS queries for external domains resolve to sinkhole

All internal PCs attempting non-proxy external connections or DNS resolution are suspicious

- ▶ no false positives, all sinkhole hits are attempts to bypass proxy
- ▶ can detect malware in the process of infection (direct attempts to fetch loaders, contact botnet C2)
- ▶ detect rogue software installations and misconfigured machines
- ▶ detect attempted data exfiltration, covert tunnelling

Honeynets

Honeypots can be managed in groups of machines or IPs

- ▶ called honeynets or honeypot farms
- ▶ can be client or server honeypots
- ▶ can be distributed across many ISPs/Hosters around the world
- ▶ can be on a single large range of IP addresses

For single large IP range

- ▶ single honeypot machine can simulate entire IP range
- ▶ useful for passive listening for Internet scanning activity

For globally distributed honeypots

- ▶ have a better view of Internet, not geo-fenced
- ▶ observe regional targeted scanning

Honey Links

Web links that are visible to machines but not people

- ▶ can be embedded in html pages, single transparent pixel
- ▶ crawlers find it, humans don't

Robots exclusion standard

- ▶ made to instruct visiting search engines
- ▶ ROBOTS.txt file lists forbidden directories
- ▶ special directories (honey links) can trigger response
- ▶ attackers, pentesting tools, and nasty search engines will find them, visit them

Website Tracking (fyi, use Privacy Badger, ad blockers)

- ▶ 3rd party tracking bugs
- ▶ social media "share" icons are spying on visitors
- ▶ analytics sites gather info, match with past cookie data

Tracking Bug Honeypots

Link usually sent via email

- ▶ also called webbugs or beacons
- ▶ used by advertising and marketing companies
- ▶ used by spammers, and criminals to distribute malware
- ▶ can be used by investigators and researchers

Web links are embedded in html mail or documents

- ▶ when opened, the client visits a honeypot
- ▶ fetches a single pixel transparent gif
- ▶ not visible to user, but honeypot server gets information about IP, browser/client, OS, etc.
- ▶ can trigger additional information gathering

Not limited to html images, can also be DNS, reverse-DNS, calendar invites, other application protocols

TOR Exit Node Honeypots

Anonymization

- ▶ TOR (The Onion Router) - cryptographic system for anonymizing network traffic
- ▶ anonymizers and relays are dedicated servers (or tiers of servers) to mask IP source addresses
- ▶ hides identity of originating machine at network layer
- ▶ but not anonymizing the upper layers (session, application)

These services have exit nodes connecting to final destination

- ▶ anyone can create a relay or an exit node honeypot
- ▶ including criminals, researchers, other agencies
- ▶ original IP is gone, but the rest of the traffic can be analyzed or manipulated
- ▶ more interesting in the days when nobody used encryption

<https://therecord.media/a-mysterious-threat-actor-is-running-hundreds-of-malicious-tor-relays/>

Other Honey pots

Honey phones or honey mobiles

- ▶ infecting phones with mobile malware, rogue apps
- ▶ make/accept voice calls and SMS messages
- ▶ analyzing social engineering attacks

Honey documents

- ▶ specially prepared documents for attacker to find
- ▶ contain false or deceptive information
- ▶ contain malware or other malicious content

Honey accounts

- ▶ fake user accounts
- ▶ social media profiles (linkedin, facebook)
- ▶ get access to contacts, content, communities

Legal Risks with Honey pots

What if somebody uses your honeypot to commit a serious crime?

- ▶ are you an accomplice to criminals who use your honeypot?
- ▶ maybe the attacker is spamming, or participating in a DDOS attack, but what if the damage is more severe?
- ▶ child exploitation, unauthorized ebanking access to steal money, or a terrorist communication channel?
- ▶ You can't say you were not aware, you built it fully expecting to have nasty people attacking it!

Which jurisdictions are involved? That is important!

- ▶ the country where you are located
- ▶ the country where your honeypot is hosted
- ▶ the country where relayed attacks are targeting people

Depending on the crime and jurisdiction, an international legal process may be started

Any Questions?

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Thanks for listening!

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