HORNE CYBER

Secure Penetration Testing Operations

Demonstrated Weaknesses in Learning Material and Tools

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Bio

- Co-Founder of HORNE Cyber, previously Halberd Group
- Directs and participates
    - Penetration testing engagements
    - Research and development
- Adjunct professor at Mississippi State University
    - NSA-CAE Cyber Operations program
    - Information Security & Reverse Engineering

The Situation at a Glance

Insecure practices used on penetration tests put clients and penetration testers alike at risk.

Penetration testers and clients during/between engagements are attractive soft targets.

The root cause of this problem is a lack of awareness, and learning materials that teach insecure practices.

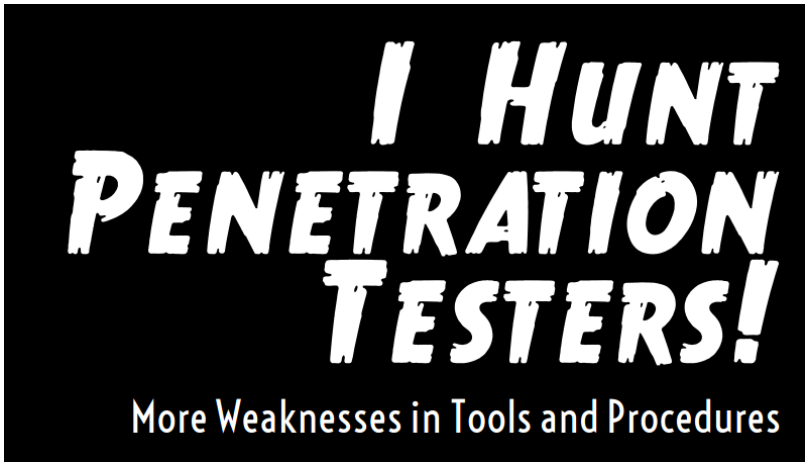
This has to change.

What are we covering today?

- Previous and Current Work
- The Threat
- Role of Learning and Reference Materials
- Analysis of Currently-Available Materials
- Recommended Best Practices
- Demonstration and Tool Release
  - Snagterpreter – Hijack meterpreter sessions
- Conclusions
- Call to Action

Where are we?

Two previous papers & presentations, DEF CON 21 and 23



This work – a paper and talk studying the root causes of these issues, recommending change.

The Threat

Why is the compromise of a penetration tester attractive?

As a Target

Tools, tactics, procedures. Intellectual property.

Operational Cover For Compromising Clients

Testers are expected to break rules, attack, elevate privilege, exfiltrate.

Cause and Effect

No Standard

Dependent on experience, intuition, pattern recognition, and complex ad-hoc processes

Tradeoff: Flexibility vs. Rigor

We operate as we learn

Lowest Common Denominator = Profit

No formal requirements for education

Few prerequisites

No testing requirements

Cause and Effect

Testing Processes Follow Training

Convenience and Expediency

Lower Depth & Breadth of Technical Knowledge

Lack of Situational Awareness in Secure Operation/Communication

Re-applying procedures learned in reading/training to more complex operational environments

The Study – The Goal

How are secure practices in penetration testing covered (or not covered) in learning and reference materials?

Books, Training, Standards Documents

The Study – The Material

Books: 16

Top Amazon results, well-known and popular books

Training: 3

Publicly available material, limited (NDAs, cost)

Standards: 4

Well known

The Study – Disclosure

Disclosure:

You'll see from the results: the lack of coverage of secure practices, and the promotion of vulnerable practices, is the norm, not an outlier.

Titles, author names, sources, are not stated. The purpose is to demonstrate an industry-wide need to move forward.

Examples are provided, if you're well-read, you may recognize them.

Host Security, Penetration Tester

Does the work address precautions for preventing penetration testers' systems from being compromised?

Host Security, Client

Does the work address precautions for maintaining the security of client systems during the test?

COMSEC

Does the work address establishing secure means of communicating with the client about the engagement?

Client Data in Transit

Does the work address issues surrounding the transmission of sensitive client data between targets and penetration testers' systems in the course of the engagement?

Client Data at Rest

Does the work discuss procedures for securing client data at rest, during, and/or after the engagement?

OSINT OPSEC

Does the work address operational security during intelligence gathering phases?

Potential Threats

Does the work address issues with conducting tests against systems over hostile networks, such as the public Internet or unencrypted wireless?

Insecure Practices

Does the work demonstrate or teach at least one example of an insecure practice without describing how it might leave the tester or client vulnerable?

Results

Resource	1 - Host Security - Penetration Tester	2 - Host Security - Client	3 - COMSEC	4 - Client Data - In Transit	5 - Client Data - At Rest	6 - OSINT OPSEC	7 - Potential Threats	8 - Insecure Practices
1	Y	N	N	N	Y	N	N	N
2	N	N	N	N	N	N	N	Y
3	N	N	N	N	N	N	N	Y
4	N	N	N	N	N	N	N	Y
5	Y	Y	Y	Y	Y	Y	Y	N
6	N	N	N	Y	Y	N	N	Y
7	N	N	N	N	N	N	N	Y
8	N	N	N	N	N	N	N	Y
9	N	Y	N	N	Y	N	N	Y
10	N	N	N	N	N	N	N	Y
11	N	N	N	N	N	N	N	Y
12	N	N	N	N	N	N	N	N
13	N	Y	Y	Y	Y	Y	N	Y
14	N	N	N	N	N	N	N	Y
15	N	N	N	N	N	N	N	Y
16	N	N	N	N	N	N	N	Y
17	N	N	N	N	N	N	N	Y
18	N	N	Y	Y	N	N	N	Y
19	N	Y	N	Y	Y	N	N	Y
20	N	N	N	N	Y	N	N	Y
21	N	N	N	N	N	N	N	Y
22	N	N	N	N	N	N	N	Y
23	Y	N	N	Y	Y	N	N	Y

Mostly red!

Almost every one specifically teaches insecure practice.

Analysis

Out of 24 works...

14 did not address basic issues.

4 addressed more than two issues.

Every work that actually covered technical practices described actions that were potentially dangerous/insecure.

2 did not cover technical practices

1 Warned about unencrypted networks

Unencrypted command and control

netcat, web shells, default meterpreter, etc.

“Greatest Hits”

You’ll have to attend or watch the talk itself to hear specific (an humorous) examples of the most insecure practices presented in the works studied.

Recommendations

Client Communication Security

OSINT OPSEC

Awareness

Host Security – Client and Pentester

Data at Rest

Demonstration

Snagterpreter

Hijacking HTTP/HTTPS meterpreter sessions.

What's going on in this demo?

- Metasploit's Meterpreter – Most commonly used and documented penetration testing implant/post-exploitation tool.
- Easy to use, more fully featured than a shell, therefore popular
- Operational use – Often traversing hostile networks, such as the public Internet.
- Protocols
    - Type-Length-Value – Commands & Responses
    - Transport – TCP, or HTTP/HTTPS for stateless resilience
- Default encryption is for **evasion**, not **security**!
- The developers know this, have implemented **paranoid** mode to validate server & client certificates
    - Nobody teaches anyone how to use this apart from official docs
- Let's demonstrate non-paranoid-mode hijacking…

Penetration tester, test thyself!

Conclusions

- In this work:
  - Explained threats
  - Demonstrated vulnerabilities
- You cannot have it both ways
  - You can’t report on vulnerabilities in situations involving malicious actors intercepting and modifying traffic.
  - …while ignoring that threat model in your own operations
- We must improve
  - Tools
  - Techniques
  - Processes
  - It all has to be integrated into learning material

Black Hat Sound Bytes

- Penetration testers put their selves and clients at risk with insecure practices. Third-party malicious attackers can take advantage of this.
- The root cause: Learning material available teach insecure practices and do not address security issues. This leads to lack of rigor in penetration testing practices.
- Direct and mindful action must be taken by penetration testers, tool developers, and learning material authors to remedy this problem.

Materials

White paper, slides, code

https://hornecyber.com/ *<precise URL provided in final slides>*

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