Vulnerability Management Workflow

Organizations that adopt a vulnerability management system should also develop a workflow approach to managing vulnerabilities. The basic steps in this workflow should include the following:

1. *Detection*: The initial identification of a vulnerability normally takes place as the result of a vulnerability scan.
2. *Validation*: Once a scanner detects a vulnerability, administrators should confirm the vulnerability to determine that it is not a false positive report.
3. *Remediation*: Validated vulnerabilities should then be remediated. This may include applying a vendor-supplied security patch, modifying a device configuration, implementing a workaround to avoid the vulnerability, or installing a web application firewall or other control that prevents the exploitation of the vulnerability.

The goal of a workflow approach is to ensure that vulnerabilities are detected and resolved in an orderly fashion. The workflow should also include steps that prioritize vulnerability remediation based upon the severity of the vulnerability, the likelihood of exploitation, and the difficulty of remediation.

Penetration Testing

The *penetration test* goes beyond vulnerability testing techniques because it actually attempts to exploit systems. Vulnerability scans merely probe for the presence of a vulnerability and do not normally take offensive action against the targeted system. (That said, some vulnerability scanning techniques may disrupt a system, although these options are usually disabled by default.) Security professionals performing penetration tests, on the other hand, try to defeat security controls and break into a targeted system or application to demonstrate the flaw.

Penetration tests require focused attention from trained security professionals, to a much greater extent than vulnerability scans. When performing a penetration test, the security professional typically targets a single system or set of systems and uses many different techniques to gain access. The process normally consists of the following phases, illustrated in Figure 15.7

- *Planning* includes agreement upon the scope of the test and the rules of engagement. This is an extremely important phase because it ensures that both the testing team and management are in agreement about the nature of the test and that the test is explicitly authorized.
- *Information gathering and discovery* uses manual and automated tools to collect information about the target environment. This includes performing basic reconnaissance to determine system function (such as visiting websites hosted on the system) and conducting network discovery scans to identify open ports.
- *Vulnerability scanning* probes for system weaknesses using network vulnerability scans, web vulnerability scans, and database vulnerability scans.
- *Exploitation* seeks to use manual and automated exploit tools to attempt to defeat system security.
- *Reporting* summarizes the results of the penetration testing and makes recommendations for improvements to system security.

Penetration testers commonly use a tool called *Metasploit* to automatically execute exploits against targeted systems. Metasploit, shown in Figure 15.8, uses a scripting language to allow the automatic execution of common attacks, saving testers (and hackers!) quite a bit of time by eliminating many of the tedious, routine steps involved in executing an attack.

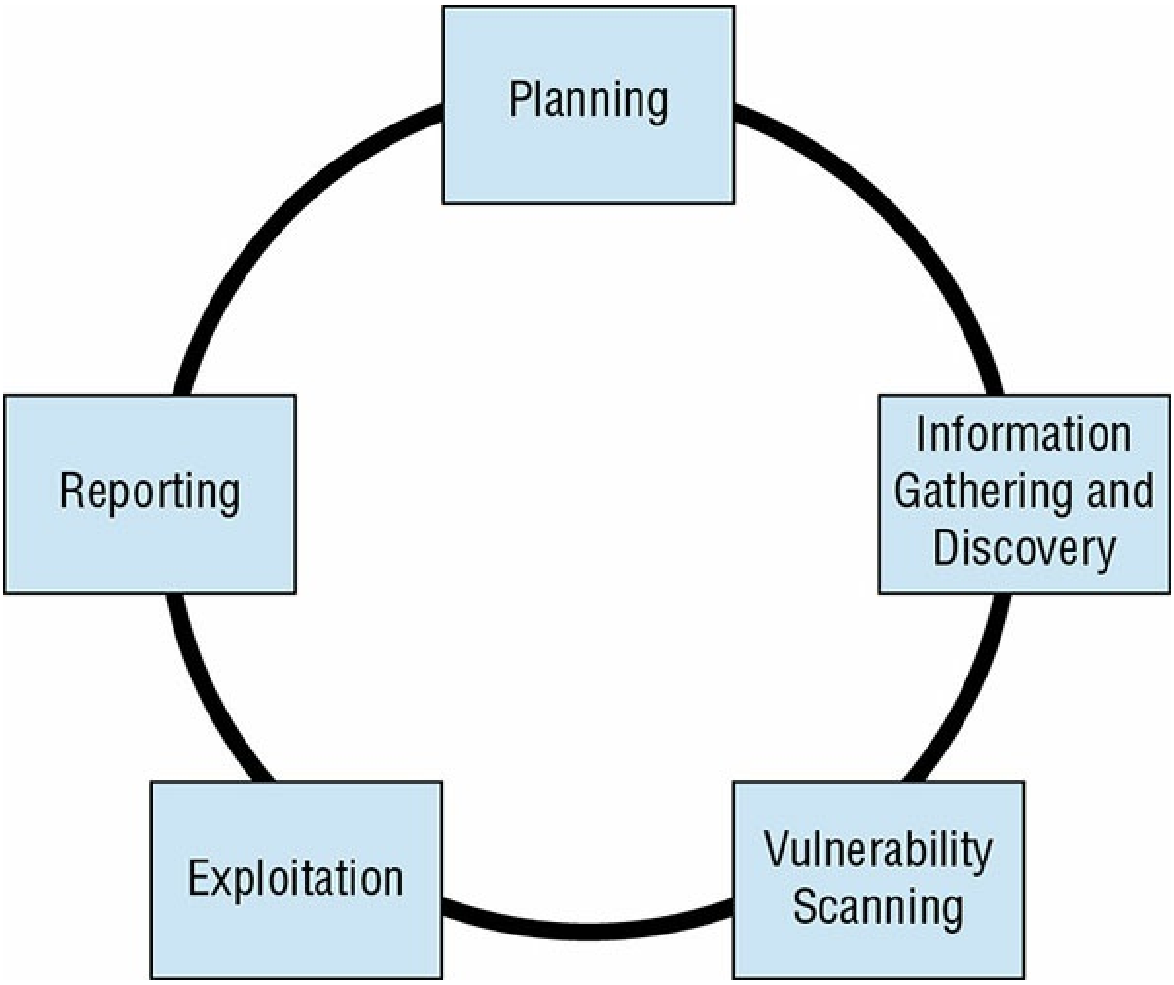
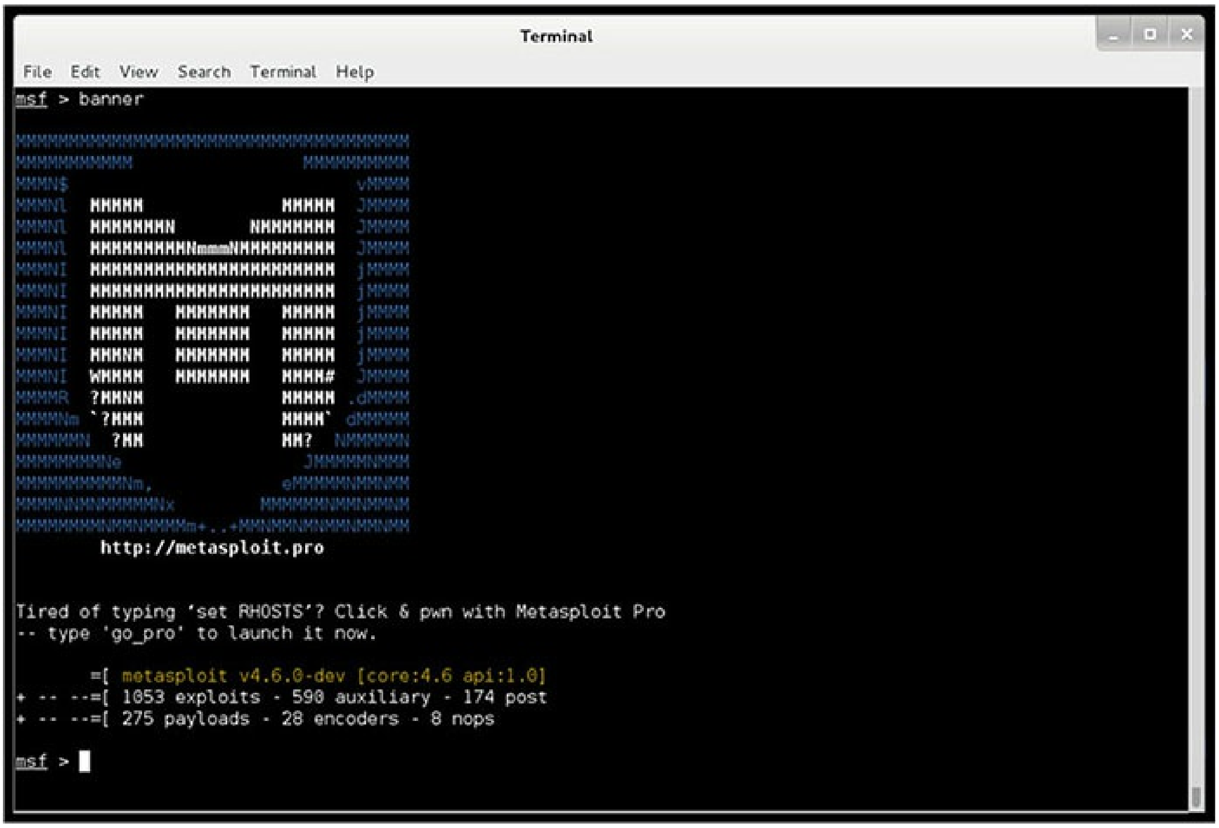


FIGURE 15.7 Penetration testing process



```
msf > banner

MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
MMMMMMMMMMM                 MMMMMMMMMM
MMMN$                           vMMMM
MMMNl  MMMMM             MMMMM  JMMMM
MMMNl  MMMMMMMN       NMMMMMMM  JMMMM
MMMNl  MMMMMMMMMNmmmNMMMMMMMMM  JMMMM
MMMNI  MMMMMMMMMMMMMMMMMMMMMMM  jMMMM
MMMNI  MMMMMMMMMMMMMMMMMMMMMMM  jMMMM
MMMNI  MMMMM   MMMMMMM   MMMMM  jMMMM
MMMNI  MMMMM   MMMMMMM   MMMMM  jMMMM
MMMNI  MMMNM   MMMMMMM   MMMMM  jMMMM
MMMNI  WMMMM   MMMMMMM   MMMM#  JMMMM
MMMMR  ?MMNM             MMMMM .dMMMM
MMMMNm `?MMM             MMMM` dMMMMM
MMMMMMN  ?MM             MM?  NMMMMMN
MMMMMMMMNe                 JMMMMMNMMM
MMMMMMMMMMNm,            eMMMMMNMMNMM
MMMMNNMNMMMMMNx        MMMMMMNMMNMMNM
MMMMMMMMNMMNMMMMm+..+MMNMMNMNMMNMMNMM
        http://metasploit.pro


Tired of typing 'set RHOSTS'? Click & pwn with Metasploit Pro
-- type 'go_pro' to launch it now.

       =[ metasploit v4.6.0-dev [core:4.6 api:1.0]
+ -- --=[ 1053 exploits - 590 auxiliary - 174 post
+ -- --=[ 275 payloads - 28 encoders - 8 nops

msf >
```

FIGURE 15.8 The Metasploit automated system exploitation tool allows attackers to quickly execute common attacks against target systems.

Penetration testers may be company employees who perform these tests as part of their duties or external consultants hired to perform penetration tests. The tests are normally categorized into three groups:

White Box Penetration Test Provides the attackers with detailed information about the systems they target. This bypasses many of the reconnaissance steps that normally precede attacks, shortening the time of the attack and increasing the likelihood that it will find security flaws.

Gray Box Penetration Test Also known as partial knowledge tests, these are sometimes chosen to balance the advantages and disadvantages of white and black box penetration tests. This is particularly common when black box results are desired but costs or time constraints mean that some knowledge is needed to complete the testing.

Black Box Penetration Test Does not provide attackers with any information prior to the attack. This simulates an external attacker trying to gain access to information about the business and technical environment before engaging in an attack.

Organizations performing penetration testing should be careful to ensure that they understand the hazards of the testing itself. Penetration tests seek to exploit vulnerabilities and consequently may disrupt system access or corrupt data stored in systems. This is one of the major reasons that it is important to clearly outline the rules of engagement during the planning phase of the test as well as have complete authorization from a senior management level prior to starting any testing.

Penetration tests are time-consuming and require specialized resources, but they play an important role in the ongoing operation of a sound information security testing program.

> .There are many industry-standard penetration testing
>
> methodologies that make a good starting point when designing your own program. Consider using the OWASP Testing Guide, OSSTMM, NIST 800-115, FedRAMP Penetration Test Guidance, or PCI DSS Information Supplement on Penetration Testing as references.