Introduction to Computer Security
Homework 2

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1.a. Select a target domain and use Nmap for: host discovery on the selected domain.

```
~ nmap ywpu.me

Starting Nmap 7.10 ( https://nmap.org ) at 2016-03-29 19:19 CST
Nmap scan report for ywpu.me (192.30.252.154)
Host is up (0.21s latency).
Other addresses for ywpu.me (not scanned): 192.30.252.153
rDNS record for 192.30.252.154: pages.github.com
Not shown: 998 filtered ports
PORT     STATE  SERVICE
80/tcp   open   http
113/tcp  closed ident

Nmap done: 1 IP address (1 host up) scanned in 15.51 seconds
~
```

→ Its IP is `192.30.252.154` (or `192.30.252.153`), having an alternative domain name `pages.github.com`. It is currently on-line.

1.b. Select a target domain and use Nmap for: port scanning on a selected host.

→ Following the previous question, its port 80 is opened for HTTP, port 113 is accessible (but closed), and there are 998 filtered ports (unreachable due to firewall, etc.)

1.c. Select a target domain and use Nmap for: active stack fingerprinting on the selected host.

```
~ sudo nmap -O ywpu.me
[sudo] password for yuwen41200:

Starting Nmap 7.10 ( https://nmap.org ) at 2016-03-29 19:46 CST
Nmap scan report for ywpu.me (192.30.252.153)
Host is up (0.18s latency).
Other addresses for ywpu.me (not scanned): 192.30.252.154
rDNS record for 192.30.252.153: pages.github.com
Not shown: 998 filtered ports
PORT     STATE  SERVICE
80/tcp   open   http
113/tcp  closed ident
Device type: general purpose|firewall
Running (JUST GUESSING): Linux 3.X|4.X|2.6.X (86%), WatchGuard Fireware 11.X (86%), IPFire 2.X (86%)
OS CPE: cpe:/o:linux:linux_kernel:3 cpe:/o:linux:linux_kernel:4 cpe:/o:watchguard:fireware:11.8 cpe:
Aggressive OS guesses: Linux 3.11 - 4.1 (86%), Linux 3.2 - 3.8 (86%), Linux 3.8 (86%), WatchGuard Fi
No exact OS matches for host (test conditions non-ideal).

OS detection performed. Please report any incorrect results at https://nmap.org/submit/ .
Nmap done: 1 IP address (1 host up) scanned in 26.76 seconds
```

→ It may be running Linux with WatchGuard. Because it has setuped an Intrusion Prevention Service (IPS), it is difficult to know the real OS.

1.d. Select a target domain and use Nmap for: version scanning on a selected port.

```
~ sudo nmap -sV ywpu.me -p80

Starting Nmap 7.10 ( https://nmap.org ) at 2016-03-29 20:06 CST
Nmap scan report for ywpu.me (192.30.252.154)
Host is up (0.21s latency).
Other addresses for ywpu.me (not scanned): 192.30.252.153
rDNS record for 192.30.252.154: pages.github.com
PORT   STATE SERVICE VERSION
80/tcp open  http    GitHub.com
1 service unrecognized despite returning data. If you know the service/vers
SF-Port80-TCP:V=7.10%I=7%D=3/29%Time=56FA6FCE%P=x86_64-redhat-linux-gnu%r(
SF:GetRequest,24F8,"HTTP/1\.1\x20404\x20Not\x20Found\r\nServer:\x20GitHub\
SF:.com\r\nDate:\x20Tue,\x2029\x20Mar\x202016\x2012:06:38\x20GMT\r\nConten
SF:t-Type:\x20text/html;\x20charset=utf-8\r\nContent-Length:\x209116\r\nCo
SF:nnection:\x20close\r\nETag:\x20\"551c96e7-239c\"\r\nContent-Security-Po
SF:licy:\x20default-src\x20'none';\x20style-src\x20'unsafe-inline';\x20img
SF:-src\x20data:;\x20connect-src\x20'self'\r\nX-GitHub-Request-Id:\x208C71
SF:7997:3F96:22D6709C:56FA6FC9\r\n\r\n<!DOCTYPE\x20html>\n<html>\n\x20\x20
SF:<head>\n\x20\x20\x20\x20<meta\x20http-equiv=\"Content-type\"\x20content
SF:=\"text/html;\x20charset=utf-8\">\n\x20\x20\x20\x20<meta\x20http-equiv=
SF:\"Content-Security-Policy\"\x20content=\"default-src\x20'none';\x20styl
SF:e-src\x20'unsafe-inline';\x20img-src\x20data:;\x20connect-src\x20'self'
SF:\">\n\x20\x20\x20\x20<title>Site\x20not\x20found\x20&middot;\x20GitHub\
SF:x20Pages</title>\n\x20\x20\x20\x20<style\x20type=\"text/css\"\x20media=
SF:\"screen\">\n\x20\x20\x20\x20\x20\x20body\x20{\n\x20\x20\x20\x20\x20\x2
SF:0\x20\x20background-color:\x20#f1f1f1;\n\x20\x20\x20\x20\x20\x20\x20\x2
SF:0margin:\x200;\n\x20\x20\x20\x20\x20\x20\x20\x20font-family:\x20\"Helve
SF:tica\x20Neue\",\x20Helvetica,\x20Arial,\x20sans-serif;\n\x20\x20\x20\x2
SF:0\x20\x20}\n\n\x20\x20\x20\x20\x20\x20\.container\x20{\x20margin:\x2050
SF:px\x20auto\x2040px\x20auto;\x20width:\x20600px;\x20tex")%r(HTTPOptions,
SF:24F8,"HTTP/1\.1\x20404\x20Not\x20Found\r\nServer:\x20GitHub\.com\r\nDat
SF:e:\x20Tue,\x2029\x20Mar\x202016\x2012:06:38\x20GMT\r\nContent-Type:\x20
SF:text/html;\x20charset=utf-8\r\nContent-Length:\x209116\r\nConnection:\x
SF:20close\r\nETag:\x20\"551c96e7-239c\"\r\nContent-Security-Policy:\x20de
SF:fault-src\x20'none';\x20style-src\x20'unsafe-inline';\x20img-src\x20dat
SF:a:;\x20connect-src\x20'self'\r\nX-GitHub-Request-Id:\x208C717997:3F96:2
SF:2D67BD1:56FA6FCE\r\n\r\n<!DOCTYPE\x20html>\n<html>\n\x20\x20<head>\n\x2
SF:0\x20\x20\x20<meta\x20http-equiv=\"Content-type\"\x20content=\"text/htm
SF:l;\x20charset=utf-8\">\n\x20\x20\x20\x20<meta\x20http-equiv=\"Content-S
SF:ecurity-Policy\"\x20content=\"default-src\x20'none';\x20style-src\x20'u
SF:nsafe-inline';\x20img-src\x20data:;\x20connect-src\x20'self'\">\n\x20\x
SF:20\x20\x20<title>Site\x20not\x20found\x20&middot;\x20GitHub\x20Pages</t
SF:itle>\n\x20\x20\x20\x20<style\x20type=\"text/css\"\x20media=\"screen\">
SF:\n\x20\x20\x20\x20\x20\x20body\x20{\n\x20\x20\x20\x20\x20\x20\x20\x20ba
SF:ckground-color:\x20#f1f1f1;\n\x20\x20\x20\x20\x20\x20\x20\x20margin:\x2
SF:00;\n\x20\x20\x20\x20\x20\x20\x20\x20font-family:\x20\"Helvetica\x20Neu
SF:e\",\x20Helvetica,\x20Arial,\x20sans-serif;\n\x20\x20\x20\x20\x20\x20}\
SF:n\n\x20\x20\x20\x20\x20\x20\.container\x20{\x20margin:\x2050px\x20auto\
SF:x2040px\x20auto;\x20width:\x20600px;\x20tex");

Service detection performed. Please report any incorrect results at https:/
Nmap done: 1 IP address (1 host up) scanned in 25.04 seconds
```

→ Nmap failed to know its version. GitHub does very well on security!

1.e. Select a target domain and use Nmap for: vulnerability scanning on the selected port.

```
/usr/share/nmap/scripts  sudo nmap -sS -sV --script=vulscan codesensor.tw -p80

Starting Nmap 7.10 ( https://nmap.org ) at 2016-03-29 23:50 CST
Nmap scan report for codesensor.tw (140.113.203.221)
Host is up (0.0026s latency).
rDNS record for 140.113.203.221: codesensor.cs.nctu.edu.tw
PORT   STATE SERVICE VERSION
80/tcp open  http    Apache httpd 2.4.6 ((CentOS) OpenSSL/1.0.1e-fips PHP/5.4.16
|_http-server-header: Apache/2.4.6 (CentOS) OpenSSL/1.0.1e-fips PHP/5.4.16
| vulscan: scip VulDB - http://www.scip.ch/en/?vuldb:
| No findings
|
| MITRE CVE - http://cve.mitre.org:
| No findings
|
| OSVDB - http://www.osvdb.org:
| No findings
|
| SecurityFocus - http://www.securityfocus.com/bid/:
| No findings
|
| SecurityTracker - http://www.securitytracker.com:
| No findings
|
| IBM X-Force - http://xforce.iss.net:
| No findings
|
| Exploit-DB - http://www.exploit-db.com:
| No findings
|
| OpenVAS (Nessus) - http://www.openvas.org:
| No findings
|_

Service detection performed. Please report any incorrect results at https://nmap
Nmap done: 1 IP address (1 host up) scanned in 6.97 seconds
```

→ Because `ywpu.me` is too secure, I decide to play `codesensor.tw`. But, still, I cannot find any vulnerability. The Nmap Scripting Engine (NSE) script I use is called `vulscan`, from `http://www.computec.ch/projekte/vulscan/`.

2. List and compare nmap-os-fingerprints used in Nmap and osprints.conf used in Siphon. Discuss how and why they differ.

→ Siphon uses window and TTL, whereas Nmap uses more sophisticate rules (because it supports more scanning options, e.g. different protocols).

```
/usr/share/nmap  vim nmap-os-db
```

```
# FreeBSD 7.2-RELEASE-p4 FreeBSD 7.2-RELEASE-p4 #0: Fri Oct 16 16:45:05 UTC 2009
Fingerprint FreeNAS 0.7 (FreeBSD 7.2-RELEASE-p4)
Class FreeBSD | FreeBSD | 7.X | storage-misc
CPE cpe:/o:freebsd:freebsd:7.2 auto
SEQ(SP=FF-109%GCD=2|4|6|8|A%ISR=101-10B%TI=I%CI=I%II=I%SS=S%TS=21)
OPS(O1=M5B4NW3ST11%O2=M578NW3ST11%O3=M280NW3NNT11%O4=M5B4NW3ST11%O5=M218NW3ST11%
WIN(W1=4000%W2=4000%W3=4000%W4=4000%W5=4000%W6=4000)
ECN(R=Y%DF=Y%T=3B-45%TG=40%W=4000%O=M5B4NW3SLL%CC=N%Q=)
T1(R=Y%DF=Y%T=3B-45%TG=40%S=O%A=S+%F=AS%RD=0%Q=)
T2(R=N)
T3(R=Y%DF=Y%T=3B-45%TG=40%W=4000%S=O%A=S+%F=AS%O=M109NW3ST11%RD=0%Q=)
T4(R=Y%DF=Y%T=3B-45%TG=40%W=0%S=A%A=Z%F=R%O=%RD=0%Q=)
T5(R=Y%DF=Y%T=3B-45%TG=40%W=0%S=Z%A=S+%F=AR%O=%RD=0%Q=)
T6(R=Y%DF=Y%T=3B-45%TG=40%W=0%S=A%A=Z%F=R%O=%RD=0%Q=)
T7(R=Y%DF=Y%T=3B-45%TG=40%W=0%S=Z%A=S%F=AR%O=%RD=0%Q=)
U1(DF=N%T=3B-45%TG=40%IPL=38%UN=0%RIPL=G%RID=G%RIPCK=G%RUCK=G%RUD=G)
IE(DFI=S%T=3B-45%TG=40%CD=S)
```

https://github.com/unmarshal/siphon/blob/master/osprints.conf

```
# Send new fingerprints to siphon@subterrain.net

# Window:TTL:DF:Operating System
# DF = 1 for ON, 0 for OFF.

7D78:64:1:Linux 2.1.122 - 2.2.14
77C4:64:1:Linux 2.1.122 - 2.2.14
7BF0:64:1:Linux 2.1.122 - 2.2.14
7BC0:64:1:Linux 2.1.122 - 2.2.14
832C:64:1:Linux 2.0.34 - 2.0.38
7FE0:64:0:Linux 2.0.34 - 2.0.38
0B68:64:1:Linux 2.0.32 - 2.0.34

4470:64:0:FreeBSD 2.2.1 - 4.0
4470:64:1:FreeBSD 2.2.1 - 4.0
43E0:64:1:FreeBSD 2.2.1 - 4.0
```

3. List and compare nmap-services and nmap-service-probe. Discuss how and why they differ.

→ `nmap-services` lists all common services and protocols run on each port. Moreover, each of them are given a possibility value. For example, HTTP through TCP on port 80 is very popular, so it has a high possibility value. `nmap-service-probe`, on the other hand, lists all common headers returned from each service. For example, an HTTP server may return a string containing `HTTP`. so we can use this message to guess whether it is an HTTP server.

```
/usr/share/nmap  vim nmap-services
```

```
#
# Fields in this file are: Service name, portnum/protocol, open-frequency, optional comments
#
tcpmux  1/tcp   0.001995        # TCP Port Service Multiplexer [rfc-1078]
tcpmux  1/udp   0.001236        # TCP Port Service Multiplexer
compressnet     2/tcp   0.000013        # Management Utility
compressnet     2/udp   0.001845        # Management Utility
compressnet     3/tcp   0.001242        # Compression Process
compressnet     3/udp   0.001532        # Compression Process
unknown 4/tcp   0.000477
rje     5/udp   0.000593        # Remote Job Entry
unknown 6/tcp   0.000502
echo    7/sctp  0.000000
echo    7/tcp   0.004855
echo    7/udp   0.024679
```

```
vettcp  78/udp  0.000626
finger  79/tcp  0.006022
finger  79/udp  0.000956
http    80/sctp 0.000000        # World Wide Web HTTP
http    80/tcp  0.484143        # World Wide Web HTTP
http    80/udp  0.035767        # World Wide Web HTTP
hosts2-ns       81/tcp  0.012056        # HOSTS2 Name Serv
hosts2-ns       81/udp  0.001005        # HOSTS2 Name Serv
xfer    82/tcp  0.002923        # XFER Utility
```

```
/usr/share/nmap  vim nmap-service-probes
```

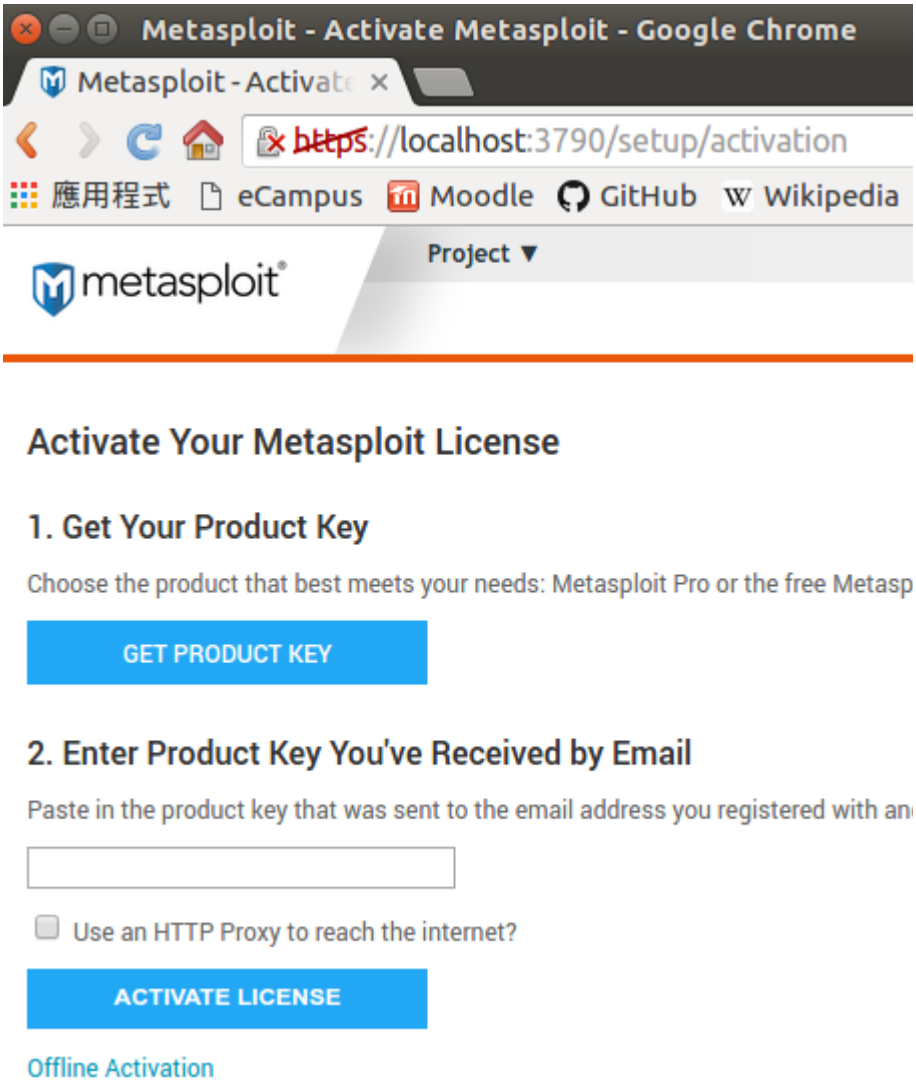
```
match smtp m|^220 SMTP Server RoiMailServer ready\.\r\n| p/Exim smtpd/ cpe:/a:exim:exim/
match smtp m|^220 Trend Micro ESMTP ([-.+\w]+) ready\.\r\n$| p/Trend Micro ESMTP/ v/$1/
match smtp m|^220 Matrix SMTP Mail Server v([\w.]+) on <MATRIX_([\w]+)> Simple Mail Transfer Service Ready\r\n| p/Matrix SMTP Mail
match smtp m|^220(\S+) WebShield SMTP V(\d\S.*?) Network Associates, Inc\. Ready at| p/Network Associates WebShield/ v/$2/ h/$1/ cp
match smtp m|^220(\S+) WebShielde(\w+)/SMTP Ready.| p/WebShielde$2 smtpd/ h/$1/
match smtp m|^220 ([-.+\w]+) ESMTP MailMasher ready to boogie\r\n| p/MailMasher smtpd/ h/$1/
# 220 example.com ESMTP Postfix (2.0.13) (Mandrake Linux)
match smtp m|^220 ([-.\w]+) ESMTP Postfix \(([-.\w]+)\) \(([-.\w ]+)\)| p/Postfix smtpd/ v/$2/ i/$3/ h/$1/ cpe:/a:postfix:postfix:$
# 220 Example LLC example.com ESMTP Postfix (2.6.1)
match smtp m|^220 (.*) ([\w._-]+) ESMTP Postfix \(([\w._-]+)\)\r\n| p/Postfix smtpd/ v/$3/ i/$1/ h/$2/ cpe:/a:postfix:postfix:$3/a
# postfix 1.1.11-0.woody2
match smtp m|^220([\s-]\S+) ESMTP Postfix| p/Postfix smtpd/ h/$1/ cpe:/a:postfix:postfix/a
match smtp m|^220 [\*\d\ ]{2,300}\r\n| p/Cisco PIX sanitized smtpd/ d/firewall/ cpe:/o:cisco:pix_firewall_software/
match smtp m|^220 ArGoSoft Mail Server Pro for WinNT/2000/XP, Version ([-.\w]+) \(([-.\w]+)\)\r\n| p/ArGoSoft Mail Server Pro/ v/$1
match smtp m|^220 ([-\w.]+) ArGoSoft Mail Server Pro for WinNT/2000/XP, Version [\d.]+ \(([\d.]+)\)\r\n| p/ArGoSoft Mail Server Pro
match smtp m|^220 ([-\w.]+) ArGoSoft Mail Server, Version [\d.]+ \(([\d.]+)\)\r\n| p/ArGoSoft Mail Server/ v/$2/ o/Windows/ h/$1/ c
match smtp m|^220 ([-\w_.]+) ArGoSoft Mail Server Freeware, Version [\d.]+ \(([\d.]+)\)\r\n| p/ArGoSoft Mail Server Freeware/ v/$2/
match smtp m|^220 ArGoSoft Mail Server Plus for WinNT/2000, Version [\d.]+ \(([\d.]+)\)\r\n| p/ArGoSoft Mail Server Plus/ v/$1/ o/W
match smtp m|^220 ([-.\w]+) ESMTP server \([Pp]ost.[Oo]ffice v([-.\w]+) release ([-.\w]+) ID# | p/Post.Office/ v/$2 release $3/ h/$
match smtp m|^220 ([-.\w]+) ESMTP VisNetic.MailServer.v([-.\w]+); | p/VisNetic MailServer/ v/$2/ h/$1/
# CommuniGate Pro 4.0.5
match smtp m|^220 ([-.\w]+) ESMTP Service. Welcome.\r\n$| p/CommuniGate Pro smtpd/ h/$1/ cpe:/a:stalker:communigate_pro/
match smtp m|^220 ([-.\w]+) Process Software ESMTP service V([-.\w]+) ready| p/Process Software smtpd/ v/$2/ o/OpenVMS/ h/$1/ cpe:/
match smtp m|^220 ([-.\w]+) Mercury (\d[-.\w]+) ESMTP server ready\.\r\n$| p/Mercury Mail smtpd/ v/$2/ h/$1/
match smtp m|^220   ESMTP Service \(Lotus Domino Release ([\w._-]+)\) ready at | p/Lotus Domino smtpd/ v/$1/ cpe:/a:ibm:lotus_domin
match smtp m|^220 ([-.\w]+) ESMTP Service \(Lotus Domino Release (\d[-.\w ]+)\) ready| p/Lotus Domino smtpd/ v/$2/ h/$1/ cpe:/a:ibm
match smtp m|^220 ([-.\w]+) ESMTP Service \(Lotus Domino (\d[-.\w ]+)\) ready at| p/Lotus Domino smtpd/ v/$2/ h/$1/ cpe:/a:ibm:lotu
match smtp m|^220  ESMTP Service \(Lotus Domino Release (\d[-.\w ]+)\) ready at | p/Lotus Domino smtpd/ v/$1/ cpe:/a:ibm:lotus_domi
match smtp m|^220 ([-.\w]+) ESMTP Service \(Lotus Domino Build V([\w_]+) Beta (\w+)\) ready at | p/Lotus Domino smtpd/ v/$2 Beta $3
```

4. On a UNIX/Linux host, list /etc/inetd.conf. Discuss what services are being offered.

→ This system may be able to run Echo, FTP, Telnet, etc., but all theses services are disabled. (For security reasons, we should always disable unused services.)

```
#echo          stream  tcp     nowait  root    internal
#echo          dgram   udp     wait    root    internal
#discard       stream  tcp     nowait  root    internal
#discard       dgram   udp     wait    root    internal
#daytime       stream  tcp     nowait  root    internal
#daytime       dgram   udp     wait    root    internal
#chargen       stream  tcp     nowait  root    internal
#chargen       dgram   udp     wait    root    internal
#time          stream  tcp     nowait  root    internal
#time          dgram   udp     wait    root    internal
#ftp           stream  tcp     nowait  root    /usr/sbin/tcpd  in.f
#telnet        stream  tcp     nowait  root    /usr/sbin/tcpd  in.t
```

5. Select a target domain, run Metasploit with Nmap scans and import Nmap results into the database. Show found hosts and available ports.



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→ I cannot use it because I need a license, but I am a Taiwanese. I even try to install it, but it still need a license to launch. Then I try to install Metasploit Framework, which is a subproject of Metasploit. Here are the results.

```
⚡ root@yuwen41200  /opt  msfconsole

                       #######                 #
                   #################          #
                 #######################       #
                #########################     #
              ############################
             ##############################
             ##############################
            ###############################
            ###############################
                          #    #######   #
       ##        ###        ####   ##
                            ###   ###
                           ####   ###
             ####          ##########   ####
             ########################   ####
               ####################   ####
                ##################  ####
                  ############      ##
                     ########        ###
                    #########        #####
                  ############      ######
                 ########      #########
                   #####       ########
                     ###       #########
                    ######    ############
                   ########################
                   #   #   ###  #   #   ##
                   ########################
                    ##     ##   ##     ##
                          http://metasploit.pro


       =[ metasploit v4.11.19-dev-3d624c0ebea4b6f60124d25b07
+ -- --=[ 1524 exploits - 891 auxiliary - 260 post        ]
+ -- --=[ 436 payloads - 38 encoders - 8 nops             ]
+ -- --=[ Free Metasploit Pro trial: http://r-7.co/trymsp ]

msf >
```