

METASPLOIT



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Metasploitation

(Exploit automation and IPS evasion)

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Agenda

- Introduction
- Metasploit 3
- Automation
- IPS Evasion
- Examples

Introductions - Who?

- **BreakingPoint Systems**
 - Director of Security Research
 - We build hardware to break things
- **The Metasploit Project**
 - Founder, developer, researcher
 - We build software to break things

Introductions - What?

- Metasploit v3.0
 - New features, massive changes
 - Starting to be usable :-)
- Automation
 - Auxiliary modules, databases, events
 - “Turning Metasploit into Nessus”:-)
- Evasion
 - Finding the “bump in the wire”
 - Low-visibility IPS fingerprinting
 - Integration with Metasploit 3

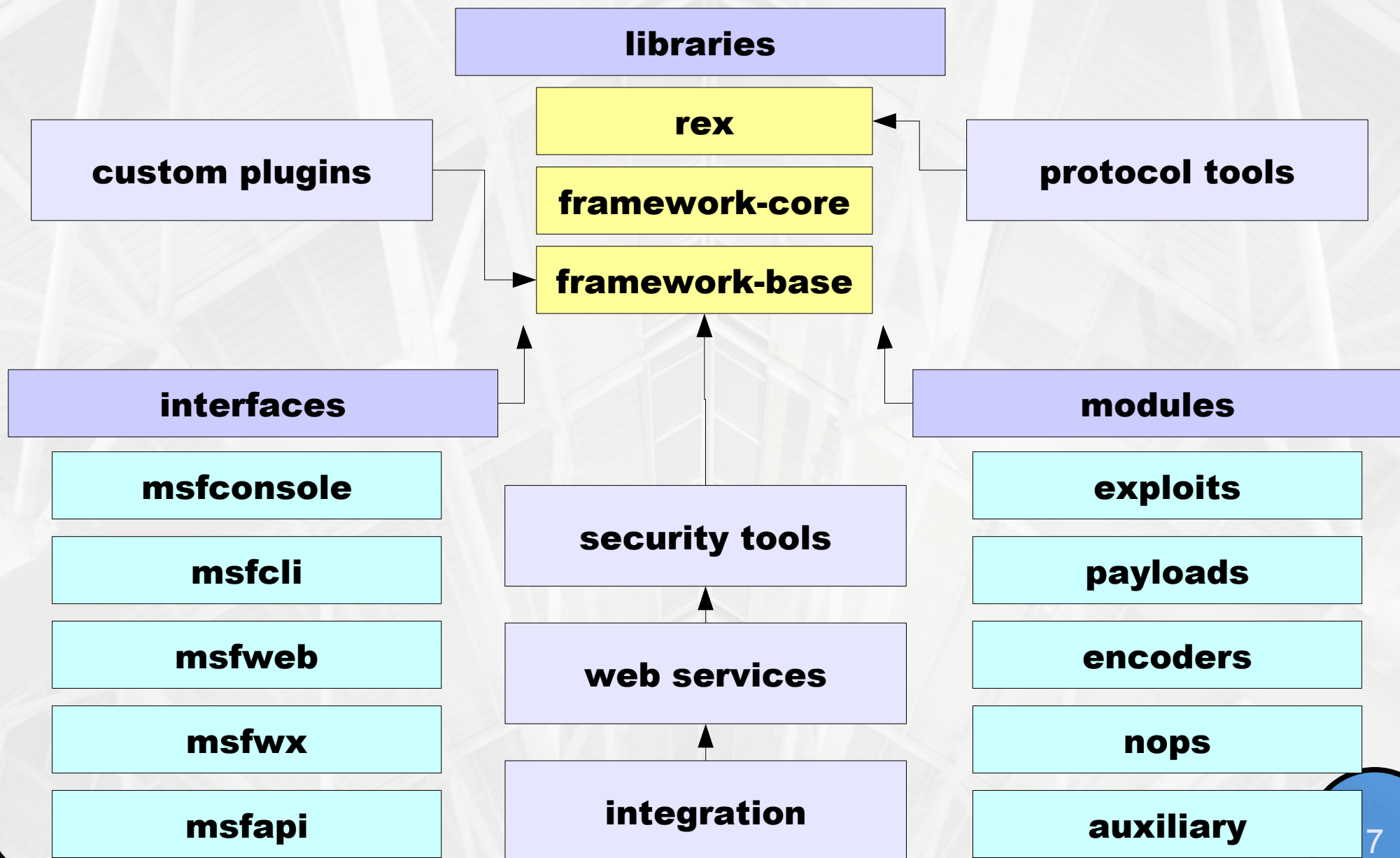
Metasploit v2.5

- April 2006 status
 - 127 remote exploits, 75 payloads
 - Found in 17 books, 950 blogs, 190 articles
 - 27,000 IPs used msfupdate in 2006
- Growing pains...
 - Load time increasing (200+ modules)
 - Client-side exploits are a pain
 - Automation is doable, but klunky
 - Concurrency depends on fork()

Metasploit v3.0

- Completely rewritten in Ruby
 - Object oriented model was a better fit
 - Code compression at ~40%
 - 2.5 was 40K lines Perl, 3.0 is 86K lines Ruby
- New design, new features, new goals
 - Focused on flexibility and automation
 - Closer integration between features
 - Development guide and API docs!

Metasploit v3.0 - Architecture



Metasploit v3.0 – New features

- Multitasking through Ruby threads
 - Share single instance with many users
 - Great for team-based penetration testing
 - Multi-user plugin is only ~20 lines of code :-)
- Concurrent exploits and sessions
 - Support for passive exploits and recon mods
 - Multiple payload sessions open at once
 - Suspend and restore payload sessions
 - Share payload sessions with other users
 - Handle multi-victim exploits :-)

Metasploit v3.0 – New features

- Extensive exploit module “Mixins”
 - Write advanced exploits in only 3 lines :-)
 - Mixins for SMB, DCERPC, HTTP, FTP...
 - Huge boost for module consistency
 - Example FTP server exploit:

```
connect
```

```
buf = Rex::Text.rand_text_english(2048, payload_badchars)  
seh = generate_seh_payload(target.ret)  
buf[229, seh.length] = seh
```

```
send_cmd( ['USER', buf] , false )
```

```
handler  
disconnect
```

Metasploit v3.0 – New features

- Shiny new interfaces!
 - Console uses module hierarchy/regex
 - Web interface uses ERB / AJAX
 - GUI version now in development:



Metasploit v3.0 – Opcode Database

- Opcode DB has been enhanced
 - Online database of win32 DLL information
 - Stores the location of usable 'opcodes'
 - Multi-language support being expanded
- Framework integration
 - New command-line tool for queries
 - Building an 'opcode pool' system
 - Automated return address updates
 - Combine this with fingerprinting...

Metasploit v3.0 – Executable processing

■ **msfpescan**

- Command-line tool for EXE processing
- Discovers usable return addresses
- Partially used to create the Opcode DB
- Now handles Resources and TLBs

■ **msfrpcscan**

- Extracts MIDL information from PE files
- Creates boilerplate for new exploits
- Still in development...

Metasploit v3.0 – Exploit upgrades

- Rewrite of all exploit modules
 - Massive number of bug fixes
 - Improved randomness, use of Mixins
- Exploit module structure
 - Single exploit can target many platforms
 - Simplified the meta-information fields
 - Mixins can also modify exploit behavior
 - **Target brute forcing**
 - **Passive exploits**

Metasploit v3.0 – Payload upgrades

- Enhancements
 - Bug fixes and size improvements
 - New “cmd” modules, “php” payloads...
- Meterpreter
 - Consolidation of standard modules
 - Wicked cool API and remote scripting

```
# Process migration  
pid = client.sys.process['calc.exe']  
client.core.migrate(pid)
```

```
# Mirror the remote hard drive in one line  
client.fs.dir.download("/tmp/", "C:\\", true)
```


Metasploit v3.0 – Auxiliary modules

- The problem...
 - Not all exploits fit into the standard structure
 - Recon modules overlapped with exploits
 - No standard for information sharing
- Auxiliary modules
 - Catch-all for interesting security tools
 - Perform reconnaissance and reporting
 - Integrate with third-party utilities
 - Report data in a standard format

Metasploit v3.0 – Events

- Event callbacks for common operations
 - Sessions – new session, closed session
 - Sockets – new socket, new connection
 - Database – object creation, modification
 - Interface – console start, other UI actions
- Event handlers hook and extend
 - Register with the EventManager
 - Export a method to hook the event
 - Catch the event, process the argument
 - Extend the object :-)

Metasploit v3.0 – Plugins

- The Ruby language rocks
 - Ability to redefine anything at runtime
 - Plugins can alter almost anything
- Framework plugins
 - Extend and replace Framework code
 - Hook events and filter parameters
 - Simplify feature development
 - Examples:
 - **Socket tracing and filtering**
 - **Multiuser exploit console**

Metasploit v3.0 – Database

- Support for common databases
 - Postgres, SQLite, MySQL, etc.
 - Based on ActiveRecord from RoR :-)
 - Simplified API and thread-safety
- Implementation defined by plugins
 - Monitor sockets with `db_tracker.rb`
 - Interact with the database (search, etc)
 - DB object creation/modification throws events
 - Persistent storage of session data
 - Reporting is just another plugin

Metasploit v3.0 – Automation

- Turning Metasploit into Nessus
 - Database backend provides “KB” function
 - Auxiliary modules for assessment/discovery
 - Event coordinator for triggering modules
 - Report generator uses the database
- Development status
 - 75% of the database schema
 - 50% of the Auxiliary module API
 - Handful of discovery modules
 - Integration with Nessus/Nmap

Metasploit v3.0 – Automation

- Creating a professional mass-rooter
 - Auxiliary modules perform discovery
 - Exploit modules perform vuln checks
 - Plugins automate exploitation
 - Plugins automate post-exploitation
 - Dump XML reports via ActiveRecord
- Useful framework for all security tools
 - Extensive protocol support, friendly API
 - Passive tools work well with event system
 - Most APIs are accessible from Rex

Metasploit v3.0 – Evasion

- Evasion is finally taken seriously
 - Evasion options now a separate class
 - Protocol stacks integrate IDS evasion
 - Mixins expose these to exploit modules
- Strong evasion techniques
 - Multi-layered evasion defeats most solutions
 - Client-side attacks impossible to detect
 - ***WMF = HTTP + Compress + Chunked + JScript***
 - Deep protocols offer so many options
 - ***LSASS = TCP + SMB + DCERPC***

Metasploit v3.0 – Evasion options

Example evasion options

TCP::max_send_size

TCP::send_delay

HTTP::chunked

HTTP::compression

SMB::pipe_evasion

DCERPC::bind_multi

DCERPC::alter_context

Metasploit v3.0 – Evasion features

- IPS fingerprinting
 - Implemented as Auxiliary modules
 - Use low-risk signature deltas to ID
 - Linux-based IPS depends on bridging...
- IPS evasion
 - Configure an 'evasion profile'
 - Override exploit / evasion options
 - Uses per-IPS evasion techniques

Metasploit v3.0 – Offensive IPS

- IPS filtering for the attacker
 - Socket hooking plugins can filter data
 - Not all vendors encrypt their signatures
 - Lets create an application layer IPS :-)
- The “ips_filter” plugin
 - Monitor all socket transactions
 - Block packets that would trigger a alert
- Challenges
 - Signatures are often for decoded data
 - Formats are difficult to convert to RE

Metasploit v3.0 – Status

- Metasploit Framework v3.0-alpha-r3
 - User interfaces are still a bit rough
 - Module caching a huge improvement
 - Over half of the exploits are ported
 - Only support Linux / OS X / BSD
 - Should work with Cygwin...but not Native yet
- Metasploit Framework v3.0-alpha-r4
 - Includes database, plugins, auxiliary modules
 - IPS detection features depend on time
 - Target release date is April 12th

Metasploit v3.0 – Other Projects

- Metasploit Research Toolkit (skape)
 - Standalone disassembler, emulator, mmu
 - eEye-style return detection, input tracing
- Metasploit Anti Forensics Tools (vinnie)
 - Standalone tools, moving to meterp modules
 - Completely hoses Encase :-)
- Miscellaneous small projects
 - IDARub – see it at RECon 2006 (spoonm)
 - Hamachi – publicly available (hdm)

Metasploit v3.0 – Miscellaneous

- Metasploit Framework License v1.0
 - Keep source code open, prevent abuse
 - Restricts commercial product integration
 - Free to use for commercial services
- Metasploit / Hacker Foundation
 - Early stages, working on non-profit status
 - Pave the way for research grants
 - T-shirts, internships, educational material...

Questions?

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Contact information:

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<http://metasploit.com/projects/Framework/msf3/>

<http://metasploit.blogspot.com/>