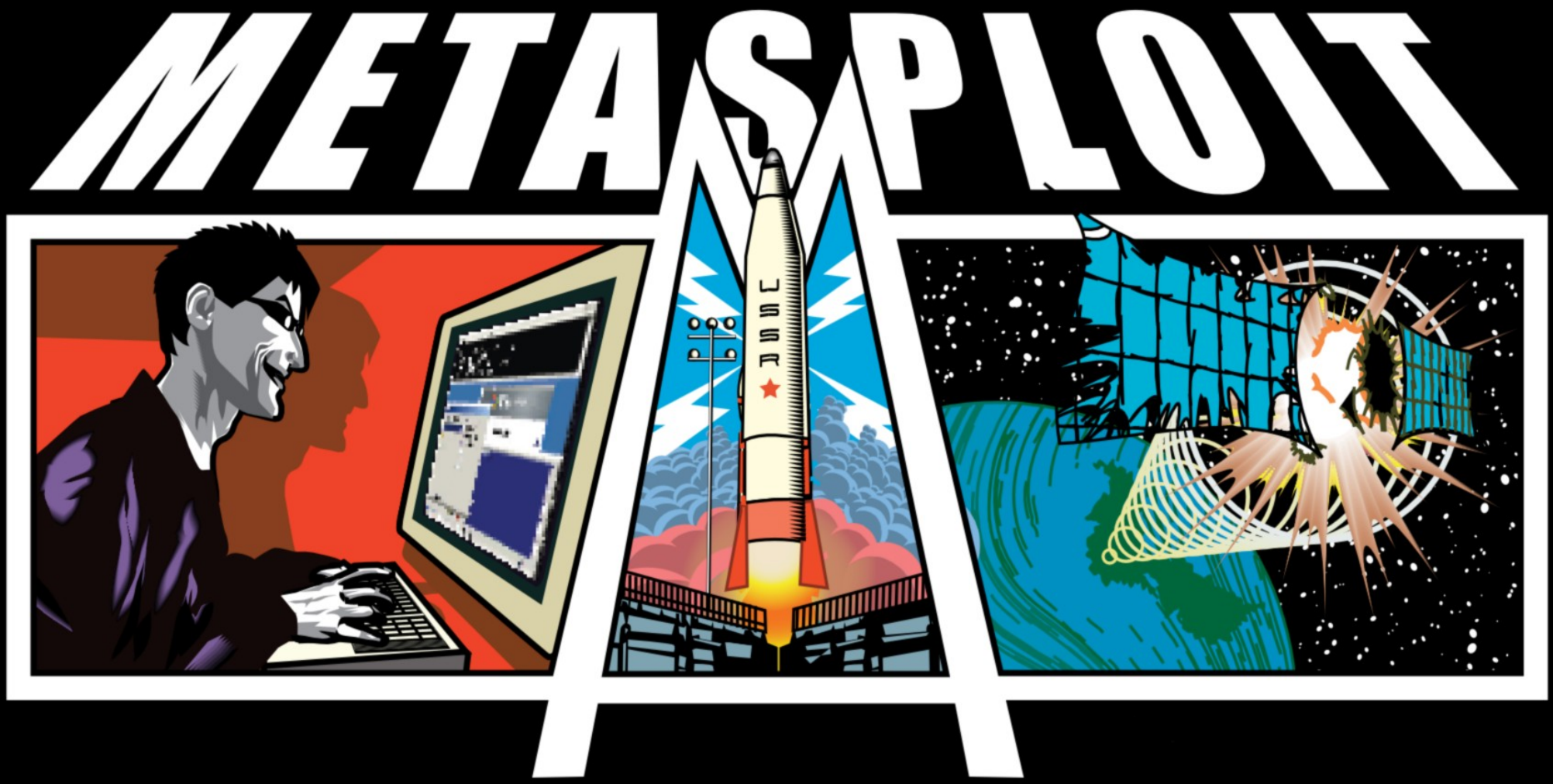

Metasploitation

(Exploit automation and IPS evasion)

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CanSecWest 2006

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

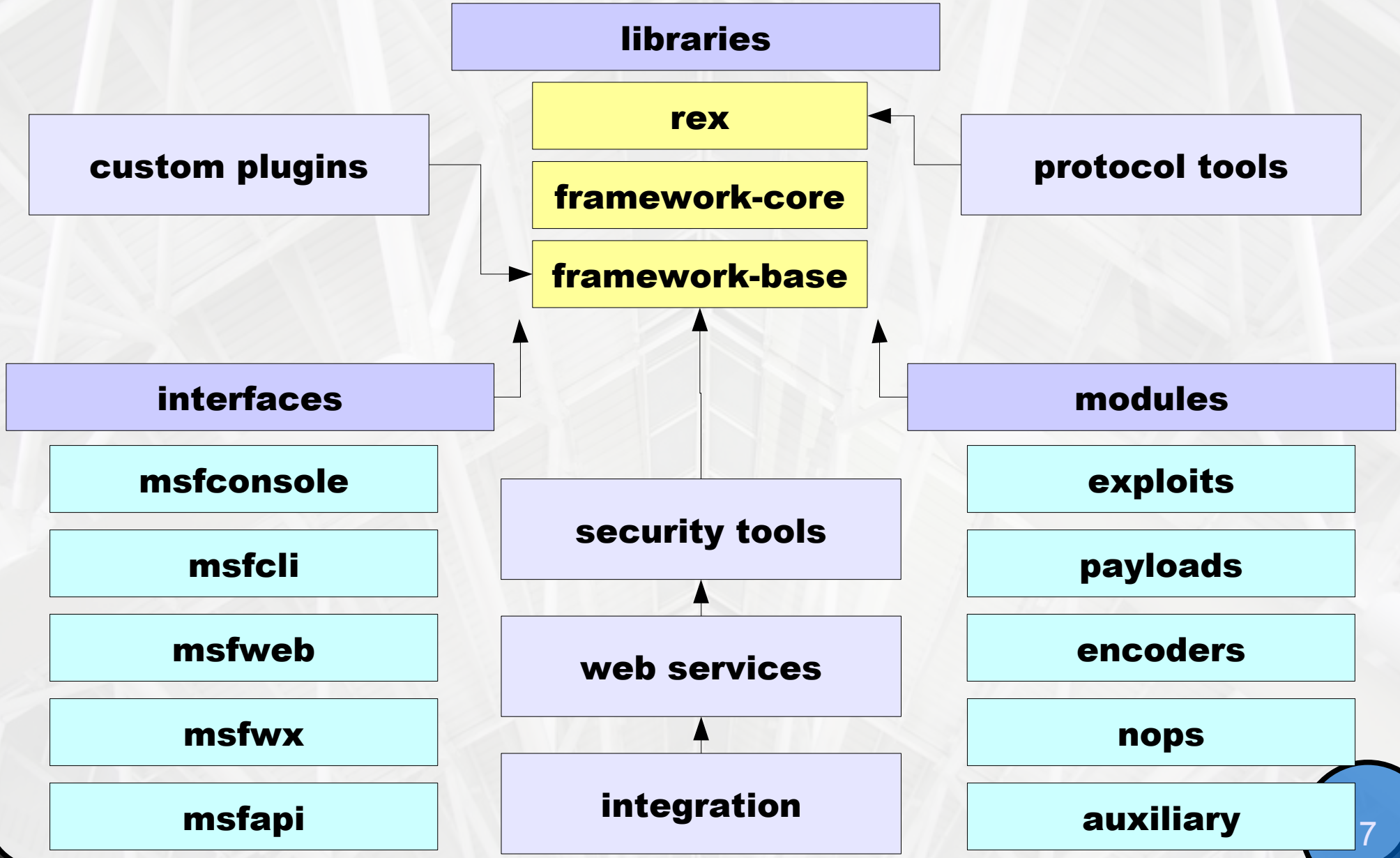
Metasploit v2.5

- 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

- msf**pescan**
  - Command-line tool for EXE processing
  - Discovers usable return addresses
  - Partially used to create the Opcode DB
  - Now handles Resources and TLBs
- msf**rpcscan**
  - 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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http://metasploit.com/projects/Framework/msf3/

http://metasploit.blogspot.com/