

# Athena Technology Overview

Athena is a beacon loader developed with Siege Technologies. At the core it is a very simple implant application. It runs in user space and beacons from the `svchost` process. The following diagram shows the concept of operation.

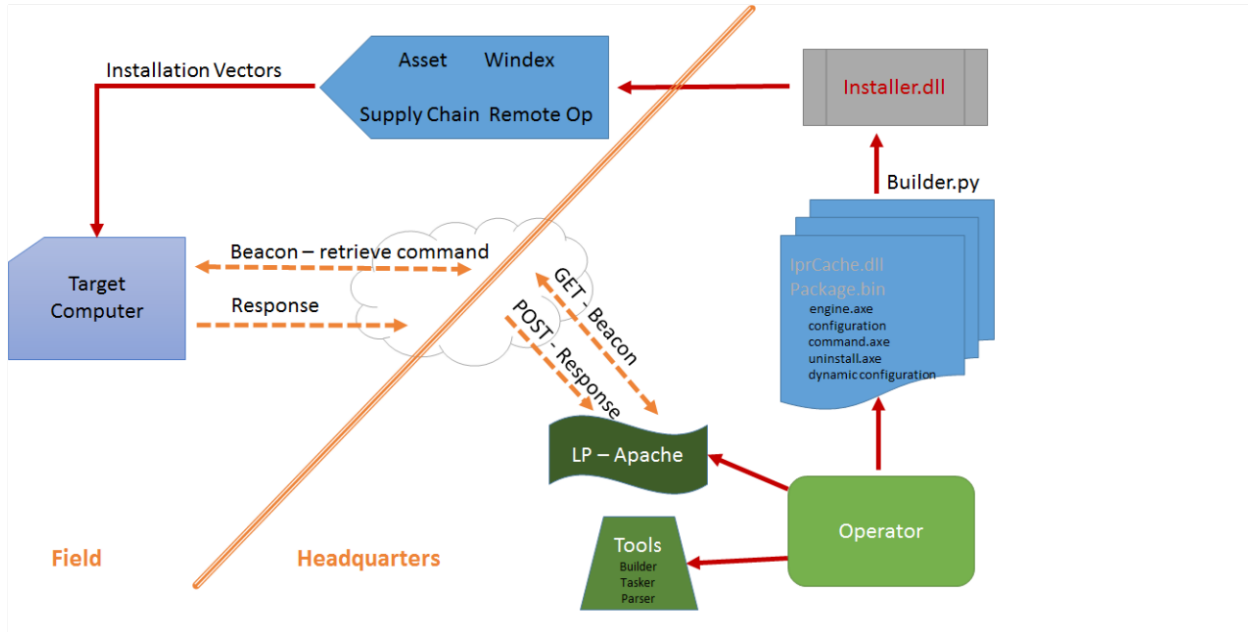


Figure – (S//NF) Athena Concept of Operation

This document will describe some of the innovations incorporated into this tool. The tool was designed to provide two unique tools while utilizing the same business logic between each instance. The naming convention for these two tools are Athena-Alpha and Athena-Bravo.

## Persistence:

The implant hijacks a support DLL by the host application.

- Athena-Alpha uses the RemoteAccess service. This service enumerates the registry to find an IP support dll called `iptrmgr.dll`. By forwarding the export functions to this original module, the implant will be loaded into `svchost` every time this service starts. By default, this service is disabled. The installation tool will enable it.
- Athena-Bravo uses the Dnscache service. This service enumerates the registry to find a support dll called `dnsextdll`. This extension is new for Windows 7 & 8 and is not available in legacy OSs. By default, this service is active. Unfortunately, Microsoft has changed the `svchost` that is not running as SYSTEM. The installer must update the `svchost` list to allow it to be included in a SYSTEM `svchost` with the correct privileges. The tool will have limited security access to the system until a reboot.

**DLL FORWARDING:** The target DLLs export a small number of functions and the implant dll forwards those function calls to the original DLL at startup time. This

forwarding is performed by the loader when the dll loads so no proxy code is required within the implant code. This approach allows the implant DLL to be removed at startup and will not reside on the module list for the host srvhost. It is not required to drop the implant in the SYSTEM32 directory because the paths are defined in the registry.

### Dynamic Loading:

The implant will load DLLs into the running process. Since the implant has a custom loader, all business logic is built as a DLL (converted to an AXE file) and loaded dynamically on-demand. The implant is made up of 4 modules (dll).

- 1) Host.dll - The host dll is the file that is dropped to disk and a reference is in the registry. This file contains no command-and-control, encryption or obfuscation logic. This file will simply load the Athena engine into memory. This file is very small (<15K size) and has no eye catching exports and minimal heuristic signature. It does dynamically load the function VirtualAlloc. It will load the engine.axe file into memory and call ordinal #1.
- 2) Engine.AXE - The engine dll is the main loop for the implant. It contains all the plumbing used by the implant:
  - a. encryption (wincrypt RSA and AES)
  - b. compression (zlib-Alpha and bzip-Bravo)
  - c. data masking (xtea-Alpha and AES-Bravo) - encryption on disk
  - d. hashing (adler-Alpha and superfast-Bravo) - import name
  - e. string masking
  - f. data package - binary file on disk that stores the AXE files and configuration
  - g. state file logic - file management used to store state files on disk

The engine waits for beacon cycles and events from the command module to perform actions such as unload or uninstall. The engine is loaded once by the host.dll and stays in memory for the entire life time of the execution. Once a beacon needs to be processed, the engine will load the command module (business logic).
- 3) Command.AXE - The command dll is the entire command-and-control command set of the tool (get/set/put/module load/module unload/secure delete/uninstall). It will beacon to the server, process the command and then signal the engine to unload it from memory. This means that the business logic is not in memory when it is not being used.
- 4) Uninstall.AXE - The uninstall dll will uninstall the implant. This includes removing registry keys and securely deleting the host.dll and data.bin files. Once the uninstall module completes, it is unloaded and returned to the engine. The engine will cleanup open handles and terminate the active thread. The engine code remains in memory but all remnants are removed.

AXE FORMAT: The AXE file is a converted DLL file that strips the PE header, hashes all import function names, and masks import module names.

## Version Similarities

Table - (U) Differences between Versions

<b>Feature</b>	<b>ALPHA</b>	<b>BRAVO</b>
Hash (function names)	Adler hash - from zlib	Superfast hash
Mask(local encryption)	XTEA with key increment	SEED
Packing Mask	0x3B	0x5C
String Mask	0x5D8E1792	0xAF27D2C9
Compilation	MSVC 2013	LLVM 3.7.0
Module Compilation (actual modules using alternate compilation)	Installer.dll Host.dll Ram_only.dll	Installer.dll Host.dll Ram_only.dll
Persistence	RemoteAccess	Dnscache
Compression	ZLIB	BZip2

Table - (U) Similarities between Versions

<b>Feature</b>	<b>Commonality</b>
Data file	File format and content is the same but the masking is different
Business Logic	The command module using different masking but the code is compiled with MSVC and will look similar. This module is dynamically loaded.
Engine	The engine module has mostly the same code between the two modules and is compiled with MSVC and will look similar. This module is dynamically loaded.
Uninstall	The uninstall module will be almost identical between version. This module is dynamically loaded.
Imports	The import tables between (installer/host/ram_only) will be similar. Additional unused imports have been included in the BRAVO version.
Communications	The communications between the versions has not changed. (RSA with a generated AES key)
State File Logic	The state file logic has not changed and the stored files may have similar information but will be masked differently on disk.
Function Ordering	No function abstractions have been incorporated between the versions. Functionally, these two versions should produce virtually the same function call list.