



PROPOSAL ABSTRACT

Prepared for:

Broad Agency Announcement

Cyber Insider Threat (CINDER)

STRATEGIC TECHNOLOGY OFFICE

DARPA-BAA 10-84

Prepared by:

HBGary Federal, LLC

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17 September 2010

Section 1. Administrative

1	Broad Agency Announcement	DARPA-BAA-10-84 Cyber-Insider Program	
2	Lead Organization	HBGARY FEDERAL, LLC	
3	Abstract Title	CYBER-INSIDER	
4	Type of Business (Check one)	<input type="checkbox"/> Large Business <input type="checkbox"/> Small Disadvantaged Business <input checked="" type="checkbox"/> Other Small Business <input type="checkbox"/> Government Laboratory or FFRDC	<input type="checkbox"/> Historically-Black Colleges <input type="checkbox"/> Minority Institution (MI) <input type="checkbox"/> Other Educational <input type="checkbox"/> Other Nonprofit
5	Contractor's Reference Number	DARPA-BAA-10-84	
6	Other Team Members (include Sub Contractors)	HBGary, Inc.	Mr. Greg Hogle, 3604 Fair Oaks Blvd, Bldg B, STE 250, Sacramento, CA 95864. 916-459-4727. greg@hbgary.com
7	Technical Point of Contact	HBGARY FEDERAL, LLC. MR. AARON BARR, 103 S. WAHSATCH AVE, LL SUITE A, COLORADO SPRINGS, CO 80903, 719-510-8478, AARON@HBGARY.COM , CAGE CODE 5U1U6	
8	Administrative Point of Contact	HBGARY FEDERAL, LLC. MR. TED VERA, 103 S. WAHSATCH AVE, LL SUITE A, COLORADO SPRINGS, CO 80903, 719-237-8623, TED@HBGARY.COM , CAGE CODE 5U1U6	
9	Funds Requested	\$\$\$	Amount of cost share (if any)
10	Date Prepared	17 SEPTEMBER 2010	

Section II. Summary of Proposal

A. Executive Summary:

Like a lie detector detects physical changes in the body based on sensitivities to specific questions, we believe there are physical changes in the body that are represented in observable behavioral changes when committing actions someone knows is wrong. Our solution is to develop a paranoia-meter to measure these observables. Using shoplifting as an example, there are peaks and valleys of adrenaline during the entire theft process. There is the moment the thief puts an item in their pocket (high), then as they walk around the store the adrenaline begins to valley a bit, then they attempt to walk out of the store (very high). It is at these points that we want to be able to take as many behavioral measurements as possible because it is at these points the insiders activity will be as far from normal behavior. In this hypothesis we will have a rootkit on the host that monitors keystrokes, mouse movements, and visual cues through the system camera. We believe that during particularly risky activities we will see more erratic mouse movements and keystrokes as well as physical observations such as surveying surroundings, shifting more frequently, etc.

The method we propose employing for monitoring for insider threat observables is a full functional rootkit on every host or on targeted hosts that can have complete control over the operating environment. The rootkit loads as a stealth kernel-mode base implant, which will consist of the basic driver framework and installation and removal program. The rootkit will collect select file access, process execution with parameters, email communications, keyboard activity with a time/date stamp, network/TDI activity (and the actual network data if appropriate), and IM traffic. If detailed surveillance is required, it can be enabled to capture screenshots and construct a video stream. All traces of the rootkit installation will be removed after the initial deployment (event log, etc). Collected data will be exfiltrated over a covcom channel to a controlling server. Communication outbound to the controlling server will emulate outbound HTTP browsing, and if possible will be burst transmitted at the same time as the user is browsing the web or using some other messaging or social media application. The outbound burst will be formatted to resemble an ad-click or some other appropriate subterfuge.

This analysis combined with data tagging, and behavioral risk values will give us a much clearer picture of individuals within the organization.

B. Summary of Innovative Claims for the Proposed Research:

Innovative Claim	Uniqueness & Benefits	Alternative Approaches
“Paranoia Meter” – human factor and activity correlation engine	Human factor analysis measuring anxiety and suspicion of test subjects. Track people’s natural reaction to stressful situations.	Rules based approach to identify risky online behaviors or activities.
Behavioral Risk Profiling	Codify risky behavior versus normal behavior specific to an organizational profile.	Threshold monitoring and whitelisting.

C. Summary of Technical Approach:

Mission: Recruited Agent in Government Organization X wants to remain as an employee of the organization while continuously identifying, gaining access, collecting, and exfiltrating information on the organizations programs as well as its IP on technologies. The scenario is broken down into six categories (aka 'dimensions') of behavior: Exploration; Analysis; Collection; Preparation; Exfiltration; Security.

Exploration: Insider threats will actively explore the data stores and networked systems they have direct access to. As well, they will try to gain access to data and systems outside their immediate data tree or organizational structure. They will likely attempt to monitor communications, open files on different programs, study organization charts, study program structures, and scour internal social media/collaboration spaces. They will communicate with various people in the organization that have access to areas of interest. Their primary means of gaining access will be through normal operations or through careless operational security rather than trying to break into systems. They will continue to try and expand their knowledge of and access to the organization.

Analysis: Insider threats who are able to bring mobile devices in and out of the organization will likely dump files onto the device for later analysis outside of the organization. If they don’t have a mobile device, the insider would likely open files they have access to and review the contents for information of interest. Over time they will learn the programs and people that usually produce the information they want. They will access organizational charts to develop corporate and project link analysis trees to understand what is done where and by whom. They will review file and system attributes to see who has access to what systems, and who develops certain types of data. This information would be recorded and analyzed to determine programs and people of interest.

Collection: Once information is deemed of interest they will pull the information to their local system (if in digital form) or to a shared store only they have access to (email or file). They will create collection files where they can cut and paste information from disparate sources. They may create spreadsheets that are password protected to help organize their information. They will store internal communications for later review, such as email, IM chats, forum, and wiki data.

Preparation: The insider threat will look to use the most inconspicuous or least observable method for exfiltrating data and will want to take the necessary precautions that the exfil process will not be detected. If the Insider has an approved laptop that can leave the facility, they will likely use that system to store the information. Alternatively, the insider will store the

information on a removable media such as a USB drive or CD, or they might store the information in email or on a protected file share so it can be accessed remotely through a VPN or remote email gateway. In the hardest of cases they might print certain information because laptops and removable media are not allowed in the facility and they are on a closed network. This process will likely entail consolidation and organization of information, possibly encryption or some other type of obfuscation or data hiding (steganography).

Exfiltration: Once the data is prepared the insider will choose an option for exfiltration out of the organization; either transmit the data through some communication protocol (smtp, http, ftp), access the data remotely through vpn or remote email gateway, physically walk the paper or removable media out of the facility for transmission, or take a laptop or other mobile computing device that contains the identified information out of the facility.

Security: The insider will be preoccupied with security. How does the organization secure its infrastructure? How does it monitor information and employees? The insider will likely review systems for changes to security software or settings, looking for monitoring capabilities. The insider will also likely look for quiet places to work rather than central locations surrounded by people, maybe working through lunches, after hours.

Detecting insider threat actions is highly challenging and will require a sophisticated monitoring, baselining, analysis, and alerting capability. Human actions and organizational operations are complex. You might think you can just look for people that are trying to gain access to information outside of their program area of expertise. Yet there are legitimate reasons for accessing this information. In many cases the activity you might call suspicious can also be legitimate. Some people are more or less inquisitive and will have different levels of activity in accessing information outside their specific organization. Some of the behaviors on systems vary widely depending on function. Software developer behavior will be very different than an HR person or senior manager. All of these factors need to be taken into account when developing detection capabilities for suspicious activity. We cannot focus on just a particular action is potentially suspicious. Instead we must quantify the legitimate reasons for the activity and whether this person has a baseline, position, attributes, and history to support the activity.

The fundamentals of our system for detecting this specific insider threat mission is the following: Normal vs. Abnormal activity monitoring and activity threshold/value development within the dimensions of the mission in conjunction with risk evaluations of Data Tagging and Monitoring; and Abnormal Human Factor Monitoring.

Trying to baseline peoples activities and define thresholds for abnormal activity has its challenges. In many cases you can create way too many false positives. That said, the approach is fundamental to detecting insider threat activity. Our solution will build patterns for normal vs. abnormal activity in conjunction with developing a methodology for risk activity valuation. In this framework, risk thresholds and values will be determined for all the different factors of observable insider threat activity. Observable activity will be assigned values and weights to calculate a risk percentage. For this to work we have to understand and be able to quantify and qualify the operations of the organization. A solid audit will need to be performed. This will enumerate potential egress points, how the information infrastructure organized, and what

accesses are people given. It will include the standard operations of the organization and whether it fosters cross-collaboration or sharing of information. Does the organization have methods to allow individuals to manage their individual systems and install software? The answers to these questions will change the values and weights given to different observable activities. The results of different observables would then be calculated to come up with a risk value for specific persons activities. Do they encrypt files (+10), do they regularly explore the data stores (+5). Are they part of a corporate effort to bring horizontal visibility across their business verticals (-5). Is the person a prolific author and not just a consumer of data on a particular topic or program (-10).

To compliment host and personnel monitoring for suspicious activity we will also tag certain data to watch how it traverses internally and externally to the organization. This will give us another view on how the organization operates as well as give us insight into individual usage of data. This will be used to add better specificity to our risk valuations as well as look directly for suspicious or risky behavior with the handling of organizational information.

D. Organization and Teaming Chart:

Programmatic Role	Capabilities	Task Responsibilities	Teaming Strategy
Prime	HBGary Federal, LLC	Program Management, Human Factor Testing	Leverage significant Information Operations experience and understanding of the DOD mission.
Subcontractor	HBGary, Inc.	Software Development	Leverage HBGary Inc's past performance developing stealthy rootkit technology and deep knowledge and experience with low-level Windows internals.

Key Personnel	Organization	Effort
Aaron Barr	HBGary Federal, LLC	TBD HRS
Ted Vera	HBGary Federal, LLC	TBD HRS
Greg Hoglund	HBGary, Inc.	TBD HRS
Martin Pillion	HBGary, Inc.	TBD HRS
Shawn Bracken	HBGary, Inc.	TBD HRS

E. Summary of Deliverables and Approach to Intellectual Property:

Deliverable	Description	Intellectual Property Claim(s)
Deliverable 1: Host Agent	Stealthy host agent used for monitoring user behaviors.	Unlimited. HBGary plans to transition technology into commercial products.
Deliverable 2: Database & Correlation Engine	Evaluate user activity risk values	Unlimited. HBGary plans to transition technology into commercial products.
Deliverable 3: Study Report		Unlimited. HBGary plans to transition technology into commercial products.

F. Summary of Cost, Schedule, and Milestones:

Task	Milestones	Schedule	Cost
Host Agent Development	Preliminary Design Review Prototype	TBD	TBD
Human Factor Correlation Engine Development	Preliminary Design Review Prototype	TBD	TBD