By:
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RETRI: Rapid Enterprise Triaging

What is RETRI?

- RETRI is a new, agile approach to the Incident Response process, consisting of 4 phases with clear entry and exit criteria
- Using special network segmentation and isolation technologies, RETRI allows network operators to run a compromised network without risk to the data and minimal impact on its users.
- It saves you time and money

Overview

- The first part of this presentation presents a new paradigm for the Incident Response process called Rapid Enterprise Triaging (RETRI), where the primary objective is to isolate the infected network segment for analysis without disrupting its availability.
- Part two of this presentation will introduce a new Enterprise Incident Response tool named Codeword that complements the RETRI paradigm. The tool is a free, agent-based tool that is deployed to the compromised segment to perform the traditional incident response tasks (detect, diagnose, collect evidence, mitigate, prevent and report back).

Assumptions

- Mid to large sized network (1,000+ users)
- Distributed, domain/forest type of network infrastructure (ie, “Government style”)
- Full Enterprise Compromise
  - This is a lot of work if only one or two machine are compromised
  - Compelling evidence will be required by CEO’s
- The compromised network segment contains critical servers/services that must remain online throughout response effort
- Forensics per se is not crucial for a successful recovery

Current Recovery Options

- Network shut down and rebuilt from trusted media (1-4 months)
  - Pros: 100% assurance, data exfil cut off ASAP
  - Cons: people can't work
- Rebuild while online
  - Pros: People keep working (for the most part)
  - Cons: Data exfil continues, bad guys keep a foothold, potential recompromise

A New Method is Required

- The RETRI method attempts to solve the shortcomings of each of the existing methods.
  - RETRI Option:
    - Pros: Data exfil stopped, high confidence in network hygiene, people keep working
    - Cons: Costly - lots of work to setup (but still cheaper in the long run)

Case Study 1
(Rebuild while online)

- Survey Data for 2006
  - On average hacked companies spent 4.7million on cleanup
    - Cost based on lost revenue, cleanup, and brand damage
    - $182 per record lost
- Survey Data for 2008
  - Average cost rose to 6.6million (up to 32Million)
  - $202 per record lost
- Lessons learned from the survey
  - Employee down time cost 3 times as much as the actual clean up
    - Even with rebuilding the network while online, there is significant downtime for employees
    - If only there was a way to eliminate employee down time
  - Record clean up was how cost was determined, not number of host / infected machines
  - “First Time” Intrusions cost more
    - 84% of 2008 Survey respondents had previous intrusions
    - 2008 numbers would by much higher if they didn’t have “practice” cleaning up intrusions

Survey: http://www.encryptionreports.com/download/Ponemon_COB_2008_US_090201.pdf

Case Study 2 (Rebuilding Offline)

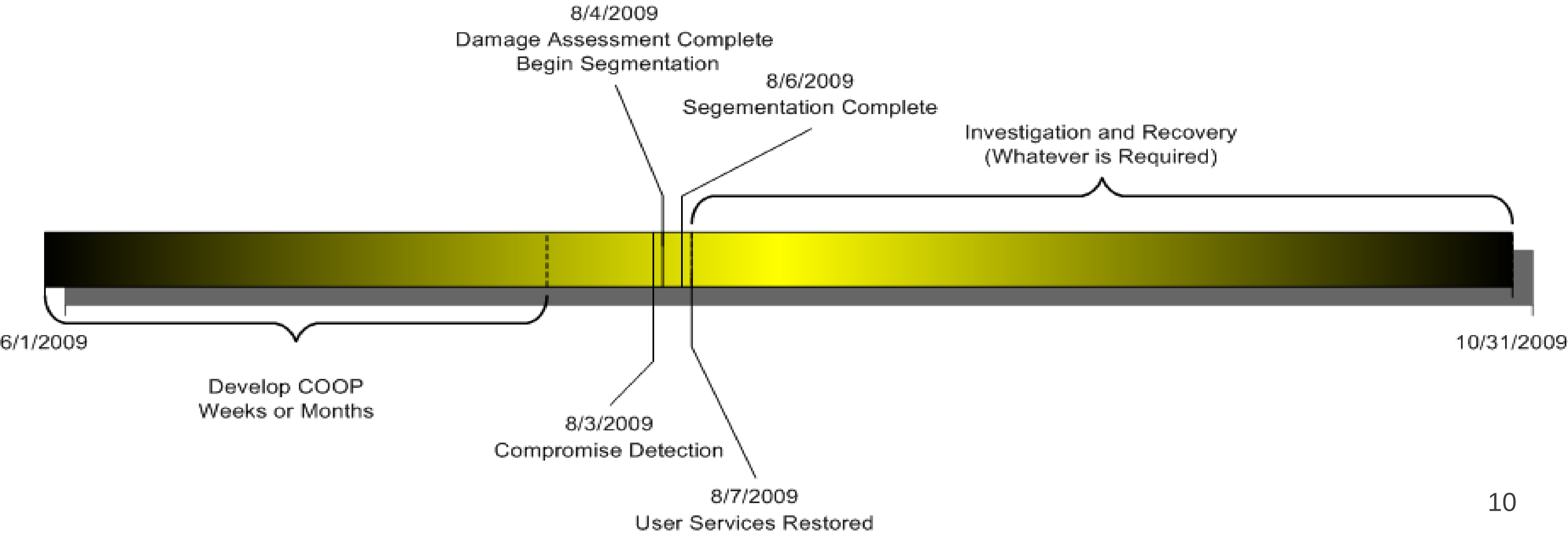
- Based on a 2007 incident we worked
  - Approximate Total Cost: $7 Million
    - IR Tools / IT Support Overtime / User Downtime
    - An extreme effort was made to minimize down time (24/7 shifts with extensive outside resources being brought in)
  - Users were offline for 2.5-3 weeks
    - User base: 1500 users
    - User down time cost approximately $4.5million
      - 1,500 user s* 15 days * 40 hours a day * $50 an hour (average)
  - Numbers based on network rebuild, not lost sales or record clean up
    - No PII or User data stolen
    - 100% of network host were rebuilt
      - $2.5 Million in IR tools and Labor

Case Study 3
(RETRI: Estimated Cost)

- 10,000 users / clients
  - Projected Cost (~$2.9 Million)
  - Best Case Scenario:
    - Decision to implement made on Thursday evening
    - RETRI Phase 3 finished by COB Monday
      - Limited user down time (1 -2 business days)
      - Start on Tuesday, response proceeds at a casual pace
      - Cost breakdown
        - ~ $576,000 for Phase 3 Labor (Network / Server Admins)
        - ~ $1,000,000 in Software Licenses (list price, without discounts)
        - ~ $650,000 in New Hardware
        - ~ $288,000 in IR
        - ~$384,000 in Re-imaging Labor (deploying and desk side support)
    - Keep in mind, this is a large network which is being 100% rebuilt
    - On average it is 2-3 times cheaper than any other method
  - So what is RETRI..

RETRI's Phased Approach

- Phase 1: Preparation
  - Weeks to months
- Phase 2: Damage Assessment
  - 24 hours or less
- Phase 3: Network Segmentation and Service Restoration
  - 3-6 days
- Phase 4: Investigation and Recovery
  - Whatever is required (users are not affected)



Phase 1 – Preparation

Weeks to months out…

Cyber COOP is required

- Traditional COOP
  - Generally ensures you have backups at an offsite, but….
    - Real-time replicated backups shouldn’t be trusted
  - Identify highly critical services and business processes which require Internet connectivity to function
- Cyber COOP
  - Create a backup plan and identify hardware and software for cyber attack recovery scenario
  - Physical media (e.g., tape) backups
  - Cloud computing provides no benefit

Resource Considerations

- People:
  - Network Admins, Server and Desktop Support staff, Incident Response Specialists, IDS / IPS Analysts
  - Switch and Router specialists
- Hardware
  - Need servers to restore backups to
- Software
  - Application Streaming Infrastructure (ASI)
    - Citrix $350 per user
    - ThinWorx $199 per user (open to "renting" the software)
    - Quest vWorkspace Enterprise $100 per user
  - IR tools

Don’t forget…

- Scripts / SMS packages
  - Prep to install / remove apps
  - Scripts to change default home page
- User Notifications
  - What will you tell your users
  - What are they allowed to say to outsiders
- Training packages
  - Emails
  - Posters
  - Web CBTs

Architecture and Planning

- Virtualization technology enables rapid response and minimizes resource consumption
  - Saves on number of physical servers necessary for RETRI network segmentation
  - Known good VM images can be restored in moments from backups
- This architecture streamlines the use of response tools
  - Many tools and applications can be loaded on VMs
  - Distributed analysis among analyst teams with common data sets
- Leverage software inventory / deployment systems in place
  - SMS, Patchlink, Hercules, etc

Know Your Network!

- Where do your assets live?
- What platforms exist?
- Network entry points
- Trust relationships
- “Dark segments”
- Are there any unique dependencies which will need to be addressed?
- Inventory / asset management
  - How will you gauge coverage?
  - If you can’t count your assets…

Phase 2 – Damage Assessment

Within 24 hours of compromise discovery….

Intrusion is detected

- Perform basic incident response to identify the attack vector
- Identify date of infection so backups can be restored from known good sources
- Identify Command and Control method
- Attempt to identify basic malware capabilities
  - Submit samples to AV vendor for rapid signature creation
- Determine the scope of the infection / intrusion

Does RETRI Fit?

- This is a major decision before proceeding..
  - Are critical backups available for RETRI?
    - Domain Controllers, Exchange servers, DNS, File servers, Print servers, Web servers
  - Does the evidence support the decision to begin a network wide rebuild…?
    - Rebuilds are very costly and time intensive
      - RETRI affords you the time to do the rebuild without taking your users offline
    - Some data may be lost
- …If not, use traditional methods!
- If so… Convince your Boss

Stop the bleeding

- Cut off network access
  - Deny the hackers access to your network and the data you are charged with protecting
    - Implement Firewall or IPS blocks for known backdoors
- Inform management and users
  - Tell them what they can and can't say…
  - Tell them when services will be restored
- Implement disaster recovery plan
  - Prepare to go to 24/7 operations in all critical IT departments

Phase 3 – Network Segmentation and Service Restoration

3-6 days

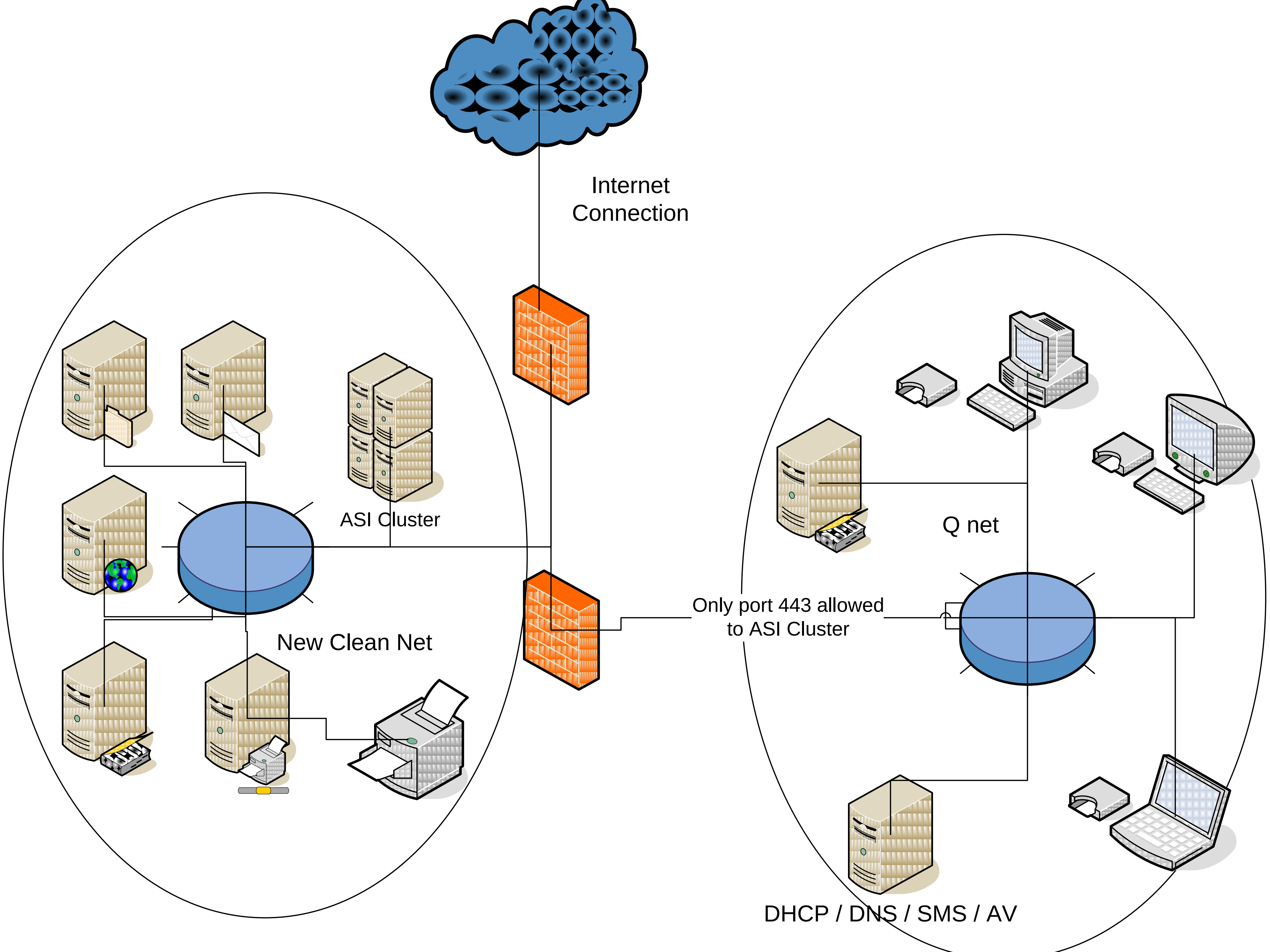
Segmentation Fundamentals

- **Virtual Routing and Forwarding** (VRF) is a technology that allows multiple instances of a routing table to co-exist within the same router at the same time.
  - Because the routing instances are independent, the same or overlapping IP addresses can be used without conflicting with each other.
  - Packets get a VRF tag added to them so that routers can distinguish which network they operate on
- **Multi-Protocol Label Switching** (MPLS) is commonly used for Enterprise VRF deployments
  - MPLS allows you to label packets so that the routers can pass packets very quickly based on its label (VRF).
- **In Summary**:
  - Switch Ports get mapped to VLANs
  - VLANs get mapped to VRFs
  - VRFs get MPLS labels
  - MPLS labels logically separate data as it traverse shared network hardware

http://en.wikipedia.org/wiki/VRF

Creating the two networks

- The Quarantine Network (Qnet)
  - Using VLAN/VRF technology, place your old network into a new VRF
    - All packets get tagged for your new VRF and are restricted to the new zone based on routing / firewall rules
      - No external connectivity
- The Clean Network (CleanNet)
  - Create an empty VRF which mirrors the other network's IP space and layout
    - The difference is the CleanNet has connectivity to the Internet
    - Initially this network will be totally empty


Internet
Connection
ASI Cluster
New Clean Net
Q net
Only port 443 allowed
to ASI Cluster
DHCP / DNS / SMS / AV

What is the Qnet?

- All devices on the infected network must be placed in the Qnet
- The Qnet will require basic network infrastructure
  - DHCP, DNS, Active Directory / Auth Services
  - SMS, Software Deployment Services, Remote Imaging
  - AV, Forensic / IR Tools, Network Scanners

What is the CleanNet?

- A network that will become your new enterprise
  - Email Servers, File Servers, Print Servers, Web servers, Domain Controllers, Authentication Systems, DNS, DHCP
  - Printers can be in the CleanNet VLAN while physically remaining where they are
    - Printers should be verified before being placed in CleanNet
    - This way printers can be mapped from the ASI cluster
- A network that has standard internet connectivity
  - Servers moved over or restored here take the IPs they used to have
  - Firewall, IDS and IPS rules should not need to be modified as you restore services in the CleanNet
- ASI Cluster and App Server Farm

Gluing the networks together

- How do you provide access to the CleanNet from the Qnet without risking the security of the CleanNet and the data still residing in the Qnet?
  - Very restrictive firewall rules
    - Only Port 443 allowed to specific IPs in the CleanNet
    - All communications with the CleanNet must be authenticated by some 2 factor method (Smart Card, RSA, biometrics)
    - All communications with the CleanNet must be encrypted
  - Qnet DNS
    - Option 1: All DNS points to the ASI cluster so users always get to a login screen
    - Option 2: (recommended)
      - ASI.company.com points to the ASI
        - Becomes default homepage in browser
      - All other entries (*.com, *.net, etc) point to a tarpit / IDS for analysis

The ASI Cluster

- What is available
  - Email
  - Office Apps
  - Web (IE/FireFox)
  - Other critical applications which your users/organization rely on
- What isn't
  - Multimedia intensive applications
    - Streaming Video
  - Locally installed user applications which require direct access to the internet
    - Anything that requires access to the internet must be installed on the cluster or it won't work

Securing the Cluster

- No Copy/Paste between Qnet
- No Device mapping
- Only 2 factor sessions, encrypted
- Applications locked down
  - Consider disabling Javascript on browsers (or use noscript) and office products
- DEP enforced on all running process
- User permissions extremely limited
- ASI Clients become "Dumb-Terminals"

Moving The File Server…

- Before moving it to the CleanNet
  - What do you do with a multi-terabyte file server?
    - Scan with multiple AV solutions
    - Scan with IR tool for known bad hashes
- After the Move
  - On the ASI
    - Enforce MOICE (Microsoft Office Isolated Conversion Environment) on all Office files
    - Disable JavaScript in Adobe Acrobat
    - No untrusted executables

Neutralizing file format threats

- What is MOICE
  - Converts 2003 and previous Office files (binary formats) to xml
  - Conversion is done in a sandbox of sorts
  - Exploits in files cause a safe crash in conversion without exploiting user
- What is DEP
  - *Data Execution Prevention (DEP) is a set of hardware and software technologies that perform additional checks on memory to help prevent malicious code from running on a system.* (microsoft.com)
  - Software protected by DEP is much harder to exploit
- PDF Viewer
  - How many of you use Adobe Acrobat on your network?
    - Adobe Acrobat == Massive Vulnerability / Backdoor
    - Ditch it and get Foxit, etc

Restoring User Services

- Enforce 2 factor and reset any accounts which are not 2 factor
- Install ASI client on all Qnet host
  - Make ASI the default home page on all client machines
- Remove / hide all office applications (in Qnet) with SMS
- Train users
  - Email
  - Handouts, Posters
  - hands/virtual training
  - memos, TPS reports, etc

What’s next?

- After restoring operations, the focus shifts to cleanup, recovery, and attribution
- Verify initial assumptions and analysis
- Deeper Malware analysis of collected samples
    - Submit samples to AV vendors
- Network data analysis
- Verify attack vector (root cause)
- What data was taken – regulatory implications (HIPAA, SOX, etc)
- “Deep dive”

Introducing **Codeword**: A tool for rapid detection, recovery, mitigation and cleanup

Phase 4 – Investigation and Recovery

Tools of the trade

- Commercial forensics tools:
  - Enterprise versions are very costly
  - Complicated
  - Steep learning curve
  - Require expensive full-time resources
  - Heavily forensics-focused, not recovery-focused
  - Mostly bulky, slow and painfully “thorough”
- Other enterprise “security tools” (e.g., Scanners, AV, HIPS):
  - Poorly configured, not watched
  - Not widely or consistently deployed
  - Require problematic integration with infrastructure
- Free/Open source tools:
  - Mixed capabilities
  - Enterprise design not in mind

Bottom line

You need the 10-day solution,
not the 90-day solution

Critical data is easy to get

- There is a limited set of **critical data** that an analyst must be able to quickly *search* and *retrieve* to identify a majority of common infections:
  - Disk indicators: file name, size, hash, PE characteristics
  - Memory indicators: process name, loaded modules, command line arguments, strings in heap
  - Registry indicators: GUIDs and other static values
- Codeword's main purpose is to quickly expose this information in a meaningful way, so that an analyst can come to a reasonable conclusion about an enterprise-wide, active infection in minutes to hours
- Of course, it also has more advanced features ;-)

Codeword inspiration

- **Frustration** with commercial forensics tools
  - Bugs
  - Time wasted on service calls
  - Licensing headaches
  - Inconsistent results (v5.5a != v6.5.1 ??)
  - Over-engineered, misses the simple use cases
  - Core capabilities aren't customizable
  - Lacking robust rootkit detection
- Fruitless search for a comprehensive **open-source alternative**
- The **agile**, responsive attitude of Codeword fits perfectly with RETRI

Codeword goals

- Imagine combining these enterprise tools into one simple, easy-to-use tool:
  - Vulnerability & AV scanners – Codeword uses signatures to detect and scan host locally
  - Enterprise forensic tool – Codeword uses forensic techniques to collect malware evidence in an agent-based framework
  - Rootkit detection – think GMER or Ice Sword
- Extensible – define what you consider to be malicious
- Free…

Current Capabilities

- **Detection -**Uses registry, file and memory “signatures” to detect malware and misconfigurations and heuristics to identify anomalous behavior
- **Evidence collection** – collects any malicious files discovered
- **Reporting** - Results are collected, compressed/encrypted and uploaded to a secure location in the Qnet (Sftp, http, smtp, or network share)
- **Mitigation** – disable devices, uninstall apps, change system policies, etc
- **Cleanup** – kill processes/threads, delete/rename files, delete/clear registry entries, restore boot sector
- **Remote Analysis**– connect to agent from admin interface

Major Features

- Write your own **signatures** to find malware
  - **Simple** signature logic – use file names, sizes, hashes, etc
- Tweak advanced **heuristics** for better detection
  - **User** mode, **kernel** mode, and **low-level** heuristics
- **Isolate**, **clean** and **prevent** future reoccurrence of infections
- **Thorough** detection –Codeword searches the computer's registry, hard drives and removable media, and live system memory for evidence of infection
- Receive **usable** alerts and data – collect all relevant evidence, along with meaningful log files and summary reports, and ships those back to you over a reporting method of your choice.
- Real-time, remote analysis – connect to agents over encrypted tunnel

Benefits and other uses

- Can be used on a regular basis as part of a network security best practice
- Use as a triage tool (e.g., in support of RETRI)
- Aggregate information on all system infections by site name and location
- Help find original infection point: All malware and system information, including pinpointing USB devices, is reported back

With that said…

- Codeword is not a “Forensically-sound” tool
- It will not solve all of your problems
- You should use Codeword as part of an overarching response process, not as The Easy Button

- Codeword is beta freeware – don’t complain when it crashes
- Comes with no warranties or hypno-toads

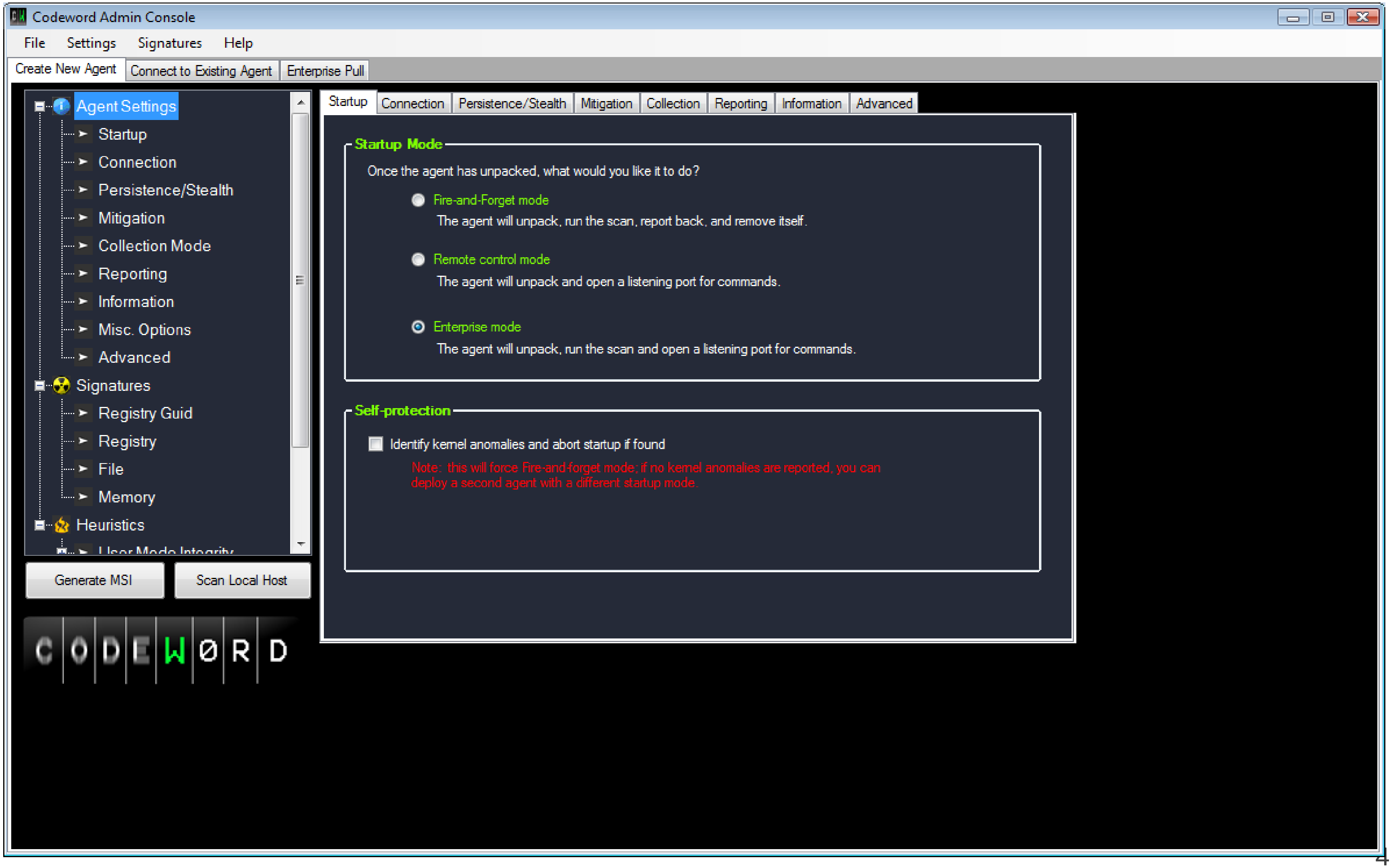
Components

- Codeword has 3 primary components:
  - **Admin Console (C#)**: A graphical interface used to generate new agents and connect to existing deployed agents; wraps agent binary in an MSI installer file for deployment
  - **Agent (C#)**: A single binary contained inside the generated MSI; a host-level scanner to detect viruses, clean related files and footprints, and to implement remediation actions to prevent further infection
  - **Kernel-mode driver (C)**: A single SYS file that contains rootkit detection logic and other evidence-collecting code

Quick start: using Codeword

1. Create an agent
   - Define signatures specific to malware
   - Choose user mode and kernel mode heuristics
   - Generate agent MSI installer
   - Deploy using psexec, sms, altiris, etc.
2. Connect/scan/analyze
   - Fire-and-forget mode: agent automatically sends an encrypted zip archive with results/evidence
   - Enterprise/Remote Control: use Admin Console
3. Collect/Mitigate

Admin Console



Startup Mode

Once the agent has unpacked, what would you like it to do?

○ Fire-and-Forget mode
The agent will unpack, run the scan, report back, and remove itself.

○ Remote control mode
The agent will unpack and open a listening port for commands.

● Enterprise mode
The agent will unpack, run the scan and open a listening port for commands.

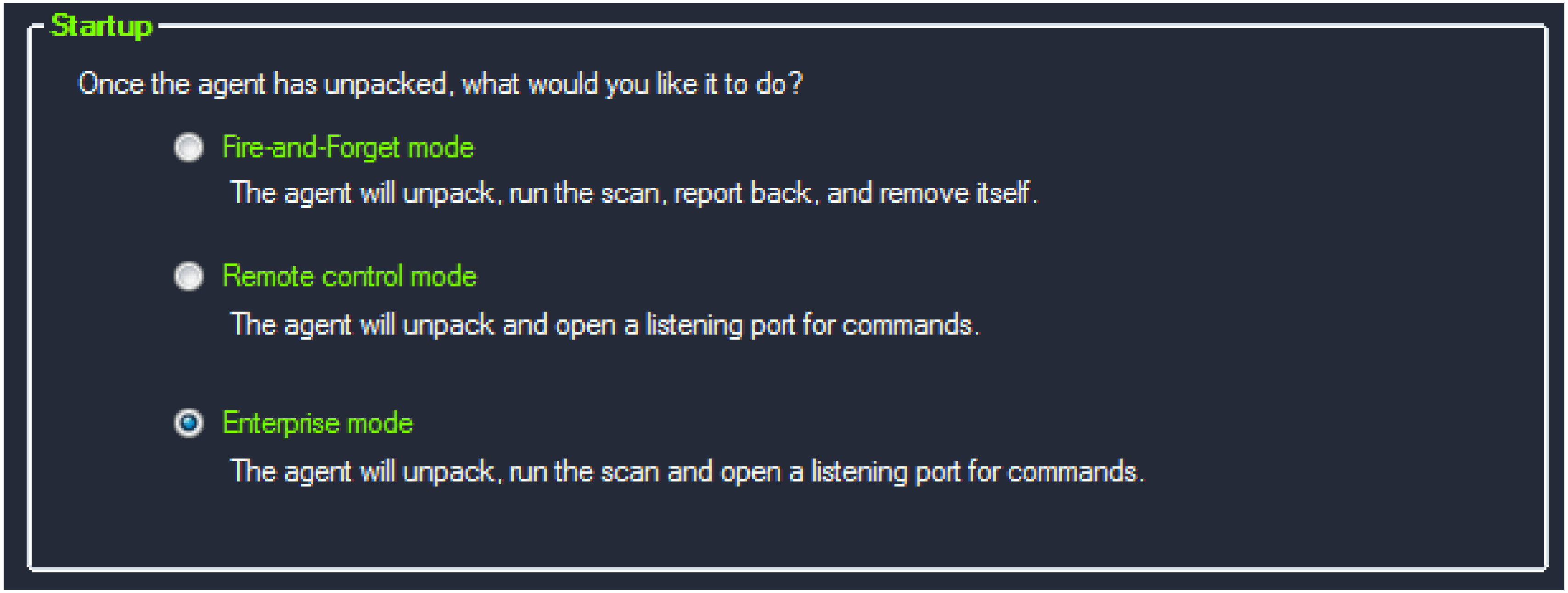
Self-protection

□ Identify kernel anomalies and abort startup if found

Note: this will force Fire-and-forget mode; if no kernel anomalies are reported, you can deploy a second agent with a different startup mode.

Step 1: Create an agent

Startup modes



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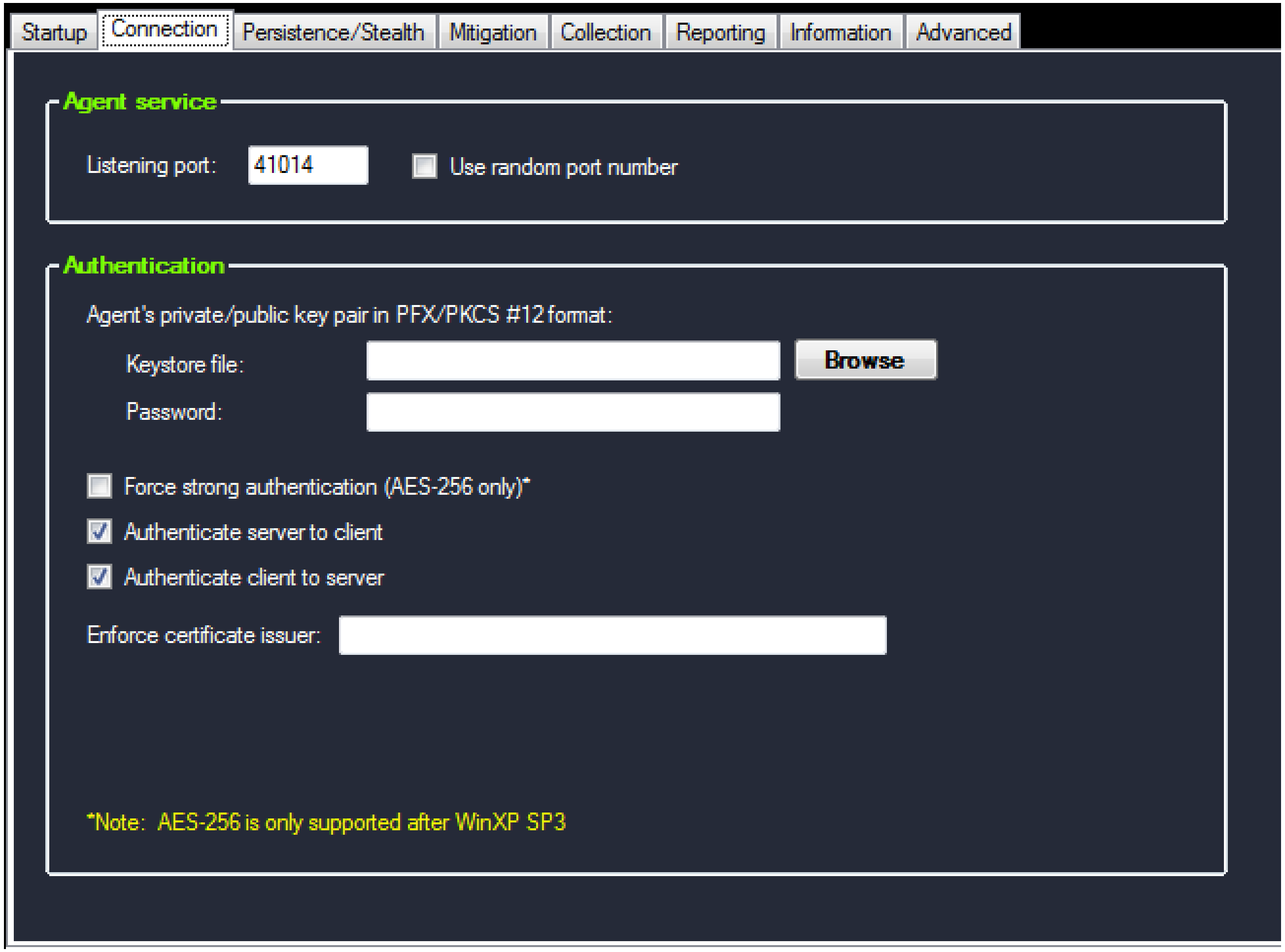
Connection



Agent service

Listening port: 41014

□ Use random port number

Authentication

Agent's private/public key pair in PFX/PKCS #12 format:

Keystore file:

Password:

□ Force strong authentication (AES-256 only)*

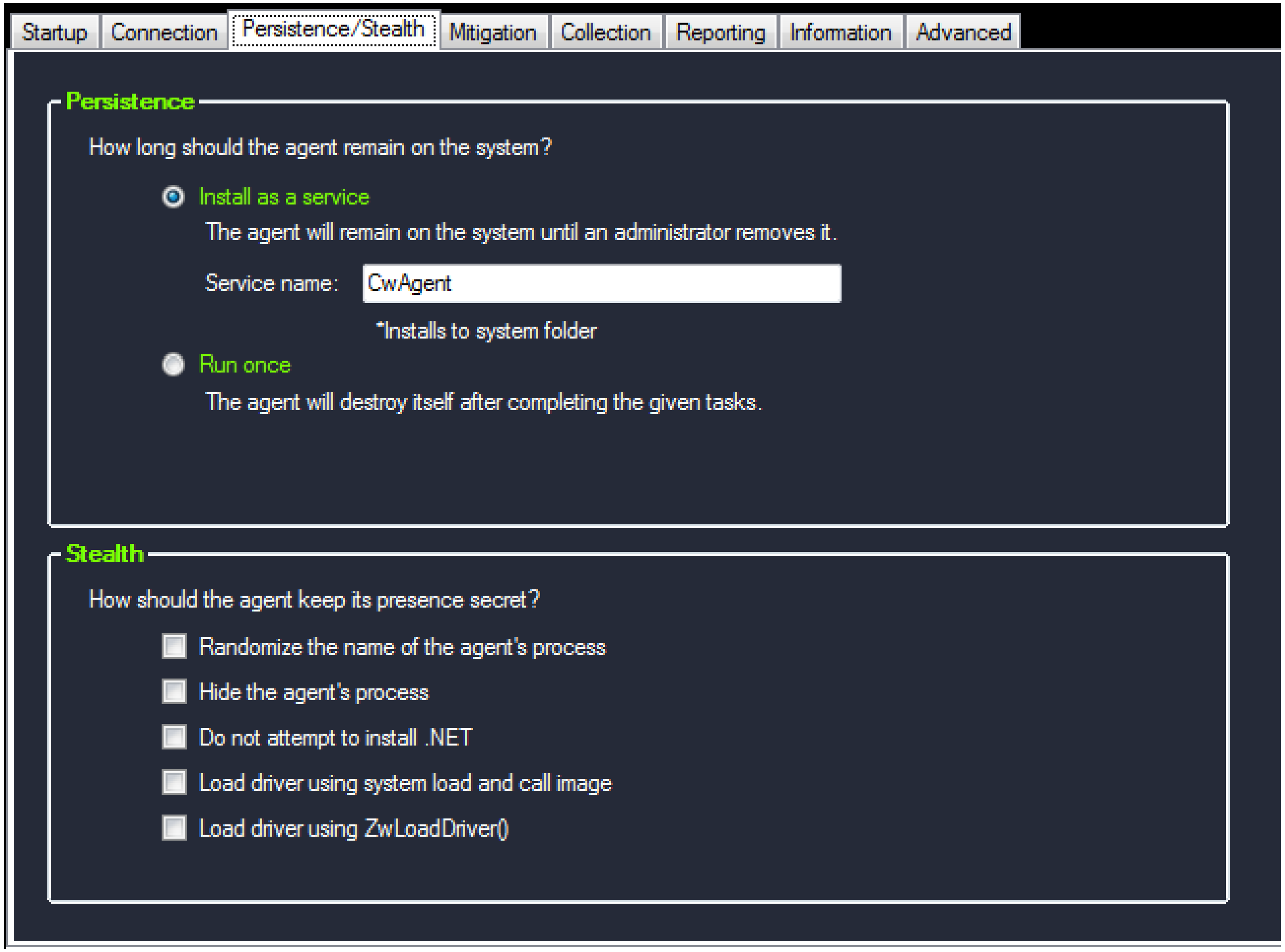
☑ Authenticate server to client

☑ Authenticate client to server

Enforce certificate issuer:

*Note: AES-256 is only supported after WinXP SP3

Persistence/Stealth



Persistence

How long should the agent remain on the system?

● Install as a service

The agent will remain on the system until an administrator removes it.

Service name: CwAgent

*Installs to system folder

○ Run once

The agent will destroy itself after completing the given tasks.

Stealth

How should the agent keep its presence secret?

□ Randomize the name of the agent's process

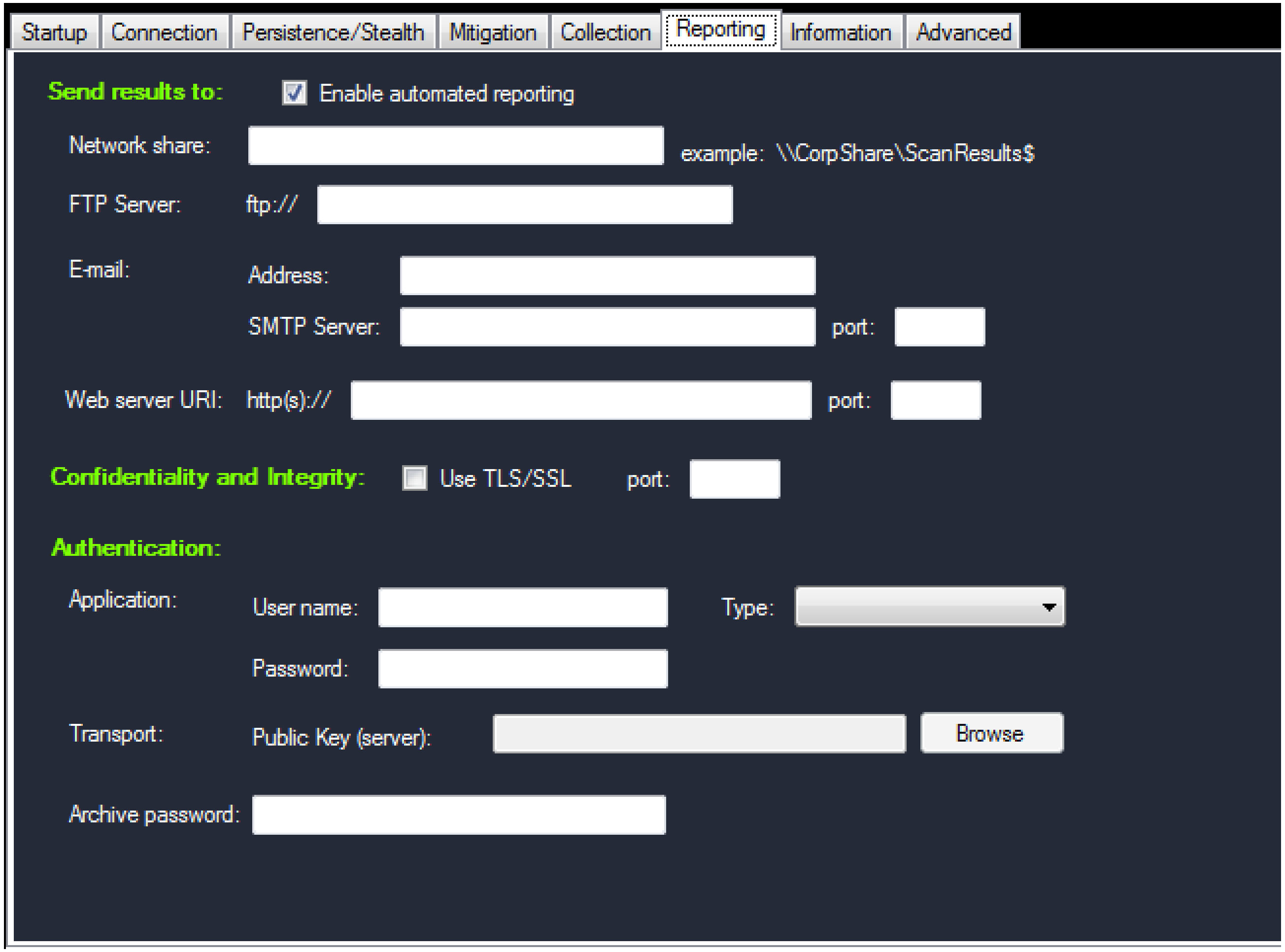
□ Hide the agent's process

□ Do not attempt to install .NET

□ Load driver using system load and call image

□ Load driver using ZwLoadDriver()

Reporting



Send results to: ☑ Enable automated reporting

Network share: example: \\CorpShare\ScanResults$

FTP Server: ftp://

E-mail: Address:

SMTP Server: port:

Web server URI: http(s):// port:

Confidentiality and Integrity: □ Use TLS/SSL port:

Authentication:

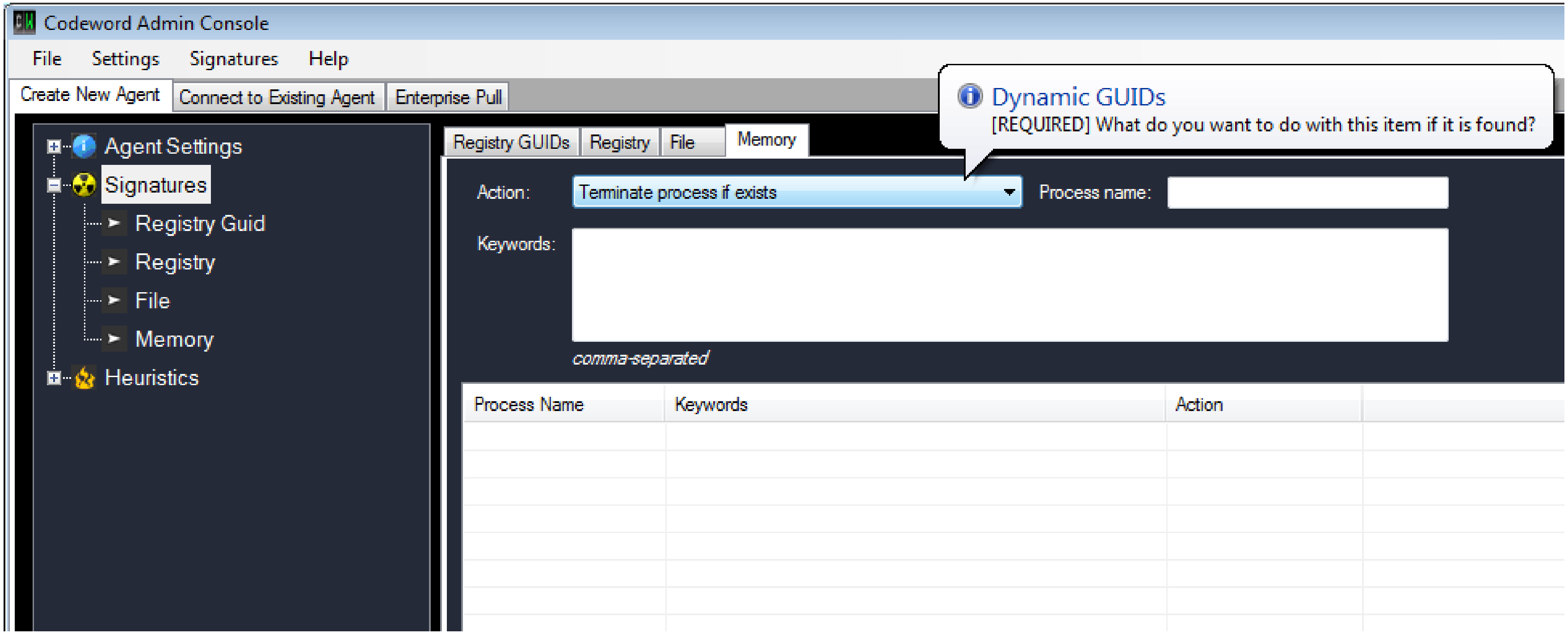
Application: User name: Type:

Password:

Transport: Public Key (server):

Archive password:

Defining signatures



Dynamic GUIDs
[REQUIRED] What do you want to do with this item if it is found?

Action: Terminate process if exists

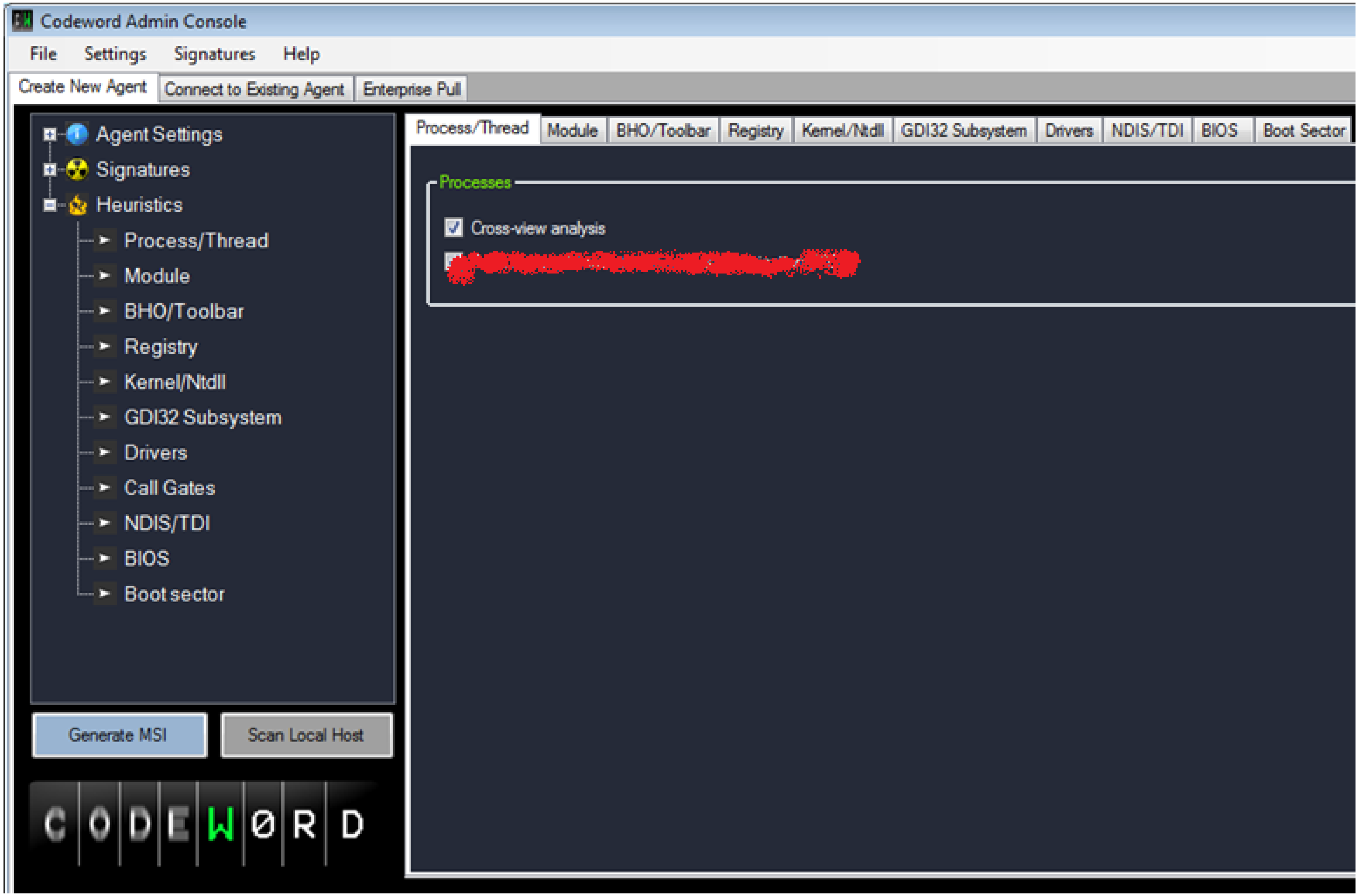
Process name:

Keywords:

comma-separated

Process Name	Keywords	Action

Selecting Heuristics

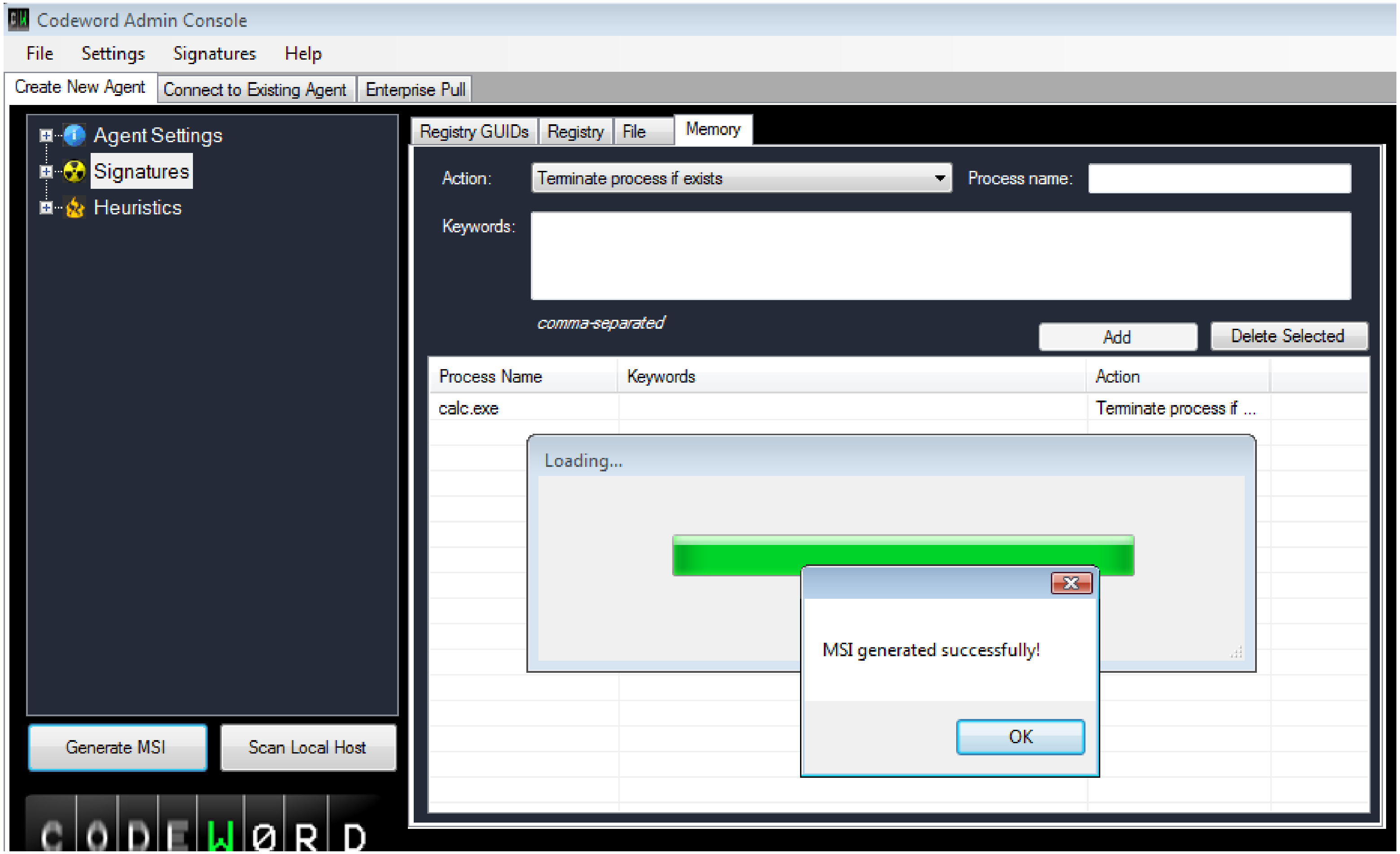


Processes

☑ Cross-view analysis

[redacted]

Generate it!



Action: Terminate process if exists

Process name:

Keywords:

comma-separated

Process Name	Keywords	Action
calc.exe		Terminate process if ...

Loading...

MSI generated successfully!

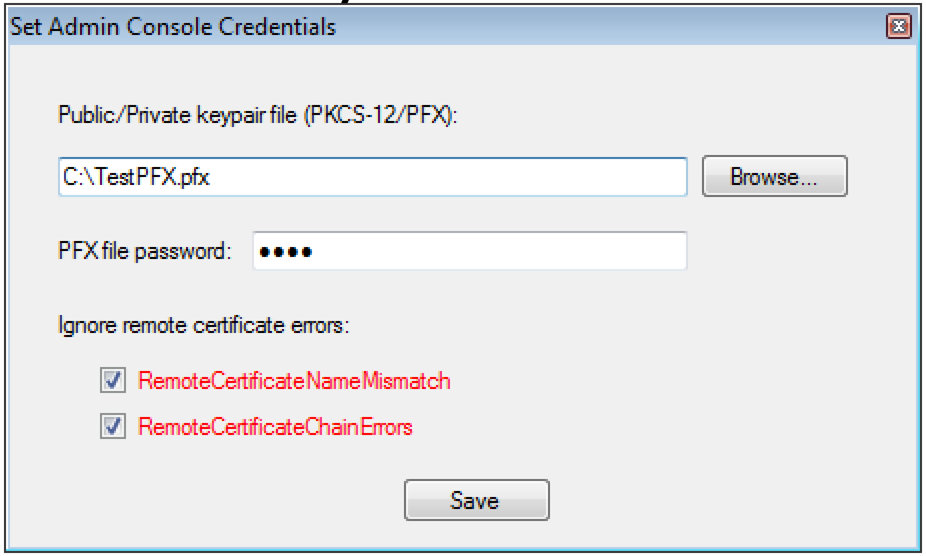
OK

Step 2: Connect/Scan/Analyze

Enterprise and Remote Control Modes

Connecting to an agent

1. Specify admin console keys



Set Admin Console Credentials

Public/Private keypair file (PKCS-12/PFX): C:\TestPFX.pfx

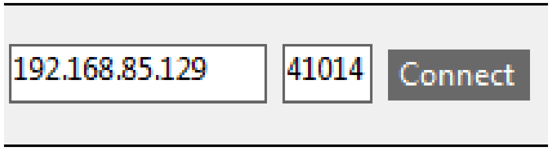
PFX file password: ●●●●

Ignore remote certificate errors:

☑ RemoteCertificateNameMismatch

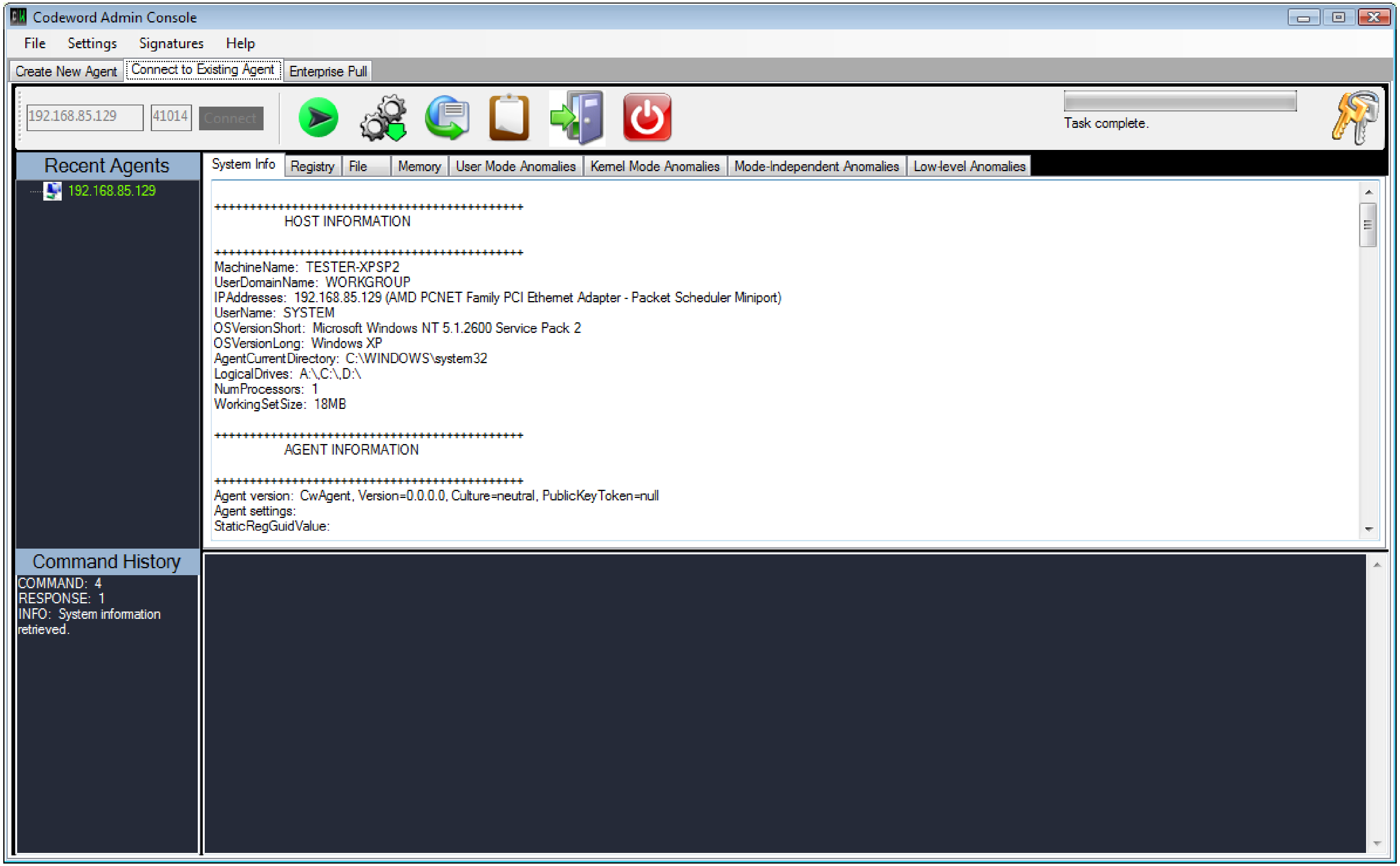
☑ RemoteCertificateChainErrors

2. Click connect!



192.168.85.129 41014

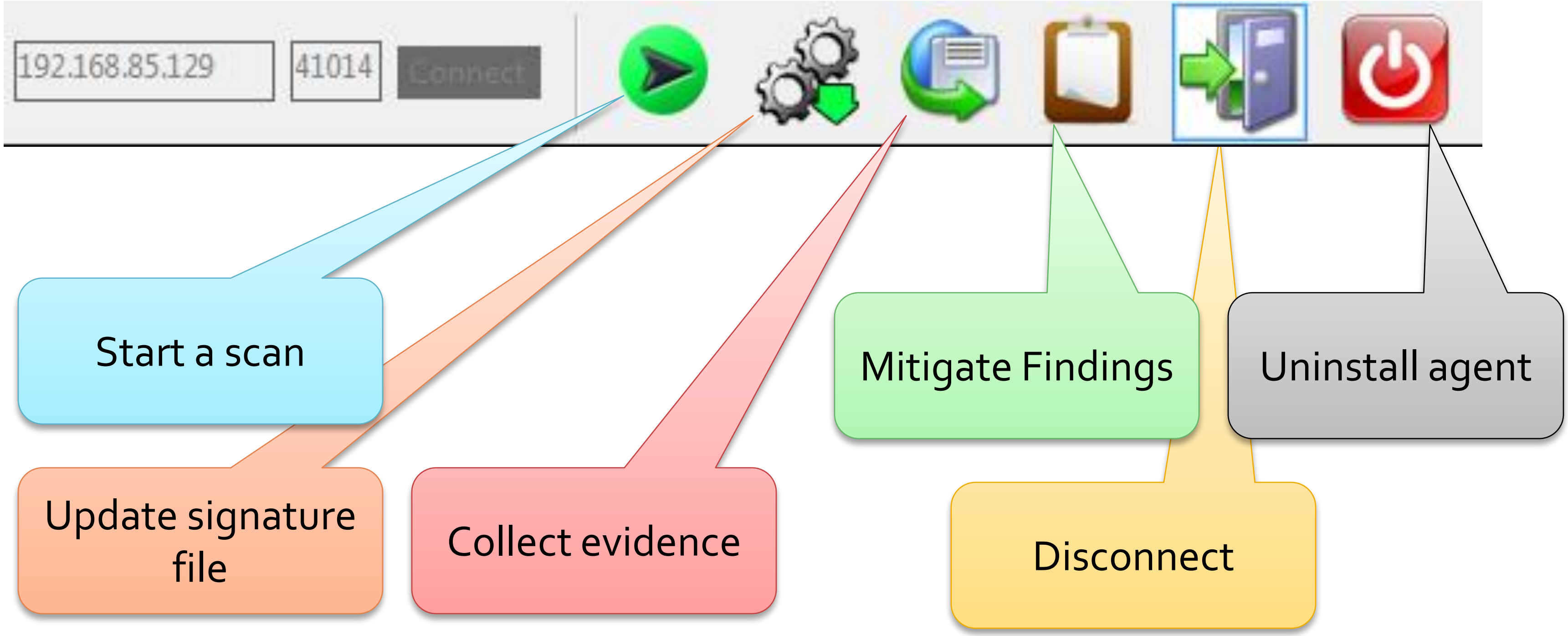
..we are connected



```
+++++++++++++++++++++++++++++++++++++++++++++
          HOST INFORMATION

+++++++++++++++++++++++++++++++++++++++++++++
MachineName:  TESTER-XPSP2
UserDomainName:  WORKGROUP
IPAddresses:  192.168.85.129 (AMD PCNET Family PCI Ethernet Adapter - Packet Scheduler Miniport)
UserName:  SYSTEM
OSVersionShort:  Microsoft Windows NT 5.1.2600 Service Pack 2
OSVersionLong:  Windows XP
AgentCurrentDirectory:  C:\WINDOWS\system32
LogicalDrives:  A:\,C:\,D:\
NumProcessors:  1
WorkingSetSize:  18MB

+++++++++++++++++++++++++++++++++++++++++++++
          AGENT INFORMATION

+++++++++++++++++++++++++++++++++++++++++++++
Agent version:  CwAgent, Version=0.0.0.0, Culture=neutral, PublicKeyToken=null
Agent settings:
StaticRegGuidValue:
```

```
COMMAND:  4
RESPONSE:  1
INFO:  System information
retrieved.
```

The Toolbar

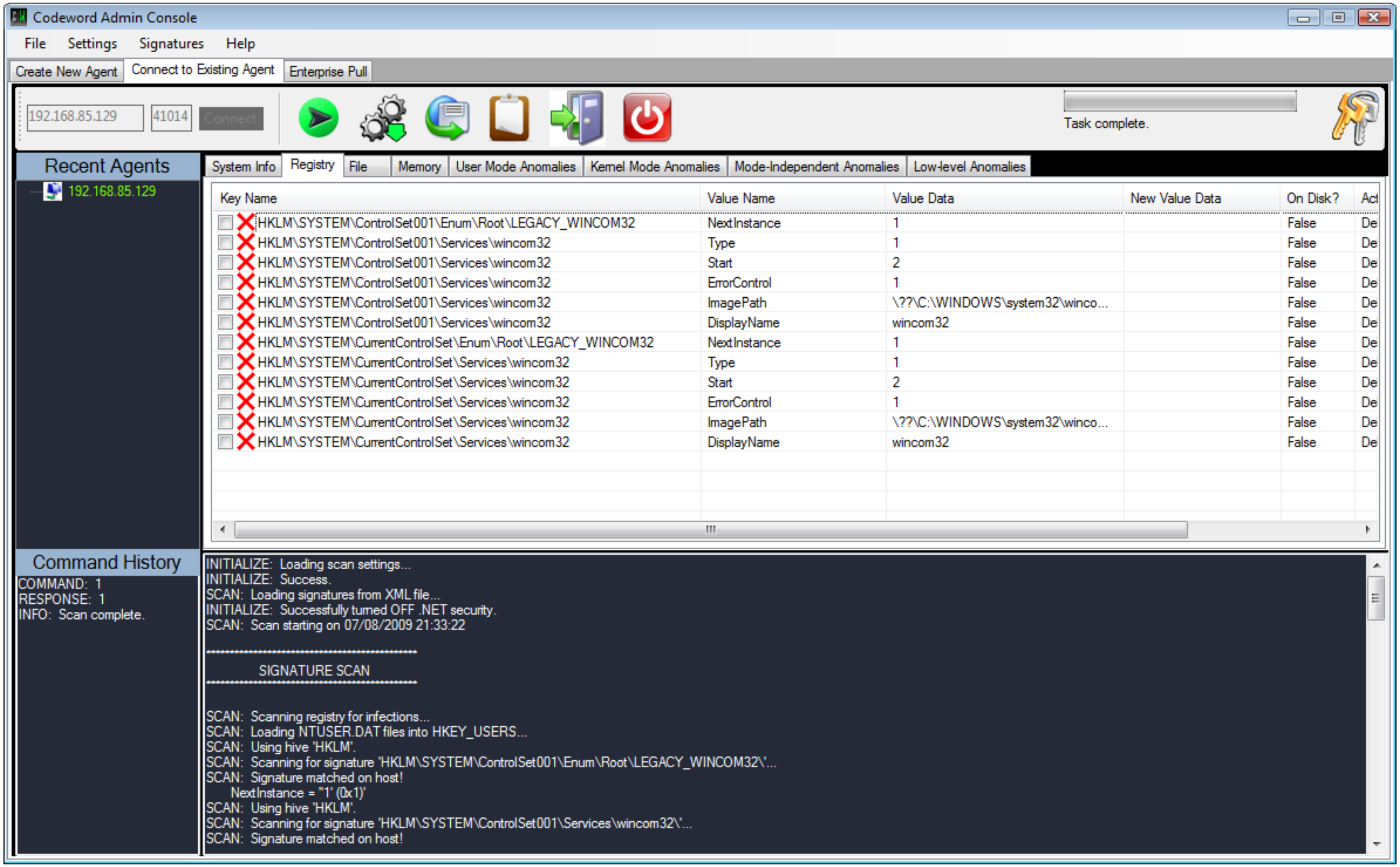


192.168.85.129
41014
Connect
Start a scan
Update signature file
Collect evidence
Mitigate Findings
Uninstall agent
Disconnect

Issue a scan

- Click the big green “PLAY” button
- Issues a command to the agent to begin scanning with whatever signature file it has
- Scan as many times as you like; change signatures by uploading new signatures file

Storm Worm Results: Registry



192.168.85.129 41014

Task complete.

Recent Agents: 192.168.85.129

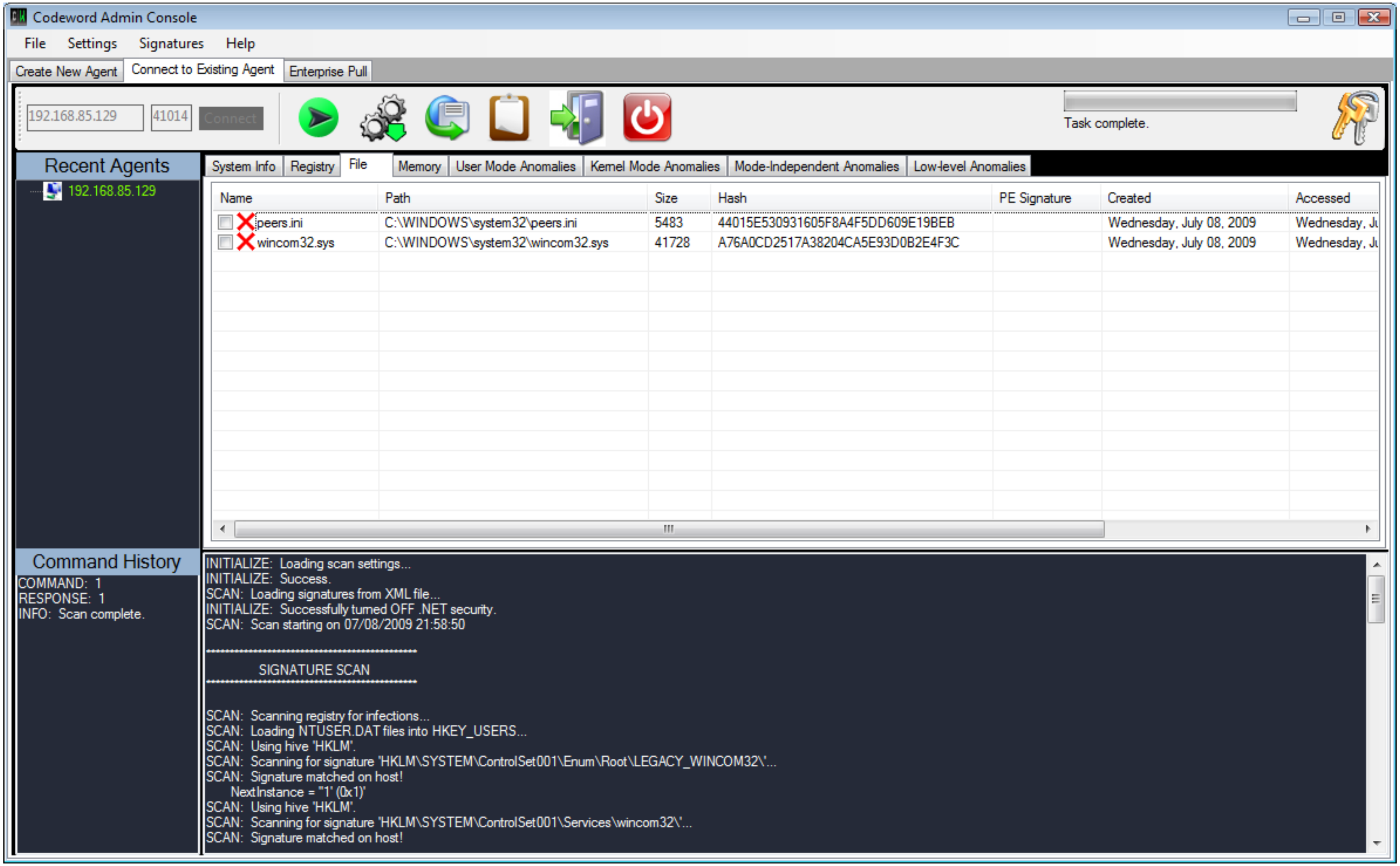
Key Name	Value Name	Value Data	New Value Data	On Disk?	Act
□ ✗ HKLM\SYSTEM\ControlSet001\Enum\Root\LEGACY_WINCOM32	NextInstance	1		False	De
□ ✗ HKLM\SYSTEM\ControlSet001\Services\wincom32	Type	1		False	De
□ ✗ HKLM\SYSTEM\ControlSet001\Services\wincom32	Start	2		False	De
□ ✗ HKLM\SYSTEM\ControlSet001\Services\wincom32	ErrorControl	1		False	De
□ ✗ HKLM\SYSTEM\ControlSet001\Services\wincom32	ImagePath	\??\C:\WINDOWS\system32\winco...		False	De
□ ✗ HKLM\SYSTEM\ControlSet001\Services\wincom32	DisplayName	wincom32		False	De
□ ✗ HKLM\SYSTEM\CurrentControlSet\Enum\Root\LEGACY_WINCOM32	NextInstance	1		False	De
□ ✗ HKLM\SYSTEM\CurrentControlSet\Services\wincom32	Type	1		False	De
□ ✗ HKLM\SYSTEM\CurrentControlSet\Services\wincom32	Start	2		False	De
□ ✗ HKLM\SYSTEM\CurrentControlSet\Services\wincom32	ErrorControl	1		False	De
□ ✗ HKLM\SYSTEM\CurrentControlSet\Services\wincom32	ImagePath	\??\C:\WINDOWS\system32\winco...		False	De
□ ✗ HKLM\SYSTEM\CurrentControlSet\Services\wincom32	DisplayName	wincom32		False	De

Command History

```
COMMAND:  1
RESPONSE:  1
INFO:  Scan complete.
```

```
INITIALIZE:  Loading scan settings...
INITIALIZE:  Success.
SCAN:  Loading signatures from XML file...
INITIALIZE:  Successfully turned OFF .NET security.
SCAN:  Scan starting on 07/08/2009 21:33:22

--------------------------------------------
          SIGNATURE SCAN
--------------------------------------------

SCAN:  Scanning registry for infections...
SCAN:  Loading NTUSER.DAT files into HKEY_USERS...
SCAN:  Using hive 'HKLM'.
SCAN:  Scanning for signature 'HKLM\SYSTEM\ControlSet001\Enum\Root\LEGACY_WINCOM32\'...
SCAN:  Signature matched on host!
     NextInstance = "1" (0x1)'
SCAN:  Using hive 'HKLM'.
SCAN:  Scanning for signature 'HKLM\SYSTEM\ControlSet001\Services\wincom32\'...
SCAN:  Signature matched on host!
```

Storm Worm Results: File



Name	Path	Size	Hash	PE Signature	Created	Accessed
□ ✗ peers.ini	C:\WINDOWS\system32\peers.ini	5483	44015E530931605F8A4F5DD609E19BEB		Wednesday, July 08, 2009	Wednesday, Ju
□ ✗ wincom32.sys	C:\WINDOWS\system32\wincom32.sys	41728	A76A0CD2517A38204CA5E93D0B2E4F3C		Wednesday, July 08, 2009	Wednesday, Ju

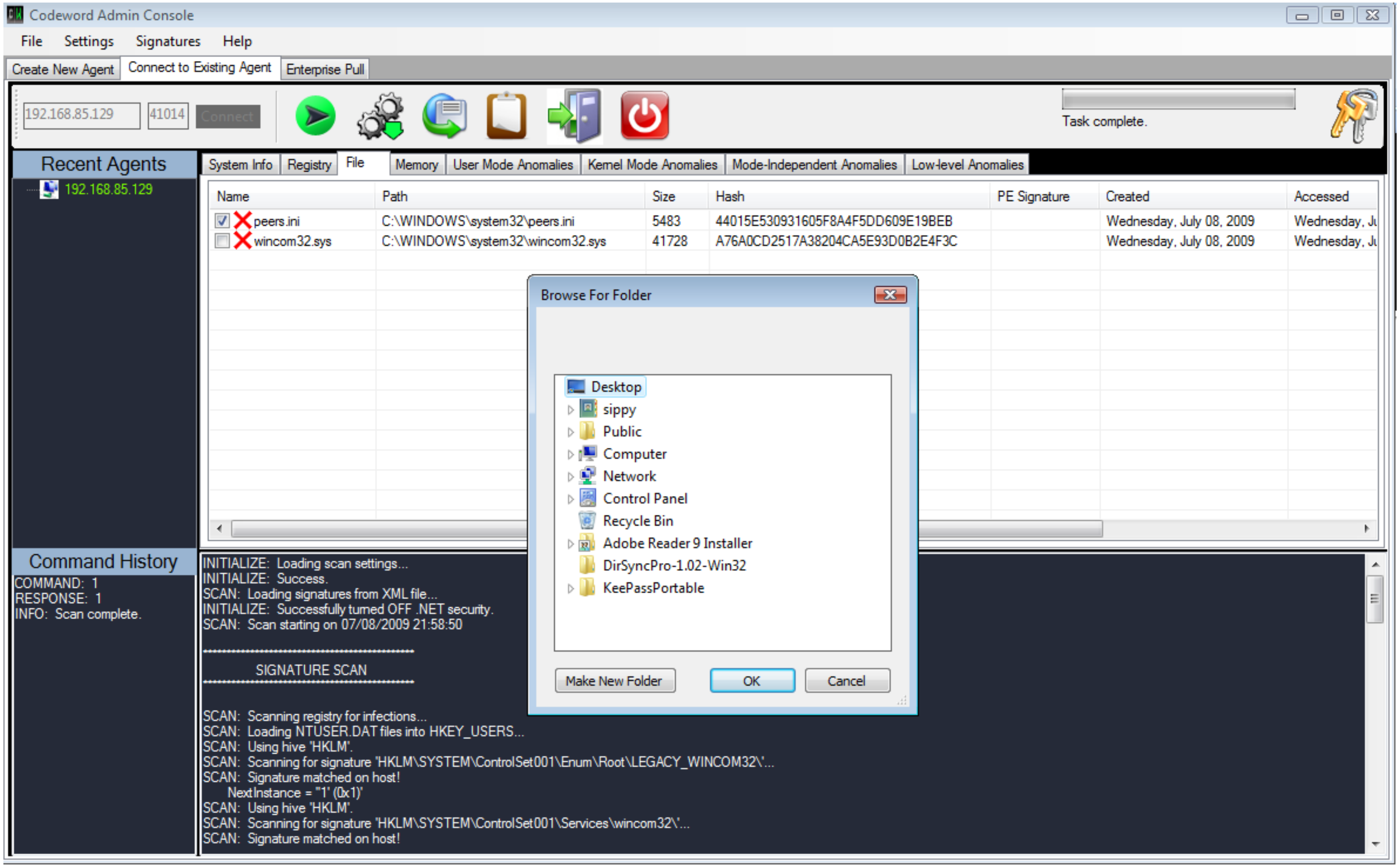
```
COMMAND:  1
RESPONSE:  1
INFO:  Scan complete.
```

```
INITIALIZE:  Loading scan settings...
INITIALIZE:  Success.
SCAN:  Loading signatures from XML file...
INITIALIZE:  Successfully turned OFF .NET security.
SCAN:  Scan starting on 07/08/2009 21:58:50

*********************************************
            SIGNATURE SCAN
*********************************************


SCAN:  Scanning registry for infections...
SCAN:  Loading NTUSER.DAT files into HKEY_USERS...
SCAN:  Using hive 'HKLM'.
SCAN:  Scanning for signature 'HKLM\SYSTEM\ControlSet001\Enum\Root\LEGACY_WINCOM32\'...
SCAN:  Signature matched on host!
      NextInstance = "1' (0x1)'
SCAN:  Using hive 'HKLM'.
SCAN:  Scanning for signature 'HKLM\SYSTEM\ControlSet001\Services\wincom32\'...
SCAN:  Signature matched on host!
```

Step 3: Collect and Mitigate

Enterprise and Remote Control Modes

Collect

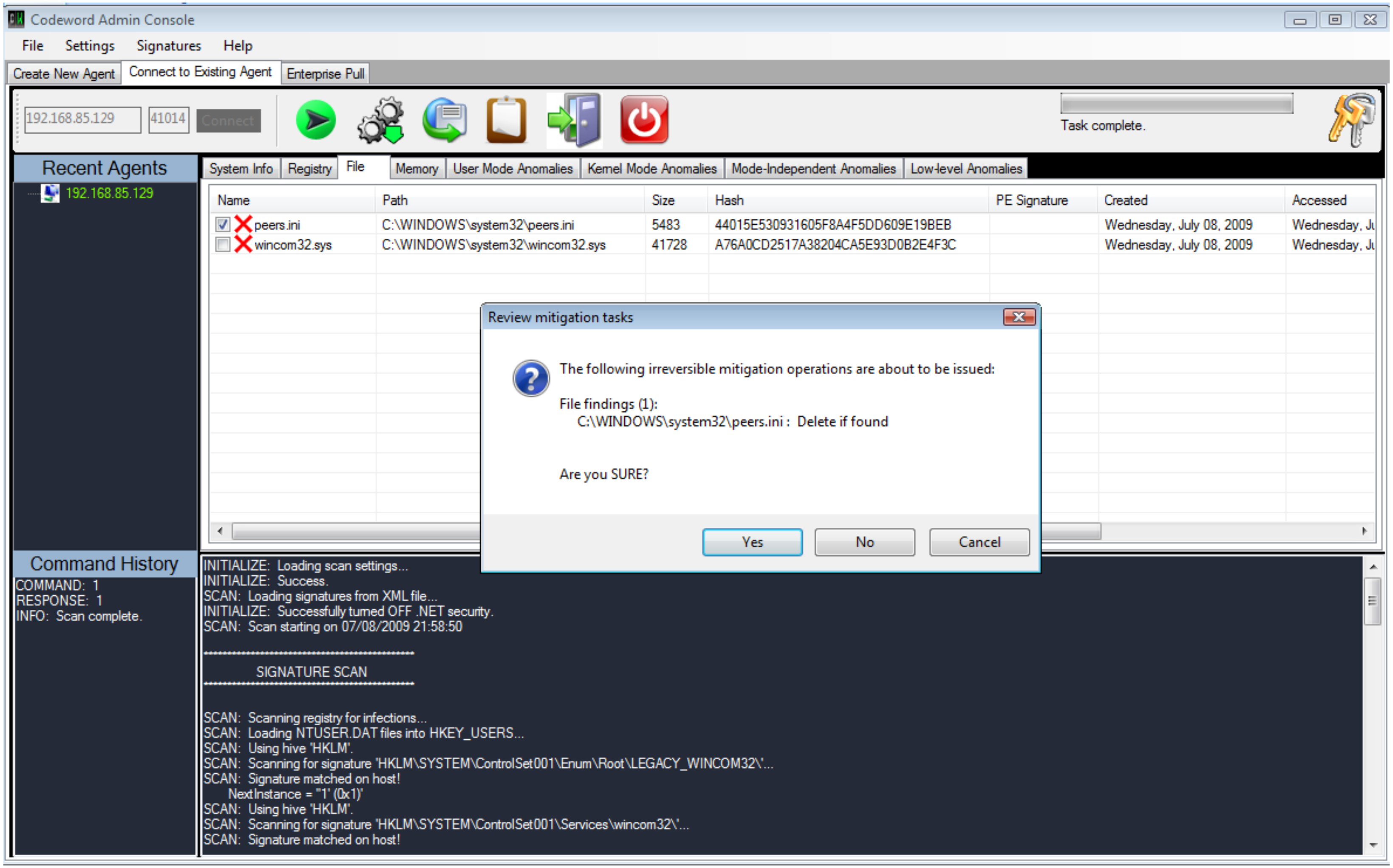


Name	Path	Size	Hash	PE Signature	Created	Accessed
☑ ✗ peers.ini	C:\WINDOWS\system32\peers.ini	5483	44015E530931605F8A4F5DD609E19BEB		Wednesday, July 08, 2009	Wednesday, Ju
☐ ✗ wincom32.sys	C:\WINDOWS\system32\wincom32.sys	41728	A76A0CD2517A38204CA5E93D0B2E4F3C		Wednesday, July 08, 2009	Wednesday, Ju

```
COMMAND:  1
RESPONSE:  1
INFO:  Scan complete.
```

```
INITIALIZE:  Loading scan settings...
INITIALIZE:  Success.
SCAN:  Loading signatures from XML file...
INITIALIZE:  Successfully turned OFF .NET security.
SCAN:  Scan starting on 07/08/2009 21:58:50

---------------------------------------------
          SIGNATURE SCAN
---------------------------------------------

SCAN:  Scanning registry for infections...
SCAN:  Loading NTUSER.DAT files into HKEY_USERS...
SCAN:  Using hive 'HKLM'.
SCAN:  Scanning for signature 'HKLM\SYSTEM\ControlSet001\Enum\Root\LEGACY_WINCOM32\'...
SCAN:  Signature matched on host!
     NextInstance = "1' (0x1)'
SCAN:  Using hive 'HKLM'.
SCAN:  Scanning for signature 'HKLM\SYSTEM\ControlSet001\Services\wincom32\'...
SCAN:  Signature matched on host!
```

Mitigate



Name	Path	Size	Hash	PE Signature	Created	Accessed
☑ peers.ini	C:\WINDOWS\system32\peers.ini	5483	44015E530931605F8A4F5DD609E19BEB		Wednesday, July 08, 2009	Wednesday, Ju
□ wincom32.sys	C:\WINDOWS\system32\wincom32.sys	41728	A76A0CD2517A38204CA5E93D0B2E4F3C		Wednesday, July 08, 2009	Wednesday, Ju

The following irreversible mitigation operations are about to be issued:

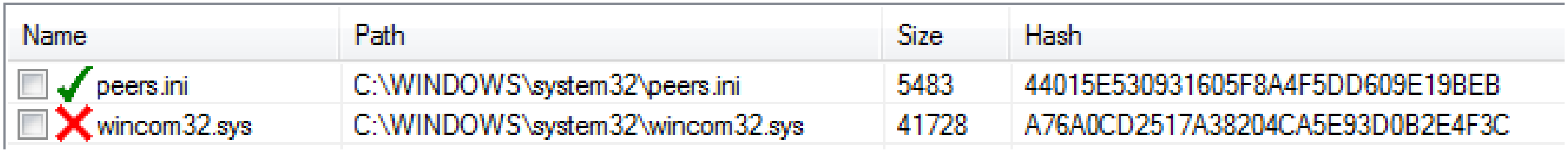
File findings (1):
C:\WINDOWS\system32\peers.ini : Delete if found

Are you SURE?

```
COMMAND:  1
RESPONSE:  1
INFO:  Scan complete.
```

```
INITIALIZE:  Loading scan settings...
INITIALIZE:  Success.
SCAN:  Loading signatures from XML file...
INITIALIZE:  Successfully turned OFF .NET security.
SCAN:  Scan starting on 07/08/2009 21:58:50

-------------------------------------------
          SIGNATURE SCAN
-------------------------------------------

SCAN:  Scanning registry for infections...
SCAN:  Loading NTUSER.DAT files into HKEY_USERS...
SCAN:  Using hive 'HKLM'.
SCAN:  Scanning for signature 'HKLM\SYSTEM\ControlSet001\Enum\Root\LEGACY_WINCOM32\'...
SCAN:  Signature matched on host!
     NextInstance = "1' (0x1)'
SCAN:  Using hive 'HKLM'.
SCAN:  Scanning for signature 'HKLM\SYSTEM\ControlSet001\Services\wincom32\'...
SCAN:  Signature matched on host!
```

Mitigate (2)



Name	Path	Size	Hash
□ ✓ peers.ini	C:\WINDOWS\system32\peers.ini	5483	44015E530931605F8A4F5DD609E19BEB
□ ✗ wincom32.sys	C:\WINDOWS\system32\wincom32.sys	41728	A76A0CD2517A38204CA5E93D0B2E4F3C

Fire-and-forget Mode

What’s reported?

- A password-protected, encrypted (AES 256) Zip archive containing:
  - Infection summary report
  - Mitigation report
  - All collected malware binaries and evidence
  - A detailed run log

Video Demos

Demo #1: Storm Worm

- GOAL:
  - Understand how to define registry, disk and memory signatures to detect user-mode malware
- SCENARIO:
  - VM Guest infected with Storm worm
- OBJECTIVES:
  - Deploy agent using Remote Control mode
  - Examine malware footprints

Demo #2: TcpIrpHook

- GOAL:
  - Understand how Codeword heuristics help catch kernel malware (and anti-virus)
- SCENARIO:
  - VM Guest infected with kernel-mode rootkit TcpIrpHook
- OBJECTIVES:
  - Deploy agent using Remote Control mode
  - Scan with Driver IRP hook heuristic

Conclusions

Possible Limitations

- Software licensing costs can be prohibitive
  - These costs are outweighed by user productivity
  - “renting” the software may be a cost-effective solution
- Some challenges that plague traditional methods also impact RETRI:
  - Disorganized networks, lack of funding, lack of mgmt-level support, lack of resources, etc.
  - Assumptions made early on have cumulative impact later on:
    - Availability of backups
    - COOP readiness
    - Date and scope of infection

Final Thoughts

- Preparation is key to ensuring services are restored quickly
  - Know your network and critical services
  - Ensure backups exist
  - Have hardware / software ready
- Keeping services up significantly reduces the cost of recovery
- Remember: User downtime costs 3 times as much as the actual cleanup

Thanks for coming!!

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www.code-word.org

Hexagon Security Group

Security Without Imagination is a Vulnerability