CONTINUOUS NETWORK AUDIT

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ISACA TALLAHASSEE

JUNE 2018

FISMA

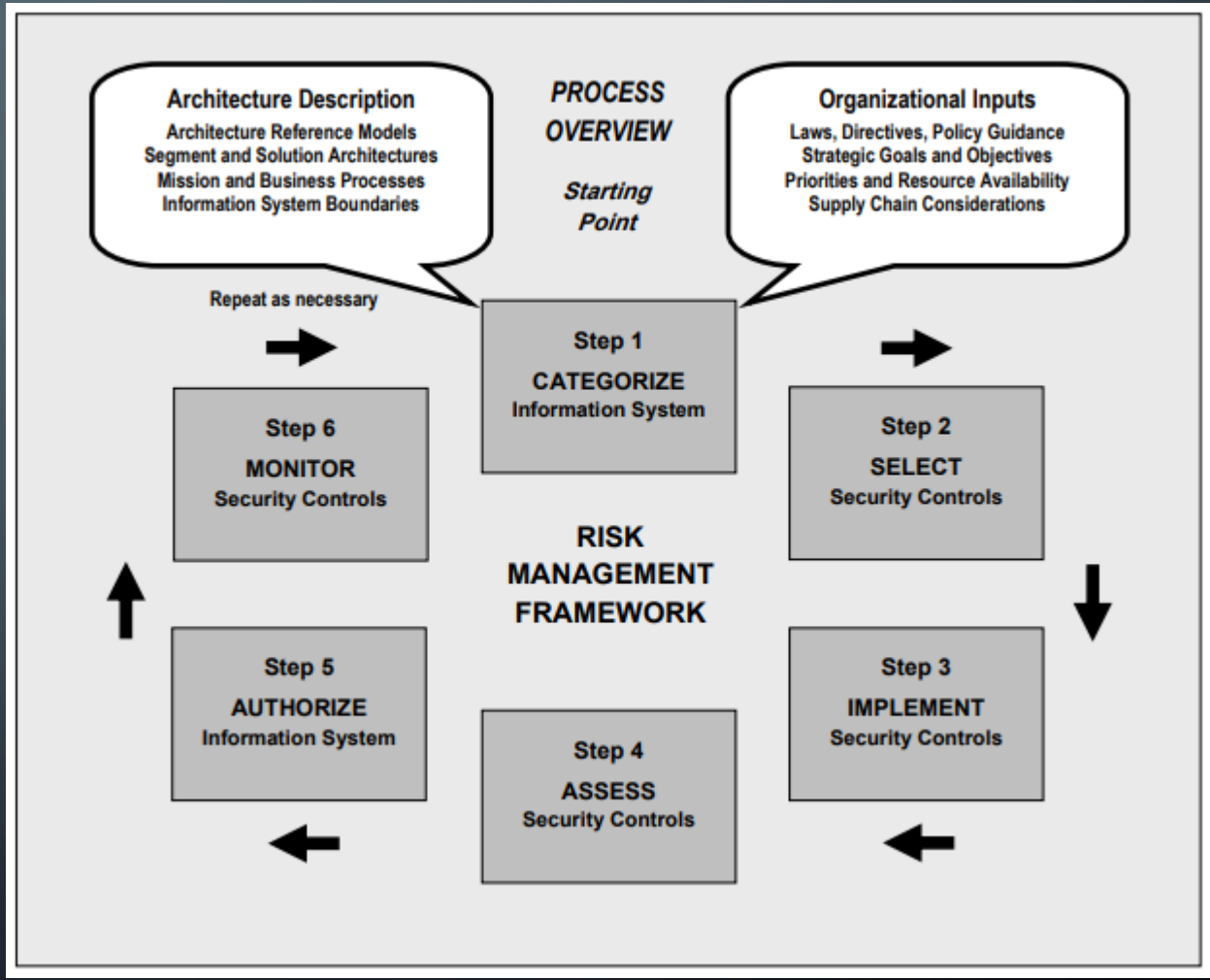
- Federal Information Security Management Act
- Originally laid out in 2002 as part of the Electronic Government Act
- Called for continuous monitoring with a major focus on compliance for Federal agencies
- Updated in 2014 to re-emphasize continuous monitoring over simple “check the box” compliance

FISMA

- Requirements now include…
  - “the use of automated tools in agencies' information security programs, including for periodic risk assessments, testing of security procedures, and detecting, reporting, and responding to security incidents.”
- We must become *proactive* and move beyond summary data with our audits

NIST 800-37

- Incorporates the FISMA continuous monitoring standard as part of the RMF
- Monitoring and auditing must become regular parts of our lives



AUDIT BEYOND EVERY NOW AND THEN…

- Many organizations are still auditing once a year, or maybe once a quarter
- Often a staffing or budget issue, but we can all move beyond this point with a little extra effort
- Many of you already have SIEMs and excellent policies and tools in place, but if you don't, here's a few ideas to help you take a more proactive approach to your testing…

LAYOUT YOUR OWN FRAMEWORK

- If you haven't already, make sure you are using some sort of plan
- Keep it as simple as possible…
  - 1. Set your scope
    - Internal and external hosts, Software in use, etc.
  - 2. Define the threats to your organization
    - Malware, Insiders, Natural disasters, etc.
  - 3. Prioritize your risks
    - Look at trends, Compliance needs, Organization history, etc.
  - 4. Check your current posture
    - Mind your gaps!
  - 5. Create automated responses
    - Runbooks for CIRST employees to follow, Continuous monitoring tools, etc.

AUTOMATION IS KEY

- The more we automate, the less our burden
- This may have some upfront administrative cost, but it can pay dividends
- How you automate depends on your organizations needs and the tools you use
- We'll take a high level overview of some ideas and examples for automation
- Everything mentioned today has been compiled at…
- https://github.com/ContinuousAudit/ISACA

POWERSHELL

- Handy if you're in a primarily Windows environment
- Most things you can think of have been written for you!
- Easy to write for, modify existing scripts to match, and works great for automation
- Can be set for output to generate alert emails, CSVs for easy Excel reports, etc.
- Check out…
  - https://gallery.technet.microsoft.com/
  - https://blogs.technet.microsoft.com/heyscriptingguy/

POWERSHELL – GPO REPORT

- Let's start with something simple; the report for our current GPOs
  - https://github.com/ContinuousAudit/ISACA/blob/master/GPO_Report.ps1
- Open PowerShell ISE
- Start a New Script ( )
- Paste in the report script from the GitHub and change the domain parameter

Untitled1.ps1*

```
Import-Module ActiveDirectory
Import-Module GroupPolicy
$dc = Get-ADDomainController -Discover -Service PrimaryDC
Get-GPOReport -All -Domain your.domain -Server $dc -ReportType HTML -Path C:\Temp\GPOReportsAll.html
```

- Run it by pressing F5 or

POWERSHELL – GPO REPORT

- Now go open your report in C:\temp
- We can combine PowerShell, Task Scheduler, email, and more to minimize the need to manually pull such information
- Let's look at a slightly more involved example

Domain Password Policy

Data collected on: 3/25/2016 12:05:45 PM

General

Computer Configuration (Enabled)

Policies/Windows Settings/Security Settings/Account Policies /Password Policy

Policy	Setting
Enforce password history	12 passwords remembered
Maximum password age	90 days
Minimum password age	1 days
Minimum password length	8 characters
Password must meet complexity requirements	Enabled
Store passwords using reversible encryption	Enabled

POWERSHELL – ACCOUNT LOCKOUT

- Here's a Technet script to email you whenever someone's account locks out
  - https://github.com/ContinuousAudit/ISACA/blob/master/account_locked_out.ps1
- Anyone on the receiving end gets an email that looks like this:

User is locked in the Active Directory

Account name	Account Domain	Caller Computer Name	Date
TEST	TEST-DOMAIN	PCTEST	16-4-2013 9:53:41

- Setup Task Scheduler to call the script on a DC with a trigger on EventID 4740
- Task should call the application PowerShell with arguments that match the script name
- Ex. - powershell -command "& 'C:\Powershell\account_locked_out.ps1' "

POWERSHELL – ACCOUNT LOCKOUT

- Change “smtp.yoursmtpserver” to be your email server’s name or IP
- Set the from address to your liking
- Set the to addresses to your liking

```
$Report= "c:\powershell\html.html"

$HTML=@"
<title>Account locked out Report</title>
<!--mce:0-->
"@

$Account_Name = @{n='Account name';e={$_.ReplacementStrings[-1]}}
$Account_domain = @{n='Account Domain';e={$_.ReplacementStrings[-2]}}
$Caller_Computer_Name = @{n='Caller Computer Name';e={$_.ReplacementStrings[-1]}}


$event= Get-EventLog -LogName Security -InstanceId 4740 -Newest 1 |
   Select TimeGenerated,ReplacementStrings,"Account name","Account Domain","Caller Computer Name" |
   % {
     New-Object PSObject -Property @{
      "Account name" = $_.ReplacementStrings[-7]
      "Account Domain" = $_.ReplacementStrings[5]
      "Caller Computer Name" = $_.ReplacementStrings[1]
      Date = $_.TimeGenerated
    }
   }

  $event | ConvertTo-Html -Property "Account name","Account Domain","Caller Computer Name",Date -
head $HTML -body  "<H2> User is locked in the Active Directory</H2>"|
     Out-File $Report -Append

$MailBody= Get-Content $Report
$MailSubject= "User Account locked out"
$SmtpClient = New-Object system.net.mail.smtpClient
$SmtpClient.host = "smtp.yoursmtpserver"
$MailMessage = New-Object system.net.mail.mailmessage
$MailMessage.from = "account_locked_out@........com"
$MailMessage.To.add("youremail@youremail.com")
$MailMessage.Subject = $MailSubject
$MailMessage.IsBodyHtml = 1
$MailMessage.Body = $MailBody
$SmtpClient.Send($MailMessage)

del c:\powershell\html.html
```

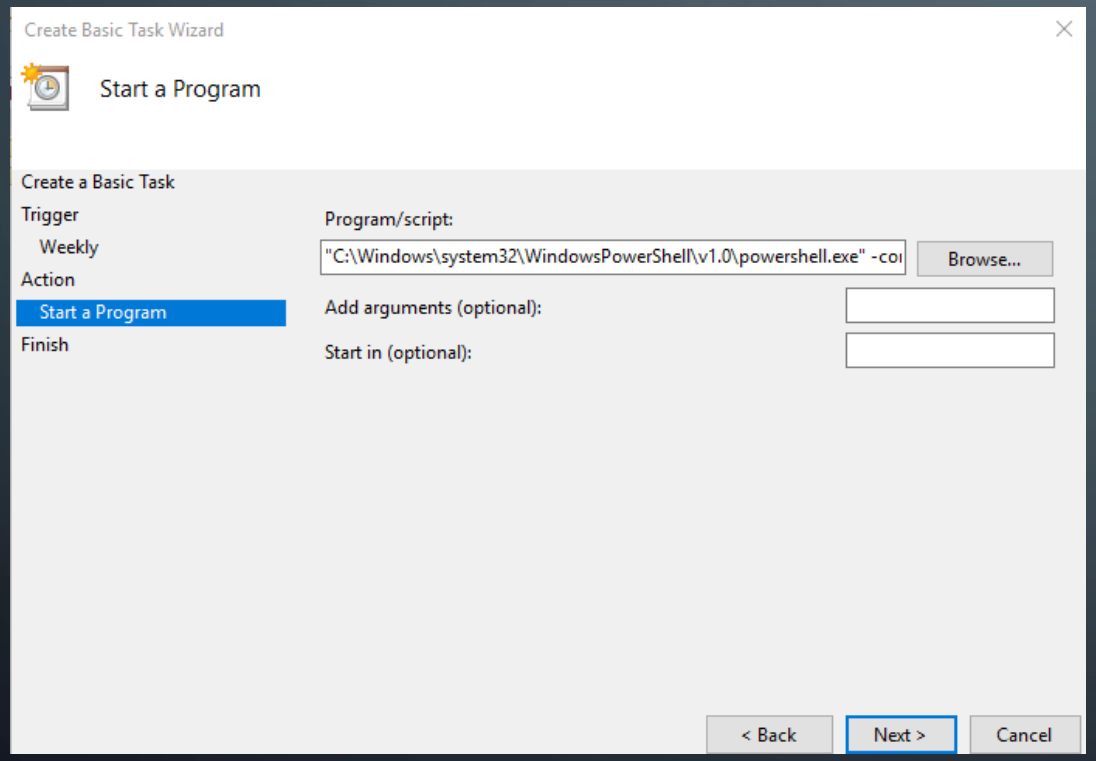
POWERSHELL – GROUP MODIFICATIONS

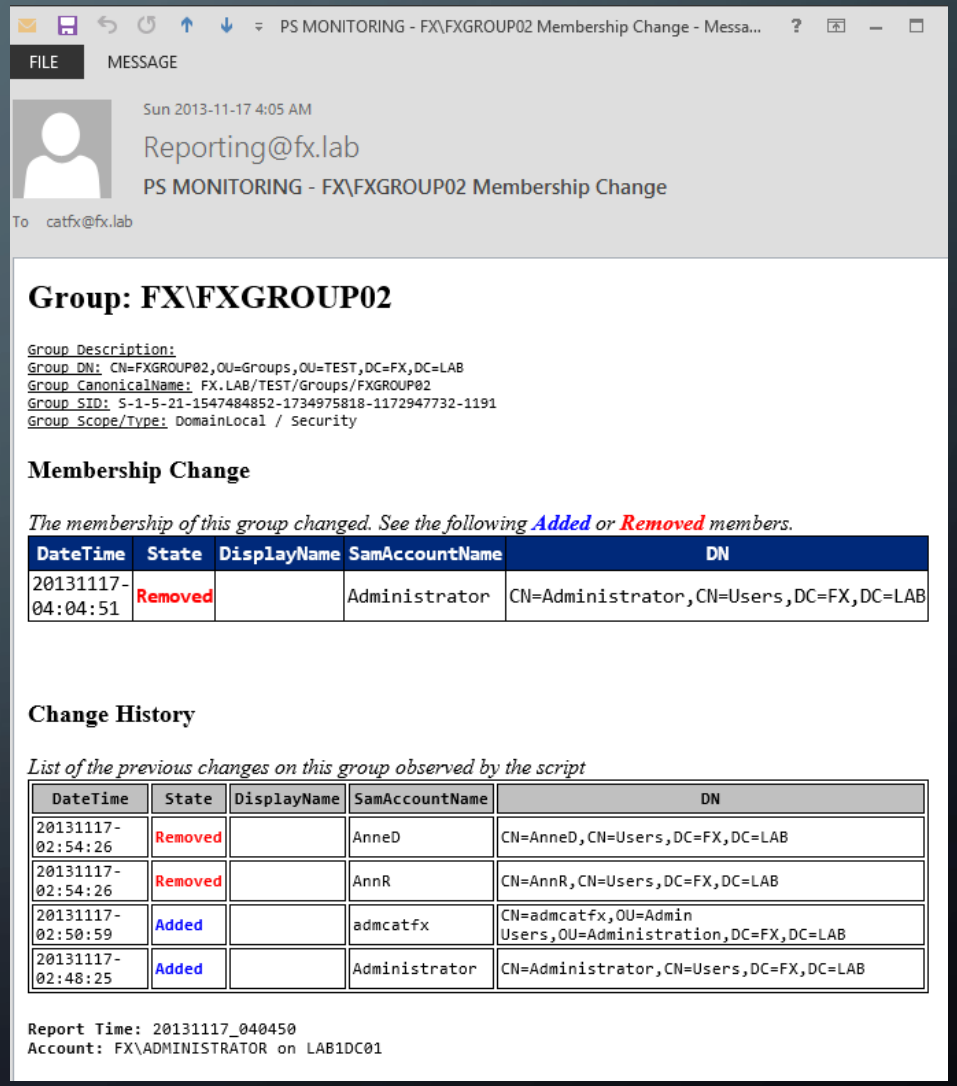
- Here's a favorite compliments of LazyWinAdmin
- Monitors and reports on AD group changes
- Perfect for auditing unnecessary admin accounts away
- Can be scheduled with Task Scheduler to run at your convenience
- Ex. - "C:\Windows\system32\WindowsPowerShell\v1.0\powershell.exe" -command "C:\Scripts\LazyWinAdmin\Monitor-ADGroupMembership.ps1 -group \"Domain Admins\",\"Enterprise Admins\",\"Example Group\" -Emailfrom \"example@email.com\" -Emailto \"your@email.com\" -Emailserver \"your.email.server\""

POWERSHELL – GROUP MODIFICATIONS

- Download the script from the GitHub
  - https://github.com/ContinuousAudit/ISACA/blob/master/Monitor-ADGroupMemberShip.ps1
- Install in PowerShell "Install-Script –name Monitor-ADGroupMembership.ps1"
- Let it run once on the schedule to create your baseline
- Any subsequent changes will be logged in your report
- This report is saved as a CSV you can use, as well as the HTML email

POWERSHELL – GROUP MODIFICATIONS





SCANS

- Vulnerability scans can be an integral part of any security audit
- Though most commercial scanners aren't terribly priced, budget restricted organizations can still setup scheduled scans with a little extra elbow grease
- To start this recipe, you need some flavor of Linux running on whatever you want to run it on (VM, retired desktop, Griffin Connected Toaster, etc.)

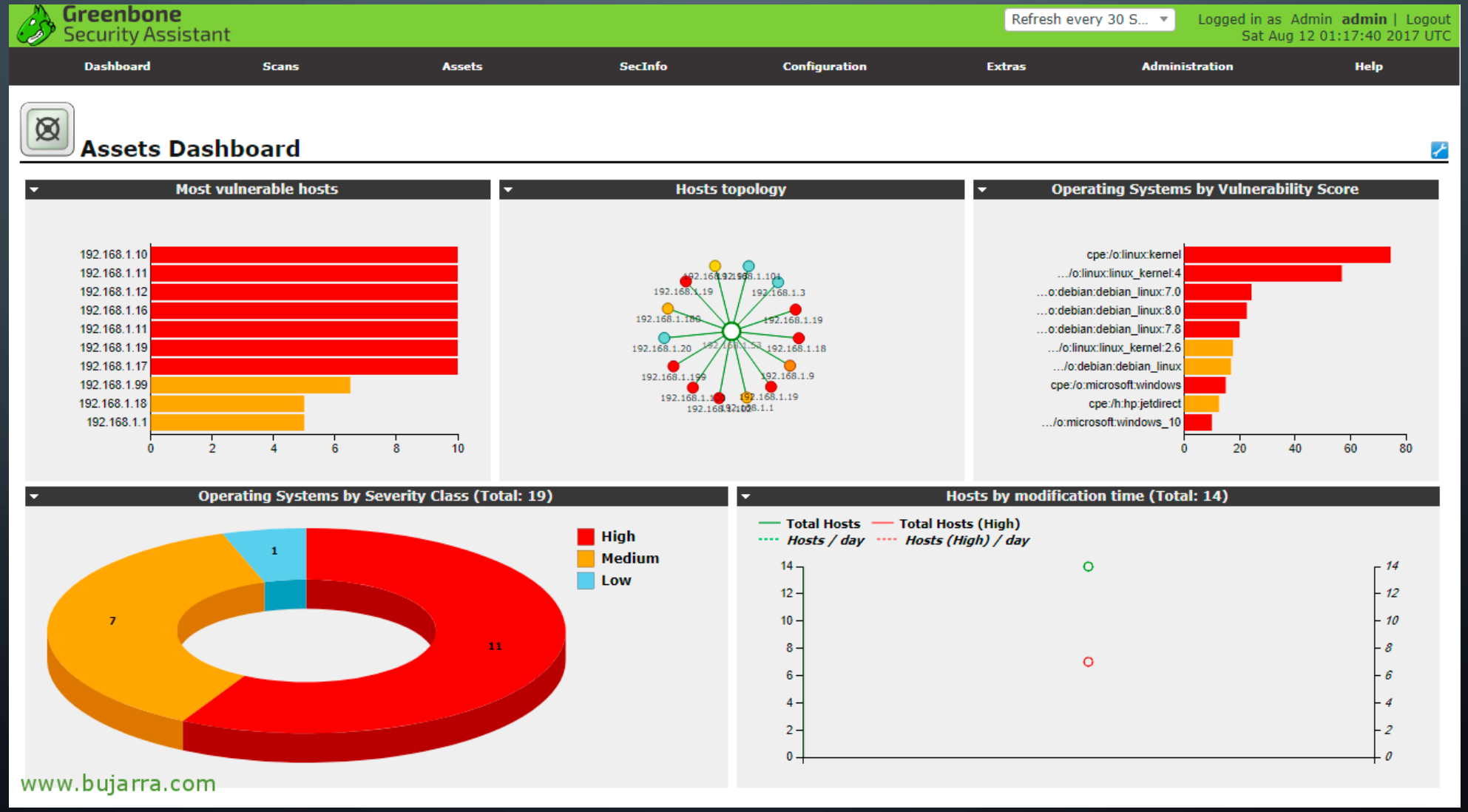
SCANS - OPENVAS

- OpenVAS (Open Vulnerability Assessment System) is a Nessus fork currently maintained by Greenbone Security and the open source community
- You can download a standalone, easy setup VM (Greenbone Security Manager) at https://dl.greenbone.net/download/VM/gsm_ce_4.2.17.iso
- GSM does not have the ability to run scans on a schedule unless you license it
- But an OpenVAS install you do yourself does retain that ability

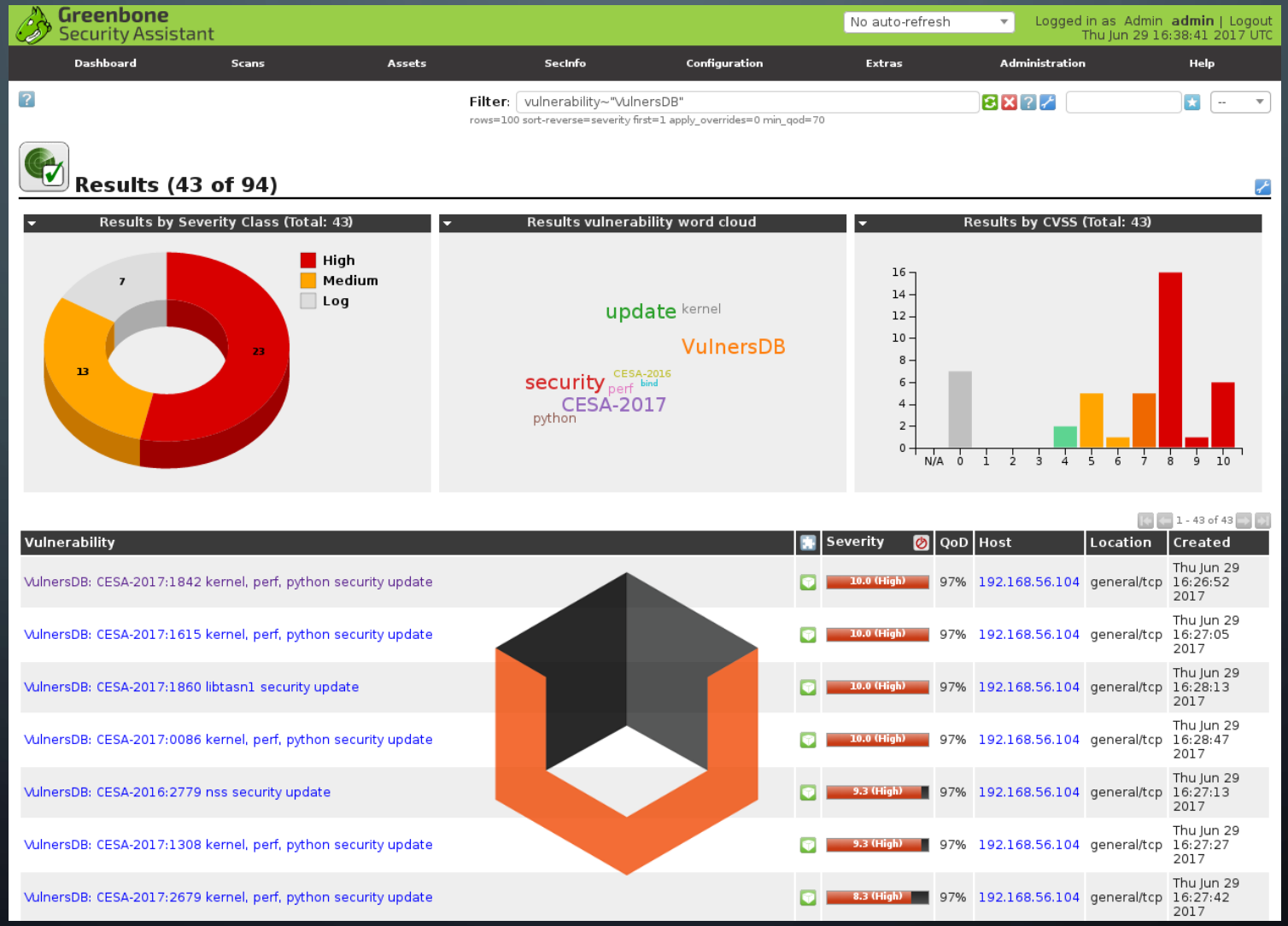
SCANS - OPENVAS

- There are plenty of good tutorials for installing OpenVAS in Linux
  - Debian\Ubuntu:
  - https://launchpad.net/~mrazavi/+archive/ubuntu/openvas
  - http://www.bujarra.com/instalando-usando-openvas/?lang=en
  - https://www.vultr.com/docs/how-to-install-openvas-vulnerability-scanner-on-ubuntu-16-04
  - RHEL\CentOS:
  - https://forums.atomicorp.com/viewtopic.php?f=31&t=8539#p44057
  - https://www.itzgeek.com/how-tos/linux/centos-how-tos/install-openvas-on-centos-7-rhel-7.html

SCANS - OPENVAS



SCANS - OPENVAS



SCANS - OPENVAS

Greenbone Security Assist

https://192.168.1.6/omp?cmd=get_report&type=prognostic&host=192.168.1.8&pos=1&host_search_phrase=&hc

Filtered Prognostic Results 1 - 4 of 4

Host	OS	Start	End	High	Medium	Low	Log	False Pos	Total
192.168.1.8 (ubuntu32.domain.home)		Aug 13, 00:58:46	Aug 13, 01:15:47	1	3	0	0	0	4
Total: 0				1	3	0	0	0	4

Security Issues reported for 192.168.1.8

High (CVSS: 5.1) cpe:/a:apache:http_server:2.2.22
CVE-2013-1862

The host carries the product: cpe:/a:apache:http_server:2.2.22
It is vulnerable according to: CVE-2013-1862.

mod_rewrite.c in the mod_rewrite module in the Apache HTTP Server 2.2.x before 2.2.25 writes data to a log file without sanitizing non-printable characters, which might allow remote attackers to execute arbitrary commands via an HTTP request containing an escape sequence for a terminal emulator.

Medium (CVSS: 4.3) cpe:/a:apache:http_server:2.2.22
CVE-2012-3499

The host carries the product: cpe:/a:apache:http_server:2.2.22
It is vulnerable according to: CVE-2012-3499.

Multiple cross-site scripting (XSS) vulnerabilities in the Apache HTTP Server 2.2.x before 2.2.24-dev and 2.4.x before 2.4.4 allow remote attackers to inject arbitrary web script or HTML via vectors involving hostnames and URIs in the (1) mod_imagemap, (2) mod_info, (3) mod_ldap, (4) mod_proxy_ftp, and (5) mod_status modules.

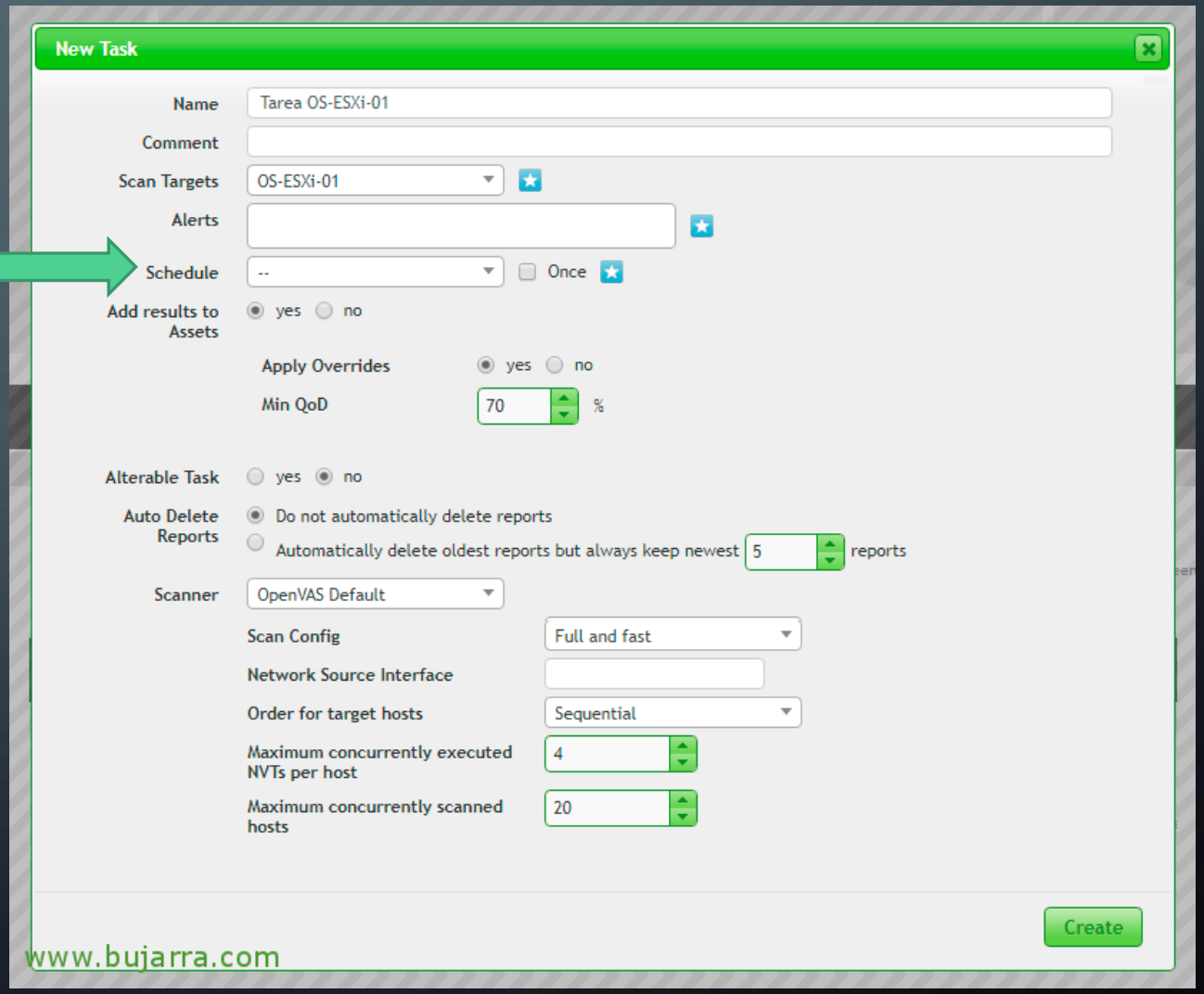
Medium (CVSS: 4.3) cpe:/a:apache:http_server:2.2.22
CVE-2012-4558

The host carries the product: cpe:/a:apache:http_server:2.2.22
It is vulnerable according to: CVE-2012-4558.

Multiple cross-site scripting (XSS) vulnerabilities in the balancer_handler function in the manager interface in mod_proxy_balancer.c in the mod_proxy_balancer module in the Apache HTTP Server 2.2.x before 2.2.24-dev and 2.4.x before 2.4.4 allow remote attackers to inject arbitrary

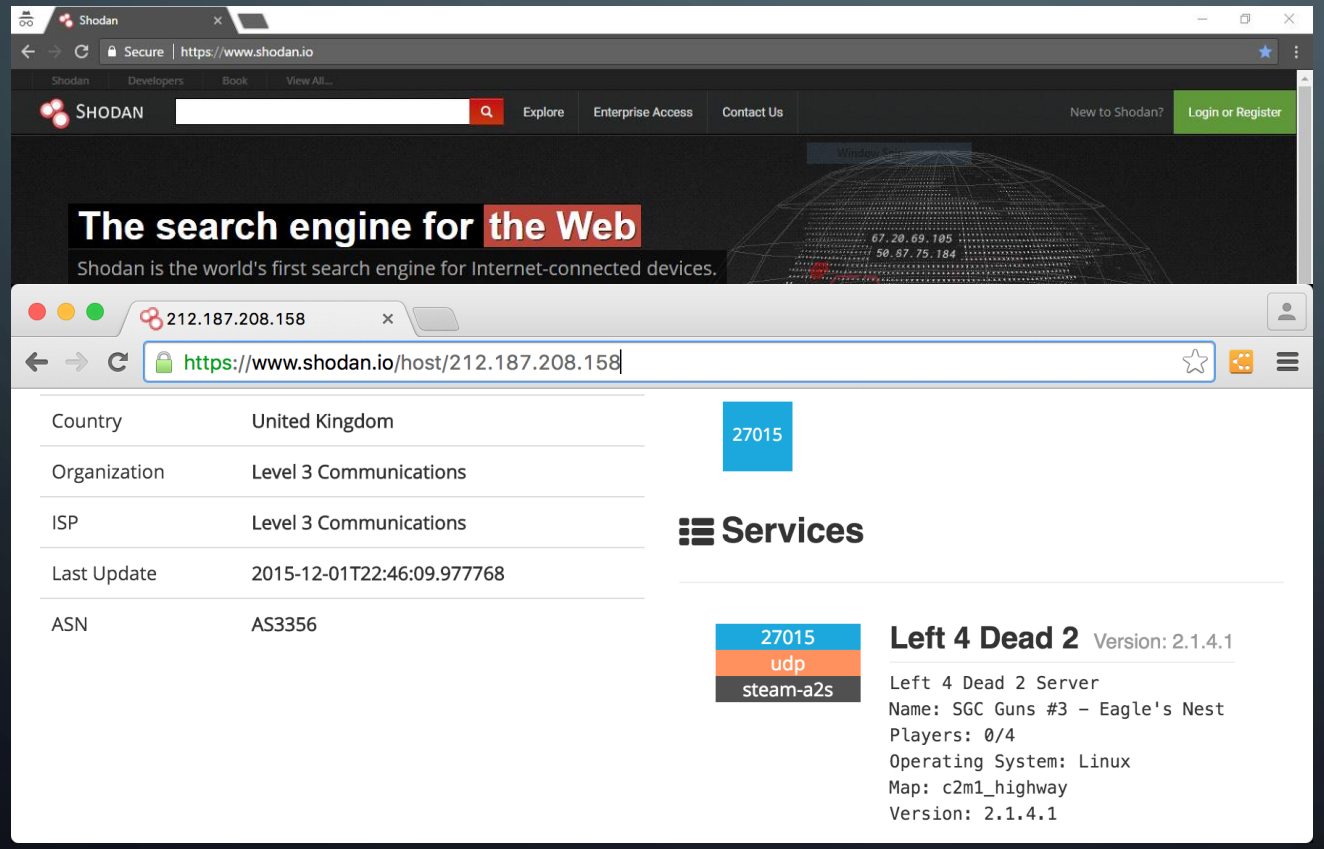
SCANS - OPENVAS

- Scans, or tasks, can be set to run on a schedule and generate PDF reports
- If interested, check one of the earlier tutorial links for a complete walkthrough



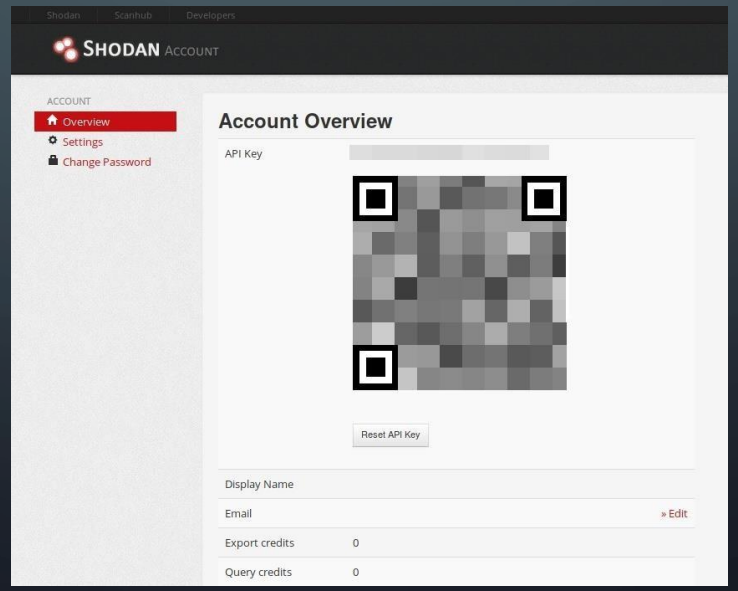
SCANS – SHODAN

- Shodan.io is great for checking what you've exposed to the world



SCANS – SHODAN AUTOMATION

- Shodan.io features an API that can be called with Python
- This allows us to create automated tasks to monitor our organizations public systems
- Create a Shodan account, and go under the “My Account” section to get your API key



SCANS – SHODAN AUTOMATION

- Install Python on your Windows (or Linux) system
  - Get it from: https://github.com/ContinuousAudit/ISACA/blob/master/python-2.7.15.amd64.msi
- Open Command Prompt, navigate to your python directory
  - "cd C:\Python27\"
- Install PIP
  - Download from: https://github.com/ContinuousAudit/ISACA/blob/master/get-pip.py
  - Copy it to your Python directory
  - Run "python get-pip.py"

Command Prompt

```
Microsoft Windows [Version 10.0.17134.112]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\Nick>cd C:\Python27\

C:\Python27>python get-pip.py
```

SCANS – SHODAN AUTOMATION

- Change to your scripts directory
  - cd ".\scripts"

```
C:\Python27>cd .\scripts

C:\Python27\Scripts>
```

- Install the Shodan library using Pip
  - "pip install shodan"

```
C:\Python27\Scripts>pip install shodan
Collecting shodan
  Downloading https://files.pythonhosted.org/packages/fe/cd
/shodan-1.8.1.tar.gz (43kB)
    100% |################################| 51kB 1.0MB/s
Collecting click (from shodan)
  Downloading https://files.pythonhosted.org/packages/34/c1
/click-6.7-py2.py3-none-any.whl (71kB)
    100% |################################| 71kB 1.3MB/s
Collecting click-plugins (from shodan)
  Downloading https://files.pythonhosted.org/packages/77/05
/click-plugins-1.0.3.tar.gz
Collecting colorama (from shodan)
  Downloading https://files.pythonhosted.org/packages/db/c8
/colorama-0.3.9-py2.py3-none-any.whl
Collecting requests>=2.2.1 (from shodan)
  Downloading https://files.pythonhosted.org/packages/65/47
/requests-2.19.1-py2.py3-none-any.whl (91kB)
    100% |################################| 92kB 1.5MB/s
Collecting XlsxWriter (from shodan)
  Downloading https://files.pythonhosted.org/packages/33/50
/XlsxWriter-1.0.5-py2.py3-none-any.whl (142kB)
    100% |################################| 143kB 2.0MB/s
Collecting idna<2.8,>=2.5 (from requests>=2.2.1->shodan)
  Downloading https://files.pythonhosted.org/packages/4b/2a
/idna-2.7-py2.py3-none-any.whl (58kB)
    100% |################################| 61kB 1.2MB/s
```

- Install PIP
  - Download from: https://github.com/ContinuousAudit/ISAC
  - Copy it to your Python directory
  - Run "python get-pip.py"

```
Command
Microsoft
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\Nick>cd C:\Python27\

C:\Python27>python get-pip.py
```

SCANS – SHODAN AUTOMATION

- Change to your scripts directory
  - cd ".\scripts"
- Install the Shodan library using Pip
  - "pip install shodan"

```
C:\Python27>cd .\scripts

C:\Python27\Scripts>
```

```
C:\Python27\Scripts>pip install shodan
Collecting shodan
  Downloading https://files.pythonhosted.org/packages/fe/cd
/shodan-1.8.1.tar.gz (43kB)
    100% |################################| 51kB 1.0MB/s
Collecting click (from shodan)
  Downloading https://files.pythonhosted.org/packages/34/c1
/click-6.7-py2.py3-none-any.whl (71kB)
    100% |################################| 71kB 1.3MB/s
Collecting click-plugins (from shodan)
  Downloading https://files.pythonhosted.org/packages/77/05
/click-plugins-1.0.3.tar.gz
Collecting colorama (from shodan)
  Downloading https://files.pythonhosted.org/packages/db/c8
/colorama-0.3.9-py2.py3-none-any.whl
Collecting requests>=2.2.1 (from shodan)
  Downloading https://files.pythonhosted.org/packages/65/47
/requests-2.19.1-py2.py3-none-any.whl (91kB)
    100% |################################| 92kB 1.5MB/s
Collecting XlsxWriter (from shodan)
  Downloading https://files.pythonhosted.org/packages/33/50
/XlsxWriter-1.0.5-py2.py3-none-any.whl (142kB)
    100% |################################| 143kB 2.0MB/s
Collecting idna<2.8,>=2.5 (from requests>=2.2.1->shodan)
  Downloading https://files.pythonhosted.org/packages/4b/2a
/idna-2.7-py2.py3-none-any.whl (58kB)
    100% |################################| 61kB 1.2MB/s
```

SCANS – SHODAN AUTOMATION

- Open your text editor of choice
- We're going to create our actual script
- Shodan allows for many filters depending on what we want to monitor, ex.-
  - country: Country
  - city: City
  - geo: Coordinates
  - hostname: Hostname
  - net: IP\Prefix
  - os: Operating System
  - port: Ports
  - org: Organization
  - product: Specific software

SCANS – SHODAN AUTOMATION

- Grab the sample script from:
  https://github.com/ContinuousAudit/ISACA/blob/master/shodan_automation_sample.py
- Script should include a few things
  - "import shodan" to import the library
  - Your API key
  - Whatever you want to find or monitor
- The example script looks for

  XP systems with RDP open in Tallahassee

  and outputs their IPs as a CSV

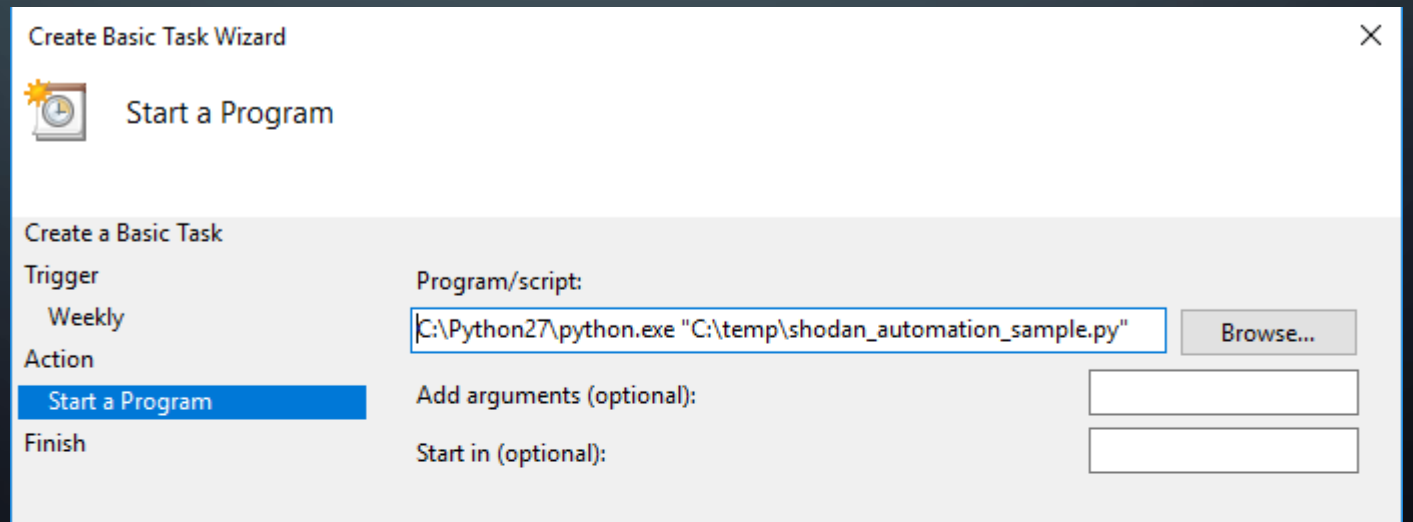
shodan_automation_sample - Notepad

File Edit Format View Help

```
import shodan

SHODAN_API_KEY = "YOUR API KEY IN THESE QUOTES"

api = shodan.Shodan(SHODAN_API_KEY)

try:
        #Search\Monitor Item
        results = api.search('whatever you want')

        #Gather Info
        for result in results['matches']
                print '%s' % result['ip_str']

import csv
```

SCANS – SHODAN AUTOMATION

- Now we can use Task Scheduler to automatically run this report item for us
- Save your .py script file and use it in the program name in quotes
  - Ex. – C:\Python27\python.exe “C:\whereyourfileis\shodan_automation_sample.py”
- Set whatever schedule you like and enjoy

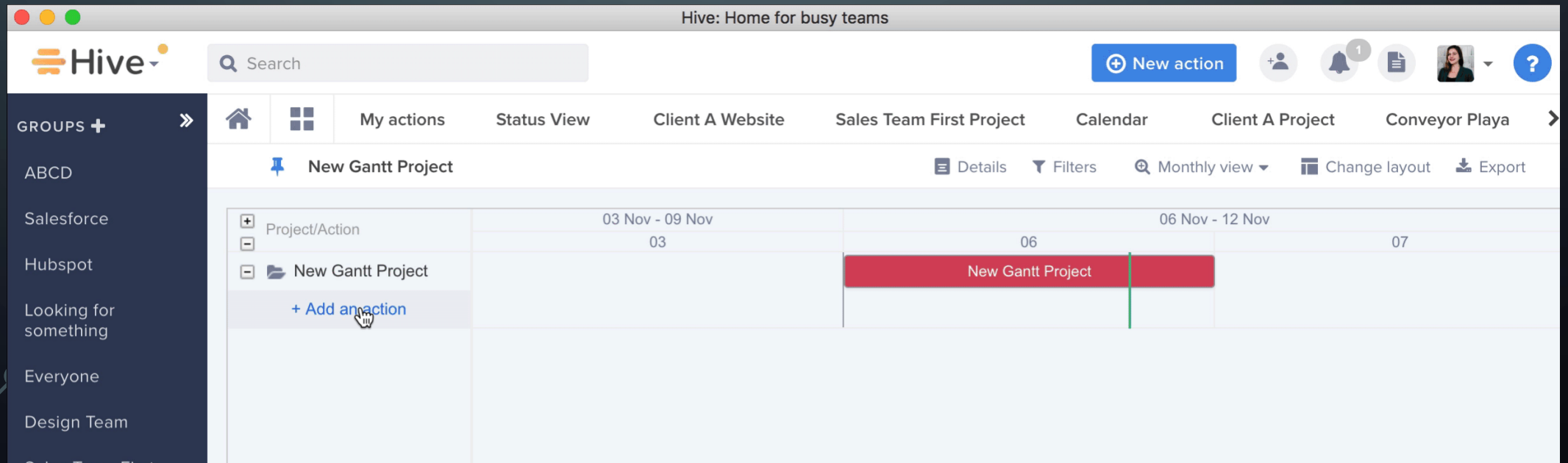


KEEPING TRACK OF IT ALL

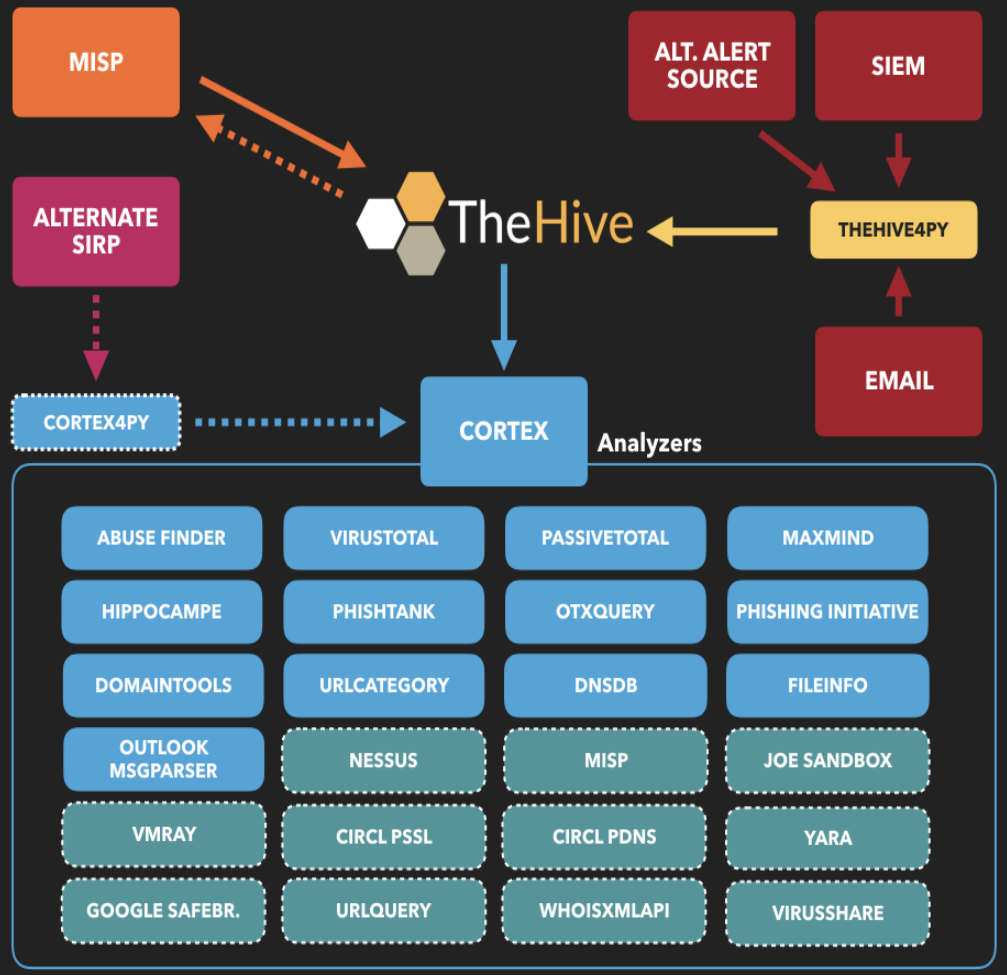
- Now that you've started automating some of your tasks, how to keep track of it all?
- Gathered audit information, and the logs needed to generate it, can be assembled with your SIEM or other logging tool
- If the budget doesn't allow for a commercial tool, try standing up an open source option such as Graylog or TheHive
- Leveraging some form of SIEM or similar tracking tool allows for quick access to any related data or gathered alerts and reports
- This takes the sting out of compiling all your new automated reports and alerts and converting it into actionable data

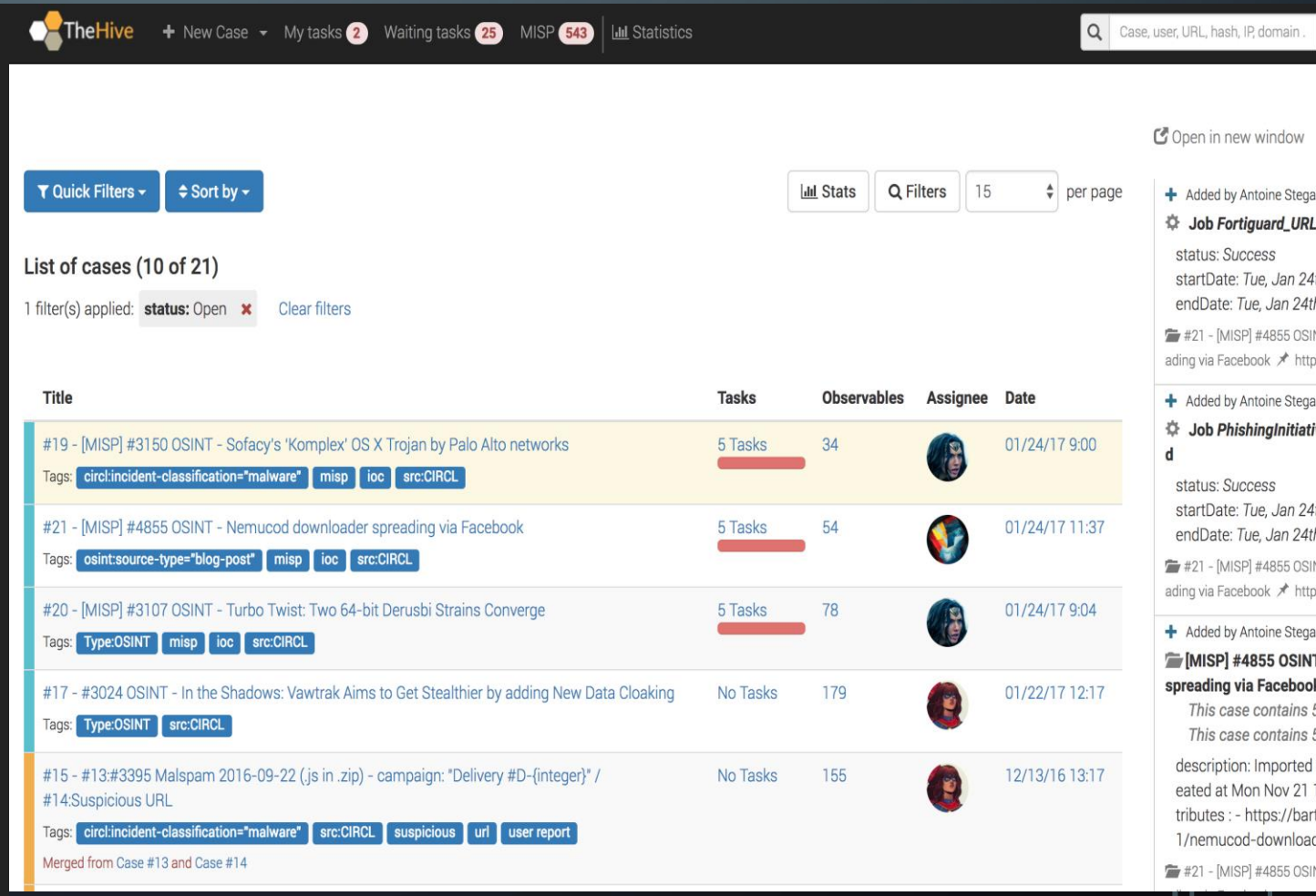
KEEPING TRACK OF IT ALL

- TheHive allows for easy searching and collection of audit and incident response materials
- There's a test VM available to play with at:
- https://drive.google.com/open?id=0B3G-Due88gfQMzlfZ2t6RVhqTUk



KEEPING TRACK OF IT ALL





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