



# HOME NETWORK SECURITY MONITORING

THE CHEAP AND EASY WAY!

# WHOAMI

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# WHY MONITOR THE HOME NETWORK?

- Attacks are not restricted to Enterprise networks
- Sanity-checking networked device communications
- Awareness of unauthorized devices on the network
- Provides additional troubleshooting support
- Allows you to create your own events to alert on
- ...Why not? 😊



SecurityOnion

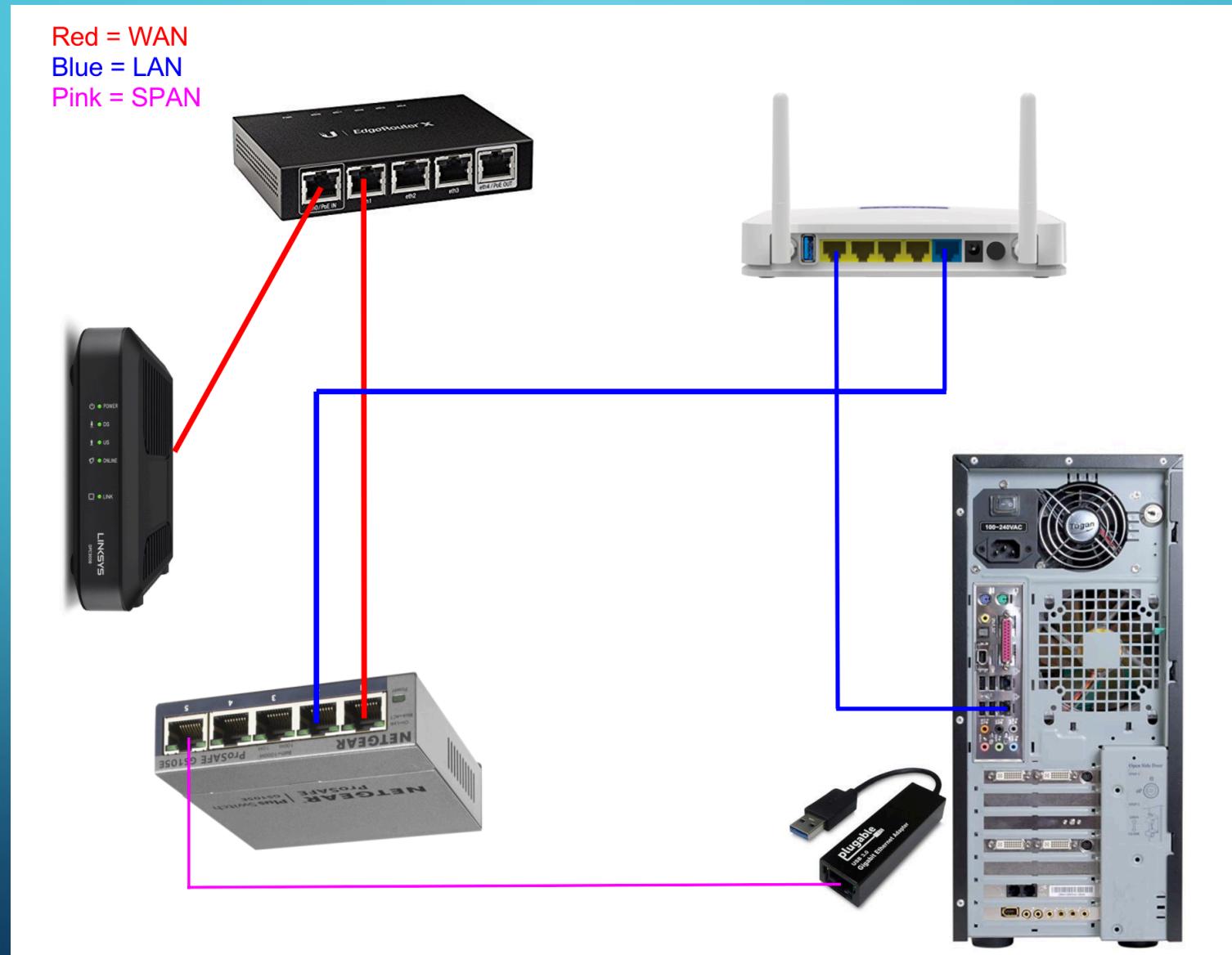
# SHOPPING LIST

- Ubiquiti EdgeRouter X - \$50
- Netgear GS105E - \$45
- USB 3.0 Ethernet adapter (ASIX AX88179 Chipset) - \$15
- VirtualBox VM - \$0
  - We'll also need the SecurityOnion ISO
  - ...also \$0 😊



**TOTAL COST TO IMPLEMENT: \$110\***

# EXAMPLE NETWORK CONFIGURATION



# DOWNLOADING & INSTALLING VIRTUALBOX

- Visit <https://www.virtualbox.org/wiki/downloads>
  - Download the appropriate platform package for your OS
  - Grab the Extension Pack as well (the same pack supports all OSes)
- Run the installer and follow the instructions presented on the screen
- Start VirtualBox
- Run the Extension Pack file, select “Install” in VirtualBox, then accept the ToS from Oracle

# DEPLOY AND CONFIGURE THE EDGEROUTER X

- Supply power to the ERX and connect your computer to the ERX's eth0 port
  - You'll need to give your computer an IP on the 192.168.1.0/24 subnet; the ERX doesn't have a DHCP server enabled by default
- Open a web browser and go to <https://192.168.1.1>
  - Accept the cert; you can add it to your trust store or supply your own later
- Login with the default credentials
  - Username: ubnt
  - Password: ubnt

# DEPLOY AND CONFIGURE THE EDGEROUTER X

- Download the firmware update by visiting Ubiquity's website
  - Direct link: <https://dl.ubnt.com/firmwares/edgemax/v1.9.7/ER-e50.v1.9.7+hotfix.3.5013617.tar>
- Upload and install the new firmware image
  - System tab (bottom) > Upgrade System Image > Upload a file
  - Reboot and login again

# DEPLOY AND CONFIGURE THE EDGEROUTER X

- First we need to run the setup wizard
  - You should be taken there automatically, but if not, Wizards tab > Basic Setup
  - In the “One LAN” section, uncheck “Only use one lan”
    - This gives us a LAN on eth1 with a DHCP server, a separate LAN on eth2, eth3 and eth4 with its own DHCP server, default “Deny” firewall rules, and a WAN link on eth0
  - In the “User setup” section, choose “Create new admin user” and provide a new username and password
  - Click “Apply”, then “Apply Changes”, then “Reboot Now”
  - While the ERX is rebooting, connect your modem and switch to the ERX via eth0 and eth1 respectively; connect your computer to the switch via port 3

# DEPLOY AND CONFIGURE THE GS105E

- Apply power to the switch and give it a moment to boot
- Look for the DHCP address assigned to the switch in the ERX
  - Dashboard tab > DHCP > LAN1 Actions drop-down > View Leases
  - MAC starts with b0:7f:b9, helpful if it's the only Netgear product on the network...
- Direct your web browser to <http://ip.of.the.gs105e>
  - Use the IP you found above, not that terrible URL!
  - Login with the default password of “password”... over HTTP...
    - Bad Netgear! Bad bad bad!

# DEPLOY AND CONFIGURE THE GS105E

- Let's start off by changing that awful default password...
  - System tab > Maintenance > Change Password
- Now we can setup the SPAN port
  - System tab > Monitoring > Mirroring
  - Select “Enable” from the Mirroring drop-down menu
  - Select “5” from the Destination Port drop-down menu
  - Select ports 1-4 for the “Source Port”
  - Click “Apply”
- Now, connect port 2 of the switch to the WAN port of your wireless router

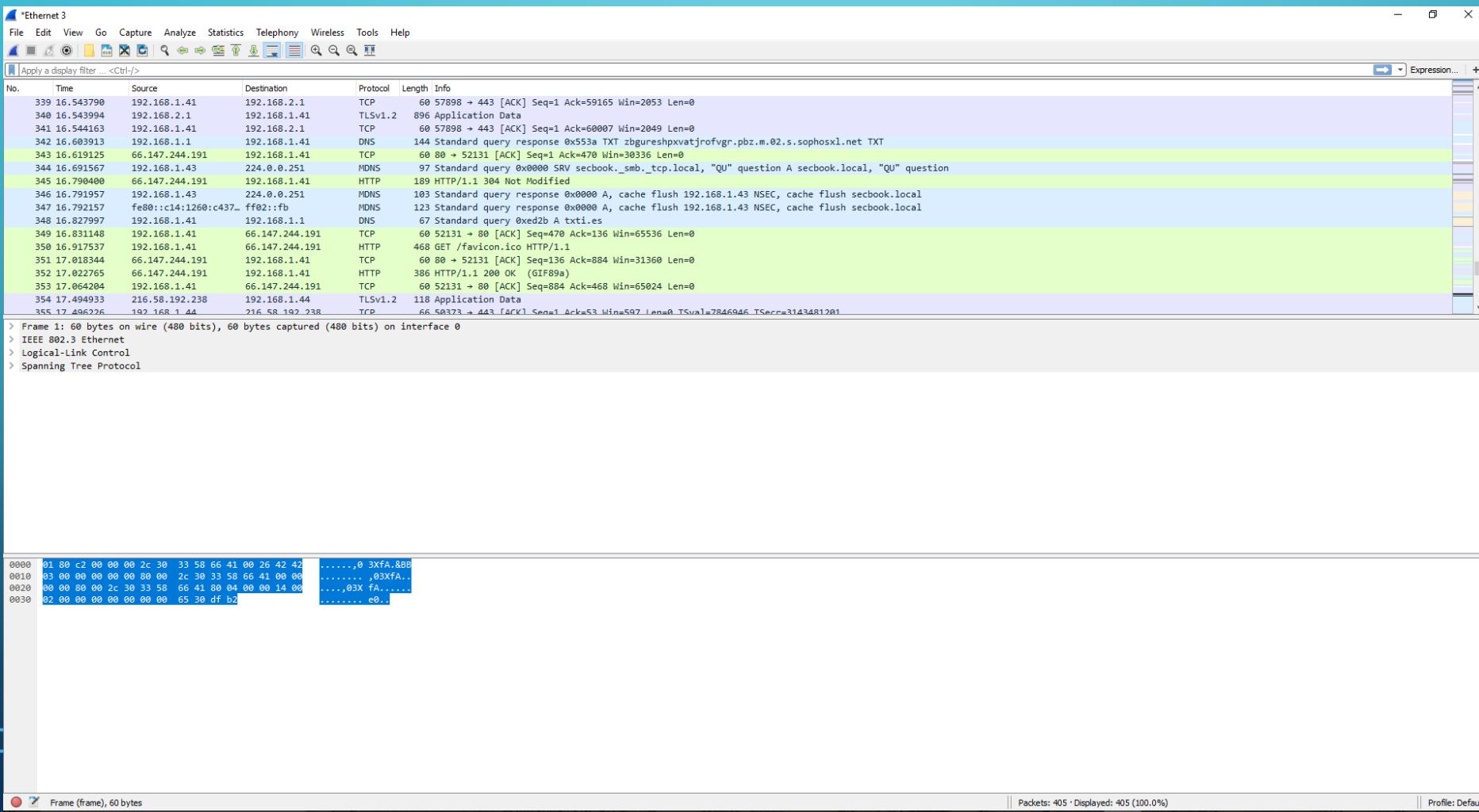
# RECONFIGURE YOUR WIRELESS ROUTER

We need to configure your existing wireless router to act as an AP, not a router.

How to do this will vary by manufacturer, but for Netgear products...

- Login to the router web GUI
  - Advanced tab > Advanced setup > Wireless AP
  - Check the “Enable AP Mode” box and click “Apply”
  - Keep the “Get IP settings dynamically” option selection and confirm your choice

# VERIFY EVERYTHING WORKS BY RUNNING A PACKET CAPTURE ON THE SPAN INTERFACE





WE ARE NOW MIRRORING ALL NETWORK TRAFFIC!

NOT ONLY THAT, WE'RE DOING IT WITH PER-HOST LEVEL GRANULARITY.

# DOWNLOAD AND DEPLOY SECURITYONION

- Visit <https://securityonion.net/> and download the latest ISO
- Fire up VirtualBox and click “New”
  - Name the virtual machine, choose “Linux” as the Type, “Ubuntu (64-bit)” for Version, then click Next
  - Set the memory to 4096 MB, then click Next
  - Keep the “Create a virtual hard disk now” option selected, then click Create
  - Keep “VDI” selected as the image type, then click Next
  - Keep “Dynamically allocated” selected, then click Next
  - Give the OS disk as much disk space as possible, choose a location to save it, then click Create

# DOWNLOAD AND DEPLOY SECURITYONION

- Highlight the virtual machine you just created and make the following changes
  - Click “Display”, adjust the video memory to 128 MB
  - Click “Network”, select the “Adapter 2” tab
    - Enable it
    - Choose “Bridged Adapter” for the network interface
    - Click “Advanced”, and change the Promiscuous Mode drop-down to “Allow All”
  - Click “Storage”, click the disk with the green plus sign, then select “Add Optical Drive”
    - Select “Choose disk”, locate the SecurityOnion ISO you downloaded, then click “Open”
    - Click “OK”
  - Finally, click “Start” to power on the virtual machine

# DOWNLOAD AND DEPLOY SECURITYONION

- Once the OS loads, select your language and click “Continue”
  - Select the “Download updates while installing” option, then click “Continue”
  - Click “Install Now”, then click “Continue”
  - Select your time zone (should be detected automatically) and click “Continue”
  - Select your keyboard layout, move the window to the left a bit click “Continue”
  - Enter the user information, then click “Continue”

SecurityOnion will now install itself as the OS of the VM!

When prompted, click “Restart Now” to complete the installation.

# CONFIGURE SECURITYONION

- Login with the user credentials you created during deployment
- Click the icon in the upper left, then click “Terminal”
  - Run the command “sudo soup” (without quotes); this will update the SecurityOnion OS
  - If asked, don’t update `50unattended_upgrades`
  - Reboot & login when prompted
- Double-click “Setup” and enter your password
  - Click “Yes, Continue!”
  - Click “Yes, configure `/etc/network/interfaces`!”
    - Select “eth0” for the management interface and click “OK”
    - Select “DHCP” and click “OK” (you can change this later)

# CONFIGURE SECURITYONION

- Click “Yes, configure sniffing interfaces!”
  - Ensure “eth1” is checked and click “OK”
- Click “Yes, make changes!” followed by “Yes, reboot!”
- Login again once the system has rebooted, then double-click “Setup” again
  - Enter your password, then click “Yes, Continue!” when prompted
  - Click “Yes, skip network configuration!”

# CONFIGURE SECURITYONION

- Select “Production Mode”, then click “OK”
  - Select “Standalone”, then click “OK”
  - Select “Best Practices”, then click “OK”
  - Select a Sguil username, then click “OK”
  - Enter a password for the user, click “OK”, confirm the password, and click “OK” again
  - Ensure “Snort” is selected as your IDS Engine, then click “OK”
  - Ensure “Emerging Threats Open” is selected as your IDS ruleset, then click “OK”
  - Leave the default PF\_RING min\_num\_slots value at 4096, then click “OK”
  - Ensure “eth1” is checked, then click “OK”
  - Leave the default HOME\_NET value, then click “OK”
  - Click “Yes, proceed with changes!”

# CONFIGURE SECURITYONION

- Finally, we'll poke in hole in the firewall so we don't have to use the VM directly all the time...
  - Open a terminal and run `sudo ufw allow https && sudo ufw reload`
  - This gives us access to the web interface of ELSA, our default SIEM for Bro logs, from anywhere on our LAN; you might want to restrict this further if your home network is big enough



# WE ARE NOW CAPTURING ALL NETWORK TRAFFIC!



STILL DOING IT WITH PER-HOST LEVEL GRANULARITY B)

R.I.P. YOUR DISK SPACE



# DO YOU EVEN SCRIPT, BRO?

- Bro is an awesome network monitoring tool
  - Event-driven, connection-oriented framework
  - Correlation is left completely to the user
- SecurityOnion sets Bro up to monitor a lot out of the box:
  - Top connections, top services, DNS info, MIME types, HTTP, Kerberos, MySQL, RADIUS, RDP, SNMP, Snort, and more!
  - Sguil is provided to help detect and deal with what Bro sees, but what if we want custom alerts?

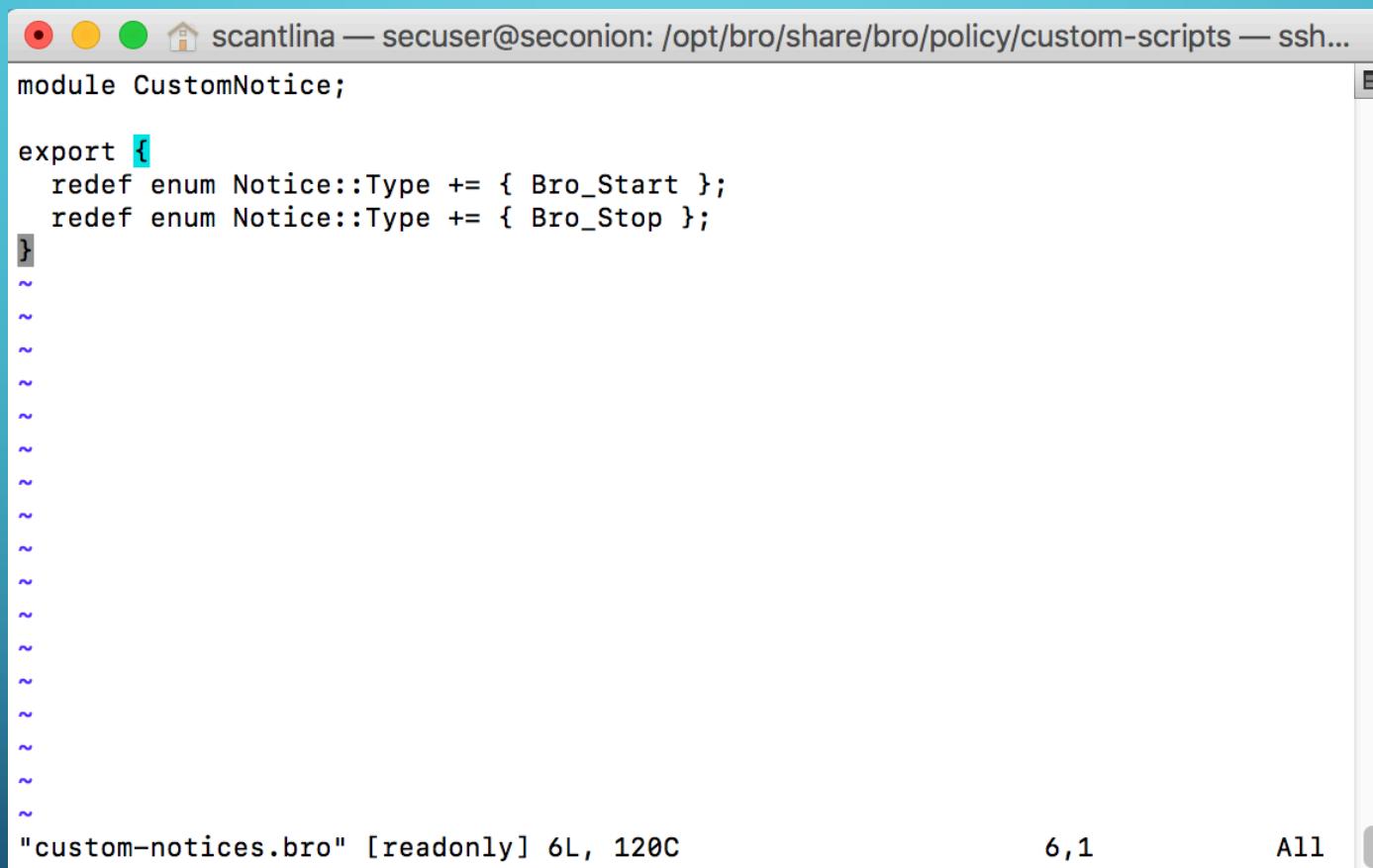
# DO YOU EVEN SCRIPT, BRO?

- The answer: Bro scripting
  - Virtually everything Bro does is orchestrated through Bro scripts
  - We will store our custom scripts in a folder at `/opt/bro/share/bro/policy/`
    - Run the command `sudo mkdir /opt/bro/share/bro/policy/custom-scripts`
- Our collection of scripts will make up a module, which needs
  - `main.bro` - this is where we implement the logic for our scripts
  - One or more `bro` scripts - this is where we implement the functionality for our scripts
  - `__load__.bro` - this is a list of the files that make up your module

# DO YOU EVEN SCRIPT, BRO?

- `custom-notices.bro`
  - As the name implies, the function of this script will be to facilitate custom notices
  - At a minimum, a module script needs
    - To declare the module name
    - Provide all variables and functions to be accessed by other scripts in the `export` block
  - For now, we'll just create some custom Notice types to raise when Bro starts and stops

# DO YOU EVEN SCRIPT, BRO?



```
scantlina — secuser@seconion: /opt/bro/share/bro/policy/custom-scripts — ssh...
module CustomNotice;

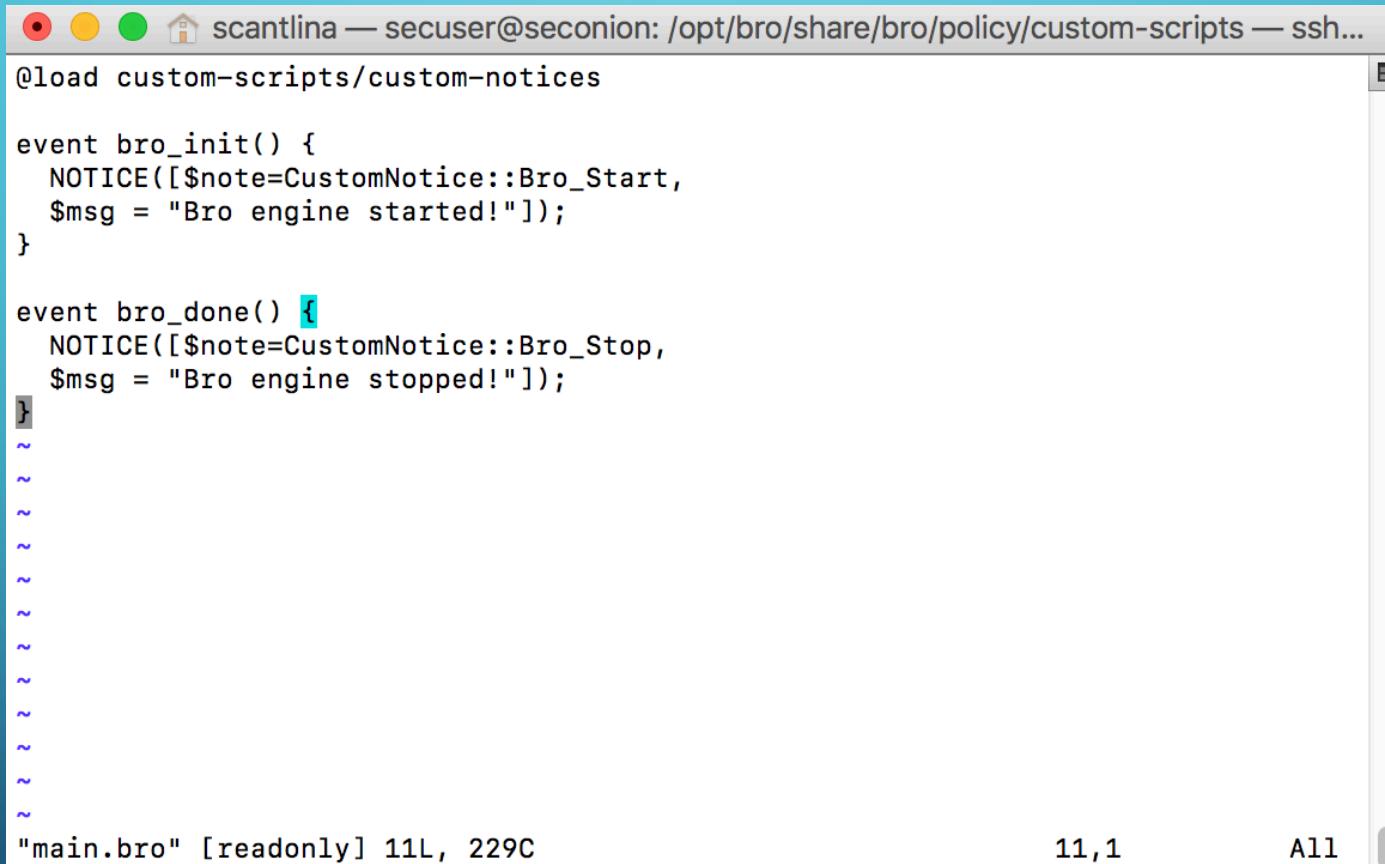
export {
    redef enum Notice::Type += { Bro_Start };
    redef enum Notice::Type += { Bro_Stop };
}

"custom-notices.bro" [readonly] 6L, 120C      6,1      All
```

# DO YOU EVEN SCRIPT, BRO?

- **main.bro**
  - Event-driven logic component
  - Two events always happen
    - `bro_init()`
    - `bro_done()`
  - Our template script will make use of these two events

# DO YOU EVEN SCRIPT, BRO?



A terminal window titled "scantlina — secuser@seconion: /opt/bro/share/bro/policy/custom-scripts — ssh..." displays a custom Bro script named "custom-notices". The script contains two event handlers: "bro\_init()" and "bro\_done()". Both events trigger a NOTICE message with the note "CustomNotice::Bro\_Start" or "CustomNotice::Bro\_Stop" and a message string "Bro engine started!" or "Bro engine stopped!". The terminal window also shows the file path "main.bro" [readonly] 11L, 229C at the bottom.

```
@load custom-scripts/custom-notices

event bro_init() {
    NOTICE([$note=CustomNotice::Bro_Start,
    $msg = "Bro engine started!"]);
}

event bro_done() {
    NOTICE([$note=CustomNotice::Bro_Stop,
    $msg = "Bro engine stopped!"]);
}

"main.bro" [readonly] 11L, 229C
```

# DO YOU EVEN SCRIPT, BRO?

- \_\_load\_\_.bro
  - Tells the Bro control process what files are needed for this module to operate

# DO YOU EVEN SCRIPT, BRO?

# DO YOU EVEN SCRIPT, BRO?

- Now we need to make sure Bro will use our custom module
  - Crack open `/opt/bro/share/bro/site/local.bro` and add the line `@load custom-scripts` to the end of the file
- Time to reload Bro!
  - Run the command `sudo broctl`
    - From BroControl, run the command `install`
    - Then, run the command `restart`
    - Next, run the command `scripts` and confirm your `custom-scripts` module is in the list
    - Finally, run the command `exit` to return to the shell

# DO YOU EVEN SCRIPT, BRO?

Security Onion

- ▶ [Connections](#)
- ▶ [DHCP](#)
- ▶ [DNP3](#)
- ▶ [DNS](#)
- ▶ [Files](#)
- ▶ [Firewall](#)
- ▶ [FTP](#)
- ▶ [Host Logs](#)
- ▶ [HTTP](#)
- ▶ [Intel](#)
- ▶ [IRC](#)
- ▶ [Kerberos](#)
- ▶ [Modbus](#)
- ▶ [MySQL](#)
- ▶ [Notice](#)
  - [Top / Bottom SRC IPs](#)
  - [Top / Bottom DST IPs](#)
  - [Top / Bottom Notice Types](#)
  - [ShellShock Exploits](#)
  - [ShellShock Scanners](#)
- ▶ [PE](#)

ELSA ▾ Admin ▾

Query `class=BRO_NOTICE "-" groupby:notice_type`  [Help](#)

UTC  notice\_type ▾   Reuse current tab  Grid display

`class=BRO_NOTICE "-" groupby:notice_type (2) [Grouped by notice_type]`

Result Options... ▾

Count	Value
29	<a href="#">SSL::Invalid_Server_Cert</a>
1	<a href="#">CustomNotice::Bro_Start</a>

■ notice\_type `class=BRO_NOTICE "-" groupby:notice_type (2) [Grouped by notice_type]`

Notice Type	Count
SSL::Invalid_Server_Cert	29
CustomNotice::Bro_Start	1

1 node(s) with 56675.0 logs indexed and 56733.0 archives

# DO YOU EVEN SCRIPT, BRO?

Ok, that's cool... but not terribly useful. Bro scripting is too complex to cover in a matter of hours, but one important event for security alerts is *new\_connection*

- **event *new\_connection* (c: connection)**
  - Generated for every new connection
  - Event contains a *connection* object
  - Among other things, this object provides the origin IP and destination IP
- **Using this connection, we can come up with some more meaningful alerts**
  - Compare origin and/or destination with a known malicious IP list, alert on match
  - Examine port and protocol, alert on atypical results
  - Compare HTTP info with a known malicious domain list, alert on match

## A FUN, TRIVIAL EXAMPLE...



Bing\_User\_Detected|Bing user detected at 192.168.1.47! Teach 'em to fish or drown 'em, your choice.|---|---|---|

NOTICE srcip=127.0.0.1 srcport=0 dstip=127.0.0.1 dstport=0 mime\_type=- desc=- protocol=-  
notice\_msq=Bing user detected at 192.168.1.47! Teach 'em to fish or drown 'em, your choice. sub\_msq=-

# A FUN, TRIVIAL EXAMPLE...

```
scantlina — secuser@seconion: /opt/bro/share/bro/policy/custom-scripts — ssh...
@load custom-scripts/custom-notices

event bro_init() {
    NOTICE([$note=CustomNotice::Bro_Start,
    $msg = "Bro engine started!"]);
}

event new_connection(c: connection) {
    if (c$id$resp_h == 13.107.21.200 || c$id$resp_h == 204.79.197.200) {
        NOTICE([$note=CustomNotice::Bing_User_Detected,
        $msg = fmt("Bing user detected at %s! Teach 'em to fish or drown 'em, your choice.", c$id$orig_h)]);
    }
}

event bro_done() {
    NOTICE([$note=CustomNotice::Bro_Stop,
    $msg = "Bro engine stopped!"]);
}
~.
~.
~.
~.

"main.bro" 18L, 502C
```

18,1

All

# WHERE TO GO FROM HERE?

- Start reading up on the Bro documentation
  - This will help you write better Bro scripts
- Check out Sguil
  - Out of the box alerting; might give you some good ideas
- Check out the plethora of Bro script repos on GitHub etc.
  - Don't re-invent the wheel (unless it's in the name of learning!)
- ZodiacFX (<https://northboundnetworks.com/products/zodiac-fx>)
  - OpenFlow capable switch for ~\$85
  - Use software-defined network + Bro's NetControl framework to give Bro some teeth!
- Try to reduce the hardware complexity
  - I feel like I'm so close to getting this down to only needing the EdgeRouter X...

# LINKZ

[https://dl.ubnt.com/guides/edgemax/EdgeRouter\\_ER-X\\_QSG.pdf](https://dl.ubnt.com/guides/edgemax/EdgeRouter_ER-X_QSG.pdf)

<https://www.netgear.com/support/product/gs105e.aspx>

<https://www.virtualbox.org/wiki/VirtualBox>

<https://github.com/Security-Onion-Solutions/security-onion/wiki/Bro>

<http://try.bro.org/#/?example=hello>

<https://www.bro.org/sphinx/frameworks/notice.html>

<https://www.bro.org/sphinx/scripts/base/init-bare.bro.html#type-connection>

<https://www.bro.org/sphinx/scripting/#the-connection-record-data-type>

END

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