Intrusion Detection

Who am I?

- Informal Security Education
- CS - Colby College
  - Honors work in Static Analysis
- Fortify Software
  - Engineer
  - Architect
  - Product Management
- HP
- AlienVault
  - Products
- BlackHat
- RSA

What is it?

What are you looking for?

- Pattern – known sequences of behaviors that indicate malicious activity
- Statistical – deviations from normal (anomalous) behavior that could indicate malicious activity

Where are you looking for it?

- User Activity
- Application Activity
- Operating System Activity
- Network Activity

- SIEM
- SIEM / Host-based IDS
- Host-based IDS
- Network-based IDS

Where are you looking for it?

- User Activity
- Application Activity
- Operating System Activity
- Network Activity

- SIEM
- SIEM / Host-based IDS
- Host-based IDS
- Network-based IDS

Why so many products??

Different Data

- SIEM
- Host-based IDS
- Network-based IDS
- Event logs
- Operating system events
- Raw network data

Host-based IDS

Host-based IDS

- Monitors operating system activity
  - File changes
  - Registry
  - Application / Processes
- Deployment:
  - Agent
  - Remote

- Products
  - OSSEC (free)
  - McAfee EPO
  - Symantec HIDS
  - Tripwire

Host-based IDS

```
<var name="SYS_USERS">^apache$|^mysql$|^www$|^nobody$|^nogroup$|^portmap$|
^named$|^rpc$|^mail$|^ftp$|^shutdown$|^halt$|^daemon$|^bin$|^postfix$|^shell
$|^info$|^guest$|^psql$|^user$|^users$|^console$|^uucp$|^lp$|^sync$|^sshd$|
^cdrom$|^ossec$</var>
```

```
<rule id="40101" level="12">
     <if_group>authentication_success</if_group>
     <user>$SYS_USERS</user>
     <description>System user successfully logged to the
system.</description>
     <group>invalid_login,</group>
   </rule>
```

Host-based IDS

Pro

- Process level inspection
- Acute behavioral detection
- User attribution

Cons

- Easy to disable
- High Administrative Costs

Network IDS

Network IDS

- Monitors network activity
  - Protocol Usage
  - Deep Packet Inspection
  - File Identification
- Deployment:
  - Inline

- Products
  - Suricata (free)
  - McAfee IntruShield
  - Cisco
  - Juniper

Network IDS

```
alert tcp $EXTERNAL_NET any -> $HOME_NET any (msg:"ET
ATTACK_RESPONSE Metasploit Meterpreter Sysinfo Command
Detected"; flow:to_client,established;
content:"stdapi_sys_config_sysinfo"; depth:60;
reference:url,www.nologin.org/Downloads/Papers/
meterpreter.pdf; reference:url,doc.emergingthreats.net/
2009563; classtype:successful-user; sid:2009563; rev:
2;)
```

Network IDS

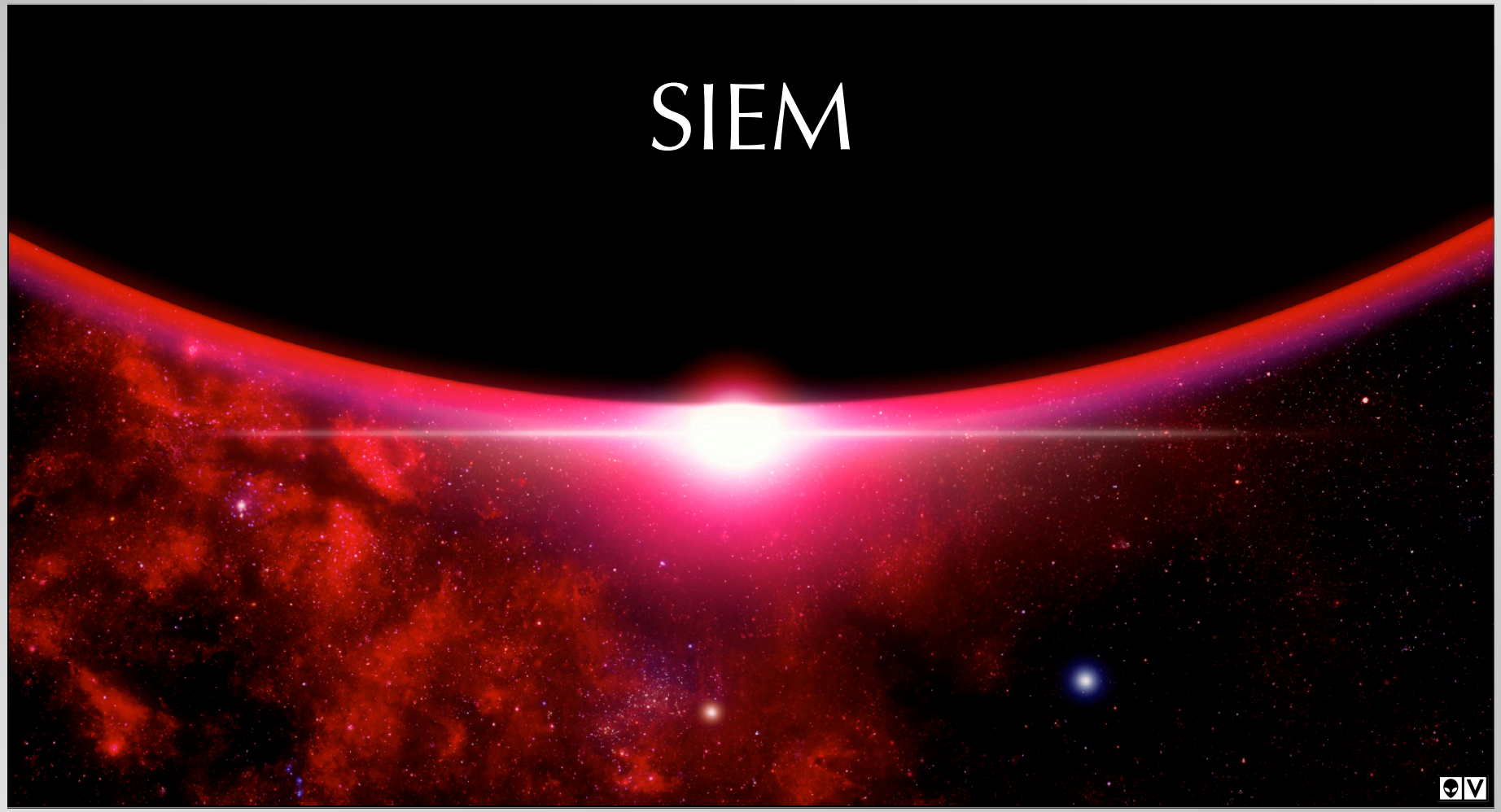
Pro

- Difficult to disable
- Early identification of threats
- Broad rulesets available

Cons

- Difficult to derive context

SIEM



SIEM

- Monitors anything you can feed it
  - VPN, Firewall, Application, Email server, door readers, etc
- Deployment:
  - Central
- Products
  - ArcSight (HP)
  - IBM (Q1)
  - OSSIM (Free)

Data Normalization Example

Juniper SRX – Session Denied Raw Log Event

```
#Sep 25 06:26:09 1.1.3.1  2010-09-25T06:26:10.420 SRX2-NY RT_FLOW - RT_FLOW_SESSION_DENY
[junos@2636.1.1.1.2.35 source-address="1.2.3.4" source-port="1234" destination-address="2.3.4.5"
destination-port="80" service-name="junos-http" protocol-id="6" icmp-type="0" policy-name="DENY"
source-zone-name="trust" destination-zone-name="untrust"]
```

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source-zone-name="trust" destination-zone-name="untrust"]
```

NORMALIZED

```
Event ID=SESSION_DENY
Date=September 25, 2010 6:26:09
Source IP=1.2.3.4
Source Port=1234
Source Zone=trust
Destination IP=2.3.4.5
Destination Port=80
Destination Zone=untrust
Service Name=Junos HTTP
Protocol=TCP
ICMP Type=Echo
Policy=Deny
```

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NORMALIZED

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Source IP=1.2.3.4
Source Port=1234
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Destination IP=2.3.4.5
Destination Port=80
Destination Zone=untrust
Service Name=Junos HTTP
Protocol=TCP
ICMP Type=Echo
Policy=Deny
```

- Necessary for cross-data source correlation
  - Identify similar data from different data sources (User Name, IP Address, etc.)
- Each data source requires some custom logic
  - Each log has a unique format

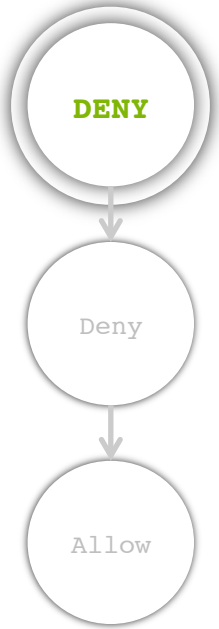
Correlation Example

`Probing`

Correlation can be thought of as a state machine

Correlation Example

Probing



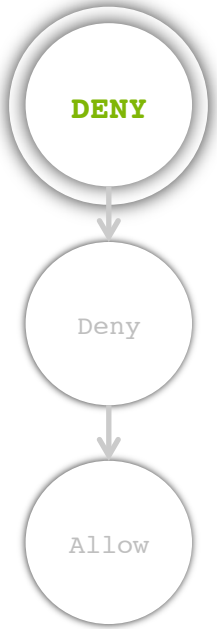
Event 1

```
Event ID=SESSION_DENY
Date=September 25, 2010 6:26:09
Source IP=1.2.3.4
Source Port=1234
Source Zone=trust
Destination IP=2.3.4.5
Destination Port=80
Destination Zone=untrust
Service Name=Junos HTTP
Protocol=TCP
ICMP Type=Echo
Policy=Deny
```

Each event can ‘match’ and progress the state

Correlation Example

Probing




```
Event ID=SESSION_DENY
Date=September 25, 2010 6:26:09
Source IP=1.2.3.4
Source Port=1234
Source Zone=trust
Destination IP=2.3.4.5
Destination Port=80
Destination Zone=untrust
Service Name=Junos HTTP
Protocol=TCP
ICMP Type=Echo
Policy=Deny
```

Event 2

```
Event ID=SESSION_DENY
Date=September 25, 2010 6:26:10
Source IP=1.2.3.4
Source Port=1234
Source Zone=trust
Destination IP=2.3.4.5
Destination Port=443
Destination Zone=untrust
Service Name=Junos HTTP
Protocol=TCP
ICMP Type=Echo
Policy=Deny
```

Subsequent events need to match within time window

Correlation Example

Probing


```
Event ID=SESSION_DENY
Date=September 25, 2010 6:26:09
Source IP=1.2.3.4
Source Port=1234
Source Zone=trust
Destination IP=2.3.4.5
Destination Port=80
Destination Zone=untrust
Service Name=Junos HTTP
Protocol=TCP
ICMP Type=Echo
Policy=Deny
```

```
Event ID=SESSION_DENY
Date=September 25, 2010 6:26:10
Source IP=1.2.3.4
Source Port=1234
Source Zone=trust
Destination IP=2.3.4.5
Destination Port=80
Destination Zone=untrust
Service Name=Junos HTTP
Protocol=TCP
ICMP Type=Echo
Policy=Deny
```

Event 3

```
Event ID=SESSION_CREATE
Date=September 25, 2010 6:26:11
Source IP=1.2.3.4
Source Port=1234
Source Zone=trust
Destination IP=2.3.4.5
Destination Port=22
Destination Zone=untrust
Service Name=Junos HTTP
Protocol=TCP
ICMP Type=Echo
Policy=Deny
```

Subsequent events need to match within time window

Correlation Example

Probing


```
Event ID=SESSION_DENY
Date=September 25, 2010 6:26:09
Source IP=1.2.3.4
Source Port=1234
Source Zone=trust
Destination IP=2.3.4.5
Destination Port=80
Destination Zone=untrust
Service Name=Junos HTTP
Protocol=TCP
ICMP Type=Echo
Policy=Deny
```

```
Event ID=SESSION_DENY
Date=September 25, 2010 6:26:10
Source IP=1.2.3.4
Source Port=1234
Source Zone=trust
Destination IP=2.3.4.5
Destination Port=443
Destination Zone=untrust
Service Name=Junos HTTP
Protocol=TCP
ICMP Type=Echo
Policy=Deny
```

```
Event ID=SESSION_CREATE
Date=September 25, 2010 6:26:11
Source IP=1.2.3.4
Source Port=1234
Source Zone=trust
Destination IP=2.3.4.5
Destination Port=22
Destination Zone=untrust
Service Name=Junos HTTP
Protocol=TCP
ICMP Type=Echo
Policy=Deny
```

ALARM – Probing
Source IP=1.2.3.4
Source Port=1234
Source Zone=trust
Destination IP=2.3.4.5
Destination Port=80,443,22
Protocol=TCP

Fully loaded state machine generates an alarm

SIEM

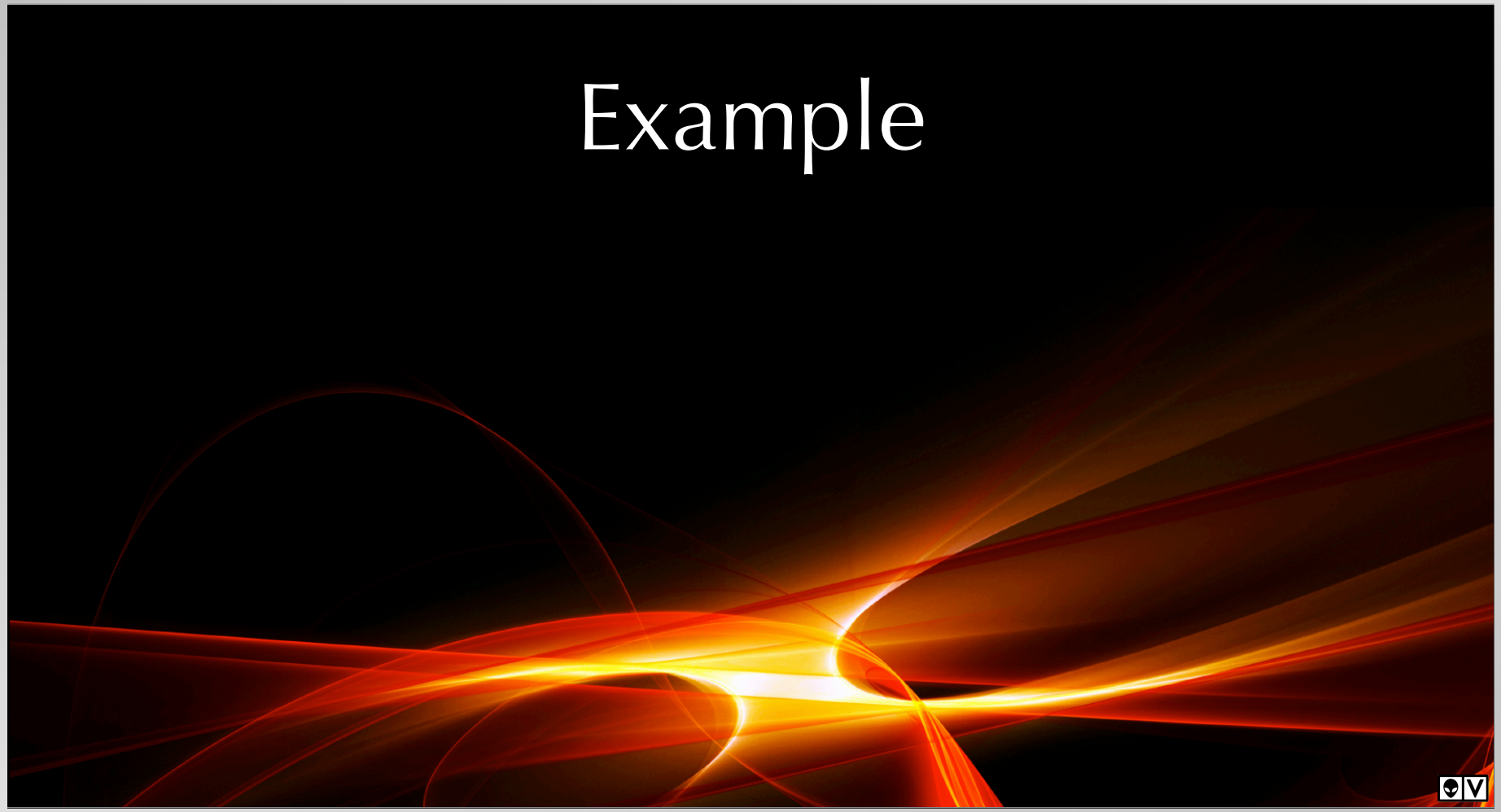
Pro

- Flexible and complete

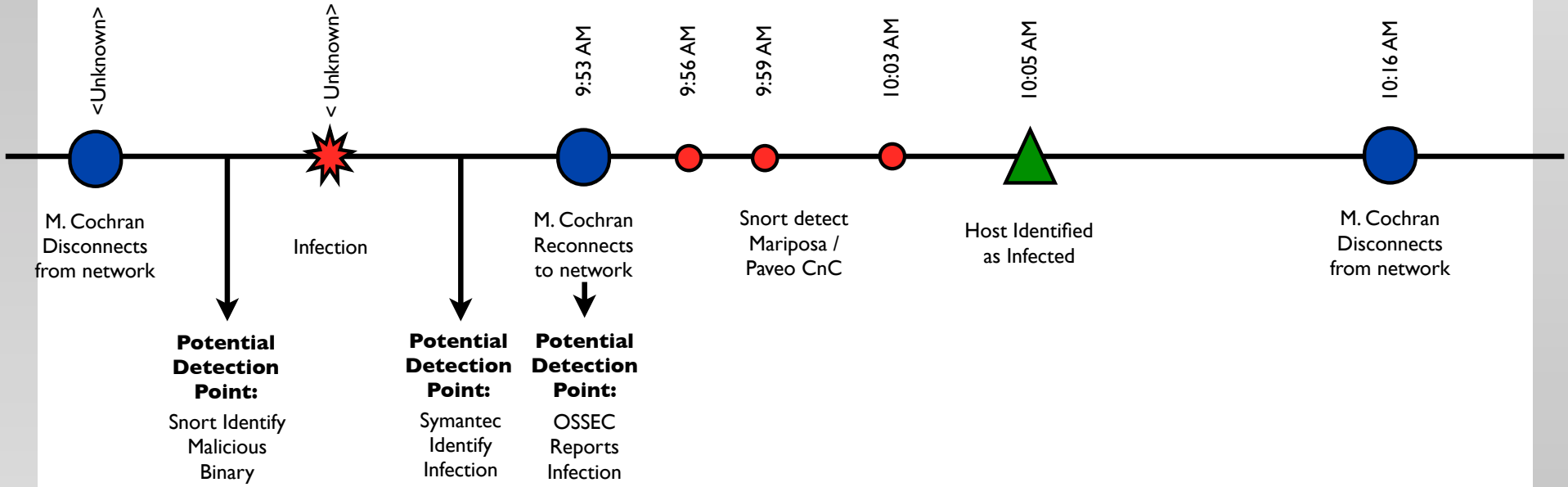
Cons

- Expensive to deploy

Example



Example


<Unknown>
< Unknown>
9:53 AM
9:56 AM
9:59 AM
10:03 AM
10:05 AM
10:16 AM
M. Cochran Disconnects from network
Infection
M. Cochran Reconnects to network
Snort detect Mariposa / Paveo CnC
Host Identified as Infected
M. Cochran Disconnects from network
Potential Detection Point: Snort Identify Malicious Binary
Potential Detection Point: Symantec Identify Infection
Potential Detection Point: OSSEC Reports Infection