MIRcon 2014

Applied Detection and Analysis Using Network Flow Data

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TAP Intel-Based Detection
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- Christian & Husband
- Kentuckian and South Carolinian
- MS, GSE, et al.
- Non-Profit Director
- BBQ Pit Master

Jason Smith

- Kentuckian
- Car Aficionado
- Raspberry Pi enthusiast
- Junkyard Engineer

Applied Network Security Monitoring

"This book should be required reading for all intrusion analysts and those looking to develop a security monitoring program."

"Written by analysts, for analysts."

- Amazon Reviewers

Agenda

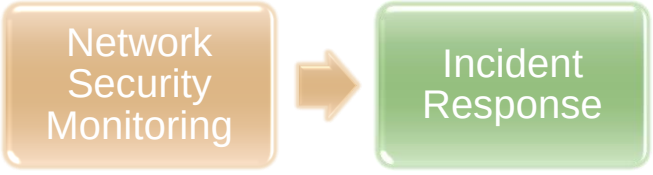
Flow Data!

- Why it's important
- How you can collect it
- What you can do with it
- Tools that can help

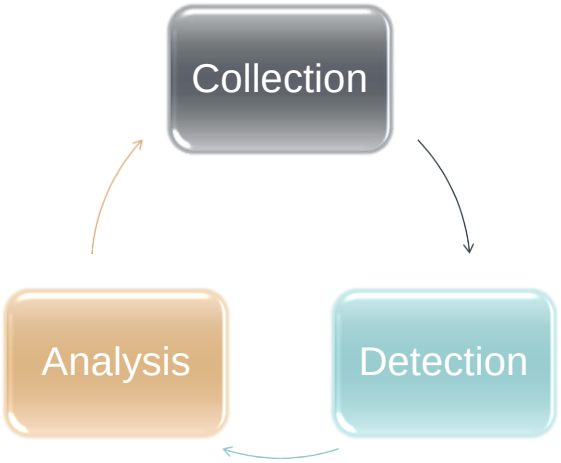
"Why/How to use Flow Data in NSM/IR"

Network Security Monitoring

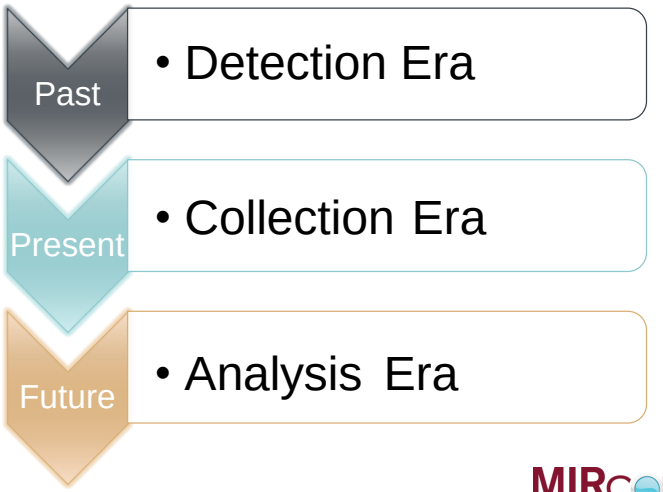
- The collection, detection, and analysis of network security data.
- The goal of NSM is escalation, or to declare that an incident has occurred so that incident response can occur.



The NSM Cycle



Evolution of NSM Emphasis



NSM/IR Challenges of the Present

We All Want Full PCAP…

- Collection
  - Easy to Capture / Filter Stream Data
- Detection
  - Major Detection Tools are PCAP Oriented
- Analysis
  - Gives us Who, Where, When, and What

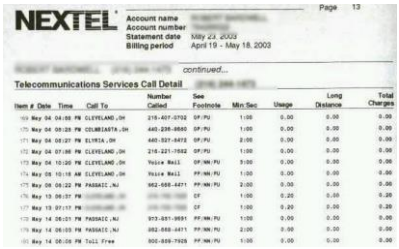
NSM/IR Challenges of the Present

But, It's not Feasible for Every Goal…

- Collection
  - Not Scalable for Extended Retention
- Detection
  - Not Ideal of Hunting / Rapid Pivoting
- Analysis
  - Not a Great Starting Point

Full PCAP vs. Flow Data

PCAP Data



Flow Data

Flow Data

- Often Called Flow / Session / NetFlow
- Summary of Network Communications
- Aggregated Record of Packets
- Gives Us Who, Where, When
- Based on the 5-tuple + Timing/Data Stats

Source IP	Source Port	Dest IP	Dest Port	Protocol
192.168.5.1	48293	8.8.8.8	53	UDP

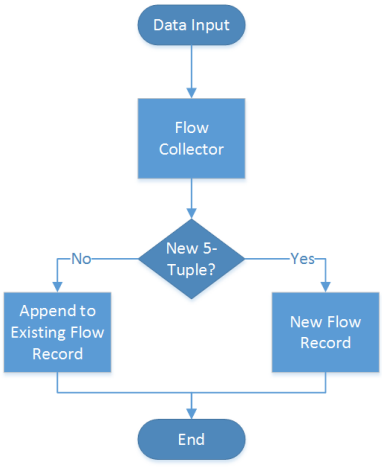
Start Time	End Time	Bytes
2014/09/22T00:03:58.756	2014/09/22T00:04:58.756	76

Flow Data Example

sTime|	sIP|	dPort|	dIP|	dPort|	pro|	bytes|
2014/09/22T00:03:58.756|	10.10.120.1|	53|	10.1.179.5|	53|	17|	72|
2014/09/22T00:03:58.999	10.10.120.1|	53|	10.1.188.5|	53|	17|	89|
2014/09/22T00:08:59.012|	10.10.120.1|	53|	10.1.179.5|	53|	17|	72|
2014/09/22T00:08:59.466|	10.10.120.1|	53|	10.1.188.5|	53|	17|	89|
2014/09/22T00:03:58.756|	10.10.120.1|	53|	10.1.179.5|	53|	17|	72|
2014/09/22T00:03:58.999	10.10.120.1|	53|	10.1.188.5|	53|	17|	89|
2014/09/22T00:08:59.012|	10.10.120.1|	53|	10.1.179.5|	53|	17|	72|
2014/09/22T00:08:59.466|	10.10.120.1|	53|	10.1.188.5|	53|	17|	89|

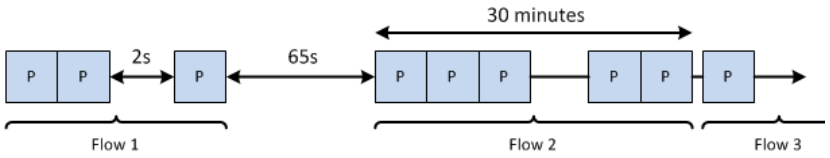
Building Flow Records

- Records are Defined by Unique 5-tuples
- Data is added to the 5-tuple Record until a termination condition is met.



Flow Record Termination Conditions

- Natural Timeout
  - End of communication per protocol (ex. TCP RST/FIN)
- Idle Timeout
  - No data received for 30 seconds
- Active Timeout
  - Thirty minute max timeout (configurable)



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Collection with Flow Data

Generating Flow Data

- Generation
  - Routers
  - Sensors
    - Fprobe
    - YAF
- Multiple Types:
  - NetFlow (v5,v9)
  - IPFIX
  - jFlow
  - More…

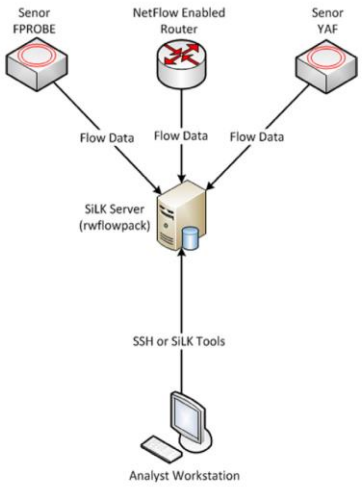
Collecting Flow Data

- Popular Platforms
  - Argus
    - + Reliable + Fast Collection
    - - Not Well Supported
  - NFDump
    - + Easy to Setup and Use
    - - Not in Wide Use
  - SiLK
    - + Exceptional Analysis Tools
    - - More Involved Setup

SiLK

- The System for Internet-Level Knowledge
- CERT NetSA Team
- Two Major Components:
  - Packing Suite
    - Collection and parsing of flow data
  - Analysis Suite
    - Filter, display, sort, count, group, mate, and more
- Excellent Documentation & Community
  - https://tools.netsa.cert.org/silk/docs.html

SiLK Collection Architecture



SiLK – What You Need

- Flow Sources
  - Hardware: Routers, Switches
  - Software: YAF, fprobe
- SiLK Server
  - Rwflowpack
  - Will also have SiLK analysis suite installed
- Analyst Workstation
  - Access SiLK server directly
  - Locally mirrored database

SiLK – Analysis Suite

- rwfilter - Filters through data based on conditions.
- rwcut - Converts flow binary data to a human readable format.
- rwstats - Generates statistics from flow data
- rwcount - Summarizes total network traffic over time

SiLK Analysis – rwfilter / rwcut (1)

- Display all records from the beginning the current day until the current time:

```
rwfilter --type=all --proto=0-255 --pass=stdout | rwcut
```

```
            sIP|            dIP|sPort|dPort|pro|   packets|     bytes|   flags|               sTime| duration|               eTime|sen|
197.9.246.221|    182.14.164.4|35011|50066|  6|         3|       132|FS  A   |2014/05/13T10:00:02.043|    0.225|2014/05/13T10:00:02.268| S1|
197.9.246.221|    182.14.164.4|   21|50065|  6|        14|       853|FS PA   |2014/05/13T10:00:01.304|    1.982|2014/05/13T10:00:03.286| S1|
68.30.155.170| 182.82.134.177|53627| 3001|  6|         7|       770|FS PA   |2014/05/13T10:00:03.430|    0.187|2014/05/13T10:00:03.617| S1|
197.9.246.221|    182.14.164.4|35024|50068|  6|         3|       132|FS  A   |2014/05/13T10:00:04.361|    0.239|2014/05/13T10:00:04.600| S1|
68.30.155.170| 182.82.134.177|53628| 3003|  6|         7|       770|FS PA   |2014/05/13T10:00:05.198|    0.190|2014/05/13T10:00:05.388| S1|
68.30.155.170| 182.82.134.177|53630| 3001|  6|         7|       770|FS PA   |2014/05/13T10:00:06.081|    0.195|2014/05/13T10:00:06.276| S1|
197.9.246.221|    182.14.164.4|35171|50070|  6|         3|       132|FS  A   |2014/05/13T10:00:06.679|    0.286|2014/05/13T10:00:06.965| S1|
68.30.155.170| 182.82.134.177|53631| 3003|  6|         8|      1081|FSRPA   |2014/05/13T10:00:06.456|    0.651|2014/05/13T10:00:07.107| S1|
68.30.155.170| 182.82.134.177|53629| 3002|  6|       423|    460072|FSRPA   |2014/05/13T10:00:05.521|    2.454|2014/05/13T10:00:07.975| S1|
68.30.155.170| 182.82.134.177|53629| 3002|  6|       483|    462473|FSRPA   |2014/05/13T10:00:05.522|    2.453|2014/05/13T10:00:07.975| S1|
197.9.246.221|    182.14.164.4|   21|50069|  6|        13|       812| S PA   |2014/05/13T10:00:05.944|    2.049|2014/05/13T10:00:07.993| S1|
197.9.246.221|    182.14.164.4|   21|50069|  6|         1|        40|F   A   |2014/05/13T10:00:07.994|    0.000|2014/05/13T10:00:07.994| S1|
  5.47.194.56|182.140.208.205|   22|64210|  6|        45|      7317| S PA   |2014/05/13T10:00:07.773|    1.421|2014/05/13T10:00:09.194| S1|
  5.47.194.56|182.140.208.205|   22|64210|  6|         1|        40|F   A   |2014/05/13T10:00:09.195|    0.001|2014/05/13T10:00:09.196| S1|
197.9.246.221|    182.14.164.4|35092|50072|  6|         3|       132|FS  A   |2014/05/13T10:00:09.044|    0.229|2014/05/13T10:00:09.273| S1|
197.9.246.221|    182.14.164.4|35006|50074|  6|         3|       132|FS  A   |2014/05/13T10:00:11.382|    0.234|2014/05/13T10:00:11.616| S1|
197.9.246.221|    182.14.164.4|   21|50073|  6|        13|       813|FS PA   |2014/05/13T10:00:10.650|    1.982|2014/05/13T10:00:12.632| S1|
197.9.246.221|    182.14.164.4|   21|50073|  6|         1|        40|    A   |2014/05/13T10:00:12.634|    0.002|2014/05/13T10:00:12.636| S1|
197.9.246.221|    182.14.164.4|35176|50076|  6|         3|       132|FS  A   |2014/05/13T10:00:13.707|    0.231|2014/05/13T10:00:13.938| S1|
197.9.246.221|    182.14.164.4|   21|50077|  6|        13|       812|FS PA   |2014/05/13T10:00:15.314|    1.997|2014/05/13T10:00:17.311| S1|
197.9.246.221|    182.14.164.4|35140|50080|  6|         3|       132|FS  A   |2014/05/13T10:00:18.670|    0.229|2014/05/13T10:00:18.899| S1|
 6.128.17.158| 11.237.137.249|54969| 5900|  6|         2|        84| SR     |2014/05/13T10:00:04.355|   14.655|2014/05/13T10:00:19.010| S1|
197.9.246.221|    182.14.164.4|35090|50082|  6|         3|       132|FS  A   |2014/05/13T10:00:21.194|    0.233|2014/05/13T10:00:21.427| S1|
197.9.246.221|    182.14.164.4|   21|50081|  6|        14|       852|FS PA   |2014/05/13T10:00:20.324|    2.141|2014/05/13T10:00:22.465| S1|
143.141.15.64| 182.82.134.205| 8443|51142|  6|         4|       179|FS PA   |2014/05/13T10:00:22.712|    0.051|2014/05/13T10:00:22.763| S1|
143.141.15.64| 182.82.134.205| 8443|51143|  6|        11|      3859|FS PA   |2014/05/13T10:00:22.763|    1.392|2014/05/13T10:00:24.155| S1|
```


SiLK Analysis – rwfilter / rwcut (2)

- Display all records of communication to or from Chinese IP addresses over a specific week to one local CIDR range:

```
 rwfilter --type=all --start-date=2014/08/01 --end-
date=2014/08/07 --any-address=192.168.1.0/24 --any-cc=cn
--pass=stdout | rwcut --
fields=stime,sip,dip,sport,dport,type
```

```
                  sTime|            sIP|            dIP|sPort|dPort|   type|
    2014/08/05T15:54:50.990|  10.106.123.45| 10.107.173.196|28993|41142|     in|
    2014/08/05T15:54:50.992|  10.194.186.42| 172.28.239.102|41142|28993|    out|
    2014/08/05T18:04:00.090|  10.122.74.199|    10.31.10.21| 1026|41142|     in|
    2014/08/05T23:50:48.570|   10.52.111.14| 10.138.232.188|40357|41142|     in|
    2014/08/05T23:58:01.418|  10.117.48.59|   10.24.175.71|53312|41142|     in|
    2014/08/05T23:50:48.572|  10.73.176.195|   10.10.20.112|41142|40357|    out|
    2014/08/05T23:58:01.475|   10.55.121.43|   10.165.47.26|41142|53312|    out|
    2014/08/06T00:13:57.692|  10.104.43.101| 10.127.158.111|13202|41142|     in|
    2014/08/06T00:18:30.596| 10.142.187.222|  10.71.237.199|51807|41142|     in|
    2014/08/06T00:24:41.169| 10.134.111.247| 10.210.221.167|64339|41142|     in|
```

SiLK Analysis – rwstats (1)

- Display statistics for the total amount of bytes transferred by protocol (top 10):

```
rwfilter --type=all --proto=0-255 --pass=stdout |
rwstats --top --count=10 --fields=proto --
value=bytes
```

```
INPUT: 7671365 Records for 7 Bins and 1880722375406 Total Bytes
OUTPUT: Top 10 Bins by Bytes
pro|               Bytes|    %Bytes|   cumul_%|
  6|      1876692757588| 99.785741| 99.785741|
 17|         3886949450|  0.206673| 99.992414|
  1|           69185319|  0.003679| 99.996093|
 47|           40843957|  0.002172| 99.998265|
 50|           31424357|  0.001671| 99.999935|
 41|            1144367|  0.000061| 99.999996|
  2|              70368|  0.000004|100.000000|
```


SiLK Analysis – rwstats (2)

- Show the top 10 sip,dip pairs for valid conversations (top 10)

```
rwfilter --type=all --proto=0-255 --packets=4, --
pass=stdout | rwstats --top --count=10 --
fields=sip,dip --value=bytes
```

```
INPUT: 3553669 Records for 210934 Bins and 1880090680938 Total Bytes
OUTPUT: Top 10 Bins by Bytes
            sIP|            dIP|               Bytes|    %Bytes|   cumul_%|
 182.82.172.111| 182.140.188.64|       219038598507| 11.650427| 11.650427|
 182.140.188.64|  182.82.26.133|       188205311455| 10.010438| 21.660865|
   182.82.3.85| 182.140.188.64|       180386700023|  9.594574| 31.255440|
 182.140.188.64|    182.82.3.85|       163207001357|  8.680805| 39.936245|
  11.237.171.87|182.140.188.102|       158910367747|  8.452271| 48.388516|
  182.82.26.133| 182.140.188.64|       135227063103|  7.192582| 55.581098|
 182.82.145.235| 182.140.188.64|       119072866667|  6.333358| 61.914456|
 182.140.188.64| 182.82.145.235|       117393912025|  6.244056| 68.158511|
 11.237.171.166|182.140.188.111|        90192333665|  4.797233| 72.955745|
  97.125.231.85| 11.237.224.220|        79984274054|  4.254277| 77.210022|
```

SiLK Analysis – rwstats (3)

- Show the top 10 outbound destination country codes by records:

```
rwfilter --type=out,outweb --proto=0-255 --
pass=stdout | rwstats --top --count=10 --fields=dcc
```

```
INPUT: 7125124 Records for 147 Bins and 7125124 Total Records
OUTPUT: Top 10 Bins by Records
dcc|   Records|  %Records|   cumul_%|
 us|   2677276| 37.575150| 37.575150|
 cn|   2234597| 31.362219| 68.937369|
 id|    834469| 11.711642| 80.649010|
 in|    327519|  4.596678| 85.245688|
 ar|    313590|  4.401187| 89.646875|
 jp|    231349|  3.246947| 92.893822|
 gb|     38085|  0.534517| 93.428339|
 de|     36410|  0.511009| 93.939348|
 cl|     32304|  0.453382| 94.392729|
 my|     28288|  0.397018| 94.789747|
```


SiLK Analysis – Real World Examples

- Rwstats to discover potential ZeroAccess victims

```
rwfilter --type=all --dport=16464,16465,16470,16471 --
pass=stdout  | rwstats --top --fields=sip --
value=distinct:dcc --threshold=3
```

```
INPUT: 272 Records for 1 Bin
OUTPUT: Top 1 bins by dcc-Distinct (threshold 3)
            sIP|dcc|%dcc-Disti|   cumul_%|
192.168.106.131| 52|         ?|         ?|
```

SiLK Analysis – Real World Examples

- Discovering outbound data to applications using nonstandard ports.

```
rwfilter Sampledata/sample.rw \
--plugin=app-mismatch.so \
--type=out,outweb --proto=6 \
--sport=1024- \
--packets=4- \
--flags-initial=S/SURFPACE \
--pass=stdout | \
rwstats --fields=application,dport --count=100 \
--distinct:dport
```

```
INPUT: 3420 Records for 4 Bins
OUTPUT: Top 100 Bins by dPort-Distinct
appli|dPort-Dist|%dPort-Dis|   cumul_%|
   80|        23|         ?|         ?|
   22|         5|         ?|         ?|
   21|         2|         ?|         ?|
 5222|         1|         ?|         ?|
```


Collecting Intelligence Data

- Friendly Intelligence Gathering
- Identify Services on the Network
- Identify Normal Behaviors of Hosts
- Identify “Friends and Family”
  - Friends: Who a host communicates with outside the network
  - Family: Who a host communicates with inside the network

Identifying Services

- Identify SSH Servers

```
rwfilter --type=out --protocol=6 --packets=4- --ack-flag=1 --sport=22 --pass=stdout | rwcut --fields=sip
```

- Identify Web Servers

```
rwfilter --type=outweb --protocol=6 --packets=4- --ack-flag=1 --sport=80,443,8080 --pass=stdout | rwcut --fields=sip
```


Identifying Friends and Family

- Identify Friends

```
rwfilter --type=out,outweb --saddress=192.168.1.1 --pass=stdout | rwfilter --input-pipe=stdin --dcidr=192.168.0.0/24 --fail=stdout
```

- Identify Family

```
rwfilter --type=out,outweb --saddress=192.168.1.1 --pass=stdout | rwfilter --input-pipe=stdin --dipset=local --fail=stdout
```

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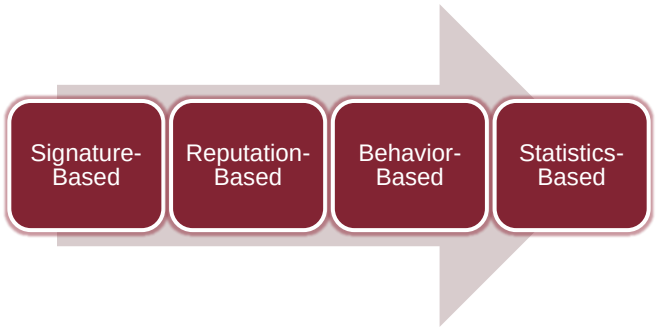
Detection with Flow Data

Flow for Detection

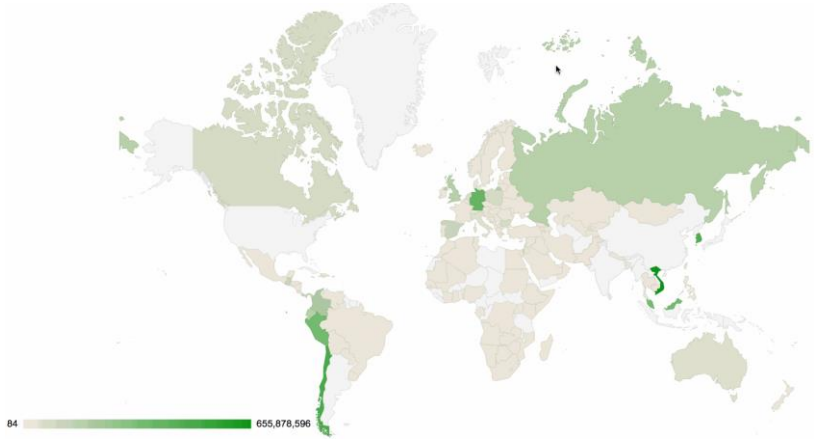


FlowPlotter

- Generates Visualizations from the Output of Flow Tools
- Useful for Detection-Oriented Statistics
- Written in BASH – Flexible/Tweakable/Minimal
- Free/Open Source - Maintained in GitHub
- Browser Independent

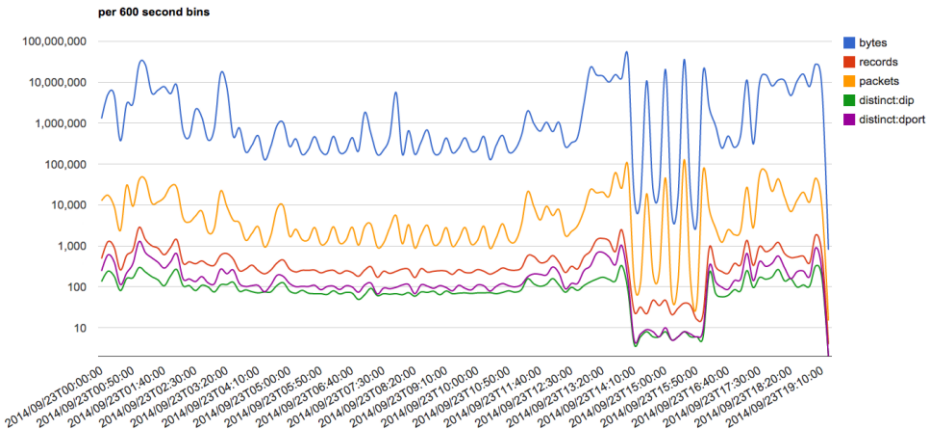
FlowPlotter - GeoMap

- rwfilter ../Sampledata/sample.rw --dcc=us,cn,-- --fail=stdout | ./flowplotter.sh geomap dcc bytes > geomap.html



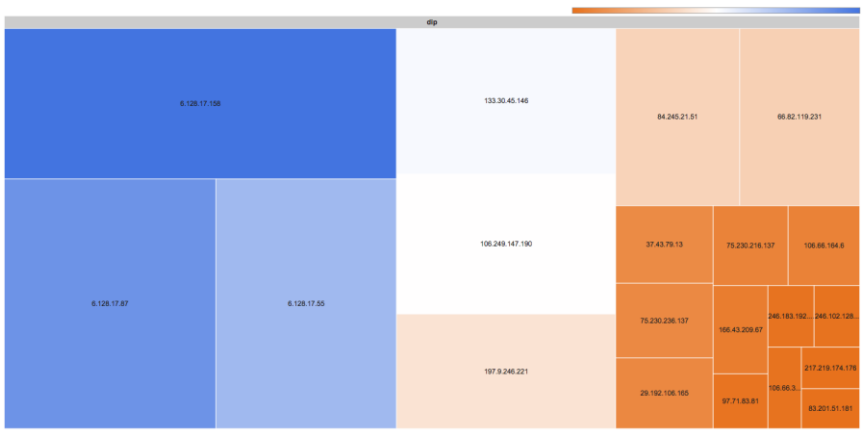
FlowPlotter - LineChart

- rwfilter --type=all --proto=0-255 --pass=stdout | ./flowplotter.sh linechart 600 bytes > linechart.html



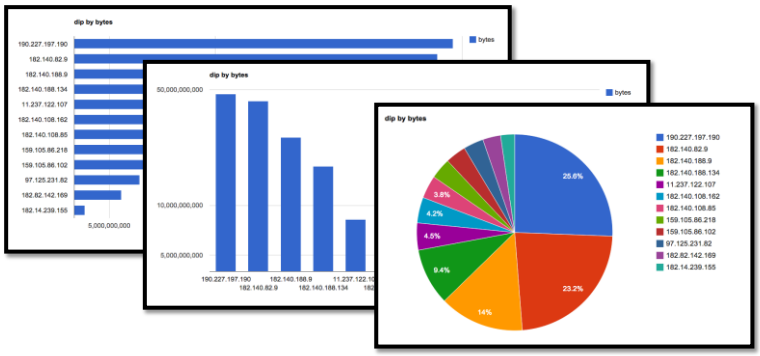
FlowPlotter - TreeMap

- rwfilter ../Sampledata/sample.rw --sport=1025- --dport=1025- --proto=0- --type=out --pass=stdout | ./flowplotter.sh treemap dip records > treemap.html



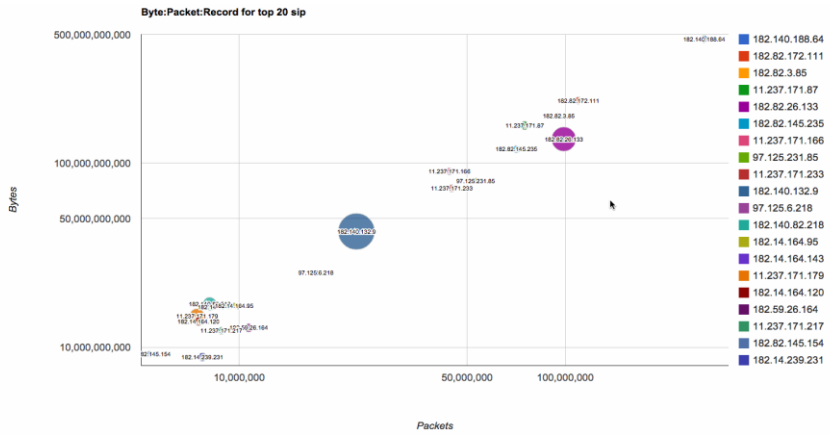
FlowPlotter - Pie/Bar/Column Chart

- rwfilter ../Sampledata/sample.rw --sport=1025- --dport=1025- --proto=0- --type=all --pass=stdout | ./flowplotter.sh piechart dip bytes > piechart.html



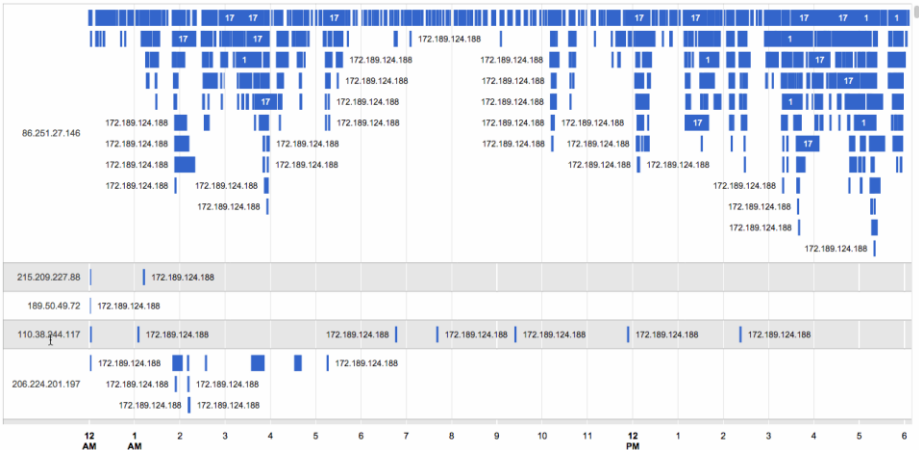
FlowPlotter - BubbleChart

- rwfilter ../Sampledata/sample.rw --type=all --proto=0-255 --pass=stdout | ./flowplotter.sh bubblechart sip > bubblechart.html



FlowPlotter - Timeline

- rwfilter --proto=0- --type=out --sport=41142 --pass=stdout | ./flowplotter.sh timeline dip sip > timeline.html



FlowPlotter - Force Directed

- rwfilter ../Sampledata/sample.rw --scc=kr --proto=0- --type=all --pass=stdout | ./flowplotter.sh forceopacity sip dip distinct:dport 100 > forcetest.html

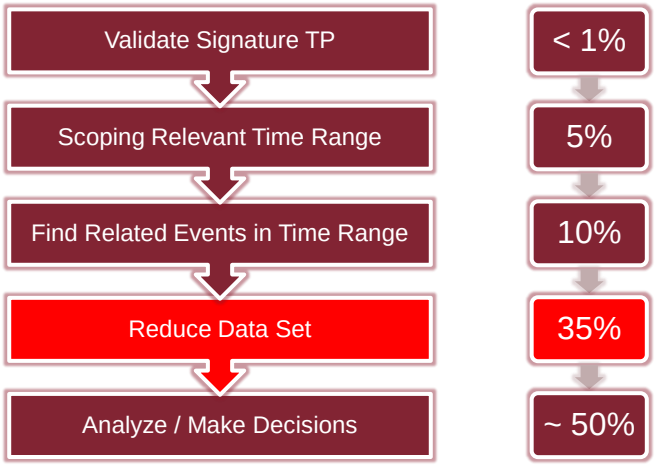
FlowPlotter - AssetDiscovery

- rwfilter ../Sampledata/sample.rw --proto=0- --type=all --pass=stdout | ./flowplotter.sh assetdiscovery > assettest.html

MIRcon 2014

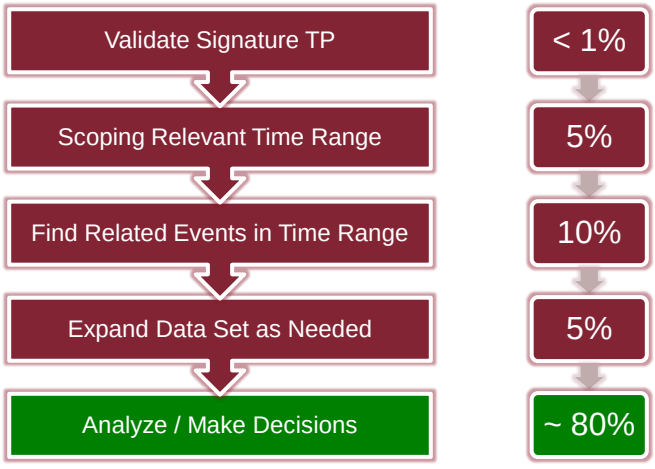
Analysis with Flow

Flow in Analysis – PCAP Only



** Based on the First Hour of Analysis*

Flow in Analysis - Improved

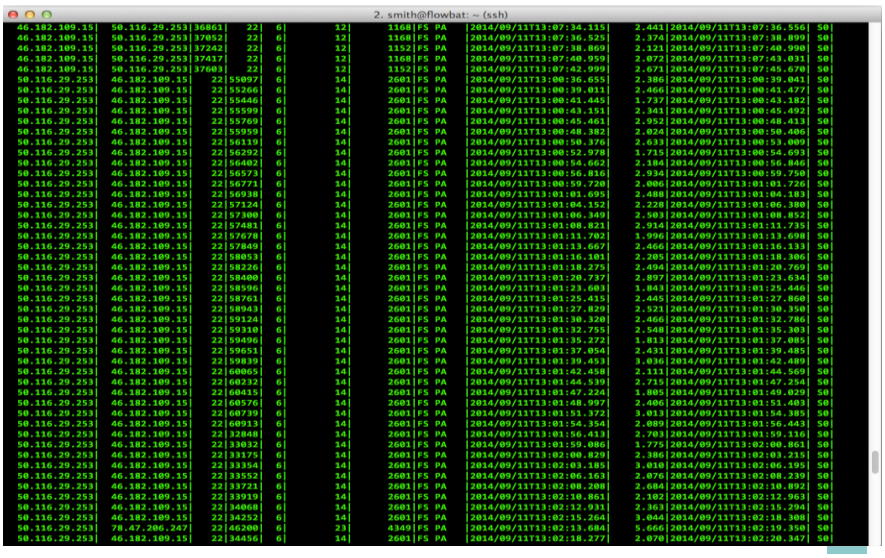


** Based on the First Hour of Analysis*

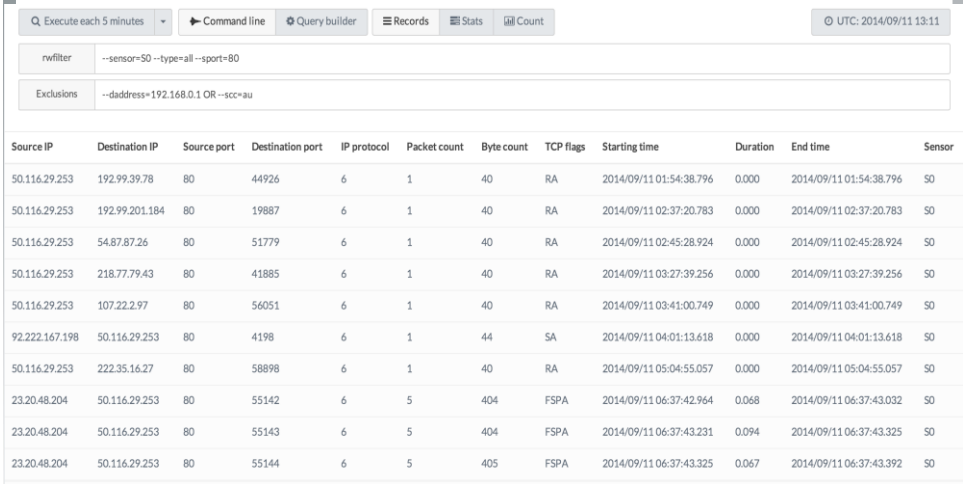
Flow – Barriers to Entry

- Be Prepared to Look at a LOT of Line-Based Data
- Very Command Line Oriented
- Not Welcoming to Junior-Level Analysts
- Hard to Display/Interpret Data Visually

SiLK Data Output



FLOWBAT

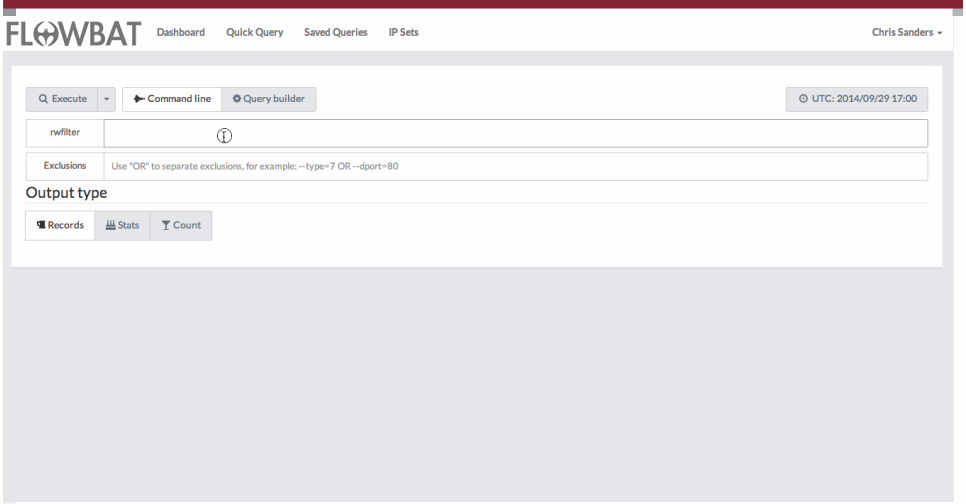


Source IP	Destination IP	Source port	Destination port	IP protocol	Packet count	Byte count	TCP flags	Starting time	Duration	End time	Sensor
50.116.29.253	192.99.39.78	80	44926	6	1	40	RA	2014/09/11 01:54:38.796	0.000	2014/09/11 01:54:38.796	S0
50.116.29.253	192.99.201.184	80	19887	6	1	40	RA	2014/09/11 02:37:20.783	0.000	2014/09/11 02:37:20.783	S0
50.116.29.253	54.87.87.26	80	51779	6	1	40	RA	2014/09/11 02:45:28.924	0.000	2014/09/11 02:45:28.924	S0
50.116.29.253	218.77.79.43	80	41885	6	1	40	RA	2014/09/11 03:27:39.256	0.000	2014/09/11 03:27:39.256	S0
50.116.29.253	107.22.2.97	80	56051	6	1	40	RA	2014/09/11 03:41:00.749	0.000	2014/09/11 03:41:00.749	S0
92.222.167.198	50.116.29.253	80	4198	6	1	44	SA	2014/09/11 04:01:13.618	0.000	2014/09/11 04:01:13.618	S0
50.116.29.253	222.35.16.27	80	58898	6	1	40	RA	2014/09/11 05:04:55.057	0.000	2014/09/11 05:04:55.057	S0
23.20.48.204	50.116.29.253	80	55142	6	5	404	FSPA	2014/09/11 06:37:42.964	0.068	2014/09/11 06:37:43.032	S0
23.20.48.204	50.116.29.253	80	55143	6	5	404	FSPA	2014/09/11 06:37:43.231	0.094	2014/09/11 06:37:43.325	S0
23.20.48.204	50.116.29.253	80	55144	6	5	405	FSPA	2014/09/11 06:37:43.325	0.067	2014/09/11 06:37:43.392	S0

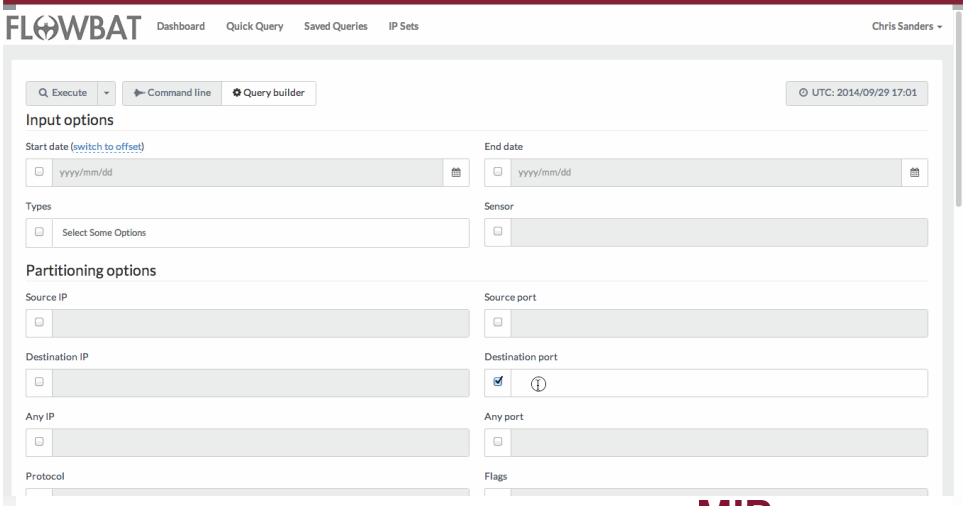
FLOWBAT

- Flow Basic Analysis Tool
- Graphical Front-End to SiLK
- Easy Two-Step Install on SiLK Capable Box
  - Install Locally to SiLK Box
  - Install Remotely and Interact via SSH w/ Keys
- Rapid Pivoting Between Data
- Graphing Ability
- By Analysts, for Analysts

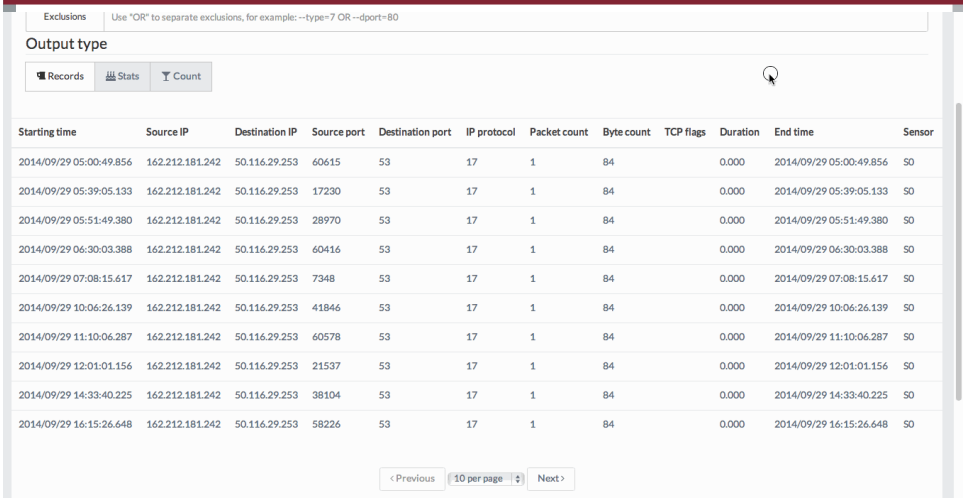
Getting Data with FlowBAT (CLI Mode)



Getting Data with FlowBAT (Guided Mode)



Manipulating FlowBAT Data



Exclusions: Use "OR" to separate exclusions, for example: --type=7 OR --dport=80

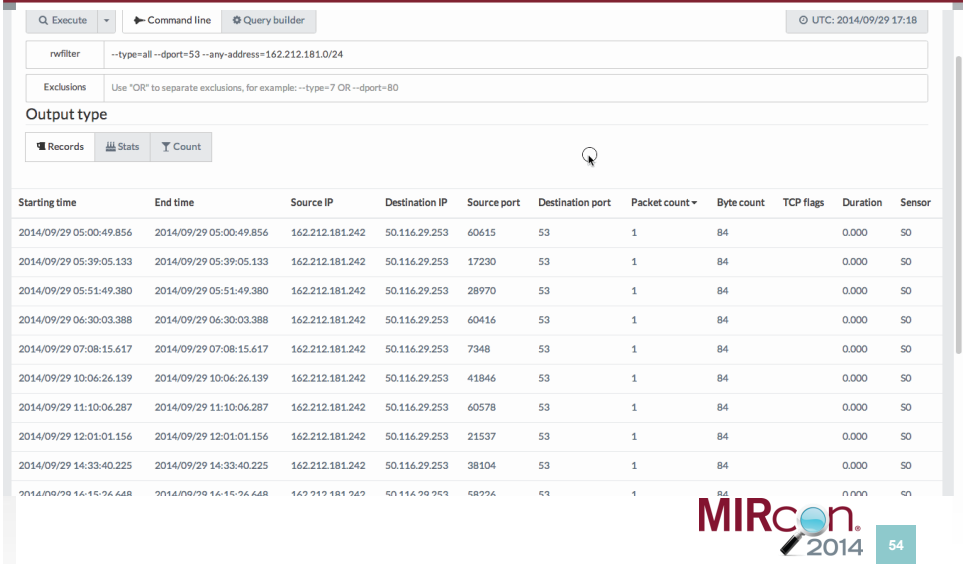
Output type

Records | Stats | Count

Starting time	Source IP	Destination IP	Source port	Destination port	IP protocol	Packet count	Byte count	TCP flags	Duration	End time	Sensor
2014/09/29 05:00:49.856	162.212.181.242	50.116.29.253	60615	53	17	1	84		0.000	2014/09/29 05:00:49.856	S0
2014/09/29 05:39:05.133	162.212.181.242	50.116.29.253	17230	53	17	1	84		0.000	2014/09/29 05:39:05.133	S0
2014/09/29 05:51:49.380	162.212.181.242	50.116.29.253	28970	53	17	1	84		0.000	2014/09/29 05:51:49.380	S0
2014/09/29 06:30:03.388	162.212.181.242	50.116.29.253	60416	53	17	1	84		0.000	2014/09/29 06:30:03.388	S0
2014/09/29 07:08:15.617	162.212.181.242	50.116.29.253	7348	53	17	1	84		0.000	2014/09/29 07:08:15.617	S0
2014/09/29 10:06:26.139	162.212.181.242	50.116.29.253	41846	53	17	1	84		0.000	2014/09/29 10:06:26.139	S0
2014/09/29 11:10:06.287	162.212.181.242	50.116.29.253	60578	53	17	1	84		0.000	2014/09/29 11:10:06.287	S0
2014/09/29 12:01:01.156	162.212.181.242	50.116.29.253	21537	53	17	1	84		0.000	2014/09/29 12:01:01.156	S0
2014/09/29 14:33:40.225	162.212.181.242	50.116.29.253	38104	53	17	1	84		0.000	2014/09/29 14:33:40.225	S0
2014/09/29 16:15:26.648	162.212.181.242	50.116.29.253	58226	53	17	1	84		0.000	2014/09/29 16:15:26.648	S0

‹ Previous | 10 per page | Next ›

Pivoting with FlowBAT Data



Execute | Command line | Query builder | UTC: 2014/09/29 17:18

rwfilter: --type=all --dport=53 --any-address=162.212.181.0/24

Exclusions: Use "OR" to separate exclusions, for example: --type=7 OR --dport=80

Output type

Records | Stats | Count

Starting time	End time	Source IP	Destination IP	Source port	Destination port	Packet count	Byte count	TCP flags	Duration	Sensor
2014/09/29 05:00:49.856	2014/09/29 05:00:49.856	162.212.181.242	50.116.29.253	60615	53	1	84		0.000	S0
2014/09/29 05:39:05.133	2014/09/29 05:39:05.133	162.212.181.242	50.116.29.253	17230	53	1	84		0.000	S0
2014/09/29 05:51:49.380	2014/09/29 05:51:49.380	162.212.181.242	50.116.29.253	28970	53	1	84		0.000	S0
2014/09/29 06:30:03.388	2014/09/29 06:30:03.388	162.212.181.242	50.116.29.253	60416	53	1	84		0.000	S0
2014/09/29 07:08:15.617	2014/09/29 07:08:15.617	162.212.181.242	50.116.29.253	7348	53	1	84		0.000	S0
2014/09/29 10:06:26.139	2014/09/29 10:06:26.139	162.212.181.242	50.116.29.253	41846	53	1	84		0.000	S0
2014/09/29 11:10:06.287	2014/09/29 11:10:06.287	162.212.181.242	50.116.29.253	60578	53	1	84		0.000	S0
2014/09/29 12:01:01.156	2014/09/29 12:01:01.156	162.212.181.242	50.116.29.253	21537	53	1	84		0.000	S0
2014/09/29 14:33:40.225	2014/09/29 14:33:40.225	162.212.181.242	50.116.29.253	38104	53	1	84		0.000	S0
2014/09/29 16:15:26.648	2014/09/29 16:15:26.648	162.212.181.242	50.116.29.253	58226	53	1	84		0.000	S0

Generating Stats with FlowBAT

Final query

```
$ rwfilter --type=all --start-date=2014/09/29:21 --active-time=2014/09/29T21:35:14.803-2014/09/29T22:35:14.803 --dport=1025- --sport=1025- --protocol=0-255 --pass=stdout > /tmp/AD2CYk2AZfax7bvbz.rwf
$ rwstats --delimited --fields=sIP,dIP --values=Bytes --top --count=10 /tmp/AD2CYk2AZfax7bvbz.rwf
```

Execute | Command line | Query builder

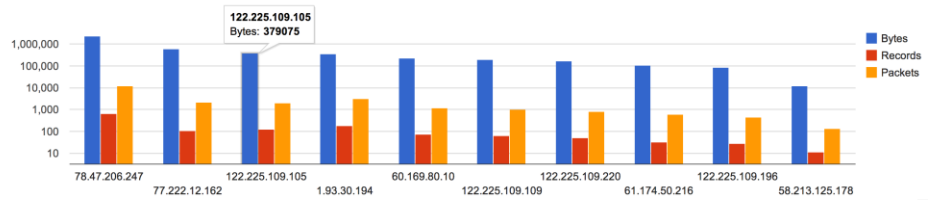
Source IP	Destination IP	Bytes	% Bytes	% Cumulative
198.143.173.180	50.116.29.253	426	46.968026	46.968026
201.186.63.136	50.116.29.253	156	17.199559	64.167585
50.116.29.253	201.186.63.136	120	13.230430	77.398015
198.20.70.114	50.116.29.253	45	4.961411	82.359427
116.255.204.235	50.116.29.253	40	4.410143	86.769570
50.116.29.253	116.255.204.235	40	4.410143	91.179713
219.140.170.70	50.116.29.253	40	4.410143	95.589857
50.116.29.253	219.140.170.70	40	4.410143	100.000000

Generating Stats with FlowBAT

Final query

```
$ rwfilter --type=in --dport=22 --packets=4- --ack-flag=1 --pass=stdout | rwfilter --input-pipe=stdin --scc=-- --fail=stdout > /tmp/szoY2QPsne3TsXk5q.rwf
$ rwstats --delimited --fields=sIP --values=Bytes,Records,Packets --top --count=10 /tmp/szoY2QPsne3TsXk5q.rwf
```

Execute each 60 minutes | Command line | Query builder



Conclusion

- Flow Data is Underused and Underrated
- Easy to Collect, Enhances Detection & Analysis
- Minimal Barriers to Entry
  - SiLK (Easy to Install on SO)
  - Argus (Already Installed on SO)
  - Bro (Already Installed on SO)

Thanks Folks!

- Questions?
  - Chris Sanders – chris@chrissanders.org
  - Jason Smith – jason.smith.webmail@gmail.com
- Blog / Book
  - http://www.appliednsm.com
- FlowPlotter
  - http://www.github.com/automayt/FlowPlotter/
- FlowBAT
  - http://www.flowbat.com