# A Framework for Effective Alert Visualization

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*SecureWorks*

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# Visualization

- Visualization has always been used – but mostly from a reporting standpoint
- We need to start pushing it from the Reporting space to the Analytical space

# Visualization

- Security departments/organizations deal with hundreds of thousands to millions(+) security alerts/messages a day from various devices:
  - IPS/IDS
  - Firewalls
  - AntiSpam / Antivirus devices, etc.
- Correlation is only so effective…
- Humans need to look at the outputs of the correlations, and should also be able to look at the larger picture to effectively analyze the situation

# Visualization (contd.)


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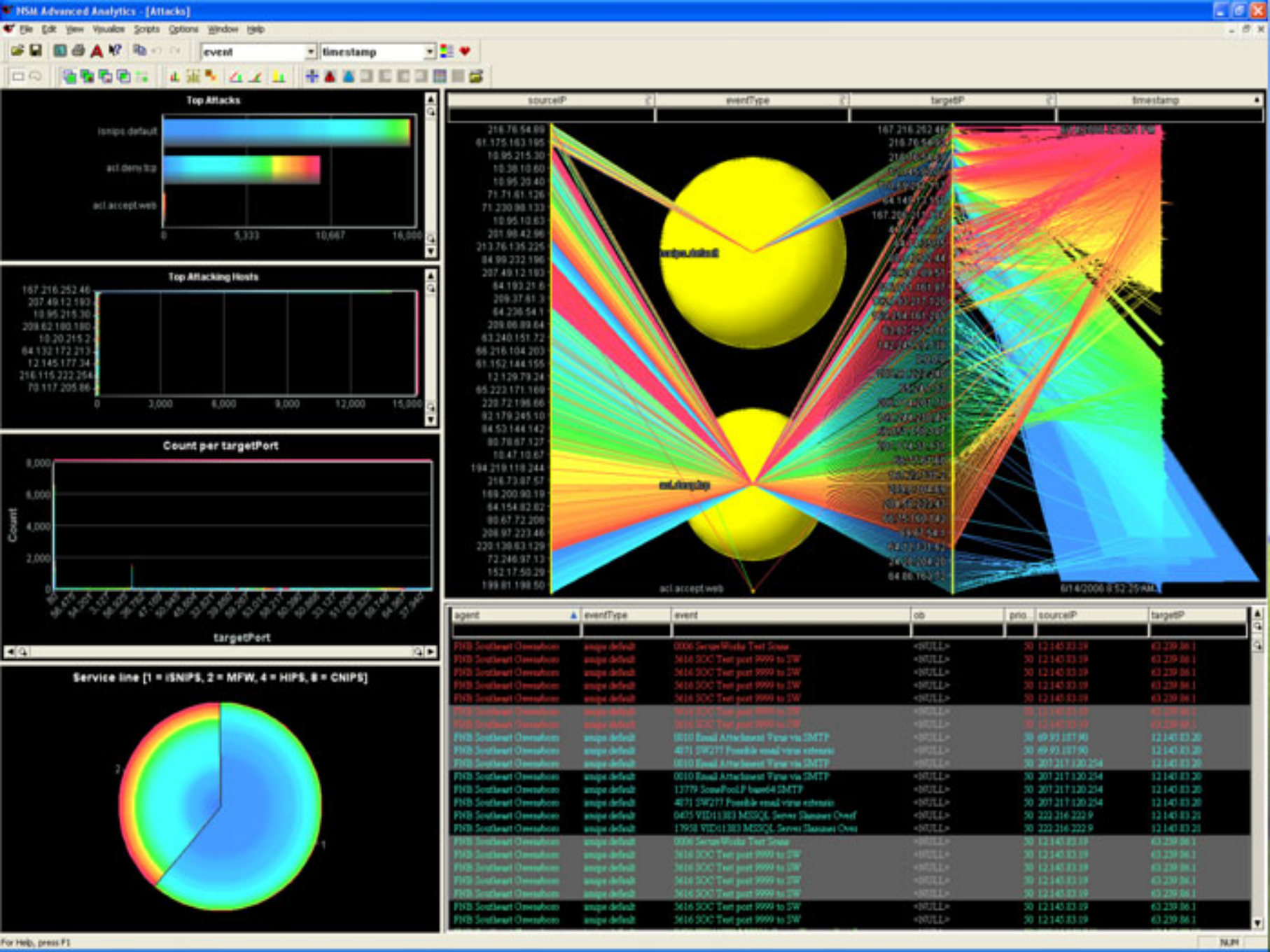
MSM Advanced Analytics - [Attacks]
File Edit View Visualize Scripts Options Window Help
event
timestamp
Top Attacks
isnips default
acl.deny.tcp
acl.accept.web
0
5,333
10,667
16,000
Top Attacking Hosts
167.216.252.46
207.49.12.193
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209.62.180.180
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70.117.205.86
0
3,000
6,000
9,000
12,000
15,000
Count per targetPort
8,000
6,000
4,000
2,000
0
Count
targetPort
Service line [1 = iSNIPS, 2 = MFW, 4 = HIPS, 8 = CNIPS]
sourceIP
eventType
targetIP
timestamp
acl.accept.web
agent
eventType
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For Help, press F1
NUM

# The case for Visualization

- Visualization is a very effective way to represent large volumes of information in a succinct manner
- Allows one to look at the same data from multiple viewpoints
- Allows one to look “around” the alerts that you are investigating to gain some additional perspective

# What makes a good visualization?

- Data driven display: we should be able to ‘slice and dice’ the data, bring related events into focus based on the data selected. E.g. select data by:
  - Protocol
  - IP Address
  - Timestamp
  - Asset Value
  - Port

  And have it bring into focus all related alerts.
- Multiple views into the same data: can elicit a different perspective

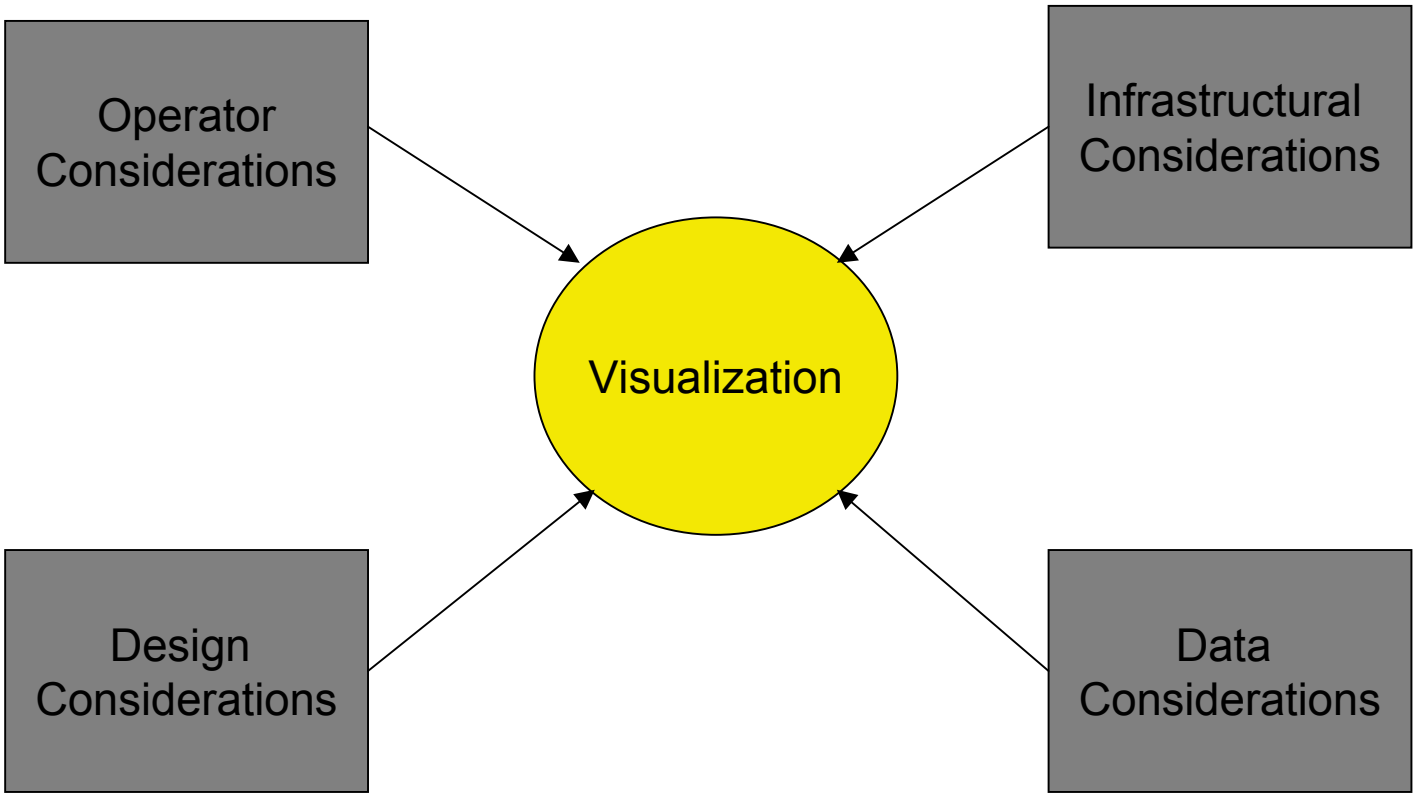
# What makes a good visualization? (contd.)

- Data linkage across all views
- On-the-fly customization of views
- Drill down/Zoom out : allows to isolate a particular event-set or allows you to see the big picture
- Data suppression : allows to quickly eliminate data that is of no consequence to the analysis (e.g. UDP traffic when analyzing TCP flows)
- Statistical information : It is useful to know information on total or selected events (like totals, maximum values, unique values, etc.) to gain a perspective on the nature of the activity

# What makes a good visualization? (contd.)

- Other desirable features:
  - Realtime visualizations
  - Interoperability with other systems (ticketing, reporting)
  - Easily accessible (via a web browser?)

# Considerations for Effective Visualization



# Data Considerations

- Richer data sets make for better visualizations. We need to gather as much information around the event as possible
- Data should be normalized
- More visual correlation can be performed if there are a large number of data fields to work with. Some examples:
  - Device Interface > Tells you which interface the IDS/IPS alert was detected on > Tells us if the alert traffic was inbound or outbound
  - Action taken > was this alert blocked or allowed? > Different responses to alerts from IPS versus IDS
  - IP addresses > is the source IP on our ‘attacker’ watchlist?
  - Type of signatures tripped > specific attack or general scan

# Infrastructural considerations

- Dedicated, capable database used exclusively for storing visualization data (allows for the flexibility to add/remove/modify content without affecting other production systems)

- Visualization tools should have access to other databases like Asset and Vulnerability databases so they can provide even more context

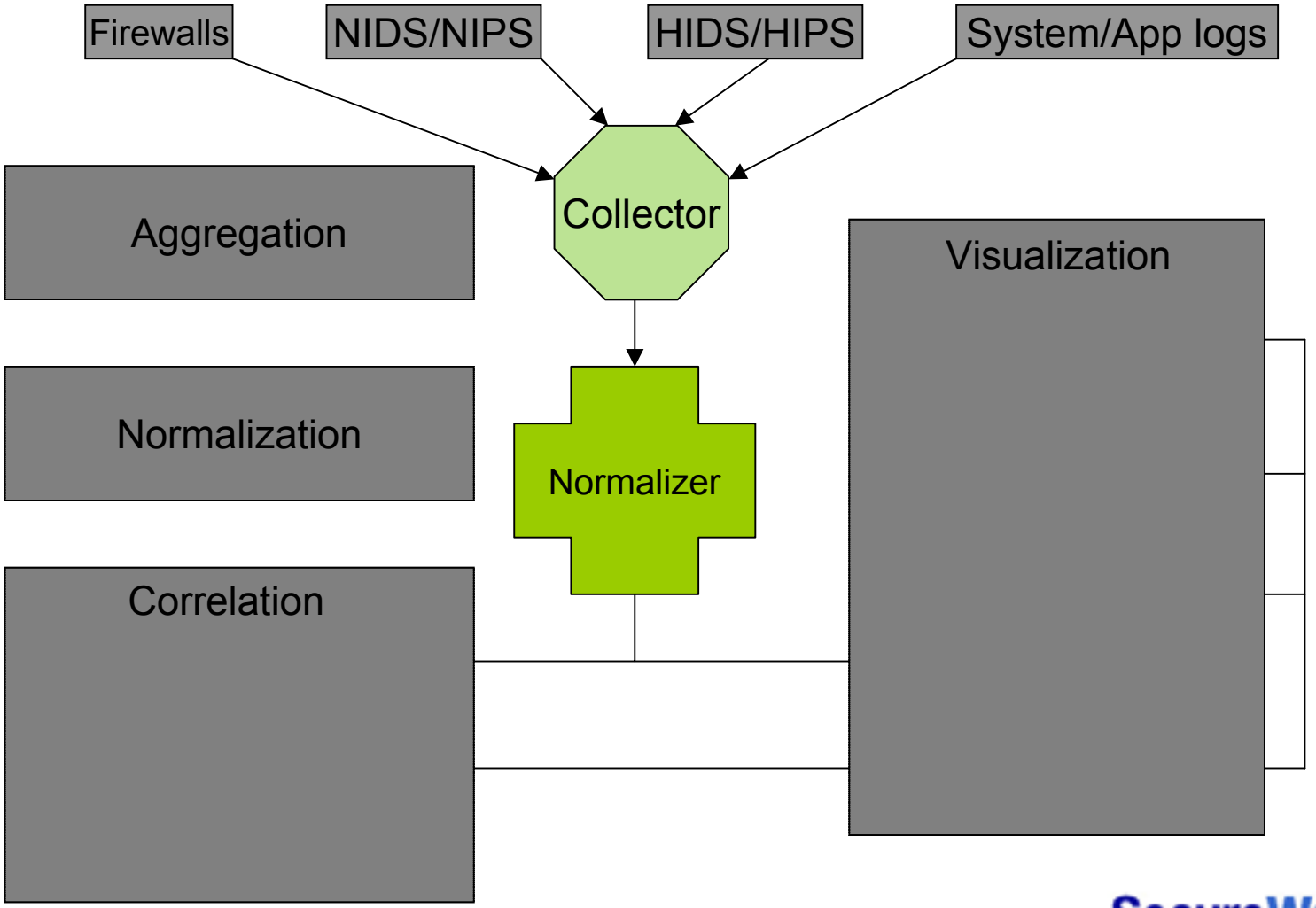
# Operator Considerations

- If using color to key off on events, the ability of the operator to discern colors must be taken into consideration
- Screen real estate is *very* important
- Training
  - Using data from real scenarios

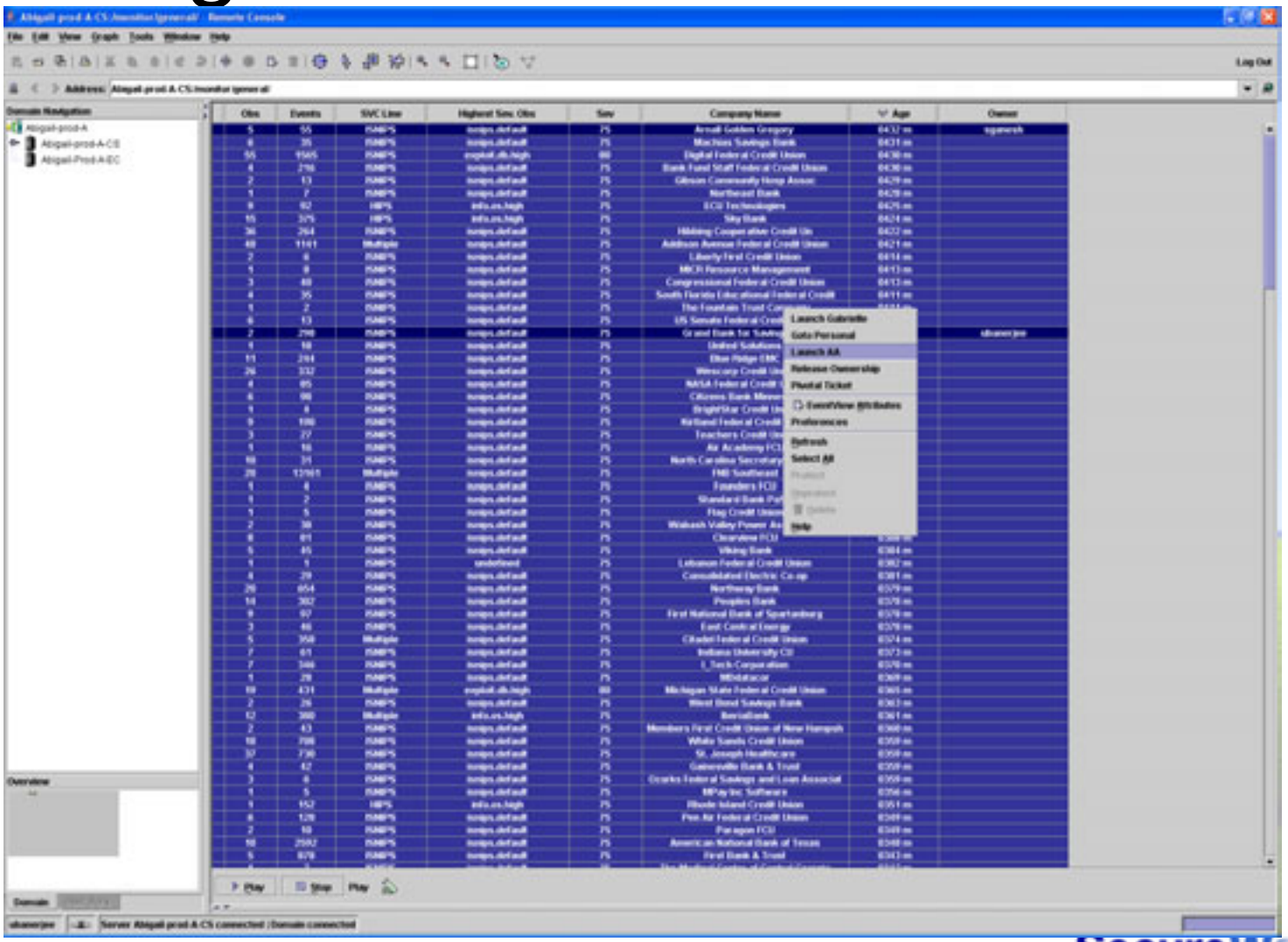
# Design Considerations

- Design of the visualization is of utmost importance (layout, intuitiveness, features)
- The visualizations should be presented in such a way that inferences should quite literally, present themselves

# Data Flow through the system



# Integration with our SIM Tool



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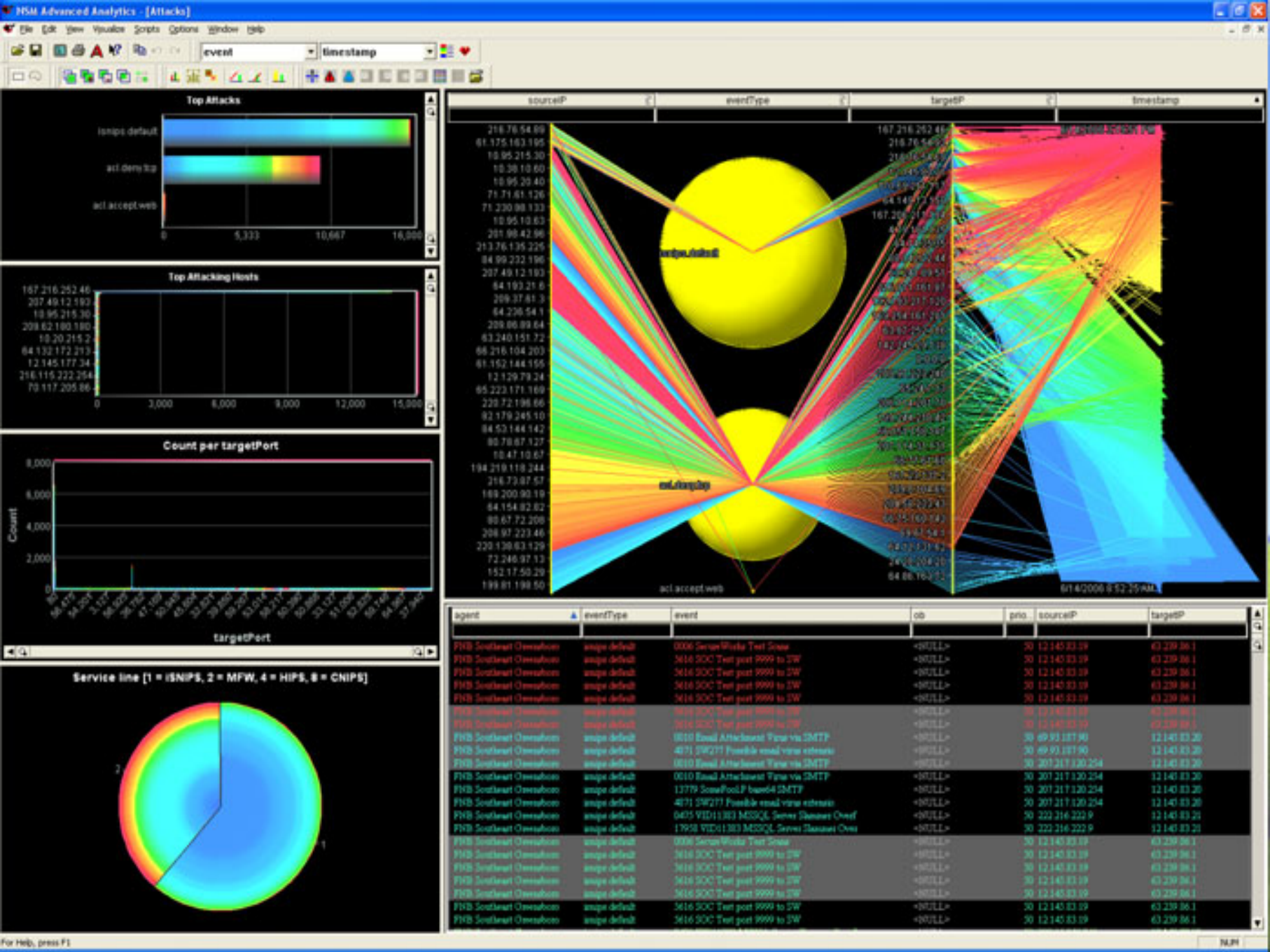
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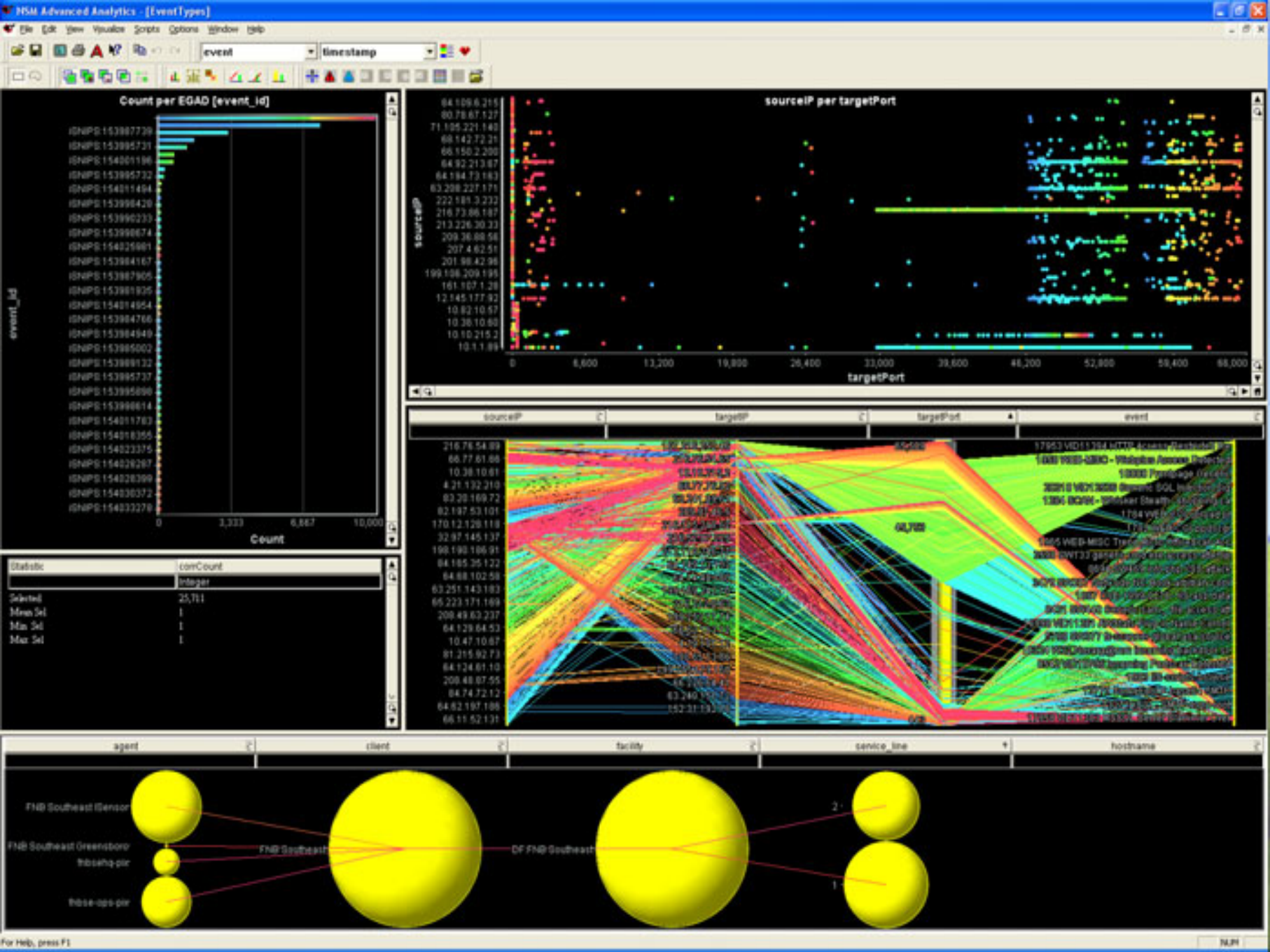
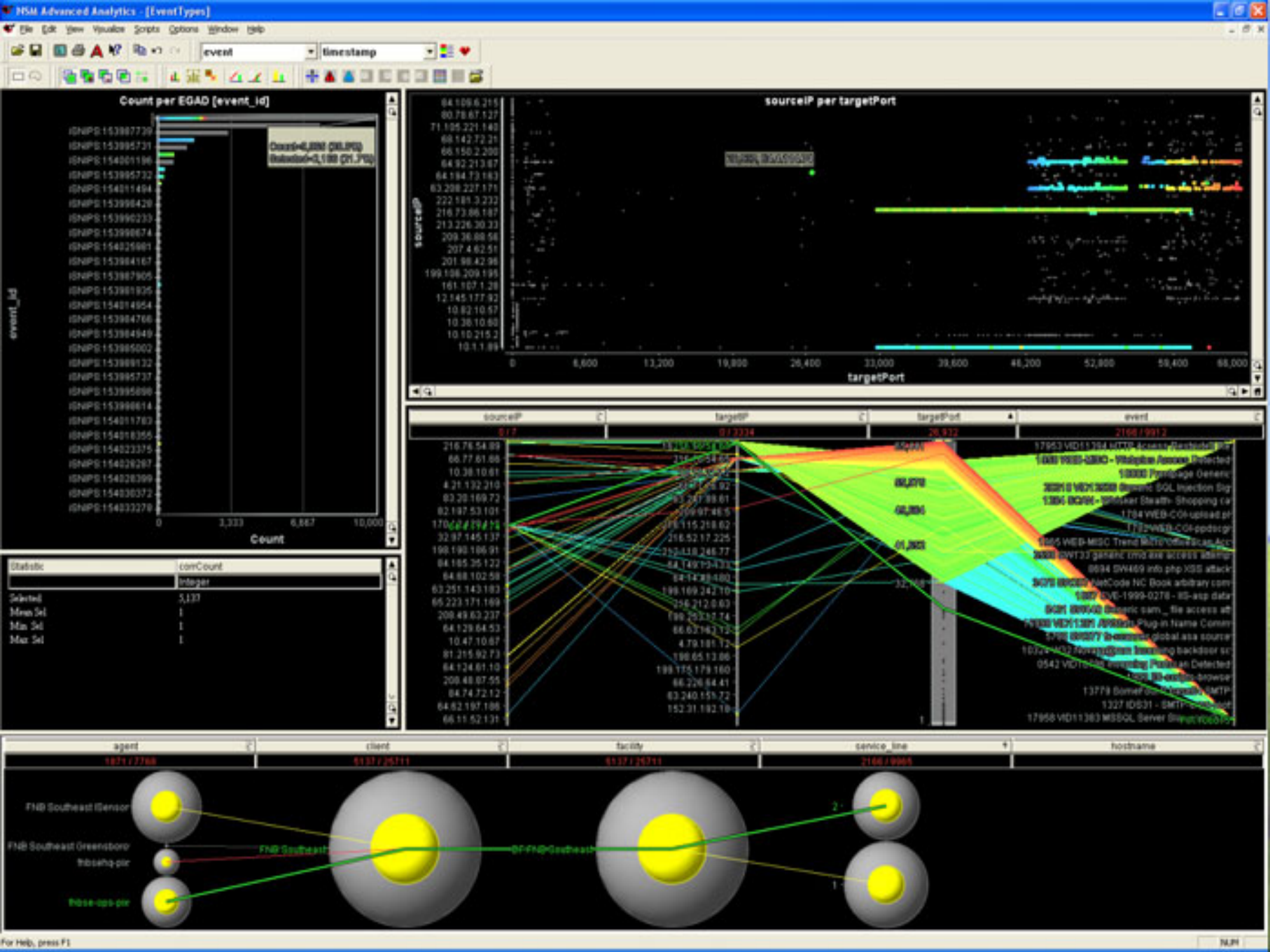

NSM Advanced Analytics - [EventTypes]
File Edit View Visualize Scripts Options Window Help
event
timestamp
Count per EGAD [event_id]
event_id
Count
0
3,333
6,667
10,000
sourceIP per targetPort
sourceIP
targetPort
0
6,600
13,200
19,800
26,400
33,000
39,600
46,200
52,800
59,400
66,000
Statistic
corrCount
Integer
Selected
25,761
Mean Sel
1
Min Sel
1
Max Sel
1
sourceIP
targetIP
targetPort
event
agent
client
facility
service_line
hostname
FNB Southeast iSensor
FNB Southeast Greensboro
fnbsahq-pir
fnbse-ops-pir
FNB Southeast
DF FNB Southeast
For Help, press F1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event_id
Count
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6,667
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6,600
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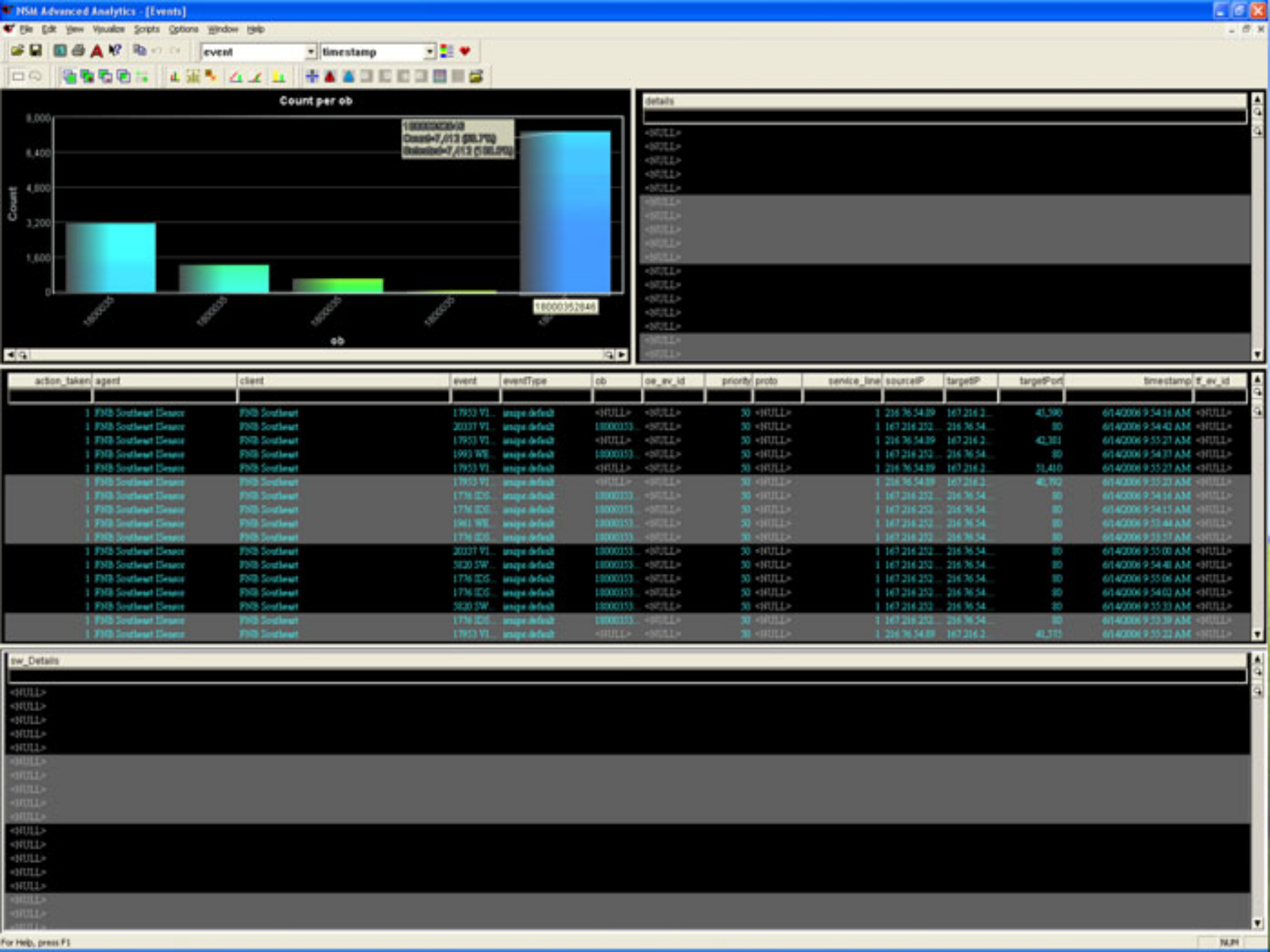
26,400
33,000
39,600
46,200
52,800
59,400
66,000
Statistic
corrCount
Integer
Selected
Mean Sel
Min Sel
Max Sel
sourceIP
targetIP
targetPort
event
agent
client
facility
service_line
hostname
FNB Southeast iSensor
FNB Southeast Greensboro
fnbsahq-pix
fnbse-ops-pix
FNB Southeast
For Help, press F1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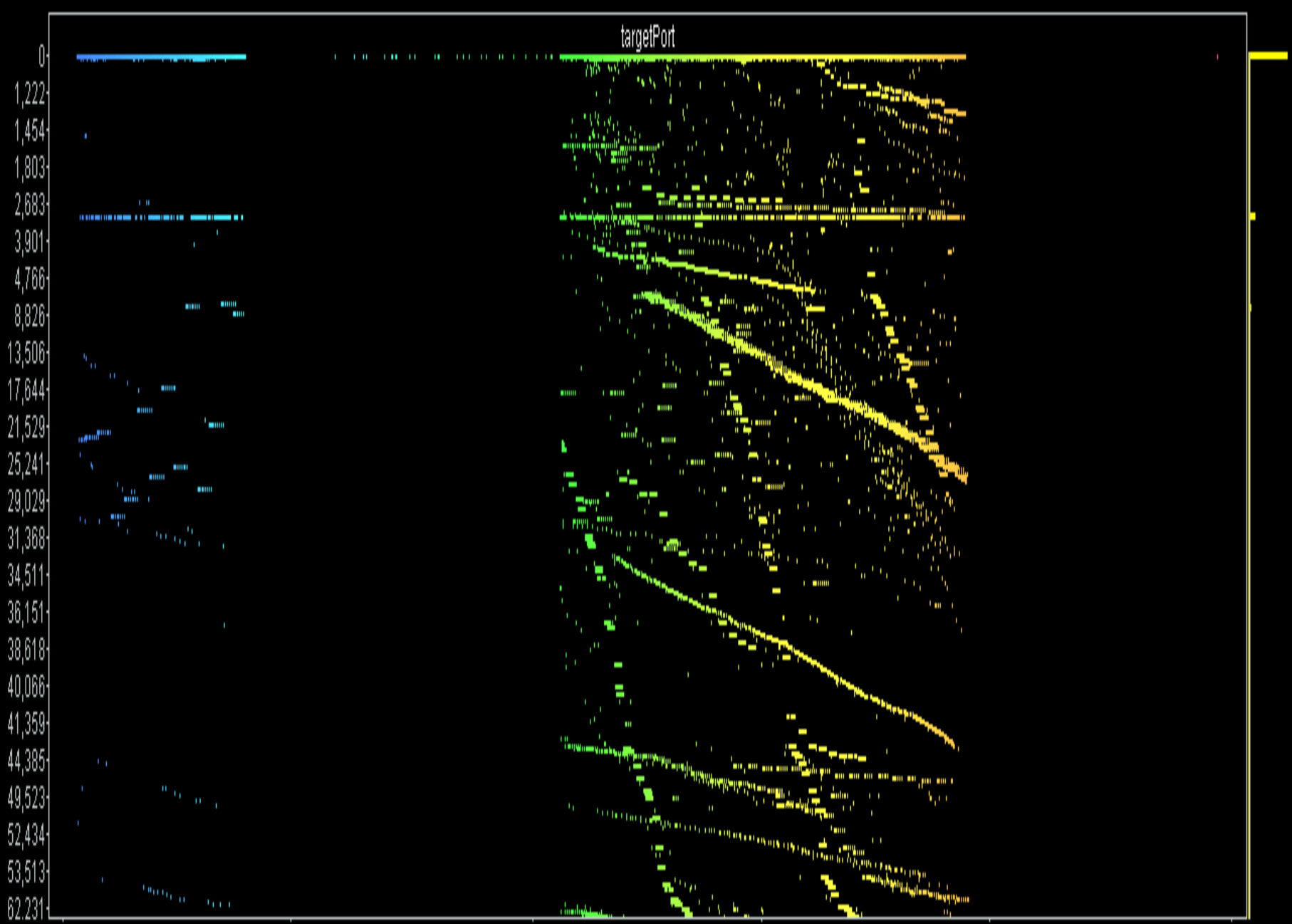
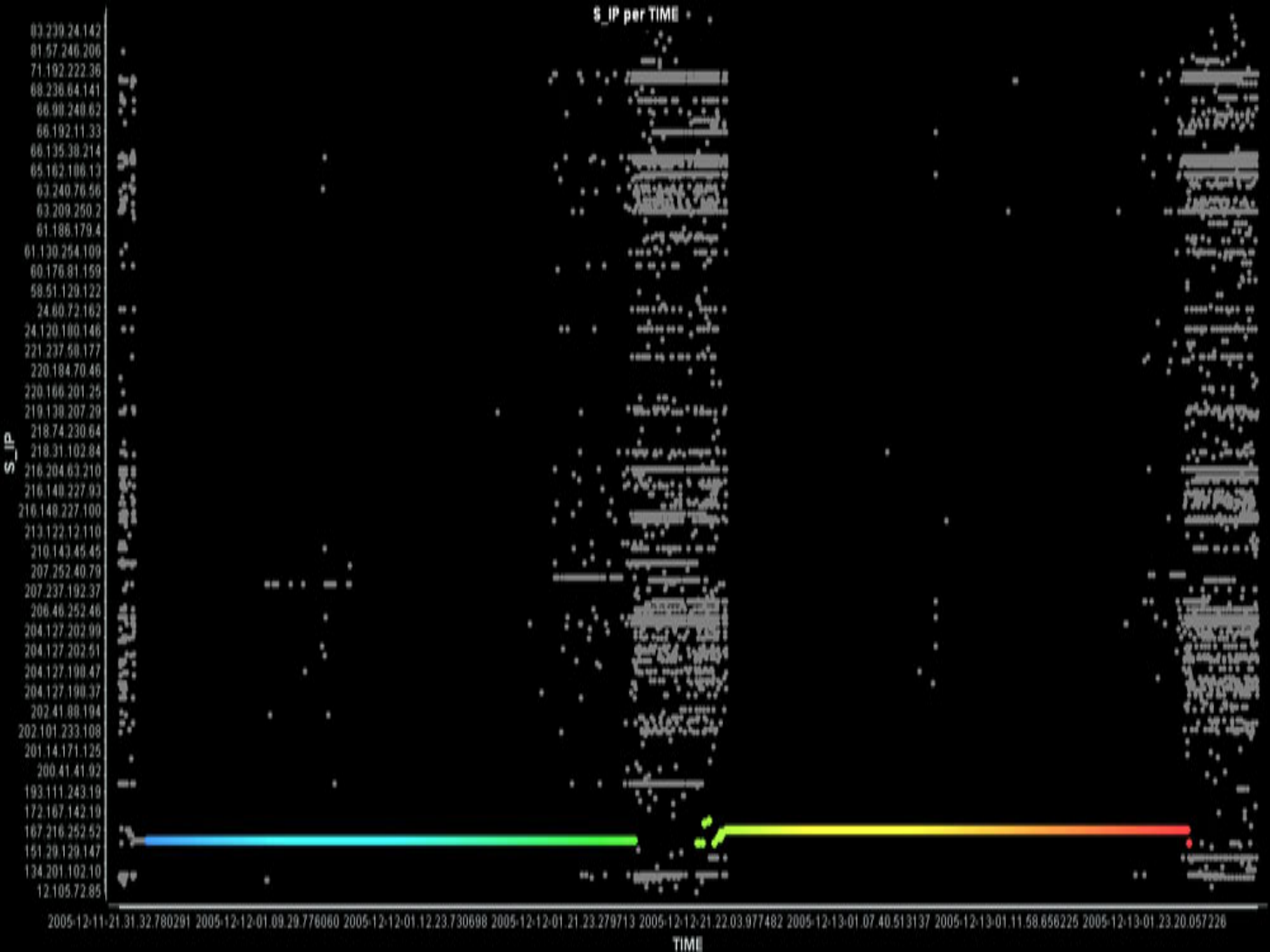
File Edit View Visualize Scripts Options Window Help
event
timestamp
Count per ob
Count
ob
details
action_taken agent client event eventType ob ce_av_id priority proto service_line sourceIP targetIP targetPort timestamp tf_av_id
sw_Details
For Help, press F1


targetPort
0
1,222
1,454
1,803
2,683
3,901
4,766
8,826
13,506
17,644
21,529
25,241
29,029
31,368
34,511
36,151
38,618
40,066
41,359
44,385
49,523
52,434
53,513
62,231
6/27/2006 11:45:00 PM
6/28/2006 3:45:00 AM
6/28/2006 8:00:00 AM
6/28/2006 12:00:00 PM
6/28/2006 4:00:00 PM
6/28/2006 8:15:00 PM


S_IP per TIME
S_IP
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01.57.246.206
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68.236.64.141
66.90.240.62
66.192.11.33
66.135.38.214
65.162.106.13
63.240.76.56
63.209.250.2
61.186.179.4
61.130.254.109
60.176.81.159
58.51.120.122
24.60.72.162
24.120.180.146
221.237.58.177
220.184.70.46
220.166.201.25
219.138.207.29
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218.31.102.84
216.204.63.210
216.140.227.93
216.140.227.100
213.122.12.110
210.143.45.45
207.252.40.79
207.237.192.37
206.46.252.46
204.127.202.99
204.127.202.51
204.127.198.47
204.127.198.37
202.41.88.194
202.101.233.108
201.14.171.125
200.41.41.92
193.111.243.19
172.167.142.19
167.216.252.52
151.29.120.147
134.201.102.10
12.105.72.85
2005-12-11-21.31.32.780291
2005-12-12-01.09.29.776060
2005-12-12-01.12.23.730698
2005-12-12-01.21.23.279713
2005-12-12-21.22.03.977482
2005-12-13-01.07.40.513137
2005-12-13-01.11.58.656225
2005-12-13-01.23.20.057226
TIME

# Visualization: caveats

- Only becomes more effective as data grows larger
- May not be very suitable for quickly analyzing very small amounts of data

# Some useful views

- Source IP vs Target IP vs Timestamp
- Source IP vs Target Port
- Source IP vs Alert Timestamp
- Dest Port vs Alert Timestamp
- Counts by (S_IP, T_IP, T_Port, etc.)
- Attacks vs Asset value vs Vulnerabilities

# Demo

# Questions?
# Comments?

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