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Advanced Splunk Searching for Security Hunting and Alerting

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September 26, 2017 | Washington, DC

What Makes a Security Alert

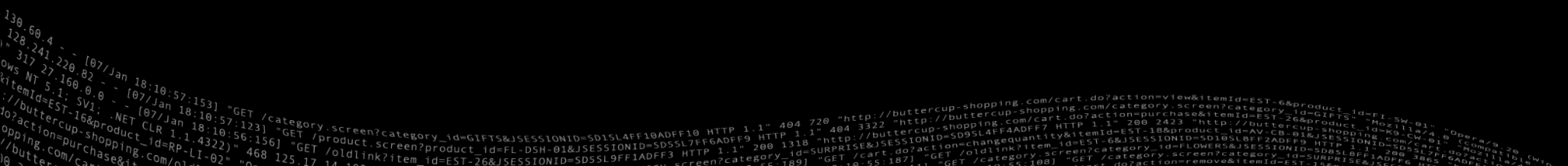
Its not just the SPL

- What question are you trying to answer?
- What are acceptable signal to noise ratios?
- What are acceptable false positive rates?

The Alert Creation Process

Step one: there's a fire!

- If you know TDD, you'll love IDD
- The best alerts start from having the data for something that is known to be bad.
- Incidents come from other alerting platforms or threat hunting
- | bucket _time span=15m | stats … by … _time
- Our SOC works closely with our Engineering team



Basic Search Commands

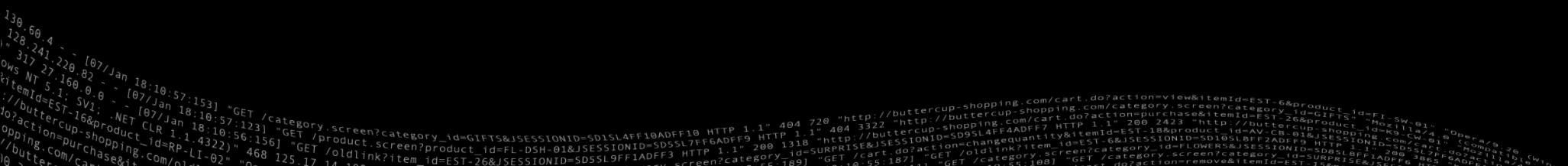
We all know and love them

- stats
  - Calculates aggregate statistics over result set
- eval
  - Calculates expression to create a new field
- where
  - Uses eval expression to filter events
- (input)lookup
  - Allows data to be pulled in from file sources

Basic Search Limitations

Stats can be your best friend, but it shouldn't be your only one

- The basic commands limit what security questions can be asked and answered.
- Alerts created with only these are often more static than can be useful.
- Streaming vs Generating commands



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Conceptualizing data in Splunk terms

In order to master Splunk, you must think like Splunk

- Data in Splunk is a stream of events NOT rows in a table
- The order of events sometimes matters – sort is helpful here
- Tables are misleading

Advanced Search Commands

Meet your new friends

- Transaction
  - Groups events as transactions based off of constraints
- Eventstats
  - Same as stats, but applies the aggregates back to the raw data
- Streamstats
  - Same as stats, but aggregates the statistics as the events pass through the stream
- Chart
  - Applies statistics across the axes specified
- Stats (with eval clauses)
  - Using eval commands in stats aggregate functions to selectively include events in aggregates
  - | stats count, count(eval(like(src,”10.%"))) as internalSrc

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Benefits of Advanced Commands

Level up your SPL!

- Advanced commands expand question vocabulary
  - Allows for current events to be compared to historical trends without lookups
  - Ability to answer the question “Did x then y happen”?
    - “Is there a user that has failed logging in to 5 hosts, and was then able to successfully log in to a host?”
  - “Did a user log in from a new country with a new user agent today?”
- Eventstats and Streamstats are streaming commands, leaving the underlying data intact

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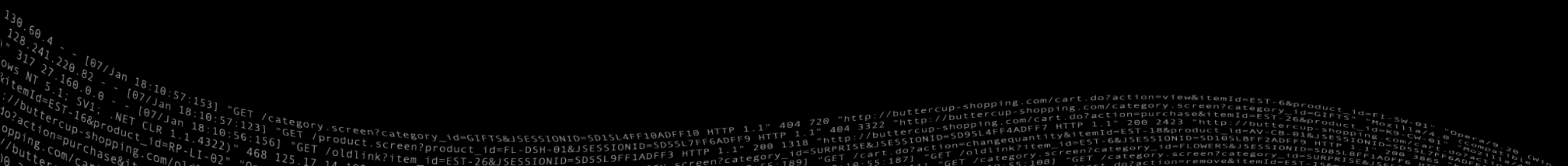
Eventstats

Stats' more useful cousin

- Splunk comparisons in where and eval clauses are done on an event by event basis
- Makes the aggregate statistic available to compare against individual fields in the event
- This also retains all fields that were previously in the event for further analysis and context



Stats Limitations

```
index=[redacted]_logs src_user=[redacted]\\stefan.hutchison
| stats max(bytes), count, avg(bytes) by dest
```

Last 4 hours

✓ 225 events (8/14/17 11:39:00.000 PM to 8/15/17 3:39:20.000 AM) No Event Sampling

Job | Fast Mode

Events | Patterns | Statistics (5) | Visualization

100 Per Page | Format | Preview

dest	max(bytes)	count	avg(bytes)
[redacted].10.83	102332	60	19027.20588235294
[redacted].10.84	24845	36	4634.916666666667
[redacted].138.11	13598	7	3620.2
[redacted].239.138	82	54	80.81481481481481
[redacted].239.139	82	68	80.58823529411765

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What Eventstats Provides

```
index=[redacted]_logs src_user=[redacted]\stefan.hutchison
| eventstats max(bytes) as max_bytes, count, avg(bytes) as avg_bytes by dest
| where bytes=max_bytes
| table src, app, dest, bytes, max_bytes, count, avg_bytes
```

Last 4 hours

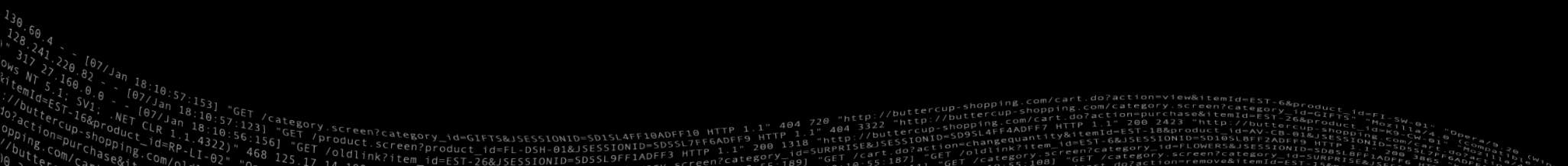
✓ 3 events (8/14/17 11:42:00.000 PM to 8/15/17 3:42:49.000 AM) No Event Sampling

Job Fast Mode

Events | Patterns | Statistics (3) | Visualization

100 Per Page | Format | Preview

src	app	dest	bytes	max_bytes	count	avg_bytes
[redacted].1.125	ssl	[redacted].10.83	102332	102332	71	16345.075
[redacted].1.125	splunk	[redacted].138.11	13598	13598	7	3620.2
[redacted].1.125	ssl	[redacted].10.84	24845	24845	36	4634.916666666667



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Streamstats

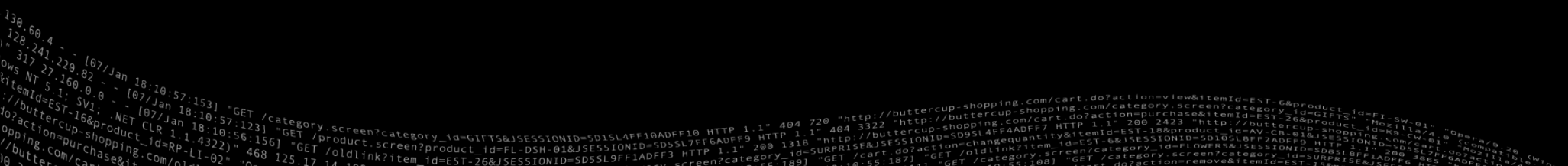
Stats' other more useful cousin… it's a big family

- Similar to eventstats where the aggregate functions are applied to the original events
- The value of the field changes as more events pass through the stream
- Example: " | streamstats count" will count 1, 2, 3, etc. until the last event

Transaction

One of the most expensive commands

- Joins events based off of shared fields to form a logical transaction
- Quite expensive, use it sparingly
- Adds the fields duration and eventcount
- Very useful when trying to determine if x then y



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Eventstats and Transaction in Action

```
index=os sourcetype=sshd "Failed " OR "Accepted " host=[redacted]
| sort 0 src, dest, user, _time desc
| streamstats count as contiguous_action by src dest user action current=true window=50 reset_on_change=true
| where (tag="success" AND contiguous_action>3) OR (tag="error")
| transaction src dest user maxevents=2 startswith=eval(like(tag,"success")) endswith=eval(like(tag,"error"))
| rename contiguous_action as success_attempts
| stats count dc(dest) as distinct_dests sum(success_attempts) as "Total Successes" by user
```

Last 24 hours

✓ 1 event (8/13/17 9:00:00.000 PM to 8/14/17 9:17:14.000 PM) No Event Sampling Job Verbose Mode

Events (1) Patterns Statistics (1) Visualization

100 Per Page Format Preview

user	count	distinct_dests	Total Successes
stefan.hutchison	1	1	5

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Under the Hood

```
index=os sourcetype=sshd "Failed " OR "Accepted " host=[redacted] stefan.hutchison
| sort 0 src, dest, user, _time asc
| streamstats count as contiguous_action by src dest user action current=true window=50 reset_on_change=true
| search src=*
| table _time src dest user tag contiguous_action
```

Last 24 hours

✓ 5 events (8/13/17 9:00:00.000 PM to 8/14/17 9:34:29.000 PM) No Event Sampling Job Verbose Mode

Events (5) Patterns Statistics (5) Visualization

100 Per Page Format Preview

_time ^	src	dest	user	tag	contiguous_action
2017-08-14 21:09:02	[redacted].2.12	[redacted]	stefan.hutchison	authentication remote success	1
2017-08-14 21:11:07	[redacted].2.12	[redacted]	stefan.hutchison	authentication remote success	2
2017-08-14 21:11:12	[redacted]2.12	[redacted]	stefan.hutchison	authentication remote success	3
2017-08-14 21:11:17	[redacted]2.12	[redacted]	stefan.hutchison	authentication remote success	4
2017-08-14 21:11:46	[redacted]2.12	[redacted]	stefan.hutchison	authentication error remote	1

Chart

And you thought we were done with the Stats family

- Calculates statistics (or eval values) based on multiple axes of data
- This can allow us to pivot the data
  - This is different from the splunk pivot functionality
- Allows us to compare the results of aggregate functions of 2 different groups

Chart in Action

```
| tstats `summariesonly` dc(All_Traffic.dest) as distinct_host from datamodel=Network_Traffic where nodename=All_Traffic  by All_Traffic.src, _time span=1h
| `drop_dm_object_name("All_Traffic")`
| eval StartTime=relative_time(now(),"-1h")
| eval Series=
    if(_time>=StartTime,"now","prior")
| chart avg(distinct_host) as avg, stdev(distinct_host) as stdev, count by src, Series
| where 'count: prior'>20 AND 'avg: now' > ('avg: prior' + 'stdev: prior')
```

Last 7 days

✓ 2,401,031,932 events (8/7/17 10:00:00.000 PM to 8/14/17 10:44:25.000 PM) No Event Sampling

Job Fast Mode

Events | Patterns | Statistics (2,697) | Visualization

100 Per Page | Format | Preview

< Prev 1 2 3 4 5 6 7 8 9 ... Next >

src	avg: now	avg: prior	count: now	count: prior	stdev: now	stdev: prior
[redacted].232.2	29641	593.6501706484642	1	8204	0	3031.7632627377234
[redacted].50.14	217	36.149950714637754	1	8116	0	82.3831277029888
[redacted].1.249	49	8.081126469448392	1	7741	0	15.324386725032245
[redacted].1.12	1422	149.99801429706116	1	7554	0	368.9941694255707
[redacted].1.131	822	69.99583836756612	1	7449	0	180.9665491188129
[redacted].232.3	492	88.5518817204301	1	7440	0	166.06792500755066
[redacted].0.131	774	68.7271112325772	1	7318	0	172.56760090292187
[redacted].56.2	22	3.7436437490597263	1	6647	0	5.9589978413830496

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Key Takeaways

Hopefully

1. IDD and a process to keep Alerts relevant
2. For robust alerting, go beyond the basic search commands
3. It is necessary to think about your data the way Splunk does

Thank You

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