splunk> .conf2017

Speed up your searches!

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Forward-Looking Statements

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Bio: Satoshi Kawasaki

Splunk4Good Ninja

hobbes3

BS in Aerospace Engineering from Georgia Tech

- Also joined Splunk in 2013
  - 3 years of Professional Services (PS)
  - 1+ year of Splunk4Good
- Unofficially became a dashboard/visualization specialist in PS
  - .conf 2014: *I Want that Cool Viz in Splunk!*
  - .conf 2015: *Enhancing Dashboards with JavaScript!*
- Doing 3 talks this year
  - .conf 2017: *Speed up your searches!*
  - .conf 2017: *Splunking to fight human trafficking*
  - .conf 2017: *Splunking the 2016 presidential election*

You are here.

Splunk4Good

Big data can make a big difference

WOUNDED WARRIOR PROJECT®

NETHOPE

TEAM RUBICON

npower

- $100 million Splunk Pledge has issued licenses and training worth over $6 million
- Provide workforce training to veterans and opportunity youth to train the workforce of tomorrow
- Engaging our partners in initiatives to promote STEM and develop shared solutions for humanitarian response and human trafficking
- Supporting life-changing research at top universities
- More than 70,000 hours of paid volunteer time

Dashboards are like web pages

Because all good searches become dashboards

amazon

"For every one second delay, conversions dropped by 7%"

Google

"2 seconds is the threshold for ecommerce website acceptability. We aim for under a half second."

"For every one second past 2 seconds a Splunk dashboard loads, the user becomes 20% more likely to open YouTube, Facebook, or 4chan."

How does acceleration work?

Nothing in this world is free

Increase speed at the cost of space!

Luckily, disk space is much cheaper than processors!

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Also know as the "summary" or .tsidx

- Scheduled searches[1]
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- **DATA MODEL ACCELERATION**
- Batch mode search parallelization[2]

[1] For dashboards
[2] This is actually an indexer setting

The baseline search

Cisco Meraki providing free wifi in refugee camps around Greece

77s

A sample of 2,251,967 raw events from July 19th, 2017

The baseline search takes **77s**:

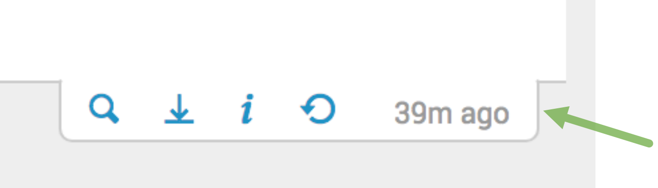
```
index=meraki sourcetype=meraki_syslog
log_type=urls
| stats dc(mac)
```

Scheduled searches

"It's my search and I need it now!"

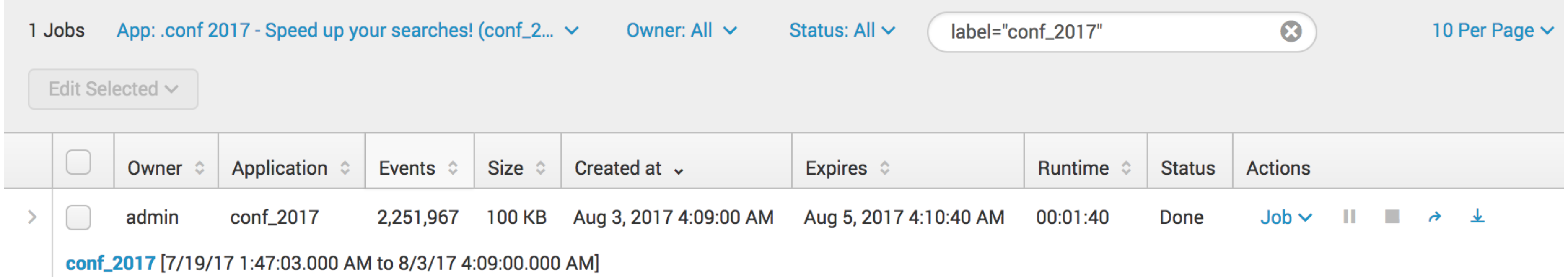
Scheduled search

For dashboard panels



Panel status shows the 39 minute "delay" in the scheduled search.

<1s



	□	Owner	Application	Events	Size	Created at	Expires	Runtime	Status	Actions
›	□	admin	conf_2017	2,251,967	100 KB	Aug 3, 2017 4:09:00 AM	Aug 5, 2017 4:10:40 AM	00:01:40	Done	Job

conf_2017 [7/19/17 1:47:03.000 AM to 8/3/17 4:09:00.000 AM]

Job Inspector (or "View Recent" from "Searches, reports, and alerts") shows how long the search actually took and when the search last ran.

Scheduled search

Pros and cons

- Searches instantly load from disk
- Good for "static" dashboards (like single value KPIs for TV displays)
- Better than saving to lookups for static data[1]

- Less flexibility on search parameters, like you can't increase the time range
- Results delayed up to the scheduled interval
- Managing a saved search per panel could be a pain

[1]Unless you're really working with unreliable test data

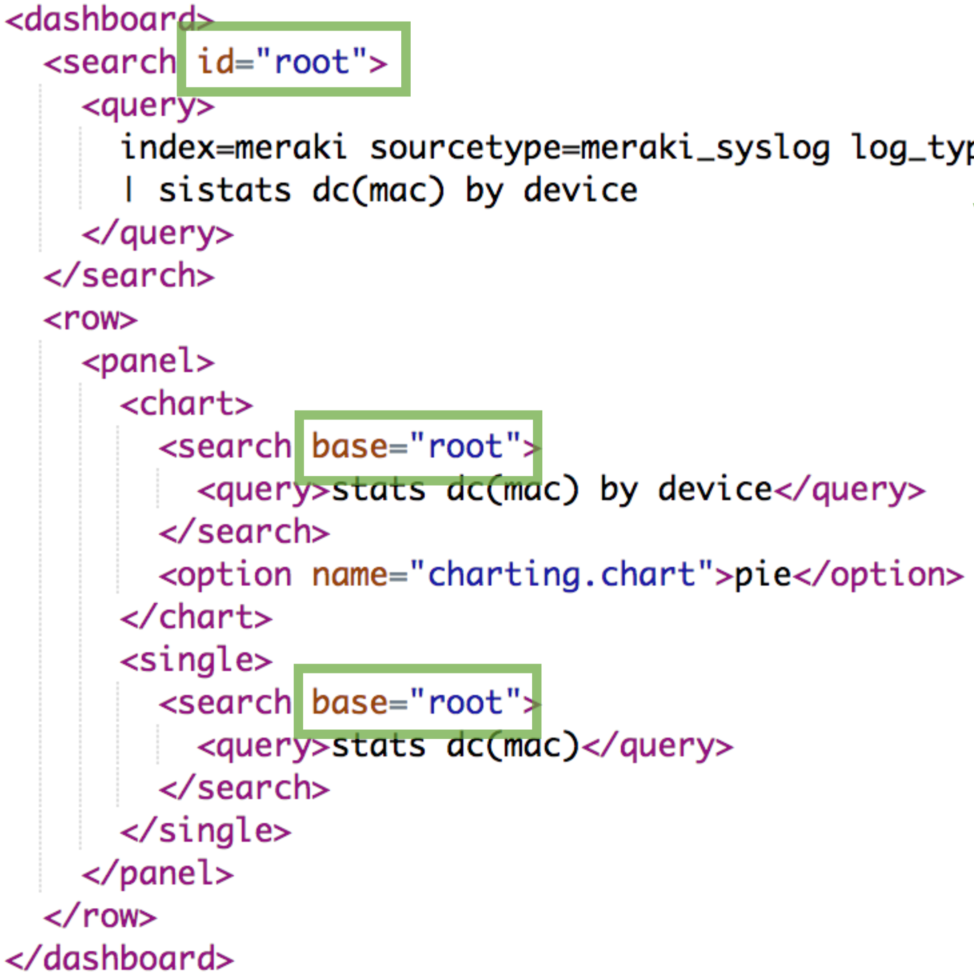
Post-process searches

One construction worker working, the rest standing

Post-process searches

For dashboards

N/A



```
<dashboard>
  <search id="root">
    <query>
      index=meraki sourcetype=meraki_syslog log_type=urls
      | sistats dc(mac) by device
    </query>
  </search>
  <row>
    <panel>
      <chart>
        <search base="root">
          <query>stats dc(mac) by device</query>
        </search>
        <option name="charting.chart">pie</option>
      </chart>
      <single>
        <search base="root">
          <query>stats dc(mac)</query>
        </search>
      </single>
    </panel>
  </row>
</dashboard>
```

Two searches driven by one base search (aka the "data cube").

Both post-process searches will complete at the same time.

Post-process search

Pros and cons

- Post-process searches share the same processing usage of the base search
- As long as the base search doesn't change, changes in post-process is very fast (ie using $tokens$)
- Less validation on search results when post-processing from a "data cube"

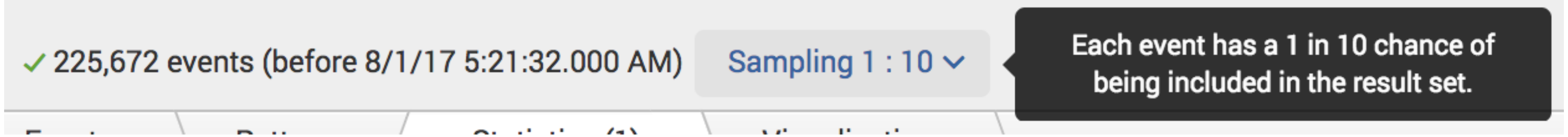
- Must be done in Simple XML (no UI option as of Splunk 6.6)

Event sampling

"We're gonna need a bigger sample"

Event sampling

Sampling 1:10



✓ 225,672 events (before 8/1/17 5:21:32.000 AM)

Each event has a 1 in 10 chance of being included in the result set.

9.5s

- No sampling covers 2,251,967 events (baseline)
- 1:10 sampling covers 225,672 events

Generally,
1:10 is 10× faster,
1:100 is 100× faster, etc.

Event sampling

Pros and cons

- Easiest way to speed up a search
- No prerequisites to use event sampling
- Good for ratios (ie pie charts)

- Results are approximates with inherent sampling errors
- A big assumption is that the data is uniform enough
- Certain statistical functions are almost useless in sampling (like total count, sum, dc, etc.)

Summary indexing

Search. Reduce. Recycle.

Summary indexing (SI)

Searching against the summary index

<1s

- Original search:

```
index=meraki sourcetype=meraki_syslog log_type=urls
| stats dc(mac)
```

- Summary index search:

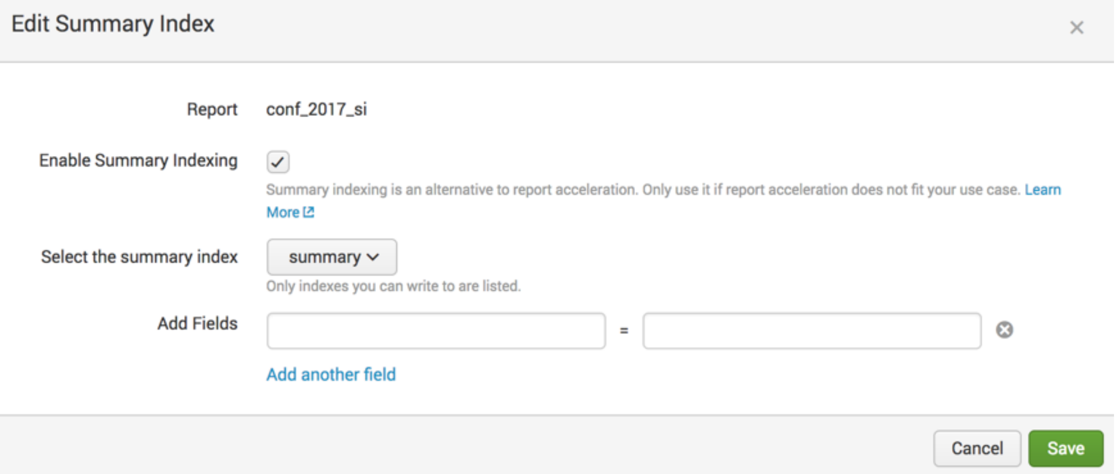
```
index=summary search_name=conf_2017_si
| stats dc(mac)
```

Summary indexing (SI)

The summarizing search that goes into the SI

- Summary-populating search called "conf_2017_si" runs every hour and looks back one hour[1]:

```
index=meraki sourcetype=meraki_syslog log_type=urls
| sistats dc(mac) by device
```



Edit Summary Index ×

Report conf_2017_si

Enable Summary Indexing ☑

Summary indexing is an alternative to report acceleration. Only use it if report acceleration does not fit your use case. Learn More

Select the summary index: summary

Only indexes you can write to are listed.

Add Fields [ ] = [ ]

```
07/19/2017 06:00:00 -0700, search_name=conf_2017_si,
search_now=1500519600.000, info_min_time=1500516000.000,
info_max_time=1500519600.000,
info_search_time=1501727194.366, device=GRE_040_AP5,
psrsvd_ct_mac=408, psrsvd_gc=408, psrsvd_v=1,
psrsvd_vm_mac="18:21:95:8A:E8:23;19;3C:BB:FD:21:E0:CD;14;6
0:FE:1E:89:47:6C;15;60:FE:1E:8F:AD:64;1;84:11:9E:2C:D7:D6;
83;88:83:22:71:93:4C;3;8C:79:67:DA:DE:20;33;C4:3A:BE:A6:33
:CB;68;D0:FF:98:62:E3:5B;4;D4:DC:CD:BD:5E:0A;4;EC:10:7B:8D
:8E:C8;164;"
```

"Mysterious" fields created by sistats

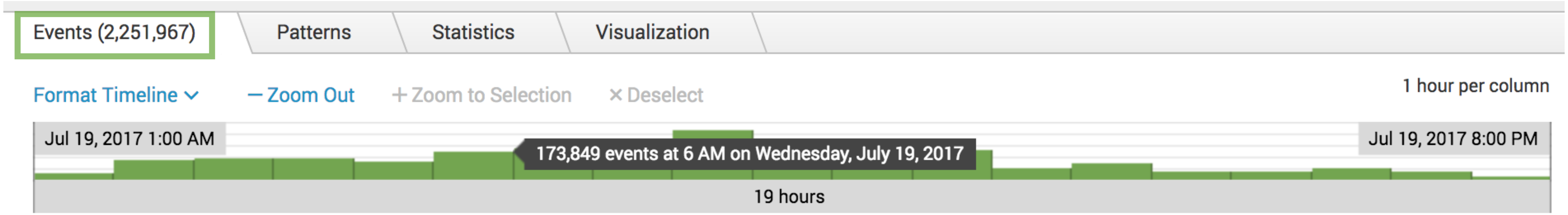
[1] Backfilled the SI using:

```
./splunk cmd python fill_summary_index.py -app conf_2017 -name
conf_2017_si -et 1500447600 -lt 1500534000 -owner admin
```

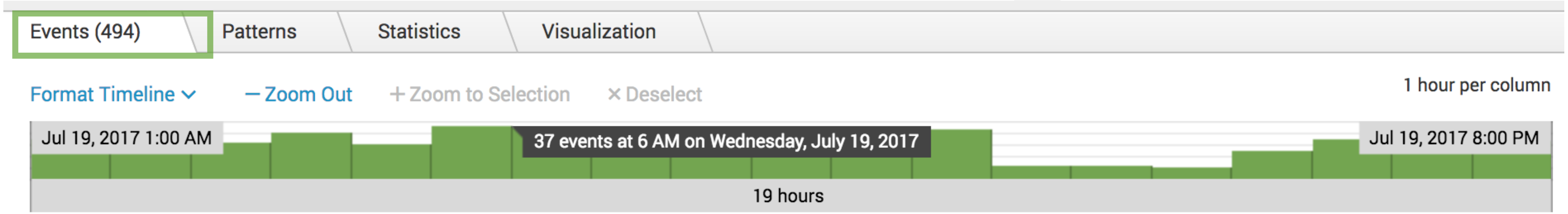
splunk> .conf2017

Summary indexing

How is SI fast?



173,849 events at 6 AM on Wednesday, July 19, 2017



37 events at 6 AM on Wednesday, July 19, 2017

Original index with 2,251,967 events (baseline)
SI with 494 events

Summary indexing

Pros and cons

- Also useful for having a "cleaner" copy of the data or hardcoding calculated or lookup values to the summary
- Has all the same functionalities of an index: RBAC, data retention, clustering replication, etc.

- Can't go more granular than the summary's scheduled interval
- Can have gaps or overlaps
- Backfilling is a manual python script
- Impossible to search outside the summarized time range
- Messing up the summary is the worst

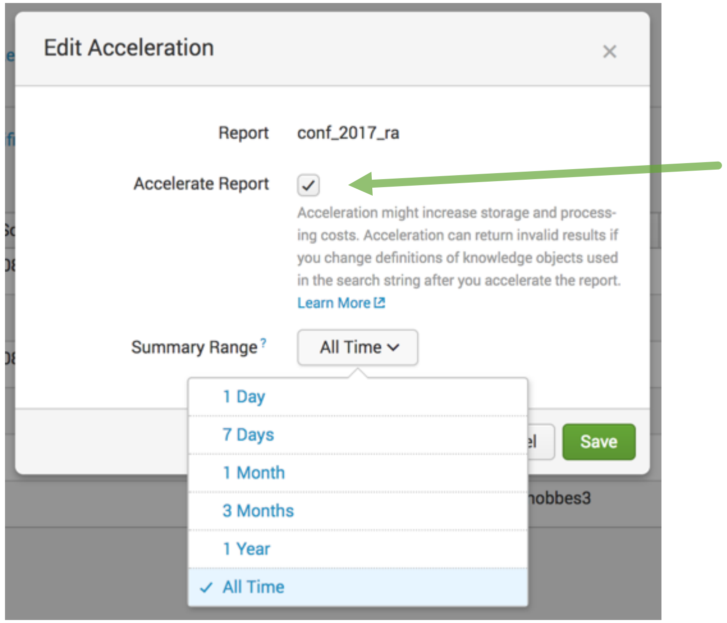
Report acceleration

The "that was easy" button

Report acceleration (RA)

Simply check a box and select a summary range

<1s



Edit Acceleration

Report conf_2017_ra

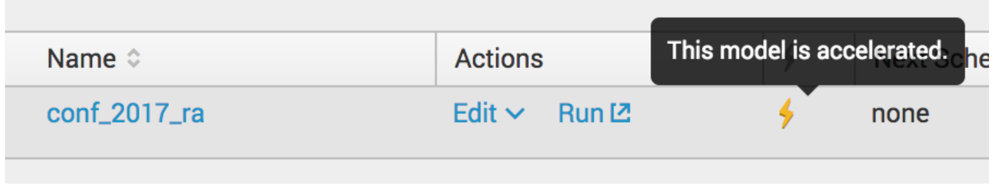
Accelerate Report ☑

Acceleration might increase storage and processing costs. Acceleration can return invalid results if you change definitions of knowledge objects used in the search string after you accelerate the report.

Learn More

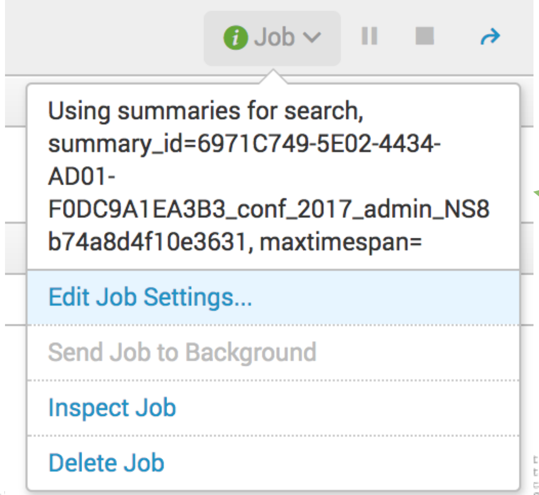
Summary Range? All Time

Create a saved search and enable RA



Name	Actions		Next Sche
conf_2017_ra	Edit Run	⚡	none

This model is accelerated



Using summaries for search, summary_id=6971C749-5E02-4434-AD01-F0DC9A1EA3B3_conf_2017_admin_NS8b74a8d4f10e3631, maxtimespan=

Some similar searches (even ad-hoc) will automagically use the RA summary

Report acceleration (RA)

Pros and cons

- Very easy to enable
- Has a summary time range to easily control the size of the RA
- Searching outside the summary time range will automatically fall back to a regular search
- Similar searches automagically uses the RA summary

- Similar searches automagically *not* using the RA summary (just switching the order of the search terms tricks Splunk to not use the RA summary, ie `foo=A bar=B` vs `bar=B foo=A`)

DATA MODEL ACCELERATION!

The big daddy of search acceleration

DATA MODEL (DM) ACCELERATION

Regular vs tstats search format

<1s

- Regular search:

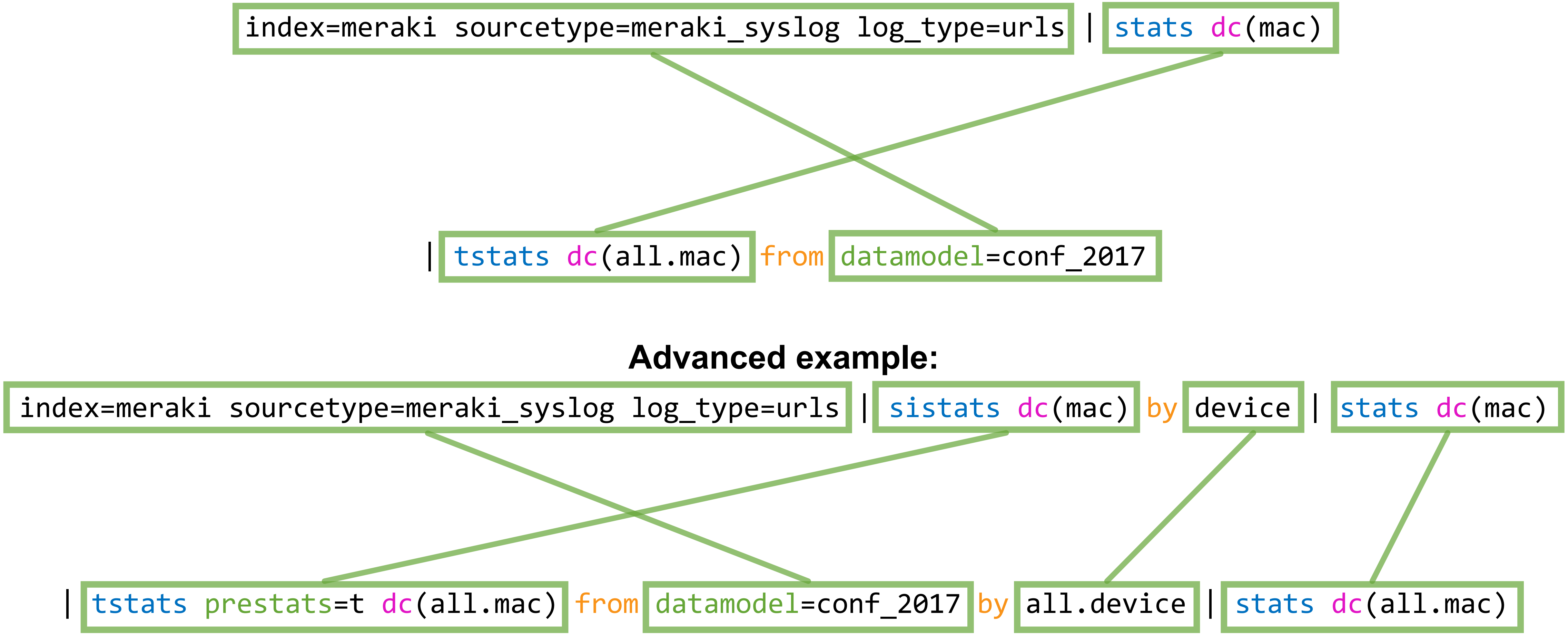
```
index=meraki sourcetype=meraki_syslog log_type=urls
| sistats dc(mac) by device
| stats dc(mac)
```

- DM (tstats) search:

```
| tstats prestats=t dc(all.mac) from datamodel=conf_2017
by all.device
| stats dc(all.mac)
```

DATA MODEL (DM) ACCELERATION

Regular vs tstats search format



Simple example:

```
index=meraki sourcetype=meraki_syslog log_type=urls | stats dc(mac)
```

```
| tstats dc(all.mac) from datamodel=conf_2017
```

Advanced example:

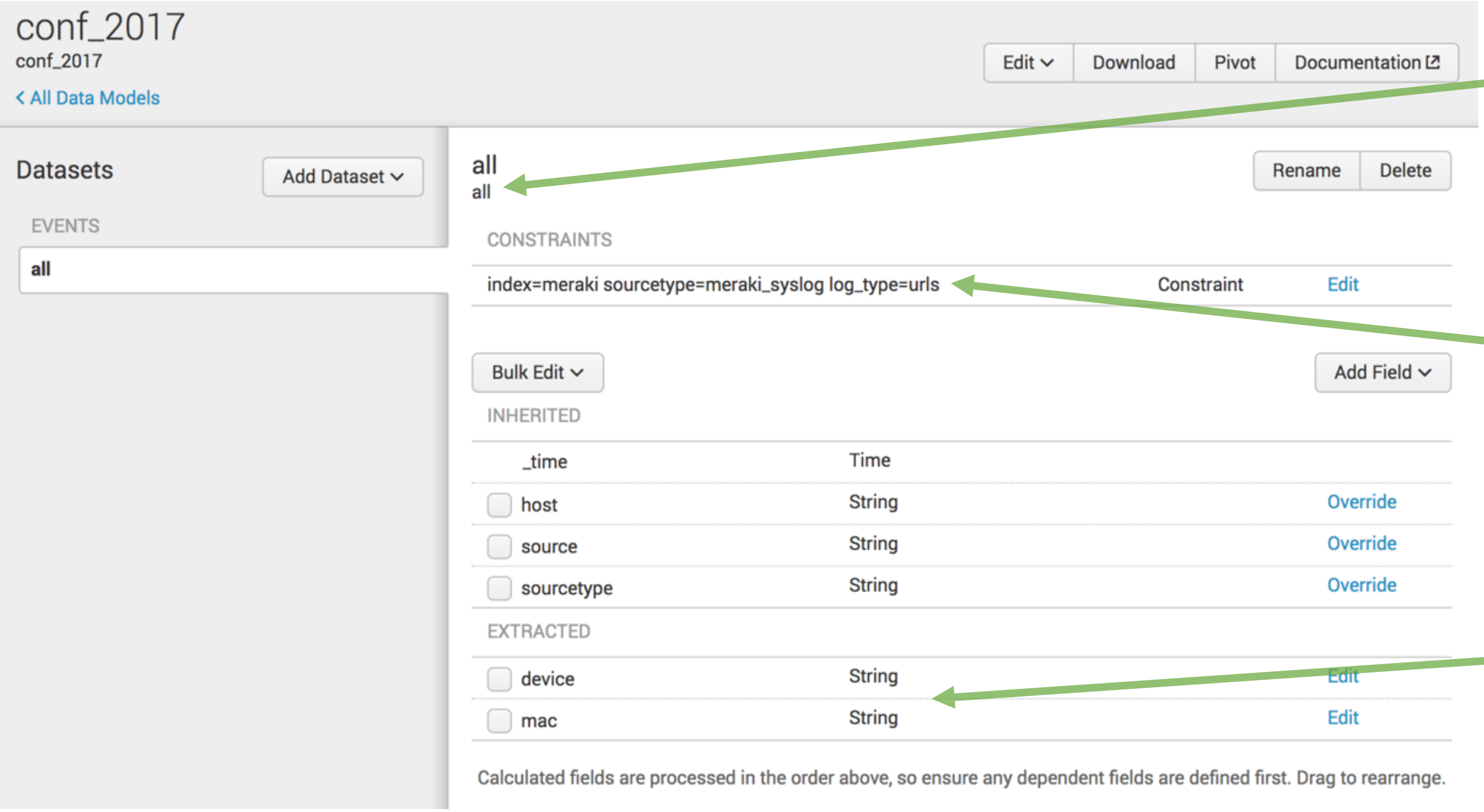
```
index=meraki sourcetype=meraki_syslog log_type=urls | sistats dc(mac) by device | stats dc(mac)
```

```
| tstats prestats=t dc(all.mac) from datamodel=conf_2017 by all.device | stats dc(all.mac)
```

DATA MODEL (DM) ACCELERATION

Creating the data model

Before using tstats, you must create a DM[1]



conf_2017
conf_2017
< All Data Models

Datasets

EVENTS

all

all
all

CONSTRAINTS

index=meraki sourcetype=meraki_syslog log_type=urls	Constraint	Edit

INHERITED

_time	Time	
□ host	String	Override
□ source	String	Override
□ sourcetype	String	Override

EXTRACTED

□ device	String	Edit
□ mac	String	Edit

Calculated fields are processed in the order above, so ensure any dependent fields are defined first. Drag to rearrange.

Keep this name short! (you'll be typing this a lot)

Only root events can be accelerated

List the fields you will use later in tstats

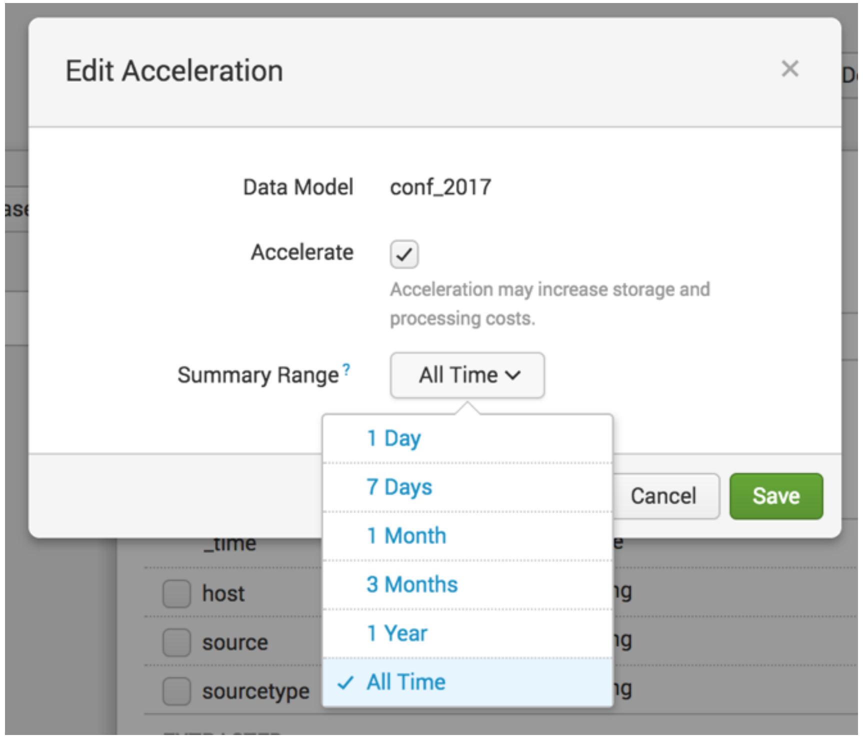
[1] You can actually use tstats without a DM, but you can only use index-time fields (default fields like host, sourcetype, etc. or indexed extraction fields)

DATA MODEL (DM) ACCELERATION

Accelerating the data model

You can actually use tstats searches on an unaccelerated DM.

This way you can review and check that all fields are accounted for before accelerating the DM.



Edit Acceleration

Data Model: conf_2017

Accelerate: ☑

Acceleration may increase storage and processing costs.

Summary Range: All Time

If a tstats searches outside the summary range, then it will automagically convert that part to a regular search (like RA).

DATA MODEL (DM) ACCELERATION

What really happens when you accelerate a DM

DM acceleration basically creates a compressed, optimized summary table (.tsidx files) on the indexers where

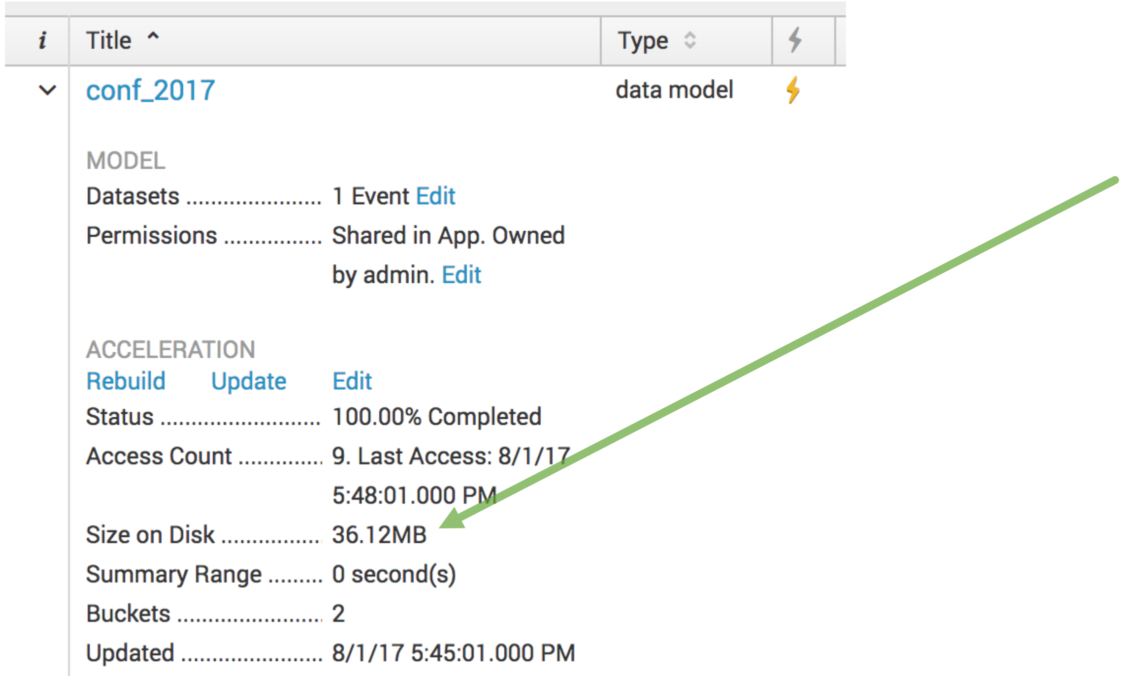
- rows = # of root events within the summary range
- columns = # of fields in the DM

	_time	host	...	device	mac
event 1	1501634605	meraki	...	GRE_003_AP2	00:00:3F:2E:4B:3A
event 2	1501634662	meraki	...	GRE_003_AP2	00:03:AB:11:4B:7D
event 3	1501634705	meraki	...	GRE_003_AP3	00:08:22:72:6C:3A
...	...	...	...	...	...

Therefore size of DM ~ rows × columns

DATA MODEL (DM) ACCELERATION

DM acceleration cost



i	Title ^	Type	⚡
⌄	conf_2017	data model	⚡

MODEL

Datasets .... 1 Event Edit

Permissions .... Shared in App. Owned by admin. Edit

ACCELERATION

Rebuild Update Edit

Status .... 100.00% Completed

Access Count .... 9. Last Access: 8/1/17 5:48:01.000 PM

Size on Disk 36.12MB

Summary Range .... 0 second(s)

Buckets 2

Updated .... 8/1/17 5:45:01.000 PM

DM summary lives on the indexers[1] and is only 37 MB total!

Is this worth speeding up the search by almost 100×?

YES!

[1] DM summary lives in
`$SPLUNK_DB/<index_name>/datamodel_summary/<bucket_id>_<indexer_guid>/<search_head_guid>/DM_<app>_<data_model_name>`

DATA MODEL (DM) ACCELERATION

Pros and cons

👍

- Reusability: one DM can feed many searches
- Summaries can be replicated in a cluster (not by default)
- Also useful for hardcoding calculated or lookup values to the summary (like in SI)
- Tstats can still search outside the summary range

👎

- Requires creating an accelerated DM first
- May need to manually convert old searches to tstats and not all searches can be converted
- Need to stop and re-accelerate the DM to modify it
- Tstats is only fast for "reducing" searches

Batch mode search parallelization

Because two is better than one

Batch mode search parallelization

What it is and where to set this setting

N/A

Batch mode search parallelization allows launching multiple search pipelines per qualifying search[1], which are processed concurrently.

Set limits.conf on indexers:

```
[search]
batch_search_max_pipeline = 2
```

- The default is 1
- 2 is the best value (higher values succumbs to diminishing returns)

[1] Only for "batch mode" searches, which are searches that are distributed (ie not time-ordered searches like streamstats, transaction, head, etc.)

Batch mode search parallelization

Pros and cons

- Faster searches by using up more resources (IO, processing, and memory)

- Only for the rich
- Only works on "batch mode" searches

Review

The final countdown!

	Definition
Scheduled search	Caching fixed time range search results
Post-process searches	Creating a "data cube" to power multiple other searches
Event sampling	Randomly sampling every 1 out of X events
Summary indexing	Reducing the number of events by reducing the time "resolution" to a new index
Report acceleration	The lazy version of data model acceleration
DATA MODEL ACCELERATION	Create a data model, then use it via tstats
Batch mode search acceleration	Don't worry about this unless your Splunk is heavily underutilized.

Mix and match!

"No seriously, I have nothing to wear!"

Mix and match!

The sky is the limit

Examples:

- DMs off of SI
- Post-process searches off of a scheduled search
- RA off of SI
- Tstats to create SI
- Scheduled search off of tstats

Closing remark

Satoshi Kawasaki | Splunk4Good Ninja

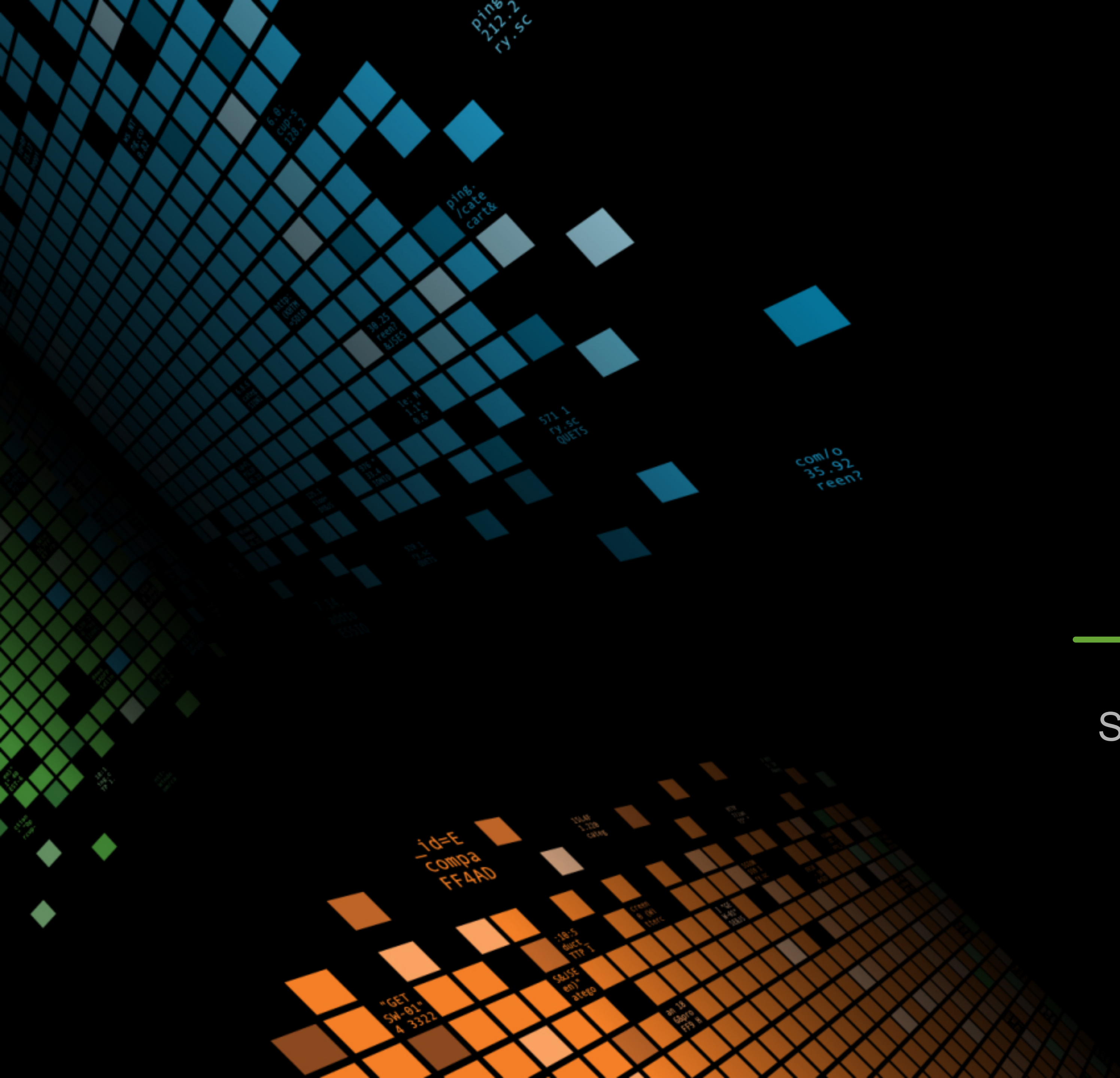
Thank You!

Shout-out to **Eric Merkel**, my content delivery manager!

And to all of my fellow PSers and awesome former clients!

Don't forget to rate this session in the .conf2017 mobile app

splunk> .conf2017



Q&A

Satoshi Kawasaki | Splunk4Good Ninja