splunk> .conf2017

Revealing the Magic

The Lifecycle of a Splunk Search

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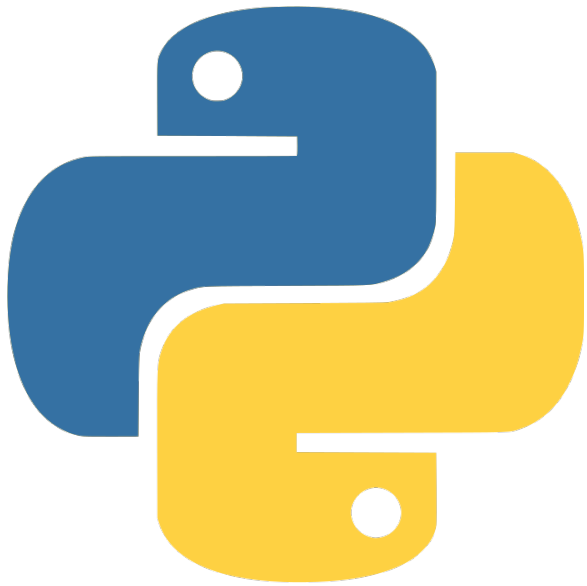
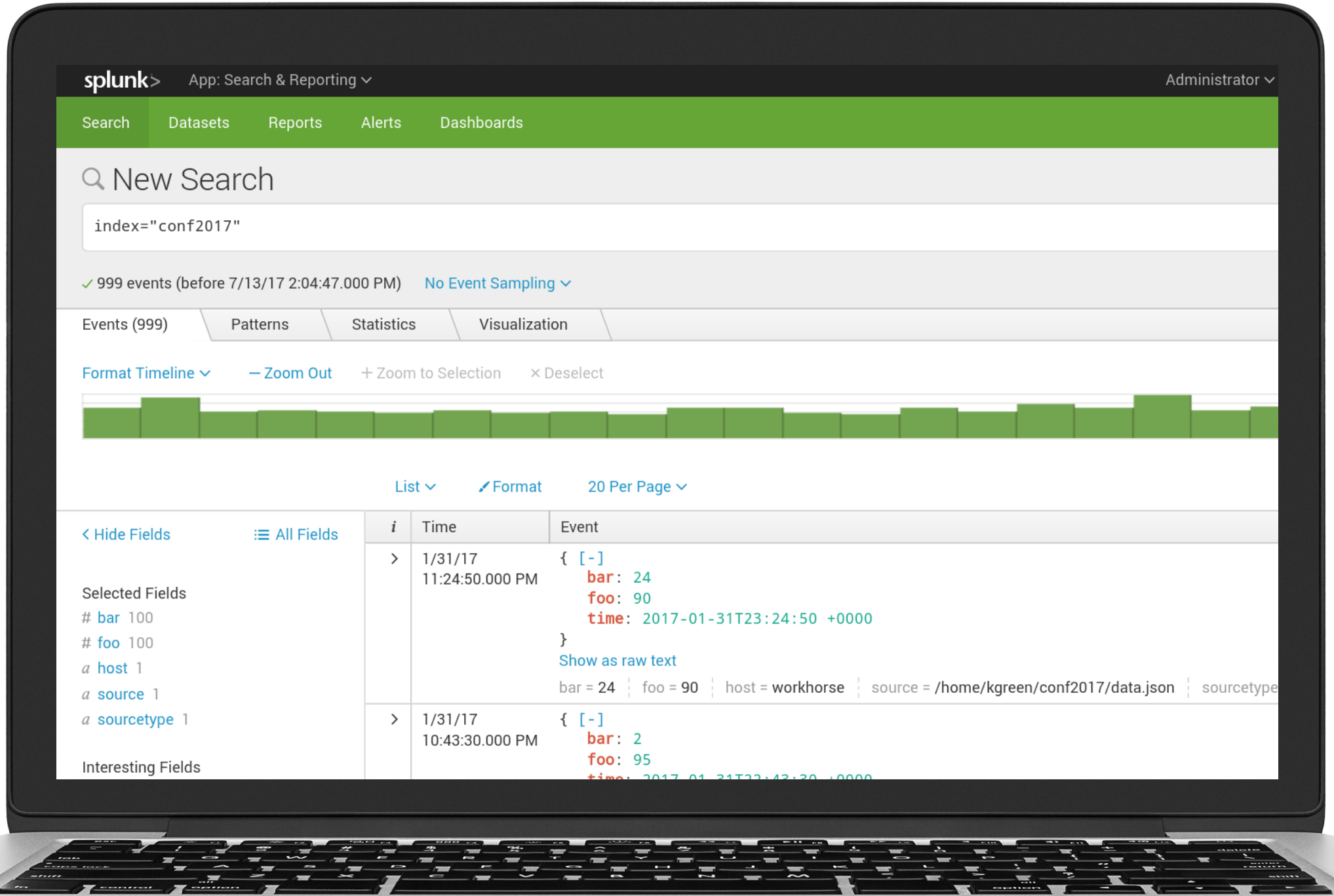
September 27th, 2017 | Washington, DC

About Myself

web developer



splunk> .conf2017



“OUR DEVELOPERS HAVE PRODUCTIVITY SUPERPOWERS.”

Kris Wehner, VP of Engineering, Yelp Reservations

IT’S NOT MAGIC. IT’S SPLUNK.™

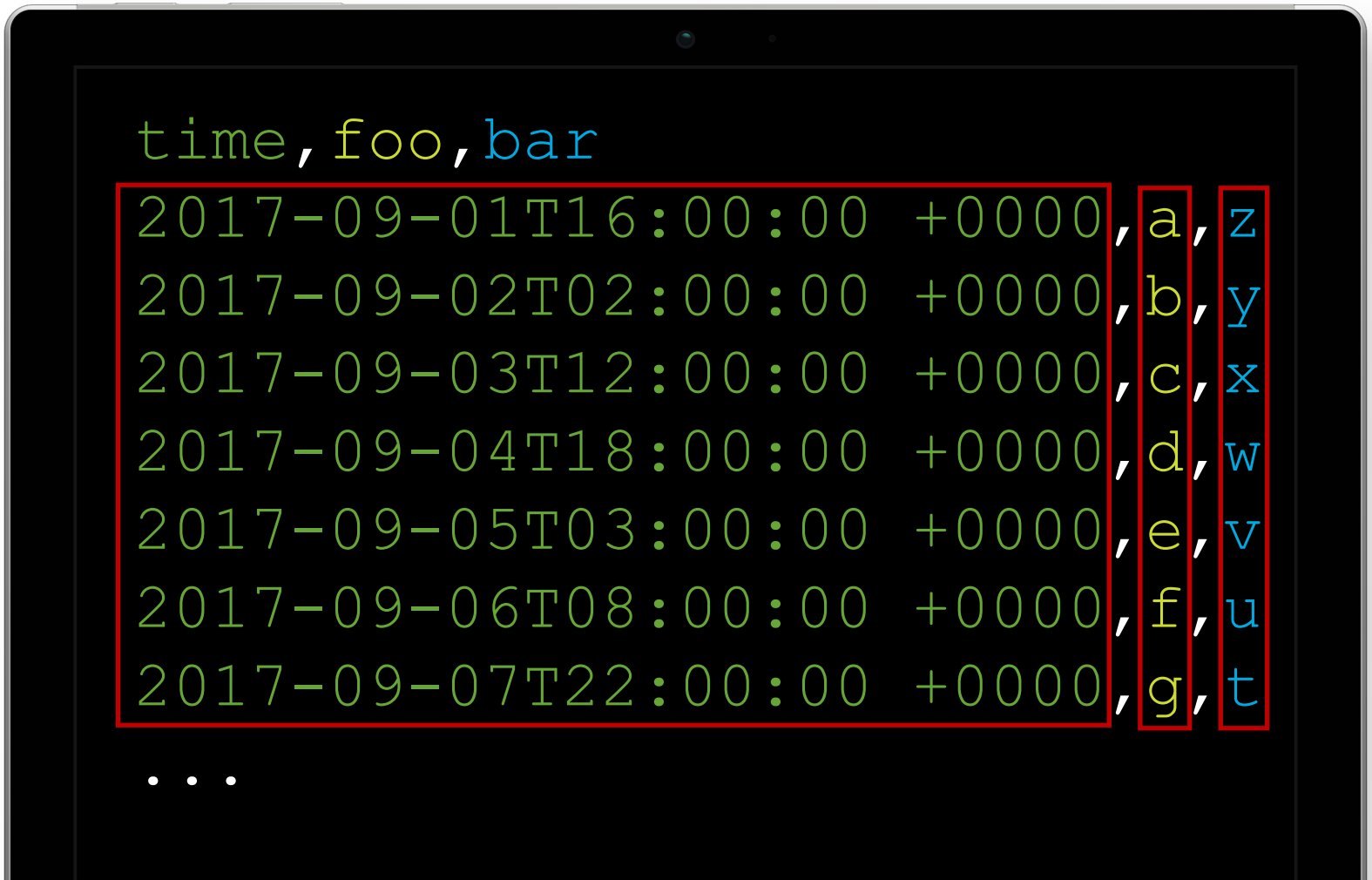
Magic?

Let's debunk that!

1. Develop a deeper understanding of the core components that make up a Splunk search.
2. Increase performance of your searches through more efficient queries.
3. Obtain stronger grasp of which deployment types are better suited for specific workloads.

Data Set

26 event CSV file



- One event per day from Sept. 1 - 26
  - Random hour of the day
- Indexed field `foo`
  - Descending A - Z
- Unindexed field `bar`
  - Ascending Z - A

splunk> .conf2017

Search #1

Indexer Workflow

```
index="conf2017" foo="0"
```

Sept. 1st to the 27th

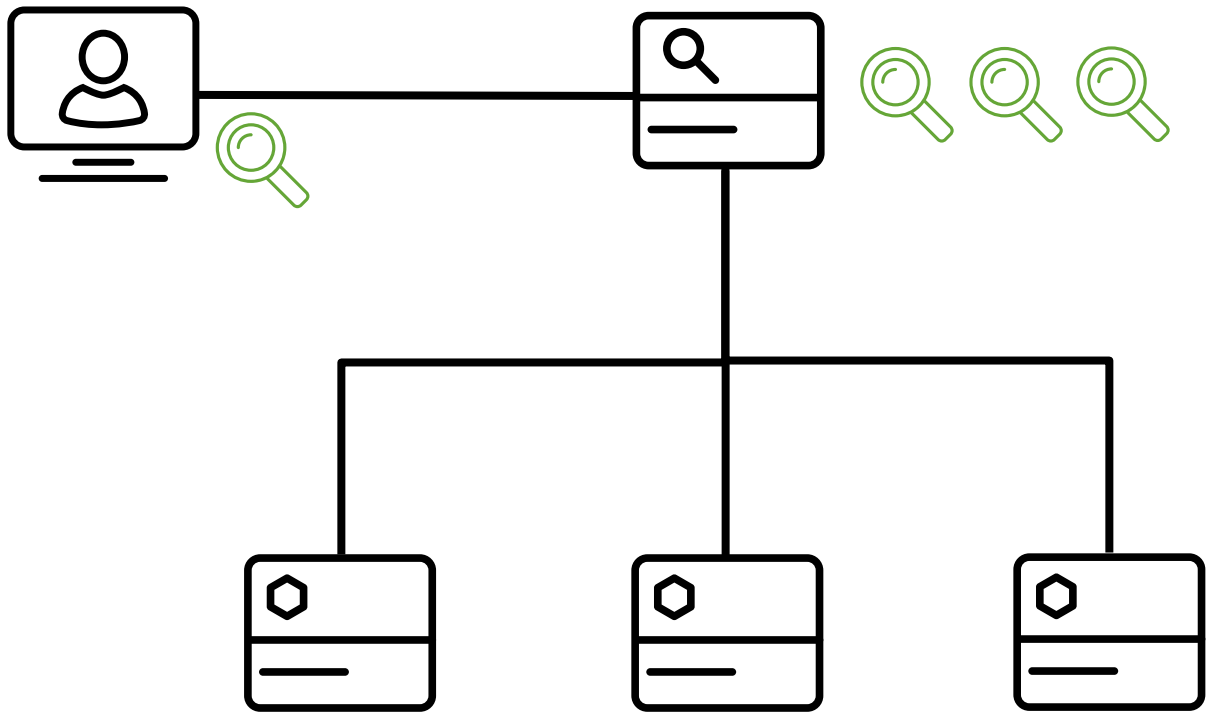
No Results?

index="conf2017" foo="0"

Yep, but I promise it's interesting!

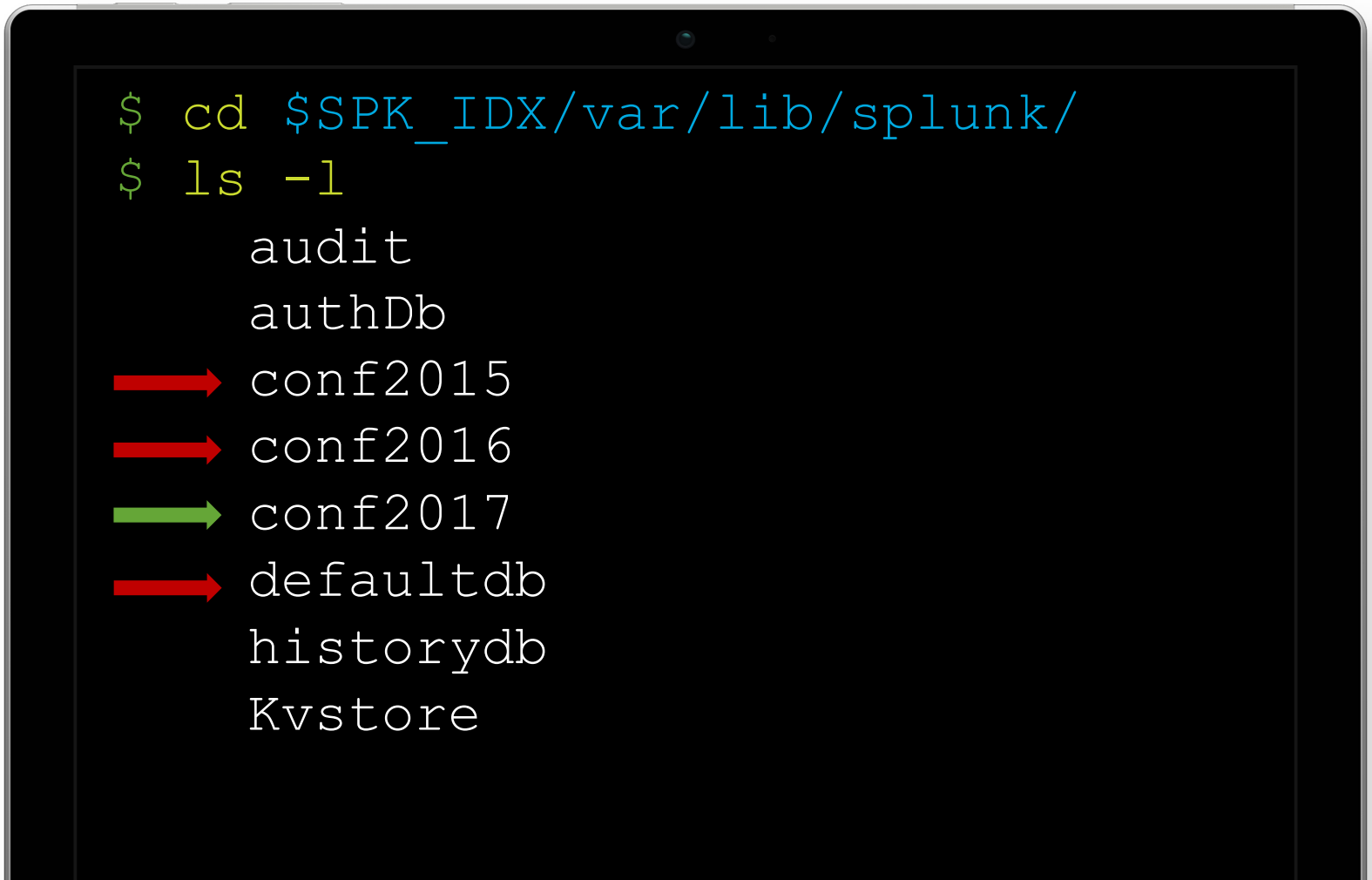
Client to Indexer

index="conf2017" foo="0"



Indexes Directory

index="conf2017" foo="0"



- Root directory for indexes.
- Check if queried index directory exists.
- Specify an index to improve improve search performance.

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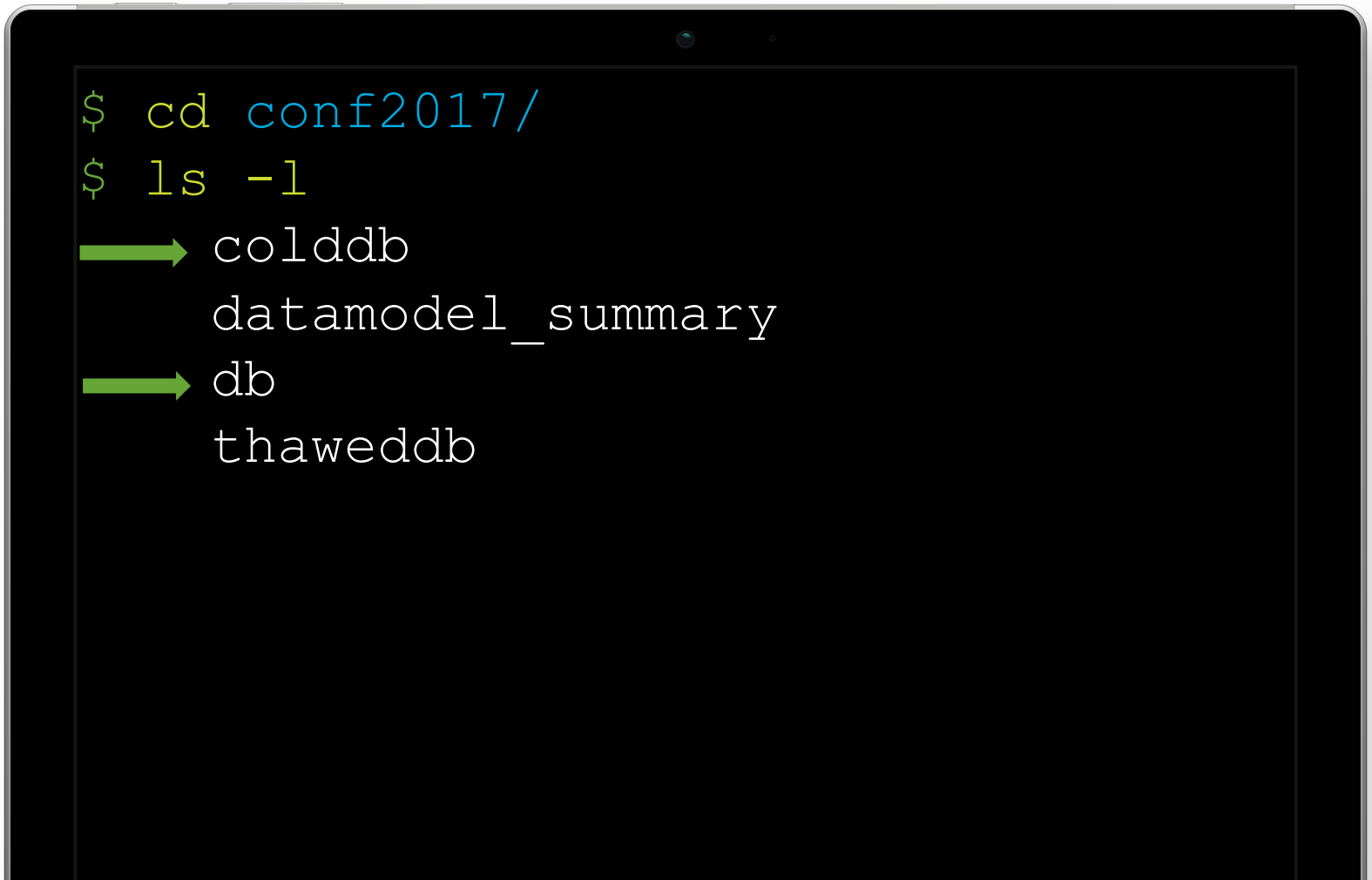
Index Directory

index="conf2017" foo="0"

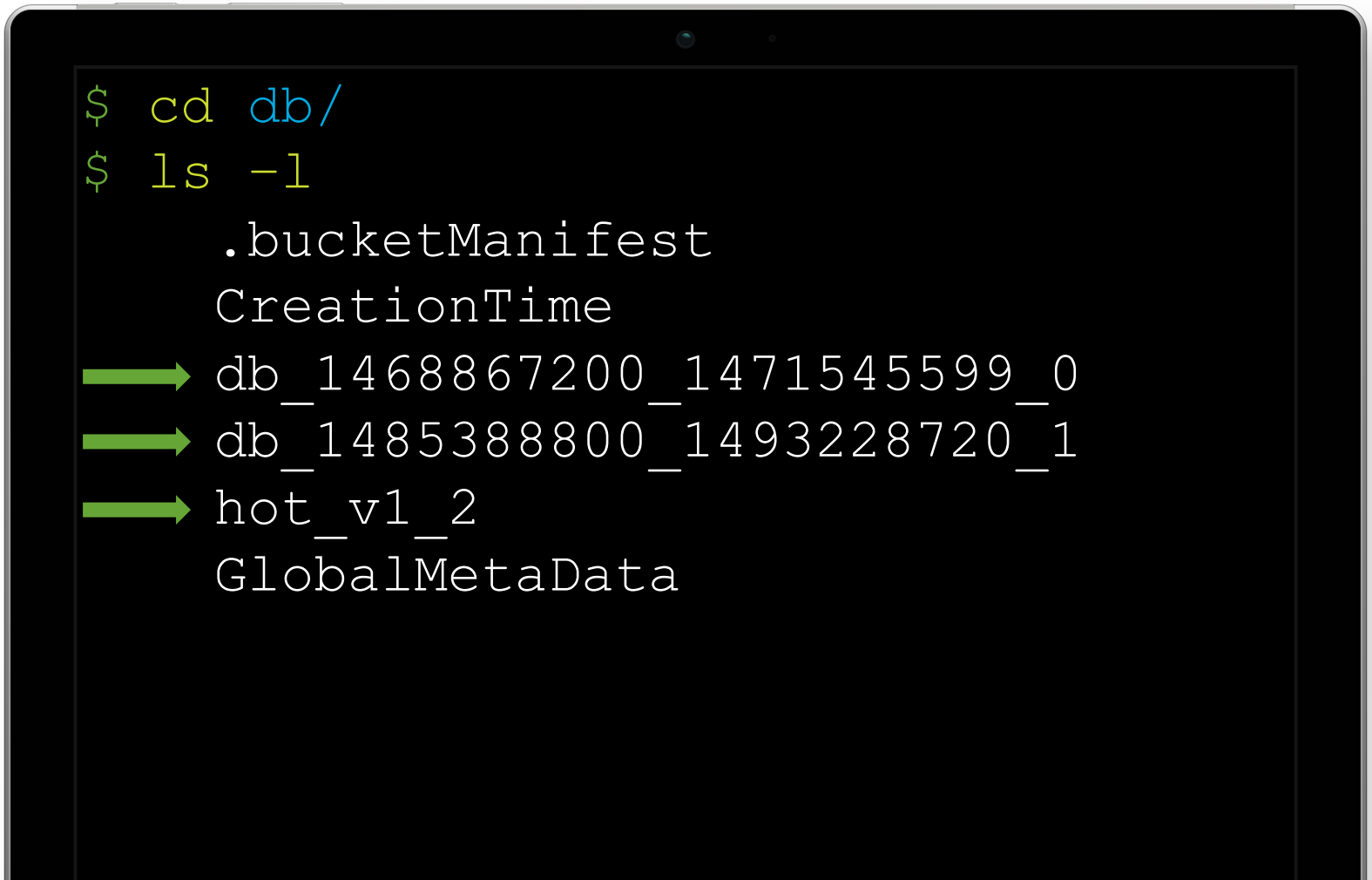


- `colddb` houses older searchable data.
  - Implement cheaper storage solutions.
- `db` directory for fresh data in high demand.
- Configurable in `indexes.conf`.

splunk> .conf2017

Buckets Directory

index="conf2017" foo="0"



- Hot buckets are still being written to.
- Warm buckets are event immutable.
  - Named by time range.
- Specify strict time range to boost Performance.

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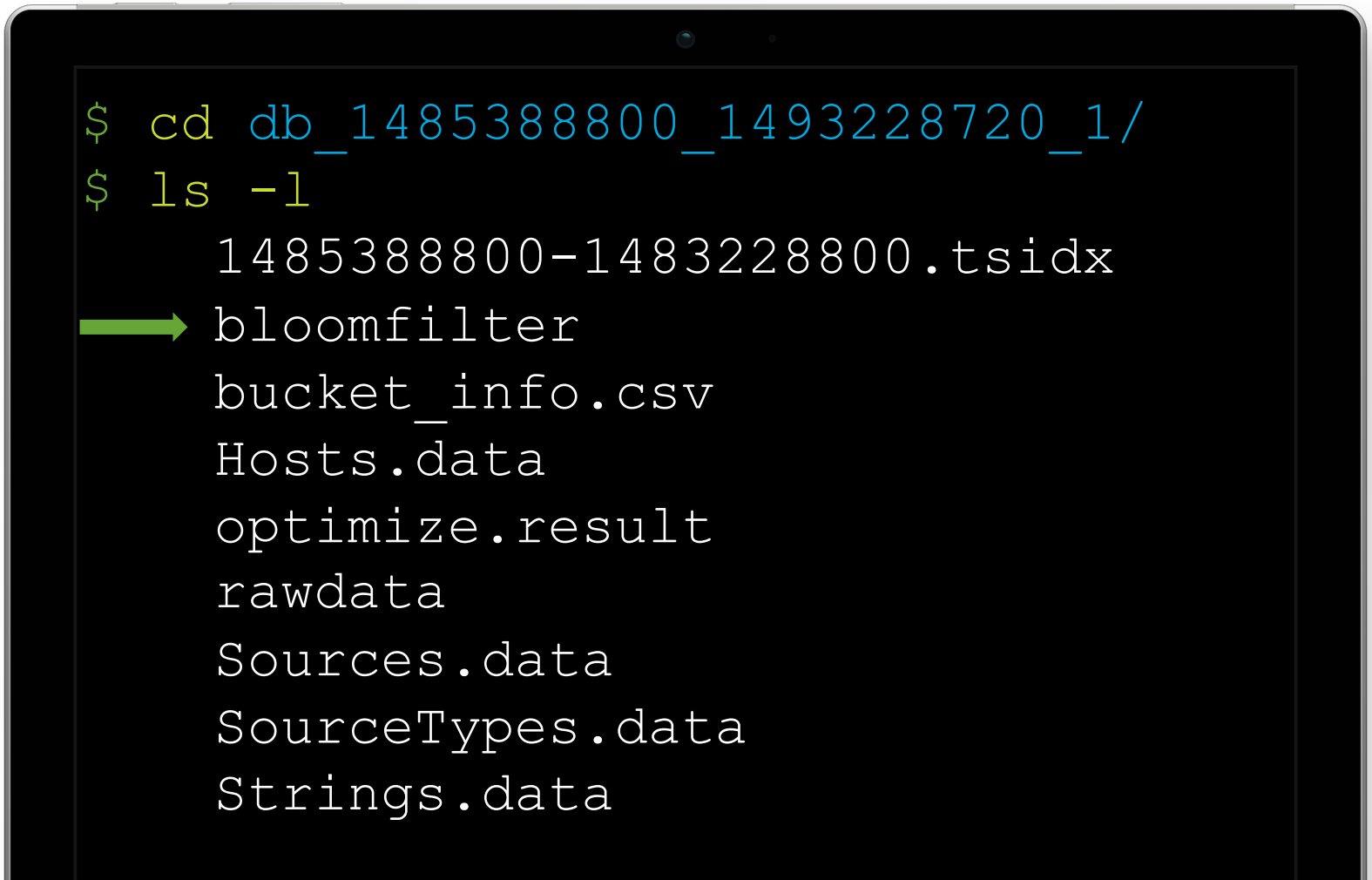
Bloom Filter

index="conf2017" foo="0"



- Scanning buckets can be expensive.
- Bloom filter provides us with a fast way to determine if a term is **NOT** in a bucket.

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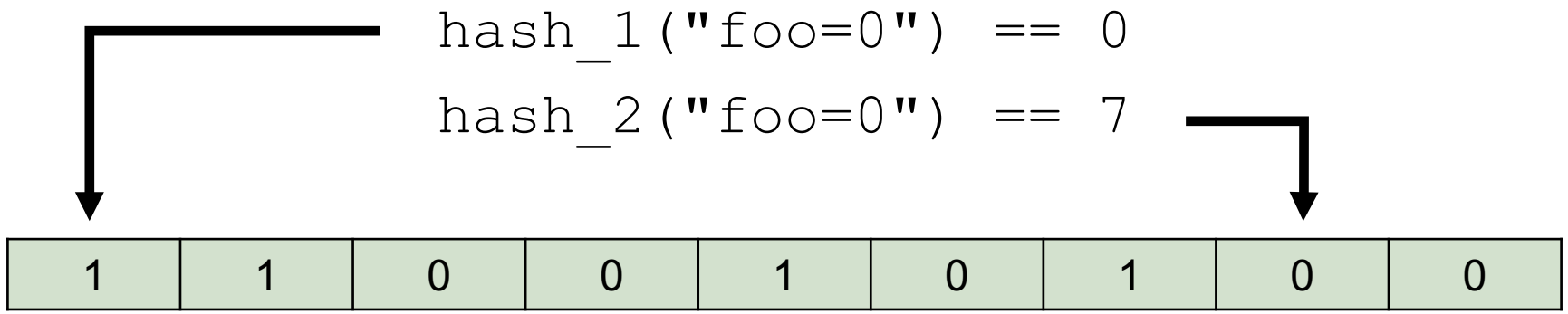
Bloom Filter Hashing

index="conf2017" foo="0"



- Second hash result points to `false`, so bucket will not contain matching events.

Bloom Filter Performance

index="conf2017" foo="0"

- For search terms that are common, the bloom filter will do nothing to improve search performance.

- Huge performance boost for rare and nonexistent events.
  - Speed up on the order of 100x (1-2s to 10ms).

Search #2

Indexing

```
index="conf2017" foo="a"
```

vs

```
index="conf2017" bar="z"
```

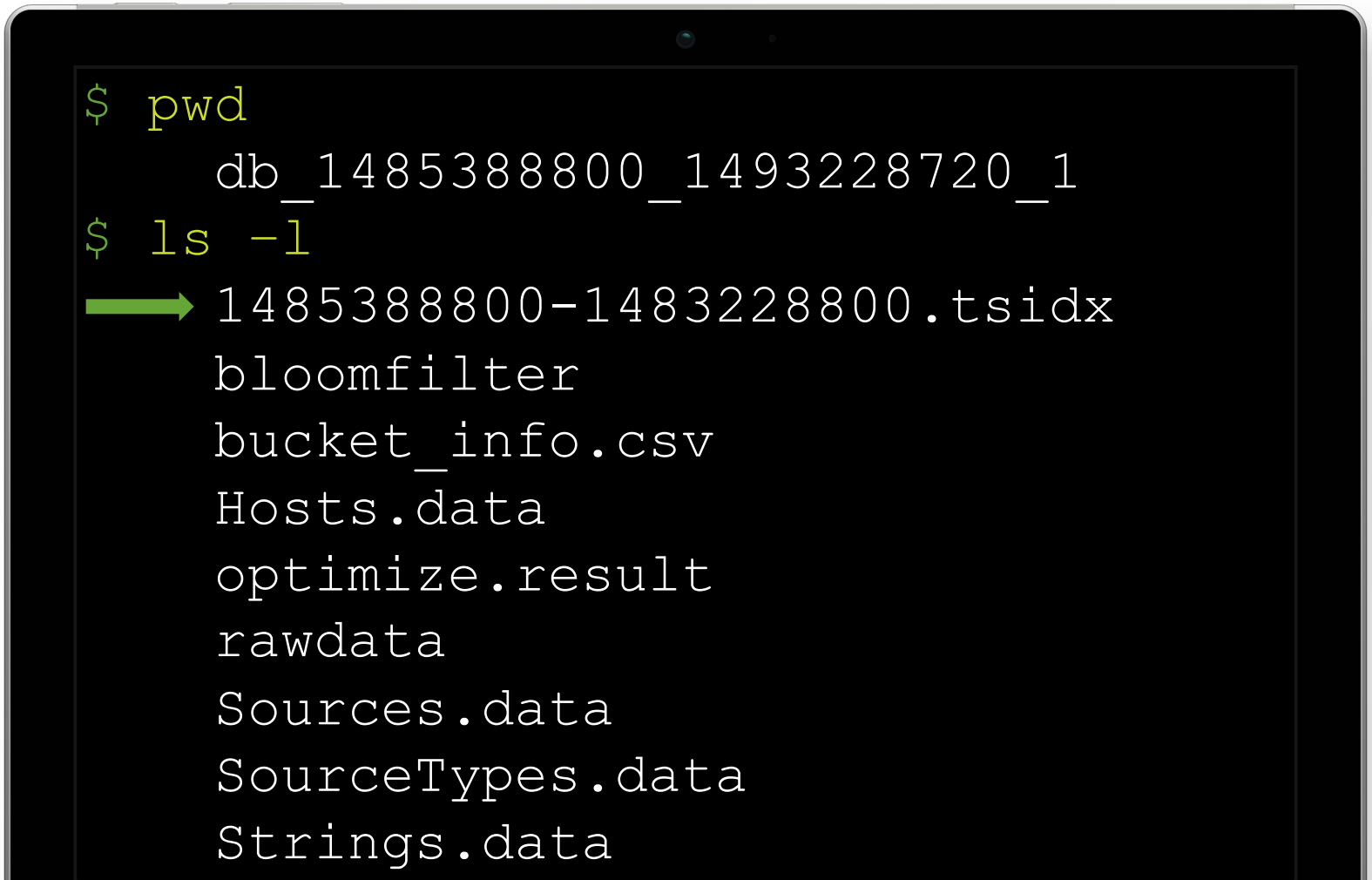
Both Give Same Result

foo="a" vs bar="z"

```
2017-09-01T16:00:00 +0000,a,z
```

TSIDX File

foo="a" vs bar="z"



- Index file used to reduce the number of matching events.
- Lexigraphically sorted array of all terms within the bucket.
- The flag for `|delete` is also set here.

Lispy Query

foo="a" vs bar="z"

- The Lispy query is used to when searching through TSIDX files.
- Created by the Search Head at search time.
- `foo="a"` becomes `[foo::a]` in Lispy.
- This will match all events where `foo` equals exactly `a`.

Lispy for Unindexed Fields

foo="a" vs bar="z"

- `bar="z"` becomes `[z]` in Lispy.
- This will match all events that contain `z` anywhere within the event.
- This might seem counter intuitive, but there is a good reason for this behavior.

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Post TSIDX Results

foo="a" vs bar="z"

`[foo::a]`

Time	Foo	Bar
2017-09-01T16:00:00 +0000	**a**	z

`[z]`

Time	Foo	Bar
2017-09-01T16:00:00 +0000	a	**z**
2017-09-26T07:00:00 +0000	**z**	a

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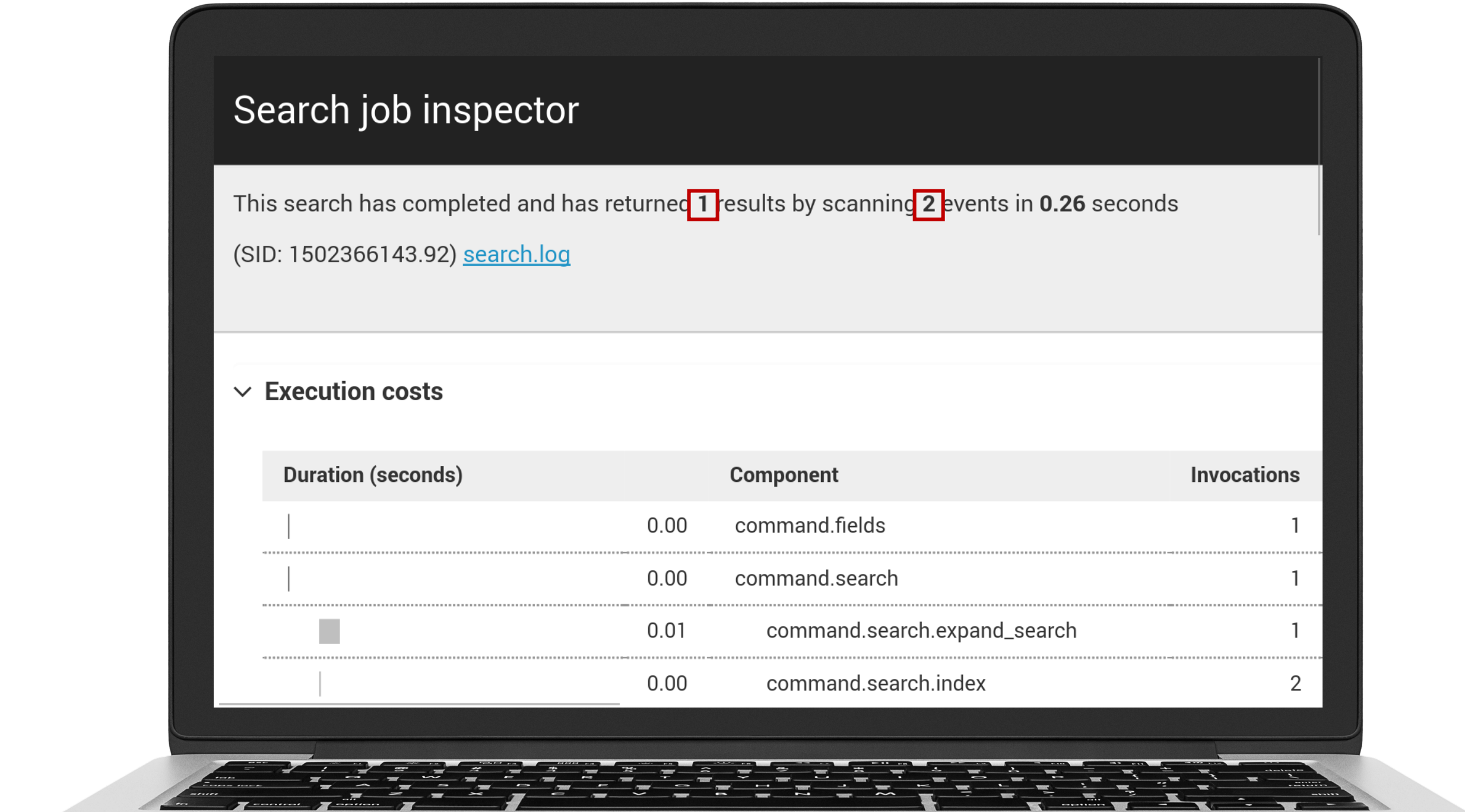
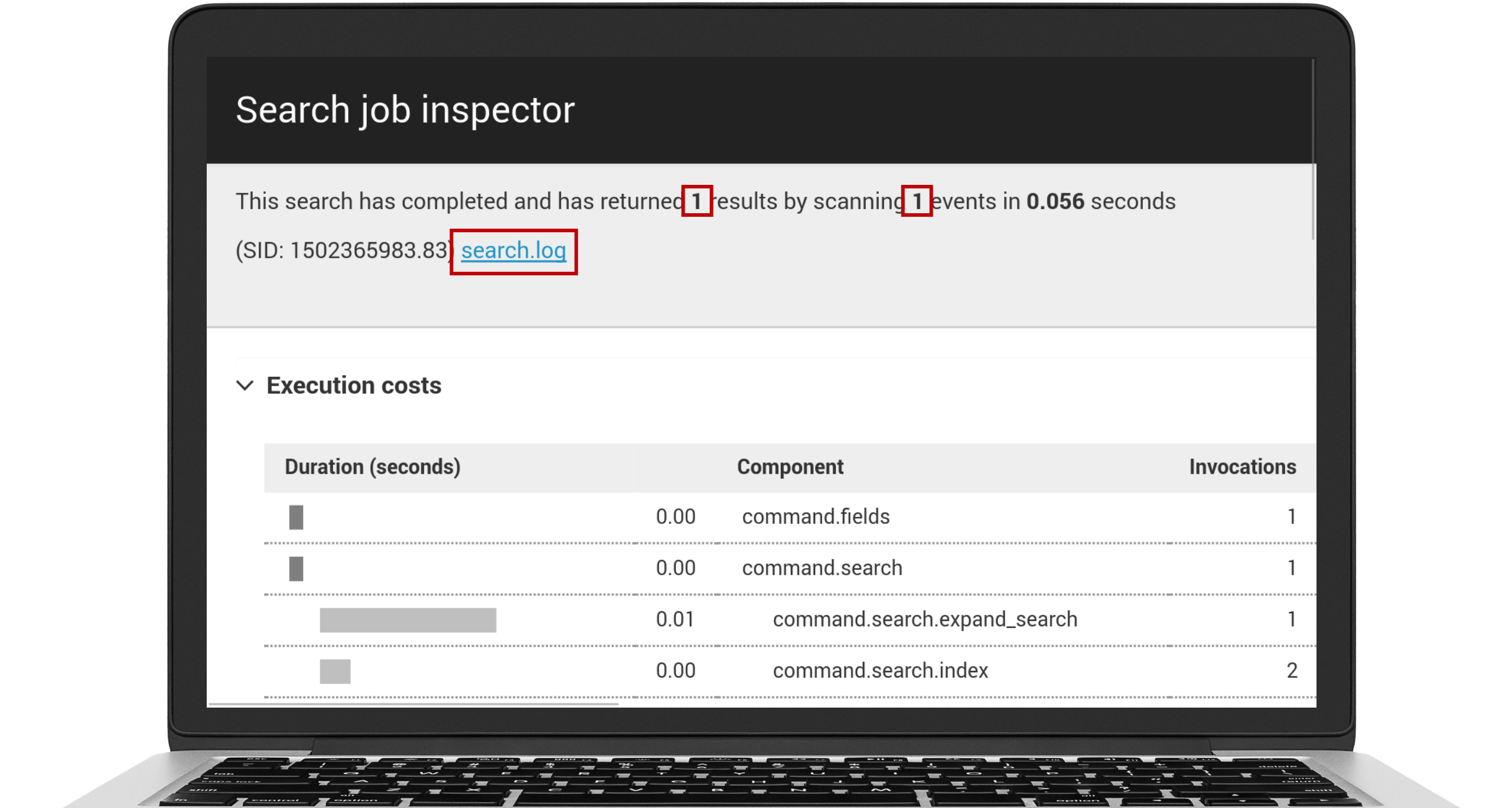
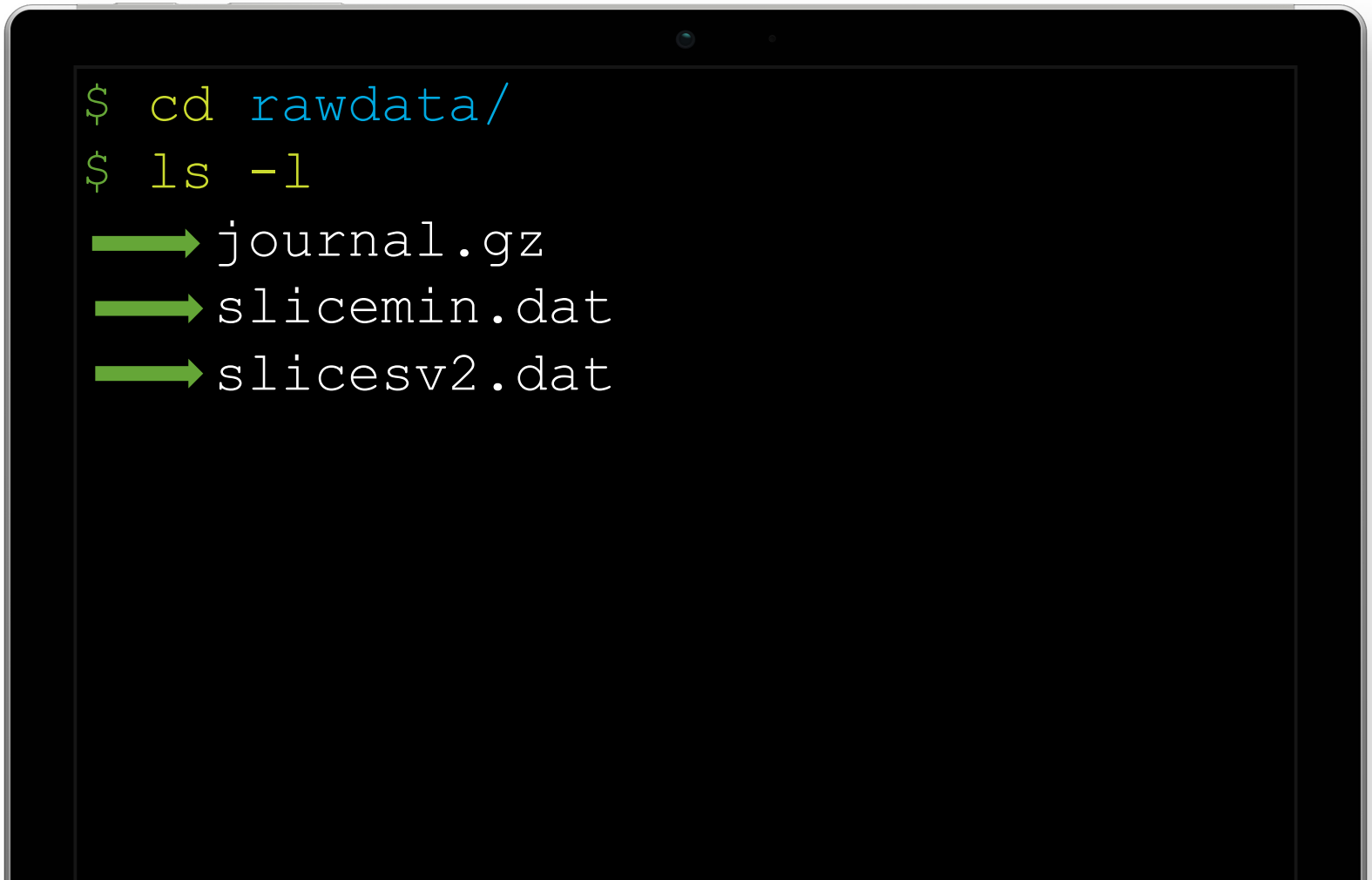




Raw Data Extraction

foo="a" vs bar="z"



- `journal.gz` compressed slices of raw events.
- `slices.dat` map from TSIDX to slice.
- Remaining unwanted events will be filtered during extraction.

Cons of Unindexed Fields

foo="a" vs bar="z"

- Increased number of potential matching events coming out of TSIDX.
- This list is kept in memory, leading to increased memory usage.
- More events, leads to more CPU needed for Journal decompression.

Index Everything?

foo="a" vs bar="z"

- This can quickly explode the size of your TSIDX files.
  - Leading to slow queries across the board.

- Only recommended for fields who's key-val pair is important, AND has a value which frequently occurs in other fields.

  - For example the pair `foo="a"` is important and often searched.
  - But `bar="a"`, `baz="a"`, and `biz="a"` are also common occurrences.
  - Then `foo` might make for a good index candidate.

Walklex Command

foo="a" vs bar="z"

```
$ walklex my.tsidx "foo::a"
0035130149.tsidx "foo::a"
my needle: foo::a
209 1 foo::a

$ walklex my.tsidx "z"
0035130149.tsidx "z"
my needle: z
287 2 z
```

- Shows us the number of matching TSIDX events for a given Lispy query.
- Useful for hunting down field indexing candidates.

Search #3

Wildcards

```
index="conf2017" foo="*a"
```

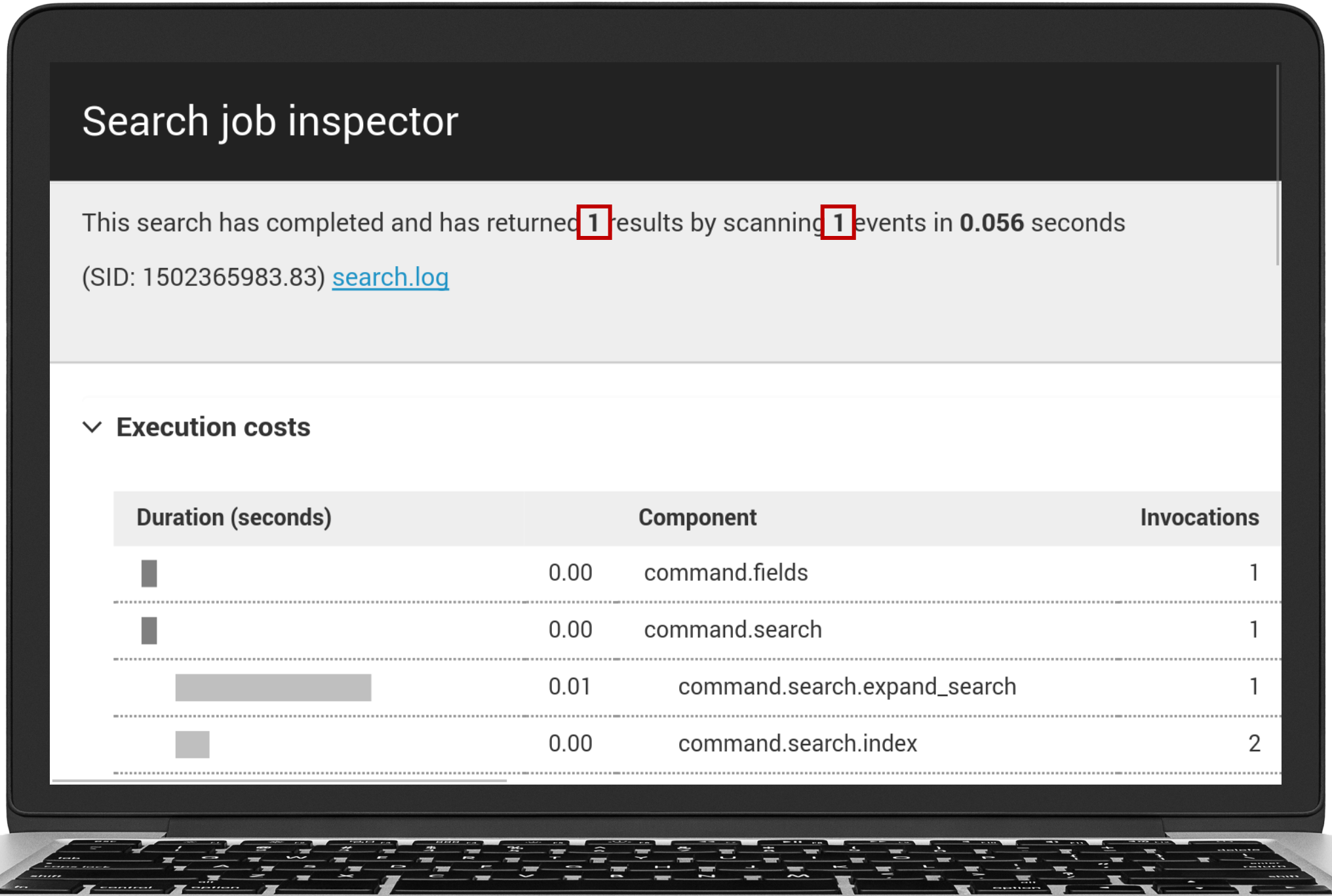
vs

```
index="conf2017" foo="a*"
```

Again Same Result

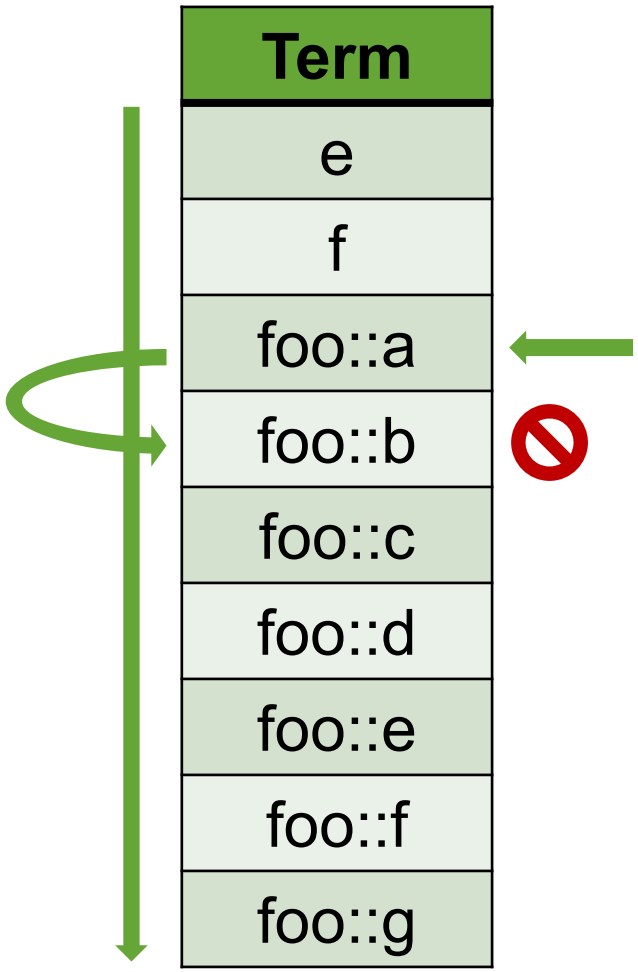
foo="*a" vs foo="a*"

```
2017-09-01T16:00:00 +0000,a,z
```



Trailing Wildcard

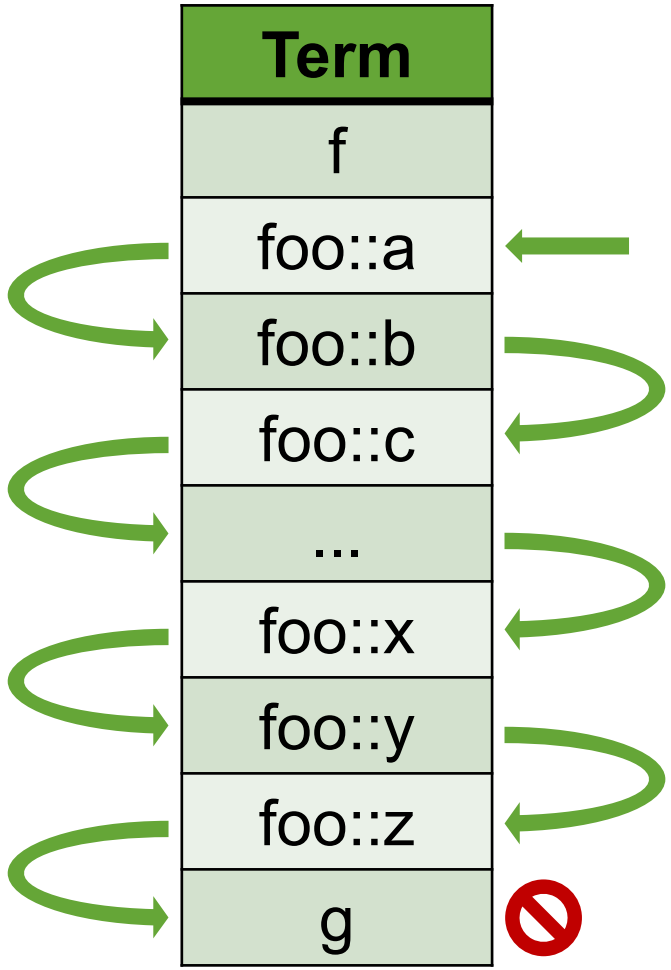
foo="*a" vs foo="a*"



- Terms are sorted lexicographically within the TSIDX file.
- Binary search the index for the first matching term.
- For `foo="a*"`, continue downward until we come to the first none matching term.

Leading Wildcard

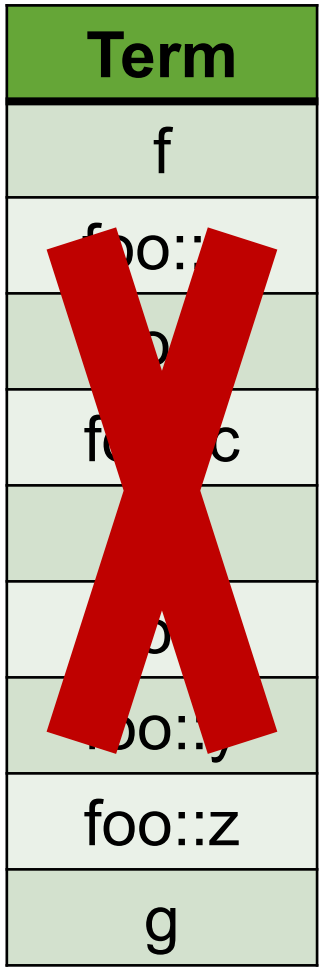
foo="*a" vs foo="a*"



- Same as trailing wildcard, start with the first matching term.
- However this time we must check all events that match our field name.
- Only when we get to "g", can we stop the search.

Trailing Wildcard + Unindexed

foo="*a" vs foo="a*"



- What if we searched for `bar="*z"`?
- Lispy is for this search is `"[]"`.
- Skips TSIDX reducing altogether, relying completely on Journal extraction.

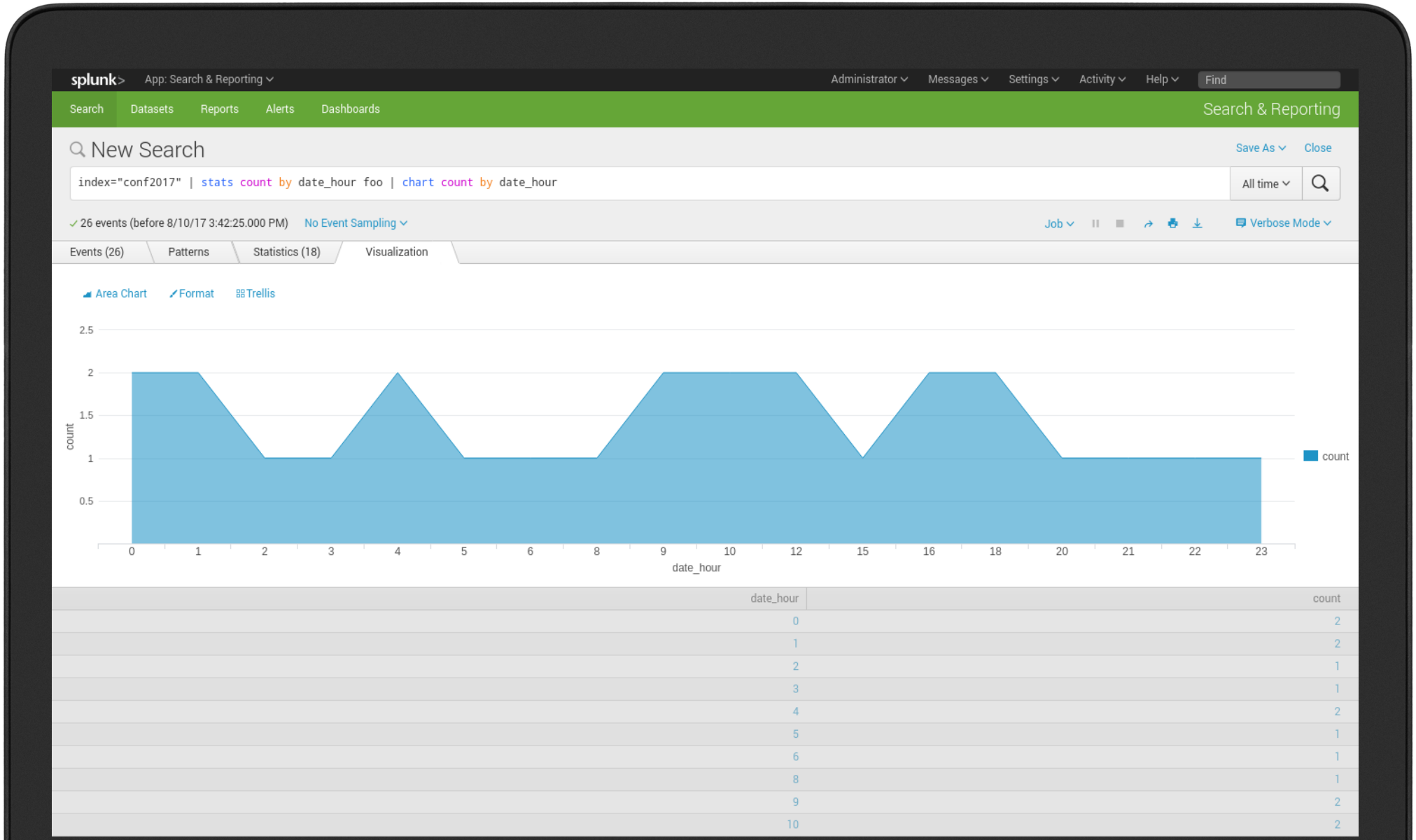
Search #4

Transactions

```
index="conf2017"
| transaction date_hour
```

vs

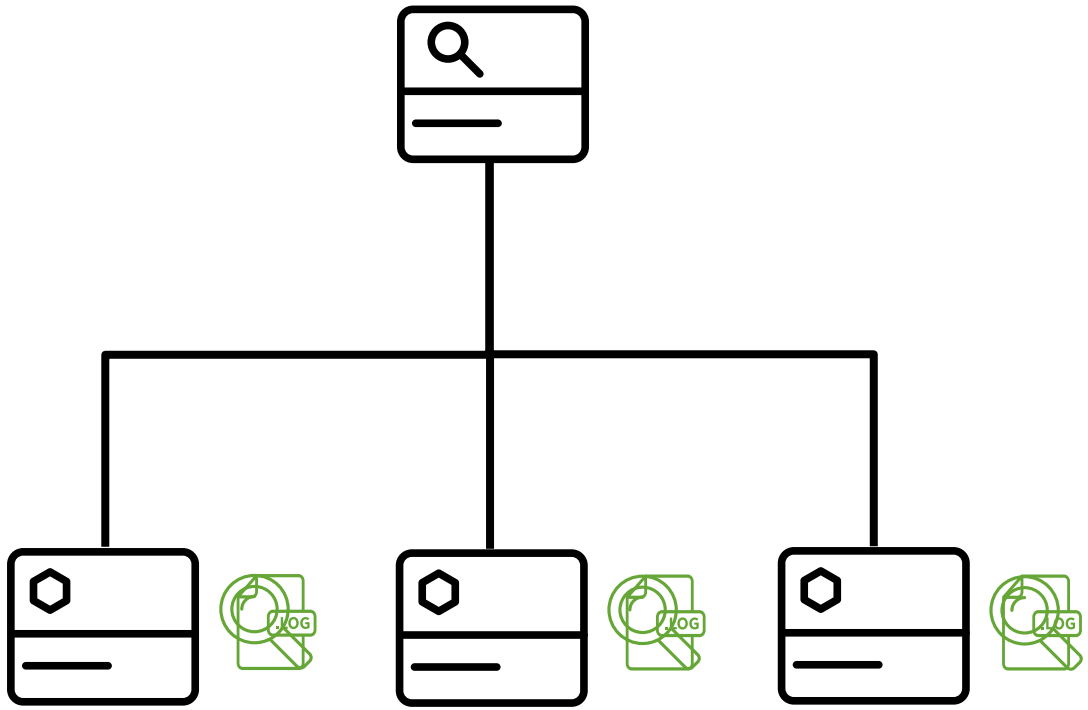
```
index="conf2017"
| stats count by date_hour
```



date_hour	count
0	2
1	2
2	1
3	1
4	2
5	1
6	1
8	1
9	2
10	2

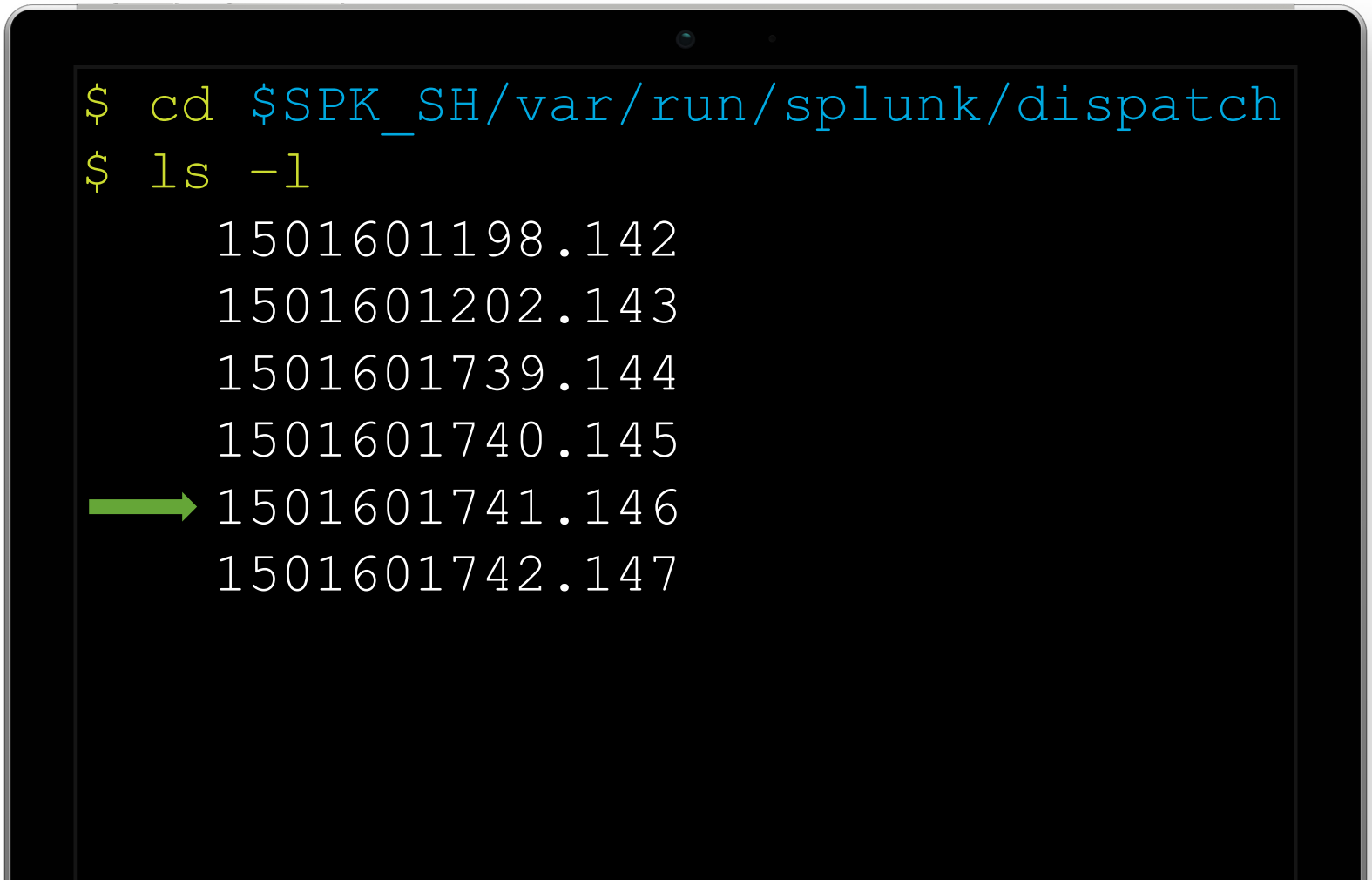
Back to the Search Head

transaction vs stats



Dispatch Folder

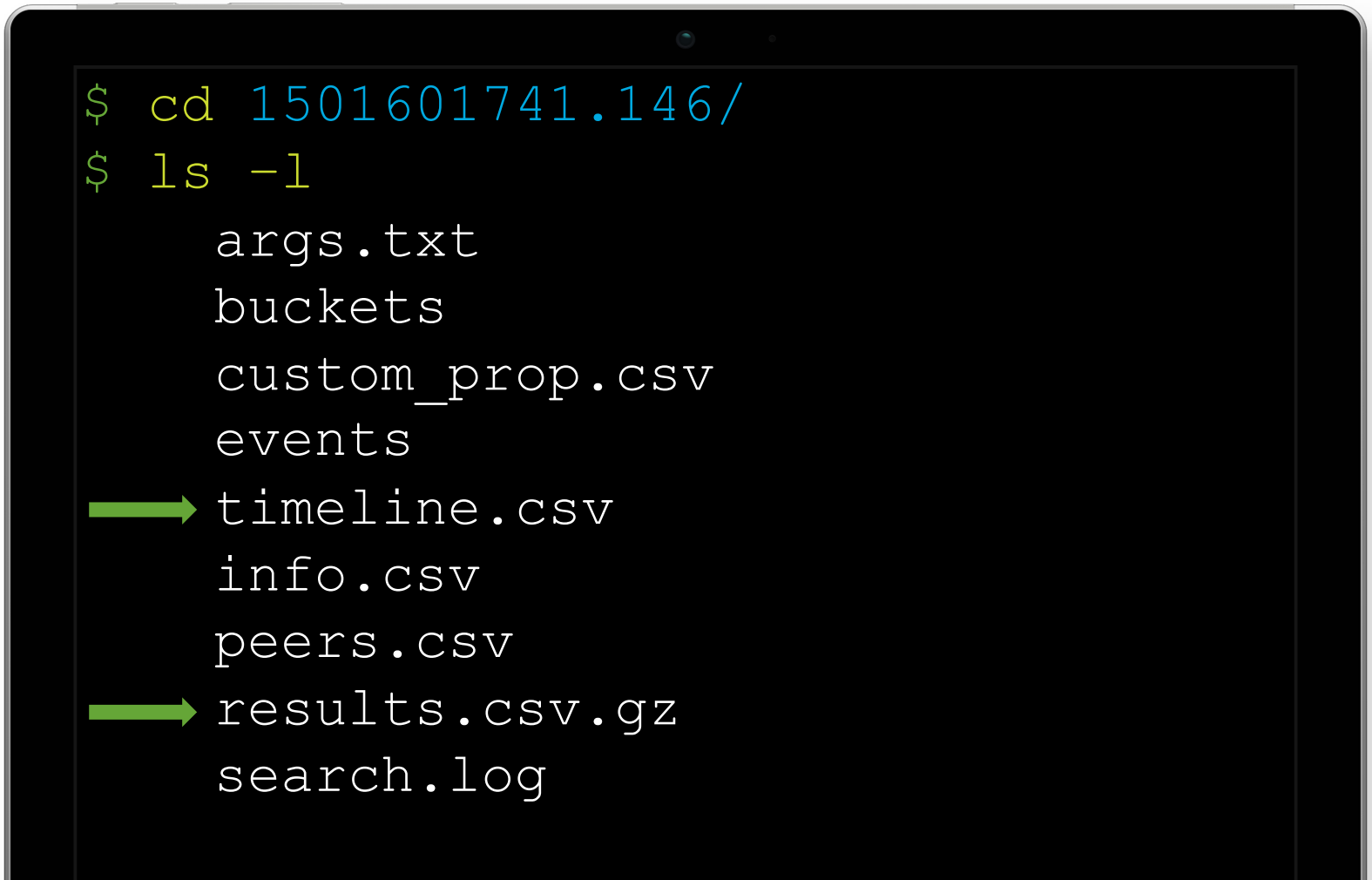
transaction vs stats



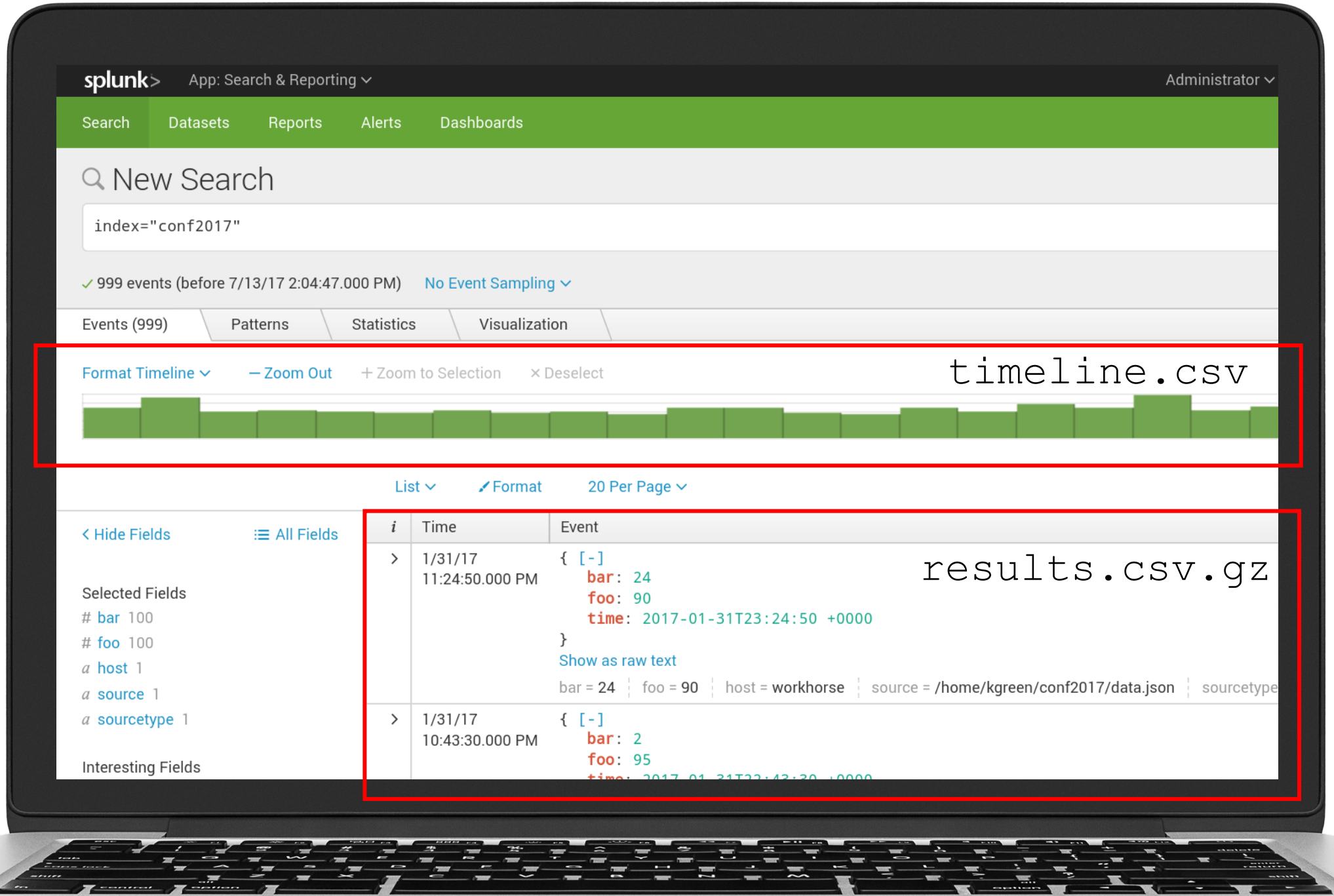
- Directory of all saved and running searches on the Search Head.
- `sid` can be obtained in the Job Inspector.

Search Folder

transaction vs stats

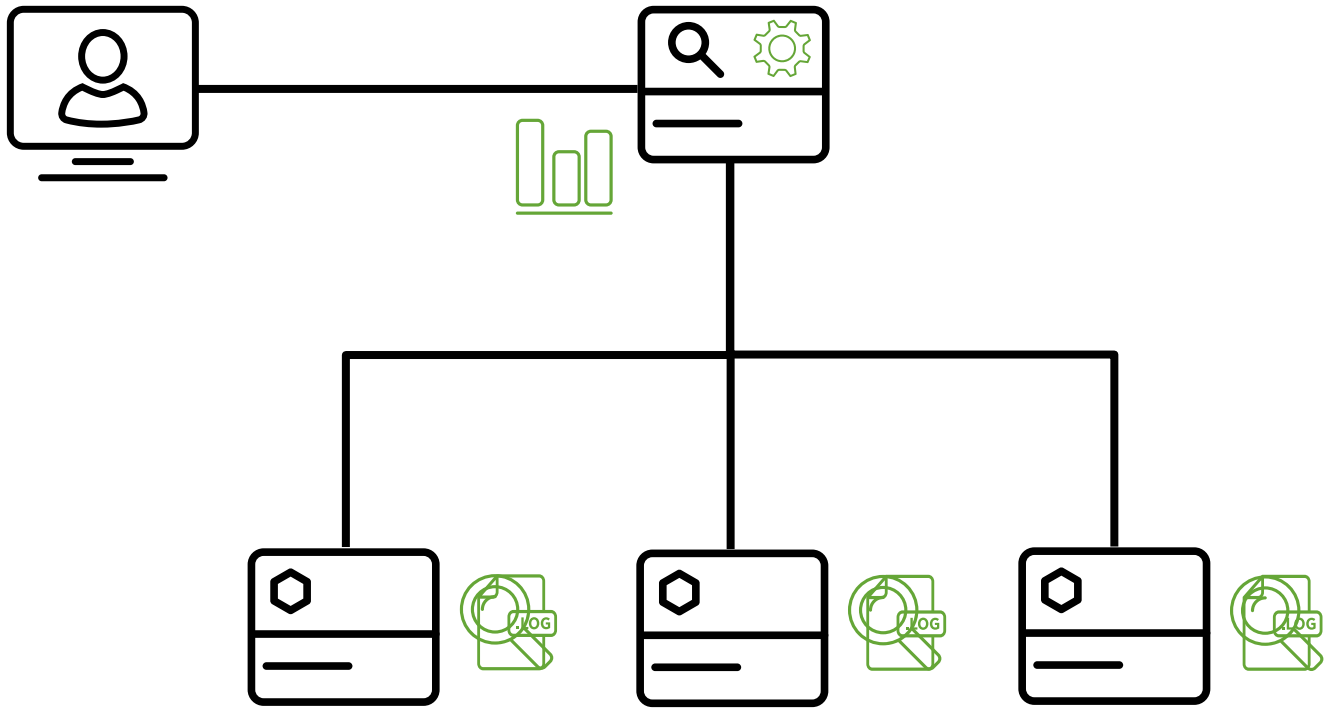


- Collection of all data being returned from the indexers.
- `results.csv.gz` compressed events.
- `timeline.csv` UI timeline numbers.



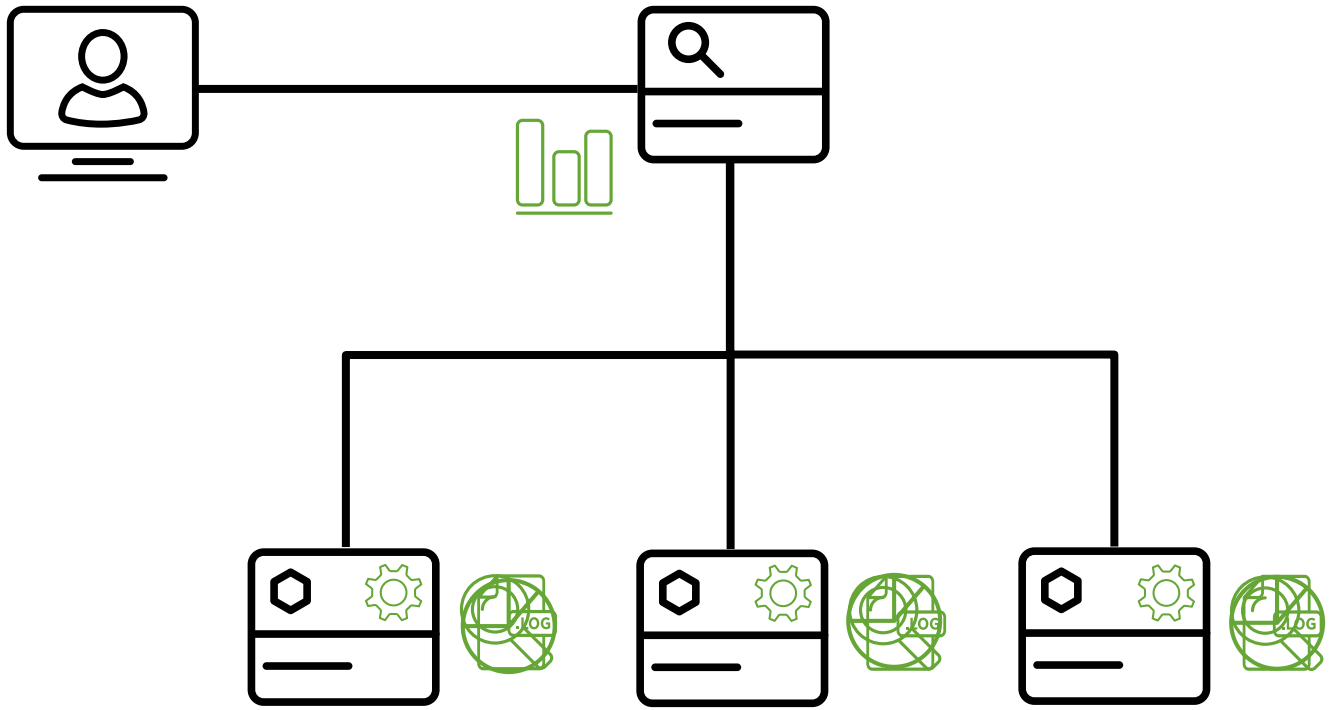
Transaction Workflow

transaction vs stats



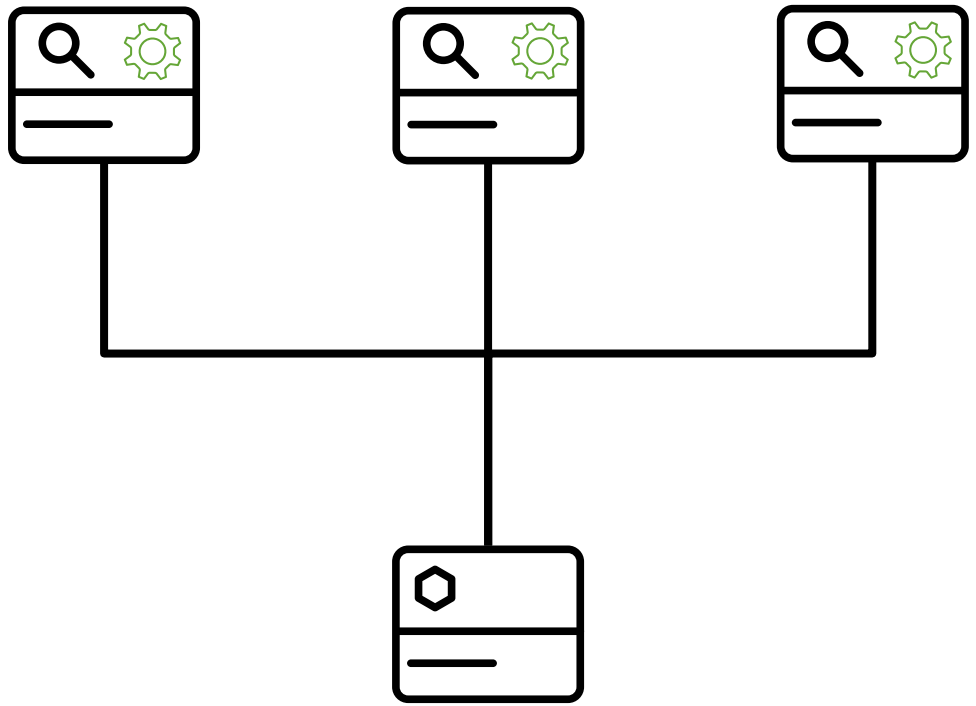
Stats Workflow

transaction vs stats



Search Head Cluster

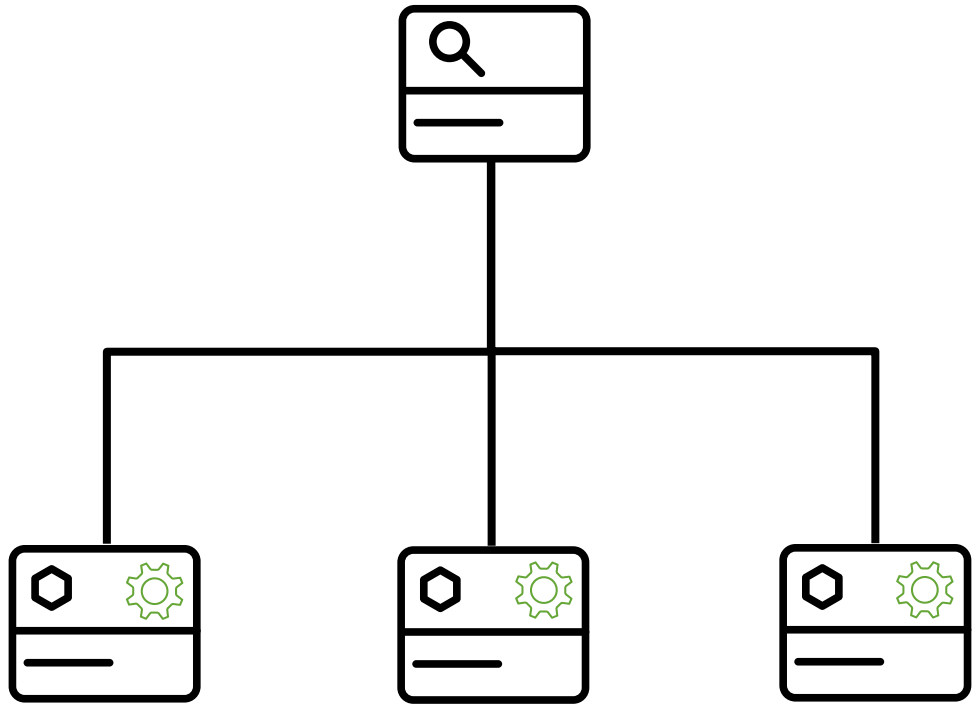
transaction vs stats



Performance boost for `transactions` running in parallel.

Distributed Search & Index Cluster

transaction vs stats



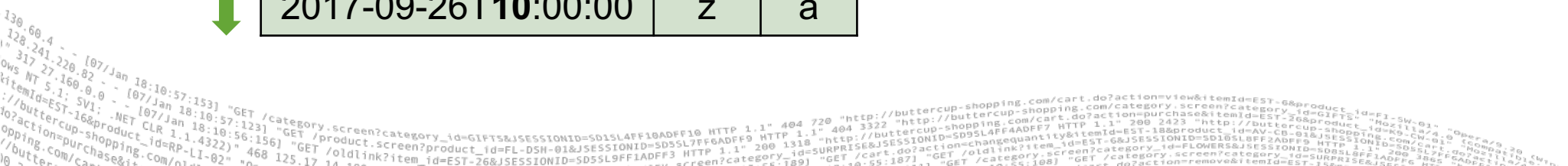
Scalable performance boost to `stats` and `eval`.

Stats Computation

transaction vs stats

Time	Foo	Bar
2017-09-01T**09**:00:00	a	z
2017-09-02T**07**:00:00	b	y
2017-09-03T**02**:00:00	c	x
2017-09-04T**13**:00:00	d	w
2017-09-05T**23**:00:00	e	v
…		
2017-09-21T**15**:00:00	v	e
2017-09-23T**16**:00:00	w	d
2017-09-24T**09**:00:00	x	c
2017-09-25T**06**:00:00	y	b
2017-09-26T**10**:00:00	z	a

- `stats` only concerns itself with a single event at once.
- Requires only one pass to complete the computation.
- For `stats count` Splunk returns value plus event occurrence count.
  - For example: hour `"09"` has 2 events.



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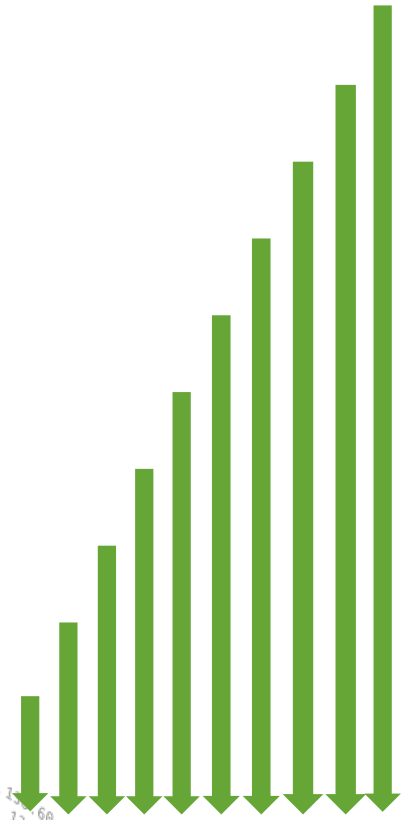
Transaction Discovery

transaction vs stats



Time	Foo	Bar
2017-09-01T**09**:00:00	a	z
2017-09-02T**07**:00:00	b	y
2017-09-03T**02**:00:00	c	x
2017-09-04T**13**:00:00	d	w
2017-09-05T**23**:00:00	e	v
…		
2017-09-21T**15**:00:00	v	e
2017-09-23T**16**:00:00	w	d
2017-09-24T**09**:00:00	x	c
2017-09-25T**06**:00:00	y	b
2017-09-26T**10**:00:00	z	a

- Splunk must iterate over each event for every transaction window.
- Looking at a time complexity difference between n and n^2.
- Running only on a single Search Head doesn't help the situation.

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Search #5

transaction plus stats

```
index=conf2017
| transaction foo
| stats count by foo
```

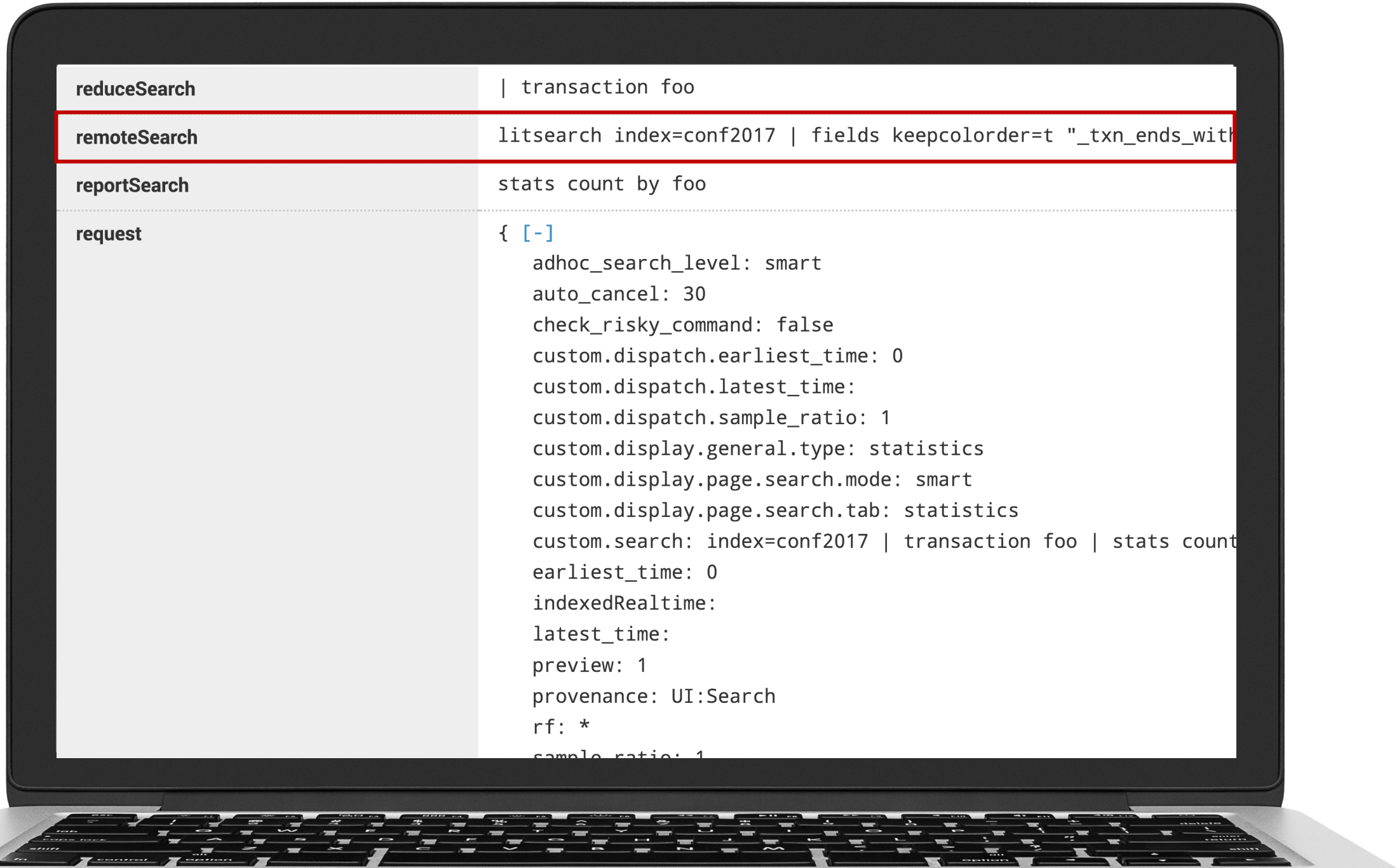
splunk> .conf2017

Where Does it Run?

transaction plus stats

```
index=conf2017
| transaction foo
| stats count by foo
```

- Splunk runs everything on the Indexer, until the first "slow" command forces otherwise.
- Everything trailing that command, will be forced to run on the Search Head.
- `transactions` and `joins` are examples of commands which would trigger this behavior.



Takeaways

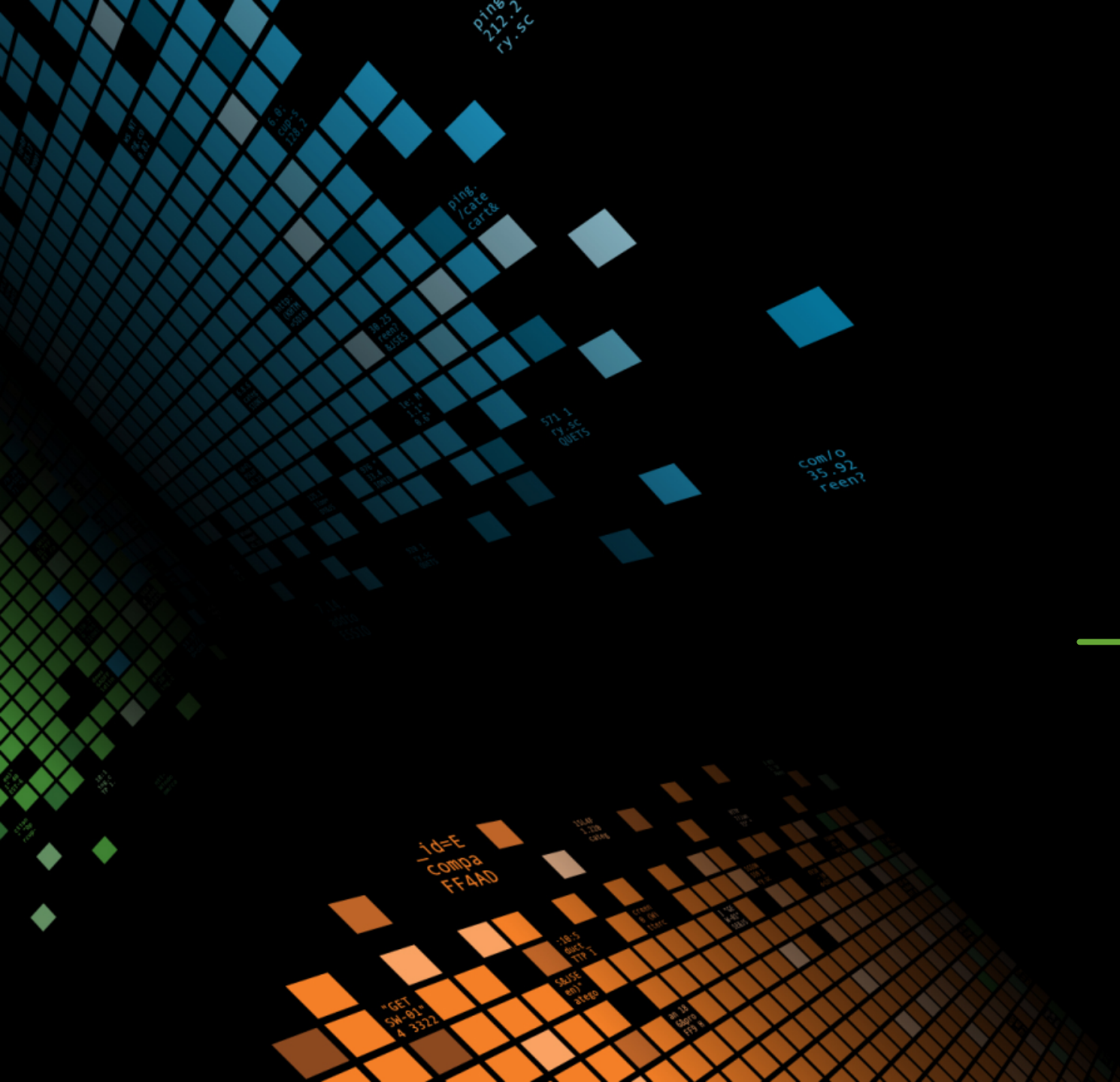
You're all wizards now!

1. Leverage `stats` and `eval` over `transactions` whenever possible.
2. Choose trailing wildcards over leading in queries that require such functionality.
3. Look into indexing important fields who shares values with other fields.
4. Move slow commands as far right into the query string as possible.

No Magic

Just Splunk

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



Q&A