Fields, Indexed Tokens, And You

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SPLUNK TRUST 2015-2016

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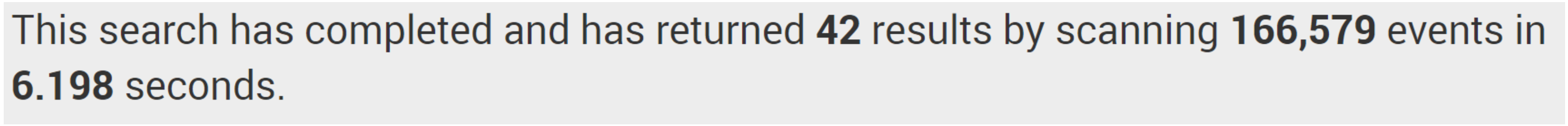
splunk>

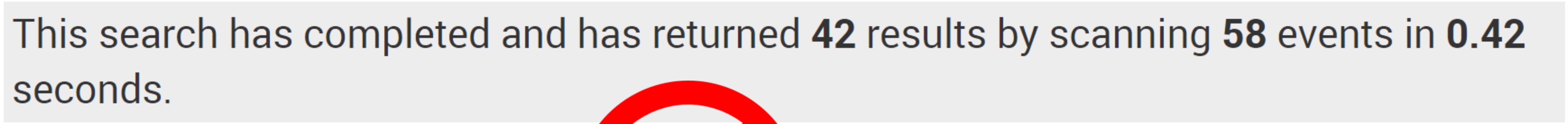
Disclaimer

Why Are We Here?

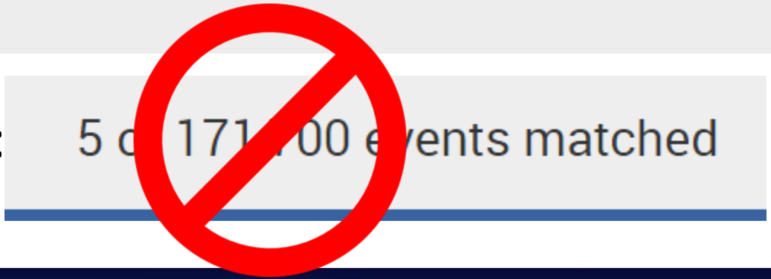
- Supercharged searches!
- I want you to turn this…


This search has completed and has returned **42** results by scanning **166,579** events in **6.198** seconds.

…into this!


This search has completed and has returned **42** results by scanning **58** events in **0.42** seconds.

…this is bad:


5 of 171,[illegible]00 events matched

Who‘s That Guy?

- Professional Services Consultant, Certified Architect, Splunk Trustee
- Six years at EMEA Splunk Partner CONSIST Business Information Technology
- Heavy Splunker since 2012

- Get in touch with me: martin.mueller@consist.de
- Give karma at Splunk Answers: martin_mueller
- Join us on Slack: splunk402.com/chat

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Session Objectives

- Understand how Splunk turns a logfile into indexed tokens
- Learn how your searches make good use of indexed tokens (or not)

- Topics in detail:
  – Breakers & Segmentation
  – Lispy
  – Fields

Breakers & Segmentation

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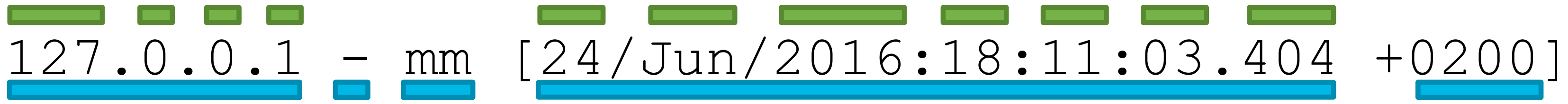
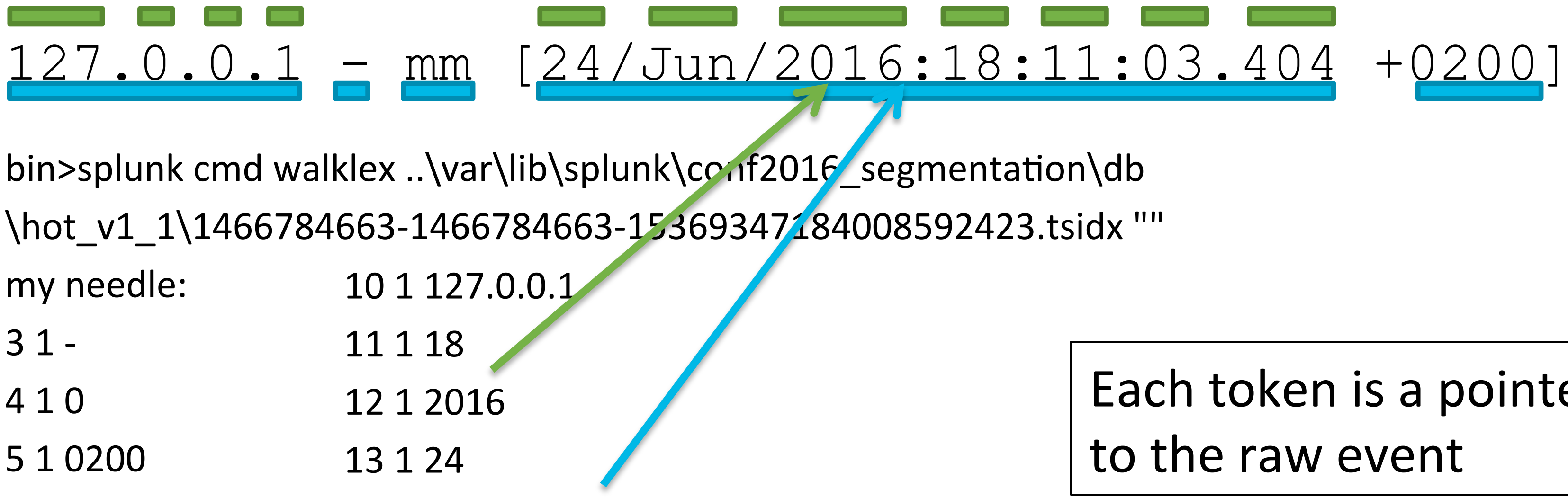
How Splunk Chops Up An Event

- Read in a line of data, apply segmentation, store tokens in TSIDX files
- Minor breakers: / : = @ . - $ # % \ _
- Major breakers: \r\n\s\t [] <> () {} | ! ; , ‘ " etc.
- Can be configured in segmenters.conf – but very rarely should!



```
127.0.0.1 - mm [24/Jun/2016:18:11:03.404 +0200]
```

Inspect A TSIDX File



```
127.0.0.1 - mm [24/Jun/2016:18:11:03.404 +0200]
```

```
bin>splunk cmd walklex ..\var\lib\splunk\conf2016_segmentation\db
\hot_v1_1\1466784663-1466784663-15369347184008592423.tsidx ""
my needle:            10 1 127.0.0.1
3 1 -                 11 1 18
4 1 0                 12 1 2016
5 1 0200              13 1 24
6 1 03                14 1 24/jun/2016:18:11:03.404
7 1 1                 15 1 404
8 1 11                27 1 jun
9 1 127               29 1 mm
```

Each token is a pointer to the raw event

Room For Optimization

- Look for high-cardinality groups of tokens you don‘t search for
- Common offender: Textual timestamp representations: `24/jun/2016:18:11:03.404`
- You don‘t filter for „events from June“ by searching for `jun`
- Segmenters.conf lets you filter out unwanted parts of your events
- Beware: Easy to break stuff, hard to define filters in some cases
- More info available at http://www.duanewaddle.com/splunk-bucket-lexicons-and-segmentation/

Lispy

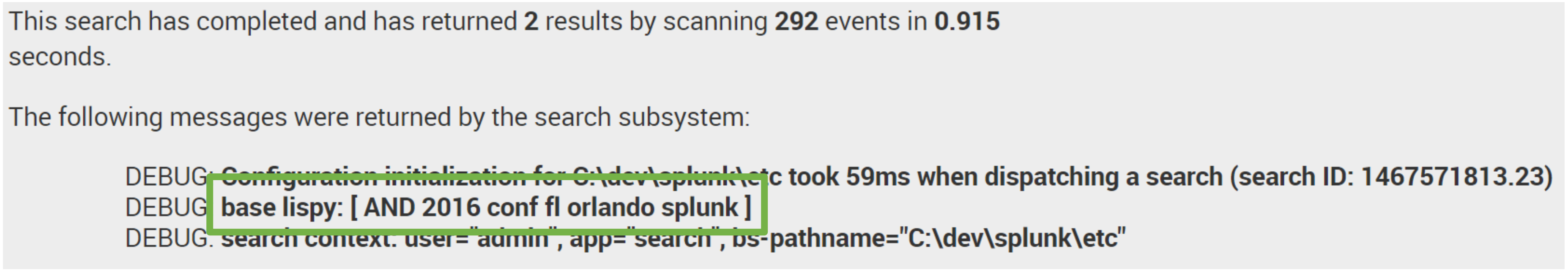
Lispy??

- Lispy expressions are predicates Splunk uses to locate events
- Awesome for debugging and performance tuning

- Square brackets, prefix notation for operators? That's lispy
- Search for `splunk.conf 2016 - Orlando, FL` and you get `[ AND 2016 conf fl orlando splunk ]`
- All events matching the predicate are scanned

Job Inspector

- Since 6.2, lispy is by default only visible in `search.log`
- Enable the old-fashioned header in `limits.conf`:
  `[search_info] infocsv_log_level=DEBUG`



This search has completed and has returned **2** results by scanning **292** events in **0.915** seconds.

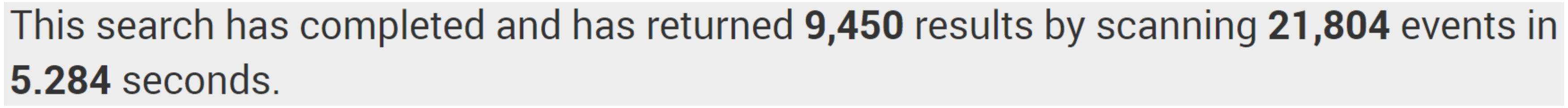
The following messages were returned by the search subsystem:

```
DEBUG: Configuration initialization for C:\dev\splunk\etc took 59ms when dispatching a search (search ID: 1467571813.23)
DEBUG: base lispy: [ AND 2016 conf fl orlando splunk ]
DEBUG: search context: user="admin", app="search", bs-pathname="C:\dev\splunk\etc"
```

- Check lispy efficiency by comparing `eventCount/scanCount`

Building The Lispy For A Search

- Every breaker is a major breaker
- Remove duplicates, sort alphabetically
- Some additional optimizations
- `127.0.0.1` becomes `[ AND 0 1 127 ]`
- Load all events off disk that contain all three tokens – `scanCount`
- Filter for `127.0.0.1` in the raw event – `eventCount`



This search has completed and has returned **9,450** results by scanning **21,804** events in **5.284** seconds.

AND and OR behave

Search	Lispy
`foo bar` (implicit AND)	`[ AND bar foo ]`
`foo OR bar`	`[ OR bar foo ]`
`(a AND b) OR (c AND d)`	`[ OR [ AND a b ] [ AND c d ] ]`
`(a OR b) AND (c OR d)`	`[ AND [ OR a b ] [ OR c d ] ]`

`NOT` Can Be Tricky

- `NOT bad` works as expected: `[ NOT bad ]`
- Load all events that don‘t have that token

- How do you translate `NOT 127.0.0.1`?
- `[ NOT [ AND 0 1 127 ] ]`?
- That would rule out `127.0.1.1`!
- The sad reality: `[ AND ]`
- Same story with `NOT "foo bar"`

Wildcards

- Filter for partial matches of indexed tokens
- Beware of wildcards at the beginning!

Search	Lispy
foo*	[AND foo*]
*foo	[AND]
f*o	[AND f*o]

Wildcards Can Be Tricky

- Wildcards in combination with breakers lead to unexpected results

- `Hello W*rld` gives you `[ AND hello w*rld ]` – great!
- `Hello*World` gives you `[ AND hello*world ]` – oops!
- There is no indexed token matching this lispy!

Wildcards Can Be Really Tricky

- Wildcards in combination with breakers lead to unexpected results

- Say your events contain `one.two.three`
- Indexed tokens: `one two three one.two.three`
- `one*three` / `[ AND one*three ]` – great!
- `one.two*three` / `[ AND one two*three ]` – oops!

- In short: Be very very careful around wildcards

TERM()

- Force lispy to use a complex token, ignore breakers
- `TERM(127.0.0.1)` becomes `[ AND 127.0.0.1 ]`
- Allows leading wildcards, `TERM(*foo)` becomes `[ AND *foo ]`
- Enables inexact tstats queries \o/

```
|tstats count where index=_* TERM(*ucketMover)
```

- Beware: Crawling the index for leading wildcards is IO-intensive

Fields

Search-time Fields

- Field values are extracted from the raw event while the search runs
- Default assumption: Field values are whole indexed tokens
- `field=one.two.three` becomes `[ AND one two three ]`
- Field extractions and post-filtering happens after loading raw events
- Pro: Flexibility, scoping, mostly decent performance
- Con: Terrible performance in some cases

Index-time Fields

- Default fields: `host`, `source`, `timestartpos`, etc.
- Custom fields in `transforms.conf` (`WRITE_META=true`)
- Pro: Search performance
- Con: Flexibility, lack of sourcetype namespace
- Con if over-used: Indexing overhead, disk space

- Search for `sourcetype=foo timestartpos>0`

```
[ AND sourcetype::foo [ GT timestartpos 0 ] ]
```

Define Custom Index-time Fields

- `transforms.conf`: `REGEX`, `FORMAT`, `WRITE_META`
- `props.conf`: `TRANSFORMS-class = stanza`
- `fields.conf`: `[fieldname] INDEXED = true`

- …`fields.conf`?
- Tells search that a field is expected as an indexed field (lispy : :)
- Not scoped to a `props.conf` stanza such as sourcetype!

Calculated Fields

- Call an eval at search time: `[stanza] EVAL-answer=42`
- Field values don't have to be indexed tokens, hard to filter in lispy
  `answer=42` becomes `[ OR 42 sourcetype::stanza ]`
- Scan all events for the field value plus all events for that stanza
- Common use case: CIM normalization,
  e.g. `TA-bluecoat`
  `EVAL-dest=coalesce(dest_host,dest)`
- No pre-search optimization
- Use sparingly when searching by a field

Fields From Fields

- `props.conf: EXTRACT-class = <regex> in <field>`
- Extracts a field from another field
- Can cut down regex duplication
- Common use case: Pull field from paths or file names: `in source`
- Search for `field=value`
- `[ OR sourcetype::foo value ]`
- No pre-search optimization
- Config ordering: No `in field` for auto-KV

Comparisons

- Access logs, search for server errors: `status>=500`
- What indexed token to scan for? None - `[ AND ]`

- Can be solved with a lookup of known server error codes (CIM App)
- Can be solved with an indexed field

- Non-solution: `status=5*`, `[ AND 5* ]`
- Too many events have a `5*` token somewhere

Remember `NOT`? Tricky…

- `NOT bad` worked well: `[ NOT bad ]`
- What about `NOT field=bad`?
- Index-time? No problem: `[ NOT field::bad ]`
- Search time? `[ NOT bad ]`?

- That would rule out events like this: `field=good otherfield=bad`!
- Instead, Splunk has to scan all the events

Another TERM()

- Can you use `field=TERM(*foo)`? Should you?
- `index=_internal action=TERM(*ebhook)`
- `index=_internal component=TERM(*ucketMover)`
- Calculated fields break `TERM()`!

-
  ```
  [ AND index::_internal
        [ OR sourcetype::audittrail term ] ]
  ```
- `[ AND *ucketmover index::_internal ]`

Value Uniqueness

- `2016-09-28 12:34:56.789 uid=2016 syscall=2`
- Search for `uid=2016`, get `[ AND 2016 ]`
- Token is not very unique, scans all events from this year
- Common offenders: Small integers, `true`, `yes`, `ERROR`, etc.

- Can be solved with an indexed field
- Can sometimes be solved with `TERM(uid=2016)`
- Beware of `uid="2016"` – major breakers break `TERM()`

Fields From Partial Tokens

- Any financial services people? – `DE44500105175407324931`
- Extract fields: `(?<country>[A-Z][A-Z])(?<check>\d\d)`…
- Search for `country=DE`, get lispy `[ AND DE ]` – oops!
- Can be fixed by `fields.conf` (but beware of scoping!)

```
[country] INDEXED_VALUE = <VALUE>*
```

- Search for `check=44` – fixing in `fields.conf` gets ugly

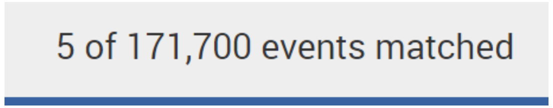
```
[check] INDEXED_VALUE = *<VALUE>*
[check] INDEXED_VALUE = false
```

What About Accelerations?

- Accelerated Datamodels and Reports get filled by frequent searches
- Users of accelerations get a large performance boost regardless of their lispy efficiency – good!

- However!
- The frequent summarizing searches should be well-optimized
- Rule of thumb: The more often something will run for a long time into the future, the more time you should spend on optimizations

Key Takeaways

- Love thy Job Inspector
- Start to think of lispy when writing searches
- Level 2: Think in lispy
- Carefully consider opportunities for index-time fields
- Give extra scrutiny to…
  - Searches using wildcards
  - Small numbers
  - Filtering through `NOT` – especially for fields
  - Calculated fields
  - These: 
    5 of 171,700 events matched

What Now?

Related breakout sessions and activities…

THANK YOU

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