Splunk Performance Reloaded
Best Practices For Optimal Performance

Stefan Sievert

Staff Architect, Splunk Inc.

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Agenda

- Setting The Stage, Why Is This Important
- Collection/Forwarding
- Indexing
- Search
- UI/Dashboards
- Summary

Setting The Stage

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The Goal

> "Let our advance worrying become advance thinking and planning."
>
> - *Winston Churchill*

General Architecture Considerations

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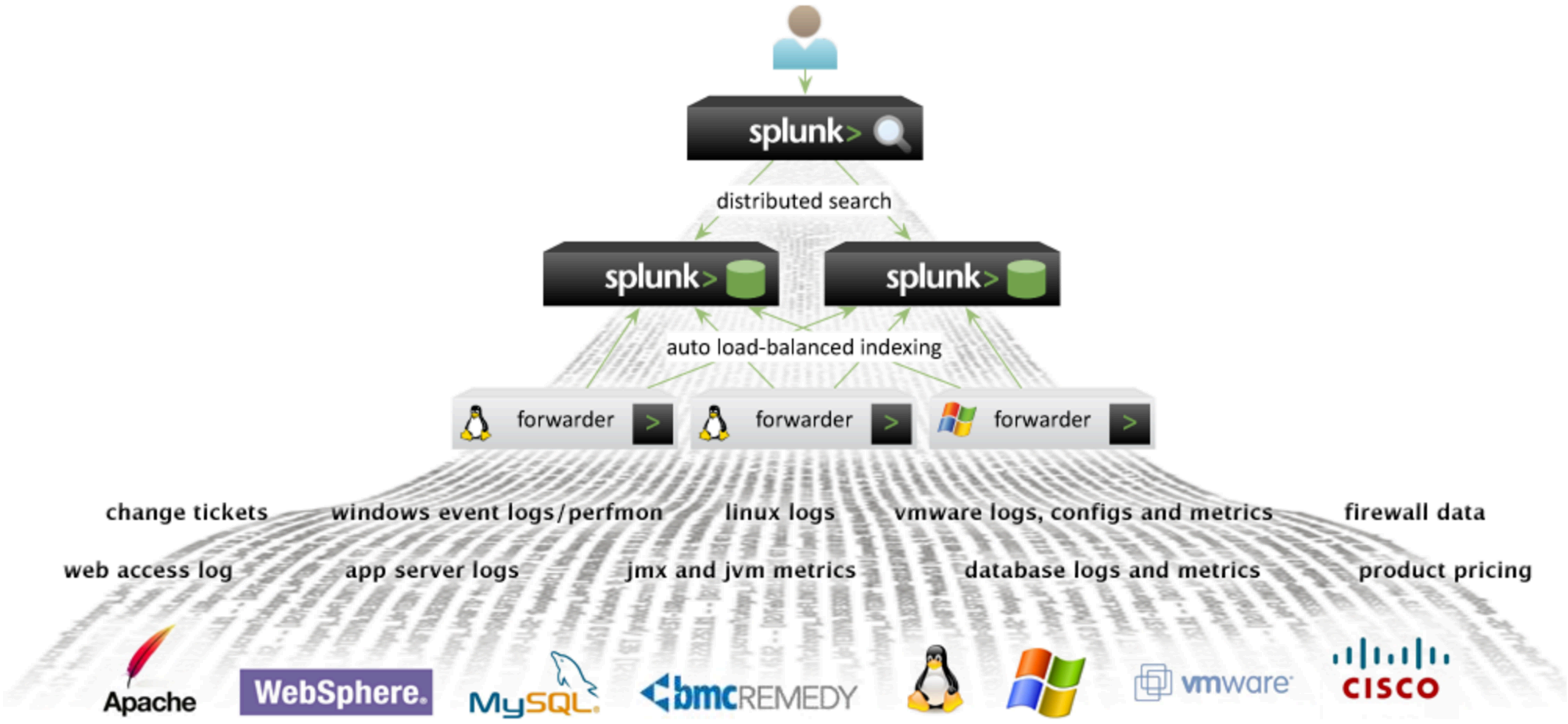
A Quick Refresher



Architecture Considerations

- Remember: Indexers are search peers and handle the bulk of the search workload
  - More indexers = less data per indexer = higher concurrency = more searches per time unit
  - Indexer processing capacity needs to be > SH capacity, top-heavy deployments can overwhelm the search peers
- Address search performance issues at the search peer tier first, i.e. when in doubt, add an indexer
- Avoid complex architectures, keep it simple (intermediary forwarders, over-building for every failure scenario, etc.)

Collection/Forwarding

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Collection/Forwarding Performance

- Forwarder configuration can affect…
  - **Event distribution** across indexers, which negatively affects search performance
    - High-velocity log source can cause stickiness (see: **forceTimebasedAutoLB**)
  - **Event throughput**, which may affect index time latency, causing events to not be searchable for extended periods of time
    - UF has Default MaxKBps of 256kbps
    - Keep number of monitored sources low
    - New in 6.4: **parallelIngestionPipelines** (server.conf)
- Use UF vs. HF for intermediary FWD tier if possible
- Consider HTTP Event Collector for forwarder-less collection

Indexing

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Indexer Resources

- Storage performance is single most critical factor
  – Splunk doesn't care which supported storage technology you use as long as it meets minimum IO performance requirements
  – Locally attached storage almost always wins over shared SAN
- Indexing itself is streaming write IO, but indexers do double duty!
  →Random Seek performance is critical for searching
- Slow storage for COLDDB can slow down indexing
- Indexers need resources (cores, memory, IO); constrained resources are the #1 cause for performance issues

Recommended Approach

- Separate HOT/WARM from COLD and limit HOT/WARM to the minimum required to fulfil ~80% of your search use cases

  This allows you to economically use SSDs for HOT/WARM and cheaper storage for the remaining search use cases (assuming search performance is less critical there)

Indexer Configuration

- Keep number of indices reasonable, create new index to address retention and access control requirements
- Separate high-velocity log sources from low-velocity sources
- Take advantage of parallel indexing pipelines if you can
- Combine things frequently searched together in the same index

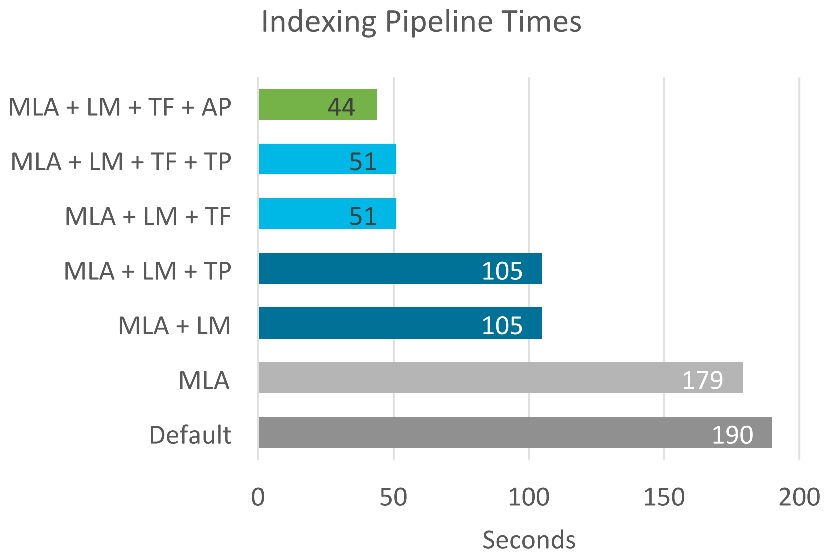
- Turn that Hyperthreading ON, it does not hurt!
- Turn CPU power-safe OFF!
- If you are on RedHat Linux, turn THP off!

“Although the default Splunk configurations are typically appropriate, certain high-performance environments can benefit from tuning various parameters.”

- John F. Kennedy

Data Source Configuration

- For each sourcetype, always set:
  - TIME_FORMAT (TF)
  - TIME_PREFIX (TP)
  - MAX_TIMESTAMP_LOOKAHEAD (MLA)
  - LINE_BREAKER
  - TRUNCATE
  - SHOULD_LINEMERGE=false
  - ANNOTATE_PUNCT=false (AP)



Searching

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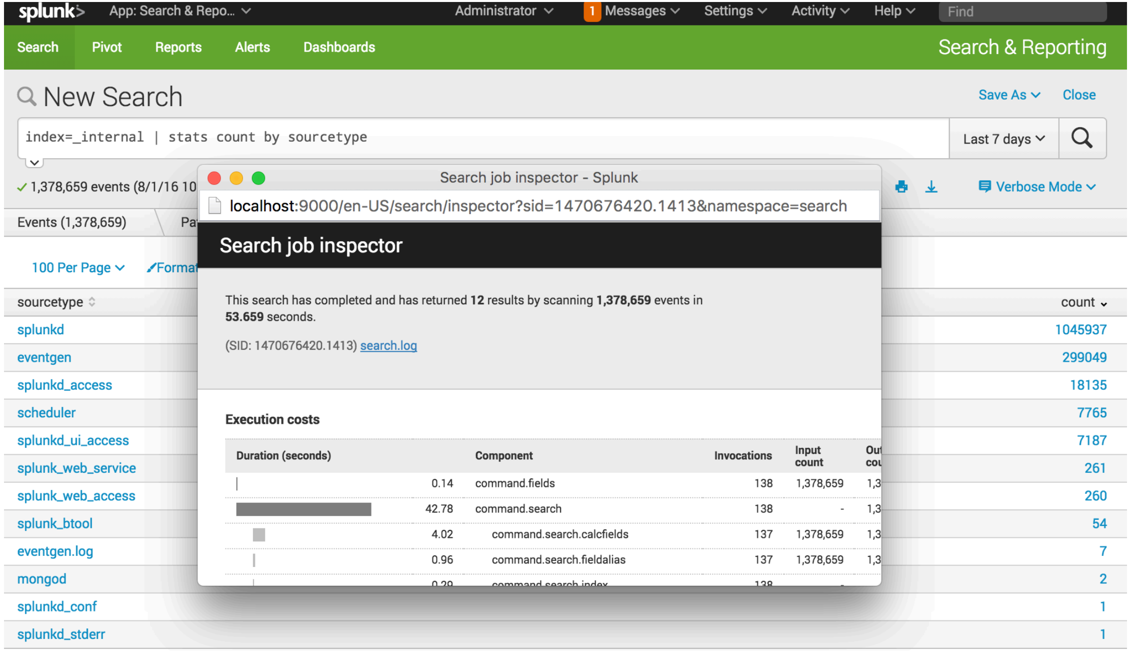
Searching – Part 1

- Search time field extractions
  - Use DELIMS based field extractions when you can (KV, comma, pipe)
  - Anchor RegExs, Avoid RegEx lookbehind if you can
- Be as specific as you can when writing searches
  - Pick the smallest search timerange that meets your needs (Default!=All time)
  - Use indexed fields (host/source/sourcetype)
  - Specify index explicitly, e.g. index=firewall
- Don't use **|table** in the middle of a search, use **|fields** instead
- Avoid realtime searches (use indexed_realtime if you can't)
- Avoid verbose mode, unless you are exploring

Searching – Part 2

- When reporting on indexed fields, consider using **| tstats** to search index files only
- Exploit acceleration options where it makes sense
  - Report acceleration
  - Data model acceleration
- Got extra indexer cores? Use parallel search pipelines (see D)
- Stay current on Splunk releases, we continuously focusing on performance improvements

Example: Search Vs. | tstats



```
index=_internal | stats count by sourcetype
```

✓ 1,378,659 events (8/1/16 10

Events (1,378,659)

sourcetype	count
splunkd	1045937
eventgen	299049
splunkd_access	18135
scheduler	7765
splunkd_ui_access	7187
splunk_web_service	261
splunk_web_access	260
splunk_btool	54
eventgen.log	7
mongod	2
splunkd_conf	1
splunkd_stderr	1

localhost:9000/en-US/search/inspector?sid=1470676420.1413&namespace=search

Search job inspector

This search has completed and has returned **12** results by scanning **1,378,659** events in **53.659** seconds.

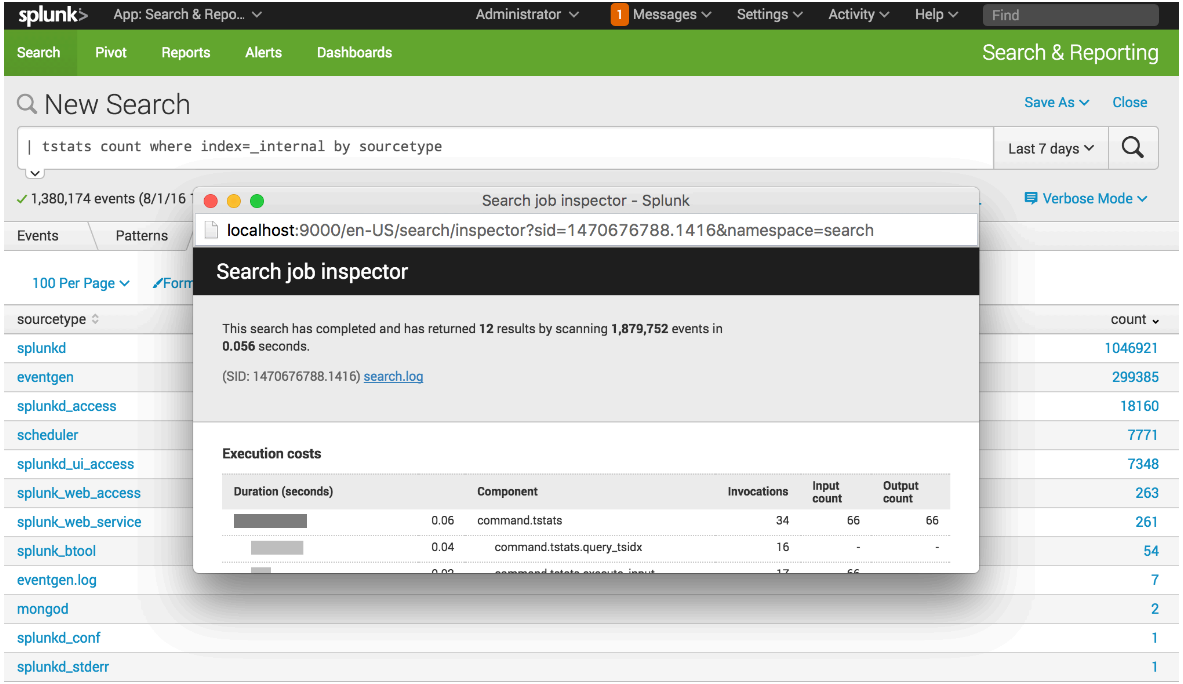
(SID: 1470676420.1413) search.log

Execution costs

Duration (seconds)	Component	Invocations	Input count	Ou cou
0.14	command.fields	138	1,378,659	1,3
42.78	command.search	138	-	1,3
4.02	command.search.calcfields	137	1,378,659	1,3
0.96	command.search.fieldalias	137	1,378,659	1,3
0.29	command.search.index	138	-	

index=_internal | stats count by sourcetype: 1.37MM events, 53.66secs

Example: Search Vs. | tstats



```
| tstats count where index=_internal by sourcetype
```

✓ 1,380,174 events (8/1/16

sourcetype	count
splunkd	1046921
eventgen	299385
splunkd_access	18160
scheduler	7771
splunkd_ui_access	7348
splunk_web_access	263
splunk_web_service	261
splunk_btool	54
eventgen.log	7
mongod	2
splunkd_conf	1
splunkd_stderr	1

Search job inspector - Splunk

localhost:9000/en-US/search/inspector?sid=1470676788.1416&namespace=search

Search job inspector

This search has completed and has returned **12** results by scanning **1,879,752** events in **0.056** seconds.

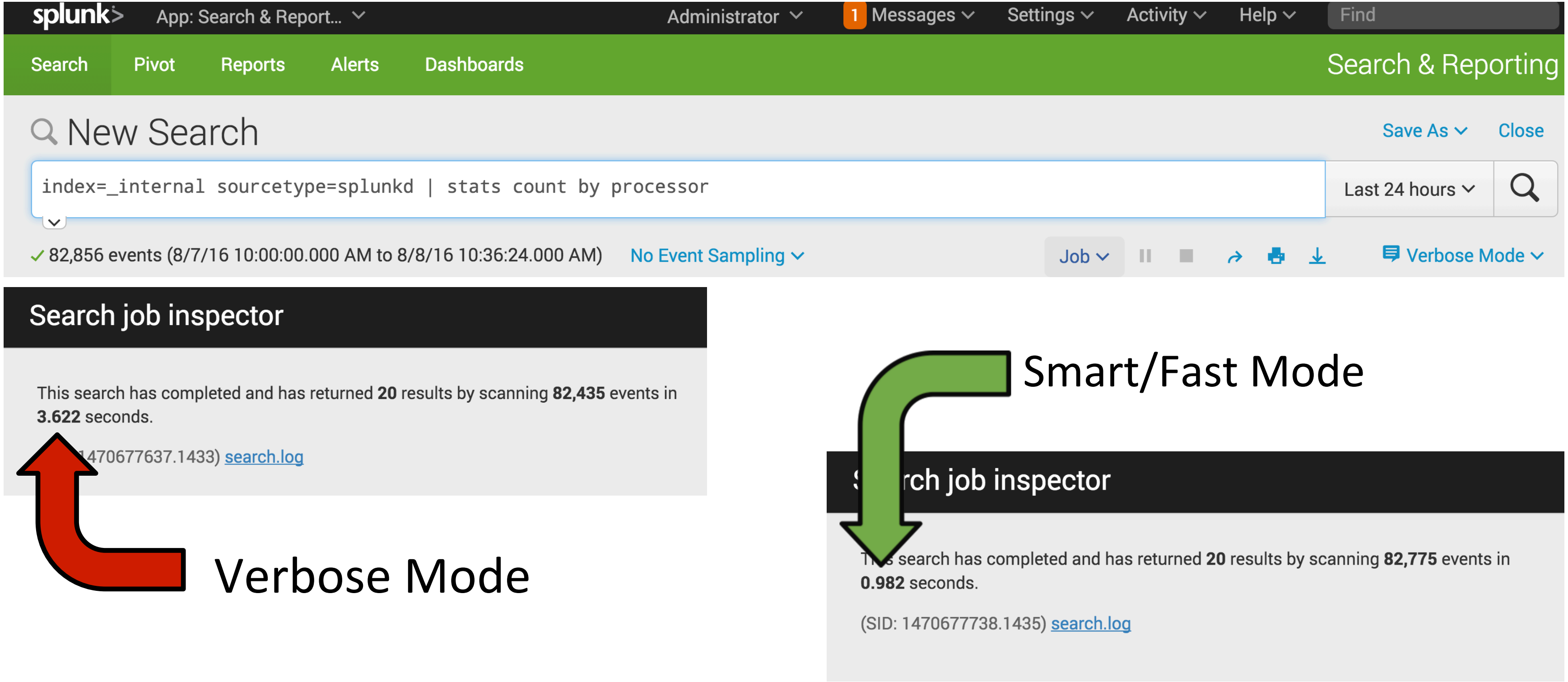
(SID: 1470676788.1416) search.log

Execution costs

Duration (seconds)	Component	Invocations	Input count	Output count
0.06	command.tstats	34	66	66
0.04	command.tstats.query_tsidx	16	-	-
0.02	command.tstats.execute_input	17	66	

| tstats count where index=_internal by sourcetype: 1.88MM events, 0.056secs

Example: Verbose Vs. Smart/Fast Mode



```
index=_internal sourcetype=splunkd | stats count by processor
```

✓ 82,856 events (8/7/16 10:00:00.000 AM to 8/8/16 10:36:24.000 AM)

Search job inspector

This search has completed and has returned **20** results by scanning **82,435** events in **3.622** seconds.

1470677637.1433) search.log

Verbose Mode

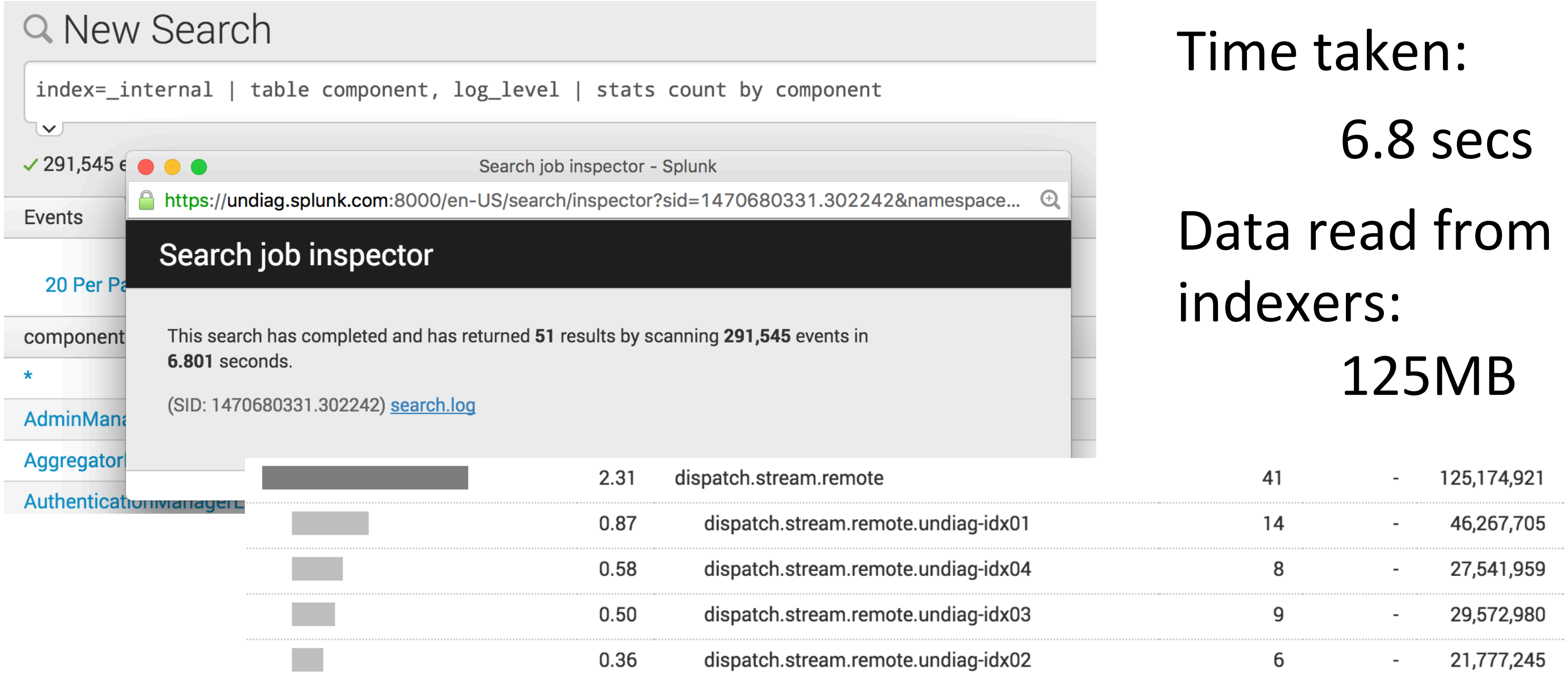
Smart/Fast Mode

Search job inspector

This search has completed and has returned **20** results by scanning **82,775** events in **0.982** seconds.

(SID: 1470677738.1435) search.log

Example: Table Vs. Fields



```
index=_internal | table component, log_level | stats count by component
```

Search job inspector - Splunk

https://undiag.splunk.com:8000/en-US/search/inspector?sid=1470680331.302242&namespace...

Search job inspector

This search has completed and has returned **51** results by scanning **291,545** events in **6.801** seconds.

(SID: 1470680331.302242) search.log

▬	2.31	dispatch.stream.remote	41	-	125,174,921
▬	0.87	dispatch.stream.remote.undiag-idx01	14	-	46,267,705
▬	0.58	dispatch.stream.remote.undiag-idx04	8	-	27,541,959
▬	0.50	dispatch.stream.remote.undiag-idx03	9	-	29,572,980
▬	0.36	dispatch.stream.remote.undiag-idx02	6	-	21,777,245

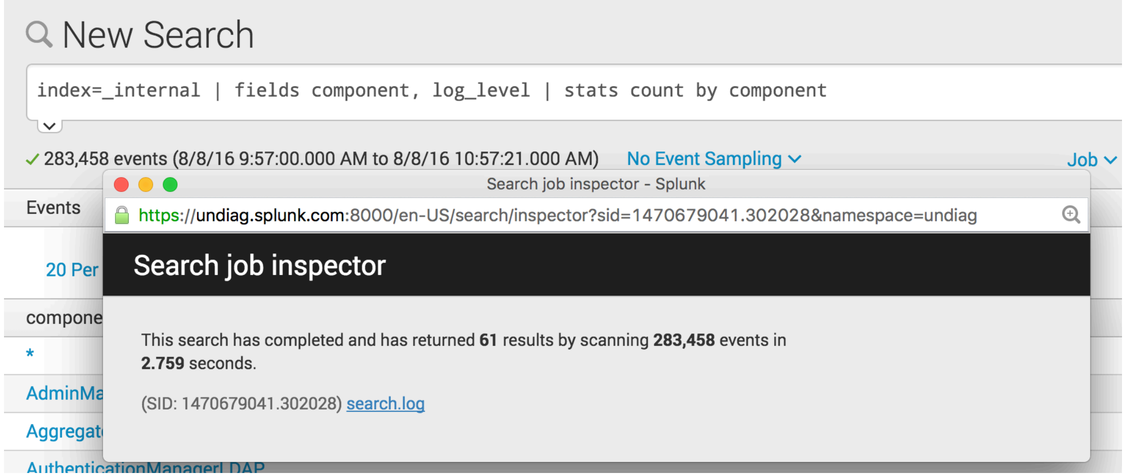
Time taken:

6.8 secs

Data read from indexers:

125MB

Example: Table Vs. Fields



```
index=_internal | fields component, log_level | stats count by component
```

✓ 283,458 events (8/8/16 9:57:00.000 AM to 8/8/16 10:57:21.000 AM) No Event Sampling Job

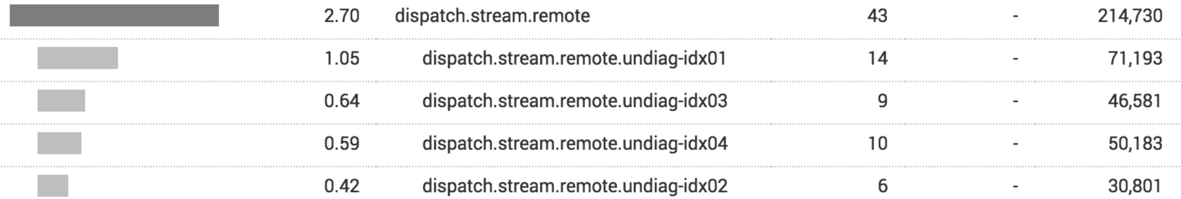
Search job inspector - Splunk

https://undiag.splunk.com:8000/en-US/search/inspector?sid=1470679041.302028&namespace=undiag

Search job inspector

This search has completed and has returned **61** results by scanning **283,458** events in **2.759** seconds.

(SID: 1470679041.302028) search.log



2.70	dispatch.stream.remote	43	-	214,730
1.05	dispatch.stream.remote.undiag-idx01	14	-	71,193
0.64	dispatch.stream.remote.undiag-idx03	9	-	46,581
0.59	dispatch.stream.remote.undiag-idx04	10	-	50,183
0.42	dispatch.stream.remote.undiag-idx02	6	-	30,801

Time taken:

2.76 secs

Data transferred from indexers:

214KB

UI/Dashboarding

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UI/Dashboarding

- Use saved/scheduled searches in dashboards (reuse search results across users)
- Use summary indices for long-term, aggregated metrics (don’t recalculate from raw)
- Restrict time-range picker options to minimum req’d for use case
- Use base searches and PostProcess for panels that are based on the same raw event search
- Minimize the number of panels that require individual searches
- Avoid auto-refresh if you can (kiosk/NOC use-case only)
- Don’t use real-time searches or at least use indexed_realtime

Conclusions/References

Conclusions

- Architecture choices affect performance. KISS!
- Pick the fastest storage you can afford for HOT/WARM
- Configurations at all tiers can affect performance
- Inefficient use of SPL affects performance
- Concurrent searches is the critical metric for search capacity planning
- Always consider search impact on ‘indexers’
- Enjoy your well-performing Splunk deployment!

Where To Go From Here

- Docs on search performance:
  - Optimize Splunk for Peak performance: http://docs.splunk.com/Documentation/Splunk/6.1.4/Admin/OptimizeSplunkforpeakperformance
  - Splunk performance checklist: http://docs.splunk.com/Documentation/Splunk/6.4.2/Capacity/Performancechecklist
  - How search types affect performance: http://docs.splunk.com/Documentation/Splunk/6.4.2/Capacity/HowsearchtypesaffectSplunkEnterpriseperformance

Related Sessions Of Interest

- **Observations and Recommendations on Splunk Performance**
  Wednesday, September 28, 2016 | 12:05 PM-12:50 PM
- **Behind the Magnifying Glass: How Search Works**
  Wednesday, September 28, 2016 | 1:10 PM-1:55 PM
- **Fields, Indexed Tokens and You**
  Wednesday, September 28, 2016 | 11:00 AM-11:45 AM
- **Indexer Clustering Internals, Scaling, and Performance**
  Tuesday, September 27, 2016 | 3:15 PM-4:00 PM
- **Worst Practices... and How to Fix Them**
  Tuesday, September 27, 2016 | 10:30 AM-11:15 AM
- **Jiffy Lube Quick Tune-up for Your Splunk Environment**
  Wednesday, September 28, 2016 | 11:00 AM-11:45 AM
- **Architecting Splunk for Epic Performance at Blizzard Entertainment**
  Tuesday, September 27, 2016 | 12:40 PM-1:25 PM
- **Lesser Known Search Commands**
  Wednesday, September 28, 2016 | 3:30 PM-4:15 PM

THANK YOU

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