



Troubleshooting Splunk Enterprise

Document Usage Guidelines

- Should be used only for enrolled students
- Not meant to be a self-paced document, an instructor is needed
- Do not distribute

Course Prerequisites

- Required:
 - Splunk Fundamentals 1
 - Splunk Fundamentals 2
 - Splunk Enterprise System Administration
 - Splunk Enterprise Data Administration

Note



In order to receive credit for this course, you must complete all lab exercises.

Course Goals

- Understand the Splunk Support Model and its resources
- Identify the best practices for troubleshooting Splunk Enterprise
- List ways to gather useful Splunk diagnostic information
- Use Splunk diagnostic tools
- Identify common Splunk technical issues and solve them

Note



This course does not discuss the issues specific to Splunk Cloud, Splunk Clusters, or Splunk premium apps.

You must complete this course before you can attend the Splunk Cluster Administration course.

Course Outline

- Module 1: Splunk Troubleshooting Methods and Tools
- Module 2: Indexing Problems
- Module 3: Input Configuration Problems
- Module 4: Deployment and Forwarder Problems
- Module 5: Upgrading, Licensing, and User Management Problems
- Module 6: Search Management Problems
- Module 7: User Search Problems

Module 1: Splunk Troubleshooting Methods and Tools

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Module Objectives

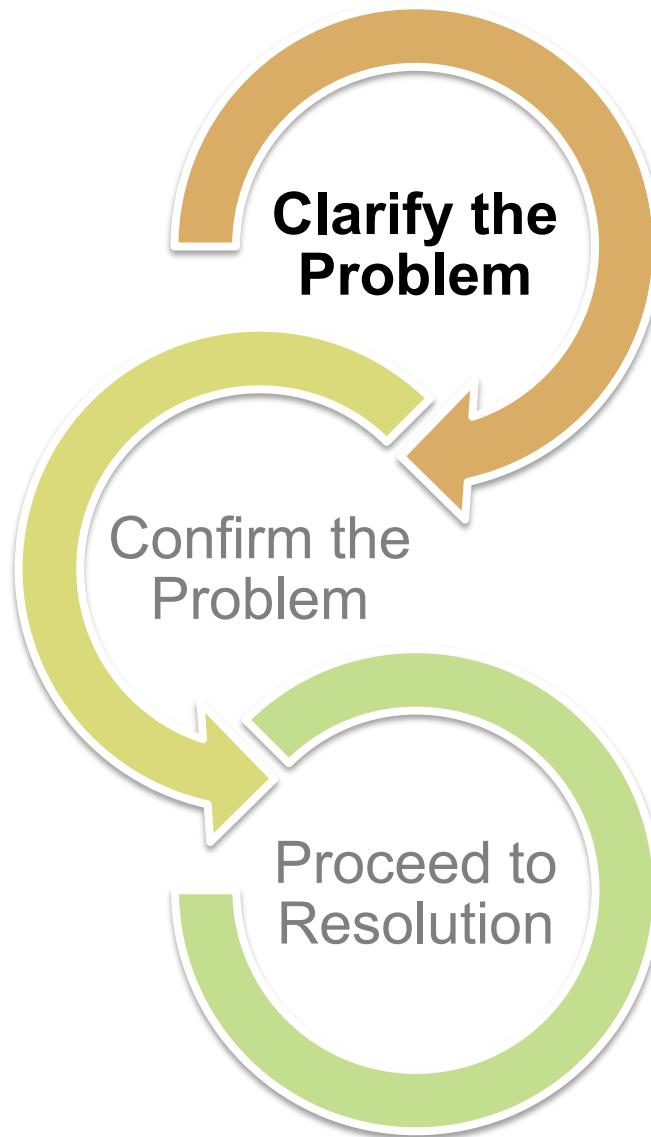
- Describe the Splunk troubleshooting approach
- List Splunk diagnostic resources and tools
- Create and splunk a diag

Splunk Troubleshooting Approach



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Step 1 – Clarify the Problem

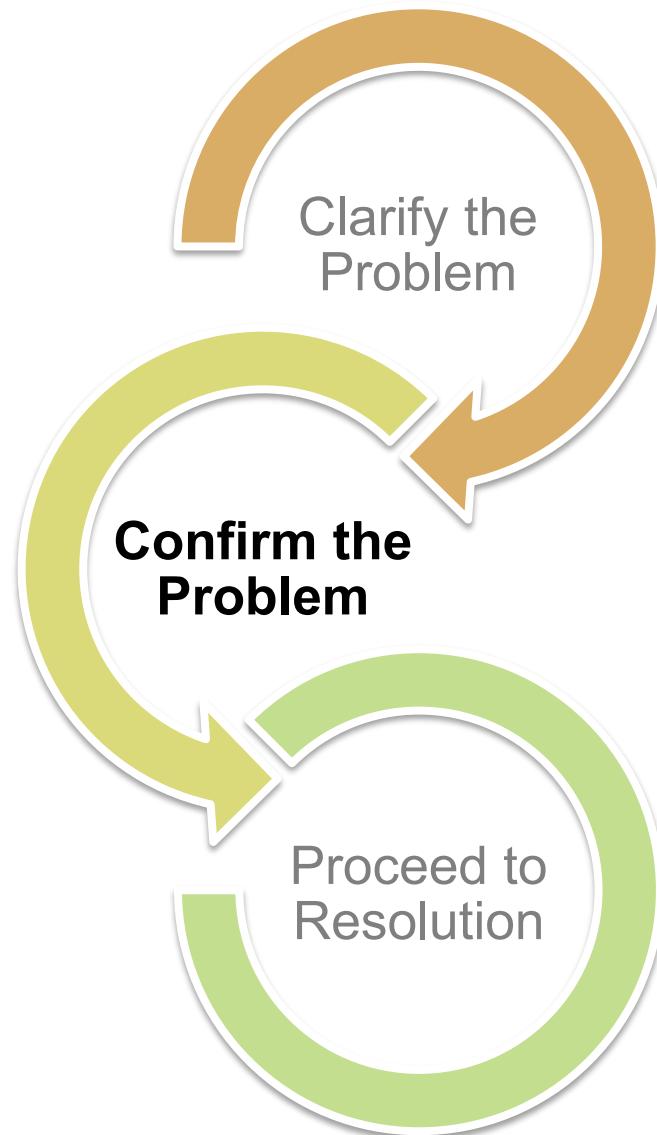


- Define the problem in a single statement
- Gather facts
 - What is the environment?
 - What version of Splunk is running on which OS?
 - Establish a baseline
 - What is and is not working?
 - What changed?
 - Did it work yesterday but does not work today?
 - What is the EXACT search term and the time range?
 - Problems are usually revealed by a search
- Investigate one issue at a time

<http://docs.splunk.com/Documentation/Splunk/latest/Troubleshooting/IntrototroubleshootingSplunk>

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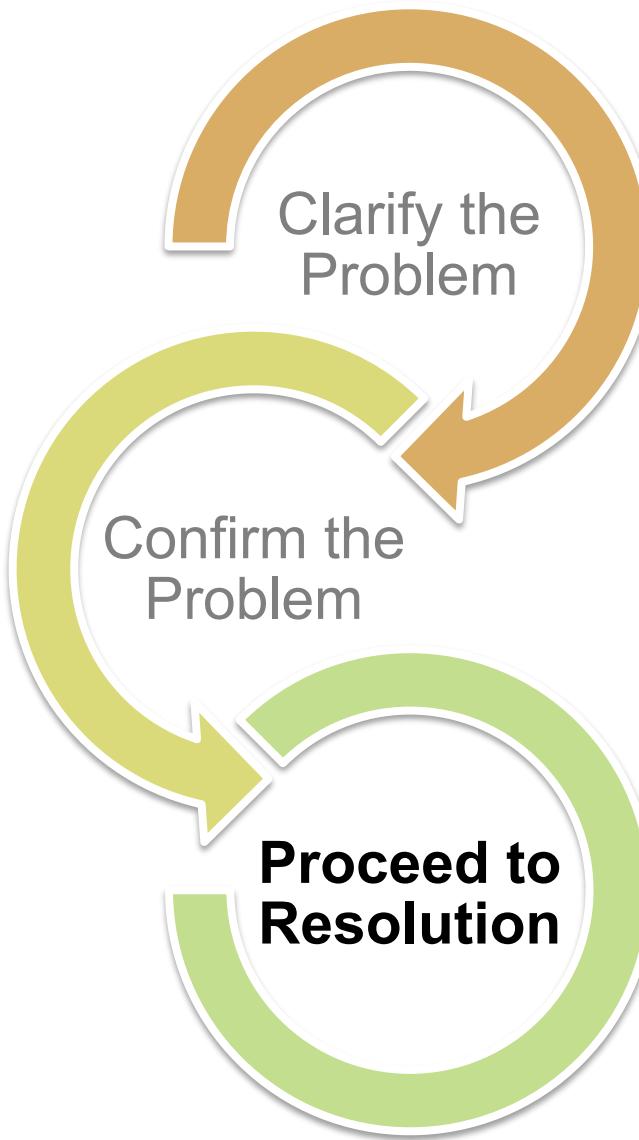
Step 2 – Confirm the Problem



- What type of issue is occurring?
 - What are the symptoms?
 - What are the common problems for this type of issue?
- Can you manually verify the problem?
 - Is this an intermittent or reproducible issue?
 - Is it reproducible in standard Splunk or only in your environment?
- Which Splunk tools can help diagnose the problem?
- Which log channels can help diagnose the problem?

<http://docs.splunk.com/Documentation/Splunk/latest/ReleaseNotes/Knownissues>

Step 3 – Proceed to Resolution



- Once the issue is narrowed down, you can work on resolving the problem
- Splunk offers a variety of resources available to everyone that can help resolve issues
 - Online troubleshooting manual
https://docs.splunk.com/Documentation/Splunk/latest/Troubleshooting/W_hatsinhere
 - Common Symptoms and Solutions
https://docs.splunk.com/Documentation/Splunk/latest/Troubleshooting/W_hatsinhere#Some_common_scenarios
 - Splunk Answers
<https://community.splunk.com/t5/Splunk-Answers/ct-p/en-us-splunk-answers>

Submitting a Case

- Use the Splunk support portal if you need to submit a case
 - If it is reproducible, provide the detailed steps
 - Provide a diag
- After the case is submitted successfully, you can provide supporting files
 - Always attach your diag output
 - Helpful to include sample data, screenshots, network diagrams, Splunk architecture topology, etc.

http://login.splunk.com/page/sso_redirect?type=portal

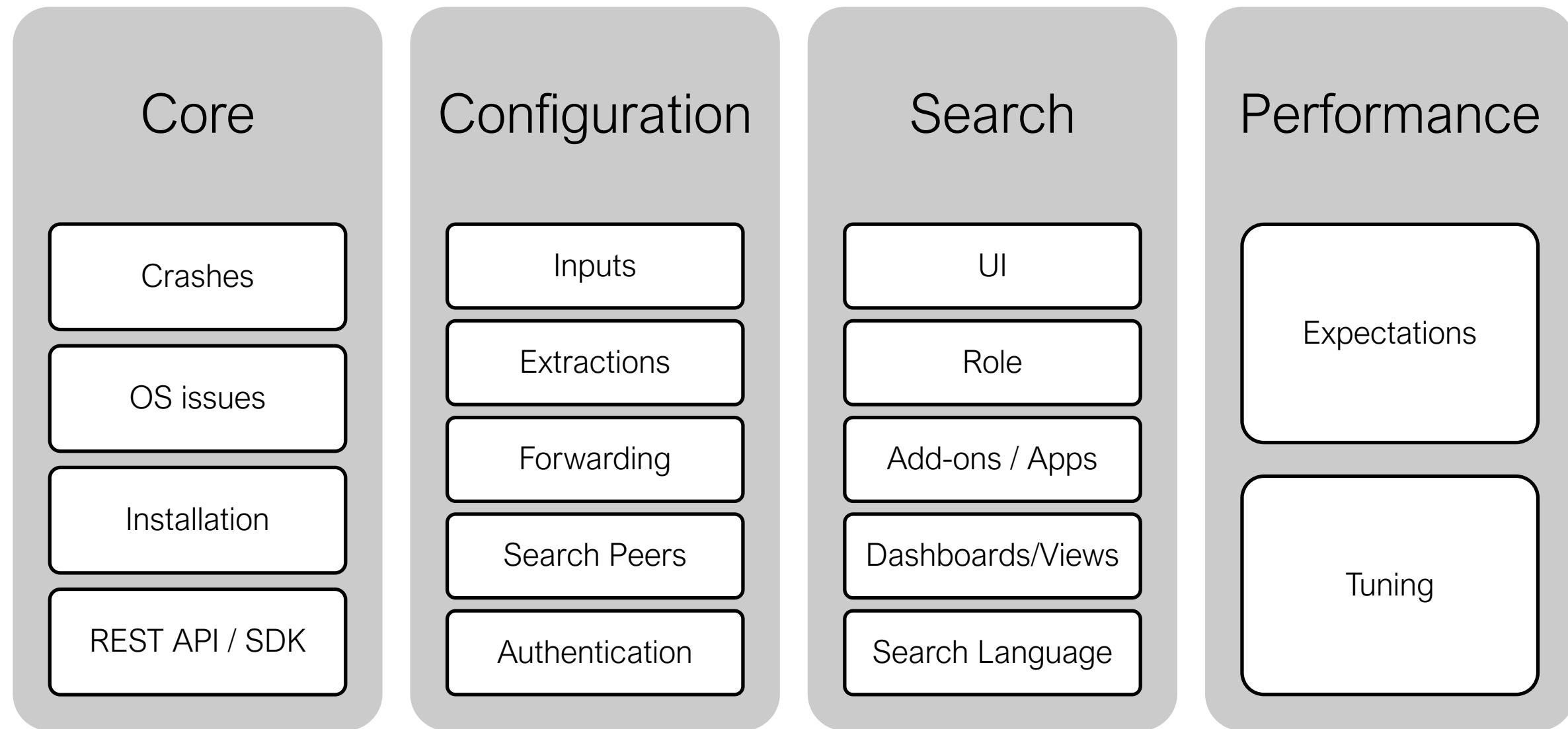
The screenshot shows a step-by-step process titled "Tell us more about your case". The first step, "Product", is completed with "Splunk Enterprise". Subsequent steps are listed as dropdown menus: "Product Version", "Select Entitlement", "Deployment Type", "I need help with...", "Feature / Component / App", "What OS are you using?", "What OS Version are you using?", and "Select Deployment". Each dropdown menu has "--none--" selected. Navigation buttons "Back", "Cancel", "Previous", and "Next" are visible at the top and bottom right respectively.

<http://docs.splunk.com/Documentation/Splunk/latest/Troubleshooting/HowtofileagreatSupportcase>

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Splunk Problem Classification

What is the problem?



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Splunk Diagnostic Tools

- Review: **splunk btool**
 - Displays merged configuration values on disk
 - **splunk btool <conf> list [options]**
- Splunk REST API endpoints
 - Shows the in-memory configuration values
 - <http://docs.splunk.com/Documentation/Splunk/latest/RESTREF/RESTprolog>
- Splunk internal logs and indexes
- Monitoring Console
- Proactive Splunk Component Monitoring
- Splunk instrumentation (telemetry)
- **splunk diag**
 - Diag UI
- RapidDiag app

Note



More REST API topics are discussed in detail in the following courses:

- Building Splunk Apps
- Developing with Splunk REST API

Viewing Service Settings with REST Endpoints

<https://<host>:<mPort>/services/data/inputs/tcp/raw>

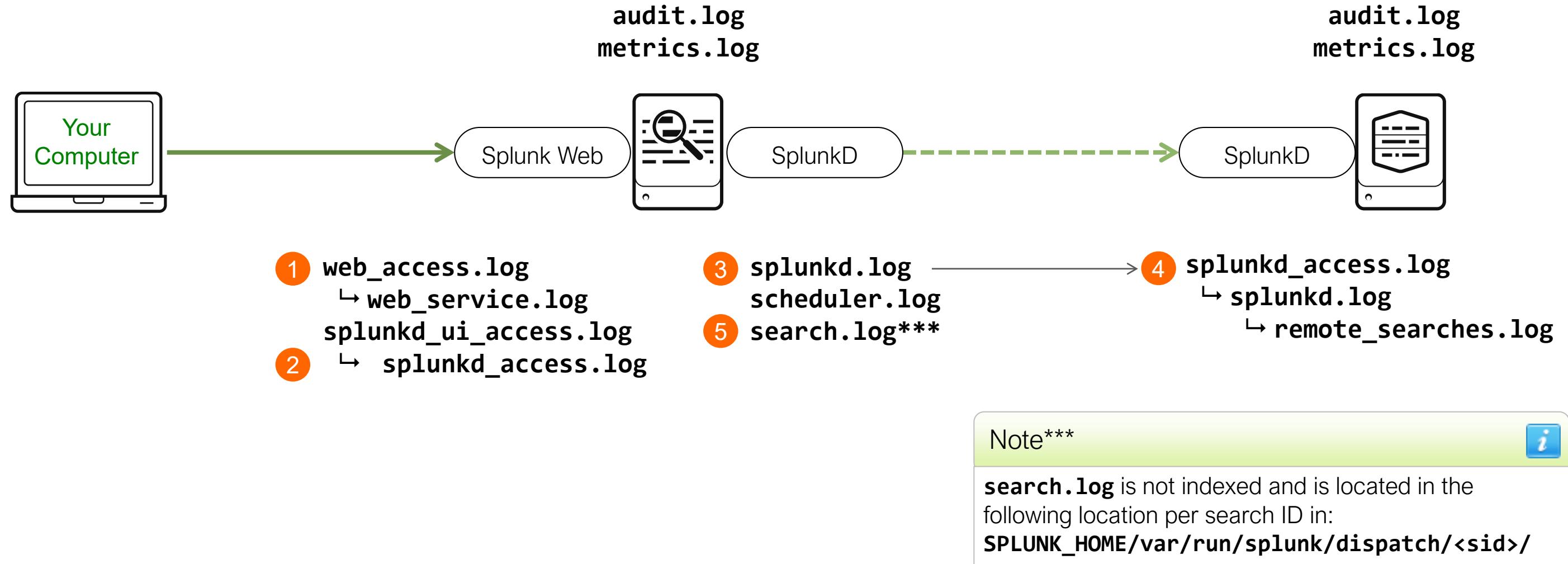
9514	
_rcvbuf	1572864
connection_host	ip
disabled	0
app	search
can_list	1
can_write	1
modifiable	0
owner	nobody
eai:acl	
perms	
read	1. admin 2. power 3. splunk-system-role 4. user
write	1. admin 2. splunk-system-role
removable	1
sharing	app
group	listenerports
host	so1
host_resolved	so1
index	web
sourcetype	snort

<code> rest /services/data/inputs/tcp/raw fields - eai* transpose</code>	
_rcvbuf	1572864
author	nobody
connection_host	ip
disabled	0
group	listenerports
host	so1
host_resolved	so1
id	https://127.0.0.1:8089/servicesNS/nobody/search/data/inputs/tcp/raw/9514
index	web
published	
sourcetype	snort
splunk_server	so1
title	9514

```
> ./splunk btool inputs list tcp://9514
[tcp://9514]
_rcvbuf = 1572864
connection_host = ip
host = so1
index = network ←
sourcetype = snort
```

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What Splunk Logs About Itself

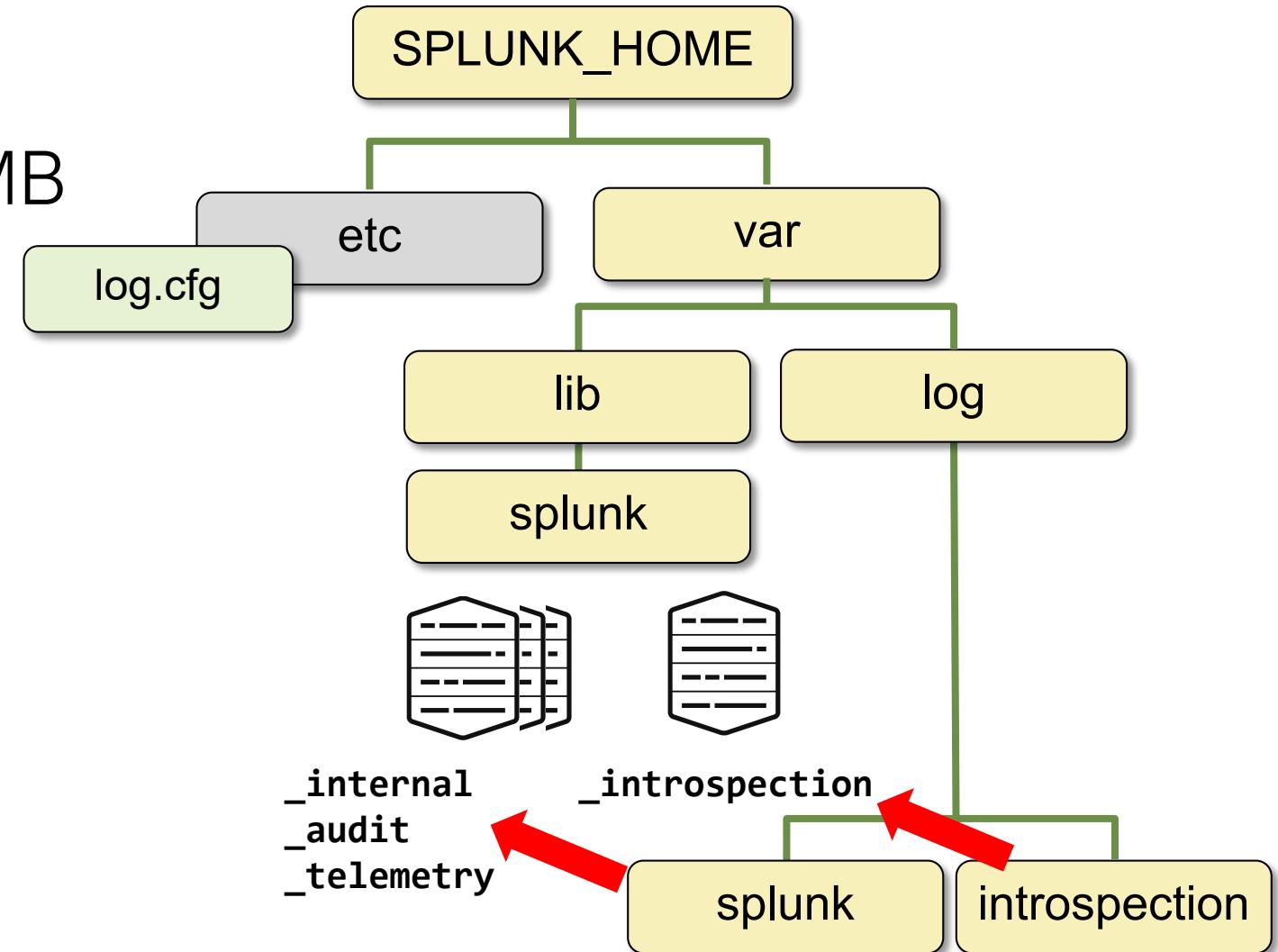


<http://docs.splunk.com/Documentation/Splunk/latest/Troubleshooting/WhatSplunklogsaboutitself>

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Splunk Internal Log Files and Indexes

- Splunk internal logs are in **SPLUNK_HOME/var/log**
 - Logs are rolled based on size (25MB by default)
- Index retention:
 - _introspection** = 14 days
 - _internal** = 30 days
 - _audit** = 6 years
 - _telemetry** = 2 years (if opted in)



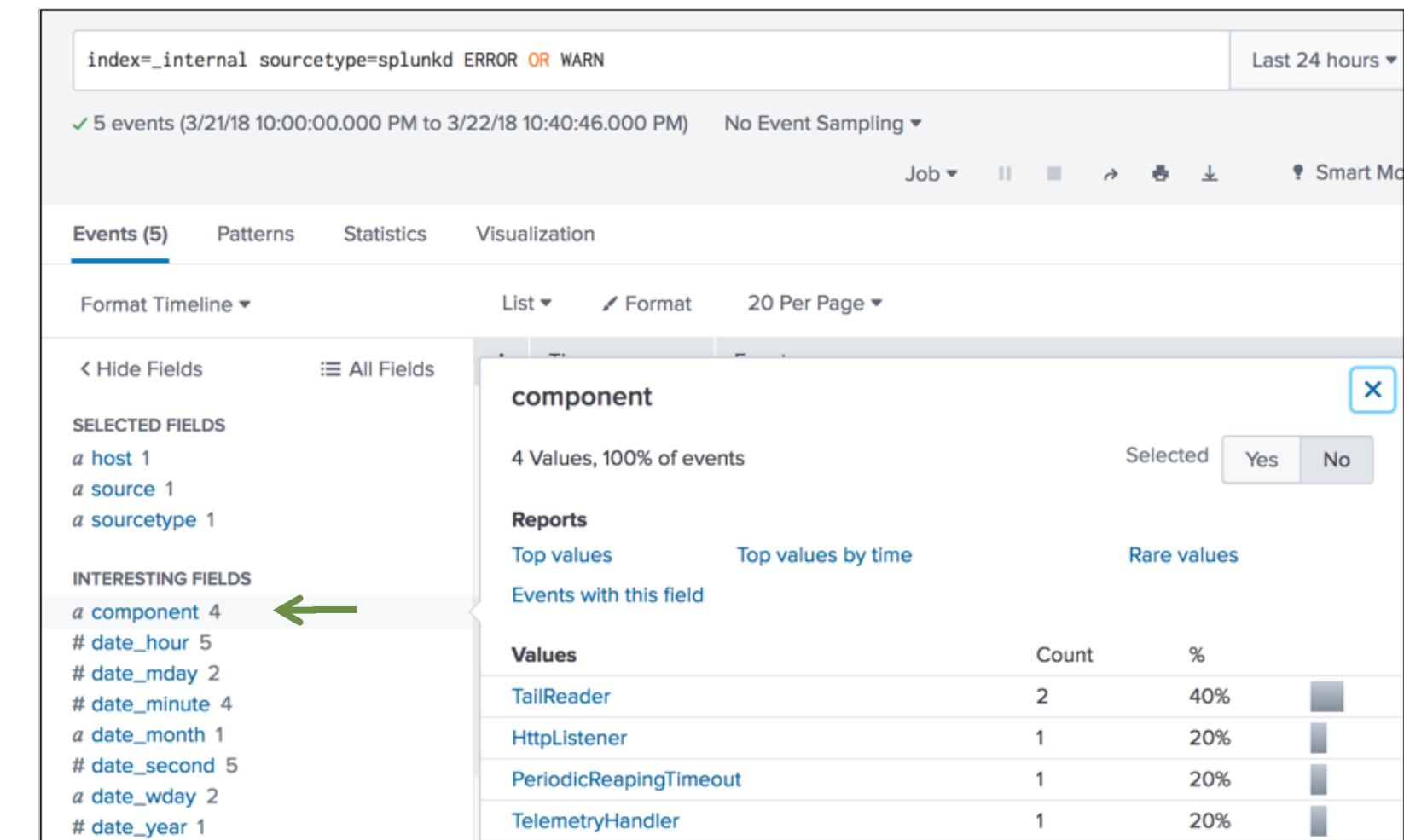
Splunk Log Channel Levels

- Splunk platform internal logging levels are:
 - **DEBUG** » **INFO** » **WARN** » **ERROR** » **CRITICAL** » **FATAL**
- To view and manage the log level of a particular channel, go to **Settings > Server settings > Server logging**
 - Change is immediate but not persistent
 - To make it permanent, edit **log-local.cfg** to override **log.cfg**
- To set the log level of a channel with CLI:
splunk set log-level <channel> -level <level>
 - To make it permanent, edit **log cmdline.cfg**

<http://docs.splunk.com/Documentation/Splunk/latest/Troubleshooting/Enabledebuglogging>

`index=_internal sourcetype=splunkd`

- **splunkd.log** records each *splunkd child processor* event
 - Processor log channels are assigned to the **component** field
 - To diagnose problems, filter on the **component** in question
- You may need to correlate the set of logs from multiple instances or components
 - For example:
`index=_internal host=idx* sourcetype=splunkd component=tcp* (ERROR OR WARN)`



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Introspection Data

- Splunk resource collection framework logs resource usage
 - `introspection_generator_addon` writes to **SPLUNK_HOME/var/log/introspection** and it is indexed to **_introspection**
- REST endpoints provide snapshot data
 - **/services/server/info** provides system configurations
 - OS info, core count, server roles, etc.
 - **/services/server/status/resource-usage** provides CPU, memory, and disk stats per host and per Splunk-process

```
{ [-]
  component: PerProcess
  data: { [-]
    args: instrument-resource-usage -p 8089 --with-kvstore
    elapsed: 257538.3600
    fd_used: 12
    mem_used: 48.727
    normalized_pct_cpu: 0.00
    page_faults: 0
    pct_cpu: 0.00
    pct_memory: 1.29
    pid: 2731
    ppid: 2632
    process: splunkd
    process_type: scripted_input
    read_mb: 0.000
    status: W
    t_count: 8
    written_mb: 0.000
  }
  datetime: 03-22-2018 23:22:34.421 +0000
  log_level: INFO
}
Show as raw text
source = /opt/splunk/var/log/introspection/resource_usage.log
sourcetype = splunk_resource_usage
```

Proactive Splunk Component Monitoring

The screenshot shows the Splunk Enterprise search interface. The top navigation bar includes 'splunk>enterprise', 'Apps ▾', 'Administrator ▾' (with a green info icon), and 'Dashboards'. Below the bar, the 'Search' tab is selected, followed by 'Analytics', 'Datasets', 'Reports', 'Alerts', and 'Dashboards'. The main area displays a 'New Search' prompt with the query 'index=_internal sourcetype=splunkd component=PeriodicHealthReporter'. A green arrow points from the text in the search bar to the 'Dashboards' button in the top navigation bar.

Note

- You can configure a set of alert actions in 7.2+.
 - Only supports a single action per type
- You must configure alerts by editing **health.conf**.
 - No UI support
- Each node can overwrite the settings

- Checks the **/services/server/health/splunkd** REST endpoint
 - Records the status output to **SPLUNK_HOME/var/log/splunk/health.log**
- The status depends on the value of associated indicators
- Feature health status is reported in:
 - Green = the feature is functioning
 - Yellow = experiencing a problem
 - Red = negatively impacting the feature

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Health Report Manager

- To modify the health reporting options and their thresholds
 - Go to **Settings > Health report manager** and click **Edit Thresholds**
 - Or, edit **SPLUNK_HOME/etc/system/local/health.conf**
- Need the **list_health** capability to view and access the reporting options
- To change the reporting options, you need the **edit_health** capability

```
[health_reporter]
full_health_log_interval = 30
suppress_status_update_ms = 300
```

```
[feature:tailreader]
```

```
...
```

Name	Actions	Status
feature:tailreader	Edit Thresholds	<input checked="" type="checkbox"/> Enabled

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Edit Thresholds for Tail Reader

Indicator: `data_out_rate`

Description: This indicator reflects the number of consecutive times the Tail File Reader was unable to insert data into Splunk's processing queues for a period of 5 seconds. By default, this indicator becomes Yellow when this input stalls for 5 seconds, and Red after 10 seconds.

Red:

Yellow:



Splunk Instrumentation

- You can opt in to share telemetry data with Splunk
 - Improves customer support
 - Helps Splunk make future development decisions
- The ability to enable/disable instrumentation is controlled by the **edit_telemetry_settings** capability
 - The instrumentation page can only be accessed from each non-clustered search head
- Collected data is anonymized
 - The opt-in modal controls sharing for anonymized and support data
- License usage data is collected and sent to Splunk by default
<http://docs.splunk.com/Documentation/Splunk/latest/Admin/Shareperformance>

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What is a Splunk Diag?

- Diag provides insight into your instance
 - How is the instance configured?
 - What was the condition up to the point that **diag** ran
- Gathers data based on Splunk components
 - OS settings, internal logs, configuration files, etc.
 - Produces a **tar.gz** file and **diag.log**
- No customer data is retrieved
 - Splunk anonymizer combs through files and replaces identified terms in a dictionary
<http://docs.splunk.com/Documentation/Splunk/latest/Troubleshooting/AnonymizedatasamplesToSendtoSupport>
- Can serve as a quick backup of config files
- Run it before and after to track update/upgrade differences
 - You can index your own diag file

Inside a Diag

- **composite.xml** – the unified component list that **splunkd** uses at runtime to control its component sub-system
 - Resides in **SPLUNK_HOME/var/run/splunk**
- **etc** subdirectory – contains the diag system's etc directory
- **log** subdirectory – contains the diag system's Splunk logs
- **var** subdirectory – contains information about the indexes and index structure
- **dispatch** subdirectory – directory of search dispatches
- **systeminfo.txt** – contains OS and hardware info as well as Splunk version and build
 - **Msinfo-sum.txt** (only on Windows) – contains Windows system information: hardware, running process, services, hardware specification
- **introspection** – from **SPLUNK_HOME/var/log/introspection**
- And more...

A diag Run in Practice

```
[me@sh1 bin]$ ./splunk diag
Collecting components: conf_replication_summary,
consensus, dispatch, etc, file_validate, index_files,
index_listing, kvstore, log, pool, searchpeers,
suppression_listing
Skipping components: rest
Selected diag name of: diag-sh1-2019-03-23_19-55-56
Starting splunk diag...
Logged search filtering is enabled.
Skippng REST endpoint gathering...
Determining diag-launching user...
Getting version info...
Getting system version info...
Getting file integrity info...
Getting network interface config info...
Getting splunk processes info...
Getting netstat output...
(Not all processes could be identified, non-owned process
info will not be shown, you would have to be root to see
it all.)
Getting info about memory, ulimits, cpu (on windows this
takes a while)...
```

Getting etc/auth filenames...
Getting Sinkhole filenames...
Getting search peer bundles listings...
Getting conf replication summary listings...
Getting suppression files listings...
Getting KV Store listings...
Getting index listings...
Copying Splunk configuration files...
filtered file ...
The following certificates were excluded ...
If you have any certs that were not auto-detected, add to an EXCLUDE rule in the [diag] stanza of server.conf.
Copying Splunk log files...
Copying Search Pool files...
Copying bucket info files...
Copying Splunk dispatch files...
Copying Splunk consensus files...
Adding manifest files...
dding cachemanager_upload.json...
Cleaning up...
Diag created: ../diag-sh1-2020-10-23_19-55-56.tar.gz

Diag Run Options – Component On/Off

- Diag can run for a long time, produce a gigantic file, or fail to complete

```
splunk diag
```

```
Copying Splunk configuration files...
Exception occurred while generating diag, we are deeply sorry.
Traceback (most recent call last):
File "./site-packages/splunk/clilib/info_gather.py", line 1626, in copy_pool raise Exception("OMG!")
```

- Work around by collecting just a few:

```
splunk diag --collect=dispatch,etc
```

server.conf

```
splunk diag --disable=pool --disable=etc
```

```
[diag]
components = dispatch,etc
```

- Available components
 - index_files, index_listing, dispatch, etc, log, pool, and more
 - <http://docs.splunk.com/Documentation/Splunk/latest/Troubleshooting/Generateadiag>

Diag Run Options – Collection Filters

- Some components have levels of collection filters
 - exclude** "***/dispatch/***"
 - ▶ Files ruled out are logged in `excluded_filelist.txt`
 - include-lookups** <what>
 - all-dumps**=<bool>
 - log-age**=<days>
 - index-files**=[**manifests** | **full**]
 - index-listing**=[**light** | **full**]
 - etc-filesize-limit**=<size>
- Diag blocks **splunk.secret**, all files in **etc/auth**, **etc/passwd**
- Attempts to detect and exclude SSL certs anywhere in **etc**

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Diag UI

- Provides a convenient diag collection service from a search head
 - Access **Settings > Instrumentation**
 - To use, the **get_diag** capability is required
 - Equivalent of running CLI: **splunk diag -uri https://<host>:<mgmtPort>**
- With non-clustered instances, the diag collection service authenticates with remote nodes via distributed search auth tokens
 - In clustered environment, it uses its respective cluster secrets
- Supported remote instances:

The screenshot shows the 'Instrumentation' page in the Splunk UI. At the top, there's a header with 'Instrumentation' and a link to 'Learn More'. Below it is a 'Usage Data' section with a 'View in Search' link and an 'Export' button. A table follows, showing a single log entry: 'Report 2018-03-19 to 2018-03-20' with 'Actions', 'Time Sent' (2018-03-21 03:01:21), and 'Status' (success). The next section is 'Diagnostic Log', which contains a message about diagnostic files and a 'Learn More' link. It also features a 'New Diag' button highlighted with a green arrow. Below this is another table with columns for 'Data', 'Nodes', 'Actions', 'Status', 'Size', and 'Time Created'. The message 'No Diags found' is displayed, along with a link to 'Create New Diags using the button above'.

Collecting Diags with Diag UI

The image shows two screenshots of the Splunk Diag UI. The left screenshot is titled 'New Diagnostics Bundle' and shows a list of 5 instances. It includes a 'Select instance you want to collect data from.' section with 'All Roles' and 'Filter' buttons, and a table with columns for Name and Roles. The right screenshot is also titled 'New Diagnostics Bundle' and shows configuration options like 'Include components', 'Exclude patterns', and 'Index files'. A yellow callout box on the left points to the 'Filter' button with the text 'Can collect diags one at a time or by multiple instances by role or host'. Another yellow callout box on the right points to the configuration section with the text 'Same filtering options as splunk diag'.

New Diagnostics Bundle

Select instance you want to collect data from.

All Roles Filter

5 instances

Name	Roles
127.0.0.1	search head
EC2AMAZ-B95HUCT	indexer, license master, search peer
ip-10-0-0-202	indexer, license master, search peer
ip-10-0-0-88	indexer, license master, search peer
ip-10-0-0-99	indexer, license master, search peer

4 selected: EC2AMAZ-B95HUCT ip-10-0-0-202 ip-10-0-0-88 ip-10-0-0-99

Cancel Next

Can collect diags one at a time or by multiple instances by role or host

New Diagnostics Bundle

Configure bundle settings to be applied to all instances. [Learn more](#)

Include components index_files, index_listing, dispatch, etc, log, pool, searchpeers, consensus, conf_replication_summary, kvstore, file_validate Edit

Exclude patterns None Edit

Index files Manifests

Index directory listing level Light

Exclude etc files larger than 10 MB

Get every crash .dmp file No

Exclude log files larger than 1 GB

Exclude log files older than 60

Filter search terms Yes

Include lookups No

Revert to default Cancel Back Create

Same filtering options as splunk diag

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Collecting Diags with Diag UI (cont.)

- Previously created diags expire after 30 days
 - Saved in **SPLUNK_HOME/var/run/diags/**
- Available actions: Recreate, Download, and Delete
 - Recreate - useful to track changes over time

Diagnostic Log							
Diagnostic files contain information about your Splunk deployment, such as configuration files and logs, to help Splunk Support diagnose and resolve problems. Learn More							New Diag
i	Data	Nodes	Actions		Status	Size	Time Created
▼	Diag-2018-03-23	EC2AMAZ-B95HUCT, ip-10-0-0-202, ip-10-0-0-88, ip-10-0-0-99	Recreate	Delete	Success	212.64 MB	2018-03-23 13:22:13
		EC2AMAZ-B95HUCT	Recreate	Download	Delete	Success	29.73 MB
		ip-10-0-0-202	Recreate	Download	Delete	Success	2018-03-23 13:22:13
		ip-10-0-0-88	Recreate	Download	Delete	Success	2018-03-23 13:22:13
		ip-10-0-0-99	Recreate	Download	Delete	Success	2018-03-23 13:22:13

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RapidDiag – What is It?

- RapidDiag is a Splunk supported app that enables “point-in-time” data collection to assist with diagnosing issues
 - Right data, Right place, Right time
- Complements Splunk Diag by capturing additional diagnostics using pre-defined or custom templates
- Uses Json format to describe what, when, and how to collect
 - Type of collector
 - Triggers on resources (CPU/Memory)
 - ▶ For example, collects on high resource usage or long running searches
 - Triggers on logs
 - Supports periodic and one-off data collections

RapidDiag – What Does it Collect?

- Collects the following:
 - Stack dumps (pstack, eu-stacks, procdump)
 - System call traces (strace, procman)
 - Splunk diag
 - Rest endpoint outputs (`| rest search exports`)
 - I/O operations (logman, iosat)
 - Network stats and connections (netsh)
 - Process information (ps, lsof, or handle64)
- Common pre-defined templates:
 - Performance: for investigating issues related to excessive time or CPU load used by a process
 - Collector tools used: pstack (eu-stack), splunkdiag
 - Slow search performance: for investigating slow performing searches
 - Collector tools used: iops, netstat, pstack (eu-stack), splunkdiag

RapidDiag Requirements

- Currently only supports Linux OS
- Read/write privileges assigned to admin role
 - Also requires the **get_diag** capability to use app
- Rapid Diag depends on various third-party utilities to collect some of its data
 - Refer to RapidDiag documentation in the app

The screenshot shows the Splunk RapidDiag application interface. At the top, there is a navigation bar with tabs: Task Templates, Data Collection, Task Manager, and Reference Guide. The Reference Guide tab is highlighted with a green border. Below the navigation bar, there are several sections of documentation:

- Dependencies**: A section explaining that Splunk RapidDiag depends on third-party utilities and provides instructions for installation.
- Dependency Checker**: A section listing issues with third-party utilities. It includes a "Run Dependency Check" button, which is highlighted with a green border, and a note stating "Results are not automatically refreshed". A callout box points to this button with the text "Click Run Dependency Check to check for possible issues".
- Linux-specific utilities**: A section on how to install dependencies on Linux operating systems using distribution package managers like yum and apt.
- Stack traces**: A section on collecting stack traces for running processes using the eu-stack utility.

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eu-stack Utility Requirement

- Splunk RapidDiag requires the eu-stack utility, version 0.159 or above, to collect stack traces for running processes
- The elfutils package provides this utility, and can be installed by running the following command:

`apt install elfutils` on Debian-based Linux deployments

`yum install elfutils` on RHEL-based Linux deployments

- The user under which the instance runs must be able to perform the `ptrace` system call
 - To verify the `eu-stack` utility for the user, run the following:

```
sudo su splunk sh -c "sleep 5 & eu-stack -p $! && echo SUCCESS || echo FAILURE"
```

- Common reasons a user cannot perform `ptrace` system calls:

- Linux capabilities disallow it. Try explicitly whitelisting `eu-stack`:

```
setcap cap_dac_override,cap_sys_ptrace+eip `which eu-stack`
```

- Security-Enhanced Linux (SELinux) is blocking `ptrace`, try the following:

```
setsebool -P deny_ptrace off
```

Starting RapidDiag

The screenshot shows the Splunk Enterprise interface with the title bar "splunk>enterprise" and various navigation links like "Apps", "Administrator", "Messages", "Settings", "Activity", "Help", and "Find". The main content area is titled "Apps > Manage Apps". On the left, there's a sidebar with a "Search & Reporting" category and several apps listed: "Python Upgrade Readiness App", "Splunk Secure Gateway", and "Manage Apps" (which is highlighted with a green border). The main table lists several apps with columns for Name, Version, Update checking, Visible, Sharing, Status, and Actions. The "Splunk RapidDiag" row is highlighted with a red border. In the "Actions" column for this row, there are links for "Launch app", "Edit properties", and "View objects". A yellow callout box points to this row with the text: "Manage Splunk RapidDiag app settings launch the app".

Name	Version	Update checking	Visible	Sharing	Status	Actions
SplunkForwarder	SplunkForwarder	Yes	No	App Permissions	Disabled Enable	Launch app Edit properties View objects
SplunkLightForwarder	SplunkLightForwarder	Yes	No	App Permissions	Disabled Enable	Launch app Edit properties View objects
Monitoring Console	splunk_monitoring_console	8.2.0	Yes	Yes	App Permissions	Enabled Disable Launch app Edit properties View objects
Splunk RapidDiag	splunk_rapid_diag	1.4.0	Yes	Yes	App Permissions	Enabled Disable Launch app Edit properties View objects
Splunk Secure Gateway	splunk_secure_gateway	2.5.7	Yes	Yes	App Permissions	Enabled Disable Launch app Edit properties View objects View details on Splunkbase

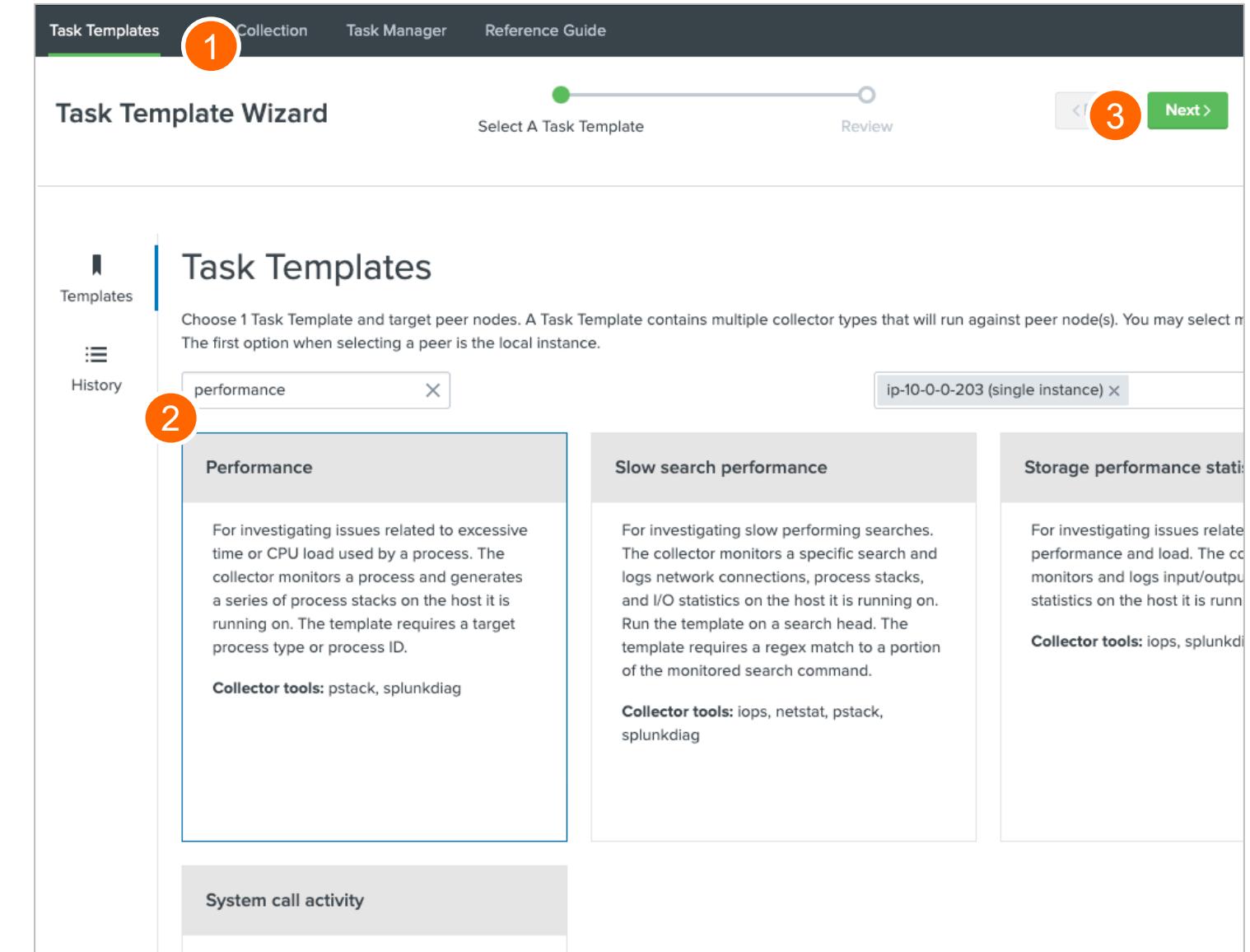
The **RapidDiag** app can also be launched from **Settings > System > RapidDiag**

SYSTEM

- [Server settings](#)
- [Server controls](#)
- [Health report manager](#)
- [RapidDiag](#)
- [Instrumentation](#)
- [Licensing](#)
- [Workload management](#)

Selecting Task Templates

- Pre-defined templates collect data for specific problems
 - ① Select Task Templates tab
 - ② Choose the template, or use the search filter to locate a template
 - ③ Click **Next** to review the template selection and to start the data collection



RapidDiag – Task Template Wizard

The screenshot shows the Task Template Wizard in the 'Review' step. The wizard has four steps: 'Select A Task Template', 'Review', 'Start Collecting', and a final step (circled 4). The 'Review' step contains the following sections:

- Collection Information**:
 - Name: Performance
 - Description: For investigating issues related to excessive time or CPU load used by a process. The collector monitors a process and generates a series of process stacks on the host it is running on. The template requires a target process type or process ID.
- Distributed Collection**:
 - Peer Nodes: ip-10-0-0-203 (single instance) x (circled 1)
- Splunk Diag Collection**:
 - Splunk Diag: Enabled

Periodic Run (circled 2):

- Sample Rates: Custom
- Number of Samples: 100
- Period: 0.5

Stack Trace (circled 3):

- Select Process: splunkd - splunkd server (2151)
- Collector Command: /usr/bin/eu-stack -i -l -p 0

Callouts:

- 1**: Select the node to run the collection process
- 2**: You can use the **Recommended** sample rates (1000 samples every 0.5 second) or select **Custom** to create a different sample rate
- 3**: Click **Select Process** and select the appropriate process
- 4**: Start Collecting

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RapidDiag – Task Manager

Task Templates Data Collection **Task Manager** Reference Guide

!

Task Manager

Use the Task Manager to review the status of a RapidDiag task collection. [Learn More](#)

2 tasks

Name	Host	Duration	Start Time	Status	Action
Performance	ip-10-0-0-203	0:00:04	05/05/2021 18:01:19	Collecting	Abort
Performance	ip-10-0-0-203	0:01:03	05/05/2021 15:26:14	Success	Re-run Delete

Action allows you to stop, rerun the task, delete and download the data collection in json format

Task Status: /opt/splunk/var/run/splunk/splunk_rapid_diag/rd_442aded87a55_2021-05-05T20h26m14s648742us/task.json [Download](#)

Output File: /opt/splunk/var/run/splunk/splunk_rapid_diag/rd_442aded87a55_2021-05-05T20h26m14s648742us.tgz [Download](#)

Description: For investigating issues related to excessive time or CPU load used by a process. The collector monitors a process and generates a series of process stacks on the host it is running on. The template requires a target process type or process ID.

Splunk Diag Collection: Yes

Collectors Status: [View Results](#)

Each task has its **Output Directory** displayed for json files and tarball packages. Default is \$SPLUNK_HOME/var/run/splunk/splunk_rapid_diag

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RapidDiag CLI Upload

- Users can upload RapidDiag output file(s) to an existing support case:
 - Requires a valid support username/password

```
./splunk cmd rapidDiag upload <diag_file.tar.gz>
--<username> -auth <password> --upload_description
```

- View help/parameters with

```
./splunk cmd rapidDiag upload -h
```

- Troubleshooting:

- Check the RapidDiag logs located at:

`$SPLUNK_HOME/var/log/splunk/splunk_rapiddiag.log`

- ▶ The logs show errors, number of chunks generated, and status of each chunk

- Run netstat to check `api.splunk.com` is accessible from the machine

- If you had a TB size file and the only 500th chunk failed, you can re-try the upload by using `-- firstchunk 500`

Lab Exercise 1 – Know Your Environment

Time: 20 minutes

Tasks:

- Access your Splunk CLI terminal and check the Splunk status
- Access Splunk Web and change the server name
- Install the **tse_lab01.spl** app
- Generate a diag for your Splunk instance and index
 - Monitor with the **index once** option
 - Index it into **index=diag**
- Search the diag for system information:
 - Splunk version, OS, CPU, REM, and installed apps

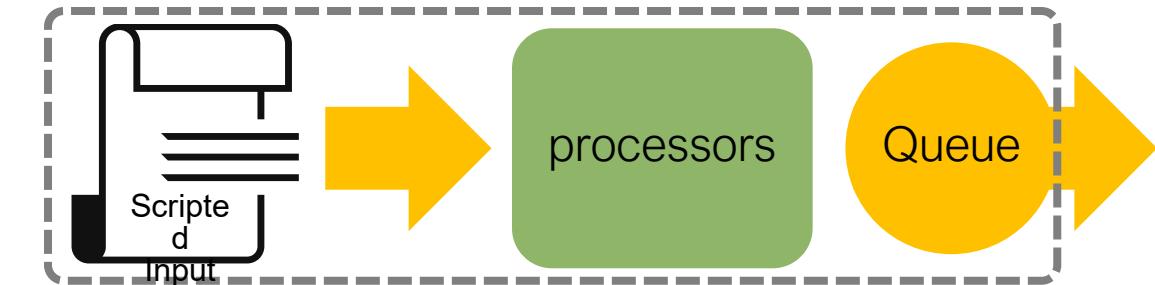
Module 2: Indexing Problems

Module Objectives

- Discover Splunk deployment topology and its server roles
- Identify where to check the index-time pipeline status
- Use the `metrics.log` to clarify the index-time problem

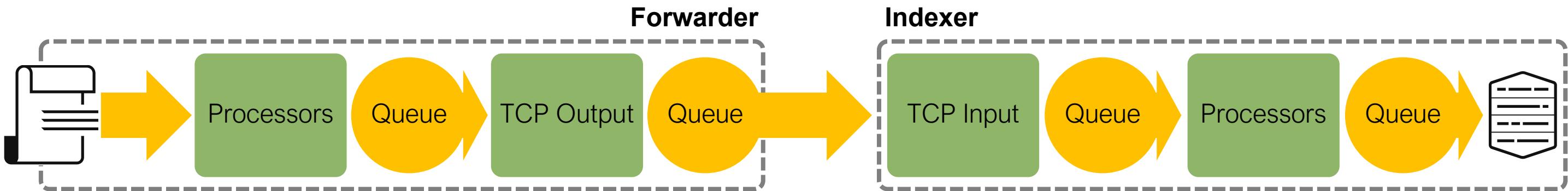
splunkd Indexing Nomenclature

- Data enters Splunk and flows through a series of pipelines linearly
- **Module** is a container for pipelines
- **Pipeline** is a single thread grouped by type
- **Pipeline Set** is a series of pipelines that are strung together to process data from input to indexing
- **Processor** performs small but discrete tasks within a pipeline
- **Queue** is memory space to store between pipelines



```
SPLUNK_HOME/etc/modules/input/exec/config.xml
<module>
  <pipeline name="exec" type="startup">
    <processor name="exec"
              plugin="execprocessor">
      <config>
        </config>
    </processor>
    <processor name="sendOut"
              plugin="queueoutputprocessor">
      <config>
        <queueName>parsingQueue</queueName>
      </config>
    </processor>
  </pipeline>
</module>
```

Indexing Pipeline Set



- A pipeline set spans across the index-time deployment topology
- Raw data from a source is pushed through the pipeline set using processors and queues
 - Processors manipulate events flowing in and out of queues
 - Queues are bounded by memory and can get blocked if full
 - Pipeline activities are captured in **metrics.log**
- With extra resources, Splunk can run multiple pipeline sets in parallel
- Detail diagram
 - <http://wiki.splunk.com/Community:HowIndexingWorks>

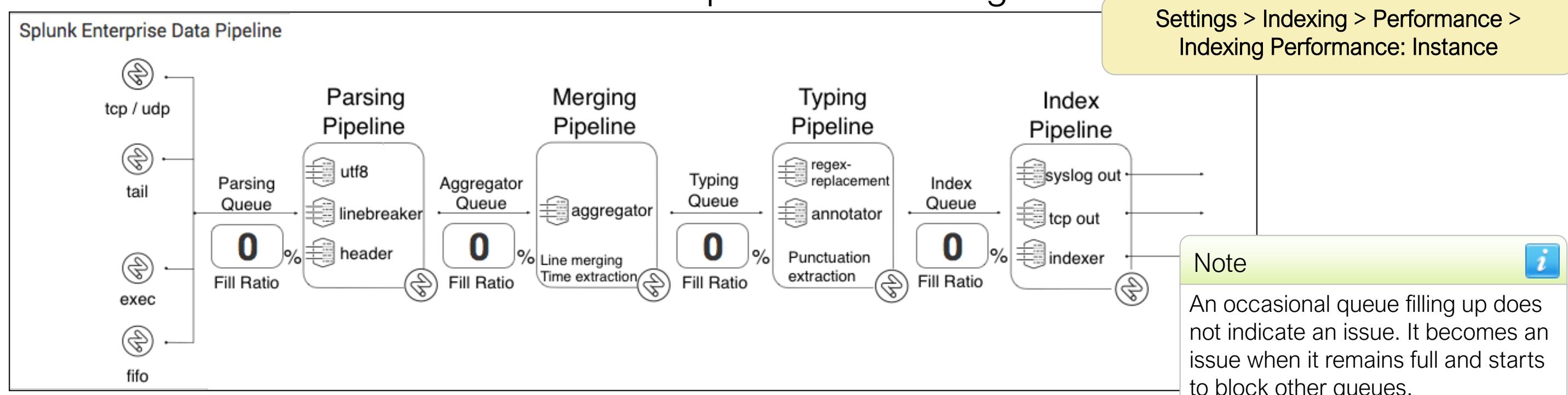
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Understanding metrics.log

- Contains a variety of introspection data including Splunk pipeline statistics
- Samples every 30 seconds and writes metrics of top 10 results in each category
 - Queue sizes
 - CPU usage per processor
 - Forwarding and indexing thruput
- **group** indicates the data type, such as pipeline, queue, thruput, etc.
 - **group=pipeline** plots the frequency (**executes**) and the duration of the pipeline process machinery (**cpu_seconds**)
 - **group=queue** displays the data to be processed
 - **current_size** can identify which queues are the bottlenecks
 - **blocked=true** indicates a busy pipeline
 - Cleared as soon as the pipeline processor catches up with its task
 - A long sequence of blocked queue messages indicates an indexing issue

Troubleshooting with metrics.log

- Checking metrics.log across the topology reveals the whole picture
 - Downstream slowdown results in upstream blockage



index=_internal source=*metrics.log host=xyz group IN(pipeline, queue)

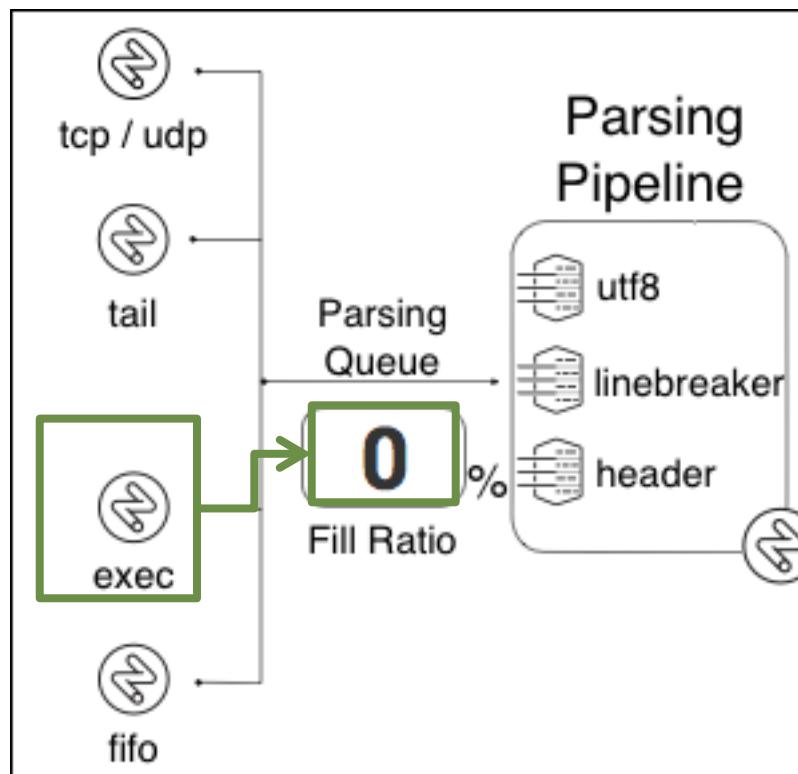
```
02-23-2021 01:08:43.802 +0000 INFO Metrics - group=queue, name=indexqueue, blocked=true,  
max_size_kb=500, current_size_kb=499, current_size=968, largest_size=968,  
smallest_size=968
```

```
02-23-2019 01:10:39.802 +0000 INFO Metrics - group=pipeline, name=typing, processor=sendout,  
cpu_seconds=0.0571019999999998, executes=134716, cumulative_hits=1180897
```

Input Pipeline

- How do we get from the **exec** pipeline to the **parsing** pipeline?
 - **readin / sendout** processors work in between queues

```
index=_internal source=*metrics.log group=pipeline name=exec processor=*
index=_internal source=*metrics.log group=queue name=parsingqueue
```



Configuration files of interest

- inputs.conf
- wmi.conf
- regmon-filters.conf
- props.conf

Attributes of interest

- CHARSET
- NO_BINARY_CHECK
- CHECK_METHOD
- initCrcLength

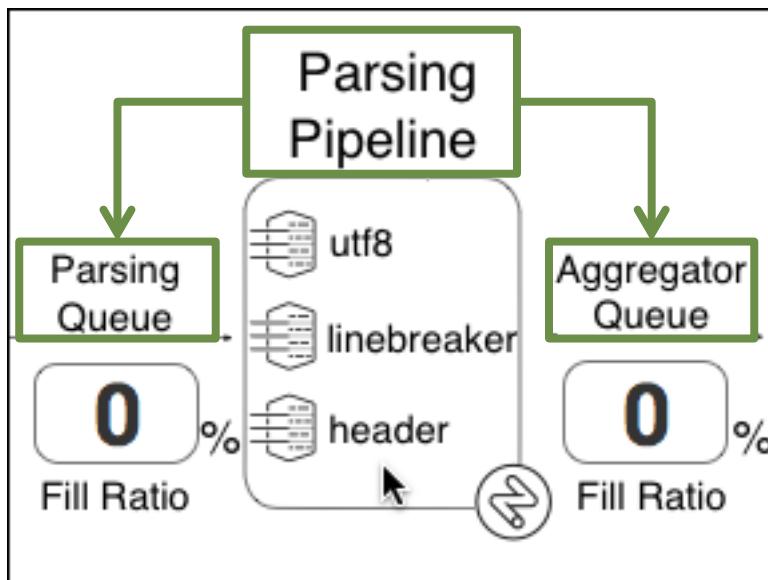
Note

Sendout will be at the end of all pipelines and it is responsible by taking the data and pushing to the next queue. Lots of **sendout** activity is not indicative of a problem and can be safely ignored when investigating a pipeline.

Parsing Pipeline

- What happens after parsing queue?
 - **readerin** processor takes in data from **parsingqueue**
 - ▶ Runs through **utf8**, **linebreaker**, and **header**
 - **sendout** processor sends out to **aggqueue**

```
index=_internal source=*metrics.log group=pipeline name=parsing processor=*
index=_internal source=*metrics.log group=queue name=aggqueue
```



Configuration files of interest

- props.conf

Attributes of interest

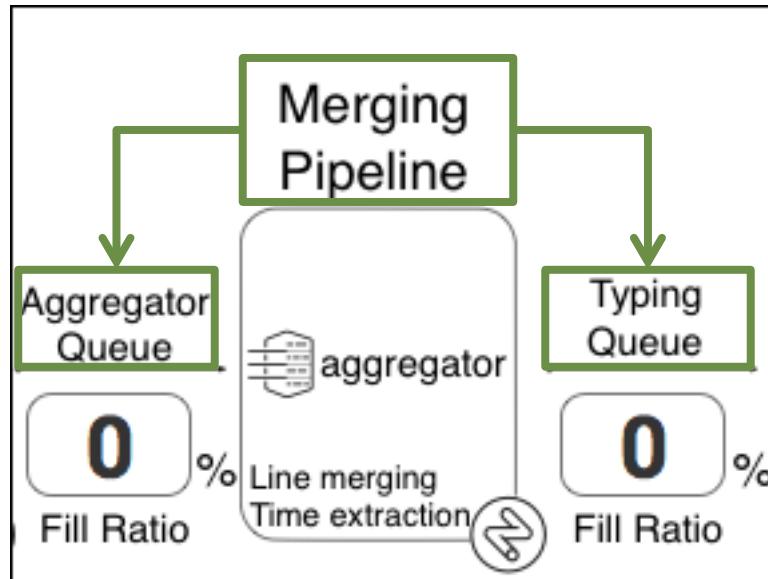
- CHARSET (is checked)
- LINE_BREAKER (single line)
- TRUNCATE
- HEADER_MODE

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Merging Pipeline

- **aggregator** identifies the event boundary and performs timestamp extraction
 - Sends out to **typingqueue** queue
- **winparsingqueue** has its own **aggregator**
 - Feeds directly into **typingqueue**

```
index=_internal source=*metrics.log group=pipeline name=merging processor=*
index=_internal source=*metrics.log group=queue name=typingqueue
```



Configuration files of interest

- props.conf

Attributes of interest (events)

- SHOULD_LINEMERGE
- BREAK_ONLY_BEFORE
- MUST_BREAK_AFTER
- MAX_EVENTS

Attributes of interest (timestamps)

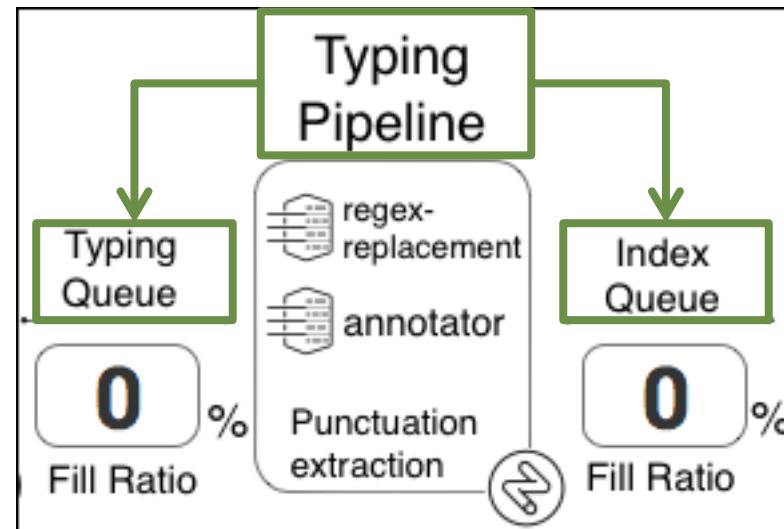
- TIME_PREFIX
- TIME_FORMAT
- MAX_TIMESTAMP_LOOKAHEAD
- DATETIME_CONFIG
- MAX_DAYS_AGO
- MAX_DAYS_HENCE
- TZ

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Typing Pipeline

- Performs the transformation tasks
 - Runs through **regexreplacement**, **annotator**, and **previewout**
 - Sends out to **indexqueue**

```
index=_internal source=*metrics.log group=pipeline name=typing processor=*
index=_internal source=*metrics.log group=queue name=indexqueue
```



Configuration files of interest

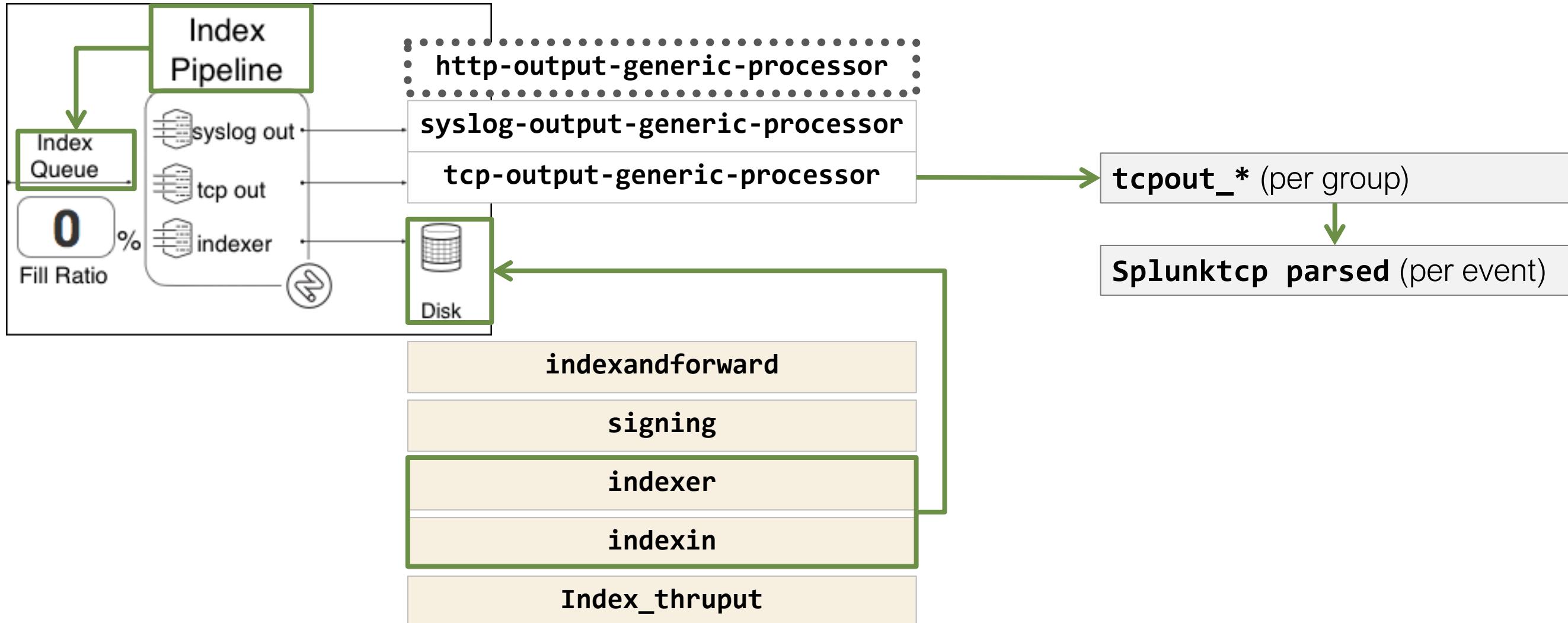
- props.conf
- transforms.conf

Attributes of interest

- TRANSFORMS-xxxx
- SEDCMD
- SOURCE_KEY
- DEST_KEY
- REGEX
- FORMAT

Index Pipeline

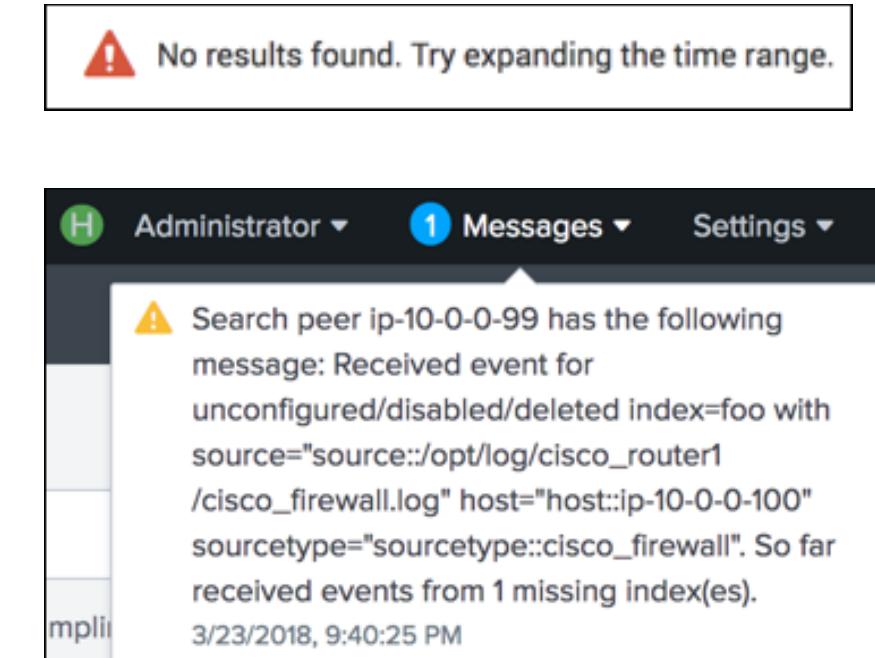
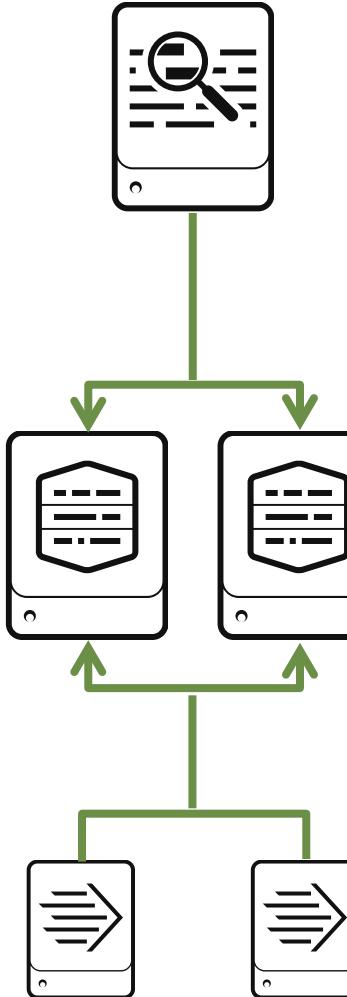
```
index=_internal source=*metrics.log group=pipeline name=indexerpipe processor=*
```



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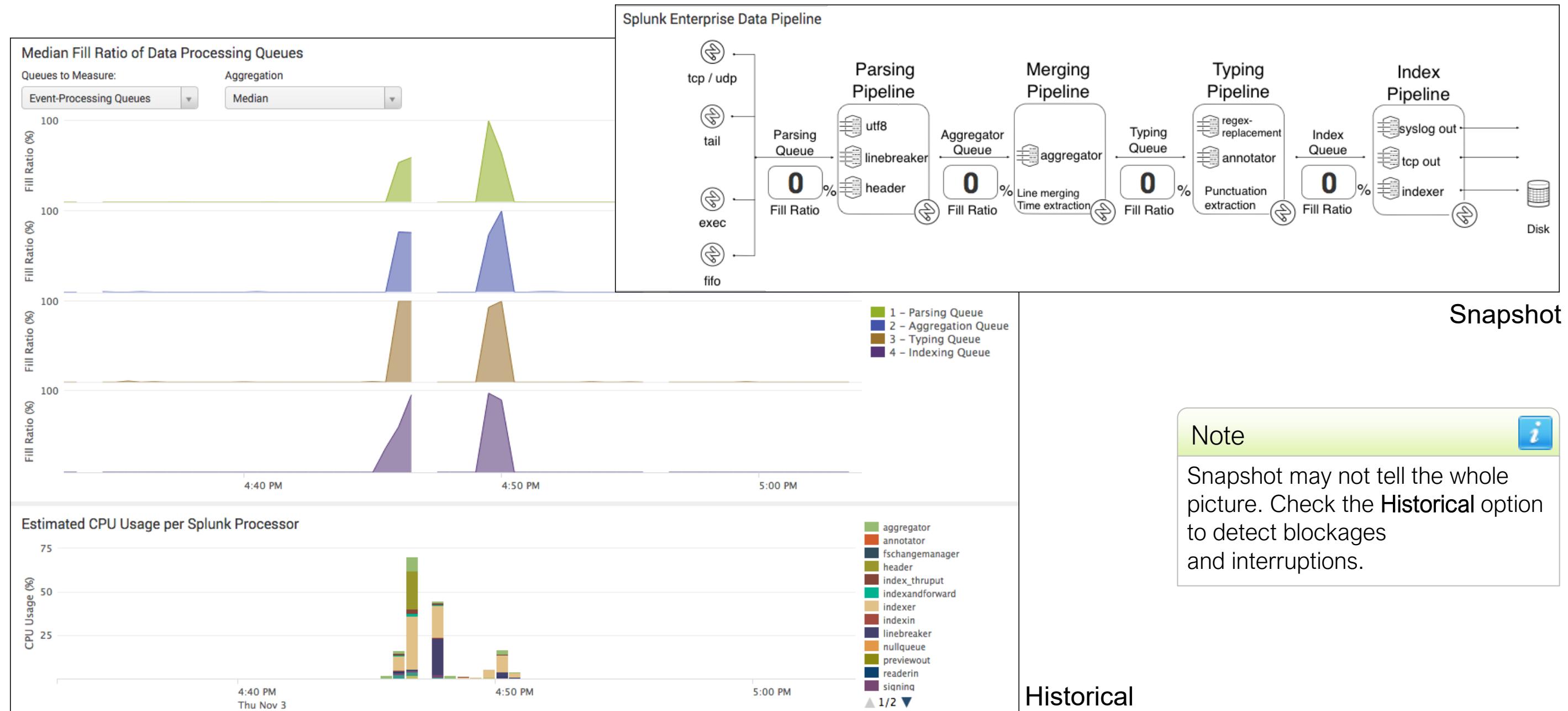
metrics.log Perspective (Gotchas)

- Metrics.log does not provide error messages or diagnostics
- For example, mistake in **inputs.conf** or **transforms.conf** drops events destined to non-existent indexes
 - metrics.log** thruput data indicates normal operations
 - A warning registers with the **IndexerService** component
 - lastChanceIndex** in **indexes.conf** provides ability to capture events destined to non-existent indexes
 - Assign to an index that only admins can access and set an alert



```
index=_internal group=per_index_thruput
series=foo metrics
03-23-2019 21:39:55.655 +0000 INFO
Metrics - group=per_index_thruput,
series="foo", kbps=4.775483123820209,
eps=0.16128387122579613,
kb=148.0458984375, ev=5, avg_age=202929,
max_age=338215
```

MC Indexing Performance



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Useful Pipeline Searches with metrics.log

- How much time is Splunk spending within each pipeline?

```
index=_internal source=*metrics.log* group=pipeline  
| timechart sum(cpu_seconds) by name
```

- How much time is Splunk spending within each processor?

```
index=_internal source=*metrics.log* group=pipeline  
| timechart sum(cpu_seconds) by processor
```

- What is the 95th percentile of measured queue size?

```
index=_internal source=*metrics.log* group=queue  
| timechart perc95(current_size) by name
```

- What is the maximum number of entries used in each queue?

(1000 is max queue size, except for forwarding)

```
index=_internal source=*metrics.log* group=queue  
| timechart max(current_size) by name
```

Indexer Health Report

- Proactive Splunk Component Monitoring reports the current health of an indexer, on a per instance basis
 - **feature:disk_space**
 - Tracks whether Splunk index filesystems contain sufficient free space based on the **minFreeSpace** setting
 - **feature:buckets** (reports per index)
 - Monitors a number of buckets created during last 60 minutes
 - Tracks the percentage of small buckets created over the last 24 hours
 - Buckets rolled during a restart or due to **maxHotSpanSecs** are not counted
 - **feature:splunkoptimize_processes**
 - Tracks whether the bucket optimization process is falling behind

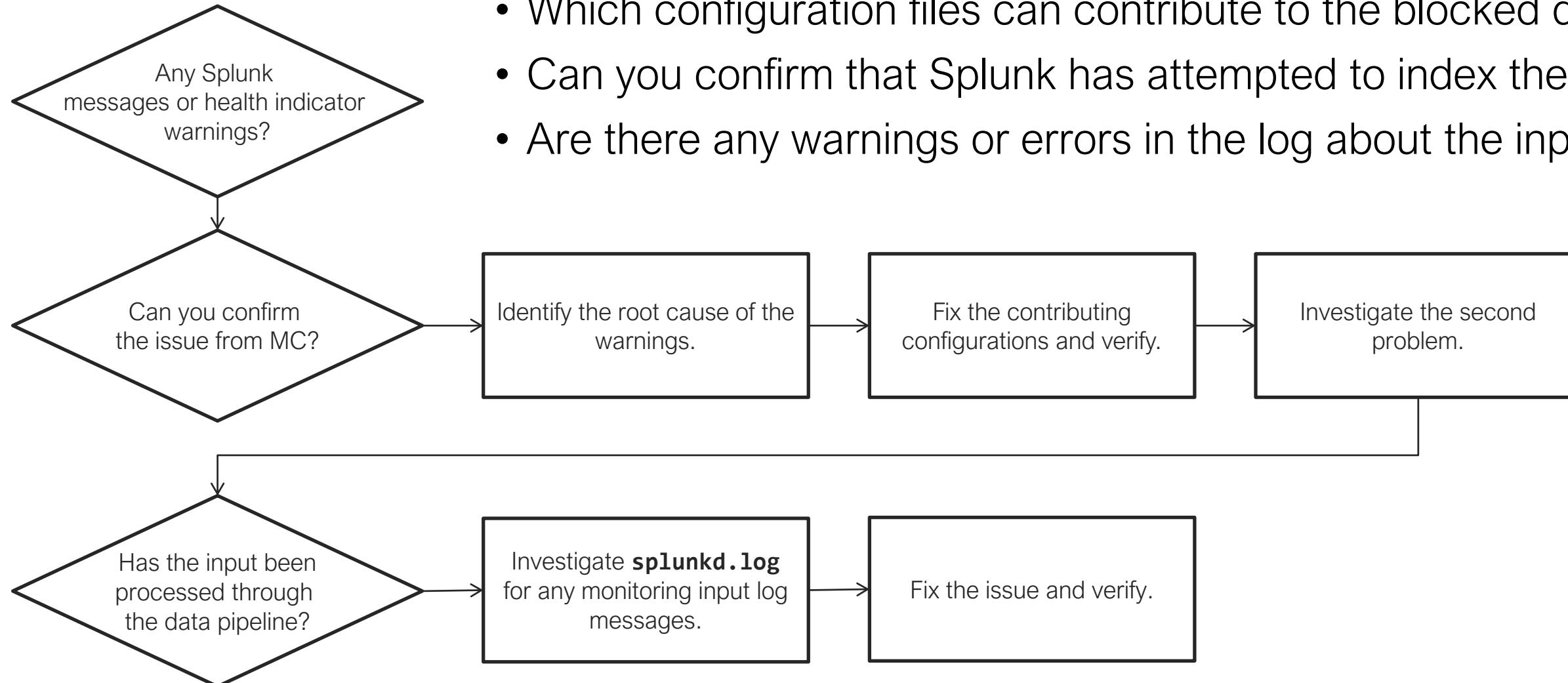
Lab Exercise 2 – Troubleshoot Indexing issue

Time: 25 minutes

Tasks:

- Configure Monitoring Console in Standalone mode
- Install the **tse_lab02.spl** app
- Enable the **trade_entries.log** monitor input
- Search **index=* sourcetype=trade_entries** for events
- Investigate pipeline fill-ratio with Monitoring Console
 - Fix the pipeline issue
- Resolve the missing data problem
 - Analyze the **splunkd.log** to resolve the missing data problem

Lab Exercise 2 – Troubleshooting Suggestions



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Module 3: Input Configuration Problems

Module Objectives

- Diagnose and clarify data input problems
- Use Monitoring Console to identify indexing issues

Review: Index Time Best Practices

- To maximize the performance and resource utilization, provide specific settings
 - The defaults are designed for flexibility, but they can be expensive
 - Remember the settings can be specified in an app
- For inputs, explicitly specify host, source type, source and index
 - Separate high-velocity sources from low-velocity sources
 - Combine things frequently searched together in the same index
- For parsing-phase pipelines, always specify:
 - Event boundary
 - Timestamp
- Distribute data uniformly to all indexers



The "Great 8" Per Sourcetype (props.conf)

HF/Indexer

MAX_TIMESTAMP_LOOKAHEAD
TIME_PREFIX
TIME_FORMAT
LINE_BREAKER
SHOULD_LINEMERGE = false
TRUNCATE

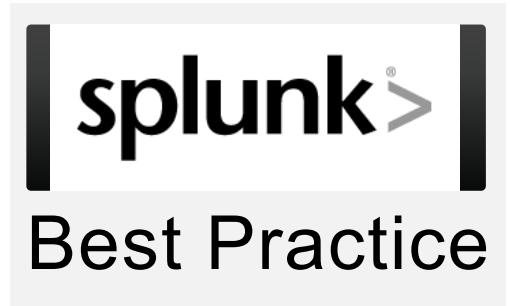
UF

EVENT_BREAKER
EVENT_BREAKER_ENABLE = true

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Clarifying the Input Problems

- Start on the system that is reading the sources
 - Establish expected vs. observed behavior
 - Is Splunk reading files it shouldn't read or failing to read the files it should be reading?
 - Is Splunk reading the same files more than once?
 - Are all files re-read, a subset of files, or only parts of a file?
 - Enable Splunk debugging on the source system
- ./splunk start --debug**
- Tells how often Splunk is actually checking the problem files
 - **BEST PRACTICE:** Roll the log files before enabling debugging
 - Do not leave debug enabled!
 - When you notice the problem, stop the instance and restart without the **--debug** flag



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Notable splunkd Input Log Channels

Monitor	Network	Scripted	Reminder 
TailingProcessor	NetUtils	ExecProcessor	
TailReader	TcpInputConfig	ModularInputs	
WatchedFile	TcpInputProc		
ChunkedLBProcessor	UDPInputProcessor	WinEventLogInputProcessor	
ArchiveProcessor	TcpOutputProc	WinEventLogChannel	
		WinEventLog	Changing log levels via Splunk Web is immediate and persists until the next reboot, but editing the SPLUNK_HOME/etc/log-local.cfg file is permanent and requires Splunk restart.

- Monitor input
 - Try to point to specific files instead of directories or using wildcards
 - When wildcards are used, Splunk creates an implicit whitelist
- Network input
 - The TCP/UDP data must be able to be parsed by the receiving Splunk ports
- Scripted input
 - Anything the script prints to **stdout** is indexed
 - Windows inputs are scripted (modular) inputs and have their own designated stanza

Common Monitor Input Errors

- Permission issue
 - Splunk is running as a user who doesn't have access permissions to the files specified in the input settings
- Network problem
 - If Splunk is monitoring the files over NFS or SMB, there could be something blocking that network access
- Status of monitored files
 - CRC problems – similar file confusion
 - Missing data or duplicate indexing
- Lagging input

Status of Monitored Files

- By default, Splunk performs a cyclical redundancy check (CRC) against the first and last 256 bytes of a file to prevent the same from re-indexing
 - Runs a CRC on every file it monitors during a startup
 - The CRC helps Splunk to determine if it has read the file before or not
 - **fishbucket** maintains the CRC state for monitored files
- Check the current file monitoring status
 - CLI: **splunk list inputstatus [-input | -type]**
 - REST: **/services/admin/inputstatus/TailingProcessor:FileStatus**

inputs./opt/log/tradelog.parent	/opt/log/tradelog/trade_entries.log
inputs./opt/log/tradelog.type	directory
inputs./opt/log/tradelog/trade_entries.log.file position	28393903
inputs./opt/log/tradelog/trade_entries.log.file size	28393903
inputs./opt/log/tradelog/trade_entries.log.parent	/opt/log/tradelog/trade_entries.log
inputs./opt/log/tradelog/trade_entries.log.percent	100.00 
inputs./opt/log/tradelog/trade_entries.log.type	open file

Note  A fast growing file can show >100%. If tailing is not reading data, it could mean a queue is blocked or the fishbucket entry is corrupted.

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CRC Problems

- A long standard header or small log files can cause CRC confusion
 - If the first half changes, Splunk re-reads the whole file
 - If the second half changes, Splunk reads from the last stored seek pointer
 - Check the internal index for possible clues:
index=_internal sourcetype=splunkd component=watchedfile
- Check the fishbucket and change/reset the tailing records if needed:
splunk cmd btprobe -h
splunk cmd btprobe -d <fishbucket_path> -k <file> --validate
splunk cmd btprobe -d <fishbucket_path> --file <file> --reset
- Possible remedy:
 - **initCrcLength** and/or **crcSalt=<SOURCE>** settings in **inputs.conf**
 - Do not use in a scenario in which log files get renamed or moved

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Using initCrcLength

- By default, Splunk checks the first 256 characters of a file, and creates a CRC fingerprint for the file
 - Have I read this before?
- If a file won't read, it often has too long a header (same CRC)
 - "I've seen this already. Maybe it's a rolled file. I'm not going to re-read it"
- Increase `initCrcLength` in `inputs.conf` to tell Splunk to read beyond the first 256 bytes, and create a unique CRC

```
[monitor://<path>]  
...  
initCrcLength = 256 <range 256 - 1048576>
```

Important 

Changing `initCrcLength` and restarting Splunk re-indexes the data.

Using crcSalt

- crcSalt forces the input to ingest files that have matching CRCs, by creating a unique CRC:
 - crcSalt = <string>: the string is added to the CRC
 - crcSalt = <SOURCE>: the full directory path to the source file is added to the CRC
- Useful if you need to
 - Forward to a new environment
 - Transition from test index to production

```
[monitor://<path>]  
...  
crcSalt = <string>|<SOURCE>
```

Important 

Do not use crcSalt = <SOURCE> with rolling log files.

Duplicate Indexing

- If Splunk processes a file more than once, it results in duplicate data and can possibly lead to license violations
- Look for **offset** in the **WatchedFile** component:
index=_internal sourcetype=splunkd component=watchedfile
 - *Checksum for seekptr didn't match, will re-read entire file*
 - *File too small to check seekcrc*
 - *Will begin reading at offset=0 means a file is new (or rolled)*
 - ▶ Seeing this twice in other conditions means it is not good

```
index=abc sourcetype=xyz
| convert ctime(_indextime) AS idxtime
| stats count dc(idxtime) as numIndexed, values(source), values(idxtime) by _raw
| where count > 1
```

File Monitor Input Health Report

- Proactive Splunk Component Monitoring reports the current health of file monitor inputs
 - **feature:batchreader**
 - Reflects the number of consecutive times the Batch File Reader was unable to insert data into Splunk queues
 - **feature:tailreader**
 - Reflects the number of consecutive times the Tail File Reader was unable to insert data into Splunk queues

Network Input Errors and Fixes

- Network problems – the source is not reaching the indexer
 - Unblock what is blocking (most likely a firewall or a wrong port)
- Routing problems – UDP traffic may not be routable to the indexer
 - Use TCP when you can or use an intermediate Splunk forwarder
- Reliability problems – a flaky network can cause data loss or corruption
 - Set up an intermediate forwarder which can cache the stream
 - Stand up a syslog server to collect the stream and have Splunk monitor
- Host extraction problems – Splunk uses reverse DNS lookup
 - Look to the data itself for a host extraction
 - Use separate ports for each host and explicitly set the host name
 - Consider using tags to help clarify hosts

Monitoring Input Data Quality

MC > Indexing > Inputs > Data Quality

Data Quality

Time Range Group Instance

Last 15 minutes All indexers All indexers of selected ... Hide Filters

Event Processing Issues by Source Type

Sourcetype	Total Issues	Host Count	Source Count	Line Breaking Issues	Timestamp Parsing Issues	Aggregation Issues
badinput	1542	1	1	0	0	1542

Clicking a source type shows issues by host and source, helping you locate the origin of this data. [Show more info]

Issues for source type badinput by host and source

Host	Source	Total Issues
qac01	/opt/log/tradelog/trade_entries.log	1542

Event Line Count

Line Count	Event Count
228	1
257	1541
5	18

Event Size

index=_internal sourcetype=splunkd (log_level=WARN OR log_level=ERROR)
(component=AggregatorMiningProcessor OR component=LineBreakingProcessor
OR component=DateParserVerbose)

message

Breaking event because limit of 256 has been exceeded - data_source="/opt/log/tradelog/trade_entries.log", data_host="qac01",
data_sourcetype="badinput"

Changing breaking behavior for event stream because MAX_EVENTS (256) was exceeded without a single event break. Will set
BREAK_ONLY_BEFORE_DATE to False, and unset any MUST_NOT_BREAK_BEFORE or MUST_NOT_BREAK_AFTER rules. Typically this will amount to
treating this data as single-line only. - data_source="/opt/log/tradelog/trade_entries.log", data_host="qac01", data_sourcetype="badinput"

Learn More. [Close these panels]

Reveals issues with line breaking, event breaking, and timestamp extraction

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72

Troubleshooting Splunk Enterprise

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Troubleshooting Indexing Latency

- A large delta can lead to missing results
 - Search results are events with timestamps only within the window at the time of the search
 - Inputs using **ArchiveProcessor** are handled serially
 - The second file in the zip package always gets indexed after the first one
- How long does it take to make your indexed data searchable?

```
index=a source=b | eval latency = round({_indextime - _time},2)  
| timechart min(latency) avg(latency) max(latency) by host
```

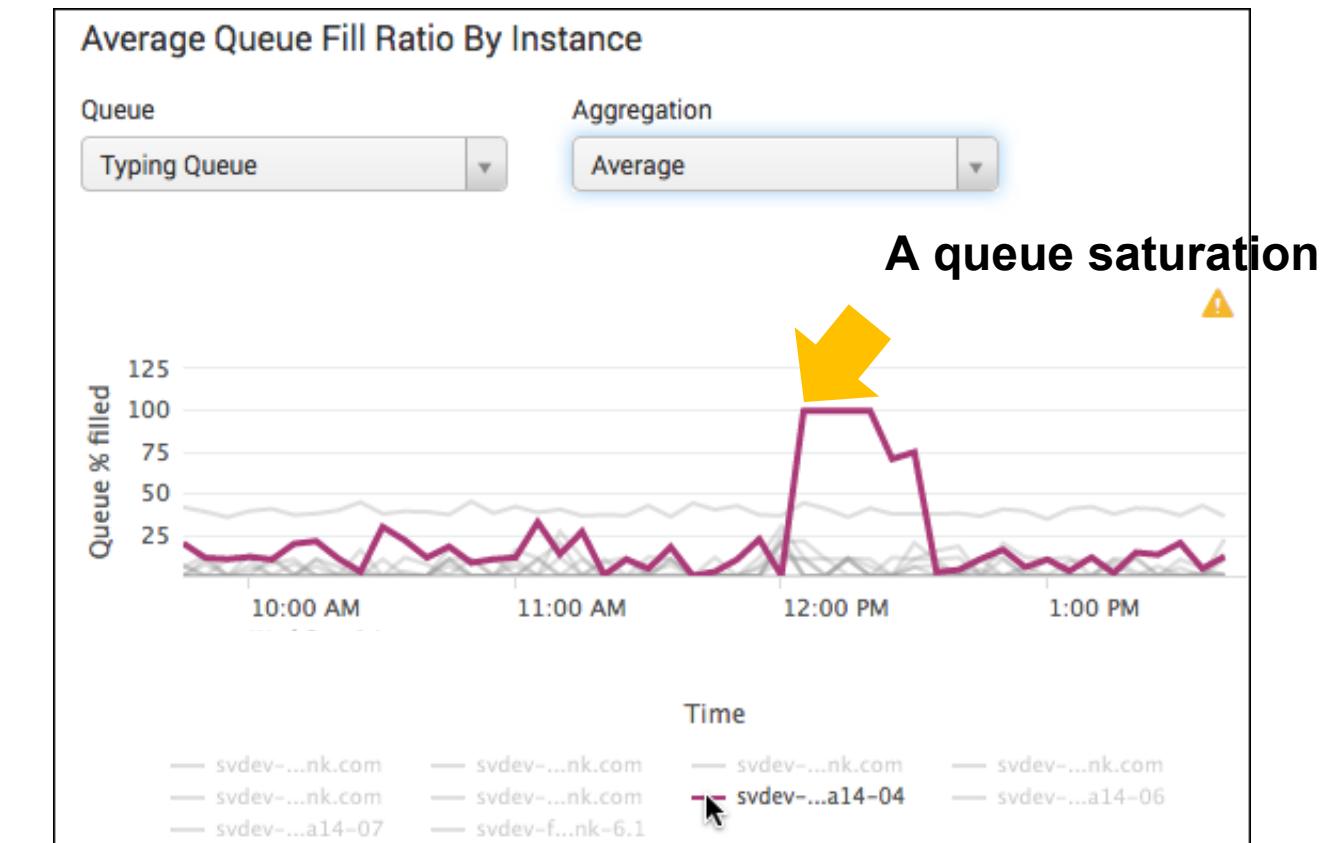
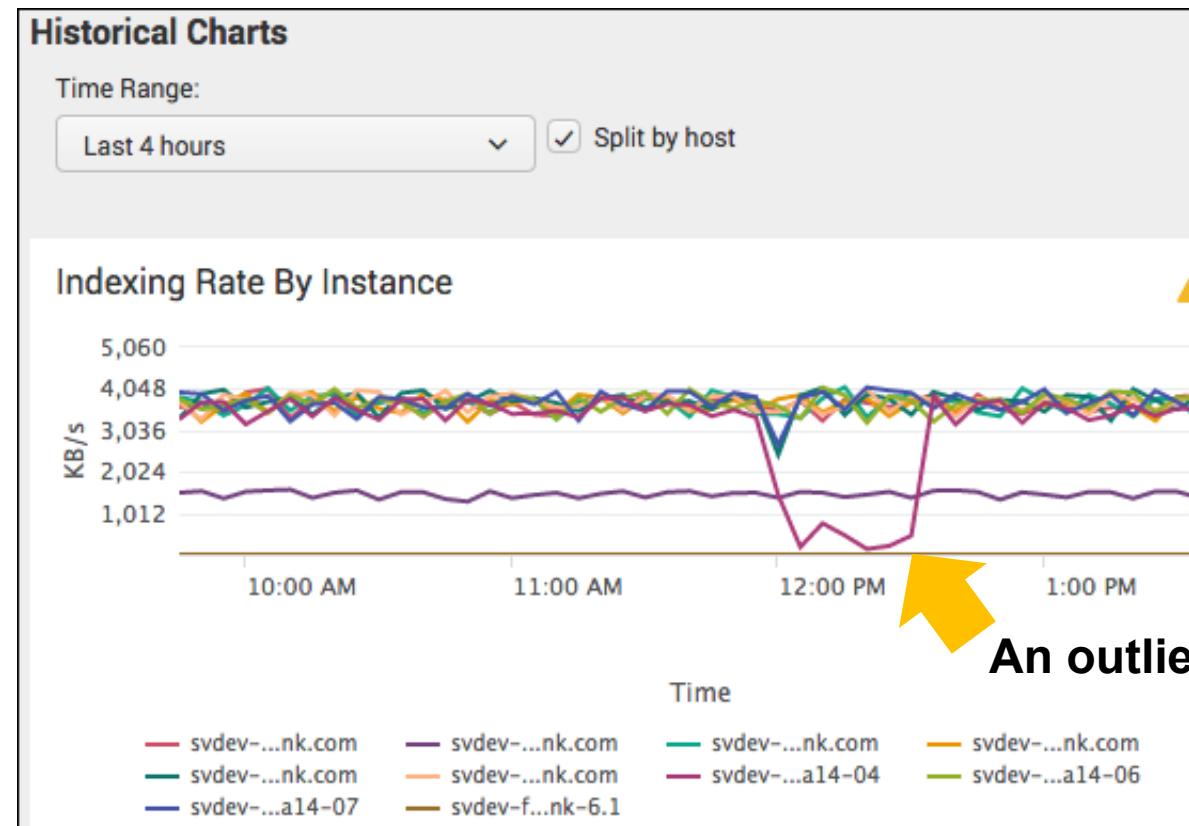
- Compare the delay between your log and the Splunk internal logs
 - If the delay is about the same, then it is likely a forwarding issue
 - Check the **thruput** setting: **splunk btool limits list thruput**
 - Check **metrics.log**
 - If the delay is significant only on your log, then it indicates an input issue

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Troubleshooting Indexing Latency (cont.)

Monitoring Console's indexing performance dashboards display increasingly granular details about indexing issues

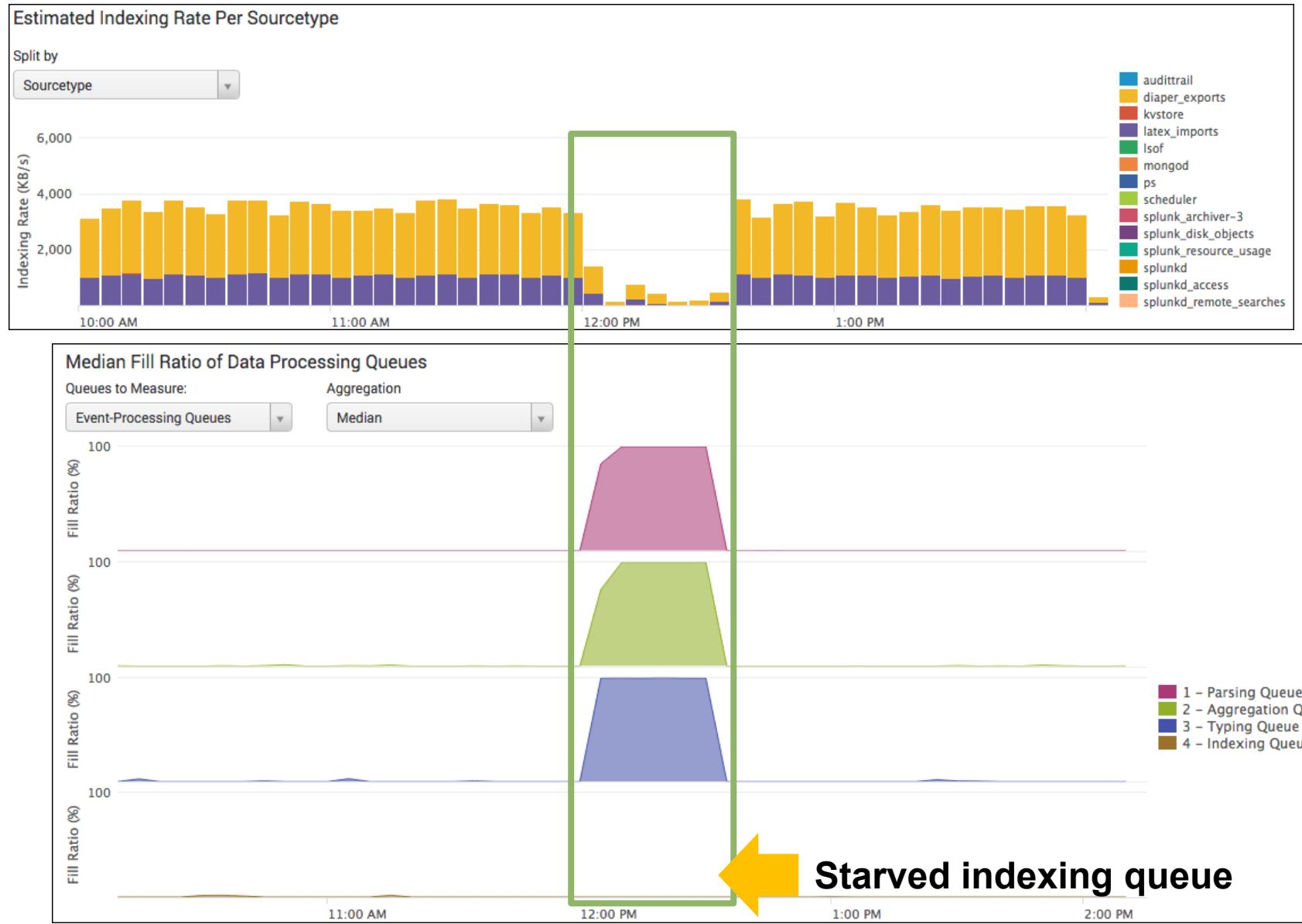
MC > Indexing > Performance > Indexing Performance: Deployment



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Troubleshooting Indexing Latency (cont.)

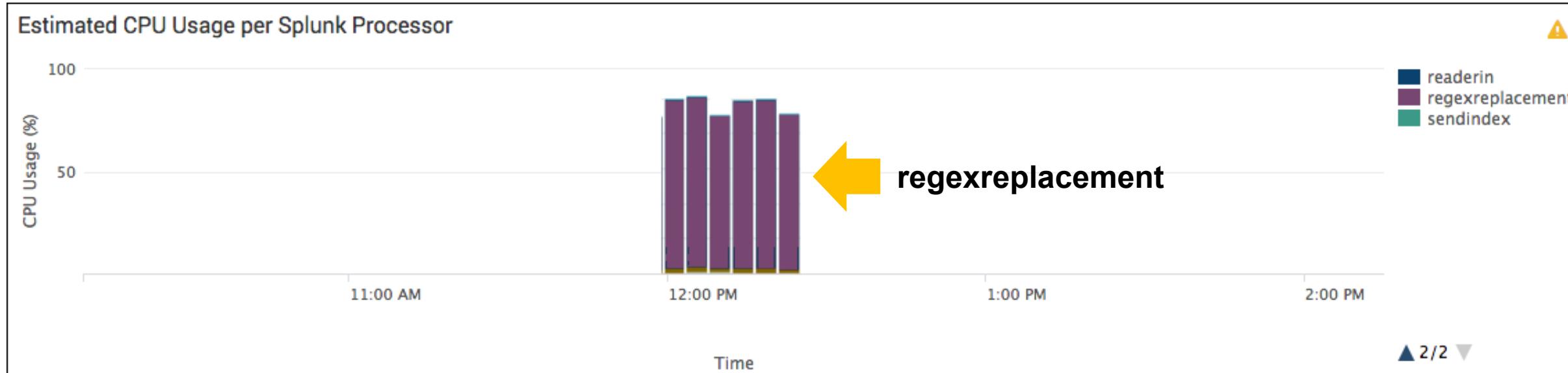
MC > Indexing > Performance > Indexing Performance: Instance



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Troubleshooting Indexing Latency (cont.)

MC > Indexing > Performance > Indexing Performance: Instance



- Search for specific hosts / sources / sourcetypes to find duplicate stanzas for possible anomalies and precedence issues
- Enable CPU time metrics for **RegexProcessor** for debugging purposes

limits.conf

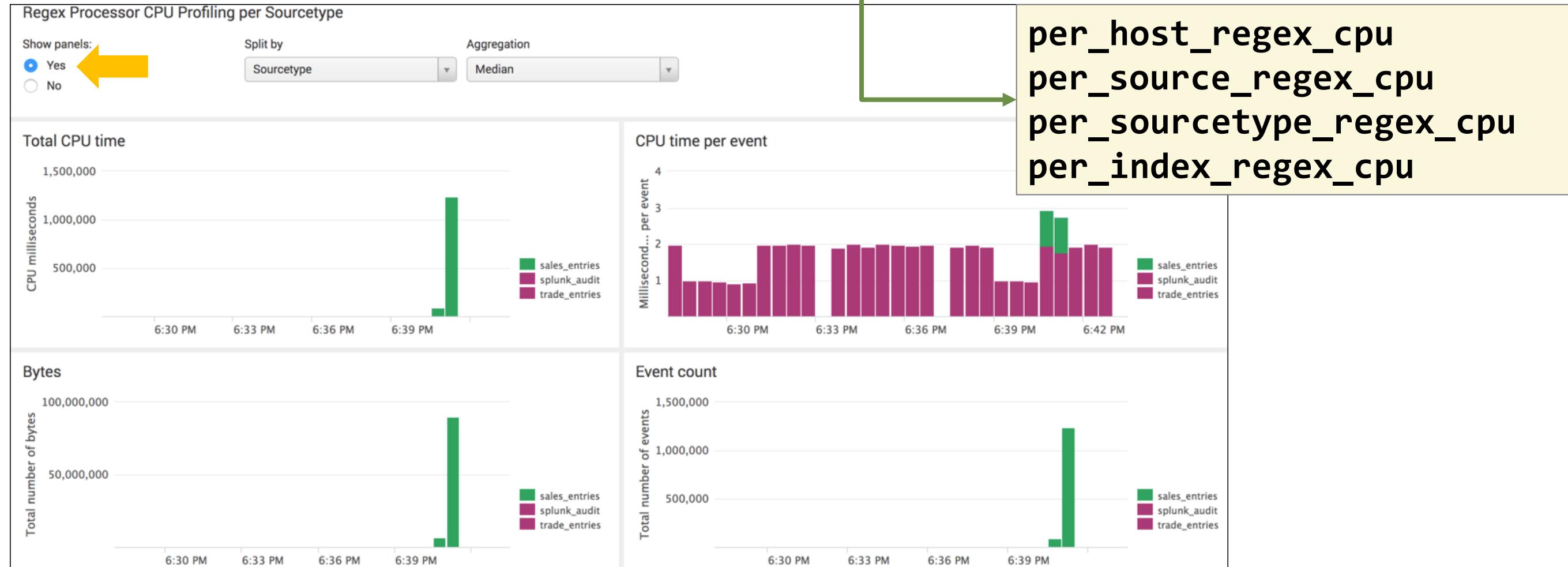
```
[default]
regex_cpu_profiling = true

[metrics]
maxseries = 100
```

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Troubleshooting Indexing Latency (cont.)

`regex_cpu_profiling` outputs `regex_cpu` groups to metrics.log



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Lab Exercise 3 – Troubleshoot Input Issues

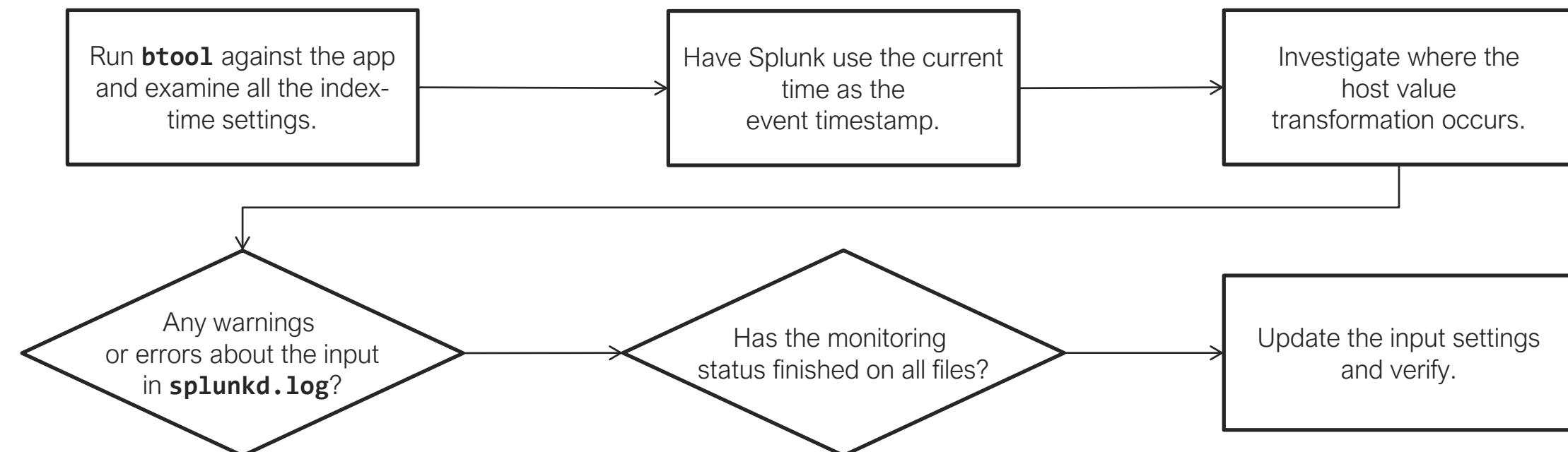
Time: 25 minutes

Tasks:

- Install the **tse_lab03.spl** app
- Enable the input **tse_lab03/data/cidr**
- Search **index=cidr** for events
 - Only shows 1 host and 1 source
 - Auto timestamp extracted a wrong event time
- Fix the input configurations
 - There should be 20 hosts and 20 sources
 - Events should be set to system time

Lab Exercise 3 – Troubleshooting Suggestions

- What index-time configurations has the app introduced?
- What Splunk time extraction options can adjust the event-time?
- Where does the host transformation get invoked?
- Are there any warnings or errors in the log about the input? How about the status of tailing?



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Module 4: Deployment and Forwarder Problems

Module Objectives

- Troubleshoot deployment server problems
- Review forwarding and receiving problems

Deployment Problems

- Deployment server (DS) performance depends on the DS specs, the phone home interval, the number of clients, and the total size of the apps

<http://docs.splunk.com/Documentation/Splunk/latest/Updating/Calculatedeploymentserverperformance>

- Forwarder management UI supports a subset of the deployment options
 - For advanced configurations, edit **serverclass.conf**
 - CAUTION: Once edited, you may not be able to configure it via the UI anymore

<http://docs.splunk.com/Documentation/Splunk/latest/Updating/Forwardermanagementcompatibility>

- My apps are not appearing on my client instances
 - Is the client contacting the correct deployment server?
 - Is the deployment server correctly matching the client in **serverclass.conf**?
 - Are whitelist and blacklist in use? Are they correct?

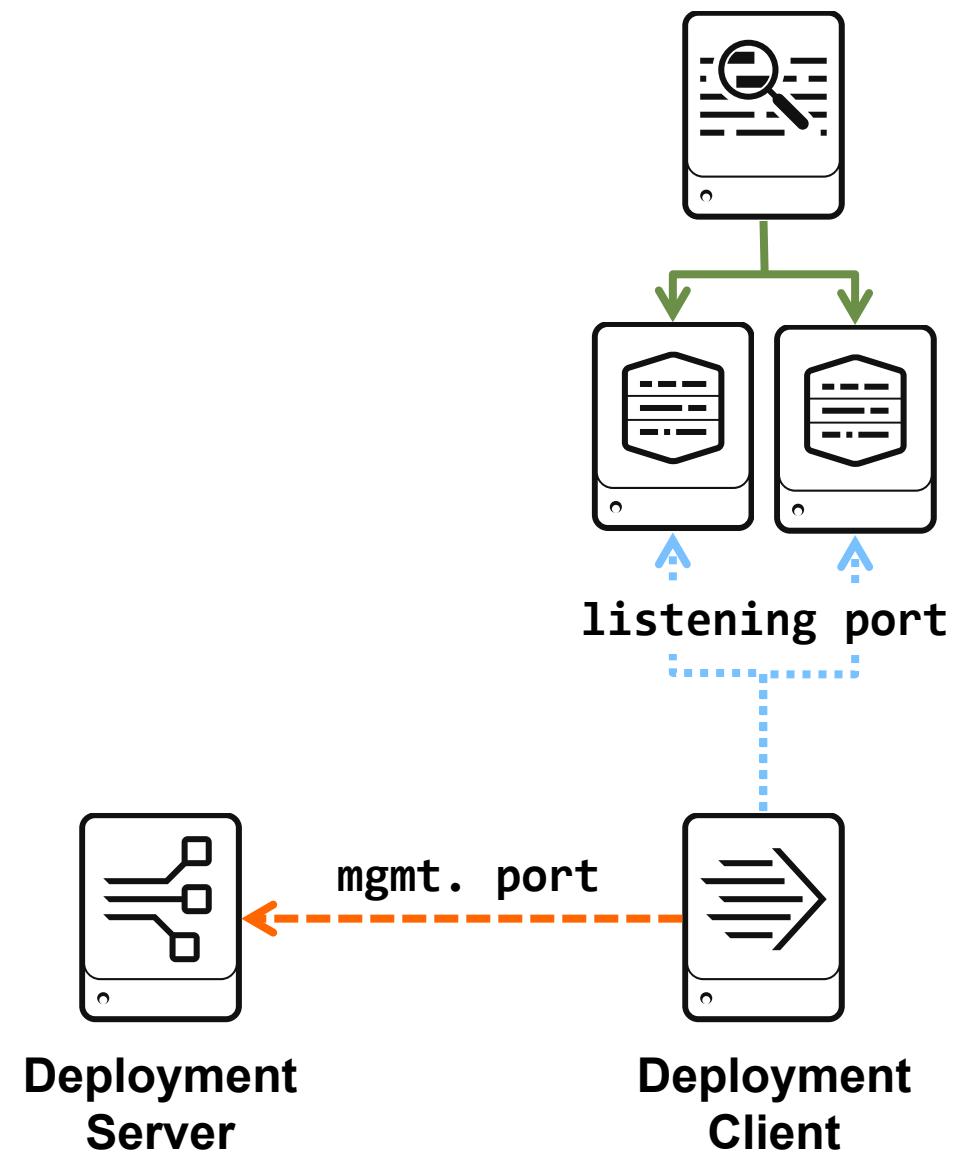
Notable Deployment Server/Client Channels

Deployment Server	Both	Deployment Client
DSManager DeploymentServer	DS_DC_Common	DC:DeploymentClient DC:HandshakeReplyHandler DC:PhonehomeThread DCManager DeployedApplication

- Show me all deployment messages on the deployment server:
`index=_internal component=DS* host=<ds> | stats count by event_message`
- Show me all deployment client messages from the client:
`index=_internal component=DC* host=<uf> | stats count by event_message`
- Show me all deployment app-related activities:
`index=_internal component=Deploy* host=<uf> | stats count by event_message`

Review: Forwarding Problem

- Is the listening port on the receiver enabled?
- Is the forwarder sending the data to the correct address and the port?
- Is a firewall blocking?
 - Traffic from the forwarder address/port
 - Traffic to the receiver address/port
- Is the server not running as root but using a root-only port?
 - Only the root user can access ports lower than 1024 on a Linux server
 - Have Splunk listen on a port higher than 1024
 - Run Splunk as the **root** user



<http://docs.splunk.com/Documentation/Splunk/latest/Forwarding/Receiverconnection>

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TCP Output Health Report

- Proactive Splunk Component Monitoring reports the current health of auto load-balanced TCP output
 - **feature:s2s_autolb**
 - Tracks whether this forwarder can successfully connect to all indexers configured in `outputs.conf`
 - Yellow when 20% of indexers are unreachable
 - Red when 70% of indexers are unreachable

Checking the Network Connection

- Verify that the network to the destination is working
 - Stop Splunk on the receiver
 - Use a network monitoring tool to check the receiving port
 - > **tcpdump src port 9997 and tcp**
 - > **nc -z host 9997**
 - ▶ If you see data, then connectivity is established
 - ▶ Check the parsing settings on your indexer to see where data is going
- If data is not being received, it is typically something a TCP connection issue
 - Check if any firewalls between the servers are blocking the traffic
 - ▶ Include the correct addresses and ports on the Include/Exclude list

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Checking the Connection Using splunkd.log

- Are the servers connected?

Indexer

```
index=_internal sourcetype=splunkd Metrics group=tcpin_connections
03-15-2021 01:13:59.135 +0000 INFO - Metrics - group=tcpin_connections,
10.0.0.50:60022:9997, connectionType=cooked, sourcePort=60022, sourceHost=10.0.0.50,
sourceIp=10.0.0.50, destPort=9997
```

Forwarder

```
index=_internal host=uf* component=TcpOutputProc
03-15-2021 23:44:59.647 +0000 INFO TcpOutputProc - Connected to idx=10.0.0.200:9997
using ACK.
```

- Is the forwarder working?

```
index=_internal host=uf* component=Metrics group=queue name=tcp*
03-15-2021 01:28:10.416 +0000 INFO Metrics - group=queue, name=tcpin_queue,
max_size_kb=500, current_size_kb=0, current_size=0, largest_size=0, smallest_size=0
03-15-2019 01:28:37.415 +0000 INFO Metrics - group=queue, name=tcpout_default-
autolb-group, max_size=7340032, current_size=0, largest_size=6756, smallest_size=0
```

Helpful Searches

- What are the current server roles of the Splunk instances?

```
| rest /services/server/info | fields server_roles
```

- Which forwarders are sending data to Splunk and how much?

```
index=_internal sourcetype=splunkd host=<indexer> metrics  
tcpin_connections | timechart span=5m max(tcp_KBps) by  
sourceIp
```

- Where is the forwarder trying to send data to?

```
index=_internal host=<uf> sourcetype=splunkd destIp
```

- What output queues are set up?

```
index=_internal host=<uf> source=*metrics.log group=queue  
tcpout | stats count by name
```

Example: Deployment Error Messages

- Possible error messages in **splunkd.log**
 - 07-13-2021 17:48:30.183 +0000 INFO DC:DeploymentClient [12522 PhonehomeThread] - channel=tenantService/handshake Will retry sending handshake message to DS; err=not_connected
 - 07-12-2021 19:50:56.681 +0000 INFO DC:DeploymentClient [2204 PhonehomeThread] - channel=deploymentServer/phoneHome/default Will retry sending phonehome to DS; err=not_connected
 - 07-12-2021 15:18:07.106 WARN DeployedApplication - Installing app: windows to location: C:\Program Files\Splunk\etc\apps\windows
 - 02-12-2021 15:18:07.106 ERROR DeployedApplication - There was a problem unarchiving file to: C:\Program Files\Splunk\etc\apps\windows\local\service?WSDL due to The filename, directory name, or volume label syntax is incorrect
- There are other possibilities; DEBUG logging can highlight any errors

Lab Exercise 4 – Troubleshoot Deployment Client Issues

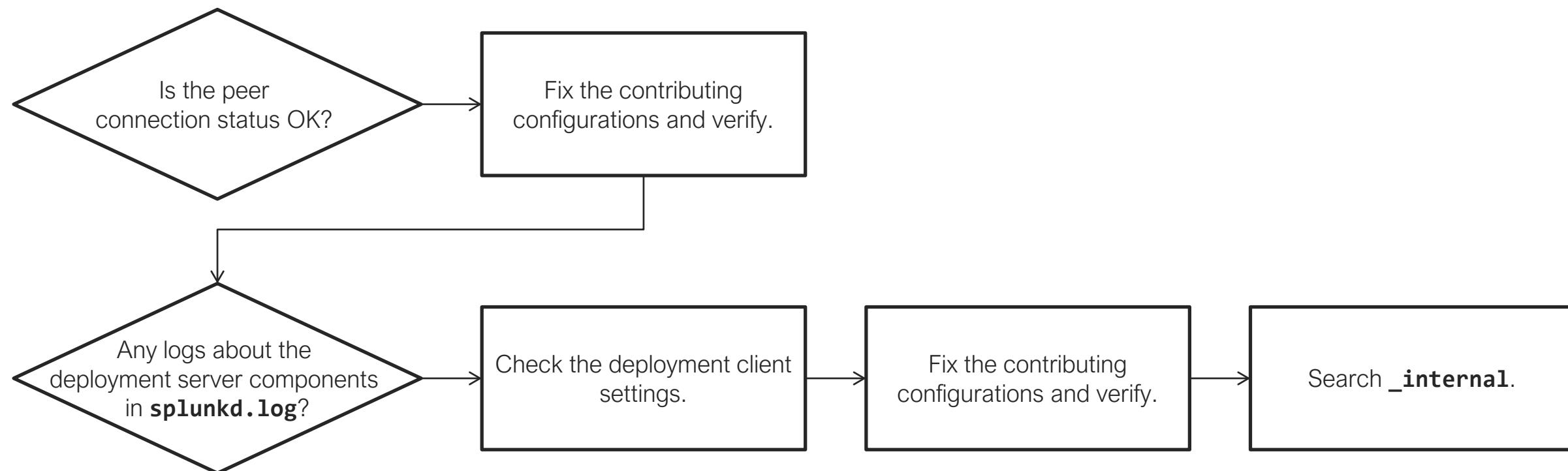
Time: 25 minutes

Tasks:

- Install the **tse_lab04.spl** app
- Check the internal log for any issues and resolve them
 - Distributed peer issue
 - Deployment client issue
- Piece together a complete picture of your lab environment topology
 - Who is forwarding?
 - How many universal forwarders are there?
 - ▶ Are they deployment clients?
 - Where is the deployment server?

Lab Exercise 4 – Troubleshooting Suggestions

- What is the status of search peer connections?
- What is the status of deployment client connection?
- What configuration files can affect the deployment connection?



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Module 5: Upgrading, Licensing, and User Management Problems

Module Objectives

- Diagnose installation problems
- Understand and troubleshoot Splunk licensing
- Describe how to troubleshoot users and roles

Diagnosing Installation Issues

- Confirm the correct package was installed for your installation/upgrade path
 - Example: Supported OS, 64-bit vs 32-bit
- Confirm user credentials
 - Example: The Windows domain account must have permission to run as a service
- See the docs for individual OS patch and hardware requirements
- Upgrades and updates require similar considerations

Your current version	First upgrade to	Then upgrade to
6.6.x	7.2.x	See 7.2.x entry in this table
7.0.x	8.0.x or 8.1.x	8.2.x
7.1.x	8.0.x or 8.1.x	8.2.x
7.2.x	8.0.x or 8.1.x	8.2.x
7.3.x	8.0.x or 8.1.x	8.2.x
8.0.x	8.2.x	N/A
8.1.x	8.2.x	N/A

https://docs.splunk.com/Documentation/Splunk/latest/Installation/HowtoupgradeSplunk#Upgrade_paths_to_version_8.2

Upgrading Splunk Enterprise

1. Back up **etc** directory
2. Stop the running Splunk instance
3. Install the new version onto the existing Splunk directory
4. Start Splunk
 - *Perform migration and upgrade without previewing configuration changes?*
 - ▶ To review the proposed migration changes, respond with **n**
 - ▶ **SPLUNK_HOME/var/log/splunk/migration.log.<timestamp>**

<http://docs.splunk.com/Documentation/Splunk/latest/Installation/HowtoupgradeSplunk>

Considerations for Upgrading

- A new password encryption scheme was introduced in 7.2, to use the new cipher on existing hashes, rotate the **splunk.secret** file
splunk rotate splunk-secret
- 8.0 enforces the default navigation menus in default Splunk apps
 - Should not customize default Splunk apps' UI
 - Any modified navigation is removed
- Migrate your KV store storage engine from the Memory Mapped (MMAP) storage engine to the WiredTiger storage engine
- May increase disk I/O, network, and CPU activity on startup
 - Checks and removes orphaned scheduled views

<https://docs.splunk.com/Documentation/Splunk/latest/Installation/AboutupgradingREADTHISFIRST>

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Python Version 3.7 Migration in Splunk

- Splunk Enterprise will be transitioning from Python version 2
 - Product will initially ship with 2.7 and 3.7 runtimes to assist with the transition from Python 2 to Python 3
 - A future release will remove Python 2.7 altogether
 - All custom scripts will default to Python 3.7 runtime
 - Splunk Web will use Python 3.7 runtime

<https://docs.splunk.com/Documentation/Splunk/latest/Python3Migration/AboutMigration>

Roles and Responsibilities for Python 3.7

- Splunk Administrators
 - Identify custom apps (and their creators) that require updating
 - Identify dependencies on Splunkbase apps that have not updated compatibility
 - Upgrade to Enterprise 8.0 and above
- In-house Developers
 - Identify use of features that will be removed
 - Remove impacted features or upgrade to Python 3 compatibility

Python Upgrade Readiness App

- Admin tool used to identify at-risk apps ahead of upgrading
 - On-prem only app
- Scans apps present in
\$SPLUNK_HOME/etc/apps
- Identifies file paths and line number of offending items and proposes changes
- Identifies old versions of SDK

The screenshot shows the Splunk Enterprise Python Upgrade Readiness App interface. At the top, there's a navigation bar with 'splunk>enterprise' and various dropdown menus like 'Administrator', 'Messages', 'Settings', 'Activity', 'Help', and 'Find'. Below the navigation is a search bar with the placeholder 'Python Upgrade Readiness App'. The main content area has tabs for 'Instance Scan' and 'Python Upgrade Readiness App'. The 'Python Upgrade Readiness App' tab is active, displaying the following information:

- About This App:** A brief description stating the app scans apps in the /etc/apps/ and /etc/peer-apps/ folder for compatibility issues before upgrading to Splunk Enterprise 8.0. It notes that Python syntax issues may not cover all required changes and suggests testing the app with Python 2 and 3 using compatibility libraries like Six. A 'Learn more' link is provided.
- Scan Results:** Summary statistics: 0 public app failed, 0 private app failed, 0 public app passed, and 1 private app passed. The 'Scan completed at 5/6/2021 8:00 PM' message is also displayed.
- Public Apps:** 0 passed public apps.
- Private Apps:** 1 passed private apps, with a link to 'Show passed private apps'.
- Scan Settings:** A dropdown menu titled 'Select which apps to scan:' with options: 'Select...', 'Scan private apps only' (which is selected), 'Scan Splunkbase apps only', 'Scan custom selection of apps', and 'Scan all apps'. A 'Scan' button is located to the right of the settings panel.

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Review: License Issues Overview

- Splunk operates with *no-enforcement license* (since 6.5) with a license volume of 100GB/day
 - <http://docs.splunk.com/Documentation/Splunk/latest/Admin/TypesofSplunklicenses>
 - Splunk licensing allows occasional data “bursts”
 - Exceeding the daily license quota raises a warning
- 5 warnings in a rolling 30-day period is a violation
 - The license manager still tracks violation
 - Indexing and searching continues
- Starting with 8.1, search is disabled for licenses with less than 100GB/day with 45 warning in a rolling 60-day period
 - Free licenses that generate 3 or more warnings in a rolling 30-day period will continue to index and search is disabled

Clarifying a License Problem

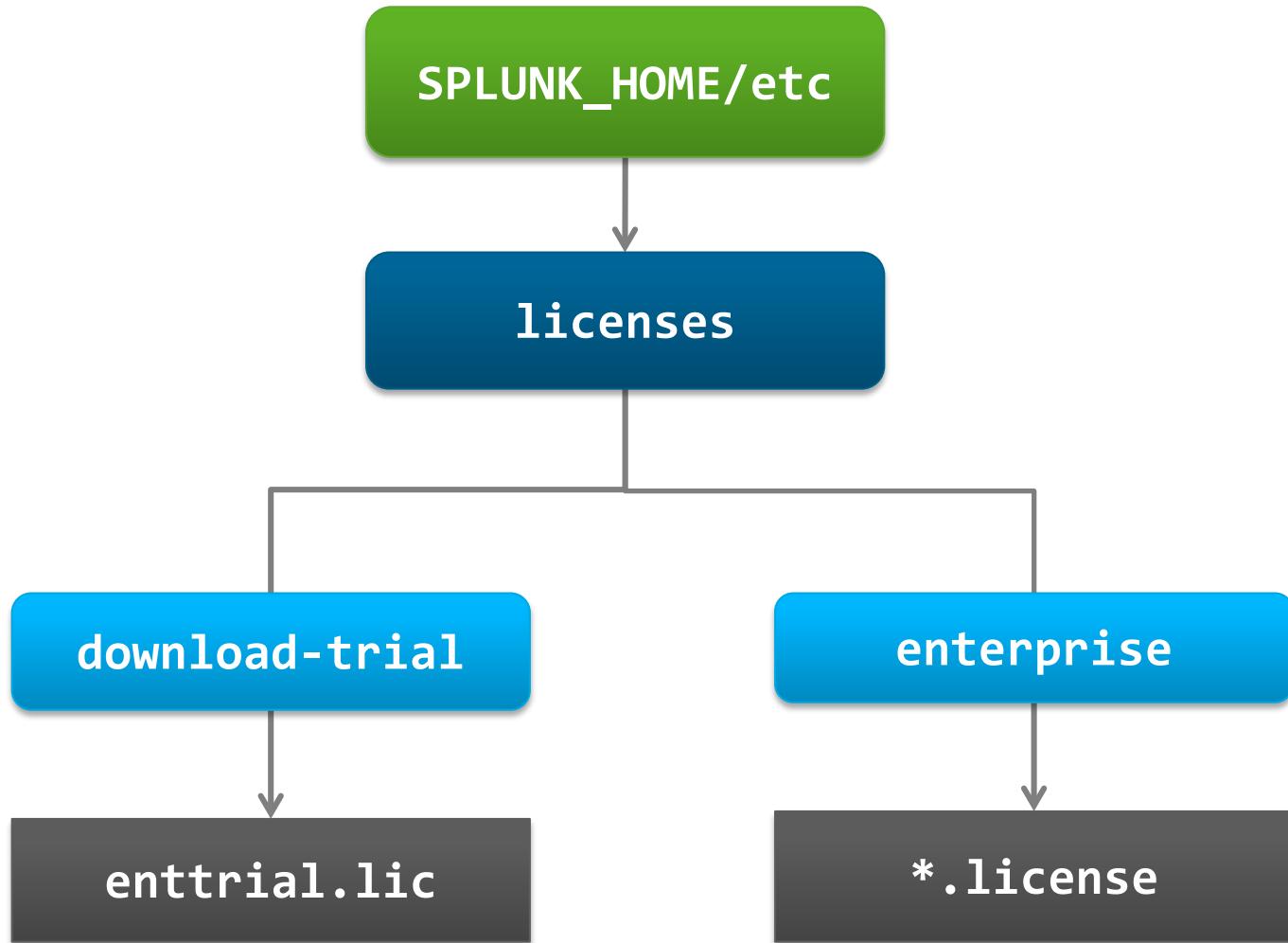
- Are you unable to search?
 - Has your license expired?
- Do you need to reset a locked license?
 - Escalate to Splunk Support
- Got a warning?
 - What's taking up most of the quota?
- Are you trying to do something that is not allowed with the installed license?
 - Contact your sales account manager

Confirming with splunkd.log

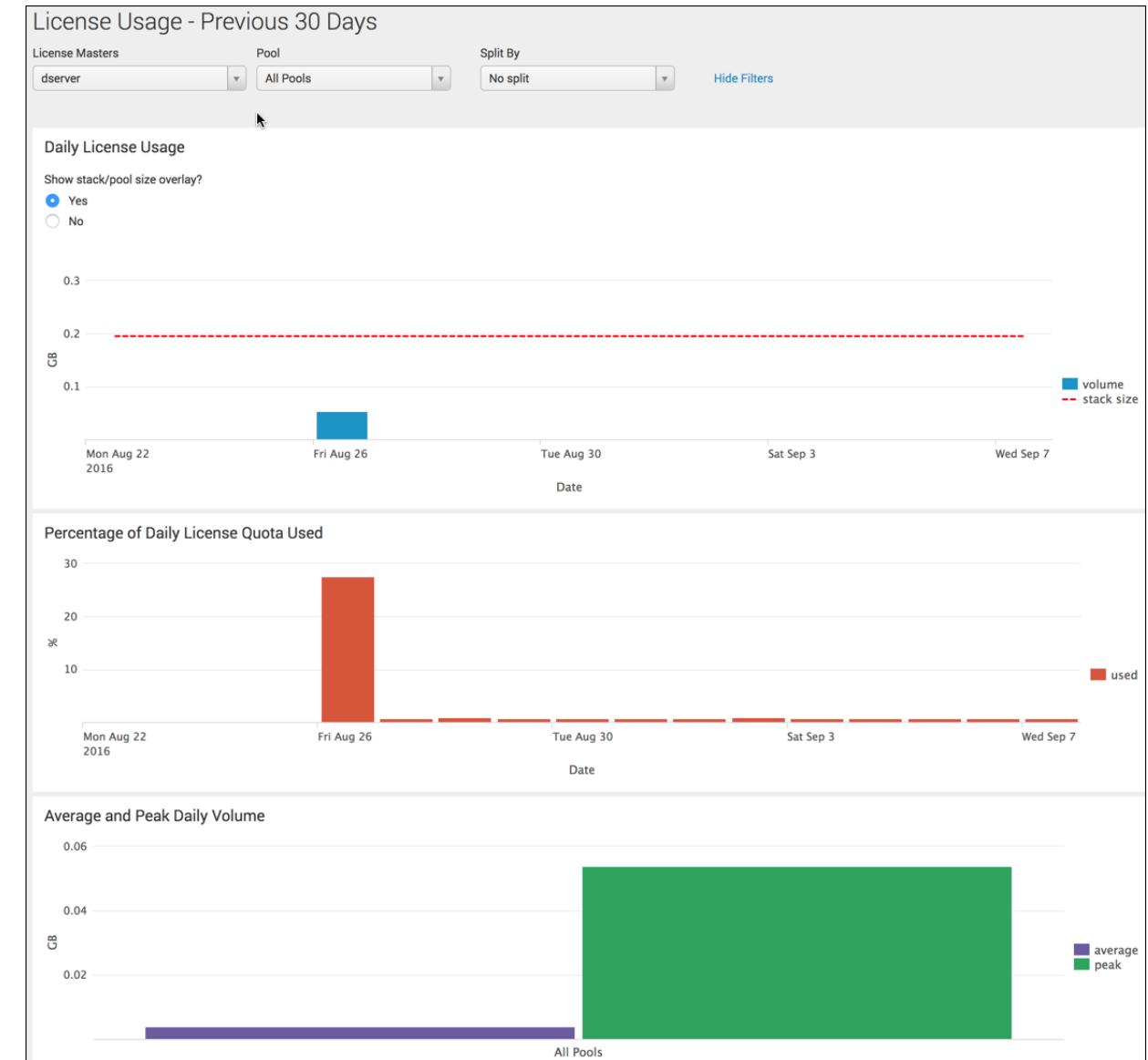
index=_internal sourcetype=splunkd component=LM*

```
03-09-2019 00:00:00.352 -0700 WARN LMStackMgr - Indexing quota exceeded for this pool,  
quota=524288000 bytes  
03-15-2019 07:00:54.561 +0000 WARN LMTracker - license expired, revoking all session keys  
03-20-2019 00:00:00.967 +0000 INFO LMStackMgr - should rollover=true because  
_lastRolloverTime=1552953600 lastRolloverDay=1552953600 snappedNow=1553040000  
03-20-2019 00:00:00.969 +0000 WARN LMStackMgr - This pool has exceeded its configured  
poolsize=209715200 bytes. A warning has been recorded for all members  
03-20-2019 00:00:00.969 +0000 INFO LMStackMgr - finished rollover, new  
lastRolloverTime=1553040000  
03-20-2019 15:08:55.720 +0000 ERROR LMAdminHandlerLicenses - splunk.license.big.license: failed  
to add because: stack already has this license, cannot add again  
03-20-2019 15:53:39.495 +0000 ERROR LMAdminHandlerPools - failed to create pool: 'A catch all  
pool already exists(auto_generated_pool_enterprise). Cannot create two catch all pools'  
03-20-2019 15:53:49.165 +0000 ERROR LMAdminHandlerPools - failed to create pool: 'Stack is fully  
allocated. No more quota to create the new pool newpool'  
03-22-2019 00:00:04.370 +0000 INFO LMSlaveInfo - Detected that masterTimeFromSlave(Thur Mar 21  
23:59:03 2019) < lastRolloverTime(Fri Mar 22 00:00:00 2019), meaning that the master has already  
rolled over. Ignore slave persisted usage.
```

License File Locations and Usage Check

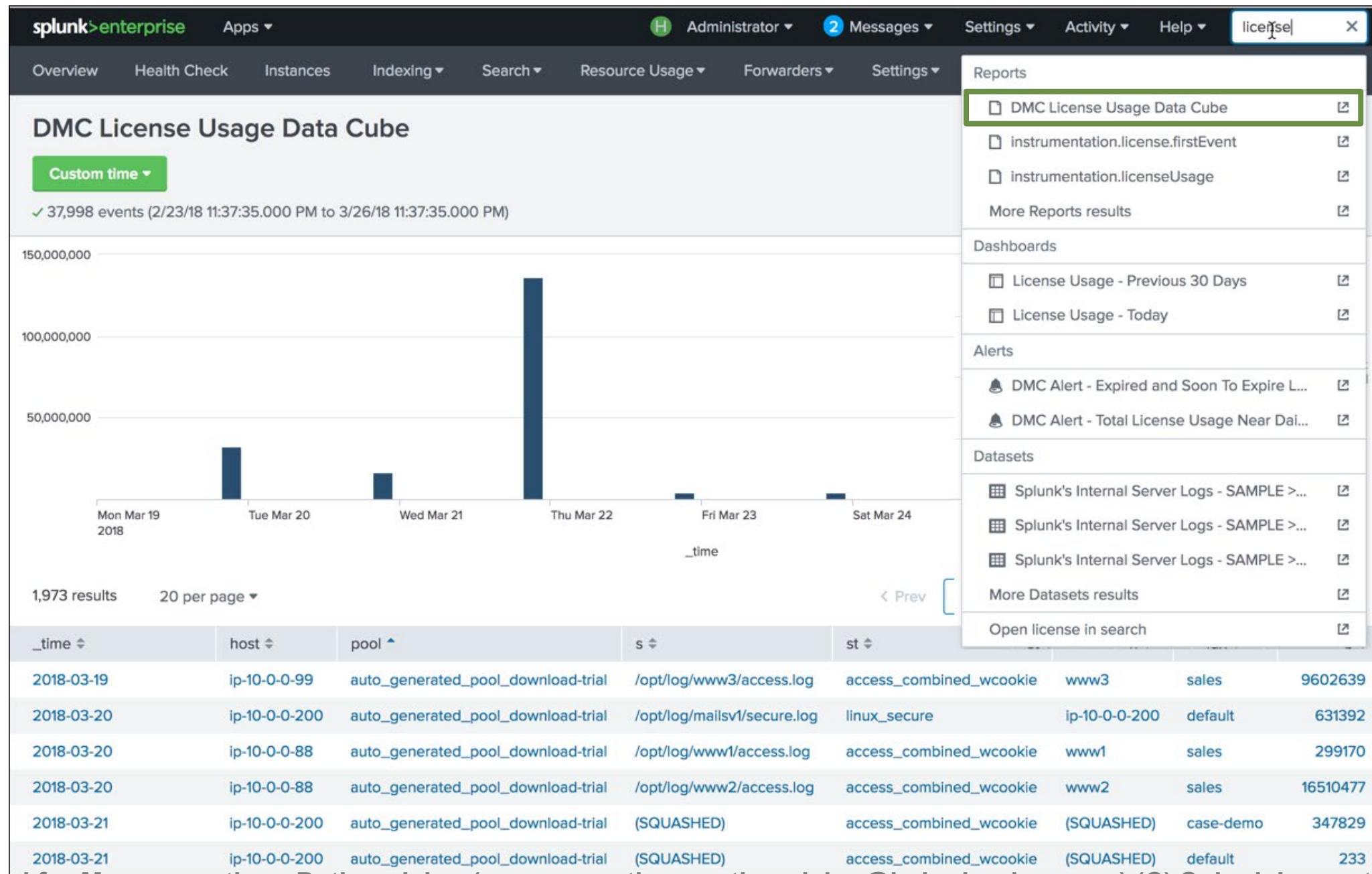


MC > Indexing > License Usage



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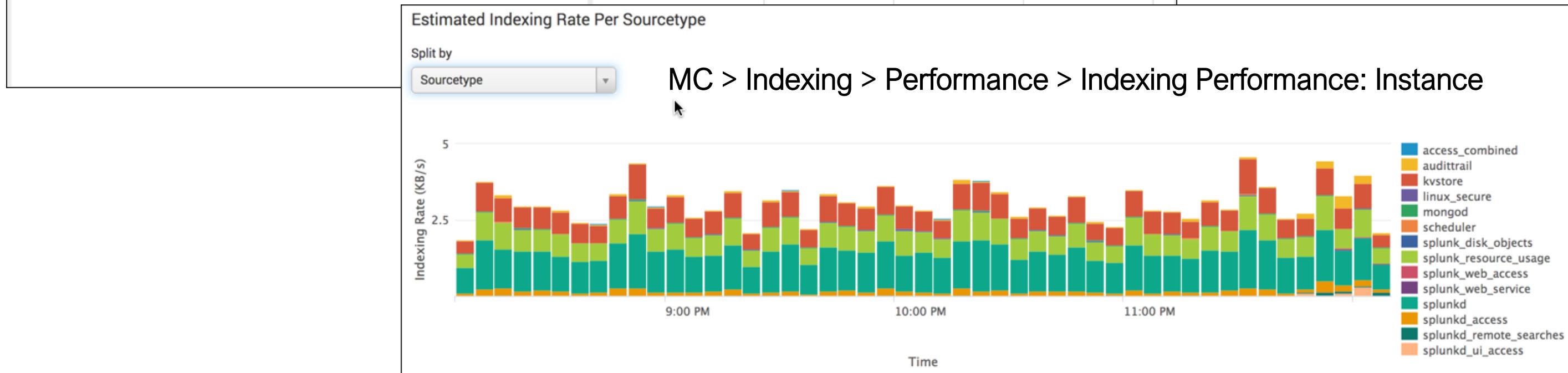
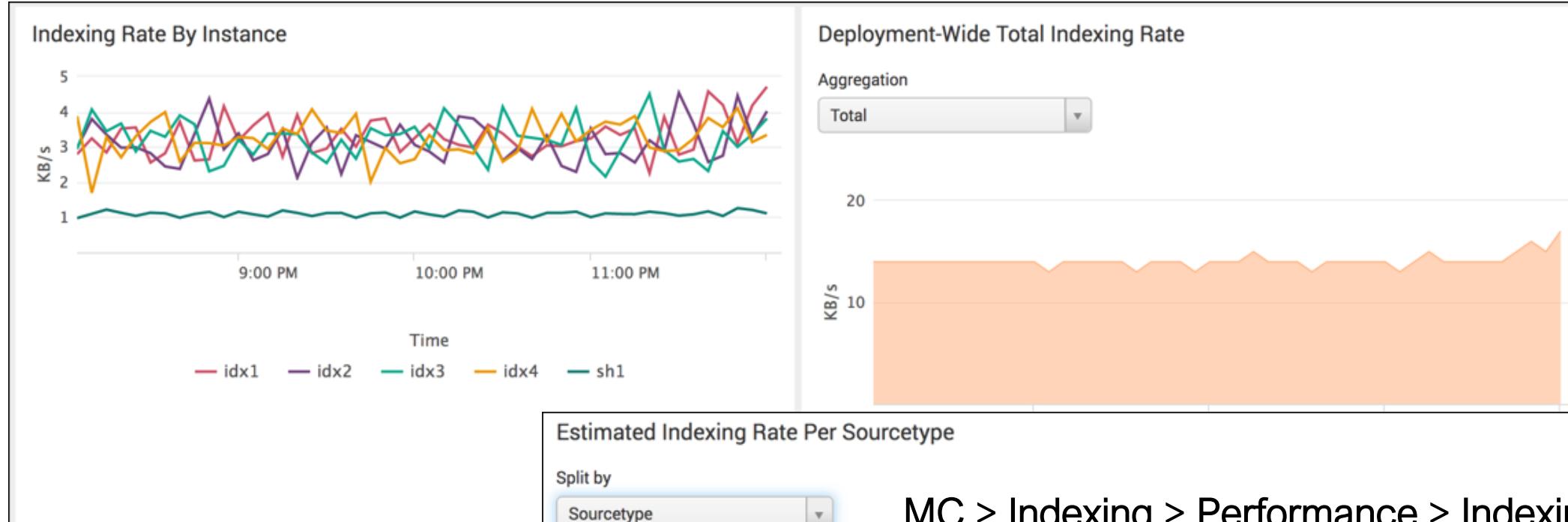
Where is all that Data Coming From?



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Where is all that Data Coming From? (cont.)

MC > Indexing > Performance > Indexing Performance: Advanced



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Notable Logs for License Problem

- **license_usage.log**
 - Contains indexed volume in bytes per pool, index, host, sourcetype, and source
 - Only available on the license master
 - Generates once a day (generally just after midnight spanning - 24h)
 - ▶ Or, when splunkd is restarted
- **metrics.log**
 - Contains a periodic report taken every 30 seconds
 - Reports top 10 results per each type
 - Useful for approximation only

License Problem – Log Channels of Interest

- Notable license_usage.log fields

Field	Description
s	Source of the license usage
st	Source type of the license usage
h	Host of the license usage
idx	Index of the license usage
type	Message type

- Log channels of interest
 - LicenseUsage**
 - LicenseUsageSummary**
 - LicenseMgr**
 - Metrics**

```
index=_internal component=LicenseUsage*  
| top type
```

- Metrics license-related fields

Field	Description
group	What type of data is being reported on
kb	The number of kilobytes indexed per thirty seconds
series	The specific data being reported on

- Metrics group
 - thruput**
 - per_index_thruput**
 - per_host_thruput**
 - per_source_thruput**
 - per_sourcetype_thruput**

```
index=_internal component=Metrics per_index_thruput  
| eval mb=(kb/1024) | timechart span=1h sum(mb) by  
series | addtotals
```

Metrics Group Values and Examples

```
03-09-2019 18:43:21.416 +0000 INFO Metrics - group=per_host_thrput, series="www3", kbps=0.014144, eps=0.354835, kb=0.438477, ev=11, avg_age=0.000000, max_age=0

03-09-2019 18:43:21.416 +0000 INFO Metrics - group=per_index_thrput, series="web", kbps=0.021547, eps=0.193546, kb=0.667969, ev=6, avg_age=0.000000, max_age=0

03-09-2019 18:43:21.417 +0000 INFO Metrics - group=per_source_thrput, series="/opt/log/www3/secure.log", kbps=0.014144, eps=0.354835, kb=0.438477, ev=11, avg_age=0.000000, max_age=0

03-09-2019 18:43:21.417 +0000 INFO Metrics - group=per_sourcetype_thrput, series="linux_secure", kbps=0.007088, eps=0.225808, kb=0.219727, ev=7, avg_age=0.000000, max_age=0

03-09-2019 18:43:21.417 +0000 INFO Metrics - group=thrput, name=cooked_output, instantaneous_kbps=0.303109, instantaneous_eps=0.967732, average_kbps=0.25 total_k_processed=304294.000000, kb=9.396484, ev=30.000000

03-09-2019 18:43:21.417 +0000 INFO Metrics - group=thrput, name=thrput, instantaneous_kbps=0.303109, instantaneous_eps=0.935475, average_kbps=0.25 total_k_processed=304319.000000, kb=9.396484, ev=29.000000, load_average=0
```

Note 

Thrput metrics measure the indexing pipeline. No data in these events means your data is not reaching the pipeline for some reason.

Troubleshooting Users and Roles

- Users have no meaning in Splunk outside of their role(s)
 - Without a role assignment, a user cannot log in
- Roles created with Splunk Web are saved in **authorize.conf**
- Roles define the capabilities
 - Which parts of the system can a user access?
 - What is a user ALLOWED to do in the system?
- For example, can a user search? If yes:
 - What is a user allowed to search?
 - ▶ Restrictions on search terms, time range, and allowed indexes
 - Has a user reached his/her allowed quota?
 - ▶ Restrictions on concurrent job limits and storage usage

<http://docs.splunk.com/Documentation/Splunk/latest/Security/Rolesandcapabilities>

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Troubleshooting Users and Roles (cont.)

- Users with multiple roles inherit broadest permissions
 - Exception: the user assigned to a role without search restrictions and another with search restrictions inherits the search restrictions
- Validate the user capabilities
 - CLI: **splunk list user** displays the roles assigned to a given user
 - Search:
| rest /services/authentication/users | table title capabilities
- Check the user's runtime quota restrictions
 - Search:
| rest /services/admin/quota-usage | search title=<user> | fields srchDiskQuota, diskUsage, srchJobsQuota, historicalSearchCount, rtSrchJobsQuota, realTimeSearchCount, srchMaxTime

Working with LDAP Problems

- LDAP is a series of key value pairs organized in a tree
 - The configuration tells Splunk what to look for and where
- Notable splunkd channels:
 - **UiAuth, UserManagerPro, AdminHandler:AuthenticationHandler**
 - **AuthenticationManagerLDAP**
 - **ScopedLDAPConnection**
- All the information that you need to make the configuration work is contained in the user and group LDIF entry
 - UNIX: **ldapsearch -x -h <host> -p <port> -b "<(user|group)BaseDN>" -D "<bindDN>" -w <realNameAttribute>**
 - Windows: **ldifde -f output.ldif**
 - Or, Active Directory Explorer app from Microsoft:
<https://technet.microsoft.com/en-us/adexplorer>

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Things to Consider with LDAP

- DO NOT grab everything in a LDAP tree
 - Choose the point in the tree that is narrow enough in scope to return the users that you want in Splunk
 - The fewer records Splunk fetches, the more efficient it is
- Use the base filters to get additional fidelity with the configuration
- NOTES:
 - Entries in **authentication.conf** are case sensitive
 - Supports multi-domain, but does not support anonymous LDAP login
 - The DN value of **userBaseDN** cannot be set to the same value as **groupBaseDN**
 - Workaround is to remove one level from the **groupBaseDN** (or vice versa)

Optional LDAP Default Role

- Without a role assignment, a user cannot log into Splunk
- If you want to give access to Splunk without needing an explicit group-to-role mapping, a default role can be specified
 - Valid only if LDAP authentication is a successful request
 - The LDAP server does not return any groups or groups cannot be mapped to Splunk roles
 - Not valid for failed request or connectivity issues

authentication.conf

```
[authentication]
authSettings = AD_splunkers
authType = LDAP
defaultRoleIfMissing = sales

[roleMap_AD_splunkers]
admin = splunkAdmins
...
```

Working with SAML Problems

- Requires the **change_authentication** capability on the search head
- Splunk must be enabled to query the identity provider (IdP)
 - IdP needs SPMetadata.xml (Service Provider Metadata)
 - Contains Splunk endpoint URI, required attributes and format, and Splunk cert
 - Splunk needs IdPMetadata.xml from the provider
 - Contains IdP endpoint URI, entity ID, Name ID format, and IdP cert
- SAML passes tokens (not credentials)
 - IdP SSO must respond (SAML Assertion) with the **realName**, **role**, and **mail** attributes
- Notable Splunk log channels:
 - **SAMLConfig**, **UiSAML**, **UserManagerPro**
 - **AuthenticationManagerSAML**
 - **Saml**, **SamlIdpCertDatabase**

Admin Tip



For troubleshooting purposes, create a non-SAML admin user to bypass SAML SSO:

<https://<SplunkWeb>/en-US/account/login?loginType=Splunk>

<http://docs.splunk.com/Documentation/Splunk/latest/Security/TroubleshootSAMLSSO>

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Managing Deactivated Users

- When a Splunk account is removed or deactivated from an external directory, Splunk does not automatically remove the corresponding user's knowledge objects (KOs)
- Do not allow KOs to operate on behalf of owners who are no longer in the system
- Orphaned KOs can cause problems in certain conditions
 - Splunk scheduler cannot run a scheduled report on behalf of a non-existent owner
 - May generate search errors if the KOs have global permissions
- As a result, dashboards would look to be broken, summary indexes may have gaps, etc.

Ways To Detect Orphaned KOs

- Review orphaned scheduled search notifications in **Messages**
- Use the **Orphaned scheduled searches** report and the **Orphaned Scheduled Searches, Reports, and Alerts** dashboard
- Run the Monitoring Console health check
- **NOTE:** These options have no way of knowing when an account has deactivated from an external directory
- To detect deactivated external user, check **splunkd.log** on the search head for any authentication errors

Removing Orphaned User Objects

- To remove the user directory from Splunk:
 1. Back up the **SPLUNK_HOME/etc/users/<user>** folder
 2. Search any reports, dashboards, and other KOs with global permissions owned by the user under **SPLUNK_HOME/etc/apps**
 - See ways to detect orphaned KOs mentioned in the previous slide
 3. Redirect all global-context objects to a new owner
 - Go to **Settings > All configurations** and click **Reassign Knowledge Objects**
 - Private objects cannot be reassigned through the UI
 4. Remove the **SPLUNK_HOME/etc/users/<user>** folder
- To reassign private objects:
 1. Temporarily recreate the Splunk account with the exact name used
 2. Log in as the user and reassign or delete the objects
 3. Delete the temporal account and the directory

Warning

Changing KO ownership may inadvertently grant access to previously inaccessible data or vice versa. Always review the permissions before reassigning.

Lab Exercise 5 – Troubleshoot LDAP Issues

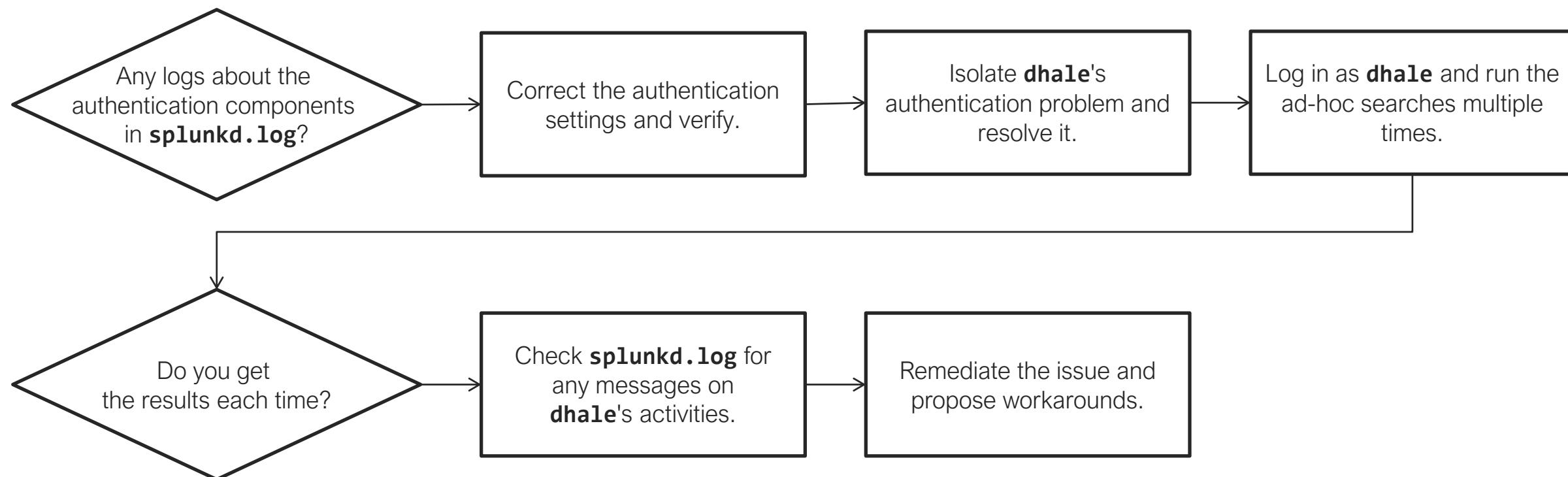
Time: 25 minutes

LIVE Tasks:

- Install the **tse_lab05** app
- Confirm the user **dhalé**'s authentication issue
- Restore the Splunk LDAP authentication service
- Troubleshoot the user **dhalé**'s search problem

Lab Exercise 5 – Troubleshooting Suggestions

- Are there any warnings or errors in the log about the authentication process?
- Are there any warnings or errors in the log about **dha1e**'s Splunk activities?
- Are there any warnings or errors in the log regarding **dha1e**'s search jobs?



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Module 6: Search Management Problems

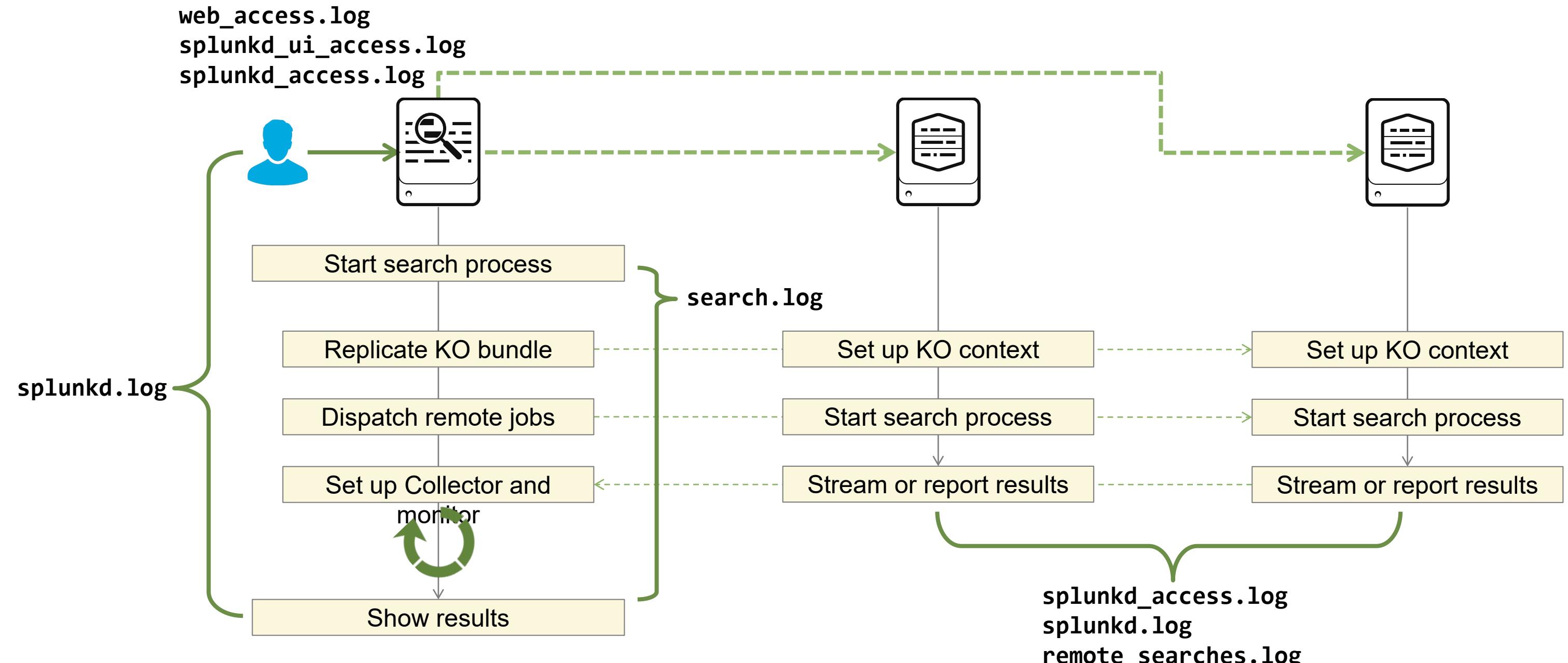
Module Objectives

- Troubleshoot distributed search problems
- Identify job scheduling problems
- Troubleshoot skipped search problems
- Learn to diagnose crashing problems
- Describe how to prioritize resources for critical Splunk processes

What is a Splunk Job?

- A job is the individual search process kicked off by a search, alert, etc.
- Manifests as Splunk processes in the OS
 - Has its own child processes on the search head and on every peer that participates in the search
 - Used by the **splunkd** process to do further work as needed
- In Linux, each search job starts two processes
 - **search-launcher** and **process-runner**
 - Can isolate all the *splunk-search* processes with: **ps -ef | grep search**
 - The main job is the one using system resources
 - Contains the **search --id** in its name
- In Windows, each job spins up a new **splunkd service**

Distributed Search Job Overview



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Other Notable Logs in Distributed Searches

- **splunkd_access.log** on search peers
 - Shows splunkd requests via the UI and the REST calls
 - Includes the time taken to respond to the requests and the artifact size
- **remote_searches.log** on search peers
 - Contains messages regarding searches executed on the search peers in response to a search head request
- **scheduler.log** on search head
 - Shows scheduled search activity performed by the splunkd and alert scheduler

Knowledge Bundle Replication

- Distributed searches utilize a replicated knowledge bundle on the peers
 - SH periodically replicates its knowledge objects (KO) – fields, tags, lookups, and other entities used in a search – to its search peers
 - A bundle contains nearly everything under **etc/system**, **etc/apps**, **etc/users** } by default
 - By default, a bundle larger than 2GB is not replicated to the search peers
- SH generates and maintains the source bundle in **SPLUNK_HOME/var/run**
 - Generates a bundle in the form of **<serverName>-<time>.bundle**
 - Or, a delta bundle in the form of **<serverName>-<oldTime>-<newTime>.delta**
 - A delta bundle represents a difference between the prior and current bundles
- Splunk tries to replicate **.delta** first
 - If **.delta** replication fails, do the full **.bundle** replication
- The search peers ignore their local KOs and use only this bundle in their part of the search on SH's behalf

Knowledge Bundle Management

- On each search peer, replicated bundles are stored in **SPLUNK_HOME/var/run/searchpeers**
 - Keeps N number of bundle generation per search head (5 by default)
 - Currently-running searches use the bundle from the time they were started
 - The no-longer-needed generation gets deleted periodically
- Check the high-level replication status in:
Settings > Distributed search > Search peers
- Notable Splunk log channels on SH:
 - **Archiver**
 - **ArchiverFilters**
 - **BundleDeltaHandler**
 - **BundleArchiver**
 - **DistributedBundleReplicationManager**

Bundle Management Options

- Even minimal KO changes can result in a new bundle replication
 - Frequently updated files can trigger retransmission
 - Asynchronous and in some cases partial (**.delta**)
- Limit the size of the knowledge bundle
- Migrate largest csv lookups to KV Store

Notable Logs on Search Peers

- `splunkd_access.log`

`index=_internal sourcetype=splunkd_access host=<peer>
uri_path="*bundle*/<sh>"`

```
..."GET /services/admin/bundles/sh?count=-1 HTTP/1.1" 200 9671 - - - 1ms  
..."POST /services/receivers/bundle/sh HTTP/1.0" 200 19 - - - 700ms  
..."GET /services/receivers/bundle/sh HTTP/1.0" 200 212 - - - 0ms  
  
..."GET /services/admin/bundles/sh?count=-1 HTTP/1.1" 200 3339 - - - 0ms  
..."POST /services/receivers/bundle-delta/sh HTTP/1.0" 200 2027 - - - 11ms
```

- `splunkd.log` channels

- **DistributedBundleReplicationManager**

- Change the log level to **INFO** for debugging purposes (**WARN** by default)

- **DistBundleRestHandler**

- **BundleDeltaHandler**

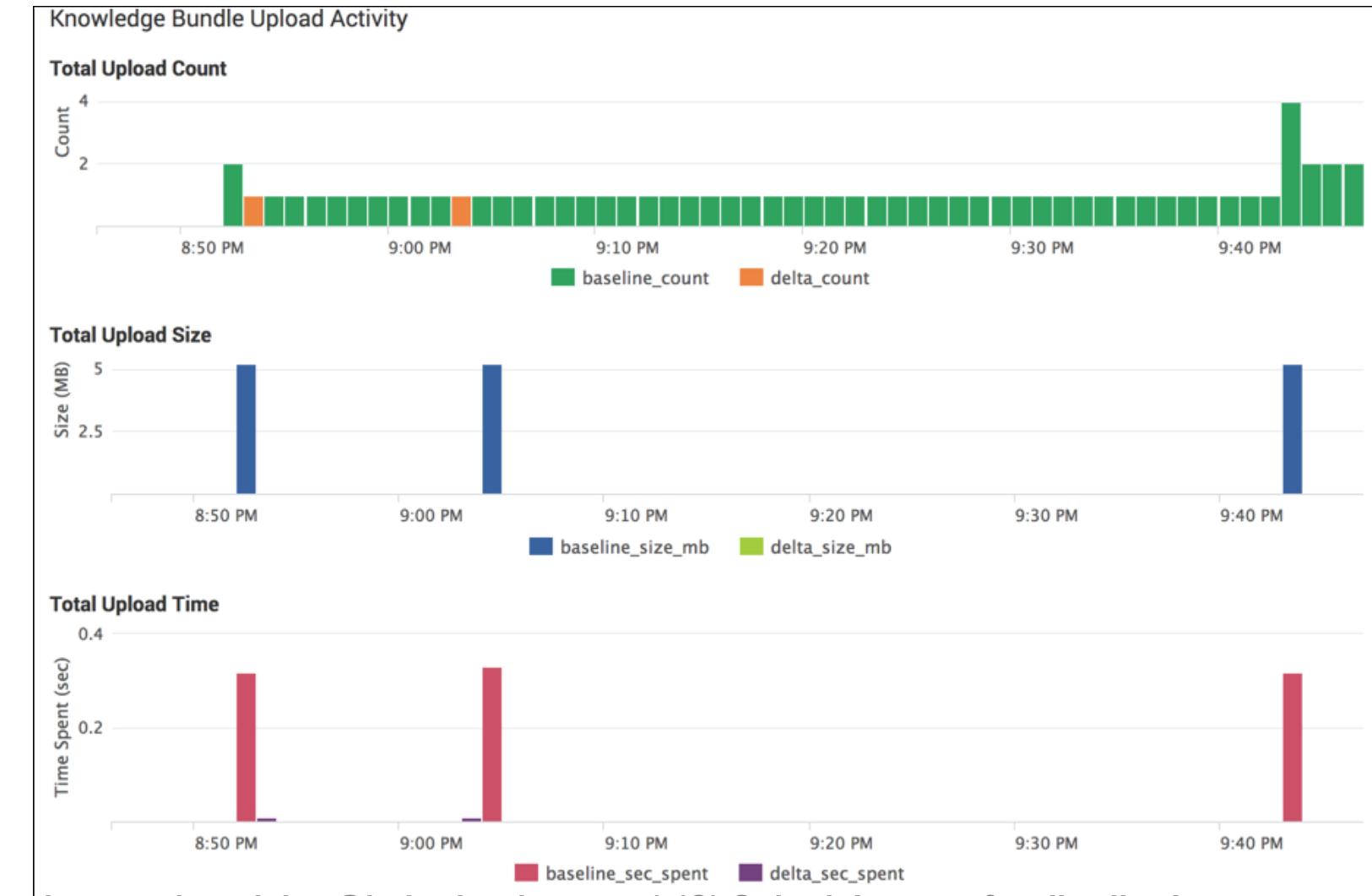
- **NewDistBundleHandler**

- **SearchPeerBundlesSetup**

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Monitoring Bundle Replication Activity

- Monitoring Console in distributed mode
 - Search > Distributed Search > **Distributed Search: Deployment**
- Knowledge Bundle Activity panel shows the replication of both full bundle and delta bundles
- Check both upload and download activities



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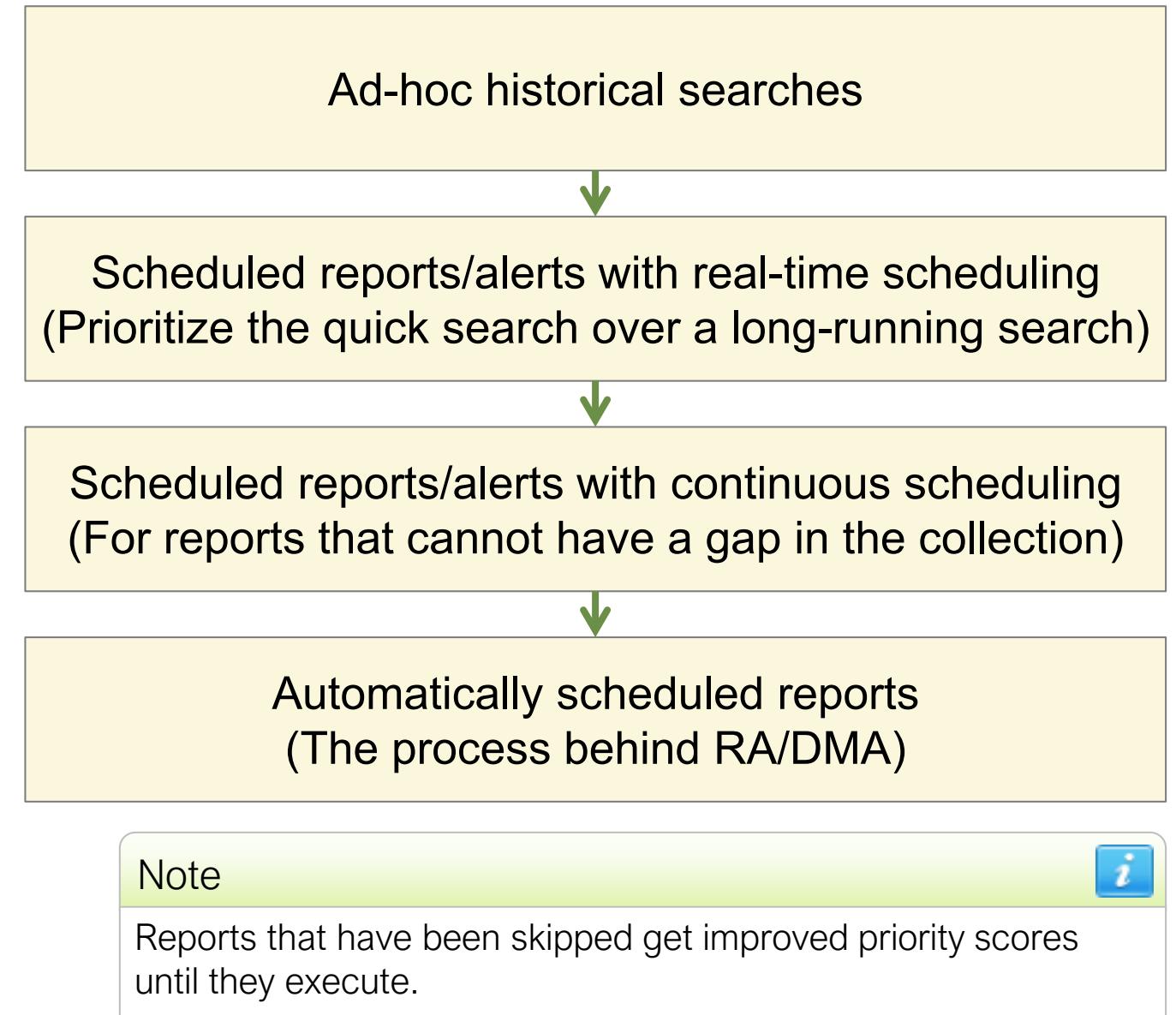
Search Scheduler

- Scheduler manages if, when, and how searches/alerts can be triggered
 - Tracks priority based on search settings and prior-run scoring rules
- When the scheduler is oversubscribed, each job's scheduling mode determines if it is *skipped* or *deferred*
- There are two types of scheduling modes
 - Real-time scheduling can skip a job (default)
 - Continuous scheduling defers a job
- The scheduler prioritizes reports with real-time scheduling over reports with continuous scheduling
- **realtime_schedule** in **savedsearches.conf** indicates the scheduling mode of a search
- If a search is skipped or deferred, check the reported reason in **scheduler.log**

Splunk Scheduling Modes and Priority

- Real-time scheduling
 - **realtime_schedule = 1**
 - Not same as the real-time search
 - Use when you want the latest reports to return up-to-date data
 - A job is skipped if more reports are set to run at the same time than the available capacity
- Continuous scheduling
 - **realtime_schedule = 0**
 - Use when you value data availability over recency
 - A job runs eventually when there is available capacity

• Scheduling Priority



Scheduler Oversubscription – Symptoms

- Health Check indicator provides a single pane of glass of current health status
- Blank dashboard panels
- Alerts are not triggered on time or at all
- Summary indexes have gaps
- DMAs are not 100% up to date
- High number of skipped or deferred searches
 - Check **Search > Scheduler Activity: Instance in Monitoring Console**

Health Status of Splunkd

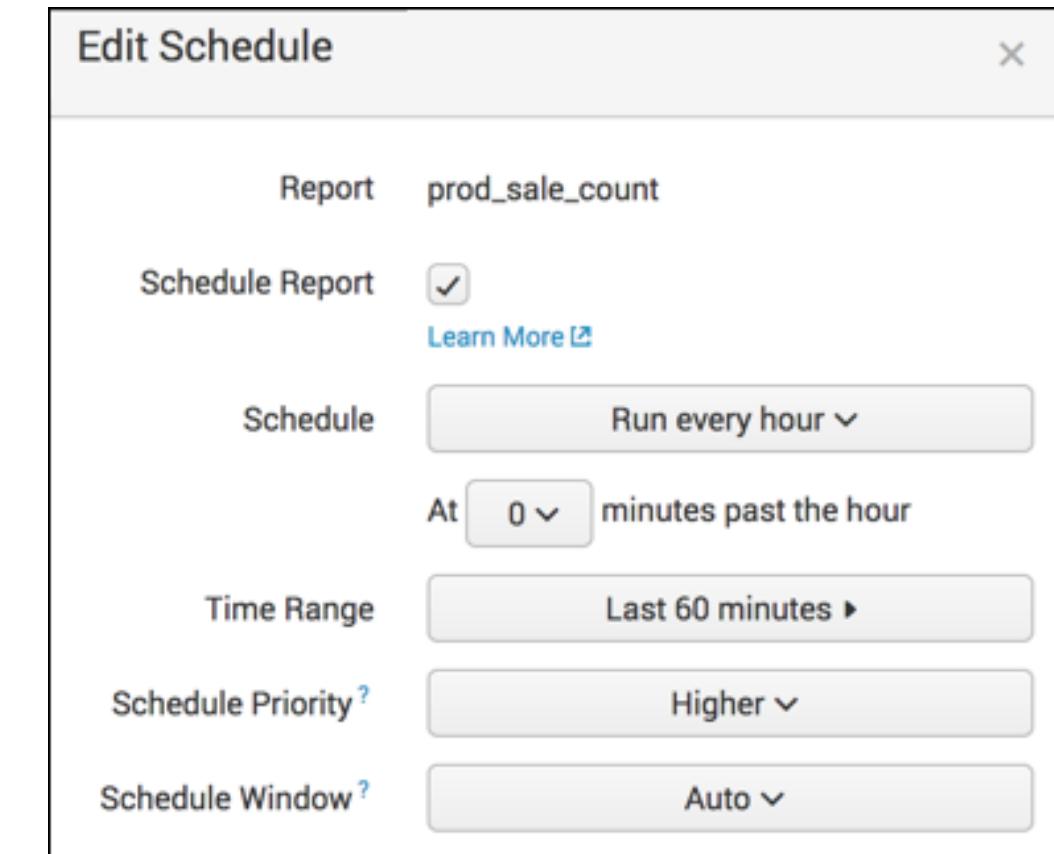
splunkd

Data Forwarding	How to interpret this health report:
Splunk-2-Splunk Forwarding	This health report displays information from the /health/splunkd/details endpoint. There are three potential states for a feature:
TCPOutAutoLB-0	<ul style="list-style-type: none">Green: The feature is functioning properly.Yellow: The feature is experiencing a problem. The feature's status might automatically improve, or it might worsen over time. For details, see Root Cause.Red: The feature has severe issues and is negatively impacting the functionality of your deployment. For details, see Root Cause.Grey: Health report is disabled for the feature.
File Monitor Input	To manage red and yellow threshold values for the individual features, go to Health Report Manager
BatchReader-0	For more information on this health report, see Learn more
TailReader-0	
Index Processor	
Buckets	
Disk Space	
Index Optimization	
Search Scheduler	
Search Lag	
Searches Delayed	
Searches Skipped	

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Scheduler Oversubscription – Workarounds

- Convert inline searches to scheduled searches
- Utilize base searches in dashboards
- Use Splunk guardrails to prevent users from overloading SHs
<http://docs.splunk.com/Documentation/Splunk/latest/Report/PrioritizescheduledreportsinSplunkWeb>
 - Schedule Priority
 - Require the **edit_search_scheduler_priority** capability
 - Schedule Window
 - **allow_skew** in **savedsearches.conf**
 - User/role-based quotas in **authorize.conf**
 - Workload management
- Check **Activity > Jobs** and cancel any rogue jobs
- Monitor MC for search patterns and adjust the schedules
- Add more physical CPU cores
- Use Search Head Clustering



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What Is Using Cores?

	Summary Index	Report Acceleration	Data Model Acceleration
Notes	<ul style="list-style-type: none">Extract the precise results and save to a designated indexCan keep longer than the index retention	<ul style="list-style-type: none">Speed up qualified transforming reports and dashboardsNot useful for reports that generate very high cardinality (use DMA)	<ul style="list-style-type: none">Accelerate many fields as dataset from different searches
Requirements	<ul style="list-style-type: none">Access to indexes	<ul style="list-style-type: none">accelerate_search and schedule_search capabilitiesHave write permissions for the report	<ul style="list-style-type: none">accelerate_datamodel capability
Configuration	<ul style="list-style-type: none">Scheduled reports or SPL	<ul style="list-style-type: none">UI	<ul style="list-style-type: none">UI
Schedule	<ul style="list-style-type: none">User-defined interval1 historical scheduler slot per schedule	<ul style="list-style-type: none">After the initial build, runs scheduled searches on a 10 minute intervalEach acceleration uses 1 summary scheduler slot	<ul style="list-style-type: none">After the initial build, runs scheduled searches on a 5 minute intervalEach acceleration uses 3 summary scheduler slots
Scheduler Mode	<ul style="list-style-type: none">Continuous scheduling	<ul style="list-style-type: none">Real-time scheduling	<ul style="list-style-type: none">Real-time scheduling
Status in MC	<ul style="list-style-type: none">complete / deferred	<ul style="list-style-type: none">complete / skipped	<ul style="list-style-type: none">complete / skipped

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Adjusting Scheduler Guardrails

- A large number of concurrent searches can overload network resources
 - This is not a Splunk issue
 - Use the **allow_skew** setting in **savedsearches.conf**
 - A valid timescale is **0, %, m, h, or d**
- After evaluating the search patterns in MC, if you need to adjust the concurrency allocation, you can adjust them via:
 - **[scheduler]** settings in **limits.conf**
 - Settings > Server settings > Search preferences

Search preferences
Server settings » Search preferences

Default search time range
 This time range is used as the default time range for searches. [Learn More](#)

Relative concurrency limit for scheduled searches
 The maximum number of searches the scheduler can run, as a percentage of the maximum number of concurrent searches. Default value is 50%. [Learn More](#)
This results in an effective concurrency limit for scheduled searches of 7.

Relative concurrency limit for summarization searches
 The maximum number of concurrent searches to be allocated for auto summarization, as a percentage of the concurrent searches that the scheduler can run. Auto summary searches include: searches which generate the data for the Report Acceleration feature or for Data Model acceleration. Note: user scheduled searches take precedence over auto summary searches. Default value is 50%. [Learn More](#)
This results in an effective concurrency limit for summarization searches of 3.

Saving changes to the default time range or concurrency limits does not trigger a restart.

Save

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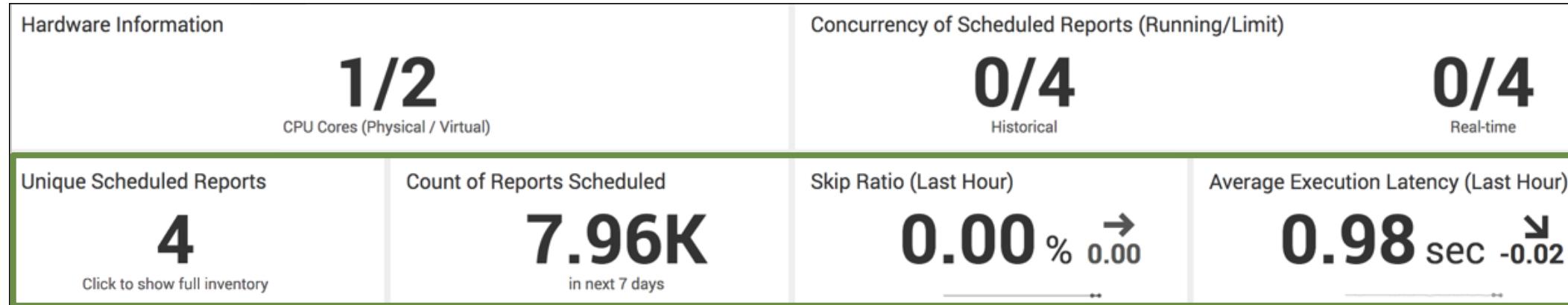
Scheduled Search Best Practice

- Verify when events occurred and actually indexed

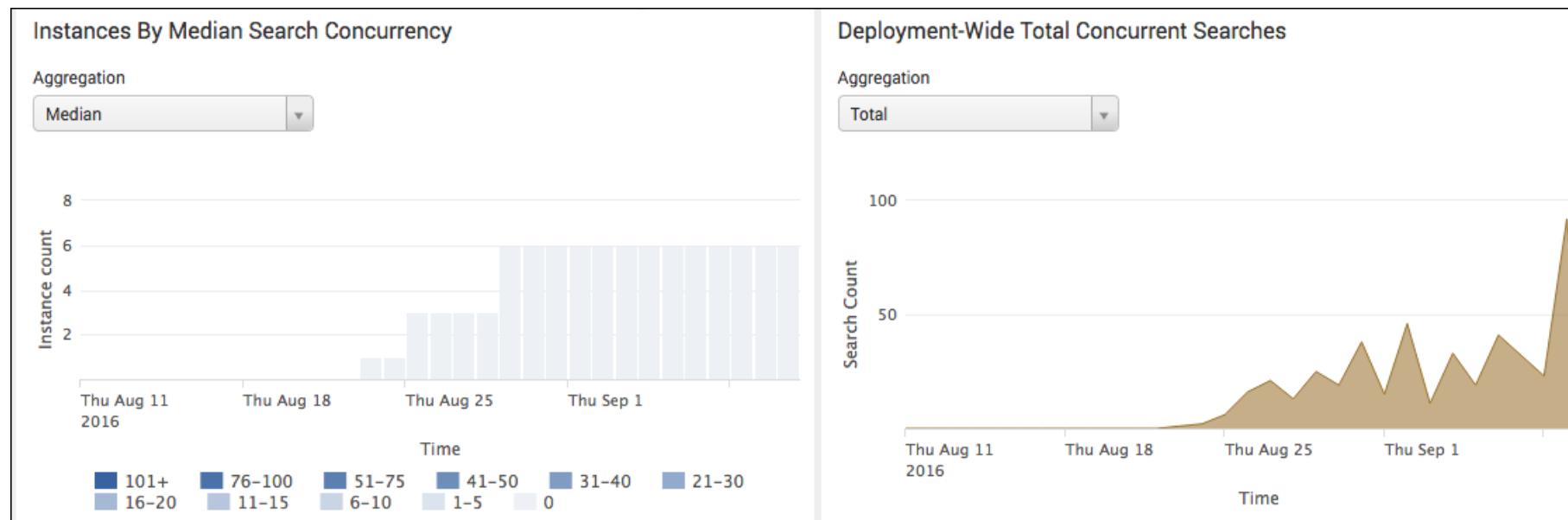
```
<base_search> | head | convert ctime(_time) as evtTime  
ctime(_indextime) as idxTime | eval lag=_indextime-_time |  
table evtTime idxTime lag
```
- Offset search range to compensate for the lag in indexing
Example for a less than a minute lag:
 - Before: **<base_search> earliest=-1m@m latest=now**
 - After: **<base_search> earliest=-2m@m latest=-1m@m**
 - Can accommodate indexing lag and searches over a same span
- Classify and reserve resources for critical services with Workload Management

Troubleshooting Skipped Searches

MC > Search > Scheduler Activity: Instance



MC > Search > Search Activity: Deployment



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Notable Logs

- scheduler.log
`index=_internal
sourcetype=scheduler
status=skipped | stats
count values(alert_actions)
by savedsearch_name, reason`
- audit.log
`index=_audit action=search
| stats count by info`

Troubleshooting a Crash

- Splunk can crash if there is not enough memory
 - On Linux, number of open file descriptors and max user process limit can also be contributing factors
 - <http://docs.splunk.com/Documentation/Splunk/latest/Troubleshooting/ulimitErrors>
 - https://www.splunk.com/en_us/blog/tips-and-tricks/whats-your-ulimit.html
- Most frequent cause – the search ran out of memory
 - Too many events from **join**, **append**, **transaction**, or SPLs with **BY** clause
 - Check the search to see if it can be refined
 - Usually the parent process should still be up
 - Make use of summarization methods
- Not enough disk space (too many job artifacts)
 - Indexing may continue but new searches may not be serviced

Note



Crash problems are VERY difficult to track down and you often need to work with Splunk Support.

Not Enough Memory

- Find System Memory section in the diag:

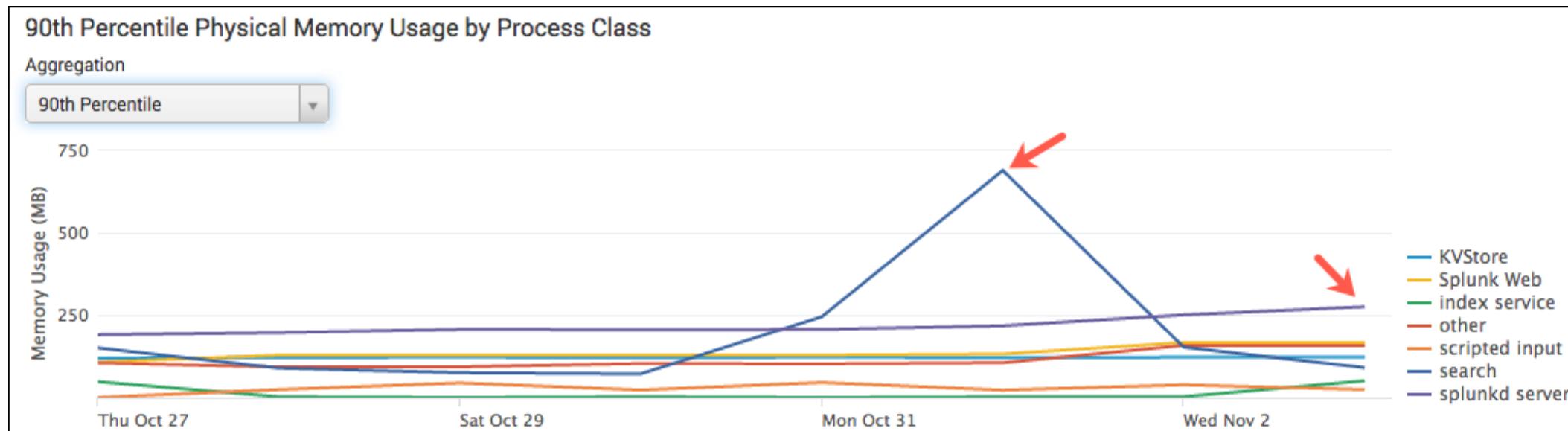
index=mydiag source="*systeminfo.txt" "System Memory"

- Is the memory full? If so, you need to free up more RAM

- Monitoring Console > Resource Usage

- Per instance or machine

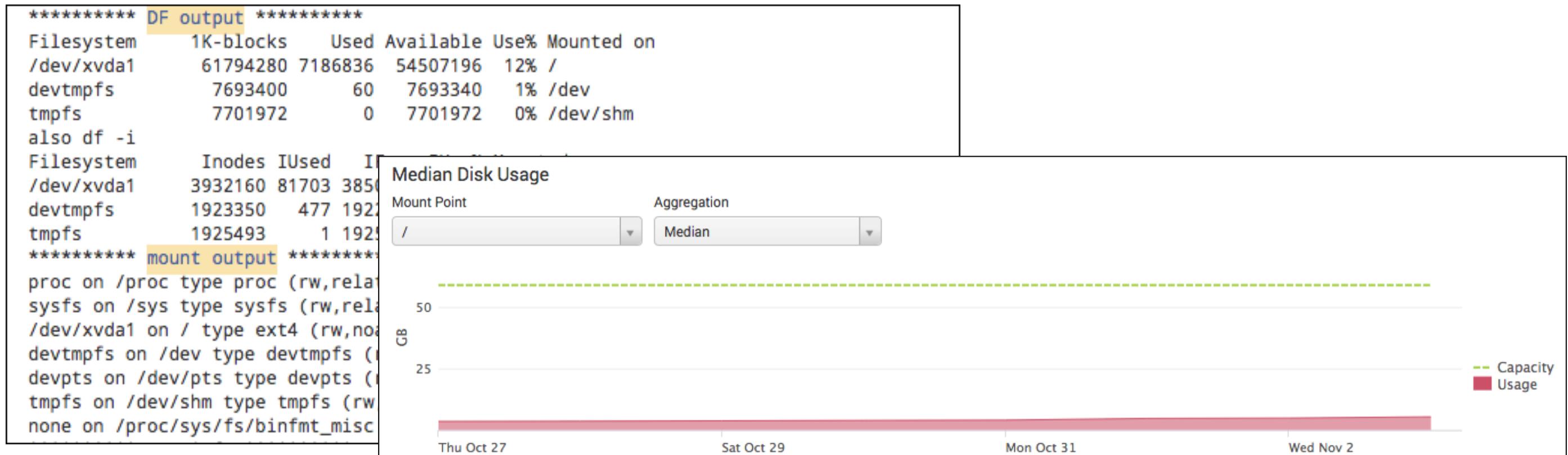
- The historical data comes from **_introspection** index



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Not Enough Disk Space

- Monitoring Console > Resource Usage
- Find DF output section in the diag:
 - **index=mydiag source="*systeminfo.txt" "DF output"**
- Is the Splunk partition full?
- Indexes, search artifacts, old search bundles, and rogue lookup files contribute to disk usage



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Notable Logs for Crashes

- Check if **crash*log** exists
 - For example: **crash-2019-04-27-11:54:26.log**
 - ▶ The timestamp occurs when the crash is reported
 - **splunkd_stderr.log**
 - For *nix, this contains times of healthy start and stop events, exceptions, assertions, and other errors generated by libraries and the OS
- On Windows OS, the dump files are created (***.dmp**)
 - Contains what was in memory at the time of crash
- Check other logs to determine what Splunk was doing at the time
 - **audit.log**
 - **splunkd.log**
 - **metrics.log**
 - **web*.log**

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Helpful Searches

- Show me all Splunk restarts based on loader?

index=_internal sourcetype=splunkd loader event_message=*xml

- Check `splunkd.xml` and `composite.xml` for enabled/disabled processors

- When did Splunk last crash?

index=_internal sourcetype=splunkd_crash_log

- If no crash log exists:

**index=_internal sourcetype=splunkd ("pipelines finished" OR "My
GUID") | transaction startswith="My GUID" endswith="pipelines
finished" keepevicted=true keeporphans=true | search
closed_txn=0 | head 1**

Splunk Workload Management (WLM)

- Policy-based Splunk system resource manager
 - **Workload pools** allocate dedicated compute and memory resources to Splunk processes
 - Assign individual scheduled or ad-hoc searches to designated workload pools, based on policies that you define in *workload rules*
 - **Workload categories** determine the resources available to *workload pools* by process types
 - Three types: search, ingest, and misc.
 - **Workload rules** control access to *workload pools*
 - Protects high-priority search workloads
 - Minimizes indexing latency due to heavy search load
- Create search rules to reserve and assign system resources based on apps and roles
 - Allow admins to take action on runaway search offenders

<http://docs.splunk.com/Documentation/Splunk/latest/Workloads/Keyconcepts>

Lab Exercise 6 – Troubleshoot Job Problems

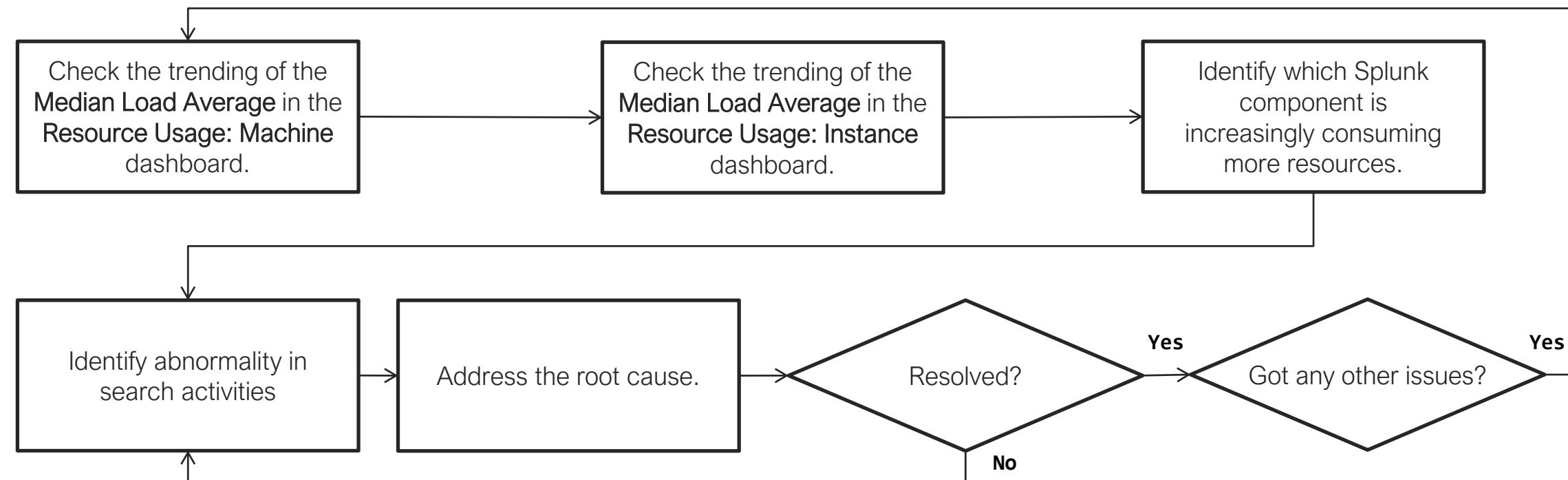
Time: 25 minutes

Tasks:

- Review the **Scheduler Activity: Instance** dashboard
- Confirm the search problems
- Investigate the root cause
- Restore the search functionality

Lab Exercise 6 – Troubleshooting Suggestions

- What is the limit of job types your search head can handle concurrently?
- Can you identify any search job patterns?
 - Who's running the searches, what type of searches, and from which apps?
- How does Splunk handle the search jobs when it is overloaded?
- What Splunk search-time options can help distribute the load?



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Module 7: User Search Problems

Module Objectives

- Identify the types of search problems
- Isolate and troubleshoot search problems

Identifying the Search Problem

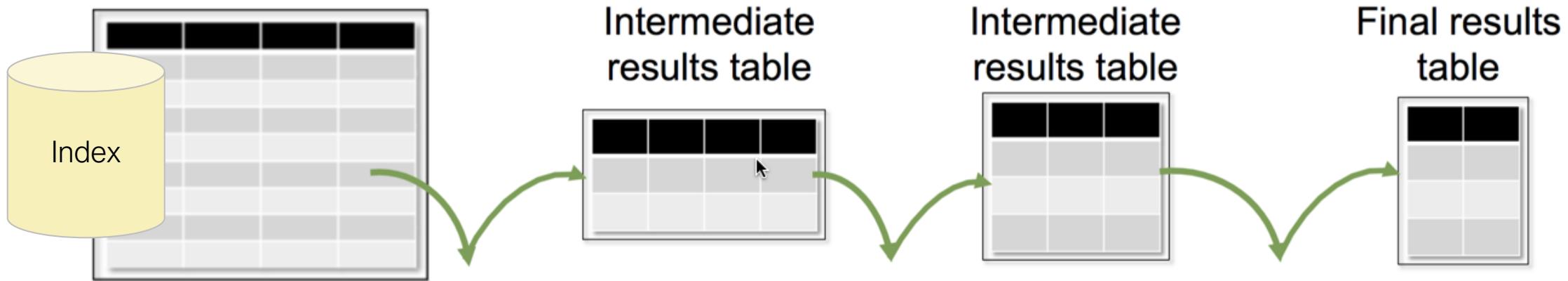
- What type of search is this?
 - Ad-hoc search
 - Real-time search
 - Saved search
 - Scheduled search
 - Alerts
 - Load jobs
- What is the problem?
 - No results
 - Too many results
 - Duplicated events?
 - Partial results
 - Access permission?
 - Slow results
 - Error generated

Note



All search heads and search peers in the environment must have a unique name.

Search Pipeline and Processors



- Splunk Search Processing Language (SPL) encompasses all the search commands and their functions, arguments, and clauses
- Search command is a search processor
 - Each command after a | in a query is a search processor
- Search pipeline is an ordered group of search processors in SPL
 - Translates the commands into processor categories and optimizes them
- Each processor receives events in batch, processes them, and outputs the results based on the processor category

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Determine Where the Search Breaks

- As part of your fact finding, you should “run” the problem search
 - Run the search yourself (on example data) with same permissions
 - Break the search query down into logical pipe segments and run each one incrementally
- Iterate through each subset of the search and check the job inspector
 - Review the search properties and **search.log**
 - ▶ Pay attention to how Splunk optimizes the base *lispys*earch
[https://en.wikipedia.org/wiki/Lisp_\(programming_language\)](https://en.wikipedia.org/wiki/Lisp_(programming_language))
 - Check the execution cost chart for any anomalies
 - Check the **status.csv** in the job directory

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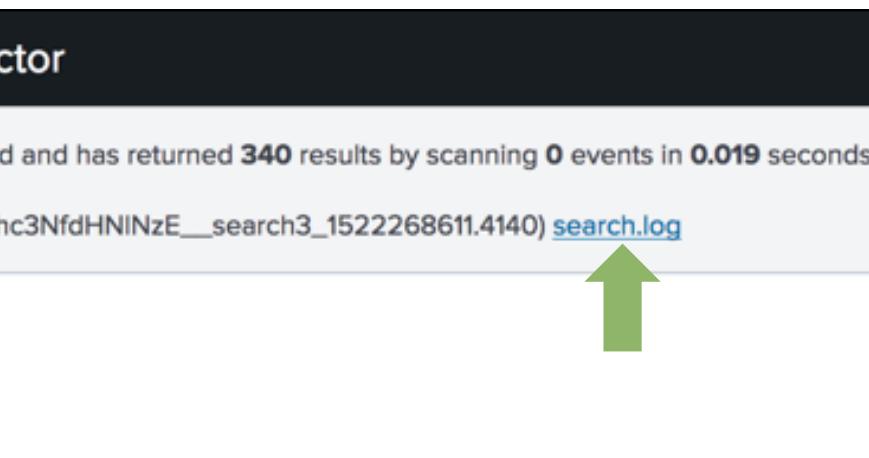
Search Job Inspector

- Job inspector provides details about a search in progress or finished
 - Execution cost can help you determine search processor performance
 - Search job properties is like a "query plan" but more
- Investigate search errors with **search.log**
 - Control the search logging level by:
 - ▶ Editing **limits.conf**

```
[search_info]
infocsv_log_level = DEBUG
```
 - ▶ Insert **| noop log_debug=*** after the base search
 - The default logging can use up to 30 MB (10 MB x 3)
 - Can adjust the size in **SPLUNK_HOME/etc/log-searchprocess.cfg**

<http://docs.splunk.com/Documentation/Splunk/latest/Search/ViewsearchjobpropertieswiththeJobInspector>

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More on Splunk Jobs

- The job result is aggregated to SH and saved in:
SPLUNK_HOME/var/run/splunk/dispatch/<search_id>/
 - Scheduled jobs include the search name as part of the directory name
- Job limits are defined as role restrictions in **authorize.conf**:
 - **srchJobsQuota** and **cumulativeSrchJobsQuota**
 - Maximum number of concurrently running searches a member of this role can have
 - Can be scoped at the role-level and the user-level
 - **srchDiskQuota**
 - Maximum disk space (MB) that can be taken by search jobs belonging to this role
- A list of all current jobs is available under **Activity > Jobs**
 - Or, via REST: **| rest /services/search/jobs**
- Job TTL determines how long the artifact remains in the **dispatch** directory

Default TTL for Job Artifacts

Ad-hoc search

```
[search]
ttl = 600 (10 min)
default_save_ttl = 604800 (1 week)
remote_ttl = 600 (10 minutes)
failed_job_ttl = 86400 (24 hours)
```

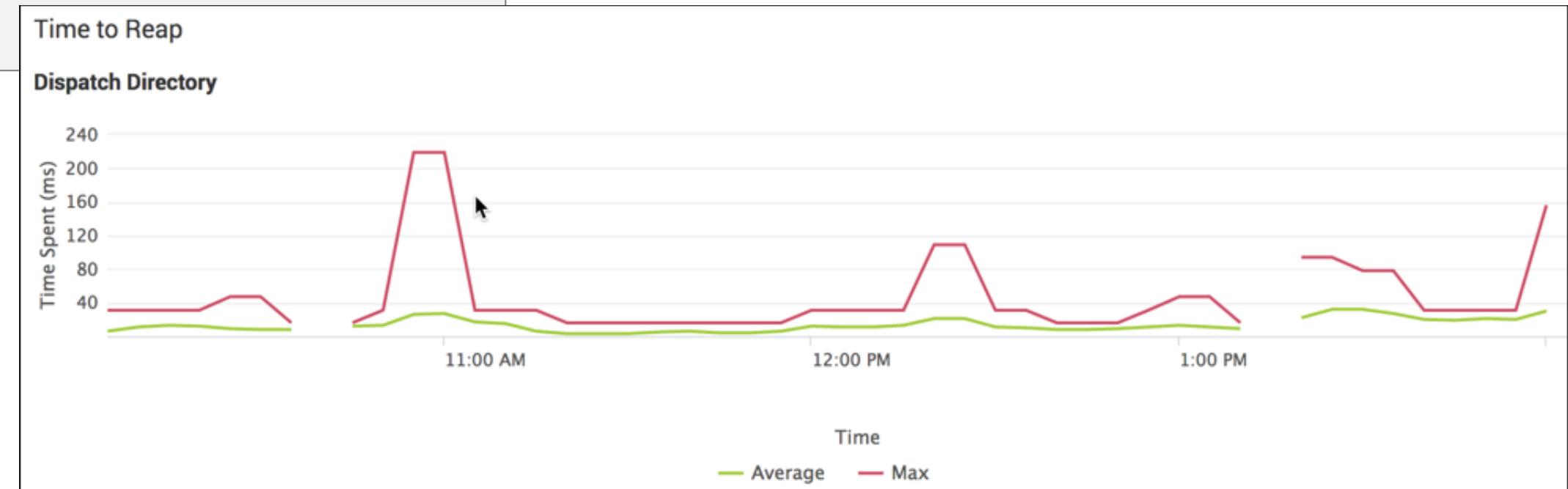
```
[subsearch]
ttl = 300 (5 min)
```

limits.conf

Scheduled search

```
[search_name]
dispatch.ttl = 2p (2x the scheduled period)
```

savedsearches.conf



MC > Search > Distributed Search > Distributed Search: Instance

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Troubleshooting Slow Search Problems

- Check resource usage and search processes in Monitoring Console
- Verify and optimize the search query
 - Check the execution cost
 - Strip out the data you don't need
 - Avoid reporting commands early in the search
- Use the **splunk_server** field to determine if correct search peers are participating
- Restrict searches to certain peers using **splunk_server_group**

Duration (seconds)	Component	Invocations	Input count	Output count
8.33	dispatch.stream.remote	51	-	20,767,549
5.72	dispatch.stream.remote.idx1	27	-	12,316,674
2.61	dispatch.stream.remote.idx2	22	-	8,431,689
0.00	dispatch.stream.remote.idx3	1	-	9,590
0.00	dispatch.stream.remote.idx4	1	-	9,596

```
[distributedSearch]
servers = https://idx1:8089,https://idx2:8089,https://idx3:8089,https://sh1:8089
[distributedSearch:peers4myapp]
servers = localhost:localhost,https://idx1:8089,https://idx2:8089
```

distsearch.conf

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Useful Searches

- Long-running search?

```
index=_audit action="search" (id=* OR search_id=*) | eval  
user=if(user=="n/a",null(),user) | stats max(total_run_time) as  
total_run_time first(user) as user by search_id | stats count  
perc95(total_run_time) median(total_run_time) by user
```

- How much time are the indexers spending in response to queries from SH?

```
index=_internal source=*remote_searches.log server=<sh> | stats  
max(elapsedTime) by search_id host
```

- Identify all splunkd responses taking more than 100ms

```
index=_internal sourcetype=splunkd_access host=<sh> user=<user> | rex  
"(?<spent>\d+)ms" | search spent > 100
```

- What is the size of the artifacts?

```
index=_internal sourcetype=splunkd_access method=GET jobs | stats  
sum(bytes) by uri
```

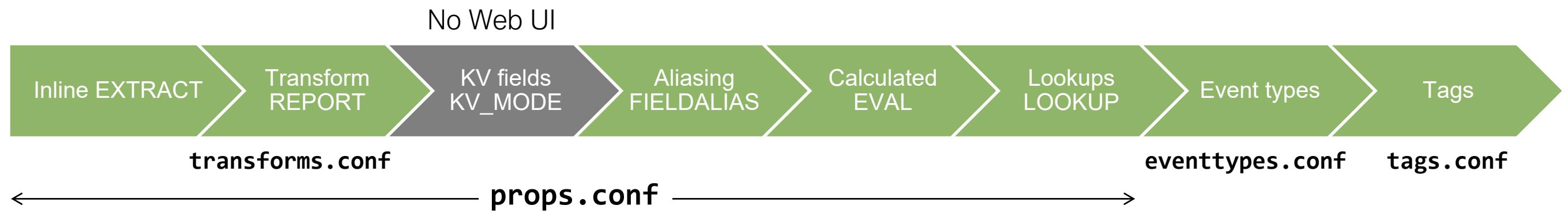
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Troubleshooting No Results Problems

- Modify time span
 - Do not just use All Time
 - First try **_index_earliest=-10m**
- Double check the logic
 - For example, is the user trying to average a non-numeric field?
- Use explicit **index**, **host**, **sourcetype**, **source**, and **splunk_server**
 - **index=*** **host=<x>** **sourcetype=<y>** **splunk_server=<indexer>**
- Has the data actually been indexed? (segmenters and base LISPY)
- Do you have permissions to see the data?
- Is the quota OK? (free space, role, and user)
- Is the peer you are searching in automatic detention?

Search-Time Operation Sequence

- Splunk search derives knowledge objects into a flattened search following a specific sequence
 - Example: Fields from lookups are unavailable when calculated fields reference them in an **eval** expression

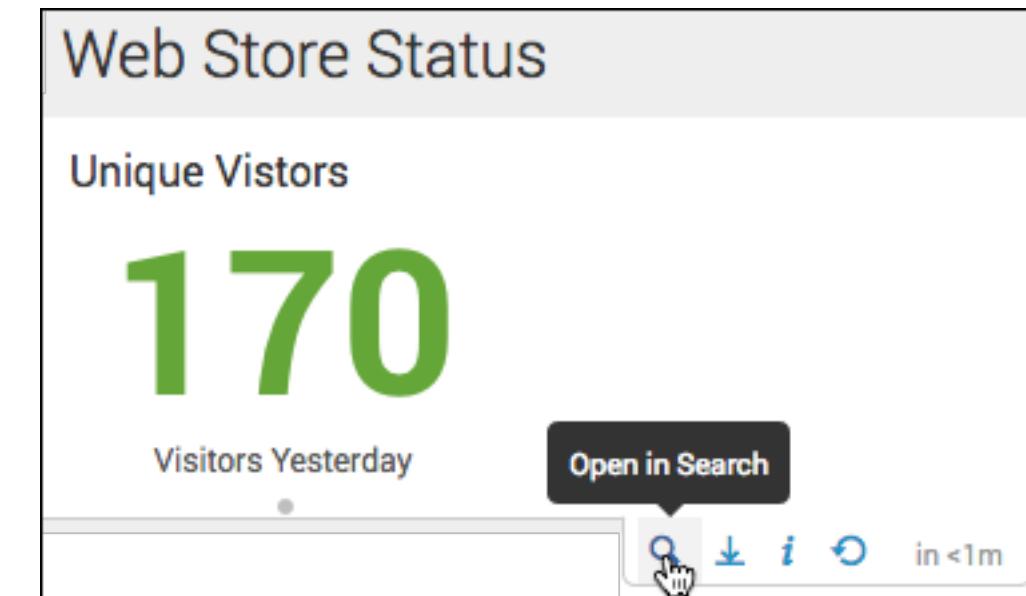


<http://docs.splunk.com/Documentation/Splunk/latest/Knowledge/Searchtimeoperationssequence>

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Dashboard Issues

- Dashboard is loading very slowly
 - Do you need all those searches?
 - ▶ Use base search and post processing
 - Can you use one of the summary options?
- Panel doesn't work
 - Look at the underlying search
 - Expand the search
 - ▶ Mac OSX: Command-Shift-E
 - ▶ Linux & Windows: Control-Shift-E
 - Check the xml source
 - ▶ Is the XML well formed?
 - ▶ Permissions, both file system and Splunk KOs



Note

More dashboard troubleshooting is discussed in Advanced Dashboards and Visualizations course.

Lab Exercise 7 – Troubleshoot Search Issues

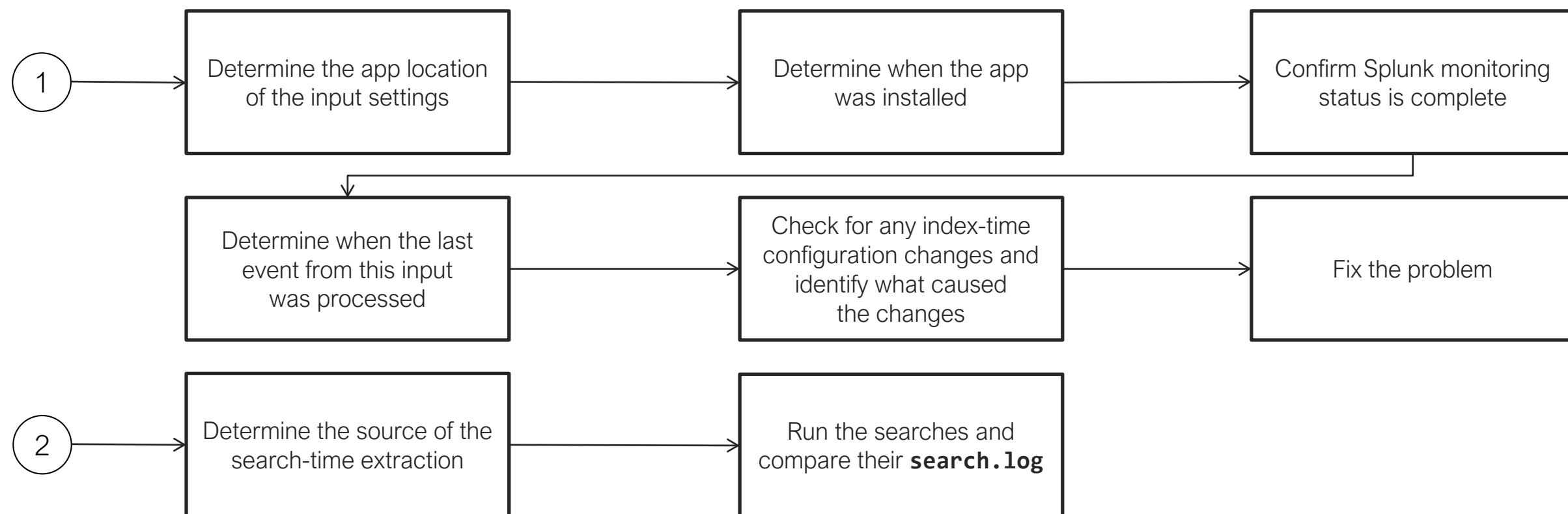
Time: 25 minutes

Tasks:

- Install the **tse_lab07** app
- Two search problems:
 - **index=itops sourcetype=ghostwww | timechart count by host** shows data is missing from a host
 - **index=itops sourcetype=wocheese country=BA OR country=*ZB** shows results but **index=itops sourcetype=wocheese country=ZB** does not
- Investigate the root causes and resolve the issues

Lab Exercise 7 – Troubleshooting Suggestions

1. Can you confirm the input was working before?
 - Since when did the events go missing?
 - Any changes to the system prior to this time?
2. Can you confirm if the searched keywords are in the index?



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Wrap-up Slides

What's Next?

- Splunk Certification program
https://www.splunk.com/en_us/training/faq-training.html
- Program information
 - <https://www.splunk.com/pdfs/training/Splunk-Certification-Candidate-Handbook.pdf>
- Exam registration
 - <https://www.splunk.com/pdfs/training/Exam-Registration-Tutorial.pdf>
- If you have further questions, send an email to:
certification@splunk.com

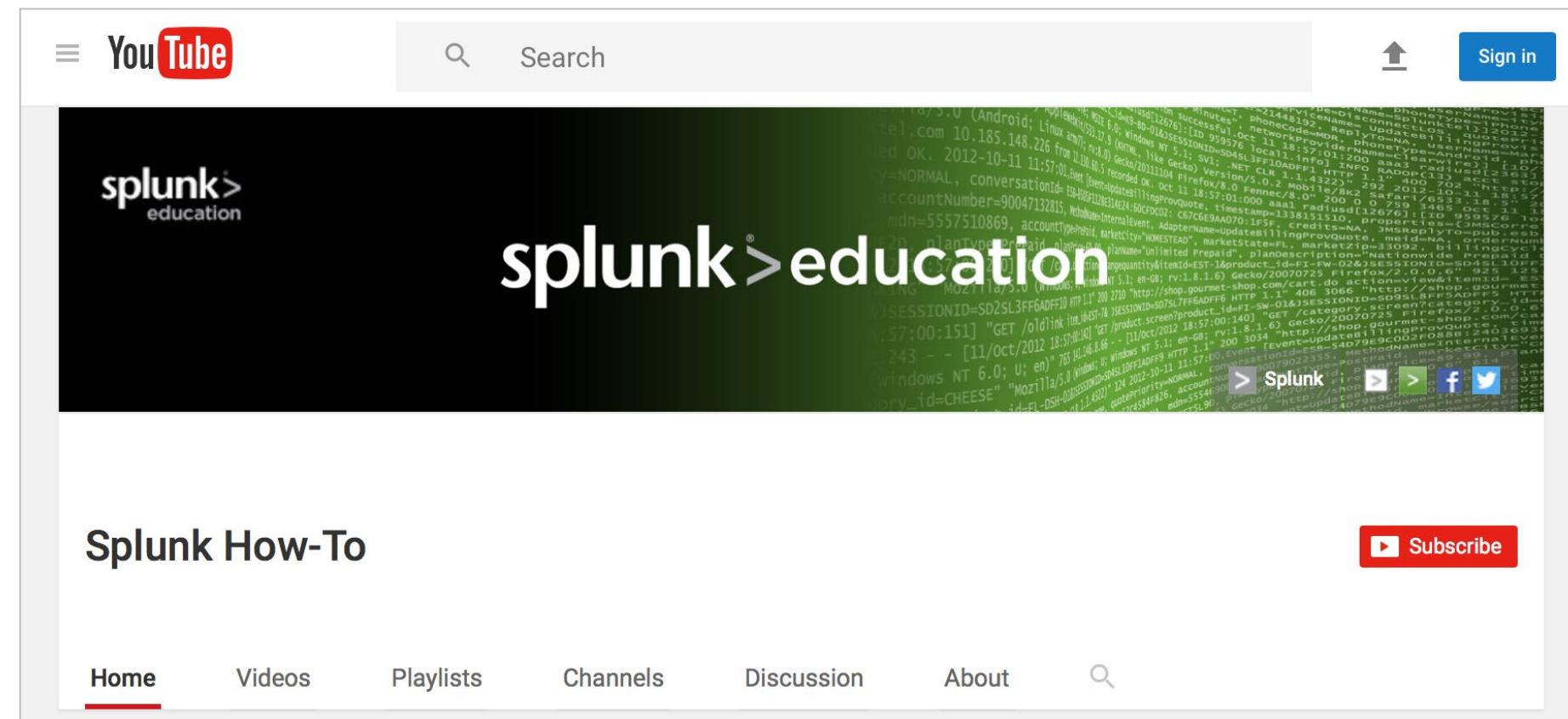
The screenshot shows a landing page for Splunk Training + Certification. The header reads "SPLUNK TRAINING + CERTIFICATION" and "Program Guide & FAQ". Below the header, a sub-header says "Everything you need to know about our training and certification programs, including courses, exams, badges, and policies." A callout "Looking for a downloadable resource for all things Splunk Certification? Look no further." points to a "Splunk Certification Handbook" button. The main content area is divided into two sections: "Training + Certification" on the left and "You Ask, We Answer" on the right. The "Training + Certification" section lists various certification tracks with dropdown menus: "Free Courses", "Learning Paths", "Certification Tracks" (with sub-options like "Splunk Core Certified User", "Splunk Core Certified Power User", etc.), and "Splunk Phantom Certified Admin". The "You Ask, We Answer" section contains a list of frequently asked questions with plus signs for expansion:

- How do I register for Splunk classes?
- I registered for a course. How do I access it?
- How do I launch an eLearning/IOD class?
- How do I reschedule or cancel a class I cannot attend?

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YouTube: The Splunk How-To Channel

- In addition to our roster of training courses, check out the Splunk Education How-To channel: <http://www.youtube.com/c/SplunkHowTo>
- This site provides useful, short videos on a variety of Splunk topics



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Appendix A: Splunk Self-Service and Support Programs

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Splunk Self-Service Support Resources

- Splunk online documentation
 - <http://docs.splunk.com>
 - Make sure you select the correct version
- Splunk community portal
 - <http://community.splunk.com>

The screenshot shows the Splunk Enterprise documentation website. At the top right, there is a dropdown menu labeled "Version" with "8.0.0" selected. The main title is "Splunk® Enterprise". Below the title, there is a breadcrumb navigation: "Documentation / Splunk® Enterprise". A brief description states: "Splunk Enterprise is the data collection, indexing, and visualization engine for operational intelligence." Below this, there is a horizontal navigation bar with tabs: "Get started", "Search and report", "Administer" (which is highlighted in dark grey), "Deploy", "Add data", and "Develop". The main content area contains several sections: "Inherit a Splunk Enterprise Deployment", "Securing Splunk Enterprise", "Monitoring Splunk Enterprise", "Admin Manual", "Troubleshooting Manual", "Workload Management", "Getting Data In", "Splunk Analytics for Hadoop", and "REST API Reference Manual". Each section has a brief description and a link.

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Splunk Community Portal

- Ask an expert: <https://community.splunk.com>
 - Get answers to your questions from Splunk experts
- Splunk blogs: https://www.splunk.com/en_us/blog
- Splunk for developers: <http://dev.splunk.com>
- Hot wiki topics: <http://wiki.splunk.com>
 - Includes best practices and how-tos
- Splunk user groups: <https://usergroups.splunk.com>
 - Connect with like-minded Splunk professionals near you

Splunk Support Programs

	Community (Free)	Standard (Enterprise, Cloud, Premium Apps)	Premium
Access to Splunk Documentation	✓	✓	✓
Access to Splunk Answers	✓	✓	✓
Live Product Roadmap Input	✓	✓	✓
Online Case Submission		✓	✓
Online Case Status		✓	✓
Response Time Targets		✓	✓
Phone Support		✓	✓
Direct Access to Advanced Support Team			✓
24/7 Availability		P1	P1 & P2

Splunk support versions: https://www.splunk.com/en_us/support-and-services/support-programs.html

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Splunk Support Case Priority Levels

Priority Level	Description
P1	<ul style="list-style-type: none">• A production environment is completely inaccessible• Most functionality is unusable
P2	<ul style="list-style-type: none">• One or more important features of a production environment is unusable
P3	<ul style="list-style-type: none">• Any feature of purchased Splunk software is not operating as documented
P4	<ul style="list-style-type: none">• All enhancement requests and general questions

Check targeted response times:

https://www.splunk.com/en_us/support-and-services/support-programs.html

Note



Targeted response times are based on support program and priority level.

Escalating to Splunk Support

- Splunk Support is your communication channel to all things Splunk
 - Splunk Support Portal
 - ▶ http://login.splunk.com/page/sso_redirect?type=portal
 - Phone: (855) SPLUNKS or (855) 775-8657
 - ▶ Regional business hours, 24x7 for critical issues
 - More in-country toll-free hotlines:
 - ▶ http://www.splunk.com/en_us/about-us/contact.html#tabs/customer-support

Splunk Success Plans

- An additional tiered, Splunk support entitlement

https://www.splunk.com/en_us/support-and-services/support-programs.html#success

- Includes Support, Admin on Demand (AoD), and Customer Success Managers (CSM)

- AoD is a credit-based, technical assistance service to provide pre-defined PS tasks

<https://www.splunk.com/pdfs/legal/Splunk-Admin-On-Demand-CSM-Datasheet-101.pdf>

- Click **Admin on Demand Submit Request** from the Splunk Customer Support Portal
 - A CSM is your Splunk advocate and will help you with use cases, data lifecycle management, program management, etc.

Appendix B: Windows Input Error

Scripted Input Errors and Fixes

- Fix the permissions
 - Splunk is running as a user who doesn't have the permission to run the script
 - Or the script is trying to do something that the Splunk user can't do
 - Make sure that the script actually works by running it manually

```
./splunk cmd ../etc/apps/<app>/bin/<script>
```
- Wrong directory
 - Splunk runs scripted inputs from designated **bin** directories
 - **SPLUNK_HOME/etc/system/bin**
 - **SPLUNK_HOME/etc/apps/<app_name>/bin**
 - Move the script to the proper location
- Duplicate data
 - A custom script may lack the intelligence that the monitor has
 - Make sure the script “knows” what to output on each run
 - Modular input provides a checkpoint facility

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Windows Inputs Errors and Fixes

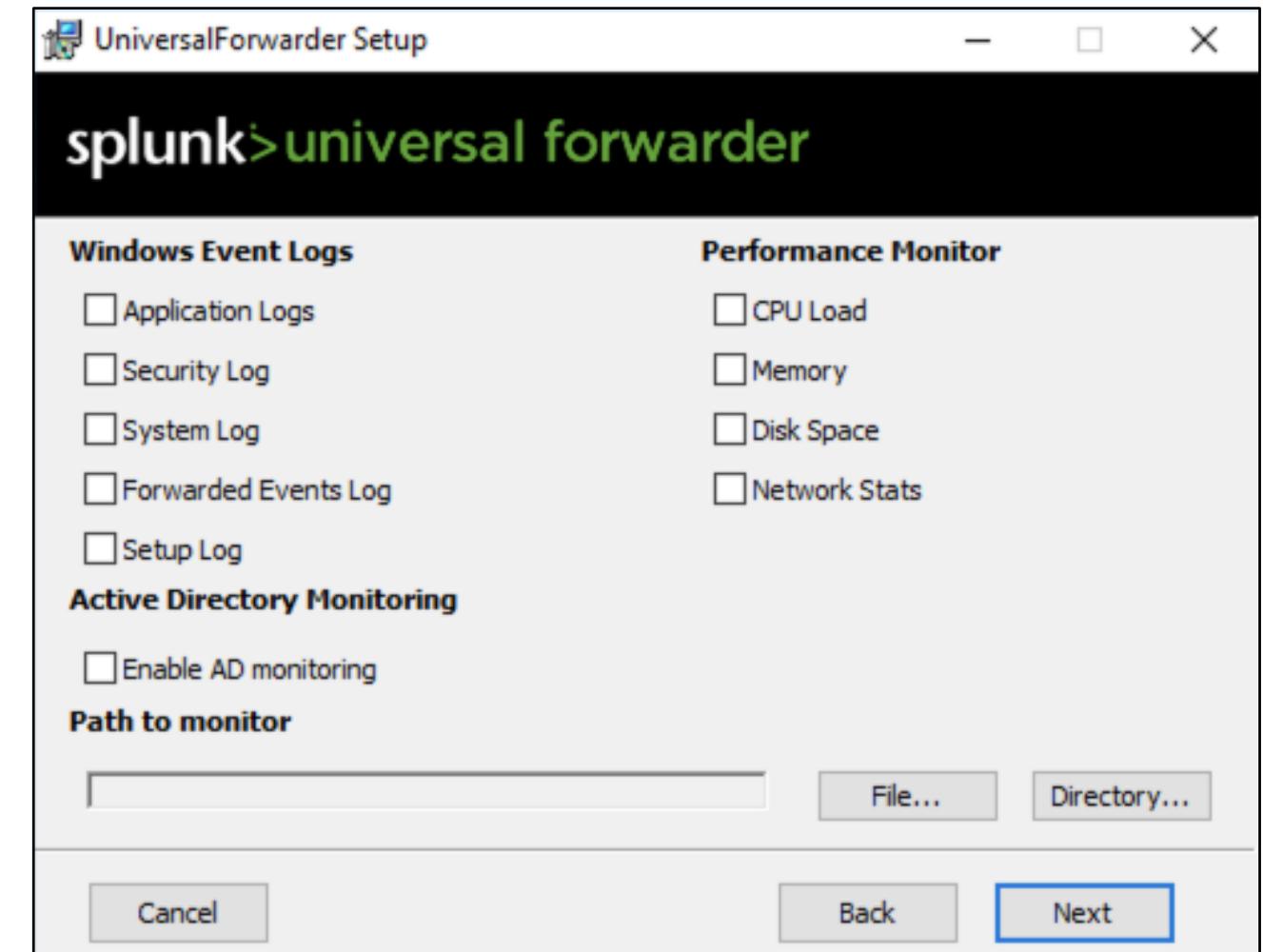
- Use local Windows collection whenever possible
 - Local Windows inputs behave differently than remote collection
 - Local Windows inputs only involve a forwarder setup
- Too much data from AD monitor (**admon**)
 - Splunk AD monitor recursively traverses the AD tree from a given start point
 - ▶ When set without any restrictions, Splunk may read too much data
 - Limit with **startingNode** and **monitorSubtree**
 - <http://docs.splunk.com/Documentation/Splunk/latest/Data/MonitorActiveDirectory>
- For WMI inputs, the user must have the proper domain privileges to gather remote data
 - Can only support a small number of remote clients
 - Remote collection on desktop clients is turned off

Windows Inputs Errors and Fixes (cont.)

- Windows servers can generate a lot of events
- A busy Windows UF can encounter collection limit, especially when the UF has been restarted
 - Might still be collecting the older events first
 - If you can, upgrade the forwarder to the latest version
 - If upgrade is not possible, collect only recent logs or monitor the recent events first
 - **current_only=1**
 - **start_from=newest**
- Reduce the volume of events to collect
 - Use **whitelist/blacklist** to filter specific **EventCodes** or **key=regex**
- Sysinternals: <https://docs.microsoft.com/en-us/sysinternals/>

Considerations for Windows Installer Inputs

- When you select inputs from the list while using the Windows universal forwarder installer, the resulting **inputs.conf** is:
 - Put in **etc/system/local**
 - Owned by msi-installer
 - Cannot be managed via deployment server
 - Will not allow Windows to install TA on top



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