



Splunk Fundamentals 1

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Outline

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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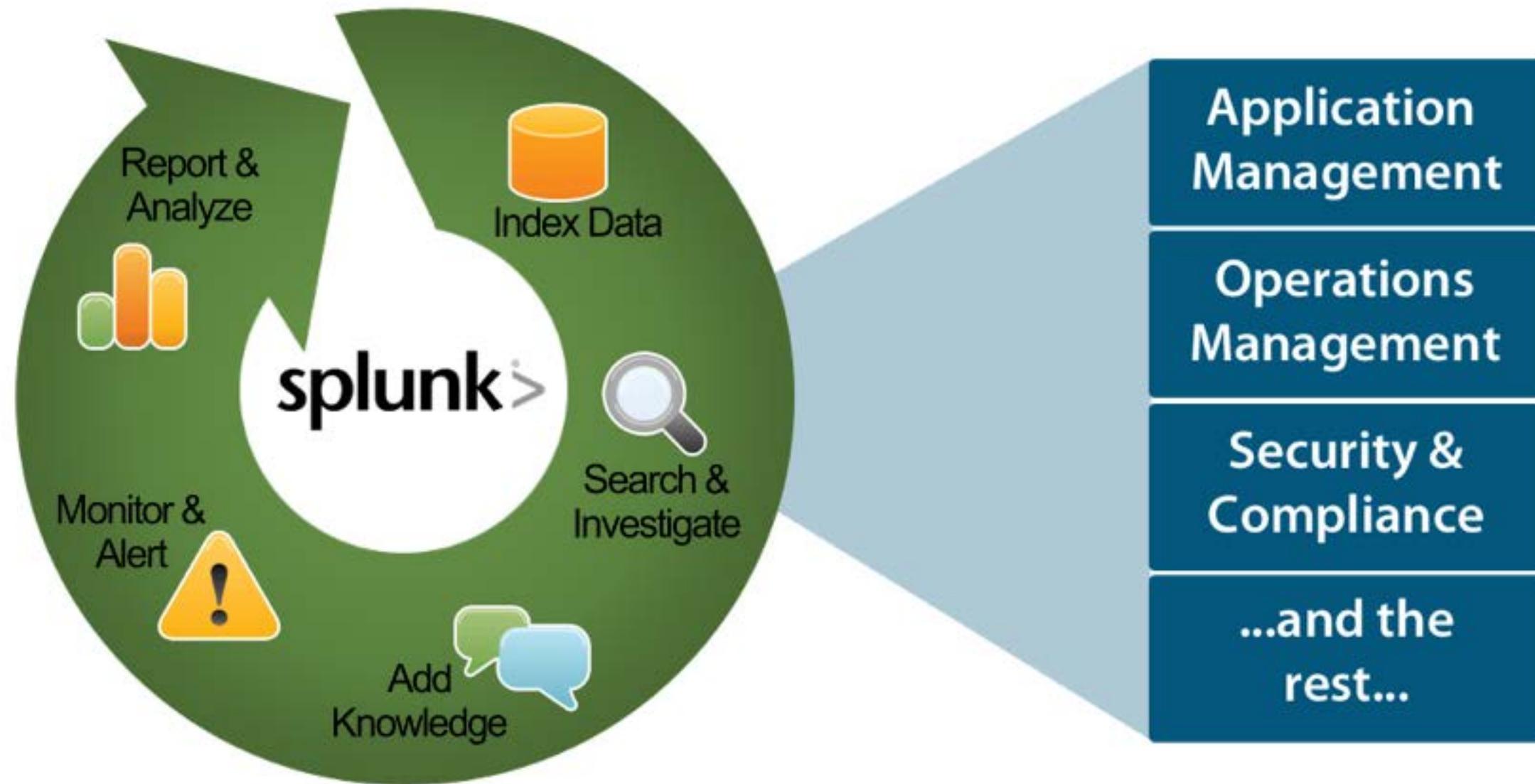
Understanding Splunk



- 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

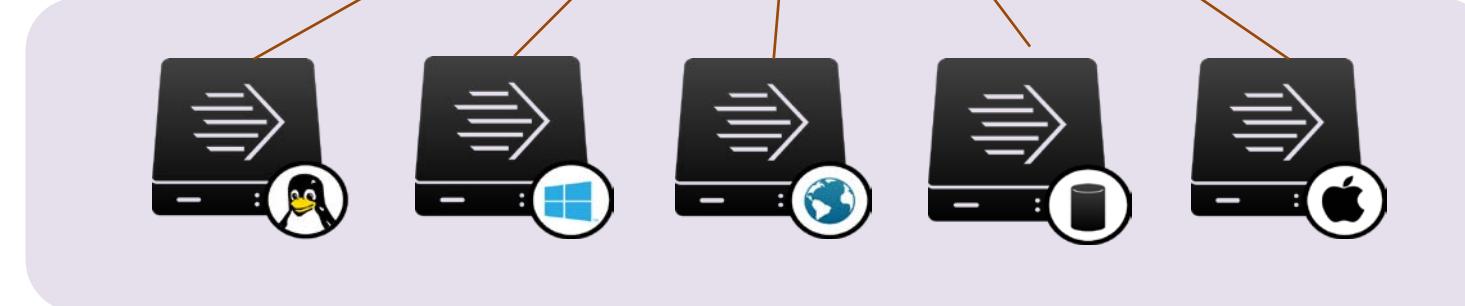
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How Does Splunk Work?

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**

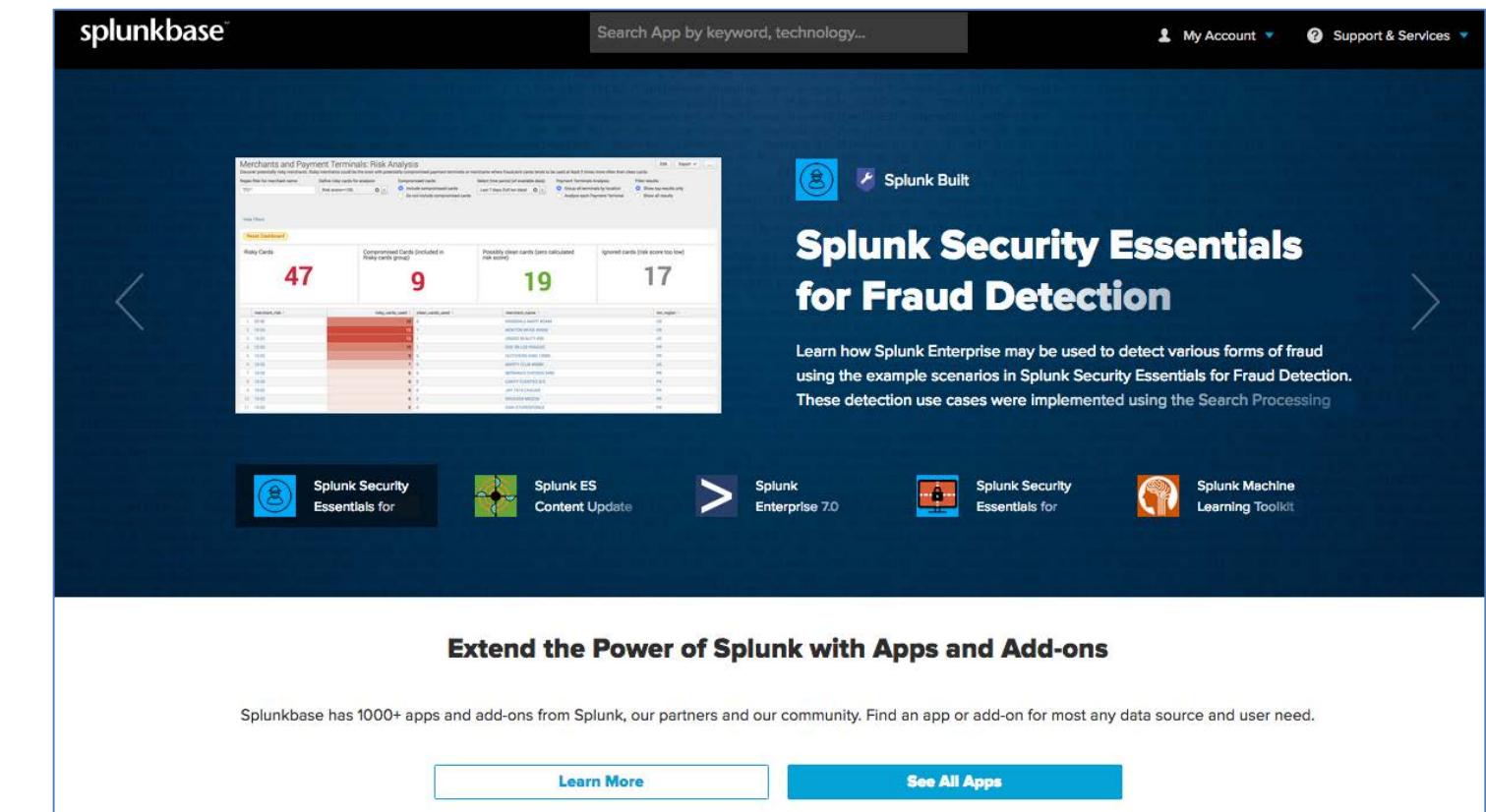
- Solution for small IT environments



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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) 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



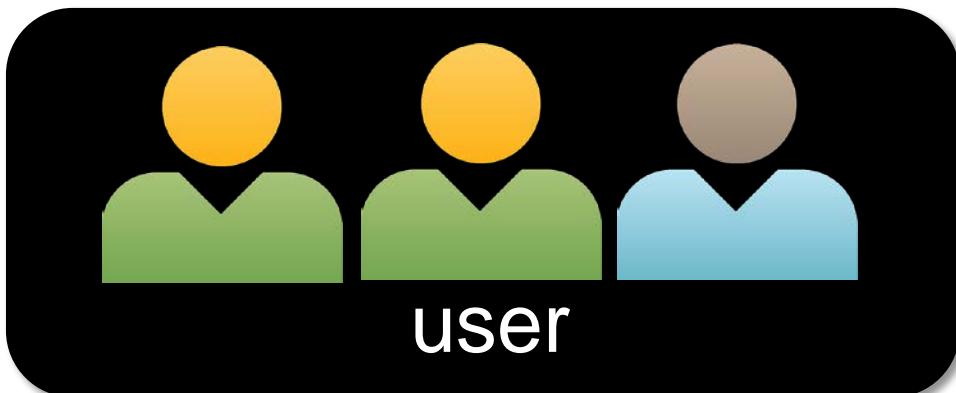
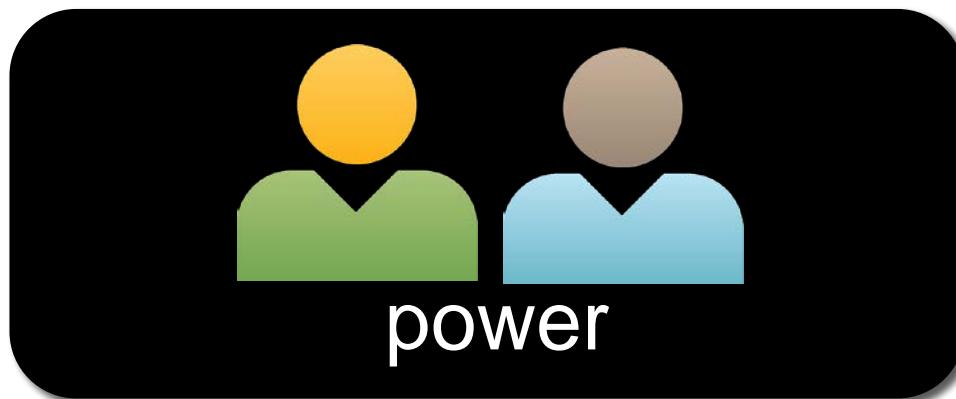
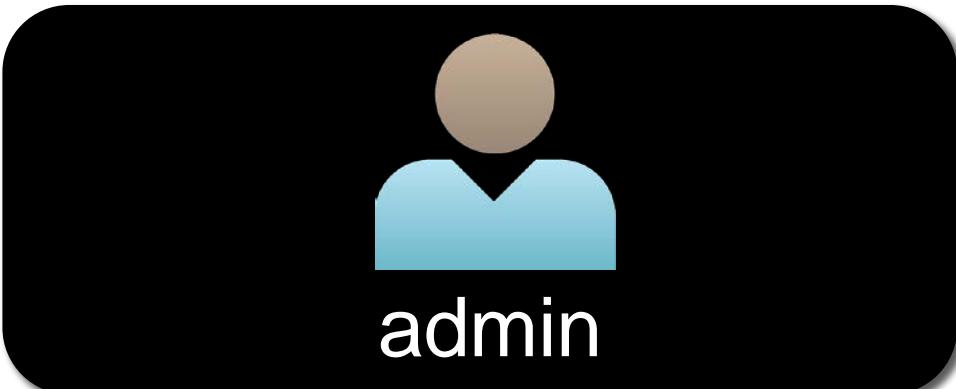
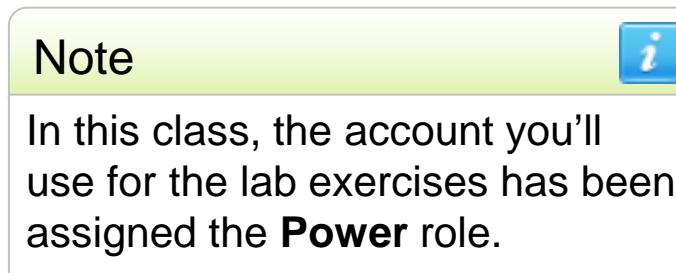
Note

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

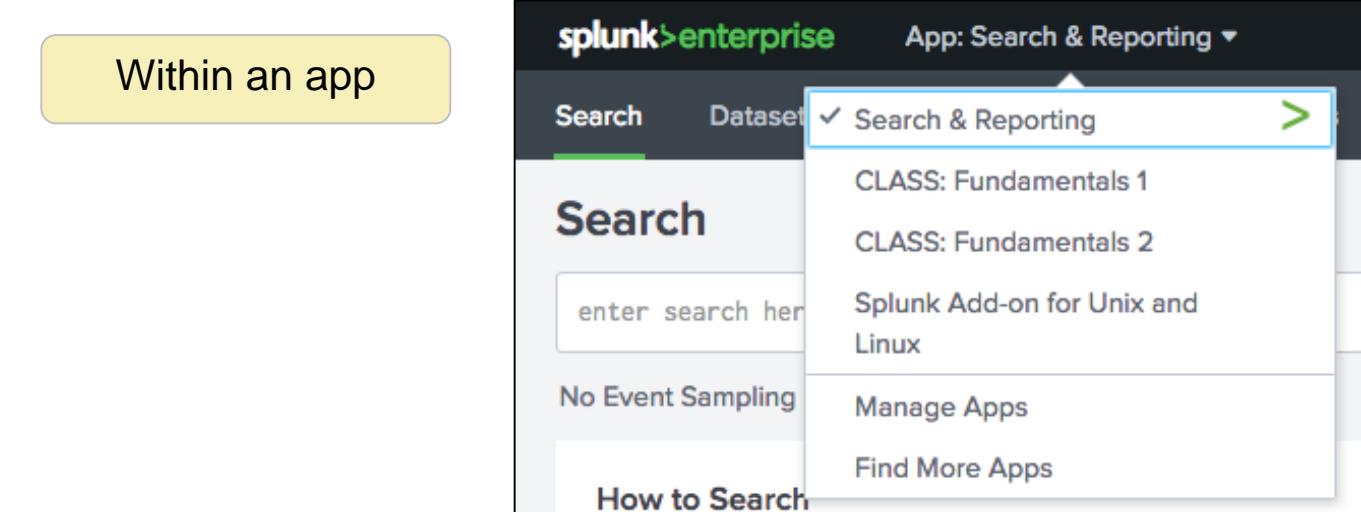
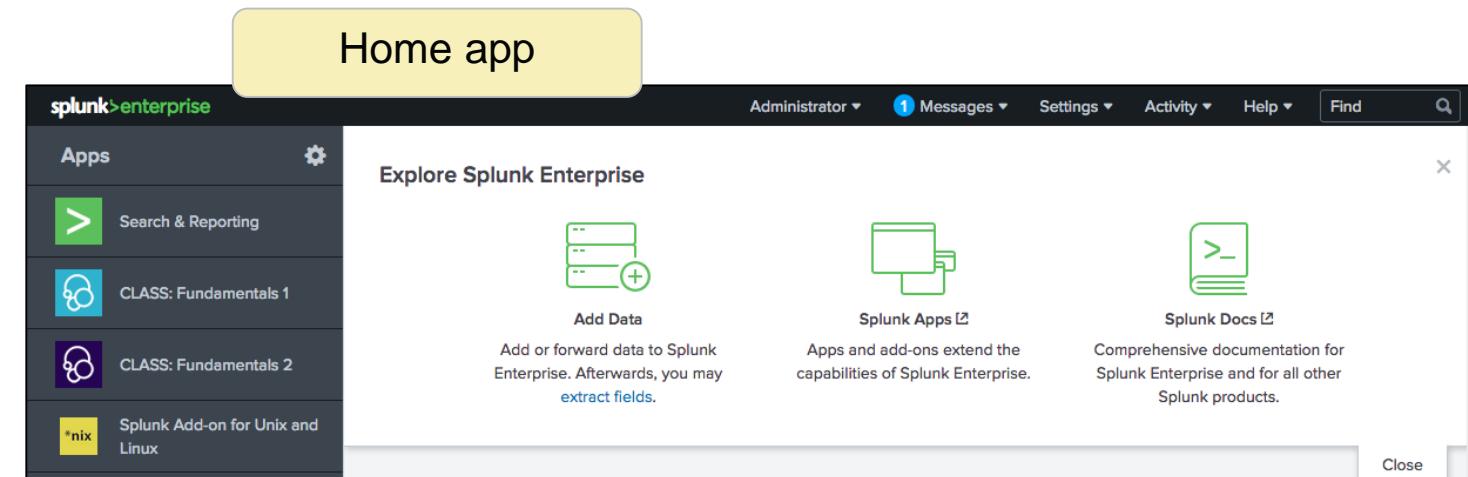
You or your organization may change your default app



A screenshot of the Splunk Enterprise search interface. The top navigation bar includes the "splunk>enterprise" logo, a dropdown for "App: Search & Reporting", user profile information, and a "Find" search bar. A red circle labeled "1" is over the "Username" field in the login area. Another red circle labeled "2" is over the "Search" tab in the main menu. The main search area has a search bar with "enter search here...", a time range selector set to "Last 24 hours", and a "Search & Reporting" link. On the left, there's a "How to Search" section with links to "Documentation" and "Tutorial". On the right, there's a "What to Search" summary showing "5,981,905 Events" from "7 months ago" to "Now", with links to "INDEXED", "EARLIEST EVENT", and "LATEST EVENT". At the bottom, a footer note reads "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

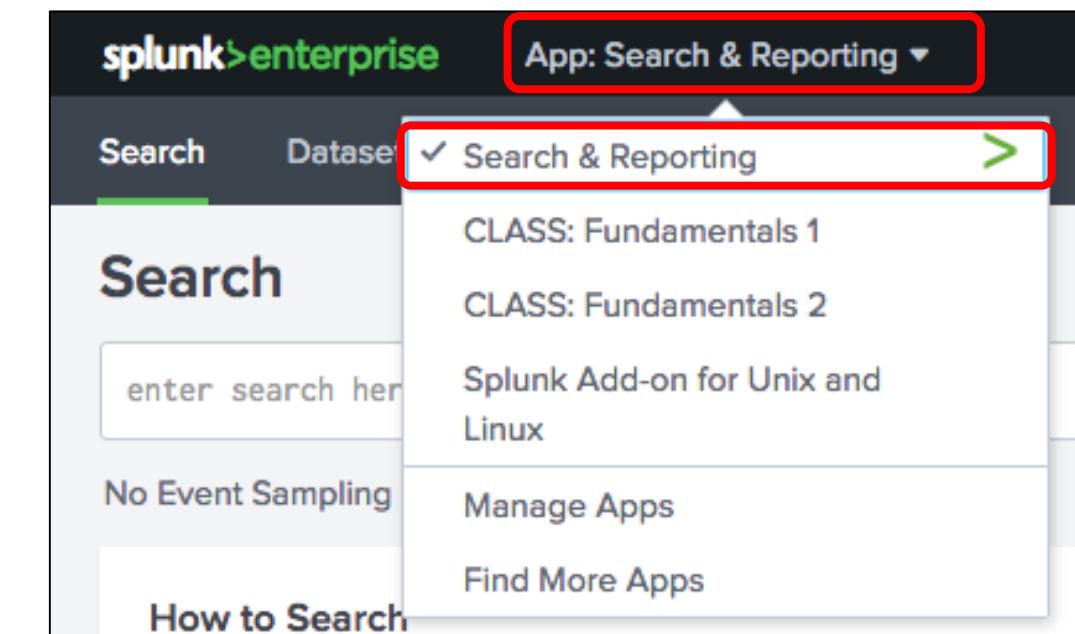
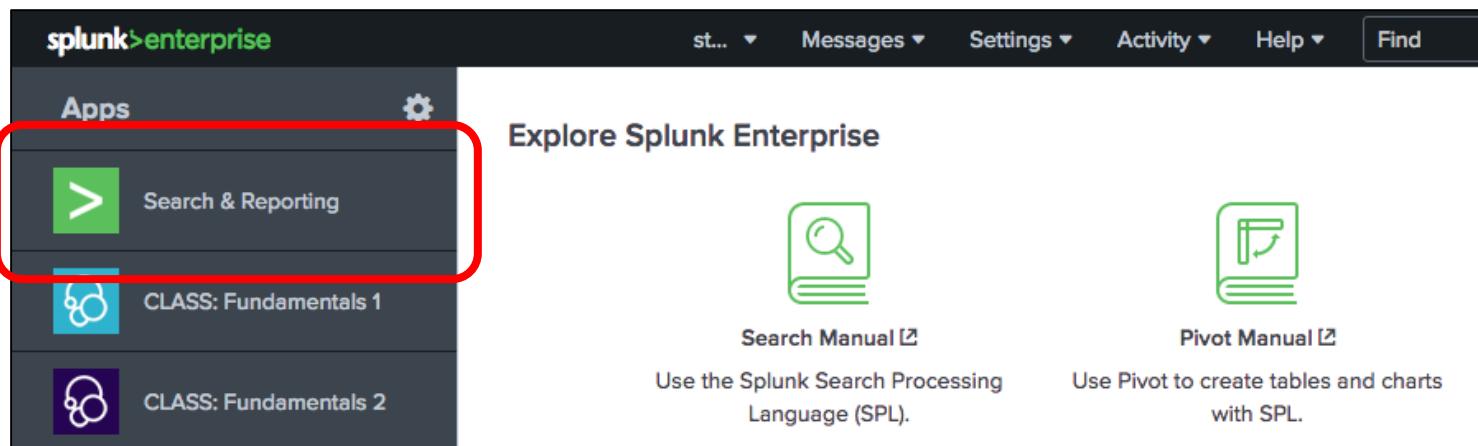
You can always click the Splunk logo to return to whatever app is set as your default app.

The screenshot shows the Splunk Enterprise Home App interface. At the top, there's a navigation bar with 'student1' (dropdown), 'Messages' (dropdown), 'Settings' (dropdown), 'Activity' (dropdown), 'Help' (dropdown), 'Find', and a search icon. Below the navigation bar is a sidebar titled 'splunk>enterprise' with a gear icon. The sidebar lists several apps: '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 main content area titled 'Explore Splunk Enterprise'. It features three cards: 'Search Manual' (book with magnifying glass icon), 'Pivot Manual' (book with chart icon), and 'Dashboards & Visualizations' (book with dashboard icon). Below these cards is a section titled 'Choose a home dashboard' with a monitor icon. A yellow callout bubble points to the 'Dashboards & Visualizations' card with the text 'Links to several helpful resources'. Another yellow callout bubble points to the 'Choose a home dashboard' section with the text 'After you've built dashboards with your data, you can choose one to appear in your Home app'. A note at the bottom left says 'If you or your organization doesn't choose a default app, then your default app is the Home app.' with an info icon.

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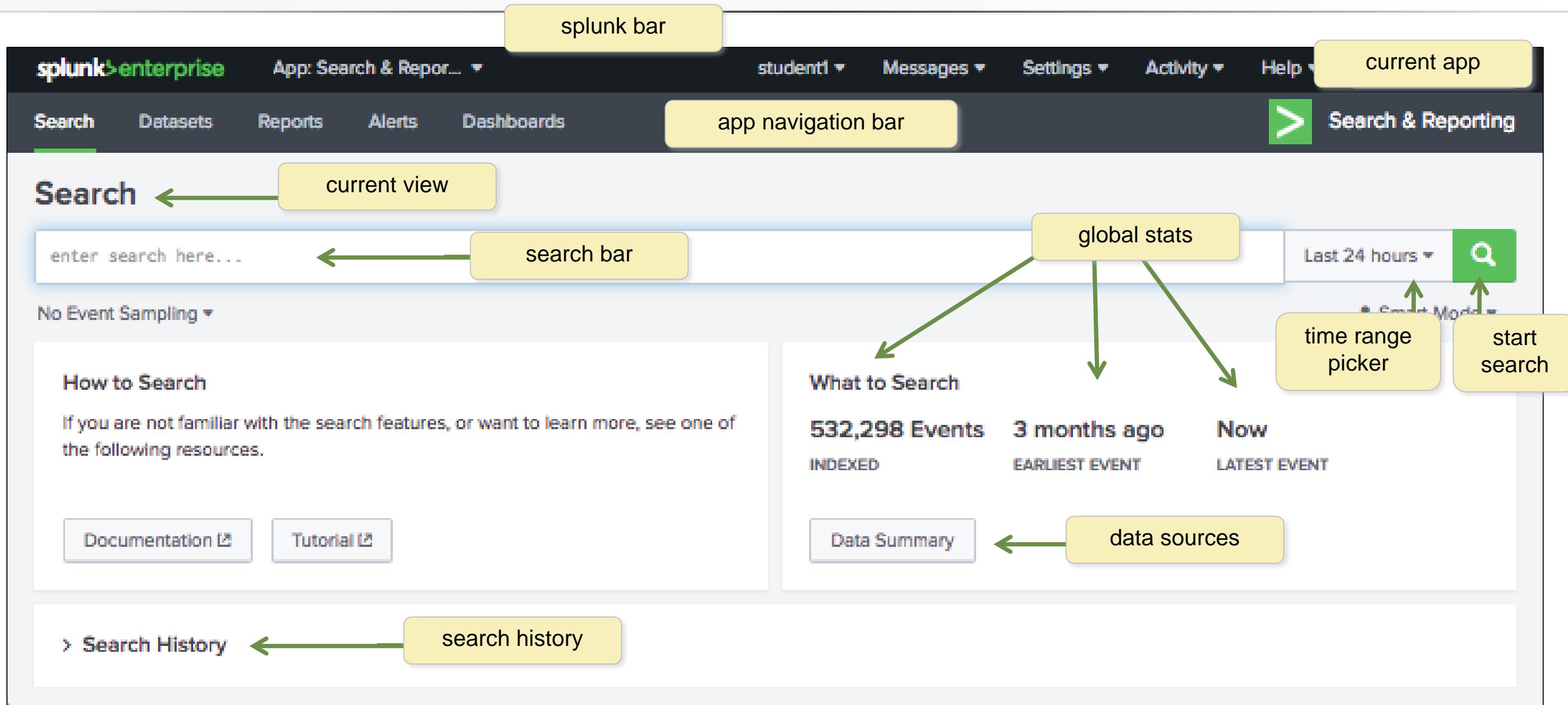
Search & Reporting App

- 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

Click Data Summary to see hosts, sources, or sourcetypes on separate tabs

- Host – Unique identifier of where the events originated (host name, IP address, etc.)
- Source - Name of the file, stream, or other input
- Sourcetype - Specific data type or data format

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 query 'error OR fail*' is entered in the search bar, resulting in 2,044 events found over the last 24 hours. The 'Events (2,044)' tab is selected, displaying a timeline of events from January 4, 2018, at 16:12:44. The events list includes fields such as host, source, and sourcetype. A specific event is highlighted, showing details like 'host = www2' and 'source = /opt/log/www2/secure.log'. The interface also shows a sidebar with 'SELECTED FIELDS' and 'INTERESTING FIELDS'.

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

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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 3rd party stores and through its online store



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Your Role at Buttercup Games

- 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



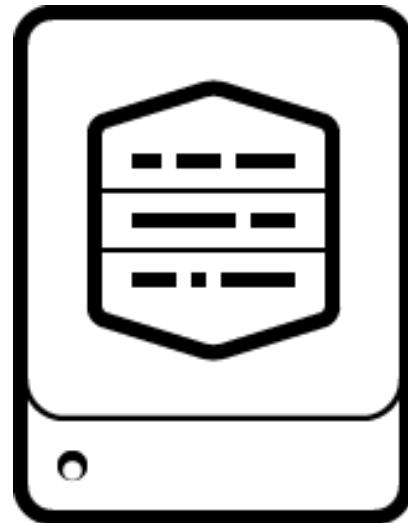
Learn more about Splunk from Splunk's online glossary, the Splexicon at <http://docs.splunk.com/Splexicon>

Module 2: Splunk Components

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Splunk Components

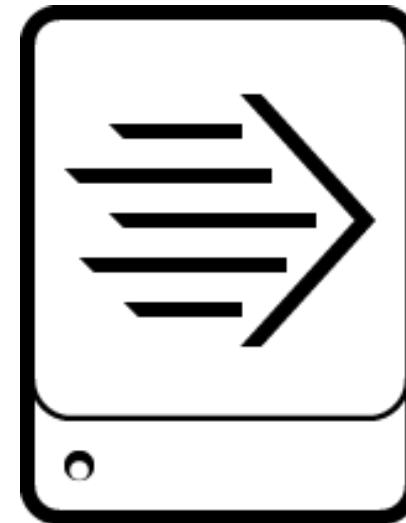
Splunk is comprised of three main processing components:



Indexer



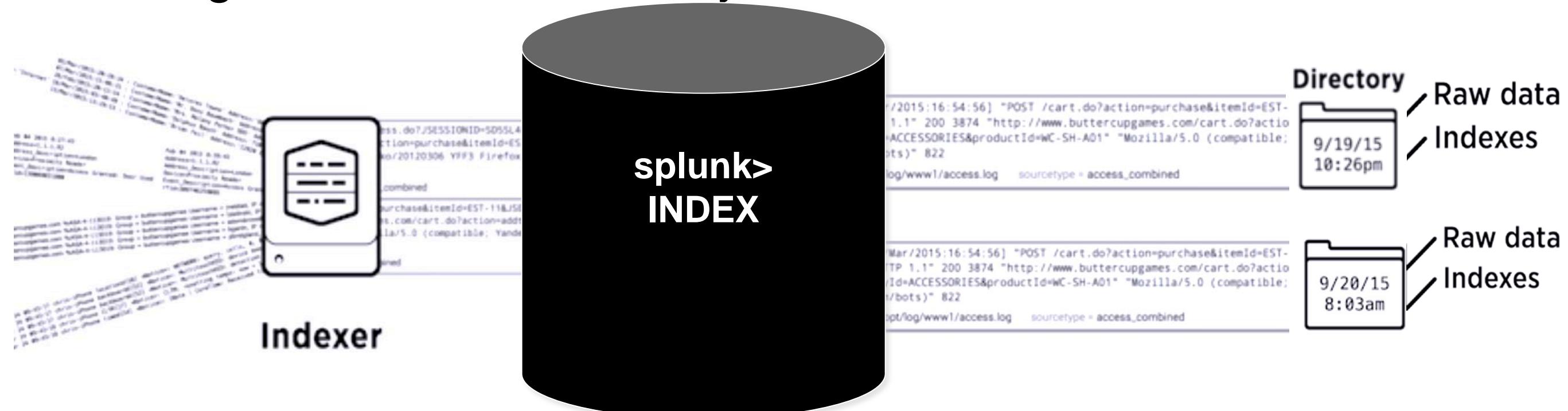
Search Head



Forwarder

Splunk Components - Indexer

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

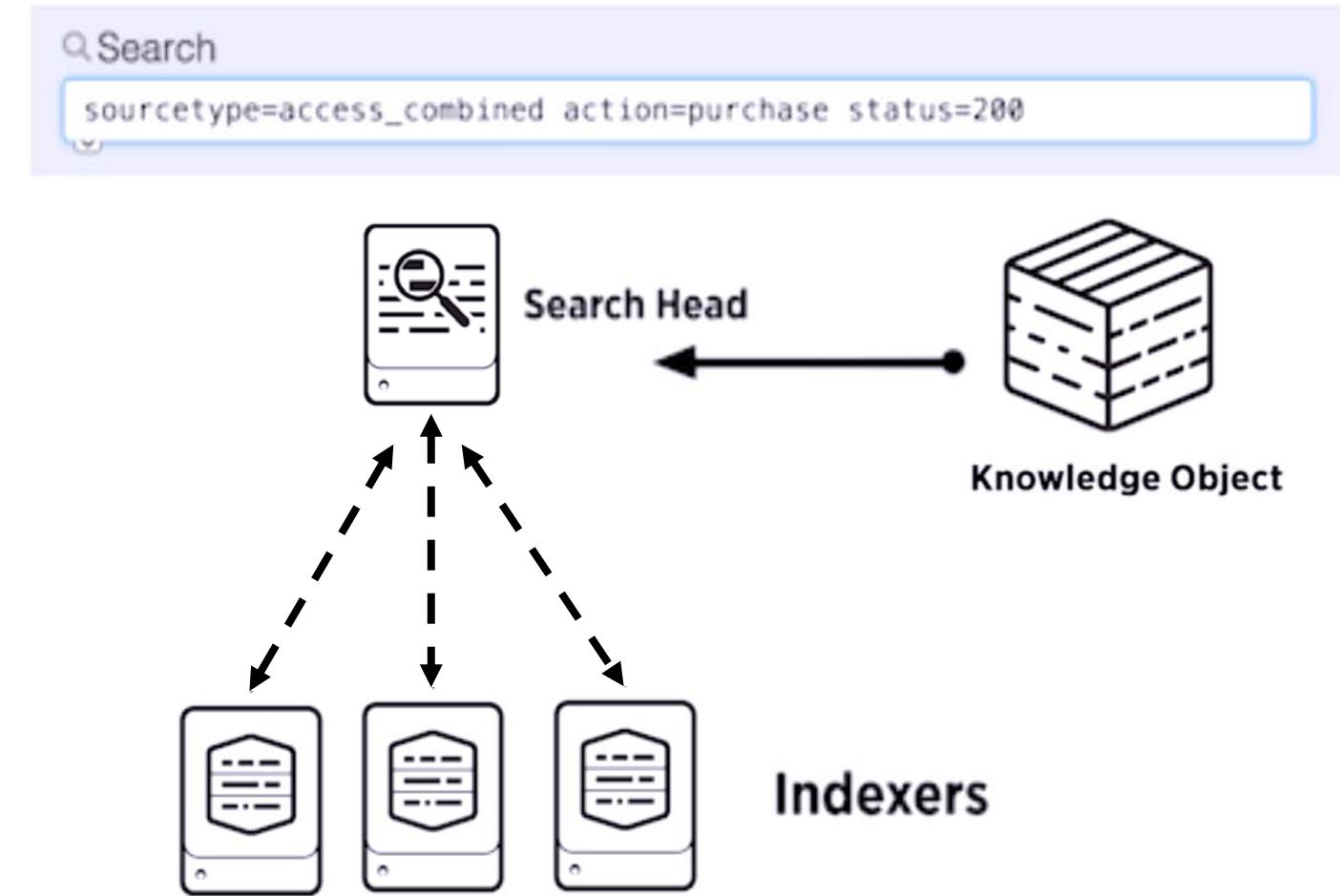


- As the Indexer indexes data, it creates a number of files organized in sets of directories by age
 - Contains raw data (compressed) and indexes (points to the raw data)

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Splunk Components – Search Heads

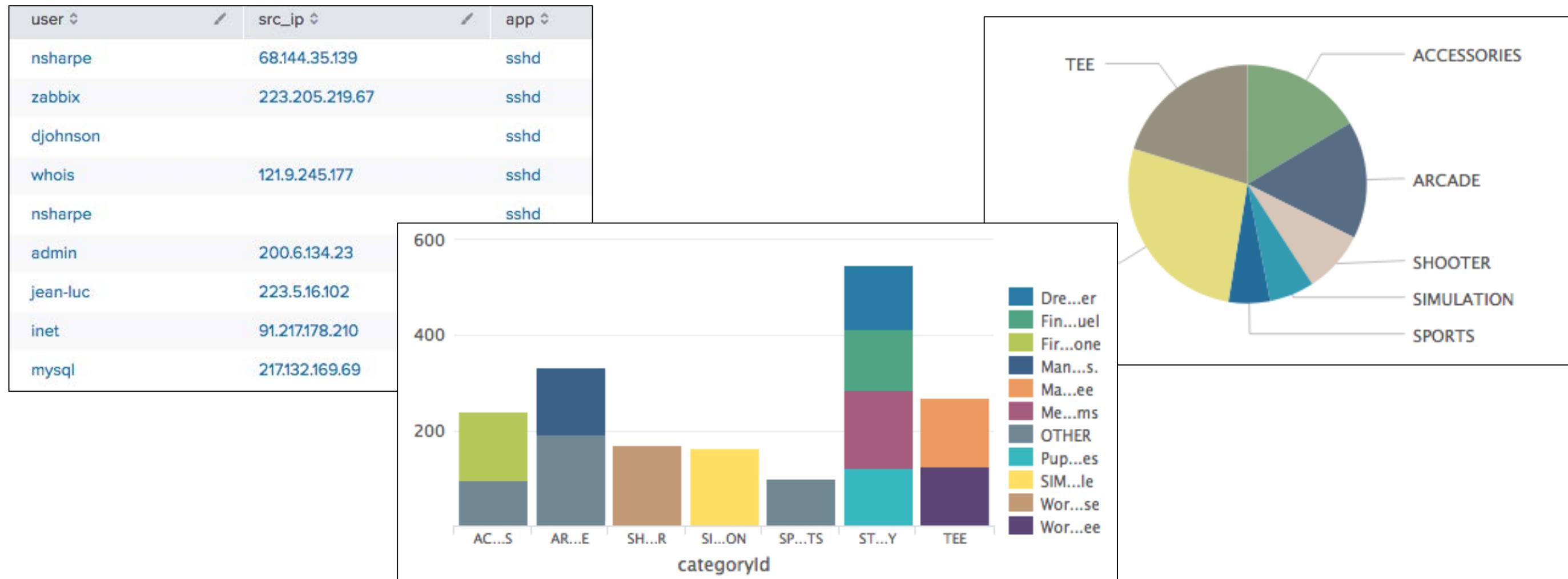
- Allows users to use the Search language to search the indexed data
- Distributes user search requests to the Indexers
- Consolidates the results and extracts field value pairs from the events to the user
- Knowledge Objects on the Search Heads can be created to extract additional fields and transform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



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Splunk Components – Search Heads (cont.)

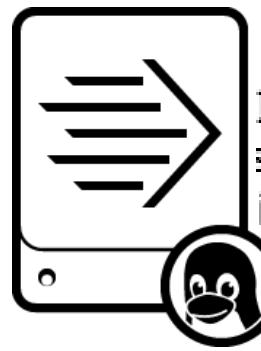
Search Heads also provide tools to enhance the search experience such as reports, dashboards and visualizations



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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 = TPsecOverTLS, IP = 10.1.10.216, Session connected. Session type = SSL, Duration = 10.1.10.216, IP = 10.1.10.133, Session connected. Session type = IKE, Duration = 10.1.10.133, IP = 10.3.10.18, Session disconnected. Session type = IKE, Duration = 10.3.10.18, IP = 10.1.10.211, Session connected. Session type = SSL, Duration = 10.1.10.211

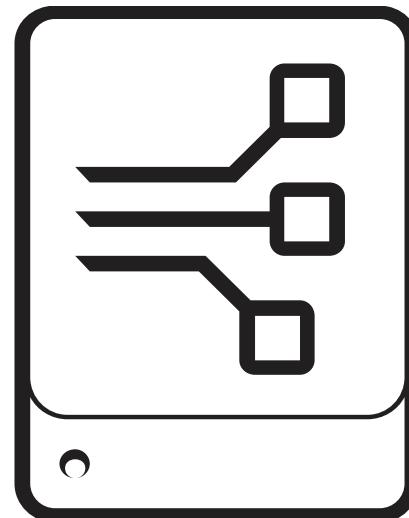


Indexer

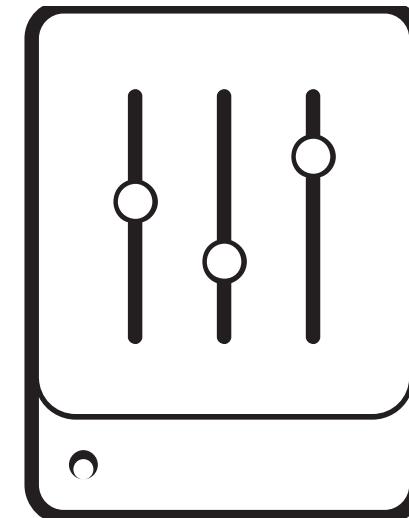
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Additional Splunk Components

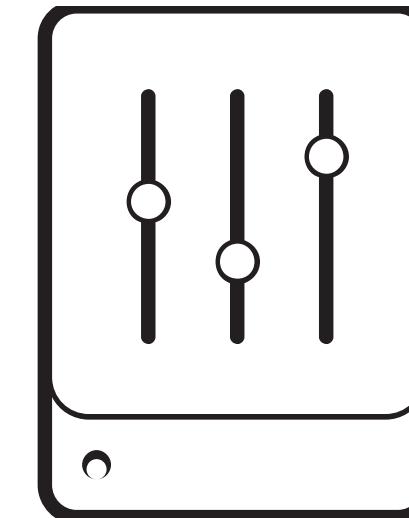
In addition to the three main Splunk processing components, there are some less-common components including :



**Deployment
Server**



Cluster Master

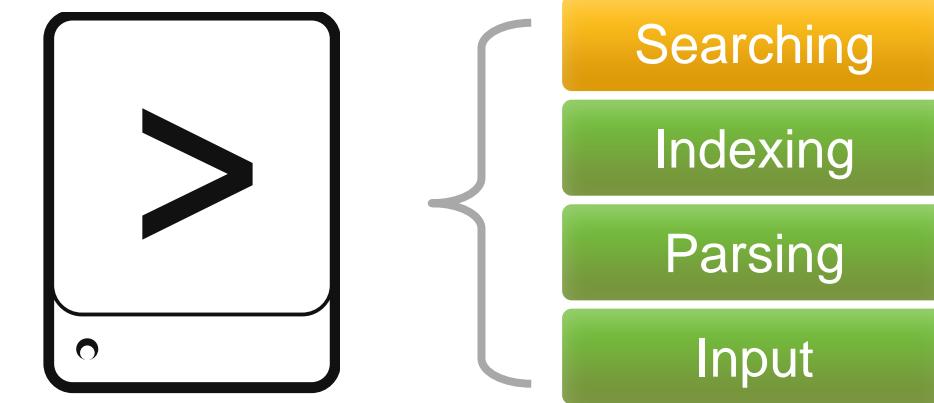


License Master

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



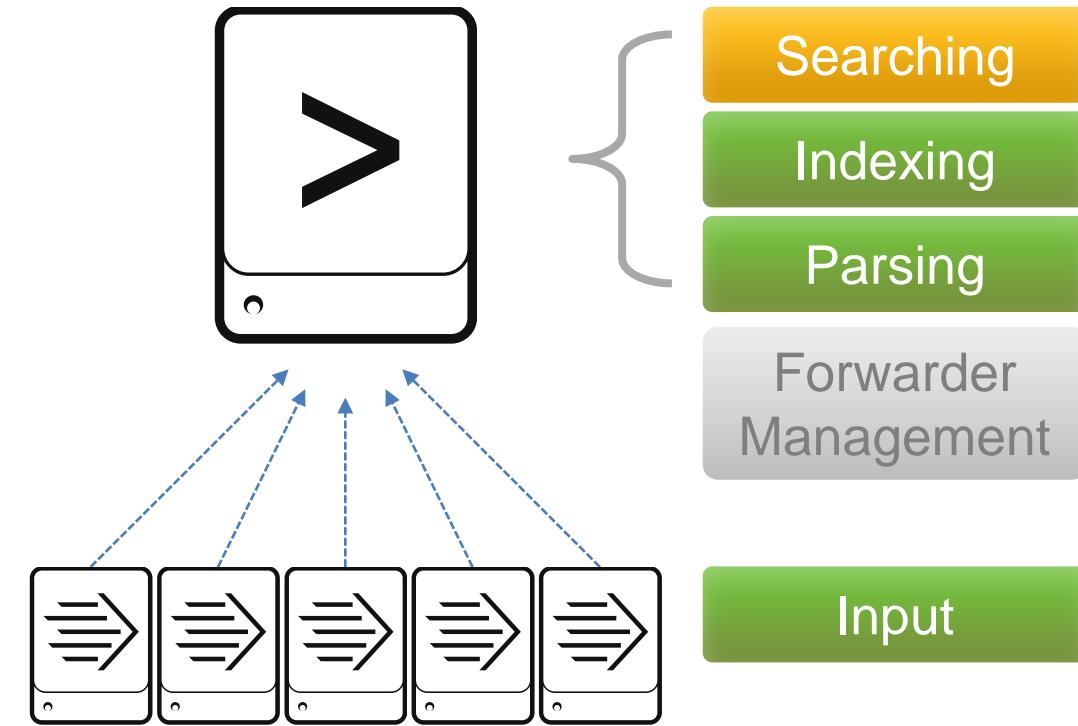
- Recommendation

- 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)

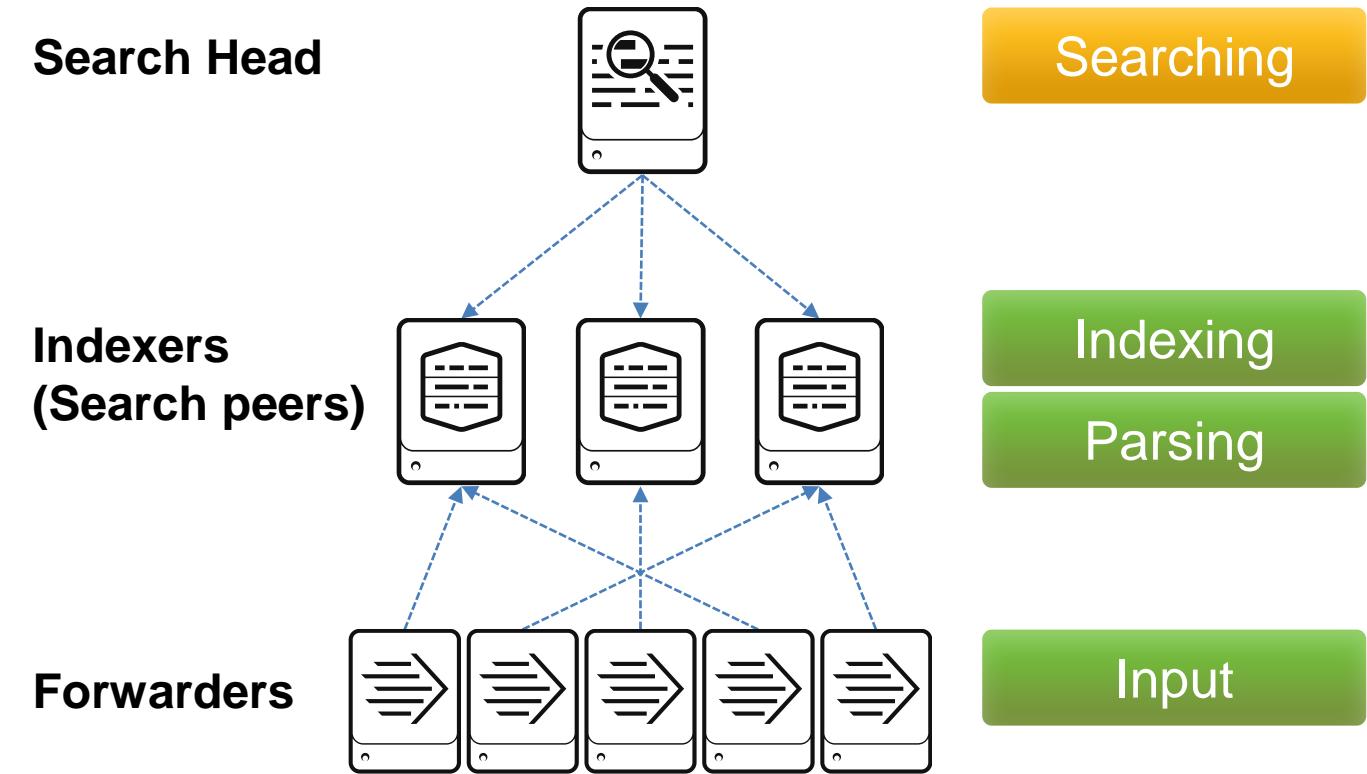


Basic Deployment for organizations:

- 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

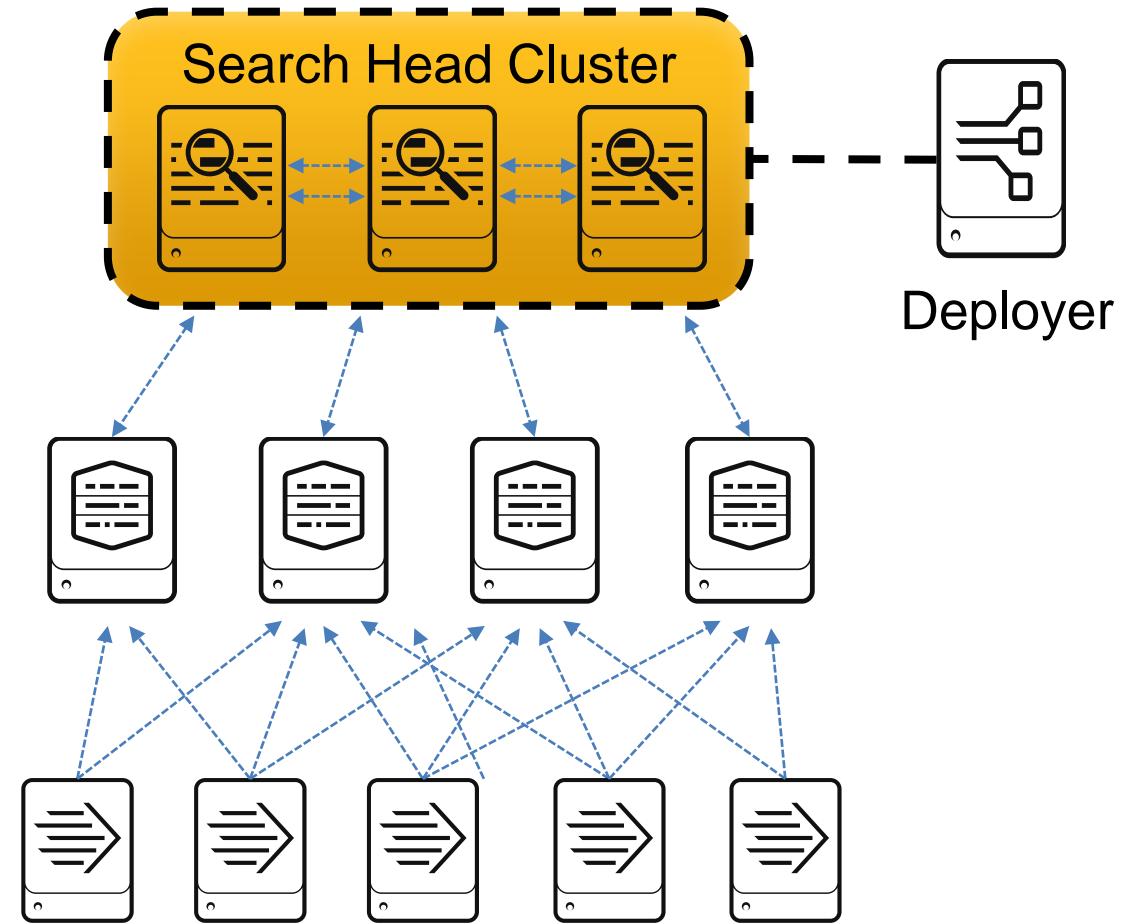


Deployment for organizations:

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

Splunk Deployment – Increasing Capacity

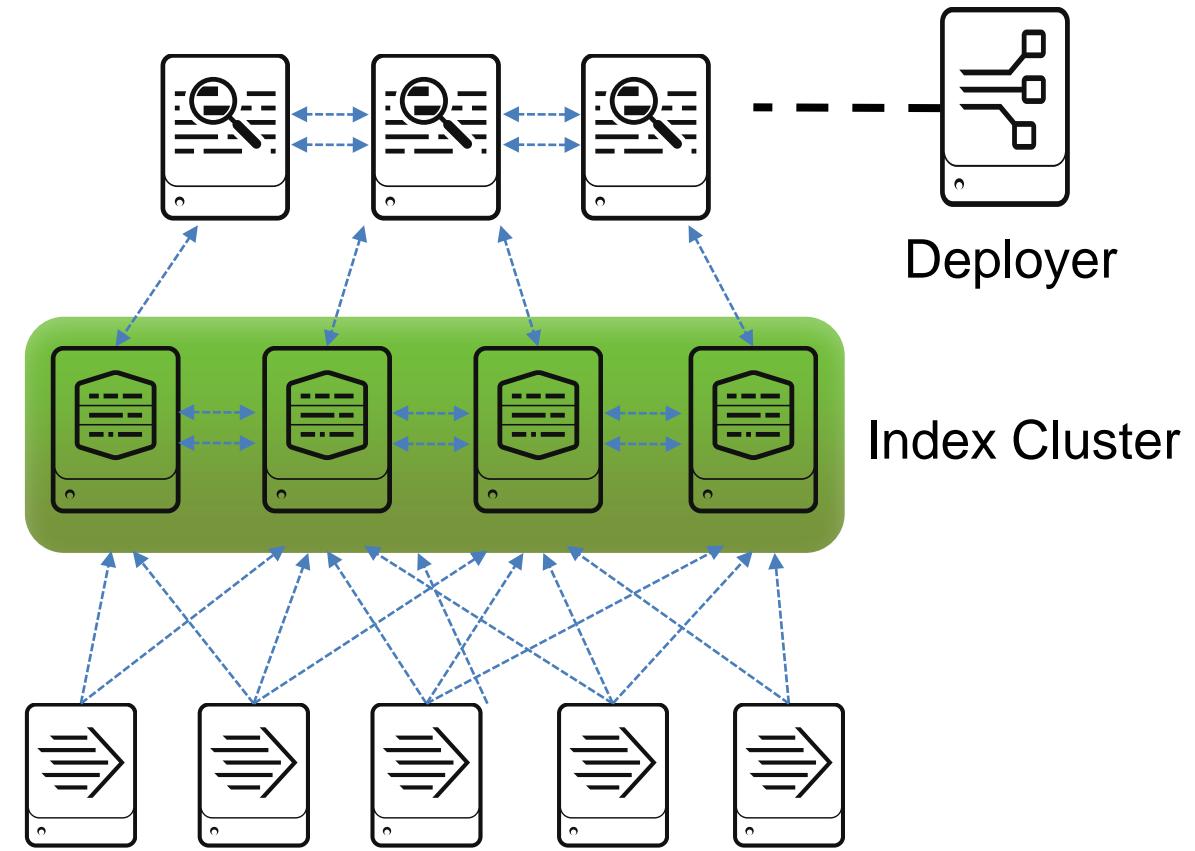
- Adding a Search Head Cluster:
 - Services more users for increased search capacity
 - Allows users and searches to share resources
 - Coordinate activities to handle search requests and distribute the requests across the set of indexers
- Search Head Clusters require a minimum of three Search Heads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

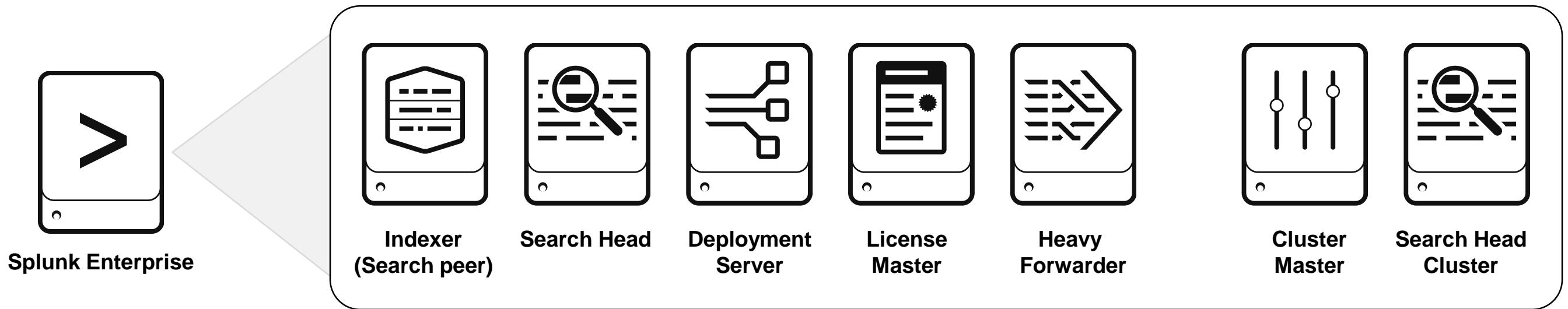


Module 3: Installing Splunk

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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

- Verify required ports are open (splunkweb, splunkd, forwarder) and start-up account
- Download Splunk Enterprise from 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
- 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

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

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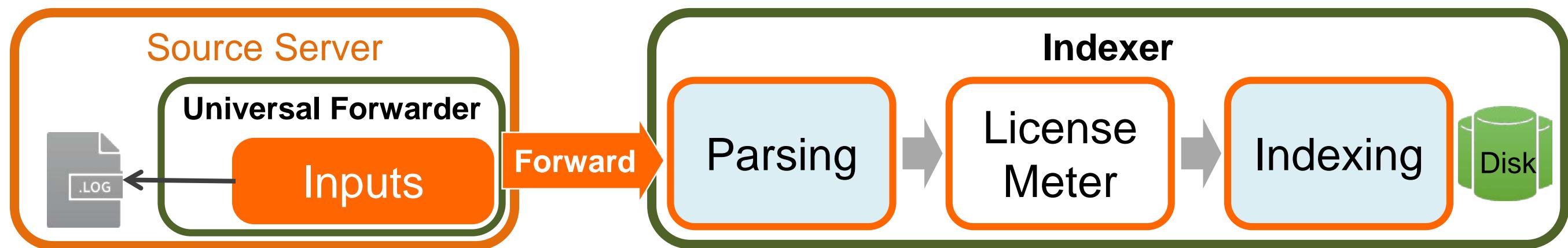
Module 4

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

- 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

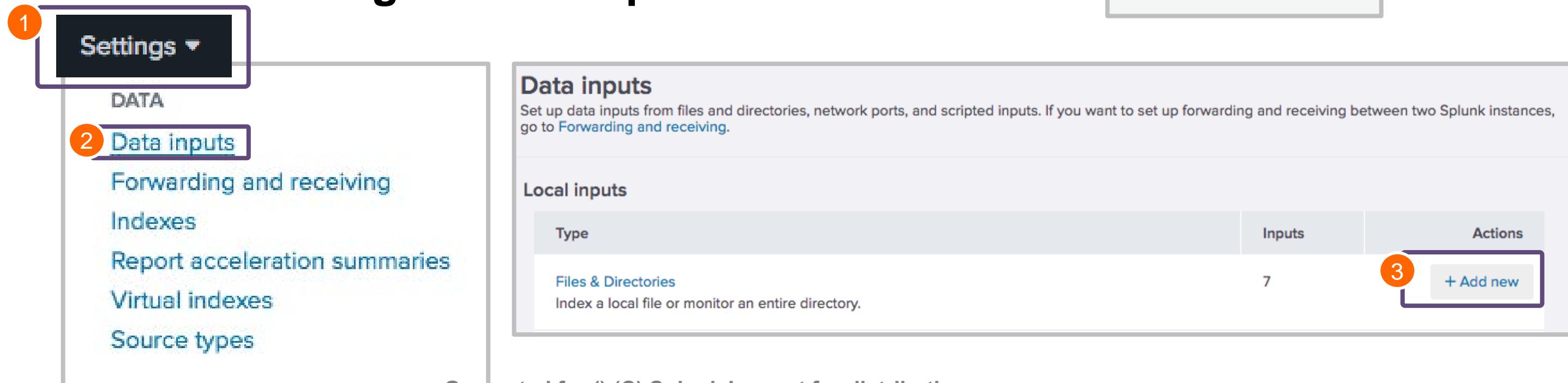
- When you index a data source, Splunk assigns metadata values
 - The metadata is applied to the entire source
 - Splunk applies defaults if not specified
 - You can also override them at input time or later

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

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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. The left sidebar has a purple outline around the 'Settings' dropdown, with the number '1' in an orange circle above it. The 'Data inputs' link in the sidebar is highlighted with a purple underline, and the number '2' in an orange circle is to its left. The main content area is titled 'Data inputs' and contains a sub-section for 'Local inputs'. It lists 'Files & Directories' with a note: 'Index a local file or monitor an entire directory.' To the right, there is a table with columns 'Type', 'Inputs', and 'Actions'. A row for 'Files & Directories' shows the number '7' under 'Inputs' and a blue button labeled '+ Add new' under 'Actions'. The number '3' in an orange circle is to the right of the '+ Add new' button.

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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`

Add Data

Select Source Type

Input Settings

Review

Done

Back

Next >

Files & Directories

Upload a file, Index a local file, or monitor an entire directory.

HTTP Event Collector

Configure tokens that clients can use to send data over HTTP or HTTPS.

TCP / UDP

Configure Splunk to listen on a network port.

Scripts

Get data from any API, service, or database with a script.

File or Directory ? Browse

On Windows: c:\apache\apache.error.log or \\hostname\apache\apache.error.log. On Unix: /var/log or

Continuously Monitor

Index Once

Whitelisted?

Blacklist ?

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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

Default Settings
Splunk's default source type settings

Application
Database
Email
Metrics
Miscellaneous
Network & Security 2
Operating System
Structured
Web

List ▾ Format 20 Per Page ▾ < Prev 1 2 3 4 5 6 7 8 ... Next >

	Time	Event
1	11/28/17 4:58:01.000 PM	111.161.27.20 - - [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
2	11/28/17 4:58:03.000 PM	111.161.27.20 - - [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
3	11/28/17 4:58:09.000 PM	111.161.27.20 - - [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
4	11/28/17 00 PM	111.161.27.20 - - [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
		111.161.27.20 - - [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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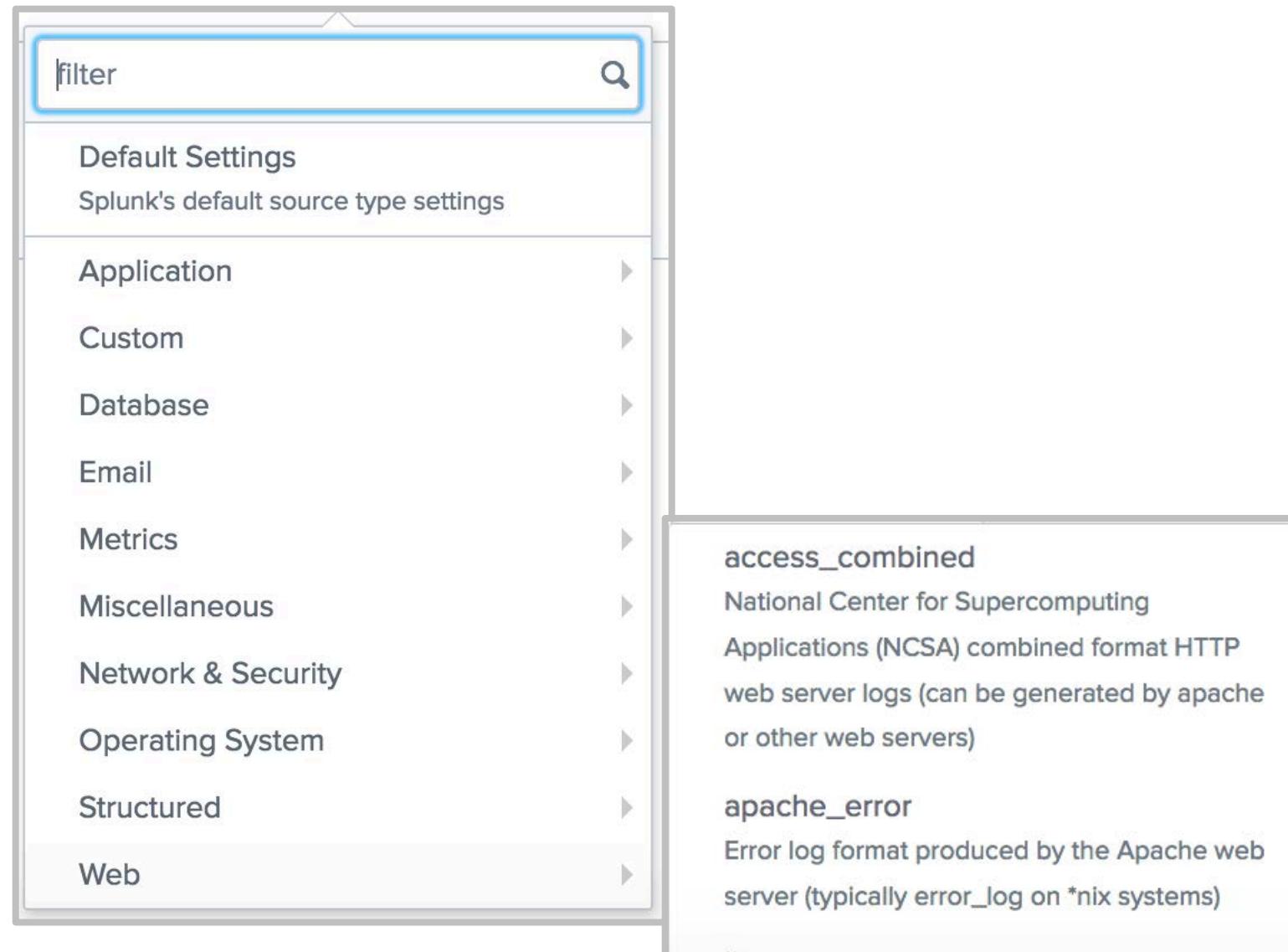
Set Source Type (cont.)

- ① Splunk automatically determines the source type for major data types when there is enough data
- ② You can choose a different source type from the dropdown list
- ③ Or, you can create a new source type name for the specific source
- ④ **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

- 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)

Host field value: splunk01

Index: itops

Create a new index

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Review

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

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 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

Select Source Set Source Type Input Settings Review Done

< Back Submit >

Review

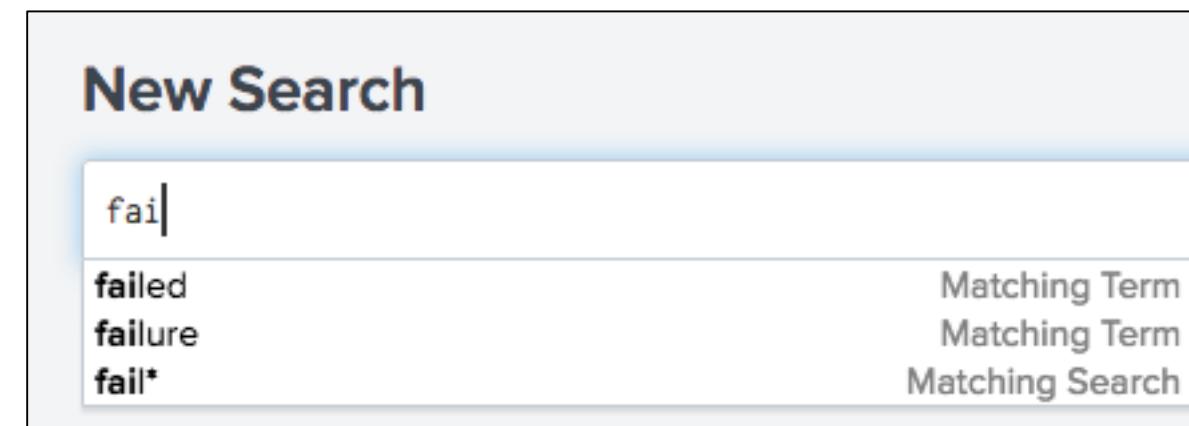
Input Type	File Monitor
Source Path	/opt/log/www1/access.log
Continuously Monitor	Yes
Source Type	access_combined_wcookie
App Context	search
Host	splunk01
Index	test

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 Search Assistant interface. The search bar contains the partial command `failed | cha`. Below the search bar, a list of command suggestions is displayed, starting with `chart`, followed by `sichart`, `timechart`, and `sitimechart`. To the right of the suggestions, there are four "Command" buttons with the letters `t`, `b`, `c`, and `d`. At the bottom left, there is a section titled "Events (1,942)" with a description: "Returns results in a tabular output for charting. Example: ... I chart max(delay) over foo". A blue "Learn More" link is also present.

A screenshot of the Splunk Search Assistant interface, showing the continuation of command suggestions. The search bar now contains `failed | chart cou`. The suggestions list includes `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`. To the right, there are "Command Args" and "Command History" sections for each suggestion. At the bottom left, there is a section titled "Events (1,942)" with a description: "Returns results in a tabular output for charting. Example: ... I chart max(delay) over foo". A blue "Learn More" link is also present.

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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

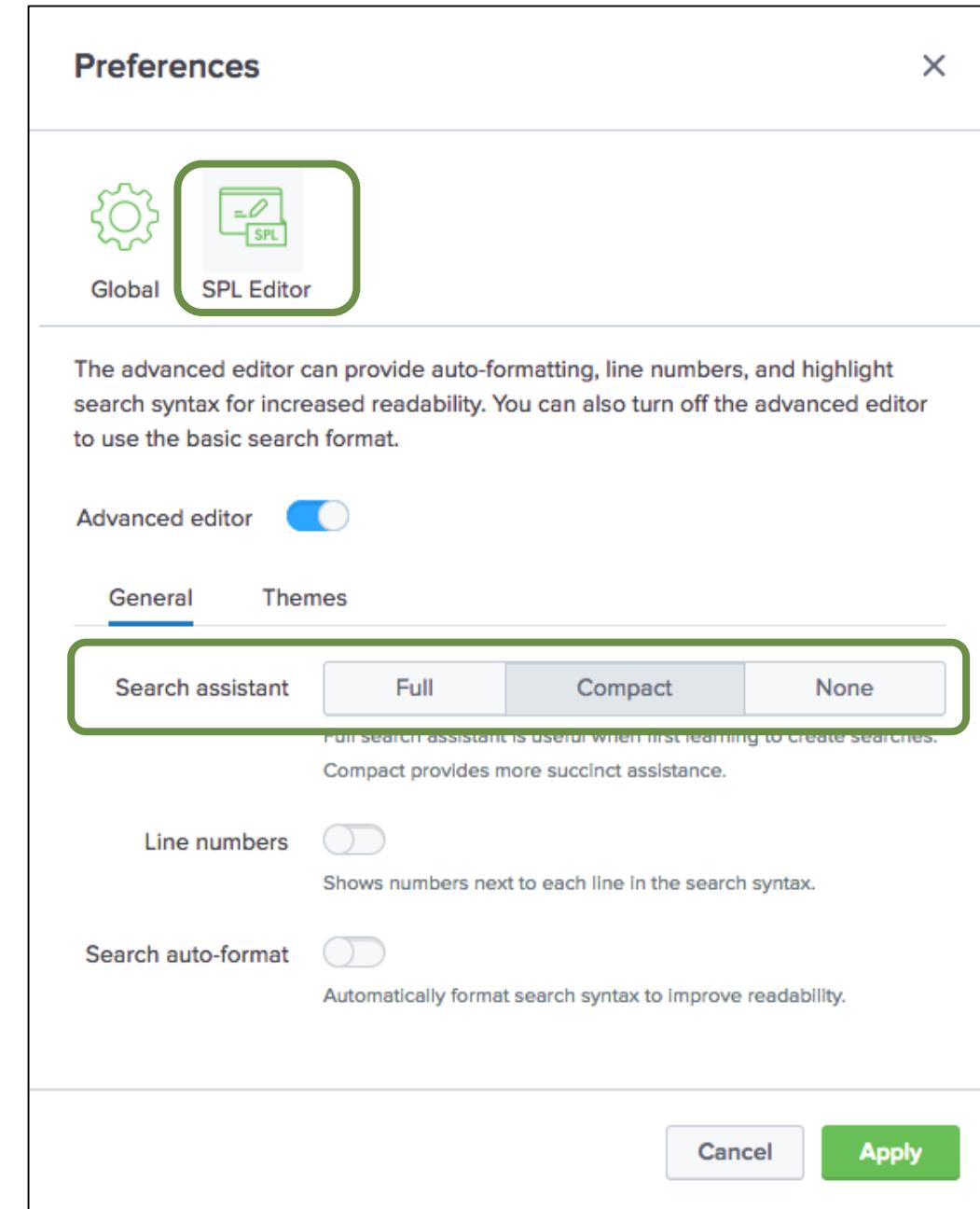
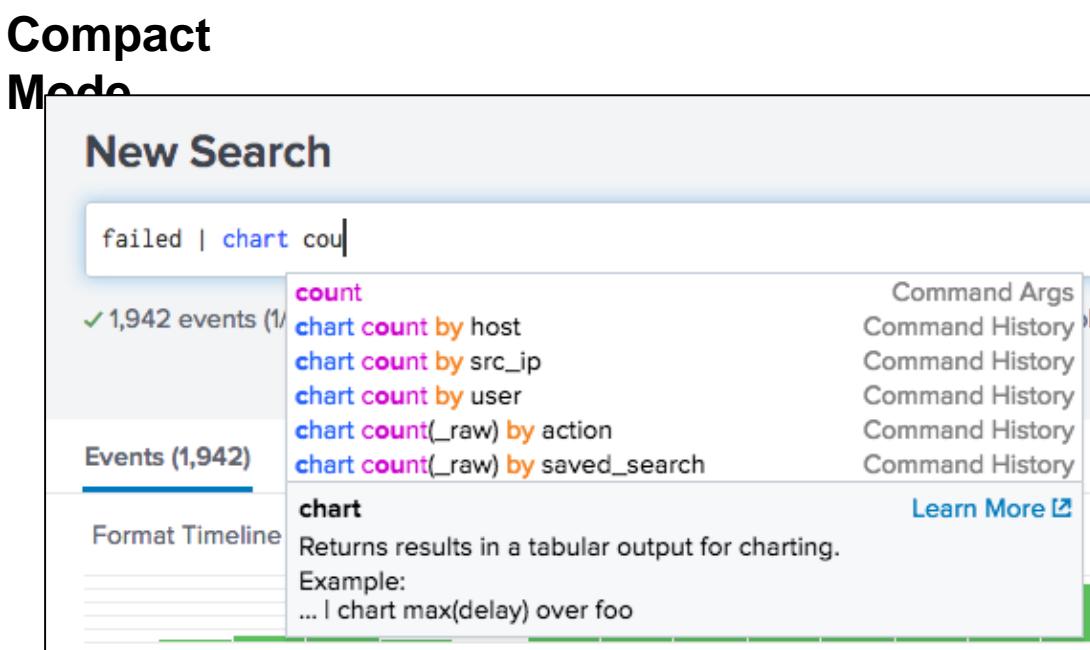
```
failed | chart cou
```

✓ 1,942 events (1/1)

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**

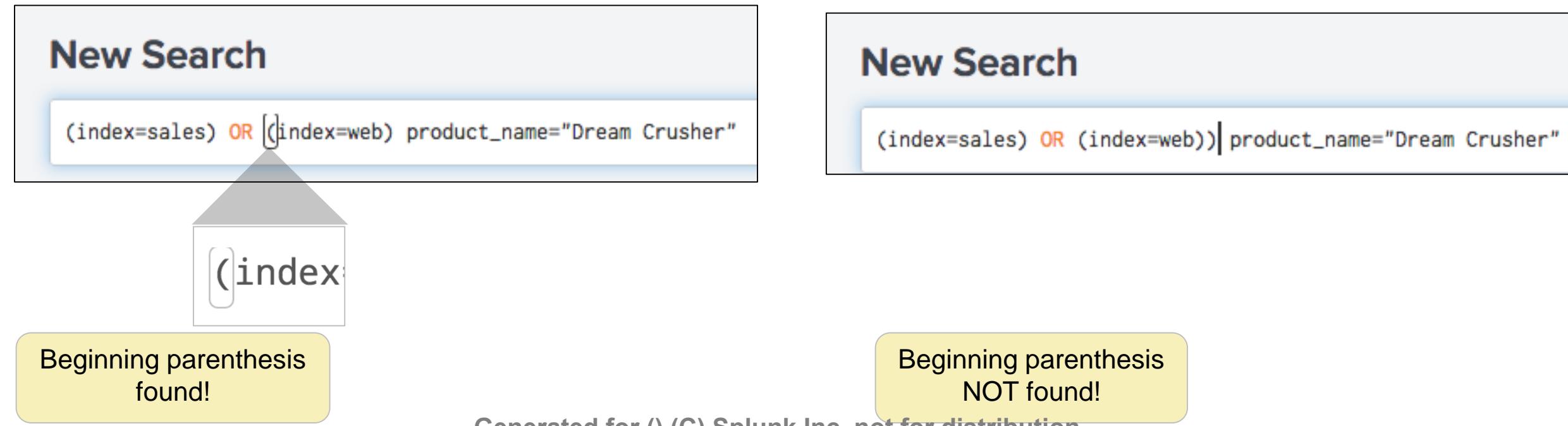
The screenshot shows the Splunk Search Assistant interface. A search bar at the top contains the query "failed | chart cou". Below the search bar, there's a "Command History" section with several search suggestions. On the right side, a detailed card for the "chart" command is displayed. The card includes a "Help" link, a "More »" button (circled in orange), and a note stating "Returns results in a tabular output for charting." It also lists "Examples" and "Command Args". A checkbox labeled "Auto Open" is checked. The entire interface is enclosed in a light gray border.

This screenshot shows the same interface as above, but with the "Auto Open" checkbox unchecked (circled in orange). As a result, the "More »" button has been replaced by a "Less" button (circled in orange). The card for the "chart" command now includes a "Details" section with descriptive text about the command's function and usage.

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Search Assistant – Parentheses

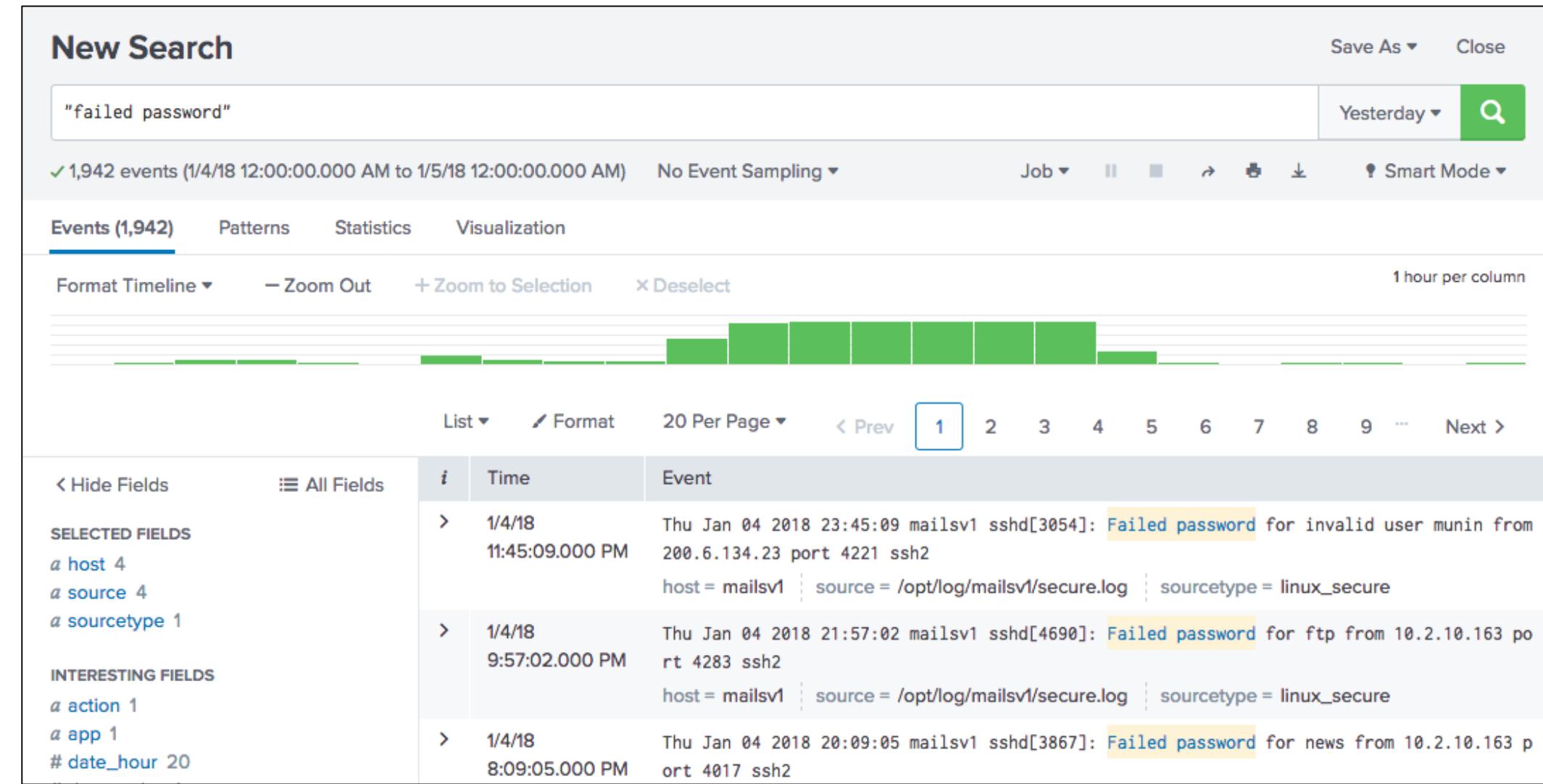
- The Search Assistant provides help to match parentheses as you type
- When an end parenthesis is typed, the corresponding beginning parenthesis is automatically highlighted
 - If a beginning parenthesis cannot be found, *nothing* is highlighted



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Viewing Search Results

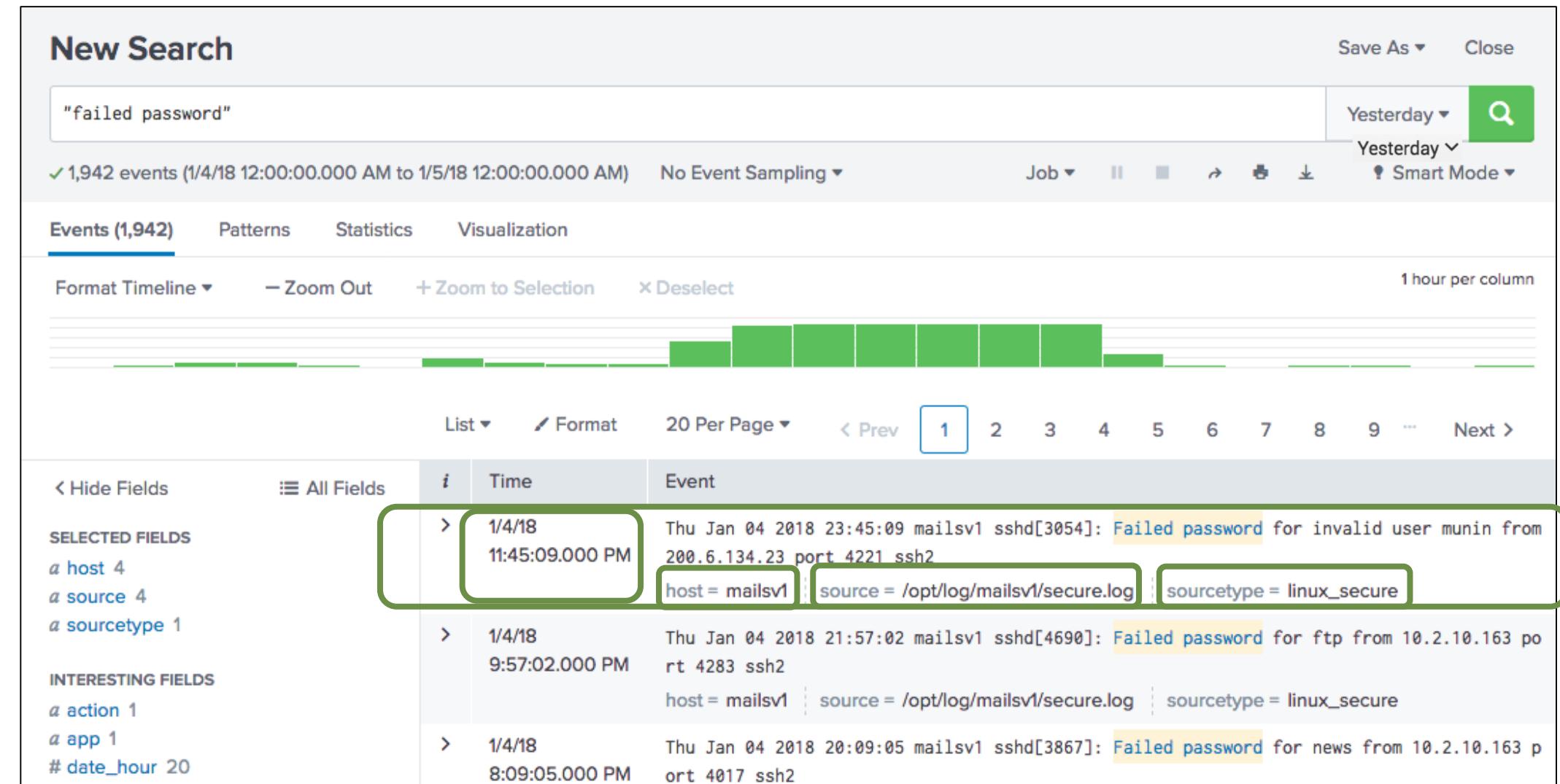
- Matching results are returned immediately
- Displayed in reverse chronological order (newest first)
- Matching search terms are highlighted



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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.)

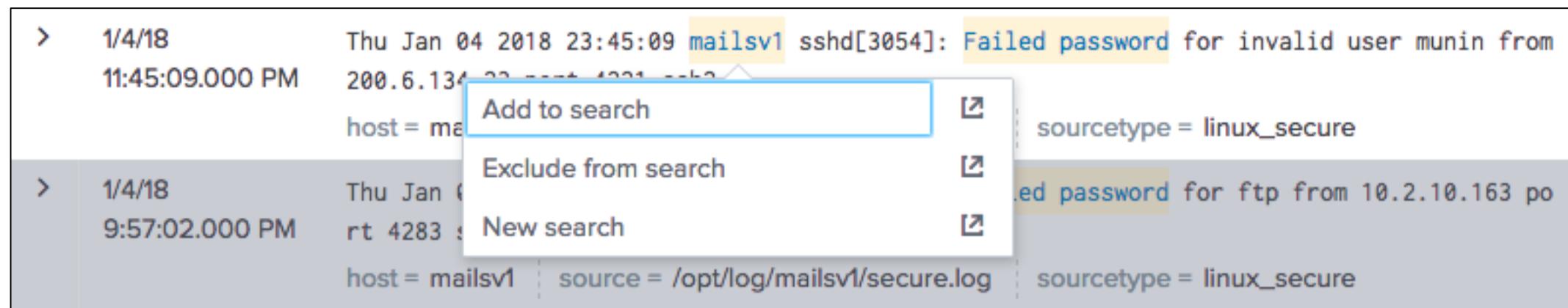
The screenshot shows the Splunk search interface with the following annotations:

- New Search**: The search bar contains the query `"failed password"`.
- time range picker**: Shows the search range from `1/4/18 12:00:00.000 AM` to `1/5/18 12:00:00.000 AM`, with a dropdown for `Yesterday` and a search icon.
- Events (1,942)**: The selected tab, with a green arrow pointing to it from the left sidebar.
- Patterns**: A tab in the top navigation.
- Statistics**: A tab in the top navigation.
- Visualization**: A tab in the top navigation.
- search mode**: A dropdown menu in the top right.
- timeline**: A timeline visualization below the search bar.
- paginator**: The pagination controls at the bottom of the search results.
- Fields sidebar**: A sidebar on the left 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 column in the search results table.
- selected fields**: A tooltip for the selected fields in the search results table.
- events**: A large callout box covering the search results table area.

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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 for a search titled "failed password". The search results are displayed in three different formats:

- Raw:** Shows raw log entries. The first entry is:

```
11:45:09.000 PM |> Thu Jan 04 2018 23:45:09 mailsv1 sshd[3054]: Failed password for invalid user munin from 200.6.134.23 port 4221 ssh2
```
- List:** Shows a list of events. The first two entries are:

Time	Event
11:45:09.000 PM	Thu Jan 04 2018 23:45:09 mailsv1 sshd[3054]: Failed password for invalid user munin from 200.6.134.23 port 4221 ssh2
9:57:02.000 PM	Thu Jan 04 2018 21:57:02 mailsv1 sshd[4690]: Failed password for ftp from 10.2.10.163 port 4283 ssh2
- Table:** Shows a table of events. The first two entries are:

Time	host	source	sourcetype
11:45:09.000 PM	mailsv1	/opt/log/mailsv1/secure.log	linux_secure
9:57:02.000 PM	mailsv1	/opt/log/mailsv1/secure.log	linux_secure

The interface includes a sidebar with selected fields (host, source, sourcetype) and interesting fields (action, app, date_hour). The bottom right corner shows a dropdown menu for changing the view.

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Selecting a Specific Time

The diagram illustrates the different ways to select a specific time in Splunk, categorized into two main groups: **custom time ranges** and **preset time ranges**.

Custom Time Ranges: Represented by a green rounded rectangle enclosing five sections:

- Relative:** Set Earliest to 7 Days Ago and Latest to Now.
- Real-time:** Set Earliest to 7 Days Ago and Latest to now.
- Date Range:** Set Between 12/29/2017 and 01/05/2018, and 00:00:00 and 24:00:00.
- Date & Time Range:** Set Between 12/29/2017 at 11:00:00.000 and 01/05/2018 at 11:26:07.000.
- Advanced:** Set Earliest to -24h@h and Latest to now.

Preset Time Ranges: Represented by a yellow rounded rectangle enclosing a list of pre-defined time intervals:

- 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 green bracket on the left side of the diagram groups the first four sections under the heading "Generated for () (C) Splunk Inc, not for distribution".

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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

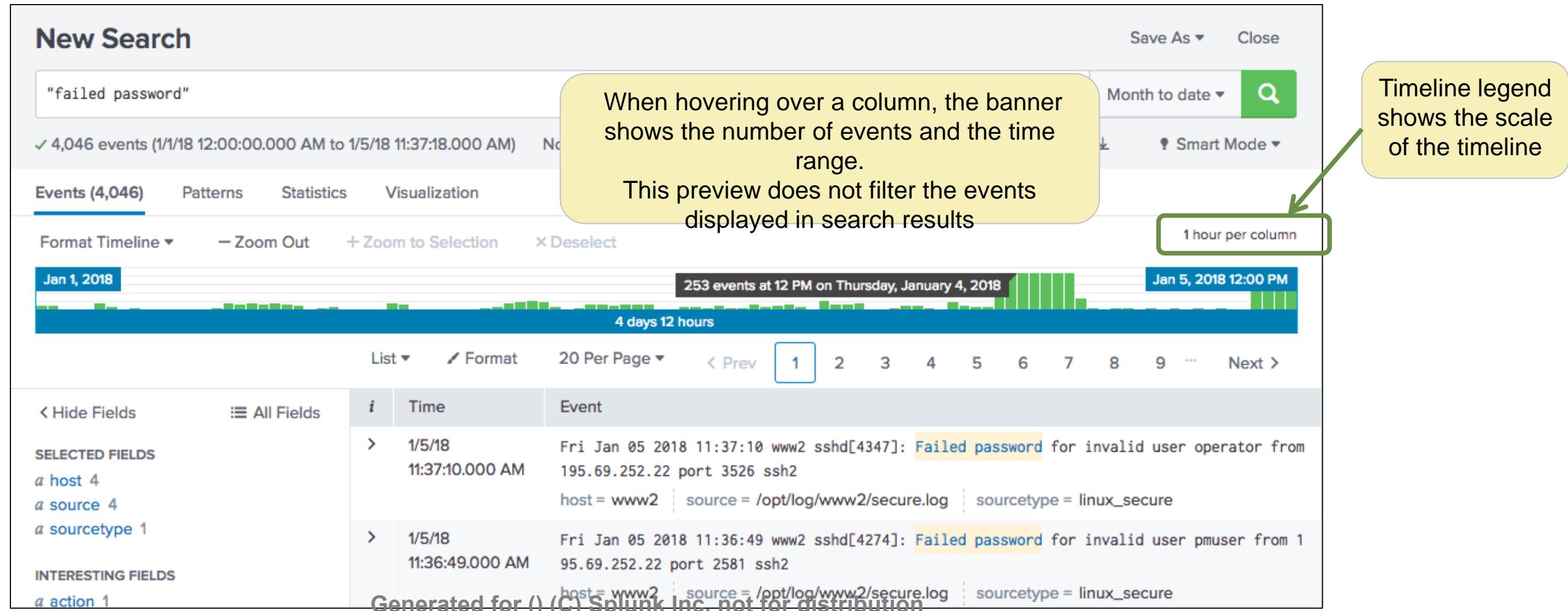
Note



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

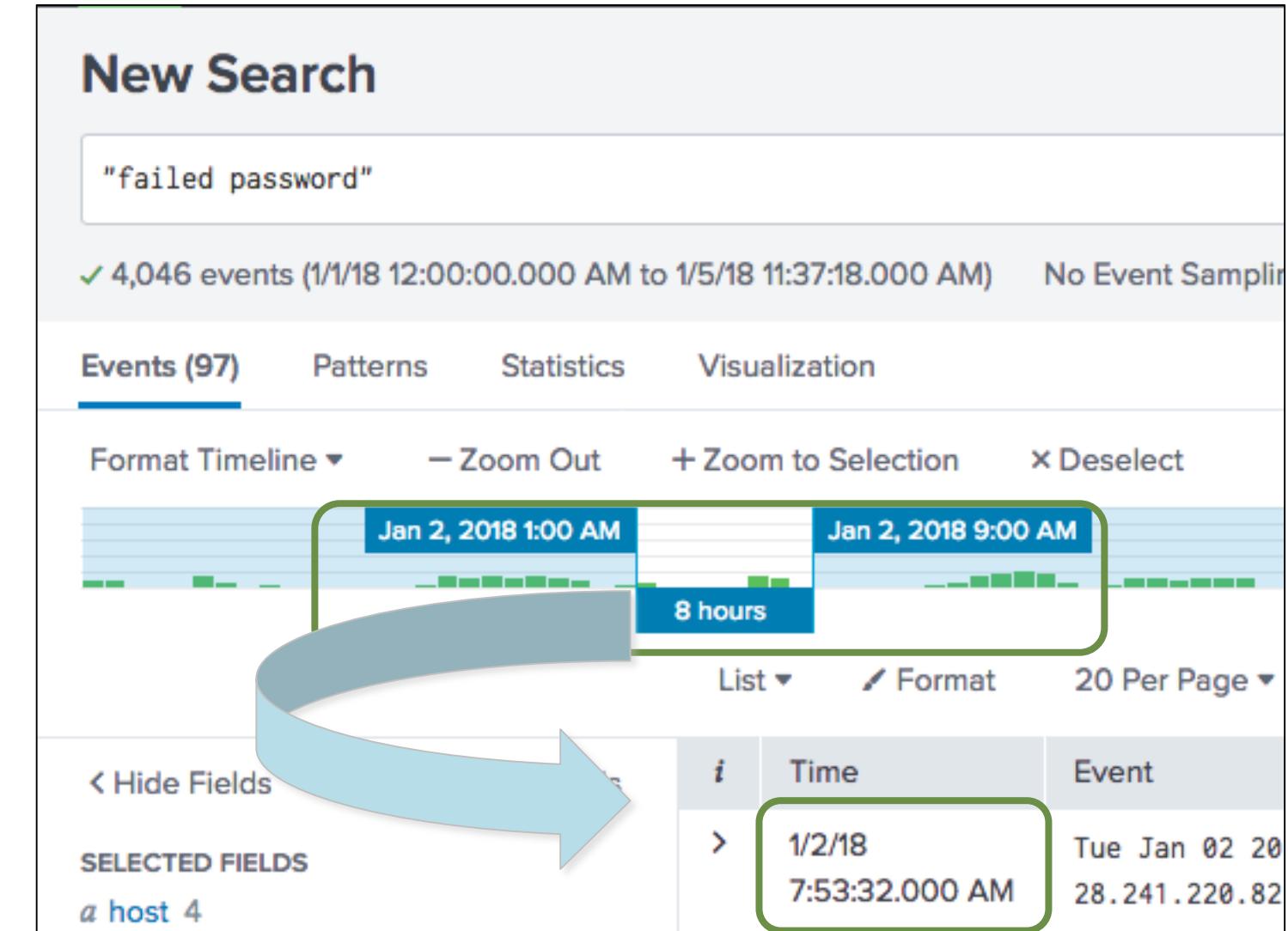
Viewing the Timeline

- 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**

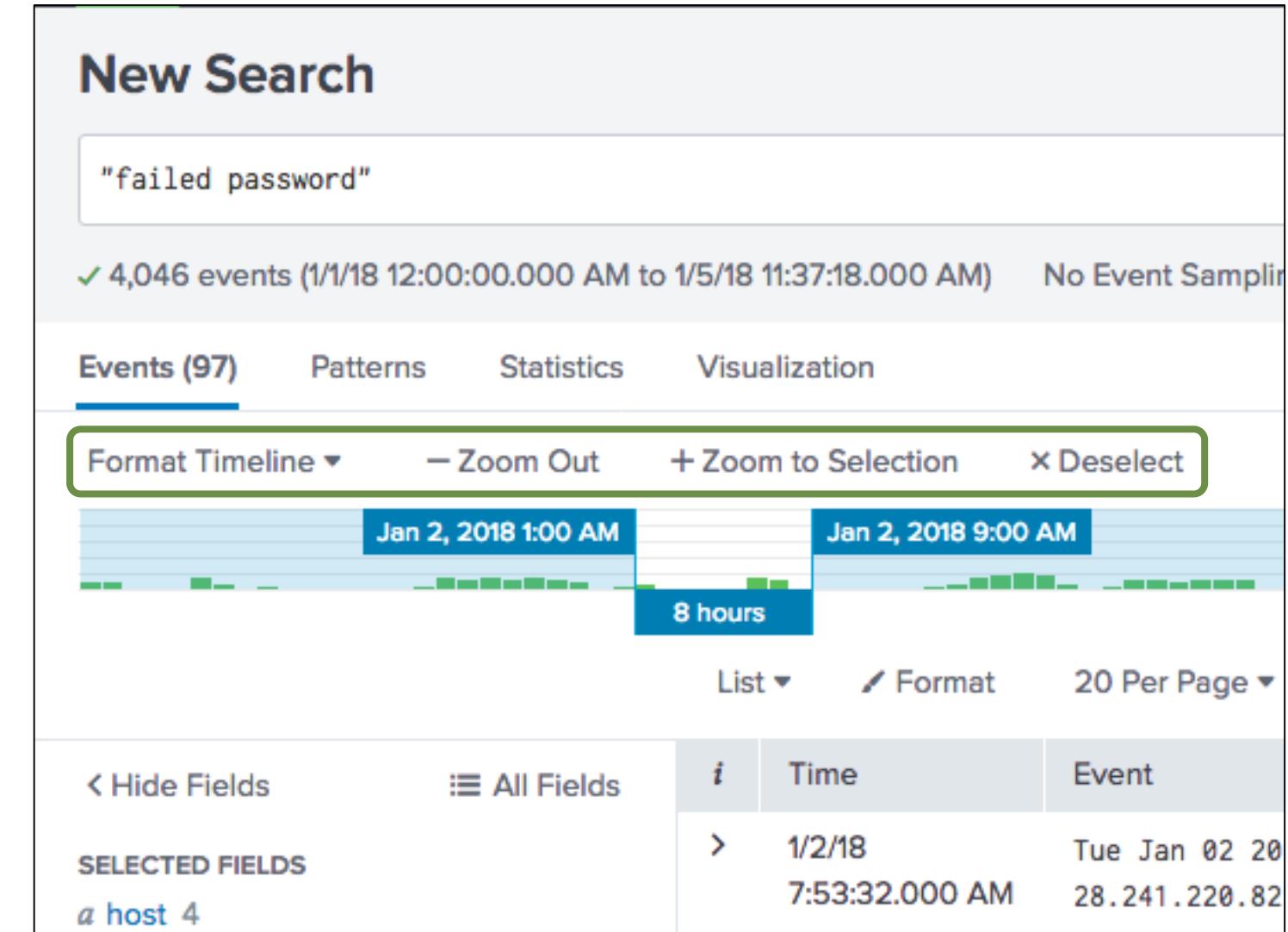
- Expands the time focus and re-executes the search

- **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

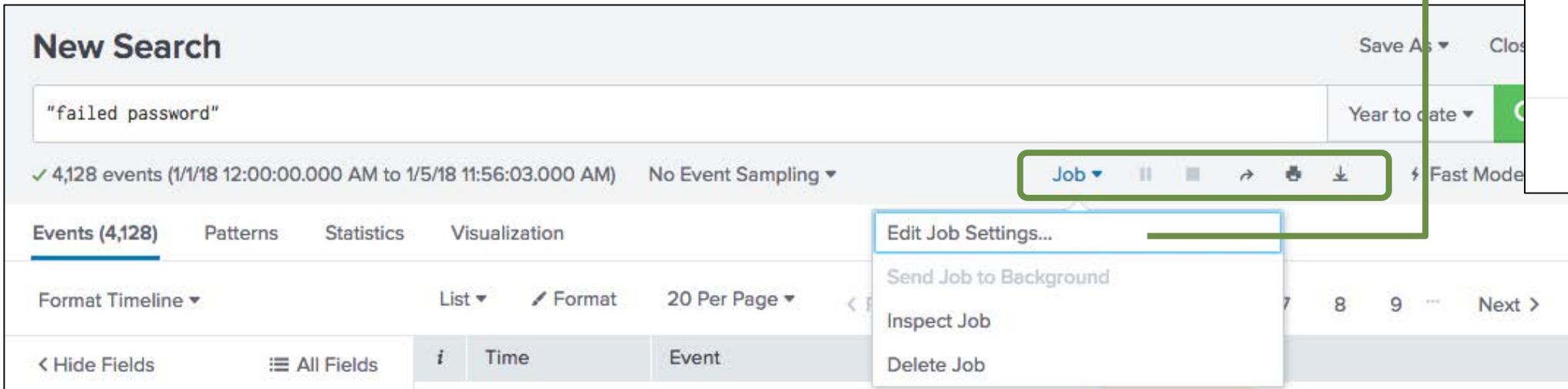
- Every search is also a **job**
- Use the Job bar to control search execution

 **Pause** – toggles to resume the search

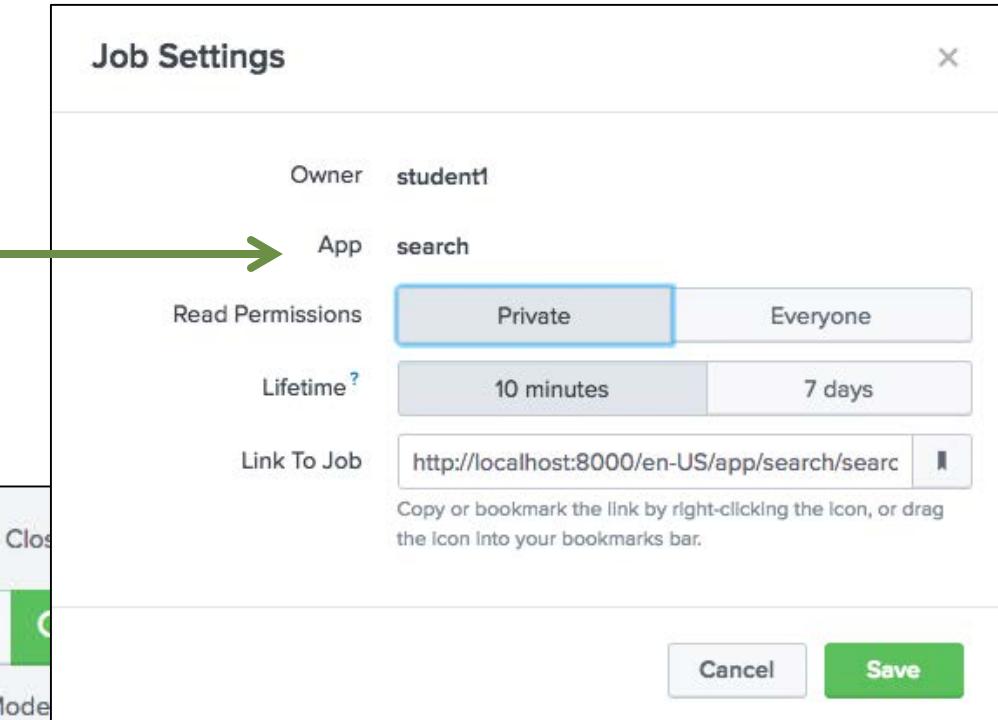
 **Stop** – finalizes the search in progress

– 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 over the Job bar, with the "Edit Job Settings..." option highlighted. The Job bar itself has icons for Pause, Stop, and other controls.



Setting Permissions

- **Private [default]**

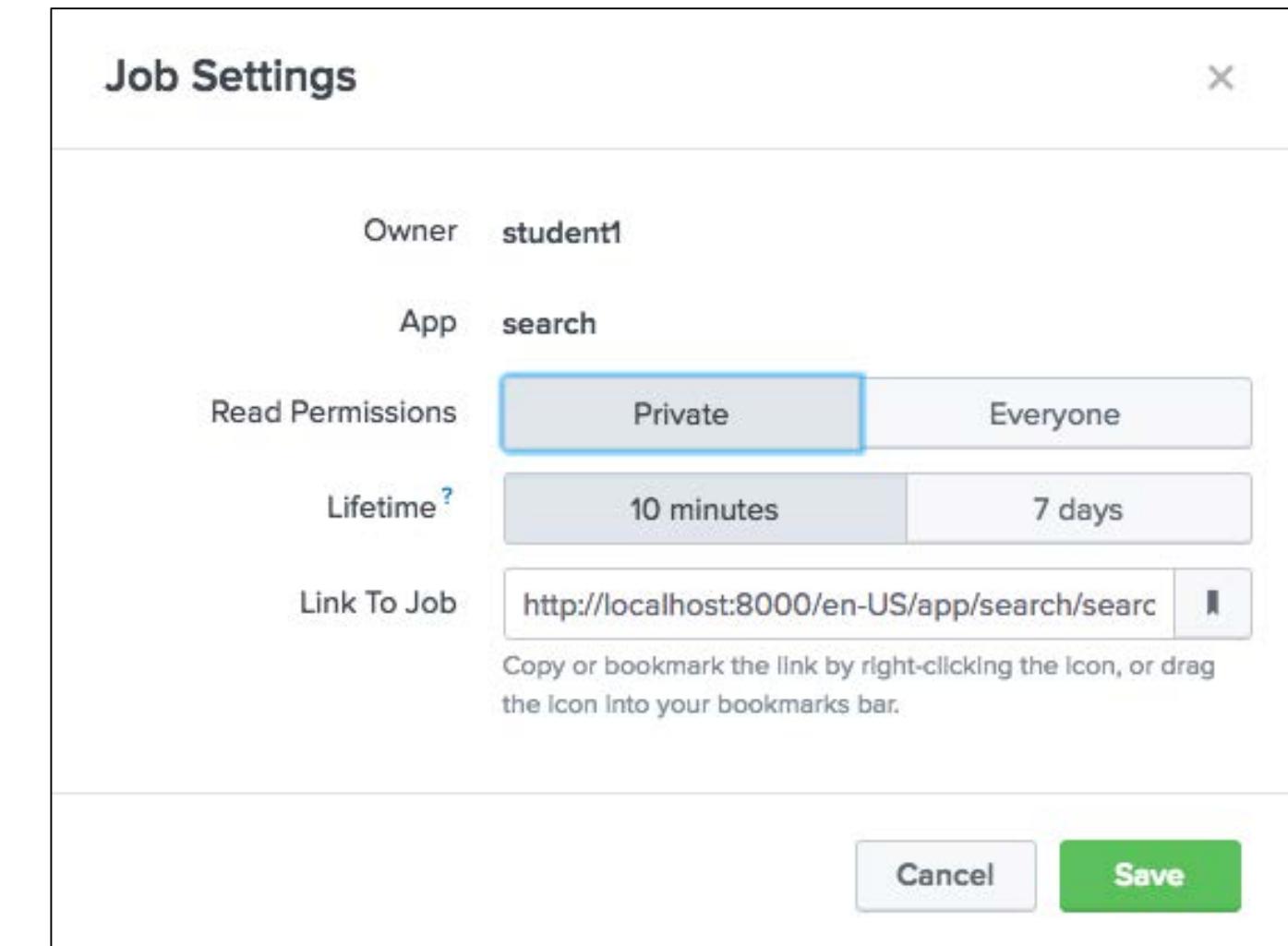
- Only the creator can access

- **Everyone**

- All app users can access search results

- **Lifetime**

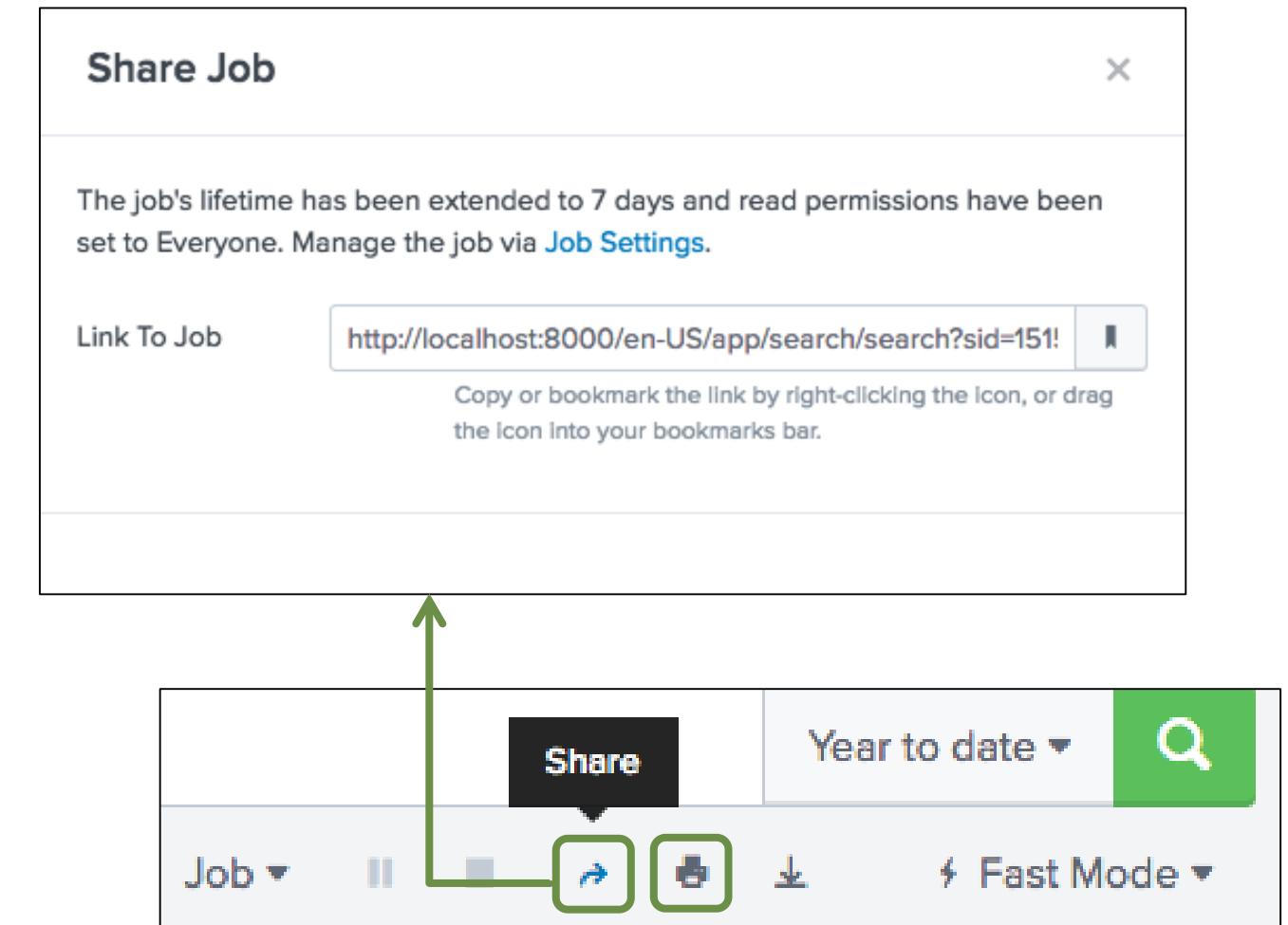
- Default is 10 minutes
 - Can be extended to 7 days
 - To keep your search results longer, schedule a report



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Sharing Search Jobs

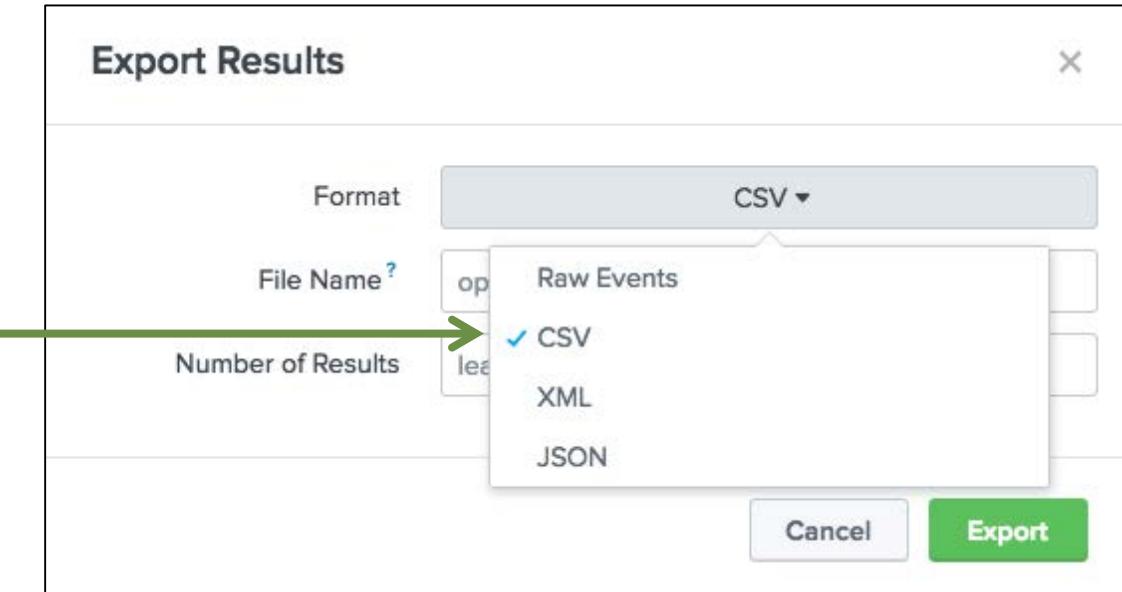
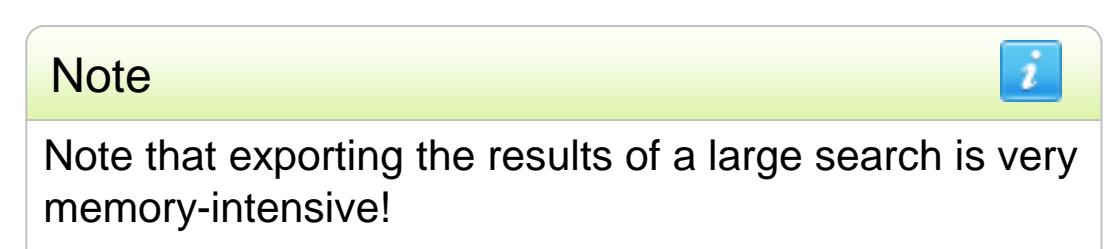
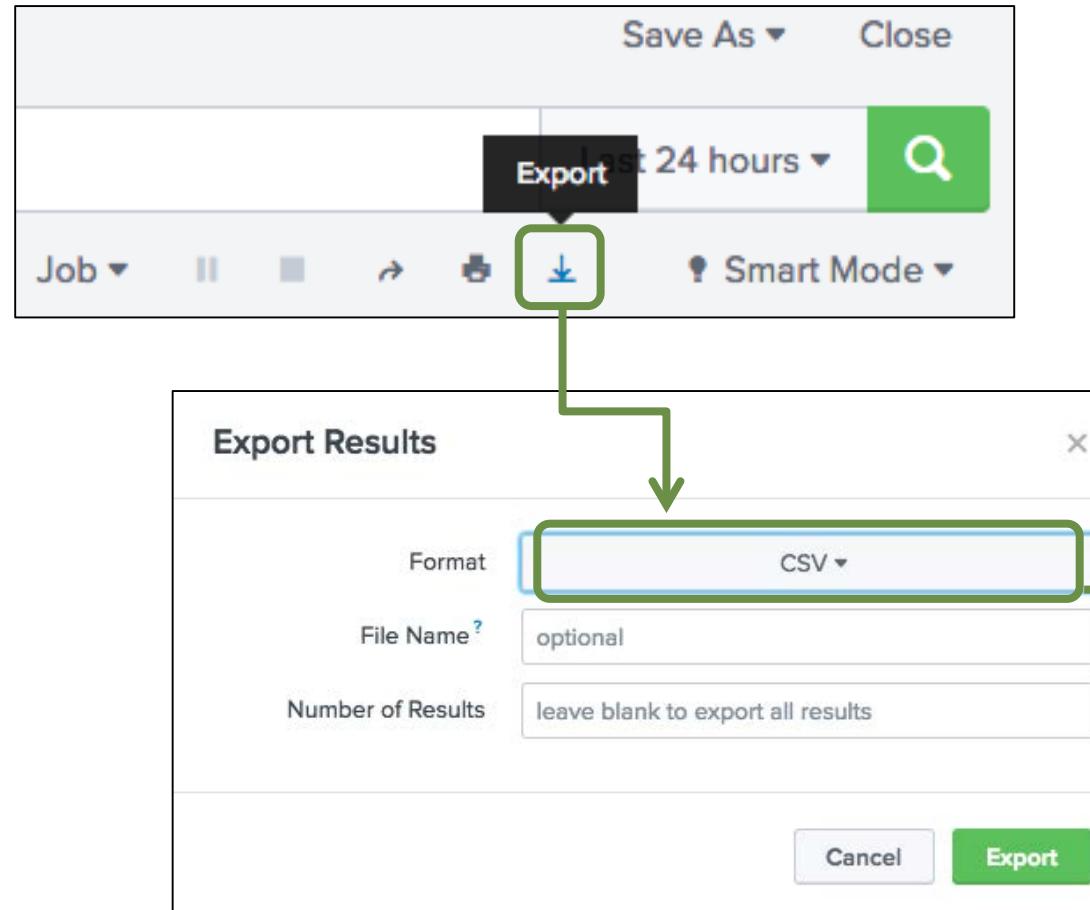
- Use the Share button next to the Job bar to quickly:
 - Give everyone read permissions
 - Extend results retention to 7 days
 - Get a sharable link to the results
- Sharing search allows multiple users working on same issue to see same data
 - More efficient than each running search separately
 - Less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



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

Exporting Search Results

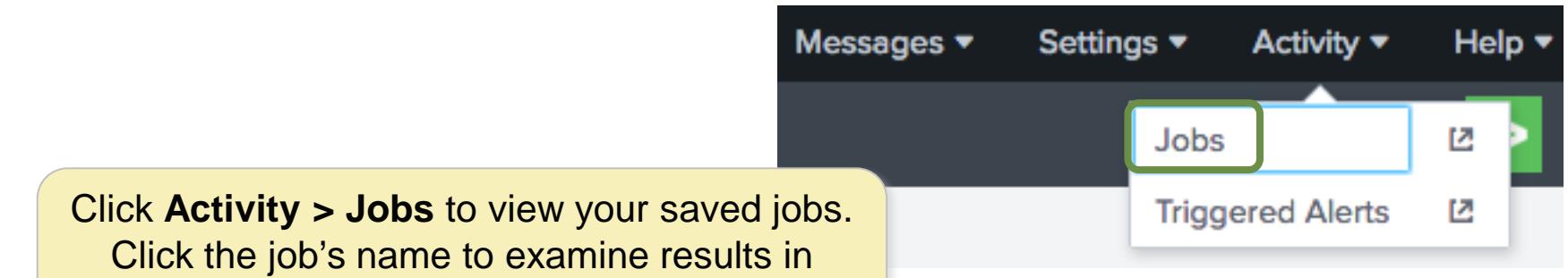
For an external copy of the results, **export** search results to Raw Events (text file), CSV, XML, or JSON format



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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 ▾	■ ↻ ↓
"failed password" [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:** Includes links to "Documentation" and "Tutorial".
- What to Search:** Shows "537,902 Events" indexed from "3 months ago" to "a few seconds ago".
- 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 (Step 3):** A table of search queries with columns for "Search", "Actions", and "Last Run". The first query is expanded to show its full text:

(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
- 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

area_code=404

action=purchase status=503

source=/var/log/messages* NOT host=mail12

sourcetype=access_combined

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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

New Search
"failed password"
✓ 2,406 events (1/4/18 1:00:00.000 PM to 1/5/18 1:36:10.000 PM) No Event Sampling ▾

Events (2,406) Patterns Statistics Visualization Format Timeline ▾ List ▾ Format 20 Per Page ▾

◀ Hide Fields ⌂ All Fields i Tim click to view all fields

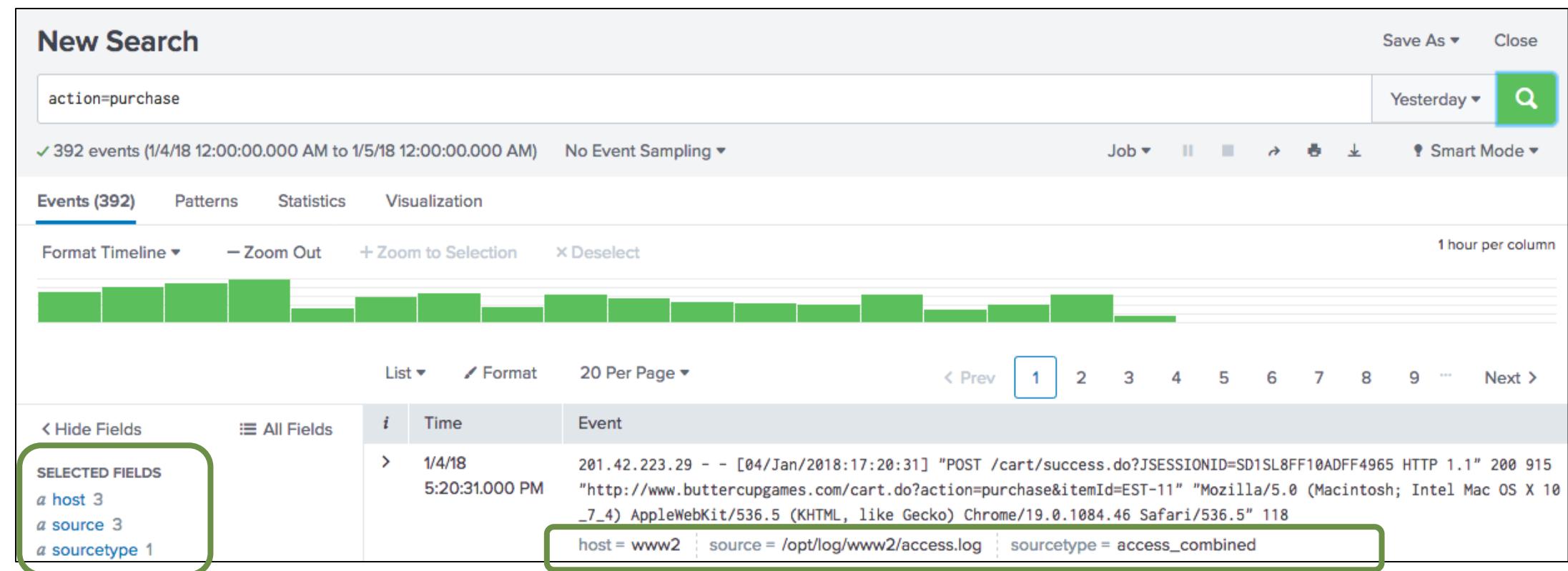
SELECTED FIELDS
a host 4
a source 4
a sourcetype 1

INTERESTING FIELDS
a action 1
a app 1
date_hour 17
date_mday 2
date_minute 60

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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

- Click a field in the Fields sidebar
- 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 panels: a sidebar and a main event viewer.

Left Sidebar: Shows the "SELECTED FIELDS" section containing three items: `a host`, `a source`, and `a sourcetype`. Below it is the "INTERESTING FIELDS" section, which contains a list of 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, indicating it is the target for selection.

Right Panel: A detailed view of an event from January 4, 2018. The event details are as follows:

```
> 1/4/18 201.42.223.29 - [04/Jan/2018:17:20:31] "POST /cart/success.do?JSE
  0 915 "http://www.buttercupgames.com/cart.do?action=purchase&itemI
  Mac OS X 10_7_4) AppleWebKit/536.5 (KHTML, like Gecko) Chrome/19.0.
  action = purchase host = www2 source = /opt/log/www2/access.log
```

The "action" field is listed under "Values" with a count of 392 and 100% frequency. The "Selected" checkbox is checked, and the "Yes" button is highlighted with a green border and a red circle with the number "2" above it, indicating it was clicked to confirm the selection.

Bottom Panel: An event list showing 392 events from January 4, 2018, to January 5, 2018. The "Events (392)" tab is selected. The "Selected Fields" sidebar at the bottom shows `a action` as the selected field. The event list includes the timestamp, source IP, and the full event details, with the selected field (`a action`) highlighted in orange.

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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 for managing selected fields. A green arrow points from the 'All Fields' button in the sidebar to the 'Select Fields' modal window.

Select Fields Modal:

- Buttons: Select All Within Filter, Deselect All, Coverage: 1% or more, Filter, and a search icon.
- Table Headers: # of Values, Event Coverage, Type.
- Table Data:

# of Values	Event Coverage	Type
1	100%	String
3	100%	String
3	100%	String
1	100%	String
>100	100%	String
>100	100%	Number
8	50.77%	String

Sidebar Buttons: < Hide Fields, All Fields (highlighted with a green box).

Selected Fields:

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

Event Preview:

```
5:20:31.000 PM 0 915 "http://www.butte
Mac OS X 10_7_4) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/41.0.2227.118 Safari/537.36
action = purchase | host
1/4/18 201.42.223.29 - - [04/J
```

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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%
addtocart	377	9.692%
success	230	5.912%
TCP_REFRESH_HIT	189	4.859%
remove	100	2.602%
TCP_DENIED	43	1.105%

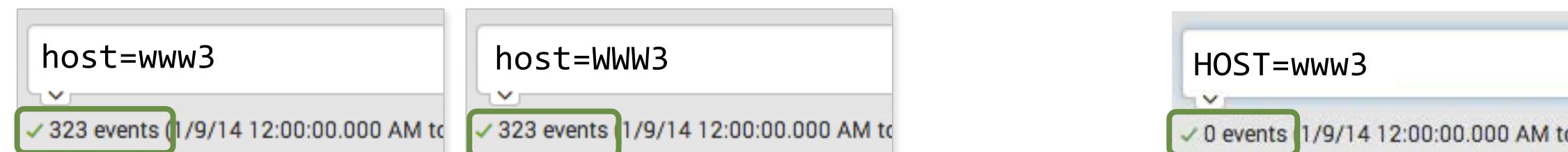
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Using Fields in Searches

- Efficient way to pinpoint searches and refine results



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



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

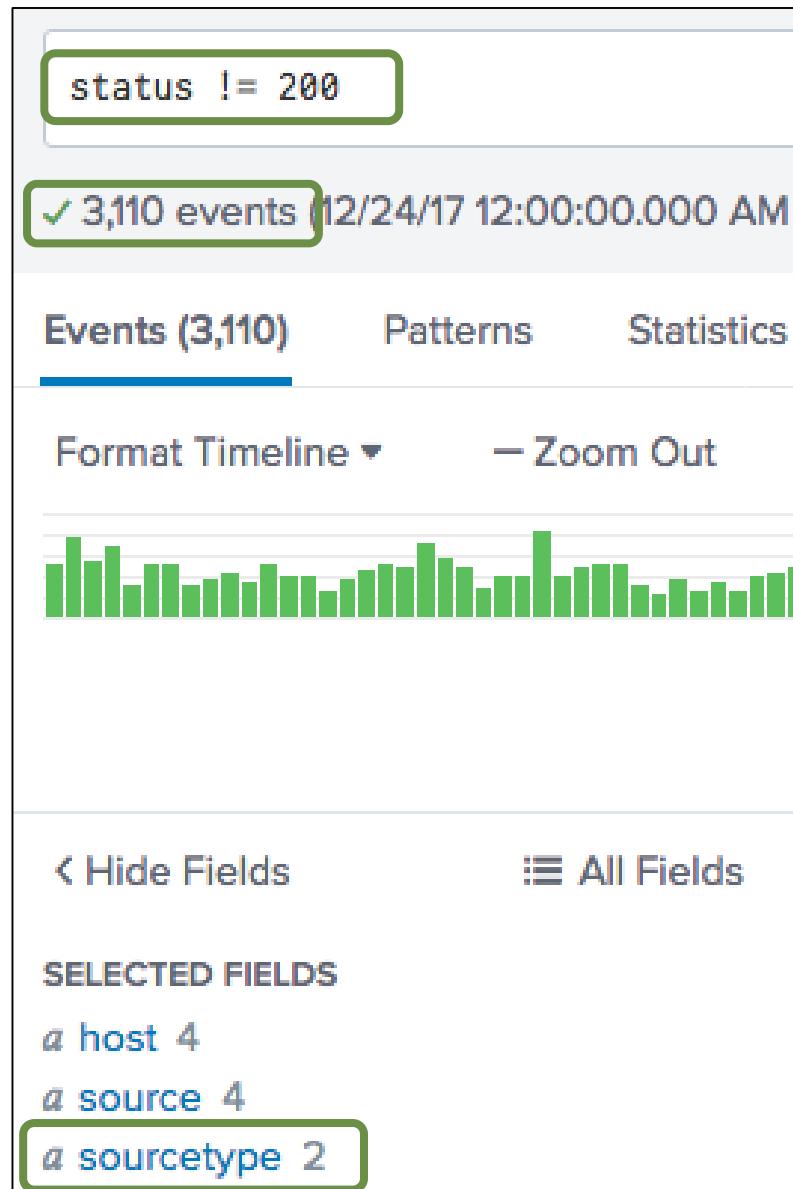
```
host!=www3
```

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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

$!=$ vs. NOT (cont.)

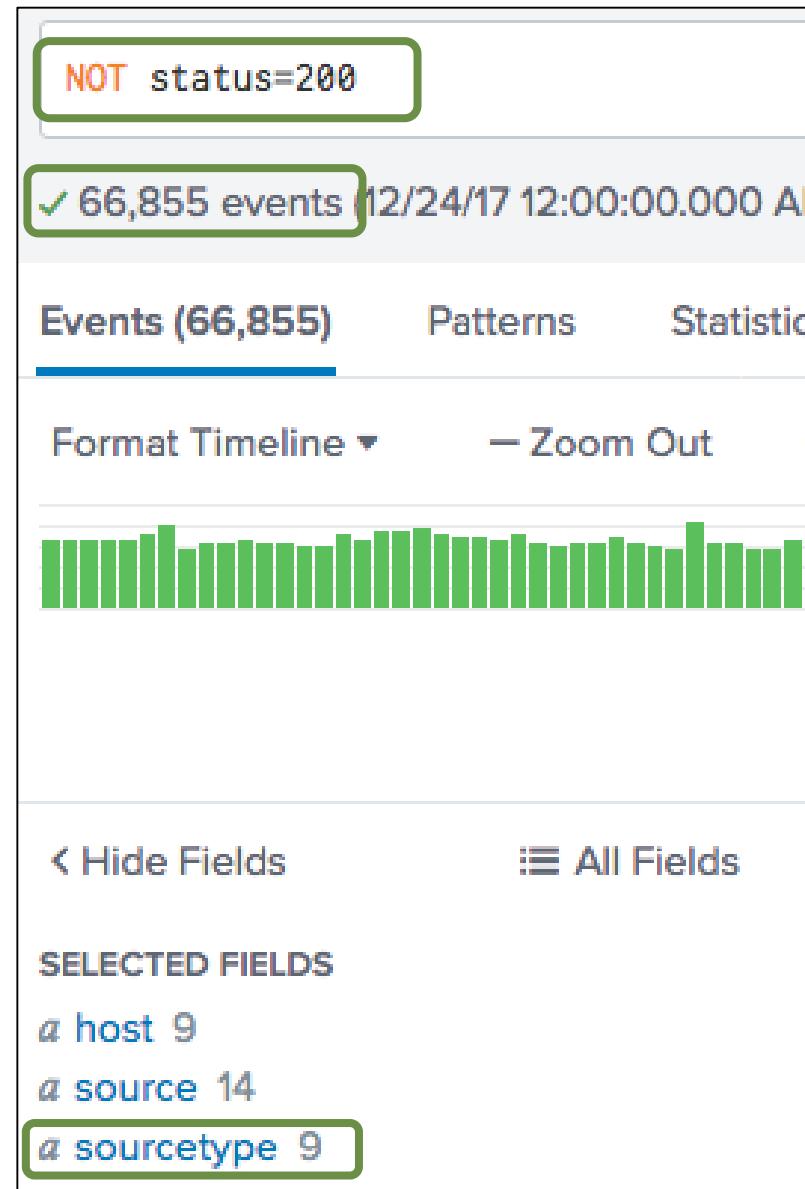


In this example:

- `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.



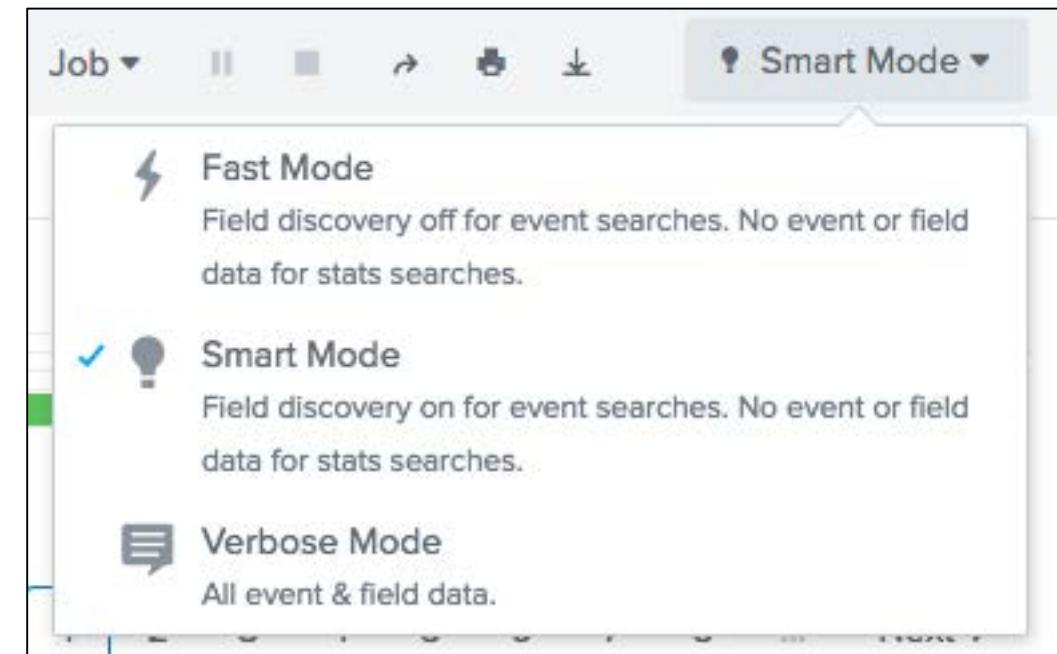
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!= vs. NOT (cont.)

- 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.)

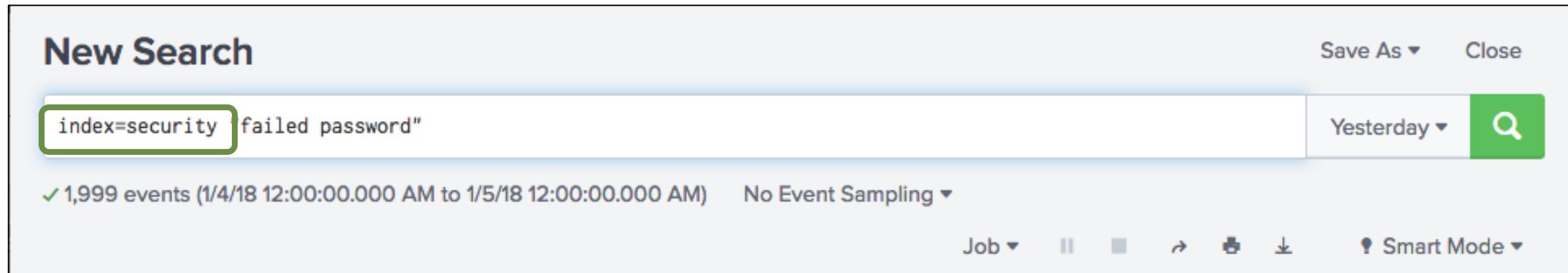
- Filter as early as possible
 - For example, remove duplicate events, then sort
- Avoid using wildcards at the beginning or middle of a string
 - Wildcards at *beginning* of string scan all events within timeframe
 - Wildcards in *middle* of string may return inconsistent results
 - So use fail* (not *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

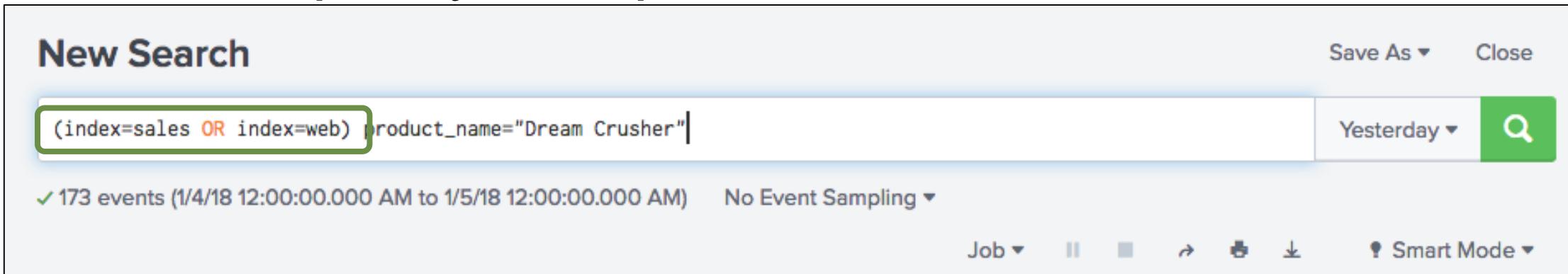
Remember, field names are case *sensitive* and field values are case *insensitive*.

Working with Indexes

- This search returns event data from the security index



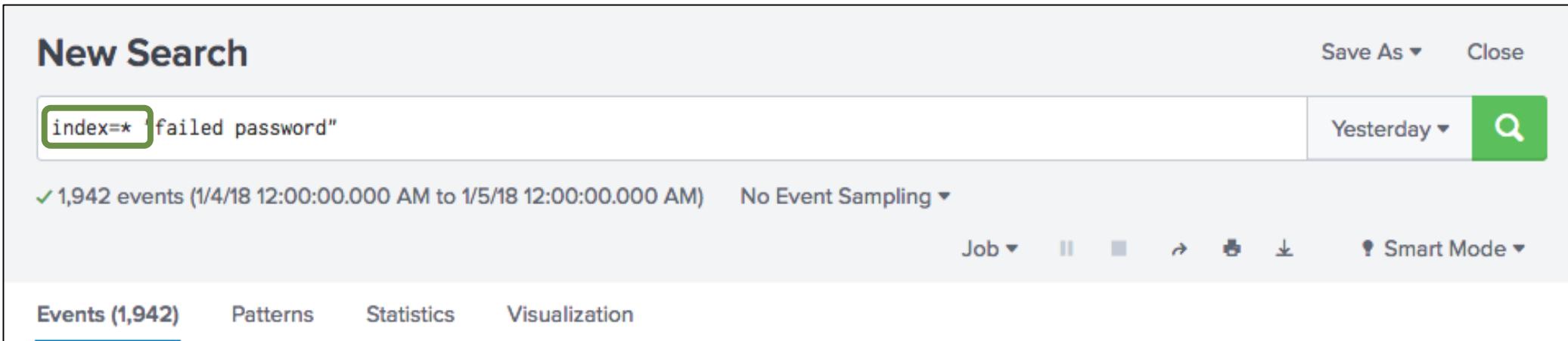
- It's possible to specify multiple index values in a search



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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 i

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

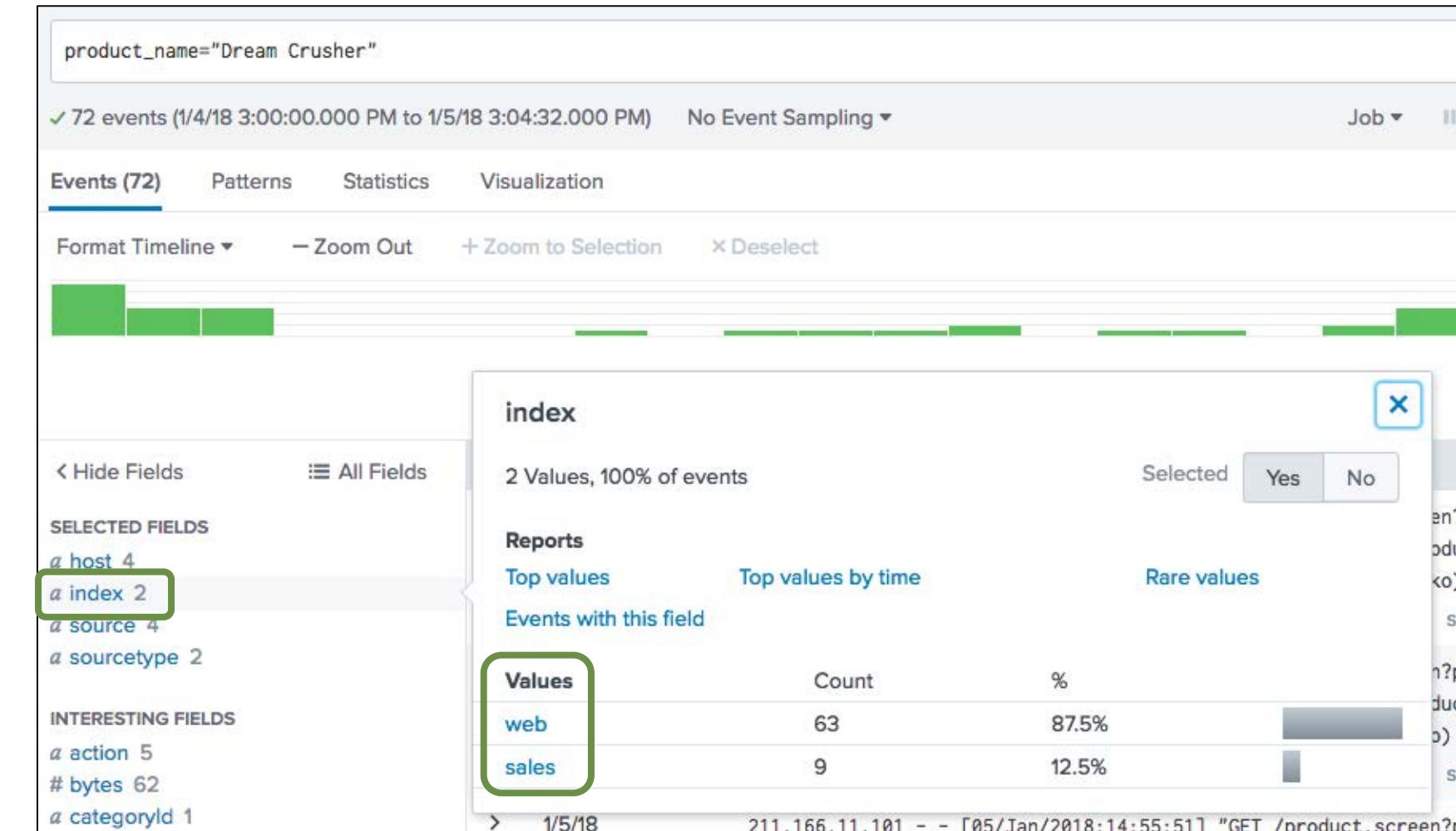
Note 2 i

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



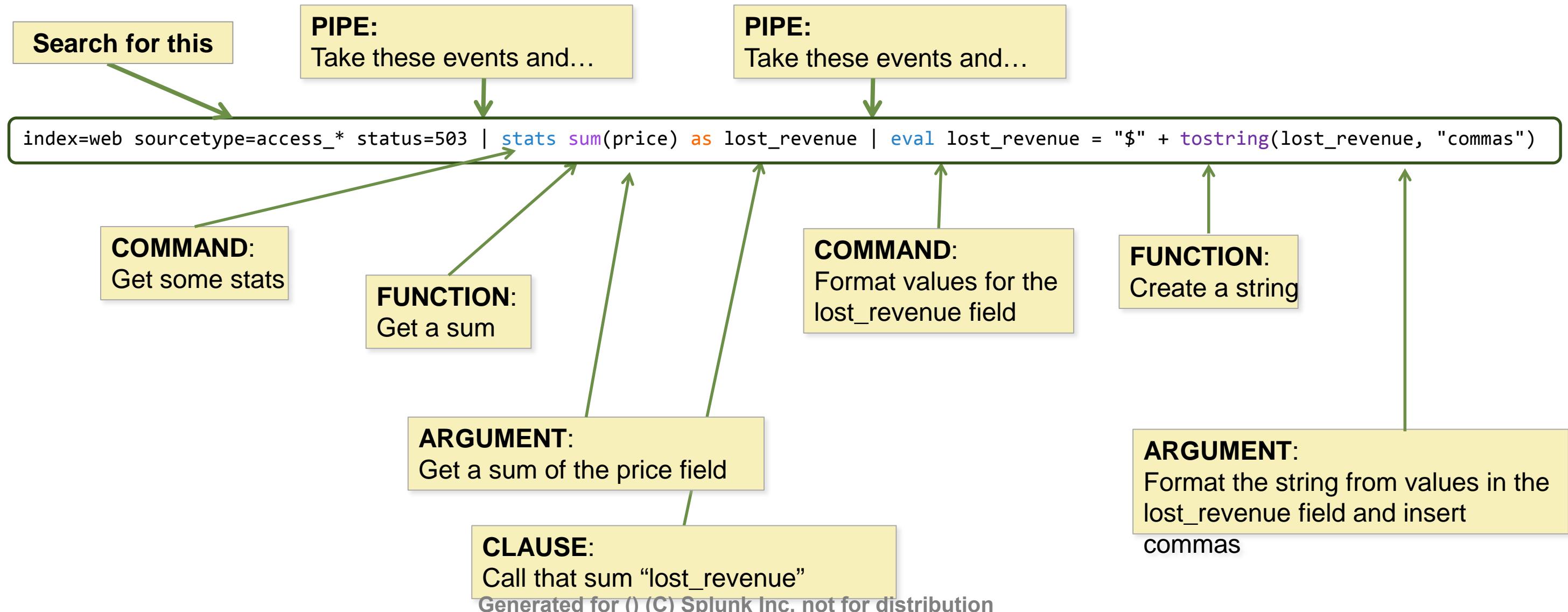
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Module 8: Splunk's Search Language

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Search Language Syntax

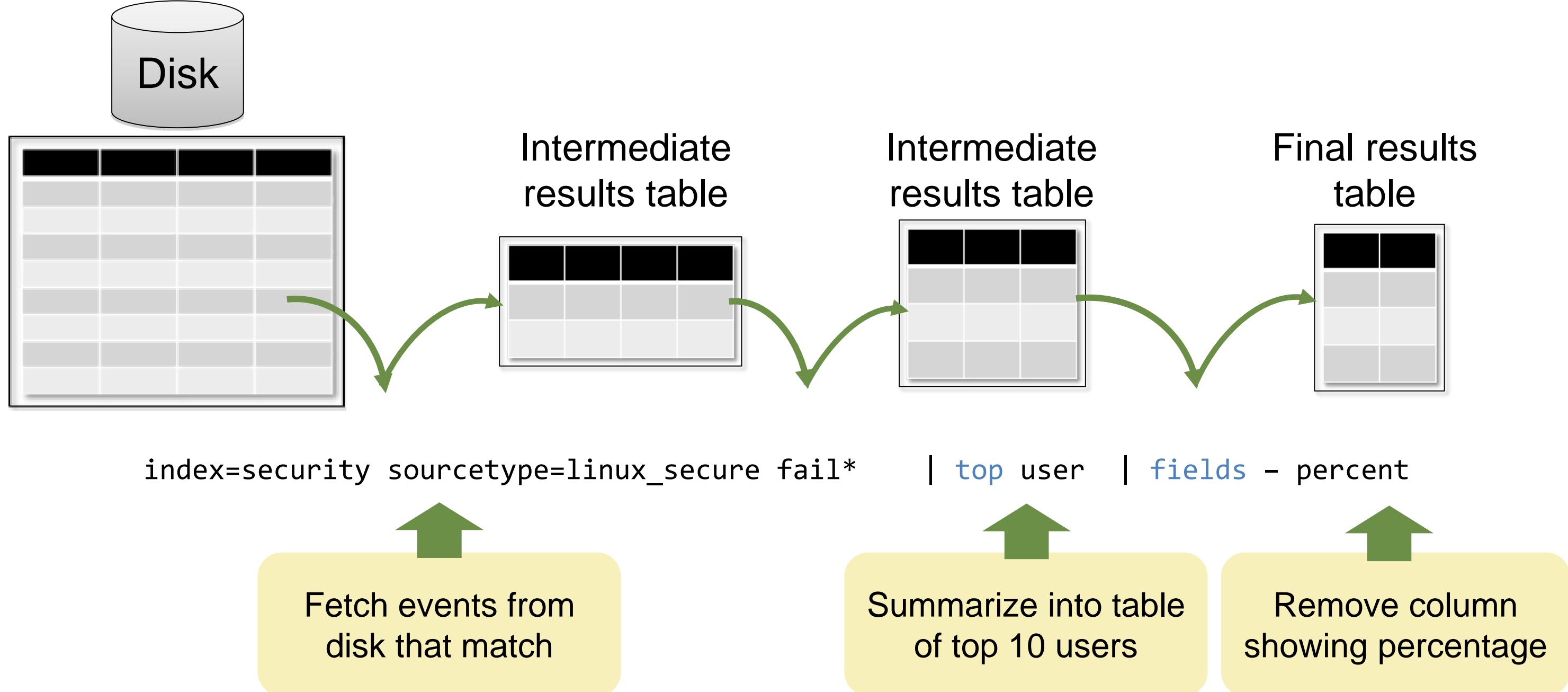
This diagram represents a search, broken into its syntax components:



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



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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")
```

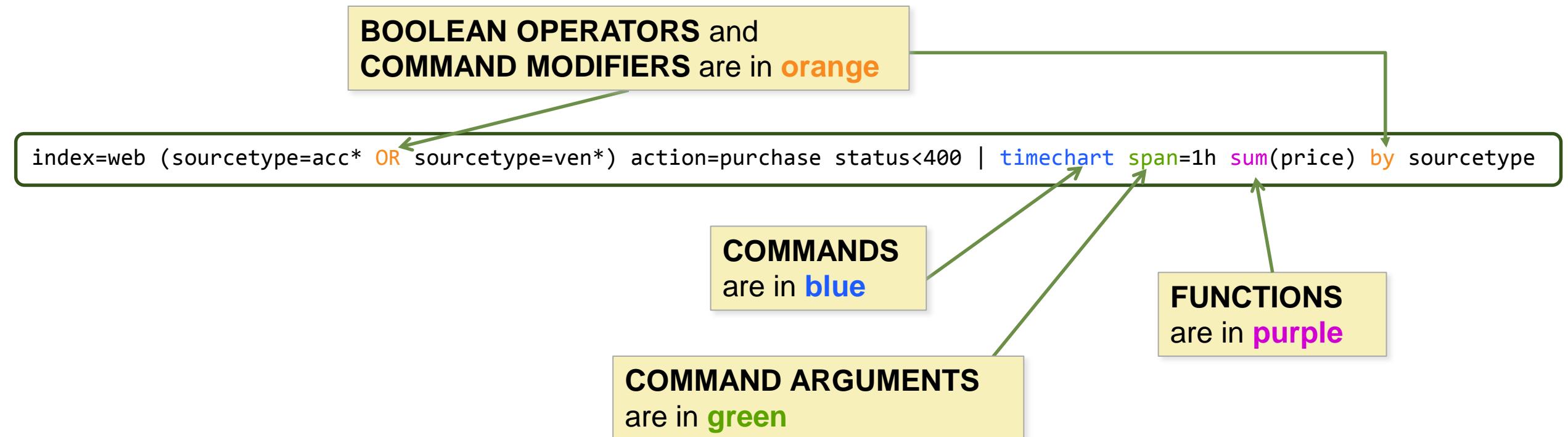
Note 

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

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Syntax Coloring

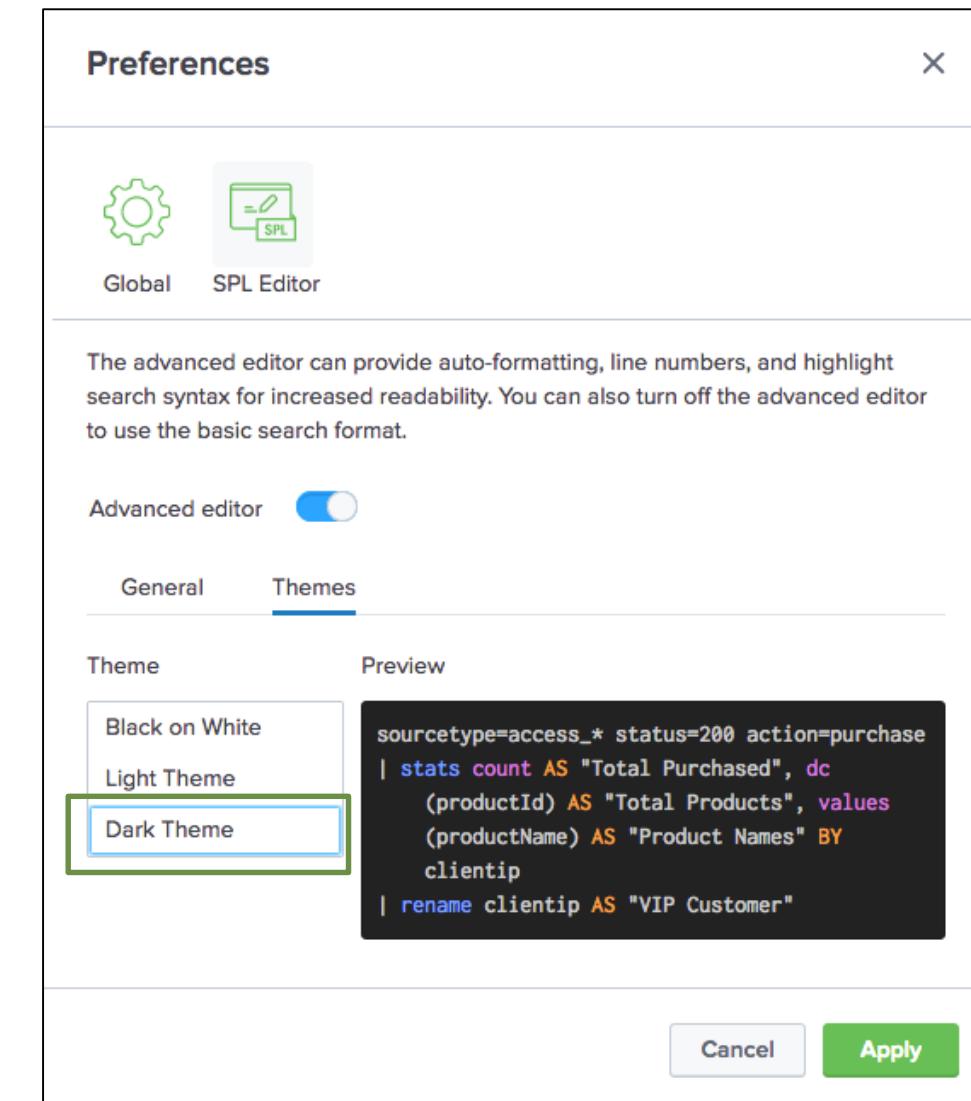
- By default, some parts of the search string are automatically colored as you type
- The color is based on the search syntax
- The rest of the search string remains black



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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

- 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
```

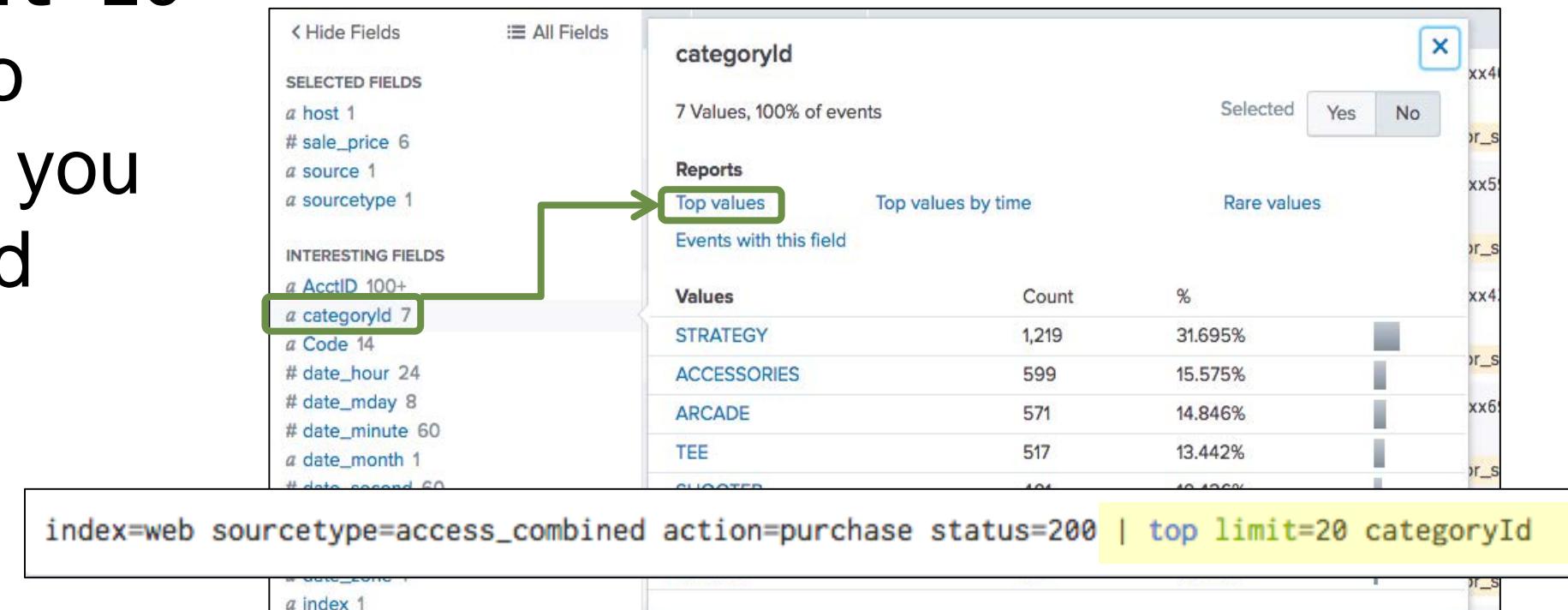
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top Command

- 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

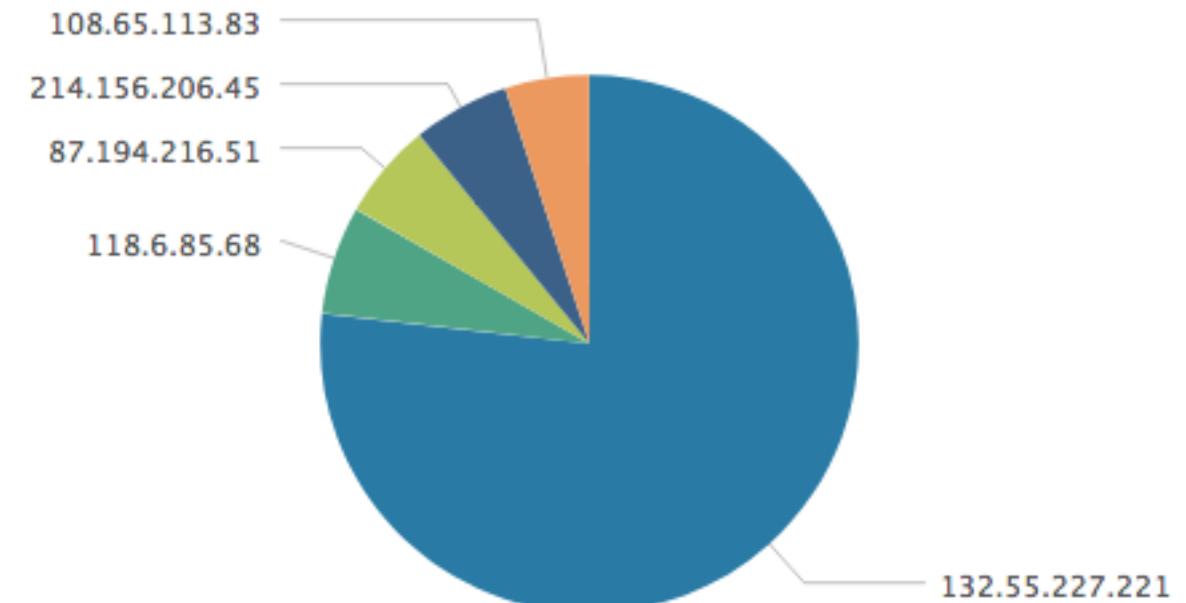
- Control # of results displayed using `limit`
- `limit=#` returns this number of results
- `limit=0` returns unlimited results

```
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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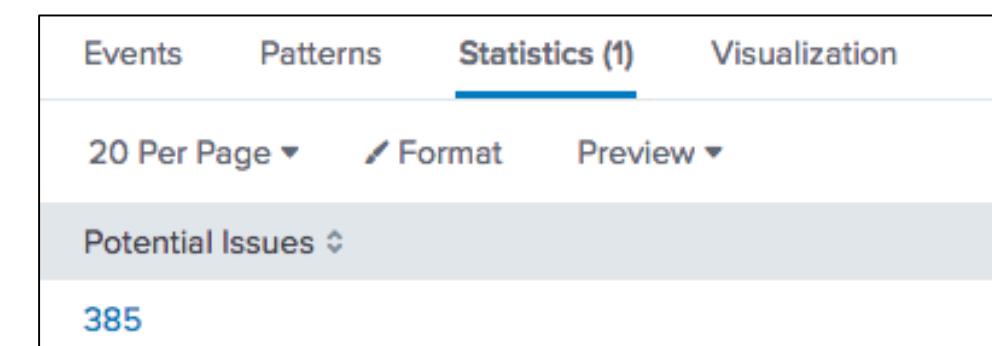
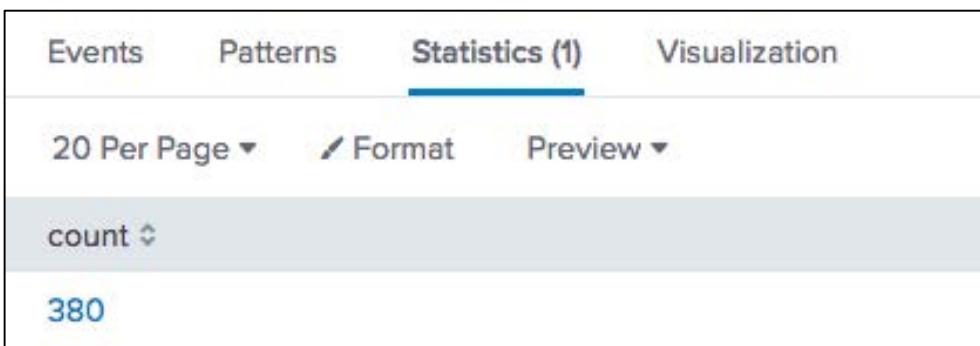
stats Command – count

- 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*)

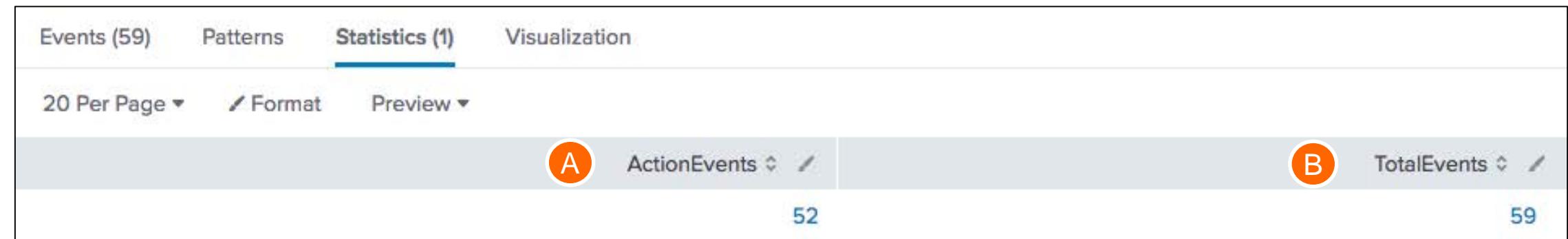
Adding a *field* as an argument to the count function returns the number of events where a value is present for the specified field

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?

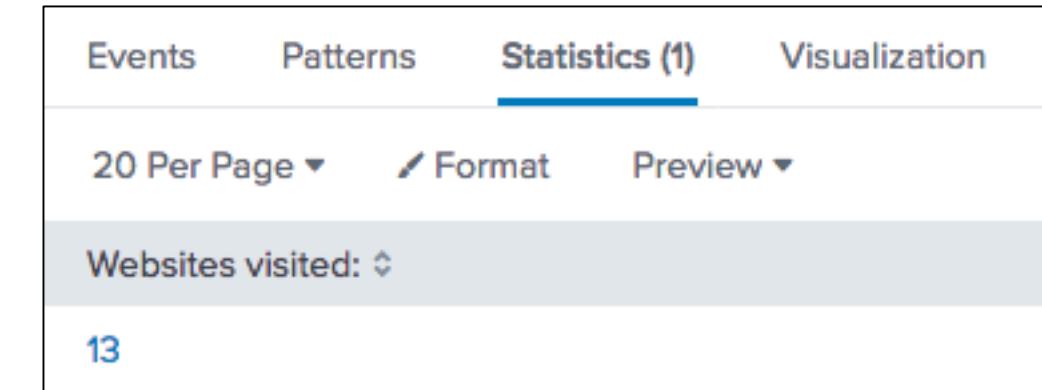
```
index=network sourcetype=cisco_wsa_squid  
| stats dc(s_hostname) as "Websites visited:"
```

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

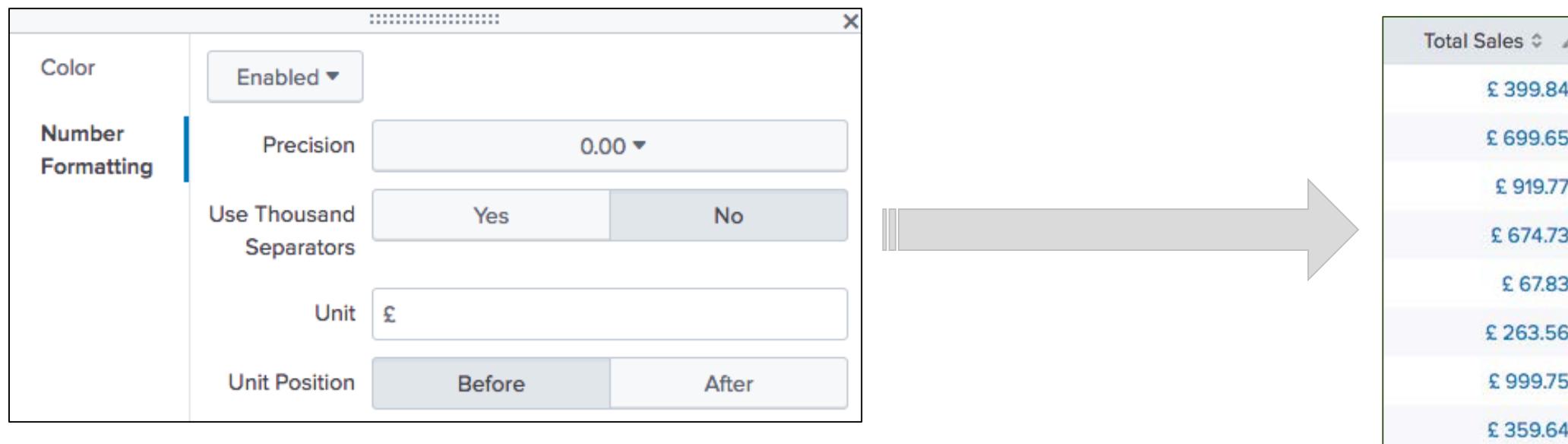
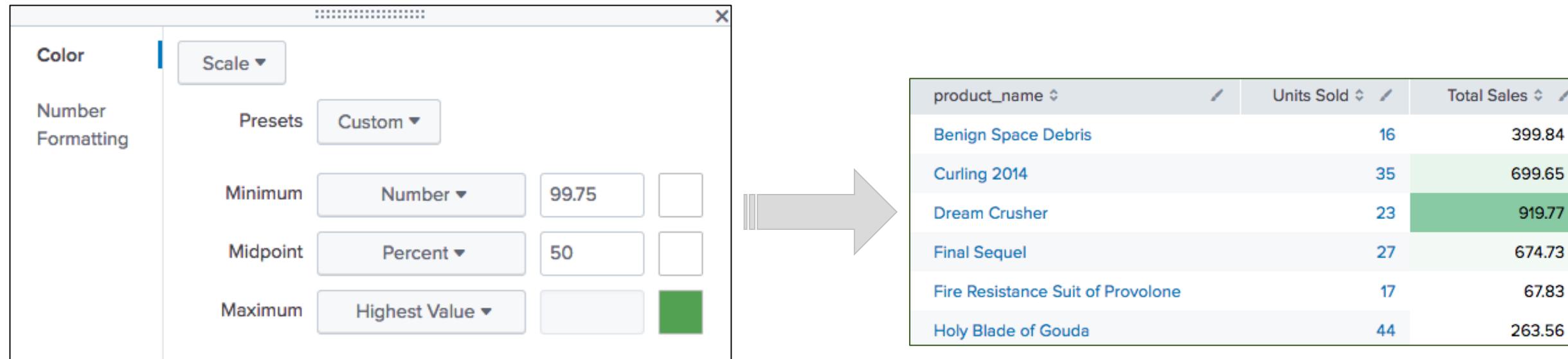
- Tables created with stats commands can be formatted
- Color code data in each column, based on rules you define
- Add number formatting (e.g. currency symbols, thousands separators)
- Can also format data on a per-column basis by clicking the  icon above that column



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?

- 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 with the following steps highlighted:

- 1 Run a search: The search bar at the top contains the query `index=web sourcetype=access_combined action=purchase status!=200`.
- 2 Select Save As: A context menu is open, with the "Report" option highlighted.
- 3 Select Report: The "Report" option in the context menu is selected.

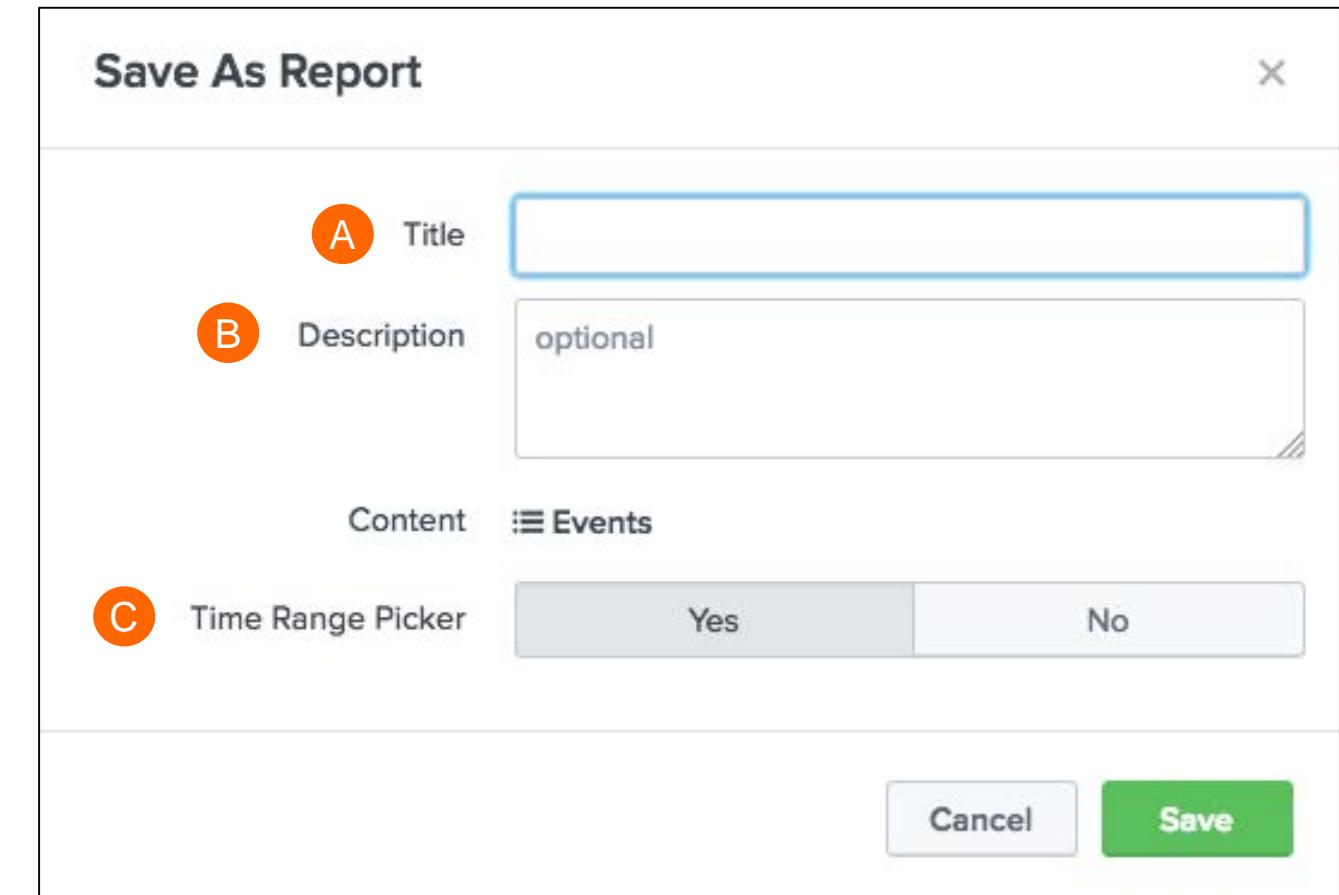
The main search results table displays 50 events from March 11, 2018, to March 12, 2018. The first event in the list is:

Event		
Time	Event	Selected Fields
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&JSE SSIONID=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.)

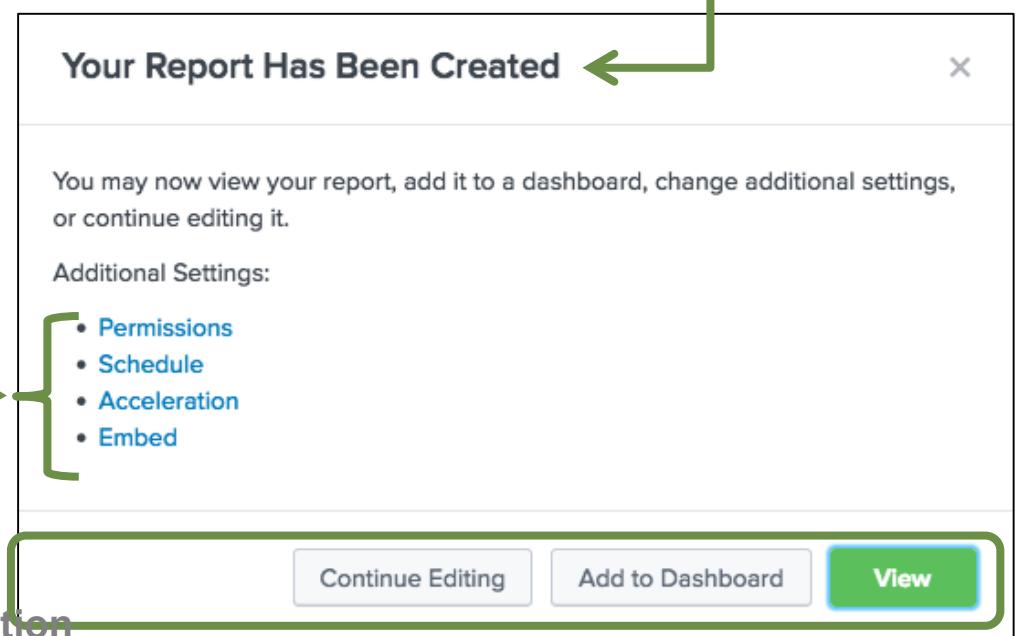
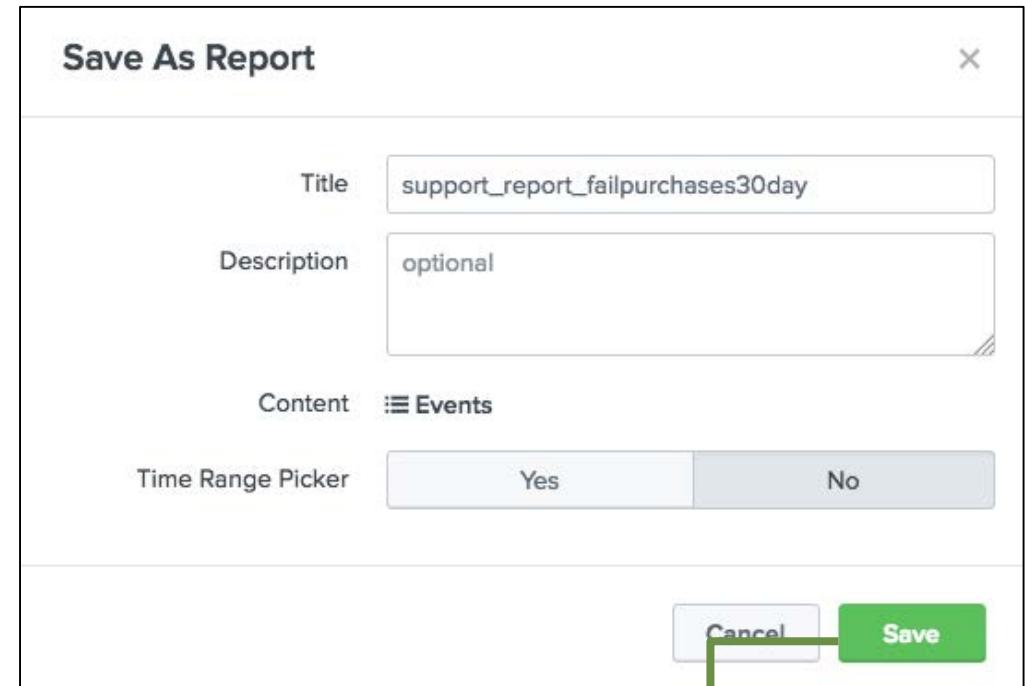
- A Give the report a meaningful title (required)
- B Specify a description (optional)
- C Select whether to include or not to include a time range picker
 - The report is saved with the time range that was selected when it was created
 - Adding a time range picker allows you to adjust the time range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



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 sidebar with tabs for Search, Datasets, Reports (which is selected), and Alerts. Below the tabs, there's a section for 'Reports' with a note about them being based on single searches and a link to view the report in Pivot or SPL. A list of 7 reports is shown, with the first one, 'support_report_failpurchases30day', selected and expanded.

The main area displays the report results for 'support_report_failpurchases30day'. The title is 'support_report_failpurchases30day'. At the top right are buttons for Edit, More Info, and Add to Dashboard. Below the title, a message says '✓ 953 events (12/9/17 12:00:00.000 AM to 1/8/18 9:56:39.000 AM)'. There are buttons for Job, II, and other controls. The results are presented in a table with columns for i, Time, and Event. The first two rows of the table are:

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

Below the table, there are buttons for Open in Search, Edit, None, nobody, search, and App. The last row of the table is partially visible.

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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 named "support_report_failpurchases30day". The report displays 953 events from December 9, 2017, to January 8, 2018. The search command is:

```
sourcetype=access_combined action=purchase status!=200
```

The interface includes tabs for Events (953), Patterns, Statistics, and Visualization. A context menu is open on the right, with "Open in Search" highlighted. Other options in the menu include:

- Edit Description
- Edit Permissions
- Edit Schedule
- Edit Acceleration
- Clone
- Embed
- Delete

The bottom of the interface shows a footer with the text "Generated for () (C) Splunk Inc, not for distribution".

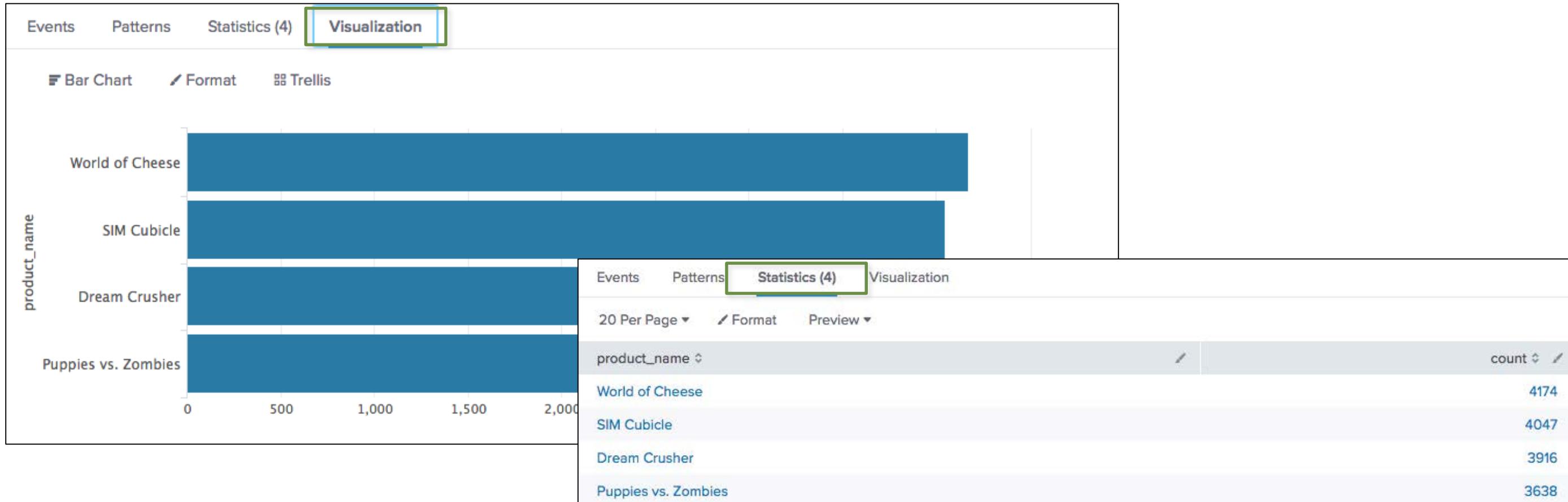
Creating Tables and Visualizations

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



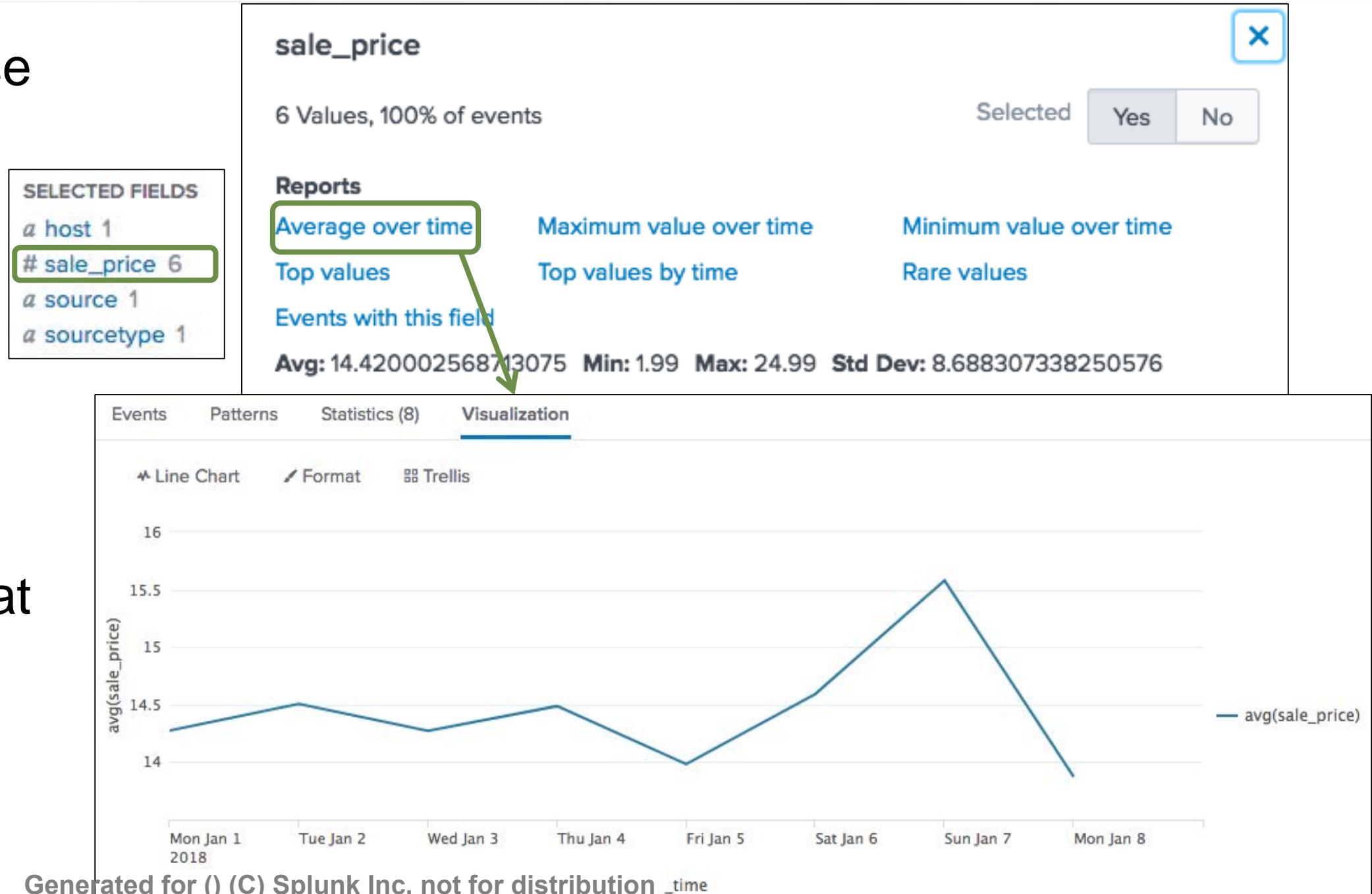
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Creating Reports From the Field Window

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

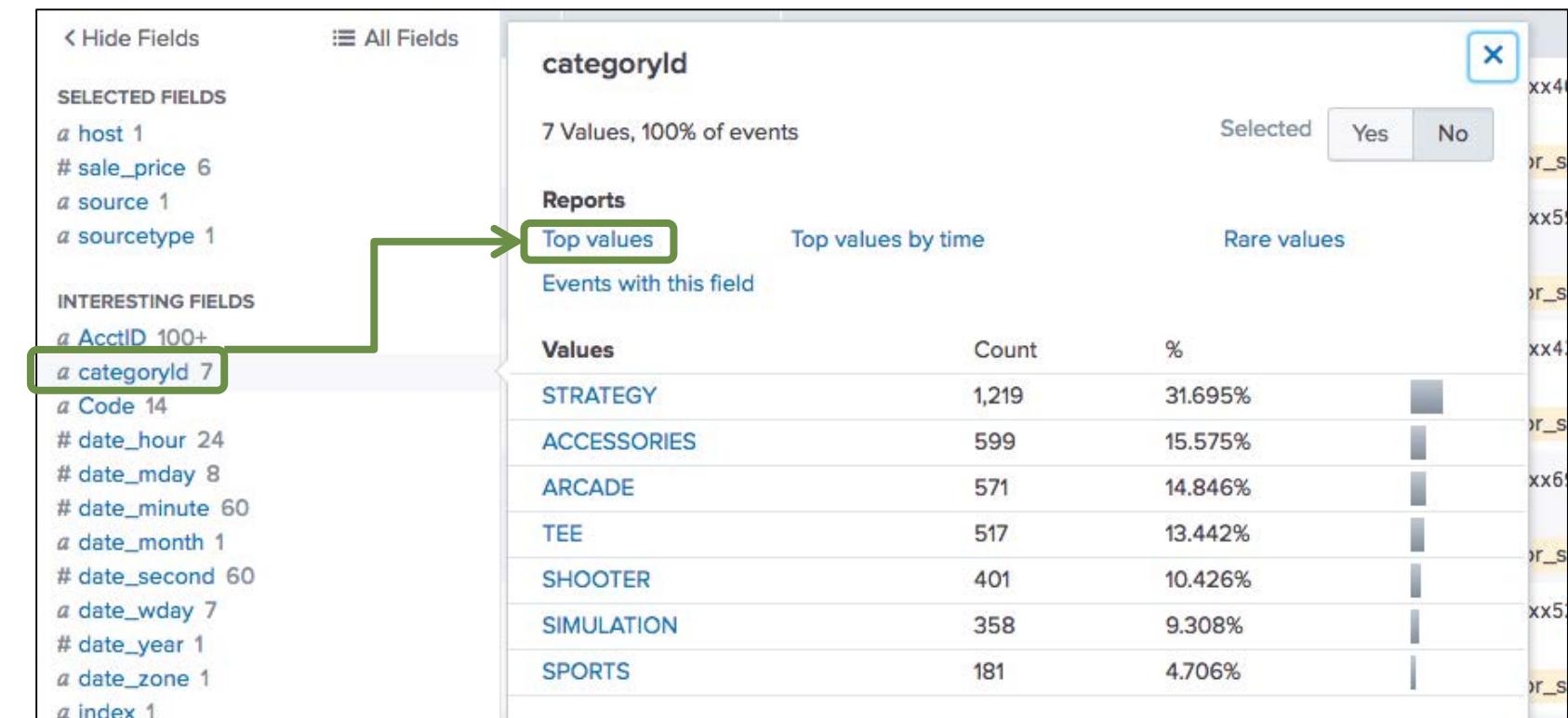
- This example generates a report that shows the average over time

– This is known as a **timechart**



Creating a Top Values Report

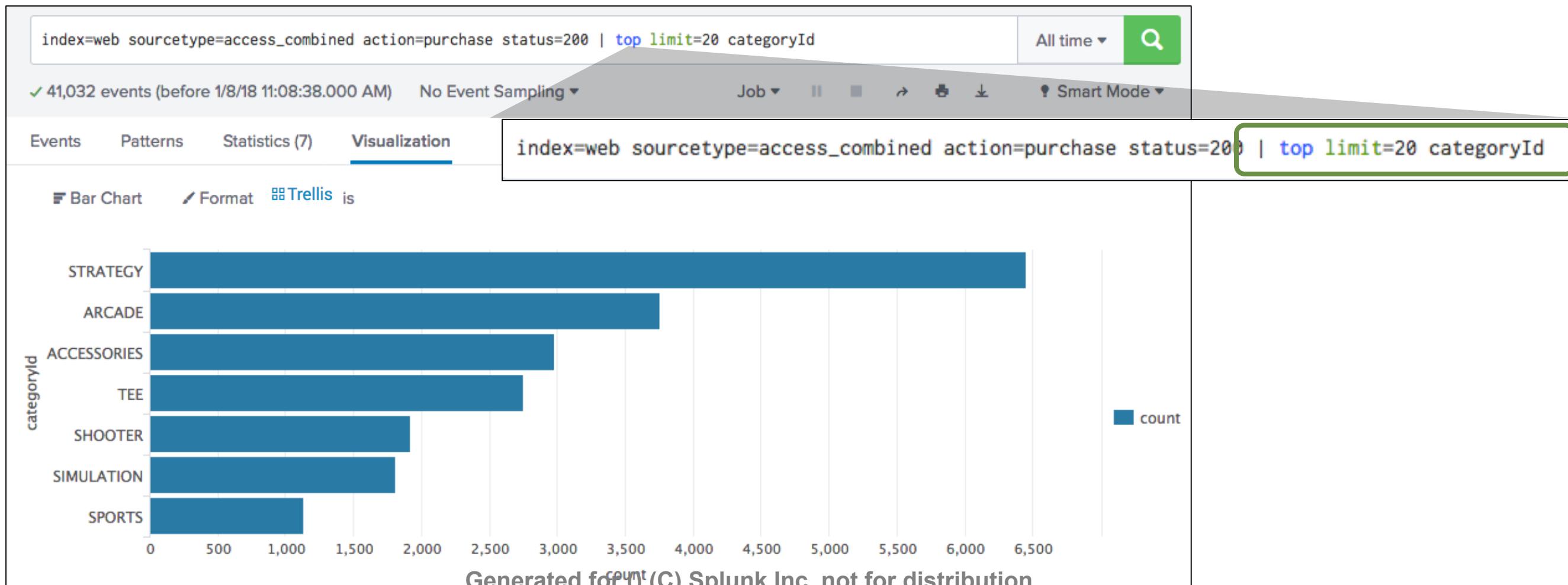
- For alphanumeric character fields, there are only 3 available reports
- In this example, you want a report that shows the top **categories** purchased
 1. Run basic search: sourcetype=access_combined status=200 action=purchase
 2. Click the **categoryId** field
 3. Click **Top values**



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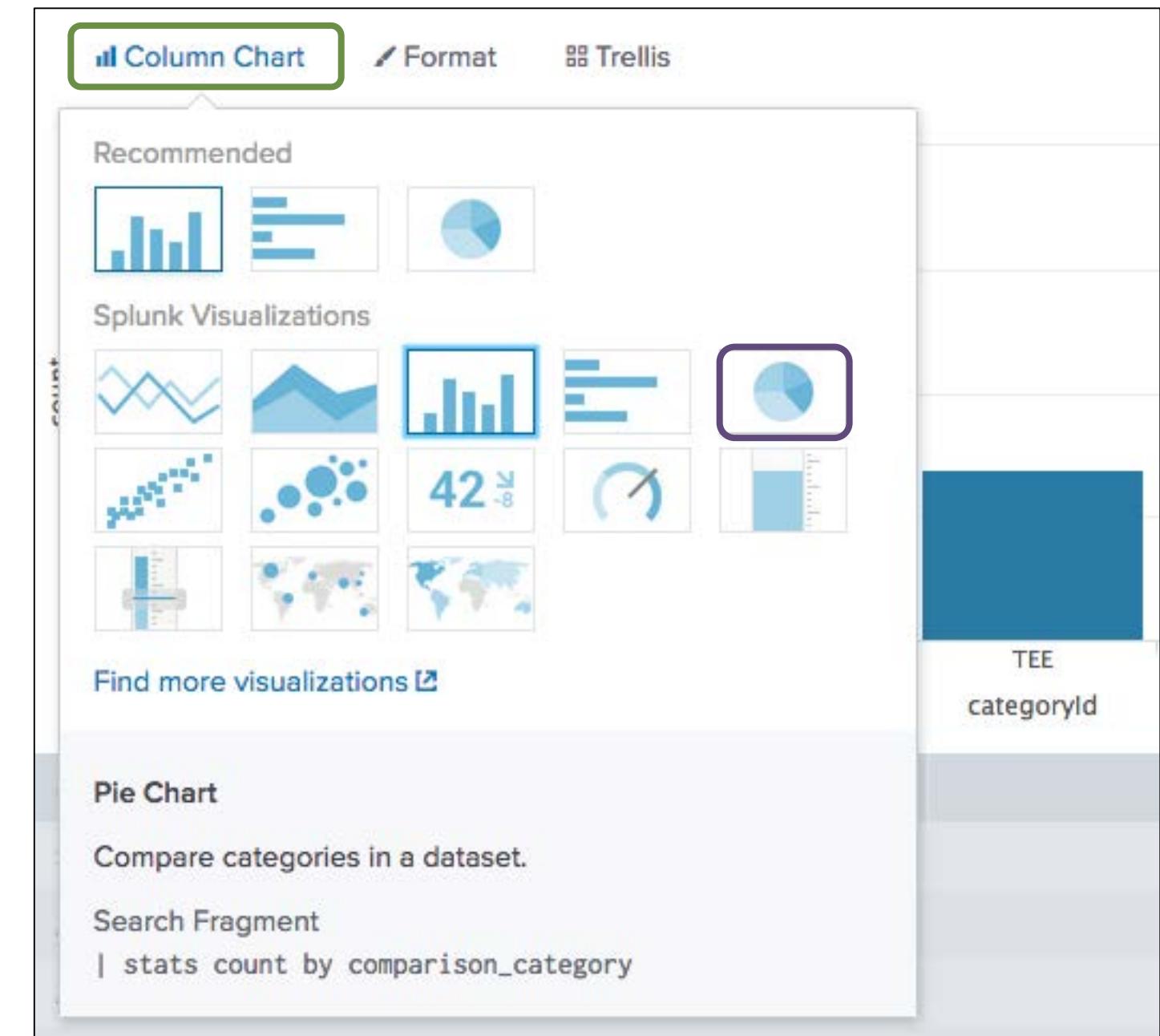
Creating a Top Values Report (cont.)

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

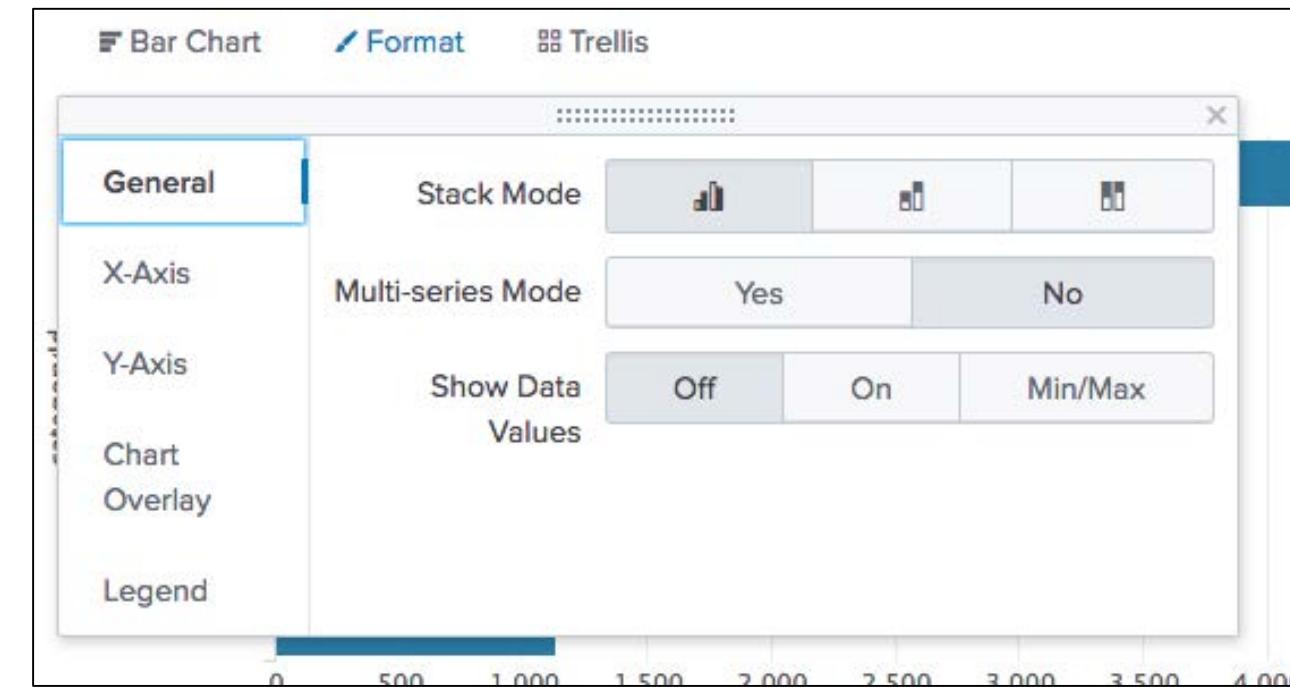
- Select a visualization from the visualization type dropdown menu
- In this example, the column chart is changed to a pie chart



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Changing the Visualization Format

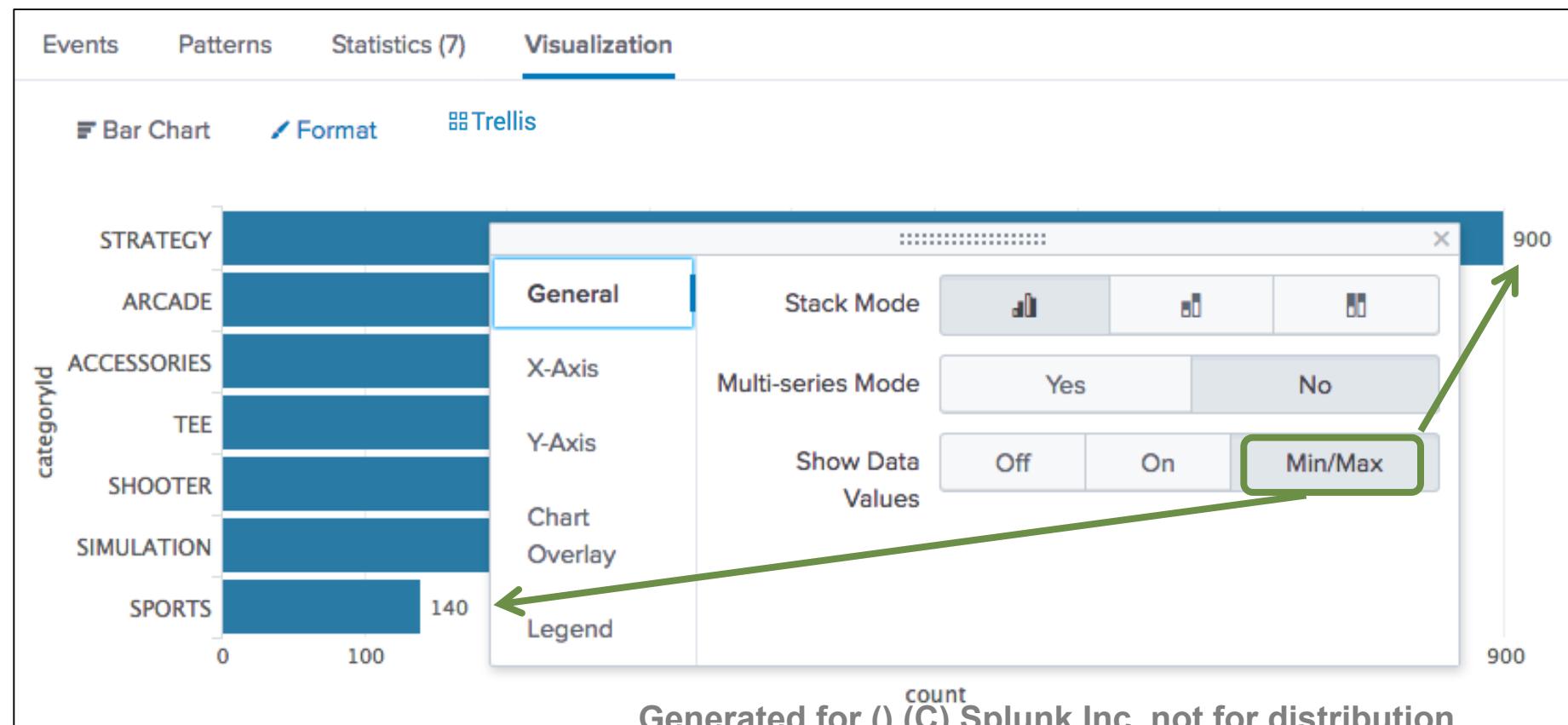
- The **Format** menu allows you to change formatting options
- For example, for bar and column charts:
 - The **General** tab allows you to change Stack and Multi-series modes
 - The **X-Axis** and **Y-Axis** tabs allow you to change the axis labels and orientation
 - **Chart Overlay** allows you to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

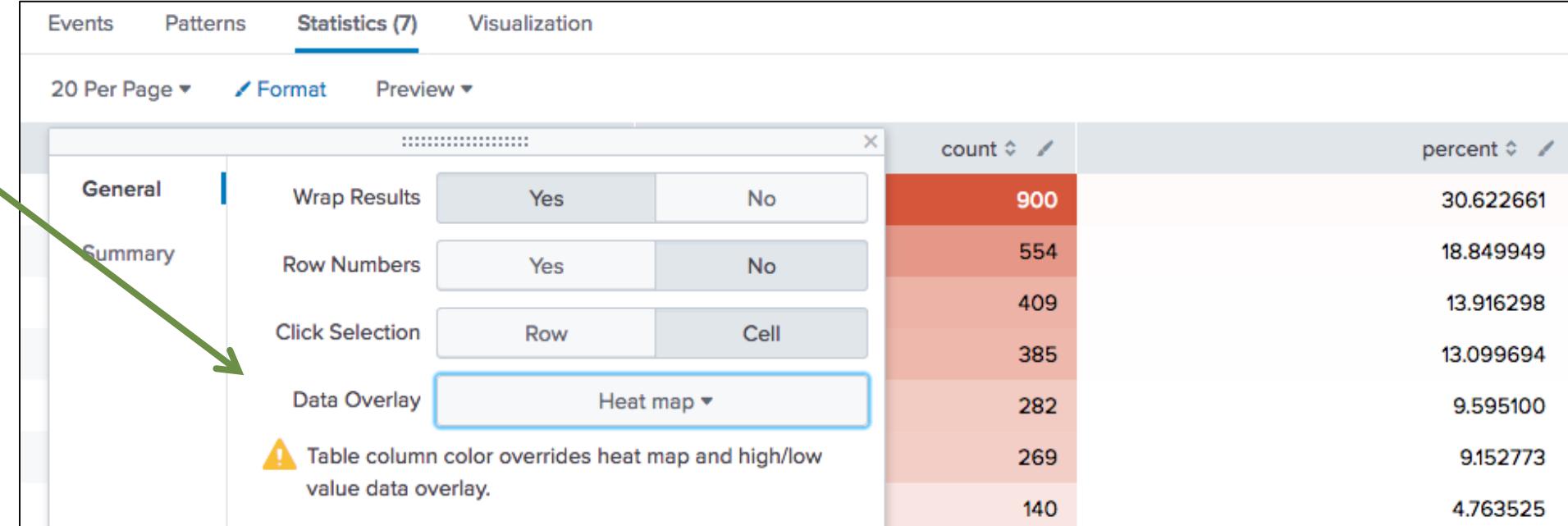
The screenshot shows the Splunk interface with the Statistics tab selected. The table lists categories and their counts and percentages:

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

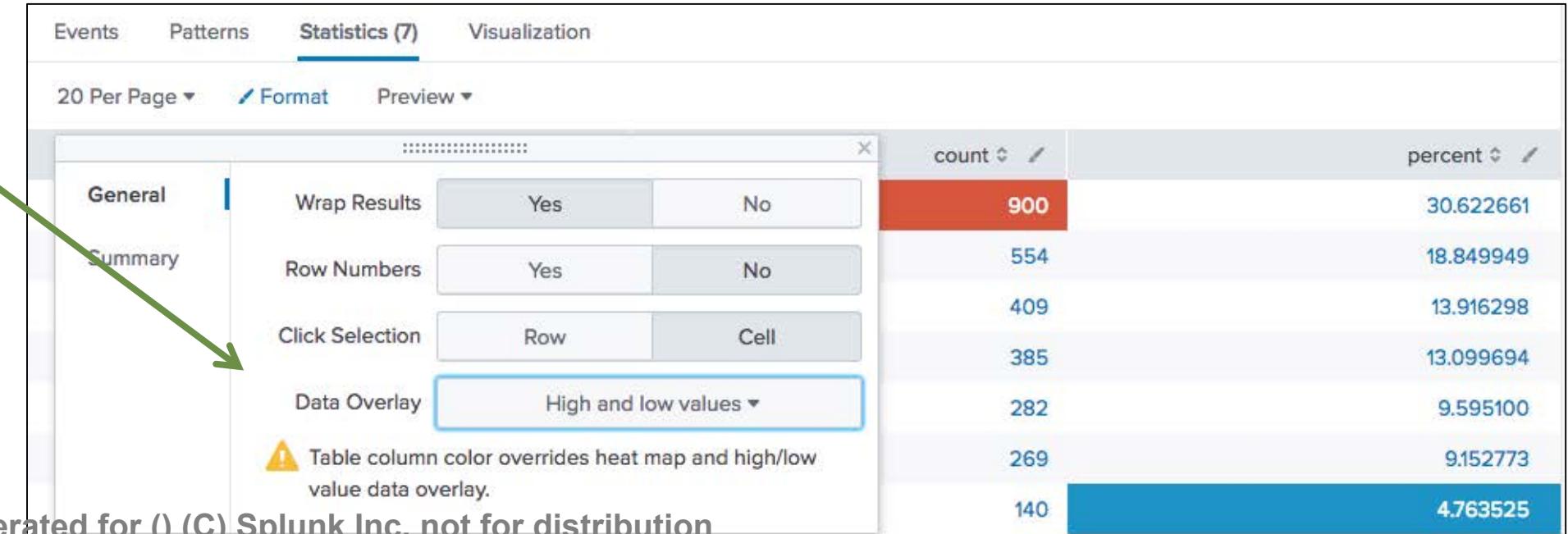
- Heat map highlights outstanding values



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 'Wrap Results', 'Row Numbers', 'Click Selection', and a warning about table column colors overriding the 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



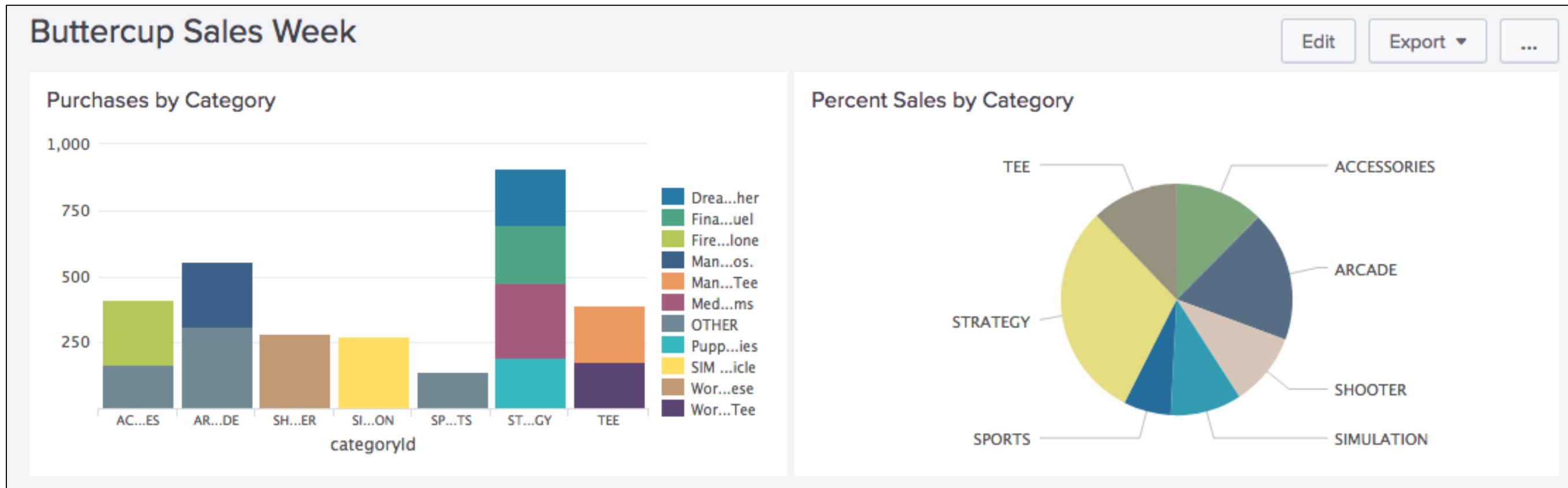
The screenshot shows the Splunk Statistics interface with the 'High and low values' option selected under 'Data Overlay'. A green arrow points from the text 'High and low values highlights max and min of non zero values' to this selection. The interface is identical to the first screenshot, with the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

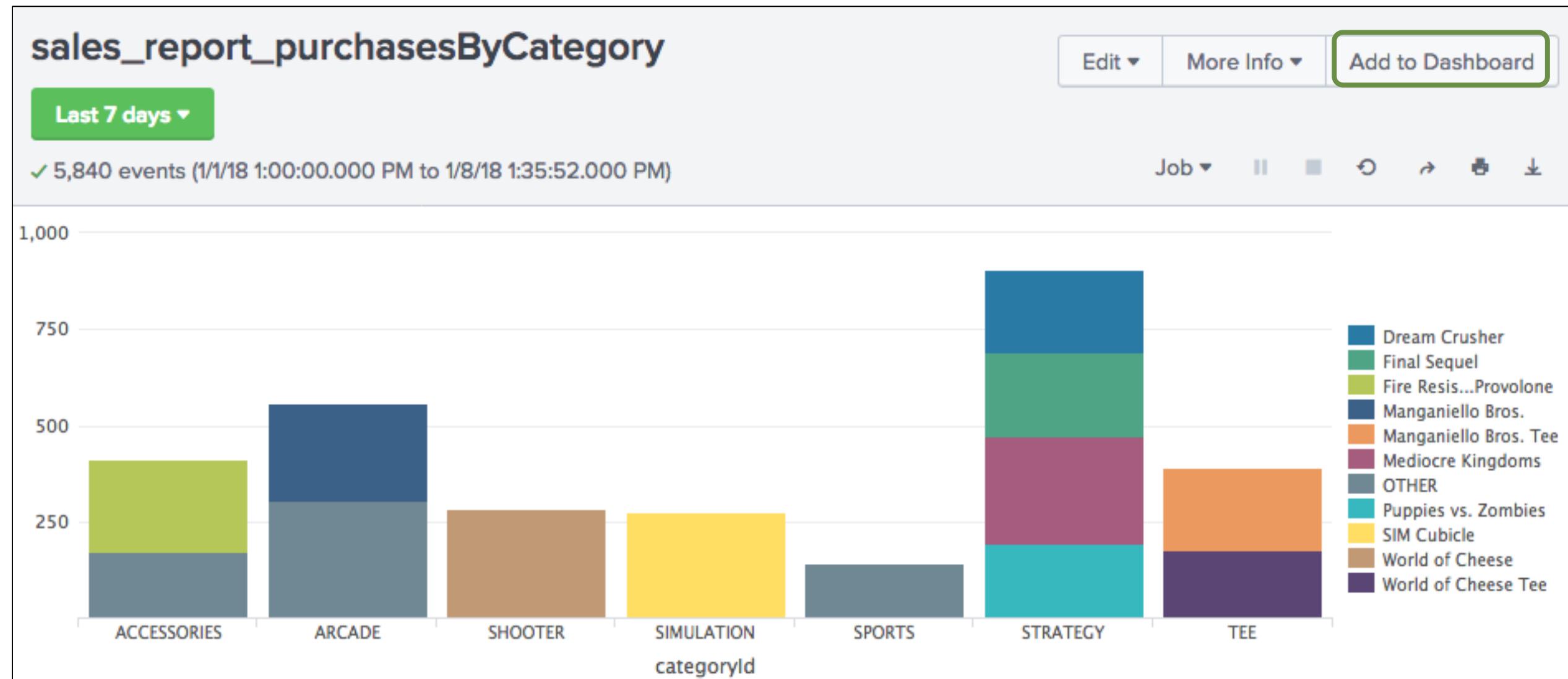
- A dashboard consists of one or more panels displaying data visually in a useful way – such as events, tables, or charts
- A report can be used to create a panel on a dashboard



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Adding a Report to a Dashboard

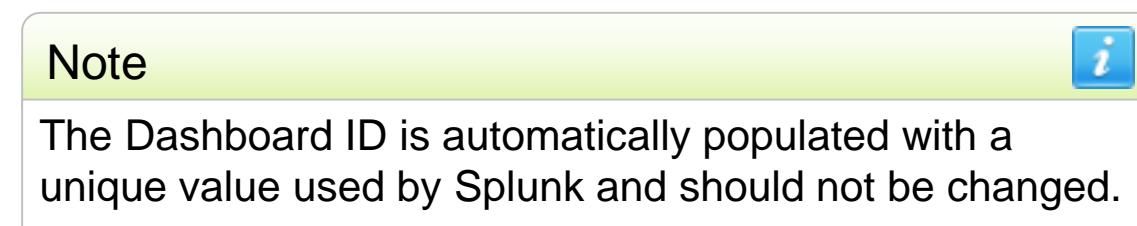
In the report, click Add to Dashboard to begin



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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



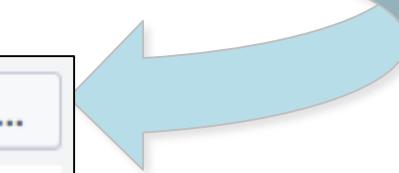
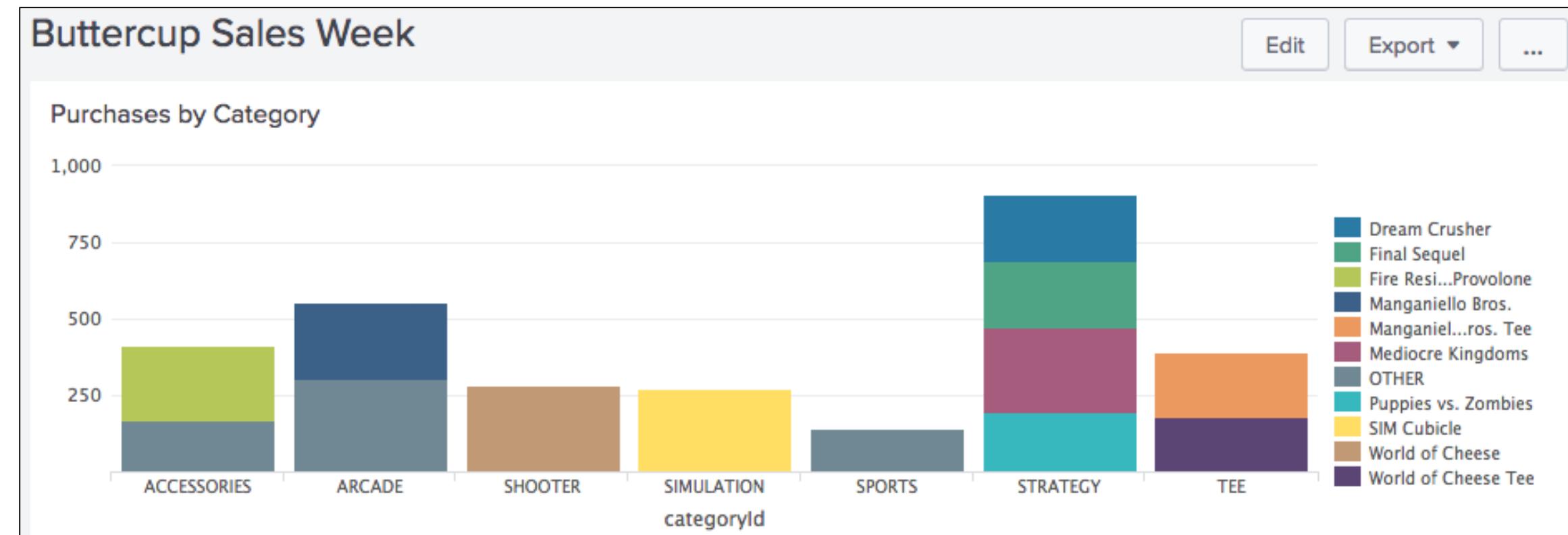
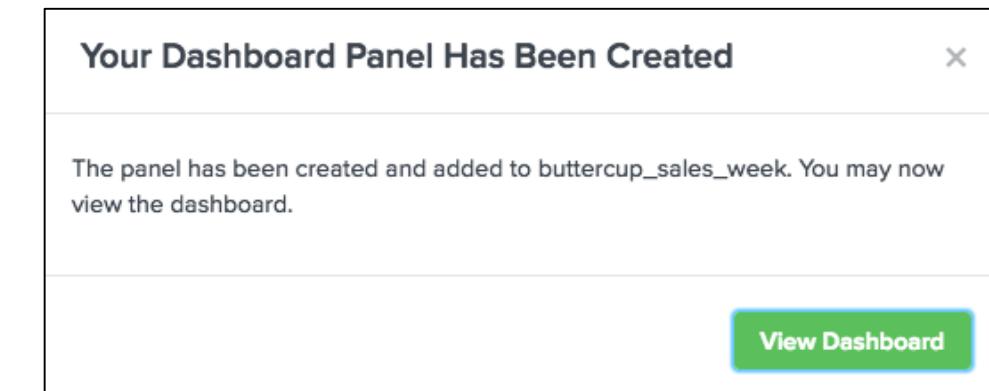
Save As Dashboard Panel

Dashboard	New	Existing	
Dashboard Title	Buttercup Sales Week	A	
Dashboard ID ?	buttercup_sales_week	Can only contain letters, numbers and underscores.	
Dashboard Description	optional		
Dashboard Permissions	Private	Shared in App	
Panel Title	Purchases by Category	C	
Panel Powered By	<input type="text"/> Inline Search	<input checked="" type="radio"/> Report	D
Drilldown ?	No action		
Panel Content	<input checked="" type="radio"/> Statistics	<input type="radio"/> Column Chart	E
<button>Cancel</button> <button>Save</button>			

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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

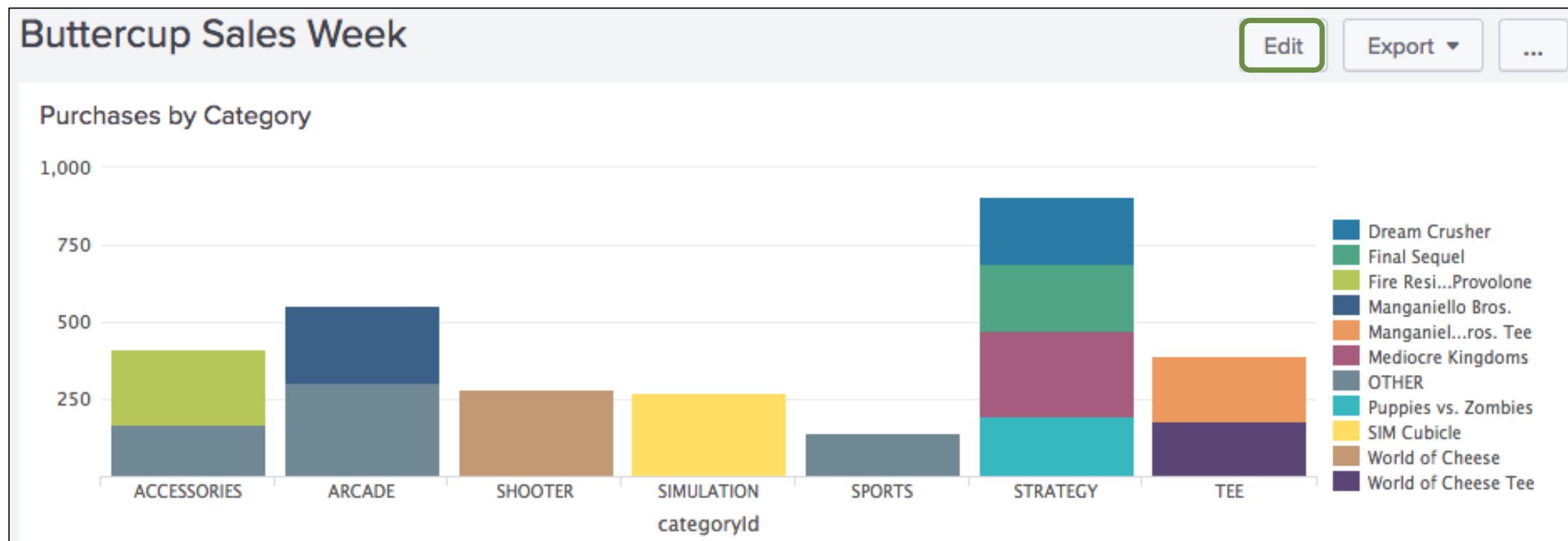


Why Create Panels from Reports?

- 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

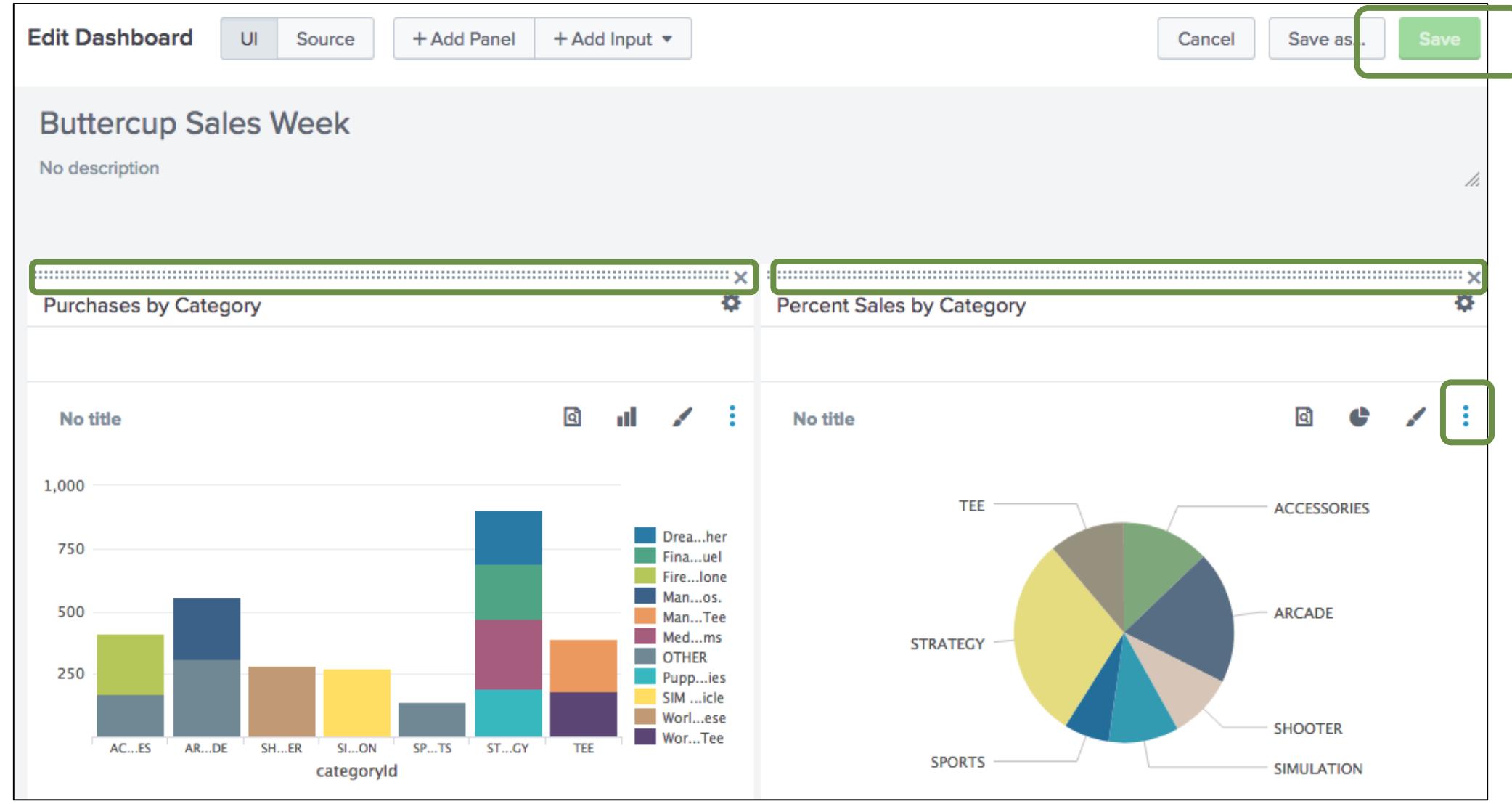
- After saving the panel, a window appears from which you can view the updated dashboard
- Click Edit to customize the dashboard



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Editing Panel Layout

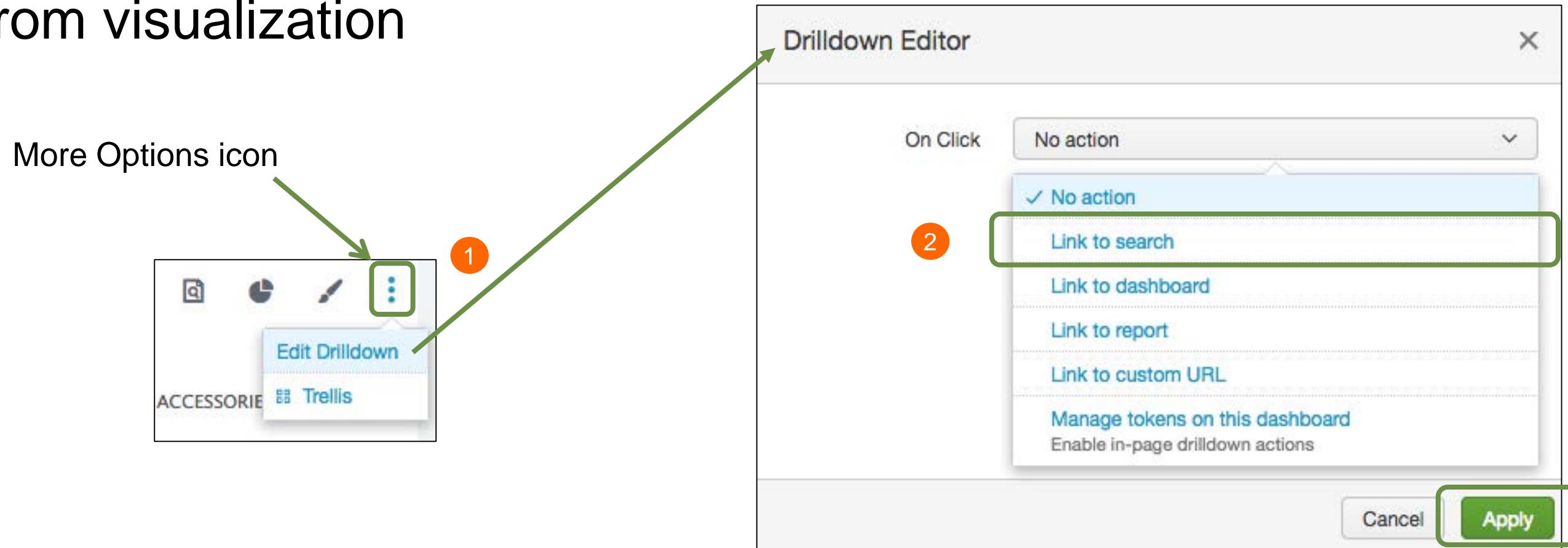
Click on the dotted bar on a panel to drag the panel to a new location



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

New Search

index=web sourcetype=access_combined action=purchase status=200 categoryId=STRATEGY

✓ 110 events (1/7/18 2:00:00.000 PM to 1/8/18 2:43:25.000 PM) No Event Sampling ▾

Save As ▾ Close Date time range ▾

Job ▾ II ■ ▾ Smart Mode ▾

Events (110) Patterns Statistics Visualization

Format Timeline ▾ - Zoom Out + Zoom to Selection × Deselect

List ▾ Format 20 Per Page ▾

< Prev 1 2

Time Event

1/8/18 2:39:31.000 PM 192.162.19.179 -- [08/Jan/2018:14:39:31] "POST /cart.do?act...
IONID=SD0SL5FF5ADFF4953 HTTP/1.1" 200 3567 "http://www.buttercupg...
dtocart&itemId=EST-7&categoryId=STRATEGY&productId=FS-SG-C03"
ntel Mac OS X 10_6_3; en-US) AppleWebKit/533.4 (KHTML, like
/533.4" 650
host = www3 | source = /opt/log/www3/access.log | sourcetype = access_log

SELECTED FIELDS
host 3
source 3
sourcetype 1

INTERESTING FIELDS
action 1
bytes 100+
categoryId 1

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categoryId: STRATEGY
count: 110
count%: 30.055%

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	350
SH...ER	250
SI...ON	250
SP...TS	150
ST...GY	450
TEE	350

Percent Sales by Category

Category	Percentage
TEE	35%
STRATEGY	30%
SPORTS	20%
OTHER	10%
Wor...Tee	5%

Edit Export ...

Edit Permissions

Clone (highlighted)

Set as Home Dashboard

Delete

Clone

Title: Buttercup Sales Week Clone

ID: buttercup_sales_week_clone

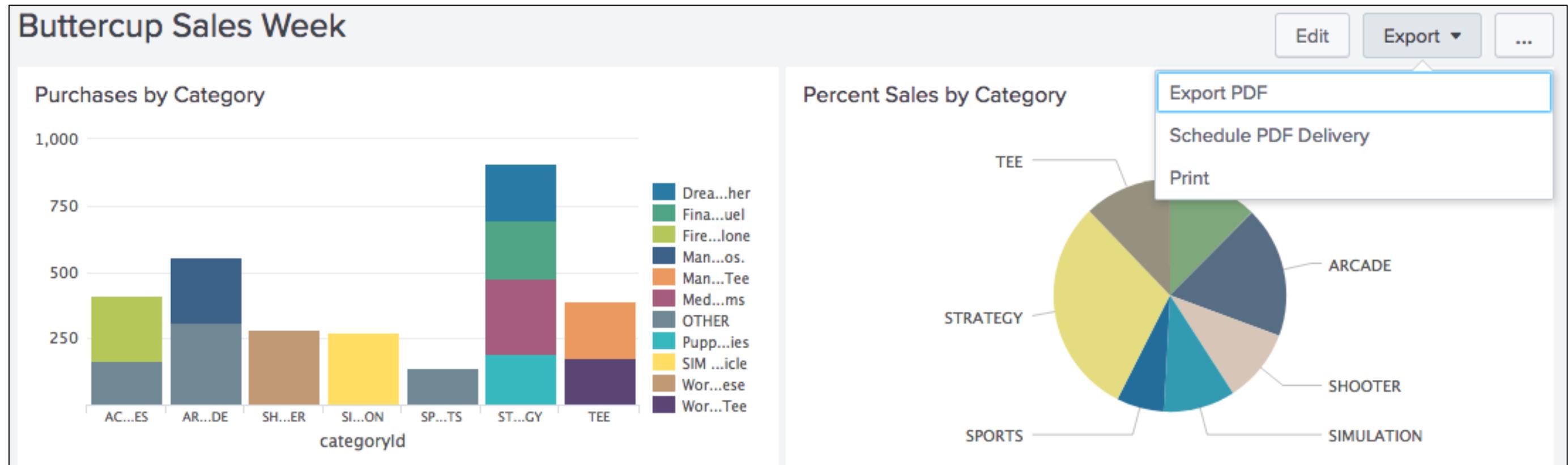
New Description: optional

Cancel Clone Dashboard (highlighted)

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Export a Dashboard

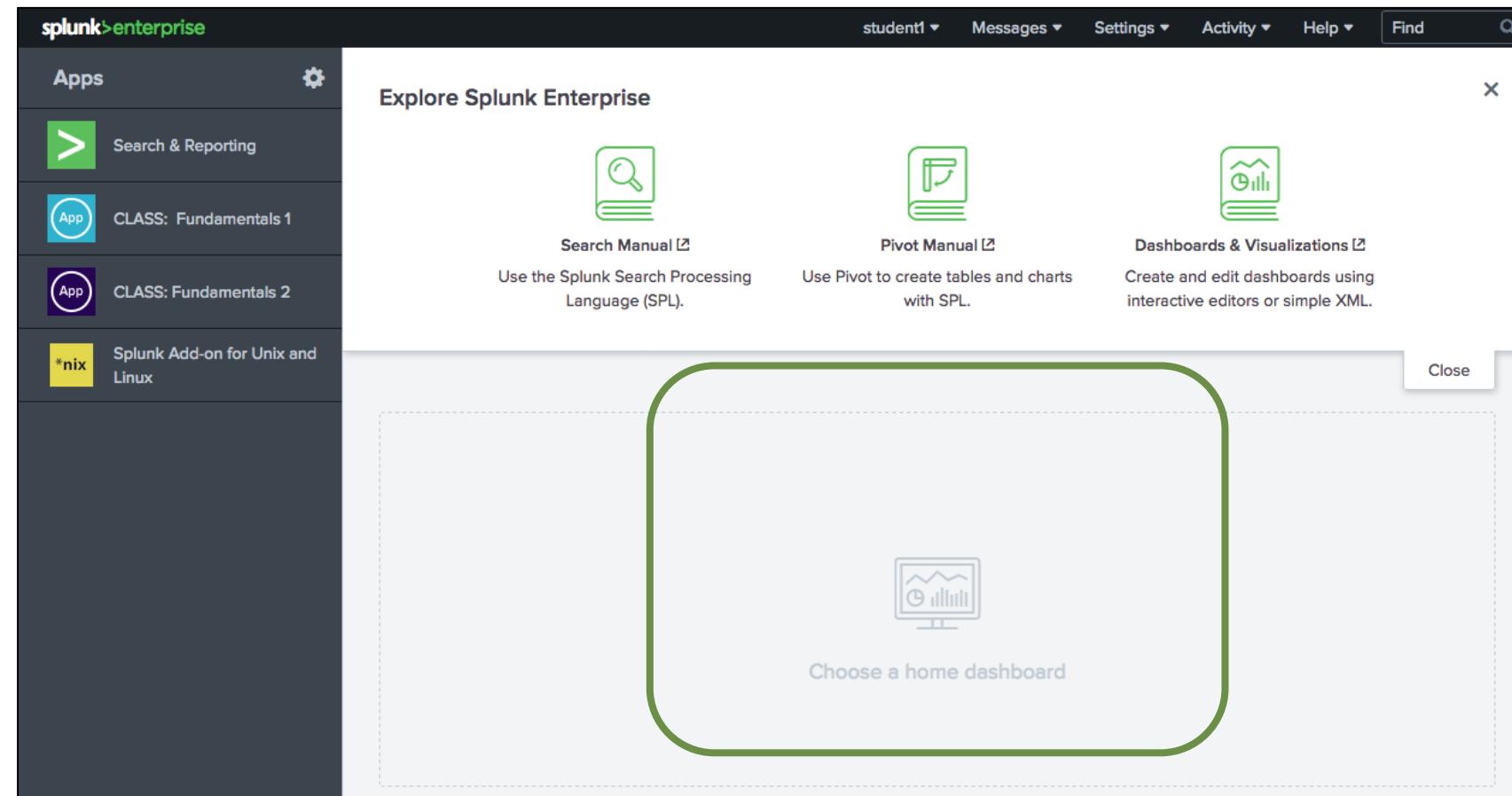
Dashboards can be exported as PDF or printed



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Set the Default Dashboard

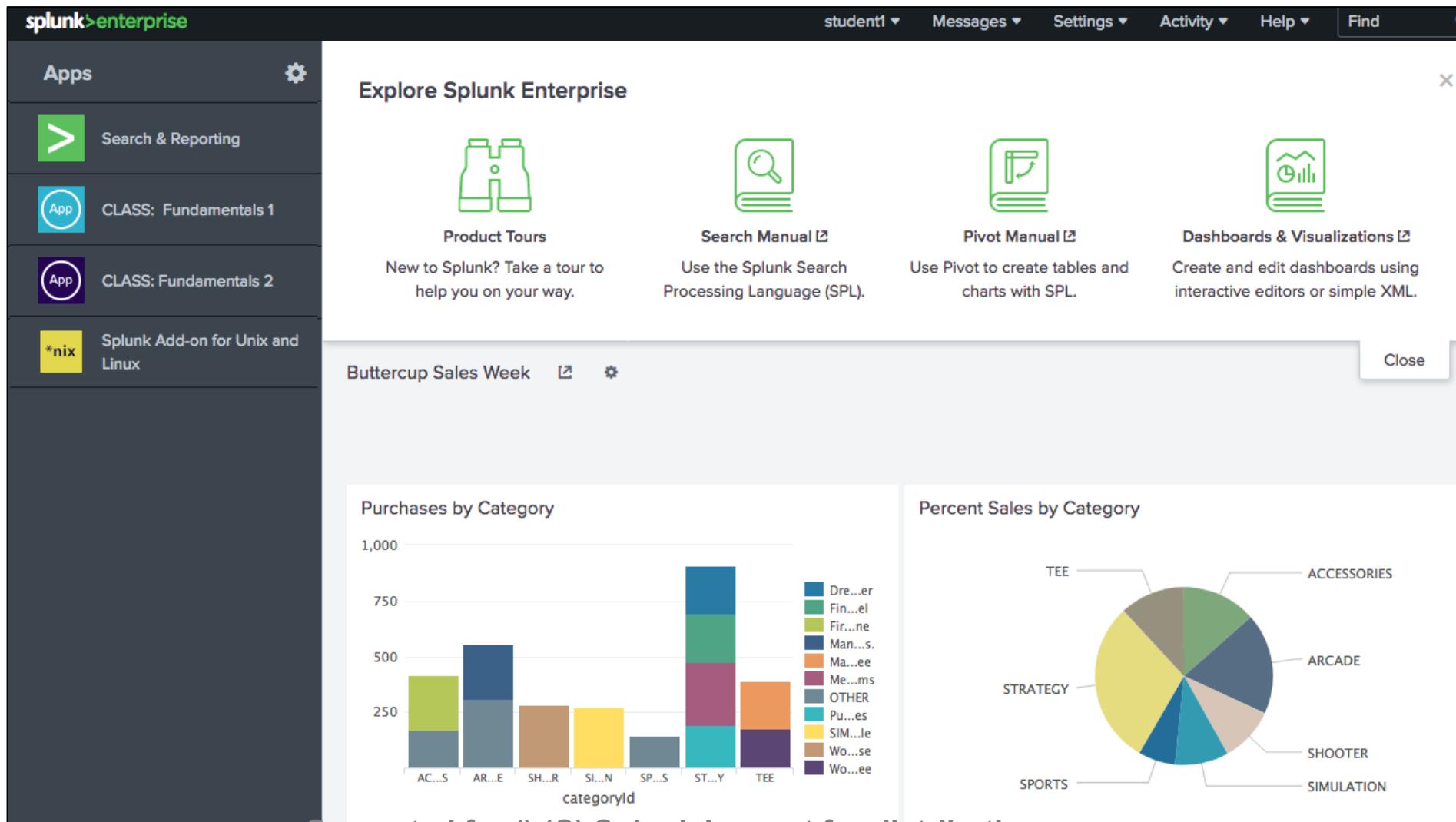
- Set a dashboard to appear by default in the bottom panel of your home view
- From the Home app, click **Choose a home dashboard**



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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

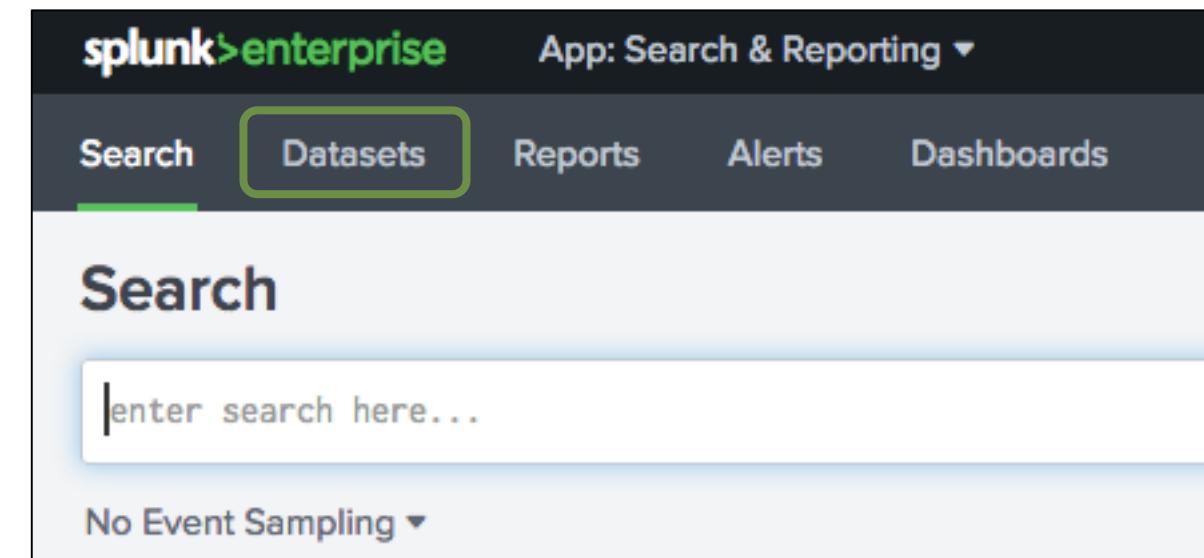
Pivot & Datasets

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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

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



> Buttercup Games Online Sales > Web Requests	data model	⚡	Explore ▾
> Buttercup Games Online Sales > Web Requests > Failed Reqe...	data model	⚡	Explore ▾
> Buttercup Games Online Sales > Web Requests > Failed Reqe...	data model	⚡	Explore ▾
> Buttercup Games Online Sales > Web Requests > Failed Reqe...	data model	⚡	Explore ▾
> Buttercup Games Online Sales > Web Requests > Failed Reqe...	data model	⚡	Explore ▾
> Buttercup Games Online Sales > Web Requests > Successful R...	data model	⚡	Explore ▾
> Buttercup Games Online Sales > Web Requests > Successful R...	data model	⚡	Visualize with Pivot
> Buttercup Games Online Sales > Web Requests > Successful R...	data model	⚡	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

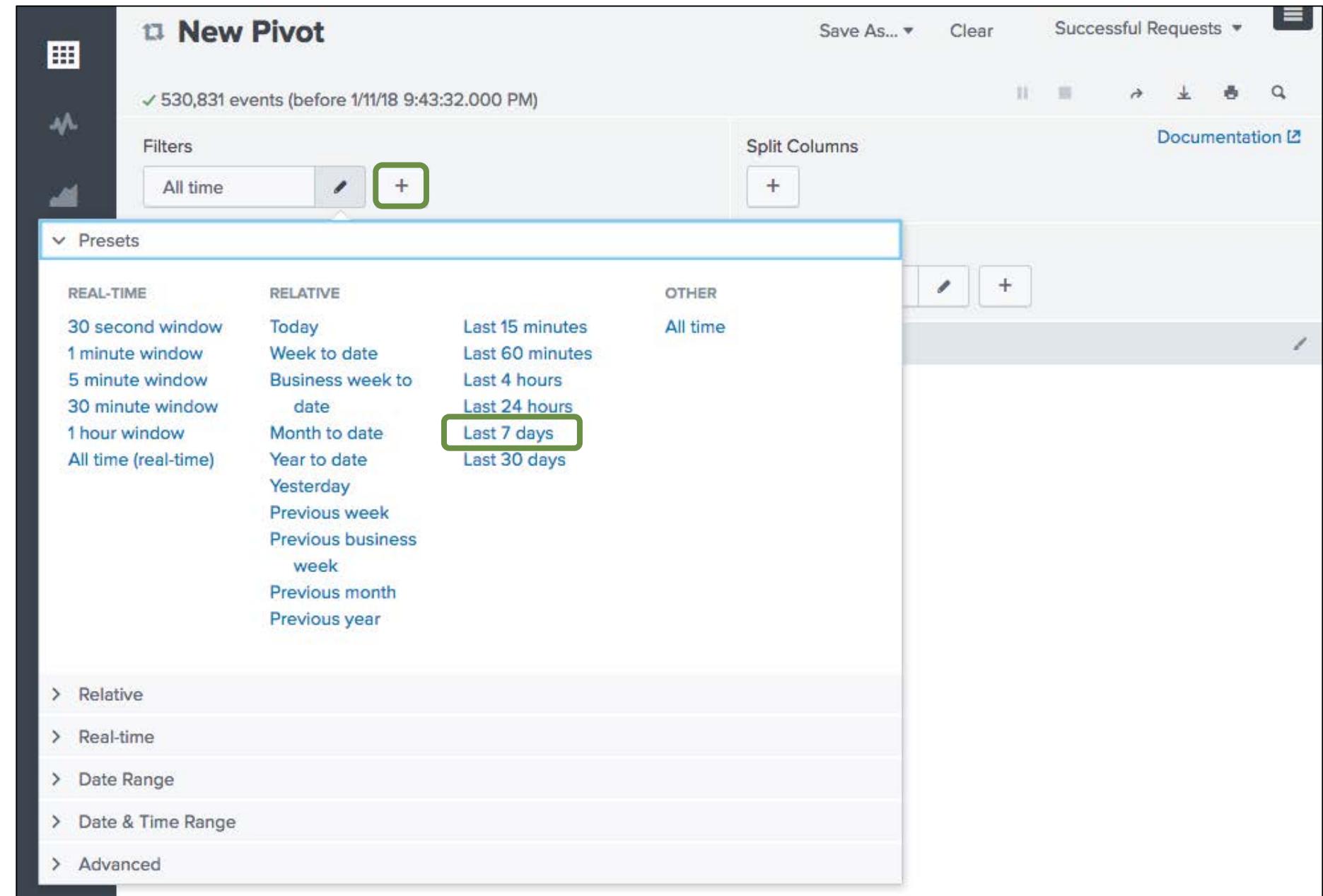
The screenshot shows the Splunk Pivot interface with the following details:

- 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 Suc... (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

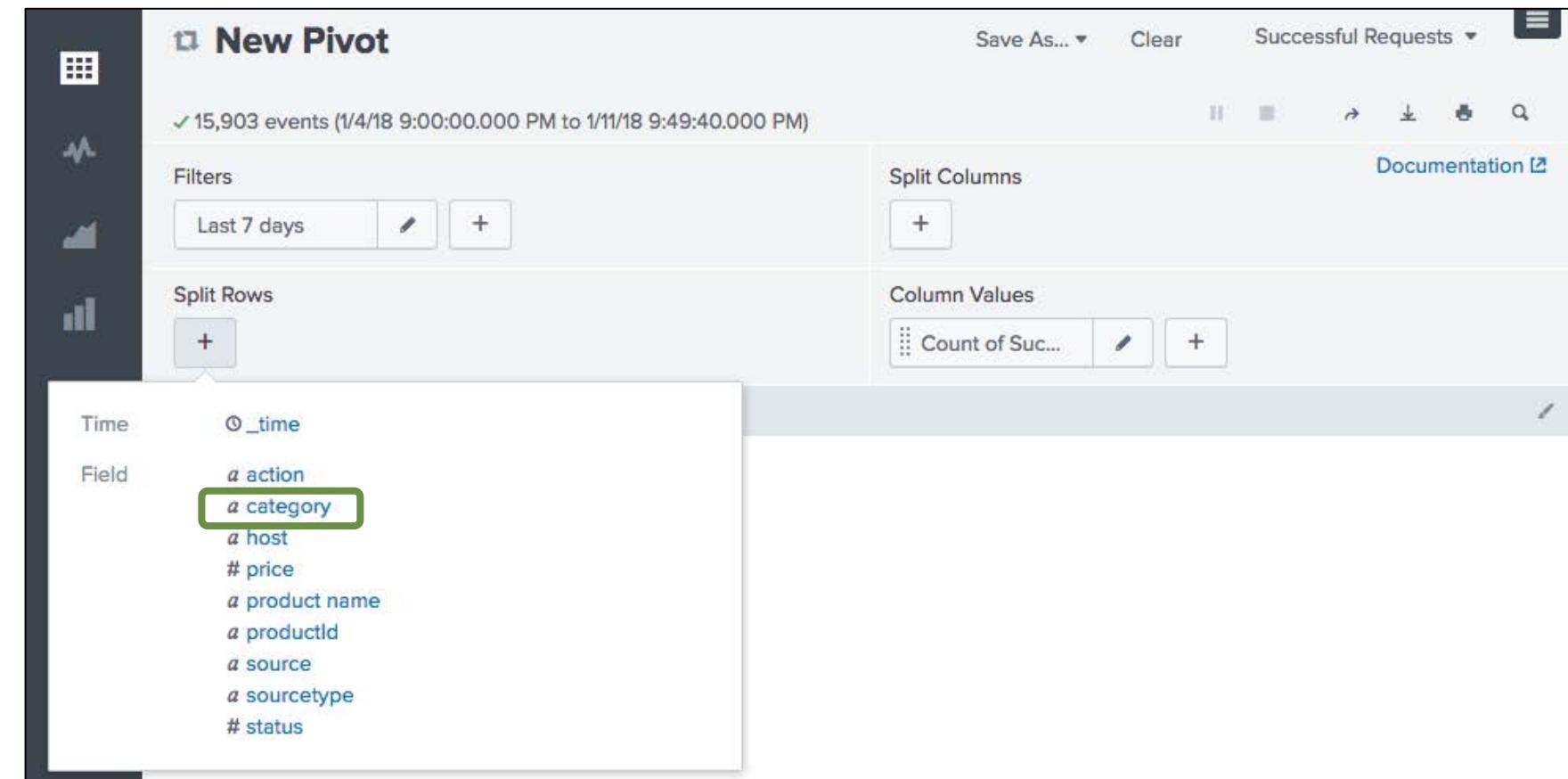
- The default is All time
- Click the pencil icon to select the desired time range
- The pivot runs immediately upon selecting the new time range



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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



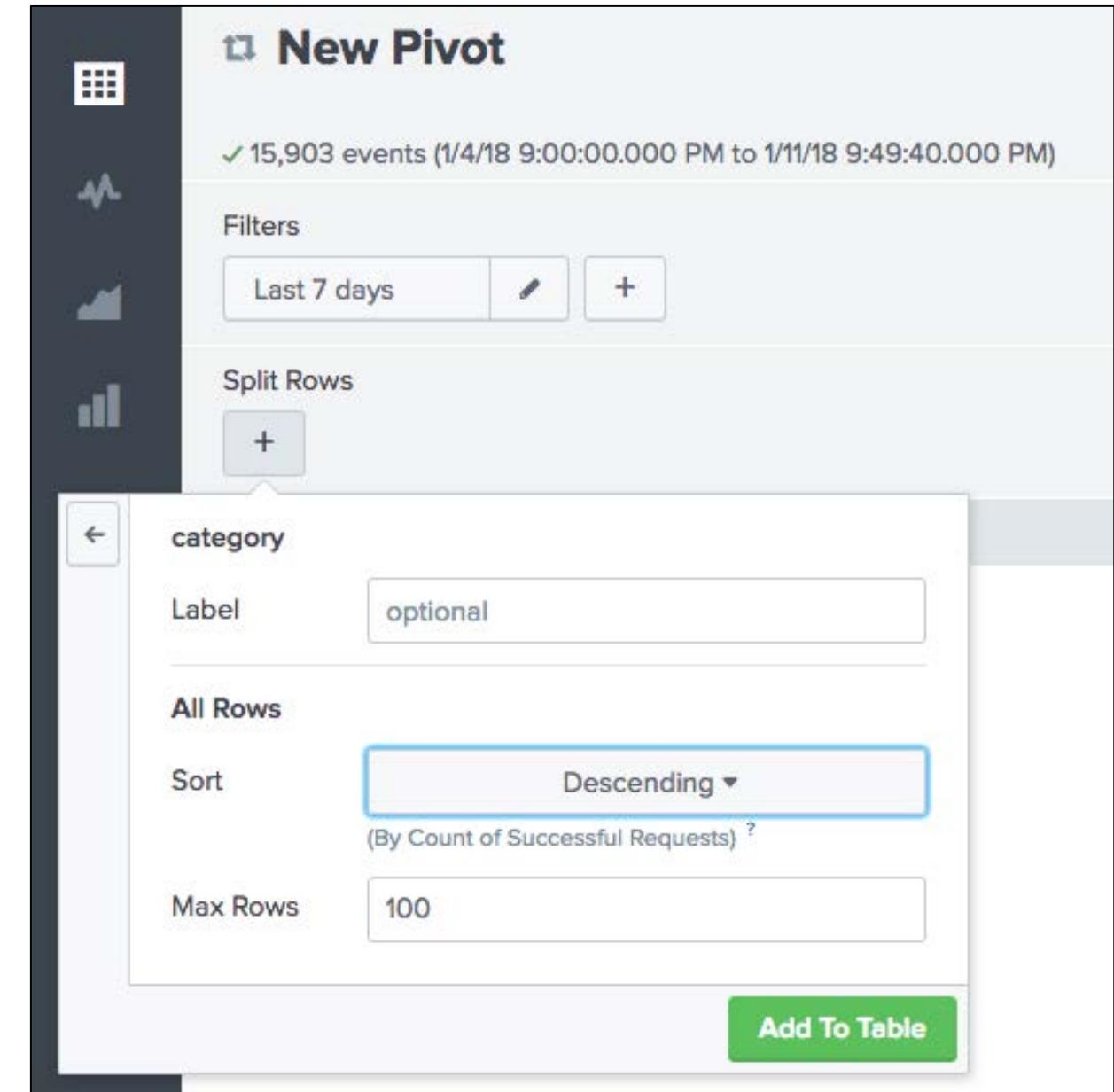
The screenshot shows the Splunk Pivot interface with the following details:

- Filters:** Last 7 days.
- Split Columns:** An empty list.
- Column Values:** Count of Suc... (with a plus sign).
- Split Rows:** A dropdown menu listing various fields. The field **a category** is highlighted with a green border.
- Time Field:** @_time.

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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 a Splunk 'New Pivot' search interface. The left sidebar contains various navigation icons. The main area displays a pivot table with the following data:

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

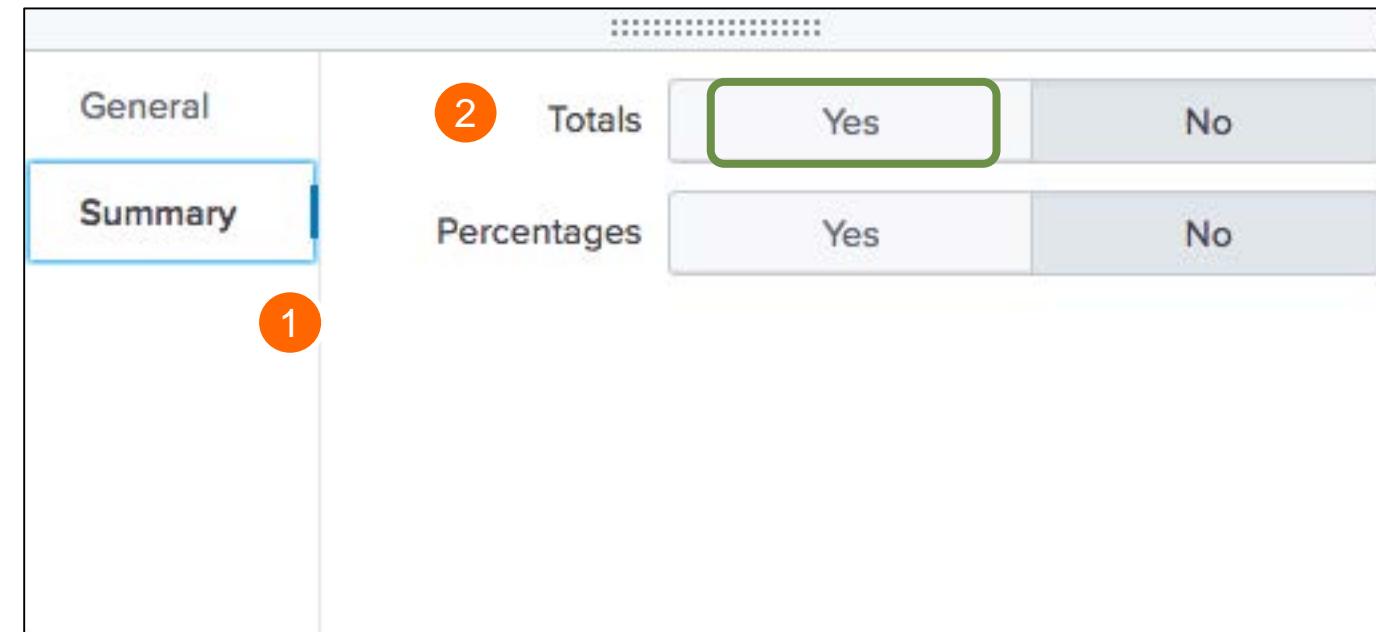
Annotations highlight specific elements:

- A yellow callout box labeled "categories" points to the "category" column header.
- A yellow callout box labeled "count by category" points to the "Count of Successful Requests" column header.
- A green callout box at the bottom center points to the "Format" button in the footer, with the text "To format the results, click here".
- A green arrow points from the "Format" button to the "Format" button.

Footer text: Generated for () (C) Splunk Inc, not for distribution

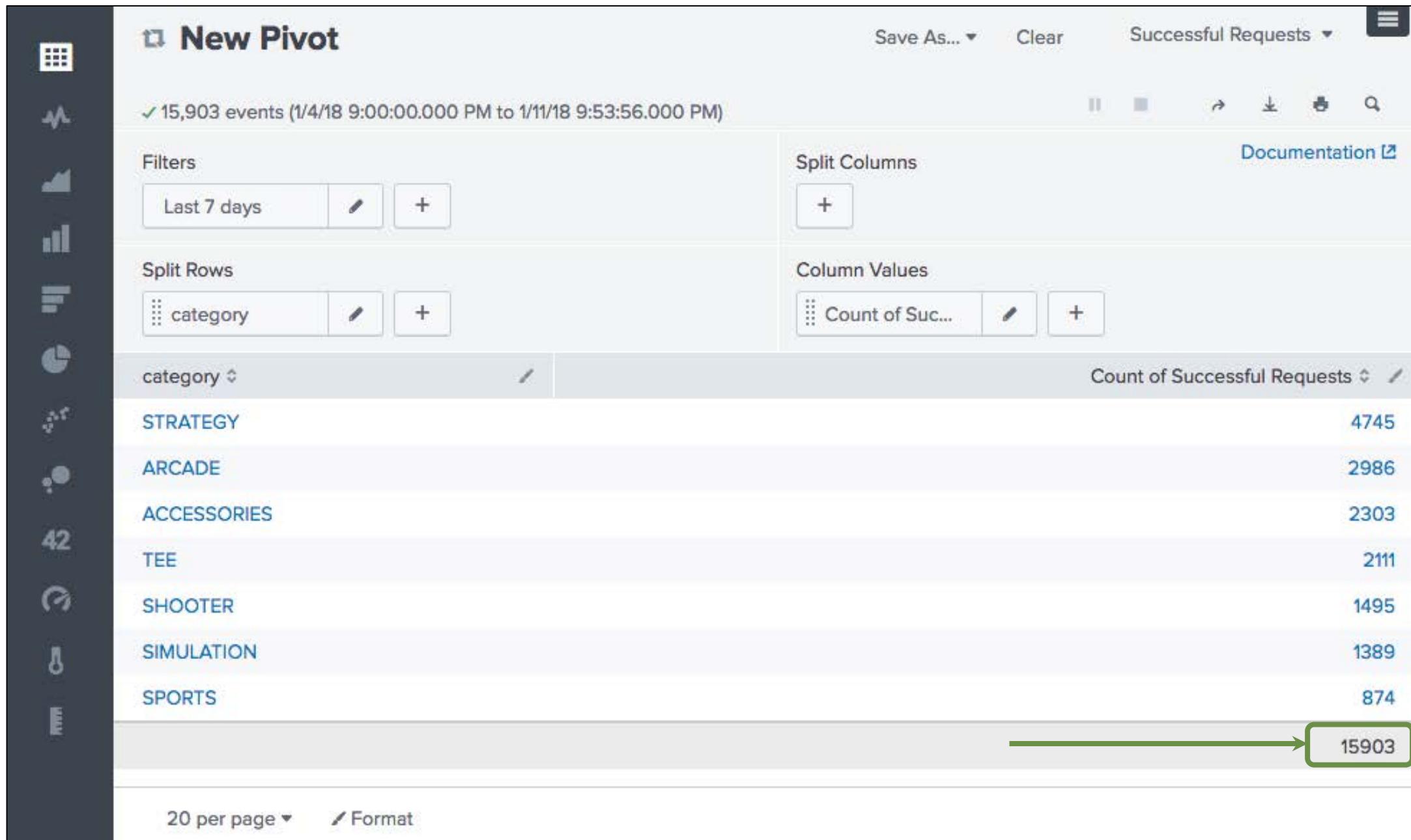
Formatting the Results

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



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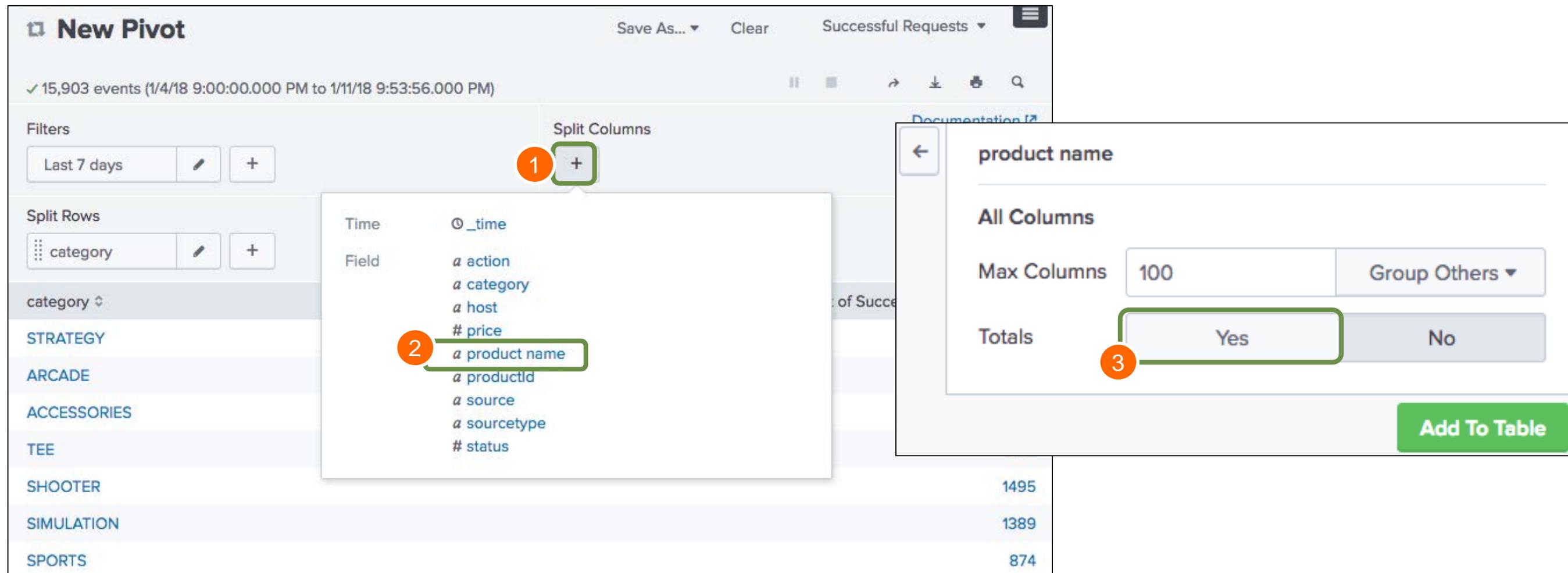
Updated Results (with Total)



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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 **Totals** option to **Yes**.

The interface includes a sidebar with filters for **Last 7 days**, **category**, and categories like **STRATEGY**, **ARCADE**, **ACCESSORIES**, **TEE**, **SHOOTER**, **SIMULATION**, and **SPORTS**. The main area shows a table with columns for **Time** and **Field**, and a summary table at the bottom:

		1495	1389	874
product name	All Columns			
Max Columns	100			
Totals	Yes			

Add To Table button is located at the bottom right of the dialog.

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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 interface. Both screenshots show a 'New Pivot' window with a count of 15,825 events from 1/4/18 to 1/11/18.

Left Screenshot: Shows the initial state of the 'Filters' section. It has a 'Last 7 days' range and a '+' button with a red circle containing the number '1'. A vertical list of fields is visible on the right, with 'a category' highlighted in green. A red circle with the number '2' is placed over the 'Field' header of the list.

Right Screenshot: Shows the 'category' filter being applied. The 'category' field is selected in the 'category' dropdown. The 'Filter Type' is set to 'Match' (indicated by a red circle with '3'). The 'Match' dropdown shows 'is not' selected (indicated by a red circle with '5'). The value 'ACCESSORIE' is entered in the dropdown (indicated by a red circle with '4'). At the bottom right is a green 'Add To Table' button (indicated by a red circle with '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

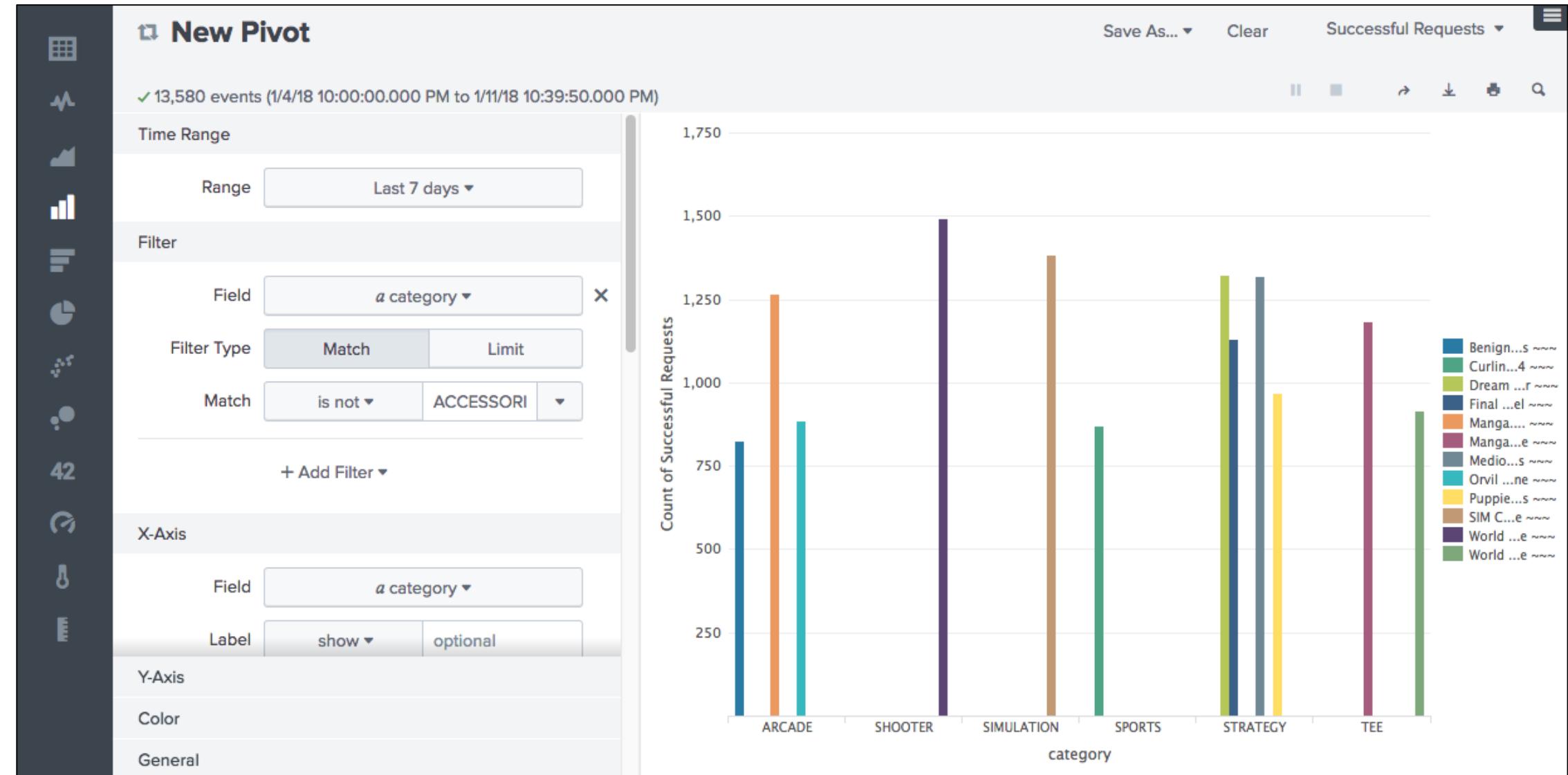
Count of Suc... +

category	Benign Space Debris	Curling 2014	Dream Crusher	Final Sequel	Manganiello Bros.	Manganiello Bros. Tee	Mediocre Kingdoms	Orvil 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

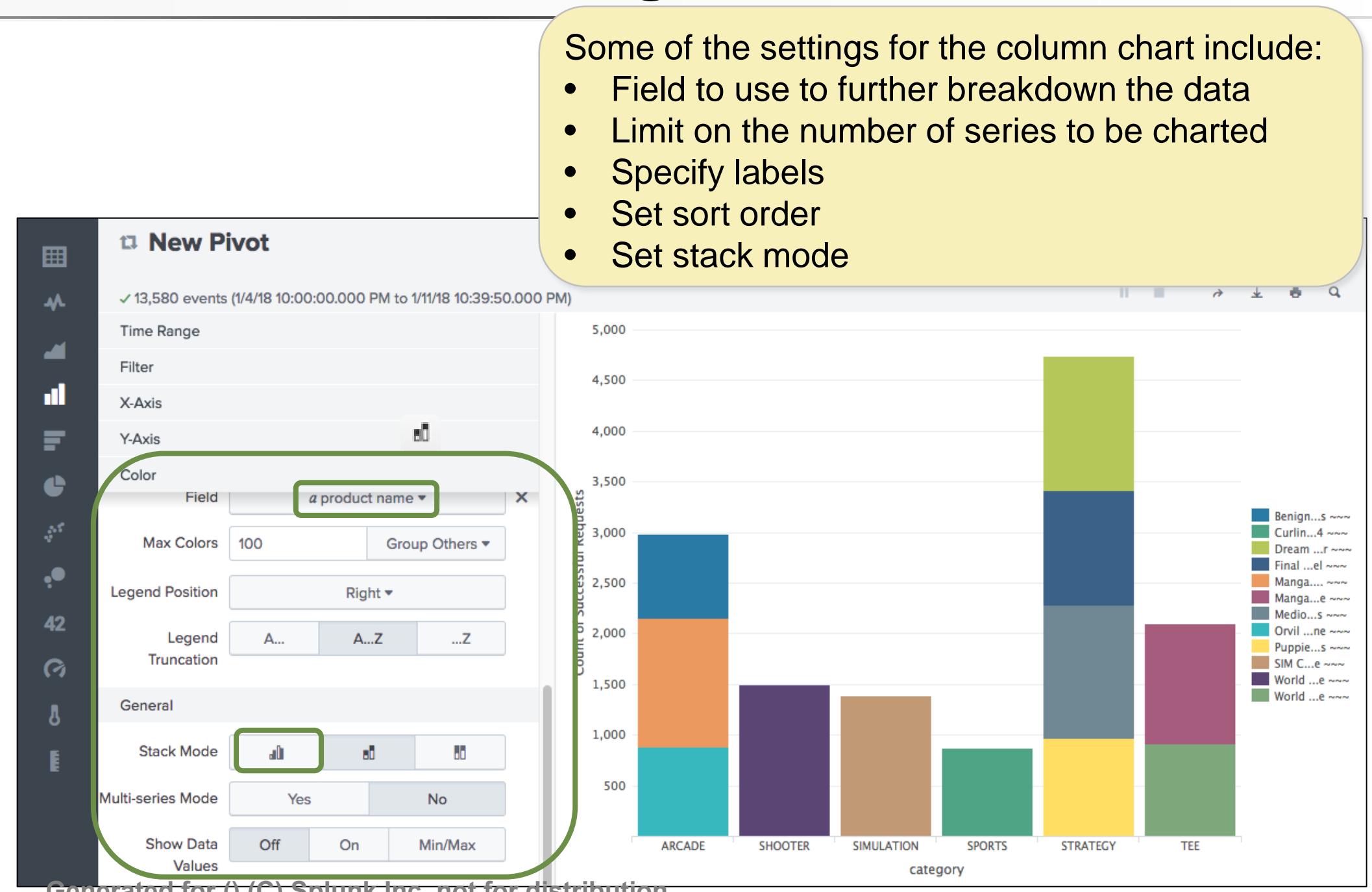


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Modify Visualization Settings

- 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

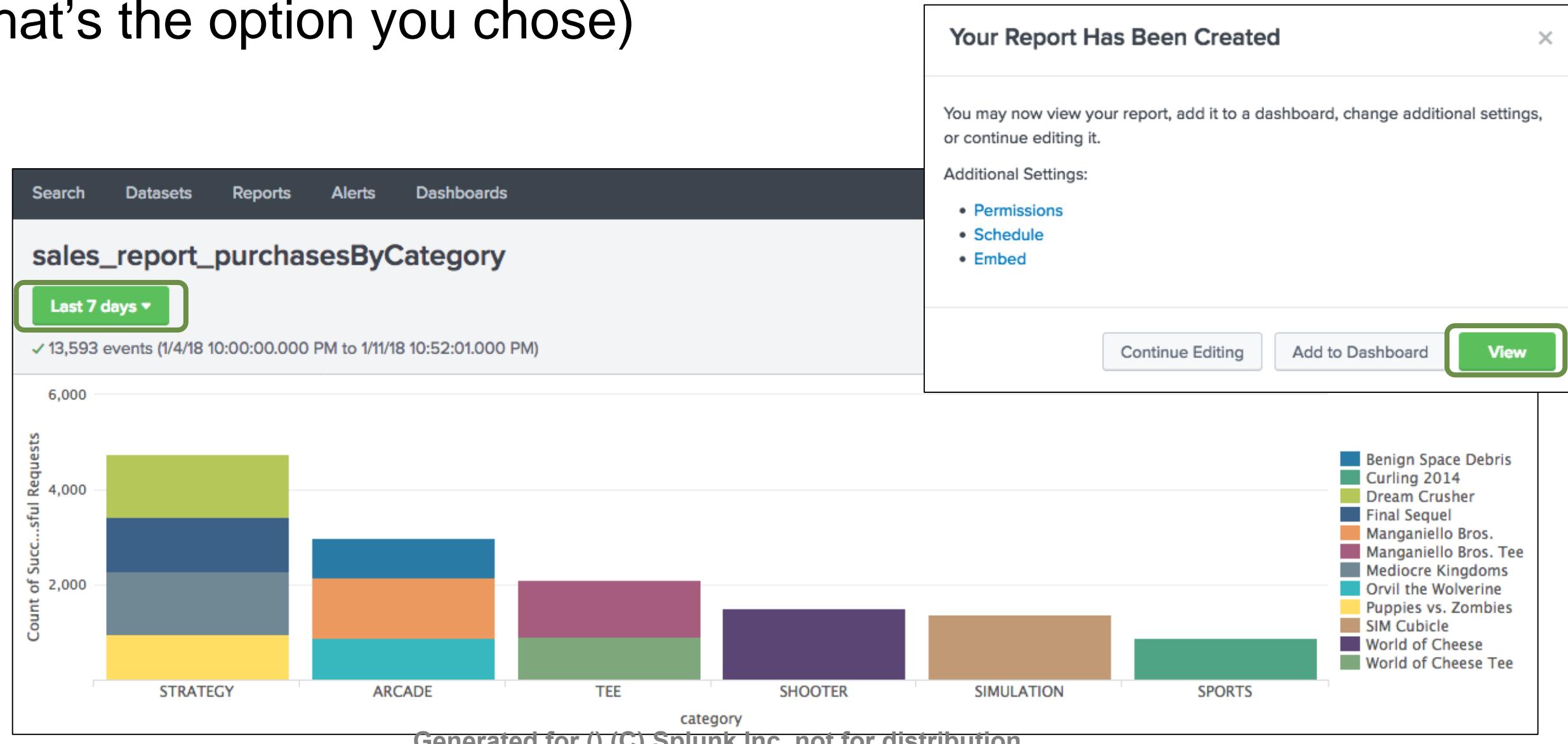
- Pivots can be saved as reports
 - You can choose to include a Time Range Picker in the report to allow people who run it to change the time range (default is Yes)



The figure shows a 'Save As Report' dialog box. It has fields for 'Title' (set to 'sales_report_purchasesByCategory'), 'Description' (set to 'optional'), and a 'Time Range Picker' switch (set to 'Yes'). At the bottom are 'Cancel' and 'Save' buttons. A red circle with number 3 highlights the 'Time Range Picker' switch, and another red circle with number 4 highlights the 'Save' button.

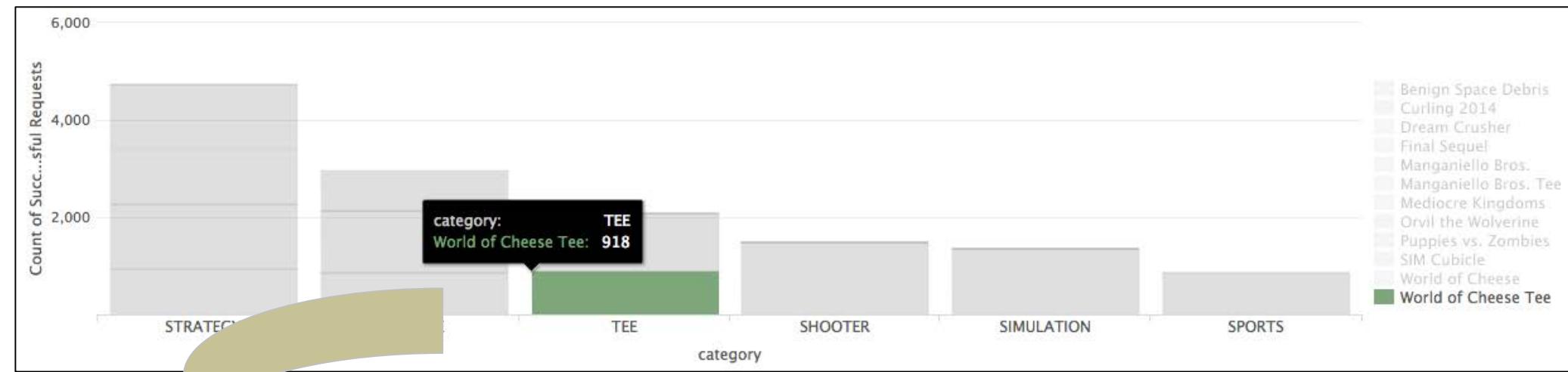
Saving a Pivot (cont.)

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.

New Search

```
(index==* OR index=_*) (sourcetype=access_* productId!="") (categoryId!=ACCESSORIES) | search (status=200) | eval  
is_successful_purchase=if(searchmatch("(action=purchase)",1,0), 1,0), is_not_successful_purchase=1-is_successful_purchase,  
is_successful_add_to_cart=if(searchmatch("(action=addtocart)",1,0), 1,0), is_not_successful_add_to_cart=1-is_successful_add_to_cart,  
is_successful_remove=if(searchmatch("(action=remove)",1,0), 1,0), is_not_successful_remove=1-is_successful_remove | rename action AS  
http_request.action categoryId AS http_request.categoryId price AS http_request.price product_name AS http_request.product_name  
productId AS http_request.productId status AS http_request.status is_successful_purchase AS http_request.successful_request  
.is_successful_purchase is_not_successful_purchase AS http_request.successful_request.is_not_successful_purchase  
is_successful_add_to_cart AS http_request.successful_request.is_successful_add_to_cart is_not_successful_add_to_cart AS  
http_request.successful_request.is_not_successful_add_to_cart is_successful_remove AS http_request.successful_request  
.is_successful_remove is_not_successful_remove AS http_request.successful_request.is_not_successful_remove | search  
"http_request.categoryId"="TEE" "http_request.product_name"="World of Cheese Tee"
```

Events (918) Patterns Statistics Visualization

Format Timeline ▾ - Zoom Out + Zoom to Selection X Deselect

1 hour per column

Events (918) List Format 20 Per Page < Prev 1 2 3 4 5 6 7 8 9 ... Next >

< Hide Fields All Fields t Time Event

SELECTED FIELDS

1/11/18 148.107.2.20 - - [11/Jan/2018:22:49:40] "POST /cart.do?action=changequantity&itemId=EST-11&r

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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 Results:** New Search for "action=purchase".
 - 1: Search bar: action=purchase.
 - 2: Statistics tab (highlighted).
 - 3: Pivot icon.
 - 4: Fields dialog box:
 - Question: Which fields would you like to use as a Data Model?
 - Options:
 - All Fields (46) (selected)
 - Selected Fields (4)
 - Fields with at least 8 % coverage (45)
 - Buttons: Cancel, OK.
- Bottom:** Generated for () (C) Splunk Inc, not for distribution.

Saving a Pivot as a Report

The screenshot shows the 'New Pivot' interface. At the top right, there is a 'Save As...' button with a dropdown menu. The 'Report' option in this menu is highlighted with a red circle containing the number '1'. Other options in the menu include 'Dashboard Panel' and 'Split Columns'. Below the menu, there are sections for 'Filters' (with a 'Yesterday' button), 'Split Rows' (with a '+'), 'Column Values' (with a 'Count of 1515...' button), and 'host' (with a 'Split Columns' button).

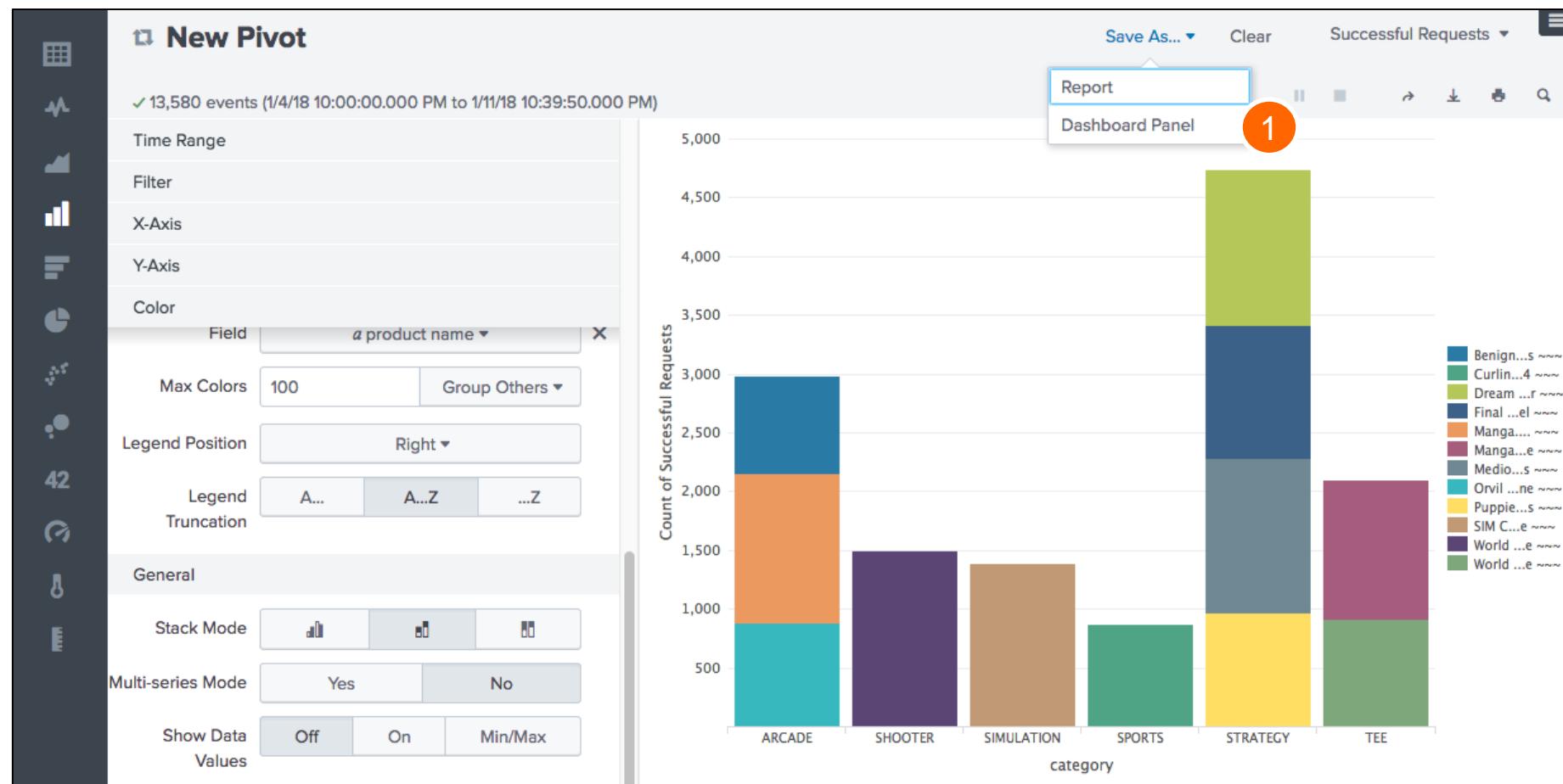
- When saving as a report, the **Model Title** is required
 - This is used to create a data model, which is required by the pivot report
- The **Model ID** is automatically generated based on the **Model Title**

The screenshot shows the 'Save As Report' dialog box. It has fields for 'Title' (set to 'sales_report_purchases') and 'Description' (set to 'optional'). Below these is a 'Time Range Picker' with 'Yes' selected. A note at the bottom states: 'You must save the original search as a data model. This will power the report.' The dialog is divided into three numbered sections: 1) The 'Report' option in the 'Save As...' menu of the New Pivot interface. 2) The 'Model Title' field in the dialog (set to 'purchase data model') and the 'Model ID?' field (set to 'purchase_data_model_'). 3) The 'Save' button at the bottom right of the dialog.

Note 
Manually changing the Model ID is not recommended.

Add a Pivot to a Dashboard

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



Save As Dashboard Panel

Dashboard

New Existing

Dashboard Title

Buttercup Sales Week

Dashboard ID

buttercup_sales_week_

Can only contain letters, numbers and underscores.

Dashboard Description

optional

Dashboard Permissions

Private Shared in App

Panel Title

optional

Panel Powered By

Inline Search Report

Drilldown

No action

Panel Content

Statistics Column Chart

Cancel Save

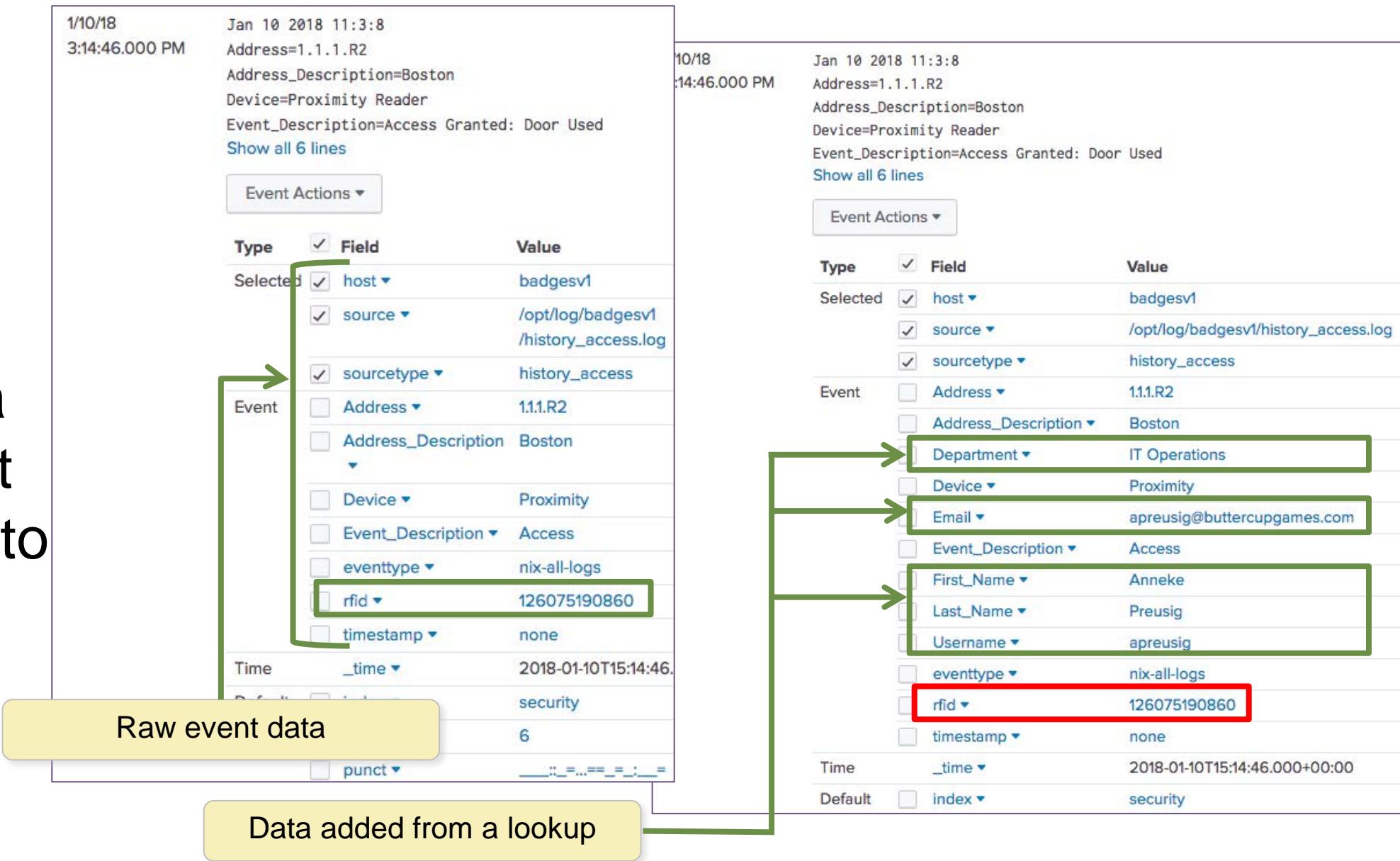
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Module 12: Creating and Using Lookups

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What Is a Lookup?

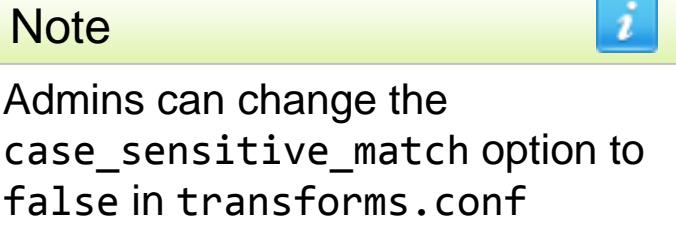
- Sometimes static (or relatively unchanging) data is required for searches, but isn't available in the index
- Lookups pull such data from standalone files at search time and add it to search results



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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, or 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

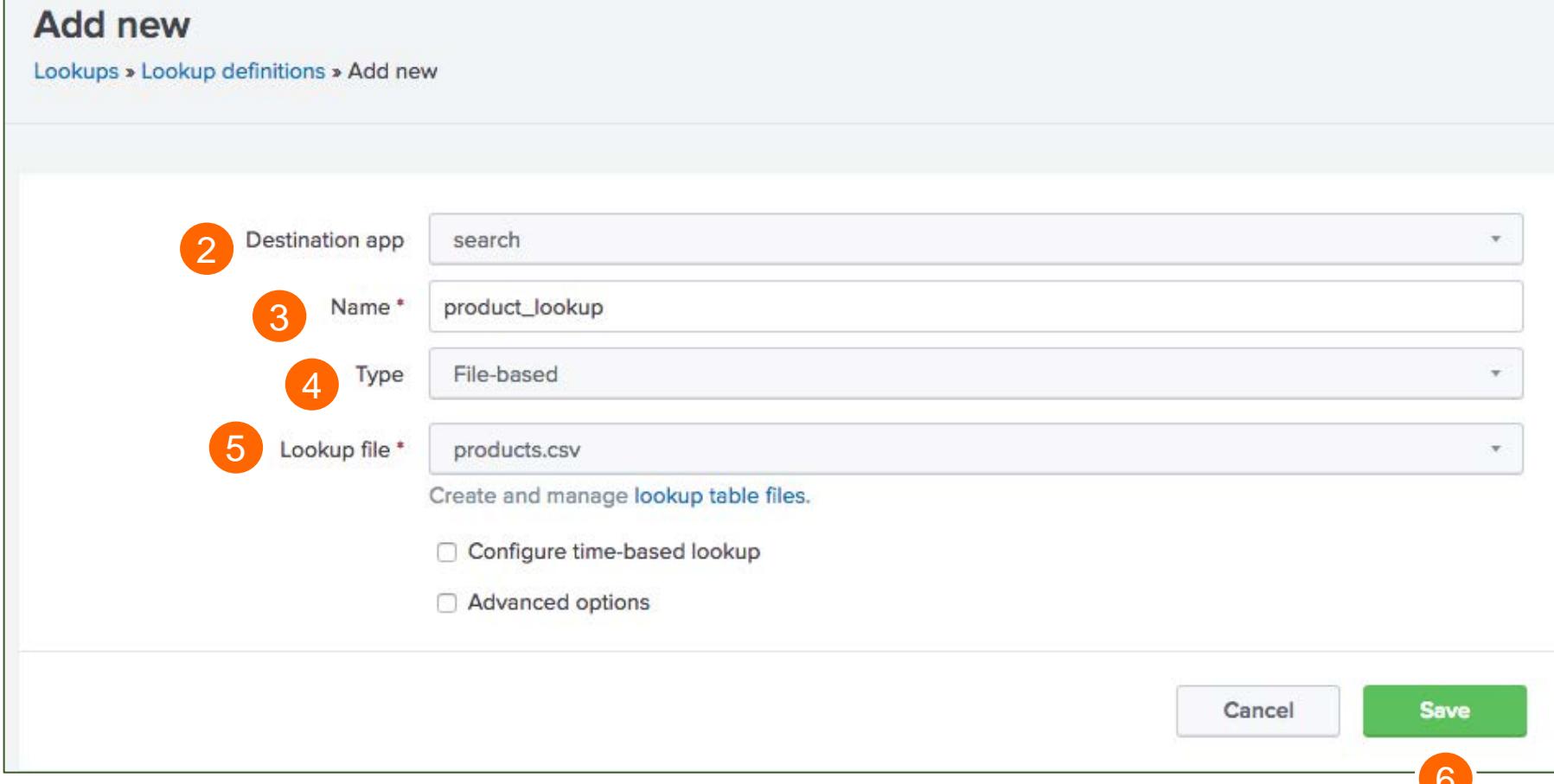
Create and manage [lookup table files](#).

Configure time-based lookup

Advanced options

[Cancel](#) [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 box highlights the 'productId' field, which is the 'column name in lookup'. An orange circle labeled 'A' is at the top left of this box. To its right is an equals sign (=), followed by another green box containing the 'field name in Splunk' 'file', with an orange circle labeled 'B' at the top right. Below these are four empty fields for 'categoryId', 'price', 'product_name', and 'sale_price', each with an orange circle labeled 'D' at the top right. A 'Delete' button is located to the right of each of these four fields. At the bottom left is a '+ Add another field' button, and at the bottom right are 'Cancel' and 'Save' buttons.

- 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

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

Last 24 hours ▾

i	Time	Event	price	productId	product_name
>	1/9/18 10:56:54.000 PM	203.45.206.135 - - [09/Jan/2018:22:56:54] "POST /cart.do?action=purchase&itemId=EST-19&JSESSONTID=SD5SL5 FF10ADF4951 HTTP 1.1" 200 1427 "http://www.buttercupgames.com/cart.do?action=addtocart&i tegoryId=STRATEGY&productId=DC-SG-G02" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_7_4) Ap (KHTML, like Gecko) Chrome/19.0.1084.46 Safari/536.5" 314 host = www productId = DC-SG-G02 source = /opt/log/www/4/access.log sourcetype = access	24.99	DB-SG-G01	Mediocre Kingdoms
>	1/9/18 10:56:08.000 PM	203.45.206.135 - - [09/Jan/2018:22:56:08] "POST /cart.do?action=purchase&itemId=EST-7&JSE SSONTID=SD5SL5 HTTP 1.1" 200 1427 "http://www.buttercupgames.com/cart.do?action=addtocart&i tegoryId=STRATEGY&productId=DC-SG-G02" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_7_4) Ap (KHTML, like Gecko) Chrome/19.0.1084.46 Safari/536.5" 314 host = www productId = DC-SG-G02 source = /opt/log/www/4/access.log sourcetype = access	39.99	DC-SG-G02	Dream Crusher
		Events Patterns Statistics (14) Visualization 20 Per Page ▾ Format Preview ▾	24.99	FS-SG-G03	Final Sequel
		productId ◆ product_name ◆ sales ◆	24.99	WC-SH-G04	World of Cheese
		BS-AG-G09 Benign Space Debris 274.89	9.99	WC-SH-T02	World of Cheese Tee
		CU-PG-G06 Curling 2014 319.84			
		DB-SG-G01 Mediocre Kingdoms 499.80			
		DC-SG-G02 Dream Crusher 879.78			
		FI-AG-G08 Orvil the Wolverine 479.88			

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	product_name	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

New Search

index=security fail* root

✓ 212 events (1/9/18 7:00:00.000 PM to 1/10/18 7:05:31.000 PM) No Event Sampling ▾ Job ▾

Events (212) Patterns Statistics Visualization

Format Timeline ▾ — Zoom Out + Zoom to Selection × Deselect 1 hour per column

List ▾ Format 20 Per Page ▾

< Prev 1 2 3 4 5 6 7 8 9 ... Next >

Time	Event
1/10/18 6:26:20.000 PM	Wed Jan 10 2018 18:26:20 www3 sshd[5509]: Failed password for root from 87.194.216.51 port 1220 ssh2 host = www3 source = /opt/log/www3/secure.log sourcetype = linux_secure
1/10/18 6:15:51.000 PM	Wed Jan 10 2018 18:15:51 www1 sshd[2276]: Failed password for root from 221.207.229.6 port 2505 ssh2 host = www1 source = /opt/log/www1/secure.log sourcetype = linux_secure

< Hide Fields All Fields i Time Event

SELECTED FIELDS a host 4 a source 4 a sourcetype 1

INTERESTING FIELDS a action 1

Save As ▾ Close Report Dashboard Panel Alert Event Type

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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	<input type="radio"/> Yes <input checked="" type="radio"/> No

Note 

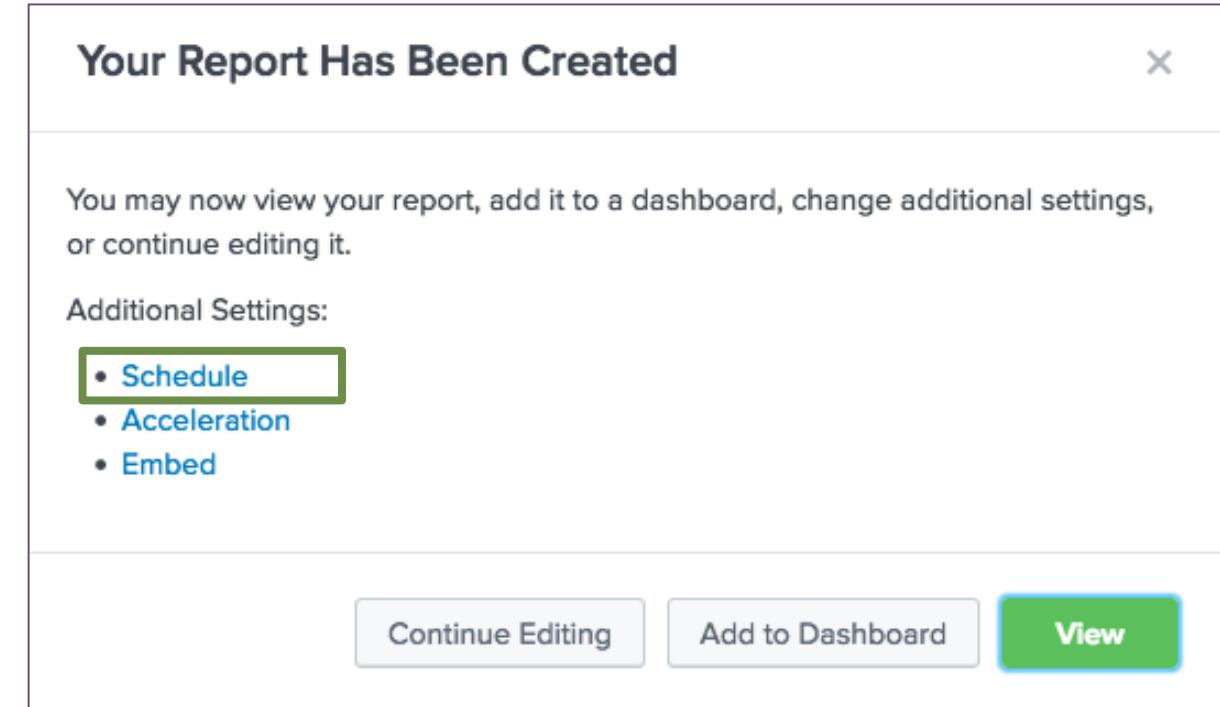
Time Range Picker cannot be used with scheduled reports.

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 ▾

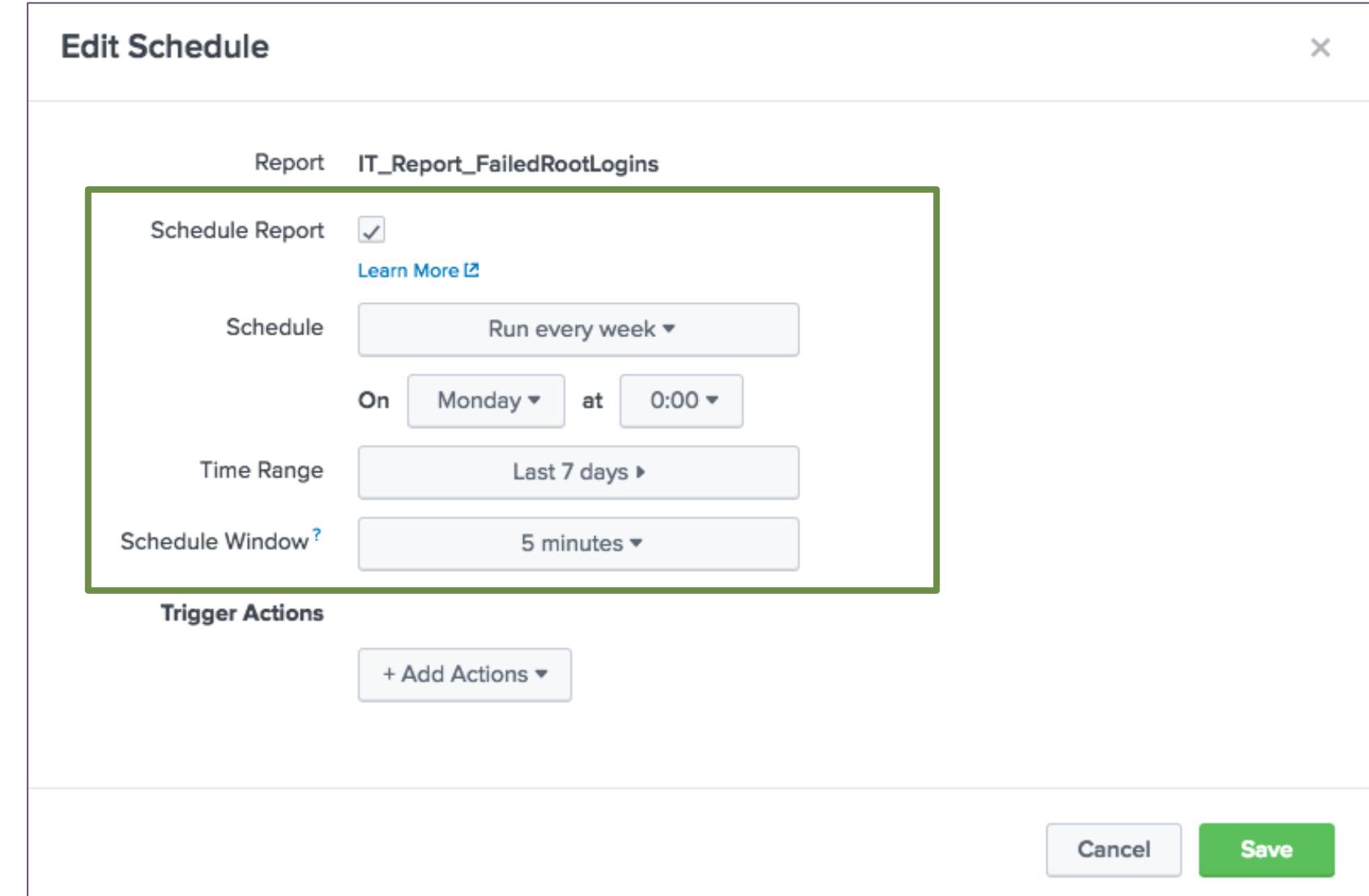
On Monday at 0:00

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

Note [i](#)
Users with admin privileges can also select a Schedule Priority of Default, Higher, or Highest.

Select Time Range

Presets

RELATIVE	OTHER
Today	Last 15 minutes
Week to date	Last 60 minutes
Business week to date	Last 4 hours
Month to date	Last 24 hours
Year to date	Last 7 days
Yesterday	Last 30 days
Previous week	All time
Previous business week	
Previous month	
Previous year	

Relative

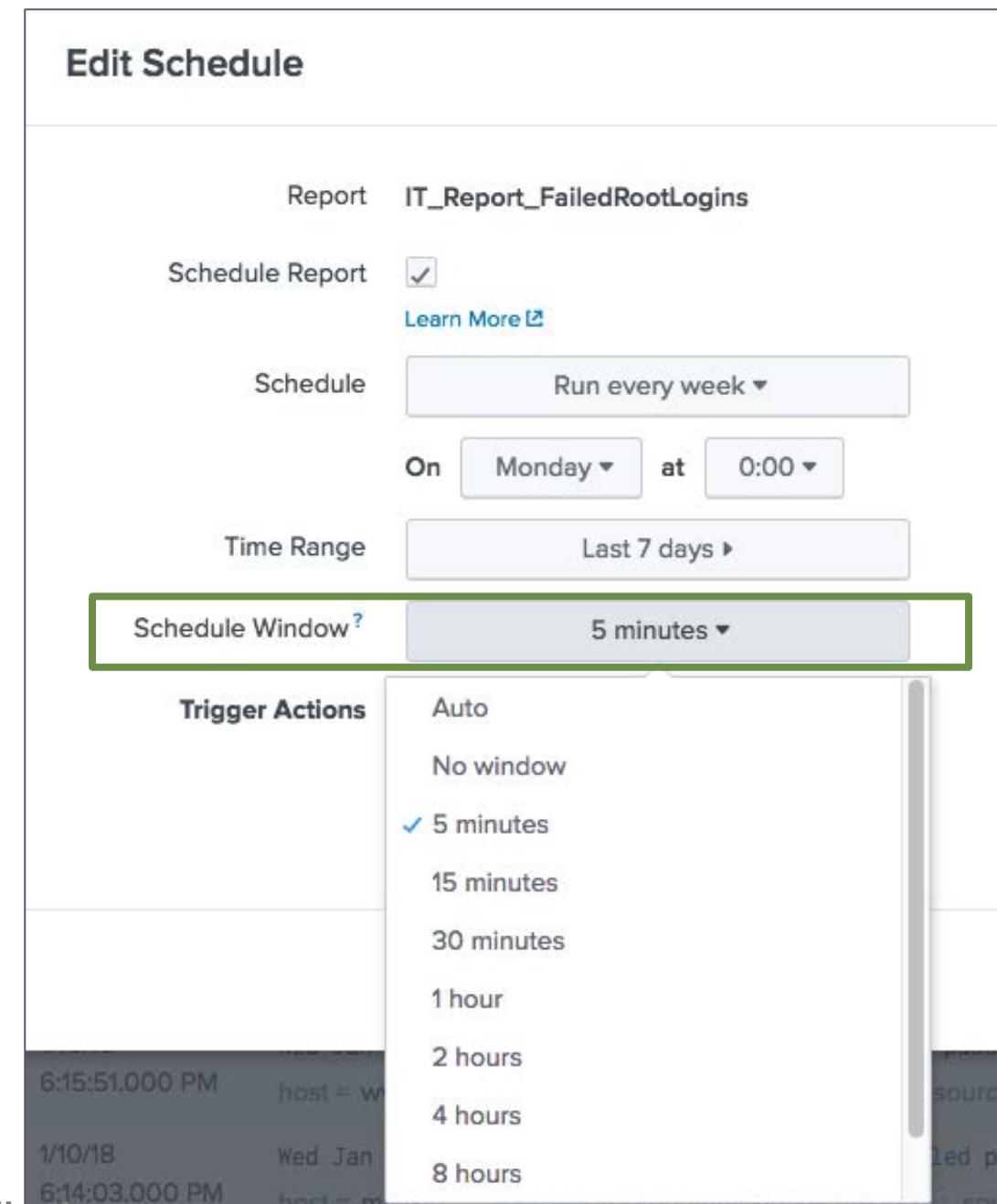
Advanced

Back

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Creating a Scheduled Report – Schedule Window

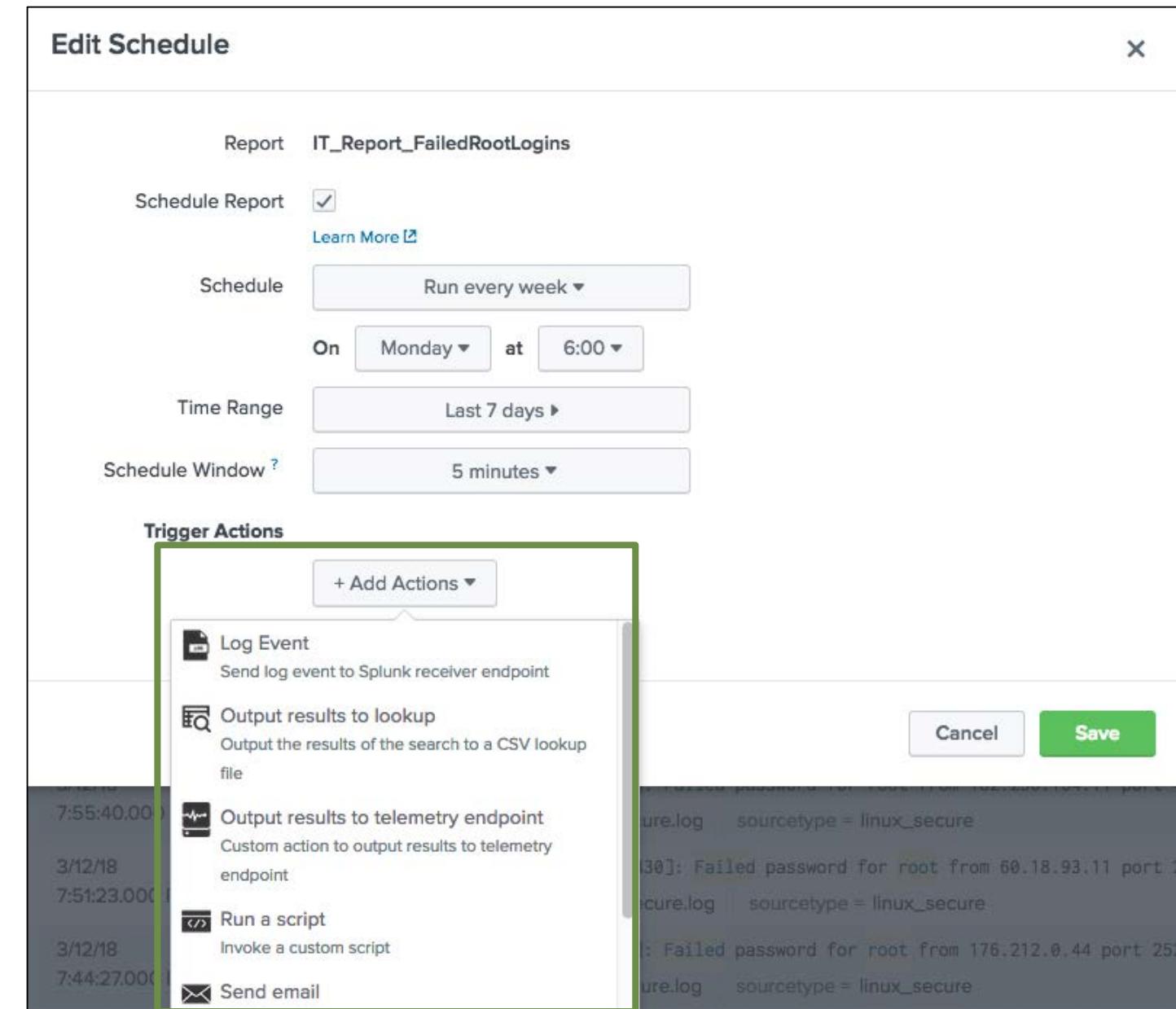
- Schedule Window – this setting determines a time frame to run the report
 - If there are other reports scheduled to run at the same time, you can provide a window in which to run the report
 - This setting provides efficiency when scheduling several reports to run
- After you configure the report schedule,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



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Creating a Scheduled Report – Add Actions

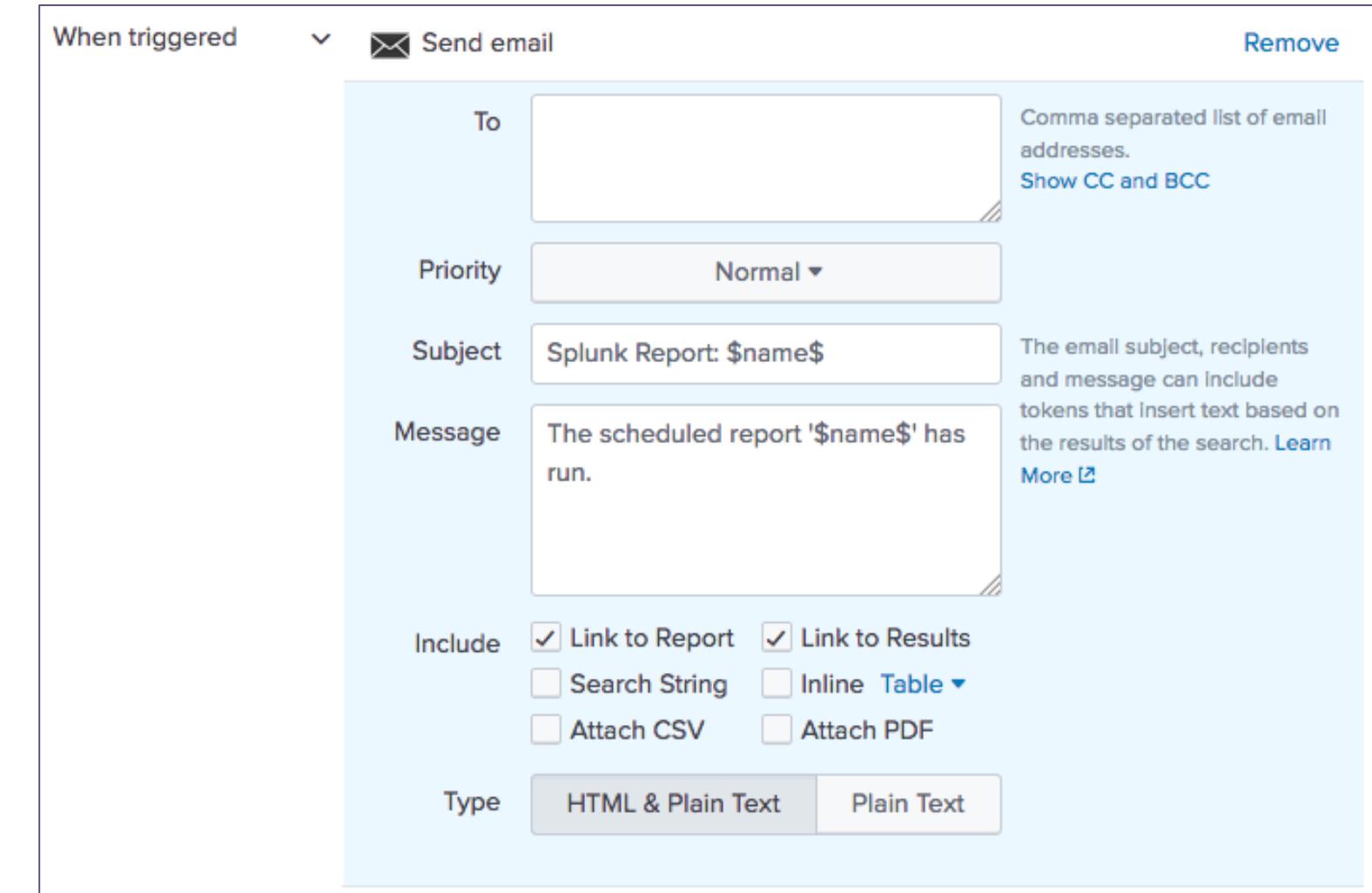
- **Log Event** – creates an indexed, searchable log event
- **Output results to lookup** – sends results of search to CSV lookup file
- **Output results to telemetry endpoint** – sends usage metrics back to Splunk (if your company has opted-in to program)
- **Run a script** – runs a previously created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

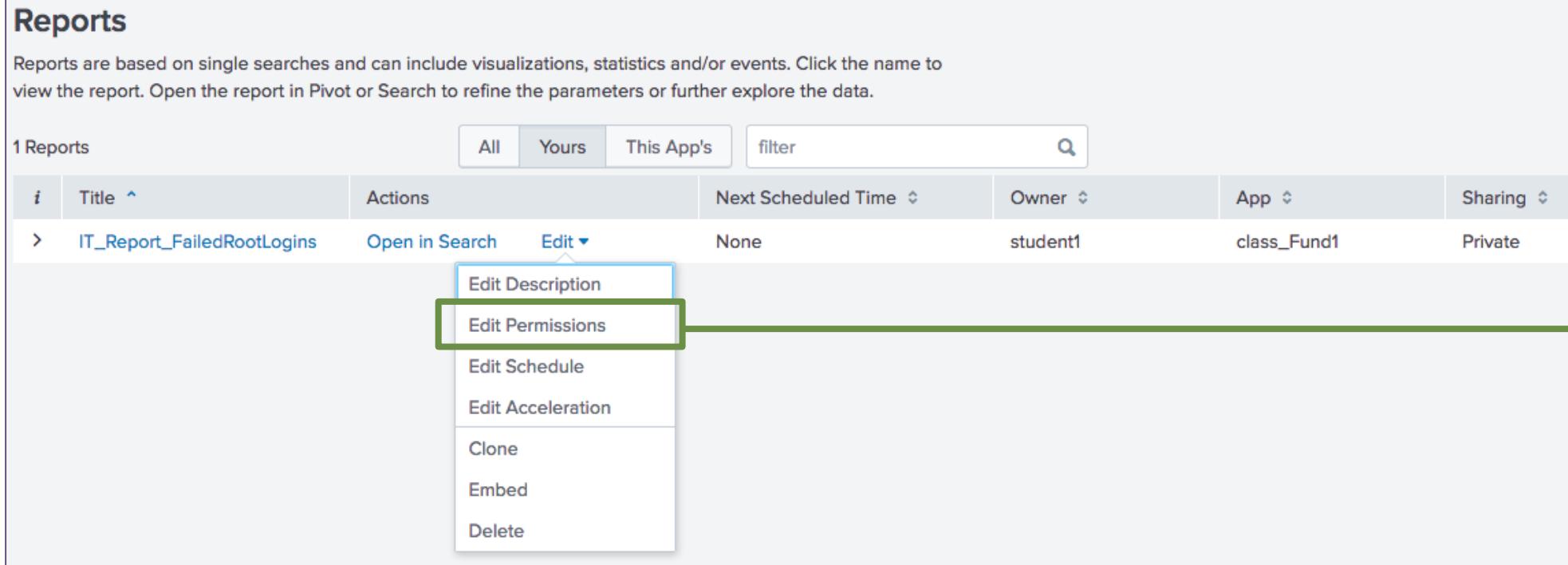
Reports are based on single searches and can include visualizations, statistics and/or events. Click the name to view the report. Open the report in Pivot or Search to refine the parameters or further explore the data.

1 Reports

Title	Actions	Next Scheduled Time	Owner	App	Sharing
IT_Report_FailedRootLogins	Open in Search Edit ▾	None	student1	class_Fund1	Private

Note

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



A green arrow points from the 'Edit Permissions' option in the dropdown menu to the 'Edit Permissions' dialog box on the right.

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"/>

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

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	Open in Search Edit	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

The image shows a sequence of three screenshots illustrating the steps to enable report embedding:

- Screenshot 1: Reports List**
Shows a list of reports. A report titled "IT_Report_FailedRootLogins" is selected. The "Edit" dropdown menu is open, and the "Embed" option is highlighted with a green box and an arrow pointing to the next step.
- Screenshot 2: Enable Report Embedding Confirmation**
A modal dialog titled "Enable Report Embedding" asks, "Are you sure you want to enable embedding for report IT_Report_FailedRootLogins? An embedded report can be viewed by anyone with access to the web page(s) in which it is inserted." The "Enable Embedding" button is highlighted with a green box and an arrow pointing to the final step.
- Screenshot 3: Embed Result**
The "Embed" result page displays the generated HTML code for embedding the report. It includes a warning about the report not having data until scheduled, a "Copy" button, and "Disable Embedding" and "Done" buttons.

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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 Shared in App

Alert type: Scheduled Real-time

Trigger Conditions

Trigger alert when: Per-Result

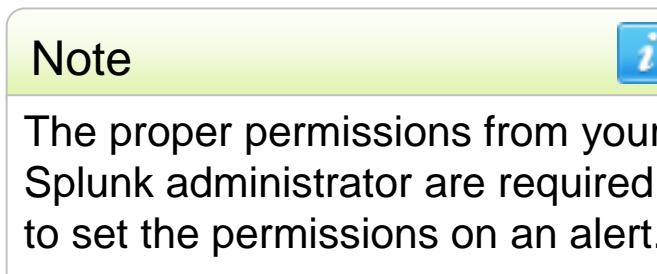
Throttle:

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



The dialog box is titled "Save As Alert". It has sections for "Settings", "Permissions", "Trigger Conditions", and "Trigger Actions". The "Permissions" section is highlighted with a green border. It shows three options: "Private" (selected), "Shared in App", and "Real-time". Below the permissions are tabs for "Alert type": "Scheduled" and "Real-time". The "Trigger Conditions" section includes "Trigger alert when" (set to "Per-Result") and a "Throttle" checkbox. The "Trigger Actions" section has a "+ Add Actions" button. At the bottom are "Cancel" and "Save" buttons.

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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	+ Add Actions ▾	
Cancel Save		

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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

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** (highlighted)

Real-time

Time Range:

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

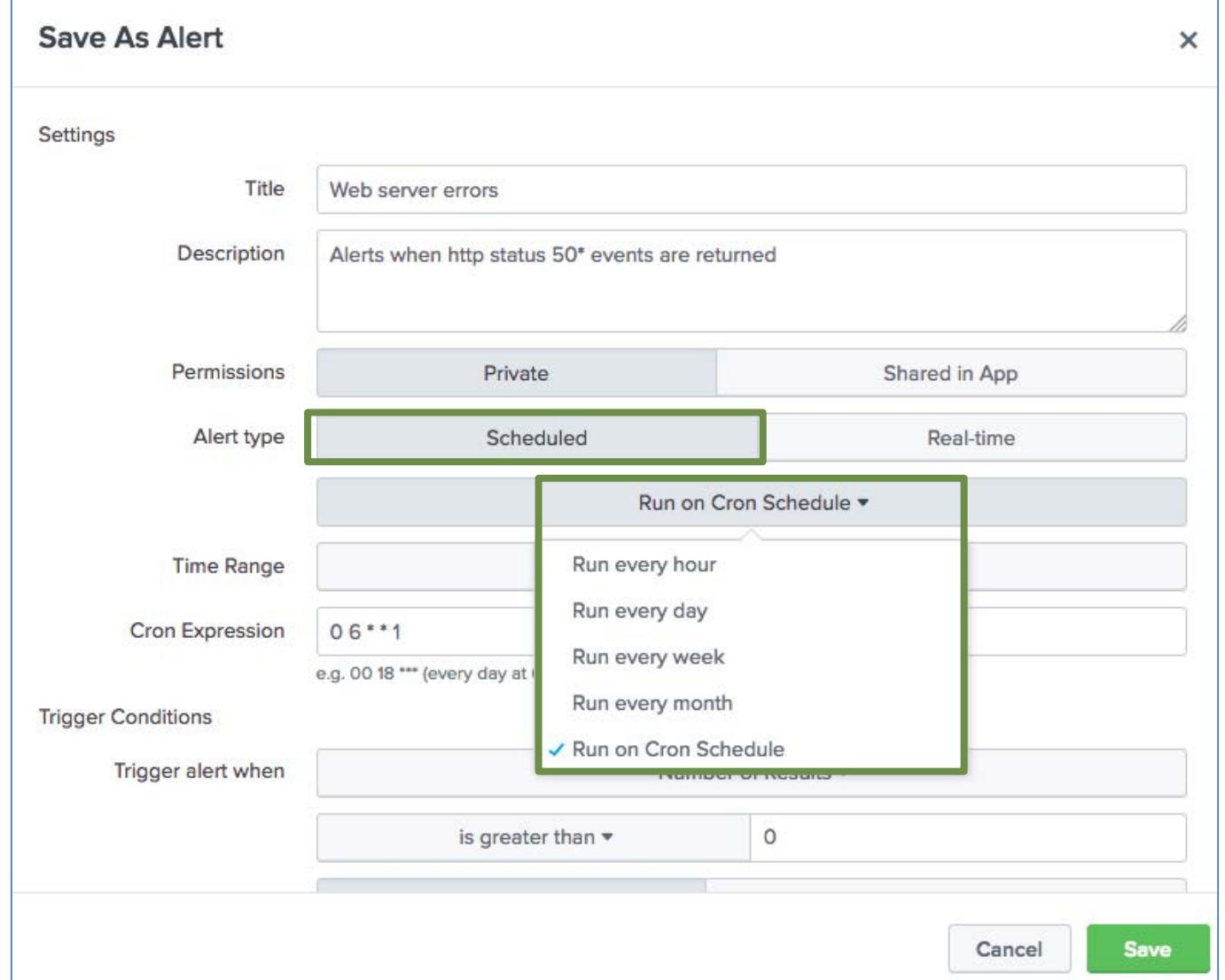
Trigger Conditions

Trigger alert when: is greater than 0

Run on Cron Schedule ▾

- Run every hour
- Run every day
- Run every week
- Run every month
- Run on Cron Schedule** (highlighted)

Cancel Save



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

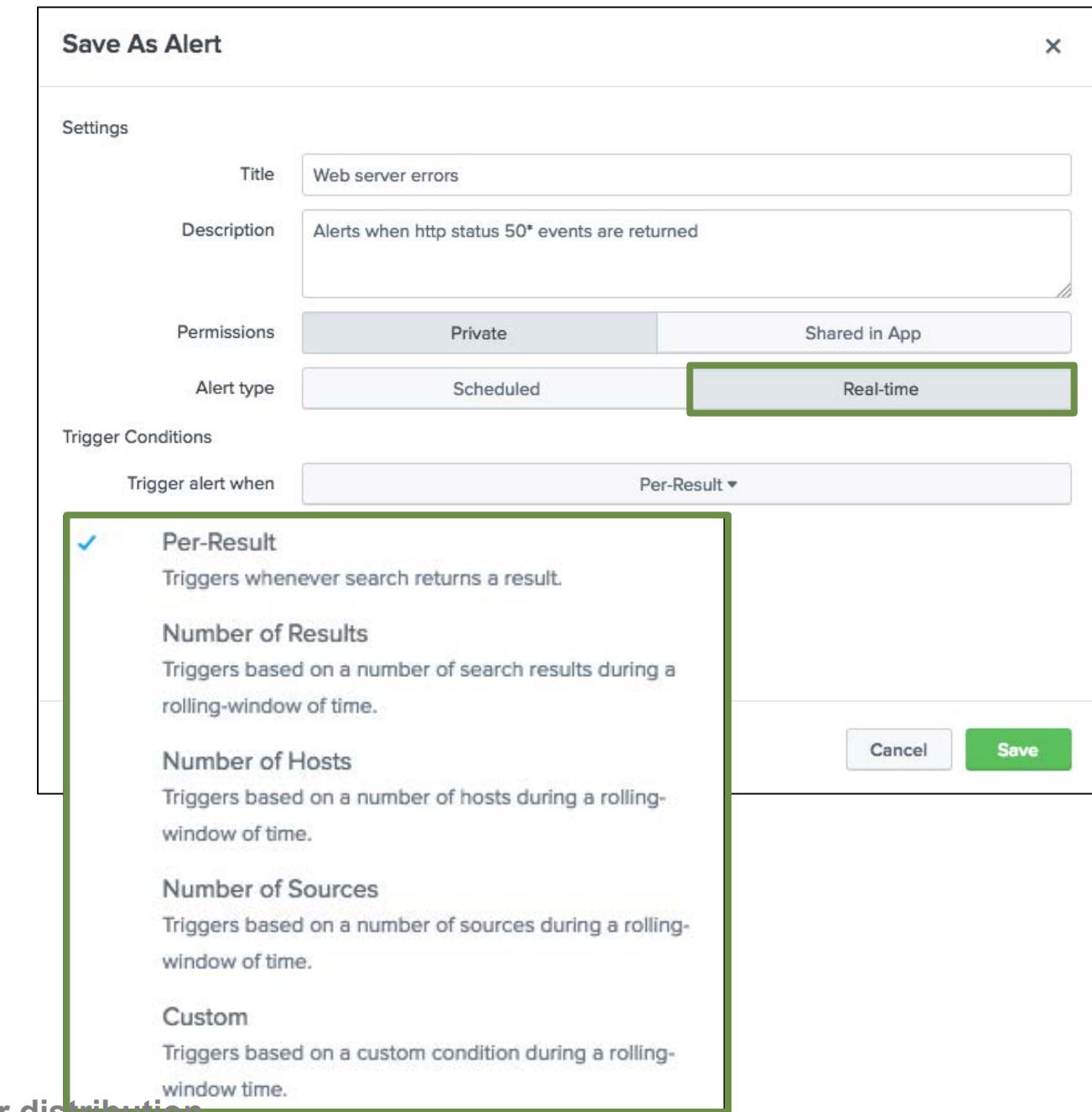
Trigger alert when: Number of Results ▾
is greater than ▾ 2

Cancel Save

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Setting Trigger Conditions – Real-time

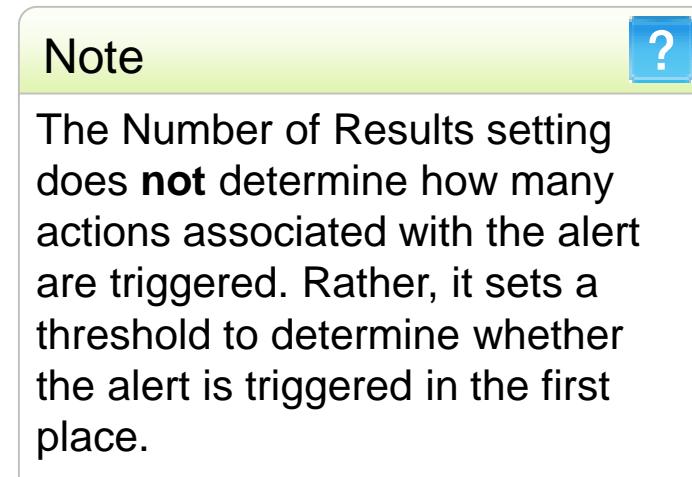
- Trigger conditions allow you to capture a larger data set, then apply more stringent criteria to results before executing the alert
- You can set alerts to trigger:
 - **Per-Result** – triggers when a result is returned
 - **Number of Results** – define how many results are returned before the alert 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 x

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

Cancel Save

A green box highlights the 'Trigger Conditions' section, which contains the 'Number of Results' dropdown and the 'is greater than' input field with the value '2'.

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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

The screenshot shows the 'Save As Alert' dialog box. Under 'Trigger Conditions', the 'Trigger' dropdown is set to 'Once'. Below it, the 'Throttle' section is highlighted with a green border, containing a checkbox labeled 'Throttle?' and a field 'Suppress triggering for' with the value '10 minute(s)'. Other settings include 'Scheduled' alert type, 'Last 5 minutes' time range, and a cron expression '0 6 * * 1'.

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

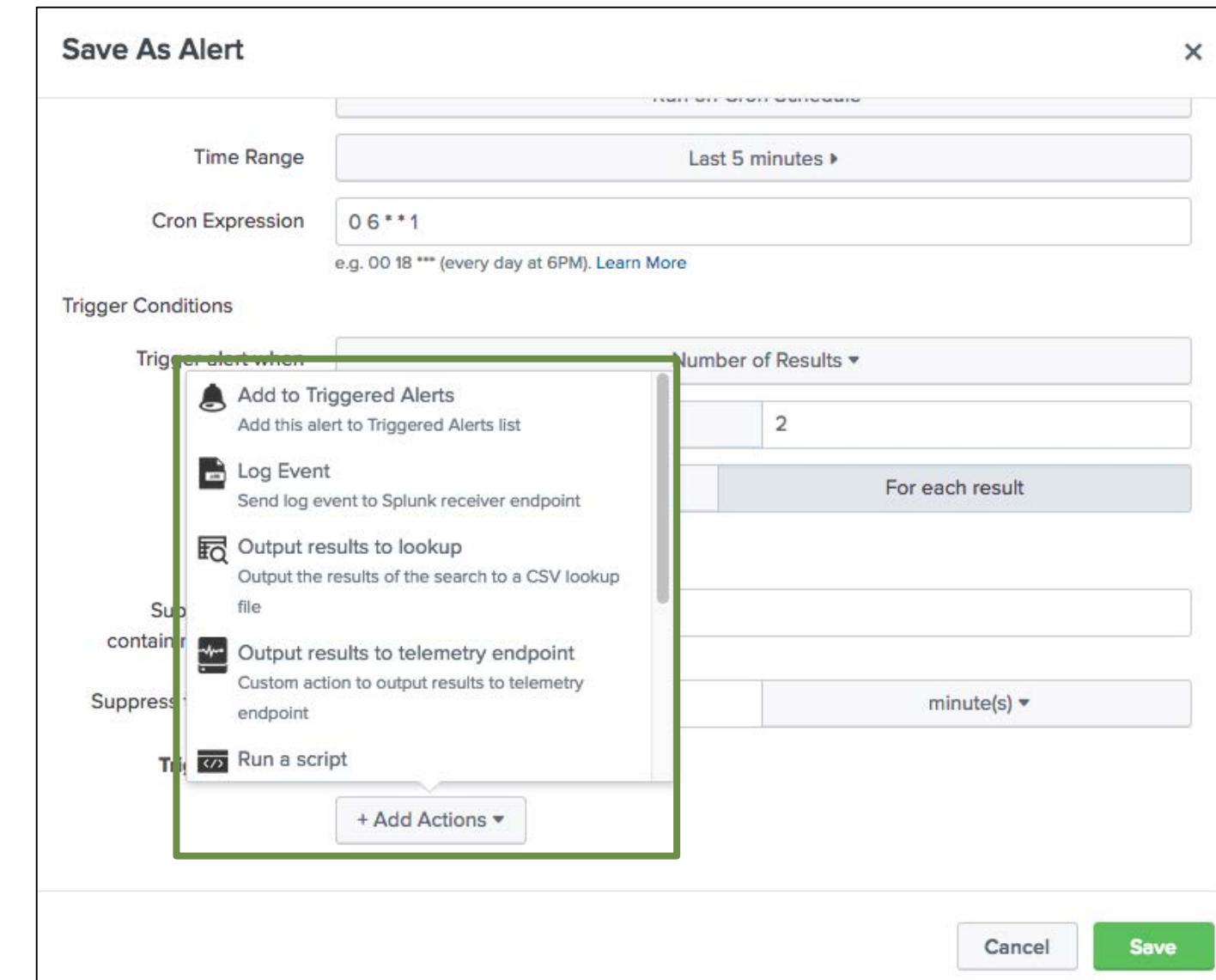
Save As Alert

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). Learn More	
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

Cancelling... Save

App CLASS: Fundamentals 1 (class_Fund1) Owner student... Severity All Alert All ▾ [Search](#)

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 View results Edit search Delete
2018-01-11 00:26:28 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest View results Edit search Delete
2018-01-11 00:26:24 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest View results Edit search Delete
2018-01-11 00:26:23 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest View results Edit search Delete
2018-01-11 00:26:19 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest View results Edit search Delete

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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)

The screenshot shows the 'Log Event' configuration screen under 'When triggered'. It includes fields for Event, Source, Sourcetype, Host, and Index. The Event field contains a template with tokens like \$trigger_date\$, \$trigger_timeHMS\$, and \$sourcetype\$. The Source field is set to 'alert:\$name\$'. The Sourcetype field is set to 'generic_single_line'. The Host and Index fields are both set to 'main'. A note at the bottom right of the interface provides a link to a complete list of available tokens.

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 illustrates the configuration of an alert action to log events. On the left, the 'Log Event' configuration window is shown with the following fields:

- Event:** \$trigger_date\$ \$trigger_timeHMS\$ 50*
web server errors
sourcetype=\$result.sourcetype\$
- Source:** alert:\$name\$
- Sourcetype:** generic_single_line
- Host:** [empty]
- Index:** main

The 'New Search' window on the right shows the results of the search defined in the alert configuration. The search results table displays the following events:

Time	Event
2018-01-11 12:00:20 PM	host = 127.0.0.1 source = alert:Web server errors sourcetype = generic_single_line
2018-01-11 11:59:29 AM	host = 127.0.0.1 source = alert:Web server errors sourcetype = generic_single_line
2018-01-11 11:56:39 AM	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 Send email

To
Comma separated list of email addresses.
[Show CC and BCC](#)

Priority

Subject

Message
The email subject, recipients and message can include tokens that insert text based on the results of the search. [Learn More](#)

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), and 'Help'. A search bar with a magnifying glass icon is also present. Below the navigation, there are several search filters: 'App' (set to 'CLASS: Fundamentals 1 (class_F...)'), 'Owner' (set to 'student...'), 'Severity' (set to 'All'), and an 'Alert' dropdown menu. The 'Alert' menu is open, showing options: 'Jobs' (selected) and 'Triggered Alerts' (highlighted with a green box). Below the filters, there are buttons for '<prev' and 'next>' and a message indicating 'Showing 1-12 of 12 results'. The main content area displays a table of triggered alerts. The columns are: Time, Fired alerts, App, Type, Severity, Mode, and Actions. The table lists three entries, each corresponding to a 'Web server errors' event from 'class_Fund1' at different times (2018-01-11 00:26:29 UTC, 2018-01-11 00:26:28 UTC, and 2018-01-11 00:26:24 UTC). Each row includes a checkbox, the fired alert time, the app name, the type ('Real-time'), the severity ('Medium'), the mode ('Digest'), and a 'Actions' column with links for 'View results', 'Edit search', and 'Delete'.

Time	Fired alerts	App	Type	Severity	Mode	Actions
2018-01-11 00:26:29 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest	View results Edit search Delete
2018-01-11 00:26:28 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest	View results Edit search Delete
2018-01-11 00:26:24 UTC	Web server errors	class_Fund1	Real-time	Medium	Digest	View results Edit search 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, Alerts set a condition that triggers an action, such as sending an email that contains the results of the triggering search to a list of people. Click the name to view the alert. Open the alert in Search to refine the parameters.
- Alerts Table:** 1 Alerts. Columns include Title (sorted by Title), Actions, Owner, App, Sharing, and Status.
- Action Row:** Web server errors. The 'Actions' column contains an 'Open in Search' link and an 'Edit ▾' button. An arrow points from the 'Edit' button to a dropdown menu.
- Dropdown Menu:** 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 is highlighted, and a dropdown menu appears, with 'Edit Permissions' being selected. A green arrow points from this selection to the 'Edit Permissions' dialog box on the right. The dialog box shows the alert is named 'Web server errors', owned by 'student1', and associated with the 'class_Fund1' app. The 'Sharing' tab is selected, showing 'Owner' (student1) and 'App' (class_Fund1). The 'Display For' section is set to 'Owner'. At the bottom are 'Cancel' and 'Save' buttons.

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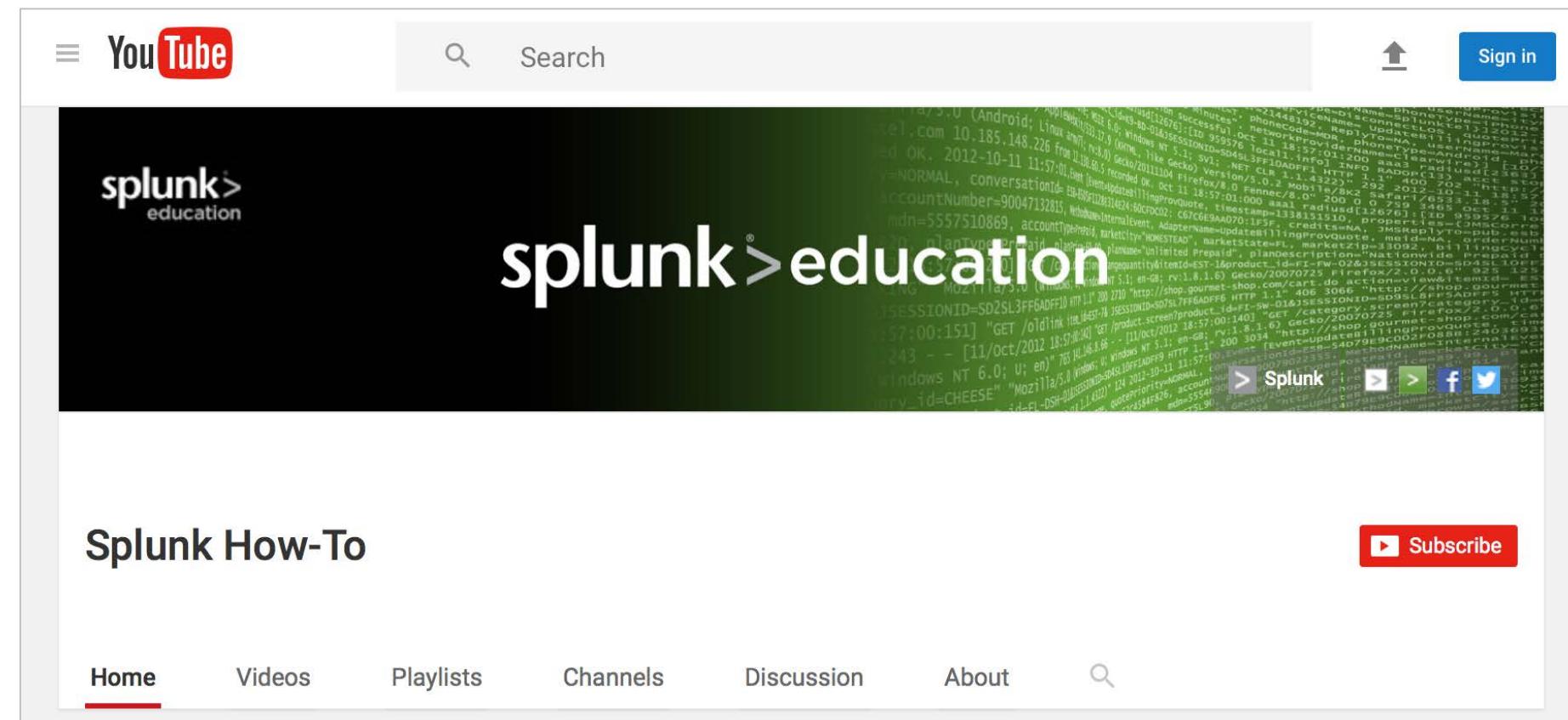
What's Next?: *Splunk Fundamentals 2*

- 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

• 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

• Enterprise Support

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

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Other Resources

- 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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