
splunk>

# Outline

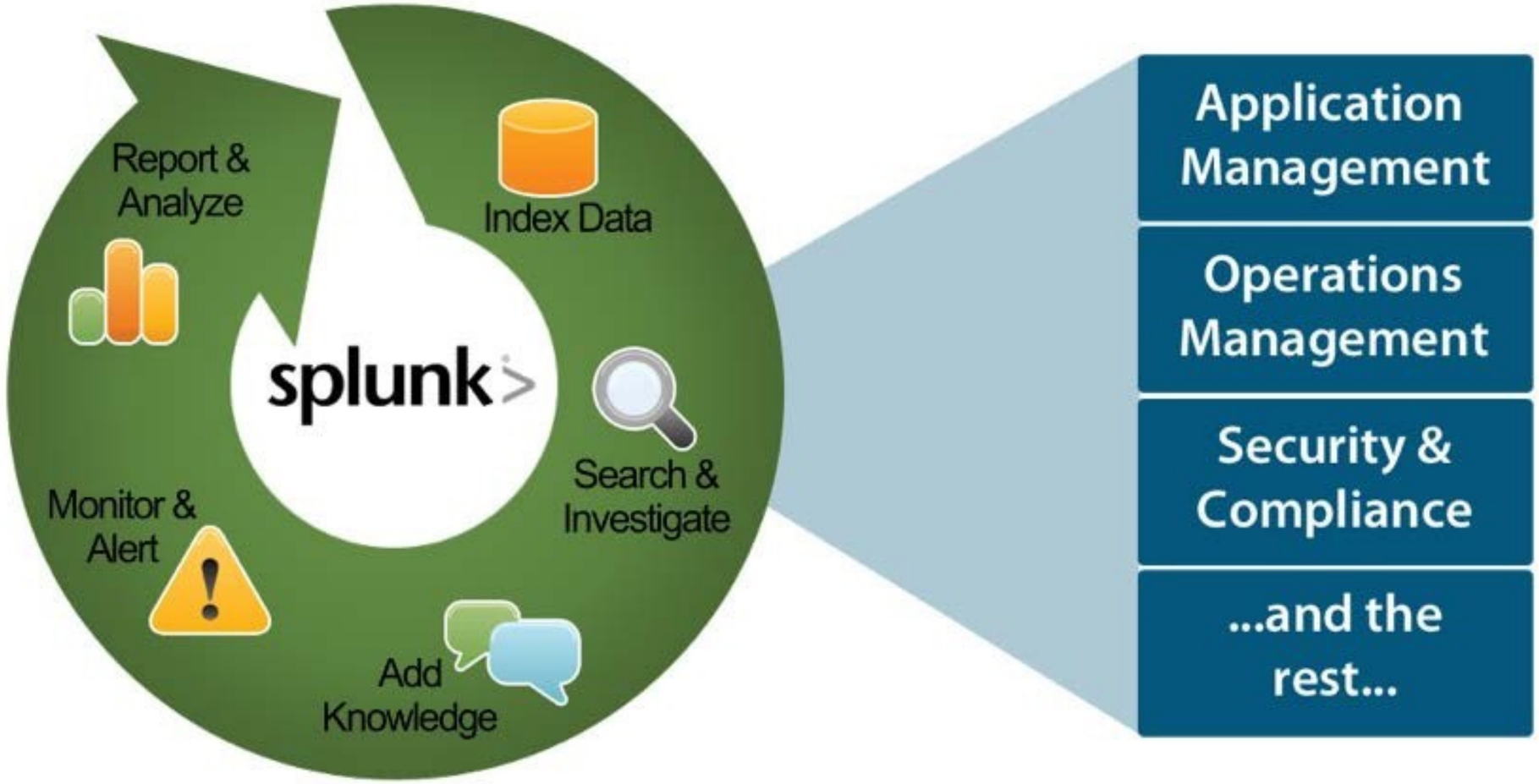
Module 1: Introducing Splunk
Module 2: Splunk Components
Module 3: Installing Splunk
Module 4: Getting Data In
Module 5: Basic Search
Module 6: Using Fields
Module 7: Best Practices
Module 8: Splunk's Search Language
Module 9: Transforming Commands
Module 10: Creating Reports and Dashboards
Module 11: Pivot and Datasets
Module 12: Creating and Using Lookups
Module 13: Creating Scheduled Reports and Alerts

# Module 1
# Introducing Splunk

# Understanding Splunk


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

# What Is Splunk?




Aggregate, analyze, and get answers from your machine data

# What Data?

## Index **ANY** data from **ANY** source

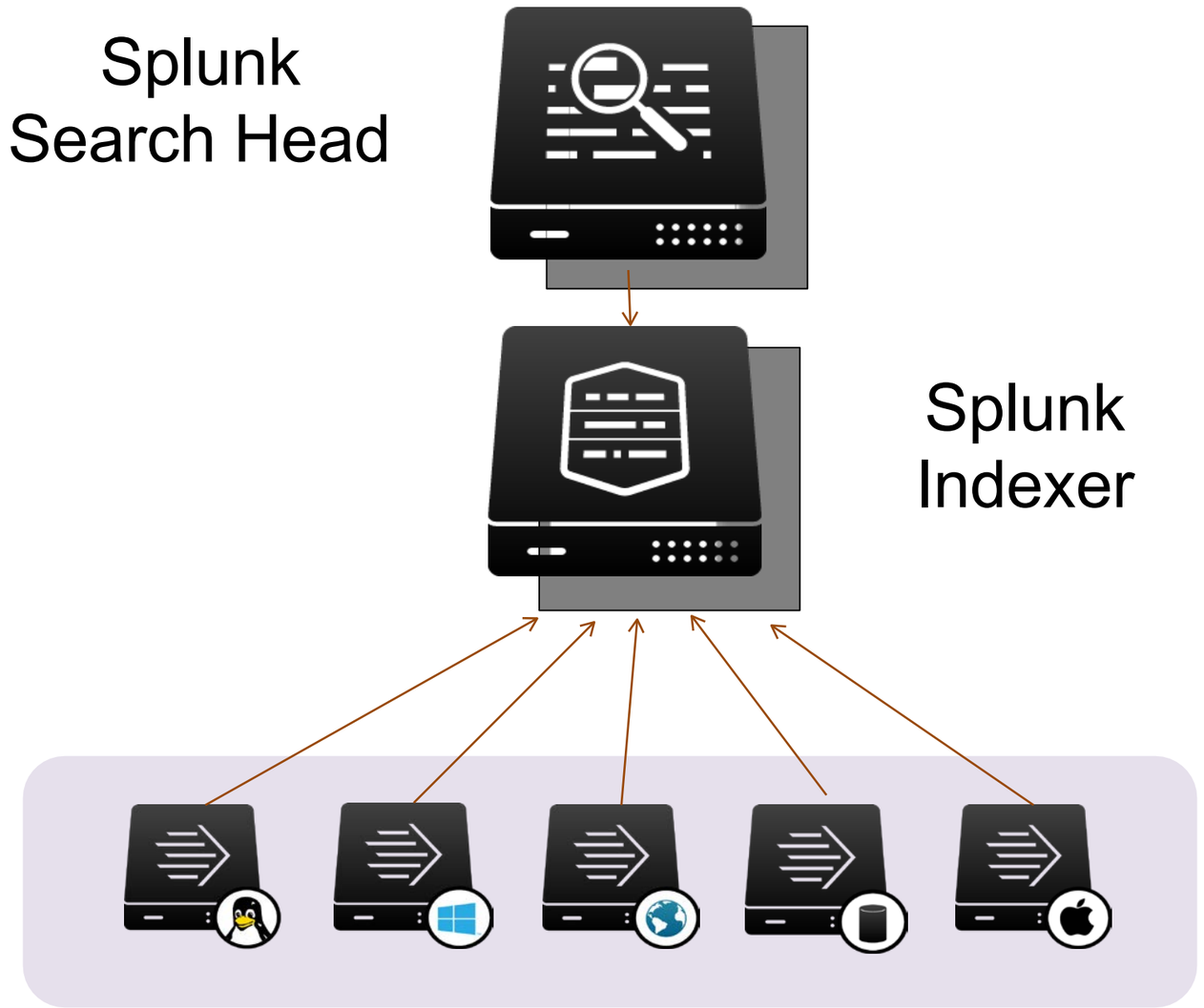

- Computers
- Network devices
- Virtual machines
- Internet devices
- Communication devices
- Sensors
- Databases


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

**Note**

For **lots** of ideas on data to collect in your environment, get the Splunk publication *The Essential Guide to Machine Data*.

# How Does Splunk Work?



# How Is Splunk Deployed?

- Splunk Enterprise

  Splunk components installed and administered on-premises

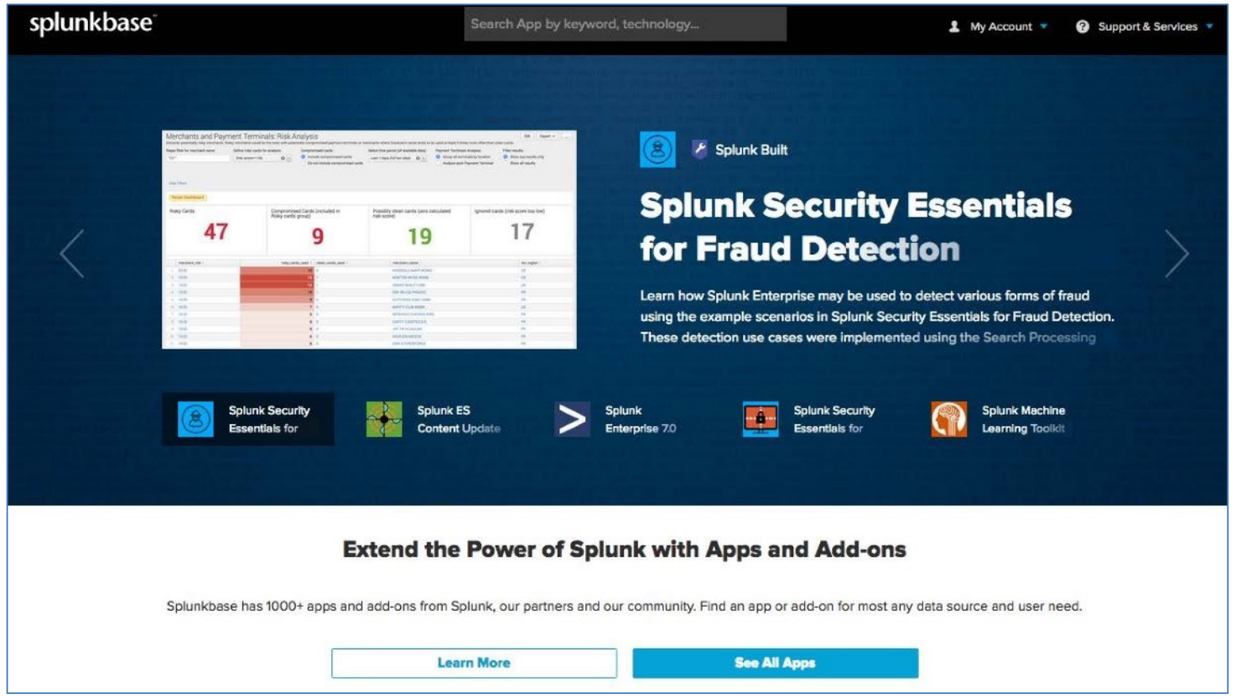
- Splunk Cloud
  - Splunk Enterprise as a scalable service
  - No infrastructure required

- Splunk Light

  Solution for small IT environments

# 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



# 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)

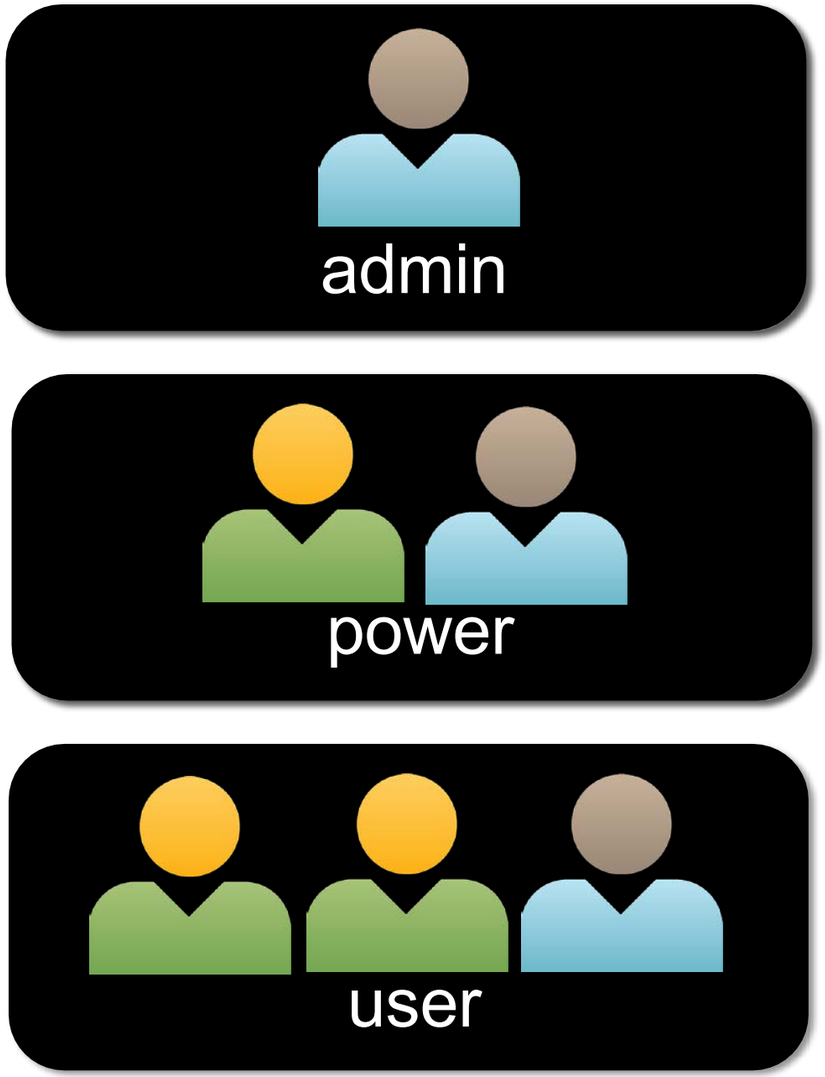
  Finds known, unknown, and hidden threats by analyzing user behavior and flagging unusual activity

Note

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

# 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



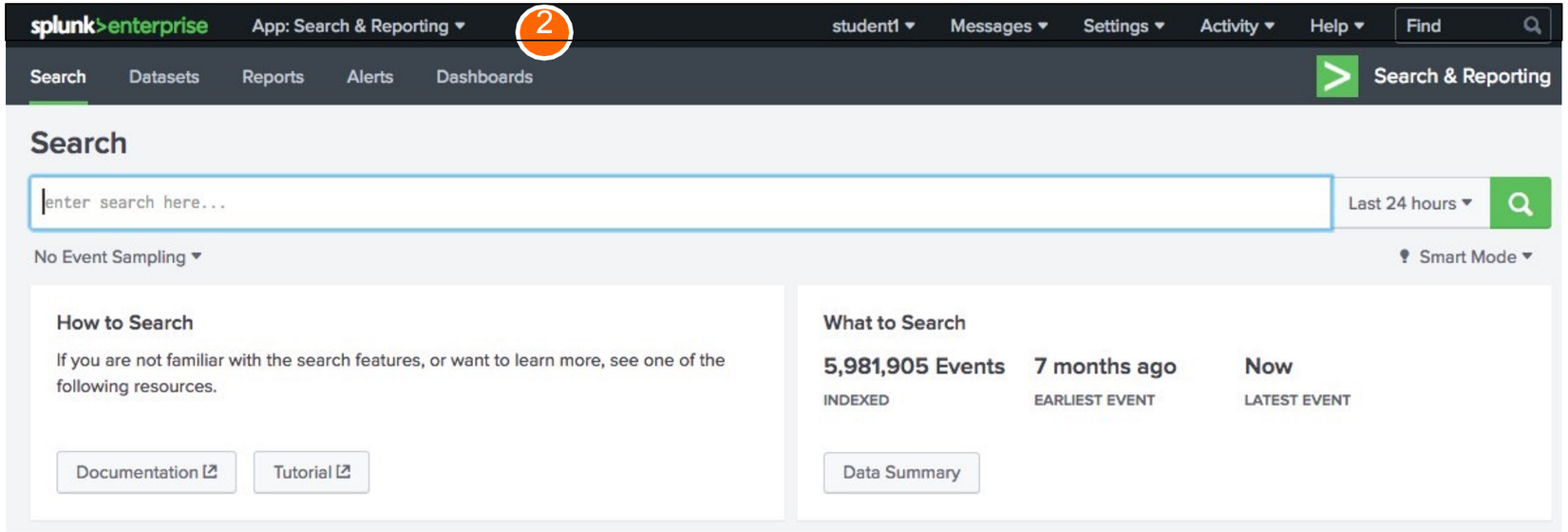

**Note**

In this class, the account you'll use for the lab exercises has been assigned the **Power** role.

# Logging In

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

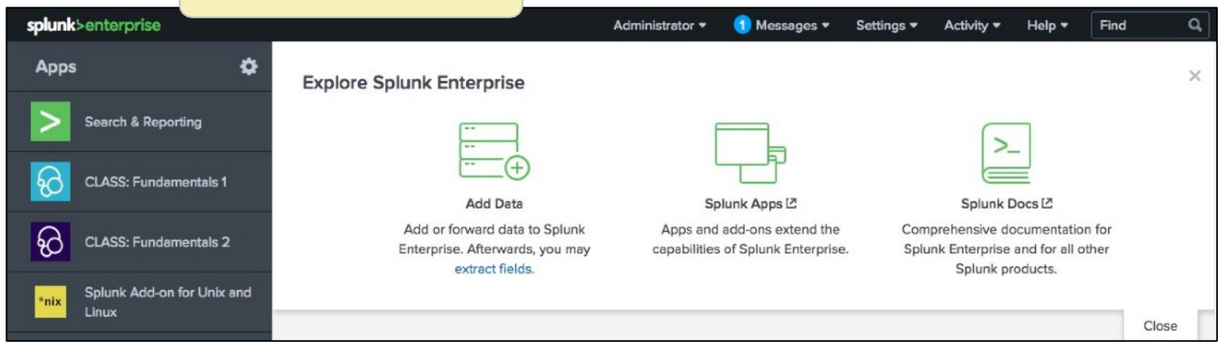
   You or your organization may change your default app

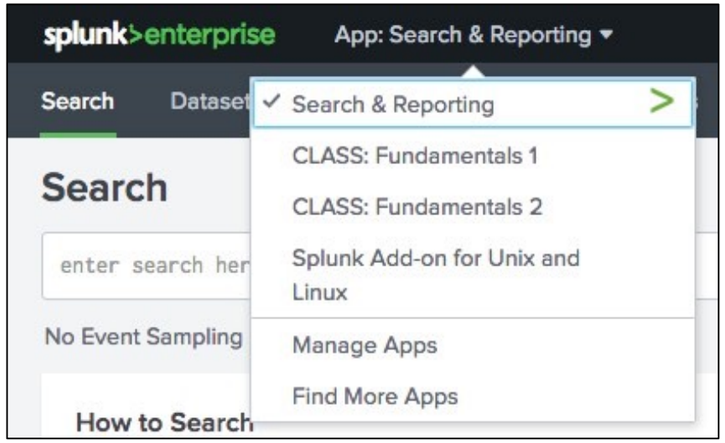
# Choosing Your App

- 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)

Home app




Within an app

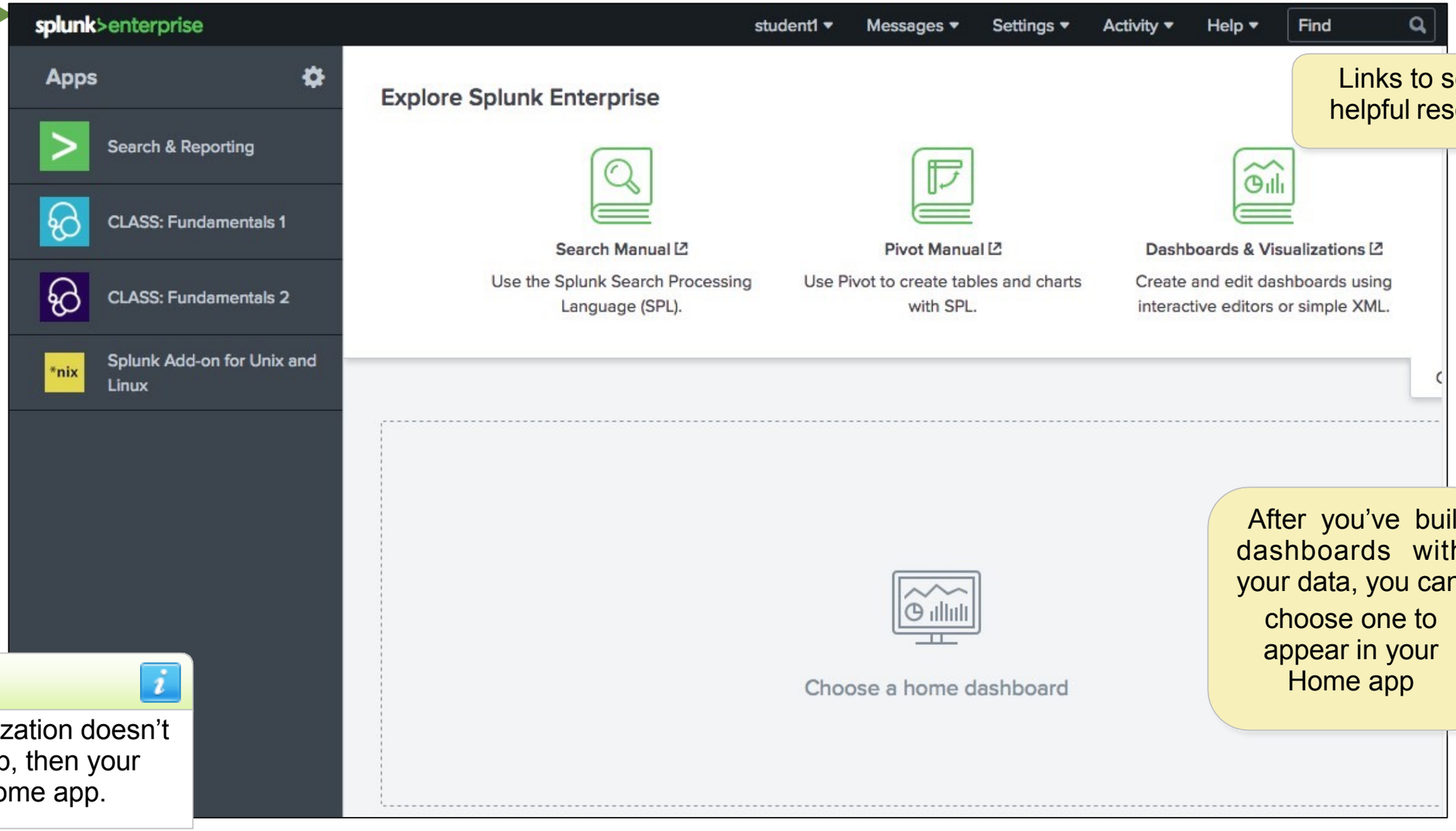



**Note**

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.




Links to several helpful resources

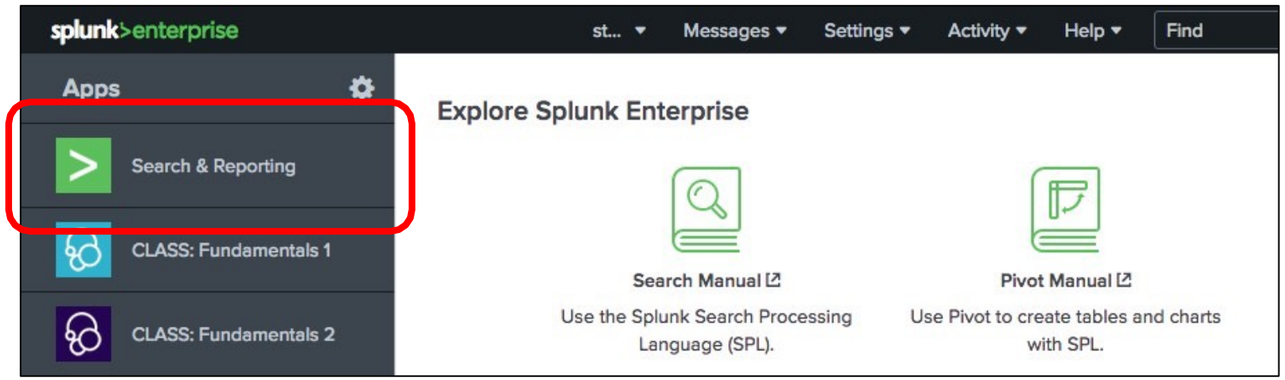
After you've built dashboards with your data, you can choose one to appear in your Home app

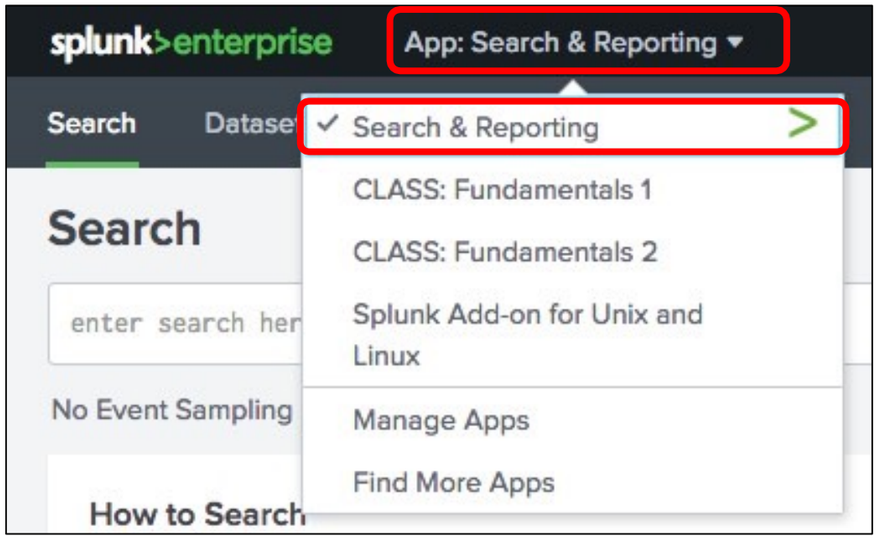
**Note**

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

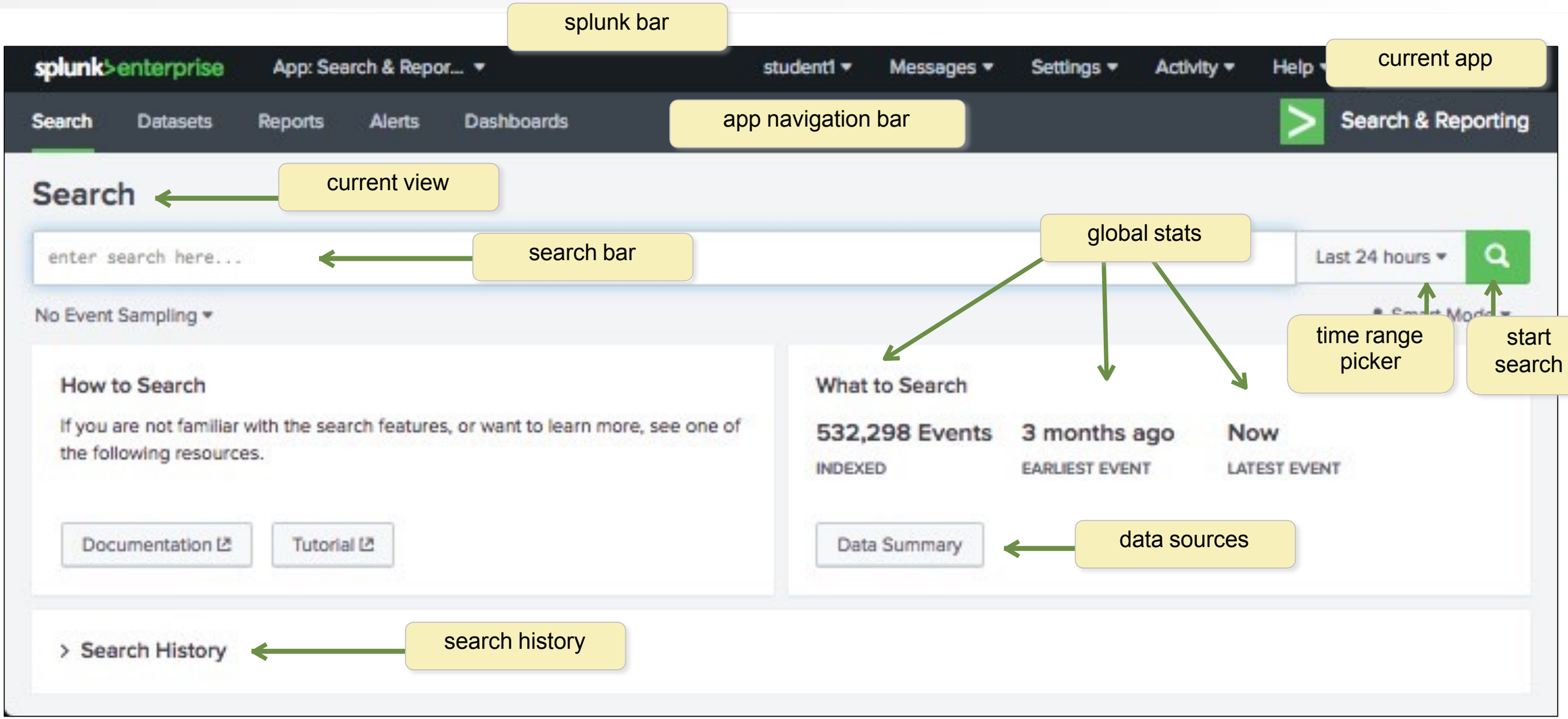
# Search & Reporting App

- 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**

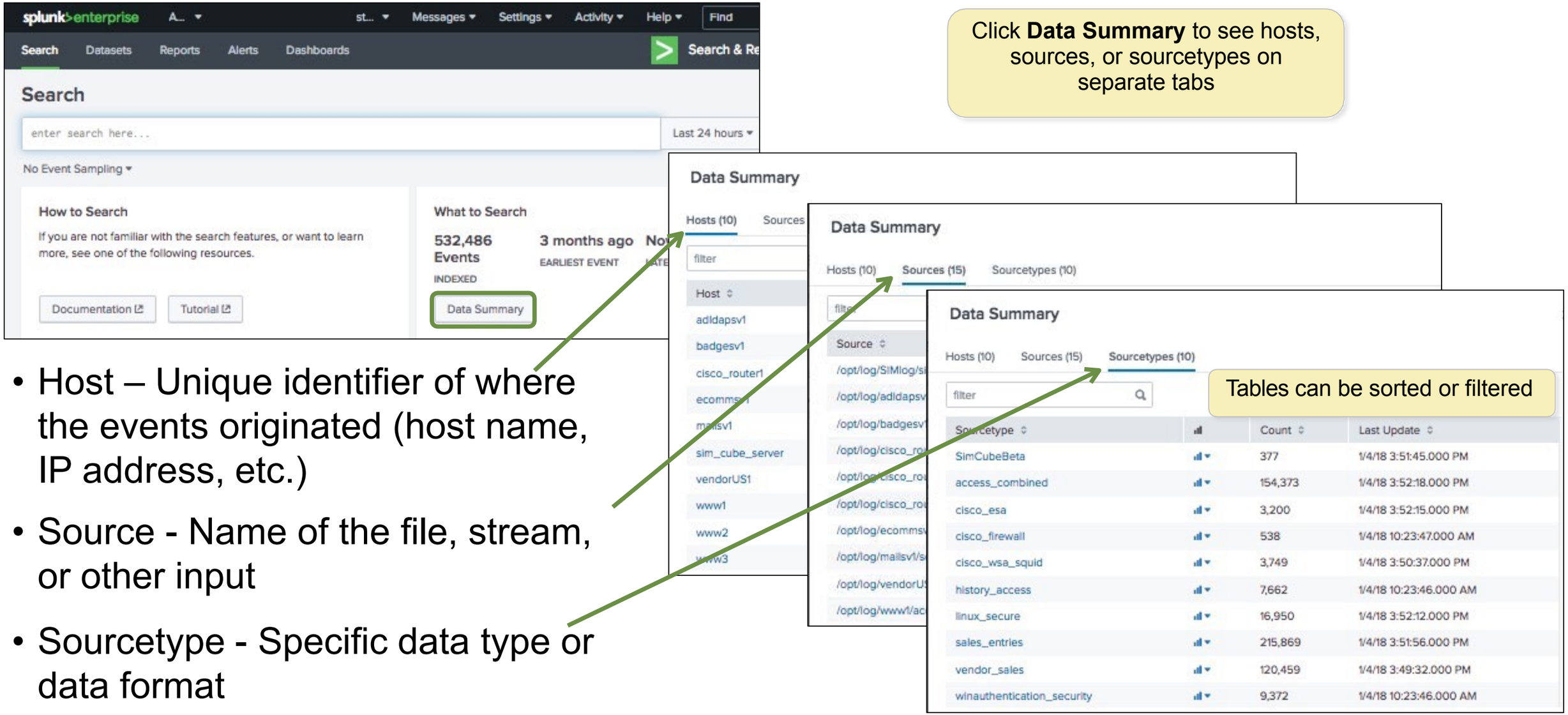


# Search & Reporting App (cont.)

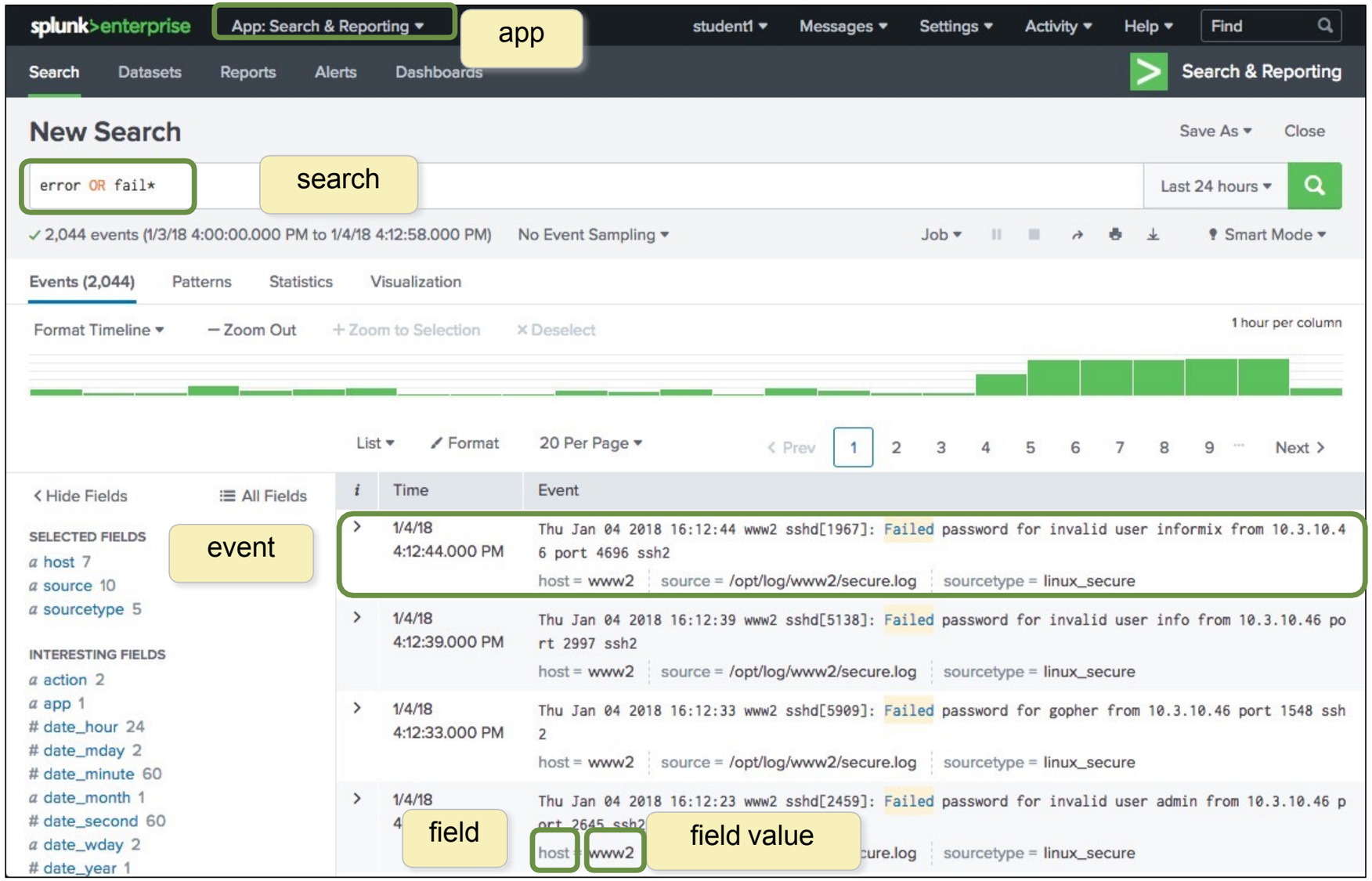


# Data Summary Tabs




- 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

# Events Tab


splunk>enterprise
App: Search & Reporting
app
student1
Messages
Settings
Activity
Help
Find
Search
Datasets
Reports
Alerts
Dashboards
Search & Reporting
New Search
Save As
Close
error OR fail*
search
Last 24 hours
✓ 2,044 events (1/3/18 4:00:00.000 PM to 1/4/18 4:12:58.000 PM)
No Event Sampling
Job
Smart Mode
Events (2,044)
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
Hide Fields
All Fields
SELECTED FIELDS
a host 7
a source 10
a sourcetype 5
INTERESTING FIELDS
a action 2
a app 1
# date_hour 24
# date_mday 2
# date_minute 60
a date_month 1
# date_second 60
a date_wday 2
# date_year 1
event
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 10.3.10.46 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
Thu Jan 04 2018 16:12:23 www2 sshd[2459]: Failed password for invalid user admin from 10.3.10.46 p
field
field value
host = www2
sourcetype = linux_secure

# Course Scenario

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

# 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

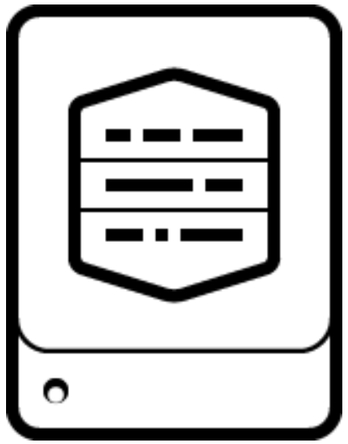
Note

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

# Module 2:
# Splunk Components

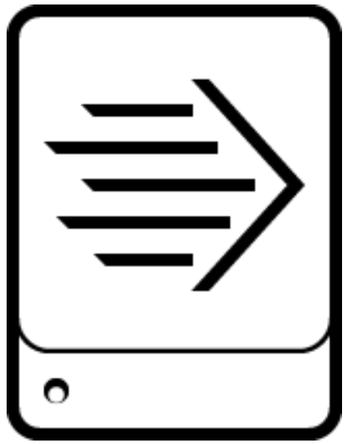
# Splunk Components

Splunk is comprised of three main processing components:



**Indexer**

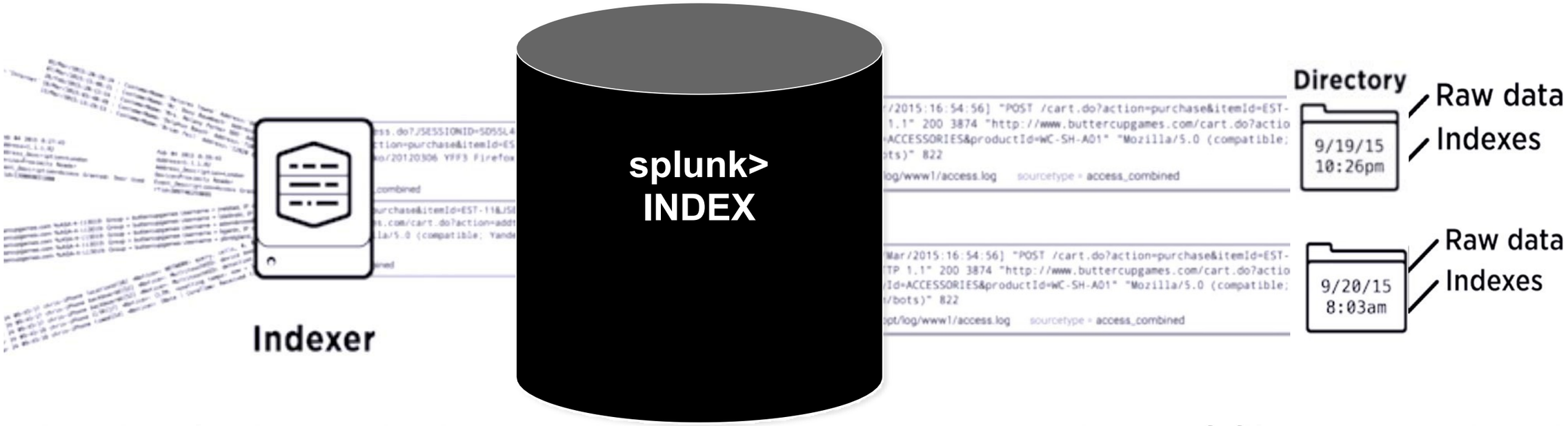
**Search Head**



**Forwarder**

# Splunk Components - Indexer

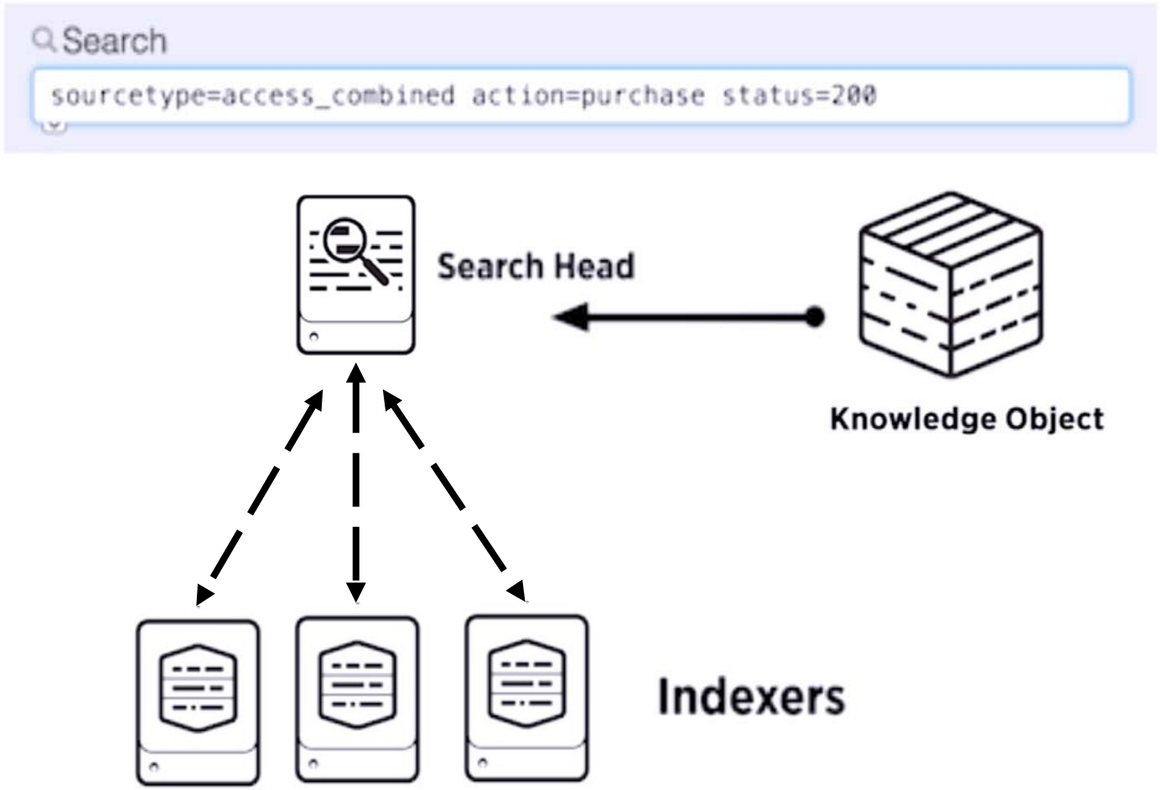
- Processes machine data, storing the results in indexes as events, enabling fast search and analysis




- 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)

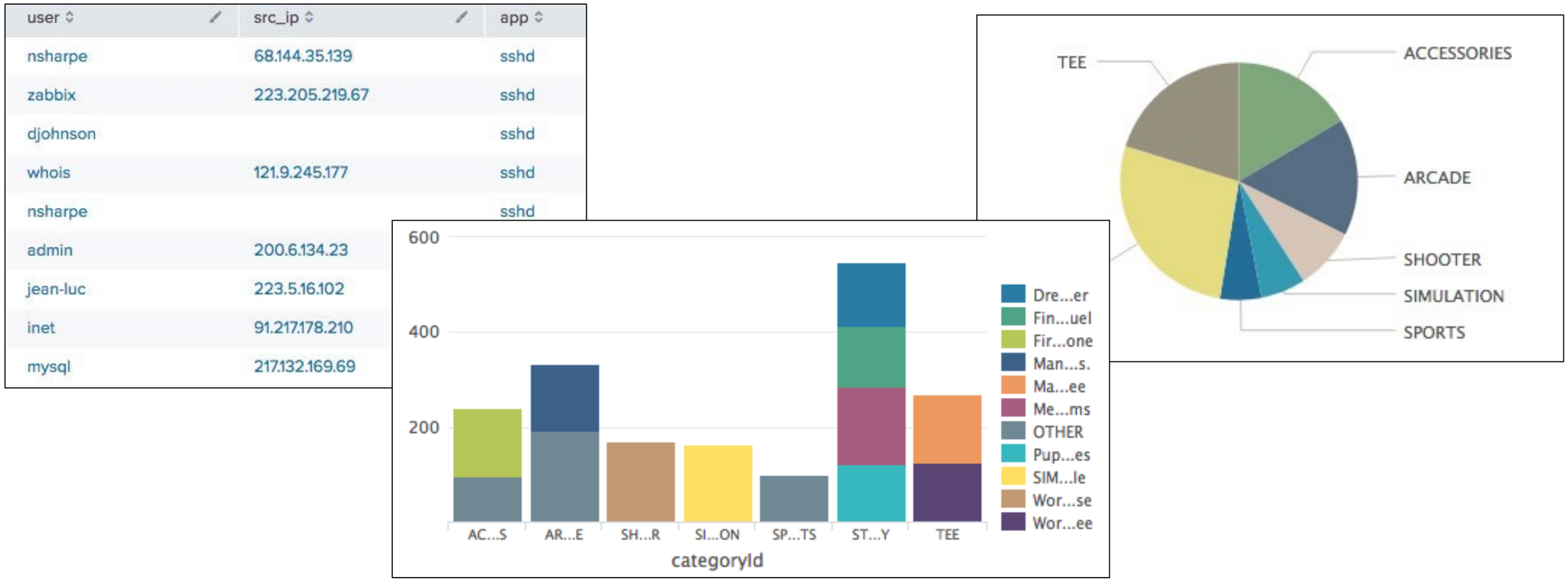
# Splunk Components – Search Heads

- 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



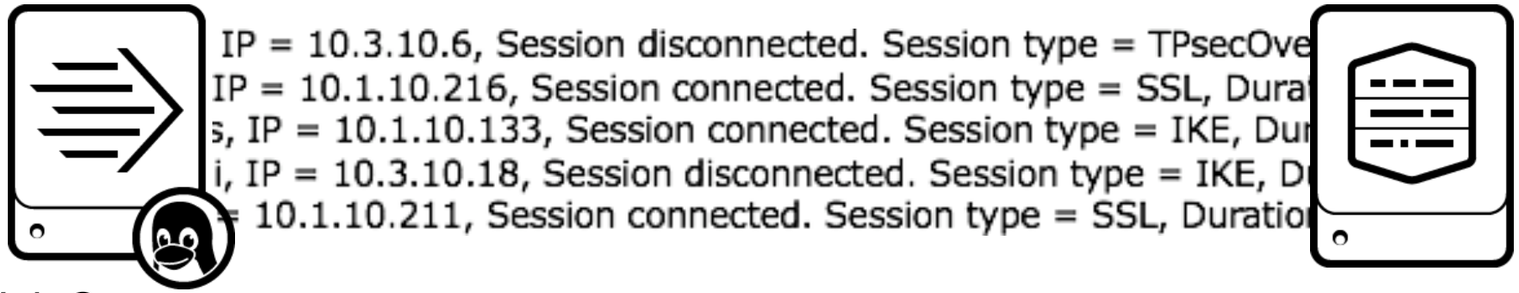
# Splunk Components – Search Heads (cont.)

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



# 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

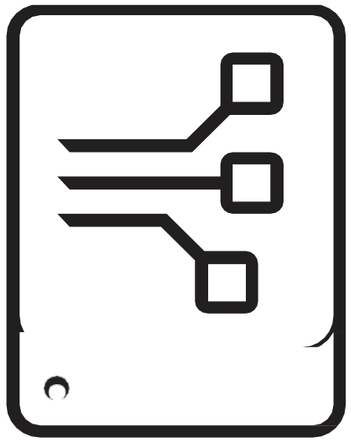



Web Server
with Forwarder instance
installed

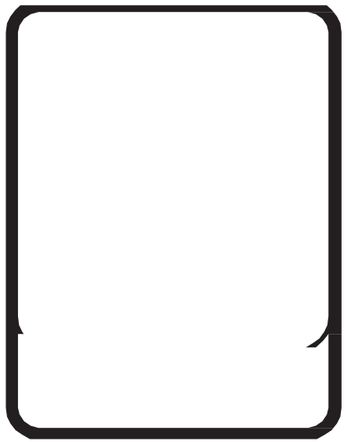
Indexer

# Additional Splunk Components

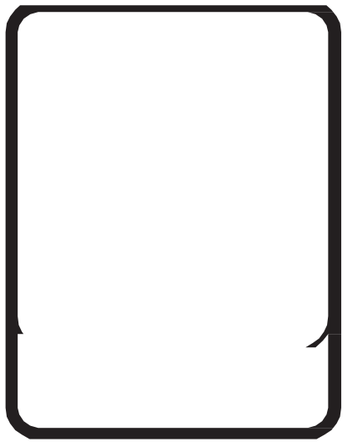
In addition to the three main Splunk processing components, there are some less-common components including :



**Deployment Server**



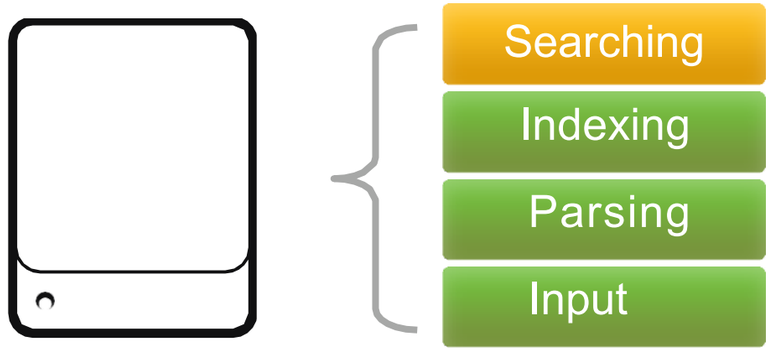
**Cluster Master**



**License Master**

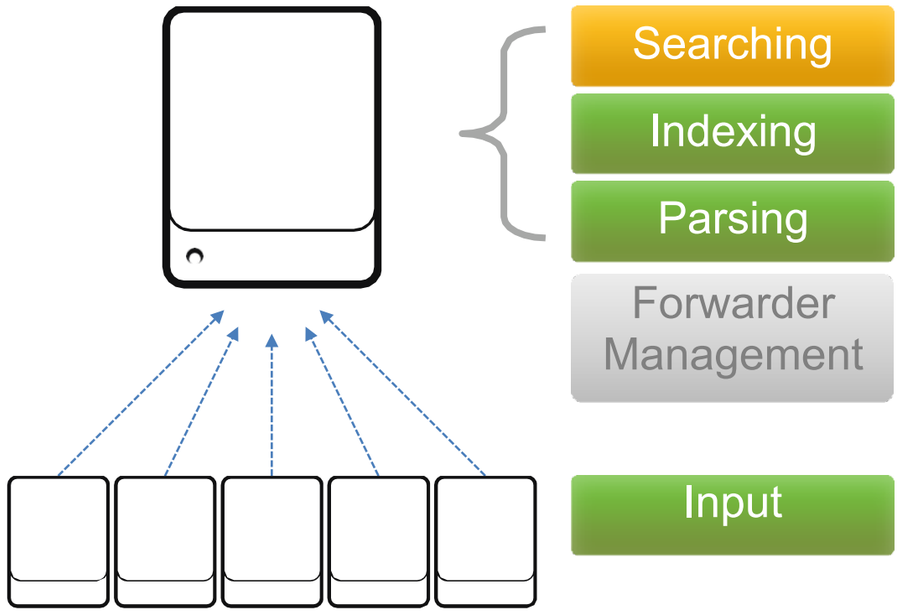
# Splunk Deployment – Standalone

- **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



# 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)

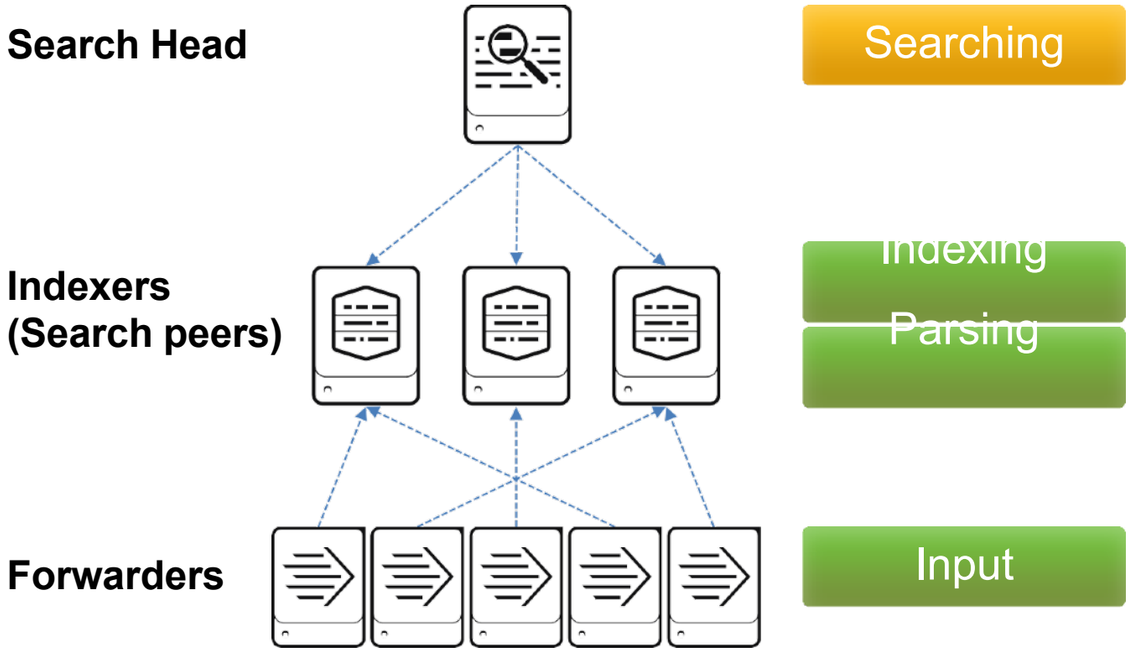



Basic Deployment for organizations:

- 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

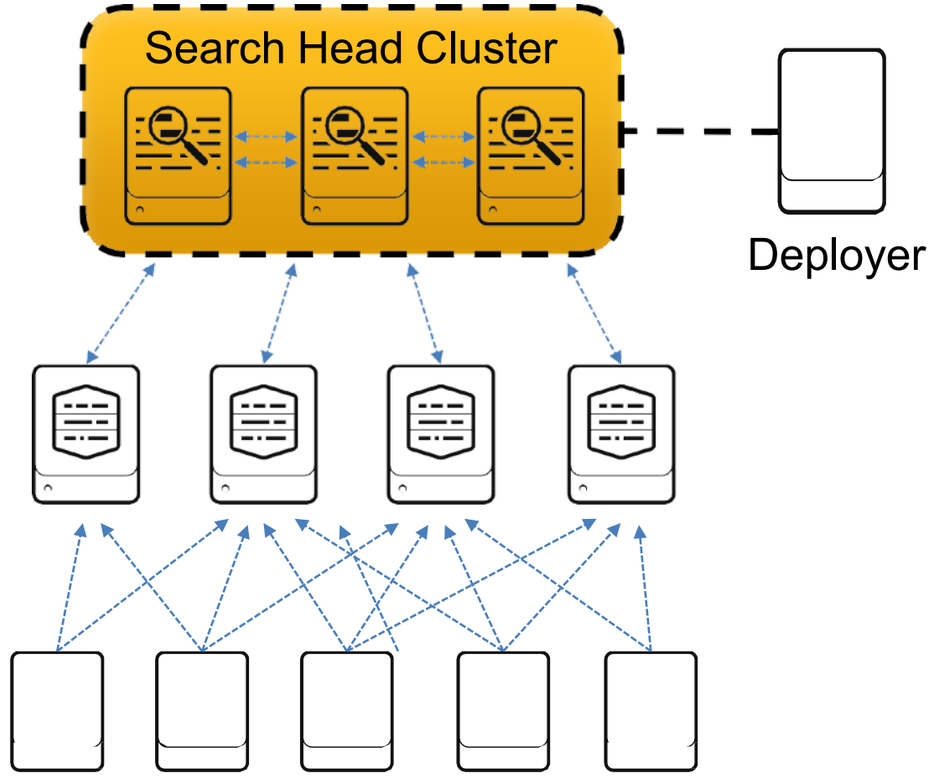



Deployment for organizations:

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

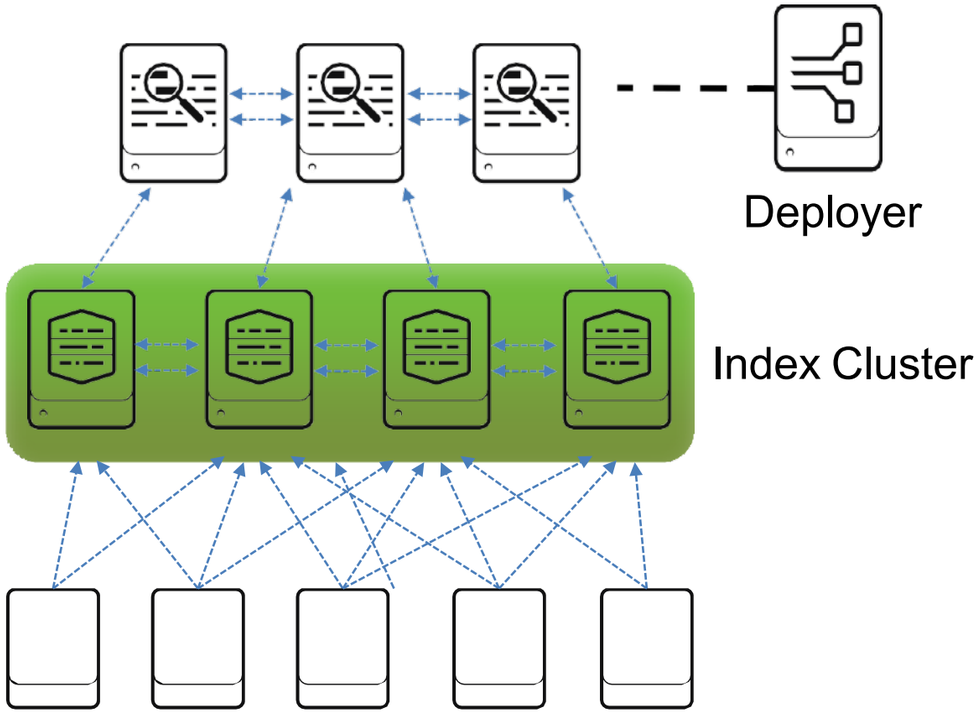
# Splunk Deployment – Increasing Capacity

- 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



# Splunk Deployment – Index Cluster

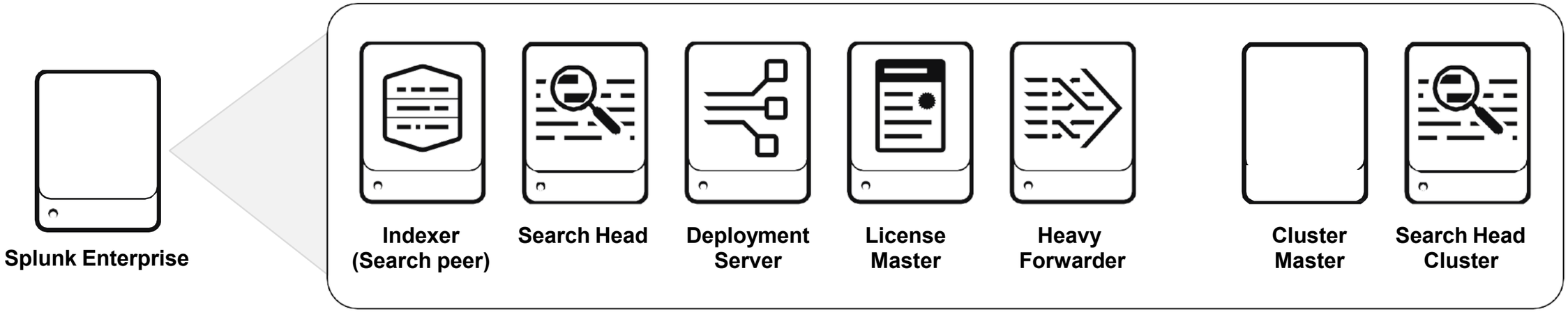
- Traditional Index Clusters:
  - Configured to replicate data
  - Prevent data loss
  - Promote availability
  - Manage multiple indexers
- Non-replicating Index Clusters
  - Offer simplified management
  - Do not provide availability or data recovery



# Module 3:
# Installing Splunk

# Splunk Enterprise Install Package

There are multiple Splunk components installed from the Splunk Enterprise package



# 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

# 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

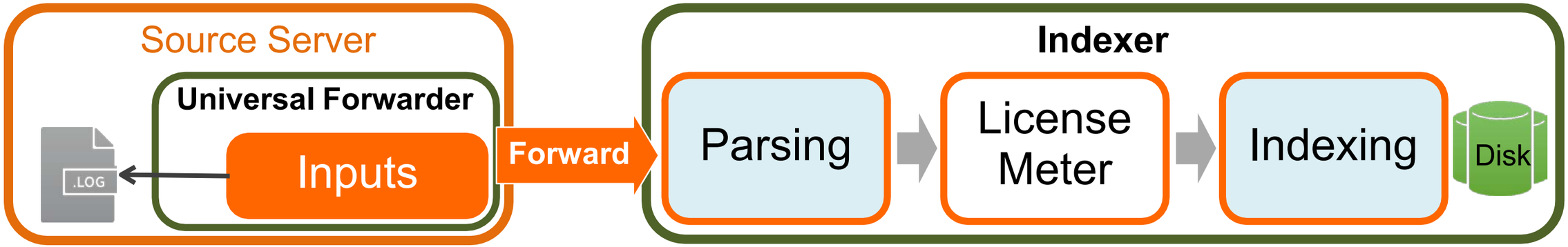
**`splunk`** is the program in the **`bin`** directory to run the CLI

| 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 |

# Module 4
# Getting Data In

# 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



# 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`**

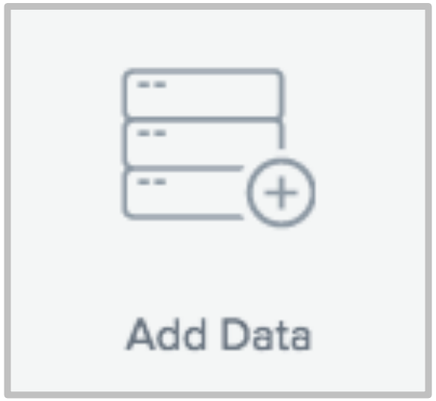
# Default Metadata Settings

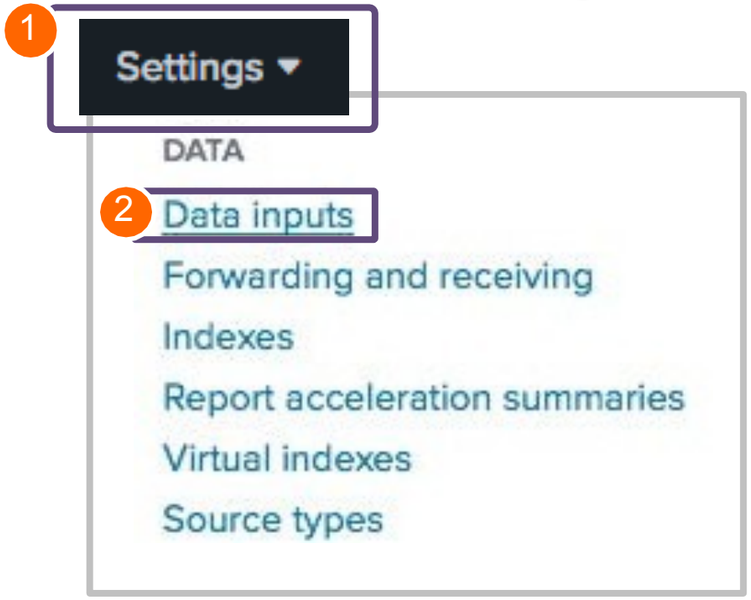
- When you index a data source, Splunk assigns metadata values
  - The metadata is applied to the entire source
  - Splunk applies defaults if not specified
  - You can also override them at input time or later

| 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` |

# Adding an Input with Splunk Web

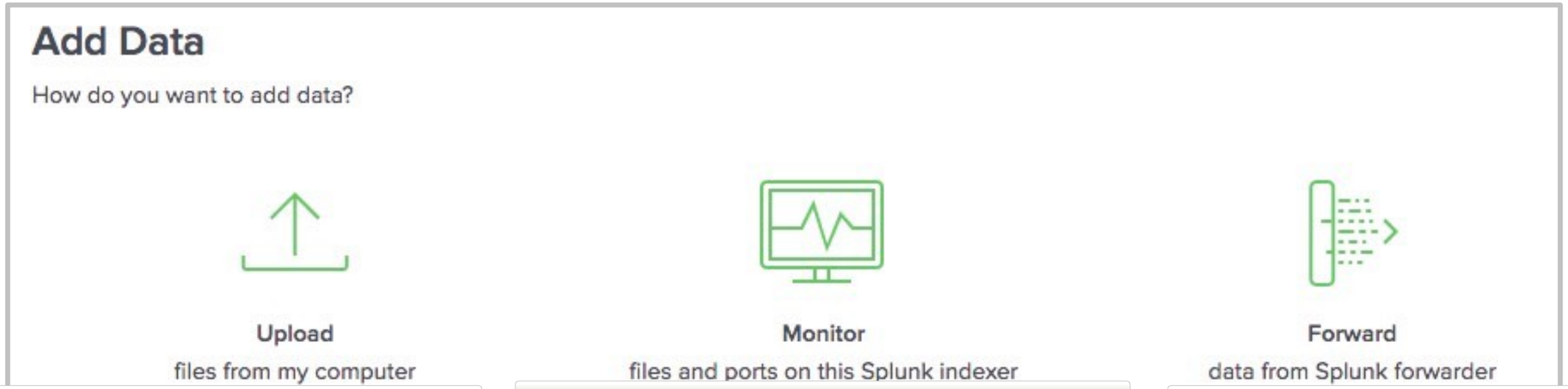
- Splunk admins have a number of ways to start the **Add Data** page
  - Click the **Add Data** icon
    - On the admin's **Home** page
    - On the **Settings** panel
  - Select **Settings** > **Data inputs** > **Add new**




# Add Data Menu

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




**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`.

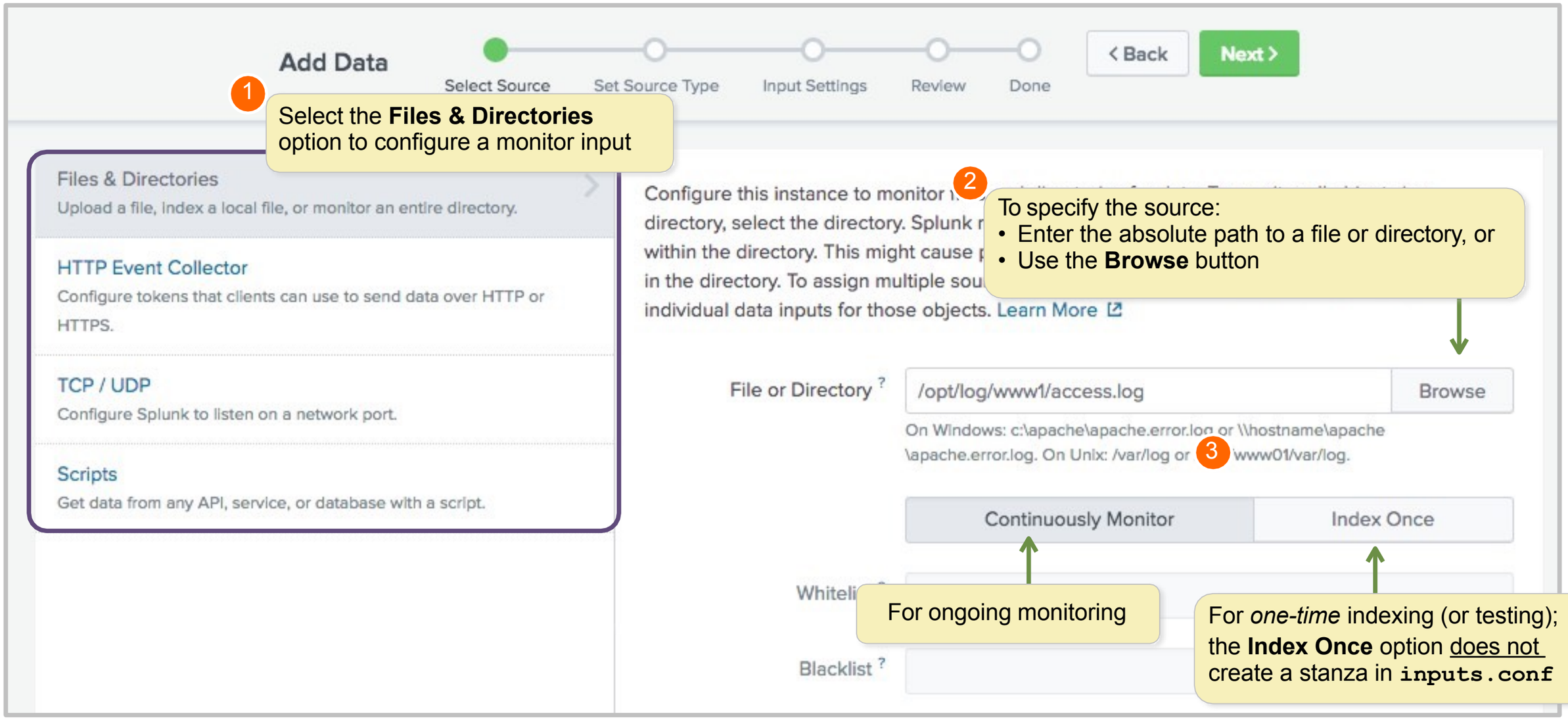
**Monitor Option**

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.

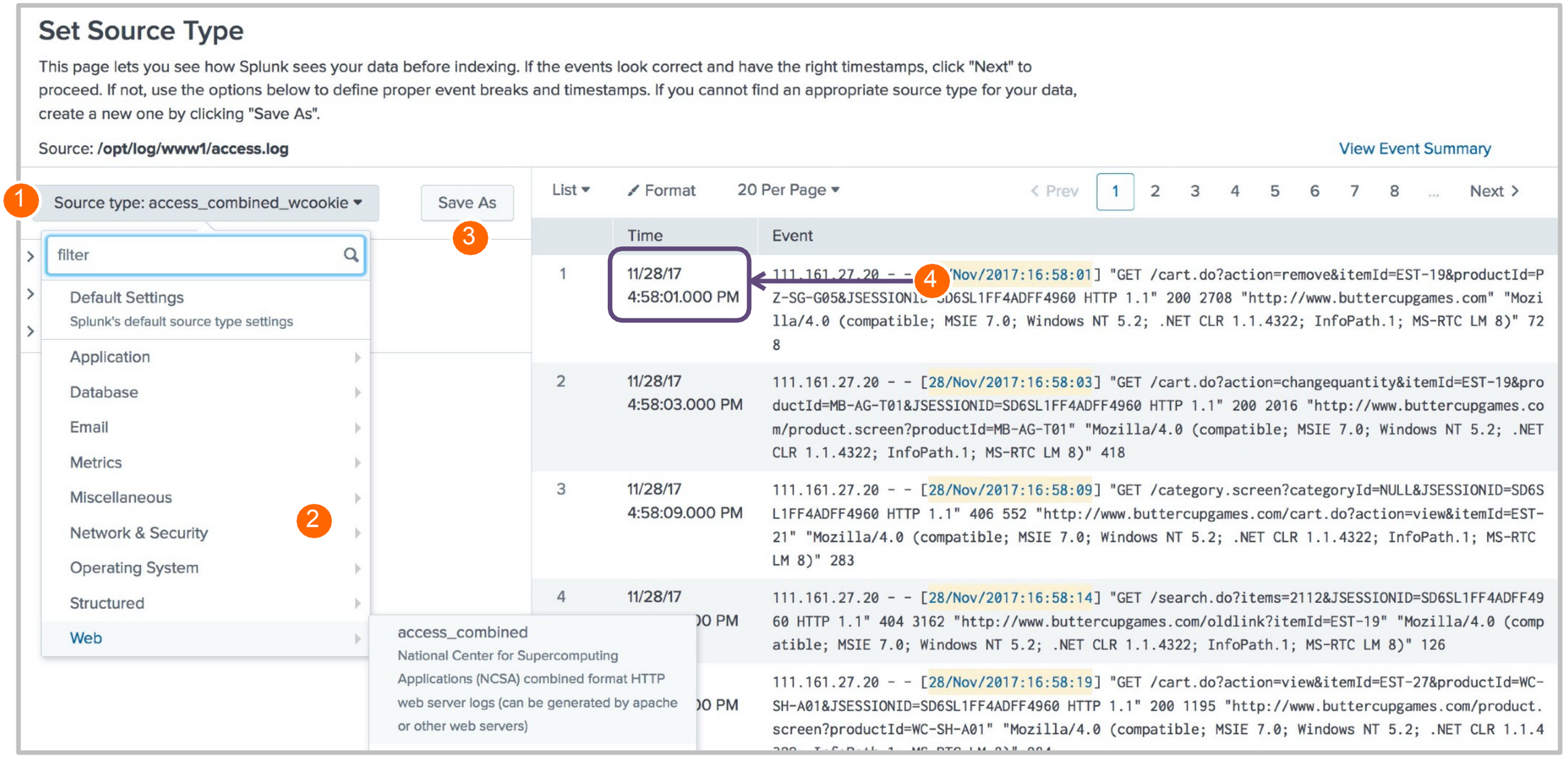
**Forward Option**

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

# Select Source



# Set Source Type (Data Preview Interface)

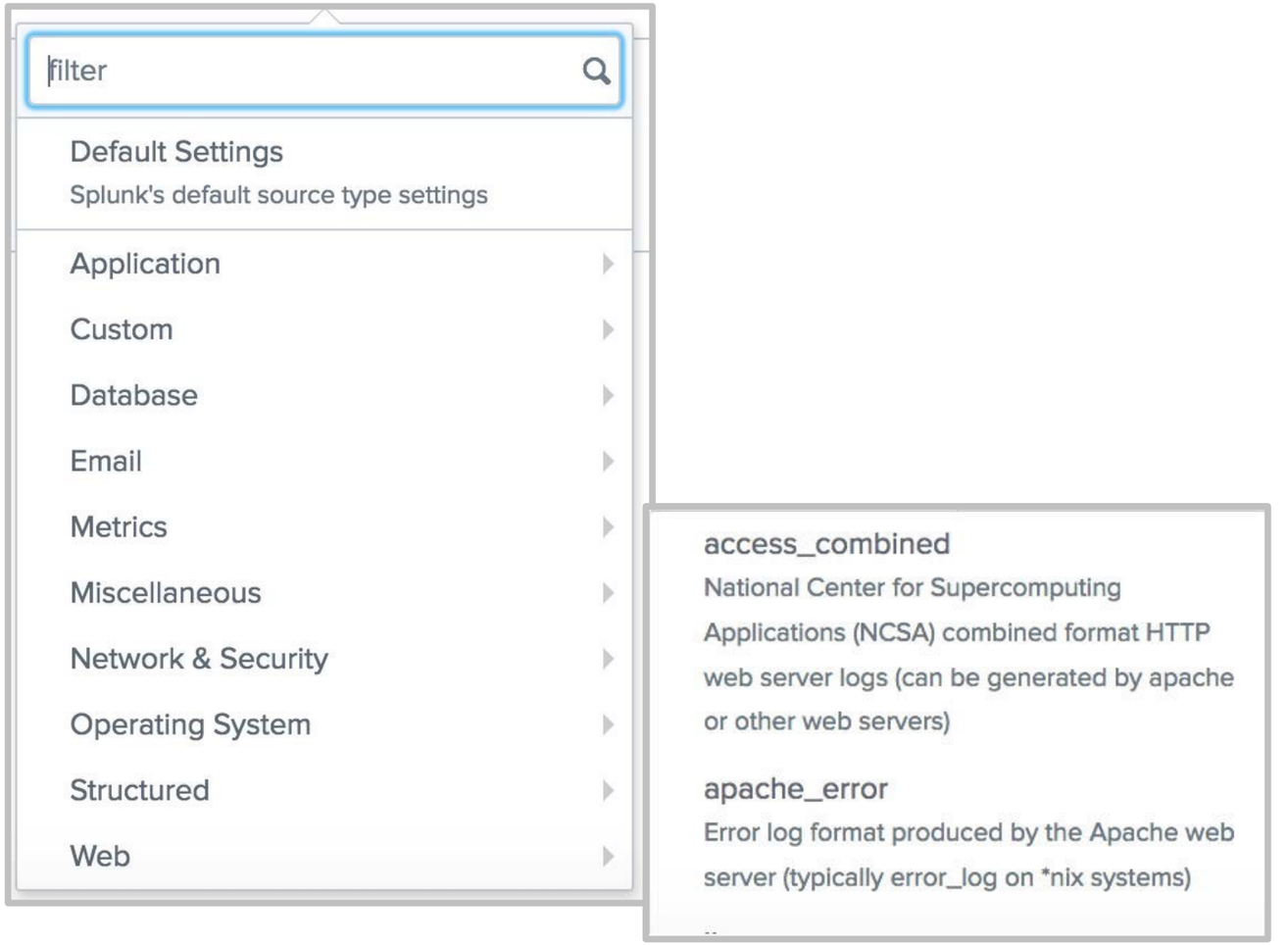


# Set Source Type (cont.)

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

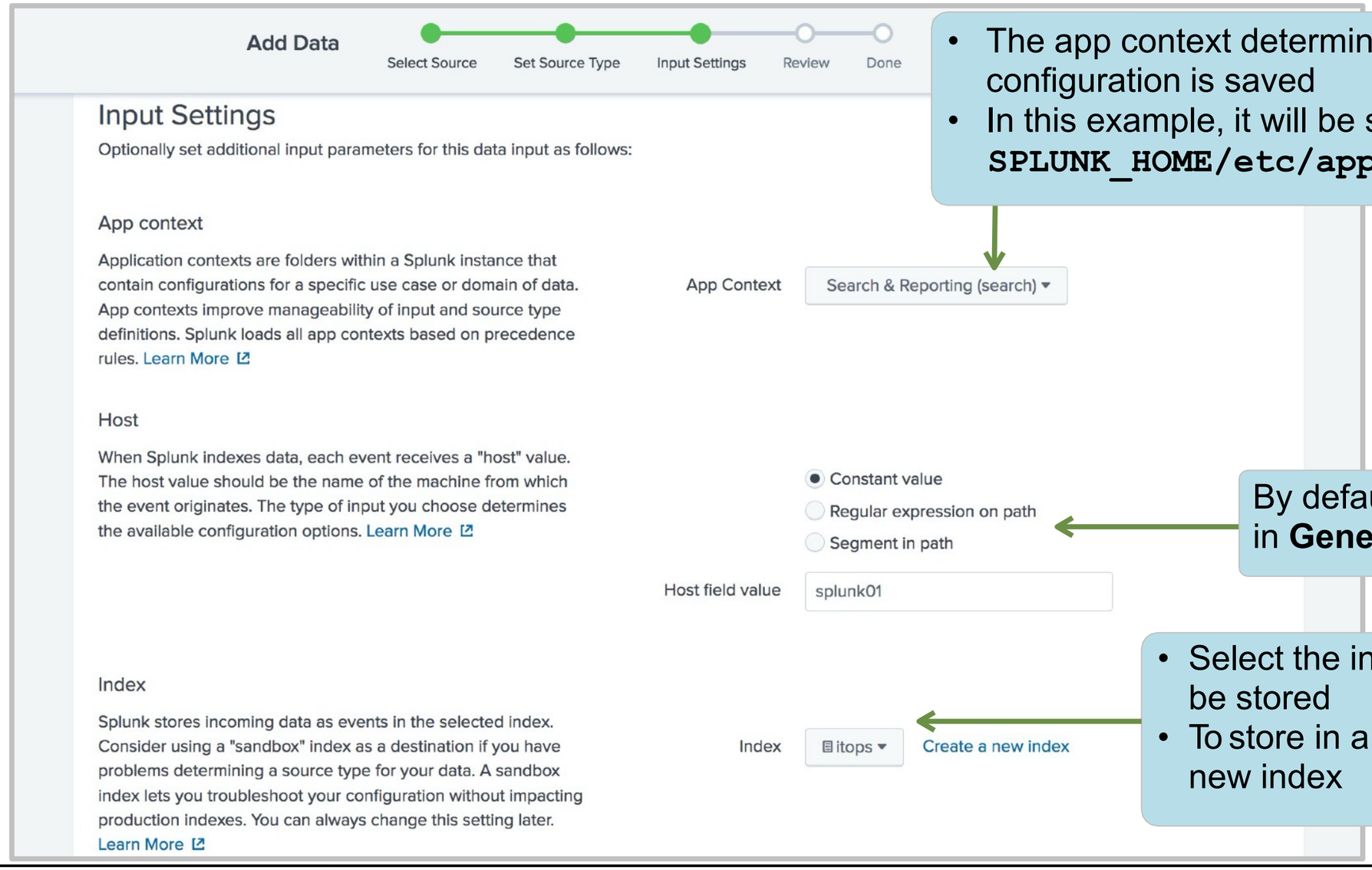
# Pretrained Source Types

- 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/Listofpretrainedsourcetypes

# Input Settings



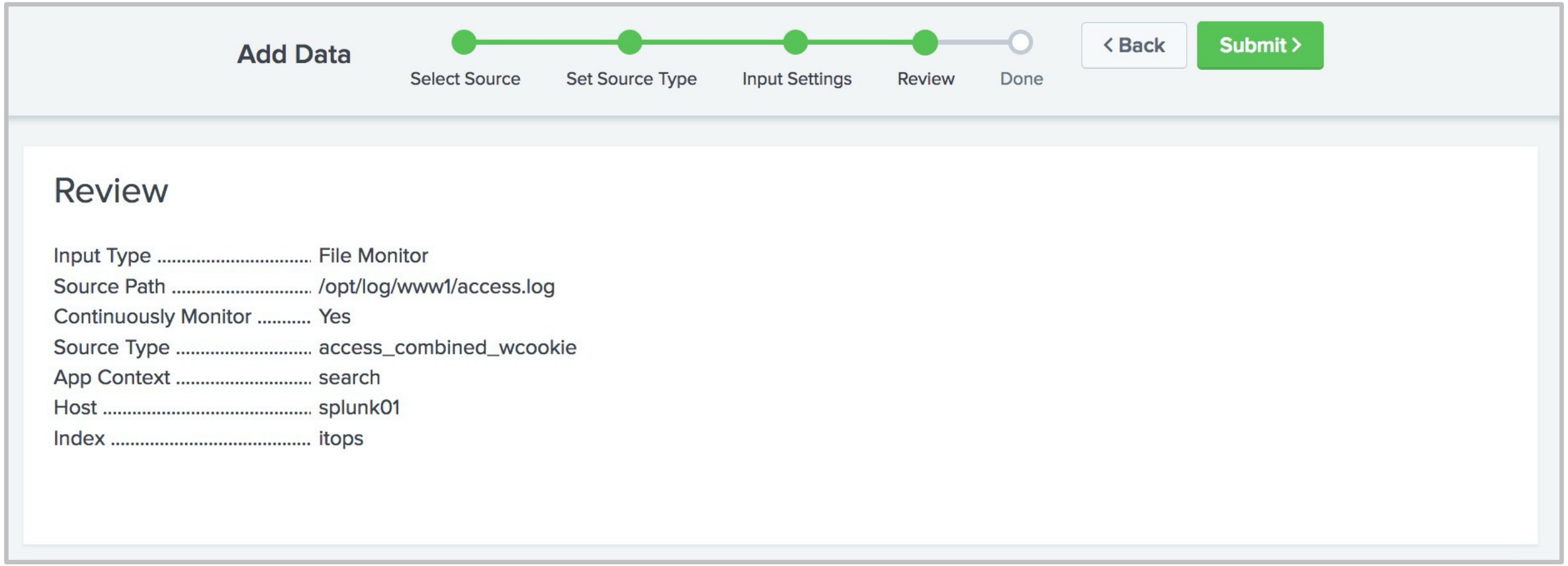

- The app context determines where your input configuration is saved
- In this example, it will be saved in: **`SPLUNK_HOME/etc/apps/search/local`**

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

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

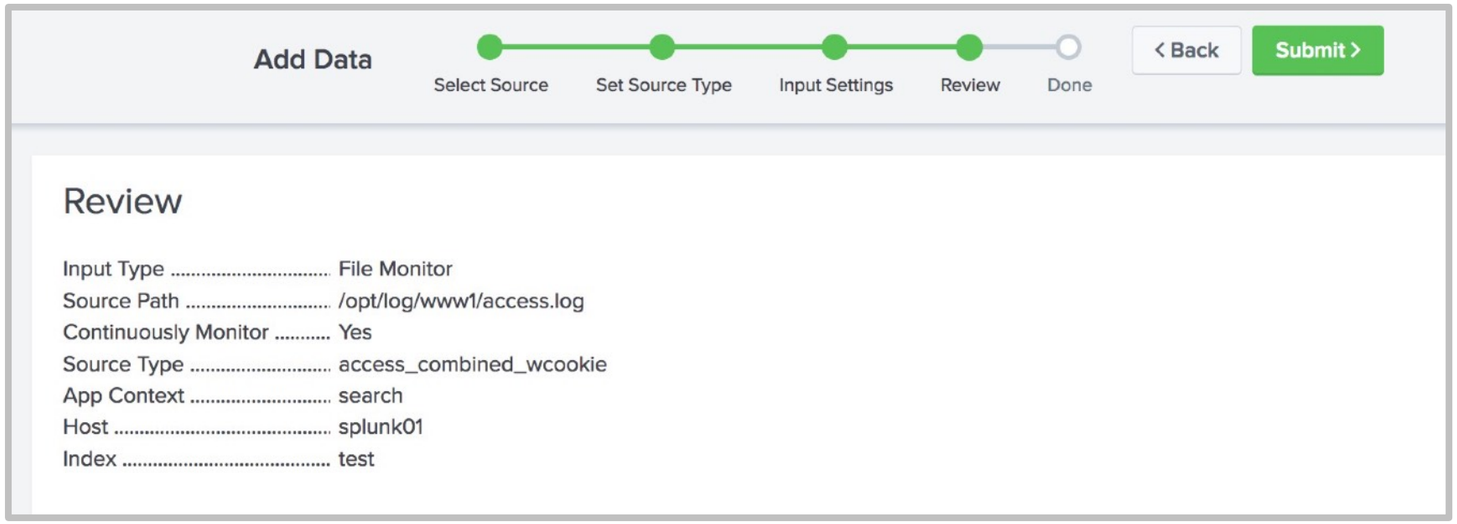
# Review

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



# What Happens Next?

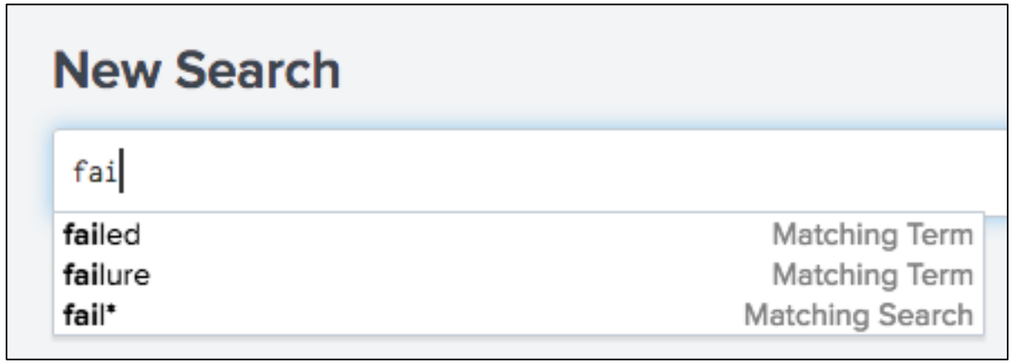
- Indexed events are available for immediate search
  - However, it may take a minute for Splunk to *start* indexing the data
- You are given other options to do more with your data



# Module 5:
# Basic Search

# Search Assistant

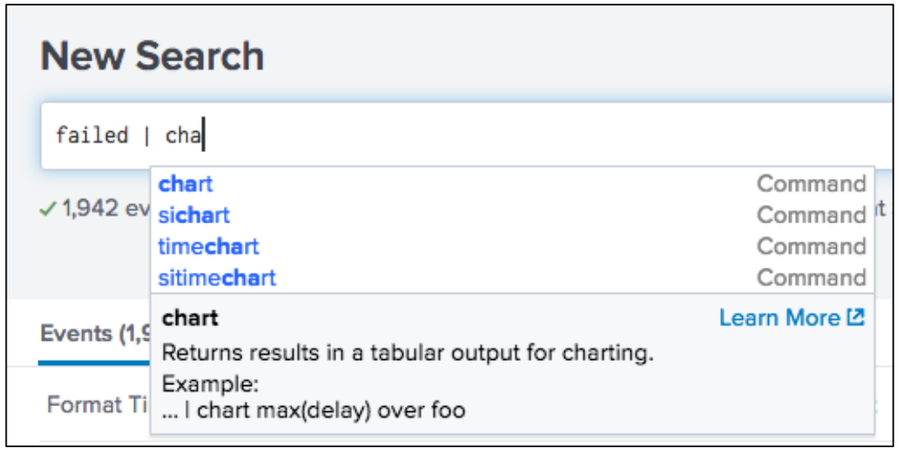
- Search Assistant provides selections for how to complete the search string
- Before the first pipe ( | ), it looks for matching terms
- You can continue typing OR select a term from the list
  - If you select a term from the list, it is added to the search



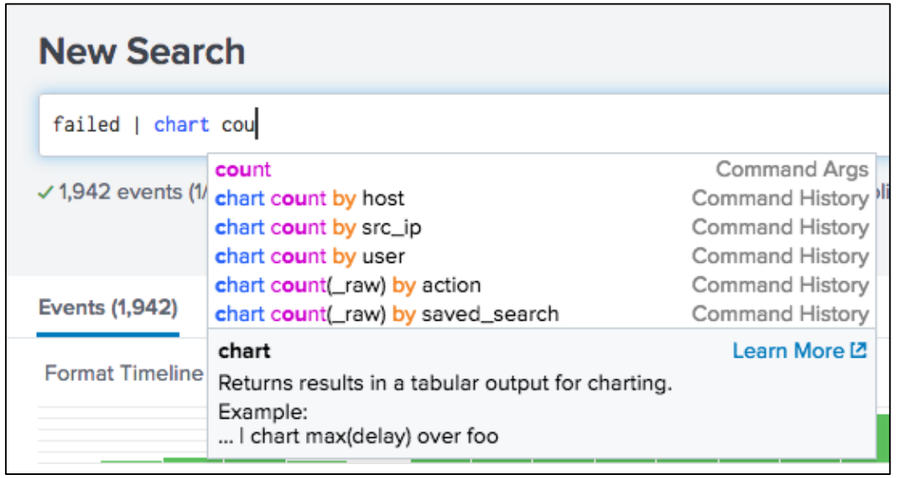
# Search Assistant (cont.)

- After the first pipe, the Search Assistant shows a list of commands that can be entered into the search string
- A • 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



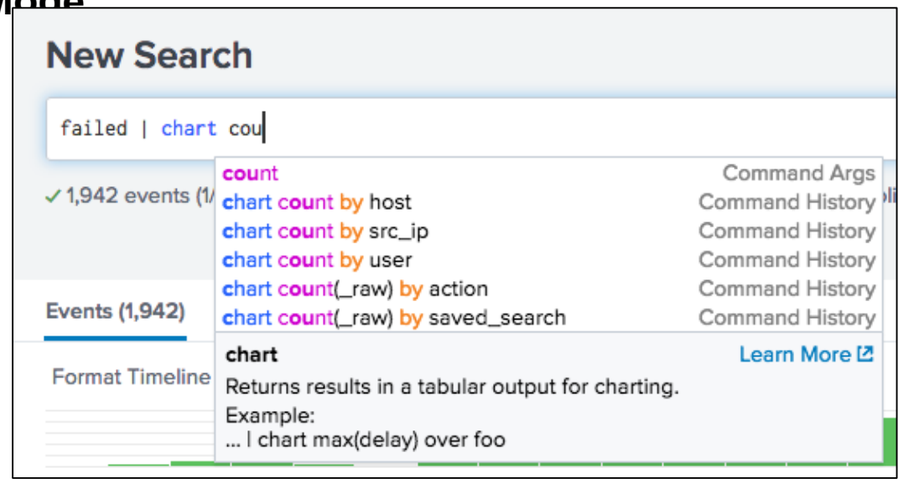

B

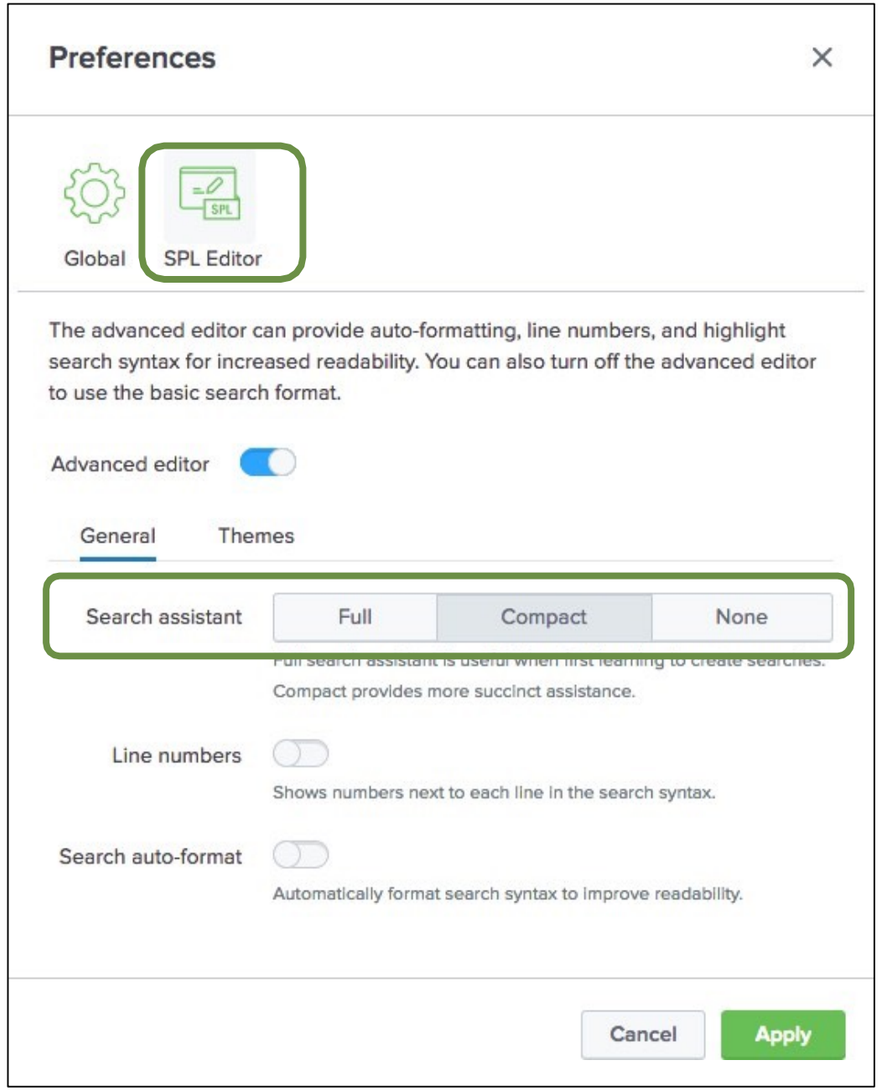


# Search Assistant (cont.)

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

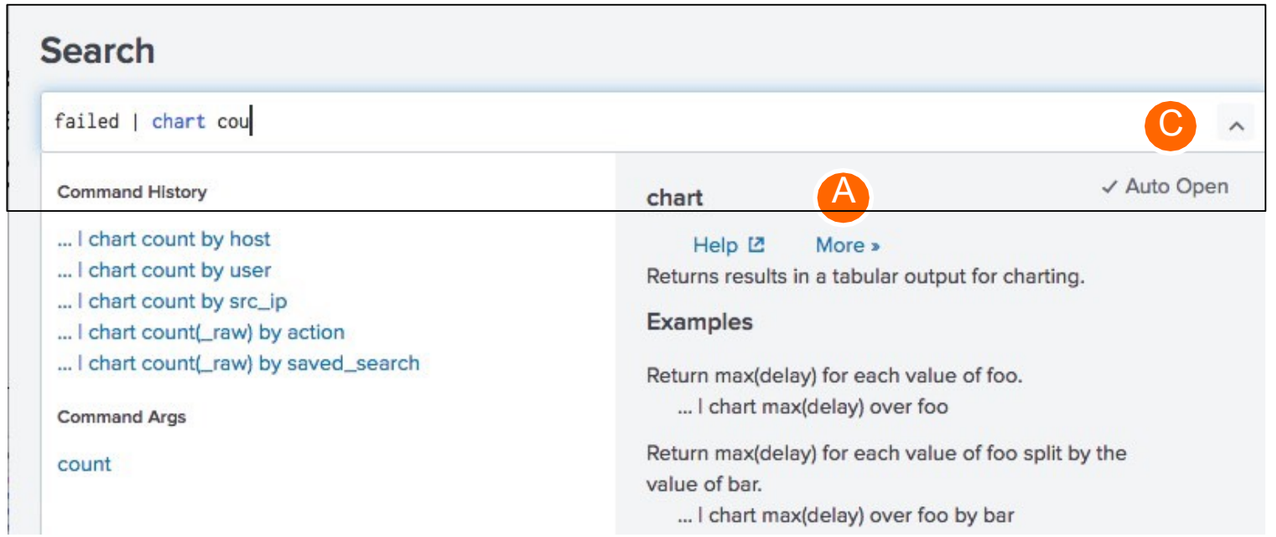
**Compact Mode**

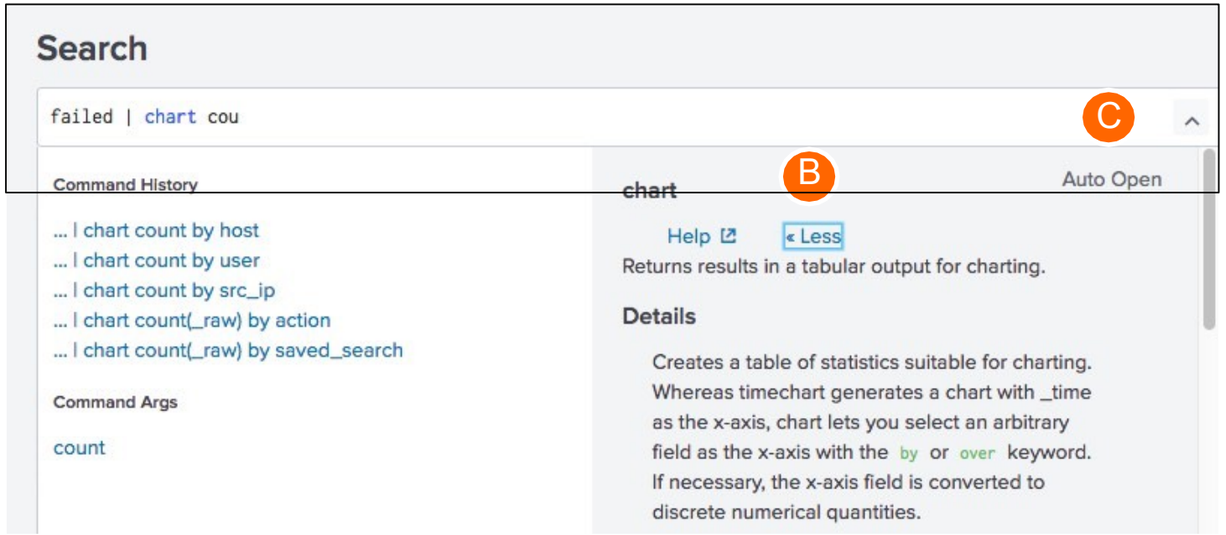


# Search Assistant – Full Mode

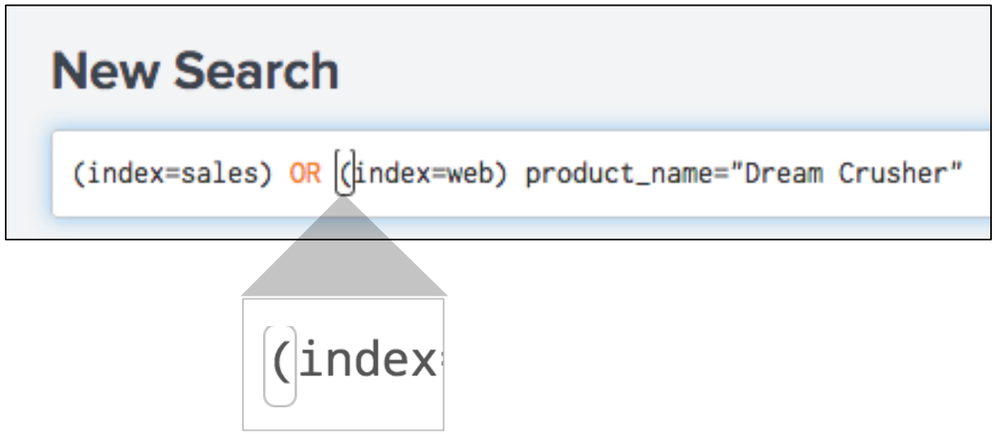
- A To show more information, click **More »**
- B To show less information, click **« Less**
- C To toggle Full mode off, de-select **Auto Open**



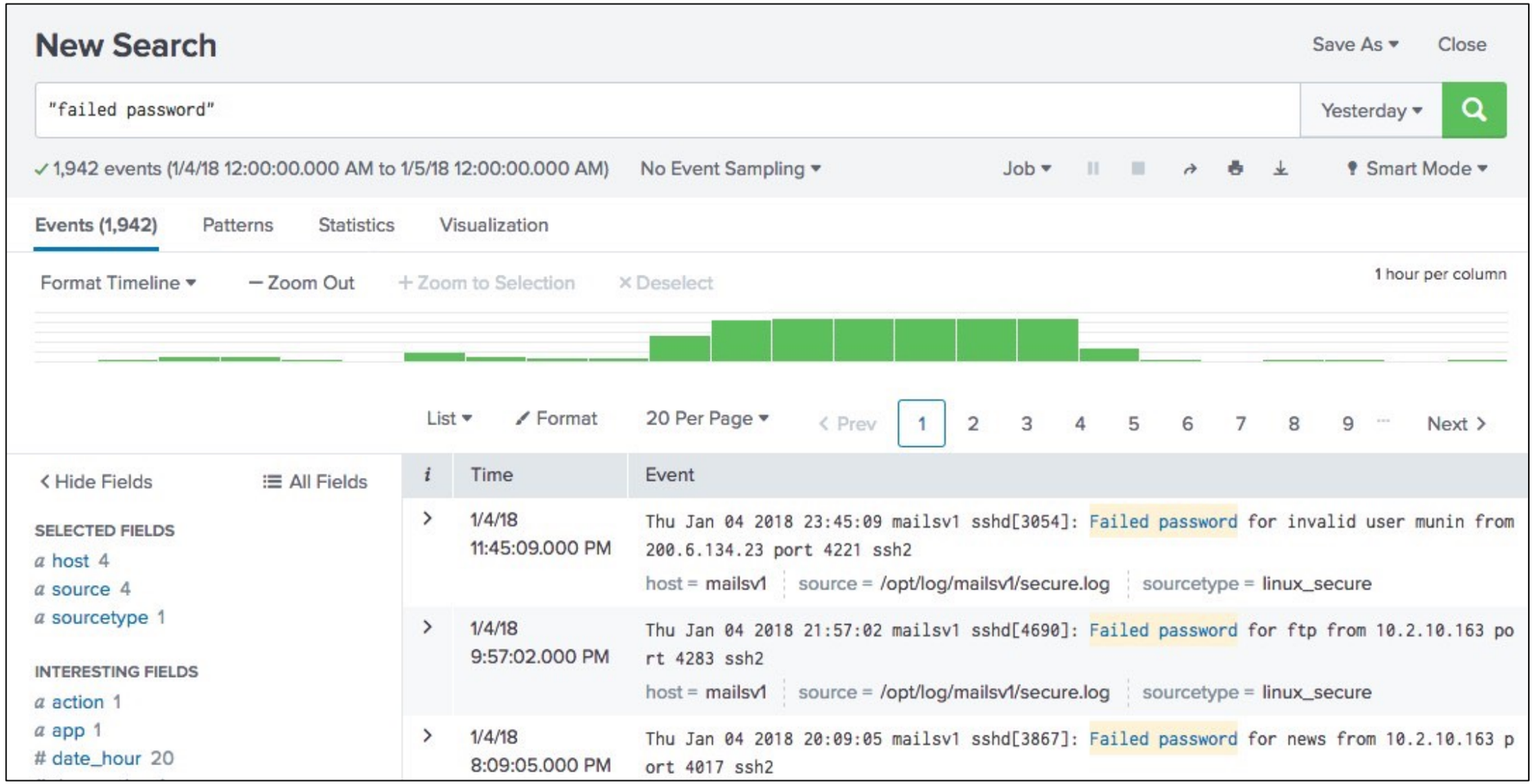
# Search Assistant – Parentheses

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



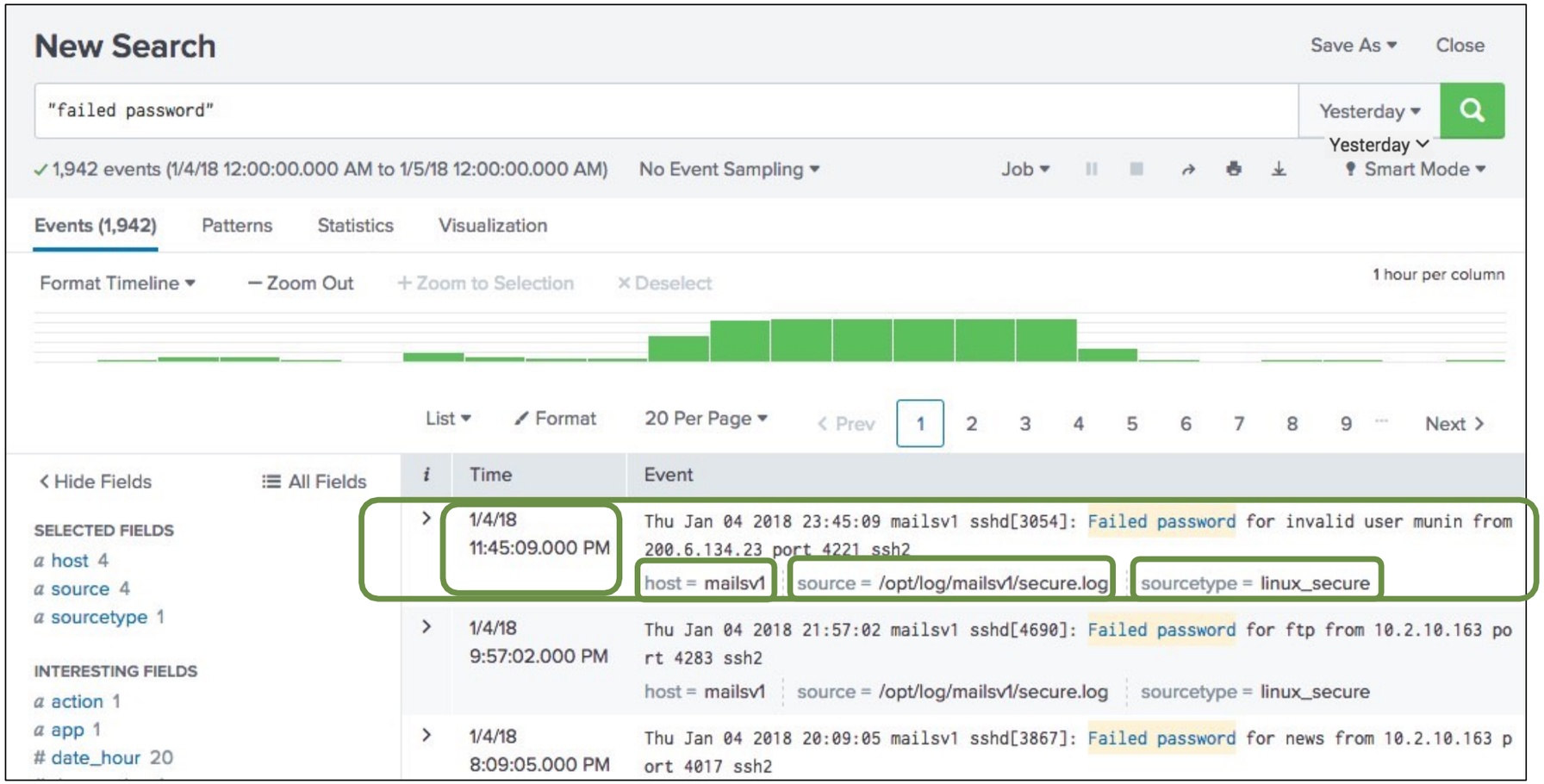

# Viewing Search Results

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

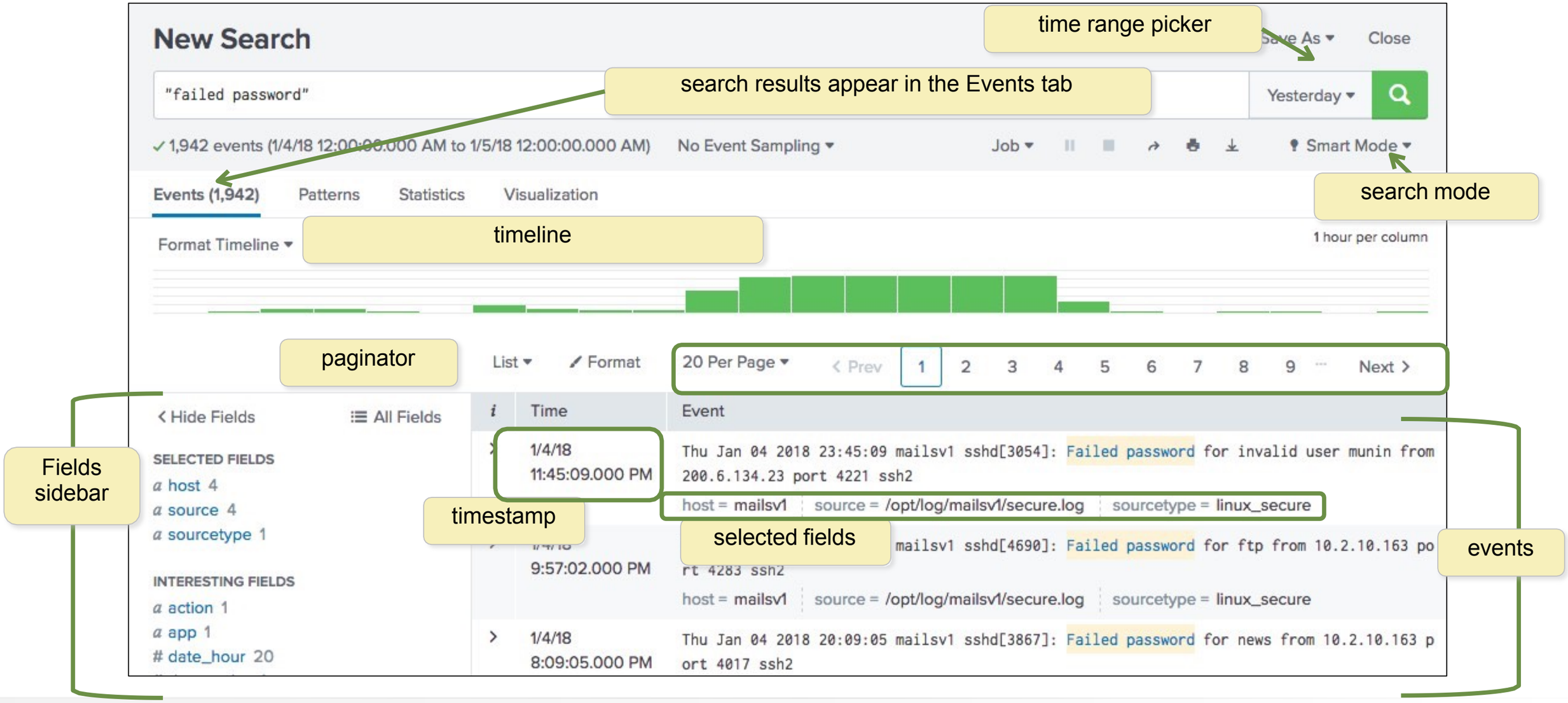


# Viewing Search Results (cont.)

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

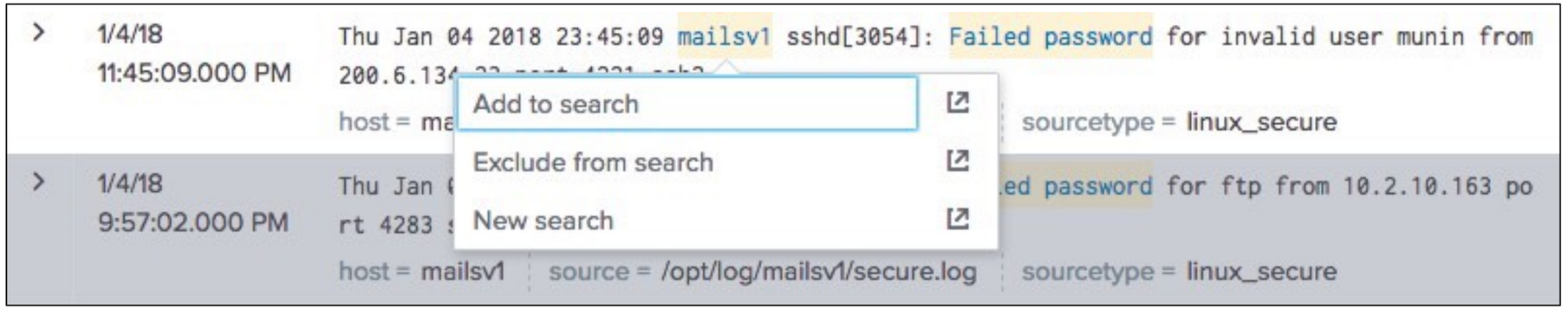


# Viewing Search Results (cont.)



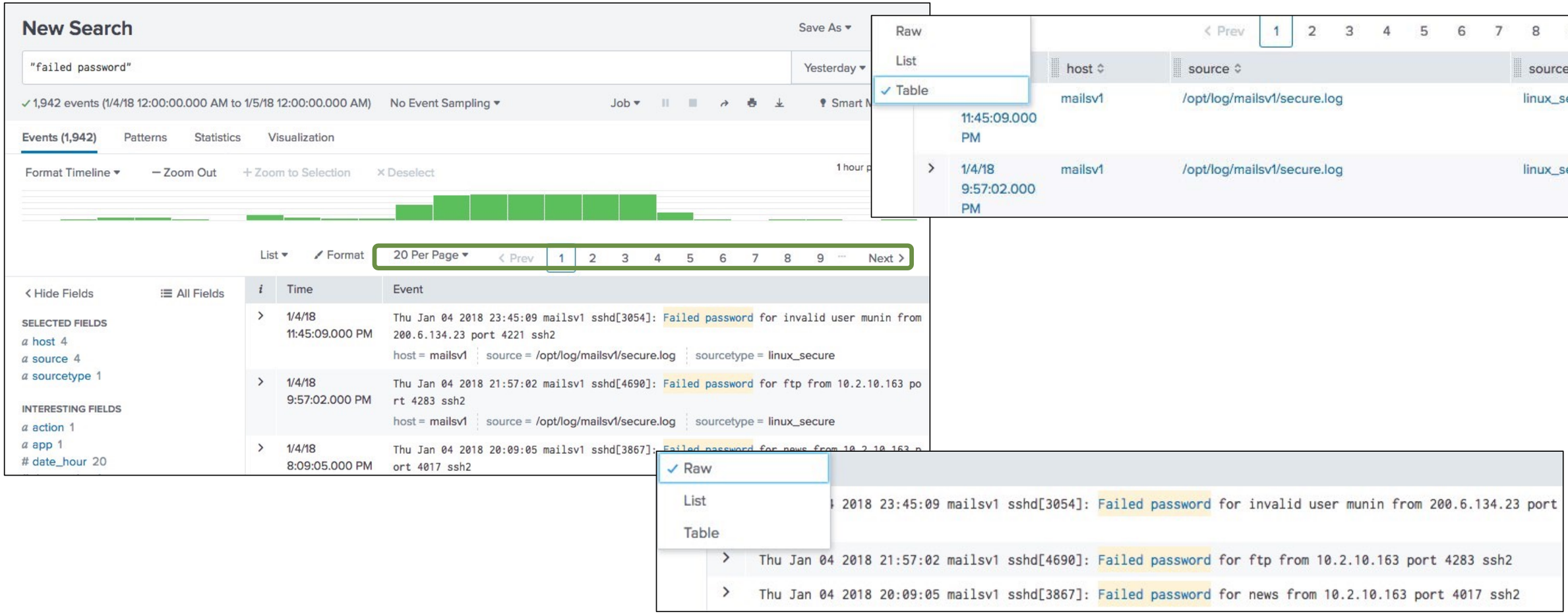
# Using Search Results to Modify a Search

- 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

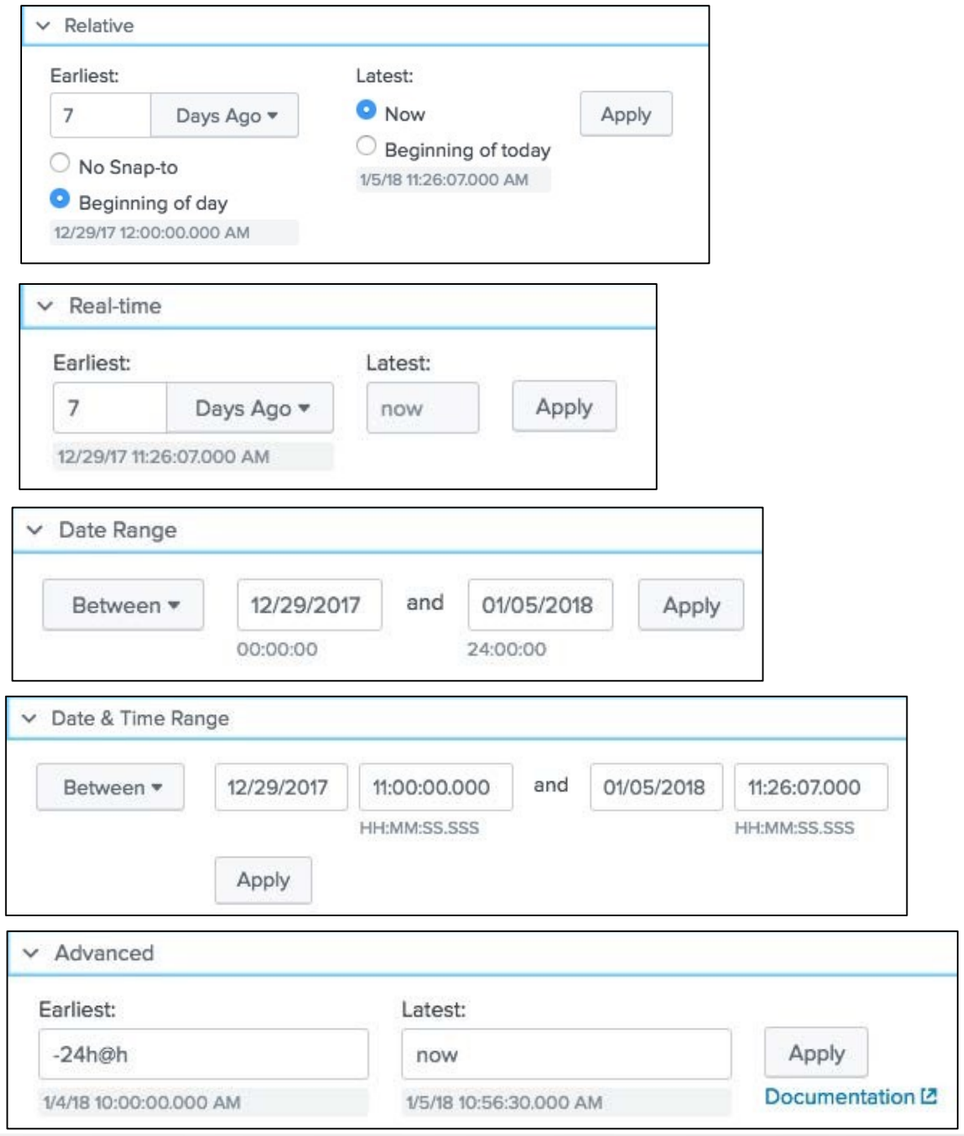


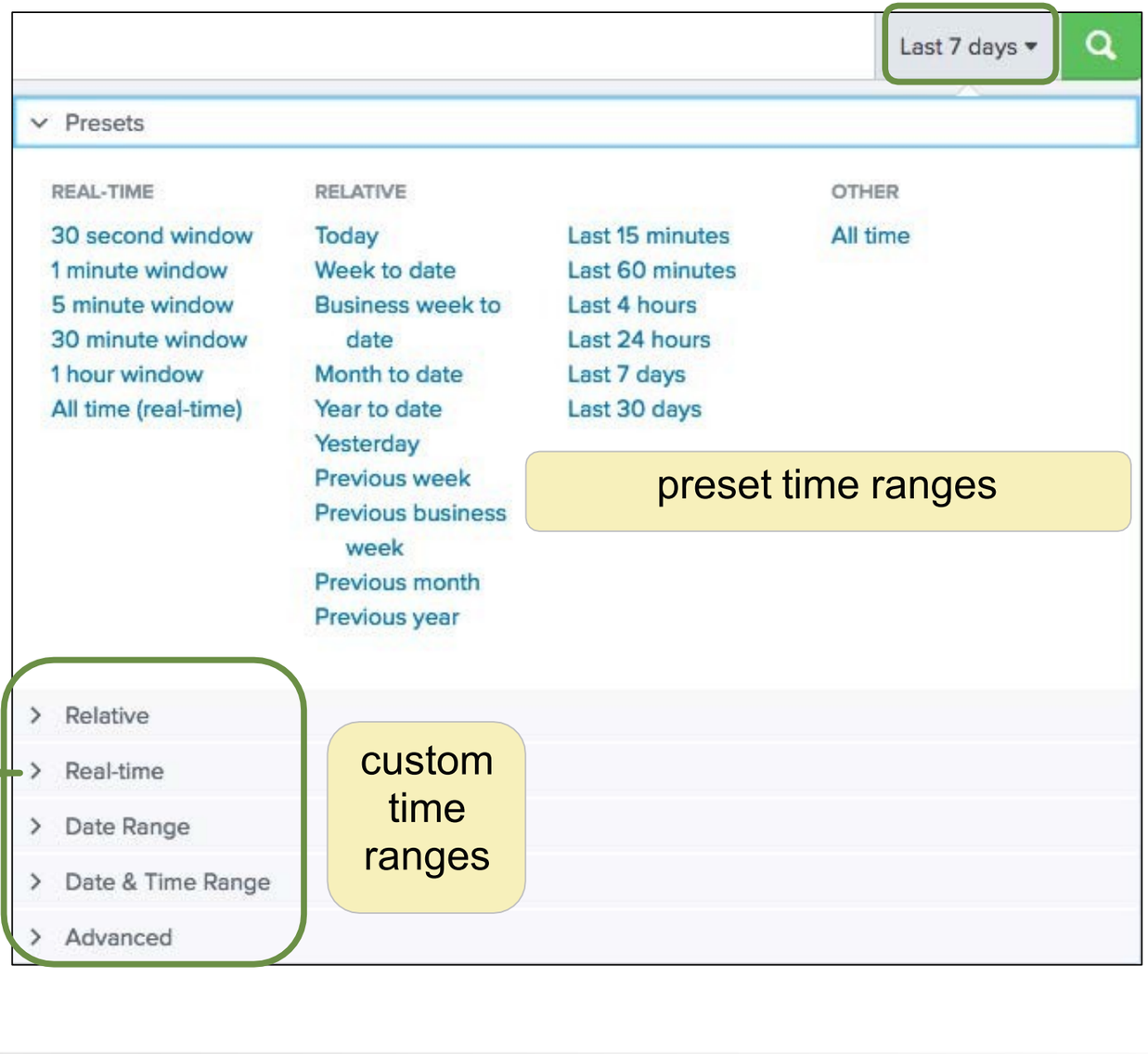
# Changing Search Results View Options

You have several layout options for displaying your search results



# Selecting a Specific Time



# 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:

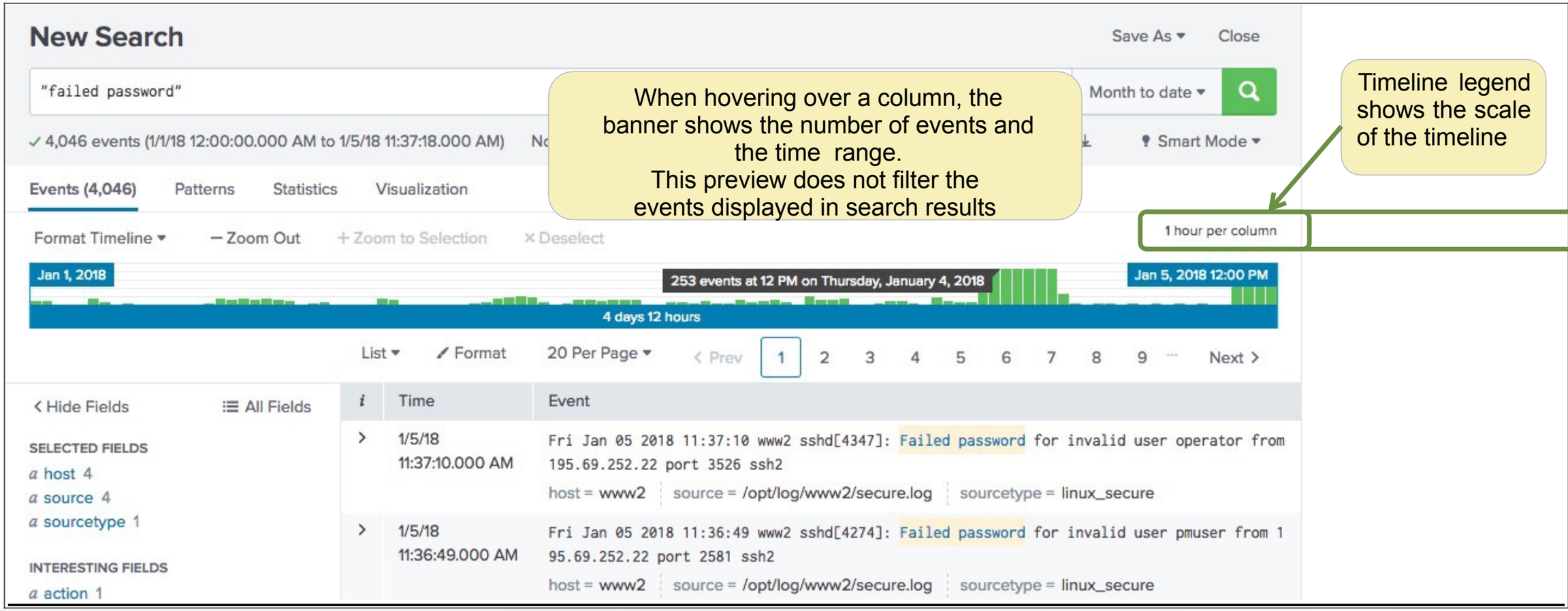
| | |
|---|---|
| `earliest=-h` | looks back one hour |
| `earliest=-2d@d latest=@d` | looks back from two days ago, up to the beginning of today |
| `earliest=6/15/2017:12:30:00` | looks back to specified time |

**Note**

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

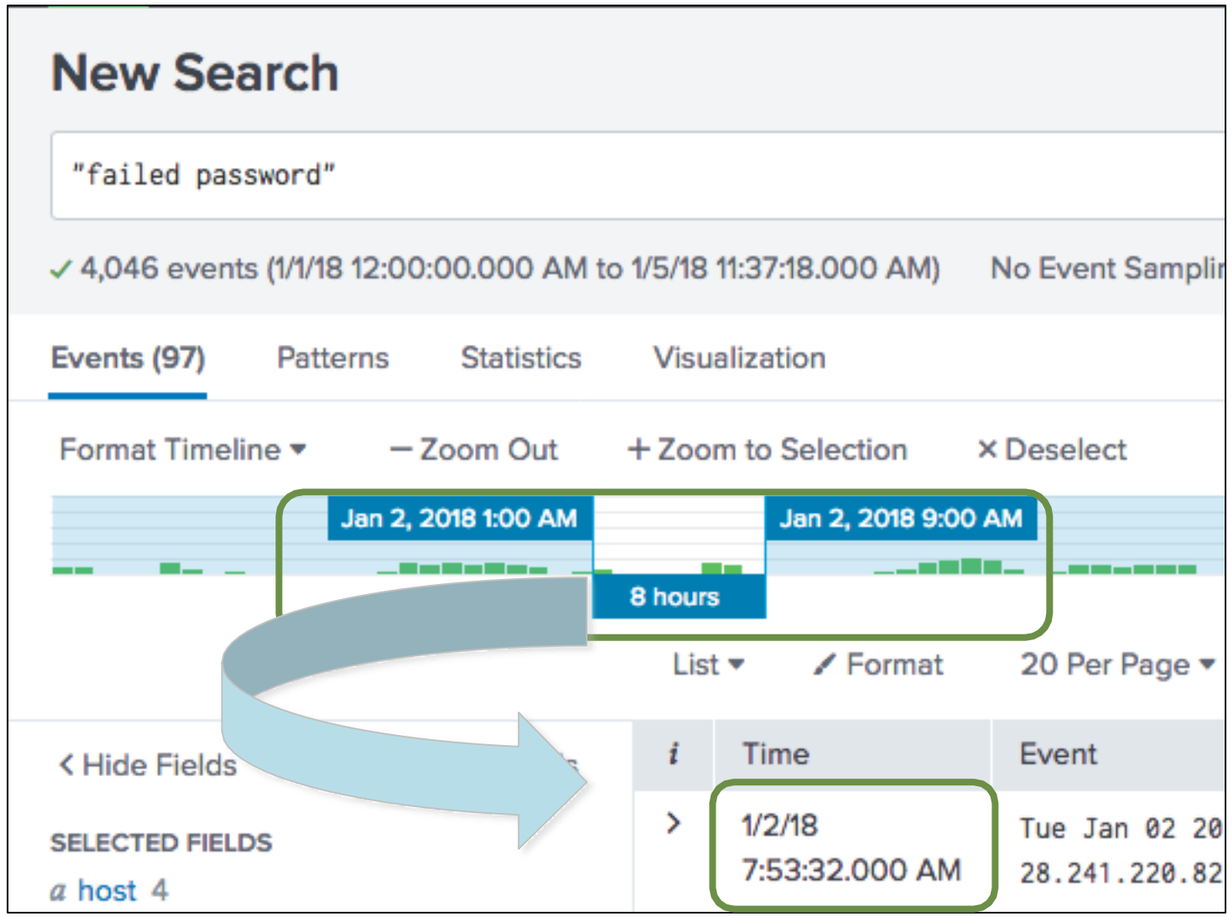
# Viewing the Timeline

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



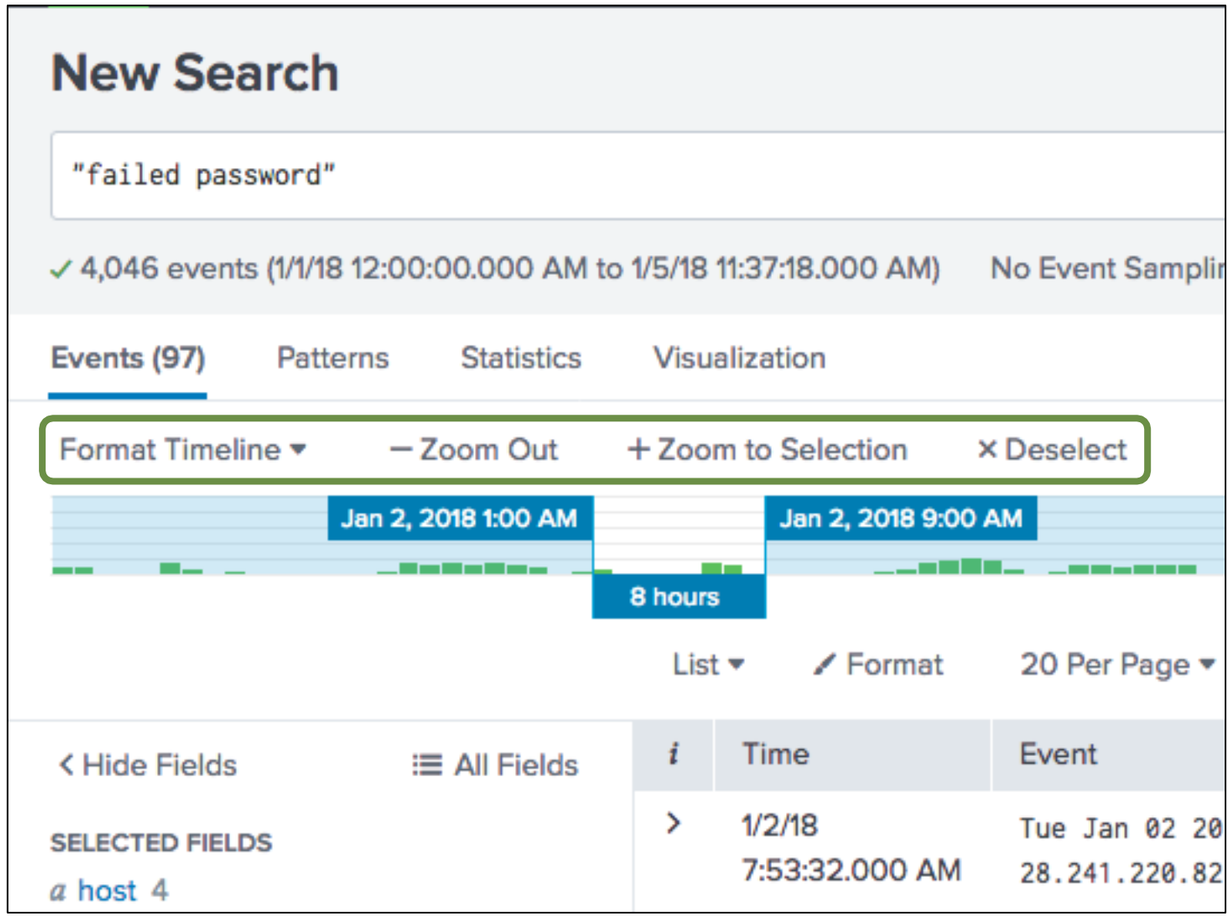
# Viewing a Subset of the Results with Timeline

- 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)



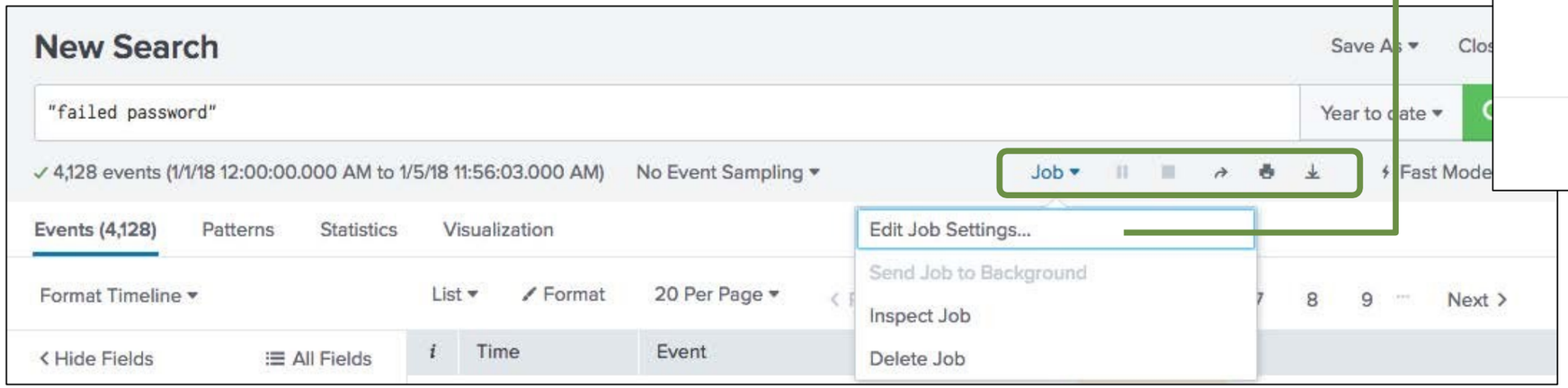
# Using Other Timeline Controls

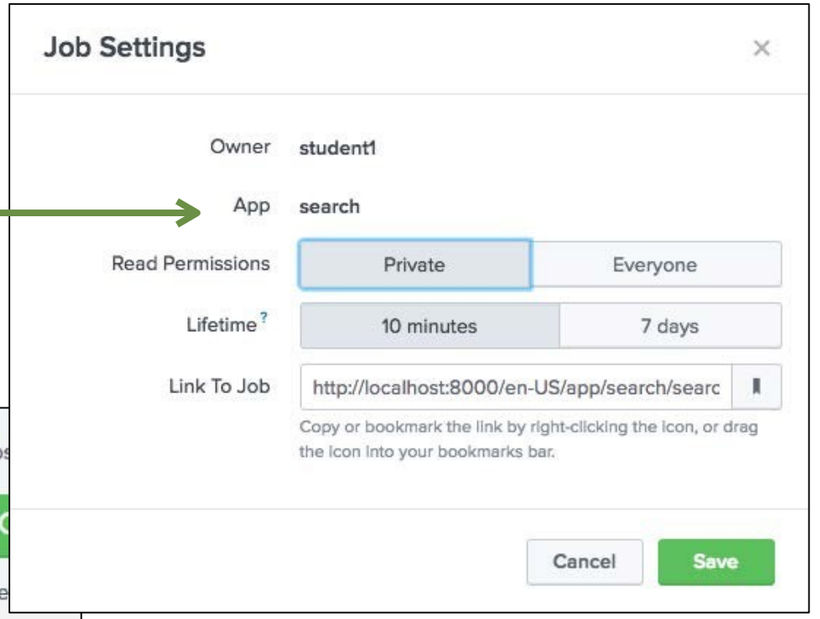
- **Format Timeline**
  - Hides or shows the timeline in different views
- **Zoom Out**
  - Expands the time focus and re-executes the search
- **Zoom to Selection**
  - Narrows the time range and re-executes the search
- **Deselect**
  - If in a drilldown, returns to the original results set
  - Otherwise, grayed out / unavailable



# Controlling and Saving Search Jobs

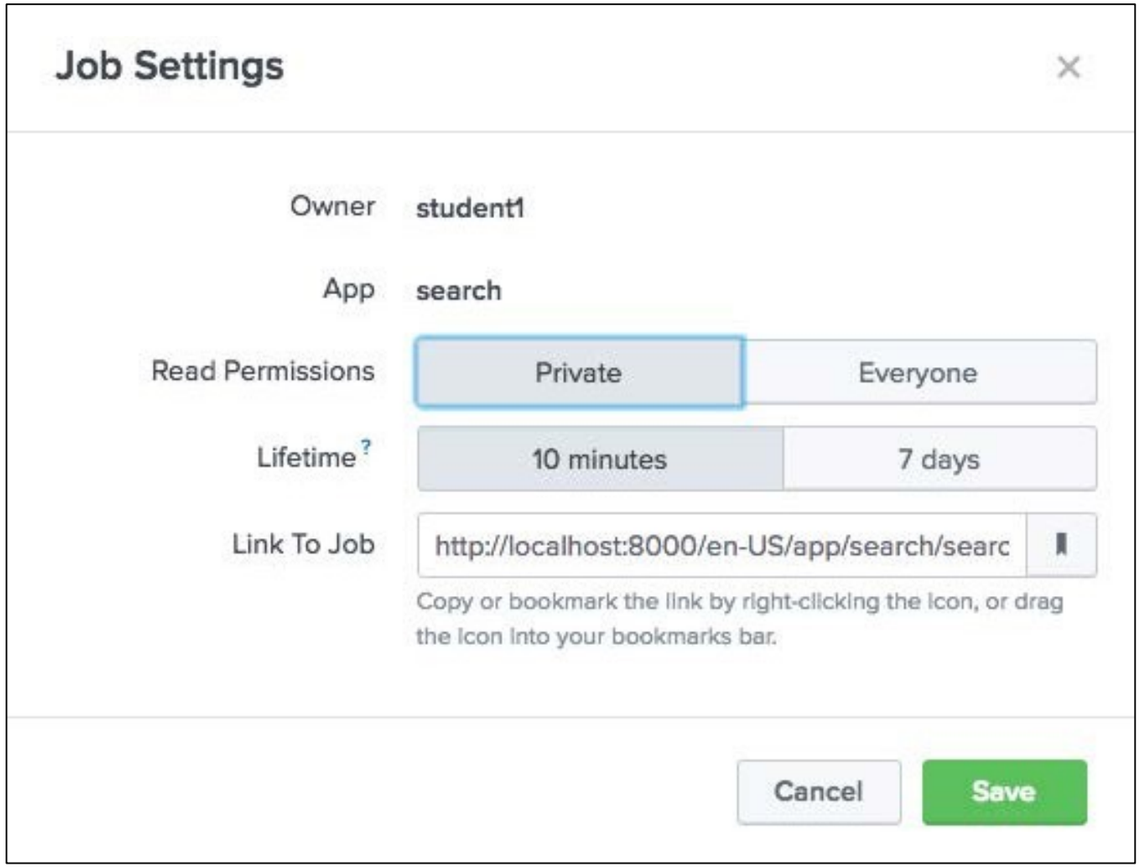
- Every search is also a **job**
- Use the Job bar to control search execution
  - **Pause** – toggles to resume the search
  - **Stop** – finalizes the search in progress
    - Jobs are available for 10 minutes (default)
    - Get a link to results from the **Job** menu



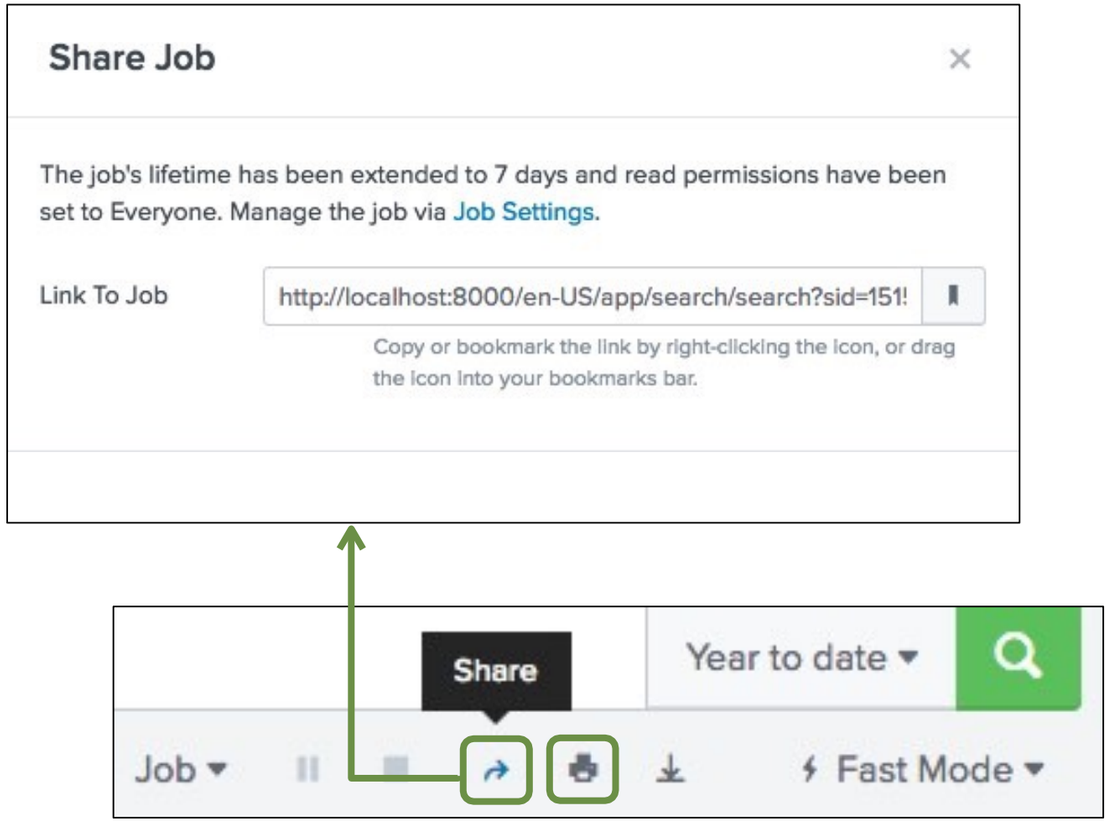
# Setting Permissions

- **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



# Sharing Search Jobs

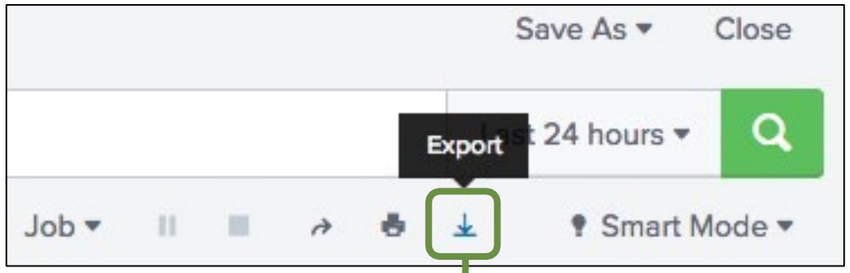
- Use the Share button next to the Job bar to quickly:
  - Give everyone read permissions
  - Extend results retention to 7 days
  - Get a sharable link to the results
- Sharing search allows multiple users working on same issue to see same data
  - More efficient than each running search separately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

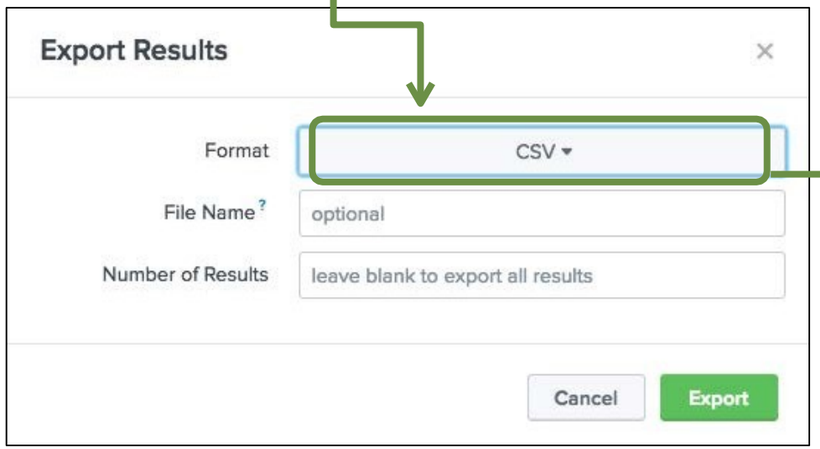



- Can also click printer icon to print results or save as PDF

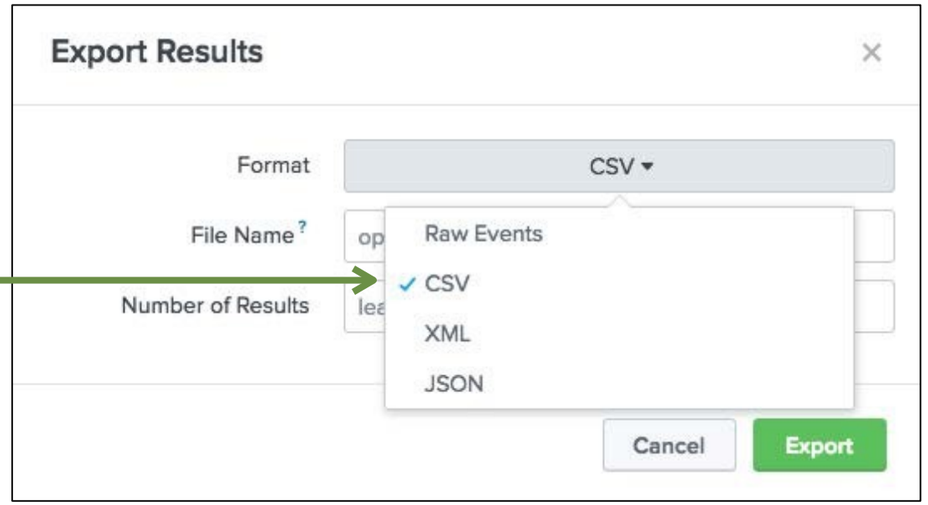
# Exporting Search Results

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



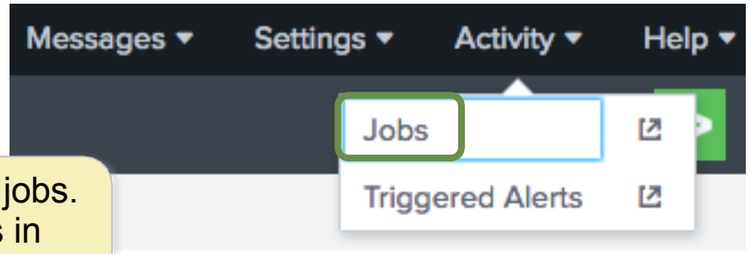




> **Note**
>
> Note that exporting the results of a large search is very memory-intensive!

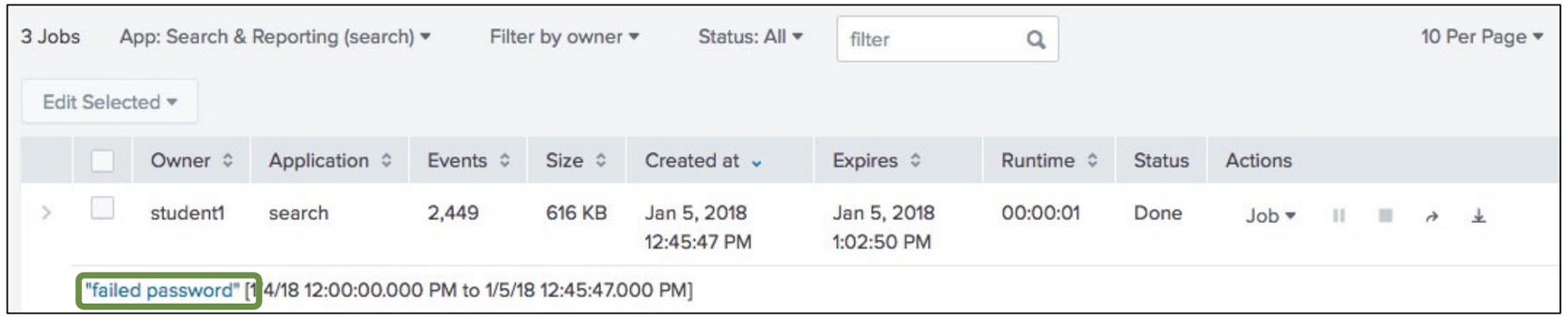


# Viewing Your Saved Jobs

- 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.)

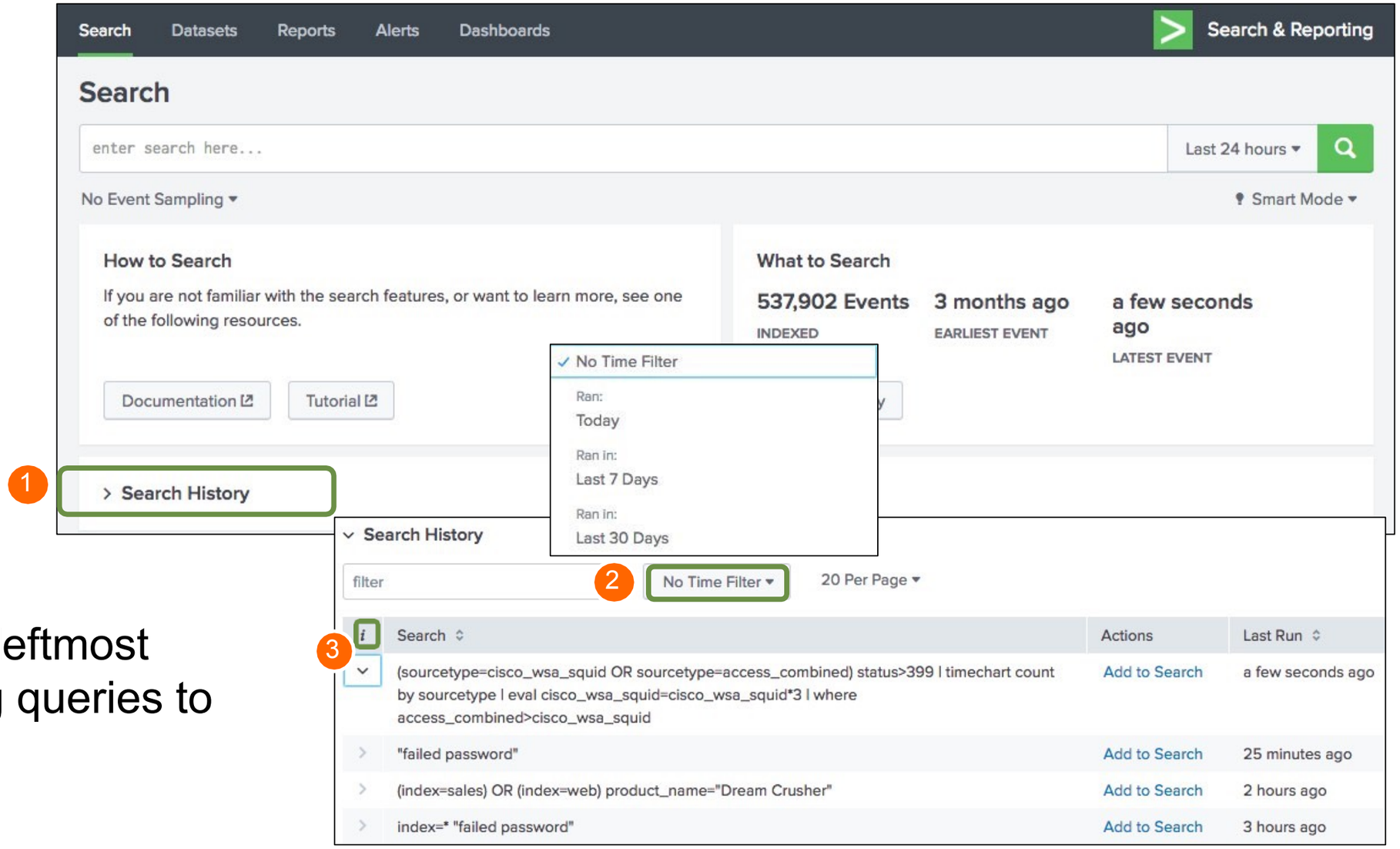


# Viewing Your Search History

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

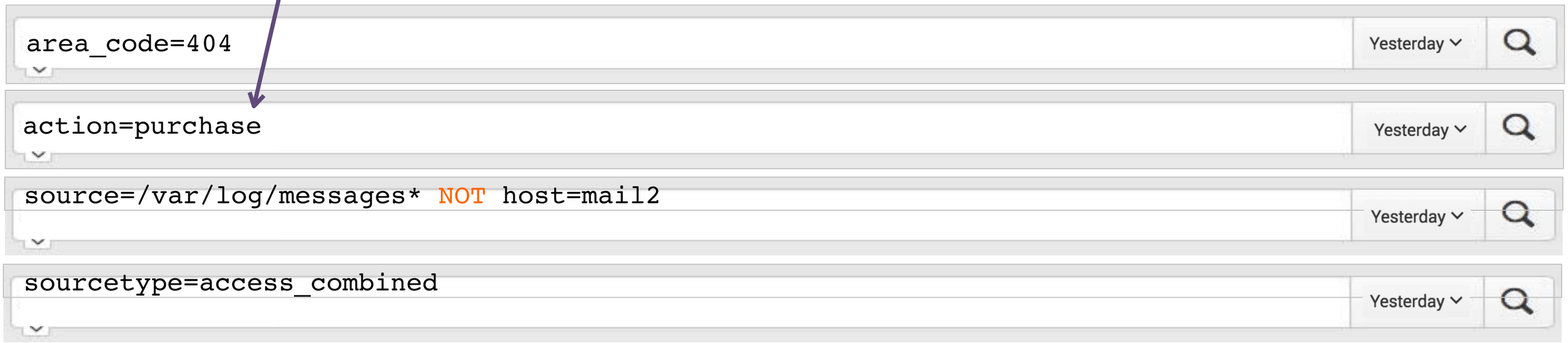
3. Click the > icon in the leftmost column to expand long queries to display the full text



# Module 6:
# Using Fields in Searches

# 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



# 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 HTTP 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 |

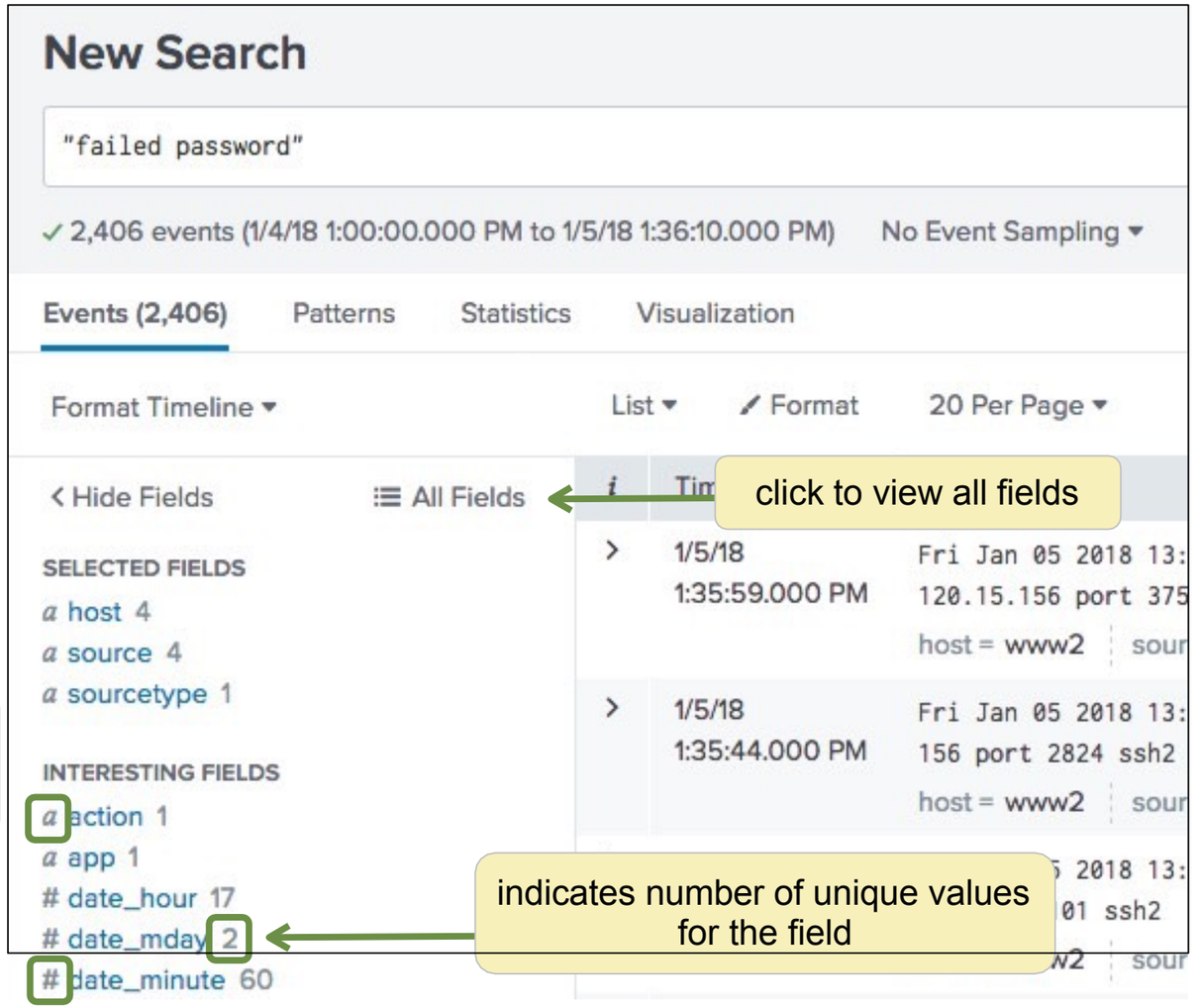
**Note**

For more information, please see: http://docs.splunk.com/Documentation/Splunk/latest/Data/Listofpretrainedsourcetypes

# 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)

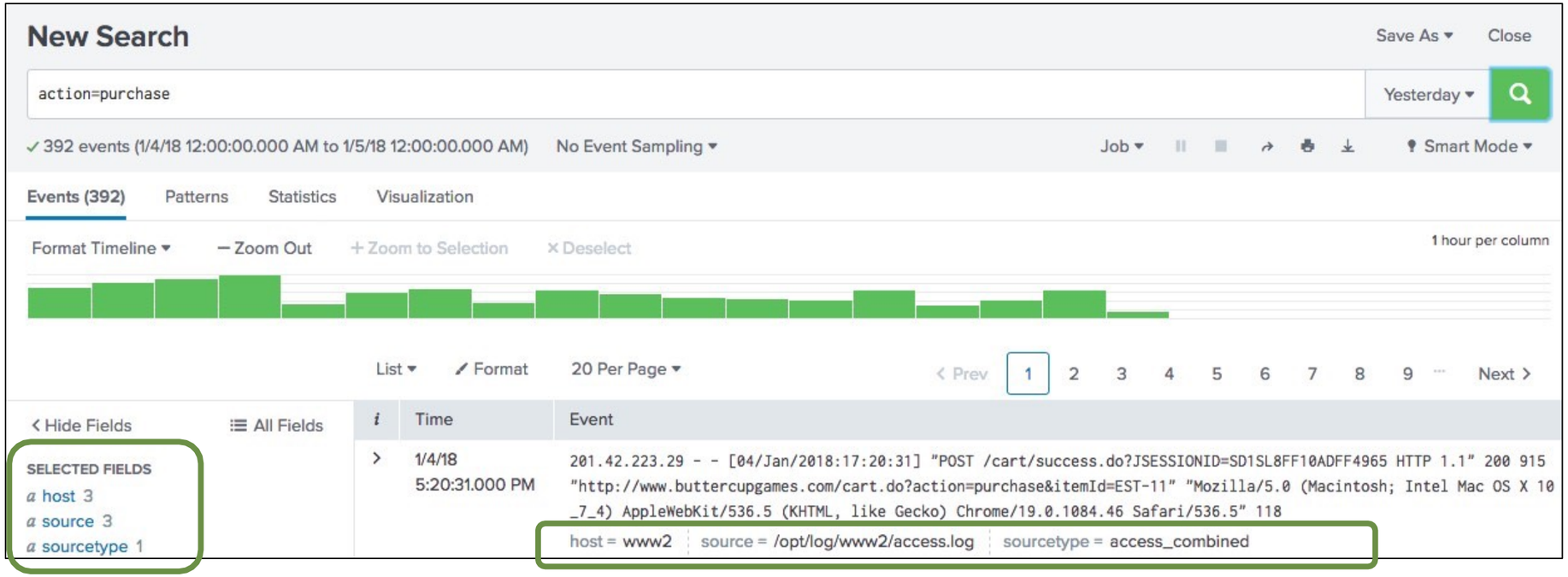



indicates the field's values are alpha-numeric

indicates that the majority of the field values are numeric

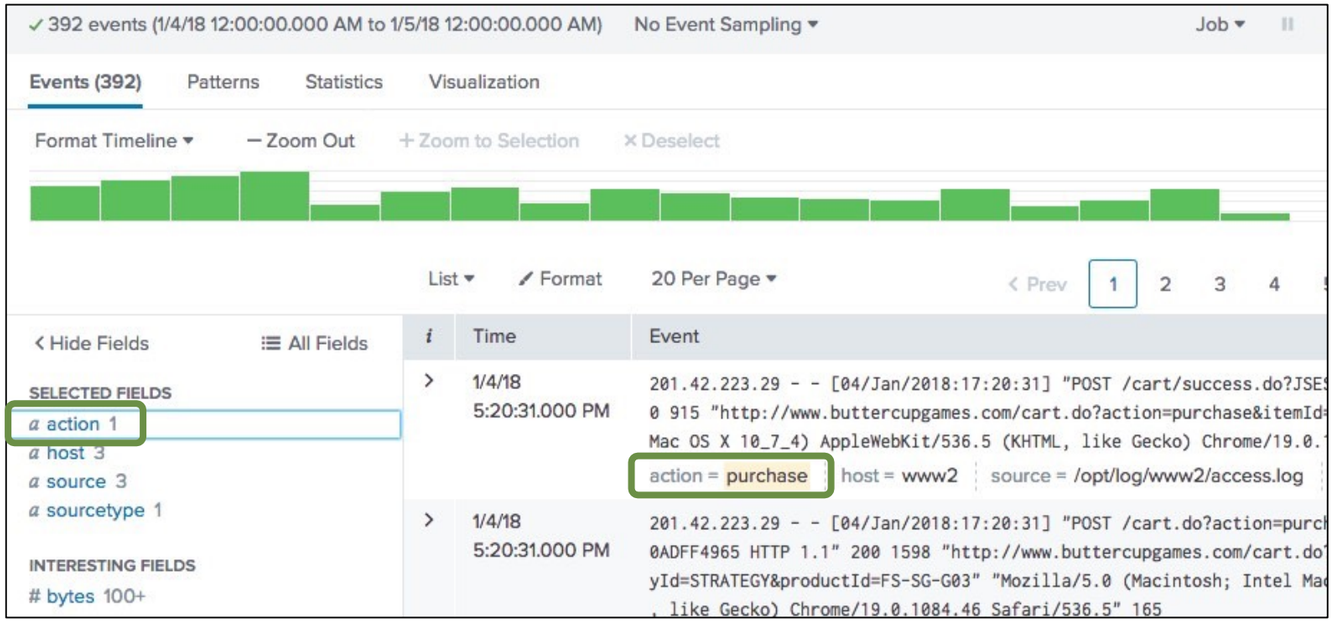
# Describe Selected Fields

- 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



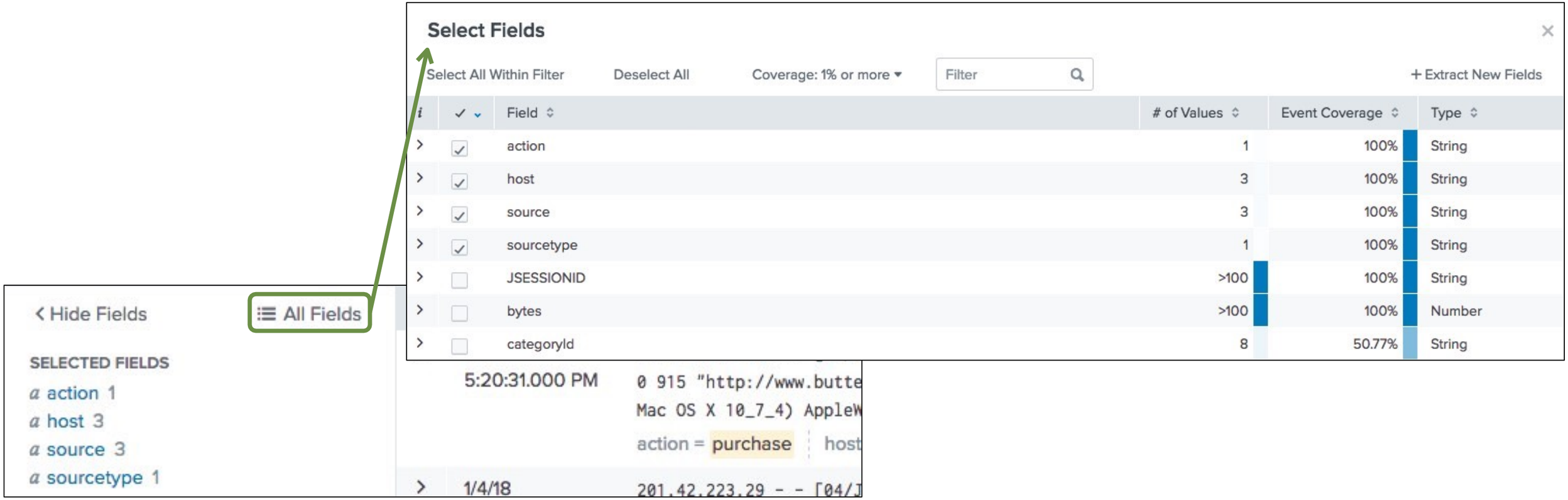
# Make an Interesting Field a Selected Field

- You can modify selected fields
  1. Click a field in the Fields sidebar
  2. Click **Yes** in the upper right of the field dialog
- Note that a selected field appears:
  - In the Selected Fields section of the Fields sidebar
  - Below each event where a value exists for that field

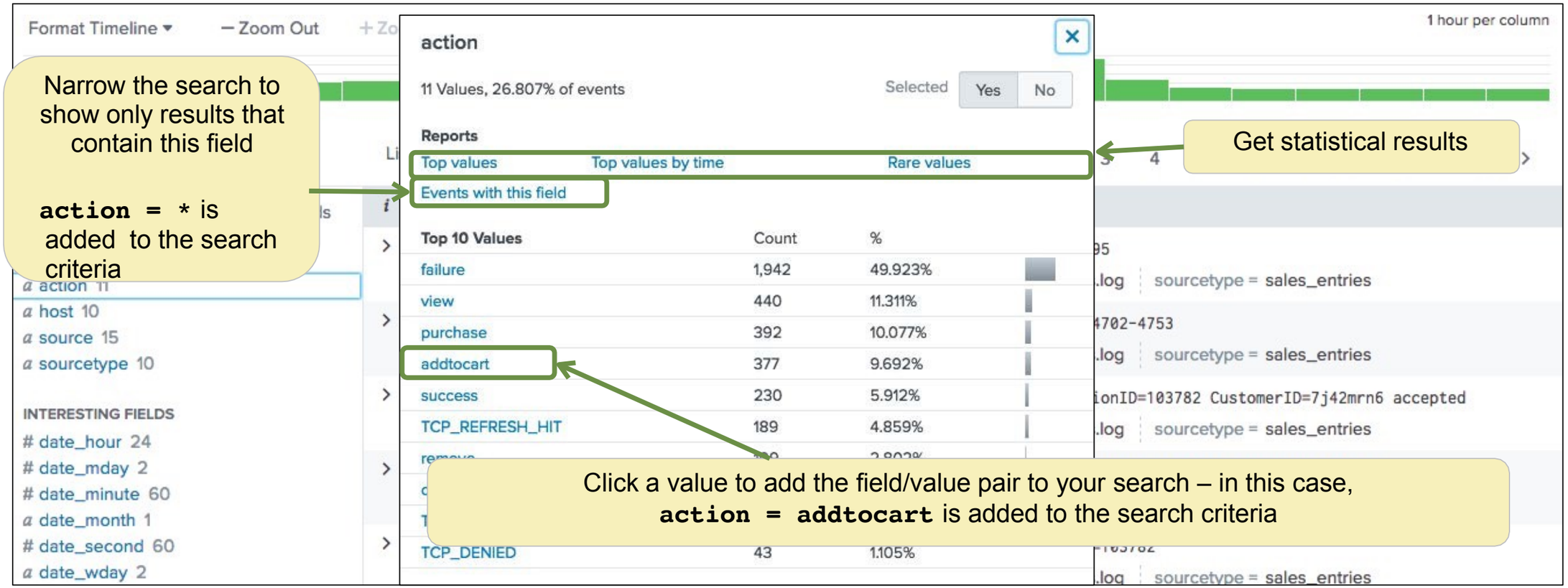
# Make Any Field Selected

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



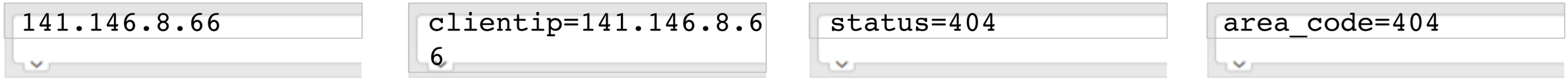
# The Field Window

Select a field from the Fields sidebar, then:

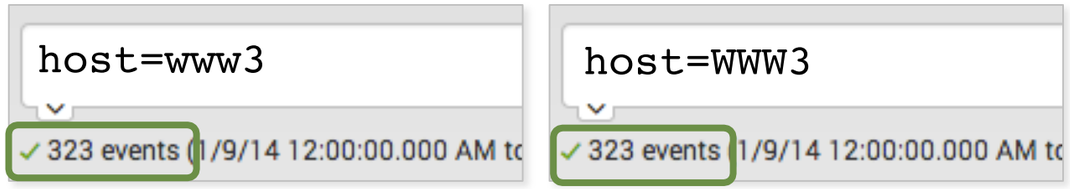


# Using Fields in Searches

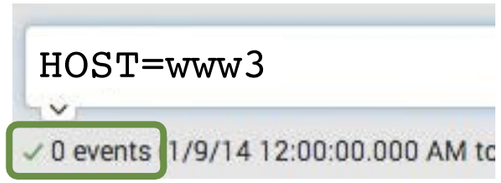
- Efficient way to pinpoint searches and refine results




- 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.)

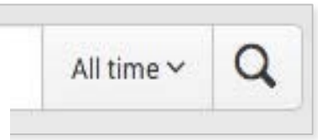
- For IP fields, Splunk is subnet/CIDR aware

```
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 u[illegible])

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




- Use relational operators

With numeric fields

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

With alphanumeric fields

```
host!
=www3
```

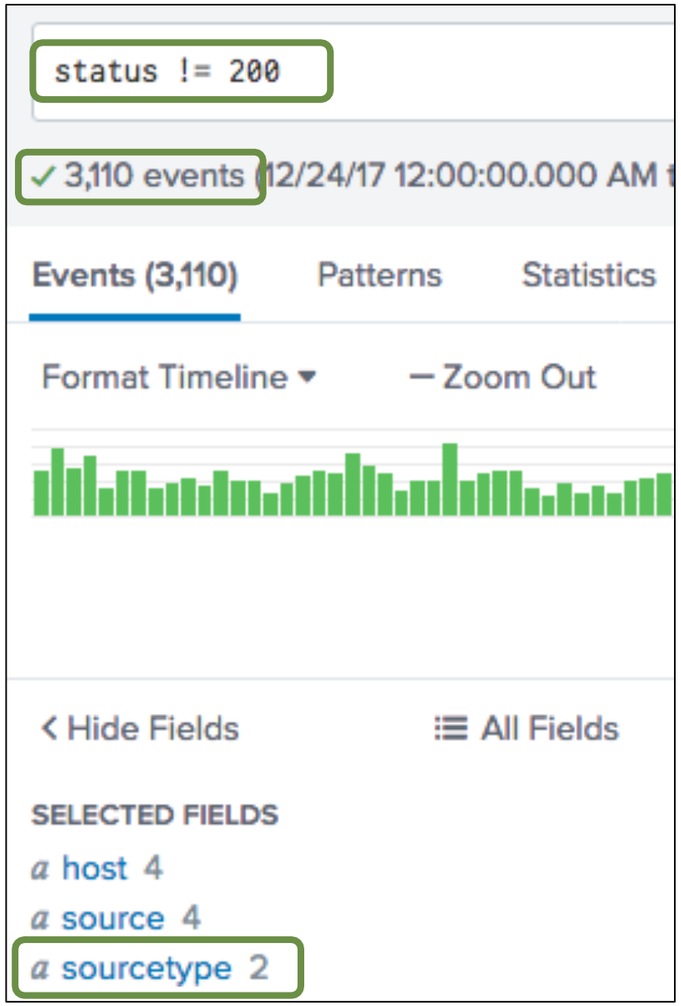
# != vs. NOT

- 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.)

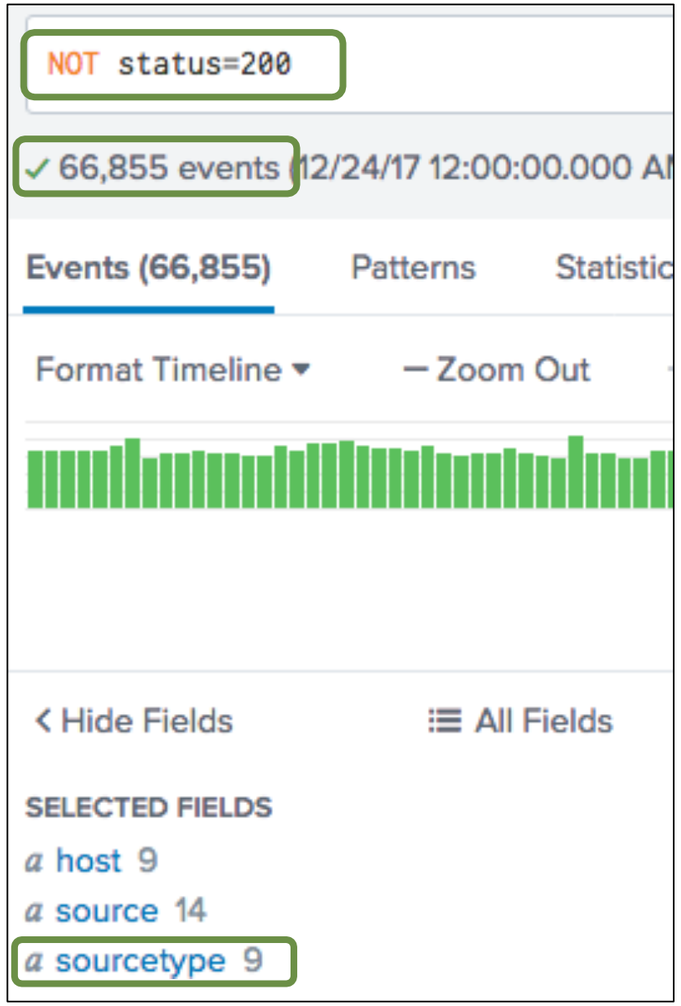



In this example:

- `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.



# != 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:

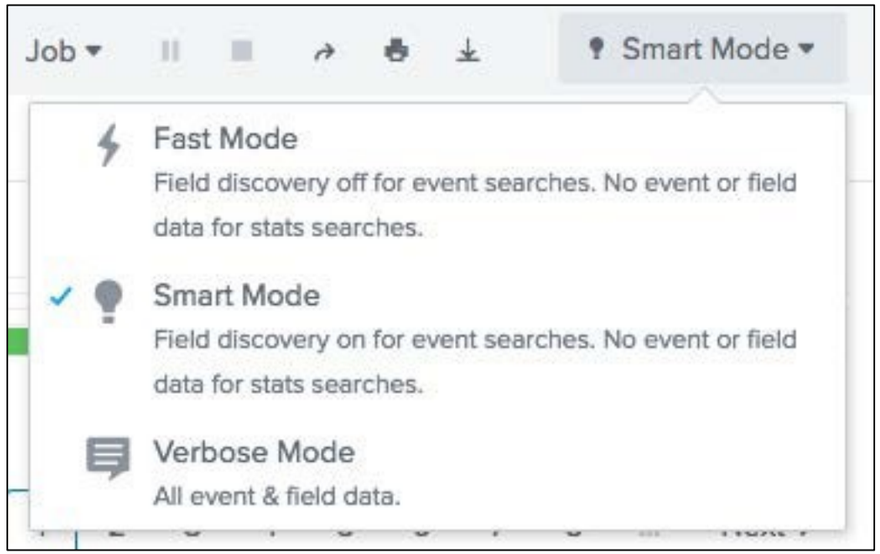
    `index=web sourcetype=access_combined status!=200`

    `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

# 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

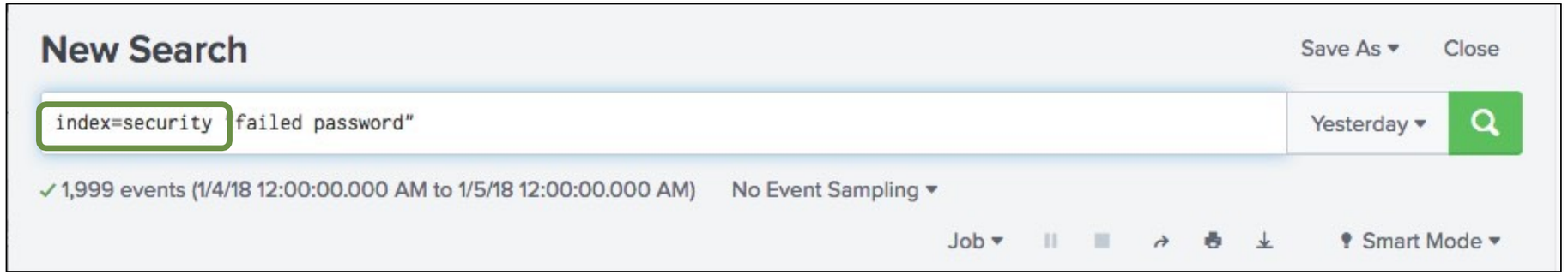
- Avoid using wildcards at the beginning or middle of a string
  - Wildcards at *beginning* of string scan all events within timeframe
  - Wildcards in *middle* of string may return inconsistent results
  - So use `fail*` (not `*fail` or `*fail*` or `f*il`)
- When possible, use OR instead of wildcards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

**Note**

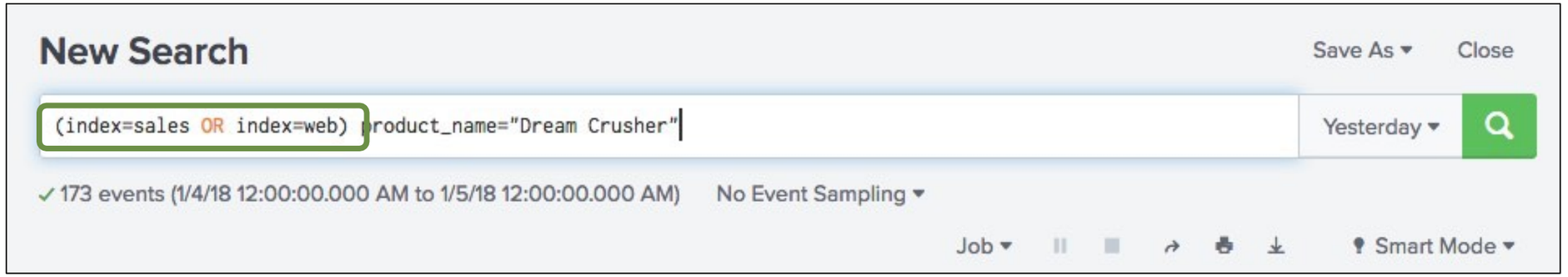
Remember, field names are case *sensitive* and field values are case *insensitive.*

# Working with Indexes

- This search returns event data from the security index

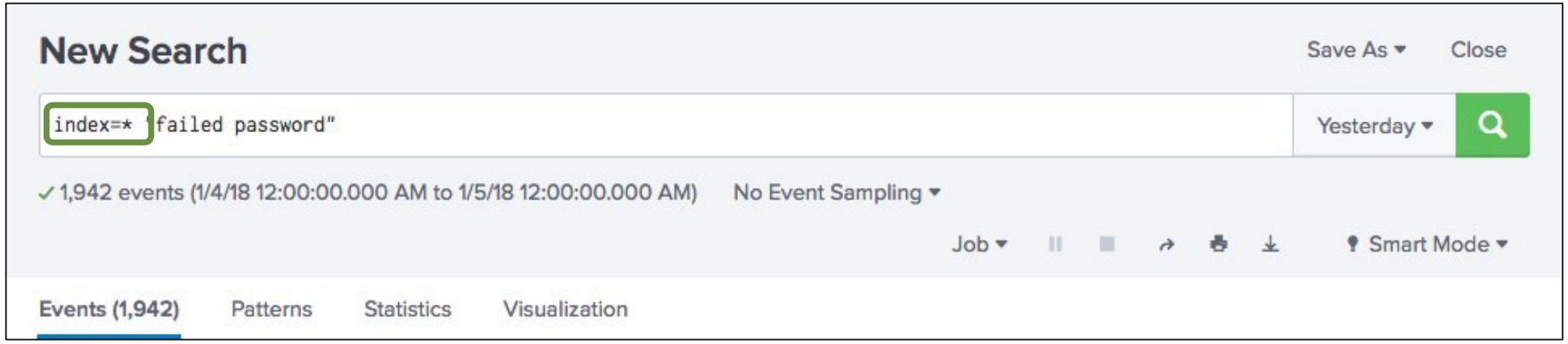



- It's possible to specify multiple index values in a search



# Working with Indexes (cont.)

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




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

**Note 1**

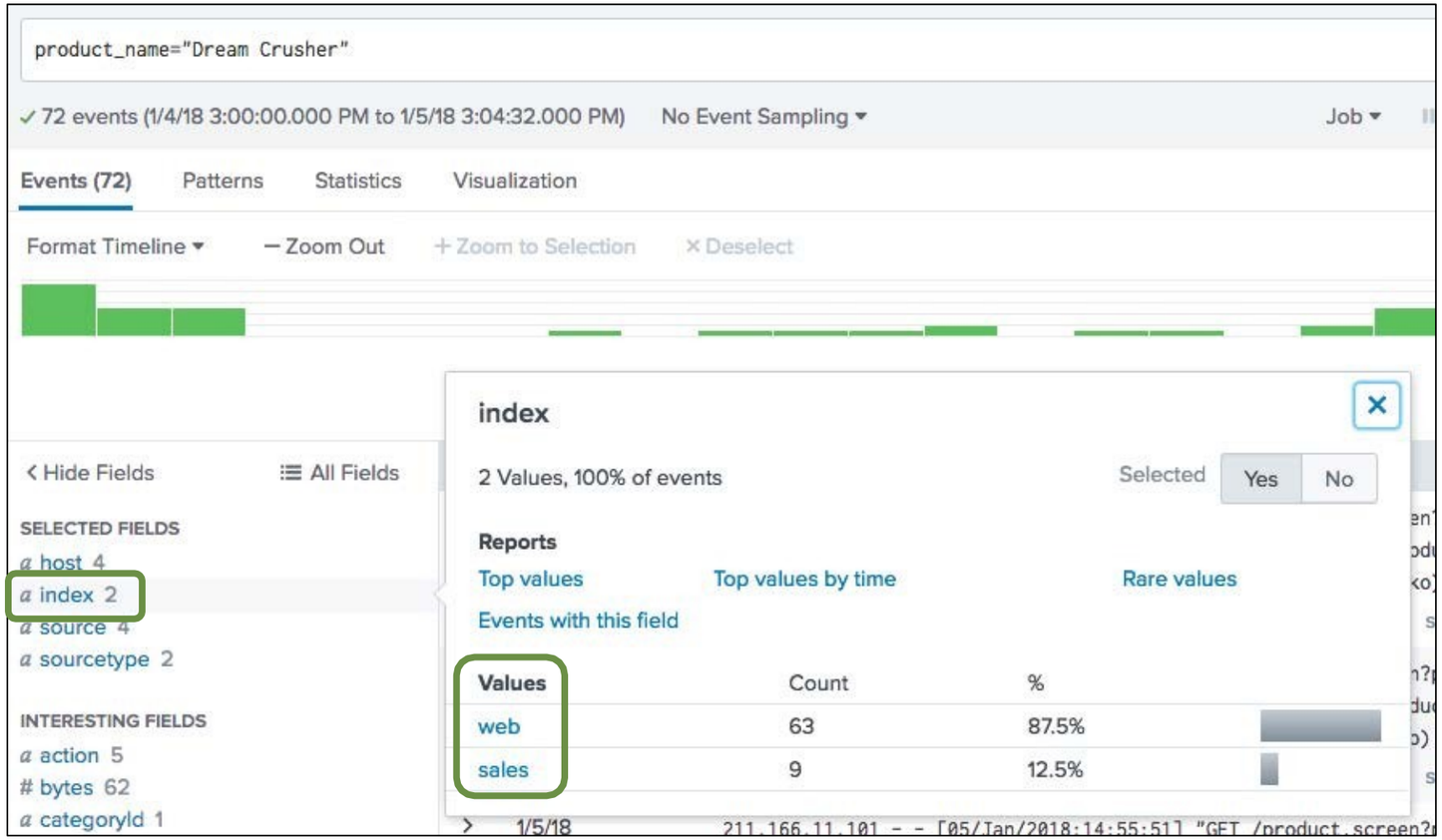
Although `index=*` is a valid search, better performance is always obtained by specifying one or more specific index values.

**Note 2**

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

# Viewing the Index Field

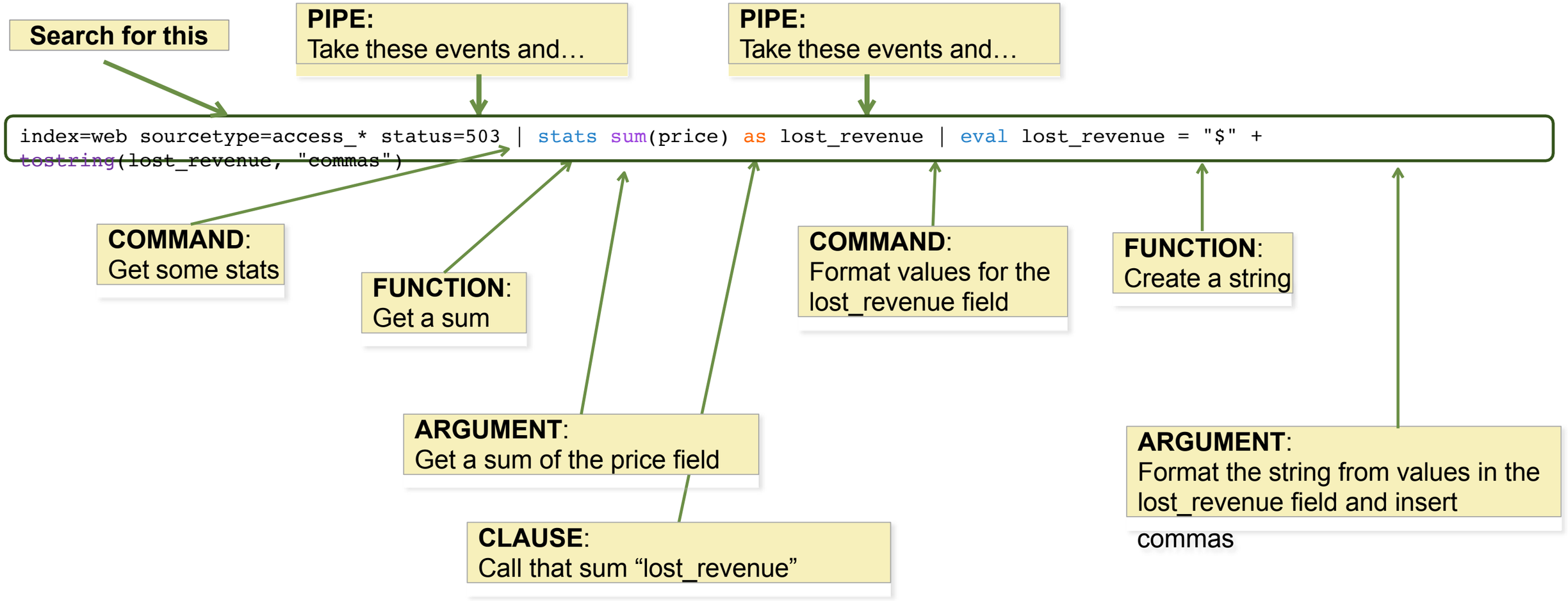
- The *index* always appears as a field in search results
- In the search shown here, no index was indicated in the search, so data is returned from two indexes: `web` and `sales`
- Remember, this practice is **not** recommended—it's always more efficient to specify one or more indexes in your search



# Module 8:
# Splunk's Search Language

# Search Language Syntax

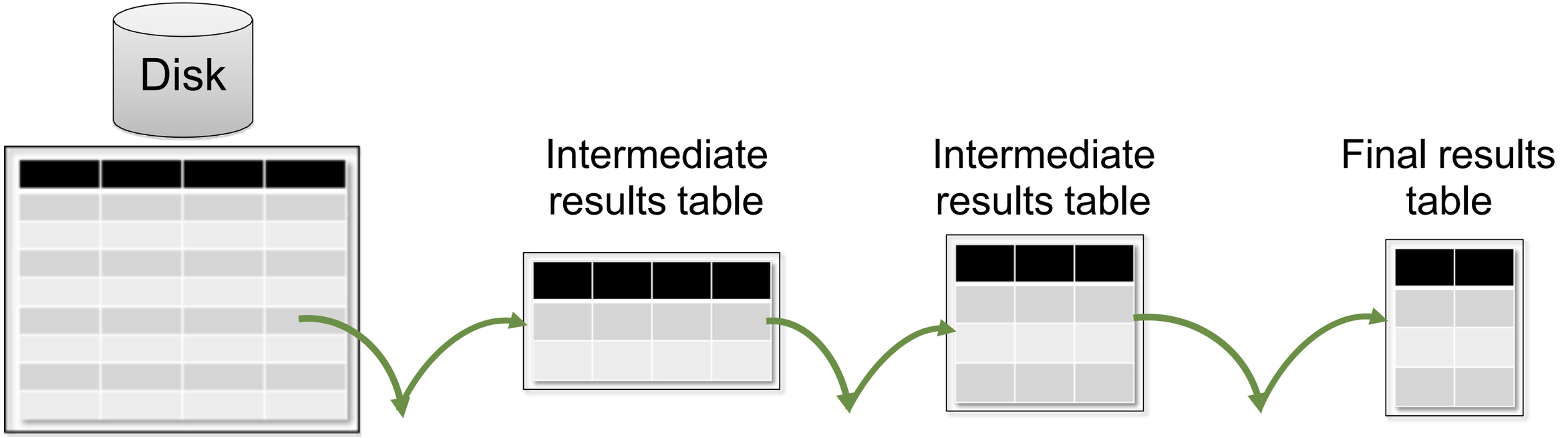
This diagram represents a search, broken into its syntax components:



# 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




```
index=security sourcetype=linux_secure fail*
| top user
| fields – percent
```

Fetch events from disk that match

Summarize into table of top 10 users

Remove column showing percentage