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# ThoughtSpot Data Integration Guide

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# Introduction to administration

**Summary:** This guide covers all topics of special interest to application administrators.

This guide provides information for application administrators.

Before addressing the major components of this guide, we recommend that you familiarize yourself with the general top-level architecture [See page 0] of the ThoughtSpot service.

Administrators are responsible for many facets of the ThoughtSpot service. They are most frequently in charge of these common processes:

- Installation and setup of ThoughtSpot [See page 0]
- Loading and managing data [See page 0]
- Managing users and groups [See page 34]
- Security [See page 64]
- System administration [See page 0]
- Backup and Restore [See page 0]

Additionally, administrators are often involved in the following workflows:

- Data modeling [See page 119]
- Using worksheets [See page 184] to simplify search
- Using views [See page 259] for 'stacked' search; note that starting with Release 5.2, you can accomplish some aspects of search stacking by using the `IN` keyword (See <https://docs.thoughtspot.com/6.0/complex-search/in-keyword-searches.html>).
- Managing scheduled jobs [See page 267]
- Monitoring system health [See page 272]
- Troubleshooting [See page 277]

# ThoughtSpot Support Handbook

**Summary:** Thank you for choosing ThoughtSpot.

The ThoughtSpot Support team is committed to making you successful when deploying and using ThoughtSpot, regardless of your location. We provide 24x7 worldwide support to all our valued customers.

Reliability of your business is very important for us. We created this document to describe our Support offering, so you can find resources to resolve your issues, and answer your questions.

We also provide these instructions in PDF format [See page 0].

## Chapter 1: Support Roles

We have distinct roles in ThoughtSpot Support, and understanding them helps you to streamline issue resolution.

### Systems Reliability Engineer (SRE)

Your cases are assigned to the SRE team, your main contact for providing support. Their primary goal is improving your user experience from a service management perspective. The SRE responsibilities include:

- Responding to support cases through the Support website, by email, or by phone
- Reproducing reported issues, as necessary
- Researching, identifying, and resolving product technical issues
- Working with other ThoughtSpot teams to resolve issues

### SRE Manager

This role manages the team, and steps into the role of Escalation Manager when necessary.

## Escalation Manager

If the issue is not progressing to your satisfaction (based on normal case lifecycle process expectations), the Escalation Manager joins the team. Escalations can be initiated by either the customer, or the SRE. The Escalation Manager:

- Coordinates resources to diagnose and resolve the issue, including third parties as needed
- Ensures that regular updates are shared with internal and customer stakeholders
- Ensures that issues are resolved to the best possible satisfaction of all stakeholders

## Customer Success Architect (CSA)

The CSA is your main contact for architecting the ThoughtSpot solution. The CSA is a member of the paid professional services team. The CSA:

- Oversees the engagement from Launch Kickoff to Wrap-Up
- Helps define the architecture and solution approach
- Assists the CSE with solution implementation
- Helps the client Product Owner with story selection and use case prioritization

## Customer Engagement Manager (EM)

The EM implements the solution, working in tandem with the CSA. The EM is a member of the paid professional services team. The EM:

- Participates in architecture and planning activities
- Acts as primary implementation person for ThoughtSpot on the project
- Trains the implementation team and end users

## Customer Success Manager (CSM)

The CSM assists when starting ThoughtSpot in your organization.

The CSM works with your entire team to identify and establish the correct fit, the right team, and the optimal plan. The CSM coordinates the ABCs of your ThoughtSpot experience: Adoption, Benefits, and Competency Building.

## Chapter 2: Support Components

We have a multifaceted approach to ensure the success of ThoughtSpot deployments.

### Support Cases

We help you resolve product issues through our online support case management system.

### Alert Monitoring

ThoughtSpot product implements an intelligent alerting system that sends regular system status reports and alerts to ThoughtSpot Support when it encounters critical events. These notifications prompt SREs to engage, and resolve all ThoughtSpot issues.

### Metrics and Diagnostics

The ThoughtSpot product records application and system metrics, and sends these to ThoughtSpot Support. These metrics provide the SRE team with visibility into capacity and system resource usage, and allow them to prevent or quickly resolve issues.

When working on cases, ThoughtSpot Support may collect diagnostic information on the system, and also request that you share the information with us. You can securely share the diagnostics with us through our secure ThoughtSpot File Server.

### Remote Access

To help with diagnosing the issues, and to perform administrative tasks such as software upgrades, ThoughtSpot Support needs remote access to your system. This access may include using a web browser to view ThoughtSpot service status pages, or starting an SSH session to execute Linux commands on ThoughtSpot nodes.

### *For ThoughtSpot Cloud clusters*

The ThoughtSpot Support team doesn't have access to your Cloud instance's graphical user interface.

We count on your availability to understand the user-experience via our web-conferencing solution.

Please make sure that you have web access to ThoughtSpot nodes.

### *For ThoughtSpot Software clusters*

ThoughtSpot Support provides the option to initiate the Reverse SSH Tunnel (RST) to establish a secure connection between ThoughtSpot nodes and ThoughtSpot tunnel server. You have complete control to initiate, monitor, or stop the secure tunnel session. This is the preferred method to obtain remote access as it doesn't block customer resources and helps in efficient resolution of the issue especially in case of round-the-clock effort being needed.

If RST is not possible for any reason, ThoughtSpot Support will use internet-based facilities, such as Zoom, for remote access. Please make sure that you have web and SSH access to ThoughtSpot nodes.

### File Server

ThoughtSpot File Server is a secure way of sharing files, like diagnostics information files or software packages for performing updates. Only valid users can access the file server.

### Product Updates

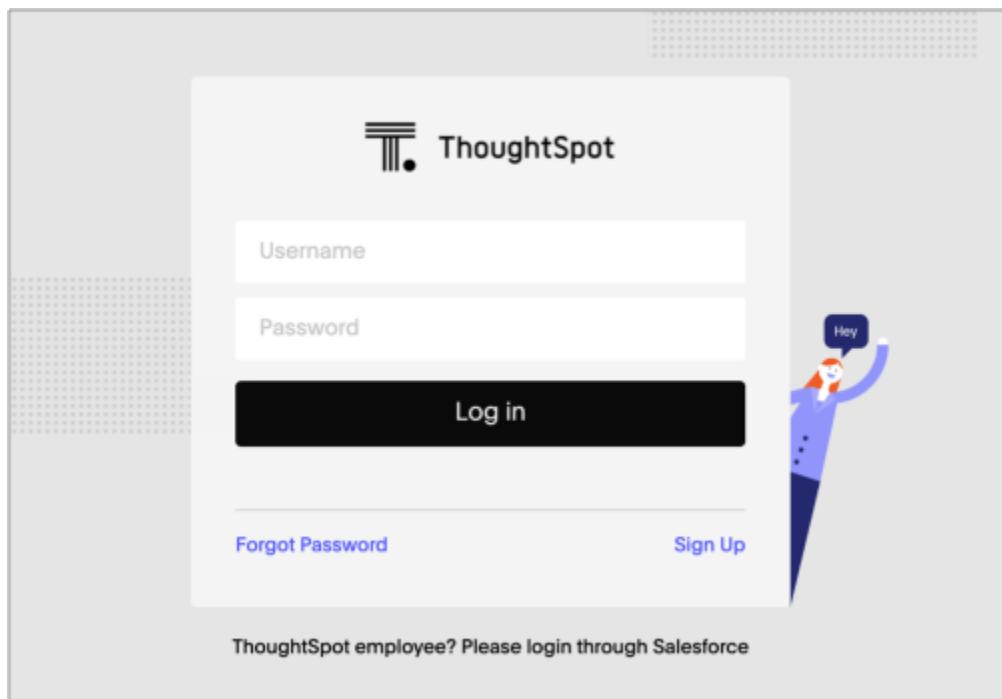
Customers can request for the latest version of ThoughtSpot or ThoughtSpot Support may recommend updates as the resolution to an issue. ThoughtSpot Support will work with you to schedule and perform product updates. As part of the update process, you'll have to download the software package from a secure ThoughtSpot File Server.

For cloud customers, ThoughtSpot automatically performs Cloud Release updates on a monthly basis. You will be notified in advance when these updates will occur. ThoughtSpot Support performs the upgrade.

## Chapter 3: Support Case Management

### ThoughtSpot Support Portal

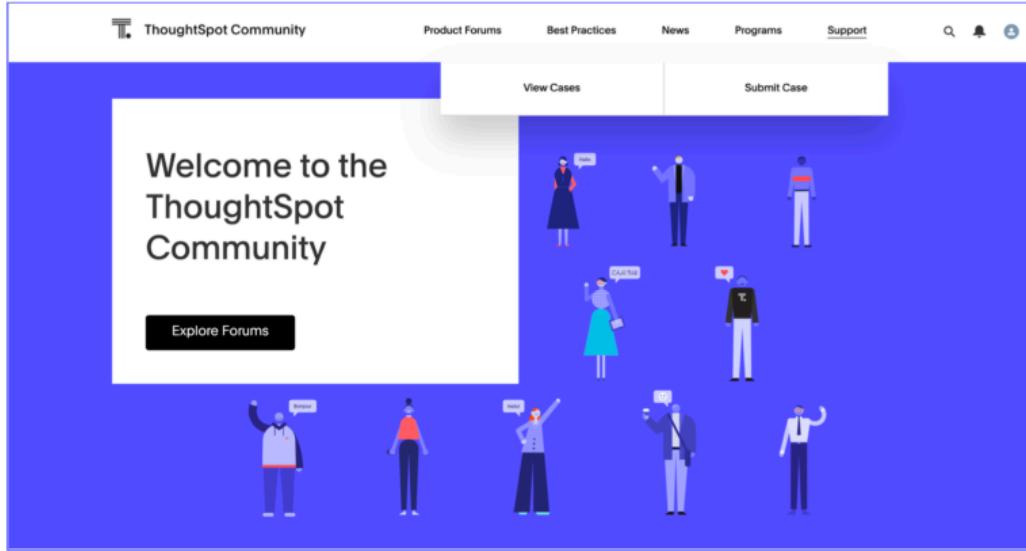
You must have a valid [ThoughtSpot Community](https://community.thoughtspot.com/customers/s/) (<https://community.thoughtspot.com/customers/s/>) user to access the [Support Portal](https://community.thoughtspot.com/s/login/?ec=302&startURL=%2Fcustomers%2Fs%2Fcontactsupport) (<https://community.thoughtspot.com/s/login/?ec=302&startURL=%2Fcustomers%2Fs%2Fcontactsupport>). If you're not signed up yet, please click on "Sign Up" (<https://community.thoughtspot.com/customers/s/login/SelfRegister>) and follow the instructions to register and receive access.



After logging into the Community, you'll see the top-level navigation options for getting help: **Product Forums, Best Practices, News, and Support.**

This document only describes how to submit a request for contacting ThoughtSpot Support.

- To file a new case, click **Submit Case**.
- To view your cases, click **View Cases**.



Scroll down on the main page to see additional resources on **Office Hours**, **Documentation**, **Training**, and **User Groups**.

A screenshot of the ThoughtSpot Support Portal. It features four main sections: "Product Forums" (with a Q&amp;A icon, "Ask a Question" button, and text about asking product questions), "Best Practices" (with a star icon, "Learn" button, and text about exploring implementation and impact), "News &amp; Announcements" (with a megaphone icon, "Read" button, and text about staying updated with community and product news), and "Contact Support" (with an info icon, "Submit Case" button, and text about logging in for support). Below these sections is a "Additional Resources" section with four buttons: "Office Hours", "Documentation", "Training", and "User Groups".

## Create a New Support Case

You can create a new support case through the Support Portal, or over the telephone. ThoughtSpot Support recommends that you use the Support Portal for reporting issues, especially critical ones.

To create a new case, log into the [ThoughtSpot Community](https://community.thoughtspot.com/s/login/) (<https://community.thoughtspot.com/s/login/>) website, and click *Submit Case*.

The screenshot shows a web page with a left panel for creating a new case and a right panel for "Need Answers Fast?".

**Left Panel (Case Creation Form):**

- Have an issue you need help with?**
- Submit a case below and a team member will contact you soon.
- \*Case Customer Category:** None
- \*Priority:** P2
- Case Priority Subcategory:** None
- \*Subject:** (empty input field)
- \*Description:** (empty input field)
- Upload File:** (button)
- Submit:** (button)

**Right Panel (Knowledge Base):**

### Need Answers Fast?

Find what you need here.

- [How to export ThoughtSpot users to an excel sheet](#)  
Aug 11, 2020
- [How to embed an image in a ThoughtSpot pinboard?](#)  
Aug 8, 2020
- [Error: Unable to convert data using date format](#)  
Aug 11, 2020
- [How do I update ThoughtSpot when a source column was dropped in Embrace?](#)  
Nov 10, 2020

### How do I determine priority?

<b>P0</b> Production Software is unavailable; all users are blocked and productivity halted.	<b>P1</b> Production Software is available; functionality or performance is severely impaired.
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Please provide all required information in the web form. You may notice that on the left side of the form, under **Need Answers Fast?**, we suggest Knowledge Base articles that match the keywords in the **Subject** and **Description** you provide. Click on the suggested articles to see if they help you to resolve your situation quickly.

Alternatively, you can open a new case by calling us on the telephone. You can find these support phone numbers on the [Contact Us](https://www.thoughtspot.com/contact-us) (<https://www.thoughtspot.com/contact-us>) section of the ThoughtSpot website.

Region	Phone
Americas	1-800-508-7008, ext 1
UK	+44 (0) 20 8102 1212
Germany	+49 32 221852493

France +33 176400256

Please have the following information ready, so the SRE can log your case accurately:

- Organization name
- Your full name
- Your phone number
- Your email address
- Priority for the case
- Description of the issue

## View Cases

You can view your cases, or all cases within your organization by clicking menu:Support[View Cases].

Case Number	Subject	Status	Date/Time Opened	Case Owner ...
1 00319538	Here is a case	Solved	8/30/2020 2:05 PM	
2 00301077	testing for survey	Closed	5/18/2020 8:33 PM	

You can change the list view, and pin a specific view as default for the next time you use the portal.

**My Customer Support Case** view is for your cases, while **All Customer Support Cases** shows all cases within your organization. You can request that access when working with your ThoughtSpot Customer Success Representative.

Case N... ↑	Contact Name	Subject	Status	P...
1 00301077	brian HOLDER	testing for survey	Closed	P...
2 00319538	brian HOLDER	Here is a case	Solved	P...

Recently Viewed Cases ▾

**LIST VIEWS**

- All Customer Support Cases: Closed
- All Customer Support Cases: Open
- My Customer Support Cases: All
- My Customer Support Cases: Closed
- My Customer Support Cases: Open
- My Customer Support Cases: Pending
- My Customer Support Cases: Solved
- Recently Viewed
- Recently Viewed Cases (Pinned list)

## Close Case

ThoughtSpot Support works with you to determine if the issue is resolved to your satisfaction, and closes the case. A case may be closed if we don't hear from you within two weeks after a request for information, and when we made multiple attempts to contact you during this period.

## Case Category and Assignment

All cases reported to ThoughtSpot must have a category. The category establishes the case assignment rule.

Category	Assignment
Issue	Systems Reliability Engineer
Feature Request	Customer Success Representative

## Case Priority

Case priorities help us understand the real impact of an issue to your business, so we can determine the urgency of initial response. For each error, assign a priority level based on the relative impact the error has on your use of ThoughtSpot in your organization. ThoughtSpot may re-assign the priority level at its sole discretion. In the following table, we describe ThoughtSpot Support priority levels and the corresponding target initial response times.

Priority	Description	Initial Response level
P0	The Production instance is unavailable; all users are blocked and productivity halted.	Within 1 hour
P1	The Production instance is available; functionality or performance is severely impaired.	Within 2 hours

P2	The Production instance is available and can be used with partial, non-critical loss of functionality, or the production instance has an occasional issue that the Customer wants to be identified and resolved. Requests for help on administrative tasks.	Within 4 hours
P3	Cosmetic issues, or requests for general information about the ThoughtSpot Cloud, Documentation, process, or procedures.	By next business day

## Case Escalation

You can escalate a case at any time by requesting that you would like an SRE Manager to be engaged. Escalations occur when case progress or issue resolution is not in line with your expectations relative to the prescribed case resolution process. The SRE Manager serves as the Escalation Manager until we resolve the issue to your satisfaction.

# Configure casing

**Summary:** You can set the type of case sensitivity you would like to see reflected in the ThoughtSpot display.

Before you load your data, you should consider the type of casing you would like your data to reflect. The case sensitivity for source data strings is preserved in the display. So, the visual display of results is identical to the input case that is loaded.

**Note:** The casing will remain lowercase in other parts of the application, such as when you ask a question or filter.

It is important to note that string casings aren't applied globally, but by column. So datasets will have different string casings as long as they're in different columns. Tables that are already compacted will keep their lowercase format. In these cases, to get the specific string case that you want, you would have to truncate related tables and reload them.

To take advantage of case configuration, you need to have ThoughtSpot Support enable it on your cluster for you. In addition, title casing should be disabled for string casing to properly work.

# Load CSV files with the UI

**Summary:** The simplest way to load data is to upload a CSV or Excel file from the ThoughtSpot Web interface.

**Note:** This feature is exclusive to ThoughtSpot Free Trial. Use Connections to access your data in ThoughtSpot Cloud.

Loading data through the Web browser is recommended for smaller tables (under 50MB) with simple relationships between them. This method is recommended for small, one time data loads. Using this method, the data schema is created for you automatically.

Any user who belongs to a group that has the privilege **Has administration privileges** or **Can upload user data** can upload their own data from the browser.

Your data should be in a CSV (comma separated values) before you load it. A CSV file is a text file made up of data fields separated by a delimiter and optionally enclosed with an enclosing character. If your data contains multiple tables, you can have a separate CSV for each table.

## Formatting the CSV

Your ETL (extract, transform, load) process will typically generate CSV files. You can also create a CSV file from a Microsoft Excel spreadsheet by opening the spreadsheet in Excel, choosing **Save As** and selecting CSV.

A CSV file contains a delimiter that marks the separation between fields in the data. The delimiter is usually comma, but it can be any character. The file also contains fields optionally enclosed with double quotes. Use these guidelines when creating the CSV file:

- If the CSV contains column headers, they must match the column names in the database exactly.
- Often a `|` (pipe) or tab is used as the delimiter, because it may be less likely to occur within the data values.
- When a field contains a double quote, it must be escaped with the character specified in the escape character argument in `tsload`.

- When a field contains the delimiter, the field must be enclosed in double quotes.

ThoughtSpot supports a wide range of date and timestamp formats (See <https://docs.thoughtspot.com/6.0/reference/date-formats-for-loading.html#>) in the CSV file. Blank values in user uploaded CSV files are interpreted as NULL values. These include the values (case insensitive):

- `NULL`
- `\N`
- `NA`
- `N/A`
- [space]

If you are appending data to an existing schema or table, columns in the CSV file must be in the same order as defined in the target table.

If you are loading a fact table that joins to dimension tables, you must load the fact table first, and then the dimension tables. The joining key must be a single column of unique values in the dimension table. `NULL` values in the fact table cannot be joined.

## Create a CSV file

The first step in loading data is to obtain or create one or more CSV files that contain the data to be loaded into ThoughtSpot. CSV is a common format for transferring data between databases. ThoughtSpot requires this format.

Most applications such as Microsoft Excel or Google Sheets can output CSV formatted files. If your source is an Excel spreadsheet or Google Sheet:

1. Save, export, or download the file in CSV format. The exact procedure you use will depend on the source application.
2. Review the file's format before uploading it to ThoughtSpot.

Your source data may be in another database. If this is the case, your company's ETL (extract, transform, load) process will typically generate CSV files. If your source is another database:

3. Connect to the source database.

4. Extract each table you wish to import into ThoughtSpot as a CSV file.

The column delimiter should be a (comma), (pipe), or tab.

For general information about CSV files and the rules for creating them, see the Comma-separated\_values on Wikipedia ([http://en.wikipedia.org/wiki/Comma-separated\\_values](http://en.wikipedia.org/wiki/Comma-separated_values)).

## Load the CSV File

Any user who belongs to a group that has the privilege **Has administration privileges** or **Can upload user data** can upload their own data from the browser. To load the CSV or Excel file into ThoughtSpot:

1. Log in to ThoughtSpot from a browser.
2. Click **Data**, on the top navigation bar.
3. Click the ellipses icon , in the upper right corner, and select **Upload Data**.
4. In **Step 1: Upload your file**, complete these selections:
  - a. Upload the CSV or Excel file by these methods:

### Browse

Click \*\*Browse your files\*\* and select the file.

### Drag and drop

Move the file from the file manager on your computer into the drop area.

- a. Answer the question **Are the column names already defined in the file header?**

The options are **Yes** or **No**.

- b. Answer the question **Are the fields separated by?** by specifying one of:

### Comma

(,), example: `Jacket,Winter 2021,yellow,600`

### Semicolon

(;), example: `Jacket;Winter 2021;yellow;600`

### Pipe

(|), example: `Jacket|Winter 2021|yellow|600`

### Space

( ), example: `Jacket "Winter 2021" yellow 600`

### Tab

( ), example: `Jacket Winter 2021 yellow 600`

Click **Next**.

5. In **Step 2: Set column names**, review your data.

When necessary, click the column header names to change them to more descriptive and easier names.

Click **Next**.

6. In **Step 3: Set column types**, review the automatically generated data types for each column, and make necessary changes.

These are the possible data types:

#### True/False

Boolean, Yes,no.

#### Integer

Smaller integers represented by 32 bits.

#### Large Integer

Larger integers represented by 64 bits.

#### Decimal

Floating point or Decimal.

#### Text

Character or text.

#### Date

Simple date, not including the time component.

#### Date\_Time

The date and time.

#### Time

Only the time, not including the date component.

#### 7. Click **Upload**.

When an upload is complete, the system reports the results and offers you some further actions.

- Click **Link to Existing Data** if you want to link the data you uploaded to the data in another table or worksheet.
- Click **Search** if you want to begin a new search.
- Click **SpotIQ Analyze** if you want to use the SpotIQ feature to find insights in your new data.

## Append to an existing table

You can append data to your existing system tables through the ThoughtSpot application, even if the tables were initially loaded using `tsload`. The CSV file must have the same structure as the table it is being loaded into, including number and type of columns, in the same order as the target table.

To append data into ThoughtSpot:

1. Log in to ThoughtSpot from a browser.
2. Click **Data** on the top navigation bar.
3. Click the name of the table you would like to append data to.
4. Click the **Load Data** button.
5. Upload the CSV or Excel file by doing one of these options:
  - Click **Browse your files** and select the file.
  - Drag and drop the file into the drop area.
6. Answer the question **Are the column names already defined in the file header?**
7. For the question **Do you want to append to the existing data or overwrite it?**, select **Append**.
8. Answer the question **Are the fields separated by?**, and click **Next**.

9. Click **Upload**.
10. Click **Link to existing data** if you want to link the data you uploaded to the data in another table or worksheet. Or click **Ask a question** if you want to begin a new search.

# How to view a data schema

**Summary:** Use the schema viewer to see tables and worksheets and their relationships.

ThoughtSpot has a **Schema Viewer** through which you can examine the database schema. It is interactive and configurable, so you can see the level of detail that is relevant to your work.

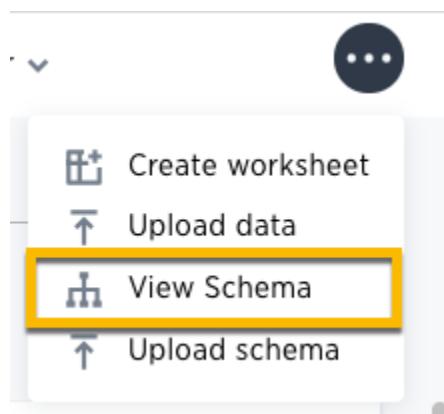
You must have **Admin** privileges to use the **Schema Viewer**.

## Accessing the Schema Viewer for all objects

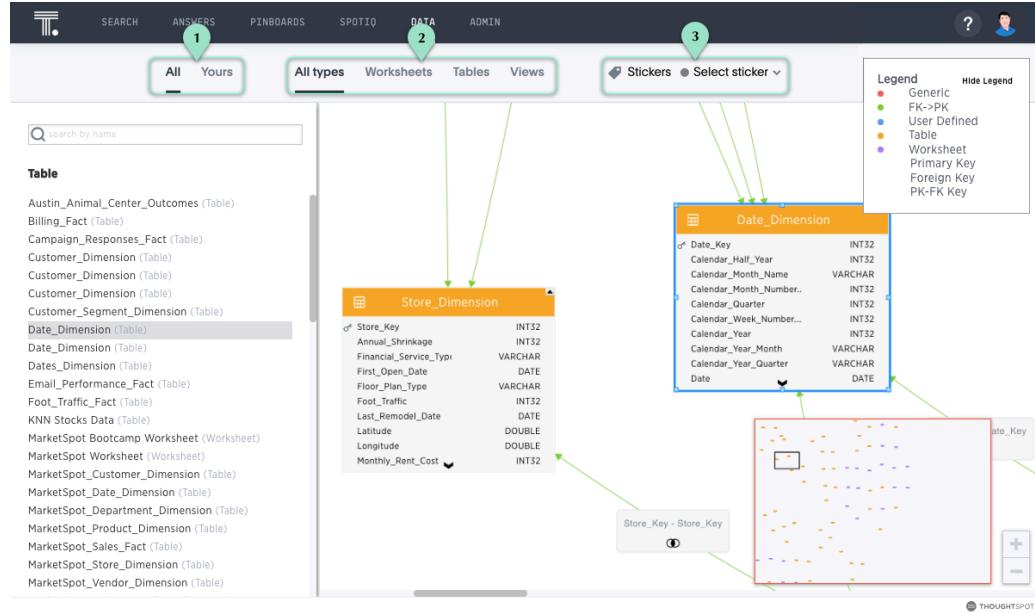
1. Click the **Data** tab in the top menu.



2. Click the ellipses icon, ..., and select **View Schema**.



1. When the schema appears, you can see that you can control the visible part of the schema.



#### Legend Action

1. See either **All** (Default), or **Yours**.
2. See either **All types** (Default), **Worksheets**, **Tables**, or **Views**.
3. Select artifacts tagged with tags.

1. The list of tables, worksheets, and imported data on the left changes as you select the various filters. The schema view focus changes in tandem.
2. To center the view panel on a specific table, worksheet, or view, click that object.

You can also drag the objects around in the viewer to position them better.

## Accessing Schema Viewer for a single worksheet, table, or view

You can now see the schema for each object for tables, worksheets, or views.

1. Click the **Data** tab in the top menu.



2. Select from the list of the possible objects:

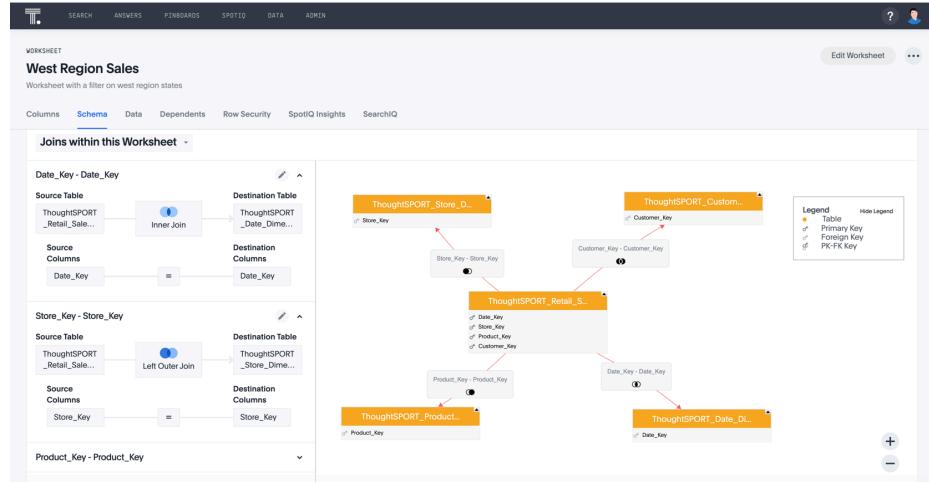
#### Legend Action

1. See either **All** (Default), or **Yours**.
2. See either **All types** (Default), **Worksheets**, **Tables**, or **Views**.
3. Select artifacts tagged with tags.

3. From the list of objects, select one. Here, we selected the worksheet **West Regional Sales**.
4. At the top of the worksheet, click the **Joins** tab.

COLUMN NAME	DESCRIPTION	DATA TYPE	COLUMN TYPE	ADDITIVE	AGGREGATION	HIDDEN
Sales	Click to edit	DOUBLE	MEASURE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO
Gross Margin	Click to edit	DOUBLE	MEASURE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO
Quantity	Click to edit	INT32	MEASURE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO
POS Transaction Nu...	Click to edit	INT32	ATTRIBUTE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO
Date	Click to edit	DATE	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO
Latitude	Click to edit	DOUBLE	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO
Longitude	Click to edit	DOUBLE	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO
Store City	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO

5. The join information and the schema for the worksheet appear.



## Why use the Schema Viewer

You can use the Schema Viewer to discover the following information:

- What is the relationship between two tables?
- What tables make up this worksheet, and how are they joined?

The schema viewer shows joins between tables, join directionality, and join type.

## How the Schema Viewer shows joins

You can use the Schema Viewer to review your schema and ensure that it was modeled using best practices. For example, joins appear in different colors to distinguish their type:

- Red is used for generic relationships
- Green is used for primary key/foreign key joins

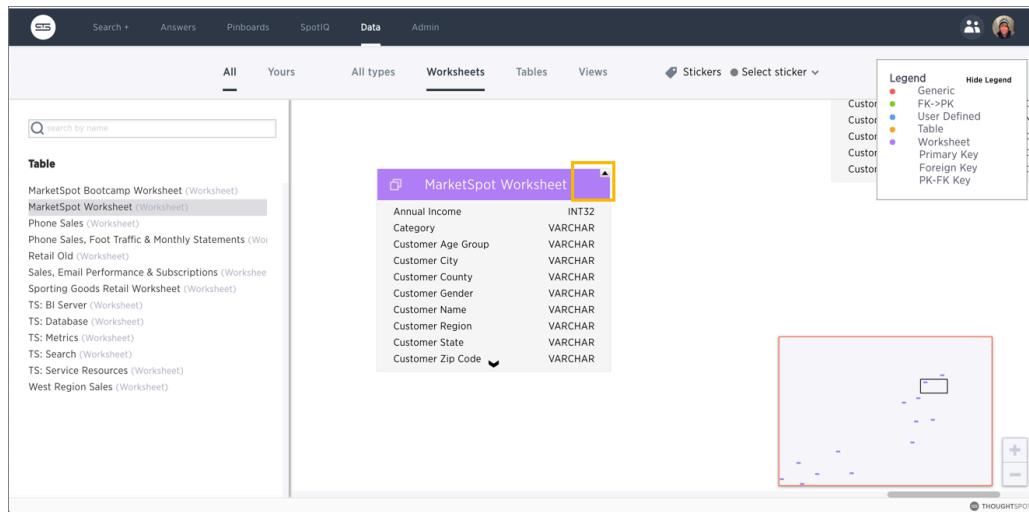
When viewing a worksheet, you can also see what joins connect the tables: the inner, left outer, right outer, or full outer joins

A good rule to follow is "Keep it Green". This means that you can get better results from PK/FK joins rather than from using generic relationships. You should only use generic relationships when the tables being joined have a many-to-many rather than a PK/FK structure. If you find tables that have been joined using a generic relationship, but could have used a PK/FK join, you should drop the relationship and create a PK/FK join instead.

## Worksheet view

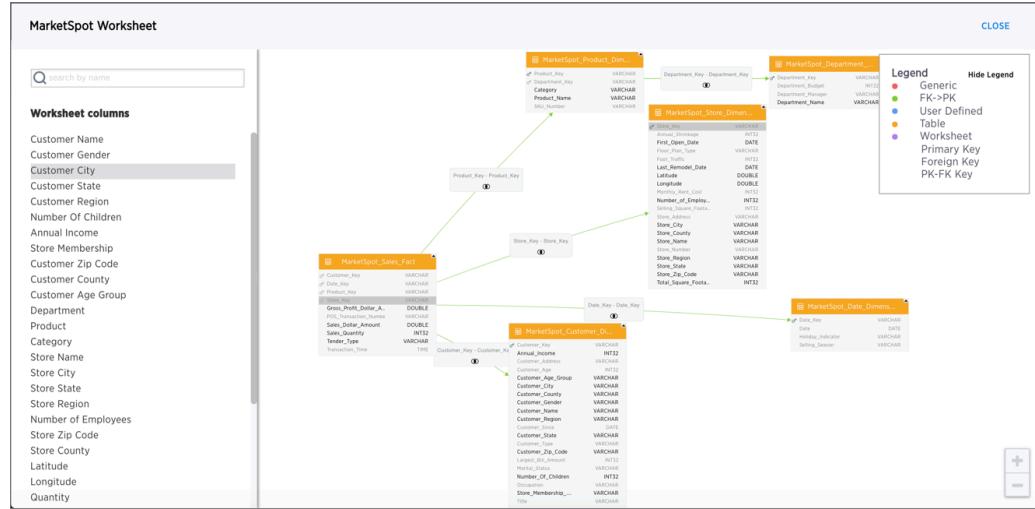
Worksheets are often based on more than one table. The worksheet schema will show schemas for the tables behind the worksheet, as well as the joins between tables *that were created as a part of the worksheet*.

Click a worksheet, to see it in the Schema Viewer. If the schema view is not showing the schema behind the worksheet, double click the tab on the top right of the worksheet object.



The worksheet view shows the following information:

- All tables in the worksheet, and the relationships between these tables.
- Source columns for all columns of a worksheet.
- Keys and definitions for each relationship, as well as join paths and types.
- Columns that are derived from formulas.
- Correct join paths for newly created chasm trap worksheets. Chasm trap worksheets created prior to ThoughtSpot version 4.4 do not show the correct join paths.



## Related Information

- [Worksheet joins \[See page 203\]](#)
- [Modify joins within a worksheet \[See page 213\]](#)

# Delete a data source

**Summary:** How to prepare for and delete a data source using the ThoughtSpot application.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

You can delete a data source through the browser. When you want to delete a data source, you first need to handle any dependent objects that have been built on top of it. You can easily see these dependencies, and choose how to handle them before deleting the data source.

## Check data source dependencies

You can see all of the dependencies for any data source (worksheet or table) on the **Data** page.

To view dependent objects for a data source:

1. Click **Data** on the top navigation bar.
2. Click the name of the data source whose dependencies you want to view.
3. Click **Dependents**.

You will see a list of the names of the dependent objects (worksheets and Liveboards), and the columns they use from that data source. You can use this information to determine the impact of changing the structure of the data source or to see how widely it is used.

The screenshot shows a 'WORKSHEET' titled 'Sporting Goods Retail Worksheet' under the 'ThoughtSPORT worksheet' category. The 'Dependents' tab is selected. A table displays the following data:

COLUMN NAME	DEPENDENT NAME	TYPE
Age Group	Total Sales by Depar..	View
Date	Top 100 Products M..	View
Product Name	Top 100 Products M..	View
Department	Total Sales by Depar..	View
Sales	Total Sales by Depar..	View
Customer City	Customer Location	Answer
Customer Name	Customer Location	Answer

( showing rows 1-0 of 27 )

4. Click a dependent object to modify or delete it.

If you want to remove the dependency by modifying the dependent object, you must remove all search terms or columns that refer back to the data source you are trying to delete.

5. When all dependencies have been removed, you will be able to go back and delete the data source.

## Delete a data source

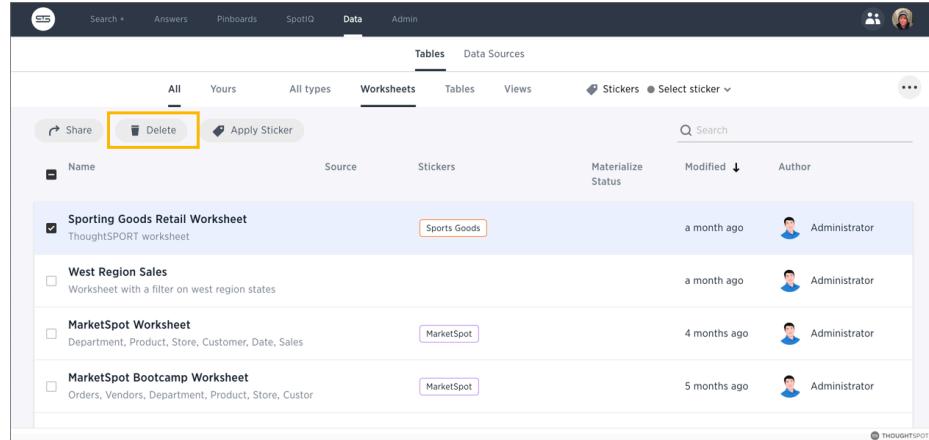
You can delete the following types of data sources:

- Worksheets.

ThoughtSpot checks for dependencies whenever you try to delete a table or worksheet.

1. Click **Data** on the top navigation bar.
2. Check the box next to the name of the data source you want to delete.
3. Click the delete icon.

## Delete a data source

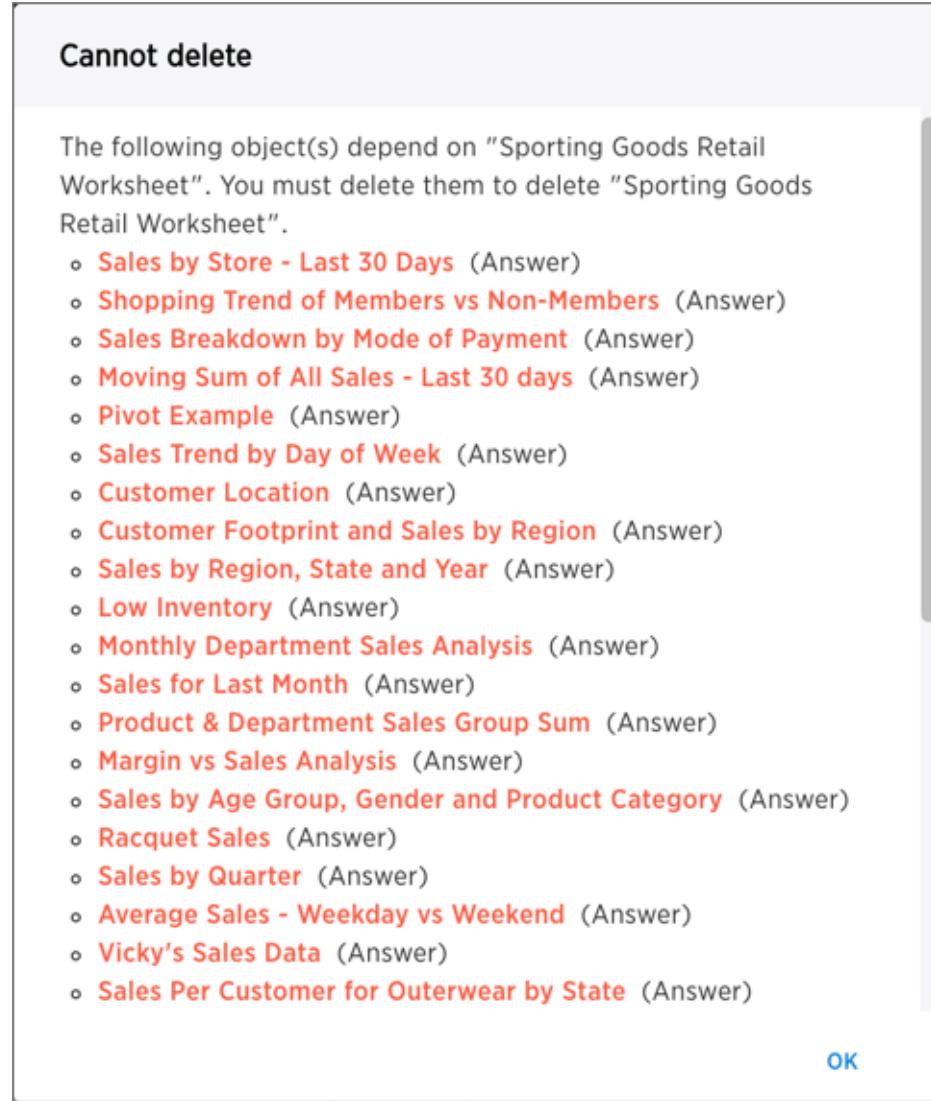


The screenshot shows the ThoughtSpot interface with the 'Data' tab selected. Under the 'Worksheets' tab, there is a list of four worksheets. The first worksheet, 'Sporting Goods Retail Worksheet', has a checked checkbox next to its name. A yellow box highlights the 'Delete' button, which is located in the top right corner of the row for this worksheet. The other three worksheets listed are 'West Region Sales', 'MarketSpot Worksheet', and 'MarketSpot Bootcamp Worksheet'. Each worksheet row includes columns for Name, Source, Stickers, Materialize Status, Modified, and Author.

Name	Source	Stickers	Materialize Status	Modified	Author
Sporting Goods Retail Worksheet ThoughtSPORT worksheet	Sports Goods			a month ago	Administrator
West Region Sales Worksheet with a filter on west region states				a month ago	Administrator
MarketSpot Worksheet Department, Product, Store, Customer, Date, Sales	MarketSpot			4 months ago	Administrator
MarketSpot Bootcamp Worksheet Orders, Vendors, Department, Product, Store, Custor	MarketSpot			5 months ago	Administrator

4. If you attempt to delete a data source with dependent objects, the operation will be blocked.

You will see a list of dependent objects with links.



5. Click a dependent object to modify or delete it.

If you want to remove the dependency by modifying the dependent object, you must remove all search terms or columns that refer back to the data source you are trying to delete.

6. When all dependencies have been removed, you will be able to go back and delete the data source.

# Onboarding Users

**Summary:** Guided onboarding simplifies the initial engagement that new users have with ThoughtSpot, and encourages adoption throughout your organization.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

Onboarding enables users to master the key workflows of ThoughtSpot, and makes them productive and capable users in a very short time.

When you create a new user, we recommend that you add them to a user group immediately.

Configure that user group to use a specific data source, choose up to three initial Liveboards, and specify the text of the welcome email.

## Prerequisites for onboarding

- **Valid emails** All users must have valid emails.

To include users in the onboarding process, each user profile must include a valid email address; see [Create a user \[See page 52\]](#). [Contact ThoughtSpot Support \[See page 292\]](#) to whitelist email domains.

Before starting the onboarding process, an administrator must specify the configuration.

## Onboarding Process

The key workflows that enable successful onboarding include the following:

1. Configure and save a default Liveboard (or Liveboards) for new users. Alternatively, determine what default Liveboards you plan to use for each user group.

See steps for [creating a Liveboard \[See page 0\]](#).

2. Create a new user group, or edit an existing user group to which new users belong:
  - specify the group name and its display name
  - set the sharing visibility to visible
  - specify the Privileges
  - select up to 3 default Liveboards
  - test and customize the test welcome email. See steps for [creating a user group \[See page 40\]](#) or [editing a user group \[See page 44\]](#).
3. Create a new user and assign them to the group you are using for onboarding. See steps for [creating a new user \[See page 52\]](#). You can also [add existing users to the group \[See page 47\]](#).
4. When the new user signs in for the first time, the ThoughtSpot onboarding process starts automatically and guides them through a few basic scenarios of using the application. See [User onboarding experience \[See page 0\]](#).
5. **[Optional]** Any user can repeat their onboarding experience at any time. Simply select **Profile** from user icon on the top right corner of the page. Under **Preferences > New user onboarding**, click **Revisit**. See [Revisit onboarding \[See page 0\]](#).

## Notes on Data Source recommendation

User groups in ThoughtSpot can be hierarchical, and each user can belong to multiple groups. Because of this, the choice of the Recommended Data Source may be surprising, both to users and admins.

We determine the default Data Source for **each user** based on these criteria:

- Consider all default Liveboards, across all Groups
- Identify Data Sources associated with these Liveboards
- Rank the Data Sources on frequency of use
- Select the highest ranked Data Source

Admins can preview onboarding flow for any given user, and adjust the selection of default Liveboards.

# Understand groups and privileges

**Summary:** Creating groups and assigning users to them makes privilege management easier.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

Before people can log in and use ThoughtSpot, you need to create a username, a password, and a membership in one or more groups for them.

This page describes manual creation of users, groups, and privileges, but you can also manage users through SAML.

## Privileges and groups

Privileges determine what kinds of actions users are allowed to do. You assign privileges to groups. Then, you create users and assign them to groups. This is how you grant users access to different capabilities in ThoughtSpot.

Each group includes a set of privileges for its users. The privileges a group has determine the actions that its members are allowed to do. If a user belongs to more than one group, they will have the highest level of the privileges from all the groups they belong to. Plan your groups so that you can use them to assign a common set of privileges to multiple users. Good planning will pay off in ease of administration and a better search experience.

There is a default group called **All**, which includes every user in ThoughtSpot. When you create a new user, they will be added to the **All** group automatically. You cannot delete the **All** group or remove members from it.

You can also have a hierarchy of groups. That is, groups can belong to (that is, be children of) other groups. When using group hierarchies, permissions are inherited from the parent group. So if you're a member of a sub-group, you would automatically have the privileges of the parent group.

## List of privileges

Here are the different privileges, and the capabilities they enable:

Privilege	Description
<b>Can administer ThoughtSpot</b>	Can manage Users and Groups and has view and edit access to all data. Users with this privilege can also download a saved answer.
<b>Can download data</b>	Can download data from search results and Liveboards.
<b>Can share with all users</b>	Can see the names of and share with users outside of the groups the user belongs to. Members of groups with this privilege can also share with groups marked as <b>NOT SHAREABLE</b> .
<b>Can manage data</b>	Can create connections. To view or edit other people's connections, you must have the <b>Can administer ThoughtSpot</b> privilege. Can create worksheets and views. Note that to edit a worksheet or a view created by another user, you must have the <b>Edit</b> permission on that object, and it must be shared with you.
<b>Can use experimental features</b>	Can access trial and experimental features that ThoughtSpot makes available to early adopters.
<b>Can schedule Liveboards</b>	Can create Liveboard schedules and edit their own scheduled jobs.
<b>Has SpotIQ privilege</b>	Can use the SpotIQ feature. If this privilege is not enabled for the user, they can still see "Did you know" SpotIQ insights on the ThoughtSpot home page.
<b>Can administer and bypass RLS</b>	Users in groups with this privilege (directly or through group inheritance): <ul style="list-style-type: none"> <li>• Are exempt from row-level security (RLS) rules.</li> <li>• Can add/edit/delete existing RLS rules.</li> <li>• Can check or uncheck Bypass RLS on a worksheet.</li> </ul> Your installation configuration may enable or disable the availability of this privilege. By default, it is enabled. Administrators or groups with the privilege <b>Can administer ThoughtSpot</b> can grant this privilege.
<b>Has Developer privilege</b>	Can access and use the <a href="#">Developer Portal [See page 0]</a> to explore the ThoughtSpot APIs and developer tools, and build web applications with ThoughtSpot content.

Privilege	Description
<b>Cannot create or update Liveboards</b>	<p>Users are limited to viewing and exploring curated Liveboards (and Answers). They cannot copy, edit, download, or share them.</p> <p>This privilege is designed to support embedded implementations, and is not available by default. <a href="#">Contact ThoughtSpot Support [See page 0]</a> to enable it.</p> <p>See <a href="#">Granular access to Liveboards [See page 0]</a> for a deeper discussion of this privilege, and an implementation example.</p>

Privileges are additive, meaning that if a user belongs to more than one group, they will have the highest level of privileges from among the groups they are a member of. They are also inherited from the parent, so that a sub-group gets all the same privileges of its parent, all the way up the group hierarchy.

If you add the privilege **Has administration privileges** to a group, note that all users in that group will be able to see all the data in ThoughtSpot. Administrators can see all data sources, and [Row level security \[See page 103\]](#) does not apply to them.

Permissions to see and edit tables, worksheets, and Liveboards are set when you share them with users and groups, as described in the topic [Data security \[See page 69\]](#).

The following table shows the intersection of user privilege and ability:

	Create/Edit WS	Create View	Create Connection	Modify Col. Props. <sup>1</sup>	Download Data	Share within Group	Share with all users	Manage and bypass RLS rules	CrUD Relationships	Read Relationships	See Hidden Cols	Join with Upload Data	Schema Viewer	Use Scheduler	Use Auto-Analyze	Access Developer Portal
Can administer ThoughtSpot	Y	Y	Y	Y	Y	Y	Y	Y <sup>2</sup>	Y	Y	Y	Y	Y	Y	Y	Y
Can download data	N	N	N	N	Y	Y	N	Y <sup>4</sup>	N	Y <sup>4</sup>	N	N	N	N	N	N
Can manage data	Y	Y	Y	Y	N	Y	N	Y <sup>4</sup>	Y <sup>4</sup>	Y <sup>5</sup>	Y	N	N	N	N	N
Can share with all users	N	N	N	N	Y	Y	N	Y <sup>4</sup>	N	N	N	N	N	N	N	N
Has SpotIQ privilege	N	N	N	N	N	N	N	Y <sup>4</sup>	N	N	N	N	N	Y	N	N
Can Administer and Bypass RLS	N	N	N	N	N	Y	N	Y	N	N	N	N	N	N	N	N
Has Developer privilege	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N
None	N	N	N	N	Y	N	N	Y <sup>4</sup>	N	N	N	N	N	N	N	N

Table notes:	<ol style="list-style-type: none"><li>1. Applies to non-owners only.</li><li>2. Any tables.</li><li>3. Author of at least one table in relationship.</li><li>4. Only when read permission for columns used in the relationship.</li><li>5. With edit permission.</li></ol>
	<i>Create/Edit WS</i>
	<i>Create View</i>
	<i>Create Connection</i>
	<i>Modify Col. Props.<sup>1</sup></i>
	<i>Download Data</i>
	<i>Share within Group</i>
	<i>Share with all users</i>
	<i>Manage and bypass RLS rules</i>
	<i>CrUD Relationships</i>
	<i>Read Relationships</i>
	<i>See Hidden Cols</i>
	<i>Join with Upload Data</i>
	<i>Schema Viewer</i>
	<i>Use Scheduler</i>
	<i>Use Auto-Analyze</i>
	<i>Access Developer Portal</i>

## Related information

- [Add a group and set security privileges \[See page 40\]](#)
- [Add a user \[See page 52\]](#)

# Create, edit, or delete a group

**Summary:** ThoughtSpot has intuitive and powerful user group management for assigning privileges, user selection, multi-tier subgroups, default Liveboard assignment, and emailing.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

Before adding users, create the groups to which they belong. Each group includes a set of privileges for its users.

## Create a group

To create a group and add privileges for the group, follow these steps:

1. Navigate to the Admin Console by clicking on the **Admin** tab from the top navigation bar.
2. Select **Groups** from the side navigation bar that appears.

Display Name	Name	Created At	Default pinboards
A Administration Group	Administrator	7 years ago	0
A Analyst Group	Analyst	7 years ago	0
C Consumer Group	Consumer	7 years ago	0
D Data Downloader Group	DataDownloader	7 years ago	0

3. Click the **+ Add Group** button on the upper left-hand side of the list of groups.
4. In the **Add a new group** modal, enter the details for the new group:

### Add a new group

Group name *	Sales EMEA
Display name *	Sales EMEA
Sharing visibility *	SHARABLE
Description	
Privileges	<input type="checkbox"/> Can administer ThoughtSpot <input checked="" type="checkbox"/> Can upload user data <input checked="" type="checkbox"/> Can download data <input type="checkbox"/> Has Developer privilege <input type="checkbox"/> Can share with all users <input type="checkbox"/> Can manage data <input type="checkbox"/> Can use experimental features <input type="checkbox"/> Can invoke Custom R Analysis <input type="checkbox"/> Can schedule pinboards <input type="checkbox"/> Has SpotIQ privilege <input type="checkbox"/> Can administer and bypass RLS

\* Required field

Default Pinboards
Groups
Users

Select default pinboards [i](#)

Steps to setup default pinboards for this group:

1. Create this group
2. Share existing or new Pinboards with this group
3. Edit this group and assign default Pinboards

Cancel
**ADD**

Field	Description
<b>Group name</b>	Enter a unique name for the group.
<b>Display name</b>	Name of the group as it appears in ThoughtSpot.
<b>Sharing visibility</b>	Indicate whether objects can be shared with this group. When set to <b>SHAREABLE</b> , this group is an option in the <b>Share</b> dialog.
<b>Description</b>	Optionally, enter a description.
<b>Privileges</b>	Check the <a href="#">privileges [See page 35]</a> you want to grant to the group. If you add the privilege <b>Has administration privileges</b> to a group, all users in that group can see all the data in ThoughtSpot. Administrators can always see all data sources, and <a href="#">Row level security [See page 103]</a> does not apply to them.

5. You can also add [Groups \[See page 42\]](#) (these would be the subgroups of the group you are editing), [Users \[See page 43\]](#). Also, see [Default Liveboards \[See page 0\]](#).
6. Click **Add** to create the group.

## Default Liveboards

You cannot add default Liveboards to a new user group. You must create it first, and then edit it to add default Liveboards. See [Edit a group > Default Liveboards \[See page 45\]](#).

### Add a new group

Group name \*

Display name \*

Sharing visibility \*

Description

Privileges  Can administer ThoughtSpot  
 Can upload user data  
 Can download data  
 Has Developer privilege  
 Can share with all users  
 Can manage data  
 Can use experimental features  
 Can invoke Custom R Analysis  
 Can schedule pinboards  
 Has SpotIQ privilege  
 Can administer and bypass RLS

\* Required field

Default Pinboards Groups Users

Select default pinboards *i*

Steps to setup default pinboards for this group:

1. Create this group
2. Share existing or new Pinboards with this group
3. Edit this group and assign default Pinboards

Cancel ADD 

## Groups

Follow these steps to assign subgroups to the group:

1. Click the **Groups** tab.
2. Select the groups you want to add in the list by clicking the box next to the group name.
3. You can also use **Search** to find groups by name.

### Add a new group

Group name \* Sales EMEA

Display name \* Sales EMEA

Sharing visibility \* SHARABLE

Description

Privileges

- Can administer ThoughtSpot
- Can upload user data
- Can download data
- Has Developer privilege
- Can share with all users
- Can manage data
- Can use experimental features
- Can invoke Custom R Analysis
- Can schedule pinboards
- Has SpotIQ privilege
- Can administer and bypass RLS

\* Required field

Default Pinboards Groups Users

No Groups in Group

Q Search by name

Clear all Select all

- Sales Engineering
- Sales Executives
- Sales Reps

Cancel ADD 

## Users

Follow these steps to assign users to the group:

1. Click the **Users** tab.
2. Select the users you want to add in the list by clicking the box next to the user name.
3. You can also use **Search** to find users by name.

### Add a new group

Group name *	Sales EMEA
Display name *	Sales EMEA
Sharing visibility *	SHARABLE
Description	
Privileges	<input type="checkbox"/> Can administer ThoughtSpot <input checked="" type="checkbox"/> Can upload user data <input checked="" type="checkbox"/> Can download data <input type="checkbox"/> Has Developer privilege <input type="checkbox"/> Can share with all users <input type="checkbox"/> Can manage data <input type="checkbox"/> Can use experimental features <input type="checkbox"/> Can invoke Custom R Analysis <input type="checkbox"/> Can schedule pinboards <input type="checkbox"/> Has SpotIQ privilege <input type="checkbox"/> Can administer and bypass RLS

\* Required field

No User in Group

**User**

- user\_sharing\_82
- user\_sharing\_83
- user\_sharing\_84
- user\_sharing\_85
- user\_sharing\_86
- user\_sharing\_87
- user\_sharing\_88
- user\_sharing\_89
- user\_sharing\_90
- user\_sharing\_91

Cancel
ADD

## Edit a group

After adding a group, you can edit its settings to add or revoke privileges. The new settings apply to all group members.

To edit an existing group, follow these steps:

1. Navigate to the Admin Console by clicking on the **Admin** tab from the top navigation bar.
2. Select **Groups** from the side navigation bar that appears.

Display Name	Name	Created At	Default pinboards
A Administration Group	Administrator	7 years ago	0
B Analyst Group	Analyst	7 years ago	0
C Consumer Group	Consumer	7 years ago	0
D Data Downloader Group	DataDownloader	7 years ago	0

3. Find the group you want to edit in the list, and click its name.

If you don't immediately see the name of the group, try searching for it.

4. You can change the [Group name \[See page 41\]](#), [Display name \[See page 41\]](#), [Sharing visibility \[See page 0\]](#), [Description \[See page 41\]](#), and the selected [Privileges \[See page 41\]](#).

Here, we added the `Can manage data` privilege.

The screenshot shows the 'Edit group' interface. On the left, there are fields for 'Group name \*' (Sales EMEA), 'Display name \*' (Sales EMEA), 'Sharing visibility \*' (SHARABLE), and a 'Description' field. Below these is a 'Privileges' section containing a list of checkboxes. The 'Can manage data' checkbox is checked and highlighted with a blue border. Other options include 'Can administer ThoughtSpot', 'Can upload user data', 'Can download data', 'Has Developer privilege', 'Can share with all users', 'Can use experimental features', 'Can invoke Custom R Analysis', 'Can schedule pinboards', 'Has SpotIQ privilege', and 'Can administer and bypass RLS'. At the bottom of the Privileges section is a note: '\* Required field'. On the right, there are tabs for 'Default Pinboards', 'Groups', 'Users', and 'Email'. Under 'Default Pinboards', there is a search bar and a list of pinboards: AE Pinboard, Activity Dashboard (which is checked), Campaign Dashboard, Deal Flow Analysis, Demo - Customer Sales Metrics, Free Trial Usage Analysis, Marketing Attribution, Marketing Demand Generation, and Marketing Funnel. At the bottom right are 'Cancel' and 'Update' buttons, with a cursor pointing at the 'Update' button.

You can also make changes to the [Default Liveboards \[See page 45\]](#), [Groups \[See page 46\]](#) (these would be the subgroups of the group you are editing), [Users \[See page 47\]](#), or [Email \[See page 48\]](#).

5. Make your changes, and click **Update**.

## Default Liveboards

To assign default Liveboards to groups, follow these steps:

1. Create a group, or choose an existing group. Note its name.

2. In the **Liveboards** interface, find the correct Liveboards, and share them with this group.  
See [Share a Liveboard \[See page 87\]](#).
3. Open the Group for editing. See [Edit a group \[See page 44\]](#).
4. Click the **Default Liveboards** tab.
5. From the list of shared Liveboards, select 1-3 default Liveboards in the list by clicking the box next to the Liveboard name.
6. You can also use **Search** to find Liveboards by name.
7. Click **Update** to save changes.

## Groups

When editing a group, keep in mind that only subgroups or possible subgroups appear in the list of groups. The **No Groups in Group** only indicates there are no children in this group's hierarchy. Do not underestimate the importance of the parent(s) of the group, because each group inherits the privileges of each of its parent groups.

Follow these steps to change subgroups of the group:

1. Click the **Groups** tab.
2. Select the groups you want to add in the list by clicking the box next to the group name.
3. You can also use **Search** to find groups by name.
4. Deselect the groups you want to remove from the list by clearing the box next to the group name.
5. Click **Update** to save changes.

### Edit group

Group name \* Sales EMEA

Display name \* Sales EMEA

Sharing visibility \* SHARABLE

Description

Privileges

- Can administer ThoughtSpot
- Can upload user data
- Can download data
- Has Developer privilege
- Can share with all users
- Can manage data
- Can use experimental features
- Can invoke Custom R Analysis
- Can schedule pinboards
- Has SpotIQ privilege
- Can administer and bypass RLS

\* Required field

Default Pinboards Groups Users Email

No Groups in Group

Search by name

Clear all Select all

- Sales Engineering
- Sales Executives
- Sales Reps

Cancel Update

## Users

Follow these steps to change the users of the group:

1. Click the **Users** tab.
2. Select the users you want to add in the list by clicking the box next to the user name.
3. You can also use **Search** to find users by name.
4. Deselect the users you want to remove from the list by clearing the box next to the user name.
5. Click **Update** to save changes.

### Edit group

Group name \* Sales EMEA

Display name \* Sales EMEA

Sharing visibility \* SHARABLE

Description

Privileges

- Can administer ThoughtSpot
- Can upload user data
- Can download data
- Has Developer privilege
- Can share with all users
- Can manage data
- Can use experimental features
- Can invoke Custom R Analysis
- Can schedule pinboards
- Has SpotIQ privilege
- Can administer and bypass RLS

\* Required field

Default Pinboards Groups **Users** Email

11 Users in Group

Search by name

Clear all Select all

- user\_sharing\_82
- user\_sharing\_83
- user\_sharing\_84
- user\_sharing\_85
- user\_sharing\_86
- user\_sharing\_87
- user\_sharing\_88
- user\_sharing\_89
- user\_sharing\_9
- user\_sharing\_90
- user\_sharing\_91

Cancel Update

## Email

You can configure groups so that users receive a **welcome email** that introduces them to ThoughtSpot, and initiates the onboarding process.

Follow these steps to configure group-wide emails:

1. Click the **Email** tab.
2. Under **Resend welcome email**, select either either **All users** or **New users**.
3. Enter optional text for the email. Here, we added "Welcome!"
4. To send the email immediately, click **Send**.
5. To test the email, click "Test welcome email"
6. Click **Update** to save changes.

**Edit group**

Group name \* Sales EMEA

Display name \* Sales EMEA

Sharing visibility \* SHARABLE

Description

Privileges

- Can administer ThoughtSpot
- Can upload user data
- Can download data
- Has Developer privilege
- Can share with all users
- Can manage data
- Can use experimental features
- Can invoke Custom R Analysis
- Can schedule pinboards
- Has SpotIQ privilege
- Can administer and bypass RLS

\* Required field

Default Pinboards Groups Users Email

Resend welcome email

All users  New users

Welcome!

Send

Test welcome email

Cancel Update

## Deleting groups

To delete existing groups, follow these steps:

1. Navigate to the Admin Console by clicking on the **Admin** tab from the top navigation bar.
2. Select **Groups** from the side navigation bar that appears.

Display Name	Name	Created At	Default pinboards
A Administration Group	Administrator	7 years ago	0
B Analyst Group	Analyst	7 years ago	0
C Consumer Group	Consumer	7 years ago	0
D Data Downloader Group	DataDownloader	7 years ago	0

3. Select the groups you plan to delete by clicking the box next to the group name.

If you don't immediately see the name of the group, try searching for it.

4. Click **Delete** in the upper left-hand corner.

## List group members

When browsing through users or subgroups, you can often see only a limited list. To check for other users, search for the name of a specific user or subgroup.

## Add multiple users to a group

To add multiple users to a group, you must be on the **Users** interface. Follow these steps:

1. Navigate to the Admin Console by clicking on the **Admin** tab from the top navigation bar.
2. Select **Users** from the side navigation bar that appears.

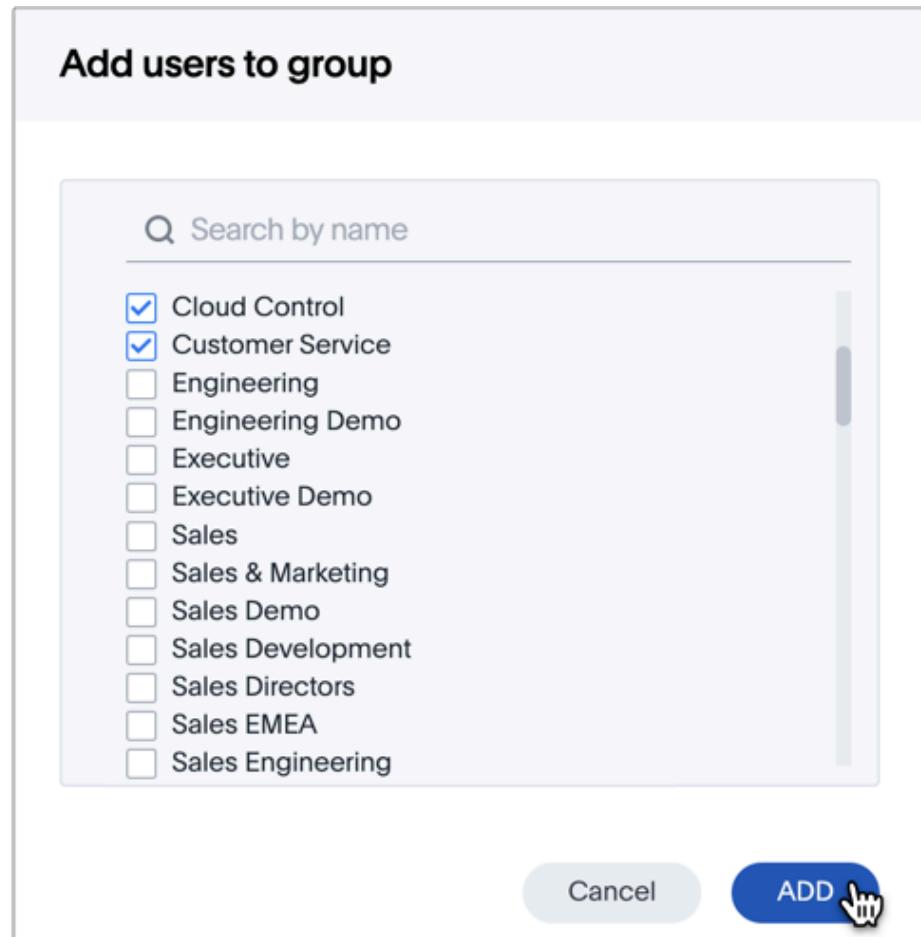
Display Name	Name ↑	Created At
G Guest	guest	7 years ago
G Guest 1	guest1	7 years ago
G Guest 2	guest2	7 years ago
G Guest 3	guest3	7 years ago
G Guest 4	guest4	7 years ago

3. Select the names of users you plan to add to groups by clicking the box next to the user name.

If you don't immediately see the user name, try searching for it.

4. Click the **Add Users to Groups** button on the top of the list of users.
5. In the **Add Users to Groups** interface, select the groups by clicking the box next to the group name.

6. Click **Add**.



# Create, edit, or delete a user

**Summary:** For each unique person who accesses ThoughtSpot, you must create a user account. When you create a user manually in ThoughtSpot, you continue to manage that user in ThoughtSpot.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

You can create users directly in ThoughtSpot, or import users and user groups through SAML or similar protocols.

For users who have access through SAML, the SAML installation manages all user information.

## Create a user in ThoughtSpot

This procedure demonstrates how to create a user manually. When you create a user, you can specify the [username \[See page 53\]](#), [display name \[See page 54\]](#), [sharing visibility \[See page 54\]](#), the [password \[See page 54\]](#), [email \[See page 54\]](#), whether they get a [welcome email \[See page 54\]](#) and its [text \[See page 0\]](#), and assign [group \[See page 55\]](#) memberships. The user inherits privileges and permissions directly from the group assignments.

Note that all users automatically belong to the group **All**.

To create a new user and assign that user to groups, follow these steps:

1. Navigate to the Admin Console by clicking on the **Admin** tab from the top navigation bar.
2. Select **Users** from the side navigation bar that appears.

Users			Search
	Display Name	Name ↑	
	Guest	guest	7 years ago
	Guest 1	guest1	7 years ago
	Guest 2	guest2	7 years ago
	Guest 3	guest3	7 years ago
	Guest 4	guest4	7 years ago

3. Click the **+ Add User** button on the upper left-hand side of the list of users.
4. In the **Add a new user** interface, enter the details for the new user:

### Add a new user

Username *	Auser
Display name *	Auser
Sharing visibility *	SHARABLE
Change password *	*****
Confirm password *	*****
Email *	auser@thoughtspot.com
<input checked="" type="checkbox"/> Send a welcome email <div style="border: 1px solid #ccc; padding: 5px; height: 40px; margin-top: 5px;">Welcome!</div>	
<input type="checkbox"/> Manage Data <input type="checkbox"/> Marketing <input type="checkbox"/> Marketing Demo <input checked="" type="checkbox"/> Sales Demo <input checked="" type="checkbox"/> Sales Development <input checked="" type="checkbox"/> Sales Directors <input checked="" type="checkbox"/> Sales EMEA <input checked="" type="checkbox"/> Sales Engineering <input checked="" type="checkbox"/> Sales Executives	
<span style="float: right;"><input type="button" value="Cancel"/> <input style="background-color: #0072bc; color: white; border-radius: 50%; border: none; width: 20px; height: 20px; vertical-align: middle;" type="button" value="ADD"/></span>	

\* Required field

Field	Required?	Description
<b>Username</b>	Yes	A login name for the user. Usernames must be unique and lowercase.

<b>Display name</b>	Yes	A unique name for the user (usually their first and last name).
<b>Sharing visibility</b>	Yes	Indicate whether objects can be shared with this user. When set to <b>SHAREABLE</b> , this user is an option in the <b>Share</b> dialog.
<b>Change password</b>	Yes	<p>A password. Your password must meet the following requirements:</p> <ul style="list-style-type: none"> <li>The password must be 8 characters or more in length.</li> <li>The password must include at least 1 uppercase letter, 1 lowercase letter, 1 number, and 1 special character.</li> <li>The password must pass a complexity test based on an external library. This test ensures password complexity and uniqueness by checking for known patterns or words that are too simple. If the password is not complex enough, ThoughtSpot rejects it, even if it fulfills the other requirements. Refer to the <a href="https://github.com/dropbox/zxcvbn">Dropbox password library</a> (<a href="https://github.com/dropbox/zxcvbn">https://github.com/dropbox/zxcvbn</a>) for more information.</li> <li>The password cannot use certain blocked words. By default, the blocked words are: your username, any part of your display name, and any blocked words your company configures. To add additional words to the blocklist, <a href="#">contact ThoughtSpot Support [See page 292]</a>.</li> </ul>
<b>Confirm password</b>	Yes	Enter the password again.
<b>Email</b>	Yes	<p>The user's email address. ThoughtSpot uses this for notification when another user shares something with them, for onboarding, for the <b>Ask an Expert</b> feature, and others.</p> <p>Note that during cluster configuration, the domain is specified. ThoughtSpot does not accept emails outside this domain. <a href="#">Contact ThoughtSpot Support [See page 292]</a> to whitelist domains.</p>
<b>Send a welcome email</b>	No	When checked, this option ensures that the new user receives a welcome email.

<b>Email message text</b>	No	Enter text of the optional welcome email here.
<b>Groups</b>	Recommended	Select the groups for the user.

Note that if you add the user to a group that has the privilege **Has administration privileges**, they can see all the data in ThoughtSpot.

When you create a new user, the groups they belong to define the following attributes for the user:

- **Privileges:** the actions they can perform, defined when you [Add a group and set security privileges \[See page 40\]](#).
- **Permissions:** the data they can access and view, defined when you consider [Data security \[See page 69\]](#).

Administrators can see all data sources, and [Row level security \[See page 103\]](#) does not apply to them.

5. Click **Add** to create the user.

Note that this process of identifying the user's needs contributes to a robust onboarding process. See [Onboarding users \[See page 32\]](#).

## Edit an existing user

As an administrator, you can edit a user account, and change the user's groups. You can also help users by resetting their password, and evaluating their onboarding experience to ensure they receive the best possible introduction to relevant information in ThoughtSpot.

To edit an existing user, follow these steps:

1. Navigate to the Admin Console by clicking on the **Admin** tab from the top navigation bar.
2. Select **Users** from the side navigation bar that appears.

Display Name	Name	Created At
Guest	guest	7 years ago
Guest 1	guest1	7 years ago
Guest 2	guest2	7 years ago
Guest 3	guest3	7 years ago
Guest 4	guest4	7 years ago

- Click the username in the list to open the **Edit User** interface.

If you don't immediately see the username you plan to edit, try searching for it.

- In the **Edit User** interface, edit the basic user information.

You can change the [username \[See page 53\]](#), [display name \[See page 54\]](#), [sharing visibility \[See page 54\]](#), [passwords \[See page 54\]](#), and [user's email \[See page 54\]](#).

**Edit User**

Username *	Auser
Display name *	Auser
Sharing visibility *	SHARABLE
Change password	
Confirm password	
Email *	auser@thoughtspot.com

**Groups**

6 Groups assigned to User

Q Search by name

Manage Data  
 Marketing  
 Marketing Demo  
 Sales Demo  
 Sales Development  
 Sales Directors  
 Sales EMEA  
 Sales Engineering  
 Sales Executives

[Preview onboarding](#)

Cancel **Update**

\* Required field

You can also [Preview onboarding \[See page 57\]](#), and make changes to the **Groups** [[See page 57](#)] assigned to the user.

5. Click **Update**.

### Preview onboarding

You can click **Preview onboarding** to evaluate this user's first experience with ThoughtSpot. After previewing the user's default data source and Liveboards, you may choose to change the **Group** [[See page 0](#)] assignments.

### Edit User

Username *	Auser
Display name *	Auser
Sharing visibility *	SHARABLE
Change password	
Confirm password	
Email *	auser@thoughtspot.com

**Groups**      Email  
6 Groups assigned to User

Search by name

Manage Data  
 Marketing  
 Marketing Demo  
 Sales Demo  
 Sales Development  
 Sales Directors  
 Sales EMEA  
 Sales Engineering  
 Sales Executives

**Preview onboarding** 

\* Required field

Cancel      Update

### Groups

Follow these steps to change the user's groups:

1. Click the **Groups** tab.
2. Select the groups you want to add in the list by clicking the box next to the group name.

3. You can also use **Search** to find groups by name.
4. Deselect the groups you want to remove from the list by clearing the box next to the group name.
5. Click **Update** to save changes.

**Edit User**

Username *	Auser
Display name *	Auser
Sharing visibility *	SHARABLE
Change password	
Confirm password	
Email *	auser@thoughtspot.com

**Groups**  
7 Groups assigned to User

Search by name

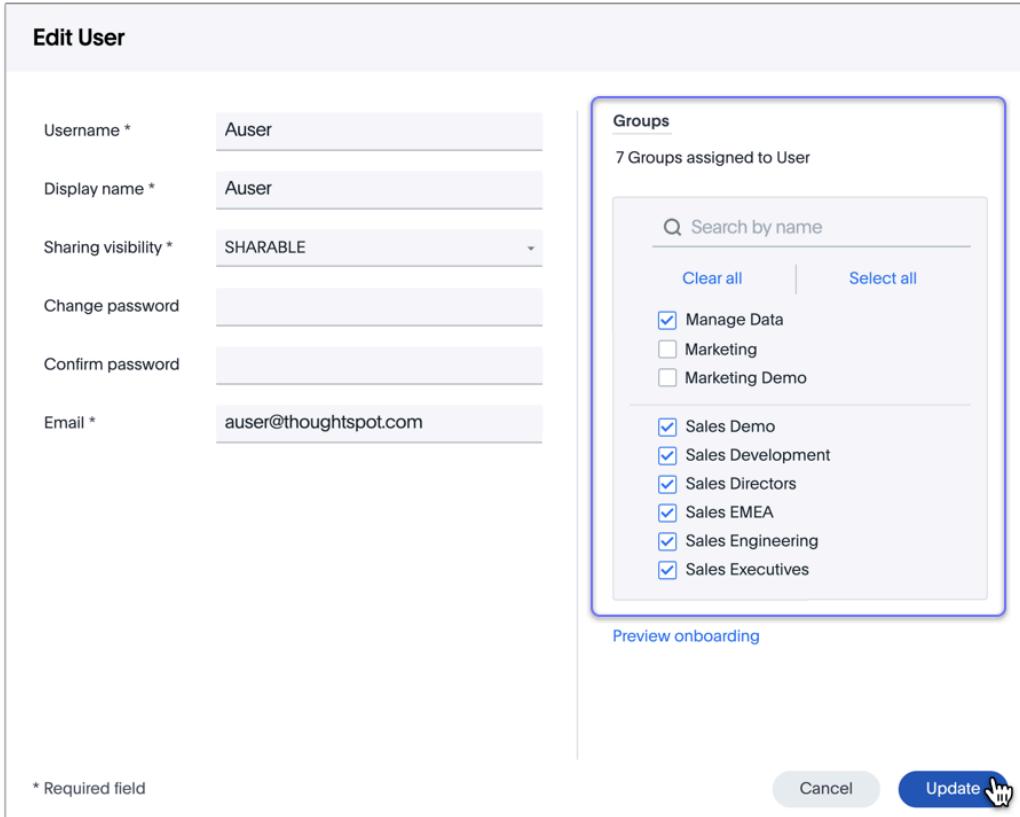
Manage Data  
 Marketing  
 Marketing Demo

Sales Demo  
 Sales Development  
 Sales Directors  
 Sales EMEA  
 Sales Engineering  
 Sales Executives

Preview onboarding

\* Required field

Cancel **Update** 



## Delete users

To delete users, follow these steps:

1. Navigate to the Admin Console by clicking on the **Admin** tab from the top navigation bar.
2. Select **Users** from the side navigation bar that appears.

The screenshot shows the ThoughtSpot Admin interface with the 'User Management' section selected. Under 'User Management', 'Users' is highlighted. The main area is titled 'Users' and contains a table with the following data:

Display Name	Name	Created At
G Guest	guest	7 years ago
G Guest 1	guest1	7 years ago
G Guest 2	guest2	7 years ago
G Guest 3	guest3	7 years ago
G Guest 4	guest4	7 years ago

3. Select the users you plan to delete by clicking the box next to the username.

If you don't immediately see the username you plan to delete, try searching for it.

4. Click **Delete** in the upper left-hand corner.

# Managing user logins and sessions

**Summary:** Learn how to manage user logins and sessions.

## User login

Users can log into ThoughtSpot in several ways: as users with local ThoughtSpot accounts [See page 0] and by using SAML [See page 0]. Refer to [Authentication](#) [See page 0] for more information about ThoughtSpot's authentication options. Administrators can configure their preferred authentication method from the **Admin Console**.

## User sessions

Depending on which version of ThoughtSpot Cloud you first deployed your cluster on, your users' experience with maximum session validity and idle session timeouts may differ.

Clusters deployed on November Cloud 2021 and later

When a user clicks **Remember me** on the login screen:

- **Idle session timeout:** If a user is not active for 14 days, ThoughtSpot logs the user out, and the user must enter their login credentials again.
- **Maximum session validity:** ThoughtSpot forces the user's session to expire after 14 days, even if they are active throughout that period.

When a user does not click **Remember me**:

- **Idle session timeout:** If a user is not active for 30 minutes, ThoughtSpot logs the user out, and the user must enter their login credentials again.
- **Maximum session validity:** No maximum session validity.

Clusters deployed on October Cloud 2021 and earlier

When a user clicks **Remember me** on the login screen:

- **Idle session timeout:** If a user is not active for 60 minutes, ThoughtSpot logs the user out, and the user must enter their login credentials again.

- **Maximum session validity:** ThoughtSpot forces the user's session to expire after 7 days, even if they are active throughout that period.

When a user does not click **Remember me**:

- **Idle session timeout:** If a user is not active for 30 minutes, ThoughtSpot logs the user out, and the user must enter their login credentials again.
- **Maximum session validity:** No maximum session validity.

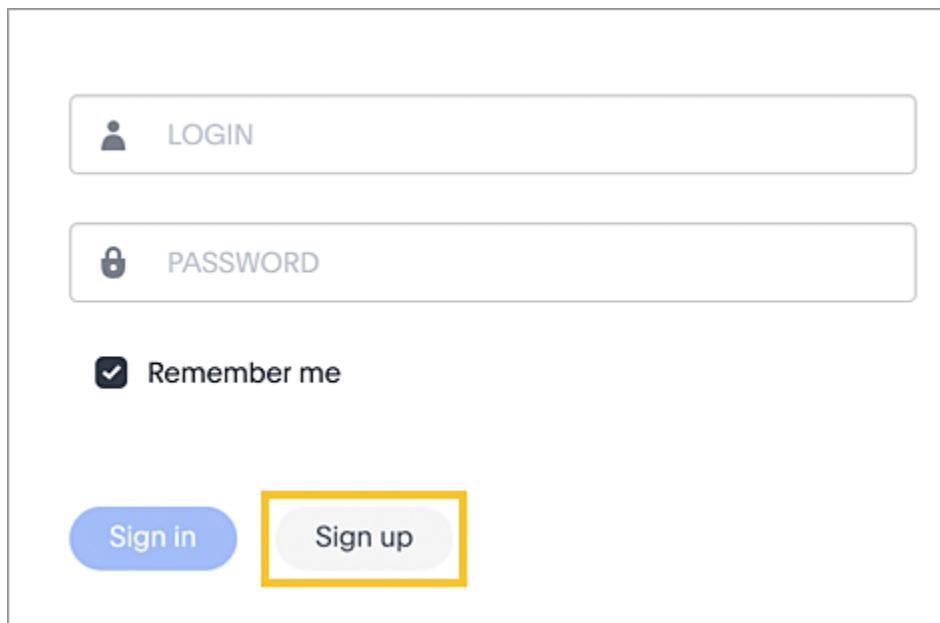
To increase idle session timeouts or maximum session validity, [contact ThoughtSpot Support \[See page 292\]](#).

## Allow users to sign up

**Summary:** Learn how to allow people in your organization to sign up for ThoughtSpot.

You can allow people in your organization to sign up for ThoughtSpot by clicking a button on the sign-in page.

You do this by providing them with the ThoughtSpot sign-up URL. When they go to this URL, they see the sign-up button.



When a person clicks the sign-up button, they go to a sign-up page that you've already set up outside of ThoughtSpot. This can be any page you want to use for registering new users.

## Create the ThoughtSpot sign-up URL

Follow this syntax for creating the URL:

```
https://<your-thoughtspot-URL>/?signUpEnabled=true&signUpButtonLink=https://<your-sign-up-page-URL>
```

Example:

```
https://thoughtspot.mycompany.com/?signUpEnabled=true&signUpButtonLink=https://signup.mycompany.com/  
thoughtspot
```

## Customize the sign-up button text

By default, the button text is 'Sign up', but you have the option to change it. To do that, you add the 'signUpButtonText' parameter to the URL and include the custom text you want. If the text contains spaces, you must replace each space with a percent sign and the number 20 (%20). For example, if you wanted the button text to be 'Request Account', you would use 'Request%20Account'.

Follow this syntax for creating the URL with custom button text:

```
https://<your-thoughtspot-URL>/?signUpEnabled=true&signUpButton  
Text=<your-sign-up-button-text>&signUpButtonLink=https://<your-  
sign-up-page-URL>
```

Example:

```
https://thoughtspot.mycompany.com/?signUpEnabled=true&signUpButtonText=Request%20Account&signUpButtonLink=https/  
thoughtspot
```

## Display the sign-up button by default

If you want to display the sign-up button on the ThoughtSpot sign-in page without using the special sign-up URL, [contact ThoughtSpot Support \[See page 292\]](#).

# Overview of security features

**Summary:** Learn about ThoughtSpot's security features.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

There are several aspects of security, including access and permissions, data security and privacy, and security from an IT perspective.

System security [See page 65] refers to audit logs and security policies.

Data Security [See page 69] refers to which users can see which data in the ThoughtSpot application, and includes:

- Users and Groups [See page 34]
- Privileges [See page 34]
- Table and columns sharing [See page 75]
- Row level security [See page 103]
- Worksheet sharing [See page 79]
- Liveboard sharing [See page 87]

# Collect security logs

**Summary:** Collect security audit logs to monitor user activity in ThoughtSpot and increase your system security.

ThoughtSpot Cloud provides security audit events related to account activities and user actions within ThoughtSpot. These events can help your SOC team detect potential security threats or compromised user accounts in your organization. These human-readable and comprehensive events can be shipped to your SIEM application in near real-time. Security events remain within the system for 30 days. To integrate with your SIEM or view these logs, [contact ThoughtSpot Support \[See page 292\]](#).

ThoughtSpot security events include the following information:

- An event ID
- A unique description of the event (e.g. "A user account was created")
- Timestamp (in UTC) yyyy/mm/dd:hh:mm:ss
- User ID of the person initiating the event
- IP of the user
- Fields specific to the event (e.g. name of the new account)

## Security events

The possible events are:

- [account-logout \[See page 0\]](#)
- [answer-creation \[See page 0\]](#)
- [answer-deletion \[See page 0\]](#)
- [answer-update \[See page 0\]](#)
- [create-rls-rule \[See page 0\]](#)
- [delete-rls-rules \[See page 0\]](#)
- [failed-login \[See page 0\]](#)
- [failed-logout \[See page 0\]](#)
- [group-creation \[See page 0\]](#)
- [group-deletion \[See page 0\]](#)
- [group-modification \[See page 0\]](#)
- [group-principals-update \[See page 0\]](#)
- [locked-account \[See page 0\]](#)

- object-sharing [See page 0]
- password-change [See page 0]
- pinboard-creation [See page 0]
- pinboard-deletion [See page 0]
- pinboard-update [See page 0]
- privilege-change [See page 0]
- profile-change [See page 0]
- successful-login [See page 0]
- table-creation [See page 0]
- update-rls-rule [See page 0]
- user-account-creation [See page 0]
- user-account-deletion [See page 0]
- user-invitation [See page 0]

## Event descriptions

ThoughtSpot defines these events as follows:

### **Account logout**

A user logs out from ThoughtSpot.

### **Answer creation**

A user attempts to create a new answer.

### **Answer deletion**

A user attempts to delete an answer.

### **Answer update**

A user attempts to modify an existing answer.

### **Row-level security (RLS) rule creation**

A user creates an RLS rule on a table.

### **RLS rule deletion**

A user deletes an RLS rule on a table.

### **Failed login**

A user fails to log in due to an incorrect password, or IdP/ADP deny the authentication request.

### **Failed logout**

User logout failed.

### **Group creation**

A user creates a new group, either manually through the Admin Portal, or through the internal API.

### **Group deletion**

A user deletes a group, either manually through the Admin Portal, or through the internal API.

### **Group modification**

A user modifies the properties of a group, either in Admin Portal or over internal API. (Properties include group name, display name, and sharing visibility.)

### **Group principals update**

A user successfully or unsuccessfully attempts to add or remove users or groups from a group.

### **Locked account**

A local user fails to authenticate \_x\_ times in a row, locking the account. Administrators can configure the number of authentication attempts before lockout within ThoughtSpot.

### **Object sharing**

A user successfully or unsuccessfully attempts to share an object (Pinboard, Worksheet, Answer) with another user or group.

### **Password change**

A user successfully or unsuccessfully attempts to change their password.

### **Pinboard creation**

A user attempts to create a new Pinboard.

### **Pinboard deletion**

A user attempts to delete a Pinboard.

### **Pinboard update**

A user attempts to modify an existing Pinboard.

### **Privilege change**

A user adds or removes one or several privileges from a group.

### **Profile change**

A user profile changes, either manually in the Admin Portal or over SAML sync.

### **RLS rule update**

A user modifies an RLS rule on a table.

### **Successful login**

A local, IdP or AD user logs in to ThoughtSpot.

### **Table creation**

A user attempts to create a new table.

### **User account creation**

A new user creates an account, either manually in the Admin Portal or through the internal API.

### **User account deletion**

A user account is deleted, either manually in the Admin Portal or through the internal API.

**User invitation**

A user is invited to ThoughtSpot for a free trial.

# Data security

**Summary:** Data security refers to which users can see which data in the ThoughtSpot application.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

Sharing and security privileges govern what data a user can access and what they can do with the data. Admins can use privileges to regulate access to information and provide a personalized user experience.

## Users, groups, and privileges

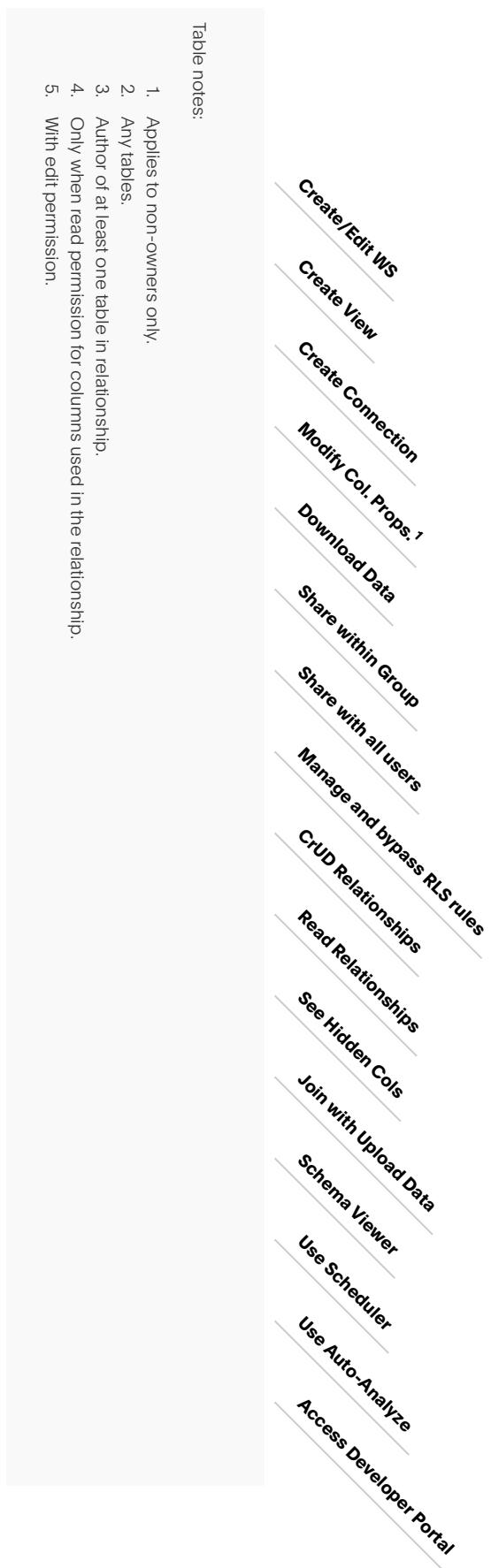
Data security applies to users and groups. Users can be managed [manually \[See page 34\]](#). Each user can have membership in one or more groups. Admins can make security settings that determine what users are allowed to do in ThoughtSpot. These settings are applied at the group level.

The following table shows the intersection of user privilege and ability:

	Create/Edit WS	Create View	Create Connection	Modify Col. Props. <sup>1</sup>	Download Data	Share within Group	Share with all users	Manage and bypass RLS rules	CrUD Relationships	Read Relationships	See Hidden Cols	Join with Upload Data	Schema Viewer	Use Scheduler	Use Auto-Analyze	Access Developer Portal
Can administer ThoughtSpot	Y	Y	Y	Y	Y	Y	Y	Y <sup>2</sup>	Y	Y	Y	Y	Y	Y	Y	Y
Can download data	N	N	N	N	Y	Y	N	Y <sup>4</sup>	N	Y <sup>4</sup>	N	N	N	N	N	N
Can manage data	Y	Y	Y	Y	N	Y	N	Y <sup>4</sup>	Y <sup>4</sup>	Y <sup>5</sup>	Y	N	N	N	N	N
Can share with all users	N	N	N	N	Y	Y	N	Y <sup>4</sup>	N	N	N	N	N	N	N	N
Has SpotIQ privilege	N	N	N	N	N	N	N	Y <sup>4</sup>	N	N	N	N	N	Y	N	N
Can Administer and Bypass RLS	N	N	N	N	N	Y	N	Y	N	N	N	N	N	N	N	N
Has Developer privilege	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N
None	N	N	N	N	Y	N	N	Y <sup>4</sup>	N	N	N	N	N	N	N	N

Table notes:

1. Applies to non-owners only.
2. Any tables.
3. Author of at least one table in relationship.
4. Only when read permission for columns used in the relationship.
5. With edit permission.



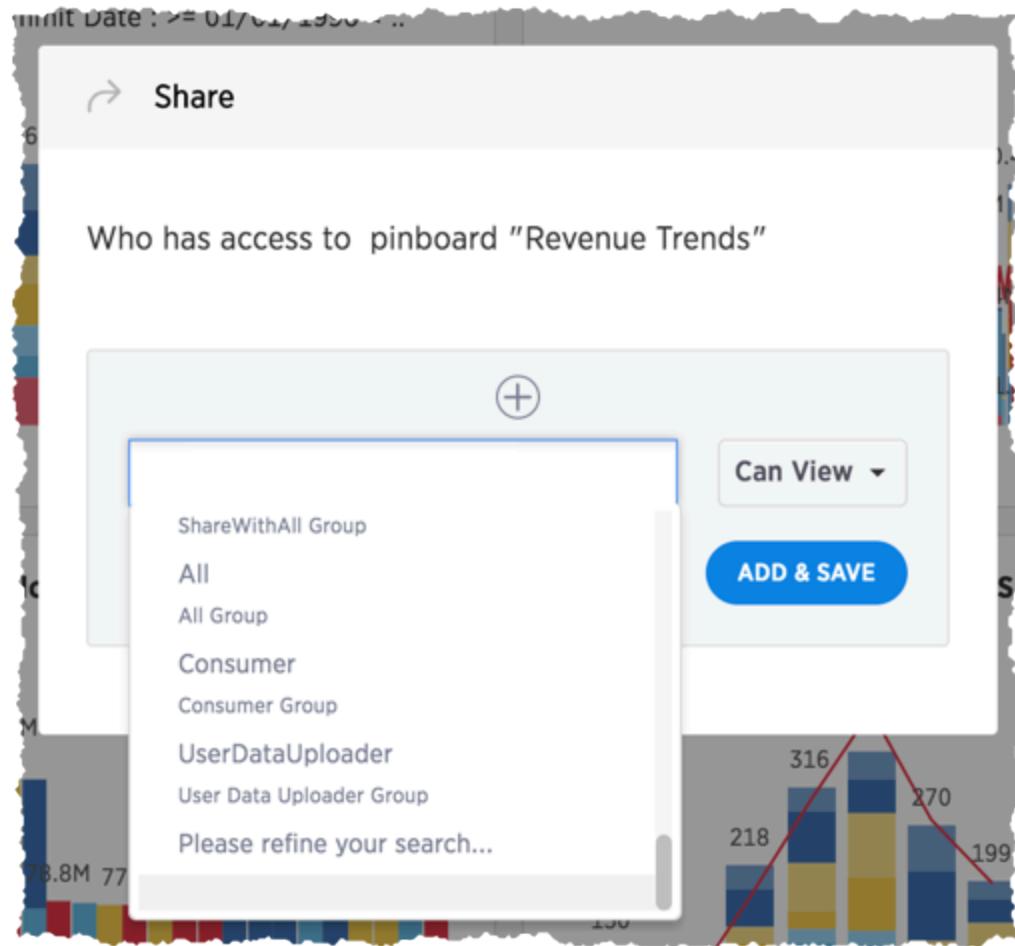
## Security model for sharing objects

You can share with groups and with individual users. Sharing of tables can be defined at the table, column, or row level. This provides flexibility in modeling your data security policy. Security and sharing settings apply to several different types of objects, each of which has its own security default settings and rules.

Object type	Description	Default security model
Tables	The source data tables that have been loaded using ThoughtSpot Loader.	Administrator users have access to source tables. They can share a table with other users or groups. See [Share tables and columns](share-source-tables.html#)
Columns	The columns in the source data tables that have been loaded using ThoughtSpot Loader.	Administrator users have access to columns in the source tables. They can share selected columns with other users or groups. See [Share tables and columns](share-source-tables.html#)
Rows	The rows in the source data tables that have been loaded using ThoughtSpot Loader.	All rows in the source tables are shared with all users by default.
Imported data	Data that was imported using a Web browser.	Only the user who imported the data (and any user with administrator privileges) has access to it by default. They can share a table (or selected columns) with other users or groups. See [Share tables and columns](share-source-tables.html#)
Worksheets	A worksheet created using a Web browser.	Only the creator of the worksheet (and any user with administrator privileges) has access to it by default. They can share a worksheet with other users or groups. See [Share worksheets](share-worksheets.html)
Liveboards	A Liveboard of saved search results.	Anyone who can view a Liveboard can share it. See [Share a Liveboard](share-pinboards.html)

## Understanding SHAREABLE

When you share an object, only the users and groups that have **SHAREABLE** set for the **Sharing visibility** option appear on the dialog.



Only users in the **Administrators** group or users with **Admin** privileges can share with groups marked as **NOT SHAREABLE**. Members of a group with **Can share with all users** authorization can also share with groups marked as **NOT SHAREABLE**.

Users in groups marked **NOT SHAREABLE** cannot share objects among themselves. In multi-tenant scenarios, admins can create groups that bring together portions of two non-share groups so that they can share. For example, the members of group C can share even if they belong to other groups that cannot.

## Row level security

ThoughtSpot includes robust row level security, which allows you to filter all objects users see based on conditions you set at the level of row values in base data tables.

You may find it useful to create groups for RLS. To prevent these groups from appearing in the **Share** dialog, create a **NOT SHAREABLE** group with a single user and an RLS group with another single user (1-to-1).

## Related information

- [Revoke access \(unshare\) \[See page 101\]](#)
- [Row level security \[See page 103\]](#)

# Sharing tables and columns

**Summary:** As an administrator, you can share view or edit access to any table.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

By default, when a table is loaded using the ThoughtSpot Loader, ODBC, or JDBC, it is only visible to administrators. Tables imported from a Web browser are visible to administrators and the user who uploaded it. Administrators and owners can share **Can View** or **Can Edit** privileges on tables with other users, who can further share them with others.

When you share a table, you can share the entire table, or specific columns. For column level security (CLS), share only specific columns.

## Permissive or strict sharing

Use caution when sharing tables, because any objects created from that table will have dependencies on it and its underlying structure. Objects created from tables can include worksheets, views, answers, and Liveboards. This means that if a user wants to drop or modify a table, any object that depends upon it must be edited or removed first, to remove the dependency.

For this reason, it is a best practice to only grant the **Edit** permission on a table to a small number of users. If you want to prevent shares from also revealing the columns regardless of where it appears (worksheets, answers, and Liveboards), you can ask [ThoughtSpot Support \[See page 0\]](#) to enable a stricter behavior.

You can share a table or multiple tables [from the Data tab \[See page 75\]](#), or share a single table [from within the table \[See page 77\]](#) that you want to share.

## Share from the Data tab

To share a table, worksheet, or view from the **Data** tab, follow these steps.

1. Click **Data** on the top navigation bar.
2. Hover over the dataset you want to share and select it by clicking the empty checkbox that appears.
3. Click **Share**.

The screenshot shows the ThoughtSpot Data interface with the 'Tables' tab selected. A user has selected the 'MarketSpot\_Vendor\_Dimension' table. The 'Share' button is highlighted with a mouse cursor. The table list includes:

Name	Source	Stickers	Materialize Status	Modified	Author
TRIPS_VW		MarketSpot		3 months ago	E Engineering Admin
<input checked="" type="checkbox"/> MarketSpot_Vendor_Dimension		MarketSpot		9 months ago	A Administrator Super-User
<input type="checkbox"/> MarketSpot_Wholesale_Orders_Fact		MarketSpot		9 months ago	A Administrator Super-User
<input type="checkbox"/> MarketSpot_Department_Dimension		MarketSpot		9 months ago	A Administrator Super-User
<input type="checkbox"/> MarketSpot_Sales_Fact		MarketSpot		9 months ago	A Administrator Super-User
<input type="checkbox"/> MarketSpot_Product_Dimension		MarketSpot		9 months ago	A Administrator Super-User
<input type="checkbox"/> MarketSpot_Store_Dimension		MarketSpot		9 months ago	A Administrator Super-User

4. If you are sharing a table, select **Entire Table** or **Specific Columns**. To use Column Level Security (CLS), select **Specific Columns**, and only share the columns the users or groups should have access to.

The screenshot shows the 'Share' dialog box for the 'MarketSpot\_Vendor\_Dimension' table. The 'Specific Columns' option is selected. A list of columns is shown, and a 'Done' button is at the bottom right.

- If you select **Specific Columns**, select the column(s) you want to share, and add the users or groups you want to share the column(s) with. Use this option for Column Level Security (CLS). If you select **Entire Table**, skip to step 6.

**Note:** You cannot click multiple columns at once. You must input the users or groups with whom you want to share for each column.

- Click **+ Add users or groups** and select the users and groups with whom you want to share.

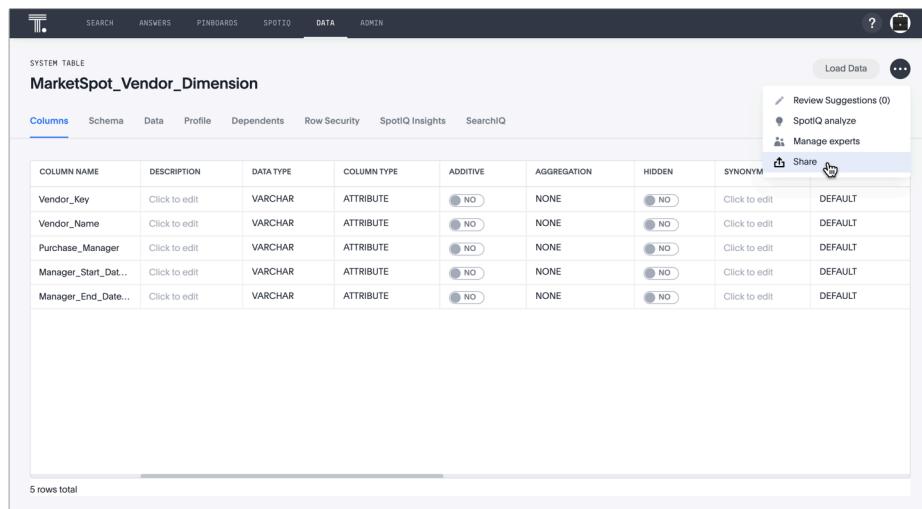
**+ Add users or groups**

- Specify permissions [See page 78].

## Share from within the dataset

To share a table, worksheet, or view from within the dataset, follow these steps.

- Navigate to the dataset you want to share.
- Click the ellipsis icon  , and then click **Share**.



The screenshot shows the ThoughtSpot interface for a 'SYSTEM TABLE' named 'MarketSpot\_Vendor\_Dimension'. The table has 5 rows total. The columns are: COLUMN NAME, DESCRIPTION, DATA TYPE, COLUMN TYPE, ADDITIVE, AGGREGATION, HIDDEN, and SYNONYM. The 'Share' button in the top right corner of the table view is highlighted with a mouse cursor.

COLUMN NAME	DESCRIPTION	DATA TYPE	COLUMN TYPE	ADDITIVE	AGGREGATION	HIDDEN	SYNONYM	
Vendor_Key	Click to edit	VARCHAR	ATTRIBUTE	<input checked="" type="radio"/> NO	NONE	<input checked="" type="radio"/> NO	Click to edit	DEFAULT
Vendor_Name	Click to edit	VARCHAR	ATTRIBUTE	<input checked="" type="radio"/> NO	NONE	<input checked="" type="radio"/> NO	Click to edit	DEFAULT
Purchase_Manager	Click to edit	VARCHAR	ATTRIBUTE	<input checked="" type="radio"/> NO	NONE	<input checked="" type="radio"/> NO	Click to edit	DEFAULT
Manager_Start_Date..	Click to edit	VARCHAR	ATTRIBUTE	<input checked="" type="radio"/> NO	NONE	<input checked="" type="radio"/> NO	Click to edit	DEFAULT
Manager_End_Date..	Click to edit	VARCHAR	ATTRIBUTE	<input checked="" type="radio"/> NO	NONE	<input checked="" type="radio"/> NO	Click to edit	DEFAULT

3. Select the users or groups with whom you want to share.

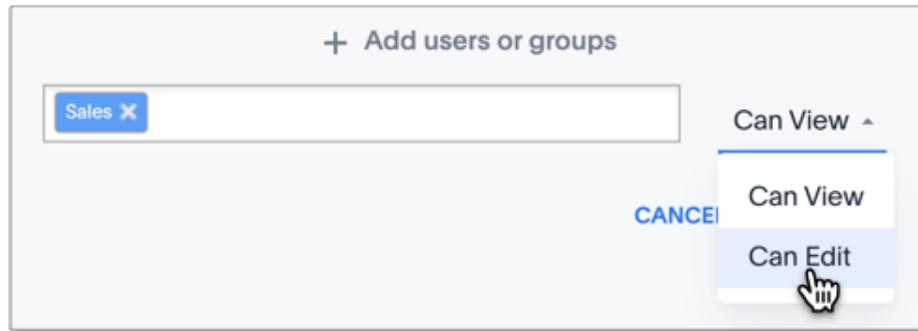
You can only share the entire dataset. You cannot share individual columns. To share individual columns, share a table [from the Data tab \[See page 0\]](#). You cannot share individual columns for Worksheets or Views.

4. [Specify permissions \[See page 78\].](#)

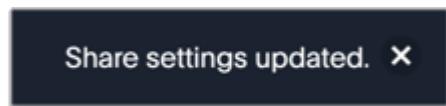
## Specify permissions

1. Configure the level of access by selecting from the dropdown list. You can select:

- **Can View** to provide read-only access. This enables viewing the data source's data. If the data source is a table, **Can View** also enables defining worksheets based on that data.
- **Can Edit** to allow modification. This enables renaming, modifying, or deleting the entire data source and adding or removing its columns.



2. Click **Add**.
3. Click **Done**.
4. The **Share settings updated** notification appears on the bottom of your screen.



# Share worksheets

**Summary:** You can share worksheets with users or with groups.

Sharing a worksheet allows users to select it as a data source and search it.

When you share a worksheet, you give users or groups within your cluster access to the worksheet's data. You share all of its columns. Sharing a worksheet does not share the underlying tables. If you want to share the underlying tables, see [Sharing tables and columns \[See page 75\]](#).

If you want to migrate the worksheet to another cluster, or otherwise export it, see [Migrate or restore worksheets \[See page 219\]](#).

A worksheet can be shared by the owner of the worksheet, or by an administrator. Users can start searching a worksheet as soon as the worksheet is shared with them.

You can share a worksheet from the list of worksheets under **worksheets** on the **Data** tab [See page 79], or from [within the worksheet \[See page 81\]](#).

## Share from the Data tab

To share a table, worksheet, or view from the **Data** tab, follow these steps.

1. Click **Data** on the top navigation bar.
2. Hover over the dataset you want to share and select it by clicking the empty checkbox that appears.
3. Click **Share**.

The screenshot shows the ThoughtSpot interface with the 'DATA' tab selected. Under the 'Tables' section, there is a list of tables. The 'MarketSpot\_Vendor\_Dimension' table is selected, indicated by a blue border around its row. To the left of the table name is a checkbox. To the right are columns for 'Source' (labeled 'MarketSpot'), 'Stickers' (labeled 'MarketSpot'), 'Materialize Status' (labeled '3 months ago'), and 'Author' (labeled 'Engineering Admin'). A search bar and a 'Share' button are visible at the top of the table list.

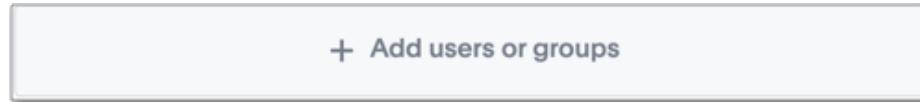
4. If you are sharing a table, select **Entire Table** or **Specific Columns**. To use Column Level Security (CLS), select **Specific Columns**, and only share the columns the users or groups should have access to.

The screenshot shows the 'Share' dialog box overlaid on the main 'Tables' page. The 'MarketSpot\_Vendor\_Dimension' table is selected. In the dialog, the 'Specific Columns' radio button is selected. Below it, the 'Vendor\_Key' column is highlighted with a blue border. Other columns listed are 'Vendor\_Nm', 'Purchase\_Manager', 'Manager\_Start\_Date', and 'Manager\_End\_Date'. A 'Done' button is at the bottom right of the dialog.

5. If you select **Specific Columns**, select the column(s) you want to share, and add the users or groups you want to share the column(s) with. Use this option for Column Level Security (CLS). If you select **Entire Table**, skip to step 6.

**Note:** You cannot click multiple columns at once. You must input the users or groups with whom you want to share for each column.

6. Click **+ Add users or groups** and select the users and groups with whom you want to share.

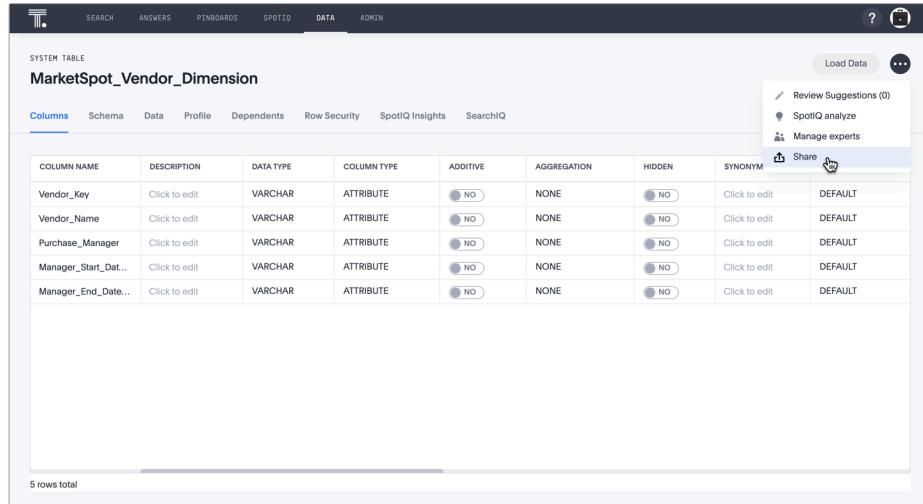


7. Specify permissions [See page 82].

## Share from within the dataset

To share a table, worksheet, or view from within the dataset, follow these steps.

1. Navigate to the dataset you want to share.
2. Click the ellipsis icon  , and then click **Share**.



A screenshot of the ThoughtSpot Data tab interface. At the top, there are tabs: SEARCH, ANSWERS, PINBOARDS, SPOTIQ, DATA (which is selected), and ADMIN. Below the tabs, the title is "SYSTEM TABLE MarketSpot\_Vendor\_Dimension". There is a "Load Data" button and a three-dot ellipsis menu icon. On the right side of the table, there is a vertical toolbar with icons for Review Suggestions (0), SpotIQ analyze, Manage experts, and a Share button, which has a hand cursor icon over it. The main area shows a table with columns: COLUMN NAME, DESCRIPTION, DATA TYPE, COLUMN TYPE, ADDITIVE, AGGREGATION, HIDDEN, and SYNONYM. The table contains five rows of data:

COLUMN NAME	DESCRIPTION	DATA TYPE	COLUMN TYPE	ADDITIVE	AGGREGATION	HIDDEN	SYNONYM
Vendor_Key	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit DEFAULT
Vendor_Name	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit DEFAULT
Purchase_Manager	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit DEFAULT
Manager_Start_Dat...	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit DEFAULT
Manager_End_Date...	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit DEFAULT

5 rows total

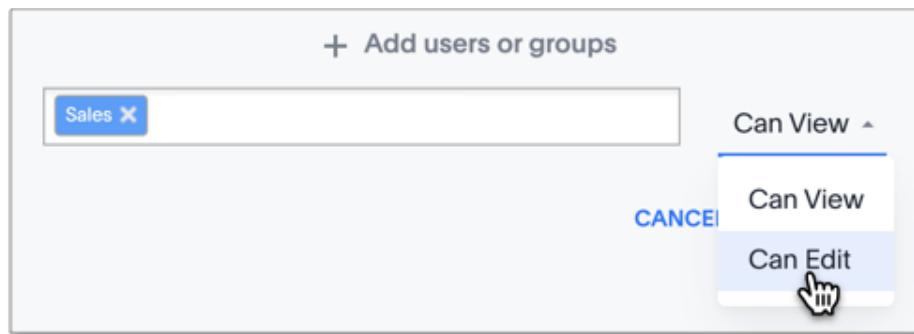
3. Select the users or groups with whom you want to share.

You can only share the entire dataset. You cannot share individual columns. To share individual columns, share a table [from the Data tab \[See page 0\]](#). You cannot share individual columns for Worksheets or Views.

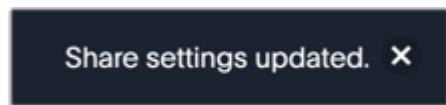
4. Specify permissions [See page 82].

## Specify permissions

1. Configure the level of access by selecting from the dropdown list. You can select:
  - **Can View** to provide read-only access. This enables viewing the data source's data. If the data source is a table, **Can View** also enables defining worksheets based on that data.
  - **Can Edit** to allow modification. This enables renaming, modifying, or deleting the entire data source and adding or removing its columns.



2. Click **Add**.
3. Click **Done**.
4. The **Share settings updated** notification appears on the bottom of your screen.



# Share Views

**Summary:** You can share Views with users or with groups. Sharing a View allows users to select it as a data source and search it.

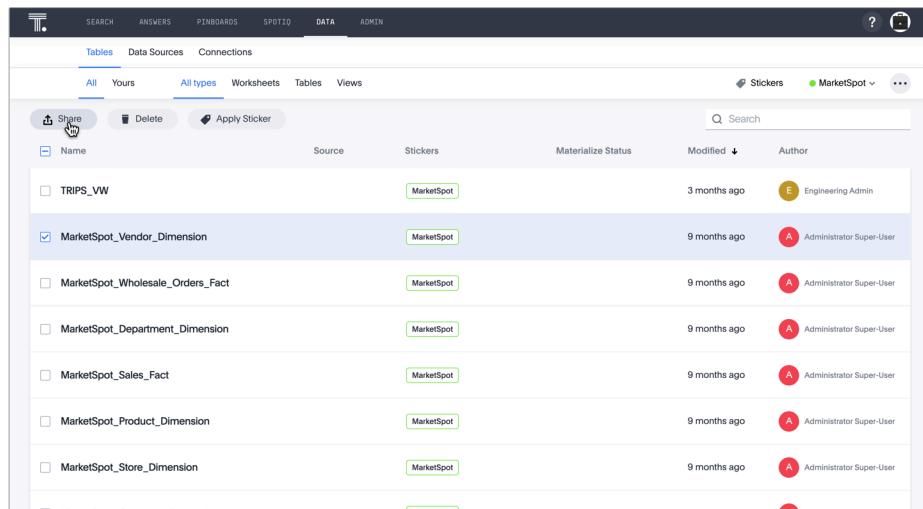
When you share a View, you share all of its data. Sharing a View does not share the underlying tables. If you want to share the underlying tables, see [Sharing tables and columns \[See page 75\]](#). A View can be shared by the owner of the View, or by an administrator. Users can start searching a View as soon as the View is shared with them.

You can share a View from the the list of Views under **Views** on the **Data** tab [See page 83], or from the View itself [See page 84].

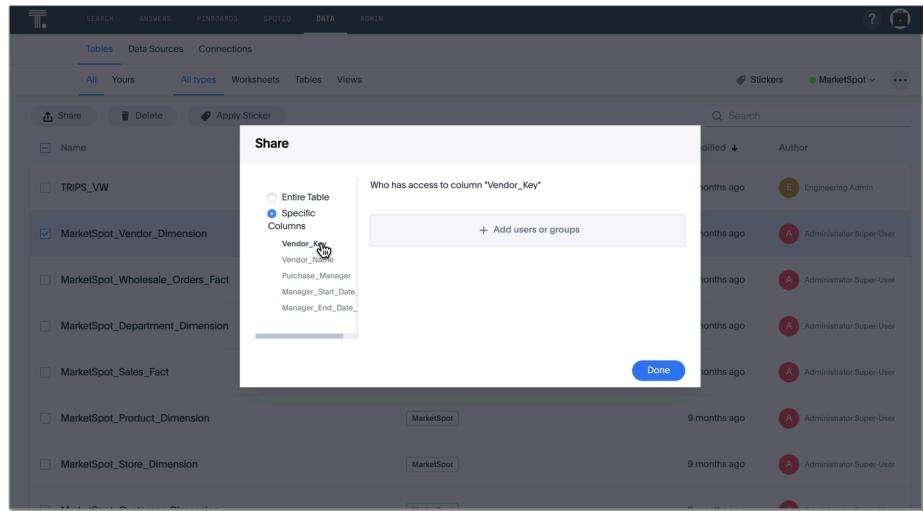
## Share from the Data tab

To share a table, worksheet, or view from the **Data** tab, follow these steps.

1. Click **Data** on the top navigation bar.
2. Hover over the dataset you want to share and select it by clicking the empty checkbox that appears.
3. Click **Share**.



4. If you are sharing a table, select **Entire Table** or **Specific Columns**. To use Column Level Security (CLS), select **Specific Columns**, and only share the columns the users or groups should have access to.



5. If you select **Specific Columns**, select the column(s) you want to share, and add the users or groups you want to share the column(s) with. Use this option for Column Level Security (CLS). If you select **Entire Table**, skip to step 6.

**Note:** You cannot click multiple columns at once. You must input the users or groups with whom you want to share for each column.

6. Click **+ Add users or groups** and select the users and groups with whom you want to share.

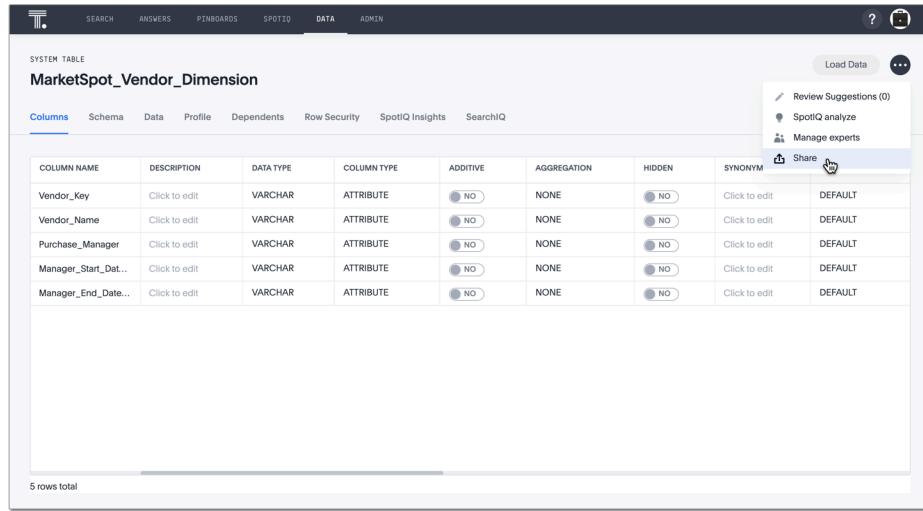
**+ Add users or groups**

7. Specify permissions [See page 85].

## Share from within the dataset

To share a table, worksheet, or view from within the dataset, follow these steps.

1. Navigate to the dataset you want to share.
  
2. Click the ellipsis icon  , and then click **Share**.



The screenshot shows the 'MarketSpot\_Vendor\_Dimension' table in the Data tab. The table has five columns: COLUMN NAME, DESCRIPTION, DATA TYPE, COLUMN TYPE, and several others. The 'Share' button is highlighted with a mouse cursor, indicating the step to click.

COLUMN NAME	DESCRIPTION	DATA TYPE	COLUMN TYPE	ADDITIVE	AGGREGATION	HIDDEN	SYNONYM	Share
Vendor_Key	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Vendor_Name	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Purchase_Manager	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Manager_Start_Date...	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Manager_End_Date...	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT

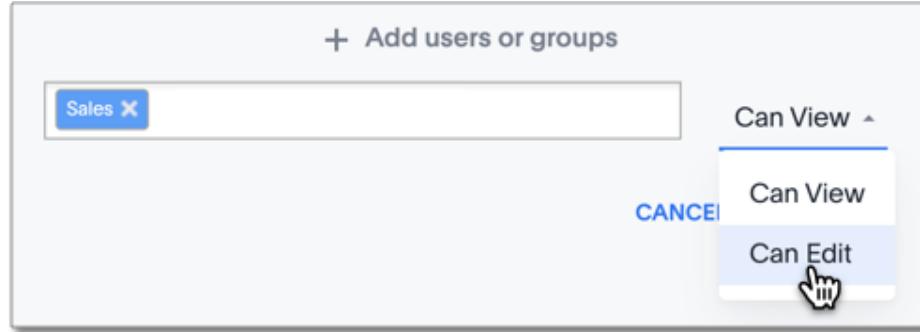
3. Select the users or groups with whom you want to share.

You can only share the entire dataset. You cannot share individual columns. To share individual columns, share a table [from the Data tab \[See page 0\]](#). You cannot share individual columns for Worksheets or Views.

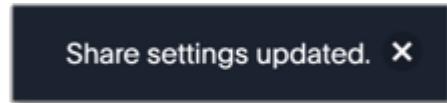
4. [Specify permissions \[See page 85\].](#)

## Specify permissions

1. Configure the level of access by selecting from the dropdown list. You can select:
  - **Can View** to provide read-only access. This enables viewing the data source's data. If the data source is a table, **Can View** also enables defining worksheets based on that data.
  - **Can Edit** to allow modification. This enables renaming, modifying, or deleting the entire data source and adding or removing its columns.



2. Click **Add**.
3. Click **Done**.
4. The **Share settings updated** notification appears on the bottom of your screen.



# Share a Liveboard

**Summary:** Whenever you view a Liveboard you have the option of sharing it with others.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

When you share a Liveboard, you share a live link to the Liveboard that reflects the latest version of it.

When someone else views the Liveboard you shared with them, they see the most recently saved version with the most recent data.

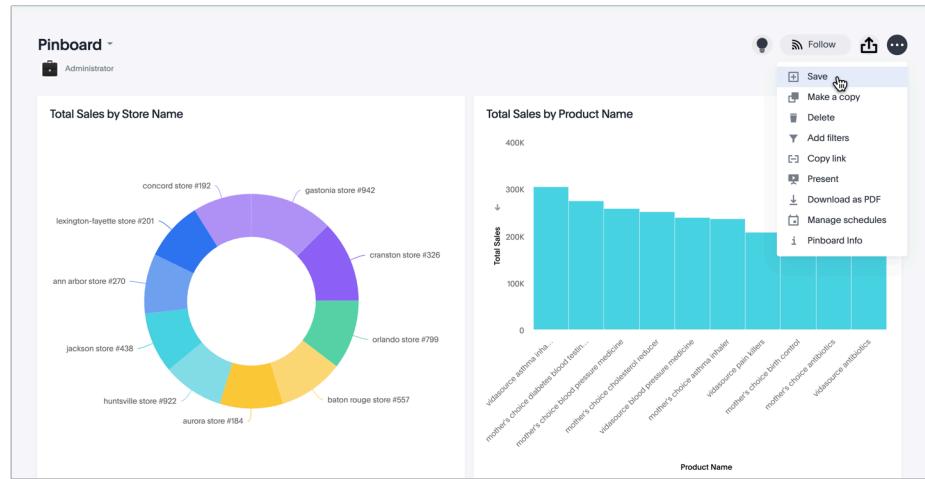
You do not have to be an administrator or the Liveboard's owner to share saved Liveboards. Any user can share them, based on the access levels the user has.

You can share a Liveboard from the list of Liveboards on [the main Liveboards page \[See page 87\]](#), or from [the Liveboard itself \[See page 88\]](#).

## Share from the Liveboards page

To share Liveboards from the main Liveboard page, follow these steps.

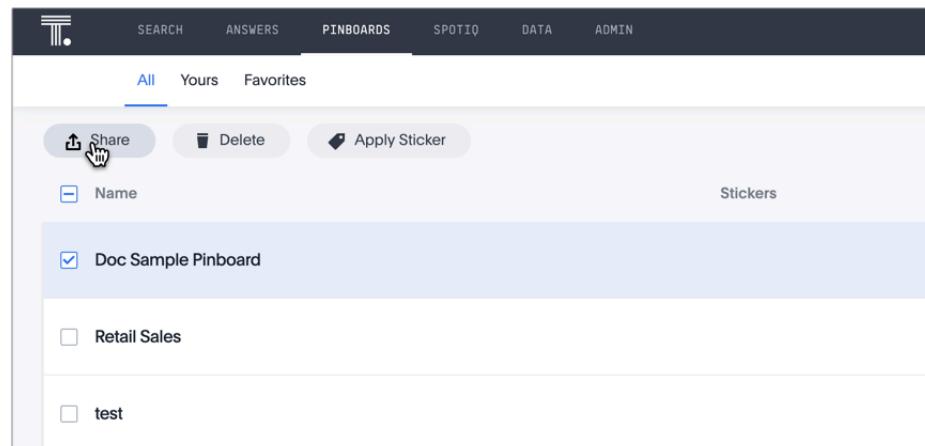
1. Configure the Liveboard(s) to look as it must appear when you share it.
2. Save the Liveboard(s) by clicking the ellipsis icon  , and selecting **Save**.



- Click **Liveboards** on the bar at the top of your screen.



- Select the Liveboard(s) you want to share from the list of Liveboards by hovering over the Liveboard name and clicking the empty check box that appears.
- Click **Share**.



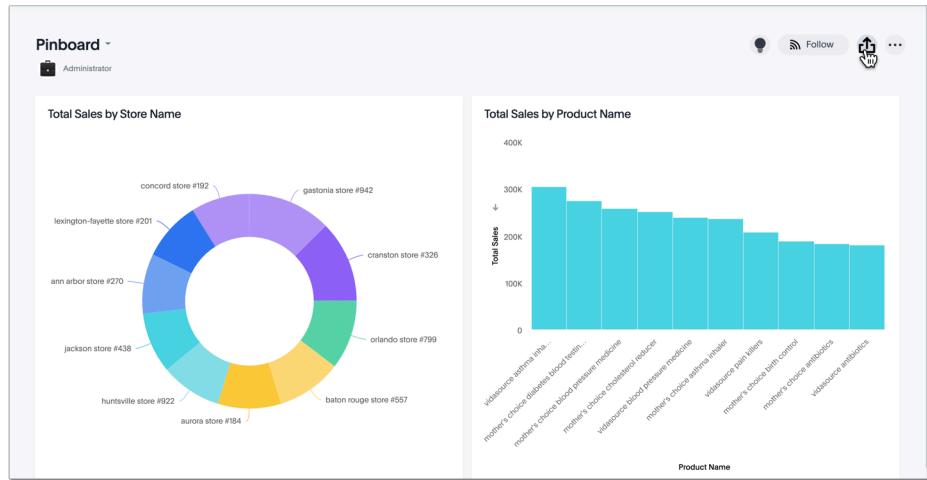
- Specify permissions [See page 90].

## Share from within a Liveboard

To share a Liveboard from within the Liveboard, follow these steps.

1. Configure the Liveboard to look as it must appear when you share it.
2. Save the Liveboard by clicking the ellipsis icon  , and selecting **Save**.

3. Click the sharing icon .



4. Specify permissions [See page 90].

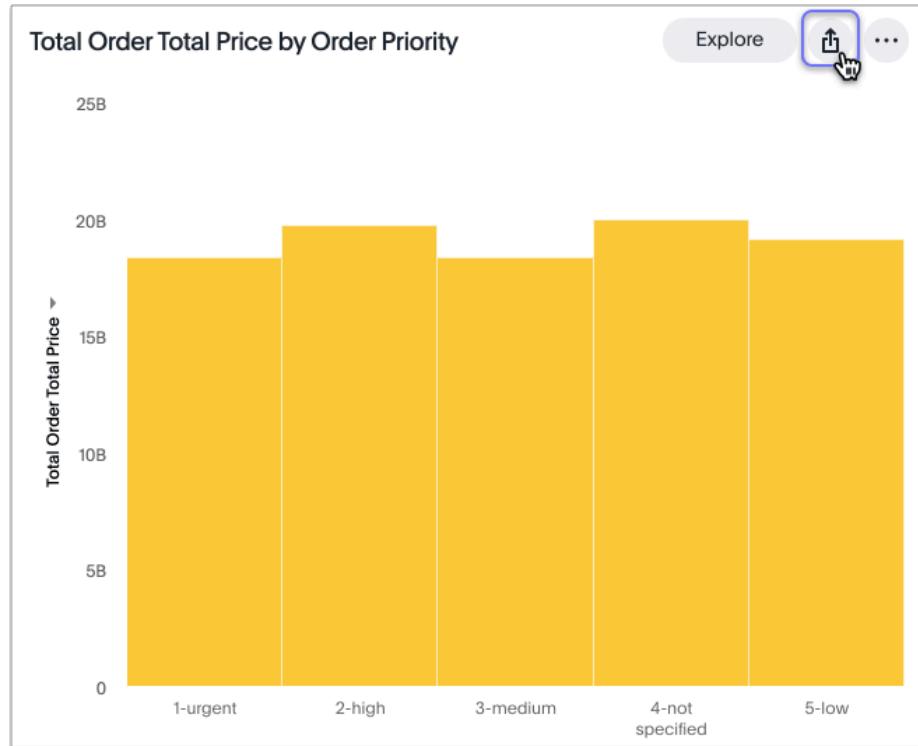
## Share a Liveboard visualization

You can also share a specific visualization within a Liveboard. When you share a Liveboard visualization, the user or group receives an email with a link to that visualization.

Note that sharing a specific visualization within a Liveboard gives users and groups access to the entire Liveboard.

To share a Liveboard visualization, follow these steps:

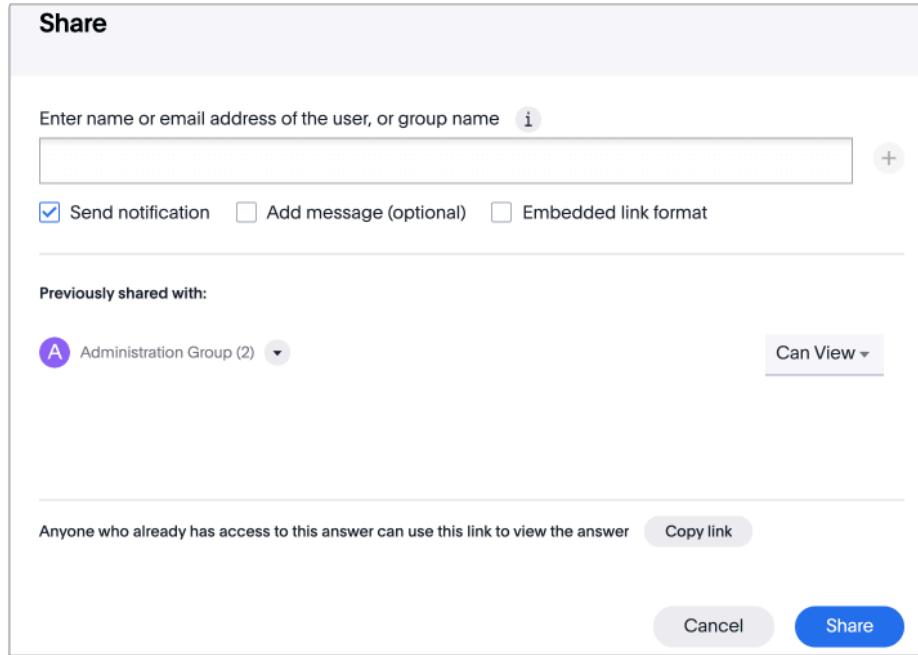
1. Navigate to the Liveboard visualization that you would like to share.
2. Select the sharing icon  that appears when you hover over the visualization.



3. Specify permissions [See page 90].

## Specify permissions

1. After you click the **Share** icon, the sharing dialog box appears.

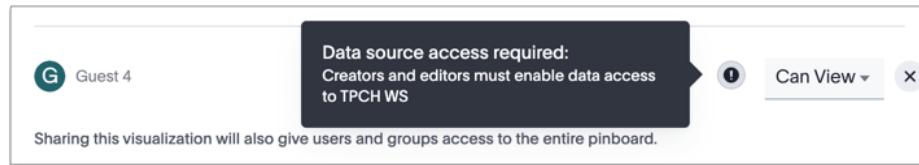


2. Enter users or groups with whom you want to share this object in the text box. To stop sharing with a user or group, click the **x** icon next to the **Permissions** dropdown for that user or group.

Note that you can only enter email addresses whose domains are in your list of allowed domains. These domains appear when you click on the info button **i**.

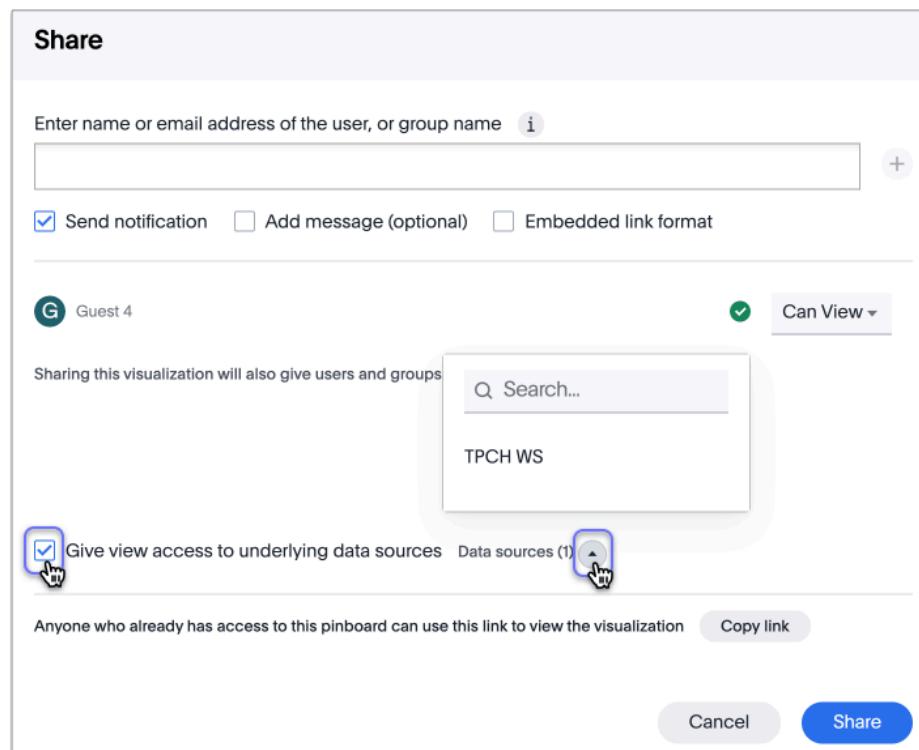
**Tip:** If you want to hide the allowed email domains for your company, or otherwise customize them, contact ThoughtSpot support.

3. Configure the level of access by selecting from the drop-down list. You can select:
  - **Can View** to provide read-only access. If the user doesn't have access to the underlying worksheet, they can only view the shared object.
  - **Can Edit** to allow modification. Enables renaming or deleting the shared object. If a user with edit privileges modifies a shared object, the object saves their changes.
4. If the selected group or user does not have access to the underlying data, you must enable access to the worksheet, view, or table. A black warning symbol appears when you try to share with a user who does not have underlying data access. If you click on it, it tells you to enable access:



If you own the underlying data source, you can enable access through the sharing dialog box. If you do not own the data source, ThoughtSpot emails the owner of the data source or your ThoughtSpot administrator to ask them to share the data.

To enable access, select **Give view access to underlying data sources** at the bottom of the dialog box. You can click on the arrow to view the data sources.

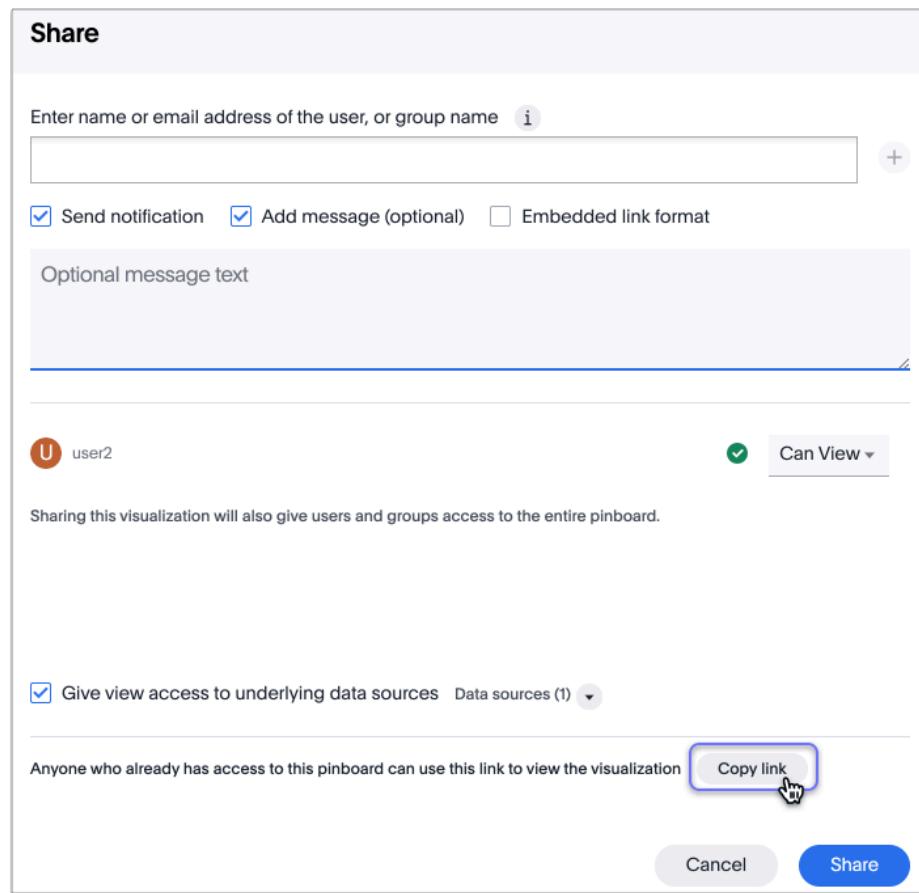


After you enable access, the warning symbol turns into a green checkmark.

5. You can choose to send an email notification and an optional message.
6. If your ThoughtSpot environment is embedded, select **Embedded link format** to generate a URL for your host application context. This option allows you to ensure that the links to the object in email notifications go to the appropriate application URL.

7. You can also copy a direct link to the answer, Liveboard, or visualization within a Liveboard that you are sharing, and separately send that link to users after you share the object with them. Simply click the **Copy link** button at the bottom of the sharing dialog box.

Note that sending users this link does not share the object with them. You must also share the object by clicking the **Share** button at the bottom of the dialog box.



8. Click **Share**.

# Share answers

**Summary:** You do not have to be an administrator or the owner to share saved answers. Any user can share them, based on the access levels the user has.

You do not have to be an administrator or the owner of an Answer to share saved Answers. Whenever you view an Answer, you have the option of sharing it with others. The Answer appears in its most recent state when you share it. For example, if you add a filter after saving the Answer and then share it, the Answer you share has that filter.

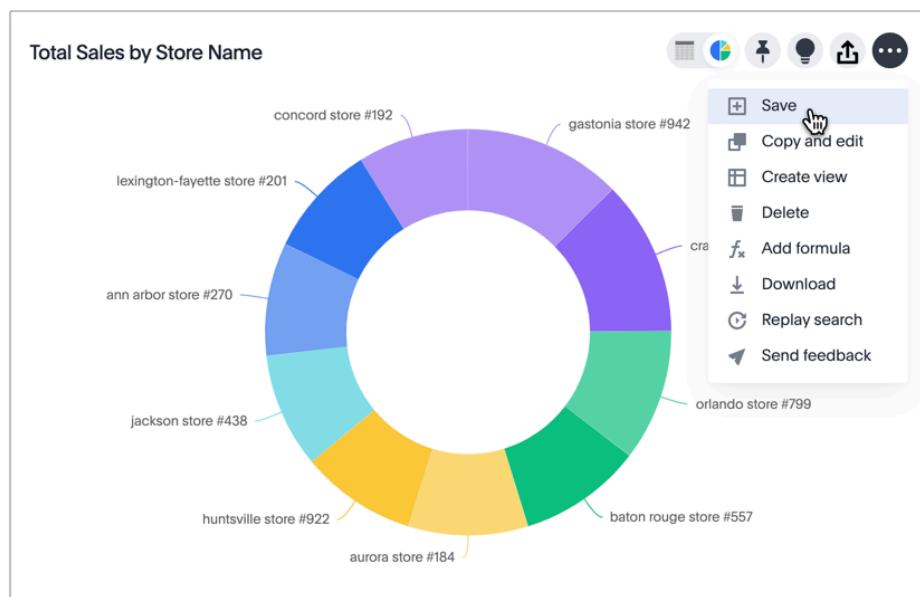
You can share an Answer from the list of Answers on the [main Answers page](#) [See page 94], or from the Answer itself [See page 95].

## Share from the Answers page

To share Answers from the **Answers** page, follow these steps.

1. Configure the Answer(s) to look as it must appear when you share it.

2. Save the Answer(s) by clicking the ellipsis icon  , and selecting **Save**.



3. Click **Answers** on the bar at the top of your screen.

Name	Stickers	Modified	Author
Copy of Sales by State - Last 3 Months		1 week ago	Retail
Product Name, Category Name, Reorder Level, Product Status, Supplier...		1 week ago	Inventory

4. Select the Answer(s) you want to share from the list of Answers by hovering over the Answer name and clicking the empty check box that appears.
5. Click **Share**.

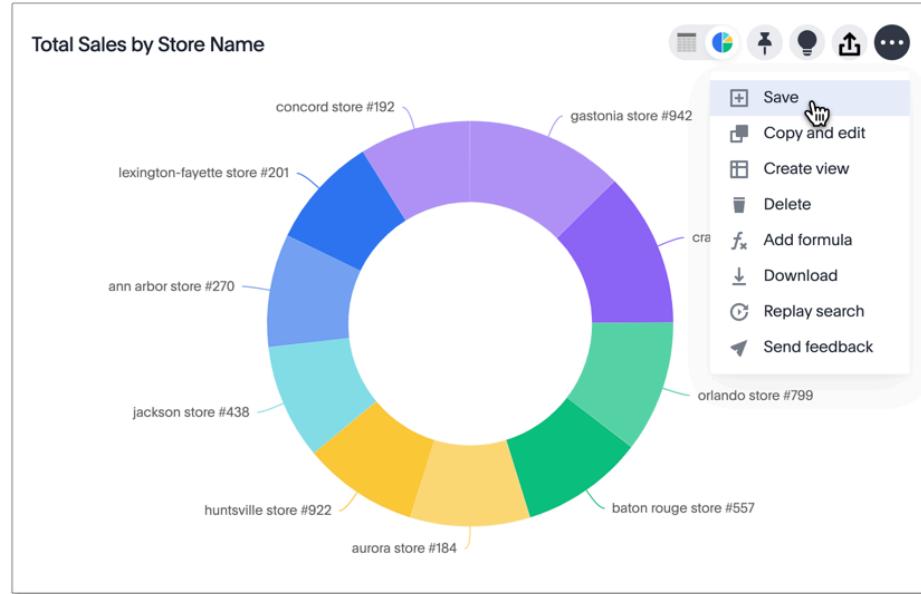
Name	Stickers	Modified	Author
<input checked="" type="checkbox"/> Copy of Sales by State - Last 3 Months		1 week ago	Retail
<input type="checkbox"/> Product Name, Category Name, Reorder Level, Product Status, Supplier...		1 week ago	Inventory

6. Specify permissions. [See page 97]

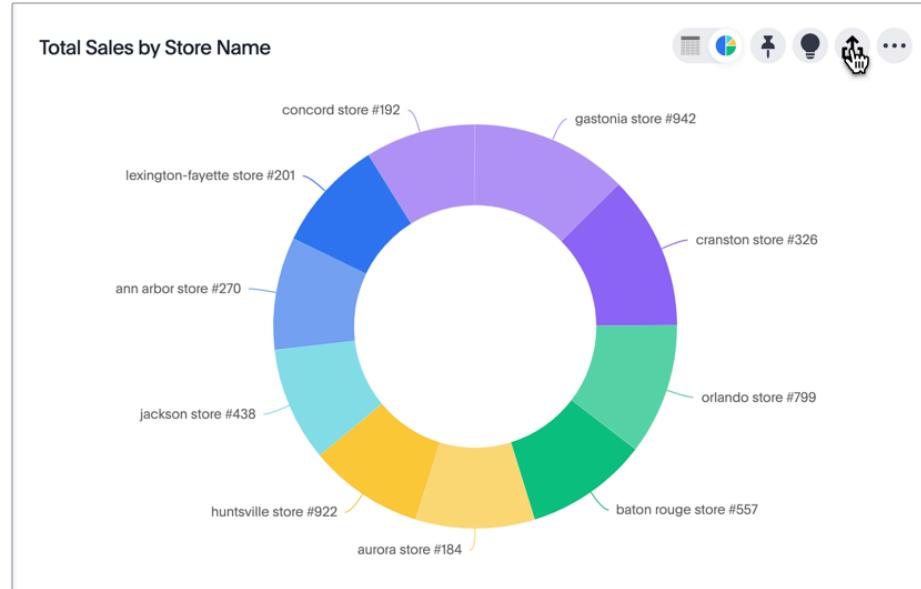
## Share from within the Answer

To share an Answer from within the Answer, follow these steps.

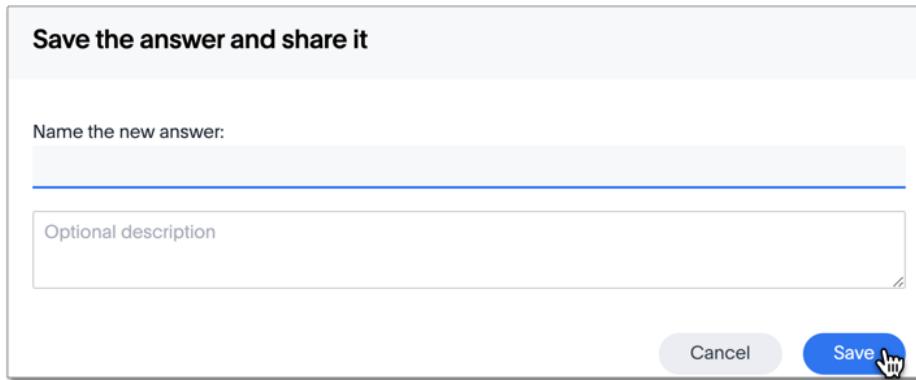
1. Configure the answer to look exactly like it must appear when you share it.
2. Save the answer by clicking the ellipsis icon , and selecting **Save**.



3. Share the answer by clicking the sharing icon .



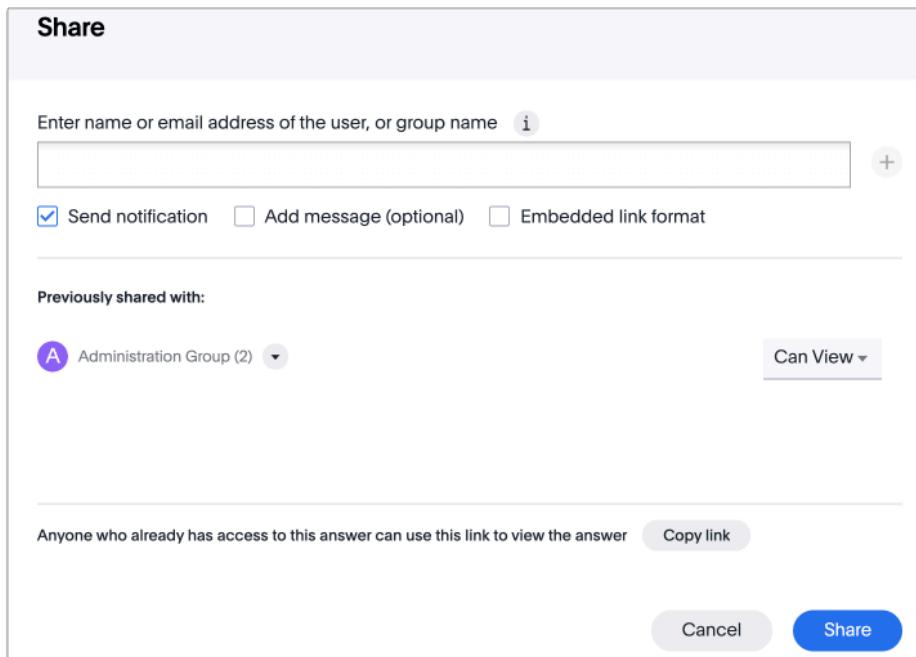
4. If you did not save the answer, ThoughtSpot prompts you to name and save the answer before sharing it.



5. Specify permissions. [See page 97]

## Specify permissions

1. After you click the **Share** icon, the sharing dialog box appears.

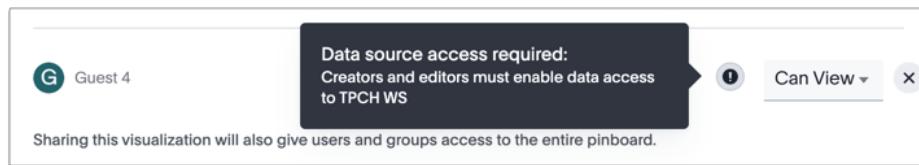


2. Enter users or groups with whom you want to share this object in the text box. To stop sharing with a user or group, click the **x** icon next to the **Permissions** dropdown for that user or group.

Note that you can only enter email addresses whose domains are in your list of allowed domains. These domains appear when you click on the info button **i**.

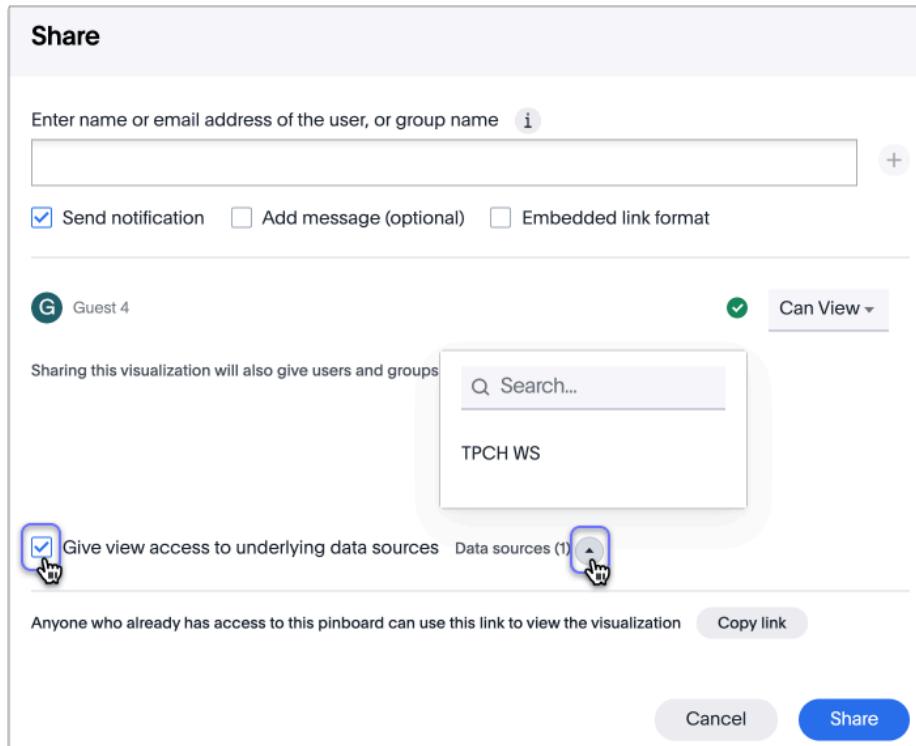
**Tip:** If you want to hide the allowed email domains for your company, or otherwise customize them, contact ThoughtSpot support.

3. Configure the level of access by selecting from the drop-down list. You can select:
  - **Can View** to provide read-only access. If the user doesn't have access to the underlying worksheet, they can only view the shared object.
  - **Can Edit** to allow modification. Enables renaming or deleting the shared object. If a user with edit privileges modifies a shared object, the object saves their changes.
4. If the selected group or user does not have access to the underlying data, you must enable access to the worksheet, view, or table. A black warning symbol appears when you try to share with a user who does not have underlying data access. If you click on it, it tells you to enable access:



If you own the underlying data source, you can enable access through the sharing dialog box. If you do not own the data source, ThoughtSpot emails the owner of the data source or your ThoughtSpot administrator to ask them to share the data.

To enable access, select **Give view access to underlying data sources** at the bottom of the dialog box. You can click on the arrow to view the data sources.



After you enable access, the warning symbol turns into a green checkmark.

5. You can choose to send an email notification and an optional message.
6. If your ThoughtSpot environment is embedded, select **Embedded link format** to generate a URL for your host application context. This option allows you to ensure that the links to the object in email notifications go to the appropriate application URL.
7. You can also copy a direct link to the answer, Liveboard, or visualization within a Liveboard that you are sharing, and separately send that link to users after you share the object with them. Simply click the **Copy link** button at the bottom of the sharing dialog box.

Note that sending users this link does not share the object with them. You must also share the object by clicking the **Share** button at the bottom of the dialog box.

**Share**

Enter name or email address of the user, or group name [i](#)

Send notification  Add message (optional)  Embedded link format

Optional message text

 user2  Can View ▾

Sharing this visualization will also give users and groups access to the entire pinboard.

Give view access to underlying data sources Data sources (1) ▾

Anyone who already has access to this pinboard can use this link to view the visualization [Copy link](#) 

[Cancel](#) [Share](#)

8. Click **Share**.

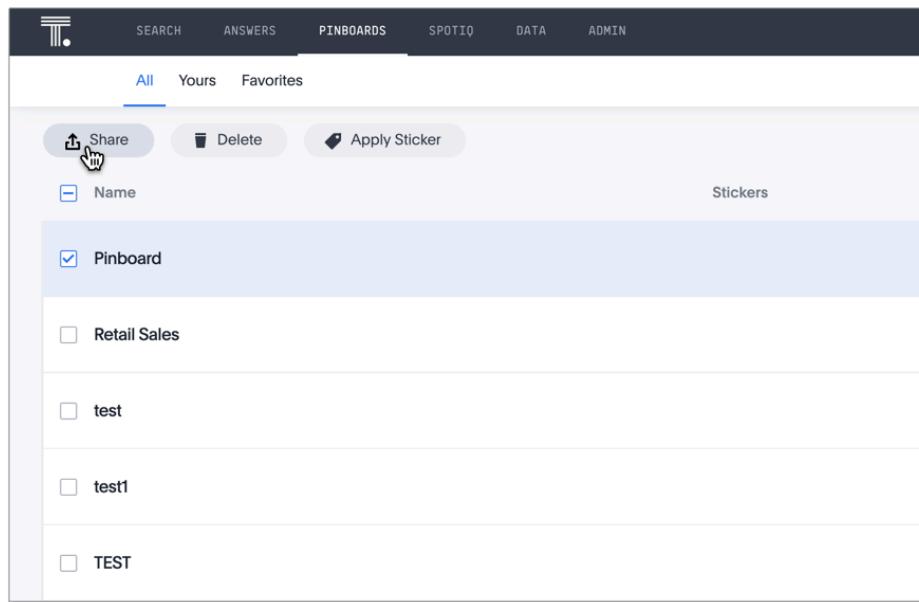
# Revoke access (unshare)

**Summary:** Learn how to revoke access to an object.

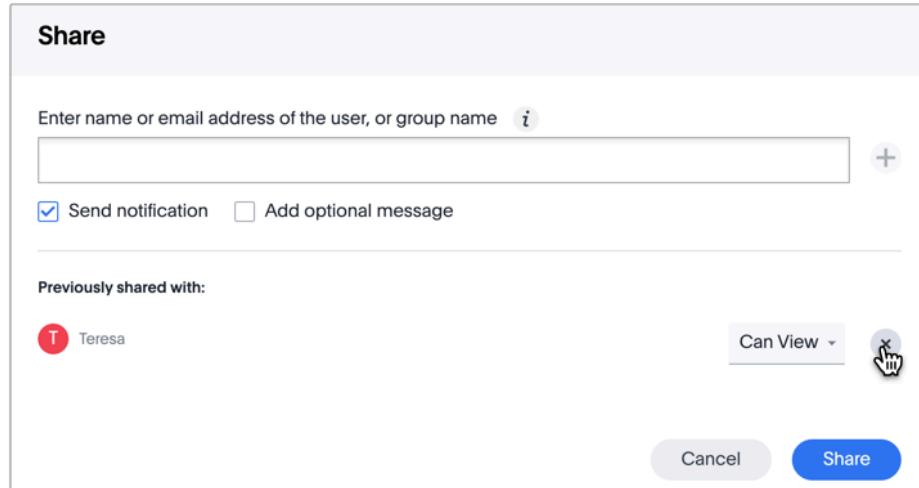
You may need to revoke access to an object (table, worksheet, Liveboard, or answer) that you previously shared. Unsharing an object is very similar to sharing it.

Follow these steps to unshare one or more objects:

1. Navigate to the current section from the top menu bar.
  - If the object is a table or worksheet, click **Data**.
  - If the object is a Liveboard, click **Liveboards**.
  - If the object is an answer, click **Answers**.
2. Hover over the object(s) you want to unshare, and select them by clicking the checkbox to the left of their name.
3. Click the **Share** icon.



4. Hover over a user or group with whom you want to stop sharing the object and click the **X** to remove them.



5. Click **Share** to update sharing permissions, and unshare with the specified users and groups.
6. The **Share settings updated** notification appears on the bottom of your screen.

# About row-level security (RLS)

**Summary:** Using row level security, you can restrict data that appears in search results and Liveboards by group.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

Row-level security (RLS) allows you to restrict a group's access to table row data. You do this by creating a *rule* that associates a filter with a group. When a group member searches, views an answer, or otherwise works with data, ThoughtSpot evaluates the rules and prevents the display of the restricted data. Users see only the data they are permitted to see.

## How does RLS impact user interactions?

The security rules apply to objects shared with users individually or through groups they are a member of. The rules restrict the visible data when users:

- view a table
- view a worksheet derived from the table
- search for data in the worksheet or table
- view answers from restricted data - either that they've created or that were shared with them
- interact with Liveboards from restricted data - either that they've created or that were shared with them

Search suggestions also fall under row-level security. If a user would not have access to the row data, then values from the row do not appear in **Search** suggestions.

If you are using passthrough security for a [Snowflake \[See page 0\]](#) or [Google BigQuery \[See page 0\]](#) connection, search suggestions may not fall under row-level security. When using passthrough security, ThoughtSpot builds the search index on the user who created the connection. This user may have less restrictive row-level-security, or may be able to see all data. Other users may be able to see

search suggestions for columns or values they should not see. They cannot run queries on these columns or values, however. If you are using passthrough security, ThoughtSpot recommends you [turn off indexing \[See page 140\]](#) for sensitive columns.

## Why use RLS?

RLS allows you to set up flexible rules that are self-maintaining. An RLS configuration can handle thousands of groups. There are several reasons you might want to use row level security:

Reason	Example
Hide sensitive data from groups who should not see it.	In a report with customer details, hide potential customers (those who have not yet completed their purchase) from everyone except the sales group.
Filter tables to reduce their size, so that only the relevant data is visible.	Reduce the number of rows that appear in a very large table of baseball players, so that players who are no longer active are not shown except to historians.
Enable creation of a single Liveboard or visualization, which can display different data depending on the group who is accessing it.	Create one sales Liveboard that shows only the sales in the region of the person who views it. This effectively creates a personalized Liveboard, depending on the viewer's region.

## Related information

- To continue learning about RLS, see [How rule-based RLS works \[See page 105\]](#).
- **Search** suggestions relies on compile indices to present suggestions to users from your data. See [Manage suggestion indexing \[See page 140\]](#) to learn how to configure suggestions.

# How rule-based RLS works

**Summary:** Use rule-based RLS to restrict a group's access to data.  
Users see only accessible row data.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

Row-level security works at the group level and is configured on tables. A table's RLS rules also apply to any objects with data from that table. So, searches, answers, worksheets, and Liveboards that rely on a table's data fall under RLS rules.

## Worksheet queries and RLS

You cannot set RLS rules on worksheets, only on tables. However, administrators can disable RLS on worksheets that are derived from tables with RLS rules. After RLS rules are disabled, users with access to the worksheet can see all its data.

By default, worksheet queries only take into account RLS rules on tables whose columns appear in the query. Other related tables that may underly the worksheet are ignored. This means that not all RLS rules on underlying tables are applied when a user queries a worksheet.

You can configure a stricter application of RLS rules to take into account RLS rules from all the tables underlying the worksheet. This is recommended if you have key dimension tables that worksheets rely on but that are not necessarily regularly accessed through query. To do this, contact ThoughtSpot Customer Support.

## Privileges that allow users to set, or be exempt from, RLS

Users in the **Administrators** group or with the **Has administration privilege** have full access to everything in the system. As a result:

- Row level security does not apply to them.
- They can create, edit, and delete RLS rules.

- They can also disable RLS rules on individual worksheets.

If your installation has enabled the **Can Administer and Bypass RLS** privilege, administrators can also grant **Can Administer and Bypass RLS** to groups. Members of groups with **Can Administer and Bypass RLS**:

- Are exempt from row-level security (RLS) rules.
- Can add/edit/delete existing RLS rules.
- Can check or uncheck Bypass RLS on a worksheet.

This behavior is true regardless of whether the privilege is from a direct group membership or indirect (through a group hierarchy, where the user is part of a group that is part of a larger, top-level group with the RLS privilege).

## Examples of RLS rules

An RLS rule evaluates against two system variables:

Function	Description	Examples
ts_groups	Returns a list of all the groups the current logged in user belongs to. For any row, if the expression evaluates to true for any of the groups, the user can see that row.	ts_groups = 'east'
ts_username	Returns the user with the matching name.	ts_username != 'mark'

**Note:** You cannot use these variables (ts\_groups and ts\_username) within an expression. For example, `ts_groups = substr(rls_group_name, 0, 3)` is valid, but `substr(ts_groups,0,3) = rls_group_name` is NOT valid.

ThoughtSpot filters a table's rows by evaluating a rule against the authenticated user.

A rule is an expression that returns a boolean, `TRUE` or `FALSE`. If the rule evaluates to `TRUE`, a user can see that row. If the rule evaluates to `FALSE` for the user, then the user cannot view the data and instead they see the message `No data to display`.

Rule expression can be implicit or explicit. And rules may or may not contain logic. A simple implicit RLS rule has the format:

```
COLUMN_FILTER = ts_groups
```

An example of an explicit rule that contains logic would be:

```
if ( COLUMN_FILTER ) then true else false
```

Rules can also reference tables other than the table you are securing.

Consider a simple RLS rule example. Your company has `vendor-purchase` table such as:

DATE	VENDOR	AMOUNT
12/11/39..	zendesk	116.00
12/11/39..	getquik com ca	289.70
12/11/39..	ikea	113.91
12/11/39..	costco	274.43
12/11/39..	waiters wheels pa	66.52
12/11/39..	waiters whee	76.49
12/11/39..	chipotle	175.33

You want to give your vendors the ability to see trends in company purchases. You give vendor personnel access to ThoughtSpot *and* add them to self-titled vendor groups. So, all users from the Starbucks vendor are in the `Starbucks` group and all users from `round table` are in the `Round Table` group. Then, you set a **Row security** on the `vendor-purchase` table as follows:

```
VENDOR = ts_groups
```

Only users in `Starbucks` group see `starbucks` data and so forth. Rules ignore case inconsistencies and spaces are evaluated so `round table` in the data matches the `Round table` group but not a group named `RoundTable`.

Rules can be simple or they can incorporate logic such as `if/then` rules. For example, vendors should see their own data but your accounts payable group needs to see all the vendor data:

```
VENDOR = ts_groups or 'Accounts Payable' = ts_groups
```

This rule continues to work as you add data from new vendor or team members to `Accounts Payable`. In this way, a well-written rule is *self maintaining*, meaning you don't have to revisit the rule as your system changes.

You can also create rules that reference tables other than the table you are securing. For example, if you have a `sales` table and `store` dimension table, you can use attributes from the `store` table to secure the `sales` table.

## Multiple rules and multiple group membership

You can define multiple rules on table. In this case, ThoughtSpot treats the rules as additive. That is, they are applied using an `OR` operator. If any of the rules evaluate to `true` for a user on a row, that row's data is visible.

If a user is a member of multiple groups, the user can see all the rows that are visible to all of their groups. The most permissive policy is used.

Members of groups with **Can Administer and Bypass RLS** are exempt from row-level security (RLS) rules. This is true regardless of whether the group membership is direct or indirect (through a group hierarchy).

## Best practices for using Rule-Based Row Level Security

Use these best practices for Rule-Based Row Level Security:

- Use **Share** as the first level of data access.

Non-administrative users and groups have no way to access any data without first having it shared with them. So, only share what you need.

When you share, share worksheets. This is a general best practice. Worksheets simplify the data environment for end users; they only need to choose among a few sources, rather than many tables. Also, one worksheet can also combine data from several tables.

- Set row level security wherever you want to keep data secure.

It is always a possibility that a particular search only includes data from a single table, and a user will see something they shouldn't. So, protect your data by setting row level security wherever you want to keep data secure.

- Explicitly grant access for users that should see all rows.

As soon as you define a rule on a table for one group, you prevent access by all others outside of that group hierarchy. Subsequent rules should specifically add groups that need access.

- Keep in mind that multiple rules on a table are additive with `or`.

If you are concerned with security, start with very limited access. Then, expand the access as needed.

- Keep rules simple.

Complex rules can impact the system performance. So, err on the side of simple rules rather than complex rules with a lot of logic.

## Related information

- To learn the procedure you follow for setting a rule, [Set RLS rules \[See page 110\]](#)
- For a list of operators and functions you can use to build RLS rules see [Row level security rules reference \[See page 0\]](#).
- For information on bypassing rules on a worksheet, see [Change inclusion, join, or RLS for a worksheet \[See page 201\]](#).

# Set row level security rules

**Summary:** Learn how to set RLS rules.

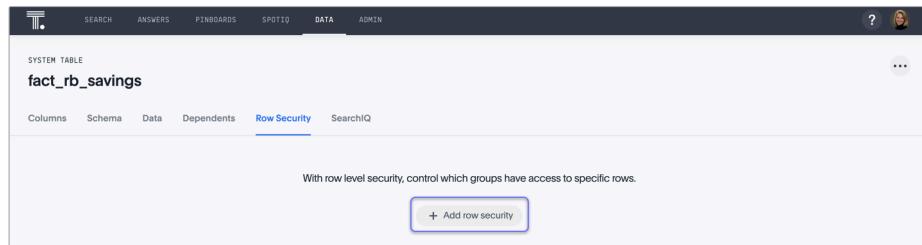
When rule-based row level security (RLS) is set, it prevents users from seeing data they shouldn't in tables and the objects derived from them. You must have administrative rights on ThoughtSpot to set RLS rules.

Before you create a rule, make sure you have read [How rule-based RLS works \[See page 105\]](#).

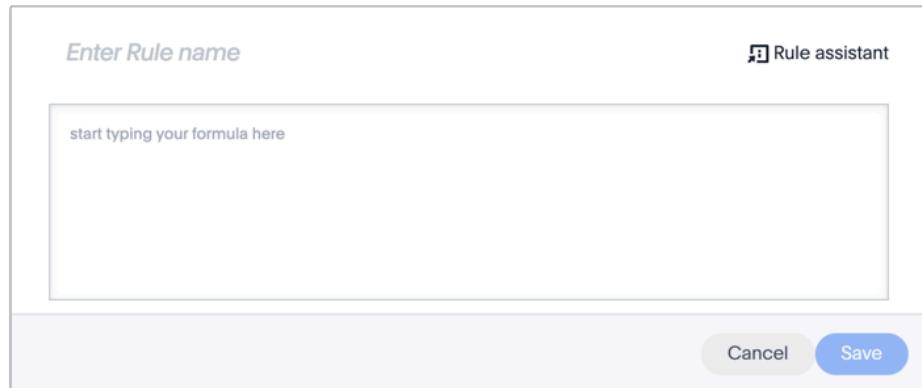
## Create a rule on a table

You can set RLS rules **only** on tables. To set up rule-based row level security, do the following:

1. Click **Data**, and double-click a table.
2. Click **Row security**.
3. Click **+ Add row security**.



The system displays the Rule Builder.

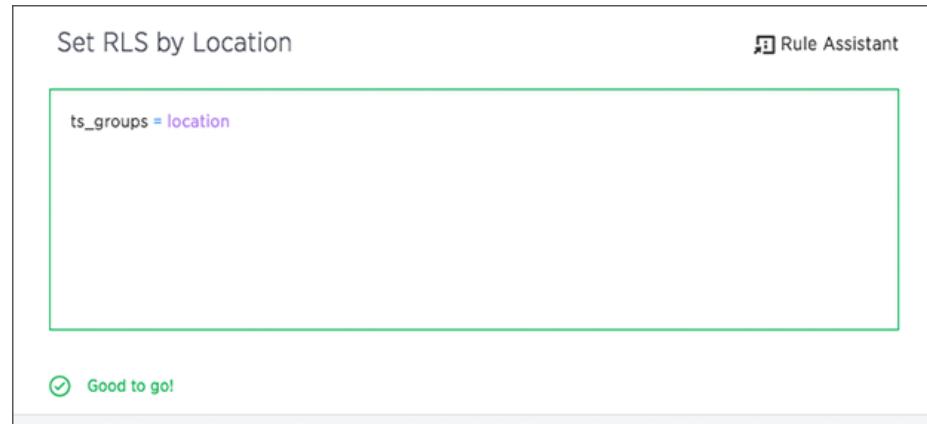


You define row level security by creating an expression that gets evaluated for every row and group combination. This powerful feature can be used with up to thousands of groups.

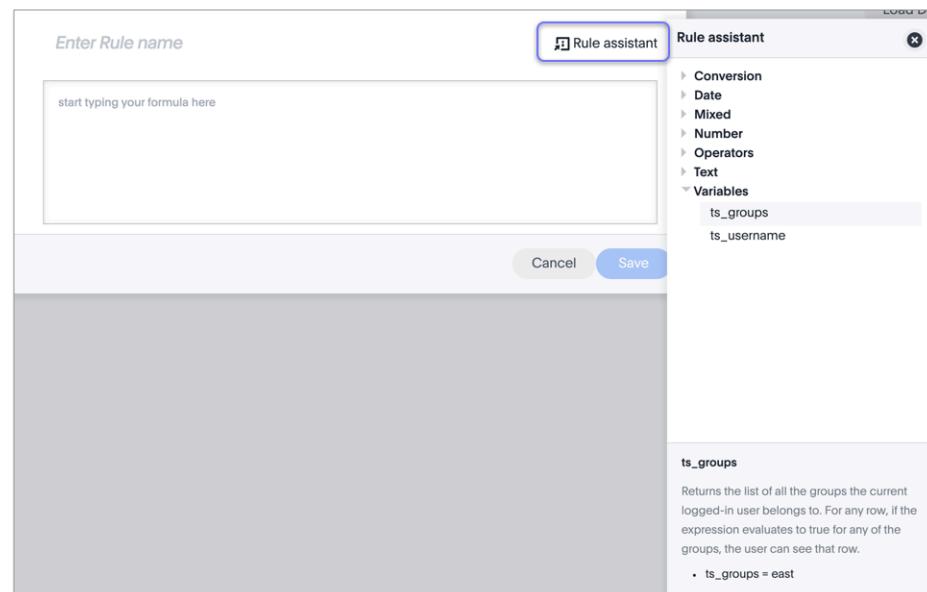
4. Open the Rule Builder.
5. Give your rule a name.
6. Enter an expression for your rule.

The rule gets evaluated against an authenticated user for every row and group combination.

If the rule evaluates to `FALSE`, the user cannot see that row's data. Instead, they see the message `No data to display`. Use the variable **ts\_groups** to refer to the group name.



You can see a list of available operators by clicking on **Rule Assistant**.



As you type, ThoughtSpot suggests formula syntax, variables, and column names. If you can't remember the exact column name or variable you want to use, the suggestions can help.

When your expression is valid, a green indicator appears at the bottom of the Rule Builder.

7. Click **Save**.

The rule you created is listed in the rules. You can edit the rule or add more rules by clicking **+ Add**.

## Test your rule with restricted and unrestricted users

To test your rule, log in as users in different groups. Search within the table for data that your test user can and can't access. Make sure your test users can see the appropriate rows.

## Related information

- Administrators can bypass the RLS rules set on a the table at the worksheet level. See [change the join rule or RLS setting for a worksheet \[See page 201\]](#).
- For a list of operators and functions you can use to build RLS rules, see the [row level security rules reference \[See page 0\]](#).

# ThoughtSpot Lifecycle

**Summary:** This topic covers security processes for the entire lifecycle of a ThoughtSpot deployment from development, release, installation, upgrades, to software patching.

## Overview

A ThoughtSpot deployment consists of the following high level software systems:

- Operating System (OS) and software packages installed on the OS
- Third-party software
- ThoughtSpot application services (binaries and configuration)

### Operating System

All ThoughtSpot physical appliances, virtual machines (VMs) and public cloud images come pre-installed with CentOS 7. The [CentOS](https://www.centos.org/) (<https://www.centos.org/>) distribution of Linux is owned by [RedHat](https://www.redhat.com/en) (<https://www.redhat.com/en>) and closely tracks versions of RedHat Enterprise Linux (RHEL).

ThoughtSpot uses the minimal install of CentOS 7 with the addition of a few software packages (e.g. Python) needed for ThoughtSpot operations. The most notable change to the installation is to the Linux kernel, which is sourced from the current long term stable kernel version instead of the default included in CentOS 7 (kernel-lt package). To list all the installed packages, see [Checking Package Versions \[See page 116\]](#).

### Third-Party Software (Middleware)

Third party software used includes Java, Boost C++ libraries, Google protocol buffers, etc. These are software components necessary for operation of the ThoughtSpot application. ThoughtSpot only uses software licensed for distribution.

## Development and Release Process

ThoughtSpot releases its software as a tarball containing all the ThoughtSpot application (binaries and configuration), third-party software, and an operating system image. Installation or update using this release tarball on appliances, VMs, or cloud instances updates each of these components.

### Operating System

Building the operating system image including software packages is a multi-step process:

1. Begin with the set of packages in the base OS image and our added packages.
2. Configure all installation to only use official public RedHat repositories.
3. For each package, install the current stable version including any security patches.
4. Bring up the image on all supported platforms for stability and performance testing along with the ThoughtSpot application stack. Success criteria: no OS impact on stability or performance.
5. Scan the Operating System and ThoughtSpot application stack using Qualys scans with additional modules enabled: Vulnerability Management, Web App Scanning.
6. Review all vulnerabilities found. Success criteria is zero severity 4+ vulnerabilities.
7. Assuming all above testing and exit criteria are met, the OS image is considered qualified.

### Third-Party Software

Third-party software is periodically sourced from the upstream distribution of each software component. Unlike OS and ThoughtSpot application, this changes less frequently and on an as needed basis, when any new security vulnerability or stability issue is discovered in the library. The list of all third-party software as well as licensing details are [here](#).

## ThoughtSpot Application

ThoughtSpot follows industry standard best practices for writing robust software. Every code change is reviewed by at least one engineer. Our engineering team consists of senior engineers from Enterprise software and web companies.

ThoughtSpot uses a small number of proven programming languages powering some of the largest enterprises in the world. ThoughtSpot tracks stability, performance, and reliability of our software and services aggressively. The ThoughtSpot platform is trusted by dozens of global F2000 organizations.

### *Protection of Source Code*

Source code is private and not shared publicly, e.g. all distribution to customers is in binary or minified format to discourage reverse engineering.

### *Automated Tools*

We use automated tools and infrastructure like Jenkins, Kubernetes, AWS, partnering with the teams behind these systems so as to adopt best practices. For example, all our automation runs through Jenkins, which is managed by CloudBees (the company behind Jenkins) using an enterprise license with regular security patching, and so on. We upgrade our automation tools regularly.

### *Independent Testing*

Independent testing is done outside of the product team by pre sales and post sales before promoting to production. Some areas are tested by third party testers.

### Security Hardening

Starting 4.5.1.5, we have also taken specific steps to incorporate most of CIS standard recommendations towards hardening.

## Installation and Upgrade Process

ThoughtSpot is installed or updated from a release tarball which contains the ThoughtSpot application (binaries and configuration), third-party software, and Operating System image.

### Operating System Image Installation

Installing ThoughtSpot on any node (VM, cloud instance, appliance) automatically updates the operating system and required packages on the node. No Internet or repository access is required for this, the update is applied directly from the release tarball.

Specifically, all nodes running ThoughtSpot are required to have two root partitions on their boot drive of which one of them is booted from at any given time. During installation or update, the Operating System image contained in the release tarball is copied into the second currently-unused root partition and the system switches to it through a reboot.

### Checking OS Package Versions

The following command run from any ThoughtSpot node will indicate versions of all installed packages:

```
rpm -qa
```

### Upgrades

ThoughtSpot patches the Operating System at the time of upgrades. The exact same process used during installation is also applied during upgrades. The previous OS image on a node gets replaced by the new image carried in the release tarball.

Only some releases may patch the Operating System, not all. Typically, all major and minor releases (e.g. 4.4, 4.5, 4.5.1, 5.0) upgrade OS patches, whereas only some patch releases (e.g. 4.4.1.4) contain OS patches.

## Distributed Clusters and Failure Handling

On distributed clusters, individual nodes receive the OS image from the release tarball individually.

Initially, the new image is deployed on a single node only. When that node is deemed healthy following the update and a rich set of tests, the image is made available to remaining nodes in the cluster.

If a node fails to patch, then ThoughtSpot support will modify the upgrade workflow to either retry the patching or skip and exclude the node.

## Third-Party Software

Installation or upgrade of ThoughtSpot deployments automatically upgrades all third-party software to the version included in the release tarball.

# Security Scanning and Patching Process

The ThoughtSpot Security team continuously scans security bulletins for new vulnerabilities discovered in included OS packages (e.g., Linux Kernel, libc) and third party software (e.g., Java). Additionally, weekly scans are done for all release branches using Qualys with the following additional modules enabled: Vulnerability Management, Web App Scanning. The security scans discover vulnerabilities at all layers: OS, third-party software, as well as ThoughtSpot application binaries and configuration. Additionally, ThoughtSpot periodically scans all source code for third-party software as well as ThoughtSpot's proprietary code base for vulnerabilities or unsafe usage using SourceClear.

After a critical new vulnerability is found (severity 4 or 5), ThoughtSpot includes the corresponding patch in the next patch release for all supported release branches. Consult ThoughtSpot documentation or support to find out if you are on an active or supported release branch.

After a new patch release with a critical security vulnerability is available, customers are encouraged to upgrade their deployment quickly.

## Latency

We recommend customers to wait for the next regular release for receiving security patches.

However, should a critical vulnerability be discovered in the interim, ThoughtSpot can push out a new patch release containing the required patches, if available upstream.

ThoughtSpot targets a three week or less cadence for generating patch releases for all supported release branches. Timeline for the new release and patching depends on availability of the patch upstream (e.g., not all vulnerabilities in Linux are immediately fixed) and qualification (ThoughtSpot qualifies each build on each supported cloud and on-prem platform). If a fix is unavailable upstream at the moment, customers and ThoughtSpot support can work together to identify potential workarounds.

# Storage Security

## Encryption at Rest

ThoughtSpot provides standard Encryption at Rest (EAR) for storage encryption. This includes centralized key management, key rotation, and key revocation.

## Secure Erase

Current erase guide (See [https://thoughtspot.egnyte.com/dl/E1eYDyfotL/SOP-520-0007-00-User-Data-Removal.pdf\\_](https://thoughtspot.egnyte.com/dl/E1eYDyfotL/SOP-520-0007-00-User-Data-Removal.pdf_))

# Data modeling

**Summary:** Modeling, tagging, and adding links between your data sources can make the data even easier to search.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

Data modeling allows you to define metadata and other aspects of your data. For example, you can give data columns search friendly names or predefine how they can be explored and aggregated.

Metadata include such information as **Column Names**, **Column Visibility**, **Column** and **Data Definition**, **Column Rank** and so forth.

When you load data, most of this data modeling metadata is set up for you automatically. However, since you know your data best, you can adjust the modeling settings to improve the experience for your users. After loading data, you can start searching your data without doing any data modeling, creating relationships, or tagging. However, since you know your data best, you can customize the modeling settings. Putting some thought into these will make the data even easier and more intuitive to search for your end users.

## User interfaces for modeling data

Data modeling is a very lightweight process compared to what you may have experienced in other tools. It enables you to change some of the settings (or properties) of the data so that it becomes more searchable. You can configure the model [for an individual data table \[See page 121\]](#) or you can view and configure all the system data [using a modeling file \[See page 123\]](#). Editing the data model file requires that you have administrative privileges.

The model file contains a row for each column in your data set. It isn't unusual to have tens of thousand of rows in this file. This means that editing this file is equivalent to editing all the tables simultaneously. When you add new data to your system, this file expands to accommodate the new data columns you have added.

Both of these methods have the same effect: they improve search. Moreover, while they have different effects of scale, they use the same mechanisms to accomplish these effects.

## Modeling topics

The following topics explain how to model your data:

- **[Change a table's data model \[See page 121\]](#)**

Explains how to make modeling settings for a table you've just loaded, or to make a quick change to existing settings.

- **[Edit the system-wide data model \[See page 123\]](#)**

Explains how to define a default data model to use for data system-wide.

- **[Data modeling settings \[See page 127\]](#)**

Explains the possible data model settings and their accepted values. These are the same for a table or the system.

- **[Link tables using relationships \[See page 172\]](#)**

Linked tables can be searched together or combined into a worksheet for easy searching.

Tables that have no relationship between their columns can not be combined in a single search.

- **[About tags \[See page 179\]](#)**

You can create tags to make it easier for people to find data sources and Liveboards.

- **[Manage experts or add an expert to your data \[See page 161\]](#)**

# Change a table's data model

**Summary:** You can adjust the data model for a newly loaded table.

To make modeling settings for a data source you've just loaded, or to make a quick change to existing settings, use the ThoughtSpot web interface. You can adjust the **Columns** settings from the data management listing.

You can change all the same data model settings here as in the model file. This method is easier and faster, unless you need to make many settings in bulk. In that case, [using the model file \[See page 123\]](#) is recommended.

## About data sources

You can change the data modeling settings for base **Tables**, **Worksheets**, and [Views \[See page 259\]](#). Worksheets will inherit the data modeling settings from the tables upon which they are based. However, if you make further changes to a base table *after* you've created worksheets on it, the new data model changes will not propagate up. You must make any new data model changes directly to the worksheets (if you want them).

## Change the data model for a data source

1. Click **Data** on the top navigation bar.
2. Click a data source you own or can edit.

The screenshot shows the ThoughtSpot interface with the 'Data' tab selected. Under the 'Tables' section, there is a list of tables. One table, 'ThoughtSPORT\_Product\_Dimension', is highlighted with a yellow border. The columns in the table list are: Name, Source, Stickers, Materialize Status, Modified, and Author. The table details are: Name (ThoughtSPORT\_Product\_Dimension), Source (Sports Goods), Stickers (None), Materialize Status (None), Modified (a month ago), and Author (Administrator Super-User).

This brings up the **Columns** screen, where you can make your modeling settings.

3. Modify one or more column settings.

Descriptions of the possible settings are listed in [Data modeling settings \[See page 127\]](#).

4. Save your changes.

The screenshot shows the 'ThoughtSPORT\_Product\_Dimension' table's column configuration screen. At the top, there are tabs for 'Columns', 'Schema', 'Data', 'Profile', 'Dependents', 'Row Security', and 'SpotIQ Insights'. The 'Columns' tab is selected. Below the tabs is a table with columns: COLUMN NAME, DESCRIPTION, DATA TYPE, COLUMN TYPE, ADDITIVE, AGGREGATION, HIDDEN, SYNONYMS, and INDEX TYPE. The rows show five columns: Product\_Key, Product\_Name, SKU\_Number, Department\_Desc., and Category. Each row has a 'Click to edit' link for the description and a radio button for additive and hidden settings. The 'Save Changes' button is located at the top right of the screen.

5. To check your changes, use the **SEARCH** page to search for across the changed data.

## Related information

- [Data modeling settings \[See page 127\]](#)
- [Edit the system-wide data model \[See page 123\]](#)
- [Understand data sources \[See page 0\]](#)

# Edit the system-wide data model

**Summary:** Edit the modeling file to edit your data settings.

When you load data, ThoughtSpot uses defaults for data modeling metadata. You change these defaults using the data modeling file. Editing this file allows you to view and edit all the system data columns. When you (or your users) add new data to your system, this file changes as it expands to accommodate new data columns.

**Tip:** If you just want to change a subset of your data, use the [Change a table's data model \[See page 121\]](#) instead.

## Overview of the modeling process

The data formats you use in your system are controlled by the modeling file, an Excel file. To make these changes you download the model file, change the model, and upload your changes back into the system.

In each row of the modeling file, all the data properties corresponding to a column from your data are listed. You can modify many of these properties by typing in the new value. Remember these important guidelines when editing the model file:

- Do not modify any value in a column which contains **DoNotModify** in the field under the column heading.
- Make sure to keep the file in the same format as it had when you downloaded it.

The model file contains a row for each column in your data set. It isn't unusual to have tens of thousand of rows in this file. You can change all or a subset of rows. You can edit the file to leave the heading rows and only those rows you want to change. This can make the file more convenient to work with.

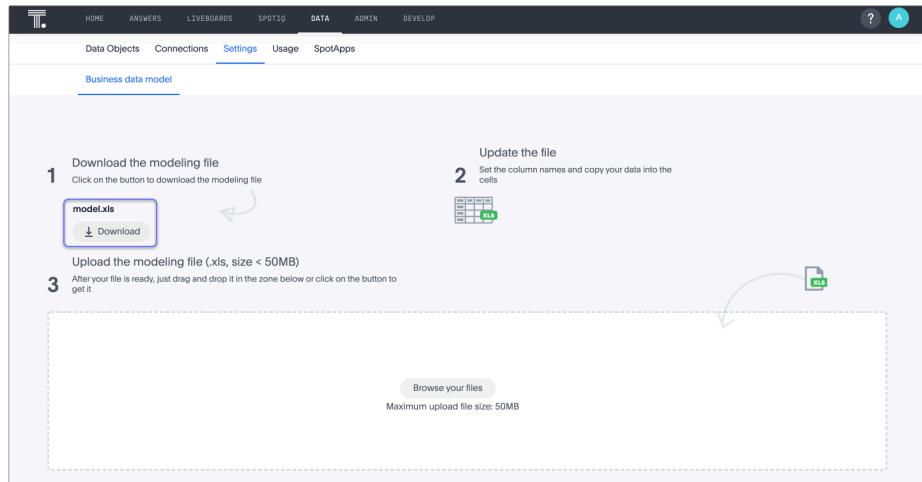
The model file must be saved in TSV (tab-separated values) format, and it must be UTF-8 encoded. If you already changed the file extension to .tsv after downloading, your file editor should save it in TSV format automatically. If your model file includes multi-byte characters, edit the file using vi or vim to ensure the file is saved in the correct format. Otherwise, you won't be able to upload it after making your edits.

## Download the model file

Before you can make changes to the model file, you need to download it. Then, you edit it using Microsoft Excel, vi/vim, or a similar text editing tool.

To obtain the model file:

1. Log in to ThoughtSpot from a browser as an Administrator user.
2. Navigate to **Data > Settings > Business Data Model**.
3. Click **Download**.



4. Change the file extension to **.tsv**. This ensures that your editor (Excel, vi/vim, and so on) knows the file contains tab-separated values.

The model file downloads in the TSV (tab-separated values) format, but its extension is `.xls`, which can prompt editors to suggest you save the file in `xls` format when you open or edit the file. Do not change the existing TSV format. To avoid this problem, change the file extension to `.tsv`.

## Edit the file and change the settings

You can make changes to the settings using this procedure. To see a list of the changes you can make, see [Data modeling settings \[See page 127\]](#). You can edit any of the values in the model file, except for those where the words **DoNotModify** appear under the column header. To make changes in the model file:

1. Open the model file you downloaded in Excel, vi/vim, or a text editor.

If you are using Excel, you may see a warning message, saying that the file is in a different format than the one specified by the file extension.

Click `YES` to proceed.

2. Find the column you want to modify.

Descriptions of the meanings of the columns are listed in [Data modeling settings \[See page 127\]](#).

3. Select the value you want to change.
4. Type in the new value.
5. After making all your changes, save the model file.

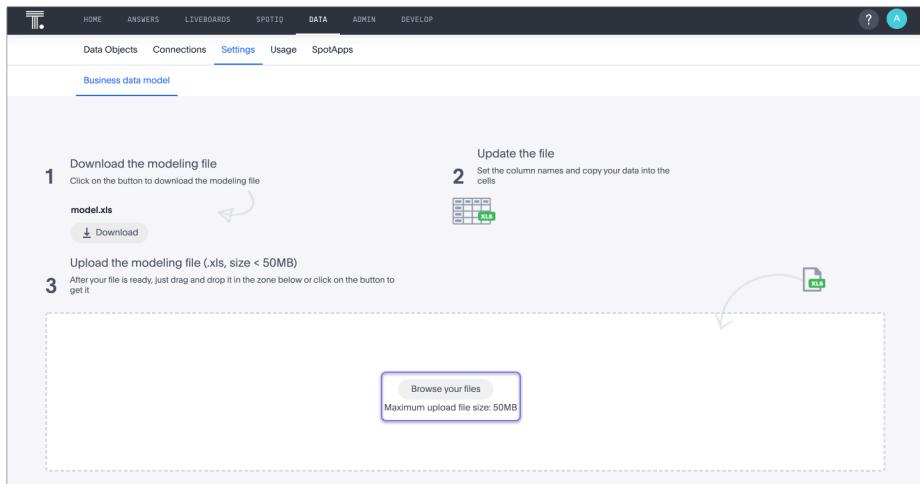
The model file must be saved in TSV (tab-separated values) format, and it must be UTF-8 encoded. If you already changed the file extension to `.tsv` after downloading, your file editor should save it in TSV format automatically. Otherwise, you won't be able to upload it after making your edits.

## Upload the edited file

After you have made changes to the modeling file, you must upload it back to ThoughtSpot before the changes will take effect. To upload the model file:

## Edit the system-wide data model

1. Log in to ThoughtSpot from a browser as an Administrator user.
2. Navigate to **Data > Settings > Business Data Model**.
3. Click **Browse your files** to upload the model file in **.tsv** format, or drag and drop it in the zone.



If you receive an error message upon uploading the file, check that it does not include any multi-byte characters (for example, Japanese or other multi-byte language characters). If it does, you must download the file again and make your edits using vi or vim.

You can remove all the rows you have not changed from the model file before uploading it. If you upload a model file that includes only the changed rows, you won't lose any of the pre-existing model file settings. This is a good option if your model file is causing an error on upload, but you aren't sure where in the model file the problem is.

As soon as the file is uploaded, ThoughtSpot performs any necessary re-indexing for you automatically. Your new settings will be reflected within a few minutes.

## Related information

- [Data modeling settings \[See page 127\]](#)
- [Change a table's data model \[See page 121\]](#)

# Overview of data modeling settings

**Summary:** Learn about data modeling settings.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

You can change data modeling settings in two ways, both of which change the model. If you want to make a few small changes, you should [make them in the ThoughtSpot application \[See page 121\]](#). If you want to make many changes [you should edit the modeling file \[See page 123\]](#). Whether you are changing data modeling settings using the modeling file or the Web interface, the settings and their accepted values are the same.

## Modeling settings

The following index includes mutable data modeling settings that you can apply to columns, both tables and worksheets.

Setting	Description
Column Name [See page 0]	Sets the name of the column to be used in searches.
Description [See page 131]	Adds a text description of what the column contains.
Data Type [See page 168]	<b>Read only.</b> Shows the column's data type.
Column Type [See page 132]	Sets the type of column, either ATTRIBUTE or MEASURE .
Additive [See page 134]	Controls the type of aggregations that will be available for a column.

<b>Setting</b>	<b>Description</b>
Aggregation [See page 134]	Sets the default aggregation type for a column.
Hidden [See page 138]	Sets the visibility of a column.
Synonyms [See page 138]	Adds synonyms that can be used in the search bar to refer to a column.
	SpotIQ Preference [See page 163]
	Excludes specified columns from SpotIQ analyses. By Default, all columns are included in SpotIQ.
Index Type [See page 140]	Sets the type of index that will be created for a column.
Geo Config [See page 148]	Enables a column to be used in geo map visualizations.
Index Priority [See page 140]	Changes the priority of a column in search suggestions.
Format Pattern [See page 152]	Specifies the format to use for numeric values or dates that show in the column.
Currency Type [See page 156]	Specifies the format of currencies in a column.
Attribution Dimension [See page 158]	Only applies to tables that join over a <a href="#">Chasm Trap</a> [See page 165]. Designates whether the tables depend on this column for attribution. You cannot change the attribution dimension in the modeling file. You can only configure it on a table-by-table basis.
Calendar Type [See page 0]	Specifies what type of calendar a date type column uses. It can be Gregorian calendar (default), a fiscal calendar, or any custom calendar.

## Data modeling best practices

As a best practice, make any data modeling settings in the table when you will be creating multiple worksheets that use that table. This way, you won't have to make the same settings in each worksheet. The settings will be inherited when you create worksheets that uses columns from the table.

If you have settings that only apply in the context of a particular worksheet, make those settings in the worksheet rather than in the underlying table(s).

Note that if you make your settings at the table level, and then create a worksheet that uses columns from the table, the settings are inherited from the table at the point in time that the worksheet is created. If you then go back and change the settings at the table level, your changes will not be reflected in the worksheet.

If you want the worksheet to have the changes you made at the table level, you must drop those columns from the worksheet and re-add them. Then save the worksheet. At this point, the new settings will be used in the worksheet. Note that any saved answers or Liveboards based on the worksheet may display differently because of your changes. For example, if you've changed the geo map setting from "None" to "Country", you will now see a map where before you might have seen a table.

## Related information

- [Model the data for searching \[See page 119\]](#)
- [Add a geographical data setting for a column \[See page 148\]](#)

# Set column name, description, and type

**Summary:** Modeling includes setting basic information for a data column such as its name, description, and type.

When you model your data, you set basic information for data columns, such as a column's **NAME**, **DESCRIPTION**, and **TYPE**. All of these can influence how a user experiences your data. For example, the **DESCRIPTION** appears as a "tip" when a user hovers over a column. It helps users understand where the data they are searching comes from.

## Data modeling from the UI

To model your data columns from the ThoughtSpot UI, follow these steps:

1. Navigate to the **Data** tab from the top navigation bar.
2. Click on the data source that you would like to update.
3. Click **Edit Worksheet** in the top right corner of the screen.

COLUMN NAME	DESCRIPTION	DATA TYPE	COLUMN TYPE	ADDITIVE	AGGREGATION	HIDDEN	SYNONYMS	SPOTIQ PREFERENCE
Sales Amount	Click to edit	DOUBLE	MEASURE	YES	SUM	NO	Sales Amt, Reve...	DEFAULT
Cost Amount	Click to edit	DOUBLE	MEASURE	YES	SUM	NO	Click to edit	DEFAULT
Store Name	Click to edit	VARCHAR	ATTRIBUTE	NO	NONE	NO	Click to edit	DEFAULT
Product	Click to edit	VARCHAR	ATTRIBUTE	NO	NONE	NO	Click to edit	DEFAULT

4. Update your data columns.

## Change the column name

The **Column Name (UI)/ ColumnName** (model file) parameter is the name users type to add a column to their search. Change these column names in ThoughtSpot to make them more meaningful to users.

The model file contains a row for each column in your data set. It isn't unusual to have tens of thousand of rows in this file. You can change all or a subset of rows. You can edit the file to leave the heading rows and only those rows you want to change. This can make the file more convenient to work with.

The default column name is the name you gave the column when you defined the table in the database or imported the CSV file from the browser.

To update the column name, follow these steps:

1. Find the column name you want to change, either on the ThoughtSpot application or in the model file.
2. Type in the new column name.
3. Save your changes.

**Important:** If any of your column names or values contain leading or trailing whitespaces, you must remove these spaces before and after column names and values when loading or modeling data. The ThoughtSpot search bar does not accept column names or values with leading or trailing whitespaces. If you must keep these spaces, tell your users to add a delimiter for the search bar to accept them. For example, if you have a column named Sales , with a space before and after the word Sales, you must enter it in the search bar as ' Sales ', with single quotes surrounding the name. Otherwise, ThoughtSpot automatically removes the extra spaces and does not recognize the column name.

## Change column description

The **Description (UI)/ ColumnDescription** (model file) parameter is an optional description for a column. You can provide a description for a specific column, to provide additional information for users about the data it contains. When a user hovers over the column, a tooltip will show this description.

To create a column description:

1. Find the column description you want to change, either on the ThoughtSpot application or in the model file.
2. Enter a new description.
3. Save your changes.

## Change column type

The **Column Type** (UI)/ **ColumnType** (model file) parameter describes the kind of data a column stores. This is set automatically upon defining the table, but in some cases, you may want to change the type. There are two types of columns:

- **ATTRIBUTE** contains a characteristic or trait associated with your data, such as `name`, `address`, or `id number`.
- **MEASURE** contains a numeric value that can be compared in a meaningful way using math, such as a count or measurement, like `sales`.

When you create a new table, the default column type is set according to the **Data Type** defined for each column. By default, columns with numeric data types (`FLOAT`, `DOUBLE`, `INT`, or `BIGINT`) are assigned the type `MEASURE`. Columns with `VARCHAR`, `BOOL`, or date/time data types are assigned the type `ATTRIBUTE`.

Usually the default setting for column type works fine. But occasionally, you must change a `MEASURE` to an `ATTRIBUTE`. Examples of numeric values for which mathematical operations are not meaningful include:

- ID numbers
- Key values that are primarily used for joining tables
- Product number or SKU
- Sports team member jersey number
- Year, when separate from a date (e.g. 1999, 2000)
- Zipcodes

These values are numbers, but you would not do math on them. For example, it is not meaningful to add two zipcodes together.

To change the column type:

1. Find the column type you want to change, either on the ThoughtSpot application, or in the model file.
2. Change it to either `MEASURE` or `ATTRIBUTE`.
3. Save your changes.

## Related information

- Model the data for searching [See page 119]
- Hide column or define a column synonym [See page 138]

# Set ADDITIVE or AGGREGATION

**Summary:** You can allow aggregation on MEASURE columns and some ATTRIBUTE columns.

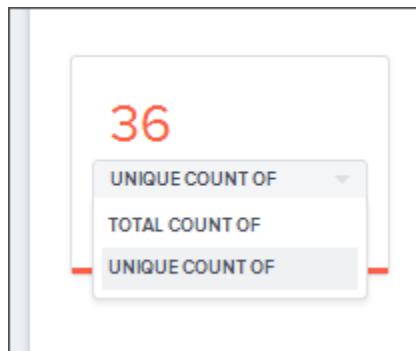
Aggregation is grouping many units or parts into a new value. In data, aggregation gathers multiple input values and calculates a summary value from them. You then use this aggregated value to do an analysis.

Every summary value results from a data aggregation function. An example aggregation function would be average or minimum. You can control how aggregation works in your data.

## Making an ATTRIBUTE column ADDITIVE

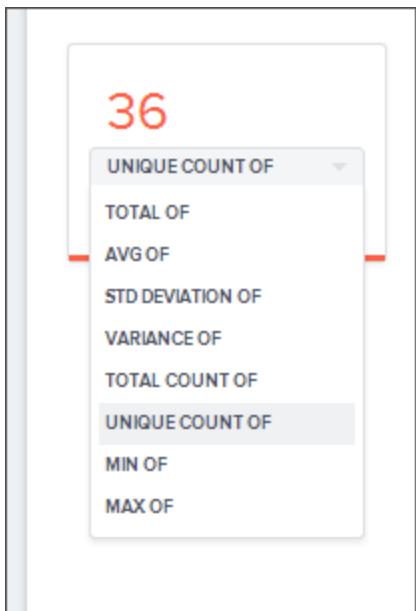
Your data may contain a column with a numeric data type that you have defined as an ATTRIBUTE rather than a MEASURE. For example, you may have ATTRIBUTE column with an INTEGER data type that represents age. Typically, these columns have an ADDITIVE setting of N0. Within a search result that contains data from this column, the options for each column on the left side of the screen includes:

- UNIQUE COUNT OF
- TOTAL COUNT OF



To display extended aggregate view options, you must set ADDITIVE to YES on these ATTRIBUTE columns. This option is only possible on columns that have a numeric data type (FLOAT, DOUBLE or INTEGER) or a date data type (DATE, DATETIME, TIMESTAMP, or TIME). After you make this change, these additional view options area-charts offered:

- **TOTAL OF**
- **AVG OF**
- **STD DEVIATION OF**
- **VARIANCE OF**
- **TOTAL COUNT OF**
- **UNIQUE COUNT OF**
- **MIN OF**
- **MAX OF**



To change this setting:

1. Find the column whose **ADDITIVE** setting you want to change
2. Select the **ADDITIVE** toggle.
3. Change the value to one of these:
  - YES or NO, if using the Web interface.
  - TRUE or FALSE, if using the model file.
4. Save your changes.

## Change Aggregation

Both `MEASURE` columns and `ATTRIBUTE` columns support **AGGREGATION** operations. To aggregate a column without having to enter the aggregation type explicitly in your searches every time, you can set a default **Aggregation** for that column. Setting this default can make combining data more intuitive and faster.

`ATTRIBUTE` columns have **AGGREGATION(UI)/AggregationType** (model file) values with default aggregate type of **NONE**. You can change **AGGREGATION** to one of the supported aggregation types. To extend the available aggregation actions, set **ADDITIVE** on these columns to `YES` ( `TRUE` ).

Aggregate type	Description
<b>NONE</b>	Does no aggregation. This is the default for <code>ATTRIBUTE</code> type columns.
<b>SUM</b>	Adds the values together and returns the total. This is the default for <code>MEASURE</code> type columns.
<b>AVERAGE</b>	Calculates the average of all the values.
<b>MIN</b>	Calculates the minimum value.
<b>MAX</b>	Calculates the maximum value.
<b>STD_DEVIATION</b>	Calculates the standard deviation of all the values.
<b>VARIANCE</b>	Calculates the variance of all the values.
<b>COUNT</b>	Calculates the total number of values.
<b>COUNT_DISTINCT</b>	Calculates the total number of distinct values.

Keep in mind that not all `MEASURE` data should be aggregated. Consider a table containing data about athletes on a sports team. The data contains some numerical values, including points scored, salaries, and jersey numbers for each of the players. Because jersey number is an INTEGER, it would become a column of type `MEASURE` (not `ATTRIBUTE`). So it will aggregate, by default. But you may want to make its aggregation type **NONE** instead. This ensures that search results that include jersey number will not attempt to compare or aggregate those values in a way that is not meaningful.

To set this value.

1. Find the column whose default aggregation type you want to change
2. Select its **Aggregation**. If using the modeling file, use the **AggregationType** setting.
3. Select the new default aggregation type.
4. Save your changes.

## Related information

[Model the data for searching \[See page 119\]](#)

# Hide a column or define a synonym

**Summary:** Hide a column from users or make it easier to find by assigning a synonym.

You can hide columns from users in ThoughtSpot without dropping them from the database. It is common to hide a column when its data contains identifier columns that are used to join tables, but which do not have any meaning to users.

Alternatively, rather than hiding a column, you can make it easier to find by creating synonyms for it. This is helpful, for example, when different departments refer to the data using different terminology.

## Hide a column

As the number of columns in the dataset increases, the search experience requires more effort. Users have to navigate through larger numbers of columns to choose the correct one. There might also be some columns in the dataset that you don't want to expose to the users.

When you hide a worksheet, table, or view column, you only hide it from users without **edit** privileges on the object. Administrators and users with edit privileges on the object can still see and interact with the hidden column. Users without edit privileges for the object cannot see or interact with the hidden column.

To hide a column, change the **HIDDEN (UI)/Hide** (model file) setting. By default, all columns in a data source appear in ThoughtSpot. To hide these columns, set the **HIDDEN** setting to **YES**.

1. Find the **HIDDEN (UI)/Hide** (model file) setting for a column.
2. Set its value to **YES**.
3. Save your changes.

## Create synonyms for a column

When users search a data source, they might try typing different words to try to retrieve a particular column. This could be due to different groups in your organization using different terms for the same data. Or maybe your users just intuitively use different words when searching for that item. Using synonyms allows them to access the data even if the term they choose isn't the same as the actual column name.

You can set column synonyms for columns in tables, user imported data, and worksheets. The returned table or chart uses the **actual column name**, but the search bar reflects the term the user typed in (the synonym).

To create a synonym for a column:

1. Find the column for which you want to add synonyms.
2. Select its **Synonyms**.
3. Enter a comma-separated list of the synonyms.

If a synonym is more than one word, enclose it in double quotes. If you are using the Web interface, you would type:

```
profit,"gross profit"
```

If you are using the model file, the list of synonyms must be enclosed in square brackets:

```
[profit, "gross profit"]
```

4. Save your changes.

## Related information

[Model the data for searching \[See page 119\]](#)

# Manage suggestion indexing

**Summary:** ThoughtSpot dynamically indexes Search bar suggestions for column names and values.

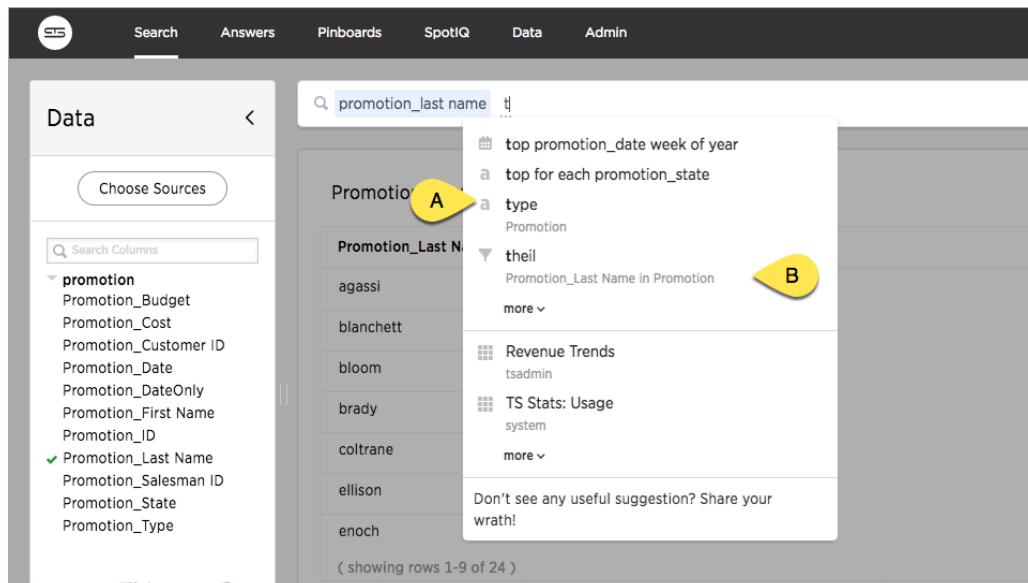
When a user searches in the **Search** bar, ThoughtSpot supplies the user with suggestions for column names and their column values. The **COLUMN NAME** and any **SYNONYMS** appear in **Search** suggestions. For tables and Views, a column's **INDEX TYPE** controls whether and how ThoughtSpot suggests column values. For Worksheets, the **SUGGEST VALUES IN SEARCH** section for a column determines whether ThoughtSpot suggests column values.

Additionally, ThoughtSpot uses a column's **INDEX PRIORITY** value to determine where to rank a column's name and values in the search suggestions. These values impact the dynamically calculated *usage based ranking (UBR)*.

To configure certain aspects of ThoughtSpot's indexing behavior, refer to [Managing search and SpotIQ settings \[See page 0\]](#).

## Example of Search suggestion behavior

The following example illustrates how searching for `promotion_last_name t` causes the system to suggest several ways of completing the `t` in the search:



The system is suggesting the synonym `type` (callout A) for a column in the `Promotion` table. It is also suggesting a value of `theil` (callout B) for the `Promotion_Last Name` column. If you look in the **Data > Tables** page, you can see that there is a `type` synonym for the `Promotion_Type` column which is using default indexing.

COLUMN NAME	AGGREGATION	HIDDEN	SYNOMYS	INDEX TYPE	GEO C...
Promotion_Type	NONE	<input checked="" type="radio"/> NO	Type	DEFAULT	None
Promotion_Date	NONE	<input checked="" type="radio"/> NO	Click to edit	DEFAULT	None
Promotion_Sales..	NONE	<input checked="" type="radio"/> NO	Click to edit	DEFAULT	None
Promotion_Cat...	NONE	<input checked="" type="radio"/> NO	Click to edit	POINT_WISE	...

Managing search suggestions through **INDEX TYPE** and **INDEX PRIORITY** is important. Properly configured suggestions can decrease “noise” in the suggestion list. Increasing the visibility of important columns is helpful for new or intermittent ThoughtSpot users.

## Understand the default indexing behavior for tables and Views

ThoughtSpot has a system default **INDEX TYPE** behavior for search suggestions for table and View values. This system default is configured on your cluster and applies to all tables. You can override this default behavior on a per-column basis.

The screenshot shows the 'New\_store' table configuration in the ThoughtSpot interface. The 'INDEX TYPE' column is highlighted with a blue border. The table has 23 rows and columns for Column Name, Description, Data Type, Column Type, Additive, Aggregation, Hidden, Synonyms, and Index Type.

COLUMN NAME	DESCRIPTION	DATA TYPE	COLUMN TYPE	ADDITIVE	AGGREGATION	HIDDEN	SYNONYMS	INDEX TYPE
Order ID	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Order Date	Click to edit	DATE	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Ship Date	Click to edit	DATE	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Ship Mode	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Customer ID	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Customer Name	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Segment	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
City	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
State	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Country	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Postal Code	Click to edit	INT64	MEASURE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO	Click to edit	DEFAULT

Table has 23 rows

The system behavior when the **INDEX TYPE** is **DEFAULT** is as follows:

- With two exceptions, the system indexes all columns using their **COLUMN NAME** value.

The exceptions are columns with **COLUMN TYPE** of **MEASURE** and columns with **DATA TYPE** of **DATE**.

- Columns that contain data values with large amount of free-form strings, that is, a length is greater than 50 words, are indexed as **PREFIX\_ONLY** by default.

**Warning:** If a column has a very large free text values, ThoughtSpot recommends you keep **DEFAULT** or set **DONT\_INDEX**. Other settings indexing on these values may generate confusing suggestions.

- Short strings (like a `firstname` column) are indexed using **PREFIX\_AND\_SUBSTRING** by default, which indexes both prefix and substrings.
- If a column is using has a **cardinality** – the number of unique column values – greater than 10 million, it is not indexed.

If a column's **INDEX TYPE** is *not* **DEFAULT** and the column's cardinality is greater than 30 million, ThoughtSpot does not index the column.

## High cardinality and performance

A column's cardinality can impact indexing. If you have a column with a very high cardinality and a very high number of rows, indexing these values can impact your ThoughtSpot performance. ThoughtSpot Support recommends you turn off indexing of primary key columns on extremely large tables (> 10 million rows) in your cluster.

High cardinality is relative to other considerations. In some cases, columns with fewer than 10 million rows but with columns containing long strings can cause performance problems with memory. If you have concerns or questions, your ThoughtSpot Customer Success Engineer can help you determine appropriate cardinality thresholds for your ThoughtSpot installation.

## Configure your own cluster defaults

If you need to, you can work with ThoughtSpot Support or your Customer Success Engineer to configure new cluster defaults.

Additionally, you can configure certain aspects of ThoughtSpot's indexing behavior from the Admin Console. Refer to [Managing search and SpotIQ settings \[See page 0\]](#).

## Understand the indexing behavior for Worksheets

For Worksheets, you can only choose whether or not to index the column. You cannot choose an index type. When viewing a Worksheet, toggle the **SUGGEST VALUES IN SEARCH** option on or off.

COLUMN NAME	DESCRIPTION	DATA TYPE	COLUMN TYPE	ADDITIVE	AGGREGATION	HIDDEN	SYNOMYS
ORDERKEY	Click to edit	INT64	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit
LINENUMBER	Click to edit	INT64	MEASURE	<input type="radio"/> NO	SUM	<input type="radio"/> NO	Click to edit
CUSTKEY	Click to edit	INT64	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit
PARTKEY	Click to edit	INT64	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit
SUPPKEY	Click to edit	INT64	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit
ORDERDATE	Click to edit	DATE	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit
ORDERPRIORITY	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit
SHIPPPRIORITY	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit
QUANTITY	Click to edit	INT64	MEASURE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO	Click to edit
EXTENDEDPRICE	Click to edit	INT64	MEASURE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO	Click to edit
ORDERTOTALPRICE	Click to edit	INT64	MEASURE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO	Click to edit

Table has 17 rows

## Override the system default on a column

You can change a column's **INDEX TYPE** in the **Data > Tables > Columns** page or in the **Index** value in the modeling file.

The values you can set for **INDEX TYPE** are:

Index type	Description
DEFAULT	The default behavior applies to all <code>ATTRIBUTE</code> columns that are not <code>DATE</code> types. <code>PREFIX_AND_SUBSTRING</code> for short values and <code>PREFIX_ONLY</code> for long values and free-form text.
DONT_INDEX	Prevents indexing on the column values. The column doesn't appear in search suggestions.
PREFIX_AND_SUBSTRING	Allows full indexing such that prefix and sub-string search both work for the column values.
PREFIX_AND_WORD_SUBSTRING	Allows indexing such that only prefix search works for each word of a multi-word string, for the column values.
PREFIX_ONLY	Allows indexing such that only prefix search works for the column values.

Consider a column in which there are four values `ThoughtSpot`, `Thought`, `Spot` and `Thought Spot`. If you search for `sp`, depending on the setting for indexing, the column value search result suggestions will vary:

Index field value	Search bar suggestions
DEFAULT	<code>ThoughtSpot</code> , <code>Spot</code> and <code>Thought Spot</code>
DONT_INDEX	No suggestions.
PREFIX_AND_SUBSTRING	<code>ThoughtSpot</code> , <code>Spot</code> and <code>Thought Spot</code>
PREFIX_ONLY	<code>Spot</code>
PREFIX_AND_WORD_SUBSTRING	<code>Spot</code> and <code>Thought Spot</code>

To change a value in the application UI:

1. Open a worksheet or table from the **Data** page.
2. Find the column whose index type you want to modify.
3. Set its **INDEX TYPE**.
4. Save your changes.

If you are using the model file, locate the **Index** cell, and enter the **INDEX TYPE** you want to use.

## Change a column's suggestion priority

A column's **INDEX PRIORITY** determines the order or rank in which it and its values appear in the search dropdown.

The screenshot shows the ThoughtSpot interface. At the top, there is a navigation bar with tabs: SEARCH (which is highlighted in orange), ANSWERS, PINBOARDS, and SPOT IQ. Below the navigation bar, the main area has a title "Data" and a back arrow icon. A button labeled "Choose Sources" is visible. To the right of the main area is a sidebar titled "Search". Inside the sidebar, there is a search bar with a magnifying glass icon and the placeholder text "Search Columns". Below the search bar, a list of indexed columns is shown, each preceded by a hash symbol (#) and a small triangle icon indicating expand/collapse:

- # latitude  
Zip\_Codes\_States
- # longitude  
Zip\_Codes\_States
- # zip\_code  
Zip\_Codes\_States
- ▼ for state nj
- more ▾

A vertical scrollbar is present on the right side of the sidebar.

By default, the **INDEX PRIORITY** value is set to `1` for all columns. You can push a column up in the order (increase the rank) by increasing its **INDEX PRIORITY** value. A higher value (like `2`) will cause the corresponding column and its values to appear higher up in the search dropdown than columns with lower value (like `1`).

The screenshot shows a user interface for managing data sources. At the top, there are tabs for 'Tables' and 'Data Sources'. The 'Data Sources' tab is active. Below the tabs, there is a search bar with the placeholder 'All' and a dropdown menu showing 'Y'. Underneath the search bar, there are buttons for 'IMPORTED', 'Columns', 'Data', 'Profile', 'Relationships', and 'Dependencies'. A table titled 'zip\_code' is listed under the 'IMPORTED' category. The table has the following columns and data:

COLUMN NAME	ONFIG	INDEX PRIORITY	FOR
zip_code		1	Click
latitude		10	Click
longitude		1	Click
city		1	Click
state		1	Click
county		1	Click

You should only use numbers between 1-10 in the **INDEX PRIORITY** field. Use a value between 8-10 for important columns to improve their search ranking. Use 1-3 for low priority columns.

To change a value in the application UI:

1. Open a worksheet or table from the **Data** page.
2. Find the column whose index type you want to modify.
3. Change the **INDEX PRIORITY** to a number between 1 and 10.
4. Save your changes.

If you are using the model file, locate the **Index** cell, and enter the priority you want to use.

## Related information

- Model the data for searching [See page 119]
- Usage based rankings (UBR) [See page 0].

# Add a geographical data setting

**Summary:** Learn how to model your geographical data.

Certain attribute columns that contain location data can be used to create Geo maps. ThoughtSpot supports Latitude, Longitude, Zip Code, US States, US Counties, Countries, and select international sub-nation regions.

You can designate a column as `Geo` by editing the **GEO CONFIG** column in the table **Columns** page. You cannot edit the geo configuration column information in the `model.xls` file.

## Guidelines for geographic columns

Columns that can be designated as `Geo` columns need to contain text (`VARCHAR`) data unless they contain latitude/longitude data. Latitude and longitude columns can contain numeric data (`DOUBLE`) or text.

If you import `geo` columns as numeric values, the data type defaults to `INT64`. ThoughtSpot recommends that you import `geo` columns, such as zipcodes as text values. The `column type` defaults to `measure` when you import numeric values. In ThoughtSpot, a `measure` is a numeric value that you can use in mathematical formulas. For geo data, you **must** change the `column type` to `attribute` and specify `additive` as `no`.

If you are using a column with the data type `DOUBLE` for latitude and longitude, change the following settings for those columns:

- set **Column Type** to `ATTRIBUTE`
- set **Additive** to `NO`
- set **Aggregation Type** to `NONE`

For information on these settings, see [Set ADDITIVE or AGGREGATION \[See page 134\]](#).

As a best practice, you should make the following changes to your geographical data **before** importing it to ThoughtSpot:

1. Specify `geo` columns as text values, and not numeric.

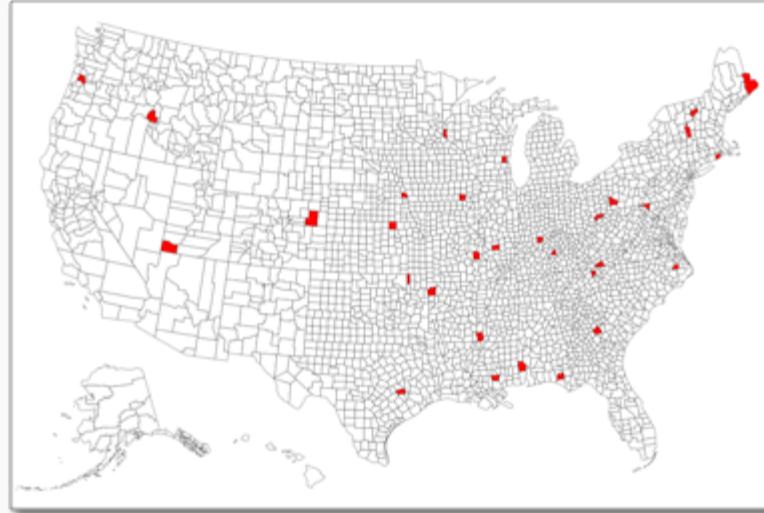
2. Make sure your data is specific, and does not contain duplicates.

For example, you may be collecting data for locations in Washington County, Alabama, and also for locations in Washington County, Wisconsin.

According to the 2010 Census, there are 31 distinct Washington Counties in the United States.

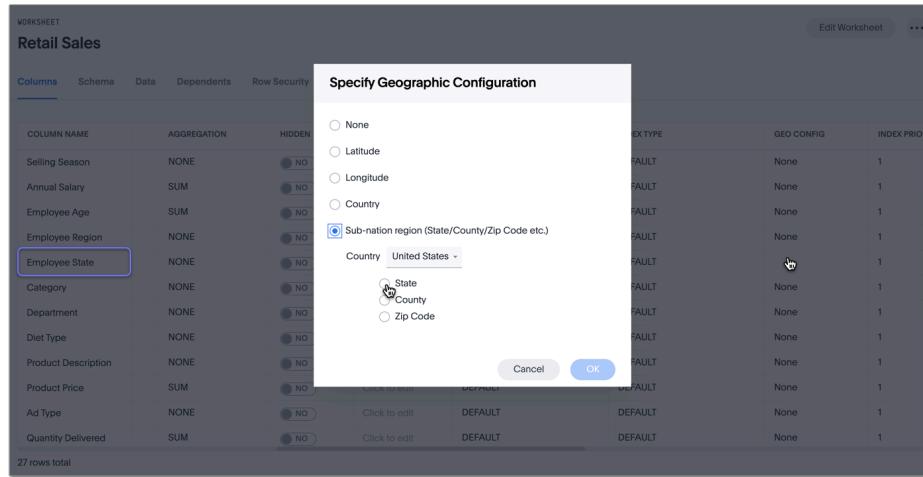
To account for multiple different geographical entities with the same name, you must be specific within your data.

A value of **Washington County** without a state attached to it may result in incorrect or incomplete geo maps.



## How to edit geographic columns

1. Find the **GEO CONFIG** for the column that contains the geographical data.
2. Select the column to display the **Specify Geographic Configuration** dialog.



3. Change the value to the appropriate **GEO CONFIG**, depending on the kind of geo data the column contains.

If your data includes latitude and/or longitude columns that are stored as a numeric data type (`DOUBLE`), make these changes for those columns:

- a. Change the **Type** to `ATTRIBUTE`.
  - b. Change **ADDITIVE** to `NO / FALSE`.
4. Save your changes.

## Supported geo maps

For a complete list of supported geo maps in ThoughtSpot, refer to: [Geo Map Reference \[See page 0\]](#)

## Related information

Model the data for searching [See page 119]

# Set number, date, and currency formats

**Summary:** Learn how to set key formats for column values.

You can set number, date, and currency display formats. These formats define how these value types display in tables and charts.

**Note:** ThoughtSpot supports number, currency, and percent formatting, at the data source level and at the answer level. The `format` pattern option combines number and percent formatting. You can override data source (“custom” in the UI) formatting at the answer level. In source level/ custom formatting, you can only define the format pattern (number and percent formatting) or currency option. If you set them both, the format pattern overrides your currency formatting.

## Number formats

You can set a format for how numbers are displayed in tables and charts. For example, you can display numbers with a different number of digits after the decimal point, based on the data modeling setting **Format Pattern**. You can use any of the supported number formats for delimiters and number of digits to show using [Java Decimal Notation](http://docs.oracle.com/javase/7/docs/api/java/text/DecimalFormat.html) (<http://docs.oracle.com/javase/7/docs/api/java/text/DecimalFormat.html>). Currency symbols are not supported.

The system has default values which are:

`#,###` For integer data types `INT` and `BIGINT`. As you can see, these can only contain numbers, alpha characters are not permitted.

`#,###.00` for decimal data types `DOUBLE` and `FLOAT`.

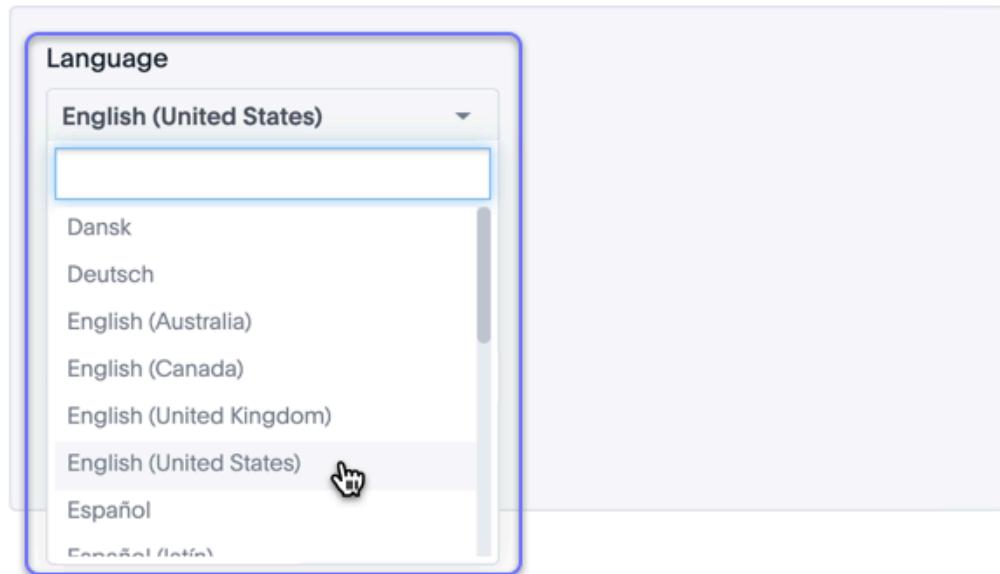
These are some examples of formats you can use:

Stored Value	Format Pattern	Display Value
12345.6789	#,##0.##	12,345.68
12345.6789	#,##0.###	12,345.679
12345.6789	#,##0.00000	12,345.67890
12345.6789	#,##0	12,346
12345.6789	#,##0.00	12,345.68
12345	#,##0.##	12,345
12345	#,##0.00	12,345.00

### Profile-based number formatting

Number formatting is set by default based on your ThoughtSpot profile's **Preferred locale** setting. You can set this value to accommodate your geographic locations.

## Preferences



For example, if you are using ThoughtSpot in the US, the number formatting should look like this:

xxx,xxx.xx . And in Europe, it should look like this: xxx.xxx,xx .

## Date formats

The **Format Pattern** option in the UI or in the model file allows you to specify how ThoughtSpot should display dates in tables and charts. For example, you can display dates in a standard European or US format based on the data modeling setting **Format Pattern**. These are some examples of formats you can use:

Format mask	Description
YYYY or yyyy	four digit year such as 2017
YY or yy	last two digits of year such as 17
M	month with no leading zero 1 - 12
MM	Two digit month 01 - 12
MMM	Three letter month such as Jan
D	Day of year without a leading zero 0 - 365
DD	Day of year with up to one leading zero 01 - 365
DDD	Day of year with up to two leading zeroes 001 - 365
d	Day of month with no leading zero 1 - 31
dd	Two digit day of month 01 - 31
HH	Two digit 24 hour representation of hour 00 - 23
hh	Two digit 12 hour representation of hour 01 - 12
H	24 hour representation of hour with no leading zero 0 - 23
h	12 hour representation of hour with no leading zero 1 - 12
mm	Minutes 00 - 59
m	Minutes with no leading zero 0 - 59
ss	Seconds 00 - 59
s	Seconds with no leading zero 0 - 59

Format mask	Description
a	AM/PM indicator

Valid delimiters include most non-alphabet characters. This includes but is not limited to:

- \ (forward slash)
- / (backward slash)
- | (pipe symbol)
- : (colon)
- - (dash)
- \_ (underscore)
- = (equal sign)

Examples of valid format masks you can produce for display are as follows:

- MM/dd/yyyy
- MMM
- DD/MM/yyyy
- MM/dd/yyyy HH:mm
- DD/MM/yyyy HH:mm

You can change the date format used to display a column's values [for a single table or Worksheet \[See page 121\]](#) or, by editing the data model, for the entire ThoughtSpot instance [\[See page 123\]](#). To edit the data model file, you must have administrative privileges. To change the date format, follow these steps:

1. Decide if the change is for a specific table or Worksheet, or for the entire instance.
2. Find the **Format Pattern** for the column.

This is either a column in a single table or Worksheet or a column in the data modeling file.

3. In the column, enter the format you want to use.
4. Save your changes.

If you are using a data-modeling file you must upload the new file to your installation.

**Note:** You can see this custom date formatting when you use the `date detailed` keyword. Other date buckets, such as `monthly` or `weekly`, use the standard format. For daily dates, ThoughtSpot uses each user's locale to determine whether to display `mm/dd/yyyy` or `dd/mm/yyyy`.

## Set currency type

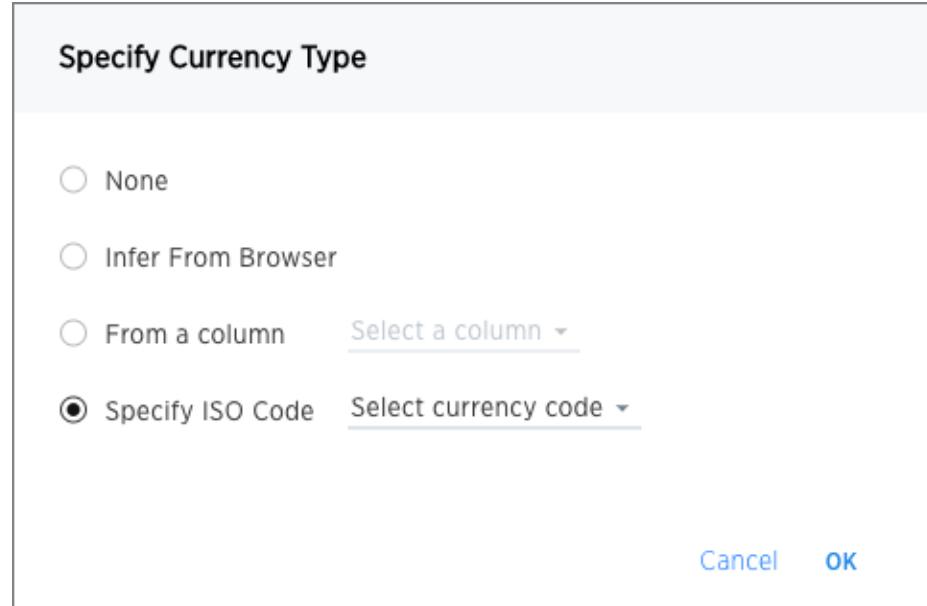
You can set a format for how currencies display in tables and charts when using the ThoughtSpot Data API or embedding. For example, you can display currencies in a standard European Euro or US Dollar format, based on the data modeling setting **Currency Type**.

You can change the currency format used to display a column's values for a single table [See page 121]. When you specify the currency type of your data in the **Columns** settings, your currency data will only display the correct format and currency code in the embedded use case. Currency specific symbols are available in the non-embedded use case as well, but they are not localized.

All users are treated as if they are in `en-US` locale unless they are in embed mode and their browser configuration tells ThoughtSpot that they are in some other locale. For example, `100 Polish Zloty` appears as `100 zł` to a user in Poland, but without localization enabled, it appears as `PLN 100`.

This subtle difference can be seen when you use the REST API. See the ThoughtSpot Application Integration Guide for more information on the API.

1. Find the **Currency Type** for the column whose display format you want to change.
2. Click it to open the **Specify Currency Type** menu.



3. Select one of the following ways you would like to change the format.

Option	Description
<b>Infer From Browser</b>	Your currency data will be modeled upon the locale of your browser setting.
<b>From a column</b>	Your currency data will be modeled upon the existing currency information in the selected column. This option is disabled if there is no VARCHAR column to choose from.
<b>Specify ISO Code</b>	Your currency data will be modeled upon your selection from the available currency code choices.

4. Click **Ok** to save your changes.

## Related information

[Model the data for searching \[See page 119\]](#)

# Change the Attribution Dimension

**Summary:** The Attribution Dimension setting applies only to tables that are related through a chasm trap. If your schema does not include these, you can ignore this setting.

The **Attribution Dimension** setting only applies to tables that join over a Chasm Trap [See page 165].

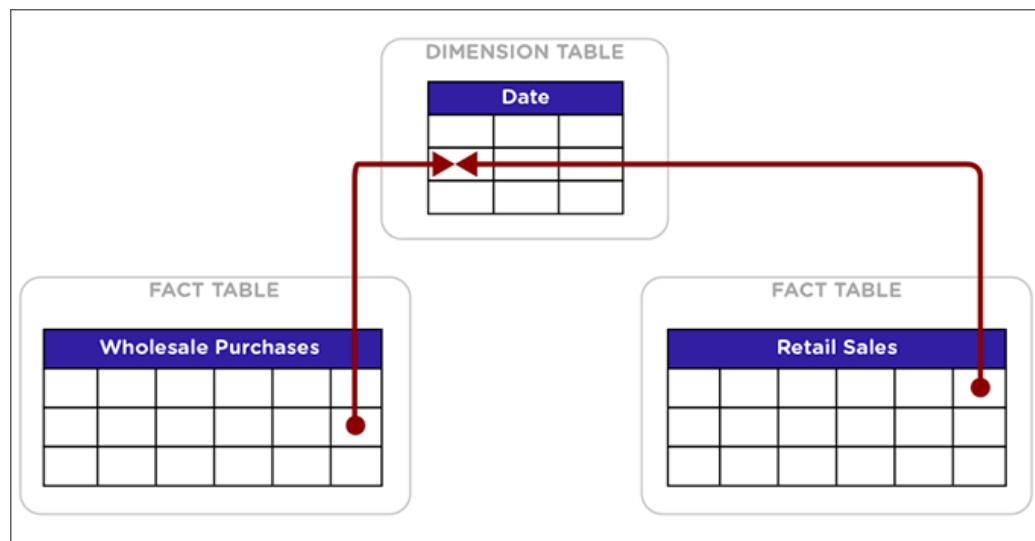
By default, the attribution dimension setting will be set to `YES`, but you can override that by setting the column's attribution dimension property to `NO`, as described here.

## Understand chasm traps and attribute dimension

In the classic chasm trap, two fact tables are related through a shared dimension table. When the two fact tables are joined, the shared column(s) in the dimension table are used to attribute rows in one fact table to match with rows in the other fact table.

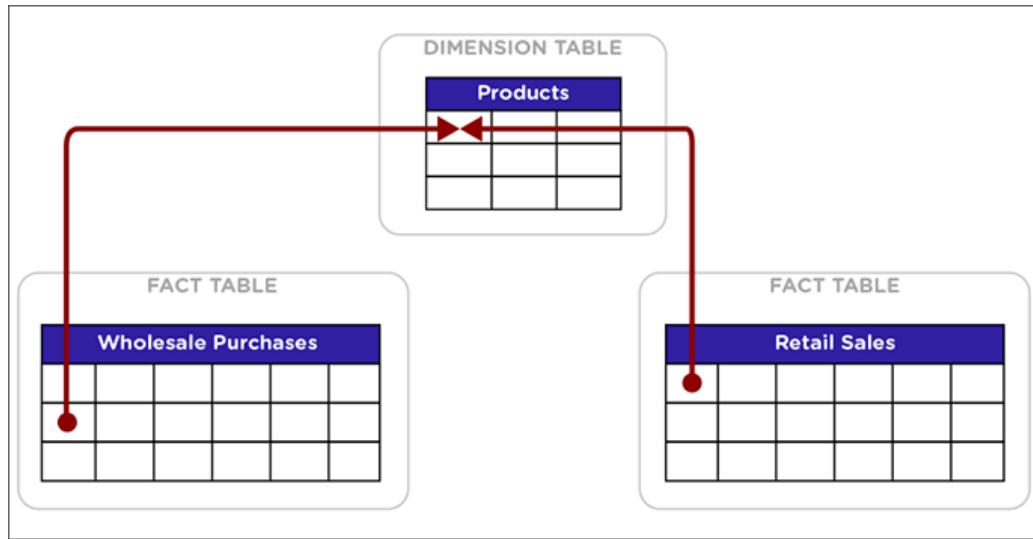
Usually, all goes well using this method. But sometimes an incorrect or illogical attribution can result. This can happen because the column chosen is not meaningful for performing this attribution. If you are seeing unexpected results in searches that include tables across a chasm trap, this setting is for you.

Below is an example of a column that is not an attribution dimension. Suppose you have two fact tables, Wholesale Purchases and Retail Sales, that share a common dimension Date.



In this example, the date column in the Date dimension should not be used for attribution, since unrelated rows in both of the fact tables could share the same row in the Date table. Why? Because if Sally bought oranges wholesale on April 25, 2005 and made a retail sale of apples on the same day, there is no logical relationship between those two events. Combining the two events using the date they share will not create any meaningful information.

If matching rows in two fact tables over a chasm trap depends on the values in a column contained in a dimension table, that column is known as an attribution dimension.



In this example, the Product ID column in the Products dimension table is an attribution dimension. For rows where the Product ID in the Wholesale Purchases and in the Retail Sales tables is a match, those rows are logically related in a meaningful way. They can be combined in charts and reports to produce a logical, expected outcome.

## How to set attribute dimension

You cannot configure this setting in the model file. You can only configure it on a table-by-table basis.

To designate a column as not being an attribution dimension (not producing any meaningful attribution across a chasm trap):

1. Find the column that is not an attribution dimension.
2. Select its **Attribution Dimension**.
3. Set the value to `NO`.
4. Save your changes.

## Related information

[Model the data for searching \[See page 119\]](#)

# Add or manage experts

**Summary:** You can designate experts for each data source, so users won't get stuck if they need help.

**∅ Deprecation:** This feature is now deprecated. You may not use it starting with the May Cloud release. For details, see [Deprecation Announcements](#).

If your users occasionally struggle to answer a specific question, build a chart they have in mind, or find something in their data, you can enable **Ask an Expert**. This lets them request help from someone in your organization.

The request goes to the person in your company who knows the data source very well, and how to search it in ThoughtSpot. The user can see the expert's answer in the **Ask an Expert** interface in ThoughtSpot.

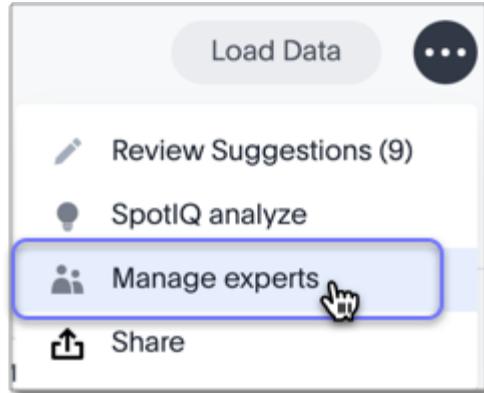
You can see how an end user experiences **Ask an Expert** [here](#) [See page 0].

## Add an expert to a data source

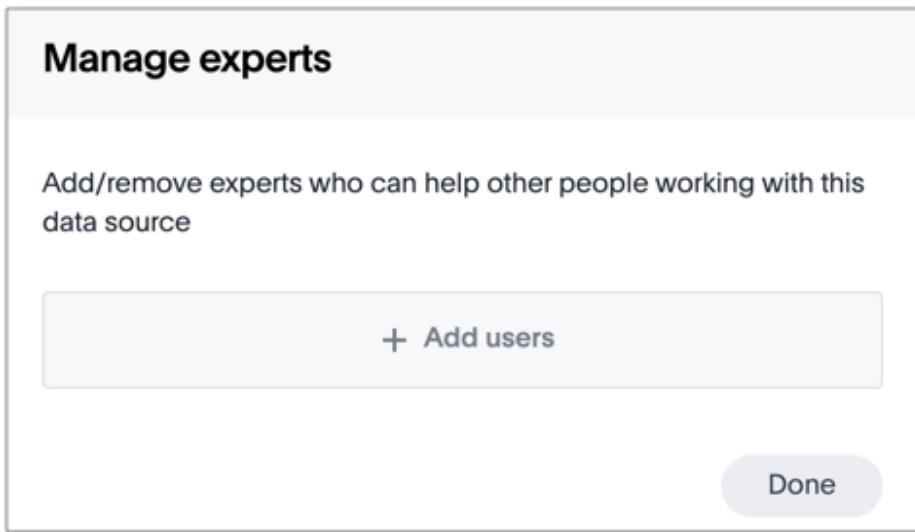
Adding an expert for a data source enables **Ask an Expert** in your ThoughtSpot instance. Until you add an expert, users won't see the prompt to **Ask an Expert** when using that data source.

To add an expert to a data source:

1. Let the expert(s) know to expect user questions to start coming their way in email. If your expert(s) don't have an email in ThoughtSpot, they must [check in ThoughtSpot for requested answers](#) [See page 0].
2. Click the name of the worksheet or table from the **Data** page.
3. Click the three dot icon in the upper right side of the page and select **Manage experts**.



4. Make your selections and click **Done**.



## Related information

- Model the data for searching [See page 119]
- Ask an Expert [See page 0]

# Set columns to exclude from SpotIQ analyses

**Summary:** You can specify columns to exclude from SpotIQ analyses.

SpotIQ [See page 0] is a ThoughtSpot feature that provides users with insights about their data by automatically surfacing interesting characteristics (trends, correlations, outliers, and so on).

If you have access to tables, worksheets, and views for data modeling purposes, you can specify columns to exclude from SpotIQ analyses. By default, all columns are *included* in SpotIQ analyses.

## Exclude columns from SpotIQ analyses

To specify columns to exclude from SpotIQ analyses:

1. Click **Data** in the top menu, and choose **Tables**, **Worksheets**, or **Views** [See page 259].
2. Click the name of your data source.
3. On the **Columns** tab, find the COLUMN NAMES you want to exclude from SpotIQ analyses, and scroll to the right to find **SPOTIQ PREFERENCE**.
4. Use the drop-down menu to set the **SPOTIQ PREFERENCE** to **EXCLUDE** for each column you want to exclude.
5. Click **SAVE CHANGES** in the upper right.

## Include columns in SpotIQ analyses

By default, all columns are included in SpotIQ analyses.

If you have previously set some columns to EXCLUDE and you want to re-set these to be included, do the following.

1. Click **Data** in the top menu, and choose **Tables**, **Worksheets**, or **Views** [See page 259].

2. Click the name of your data source.
3. On the **Columns** tab, find the COLUMN NAMES you want to set back to include in SpotIQ analyses, and scroll to the right to find **SPOTIQ PREFERENCE**.
4. Use the drop-down menu to set the **SPOTIQ PREFERENCE** to **DEFAULT** for each column you want to include.
5. Click **SAVE CHANGES** in the upper right.

## Related information

- [SpotIQ tutorial \[See page 0\]](#)
- [Overview of data modeling settings \[See page 127\]](#)

# Chasm traps

**Summary:** A chasm trap occurs when two many-to-one joins converge on a single table.

In a complex schema, you may have a fact table with no relationship to another fact table, except that each contains a foreign key to a shared dimension table. This is known as a chasm trap, and ThoughtSpot can handle it!

## Understand how chasm traps occur

A fact table, just as it sounds, stores facts about your business. If you are selling apples, the sales fact table has facts about these apples.

SaleID	AppleTypeID	StoreID	Units Sold
4	55	2	12
8	34	33	3
10	09	09	1

Dimension tables describe the attributes that are interesting to analyze. For example, the apple table might look like this.

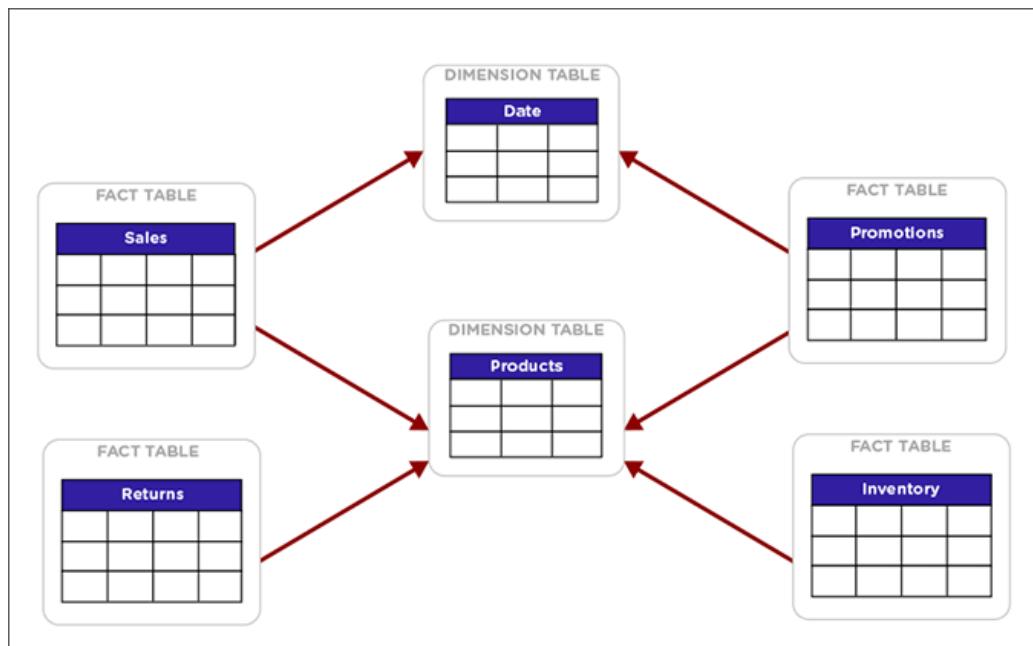
AppleTypeID	Color	Name	Use
55	Red	Red Delicious	Snack
34	Green	Granny Smith	Cooking
09	Yellow	Golden	Snack

As you can imagine, in a business you might have several fact tables that access dimension tables. So, an apple business may record waste as well as sales.

TimeID	AppleTypeID	StoreID	Units Wasted
4	55	2	2
8	34	33	43
10	09	09	11

Both the sales and waste tables are facts that reference the apple dimension table.

A chasm trap in a data schema can introduce problems of over counting if you join the two fact tables through their shared dimension table. This diagram shows a typical complex schema with several tables that are related over a chasm trap:



Examples of use cases where a chasm trap could occur when attribution analysis compare campaign data with purchase data, where all they have in common is that both contain a customer identifier that is a foreign key to a customer dimension table. Chasm traps also occur, for example, in cost of sales analysis when wholesale orders data is only related to the retail sales data through a shared products dimension table.

In many databases, joining tables across a chasm trap creates a **Cartesian product** or **cross join**. That is each row from the first fact table is joined to each row from the second table. A Cartesian product causes over counting when computing counts and aggregates. ThoughtSpot protects you from this kind of over counting.

There are still just a few things to look out for when using a schema that contains chasm traps:

- The tables should be joined to the dimension table by an equi-join (a primary key/foreign key relationship). They cannot be joined using a range of values.
- Review the column setting called [Attribution Dimension \[See page 158\]](#). You may need to change this setting if some of the columns in the shared dimension table should not be used for attribution when combining fact tables.
- Tables that will be joined across a chasm trap do not have to be co-sharded. They will be joined appropriately automatically in the most efficient way.

## Chasm trap limitations

Join information in **What am I Looking At?** does not appear for searches on a worksheet containing a chasm trap or on base tables that are related over a chasm trap.

# Data types

**Summary:** ThoughtSpot supports the common data types.

Before you import data, compare the data types you want to load with these supported data types. Then, convert your data before loading it. Typically, you would export the data, transform it to meet these type rules, and then load the data. This is known as an extract-transform-load process.

## Supported data types

The tables you create to receive the data must have the same number of columns and data types as the data you will be loading. Choose a data type for each column from the list of supported data types:

Data	Supported data types	Details
Character	VARCHAR(*n*)	Specify the maximum number of characters, as in VARCHAR(255). The size limit is 64MB for VARCHAR values.
Floating point	DOUBLE or FLOAT	DOUBLE is recommended. DOUBLE has a range of 1.7E +/- 308 (15 digits).
Boolean	BOOL	Can be true or false.
Integer	INT32 or INT64	INT32 holds 32 bits. INT64 holds 64 bits. INT32 has a range of -2,147,483,648 to 2,147,483,647. INT64 has a range of -9,223,372,036,854,775,808 to 9,223,372,036,854,775,807.
Date or time	DATE, DATETIME, TIMESTAMP, TIME	DATETIME, TIMESTAMP, and TIME are stored at the granularity of seconds. TIMESTAMP is identical to DATETIME, but is included for syntax compatibility.

**⚠ Warning:** There is a 64MB limitation on the number of characters for VARCHAR. If you have any VARCHAR data that exceeds this limit, the entire load will fail.

## Geographical data types

ThoughtSpot supports geographical data.

### How to import geographical data

Import your geographical data as **text** values. This ensures that the data defaults to the correct configuration, where the data type is `VARCHAR`. You can use `DOUBLE` or `VARCHAR` for latitude and longitude data. See the following example:

COLUMN NAME	DATA TYPE	COLUMN TYPE	ADDITIONAL	AGGREGATION	HIDDEN	SYNONYMS	SPOTIQ PREFERENCE	INDEX TYPE	GEO CONFIG
Store Name	VARCHAR	ATTRIBUTE	<input checked="" type="radio"/> NO	NONE	<input checked="" type="radio"/> NO	Click to ...	DEFAULT	DEFAULT	None
Store State	VARCHAR	ATTRIBUTE	<input checked="" type="radio"/> NO	NONE	<input checked="" type="radio"/> NO	Click to ...	DEFAULT	DEFAULT	State
Store Region	VARCHAR	ATTRIBUTE	<input checked="" type="radio"/> NO	NONE	<input checked="" type="radio"/> NO	Click to ...	DEFAULT	DEFAULT	None
Store Zip Code	VARCHAR	ATTRIBUTE	<input checked="" type="radio"/> NO	NONE	<input checked="" type="radio"/> NO	Click to ...	DEFAULT	DEFAULT	Zip Code

In the above example, the zipcodes were imported as text values. By default, the `data type` is `VARCHAR`, the `column type` is `attribute`, and `additive` is `no`. You must specify the `geo config` for your data yourself. ThoughtSpot does not specify geo config automatically.

If you import zipcodes as numeric values, the `column type` defaults to `measure`. In ThoughtSpot, a `measure` is a numeric value that you can use in mathematical formulas. If you import your geographical data as numeric values, you **must** change the `column type` to `attribute` and specify `additive as no`.

### Latitude and longitude

For latitude and longitude, you can use either `VARCHAR` or `DOUBLE`. Note that your latitude and longitude data must be in the form of positive and negative numbers, and not in the form of degrees. North of the Equator, latitude values are **positive**, and south of the Equator, latitude values are **negative**. East of the Prime Meridian, longitude values are **positive**, and West of the Prime Meridian, longitude values are **negative**.

## Designate your geographical data in ThoughtSpot

After loading the data, designate it as a geographical data type when you [Edit the system-wide data model \[See page 123\]](#). Wherever abbreviations or codes are used, they are the same as what the USPS (United States Postal Service) recognizes.

These data types can be designated as geographical data, which enables them to be visualized using the Geo chart types:

- Countries, for example:
  - United States
    - `long_name` : United States
    - `name_sort` : United States of America
    - `abbreviation` : U.S.A.
    - `adm0_a3` : USA
    - `adm0_a3_is` : USA
    - `adm0_a3_us` : USA
    - `admin` : United States of America
    - `brk_a3` : USA
    - `brk_name` : United States
    - `formal_en` : United States of America
    - `iso_a2` : US
    - `iso_a3` : USA
    - `iso_n3` : 840
  - `COUNTY` for counties in the United States, for example:
    - santa clara county
    - pike county, ohio
    - pike county, OH
  - `STATE_PROVINCE` for states in the United States, for example:
    - `name` : California
    - `US Postal Service abbreviation` : CA
  - `LATITUDE`, which must be used with `LONGITUDE`, for example:

- 37.421023
  - -1.282911
- 
- `LONGITUDE`, which must be used with `LATITUDE`, for example:
    - 122.142103
    - -103.848865
- 
- `ZIP_CODE` for zip codes in the United States, for example:
    - `po_name` : MT MEADOWS AREA
    - `ZIP` : "00012"
    - `zip2` : 12
- 
- Other Sub-nation Regions, which are administrative regions found in countries other than the United States, for example:
    - bremen
    - normandy
    - west midlands

**⚠ Important:** You cannot upload your own custom boundaries.

# Link tables using relationships

**Summary:** Learn how to link tables using relationships.

You can link tables by creating relationships between their columns. Linked tables can be searched together or combined into a worksheet for easy searching. Tables that have no relationship between their columns cannot be combined in a single search.

Create a relationship through the web interface. [See page 173]

The two methods create the same kind of relationship. When creating a relationship between two tables, the columns that form the link must have the same data type. For example, you can build a relationship between two columns that use the `INT32` data type.

These relationships can be managed by going to the **Relationships** page when viewing data in the **Data Modeling** section in the ThoughtSpot application. You can view, modify, or delete relationships in either place.

The relationships you create cannot form a circular relationship, or “cycle”. If you attempt to create a relationship that would complete a cycle, you will see a message stating that the relationship could not be added because it conflicts with another existing relationship.

# Join a table or View to another data source

**Summary:** Learn how to define joins between a table or View and another table, View, or Worksheet

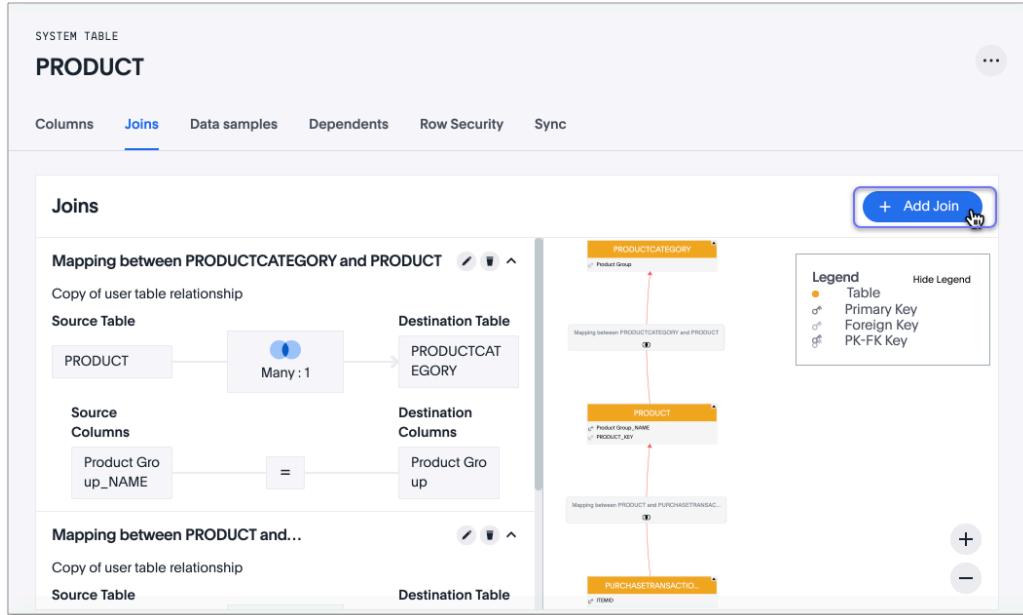
Joining a table or View to another table, View, or Worksheet creates a relationship that allows them to be searched together. Choose a column to join on that both tables contain (e.g. employee ID or product key). This process creates a [generic join \[See page 0\]](#) between the table or View and the other table, View, or Worksheet on the column you specify.

You must have either the **Can administrator ThoughtSpot** or the **Can manage data** privilege [\[See page 34\]](#) to create a join relationship. If you're not an administrator, you also need edit permissions on the table, View, or Worksheet.

When creating a join between the columns in two data sources, the linked columns must have the same data type, with the same meaning. That is, they must represent the same data. Normally, you can make this kind of link from a fact table column to a column in a dimension table that uniquely identifies a logical entity in your data such as Employee ID for a person, Product ID for a product, or Date Key for a specific date in a date lookup table.

To create a relationship through the Web interface:

1. Click **Data** in the top menu, and choose **Tables** or **Views**.
2. Find your table or View through browsing, Search, or selecting the appropriate Tag(s).
3. To select the table or View for adding joins, click its name in the list. You will see the **Columns** view of the data source.
4. Click the **Joins** tab. The list of existing joins appears.



1. Click **+Add Join**. The **Create Join** page appears.

**Create join**

Cancel Create join

**Data sources**

1 Embrace  Falcon

**Connection**

2 Select connection

**Join name**

3 Enter join name

**Table 1**

Select table

Column

No columns found

+ Add columns

**Join Type**

Inner

**Cardinality**

Select

**Table 2**

Select table

Column

No columns found

### Legend Action

1. Select the data source of your table or View, either **Connection**, or **Falcon**.

2. Choose your connection from the dropdown **Connection** menu. You can only create joins between data sources uploaded through the same connection.
  3. [Optional] Click **Enter join name** to name your join. Note that ThoughtSpot automatically names joins using the following syntax: [OriginDataSourceName]\_to\_[DestinationDataSourceName]. You can always enter a more meaningful join name, either when creating, or when editing the join.
- 
1. Under **Table 1**, choose the table you want to create a join from (origin table).
  2. Under **Table 2**, choose the destination table or View for the other end of the join.
  3. Choose the matching columns under each table. These columns must use the same data type. [Optional] You can select multiple columns for the same join. To add another pair of matching columns to the join definition, click **+Add columns**.
  4. Specify the join type; see [Join types \[See page 203\]](#).
  5. Specify the join cardinality; see [Cardinality \[See page 204\]](#).
  6. Click **Create join**.
  7. Repeat these steps until all the joins you want to make have been created.

After creating the join, you may change its name, type, or cardinality by clicking the edit icon. If you want to change the data source or column being joined, you must delete the join and create a new one.

## Related Information

- [Constraints \[See page 0\]](#)

# Delete a relationship

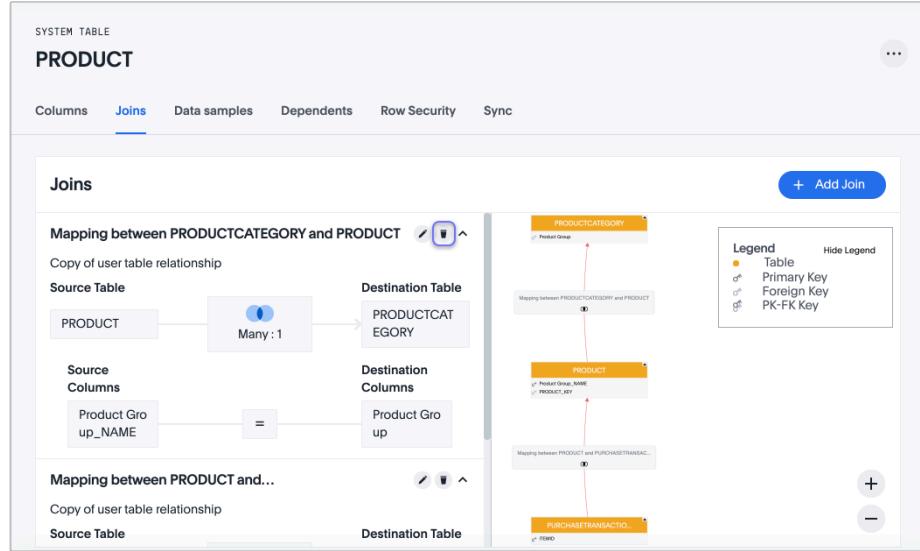
**Summary:** You can delete a relationship between tables through the ThoughtSpot application.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

You must have either the **Can administrator ThoughtSpot** or the **Can manage data** privilege [See [page 34](#)] to delete a relationship. If you're not an administrator, you also need edit permissions on the table, view, or worksheet.

## To delete a relationship from the Web interface:

1. Click **Data** on the top navigation bar.
2. Find the origin table, worksheet or view of the join you want to delete through browsing, Search, or selecting the appropriate Tag(s).
3. Click the name of the data source from which you want to remove the relationship.
4. Click **Joins**. You will see the list showing existing joins. If you want to delete an external join from a worksheet, you must click **Joins within this worksheet** and choose **Joins from this worksheet**.



5. Click the **Delete icon** to the right of the join name. The **Confirm delete** window appears.

6. Click **Delete**

**Note:** If existing answers or Liveboards depend on the join you are deleting, you will see the **Cannot delete** window listing all dependents of the join. You must delete all dependents before you can delete the join.

## Cannot delete

The following object(s) depend on "Mapping between PRODUCTCATEGORY and PRODUCT". You must delete them to delete "Mapping between PRODUCTCATEGORY and PRODUCT".

- o [2020 Sales Pinboard](#) (Pinboard)
- o [Product Stats Worksheet](#) (Worksheet)

OK

## Related Information

- [Constraints \[See page 0\]](#)

# About tags

**Summary:** Tags enable you to create categories for classification of objects, including Liveboards, answers, data sources, and worksheets.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

You can create tags to make it easier for people to find data sources and Liveboards. Tags are global in scope. This means that everyone can see the tags and use them to tag objects. They can also filter lists of objects by tag. Tags are often used to designate subject areas, such as sales, HR, and finance, but you can use them any way you like.

Keep in mind these permissions when working with tags:

- Only administrators can create tags.
- Anyone can apply a tag.
- Anyone can filter by a tag.
- You can only filter by one tag at a time from the UI.

## Create a tag

Only administrator users can create tags. Anyone can apply the tags you create, or use them as filters when selecting from a list of sources or Liveboards.

To create a tag:

1. Navigate to the **Manage Data** or **Liveboards** screen using the icons in the top navigation bar.
2. Choose the currently selected tag, scroll to the bottom of the list, and click **+ Add**.

The screenshot shows a list of four documents in the ThoughtSPORT workspace:

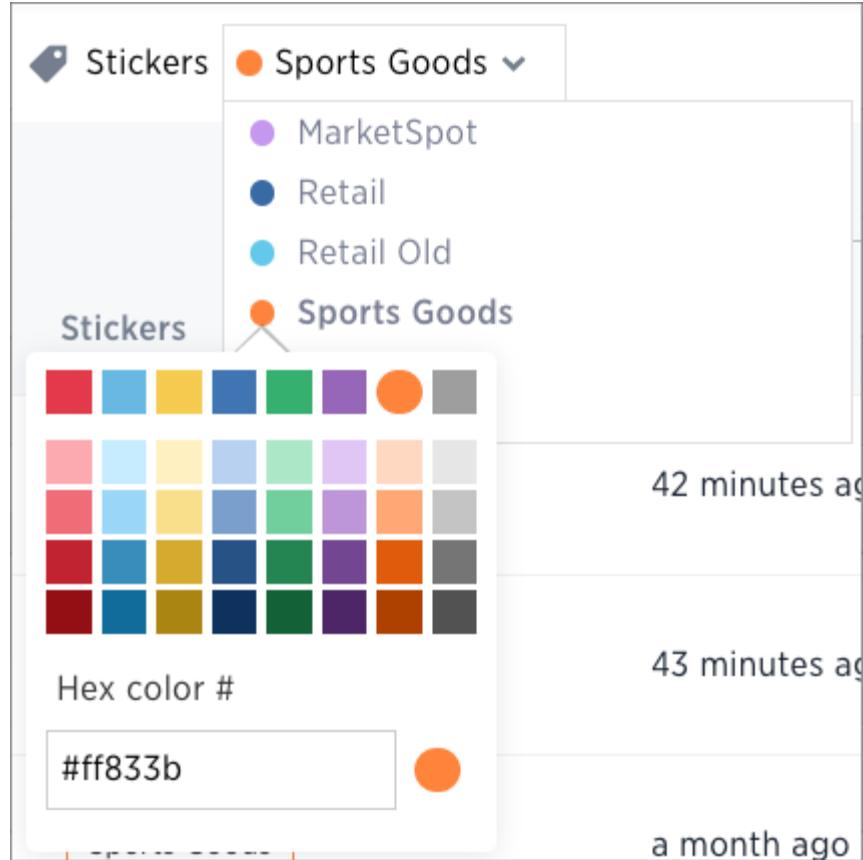
Name	Tags	Created
ThoughtSPORT Overview	Sports Goods	9 minutes ago
Advanced Analysis with R	Sports Goods	9 minutes ago
ThoughtSPORT Analysis Overview of Advanced Formulas in Thoughtspot	Sports Goods	a month ago
Comparative Analysis	Sports Goods	a month ago

A dropdown menu labeled "Tags" is open, showing the current tag "Sports Goods" selected (indicated by an orange circle). A blue box highlights the "+ Add" button.

3. Type the name for the new tag.
4. You can change the name of a tag by clicking the edit icon next to its name.

The screenshot shows the "Tags" dropdown menu with the "Sports Goods" tag selected (orange circle). A context menu is open over the "Sports Goods" tag, displaying two options: "Edit name" and "Remove tag".

5. You can change the color of a tag by clicking the color circle next to its name.

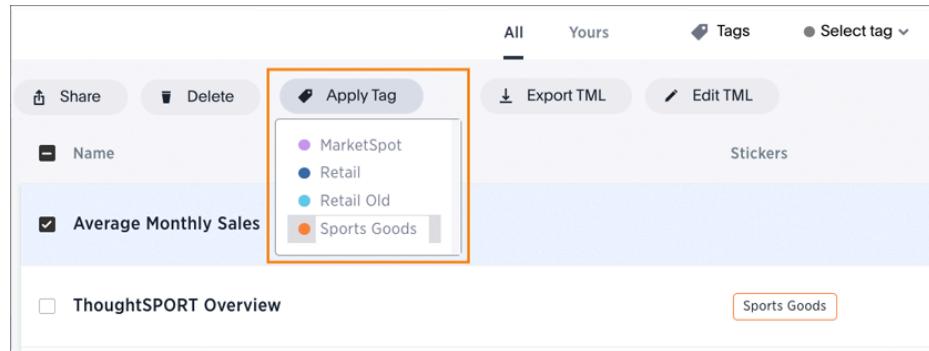


## Apply a tag

Only administrators create tags, but anyone with edit privileges can tag an object with a tag.

To tag an object with a tag:

1. From the top menu, choose Answers, Liveboards, or Data.
2. Find the item(s) you want to tag in the list, and check the box next to its name.
3. Click the apply tag icon and choose one from the list. You can apply as many tags as you like to an object.



## Filter by tags

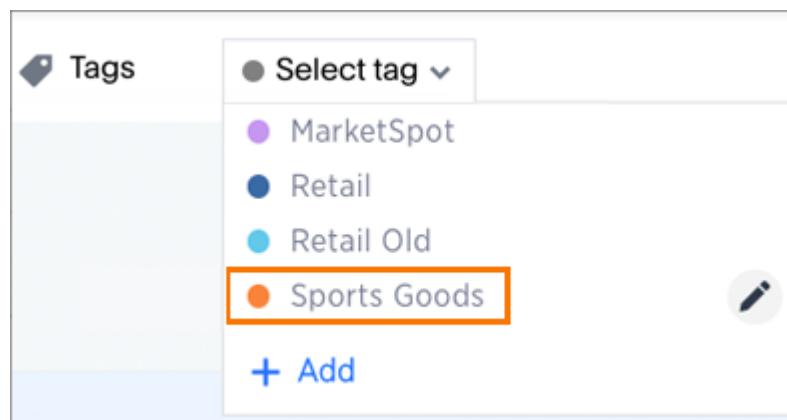
Whenever you are selecting objects from a list, you can filter by tag to find what you're looking for.

Anyone can use tags to filter lists of Liveboards or data sources. You can also filter by a tag when selecting data sources.

Note that you can only filter by one tag at a time in the UI. To get a list of ThoughtSpot objects or object headers that is filtered by multiple tag, use the [Metadata API](#) (<https://developers.thoughtspot.com/docs/?pageid=metadata-api>). The `list` and `listobjectheaders` endpoints allow you to filter by multiple tags.

To filter by tag:

1. From the top menu, choose **Answers**, **Liveboards**, or **Data**.
2. Click **Select tag**, and select the name of the tag you want to filter by.



### Remove a tag filter

To remove a tag filter and see all objects again, select the tag you filtered on in the tag list.

# Create and use worksheets

**Summary:** Worksheets are flat tables created by joining columns from a set of one or more tables or imported datasets.

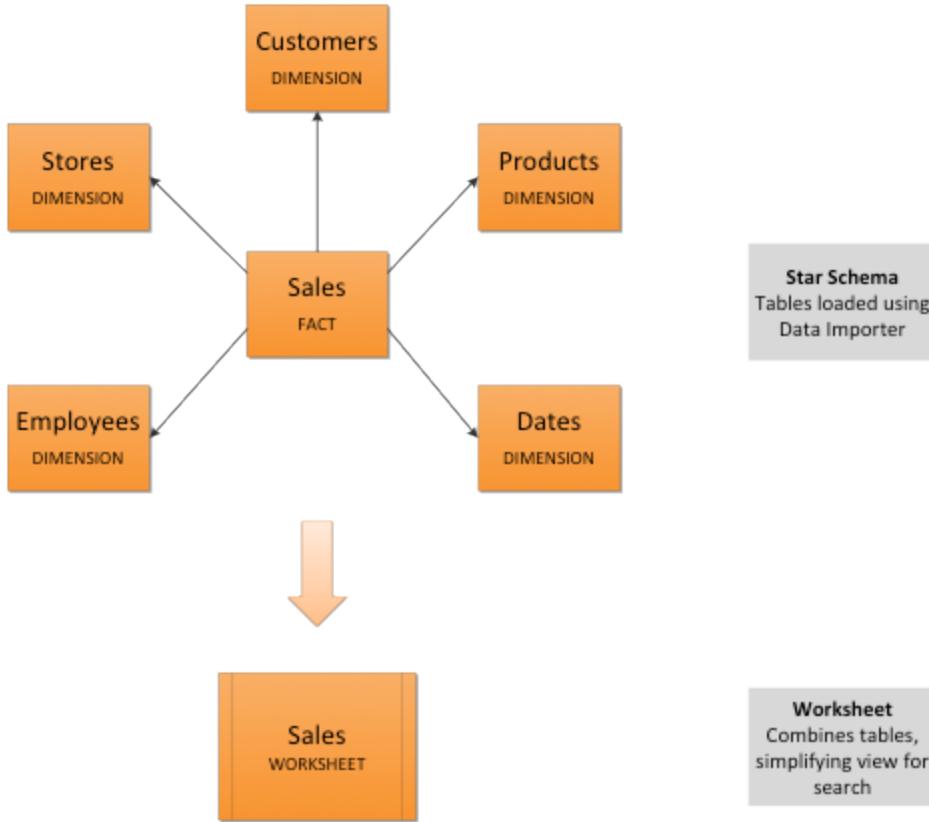
After [modeling your data \[See page 119\]](#), create worksheets to make searching easier. For example, a sales executive might need to search for information about retail sales. This data might be contained in several tables (sales, customers, products, stores, etc.), with foreign key relationships between them. An administrator who is familiar with the data model can create a retail sales worksheet, that combines all of the related fact and dimension tables into a single, easy-to-use view, and share it with the sales executive. This provides access to the data without requiring an understanding of how it is structured.

## Guidelines for worksheets

Users are often unfamiliar with tables and how they are related to one another. A worksheet groups multiple related tables together in a logical way. You might use a worksheet for these reasons:

- To pre-join multiple tables together.
- To give a user or group access to only part of the underlying data.
- To include a derived column using a formula.
- To rename columns to make the data easier to search.
- To build in a specific filter or aggregation.
- To give users a filtered set of data to search.

Typically, you create one worksheet for each set of fact and dimension tables. For example, you may have a sales fact table and an inventory fact table. Each of these fact tables shares common dimensions like date, region, and store. In this scenario, you would create two worksheets: sales and inventory. The following diagram depicts the workflow for creating the sales worksheet.



The process for creating a worksheet is:

1. Decide which tables to use for the worksheet.
2. [Create a new Worksheet \[See page 186\]](#). If the worksheet already exists in another cluster, you can migrate it [using a flat yaml file \[See page 219\]](#).
3. Add sources (tables) to the worksheet.
4. Choose the [worksheet join rule \[See page 199\]](#).
5. Select the columns to include.

**Note:** ThoughtSpot supports multiple join paths for worksheets. For example, you may have a fact table joined to a dimension table more than once. When adding attribute columns from that dimension table to your worksheet, ThoughtSpot prompts you to choose which join path you would like to use for that column. To use multiple

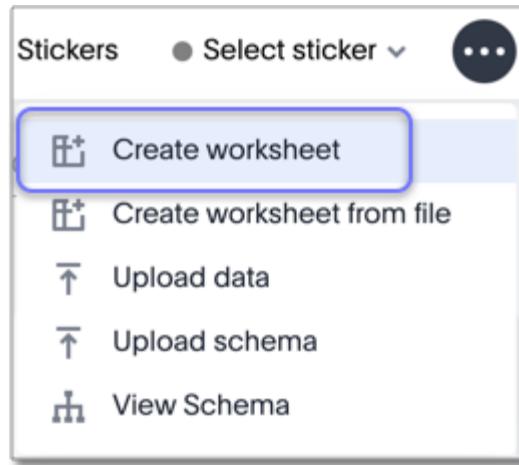
join paths, select that attribute again, modify the name, and choose the other join path when ThoughtSpot prompts you to select one.

6. Optionally [modify the join types \[See page 213\]](#) within the worksheet.
7. Optionally [create formulas \[See page 192\]](#).
8. Optionally [create worksheet filters \[See page 195\]](#).
9. Save the worksheet.
10. Share the worksheet with groups or users [\[See page 79\]](#).

## Create a worksheet

To create a new worksheet:

1. Click **Data**, on the top navigation bar.
2. Click the ellipsis icon  , and select **Create worksheet**.



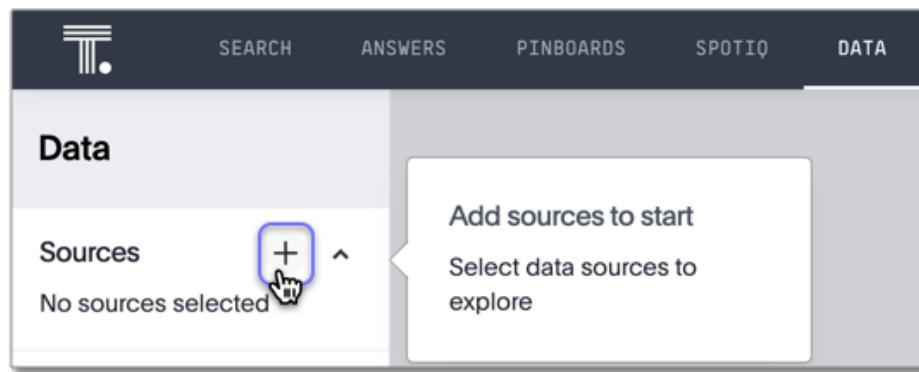
3. Add sources and columns [\[See page 187\]](#).

## Add sources and columns to a worksheet

After creating a worksheet, you need to add the sources that contain the data. A source is another name for a table. The sources you choose are typically related to one another by foreign keys.

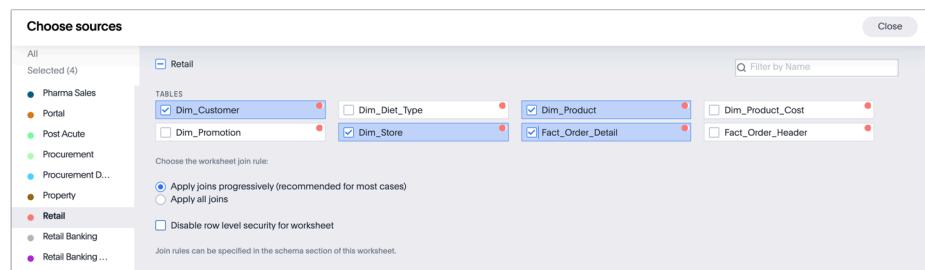
To add sources to your worksheet, follow these steps. The worksheet creation UI also guides you through the process.

1. Click the + icon next to **Sources**.



2. Check the box next to each of the sources you want to include in the worksheet. You can search for specific Views, imported data, or tables. You can also select every data source that has a specific tag, like **Retail**.

Note that the list of sources only shows the data sources on which you have view or edit privileges.

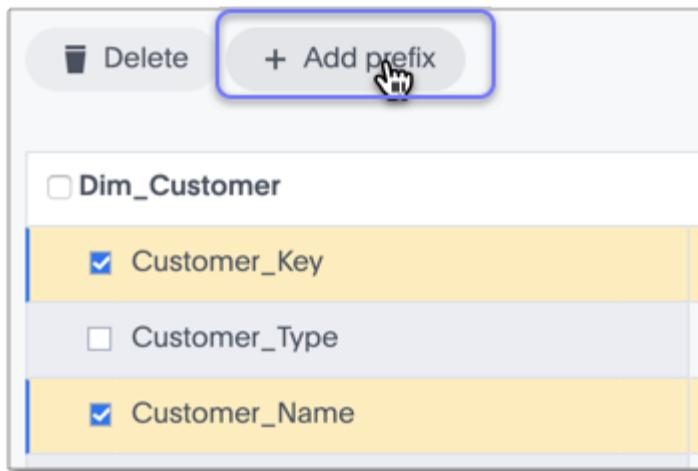


3. Choose the [worksheet join rule \[See page 199\]](#). Either **apply joins progressively** or **apply all joins**. Applying joins progressively speeds up performance.
4. If you want to disable [Row Level Security \[See page 105\]](#) for this worksheet, check the checkbox to disable it.
5. Click **CLOSE** to save your changes.
6. Expand the table names under **Sources** and select the columns to add to the worksheet, by doing any of the following:
  - a. To add all of the columns from a table, click the table name and click **+ Add Columns**.
  - b. To add a single column, double-click its name.
  - c. To add multiple columns, Ctl+click each column you want to add and click **+ Add Columns**.

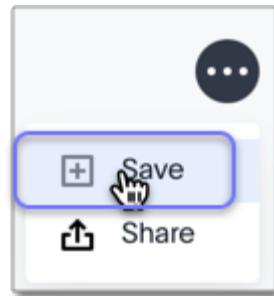
Note that after you add a column, non-related tables (those without a primary/foreign key relationship) become hidden. If you are working with two tables that should be related, but are not, you can [add a relationship between them \[See page 172\]](#).

7. (Optional) [Modify the join types \[See page 213\]](#) within the worksheet.
8. (Optional) [Create formulas \[See page 192\]](#).
9. (Optional) [Create worksheet filters \[See page 195\]](#).
10. Click the ellipsis icon  , and select **Save**.
11. In the Save Worksheet window, enter a name and description for your worksheet and click **SAVE**.
12. (Optional) Click each column name and enter a more user-friendly name for searching. You can tab through the list of columns to rename them quickly.

13. (Optional) If you want to add a prefix to the name of several columns, select them, click the **Add prefix** button, and type in the prefix.



14. Click the ellipsis icon ..., and select **Save**.



15. Share your worksheet [See page 79], if you want other people to be able to use it.

## Where to go next

- **How the worksheet join rule works [See page 199]**

Use the worksheet join rule to specify when to apply joins when a search is done on a worksheet. You can either apply joins progressively, as each search term is added (recommended), or apply all joins to every search.

# Edit or rename worksheet

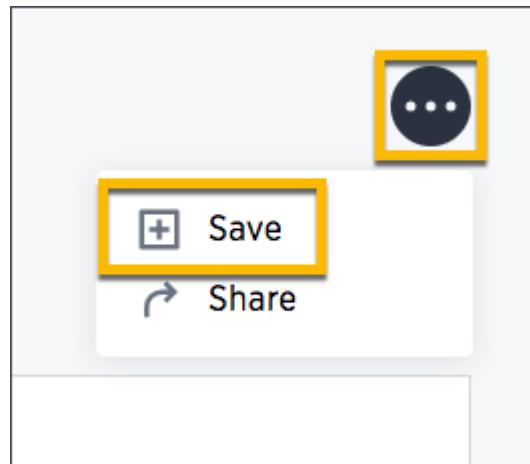
**Summary:** Anyone with the proper permissions can edit a worksheet.

If you created a worksheet, or you have edit permissions on it, you can make changes such as adding sources and columns, adding or editing formulas, changing relationships, and changing column names. You can also rename a worksheet or change its description.

## Edit a worksheet

To edit a worksheet:

1. Click **Data** on the top navigation bar.
2. Click the name of the worksheet you want to edit.
3. Click the **Edit** button in the upper-right side of the screen.
4. Make your changes to the worksheet.
5. Click the ellipsis icon  , and select **Save**.



## Rename a worksheet or table

You can change a worksheet or table name from the ThoughtSpot application.

To change the name of a worksheet or table:

1. Click **Data**, on the top navigation bar.
2. Find the worksheet or table you want to rename and click its name.
3. Click the current name, and enter a new name.

## Related information

- [Change the join rule for a worksheet \[See page 201\]](#)
- [Add joins between a worksheet and other data \[See page 203\]](#)
- [Modify table joins within a worksheet \[See page 213\]](#)

# Create a formula in a worksheet

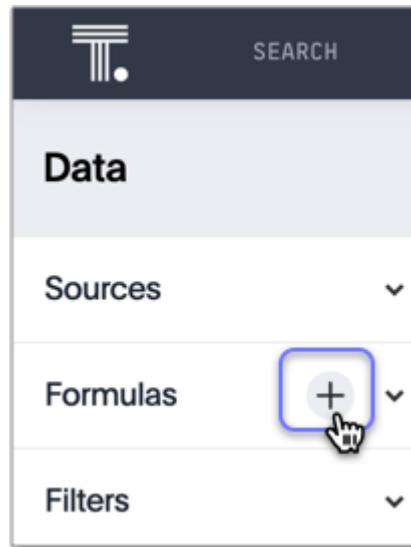
**Summary:** You can define formulas and use them to create derived columns in worksheets.

You create formulas by combining standard functions and operators, column names, and constant values.

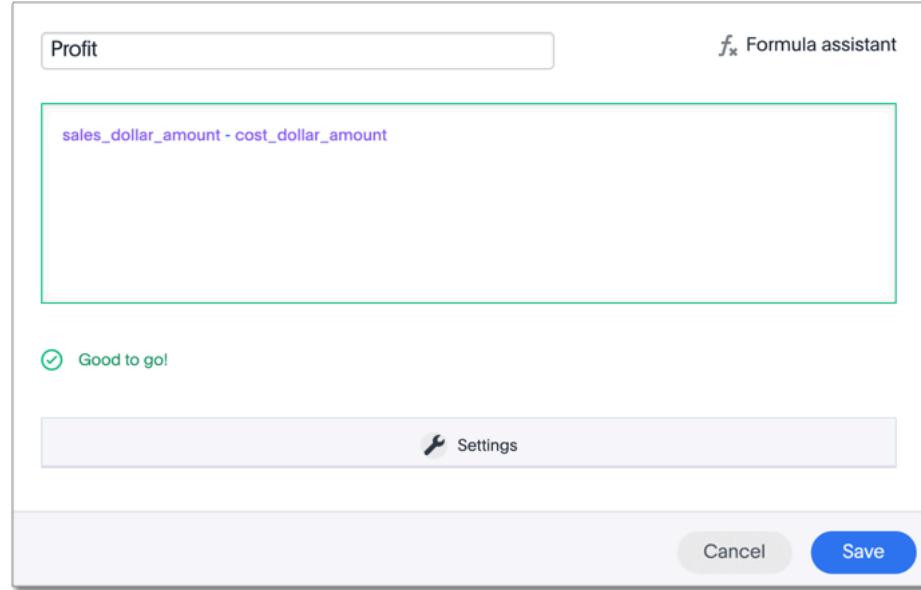
Anyone who can create a worksheet can add a formula to it. Formulas are not reusable; the formula you create is associated only with the worksheet it belongs to. A complete list of available formulas and examples of each is available in the [Formula function reference \[See page 0\]](#).

You can create a formula in a worksheet by using the Formula Builder. When you do this, the result of the formula gets added to the worksheet as a column. Use these steps to create a formula:

1. [Create a new worksheet \[See page 184\]](#), or [edit an existing one \[See page 190\]](#).
2. Click the **+** button next to **Formulas**.

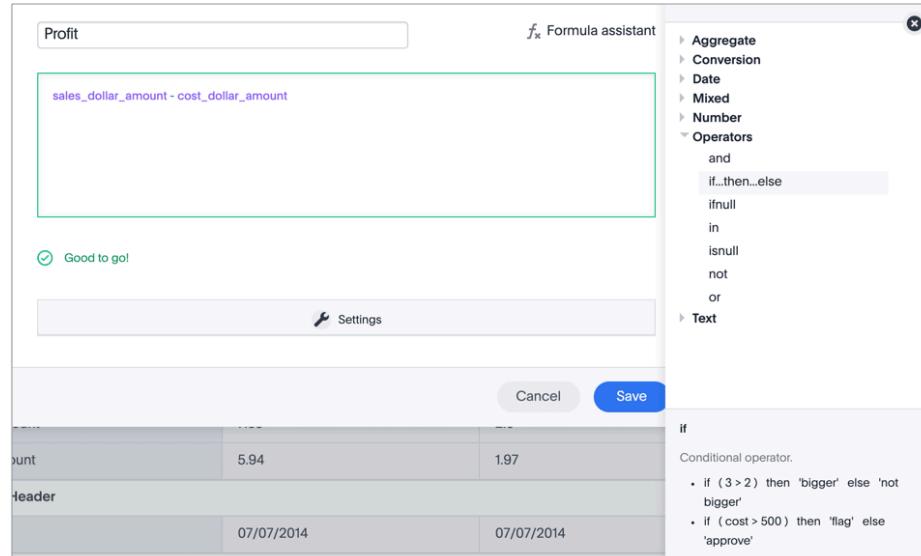


3. Type your formula in the Formula Builder.



**Note:** Formula elements are color coded by type and can include the formula operators and functions (blue), the names of columns (purple), and/or constants (black).

4. You can see a list of formula operators with examples by clicking on **Formula Assistant**.



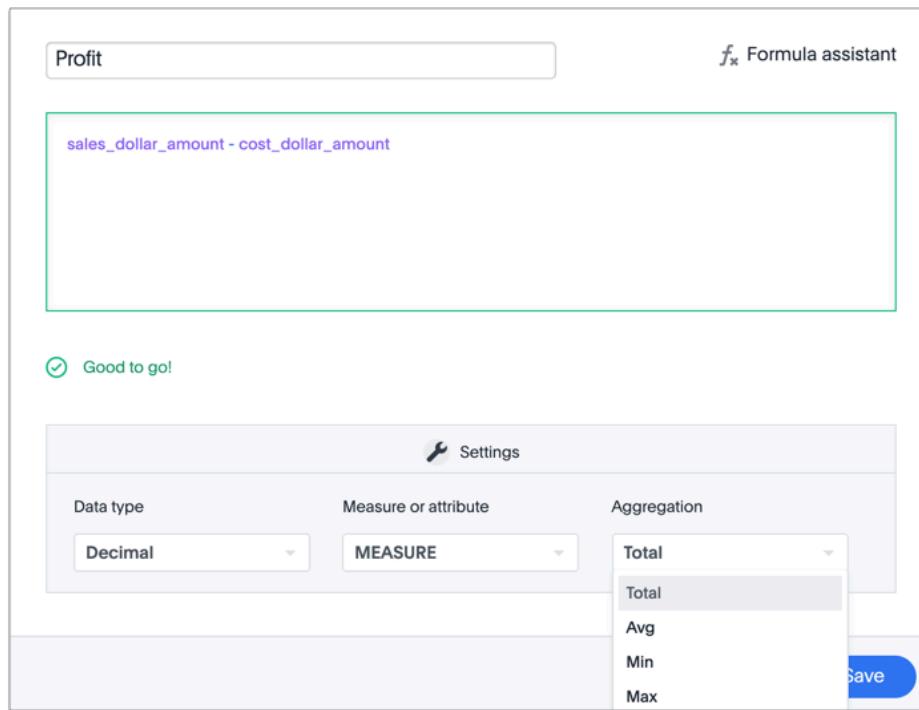
5. If you want to change what your formula returns, use the **Advanced settings**.

Depending on your formula, you may be able to change:

- **Data type:** Determines the type of data that the formula generates. For example,

use `date` for an `add_days` formula.

- **Measure or attribute:** Determines if the output of the formula is a measure or an attribute. For example, choose `attribute` for a formula that generates age groups, and choose `measure` for a formula that generates profit.
- **Aggregation:** Determines the default aggregation of the formula output. For example, choose `min` to see minimum profit.



6. Name the formula by clicking on its title and typing the new name. Click **Save**.

# Add a filter to a worksheet

**Summary:** You can add filters to a worksheet to limit the data users can access from the worksheet.

You can add filters to a worksheet to limit the data it contains. This is useful when you have underlying tables that store more data than is necessary for the types of analyses the worksheet is intended for.

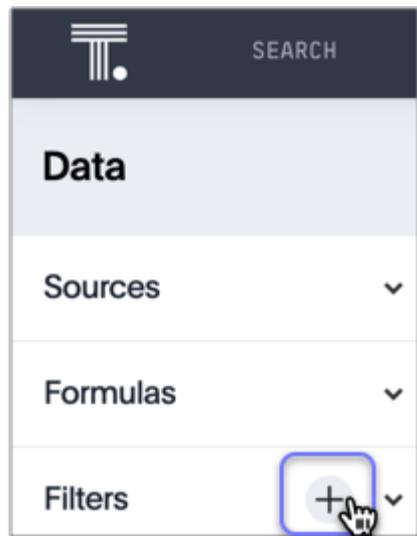
You can also use worksheet filters to provide data security, when you want different groups of users to be able to see different data without relying on row level security.

To add a filter to a worksheet:

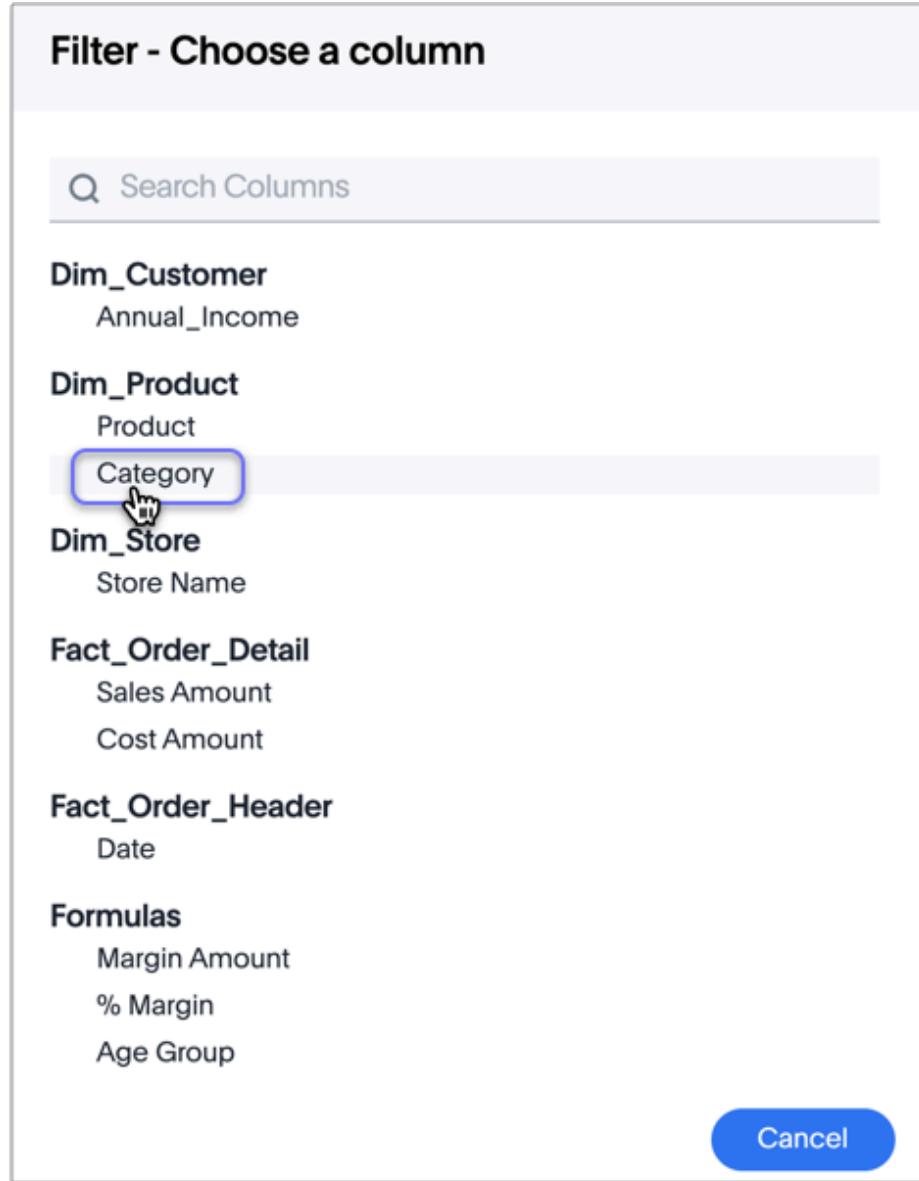
1. Click **Data** in the top menu bar, find your worksheet, and click its name.
2. Click the **Edit Worksheet** button.

COLUMN NAME	DESCRIPTION	DATA TYPE	COLUMN TYPE	ADDITIVE	AGGREGATION	HIDDEN	SYNONYMS	SPOTIQ PREFERENCE
Sales Amount	Click to edit	DOUBLE	MEASURE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO	Sales Amt, Reve...	DEFAULT
Cost Amount	Click to edit	DOUBLE	MEASURE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO	Click to edit	DEFAULT
Store Name	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT
Product	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO	Click to edit	DEFAULT

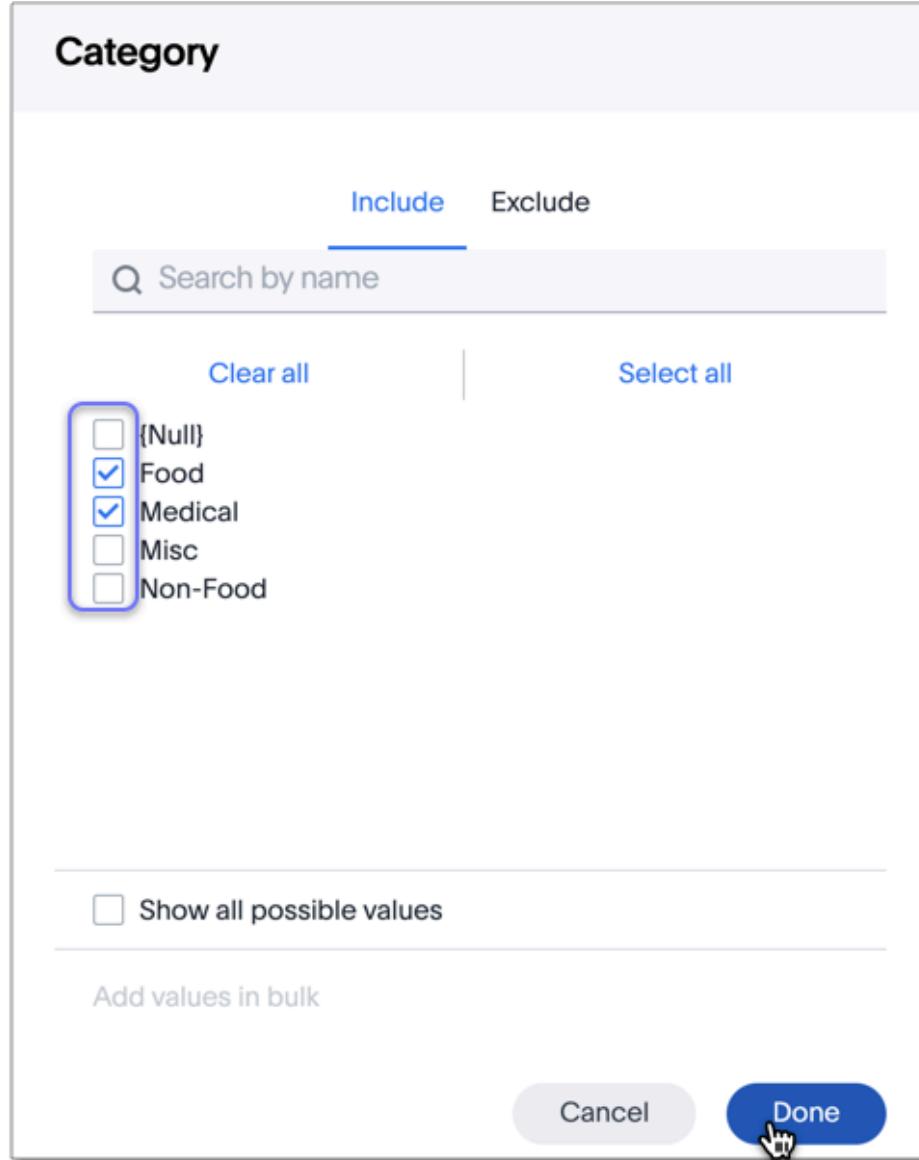
3. Hover over **Filters** on the left menu and click **+**.



4. Choose the column you want to filter on.



5. Select the values to include in your answer.



6. If you want to exclude values, click **Exclude** and choose values to exclude.

7. Click **Done**.

If there are too many values, you can use the filter search bar to find the ones you want.

# How the worksheet join rule works

**Summary:** The worksheet join rule specifies when to apply joins when searching on a worksheet.

Use the worksheet join rule to specify when to apply joins when a search is done on a worksheet. You can either apply joins progressively, as each search term is added (recommended), or apply all joins to every search.

## Understand progressive joins

Often, a worksheet includes several dimension tables and a fact table. With progressive joins, if your search only includes terms from the fact table, you can see all of the rows that satisfy your search. But as you add terms from dimension tables, the total number of rows shown may be reduced, as the joins to each dimension table are applied. It works like this:

- If you choose **Apply joins progressively (recommended for most cases)**, joins are only applied for tables whose columns are included in the search.
- If you choose **Apply all joins**, all possible joins are applied, regardless of which tables are included in the search.

When using **Apply joins progressively**, the number of rows in a search using the worksheet depends on which tables are part of the search. The worksheet contains the results of a defined query in the form of a table. So if a particular dimension table is left out of the search, its joins are not applied.

## Rule-Based Row Level Security (RLS) with worksheets

With Rule-Based RLS, you need to protect every table that contains any sensitive data. To do this, you can grant access by creating explicit row level security rules on each of the underlying tables which contain data that row level security should apply to.

When creating the row level security rules for a table that's part of a worksheet, you aren't limited to referencing only the columns in that table. You can specify columns from other tables in the worksheet as well, as long as the tables are joined to the table you're creating the rule on. Then, when

creating a worksheet on top of them, the behavior is consistent regardless of the worksheet join rule you choose. Users will never be able to see data they should not, regardless of what their search contains.

Imagine you have a worksheet that contains a `Sales` fact table, and `Customer` and `Product` dimensions that are joined on `Customer SSN` and `Product Code` columns. In order to secure the `Sales` table, you can use `Customer Name` from the `Customer` column to create a row level security rule.

## How joins are applied with chasm traps

When working with worksheets and row level security, you need to understand how joins are applied. This is particularly important with chasm trap schemas. For chasm trap schemas, if row level security is only set on one of the tables, people could see data they should not see if the scope of their search does not include that table. (this protects them from having people see the wrong things if they have chasm trap).

For chasm trap *worksheets*, progressive and non-progressive joins do not apply. There is an entirely different methodology for how worksheet joins on a chasm trap schema work with row level security. So you can safely ignore that setting.

# Change the join rule or RLS setting for a worksheet

**Summary:** As long as you have permissions to edit a worksheet, you can always go into it and set a different join or RLS rule.

If you find that the charts and tables built on a worksheet contain a large number of null values (which display as {blank} in the web browser), you can fix this by changing the [internal joins \[See page 213\]](#) for the worksheet.

If you have the **Can administer ThoughtSpot** privilege or the **Can manage data** plus edit privilege on a worksheet, you can edit the worksheet and change its RLS or other key settings.

## Change/configure a worksheet

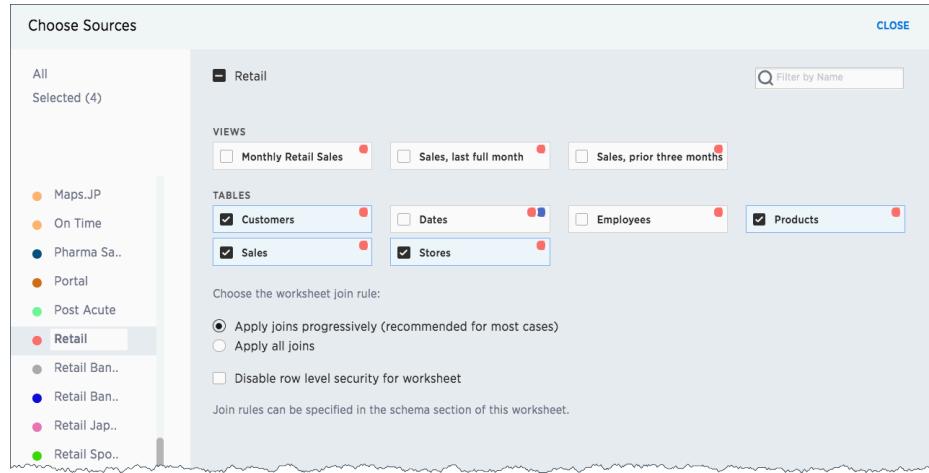
Before working through this procedure, make sure you are familiar with how the following affect data:

- [internal worksheet joins \[See page 213\]](#)
- [worksheet join rule \[See page 199\]](#)
- [row level security \(RLS\) \[See page 110\]](#)

To configure these values for a worksheet:

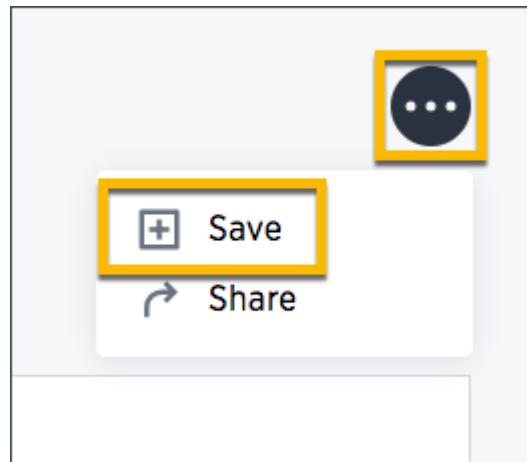
1. Click **Data** on the top navigation bar and then on **Worksheets**.
2. Click the name of the worksheet you want to edit from the list.
3. Click the **Edit Worksheet** button in the upper right hand side of the screen.
4. Click the **+ icon** next to **Sources**.
5. Scroll to the bottom of the page.
6. Configure the worksheet join rule and RLS setting as needed.

Change the join rule or RLS setting for a worksheet



7. Click **CLOSE**.

8. Click the ellipses icon , and select **Save**.



# Join a table, View, or Worksheet to another data source

**Summary:** Learn how to define joins between a table, View, or Worksheet and another table, view, or worksheet

## About joins

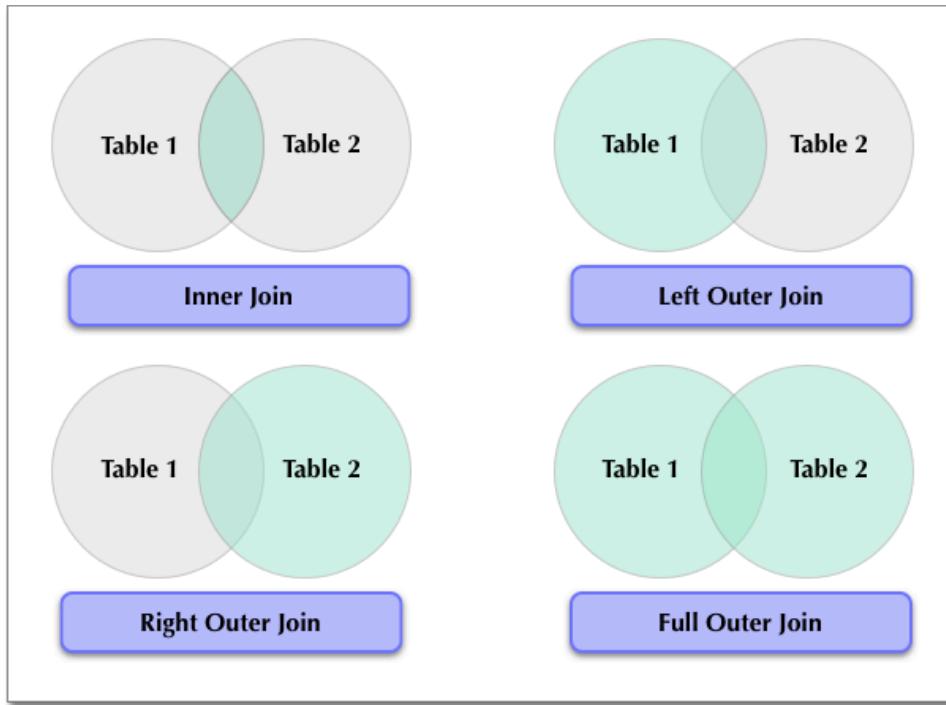
A join combines columns from one or more sources in your data by using matching values. By defining relationships between your sources, you create a new, richer set of data that you can use to answer your business questions. Choose a column to join on that both data sources contain (e.g. employee ID or product key). This process creates a [generic join \[See page 0\]](#) between the source table or View, and the target table, View, or Worksheet on the column you specify.

**Note:** If you want to create a primary key/foreign key relationship, you must use TQL rather than the web interface.

For details on primary key/foreign key relationships in TQL, see [constraints \[See page 0\]](#).

### Join types

ThoughtSpot supports the following join types: Inner, Left Outer, Right Outer, and Full Outer. You can choose a join type when creating or editing a join through the ThoughtSpot web interface.



ThoughtSpot defaults to the inner join type, which returns results for data with matching values in both the origin table (Table 1) and the target table (Table 2).

Left outer joins return results for all values from Table 1, and any matching values from Table 2.

Right outer joins return results for all values from Table 2, and any matching values from Table 1.

Full outer joins return results for all values from either Table 1 or Table 2.

### Join cardinality

When creating the join, you must also identify its **cardinality**: Many:1, 1:Many, or 1:1.

A Many:1 cardinality defines a join where multiple values in the origin table (Table 1) correspond to one value within the target table (Table 2). A join between a product table and a product category table shows multiple products that match each category.

A 1:Many cardinality defines a join where one value in the origin table corresponds to multiple values within the target table.

A 1:1 cardinality defines a join where one value in the origin table corresponds to a single value within the target table (e.g. employee name and employee ID).

You must create a join between columns in two data sources that contain the same data type, with the same meaning. That is, they must represent the same data. Normally, you can make this kind of link from a fact table column to a column in a dimension table that uniquely identifies a logical entity in your data such as Employee ID for a person, Product ID for a product, or Date Key for a specific date in a date lookup table.

## Possible joins

You must have either the **Can administer ThoughtSpot** or the **Can manage data** privilege [See page 34] to create a join relationship. If you're not an administrator, you also need edit permissions on the table, View, or Worksheet.

See this list for information about which joins you can create, and what permissions these joins require.

# Possible joins

## Origin: View

Destination: other Views

Necessary permissions: **Can edit** permission on source View

## Origin: Table uploaded through Connections

Destination: other tables uploaded through Connections, Views on top of tables uploaded through Connections

Necessary permissions: **Can edit** permission on source table, and **can manage data** permission

Note: The join must be created between two tables or a table and a View from the same connection.

## Origin: View on top of a table uploaded through Connections

Destination: Tables uploaded through Connections, other Views on top of tables uploaded through Connections

Necessary permissions: **Can edit** permission on source View

Note: The join must be created between two Views or a table and a View from the same connection.

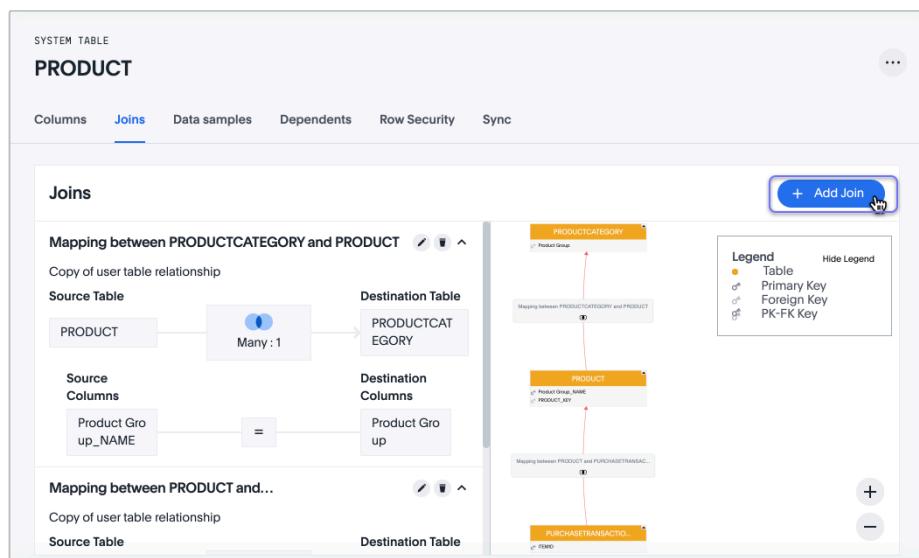
**Tip:** If you create joins at the table level, and then create a Worksheet that uses the columns

from the table, the settings are inherited from the table at the point in time that the Worksheet is created. If you then go back and change the settings at the table level, your changes will not be reflected in the Worksheet. If you want the Worksheet to have the changes you made at the table level, you must drop those columns from the Worksheet and re-add them.

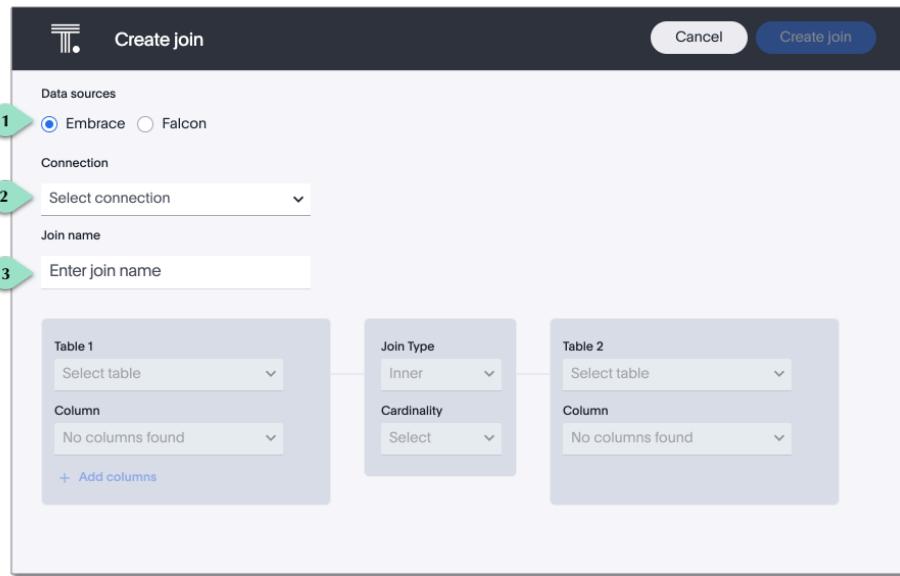
### *Creating a join from a table*

To create a table join through the Web interface:

1. Click **Data** in the top menu, and choose **Tables**.
2. Find your table through browsing, Search, or selecting the appropriate Tag(s).
3. To select the table for adding joins, click its name in the list. You will see the **Columns** view of the table.
4. Click the **Joins** tab. The list of existing joins from the table appears.



5. Click **+Add join**. The **Create Join** page appears.



#### Legend   Action

1. Select the data source of your table, either **Connection**, or **Falcon**.
2. Choose your connection from the dropdown **Connection** menu. You can only create joins between data sources uploaded through the same connection.
3. [Optional] Click **Enter join name** to name your join. Note that ThoughtSpot automatically names joins using the following syntax: [OriginDataSourceName]\_to\_[DestinationDataSourceName]. You can always enter a more meaningful join name, either when creating, or when editing the join.
6. Under **Table 1**, choose the table you want to create a join from (origin table).
7. Under **Table 2**, choose the destination table or View for the other end of the join.
8. Choose the matching columns under each table. These columns must use the same data type. [Optional] You can select multiple columns for the same join. To add another pair of matching columns to the join definition, click **+Add columns**.
9. Specify the join type; see [Join types \[See page 203\]](#).
10. Specify the join cardinality; see [Cardinality \[See page 204\]](#).
11. Click **Create join**.

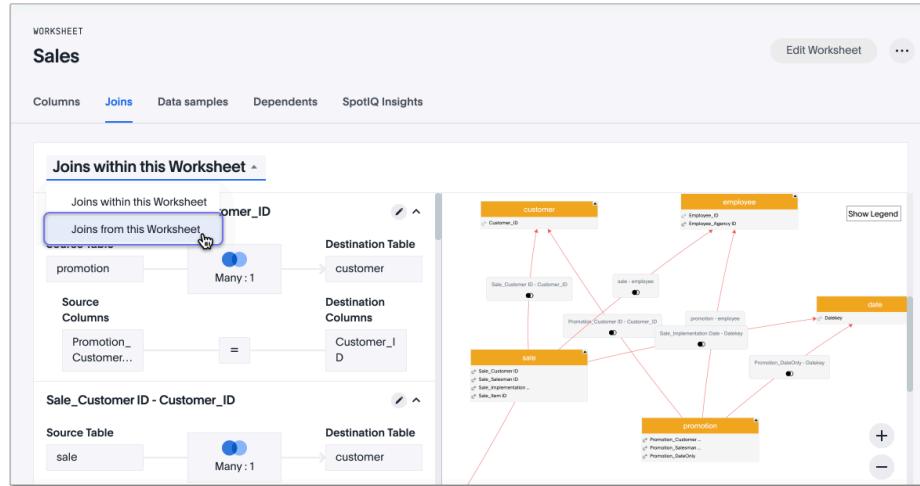
#### *Creating a join from a Worksheet or View*

To create a join from a Worksheet:

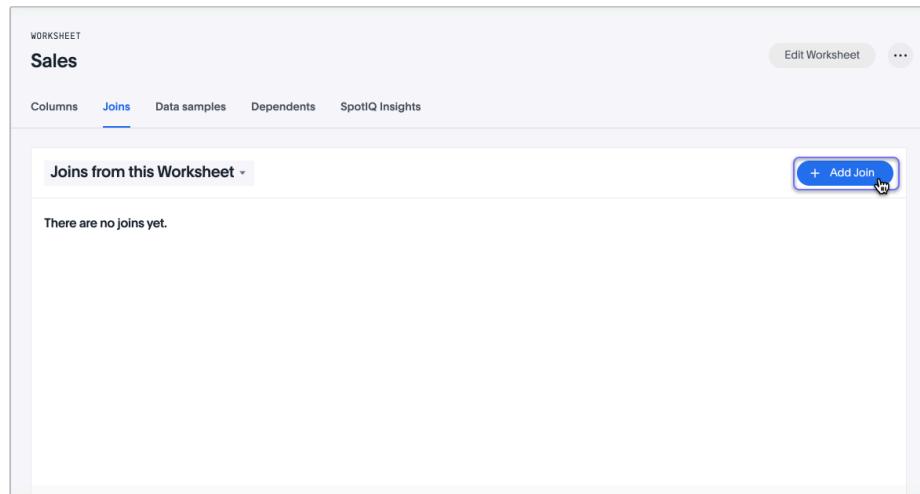
1. To find your worksheet, click **Data** on the top menu, and choose **Worksheets**.

Join a table, View, or Worksheet to another data source

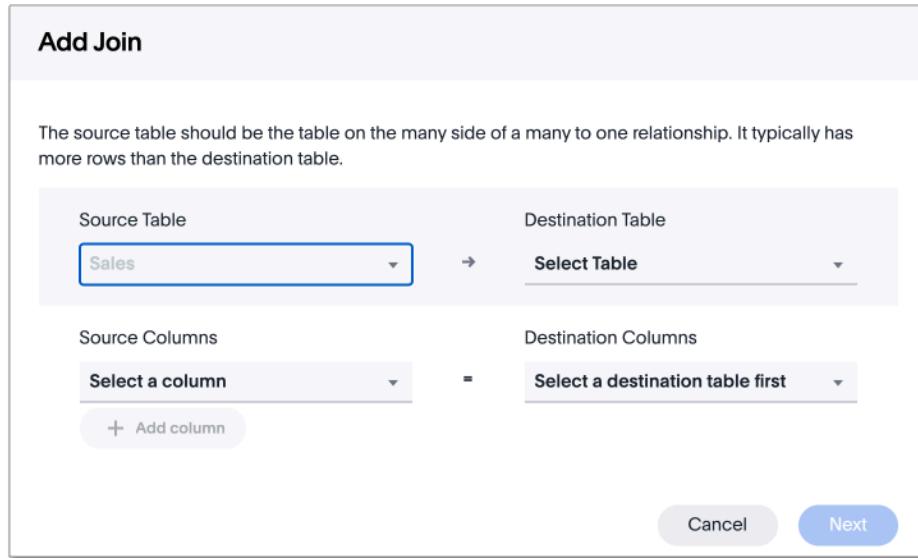
2. Find your Worksheet through browsing, Search, or selecting the appropriate Tag(s).
3. To select the Worksheet for adding joins, click its name in the list.
4. Click the **Joins** tab. The list of existing joins within the worksheet appears.



5. To view the joins between the Worksheet and other data sources, click **Joins within this worksheet**, and choose **Joins from this worksheet**.
6. To start creating a join, click **+ Add Join** on the upper right side of the screen.



7. In the **Add Join** dialog, choose the destination table or View for the other end of the join.



8. Choose the matching columns under each table. These columns must use the same data type. [Optional] You can select multiple columns for the same join. To add another pair of matching columns to the join definition, click **+ Add columns**.
9. Specify the join type; see [Join types \[See page 203\]](#).
10. Specify the join cardinality; see [Cardinality \[See page 204\]](#).
11. Click **Create join**.

## Modifying joins

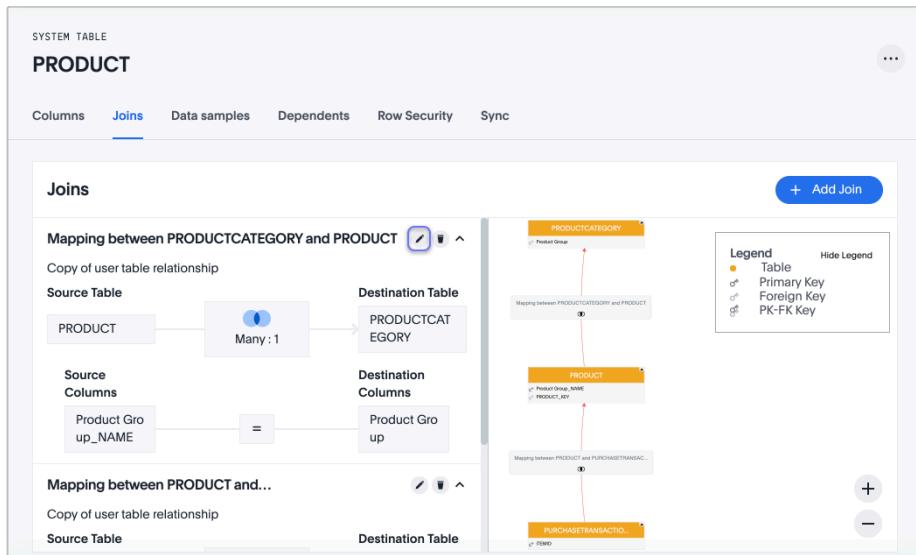
ThoughtSpot allows you to edit the name, join type, and cardinality through the Web interface. To change the columns that define a join, you must delete the join and create a new one.

### *Editing a join from a table*

To edit a join between tables:

1. Click **Data** in the top menu, and choose **Tables**.
2. Find your table through browsing, Search, or selecting the appropriate Tag(s).
3. To select the table for adding joins, click its name in the list. You will see the **Columns** view of the table.
4. Click the **Joins** tab. The list of existing joins from the table appears.

Join a table, View, or Worksheet to another data source



5. Click the edit icon to the right of the name of the join you want to modify. The **Edit join** page appears.

The 'Edit join' dialog box is open, showing the configuration for the 'Mapping between PRODUCTCA...' join. It specifies 'PRODUCT' as Table 1, 'PRODUCTCATEGORY' as Table 2, 'Inner' as Join Type, and 'Many : 1' as Cardinality. The 'Save' button is located at the top right of the dialog.

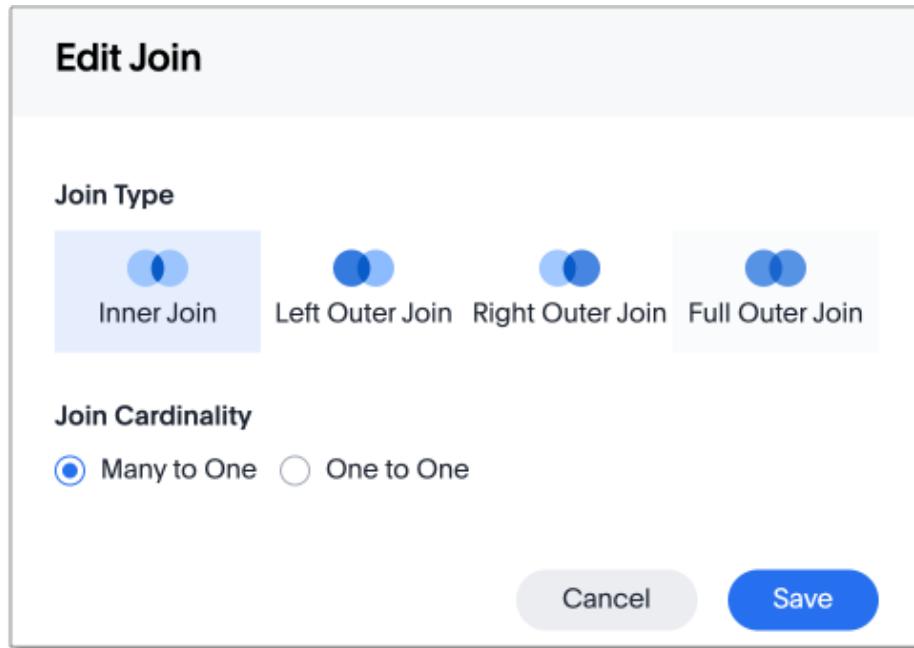
6. Make the desired changes to the name, type, or cardinality of the join.
7. Click **Save**.

### Editing a join from a Worksheet or View

To edit a join from a Worksheet or View:

1. Click **Data** in the top menu, and choose **Worksheets**.

2. Find your Worksheet through browsing, Search, or selecting the appropriate Tag(s).
3. To select the Worksheet, click its name in the list.
4. Click the **Joins** tab. The list of existing joins within the worksheet appears.
5. To view the joins between the worksheet and other data sources, click **Joins within this worksheet**, and choose **Joins from this worksheet**.
6. Click the edit icon to the right of the name of the join you want to modify. The **Edit join** window appears.



7. Make the desired changes to the join type or cardinality.

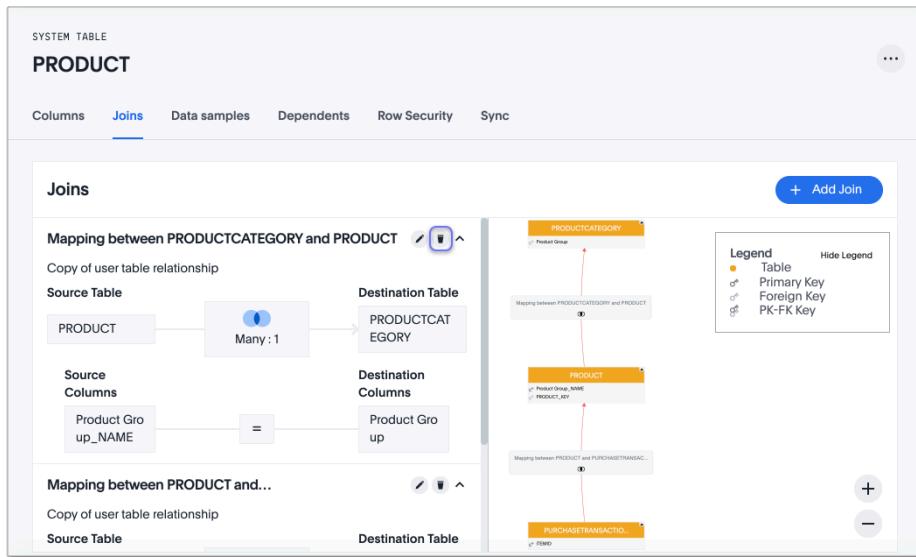
8. Click **Save**.

### *Deleting a join*

To delete a join:

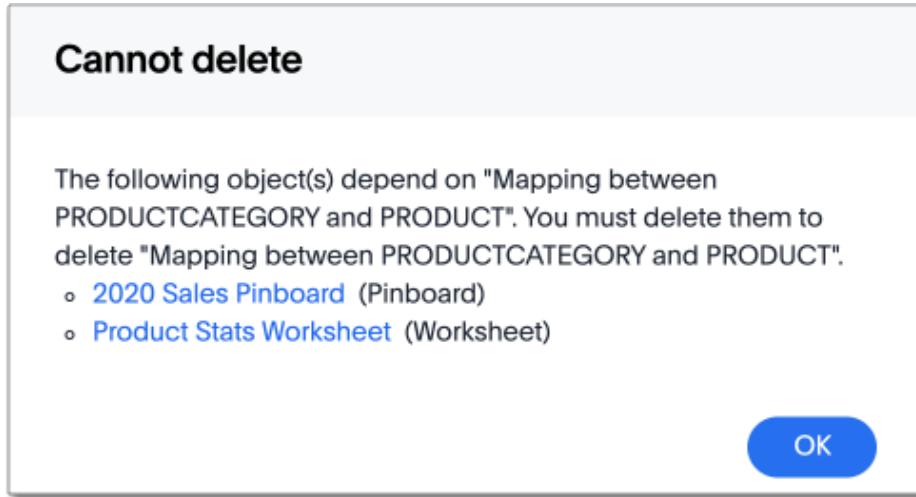
1. Click **Data** in the top menu.
2. Find the origin table, worksheet or view of the join you want to delete through browsing, Search, or selecting the appropriate Tag(s).
3. Click the name of your origin table, worksheet or view in the list.
4. Click the **Joins** tab. The list of existing joins from the table, worksheet, or view appears.

**Note:** If you want to delete an external join from a worksheet, you must click **Joins within this worksheet** under the **Joins** tab and select **Joins from this worksheet**.



5. Click the delete icon to the right of the join name. The **Confirm delete** window appears.
6. Click **Delete**.

**Note:** If existing answers or Liveboards depend on the join you are deleting, you will see the **Cannot delete** window listing all dependents of the join. You must delete all dependents before you can delete the join.



## Related Information

- Constraints [See page 0]

# Modify joins within a worksheet

**Summary:** Learn how to change the join type between the tables within a worksheet.

When you create a worksheet, you select a [join rule \[See page 199\]](#). The join rule works together with the joins defined within the worksheet determine how the tables that make up the worksheet are joined, and how those joins behave when searching on the worksheet.

Starting with ThoughtSpot version 5.0, you are not limited to just one join rule for the entire worksheet. You can define different types of joins for each join between tables in a worksheet. By default, each of these individual table joins uses an inner join. But you can override this at the individual join level.

You must have either the **Can administer ThoughtSpot** privilege or the **Can manage data** privilege to modify joins within worksheets.

## Modify a join

To modify the join types within a worksheet, follow these steps:

1. Click the **Data** tab in the top menu.

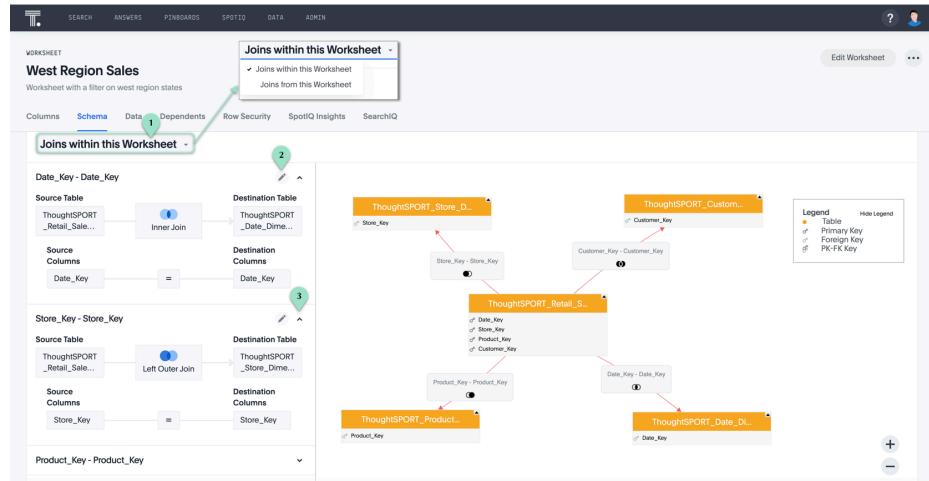


2. Select **Table**, and then select **Worksheets**.
3. Click the name of the worksheet. Here, we selected the worksheet *West Regional Sales*.
4. At the top of the worksheet, click the **Joins** tab.

COLUMN NAME	DESCRIPTION	DATA TYPE	COLUMN TYPE	ADDITIVE	AGGREGATION	HIDDEN
Sales	Click to edit	DOUBLE	MEASURE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO
Gross Margin	Click to edit	DOUBLE	MEASURE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO
Quantity	Click to edit	INT32	MEASURE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO
POS Transaction Nu...	Click to edit	INT32	ATTRIBUTE	<input checked="" type="radio"/> YES	SUM	<input type="radio"/> NO
Date	Click to edit	DATE	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO
Latitude	Click to edit	DOUBLE	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO
Longitude	Click to edit	DOUBLE	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO
Store City	Click to edit	VARCHAR	ATTRIBUTE	<input type="radio"/> NO	NONE	<input type="radio"/> NO

5. The join information and the schema for the worksheet appear.

- The schema representation includes the join type.
- You can see the list of **Joins within the worksheet**, which include all joins between the underlying tables created in the browser [See page 173].
- The fact table is always on the left side of the join, and it appears on the left side.

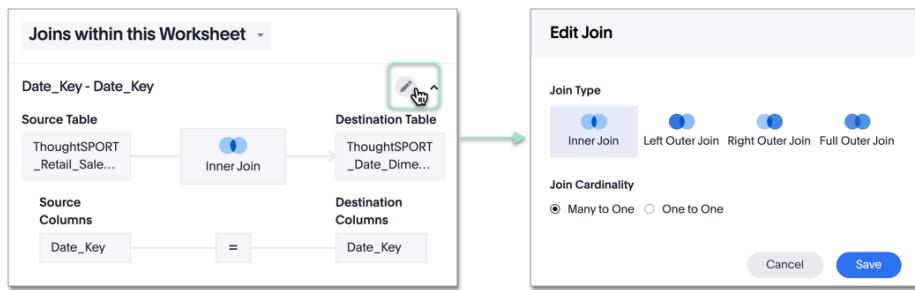


Note the available actions for the join view.

#### Legend Action

- See either **Join within this Worksheet (Default)**, or **Joins from this Worksheet**.
- Click the pencil icon to edit the join.

3. Click the up arrow icon to collapse the join detail.
  
6. Select the join you plan to modify, and click the **Edit** (pencil) icon next to it.
  
7. In the **Edit Join** window modal, make the necessary changes:



- Under **Join Type**, select one of *Inner Join*, *Left Outer Join*, *Right Outer Join*, or *Full Outer Join*.
- Under **Join Cardinality**, select either *Many to One*, or *One to One*.

Click **Save**.

## Related Information

- [Join rule \[See page 199\]](#)
- [Create join relationships in the browser \[See page 173\]](#)

# Delete a worksheet or table

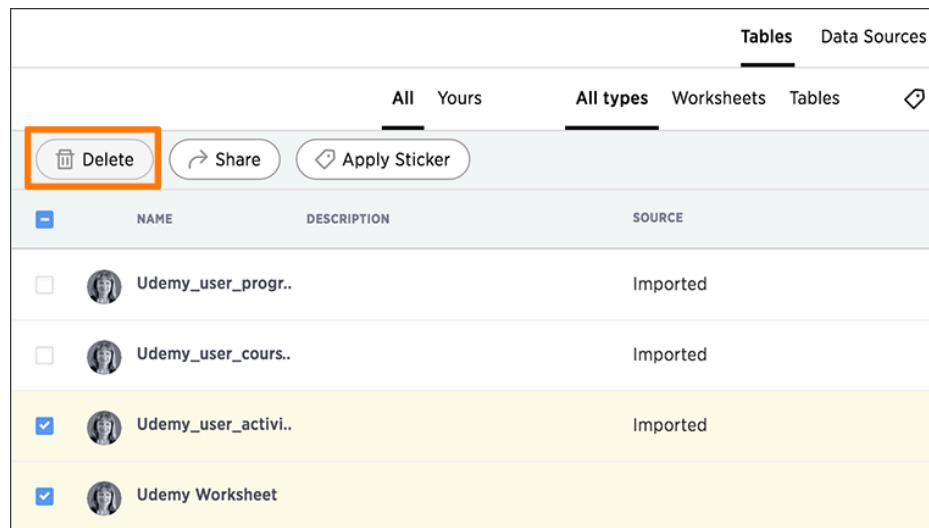
**Summary:** When you try to delete a worksheet or a table, you see a message listing any dependent objects that must be removed first.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

ThoughtSpot checks for dependencies whenever you try to remove a table or worksheet. A list of dependent objects appears, and you can click them to delete them or remove the dependency. Then, you can remove the table or worksheet.

To delete a worksheet or table:

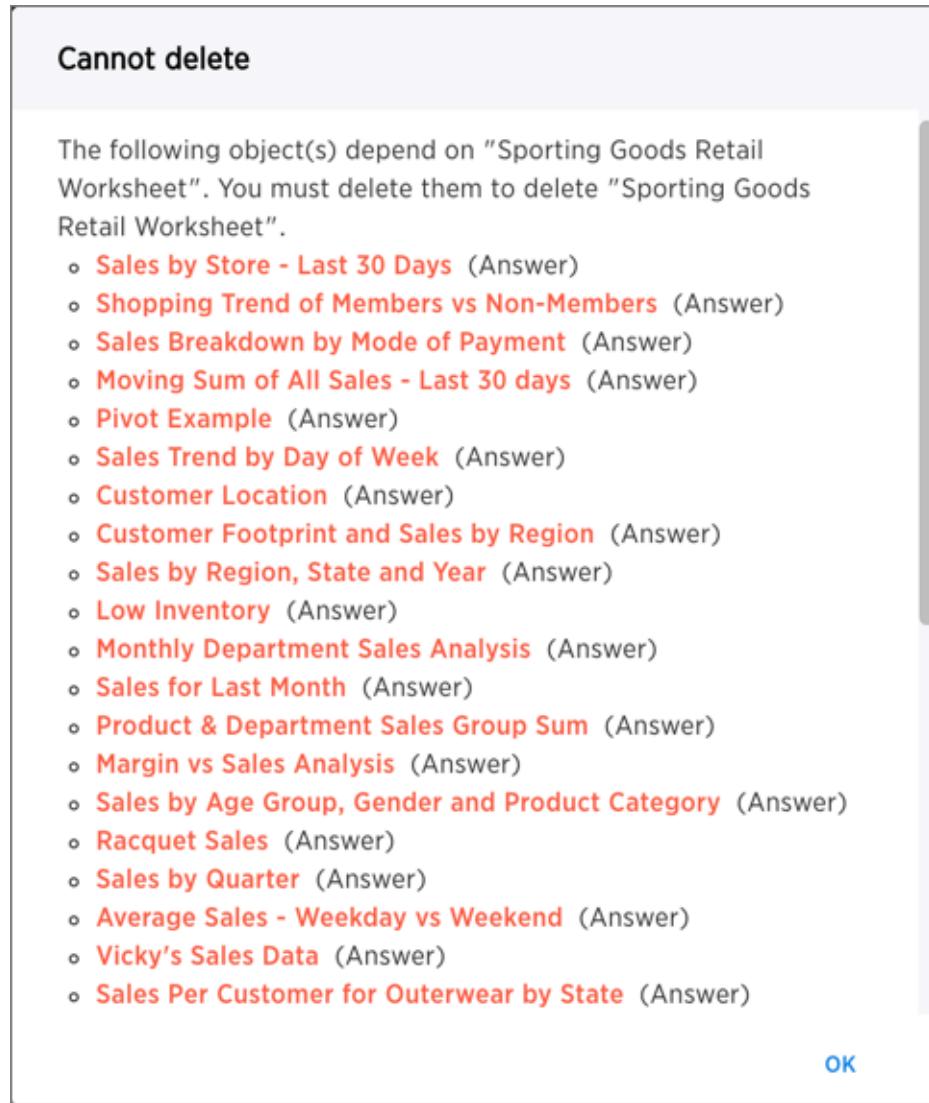
1. Click **Data**, on the top navigation bar.
2. Find the worksheet or table you want to remove in the list, and check the box next to its name.
3. Click the **Delete** icon.



If you are attempting to delete a data source with dependent objects, the operation will be blocked. You will see a warning, with a list of dependent objects with links.

4. Click the link for an object to modify or delete it.

When all its dependencies are removed, you will be able to delete the data source.



5. You can also click the name of a worksheet or table and then click **Dependents**, to see a list of dependent objects with links.

The **Dependents** list shows the names of the dependent objects (worksheets and Liveboards), and the columns they use from that source. You can use this information to determine the impact of changing the structure of the data source or to see how widely used it is. Click a dependent object to modify or delete it.

Delete a worksheet or table

WORKSHEET

## Sporting Goods Retail Worksheet

ThoughtSPORT worksheet

Columns Schema Data **Dependents** Row Security SpotIQ Insights

COLUMN NAME	DEPENDENT NAME	TYPE
Age Group	<a href="#">Total Sales by Depar..</a>	View
Date	<a href="#">Top 100 Products M..</a>	View
Product Name	<a href="#">Top 100 Products M..</a>	View
Department	<a href="#">Total Sales by Depar..</a>	View
Sales	<a href="#">Total Sales by Depar..</a>	View
Customer City	<a href="#">Customer Location</a>	Answer
Customer Name	<a href="#">Customer Location</a>	Answer

( showing rows 1-0 of 27 )

THOUGHTSPORT

# Scriptability

**Summary:** Use Scriptability to export and import worksheets, views, tables, Liveboards, and answers in a human-readable format.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

ThoughtSpot developed its own scriptable approach for exporting, enhancing, and migrating worksheets, views, tables, Liveboards, and answers.

You can model your data and build out sophisticated dashboards in your test environment, before deploying to all users.

The Scriptability feature supports several scenarios that you may encounter:

- **Migrating from a development environment to a production environment** by downloading files from the development cluster and uploading the same files into the production cluster
- **Implementing metadata changes outside ThoughtSpot UI**, such as replacing the underlying tables for an object, or replacing a single column from one table with a column in another table
- **Making bulk changes**, such as mass renaming of objects defined by Worksheets, and managing duplicates
- **Reusing existing objects to build new objects**, such as building two very similar objects based on a similar, pre-existing object.

## How to use Scriptability

Depending on how you want to use Scriptability, there are several workflows you can follow:

1. **Edit and update an existing object in the same cluster:** You can either
  - [export \[See page 221\]](#) the object(s), edit the object(s) by modifying its [ThoughtSpot Modeling Language \[See page 232\]](#) (`TML`) representation, and [import \[See page 226\]](#) the updated file(s) to modify the existing object **or**

- edit the object(s) using the in-app TML editor [See page 223] and publish the updated file(s).

- Migrate an existing object from one cluster to a new cluster:** export [See page 221] the object(s) and import [See page 228] the updated file(s) to the new cluster.
- Edit and migrate an existing object from one cluster to a new cluster:** You can either
  - export [See page 221] the object(s), edit the object(s) by modifying its ThoughtSpot Modeling Language [See page 232] ( TML ) representation, and import [See page 228] the updated file(s) to the new cluster **or**
  - edit the object(s) using the in-app TML editor [See page 223], publish the updated file(s), export [See page 221] the object(s), and import [See page 228] the updated file(s) to the new cluster. Note that this workflow changes the object(s) in both clusters.

## Prerequisites

Refer to the following tables for required permissions for importing and exporting Liveboards, answers, worksheets, tables, and views.

### Import

Import and create a new object without importing its dependents	Import and create a new object and its dependents	Import and update an existing object without dependents	Import and update an existing object with dependents
The dependents must already exist in the cluster. You must have <b>view</b> permissions for the first-level dependent. For example, if you import a Liveboard that is built on a worksheet that is built on a table, you must have <b>view</b> permission for the worksheet. When importing a new worksheet or view, you must have the <b>can manage data</b> permission.	<b>Can manage data</b> , if the object or any of its dependents is a worksheet or view.	<b>Edit</b> permission on the existing object. The dependents must already exist in the cluster. You must have <b>view</b> permissions for the first-level dependent. When importing a worksheet or view, you must have the <b>can manage data</b> permission.	<b>Edit</b> permission on the existing object(s). <b>Can manage data</b> , if the object or any of its dependents is a worksheet or view.

### Export

Export with dependents	Export without dependents
<b>View</b> permission on the object and all dependents.	<b>View</b> permission on the object and its first-level dependents.

**Note:** If you have a permissions issue with a particular object when you export multiple objects, or an object and its dependents, the complete export does not fail. The individual object does not export, and you receive an error message about this failure in the **Manifest** file in the zip file.

## Export an object

You can export one object at a time or export more than one object as a zip file. The zip file contains a document called the **Manifest** file, which defines the objects you exported, and their underlying data sources. To export custom collections of related TML files, refer to [Migrate multiple TML files \[See page 0\]](#).

### How to export objects

To export objects, follow these steps. To export custom collections of related TML files, refer to [Migrate multiple TML files \[See page 0\]](#).

1. Navigate to the **Answers**, **Liveboards**, or **Data** page from the top navigation bar, depending on the object(s) you want to export.



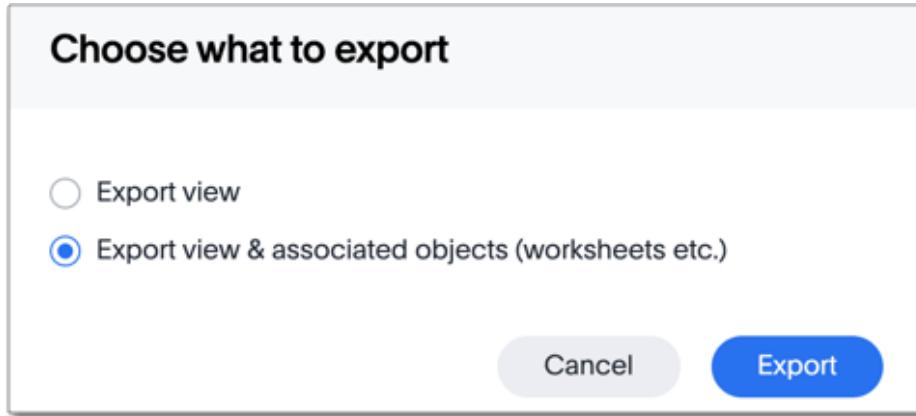
2. Hover over the object(s) you want to export, and click the empty checkboxes that appear.
3. Select the **Export TML** button.

The screenshot shows a list of objects in the ThoughtSpot interface. The objects include:

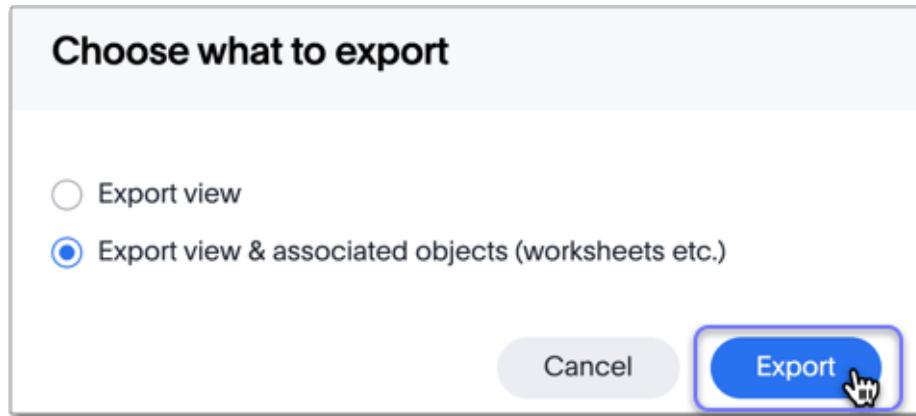
- Average Revenue by Part
- Basic Answer 1
- Brand Revenue
- Brand Revenue II
- Brand Revenue Trend
- Brand Revenue with Year Filter
- Nested Viz
- Region Revenue by Part

Each object has a checkbox next to its name, and some have additional details below them. The 'Basic Answer 1' and 'Average Revenue by Part' objects are highlighted with a blue border. At the top of the page, there is a 'Share' button, a 'Delete' button, an 'Apply Tag' button, and an 'Export TML' button (which is currently active). There is also a 'Tags' button, a 'Select tag' dropdown, and an 'Import TML' button.

4. Choose whether to export only the objects, or the objects and their underlying data sources (worksheets, tables, and views). If you export a table, you do not see this modal, since tables do not have any dependents. When exporting multiple objects, the zip file contains the `Manifest` file, even if you export the objects without their dependents.



5. Click **Export**.



6. Open the downloaded `TML` zip file. The zip file contains a document called the `Manifest` file, which defines the objects you exported, their underlying data sources, and any export errors. If an individual export fails, you can find an error message in the `Manifest` file. The zip file still exports, even if an individual object's export fails.

## Edit the TML file

You can edit the `TML` file in one of two ways. You can [export \[See page 221\]](#) the object(s) and edit the file(s) in any text editor, before you import it. Or, you can use the [in-app `TML` editor \[See page 223\]](#) to edit, validate, and publish the object(s). Refer to [ThoughtSpot Modeling Language \[See page 232\]](#) for information on syntax in the TML files.

## Edit, validate, and publish objects using the TML editor

You can access the TML editor from the object list page. It also appears when there is an error when you import TML objects, if you click **Edit**.

To use the TML editor, follow these steps:

1. Navigate to the **Answers**, **Liveboards**, or **Data** page from the top navigation bar, depending on the object you want to update.
2. Select one or more objects by clicking on the checkboxes that appear when you hover over an object name.

3. From the object list page, select the **Edit TML** button.

The screenshot shows a list of answers in the ThoughtSpot interface. The top navigation bar includes SEARCH, ANSWERS, PINBOARDS, SPOTIQ, DATA, and ADMIN. Below the navigation is a search bar with filters for All, Yours, and Favourites. A toolbar at the top right includes Share, Delete, Apply Tag, Export TML, and Edit TML (which is highlighted with a red box). The main list displays various answers with columns for Name, Tags, Modified (sorted descending), and Author. Some entries have checkboxes next to them. The first three entries are selected (indicated by blue boxes around their names).

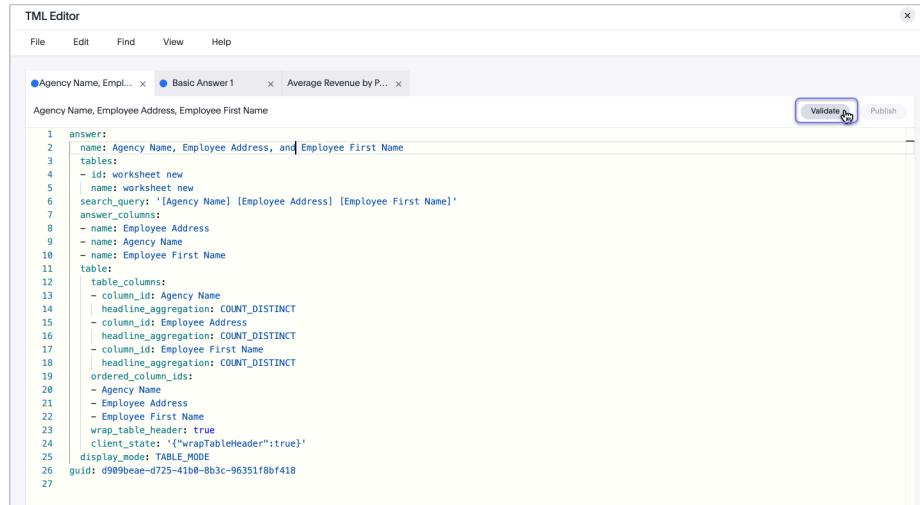
Name	Tags	Modified	Author
<input checked="" type="checkbox"/> Agency Name, Employee Address, Employee First Name		51 minutes ago	Administrator
<input checked="" type="checkbox"/> Basic Answer 1		4 hours ago	Administrator
<input checked="" type="checkbox"/> Average Revenue by Part		4 hours ago	Administrator
<input type="checkbox"/> Brand Revenue		4 hours ago	Administrator
<input type="checkbox"/> Average Revenue by Part		12 hours ago	Administrator
<input type="checkbox"/> RandomAnswer		16 hours ago	Administrator
<input type="checkbox"/> Average Revenue by Part		6 months ago	Guest 1
<input type="checkbox"/> Basic Answer 1		6 months ago	Administrator

4. The TML editor opens. Edit the TML file(s), using the syntax specified in [ThoughtSpot Modeling Language \[See page 232\]](#).

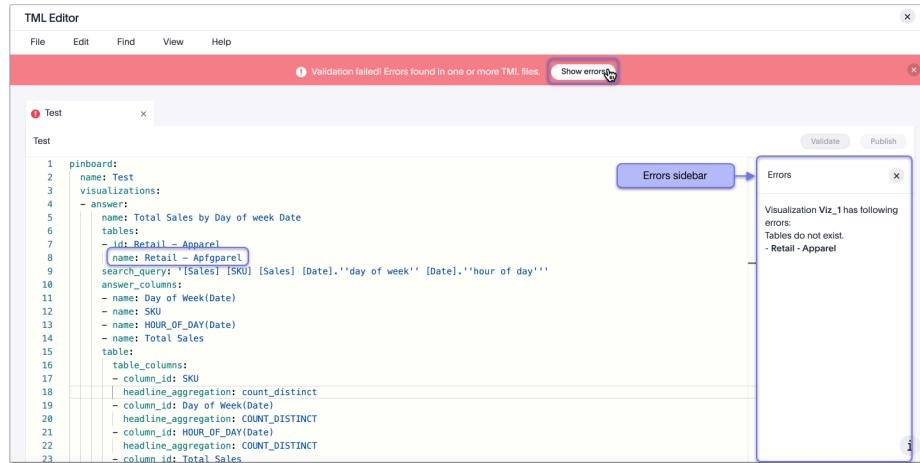
The TML editor has the following functions under the top menu:

- **File:** Validate, Publish, and Exit editor. You can also validate and publish using the **validate** and **publish** buttons at the top right of the editor. You can also exit the editor using the X button at the top right corner. The system warns you if you try to exit with unsaved changes.
- **Edit:** Undo, Redo, Cut, Copy, Select all, Fold, Fold all, Unfold, Unfold all, and Go to line. The **Fold** option compresses the lines in the file so you only see the first line of a section. **Go to line** opens a dialog box, where you can type in the number of the line you would like to go to. This is useful for long TML files.
- **Find:** Find and Find and replace. This functionality allows you to easily find words or parameters in the TML file. You can also click on a word or parameter in the TML editor, and the editor highlights all instances of that word.
- **View:** Show/Hide errors, Show line numbers, and Hide line numbers. **Show/Hide errors** toggles the **Errors** sidebar on and off. The **Errors** sidebar does not appear until after you Validate a file, if there are errors in it.
- **Help:** Documentation. This links to the [ThoughtSpot Modeling Language \[See page 232\]](#) documentation.

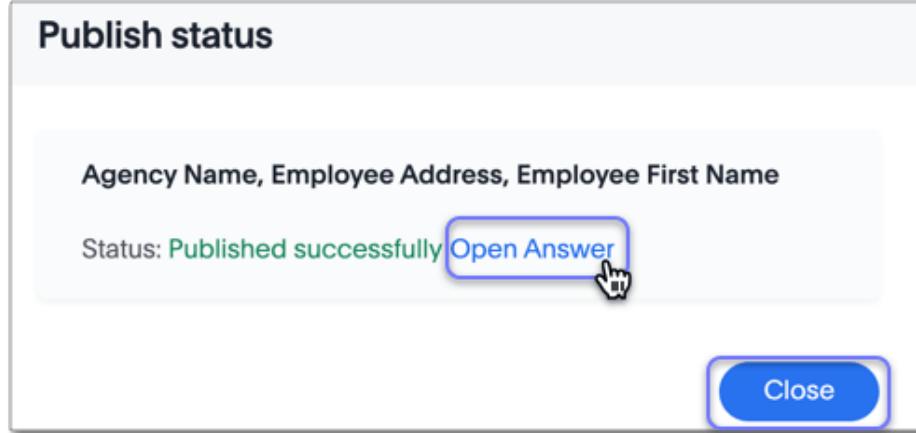
- When you finish editing the TML file(s), select **Validate** in the top right corner. You must validate each file individually. A blue dot appears next to any file that contains changes.



- If you constructed the file(s) correctly, a green check mark appears next to the name of the file. If you did not construct the file correctly, a red bar appears near the top of the screen, telling you that ThoughtSpot found errors in one or more files. Click **Show errors** to see the errors listed in the **Errors sidebar**.



- After validating, select **Publish** in the top right corner, next to **Validate**. You must publish each file individually.
- The system displays a **Publish status** dialog box. You can select **Open [object]** to open the object you just published in a new tab, or click **Close** to return to the TML editor.



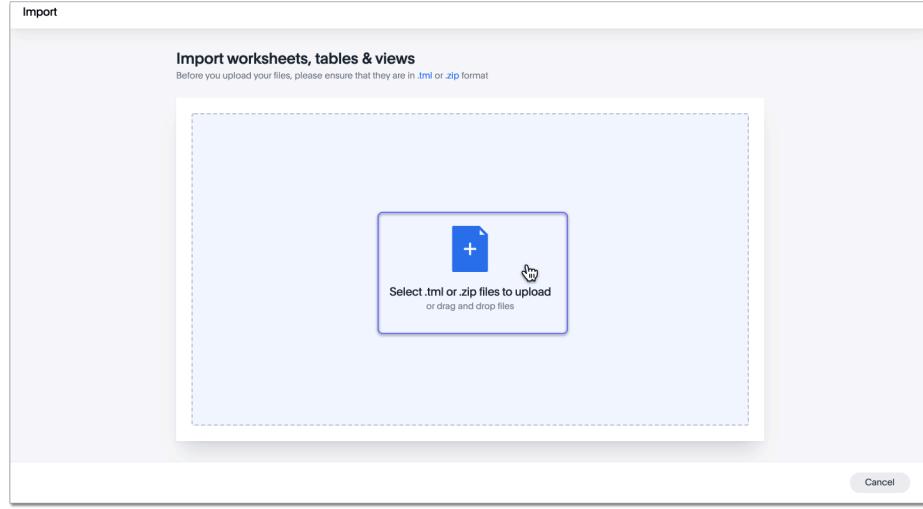
## Update an object

You can overwrite an existing worksheet, view, table, answer, or Liveboard, by downloading the [TML](#) file, making any necessary changes, and then re-uploading the [TML](#) file. To update collections of objects packaged together as a zip file, refer to [Migrate multiple TML files \[See page 0\]](#).

You can also update an object using the [TML editor \[See page 223\]](#).

To update an existing object by downloading the TML file and modifying it, follow these steps. In this case, we are updating a single Worksheet. You can update multiple objects at once by uploading them in .zip file format.

1. [Export the object \[See page 221\]](#) you want to update, as in steps 1 to 5 of the **Export an Object** section above.
2. Edit the file in a text editor.
3. Navigate to the **Answers**, **Liveboards**, or **Data** page from the top navigation bar, depending on the object you want to update.
4. Select **Import TML**.
5. In the **Import** interface, click **Select .tml or .zip files to upload**.



6. In your file system, find and select the `TML` file you edited.
7. If you uploaded a `.zip` file with multiple objects, you can unselect any files in the `.zip` file you do not want to upload.
8. The **Import** interface recognizes that an object with this GUID already exists in the system, and asks if you would like to create a new object, or update the existing one. Select **Update existing [object]**.
9. If there are errors in any of the objects you are importing, the **Status** column says **Cannot import** for that object. Next to **Cannot import**, you can **View Errors** to see the errors, and a suggested resolution.
10. Resolve any errors by selecting the **Edit** button for the object with errors. This opens the [TML editor \[See page 223\]](#). Within the editor, resolve the errors using the method suggested under **View Errors** in the Import workflow.
11. After you resolve the errors, click **Validate**, and then **Save**. Exit the TML editor.
12. Select the objects you want to import. ThoughtSpot automatically selects objects with no errors, but does not select objects with errors, even after you resolve them. You must select the objects yourself.
13. Click **Import selected**.

14. The **Import Status** screen displays the status of the objects you imported. You can open the object(s) that you imported, or click **Exit** to return to the main object page.

## Migrate an object

To migrate an answer, Liveboard, view, or worksheet from one cluster to another, follow these steps.

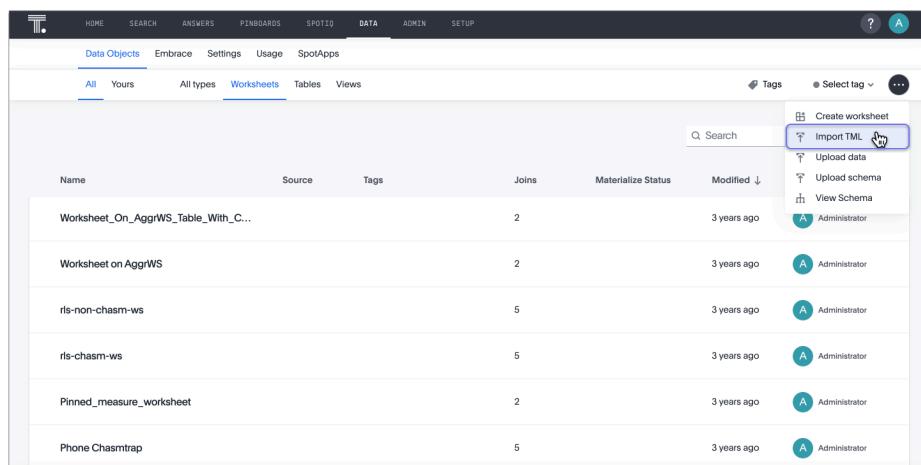
To migrate collections of objects packaged together as a zip file, refer to [Migrate multiple TML files](#)

[\[See page 0\]](#). Note that you cannot create a new table using Scriptability. You can only update existing tables.

1. [Export the object \[See page 221\]](#) you want to move, as in steps 1 to 5 of the **Export an Object** section above.

The object remains on the original cluster as well, unless you delete it.

2. Navigate to the cluster you want to add the object to.
3. Click **Answers**, **Liveboards**, or **Data** on the top navigation bar, depending on the objects you want to migrate.
4. To upload a Worksheet or View, click the More icon  in the upper-right side of the screen. Then, select **Import TML**.



5. To upload a Liveboard or answer, click the **Import TML** button in the upper-right side of the screen.

The screenshot shows the ThoughtSpot Import interface. At the top, there are tabs for SEARCH, ANSWERS, PINBOARDS, DATA, and ADMIN. Below the tabs, there are buttons for All, Yours, and Favorites. On the right side of the header, there are buttons for Tags, Select tag, and Import TML (which is highlighted with a yellow box). A search bar and a page navigation indicator (1 - 20) are also present. The main area displays a table with columns: Name, Tags, Modified ↓, and Author. The table lists several objects, each with a small circular icon next to the author name:

Name	Tags	Modified ↓	Author
Total lo_ordtotalprice, Total lo_quantity by lo_shippriority		6 hours ago	Deepthi
Total lo_revenue by Monthly lo_orderdate		6 hours ago	Administrator
Total lo_revenue by lo_shipmode		6 hours ago	Administrator
Total lo_revenue by lo_shipmode		6 hours ago	Administrator
Total poverty percent by state		6 hours ago	Administrator
Total lo_revenue by lo_shipmode		7 hours ago	sampleuser
11111Total lo_revenue, Total lo_quantity by lo_shipmode		7 hours ago	Administrator

6. In the **Import** interface, click **Select .tml or .zip files to upload**.
7. In your file system, find and select the **TML** file. The file uploads automatically.
8. If you constructed the file correctly, the **Import** interface displays a *Validation successful* message. You can now import the file.
9. If you uploaded a **.zip** file with multiple objects, you can unselect any files in the **.zip** file you do not want to upload.
10. If there are errors in any of the objects you are importing, the **Status** column says **Cannot import** for that object. Next to **Cannot import**, you can **View Errors** to see the errors, and a suggested resolution.
11. Resolve any errors by selecting the **Edit** button for the object with errors. This opens the **TML editor** [See page 223]. Within the editor, resolve the errors using the method suggested under **View Errors** in the Import workflow.
12. After you resolve the errors, click **Validate**, and then **Save**. Exit the TML editor.
13. Select the objects you want to import. ThoughtSpot automatically selects objects with no errors, but does not select objects with errors, even after you resolve them. You must select the objects yourself.
14. Click **Import selected**.

15. The **Import Status** screen displays the status of the objects you imported. You can open the object(s) that you imported, or click **Exit** to return to the main object page.

## Limitations of working with TML files

There are certain limitations to the changes you can apply by editing a worksheet, answer, table, view, or Liveboard through TML.

- Formulas and columns can either have a new name, or a new expression. You cannot change both, unless migrating or updating the worksheet two times.
- It is not possible to reverse the join direction in the TML script.
- You cannot create new tables using Scriptability. You can only update existing tables.
- You can only change logical tables using Scriptability. You cannot change the physical version of the table that exists in a database. When you change the `column_name`, for example, the name changes in the application, but not in the physical table in the database.
- You cannot create Scriptable representations of R- or Python-powered visualizations.
- You cannot import manually compressed .zip files. You can only import .zip files that you exported from ThoughtSpot: a custom set of TML files, an object and its associated data sources, or multiple objects of the same type that you exported from the object list page.
- Joins only appear in the table TML file of the source table in a join, or the table on the Many side of a Many to One join. You can only add and edit table joins from the TML file of the table on the Many side of the join. You cannot view or modify table-level joins from the destination table's TML file.
- You cannot modify joins at the table level from the worksheet, view, or answer TML file. You can only override the joins for that specific worksheet, view, or answer. To modify table-level joins, you must edit the source table's TML file.
- You cannot directly edit a relationship definition. To alter a relationship definition, you must rename the join or create a new join.

- You cannot delete joins from the TML file. You must delete them in the UI.
- You cannot remove columns or tables from a connection. You can only add them.

## Related information

- [ThoughtSpot Modeling Language \[See page 232\]](#)

# ThoughtSpot Modeling Language

**Summary:** Use ThoughtSpot Modeling Language to modify a worksheet, view, table, Liveboard, or answer, in a flat-file format. Then you can migrate the object to a different cluster, or restore it to the same cluster.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

To work with Scriptable [worksheets](#) [See page 232], [views](#) [See page 236], [tables](#) [See page 239], [answers](#) [See page 245], and [Liveboards](#) [See page 247] in ThoughtSpot, you can download these objects to a flat file in `.TML` format, modify it, and subsequently upload this file either to the same cluster, or to a different cluster. To learn how to export, change, and update worksheets, views, tables, answers, and Liveboards, see [Scriptability](#) [See page 219].

In this article, you learn the syntax of the TML files for each Scriptable object. You also learn how to [add and modify joins](#) [See page 242] for Worksheets, Views, and tables.

**Note:** The syntax examples in this article contain every possible parameter in a TML file. Some of these parameters are not in a TML file by default. If you want to use them, you must add them yourself. For example, the `fqn` parameter is not present in the TML file by default, but you can add it to differentiate a table from another table with the same name.

## Syntax of the Worksheet TML file

The `TML` file for Scriptable Worksheets has a specific syntax.

See the [Parameters](#) [See page 249] section for details about the keywords used in this example.

You may not see each of these parameters in your own TML files, depending on whether each variable is explicitly defined. For example, if you do not have any filters on your Worksheet, the `filters` parameter does not appear. You can add that variable to the TML file to specify filters for your Worksheet.

Refer to [join syntax \[See page 242\]](#) for more information on the functionality and syntax or Worksheet, View, and table joins in TML.

**❶ Note:** If you edit the joins in the Worksheet TML file, you are only editing the joins for that specific Worksheet. You are not editing the joins at the table level. To modify table-level joins, you must edit the source table's TML file.

```

guid [See page 0]: <worksheet_guid>
worksheet [See page 0]:
  name [See page 0]: <worksheet_name>
  description [See page 0]:
    This is a multi-line description of the worksheet
    Description line 2
  tables [See page 0]:
    - name [See page 0]: <table_name_1>
      id [See page 0] : <optional_table_id>
      fqn [See page 0] : <optional_GUID_of_table_name>
    - name [See page 0]: <table_name_2>
    - name [See page 0]: <table_name_n>
  joins [See page 0]:
    - name [See page 0]: <join_name_1>
      source [See page 0]: <source_table_name>
      destination [See page 0]: <destination_table_name>
      type [See page 0]: [RIGHT_OUTER | LEFT_OUTER | INNER | OUTE
R]
      on [See page 0]: <join_expression_string>
      is_one_to_one [See page 0]: [ false | true ]
    - ...
  table_paths [See page 0]:
    - id [See page 0]: <table_path_name_1>
      table [See page 0]: <table_name_1>
      join_path [See page 0]:
        - join [See page 0]:
          - <join_name_1>
          - <join_name_n>
    - id [See page 0]: <table_path_name_2>
      table [See page 0]: <table_name_2>
      join_path [See page 0]:
        - join [See page 0]:
          - <join_name_2>
    - id [See page 0]: <table_path_name_n>
      table [See page 0]: <table_name_n>
      join_path [See page 0]:
        - join [See page 0]:
          - <join_name_n>
  formulas [See page 0]:
    - name [See page 0]: <formula_name_1>
      expr [See page 0]: <formula_definition_1>
      [id]: <optional_unique_identifier>
    - name [See page 0]: <formula_name_2>
      expr [See page 0]: <formula_definition_2>
    - name [See page 0]: <formula_name_3>

```

```

expr [See page 0]: <formula_definition_3>
filters [See page 0]:
- column [See page 0]: <filtered_column_name_1>
  oper [See page 0]: <filter_operator>
  values [See page 0]: <filtered_values>
    - value 1
    - value 2
    - value n
- column [See page 0]: <filtered_column_name_2>
worksheet_columns [See page 0]:
- name [See page 0]: <column_name_1>
  description [See page 0]: <optional_column_description>
  column_id [See page 0]: <column_id_1>
  properties [See page 0]:
    column_type [See page 0]: [ MEASURE | ATTRIBUTE ]
    aggregation [See page 0]: [ SUM | COUNT | AVERAGE | MAX
      | MIN |
        COUNT_DISTINCT | NONE | STD_DEVIATION | VA
      RIANCE]
    index_type [See page 0]: [ DONT_INDEX | DEFAULT | PREFI
      X_ONLY |
        PREFIX_AND_SUBSTRING | PREFIX_AND_WORD_SUBS
      TRING ]
    index_priority [See page 0]: <index_priority>
  synonyms [See page 0] :
    <synonym_1>
    <synonym_2>
  is_attribution_dimension [See page 0] : [true | false]
  is_additive [See page 0] : [ true | false ]
  calendar [See page 0] : [ default | calendar_name ]
  format_pattern [See page 0] : <format_pattern_string>
  currency_type [See page 0] :
    is_browser : true
    OR
    column : <column_name>
    OR
    iso_code : <valid_ISO_code>
  is_hidden [See page 0]: [ true | false ]
  geo_config [See page 0] :
    latitude : true
    OR
    longitude : true
    OR
    country : true
    OR

```

```

region_name:
  - country : <name_supported_country>
  - region_name : <region_name_in_UI>
  spotiq_preference [See page 0]: <spotiq_preference_string>
  search_iq_preferred [See page 0]: [ true | false ]
  name [See page 0]: <column_name_2>
  description [See page 0]: <column_description>
  column_id [See page 0]: <column_id_2>
  ...
  properties [See page 0]:
    is_bypass_rls [See page 0]: [ true | false ]
    join_progressive [See page 0]: [ true | false ]
    lesson_plans [See page 0]:
      - lesson_id [See page 0]: <lesson_id_number_1>
        lesson_plan_string [See page 0]: <lesson_plan_string_1>
      - lesson_id [See page 0]: <lesson_id_number_2>
        lesson_plan_string [See page 0]: <lesson_plan_string_2>
      - lesson_id [See page 0]: <lesson_id_number_n>
        lesson_plan_string [See page 0]: <lesson_plan_string_n>

```

## Syntax of the View TML file

The `TML` file for Scriptable Views has a specific syntax.

See the [Parameters \[See page 249\]](#) section for details about the keywords used in this example.

You may not see each of these parameters in your own TML files, depending on whether each variable is explicitly defined. For example, if you do not have a description for your View, the `description` parameter does not appear. You can add that variable to the TML file to specify a description for your View.

Refer to [join syntax \[See page 242\]](#) for more information on the functionality and syntax of Worksheet, View, and table joins in TML.

**Note:** If you edit the joins in the View TML file, you are only editing the joins for that specific View. You are not editing the joins at the table level. To modify table-level joins, you must edit the source table's TML file.

```

guid [See page 0]: <view_guid>
view [See page 0]:
  name [See page 0]: <view_name>
  description [See page 0]:
    This is a multi-line description of the View.
    Description line 2
  tables [See page 0]:
    - name [See page 0]: <table_name_1>
      id [See page 0] : <optional_table_id>
      fqn [See page 0] : <optional_GUID_of_table_name>
    - name [See page 0]: <table_name_2>
    - name [See page 0]: <table_name_n>
  joins [See page 0]:
    - name [See page 0]: <join_name_1>
      source [See page 0]: <source_table_name>
      destination [See page 0]: <destination_table_name>
      type [See page 0]: [RIGHT_OUTER | LEFT_OUTER | INNER | OUTE
R]
      on [See page 0]: <join_expression_string>
      is_one_to_one [See page 0]: [ false | true ]
  table_paths [See page 0]:
    - id [See page 0]: <table_path_name_1>
      table [See page 0]: <table_name_1>
      join_path [See page 0]:
        - join [See page 0]:
          - <join_name_1>
          - <join_name_n>
    - id [See page 0]: <table_path_name_2>
      table [See page 0]: <table_name_2>
      join_path [See page 0]:
        - join [See page 0]:
          - <join_name_2>
    - id [See page 0]: <table_path_name_n>
      table [See page 0]: <table_name_n>
      join_path [See page 0]:
        - join [See page 0]:
          - <join_name_n>
  formulas [See page 0]:
    - id [See page 0]: <formula_id_1>
      name [See page 0]: <formula_name_1>
      expr [See page 0]: <formula_definition_1>
      properties [See page 0]: <formula_properties_1>
        column_type [See page 0]: [ MEASURE | ATTRIBUTE ]
        data_type [See page 0]: [ BOOL | VARCHAR | DOUBLE | FLOA
T | INT | BIGINT | DATE | DATETIME | TIMESTAMP | TIME ]

```

```

aggregation [See page 0]: [ SUM | COUNT | AVERAGE | MAX
| MIN |
| COUNT_DISTINCT | NONE | STD_DEVIATION
| VARIANCE]
- id [See page 0]: <formula_id_n>
  name [See page 0]: <formula_name_n>
  expr [See page 0]: <formula_definition_n>
  properties [See page 0]: <formula_properties_n>
filters [See page 0]:
- column [See page 0]: <filtered_column_name_1>
  oper [See page 0]: <filter_operator>
  values [See page 0]: <filtered_values>
  - value 1
  - value 2
- column [See page 0]: <filtered_column_name_n>
search_query [See page 0]: <query_string>
view_columns [See page 0]:
- name [See page 0]: <column_name_1>
  description [See page 0]: <optional_column_description>
  column_id [See page 0]: <column_id_1>
  phrase [See page 0]: <phrase_string_1>
  properties [See page 0]:
    column_type [See page 0]: [ MEASURE | ATTRIBUTE ]
    aggregation [See page 0]: [ SUM | COUNT | AVERAGE | MAX
| MIN |
| COUNT_DISTINCT | NONE | STD_DEVIATION | VA
RIANCE]
  index_type [See page 0]: [ DONT_INDEX | DEFAULT | PREFI
X_ONLY |
| PREFIX_AND_SUBSTRING | PREFIX_AND_WORD_SUBS
TRING ]
  index_priority [See page 0]: <index_priority>
synonyms [See page 0] :
  <synonym_1>
  <synonym_2>
is_attribution_dimension [See page 0] : [true | false]
is_additive [See page 0] : [ true | false ]
calendar [See page 0] : [ default | calendar_name ]
format_pattern [See page 0] : <format_pattern_string>
currency_type [See page 0] :
  is_browser : true
  OR
  column : <column_name>
  OR
  iso_code : <valid_ISO_code>

```

```
is_hidden [See page 0]: [ true | false ]
geo_config [See page 0] :
    latitude : true
    OR
    longitude : true
    OR
    country : true
    OR
    region_name:
        - country : <name_supported_country>
        - region_name : <region_name_in_UI>
    spotiq_preference [See page 0]: <spotiq_preference_string>
        search_iq_preferred [See page 0]: [ true | false ]
        name [See page 0]: <column_name_2>
        description [See page 0]: <column_description>
        column_id [See page 0]: <column_id_2>
    ...

```

## Syntax of the table TML file

The `TML` file for Scriptable tables has a specific syntax.

See the [Parameters \[See page 249\]](#) section for details about the keywords used in this example.

You may not see each of these parameters in your own TML files, depending on whether each variable is explicitly defined. For example, if you did not define an `index_priority` for your table, the `index_priority` parameter does not appear. You can add that variable to the TML file to specify an index priority for the table.

Refer to [join syntax \[See page 242\]](#) for more information on the functionality and syntax of worksheet, view, and table joins in TML.

```

guid [See page 0]: <table_guid>
table [See page 0]:
  name [See page 0]: <table_name>
  db [See page 0]: <database_name>
  schema [See page 0]: <schema_name>
  db_table [See page 0]: <database_table_name>
  connection [See page 0]:
    name [See page 0]: <connection_name>
    type [See page 0]: <connection_type>
  columns [See page 0]:
    - name [See page 0]: <column_name_1>
      db_column_name [See page 0]: <database_column_name>
      data_type [See page 0]: [ BOOL | VARCHAR | DOUBLE | FLOAT
      | INT32 | INT64 | DATE | TIME ]
      properties [See page 0]:
        column_type [See page 0]: [ MEASURE | ATTRIBUTE ]
        aggregation [See page 0]: [ SUM | COUNT | AVERAGE | MAX
        | MIN | COUNT_DISTINCT | NONE | STD_DEVIATION | VA
        RIANCE]
        index_type [See page 0]: [ DONT_INDEX | DEFAULT | PREFI
        X_ONLY |
          PREFIX_AND_SUBSTRING | PREFIX_AND_WORD_SUBS
        TRING ]
        index_priority [See page 0]: <index_priority>
        synonyms [See page 0] :
          <synonym_1>
          <synonym_2>
        is_attribution_dimension [See page 0] : [true | false]
        is_additive [See page 0] : [ true | false ]
        calendar [See page 0] : [ default | calendar_name ]
        format_pattern [See page 0] : <format_pattern_string>
        currency_type [See page 0] :
          is_browser : true
          OR
          column : <column_name>
          OR
          iso_code : <valid_ISO_code>
        is_hidden [See page 0]: [ true | false ]
        geo_config [See page 0] :
          latitude : true
          OR
          longitude : true
          OR
          country : true

```

```

    OR
    region_name:
      - country : <name_supported_country>
      - region_name : <region_name_in_UI>
    spotiq_preference [See page 0]: <spotiq_preference_string>
  g>
    search_iq_preferred [See page 0]: [ true | false ]
  db_column_properties [See page 0]:
    data_type [See page 0]: [ BOOL | VARCHAR | DOUBLE | FLOAT | INT32 | INT64 | DATE | TIME ]
    - name [See page 0]: <column_name_2>
    - name [See page 0]: <column_name_n>
  rls_rules [See page 0]:
    tables [See page 0]:
      - name [See page 0]: <table_name_1>
        id [See page 0] : <optional_table_id>
        fqn [See page 0] : <optional_GUID_of_table_name>
      - name [See page 0]: <table_name_2>
      - name [See page 0]: <table_name_n>
    joins [See page 0]:
      - name [See page 0]: <join_name_1>
        source [See page 0]: <source_table_name>
        destination [See page 0]: <destination_table_name>
        type [See page 0]: [RIGHT_OUTER | LEFT_OUTER | INNER | OUTER]
      on [See page 0]: <join_expression_string>
      is_one_to_one [See page 0]: [ false | true ]
      - ...
    table_paths [See page 0]:
      - id [See page 0]: <table_path_name_1>
        table [See page 0]: <table_name_1>
        join_path [See page 0]:
          - join [See page 0]:
            - <join_name_1>
            - <join_name_n>
      - id [See page 0]: <table_path_name_2>
        table [See page 0]: <table_name_2>
        join_path [See page 0]:
          - join [See page 0]:
            - <join_name_2>
      - id [See page 0]: <table_path_name_n>
        table [See page 0]: <table_name_n>
        join_path [See page 0]:
          - join [See page 0]:
            - <join_name_n>

```

```

rules [See page 0]:
- name [See page 0]: <rls_rule_name_1>
  expr [See page 0]: <rls_rule_expression_1>
- name [See page 0]: <rls_rule_name_2>
  expr [See page 0]: <rls_rule_expression_2>
- name [See page 0]: <rls_rule_name_n>
  expr [See page 0]: <rls_rule_expression_n>
joins_with [See page 0]:
- name [See page 0]: <join_name_1>
  description [See page 0]: <optional_join_description_1>
  destination [See page 0]:
    name [See page 0]: <destination_table_name_1>
    fqn [See page 0]: <optional_table_guid_1>
    on [See page 0]: <join_expression_string_1>
    type [See page 0]: [RIGHT_OUTER | LEFT_OUTER | INNER | OUTE
R]
    is_one_to_one [See page 0]: [ false | true ]
- name [See page 0]: <join_name_2>
- name [See page 0]: <join_name_n>

```

## Join syntax

The syntax and functionality of joins in the table TML file differs from the syntax and functionality for Worksheet and View TML files.

When you edit the information in the [joins \[See page 0\]](#) section of the TML for a Worksheet or View, you override the table join(s) from the table the Worksheet or View comes from. However, you only override the join(s) for the specific Worksheet or View you are editing, **not** for the source table.

When you edit the information in the [joins\\_with \[See page 0\]](#) section of the TML for a table, you edit the join information for the source table, the destination table, and any dependents, such as Worksheets and Views. Note that you can only edit joins for which the table is the source table.

### Worksheet and View join syntax

For Worksheets and Views, the join syntax is the following:

```

joins [See page 0]:
- name [See page 0]: <join_name_1>
  source [See page 0]: <source_table_name>
  destination [See page 0]: <destination_table_name>
  type [See page 0]: [RIGHT_OUTER | LEFT_OUTER | INNER | OUTER]
  on [See page 0]: <join_expression_string>
  is_one_to_one [See page 0]: [ false | true ]
  table_paths [See page 0]:
- id [See page 0]: <table_path_name_1>
  table [See page 0]: <table_name_1>
  join_path [See page 0]:
- join [See page 0]:
  - <join_name_1>
  - <join_name_n>

```

## Worksheet and View join functionality and limitations

With Worksheet and View joins, you can accomplish the following tasks:

- Add new joins at the Worksheet or View level
- Modify existing joins at the Worksheet or View level
- Delete existing joins at the Worksheet or View level

Worksheet and View joins have the following limitation:

- You cannot modify joins at the table level from the Worksheet or View TML file. You can only override the joins for that specific Worksheet or View.

## Table join syntax

```

joins_with [See page 0]:
- name [See page 0]: <join_name_1>
  description [See page 0]: <optional_join_description_1>
  destination [See page 0]:
    name [See page 0]: <destination_table_name_1>
    fqn [See page 0]: <optional_table_guid_1>
    on [See page 0]: <join_expression_string_1>
    type [See page 0]: [RIGHT_OUTER | LEFT_OUTER | INNER | OUTER]
    is_one_to_one [See page 0]: [ false | true ]
- name [See page 0]: <join_name_2>
- name [See page 0]: <join_name_n>

```

## Table join functionality and limitations

With table joins, you can accomplish the following tasks:

- Add new joins at the table level. Joins only appear in the table TML file of the source table in a join, or the table on the Many side of a Many to One join. You can only add and edit table joins from the TML file of the table on the Many side of the join.
- Create generic or range joins at the table level. Previously, you could only create non-generic joins through the TML, such as `Table1.date = Table2.date`. Now, you can create generic joins through the TML, such as `Table1.date = Table2.date AND Table1.date > Table2.start_date AND Table1.date < Table2.end_date`.

Note that you must have an 'equals' clause before you can have a 'greater than/less than' clause. `Table1.date = Table2.date AND Table1.date > Table2.start_date AND Table1.date < Table2.end_date` is valid, but `Table1.date < Table2.end_date` is not.

Joins only appear in the table TML file of the source table in a join, or the table on the Many side of a Many to One join. You can only add and edit table joins from the TML file of the table on the Many side of the join.

- Edit existing joins by changing the name of the join and modifying it to your specifications. Changing the name of the join creates a new join; you must then delete the old join in the UI. Joins only appear in the table TML file of the source table in a join, or the table on the Many side of a Many to One join. You can only add and edit table joins from the TML file of the table on the Many side of the join.

Table joins have the following limitations:

- You cannot delete a join by removing it from the TML. You must delete it through the UI.
- You cannot directly edit an existing join; you must rename it, edit it to your specifications, and then delete the old join in the UI.
- Renaming a join creates a new join with that name and does not delete the old join with the original name.
- When creating generic or range joins, you must have an 'equals' clause before you can have a 'greater than/less than' clause. `Table1.date = Table2.date AND Table1.date > Table2.start_date AND Table1.date < Table2.end_date` is valid, but `Table1.date <`

`Table2.end_date` is not.

## Generic joins

The functionality for generic joins in TML files allows the following elements:

- Constants: int, double, bool, date, and string
- Comparison operators: `=`, `!=`, `<`, `>`, `<=`, and `>=`
- Columns
- Boolean operators: `AND`, `OR`, and `NOT`

## Syntax of the Answer TML file

The `TML` file for Scriptable Answers has a specific syntax.

See the [Parameters \[See page 249\]](#) section for details about the keywords used in this example.

You may not see each of these parameters in your own TML files, depending on whether each variable is explicitly defined. For example, if you did not define any conditional formatting, the `conditional_formatting` variable does not appear. You can add that variable in the TML file to specify conditional formatting.

```

guid [See page 0]: <answer_guid>
answer [See page 0]:
  name [See page 0]: <answer_name>
  description [See page 0]:
    This is a multi-line description of the answer
    Description line 2
tables [See page 0]:
- id [See page 0]: <table_id>
  name [See page 0]: <table_name_1>
  fqn [See page 0] : <optional_GUID_of_table_name>
formulas [See page 0]:
- id [See page 0]: <formula_id_1>
  name [See page 0]: <formula_name_1>
  expr [See page 0]: <formula_definition_1>
  properties [See page 0]: <formula_properties_1>
    column_type [See page 0]: [ MEASURE | ATTRIBUTE ]
    data_type [See page 0]: [ BOOL | VARCHAR | DOUBLE | FLOA
T | INT | BIGINT | DATE | DATETIME | TIMESTAMP | TIME ]
    aggregation [See page 0]: [ SUM | COUNT | AVERAGE | MAX
| MIN |
    COUNT_DISTINCT | NONE | STD_DEVIATION | VA
RIANCE]
- id [See page 0]: <formula_id_2>
  name [See page 0]: <formula_name_2>
  expr [See page 0]: <formula_definition_2>
  properties [See page 0]: <formula_properties_2>
- id [See page 0]: <formula_id_3>
  name [See page 0]: <formula_name_3>
  expr [See page 0]: <formula_definition_3>
  properties [See page 0]: <formula_properties_3>
search_query [See page 0]: <search_query_string>
answer_columns [See page 0]:
- id [See page 0]: <column_id_1>
  name [See page 0]: <column_name_1>
  custom_name [See page 0]: <custom_name_1>
- name [See page 0]: <column_name_2>
table [See page 0]:
  table_columns [See page 0]:
- column_id [See page 0]: <column_id_1>
  conditional_formatting [See page 0]:
    - range [See page 0]:
      min [See page 0]: <conditional_formatting_minimum>
      max [See page 0]: <conditional_formatting_maximum>
    - rule [See page 0]: <conditional_formatting_rule_1>
      range [See page 0]:

```

```

        min [See page 0]: <conditional_formatting_minimum>
        max [See page 0]: <conditional_formatting_maximum>
        color [See page 0]: <color_string>
        plotAsBand [See page 0]: [ true | false ]
      - rule [See page 0]: <conditional_formatting_rule_2>
        show_headline [See page 0]: [ true | false ]
        headline_aggregation [See page 0]: <headline_aggregatio
n_string>
      - column_id [See page 0]: <column_id_2>
    ordered_column_ids [See page 0]:
      - column_id [See page 0]: <column_id_1>
      - column_id [See page 0]: <column_id_2>
      client_state [See page 0]: <client_state_string>
    chart [See page 0]:
      type [See page 0]: <chart_type>
      chart_columns [See page 0]: <chart_column_1>
      - column_id [See page 0]: <column_id_1>
        conditional_formatting [See page 0]:
          - rule [See page 0]: <conditional_formatting_rule_1>
            range [See page 0]:
              min [See page 0]: <conditional_formatting_minimum>
              max [See page 0]: <conditional_formatting_maximum>
              color [See page 0]: <color_string>
              plotAsBand [See page 0]: [ true | false ]
            - rule [See page 0]: <conditional_formatting_rule_2>
      - column_id [See page 0]: <column_id_2>
      axis_configs [See page 0]: <axis_config_1>
      - x:
        - column_id [See page 0]: <column_id_x_axis>
      - y:
        - column_id [See page 0]: <column_id_y_axis>
        color [See page 0]:
          - column_id [See page 0]: <column_id_color>
      axis_configs [See page 0]: <axis_config_2>
      locked [See page 0]: [ true | false ]
      client_state [See page 0]: <client_state_string>
      display_mode [See page 0]: <display_mode_string>

```

## Syntax of the Liveboard TML file

The `TML` file for Scriptable Liveboards has a specific syntax.

See the [Parameters \[See page 249\]](#) section for details about the keywords used in this example.

You may not see each of these parameters in your own TML files, depending on whether each variable is explicitly defined. For example, if you do not have any filters on your Liveboard, the `filters` parameter does not appear. You can add that variable to the TML file to specify filters for your Liveboard.

```
guid [See page 0]: <pinboard_guid>
pinboard [See page 0]:
  name [See page 0]: <pinboard_name>
  description [See page 0]:
    This is a multi-line description of the Liveboard
    Description line 2
  visualizations [See page 0]:
    - id [See page 0]: <viz_id_1>
      answer [See page 0]:
        This section includes all the Answer specification for a visualization, from name to display_mode, in the Answer syntax \[See page 245\] section above.
    - id [See page 0]: <viz_id_2>
      answer [See page 0]:
        This section includes all the Answer specification for a second visualization. In this case, the visualization is a headline.
      display_headline_column [See page 0]: <headline_column>
      filters [See page 0]:
        - column [See page 0]:
          - <primary_filter [See page 0]>_column_name_1>
          - <linked_filter [See page 0]>_column_name_2>
          - <linked_filter [See page 0]>_column_name_n>
        oper [See page 0]: <filter_operator>
        values [See page 0]: <filtered_values>
        - value 1
        - value 2
        - value n
      excluded_visualizations [See page 0]:
        - excluded_viz_id_1 [See page 0]
        - excluded_viz_id_2 [See page 0]
      - column [See page 0]: <filtered_column_name_2>
      ...
layout [See page 0]:
  tiles:
    - visualization_id [See page 0]: <visualization_id_1>
      size [See page 0]: <viz_id_1_size>
    - visualization_id [See page 0]: <visualization_id_2>
```

## Parameters of TML files

### **aggregation**

The default aggregation of the Worksheet, View, or table column, or the aggregation of the output for a formula.

Aggregation options depend on the data type.

Possible values: `SUM`, `COUNT`, `AVERAGE`, `MAX`, `MIN`, `COUNT_DISTINCT`, `NONE`,  
`STD_DEVIATION`, and `VARIANCE`

Default: `SUM`

### **answer**

Top-level container for all object definitions within an Answer.

### **answer\_columns**

A list of columns generated by the search query.

### **axis\_configs**

Specifies the columns for each axis on a chart. If you are displaying a column chart with a line chart overlaying it, for example, you would need to specify more than one `axis_config`.

### **calendar**

Specifies the calendar used by a date column

Can be the Gregorian calendar (`default`), a fiscal calendar, or any custom calendar.

See [Set up a custom calendar \[See page 0\]](#)

### **chart**

Contains configuration for the Answer, if it displays in chart format.

### **chart\_columns**

A list of columns in the chart.

### **client\_state**

A JSON string with more advanced chart and table configuration.

### **color**

Color to use for conditional formatting or for the columns of an Answer in chart form, in the form of a HEX value.

### **column**

The id of the column(s) being filtered on. When a Liveboard contains [linked filters \[See page 0\]](#), or filters that affect visualizations based on more than one Worksheet, the primary filter column appears first in the list of columns in the TML. The linked filter column appears after the primary filter column.

### **columns**

The columns in the table.

### **column\_id**

The `id` of the Worksheet or View column.

For Answers, `column_id` refers to how the column appears in the query. For example, if you sorted by `Quarter` in your search, from the `Commit Date` column, the `column_id` of the column is `Quarter(Commit Date)`.

### **column\_type**

The type of data the column represents. For a formula, the `column_type` refers to the output of the formula.

Possible values: `MEASURE` or `ATTRIBUTE`

For Worksheets, the default is: `MEASURE`

For formulas, the default depends on the [data\\_type \[See page 0\]](#). If the data type is `INT` or `BIGINT`, the formula output's `column_type` defaults to `Measure`. If the data type is `BOOL`, `VARCHAR`, `DOUBLE`, `FLOAT`, `DATE`, `DATETIME`, or `TIME`, the formula output's `column_type` defaults to `Attribute`.

### **conditional\_formatting**

Conditional formatting for the chart or table of an Answer.

### **connection**

A way to identify the external data warehouse connection that the table resides in. To add tables or columns to a connection, you must specify this parameter.

### **currency\_type**

The source of currency type

One of:

- `is_browser` : `true` infer the currency data from the locale of your browser
- `column` : `<column_name>` extracts the currency information from a specified column
- `iso_code` : `<valid_ISO_code>` applies currency based on the ISO code; see [ISO 4217 Currency Codes \(https://www.iso.org/iso-4217-currency-codes.html\)](#)

See [Set currency type \[See page 156\]](#)

### **custom\_name**

Optional display name for a column.

### **data\_type**

The data type of the formula output or column. If the data type is `INT` or `BIGINT`, the formula output's `column_type` defaults to `Measure`. If the data type is `BOOL`, `VARCHAR`, `DOUBLE`, `FLOAT`, `DATE`, `DATETIME`, or `TIME`, the formula output's `column_type` defaults to `Attribute`. The possible data types are `Boolean`, `Text`, `Date`, `Datetime`, `Time`, `Numeric`, and `Decimal`.

### **db**

The database that a table resides in. Note that this is not the same as the data warehouse (Falcon, Amazon Redshift, or Snowflake, for example).

### **db\_column\_name**

The name of the column in the database. Note that this database is not the same as the data warehouse (Amazon Redshift or Snowflake, for example).

### **db\_column\_properties**

The properties of the column in the database. Note that this database is not the same as the data

warehouse (Amazon Redshift or Snowflake, for example).

#### **db\_table**

The name of the table in the database. Note that this database is not the same as the data warehouse (Falcon, Amazon Redshift, or Snowflake, for example).

#### **description**

The text that describes an object: a `worksheet`, a `worksheet_column`, `answer`, `pinboard`, `view`, `view_column` and so on.

#### **destination**

The name of the destination table or View for a join

#### **display\_mode**

Determines whether the Answer displays as a chart or a table. Specify either `CHART_MODE` or `TABLE_MODE`.

#### **display\_headline\_column**

If the visualization is a headline, this parameter specifies the column the headline comes from.

#### **excluded\_visualizations**

A list of visualizations the Liveboard editor chose to exclude from the filter. Only appears when using [selective filters \[See page 0\]](#).

#### **expr**

The definition of the formula or row level security (RLS) rule. For RLS rules, the syntax for variables in TML should be the same as the syntax of the variables in the rule on the table.

#### **filters**

Contains specifications for Liveboard, view, and worksheet filters.

#### **format\_pattern**

The format pattern string that controls the display of a number, date, or currency column  
See [Set number, date, and currency formats \[See page 152\]](#)

#### **formulas**

The list of formulas in the Worksheet, View, or Answer.

Each formula is identified by `name`, the `expr` (expression), and an optional `id` attribute.

#### **fqn**

The table's GUID. You can find this string of letters and numbers at the end of the URL for that table. For example, in <https://<company>.thoughtspot.com/#/data/tables/34226aaa-4bcf-4d6b-9045-24cb1e9437cb>, the GUID is 34226aaa-4bcf-4d6b-9045-24cb1e9437cb.

Use this optional parameter to identify a specific table, if you have multiple tables with the same name.

#### **geo\_config**

Specifies the geographic information of a column  
One of:

- `latitude : true` for columns that specify the latitude
- `longitude : true` for columns that specify the longitude
- `country : true` for columns that specify the country
- `region_name` for specifying a region in a country
  - Uses two paired parameters:
    - `country: <country_name>`
    - `region_name: <region_name_in_UI>`, which can be State, Postal Code, District, and so on.

See [Add a geographical data setting \[See page 148\]](#)

#### guid

The GUID for the answer, Liveboard, table, worksheet, or view. You can find this string of letters and numbers at the end of the URL for an object.

#### headline\_aggregation

Specifies the type of headline aggregation. Can be `COUNT`, `COUNT_DISTINCT`, `SUM`, `MIN`, `MAX`, `AVERAGE`, or `TABLE_AGG`.

#### id

Specifies the id of an object, such as `table_paths`, `formula`.

For Answers, `id` refers to how the column appears in the query. For example, if you sorted by `Quarter` in your search, from the `Commit Date` column, the `id` of the column is `Quarter(Commit Date)`. Refer to [Components of a Search Query \(<https://developers.thoughtspot.com/docs/?pageid=search-data-api>\)](https://developers.thoughtspot.com/docs/?pageid=search-data-api) to understand syntax.

For formulas within Answers, `id` refers to the display name of the formula. If you do not give your formula a name, it appears as 'Untitled Formula'.

#### identity

Specifies the identity of a table, based on its `name`, `id`, and `fqn`.

#### index\_priority

A value (1-10) that determines where to rank a column's name and values in the search suggestions

ThoughtSpot prioritizes columns with higher values.

See [Change a column's suggestion priority \[See page 145\]](#).

#### index\_type

The indexing option of the Worksheet, View, or table column

Possible values: `DONT_INDEX`, `DEFAULT` (see [Understand the default indexing behavior \[See page 0\]](#)), `PREFIX_ONLY`, `PREFIX_AND_SUBSTRING`, and `PREFIX_AND_WORD_SUBSTRING`

Default: `DEFAULT`

See [Index Type Values \[See page 144\]](#)

#### is\_additive

Controls extended aggregate options for attribute columns

For attribute columns that have a numeric data type (`FLOAT`, `DOUBLE`, or `INTEGER`) or a date data type (`DATE`, `DATETIME`, `TIMESTAMP`, or `TIME`)

Possible values: `true` or `false`

Default: `true`

See [Making an ATTRIBUTE column ADDITIVE \[See page 134\]](#)

### **is\_attribution\_dimension**

Controls if the column is an attribution dimension

Used in managing chasm traps.

Possible values: `true` by default, `false` to designate a column as not producing meaningful attributions across a chasm trap

Default: `true`

See [Change the attribution dimension \[See page 158\]](#)

### **is\_bypass\_rls**

Specifies if the worksheet supports bypass of Row-level security (RLS)

Possible values: `true` or `false`

Default: `false`

See [Privileges that allow users to set, or be exempt from, RLS \[See page 105\]](#)

### **is\_hidden**

The visibility of the column

Possible values: `true` to hide the column, `false` not to hide the column

Default: `false`

See [Hide a column \[See page 138\]](#)

### **is\_one\_to\_one**

Specifies the cardinality of the join. This is an optional parameter.

Possible values: `true`, `false`

Default: `false`

### **join**

Specific join, used in defining higher-level objects, such as table paths

Defined as `name` within `joins` definition

### **join\_path**

Specification of a composite join as a list of distinct `join` attributes

These `join` attributes list relevant joins, previously defined in the `joins`, by name.

Default: `{}`

### **join\_progressive**

Specifies when to apply joins on a worksheet

Possible values: `true` when joins are applied only for tables whose columns are included in the search, and `false` for all possible joins

Default: `true`

See [How the worksheet join rule works \[See page 199\]](#)

### **joins**

Contains a list of joins between the tables and Views.

If you edit the joins in the Worksheet or View TML file, you are only editing the joins for that specific Worksheet or View. You are not editing the joins at the table level. To modify table-level joins, you must edit the source table's TML file.

Each join is identified by `name`, and the additional attributes of `source`, `destination`, `type`, and `is_one_to_one`.

### **joins\_with**

Contains a list of external joins for which this table is the source.

Each join is identified by `name` and optional `description`, and the additional attributes of `destination`, `type`, `on` and `is_one_to_one`.

### **layout**

Specifies the Liveboard layout, in the order that a `visualization_id` is listed.

### **lesson\_plan\_string**

A string that represents the fully disambiguated search query used in a [Search Assist Coach \[See page 0\]](#) lesson on a Worksheet. For example, "What is the [Quantity] of items from [Customer Nation].'egypt' per [Datekey].'day of week' by [Color] ?". Refer to [Components of a Search Query](#) (<https://developers.thoughtspot.com/docs/?pageid=search-data-api>) to understand syntax.

### **lesson\_plans**

A list of [Search Assist Coach \[See page 0\]](#) lessons for the Worksheet.

### **lesson\_id**

The id of the [Search Assist Coach \[See page 0\]](#) lesson. For example, the first lesson to appear to users has an id of `0`, the next lesson has an id of `1`, and so on.

### **locked**

The 'automatically select my chart' option in the UI. If set to `true`, the chart type does not change, even when you add items to the query.

### **max**

Maximum value for conditional formatting.

### **min**

Minimum value for conditional formatting.

### **name**

The name of an object. Applies to `worksheet`, `table`, `joins`, `formula`, `rls_rules`, `answer`, `pinboard`, `view`, `table`, `connection`, `destination`, and so on.

For Answers, `name` refers to how the column appears in the query. For example, if you sorted by `Quarter` in your search, from the `Commit Date` column, the `name` of the column is `Quarter(Commit Date)`. Refer to [Components of a Search Query](#) (<https://developers.thoughtspot.com/docs/?pageid=search-data-api>) to understand syntax.

### **on**

The join expression: the relationship definition, or the keys that your tables are joined on. For example, `[sale::Sale_Last Name] = [employee::Employee_Last Name]` AND `[sale::Sale_First Name] = [employee::Employee_First Name]`.

You cannot directly edit a relationship definition. To alter a relationship definition, you must rename the join or create a new join.

### **oper**

The operator of the Liveboard, view or worksheet filter. Accepted operators are "in", "not in", "between", =<, !=, <=, >=, >, or <.

### **ordered\_column\_ids**

A list of columns, in the order they appear in the table.

### **phrase**

Phrase associated with a View column.

### **pinboard**

Top-level container for all object definitions within the Liveboard.

### **properties**

The list of properties of a Worksheet, table, or View column, a Worksheet or View itself, or the properties of the output for a formula within an Answer, Worksheet, or View.

For Worksheets, Views, and tables, each column can have the following properties, depending on its definition: `column_type`, `aggregation`, `index_type`, `is_hidden`, `index_priority`, `synonyms`, `is_attribution_dimension`, `is_additive`, `calendar`, `format_pattern`, `currency_type`, `geo_config`, `spotiq_preference`, and `search_iq_preferred`.

Worksheets and Views themselves can have the following properties that affect query generation: `is_bypass_rls`, and `join_progressive`.

For Answers, each formula's output can have the following properties, depending on its definition: `column_type` and `aggregation`.

### **plotAsBand**

Specifies whether to plot the chart conditional formatting like a band on the Visualization. This is the 'fill chart' option in the UI.

### **range**

Range for the conditional formatting to apply to, with a specified `min` and `max`.

### **rls\_rules**

A container for the full definition of [row level security \[See page 105\]](#) rules for the table.

### **rule**

A conditional formatting rule.

### **rules**

A container for the names and expressions of [row level security \[See page 105\]](#) rules for the table.

### **schema**

The schema that the table is a part of.

### **search\_query**

A string that represents the fully disambiguated search query. Used in Answers and Views. Refer to [Components of a Search Query](#) (<https://developers.thoughtspot.com/docs/?pageid=search-data-api>) to understand syntax.

### **show\_headline**

Determines whether to show the headline for this column. `true` shows the headline.

### **size**

The size of a visualization in a Liveboard. The options are `EXTRA_SMALL` , `SMALL` , `MEDIUM` , `LARGE` , `LARGE_SMALL` , `MEDIUM_SMALL` , and `EXTRA_LARGE` .

### **source**

Name of the source table or View for a join

### **spotiq\_preference**

Specifies whether to include a column in SpotIQ analysis. Specify `EXCLUDE` , or this property defaults to include the column in SpotIQ Analysis.

Refer to [Set columns to exclude from SpotIQ analyses \[See page 163\]](#).

### **synonyms**

Alternate names for the column, used in search

See [Create synonyms for a column \[See page 139\]](#)

### **table**

Top-level container for all object definitions within the table.

Specific table, used in defining higher-level objects, such as table paths.

Defined as `name` within `tables` definition.

For Answers, this parameter contains configuration for the Answer, if it displays in table format.

### **table\_columns**

The columns in an Answer that is being displayed in table format.

### **table\_paths**

The list of table paths

Each table path is identified by the `id` , and additional attributes of `table` and `join_path` .

### **tables**

List of tables used by the worksheet, answer, or table RLS rule.

Each table is identified by `name` .

### **type**

For Worksheets, Views, and in the `joins` section of an Answer TML file, this is the join type. This is an optional parameter.

Possible values: `LEFT_OUTER` for left outer join, `RIGHT_OUTER` for right outer join, `INNER` for inner join, `OUTER` for full outer join

Default: `INNER`

For tables, this is the Embrace connection type.

Possible values: `Snowflake` , `Google BigQuery` , `Microsoft Azure` , or `Amazon Redshift` .

Within the `chart` section of an Answer TML file, this is the chart type.

Possible values: `COLUMN` , `BAR` , `LINE` , `PIE` , `SCATTER` , `BUBBLE` , `STACKED_COLUMN` , `AREA` , `PARETO` , `COLUMN` , `GEO_AREA` , `GEO_BUBBLE` , `GEO_HEATMAP` , `GEO_EARTH_BAR` , `GEO_EARTH_AREA` , `GEO_EARTH_GRAPH` , `GEO_EARTH_BUBBLE` , `GEO_EARTH_HEATMAP` , `WATERFALL` , `TREEMAP` , `HEATMAP` , `STACKED_AREA` , `LINE_COLUMN` , `FUNNEL` , `LINE_STACKED_COLUMN` , `PIVOT_TABLE` , `SANKEY` , `GRID_TABLE` , `SPIDER_WEB` , `WHISKER_SCATTER` , `STACKED_BAR` , or `CANDLESTICK` .

### **values**

The values being filtered (excluded or included) in a Liveboard, view, or worksheet.

### **view**

Top-level container for all object definitions within the View.

### **view\_columns**

The list of columns in the View.

Each column is identified by `name`, `description`, `column_id`, `phrase` and `properties`.

### **visualizations**

The visualizations in a Liveboard: tables, charts, and headlines.

### **visualization\_id**

The id of a visualization. Used to specify the Liveboard's layout [See page 0].

### **worksheet**

Top-level container for all object definitions within the worksheet

### **worksheet\_columns**

The list of columns in the worksheet

Each worksheet is identified by `name`, `description`, `column_id`, and `properties`.

## **Limitations of working with TML files**

There are certain limitations to the changes you can apply by editing a worksheet, answer, table, view, or Liveboard through TML.

- Formulas and columns can either have a new name, or a new expression. You cannot change both, unless migrating or updating the worksheet two times.
- It is not possible to reverse the join direction in the TML script.
- You cannot create new tables using Scriptability. You can only update existing tables.
- You can only change logical tables using Scriptability. You cannot change the physical version of the table that exists in a database. When you change the `column_name`, for example, the name changes in the application, but not in the physical table in the database.
- You cannot create Scriptable representations of R- or Python-powered visualizations.
- You cannot import manually compressed .zip files. You can only import .zip files that you exported from ThoughtSpot: a custom set of TML files, an object and its associated data sources, or multiple objects of the same type that you exported from the object list page.

- Joins only appear in the table TML file of the source table in a join, or the table on the Many side of a Many to One join. You can only add and edit table joins from the TML file of the table on the Many side of the join. You cannot view or modify table-level joins from the destination table's TML file.
- You cannot modify joins at the table level from the worksheet, view, or answer TML file. You can only override the joins for that specific worksheet, view, or answer. To modify table-level joins, you must edit the source table's TML file.
- You cannot directly edit a relationship definition. To alter a relationship definition, you must rename the join or create a new join.
- You cannot delete joins from the TML file. You must delete them in the UI.
- You cannot remove columns or tables from a connection. You can only add them.

# Understanding views

**Summary:** If you want to perform a search on top of another search, try saving your search as a view. Then, you can use the saved view as a data source for a new search.

**Access:** Only users with the **Can administrator ThoughtSpot** or the **Can manage data** privilege can create views and link them.

**Important:** Views do not support row level security (RLS), so all users of a view can see all the data it contains.

## Introduction to views

You may have noticed that when you do a search on a data source, ThoughtSpot is only able to aggregate one column by one other column. Because of this, you may come across searches you can't do in one pass, because they are essentially nested queries. But you can create the equivalent of nested queries using a view, which is an answer that you have saved for the purpose of building other searches on top of it.

You can use a view just like any other data source. You can even link it to other sources by defining a relationship. When you save an answer as a view, and then use it as a source in a new search, it is similar to doing a nested query in SQL, only much easier to create.

## View workflow

Suppose you created a search on the sales fact table that shows the top ten Sales Reps by revenue, for the first quarter. Then you want to do some further investigation on that subset of data, such as ranking them by how much they discounted a specific product based on data from the orders fact table. Unless you save your first answer as a view, and then search over that view, you cannot get your answers.

Here are the high-level steps for creating and using views:

1. Create the first search, and save it as a view [See page 261].
2. [Create relationships \[See page 173\]](#) or define joins [See page 0] to connect your view with any other data source.
3. Create a new search that includes your view and the other sources linked with it.
4. We recommend that you [create a new worksheet \[See page 184\]](#) that includes all these data sources.

Creating a worksheet makes it easier for people to search using your view and any related tables.

## Best practices for using views

- When creating views, keep in mind the sizing recommendations for worksheets, for the final worksheet that you plan to use in modeling your data.
- To be able to join a view with a base table, your installation must be configured to allow this. The view cannot have more than 5 tables, and the number of rows in the view cannot exceed 10 million rows.
- The order of the objects being linked (joined) matters, because joins are directional. The table or view with the foreign key must be in the first (left) position. The table or view with the primary key must be in the second (right) position.
- For best performance, views should have 50 or fewer columns, and no more than 10 million rows.

## Related Information

- [More view scenario examples \[See page 265\]](#)
- [Save a search as a view \[See page 261\]](#)
- [Constraints \[See page 0\]](#)

## Save a search as a view

**Summary:** If you want to search on top of another search, try saving your search as a view. Then, you can use the saved view as a data source for a new search.

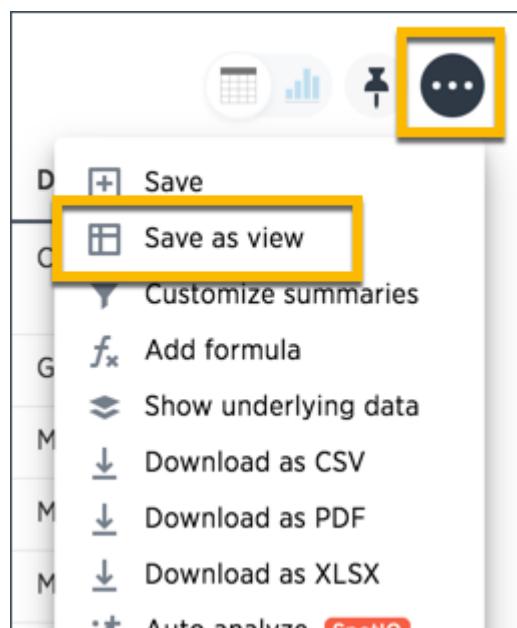
**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

This procedure walks you through creating a view from a search. To create a view from a search:

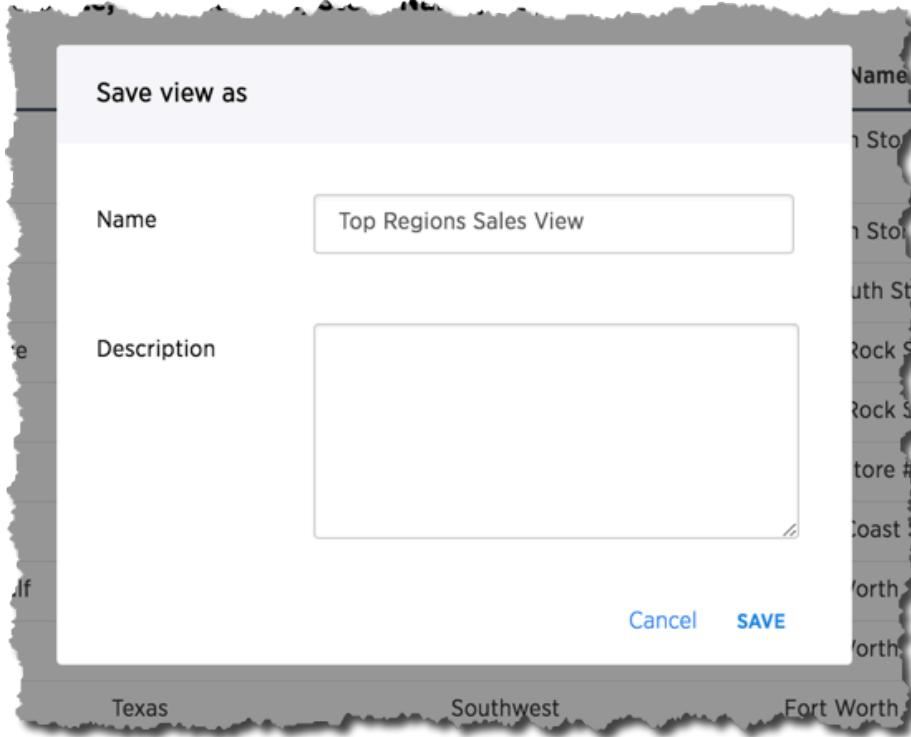
1. Start a new search, or edit an existing visualization from a Liveboard.

Any filters or aggregations created during this search will be reflected in the view.

2. Make any changes to the visualization that you want in your saved view (change aggregation level, filters, etc.)
3. Click the ellipses icon  , and **Save as view**.



4. Give the view a name and save it.



5. [Link](#) [See page 173] your view to any other data source, or [define joins](#) [See page 0].

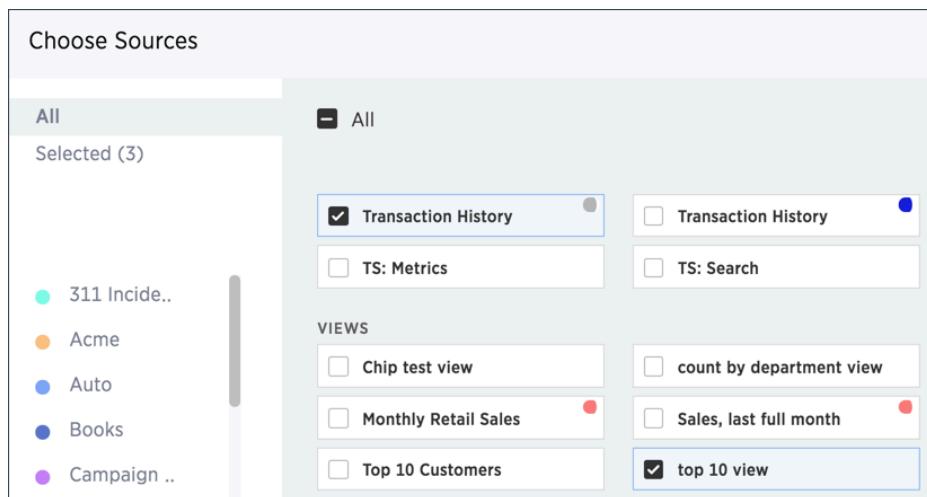
At this point the view has been saved.

# Create a search from a view

**Summary:** After creating a view, you can select it and search its data.

After creating a view and linking it to related data, you're ready to create your new search. To do a search on the view, along with any data sources you linked:

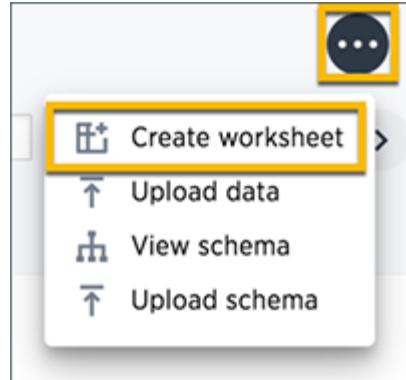
1. Click the search icon, and select **Data Source**. Choose your linked sources.



2. Do a search using columns from the linked sources.
3. Test the result, to make sure it's what you expect.

If your search shows no data found or doesn't look right to you, it is possible that one of the links between your sources was made on the incorrect column. Check the relationships you created and try linking using a different column, to see if that gives the expected search results.

4. When you have the expected answer, you can create a worksheet to make it easier for you and other people to use. To do this, click **Data**.
5. Click the ellipses icon , and select **Create worksheet**.



6. Choose your view and any other tables it is linked to using **Choose Sources**.
7. You may need to rename some columns appropriately for searching.
8. Save the worksheet and share it with the appropriate users and groups.

# View example scenarios

**Summary:** It's not always easy to know when you need to use a view, but these are some common scenarios.

Here are three common examples of when you would want to use a view.

## Example 1

Search a filtered subset

Let's say you have a table with all the sales transactions for each customer. You want to find high value customers (those who have spent a certain amount of money in the last year). Then you want to do some further analysis on these high value customers, like the count by region. Here you essentially need to sum up the sales per customer, filter by that sum to get the top customers, and then do a count, making it two levels of aggregation. A single search can do only one level of aggregation.

However, a search can calculate the initial sum and filter within it to get the highest value customers. Then you can save that result as a view. Joining the view to some other tables, like the customer dimension, allows you to do the count and other similar analyses using the view along with the other tables.

## Example 2

Cohort analysis

This example is similar to the previous example, except that it involves a more complex filter, called a cohort. You might create a search to find customers who bought product A, but did not buy product B.

First, you would have to perform searches for total sales by customer for both A and B, and create views for both. Then join these two views back in an outer join looking for conditions where the A and B join values are null.

This example could also be solved in a single search by using [conditional formulas \[See page 0\]](#) to determine the desired group (or cohort) of customers as defined by their buying behavior, and then doing the analysis on this group.

## Example 3

Combining aggregated sources

If you do a lot of your analysis in the aggregate, like at the quarterly level, you may be challenged when trying to combine this aggregated data from different sources. For example, you may want to combine three different quarterly views from SalesForce - Pipeline, Bookings, and Sales Activity to create a comprehensive analysis of each region's performance. Joining the quarterly views together in a worksheet enables you to do this type of analysis easily.

## Example 4

Lightweight data transformation

You may have a table with separate columns for people's first name and last name. You could use a concat formula to create a single column with first name, a space, and last name. But using this formula could make performance slow, since that column would always be calculated on the fly when searching. In this case, creating a view using the concatenate formula will improve performance when searching this data.

# Job management (scheduled Liveboards)

**Summary:** All jobs on your cluster will appear on the Jobs Management page. You can also view jobs for individual Liveboards under the Liveboard Actions dropdown.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

The **Jobs Management** page found on the **Admin** section in the ThoughtSpot web application allows you to create and manage jobs, namely scheduled Liveboards. Scheduled Liveboards should help with preparing for recurrent meetings, when reviewing the same Liveboard is necessary. They should also be useful when you have metrics you want to monitor at a consistent interval, like daily or monthly sales targets.

You can get Liveboards emailed to you on a regular basis and do analysis offline. This introduces an additional format for you to consume and share Liveboards with others, including those who don't have a ThoughtSpot account.

Contact [ThoughtSpot Support](#) [See page 292] if scheduled Liveboards is not enabled on your cluster, or you can run the command `tscli scheduled-pinboards` to enable it yourself.

## Scheduled Liveboard creators

Administrators and users with `can schedule` privilege can schedule and manage Liveboard jobs. These scheduled Liveboard creators must have at least edit-only and view-only rights to the Liveboard they want to share.

**Warning:** It is recommended that admins carefully choose who to give `can schedule` Liveboard privilege to, since there is a possible security hole where a user with limited access can get a Liveboard email with all access data.

## Row level security

The scheduled Liveboards respect row level security rules. This means if the recipients are users in ThoughtSpot, then they can only see data based on their own access to the Liveboard. If the user does not have at least view-only access to the Liveboard, then they will not see anything in the email. However, if the recipients are from outside of the cluster, then they will have access to the dataset of the Liveboard based on the sender's permissions.

## Scheduled Liveboard formats

The Liveboard visualizations are attached to the scheduled email as CSV or PDF files. Saved configurations such as Liveboard filters are applied to the attachments. Refer to the table to see how the Liveboard data is represented in each file format.

CSV	PDF
The CSV file gets data only for table visualizations.	The PDF file gets data for all visualizations.
The email has n CSV attachments, where there are n table visualizations in the Liveboard.	The email has only one attachment file, which includes every visualization on its own page.
Table visualizations have all data rows that they're supposed to have.	Table visualizations include only the first 100 rows.
In the case of a corrupted Liveboard: no email is sent. An error message indicating failure to export data is visible on the Admin Jobs Management page.	In the case of a corrupted Liveboard: the PDF attachment has empty/error screenshots.
In the case of a corrupted visualization: an email with the visualizations whose data can be exported is sent. An error message indicating visualization export error is visible on the Jobs Management page.	In the case of a corrupted visualization: the PDF attachment has empty/error slots for the corrupted visualizations.

The size of each email is limited to 25 MB, which matches most email services size limitations.

And the total number of recipients for a scheduled Liveboard job cannot exceed the default of 1000.

## Related information

For information on creating a Liveboard, see the [Schedule a Liveboard job \[See page 0\]](#).

# Scheduled Liveboards management

**Summary:** You can manage all scheduled Liveboards on the Jobs Management page under Admin.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

Users who are not admins, but have the **Can schedule Liveboards** privilege, can only view Liveboard schedules they've created. You can select specific jobs and choose to pause, resume, edit, or delete them. You can have up to 50 scheduled jobs on your cluster at time. [Contact ThoughtSpot Support](#) [See page 292] if you'd like to increase this limit.

To view Liveboard schedules, navigate to **Data > Usage > Jobs Management**.

Name	Status	Recipient	Created	Author
Documentation Update	> Scheduled	2 Recipients	8 months ago	tsadmin
test	> Scheduled	1 Recipient	10 months ago	tsadmin
Azim	> Scheduled	1 Recipient	10 months ago	tsadmin
ashish-test	> Scheduled	2 Recipients	11 months ago	tsadmin
empty pdf test	> Scheduled	1 Recipient	11 months ago	tsadmin
Confluence Status	> Scheduled	1 Recipient	a year ago	tsadmin
test2	> Scheduled	1 Recipient	a year ago	tsadmin

## Bulk actions

Select the scheduled Liveboards and use the **Delete**, **Resume**, and **Pause** buttons to perform these bulk actions. Deleting a Liveboard will also delete any schedules linked to it.

## Job statuses

Clicking on the row of a job will open a detailed view of every generated update of that job. You can see the start and end times of the job, as well as the status. Clicking on a job will show more information about the status updates.

Name	Started at	Ended at	Status
Documentation Update	17 hours ago	17 hours ago	Failed
test			
Azim	2 days ago	2 days ago	Failed
ashish-test			
empty pdf test			
Confluence Status			
test2			

## Liveboard links

Click the scheduled Liveboard name link to jump to a Edit schedule page, where you can edit the schedule configurations.

You can also click the Liveboard link provided in the scheduled Liveboard emails to jump to the Liveboard in ThoughtSpot. In order to have the link direct you to the correct URL, you must first configure front end host and port access. [Contact ThoughtSpot Support \[See page 292\]](#) to configure these settings.

# Introduction to monitoring

**Summary:** Learn how to monitor your system.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

ThoughtSpot Cloud provides several out-of-the-box system monitoring worksheets, views, and Liveboards. From these worksheets and views, you can create your own custom visualizations and Liveboards. This page introduces these features and directs you towards more detailed information.

## Admin Console

From the Admin Console, you can view the [User Adoption \[See page 0\]](#) system Liveboard, and view upcoming [application maintenance \[See page 0\]](#).

Navigate to the Admin Console by selecting **Admin** from the top navigation bar.

## System worksheets, views, and Liveboards

Administrators can view existing system Liveboards, or create their own, custom boards that reflect system data in ways that are meaningful to specific departments or groups. For more information, see the following documentation:

- [System worksheets and views \[See page 273\]](#)
- [System Liveboards \[See page 275\]](#)

# System worksheets and views

**Summary:** Learn about the system worksheets and views that ThoughtSpot provides.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

Most of the monitoring information in ThoughtSpot's system Liveboards comes from system worksheets and views that administrators can view, but not modify. The underlying tables are protected system tables that you cannot access directly. However, administrators can create new, custom monitoring reports from the worksheets and views.

## List the system worksheets and views

To list the system worksheets and views:

1. Go to the **Data** tab.
2. Choose **All** and **All types**.
3. Enter **System User** in the search field.

## Description of system worksheets and views

Worksheet	Description
Credits Purchased	Contains data on the number of credits for <a href="#">consumption-based pricing [See page 286]</a> your cluster has, and their expiration date. Used for the <a href="#">Credit Usage Liveboard [See page 289]</a> .
Sample Retail – Apparel	Contains sample retail data for <a href="#">Search Assist [See page 0]</a> .
Credit Usage	Tracks the credits for <a href="#">consumption-based pricing [See page 286]</a> your cluster has consumed. Used for the <a href="#">Credit Usage Liveboard [See page 289]</a> .

<b>Discover Monitoring Data</b>	Contains data on how users are searching for existing answers and Liveboards. Contains information on what users are searching for, where users are successful and where they are not. Used for the <a href="#">How Users are Searching Answers Liveboard [See page 0]</a> .
<b>Product Usage</b>	Contains usage data for the product. Specifies what existing Worksheets, tables, and Views users search on and create objects from, and what those objects are. Specifies what actions users complete in the product. You can also use this Worksheet to view the underlying data sources for any objects, and any object's dependents.
<b>MetricsMonitoring</b>	Contains data on how users are searching for existing answers and Liveboards. Contains information on what users are searching for, where users are successful and where they are not, based on click count and position. Used for the <a href="#">How Users are Searching Answers Liveboard [See page 0]</a> .
<b>TS: BI Server</b>	Contains data related to the systems associated with underlying the ThoughtSpot BI server. This includes database latency, browser clients, size of responses, and more.
<b>TS: External Table Current Row Count</b>	Contains data related to the row count for external tables, or tables loaded through Connections.
<b>TS: Rows of un-cached tables for each connection</b>	Contains data related to the sum of rows count for each uncached table in a connection.
<b>TS: External Table Stats WS</b>	Contains data related to the stats collected for external tables, or tables loaded through Connections.
<b>TS: External Table Info</b>	Contains data related to external tables, or tables loaded through Connections.
<b>TS: Daily Row Count External Table</b>	Contains Connections data, stored on a daily basis: the number of rows in your external database, and whether each external table is cached or not.

# System Liveboards

**Summary:** ThoughtSpot provides several Liveboards that help with system monitoring.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

There are several system monitoring Liveboards in ThoughtSpot that provide answers for system status and resource usage questions. The information in these Liveboards are updated hourly from internal data sources that collect monitoring statistics.

Only users with administrative privilege can view the monitoring Liveboards. They are based on [system worksheets and views \[See page 273\]](#), which administrators can view, but not modify. However, you can create new monitoring Liveboards from these Worksheets and Views.

## View the system Liveboards

To view these system Liveboards:

1. Go to the **Liveboards** tab.
  2. Choose **All**.
  3. Enter `System User` in the search field, or search for the Liveboard you would like to view.
- You can also view the User Adoption Liveboard and Performance Tracking Liveboard in the Admin Console.

## Description of system Liveboards

Liveboard	Description
Learn how to use ThoughtSpot	Contains search replays created in the system. This Liveboard is not available with the <a href="#">new Answer experience [See page 0]</a> .
TS Stats: Latency Visualizations	Latency on servers and <a href="#">impression [See page 275]</a> counts. This data comes from the TS: BI Server worksheet.

<b>Connections Liveboard</b>	Contains information on your connections: monthly and daily row count, query count, and query performance.
<b>User Adoption</b>	Contains information on how your ThoughtSpot users are interacting with ThoughtSpot, and how your user adoption is changing over time. Refer to <a href="#">User Adoption Liveboard [See page 0]</a> .
<b>Object Usage</b>	Contains information on how your ThoughtSpot users are interacting with ThoughtSpot objects such as worksheets, tables, and views. Refer to <a href="#">Object Usage Liveboard [See page 0]</a> .
<b>Performance Tracking</b>	Contains information on how your ThoughtSpot cluster is performing. Refer to <a href="#">Performance Tracking Liveboard [See page 0]</a> .
<b>Credit Usage Liveboard</b>	Tracks credit consumption for consumption-based pricing. Refer to <a href="#">Consumption-based pricing [See page 289]</a> .
<b>How Users are Searching Answers</b>	Describes how users are searching for existing answers and Liveboards. Contains information on what users are searching for, where users are successful and where they are not. Refer to <a href="#">How Users are Searching Answers [See page 0]</a> .

# About troubleshooting

**Summary:** Learn the basics of troubleshooting for ThoughtSpot.

The information here provides very basic troubleshooting.

For troubleshooting on specific incidents or cluster problems, getting a log bundle can help.

- **Network connectivity issues [See page 278]**

If network connectivity to and from ThoughtSpot is not working, try using these steps to find and correct the issue.

ThoughtSpot comes configured with the timezone where it is to be installed. If you are not using an SSL certificate for authentication, users will see an untrusted connection error in their browser when accessing ThoughtSpot. The error looks slightly different depending upon the Web browser being used.

- **Clear the browser cache [See page 279]**

You might occasionally see unexpected behavior that is due to the Web browser caching information from ThoughtSpot. In this case, clearing the browser cache and reloading the page should resolve the problem.

- **Cannot open a saved answer that contains a formula [See page 281]**

Some tables may take an unusually long time to load due to a high data version issue. This issue normally arises when ThoughtSpot completes an upgrade or the system is recovering after a crash.

- **Search results contain too many blanks [See page 284]**

If you find that your search results contain too many blanks when your data source is a worksheet, there is a simple adjustment you can make to fix this.

For more detailed troubleshooting, [Contact ThoughtSpot \[See page 292\]](#).

# Network connectivity issues

**Summary:** If network connectivity to and from ThoughtSpot is not working, try using these steps to find and correct the issue.

To troubleshoot network connectivity for ThoughtSpot:

1. Make sure that the network cables are connected correctly.
2. Check that the network cable is connecting the nodes to the network switch.
3. Try replacing the cable with a cable from a known working system to rule out a bad cable or switch connectivity issues.
4. Make sure the eth0 interface is connected to the network by issuing: `ethtool eth0` The port that's currently connected will have "link detected" in the last line of the output.
5. If the networking settings have been reconfigured, reboot each of the nodes.

## Clear the browser cache

**Summary:** Clear the browser cache if you have unexpected network issues.

You might occasionally see unexpected behavior that is due to the Web browser caching information from ThoughtSpot. In this case, clearing the browser cache and reloading the page should resolve the problem. You can usually resolve these situations by clearing the browser cache:

- During a ThoughtSpot session, the browser suddenly displays a white screen and reloading does not fix the problem. This is due to a self-signed SSL certificate that has timed out during the session.
- When accessing the Help Center, you see a login screen. This is due to a problem during automatic authentication in the Help Center, after which the bad login gets cached by the browser.

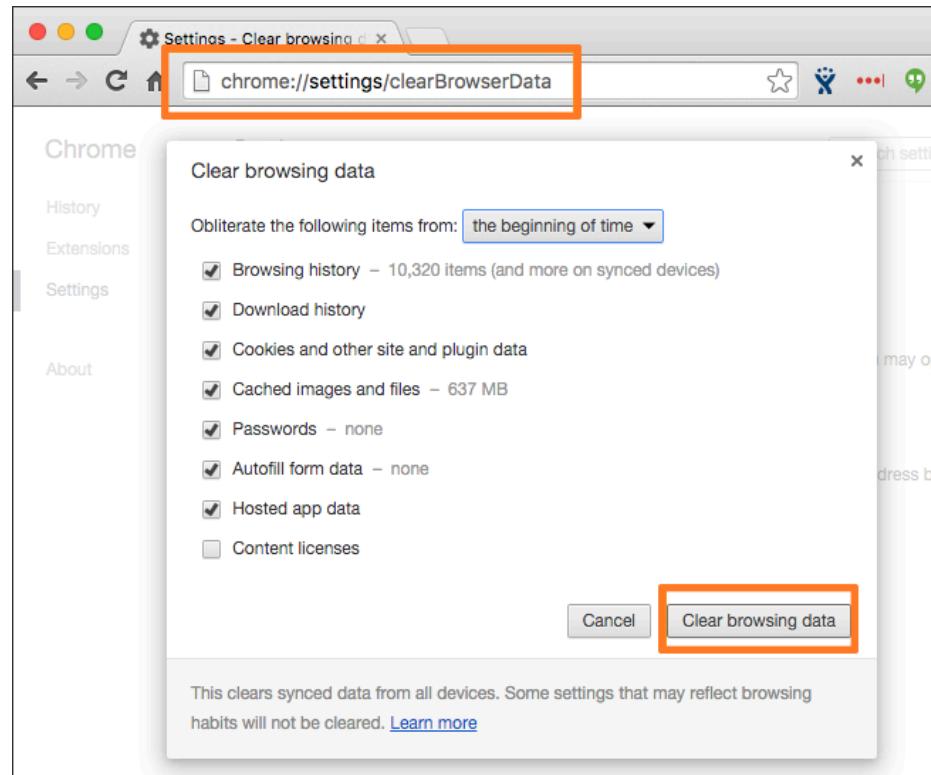
To resolve any of these situations, clear the browser cache:

1. Clear the browser cache.

This works a little differently on individual browser versions and operating systems. For example, when using Chrome, to get to the browser cache settings, navigate to:

```
chrome://settings/clearBrowserData
```

## Clear the browser cache



2. Click **Clear browsing data**.

This is the name of the button on Chrome. The name may vary slightly on other browsers.

3. Reload the page.

Now the problem should be fixed, and the page will appear as expected.

# Cannot open a saved answer that contains a formula

**Summary:** Learn how to troubleshoot problems with data types and formulas.

When working with formulas, keep in mind the data types they return. You may occasionally see unexpected results, or even be unable to open a saved answer, due to problems with data types and formulas.

In this scenario, “data type” refers the data type as defined in the column definition when creating the schema (INT, TIMESTAMP, VARCHAR, etc.).

When you define a formula, the data type it returns is set automatically. This can lead to problems, if you build another formula that uses the output of the first formula as input. This can be hard to understand, so an example will be helpful.

Suppose you have created a worksheet that contains a formula called “weekday” defined as:

```
day_of_week(date)
```

The output of that formula is the day of the week (Monday, Tuesday, etc.) returned as a text string (VARCHAR, ATTRIBUTE).

Then suppose you create an answer using the worksheet as a source. And in the answer, you create another formula on top of the formula column in the worksheet. This formula is supposed to return the day of the week that is two days after the given day of the week:

```
weekday + 2
```

In this case, you have effectively created a formula on top of another formula. This works fine, so long as the data types in the worksheet formula can work in the answer formula. If not, you may not be able to save the answer, or open it after it has been saved. Here, the second formula you created does not work, because it is invalid. It is trying to subtract a number from a text string.

If you encounter this issue, you must open the worksheet and edit its formula so that it returns the type expected by the formula that was built on top of it. In this case, a numeric data type.

You must change the underlying worksheet column to use day\_number\_of\_week instead of day\_of\_week. This is because day\_number\_of\_week returns a numeric data type.

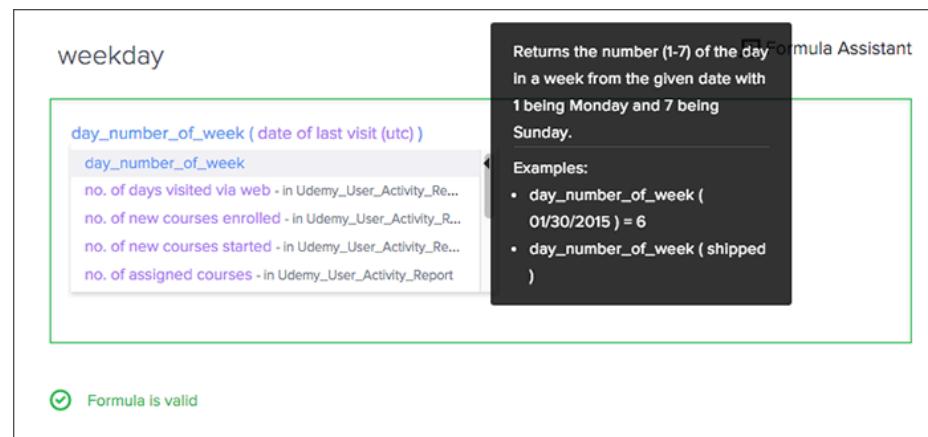
Here are the steps to resolve an issue like this:

1. Open the underlying worksheet that contains the formula whose output data type you need to change.
2. Click the formula name to edit the formula.

<input type="checkbox"/> date joined	FY 2016-08-27 17:00:00	FY 20
<input type="checkbox"/> date last visit	FY 2017-05-18 17:13:47	FY 20
<input type="checkbox"/> minutes video watched	1,159.00	1,159.
<input type="checkbox"/> number of courses assigned	0	0
<input type="checkbox"/> number of courses complet..	0	0
<input type="checkbox"/> number of days used	41	41
<input type="checkbox"/> number of modules compl..	153	153
<input type="checkbox"/> number of courses enrolled	15	15
<input type="checkbox"/> number of courses started	13	13
<input type="checkbox"/> email	anirudh@thoughtspot.com	anirudh
<input type="checkbox"/> first name	anirudh	anirudh
<input type="checkbox"/> last name	{Blank}	{Blank}

3. In the Formula Builder, modify the formula, so that it returns the expected data type.

There are data type conversion formulas available to make this easier. To view them and their syntax, open the **Formula Assistant**, and expand the section called **Conversion**.



4. Make your changes, and saving the formula by clicking **Save**.
5. Save the worksheet by clicking **Save**.
6. Now you will be able to open the answer that was created on top of the worksheet.

# Search results contain too many blanks

**Summary:** Learn how to fix the problem when your search results contain too many blanks.

If you find that your search results contain too many blanks when your data source is a worksheet, there is a simple adjustment you can make to fix this.

If you find that the charts and tables built on a worksheet contain a large number of null values (which display as {blank} in the web browser), you can fix this by changing the [inclusion rule \[See page 0\]](#) for the worksheet.

An inclusion rule that specifies **Exclude Empty Rows (Inner Join)** will reduce the number of null values in the result. Imagine a worksheet that includes data about a retail grocery store. There are rows in the worksheet from these source tables:

Table Name	Description
sales	Fact table with sales made per product per store.
products	Dimension table with information about every product.
stores	Dimension table with information about every store.

When creating the worksheet, suppose you choose **Include Empty Rows (Left Outer Join)** for the inclusion rule and **Progressive Joins** for the join rule. In this case, if you type "product name" in your search, you can see a list of all the products that exist. Suppose you then add "store name" to your search. You will see a lot of null ({blank}) values in the result. This happens because the columns "store name" and "product name" are joined through the fact table, "sales". So for every product that has never been sold in a particular store, you can see {blank} in the "store name" column. This may be what you want to see, in which case, you can leave the worksheet as is, and choose **Exclude** for the {blank} values in your table or chart, whenever you don't want to see them.

However, in many cases, including all the {blank} values could confuse end users. So if you encounter this problem, you can [edit the worksheet, and change the inclusion rule \[See page 201\]](#) to **Exclude**

**Empty Rows (Inner Join).** Now when searching for "store name" and "product name" on the worksheet, users will not be overwhelmed by null values. They'll only see the rows where a particular product has been sold in a particular store.

# Consumption-based pricing

**Summary:** ThoughtSpot's consumption-based licensing model lets you license ThoughtSpot based on usage of the ThoughtSpot product.

**Note:** ThoughtSpot has renamed Pinboards to Liveboards. The functionality remains the same.

ThoughtSpot's consumption-based licensing model lets you license ThoughtSpot based on your users' usage of the ThoughtSpot product. When you purchase a consumption-based ThoughtSpot license, ThoughtSpot bills you based on [credits \[See page 286\]](#). The ThoughtSpot consumption licensing model is available for both ThoughtSpot Cloud and for Connections software deployment on your cloud platform.

To learn about each of ThoughtSpot's pricing options, refer to [ThoughtSpot pricing](#) (<https://www.thoughtspot.com/pricing>). ThoughtSpot offers consumption- and capacity-based pricing. Each cluster must have a discrete pricing model. You cannot license one cluster as both consumption and capacity, but you can have multiple clusters with each using a different pricing model.

## Credits

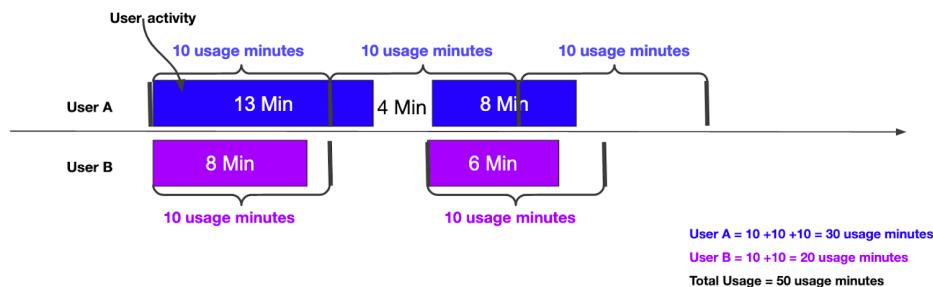
You purchase and consume credits with the consumption model. A credit is a unit of measure. When members of your organization utilize ThoughtSpot, we measure [usage minutes \[See page 287\]](#), which consume available credits. Examples of user activity that consume credits include a user performing a search in ThoughtSpot, viewing or editing Liveboards or answers, creating and editing worksheets, making any administrative changes, or changing setup configuration. Each user who actively uses ThoughtSpot consumes credits, even if they are using the product at the same time. Each usage minute is equivalent to consuming one (1) credit. ThoughtSpot refers to this as **credit consumption rate** or **credit burn rate**.

## Usage minutes

Usage minutes refer to the number of minutes that the members of your organization use ThoughtSpot. We calculate each user's usage minutes separately.

We calculate usage minutes in the following manner:

- Any user activity in the application kicks off a 10 minute usage block.
- Any additional user activity within that 10 minutes does not drive additional consumption; we charge the whole session at 10 minutes.
- The first click after the initial 10 minute window ends initiates a second 10 minute session.
- If the user activity ceases within a 10-minute time interval, then restarts and lasts past the end of the current 10-minute time interval, it triggers the subsequent time interval.
- We calculate each user's activity separately. For example, if 10 users are using ThoughtSpot for the same 10 minutes, we count 100 minutes of usage.



## User activity that incurs usage minutes

We define user activity as any user-triggered (initiated) action in ThoughtSpot, starting from the time the user initiates the action, until the time that the results of the action(s) become visible to the user of the product. This includes any time used by ThoughtSpot to process the user-triggered action in order to present the results to the user. We measure user activity in [usage minutes \[See page 287\]](#). You can consume usage minutes during implementation and training prior to go-live, as well as after.

User activity that incurs usage minutes includes any user interaction with the product, such as:

- Clicking on any interactive elements inside the ThoughtSpot product, such as menu items,

search boxes, tabs, buttons, icons and other user interface artifacts. Some examples are:

- Performing searches on data or search-related actions such as Explore, filters, drill-down, showing underlying data, and other related actions
- Creating, editing, updating deleting or interacting with answers, Liveboards, worksheets, tables, views, and other objects
- Triggering user-initiated SpotIQ analyses
- Setup and configuration actions in the product (such as those performed in the **Admin** section of the product or other such parts of the product)
- Uploads, downloads, sharing, triggering the sending of emails from within the product
- Browser actions (such as refreshing the page or using the **forward** or **back** buttons)
- Any scrolling in the product that triggers updates to objects or content being viewed

For example, if a user is scrolling through a Liveboard, initially it displays only a subset of the charts that can fit on the screen. This counts as initial user activity. At any point, if the user scrolls through the Liveboard, resulting in ThoughtSpot loading and displaying additional charts in that Liveboard for the first time, this counts as additional user activity.

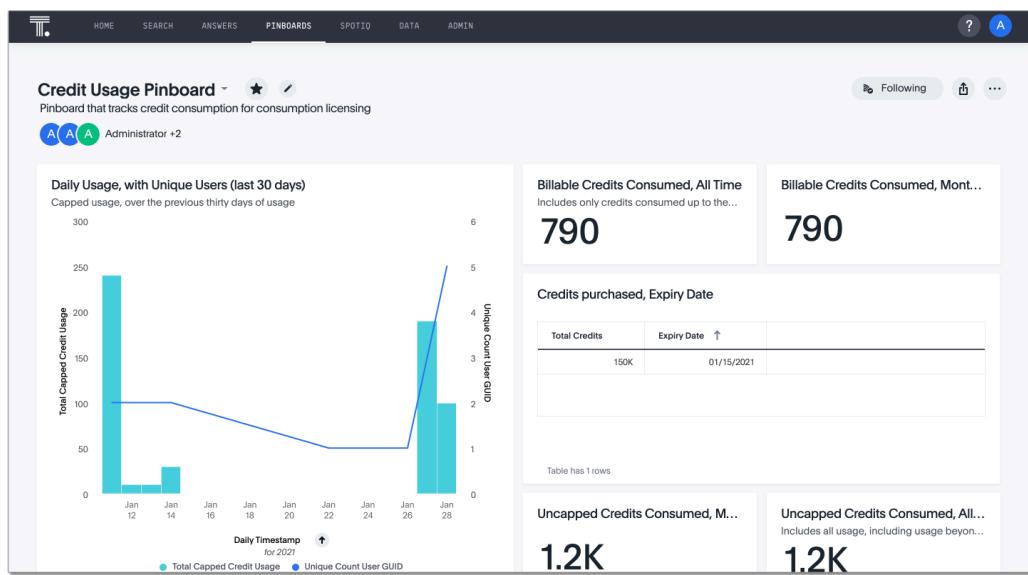
## User activity that does not incur usage minutes

The following do not count toward consumption:

- The only click that does not count as user activity is clicking **Sign out**.
- Any action that happens outside the product or is not user-triggered inside the product is not considered user activity. For example: the system sending out a scheduled Liveboard, a user receiving emails generated by ThoughtSpot based on actions such as scheduled Liveboards, welcome or other kinds of emails, and emails sent out as a result of "Following" metrics in the product do not count as user activity. (*However, if the user logs in to the product as a result of these emails, that will start user activity.*)
- Any non-user-initiated activity in the system does not count as "user activity". This includes automatically triggered SpotIQ analyses, indexing or other non-user-initiated queries against external warehouses and any other background processes or daemons that are not a result of an explicit user triggered action.
- Any scrolling on ThoughtSpot product pages that does not update any content on the page does not count towards consumption.
- Leaving ThoughtSpot open in another tab does not count toward consumption.

## Monitor your consumption

You can monitor your credit consumption with the Credit Usage Liveboard, a new default admin-only Liveboard with data from the new Credit Usage worksheet. You can also use the new default admin-only answers with data from the Credit Usage worksheet, **Sample Answer - Credit usage details** and **Credit usage from Charging Records**. You can access the Liveboards and answers by searching for them from the home page, or from the **Liveboards** or **Answers** pages.



The Credit Usage Liveboard contains useful visualizations and headlines you can use to monitor your consumption. You can use it to determine which users or time periods consume more credits than others. You can also search the data yourself, using the Credit Usage worksheet, and create your own answers and Liveboards.

The Credit Usage Liveboard contains the following visualizations and headlines:

- Daily Usage, with Unique Users (last 30 days)
- Billable Credits Consumed, All Time
- Billable Credits Consumed, Month to Date
- Credits Purchased, Expiry Date
- Uncapped Credits Consumed, Month to Date
- Uncapped Credits Consumed, All Time
- Credit Consumption & Usage, Top 10 Users, This Month

- Monthly Credits Consumed, with Unique Users
- Weekly Credits Consumed, with Unique Users, Last 8 Weeks
- Month of Year Credit Usage, by User GUID

Use the visualizations on this Liveboard to monitor your consumption. For example, you may notice that a certain user consumes most of your credits, or that there was a spike during a certain time window. You can then use the new default answers to [analyze user activity and event details](#) [See page 290].

### Analyze user activity and event details

ThoughtSpot provides 2 default system answers to help you track and analyze your credit consumption. These answers allow you to dive deeper into the credit consumption and activities of a specific user, or over a specific time window.

Follow these best practices for the 2 new answers, *Sample Answer - Credit usage details* and *Credit usage from Charging Records*.

1. Examine the Credit Usage Liveboard to determine a user or time window of interest. For example, you may notice that a certain user consumes most of your credits, or that there was a spike during a certain time window.
2. Determine how you want to investigate this credit consumption:
  - **Sample Answer - Credit usage details:** This answer is ideal for looking into object-level details, such as the objects a user accessed and the actions they performed on those objects.
  - **Credit usage from Charging Records:** Use this answer to learn more about API-level details. You can map activities and credit consumption to specific API calls.
3. Use the built-in filters on these answers to narrow down your search to the user and time window of interest. You must edit the time window filter in the search bar, using this syntax:  
`Timestamp >= mm/dd/yyyy hh:mm:ss Timestamp <= mm/dd/yyyy hh:mm:ss`.  
ThoughtSpot filters the answer to only show data in between the two dates you specify.  
Select a user to filter by, and for the *Sample Answer - Credit usage details* answer, optionally select a user action filter.

## Consumption data storage

ThoughtSpot stores your consumption data and keeps it secure. A dedicated Amazon S3 bucket is set up to store the user activity CSV files temporarily. Then, the S3 data is uploaded to a searchable data store (Amazon Redshift). There is an S3 bucket prefix for each customer and a unique key for each customer to encrypt it. The encryption key is stored in AWS KMS. As part of the pricing configuration, the customer cluster is configured with an access key to have access to the S3 bucket prefix unique to the cluster. ThoughtSpot deploys and maintains an Amazon Redshift database to load the consumption pricing data. Every customer cluster that is enabled for consumption pricing gets access to only that cluster's consumption pricing data. A unique database user is created in Redshift and configured in the customer cluster as part of the pricing configuration. This results in a unique Embrace connection per customer cluster to the ThoughtSpot manager consumption pricing database (Redshift). This is used to view the consumption pricing related reports in the customer's ThoughtSpot instance.

# Contact ThoughtSpot

You can contact ThoughtSpot by [filing a support ticket \[See page 292\]](#).

## File a support ticket

If you encounter a technical issue, file a support ticket using the Support Portal ticket filing system at:

<http://thoughtspot.com/support-request> (<http://thoughtspot.com/support-request>)

Please provide as much detail as possible about your issue, to help us resolve it quickly.

You need a Support Portal login to file a ticket. If you do not have one, contact your ThoughtSpot liaison.