Philo Interface Documentation

This document describes the interfaces of the Philo system.

Introduction

Philo is a distributed system that supports authoring and composing dashboard snapshots in conjunction with dashboard applications for business intelligence/enterprise data analytics (e.g., Tableau, Power BI) and sharing and monitoring them on conversation-based collaboration platforms (e.g., Slack or Teams). Accordingly, Philo consists of two applications for dashboard (Section 1 in this document) and collaboration platform (Section 2) and three widget interfaces for creating dashboard snapshot components (Section 3–*Component Creator*), composing and sharing dashboard snapshots (Section 4–*Snapshot Composer*), and monitoring snapshots on collaboration platform (Section 5–*My Snapshot Home*). We implemented the dashboard application and collaboration platform as stand-alone applications instead of extending existing applications because Philo's functionalities are ahead of what existing tools can offer and hence may not be supported by them due to data security issues.

Figure 1 describes a pipeline of Philo.

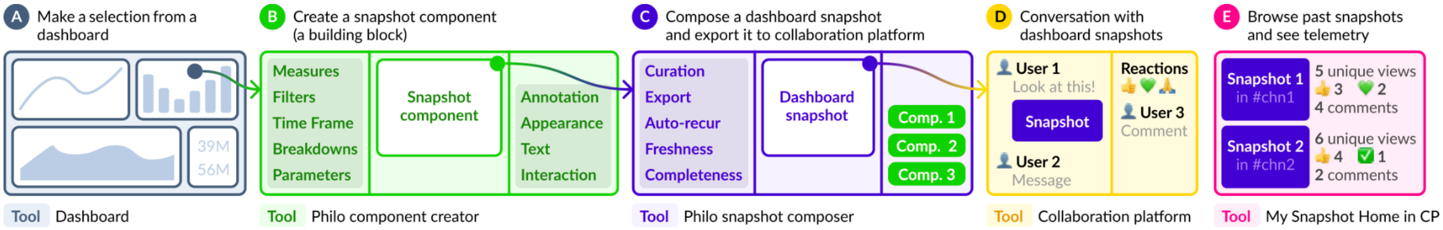
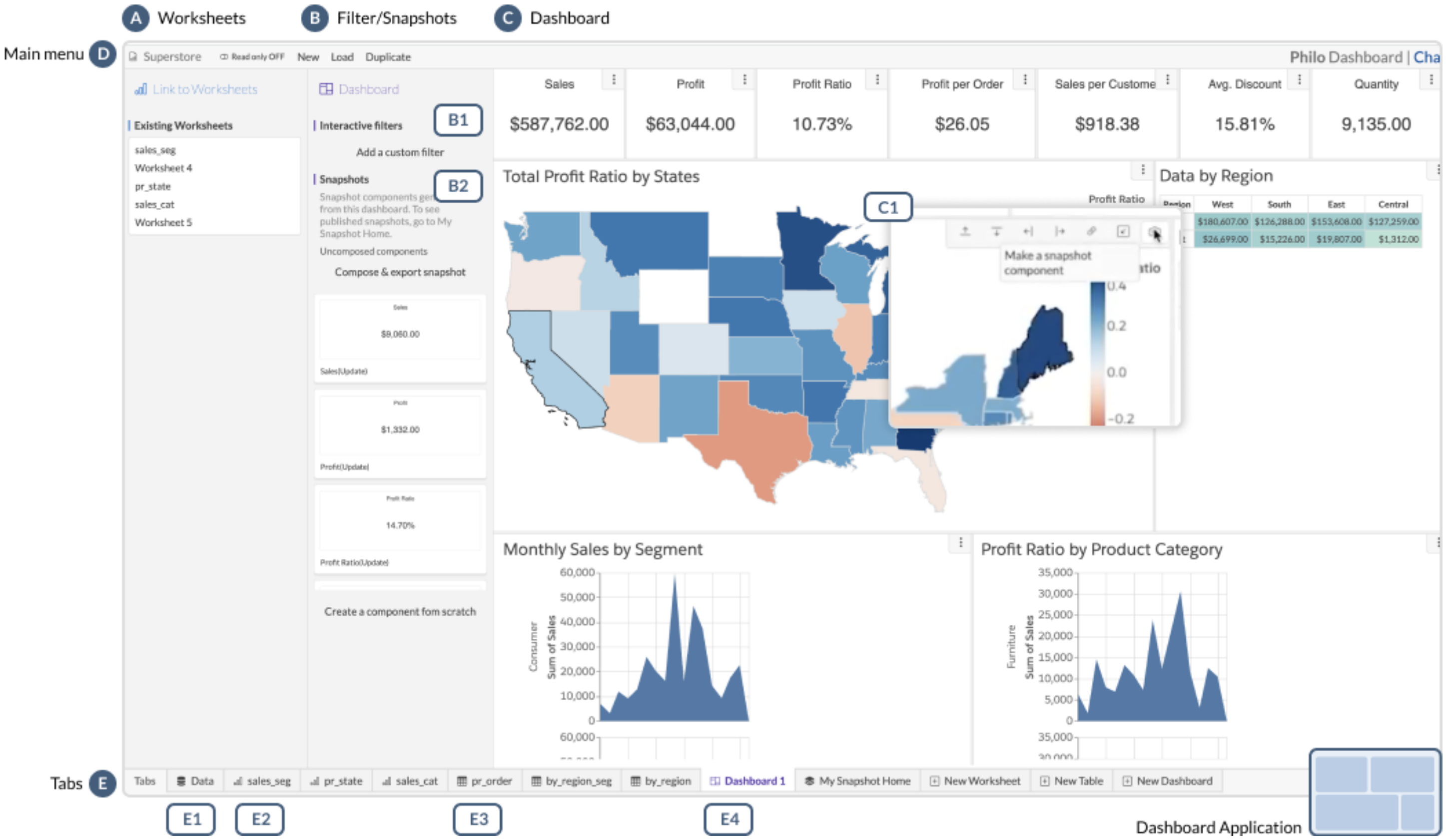


Figure 1. An overview of Philo's pipeline: A snapshot author selects dashboard content (A) and then creates a snapshot component based on the selection using the Philo component creator (B). After creating multiple snapshot components, the author consolidates them into a single snapshot and exports it to a collaboration platform channel using the Philo snapshot composer (C). Within the channel, viewers react to and comment on the snapshot (D). Finally, the author can see their dashboard snapshots and related telemetry information (e.g., view counts, comments) via 'My Snapshot Home' (E).

1 Application: Dashboard System

Philo's snapshot creation features (Component Creator and Snapshot Composer) are built on a dashboard system that offers a set of core functionalities shared across common business intelligence systems like Tableau and Power BI. In addition to a dashboard tab illustrated in Figure 2, this application offers tabs for loading and checking the data; and creating and editing a visualization (powered by Vega-Lite) and an interactive table.

At the top, the application's main menu allows for creating a new workbook, loading an existing workbook, and duplicating the current workbook. In a dashboard tab (Figure 2), authors can add interactive filters by selecting (double-clicking) visualization elements or table cells. Such interactive filters appear in the Filter/Snapshots column (B1). By hovering over the setting icon (⋮) in each cell (C1), authors can access the option to create a new snapshot component from the chosen worksheet with preserving the filters made so far, which then opens the component creator. Authors can also "create a component from scratch" by clicking the relevant button at the bottom of the Filter/Snapshots column. Once creating some components, authors can combine them into a snapshot and publish it by clicking the “Compose & export snapshot” button. The snapshots and components that authors have created from the current dashboard appear in the Filter/Snapshots column (B2).



Snapshot components ge from this dashboard. To see published snapshots, go to My Snapshot Home.

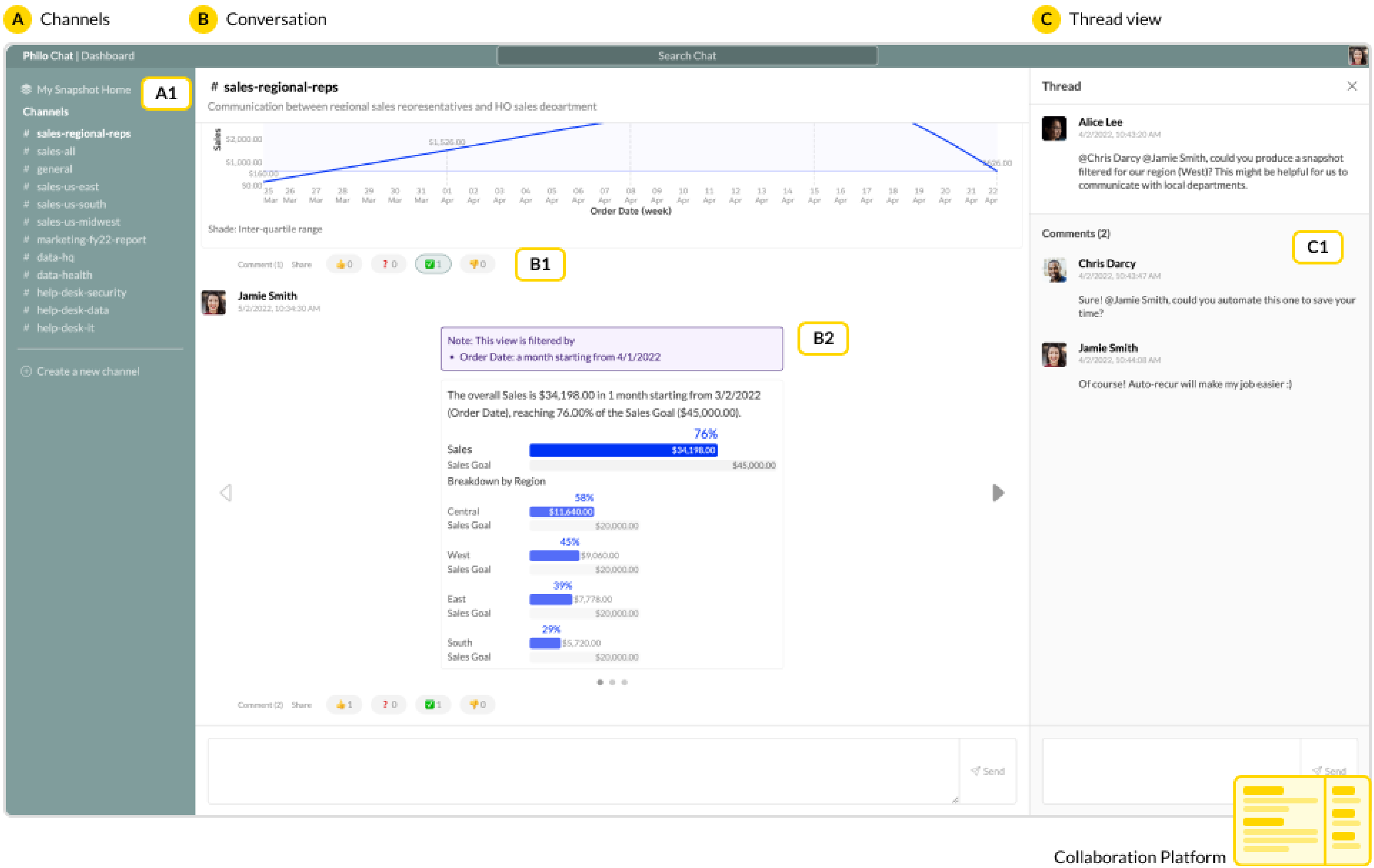
Region	West	South	East	Central
	$180,607.00	$126,288.00	$153,608.00	$127,259.00
t	$26,699.00	$15,226.00	$19,807.00	$1,312.00

Figure 2. A dashboard tab in Philo’s dashboard system (a business intelligence application). Authors can see available worksheets (tables or visualizations) (A) and filters made to this dashboard (B1) and snapshots created out of this dashboard (B2). The dashboard area (C) displays the current dashboard. By hovering over the setting icon (⋮) each cell (or worksheet) of the dashboard, authors can access several control options changing the dashboard layout, linking to a different worksheet, and creating a snapshot component, which opens the Component Creator (C1). Philo’s main menu (D) includes creating/loading/duplicating a workbook. Authors can access different tabs at the bottom of the interface (E).

Powered by Vega-Lite, a visualization tab of Philo’s dashboard application (access: E2) allows for creating simple visualizations with common mark types and encoding channels, different data aggregation options, and uncertainty representations like error bands, error bars, etc. In a table tab (access: E3), implemented using d3.js, authors can make relational tables (row-wise or column-wise) and contingent tables, with an optional cell color encoding. Lastly, in the data tab (access: E1), authors can load a data set by uploading a CSV or JSON file or providing an API link (for streaming data) and see the data.

2 Application: Collaboration Platform

As shown in Figure 3, Philo's collaboration platform application provides core functionalities of common conversation-based collaboration platforms like Slack and Microsoft Teams, including multi-channel chats (A), push notifications, threaded conversations/comments in side view (C), and emoji-based reactions to chats (B1). In addition to them, Philo's collaboration platform displays dashboard snapshots within a conversation (B2) and My Snapshot Home for telemetry information (A1, see also Section 5 in this document).



Communication between regional sales representatives and HQ sales department

Jamie Smith
5/2/2022, 10:34:30 AM

Note: This view is filtered by
- Order Date: a month starting from 4/1/2022

The overall Sales is $34,198.00 in 1 month starting from 3/2/2022 (Order Date), reaching 76.00% of the Sales Goal ($45,000.00).

Thread

Alice Lee
4/2/2022, 10:43:20 AM

@Chris Darcy @Jamie Smith, could you produce a snapshot filtered for our region (West)? This might be helpful for us to communicate with local departments.

Comments (2)

Chris Darcy
4/2/2022, 10:43:47 AM

Sure! @Jamie Smith, could you automate this one to save your time?

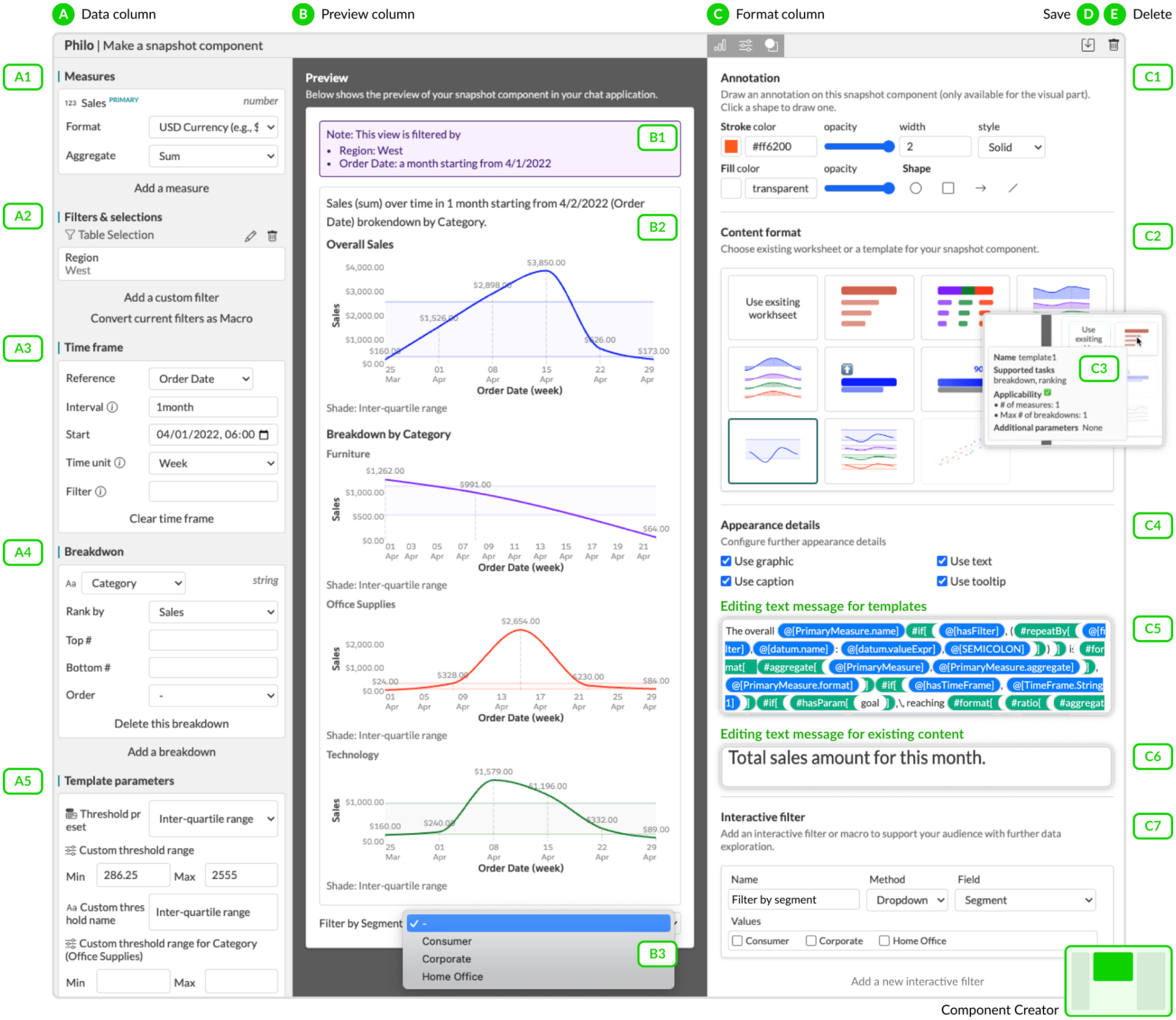
Jamie Smith
4/2/2022, 10:44:08 AM

Of course! Auto-recur will make my job easier :)

Figure 3. The collaboration platform application of Philo consists of a channel list (A), conversation area (B), and thread view (C). In the channel list, authors can access My Snapshot Home (A1) as well as chat channels. In a conversation, authors can react to a chat by others using emoji-based reactions and comments. Comments are shown in the thread view (C1). This collaboration platform also displays dashboard snapshots within a conversation (B2).

3 Widget Interface: Component Creator

Philo's component creator interface (Figure 4) consists of a data column (left), a preview column (middle), and a format column (right). This interface is intended for snapshot authors to specify the scope and format of the selected dashboard content that will appear in a snapshot component. Some of the controls in this interface and their associated concepts are inherited from business intelligence dashboard applications, including quantitative measures, filters, and breakdowns by categorical dimension, rank, or discretized bin. Other controls are novel to this interface, including those associated with template-based transformations and time frames.



Philo | Make a snapshot component

Measures
123 Sales PRIMARY number
Format: USD Currency (e.g., $
Aggregate: Sum
Add a measure

Filters & selections
Table Selection
Region
West
Add a custom filter
Convert current filters as Macro

Time frame
Reference: Order Date
Interval: 1month
Start: 04/01/2022, 06:00
Time unit: Week
Filter:
Clear time frame

Breakdwon
Aa Category string
Rank by: Sales
Top #:
Bottom #:
Order: -
Delete this breakdown
Add a breakdown

Template parameters
Threshold preset: Inter-quartile range
Custom threshold range
Min 286.25 Max 2555
Aa Custom threshold name: Inter-quartile range
Custom threshold range for Category (Office Supplies)
Min Max

Preview
Below shows the preview of your snapshot component in your chat application.

Note: This view is filtered by
- Region: West
- Order Date: a month starting from 4/1/2022

Sales (sum) over time in 1 month starting from 4/2/2022 (Order Date) brokendown by Category.

Overall Sales

Shade: Inter-quartile range

Breakdown by Category

Furniture

Shade: Inter-quartile range

Office Supplies

Shade: Inter-quartile range

Technology

Shade: Inter-quartile range

Filter by Segment: ✓ -
Consumer
Corporate
Home Office

Annotation
Draw an annotation on this snapshot component (only available for the visual part). Click a shape to draw one.
Stroke color: #ff6200 opacity width: 2 style: Solid
Fill color: transparent opacity Shape ○ □ → /

Content format
Choose existing worksheet or a template for your snapshot component.
Use exsiting worksheet
90

Name template1
Supported tasks breakdown, ranking
Applicability ✓
- # of measures: 1
- Max # of breakdowns: 1
Additional parameters None

Appearance details
Configure further appearance details
☑ Use graphic ☑ Use text
☑ Use caption ☑ Use tooltip

Editing text message for templates

```
The overall @[PrimaryMeasure.name] #if[ @[hasFilter] , ( #repeatBy[ @[fi
lter] , @[datum.name] : @[datum.valueExpr] , @[SEMICOLON] ] ) ] is #for
mat[ #aggregate[ @[PrimaryMeasure] , @[PrimaryMeasure.aggregate] ] ,
@[PrimaryMeasure.format] ] #if[ @[hasTimeFrame] , @[TimeFrame.String
1] ] #if[ #hasParam[ goal ] ,\, reaching #format[ #ratio[ #aggregat
```

Editing text message for existing content
Total sales amount for this month.

Interactive filter
Add an interactive filter or macro to support your audience with further data exploration.
Name: Filter by segment Method: Dropdown Field: Segment
Values
□ Consumer □ Corporate □ Home Office
Add a new interactive filter

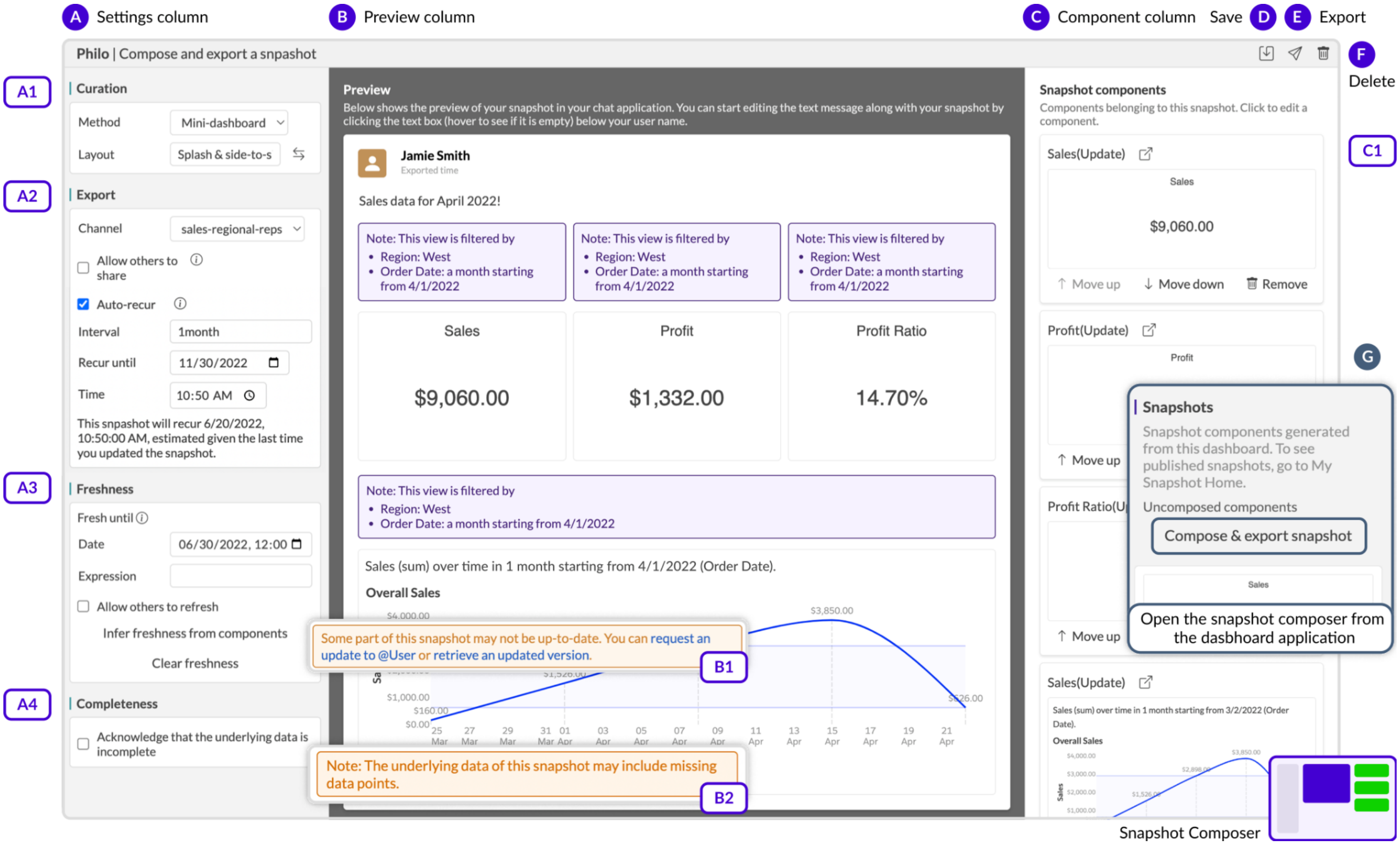
Figure 4. Philo's component creator: The data column on the left (A) consists of measures (A1), filters (A2), time frame controls (A3), breakdowns (A4), and parameters (A5). The middle preview column renders a snapshot component with a filter note (B1), main content (B2), and any interactive filters (B3). The format column on the right offers controls for annotations (C1), content formatting (C2) and inclusion (C4), captions (C5–templates, C6–preview), and interactive filters (C7). Authors can see the information about a template in a tooltip (C3) as well as save (D) and delete (E) a component.

In the data column (A), an author can specify measures, filters, a time frame, breakdowns, and optional parameters for a component. Initially, Philo propagates the current configuration of measures (A1), filters (A2), and breakdowns (A4) from a dashboard selection, however the author can modify them as needed without altering the source dashboard. The *time frame* control reflects the temporality of a component (A3); it determines both the behavior of snapshot updates as well as precise temporal filtering. Finally, authors can set parameter values as required by template-based components, values that do not appear in the original dashboard selection (A5).

In the format column (C), an author can annotate and format the component, optionally apply a template transformation, edit captions, and add interactive filters. With respect to annotation, authors can free-draw (C1) to visually emphasize content or indicate a viewing order. They can opt to retain the existing appearance of the dashboard selection or apply a template-based transformation (C2). Philo suggests templates using heuristic-based applicability, considering the number of measures and dimensions associated with a dashboard selection, similar to Tableau's Show Me. As mentioned above, some templates require authors to specify parameter values in the data column (A5). For component captions, authors can edit the provided text expression associated with a template (C5) or add their own text (C6). Lastly, they can add one or more interactive filters (C7) that will allow their viewers to answer simple predefined questions; any filters added are appended below the main component content (B3).

4 Widget Interface: Snapshot Composer

To combine multiple snapshot components into a single snapshot, authors invoke Philo's snapshot composer from the dashboard application (Figure 5G). In addition to enabling multi-component snapshots, the snapshot composer accommodates selections across multiple dashboards. Philo's snapshot composer consists of a settings column (Figure 5A), a preview column (B), and a component column (C).



Philo | Compose and export a snpashot

| Curation

Method: Mini-dashboard

Layout: Splash & side-to-s

| Export

Channel: sales-regional-reps

□ Allow others to share

☑ Auto-recur

Interval: 1month

Recur until: 11/30/2022

Time: 10:50 AM

This snpashot will recur 6/20/2022, 10:50:00 AM, estimated given the last time you updated the snapshot.

| Freshness

Fresh until

Date: 06/30/2022, 12:00

Expression:

□ Allow others to refresh

Infer freshness from components

Clear freshness

| Completeness

□ Acknowledge that the underlying data is incomplete

Preview

Below shows the preview of your snapshot in your chat application. You can start editing the text message along with your snapshot by clicking the text box (hover to see if it is empty) below your user name.

Jamie Smith
Exported time

Sales data for April 2022!

Note: This view is filtered by
- Region: West
- Order Date: a month starting from 4/1/2022

Sales	Profit	Profit Ratio
$9,060.00	$1,332.00	14.70%

Note: This view is filtered by
- Region: West
- Order Date: a month starting from 4/1/2022

Sales (sum) over time in 1 month starting from 4/1/2022 (Order Date).

Overall Sales

Some part of this snapshot may not be up-to-date. You can request an update to @User or retrieve an updated version.

Note: The underlying data of this snapshot may include missing data points.

Snapshot components

Components belonging to this snapshot. Click to edit a component.

Sales(Update)
Sales
$9,060.00

Profit(Update)
Profit

Profit Ratio(U

Sales(Update)
Sales (sum) over time in 1 month starting from 3/2/2022 (Order Date).
Overall Sales

| Snapshots

Snapshot components generated from this dashboard. To see published snapshots, go to My Snapshot Home.

Uncomposed components

Open the snapshot composer from the dasbhoard application

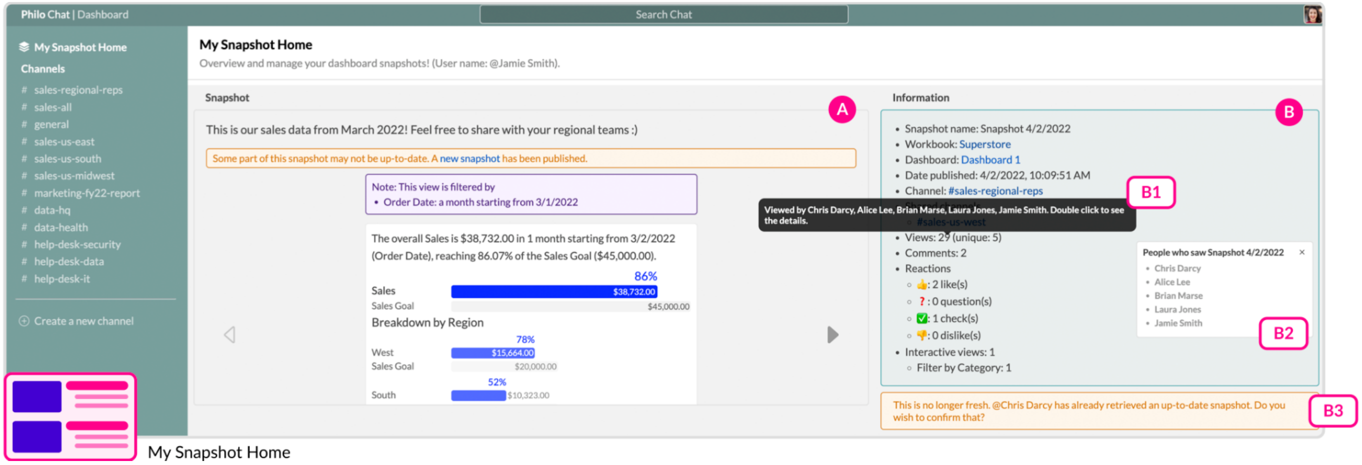
Figure 5. Philo's snapshot composer: In the settings column on the left (A), authors can adjust the curation method (A1), when and where to export (A2), the freshness criteria (A3), and the completeness (A4). The middle preview column (B) renders a snapshot, simulating a collaboration platform interface. If enabled, freshness (B1) and completeness indicators (B2) appear here. In the component column (C), authors can change the order of components or elect to edit a component in the component creator (C1). Finally, they can save (D), export (E), and delete (E) a snapshot. The snapshot composer can also be invoked from the dashboard application (G).

In the settings column (Figure 5A), authors begin by selecting a *curation* option, which includes vertical stacking, an interactive carousel, an automated slide show, and mini-dashboard (A1); for each option, it is possible adjust the placement or order of the components in the component column (C). Next, *export* controls (A2) allow authors to select a collaboration platform channel on which to post their snapshot. They can also elect to give viewers the ability to re-share the snapshot to other channels as well as control whether the snapshot will automatically recur according to a specified time interval. The freshness controls (A3) let authors specify a '*fresh-until*' (or '*best before*') for a snapshot; Philo can also infer the freshness date from the time frames of its components. Authors can further allow viewers to retrieve or request an updated snapshot when a snapshot becomes stale. For a stale snapshot, Philo will prepend a *freshness indicator* (B1), indicating a recurrence schedule and (if enabled) presenting an option for viewers to retrieve or request an updated snapshot. Altogether, Philo offers these alternative snapshot update options to ensure author agency and minimize the odds of miscommunication with their viewers. Lastly, authors can communicate to their viewers if their snapshot has missing data (*completeness indicator*, A4 → B2).

In the preview column (B), authors can check how their snapshot would appear within the conversation on the collaboration platform. They can also edit the overall text message along with the snapshot. The component column (C) offers the list of the components used in the current snapshot. Authors can add a new component, delete an existing component, open the component creator for each component, and reorder the components. Lastly, authors can save (D) and delete (F) the current snapshot. Once done with authoring the snapshot and setting the export options, they can export it by clicking the export button (E).

5 Widget Interface: My Snapshot Home

Philo's *My Snapshot Home* (Figure 6) is an extension interface for a collaboration platform that collects an author's dashboard snapshots (A) and the associated telemetry information for each (B). As our collaboration platform interface emulates the essential functionality of platforms like Slack and Microsoft Teams, a snapshot can be posted and shared across multiple channels, generate comment threads, and receive emoji-based reactions. All of these interactions can provide authors with an impression of the impact of a snapshot after it has been shared. Accordingly, *My Snapshot Home* relieves authors of the need to search for snapshots and estimate a snapshot's visibility across the platform. For each snapshot, *My Snapshot Home* indicates which channels a snapshot was shared to, the unique view, comment, and reaction counts, and who interacted with the snapshot, with more details provided in hover tooltips (B1, B2). This interface also lists any comments that a snapshot received. Finally, if a snapshot is indicated to be stale, *My Snapshot Home* also lists update requests and retrievals (B3), as well as the ability to re-post an updated snapshot directly without returning to Philo's snapshot composer.



My Snapshot Home

Overview and manage your dashboard snapshots! (User name: @Jamie Smith).

This is our sales data from March 2022! Feel free to share with your regional teams :)

Some part of this snapshot may not be up-to-date. A new snapshot has been published.

Note: This view is filtered by
- Order Date: a month starting from 3/1/2022

The overall Sales is $38,732.00 in 1 month starting from 3/2/2022 (Order Date), reaching 86.07% of the Sales Goal ($45,000.00).

- Snapshot name: Snapshot 4/2/2022
- Workbook: Superstore
- Dashboard: Dashboard 1
- Date published: 4/2/2022, 10:09:51 AM
- Channel: #sales-regional-reps
- Shared channels
  - #sales-us-west
- Views: 29 (unique: 5)
- Comments: 2
- Reactions
  - 👍: 2 like(s)
  - ❓: 0 question(s)
  - ✅: 1 check(s)
  - 👎: 0 dislike(s)
- Interactive views: 1
  - Filter by Category: 1

Viewed by Chris Darcy, Alice Lee, Brian Marse, Laura Jones, Jamie Smith. Double click to see the details.

People who saw Snapshot 4/2/2022 ×
- Chris Darcy
- Alice Lee
- Brian Marse
- Laura Jones
- Jamie Smith

This is no longer fresh. @Chris Darcy has already retrieved an up-to-date snapshot. Do you wish to confirm that?

Figure 6. Philo's telemetry monitoring interface ('My Snapshot Home'). Authors can browse their past snapshots in a single place (A) and see the log data of viewers' interaction with them (B). Authors can hover (B1) or double-click (B2) for details. For out-of-date snapshots, information about update requests, update retrieval, and auto-recurrence is accordingly provided (B3).