SAP Analytics Cloud, analytics designer

Developer Handbook

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THE BEST RUN SAP

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Preface

Why shall you read this book? Because we offer you the following:

We give you a kickstart in how to use the SAP Analytics Cloud, analytics designer. We offer you coding examples and we want to get you enthusiastic about the enormous flexibility you have for building advanced analytic applications. We want you to become a fan of our product seeking for the unlimited possibilities in the cloud.

Thanks to all people around the globe who helped writing this first version of the developer handbook for SAP Analytics Cloud, analytics designer!

Thanks to all developers, as well as colleagues from quality team, user experience, user assistance and product management (and any other contributor) who made this awesome product possible!

1 About Analytics Designer

This handbook presents the basics about SAP Analytics Cloud, analytics designer to help you understand what it's all about and how it works. Let’s start with some fundamental concepts.

1.1 What Is an Analytic Application?

An **analytic application** presents data in various forms, and lets you navigate it, and enables planning. Analytic applications can range from simple static dashboards, showing static numbers, to highly customized applications. These customized applications can contain many options for browsing and navigating data, changing visualizations, and navigating across multiple pages or areas. They can have a highly customized look-and-feel, in alignment with customer branding.

1.2 What Is Analytics Designer?

Analytics designer is the functionality in SAP Analytics Cloud that allows you to create analytic applications. There is a dedicated design environment in SAP Analytics Cloud to create such applications. The term **design** doesn't refer specifically to the UX or UI design aspect of the application.

It is the entire process of creating an analytic application, which includes:

- Defining the data model
- Laying out the screen
- Configuring widgets
- Wiring it all up with the help of custom scripts

Therefore, analytics designer is another way to create analytical content in SAP Analytics Cloud.

1.3 What Can You Do with Analytic Applications That You Can’t Do with Stories?

A **story** is created in a self-service workflow and can be made up of various widgets and a lot of configured functionality. However, the amount of customization is limited to the foreseen possibilities offered in the story design-time environment.

An **analytic application** typically contains some custom logic, expressed with the help of scripts. With analytic applications there is much more flexibility to implement custom behavior. It requires a higher skill level to create those.

1.4 How Are Stories and Analytic Applications Related to Each Other?

In general, stories and applications share widgets and functionality to a large extent, but some widgets can only be used in applications, because they need to be scripted (dropdown boxes or buttons, for example). Analytic applications can also have custom logic, which cannot be implemented in stories since there is no scripting.

From a consumption point of view, there shouldn't be any difference between stories and analytic applications. The consumer shouldn't be aware of whether the analytical content is a story or an analytic application. The exposed widgets, the available functionality, and the look, feel, and behavior should be the same.

1.5 Why Do We Need Both Stories and Analytic Applications?

Stories and analytic applications share functionality and widgets and may even have very similar design environments. Why are two different artifact types necessary? The answer is that story designers and analytics designers have completely different expectations. This is related to the differences between stories and applications:

- In the story design environment, it's practically impossible for you to create a story that doesn't work. The expectation of self-service design time for stories is that business users are guided (to some extent limited) in what they do and can do. The story design time is supposed to consist of multiple configuration steps that prevent business users from creating something which breaks. With story design time, we ensure some level of consistency.
- It's completely different with applications, especially with the added scripts. As soon as analytics designers add custom logic with scripting, they have complete freedom to change the default behavior of the entire analytic application. The design environment provides everything to create correct applications, but it doesn't guarantee that the application is correct or won't break.

In addition, an analytic application has a dedicated life-cycle. You start it and there are certain steps which are performed, like the startup event, for example. The story doesn't have that. You can switch the story between edit and view mode as often as you like.

These are major differences. That is why we offer two artifacts and two corresponding design-time environments to create stories and analytic applications.

1.6 What Is the Typical Workflow in Creating an Analytic Application?

An analytic application is always data-driven. The foundation of an analytic application is one or more underlying SAP Analytics Cloud models or a direct data access to an OData Service.

As a first step, you need to decide whether you want to visualize your data in a table or a chart and add a table or a chart to your analytic application. This triggers another step for picking a **model**. A model is a representation of the business data of an organization, organized into dimensions and measures. In addition to widgets showing data, you add to the layout other widgets that control data, such as filters, arrange and configure them, and wire them up.

Almost all widgets expose events. To add custom logic to the analytic application, you can implement event handlers with the help of the scripting language.

1.7 What Are Typical Analytic Applications?

The variety of analytic applications is huge. analytic applications can range from very static visualizations of a few data points to very advanced, highly customized and interactive applications which offer rich navigation and generic built-in exploration capabilities. However, there are some patterns of analytic applications:

- Table-centric data visualization
  The application is comprised of a table, which consumes a large extent of the available screen real estate. Around the table, typically above it, are many user interface controls (buttons, checkboxes, dropdown boxes, and so on) to change the data display, such as to filter the data, change the data view, or show different dimensions. The nature of this application is that there is only one table, but many and potentially complex ways to show data differently.
- Dashboard
  The application is a dashboard visualizing a few data points with the help of tiles. There is no interactivity, but it gives users an overview of highly aggregated data. A typical option of some dashboards is to use the tiles for further drilling into details: clicking on a tile takes you to a more detailed page or an entirely new application showing more details for the aggregated number on the tile.
- Generic application
  Many applications are created for a specific model. That means that the user interface, the widgets, and the logic are done with knowledge of the model and its available dimensions, members, and so on. Another category is generic applications. These are applications which need to be provided with a model whenever the application is executed. These applications are more complex to create as their logic needs to work with whatever model the end user selects at runtime. The advantage is that customers don't need to create applications for each model they have maintained in their system.

1.8 How Does Scripting Work in Analytic Applications?

Almost all widgets, whether smart, data-related widgets or simple widgets such as buttons and dropdown boxes, expose events. Even the analytic application itself exposes events such as a startup event or similar. To add custom logic to the application, you can implement event handlers with the help of the scripting language.

Example:

Let's say a dropdown box is populated with the available years in the data model - 2015 to 2019. The dropdown box exposes the event `OnSelect`, which is triggered whenever a value is selected from the dropdown box. The implementation of that event handler could read the selected value and set a filter for the selected year in the model. The numbers shown reflects the selected year.

Because you can add many event handlers using the scripting APIs of all widgets and other service APIs offered, the application can be geared towards the specific needs of a customer.

1.9 What’s the Scripting Language for Analytic Applications?

The scripting language is JavaScript. Scripts are executed by the web browser JavaScript engine, which is available out of the box. To offer good tool support for application designers, we add a type system on top. This is used for the tooling and for validating scripts.

Example:

Let's say that there is an API method available for filtering members: `setFilter("YEAR", "2014")`. A member is an element of a dimension. The plain JavaScript method expects two strings, and this is what is executed at runtime by the web browser. However, our definition of the API method uses dedicated predefined types for our business domain, that is `setFilter(Dimension, Member)`. With that definition, the system checks and validates that the passed strings are a valid dimension and a valid member.

The script editor uses the type information. It doesn't just statically check the types but uses the knowledge about the underlying model and provides value help to offer dimensions and members existing in the model.

2 Getting Started

Analytics designer provides a software development environment that enables application designers or developers to reuse SAP Analytics Cloud widgets and other functionalities to build different kinds of applications. Interactions between different widgets, pages, and applications are implemented with script functionalities (including planning, machine learning, and so on) - at design time. End users will then be consuming these applications - at runtime.

Analytics Designer is built around core story components to keep them synchronized as you go forward. Analytics designer and Story have different entry points but share much in common:

- Analytics designer is deeply integrated into SAP Analytics Cloud.
- Analytics designer and story share data connectivity and User Interface artifacts.
- It ensures a consistent user experience for application and story consumers.
- It inherits infrastructure and life cycle management of SAP Analytics Cloud.

2.1 Prerequisites

2.1.1 Required Access

Read access: the user of an analytic application needs a read access to open the application at runtime.

Full access: the application author who creates or edits the application needs a Create, Read, Update and Delete access (CRUD). The CRUD permissions are part the standard role **Application Creator** or can be assigned to any other role.

The folder where the application is stored passes on its access settings. For example, when an application is saved in a public folder, all users get Read access by default.

2.1.2 Required Roles

All standard Business Intelligence roles have a read access to consume analytic applications.

The ability to create, update, and delete is part of an extra standard role **Application Creator**.

2.1.3 Required Licenses

All SAP Analytics Cloud licenses include the creation and consumption of analytic applications. For planning applications, please note the following:

- If you only need read access to existing planning models and create private versions only, you can use the **SAP Analytics Cloud for business intelligence** license.
- If you need to create public versions and use all planning features, the **SAP Analytics Cloud for planning, standard edition** is required.
- If you need to create or update a planning model for your planning application, the **SAP Analytics Cloud for planning, professional edition** license is required.

2.1.4 Modes

There are three modes in analytic applications:

- **Edit mode**
  This is a design time mode. It allows you to edit applications. CRUD access is necessary. The application opens in edit mode by default if you have CRUD access.
- **Present mode**
  This is a runtime mode. It allows you to execute applications. Read access is necessary. The application opens in present mode by default if you run an it from edit mode.
- **View mode**
  This is a runtime mode. It allows you to execute applications. Read access is necessary. The application opens in view mode by default if you have read access.

2.2 Designing Elements

For analytic applications there is a strict differentiation between design time and runtime. A few trained users create applications by using the design time elements, while many end users accessing and navigating the final application only at runtime. The following are the available designing elements.

2.2.1 Canvas

The **Canvas** is a flexible space where you can explore and present your data. Applications have only one canvas. Scripting allows you to build numerous navigation options in your app.

2.2.2 Widgets and Filters

In Analytics Designer, a **Widget** is a user interface element that can be inserted and is visible on the canvas.

Note: Applications don’t have pages. The story concepts of cascading story, page, widget filters, and input controls are thus unavailable in applications. You should add a **Filter line** widget instead. The Filter line widget mimics the story filter and can be placed on the application canvas. Assign a data bound source widget, such as a table or a chart, as source widget. **Target** widgets can be assigned via scripting to apply the selected filters to several widgets.

To learn more about widgets, see the related chapter.

2.2.3 Data Sources and Models

In SAP Analytics Cloud, the widgets **table**, **chart** and **R widget** are data bound. They have their own data source, even if the same SAP Analytics Cloud model is connected. There is no shared data source concept. For example, you need to apply filters to each widget when you script in analytics designer for this reason.

2.3 Managing Your Analytic Application

2.3.1 Transporting an Analytic Application

You can import and export analytic applications from and to other SAP Analytics Cloud tenants. You can choose to export with data and other options.

Note: Custom widgets that are used in an analytic application are also exported with the analytic application.

Note: The software release Wave versions of SAP Analytics Cloud installed on the source and target tenants need to be either the same Wave version or just one Wave version different.

2.3.2 Sharing an Analytic Application

Analytics designer has its own access. As the owner of an analytic application, you can share individual analytic applications with others and grant access to these applications.

2.3.3 Bookmarking Your Analytic Application

Bookmark lets an application user capture the current state of an analytic application after certain operations such as filtering or changing hierarchy level.

Create Bookmark Component

To capture a bookmark of an analytic application, one needs to add a bookmark component at design time. A bookmark version and widgets to be bookmarked can be defined in the side panel of this component.

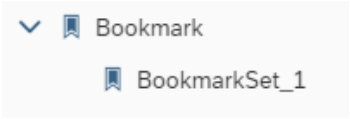


Figure 1: Bookmark Component in Outline

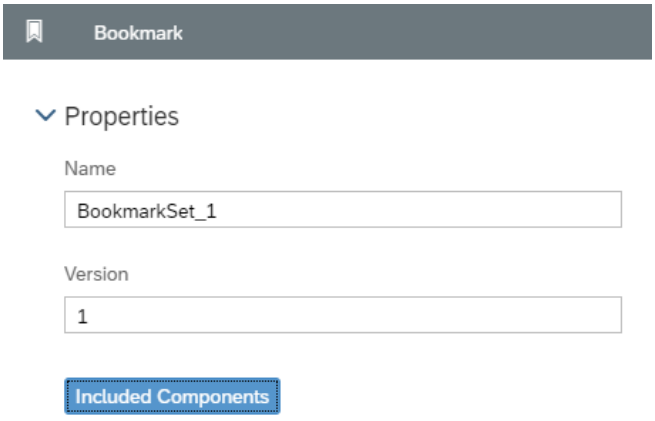


Figure 2: Side Panel of Bookmark Component

Save Bookmark

Write analytic designer scripts to save a bookmark. At runtime, the analytic application user can capture the latest application state via API.

```
BookmarkSet_1.save("application bookmark", true, true);
```

Get Bookmark Information

Certain information concerning a bookmark can be retrieved via APIs as well.

```
BookmarkSet_1.getAll();      //get all valid bookmarks
BookmarkSet_1.getVersion();  //get the version of current bookmark

//get current applied bookmark
var bookmarkInfo = BookmarkSet_1.getAppliedBookmark();

//check if bookmark is changed
BookmarkSet_1.isSameAsApplicationState(bookmarkInfo);
```

Delete Bookmark

Remove a specific bookmark via API.

```
var bookmarkInfo = BookmarkSet_1.getAppliedBookmark();
BookmarkSet_1.deleteBookmark(bookmarkInfo);  //delete bookmark
```

2.3.4 Translating Your Analytic Application

Translation is useful for multilingual use cases. An analytic application be displayed in different languages in:

- The text of a widget
- The widget tooltip if applicable
- The description of the analytic application
- And so on

To turn on translation of an analytic application for the first time, the application developer must open the *Analytic Application Details* dialog and switch on *Mark for translation*.

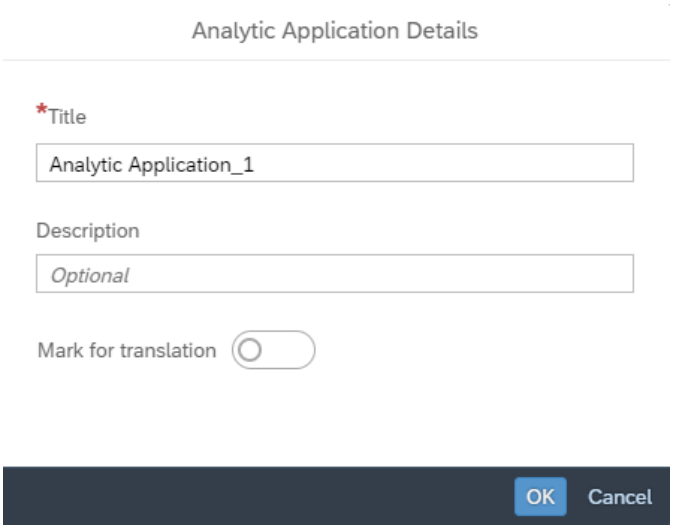


Figure 3: Turn on Translation

The current language will become the source language of this document. If users switch to another language, the document will be shown only in view mode.

2.3.5 Exporting Your Analytic Application to PDF

Analytic Applications allow users to export an application as a PDF file when running the application.

Create an Export to PDF Component

To export an application as a PDF, an Export to PDF component should be added when designing an application.

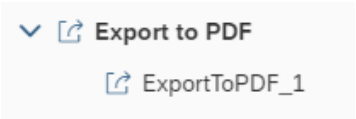


Figure 4: Export to PDF Component in Outline

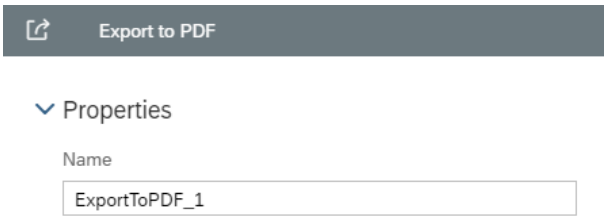


Figure 5: Side Panel of Export to PDF Component

Export PDF

Write analytic designer scripts to trigger the export. Then during application runtime, analytic application users can export an application as a PDF file via the API:

```
ExportToPDF_1.exportView();
```

Configure Export to PDF Settings

There are several PDF exporting settings that can be configured, such as:

- File name
- Orientation
- Paper size
- Page number location
- Date location
- Page header
- Page footer
- Insert Appendix or not
- Export comment or not
- Export in the background or not

The settings can be configured both at design time and run time. Application designers can update the values via the side panel of Export to PDF at design time. While at run time, all settings can be exposed to application users via related APIs and enable the users to configure these settings as well.

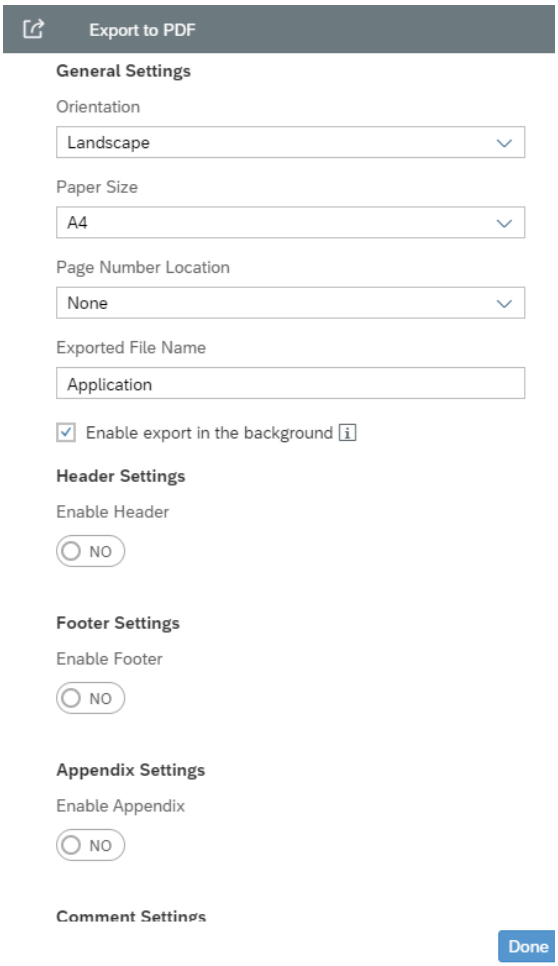


Figure 6: Side Panel of Export to PDF Component to Configure the Settings

APIs to configure the settings of export PDF include:

```
setFileName(“ApplicationPDF”)
getFileName();

setAppendixVisible(true);
isAppendixVisible();

setCommentsVisible(true);
isCommentsVisible();

setPageSize(PageSize.A4);
getPageSize();

setHeaderText(“Page Header”);
getHeaderText();
```

```
setHeaderVisible(true);
isHeaderVisible();

setFooterText(“Page Footer”);
getFooterText();
setFooterVisible(true);
isFooterVisible();

setPageOrientation(PageOrientation.Portrait);
getPageOrientation();

setDateLocation(PageDateLocation.Header);
getDateLocation();

setPageNumberLocation(PageNumberLocation.Header);
getPageNumberLocation();

setMetadataLocation(PageMetadataLocation.Header);
getMetadataLocation();

setExportInBackgroundEnabled(true);
isExportInBackgroundEnabled();
```

2.3.6 Commenting in Your Analytic Application

Besides directly creating or removing comments in an analytic application as in a story, as an application designer, you can add, view, delete comments, and so on, via scripting (available for commenting by data point in planning models only).

Manage Comment

Data cell-based comments can be managed via APIs by specifying data context or comment ID.

```
// Add comment to table cell
Table_1.getDataSource().getComments().addComment({@MeasureDimension:
"[sap.epm:M010_10_Accounts].[parentId].&[A134000]",
sap.epm:M010_10_Operating_Income_Version: "public.Actual"}, "comment1");


// Remove comment by thread ID or comment ID
// If a comment ID is specified, this comment is removed.
Table_1.getDataSource().getComments().removeComment("28760729-2540-4227-b016-
428450515042");


// Remove comment by context. One data cell has only one comment
// thread. In this case, all comments belong to this thread will
// be removed.
Table_1.getDataSource().getComments().removeComments({@MeasureDimension:
"[sap.epm:M010_10_Accounts].[parentId].&[A134000]",
sap.epm:M010_10_Operating_Income_Version: "public.Actual"});
```

Get Comment

Besides posting or removing comments, the application designer can read the comment information by data context or comment ID. The comment information includes content, author, creation date and so on.

```
// If comment ID is specified, the related comment is returned
var oCommentInfo2 = Table_1.getDataSource().getComments().getComment("28760729-2540-4227-b016-428450515042");
// Get comment thread by context
var aCommentInfos = Table_1.getDataSource().getComments().getAllComments({@MeasureDimension: "[sap.epm:M010_10_Accounts].[parentId].&[A134000]", sap.epm:M010_10_Operating_Income_Version: "public.Actual"});
```

Turn On and Off Comment Display at Runtime

Be able to turn on and off comment display via APIs. Once the comment mode is disabled, the comments and related UI will be invisible at runtime.

```
Application.isCommentModeEnabled();

Application.setCommentModeEnabled(true);
```

Like a Comment

Whether to like a comment or not can be configured via API as well. Once a comment id is specified, the number of like of the related comment will be updated.

```
setCommentLiked(("28760729-2540-4227-b016-428450515042", true);
```

2.4 Navigating from Analytic Application to Another Document or URL

2.4.1 Create a Story from a Widget

For each data-bound widget at runtime, such as Table or Chart, the analytic application user can create a new story from the widget and start exploration based on it afterwards.

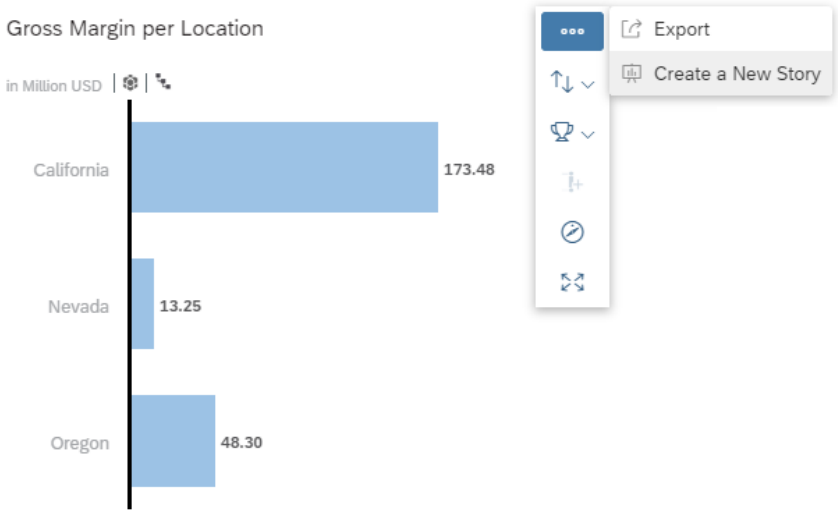


Figure 7: Create a Story from a Widget

The new story will be created in a new browser page, and the settings and data state (that is, filter, and so on) will be carried over as well.

2.4.2 Navigation APIs

Navigation APIs let users navigate from an opened analytic application to another page of a story.

Basically, the APIs can be used in two ways: open the analytic application or a page of a story directly or open an URL.

Navigate to Analytic Application or Story

The APIs take the uuid of an analytic application or a page in a story and open the expected application or page in a new tab if parameter “newTab” is set to true.

```
NavigationUtils.openStory("story_uuid", "page_uuid",
[UrlParameter.create("p_script_var_1", "123"),
UrlParameter.create("p_script_var_2", "Value with Spaces")]);
NavigationUtils.openApplication("application_uuid", true);
```

Open URL

The user can also choose to open an URL, which is a story or analytic application URL, or even a general external URL. The URL can be opened in a new tab or in a browser page that is already open.

```
var storyURL = createStoryUrl("story_uuid", "page_uuid",
UrlParameter.create("p_script_var_1", "123"));
var appURL = createApplicationUrl("application_uuid");
openUrl(storyURL, true);
openUrl(appURL, true);
```

Open Data Analyzer

The user can also choose to open a data analyzer to analyze data of a data source. The user can pass the name of the connection, the name of the data source, and URL parameters, if necessary. The data analyzer opens in a new tab or in a browser page that is already open.

```
NavigationUtils.openDataAnalyzer("myconnection", "mydataSourceName",
UrlParameter.create("P_script_var_1", "123"), true);
```

3 Designing an Analytic Application

3.1 Creating

To create an analytic application, you need the Application Creator role (or a custom role with the CRUD permissions) to be able to see the menu entry in the Home menu under Create.

1. Click the menu icon,
2. click *Create*,
3. and click *Analytic Application*.

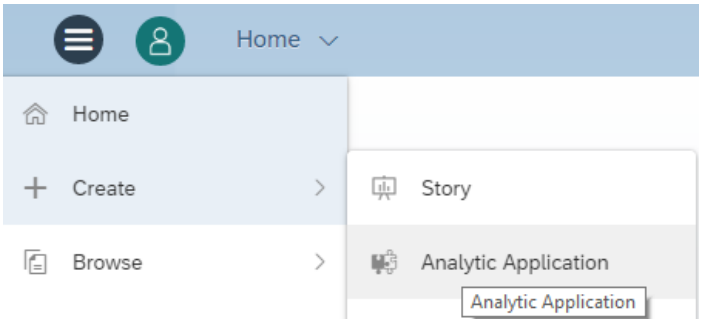


Figure 8: Create Application

3.2 Browsing

Select *Browse* under the menu to access the file repository where are:

- Filters
- All existing public analytic applications
- Private applications
- Applications shared with you.

The default access set for an application saved in a public folder is read only for others. You need to explicitly share your application with other users and give CRUD access to allow them to edit the application.

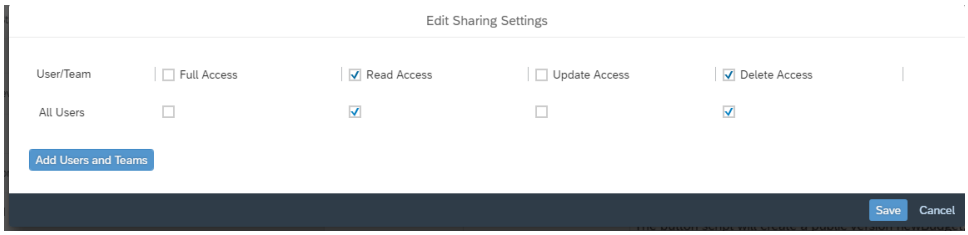


Figure 9: Edit Sharing Settings

3.3 Opening Analytic Applications in a Specific Mode

For analytic applications we talk about the edit mode, where applications can be edited and the view mode, where applications are executed.

At design time, the CRUD permissions are necessary, at runtime only read access. When users have only read access and open an application from file repository, the application will open automatically in runtime mode. If a user has CRUD permissions, the application will open per default in design time mode. If you as application author with CRUD permissions want to open the application from file repository directly in view mode, you can select this option from context menu when hovering over the application name in the list. If you are not the owner of the application and it was not shared with full access, the application will open in view mode and you don't have the option in the context menu. Only for your own applications you have this option.

3.3.1 Opening an Analytic Application from File Repository with CRUD Permissions

If you are the owner of the application, or if you have CRUD access for this analytic application, the application opens automatically **in edit mode**. The option to open the application in view mode is available in the context menu.

To open an application from a file repository in view mode:

- Hover over the application name in the list.
- Open the context menu under the  icon.
- Select *Open in view mode*.

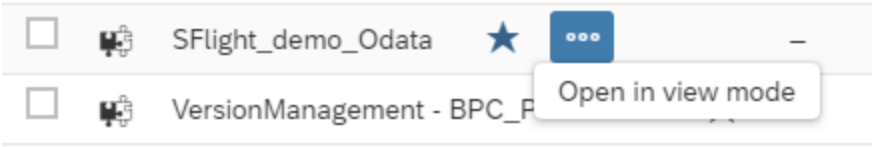


Figure 10: Open in View Mode

3.3.2 Opening an Analytic Application from File Repository with Read Permissions

If you are not the owner of the application, or if you have only read access, the application opens automatically in view mode and does not have a context menu entry.

3.3.3 Opening a Mode with the URL

A typical application URL looks as follows and contains a `mode`, for example:

```
https://xxxx/sap/fpa/ui/tenants/abc123/app.html#,mode=present;view_id=appBuilding;appID=xyz78
```

In edit mode, the URL contains `mode=edit`. In present mode, the URL contains `mode=present`. In view mode, the URL contains `mode=view`. The analytic application opens in present mode by default when running the application from the design time.

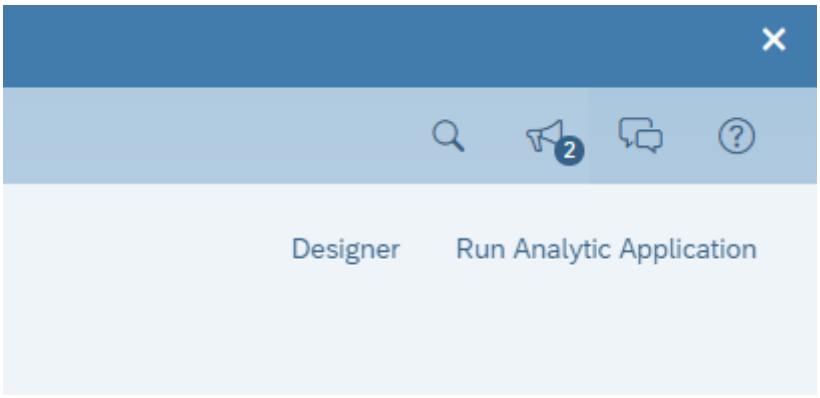


Figure 11: Run Analytic Application

To change the mode:

- Modify the URL directly or using the navigation options in the user interface.
- Click the *Fullscreen* button in the toolbar. This action changes the URL from `mode=present` to `mode=view`.

3.3.4 Switching Between Present and View Mode

You can switch between present and view mode by clicking the *Display Fullscreen* button in the toolbar. You will notice that the URL will change. Instead of `mode=present`, the URL contains now `mode=view`.

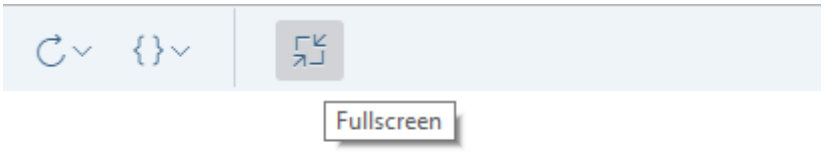


Figure 12: Fullscreen

3.4 Toolbar Functionalities

3.4.1 Toolbar in Edit Mode

As in Stories there is a toolbar on top of the application which contains the features. Some options are only active once you have saved the application, otherwise they are greyed out.

- *File* contains the options like *Application Details*, *Save* and *Save As*, *Copy*, *Duplicate*, *Paste* and *Share*.
- For Analytics Designer you have 2 **views** which are exclusively for applications and ON by default: The *Outline* and the *Info Panel*, which contains the error list and the reference list.
- *Insert* allows you to insert chart, table and all other available widgets.
- With *Tools* you can do chart scaling and create conditional formatting.

- *Data* contains refresh data and edit prompts.
- *Designer* opens the builder and styling panel.
- *Run Analytics Application* opens the application in another browser tab in present mode. Present mode means, that the toolbar is visible only at hover. But it can be toggled to View mode with a static toolbar by clicking on *Fullscreen* button in the toolbar.

3.4.2 Toolbar in View Mode

In view mode as well as in present mode the toolbar contains a limited set of features.

- *Data* allows you to refresh data and edit prompts.
- *Plan* contains publish data, version management, version history, value lock management, predictive forecast and allocate values.
- *Display Fullscreen* will change the mode to present mode by showing the toolbar only at hover.

3.5 Edit Mode Functionalities

3.5.1 Outline and Side Panels

The outline is a crucial element of the **edit mode**. It contains:

- All visible widgets in the **Layout** area, either directly on the main **Canvas** or in a **Popup**
- The non-visible elements of an application in the **Scripting** area

Click on + to create *Script Variables*, *Script Objects*, *OData Services*, and *Predictive Models*. You can maintain them here and use them in every script of the application.

The outline has a **search bar** that filters the complete tree to match your search. Click the symbol > to expand or collapse an item.

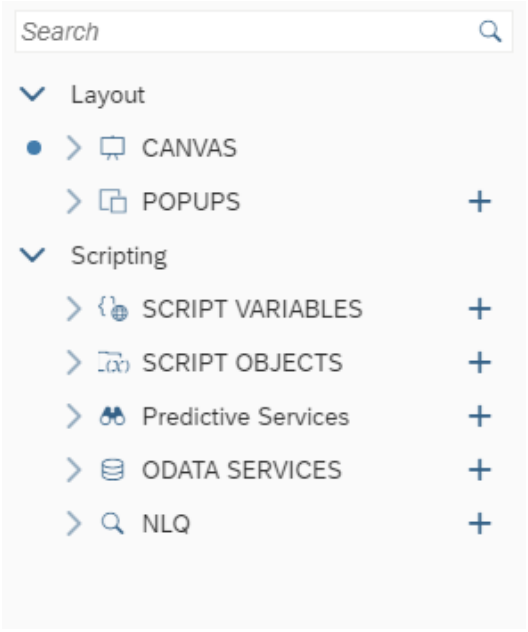


Figure 13: Outline

3.5.2 Scripting Section

Every **Scripting** object has a context menu that contains *Rename*, *Find Reference*, and *Delete*. When you select one of these objects, a side panel appears. It allows you to edit properties. The panel opens if you click these objects and closes when you click *Done* in the panel.

For more information, see the chapter on Scripting.

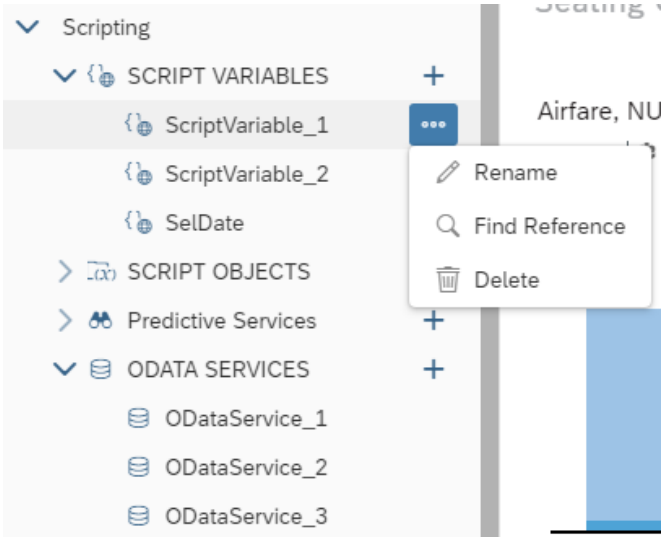


Figure 14: Context Menu for Scripting Objects in Outline

3.5.3 Layout Section

If the *Designer* button on the top right of the application is selected, a *Designer* panel is available for the visible widgets on the canvas. Access the Builder Builder and Styling Styling panels from there.

The widgets in the outline, on the canvas, and the side panel are always synchronized and based on your selection. Widgets in the outline have a context menu containing *Rename*, *Find Reference*, *Delete*, and *Hide*. *Hide* conceals the widget on the canvas in edit mode. It has no influence on the different view modes when executing the application.

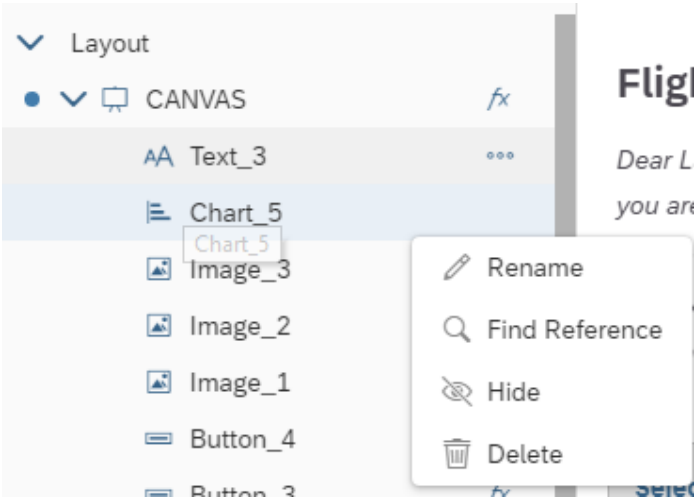


Figure 15: Context Menu for Canvas Objects in Outline

Widgets have their own analytic application *Properties* section in the *Styling* panel. This is where the widget name used for scripting can be changed; it is updated in the outline, and vice versa. The specific properties of the analytics designer depend on the widget type.

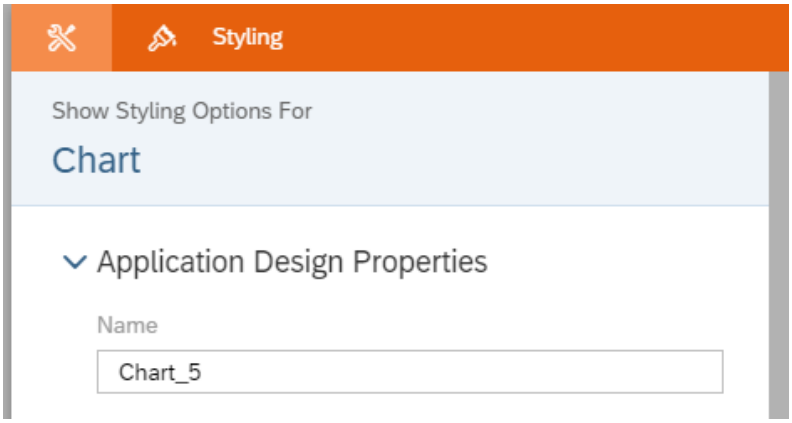


Figure 16: Widget Name

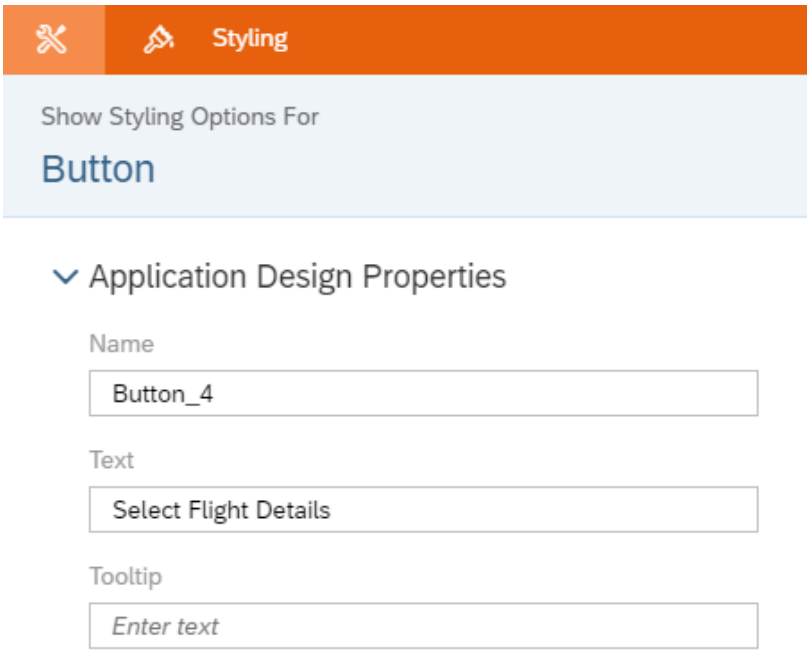


Figure 17: Analytics Designer Properties

Dropdown Widget

Users can now configure dropdown style with greater granularity. In addition to the default style, users can now configure different styles of dropdown menu when item are selected, or mouse hover, or mouse down.

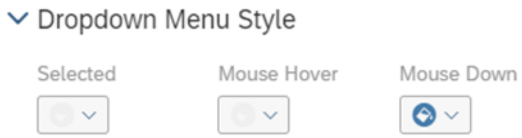


Figure 18: Dropdown Menu Style

Filter Line Widget

In addition to the default style, users can now configure different styles of filter menu during mouse hover or mouse down.

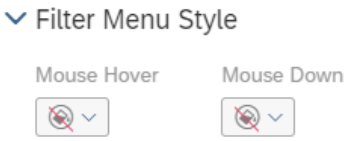


Figure 19: Filter Menu Style

Button Widget

Several new settings of Button widget have been added in the Styling Panel:

Figure 20: Visual Feedback of Mouse Click & Hover

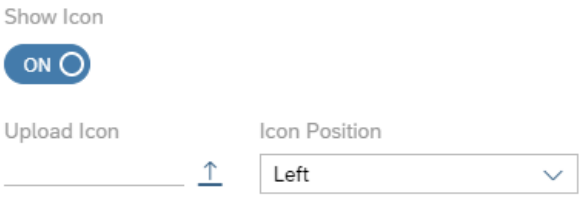


Figure 21: Settings of Icon

Figure 22: Type of Button

The possible types of button are: *standard*, *lite*, *emphasized*, *positive (accept)*, and *negative (reject)*.

Under *Actions*, you can flag the option to hide the widget in application view time.

Figure 23: Actions Menu

At runtime for each widget, there are quick menus for either a widget or relevant data points (that is, Table or Chart). An application developer can configure the visibility of these quick menu items via the settings in the Styling Panel of a widget. More styling options are available.

By checking or unchecking the checkbox before each item, the application developer can control the availability of the related quick menu item at runtime.

Please be advised that the configurable items in quick menus vary by widget.

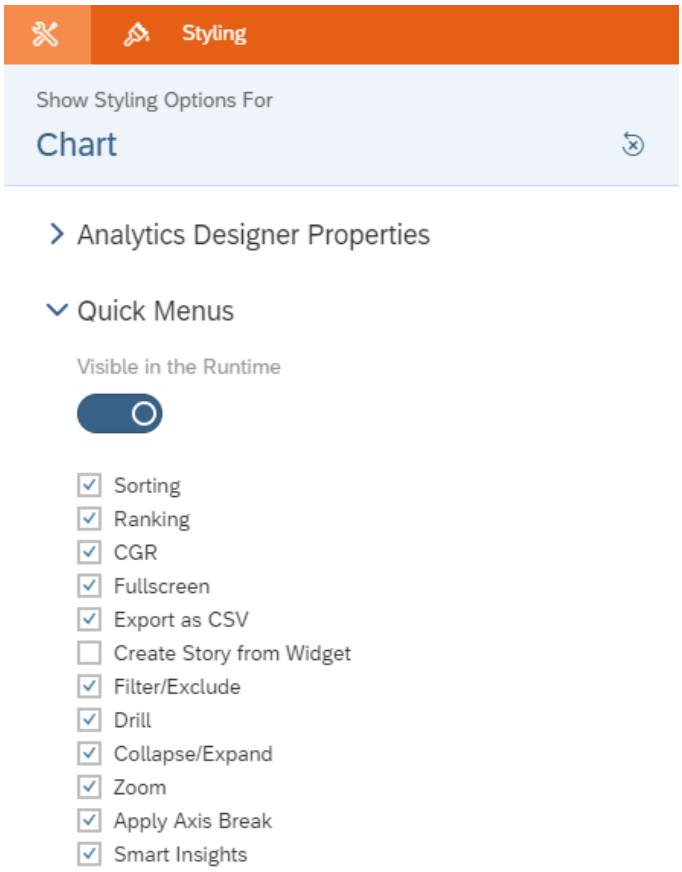


Figure 24: Quick Menu Options in Styling Panel

4 Scripting in Analytics Designer

4.1 Why Scripting?

You might be wondering why you would want to script and what advantage it could possibly be.

Most modern analytics tools avoid scripting to simplify the designer's tasks. Users may find it easier to use at first, but they quickly find themselves limited to the scenarios built into the tool.

Scripting allows you to go beyond present narratives, to respond to user interaction in a custom way, to change data result sets, and to dynamically alter layout. Scripting frees your creativity.

4.2 Scripting Language Overview

The scripting language in Analytics Designer is a **limited subset** of JavaScript. It is extended with a logical type system at design time enforcing type safety. Being a true JavaScript subset allows executing it in browser natively. All scripts are run and validated against strict mode. Some more advanced JavaScript features are hidden. Scripts are either tied to events or global script objects.

4.2.1 Type System

The logical type system runs on top of plain JavaScript. It enforces strict types to enable more powerful tooling. The behavior at runtime doesn't change as it is still plain JavaScript.

4.2.2 Tooling – Code Completion and Value Help

The Analytics Designer scripting framework exposes analytics data and metadata during script creation and editing. This enables

- Code completion in the traditional sense like completing local or global Identifiers
- Semantic code completion by suggesting member functions or similar
- Value help in the form of context-aware value proposals like measures of a data source for function parameters

For example, when calling an API method on a Business Warehouse DataSource, the code completion can propose measures as code completion options or values to specify a filter.

4.2.3 Events

Scripts always run in response to something happening in the application. Application events are your hook. There are several types of events in analytic applications. Some occur in the application itself and some occur on individual widgets.

4.2.3.1 Application Events

The application has two events: one that fires when the app starts, and another that is triggered in certain embedded scenarios.

- `onInitialization`: This event runs once when the application is instantiated by a user. It is where you script anything that you want to be done during startup. Like most events, it has no input parameters.
- `onPostMessageRecieved`: If your application is embedded in an iFrame, your SAP Analytics Cloud analytic application can communicate bidirectionally with the host web app using JavaScript PostMessage (see also: `https://developer.mozilla.org/ en-US/docs/Web/API/Window/postMessage`) calls. It allows the host application to pass information into the analytic application. This event is called whenever the host application makes a post message call into the analytic application.

Designers have access to this information and to the event's two input parameters:

- `origin`: it is the domain of the host application. The contents of an iFrame don't need to be in the same origin as the host app, even when same origin policies are in effect. It can be convenient but be careful about clickjacking attacks and malicious iFrame hosts. For the sake of security, we recommend that you check this parameter to ensure that the iFrame host is what you expect.
- `message`: it is the standard message parameter of the JavaScript `PostMessage` passed into SAP Analytics Cloud. It does not follow any format and could be almost anything. It is encoded using the structured clone algorithm and there are a few documented limitations in what can and can't be encoded.

4.2.3.2 Individual Widget Events

Most widgets have an event that is fired when the widget is clicked by a user. However, some widgets have no events, such as text labels. Data bound widgets generally have an event that is fired when the result set of the data source changes.

Most events have no input parameters, like `onSelect` and `onResultChanged`.

4.2.4 Global Script Objects

Global script objects act as containers. They allow you to maintain and organize script functions that are not tied to any event and are invoked directly. You can maintain libraries of re-usable functions. These library scripts are called functions.

4.2.5 Accessing Objects

You can access every object in the *Outline* pane such as widgets, script variables, or script objects by its name when you are working on a script.

4.2.6 Script Variable

By referencing Script Variable in Calculated Measure, users can easily build a what-if simulation with query results.

For example, an analytic application developer can bind a calculated measure which references one script variable (`ScriptVariable_Rate`) to a chart.

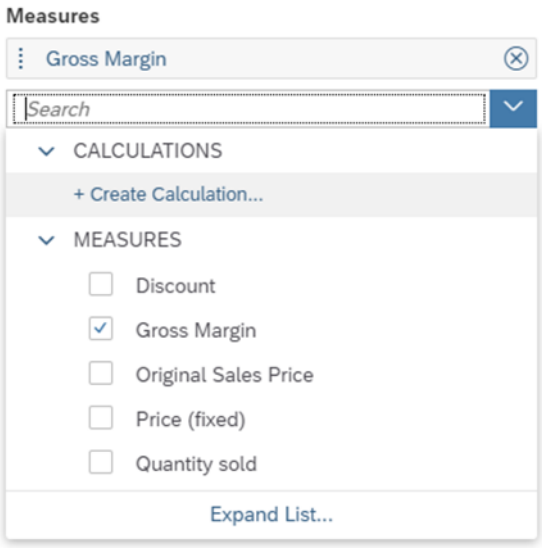


Figure 25: Create Calculation

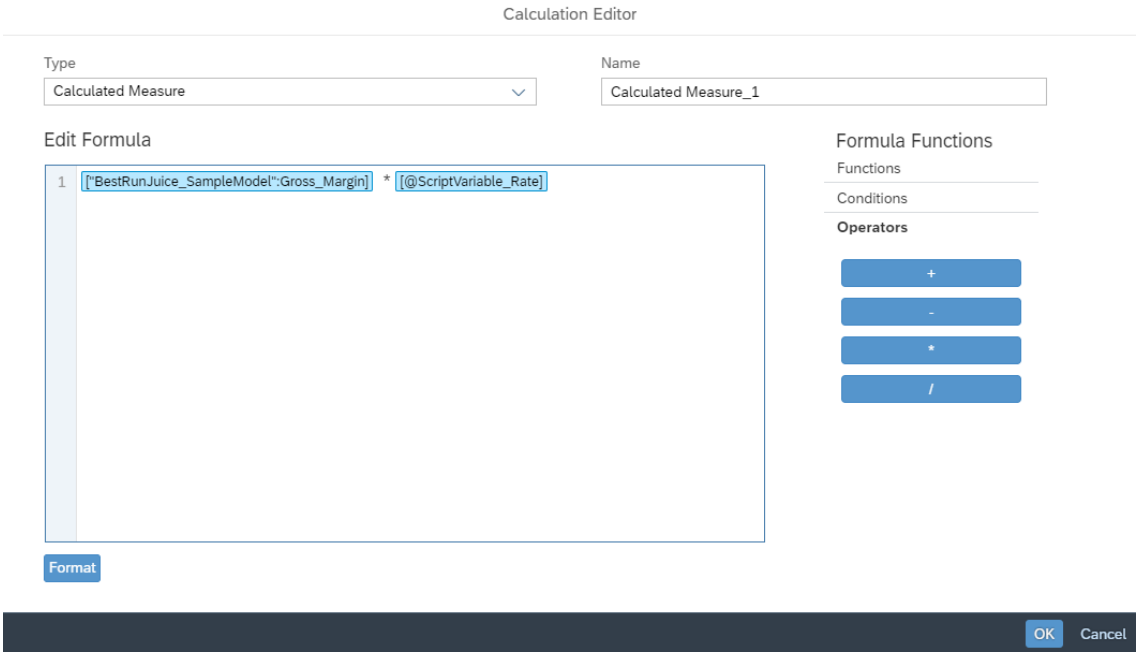


Figure 26: Reference Script Variable

4.2.7 Timer

The Timer object enables you to start a timer to trigger timing events. By leveraging the feature of a timer, you can realize different scenarios such as:

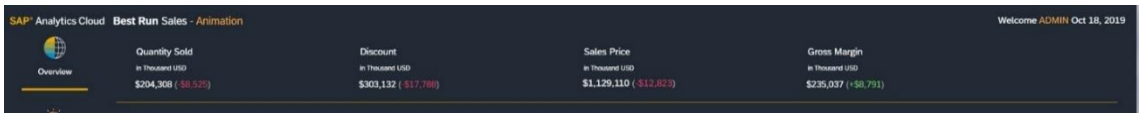
- Create animations
- Send notifications to end users regularly
- Refresh your analytic application in a certain interval of time

To further delve into its usage, I will share two samples for your reference.

4.2.7.1 Script APIs

```
Timer_1.start(delayInSeconds: number): void
Timer_1.stop(): void
Timer_1.isRunning(): boolean
Timer_1.onTimeout // event
```

4.2.7.2 Sample 1 – Create Animation



In this sample, we add animation to the header above, making the tiles (widgets) shift from right to left repeatedly.

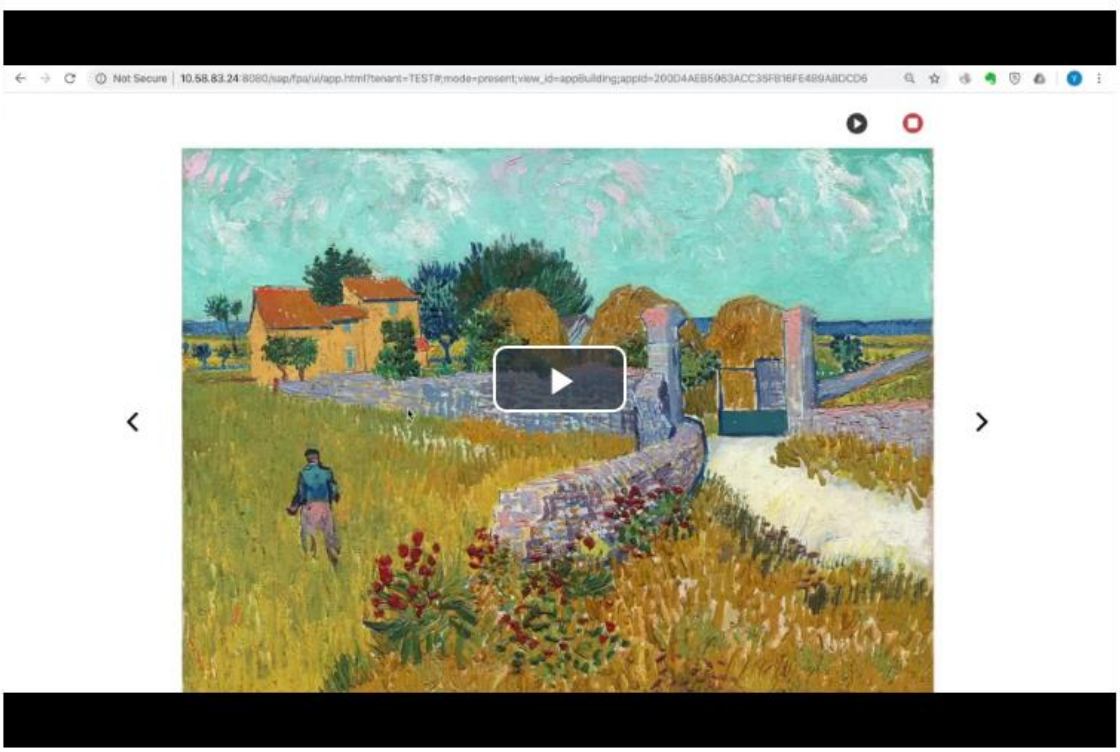
We use Timer and the Layout API.

```
// Start a timer
Timer_1.start(ANIMATION_INTERVAL);
// To make the Widget moving, the Layout API is used to dynamically
// change the position of the widget.
// These are the 4 panels we want to apply animation to
PANELS = [Panel_10, Panel_11, Panel_12, Panel_13];
var numOfPanels = PANELS.length;
var moveStep = 0.1;

var firstPanel = PANELS[0];
var leftMarginOfFirstPanel = firstPanel.getLayout().getLeft().value;
var panelWidth = firstPanel.getLayout().getWidth().value;
var padding = 0;

if (leftMarginOfFirstPanel >= moveStep) {
  for (var i = 0; i < numOfPanels; i++) {
    var layout = PANELS[i].getLayout();
    layout.setLeft(LayoutValue.create(layout.getLeft().value - moveStep,
LayoutUnit.Percent));
  }
} else {
  // Move the first panel to end
  firstPanel.getLayout().setLeft(LayoutValue.create((panelWidth + padding)*
numOfPanels, LayoutUnit.Percent));
  for (i = 0; i < numOfPanels - 1; i++) {
    PANELS[i] = PANELS[i+1];
  }
  PANELS[i] = firstPanel;
  Util_Animation.doAnimation();
}
```

4.2.7.3 Sample 2 – Automatically Play the Application

This is an interesting requirement coming from customer. This customer wants an application that is displayed in a big screen with its pages automatically played in turn similar as a page book and can be manually stopped at will.

We can do it with Timer and TabStrip.



In order to make a TabStrip widget look like a page book, a small tip is to hide the header of the Tabstrip, for example, using a shape, then use API `TabStrip_1.setSelectedKey(TabID)` to dynamically “slide” the tab.

Then start a timer to repeat this action.

```
// Here’s the code sample to switch and slide the tabs.
var key = TabStrip_1.getSelectedKey();
if (key === "Tab_1") {
  TabStrip_1.setSelectedKey("Tab_2");
} else if (key === "Tab_2") {
  TabStrip_1.setSelectedKey("Tab_3");
} else if (key === "Tab_3") {
  TabStrip_1.setSelectedKey("Tab_1");
}
```

4.3 Script Editor

The script editor is a tool within analytics designer to specify the actions taking place when an event is triggered by an application user. By adding a script to a widget, you can influence the behavior of this widget and thus enable user interaction, also referred to as events, at runtime. A script typically consists of several statements. A statement is a programmatic instruction within a script. The execution of a statement is typically triggered by user interaction with the widget.

4.3.1 Creating and Editing Event-Based Scripts

Scripts are presented in the outline pane, at the left-hand side of the analytics designer editor environment.

Find them by hovering over the widget name in the outline, or as a menu entry in the quick action menu of each widget. The *fx* icon indicates the event. By clicking on it, the script editor opens the selected function.

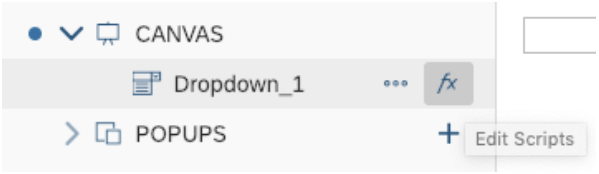


Figure 27: Edit Scripts

If a widget has multiple available events, you are presented with a choice in the hover menu.

Figure 28: Multiple Events

If there is an event with an attached script, you can see the *fx* icon in the outline pane. If there are no attached script, there is no visible icon. In the following figure, the `onSelect` event of `Dropdown_1` has a script, but there are no scripts attached to `Chart_1`.

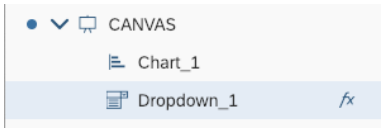


Figure 29: Script for Dropdown

If a widget has multiple events and at least one has a script attached, then the *fx* icon will be displayed.

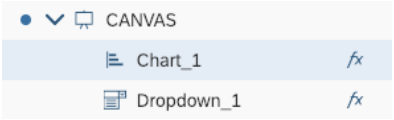


Figure 30: Script for Chart

The hover menu will show which of the events have attached scripts.

Figure 31: Hover Menu

4.3.2 Creating and Editing Functions in Global Script Objects

Functions are found under the global script objects portion of the outline pane. Before you can add functions, you will need to add your first script object. Do this by clicking the plus sign, next to the *Script Objects* header.

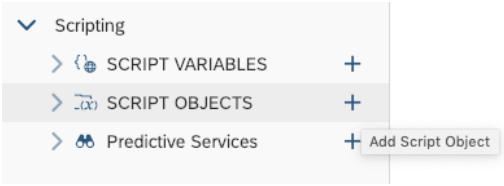


Figure 32: Add Script Object

Within a script object, you can add several functions, by invoking *Add Script Function* in the context menu. Keep in mind that the script object container is an organizational aid for you.

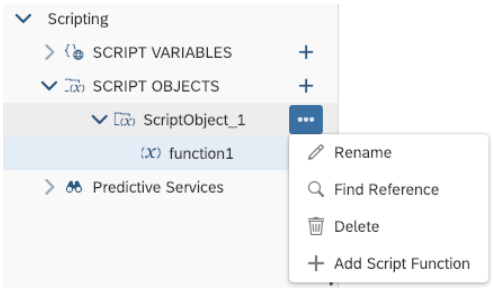


Figure 33: Add Script Function

Individual functions are nested within global script objects. For example, in the figure below **Error! Reference source not found.** you see the `function1` nested within a script object called `ScriptObject_1`.

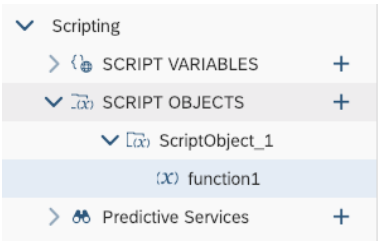


Figure 34: Script Object Function

Like canvas widgets, the scripts attached to a function are created by clicking the *fx* icon in the hover menu of that function. Functions that have and don't have scripts are visible in the outline, just as with widgets.

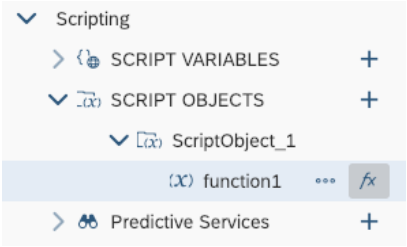


Figure 35: Script of Script Object Function

Once you have a script attached to a function, you can call it whenever you please, from any other script. The script objects are accessible by name and individual functions are accessible within the objects. If you wanted to invoke the `function1` script within `ScriptObject_1`, you would call is like this:

```
ScriptObject_1.function1();
```

4.3.3 Script Editor Layout

Once an open script is in the editor, it shows up as a tab along the top of the canvas. You can open several script editor tabs at the same time.

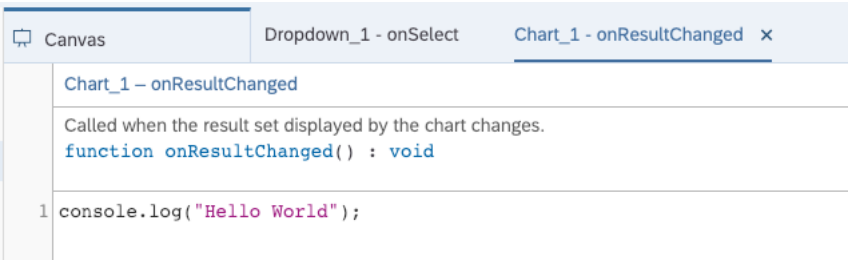


Figure 36: Script Editor

The script editor has three areas:

1. the widget and event
2. the documentation
3. the main body of the script itself

Figure 37: 3 Areas of Script Editor

Write script in the main body using the inbuild help features like code completion and value help.

4.3.4 Keyboard Shortcuts

The script editor provides several keyboard shortcuts, which let you, for example, undo or redo your editing operations.

Find a list of keyboard shortcuts in the help page *"Using Keyboard Shortcuts in the Script Editor"*: https://help.sap.com/doc/00f68c2e08b941f081002fd3691d86a7/release/en-US/68dfa2fd057c4d13ad2772825e83b491.html.

4.3.5 Info Panel: Errors and Reference List

All errors are listed in the *Errors* tab of the *Info* panel. Search for errors and filter out only warnings or errors. Double-click an error to open the script in a new tab and jump directly to the error location in the script.

Find all places where a widget or a scripting object is used with the *Find References* feature. You can find it in the context menu per object in the outline. The result is displayed in the *Reference* list tab of the *Info Panel*.

Info panel: errors and reference list

4.3.6 Renaming Widgets, Script Variables, and Script Functions

While creating an analytic application in analytics designer you can change the name of an analytics designer widget, gadget (a technical component), script variable, script object, script object function, and script object function arguments. Analytics designer then applies the new name to all relevant places, for example in analytics designer scripts.

You can change the name of a widget, gadget, script variable, script object, or script object function by selecting it in the Outline, clicking the *More* button, selecting *Rename*, and entering a new name.

You can change the name of a widget or gadget by selecting it in the Outline, then entering in the Styling Panel a new name in the *Name* input field.

You can change the name of a script variable, script object, or script object function by selecting it in the Outline, entering in the Styling Panel a new name in the *Name* input field, then clicking button *Done*.

You can change the name of a script object function argument by selecting the script object function in the Outline, clicking the *Edit* button of the function argument in the Styling Panel, entering a new name in the *Name* input field, then clicking button *Done*.

4.4 Scripting Language Features

4.4.1 Typing

Normal JavaScript is weakly typed and dynamically typed. Weak typing means that the script writer can implicitly coerce variables to act like different types. For example, you could have an integer value and treat it as if it were a string. Dynamic typing means that the runtime will try to guess the type from the context at that moment and the user can even change the type after the

variable is already in use. For example, you could change the value of the beforementioned integer to another type of object at will; “Dear integer, you are now a duck”.

SAP Analytics Cloud, analytics designer forbids both. Once you have a duck, it remains a duck and you can’t recycle variable names as new types. If you want something else, you’ll need another variable. It is also strongly typed, meaning that if you want to use an integer as a string, you’ll have to explicitly cast it. Both are a consequence of enabling the rich code completion capabilities in the editing environment.

The analytics designer scripting language is still JavaScript. You can write perfectly valid JavaScript while treating the language as if it was strongly and statically typed.

4.4.2 No Automatic Type Casting

A consequence of strong typing is that you can’t expect automatic conversions. The following is valid JavaScript:

```
var nth = 1;
console.log("Hello World, " + nth);
```

In analytics designer, you will see an error in the script editor, informing you that auto-type conversion is not possible, and the script will be disabled at runtime, until fixed. Instead, you should explicitly cast `nth` to a string.

```
var nth = 1;
console.log("Hello World, " + nth.toString());
```

4.4.3 Accessing Objects

Every object (widget or global script object) is a global object with the same name as in the outline. Suppose you have a chart in your application, named `Chart_1` and want to check and see if it is visible. You can access `Chart_1` as a global variable and then access its functions, in this case to see if it is currently visible.

```
var isVis = Chart_1.isVisible();
```

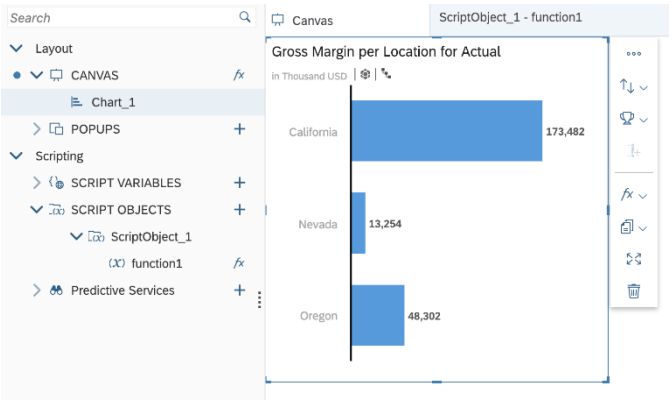


Figure 38: Accessing Objects

4.4.4 Finding Widgets with Fuzzy Matching

The application author can type in the complete name of a widget or just some first letters. By typing `CTRL+Space`, the system either

- Completes the code automatically if there is only one valid option
- Displays a value help list from which you can select an option

Fuzzy matching helps you finding the result even if you have made a typo or the written letters are in the middle of the function. Fuzzy matching is applied automatically for the standard code completion (for example, `"cose"` → `"console"`).

The script validation runs automatically in the background and shows errors and warnings indicated with red and orange underlying and a red or orange marker before the line number.

4.4.5 External Libraries

There is no provision in SAP Analytics Cloud, analytics designer for importing external JavaScript libraries. You can use the standard JavaScript built-in objects such as:

- Math
- Date
- Number
- Array
- Functions on String

All standard functions listed in the SAP Analytics Cloud, analytics designer API Reference are supported even if some browsers don't support them natively.

For example, `String#startsWith` is not available in Microsoft Internet Explorer, but can be used in SAP Analytics Cloud with all browsers.

4.4.6 Debugging with console.log()

Scripts are stored as minified variables and are not directly debuggable in the browser console. Write messages directly to the browser's JavaScript console to aid in troubleshooting. A global variable called console and has a `log()` function that accepts a string.

```
var nth = 1;
console.log("Hello World, " + nth.toString());
```

This would print `"Hello World, 1"` to the JavaScript console of the browser. Complex objects can be printed.

4.4.7 Loops

Two types of JavaScript **loops** are possible in SAP Analytics Cloud, analytics designer, `for` and `while` loops. Other types, such as `foreach` iterators, are not supported.

4.4.7.1 for

`for` loops are standard JavaScript `for` loops, with one caveat. You must explicitly declare the `for` iterator. This is valid JavaScript, but it isn't accepted in the script editor:

```
for (i = 0; i < 3; i++) {
  console.log("Hello for, " + nth.toString());
}
```

Instead, explicitly declare `i`. The example below is valid:

```
for (var i = 0; i < 3; i++) {
  console.log("Hello for, " + nth.toString());
}
```

4.4.7.2 while

We fully support `while` loops in SAP Analytics Cloud Analytics Designer:

```
var nth = 1;
while (nth < 3) {
  console.log("Hello while, " + nth.toString());
  nth++;
}
```

4.4.7.3 for in

An additional type of look is the `for in` iterator. Suppose you had a JavaScript object: you can iterate over the properties with the `for in` loop. Data selections are JavaScript objects and can be iterated over:

```
var selection = {
   "Color": "red",
   "Location": "GER"
};
for (var propKey in selection) {
  var propValue = selection[propKey];
  ...
};
```

4.4.8 Double and Triple Equals Operators

Plain JavaScript has two kinds of “equals” comparison operators, `==` (double equals) and `===` (triple equals). The main difference between these is that double equals has automatic type casting while triple equals doesn’t. With triple equals, both the value and type must be the same for the result to be `true`. The triple equals is known as the strict equality comparison operator (see `https://developer.mozilla.org/en-US/docs/Web/JavaScript/Equality_comparisons_and_sameness`).

SAP Analytics Cloud, analytics designer has no automatic type casting. It supports

- Triple equals
- Double equals only if both sides have the same static type

The examples below show the difference between double and triple equals operators. In both cases, there is a variable `aNumber`, with an integer value and we are comparing it to the string `"1"`.

In the double equals case, `aNumber` is cast to string and compared. The result is `true`, and the if block is entered. In the triple equals case, `aNumber` is not cast to string and the comparison is `false`, because the values are of a different type.

This is `true`, and you can see the `if` statement is entered:

```
var aNumber = 1;
if (aNumber == "1") {
  ...
```

```
}
```

This is `false`, and you can see the `if` statement is skipped:

```
var aNumber = 1;
if (aNumber === "1") {
  ...
}
```

4.4.9 if and else Statements

The statements `if` and `else` are supported. Remember that there is no automatic type casting and double equals are valid only if both sides have the same static type:

```
if (nth === 1) {
  console.log("if...");
} else if (nth < 3) {
  console.log("else if...");
} else {
  console.log("else...");
}
```

4.4.10 this

The `this` keyword allows you to ignore the name of the object. It is simply the object that this script is attached to, regardless of what it is called. It doesn't matter and is merely a stylistic choice. With `this`, refer to

- The instance itself within widget scripts or script object functions
- The parent instance explicitly by its variable name, such as `Chart_1`
- The parent instance as `this`

When performing the above console print on one of the events of `Chart_1` itself, use the following variation of the code:

```
var theDataSource = this.getDataSource();
console.log(theDataSource.getVariables());
```

4.4.11 switch Statements

You can use normal JavaScript `switch` statements:

```
switch (i) {
  case 0:
    day = "Zero";
    break;
  case 1:
    day = "One";
    break;
  case 2:
    day = "Two";
    break;
}
```

4.4.12 break Statement

You can use `break` to break out of loops and `switch` statements, as seen in the example above.

4.4.13 Debugging Analytics Designer Scripts in the Browser

Analytics designer supports debugging analytics designer scripts with the browser's development tools.

Note: Analytics designer supports debugging analytics designer scripts in the Chrome browser only.

Note: Analytics designer transforms the analytics designer scripts before they are run in the browser. Thus, they **will not** look exactly like the script you wrote in the script editor of analytics designer.

Note: To find the analytics designer script in the browser's development tools, the script needs to be run at least once during the current session.

Analytics Designer Script Names

Analytics designer script names follow a specific naming convention: All scripts of an application are grouped in a folder `<APPLICATION_NAME>`. Each script is named `<WIDGET_NAME>.<FUNCTION_NAME>.js`.

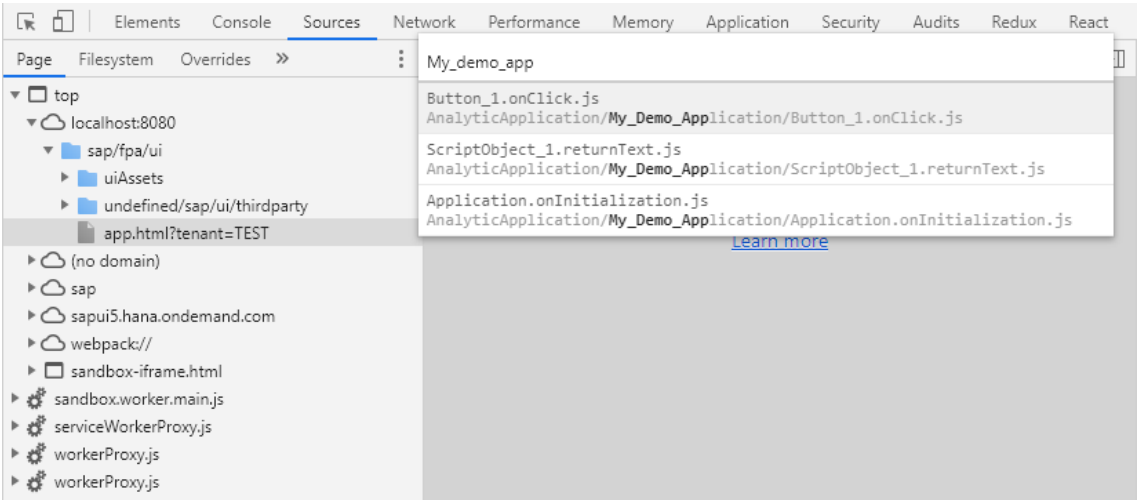
For example: If an application `My Demo Application` contains a button `Button_1` with an `onClick` handler, then the name of the script is `Button_1.onClick.js`, which is in folder `My_Demo_Application`.

Note: Special characters, for example space characters in the application name are replaced by an underscore (_), except minus (`-`) and dot (`.`) characters, which remain unchanged.

Find an Analytics Designer Script by Name

You can quickly find a script by its name with the following steps:

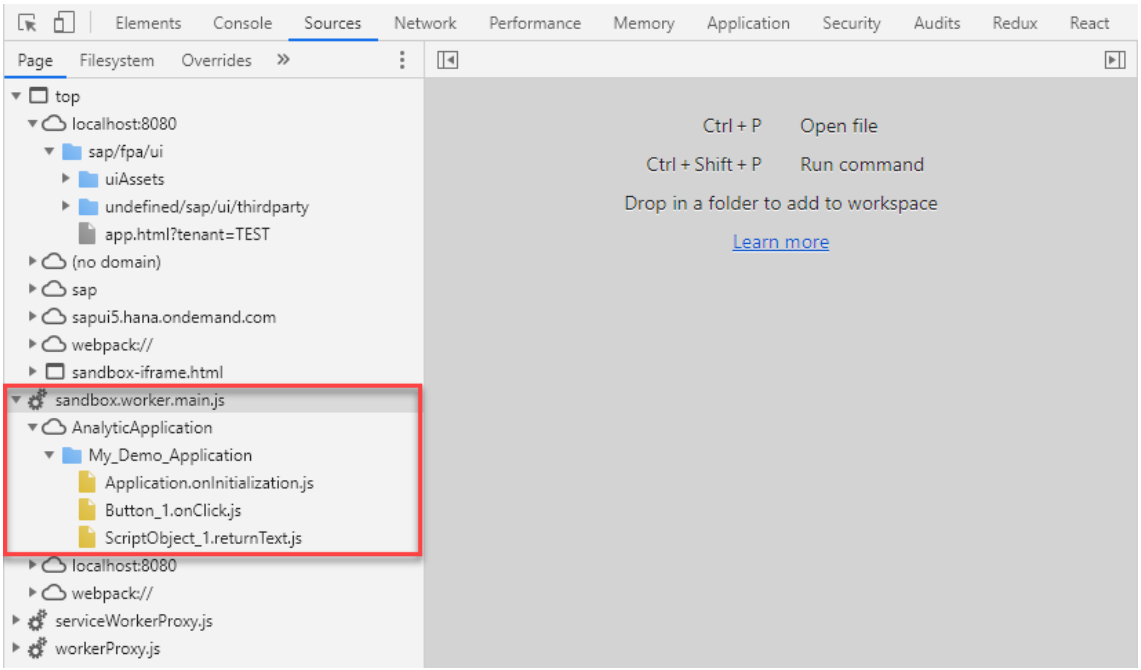
- Press `F12` to open the browser's development tools.
- Press `CTRL+P`, then start typing a part of the script's name.



Find an Analytics Designer Script by Browsing the File Tree

You can also find a script in the file tree on the left side of the development tools using the following steps:

- Press `F12` to open the browser's development tools.
- Select the tab *Sources*.
- Open the node whose name starts with `sandbox.worker.main`.
- Open the node named `AnalyticApplication`.
- Find the folder with your application's name. The scripts that have already been executed for the current analytic application appear in this folder.

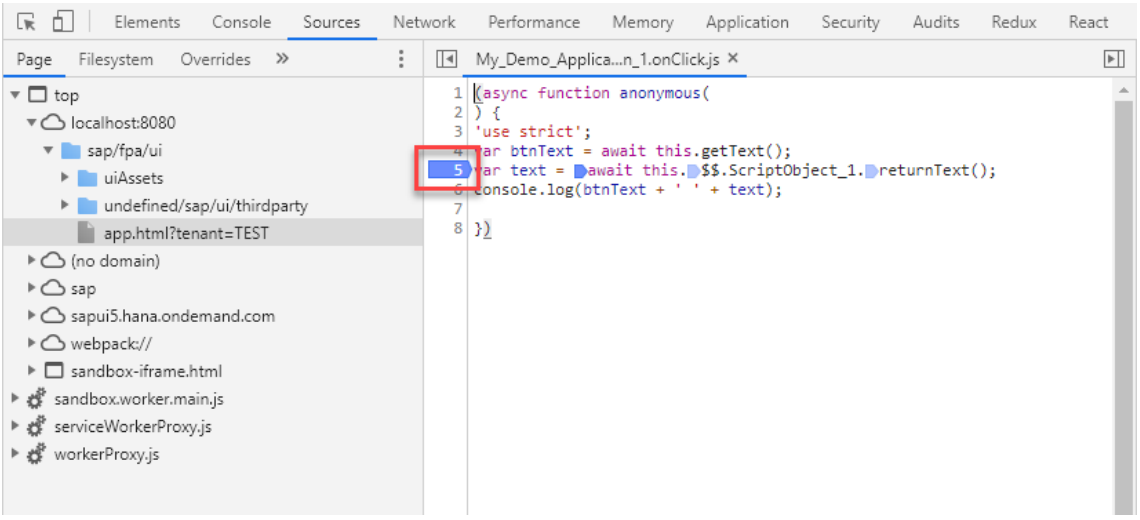


Setting and Removing Breakpoints in Analytic Designer Scripts

To pause a script while it is being executed, you can set breakpoints at certain locations in the analytic designer script.

To set a breakpoint, open the script you want to pause during its execution and click on the line number on the left side of the opened script in the developer tools.

A blue marker appears, highlighting the clicked line number. It indicates where the script will be paused when it is being executed the next time. You can add several breakpoints in one script to pause its execution at different points in time.



To remove a breakpoint, click on the blue marker. The blue maker disappears, and the script's execution won't stop at this point when the script is run the next time.

More Debugging Features

Analytic designer supports more debugging features by running an analytic application in debug mode.

You enable the debug mode for an analytic application by appending the string `;debug=true` to the URL of the analytic application in the browser.

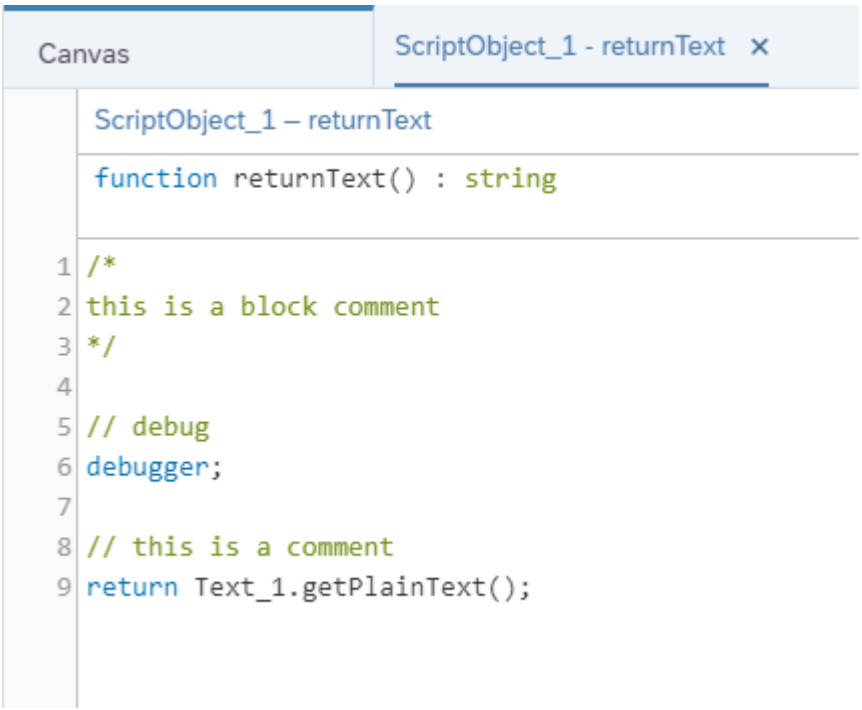
Note: The analytic designer script names in the browser change when the analytic application is run in debug mode. In debug mode, the suffix `-dbg` is added to the script name, for example, `Button_1.onClick-dbg.js`.

You enable the debug mode for an analytic application by appending the string `;debug=true` to the URL of the analytic application in the browser.

Note: The analytic designer script names in the browser change when the analytic application is run in debug mode. In debug mode, the suffix `-dbg` is added to the script name, for example, `Button_1.onClick-dbg.js`.

Enabling the debugger; Statement

When the debug mode is enabled, you can pause an analytics designer script at a specific location while it is being executed by placing a `debugger;` statement at this location of the script. The difference to a regular breakpoint is that you can define the location where the script is paused already while writing the script itself, that is, before running it.



Preserving Comments in an Analytical Designer Script

When the debug mode is enabled, then comments in a script are preserved in the transformed script that is executed in the browser. This makes it easier to recognize specifically commented locations in a script when its execution in the browser is paused.

4.5 Working with Data

You can perform many simple operations on data. Keep in mind there are no standalone data sources, and there is a `getVariables()` function on data sources.

Example:

Let's say you want to print the variables on `Chart_1` to the console.

Get the data source on a widget with its `getDataSource()` function. This returns the data source attached to that widget and allows you to perform further operations.

The snippet below prints the data source variables of `Chart_1` to the console:

```
var theDataSource = Chart_1.getDataSource();
var theVariables = theDataSource.getVariables();
console.log(theVariables);
```

4.6 Method Chaining

In the example above, one line of code executes one operation. It is useful when the individual variables might get re-used in a script, and it increases readability. But some scripts need to be made compact, and this can be done with method chaining. Certain JavaScript libraries support method chaining where the result of a previous operation can immediately be used in the same statement. SAP Analytics Cloud, analytics designer supports method chaining.

Suppose you were only logging the variables in the above example as a debug aid. You were not re-using them, and the multiple lines were visual clutter. Then you might want to use method chaining. The code below uses method chaining for compactness and does the same thing:

```
console.log(Chart_1.getDataSource().getVariables());
```

4.7 Script Runtime

Analytics designer validates the script before execution because running arbitrary JavaScript in the browser is a risk. It ensures that only allowed JavaScript subset can be used. Critical features like sending requests can be prevented or forced to use alternative secured APIs if needed. In addition, the execution is isolated to prevent

- Accessing the DOM
- Accessing global variables
- Modifying globals or prototypes
- Sending requests
- Importing scripts
- Including ActiveX, and so on
- Launching other Web Workers
- Accessing cookies
- Enforcing different domains

Validation

Validation at runtime follows the same logic as for the script editor. Not all validations have to be performed, for example, validating analytic data like filter values.

4.8 The R Widget and JavaScript

You might know the R widget from stories already. It becomes much more powerful in applications. The R widget has two separate runtime environments:

The R environment is on the server, in the R engine.

The JavaScript environment runs in the normal browser space along with the rest of the widget scripts.

Execution Order

On Startup, the R script runs and the JavaScript `onResultSetChanged` doesn't run because the widget is in its initial view state.

On data change, the R script runs first, the JavaScript `onResultChanged` event runs.

Accessing the R Environment from JavaScript

The R environment can be accessed from the JavaScript environment. It can be read from and manipulated. However, the JavaScript environment can't be accessed from the R environment.

Reading

Suppose you had an R widget that had a very simple script. It just gets the correlation coefficient between two measures on a model and puts that into a number named `gmCorrelation`:

```
grossMargin <- BestRun_Advanced$`Gross Margin`
grossMarginPlan <- BestRun_Advanced$`Gross Margin Plan`
gmCorrelation <- cor(grossMargin, grossMarginPlan)
```

Use the `getEnvironmentValues` on the R widget to access its environment and `getNumber` to read a number from the R environment. The following JavaScript code takes the correlation coefficient from the R environment and logs it to the JavaScript console. Note the `this`. This code was taken from the `onResultChanged` event of a widget with the above R snippet. It means that R widgets can be used as global data science scripts:

```
var nCcor = this.getEnvironmentValues().getNumber("gmCorrelation");
var sCor = nCcor.toString();
console.log("Margin Correlation: " + sCor);
```

Writing

You can also manipulate the R environment from JavaScript. The magic methods are `getInputParameters` and `setNumber`. The following line of JavaScript sets an R environment variable named `userSelection` to 0.

```
RVisualization_1.getInputParameters().setNumber("userSelection", 0);
```

4.9 Differences Between Analytics Cloud and Lumira

Design Studio/Lumira Designer and SAP Analytics Cloud, analytics designer have broadly similar scripting environments. Both are JavaScript based, perform similar missions and SAP Analytics Cloud, analytics designer's scripting framework was informed by experience with Design Studio. However, there are some differences that you should keep in mind.

Lumira scripts execute on the server. SAP Analytics Cloud, analytics designer scripts execute in the browser JavaScript engine. Lumira scripts execute close to the data. SAP Analytics Cloud, analytics designer scripts execute close to the user.

SAP Analytics Cloud, analytics designer is not copy-and-paste compatible with Lumira. This is partially a consequence of the close-to-data vs close-to-user philosophical difference.

Data sources are currently hidden within data bound widgets and you must access them using `getDataSource()`. When standalone data sources become available, you will be able to access them as global variables, as in Lumira.

SAC Analytics Designer not supporting automatic type conversion makes scripts more explicit and avoids common mistakes. This includes requiring a strict equality comparison operator, whereas Lumira allowed the use of the double equals comparison operator for expressions of different types.

5 Widget Concepts, APIs, and Usages

In analytics designer, widgets are UI elements and can be inserted onto the canvas. There is a wide variety of widgets available. They range from basic widgets like button, text, shape, image, dropdown, checkbox group, radio button group, to data-bound ones like Table, Chart, Geo Map, and further to custom widgets built by partners and customers.

Once you have added a widget to the canvas, you can then use its Builder Panel, Styling Panel, and Action Menu to configure its styling and runtime behavior, and even write script to configure how it interacts with other widgets.

If you need more information about any script API in analytics designer, you can read through the API Reference document which you can open from the help portal:

https://help.sap.com/doc/958d4c11261f42e992e8d01a4c0dde25/latest/en-US/index.html

5.1 Basic Widget Concepts

5.1.1 Supported Widgets

All widgets available in stories are available in analytics designer:

- Table
- Chart
- Filter Line
- Image
- Text
- Clock
- Shape
- Geo Map
- Web Page

Other widgets are available, such as:

- Dropdown
- Radio button group
- Checkbox group
- Button

Widgets can also be

- Custom-made by partners and customers

or belong to other varieties like a web page or a clock

5.1.2 Custom Widgets

You can create your own widgets with the Custom Widget SDK, which lets you extend the predefined set of widgets provided by analytics designer.

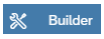
This is very useful, for example, if you need a specific user interface element, a particular visualization of data, or a certain functionality in your analytic application that is not provided by the predefined set of widgets.

Custom widgets seamlessly integrate into SAP Analytics Cloud, analytics designer.

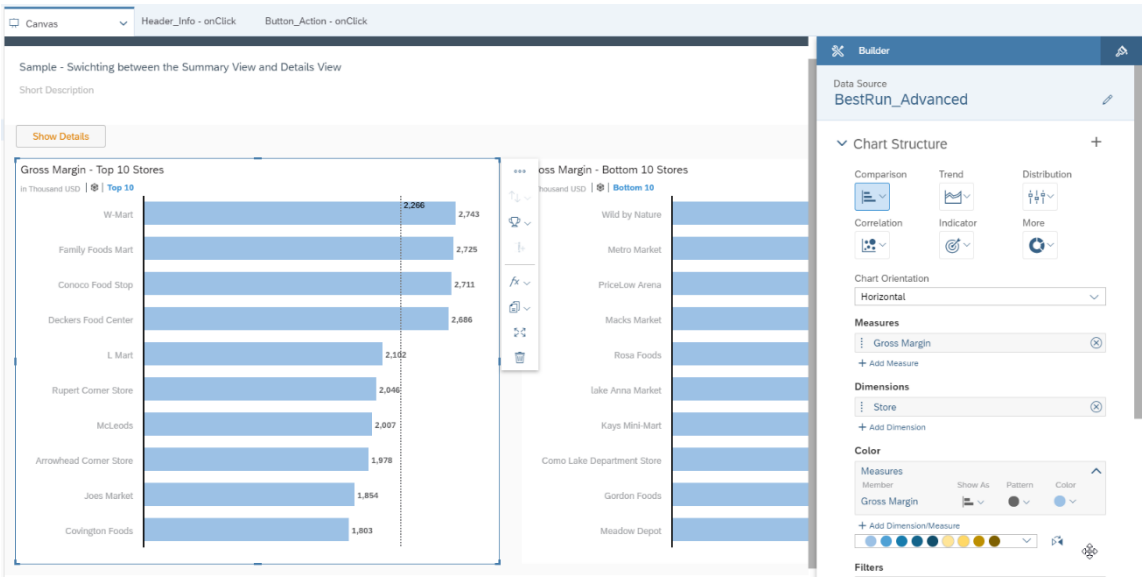
Find the Custom Widget SDK documentation at

`https://help.sap.com/viewer/0ac8c6754ff84605a4372468d002f2bf/latest/en-US`.

5.2 The Builder Panel

If you select a widget 

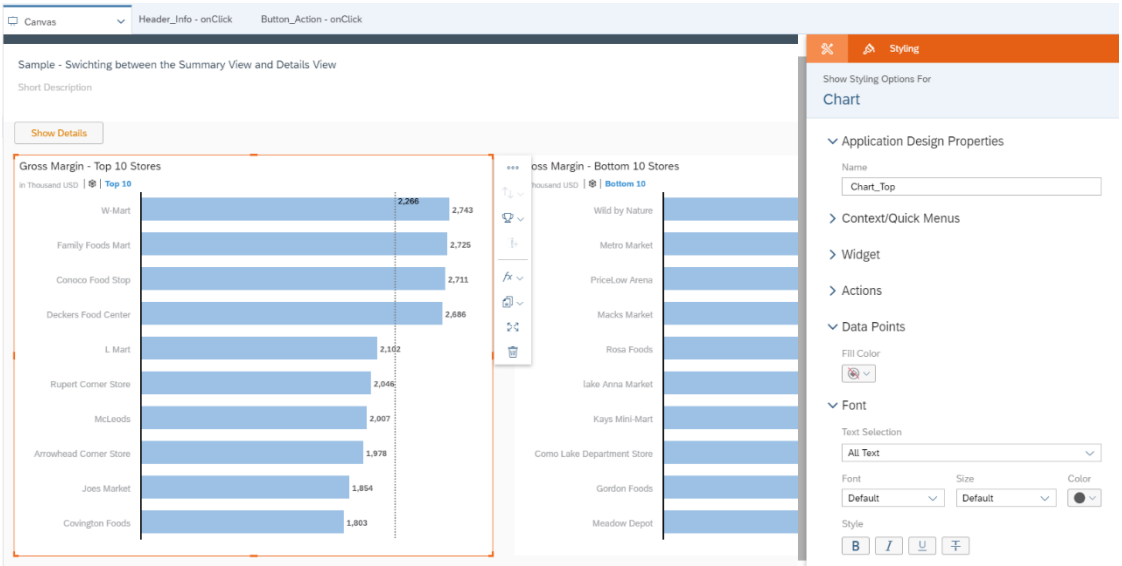
on the canvas, the Builder Panel opens on the right-hand side. With the Builder Panel you configure your widget's data-related settings. The following example shows, how to select at least a chart type, measures, and dimension to build a chart. You can add other characteristics of this chart as well: for instance, a Reference Line. Different widgets have different configurations.



5.3 The Styling Panel

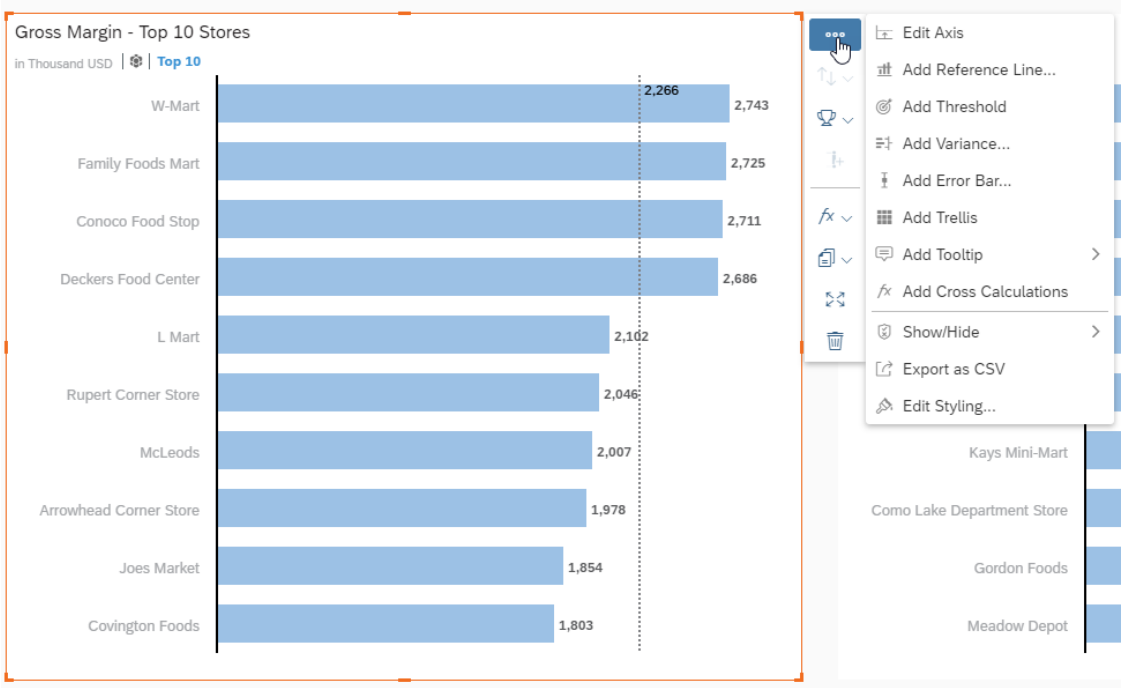
You can configure the format of a widget 

with the help of the Styling Panel. Multiple properties are provided with the Styling Panel, for example background color, font and data formats.



5.4 Action Menu

The action menu  is a dynamic menu and is only visible if the widget is selected. Different widgets have different options available, and some of the options are not available in view mode.



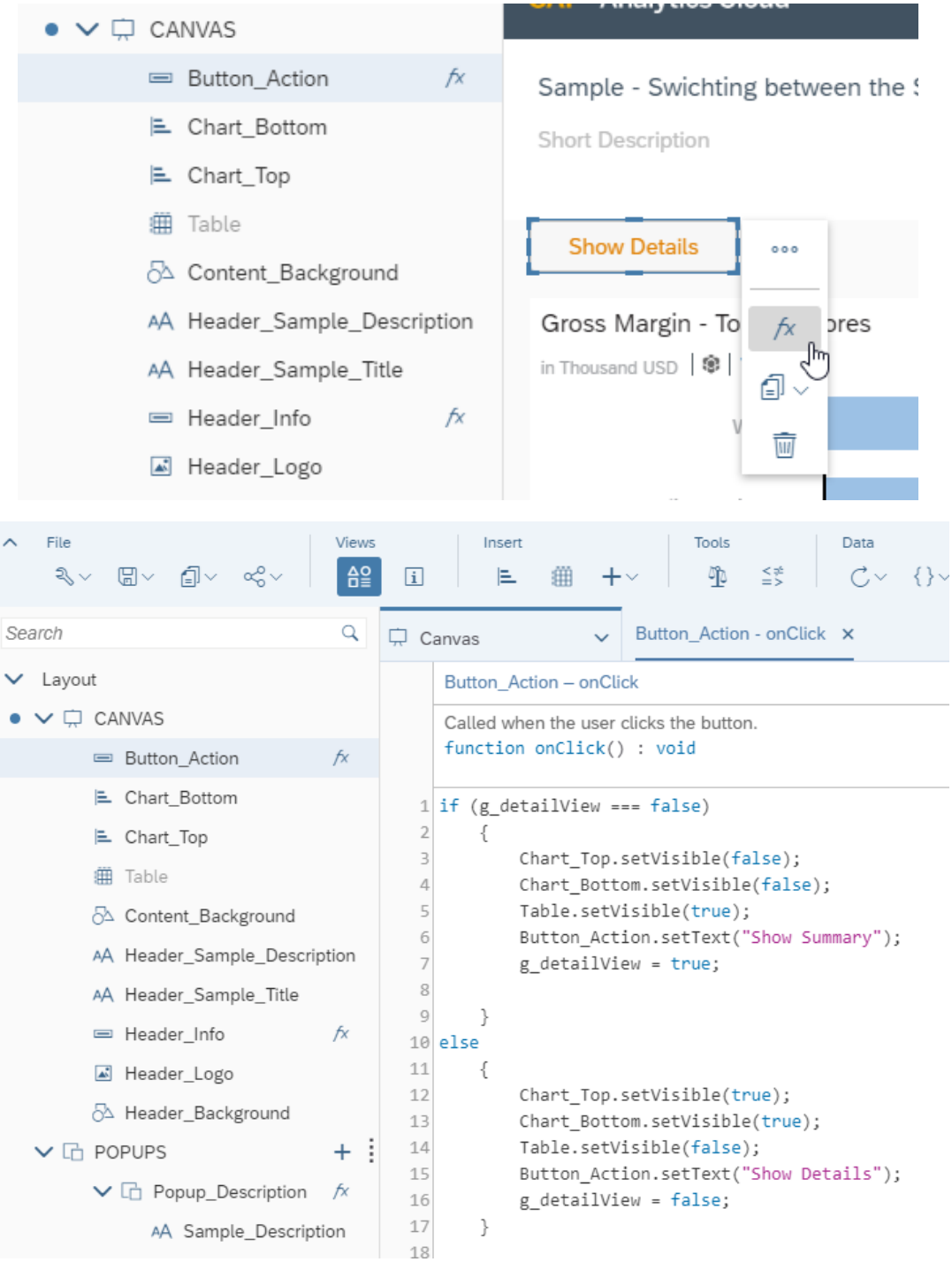
5.5 Script Editor View

Scripting provides you a powerful way to define a widget's runtime behavior and how it can interact with other widgets and other available functionality.

To edit a script function,

- Click the *fx* button in the *Action Menu*
- Or click the same button next to the widget name in the *Outline*.

It opens the *Script Editor* view.



5.6 Table

5.6.1 Table APIs

The Table widget displays data in rows and columns. In contrast to a chart (which is the graphical representation of data to help understand the relationship between a large quantity of data and its parts), a table is used to keep track of information such as quantities, price, text description,

and other details. However, both are important means to present data and to enable end users to directly interact with data.

Analytics designer provides table APIs and Data Source APIs to help analytics designers use script custom specific logic into their analytic applications.

Besides the common widget APIs like `getVisible()` and `setVisible()`, the main Table APIs are listed below:

addDimensionToColumns

```
addDimensionToColumns(dimension: string|Dimension, position?: integer): void
```

Adds the dimension to the column axis at the specified position. If no position is specified, the dimension is added as the last dimension of the column axis.

Example:

```
Table_1.addDimensionToColumns("Location_4nm2e04531");
```

addDimensionToRows

```
addDimensionToRows(dimension: string|Dimension, position?: integer): void
```

Adds the dimension to the row axis at the specified position. If no position is specified, the dimension is added as the last dimension of the row axis.

Example:

```
Table_1.addDimensionToRows("Location_4nm2e04531");
```

getDataSource

```
getDataSource(): DataSource
```

Returns the data source of the table. If the table has no data source, `undefined` is returned. Refer to the section on data-related APIs.

getDimensionsOnColumns

```
getDimensionsOnColumns(): Dimension[]
```

Returns the dimensions on the column axis.

getDimensionOnRows

```
getDimensionsOnRows(): Dimension[]
```

Returns the dimensions on the row axis.

getPlanning

```
getPlanning(): Planning
```

Returns the planning object of the table. If the table data source is not of type planning, `undefined` is returned.

Refer to the section on Planning.

getSelections

```
getSelections(): Selection[]
```

Returns the selections of the chart. You can use the elements of the returned array with the function `DataSource.getData()` to get the value of a cell. See also the documentation of `Selection` (`https://help.sap.com/doc/958d4c11261f42e992e8d01a4c0dde25/2019.8/en-US/doc/Selection.html`).

```
getSelections(): Selection[]
```

Returns the selections of the chart. You can use the elements of the returned array with the function `DataSource.getData()` to get the value of a cell. See also the documentation of `Selection` (`https://help.sap.com/doc/958d4c11261f42e992e8d01a4c0dde25/2019.8/en-US/doc/Selection.html`).

removeDimension

```
removeDimension(dimension: string|Dimension): void
```

Removes the dimension from whichever axis it is present on. If the dimension is neither on the Rows nor Columns axis, the operation is ignored.

Example:

```
Table_1.removeDimension("Location_4nm2e04531");
```

5.6.2 Table Events

onResultChanged

```
onResultChanged()
```

Called when the result set displayed by the table changes.

onSelect()

```
onSelect()
```

Called when the user selects within the table.

5.7 Chart

5.7.1 Chart APIs

A chart is a graphical representation of data in symbols such as bars, lines, or slices. Analytics designer provides chart APIs and data source APIs to help analytics designers use script custom specific logic into their analytic applications.

Besides the common widget APIs like `getVisible()` and `setVisible()`, the main Chart APIs are as below:

addDimension

```
addDimension(dimension: string|Dimension, feed: Feed, position?: integer): void
```

Adds a dimension to the feed at the specified position. If no position is specified, the dimension is added at the end of the feed.

Example:

```
Chart_1.addDimension("Location_4nm2e04531", Feed.CategoryAxis);
```

addMeasure

```
addMeasure(measure: string|Measure, feed: Feed, position?: integer): void
```

Adds the measure to the feed, at the specified position. If no position is specified, the measure is added at the end of the feed.

Example:

```
Chart_1.addMeasure("[Account_BestRunJ_sold].[parentId].&[Gross_MarginPlan]",Feed.Va
lueAxis);
```

getDataSource

```
getDataSource(): DataSource
```

Returns the data source of the chart. If the chart has no data source, `undefined` is returned.

Refer to the section on data-related APIs

getForecast

```
getForecast(): Forecast
```

Returns the forecast of the chart.

Refer to the section on Forecast.

getMeasure

```
getMeasures(feed: Feed): Measure[]
```

Returns the measures of the feed.

Example:

```
var measures = Chart_1.getMeasures(Feed.ValueAxis);
```

getSelections

```
getSelections(): Selection[]
```

Returns the selections of the chart. You can use elements of the returned array with the function `DataSource.getData()` to get the value of a cell. See also the documentation of Selection (`https://help.sap.com/doc/958d4c11261f42e992e8d01a4c0dde25/2019.8/en-US/doc/Selection.html`).

getSmartGrouping

```
getSmartGrouping(): SmartGrouping
```

Returns the Smart Grouping of the chart.

Refer to the section on Smart Grouping.

removeDimension

```
removeDimension(dimension: string|Dimension, feed: Feed): void
```

Removes the dimension from the feed.

Example:

```
Chart_1.removeDimension("Location_4nm2e04531", Feed.CategoryAxis);
```

removeMeasure

```
removeMeasure(measure: string|Measure, feed: Feed): void
```

Removes the measure from the feed.

Example:

```
Chart_1.removeMeasure("[Account_BestRunJ_sold].[parentId].&[Gross_MarginPlan]",Feed
.ValueAxis);
```

5.7.2 Chart Events

onResultChanged

```
onResultChanged()
```

Called when the result set displayed by the chart changes.

onSelect

```
onSelect()
```

Called when the user selects within the chart.

5.8 Result Set APIs

With the help of result set APIs, an application developer can get a result set based on an input data selection. So that he can traverse and get each data cell in the result set. Currently the APIs are available in chart and table widgets.

Return the Result Set According to the Selections

There are several use cases when trying to retrieve result set, such as with or without input selection. And as an application designer, you can also define the offset of dataset and the number of limits that you want to get.

```
// No input parameter, all data points of Chart_1 will be in result
// set
// Both dimension and measure context are returned, including parent
// information if it has hierarchy structure
Chart_1.getDataSource().getResultset();


// Specify input parameter (Location is CT1)
Chart_1.getDataSource().getResultset({"@MeasureDimension":
"[Account_BestRunJ_sold].[parentId].&[Gross_Margin]", "Location":
"[Location].[State].&[CT1]"});


// Specify offset and limit. Two data cells from the beginning are
// returned.
Table_1.getDataSource().getResultset(null, 0, 2);
```

Get Member Metadata

The dimension member information you are interested in can be retrieved according to selection as well. The information includes ID, description, and parent ID.

```
// Get the dimension member of "California"
```

```
Chart_1.getDataSource().getResultMember("Location", {"Location": "California",
"Product": "Alcohol"});


// Get distinct product member of table widget according to input
// selection
var selections = Table_1.getDataSource().getDataSelections();
var memberIds = ArrayUtils.create(Types.string);
for (var i = 0; i < selections.length; i++) {
  var member = Table_1.getDataSource().getResultMember("Product_4nm2e04531",
selections[i]);
  if (member && member.id && memberIds.indexOf(member.id) < 0) {
    memberIds.push(member.id); // ["P1", "P2"]
  }
}
```

Get the Number of Visible Table Column or Row

For table widget, the application designer can get the number of visible columns or rows in a table via APIs.

```
Table_1.getRowCount();
Table_1.getColumnCount();
```

5.9 Prompt API

You can use the Prompt API on a data source to perform variable-related operations in in a script.

5.9.1 Using openPrompt()

You can open the Prompt dialog on a data source with the method `openPromptDialog()`.

Example:

In the following example, the Prompt dialog of a table's data source is opened:

```
Table_1.getDataSource().openPromptDialog();
```

5.9.2 Using getVariables()

You can get the variables of a data source with the method `getVariables()`. This method returns an array of all variables as `VariableInfo` objects.

Example:

In the following example, the names of all variables of a data source are printed to the browser console:

```
var aVariables = Table_1.getDataSource().getVariables();
for (var i = 0; i < aVariables.length; i++) {
  console.log(aVariables[i].id);
}
```

5.9.3 Using setVariableValue()

To set variable values, use the script method `setVariableValue()` in the following form on a data source:

```
dataSource.setVariableValue(variable_name, variable_value);
```

Tip: In the script editor, there is context assist available for selecting variable names and variable values.

Note: By default, this function will apply variable values of a variable to the model used by the data source of the application. The widget can be configured such that variables are applied to the model of the widget only (see Figure 39). You can find out, for example, in the title area of the table whether the variables are applied on the model of the data source of the application (grey braces) or on the model of the widget only (blue braces) (see Figure 40).

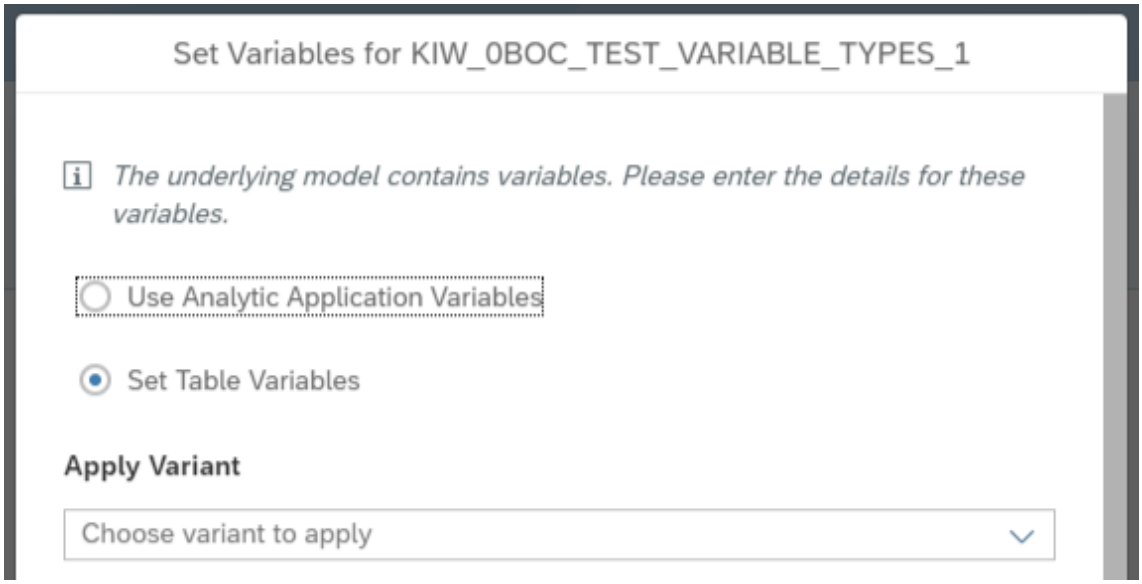


Figure 39: Prompt Dialog: Variable Values Are Applied to the Widget Only

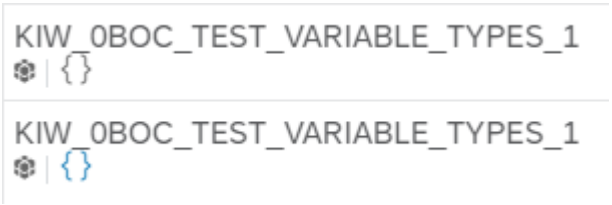


Figure 40: Variable Values Are Applied to the Model of the Application or the Widget

Note: This method is not validating the specified variable values neither at runtime nor at design time. All values and value combinations which are accepted in the Prompt dialog will be supported. All other combinations might lead to errors or inconsistent state.

Known limitation: Setting variable values of hierarchy node variables is not supported yet.

5.9.3.1 Single Variable Values

If the variable supports single variable values, you can set a variable value as follows:

Example:

```
Table_1.getDataSource().setVariableValue("VAR_NAME", {value: "5"});
```

or, alternatively,

```
Table_1.getDataSource().setVariableValue("VAR_NAME", "5");
```

If the variable supports excluding a single variable value, you can set the variable value as follows:

Example:

```
Table_1.getDataSource().setVariableValue("VAR_NAME", {exclude: true, value: "5"});
```

5.9.3.2 Multiple Variable Values

If the variable supports multiple values, you can set the variable values as follows:

Example:

```
Table_1.getDataSource().setVariableValue("VAR_NAME", {values: ["5", "7"]});
```

If the variable supports excluding multiple values, you can set the variable value as follows:

Example:

```
Table_1.getDataSource().setVariableValue("VAR_NAME", {exclude: true, values: ["5",
"7"]});
```

5.9.3.3 Comparisons

If the variable supports comparison operations `<`, `<=`, `>`, and `>=` you can set the variable value as follows:

Example:

```
Table_1.getDataSource().setVariableValue("VAR_NAME", {less: "5"});
Table_1.getDataSource().setVariableValue("VAR_NAME", {lessOrEqual: "5"});
Table_1.getDataSource().setVariableValue("VAR_NAME", {greater: "5"});
Table_1.getDataSource().setVariableValue("VAR_NAME", {greaterOrEqual: "5"});
```

5.9.3.4 Ranges

If the variable supports a range of variable values, you can set the variable value as follows:

Example:

```
Table_1.getDataSource().setVariableValue("VAR_NAME", {from: "5", to: "7"});
```

If the variable supports excluding a range of variable values, you can set the variable value as follows:

Example:

```
Table_1.getDataSource().setVariableValue("VAR_NAME", {exclude: true, from: "5", to:
"7"});
```

5.9.4 Using removeVariabeValue()

You can remove the variable value of a variable of a data source with the method `removeVariableValue()`.

Note: If you remove a variable value from a mandatory variable, then this operation is ignored.

Example:

In the following example, the variable value of variable `V_Supervisor` is removed:

```
Table_1.getDataSource().removeVariableValue("V_Supervisor");
```

5.9.5 Using copyVariableValueFrom()

You can copy the variable value from one, several, or all variables of a data source to another variable with the method `copyVariableValueFrom()`.

Note: If you copy an empty variable value to a mandatory variable then copying this variable value is ignored.

Note: If you copy a variable value to a data source of a widget that overrides variables and the variable is of type text, then copying this variable value is ignored.

Example:

In the following example, the variable value of variable `V_Country` is copied from data source 1 to data source 2:

```
var DS_1 = Table_1.getDataSource();
Table_2.getDataSource().copyVariableValueFrom(DS_1, "V_Country");
```

Example:

In the following example, the variable values of variables `V_Country` and `V_Supervisor` are copied from data source 1 to data source 2:

```
var DS_1 = Table_1.getDataSource();
Table_2.getDataSource().copyVariableValueFrom(DS_1, ["V_Country", "V_Supervisor"]);
```

Example:

In the following example, the variable values of all variables are copied from data source 1 to data source 2:

```
var DS_1 = Table_1.getDataSource();
Table_2.getDataSource().copyVariableValueFrom(DS_1);
```

5.10 Popup and Dialog

A Popup or Dialog is usually a small window on top of the main page of the application. It communicates information to the user or prompts them for inputs.

For instance, a Popup can show a description of the application, and another Popup can ask the user to perform configurations. Because the popup acts as a container widget, you can put any other widget into the popup, such as a table, button, or checkbox.

You can choose to design a popup starting from scratch. Start with an empty canvas and have the flexibility to add whatever widget you want. You can enable the header and footer setting to turn the popup directly into a popup dialog that has a consistent look and feel compared to other dialogs in SAP Analytics Cloud stories.

5.10.1Main Popup and Dialog APIs

close

```
close(): void
```

getTitle

Hides the popup.

```
getTitle(): string
```

open

Returns the title of the popup.

```
open(): void
```

setTitle

Shows the popup.

```
setTitle(title: string): void
```

Sets the title of the popup.

5.10.2Button-Related Popup and Dialog APIs

isButtonEnabled

```
isButtonEnabled(buttonId: string): Boolean
```

Returns whether the specified button in the footer of the popup is enabled.

isButtonVisible

```
isButtonVisible(buttonId: string): Boolean
```

Returns whether the specified button in the footer of the popup is visible.

setButtonEnabled

```
setButtonEnabled(buttonId: string, enabled: boolean): void
```

Enables or disables the specified button in the footer of the popup.

setButtonVisible

```
setButtonVisible(buttonId: string, visible: boolean): void
```

Shows or hides the specified button in the footer of the popup.

onButtonClick

```
onButtonClick(buttonId: string)
```

Called when the user clicks one of the buttons in the footer of the popup.

5.10.3Popup and Dialog Events

onButtonClick

```
onButtonClick(buttonId: string)
```

Called when the user clicks one of the buttons in the footer of the popup.

5.10.4 Known Limitations with Popup and Dialog

Need to add at least two widgets to a popup to run the popup as designed

We recommend you add at least two widgets to a popup as widgets are the visualization of the popup. If no widgets are added, you won't see the popup displayed when you trigger it while running the analytic application. If only one widget is added, the height and width you set for the popup won't take effect.

When a table or chart in the canvas act as the source widget of a filter line widget in a popup, source widget can't find the filter line as its reference after reloading the analytic application

In the case when a table or chart in the canvas act as the source widget of a filter line widget in a popup and you reopen or refresh the analytic application, you will find the filter line isn't listed in the reference list of the table or chart widget after you choose *Find Reference*. This is because currently we don't initiate the filter line widget in the popup when you first entering an analytic application.

To solve this, for now we recommend you activate the popups by clicking on each of them. Then the reference list will display all relevant results.

5.11 Text Widget

Use the Text widget to add user-defined text to your application. The style of the text can be configured as usual. You could refer to sample *Show R Visualization result in Text*. The most frequently used usages, getting and setting texts, and adding dynamic text are demonstrated and explained.

5.11.1 Changing Text

In *Show R Visualization result in Text*, the total value of gross margin is dynamically updated in `Text_GrossMargin` when switching among locations. Via API, `applyText()`, you can customize the display text of a Text at runtime:

```
if (totalSum) {
  Text_GrossMargin.applyText(totalSum.toString());
} else {
  Text_GrossMargin.applyText("loading...");
}
```

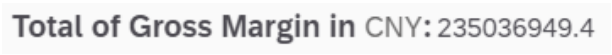
The Text shows *"loading…"* until `totalSum` is valid.

The text style can be configured by each segment. In-place edit the text by double-clicking the Text input field of `Text_Title` in Canvas and config the style of description.

5.11.2 Adding Dynamic Text

Add a script variable as the source of dynamic text to a Text widget to automatically update the text based on the values. For example, in *Show R Visualization result in Text*, `ScriptVariable_Currency` is defined and used in `Text_Title`.

The script variable can be exposed as URL parameter if you switch on the option. For example, if you input `p_ScriptVariable_Currency=CNY` in the URL link, you'll get the following:



5.12 RSS Feed

Use the RSS feed widget to present relevant articles from an RSS feed alongside data and visualizations. Leverage the open APIs to dynamically update the list of RSS feeds according to your actions. For example, show blogs relevant to your area of interest. The sample *Present relevant RSS articles* can be referred for the most frequently used APIs.

Configure Feeds

The RSS feeds in the widget can be updated dynamically at runtime via APIs when you select in `Chart_RSSCategory` in *Present relevant RSS articles*.

Example:

If you select *Business* in the chart, *BBC Business* is added in the list of feeds and selected by default after running the scripts below:

```
RssReader_Content.removeAllFeeds();
RssReader_Content.addFeed("BBCBusiness","http://feeds.bbci.co.uk/news/business/rss.xml");
RssReader_Content.setSelectedFeed("http://feeds.bbci.co.uk/news/business/rss.xml")
```

5.13 R Visualization

Use the R Visualization widget to leverage R scripts. It allows you to build your own visualizations, do calculation, and more. Refer to sample *Show R Visualization result in Text* for the most frequently used APIs.

In the script of R Visualization, you can define parameters to get input values or return results calculated in the script.

Example:

Configure the title of visualization R Visualization in *Show R Visualization result in Text* per location by input parameter:

```
RVisualization.getInputParameters().setString("titleParam", "Gross Margin of Oregon");
```

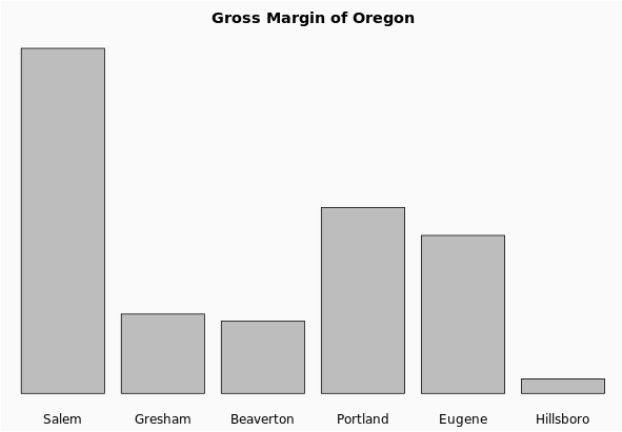
Example:

Calculate the total of gross margin in `RVisualization` script, and return the result:

```
RVisualization.getEnvironmentValues().getNumber("totalSum");
```

Configure the data source of the R Visualization via APIs. For example, in *Show R Visualization result in Text*, the dimension filter is set to *Oregon* when you change location via `Dropdown_Location` by this

```
RVisualization.getDataFrame("BestRunJuice_SampleModel").getDataSource().setDimensionFilter("Location_4nm2e04531", ["CT13", "CT14", "CT15", "CT16", "CT17", "CT18"]);
```



5.14 Geo Map

The Geo Map widget is now supported in analytic applications. It lets application users overlay multiple layers of business data on a base map and explore the information behind the data from a geographical point of view.

The Geo Map widget in an analytic applications has the same capabilities as in a Story, and also provides APIs to make changes by scripting.

Configure Layer Visibility

Since a Geo Map widget can have multiple visualization layers on the top, there are APIs to control their visibility so users can decide which layers they need to see.

```
GeoMap_1.getLayer(0).setVisible(true);
GeoMap_1.getLayer(0).isVisible();
```

5.15 Layout APIs

As an application designer, you can directly set a widget's size and position in a parent container in the *Styling* panel. In addition to that, by leveraging the layout related APIs, you can allow application users to dynamically set a widget's size and position according to the application logic and window size.

```
LayoutUnit.Pixel // sets the unit of the layout as Pixel
LayoutUnit.Auto // sets the unit of the layout as Auto
LayoutUnit.Percent // sets the unit of the layout as Percent
LayoutValue.create(value: number, LayoutUnit: Unit) // sets the layout value by
creating a value with a certain unit


getLayout(): Layout // gets the layout of a widget
Layout.getLeft(): Unit; // Returns the left margin between the widget that you
define layout for and the widget's parent container.
Layout.setLeft(value: Unit); // Sets the left margin between the widget that you
define layout for and the widget's parent container.
Layout.getRight(): Unit; // Returns the right margin between the widget that you
define layout for and the widget's parent container.
Layout.setRight(value: Unit); // Sets the right margin between the widget that you
define layout for and the widget's parent container.
```

```
Layout.getTop(): Unit; // Returns the top margin between the widget that you define layout for and the widget's parent container.
Layout.setTop(value: Unit); // Sets the top margin between the widget that you define layout for and the widget's parent container.
Layout.getBottom(): Unit; // Returns the bottom margin between the widget that you define layout for and the widget's parent container.
Layout.setBottom(value: Unit); // Sets the bottom margin between the widget that you define layout for and the widget's parent container.
Layout.getWidth(): Unit; // Returns the width of the widget that you define layout for.
Layout.setWidth(value: Unit); // Sets the width of the widget that you define layout for.
Layout.getHeight(): Unit; // Returns the height of the widget that you define layout for.
Layout.setHeight(value: Unit); // Sets the height of the widget that you define layout for.


// Application Canvas Resize Event, the event is cached to be
// dispatched every 500ms when the application window resizes.
Application.onResize() = function() {
};


Application.getInnerHeight() // If canvas' size is fixed, it returns the height of the canvas; if dynamic, returns the height of the viewport, the visible area of the window.
Application.getInnerWidth() // If canvas' size is fixed, it returns the width of the canvas; if dynamic, returns the width of the viewport, the visible area of the window.
```

We don't have the mechanism yet to automatically flow the widgets when the screen size changes, which will be introduced in future. But we can cover some of the responsive scenarios by combining dynamic layout and the scripting APIs. In an analytic application, more than just flow UI, you have the flexibility to add a widget on top of a background shape, overlapping but not flow them, and they can shrink or grow in the same proportion when the window size changes.

You need two steps to make it happen:

Step 1: Set Size and Position in Styling Panel

You can set each widget's *Left*, *Width*, *Right* and *Top*, *Height*, *Bottom* values in Pixel, Percentage and Auto (relative to its parent container, root canvas if not in a container) values on the *Styling* panel's *Layout Section*.

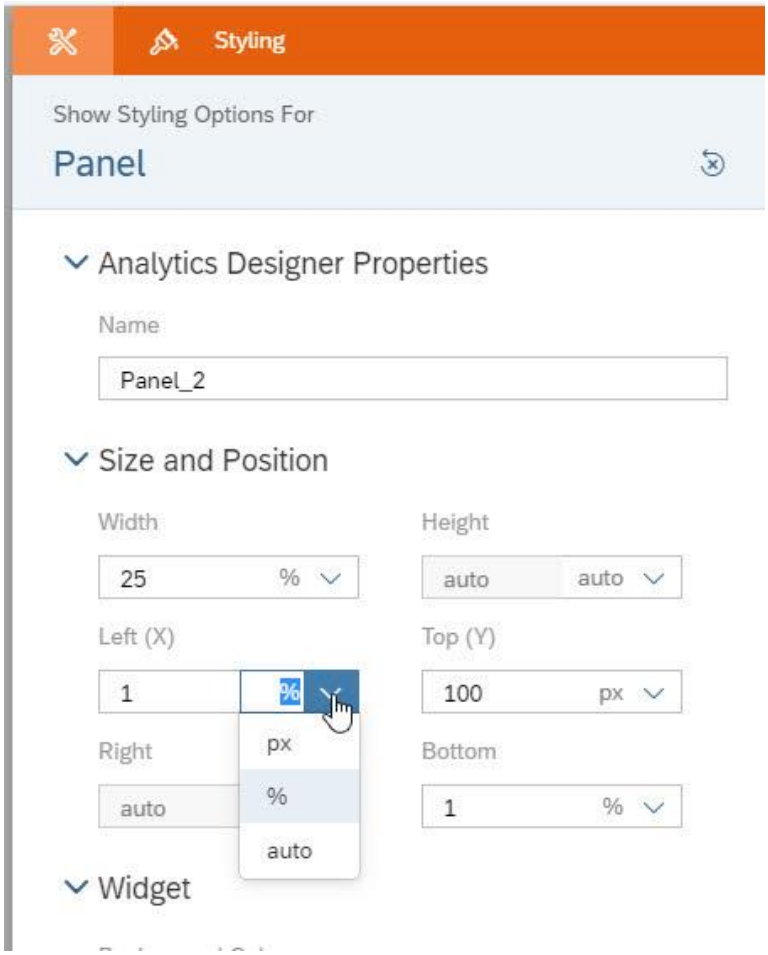


Figure 41: Layout Section in the Styling Panel

In order to adapt to the screen real-estate at runtime on different machines or browser window, you need to set the unit to percentage (%) or auto.

Step 2: Dynamically Set the Size and Position in Application.onResize Event

Application canvas `onResize` event, the event is cached to be dispatch every 500 ms when the application window resizes.

Inside the `onResize` event, you can use the Layout API to dynamically set the size and position.

Below code sample shows how to adjust the layout to fit a small screen size like phone.

```
// small screen size
if (screenWidth < 500 || screenHeight < 500) {
  Panel_3.setVisible(false);
  Panel_2.getLayout().setWidth(LayoutValue.create(98,
    LayoutUnit.Percent));
  Panel_2.getLayout().setBottom(LayoutValue.Auto);
  Panel_2.getLayout().setHeight(LayoutValue.create(376,
    LayoutUnit.Pixel));

  Panel_3.getLayout().setBottom(LayoutValue.Auto);
  Panel_3.getLayout().setLeft(LayoutValue.create(1,
    LayoutUnit.Percent));
```

```
    Panel_3.getLayout().setTop(LayoutValue.create(476,
      LayoutUnit.Pixel));
    if (screenWidth < 500) {
      //one column
      Panel_3.getLayout().setHeight(LayoutValue.create(
        (baseChartHeight + padding) * 4 + padding * 3 +
        Table_1.getLayout().getHeight().value, LayoutUnit.Pixel));
    } else {
      //two columns
      Panel_3.getLayout().setHeight(LayoutValue.create(840,
        LayoutUnit.Pixel));
    }
    Panel_3.setVisible(true);
  }
```

With the Layout APIs, you have all the flexibility to adjust the application based on the screen size, to create a responsive application in an analytic application.

6 Typical Patterns and Best Practices

6.1 Switching Between Chart and Table

In this example, we will explore how to switch between a Chart and a Table using a toggle feature in an analytic application.

To achieve this, we will add an icon that represents a Chart and another that represents a Table. Then, we will write scripts for each of the images/icon we added to make it so that when we click on the Chart icon, the chart will appear, and the Table will be invisible, and vice versa.

Our default setting, shown when the application is first run, will be to make the Table visible (and the Chart invisible).

The result will look like this when we first run the application:

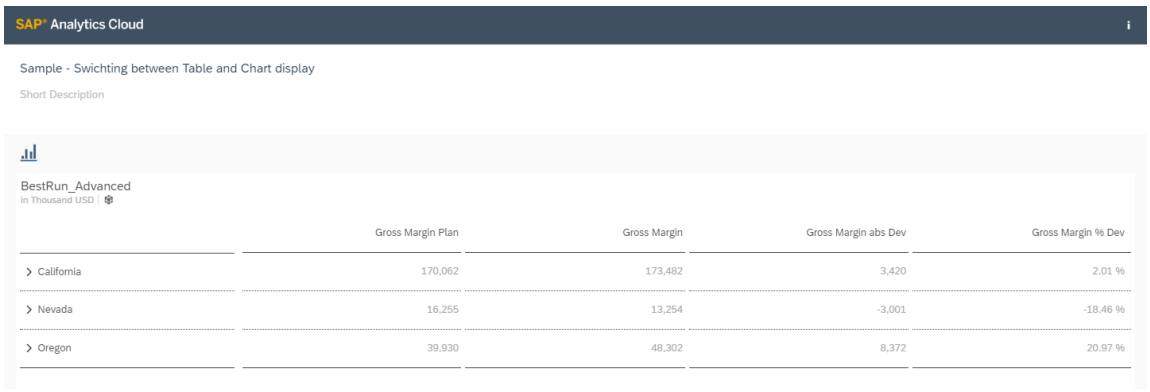


Figure 42: Example Application Switch Chart Table

And if we click on the  image, we will get the Chart and the image will change its look to a Table icon  and if we select it we come back to the view of the previous screenshot:

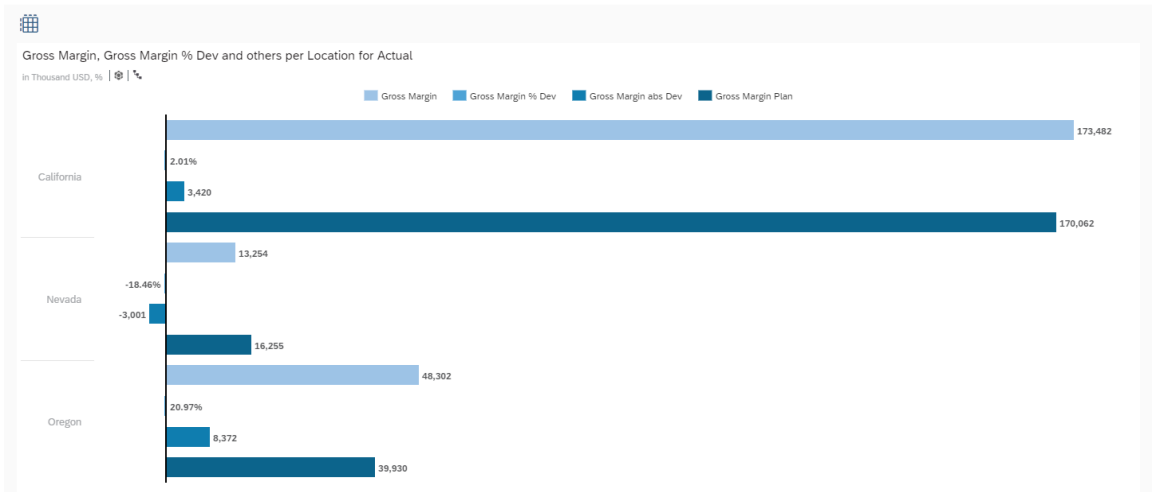
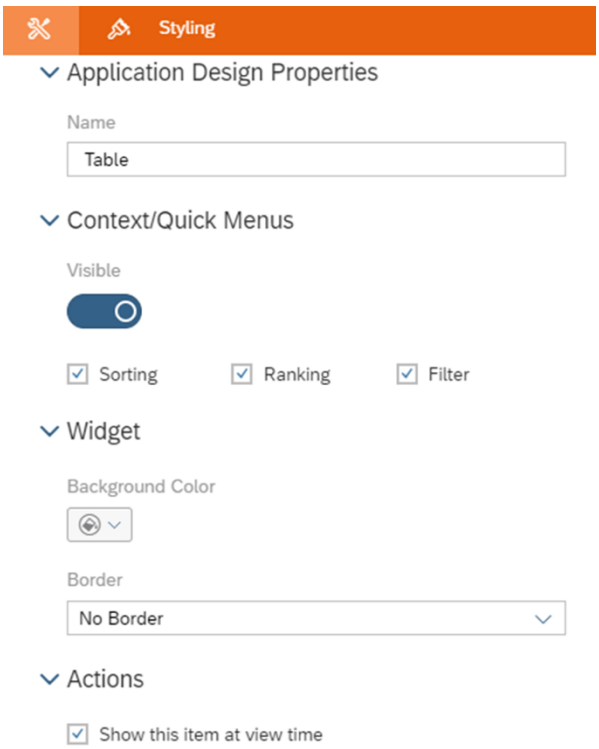
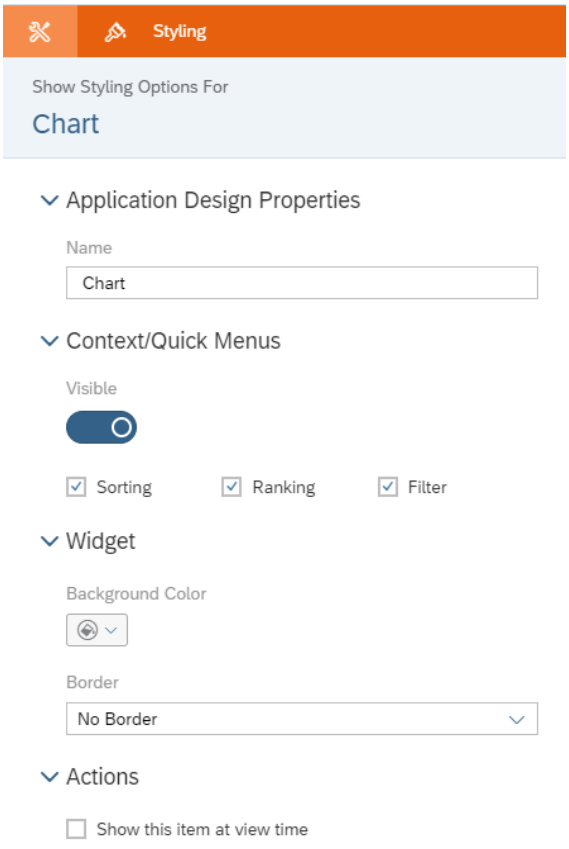
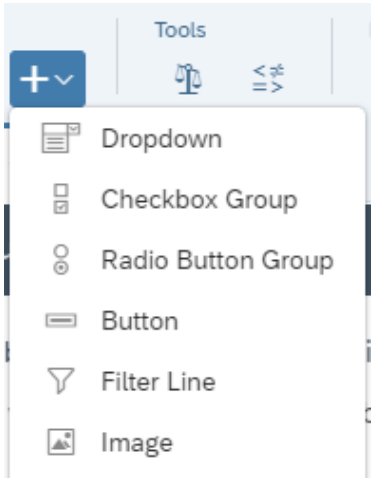
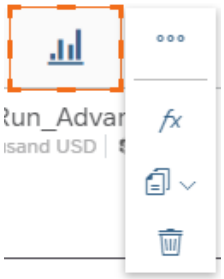


Figure 43: Switch Chart Table

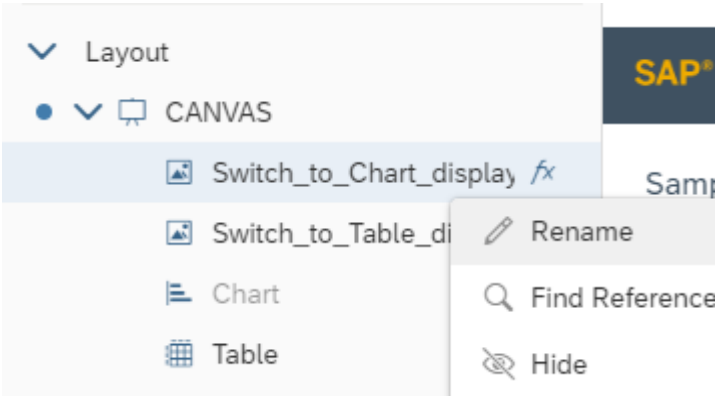
Prerequisites for this use case is having already added a Table and a Chart to your canvas. Please select, for example, the model *BestRun_Advanced* as data source.

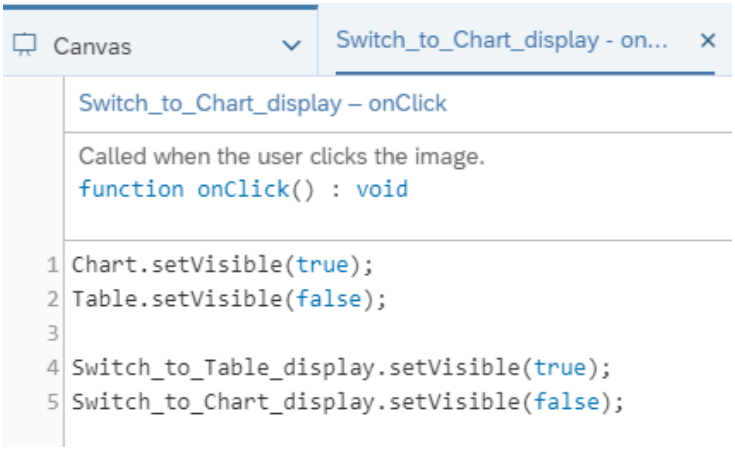
Select the Table in your canvas and click on Designer. Go to the Styling Panel and under Actions, select “Show this item at view time”. Afterwards, change the name of the widget to Table.	
Select the Chart afterwards and make sure that the action “Show this item at view time” is deselected. Afterwards, we will do the same as in the Table and change the name of this widget to “Chart”	

Choose the images you want the user to click on to change from Table to Chart and back. Here,  and  were used. You can insert them on top of each other so that when one is clicked on, the other one will appear in the same place. To insert an image, go to the Insert Panel and under the "+" Icon, select Image.	
To enable the switch between table and chart, we will edit the name and then the scripts of both images. First, we will edit the Chart Image's script. Select the image of the Chart you added and click on the  button.	

This will open the onClick script of the image.
Here, we will write a script that makes it possible to switch from the Table to the Chart.
We have set the name of the  icon to Switch_to_Table_display and the name of the  icon to Switch_to_Chart_display.
This can be done through the Canvas in the Layout or Styling Panel.

This script makes the Chart visible and the Table invisible as well as set the visibility of the Table icon to true and the visibility of the Chart icon to false. This way when the Chart is visible, the icon of the Table will also be visible to indicate our ability to now switch back to the Table.

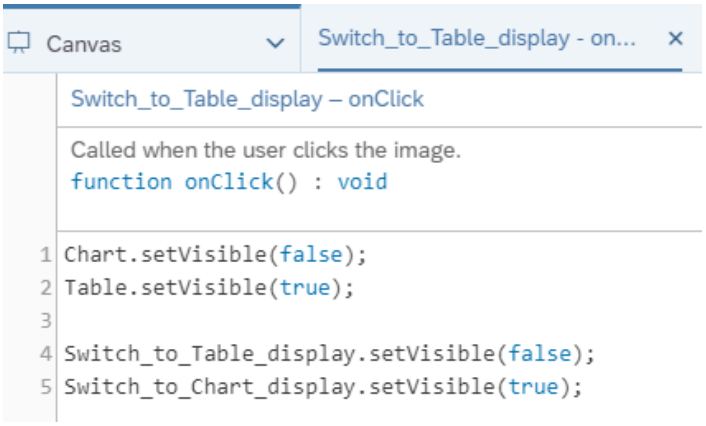




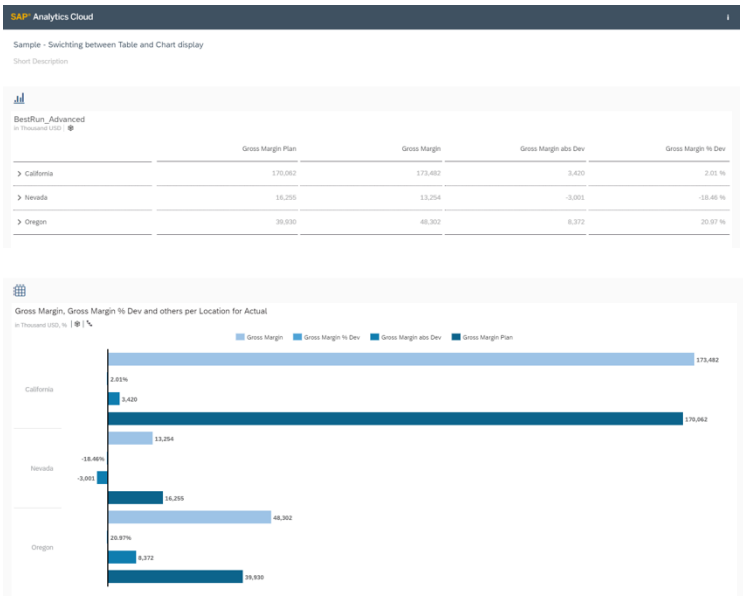

```
Chart.setVisible(true);
Table.setVisible(false);

Switch_to_Table_display.setVisible(true);
Switch_to_Chart_display.setVisible(false);
```

We will now do the same for the icon of the Table. Select the image of the Table you chose and click on the  button.

Here, we will set the Chart as well as the Switch_to_Table_display to false and the Table as well as the Switch_to_Chart_display to true.




```
Chart.setVisible(false);
Table.setVisible(true);

Switch_to_Table_display.setVisible(false);
Switch_to_Chart_display.setVisible(true);
```

Save the application and click on Run Analytic Application in the upper right side of the page and the result should look something like this: The Table is displayed as we have set it to the default. Now click on the Chart icon above it and the Table will change into a Chart. If we want to look at the Table again, we only have to click on the icon of the Table and we would have the previous icon view again.	

6.2 Selecting Measures via Dropdown or Radio Button to Filter Table and Chart to Display (Single Selection)

In this example, we will explore how to filter a Table or a Chart using a single measure selected from a Dropdown widget or a Radio Button.

In the Dropdown widget, we will load all the measures from our data set and set the default filtering measure of the table to “*Gross Margin Plan*”.

When another measure is selected, the filter is applied to the Table as well as the Chart (You can go from the Table to the Chart and vice versa using the  and the  icons, respectively.)

The result will look like this when we run the application:

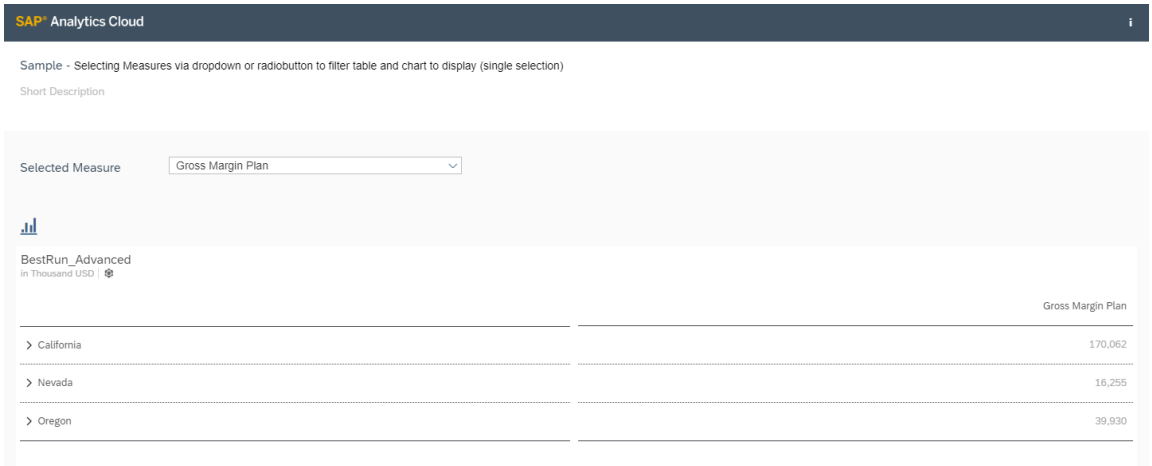


Figure 44: Example Application Dropdown

And if we click on the Dropdown box, we will get all the measures with which we can filter the results of the Table or the Chart:

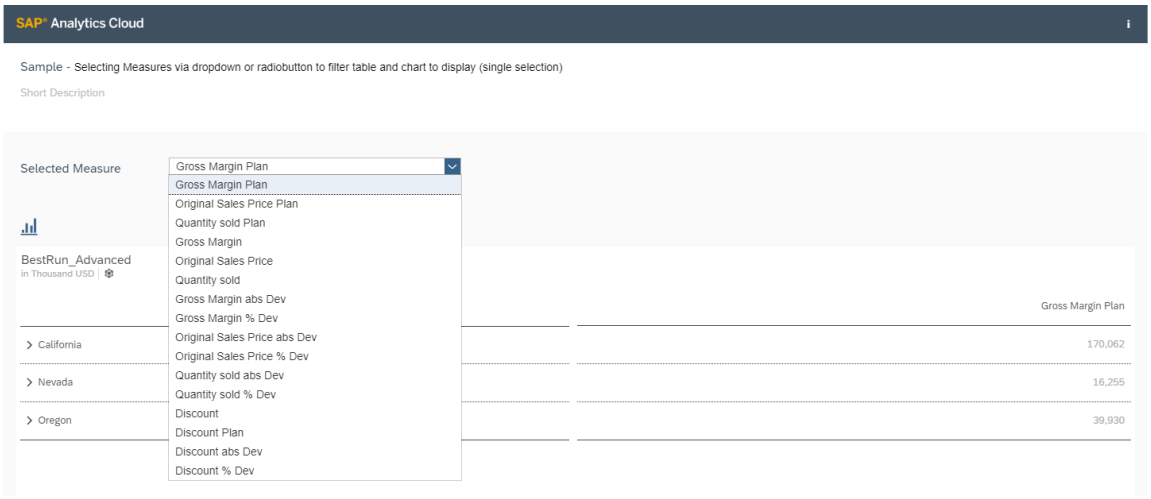
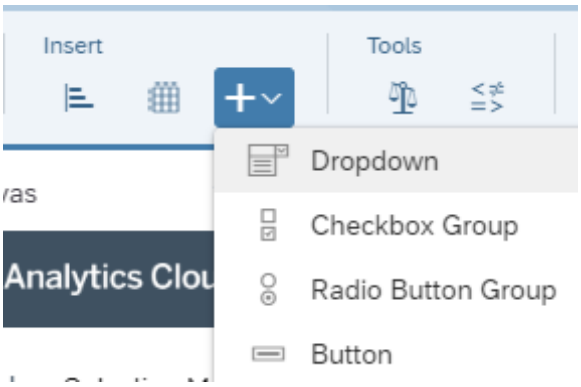
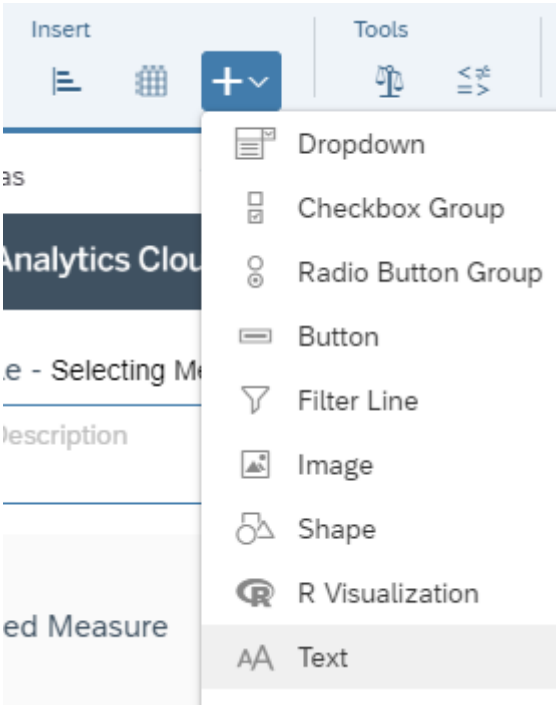
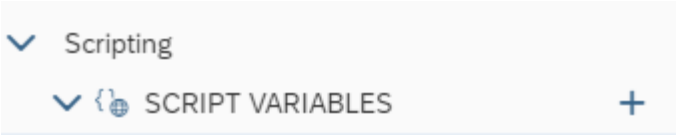


Figure 45: Dropdown Selection

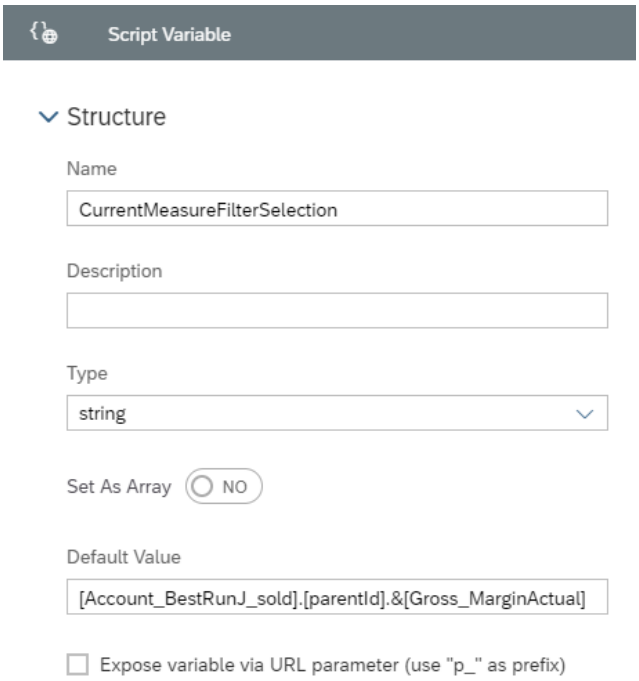
Prerequisites for this use case is having already added a table and a chart to your canvas. To have all the functionalities in this use case, please first go through the *Switching between Table and Chart* exercise.

To add a Dropdown widget, go to the Insert Panel and click on the + sign and then choose Dropdown. We will name the dropdown Dropdown_Measures. To rename the objects, hover over them one by one in the Layout and when the ••• icon appears click on it and choose Rename. This use case assumes that you have a Table and a Chart already set in the Canvas. If you don't, please go through the Switching between Table and Chart exercise and keep the names as they are in that exercise so that it works here as well.	

We will also add a Dropdown label so that we can indicate to the user that they can select measures through the Dropdown table. To insert Text, please click again on the + icon in the Insert Panel and choose Text.	
Place the Text widget on the left side of the Dropdown widget and we can then choose what to write in the Text box we inserted. We can, for example, write “Selected Measure”.	
Now we want to be able to access the value that the user chooses from the Dropdown widget. That is why we will add a Script Variable that acts as a global variable that can be accessed from anywhere in our application. To add a script variable, click on the “+” next to SCRIPT VARIABLES that is under Scripting.	

A window for the newly added script variable should now open. In the Structure part, type in CurrentMeasureFilterSelection as the Name
and set the Default Value to [Account_BestRunJ _sold].[parentId].&[Gross_Margin Actual]. This will make Gross Margin appear as our Default Value in the Dropdown widget when we run our application.

Click on Done button to close variable definition dialog.

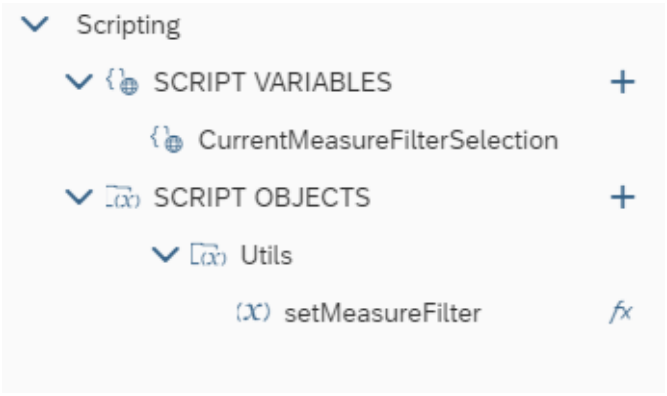



```
[Account_BestRunJ_sold].[parentId].&[Gross_MarginActual]
```

To define what should happen when a filter is selected, we need to create a Script Object. In this object, we will write a function that sets the measure filter according to what the user has chosen from the Dropdown options.

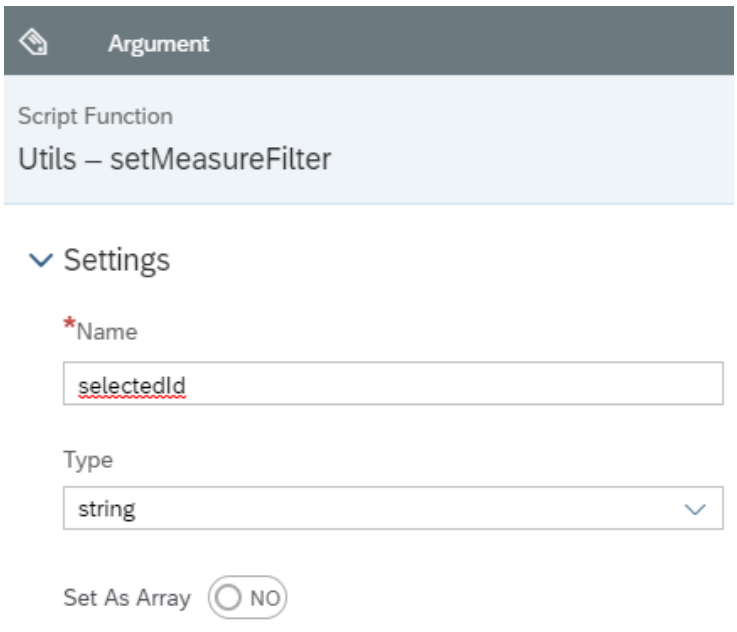
To create a Script Object, select the “+” icon next to SCRIPT OBJECTS under the Layout. Afterwards, rename both the folder that was created as well as the function.
We will name the folder Utils and the function setMeasureFilter.

To rename the objects, hover over them one by one and when the icon appears click on it and choose Rename.



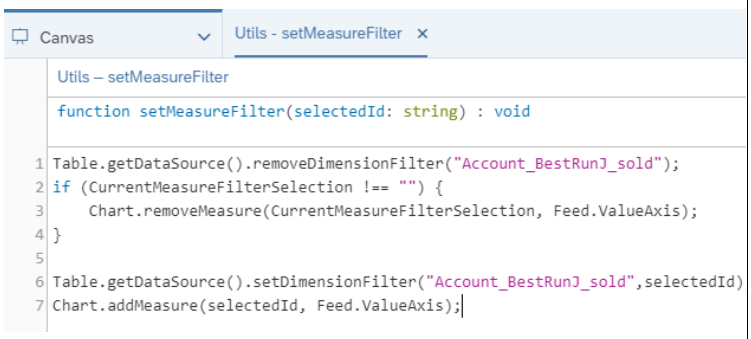
Click on the function setMeasureFilter and when the Properties window opens, click on the “+” icon next to Arguments.

We will add an argument with the name selectedId and the Type string. Click on Done.



Now we can write the script for the function.
Please hover over the setMeasureFunction and click on the fx icon that appears next to it.
Here, we will define what happens to the Table and the Chart when a user selects a measure from the Dropdown list.

We will remove any already set dimensions of the Table or measures of the Chart and then we will add the captured value as the new dimension and measure of the Table as well as the Chart.

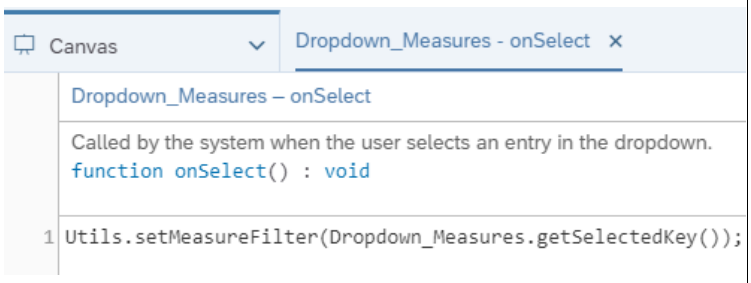



```
Table.getDataSource().removeDimensionFilter("Account_BestRunJ
_sold");
if (CurrentMeasureFilterSelection !== "") {
  Chart.removeMeasure(CurrentMeasureFilterSelection,
Feed.ValueAxis);
}

Table.getDataSource().setDimensionFilter("Account_BestRunJ_so
ld",selectedId);
Chart.addMeasure(selectedId, Feed.ValueAxis);
```

Now that we have defined how the Table and Chart would change, we will define how to pass the captured value to the setMeasureFilter function.
This will be done through onSelect function of the Dropdown widget.

To open the onSelect function, click on the fx icon next to the Dropdown object in the layout.

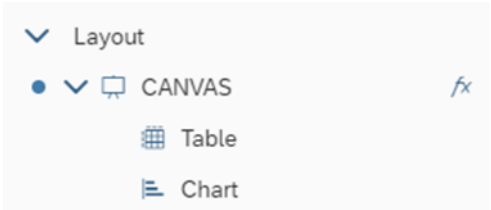
This script will get the selected value of the Dropdown list and pass it to the setMeasureFilter as a parameter.




```
Utils.setMeasureFilter(Dropdown_Measures.getSelectedKey());
```

The last step is setting what happens when the application is first run.
This is done through the onInitialization function of the Canvas itself.

To get to this script, please hover over the CANVAS in the Layout and click on the fx icon when it appears and select onInitialization.



In this use case, we want to make sure that on initialization, we load all the available measures of the Table into our Dropdown List.
After doing that, we set the selected key to the first measure in that list and then we set our measure filter to that first measure in our list.


```
var measures = Table.getDataSource().getMeasures();

var selectedKey = "";

if (measures.length > 0) {
  for (var i = 0; i < measures.length; i++){
    // Measure
    Dropdown_Measures.addItem(measures[i].id,
measures[i].description);
    if (selectedKey === "" && i === 0) {
      selectedKey = measures[i].id;
      Dropdown_Measures.setSelectedKey(selectedKey);
      console.log(["selectedKey ", selectedKey]);
    }
    console.log(["CurrentMeasure ", measures]);
  }
}

Utils.setMeasureFilter(selectedKey);
```

Now let's see how it looks like.

Save the application and click on Run Analytic Application in the upper right side of the page and the result should look something like this:

If you select a measure from the Dropdown list, the values in the Table as well as the Chart (accessed by clicking on the  icon – See "Switching between Table and Chart" exercise) should change accordingly.

Application when it's first run:

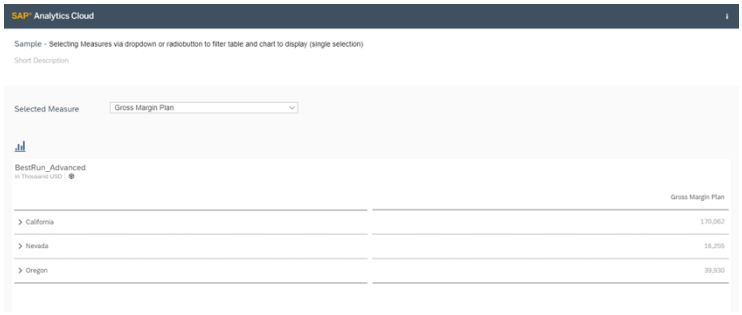


Chart with "Gross Margin Plan" as the selected measure:

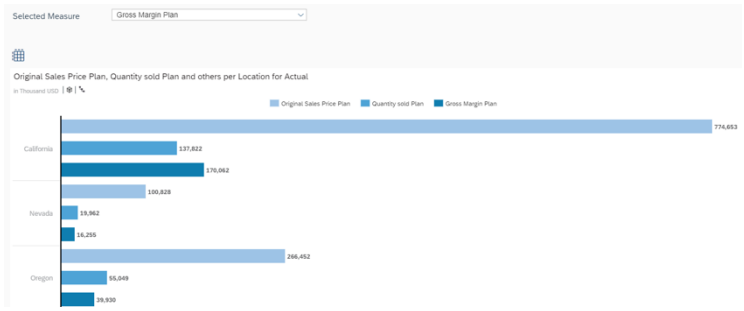
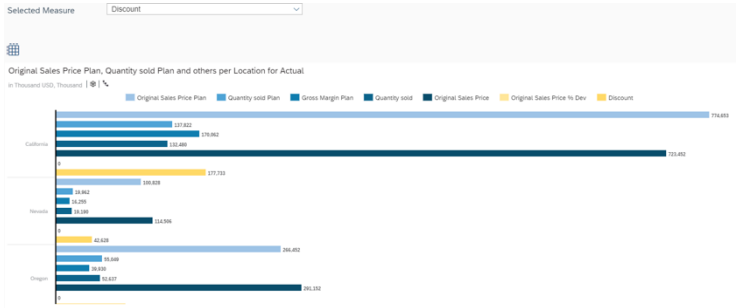


Chart with "Discount" as the selected measure:



6.3 Selecting Measures via Dropdown to Filter Table and Chart to Display (Multi-Selection)

In this example, we will explore how to filter a Table or a Chart using multiple measures selected from a Checkbox Group widget.

Unlike a Dropdown box, the Checkbox Group allows using multiple measures as filters. In this use case, we will add a Checkbox Group widget where we will list all the measures in our data set. On top of that, there will be three buttons;

- "Set selected" to filter the Table and Chart using the checked measures in the Checkbox
- "Remove all" to remove all the selected filters
- "Set all" to display all the available measures in our Table/Chart

The result will look like this when we run the application:

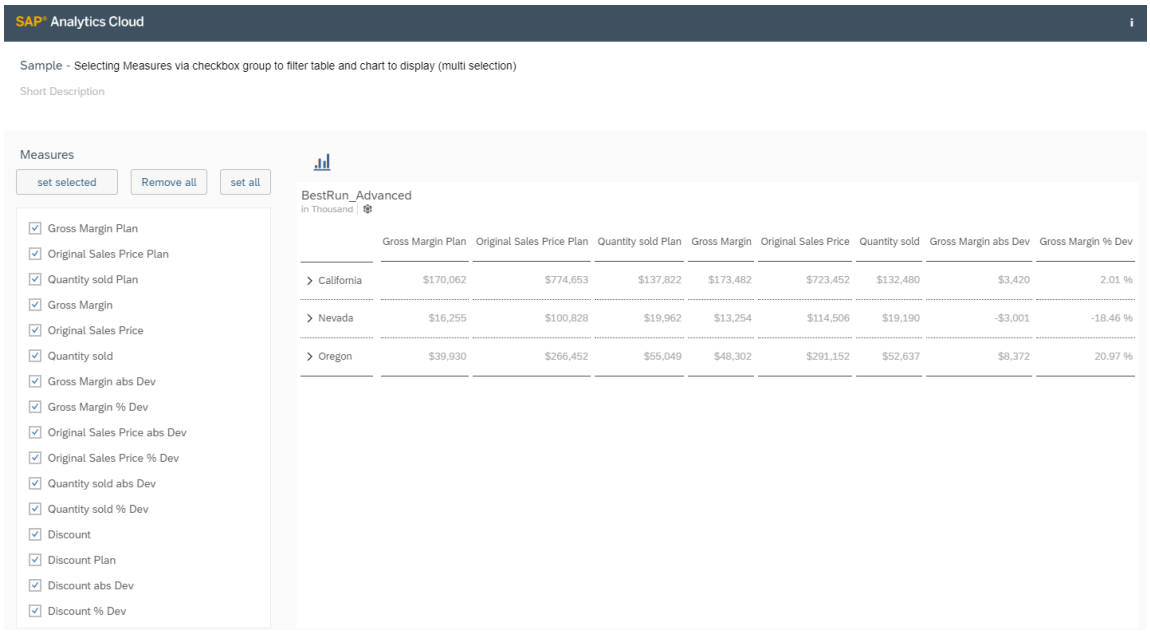


Figure 46: Example Application Multi Selection

Prerequisites for this use case is having already added a table and a chart to your canvas. To have all the functionalities in this use case, please first go through the *Switching between Table and Chart* exercise.

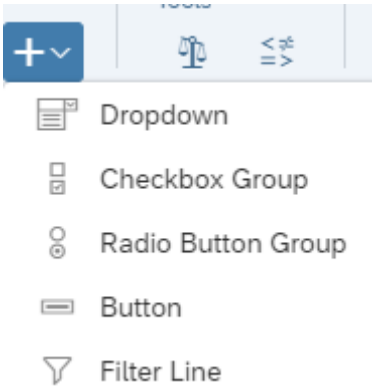
To add a Checkbox Group widget to your Canvas, go to the Insert Panel and click on the “+” sign and then choose Checkbox Group. Please place the newly added widget on the left side of your Table in the canvas.

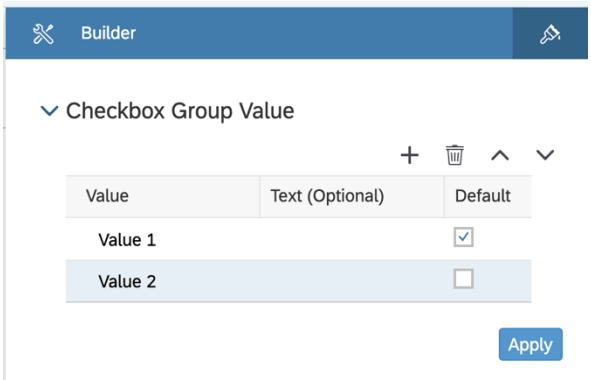
We will name the checkbox group CheckboxGroup_Measures.

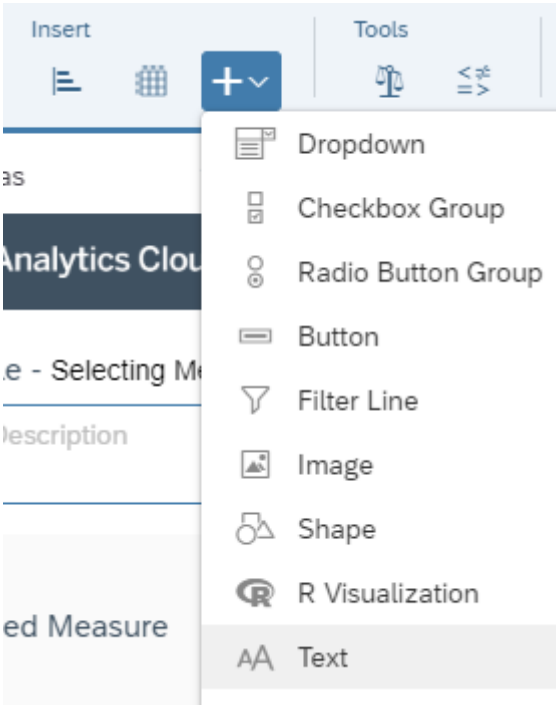
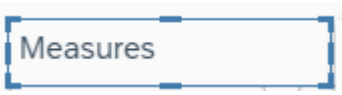
To rename the objects, hover over them one by one and when the icon appears click on it and choose Rename.

Please remove the initial values “Value 1” and “Value 2” from the Checkbox group Value list. Select and click  and then click Apply.

This use case assumes that you have a Table and a Chart already set in the Canvas. If you don’t, please go through the Switching between Table and Chart exercise and keep the names as they are in that exercise so that it works here as well.





We will also add a label so that we can indicate to the user that the Checkbox Group is displaying the measures of our data set. To insert Text, please click again on the “+” icon in the Insert Panel and choose Text.	
Place the Text widget on the left side of the Dropdown widget and we can then choose what to write in the Text box we inserted. We can, for example, simple write “Measures”.	

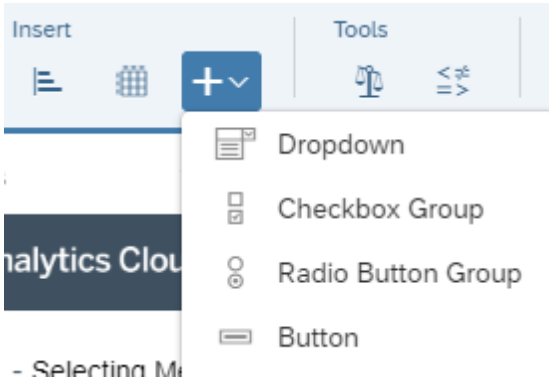
Now we want to be able to quickly use the Checkbox Group which is why we will add some buttons that will help us do that.

The first button will be a “set selected” button; this will enable us to filter the data according to the selected checkboxes in our Checkbox Group.

The second button will be a “Remove all” button; this will be a shortcut button that simplifies removing all the selected measures rather than deselecting them one by one.

And the third, and final, button will be a “set all” button which when selected, selects all the measures in the Checkbox Group.

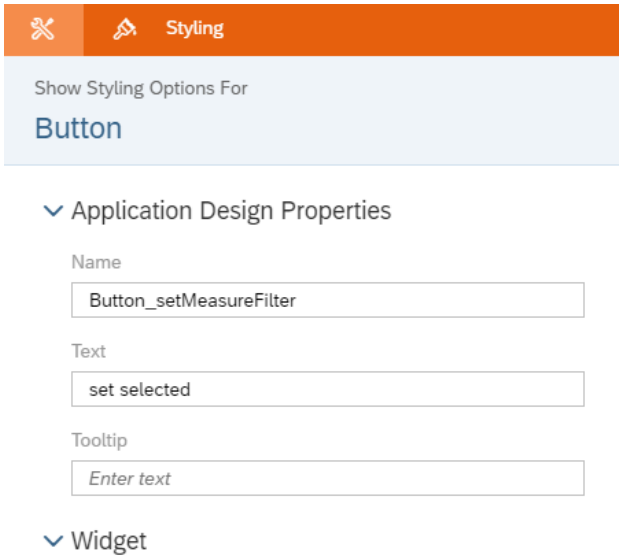
To add the buttons, go to the “+” icon in the Insert Panel and select Button and add three of them.



After adding the three buttons, we will edit some of their properties.

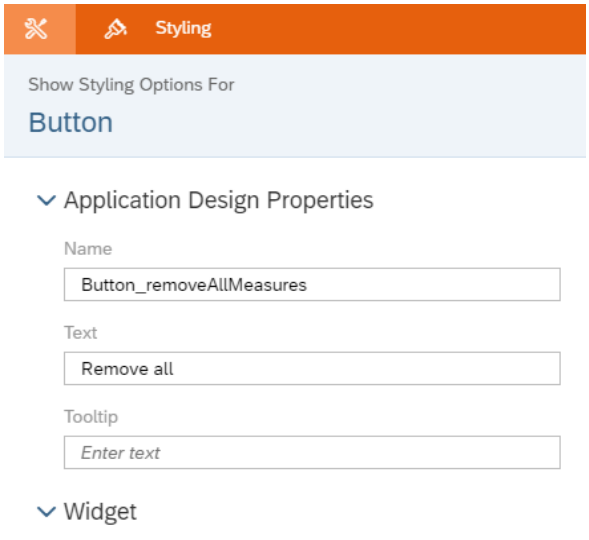
Select the first button and open the Designer (found on upper right part of the Page) and go to the Styling Panel.

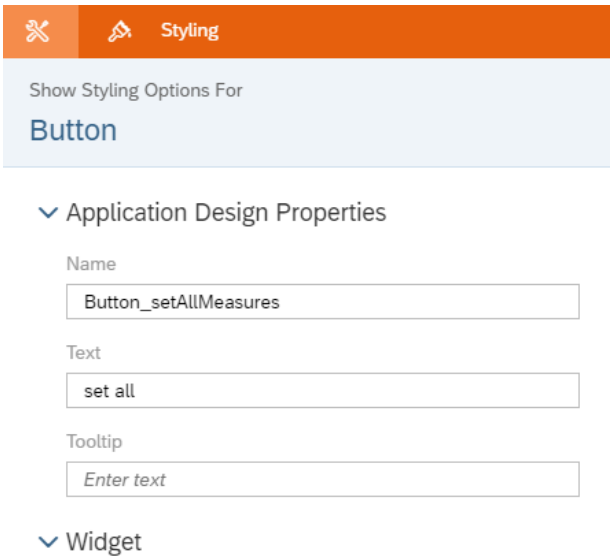
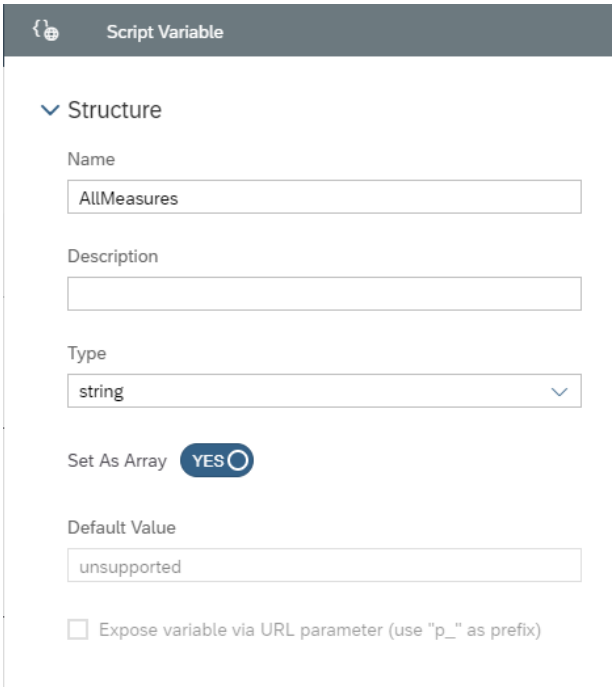
There, change the name of the button to “Button_setMeasureFilter” and the Text to “set selected”.



Select the second button and open the Designer again and go to the Styling Panel.

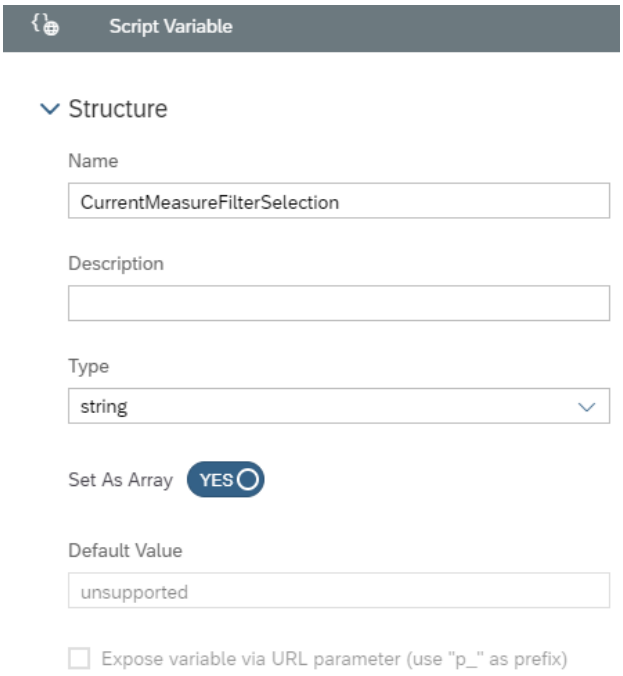
There, change the name of the button to “Button_removeAllMeasures” and the Text to “Remove all”.



Select the third button and in the Styling Panel, change the name of the button to “Button_setAllMeasures” and the Text to “set all”.	
To be able to access the values that have been selected in the Checkbox Group, we need to create variables that can be accessed anywhere in the application. Which is why, we will create 2 Script Variables. The first one will be called “AllMeasures” and we will set it as an array. This variable will hold all the measures that could be selected in the Checkbox Group. To insert this variable, go to SCRIPT VARIABLES under SCRIPTING in the Layout which you can find on the left part of the Page. Click on the “+” icon next to the SCRIPTING VARIABLES which should open a new window where you can change the structure of your variable. There, type in “AllMeasures” in the Name box, select “string” as Type, and set the Set As Array button to “YES”. Click on Done to close the properties’ window.	

Add a second Scripting Variable the same way as in Step 8.
This variable will hold the measures that the user has selected from the Checkbox Group.

When the Structure window opens, type in “CurrentMeasureFilterSelection” in the Name box, set “string” as Type, and toggle the Set As Array button to “YES”.



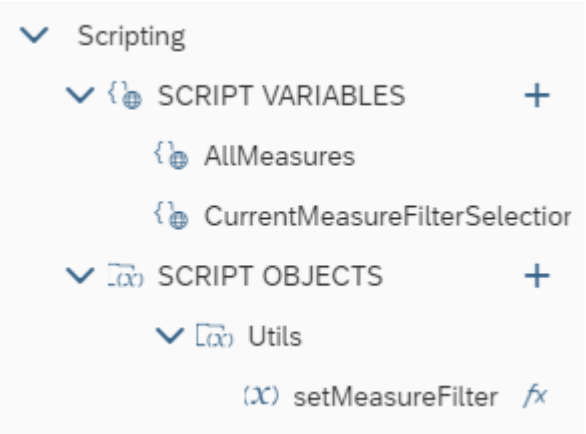
To define what should happen when a filter is selected, we need to create a Script Object.

In this object, we will create a function that sets the measure filter according to what the user has chosen from the Checkbox Group.

To create a Script Object, select the “+” icon next to SCRIPT OBJECTS under the Layout.
Afterwards, rename both the folder that was created as well as the function.

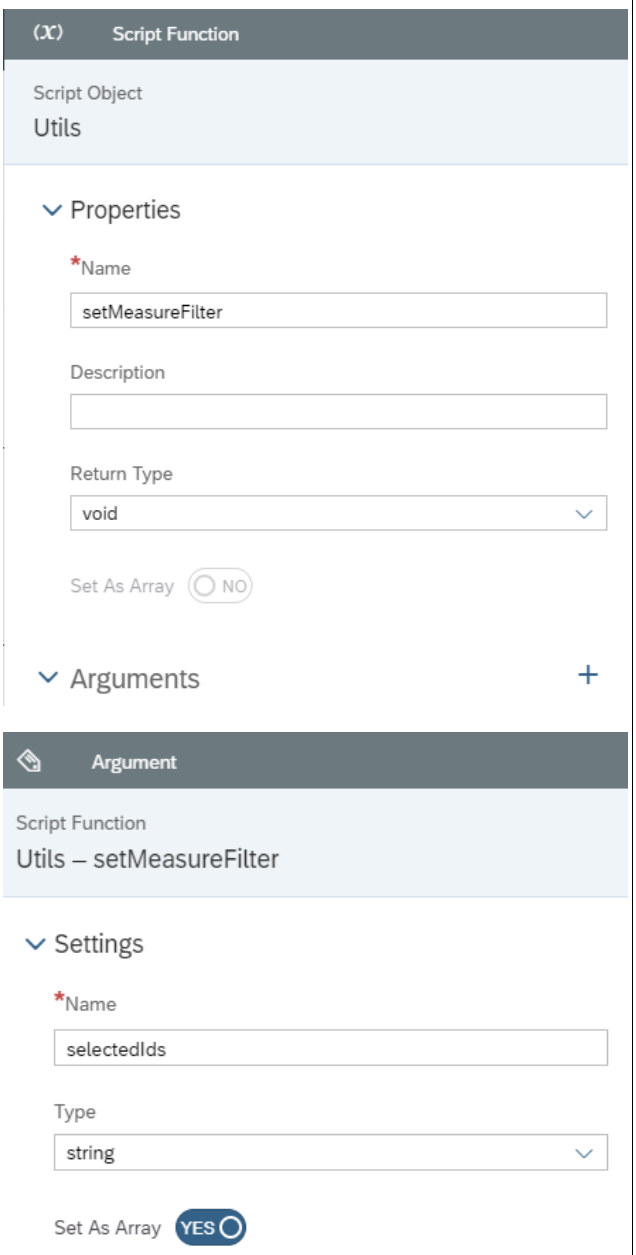
We will name the folder Utils and the function setMeasureFilter.

To rename the objects, hover over them one by one and when the icon appears click on it and choose Rename.



Click on the function setMeasureFilter and when the Editing window opens, click on the “+” icon next to Arguments.

Here, we will add an argument with the name “selectedIds” and the Type string[ ] (array of strings).



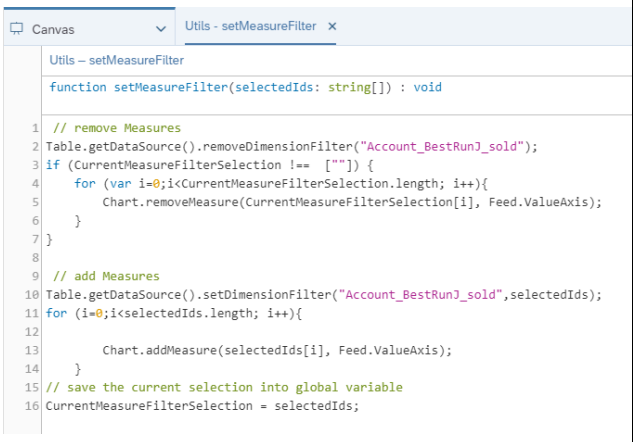
To define what the setMeasureFilter function, that we added in Step 11, does, please go to the function in the Layout,

hover over its name, and click on the fx icon next to it.

The script of this function does the following:
Firstly, it removes any dimensions from the Table or measures from the Chart that were added to filter them before.

Secondly, it looks to see which measures the user has chosen from the Checkbox Group and adds them as dimensions to the Table/measures for the Chart.

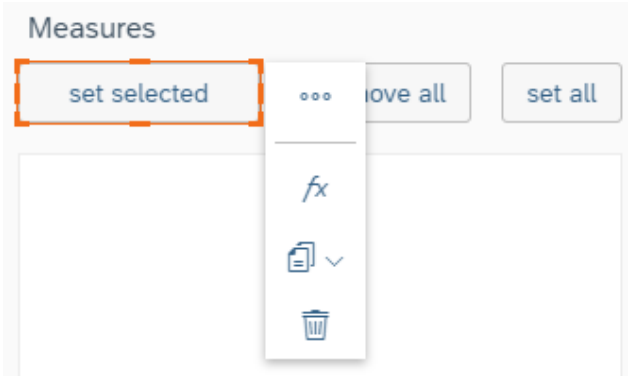
Lastly, it takes the selected measures of the user and saves them in the variable we created in Step 9 (CurrentMeasureFilterSelection).



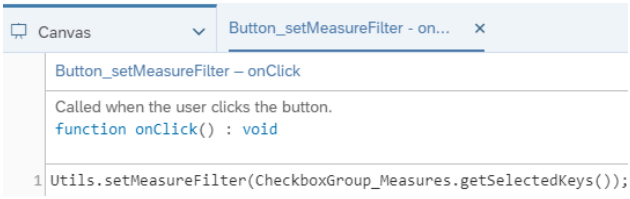

```
// remove Measures
Table.getDataSource().removeDimensionFilter("Account
_BestRunJ_sold");
if (CurrentMeasureFilterSelection !== [""]) {
  for (var i = 0; i <
CurrentMeasureFilterSelection.length; i++) {

Chart.removeMeasure(CurrentMeasureFilterSelection[i]
, Feed.ValueAxis);
  }
}

// add Measures
Table.getDataSource().setDimensionFilter("Account_Be
stRunJ_sold",selectedIds);
for (i = 0; i < selectedIds.length; i++) {
  Chart.addMeasure(selectedIds[i], Feed.ValueAxis);
}
// save the current selection into global variable
CurrentMeasureFilterSelection = selectedIds;
```

Now, we need to define what happens when the buttons we created are clicked. The first button, “set selected” should filter the data according to the selected checkboxes in our Checkbox Group.

To edit the onClick function script of the button, you can either hover over it in the Layout and click on the fx icon or you can click on the button in the canvas and similarly select fx .



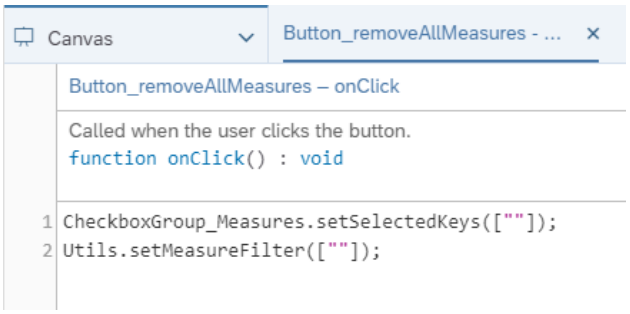
In the script of the onClick function, we will call the Utils.setMeasureFilter function and pass to it the selected measures of the Checkbox Group.




```
Utils.setMeasureFilter(CheckboxGroup_Measures.getSel
ectedKeys());
```

The second button, “Remove all”, removes all the selected measures from the Checkbox Group.

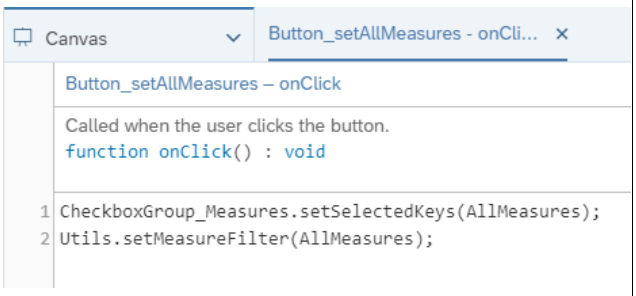
Open the script of the button like in step 13 and here, we will remove all the selected measures from the Checkbox Group itself and also pass an empty array to the Utils.setMeasureFilter so that our Table and Chart as well as our global variable CurrentMeasureFilterSelection will be updated.




```
CheckboxGroup_Measures.setSelectedKeys([""]);
Utils.setMeasureFilter([""]);
```

The third button, “set all”, selects all the measures in the Checkbox Group.

In the script of this button, we will set the selected keys of the Checkbox Group to the AllMeasures script variable we had defined before and we will pass the same variable to the Utils.setMeasureFilter function.

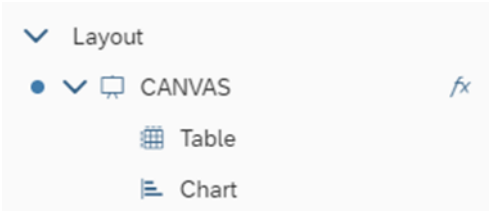



```
CheckboxGroup_Measures.setSelectedKeys(AllMeasures);
Utils.setMeasureFilter(AllMeasures);
```

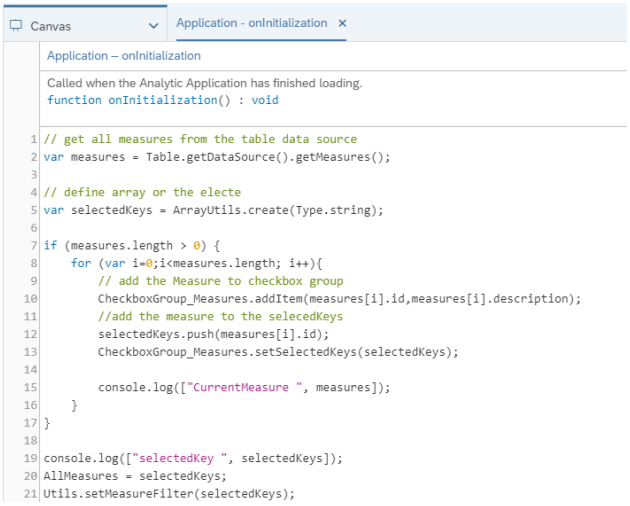
The last step is setting what happens when the application is first run.
This is done through the onInitialization function of the Canvas itself.

To get to this script, please hover over the CANVAS in the Layout and click on the

icon when it appears and select onInitialization.



In this use case, we want to make sure that on initialization, we get all the available measures of the Table's data source.
Then, we define a selected keys array of type string and using a loop, we add the measures to our Checkbox Group and the selected keys array. We also call on the setSelectedKeys function of the Checkbox Group and set its selected keys to our array.
Finally, we set the script variable AllMeasures and the measure filter to the selected keys.




```
// get all measures from the table data source
var measures = Table.getDataSource().getMeasures();

// define array or the selected Keys
var selectedKeys = ArrayUtils.create(Type.string);

if (measures.length > 0) {
  for (var i = 0; i < measures.length; i++) {
    // add the Measure to checkbox group

CheckboxGroup_Measures.addItem(measures[i].id,measur
es[i].description);
    //add the measure to the selecedKeys
    selectedKeys.push(measures[i].id);

CheckboxGroup_Measures.setSelectedKeys(selectedKeys)
;
    console.log(["CurrentMeasure ", measures]);
  }
}

console.log(["selectedKey ", selectedKeys]);
AllMeasures = selectedKeys;
Utils.setMeasureFilter(selectedKeys);
```

Now let's see how it looks like.
Click on Run Analytic Application in the upper right side of the page and the result should look something like this:

If we click on the "Remove all" button, all measures are deselected and there is no Table (or Chart -> accessed through the  icon) to look at.

If we click on "set all", all measures are selected again and the Table (or Chart) looks like when we first ran the application.

Let us only select a few measures and see how the Table will change.
In the screenshot on the right, 4 measures are chosen (Gross Margin Plan, Quantity Sold, Original Sales Price abs Dev, and Discount).
After selecting the measures, please click on "set selected" to update the Table/Chart with your chosen measures.

Application when it's first run:

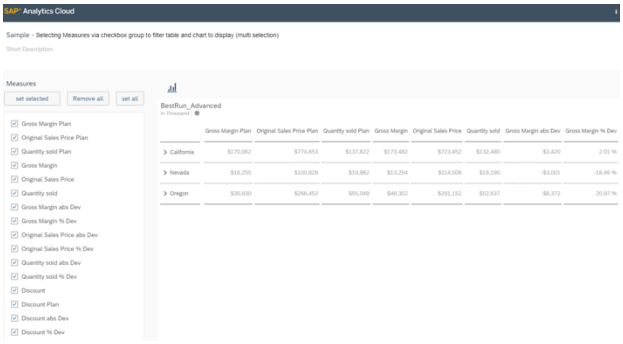


Table after clicking on "Remove all":

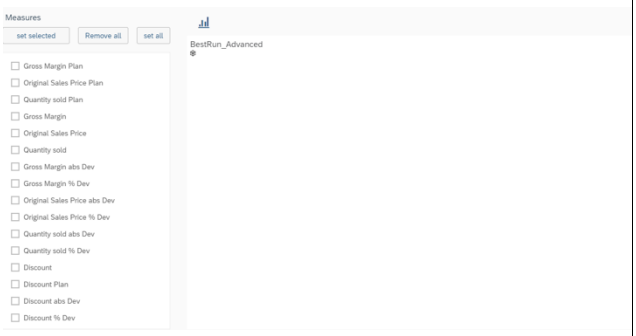


Table after clicking on "set all":

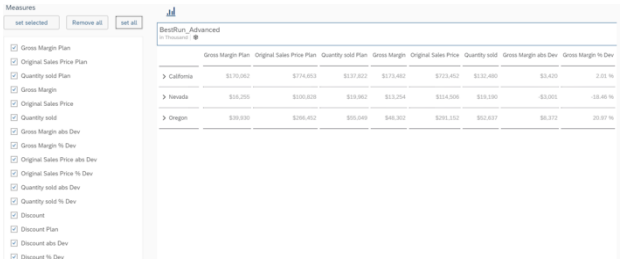
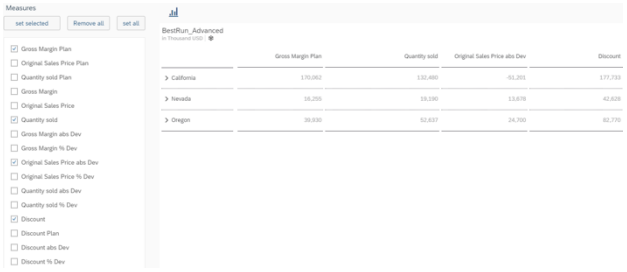


Table after selecting specific measures:



6.4 Using Filter Line for Filtering Table, Chart, and R Visualization

In this example, we will explore how to filter a Table, a Chart or an R Visualization using a Filter Line widget.

Instead of loading all the dimensions in our data set into a Checkbox group or a Dropdown widget, in this use case, we will select specific dimensions to load into a Filter Line.

Unlike other data bound widgets (such as Table or Chart), R Visualization can add multiple input data models. To support R Visualization in Filter Line, one Dropdown list is added to select the connected input data.

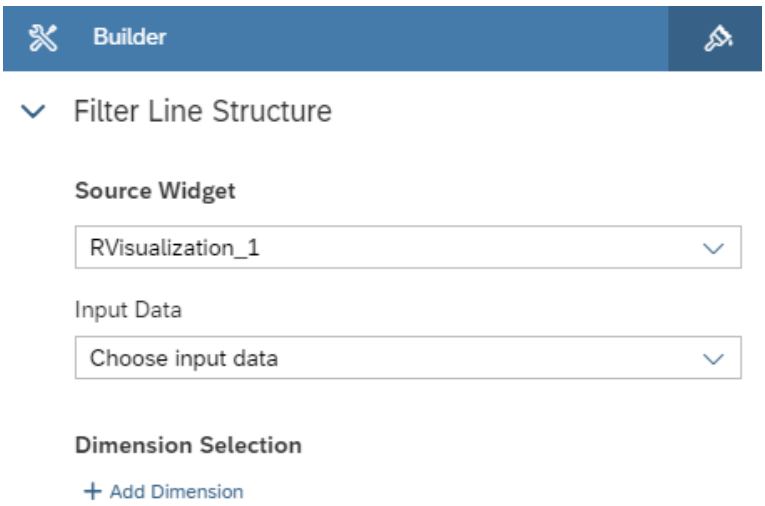


Figure 47: Choose Input Data for Filtering R Visualization

After the user selects an input data model of the R Visualization widget, the Filter Line can support R Visualization just like other widgets.

After loading the desired dimensions into our Filter Line, we will connect it to our Table/Chart/R Visualization so that the data is filtered using the selected filter.

To use the Filter Line after running the application, simply click on the Filter Line icon and select the dimension you want to use to filter your data.

The result will look like this when we run the application:

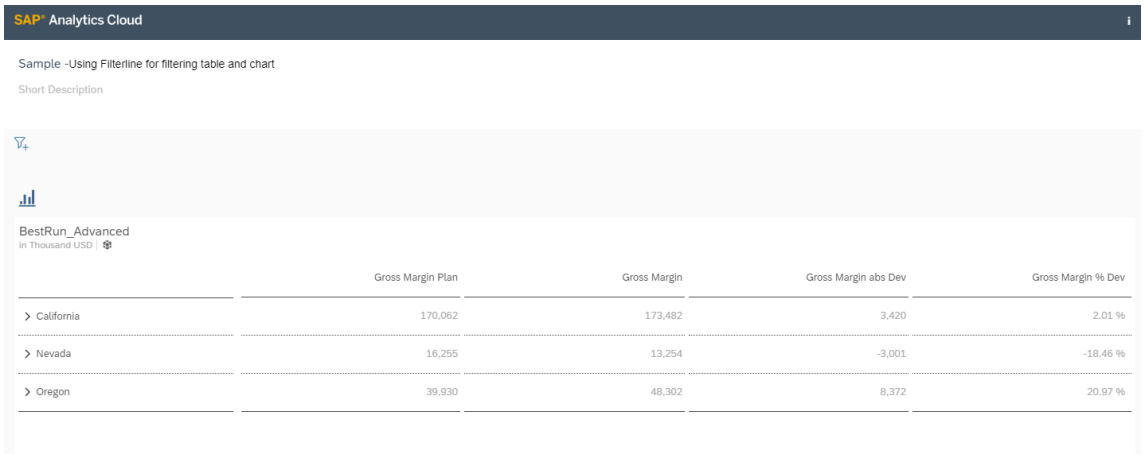


Figure 48: Example Application Filter Line

And this is how it will look like when we click on our Filter Line widget:

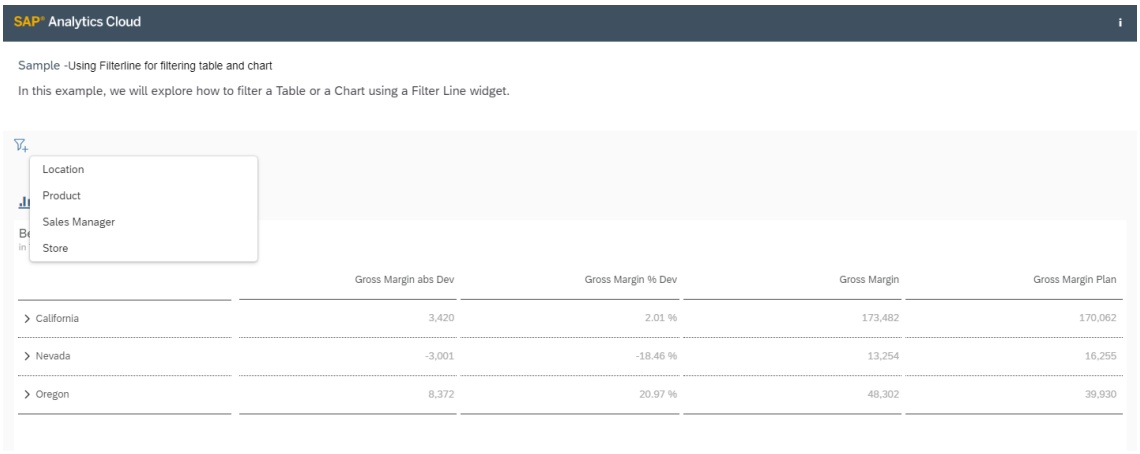
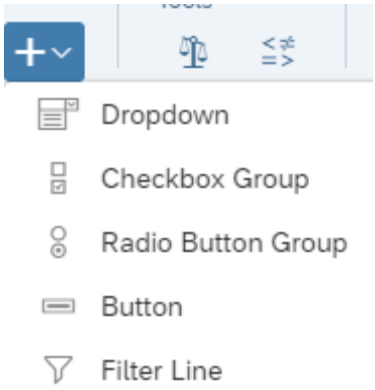
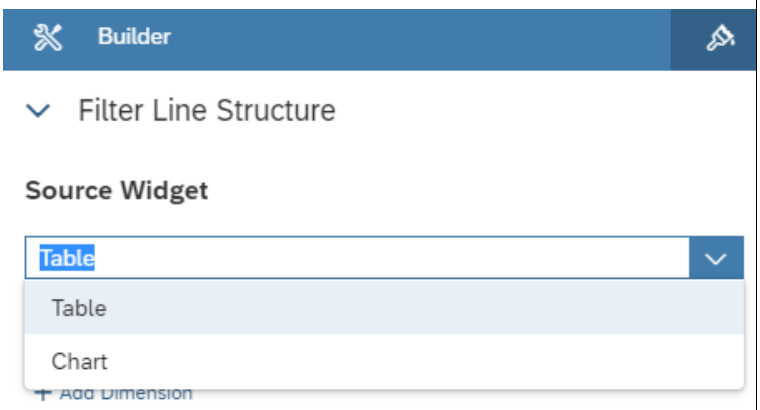
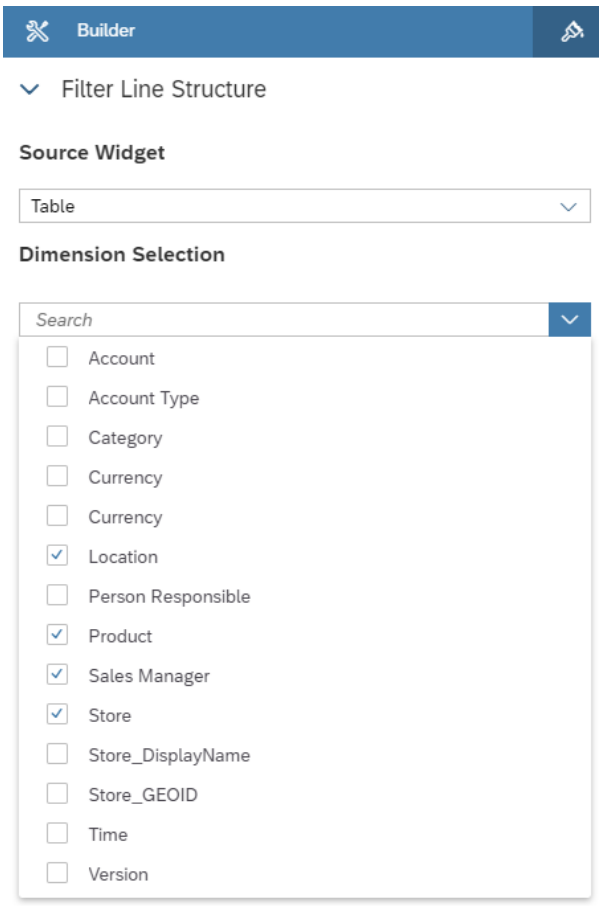
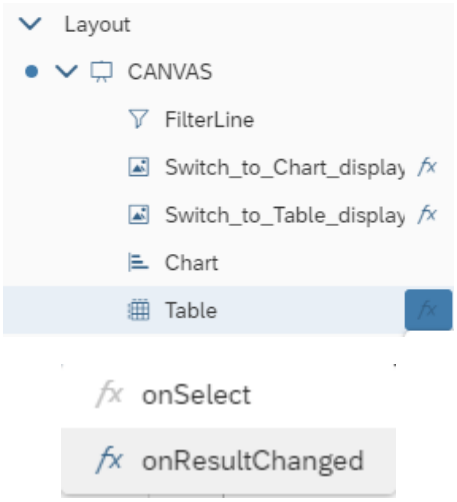


Figure 49: Select Filter Line

Prerequisites for this use case is having already added a Table and a Chart to your canvas. To have all the functionalities in this use case, please first go through the *Switching between Table and Chart* exercise.

To add a Filter Line widget to your Canvas, go to the Insert Panel and click on the "+" sign and then choose Filter Line. Please place the newly added widget above the Table. We will name the filter line FilterLine. To rename the objects, hover over them one by one and when the icon appears click on it and choose Rename. This use case assumes that you have a Table and a Chart already set in the Canvas. If you don't, please go through the Switching between Table and Chart exercise and keep the names as they are in that exercise so that it works here as well.	
After adding the Filter Line, we need to set its properties. We can do that by selecting the Filter Line we added to our canvas and afterwards, clicking on the Designer button. You can find this button on the upper right side of the screen. There, navigate over to the Builder Panel.	

In the Builder Panel, we will set the structure of the Filter Line. We will set the source widget as the Table. This is done by going to Source Widget and choosing “Table” from the Dropdown List.	
Now we will add the filters we want: In this use case we want the user to be able to filter on 4 dimensions: Location, Product, Sales Manager, and Store. We can add these by going to the Dimension Selection part and clicking Add Dimension and selecting all 4 when the Checklist comes up.	

In step 3 we needed to select a source widget for our Filter Line and we chose the Table, however, in our application we give the user the option to toggle between Table and Chart using the  and  respectively (please refer to the “Switching between Table and Chart” Exercise). This means that we have to find a way to get the filter that’s been applied to the Table so that we can apply that on our Chart too. To do that, click on the  next to the Table in the Layout and choose onResultChanged.	
In the script of the onResultChanged function, we will copy the dimension filters from the Table. We do the copying 4 times for each of the measures we had added in the Dimension Selection part (in step 4).	 `console.log('OnResultChanged');` `Chart.getDataSource().copyDimensionFilterFrom(Table.getDataSource(), "Location_4nm2e04531");` `Chart.getDataSource().copyDimensionFilterFrom(Table.getDataSource(), "Product_3e315003an");` `Chart.getDataSource().copyDimensionFilterFrom(Table.getDataSource(), "Sales_Manager__5w3m5d06b5");` `Chart.getDataSource().copyDimensionFilterFrom(Table.getDataSource(), "Store_3z2g5g06m4.Store_GEOID");`

Now let's see how it looks like.

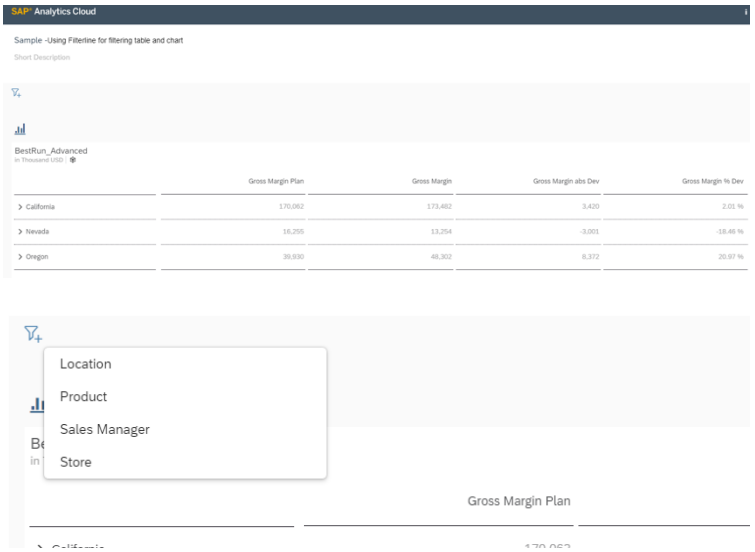
Click on Run Analytic Application in the upper right side of the page and the result should look something like this:

When you click on the Filter Line, the 4 measures we added pop up.

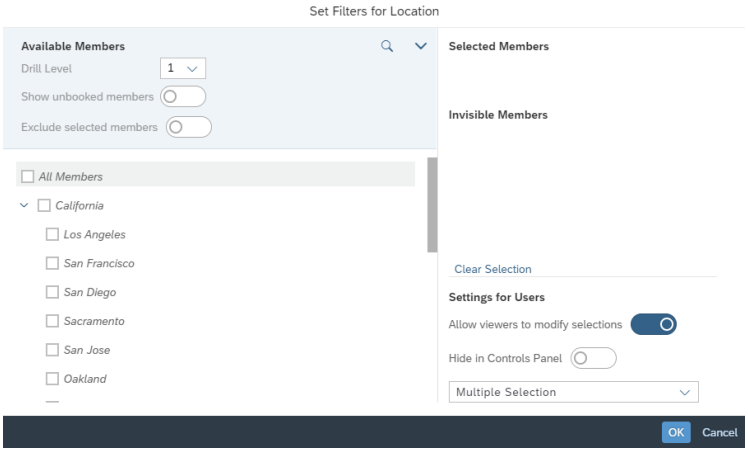
When one of the measures in the Filter Line is clicked, a pop-up window comes up and we get to choose which cities (locations), products, sales managers, and stores do we want to include in our Table or Chart.

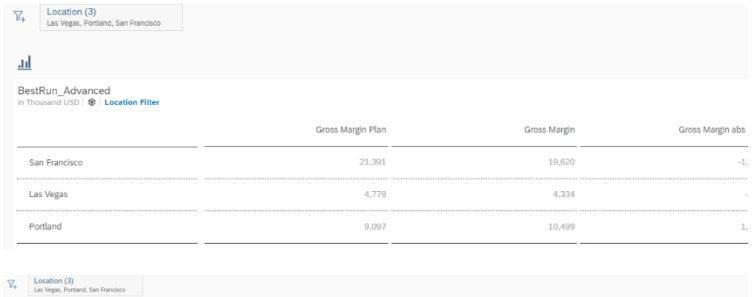
If we were to choose San Francisco, Las Vegas, and Portland as our members, the table would update according to that filter.

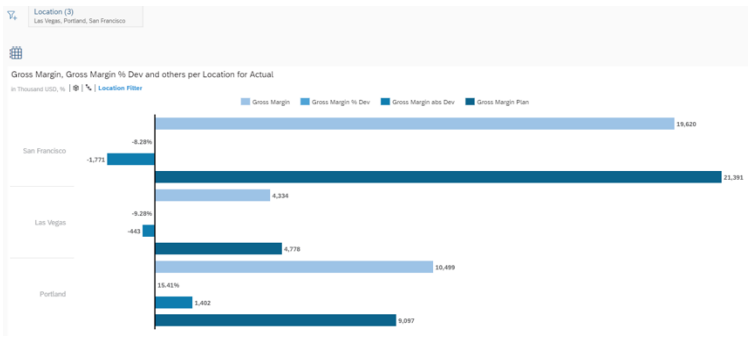
And the Chart will be updated as well (Click the  icon to get the view of the Chart.



Location is selected







6.5 Cascaded Filtering

In this example, we will explore how to do cascaded filtering; meaning filtering on dimensions and then filtering according to hierarchies (such as Flat Presentation, ABC, …) to choose how to display the data.

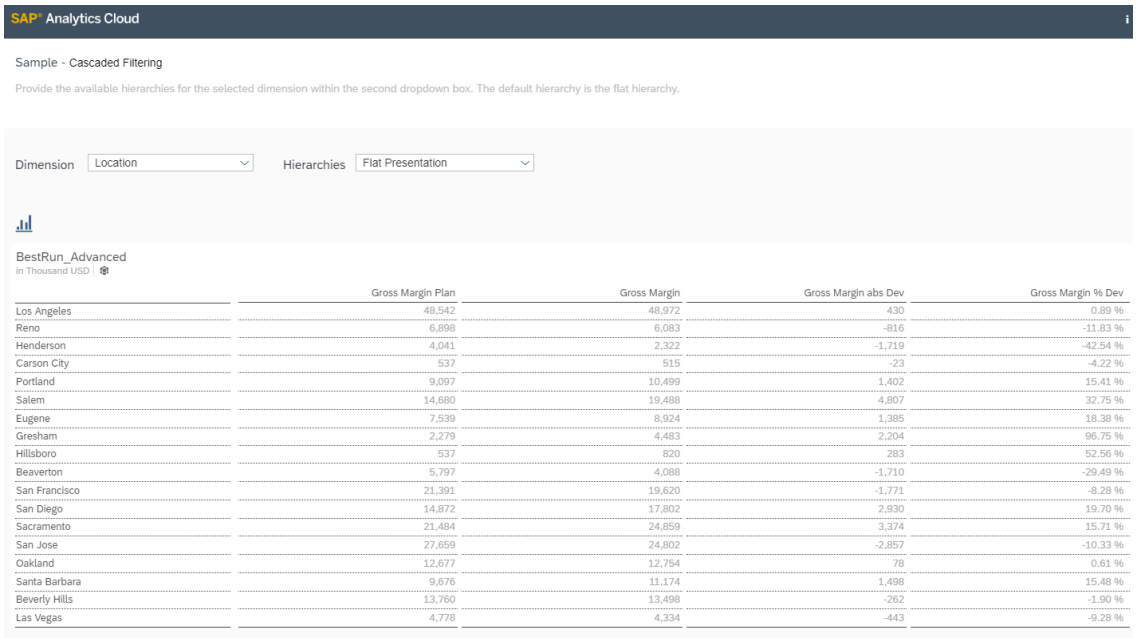
We will add two Dropdown lists, one for filtering dimensions and the other for filtering hierarchies and depending on what dimension we choose to filter on, the Dropdown List for the hierarchy filters will change.

There is always one consistent filter for hierarchies which is *Flat Presentation* and according to our chosen dimension, we might either only have that one or have more options.

For example, if we are filtering on *Location*, we have two choices for hierarchies: *Flat Presentation* and according to *States*, however, if we are filtering on *Product*, we have *Flat Presentation*, *Category*, or *ABC* (this one categorizes the dimension as “worst-selling”, “medium-selling”, or “best-selling”), and if we are filtering on *Store* or *Sales Manager*, our only option is *Flat Presentation*.

The different filters can be chosen by simply selecting them from the Dropdown lists we added.

The result will look like this when we run the application:



	Gross Margin Plan	Gross Margin	Gross Margin abs Dev	Gross Margin % Dev
Los Angeles	48,542	48,972	430	0.89 %
Reno	6,898	6,083	-816	-11.83 %
Henderson	4,041	2,322	-1,719	-42.54 %
Carson City	537	515	-23	-4.22 %
Portland	9,097	10,499	1,402	15.41 %
Salem	14,680	19,488	4,807	32.75 %
Eugene	7,539	8,924	1,385	18.38 %
Gresham	2,279	4,483	2,204	96.75 %
Hillsboro	537	820	283	52.56 %
Beaverton	5,797	4,088	-1,710	-29.49 %
San Francisco	21,391	19,620	-1,771	-8.28 %
San Diego	14,872	17,802	2,930	19.70 %
Sacramento	21,484	24,859	3,374	15.71 %
San Jose	27,659	24,802	-2,857	-10.33 %
Oakland	12,677	12,754	78	0.61 %
Santa Barbara	9,676	11,174	1,498	15.48 %
Beverly Hills	13,760	13,498	-262	-1.90 %
Las Vegas	4,778	4,334	-443	-9.28 %

Figure 50: Example Application Cascading Filtering

Prerequisites for this use case is having already added a Table and a Chart to your canvas. To have all the functionalities in this use case, please first go through the *Switching between Table and Chart* exercise.

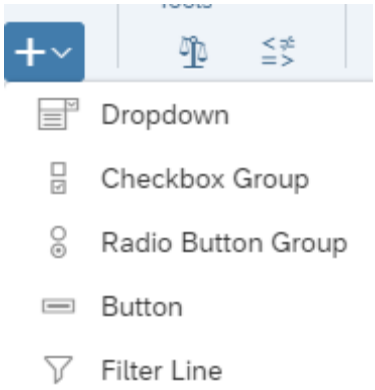
To add a Dropdown widget for the List of Dimensions and one for the Hierarchies, we need to go to the Insert Panel, click on the “+” icon, and choose Dropdown.
Please insert two widgets into your Canvas and position them on the same level above the Table.

We will name the dropdown Dropdown_Dimensions.

To rename the objects, hover over them one by one and when the  icon appears click on it and choose Rename.

Add the second Dropdown widget for the Hierarchies we will name Dropdown_Hierarchies.

This use case assumes that you have a Table and a Chart already set in the Canvas. If you don’t, please go through the Switching between Table and Chart exercise and keep the names as they are in that exercise so that it works here as well.

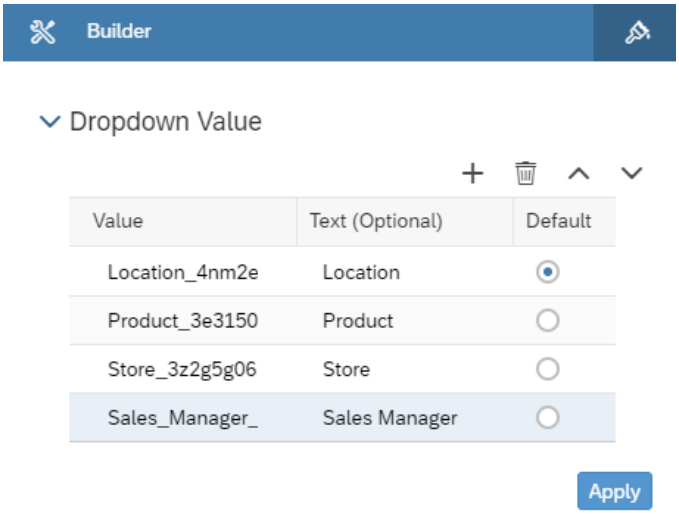


Go into the Builder properties of the Dimensions Dropdown widget (through the Designer button on the upper right side of the screen).

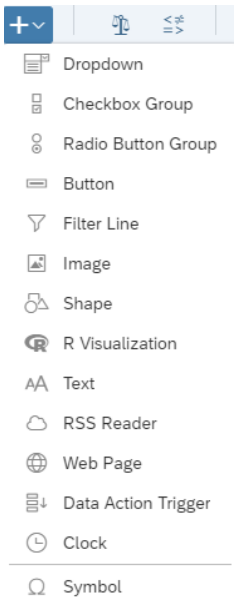
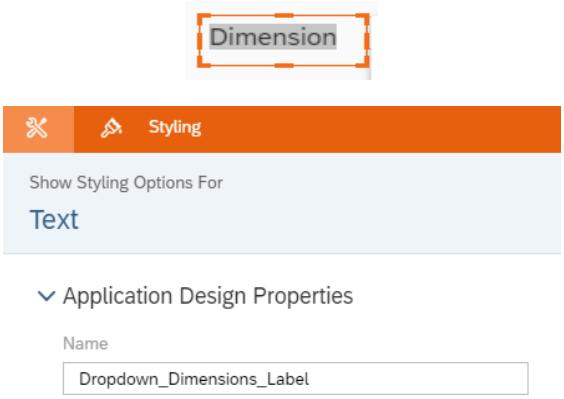
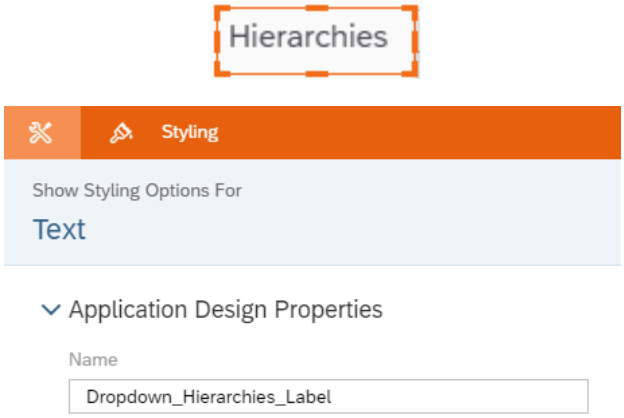
Here, we will add the values that the user can choose from the widget.

Add values by clicking on the “+” icon. We will set Location to our default value.

After entering all the values, click on “Apply” to save the changes.

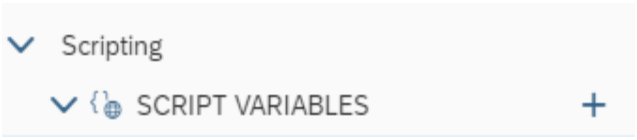


Location_4nm2e04531	Location
Product_3e315003an	Product
Store_3z2g5g06m4	Store
Sales_Manager__5w3m5d06b5	Sales Manager

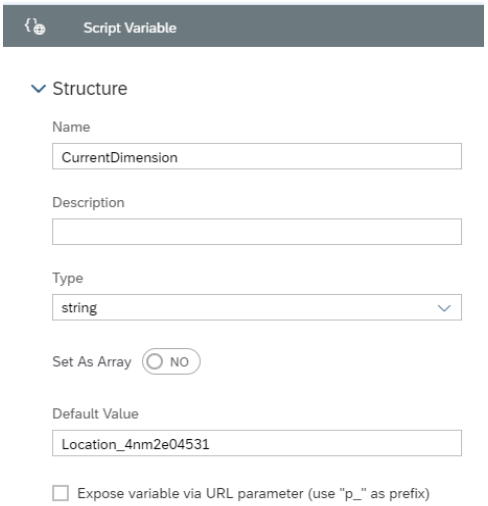
To be able to distinguish the Dropdown List of the Dimensions and the one of the Hierarchies, we need to have labels for both. To add a Label, please click again on the “+” icon, insert two Text widgets, and place them on the left side of each of the Dropdown Lists we added in the previous step.	
Now, we will set the properties of the labels we added. Double click on the first label and type “Dimension” And then go into the Designer Styling Panel of the label. There, we will set the name of the Label that we will use if we need to reference this widget in a script. Please, insert the name “Dropdown_Dimensions_Label”.	
We will do the same for our second label. Double click on the first label and type “Hierarchies” And then go into the Designer Styling Panel of the label and Insert “Dropdown_Hierarchies_Label” as its Name.	

To be able to filter according to the Dimension chosen from the Dimension Dropdown list, we need to be able to store the choice in a variable that can be accessed from anywhere in the application; that means that we need a Script Variable.

To add a script variable, click on the "+" next to SCRIPT VARIABLES that is found under Scripting.



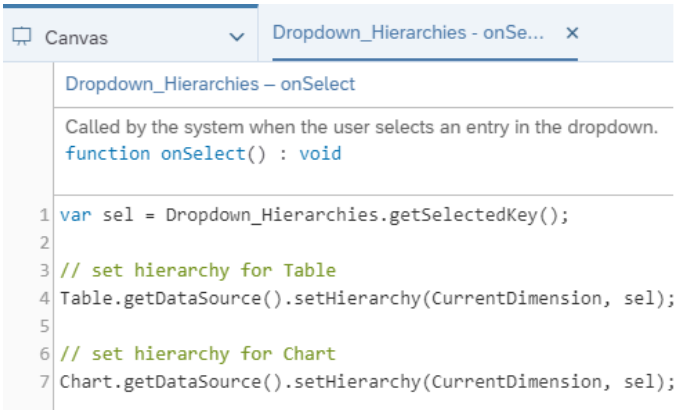
A window for the newly added script variable should now open.
In the Structure part, type in "CurrentDimension" as the Name, and then set "string" as the Type and "Location_4nm2e04531" as the Default Value.
This will make Location appear as our Default Value in the Dropdown widget when we run our application.



To trigger the action of filtering when a choice is selected from the Dropdown Lists, we need to write an onSelect script for the them.

We'll start with the Hierarchies Dropdown widget:
To open the onSelect function, hover on the Dropdown object in the Layout and click on the *fx* icon that appears next to it.

This script will get the selected value of the Dropdown list and accordingly set the hierarchy of the Table and the Chart while referencing our script variable, CurrentDimension, so that the hierarchy displays only correctly filtered data.



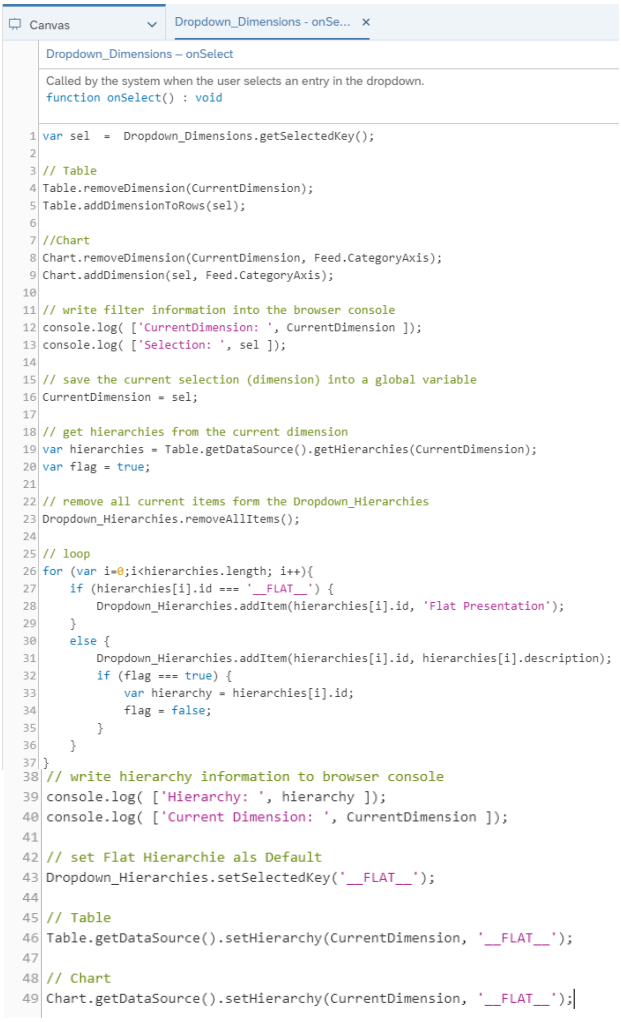

```
var sel = Dropdown_Hierarchies.getSelectedKey();

// set hierarchy for Table
Table.getDataSource().setHierarchy(CurrentDimension, sel);

// set hierarchy for Chart
Chart.getDataSource().setHierarchy(CurrentDimension, sel);
```

In this step, we will edit the onSelect script of the Dimensions Dropdown widget:
To open the onSelect function, hover on the Dropdown object in the Layout and click on the  icon that appears next to it.

This script will get the selected choice from the Dimensions Dropdown List and save it in a variable called sel. The next step is to remove all the dimensions from the Table and Chart and set the selected dimension as the new dimension.

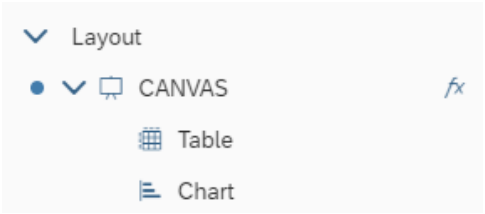
Then, from our data, we will get all the hierarchies that are available for that selected dimension, remove the hierarchies that are written now in the Hierarchies Dropdown List and loop over the available hierarchies for this selected dimension.

Lastly, we set Flat Presentation as the default hierarchy and filter our Table and Chart with the selected Dimension.

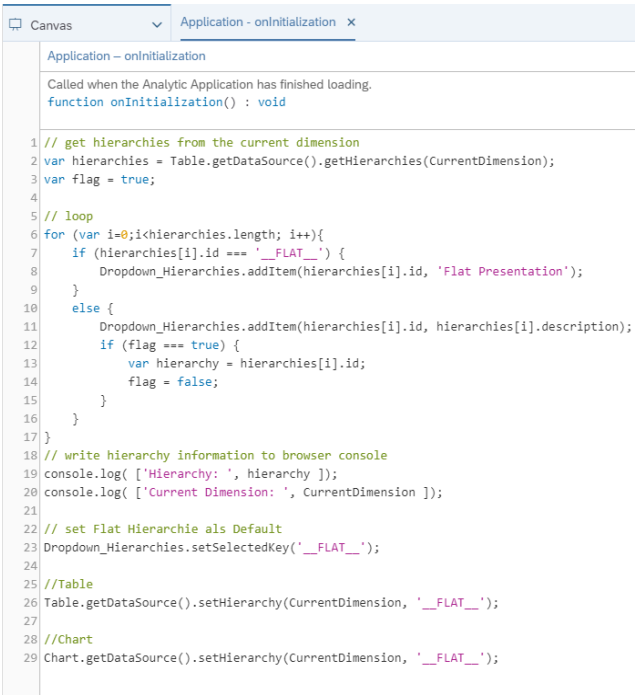



```
var sel  =  Dropdown_Dimensions.getSelectedKey();

// Table
Table.removeDimension(CurrentDimension);
Table.addDimensionToRows(sel);

//Chart
Chart.removeDimension(CurrentDimension, Feed.CategoryAxis);
Chart.addDimension(sel, Feed.CategoryAxis);

// write filter information into the browser console
console.log( ['CurrentDimension: ', CurrentDimension ]);
console.log( ['Selection: ', sel ]);

// save the current selection (dimension) into a global variable
CurrentDimension = sel;

// get hierarchies from the current dimension
var hierarchies = Table.getDataSource().getHierarchies(CurrentDimension);
var flag = true;

// remove all current items form the Dropdown_Hierarchies
Dropdown_Hierarchies.removeAllItems();

// loop
for (var i=0;i<hierarchies.length; i++){
    if (hierarchies[i].id === '__FLAT__') {
        Dropdown_Hierarchies.addItem(hierarchies[i].id, 'Flat Presentation');
    }
    else {
        Dropdown_Hierarchies.addItem(hierarchies[i].id, hierarchies[i].description);
        if (flag === true) {
            var hierarchy = hierarchies[i].id;
            flag = false;
        }
    }
}
// write hierarchy information to browser console
console.log( ['Hierarchy: ', hierarchy ]);
console.log( ['Current Dimension: ', CurrentDimension ]);

// set Flat Hierarchie als Default
Dropdown_Hierarchies.setSelectedKey('__FLAT__');

// Table
Table.getDataSource().setHierarchy(CurrentDimension, '__FLAT__');

// Chart
Chart.getDataSource().setHierarchy(CurrentDimension, '__FLAT__');
```

```
var sel = Dropdown_Dimensions.getSelectedKey();

// Table
Table.removeDimension(CurrentDimension);
Table.addDimensionToRows(sel);

//Chart
Chart.removeDimension(CurrentDimension, Feed.CategoryAxis);
Chart.addDimension(sel, Feed.CategoryAxis);

// write filter information into the browser console
console.log(['CurrentDimension: ', CurrentDimension]);
console.log(['Selection: ', sel]);

// save the current selection (dimension) into a global
variable
CurrentDimension = sel;

// get hierarchies from the current dimension
var hierarchies =
Table.getDataSource().getHierarchies(CurrentDimension);
var flag = true;

// remove all current items form the Dropdown_Hierarchies
Dropdown_Hierarchies.removeAllItems();

// loop
for (var i = 0; i < hierarchies.length; i++) {
  if (hierarchies[i].id === '__FLAT__') {
    Dropdown_Hierarchies.addItem(hierarchies[i].id, 'Flat
Presentation');
  }
  else {
```

	`` Dropdown_Hierarchies.addItem(hierarchies[i].id, hierarchies[i].description); if (flag === true) { var hierarchy = hierarchies[i].id; flag = false; } } } // write hierarchy information to browser console console.log(['Hierarchy: ', hierarchy]); console.log(['Current Dimension: ', CurrentDimension]); // set Flat Hierarchie als Default Dropdown_Hierarchies.setSelectedKey('__FLAT__'); // Table Table.getDataSource().setHierarchy(CurrentDimension, '__FLAT__'); // Chart Chart.getDataSource().setHierarchy(CurrentDimension, '__FLAT__'); ```
The last step is setting what happens when the application is first run. This is done through the onInitialization function of the Canvas itself. To get to this script, please hover over the CANVAS in the Layout and click on the fx icon when it appears and select onInitialization.	

In this use case, we want to make sure that on initialization, we load all the available hierarchies of the dimensions and set Flat Presentation as the default of the Hierarchies Dropdown List.
The script for this part is the same as some of what happens when a dimension is chosen.



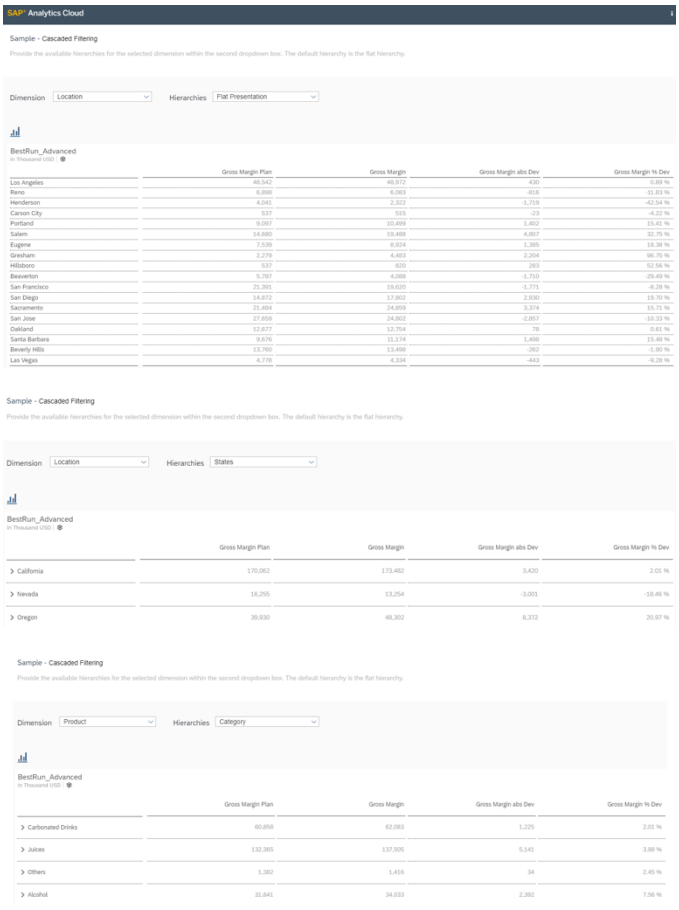

```
// get hierarchies from the current dimension
var hierarchies =
Table.getDataSource().getHierarchies(CurrentDimension);
var flag = true;

// loop
for (var i = 0; i < hierarchies.length; i++) {
  if (hierarchies[i].id === '__FLAT__') {
    Dropdown_Hierarchies.addItem(hierarchies[i].id, 'Flat
Presentation');
  }
  else {
    Dropdown_Hierarchies.addItem(hierarchies[i].id,
hierarchies[i].description);
    if (flag === true) {
      var hierarchy = hierarchies[i].id;
      flag = false;
    }
  }
}
// write hierarchy information to browser console
console.log(['Hierarchy: ', hierarchy]);
console.log(['Current Dimension: ', CurrentDimension]);

// set Flat Hierarchie als Default
Dropdown_Hierarchies.setSelectedKey('__FLAT__');

//Table
Table.getDataSource().setHierarchy(CurrentDimension,
'__FLAT__');

//Chart
Chart.getDataSource().setHierarchy(CurrentDimension,
'__FLAT__');
```

Now let’s see how it looks like.

Click on Run Analytic Application in the upper right side of the page and the result should look something like this:

If we keep the dimension on “Location” but change the hierarchy to “States”, the Table would change to display the location according to the states we have.

Now, if we change the dimension to “Product” and set the hierarchy to “Category”, we will see the different categories of products displayed.



6.6 Add and Remove Dimension in Rows and Columns for Table

In this example, we will, through Checkbox Groups, control which measures as well as which dimensions are displayed in the Table.

The user can select which measures they would like displayed in the Table through the Measures Checkbox and then through another Checkbox, they could decide which dimensions they want displayed on the columns or the rows of the Table.

The application also makes it easier for the user to select all or remove all measures by adding buttons specifically for that purpose.

They can also remove the dimensions that they added to the columns and rows and are able to choose to add them again afterwards.

The result will look like this when we run the application:

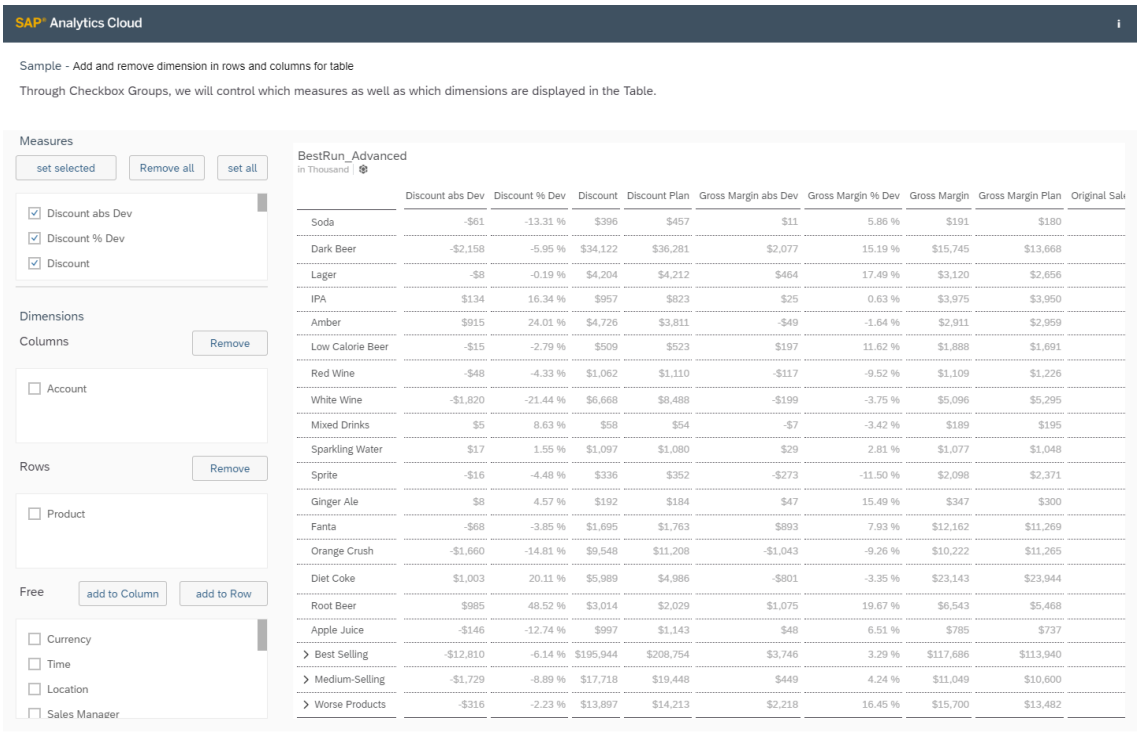
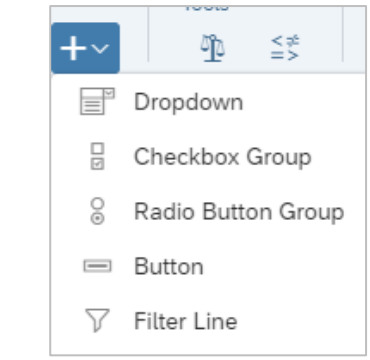
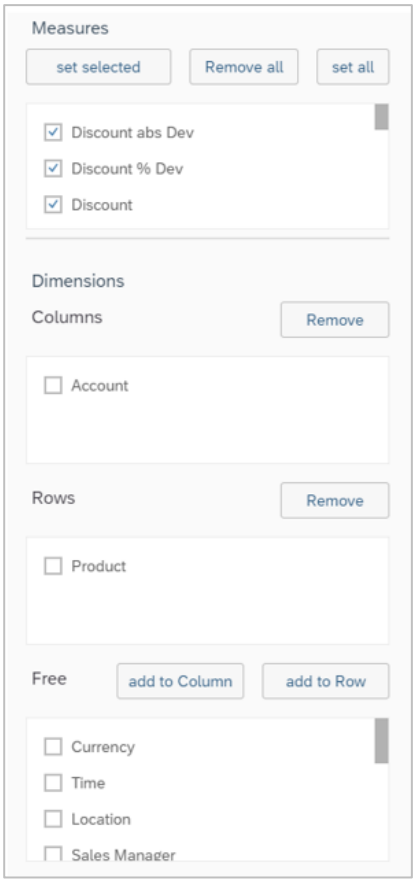


Figure 51: Add and Remove Dimensions

This application assumes that there already is a Table in your canvas. To match the scripts in the application it is recommended to rename the widget to `Table`.

We will start by adding 5 Checkbox Groups.
The first one will display all the available measures and the user can choose which ones they want to see in the Table, the second one will display the dimensions we want our Columns to be filtered on, while the third does the same but for our Rows.
The fourth Checkbox Group will display the dimensions that we could add to the second and third Checkbox.





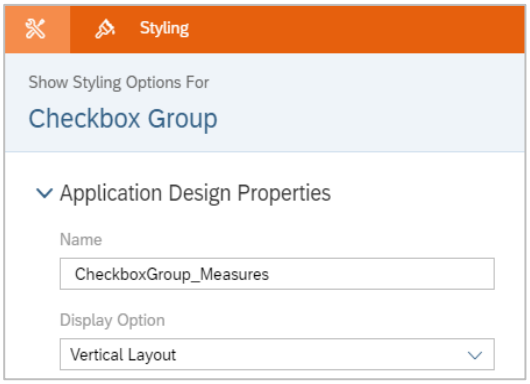
Place the first four Checkbox Groups under each other on the left side of the Table. (as shown in the screenshot).

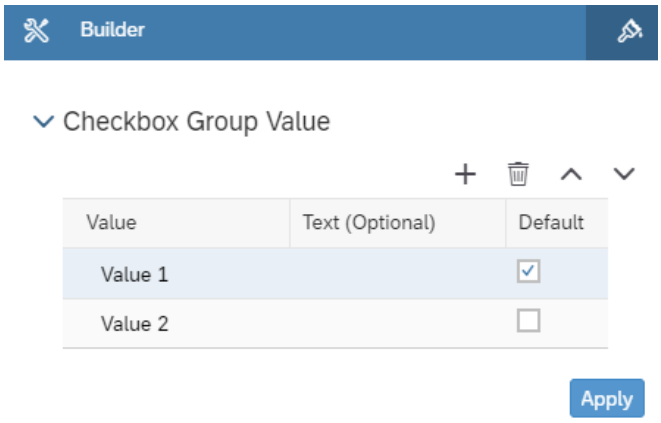
The fifth Checkbox Group will get the selected dimensions of the fourth Checkbox and order the Checkboxes according to the selections while also taking care that there aren't any repetitions in any of the other Checkbox Groups.

To start off, please click on the "+" icon in the Insert Panel and choose Checkbox Group and place on the left side of the Table.

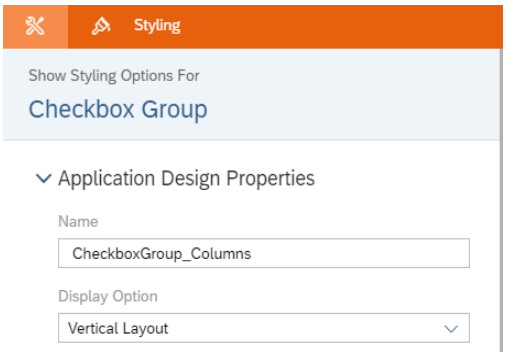
Go to the Designer of the first Checkbox (by clicking on Designer on the upper right side of the screen) and switch to the Styling Panel by clicking on the  button.

There, please enter "CheckboxGroup_Measures" as the Name and choose "Vertical Layout" as the Display Option.

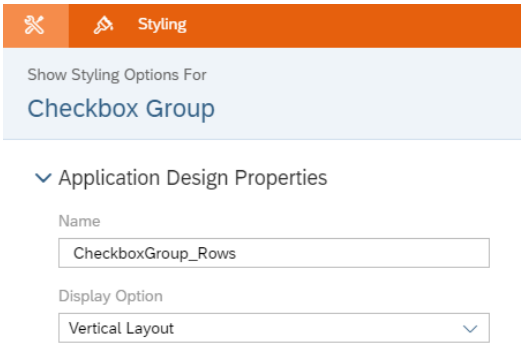


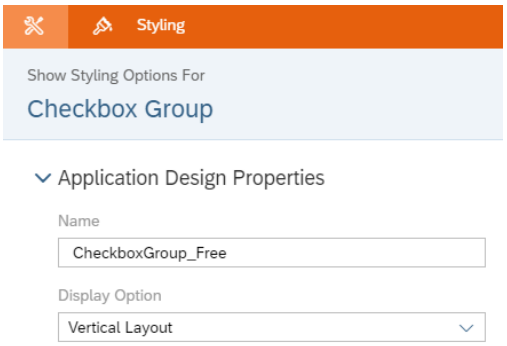
Switch over to the Builder Panel of the same widget and delete the values in the Table. Simply select the value and click on the  icon to delete it. Afterwards, click on Apply to save the changes.	

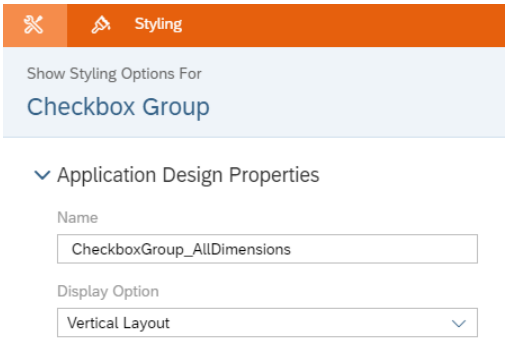
We will do the same for the other Checkbox Groups. Please add four new Checkbox Groups; for the first enter “CheckboxGroup_Columns”, for the second enter “CheckboxGroup_Rows”, for the third enter “CheckboxGroup_Free”, and for the last enter “CheckboxGroup_AllDimensions” as the Name.
Choose “Vertical Layout” as the Display Option for all of them.



Place the three Checkbox Groups under each other on the left side of the Table, under the Measure Checkbox, in the order in which we inserted them (as described before).

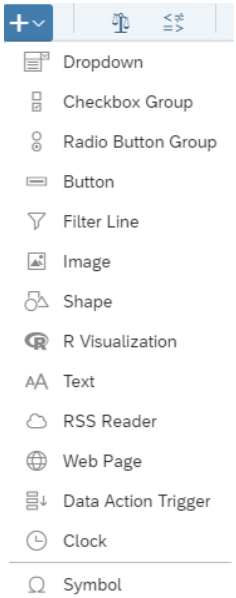
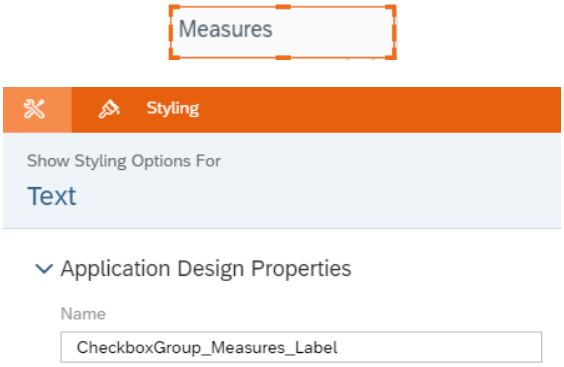
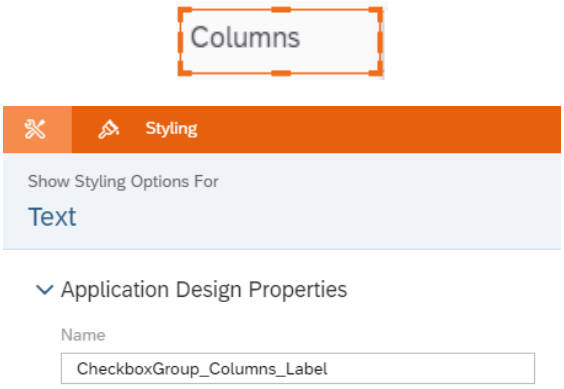


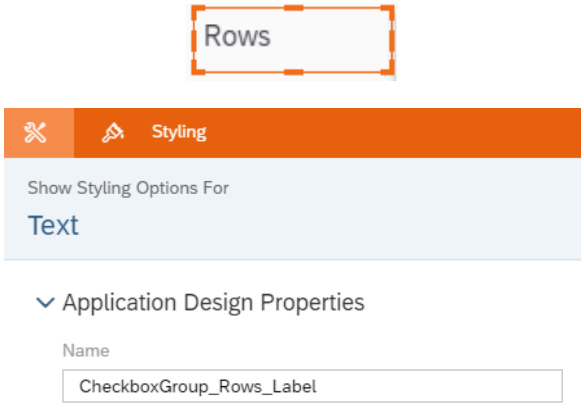
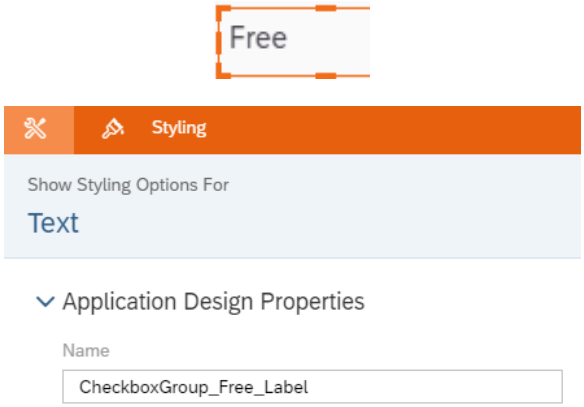
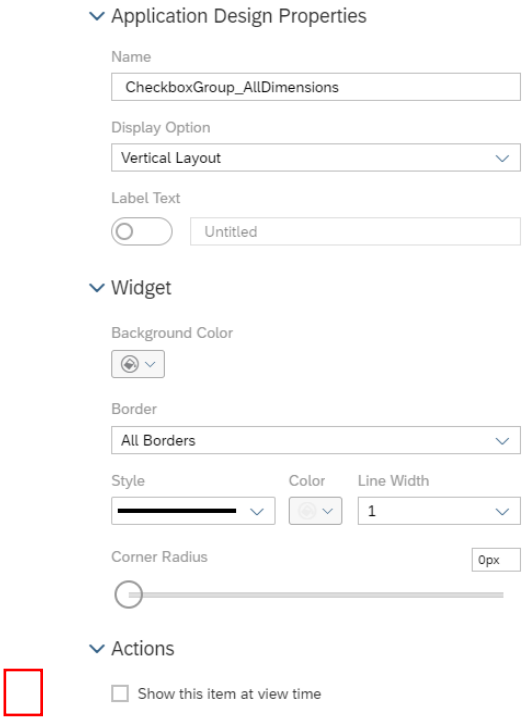


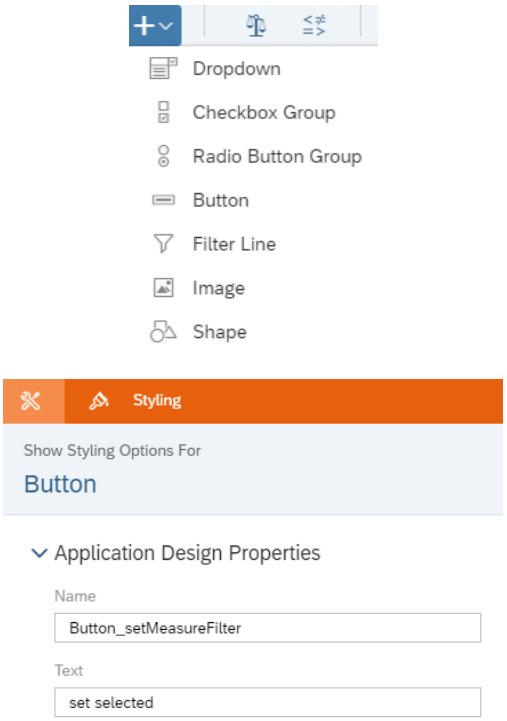
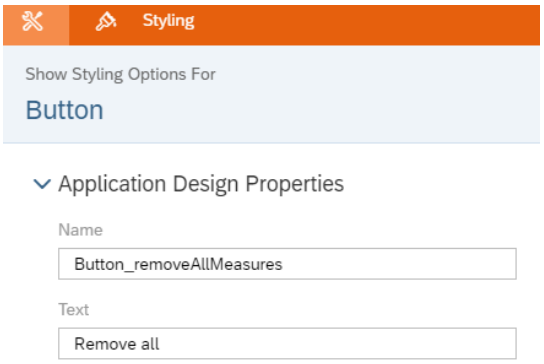
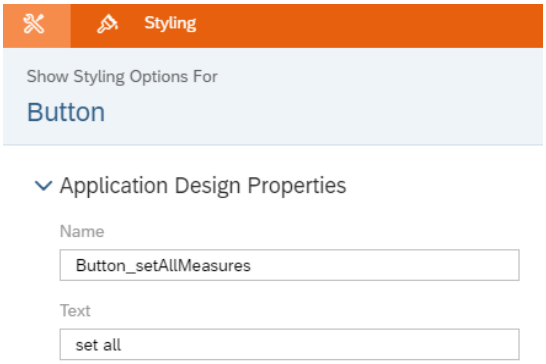


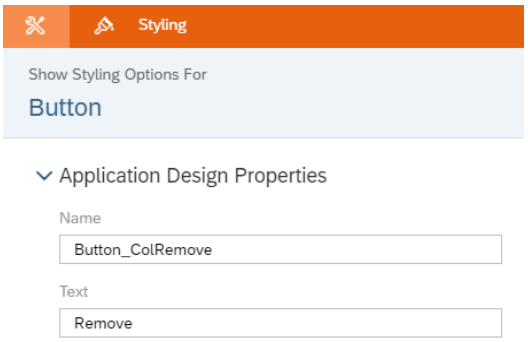
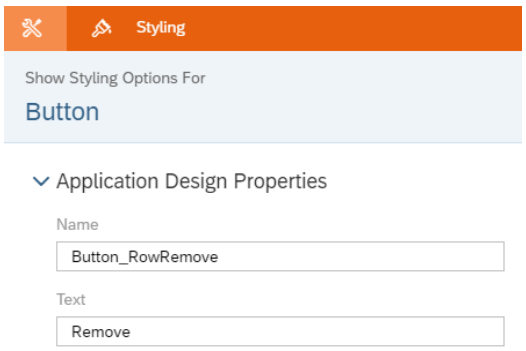
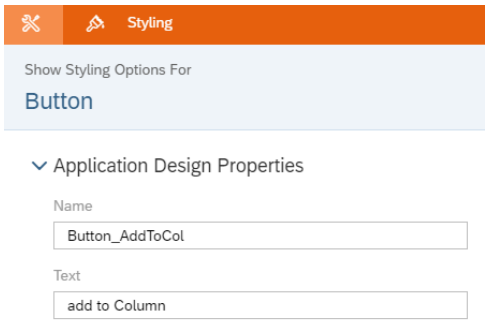
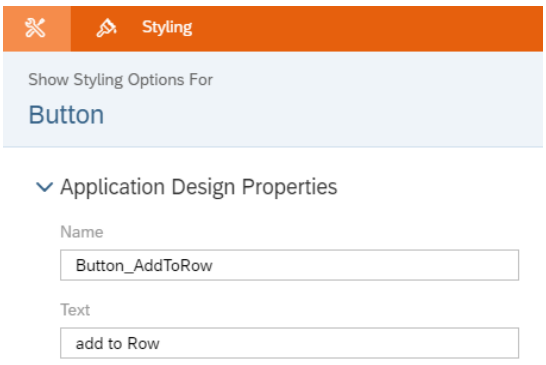
Please place the last checkbox as indicated in the screenshot on the right or somewhere in the canvas (the place is not important because the checkbox will be hidden).

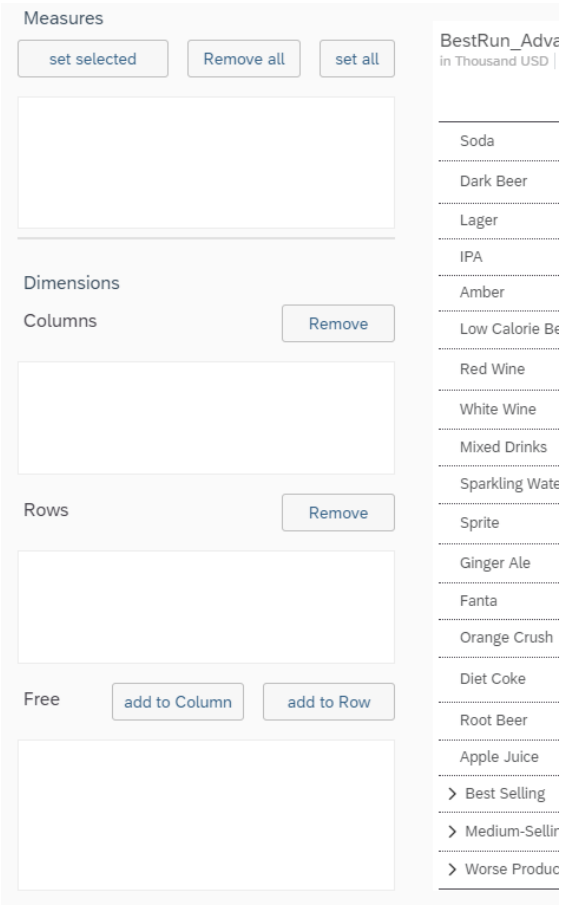
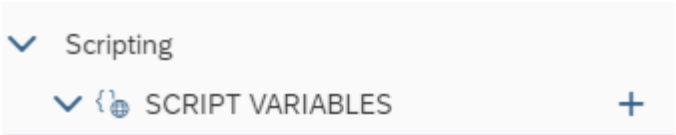
After editing these values, go to the Builder Panel of each of the Checkbox Groups and delete the values that are there like we did in the first Checkbox Group.

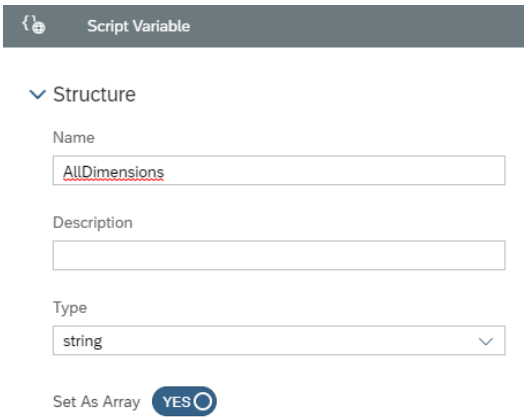
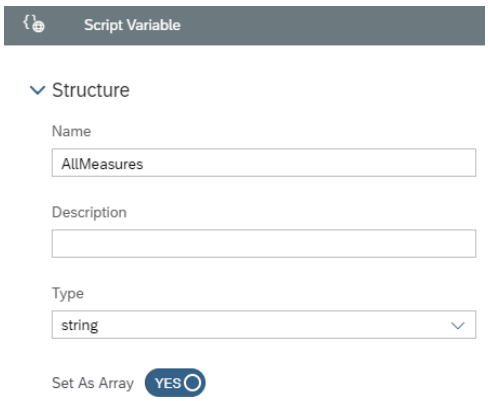
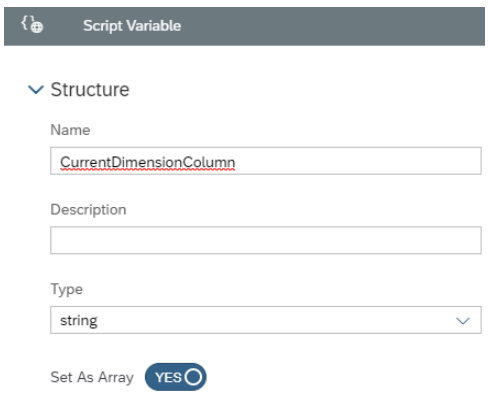
To be able to distinguish the Checkbox Groups from each other, we need to have labels for four of them. (We don't need a label for the All Dimensions Checkbox because it won't be visible at view time) To add a Label, please click again on the "+" icon, insert four Text widgets, and place each one of them above each of the Checkbox Groups we added.	
Now, we will set the properties of the labels we added. Double click on the first label and type "Measures" And then go into the Designer Styling Panel of the label. There, we will set the name of the Label that we will use if we need to reference this widget in a script. Please, insert the name "CheckboxGroup_Measures_Label".	
We will do the same for our second label. Double click on the first label and type "Columns" And then go into the Designer Styling Panel of the label and insert "CheckboxGroup_Columns_Label" in its Name field.	

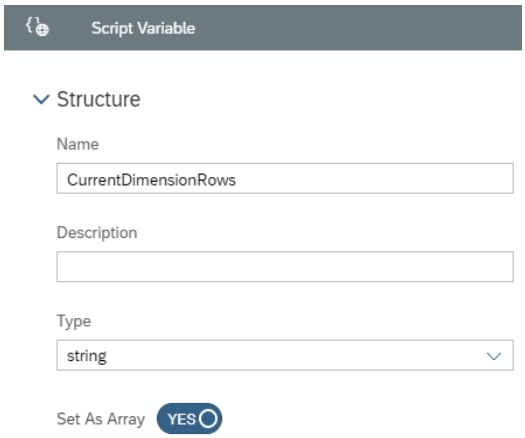
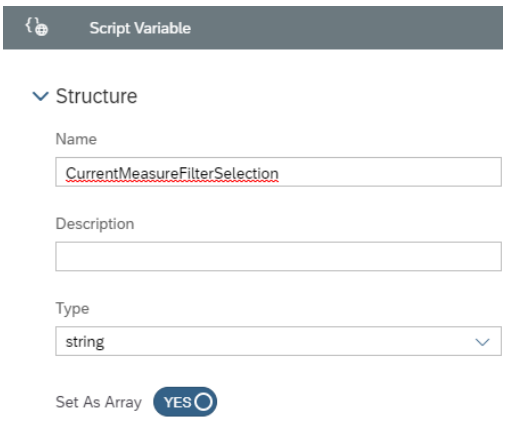
Navigate towards the third label and there: Double click on the first label and type “Rows” And then go into the Designer Styling Panel of the label and Insert the Name “CheckboxGroup_Rows_Label”.	
Finally, we will edit our fourth label. Double click on the first label and type “Free” And then go into the Designer Styling Panel of the label and insert the name “CheckboxGroup_Free_Label” as its Name.	
Now, we need to set the AllDimensions Checkbox to invisible at view time because we only need it to sort our dimensions as you’ll see later in the exercise. Go into the Styling Panel in the Designer of the CheckboxGroup_AllDimensions and uncheck Show this item at view time	

Now, we will add all the buttons, we need, to control our choices from the Checkbox Groups. To add our first button, please click on the “+” icon and insert a Button and place it between the Measures Label and its Checkbox Group. To edit the button, click on it and go to the Styling Panel in the Designer. For the Name, enter “Button_setMeasureFilter” and for the Text enter “set selected”. This button will set the measures we choose from the Measures Checkbox as measures for our Table.	
Now, we will do the same for all the buttons we need. Add a new button and place it next to the first one. For this button, enter “Button_removeAllMeasures” for the Name and “Remove all” for the Text. This button will be used to uncheck all the measures from the Measures Checkbox Group and set the measure filters for the Table to empty.	
Add a third button and place it next to the second one. For this button, enter “Button_setAllMeasures” for the Name and “set all” for the Text. This button will be used to set all the available measures as measures for our Table.	

Add a new button and place it next to the “Columns” Label. This button’s Name will be set to “Button_ColRemove” and its Text will read “Remove” and it will be used to remove the dimensions that the user selects in the Columns Checkbox from the Checkbox as well as from the columns of our Table.	
Next to the Rows Label, insert a new button and enter the Name “Button_RowRemove” and the Text “Remove” in its properties’ settings. This button will be used to remove the dimensions that the user selects in the Rows Checkbox from the Checkbox as well as the rows of our Table.	
Next to the Free Label we will add two buttons; for the first, insert a new button and enter the Name “Button_AddToCol” and the Text “add to Column” in its properties’ settings. When this button is clicked, the selected dimensions from the Free Checkbox Group will be added as dimensions of the Table’s Columns.	
Next to the previous button, please add another button and enter “Button_AddToRow” for the Name and “add to Row” for the Text. When this button is clicked, the selected dimensions from the Free Checkbox Group will be added as dimensions to the Rows in the Table.	

Please compare your Canvas to the screenshot on the right and make sure they look alike. We will not add a label for the last Checkbox Group (All Dimensions) since it is there to simply help us set the dimensions in the Columns, Rows, and Free Checkboxes so that there are no repetitions.	
To be able to filter according to the measures and dimensions chosen from the Checkbox Groups, we need to be able to store the choices in variables that can be accessed from anywhere in the application; that means that we need Script Variables. To add a script variable, click on the “+” next to SCRIPT VARIABLES that is under Scripting.	

A window for the newly added script variable should now open. In the Structure part, type in “AllDimensions” as the Name, and then set “string” as the Type and toggle the Set As Array button to Yes. This variable will hold all the dimensions in our data set.	
Now, we will add a second script variable that will hold all the measures of our data set. Add a new variable like we did in the previous 2 steps. In the name field insert “AllMeasures”, set the Type to “string”, and toggle the Set As Array button to Yes.	
To be able to implement the selected dimensions in our Columns and Rows, we need to save these in a script variable. Firstly, we will insert a script variable to hold the selected dimensions that we have chosen to add to our Columns. Add a new script variable and enter “CurrentDimensionColumn” in the Name field, set string as Type, and toggle the Set As Array button to Yes.	

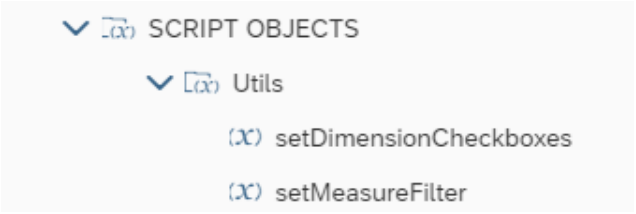
To hold the selected dimensions, we have chosen to add to our Rows, we will insert a new script variable. Type “CurrentDimensionRows” in the Name field, set the Type to string, and toggle the Set As Array button to Yes.	
Our final script variable will hold the measure(s) we have selected from the Measures Checkbox Group. Insert a new script variable and set the Name to “CurrentMeasureFilterSelection”, the Type to string, and the Set As Array to Yes.	

To define what should happen when a dimension or a measure is chosen, we need to create a Script Object. In this object, we will create a function that sets the measure filter according to what the user has chosen from the Measures Checkbox Group and another function that sets the dimensions according to what the user has chosen from the Free Checkbox Group.
To create a Script Object, select the "+" icon next to SCRIPT OBJECTS under the Layout.

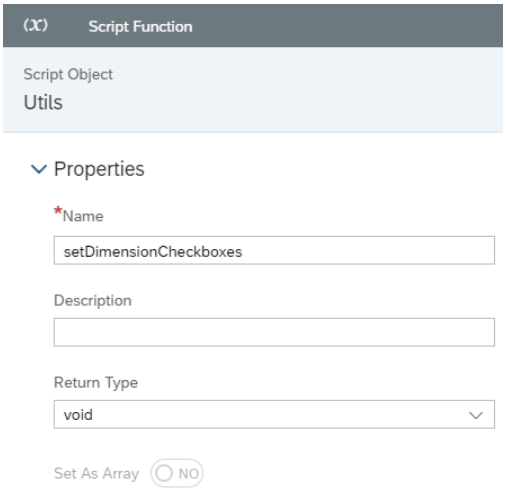
This will add only one script function to the script object.
To add a second one, hover over the folder created, click on the icon when it appears and click on "+ Add Script Function".

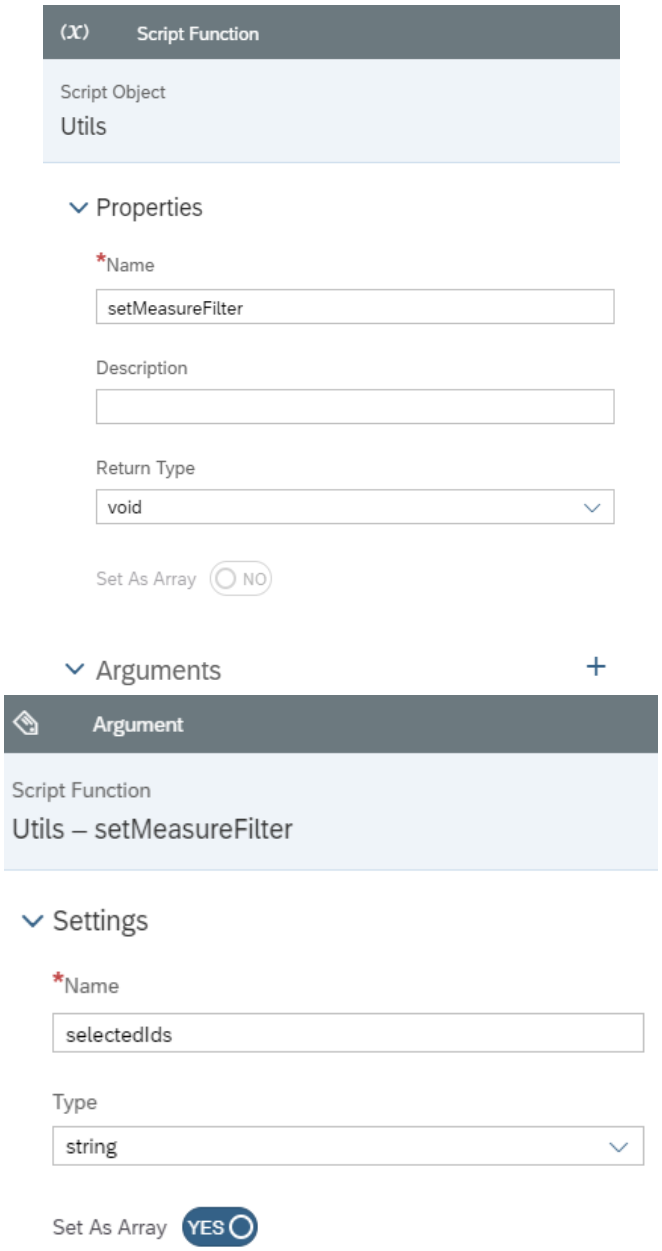
Rename all the added elements as the following:
We will name the folder Utils, the first function setDimensionCheckboxes and the second function setMeasureFilter.

To rename the objects, hover over them one by one and when the icon appears click on it and choose Rename.



Click on the function setDimensionCheckboxes and set the Return Type to void.



Click on the function setMeasureFilter and when the Properties window opens, set the Return Type to void and click on the “+” icon next to Arguments. There, add an argument with the name “selectedIds” and the type string[] (string array).	

Now, we can write the script for the functions.

Please click on the fx icon next to the setDimensionCheckboxes function.
Here, we will define what happens when a user selects dimensions from the Free Checkbox Group to be added to the Columns or the Rows.

Firstly, we will remove all items from the Column, Rows, and Free Checkboxes.

Then, we will call on the create function of the script variables and create two new string arrays and save one in our CurrentDimensionColumn script variable and the other in the CurrentDimensionRows script variable.

Afterwards, we get the dimensions that are now on the Table's columns and push each on into the string array of CurrentDimensionColumn. We then do the same for the Rows, this time pushing the row dimensions into the string array of CurrentDimensionRows.

We then get all the dimensions and we will see which dimensions were chosen from the AllDimensionsCheckbox.

Next, we will add these dimensions to our Free Checkbox but remove the ones that are in the Rows or Columns Checkboxes so that we don't have any repetitions between the three Checkboxes.


```
CheckboxGroup_Columns.removeAllItems();
CheckboxGroup_Rows.removeAllItems();
CheckboxGroup_Free.removeAllItems();

CurrentDimensionColumn = ArrayUtils.create(Type.string);
CurrentDimensionRows = ArrayUtils.create(Type.string);
console.log(["CurrentDimensionColumn should empty", CurrentDimensionColumn.slice()]);
console.log(["CurrentDimensionRows should empty", CurrentDimensionRows.slice()]);

// Dimension in Columns
var dimCol = Table.getDimensionsOnColumns();
if (dimCol.length > 0) {
    for (var i=0;i<dimCol.length; i++){
        CurrentDimensionColumn.push(dimCol[i]);
        console.log(["CurrentDimensionColumn ", dimCol[i]]);
    }
}


// Dimension in Rows
var dimRows = Table.getDimensionsOnRows();
if (dimRows.length > 0) {
    for (i=0;i<dimRows.length; i++){
        CurrentDimensionRows.push(dimRows[i]);
        console.log(["CurrentDimensionRows ", dimRows[i]]);
    }
}

// get all Dimensions
if (AllDimensions.length > 0) {
    for (i=0;i<AllDimensions.length; i++){
        if (AllDimensions[i] !== "") {
            CheckboxGroup_AllDimensions.setSelectedKeys([AllDimensions[i]]);
            var dimdesc = CheckboxGroup_AllDimensions.getSelectedTexts();
            CheckboxGroup_Free.addItem(AllDimensions[i],dimdesc[0]);
            console.log(["AllDimensions",AllDimensions[i], dimdesc[0]]);
        }
    }
}

console.log(["CurrentDimensionColumn", CurrentDimensionColumn]);
console.log(["CurrentDimensionRows", CurrentDimensionRows]);

// remove the dimsions from the free list, which are in rows / columns
if (CurrentDimensionRows.length > 0) {
    for (i=0;i<CurrentDimensionRows.length; i++){
        if (CurrentDimensionRows[i] !== "") {
            CheckboxGroup_Free.setSelectedKeys([CurrentDimensionRows[i]]);
            dimdesc = CheckboxGroup_Free.getSelectedTexts();
            CheckboxGroup_Rows.addItem(CurrentDimensionRows[i],dimdesc[0]);
            CheckboxGroup_Free.removeItem(CurrentDimensionRows[i]);
        }
    }
}

if (CurrentDimensionColumn.length > 0) {
    for (i=0;i<CurrentDimensionColumn.length; i++){
        if (CurrentDimensionColumn[i] !== "") {
            CheckboxGroup_Free.setSelectedKeys([CurrentDimensionColumn[i]]);
            dimdesc = CheckboxGroup_Free.getSelectedTexts();
            CheckboxGroup_Columns.addItem(CurrentDimensionColumn[i],dimdesc[0]);
            CheckboxGroup_Free.removeItem(CurrentDimensionColumn[i]);
        }
    }
}
```

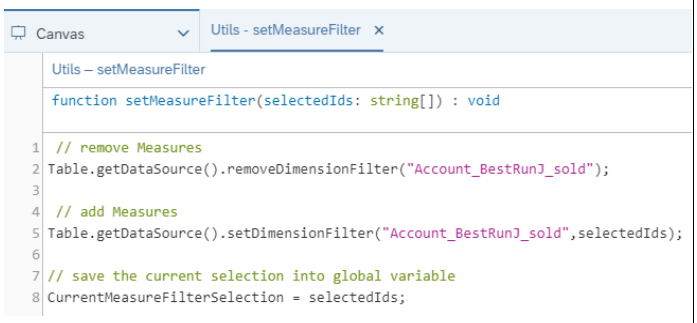
```
CheckboxGroup_Columns.removeAllItems();
CheckboxGroup_Rows.removeAllItems();
CheckboxGroup_Free.removeAllItems();

CurrentDimensionColumn = ArrayUtils.create(Type.string);
CurrentDimensionRows = ArrayUtils.create(Type.string);
console.log(["CurrentDimensionColumn should empty",
CurrentDimensionColumn.slice()]);
console.log(["CurrentDimensionRows should empty",
CurrentDimensionRows.slice()]);

// Dimension in Columns
var dimCol = Table.getDimensionsOnColumns();
if (dimCol.length > 0) {
  for (var i = 0; i < dimCol.length; i++) {
    CurrentDimensionColumn.push(dimCol[i].id);
    console.log(["CurrentDimensionColumn ",
dimCol[i].id]);
  }
}
```

```
// Dimension in Rows
var dimRows = Table.getDimensionsOnRows();
if (dimRows.length > 0) {
  for (i = 0; i < dimRows.length; i++) {
    CurrentDimensionRows.push(dimRows[i].id);
    console.log(["CurrentDimensionRows ",
dimRows[i].id]);
  }
}

// get all Dimensions
if (AllDimensions.length > 0) {
  for (i = 0; i < AllDimensions.length; i++) {
    if (AllDimensions[i] !== "") {

CheckboxGroup_AllDimensions.setSelectedKeys([AllDimension
s[i]]);
      var dimdesc =
CheckboxGroup_AllDimensions.getSelectedTexts();
      CheckboxGroup_Free.addItem(AllDimensions[i],
dimdesc[0]);
console.log(["AllDimensions",AllDimensions[i],
dimdesc[0]]);
    }
  }
}

console.log(["CurrentDimensionColumn",
CurrentDimensionColumn]);
console.log(["CurrentDimensionRows",
CurrentDimensionRows]);

// remove the dimensions from the free list, which are in
rows / columns
if (CurrentDimensionRows.length > 0) {
  for (i = 0; i < CurrentDimensionRows.length; i++) {
    if (CurrentDimensionRows[i] !== "") {

CheckboxGroup_Free.setSelectedKeys([CurrentDimensionRows[
i]]);
      dimdesc = CheckboxGroup_Free.getSelectedTexts();
      CheckboxGroup_Rows.addItem(CurrentDimensionRows[i],
dimdesc[0]);

CheckboxGroup_Free.removeItem(CurrentDimensionRows[i]);
    }
  }
}

if (CurrentDimensionColumn.length > 0) {
  for (i = 0; i < CurrentDimensionColumn.length; i++) {
    if (CurrentDimensionColumn[i] !== "") {

CheckboxGroup_Free.setSelectedKeys([CurrentDimensionColum
n[i]]);
      dimdesc = CheckboxGroup_Free.getSelectedTexts();

CheckboxGroup_Columns.addItem(CurrentDimensionColumn[i],
dimdesc[0]);

CheckboxGroup_Free.removeItem(CurrentDimensionColumn[i]);
    }
  }
}
```

Now, we will do the same for the setMeasureFilter function. Click on the fx icon next to the setMeasureFilter function and there, we will define what happens to the Table when a user selects a measure from the Dropdown list.

We will remove any already set dimension filter of the Table and then we will add the selectedIds as the new dimension(s) of the Table.

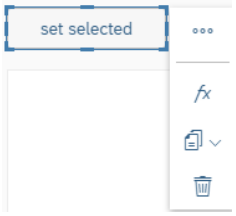
Finally, we will save the selected measures in our CurrentMeasureFilterSelection script variable.



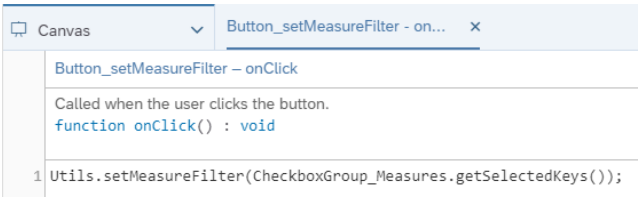

```
// remove Measures
Table.getDataSource().removeDimensionFilter("Account_Best
RunJ_sold");

// add Measures
Table.getDataSource().setDimensionFilter("Account_BestRun
J_sold", selectedIds);

// save the current selection into global variable
CurrentMeasureFilterSelection = selectedIds;
```

To trigger an action when our buttons are clicked, we need to write onClick scripts for the them.

Let's start with the first button, setMeasureFilter (Text: set selected).
Click on the button in your Canvas and select the fx icon.

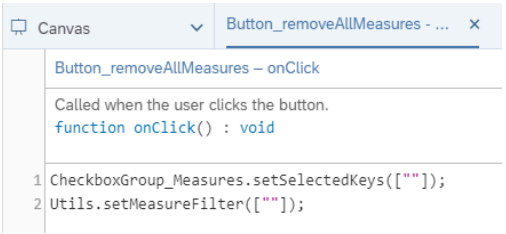


In the script of this button, we will get the selected keys of the Measures Checkbox and using the function Utils.setMeasureFilter, we will set them as the measure filters for our table.



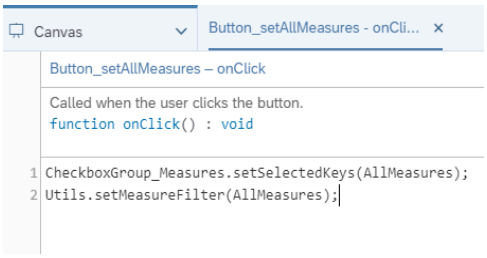

```
Utils.setMeasureFilter(CheckboxGroup_Measures.getSelected
Keys());
```

Next, we will edit the onClick script of the second button, removeAllMeasures (Text: Remove All).
Click on the button in your Canvas and select the fx icon.
Here, we will set the selected keys and the measure filter to empty arrays.



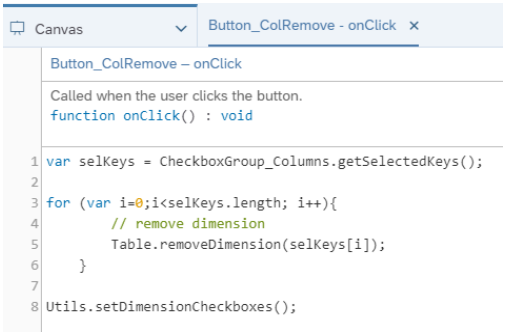

```
CheckboxGroup_Measures.setSelectedKeys([""]);
Utils.setMeasureFilter([""]);
```

The script of the third button, Button_setAllMeasures (Text: set all), will set the selected keys of the Checkbox Group to the script variable AllMeasures and use the Utils.setMeasureFilter function to set the measure filter to all measures.



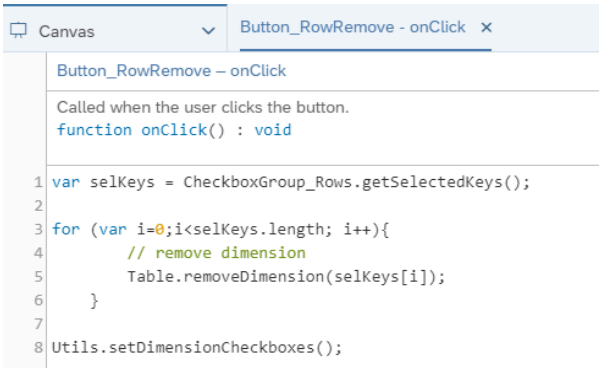

```
CheckboxGroup_Measures.setSelectedKeys(AllMeasures);
Utils.setMeasureFilter(AllMeasures);
```

The fourth button's script, Button_ColRemove (Text: Remove), when triggered, gets the selected keys of the Columns Checkbox Group and then removes these dimensions from the Table and then calls the setDimensionCheckboxes function to set the Checkboxes according to the new selections.



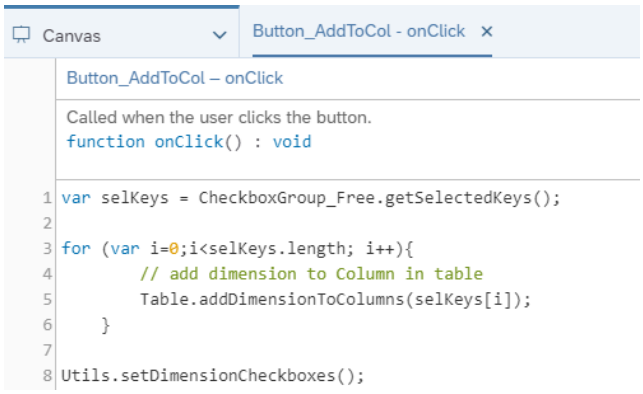

```
var selKeys = CheckboxGroup_Columns.getSelectedKeys();

for (var i = 0; i < selKeys.length; i++) {
  // remove dimension
  Table.removeDimension(selKeys[i]);
}

Utils.setDimensionCheckboxes();
```

Now, we will edit the script of the button Button_RowRemove (Text: Remove). Here, we will do the same as in step 32 with the ColRemove button. We will get the selected keys of the Rows Checkbox Group and then remove these dimensions from the Table and call the setDimensionCheckboxes function to reset the checkboxes again according to the new selections.




```
var selKeys = CheckboxGroup_Rows.getSelectedKeys();

for (var i = 0; i < selKeys.length; i++) {
  // remove dimension
  Table.removeDimension(selKeys[i]);
}

Utils.setDimensionCheckboxes();
```

The fifth button, Button_AddToCol (Text: add to Column) will, when clicked on, get the selected keys of the Free Checkbox and add the dimensions to the column of the Table.
The script will then call the setDimensionCheckboxes function to set the Checkboxes to the new selection.



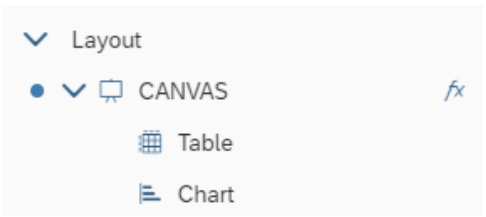

```
var selKeys = CheckboxGroup_Free.getSelectedKeys();

for (var i = 0; i < selKeys.length; i++) {
  // add dimension to Column in table
  Table.addDimensionToColumns(selKeys[i]);
}
Utils.setDimensionCheckboxes();
```

The script of the last button, Button_AddtRow (Text: add to Row), will get the selected keys of the Free Checkbox and add the dimensions to the Rows of the Table, and then, same as the previous script, it will call the setDimensionCheckboxes function to set the Checkboxes to the new selection.


```
var selKeys = CheckboxGroup_Free.getSelectedKeys();

for (var i = 0; i < selKeys.length; i++) {
  // remove dimension
  Table.addDimensionToRows(selKeys[i]);
}

Utils.setDimensionCheckboxes();
```

The last step is deciding what happens when the application is first run.
This is done through the onInitialization function of the Canvas itself.

To get to this script, please hover over the CANVAS in the Layout and click on the fx icon when it appears.



In this use case, we want to make sure that on initialization, we get all the measures from the data source of the Table.

We will then define an array of type string and call it selectedKeys. Afterwards, we will add all the measures to the Measures Checkbox Group as well as the selectedKeys array.

We will then set the selected keys of the Checkbox Group to the selectedKeys variable and set our script variable AllMeasures to selectedKeys since it still holds all the measures of our data set.

Afterwards, we define another string array and put all the dimensions of the data source in it as well as add these dimensions as items of the Checkbox Group of all dimensions (CheckboxGroup_AllDimensions).

Next, we will set the script variable AllDimensions to the string array (selectedDims) that we have created to store the dimensions in.

The last step is to call the functions of setMeasureFilter to set the selected keys to the array we had defined at the beginning (selectedKeys) and to call the setDimensionCheckboxes function to set the dimension checkboxes to its initial state.


```
// Measures
// get all measures from the table data source
var measures = Table.getDataSource().getMeasures();

// define array or the selected Keys
var selectedKeys = ArrayUtils.create(Type.string);

if (measures.length > 0) {
  for (var i = 0; i < measures.length; i++) {
    // add the Measure to checkbox group
    CheckboxGroup_Measures.addItem(measures[i].id,
measures[i].description);
    //add the measure to the selected Keys
    selectedKeys.push(measures[i].id);
  }
}
CheckboxGroup_Measures.setSelectedKeys(selectedKeys);
console.log(["selectedKey ", selectedKeys]);
AllMeasures = selectedKeys;

// define array or the selected Keys
var selectedDims = ArrayUtils.create(Type.string);
var dims = Table.getDataSource().getDimensions();
if (dims.length > 0) {
  for (i = 0; i < dims.length; i++) {
    CheckboxGroup_AllDimensions.addItem(dims[i].id,
dims[i].description);
    selectedDims.push(dims[i].id);
  }
}

console.log(["selectedDims ", selectedDims]);
AllDimensions = selectedDims;

Utils.setMeasureFilter(selectedKeys);

Utils.setDimensionCheckboxes();
```

Now let's see how it looks like.

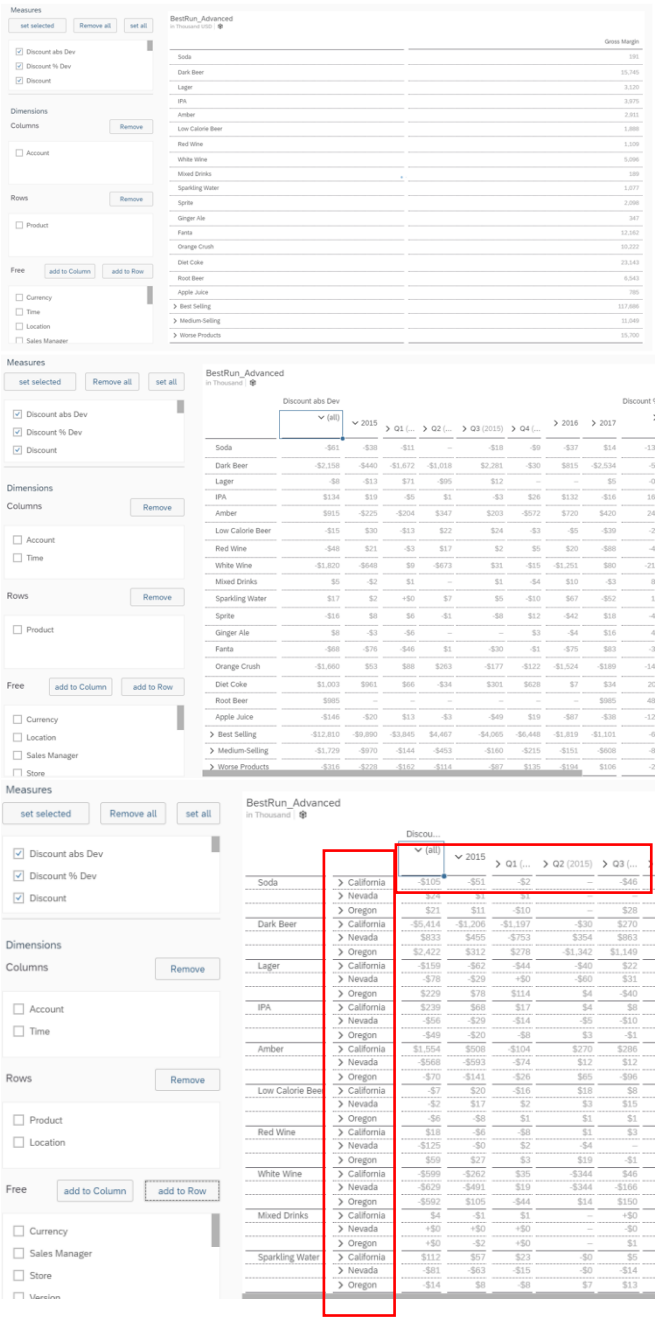
Click on Run Analytic Application in the upper right side of the page and the result should look something like this:

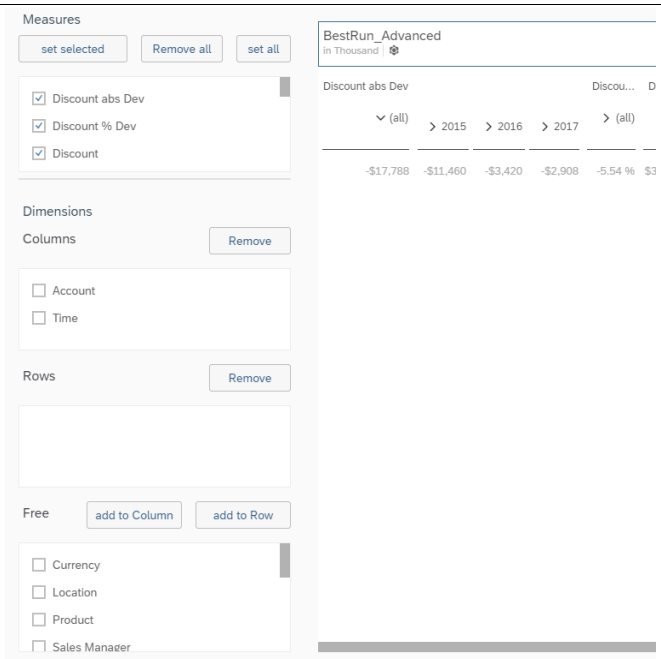
If we add the Time to the Columns Checkbox (select it in the Free Checkbox and click on add to Column), we will see that the dimension has been added and we can now see in more details what happened in which year regarding every measure.

Now, if we also add the dimension Location to the Rows, we will see the columns being filtered on the Time and the rows on the Location.

Finally, we can try to remove dimensions from the Rows and leave the Columns as we had them in the previous screenshot.

(Note: We cannot remove all the dimensions from the Columns because we must filter on at least one dimension)





6.7 Creating a Settings Panel Using a Popup Window

In this example, we will see how to use a popup window widget to create a setting panel where the user could control the contents of the Table and Chart in the canvas.

In this use case, we want to be able to filter our table and chart according to certain measure groups of our data set. Here, *Gross Margin*, *Discount*, *Quantity Sold*, and *Original Sales Price* are the options.

These measure groups are going to be selected from a Dropdown list in our canvas.

Afterwards, we will use the popup widget to switch between Table and Chart using a Radio Button Group and give the user the ability to control the measures (*Actual*, *Plan*, *Absolute*, and *% of Deviation*) of the measure groups using a Checkbox Group widget.

The result will look like this when we run the application:

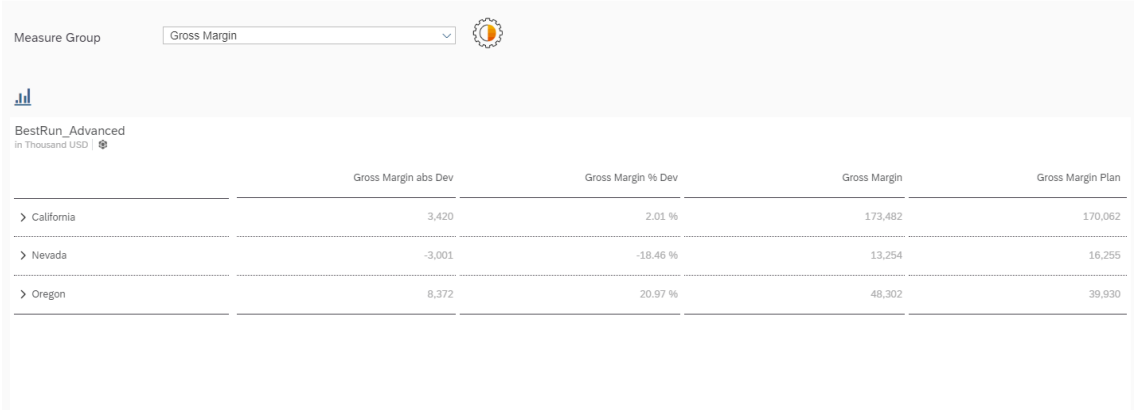


Figure 52: Example Application Settings Panel

And when the Settings button  is clicked, the application will display the popup with the settings that the user can change:

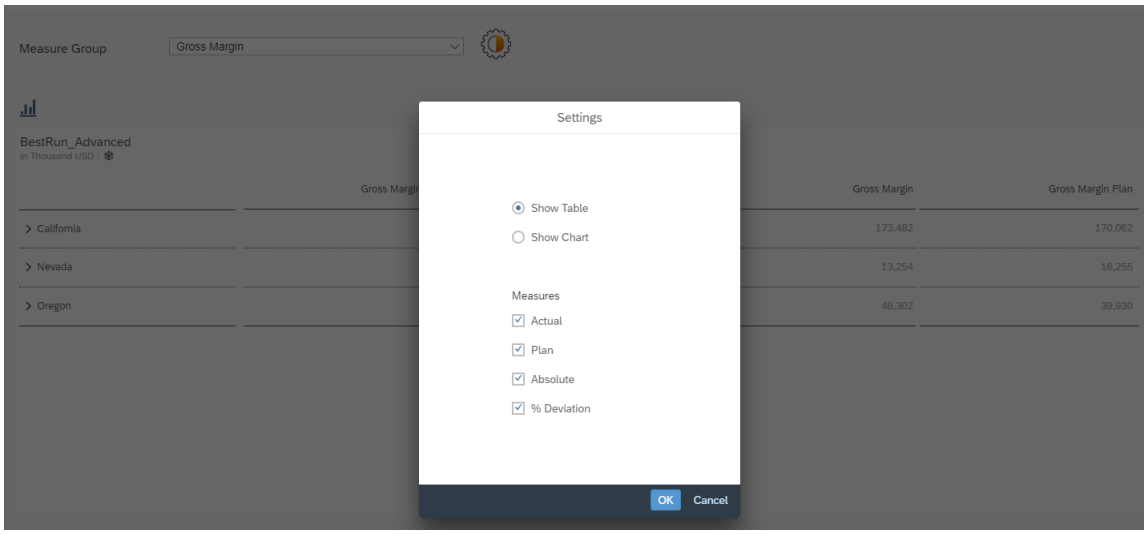
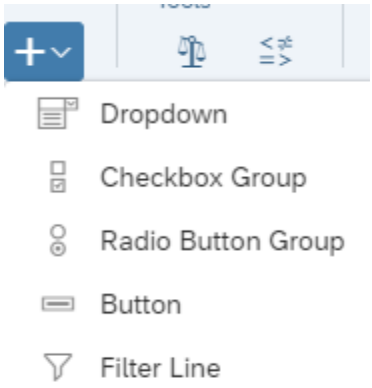
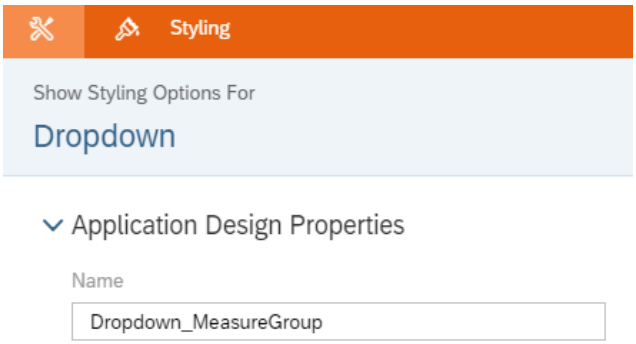


Figure 53: Popup Settings Panel

Prerequisites for this use case is having already added a table and a chart to your canvas. To have all the functionalities in this use case, please first go through the *Switching between Table and Chart* exercise.

The first thing we will do is add a Dropdown list that houses the measure groups with which we can filter our Table and Chart. To do this, please click on the “+” icon in the Insert panel and select Dropdown and place the widget above the Table in the Canvas.	
Go to the Designer (by clicking on Designer on the upper right side of the screen) and switch to the Styling Panel by clicking on the  button. There, enter “Dropdown_MeasureGroup” as the Name.	

Now, we will select which measures we want the user to be able to filter on.
In this use case, we will choose 4 measures; Gross Margin, Discount, Quantity Sold, and Original Sales Price.

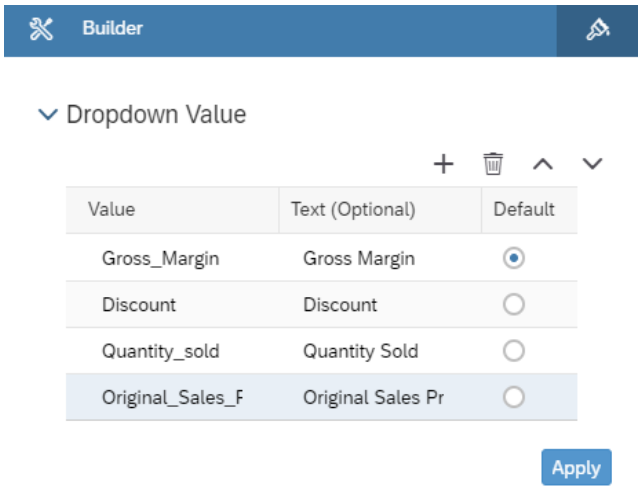
To enter these values in our dropdown list, switch over to the Builder Panel in the Designer by clicking on the  button.

There, press the “+” icon near the Dropdown value to enter our desired values.

The first value is Gross_Margin and its displayed text should read Gross Margin.
The second value is Discount and the displayed text is the same.

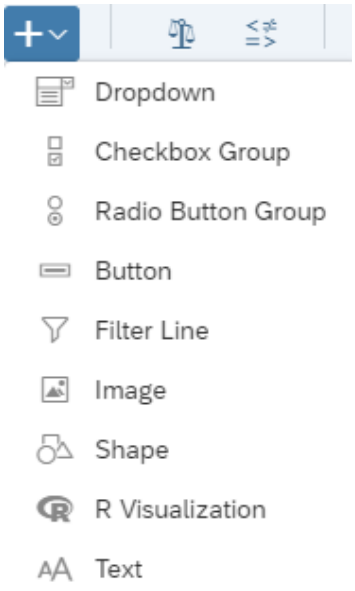
The third value is Quantity_sold and its displayed text is Quantity Sold.
And add a fourth Dropdown list element with the value Original_Sales_Price and its text should read Original Sales Price.

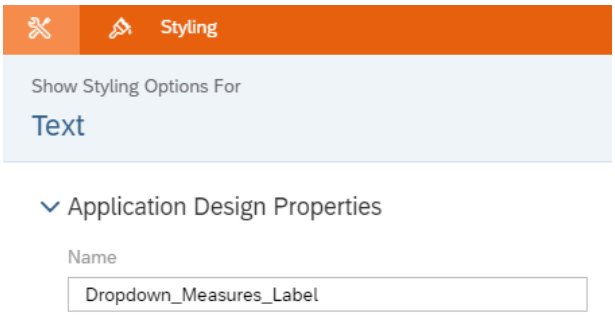
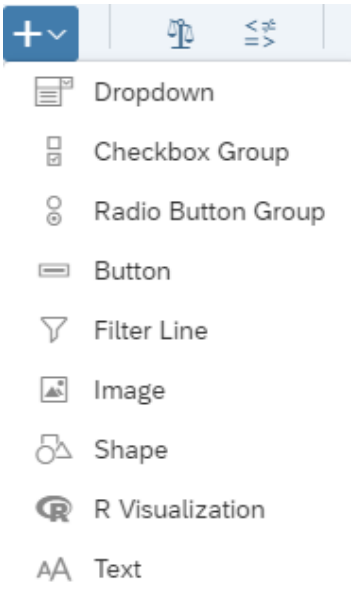
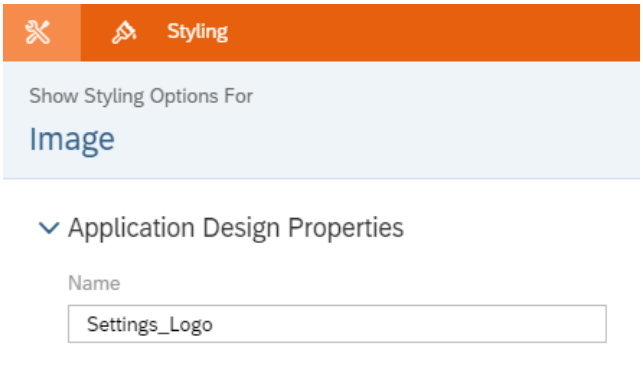
And finally, set Gross_Margin as the default value of the Dropdown list and click on Apply to save the changes.

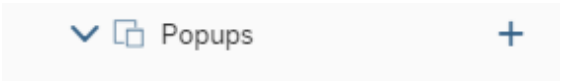
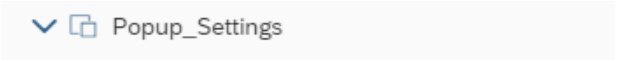
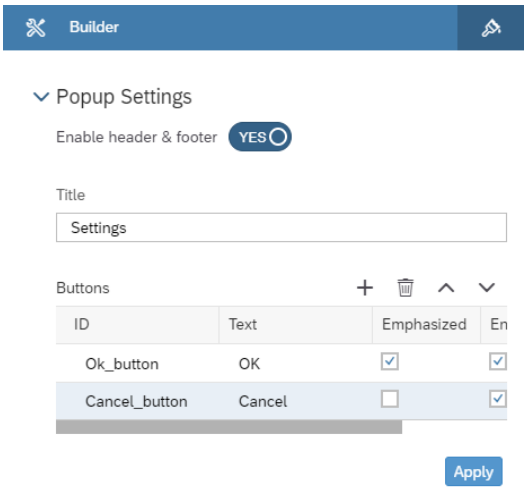
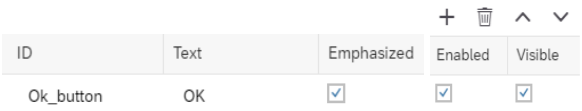
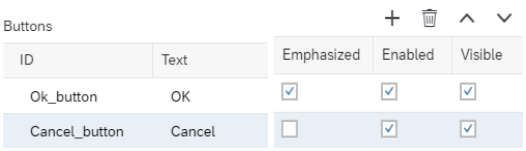


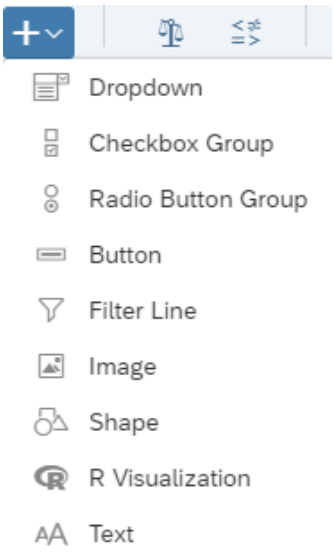
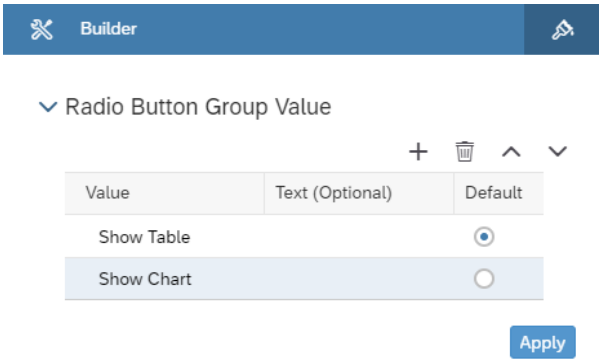
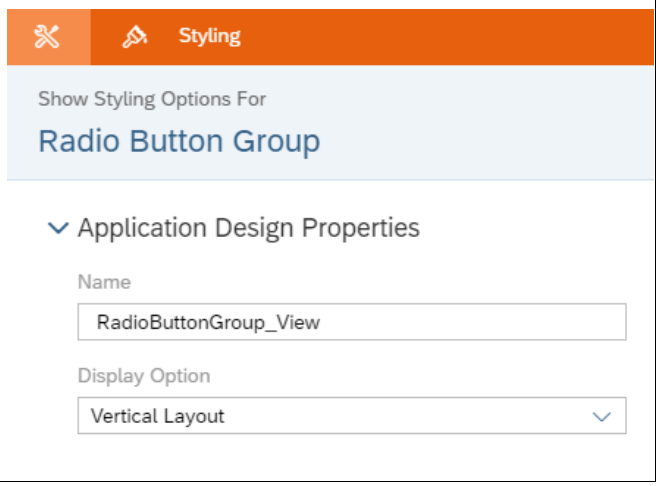
Value	Text (Optional)
Gross_Margin	Gross Margin
Discount	Discount
Quantity_sold	Quantity Sold
Original_Sales_Price	Original Sales Price

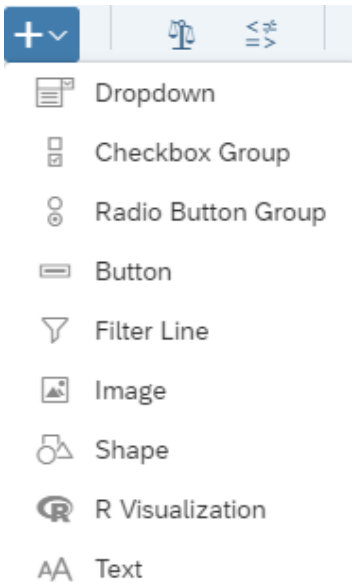
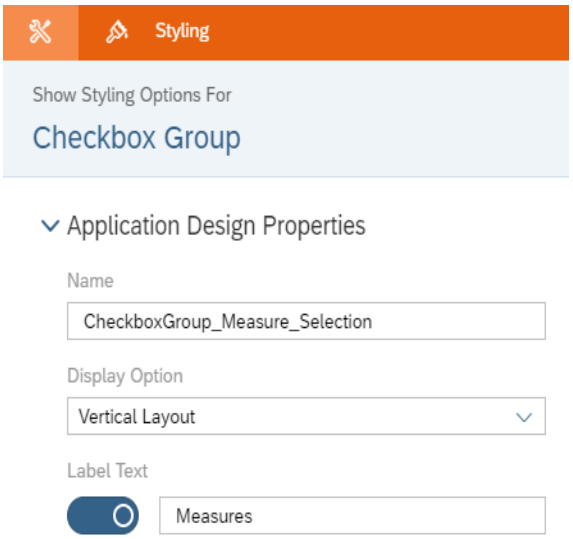
To make it clear what the contents of our Dropdown widget are, we will insert a Label.
To do that, click on the “+” icon in the Insert panel and select Text.



Place the inserted Text widget to the left side of the Dropdown widget and select it to edit its properties. Go to the Styling Panel in the Designer and enter “Dropdown_Measures_Label” as the Name.	
To edit what the label shows, double click on the Text widget in the Canvas and enter “Measure Group”.	
The next step is adding the popup that lets us edit some settings of our Table and Chart. However, we first need to add an icon that, when the user clicks on, will make the popup appear. To do this, click on the “+” icon in the Insert panel and choose image. Now add any image that you want to use as an icon for the settings. In our application, we used  as our image.	
To edit the name of the image, go to the Styling Panel in the Designer and enter Settings_Logo as the name.	

Now we will add our popup window. To do this, look for Popups in the Layout and click on the “+” icon to add one.	
Double click on the newly added popup in the Layout to rename it and enter the name “Popup_Settings”.	
And then select the popup in the Layout and a new window should open. There, we will add the elements that we want to appear in our Popup window. To have a header and a footer, click on the popup and go to the Builder Panel in the Designer. There, toggle the “Enable header & footer” button to YES.	
Enter “Settings” as the Title of the Popup.	
We will have two buttons, an Ok and a Cancel button. To add them, click on the “+” icon next to Buttons. Set the ID of the first button to “Ok_button” and the text to “OK”. Finally, select all the options displayed afterwards (Emphasized, Enabled, and Visible).	
Set the ID of the second button to “Cancel_button” and the text to “Cancel”. Please select the options Enabled and Visible but leave the Emphasized checkbox disabled. Click on Apply to save the changes.	

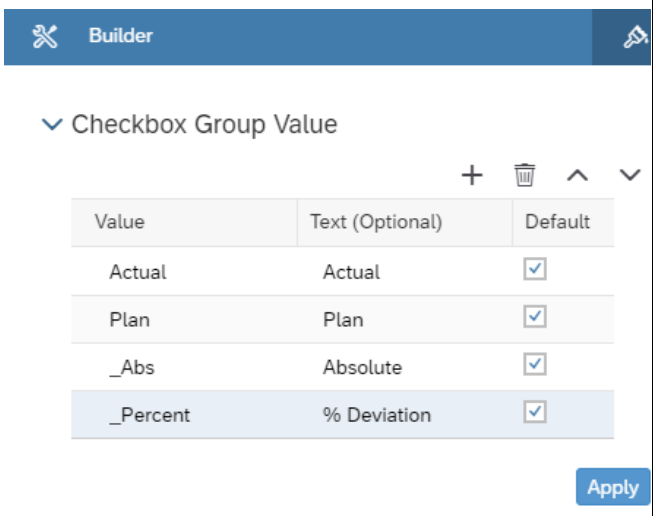
In this settings popup, we would like to give the user the option of switching between the Table and Chart. To achieve this, please add a Radio Button Group widget from the Insert Panel and place it in the middle of the Popup window.	
To edit the properties of the Radio Button Group, select the widget and go to the Builder Panel in the Designer. There, we will add the two options that users can choose from. The first will be “Show Table” and we’ll set this to the default while the second will read “Show Chart”. After entering the values, please click on Apply to save the changes.	
To edit the properties of the Radio Button Group, switch over to the Styling Panel. There, enter “RadioButtonGroup_View” as the Name and select “Vertical Layout” as the Display Option.	

We will also give the user the option of choosing which measures of the chosen measure group they want displayed. To do this, we will add a Checkbox Group from the Insert panel and place it underneath the Radio Button Group widget.	
We will firstly edit the Styling properties of the widget. To do that, select it in the Canvas or the Layout and go to the Styling panel in the Designer. There, please enter “CheckboxGroup_Measure_Selection” as the Name and select “Vertical Layout” as the Display Option. We also want a label text, so we will toggle the Label text option to enable it and write “Measures” to display it as our Checkbox Group label.	

The next step is to edit the values that appear in the Checkbox.
To do this, go to the Builder panel in the Designer.
We will add the values Actual, Plan, Absolute, and % Deviation as the measures with which the measure groups can be filtered.
To do that, click on the "+" button and add the values.

We will set all 4 values as Default.

Click on Apply to save the changes.

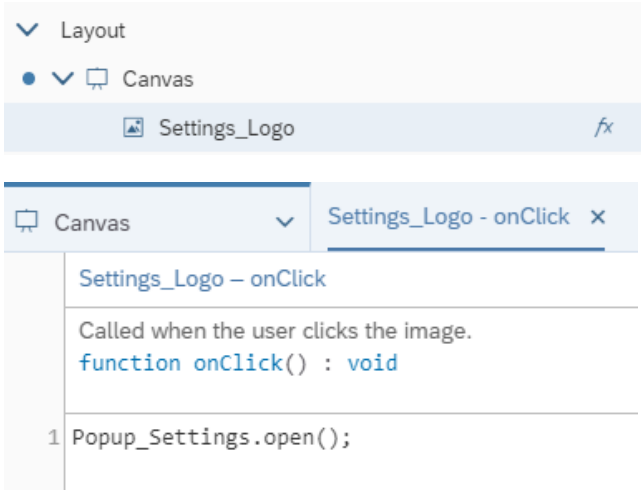


Value	Text (Optional)
Actual	Actual
Plan	Plan
_Abs	Absolute
_Percent	% Deviation

We also need to write a script for the settings icon we added so that when the user clicks on it, the settings popup we added, is opened.

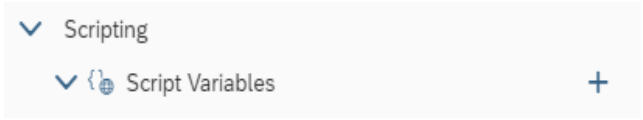
To do that, select the icon in the Layout and click on the fx icon next to it.

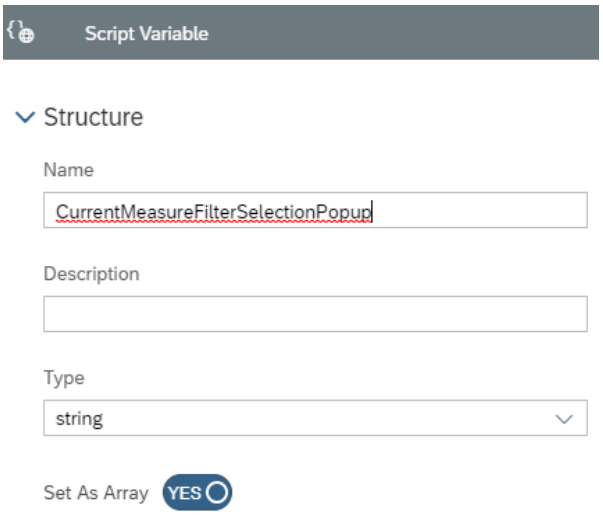
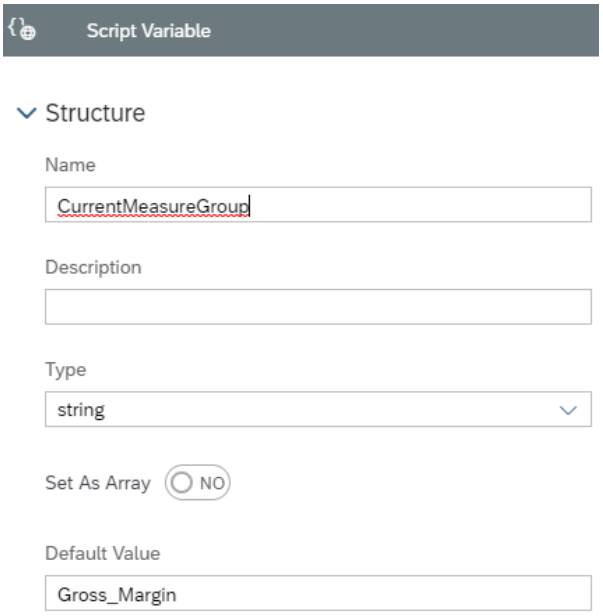
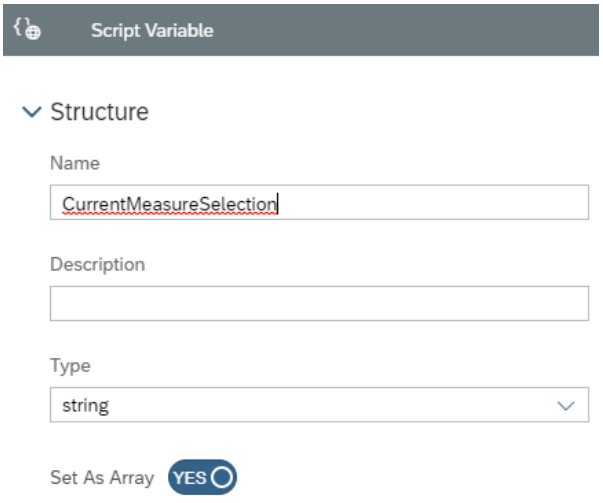
There, we will simply make the click event open our settings popup.




```
Popup_Settings.open();
```

To be able to access all the selections that the user made from any widget in our app, we need to add global variables.
To add these script variables, go to Scripting and click the "+" next to Script Variables.

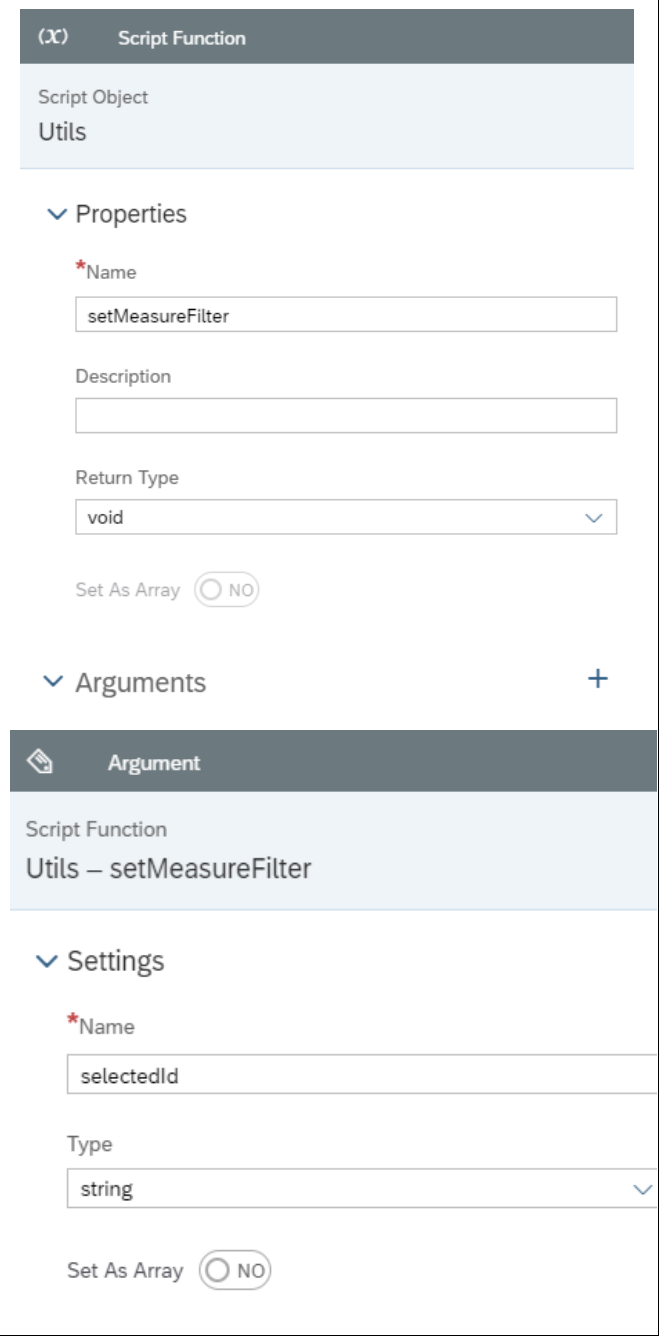


The first script variable we will add, is one that will hold the concatenated filter of the Dropdown List in the Canvas and the Checkbox Group in the Popup window. Add a script variable and its properties enter “CurrentMeasureFilterSelectionPopup” in the Name field, set the Type to “string”, and toggle the Set As Array button to “YES”.	
The second script variable we will add is one that will hold the current measure filter from the Dropdown list. Add a script variable and in its properties enter “CurrentMeasureGroup” in the Name field, set the Type to “string”, and the Default Value to “Gross_Margin”.	
The third and final script variable we need is one that will hold the measures selected from the Checkbox Group in the Popup window. Add a script variable and its properties enter “CurrentMeasureSelection” in the Name field, set the Type to “string”, and toggle the Set As Array button to “YES”.	

To define what should happen when a filter is selected, we need to create a Script Object. In this object, we will create a function that sets the measure filter according to what the user has chosen from the Checkbox Group. To create a Script Object, select the “+” icon next to SCRIPT OBJECTS under the Layout. Afterwards, rename both the folder that was created as well as the function. We will name the folder Utils and the function setMeasureFilter. To rename the objects, hover over them one by one and when the icon appears click on it and choose Rename.	

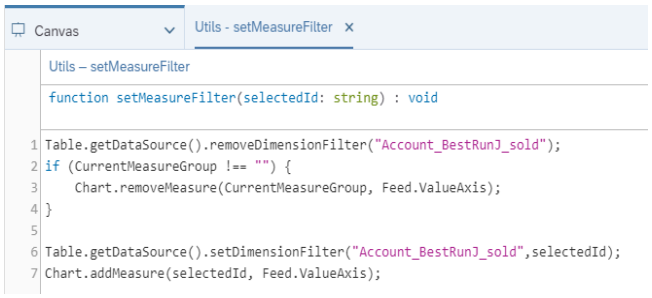
Click on the function setMeasureFilter and when the Editing window opens, click on the “+” icon next to Arguments.

Here, we will add an argument with the name “selectedId” and the Type string.



To define what the setMeasureFilter function does, please go to the function in the Layout, hover over its name, and click on the *fx* icon next to it.

In this use case, when the setMeasureFilter function is called, the set measure filters are removed from the Table and the Chart and the selected measure sent to the function is inserted instead.




```
Table.getDataSource().removeDimensionFilter("Account_
BestRunJ_sold");
if (CurrentMeasureGroup !== "") {
  Chart.removeMeasure(CurrentMeasureGroup,
Feed.ValueAxis);
}

Table.getDataSource().setDimensionFilter("Account_Bes
tRunJ_sold", selectedId);
Chart.addMeasure(selectedId, Feed.ValueAxis);
```

Now, we will define what happens when a user selects a measure group from the Dropdown list in the canvas.
To do that, select the Dropdown widget in the Canvas or Layout and click on the

icon that appears next to it.

In this script, we will first see which value was selected and will remove the measures of these measure groups from our Chart.

Then, we will save the current selection in our script variable, CurrentMeasureGroup.

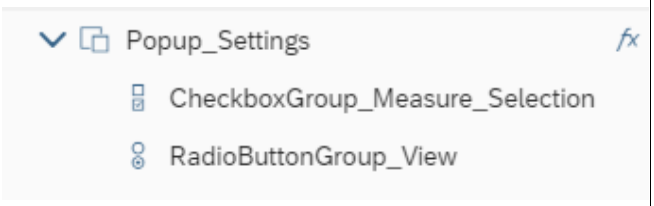
Afterwards, we will see which measures were selected in the Checkbox in the Popup so that we filter on all the inputs the user gave us.

After getting these values, we will remove any old filters used and apply the new ones.
To get a valid filter, we will concatenate the selected measures to a filter statement.

Finally, we will save the concatenated filter statement in our CurrentMeasureFilterSelectionPopup script variable and the selected keys of the Checkbox Group in the CurrentMeasureSelection script variable.


```
var sel = Dropdown_MeasureGroup.getSelectedKey();

if (CurrentMeasureGroup === 'Gross_Margin') {

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Gross_MarginActual]", Feed.ValueAxis);

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Gross_MarginPlan]", Feed.ValueAxis);

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Gross_Margin_Abs]", Feed.ValueAxis);

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Gross_Margin_Percent]", Feed.ValueAxis);
}
else if (CurrentMeasureGroup === 'Discount') {

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[DiscountActual]", Feed.ValueAxis);

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[DiscountPlan]", Feed.ValueAxis);

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Discount_Abs]", Feed.ValueAxis);

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Discount_Percent]", Feed.ValueAxis);
}
else if (CurrentMeasureGroup === 'Quantity_Sold') {
```

```
Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Quantity_soldActual]", Feed.ValueAxis);

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Quantity_soldPlan]", Feed.ValueAxis);

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Quantity_sold_Abs]", Feed.ValueAxis);

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Quantity_sold_Percent]", Feed.ValueAxis);
}
else if (CurrentMeasureGroup ===
'Original_Sales_Price') {

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Original_Sales_PriceActual]", Feed.ValueAxis);

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Original_Sales_PricePlan]", Feed.ValueAxis);

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Original_Sales_Price_Abs]", Feed.ValueAxis);

Chart.removeMeasure("[Account_BestRunJ_sold].[parentI
d].&[Original_Sales_Price_Percent]", Feed.ValueAxis);
}

// save the current selection (measure filter) into a
global variable
CurrentMeasureGroup = sel;

// get Measures Selection
var Selected_Measures =
CheckboxGroup_Measure_Selection.getSelectedKeys();

// remove the current measures from Chart
for (var i = 0; i <
CurrentMeasureFilterSelectionPopup.length; i++) {

Chart.removeMeasure(CurrentMeasureFilterSelectionPopu
p[i], Feed.ValueAxis);
}

// help variables
var Filter_Pattern_1 =
"[Account_BestRunJ_sold].[parentId].&[";
var Filter_Pattern_2 = "]";
var Filter_Area = ArrayUtils.create(Type.string);

// loop over the selected measures
for (i = 0; i < Selected_Measures.length; i++) {
  //concate all selection information together to a
valid filter statemant
  var Filter = Filter_Pattern_1 + CurrentMeasureGroup
+ Selected_Measures[i] + Filter_Pattern_2;
  Filter_Area.push(Filter);

  // add Measure to Chart
  Chart.addMeasure(Filter, Feed.ValueAxis);
}

// remove the "old" filter and set the new filter
selection
Table.getDataSource().removeDimensionFilter("Account_
BestRunJ_sold");
Table.getDataSource().setDimensionFilter("Account_Bes
tRunJ_sold", Filter_Area);

// save the current measure filter selection into a
global variable
// Note --> this global variable need to be set with
the default values on the onInitialization event from
the Main Canvas
CurrentMeasureFilterSelectionPopup = Filter_Area;
```

	`CurrentMeasureSelection = Selected_Measures;` `// write the current measure filter selection to the browser console` `console.log(["Measure Selection: ", CurrentMeasureSelection]);` `console.log(["Measure Filter Selection: ", CurrentMeasureFilterSelectionPopup]);`
The final script we need to write is the script of buttons OK and Cancel that we have in our popup window. Select the popup in the Layout and click on the fx icon that appears next to it.	

We have two buttons, OK and Cancel, so, we will start off with an if statement that differentiates the buttons according to their Ids.

In this script, we will get the selections from the Checkbox Group in the popup window and then we will remove the measures currently being used as filters for the Chart.

To get a valid filter, we will concatenate the selected measures to a filter statement.

We will save the concatenated filter statement in our CurrentMeasureFilterSelectionPopup script variable and the selected keys of the Checkbox Group in the CurrentMeasureSelection script variable.

Afterwards, we will get the selected key of the Radio Button Group in the Popup window. If “Show Table” is selected, then we will set the Table to visible and the Chart to invisible and vice versa if “Show Chart” is selected.

Finally, we will close the Popup whether the user clicked on OK or Cancel.

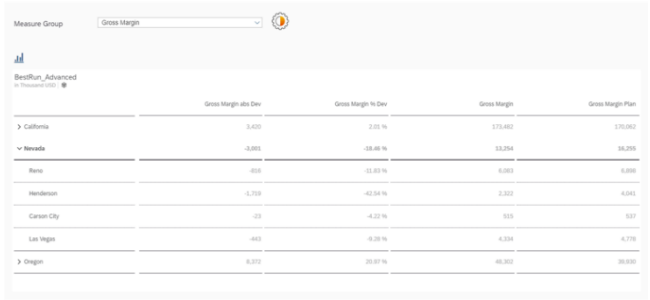

```
if (buttonId === "Ok_button"){

// get Measures Selection
var Selected_Measures = CheckboxGroup_Measure_Selection.getSelectedKeys();

if (CurrentMeasureSelection !== Selected_Measures) {

    // remove the current measures from Chart
    for (var i=0; i<CurrentMeasureGroup.length; i++){
        Chart.removeMeasure(CurrentMeasureFilterSelectionPopup[i], Feed.ValueAxis);
    }

    // help variables
    var Filter_Pattern_1 = "[Account_BestRunJ_sold].[parentId].&[";
    var Filter_Pattern_2 = "]";
    var Filter_Area = ArrayUtils.create(Type.string);

    // loop over the seleced measures
    for (i=0; i<Selected_Measures.length; i++){

    //concate all selection information together to a valid filter statemant
        var Filter = Filter_Pattern_1 + CurrentMeasureGroup + Selected_Measures[i] + Filter_Pattern_2;
        Filter_Area.push(Filter);
    // add Measure to Chart
        Chart.addMeasure(Filter, Feed.ValueAxis);
    }

    // remove the "old" filter and set the new filter selection
    Table.getDataSource().removeDimensionFilter("Account_BestRunJ_sold");
    Table.getDataSource().setDimensionFilter("Account_BestRunJ_sold", Filter_Area);

    // save the current measure filter selection into a global variable
    // Note --> this global variable need to be set with the default values on the onInitialization event from the Main Canvas
    CurrentMeasureFilterSelectionPopup = Filter_Area;
    CurrentMeasureSelection = Selected_Measures;

    // write the current measure filter selection to the browser console
    console.log(["Measure Selection: ", CurrentMeasureSelection]);
    console.log(["Measure Filter Selection: ", CurrentMeasureFilterSelectionPopup]);

}

// set the visibiltiy of Chart and Table --> Script from the RadioButtonGroup_View onSelect event
var sel = RadioButtonGroup_View.getSelectedKey();

if (sel === 'Show Table') {
    Table.setVisible(true);
    Chart.setVisible(false);
}
else {
    Table.setVisible(false);
    Chart.setVisible(true);
}
}


Popup_Settings.close();
```

```
if (buttonId === "Ok_button") {
  // get Measures Selection
  var Selected_Measures =
CheckboxGroup_Measure_Selection.getSelectedKeys();

  if (CurrentMeasureSelection !== Selected_Measures)
{

    // remove the current measures from Chart
    for (var i = 0; i < CurrentMeasureGroup.length;
i++) {

Chart.removeMeasure(CurrentMeasureFilterSelectionPopu
p[i], Feed.ValueAxis);
    }

    // help variables
    var Filter_Pattern_1 =
"[Account_BestRunJ_sold].[parentId].&[";
    var Filter_Pattern_2 = "]";
    var Filter_Area = ArrayUtils.create(Type.string);

    // loop over the seleced measures
    for (i = 0; i < Selected_Measures.length; i++) {
      // concate all selection information together
to a valid filter statemant
      var Filter = Filter_Pattern_1 +
CurrentMeasureGroup + Selected_Measures[i] +
Filter_Pattern_2;
      Filter_Area.push(Filter);
      // add Measure to Chart
      Chart.addMeasure(Filter, Feed.ValueAxis);
    }
```

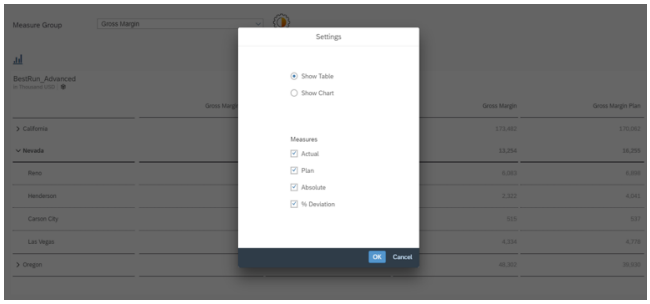
```
    // remove the "old" filter and set the new filter
selection

Table.getDataSource().removeDimensionFilter("Account_
BestRunJ_sold");

Table.getDataSource().setDimensionFilter("Account_Bes
tRunJ_sold", Filter_Area);

    // save the current measure filter selection into
a global variable
    // Note --> this global variable need to be set
with the default values on the onInitialization event
from the Main Canvas
    CurrentMeasureFilterSelectionPopup = Filter_Area;
    CurrentMeasureSelection = Selected_Measures;

    // write the current measure filter selection to
the browser console
    console.log(["Measure Selection: ",
CurrentMeasureSelection]);
    console.log(["Measure Filter Selection: ",
CurrentMeasureFilterSelectionPopup]);
  }

  // set the visibiltiy of Chart and Table --> Script
from the RadioButtonGroup_View onSelect event
  var sel = RadioButtonGroup_View.getSelectedKey();

  if (sel === 'Show Table') {
    Table.setVisible(true);
    Chart.setVisible(false);
  }
  else {
    Table.setVisible(false);
    Chart.setVisible(true);
  }
}
Popup_Settings.close();
```

Now let's see how it looks like.

Click on Run Analytic Application in the upper right side of the page and the result should look something like this:

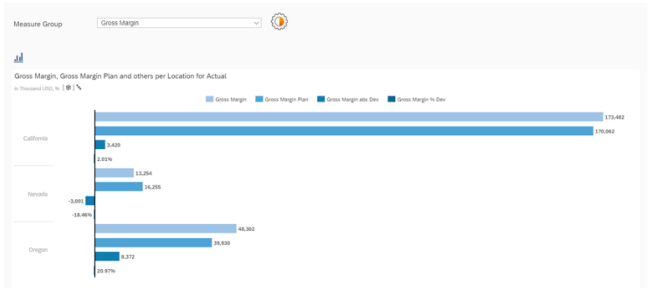


If we click on the Settings icon, the Popup will appear.

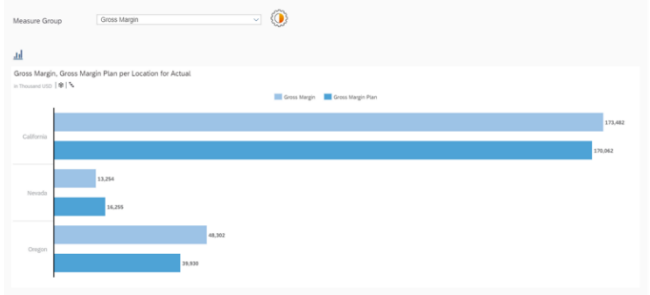


Now, let's select "Show Chart" from the popup window and leave all the measures selected. The result should be that the settings are left as they were, and the only change is that the Chart is now displayed.

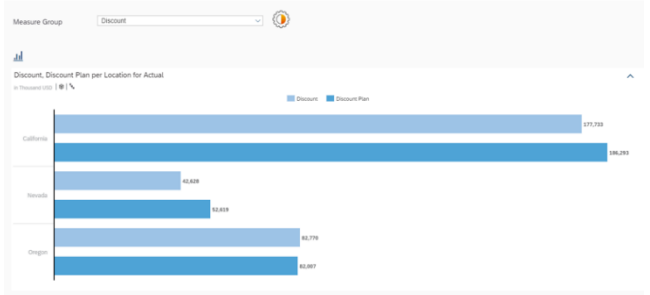
Open the popup window again but this time select only two items from the Checkbox Group.
Here, we have selected Actual and Plan.

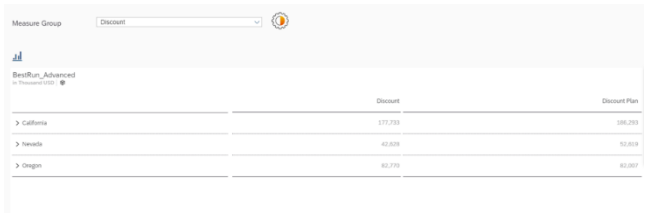


Now, change the Measure Group from the "Gross Margin" to "Discount" and the two measures, Actual and Plan are displayed here for the measure group Discount.



Finally, let's switch back to the Table from the popup window while leaving all the settings unchanged from the previous example.
The result is that the Discount measure group is presented and only Actual and Plan are displayed.





6.8 Selection Handling in a Table or Chart and Open a Details Popup

In this example, we will let the user select certain elements in the Table and the Chart that when clicked on, open a popup window with extra information in a chart format about the selected element.

In a Table, a user will be able to select a measure cell, a dimension cell, or a data cell. Each will open a popup window that displays information about the selected element in a trend chart.

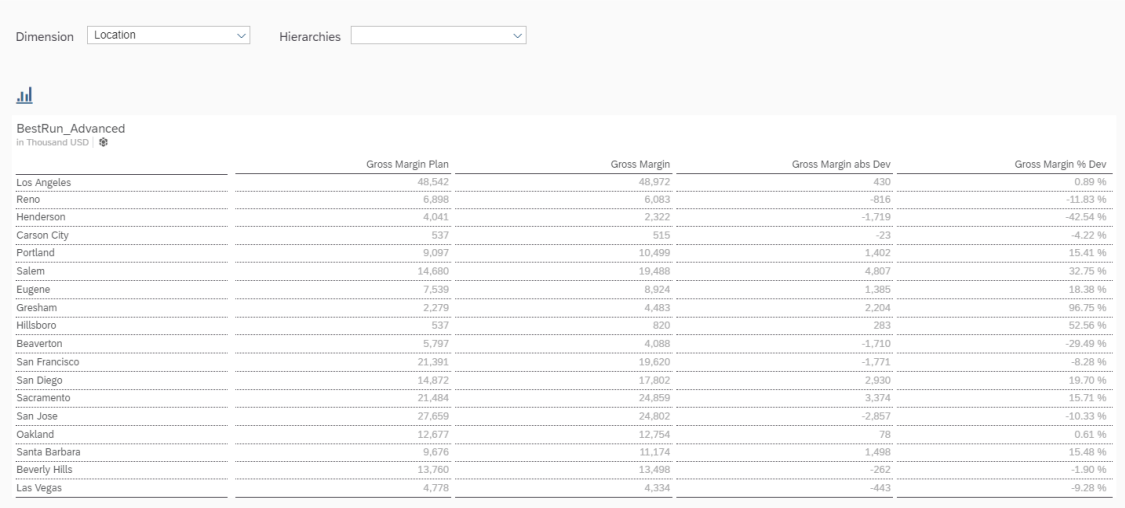
In the Chart, a user will be able to select a dimension cell and a measure/dimension chart bar (for example, *Gross Margin Plan for Lemonade*).

There are also two Dropdown lists, one for dimensions and the other for hierarchies. The list of dimensions let the user choose which dimension filter they want to use on the Table/Chart. In this use case, we have chosen 4 dimensions; *Location*, *Product*, *Store*, and *Sales Manager*.

The second Dropdown list displays the available hierarchies that can be used to change how the data is displayed.

Note: In this example, only single selection is supported for the Table and Chart.

The result will look like this when we run the application:



	Gross Margin Plan	Gross Margin	Gross Margin abs Dev	Gross Margin % Dev
Los Angeles	48,542	48,972	430	0.89 %
Reno	6,898	6,083	-816	-11.83 %
Henderson	4,041	2,322	-1,719	-42.54 %
Carson City	537	515	-23	-4.22 %
Portland	9,097	10,499	1,402	15.41 %
Salem	14,680	19,488	4,807	32.75 %
Eugene	7,539	8,924	1,385	18.38 %
Gresham	2,279	4,483	2,204	96.75 %
Hillsboro	537	820	283	52.56 %
Beaverton	5,797	4,088	-1,710	-29.49 %
San Francisco	21,391	19,620	-1,771	-8.28 %
San Diego	14,872	17,802	2,930	19.70 %
Sacramento	21,484	24,859	3,374	15.71 %
San Jose	27,659	24,802	-2,857	-10.33 %
Oakland	12,677	12,754	78	0.61 %
Santa Barbara	9,676	11,174	1,498	15.48 %
Beverly Hills	13,760	13,498	-262	-1.90 %
Las Vegas	4,778	4,334	-443	-9.28 %

Figure 54: Example Application Details Popup

And when a cell is chosen, a popup window like the one in the screenshot will appear (In this screenshot, the dimension cell of *Los Angeles* was clicked on in the Table):

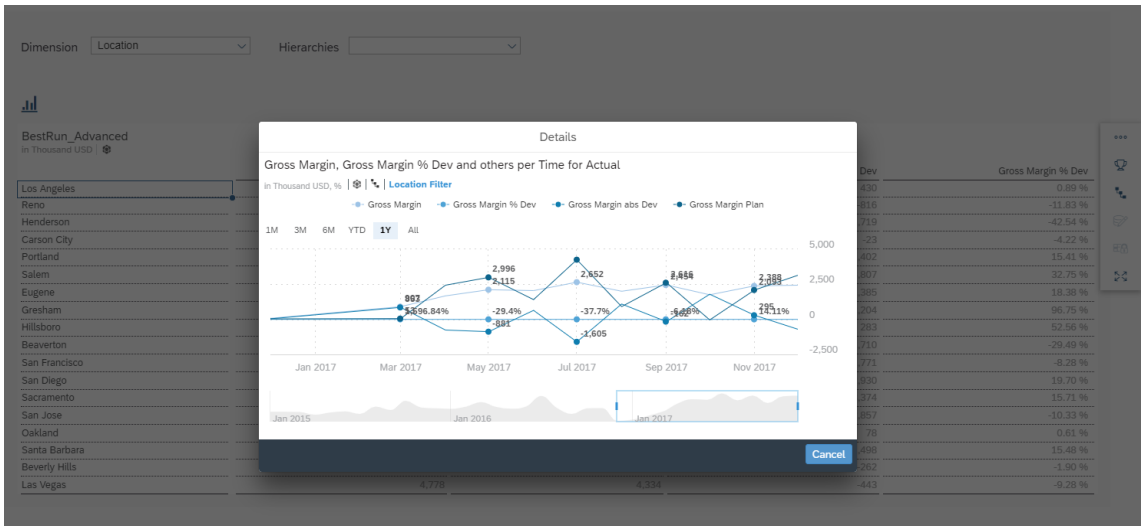
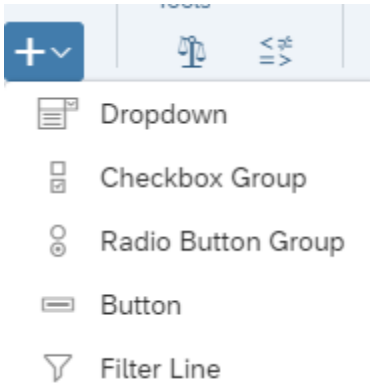


Figure 55: Details Popup

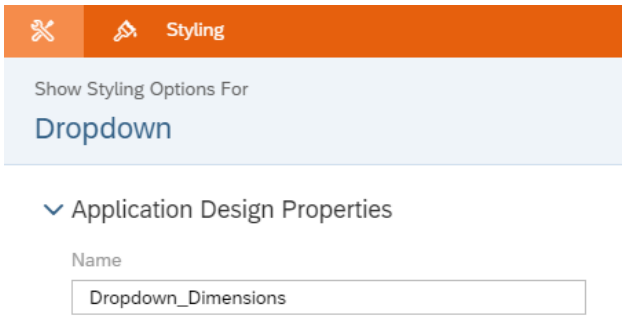
Prerequisites for this use case is having already added a functioning Table and a Chart to your canvas. To have all the functionalities in this use case, please first go through the *Switching between Table and Chart* exercise.

It is recommended to use the same names as that exercise for the Table and Chart so that the scripts in this use case don't have to be altered.

The first thing we will do is add a Dropdown list that houses the dimensions in our data set. To do this, please click on the "+" icon in the Insert panel and select Dropdown and place the widget above the Table in the Canvas.	

Go to the Designer (by clicking on Designer on the upper right side of the screen) and switch to the Styling Panel by clicking on the  button.

There, enter “Dropdown_Dimensions” as the Name.



Now, we will select which dimensions we want the user to be able to filter on. In this use case, we will choose 4; Location, Product, Store, and Sales Manager.

To enter these values in our dropdown list, switch over to the Builder Panel in the Designer by clicking on the  button.

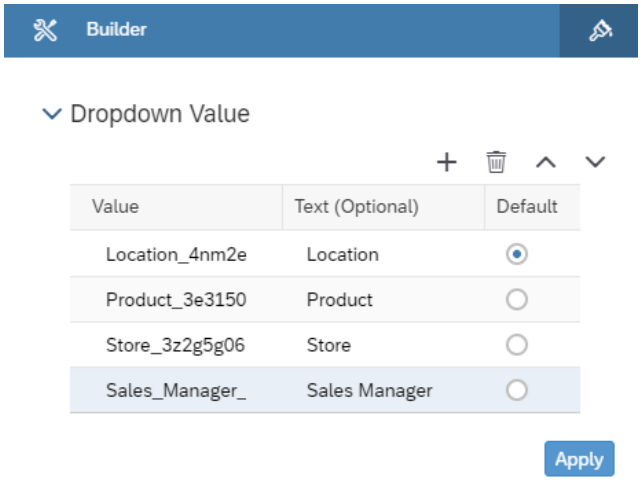
There, press the “+” icon near the Dropdown value to enter the desired values.

The first value is Location_4nm2e04531 and its displayed text should read Location.
The second value is Product_3e315003an and the displayed text is Product.

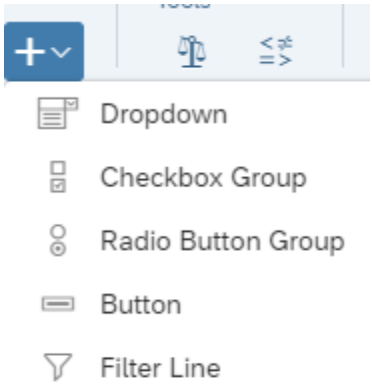
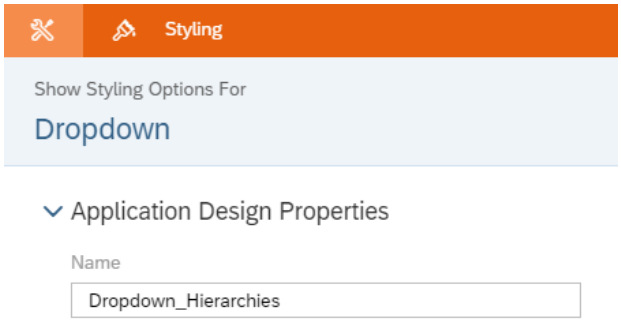
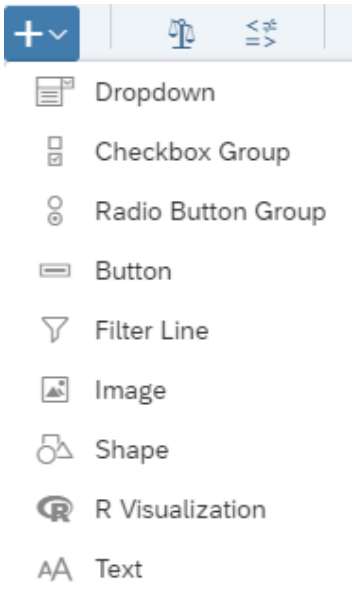
The third value is Store_3z2g5g06m4 and its displayed text is Store.
And we’ll add a fourth Dropdown list element with the value Sales_Manager__5w3m5d06b5 and its text should read Sales Manager.

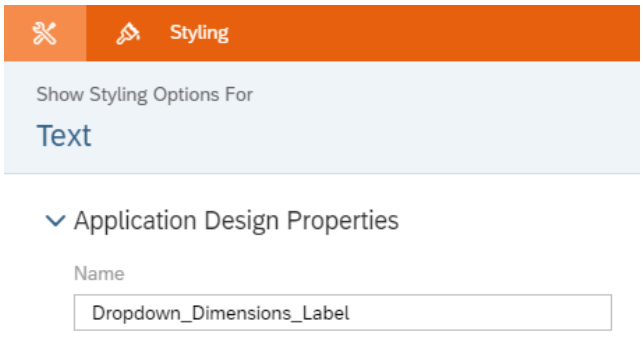
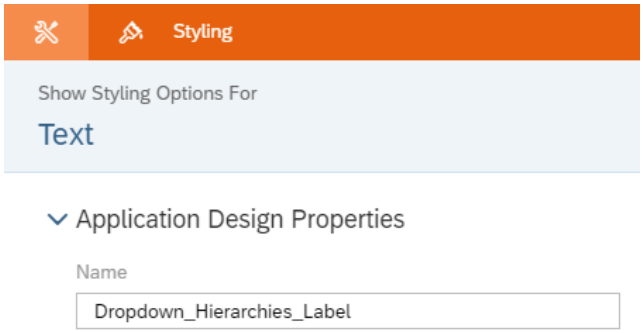
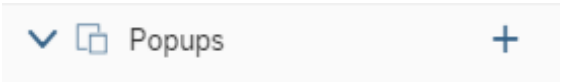
And finally, set Location as the default value of the Dropdown list.

Click on Apply to save the changes.

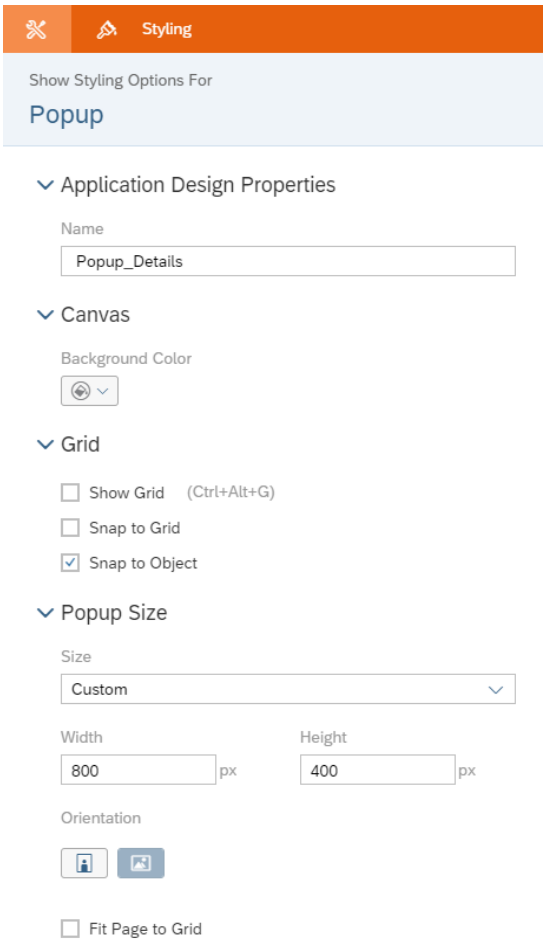


Value	Text (Optional)
Location_4nm2e04531	Location
Product_3e315003an	Product
Store_3z2g5g06m4	Store
Sales_Manager__5w3m5d06b5	Sales Manager

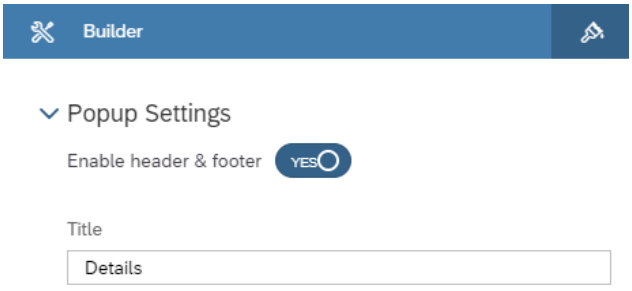
We will now add a second list where the user can choose the hierarchy in which they want to display their data. To do this, please click on the “+” icon in the Insert panel and select Dropdown and place the widget next to the first Dropdown list in the Canvas.	
Go to the Designer (by clicking on Designer on the upper right side of the screen) and switch to the Styling Panel by clicking on the  button. There, enter “Dropdown_Hierarchies” as the Name. We will load the hierarchies into this Dropdown list later from a script.	
To make it clear what the contents of our Dropdown widgets are, we will insert a Label for each of the Dropdown widgets. To do that, click on the “+” icon in the Insert panel and select Text.	

Place the inserted Text widget to the left side of each Dropdown widget and select the first one to edit its properties. Go to the Styling Panel in the Designer and enter “Dropdown_Dimensions_Label” as the Name.	
To edit what the label shows, double click on the Text widget in the Canvas and enter “Dimension”.	
Select the second label and go to the Styling Panel in the Designer and enter “Dropdown_Dimensions_Label” as the Name.	
To edit what the label shows, double click on the Text widget in the Canvas and enter “Hierarchies”.	
We will now add the popup window that will display extra information about the selected measure, dimension, or data cell. To add a popup window, go to Popups in the Layout and click on the “+” icon next to it.	

Click on the newly added popup and go to the Styling Panel in the Designer. There, enter “Popup_Details” in the Name input form and set the Popup Size to the width of 800 px and height of 400 px.

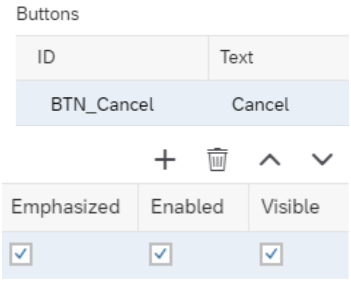


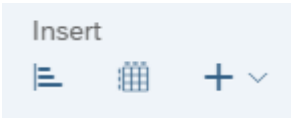
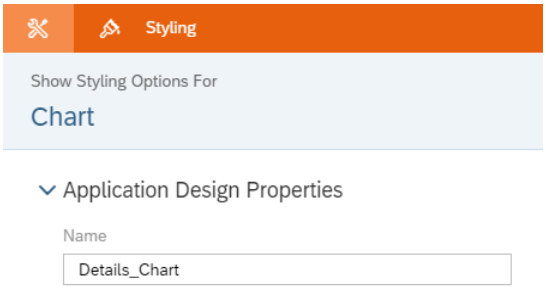
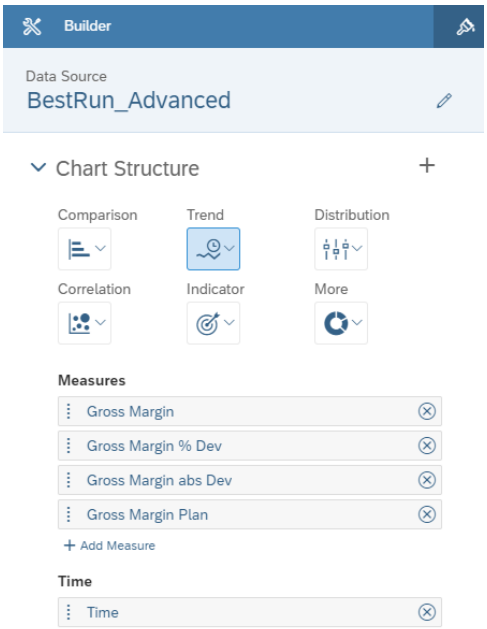
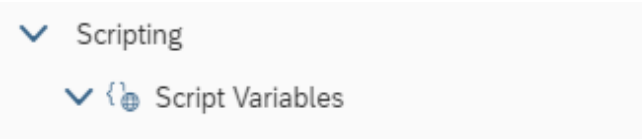
Now, switch over to the Builder Panel by clicking on the button.
Insert “Details” as the Title.
Here, we will also enable the header and footer by toggling the button to Yes.

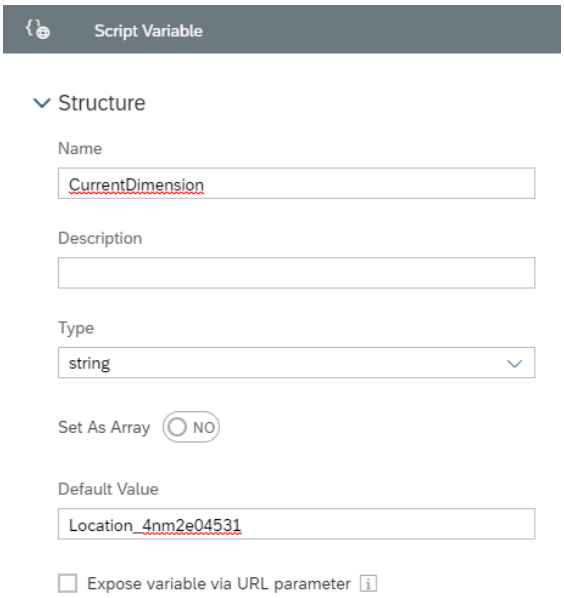
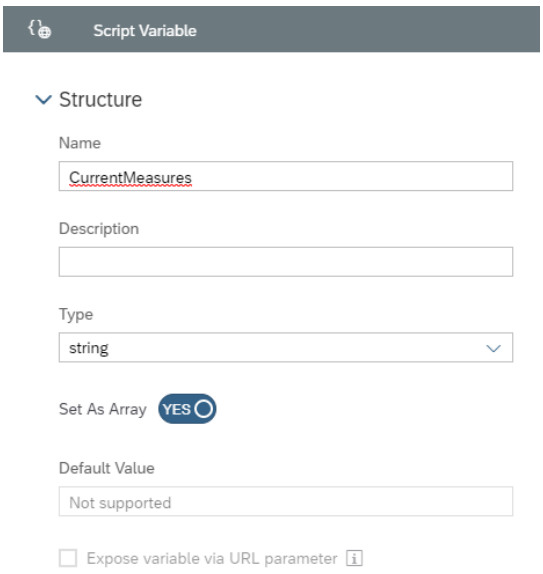


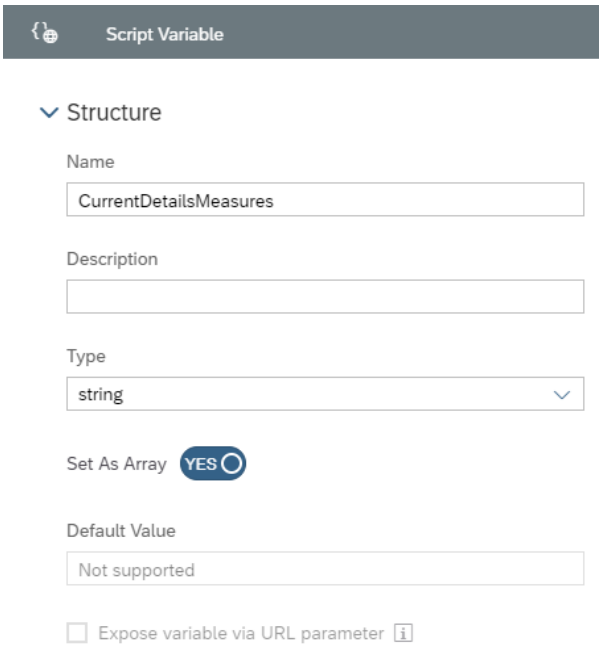
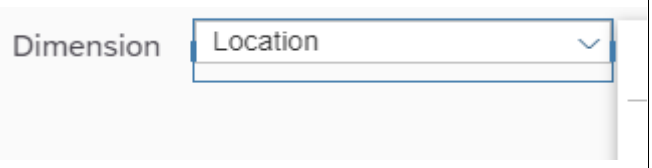
We also want to add a button through which the user can exit the popup. Firstly, delete the buttons that can be found there by selecting each of them and clicking on the icon.
To add this new button, click on the “+” icon next to Buttons.

Insert the ID “BTN_Cancel”, the text “Cancel”, and check the options “Emphasized”, “Enabled”, and “Visible”. Click on Apply to save the changes.



To be able to display the extra information that we want in the popup, we need to add a chart. To do that, please select the Chart icon from the Insert Panel.	
Click on the Chart and go to the Designer to set its properties. First, go to the Styling Panel and enter “Details_Chart” as the Name.	
Then, switch over to the Builder Panel. There, select the data source BestRun_Advanced. Select Trend (Time Series) as the Chart Structure. Add Gross Margin, Gross Margin % Dev, Gross Margin abs Dev, and Gross Margin Plan as the Measures. Under Time, add Time as the dimension	
To be able to access all the selections that the user made from any widget in our app, we need to add global variables. To add these script variables, go to Scripting and click the “+” next to Script Variables.	

The first script variable we will add is one that will hold the current selection from the Dimensions Dropdown list. Add a script variable and in its properties enter “CurrentDimension” in the Name field, set the Type to “string”, and the Default Value to “Location_4nm2e04531”.	
The second script variable we will add, is one that will hold the current measure selection(s) (Actual, Plan, Absolute, Percent). Add a script variable and its properties enter “CurrentMeasures” in the Name field, set the Type to “string”, and toggle the Set As Array button to “YES”.	

The third, and last, script variable we will add will hold the data about the selections made that will be used to display the data in the popup window. Set “CurrentDetailsMeasures” as the Name, the Type to string, and toggle the Set As Array button to YES.	
Now, we will decide what will happen when a Dropdown list element in the Canvas is selected. Firstly, we will write the script for the first widget, the Dimensions Dropdown list. To do this, select the Dimensions Dropdown list in the Canvas and click on the  icon that appears next to it.	

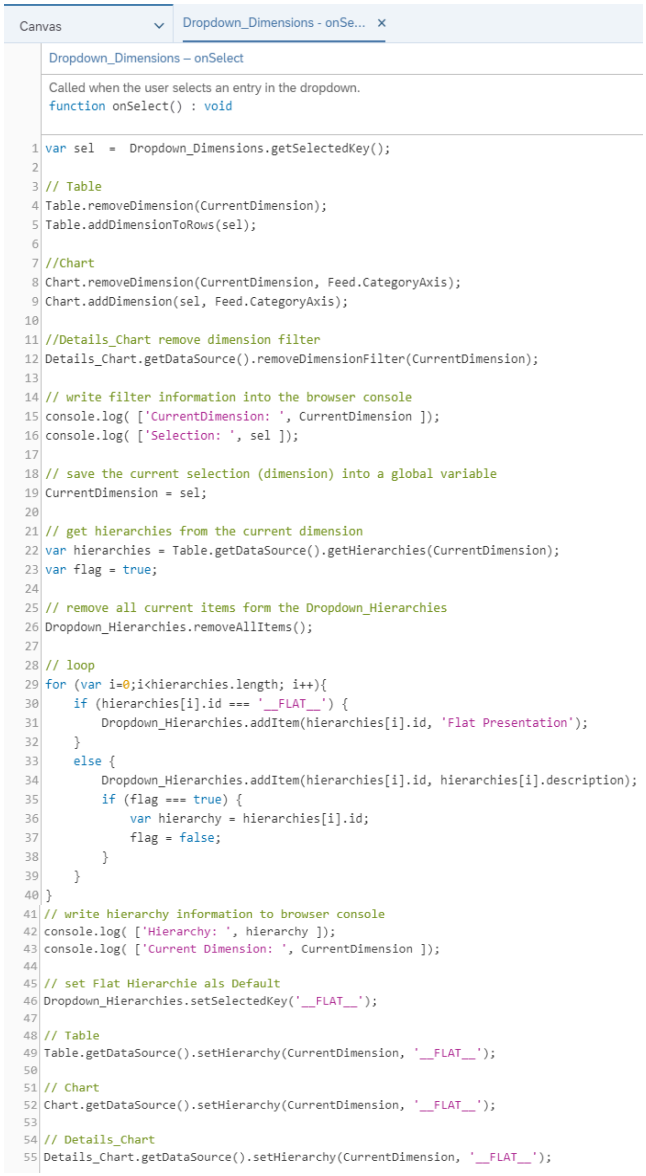
This will open the onSelect script of the Dropdown widget.
Here, we will first get the selected element of the list.

We will then remove any already set dimensions in the Table and the Chart and add the newly selected dimension to them.
We will also add that dimension to our Details Chart (the one that we added to the Popup window).

Afterwards, we will write the filter information in the browser's console and save the selection in our script variable, CurrentDimension.

Then, to set the available hierarchies for the selected dimension, we loop through the available hierarchies of our data source in relation to the current dimension and then we push all the available hierarchies in the Dropdown list of the Hierarchies.

At the end, we set the default hierarchy of the Table, Chart, and Details Chart to Flat Presentation.



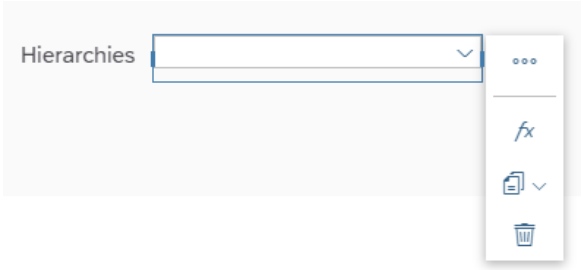

```
var sel  =  Dropdown_Dimensions.getSelectedKey();

// Table
Table.removeDimension(CurrentDimension);
Table.addDimensionToRows(sel);

//Chart
Chart.removeDimension(CurrentDimension, Feed.CategoryAxis);
Chart.addDimension(sel, Feed.CategoryAxis);

//Details_Chart remove dimension filter
Details_Chart.getDataSource().removeDimensionFilter(CurrentDimension);

// write filter information into the browser console
console.log( ['CurrentDimension: ', CurrentDimension ]);
console.log( ['Selection: ', sel ]);

// save the current selection (dimension) into a global variable
CurrentDimension = sel;

// get hierarchies from the current dimension
var hierarchies = Table.getDataSource().getHierarchies(CurrentDimension);
var flag = true;

// remove all current items form the Dropdown_Hierarchies
Dropdown_Hierarchies.removeAllItems();

// loop
for (var i=0;i<hierarchies.length; i++){
    if (hierarchies[i].id === '__FLAT__') {
        Dropdown_Hierarchies.addItem(hierarchies[i].id, 'Flat Presentation');
    }
    else {
        Dropdown_Hierarchies.addItem(hierarchies[i].id, hierarchies[i].description);
        if (flag === true) {
            var hierarchy = hierarchies[i].id;
            flag = false;
        }
    }
}
// write hierarchy information to browser console
console.log( ['Hierarchy: ', hierarchy ]);
console.log( ['Current Dimension: ', CurrentDimension ]);

// set Flat Hierarchie als Default
Dropdown_Hierarchies.setSelectedKey('__FLAT__');

// Table
Table.getDataSource().setHierarchy(CurrentDimension, '__FLAT__');

// Chart
Chart.getDataSource().setHierarchy(CurrentDimension, '__FLAT__');

// Details_Chart
Details_Chart.getDataSource().setHierarchy(CurrentDimension, '__FLAT__');
```


```
var sel  = Dropdown_Dimensions.getSelectedKey();
// Table
Table.removeDimension(CurrentDimension);
Table.addDimensionToRows(sel);
//Chart
Chart.removeDimension(CurrentDimension,
Feed.CategoryAxis);
Chart.addDimension(sel, Feed.CategoryAxis);
//Details_Chart remove dimension filter
Details_Chart.getDataSource().removeDimensionFilter(C
urrentDimension);

// write filter information into the browser console
console.log(['CurrentDimension: ',
CurrentDimension]);
console.log(['Selection: ', sel]);
// save the current selection (dimension) into a
global variable
CurrentDimension = sel;
// get hierarchies from the current dimension
var hierarchies =
Table.getDataSource().getHierarchies(CurrentDimension
);
var flag = true;
// remove all current items form the
Dropdown_Hierarchies
Dropdown_Hierarchies.removeAllItems();
```

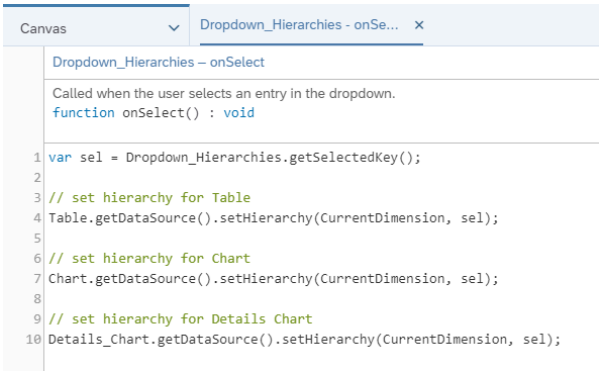
```
// loop
for (var i = 0; i < hierarchies.length; i++) {
  if (hierarchies[i].id === '__FLAT__') {
    Dropdown_Hierarchies.addItem(hierarchies[i].id,
'Flat Presentation');
  }
  else {
    Dropdown_Hierarchies.addItem(hierarchies[i].id,
hierarchies[i].description);
    if (flag === true) {
      var hierarchy = hierarchies[i].id;
      flag = false;
    }
  }
}
// write hierarchy information to browser console
console.log(['Hierarchy: ', hierarchy]);
console.log(['Current Dimension: ',
CurrentDimension]);

// set Flat Hierarchy as Default
Dropdown_Hierarchies.setSelectedKey('__FLAT__');
// Table
Table.getDataSource().setHierarchy(CurrentDimension,
'__FLAT__');
// Chart
Chart.getDataSource().setHierarchy(CurrentDimension,
'__FLAT__');
// Details_Chart
Details_Chart.getDataSource().setHierarchy(CurrentDim
ension, '__FLAT__');
```

Now to edit the onSelect function of the second Dropdown list, Hierarchies, select it in the Canvas and click on the

icon next to it.



In the script of the onSelect function of this widget, we will simply set the hierarchy of the Table, Chart, and Display Chart (the one in the popup window) to the selected element of the Dropdown list.

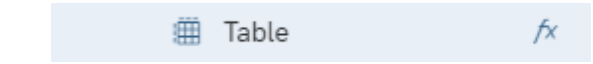



```
var sel = Dropdown_Hierarchies.getSelectedKey();
// set hierarchy for Table
Table.getDataSource().setHierarchy(CurrentDimension,
sel);
// set hierarchy for Chart
Chart.getDataSource().setHierarchy(CurrentDimension,
sel);
// set hierarchy for Details Chart
Details_Chart.getDataSource().setHierarchy(CurrentDim
ension, sel);
```

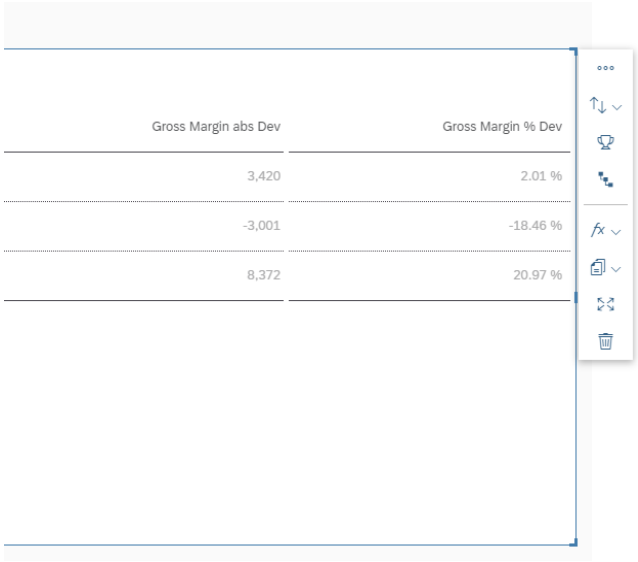
This use case enables the user to get more information about three things. A selected dimension, a selected measure, and a selected dimension, and a selected data cell.
These selections can be made in the Table as well as the Chart.

We will start off by writing the script of the Table.
Open the onSelect script of the Table by either selecting it in the Layout or the

Canvas and clicking on the  icon that appears next to it.



or



In the onSelect script of the Table we want to capture the selection made on the Table. We will write it into our console so that we can track the selections made.

We will set the visibility of the popup to false until we determine what the selected element was.

Afterwards, we will loop over the captured selected object of the Table and get whether it was a measure, a dimension, or a data cell (crossover between measure and dimension).

After capturing this information, we will push it unto the Chart in the popup window

We will then save the selected measures in the script variable CurrentDetailsMeasures.

Finally, we set the visibility of the popup to true which is then used to open it.

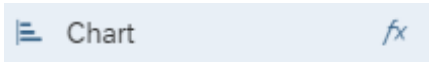

```
var sel = Table.getSelections();
console.log(['Table Selection: ', sel]);
Details_Chart.getDataSource().removeDimensionFilter(C
urrentDimension);
var Popup_show = false;
if (sel.length > 0) {
  var selection = sel[0];

  for (var dimensionId in selection) {
    var memberId = selection[dimensionId];

    if (dimensionId === '@MeasureDimension') {
      // Measure
      console.log(['Selection Measure: ',
dimensionId]);
      console.log(['Selection Member: ', memberId]);
      // remove current measure
      console.log(['CurrentMeasures: ',
CurrentMeasures]);

      for (var i = 0; i < CurrentMeasures.length;
i++) {

Details_Chart.removeMeasure(CurrentMeasures[i],
Feed.ValueAxis);
        Details_Chart.addMeasure(memberId,
Feed.ValueAxis);
      }

      //Details_Chart.addMeasure(memberId,
Feed.ValueAxis);
      CurrentDetailsMeasures.push(memberId);
```

```
      Popup_show = true;

    }
    // Dimension
    else {
      console.log(['Selection Dimension: ',
dimensionId]);
      console.log(['Selection Member: ', memberId]);

Details_Chart.getDataSource().setDimensionFilter(dime
nsionId, memberId);
      Popup_show = true;
    }
  }
}
if (Popup_show === true) {
  Popup_Details.open();
}
```

Now, we need to do the same for the Chart.
Opposed to the Table, in the Chart, the user can only click on a dimension and can click on the chart bars which are crossovers of a measure and a dimension.

To write the script of the Chart, select the widget in the Layout and click on the

icon next to it.

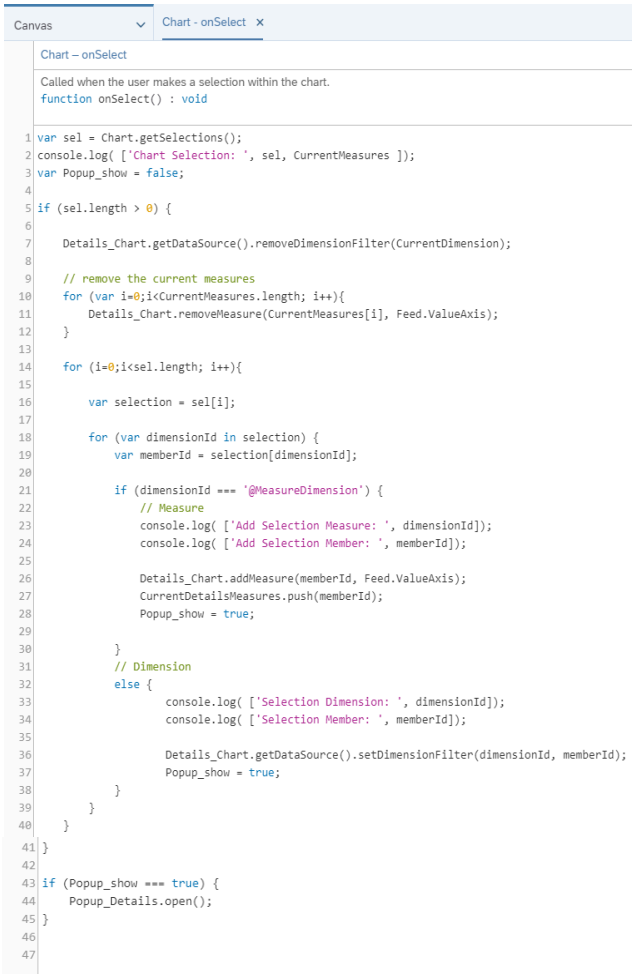


In the onSelect function of the Chart, we will get the selected element of the Chart and save it in a local variable, sel. We will set the popup window's visibility to false and remove the current measures from the Details_Chart in the popup.

And then, if it's a measure, we will add it as a measure to the Details_Chart and if it's a dimension, we will set it as a dimension filter of the Details_Chart.

We will then push the selected measures, if any, unto the script variable CurrentDetailsMeasures.

At the end, the popup window's visibility is set to true and is opened.



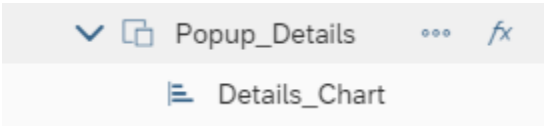

```
var sel = Chart.getSelections();
console.log( ['Chart Selection: ', sel, CurrentMeasures ]);
var Popup_show = false;

if (sel.length > 0) {

    Details_Chart.getDataSource().removeDimensionFilter(CurrentDimension);

    // remove the current measures
    for (var i=0;i<CurrentMeasures.length; i++){
        Details_Chart.removeMeasure(CurrentMeasures[i], Feed.ValueAxis);
    }

    for (i=0;i<sel.length; i++){

        var selection = sel[i];

        for (var dimensionId in selection) {
            var memberId = selection[dimensionId];

            if (dimensionId === '@MeasureDimension') {
                // Measure
                console.log( ['Add Selection Measure: ', dimensionId]);
                console.log( ['Add Selection Member: ', memberId]);

                Details_Chart.addMeasure(memberId, Feed.ValueAxis);
                CurrentDetailsMeasures.push(memberId);
                Popup_show = true;

            }
            // Dimension
            else {
                    console.log( ['Selection Dimension: ', dimensionId]);
                    console.log( ['Selection Member: ', memberId]);

                    Details_Chart.getDataSource().setDimensionFilter(dimensionId, memberId);
                    Popup_show = true;
            }
        }
    }
}

if (Popup_show === true) {
    Popup_Details.open();
}
```

```
var sel = Chart.getSelections();
console.log(['Chart Selection: ', sel,
CurrentMeasures]);
var Popup_show = false;

if (sel.length > 0) {


Details_Chart.getDataSource().removeDimensionFilter(C
urrentDimension);

  // remove the current measures
  for (var i = 0; i < CurrentMeasures.length; i++) {
    Details_Chart.removeMeasure(CurrentMeasures[i],
Feed.ValueAxis);
  }

  for (i = 0; i < sel.length; i++) {
    var selection = sel[i];

    for (var dimensionId in selection) {
      var memberId = selection[dimensionId];

      if (dimensionId === '@MeasureDimension') {
        // Measure
        console.log(['Add Selection Measure: ',
dimensionId]);
        console.log(['Add Selection Member: ',
memberId]);

        Details_Chart.addMeasure(memberId,
Feed.ValueAxis);
        CurrentDetailsMeasures.push(memberId);
        Popup_show = true;
      }
```

```
      // Dimension
      else {
        console.log(['Selection Dimension: ',
dimensionId]);
        console.log(['Selection Member: ',
memberId]);


Details_Chart.getDataSource().setDimensionFilter(dime
nsionId, memberId);
        Popup_show = true;
      }
    }
  }
}

if (Popup_show === true) {
  Popup_Details.open();
}
```

In previous steps, we had created the popup window and added a Cancel button. To make the button do anything, we need to write a script for it.

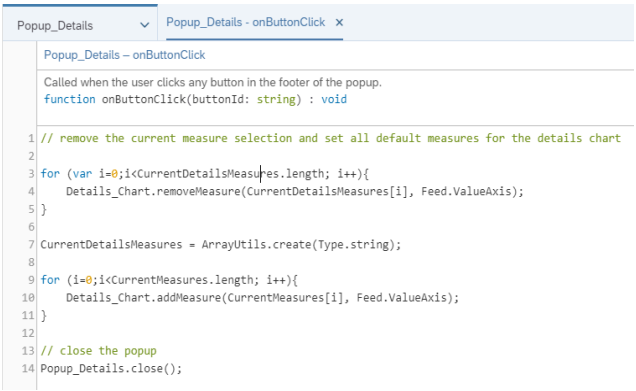
To do that, select Popup_Details in the Layout and click on the fx next to it.



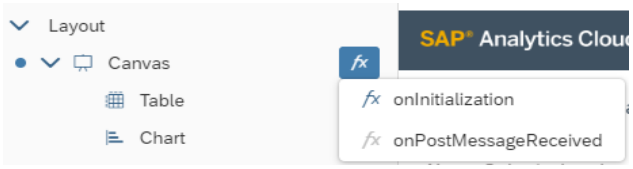
This will open the onButtonClick script of the Popup widget.
Here, we will set what happens when the user clicks on the Cancel button.

Firstly, we will remove the content, if there is any, of the CurrentDetailsMeasures from the Details_Chart and set the default measures, from the CurrentMeasures script variable, as the measures of the Details_Chart.

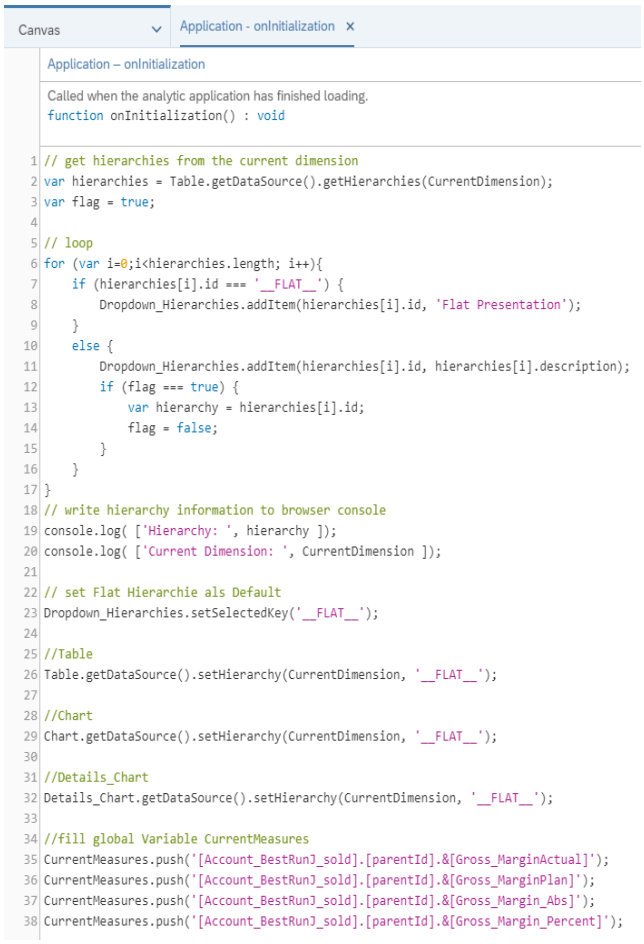
At the end, we will trigger the closing of the popup.




```
// remove the current measure selection and set all
default measures for the details chart

for (var i = 0; i < CurrentDetailsMeasures.length;
i++) {

Details_Chart.removeMeasure(CurrentDetailsMeasures[i]
, Feed.ValueAxis);
}

CurrentDetailsMeasures =
ArrayUtils.create(Type.string);

for (i = 0; i < CurrentMeasures.length; i++) {
  Details_Chart.addMeasure(CurrentMeasures[i],
Feed.ValueAxis);
}

// close the popup
Popup_Details.close();
```

The last script we will write is the one for the Canvas. This script gets executed on the initialization of the Canvas. Please, select the Canvas element in the Layout and click on the fx icon next to it. Select the onInitialization function there.	

In this script, we will load the hierarchies into the Hierarchies Dropdown list and set the default hierarchy to Flat Presentation.
At the end, we will also fill the script variable CurrentMeasures with the available measures of Gross margin (Actual, Plan, Absolute, and Percent)

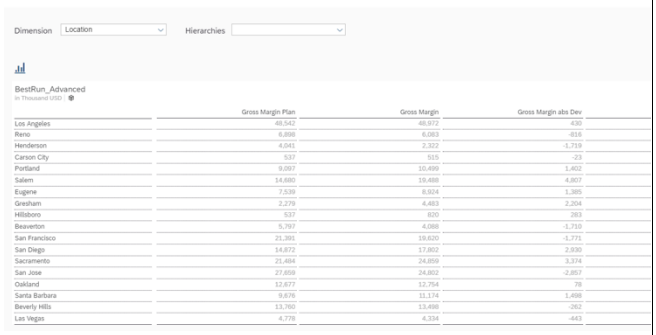



```
// get hierarchies from the current dimension
var hierarchies =
Table.getDataSource().getHierarchies(CurrentDimension
);
var flag = true;

// loop
for (var i = 0; i < hierarchies.length; i++) {
  if (hierarchies[i].id === '__FLAT__') {
    Dropdown_Hierarchies.addItem(hierarchies[i].id,
'Flat Presentation');
  }
  else {
    Dropdown_Hierarchies.addItem(hierarchies[i].id,
hierarchies[i].description);
    if (flag === true) {
      var hierarchy = hierarchies[i].id;
      flag = false;
    }
  }
}
// write hierarchy information to browser console
console.log(['Hierarchy: ', hierarchy]);
console.log(['Current Dimension: ',
CurrentDimension]);

// set Flat Hierarchy as Default
Dropdown_Hierarchies.setSelectedKey('__FLAT__');

//Table
Table.getDataSource().setHierarchy(CurrentDimension,
'__FLAT__');

//Chart
Chart.getDataSource().setHierarchy(CurrentDimension,
'__FLAT__');
```

	`//Details_Chart` `Details_Chart.getDataSource().setHierarchy(CurrentDim` `ension, '__FLAT__');` `//fill global Variable CurrentMeasures` `CurrentMeasures.push('[Account_BestRunJ_sold].[parent` `Id].&[Gross_MarginActual]');` `CurrentMeasures.push('[Account_BestRunJ_sold].[parent` `Id].&[Gross_MarginPlan]');` `CurrentMeasures.push('[Account_BestRunJ_sold].[parent` `Id].&[Gross_Margin_Abs]');` `CurrentMeasures.push('[Account_BestRunJ_sold].[parent` `Id].&[Gross_Margin_Percent]');`

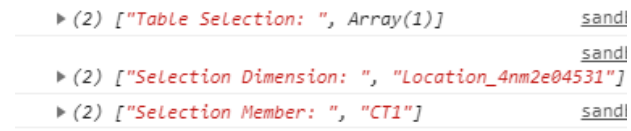
Now let's see how it looks like.

Click on Run Analytic Application in the upper right side of the page and the result should look something like this:



If we click on one of the dimension data cells, in this example the dimension is set to Location and we clicked on Los Angeles, the popup window will appear. It gives us an overview of all the measures (Gross Margin Actual, Plan, Absolute, Percent) in relation to the selected Location (Los Angeles) over the Time factor.

When opening the browser's console, we can also see that the selection was printed there.



If we click on one of the measures, in this screenshot we chose Gross Margin Actual, the measure is shown in the popup window in relation to the Time factor.

The selection is also printed out in the console:

The third option to select in the Table is an individual data cell.
In this example, we changed the Dimension to store and selected the data cell at the crossover of Gross Margin Plan and Country Fair Foods. This triggers the opening of a popup window that shows Gross Margin Plan in relation with Time and with a Store Filter of Country Fair Foods.

The selection triggers the following console message:

If we change the dimension back to Location and change the hierarchy of the Table to States, the following Table will be displayed:

We can then choose a state and we would also get a popup window that displays the measures in regard to a state (here, Nevada was selected).

This state selection prints the following message to the browser console:

Now, we will look at how the Chart behaves.
To switch to the Chart, click on the  icon in the Canvas.

There, we will firstly click on a dimension. Here, the dimension filter was set to Product and Lemonade was clicked on.

All the measures are shown in regard to Time and with a product filter of Lemonade.

This selection prints the following message into the console:
The measures are added according to the chosen product

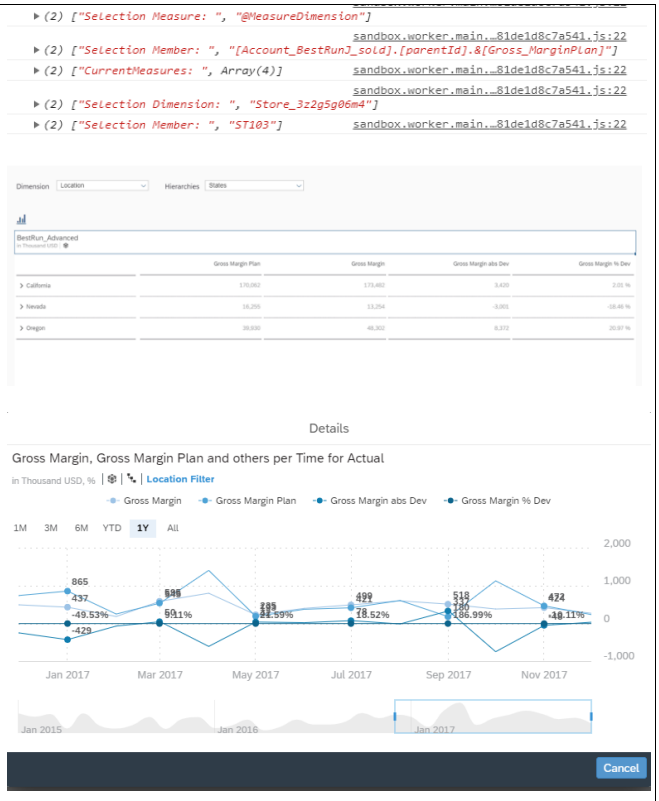
The second thing we can click on in the Chart is a specific measure in regard to a specific dimension.
For example, Gross Margin Abs Dev in relation to Orange with pulp (the chart bar marked in the screenshot).

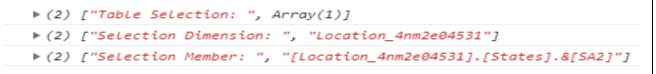
This causes a popup window to appear that displays the measure chosen (Gross Margin abs Dev) per Time and with a dimension filter (here: Product – Orange with pulp)

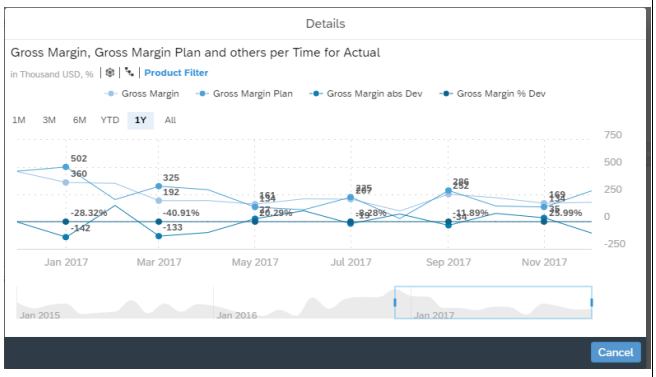
This triggers the printing of the following messages in the browser's console:

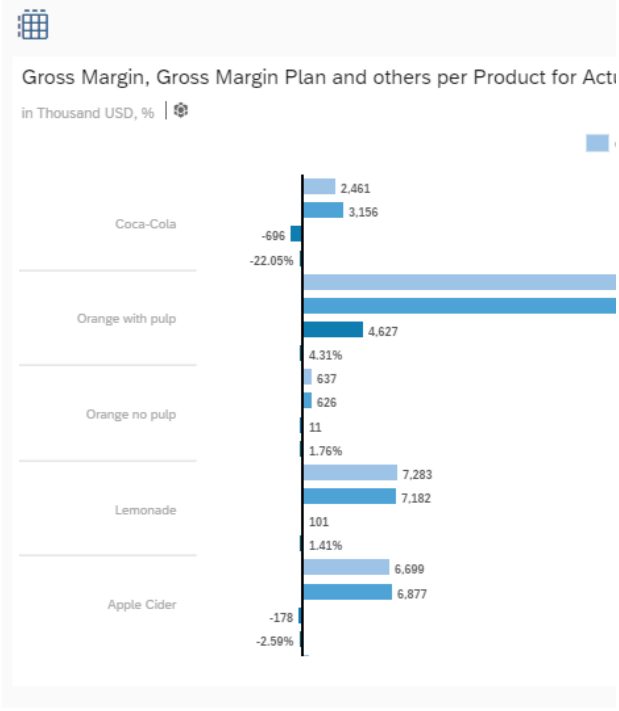
Note: The user can always check what filter is being utilized by clicking on Filter.

This opens a list of filters used – here only one product (Orange with pulp) has been used as a filter.

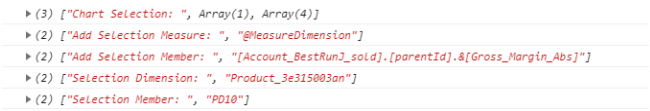




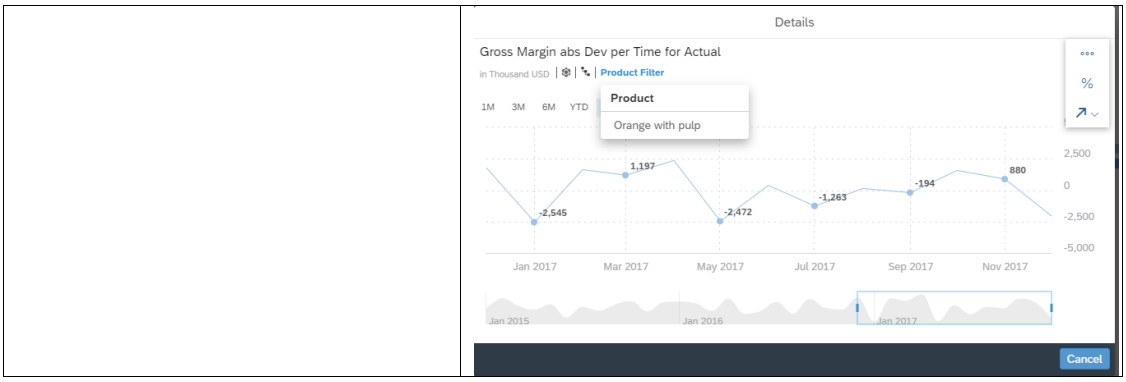



Gross Margin, Gross Margin Plan and others per Product for Acti
in Thousand USD, %
Coca-Cola
2,461
3,156
-696
-22.05%
Orange with pulp
4,627
4.31%
Orange no pulp
637
626
11
1.76%
Lemonade
7,283
7,182
101
1.41%
Apple Cider
6,699
6,877
-178
-2.59%


Details
Gross Margin abs Dev per Time for Actual
in Thousand USD
Product Filter
1M 3M 6M YTD 1Y All
5,000
2,500
0
-2,500
-5,000
1,197
-2,545
-2,472
-1,263
-194
880
Jan 2017
Mar 2017
May 2017
Jul 2017
Sep 2017
Nov 2017
Jan 2015
Jan 2016
Jan 2017
Cancel


▸ (3) ["Chart Selection: ", Array(1), Array(4)]
▸ (2) ["Add Selection Measure: ", "@MeasureDimension"]
▸ (2) ["Add Selection Member: ", "[Account_BestRunJ_sold].[parentId].&[Gross_Margin_Abs]"]
▸ (2) ["Selection Dimension: ", "Product_3e315003an"]
▸ (2) ["Selection Member: ", "PD10"]


Details
Gross Margin abs Dev per Time for Actual
in Thousand USD
Product Filter
1M 3M 6M YTD 1Y All
5,000
2,500
0
-2,500
-5,000
1,197
-2,545
-2,472
-1,263
-194
880
Jan 2017
Mar 2017
May 2017
Jul 2017
Sep 2017
Nov 2017
Jan 2015
Jan 2016
Jan 2017
Cancel



6.9 Using R Widget Word Cloud for Visualization

This application features an overview for the customer complaints a company got from its customers over the years 2018 and 2019.

In the canvas, we will add a Table with our top 10 customers as well as a Chart with the complaints of the customers. Other than that, we will have two R Visualization widgets through which we will create word clouds that change the size of the words displayed according to the frequency with which they appear in the data set.

Further functionalities in this application include how to filter widgets according to a selected element of a Table and how we can change the color of the word clouds through external input (in this use case, it is achieved through a Radio Button Group that has a script that passes the value to the R widgets.)

And lastly, the filtering of all the widgets in the canvas using Radio Button Groups will be explored (here, we will filter according to *Regions* and according to the selected *Region*, several countries from that *Region* will be displayed in another Radio Button Group (*Country*) for further filtering of the widgets).

The result will look like this when we run the application:

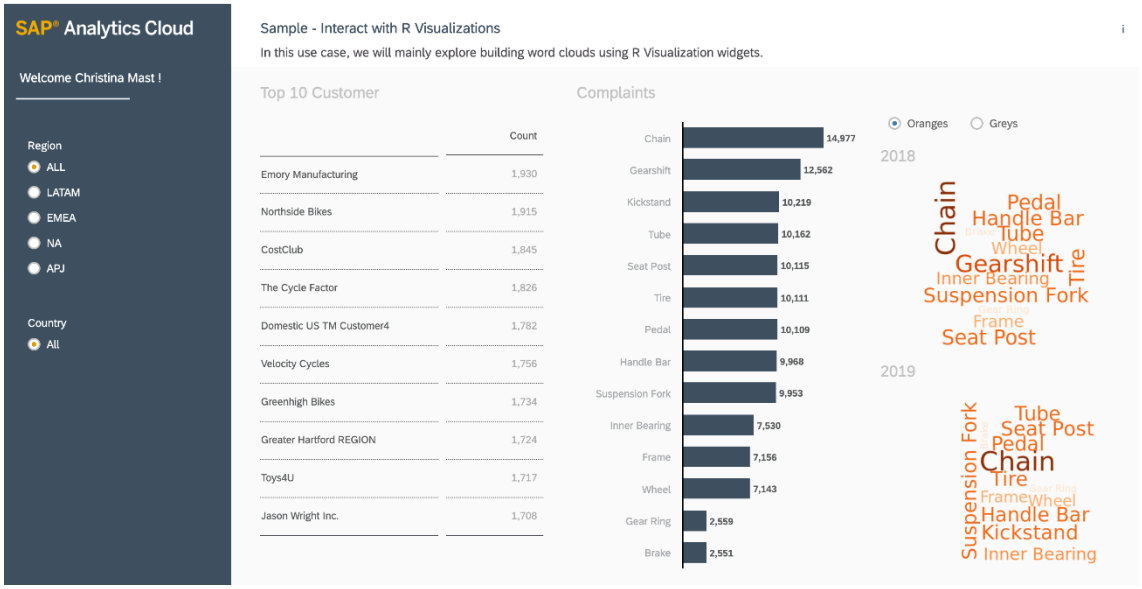
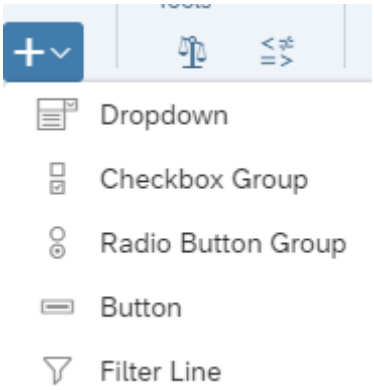
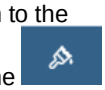
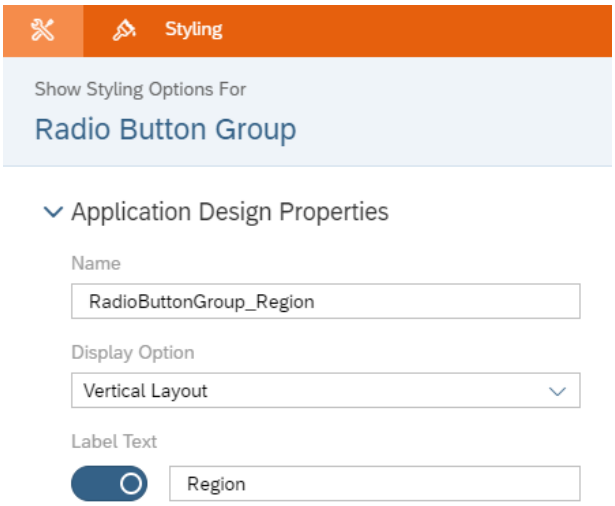


Figure 56: Example Application Word Cloud

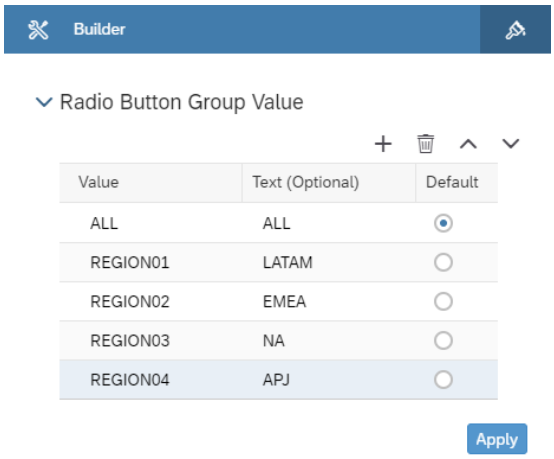
There are no prerequisites for this use case. You can start with a new application.

It is recommended to use the same names as that exercise for the used widgets so that the scripts in this use case don't have to be altered.

The first thing we will do, is add a Radio Button Group to our Canvas where we will enable the user to choose between regions .	
Select the newly added widget in the Canvas and go to the Designer (by clicking on Designer on the upper right side of the screen) and switch to the  Styling Panel by clicking on the button. There, enter "RadioButtonGroup_Region" as the Name, choose Vertical Layout as the Display Option, and toggle the Label Text button to enable it and write "Region" as the Label Text.	

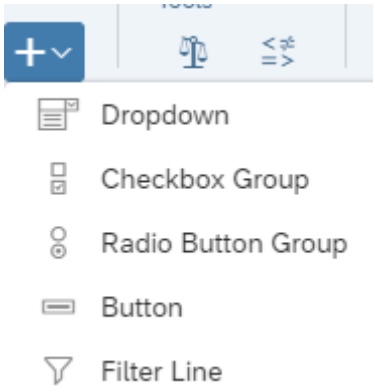
Now, we will insert the options we want available in our Radio Button Group widget.
To do that, switch to the Building Panel by clicking on the  button.
Once there, start adding values using the “+” button.
We will add an option that has all the regions (1), and the others will be for Latin America (2), Europe, the Middle East and Africa (3), North America (4), and the Asia-Pacific region (5).
We will set All as our default value; this means that the widgets in our canvas will be by default filtered according to that option and the user can change it afterwards.

Please click on Apply to save the changes to your application.



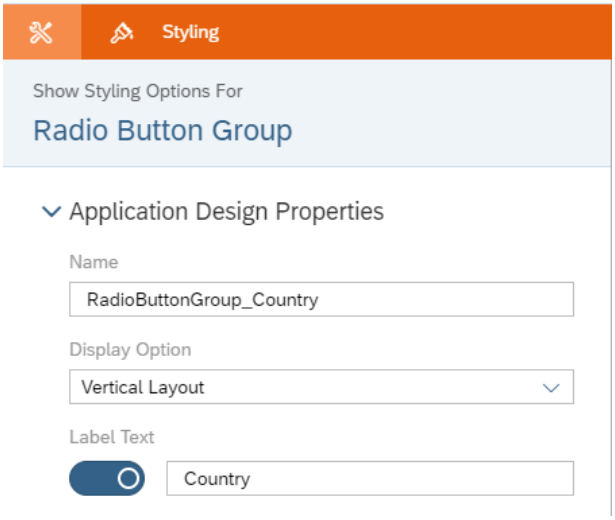
Value	Text (Optional)
ALL	ALL
REGION01	LATAM
REGION02	EMEA
REGION03	NA
REGION04	APJ

To enable further filtering, we will insert another Radio Button Group that houses the countries.
The values of this widget will change depending on the region selected.
Please place the widget underneath the Region Radio Button Group.

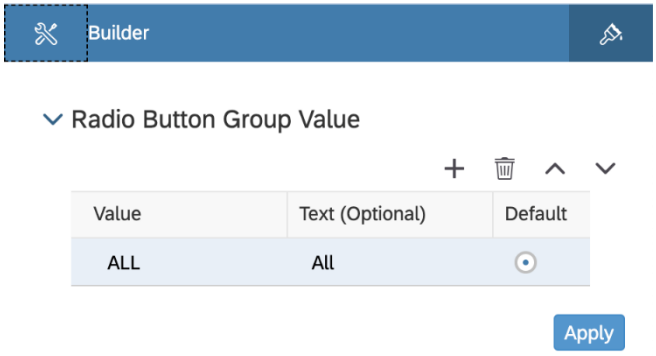


Select the widget in the Canvas and go to the Styling panel in the Designer.

There, enter "RadioButtonGroup_Country" as the Name, choose Vertical Layout as the Display Option, and toggle the Label Text button to enable it and write "Country" as the Label Text.



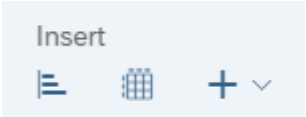
Now, we will insert the options we want available in our Radio Button Group widget.
To do that, switch to the Building Panel by clicking on the button.
For this widget, we will only add one option which is "All".
To do that, click on the "+" button and add the values like in the screenshot to the right.
Lastly, click on Apply to save the changes.
(The other countries will be added through a script later in this tutorial.)



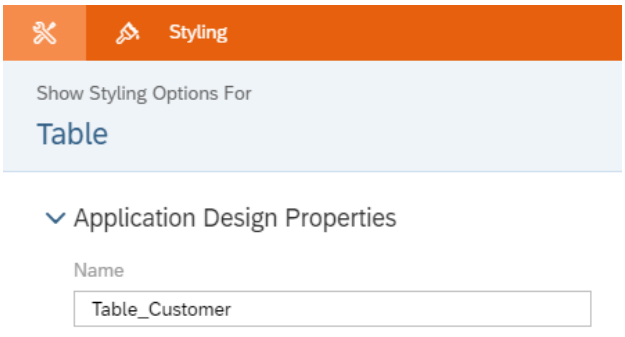
Value	Text (Optional)
ALL	All

.

Now, we will move on to add our Table, Chart, and R Widgets.
We will start off with the Table.
Through the Insert Panel, add a new Table and place it to the right side of the two radio button groups.
Select BestRunBike_Customer_Complaint as the data source.

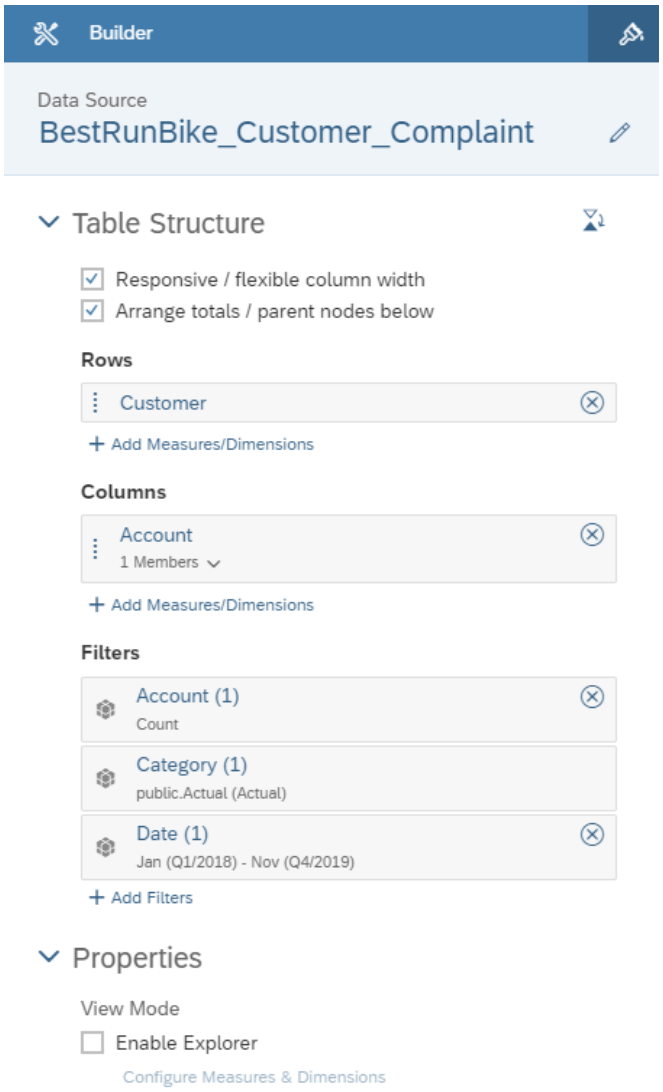


In the Styling Panel of the Table insert the Name "Table_Customer".



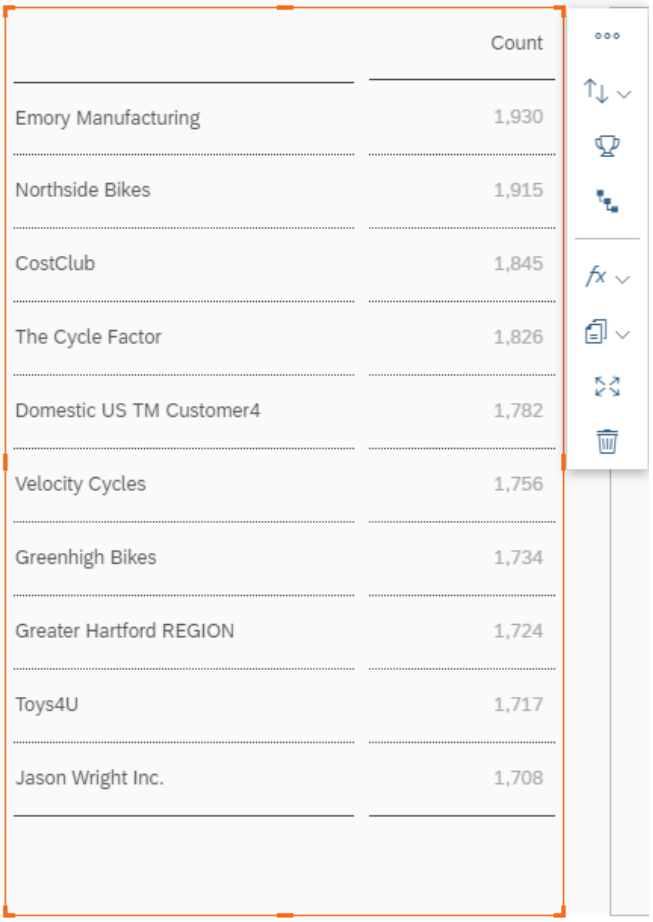
Afterwards, switch over to the Building Panel and there, enter the values as in the screenshot to the right.
Check Responsive / flexible columns width
Check Arrange totals / parent nodes below
Add Customer to Rows
Add Account to Columns
And set the Filters to
Account – Count
Category – Actual
Date – Jan (Q1/2018) – Nov (Q4/2019)

This Table will hold the customers of our data set.

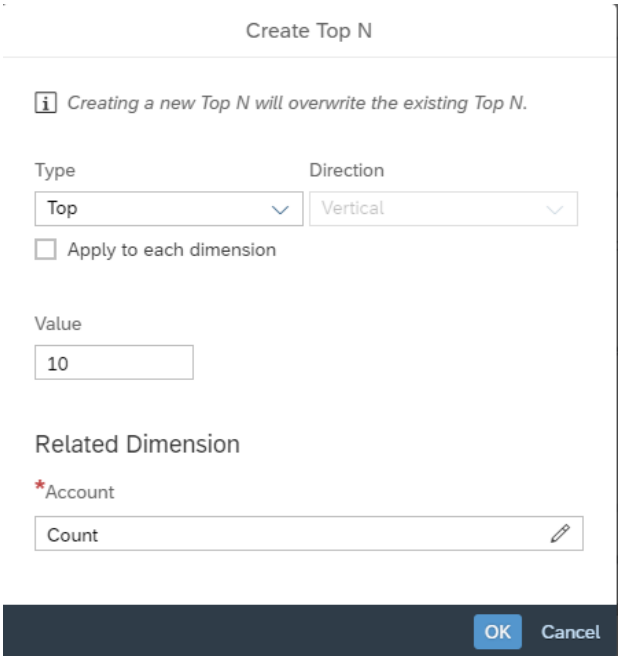


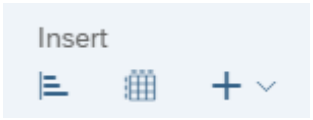
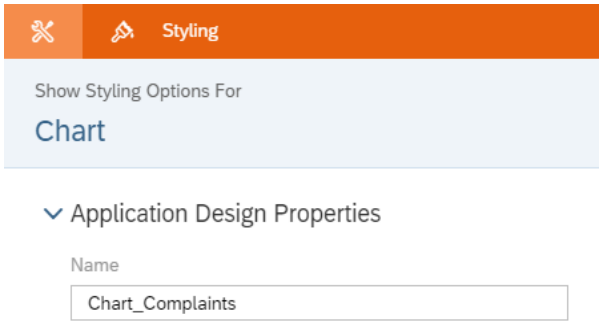
To have a better visual over our Customers and their complaints, we will only show the Top 10 Customers in our Table.

To do that, select the Table in the Canvas and click on the icon in its menu.



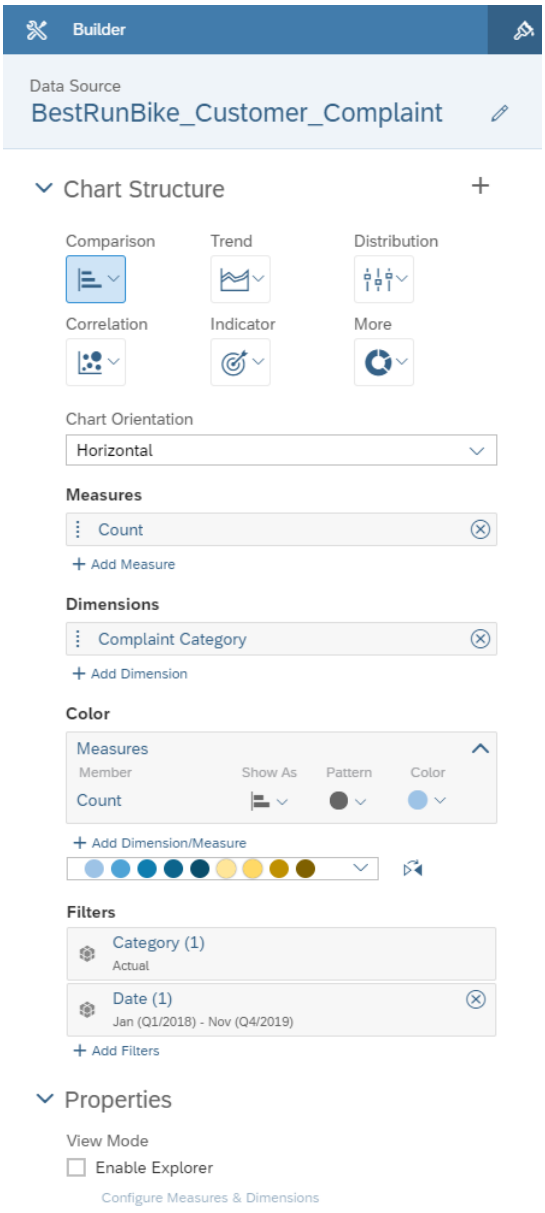
This opens a “Create Top N” window. Enter “Top” as the Type, 10 as the Value, and Count in the Related Dimension’s Account field.

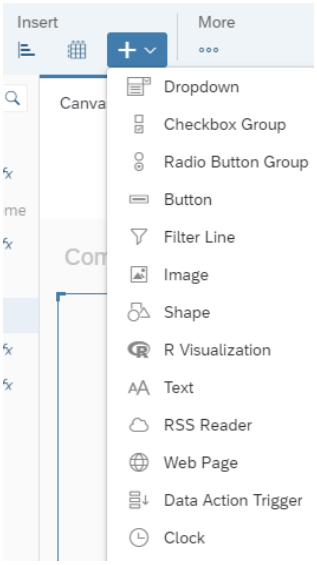
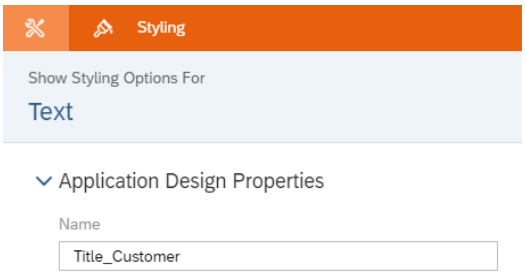
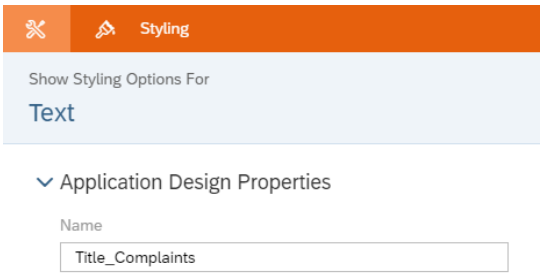


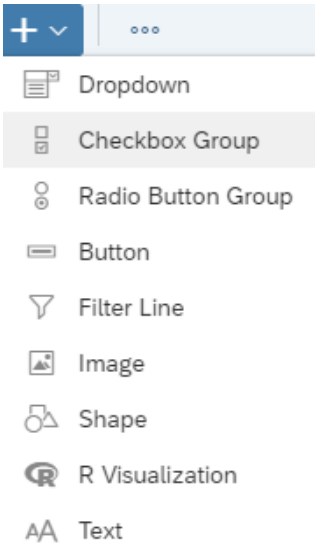
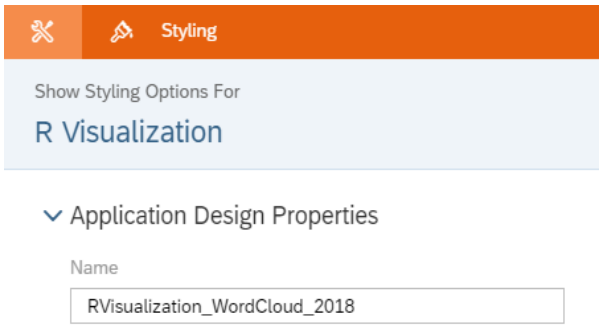
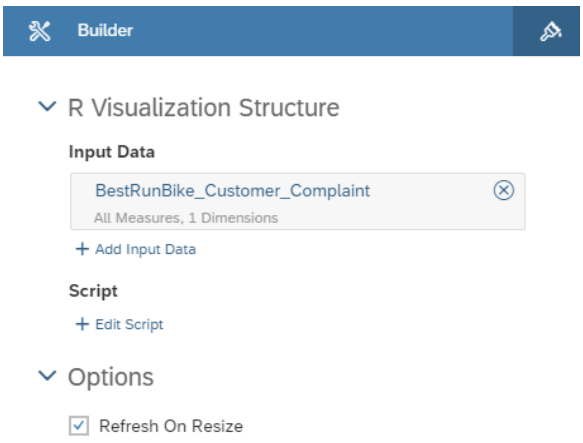
We also want to be able to view the complaints that we got from our customers, which is why we will add a chart to display them. First, we need to add the Chart. We will do that, again, through the Insert Panel.	
To edit the properties of our Chart, go to the Designer. We'll change the Styling properties first. In the Styling panel enter "Chart_Complaints" as the Name.	

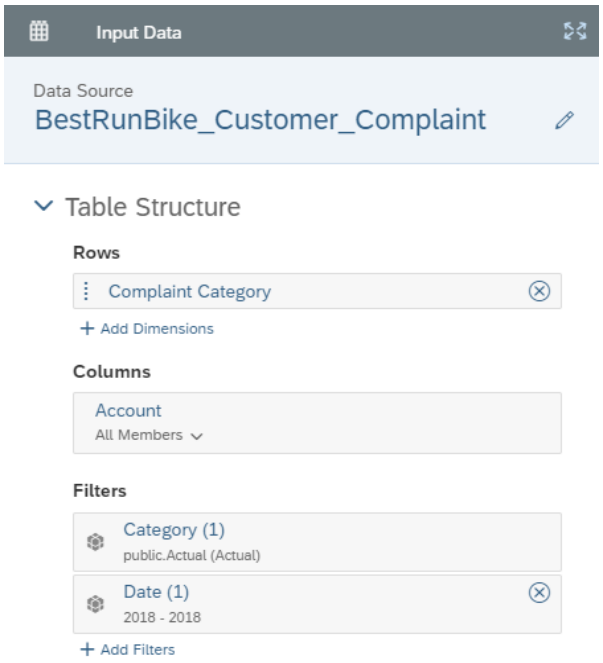
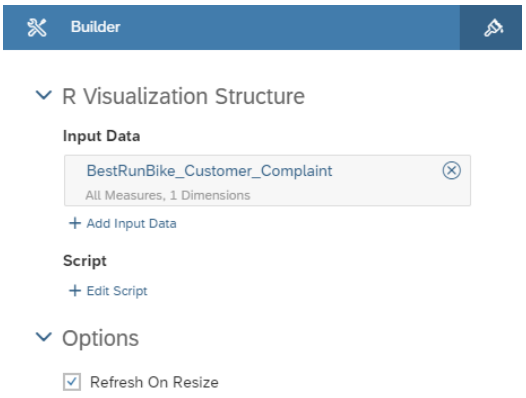
To display the complaints of our customers, we will edit the Builder components of the Chart.
Switch over to the Chart's Builder panel and enter the values as seen in the screenshot:

Chart Structure: Comparison (Bar/Column)
Chart Orientation: Horizontal
Measures: Count
Dimensions: Complaint Category
Filters:
Category: Actual
Date: Jan (Q1/2018) – Nov (Q4/2019)



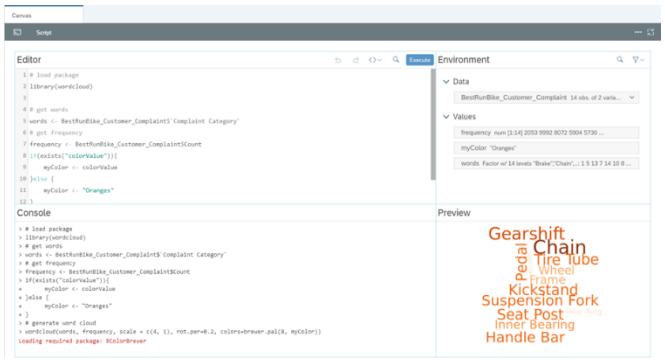
To know what the Table and Chart represent, we will add text labels on top of each of them. Add two labels and place one above the Table and the other above the Chart.	
Click on the first text widget and open the Styling Panel. There, enter “Title_Customer” as the Name.	
The previous step just edits the name through which the widget is mentioned if it’s called in a script in the application. To edit what appears in the text box, double click on it in the Canvas and enter “Top 10 Customers” in the text widget above the Table.	
Click on the second text widget and open the Styling Panel. There, enter “Title_Complaints” as the Name.	

To edit what appears in the box, double click on it in the Canvas and enter “Complaints” in the text widget above the Table.	
Now, we will add the R Visualization widgets. To do that, select the widget from the Insert panel and insert 2 into the Canvas and place them vertically next to the Chart.	
Select the first R Visualization widget in the Canvas and open the Designer to edit its properties. We will start in the Styling Panel. There, enter “RVisualization_WordCloud_2018” as the Name.	
To edit its content, let’s switch over to the Builder panel. Here, enter the data set as the input data and check the “Refresh On Resize” option.	

After inserting the data source (here: BestRunBike_Customer_Complaint), click on it (still in the Builder panel) so that we can edit the properties that we want the data set to have. Here, we will add Complaint Category to the Rows and Account to the Columns. Click on Add Filters and select Date – Range and choose Year 2018 to 2018. The filters should now be Category set to Actual and Date set to 2018-2018.	
Click on OK and back in the Builder panel of the widget, click on Edit Script.	

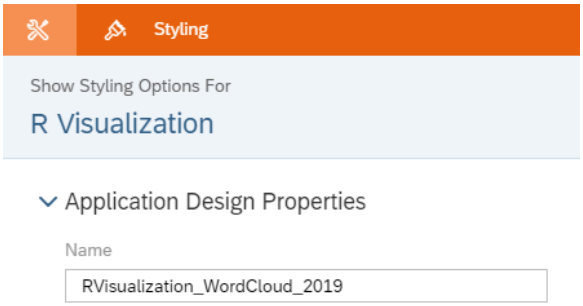
In the R script of this widget, we will get the words from the complaints and also how frequent they come up and according to these values, the word cloud is generated and the words with the higher frequency are also drawn bigger in the word cloud.

Insert the script written on the right side, into the editor of the R widget and click on Apply to save the changes.

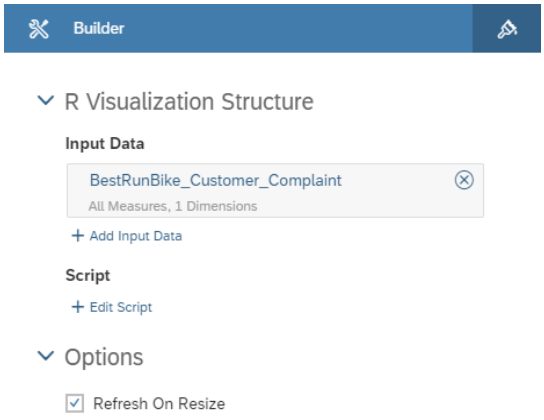


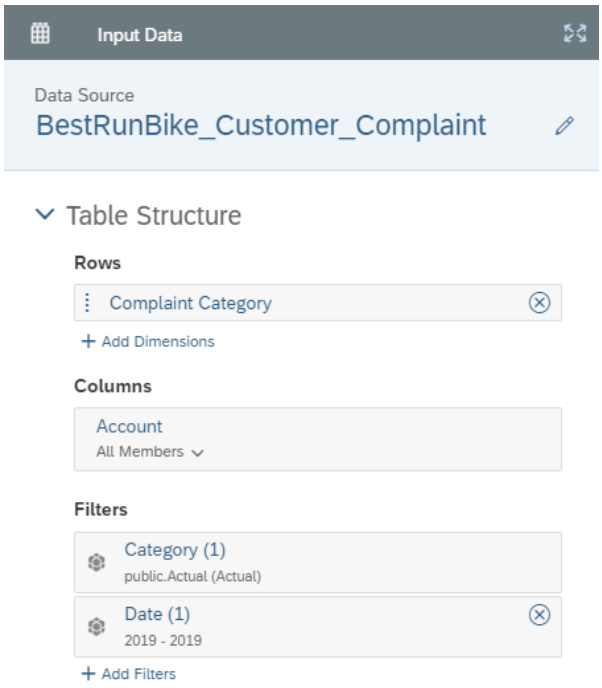
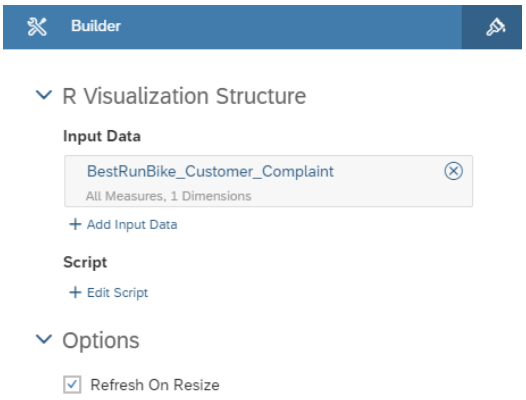

```
# load package
library(wordcloud)

# get words
words <- BestRunBike_Customer_Complaint$`Complaint
Category`
# get frequency
frequency <- BestRunBike_Customer_Complaint$Count
if (exists("colorValue")) {
  myColor <- colorValue
} else {
  myColor <- "Oranges"
}
# generate word cloud
wordcloud(words, frequency, scale = c(4, 1),
rot.per=0.2, colors=brewer.pal(8, myColor))
```

Now, let's do the same for the second R Visualization widget.
Select it in the Canvas and open the Styling panel.
There, enter "RVisualization_WordCloud_2019" as the Name.



To edit its content, let's switch over to the Builder panel.
Here, enter the data set as the input data and check the "Refresh On Resize" option.

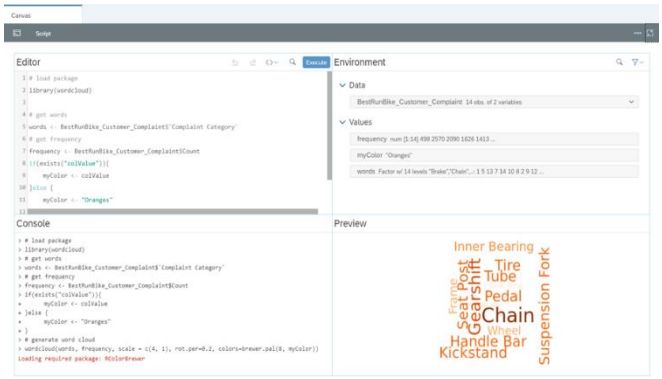


After inserting the data source, click on it (still in the Builder panel) so that we can edit the properties that we want the data set to have. (We will have the same settings that we had for the last widget but change the date to 2019.) Here, we will add Complaint Category to the Row and in the Columns, we will add Account. Click on Add Filters and select Date – Range and choose Year 2019 to 2019. The filters will be Category set to Actual and Date set to 2019-2019.	
Click on OK and back in the Builder panel of the widget, click on Edit Script.	

In the R script of this widget, we will do the same as in the first widget; we will get the words from the complaints and how frequent they come up and according to these values, the word cloud is generated and the words with the higher frequency are also drawn bigger in the word cloud.

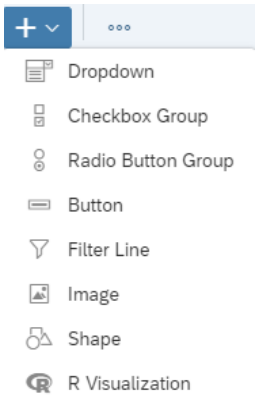
Please insert the script written on the right side, into the editor of the R widget.

Click on Apply to save the changes.

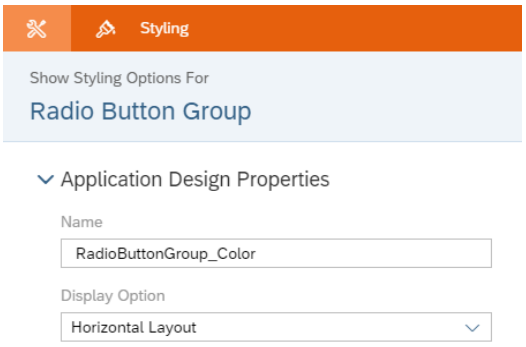


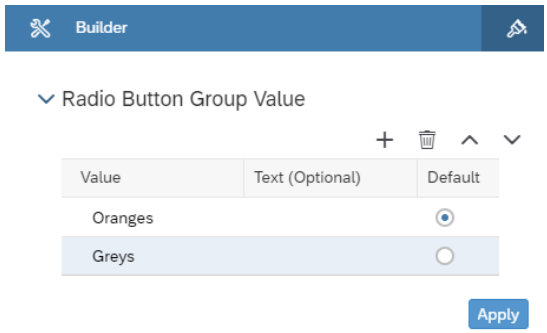
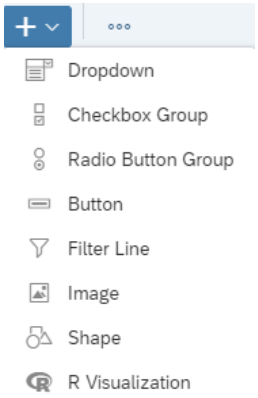
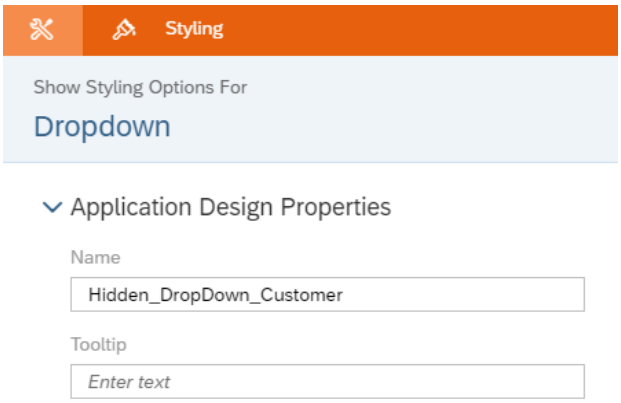

```
# load package
library(wordcloud)

# get words
words <- BestRunBike_Customer_Complaint$`Complaint
Category`
# get frequency
frequency <- BestRunBike_Customer_Complaint$Count
if (exists("colValue")) {
  myColor <- colValue
} else {
  myColor <- "Oranges"
}
# generate word cloud
wordcloud(words, frequency, scale = c(4, 1),
rot.per=0.2, colors=brewer.pal(8, myColor))
```

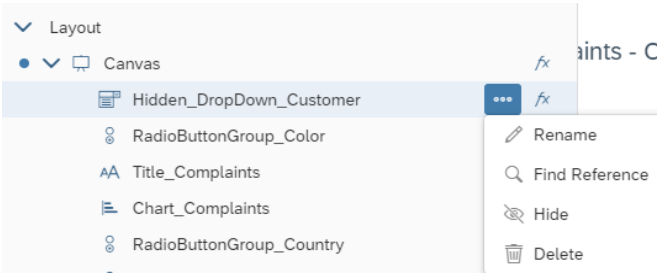
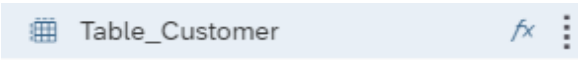
To give the users more choice in the look of the R Visualization widgets, we want them to be able to choose the color of the generated word cloud. To do this, we need to have a Radio Button Group where we will give them the choice between 2 colors.
Add a Radio Button Group widget and place it above the R Visualization widgets.



Select the widget in the Canvas and open the Styling panel.
Here, we will edit its Name and set it to “RadioButtonGroup_Color” and set the Display Option to Horizontal Layout.

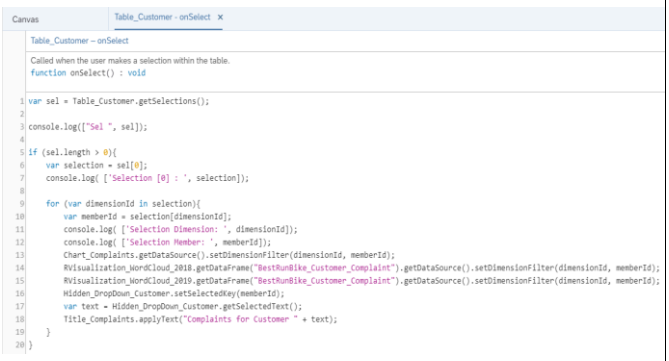


To edit the content of the Radio Button Group widget, switch over to the Builder Panel. There, we will add 2 values “Oranges” and “Greys”, while setting Oranges to our default. To save the changes, please click on Apply.	
The last widget we will need for this application is a Dropdown list. To add a Dropdown list, go to the Insert Panel and select a Dropdown widget.	
Firstly, we need to change the name of the widget to make it more comprehensible if we want to call it in a script. To do that, select the widget in the Canvas and go to the Styling Panel in the Designer. There, enter “Hidden_DropDown_Customer” in the Name field.	

Through the getSelection function of the Table, we get back a dimension ID and a member ID when a user selects an element in the Table. This ID is very useful and allows us to manipulate widgets, however, if we want to be able to display the name of the selected member (here: the name of the selected customer), we have to get the text of the name using the member ID we get from the Table's function. That's why we need this Dropdown list here, we will simply load all the customers in our data set into it and set its selected key to the captured memberId. This way we can get the text of the element and use it to make our Canvas more dynamic. Thus, we do not need this widget to be visible since we just need it for behind-the-scenes work. To set the widget to invisible, hover over it in the Layout and click on the  icon. Once there, click on Hide to make the widget invisible in the Canvas.	
To enable the user to filter the Chart and the R Visualization widgets according to a specific customer, we will write a script for the Table so that when a user select a specific customer from our Top 10 Customers list, all our other widgets are filtered to that specific customer. To access the script of the Table, hover over the widget in the Layout and click on the  icon next to it and select the onSelect function.	

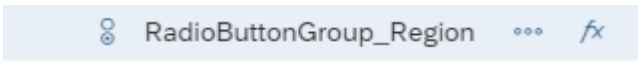
In this onSelect script, we will capture the selected element and get its dimension (here: it's already known that it's Customer) and the selected member id (the specific customer selected).
We will then use these values to add filters to the Chart, and the two R Visualization widgets.

At the end of the script, we will use our Hidden Dropdown list to get the Text related to the memberId we get back from the getSelection function and edit the text of the Complaint Chart's label to include the name of the selected customer.



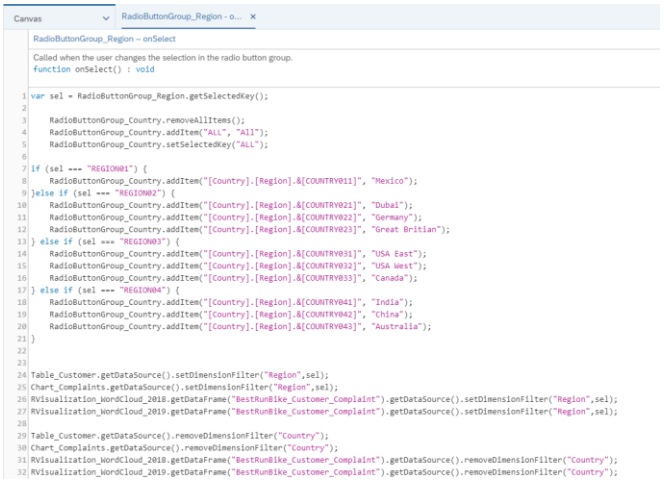

```
var sel = Table_Customer.getSelections();

console.log(["Sel ", sel]);

if (sel.length > 0) {
  var selection = sel[0];
  console.log(['Selection [0] : ', selection]);

  for (var dimensionId in selection) {
    var memberId = selection[dimensionId];
    console.log(['Selection Dimension: ',
dimensionId]);
    console.log(['Selection Member: ', memberId]);

Chart_Complaints.getDataSource().setDimensionFilter(dim
ensionId, memberId);

RVisualization_WordCloud_2018.getDataFrame("BestRunBike
_Customer_Complaint").getDataSource().setDimensionFilte
r(dimensionId, memberId);

RVisualization_WordCloud_2019.getDataFrame("BestRunBike
_Customer_Complaint").getDataSource().setDimensionFilte
r(dimensionId, memberId);
    Hidden_DropDown_Customer.setSelectedKey(memberId);
    var text =
Hidden_DropDown_Customer.getSelectedText();
    Title_Complaints.applyText("Complaints for Customer
" + text);
  }
}
```

The next script we will write is for the Region Radio Button Group.
To access the script, hover over the widget in the Layout and click on the  icon next to it.



In this script, we will add countries to the Radio Button Group of Country according to what region is selected. For example, if Region 2 (EMEA) is selected, then Dubai, Germany, and Great Britain are displayed as options in the Countries widget, however, if the region changes to another, for example, Region 4 is chosen (APJ), then the countries that the user can choose from in the other Radio Button Group are India, China, and Australia.

Furthermore, we will set the dimension filter of the widgets in our Canvas according to the selected region.

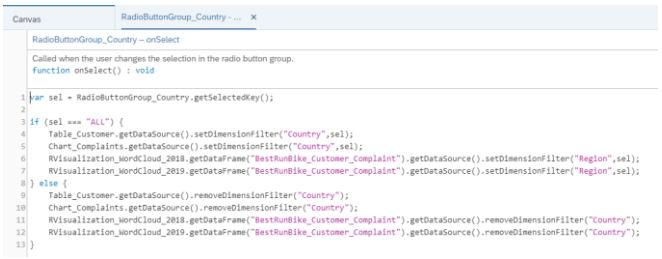



```
var sel = RadioButtonGroup_Region.getSelectedKey();

RadioButtonGroup_Country.removeAllItems();
RadioButtonGroup_Country.addItem("ALL", "All");
RadioButtonGroup_Country.setSelectedKey("ALL");

if (sel === "REGION01") {

RadioButtonGroup_Country.addItem("[Country].[Region].&[
COUNTRY011]", "Mexico");
} else if (sel === "REGION02") {

RadioButtonGroup_Country.addItem("[Country].[Region].&[
COUNTRY021]", "Dubai");

RadioButtonGroup_Country.addItem("[Country].[Region].&[
COUNTRY022]", "Germany");

RadioButtonGroup_Country.addItem("[Country].[Region].&[
COUNTRY023]", "Great Britian");
} else if (sel === "REGION03") {

RadioButtonGroup_Country.addItem("[Country].[Region].&[
COUNTRY031]", "USA East");

RadioButtonGroup_Country.addItem("[Country].[Region].&[
COUNTRY032]", "USA West");

RadioButtonGroup_Country.addItem("[Country].[Region].&[
COUNTRY033]", "Canada");
} else if (sel === "REGION04") {

RadioButtonGroup_Country.addItem("[Country].[Region].&[
COUNTRY041]", "India");

RadioButtonGroup_Country.addItem("[Country].[Region].&[
COUNTRY042]", "China");

RadioButtonGroup_Country.addItem("[Country].[Region].&[
COUNTRY043]", "Australia");
}

Table_Customer.getDataSource().setDimensionFilter("Regi
on",sel);
Chart_Complaints.getDataSource().setDimensionFilter("Re
gion",sel);
RVisualization_WordCloud_2018.getDataFrame("BestRunBike
_Customer_Complaint").getDataSource().setDimensionFilte
r("Region",sel);
RVisualization_WordCloud_2019.getDataFrame("BestRunBike
_Customer_Complaint").getDataSource().setDimensionFilte
r("Region",sel);

Table_Customer.getDataSource().removeDimensionFilter("C
ountry");
```

```
Chart_Complaints.getDataSource().removeDimensionFilter(
"Country");
RVisualization_WordCloud_2018.getDataFrame("BestRunBike
_Customer_Complaint").getDataSource().removeDimensionFi
lter("Country");
RVisualization_WordCloud_2019.getDataFrame("BestRunBike
_Customer_Complaint").getDataSource().removeDimensionFi
lter("Country");
```

Now, we will edit what happens when one of the options in the Radio Button Group Country is selected.
To do that, hover over the widget in the Layout and click on the fx icon that appears next to it.

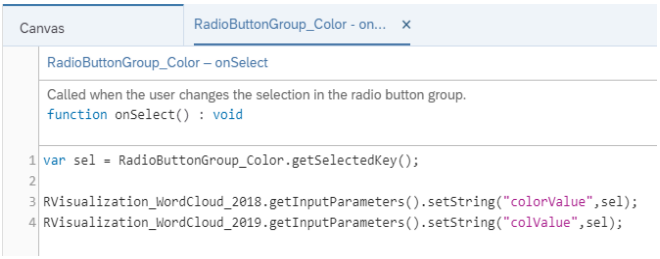
In this script, we will simply set the selected option as the dimension filter of our Table, Chart, and R Visualization widgets.
However, because the R Visualization widget needs a different kind of input than the Table and the Chart, we need to edit the key we get and cut some of it so that we can forward it to the R widgets.




```
var sel = RadioButtonGroup_Country.getSelectedKey();
var cloud_sel = sel.replace("[Country].[Region].&[",
"");
cloud_sel = cloud_sel.replace("]", "");
console.log(cloud_sel);
if (sel === "ALL") {

Table_Customer.getDataSource().removeDimensionFilter("C
ountry");

Chart_Complaints.getDataSource().removeDimensionFilter(
"Country");

RVisualization_WordCloud_2018.getDataFrame("BestRunBike
_Customer_Complaint").getDataSource().removeDimensionFi
lter("Country");

RVisualization_WordCloud_2019.getDataFrame("BestRunBike
_Customer_Complaint").getDataSource().removeDimensionFi
lter("Country");
} else {

Table_Customer.getDataSource().setDimensionFilter("Coun
try", sel);

Chart_Complaints.getDataSource().setDimensionFilter("Co
untry", sel);

RVisualization_WordCloud_2018.getDataFrame("BestRunBike
_Customer_Complaint").getDataSource().setDimensionFilte
r("Country", cloud_sel);

RVisualization_WordCloud_2019.getDataFrame("BestRunBike
_Customer_Complaint").getDataSource().setDimensionFilte
r("Country", cloud_sel);
}
```

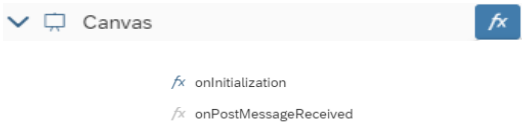
There is now another widget that we have to write the function for; the Color Radio Button Group that controls whether the word cloud will be displayed in Orange or in Gray.
To edit the script of this widget, hover over it in the Layout and click on the fx icon that appears next to it.

In the script of this widget, we will simply get the selected option, save it in a variable and pass it as input parameters to the R Visualization widgets' scripts.




```
var sel = RadioButtonGroup_Color.getSelectedKey();

RVisualization_WordCloud_2018.getInputParameters().setS
tring("colorValue", sel);
RVisualization_WordCloud_2019.getInputParameters().setS
tring("colValue", sel);
```

The last script for this application is the one that gets executed when the application is initialized. To access this script, hover over the "Canvas" in the Layout, click on the fx icon that appears next to it, and select onInitialization.



In this script, we will load a maximum of 1000 customers into the Hidden Dropdown of Customers. This number was chosen because the number of customers in our data set is under 1000, however, this number can be changed if needed.


```
var list =
Table_Customer.getDataSource().getMembers("Customer_",
1000);

if (list.length !== 0) {
  for (var i = 0; i < list.length; i++) {
    console.log(['List Dimension: ', i ,
list[i].displayId]);
    console.log(['List Description: ', i ,
list[i].description]);
    console.log(['List Member: ', i , list[i].id]);
    Hidden_DropDown_Customer.addItem(list[i].id,
list[i].description);
  }
}
```

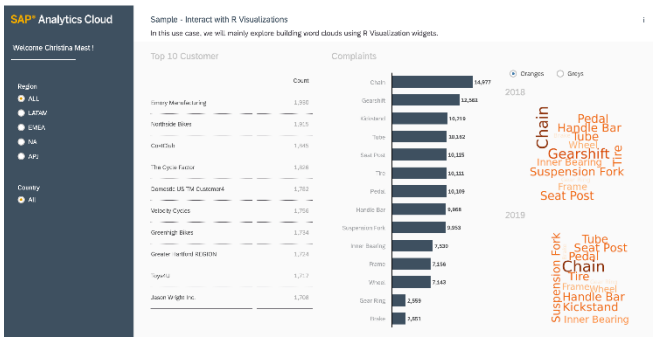
Now let's save the application and see how it looks like.

Click on Run Analytic Application in the upper right side of the page and the result should look something like this:

If we click on one of the elements in the Table (one of the Customers), the Chart and the R Visualization widgets will be filtered according to the data related to this particular customer (here: Northside Bikes was selected).

Now, if we select Greys instead of Oranges in the Color Radio Button Group, the R Visualization widgets are displayed in gray.

To filter according to a certain region, we can select one of the Regions from the Region Radio Button Group (here: EMEA was selected), and consequently the Country Radio Button Group's options changed from (All and Mexico) to EMEA countries (All, Dubai, Germany, and Great Britain).
The screenshot on the right displays the widgets filtered on EMEA and Germany; the customer is Greenhigh Bikes.



6.10 Set User Input for Planning Data

The user can set values to cells of a planning-enabled tabled using an analytics designer script. After setting one or more specific cell values the user can refresh the Table by submitting the values, for example:

```
Table_1.getPlanning().setUserInput({"sap.epm:Account":
"[sap.epm:Account].[parentId].&[TAXES]", "sap.epm:ProfitAndLoss_Version02":
"public.Actual"}, "123456789");
Table_1.getPlanning().submitData();
```

The passed value is always an unscaled value (raw value). For example, if the table applies a scaling factor of one million when displaying its cell values, then the value set above is displayed as 123.46 (formatted value). Note the rounding of the last displayed digit of the formatted value.

If the passed value is prefixed with an asterisk (*), then the value is applied as a factor to the present cell value. For example, applying the following script after the script above

```
Table_1.getPlanning().setUserInput({"sap.epm:Account":
"[sap.epm:Account].[parentId].&[TAXES]", "sap.epm:ProfitAndLoss_Version02":
"public.Actual"}, "*0.5");
Table_1.getPlanning().submitData();
```

results in a cell value (raw value) of 61728394.5, which is displayed as 61.73 (formatted value).

Another example shows a combination of a table with an input field. The value of the input field is applied as the new cell value to the first selected cell of the table:

```
var selectedCell = Table_1.getSelections()[0];
```

```
var planning = Table_1.getPlanning();
planning.setUserInput(selectedCell, InputField_1.getValue());
planning.submitData();
```

Currently, the passed value (raw value) can have up to 17 characters if it is a new value and up to 6 characters if it is a factor.

7 Planning

7.1 What to Expect from Analytics Designer Regarding Planning?

Analytics designer reuses the Planning features of Analytics Cloud and leverage the capabilities by offering flexible scripting that supports customizations of applications according to user requirements. Planning Data Models, Allocations, Data Action Triggers, and all Planning features can be integrated to applications.

And what can you not expect? In analytics designer you cannot use Input Tasks and Planning scripting is not possible for models based on BPC Write-Back.

7.2 Basic Planning Concepts in Analytics Designer

Planning specific features can be triggered through the toolbar icons in the *Plan* area.

Figure 57: Toolbar Planning Features

These icons are greyed out if no table cell with a planning model is selected.

Most of these features can also be triggered through scripting.

To get the Planning Table object, use the script below. If the table has no planning model assigned, it will return `undefined`.

```
Table.getPlanning(): Planning | undefined
```

Scripting will perform the same planning actions that could be done via UI. The benefits of scripting are augmented in cases which you want to minimize the number of clicks from your user, personalize your UI or when a special customer requirement can't be fulfilled with standard planning behavior.

Data can't be changed during design time, and you can enable the usage of planning features during runtime in two different ways:

- In the table designer UI: You can find in the Builder panel, section *Properties*, a box called *Planning enabled*.

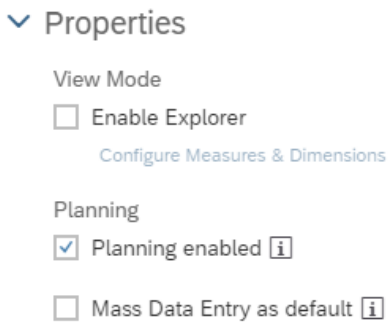


Figure 58: Planning Enabled

- Through the script below:

```
setEnabled(boolean): void
```

This option can be useful when you shall disable planning due to specific requirements. For example, budget might not be changed in last quarter of the year.

One other valuable script allows checking whether the data model is planning enabled:

```
isEnabled(): boolean
```

In the Table Builder panel, there are some configurations that you can do in each dimension, and **Unbooked** Data might be a good choice when, for example, your Planning Data Model has no booked data and your end users need to see which dimension members are available for planning.

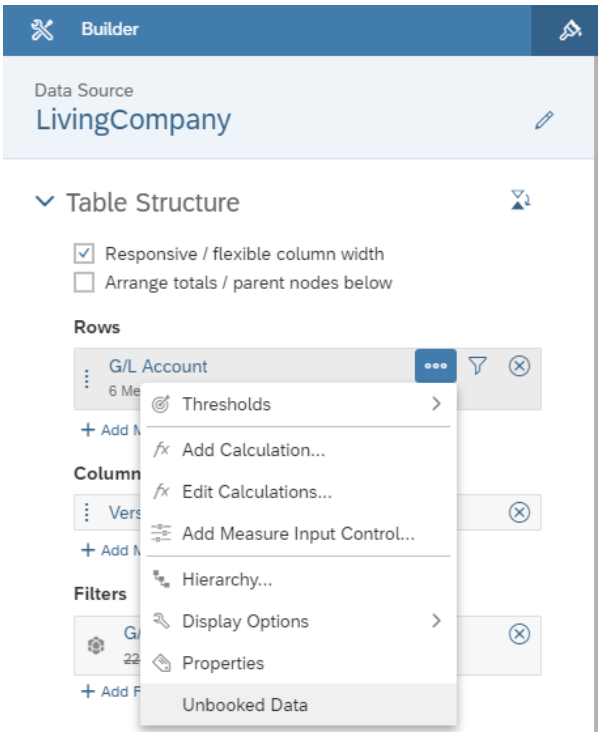


Figure 59: Unbooked Data

7.3 Refreshing Your Data

This feature is not exclusive to Planning and affects all data models and widgets of your application. It can be reached in two different ways:

- By clicking on the first icon of the toolbar.

- Through the script below:

```
Application.refreshData(): void
```

Scripting is useful when, for example, you use data models with Live Connectivity and the end user wishes to refresh data because a background process that updates master data has finished after the application was opened.

7.4 Set User Input

Instead of having to guide a business user by showing which table cell should be planned, the app designer could create a separate input field. This input field has a pre-informed value from a table selection. The changed value is then updated on a planning model.

The picture below represents the scenario mentioned above to explain this feature:

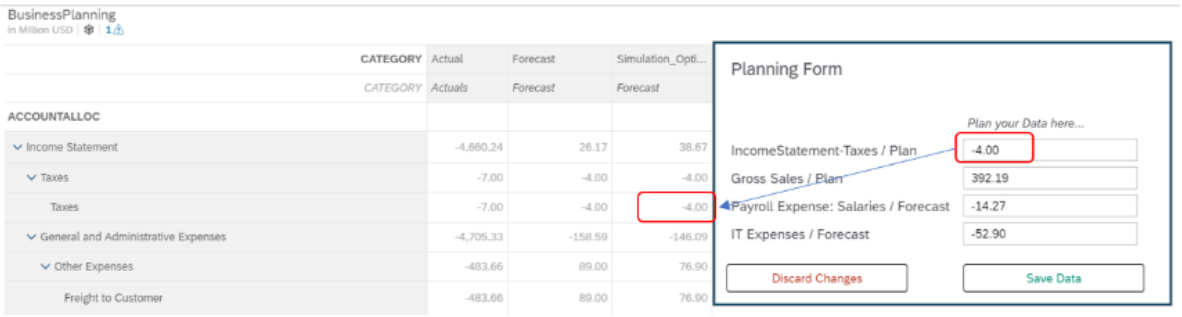


Figure 60: SetUserInput

In this example, the following scripting would be included on the *Save Data* button.

To update a cell of a table with the given value:

```
setUserInput(selectedData: Selection, value: String): boolean
```

Few considerations for this script:

- Value can be maximum 17 characters.
- If value is scaled, then it shall be less than 7 digits.
- It can be performed from a widget or from a table event.

Regarding data formatting – it takes as parameter either a raw value in the user formatting setting (“1234.567” with “.” grouping separator) or a scale in the user formatting setting (for example, “*0.5” to divide the value by half or “*2” to double the value) – both of type string.

Example: (scaling in million)

- If you plan “12345678” the formattedValue will be “12.35”.
- If you plan “123456789” the formattedValue will be “123.46”.
- If you plan “*0.5” of rawValue “123456789” the rawValue will be “61728394.5” and formattedValue will be “61.73.

Regarding data validation:

- If an invalid value is planned, error/warning message is returned, and the API also returns false.
- If the same value is planned twice, the value is set, and API returns true.
- If the cell is locked, the API returns false and a warning message is shown to the user.

To submit the updated cell data with all the beforehand modified data and to trigger refresh of data:

```
submitData(): boolean
```

7.5 Planning Versions

There are two types of planning versions, private and public.

7.5.1 Private Versions

This data is not visible to other users and other solutions of Analytics Cloud.

```
getPrivateVersions(): [Array of Planning Private Versions] | empty array
getPrivateVersion(versionId: String): Planning Private Version | undefined
```

The script below returns the user ID of the user who created this private version.

```
getOwnerID(): String
```

7.5.2 Public Versions

This data is visible to all users and all solutions of Analytics Cloud.

```
getPublicVersions(): [Array of Planning Public Versions] | empty array
getPublicVersion(versionId: String): Planning Public Version | undefined
```

Both planning version types have IDs.

```
getId(): String
```

You can use it, for example, when calling `getData()`.

```
getDisplayId(): String
```

You can use it, for example, to display the version in dropdowns or texts.

All versions but ‘Actual’ can be deleted.

```
deleteVersion(): boolean
```

7.6 How to Manage Versions

7.6.1 Publishing and Reverting Data Changes

Any change in data in any type of version is automatically saved. This means that even without any active saving action, if the browser is closed by mistake, for example, data will still be there when application is reopened by the same user who changed the data.

But to make this data visible to other users, you can publish the public versions through the following toolbar icon:

Figure 61: Publish Version

After clicking this icon, the dialog below is opened and an action can be taken per model. You can also revert, and all data changes will be discarded.

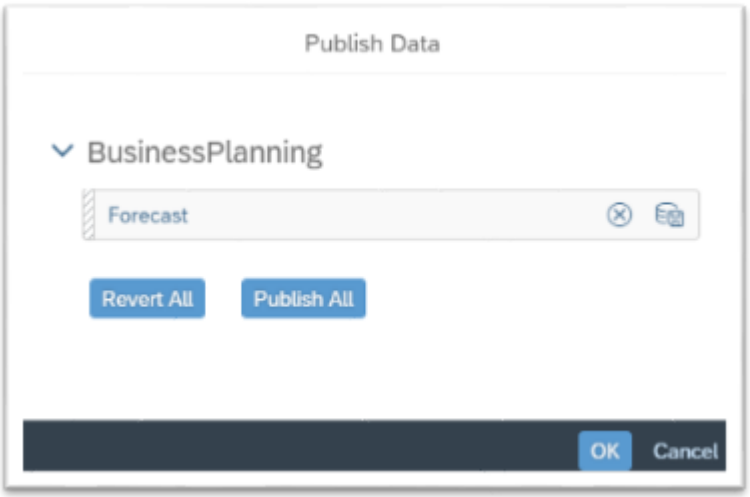


Figure 62: Publish Data

The actions performed within this dialog can also be done via the below scripting on public versions:

```
revert(): boolean
publish(): boolean
```

After the execution of these scripts, a message informs whether the script ended successfully or not. These are the expected messages:

Figure 63: Success Message

If the version was not modified before these actions are triggered, the message below should be expected:

Figure 64: Message

This message could be avoided if the dirty check is done in advance.

```
isDirty(): boolean
```

Dirty versions can be identified by an asterisk (*) just after the version name.

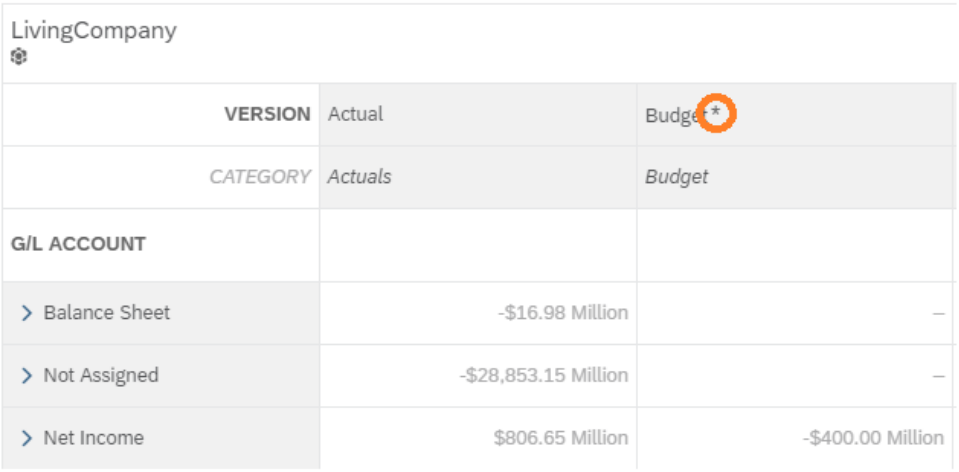


Figure 65: Dirty Version

It is also possible to publish private versions via the two scripting options below:

```
publish(): boolean
publishAs(newVersionName: String, versionCategory: PlanningCategory): boolean
```

In the second option, a version name is given, and a new public version is created under the informed version category.

These scripts can be very useful if your planning model is placed in a popup, for example. As the toolbar is kept in the background canvas, users don’t need to close the popup to then publish the data. With scripting, you can do it directly in the popup!

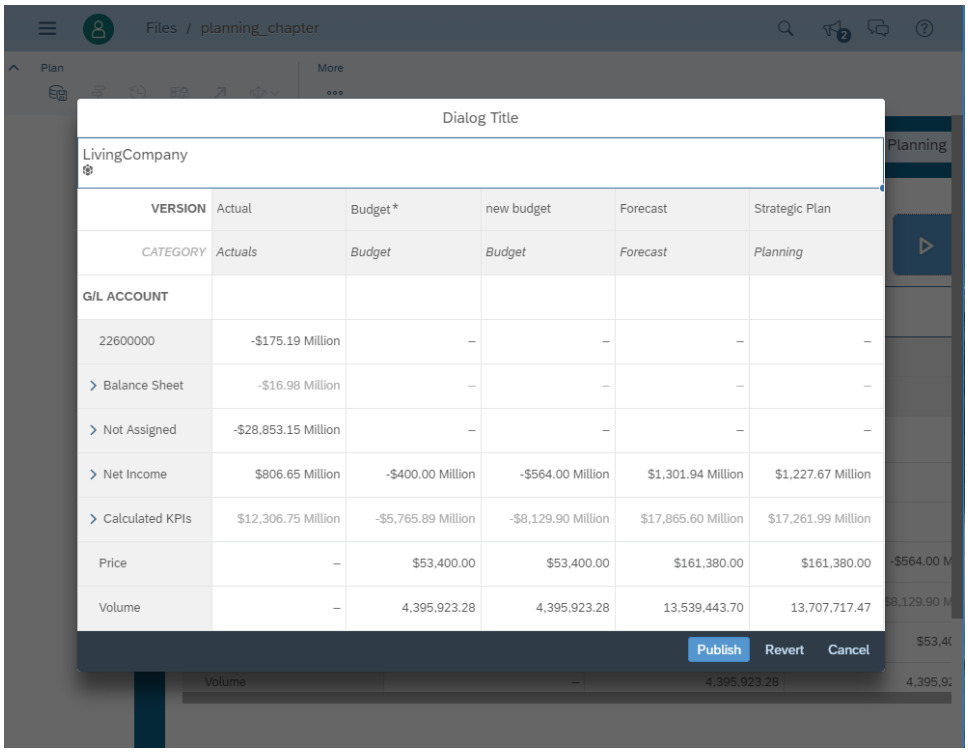


Figure 66: Planning Table in Popup

Find in the next section more information about version category and how to create private versions.

7.6.2 Copy

Data models with planning enabled capability have one dimension in common, the version. And each version is classified in one of the following planning categories:

- Actual
- Planning
- Budget
- Forecast
- Rolling Forecast

Version category 'Actuals' is created automatically and cannot be deleted.

`PlanningCopyOptions` offers you the possibility to either create a new empty version or to copy all data from the source version. In case you want to create a private copy of any version, use the script below:

```
copy(newVersionName: string, planningCopyOption: PlanningCopyOption,
versionCategory?: PlanningCategory): boolean
```

7.7 Data Locking

You can use the Data Locking API to find out if a model is data locking enabled and to set or get the data locking state, even if the table is not planning enabled.

The Data Locking API consists of the following methods:

- `Table.getPlanning().getDataLocking()`
- `Table.getPlanning().getDataLocking.getState()`
- `Table.getPlanning().getDataLocking.setState()`

7.7.1 Using getDataLocking()

You can use `getDataLocking()` to check if a model is data locking enabled.

This check is necessary because a user can't perform certain operations on a table, like `setState()` and `getState()`, if the model is not data locking enabled.

In the following example, the data locking object is retrieved and printed to the console. A data locking object is returned if data locking is enabled on the model.

```
var planning = Table_1.getPlanning();
console.log(planning.getDataLocking());
```

Note that you can also check if a model is data locking enabled in SAP Analytic Cloud by checking the model preferences (see Figure 67).

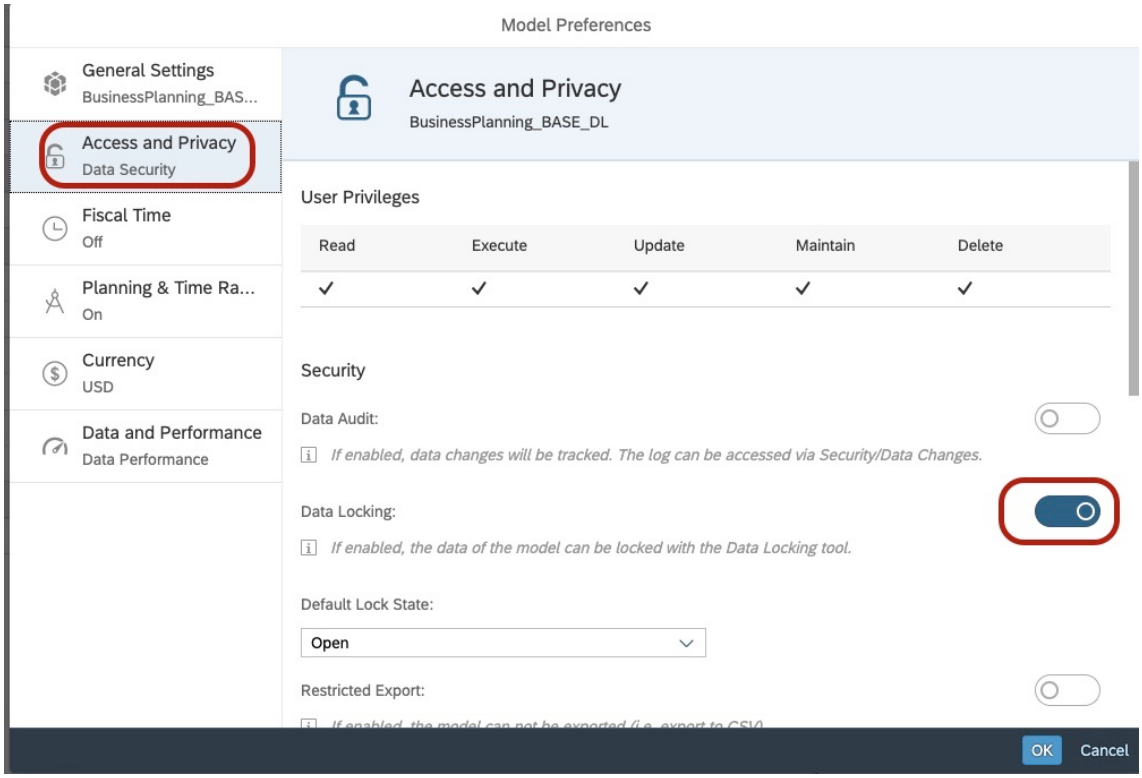


Figure 67: Enabling Data Locking in the Model Preferences

7.7.2 Using getState()

You can use `getState()` to get the data locking state of a cell belonging to a driving dimension. This method works only for SAP Analytics Cloud planning models that are data locking enabled.

In following example, the data locking state for a selected cell of a table is retrieved:

```
var selection = Table_1.getSelections()[0];
```

```
var selectionLockState =
Table_1.getPlanning().getDataLocking().getState(selection);
```

In order to create a selection on the table, you can either select the cell in the table manually or you can create the selection string yourself in the script editor.

This method returns one of the following values:

- `DataLockingState.Open`
- `DataLockingState.Restricted`
- `DataLockingState.Locked`
- `DataLockingState.Mixed`

If the state of the selection can't be determined, then the method returns `undefined`. This occurs if one of the following situations applies:

- The selection is invalid.
- The cell referenced by the selection is not found.
- The cell is in an unknown state.
- The cell has been created using "Add Calculation" at runtime.

If you have activated the *Show Locks* option for the table, then the “lock” icons will be updated after the method has finished running.

7.7.3 Using setState()

You can use `setState()` to set the data locking state of a cell belonging to a driving dimension. This method works only for SAP Analytics Cloud planning models that are data locking enabled.

The method returns `true` if the set operation was successful and `false` otherwise.

You can't set the data locking state on a private version. In this case, the following message is displayed:

“You can only set data locks on public versions. Please use a public version and try again.”

You can set one of the following data locking states:

- `DataLockingState.Open`
- `DataLockingState.Restricted`
- `DataLockingState.Locked`

If you attempt to set the data locking state `DataLockingState.Mixed`, then the following message is displayed:

“*You can't set the state with the value 'mixed'. Please specify either 'open', 'restricted' or 'locked' as value.”*

The same message is displayed at runtime if you attempt to execute the script and the script fails.

If you select multiple cells and attempt to set the data locking state, the data locking state will be applied to the first selection only.

In the following example, the data locking state is set for a selected table cell:

```
var selection = Table_1.getSelections()[0];
```

```
var isSetStateSuccessful =
Table_1.getPlanning().getDataLocking().setState(selection,
DataLockingState.Locked);
```

Note that if data locking is disabled for a model, all locks will be deleted. If it is turned on again later, all members are reset to their default locking state. The same happens if the default locking state or driving dimensions are changed.

8 Predictive

In analytics designer, there are several predictive features that can help you to explore the data and gain more insights.

8.1 Time Series Forecast

In order to predict future values of a specific measure for a period of time, you can run Time Series Forecast on historical data in a Time Series Chart. Time Series Forecast can be configured to turn on/off and switch among different algorithms. You could refer to sample *Gain insights into the data* for the usages in detail.

8.1.1 Switch On and Off Forecast

In *Gain insights into the data*, a Time Series Chart, *Chart_Forecast*, is added to show Gross Margin over time. You can turn on Forecast to predict the future trend based on existing historical data.

Basically, Time Series Forecast can be switched on and off via two ways: the entry in context menu at both design time and runtime,

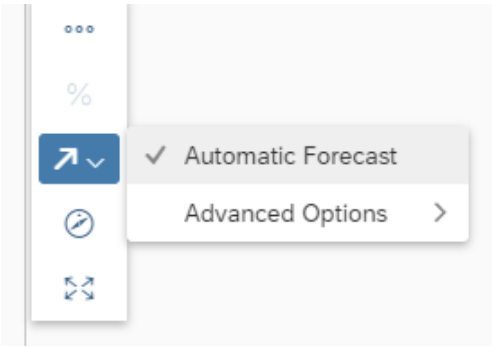


Figure 68: Automatic Forecast

and the API to set the forecast type:

```
Chart_Forecast.getForecast().setType(ForecastType.Auto);
```

8.1.2 Configure Forecast

You can also configure the number of periods to predict *Chart_Forecast* for a longer time if needed.

The number of periods to predict can be configured via two ways: the entry in Chart Details at both design time and runtime,

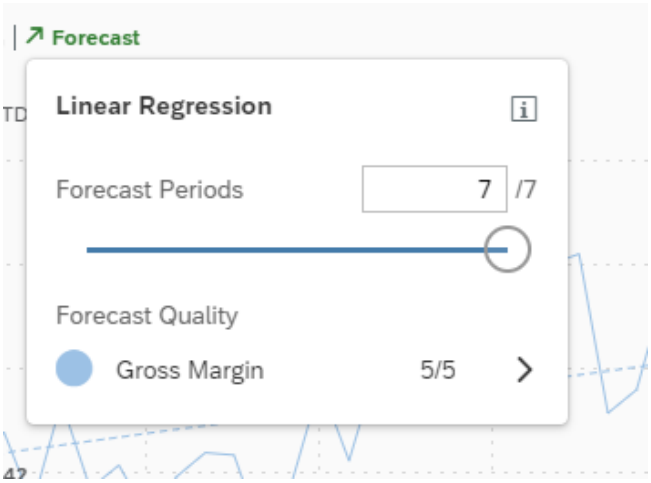


Figure 69: Linear Regression

and the API to set the value:

```
Chart_Forecast.getForecast().setNumberofPeriods(7);
```

8.2 Smart Insights

Smart Insights automatically discovers key insights based on existing data. The insights vary among links, correlations, clusters, predictions, and so on. As an analytic application developer or end user, you can straightly look into the result without any manual exploration. Sample *Gain insights into the data* can be referred to get familiar with the usage.

8.2.1 Discover per Selected Data Point

In Gain insights into the data, a Time Series Chart, *Chart_Forecast*, is added to show Gross Margin over time. You will notice that the gross margin of May 2015 is low. To get more insights, you can trigger Smart Insights to explore further.

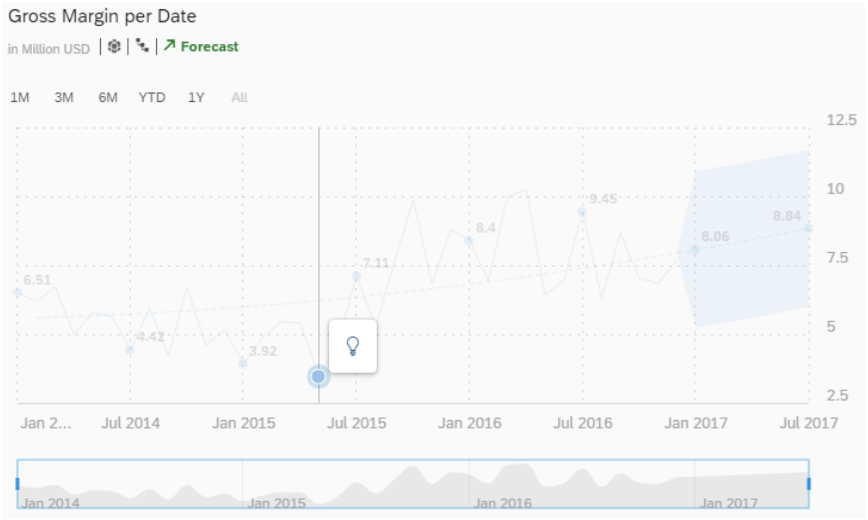


Figure 70: Time Series Chart: Select the Interested Data Point

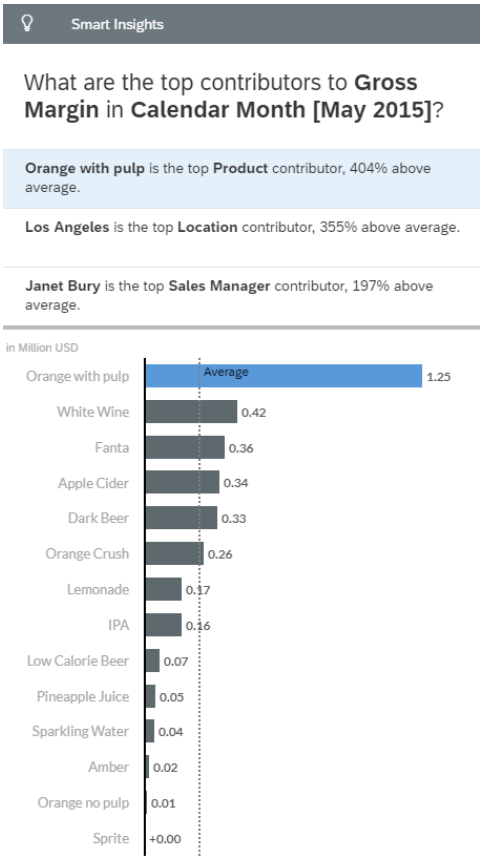


Figure 71: Side Panel of Smart Insights

8.3 Smart Grouping

Smart Grouping can be used to automatically analyze the data points in correlation chart, Bubble or Scatterplot, and group them based on similar properties. As an analytic application developer, you can configure the visibility of Smart Grouping and the related settings. Sample *Gain insights into the data* demonstrates the typical usages.

8.3.1 Switch On and Off Smart Grouping

In *Gain insights into the data*, a Scatterplot, *Chart_Group*, is added to show Discount and Gross Margin per Store. You can turn on Smart Grouping in this chart to analyze based on similar properties.

Basically, Smart Grouping can be switched on and off via two ways: the setting in Builder Panel at design time,

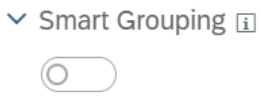


Figure 72: Smart Grouping

and the API to set the visibility.

```
Chart_Group.getSmartGrouping().setVisible(true);
```

8.3.2 Configure Smart Grouping

There are several Smart Grouping settings that you can configure in *Chart_Group*. And you can configure them in two ways: the entry in Builder Panel or Chart Details at both design time and runtime,

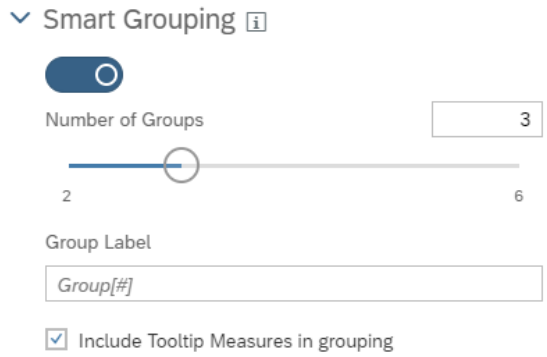


Figure 73: Configure Smart Grouping in Builder Panel of Chart

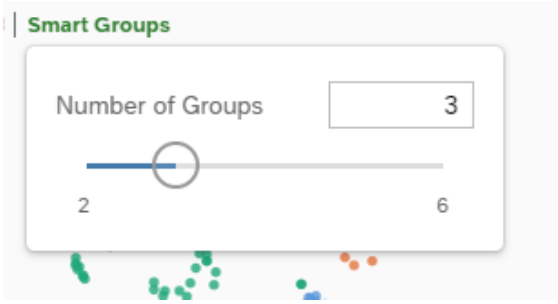


Figure 74: Configure Smart Grouping in Chart Details

and the APIs to set the values.

```
Chart_Group.getSmartGrouping().setNumberOfGroups(3);
Chart_Group.getSmartGrouping().setGroupLabel("Group");
Chart_Group.getSmartGrouping().includeTooltipMeasure(true);
```

8.4 Smart Discovery

As an analytic application developer, you can enable Smart Discovery in your application to discover additional information (for example, key influencers) between columns within a data set.

Sample *Gain insights into the data* demonstrates how to trigger Smart Discovery via APIs.

```
var ds = Chart_Forecast.getDataSource();
var members = ds.getMembers("Product_3e315003an");
var SDsetting = SmartDiscoveryDimensionSettings.create(ds, "Product_3e315003an",
[members[1]]);
SDsetting.setIncludedDimensions(["Location_4nm2e04531", "Store_3z2g5g06m4"]);
```

```
SDsetting.setIncludedMeasures(["[Account_BestRunJ_sold].[parentId].&[Gross_Margin]"
, "[Account_BestRunJ_sold].[parentId].&[Discount]"]);
SmartDiscovery.buildStory(SDsetting);
```

In this example, Smart Discovery is invoked via clicking *"More Insights…"* to discover Product with Dark Beer as the target group. In addition, two more measures (Gross Margin and Discount) and two more dimensions (Location and Store) are included in the analysis.

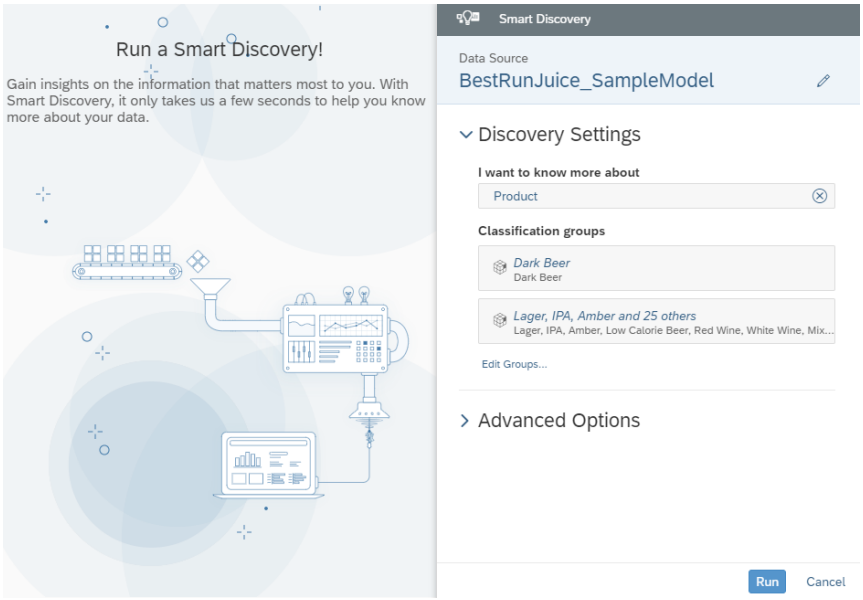


Figure 75: Smart Discovery Setting Panel

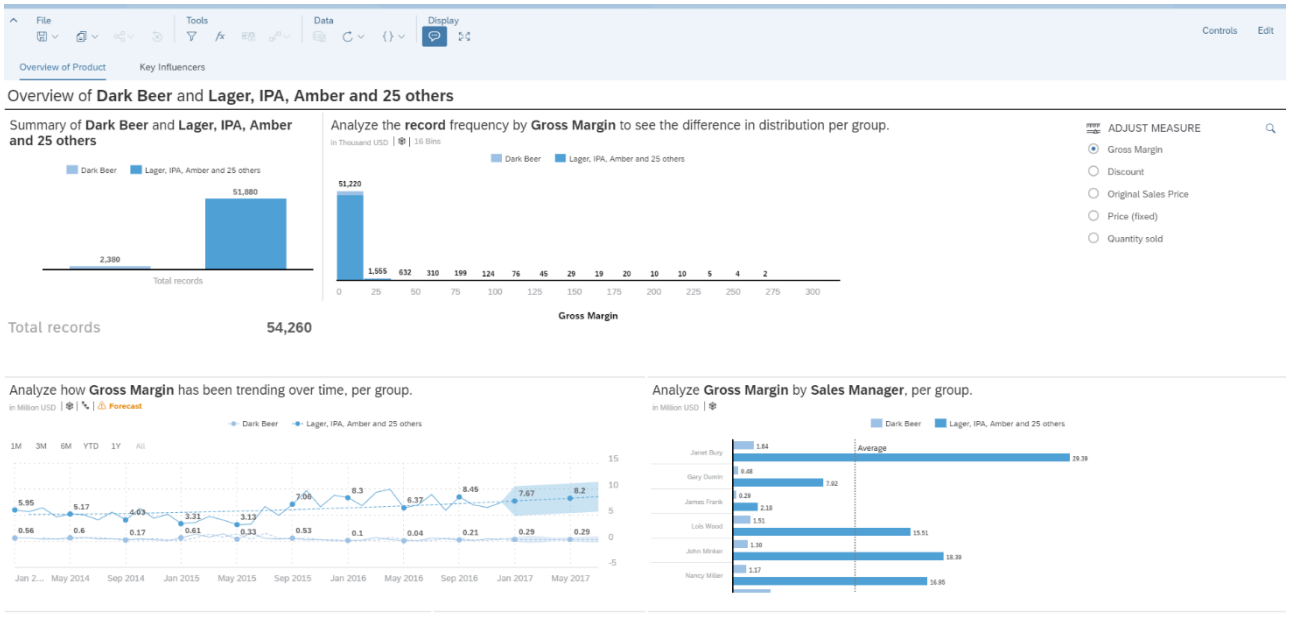


Figure 76: New Document Created by Smart Discovery

8.5 Search To Insight

Search To Insight is a natural language query function that helps users get smart insights on their data.

Create a SearchToInsight Component

To launch a Search To Insight, a SearchToInsight component should be added at design time. The analytic application developer can configure the data models to search in the side panel of this component.

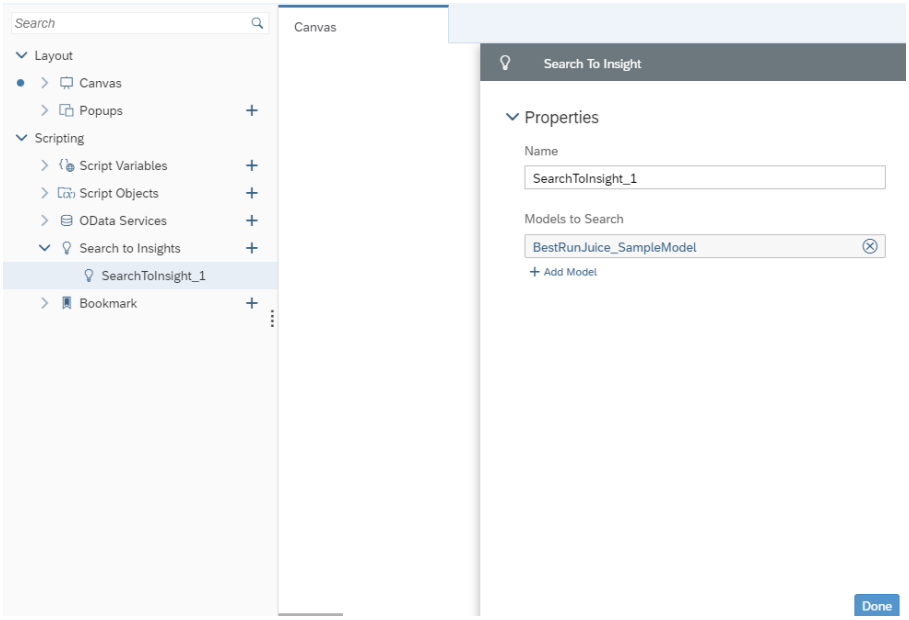


Figure 77: Create a SearchToInsight Component

Launch Search To Insight

Write Analytic Design scripts to launch Search To Insight. At runtime, the analytic application user can open the Search To Insight dialog to get deep and flexible insights of their data.

```
var mode = SearchToInsightDialogMode.Simple;
SearchToInsight_1.openDialog("Gross Margin by Location", mode, true, true);
```

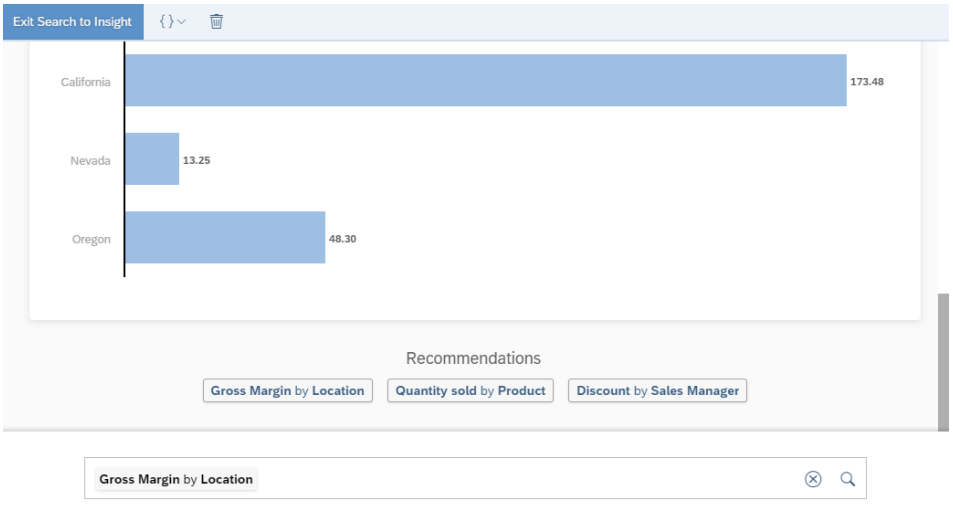


Figure 78: Launch Search To Insight

9 OData

9.1 What You Should Know About OData

The Open Data Protocol (OData) is an open protocol which allows the creation and consumption of queryable and interoperable RESTful APIs in a simple and standard way, initiated by Microsoft in 2007.

Versions 1.0, 2.0, and 3.0 are released under the Microsoft Open Specification Promise.

Version 4.0 was standardized at OASIS, with a release in March 2014. In April 2015 OASIS submitted OData v4 and OData JSON Format v4 to ISO/IEC JTC 1 for approval as an international standard.

“The protocol enables the creation and consumption of REST APIs, which allow Web clients to publish and edit resources, identified using URLs and defined in a data model, using simple HTTP messages. OData shares some similarities with JDBC and with ODBC; like ODBC, OData is not limited to relational databases.”

Source: https://en.wikipedia.org/wiki/Open_Data_Protocol

9.2 How You Can Connect to OData

In Analytics Designer in SAP Analytics Cloud, you can define OData Services based on an existing live connection in your system which was created using CORS (Cross-origin resource sharing) connectivity also referred to as direct connection.

OData Services are supported for the following system types:

- SAP S/4HANA On-Premise
- SAP BW (available with wave 2020.4)
- SAP HANA (available with wave 2020.4)
- SAP Business Planning and Consolidation (BPC) (available with wave 2020.4)

For OData, CORS should be configured on backend analogous to InA connection plus: Support for “if-match” as allowed header.

9.2.1 What You Need to Do

- Define the CORS configuration to your system according to the help page.
- Additionally: Configure support for “if-match” as allowed header in your system.
- Define a direct connection to this system.
- Open an application and add an OData service (more details in the following chapters).

9.2.2 Known Restrictions

In the initial iteration:

- Only parameters of simple types will be supported.
- Actions with mandatory parameters of unsupported types will not be available.

- For actions with optional parameters of unsupported types, the parameters will not be available but the action itself will.
- In case of bound actions, only binding on entity types (passable by key) will be supported.
- Only the JSON format will be supported.
- Only the following system types are supported:
  - SAP S/4HANA On-Premise
  - SAP BW (available with wave 2020.4)
  - SAP HANA (available with wave 2020.4)
  - SAP Business and Consolidation (BPC) (available with wave 2020.4)
- Only Direct (CORS) connections will be supported. No Path (Proxy), as this feature is being deprecated.

Script execution will block waiting on the response of a triggered action. For now, the assumption is that actions triggering long-running processes return quickly (although the process may not yet be complete). So, while of course the XHR invoking the action is asynchronous, script execution will block waiting for the response, to allow the script writer to react to the return value of the action.

The following types are not supported:

- Edm.Stream
- Edm.Untyped
- All Edm.Geography types
- All Edm.Geometry types
- All types defined in different namespaces.

9.2.3 What Is an Action

Actions are operations exposed by an OData service that **may** have side effects when invoked. Actions **may** return data but **must not** be further composed with additional path segments.

9.2.4 What Are Action Imports

Action Imports or unbound actions are not associated with any OData EntitySet or Entity. They generally expose simple parameters. All parameters are set via POST body.

9.2.5 What Is a Bound Action

Bound Actions are actions which may be invoked on a specific Entity. They always contain a first parameter which is set via URL (to resolve the binding to the Entity within the relevant EntitySet), and all other parameters are set via POST body.

In general, actions can be bound on every type, but we support only binding on single entities.

In Analytics Designer OData actions can be called from and executed in the backend system via scripting inside an analytic application. Also, programmatic read access to OData services is provided.

9.3 How You Can Call OData Actions

With this feature you as an application developer can execute OData (V4) Actions exposed by a connected system within an analytic application.

In your analytic application in the Layout Outline in the Scripting Section you can create a new OData Service by clicking on plus.

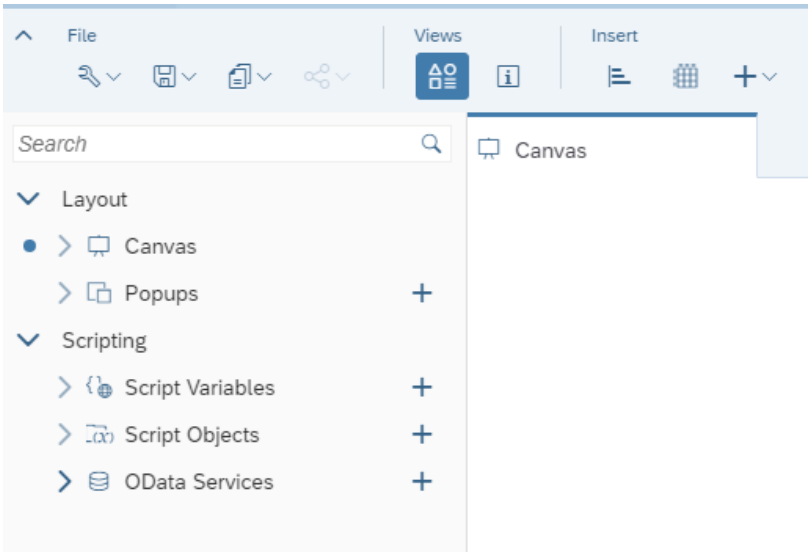


Figure 79: OData Service in Outline

Once you have clicked a new entry with the default name ODataService_1 will appear below the node. You will see a context menu indicated with three points when hovering over the name, where you do the following actions: Rename, Find References, or Delete.

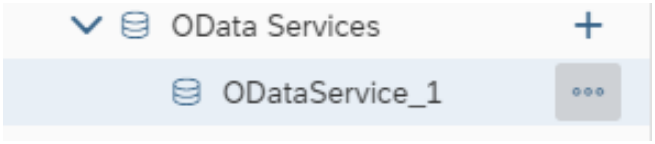


Figure 80: OData Service

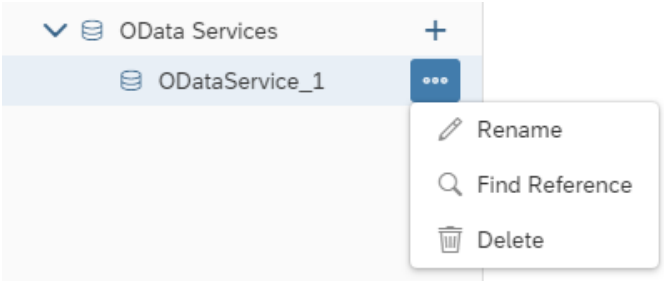


Figure 81: Actions for OData Service in Outline

At the same time the side panel opens on the right side. It opens every time you click on the OData Service in the Outline. In the side panel you can change the name, select the System from the list of available systems whose connections are already created in SAC under Connections, and specify the End-Point URL of the OData Service manually.

Note: You need to know the URL. So far there is no browse catalog implemented.

To see the metadata of the OData Service you must click the refresh button next to Metadata. Click on Done to close the panel.

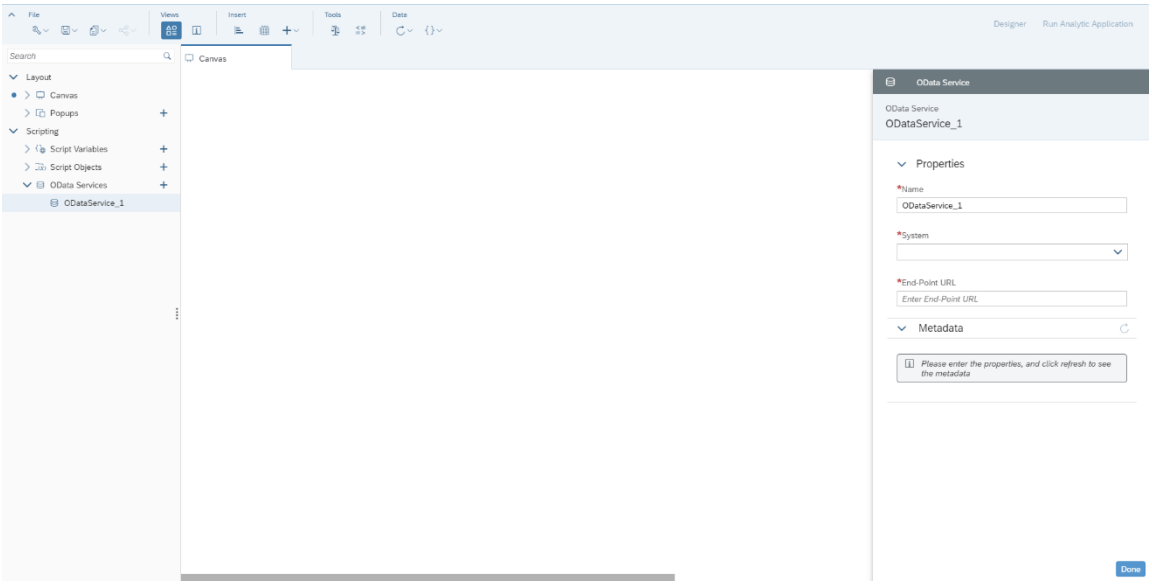


Figure 82: OData Service Side Panel

In the example you see System FUB, the End-Point URL for this OData Service and as Metadata you got the information that this Service is based on OData Version V.4 and it has 2 Actions called Flight/Book and CancelMyFlights.

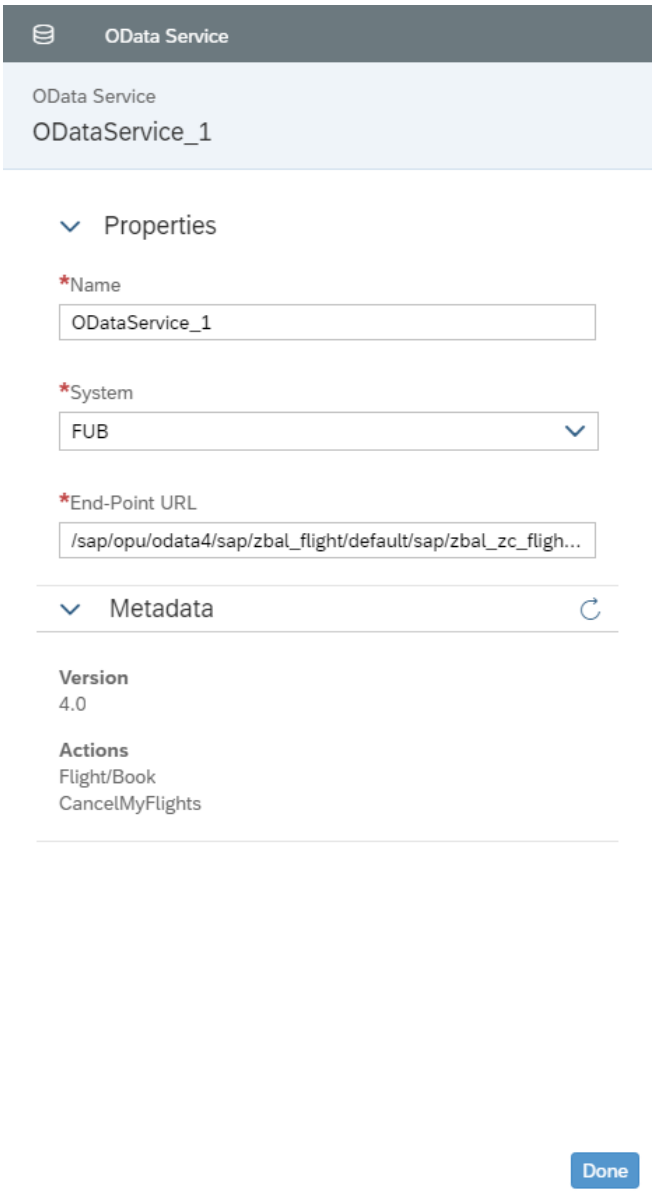


Figure 83: Define OData Service Properties

Now you can insert a Button Widget and change the text of the Button in the Analytics Designer Properties of Styling Panel to Cancel Flight.

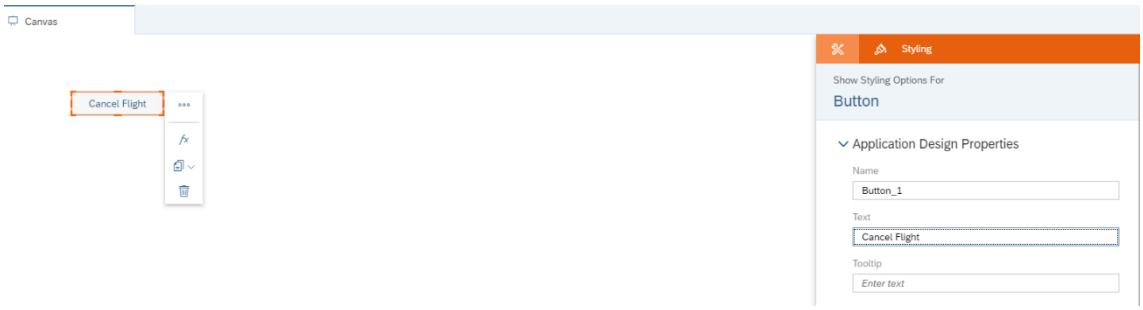


Figure 84: Styling Options

Start the script editor by clicking the *fx* icon in the quick action menu of the widget to create a script which triggers the execution of the action in the source system.

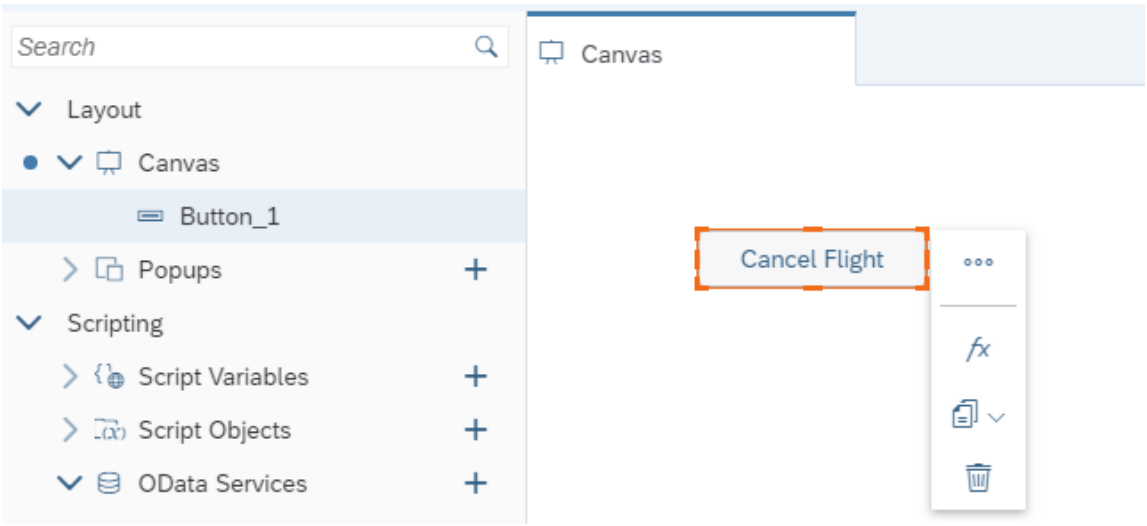


Figure 85: Widget Context Menu

The script editor opens. You can open it as well by hovering over the widget in the outline and clicking the *fx* icon.

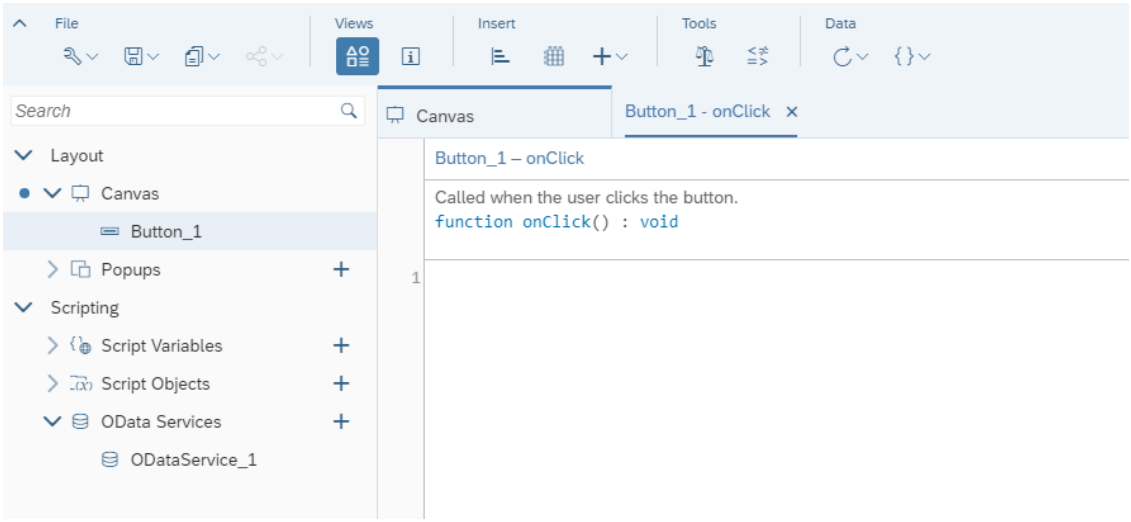


Figure 86: Create Script

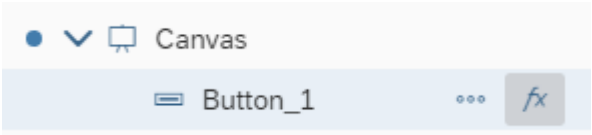


Figure 87: Create Script

Type in the name of the OData Service you have specified. The script editor assists you with code completion and value help wherever possible when you click `CTRL+Space`.

The complete expression will look like this:

```
ODataService_1.executeAction("CancelMyFlights", {DateFrom: "2019-01-01", DateTo:
"2019-12-31"});
```

You have now created the first script to execute an OData action. This Action had a very simple syntax with only 2 parameters.

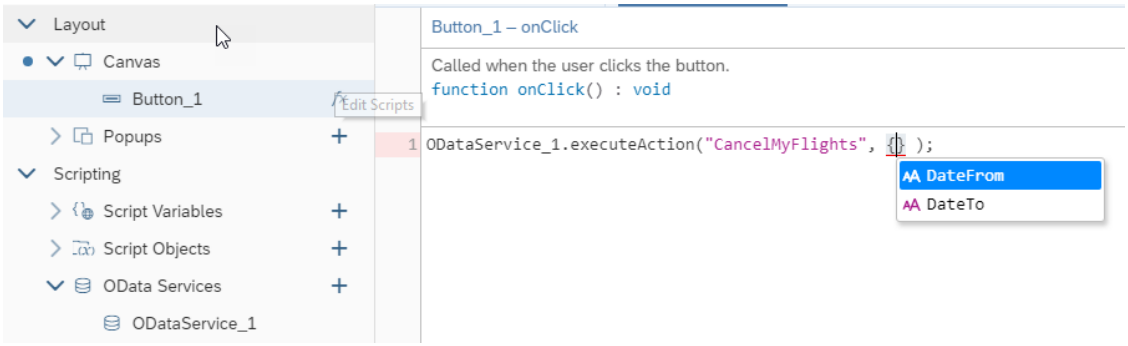


Figure 88: Value Help

Now you can insert another button, rename the text to Book Flight in the Styling Panel and open the script editor. The BookFlight Action is a bound action which is much more complex than the first one.

The result shall look like this:

```
ODataService_1.executeAction("Flight/Book", {Flight: {Airline: "UA",
Flightconnection: "0941", Flightdate: "2019-01-05"}, NumberOfSeats: 1});
```

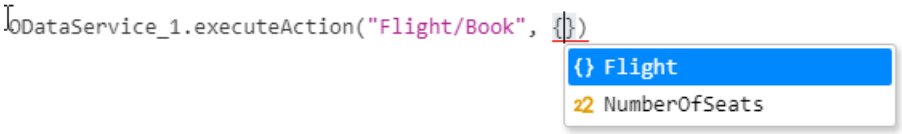


Figure 89: Value Help for Flight/Book

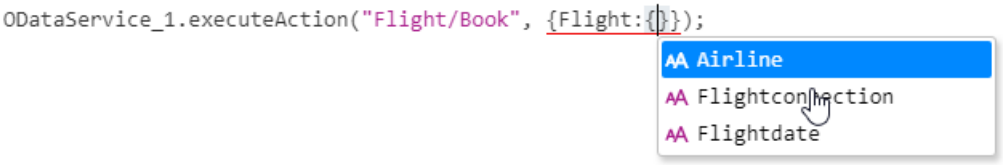


Figure 90: Value Help for Flight

Congratulations. You finished the second more complex OData action and now you can run your application and book and cancel a flight for the selected values.

You can enhance your application and start using other script methods to fill the parameter values dynamically with local or global variables.

Also, you can make the response from the backend system visible in the app by writing the response as message in a text field.

Insert six Text widgets on the canvas and rename the last one to `MessageBox`.

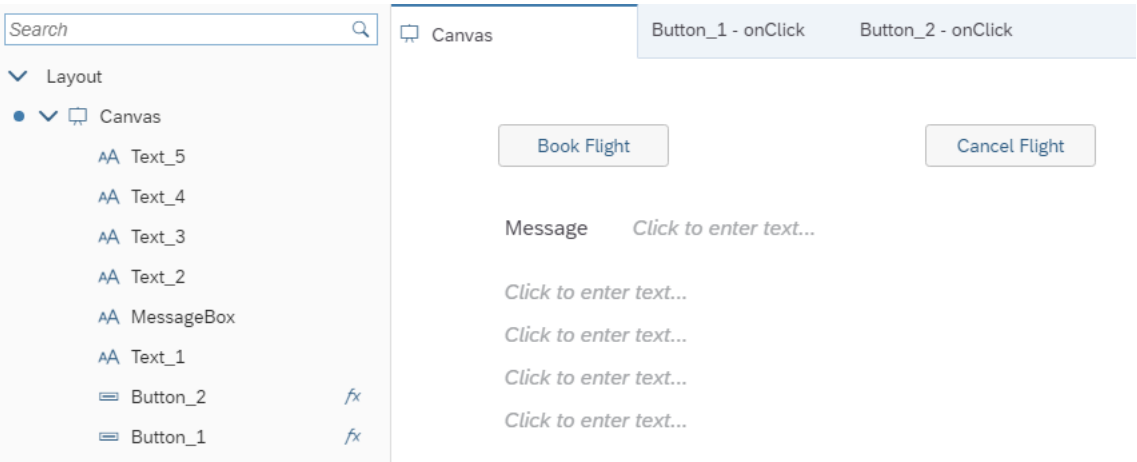


Figure 91: Define Message

Now rewrite your scripts from Book Flight as follows:

```
var ret = ODataService_1.executeAction("Flight/Book",
  {Flight: {Airline: "UA", Flightconnection: "0941", Flightdate:
  "2019-01-05"}, NumberOfSeats: 1});
var succ = "";
if (ret.ok === true) {
  succ = "SUCCESS";
} else {
  succ = "ERROR";
}
MessageBox.applyText(succ);
Text_2.applyText(succ + " message :" + ret.error.message);
Text_3.applyText(succ + " code :" + ret.error.code);
Text_4.applyText("target :" + ret.error.target);
Text_5.applyText("");
```

And rewrite your script from Cancel Flight as follows:

```
var ret = ODataService_1.executeAction("CancelMyFlights", {DateFrom: "2019-01-01",
DateTo: "2019-12-31"});
console.log(ret);
var succ = "";
if (ret.ok === true) {
  succ = "SUCCESS";
} else {
  succ = "ERROR";
}
MessageBox.applyText(succ);
Text_2.applyText(succ + " message :" + ret.error.message);
Text_3.applyText(succ + " code :" + ret.error.code);
Text_4.applyText("target :" + ret.error.target);
var info = "";
if (ret.ok === true) {
  var numberofoccupiedseats =
    ConvertUtils.integerToString(ret.value[0].Numberofoccupiedseats);
  var flightprice = ConvertUtils.numberToString(ret.value[0].Flightprice);
```

```
    var totalnumberofseats =
      ConvertUtils.integerToString(ret.value[0].Totalnumberofseats);
    var currency = ret.value[0].Currency;
    info = "Your flight price was " + flightprice + " " + currency +
      ". " + "There are " + numberofoccupiedseats +
      " occupied from " + totalnumberofseats + " seats in total.";
}
Text_5.applyText("" + info);
```

Run the application and book a flight and cancel a flight to see the error messages.

To create a meaningful application in the sense of an intelligent application, the best would be to display the backend data via a live connection to a BEx Query. Like this you would be able to see the changes (the booked and canceled seats) in the data directly after clicking the buttons and executing the actions.

9.4 How You Can Read Data from OData Services

Besides OData Actions, there are also many use cases why it makes sense to access EntitySets exposed via OData services.

Therefore, in Analytics Designer you have programmatic access to these data, which can be used for any purposes other than visualization in table or chart. For example, you can read and display one member in a text widget.

You can focus on the following capabilities regarding access to OData entity sets:

- Retrieving a single OData Entity from an EntitySet, by specifying the key to the entity. (analogous to selecting a single row from a SQL table via `SELECT * FROM T1 WHERE ID = <id>`).
- Retrieving all (throttled to a maximum number) Entities from an OData EntitySet. (analogous to `SELECT TOP <N> * FROM T1`).

As of today, the following features are not supported:

- Chaining from one EntitySet to another
- Filter
- Orderby
- Select
- Count
- Expand (analogous to joining)
- Skip
- EntitySets with parameters and EntitySets with mandatory filters

```
// Get all entities (up to a throttled limit of 1000) from
// a given EntitySet
getEntitiesFromEntitySet(entitySetName: string):
ODataResult<EntityTypeSpecificPayload[]>;


// ODataResult is the same result structure returned when
// executing actions, and contains generic information about whether
// the raw request on HTTP level was successful, and additionally
```

```
// the response payload in success cases.

ODataResult<T>: {
   ok: boolean;
   value: T; //depends on payload of action or entity type
   error: ODataError;
}
ODataError: {
  code: string;
  message: string;
  target: string;
  details: ODataError[];
}
```

10 Post Message API

When you embed an analytic application in a host HTML page or embed a web page in analytic application through the web page widget, you can follow this guide to enable message communication between host and embedded web pages.

Using the posting message API, you as the application developer can realize either of the following scenarios:

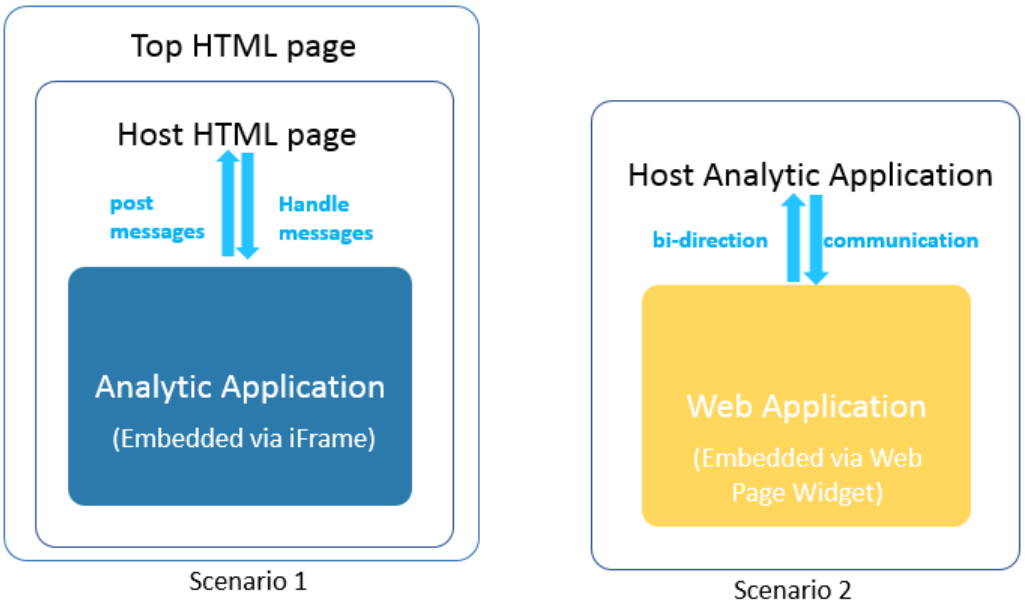


Figure 92: Post Message Scenarios

10.1 Scenario 1: How You Can Embed an Analytic Application in a Host HTML Page via iFrame

Before embedding an analytic application via an iFrame in the host HTML page, you need to first make sure the host HTML page is added as a trust origin in the **System Administration App Integration Trusted Origin**.

Then you can trigger bi-directional communication between the host HTML page and analytic application using the provided functions.

10.1.1 postMessage

This is to post messages from the analytic application to the host HTML page.

When an end user triggers a callback function on the side of the analytic application, the callback function sends out data to notify the parent receiver page which hosts the iFrame, or, when there are multiple levels of web pages embedded in one another, to the top-level HTML page of a specific target origin.

You define whether to send data to a parent or the top HTML page by means of the parameter of the PostMessageReceiver.

The syntax of the postMessage event is:

```
postMessage(receiver: PostMessageReceiver, message: string, targetOrigin: string): void
```

10.1.2 onPostMessageReceived

This is to handle messages sent from the host parent or top HTML page in the analytic application. In scenario 2 depicted below, the event can also handle messages sent from an HTML page embedded via the web page widget in an analytic application.

Note: We advise you always to check the origin when receiving an event-triggered message, because a malicious site can change the location of the window and therefore intercept the data you sent using the postMessage event without your knowledge.

In the current scenario, the parent window which hosts the iFrame can post messages to the analytic application's iFrame window of specific target origin. The messages posted are then retrieved by the analytic application and trigger changes accordingly, such as updating some input data.

The syntax of the onPostMessageReceived event is:

```
onPostMessageReceived(message: string, origin: string)
```

10.1.3 Example

You can embed an analytic application in a host HTML page. The URL of the host HTML page is `http://localhost:8080`.

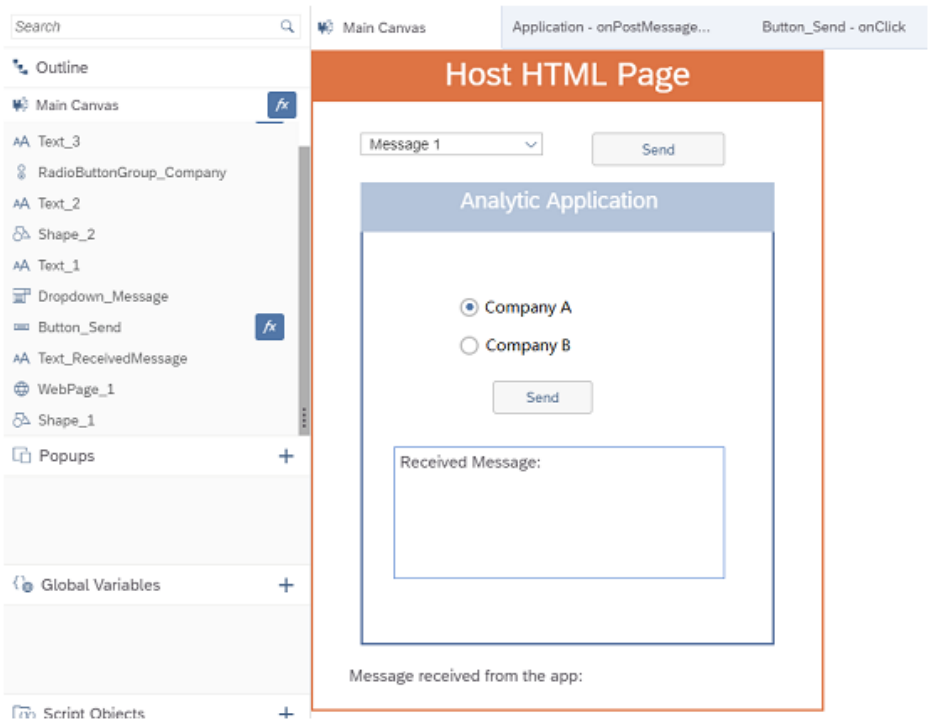


Figure 93: Embed an Analytic Application into a Host Page

First, you want to allow end users to post the company selection in the analytic application to the host HTML page. Write the script below for the sending button:

```
var message = RadioButtonGroup_Company.getSelectedText();
Application.postMessage(PostMessageReceiver.Parent, message,
"http://localhost:8080");
```

Then you want to allow end users to display the message received from the Host HTML page in a text box of the embedded analytic application.

```
if (origin == "http://localhost:8080") {
  Text_ReceivedMessage.applyText(message);
}
```

10.2 Scenario 2: How You Embed a Web Application in an Analytic Application Through the Web Page Widget

You can trigger bi-direction communication between the embedded web application and the host analytic application.

10.2.1 Web Page Widget Related postMessage and onPostMessageReceived

When the host analytic application's web page widget embeds a web application, you can post messages from the embedded application to the host analytic application or the other way around.

The syntax of the postMessage event is:

```
postMessage(message: string, targetOrigin: string): void
```

Note: The target origin is optional. If it is left empty, the URL defined in the web page widget will be taken as the target origin by default.

The syntax of the onPostMessageReceived event is:

```
onPostMessageReceived(message: string, origin: string)
```

10.2.2 Case 1 – Posting Messages from the Host Analytic Application to the Embedded Application

The event for posting messages is:

```
postMessage()
```

The event for handling messages sent from the host analytic application depends on the type of the embedded application:

- If the embedded application is an SAP Analytics Cloud application, once the message is received, the embedded application can use the event `onPostMessageReceived()` to handle the message.
- If the embedded application is another web application, once the message is received, the embedded application can use the event window.on (“message”) to handle the message.

10.2.3 Case 2 – Posting Messages from the Embedded Application to the Host Analytic Application

The event for posting messages depends on the type of the embedded application:

- If the embedded application is an SAP Analytics Cloud application, use the event `Application.postMessage()` to post messages.
- If the embedded application is another web application, use the event `window.parent.postMessage` to post messages.

The event for handling messages sent from embedded application is: Once the messages is received, the host application can use the event `onPostMessageReceived()` to handle the messages.

11 The End and the Future

Dear Reader, we hope you have enjoyed the book. We will enhance the content in the future with the newest features. Now please go ahead and have fun building awesome analytic applications!

12 Important Links

Please open the SAP Help page to find many more information about SAP Analytics Cloud, analytics designer:

https://help.sap.com/viewer/product/SAP_ANALYTICS_CLOUD/release/en-US

- The official documentation
- The API reference guide
- The SAP Analytics Cloud community
- The SAP Analytics Cloud wiki
- Many more links