Overview of Creating Accessible Reports

It is important for report designers to be able to create accessible reports using SAS Visual Analytics. This document guides you as you design your reports so that your reports comply with the Web Content Accessibility Guidelines (WCAG) and are accessible to users with disabilities. The guidelines in this document specifically apply to the 7.4 release of SAS Visual Analytics. However, the guidelines can be applied to 8.x releases as well.

This document was created primarily for report designers who create reports for a broad audience. The recommendations are intended to produce attractive and useful reports for all users, including sighted users and visually impaired or blind users. Recommendations are not provided for narrow audiences. For example, the document does not address the SAS High Contrast report theme or SAS Visual Analytics Designer (the designer) preferences for accessibility.

SAS wants to help you make reports that you create using SAS Visual Analytics accessible to as many users as possible. If you have comments on or questions about this document, contact the SAS Accessibility Team at accessibility@sas.com.

What Are the WCAG Guidelines?

The Web Content Accessibility Guidelines include the most widely adopted technical standards for digital accessibility. The most popular version of the accessibility guidelines is WCAG 2.0, which provides three levels of conformance:

- Level A: Basic accessibility features.
- Level AA: The most commonly used level. Products at this level meet a broad minimum threshold for accessibility. Products are accessible to users with a variety of abilities.
- Level AAA: The highest level of accessibility.

Most governments, corporations, educational organizations, and so on, use WCAG 2.0 Level AA as their standard for digital accessibility. This document provides best practices for designing reports that meet WCAG 2.0 Level AA when viewed in the SAS Visual Analytics App for iOS.
Viewing SAS Visual Analytics Reports

SAS Visual Analytics provides four ways to view reports:

SAS Visual Analytics Report Viewer (the report viewer)
   The HTML5 web-based viewer application.

SAS Visual Analytics App for iOS
   The native iOS viewer, which is available from Apple App Store.

SAS Visual Analytics App for Android
   The native Android viewer, which is available from Google Play.

SAS Visual Analytics App for Windows
   The native Windows 10 viewer, which is available from Microsoft Store.

The SAS Visual Analytics Apps are free mobile apps that support all charts and graphs that are available in SAS Visual Analytics.

Important: This document focuses on the SAS Visual Analytics App for iOS because it has the highest level of accessibility. This is partly due to the iOS operating system itself having a high level of accessibility. All iOS devices include an excellent built-in screen reader called VoiceOver, which is widely used by users who have visual impairments and blindness.

The SAS Visual Analytics App for iOS has powerful accessibility features including sonification, which is the ability to present data using sound. For more information, see “Reference: Accessibility Features of the SAS Visual Analytics App for iOS” on page 11.

Sharing SAS Visual Analytics Reports

In SAS Visual Analytics, you can share reports via email and links.

To email a report from the designer, select File ➤ E-mail. If the recipient opens the email on an iOS or Android mobile device and has the SAS Visual Analytics App installed, the report is displayed in the SAS Visual Analytics App. If the recipient opens the email on a Windows mobile device, the report is displayed in the SAS Visual Analytics Report Viewer. Because an iOS device has the highest level of accessibility, SAS recommends that you encourage the recipient to open the email on an iOS device.

If you prefer to provide a link to your report on a web page, you can copy the link in the email, and then add it to an external HTML page. (In newer versions of SAS Visual Analytics on SAS Viya, you can generate a link to a report instead of copying the link.)

If you create a web page that lists all of your accessible reports, SAS suggests that you encourage users to access the web page with an iOS device. When a user clicks the report link on an iOS device, the report is displayed in the SAS Visual Analytics App for iOS, which provides the best accessibility experience.
General Guidelines for Creating Accessible Reports

Overview of SAS Visual Analytics Features and Accessibility

SAS Visual Analytics provides nearly unlimited variations in the ways you design reports. However, some of its features provide more accessibility in reports than others. And, some of the report features (such as animation) are not accessible at all. Following guidelines can ensure that your reports are accessible to as many users as possible, regardless of ability.

For detailed information about the objects that you should use in your accessible reports, see “Object-Specific Guidelines”.

For additional product documentation, see the SAS Visual Analytics page.

Object Names

Choose meaningful names for your objects (rather than Bar chart 1, List table 1, and so on). Specify visible and meaningful titles for the objects in your report. When used with VoiceOver, the SAS Visual Analytics App for iOS announces the object’s visible title or the object’s name. VoiceOver users need meaningful information to help them identify the object and know what data it contains.

Examples of meaningful object names or titles include:

- Sales by Quarter
- Population by Region
- New Donors
- Donations, 2016-2018

If you omit the axis labels on a chart, make sure that the chart has a visible and meaningful title that explains the chart’s content.

Display Rules

Display rules are not WCAG level 2.0 AA compliant. They are not accessible to users with color-deficient vision (color blindness) or other visual impairments. This includes VoiceOver users. Using display rules in a compliant object in a report makes it non-compliant. Therefore, display rules should be avoided.

Sensory Characteristics in Text

Avoid using sensory characteristics in the text in your report or in accompanying documentation. Sensory characteristics include size, shape, color, position, and so on. For more information, see WCAG Success Criterion 1.3.3.

Report Interactions

As of the publication date of this document, the SAS Visual Analytics App for iOS does not provide information to VoiceOver users about interactions between objects. This can make it difficult for VoiceOver users to understand interactions, such as filtering and linking. To work around this limitation, use a text object to explain the
interactions between objects in your reports. For example, if a bar chart filters a list table, include a text object that contains an explanation of the filtering relationship. It is best to avoid complex chains of interactions that are difficult to explain. This makes your reports easier to use for everyone, regardless of ability.

Avoid using data brushing interactions. VoiceOver users cannot perceive that an object brushes or is brushed by another object or that data elements within a graph are highlighted via a data brushing interaction.

Overview Axis
Avoid using the overview axis feature. VoiceOver users cannot interact with the overview axis. They cannot scroll to data elements that are not initially visible in graphs that use an overview axis.

Lattice Columns and Lattice Rows
Avoid using lattice columns or lattice rows in charts. VoiceOver users cannot perceive the lattice structure or any of the information conveyed in the lattice.

Animation
Avoid using animation in charts. VoiceOver users cannot perceive that animation is used in a chart and cannot play an animated chart.

Reference Lines

Object-Specific Guidelines

Overview of Object-Specific Guidelines
The types of objects that you choose when you design your report in SAS Visual Analytics and how you use those objects affect the accessibility of your report more than any other single factor. Some types of objects are more accessible than others.

It is always best to use accessible object types. However, if you need to include an object that is not accessible in your report, there is a workaround. To comply with WCAG 2.0 Level AA, you can provide an accessible alternative presentation of the same information. For example, if you need a grouped bar chart, you can also provide a list table that presents the same data next to the grouped bar chart. Users who cannot access the grouped bar chart can access the data in the accessible list table.

SAS Visual Analytics objects that are not listed in this topic have not yet been fully evaluated for compliance with WCAG 2.0 Level AA. You can use these object types and maintain WCAG compliance by providing an accessible alternative presentation of the data.

Crosstabs
Crosstabs are partially compliant with WCAG 2.0 Level AA. Column headings and row headings in crosstabs are not accessible to VoiceOver users. Because of this, any actions within headings are not possible in VoiceOver. This includes sorting and drilling down in a hierarchy.

Only simple crosstabs (which do not use hierarchies and do not require sorting) are accessible to VoiceOver users.
**List Tables**

List tables are compliant with WCAG 2.0 Level AA.

**Bar Charts**

Both horizontal bar charts and vertical bar charts are compliant with WCAG 2.0 Level AA when they are used as recommended.

The following features of bar charts are not compliant with WCAG 2.0 Level AA. Either avoid these features or provide an alternative accessible presentation.

**Grouping**

SAS Visual Analytics uses color to distinguish one group from another in a bar chart. In general, using just color to distinguish one thing from another is problematic for users with color blindness and other visual impairments. With the grouped bar chart, the problem is mitigated because users can tap on a bar to determine which group the bar belongs to. This is probably sufficient for simple bar charts with a small number of bars and a small number of groups. However, this is not sufficient for larger, more complex bar charts. In addition, SAS does not believe that this workaround is compliant with WCAG 2.0 Level AA. Because of these reasons, SAS recommends that report designers provide an alternative accessible presentation. Alternative accessible presentation approaches include the following:

- Use a non-grouped bar chart that has a control (for example, a button bar) to select a single set of data to show at once, instead of showing multiple sets of data using groups.
- Use a list table that shows the same data that is displayed in a grouped bar chart.

**Multiple measures**

SAS Visual Analytics uses color to distinguish one measure from another in a bar chart. This is very similar to grouping. SAS recommends the same approaches for multiple measures as for grouping.

**Nonzero baselines**

VoiceOver users cannot perceive that a baseline other than zero has been set. (They can perceive the data in the chart, but they do not know that the data is visually shown in relation to a nonzero baseline.) If the nonzero baseline conveys any important information, use a text object to convey this information.

**Dual Axis Bar Charts**

Dual axis bar charts are not compliant with WCAG 2.0 Level AA because they use just color to distinguish one set of bars from another. See the previous recommendations for grouped bar charts, which apply to dual axis bar charts as well.

**Dual Axis Line Charts**

Dual axis line charts are compliant with WCAG 2.0 Level AA when they are used as recommended. They are similar to line charts that include multiple lines. See the recommendations for line charts below.

**Geo Maps**

Geo bubble maps, geo coordinate maps, and geo region maps are partially compliant with WCAG 2.0 Level AA. These types of geo maps include the following features that might violate WCAG contrast and use-of-color guidelines:

- In all geo map types, text labels for place names (such as continents, countries, states, and so on) might have insufficient contrast against backgrounds, depending on which map service is chosen, which map
background is used, and where the text labels are drawn (for example, over land, over water, and so on). Report designers do not have sufficient control over text labels in geo maps to guarantee that they are drawn in a compliant way. To ensure compliance, you can provide an alternative accessible presentation of the same information (for example, a list table).

- In all geo map types, the display of the map does not respect the SAS report theme. Although other objects are displayed in the appropriate colors from the SAS High Contrast report theme, if enabled, geo maps are displayed using their standard colors. To ensure compliance, you can provide an alternative accessible presentation of the same information (for example, a list table).

- In all geo map types, iOS dynamic text settings are not supported. The iOS operating system enables you to increase the size of the text shown in the operating system and in iOS apps. Although the SAS Visual Analytics App for iOS supports this feature in general and in most types of objects, it does not support increasing the size of the text in geo maps.

- In geo bubble maps, the two-color gradient used in bubbles is not compliant with WCAG Success Criterion 1.4.1 because it uses just color to convey meaning. Unlike a single-color gradient, a two-color gradient can have bubbles with the same luminosity and different hues. This can make it difficult or impossible for a user with color blindness to distinguish. It is a best practice to avoid assigning a data item to the Color data role for geo bubble maps.

**Line Charts**

Line charts are compliant with WCAG 2.0 Level AA when they are used as recommended. For line charts that include multiple lines (for example, line charts that use grouping or use multiple measures), select Show markers, which enables SAS Visual Analytics to use marker shapes and line colors to distinguish one line from another. This is important for users with color blindness. If you do not specify Show markers, users viewing your reports who cannot perceive color differences between the lines can tap a point on a line to discover identifying information for that line. This is less convenient than being able to distinguish the lines at a glance with markers.

**Pie Charts**

Pie charts are partially compliant with WCAG 2.0 Level AA. They use just color to distinguish one slice from another, and the default colors applied to slices do not have sufficient contrast (difference in luminosity) to pass WCAG Success Criterion 1.4.3.

Pie charts have broader problems that make them a poor choice for most data. Information that is presented in a pie chart is generally harder for users to understand, regardless of their abilities, than the same information presented in another object type such as a bar chart. For example, it is more difficult to compare the sizes of slices in a pie chart than it is to compare the heights of bars in a bar chart.

In general, it is a best practice to avoid using pie charts except when your intention is to emphasize the relationship between the size of a slice and the whole pie. This should be only when you have a very small number of slices, such as two or three. When in doubt, use another object type, such as a bar chart.

**Time Series Plots**

Time series plots are compliant with WCAG 2.0 Level AA when they are used as recommended. They are similar to line charts. See the previous recommendations for line charts.

**Controls**

The following controls are fully compliant with WCAG 2.0 Level AA:

- Drop-down list
The text input control is partially compliant with WCAG 2.0 Level AA. When a report uses the SAS High Contrast report theme, the Cancel button for the text input control is displayed in black text on a black background. Visual users cannot see the Cancel button.

**Images**

Images are not compliant with WCAG 2.0 Level AA. VoiceOver users cannot perceive the image object type. As a result, they are likely to be confused by reports that contain image objects. In addition, VoiceOver users cannot access tooltips for image objects, which prevents them from reading tooltip text and accessing links from image objects.

**Text**

Text objects are compliant with WCAG 2.0 Level AA. VoiceOver users cannot perceive text formatting, including font, text size, foreground color, background color, weight, italic, underlining, or justification. VoiceOver users can perceive and use links. Avoid using text formatting (including text color) to convey meaning unless you also convey the meaning via the words in the text itself.

**Additional Recommendations for Designing Reports**

**Limit Digits after Decimal Points**

Do not include long strings of digits after a decimal point unless that amount of precision is needed in your report. This can make understanding the data in a report cumbersome for VoiceOver users. You can change the format associated with a data item to limit the number of digits after a decimal point.

**Choose WCAG-Compliant Colors**

It is a best practice to choose color combinations that pass WCAG guidelines for minimum contrast. (For more information, see WCAG Success Criterion 1.4.3.) This makes it easier for all users to use your reports. SAS Visual Analytics App for iOS provides a theme override feature. Users can override the colors and styles that the report designer used with either the default report theme in SAS Visual Analytics or the SAS High Contrast report theme. Because not all users are aware of this feature and to be proactive in making your report more convenient for users, it is a best practice to choose color combinations that pass WCAG guidelines for minimum contrast.

**Use the Tiled Report Layout**

The tiled report layout in the designer enables you to place report objects directly next to other report objects. Report objects cannot overlap. All report objects in a section are sized to fit in one screen. If you adjust the size of an object, then the other objects automatically resize to ensure that all objects continue to fit in one screen.
Avoid the precision report layout, which can cause problems when users view your report on systems with different screen resolutions (for example, an iPhone versus an iPad). It is best to allow SAS Visual Analytics to lay out the report based on the screen resolution being used. For more information, see paper SAS3802-2016: Carry-on Suitcases and Mobile Devices: Using SAS Visual Analytics Designer for Creating Optimally Designed Reports for SAS Mobile BI.

**Use Static Baseline Values**

If the values shown in the object can change (for example, because of filtering or drilling down), set a static baseline value. This enables users who sonify objects to better understand the scale of the data shown in the objects. If the baseline value dynamically adjusts itself based on the data shown, this can make it confusing to interpret the sonified representation of the data.

For example, suppose that you have an object that shows sales data and supports drilling down to see sales by region. If you set a static baseline value, a user who cannot see the object can sonify the object that shows sales for all regions, and then drill down and sonify the object that shows sales by a specific region. This enables the user to quickly compare the sales numbers for all regions versus sales numbers for an individual region. The user can do this comparison by ear, because when drilled down, the object still uses the same static baseline instead of setting a new baseline. The user is able to hear that the combined sales are higher than sales for an individual region.

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**Example: An Accessible Report**

The Capital Campaign report is a sample report that is provided with SAS Visual Analytics App for iOS. It is WCAG 2.0 Level AA compliant when viewed in the SAS Visual Analytics App for iOS. This sample report was designed for accessibility using the guidelines in this document. Its display has been optimized for viewing on an iPhone. You can open and explore the report on your own iOS device, whether you have deployed a SAS Visual Analytics server or not. Simply download the SAS Visual Analytics App for iOS, open the report, and explore.
Campaign Goal: $250,000,000

Total Gift Revenue: $207,300,060
Figure 2  Page Two of the Capital Campaign Report

Capital Campaign - By State

Filter by Channel:
- Digital
- Traditional
- Event

Total Gift Revenue: $46,730,659

Revenue by State

Pages
Once you have designed and published an accessible report, it is important that the users who view your report know how to take advantage of the accessibility features in the iOS operating system and in the SAS Visual Analytics App for iOS. These features can help users adjust the system to meet their own individual needs.

The SAS Visual Analytics App for iOS includes many accessibility features that enhance the ability of users to access and understand reports. These include the following:

- Support of VoiceOver and Switch Control. These are powerful accessibility features built into the iOS operating system for users with visual impairments (VoiceOver) or physical impairments (Switch Control).

- Sonification is the ability to present data using sound. This enables users to listen to data shown in graphs by playing the data as if it were music. Sonification enables users who cannot see a graph to quickly get a summary of its data, which is similar to how users who can see the graph skimming it to glean high-level features such as the trend. Sonification is supported in certain graphs. As of the publication of this document, sonification is supported only for graphs that include a single measure and do not use grouping.

  To sonify a chart, VoiceOver users can position the VoiceOver cursor on the graph, and then two-finger double-tap. Or, users can maximize the chart, open properties, tap Sonification, and then tap the Play button.

- Support of the SAS High Contrast report theme override, which is available in the application settings. This override enables users of the SAS Visual Analytics App for iOS to use the SAS High Contrast report theme for all reports that they view, regardless of the theme chosen by the report designer. This can be useful to users with low vision who have trouble reading low-contrast text or to users who prefer a dark background with light foreground text.

- Support of a built-in magnifying glass (zoom feature) for graphs. To access this feature, simply long-press on an area of a graph. A small magnifying glass area appears, which you can drag around the graph using your finger.

- Support for text size adjustments. The iOS operating system enables users to customize the size of text shown on a device. This can be useful for users with low vision who have trouble reading small text.

On iOS devices where the SAS Visual Analytics App for iOS is installed, any link to a SAS Visual Analytics report opens in the app.

Reference: Recommended Reading

- Accessibility Features of SAS Visual Analytics 7.4
- SAS Visual Analytics App for iOS: Accessibility Features
- SAS Visual Analytics App for Android: Accessibility Features
- SAS Visual Analytics App for Windows: Accessibility Features
- SAS Visual Analytics 7.3 and 7.4: Getting Started with Exploration and Reporting
- Help and tutorials integrated into SAS Visual Analytics Apps (previously called SAS Mobile BI)
