Library: Chart2D
Document: Charting Library Specification
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Overview:
This document specifies an extensible chart down to a property level. The ease by which the chart can be extended is ensured by the specification of how the chart is to be modularized. Properties of the chart are specified to ensure that the chart will satisfy its requirements.

Chart Type:
The particular chart type being specified is a vertical, bar chart as depicted in figure 1. However, this chart is specified in a way that a vertical, line chart, and a horizontal, bar chart can be added most easily. In any of these cases, what is specified is a chart type and not a particular chart. Colors of components, width of bars, etcetera are left open to specification at a later time.

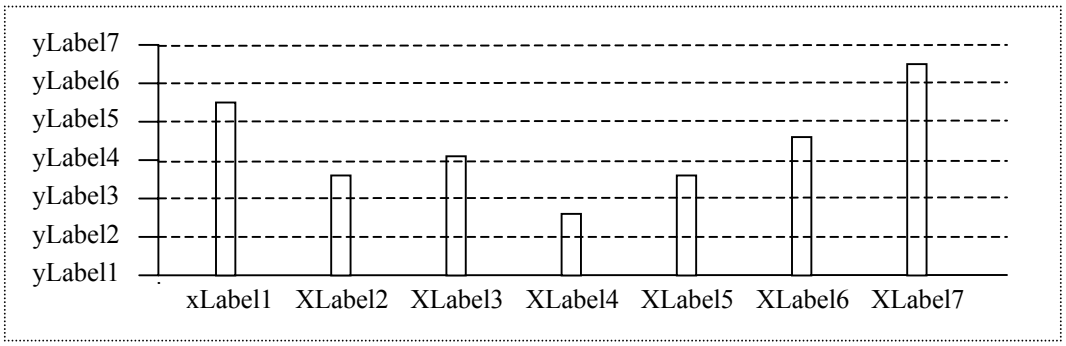

Figure 1: A Vertical, Bar Chart

Initial Size:
Any chart has an initial size. The initial size is defined by the maximum size required by its sub-components and recursively. The base cases for these recursive descents are the code-time specified sizes of the components and sub-components of the chart and the run-time specified number of columns in the table to chart.

Behavior:
If the user chooses to change the size of the chart, then the resultant chart shall be the approximate size that the user chose. Not only this, but all its components, their sub-components and recursively, shall have sizes that have been enlarged or shrunk by approximately the same amount as the chart. Two special cases exist, however, for any component, if its size is greater than 0, then its ‘size shall be greater than 0 and for any component, if its size is 0, then its ‘size shall be 0. Furthermore, all sizes are defined by integer values.

Components:
The properties of the chart, their initial values, and their behavior are specified herein. The properties are categorized by component. We establish some conventions. Whenever we have a set of components that shall all have the same instance of a sub-component or property, then we place a [1] after the name of its sub-component’s or property’s name. Whenever we have a set of components that shall all be allowed to have a different instance of a sub-component or property then we place a [n] after the sub-component’s or property’s name. Anything in braces, {}, is not part of this specification but only indicates how the specification might be extended.

chart:
description: a chart with axes and a plot area
sub-components:
chart.width
chart.height
chart.padding

chart.border
chart.backgroundColor
chart.vXAxis {or chart.hXAxis}
chart.vYAxis {or chart.hYAxis}
chart.plotArea

chart.width:
description: width of the chart
modifiable: yes, run-time
initial value: result of sizes of atomic components
subsequent values: approximates that which user defines
units: pixels

chart.height
description: height of the chart
modifiable: yes, run-time
initial value: result of sizes of atomic components
subsequent values: approximates that which user defines
units: pixels

chart.padding:
description: minimum distance between any sub-component within the chart and the innermost edge of the chart border
modifiable: yes, run-time
initial value: respective to usability, try 1
subsequent values: results of user influenced ratios applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.border:
description: chart border with its outermost edge on the chart edge and its innermost edge defining where padding begins
sub-components:
chart.border.color
chart.border.thickness

chart.border.color:
description: color of chart border
modifiable: yes, code-time
value: respective to usability, try black
units: any 8 bit RGB specifiable color

chart.border.thickness:
description: thickness of the chart border
modifiable: yes, run-time
initial value: respective to usability, 1
subsequent values: results of user influenced ratios applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.backgroundColor:
description: the background color of the chart
modifiable: yes, code-time
value: respective to usability, try white
units: any 8 bit RGB specifiable color

chart.vXAxis:
description: an object consisting of all the sub-components of a x axis
subcomponents:
chart.vXAxis.width
chart.vXAxis.height
chart.vXAxis.backgroundColor
chart.vXAxis.labels
chart.vXAxis.ticks

chart.vXAxis.line

chart.vXAxis.width:
description: width of x axis defined by the leftmost and rightmost points of any of its sub-components
modifiable: yes, run-time
initial value: result of sizes of atomic components
subsequent values: result of user influenced ratio applied to atomic components
units: pixels

chart.vXAxis.height
description: height of x axis defined by the uppermost and bottomost points of any of its sub-components
modifiable: yes, run-time
initial value: result of sizes of atomic components
subsequent values: result of user influenced ratio applied to atomic components
units: pixels

chart.vXAxis.backgroundColor:
description: the background color of the x axis
modifiable: yes, code-time
value: same color as chart.backgroundColor
units: any 8 bit RGB specifiable color

chart.vXAxis.labels:
description: all the labels of the x axis
subcomponents:
chart.vXAxis.labels.text
chart.vXAxis.labels.boundary
chart.vXAxis.labels.font
chart.vXAxis.labels.angle
chart.vXAxis.labels.LRPadding
chart.vXAxis.labels.TBPadding
chartvXAxis.labels.space
chart.vXAxis.labels.width
chart.vXAxis.labels.height

chart.vXAxis.labels.boundary[1]:
description: the maximum number of characters allowed on a single line of any label of chart.vXAxis.labels.
modifiable: yes, code-time
value: respective to usability, try 10
units: integer

chart.vXAxis.labels.text[n]:
description: the text of a label
modifiable: yes, run-time
value: decoded heading from user chosen table of data; if ever on any line in the heading the number of characters in that line is greater than chart.vXAxis.labels.boundary, then replace the right most white space by a new line, if no such space exists, replace three previous characters to boundary by dots creating an ellipsis and delete the rest of the string.
units: character string

chart.vXAxis.labels.font[1]:
description: the font of the labels
subcomponents:
chart.vXAxis.labels.font.color
chart.vXAxis.labels.font.size

chart.vXAxis.labels.font.color:
description: the color of the font
modifiable: yes, code-time
value: respective to usability, try black
units: any 8 bit RGB specifiable color

chart.vXAxis.labels.font.size:
description: size of font

modifiable: yes, run-time
initial value: respective to usability, try 10
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater; there will be two user influenced ratios, ‘height/height and ‘length/length and that we apply the smaller of the two
units: points

chart.vXAxis.labels.angle[1]:
description: angle of label counter clock-wise from a horizontal line
modifiable: no
value: 0
units: degrees

chart.vXAxis.labels.LRPadding[1]:
description: space to left and to right of label that no other component may enter
modifiable: yes, code-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.vXAxis.labels.TBPadding[1]:
description: space to above and below label that no other component may enter
modifiable: yes, code-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.vXAxis.labels.width[n]:
description: width of the label including padding
modifiable: yes, run-time
initial value: result of sizes of atomic components
max((or (width of string between new lines)
(width of string between new line and beginning)
(width of string between new line and end)))
subsequent values: result of user influenced ratio applied to atomic components
max((or (width of string between new lines)
(width of string between new line and beginning)
(width of string between new line and end)))
units: pixels

chart.vXAxis.labels.height[n]:
description: height of the label including padding
modifiable: yes, run-time
initial value: result of sizes of atomic components
calculation: height of the font*number of new lines in the string
subsequent values: result of user influenced ratio applied to atomic components
calculation: (times (height of the font) (plus (number of new lines in the string) 1))
units: pixels

chart.vXAxis.ticks:
description: the vertical lines that may exist horizontally along the x axis intended to indicate division between that which the x labels represent
subcomponents:
chart.vXAxis.ticks.thickness
chart.vXAxis.ticks.length
chart.vXAxis.ticks.color
chart.vXAxis.ticks.ends
chart.vXAxis.ticks.middle

chart.vXAxis.ticks.thickness[1]:
description: thickness of the vertical line

modifiable: yes, run-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.vXAxis.ticks.length[1]:
description: length of the vertical line
modifiable: yes, run-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value
units: pixels

chart.vXAxis.ticks.color[1]:
description: color of the tick marks
modifiable: yes
units: any 8 bit RGB specifiable color

chart.vXAxis.ticks.ends[1]:
description: indicates whether there should exist tick marks at the ends of the of x axis
modifiable: yes, code-time
value: respective to usability, try false
units: boolean

chart.vXAxis.ticks.middle[1]:
description: indicates whether there should exist tick marks imbetween the ends of the x axis and between each x axis label
modifiable: yes, code-time
value: respective to usability, try true
units: boolean

chart.vXAxis.line:
description: the horizontal line of the x axis
subcomponents:
chart.vXAxis.ticks.thickness
chart.vXAxis.ticks.length
chart.vXAxis.ticks.color

chart.vXAxis.line.thickness:
description: thickness of the horizonal line
modifiable: yes, run-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.vXAxis.line.length:
description: length of the horizontal line
modifiable: yes, run-time
initial value: maximum width required by sizes of atomic components in chart.yPlotArea and chart.yXAxis
subsequent values: result of recalculation after application of user influenced ratio applied to atomic components
units: pixels

chart.vXAxis.line.color:
description: color of the line
modifiable: yes, code-time
value: respective to usability, try black
units: any 8 bit RGB specifiable color

chart.vYAxis:
description: an object consisting of all the sub-components of a y axis
subcomponents:
chart.vYAxis.width
chart.vYAxis.height

chart.vYAxis.backgroundColor
chart.vYAxis.labels
chart.vYAxis.ticks
chart.vYAxis.line

chart.vYAxis.width:
description: width of axis defined by the leftmost and rightmost points of any of its sub-components
modifiable: yes, run-time
initial value: result of sizes of atomic components
subsequent values: result of user influenced ratio applied to atomic components
units: pixels

chart.vYAxis.height
description: height of axis defined by the uppermost and bottomost points of any of its sub-components
modifiable: yes, run-time
initial value: result of sizes of atomic components
subsequent values: result of user influenced ratio applied to atomic components
units: pixels

chart.vYAxis.backgroundColor:
description: the background color of the x axis
modifiable: yes, code-time
value: same color as chart.backgroundColor
units: any 8 bit RGB specifiable color

chart.vYAxis.labels:
description: all the labels of the axis
subcomponents:
chart.vYAxis.labels.text
chart.vYAxis.labels.boundary
chart.vYAxis.labels.font
chart.vYAxis.labels.angle
chart.vYAxis.labels.LRPadding
chart.vYAxis.labels.TBPadding
chartvYAxis.labels.space
chart.vYAxis.labels.width
chart.vYAxis.labels.height

chart.vYAxis.labels.boundary[1]:
description: the maximum number of characters allowed on a single line of any label of chart.vYAxis.labels.
modifiable: yes, code-time
value: respective to usability, try 10
units: integer

chart.vYAxis.labels.percentToPad[1]:
description: percent to add to greatest number in data table for the text of the highest label
modifiable, yes, code-time
value: respective to usability, try 10
units: integers

chart.vYAxis.labels.text[n]:
description: the text of a label
modifiable: yes, run-time
value: the labels will specify semi-equidistant values from a value chart.vYAxis.labels.percentToPad greater than the greatest value in the data table; if ever any value contains greater than chart.vYAxis.labels.boundary characters, then replace three previous characters to boundary by dots creating an ellipsis and delete the rest of the string.
units: character string

chart.vYAxis.labels.font[1]:
description: the font of the labels
subcomponents:
chart.vYAxis.labels.font.color

chart.vYAxis.labels.font.size
chart.vYAxis.labels.font.color:
description: the color of the font
modifiable: yes, code-time
value: respective to usability, try black
units: any 8 bit RGB specifiable color
chart.vYAxis.labels.font.size:
description: size of font
modifiable: yes, run-time
initial value: respective to usability, try 10
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater; there will be two user influenced ratios, 'height/height and 'length/length and that we apply the smaller of the two
units: points
chart.vYAxis.labels.angle[1]:
description: angle of label counter clock-wise from a horizontal line
modifiable: no
value: 0
units: degrees
chart.vYAxis.labels.LRPadding[1]:
description: space to left and to right of label that no other component may enter
modifiable: yes, code-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels
chart.vYAxis.labels.TBPadding[1]:
description: space to above and below label that no other component may enter
modifiable: yes, code-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels
chart.vYAxis.labels.width[n]:
description: width of the label including padding
modifiable: yes, run-time
initial value: result of sizes of atomic components
subsequent values: result of user influenced ratio applied to atomic components
units: pixels
chart.vYAxis.labels.height[n]:
description: width of the label [defined by the amount of vertical space the label takes]
modifiable: yes, run-time
initial value: result of sizes of atomic components
subsequent values: result of user influenced ratio applied to atomic components
units: pixels
chart.vYAxis.ticks:
description: the horizontal lines that may exist vertically along the y axis intended to indicate association between that which the y labels represent and a imaginary or drawn line
subcomponents:
chart.vYAxis.ticks.thickness
chart.vYAxis.ticks.length
chart.vYAxis.ticks.color
chart.vYAxis.ticks.existence
chart.vYAxis.ticks.thickness[1]:
description: thickness of the line
modifiable: yes, run-time

initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.vYAxis.ticks.length[1]:
description: length of the line
modifiable: yes, run-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value
units: pixels

chart.vYAxis.ticks.color[1]:
description: color of the tick marks
modifiable: yes
units: any 8 bit RGB specifiable color

chart.vYAxis.ticks.existence[1]:
description: indicates whether there should exist tick marks
modifiable: yes, code-time
value: respective to usability, try false
units: boolean

chart.vYAxis.line:
description: the vertical line of the y axis
subcomponents:
chart.vYAxis.ticks.thickness
chart.vYAxis.ticks.length
chart.vYAxis.ticks.color

chart.vYAxis.line.thickness:
description: thickness of the line
modifiable: yes, run-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.vYAxis.line.length:
description: length of the line
modifiable: yes, run-time
initial value: maximum height required by sizes of atomic components in chart.yYAxis
subsequent values: result of recalculation after application of user influenced ratio applied to atomic components
units: pixels

chart.vYAxis.line.color:
description: color of the line
modifiable: yes, code-time
value: respective to usability, try black
units: any 8 bit RGB specifiable color

chart.plotArea:
description: an object right of the y axis and above the x axis where the data is plotted
sub-components:
chart.plotArea.width
chart.plotArea.height
chart.plotArea.backgroundColor
chart.plotArea.pseudoBorder
chart.plotArea.vXLines {or chart.plotArea.vXLines}
chart.plotArea.vYLines {or chart.plotArea.vYLines}
chart.plotArea.vBar {, chart.plotArea.vLine, or chart.plotArea.hBar}

chart.plotArea.width:
description: the horizontal distance between the left edge and the right edge

modifiable: yes, run-time
value: equivalent to chart.vXAxis.line.length
units: pixels

chart.plotArea.height:
description: the vertical distance between the top edge and the bottom edge
modifiable: yes, run-time
value: equivalent to chart.vXAxis.line.length
units: pixels

chart.plotArea.backgroundColor:
description: color of the background
modifiable: yes, code-time
value: respective to usability, try light grey
units: any 8 bit RGB specifiable color

chart.plotArea.pseudoBorder:
description: border that exists either on both the top edge and the right edge or not at all
sub-components:
chart.plotArea.pseudoBorder.color
chart.plotArea.pseudoBorder.thickness

chart.plotArea.pseudoBorder.color
description: color of border
modifiable: yes, code-time
value: respective to usability, try dark grey
units: any 8 bit RGB specifiable color

chart.plotArea.pseudoBorder.thickness:
description: thickness of the chart border
modifiable: yes, run-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.plotArea.vXLines:
description: horizontal lines existing in the plot area, at the same heights as the center of the chart.vYAxis.labels
subcomponents:
chart.plotArea.vXLines.thickness
chart.plotArea.vXLines.length
chart.plotArea.vXLines.color
chart.plotArea.vXLines.penStyle

chart.plotArea.vXLines.thickness[1]:
description: thickness of the horizontal line
modifiable: yes, run-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.plotArea.vXLines.length[1]:
description: length of the horizontal line
modifiable: yes, run-time
value: equivalent to chart.vXAxis.line.length
units: pixels

chart.plotArea.vXLines.line.color[1]:
description: color of the line
modifiable: yes, code-time
value: respective to usability, try black
units: any 8 bit RGB specifiable color

chart.plotArea.vXLines.penStyle[1]:

description: style of the line
modifiable: yes, code-time
value: respective to usability, try dashed
units: continuous, dotted, dashed, etcetera

chart.plotArea.vYLines:
description: vertical lines existing in the plot area, running between each bar
subcomponents:
chart.plotArea.vYLines.thickness
chart.plotArea.vYLines.length
chart.plotArea.vYLines.color

chart.plotArea.vYLines.thickness[1]:
description: thickness of the line
modifiable: yes, run-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.plotArea.vYLines.length[1]:
description: length of the line
modifiable: yes, run-time
value: equivalent to chart.vXAxis.line.length
units: pixels

chart.plotArea.vYLines.color[1]:
description: color of the line
modifiable: yes, code-time
value: respective to usability, try black
units: any 8 bit RGB specifiable color

chart.plotArea.vBar:
description: the rectangular objects that represent the data, bottom edges exist on chart.vXAxis.line
sub-components:
chart.plotArea.vBar.width
chart.plotArea.vBar.height
chart.plotArea.vBar.color
chart.plotArea.vBar.border
chart.plotArea.vBar.space

chart.plotArea.vBar.width[1]:
description: the horizontal distance between the left edge and the right edge
modifiable: yes, run-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.plotArea.vBar.height[n]:
description: the vertical distance between the top edge and the bottom edge
modifiable: yes, run-time
value: respective to the heights of the yLabels and the data being plotted
units: pixels

chart.plotArea.vBar.color[1]:
description: color of the bar
modifiable: yes, code-time
value: respective to usability, try match Excel blue
units: any 8 bit RGB specifiable color

chart.plotArea.vBar.space[1]:
description: minimum amount of space to be applied as padding on both right and left of each bar
modifiable: yes, run-time
initial value: respective to usability, try 1

subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels

chart.plotArea.vBar.border [1]:
description: border that exists either on both the top edge, the left edge and the right edge or not at all
sub-components:
chart.plotArea.vBar.border.color
chart.plotArea.vBar.border.thickness

chart.plotArea.vBar.border.color
description: color of border
modifiable: yes, code-time
value: respective to usability, try black
units: any 8 bit RGB specifiable color

chart.plotArea.vBar.border.thickness:
description: thickness of the border
modifiable: yes, run-time
initial value: respective to usability, try 1
subsequent values: result of user influenced ratio applied to current value; if initially greater than 1, then always 1 or greater
units: pixels