Sankey Diagram

Overview

A *sankey diagram* is a visualization used to depict a flow from one set of values to another. The things being connected are called *nodes* and the connections are called *links*. Sankeys are best used when you want to show a many-to-many mapping between two domains (e.g., universities and majors) or multiple paths through a set of stages (for instance, Google Analytics uses sankeys to show how traffic flows from pages to other pages on your web site).

For the curious, they're named after Captain Sankey, who created a diagram of steam engine efficiency (https://upload.wikimedia.org/wikipedia/commons/1/10/JIE_Sankey_V5_Fig1.png) that used arrows having widths proportional to heat loss.

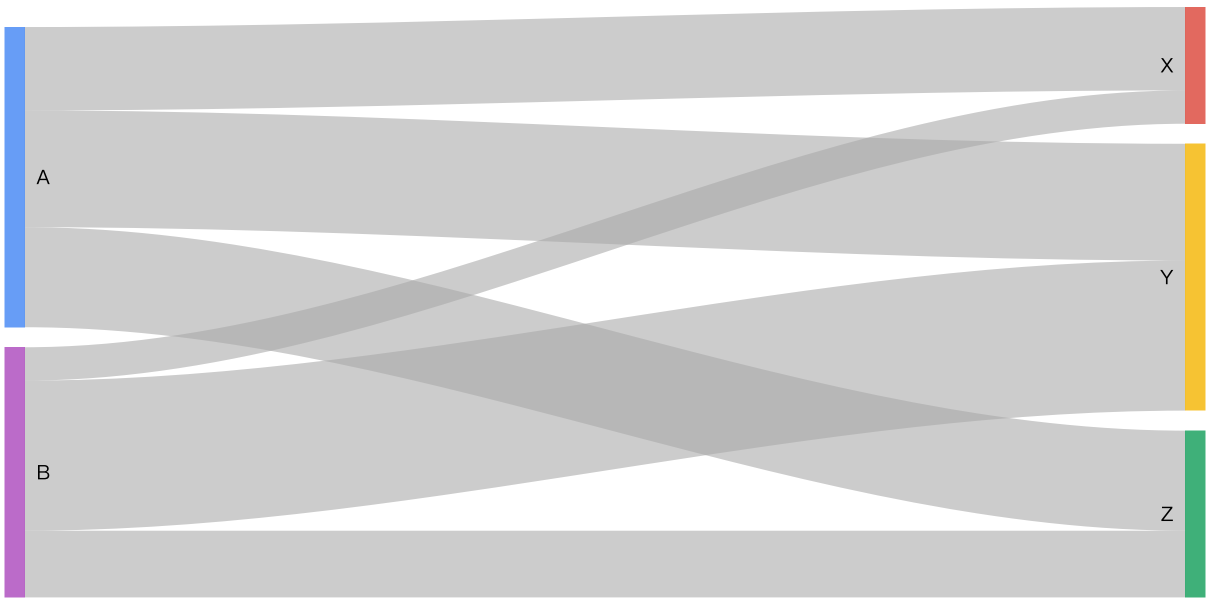
Note: The sankey chart may be undergoing substantial revisions in future Google Charts releases.

Sankey diagrams are rendered in the browser using SVG (http://www.w3.org/Graphics/SVG/) or VML (http://en.wikipedia.org/wiki/Vector_Markup_Language), whichever is appropriate for the user's browser. Google's sankey layout code is derived from D3's sankey layout code.

Note: Google sankey charts are unavailable in Microsoft Internet Explorer 8 and earlier versions.

A Simple Example

Suppose you had two categories, A and B, that connect to three other categories, X, Y, and Z. Some of those connections are heavier than others. For instance, B has a thin connection to X and a much thicker connection to Y.



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Try hovering over one of the links to highlight the connection.

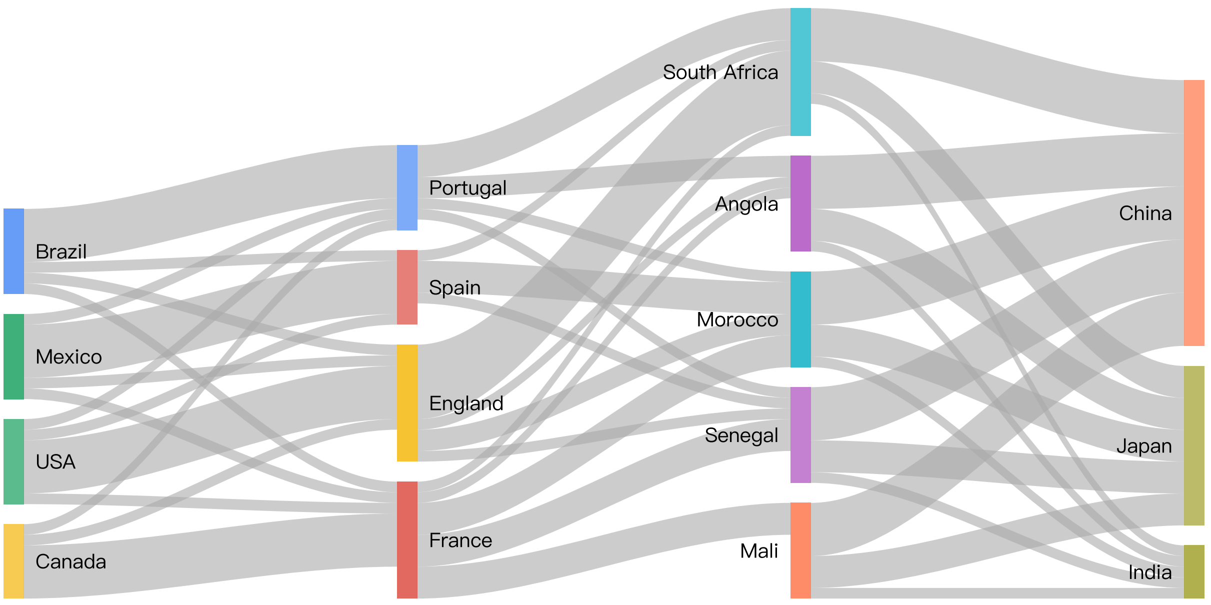
To create a sankey chart, provide a set of rows, with each containing information about one connection: from, to, and weight. Then use the `google.visualization.Sankey()` method to initialize the chart and then the `draw()` method to render it:

```
<html>
  <head>
    <script type="text/javascript" src="https://www.gstatic.com/charts/loader
    <script type="text/javascript">
      google.charts.load('current', {'packages':['sankey']});
      google.charts.setOnLoadCallback(drawChart);

      function drawChart() {
        var data = new google.visualization.DataTable();
        data.addColumn('string', 'From');
        data.addColumn('string', 'To');
        data.addColumn('number', 'Weight');
        data.addRows([
          [ 'A', 'X', 5 ],
          [ 'A', 'Y', 7 ],
          [ 'A', 'Z', 6 ],
          [ 'B', 'X', 2 ],
          [ 'B', 'Y', 9 ],
          [ 'B', 'Z', 4 ]
        ]);

        // Sets chart options.
        var options = {
          width: 600,
        };

        // Instantiates and draws our chart, passing in some options.
        var chart = new google.visualization.Sankey(document.getElementById('s
        chart.draw(data, options);
      }
    </script>
  </head>
  <body>
    <div id="sankey_basic" style="width: 900px; height: 300px;"></div>
  </body>
</html>
```

Note: Avoid cycles in your data: if A links to itself, or links to B which links to C which links to A, your chart will not render.

Multilevel Sankeys

You can create a Sankey chart with multiple levels of connections:



Sankey charts will add additional levels as needed, laying them out automatically. Here's the complete code for the above chart:

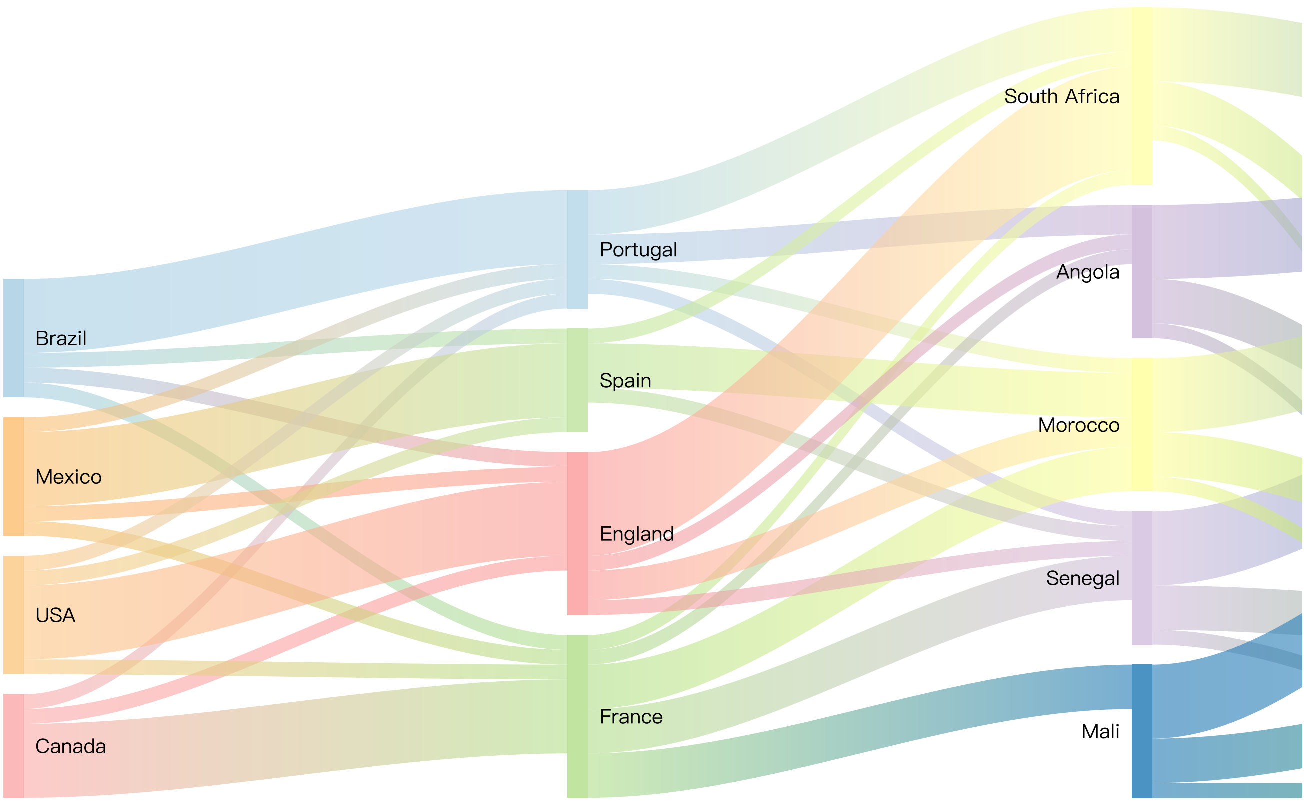
```
<html>
<body>
 <script type="text/javascript" src="https://www.gstatic.com/charts/loader.js
```

```
<div id="sankey_multiple" style="width: 900px; height: 300px;"></div>

<script type="text/javascript">
  google.charts.load("current", {packages:["sankey"]});
  google.charts.setOnLoadCallback(drawChart);
   function drawChart() {
    var data = new google.visualization.DataTable();
    data.addColumn('string', 'From');
    data.addColumn('string', 'To');
    data.addColumn('number', 'Weight');
    data.addRows([
       [ 'Brazil', 'Portugal', 5 ],
       [ 'Brazil', 'France', 1 ],
       [ 'Brazil', 'Spain', 1 ],
       [ 'Brazil', 'England', 1 ],
       [ 'Canada', 'Portugal', 1 ],
       [ 'Canada', 'France', 5 ],
       [ 'Canada', 'England', 1 ],
       [ 'Mexico', 'Portugal', 1 ],
       [ 'Mexico', 'France', 1 ],
       [ 'Mexico', 'Spain', 5 ],
       [ 'Mexico', 'England', 1 ],
       [ 'USA', 'Portugal', 1 ],
       [ 'USA', 'France', 1 ],
       [ 'USA', 'Spain', 1 ],
       [ 'USA', 'England', 5 ],
       [ 'Portugal', 'Angola', 2 ],
       [ 'Portugal', 'Senegal', 1 ],
       [ 'Portugal', 'Morocco', 1 ],
       [ 'Portugal', 'South Africa', 3 ],
       [ 'France', 'Angola', 1 ],
       [ 'France', 'Senegal', 3 ],
       [ 'France', 'Mali', 3 ],
       [ 'France', 'Morocco', 3 ],
       [ 'France', 'South Africa', 1 ],
       [ 'Spain', 'Senegal', 1 ],
       [ 'Spain', 'Morocco', 3 ],
       [ 'Spain', 'South Africa', 1 ],
       [ 'England', 'Angola', 1 ],
       [ 'England', 'Senegal', 1 ],
       [ 'England', 'Morocco', 2 ],
       [ 'England', 'South Africa', 7 ],
       [ 'South Africa', 'China', 5 ],
       [ 'South Africa', 'India', 1 ],
       [ 'South Africa', 'Japan', 3 ],
       [ 'Angola', 'China', 5 ],
       [ 'Angola', 'India', 1 ],
       [ 'Angola', 'Japan', 3 ],
       [ 'Senegal', 'China', 5 ],
       [ 'Senegal', 'India', 1 ],
       [ 'Senegal', 'Japan', 3 ],
       [ 'Mali', 'China', 5 ],
       [ 'Mali', 'India', 1 ],
       [ 'Mali', 'Japan', 3 ],
       [ 'Morocco', 'China', 5 ],
       [ 'Morocco', 'India', 1 ],
       [ 'Morocco', 'Japan', 3 ]
    ]);

    // Set chart options
    var options = {
      width: 600,
    };

    // Instantiate and draw our chart, passing in some options.
    var chart = new google.visualization.Sankey(document.getElementById('sank
    chart.draw(data, options);
   }
</script>
</body>
</html>
```

Controlling Colors

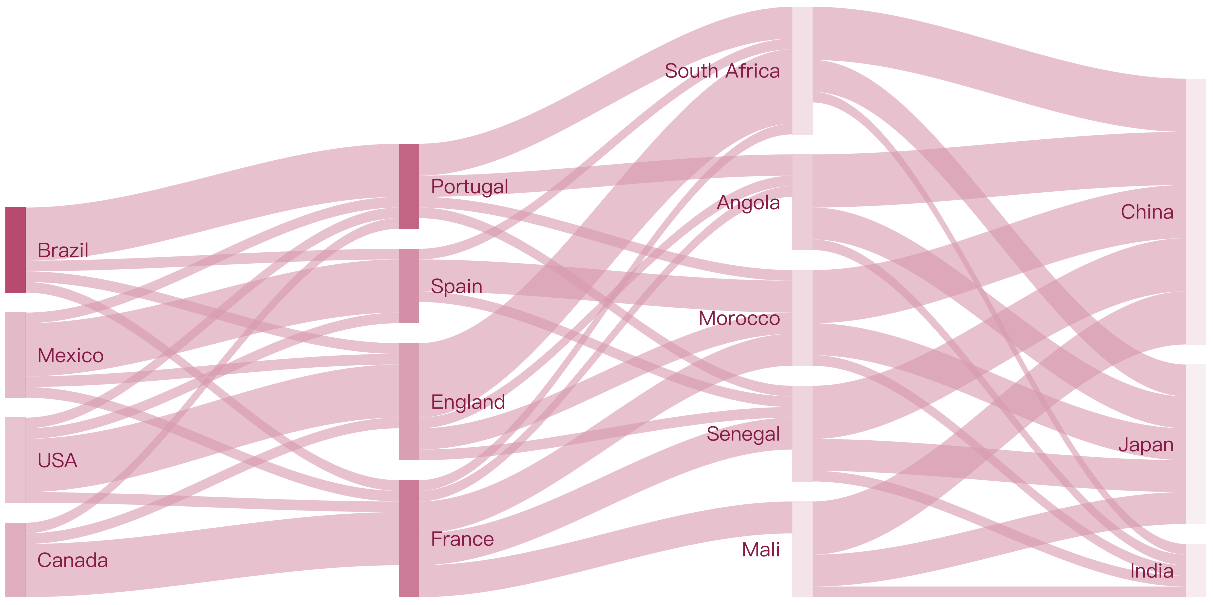
Sankey charts have the ability to set custom colors for nodes and links. Both nodes and links can be given custom color palettes using their `colors` options (`sankey.node.colors` and `sankey.link.colors`, respectively). They can also be given different coloring modes using the `colorMode` option.

If the colors aren't customized, they default to the standard Material palette.



```
var colors = ['#a6cee3', '#b2df8a', '#fb9a99', '#fdbf6f',
              '#cab2d6', '#ffff99', '#1f78b4', '#33a02c'];

var options = {
  height: 400,
  sankey: {
    node: {
      colors: colors
    },
    link: {
      colorMode: 'gradient',
      colors: colors
    }
  }
};
```

You can control the colors of the links, nodes, and labels with configuration options. Here, we select three with the same hue but different brightnesses:



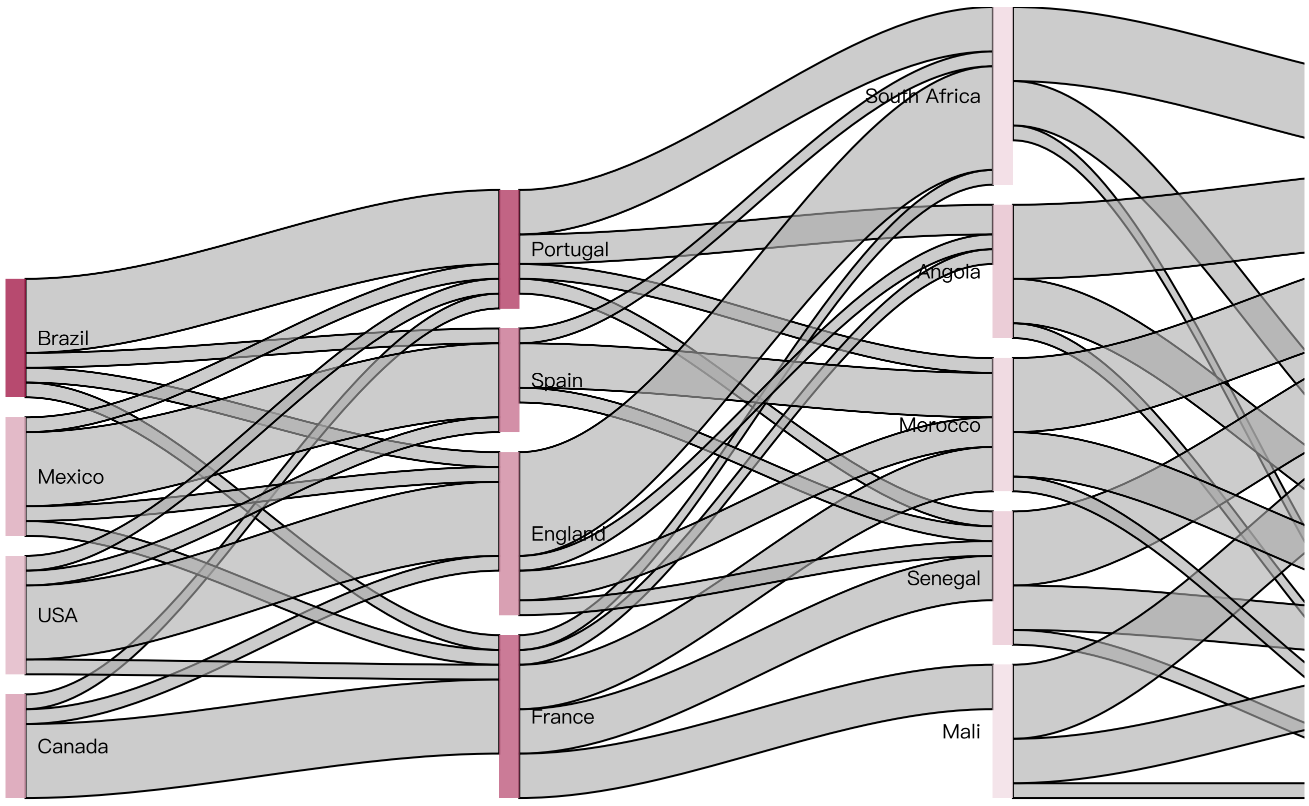
Here's what those options look like:

```
    var options = {
      width: 600,
      sankey: {
        link: { color: { fill: '#d799ae' } },
        node: { colors: [ '#a61d4c' ],
                label: { color: '#871b47' } },
      }
    };
```

You can also control the transparency of the links with the `sankey.link.color.fillOpacity` option:

```
    var options = {
      width: 600,
      sankey: {
        link: { color: { fill: '#d799ae', fillOpacity: 0.8 } },
        node: { colors: [ '#a61d4c' ],
                label: { color: '#871b47' } },
      }
    };
```

To create a border around the links, use the `sankey.link.color.stroke` and `sankey.link.color.strokeWidth` options:

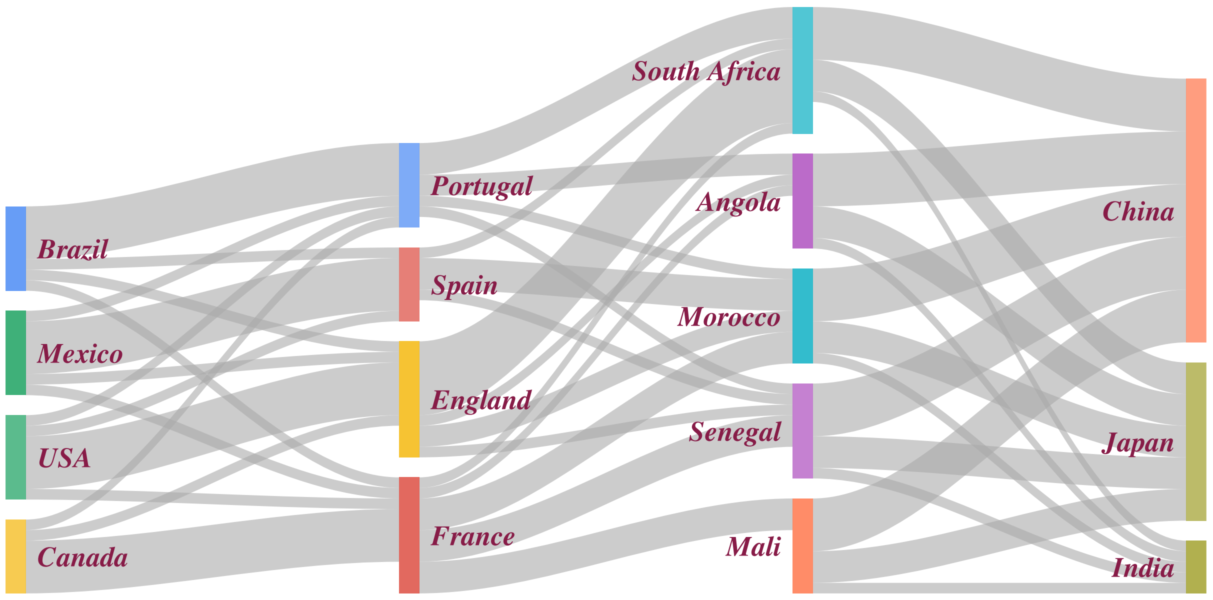


The stroke color can be specified either in RGB format or by English name.

```
  var options = {
    width: 750,
    height: 400,
    sankey: {
      node: { colors: [ '#a61d4c' ] },
      link: { color: { stroke: 'black', strokeWidth: 1 } },
    }
  };
```

Customizing Labels

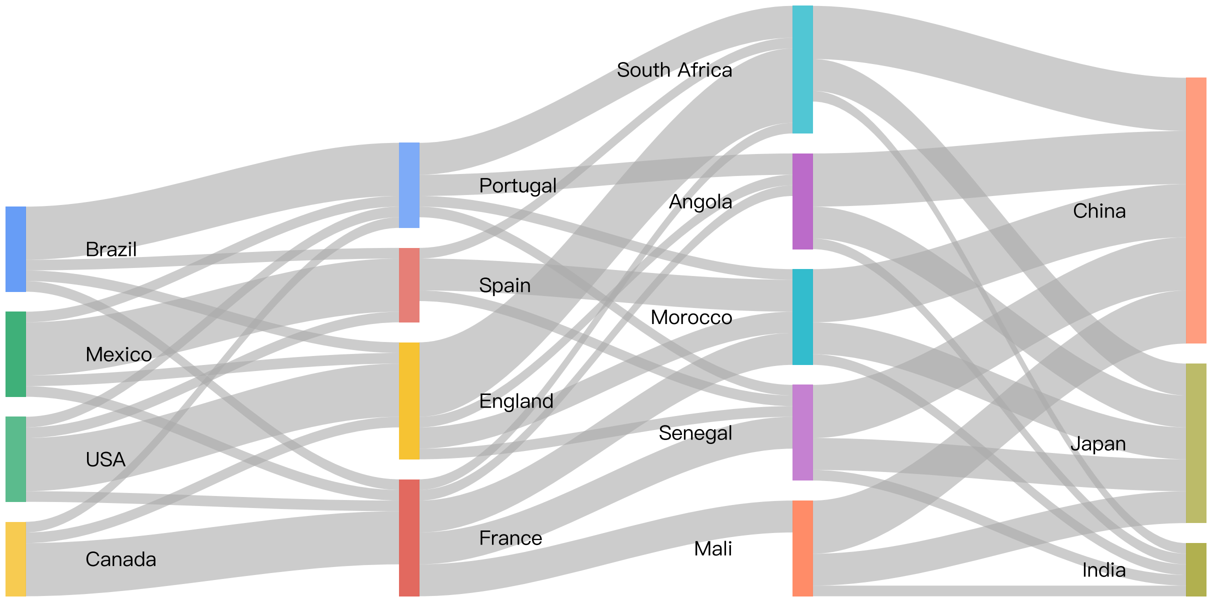
The text on sankey charts can be customized using `sankey.node.label.fontName` and friends:



Here's the option stanza for the above chart:

```
  var options = {
    width: 600,
    sankey: {
      node: { label: { fontName: 'Times-Roman',
                       fontSize: 14,
                       color: '#871b47',
                       bold: true,
                       italic: true } } },
  };
```

You can adjust the position of the labels relative to the nodes with the `sankey.node.labelPadding` option:

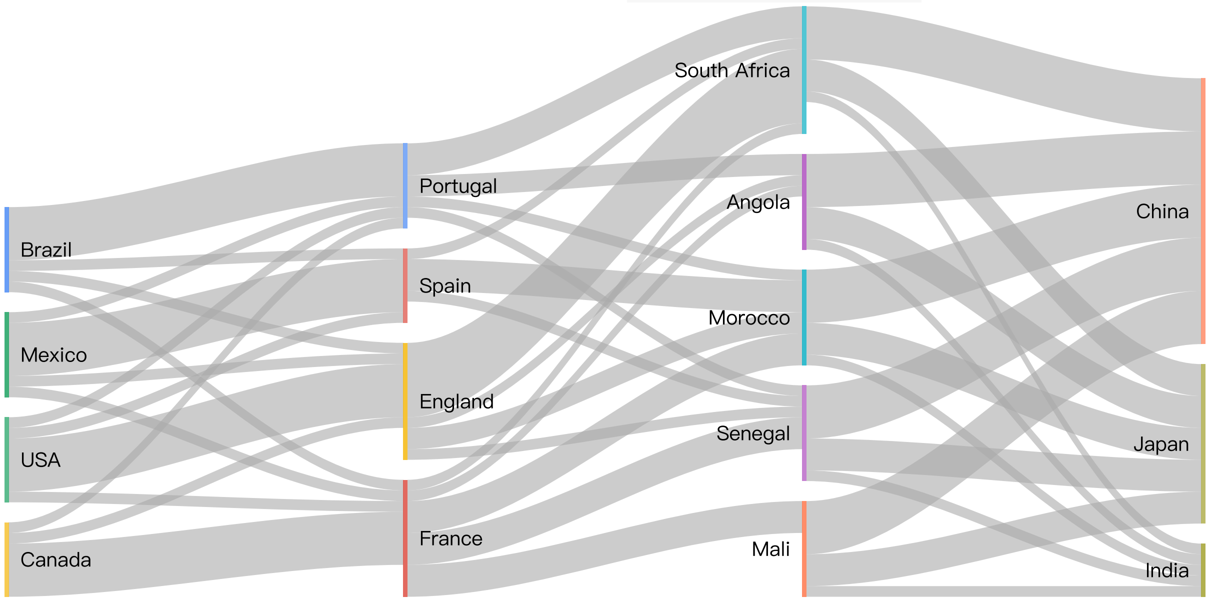


In the chart above, we've added 30 pixels of padding between the labels and the nodes.

```
var options = {
  width: 600,
  sankey: { node: { labelPadding: 30 } },
};
```

Adjusting Nodes

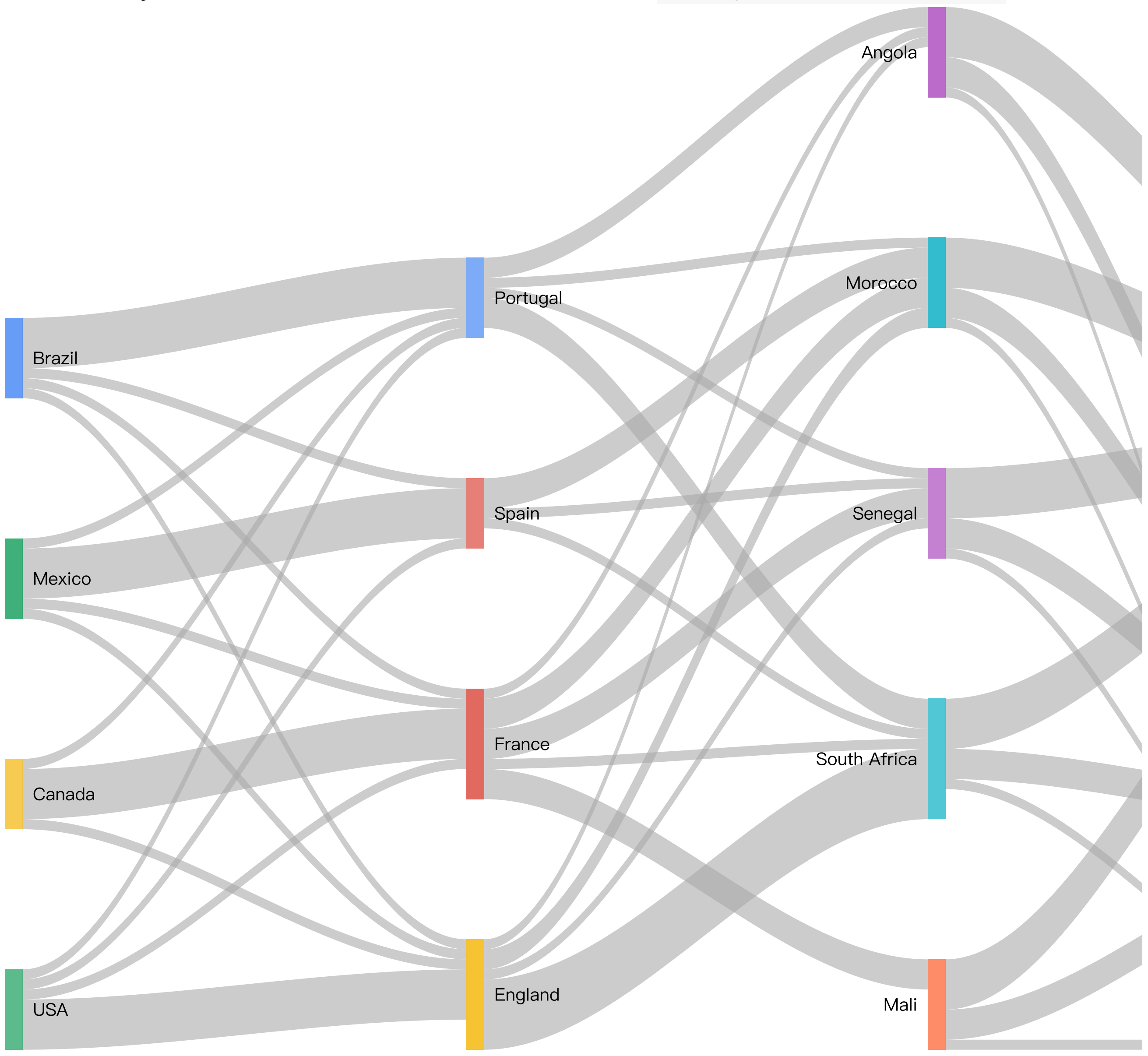
You can control the width of the nodes with `sankey.node.width`:



Above, we set the node width to 2.

```
var options = {
  width: 600,
  sankey: { node: { width: 2 } },
};
```

You can adjust the distance between the nodes with `sankey.node.nodePadding`:



In the above chart, we set `sankey.node.nodePadding` to 80.

```
  var options = {
    width: 900,
    sankey: { node: { nodePadding: 80 } },
  };
```

Loading

The `google.charts.load` package name is `"sankey"`:

```
google.charts.load("current" {packages: ["sankey"]});
```

The visualization's class name is `google.visualization.Sankey`:

```
var visualization = new google.visualization.Sankey(container);
```

Data Format

Rows: Each row in the table represents a connection between two labels. The third column indicates the strength of that connection, and will be reflected in the width of the path between the labels.

Columns:

	Column 0	Column 1	Column 2	...Column N
Purpose:	Source	Destination	Value	... Optional ro
Data Type:	string	string	number	...
Role:	domain	domain	data	...
Optional column roles (https://developers.google.com/chart/interactive/docs/roles) **:**	*None*	*None*	*None*	... • tooltip (https:/ • style (https:/

Configuration Options

Name	
forceIFrame	Draws the chart inside an inline frame. (Note that on IE8, this option is frames.) **Type:** boolean **Default:** false
height	Height of the chart, in pixels.

	Type: number **Default:** height of the containing element
sankey.iterations	With multilevel sankeys, it's sometimes nonobvious where nodes shou The D3 layout engine experiments with different node layouts, stoppin attempts have been made. The larger this number, the more pleasing t comes with a cost: the sankeys will take longer to render. Conversely, t your charts will render. **Type:** integer **Default:** 32

sankey.link	Controls attributes of the connections between nodes. Currently all att
	
	`sankey: {`
	`  link: {`
	`    color: {`
	`      fill: '#efd',     // Color of the link.`
	`      fillOpacity: 0.8, // Transparency of the link.`
	`      stroke: 'black',  // Color of the link border.`
	`      strokeWidth: 1    // Thickness of the link bor`
	`    },`
	`    colors: [`
	`      '#a6cee3',        // Custom color palette for`
	`      '#1f78b4',        // Nodes will cycle through`
	`      '#b2df8a',        // giving the links for that`
	`      '#33a02c'`
	`    ]`
	`  }`
	`}`
	
	Type: object
	Default: null

sankey.link.colorMode	Sets a coloring mode for the links between nodes. Possible values: • `'source'` - The color of the source node is used for the links to all • `'target'` - The color of the target node is used for the link to its s • `'gradient'` - The link between a source and target node is colore color to the target node color. • `'none'` - the default option; link colors will be set to the default (or `sankey.link.color.fill` and `sankey.link.color.fillOp` This option overrides sankey.link.color. **Type:** string **Default:** 'none'

sankey.node	Controls attributes of the nodes (the vertical bars between links):
	
	`sankey: {`
	`  node: {`
	`    label: {`
	`      fontName: 'Times-Roman',`
	`      fontSize: 12,`
	`      color: '#000',`
	`      bold: true,`
	`      italic: false`
	`    },`
	`    interactivity: true, // Allows you to select nod`
	`    labelPadding: 6,     // Horizontal distance betw`
	`    nodePadding: 10,     // Vertical distance betwee`
	`    width: 5,            // Thickness of the node.`
	`    colors: [`
	`      '#a6cee3',         // Custom color palette for`
	`      '#1f78b4',         // Nodes will cycle through`
	`      '#b2df8a',         // giving each node its own`
	`      '#33a02c'`
	`    ]`
	`  }`
	`}`
	
	Type: object
	Default: null

sankey.node.colorMode	Sets a coloring mode for the sankey nodes. Possible values: • `'unique'` - Each node will receive a unique color. **Type:** string **Default:** 'unique'
tooltip	An object with members to configure various tooltip elements. To spec use object literal notation, as shown here: `{textStyle: {color: '#FF0000'}, showColorCode: true}` **Type:** object **Default:** null
tooltip.isHtml	If set to true, use HTML-rendered (rather than SVG-rendered) tooltips. S (https://developers.google.com/chart/interactive/docs/customizing_t ★ **Note:** customization of the HTML tooltip content via the tooltip columr (https://developers.google.com/chart/interactive/docs/roles#tooltipr

	Chart (https://developers.google.com/chart/interactive/docs/gallery/b **Type**: boolean **Default**: false

tooltip.textStyle	An object that specifies the tooltip text style. The object has this forma
	
	`{ color: <string>,`
	`  fontName: <string>,`
	`  fontSize: <number>,`
	`  bold: <boolean>,`
	`  italic: <boolean> }`
	
	The `color` can be any HTML color string, for example: `'red'` or `'#00`
	`fontSize`.
	
	Type: object
	Default: `{color: 'black', fontName: <global-font-name>,`
	`size>}`

width	Width of the chart, in pixels. **Type**: number **Default**: width of the containing element

Methods

Method	
`draw(data, options)`	Draws the chart. The chart accepts further method calls only after the (#Events)event is fired. Extended description (https://developers.google.com/chart/interactive/docs/reference#vis **Return Type**: none
`getBoundingBox(id)`	Returns an object containing the left, top, width, and height of chart ele The format for `id` isn't yet documented (they're the return values of eve (https://developers.google.com/chart/interactive/docs/events)), but h some examples: `var cli = chart.getChartLayoutInterface();` **Height of the chart area**

	`cli.getBoundingBox('chartarea').height`
	
	Width of the third bar in the first series of a bar or column cl
	
	`cli.getBoundingBox('bar#0#2').width`
	
	Bounding box of the fifth wedge of a pie chart
	
	`cli.getBoundingBox('slice#4')`
	
	Bounding box of the chart data of a vertical (e.g., column) c
	
	`cli.getBoundingBox('vAxis#0#gridline')`
	
	Bounding box of the chart data of a horizontal (e.g., bar) cha
	
	`cli.getBoundingBox('hAxis#0#gridline')`
	
	Values are relative to the container of the chart. Call this *after* the chart
	
	Return Type: object

`getSelection()`	Returns an array of the selected chart entities. Selectable entities are b entries and categories. For this chart, only one entity can be selected a moment. Extended description (https://developers.google.com/chart/interactive/docs/reference#vis . **Return Type:** Array of selection elements
`setSelection()`	Selects the specified chart entities. Cancels any previous selection. Se entities are bars, legend entries and categories. For this chart, only one be selected at a time. Extended description (https://developers.google.com/chart/interactive/docs/reference#vis . **Return Type:** none
`clearChart()`	Clears the chart, and releases all of its allocated resources. **Return Type:** none

Events

Name

`error`	Fired when an error occurs when attempting to render the chart. **Properties:** id, message
`onmouseover`	Fired when the user mouses over a visual entity. Passes back the row and column indices of the corresponding data table element. A bar correlates to a cell in the data table, a legend entry to a column (row index is null), and a category to a row (column index is null). **Properties:** row, column
`onmouseout`	Fired when the user mouses away from a visual entity. Passes back the row and column indices of the corresponding data table element. A bar correlates to a cell in the data table, a legend entry to a column (row index is null), and a category to a row (column index is null). **Properties:** row, column
`ready`	The chart is ready for external method calls. If you want to interact with the chart, and call methods after you draw it, you should set up a listener for this event *before* you call the `draw` method, and call them only after the event was fired. **Properties:** none
`select`	Fired when the user clicks a visual entity. To learn what has been selected, call `getSelection()` (#Methods). **Properties:** none

Data Policy

All code and data are processed and rendered in the browser. No data is sent to any server.