

# How to use the `sankey` package to build Sankey diagrams\*

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## Abstract

The `sankey` package provides macros and environments to build *Sankey diagrams*<sup>1</sup> (or *flow diagram* in which the width of the arrows is proportional to the flow rate). The idea comes out from [this question](#) on [TeX.StackExchange](#).

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\*This file described version v2.0.

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<sup>1</sup>[https://en.wikipedia.org/wiki/Sankey\\_diagram](https://en.wikipedia.org/wiki/Sankey_diagram)

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## 1 Preamble

To use the `sankey` package, insert the following line in your preamble:

```
\usepackage{sankey}
```

## 2 The sankeydiagram environment

A `sankeydiagram` environment nested in a `tikzpicture` environment activates the sankey macros:

```
\begin{tikzpicture}
  \begin{sankeydiagram}[... options ...]
    ... sankey macros ...
  \end{sankeydiagram}
\end{tikzpicture}
```

## 3 Sankey diagram options

The `sankey` package uses `pgfkeys` to define options via `key=value` pairs.

The options can be defined via the optional argument of the `sankeydiagram` environment:

```
\begin{sankeydiagram}[debug=true]
  \sankeynode{name=a,quantity=1,angle=0,at={0,0}}
\end{sankeydiagram}
```

The options can also be modified via the `\sankeyset` macro:

```
\begin{sankeydiagram}
  \sankeyset{debug=true}
  \sankeynode{name=a,quantity=1,angle=0,at={0,0}}
\end{sankeydiagram}
```

The options can be temporarily modified for a single macro:

```
\begin{sankeydiagram}
  \sankeynode[debug=true]{name=a,quantity=1,angle=0,at={0,0}}
\end{sankeydiagram}
```

### 3.1 Keys to choose the scale

The scale or ratio of the Sankey diagram is the ratio between the **ratio length** and the **ratio quantity**.

`/sankey/ratio quantity=<number>` (initially: 10)

Quantity (in units of flow) to define ratio. The `<number>` can be any math expression.

`/sankey/ratio length=<distance>` (initially: 1cm)

Distance (a graphical distance) to define scale.

`/sankey/ratio=<distance>/<number>` (initially: 1cm/10)

Fix the ratio to `<distance>/<number>`.

The initial ratio is 1 cm/10 units.

**Note:** the **sankey** package uses the **xfp** package to evaluate all math expressions that use quantities (in units of flow). You can therefore use quantities of a very large or very small order of magnitude. In contrast, for graphic distances, the **sankey** package uses the **pgfmath** package (all calculations must not exceed  $\pm 16383.99999$ ).

### 3.2 Keys to define drawing parameters

`/sankey/minimum radius=<distance>` (initially: 5mm)

The minimum radius used by `\sankeyturn` and `\sankeydubins`.

`/sankey/outin steps=<integer>` (initially: 10)

Number of steps used by the `\sankeyoutin` macro to simulate flow lanes with constant width.

### 3.3 Keys to choose drawing styles

`/sankey/fill/.style=<style>` (initially: line width=0pt,fill=white)

This TikZ style is used to *fill* all sankey paths.

`/sankey/draw/.style=<style>` (initially: draw=black,line width=.4pt)

This TikZ style is used to *draw* all sankey paths.

`/sankey/start style=<style name>` (initially: none)

There are three predefined *start* styles: **none**, **simple**, **arrow**.

`/sankey/end style=<style name>` (initially: none)

There are three predefined *end* styles: **none**, **simple**, **arrow**.

### 3.4 Keys to define new *start* and *end* styles

`/sankey/new start style={<name>}{<fill path>}{<draw path>}`

Define the new start style named `<name>` with its `<fill path>` and its `<draw path>`.

`/sankey/new end style={<name>}{<fill path>}{<draw path>}`

Define the new end style named `<name>` with its `<fill path>` and its `<draw path>`.

*Fill* and *draw* paths are composed in a TikZ scope where the origin is the current Sankey node center (and its name is `\name`) and the coordinate system is rotated by its orientation.

### 3.5 The *debug* key

`/sankey/debug=<boolean>`

To debug a sankey diagram.

`(default: true)(initially: false)`

## 4 Sankey nodes and flows

### 4.1 Create Sankey nodes

`\sankeynode[<options>]{<node parameters>}`

The `\sankeynode` macro defines a Sankey node. The `<options>` can be any Sankey diagram keys. To define a Sankey node, you must provide a *name*, a *quantity*, an *angle* and a *position* as `<node parameters>`.

`/sankey/node parameters/name=<name>`

The `<name>` of the new Sankey node (and the associated TikZ node).

`/sankey/node parameters/quantity=<quantity>`

The quantity (in flow unit) of the new Sankey node. The `<quantity>` can be any math expression.

`/sankey/node parameters/angle=<angle>`

The orientation of the flow (0 points to the right) of the new Sankey node.

`/sankey/node parameters/at=<at>`

The position of the new Sankey node (a TikZ coordinate *without* round brackets or parentheses).

`/sankey/node parameters/anchor=<anchor>` (default: `center`)(initially: `center`)

Specify the anchor of the Sankey node. Possible values are `center`, `left` or `right`.

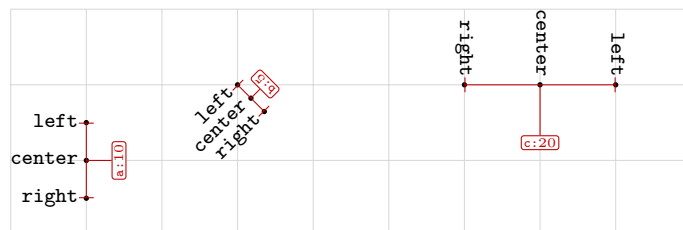
`/sankey/node parameters/as=<name>`

Copy the *name*, the *quantity*, the *angle* and the *position* of the Sankey node named `<name>`.

A Sankey node is also a Tikz node but with only three anchors: `left`, `center` and `right`.

```
\begin{tikzpicture}
  \begin{sankeydiagram}[debug]
    \draw[gray!30] (-1,-1) grid (8,2);
    \sankeynode{name=a,quantity=10,angle=0,at={0,0}}
    \sankeynode{name=b,quantity=5,angle=45,at={2,1},anchor=left}
    \sankeynode{name=c,quantity=20,angle=-90,at={5,1},anchor=right}

    \foreach \nodename/\pos in {a/left,b/below left,c/above}{
      \foreach \ancname in {left,center,right}{
        \node[node font=\ttfamily\footnotesize,\pos=1mm of \nodename.\ancname,
          inner sep=0pt,rotate=\sankeygetnodeorient{\nodename},anchor=east]
          {\ancname\vphantom{g}};
        \fill[black] (\nodename.\ancname) circle(1pt);
      }
    }
  \end{sankeydiagram}
\end{tikzpicture}
```



`\sankeynodestart[<options>]{<node parameters>}`

The `\sankeynodestart` creates and fills/draws a starting Sankey node:

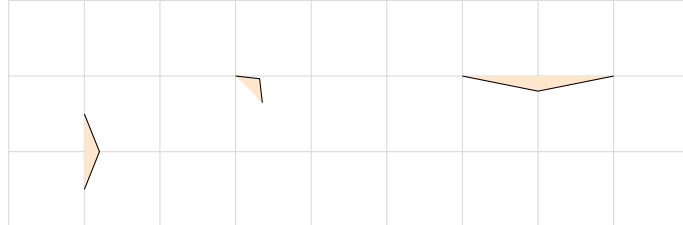
```
\begin{tikzpicture}
\begin{sankeydiagram}[start style=arrow,fill/.style={fill=orange!20}]
\draw[gray!30] (-1,-1) grid (8,2);
\sankeynodestart{name=a,quantity=10,angle=0,at={0,0}}
\sankeynodestart{name=b,quantity=5,angle=45,at={2,1},anchor=left}
\sankeynodestart{name=c,quantity=20,angle=-90,at={5,1},anchor=right}
\end{sankeydiagram}
\end{tikzpicture}
```



`\sankeynodeend[<options>]{<node parameters>}`

The `\sankeynodeend` creates and fills/draws an ending Sankey node:

```
\begin{tikzpicture}
\begin{sankeydiagram}[end style=simple,fill/.style={fill=orange!20}]
\draw[gray!30] (-1,-1) grid (8,2);
\sankeynodeend{name=a,quantity=10,angle=0,at={0,0}}
\sankeynodeend{name=b,quantity=5,angle=45,at={2,1},anchor=left}
\sankeynodeend{name=c,quantity=20,angle=-90,at={5,1},anchor=right}
\end{sankeydiagram}
\end{tikzpicture}
```



## 4.2 Retrieve informations from a Sankey node

`\sankeygetnodeqty{<node name>}`

The expandable command `\sankeygetnodeqty` returns the quantity assigned to the Sankey node named `<node name>`.

`\sankeygetnodeorient{<node name>}`

The expandable command `\sankeygetnodeorient` returns the angle (orientation) assigned to the Sankey node named `<node name>`.

### 4.3 Move nodes

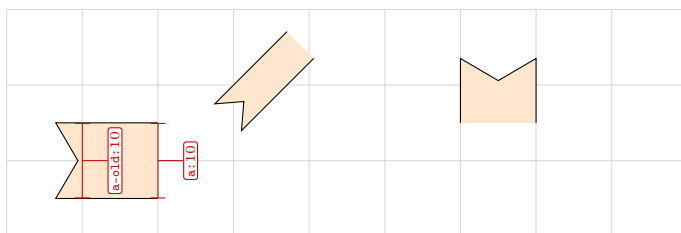
The `\sankeyadvance` and `\sankeyturn` commands move a Sankey node (and fill/draw a portion of the Sankey flow). Then the previous position of the Sankey node is accessible via the `-old` suffix (if you move the `a` node, its previous position is the `a-old` node).

#### 4.3.1 forward commands

`\sankeyadvance[<options>]{<node name>}{<distance>}`

The `\sankeyadvance` moves the sankey node straight ahead and fills/draws this portion of the sankey path.

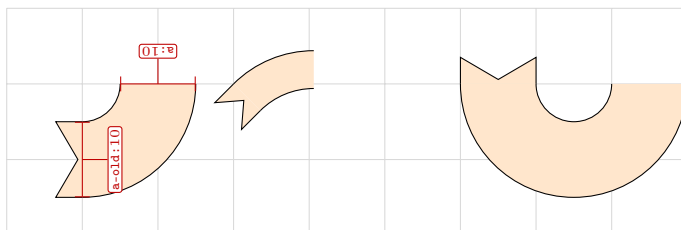
```
\begin{tikzpicture}
\begin{sankeydiagram}[start style=arrow,fill/.style={fill=orange!20}]
\draw[gray!30] (-1,-1) grid (8,2);
\sankeynodestart{name=a,quantity=10,angle=0,at={0,0}}
\sankeyadvance{a}{1cm}
\sankeynode[debug]{as=a}
\sankeynode[debug]{as=a-old}
\sankeynodestart{name=b,quantity=5,angle=45,at={2,1},anchor=left}
\sankeyadvance{b}{1cm}
\sankeynodestart{name=c,quantity=10,angle=-90,at={5,1},anchor=right}
\sankeyadvance{c}{5mm}
\end{sankeydiagram}
\end{tikzpicture}
```



`\sankeyturn[<options>]{<node name>}{<angle>}`

The `\sankeyturn` macro moves the sankey node by turning to one side or the other and fills/draws this portion of the sankey path. A *positive* `<angle>` turns left while a *negative* `<angle>` turns right.

```
\begin{tikzpicture}
\begin{sankeydiagram}[start style=arrow,fill/.style={fill=orange!20}]
\draw[gray!30] (-1,-1) grid (8,2);
\sankeynodestart{name=a,quantity=10,angle=0,at={0,0}}
\sankeyturn{a}{90}
\sankeynode[debug]{as=a}
\sankeynode[debug]{as=a-old}
\sankeynodestart{name=b,quantity=5,angle=45,at={2,1},anchor=left}
\sankeyturn[minimum radius=1cm]{b}{-45}
\sankeynodestart{name=c,quantity=10,angle=-90,at={5,1},anchor=right}
\sankeyturn{c}{180}
\end{sankeydiagram}
\end{tikzpicture}
```

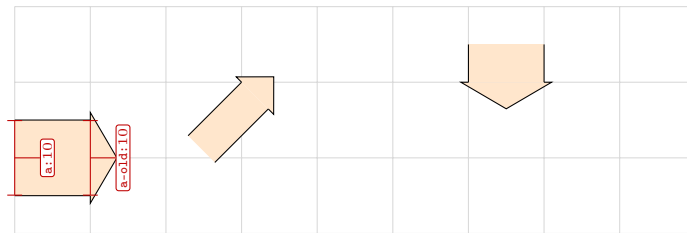


### 4.3.2 backward commands

`\sankeyadvance*{<options>}{<node name>}{<distance>}`

The `\sankeyadvance*` moves the sankey node straight back and fills/draws this portion of the sankey path.

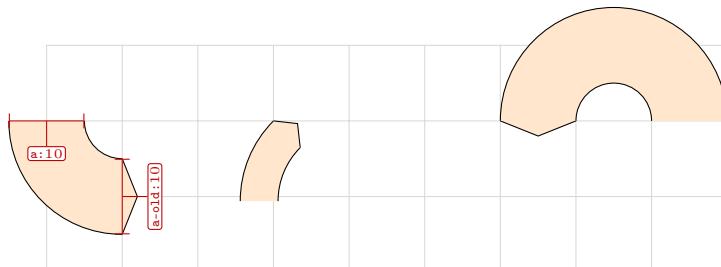
```
\begin{tikzpicture}
  \begin{sankeydiagram}[end style=arrow,fill/.style={fill=orange!20}]
    \draw[gray!30] (-1,-1) grid (8,2);
    \sankeynodeend{name=a,quantity=10,angle=0,at={0,0}}
    \sankeyadvance*{a}{1cm}
    \sankeynode[debug]{as=a}
    \sankeynode[debug]{as=a-old}
    \sankeynodeend{name=b,quantity=5,angle=45,at={2,1},anchor=left}
    \sankeyadvance*{b}{1cm}
    \sankeynodeend{name=c,quantity=10,angle=-90,at={5,1},anchor=right}
    \sankeyadvance*{c}{5mm}
  \end{sankeydiagram}
\end{tikzpicture}
```



`\sankeyturn*{<options>}{<node name>}{<angle>}`

The `\sankeyturn*` macro moves the sankey node backwards by turning right or left and fills/draws this portion of the sankey path. A *positive* `<angle>` turns left while a *negative* `<angle>` turns right.

```
\begin{tikzpicture}
  \begin{sankeydiagram}[end style=simple,fill/.style={fill=orange!20}]
    \draw[gray!30] (-1,-1) grid (8,2);
    \sankeynodeend{name=a,quantity=10,angle=0,at={0,0}}
    \sankeyturn*{a}{90}
    \sankeynode[debug]{as=a}
    \sankeynode[debug]{as=a-old}
    \sankeynodeend{name=b,quantity=5,angle=45,at={2,1},anchor=left}
    \sankeyturn*[minimum radius=1cm]{b}{-45}
    \sankeynodeend{name=c,quantity=10,angle=-90,at={5,1},anchor=right}
    \sankeyturn*{c}{180}
  \end{sankeydiagram}
\end{tikzpicture}
```





## 4.4 Links between nodes

`\sankeyoutin[<options>]{<node A>}{<node B>}`

The `\sankeyoutin` macro fills/draws a lane between `<node A>` and `<node B>` using a Bézier curve with regular steps (10 steps by default) to simulate constant width lane.

The constant width and the minimum curvature are *not* guaranteed!

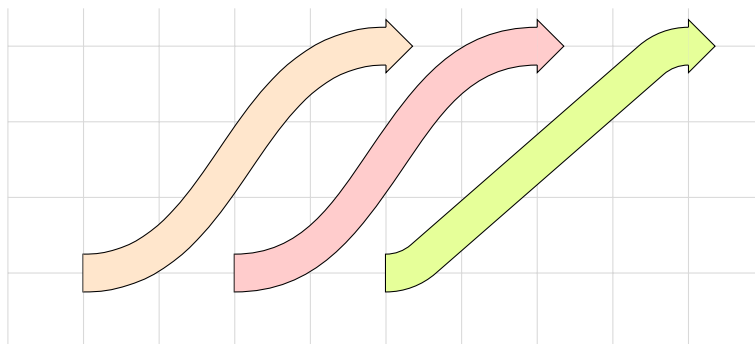
`\sankeydubins[<options>]{<node A>}{<node B>}`

The `\sankeydubins` macro fills/draws a lane between `<node A>` and `<node B>` using a Dubins path<sup>2</sup>.

The constant width and the minimum curvature are guaranteed.

### 4.4.1 Comparison between outin and dubins paths

```
\begin{tikzpicture}
  \begin{sankeydiagram}[start style=simple,end style=arrow]
    \draw[gray!30] (0,-1) grid (10,3.5);
    %
    \sankeyset{fill/.style={fill=orange!20}}
    \sankeynodestart{name=a,at={1,0},angle=0,quantity=5}
    \sankeynodeend{name=b,at={5,3},angle=0,quantity=5}
    \sankeyoutin{a}{b}
    %
    \sankeyset{fill/.style={fill=red!20}}
    \sankeynodestart{name=a,at={3,0},angle=0,quantity=5}
    \sankeynodeend{name=b,at={7,3},angle=0,quantity=5}
    \sankeyoutin[outin steps=2]{a}{b}
    %
    \sankeyset{fill/.style={fill=lime!40}}
    \sankeynodestart{name=a,at={5,0},angle=0,quantity=5}
    \sankeynodeend{name=b,at={9,3},angle=0,quantity=5}
    \sankeydubins[minimum radius=5mm]{a}{b}
  \end{sankeydiagram}
\end{tikzpicture}
```

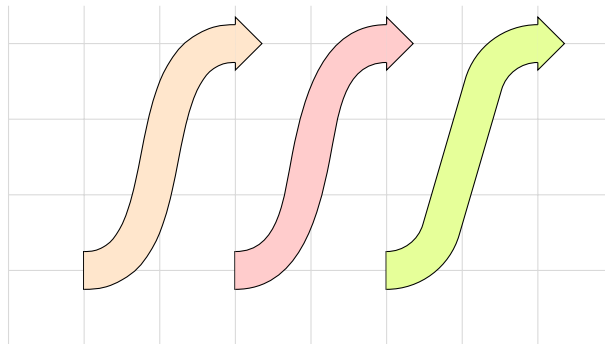


<sup>2</sup>[https://en.wikipedia.org/wiki/Dubins\\_path](https://en.wikipedia.org/wiki/Dubins_path)

```

\begin{tikzpicture}
  \begin{sankeydiagram}[start style=simple,end style=arrow]
    \draw[gray!30] (0,0) grid (8,4.5);
    %
    \sankeyset{fill/.style={fill=orange!20}}
    \sankeynodestart{name=a,at={1,1},angle=0,quantity=5}
    \sankeynodeend{name=b,at={3,4},angle=0,quantity=5}
    \sankeyoutin{a}{b}
    %
    \sankeyset{fill/.style={fill=red!20}}
    \sankeynodestart{name=a,at={3,1},angle=0,quantity=5}
    \sankeynodeend{name=b,at={5,4},angle=0,quantity=5}
    \sankeyoutin[outin steps=2]{a}{b}
    %
    \sankeyset{fill/.style={fill=lime!40}}
    \sankeynodestart{name=a,at={5,1},angle=0,quantity=5}
    \sankeynodeend{name=b,at={7,4},angle=0,quantity=5}
    \sankeydubins[minimum radius=5mm]{a}{b}
  \end{sankeydiagram}
\end{tikzpicture}

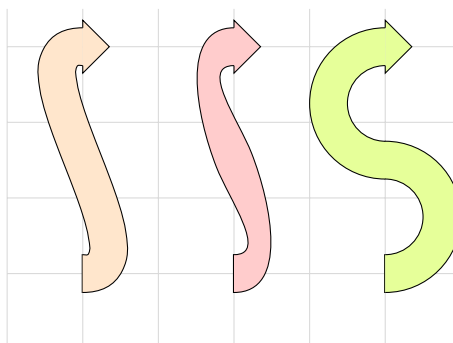
```



```

\begin{tikzpicture}
  \begin{sankeydiagram}[start style=simple,end style=arrow]
    \draw[gray!30] (0,0) grid ((6,4.5);
    %
    \sankeyset{fill/.style={fill=orange!20}}
    \sankeynodestart{name=a,at={1,1},angle=0,quantity=5}
    \sankeynodeend{name=b,at={1,4},angle=0,quantity=5}
    \sankeyoutin{a}{b}
    %
    \sankeyset{fill/.style={fill=red!20}}
    \sankeynodestart{name=a,at={3,1},angle=0,quantity=5}
    \sankeynodeend{name=b,at={3,4},angle=0,quantity=5}
    \sankeyoutin[outin steps=2]{a}{b}
    %
    \sankeyset{fill/.style={fill=lime!40}}
    \sankeynodestart{name=a,at={5,1},angle=0,quantity=5}
    \sankeynodeend{name=b,at={5,4},angle=0,quantity=5}
    \sankeydubins[minimum radius=5mm]{a}{b}
  \end{sankeydiagram}
\end{tikzpicture}

```



#### 4.4.2 Examples of dubins paths

```
\begin{tikzpicture}
\begin{sankeydiagram}[start style=simple,end style=arrow]
\draw[gray!30] (-1,-1) grid (10,2.5);

\sankeyset{
fill/.style={fill=lime!40},
draw/.style={draw=green!50!black,line width=2pt},
}

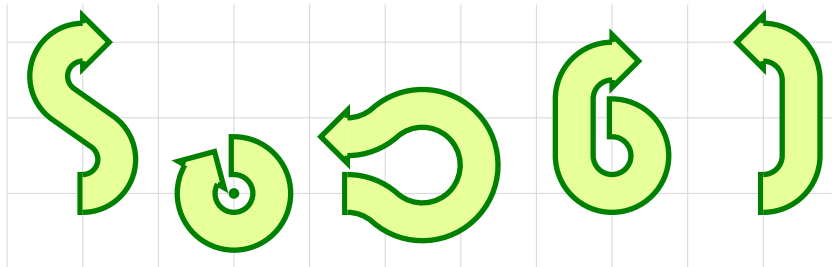
\sankeynodestart{name=a,at={0,0},angle=0,quantity=5}
\sankeynodeend{name=b,at={0,2},angle=0,quantity=5}
\sankeydubins[minimum radius=2mm]{a}{b}

\fill[green!50!black] (2,0) coordinate (c) circle(2pt);
\sankeynodestart{name=a,at={([shift={(c)}])90:5mm},angle=0,quantity=5}
\sankeynodeend{name=b,at={([shift={(c)}])150:5mm},angle=60,quantity=5}
\sankeydubins[minimum radius=2.5mm]{a}{b}

\sankeynodestart{name=a,at={3.5,0},angle=0,quantity=5}
\sankeynodeend{name=b,at={3.5,.75},angle=-180,quantity=5}
\sankeydubins[minimum radius=5mm]{a}{b}

\sankeynodestart{name=a,at={7,1},angle=0,quantity=5}
\sankeynodeend{name=b,at={7,1.75},angle=0,quantity=5}
\sankeydubins[minimum radius=2.5mm]{a}{b}

\sankeynodestart{name=a,at={9,0},angle=0,quantity=5}
\sankeynodeend{name=b,at={9,2},angle=180,quantity=5}
\sankeydubins[minimum radius=2.5mm]{a}{b}
\end{sankeydiagram}
\end{tikzpicture}
```

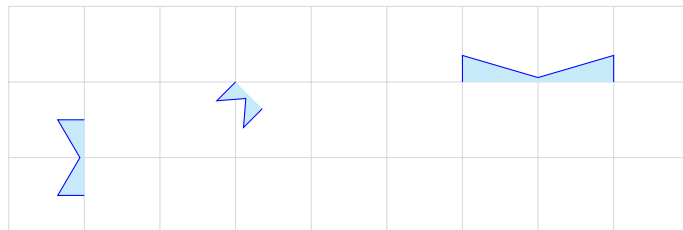


## 4.5 Pure filling/drawing macros

`\sankeystart[<options>]{<name>}`

The `\sankeystart` fills/draws a starting extremity attached to the preexistent Sankey node `<name>`:

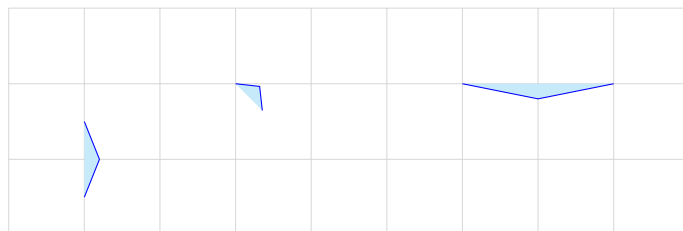
```
\begin{tikzpicture}
\begin{sankeydiagram}
[start style=arrow,fill/.style={fill=cyan!20},draw/.style={draw=blue}]
\draw[gray!30] (-1,-1) grid (8,2);
\sankeynode{name=a,quantity=10,angle=0,at={0,0}}
\sankeystart{a}
\sankeynode{name=b,quantity=5,angle=45,at={2,1},anchor=left}
\sankeystart{b}
\sankeynode{name=c,quantity=20,angle=-90,at={5,1},anchor=right}
\sankeystart{c}
\end{sankeydiagram}
\end{tikzpicture}
```



`\sankeyend[<options>]{<name>}`

The `\sankeyend` fills/draws an ending extremity attached to the preexistent Sankey node `<name>`:

```
\begin{tikzpicture}
\begin{sankeydiagram}
[end style=simple,fill/.style={fill=cyan!20},draw/.style={draw=blue}]
\draw[gray!30] (-1,-1) grid (8,2);
\sankeynode{name=a,quantity=10,angle=0,at={0,0}}
\sankeyend{a}
\sankeynode{name=b,quantity=5,angle=45,at={2,1},anchor=left}
\sankeyend{b}
\sankeynode{name=c,quantity=20,angle=-90,at={5,1},anchor=right}
\sankeyend{c}
\end{sankeydiagram}
\end{tikzpicture}
```

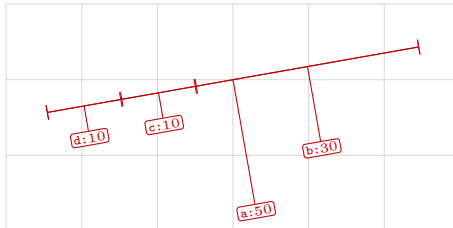


## 4.6 Forked node

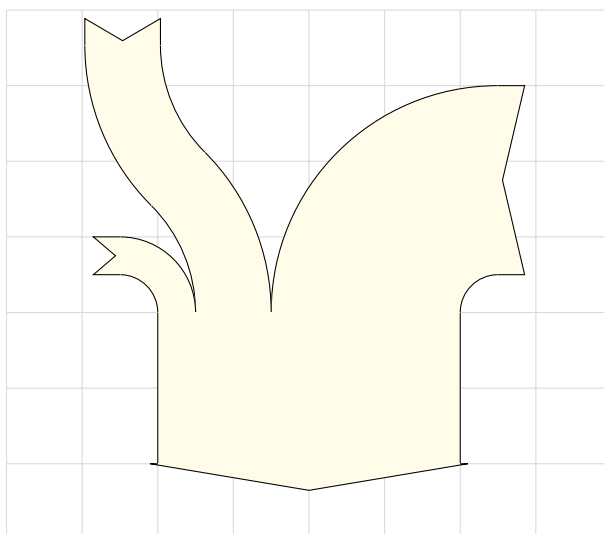
`\sankeyfork[<options>]{<node>}{<quantity/name pairs>}`

The `\sankeyfork` macro splits a Sankey node in a list of new Sankey nodes. The `<quantity/name pairs>` is a comma separated list of *quantity/name* pairs. The sum of all quantities *must* be equal to the quantity of the node to fork.

```
\begin{tikzpicture}
  \begin{sankeydiagram}[debug]
    \draw[gray!30] (-3,-2) grid (3,1);
    \sankeynode{name=a,quantity=50,angle=-80,at={0,0}}
    \sankeyfork{a}{30/b,10/c,10/d}
  \end{sankeydiagram}
\end{tikzpicture}
```



```
\begin{tikzpicture}
  \begin{sankeydiagram}
    \sankeyset{
      start style=arrow,end style=arrow,
      fill/.style={fill=yellow!10,line width=0pt,draw=yellow!10},
    }
    \draw[gray!30] (-4,-3) grid (4,4);
    \sankeynode{name=a,quantity=40,angle=-90,at={0,0}}
    \sankeyfork{a}{25/b,10/c,5/d}
    \sankeyturn*{b}{90}
    \sankeyturn*[minimum radius=2cm]{c}{-45}
    \sankeyturn*[minimum radius=2cm]{c}{45}
    \sankeyturn*[minimum radius=5mm]{d}{-90}
    \sankeyadvance{a}{2cm}
    \foreach \nodename in {b,c,d}{
      \sankeystart{\nodename}
    }
    \sankeyend{a}
  \end{sankeydiagram}
\end{tikzpicture}
```



## 5 Miscellaneous

### 5.1 The debug layer

The `debug` option key uses the `sankeydebug` layer to draw above the `main` TikZ layer (via `\pgfsetlayers`, the `sankey` package installs four layers: `background`, `main`, `foreground`, `sankeydebug`).

The four following styles define how to display debug informations:

```
\sankeyset{
  % debug color used by all debug macros
  debug color/.style={/utils/exec={\colorlet{debug color}{#1}}},
  debug color=red!75!black,
  % debug line between left and right anchors
  debug line/.style={draw=debug color,|-|},
  % debug line between center and label
  debug normal/.style={draw=debug color},
  % debug node label
  debug label/.style={
    draw,
    font=\ttfamily\tiny,
    text=debug color,text opacity=1,
    inner sep=.1em,
    fill=white,fill opacity=1,
    rounded corners=.1em,
  },
}
```

### 5.2 The dubins TikZ library

The `sankey` package uses the `dubins` TikZ library (the `tikzlibrarydubins.code.tex` file) to compute Dubins paths. The documentation for this library does not yet exist.

### 5.3 How to duplicate a Sankey node

```
\sankeynodealias{<origname>}{<clonename>}
```

The `\sankeynodealias` macro clones the Sankey node named `<origname>` into the Sankey node named `<clonename>`.

So, you can clone a Sankey node via two methods:

```
\sankeynode{name=a,quantity=10,angle=0,at={0,0}}
\sankeynode{as=a,name=b}
```

```
\sankeynode{name=a,quantity=10,angle=0,at={0,0}}
\sankeynodealias{a}{b}
```

## 5.4 How to define new start and end styles

Here are the definitions of the `arrow` styles:

```
\sankeyset{
  % arrow style
  new start style={arrow}{
    (\name.left) -- ++(-10pt,0)
    -- ([xshift=-10pt/6]\name.center)
    -- ([xshift=-10pt]\name.right)
    -- (\name.right) -- cycle
  }{
    (\name.left) -- ++(-10pt,0)
    -- ([xshift=-10pt/6]\name.center)
    -- ([xshift=-10pt]\name.right)
    -- (\name.right)
  },
  new end style={arrow}{
    (\name.left) -- ([yshift=1mm]\name.left)
    -- ([xshift=10pt]\name.center)
    -- ([yshift=-1mm]\name.right) -- (\name.right) -- cycle
  }{
    (\name.left) -- ([yshift=1mm]\name.left)
    -- ([xshift=10pt]\name.center)
    -- ([yshift=-1mm]\name.right) -- (\name.right)
  },
}
```

## 6 History

v2.0 (2021/01/27)

- First public version (on CTAN).

v1.0 (2016/03/06)

- First version.

## 7 Examples

### 7.1 Simple example

See figure 1.

```
\begin{tikzpicture}
\colorlet{cold}[rgb]{cyan!75!blue!50!white}
\colorlet{hot}[rgb]{red!50!orange!75!white}
\begin{sankeydiagram}
\sankeyset{
  ratio=90pt/6,
  minimum radius=15pt,
  start style=simple,
  end style=simple,
  % debug,
  draw/.style={
    draw=blue!50!cyan,
    line width=1pt,
    line cap=round,line join=round,
  },
  cold/.style={
    fill/.style={
      draw=cold,
      line width=0pt,
      fill=cold,
    },
  },
  cold to hot/.style={
    fill/.style={
      fill=none,
      top color=cold,
      bottom color=hot,
      middle color=yellow,
    },
  },
  hot/.style={
    fill/.style={
      draw=hot,
      line width=0pt,
      fill=hot,
    },
  },
}

\sankeyset{cold}
\sankeynodestart{name=p0,at={0,100},angle=-90,quantity=6}
\sankeyadvance{p0}{50pt}

\sankeyfork{p0}{3/p1,3/p2}

\sankeyturn{p1}{90}
\sankeyadvance{p1}{20pt}

\sankeyadvance{p2}{60pt}

\sankeyfork{p2}{2/p3,1/p4}

\sankeyturn{p3}{90}
\sankeyadvance{p3}{50pt}

\sankeyfork{p3}{1/p5,1/p6}

\sankeyadvance{p5}{70pt}

\sankeyfork{p1}{1/p7,1/p8,1/p9}
\sankeyadvance{p7}{50pt}
\sankeyadvance{p9}{50pt}
```



```

\sankeyadvance{p4}{40pt}
\sankeyturn{p4}{90}
\sankeyadvance{p4}{65pt}

\sankeyadvance{p7}{40pt}

\sankeynode{name=p11,at={[\shift={(50pt,-15pt)}}]p7},angle=0,quantity=3}
\sankeyfork{p11}{1/p7a,1/p9a,1/p5a}
\sankeyoutin{p7}{p7a}
\sankeyoutin{p9}{p9a}
\sankeyoutin{p5}{p5a}
\sankeyadvance{p11}{30pt}
\sankeyend{p11}

\sankeyturn{p8}{-90}
\sankeyturn{p6}{-90}
\sankeyturn{p4}{-90}

\sankeyset{hot}

\sankeyadvance[cold to hot]{p8}{40pt}

\sankeynode{name=p10,at={[\shift={(-15pt,-60pt)}}]p8},angle=-90,quantity=3}
\sankeyfork{p10}{1/p8a,1/p6a,1/p4a}
\sankeyoutin[cold to hot]{p4}{p4a}
\sankeyoutin[cold to hot]{p6}{p6a}
\sankeyoutin{p8}{p8a}
\sankeyadvance{p10}{30pt}
\sankeyend{p10}
\end{sankeydiagram}
\end{tikzpicture}

```

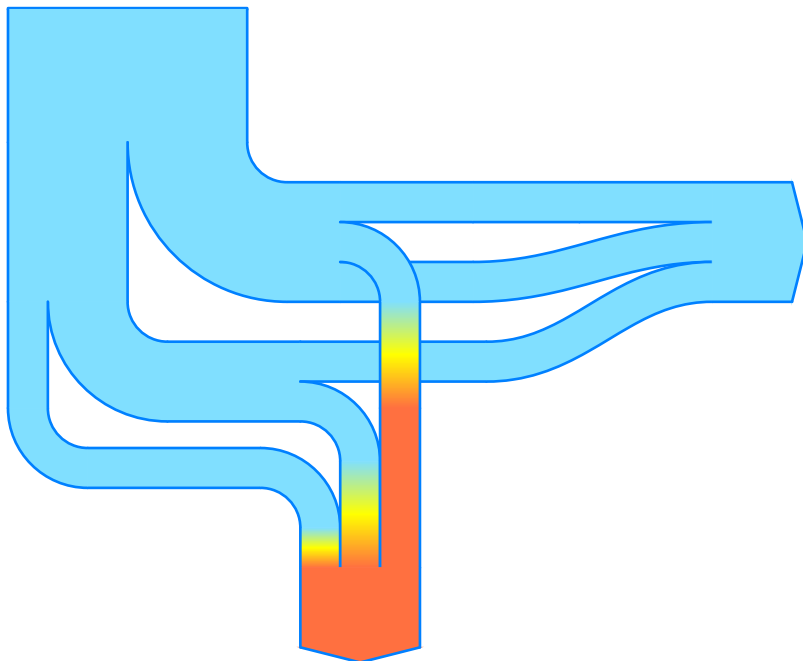


Figure 1: Simple example

## 7.2 Example from question on TeX.se

This example comes from [this question](#) on [TeX.StackExchange](#).

See figure 2.

```
\begin{tikzpicture}
  \renewcommand*\sfdefault{txss}

  \begin{sankeydiagram}

    \sankeyset{
      ratio=4cm/524.3,
      minimum radius=3mm,
      start style=arrow,
      end style=arrow,
      % debug,
      fill/.style={
        line width=0pt,
        fill=cyan!50!blue!50!black,
        draw=cyan!50!blue!50!black,
      },
      draw/.style={draw=none},
    }

    \sankeynodestart{name=B,at={-.5,0},angle=-90,quantity=7.2}
    \coordinate[below=1mm of B.center] (B label);
    \sankeyadvance{B}{5mm}
    \sankeynodestart{name=GI,at={1,0},angle=-90,quantity=137.3}
    \coordinate[below=1mm of GI.center] (GI label);
    \sankeyadvance{GI}{5mm}
    \sankeynodestart{name=I,at={4,0},angle=-90,quantity=397.8}
    \coordinate[below=1mm of I.center] (I label);
    \sankeynode{name=EI,at={2.86,-3},angle=-90,quantity=542.3}
    \sankeyfork{EI}{397.8/Ia,137.3/GIa,7.2/Ba}
    \sankeydubins[minimum radius=1.2cm]{I}{Ia}
    \sankeyoutin{GI}{GIa}
    \sankeyoutin{B}{Ba}
    \sankeyadvance{EI}{5mm}
    \coordinate (EI label) at (EI);
    \sankeyadvance{EI}{5mm}
    \sankeyfork{EI}{63.1/EB,479.2/P}

    \sankeyturn{EB}{90}
    \sankeyadvance{EB}{4cm}
    \coordinate (EB label) at ($(EB)!.5!(EB-old)$);
    \sankeyend{EB}

    \sankeyadvance{P}{10mm}
    \coordinate (P label) at (P);
    \sankeyadvance{P}{5mm}

    \sankeyfork{P}{33.5/NV,445.7/P}

    {
      \colorlet{NV color}{cyan!80!lime!50!gray}
      \sankeyset{fill/.append style={fill=NV color,draw=NV color}}
      \sankeyturn{NV}{90}
      \sankeynode{as=NV,name=NV2,at=NV -| EB}
      \sankeyoutin{NV}{NV2}
      \coordinate (NV label) at (NV -| EB label);
      \sankeyend{NV2}
    }

    \sankeyadvance{P}{10mm}
    \sankeyfork{P}{118.1/U,327.6/P}

    {
      \sankeyset{
```

```

    fill/.style={fill=orange!70!gray!50,draw=orange!70!gray!50}
  }
  \sankeyturn{U}{90}
  \sankeynode{as=U,name=U2,at=U -| EB}
  \sankeyoutin{U}{U2}
  \coordinate (U label) at (U -| EB label);
  \sankeyend{U2}
}

\sankeyadvance{P}{10mm}

\sankeyfork{P}{327.2/P,0.4/SD}

{
  \sankeyturn{SD}{-90}
  \sankeyadvance{SD}{15mm}
  \coordinate (SD label) at (SD);
  \sankeyadvance{SD}{15mm}
  \sankeyend{SD}
}

\sankeyadvance{P}{8mm}
\sankeyfork{P}{18.8/VE,308.4/E}

{
  \sankeyset{fill/.append style={orange!70!gray!30}}
  \sankeyturn{VE}{90}
  \sankeynode{as=VE,name=VE2,at=VE -| EB}
  \sankeyoutin{VE}{VE2}
  \coordinate (VE label) at (VE -| EB label);
  \sankeyend{VE2}
}

\sankeyadvance{E}{8mm}
\coordinate (E label) at (E);
\sankeyadvance{E}{20mm}

\sankeyfork{E}{135.1/H+GHD,87.2/V,86.1/In}

\sankeyturn{In}{-90}
\sankeyadvance{In}{10mm}
\sankeyturn{In}{90}
\sankeyadvance{In}{5mm}
\coordinate (In label) at (In);
\sankeyadvance{In}{10mm}
\sankeyend{In}

\sankeynode{as=V,name=V2,at=V|-In label}
\sankeyoutin{V}{V2}
\coordinate (V label) at (V2);
\sankeyadvance{V2}{10mm}
\sankeyend{V2}

\sankeyturn{H+GHD}{90}
\sankeyadvance{H+GHD}{5mm}
\sankeyfork{H+GHD}{47.0/GHD,88.1/H}

\sankeyturn{H}{-90}
\sankeynode{as=H,name=H2,at=H|-In label}
\sankeyoutin{H}{H2}
\coordinate (H label) at (H2);
\sankeyadvance{H2}{10mm}
\sankeyend{H2}

\sankeyadvance{GHD}{30mm}
\sankeyturn{GHD}{-90}
\sankeynode{as=GHD,name=GHD2,at=GHD|-In label}
\sankeyoutin{GHD}{GHD2}
\coordinate (GHD label) at (GHD2);

```

```

\sankeyadvance{GHD2}{10mm}
\sankeyend{GHD2}
\end{sankeydiagram}

% labels
\tikzset{
  label/.style={
    fill=white,fill opacity=.8,text opacity=1,
    inner sep=1mm,
    text=cyan!50!blue!50!black,
    inner xsep=2mm,
    font=\sffamily\bfseries\footnotesize,
    align=center,
  },
}
\node[label,anchor=north] (B label) at (B label) {7.2};
\node[label,left=1mm of B label] {Bestands-\entnahme};
\node[label,anchor=north] at (GI label) {137.3};
\node[label,above=5mm of GI label] {Gewinnung\im Inland};
\node[label,anchor=north] at (I label) {397.8};
\node[label,above=5mm of I label] {Import};

\node[label] at (EI label) {542.3\Energieaufkommen im Inland};

\node[label,anchor=center] (EB label) at (EB label) {63.1};
\node[label,above=1mm of EB label] {Export und\Bunkerung};

\node[label] at (P label) {479.2\Primärenergieverbrauch};

\node[label,anchor=center] (NV label) at (NV label) {33.5};
\node[label,above=0mm of NV label] {Nichtenergetischer Verbrauch};

\node[label,anchor=center] (U label) at (U label) {118.1};
\node[label,below=3mm of U label] {Umwandlungsverluste};

\node[label,anchor=center] (SD label) at (SD label) {0.4};
\node[label,above=0mm of SD label] {Statistische\Differenzen};

\node[label,anchor=center] (VE label) at (VE label) {18.8};
\node[label,below=0mm of VE label] {Verbrauch in den\Energiesektoren};

\node[label,anchor=north] (E label) at (E label)
{308.4\Endenergieverbrauch};

\node[label,anchor=north] (In label) at (In label) {86.1};
\node[label,anchor=north,below=1cm of In label] {Industrie};

\node[label,anchor=north] (V label) at (V label) {87.2};
\node[label,anchor=north,below=1cm of V label] {Verkehr};

\node[label,anchor=north] (H label) at (H label) {88.1};
\node[label,anchor=north,below=1cm of H label] {Haushalte};

\node[label,anchor=north] (GHD label) at (GHD label) {47.0};
\node[label,anchor=north,below=1cm of GHD label]
{Gewerbe, Handel\Diensleistungen};
\end{tikzpicture}

```

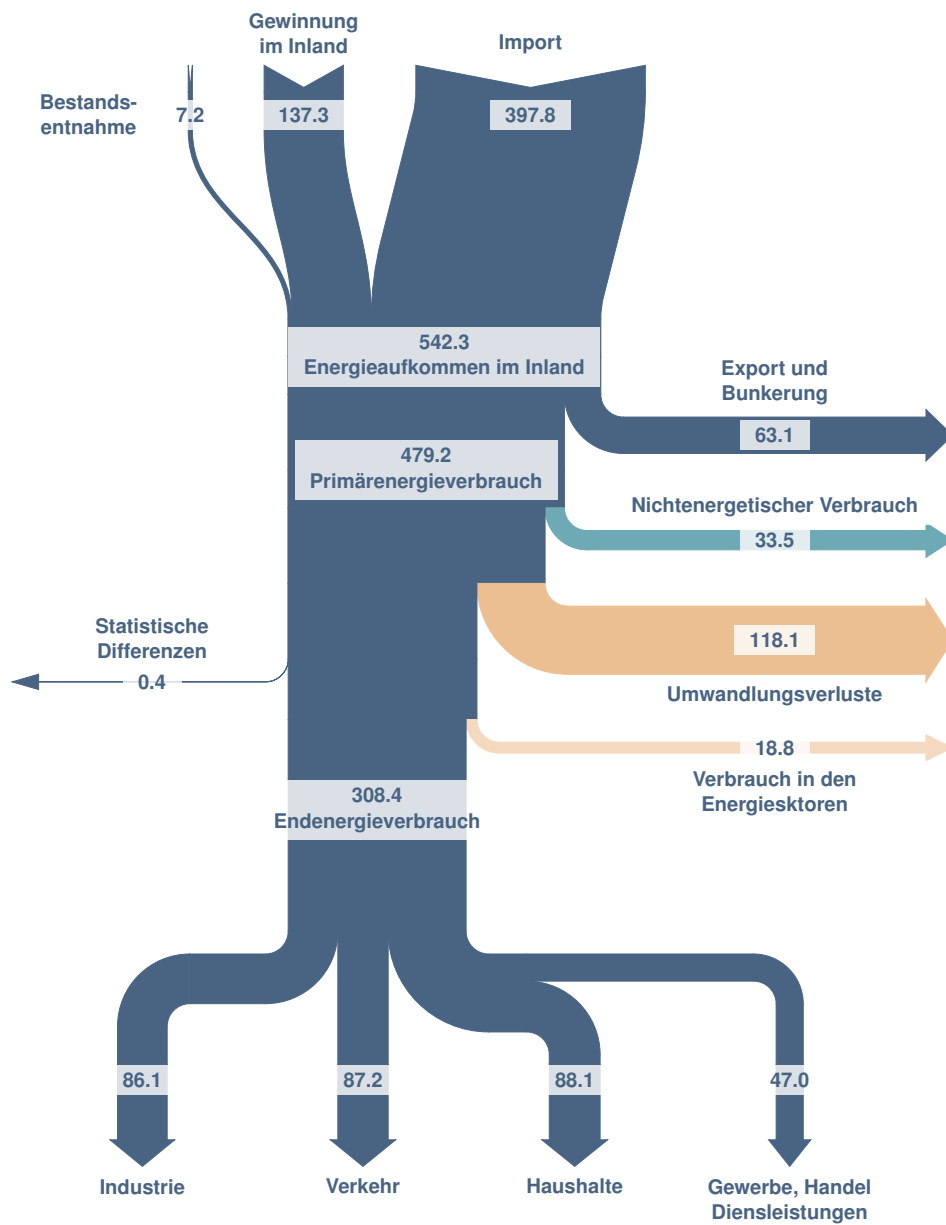


Figure 2: Example from TeX.se question

### 7.3 Very nice example – Nadieh Bremer creation

Graphic designer Nadieh Bremer created this very nice Sankey diagram<sup>3</sup> for Adyen's second half 2018 report to shareholders. It is coded here with her kind permission.

You can change the data values between lines 28 and 53.

See figure 3.

```
1 \begin{tikzpicture}
2 %
3 \renewcommand*\sfdefault{txss}
4 \sffamily
5 \sisetup{
6   detect-all=true,
7   group-separator={,},
8   group-minimum-digits=4,
9 }
10 % storage of labels
11 \newcommand\LabSet[2]{% none name, label
12   \expandafter\edef\csname #1Lab\endcsname{#2}}
13 \newcommand\Lab[1]{% node name
14   \csname #1Lab\endcsname}
15 % storage of quantities
16 \newcommand\QtySet[2]{% node name, quantity
17   \expandafter\edef\csname #1Qty\endcsname{\fpeval{#2}}}
18 \newcommand\Qty[1]{% node name
19   \csname #1Qty\endcsname}
20 % all nodes with their name, label and quantity
21 \sankeyset{
22   def data/.code args={#1/#2/#3}{% node name/label/values
23     \LabSet{#1}{#2}
24     \QtySet{#1}{#3}
25     \typeout{#1: \Qty{#1}€ (\Lab{#1})}
26   },
27   def data/.list={
28     {Pf/Processing\\fees/71713},
29     {Sog/Sales of\\good/4547},
30     {Sf/Settlement\\fees/842075},
31     {Os/Other\\services/37532},
32     {R/Revenues/\Qty{Pf}+\Qty{Sog}+\Qty{Sf}+\Qty{Os}},
33     {Coi/Cost of Inventory/5151},
34     {Ciffi/Cost insecure from financial institutions/758234},
35     {Nr/Net revenue/\Qty{R}-\Qty{Coi}-\Qty{Ciffi}},
36     {Aadotaifa/Amortization and\\depreciation of tangible and\\%
37       intangible fixed assets/4688},
38     {Ssapc/Social securities and\\pension costs/7860},
39     {Was/Wages and salaries/35627},
40     {Ooe/Other operating expenses/37346},
41     {Nr2/-/\Qty{Nr}-\Qty{Aadotaifa}-\Qty{Ssapc}-\Qty{Was}-\Qty{Ooe}},
42     {Oi/Other income/47},
43     {Ibiieait/Income before interest income,\\interest expense and %
44       income taxes/\Qty{Nr2}+\Qty{Oi}},
45     {Fe/Finance expense/561},
46     {Ofr/Other financial results/2533},
47     {Ibiieait2/-/\Qty{Ibiieait}-\Qty{Fe}-\Qty{Ofr}},
48     {Fi/Finance income/204},
49     {Ibit/Income before income taxes/\Qty{Ibiieait2}+\Qty{Fi}},
50     {It/Income taxes/21134},
51     {Niftp/Net income for the period/\Qty{Ibit}-\Qty{It}},
52     {Octa/Other currency\\translation adjustments/785},
53     {Tci/Total comprehensive income/\Qty{Niftp}+\Qty{Octa}}
54   },
55 }
56
57 \definecolor{mygreen}{RGB}{9,192,82}
58 \tikzset{
59   cost node/.style 2 args={
```

<sup>3</sup><https://www.visualcinnamon.com/portfolio/adyen-report-2019/>

```

60     overlay,
61     align=flush center,
62     node font=\footnotesize\sffamily\bfseries,
63     inner sep=0,
64     node contents={%
65         {\mdseries\, \num{#1}}\%
66         #2\vphantom{g}%
67     },
68 },
69 white hash/.style={
70     draw=none,fill=none,
71     pattern={Lines[angle=60,line width=2pt,distance=4pt]},
72     pattern color=white,
73 },
74 line sep/.style={draw=white,line width=1pt},
75 left label/.style={left=#1,align=flush right,anchor=north east},
76 right label/.style={right=#1,align=flush left},
77 right label hashed/.style={
78     right=1mm of $(#1.left)!.5!(#1-old.left)$,align=flush left,
79 },
80 left label hashed/.style={
81     left=1mm of $(#1.right)!.5!(#1-old.right)$,align=flush right,
82 },
83 }
84
85 \newcommand\turnandstop[1]{
86     \sankeyturn[green to greenwhite]{#1}{-90}
87     \sankeynode{as=#1,name=#1-e,at={#1 -| Coi}}
88     \sankeyoutin[greenwhite to white]{#1}{#1-e}
89     \node[cost node={\Qty{#1}}]{\Lab{#1}},left label={1mm of #1-e.right}};
90 }
91
92 \begin{sankeydiagram}
93     \sankeyset{
94         ratio=28em/1000000,
95         minimum radius=2cm,
96         start style=none,
97         % default fill and draw styles
98         fill/.style={
99             line width=0pt,
100             fill=mygreen,
101         },
102         draw/.style={draw=none},
103         % specific fill and draw styles
104         green to greenwhite/.style={
105             fill/.style={
106                 line width=0pt,
107                 right color=mygreen,
108                 left color=mygreen!20!white,
109             }
110         },
111         greenwhite to white/.style={
112             fill/.style={
113                 line width=0pt,
114                 right color=mygreen!20!white,
115                 left color=mygreen!5!white,
116             }
117         },
118         dashed/.style={draw/.style={draw=mygreen,dashed}},
119         % debug,
120     }
121
122     \coordinate (top) at (0,2em);
123
124     \sankeynodestart{name=Pf,quantity=\Qty{Pf},
125         at={0,0},angle=-90}
126     \node[cost node={\Qty{Pf}}]{\Lab{Pf}},above=.5em of Pf.center];
127
128     \sankeynodestart{name=Sog,quantity=\Qty{Sog},

```

```

129     at={[xshift=4em]Pf.left},angle=-90,anchor=right}
130 \node[cost node={\Qty{Sog}}{\Lab{Sog}},above=.5em of Sog.center];
131
132 \sankeynodestart{name=Sf,quantity=\Qty{Sf},
133     at={[xshift=2em]Sog.left},angle=-90,anchor=right}
134 \node[cost node={\Qty{Sf}}{\Lab{Sf}},above=.5em of Sf.center];
135
136 \sankeynodestart{name=Os,quantity=\Qty{Os},
137     at={[xshift=2em]Sf.left},angle=-90,anchor=right}
138 \node[cost node={\Qty{Os}}{\Lab{Os}},above=.5em of Os.center];
139
140 \sankeynode{name=R,quantity=\Qty{R},
141     at={[yshift=-10em]Sf.center},angle=-90}
142 \sankeyfork{R}{\Qty{Os}/Os-a,\Qty{Sf}/Sf-a,\Qty{Sog}/Sog-a,\Qty{Pf}/Pf-a}
143
144 \foreach \nodename in {Pf,Sog,Sf,Os}{
145     \sankeyoutin[fill/.style={top color=white,bottom color=mygreen}]
146     {\nodename}{\nodename-a}
147 }
148
149 \sankeyadvance{R}{1em}
150 \node[cost node={\Qty{R}}{\Lab{R}},right label hashed=R];
151
152 \sankeyfork{R}{\Qty{Ciffi}/Ciffi,\Qty{Nr}/Nr,\Qty{Coi}/Coi}
153
154 \sankeyturn[minimum radius=1.cm]{Ciffi}{90}
155 \node[cost node={\Qty{Ciffi}}{\Lab{Ciffi}},
156     at=([shift=(1mm,0)]Ciffi.center),rotate=-90,
157     anchor=south,align=flush left,node font=\scriptsize\sffamily\bfseries];
158
159 \sankeyturn[green to greenwhite]{Coi}{-90}
160 \sankeyadvance[greenwhite to white]{Coi}{1em}
161 \node[cost node={\Qty{Coi}}{\Lab{Coi}},
162     left=1mm of [yshift=.75ex]Coi.left,
163     align=flush right,anchor=north east,overlay];
164
165 \sankeyadvance{Nr}{9em}
166 \sankeyadvance{Nr}{1em}
167 \node[cost node={\Qty{Nr}}{\Lab{Nr}},
168     left label hashed=Nr,node font=\large\sffamily\bfseries];
169
170 \sankeyfork{Nr}{\Qty{Nr2}/Nr2,\Qty{Ooe}/Ooe,
171     \Qty{Was}/Was,\Qty{Ssapc}/Ssapc,\Qty{Aadotaifa}/Aadotaifa}
172
173 \turnandstop{Aadotaifa}
174
175 \sankeyadvance{Ssapc}{5em}
176 \turnandstop{Ssapc}
177
178 \sankeyadvance{Was}{9em}
179 \turnandstop{Was}
180
181 \sankeyadvance{Ooe}{12em}
182 \turnandstop{Ooe}
183
184 \sankeyadvance{Nr2}{15em}
185 \sankeynode{name=Ibiieait,quantity=\Qty{Ibiieait},
186     angle=-90,anchor=right,at={Nr2.right}}
187 \sankeyfork{Ibiieait}{\Qty{Oi}/Oi,\Qty{Nr2}/Nr2-e}
188
189 \sankeyturn*[minimum radius=1cm,dashed]{Oi}{90}
190 \node[cost node={\Qty{Oi}}{\Lab{Oi}},right label=1mm of Oi.left];
191
192 \sankeyadvance{Ibiieait}{1em}
193 \node[cost node={\Qty{Ibiieait}}{\Lab{Ibiieait}},
194     right label hashed=Ibiieait];
195
196 \sankeyfork{Ibiieait}
197 {\Qty{Ibiieait2}/Ibiieait2,\Qty{Ofr}/Ofr,\Qty{Fe}/Fe}

```



```

198 \turnandstop{Fe}
199
200 \sankeyadvance{Ofr}{3em}
201 \turnandstop{Ofr}
202
203 \sankeyadvance{Ibiieait2}{6em}
204 \sankeynode{name=Ibit,quantity={\Qty{Ibiieait2}+\Qty{Fi}},
205   angle=-90,anchor=right,at={Ibiieait2.right}}
206 \sankeyfork{Ibit}{\Qty{Fi}/Fi,\Qty{Ibiieait2}/Ibiieait2-e}
207
208 \sankeyturn*[minimum radius=1cm,dashed]{Fi}{90}
209 \node[cost node={\Qty{Fi}}{\Lab{Fi}},right label=1mm of Fi.left];
210
211 \sankeyadvance{Ibit}{1em}
212 \node[cost node={\Qty{Ibit}}{\Lab{Ibit}},right label hashed=Ibit];
213
214 \sankeyfork{Ibit}{\Qty{Niftp}/Niftp,\Qty{It}/It}
215
216 \turnandstop{It}
217
218 \sankeyadvance{Niftp}{6em}
219
220 \sankeyadvance{Niftp}{1em}
221 \node[cost node={\Qty{Niftp}}{\Lab{Niftp}},right label hashed=Niftp];
222
223 \sankeynode{name=Tci,quantity=\Qty{Niftp}+\Qty{Octa},
224   angle=-90,anchor=right,at={\yshift=-6em}Niftp.right}}
225 \sankeyfork{Tci}{\Qty{Octa}/Octa,\Qty{Niftp}/Niftp-e}
226 \sankeyoutin{Niftp}{Niftp-e}
227
228 \sankeyturn*[minimum radius=1cm]{Octa}{90}
229 \node[cost node={\Qty{Octa}}{\Lab{Octa}},right label=1mm of Octa.left];
230
231 \sankeyadvance{Tci}{1em}
232 \node[cost node={\Qty{Tci}}{\Lab{Tci}},right label hashed=Tci];
233
234 \newcommand\hashband[1]{
235   \draw[line sep] (#1-old.right) -- (#1-old.left);
236   \draw[line sep] (#1.right) -- (#1.left);
237   \path[white hash] (#1-old.right) rectangle (#1.left);
238 }
239
240 \foreach \nodename in {R,Nr,Nr,Ibiieait,Ibit,Niftp,Tci}{
241   \hashband{\nodename}
242 }
243
244 \end{sankeydiagram}
245 \end{tikzpicture}

```

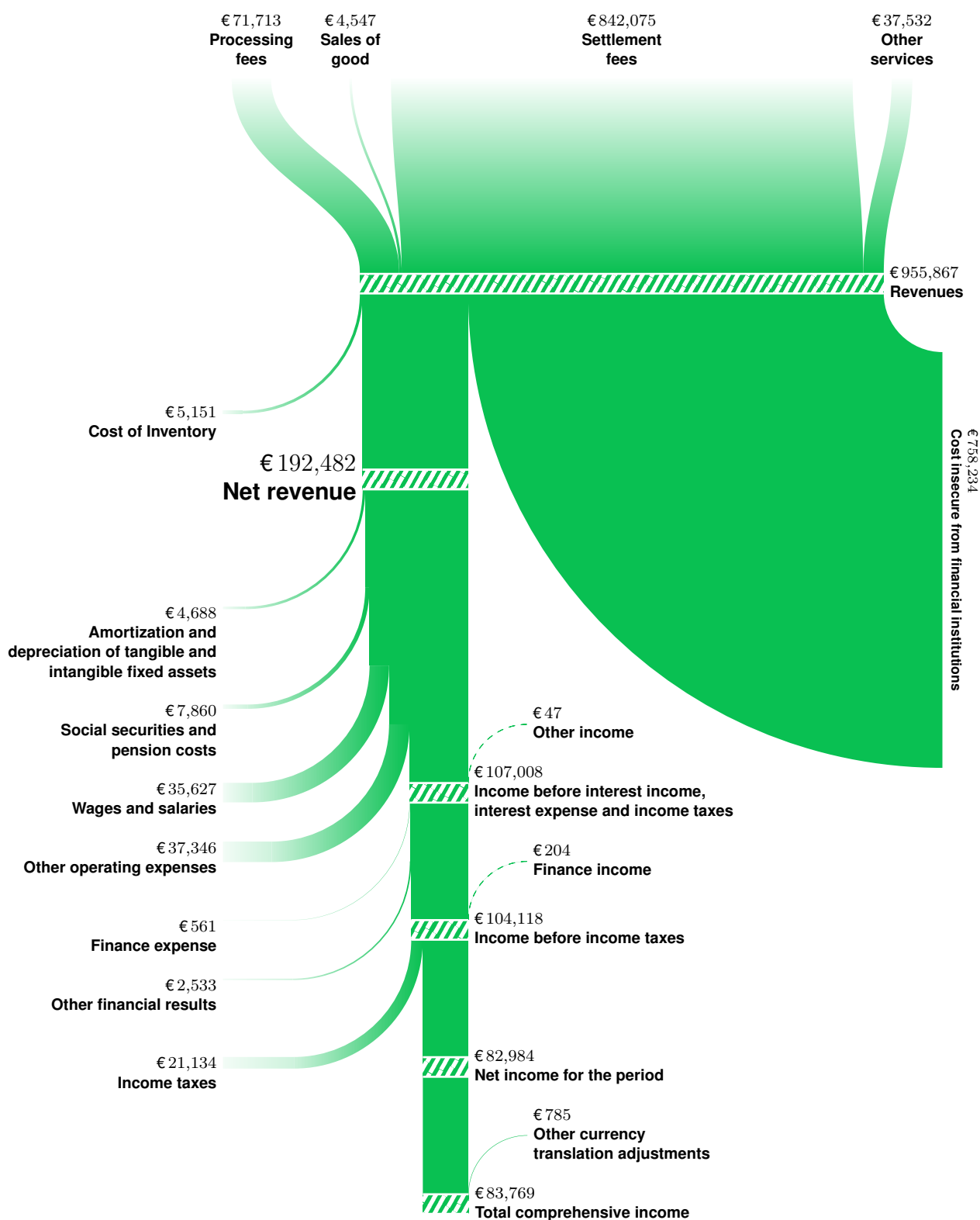


Figure 3: Very nice example – Nadieh Bremer’s creation  
(from [Adyen’s Shareholder Report](#))