

# The `string-diagrams` package\*

## Draw string diagrams using TikZ

Paolo Brasolin  
[paolo.brasolin@gmail.com](mailto:paolo.brasolin@gmail.com)

v0.1.0 (2023/05/31)

Please note this is the **major version zero**, meant for initial development: *anything MAY change at any time*. The upside is that this is the best time to **contribute!** Of course you can also just keep the `sty` along with your code and not care at all.

## 1 Documentation

Let's walk through the features by example.

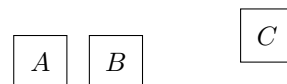
To draw boxes, you use the `box` style on a node.

```
\begin{tikzpicture}  
  \node[box] {A};  
\end{tikzpicture}
```



You can draw multiple boxes using any of your standard TikZ positioning techniques. Don't forget to label the nodes so you can easily reference them.

```
\begin{tikzpicture}  
  \node[box] (A) at (0,0) {A};  
  \node[box, right of=A] (B) {B};  
  \node[box] (C) at ($(B)+(2cm,1em)$) {C};  
\end{tikzpicture}
```



To connect boxes, you can use the `\wires` macro. The first argument is TikZ styling for the wires; the second argument is a nested dictionary specifying the connectivity; the third argument is a list of the loose ends to draw. `boxes` have the following anchors: `west`, `west0`, `west1`, `east`, `east0`, and `east1`.

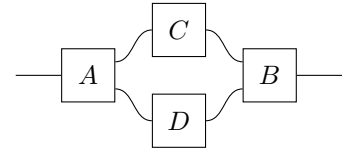
---

\*Thanks!

```

\begin{tikzpicture}[scale=0.6]
  \node[box] (A) at (-2, 0) {A};
  \node[box] (B) at (+2, 0) {B};
  \node[box] (C) at ( 0,+1) {C};
  \node[box] (D) at ( 0,-1) {D};
  \wires[] {
    A = { east0 = C.west, east1 = D.west },
    C = { east = B.west0 },
    D = { east = B.west1 },
  } { A.west, B.east }
\end{tikzpicture}

```

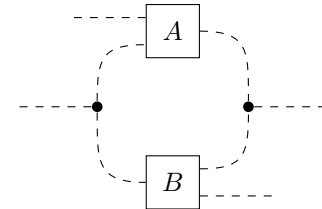


To split and join wires, you can use `dots` and their anchors `north`, `east`, `south`, and `west`. Remember to have fun with styling wires.

```

\begin{tikzpicture}
  \node[box] (A) at ( 0,+1) {A};
  \node[box] (B) at ( 0,-1) {B};
  \node[dot] (x) at (+1, 0) {};
  \node[dot] (y) at (-1, 0) {};
  \wires[looseness=1.5, dashed] {
    A = { east = x.north },
    B = { east0 = x.south },
    y = { north = A.west1, south = B.west },
  } {
    A.west0, B.east1, x.east, y.west
  }
\end{tikzpicture}

```



That's it. This is the package, for now.

## 2 Implementation

Open the DocStrip guards.

```

1 <{*package}
   Identify the internal prefix (LATEX3 DocStrip convention).
2 <{@@=stridi}
   Load the essential support (expl3) “up-front”.
3 \RequirePackage{expl3}[2023/05/11]
4 \RequirePackage{tikz}[2023/01/15]
   Identify the package and give the over all version information.
5 \ProvidesExplPackage
6   {string-diagrams}
7   {2023/05/31}
8   {0.1.0}
9   {Draw string diagrams using TikZ}
   Define a shape with useful anchor points.
10 \pgfdeclareshape{box}{
11   \inheritbackgroundpath[from=rectangle]

```

```

12 \inheritsavedanchors[from=rectangle]
13 \inheritanchorborder[from=rectangle]
14 \inheritanchor[from=rectangle]{center}
15 \inheritanchor[from=rectangle]{north}
16 \inheritanchor[from=rectangle]{south}
17 \inheritanchor[from=rectangle]{west}
18 \inheritanchor[from=rectangle]{east}
19 \anchor{east0}{
20   \pgf@process{\southwest}
21   \pgf@ya=0.25\pgf@y
22   \pgf@process{\northeast}
23   \pgf@y=0.75\pgf@y
24   \advance\pgf@y by \pgf@ya
25 }
26 \anchor{east1}{
27   \pgf@process{\southwest}
28   \pgf@ya=0.75\pgf@y
29   \pgf@process{\northeast}
30   \pgf@y=0.25\pgf@y
31   \advance\pgf@y by \pgf@ya
32 }
33 \anchor{west0}{
34   \pgf@process{\northeast}
35   \pgf@ya=0.75\pgf@y
36   \pgf@process{\southwest}
37   \pgf@y=0.25\pgf@y
38   \advance\pgf@y by \pgf@ya
39 }
40 \anchor{west1}{
41   \pgf@process{\northeast}
42   \pgf@ya=0.25\pgf@y
43   \pgf@process{\southwest}
44   \pgf@y=0.75\pgf@y
45   \advance\pgf@y by \pgf@ya
46 }
47 }

```

Define styles to draw boxes and dots.

```

48 \ExplSyntaxOff
49 \tikzset{
50   box/.style={
51     shape=box,
52     draw,
53     inner sep=.5em,
54     minimum width=2em,
55     minimum height=2em,
56     execute at begin node=$,
57     execute at end node=$,
58   },
59   dot/.style={
60     shape=circle,
61     fill,
62     inner sep=0,
63     minimum width=0.4em,
64   },

```

```

65 }
66 \ExplSyntaxOn
    Define our main actor.

```

`\wires`

```

67 \NewDocumentCommand{\wires}{o m m }
68 {
69   \prop_set_from_keyval:Nn \l_tmpa_prop { #2 }
70   \prop_map_inline:Nn \l_tmpa_prop
71   {
72     \prop_set_from_keyval:Nn \l_tmpb_prop { ##2 }
73     \prop_map_inline:Nn \l_tmpb_prop
74     {
75       \regex_match_case:nnTF
76       {
77         { \. north } { \tl_gset:Nn \g_tmpa_tl { 90 } }
78         { \. south } { \tl_gset:Nn \g_tmpa_tl { -90 } }
79         { \. west } { \tl_gset:Nn \g_tmpa_tl { 180 } }
80         { \. east } { \tl_gset:Nn \g_tmpa_tl { 0 } }
81       } { ####2 } {} {}
82       \regex_match_case:nnTF
83       {
84         { north } { \tl_gset:Nn \g_tmpb_tl { 90 } }
85         { south } { \tl_gset:Nn \g_tmpb_tl { -90 } }
86         { west } { \tl_gset:Nn \g_tmpb_tl { 180 } }
87         { east } { \tl_gset:Nn \g_tmpb_tl { 0 } }
88       } { ####1 } {} {}
89       \draw [
90         out={\tl_use:N \g_tmpb_tl},
91         in={\tl_use:N \g_tmpa_tl},
92         #1,
93       ] (##1.####1) to (####2);
94     }
95   }
96   \clist_set:Nn \l_tmpa_clist { #3 }
97   \clist_map_inline:Nn \l_tmpa_clist {
98     \regex_match_case:nnTF
99     {
100       { \. north } { \draw[#1] (##1) -- +(0,+1); } % TODO: cleaner solution?
101       { \. south }
102       {
103         \draw[out=-90, in=0,#1] (##1)
104           to ($(\pgf@picminx, \pgf@y)$);
105         } % TODO: not sure why this works
106       { \. west } { \draw[#1] (##1) -- +(-1, 0); }
107       { \. east } { \draw[#1] (##1) -- +(1, 0); }
108     } { ##1 } {} {}
109   }
110 }

```

(End definition for `\wires`. This function is documented on page ??.)

# Change History

0.1.0

General: Initial version . . . . . 1

## Index

The italic numbers denote the pages where the corresponding entry is described, numbers underlined point to the definition, all others indicate the places where it is used.

<b>Symbols</b>	
<code>\.</code> . . . . .	77, 78, 79, 80, 100, 101, 106, 107
<b>A</b>	
<code>\advance</code> . . . . .	24, 31, 38, 45
<code>\anchor</code> . . . . .	19, 26, 33, 40
<b>C</b>	
clist commands:	
<code>\clist_map_inline:Nn</code> . . . . .	97
<code>\clist_set:Nn</code> . . . . .	96
<code>\l_tmpa_clist</code> . . . . .	96, 97
<b>D</b>	
<code>\draw</code> . . . . .	89, 100, 103, 106, 107
<b>E</b>	
<code>\ExplSyntaxOff</code> . . . . .	48
<code>\ExplSyntaxOn</code> . . . . .	66
<b>I</b>	
<code>\inheritanchor</code> . . . . .	14, 15, 16, 17, 18
<code>\inheritanchorborder</code> . . . . .	13
<code>\inheritbackgroundpath</code> . . . . .	11
<code>\inheritssavedanchors</code> . . . . .	12
<b>N</b>	
<code>\NewDocumentCommand</code> . . . . .	67
<code>\northeast</code> . . . . .	22, 29, 34, 41
<b>P</b>	
<code>\pgfdeclareshape</code> . . . . .	10
<b>prop commands:</b>	
<code>\prop_map_inline:Nn</code> . . . . .	70, 73
<code>\prop_set_from_keyval:Nn</code> . . . . .	69, 72
<code>\l_tmpa_prop</code> . . . . .	69, 70
<code>\l_tmpb_prop</code> . . . . .	72, 73
<code>\ProvidesExplPackage</code> . . . . .	5
<b>R</b>	
regex commands:	
<code>\regex_match_case:nnTF</code> . . . . .	75, 82, 98
<code>\RequirePackage</code> . . . . .	3, 4
<b>S</b>	
<code>\southwest</code> . . . . .	20, 27, 36, 43
<b>T</b>	
TeX and L <sup>A</sup> T <sub>E</sub> X 2 <sub>ε</sub> commands:	
<code>\pgf@picminx</code> . . . . .	104
<code>\pgf@process</code> 20, 22, 27, 29, 34, 36, 41, 43	
<code>\pgf@y</code> . . . . .	21, 23, 24,
	28, 30, 31, 35, 37, 38, 42, 44, 45, 104
<code>\pgf@ya</code> . . . . .	21, 24, 28, 31, 35, 38, 42, 45
<code>\tikzset</code> . . . . .	49
tl commands:	
<code>\tl_gset:Nn</code> 77, 78, 79, 80, 84, 85, 86, 87	
<code>\tl_use:N</code> . . . . .	90, 91
<code>\g_tmpa_tl</code> . . . . .	77, 78, 79, 80, 91
<code>\g_tmpb_tl</code> . . . . .	84, 85, 86, 87, 90
<b>W</b>	
<code>\wires</code> . . . . .	1, <u>67</u>