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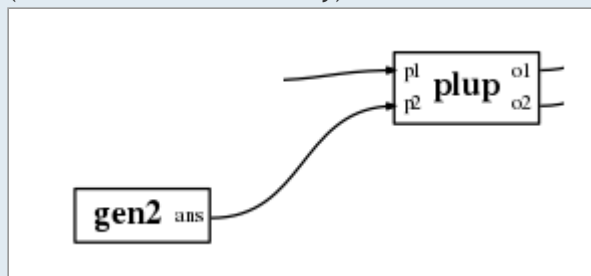
[johnahay](#)

## TikZ: Custom shape with input and output ports

Mon Jan 04, 2016 5:56 pm

Dear all!

I'm trying to create some blocks in tikz and create some edges between them. It should look like the attached image. (With more blocks obviously)



goal.png (4.5 KiB) Viewed 4338 times

Each block may have an arbitrary number of inputs on its left hand side, and an arbitrary number of outputs on its right hand side. (-> tikz-anchors?)

The block names, inputs and outputs are generated via a python3 script. (among other things)

I tried to create the block on the right first: "just" 2 inputs, 2 outputs. In the tikz manual I read about "anchors", "declareshape" and "circle split", so I tried to create a rectangle with a second label (somewhere).

It looks like I'm too dumb to do that... 🙄

Edit:

Another question that I have:

Will I be able to use that with automatic layout?

Minimal code included below:

**Code:** [\[Select all\]](#) [\[Expand/Collapse\]](#) [\[Download\]](#) (untitled.tex) [Open in Overleaf](#)

! Package PGF Math Error: Unknown function `port' (in ' port').

...

! Missing number, treated as zero.

...

! A <box> was supposed to be here.

...

Code: [\[Select all\]](#) [\[Expand/Collapse\]](#) [\[Download\]](#) (untitled.tex) [Open in Overleaf](#)

```
\documentclass{standalone}
\usepackage{tikz}
\usetikzlibrary{shapes}
\makeatletter

\begin{document}

\newbox\pgfnodepartportbox

\pgfdeclareshape{document}{
  \nodeparts{text, port}

  \savedanchor\centerpoint{%
    \pgf@x=.5\wd\pgfnodeparttextbox%
    \pgfmathsetlength{\pgf@y}{10mm}%
    \pgf@y=-\pgf@y%
    \advance\pgf@y by-\dp\pgfnodeparttextbox%
    \advance\pgf@y by-.5\pgflinewidth%
  }%
  \savedanchor\portanchor{%
    \pgf@x=-.5\wd\pgfnodepartportbox%
    \advance\pgf@x by.5\wd\pgfnodeparttextbox%
    \pgfmathsetlength{\pgf@y}{10mm}%
    \pgf@y=-2\pgf@y%
    \advance\pgf@y by-\ht\pgfnodepartportbox%
    \advance\pgf@y by-.5\pgflinewidth%
    \advance\pgf@y by-\dp\pgfnodeparttextbox%
    \advance\pgf@y by-.5\pgflinewidth%
  }

  \inheritsavedanchors[from=rectangle]
  \inheritanchorborder[from=rectangle]
  \inheritanchor[from=rectangle]{center}
  \inheritanchor[from=rectangle]{north}
  \inheritanchor[from=rectangle]{south}
  \inheritanchor[from=rectangle]{west}
  \inheritanchor[from=rectangle]{east}
  \inheritbackgroundpath[from=rectangle]

  \anchor{port}{\portanchor}
}
```

```

\begin{tikzpicture}
  \node[draw,shape=circle split] (x) {Remark \nodepart{lower} test};
  \node[draw,shape=document] at ([shift=(0:3cm)]x) (x) {test1 \nodepart{port} test2};
\end{tikzpicture}
\end{document}

```

**Tags:**

tikz  
shapes



**Stefan Kottwitz**  
Site Admin



Wed Jan 06, 2016 12:55 am

Hi,

welcome to the forum!

I think programming shapes would be very challenging. That's because you require different anchors and node parts, so it's not just a single shape.

Perhaps it's manageable to create the shapes by macros. Each macro could draw a rectangular shape with text and small input and output nodes. Connection arrows could be pointed at those nodes.

I use macros myself to handle complex drawings with repeated parts. They can take arguments for node texts.

Stefan

Site admin



**johnahay**



Thu Jan 07, 2016 4:05 pm

Hi, thanks for your reply!

As the data is generated by a python3 script, I think I may just create 1 shape definition for each different block. So port counts and sizes will not have to be generated by latex/tikz, alleviating the need for macros? 😊

Problem is: I can't get a custom shape correctly defined in latex/tikz. I don't know latex/tikz enough to create any custom shape (or complex macros). So in my code, I tried to modify the circle split example but ran into the errors posted above.

I found the code for split circle \*quite\* difficult to understand, but I did not find an easier example. What I think the circle split code does:

**Code:** [\[Select all\]](#) [\[Expand/Collapse\]](#) [\[Download\]](#) (untitled.tex) [Open in Overleaf](#)  
`\newbox\pgfnodepartlowerbox`

Creates a box for the lower text label. Is this empty until the \nodepart command in instantiation via \createnode?

Code: [\[Select all\]](#) [\[Expand/Collapse\]](#) [\[Download\]](#) (untitled.tex) [Open in Overleaf](#)

```
\nodeparts{text,lower}
```

Tells tikz that my shape consists of two labels I can specify using \nodepart.

Code: [\[Select all\]](#) [\[Expand/Collapse\]](#) [\[Download\]](#) (untitled.tex) [Open in Overleaf](#)


```
\savedanchor\centerpoint{%
  \pgf@x=.5\wd\pgfnodeparttextbox%
  \pgfmathsetlength{\pgf@y}{\pgfkeysvalueof{/pgf/inner ysep}}%
  \pgf@y=-\pgf@y%
  \advance\pgf@y by-\dp\pgfnodeparttextbox%
  \advance\pgf@y by-.5\pgflinewidth%
}%
```

I think I don't understand this part for example: What variables are set by this? Does this influence shape sizes too? Is the position of the labels set here?

Code: [\[Select all\]](#) [\[Expand/Collapse\]](#) [\[Download\]](#) (untitled.tex) [Open in Overleaf](#)

```
\inheritbackgroundpath[from=circle]
\beforebackgroundpath{
  \pgfutil@tempdima=\radius%
  \pgfmathsetlength{\pgf@xb}{\pgfkeysvalueof{/pgf/outer xsep}}%
  \pgfmathsetlength{\pgf@yb}{\pgfkeysvalueof{/pgf/outer ysep}}%
  \ifdim\pgf@xb<\pgf@yb%
    \advance\pgfutil@tempdima by-\pgf@yb%
  \else%
    \advance\pgfutil@tempdima by-\pgf@xb%
  \fi%
  \advance\pgfutil@tempdima by-.5\pgflinewidth%
  \pgfsetshortenstart{0pt}%
  \pgfsetshortenend{0pt}%
  \pgfsetarrows{-}%
  \pgfpathmoveto{\pgfpointadd{\centerpoint}{\pgfpoint{-1\pgfutil@tempdima}{0pt}}}%
  \pgfpathlineto{\pgfpointadd{\centerpoint}{\pgfpoint{\pgfutil@tempdima}{0pt}}}%
  \pgfusepath{stroke}%
}
```

This part uses the radius variable to create the visible shapes horizontal line, the circle is inherited. How do the \advance correlate to the \advance in the anchor part?

I'm looking for some dead-simple example code for custom tikz shapes. (e.g. a block with 2 inputs and 2 outputs )



**Stefan Kottwitz**  
Site Admin



📅 Thu Jan 07, 2016 10:54 pm

Here is a suggestion using TikZ `pic` instead of `pgf` code. This can be adjusted.

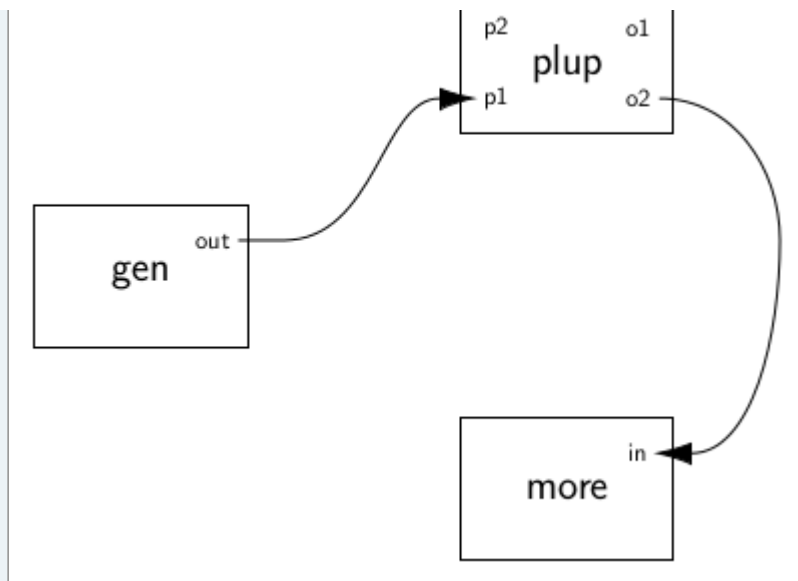
Code: [\[Select all\]](#) [\[Expand/Collapse\]](#) [\[Download\]](#) (untitled.tex) [Open in Overleaf](#)

```
\documentclass[border=10pt]{standalone}
```

```

\usepackage{tikz}
\usetikzlibrary{arrows.meta}
\tikzset{>={Latex[width=3mm,length=5mm]}}
\renewcommand*{\familydefault}{\sfdefault}
\def\Width{1}
\def\Height{0.5}
\tikzset{
  block/.style={
    thick, draw,
    minimum width=2.8cm, minimum height=2cm,
    text width = 3cm, inner sep=0pt,
    text = black, align=center, font=\LARGE,
  },
  pics/blockFourInputs/.style args = {#1/#2/#3/#4}{
    code = {
      \node [block] {\tikzpictext};
      \node (-1) at (-\Width,-\Height) {#1};
      \node (-2) at (-\Width,\Height) {#2};
      \node (-3) at (\Width,\Height) {#3};
      \node (-4) at (\Width,-\Height) {#4};
    }
  }
}
\begin{document}
\begin{tikzpicture}
  \pic (block1) [pic text = plup] at (6,3) {blockFourInputs = p1/p2/o1/o2};
  \pic (block2) [pic text = gen] at (0,0) {blockFourInputs = //out/};
  \pic (block3) [pic text = more] at (6,-3,0) {blockFourInputs = //in/};
  \draw [->] (block2-3) to [in=-180, out=0] ++ (1,0)
    to [in=180, out=0] (block1-1);
  \draw [->] (block1-4) to [in=90, out=0] ++ (2,-2)
    to [in=0, out=270] (block3-3);
\end{tikzpicture}
\end{document}

```



tikz-pic.png (9.46 KiB) Viewed 4296 times

Stefan

Site admin

johnahay

Thu Jan 07, 2016 11:44 pm

Looks very good, I will try that. Thank you!

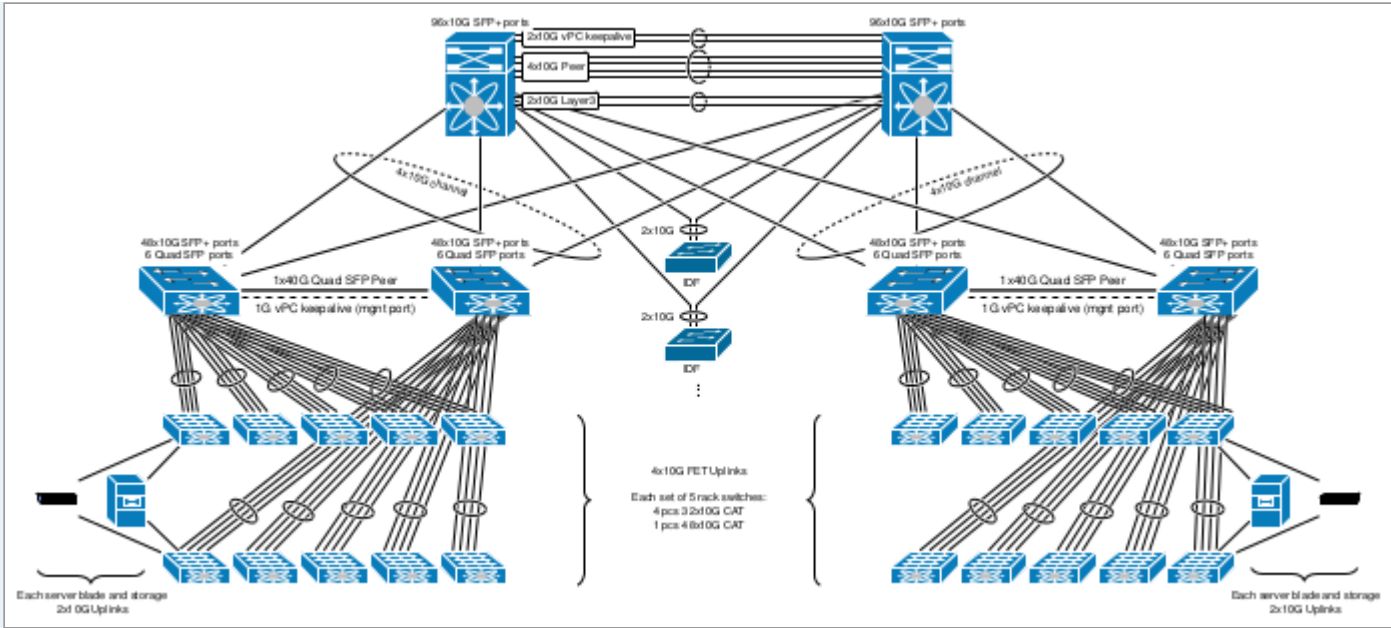


**Stefan Kottwitz**  
Site Admin

Fri Jan 08, 2016 12:45 am

It was a quick shot - [pic](#) codes (TikZ 3.0 or above required) are easier than `pgf` shapes and you can do more in a similar way. Let me know if you would like to know more or if there's trouble in applying it.

And I'm very interested in your final drawings - can you tell us more, post results, perhaps also Python code? I use TikZ for comprehensive network drawings. Just to show, I attach a sample PDF, and embed a downsized preview bitmap. (Not that I post I noticed that my foreground/background bundling ellipses don't work well in the lower part - I accidentally made the lines in the lower parts background lines, to be corrected.)



bandwidth.png (120.21 KiB) Viewed 4294 times

Stefan

ATTACHMENTS

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