

The smartdiagram package*

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Abstract

This package provides a way to easily draw diagrams in documents and presentations from a list of items thanks to TikZ. The idea came out from [this question](#) on [TeX.StackExchange](#).

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*This document corresponds to smartdiagram v0.1, dated 2012/10/28; it is released under and subject to the [L^AT_EX Project Public License \(LPPL\)](#).

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1 Introduction and requirements

The aim of the package is to provide a way to draw diagrams starting from a list of items colored automatically. The diagrams created could be used in a simple document or in a presentation: in the latter case, while using the Beamer class, the user could decide if diagrams should be overlay-awared or not.

Automatically, the `smartdiagram` package loads:

- `TikZ`;
- `etoolbox`;
- `xparse`.

Moreover, the package loads the following TikZ libraries:

- `backgrounds`;
- `calc`;
- `fadings`;
- `shadows`;
- `shapes.arrows`.

and it sets a new layer called `smart diagram arrow back`.

The package could be loaded by means of `\usepackage{smartdiagram}`.

2 Basic Usage

`\smartdiagram` The basic command is `\smartdiagram[⟨type of diagram⟩]{⟨list of items⟩}`. The `{⟨list of items⟩}` should be comma-delimited: to insert, for example, a comma as part of the item label use `\smartdiagram[. . .]{elem1,{elem2,text},elem3}`.

The possible diagrams that could be created are:

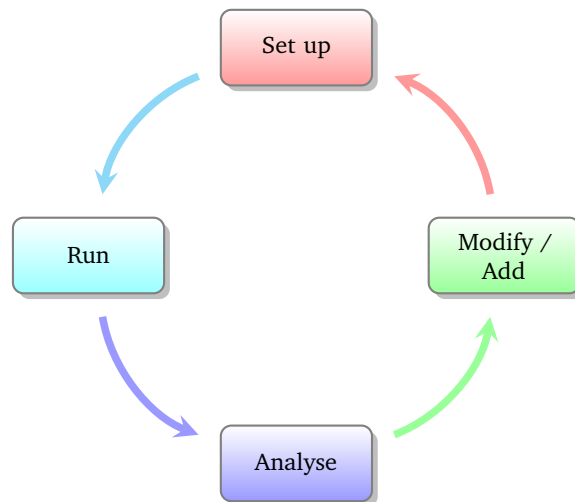
- **circular diagram**: the items in the list are displayed around a circle;
- **flow diagram**: the items in the list are displayed as a flow chart;
- **descriptive diagram**: a diagram in which are displayed concepts and their description;
- **priority descriptive diagram**: a diagram in which the items are deployed based on their relevance;

- **bubble diagram**: each item is a bubble deployed around a bubble center, which is the first element in the list;
- **constellation diagram**: each item is a circle connected to the center, the first element in the list again;
- **connected constellation diagram**: each item is a circle and, a part from the first element in the list, the other ones are connected together.

For example:

```
\begin{center}
\smartdiagram[circular diagram]{Set up,Run,Analyse,Modify~/ Add}
\end{center}
```

produces:



All diagrams could be customized in various ways, from the selection of the background colors to the font size, from the size of the items to the shape of the border. The keys necessary for this task will be analysed in detail in section 3.

For what concern the **bubble diagram**, the **constellation diagram** and the **connected constellation diagram**, they are a bit different from the rest of the diagrams, in the sense that the first item in the $\{\langle list\ of\ items \rangle\}$ is particular: called *bubble center* and *planet*, respectively, its aspect is different and it could be customized with dedicated keys.

`\smartdiagramanimated`

Inside presentations, the user could select if the diagram should be displayed in a *persistent* way, or with an animation. The *persistent* way is achieved by exploiting, again, `\smartdiagram`, while to have the diagram *overlay-aware* the command is `\smartdiagramanimated[⟨type of diagram⟩]{⟨list of items⟩}`.

For diagrams like the **circular diagram** and the **flow diagram** the animation runs as follows: at the beginning the first item of the list is displayed, then each time appears an arrow connecting the previous element with the new one; at the end it is displayed the arrow connecting the last element with the first one. Considering instead the **descriptive diagram**, per couple description title-description, first it is shown the description title and subsequently the description. In the **priority descriptive diagram**, very simply,

the list of items is deployed starting from the bottom, that is the less relevant item, to the top to progressively show much relevant items. Finally, for the `bubble diagram`, the `constellation diagram` and the `connected constellation diagram`, at first it is always shown the *bubble center* and *planet*, respectively and later all the items subsequently.

3 The options

3.1 Setting the options

`\smartdiagramset` The options should be introduced similarly to what happens with `\tikzset` in TikZ: `\smartdiagramset{⟨list of options⟩}`. Examples in which some options are used are shown in section 4.

3.2 Available options

Here follows the list of general available options.

3.2.1 General options

- `module minimum width` (initial: 2cm): this option sets the minimum width of the module;
- `module minimum height` (initial: 1cm): this option sets the minimum height of the module;
- `module y sep` (initial: 1.65): this option sets a vertical distance factor among the modules in a flow diagram;
- `module shape` (initial: rectangle,rounded corners): this option should be used to change the shape of the module, but the user should load manually the proper TikZ library; for example, to use an ellipse, load `shapes.geometric` in the preamble;
- `text width` (initial: 1.75cm): this option sets the text width inside the module;
- `font` (initial: `\small`): this option sets the module font;
- `border color` (initial: gray): this option sets the border color of the module;
- `circular distance` (initial: 2.75cm): this option sets the radius of circle around which the modules in a circular diagram;
- `arrow line width` (initial: 0.1cm): this option sets the width of the connection arrows within two modules;
- `set color list` (initial: none): this option allows the user to define the list of colors usable in the diagram;
- `use predefined color list` (initial: none): this option allows the user to reuse the pre-defined colors whenever in a previous diagram they have been changed;
- `insert decoration` (initial: none): this option allows to decorate the border of the module; the user should declare properly a decoration style and load manually the libraries required, e.g. `decorations.pathmorphing`; some more hints are given in section 5;
- `arrow tip` (initial: stealth): this option allows to select the arrow tip; possible choices are described in the pgfmanual and for particular types it is recommended to load the library `arrows`.

3.2.2 Specific options

Here follows the list of specific available options per type of diagram.

For what concern the **descriptive diagram** and the **priority descriptive diagram**:

- **descriptive items y sep** (initial: 1.75): this option sets a vertical distance factor among the descriptive items;
- **description title width** (initial: 1.5cm): this option sets the minimum width of the description-title;
- **description title text width** (initial: 1.25cm): this option sets the text width of the description-title;
- **description text width** (initial: 5cm): this option sets the text width of the description;
- **description title font** (initial: \small): this option sets the font size of the description-title;
- **description font** (initial: \small): this option sets the font size of the description;
- **description width** (initial: 5.5cm): this option sets the minimum width of the description;
- **priority arrow width** (initial: 1.5cm): this option sets the width of the vertical arrow;
- **priority arrow head extend** (initial: 0.15cm): this option sets the width of the arrow head extend;
- **priority tick size** (initial: 5pt): this option sets the size of the line denoting the relevance position of items in the vertical arrow;
- **priority arrow height advance** (initial: 2cm): this option specifies how much the vertical arrow is vertically extended above the most relevant item.

For what concern the **bubble diagram**, the **constellation diagram** and the **connected constellation diagram**:

- **bubble center node size** (initial: 4cm): the option specifies the minimum size of the bubble center node;
- **bubble center node font** (initial: \large): this option sets the font size of the bubble center node;
- **bubble center node color** (initial: lightgray!60): this option allows to customize the background color of the bubble center node;
- **distance center/other bubbles** (initial: 0.8cm): this options specifies which is the distance among the bubble center node and the other bubbles; keep this value under controll to avoid that bubbles do not overlap anymore the bubble center node;
- **distance text center bubble** (initial: 0.5cm): this option sets the distance from the text to the border of the bubble center node;
- **bubble fill opacity** (initial: 0.5): this option sets the opacity at which the bubbles are shown;
- **bubble node size** (initial: 2.5cm): the option specifies the minimum size of the bubbles;

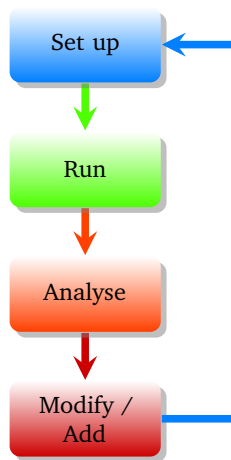
- `bubble text opacity` (initial: 0.8): this option sets the opacity at which the bubble text is shown;
- `bubble node font` (initial: `\normalfont`): this option sets the font size of the bubbles;
- `planet size` (initial: 2.5cm): the option specifies the minimum size of the planet;
- `planet color` (initial: `lightgray!60`): this option allows to customize the background color of the planet;
- `planet font` (initial: `\large`): this option sets the font size of the planet;
- `distance planet-connection` (initial: 0.1cm): this option sets the distance from the planet to the arrow directed to the satellites;
- `distance planet-text` (initial: 0.5cm): this option sets the distance from the text to the border of the planet;
- `planet text width` (initial: 1.75cm): this option sets the planet text width;
- `satellite size` (initial: 1.75cm): the option specifies the minimum size of the satellites;
- `satellite font` (initial: `\normalfont`): this option sets the font size of the satellites;
- `satellite fill opacity` (initial: 0.5): this option sets the opacity at which the satellites are shown;
- `satellite text opacity` (initial: 0.8): this option sets the opacity at which the satellite text is shown;
- `satellite text width` (initial: 1.5cm): this option sets the satellite text width;
- `distance satellite-connection` (initial: 0.075cm): this option sets the distance from the satellites to the arrows directed to the planet;
- `connection line width` (initial: 0.1cm): this option allows to customize the width of the connections from the planet to the satellites;
- `distance planet-satellite` (initial: 3.5cm): this option determine the distance among any pair of planet-satellite.

4 Gallery of examples

Flow chart with custom
color list

Example with a flow chart:

```
\begin{center}
\smartdiagramset{border color=none,
  set color list={blue!50!cyan,green!60!lime,orange!50!red,red!80!black}}
\smartdiagram[flow diagram]{Set up,Run,Analyse,Modify~/ Add}
\end{center}
```



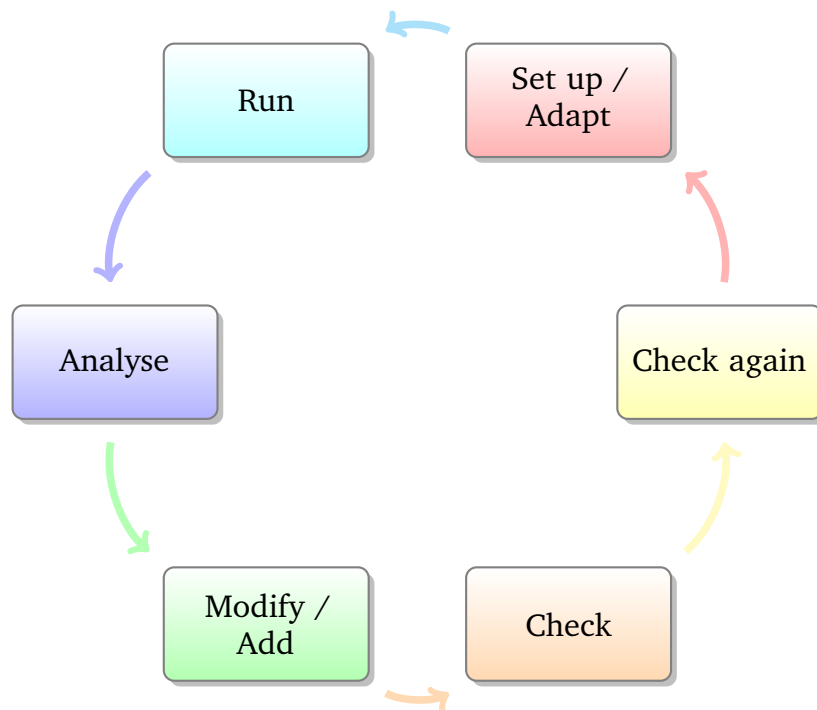
Circular diagram with
custom options

Another example:

```

\begin{center}
\smartdiagramset{circular distance=4cm, font=\large, text width=2.5cm,
module minimum width=2.5cm, module minimum height=1.5cm,arrow tip=to}
\smartdiagram[circular diagram]{Set up~/ Adapt,Run,Analyse,Modify~/ Add,Check,Check again}
\end{center}

```



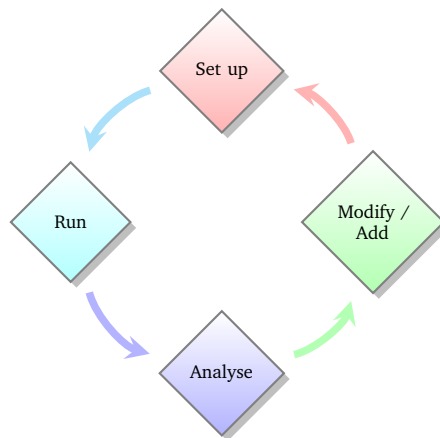
Circular diagram with
custom shape

An example with a diamond shape:

```

\begin{center}
\usetikzlibrary{shapes.geometric} % required in the preamble
\smartdiagramset{module shape=diamond,font=\scriptsize,
  module minimum width=1cm,module minimum height=1cm,text width=1cm,
  circular distance=2cm}
\smartdiagram[circular diagram]{Set up,Run,Analyse,Modify~/ Add}
\end{center}

```



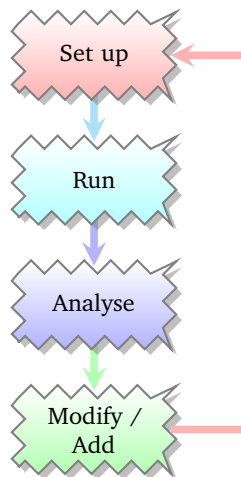
Flow diagram with
decorated border

An example with a decorated shape:

```

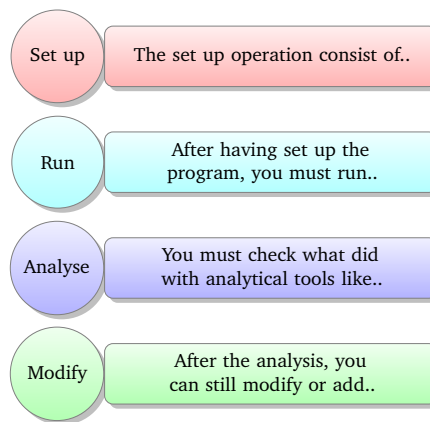
\usetikzlibrary{decorations.pathmorphing} % required in the preamble
\begin{center}
\tikzset{my decoration/.style={decorate,decoration=zigzag}}
\smartdiagramset{module shape=rectangle,insert decoration={my decoration}}
\smartdiagram[flow diagram]{Set up,Run,Analyse,Modify~/ Add}
\end{center}

```



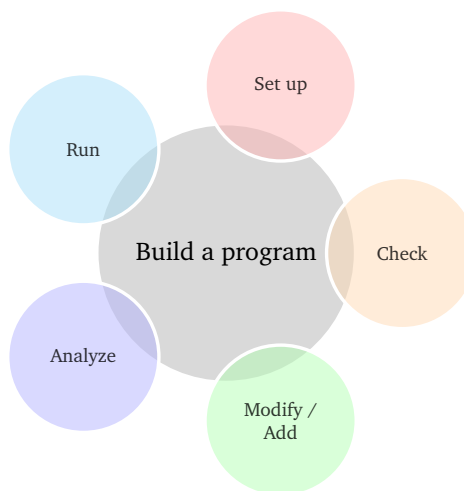
Descriptive diagram An example of descriptive diagram:

```
\begin{center}
\smartdiagram[descriptive diagram]{
{Set up,The set up operation consist of..},
{Run, {After having set up the program, you must run..}},
{Analyse, You must check what did with analytical tools like..},
{Modify, {After the analysis, you can still modify or add..}},
}
\end{center}
```



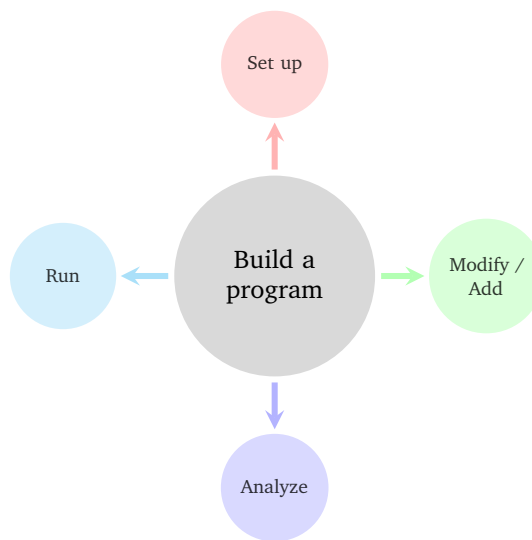
Bubble diagram An example of bubble diagram:

```
\begin{center}
\smartdiagram[bubble diagram]{Build a program,Set up,Run,Analyze,Modify~/\\ Add,Check}
\end{center}
```



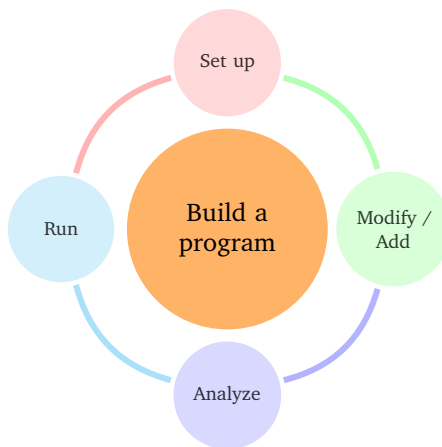
Constellation diagram An example of constellation diagram:

```
\begin{center}
\smartdiagram[constellation diagram]{Build a program,Set up,Run,Analyze,Modify~/\ Add}
\end{center}
```



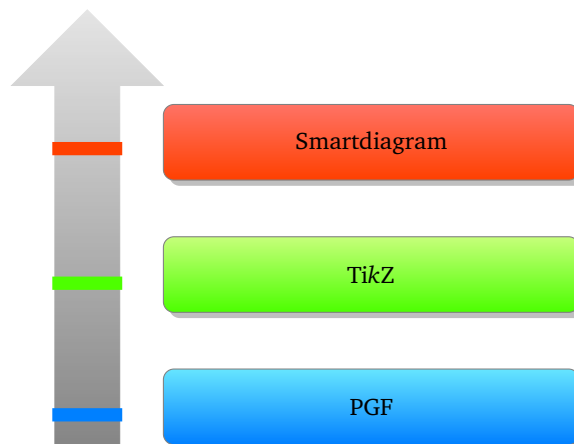
Connected constellation diagram An example of connected constellation diagram:

```
\begin{center}
\smartdiagramset{planet color=orange!60, distance planet-satellite=1cm}
\smartdiagram[connected constellation diagram]
{Build a program,Set up,Run,Analyze,Modify~/\ Add,Check}
\end{center}
```



Priority descriptive diagram An example of priority descriptive diagram describing that TikZ is built on top of PGF and Smartdiagram on top of TikZ:

```
\begin{center}
\smartdiagramset{set color list={blue!50!cyan,green!60!lime,orange!50!red},
priority arrow width=2cm,priority arrow height advance=2.25cm}
\smartdiagram[priority descriptive diagram]{PGF,Ti\textit{k}Z,Smartdiagram}
\end{center}
```



5 Recommendations and known issues

5.1 Something about colors

As seen in the section 3, the colors could be customized by means of the key `set color list`. By default there are 10 predefined colors; in order: red!40 (red), cyan!40 (cyan), blue!40 (blue), green!40 (green), orange!40 (orange), yellow!40 (yellow), magenta!40 (magenta), brown!40 (brown), violet!40 (violet) and teal!40 (teal). This implies that, by default, it is not possible to have list longer than 10 items. This, of course, could be avoided by declaring its own proper list with, say, 20 colors and therefore develop diagrams with more than 10 items. In any case, it is always possible to reset custom color lists by means of:

```
\smartdiagramset{use predefined color list}
```

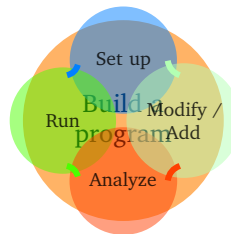
5.2 Circular, bubble and constellation diagrams

For these type of diagrams, the number of items is relevant: too many items lead to overlapping satellites and bubbles besides any attempt to resize things by means of keys that reduce the radius.

Notice also that imposing a too short distance from the planet to satellites is bad and leads to something like:

```
\begin{center}
```

```
\smartdiagramset{planet color=orange!60, distance planet-satellite=1cm}
\smartdiagram[connected constellation diagram]
{Build a program,Set up,Run,Analyze,Modify~/\ Add,Check}
\end{center}
```



5.3 Descriptive diagrams

When the user has to build a **descriptive diagram**, simple or animated, the following rules have to be respected:

- each description title and description should be separated by a comma;
- to use a comma inside a description, enclose by { } the description;
- use a comma after the last couple description title-description.

A working example:

```
\smartdiagram[descriptive diagram]{
{Set up,The set up operation consist of..},
{Run, {After having set up the program, you must run..}},
{Analyze, You must check what did with analytical tools like..},
}
```

A non-working example:

```
\smartdiagram[descriptive diagram]{
{Set up,The set up operation consist of..},
{Run, {After having set up the program, you must run..}},
{Analyze, You must check what did with analytical tools like..}
}
```

The *mandatory* final comma is missing thus, as result, the last couple description title-description will be entirely treated as a description title.

Another suggestion regarding descriptive diagrams is about the description title: it should be short in order to avoid the size of the circle explode. To kept it under controll, the keys `description title width`, `description title text width` and `description title font` are of help.

5.4 Decorations

To decorate the border of modules, it is kindly recommended to first declare the decoration chosen by means of an apposite style and then apply the style. The procedure, in code, should be as follows:

```
\tikzset{my wonderful decoration/.style={decorate,decoration=bent}}
\smartdiagramset{insert decoration=my wonderful decoration,...}
```

where the dots represent the other options.

The insertion of decorations inside a **descriptive diagram** are problematic: only random steps, bent and coil do not raise errors. Other decorations, like coil, raise as error:

```
! Dimension too large.
```

but, after all, the decoration is deployed anyway.

In case the user wants to decorate a border with a decoration that involves random numbers, such as random steps or other custom-built decorations, it is preferable to set a seed for the animated diagram, to avoid that at each step the border of the same module changes. An example:

```
\begin{frame}
\begin{center}
\pgfmathsetseed{12354}
\tikzset{my decoration/.style={decorate,decoration=random steps}}
\smartdiagramset{insert decoration=my decoration}
\smartdiagramanimated[descriptive diagram]{
{Set up,The set up operation consist of..},
{Run, {After having set up the program, you must run..}},
{Analyze, You must check what did with analytical tools like..},
{Modify, {After the analysis, you can still modify or add..}},
}
\end{center}
\end{frame}
```

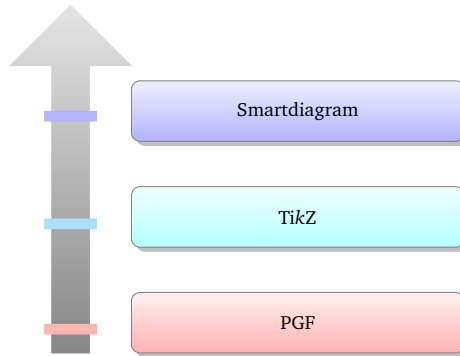
5.5 Priority descriptive diagrams

The vertical arrow is drawn in background with a fading effect: it may occur that under some pdf editor this effect is not shown (this happened to me with evince, but it perfectly worked with okular).

For what concern these diagrams there is a bug in displaying the tick line when the **priority arrow head extend** is set with a bigger size than the default; a minimal-non-working example:

```
\begin{center}
\smartdiagramset{priority arrow width=2cm,priority arrow height advance=2.25cm,
priority arrow head extend=0.3cm}
\smartdiagram[priority descriptive diagram]{PGF,Ti\textit{k}Z,Smartdiagram}
```

\end{center}



6 Acknowledgements

I would like to acknowledge first of all [Alain Matthes](#) and [Mohsen](#) because the [bubble diagram](#) and the [constellation diagram](#) are based on [Alain's answer](#) while the [circular diagram](#) is based on [Mohsen's answer](#).

Last, but not least, I would like to thank [Enrico Gregorio](#) and [Ahmed Musa](#) for the courtesy of explaining me why my poor attempt in creating the [set color list](#) failed and for providing me valid solutions.

7 Implementation

7.1 Initialization and Package Options

This subsection highlights which are the package loaded and the `tikzlibraries` needed.

```
1 \RequirePackage{tikz}
2 \RequirePackage{xparse,etoolbox}
3
4 \usetikzlibrary{backgrounds,calc,fadings,shadows,shapes.arrows}
5 \pgfdeclarelayer{smart diagram arrow back}
6 \pgfsetlayers{background,smart diagram arrow back,main}
```

7.2 Keys and color declaration

The predefined colors:

```
7 \@namedef{color@1}{red!40}
8 \@namedef{color@2}{cyan!40}
9 \@namedef{color@3}{blue!40}
10 \@namedef{color@4}{green!40}
11 \@namedef{color@5}{orange!40}
12 \@namedef{color@6}{yellow!40}
13 \@namedef{color@7}{magenta!40}
```

```

14 \@namedef{color@8}{brown!40}
15 \@namedef{color@9}{violet!40}
16 \@namedef{color@10}{teal!40}

```

Basic shape definition and function to compute the height of the **priority descriptive diagram**:

```

17 \tikzset{rnd rectangle/.style={rectangle,rounded corners}
18 }
19
20 \def\CalcHeight(#1,#2)#3{%
21 \pgfpointdiff{\pgfpointanchor{#1}{south west}}{\pgfpointanchor{#2}{north west}}
22 \pgfmathsetmacro{\myheight}{veclen(\pgf@x,\pgf@y)}
23 \global\expandafter\edef\csname #3\endcsname{\myheight}
24 }

```

The key definition and function to set them:

```

25 \pgfkeys{/smart diagram/.cd, module minimum width/.initial=2cm,
26   module minimum height/.initial={1cm},
27   module y sep/.initial={1.65},
28   descriptive items y sep/.initial={1.75},
29   text width/.initial={1.5cm},
30   description title width/.initial={1.5cm},
31   description text width/.initial={5cm},
32   description title text width/.initial={1.25cm},
33   description title font/.initial={\small},
34   description font/.initial={\small},
35   description width/.initial={5.5cm},
36   font/.initial={\small},
37   border color/.initial={gray},
38   circular distance/.initial={2.75cm},
39   arrow line width/.initial={0.1cm},
40   module shape/.initial={rnd rectangle},
41   insert decoration/.initial={},
42   arrow tip/.initial={stealth},
43   bubble center node size/.initial={4cm},
44   bubble center node font/.initial={\large},
45   bubble center node color/.initial={lightgray!60},
46   distance center/other bubbles/.initial=0.8cm,
47   distance text center bubble/.initial={0.5cm},
48   bubble fill opacity/.initial={0.5},
49   bubble node size/.initial={2.5cm},
50   bubble text opacity/.initial={0.8},
51   bubble node font/.initial={\normalfont},
52   planet size/.initial={2.5cm},
53   planet color/.initial={lightgray!60},
54   planet font/.initial={\large},
55   distance planet-connection/.initial={0.1cm},
56   distance planet-text/.initial={0.5cm},
57   planet text width/.initial={1.75cm},
58   satellite size/.initial={1.75cm},
59   satellite font/.initial={\normalfont},

```

```

60     satellite fill opacity/.initial={0.5},
61     satellite text opacity/.initial={0.8},
62     satellite text width/.initial={1.5cm},
63     distance satellite-connection/.initial={0.075cm},
64     connection line width/.initial={0.1cm},
65     distance planet-satellite/.initial={3.5cm},
66     priority arrow width/.initial={1.5cm},
67     priority arrow head extend/.initial={0.15cm},
68     priority tick size/.initial={5pt},
69     priority arrow height advance/.initial={2cm},
70 }%
71
72 \pgfkeys{/smart diagram/.cd, module minimum width/.get=\modulewidth,
73     module minimum height/.get=\moduleheight,
74     module y sep/.get=\moduleysep,
75     descriptive items y sep/.get=\descriptiveitemsysep,
76     text width/.get=\moduletextwidth,
77     description title width/.get=\descriptiontitlewidth,
78     description text width/.get=\descriptiontextwidth,
79     description title text width/.get=\descriptiontitletextwidth,
80     description title font/.get=\descriptiontitlefontsize,
81     description font/.get=\descriptionfontsize,
82     description width/.get=\descriptionwidth,
83     font/.get=\modulefontsize,
84     border color/.get=\bordercolor,
85     circular distance/.get=\circulardistance,
86     arrow line width/.get=\arrowlinewidth,
87     module shape/.get=\moduleshape,
88     insert decoration/.get=\borderdecoration,
89     arrow tip/.get=\arrowtip,
90     bubble center node size/.get=\bubblecenternodesize,
91     bubble center node font/.get=\bubblecenternodefont,
92     bubble center node color/.get=\bubblecenternodecolor,
93     distance center/other bubbles/.get=\distancecenterotherbubbles,
94     distance text center bubble/.get=\distancetextcenterbubble,
95     bubble fill opacity/.get=\bubblefillopacity,
96     bubble node size/.get=\bubblenodesize,
97     bubble text opacity/.get=\bubbletextopacity,
98     bubble node font/.get=\bubblenodefont,
99     planet size/.get=\planetminimumsize,
100    planet color/.get=\planetcolor,
101    planet font/.get=\planetfont,
102    distance planet-connection/.get=\planetoutersep,
103    distance planet-text/.get=\planetinnersep,
104    planet text width/.get=\planettextwidth,
105    satellite size/.get=\satelliteminimumsize,
106    satellite font/.get=\satellitefont,
107    satellite fill opacity/.get=\satellitefillopacity,
108    satellite text opacity/.get=\satellitetextopacity,
109    satellite text width/.get=\satellitetextwidth,

```



```

110 distance satellite-connection/.get=\satelliteoutersep,
111 connection line width/.get=\connectionlinewidth,
112 distance planet-satellite/.get=\distanceplanetsatellite,
113 priority arrow width/.get=\priorityarrowwidth,
114 priority arrow head extend/.get=\priorityarrowheadextend,
115 priority tick size/.get=\prioritytick,
116 priority arrow height advance/.get=\priorityarrowheightadvance,
117 }%
118
119 \pgfkeys{/smart diagram/.cd, set color list/.code={
120     \foreach \listitem [count=\i] in {#1}{
121         \global\@namedef{color@i}\expandafter}\expandafter{\listitem}
122     }
123 }
124 }
125
126 \pgfkeys{/smart diagram/.cd, use predefined color list/.code={
127     \@namedef{color@1}{red!30}
128     \@namedef{color@2}{cyan!30}
129     \@namedef{color@3}{blue!30}
130     \@namedef{color@4}{green!30}
131     \@namedef{color@5}{orange!30}
132     \@namedef{color@6}{yellow!30}
133     \@namedef{color@7}{magenta!30}
134     \@namedef{color@8}{brown!30}
135     \@namedef{color@9}{violet!30}
136     \@namedef{color@10}{teal!30}
137 }
138 }
139
140 \NewDocumentCommand{\smartdiagramset}{m}{%
141     \pgfkeys{/smart diagram/.cd, #1}%
142     \pgfkeys{/smart diagram/.cd, module minimum width/.get=\modulewidth,
143     module minimum height/.get=\moduleheight,
144     module y sep/.get=\moduleysep,
145     descriptive items y sep/.get=\descriptiveitemsysep,
146     text width/.get=\moduletextwidth,
147     description title width/.get=\descriptiontitlewidth,
148     description text width/.get=\descriptiontextwidth,
149     description title text width/.get=\descriptiontitletextwidth,
150     description title font/.get=\descriptiontitlefontsize,
151     description font/.get=\descriptionfontsize,
152     description width/.get=\descriptionwidth,
153     font/.get=\modulefontsize,
154     border color/.get=\bordercolor,
155     circular distance/.get=\circulardistance,
156     arrow line width/.get=\arrowlinewidth,
157     module shape/.get=\moduleshape,
158     insert decoration/.get=\borderdecoration,
159     arrow tip/.get=\arrowtip,

```

```

160 bubble center node size/.get=\bubblecenternodesize,
161 bubble center node font/.get=\bubblecenternodefont,
162 bubble center node color/.get=\bubblecenternodecolor,
163 distance center/other bubbles/.get=\distancecenterotherbubbles,
164 distance text center bubble/.get=\distancetextcenterbubble,
165 bubble fill opacity/.get=\bubblefillopacity,
166 bubble node size/.get=\bubblenodesize,
167 bubble text opacity/.get=\bubbletextopacity,
168 bubble node font/.get=\bubblenodefont,
169 planet size/.get=\planetminimumsize,
170 planet color/.get=\planetcolor,
171 planet font/.get=\planetfont,
172 distance planet-connection/.get=\planetoutersep,
173 distance planet-text/.get=\planetinnersep,
174 planet text width/.get=\planettextwidth,
175 satellite size/.get=\satelliteminimumsize,
176 satellite font/.get=\satellitefont,
177 satellite fill opacity/.get=\satellitefillopacity,
178 satellite text opacity/.get=\satellitetextopacity,
179 satellite text width/.get=\satellitetextwidth,
180 distance satellite-connection/.get=\satelliteoutersep,
181 connection line width/.get=\connectionlinewidth,
182 distance planet-satellite/.get=\distanceplanetsatellite,
183 priority arrow width/.get=\priorityarrowwidth,
184 priority arrow head extend/.get=\priorityarrowheadextend,
185 priority tick size/.get=\prioritytick,
186 priority arrow height advance/.get=\priorityarrowheightadvance,
187 }%
188 }%

```

The fading style applied to the **priority descriptive diagram** and styles diagram definition:

```

189 \tikzfading[name=priorityarrowfading, bottom color=transparent!5, top color=transparent!80]
190 \tikzset{priority arrow fill/.style={fill=gray,path fading=priorityarrowfading}}
191
192 \tikzset{module/.style={
193     \pgfkeysvalueof{/smart diagram/module shape},
194     thick,
195     draw=\bordercolor,
196     top color=white,
197     bottom color=\col,
198     text width=\moduletextwidth,
199     minimum width=\modulewidth,
200     minimum height=\moduleheight,
201     font=\modulefontsize,
202     \borderdecoration
203 },
204 diagram arrow type/.style={
205     >=\arrowtip,line width=\arrowlinewidth,\col,
206 },

```

```

207 }
208 \tikzset{description title/.style={
209     circle,
210     draw=\bordercolor,
211     minimum width=\descriptiontitlewidth,
212     anchor=east,
213     bottom color=\col,
214     top color=white!80!\col,
215     font=\descriptiontitlefontsize,
216     text width=\descriptiontitletextwidth,
217     \borderdecoration,
218 },
219 description/.style={
220     \pgfkeysvalueof{/smart diagram/module shape},
221     text width=\descriptiontextwidth,
222     draw=\bordercolor,
223     anchor=west,
224     minimum height=\moduleheight,
225     minimum width=\descriptionwidth,
226     bottom color=\col,
227     top color=white!80!\col,
228     font=\descriptionfontsize,
229     \borderdecoration,
230 }
231 }
232 \tikzset{priority arrow/.style={
233     draw=\bordercolor,
234     single arrow,
235     minimum height=\distancemodules,
236     minimum width=\priorityarrowwidth,
237     priority arrow fill,
238     rotate=90,
239     single arrow head extend=\priorityarrowheadextend,
240     anchor=west,
241 }
242 }
243 \tikzset{bubble center node/.style={
244     minimum size=\bubblecenternodesize,
245     circle,
246     fill=\bubblecenternodecolor,
247     font=\bubblecenternodefont,
248     outer sep=\distancecenterotherbubbles,
249     inner sep=\distancetextcenterbubble,
250 },
251 bubble node/.style={
252     minimum size=\bubblenodesize,
253     circle,
254     ultra thick,
255     font=\bubblenodefont,
256     draw=white,

```

```

257 fill opacity=\bubblefillopacity,
258 fill=\col,
259 text opacity=\bubbletextopacity,
260 }
261 }
262 \tikzset{planet/.style={
263     minimum size=\planetminimumsize,
264     circle,
265     fill=\planetcolor,
266     font=\planetfont,
267     outer sep=\planetoutersep,
268     inner sep=\planetinnersep,
269     text width=\planettextwidth,
270 },
271 satellite/.style={
272     minimum size=\satelliteminimumsize,
273     circle,
274     font=\satellitefont,
275     fill opacity=\satellitefillopacity,
276     fill=\col,
277     text opacity=\satellitetextopacity,
278     text width=\satellitetextwidth,
279     outer sep=\satelliteoutersep,
280 },
281 connection planet satellite/.style={
282     line width=\connectionlinewidth,
283     >=\arrowtip,
284     \col,
285 }
286 }

```

7.3 Commands

Definition of the two basic commands. The diagrams:

```

287 \NewDocumentCommand{\smartdiagram}{r[] m}{%
288     \IfNoValueTF{#1}{% true-no value 1
289         \PackageError{smartdiagram}{Type of the diagram not inserted. Please insert it}
290         {Example: \protect\smartdiagram[flow diagram]}}
291     {%false-no value 1
292         \ifstrequal{#1}{circular diagram}{% true-circular diagram
293             \begin{tikzpicture}[every node/.style={align=center}]
294
295             \foreach \smitem [count=\xi] in {#2} {\global\let\maxsmitem\xi}
296
297             \foreach \smitem [count=\xi] in {#2}{%
298                 \pgfmathtruncatemacro{\angle}{360/\maxsmitem*\xi}
299                 \edef\col{\@nameuse{color@\xi}}
300                 \node[module,drop shadow] (module\xi) at (\angle:\circulardistance) {\smitem };
301             }%

```

```

302
303 \foreach \smitem [count=\xi] in {#2}{%
304 \pgfmathtruncatemacro{\xj}{mod(\xi, \maxsmitem) + 1}}
305 \edef\col{\@nameuse{color@\xj}}
306 \draw[<-,diagram arrow type,shorten <=0.3cm,shorten >=0.3cm]
307 (module\xj) to[bend left] (module\xi);
308 }%
309 \end{tikzpicture}
310 }{}% end-circular diagram
311 \ifstrequal{#1}{flow diagram}{% true-flow diagram
312 \begin{tikzpicture}[every node/.style={align=center}]
313
314 \foreach \smitem [count=\xi] in {#2} {\global\let\maxsmitem\xi}
315
316 \foreach \smitem [count=\xi] in {#2}{%
317 \edef\col{\@nameuse{color@\xi}}
318 \path let \n1 = {int(0-\xi)}, \n2={0-\xi*\moduleysep}
319 in node[module,drop shadow] (module\xi) at +(0,\n2) {\smitem};
320
321 }%
322
323 \foreach \smitem [count=\xi] in {#2}{%
324 \pgfmathtruncatemacro{\xj}{mod(\xi, \maxsmitem) + 1}}
325 \edef\col{\@nameuse{color@\xj}}
326 \ifnum\xi<\maxsmitem
327 \begin{pgfonlayer}{smart diagram arrow back}
328 \draw[<-,diagram arrow type] (module\xj) -- (module\xi);
329 \end{pgfonlayer}
330 \fi
331 % last arrow - not display it in background
332 \ifnum\xi=\maxsmitem
333 \draw[<-,diagram arrow type] (module\xj.east)--
334 ($ (module\xj.east)+(1,0)$) |- (module\xi);
335 \fi
336 }%
337 \end{tikzpicture}
338 }{}% end-flow diagram
339 \ifstrequal{#1}{descriptive diagram}{% true-descriptive diagram
340 \begin{tikzpicture}[every node/.style={align=center}]
341 \foreach \smitem [count=\xi] in {#2}{%
342 \edef\col{\@nameuse{color@\xi}}
343 \foreach \subitem [count=\xii] in \smitem{%
344 \ifnumequal{\xii}{1}{% true
345 \node[description title,drop shadow]
346 (module-title\xi) at (0,0-\xi*\descriptiveitemsysep) {\subitem};
347 }{}
348 \ifnumequal{\xii}{2}{% true
349 \node[description,drop shadow](module\xi)
350 at (0,0-\xi*\descriptiveitemsysep) {\subitem};
351 }{}

```

```

352 }%
353 }%
354 \end{tikzpicture}
355 }{}% end-descriptive diagram
356 \ifstrequal{#1}{bubble diagram}{% true-bubble diagram
357 \begin{tikzpicture}[every node/.style={align=center}]
358 \foreach \smitem [count=\xi] in {#2}{\global\let\maxsmitem\xi}
359 \pgfmathtruncatemacro\actualnumitem{\maxsmitem-1}
360 \foreach \smitem [count=\xi] in {#2}{%
361 \ifnumequal{\xi}{1}{ %true
362 \node[bubble center node](center bubble){\smitem};
363 }{%false
364 \pgfmathtruncatemacro\xj{\xi-1}
365 \pgfmathtruncatemacro\angle{360/\actualnumitem*\xj}
366 \edef\col{\@nameuse{color@\xj}}
367 \node[bubble node] (module\xi) at (center bubble.\angle) {\smitem };
368 }%
369 }%
370 \end{tikzpicture}
371 }{}%end-bubble diagram
372 \ifstrequal{#1}{constellation diagram}{% true-constellation diagram
373 \begin{tikzpicture}[every node/.style={align=center}]
374 \foreach \smitem [count=\xi] in {#2}{\global\let\maxsmitem\xi}
375 \pgfmathtruncatemacro\actualnumitem{\maxsmitem-1}
376 \foreach \smitem [count=\xi] in {#2}{%
377 \ifnumequal{\xi}{1}{ %true
378 \node[planet](planet){\smitem};
379 }{%false
380 \pgfmathtruncatemacro\xj{\xi-1}
381 \pgfmathtruncatemacro\angle{360/\actualnumitem*\xj}
382 \edef\col{\@nameuse{color@\xj}}
383 \node[satellite] (satellite\xi) at (\angle:\distanceplanetsatellite) {\smitem };
384 \draw[->,connection planet satellite] (planet) -- (satellite\xi);
385 }%
386 }%
387 \end{tikzpicture}
388 }{}%end-constellation diagram
389 \ifstrequal{#1}{connected constellation diagram}{% true-connected constellation diagram
390 \begin{tikzpicture}[every node/.style={align=center}]
391 \foreach \smitem [count=\xi] in {#2}{\global\let\maxsmitem\xi}
392 \pgfmathtruncatemacro\actualnumitem{\maxsmitem-1}
393 \foreach \smitem [count=\xi] in {#2}{%
394 \ifnumequal{\xi}{1}{ %true
395 \node[planet](planet){\smitem};
396 }{%false
397 \pgfmathtruncatemacro\xj{\xi-1}
398 \pgfmathtruncatemacro\angle{360/\actualnumitem*\xj}
399 \edef\col{\@nameuse{color@\xj}}
400 \node[satellite] (satellite\xj) at (\angle:\distanceplanetsatellite) {\smitem };
401 }%

```

```

402 }%
403 \foreach \smitem [count=\xi] in {#2}{%
404     \ifnumgreater{\xi}{1}{ %true
405         \pgfmathtruncatemacro{\xj}{\xi-1}
406         \edef\col{\@nameuse{color@\xj}}
407         \pgfmathtruncatemacro{\xk}{mod(\xj,\actualnumitem) +1}
408         \path[connection planet satellite] (satellite\xj) edge[bend right] (satellite\xk);
409     }{}
410 }%
411 \end{tikzpicture}
412 }{}%end-connected constellation diagram
413 \ifstrequal{#1}{priority descriptive diagram}{% true-priority descriptive diagram
414     \pgfmathparse{subtract(\priorityarrowwidth,\priorityarrowheadextend)}
415     \pgfmathsetmacro{\priorityticksize}{\pgfmathresult/2}
416     \pgfmathsetmacro{\arrowtickxshift}{(\priorityarrowwidth-\priorityticksize)/2}
417     \begin{tikzpicture}[every node/.style={align=center}]
418         \foreach \smitem [count=\xi] in {#2}{\global\let\maxsmitem\xi}
419         \foreach \smitem [count=\xi] in {#2}{%
420             \edef\col{\@nameuse{color@\xi}}
421             \node[description,drop shadow] (module\xi)
422                 at (0,0+\xi*\descriptivitemsysep) {\smitem};
423 \draw[line width=\prioritytick,\col] ([xshift=-\arrowtickxshift pt]module\xi.base west)--
424     ($([xshift=-\arrowtickxshift pt]module\xi.base west)-(\priorityticksize pt,0)$);
425 }%
426 \coordinate (A) at (module1);
427 \coordinate (B) at (module\maxsmitem);
428 \CalcHeight(A,B){heightmodules}
429 \pgfmathadd{\heightmodules}{\priorityarrowheightadvance}
430 \pgfmathsetmacro{\distancemodules}{\pgfmathresult}
431 \pgfmathsetmacro{\arrowxshift}{\priorityarrowwidth/2}
432 \begin{pgfonlayer}{background}
433     \node[priority arrow] at ([xshift=-\arrowxshift pt]module1.south west){};
434 \end{pgfonlayer}
435 \end{tikzpicture}
436 }{}% end-priority descriptive diagram
437}% end-no value 1
438}% end-command

```

Definition of the style for making visible elements and command definition for animations:

```

439 \tikzset{
440     sminvisible/.style={opacity=0,text opacity=0},
441     smvisible on/.style={smalt=#1}{sminvisible}},
442     smalt/.code args={<#1>#2#3}{%
443         \alt<#1>{\pgfkeysalso{#2}}{\pgfkeysalso{#3}}
444     },
445 }
446
447
448 \NewDocumentCommand{\smartdiagramanimated}{r[] m}{%
449     \IfNoValueTF{#1}{% true-no value 1

```

```

450 \PackageError{smartdiagram}{Type of the diagram not inserted. Please insert it}
451 {Example: \protect\smartdiagram[flow diagram]}}
452 {%false-no value 1
453 \ifstrequal{#1}{circular diagram}{% true-circular diagram
454 \begin{tikzpicture}[every node/.style={align=center}]
455
456 \foreach \smitem [count=\xi] in {#2} {\global\let\maxsmitem\xi}
457
458 \foreach \smitem [count=\xi] in {#2}{%
459 \pgfmathtruncatemacro{\angle}{360/\maxsmitem*\xi}
460 \edef\col{\@nameuse{color@\xi}}
461 \node[module,
462 drop shadow={smvisible on=<\xi->},
463 smvisible on=<\xi->] (module\xi) at (\angle:\circulardistance) {\smitem };
464 }%
465
466 \foreach \smitem [count=\xi] in {#2}
467 {%
468 \pgfmathtruncatemacro{\xj}{mod(\xi, \maxsmitem) + 1)}
469 \pgfmathtruncatemacro{\adv}{\xi + 1)}
470 \edef\col{\@nameuse{color@\xi}}
471 \draw[<-,diagram arrow type,shorten <=0.3cm,shorten >=0.3cm,
472 smvisible on=<\adv->] (module\xj) to[bend left] (module\xi);
473 }%
474 \end{tikzpicture}
475 }{% end-circular diagram
476 \ifstrequal{#1}{flow diagram}{% true-flow diagram
477 \begin{tikzpicture}[every node/.style={align=center}]
478
479 \foreach \smitem [count=\xi] in {#2} {\global\let\maxsmitem\xi}
480
481 \foreach \smitem [count=\xi] in {#2}{%
482 \edef\col{\@nameuse{color@\xi}}
483 \path let \n1 = {int(0-\xi)}, \n2={0-\xi*\moduleysep}
484 in node[module,
485 drop shadow={smvisible on=<\xi->},
486 smvisible on=<\xi->] (module\xi) at +(0,\n2) {\smitem};
487 }%
488 }%
489
490 \foreach \smitem [count=\xi] in {#2}{%
491 \pgfmathtruncatemacro{\xj}{mod(\xi, \maxsmitem) + 1)}
492 \edef\col{\@nameuse{color@\xj}}
493 \ifnum\xi<\maxsmitem
494 \begin{pgfonlayer}{smart diagram arrow back}
495 \draw[<-,diagram arrow type,smvisible on=<\xi->]
496 (module\xj) -- (module\xi);
497 \end{pgfonlayer}
498 \fi
499 % last arrow - not display it in background

```



```

500 \ifnum\xi=\maxsmitem
501 \draw[<-,diagram arrow type,smvisible on=<\xi->]
502 (module\xj.east)--($ (module\xj.east)+(1,0)$) |- (module\xi);
503 \fi
504 }%
505 \end{tikzpicture}
506 }{}% end-flow diagram
507 \ifstrequal{#1}{descriptive diagram}{% true-descriptive diagram
508 \begin{tikzpicture}[every node/.style={align=center}]
509 \foreach \smitem [count=\xi] in {#2}{%
510 \edef\col{\@nameuse{color@\xi}}
511
512 \foreach \subitem [count=\xii] in \smitem{%
513 \pgfmathtruncatemacro\subitemvisible{\xi}
514 \ifnumequal{\xii}{1}{% true
515 \node[description title,drop shadow, smvisible on=<\subitemvisible->]
516 (module-title\xi) at (0,0-\xi*\descriptiveitemsysep) {\subitem};\pause
517 }{}
518 \ifnumequal{\xii}{2}{% true
519 \node[description,drop shadow,smvisible on=<\subitemvisible->]
520 (module\xi)at (0,0-\xi*\descriptiveitemsysep) {\subitem};\pause
521 }{}
522 }%
523 }%
524 \end{tikzpicture}
525 }{}% end-descriptive diagram
526 \ifstrequal{#1}{bubble diagram}{% true-bubble diagram
527 \begin{tikzpicture}[every node/.style={align=center}]
528 \foreach \smitem [count=\xi] in {#2}{\global\let\maxsmitem\xi}
529 \pgfmathtruncatemacro\actualnumitem{\maxsmitem-1}
530 \foreach \smitem [count=\xi] in {#2}{%
531 \ifnumequal{\xi}{1}{% true
532 \node[bubble center node, smvisible on=<\xi->](center bubble){\smitem};
533 }{%false
534 \pgfmathtruncatemacro{xj}{\xi-1}
535 \pgfmathtruncatemacro{angle}{360/\actualnumitem*xj}
536 \edef\col{\@nameuse{color@\xj}}
537 \node[bubble node, smvisible on=<\xi->](module\xi) at (center bubble.\angle) {\smitem };
538 }%
539 }%
540 \end{tikzpicture}
541 }{}%end-bubble diagram
542 \ifstrequal{#1}{constellation diagram}{% true-constellation diagram
543 \begin{tikzpicture}[every node/.style={align=center}]
544 \foreach \smitem [count=\xi] in {#2}{\global\let\maxsmitem\xi}
545 \pgfmathtruncatemacro\actualnumitem{\maxsmitem-1}
546 \foreach \smitem [count=\xi] in {#2}{%
547 \ifnumequal{\xi}{1}{% true
548 \node[planet, smvisible on=<\xi->](planet){\smitem};
549 }{%false

```

```

550 \pgfmathtruncatemacro{\xj}{\xi-1}
551 \pgfmathtruncatemacro{\angle}{360/\actualnumitem*\xj}
552 \edef\col{\@nameuse{color@\xj}}
553 \node[satellite, smvisible on=<\xi->] (satellite\xi)
554 at (\angle:\distanceplanetsatellite) {\smitem };
555 \draw[->,connection planet satellite, smvisible on=<\xi->]
556 (planet) -- (satellite\xi);
557 }%
558 }%
559 \end{tikzpicture}
560 }{}%end-constellation diagram
561 \ifstrequal{#1}{connected constellation diagram}{% true-connected constellation diagram
562 \begin{tikzpicture}[every node/.style={align=center}]
563 \foreach \smitem [count=\xi] in {#2}{\global\let\maxsmitem\xi}
564 \pgfmathtruncatemacro\actualnumitem{\maxsmitem-1}
565 \foreach \smitem [count=\xi] in {#2}{%
566 \ifnumequal{\xi}{1}{ %true
567 \node[planet,smvisible on=<\xi->] (planet){\smitem};
568 }{%false
569 \pgfmathtruncatemacro{\xj}{\xi-1}
570 \pgfmathtruncatemacro{\angle}{360/\actualnumitem*\xj}
571 \edef\col{\@nameuse{color@\xj}}
572 \node[satellite,smvisible on=<\xi->] (satellite\xj)
573 at (\angle:\distanceplanetsatellite) {\smitem };
574 }%
575 }%
576 \foreach \smitem [count=\xi] in {#2}{%
577 \ifnumgreater{\xi}{1}{ %true
578 \pgfmathtruncatemacro{\xj}{\xi-1}
579 \edef\col{\@nameuse{color@\xj}}
580 \pgfmathtruncatemacro{\xk}{mod(\xj,\actualnumitem) +1}
581 \pgfmathtruncatemacro{\smvisible}{\xi+1}
582 \path[connection planet satellite,smvisible on=<\smvisible->]
583 (satellite\xj) edge[bend right] (satellite\xk);
584 }{}
585 }%
586 \end{tikzpicture}
587 }{}%end-connected constellation diagram
588 \ifstrequal{#1}{priority descriptive diagram}{% true-priority descriptive diagram
589 \pgfmathparse{subtract(\priorityarrowwidth,\priorityarrowheadextend)}
590 \pgfmathsetmacro\priorityticksize{\pgfmathresult/2}
591 \pgfmathsetmacro\arrowtickxshift{(\priorityarrowwidth-\priorityticksize)/2}
592 \begin{tikzpicture}[every node/.style={align=center}]
593 \foreach \smitem [count=\xi] in {#2}{\global\let\maxsmitem\xi}
594 \foreach \smitem [count=\xi] in {#2}{%
595 \edef\col{\@nameuse{color@\xi}}
596 \pgfmathtruncatemacro\smvisible{\xi+1}
597 \node[description,drop shadow={smvisible on=<\smvisible->,smvisible on=<\smvisible->}]
598 (module\xi) at (0,0+\xi*\descriptiveitemsep) {\smitem};
599 \draw[line width=\prioritytick,\col,smvisible on=<\smvisible->]

```

```

600 ([xshift=-\arrowskip pt]module\xi.base west)--
601 ($([xshift=-\arrowskip pt]module\xi.base west)-(\priorityticks pt,0)$);
602 }%
603 \coordinate (A) at (module1);
604 \coordinate (B) at (module\maxsmitem);
605 \CalcHeight(A,B){heightmodules}
606 \pgfmathadd{\heightmodules}{\priorityarrowheightadvance}
607 \pgfmathsetmacro{\distancemodules}{\pgfmathresult}
608 \pgfmathsetmacro{\arrowskip}{\priorityarrowwidth/2}
609 \begin{pgfonlayer}{background}
610 \node[priority arrow] at ([xshift=-\arrowskip pt]module1.south west){};
611 \end{pgfonlayer}
612 \end{tikzpicture}
613 }{}% end-priority descriptive diagram
614 }% end-no value 1
615 }% end-command

```